PROJECT MANUAL FOR:
UNIVERSITY OF MISSOURI TEACHING HOSPITAL – CCA & TH EMERGENCY POWER MODIFICATIONS

PROJECT NUMBER: CP210961

AT
UNIVERSITY OF MISSOURI
COLUMBIA, MISSOURI

FOR:

THE CURATORS OF THE UNIVERSITY OF MISSOURI

PREPARED BY:

Burns & McDonnell Engineering Company, Inc.
Reid DeBaun
9400 Ward Parkway
Kansas City, MO 64114
816-333-9400

DATE: July 29, 2021

PROJECT MANUAL FOR:
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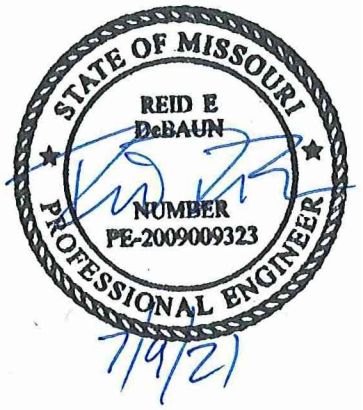
Kansas City, MO 64114
816-333-9400

DATE: July 29, 2021

I hereby certify that these Drawings and/or Specifications have been prepared by me, or under my supervision. I further certify that to the best of my knowledge these Drawings and/or Specifications are as required by and in compliance with Building Codes of the University of Missouri.

Signature: _____



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DIVIIONS 33 UTILITIES (NOT USED)

END OF SECTION

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CAMPUS FACILITIES

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

ADVERTISEMENT FOR BIDS

Sealed bids for:

VARIOUS LOCATIONS –
TH & CCA EMERGENCY POWER MODIFICATIONS
UNIVERSITY OF MISSOURI
COLUMBIA, MISSOURI
PROJECT NUMBER: CP210961 CONSTRUCTION ESTIMATE $1,662,000 - $1,847,000

will be received by the Curators of the University of Missouri, Owner, at Campus Facilities, Planning, Design & Construction, Room L100 (Front Reception Desk), General Services Building, University of Missouri, Columbia, Missouri 65211, until 1:30 p.m., C.T., August 19, 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 should be directed to Reid DeBaun with Burns & McDonnell Engineering Company, Inc. at (816) 349-6701 or rdebaun@burnsmcd.com. Questions regarding commercial conditions should be directed to Brad Rackers at (573) 884-7086 or rackersba@missouri.edu.

A prebid meeting will be held at 10:00 a.m., C.T., August 5, 2021 in the General Services Bldg., Rm 194B, University of Missouri, Columbia, Missouri, followed by a walk-through at the site. All interested bidders are invited to attend this meeting. A walk-through of the project may be scheduled by contacting the Prebid Inspection Guide at (573) 882-2228 or mucfpmprebidinspectionguides@missouri.edu. A 24 – 48 hour advance notice is required for all walk-through request.

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 and 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: July 29, 2021

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

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SECTION 1.A

BID FOR LUMP SUM CONTRACT

Date:_____

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

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

1. Bidder, in compliance with invitation for bids for construction work in accordance with Drawings and Specifications prepared by Burns & McDonnell Engineering, Inc., entitled "CCA & TH EMERGENCY POWER MODIFICATIONS", project number CP210961, dated July 9, 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 recircuit all existing electrical conductors in existing ductbanks between Gasoline Alley and GE08 to alternate and/or temporary power sources, replace existing pullboxes in Gasoline Alley and GE08, recircuit (5) five transfer switches from the CCA generator plant to a temporary generator source, remove existing CCA feeder to and equipment in the Teaching Hospital electrical room GE08A, and provide permanent power connection from Teaching Hospital to existing to remain equipment in GE08 & GE08A. Additionally, re-circuit (1) one critical power distribution panel, Hybrid OR, and CT-1E17 from the CCA generator plant to the Teaching Hospital generator plant, add critical power transfer switch and associated power distribution, and re-circuit one of the existing isolation panels in each of the operating rooms to the new critical power transfer switch power source; all as indicated on the Drawings and described in these Specifications for sum of:

_____

_____DOLLARS ($_____).

b. Additive Alternate Bids: (Not Used)

c. Unit Prices: (Not Used)

d. Allowance: (Not Used)

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 365 (three-hundred sixty-five) calendar days from receipt of aforementioned documents. Fifteen (15) calendar days have been allocated in construction schedule for receiving aforementioned documents from Bidder.

b. Commencement - Contractor agrees to commence work on this project after the "Notice to Proceed" is issued by the Owner. "Notice to Proceed" will be issued within seven (7) calendar days after Owner receives properly prepared and executed Contract documents listed in paragraph 4.a. above.

c. Liquidated Damages – (Not Used)

d. Refer to SPECIAL SCHEDULEING REQUIREMENTS in SPECIAL CONDITIONS for specific scheduling of the following activities:

(1) Special work times
(2) Incidental Floor Work (work in other occupied spaces for utility tie-ins)
(3) Crane work
(4) Utility Shut-downs, Outages and Tie-ins
(5) Refuse / trash removal and Materials Delivery

5. SUBCONTRACTOR LIST:

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

NOTE: Failure to list subcontractors for each category of work identified on this form or listing more than one subcontractor for any category of work without designating the portion of work performed by each shall be grounds for rejection of bid. List name, city, and state of designated subcontractor, for each category of work listed in Bid For Lump Sum Contract. If work within a category will be performed by more than one subcontractor, Bidder shall provide name, city, and state of each subcontractor and specify exact portion of work to be performed by each. If acceptance/non-acceptance of Alternates will affect designation of a

subcontractor, Bidder shall provide information, for each affected category, with this bid form. If Bidder intends to perform any designated subcontract work by using Bidder's own employees, then Bidder shall list their own name, city, and state. The bidder may petition the Owner to change a listed subcontractor only within 48 hours of the bid opening. See Information For Bidders Section 16 List of Subcontractors for requirements.

Work to be performed	Subcontractor Name,	City, State

Certified Fire Stop Contractor _____

Electrical Contractor _____

6. SUPPLIER DIVERSITY PARTICIPATION GOALS

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

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

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

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

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

7. BIDDER'S ACKNOWLEDGMENTS

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

b. Bidder agrees that bid shall not be withdrawn for a period of ninety(90) days after scheduled closing time for receipt of bids.

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

d. Accompanying the bid is a bid bond, or a certified check, or an irrevocable letter of credit, or a cashier's check payable without condition to "The Curators of the University of Missouri" which is

an amount at least equal to five percent (5%) of amount of largest possible total bid herein submitted, including consideration of Alternates.

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

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

8. BIDDER'S CERTIFICATE

Bidder hereby certifies:

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

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

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

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

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

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

9. BIDDER'S SIGNATURE

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

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

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UNIVERSITY OF MISSOURI
BIDDER'S STATEMENT OF QUALIFICATIONS

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

1. Company Name_____

   Phone# _____ Fax #:_____

   Address _____

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

_____

_____

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

_____

_____

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

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

12. List banking references.

_____

_____

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

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

Dated at _____ this _____ day of _____ 20____

_____
Name of Organization

_____
Signature

_____
Printed Name

_____
Title of Person Signing

END OF SECTION

SUPPLIER DIVERSITY COMPLIANCE EVALUATION FORM

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

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

I. Project:

_____

II. Name of General Contractor:_____

III. Name of Diverse Firm:_____

Address:_____

Phone No.:_____ Fax No.:_____

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

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

Base Bid:_____

_____

_____

_____

_____

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

Base Bid:_____

Alternate(s), (Identify separately):_____

_____

_____

_____

_____

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

Yes _____ No _____

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

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

_____

_____

_____

_____

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

Yes _____ No _____ If yes, please attach letter.

Signature: _____

Name: _____

Title: _____

Date: _____

APPLICATION FOR WAIVER

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

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

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

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

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

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

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

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

_____

_____

_____

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

_____

_____

_____

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

_____

_____

_____

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

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

Signature_____

Name_____

Title_____

Company_____

Date_____

AFFIDAVIT

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

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

Signature _____

Name _____

Title _____

Date _____

Corporate Seal (where appropriate)

Date _____

State of _____

County of _____

On this _____ day of _____, 19_,

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

_____

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

(Seal)

Notary Public _____

Commission expires _____

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AFFIDAVIT FOR AFFIRMATIVE ACTION

State of Missouri)
) ss.
County of)

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

_____

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

My commission expires _____, 19_____.

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CERTIFYING SUPPLIER DIVERSITYAGENCIES

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

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

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

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

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

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

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

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

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

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

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

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

Minority Newspapers

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

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

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

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

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

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

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

AFFIDAVIT OF SUPPLIER DIVERSITY PARTICIPATION

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

1. Diverse Firm:_____

   Contact Name: _____

   Address:_____

   Phone No.:_____ E-Mail:_____

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

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

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

   Certification Number:_____

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

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

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

General Contractor:_____ Diverse Firm: _____

Signature: _____ Signature: _____

Name: _____ Name: _____

Title: _____ Title: _____

Date: _____ Date: _____

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

.

Contractor: _____ Diverse Firm: _____

Signature: _____ Signature: _____

Name: _____ Name: _____

Title: _____ Title: _____

Date: _____ Date:_____

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University of Missouri

INFORMATION FOR BIDDERS

Page No.

1. Contract Documents

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

2. Bidder Obligations

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

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

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

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University of Missouri

General Conditions

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TABLE OF ARTICLES

ARTICLE 1
GENERAL PROVISIONS

1.1 Basic Definitions

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

1.1.1 Owner

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

1.1.2 Contracting Officer

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

1.1.3 Owner's Representative

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

1.1.4 Architect

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

1.1.5 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 July 9, 2021 – "CCA & TH Emergency Power Modifications".

b. Architect & Engineer
Burns & McDonnell Engineering, Inc.
9400 Ward Parkway
Kansas City, MO 64114
(816) 333-9400

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

2. SPECIAL SCHEDULING REQUIREMENTS

a. Special scheduling requirements supplemental to the bid form

(1) Normal working hours are defined as weekdays between the hours of 6:00 a.m. and 5:00 p.m.

(2) Night hours are defined as Monday through Thursday, after 5:00 p.m. and before 6:00 a.m. Noisy work must stop between the hours of 9:00 p.m. and 6:00 a.m.

(3) Weekend hours are defined as after 5:00 p.m. on Friday until 6:00 a.m. Monday

(4) Excessive Noisy Work hours – All interior concrete demolition work shall occur between 6:00 a.m. and 10:00 a.m. Such work shall be coordinated and approved at least 24 hours in advance with Owner's Representative.

(5) Utility outages must be coordinated with Owner's Representative with a minimum of 14 days notice. Some feeders may be acceptable to be combined into a single outage while other feeders may require individual outages. Outages may only occur between the hours of **10:00 p.m. Thursday and 4:00 a.m. Friday** unless approved by Owner's Representative.

b. Crane Work – All crane work associated with this project must be scheduled. This scheduling shall be coordinated and approved at least fourteen (14) calendar days in advance with Owner's Representative so that sufficient notification can be made to Owner's personnel. Coordinate location of crane with Owner'

c. Utility Shut-Downs, Outages, and Tie-ins – Contractor shall submit a Utility Outage Request Form including a written plan outlining the required shutdowns,

outages, and tie-ins fourteen (14) calendar days prior to starting the work.

a. Contractor shall implement a "Fire Watch" during, at a minimum, the following conditions:

i. Fire Alarm System out of service for more than four (4) hours in a 24-hour period

ii. Fire Sprinkler System out of service for more than ten (10) hours in a 24-hour period

iii. Fire Pump out of service for more than ten (10) hours in a 24-hour period

Where utilized, fire watches (personnel) shall be provided with not less than one approved means for notification of the fire department and their only duty shall be to perform constant patrols of the protected premises and keep watch for fire.

A log shall be maintained identifying personnel performing fire watch duties and time period(s) assigned to the individual(s).

d. Refuse/Trash Removal and Material Delivery:

a. Contractor can use the loading dock elevator between the hours of 6:00 p.m. and 10:00 p.m. or as directed by Owner's Representative. The Owner has the right to request the Contractor provide vinyl wall protection (at Contractor's expense) on the elevator walls if damage is occurring.

b. Contactor can use the areaway / exterior stairwell located south of the ED entrance for delivery and removal of large and heavy items between the hours of 4:00 a.m. and 10:00 a.m. with approval from Owners Representative. Use of crane or boom truck requires a minimum of 72 hours notice.

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 replacing pullboxes in Gasoline Alley and GE08, and re-circuiting Teaching Hospital loads from the CCA electrical systems to the Teaching Hospital electrical systems.

(2) Demolition shall consist of removal of existing electrical services from CCA.
(3) Architectural work shall consist of firestopping new penetrations.

4. LOCATION

Work shall be performed under this Contract on campus of the University of Missouri - Columbia, at the University of Missouri Teaching Hospital

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 furnish explanatory and changed Drawings in pdf format to Contractor as issued during project.

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

6. SUBMITTALS

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

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

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

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

(a) Project Title and Location
(b) Project Number
(c) Supplier's Name
(d) Manufacturer's Name
(e) Contract Specification Section and Article Number
(f) Contract Drawing Number

(g) Acrobat file name: Spec Section_Times Submitted-Spec Title: 033000 _01-Cast In Place Concrete.pdf

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

d. The Contractor shall submit to the Architect one (1) pdf copy uploaded to Projex4 site of all required Operating Instructions and Service Manuals for the Architect's and the Owner's sole use prior to completing 50% of the adjusted contract. Payments beyond 50% of the contract amount may be withheld until all Operating Instructions and Service Manuals are received as referenced in the accompanying Operating Instructions and Service Manual Log at the end of this section (1.E.4).

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

7. NOTIFICATION

Before beginning Demolition Work or service outages, the Contractor shall provide, at minimum, fourteen (14) days 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) No parking permits will be issued for this project.

(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) Sidewalk(s) and Hardscape – Parking/driving on hardscapes is strictly prohibited unless specifically directed by the Owner's Representative

through the MU sidewalk permitting process. Restricted use permits will be limited to activities that are constrained by an absolute need to access from a sidewalk. Such activities shall be considered the exception and not the norm. Adequate signage, fencing and alternate routes must be provided in the immediate and adjacent areas.

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

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

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

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

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

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

e. Restroom: Existing toilet facilities within Project Limits or Restrooms designated by the Owner's Representative for use by the Contractor will be available. Failure of the Contractor to maintain restrooms in a clean condition will be cause for the

Contractor's discontinued use of the restroom.

f. The use of tobacco products is prohibited at the University of Missouri and all properties owned, operated, leased or controlled by the University of Missouri. Violation of the policy is defined as the use of 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.

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

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

all “permit required spaces”.

The Contractor shall notify the Owner’s Representative if 1) conditions change resulting in a non-permit required confined space being reclassified to a “permit required confined space” after evaluation of the space by a competent person; 2) a space previously thought to be non-permit required space is classified as a “permit required confined space”; or 3) during the course of construction a “permit required confined space” is created after evaluation by a competent person.

The Contractor shall submit to the Owner’s Representative a copy of the cancelled confined space entry permit and a written report summarizing the permit space program followed and all hazards confronted or created during entry operations. This information shall be submitted within one week of cancelling the permit.

9. PROTECTION OF OWNER'S PROPERTY

a. The Contractor shall be responsible for repair of damage to building exterior and interior, drives, curbs, streets, walks, grass, shrubbery and trees, which was caused by workmen or equipment employed during progress of work. All such repairs shall be made to satisfaction of the Owner's Representative, at no cost to the Owner, or reimburse the Owner if the Owner elects to make repairs. For landscape damage, the Owner shall make such repairs. Compensation for these repairs shall be determined by the Owner's Representative using the "Valuation of Landscape Trees, Shrubs, and other Plants" as published by the International Society of Arboriculture, as last revised.

b. Construction Project Fencing:

(1) Fencing will not be required as a part of work.

c. Preserving and Protecting Existing Vegetation: (Not Used)

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 of <u>any item</u> described in the Contract Documents will be <u>allowed only prior to the receipt of bids</u> provided that a request for approval has been received by both the Architect and the Owner at least ten calendar days prior to the date for receipt of Bids. To be considered, bidder’s proposal shall include a complete description of the proposed substitution and/or equal and a comparison of significant qualities of the proposed substitution and/or equal with those specified including drawings, performance and test data, and other information necessary for an evaluation. The Architect's decision on the approval or disapproval of a proposed substitution and/or equal shall be final.

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

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

Item	Specification Section
Automatic Transfer Switches	263600

11. CODES AND STANDARDS

The Contractor shall comply with applicable codes and standards as listed in General Conditions. All applicable codes and standards referenced in the Construction Documents shall also apply.

12. PERMITS

Permits and inspection for work on UM property are required.

a. The owners Representative shall secure University Authority Having Jurisdiction building permits required for the project and shall provide a list of required inspection to the Contractor.
   i. The Contractor shall coordinate and provide reasonable scheduling and access to the Work for the Owner's Inspection.
   ii. Re-inspection of work as a result of either failed inspection or work not ready as scheduled may be at the Contractor's expense.

b. The Contractor shall comply with applicable codes and standards as listed in the Contract Documents, General Conditions, and the Healthcare Construction Guidelines.

c. All permits, including, but not limited to Infection Control, Hot Work, Fire Alarm, Energized Work and HVAC interruption shall be coordinated and scheduled with the Owner's Representative or designee prior to commencement of the work.

d. Permits for Boilers, Water Heaters and Pressure Vessels require an installation permit from the State of Missouri. Before commencement of Boilers, Water Heaters or Pressure Vessels the Contractor must obtain an installation permit from the State of Missouri, Division of Fire Safety, Boiler and Pressure Unit as required by 11 CSR 40-2.010 through 11 CSR 40-2.065. The permit applications are available at http://www.dfs.dps.mo.gov/programs/bpv/.

13. SPECIALTIES (Not Used)

14. PRE-BID INSPECTION

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

15. ROOF WARRANTY REQUIREMENT (Not Used)

16. MODIFICATIONS TO INFORMATION TO BIDDERS

a. Information to Bidders:

(1) Referenced Information to Bidders, Page IFB/6.
Add new Article 15.9.2 as follows:

15.9.2.1 Within 48 hours of the receipt of bids, the apparent low bidder shall submit to the Director of Facilities Planning and Development an "Affidavit of Supplier Diversity Participation" for every diverse subcontractor or supplier the bidder intends to award work to on the contract. The affidavit will be signed by both the bidder and the diverse firm.

17. MODIFICATION TO INFORMATION FOR BIDDERS: BIDDERS STATEMENT OF QUALIFICATIONS (Not Used)

18. MODIFICATIONS TO GENERAL CONDITIONS (Not Used)

19. PROJECT SCHEDULING

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.

Option 3: Contractor Schedule – Contractor is responsible for the schedule and he may provide with in-house personnel or hire a third party scheduling consultant. See Contractor Schedule Specification included in these documents.

20. PROJECT COORDINATION

a. Coordinate construction operations included in various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections that depend on each other for proper installation, connection, and operation.

(1) Schedule construction operations in the sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

(2) Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.

(3) Make provisions to accommodate items scheduled for later installation.

21. PROJECT PARTNERING (Not Used)

22. VALUE ENGINEERING (Not Used)

23. BUILDING SYSTEM COMMISSIONING

a. Contractor shall provide all personnel and equipment required to complete the commissioning activities referenced in the Commissioning Plan. The requirements of the commissioning plan shall be completed in their entirety before substantial completion and submitted as referenced in the Closeout Log.

b. The contractor shall designate a competent person to act as the contractor's commissioning coordinator. The commissioning coordinator is responsible for planning, scheduling, coordinating, conducting and verifying all commissioning activities required by the commissioning plan and ensuring all building systems are complete, operable and ready for use by the Owner. At a minimum, building ventilation systems, chilled/hot water generation systems, hydronic distribution systems, power distributions systems and fire detection and alarm systems, as applicable.

25. COST BREAKOUT FOR OWNER'S ACCOUNTING PURPOSES (Not Used)

26. PROJECT MANAGEMENT/COMMUNICATION REQUIREMENTS

a. The Contractor shall be represented at the site by a competent Project Manager and a full-time, competent superintendent with no other assigned duties or responsibilities from the beginning of the work until its final acceptance, unless otherwise permitted by the Owner's Representative. The superintendent for the Contractor for the general building work shall exercise general supervision over all subcontractors of any tier engaged on the work with decision-making authority of the Contractor.

b. The Contractor shall use a current industry standard (Primavera, Microsoft Project, etc.) project scheduling software which provides as a minimum: Critical paths, milestones, estimated and actual start and completion dates, scheduled vs. actual progress, and detailed task and subtask breakdown. The following schedules shall be provided as a minimum and kept current: Overall project schedule, four- (4-) week look-ahead, and two- (2-) week look-ahead.

c. The Contractor shall furnish on-site Internet access for use by his Project Manager and superintendent. The contractor shall utilize the Owner's secure information sharing system for submittals, construction payment process, change orders, RFI's/ASI's, O&M manuals and all other project manual requirements as directed by the Owner's Representative. Field staff are also required to utilize this software as directed by the Owner's Representative.

d. The Contractor shall provide at least two (2) job site FM handheld communication radios (walkie-talkies) for use by the on-site superintendent and the Owner's Representative or the Contractor shall provide his on-site superintendent with a handheld cellular telephone.

27. SAFETY PRECAUTIONS AND PROGRAMS

a. The Bidder's Statement of Qualifications includes a requirement that the Bidder provide its Worker's Compensation Experience Modification Rates (EMR) and Incidence Rates for the three recent years. The Bidder shall also include the EMR and Incidence Rates of listed major subcontractors on the Bid for Lump Sum Contract. If the EMR exceeds 1 or the Incidence Rate exceeds 13, the Contractor or major subcontractor shall take additional safety measures including, but not limited to, developing a site specific safety plan and assigning a Safety Manager to the Project to perform inspections on a schedule as determined acceptable by the Owner with written reports to be submitted to the Owner. The Owner reserves the right to reject a Bidder or major subcontractor whose rates exceed these stated rates.

b. The contractor shall provide Emergency Contact Information for the Contractor's on-site staff and home office management as well as contact information for all major subcontractor personnel. This information shall contain business and personal phone numbers for each individual for contact during or after hours in case of an emergency. This information shall be submitted within 15 days of the Notice to Proceed.

28. HOT WORK PERMITTING AND GENERAL REQUIREMENTS

Hot work Requirements: The contractor shall comply with the following hot work requirements and the requirements of the International Fire Code and 2014 NFPA 51B.

a. Hot work shall be defined as any work involving burning, welding, grinding, cutting, or similar operations that are capable of initiating fires or explosions.

a. The Contractor shall utilize the hot work permit decision tree and permit provided in the 2014 NFPA 51B for all Hot Work operations.

b. A hot work permit shall be used on all hot work performed outside a designated hot work area. The hot work permit shall be posted and clearly visible within proximity of the hot work area. The hot work permit authorizing individual (PAI) shall be as designated by the Contractor.

c. Notify the Owner's Representative 24 hours prior to starting hot work in buildings with operational fire alarm or fire suppression systems. The Owner's Representative will coordinate the appropriate system outage with Campus Maintenance personnel.

d. Unless otherwise instructed by the Owner's Representative, the Contractor shall post a copy of each completed hot work permit to the Owner's project management file system the following business day.

29. GENERAL REQUIREMENTS FOR CRANE AND HOISTING OPERATIONS

All crane and hoisting operations shall be performed in compliance with OSHA 29 CFR

1926. All Operators, riggers, and signal persons must have the proper qualifications and training necessary to perform the intended hoisting activities for this project.

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

b. Submittal requirements:

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

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

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

30. CONSTRUCTION WASTE MANAGEMENT

The goal of Construction Waste Management is to divert waste from the sanitary landfill. This shall be accomplished through reuse, recycling and/or salvage of non-hazardous construction and demolition debris to the greatest extent practical. Track and report all efforts related to reuse, recycling and/or salvage materials from the project (including clean fill material). Report all material types and weights, where material was diverted, type of diversion, documentation of diversion (eg: waste or recycling tickets), and applicable dates. In order to calculate the diversion percentage, total weights of all non-hazardous landfill material must be reported. This information shall be updated monthly utilizing the Construction Waste Management Worksheet provided here: http://www.cf.missouri.edu/cf/pdc/contractor_information. Copies of all applicable receipts, tickets and tracking logs shall be uploaded to the Owner's information sharing website or reported as required by the Construction Project Manager.

(A summary worksheet is required prior to substantial completion).

31. WARRANTY WALKTHROUGH

Contractor shall attend a walk-thru with the Owner at 11 months after acceptance to review and document any warranty items to be addressed as part of the 12 month warranty stated in article 3.1 of the General Conditions.

END OF SECTION

Option #3 – Contractor Schedule

1. GENERAL
   a) Time is of the essence for this contract.
      The time frames spelled out in this contract are essential to the success of this project. The University understands that effective schedule management, in accordance with the General Conditions and these Special Conditions is necessary to insure to that the critical milestone and end dates spelled out in the contract are achieved.
   b) Related Documents
      Drawings and general provisions of the Contract, including General Conditions' Article 3.17 shall apply to this Section.
   c) Stakeholders
      A Stakeholder is anyone with a stake in the outcome of the Project, including the University, the University Department utilizing the facility, the Design Professionals, the Contractor and subcontractors.
   d) Weather
      (1) Contractor acknowledges that there will be days in which work cannot be completed due to the weather, and that a certain number of these lost days are to be expected under normal weather conditions in Missouri.
      (2) Rather than speculate as to what comprises "normal" weather at the location of the project, Contractor agrees that it will assume a total of 44 lost days due to weather over the course of a calendar year, and include same in its as planned schedule. For projects of less than a calendar year, lost weather days should be prorated for the months of construction in accordance with the following schedule.
      (3) Anticipated weather days for allocation/proration only. For projects lasting 12 months or longer, the 44 days per year plus whatever additional months are included will constitute normal weather.

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

2. SCHEDULING PROCESS
   a) The intent of this section is to insure that a well-conceived plan, that addresses the milestone and completion dates spelled out in these documents, is developed with input from all stakeholders in the project. Input is limited to all reasonable requests that are consistent with the requirements of the contract documents, and do not prejudice the Contractor's ability to perform its work consistent with the contract documents.
      Further, the plan must be documented in an understandable format that allows for each stakeholder in the project to understand the plan for the construction and/or renovation contained in the Project.

   b) Contractor Requirements
      (1) Schedule Development
      Contractor shall prepare the Project Schedule using Primavera P3 or Oracle P6.
      (2) Schedule Development
      Within 4 weeks of the NTP, contractor shall prepare a schedule, in CPM format, that reflects the contractor's and each 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 and

(iii) Review the resultant critical and near critical paths to determine any impact of the occurrences encountered over the last month.

(4) Schedule Narrative

After finalization of the update, the Contractor will prepare a Narrative that describes progress for the month, impacts to the schedule and an assessment as to the Contractor's entitlement to a time extension for occurrences beyond its control during the month and submit in accordance with this Section.

(5) Progress Meetings

(a) Review the updated schedule at each monthly progress meeting. Payments to the Contractor may be suspended if the progress schedule is not adequately updated to reflect actual conditions.

(b) Submit progress schedules to subcontractors to permit coordinating their progress schedules to the general construction work. Include 4 week look ahead schedules to allow subs to focus on critical upcoming work.

3. CRITICAL PATH METHOD (CPM)

a) This Section includes administrative and procedural requirements for the critical path method (CPM) of scheduling and reporting progress of the Work.

b) Refer to the General and Special Conditions and the Agreement for definitions and specific dates of Contract Time.

c) Critical Path Method (CPM): A method of planning and scheduling a construction project where activities are arranged based on activity relationships and network calculations determine when activities can be performed and the critical path of the Project.

d) Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall project duration.

e) Network Diagram: A graphic diagram of a network schedule, showing the activities and activity relationships.

f) Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling, the construction project. Activities included in a construction schedule consume time and resources.

g) Critical activities are activities on the critical path.

h) Predecessor activity is an activity that must be completed before a given activity can be started.

i) Milestone: A key or critical point in time for reference or measurement.

j) Float or Slack Time: The measure of leeway in activity performance. Accumulative float time is not for the exclusive use or benefit of the Owner or Contractor, but is a project resource available to both parties as needed to meet contract milestones and the completion date.

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

l) Weather: Adverse weather that is normal for the area must be taken into account in the Contractor's Project Schedule. See 1.d.3, above.
m) Force Majeure Event: Any event that delays the project but is beyond the control and/or contractual responsibility of either party.
n) Schedule shall including the following, in addition to Contractor's work.
    (1) Phasing: Provide notations on the schedule to show how the sequence of the Work is affected by the following:
        (a) Requirements for phased completion and milestone dates.
        (b) Work by separate contractors.
        (c) Work by the Owner.
        (d) Coordination with existing construction.
        (e) Limitations of continued occupancies.
        (f) Uninterruptible services.
        (g) Partial occupancy prior to Substantial Completion.
        (h) Area Separations: Use Activity Codes to identify each major area of construction for each major portion of the Work. For the purposes of this Article, a "major area" is a story of construction, a separate building, or a similar significant construction element.

4. TIME EXTENSION REQUESTS
    a) Refer to General Conditions of the Contract for Construction, Article 4.7 Claims for Additional Time.
    b) Changes or Other Impacts to the Contractor's Work Plan
    The Owner will consider and evaluate requests for time extensions due to changes or other events beyond the control of the Contractor on a monthly basis only, with the submission of the Contractor's updated schedule, in conjunction with the monthly application for payment. The Update must include:
        (1) An activity depicting the event(s) impacting the Contractors work plan shall be added to the CPM schedule, using the actual start date of the impact, along with actually required predecessors and successors.
        (2) After the addition of the impact activity(ies), the Contractor will identify subsequent activities on the critical path, with finish to start relationships that can be realistically adjusted to overlap using good, standard construction practice.
            (a) If the adjustments above result in the completion date being brought back within the contract time period, no adjustment will be made in the contract time.
            (b) If the adjustments above still result in a completion date beyond the contract completion date, the delay shall be deemed excusable and the contract completion date shall be extended by the number of days indicated by the analysis.
            (c) Contractor agrees to continue to utilize its best efforts to make up the time caused by the delays. However the Contractor is not expected to expend costs not contemplated in its contract, in making those efforts.

    c) Questions of compensability of any delays shall be held until the actual completion of the project. If the actual substantial completion date of the project based on excusable delays, excluding weather delays, exceeds the original contract completion date, AND there are no delays that are the responsibility of the contractor to consider, the delays days shall be considered compensable. The actual costs, if any, of the Contractor's time sensitive jobsite supervision and general conditions costs, shall be quantified and a change order issued for these costs.

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SHOP DRAWING AND SUBMITTAL LOG
Project: CCA & TH EMERGENCY POWER MODIFICATIONS
Contractor:

Section	Description	Submittal Number	Date Submitted	Review Status	Date Returned	Remarks		Resubmittal Date	Returned Date	Review Status
DIVISION 26 ELECTRICAL										
26 0510 Basic Electrical Requirements	Coordination Drawings									
26 0519 Low-Voltage Electrical Power Conductors and Cables	Product Data									
	Feeder conductor takeoff used for procurement									
	Field Quality-Control Test Reports									
26 0529 Hangers and Supports for Electrical Systems	Delegated Design Submittal									
	Welding certificates									
26 0533 Raceways for Electrical Systems	Product Data									
26 0553 Electrical Identification	Product Data									
26 2213 Transformers	Product Data									
26 2416 Panelboards	Product Data									
26 2813 Fuses	Product Data									
26 2816 Circuit and Motor Disconnect Switches	Product Data									
26 3600 Transfer Switches	Product Data									
	Shop Drawings									
	Seismic Qualification Certificates									

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Project: CCA & TH EMERGENCY POWER MODIFICATIONS
Contractor:

Section	Description	Catalog Data	Wiring Diagrams	Installation Instructions	Service & Maintenance Instructions	Parts List & Availability	Performance Curves	Startup & Operating Instructions	Date Submitted	Date Returned	Submittal Status
26 2213	Operation and Maintenance Data - Transformers										
26 2416	Operation and Maintenance Data - Panelboards										
26 3600	Operation and Maintenance Data - Transfer Switches										

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Project: CCA & TH EMERGENCY POWER MODIFICATIONS
Contractor:

Section	Description	Contractor / Subcontractor	Date Rec'd	# of Copies	CPM Initials	Remarks
GC /3.14	Record Drawings					
GC /13.5.6	Final Affidavit of Supplier Diversity Participation for each Diverse firm					
SC/23	Executed commissioning plan w/ required documentation					
26 0510	Final installed feeder conductor sizes and lengths.					
26 0519	Low-Voltage Power Conductors & Cables					
	Field Quality-Control Test Reports					
	Infrared Scanning report					
26 0526	Grounding					
	Inspection Reports					
26 2213	Transformers					
	Field Test Data					
26 2416	Panelboards					
	Field Test Data					
26 3600	Transfer Switches					
	Field Quality-Control Test Reports					

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Section 1.E.1

Healthcare Construction Guideline

(Included for your information on Healthcare projects only)

SEPT 2017 Edition

Table of Contents

Section 1 Training Requirements

The purpose of the training requirements for contractors is to ensure that construction project work in and around the healthcare environment is managed in such a way to minimize health and safety risks associated with construction activities and that contractors know and understand their responsibilities.

Required Training

1. Contractor project managers, superintendents and subcontractor foremen will be required to attend the following training:
    - Minimum of One (1) hour training related to ***"Infection Control & Dust Barriers"*** and "***Healthcare Construction Training for Contractors".***
2. Contractor project managers, superintendents and subcontractor foremen have the responsibility for ensuring that contractor employees are knowledgeable of the training requirements and direct their employees and project work accordingly.
3. Contractors will be required to utilize the MU Hospital online **eMeditrack** system for initiating work requests of various types, examples may include infection control barriers, utility outage, various permits required.
4. Contractors are required to report in and sign in and out at the designated location per building location each work day upon arrival and exit of the work location.

Training Agenda

At a minimum the topics to be covered in the training include the following:

1. Construction Risk Assessment, Infection Control, ventilation, barrier plans and Interim Life Safety.
2. Contractor Training Requirements.

Documentation

1. All employees who receive training will be required to sign their name on a training acknowledgement form stating that they have been oriented to the training requirements.
2. Healthcare Safety and Infection Control Requirements will be in the project contract documents for further review as required.
3. **COMPLIANCE VIOLATIONS:** Contractors/Vendors who violate the requirements of this Guideline are subject to disciplinary action and removal from the project.

Section 2 Emergency Phone Numbers & Contact Information

Telephone contacts should be used by the contractor for emergency situations which may arise during the construction project. Contact Plan will be identified and coordinated at the project Pre-Construction Meeting by the owner's representative.

Section 3 Contractor Identification Badge

Contractors working in and around the MUHC facilities will be required to display and wear the ***"Contractor Identification Badge"*** and in accordance with the information displayed below. It is the responsibility of the contractor to provide the computer and color printer for reproduction of badges required. Consult the Owner's Representative for the electronic file.

Contractor ID Badge

1. Contractor is to issue badges to employees as required. (Contractor to validate employee with proof of ID).
2. Contractor to edit the information, print in color, cut out the badges, fold in the center and insert. Contractor will provide badge holders.
3. Contractor shall keep a roster/log of badged employees by trade/subcontractor at the project jobsite for reference by the Owners Representative.
4. All badges to be collected and returned to PD&C at the end of the project.
5. Any orientation required will be discussed at the pre-construction meeting with the Owner's Representative.
6. Contractor employees are to wear the badge on the upper chest facing forward unless approved otherwise for safety reasons.
7. All contractor superintendent and foreman shall attend "Healthcare Construction Training" and affix issued "T" sticker in the circle area on badge as shown. This will show evidence that the employee has completed training

8. The Badge document will be provided to the Contractor to make copies and distribute as required. See Page HCG 12.

Section 4 General Safety Requirements for Health Care Projects

The General Contractor and its Subcontractors are responsible for understanding, planning and implementing the following requirements in the management of the project.

1. Make sure shoes/boots and clothing are free of excessive dirt/debris before entering and leaving the construction area.
2. If you leave any dust/dirt or tracks in the occupied area of the healthcare facility, you must stop and clean them up immediately by using a HEPA filtered vacuum and/or a clean dampened floor mop with a UMTH hospital approved furnished cleaning solution.
3. Assure that all construction material, supplies and tools are cleaned and covered with a clean covering material while transporting through the healthcare facility.
4. Ensure that the carts and wheels on tool and supply carts as well as trash/demolition waste carts are properly wiped clean before leaving the construction area. Cleaning/wiping solutions are provided by the hospital and must be approved per direction of the Owner's Representative.
5. Staff and patients **ALWAYS** have priority and the **"Right of Way"** in the elevators and corridors.
6. Never use aerosol sprays or cleaning solvents that could dispense fumes, odors or cause potentially allergenic reactions or medical problems to susceptible patients, staff or visitors.

Section 5 Construction-Renovation-Maintenance Risk Assessment (CRMRA)

The ***"Construction-Renovation-Maintenance Risk Assessment" (CRMRA)*** planning process establishes criteria to be used and measures to be taken for the protection of patients, healthcare workers, visitors and contractors, from construction/renovation activities which could lead to infections or compromise existing life safety systems in the healthcare facility.

Once the Contractor is selected, they will be required, and the Subcontractors as applicable to participate in the ***"CRMRA"*** planning process for orientation of project requirements and help in identifying any additional project needs or risks prior to any contract construction work commencing.

The owner's representative will work with the contractor to coordinate and facilitate these ***CRMRA*** planning activities with MUHC engineering services, infection control department and others as required during the duration of the project.

Section 6 Construction – Renovation – Maintenance Infection Control Risk Mitigation Criteria

The ***"Construction–Renovation-Maintenance Infection Control Risk Mitigation Criteria" (CRMICRMC)*** is a process to evaluate construction projects for required interventions during construction in order to minimize Hospital Acquired Infections (HAI's), and controlling dispersal of air and/or water-borne infectious agents concealed within the building components.

All construction activities shall be defined and managed in such a way that occupant's exposure to dust, moisture and their accompanying hazards is limited.

1. ***Construction–Renovation-Maintenance Infection Control Risk Mitigation Criteria*** *and the* ***Construction–Renovation-Maintenance Infection Control Risk Mitigation Permit*** which will be used for all MUHC construction and renovation projects.
2. **Any work required outside the main project limits will require a NEW Infection Control Risk Assessment.**
3. The owner's representatives and Contractor will work together to coordinate the assessment and determine the requirements and permit.
4. The owner's representative will ensure that all required infection control interventions and needed life safety measures required for the project are in place by the contractor prior to starting work. (i.e. barrier walls, tacky mats, required exits, etc.)
5. The contractor shall follow all requirements to support the **"Construction – Renovation- Maintenance Infection Control Risk Mitigation Criteria".**
6. The contract documents and CRM IC Permit will provide requirements specific to the project.

7. *Work outside of construction limits.* Prior to contractor performing any work outside of construction limits, the owner's representative must be notified.
8. Contractors that violate the requirements of the "**Construction – Renovation- Maintenance Infection Control Risk Mitigation Criteria/Permit** will be removed from the project.

Section 7 Construction of Dust Barrier Walls

Infection control is the number one health concern in a construction project. Infection can occur when workers are not cautious about keeping dust, bacteria, mold, etc. from becoming airborne during the construction process. For these reasons, barrier walls are built to isolate dust and fumes in the construction site to separate the patient care and public areas of the healthcare facility.

Dust Barriers Walls and Contamination Reduction

1. A signed copy of the ***"CRM Infection Control Construction Permit"*** shall be kept at the job site at all times. Large AND small projects may have several ***"CRM Infection Control Construction Permits"*** issued as project phases, needs and assessments evolve.
2. Barriers are required to contain the ceiling envelope, chases, interstitial spaces, etc.
3. When access and exiting to the construction site can only be accomplished through a public area, the interior space of the construction site must be cleaned once every 8 – hour shift to control excessive dust and ventilation filtering issues. Debris shall be removed daily.
4. A temporary fire resistant 6 mil., polyethylene dust barrier is required to control dust while the rigid barrier is being constructed as well as at the end of the job during removal of the rigid barrier.
5. Contractors are responsible to ensure that barrier systems and walls are properly constructed, penetrations sealed and maintained for effectiveness for the duration of the project. Anytime polyethylene is used in a control barrier, it must be fire resistant, 6 mil. See ***"Approved Equipment and Product Information".***
6. Once barrier walls are built they are required to be cleaned or wiped down prior to the start of work.
7. Barrier doors and exits from the construction site must be installed with a closer and kept in good working order with positive latching.
8. Keep doors closed except when in use in order to minimize migration of dust and to maintain negative air pressure relationships.
9. Doors must have a seal/door sweep installed at the undercut and weather stripping around the metal frame to control the migration of dust from the construction site.
10. Doors in barrier walls which are not in use by the contractor to the public spaces must be sealed off and taped around the door, frame and threshold undercut, in order to minimize migration of dust and to maintain negative air pressure requirements.
11. If an elevator, dumb waiter, pneumatic tube system, stairway, linen chute, or any other chased or open type building system is located within the construction site, a barrier wall system will be required to be built around the open building system from deck to deck and properly sealed at top, bottom and sidewalls.
12. Upon completion of barriers and prior to beginning work, the contractor shall notify the owner's representative and healthcare construction compliance manager to coordinate an inspection and verify that the barrier wall meets requirements and that acceptable negative air pressure is being achieved.

Special Notes: 1. See ***"Barrier Wall Design Details"*** for additional requirements.
2. See section in this manual on ***"Ventilation and Negative Air Pressure Requirements"*** for additional requirements *when* building dust barrier systems and walls.
3. See section in this manual on ***"Approved Equipment and Product Information"*** .

Section 8 Ventilation and Negative Air Pressure Requirements

The first step is building of dust barrier walls to isolate the construction site from patient care and public areas of the healthcare facility to protect patients and the public from construction related dust, fumes and other activities. The effectiveness of barrier walls is minimal unless the construction site is also under negative air pressure. (i.e. air must flow from clean or public spaces into the dirty or construction site).

The following are the ***"Ventilation and Negative Air Pressure Requirements"*** which contractors shall strictly follow in the management and construction of their projects.

Negative Air Pressure Requirements

1. The contractor shall provide all necessary ***"Negative Air HEPA Filtered Ventilation Units"*** required for the negative air requirements of the construction area.
2. See section in this manual on ***"Approved Equipment and Product Information"*** for more information.
3. The contractor will work with the owner's representative to determine best methods and equipment set up requirements for the project.
4. The contractor shall run the ***"Negative Air HEPA Filtered Ventilation Unit"*** in the work zone location prior to starting any barrier wall construction or work.
5. ***"Negative Air HEPA Filtered Ventilation Units"***, may be connected to normal or emergency power and shall run continuously, 24/7. Critical areas of the healthcare facility may require the HEPA filtered ventilation units to be connected to emergency power only.
6. A secondary method to maintain negative air pressure is by using the hospitals exhaust system attached to the ***"Negative Air HEPA Filtered Ventilation Units"***. This process and installation must be approved by the owner's representative.
7. **Pre-Filters shall be changed at least twice weekly during demolition and drywall sanding and a minimum of once a week during other times.** This frequency requirement may be relaxed for lower risk projects and on prior approval from the owner's representative.
8. The contractor shall furnish and install the negative air-monitoring device to monitor daily negative air pressure ***-.01 inches of water column.*** See section in this manual on ***"Approved Equipment and product Information".***
9. The contractor shall record daily on the ***"Negative Air Pressure and Filter Change Log"*** the air pressure reading in the construction area to insure that appropriate negative air pressure is being maintained.
10. See ***"Negative Air Pressure and Filter Change Log"*** form at the end of this section.

Barrier Walls and Negative Air Ventilation

Special Infection Control Requirements and Interventions for Contractors When Working In (Surgical OR's, Sterile Processing, Bone Marrow Transplant)

Construction activities can lead to increased Aspergillus counts in the air and increased risk for Aspergillus infections in high risk patients. In an effort to minimize and contain dust, and lessen the possibility of microbial contamination during renovation work in high risk special care units, Interventions are typically initiated and maintained until the completion of the project. The owner's representative, MUHC infection control and engineering services departments will be involved in contractor orientation for project work procedures in high risk special care units.

Special work scheduling in these special care units may be a requirement of the project and contractor.

Negative Air Pressure and Filter Change Log

Project Name: _____

Location: _____

Date:	Time	Negative Air			Unit No.	Inspected By:	Actions Taken (Filter Change, Pre Filter, HEPA, Other)
		Yes	No	Pressure Reading			

Project Number: _____

Contractor to complete the **Negative Air Pressure and Filter Change Log** daily at the start of each work shift and maintain completed forms in the project safety file for future review. Post this log inside construction site entrance for use and review.

Pressure Relationship Illustration

-.0	20 - .0	10 0	.00 +.0	10 +.0	20

Negative Pressure ← Better **Minimum** Even **Pressure** Positive

Section 9 Interim Life Safety Measures Assessment (ILSM)

Interim Life Safety Measures (ILSM) are a series of administrative actions that must be taken to compensate temporarily for the hazards posed by existing NFPA Life Safety Code 101, 2014 edition deficiencies, other building code issues or construction activities. Examples of when construction activities require ILSM's to be implemented are as follows:

1. Fire alarm system, detection, and/or sprinkler system are impaired or disabled.
2. Normal exits or exit routes and/or exit lighting have been compromised.
3. Re-routing of traffic due to construction activities.
4. Temporary narrowing of the corridor.
5. Deficiencies in fire and/or smoke separations and systems caused by construction activities. (Changes to wall, door, dampers, penetrations, etc.)
6. Emergency lighting not compliant.
7. Major and minor construction/renovation in an occupied health care occupancy.
8. Hot work.

Whenever an ***"Interim Life Safety Measure"*** is identified for implementation during the construction project, there will typically be measures or actions required by both the MUHC engineering services department as well as the contractor.

The contractor has the responsibility prior to the beginning of work and throughout the project to become familiar with the ILSM in order to plan and identify what construction related activities will require an evaluation of ILSM's as noted in the ILSM. The ***"Interim Life Safety Measures Evaluation"*** is a required team effort.

Section 10 Noise and Vibration Control Management

Construction related noise and vibration control and mitigation measures are to be implemented when the contractor is working in and around healthcare facilities. The contractor shall work with the owner's representative to develop means and methods for controlling excessive noise and vibration during construction.

Section 11 Above Ceiling Work Permit

All contractors who need access above ceilings in the public areas of the healthcare facility and outside the approved construction site shall be required to obtain an ***"Above Ceiling Work Permit"*** from the owner's representative prior to disrupting or lifting out ceiling tiles. The contractor shall notify the owner's representative fourteen (14) days prior to the need for ceiling access in order to process and evaluate any special requirements of the permit.

General Requirements for Working above Ceilings ("Above Ceiling Permit Required")

1. The Construction-Renovation-Maintenance Infection Control Risk Mitigation Permit issued for the work activity will note specifics required for Barrier Types.
2. Any cable and wiring pulls through the healthcare facility which will require a ceiling disturbance must be approved in advance by obtaining an ***"Above Ceiling Work Permit"***.
3. Ceiling tiles must not be left displaced by the contractor if he walks away from the area unless the area has been contained by an approved ***"Dust Barrier"***.
4. If a ceiling tile is damaged by the contractor he should notify the owner's representative to acquire a new tile for replacement.
5. All debris shall be cleaned up by the contractor daily when working in cabling and electrical closets.
6. Pulling of communication cables in a patient care or other critical care areas will require special scheduling. Consult with the owner's representative for coordination.
7. When cables must be pulled in an active patient care unit, a dust partition must be used at the site of entry and exit of the cable.
8. The dust partition may be attached to the false ceiling because taking it to deck may interfere with the work.
9. The site of entry and exit of the cable or other above ceiling work must be HEPA vacuumed (ceiling tiles and pipes) before the work begins.

Section 12 Lock Out/Tag out Permit

The contractor shall give a minimum fourteen (14) working days) notice to the owner's representative for shutdown work on electrical systems or other critical utility systems which could significantly impact the healthcare facilities operations, **the contractor will be required to plan these "Lock Out/Tag Out" activities ten (14) days in advance.** Major utility shutdowns may require weeks of notice and planning. The contractor shall work with the owner's representative to identify these time planning requirements.

Section 13 Utility Systems Shutdown & Service Permit

The ***"Utility Systems Shutdown & Service Permit"*** is to be used when work on an existing utility system **may cause** a disruption within the MUHC facility.

"Utility Systems" shall be defined as any system that would hinder the delivery of patient care and hospital operations should the system be interrupted for any reason. Planning for this work usually requires a contingency plan by the healthcare facility management department to address any failure of the utility system.

Utility Shutdown

Any and all utility or system connections, shut-off, or interruptions must be scheduled with the owner's representative prior to commencement of the work. This work shall be defined as a ***"Utility Shutdown"*** and notice shall be made to the owner's representative to coordinate the request and facilitation.

Utility Service - (System must be worked live or energized)

In addition to utility system connection, shut-off, or interruption, the contractor must also schedule any work on existing utility systems that either **do not require interruption or cannot be interrupted** to accomplish the work. This type of work shall be defined as ***"Utility Service"*** and notice shall be made to the owner's representative. **The contractor shall give up to 14 working days' notice** to the owner's representative in order to properly plan and coordinate required activities.

All permits are to be posted at the job site location for the duration of the permit. When complete the contractor shall file the permits in the contractor job safety file for future review as may be required.

Section 14 Hot Work & Permit

Hot work shall be defined as welding, brazing, cutting soldering, grinding, or other activities which produce sparks or use flame which are capable of initiating fires or explosions.

All contractors performing construction, renovation and installation work for MUHC facilities are required to follow the requirements and provisions of **NFPA 51B** and the owner's representative procedures related to "Hot Work" and obtaining a ***"Hot Work Permit"***.

The following are the requirements for a contractor to obtain a ***"Hot Work Permit".***

1. Contractors shall contact the owner's representative two (2) days, forty eight (48) hours in advance to request a hot work permit. A request for complex projects which requires extensive planning on behalf of the owner's representative may require a longer notice period.
2. All hot work sites are inspected by the owner's representative using the requirements printed on the ***"Hot Work Permit".***
3. The owner's representative will issue a ***"Hot Work Permit"*** tag to be attached in the vicinity of the actual hot work being performed. Upon completion, the hot work tag shall be returned to the owner's representative.
4. ***"Hot Work Permits"*** will be issued for only one shift unless other arrangements have been made with owner's representative. All permits expire 30 minutes prior to the end of the shift.
5. If hot work cannot be completed within one work shift, the contractor is responsible for obtaining approval for a revised permit extension from the owner's representative. The contractor is responsible for meeting all the safety requirements required by the permit for any and all extensions granted.
6. The contractor shall be responsible for supplying a trained worker for the requirement of a fire watch during the actual hot work. The fire watch's only responsibility will be as a fire watch.

7. A fire watch shall be provided for 30 minutes following the completion of work, including during lunch and breaks by the contractor.
8. The contractor shall provide at a minimum a ten pound (10) ABC fire extinguisher that has a current, valid inspection tag.
9. A copy of the "***Hot Work Permit"*** shall be kept in the general contractors project file for future review as may be required.
10. The contractor shall upload completed Hot Work Permits to the owner's electronic construction document program (Projex 4) in the Hot Work Permit folder for the project not less than on a weekly basis or as instructed by the owner's representative.

Section 15 Exterior Construction Site Helicopter Landings

Any contractor doing construction work or activities on the hospital grounds, property or on the roof of the buildings is required to follow the guidelines regarding construction activities during helicopter landings on the helipad. The contractor shall coordinate with the owner's representative roof access, roof protection, keying, roof and safety precautions to be taken when working close to the roof edge regarding helicopter landings and contractor responsibilities during this time. In addition, the placement of vertical installations such as tall lighting poles and the use of project cranes or hoisting on the hospital property might affect the ***"Final Approach and Take Off"*** of medical center ambulance helicopters. It is essential that the contractor plans these types of activities with the owner's representative prior to the beginning of work.

Section 16 Required Forms, Permits, Postings and Documentation

Note: Refer to the sections in the "Healthcare Construction Requirements" manual for detailed information on each form and permit approval procedure.

Category	Required Notice	Form	Permit Approval	Job Site Posting	Contractor Safety File
CRM Infection Control Construction Permit	Before Starting	√	√	√	√
Above Ceiling Permit	14 Days	√	√	√	√
Utility Systems Shutdown & Service Permit	14 Days	√	√	√	√
Fire Protection System Impairment Permit	14 Days	√	√	√	√
Hot Work Permit	2 Days	√	√	√	√
Lock Out/Tag Out Permit	14 Days	√	√	√	√
CRM Interim Life Safety Measures Assessment		√			
Negative Air Pressure Log		√		√	√
CRM Risk Assessment		√			
Construction Safety Deficiency Notice		√			√
Violations and "Notice To Contractor"		√			√
Hazardous Material Abatement Signage				√	
Required Construction Jobsite Signage				√	
Interim Life Safety Signage				√	
Contractor & Employee Training Acknowledgment		√			√
Contractor Safety Meeting Minutes					√

The contractor will be required to furnish and install a "Project Safety Information" bulletin board on their project site for posting of required safety information. Small, short duration projects may have this requirement waived by the owner's representative.

LEGEND CRM = Construction-Renovation-Maintenance

Section 17 Project Cleaning and Barrier Removal Process

The following is the typical sequence prior to the removal of barrier walls.
With the barrier in place and with the ***"Negative Air HEPA Filtered Ventilation Unit"*** running, the contractor will HEPA vacuum all horizontal and vertical surfaces.

1. Clean the covers that are isolating the HVAC ducts.
2. Clean the outside of the negative air HEPA machine and its exhaust duct.
3. The contractor shall notify the owner's representative to schedule a walk-through of the clean space for inspection and approval prior to removal of the barrier wall.
4. Following all job site cleaning and flushing of plumbing, the contractor can begin the barrier cleaning process.

5. During construction or removal of barrier walls, fire resistant polyethylene barriers must be put into place to help control any construction or demolition dust of the barrier wall system.
6. MUHC must approve removal of any Infection Control or other barriers. Prior to removal of the temporary fire resistant polyethylene barrier, it shall be vacuumed with a HEPA vacuum to eliminate any dust attached to the plastic. The polyethylene barrier is then wiped down with the use of damp cleaning cloths and using a hospital furnished approved infection control cleaning solution. The contractor shall roll or fold the polyethylene in on itself creating as little dust as possible prior to transporting out of the building in a covered cart.
7. Remove the covers or caps from any and all HVAC system supply, return and exhaust ducts and restore the HVAC system.
8. The ***"Negative Air HEPA Filtered Ventilation Unit"*** is removed from the project site once the HVAC system is verified is operating properly.

If Air Sampling Is Required
When construction/renovation is done and completed in or near a high risk assessment critical care unit (i.e. Burn Unit, Operating Rooms, Intensive Care, etc.) there may be a requirement to do air sampling after the negative air system has been removed and the building HVAC system has been restored. This will be a requirement only if the infection control department determines the need at the end of the project and prior to occupancy.

Section 18 Approved Equipment and Product Information

"NEGATIVE AIR HEPA FILTERED VENTILATION UNIT", HEPA filter equipped negative air machines that provide rough in filters, primary filters and a HEPA final filter. Rating of 300 to 2000 cubic feet per minute, (CFM). HEPA filters **must** be a minimum 99.97% efficient @ 0.3 microns. Differential pressure alarm required if not installed in another fashion to monitor construction site negative air of
– 0.01 water column. Or approved equal.

- MICRO Trap Corporation, Models MT 1000 or Model MT 2000. 1300 W. Steel Road, No. 2 Morrisville, PA 19067 (215) 295-8208 or (877) 646-8208.
- ABATEMENT Technologies, Inc. Model HEPA-AIRE PAS2400HC Portable Air Scrubber or Model PAS1200HC 605 Satellite Blvd. Suite 300 Suwanee, GA 30024 (800) 634-9091

"HEPA VACUUM", A shop style vacuum with a HEPA filter cartridge at 99.97% filtration @ 0.3 microns. Or approved equal.

- ABATEMENT Technologies Inc. Model V8000WD Canister Style Wet/Dry HEPA Vacuum. 605 Satellite Blvd. Suite 300 Suwanee, GA 30024 (800) 634-9091.
- ABATEMENT Technologies Inc. Model V1300H Hip Mounted HEPA Vacuum, designed for use on scaffolding and mobile conditions such as ceiling tile type cleaning. Lightweight at 6.4 lbs. 605 Satellite Blvd. Suite 300 Suwanee, GA 30024 (800) 634-9091.

"ADHESIVE WALK OFF MATS", 24" x 36" Tacky Mat. Peel up dirty layer and dispose to reveal a new, fresh clean tacky mat.

- Tacky walk off mat No. 5838 24" x 36", 60 tacky mats to a unit. Four units per case.
  3M Company, St. Paul, MN 55144 (888) 364-3577. Or approved equal.

"NEGATIVE AIR PRESSURE INDICATOR", Manometer.

- Model "Mark II Model No. 25 inclined-vertical Manometer. Dwyer Instruments Inc. PO Box 373, Michigan City, IN 46361 (219) 879-2000.
- MICRO Trap Corporation, Model Tri/Mon, digital recording manometer for tracking differential pressure. 1300 W. Steel Road, No. 2 Morrisville, PA 19067 (215) 295-8208 or (877) 646-8208.

"PORTABLE WORK ENCLOSURE", For temporary fire resistant polyethylene dust barrier. System components supplier of zip poles, door opening access zippers, dust sealing system parts, etc.

- Zip Wall, LLC. 37 Broadway, Arlington, MA 02474 (800) 718-2255. Or approved equal.

"FIRE RESISTANT POLYETHYLENE", For temporary dust barriers and use with Zip Wall Barrier System. Fire resistant polyethylene 6 mil. Underwriters Laboratories listed. Americover, Inc. 6 mil. Fire Retardant Polyethylene No. ASFR6. Use with Zip Pole System also sold by Americover. 2067 Wineridge Place. Suite F Escondido, CA 92029. 800-747-6095 Dept. 48. Or approved equal.

Example of Badge for Contractor use -

Protocol for Hospital Contractor Badges:

Contractor to issue badges to employees as necessary. (Need to show proof of ID)

Contractor to edit the information, print in color, cut out the badges, fold in the center and insert in badge holders.

Contractor shall keep a log of badged employees on site for reference by MU as necessary.

All permits to be collected and returned to MU at the end of the project.

Any orientation required will be discussed at the preconstruction meeting with the Owner's Representative.

SECTION 19 Health Care Construction Cleaning Definitions

Construction Clean

1. Remove tools & equipment from the work area.
2. Remove all bulk trash from the work area.
3. Thoroughly sweep all floor surfaces in the work area utilizing a dust compound (floor sweep) material.
4. Dry wipe all horizontal & vertical surfaces in the work area. Surfaces to include but not limited to walls, window sills, doors & door frames, base trim, casework (inside & out), fixtures, and wall-mounted equipment.
5. Sweep all floor surfaces utilizing a dust mop.
6. Wet mop all floor surfaces.

Thorough Clean

1. To be implemented only after Construction Clean procedures have been completed.
2. Wet wipe all horizontal and vertical surfaces utilizing a MUHC – Infection Control Department approved germicidal disinfectant. Surfaces to include but not limited to walls, window sills, doors & door frames, base trim, casework (inside & out), all fixtures, and wall-mounted equipment.
3. Wet mop all floor surfaces utilizing a MUHC Infection Control Department approved germicidal disinfectant.

Terminal Clean

1. To be implemented only after Through Clean procedures have been completed.
2. Cleaning procedures shall be conducted by MUHC trained Environmental Services, Sterile Processing or Surgical Services staff only.
3. Thoroughly clean and disinfect surfaces on the ceiling such as diffusers, light fixtures, and ceiling mounted devices & equipment.
4. Thoroughly clean and disinfect all equipment in the work area.
5. Thoroughly clean and disinfect all flooring including moving equipment & furnishings to allow access to all floor surfaces.
6. Move all portable equipment and furnishings away from the walls. Wet wipe and disinfect all wall surfaces and wall mounted equipment.

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SECTION 1.F

INDEX OF DRAWINGS

Drawings referred to in and accompanying Project Manual consist of following sheets.

Sheet 1 of 18: G-001 – PROJECT INFORMATION, KEYPLAN, DRAWING INDEX, ADOPTED CODES, AND CERTIFICATION

Sheet 2 of 18: G-101 – CONTRACTOR ACCESS PLAN

Sheet 3 of 18: E-001 – ELECTRICAL LEGEND

Sheet 4 of 18: E-101 – GROUND FLOOR ELECTRICAL PLAN – PHASE 1

Sheet 5 of 18: E-102 – GROUND FLOOR ELECTRICAL PLAN – PHASE 2

Sheet 6 of 18: E-103 – SITE ELECTRICAL PLAN – PHASE 2

Sheet 7 of 18: E-104 – GROUND FLOOR ELECTRICAL PLAN – PHASE 3

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Sheet 12 of 18: E-501 – ELECTRICAL RISER DIAGRAM – PHASE 1

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Sheet 14 of 18: E-503 – ELECTRICAL RISER DIAGRAM – PHASE 3

Sheet 15 of 18: E-601 – ELECTRICAL SCHEDULES

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Sheet 17 of 18: E-701 – ELECTRICAL DETAILS

Sheet 18 of 18: E-702 – ELECTRICAL DETAILS

END OF SECTION

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Missouri
Division of Labor Standards
WAGE AND HOUR SECTION

MICHAEL L. PARSON, Governor

Annual Wage Order No. 27

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, 2020**

Last Date Objections May Be Filed: **April 9, 2020**

Prepared by Missouri Department of Labor and Industrial Relations

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	$52.88
Boilermaker	*$27.06
Bricklayer	**$49.54**
Carpenter	**$44.27**
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	$41.89
Plasterer	
Communications Technician	$51.30
Electrician (Inside Wireman)	$51.37
Electrician Outside Lineman	$73.26
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	*$27.06
Glazier	**$41.33**
Ironworker	$58.10
Laborer	$39.16
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	$50.20
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	*$27.06
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	$39.03
Plumber	**$56.87**
Pipe Fitter	
Roofer	$49.42
Sheet Metal Worker	**$52.30**
Sprinkler Fitter	**$44.65**
Truck Driver	*$27.06
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	$49.56
Millwright	
Pile Driver	
Electrician (Outside Lineman)	$73.26
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	$43.60
General Laborer	
Skilled Laborer	
Operating Engineer	$55.90
Group I	
Group II	
Group III	
Group IV	
Truck Driver	$43.10
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.

Intertek-PSI
8669 Olive Boulevard
St. Louis, Missouri 63132

Tel +1 314 432 8073
Fax +1 314 432 5119
intertek.com/building

June 3, 2021

University of Missouri
130 General Services Building
Columbia, Missouri 65211

ATTN: Mr. Brad Rackers, PE
Campus Facilities – Planning, Design & Construction
Email: rackersba@missouri.edu

RE: **Limited Asbestos Survey**
TH & CCA Emergency Power Modifications
MU Project Number: CP210961
Columbia, Missouri
PSI Project Number: 0029-5011

Dear Mr. Rackers:

In accordance with our agreement, Professional Service Industries, Inc., (PSI), an Intertek company, has conducted a limited asbestos survey for the above-referenced project. Please find one (1) electronic (.pdf format) copy of the report for these services enclosed.

We appreciate the opportunity to provide our services to you on this project and would be pleased to continue our role as your environmental consultant. If we can be of further assistance to you, please feel free to contact us.

Respectfully submitted,
PROFESSIONAL SERVICE INDUSTRIES, INC.

Jada VonBokel
IH/Environmental Services

Greg Chambliss, RPIH, LEED AP
Department Manager

Enclosures

LIMITED ASBESTOS SURVEY REPORT

At

TEACHING HOSPITAL & CCA
EMERGENCY POWER MODIFICATIONS
UNIVERSITY OF MISSOURI CAMPUS
COLUMBIA, MISSOURI
MU PROJECT NUMBER: CP210961

Prepared for

UNIVERSITY OF MISSOURI
130 GENERAL SERVICES BUILDING
COLUMBIA, MISSOURI 65211

Submitted by:

Professional Service Industries, Inc.
8669 Olive Boulevard
St. Louis, Missouri 63132

PSI PROJECT #0029-5011

June 3, 2021

LIMITED ASBESTOS SURVEY REPORT

For

TEACHING HOSPITAL AND CCA
Emergency Power Modifications
University of Missouri Campus
Columbia, Missouri
MU Project Number: CP210961

Prepared for

University of Missouri
130 General Services Building
Columbia, Missouri 65211

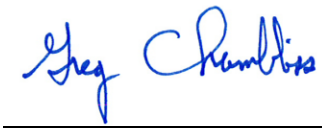
Prepared by

Professional Service Industries, Inc.
8669 Olive Boulevard
St. Louis, Missouri 63132
Telephone 314-432-8073

PSI PROJECT NUMBER 0029-5011

June 3, 2021

Matthew Basch
MDNR Asbestos Inspector
Cert. #7118073120MOIR12911



Greg Chambliss, RPIH, LEED AP
Department Manager
Principal Consultant

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 GENERAL INFORMATION

Professional Service Industries, Inc. (PSI), an Intertek company, was retained by the University of Missouri, Columbia to conduct a limited Asbestos Survey for the planned TH and CCA Emergency Power Modifications on the University of Missouri, Columbia Campus and associated with MU Project Number CP210961.

This report has been prepared for the exclusive use of the University of Missouri, Columbia.

1.2 AUTHORIZATION

Authorization to perform the assessment was given by Mr. Brad Rackers of the University of Missouri via an email dated May 19, 2021 for Project Number CP210961 – TH & CCA Emergency Power Modifications.

1.3 PURPOSE

The purpose of the survey was to determine the presence/absence of asbestos in the materials that may be disturbed when routing new conduit for the TH & CCA Emergency Power Modifications. Only areas with the potential of being impacted by this project were assessed to determine if asbestos is present in areas where the new conduit will be routed.

2.0 SCOPE OF SERVICES

2.1 SCOPE OF WORK

As part of this project, the following services were performed:

- Asbestos Survey and Sampling

2.2 SAMPLING GUIDELINES

The survey of the project area was conducted in general accordance with the Environmental Protection Agency (EPA) Asbestos Hazard Emergency Response Act (AHERA) and the National Emission Standards for Hazardous Air Pollutants (NESHAP) sampling guidelines to determine the presence of exposed and/or physically accessible suspect asbestos-containing material (ACM), identify the location of ACM or assumed ACM, and quantify the amount of ACM identified during the inspection. Each suspect material was touched, where possible, to determine the friability of the material.

A visual inspection and sampling survey of the facility was conducted in accordance with general EPA/AHERA sampling guidelines to determine the presence of suspect ACMs. Mr. Matthew Basch, State of Missouri and EPA accredited asbestos inspector, performed the asbestos survey.

Samples of suspect asbestos-containing materials were collected from representative areas of the Teaching Hospital and CCA. Only areas with the potential of being impacted by the routing of the new conduit from the ground floor to the 3rd floor were assessed as part of this project. Only the ground floor was assessed at this time.

Samples were sent to PSI's laboratory located in Pittsburgh, Pennsylvania, for analysis. Each sample underwent Polarized Light Microscopy (PLM) analysis for detection of asbestos fibers in the building materials. The current EPA Method for the Determination of Asbestos in Bulk Building Materials is in document EPA-600/R-93/116 July 1993. The results of the analyses are summarized in Section 4.0 of this report. Suspect materials identified, but not sampled are also summarized. The laboratory report and chain-of-custody for these analyses are presented in Appendix A.

3.0 METHODOLOGY

3.1 ASBESTOS GENERAL REFERENCES

Asbestos sampling and assessment procedures were performed in general accordance with the guidelines published by the EPA in 40 CFR Part 763 Subpart E, October 30, 1987, and in the NESHAP regulation (40 CFR Part 61, April 6, 1973, revised 1990).

3.2 ASBESTOS VISUAL INSPECTION

The visual inspection for asbestos was performed by an EPA and State of Missouri accredited inspector. An initial walkthrough of the ground floor survey area was conducted to determine the presence and condition of suspect materials, which were accessible and/or exposed. Materials, which were similar in general appearance, were grouped into homogeneous sampling areas.

3.2.1 Homogeneous Material Classifications

A preliminary walkthrough of the survey areas was conducted to determine areas of materials, which were visually similar in color, texture, general appearance, and which appeared to have been installed at the same time. Such materials are termed "homogeneous materials" by the EPA. During the walkthroughs, the approximate locations of these homogeneous materials were also noted.

Following the EPA inspection protocol, each identified suspect asbestos homogeneous material was placed in one of the following EPA classifications:

Surfacing Materials (spray or trowel applied to building members)

Thermal System Insulation (materials generally applied to various mechanical systems)

Miscellaneous Materials (any materials which do not fit either of the above categories)

Following the EPA NESHAP inspection protocol, each identified suspect homogeneous material that was confirmed as an ACM was also placed in one of the following NESHAP classifications:

- Friable Materials: NESHAP defines a friable ACM as any material containing more than one percent asbestos that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.
- Category I Non-Friable (Cat. I NF): NESHAP defines a Category I non-friable ACM as packing, gaskets, resilient floor covering (except vinyl sheet flooring products which are considered friable), and asphalt roofing products which contain more than one percent asbestos.
- Category II Non-Friable (Cat. II NF): NESHAP defines a Category II non-friable ACM as any

material, except for a Category I non-friable ACM, which contains more than one percent asbestos and cannot be reduced to a powder by hand pressure when dry.

In the NESHAP regulation, a regulated asbestos-containing material (RACM) is defined as any (a) friable asbestos material; (b) Category I Non-Friable ACM that has become friable; (c) Cat. I NF ACM that will be or has been subjected to sanding, grinding, cutting, or abrading; or (d) Category II Non-Friable 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.

3.3 SAMPLING PROCEDURES

Following the walkthrough, the inspector collected selected samples of suspect asbestos-containing materials. Sampling was limited to those materials physically accessible to the inspector during the time of the inspection, except if the structural integrity of the item being tested would be compromised.

EPA guidelines were used to determine the sampling protocol. Sampling locations were chosen to be representative of the homogeneous material.

Samples of suspect miscellaneous asbestos materials were taken as randomly as possible while again attempting to sample already damaged areas so as to minimize disturbance of the material.

3.4 QUANTIFICATION

Quantities of accessible and/or exposed building materials, which were confirmed or assumed to contain asbestos were estimated. This estimation was performed by taking approximate measurements in the field.

Quantities are estimates and should be confirmed prior to putting out to bid for abatement.

3.5 ASBESTOS LABORATORY PROCEDURES

3.5.1 Method of Analysis

Asbestos analysis was performed by using the bulk sample for visual observation and slide preparation(s) for microscopic examination and identification. The samples were mounted on slides and then analyzed for asbestos (chrysotile, amosite, crocidolite, anthophyllite, and actinolite/tremolite) and non-asbestos fibrous constituents (mineral wool, paper, etc.). Asbestos was identified by refractive indices, morphology, color, pleochroism, birefringence, extinction characteristics, and signs of elongation. The same characteristics were used to identify the non-asbestos constituents.

The microscopist visually estimated relative amounts of each constituent by determining the volume of each constituent in proportion to the total volume of the sample, using a stereoscope.

3.5.2 Laboratory Quality Control Program

PSI's laboratory maintains an in-house quality control program. This program involves blind reanalysis of ten percent of samples, precision, and accuracy controls, and use of standard bulk reference materials for asbestos.

3.6 REPORT FORMATS

3.6.1 Report Format for Asbestos Survey Summary Table

Sample Number
An alpha numeric number is assigned to each sample to track results. A homogenous area is defined as an area of material that is uniform in color, texture, and age. Each homogenous area was given a distinct letter designation. An example of the numbering sequence is as follows:

GF-DW-A-01
GF = Floor where sample was collected (i.e., Ground Floor)
DW = Type of material sampled (i.e., Drywall)
A = Homogeneous Area 'A'
01 = First sample taken from homogeneous area A

Material Description
Describes the material.

Estimated Quantity
Approximate quantity of confirmed ACM, broken down by location.

Abbreviations
SF = Square Feet
LF = Linear Feet
EA = Each

Location
Area in the facility where suspect material was found.

Results
Amount and type of asbestos (Any material containing more than 1% asbestos is considered an ACM) or if the material does not contain asbestos (NAD = No Asbestos Detected).

4.0 FINDINGS AND RECOMMENDATIONS

4.1 GENERAL SUMMARY

Asbestos-Containing Materials

A material is considered by the EPA and the State of Missouri to be asbestos-containing if at least one sample collected from the homogenous area shows asbestos present in an amount greater than 1%.

Asbestos-containing materials were identified.

Please refer to Appendix A for a more detailed description of the microscopic analysis of these samples.

4.2 SPECIFIC FINDINGS AND OBSERVATIONS

Asbestos-Containing Materials

The following suspect asbestos-containing materials were sampled during the course of this survey and submitted for laboratory analysis. The table is a summary of the analytical results of this survey.

A material is considered by the EPA and the State of Missouri to be asbestos-containing if at least one sample collected from the homogenous area shows asbestos present in an amount greater than 1%. A material is defined as friable (F) if the material can be reduced to a powder by hand pressure when dry. Non-Friable (NF) materials that are damaged can also be considered friable.

SAMPLE NUMBER	MATERIAL DESCRIPTION	ESTIMATED QUANTITY	LOCATION	ASBESTOS %	FRIABLE / NON-FRIABLE	CONDITION
GF-DW-A-01, 02, 03	(1) Drywall (2) Joint Compound	NA	Rooms GE08A, GE08C	(1) NAD, NAD, NAD (2) NAD, NAD, NAD	NF F	Good
GF-PL-B-01, 02, 03	Plaster, gray	NA	Rooms GE08C, GE08A	NAD, NAD, NAD	NF	Good
GF-FP-C-01, 02, 03	Fireproofing	NA	Rooms GE08A, GE08C	NAD, NAD, NAD	F	Good
GF-M-D-01, 02, 03	**Mastic, black**	**125 SF**	**Room GE08C**	**5% CH, NT, NT**	**NF**	**Good**
GF-PI-E-01, 02, 03	**Pipe and Pipe Fitting Insulation**	**120 LF**	**Room GE08A**	**10% AM/CH, NT, NT**	**F**	**Good**

Materials sampled and found to be asbestos containing are presented in **bold** type.
*See Site Sketch for Approximate Locations
SF – Square Feet, LF – Linear Feet, EA - Each
CH – Chrysotile asbestos, AM – Amosite asbestos
NAD – No Asbestos Detected, NA – Not Applicable, NT – Sample not tested due to 1st positive result
F – Friable, NF – Non-Friable

Based on the above sample results, the pipe and pipe fitting insulation in Room GE08A was found to contain 10% Chrysotile and Amosite asbestos and the black mastic located in Room GE08C was

found to contain 5% Chrysotile asbestos. If the planned routing of new conduit for the TH & CCA Emergency Power Modifications has a likelihood of disturbing these materials, they should be removed by a State of Missouri licensed asbestos abatement contractor.

4.4 ADDITIONAL FINDINGS & RECOMMENDATIONS

If other materials are discovered during the project that were not addressed in this report and/or previously sampled, PSI recommends that these materials be sampled to determine the presence or absence of asbestos or assume the material to be asbestos and have it removed by a State of Missouri licensed asbestos abatement contractor.

4.5 ENVIRONMENTAL COST ESTIMATES

PSI used recognized standard engineering principals in developing the unit cost budgetary estimate for removal of the listed environmental concerns. This estimate is for removal and disposal of the listed items and anticipates all work being performed at the same time.

Asbestos-Containing Materials

120 LF	pipe and pipe insulation	$ 4,200.00
125 SF	mastic	$ 1,250.00
TOTAL ESTIMATED ASBESTOS ABATEMENT COSTS:		**$ 5,450.00**

Environmental Consulting Costs

Project Design	$ 750.00
Project Oversight and Air Monitoring – 2 shifts @ $995.00 each	$ 1,990.00
Project Closeout Documentation	$ 350.00
TOTAL ESTIMATED CONSULTING COSTS:	**$ 3,090.00**

EST. ASBESTOS REMOVAL COSTS (CONTRACTOR & CONSULTANT) $ 8,540.00

This is an estimate only, intended for use in general policy discussions regarding program development and planning. The figures are as of the date of the report and cover only the removal contractor's fees. Not included are items such as: project management or indirect or hidden costs. Other variables included in an engineering cost estimate are the project schedule and phasing, size of the project, and other factors which can affect project cost. It is recognized that neither PSI nor the owner has control over the cost of labor, materials or equipment, market or negotiating conditions. Accordingly, PSI cannot and does not warrant or represent that bids or negotiated prices will not vary from the budgetary estimate prepared by PSI.

5.0 WARRANTY

Professional Service Industries, Inc. warrants that the findings contained herein have been prepared in general accordance with accepted professional practices as applied by similar professionals in the community at the time of its preparation. Changes in the state of the art or in applicable regulations cannot be anticipated and have not been addressed in this report.

The field and laboratory results reported herein are considered sufficient in detail and scope to determine the presence, condition, and hazard potential of accessible and/or exposed suspect asbestos-containing or lead-based paint materials in the property at the time of survey. Test results are valid only for the material tested.

There is a distinct possibility that conditions may exist which could not be identified within the scope of study or which were not apparent during the site visit. This survey covered only those areas, which were exposed and/or physically accessible to the inspector. The study is also limited to the information available from the client at the time it was conducted.

PSI warrants that the findings contained herein have been prepared with the level of care and skill ordinarily exercised by professionals practicing in the community. The scope of work addressed readily accessible and exposed interior and exterior building areas. Observation or sampling of inaccessible areas such as behind walls or within ductwork was performed on a limited basis.

The University of Missouri, Columbia acknowledges that mold is ubiquitous to the environment with mold amplification occurring when building materials are impacted by moisture. The clients further acknowledge that site conditions are outside of PSI's control, and that mold amplification will likely occur, or continue to occur, in the presence of moisture. As such, PSI cannot and shall not be held responsible for the occurrence or reoccurrence of mold amplification.

No other warranties are implied or expressed.

APPENDIX A

ASBESTOS LABORATORY RESULTS

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REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: PSI, Inc
8669 Olive Boulevard
St. Louis, MO 63132
Attn: Greg Chambliss

Project ID: 0029-5011
UMO Teaching Hospital
Emergency Power Modification

Date Received: 5/24/2021 **Date Completed:** 5/26/2021 **Date Reported:** 5/26/2021

Analyst: Dan Anderson **Work Order:** 2105547 **Page:** 1 of 2

Client ID	Lab ID (Layer)	Sample Description (Color, Texture, Etc.) *Analyst's Comment*	Asbestos Content (Percent and Type)	Non-asbestos Fibers (Percent and Type)
GF-DW-A-01	001A	(1) Gray, Drywall, Homogeneous	**NO ASBESTOS DETECTED**	15% Cellulose Fiber
		(2) White, Joint Compound, Homogeneous	**NO ASBESTOS DETECTED**	None Reported
GF-DW-A-02	002A	(1) Gray, Drywall, Homogeneous	**NO ASBESTOS DETECTED**	15% Cellulose Fiber
		(2) White, Joint Compound, Homogeneous	**NO ASBESTOS DETECTED**	None Reported
GF-DW-A-03	003A	(1) Gray, Drywall, Homogeneous	**NO ASBESTOS DETECTED**	15% Cellulose Fiber
		(2) White, Joint Compound, Homogeneous	**NO ASBESTOS DETECTED**	None Reported
GF-PL-B-01	004A	(1) Gray, Plaster, Homogeneous	**NO ASBESTOS DETECTED**	None Reported
GF-PL-B-02	005A	(1) Gray, Plaster, Homogeneous	**NO ASBESTOS DETECTED**	None Reported
GF-PL-B-03	006A	(1) Gray, Plaster, Homogeneous	**NO ASBESTOS DETECTED**	None Reported
GF-FB-C-01	007A	(1) Gray, Fireproofing, Homogeneous	**NO ASBESTOS DETECTED**	7% Fibrous Glass 35% Cellulose Fiber
GF-FB-C-02	008A	(1) Gray, Fireproofing, Homogeneous	**NO ASBESTOS DETECTED**	7% Fibrous Glass 35% Cellulose Fiber
GF-FB-C-03	009A	(1) Gray, Fireproofing, Homogeneous	**NO ASBESTOS DETECTED**	7% Fibrous Glass 35% Cellulose Fiber
GF-M-D-01	010A	(1) Black, Mastic, Homogeneous	**5% Chrysotile**	None Reported

Quantitation is based on a visual estimation of the relative area of bulk sample components, unless otherwise noted in the "Comments" section of this report. The results are valid only for the item tested as received. This report may not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. Method used: E.P.A. Interim Method for the Determination of Asbestos in Bulk Insulation Samples (EPA 600/M4-82-020). Polarized Light Microscopy is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. Quantitative Transmission Electron Microscopy is currently the only method that can be used to determine if the material can be considered or treated as non-asbestos containing. Samples will be disposed of within 30 days unless notified in writing by the client. No part of this report may reproduced, except in full, without written permission of the laboratory. The reporting limit is 1% by weight. NVLAP Lab Code 101350-0.

Respectfully submitted,
PSI, Inc.

George Skarupa

Approved Signatory
George Skarupa

Client ID	Lab ID (Layer)	Sample Description (Color, Texture, Etc.) *Analyst's Comment*	Asbestos Content (Percent and Type)	Non-asbestos Fibers (Percent and Type)
GF-M-D-02	011A	**Sample Not Tested**		
GF-M-D-03	012A	**Sample Not Tested**		
GF-PI-E-01	013A	(1) White, Pipe Insulation, Homogeneous	**10% Amosite** **10% Chrysotile**	20% Cotton
GF-PI-E-02	014A	**Sample Not Tested**		
GF-PI-E-03	015A	**Sample Not Tested**		

Report Notes: **(PT) Point Count Results**

Quantitation is based on a visual estimation of the relative area of bulk sample components, unless otherwise noted in the "Comments" section of this report. The results are valid only for the item tested as received. This report may not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. Method used: E.P.A. Interim Method for the Determination of Asbestos in Bulk Insulation Samples (EPA 600/M4-82-020). Polarized Light Microscopy is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. Quantitative Transmission Electron Microscopy is currently the only method that can be used to determine if the material can be considered or treated as non-asbestos containing. Samples will be disposed of within 30 days unless notified in writing by the client. No part of this report may reproduced, except in full, without written permission of the laboratory. The reporting limit is 1% by weight. NVLAP Lab Code 101350-0.

Respectfully submitted,
PSI, Inc.

George Skarupa

Approved Signatory
George Skarupa

CHAIN OF CUSTODY - ASB/LEAD/IH

2105547

Project Information	
Project No:	002a- Soil
Project Name:	UMC- Teaching Hospital: Emergency Power modification
Project Address:	

Information To Build On
Engineering • Consulting • Testing

IH Laboratory
850 Poplar Street
Pittsburgh, PA 15220
412-922-4001 ext. 228/425

Send Results To:	
Company:	Professional Service Industries, Inc. (PSI)
Attn:	Greg Chambliss
Address:	8669 Olive Boulevard; St., Louis, Missouri 63132
Telephone:	314-432-8073
Email:	greg.chambliss@intertek.com

Send Invoice To:	
Company:	Professional Service Industries, Inc. (PSI)
Attn:	Greg Chambliss
Address:	8669 Olive Boulevard; St., Louis, Missouri 63132
Telephone:	314-432-8073
Email:	greg.chambliss@intertek.com

Requested Turnaround Time:			
Same Day	1-2 Day	3-5 Day	Requested Date:
☐	☐	☑	5/26/21 → 5/27/21 SW 5/24/2021

Stop at First Positive	
Y	N
☑	☐

Laboratory Use Only	Y	N
All Samples In Acceptable Condition:	☐	☐
Comments:		
Shipping Charges Apply:	☐	☐

Sample ID:	Number of Samples	PLM Bulk	Point Count (400)	Point Count (1000)	Lead Wipe	Lead Air	Lead Soil	Lead Paint Chip	Lead TCLP	PCM	PCM "B Rules"	TEM AHERA	TEM 7402	TEM Chatfield	TEM Vacuum	TEM Wipe	NY PLM Friable/NOB	NY TEM NOB	NY SOF-V	Total Nuisance Dust	Respirable Dust	Material Description
	Parameter																					
GF-DW-A-01,02,03	3	✓																				Drywall + joint compound
GF-PL-B-01,02,03	3	✓																				Plaster
GF-FB-C-01,02,03	3	✓																				Spray-on Fire Proofing
GF-M-D-01,02,03	3	✓																				Mastic
GF-PI-E-01,02,03	3	✓																				Pipe Insulation

Relinquished by	Date/Time	Received by	Date/Time
Matthew Ball	5/20/21	[signature]	5/24/2021 9a

Analyst Name:		Analyst Signature:	

Special Instructions / Comments:	

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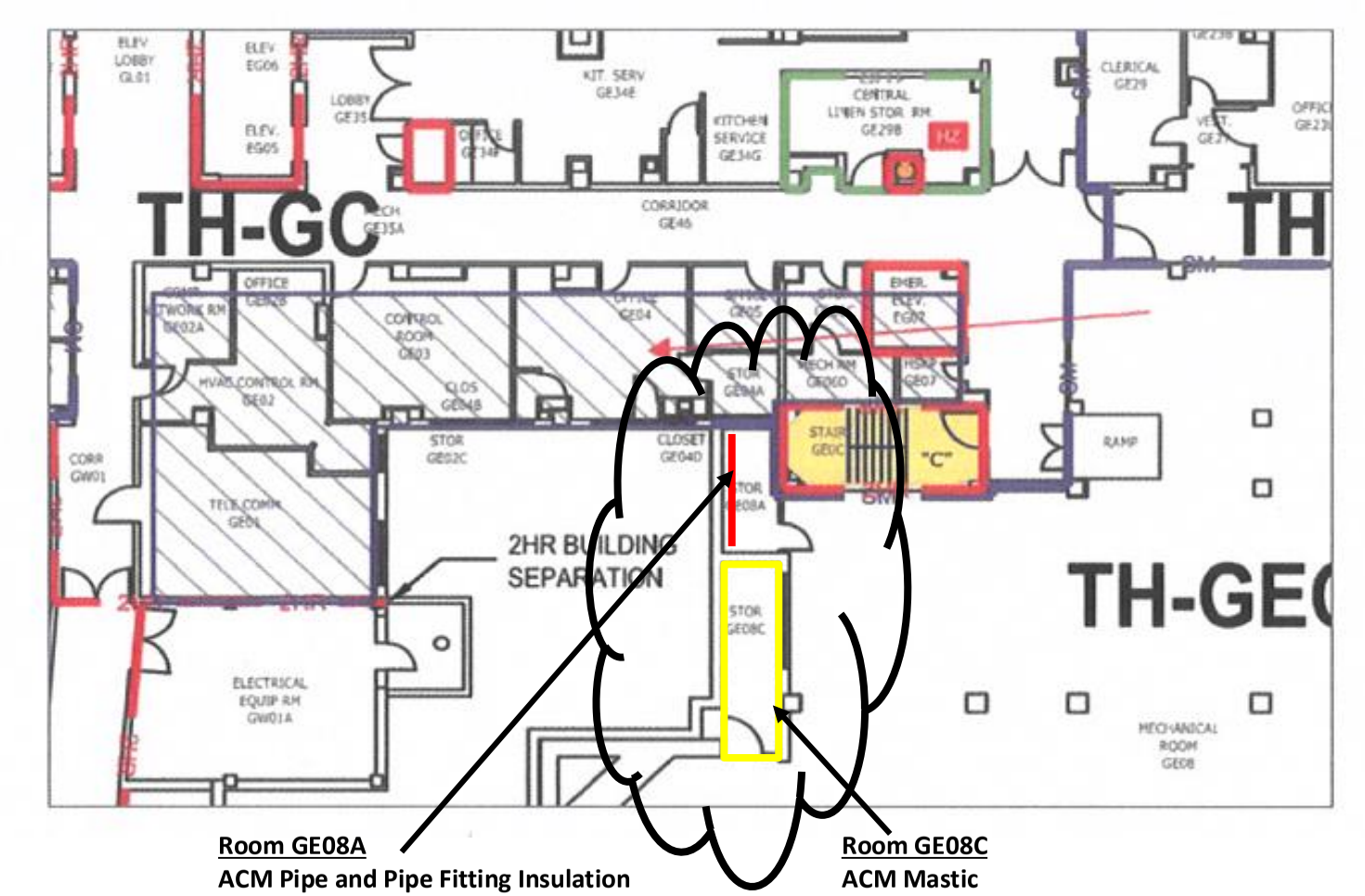
APPENDIX B

SITE SKETCHES



intertek psi	UNIVERSITY OF MISSOURI, COLUMBIA TH & CCA EMERGENCY POWER MODIFICATIONS MU PROJECT NUMBER: CP210961	PSI Project No.: 0029-5011 Approximate Locations of Asbestos-Containing Materials Date: May 28, 2021 Drawn, not to scale, by: jcvb

APPENDIX C

PERSONNEL/LABORATORY ACCREDITATIONS

Missouri Department of NATURAL RESOURCES

dnr.mo.gov

Michael L. Parson, Governor

Carol S. Comer, Director

August 13, 2020

Matthew E Basch
10822 Lawnbrook Dr
St Louis, MO 63123

CERTIFICATION NUMBER:
7118073120MOIR12911

THIS CERTIFIES
Matthew E Basch
HAS COMPLETED THE CERTIFICATION
REQUIREMENTS FOR
Inspector

APPROVED: **08/13/2020**
EXPIRES: **08/13/2021**

TRAINING DATE: **07/31/2020**

Director of Air Pollution Control Program

RE: **Missouri Asbestos Occupation Certification Card**

Enclosed is your certification card for Asbestos Inspector, as issued by the Asbestos Unit of the Missouri Department of Natural Resources' Air Pollution Control Program.

Missouri Certification Number: 7118073120MOIR12911
Course Training Date: July 31, 2020
Missouri Certification Approval Date: August 13, 2020
Missouri Certification Expiration Date: August 13, 2021

Note:

- All Missouri-certified asbestos personnel must comply with the following statutes and regulations:
  - Sections 643.225 to 643.250, RSMo;
  - 10 CSR 10-6.241 *Asbestos Projects-Registration, Abatement, Notification, Inspection, Demolition, and Performance Requirements; and*
  - 10 CSR 10-6.250 *Asbestos Projects-Certification, Accreditation and Business Exemption Requirements.*
- To keep your occupation certification up-to-date, you must complete an annual refresher course and submit a renewal application each year.
- In order to be eligible to renew your certification, you must successfully complete a refresher course with a Missouri-accredited training provider within 12 months of the expiration date of your current training certificate. If you exceed this grace period, you will be required to retake a Missouri-accredited initial course in order to be eligible for Missouri certification.

To obtain a copy of the certification renewal application, or review regulations and requirements, please visit our website at http://dnr.mo.gov/env/apcp/asbestos/index.htm.

If you have any questions please call the Air Pollution Control Program at 573-751-4817.

AIR POLLUTION CONTROL PROGRAM

Director of Air Pollution Control Program

United States Department of Commerce
National Institute of Standards and Technology

Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 101350-0

Intertek-PSI, Inc.

Pittsburgh, PA

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Asbestos Fiber Analysis

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2020-07-01 through 2021-06-30

Effective Dates

For the National Voluntary Laboratory Accreditation Program

National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

Intertek-PSI, Inc.
PSI, Inc.
850 Poplar Street
Pittsburgh, PA 15220
Ms. Catherine McNamee
Phone: 412-922-4010 x286 Fax: 412-922-4014
Email: cathy.mcnamee@intertek.com
http://www.intertek.com

ASBESTOS FIBER ANALYSIS — NVLAP LAB CODE 101350-0

Bulk Asbestos Analysis

Code	*Description*
18/A01	EPA -- 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples
18/A03	EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

Airborne Asbestos Analysis

Code	*Description*
18/A02	U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A.

For the National Voluntary Laboratory Accreditation Program

CP210961 MUTH CCA and TH Emergency Pwr Mods Quality Assurance List

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
1						
Building System Commissioning						
Commissioning Agent - Conduct pre-installation meetings per specifications.					Meeting Minutes	☑
78413						
Penetration Firestopping						
Do not enclose firestopping with other construction until inspection has been completed.					Inspection Report	☑
Perform Field Quality Control section of specifications					Test Report	☑
260519						
Low-Voltage Electrical Power Conductors and Cables						
Ensure wires are color coded per specifications						☐
Perform Field Quality Control section of specifications					Test Report	☑
260526						
Grounding						
Perform resistance test as described in "Field Quality Control" section of spec					test report	☑
260553						
Identification for Electrical Systems						
Verify all equipment, panels, conduits and conductors are correctly labeled.						☐

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
260573						
Overcurrent Protective Device Studies						
SKM data to be e-mailed to MU Commissioning Engineer					SKM Data	☑
Train owners representatives in setting of overcurrent devices					Sign-up Sheet	☑
262213						
Transformers						
Perform checks and tests as noted in "Testing" section of spec					test report	☑
262416						
Panelboards						
Perform checks per "Field Quality Control" and "Testing" section of spec					Test Reports	☑
Provide Extra Materials as specified					Transmittal	☑
262813						
Fuses						
Test for continuity and short circuits prior to energization						☐
263600						
Transfer Switches						
Perform tests per "Demonstration" section of spec					sign in sheet	☑
Perform tests per "Field Quality Control" section of spec					Test Report	☑

Please see following website for suggested commissioning forms:

https://operations.missouri.edu/facilities/commissioning-forms

Construction Management Checklist for Energizing Utilities

(Contractor to initial each item upon completion and provide completed form to the Owner's Representative prior to energizing utility)

AM #1

Water – turned on to the first valve past Energy Management's last valve.

___ Review all piping and equipment being turned on for proper installation and completed testing.
___ Insulation installed (preferred but not required)
___ Meter properly installed, working, and in readable location.
___ Contractor has swabbed out with chlorine all piping from the backflow preventer to the source while installing.
___ All bacteriological tests have been completed and passed.
___ Backflow preventer installed and tested. (will need water pressure to test)
___ Pressure test completed in piping being turned on.
___ Contractor has method to communicate "Services On" to other contractor personnel and Owner's personnel.
___ Consultant has signed off

Steam – turned on to the first valve past Energy Management's last valve.

___ Review all piping, equipment, valves, reducing stations, relief valves, etc. for proper installation and complete testing.
___ Piping protected from the weather.
___ Insulation must be installed.
___ All hangers and bolts have been installed.
___ Meter installed, working and in readable location. (Don't need metasys to turn on.)
___ All needed traps are installed and able to be tested as they are turned on.
___ Condensate system is installed and operating including the pumping system.
___ Pressure test completed in piping being turned on.
___ Contractor has method to communicate "Services On" to other contractor personnel and Owner's personnel.
___ Consultant has signed off

Condensate – turned on to the first valve past Energy Management's last valve.

___ Review all piping and equipment being turned on for proper installation and completed testing.
___ Piping protected from the weather.
___ Insulation installed (preferred but not required)
___ Pressure test completed in piping being turned on.
___ Contractor has method to communicate "Services On" to other contractor personnel and Owner's personnel.
___ Consultant has signed off

Electric – turned on to the first breaker past 13.8kV transformer.

___ Review all wiring and equipment being turned on for proper installation and completed testing
___ GFCI set and tested.
___ Breakers set and tested.
___ All needed permanent grounds are installed.
___ Meter installed, working and in readable location.
___ Main switchgear protected from the weather.
___ Contractor has method to communicate "Services On" to other contractor personnel and Owner's personnel.
___ Consultant has signed off

Chilled Water – turned on to the first valve inside of building.

___ Review all piping and equipment being turned on for proper installation and completed testing.
___ Pressure test completed in piping being turned on.
___ Insulation must be installed.
___ Meter installed, working and connected to Metasys.
___ Building pump and automatic isolation/control valve must be installed and under control.
___ If chillers are installed, automatic loop pump isolation must be installed.
___ Control valves must be installed and automatically controlled on all loads.
___ Contractor has method to communicate "Services On" to other contractor personnel and Owner's personnel.
___ Consultant has signed off

SECTION 01 91 13 – GENERAL COMMISSIONING REQUIREMENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
B. Division 26 – Electrical

1.02 DESCRIPTION

A. Burns and McDonnell (BMcD) will act as the Commissioning Authority, hired to verify that the systems work as intended. The Commissioning Authority will inform the Owner of the results of the commissioning and provide suggestions, as necessary, to correct deficiencies in observed performance or installation.
B. Commissioning is the process to verify to the Owner that systems, equipment, mechanical, electrical, controls and special systems function together properly to meet performance requirements and design intent, and as described in the Contract Documents. The General Contractor and Sub contractor shall be responsible for participation in the commissioning process as outlined below and in references and attachments throughout the Contract Documents. The Sub contractor shall furnish labor, materials, and test equipment sufficient to meet all requirements of commissioning under this contract.
C. Various sections in the Division 26 Specifications outline the specific commissioning responsibilities of the Sub contractor for the division and also obligate the General Contractor (GC) to coordinate and manage the commissioning responsibility of those subcontractors.

1.03 REQUIREMENTS INCLUDED

A. Duties of General Contractor and Sub Contractor
B. Duties of Commissioning Authority
C. Acceptance Procedures
D. Performance Period
E. Training and Instruction

1.04 RELATED SECTIONS

A. Section 260800 – Commissioning of Electrical Systems

1.05 TERMS

A. Acceptable Performance: A component or system being able to meet specified design parameters under actual load including satisfactory documented completion of all functional performance tests, control system trending and resolution of outstanding issues.
B. Basis of Design: The Basis of Design is the documentation provided by the design engineer documenting design decisions that were made to meet the design intent as defined by Owner. The Basis of Design describes the systems, components, conditions and methods to meet the design intent.
C. Commissioning Plan: The Commissioning Plan is prepared by the Owner's Commissioning Authority and defines the scope and format of the commissioning process and the responsibilities of all involved parties. The Commissioning Plan is provided to all commissioning team members to inform them of the intent and scope of

the commissioning work to confirm inclusion in the project scope and to expedite the commissioning process.

D. Functional Performance Testing: That full range of checks and tests carried out to determine if all components, sub-systems, systems and interfaces between systems function in accordance with the Contract Documents. In this context, "function" includes all modes and sequences of control operation, all interlocks and conditional control responses and all specified responses to abnormal conditions. The functional performance tests will be prepared by the Commissioning Authority.

E. Commissioning: The process to verify that building equipment, controls and systems function together properly to meet design intent and performance requirements shown in a composite manner in the Contract Documents.

F. Issue Resolution Log: The purpose of this log is to provide a method for tracking and resolution of deficiencies discovered as a result of the commissioning process. This list also includes the current disposition of issues and the date of final resolution as confirmed by the Commissioning Authority. Deficiencies are defined as those issues where products, execution or performance do not satisfy the Specifications and/or the design intent. The Issue Resolution Log will be created and managed by the Commissioning Authority.

G. Pre-functional Construction Checklists: Checklist is prepared by the Commissioning Authority and completed by the Sub Contractor responsible for installing the equipment or system. Checklist shall be by system or equipment to verify installation and start-up of equipment is complete and ready for functional testing. These documents require signature by the Sub contractor prior to continuing with the commissioning process.

1.06 DUTIES OF GENERAL CONTRACTOR AND SUB CONTRACTORS

A. Provide copies of all shop drawings, manufacturer's literature, maintenance information or other information as may be needed for systems to be commissioned to the Commissioning Authority.

B. Collect and provide the information requested by Commissioning Authority for development of the Commissioning Plan, Pre-functional Construction Checklists, and Functional Tests. The General Contractor and Sub contractors shall review these documents and confirm in writing to the Owner and Commissioning Authority any known areas of conflict or areas requiring clarifications.

C. Collect all proposed start-up and Pre-functional Construction Checklists documentation

D. To use BMcD's on-line web-based Commissioning application to fill out Construction Checklist and to track issues resolutions. Attendance at one BMcD training class is required for all sub-contractors. This training will take place at the construction Cx kick off meeting. The application is available as a free download for Windows, Apple, and Android operating systems and will need to be loaded on to the sub contractor's tablet, computer, or smartphone and taken into the field. Checklist must be completed in the field by the installing contractor or sub contractor.

E. Plan for and incorporate commissioning activities into the construction schedule.

F. Provide Commissioning Authority with submittals for all equipment and systems to be commissioned including controls diagrams, wiring diagrams, narrative sequences of operation, operating setpoints, and time delays in time for use in preparing the Functional Test Procedures.

G. Provide a fully operational system per Specifications, started, verified, debugged, calibrated, balanced, tested and under automatic control.

H. Provide at the end of the job the following items for inclusion in the final commissioning report.

1. As built drawings, sequences of control/ operation

2. A table of all set points
3. Schedules and instructions for operation of each piece of equipment for emergencies, seasonal adjustment, startup and shutdown. This needs to be listed in a word or excel formatted document.
4. A list of all manufacture recommended preventive maintenance procedures for all commissioned equipment and systems. This needs to be listed in a word formatted document.

I. Provide qualified personnel to participate in the commissioning tests, including seasonal testing.

J. Cooperate with the Commissioning Authority's personnel.

K. Provide access to site for the Commissioning Authority for review, verification and testing activities.

L. Provide organized storage space for project drawings, Specifications, equipment and materials submittals, shop drawings and operation and maintenance manuals in the job site trailers or job site office space.

M. Provide updates to all project documentation to reflect all supplemental instructions, addenda or other revisions to the project construction documents. Updates and supplemental instructions must be posted to the master set of documentation for review and reference by all Contractors and for the Commissioning Authority's use.

N. Provide adequate time and resources to perform functional testing of system to be commissioned in contract.

O. Coordinate participation of the mechanical, electrical, controls and TAB subcontractors in the commissioning process.

P. Participate in any efforts to finalize sequences of operations with Owner, Designers and Commissioning Authority.

Q. Verify that coordination, installation, quality control and final testing have been completed such that installed systems and equipment comply with construction documents.

R. Review the Commissioning Plan, Project Reports and test results and submit comments to the Commissioning Authority.

S. In a timely manner, address issues identified during construction that may affect the commissioning process or final system performance.

T. Perform start-up and testing of equipment and systems and document as required with start-up reports and completion of Pre-functional Construction Checklists. These checklists include installation documentation, start-up documentation, point-to-point documentation, calibration documentation, and verification that sequence of operations meets design intent. Reports shall be electronically submitted to Owner and Commissioning Authority for review and hard copies stored in the Sub contractor's field trailer. Sub-contractor will coordinate efforts to complete the pre-functional documentation.

U. Issue a written Notice of Readiness for each system to Commissioning Authority upon completion of all systems work, start-up and Pre-functional Construction Checklists requirements by trade sub-contractors.

V. Provide a detailed start up plan for CxA's review, comment, and recommendation.

W. Operate equipment and systems as required for functional performance testing. This includes, but is not limited to, manipulating the appropriate controls systems to execute the Functional Test Procedures.

X. Participate in the fine-tuning or troubleshooting of system performance, if either of these measures becomes necessary.

Y. Compensate owner for retesting and/or troubleshooting time required by the Commissioning Authority because Sub contractor's systems do not meet specified

performance. Back-charge Sub contractors as necessary to collect reimbursement for Commissioning Authority compensation.

Z. Review operating and maintenance data for verification, organization, distribution, and conformance to requirement of the Contract Documents.

AA. Submit complete operation and maintenance information and as-built drawings to the Commissioning Authority for compliance review of the requirement of the Contract Documents.

BB. Provide documentation of training for the systems listed to be commissioned.

CC. Provide proprietary test equipment required to test all the systems and equipment in this project.

1.07 DUTIES OF COMMISSIONING AUTHORITY

A. Develop the Commissioning Plan.

B. Develop Functional Test Procedures from Contract Documents and final equipment submittals including narrative sequences of operation, control diagrams and software code for execution with the assistance of Contractor staff as required.

C. Review the Sub contractor's submittals relative to the systems to be commissioned.

D. Perform site observations to review installation progress and to verify system installation quality and readiness for testing.

E. Observe or review documentation of validation activities including: electrical testing and pre-functional tests for normal and off-normal operating sequences.

F. Review submittal of all required pre-functional and start-up documentation provided by Sub contractor for completeness and reasonableness. This includes installation documentation, start-up documentation, point-to-point checklists and electrical testing reports, prior to initiation of functional testing.

G. Schedule and witness functional testing as defined in the Commissioning Plan and Functional Test Procedures. All testing shall be performed by the Sub contractors and documented by the Commissioning Authority.

H. Witness and verify satisfactory completion of equipment and system tests and inter-systems functional performance tests.

I. Conduct commissioning meetings.

J. Provide site observation, functional tests or other project reports in a timely manner.

K. Document inconsistencies or deficiencies in system operations and system compliance. System deficiencies shall be forwarded to the Owner's Representative and documented in a Resolution Log.

L. Coordinate via the General Contractor participation of Owner's personnel with equipment, component and systems performance verification and participation in required training.

M. When commissioning has been successfully completed, recommend acceptance to the Owner.

N. Once all functional tests have been successfully completed and all outstanding issues resolved, the Commissioning Authority will provide the Owner with a Final Commissioning Report of all commissioning activities that occurred during the project.

O. Provide technically qualified personnel when scheduled.

P. Verify that the specified training schedule of Owner's personnel is provided by the General Contractor and Sub Contractor.

Q. The Commissioning Authority will formally communicate with the Sub contractor via approved project channels. It is expected, however, that informal communication and coordination will be conducted directly with the subcontractors; records of all contacts will be sent to the General Contractor through the normal channels.

R. The Commissioning Authority is not authorized to release, revoke, alter or expand requirements of Contract Documents, to approve or accept any portion of the work or to perform any duties of the Sub contractor.

1.08 COMMISSIONING PLAN

A. The Commissioning Plan is a tool through which the commissioning process is described and incorporates the Owner, Designer of Record, General Contractor, Sub contractor, and Commissioning Authority roles relative to the commissioning process. Commissioning team members are general contractor, all sub contractors, equipment vendors, and design professionals whose participation is of benefit in the delivery of a fully functioning building or system to the Owner. The plan shall describe the communication, authority, and responsibility of commissioning team members. The Commissioning Plan will include the following:

1. The purpose of commissioning
2. Detail the commissioning process
3. Commissioning team members' responsibilities
4. Describe Pre-functional Construction Checklist Procedures
5. Provide a guideline for acceptance of each piece of equipment or system
6. Systems to be commissioned

1.09 SYSTEMS TO BE COMMISSIONED

A. Systems and Equipment to Be Functionally Tested: The listed system features are to be functionally tested and other building features will be evaluated for installation quality during construction. The functional performance testing will include the following systems and equipment: (note: If there is 1 failure encountered during functional testing, the Sampling Rate shall increase by 10%.)

1. Electrical Systems

System	**Estimated Quantity**	**Sampling Rate**
Permanent Feeder Terminations – 100A and larger	24	50%
Distribution and Branch Panelboards	4	100
Transformers	5	100
Disconnect Switches	5	100
Automatic Transfer Switches	1	100
Temporary Generator	1	100

1.10 COMMISSIONING ACTIVITIES

A. The Commissioning Schedule: This schedule defines the milestones and conditions that must be achieved before system testing and other commissioning activities can commence. The schedule also includes the expected duration of the various tasks so that the commissioning process can be incorporated into the overall construction schedule.

B. Preparation for Testing: To prepare for the system performance testing, the Commissioning Authority will examine the design and Construction Documents, develop with appropriate Sub contractors Pre-functional Construction Checklists of construction responsibilities that must be completed prior to testing and develop detailed Functional Test Procedures and data forms.

C. Using the Pre-functional Construction Checklists, the Sub contractor must verify that the systems they install are in compliance with the Construction Documents and are fully functional. Commissioning is not intended to be a testing or inspection function that

replaces any of the Sub contractors' obligations for testing and proof of performance. Functional testing will only begin when checklists are completed by the appropriate subcontractors, submitted on line and verified by the Commissioning Authority.

D. Functional Testing: Functional testing is performed by experienced and qualified technicians of the Sub contractor(s) responsible for installation as facilitated by the Commissioning Authority and may be observed by other members of the commissioning team. Functional testing will verify proper sequencing, operation and performance of installed equipment and systems under realistic operating conditions. The functional testing will follow with written Functional Test Procedures with test results documented for permanent record.

E. Documentation: In addition to the Pre-functional Construction Checklists and Functional Test Procedures, written documentation will be maintained for all other commissioning activities. Project communication reports shall be issued by the Commissioning Authority to the Sub contractor and key members of the commissioning team to document apparent deficiencies identified during examination of design and construction documents, daily activities on-site, construction deficiencies and successful or unsuccessful functional test results. At the end of the commissioning process, all documentation will be assembled and summarized in the Final Commissioning Report.

F. Deficiency Resolution: When a Project Report is issued to address an identified deficiency, the Sub contractor shall forward the reports to the appropriate parties to initiate corrective action in an expeditious manner. The designer is relied on for supplemental instructions or design modifications and issuance of final design details and the Sub contractors are relied on for implementation of that design. Change orders must be issued through proper contract channels.

1.11 FUNCTIONAL TEST PROCEDURES

A. The Functional Test Procedures include, but are not limited to, the following:
   1. Verification of equipment's ability to perform to the design intent.
   2. Verification of the performance of systems consisting of combinations of equipment (e.g., generators, ATS, interconnecting wire, panelbaords, etc.).
   3. Verification of the performance of the automatic controls in all modes.
   4. Verification of the performance of the emergency electrical system as a whole.

PART 2 PRODUCTS

2.01 Not used in this section.

PART 3 EXECUTION

3.01 GENERAL

A. Operating equipment and systems shall be tested in presence of Owner's Commissioning Authority to demonstrate compliance with specified requirements.
   1. Notify Owner, in writing, fourteen (14) days prior to tests scheduled under requirements of this Section.
   2. Testing shall be conducted under specified design operating conditions as recommended or approved by Owner.

B. Functional performance testing shall be completed and accepted by Owner as a condition of final completion.

C. All elements of systems shall be tested to demonstrate that total systems satisfy all requirements of these Specifications. Testing shall be accomplished on hierarchical

basis. Test each piece of equipment for proper operation, followed by each sub-system, followed by entire system.

D. Proprietary test equipment required by the manufacturer, whether specified or not, shall be provided by the manufacturer of the equipment through the installing sub contractor. Manufacturer shall provide the test equipment, demonstrate its use, and assist the Commissioning Authority in the commissioning process.

E. Acceptance Documentation: A copy of the functional performance tests results shall be necessary acceptance documentation along with other specified requirements.

3.02 ACCEPTANCE PROCEDURES

A. Prior to functional performance testing of each system, the Commissioning Authority shall observe and verify that the physical installation of components and systems being tested is substantially installed in accordance with the Contract Documents.

B. Sub contractor's Tests
   1. System shall be checked for proper installation, shall be adjusted and calibrated to verify that it is ready to function as specified.
   2. All system elements shall be checked to verify that they have been installed properly and that all connections have been made correctly.
   3. All discrete elements and sub-systems shall be adjusted and checked for proper operation.
   4. Start-up and operational tests shall be complete, with all required Pre-functional Construction Checklists submitted for review by Commissioning Authority within five (5) days of each activity, prior to starting functional performance testing.

C. CxA-witnessed Functional Tests
   1. Objective of these tests is to demonstrate that system is operating and complying with specified performance requirements.
   2. Owner-witnessed functional performance tests shall be performed on complete system. Each function shall be demonstrated to satisfaction of the Owner's Commissioning Authority on paragraph-by-paragraph basis of Commissioning Authority's written test procedure, developed to demonstrate conformance to requirements of the Specifications.
   3. Functional performance tests shall be witnessed and endorsed by the Commissioning Authority upon satisfactory completion.
   4. Actual testing program shall be conducted in accordance with prior approved procedures and shall be documented as required herein.
   5. Sub contractor shall notify Commissioning Authority and Owner at least two (2) weeks prior to date of functional performance tests.

D. The functional performance testing process shall be accomplished for all equipment, sub-systems, systems and system interfaces. All must be tested for acceptances and there shall be a separate checklist for each to verify documentation specific to each is complete.

E. Each system shall be operated through all modes of system operation (e.g., seasonal, occupied, unoccupied, warm-up, cool-down, etc., as applicable) including every individual interlock and conditional control logic, all control sequences, both full-load and part-load conditions and simulation of all abnormal conditions for which there is a specified system or controls response. The warm-up and cool-down test shall be a performance test.

F. Temporary upsets of systems, such as distribution fault, control loss, setpoint change, equilibrium upset and component failure, shall be imposed at different operation loads to determine system stability and recovery time.

G. When the functional performance of all individual systems has been proven, the interface or coordinated responses between systems shall be checked. The systems involved may be within the overall project work or they may involve other systems, such as emergency systems for life safety.

H. Corrective Measures: If acceptable performance cannot be achieved, the cause of the deficiency will be identified. If it is determined that the deficiency was caused by the system or component not being installed per the manufacturer's recommendations or Contract Documents, the necessary corrective measures shall be carried out by the Sub contractor. Every check or test for which acceptable performance was not achieved shall be repeated after the necessary corrective measures have been completed. This re-testing process should be repeated until acceptable performance is achieved. The Sub contractor will be allowed one retest after initial testing of the equipment. If the retest fails the Sub contractor shall be financially responsible, at standard rates, to reimburse the Commissioning Authority for the additional time taken to achieve acceptable performance.

3.03 TRAINING AND INSTRUCTION

A. Training and instruction of Owner personnel is a part of the commissioning process and essential for the proper operation of the facility. The sub contractors and vendors providing the training will complete training plans and submit to the Commissioning Authority for review and approval in conjunction with the Owner's representative.

3.04 RETESTING OR ADDTIONAL TESTING DUE TO FAILURES

A. The cost, including the CxA's time, to retest a functional performance test shall be the General Contractor's (GC)

B. The time for the CxA to direct any retesting required because a specific construction checklist or start-up test item, reported to have been successfully completed, but determined during functional testing to be faulty, will be back charged to the General Contractor, who may choose to recover costs from the party responsible for executing the faulty pre-functional test.

C. If a second, subsequent startup, retest, or increased sampling is required, for any reason, or if Installing Sub contractor is not ready for a startup or test at the scheduled time, the GC shall compensate the Owner for the CxA's additional time and expenses. Compensation shall be computed by multiplying hours worked by CxA times CxA's established billing rate and adding the cost of CxA's expenses (including by way of example but not limitation: air travel, car rental, lodging, meals, long distance, reproduction, special insurance, procured equipment, leased equipment, delivery service, and postage). GC may unilaterally withhold said funds from payments otherwise due to Installing Sub contractor.

1. The Sub contractor shall respond in writing to the CxA and GC at least as often as commissioning meetings are being scheduled concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.
2. The CxA retains the original non-conformance forms until the end of the project.
3. Any required retesting or increased test sampling by any sub contractor shall not be considered a justified reason for a claim of delay or for a time extension by the prime sub contractor.

D. Failure Due to Manufacturer Defect: If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance spec, all identical units may be considered

unacceptable by the GC. In such case, the Sub contractor shall provide the Owner with the following:

1. Within one week of notification from the GC, the Sub contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the GC within two weeks of the original notice.
2. Within two weeks of the original notification, the Sub contractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
3. The GC will determine whether a replacement of all identical units or a repair is acceptable.
4. Two examples of the proposed solution will be installed by the Sub contractor and the GC will be allowed to test the installations for up to one week, upon which the GC will decide whether to accept the solution.
5. Upon acceptance, the Sub contractor and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

3.05 SCHEDULE

A. Refer to Commissioning Plan for commissioning milestones that need to be incorporated into construction schedule.

END OF SECTION 019113

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SECTION 07 84 13 - PENETRATION FIRESTOPPING

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:
   1. Penetrations in fire-resistance-rated walls.
   2. Penetrations in horizontal assemblies.

1.03 RELATED REQUIREMENTS:

A. Section 07 84 43 - Joint Firestopping for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

1.01 REFERENCE STANDARDS:

A. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
B. ASTM International:
   1. ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials
   2. ASTM E 814 - Test Method for Fire Tests of Penetration Firestop Systems
   3. ASTM E 2174 - On-Site Inspection of Installed Fire Stops
C. California Department of Public Health:
   1. Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers. 2010.
D. FM Global:
   1. FM Global 4991-2001: Approval of Firestop Contractors
   2. Building Materials Approval Guide. 2013.
E. Intertek Group:
   1. Directory of Listed Building Products. 2013.
F. Underwriters Laboratories Inc. (UL):
   1. UL 1479-2003: Fire Tests of Through-Penetration Firestops (ANSI)
   2. Fire Resistance Directory. 2013.
   3. Qualified Firestop Contractor Program Requirements. 2012.
G. Firestop Contractors International Association (FCIA):
   1. FCIA Firestop Manual of Practice. Hillside, IL: FCIA, 2005. (4415 W. Harrison St., Suite 436, Hillside, IL 60162; 708-202-1108)

1.02 PREINSTALLATION MEETINGS:

A. Preinstallation Conference: Conduct conference at Project Site.

1.03 SUBMITTALS:

A. Product Data: For each type of product.
B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.
   1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment

or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

C. Qualification Data: For Installer.

D. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

E. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.04 QUALITY ASSURANCE:

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.05 PROJECT CONDITIONS:

A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.06 COORDINATION:

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS:

A. Fire-Test-Response Characteristics:

1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
   a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
      (1) UL in its "Fire Resistance Directory."

2.02 PENETRATION FIRESTOPPING SYSTEMS:

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

1. Hilti, Inc.
2. Specified Technologies, Inc.
3. 3M Fire Protection Products.

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch w.g. (2.49 Pa).

1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch w.g. (2.49 Pa).
   1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
   2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
   3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.

D. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.

E. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
   1. Permanent forming/damming/backing materials.
   2. Substrate primers.
   3. Collars.
   4. Steel sleeves.

2.03 FILL MATERIALS:

A. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

B. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

C. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

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

3.02 PREPARATION:

A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:
   1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
   2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.03 INSTALLATION:

A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
   1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

C. Install fill materials by proven techniques to produce the following results:
   1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
   2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
   3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.04 IDENTIFICATION:

A. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
   1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
   2. Contractor's name, address, and phone number.
   3. Designation of applicable testing and inspecting agency.
   4. Date of installation.
   5. Manufacturer's name.
   6. Testing agency system number (UL System No. C-AJ-5090 for instance).
   7. Installer's name.

3.05 FIELD QUALITY CONTROL:

A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2174.

B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.

C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.06 CLEANING AND PROTECTION:

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

3.07 PENETRATION FIRESTOPPING SYSTEMS:

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.

1. Refer to drawings for specific systems. If a penetration is encountered that does not fit under the parameters of the noted systems, please coordinate with manufacturer's rep to obtain engineering judgements as needed.

END OF SECTION 07 84 13

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SECTION 260510 - BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. This Section specifies general administrative and procedural requirements for electrical installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in DIVISION 01:
   1. Submittals.
   2. Coordination drawings.
   3. Record documents.
   4. Maintenance manuals.
   5. Rough-ins.
   6. Electrical installations.
   7. Cutting and patching.
   8. Electrical Demolition
   9. Touch-up Painting.
   10. Electrical service and distribution system switch-over.

1.02 REFERENCE STANDARDS:

A. National Fire Protection Association (NFPA): NFPA - 70 National Electrical Code (NEC).
B. Institute of Electrical and Electronics Engineers (IEEE): IEEE C2 National Electrical Safety Code (NESC).
C. Underwriters Laboratories (UL).
D. Federal Information Processing Standards Publication (FIPS).
E. National Electrical Contractors Association (NECA): National Electrical Installation Standards (NEIS): Except where the NEIS requirements specifically deviate from specific requirements of the NEC, the NEC shall take precedence.

1.03 SUBMITTALS:

A. Submit as specified in DIVISION 01.
B. Refer to each Section of this Division for specific Submittal requirements.
C. Provide Conforming to Construction Records schematic diagrams and wiring diagrams.
D. Provide product data on electrical material and products.
E. Submit installed feeder conductor lengths and sizes.

1.04 COORDINATION DRAWINGS:

A. Prepare coordination drawings in accordance with DIVISION 01, for equipment rooms, and other congested areas to a scale of 1/4 inch = 1 foot-0 inch or larger if required. Detail major elements, components, and systems of electrical equipment and materials in relationship with other systems, installations, and building components. Drawings shall be prepared on 30 by 42 inch sheets. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:
   1. Indicate the proposed locations of major raceway systems, equipment, and materials.
   2. Exterior wall and foundation penetrations.
   3. Fire-rated wall and floor penetrations.
   4. Equipment connections and support details.
   5. Sizes and location of required concrete pads and bases.

6. Support details.
7. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
8. Prepare floor plans, elevations, and appropriate details to indicate penetrations in floors, walls, and ceilings, and their relationship to other penetrations and installations.
9. Prepare reflected ceiling plans to coordinate and integrate installations, air outlets, air inlets, light fixtures, communications systems' components, sprinklers, heat detectors, smoke detectors, motion detectors, speakers, and other ceiling-mounted devices.
10. Coordinate chases, slots, inserts, sleeves, and openings with general construction work.

1.05 RECORD DOCUMENTS:

A. Prepare record documents in accordance with the requirements specified in DIVISION 01, indicate installed conditions for:
   1. Major raceway systems, size and location for both exterior and interior; locations of control devices; distribution and branch electrical circuitry; fuse sizes, circuit breaker sizes and arrangements.
   2. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
   3. Approved substitutions, Contract Modifications, and actual equipment and materials installed.

B. Provide summary of final installed feeder conductor lengths and sizes to Engineer for final modeling of the electrical system and preparation of the short circuit, coordination, and arc-flash studies. Final installed conductor lengths shall be provided minimum 6 weeks prior to energization and/or application of arc-flash labels.

1.06 MAINTENANCE MANUALS:

A. Prepare maintenance manuals in accordance with the requirements specified in DIVISION 01, include the following information for equipment items:
   1. Description of function, normal operating characteristics and limitations, performance curves, engineering data, tests, and complete nomenclature and commercial numbers of replacement parts.
   2. Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; lockout/tagout procedures; and summer and winter operating instructions.
   3. Maintenance procedures for routine preventive maintenance and troubleshooting; disassembly, repair, reassembly; aligning and adjusting instructions.
   4. Servicing instructions, lubrication charts and schedules.
   5. "Conforming to Construction Records" schematic and wiring diagrams.

1.07 DELIVERY, STORAGE, AND HANDLING:

A. Deliver products to the project site properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.

1.08 WARRANTY:

A. Provide a minimum one-year warranty on all electrical equipment. Warranty period shall begin at date of Substantial Completion. Contractor shall provide written notification to Owner prior to this warranty start date.

PART 2 - PRODUCTS

2.01 PRODUCTS:

A. Unless indicated otherwise, all equipment and material shall be new, undamaged and meet the requirements of Underwriters Laboratories, Inc. (UL). Where UL requirements are not applicable, equipment and material shall be identified as such by Contractor and approved by Owner before purchase and installation.

2.02 ELECTRONIC EQUIPMENT COMPLIANCE:

A. Contractor warrants that all equipment, devices, items, systems, software, hardware, or firmware provided shall properly, appropriately, and consistently function and accurately process date and time data (including without limitation: calculating, comparing, and sequencing). This warranty supersedes anything in the Specifications or other Contract Documents which might be construed inconsistently. This warranty is applicable whether the equipment, device, item, system, software, hardware, or firmware is specified with or without reference to a manufacturer's name, make, or model number.

2.03 FINISHES:

A. For equipment: Equipment manufacturer's paint selected to match installed equipment finish.
B. Galvanized surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.01 ELECTRICAL SERVICE AND DISTRIBUTION SYSTEM SWITCHOVER:

A. Maintain all existing systems including electrical service, generators, feeders, chillers, air handlers and boilers for all occupied areas and operational facilities, unless otherwise indicated or when authorized otherwise in writing by Owner. Provide temporary service during interruptions to existing facilities. When necessary, schedule momentary outages to existing systems in accordance with the requirements for Interruption of Existing Electrical Service.
B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
    1. Notify Owner no fewer than ten business days in advance of proposed interruption of electric service.
    2. Outages may only occur between the hours of 10:00 p.m. Thursday and 4:00 a.m. Friday unless otherwise approved by Owners Representative.
    3. Do not proceed with interruption of electric service without Owner's approval of a written outage plan, Method of Procedure, specific for the work being performed during the planned interruption of service.
    4. Do not proceed with interruption of electric service without Owner's written permission to proceed.
C. Contractor shall not operate any energized medium voltage equipment.

3.02 ERECTION, INSTALLATION, APPLICATION:

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

B. Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. All electrical work and material shall comply with the following requirements:
   1. NFPA 70 - The National Electrical Code (NEC).
   2. IEEE C2, National Electrical Safety Code, Federal Information Processing Standards Publication (FIPS).
   3. NECA National Electrical Installation Standards (NEIS) (all except Table 1 of NECA 1).
   4. Coordinate electrical systems, equipment, and materials installation with other building components. Equipment motor horsepower sizes and kilowatt sizes shown are approximate. If equipment of a different size is furnished by Contractor, Contractor shall furnish and install the proper support equipment, motor starter, switchgear, feeders, fuses, circuit breaker, disconnect switch, wire, and conduit required for the equipment furnished, at no additional cost to Owner.
   5. Verify all existing dimensions by field measurements.
   6. Arrange for chases, slots, and openings in other building components during progress of construction to allow for electrical installations.
   7. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components as they are constructed.
   8. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing in the building. Coordinate concrete pads, bases, and related items.
   9. Coordinate with all other building trades.
   10. Where mounting heights are not specifically detailed, specified, or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
   11. Coordinate connection of electrical systems with exterior utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
   12. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the work are shown only in diagrammatic form. Should coordination requirements conflict with individual system requirements, refer conflict to Owner's Representative in writing.
   13. Install systems, materials, and equipment level, plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
   14. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting with minimum of interference with other installations.
   15. Install access panel or doors where units are concealed behind finished surfaces. The electrical contractor shall be responsible for furnishing access panels required for electrical equipment access. Access panels shall be installed by Contractor.
   16. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
   17. All equipment and materials shall be installed in accordance with NFPA 70 - The National Electrical Code (NEC).
   18. All equipment conductor termination provisions shall be UL listed for 75ºC conductors.
   19. All electrical equipment and installations shall be of adequate strength to withstand, without failure, forces encountered in defined Seismic conditions.
   20. Install raceways, cables, wireways, cable trays and busways clear of obstructions and clear of the required working space of equipment.

C. Refer to each SECTION of this DIVISION for specific performance requirements.

3.03 DEMOLITION:

A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the work, remove damaged portions and install new products of equal capacity, quality, and functionality.
B. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.
C. Abandoned Work: Remove all wiring back to the source as indicated. Raceways indicated to be abandoned in place shall be labeled as spare per identification requirements of Section 260553.
D. Remove demolished material from project site.
E. Remove, store, clean, re-install, reconnect and make operational components indicated for relocation.
F. Disposal of existing fluorescent lamps shall be by Contractor shipping the lamps to an EPA approved recycler for recycling. All shipping and disposal costs will be paid by Contractor at no additional expense to Owner.

3.04 CUTTING AND PATCHING:

A. General: Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of the trades involved. The following requirements apply:
    1. Perform cutting and patching for electrical equipment and materials required to:
        a. Uncover work to provide for installation of ill-timed work.
        b. Remove and replace defective work.
        c. Remove and replace work not conforming to requirements of the Contract Documents.
        d. Remove samples of installed work as specified for testing.
        e. Install equipment and materials in existing structures.
        f. Upon written instructions from Engineer, uncover and restore work to provide for Engineer's observation of concealed work if installed without using the proper specified procedures.
B. For work in existing installations, the Contractor shall cut, remove, and legally dispose of selected electrical equipment, components, and materials as indicated, including, but not limited to, removal of electrical items indicated to be removed and items made obsolete by the new work.
C. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
D. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas per Owner’s infection control guidelines and procedures.
E. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
F. All penetrations through fire-rated walls, ceilings and floors shall be sealed with a U.L. listed sealant system that matches the fire rating of the surface penetrated.
G. Patch existing finished surfaces and building components that must be cut for the electrical installation or are damaged by Contractor using new materials matching existing materials.
H. Patch finished surfaces and building components using new materials specified for the original installation.
I. All cutting, patching, and repairing shall be subject to the supervision and the approval of Owner's Representative.

J. Repair and re-finish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fire proofing where existing fireproofing has been disturbed. Repair and re-finish materials and other surfaces by skilled mechanics of trades involved.

3.05 FINISHES:

A. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit degree of damage at each location.
B. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
C. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
D. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.
E. Repair damage to protective coatings in accordance with manufacturer’s recommendations.

3.06 CLEANING:

A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

3.07 PROTECTION:

A. Protect equipment and installations and maintain conditions to ensure that coatings, finishes and cabinets are without damage or deterioration at time of Substantial Completion.

3.08 CLOSEOUT:

A. Instructions, training, and manufacturer’s service representative:
   1. Provide on-site instructions and training of Owner's personnel as specified.
   2. Provide on-site services of a manufacturer's authorized service representative as specified

END OF SECTION 260510

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and DIVISION 01 Specification SECTION, apply to this SECTION.

1.02 SUMMARY:

A. This SECTION includes the following:
   1. Building wires and cables rated 600V and less.
   2. Connectors, splices, and terminations rated 600V and less.

1.03 REFERENCE STANDARDS:

A. Applicable Standards (latest edition):
   1. ASTM International:
      a. ASTM B 3-13 – Specification for Soft or Annealed Copper Wire.
   2. Code of Federal Regulations (CFR):
      a. 29 CFR - Labor, Chapter XVII - Occupational Safety and Health Administration, Department of Labor, Part 1910 - "Occupational Safety and Health Standards," Sub "General," Section 1910.7 - "Definition and Requirements for a Nationally Recognized Testing Laboratory."
   3. The Institute of Electrical and Electronics Engineers, Inc. (IEEE):
      a. IEEE 141 - Recommended Practice for Electric Power Distribution for Industrial Plants (the Red Book).
      b. IEEE 241 - Recommended Practice for Electric Power Systems in Commercial Buildings (the Gray Book).
   4. International Electrical Testing Association (NETA):
      a. NETA Acceptance Testing Specification - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
   5. National Electrical Manufacturers Association/Insulated Cable Engineers Association, Inc. (NEMA/ICEA):
      a. NEMA WC 70/ICEA S-95-658 - Power Cables Rated 2000 V or Less for the Distribution of Electrical Energy (ANSI)
   6. National Fire Protection Association (NFPA):
      a. NFPA 70 - National Electrical Code.
   7. Underwriters Laboratories Inc. (UL):
      a. UL 44 - Thermoset-Insulated Wires and Cables.
      b. UL 83 - Thermoplastic-Insulated Wires and Cables.
      c. UL 486A-486B - Wire Connectors.
      d. UL 493 - Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables.

1.04 DEFINITIONS:

A. EPDM: Ethylene-propylene-diene terpolymer rubber.
B. NBR: Acrylonitrile-butadiene rubber.

1.05 SUBMITTALS:

A. Product Data: For each type of product indicated.
B. Feeder conductor takeoffs used for procurement.
C. Field quality-control test reports.

1.06 QUALITY ASSURANCE:

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.01 CONDUCTORS AND CABLES:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Allied Wire and Cable, Inc.
   2. Cerro Wire, LLC.; a Marmon Wire & Cable/ Berkshire Hathaway company.
   3. Encore Wire and Cable.
   4. General Cable Corporation.
   5. Senator Wire & Cable Company.; a subsidiary of Southwire Company.
   6. Southwire Company.
   7. United Copper Industries.
B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.
C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Types THHN-THWN, XHHW.

2.02 CONNECTORS AND SPLICES:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. AFC Cable Systems, Inc.
   2. Cooper Bussmann; Eaton.
   3. Hubbell Power Systems, Inc.
   4. O-Z/Gedney; EGS Electrical Group LLC.
   5. 3M; Electrical Products Division.
   6. Tyco Electronics Corp.
   7. ILSCO.
   8. Ideal Industries, Inc.
   9. Frametone Connectors/Burndy Electrical.
   10. Thomas & Betts.
   11. Littelfuse.
B. Description: Long barrel compression splices, factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.01 CONDUCTOR MATERIAL APPLICATIONS:

A. General: Provide wire and cable suitable for the location where installed.
B. Conductors: Minimum conductor size shall be #12 AWG.
   1. Copper.
   2. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
C. Insulation Rating: Minimum insulation rating shall be 90°C.

3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS:

A. Exposed Feeders: Type THHN-THWN or XHHW, single conductors in raceway.
B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN or XHHW, single conductors in raceway.
C. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-THWN or XHHW, single conductors in raceway.
D. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN or XHHW, single conductors in raceway.
E. Class 1 Control Circuits: Type THHN-THWN, in raceway.
F. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.03 INSTALLATION OF CONDUCTORS AND CABLES:

A. General: Install electrical cables, wires, and connectors in compliance with NEC.
B. Coordinate cable installation with other Work.
C. Do not pull wire and cable until raceway system is complete. Pull conductors simultaneously where more than one is being installed in same raceway.
D. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
E. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
F. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
G. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.
H. Support cables according to SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS.
I. Identify and color-code conductors and cables according to SECTION 260553 - ELECTRICAL IDENTIFICATION.
   1. Insulation Color Coding for Phase Identification:
   2. Color code 600V insulated, feeder and branch circuit conductors with factory-applied colored insulation as follows:

208Y/120V	Phase	480Y/277V
Black	A	Brown
Red	B	Orange
Blue	C	Yellow
White	Neutral	Gray or White
Green	Ground	Green

J. For multi-wire branch circuits installed in a common raceway provide neutral insulation color noted above with tracer color corresponding to the phase the load is connected to.
K. Keep conductor splices to a minimum. All splices shall be made in junction boxes.
L. Provide adequate length of conductors within electrical enclosures and neatly train the conductors to terminal points. Circuits with conductors larger than No. 10 AWG shall be bundled together inside of enclosures. Make terminations so there are no bare conductors visible at the terminal.
M. Group circuits in conduit such that no conduit contains more than a total of three phase conductors, three neutral conductors, and one ground conductor (unless indicated or specified otherwise).
N. Provide a dedicated neutral conductor for each branch circuit. Sharing of neutrals is not acceptable.
O. Install wire and cable numbers on all field wiring that matches electrical schematics.
P. Wire phasing shall be A, B, C with Phase A connected to the left or top terminal, Phase B connected to the center terminal, and Phase C connected to the right or bottom terminal.
Q. All wire and cable shall be installed in raceways.

3.04 CONNECTIONS:

A. Provide UL-listed factory-fabricated, solderless metal connectors of sizes, ampacity ratings, materials, types and classes for applications and for services indicated.
   1. Conductor splices and taps for No. 10 AWG and smaller shall be twist-on spring solderless connectors or crimp pressure type connectors. Provide silicone filled twist-on watertight/raintight connectors for all circuits routed outdoors or indoors in wet locations.
   2. Taps and bus bar terminations of conductors No. 8 AWG and larger shall be made with compression, crimp type connection devices.
   3. Conductor splices No. 8 AWG and larger:
      a. Finger safe power distribution blocks with short circuit and ampacity ratings appropriate for conductor being spliced.
      b. Compression, crimp type two-way splice connector barrel for use with tool and die. Die code shall be embossed on connector after crimping.
   4. All uninsulated joints shall be taped to provide an insulation value equal to that of the wire.
B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
C. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
D. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.05 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS:

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in SECTION 260533 - RACEWAYS FOR ELECTRICAL SYSTEMS.

3.06 FIRESTOPPING:

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

3.07 FIELD QUALITY CONTROL:

A. Perform tests and inspections and prepare test reports.
B. Tests and Inspections:
   1. Prior to energizing, test wires and cables for electrical continuity and for short circuits.
   2. Prior to energizing, check all installed feeders and building service wires and cables with insulation megohm meter to determine insulation resistance levels to assure requirements are fulfilled. Record and submit all field test data. Megger 300V cables with 500Vdc megohm meter between each conductor and ground. Megger 600V cables with 1,000Vdc megger between each conductor and ground. Also, megger between adjacent conductors. Megger cables after installation (not on cable reel) with cables disconnected at both ends. Where existing feeders are extended to new electrical equipment, test new conductors prior to splicing to existing conductors. The values must be approximately as follows:

Conductor Size (AWG or MCM)	Resistance (Megohms-1,000 ft.)
14-8	200
6-2/0	100
3/0-500	50

   3. Do not test wires or cables with an ac test set.
   4. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   5. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each termination and splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so terminations and splices are accessible to portable scanner.
      a. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
      b. Record of Infrared Scanning: Prepare a certified report that identifies terminations and splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
C. Test Reports: Prepare a written report to record the following:
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
D. Remove and replace malfunctioning units, conductors, or cables and retest as specified above.

END OF SECTION 260519

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SECTION 260526 - GROUNDING

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 specifies electrical grounding and bonding as indicated on Drawings and schedules and as specified herein. Grounding and bonding work is defined to encompass systems, circuits, and equipment.
B. Type of electrical grounding and bonding work specified in this Section includes the following:
   1. Solidly grounded. Grounded through a ground connection in which no impedance has been intentionally inserted.
C. Applications of electrical grounding and bonding work in this Section include the following:
   1. Electrical power systems.
   2. Grounding electrodes.
   3. Separately derived systems.
   4. Raceways.
   5. Service equipment.
   6. Boxes and enclosures.
   7. Equipment.
   8. Lighting standards and poles.
D. Refer to other DIVISION 26 Sections for wires/cables, electrical raceways, boxes and fittings, and wiring devices which are required in conjunction with electrical grounding and bonding work; not work of this Section.

1.03 REFERENCES:

A. Applicable Standards:
   1. Institute of Electrical and Electronic Engineers (IEEE): Comply with applicable requirements and recommended installation practices of the following IEEE Standards pertaining to grounding and bonding of systems, circuits, and equipment:
      a. 32 - Requirements, Terminology, and Test procedures for Neutral Grounding Devices.
      b. 80 - Guide for Safety in Substation Grounding.
      c. 81 - Guide for Measuring Ground Resistance, and Potential Gradient in the Earth.
      d. 141 - Recommended Practice for Electric Power Distribution for Industrial Plants.
      e. 142 - Recommended Practice for Grounding Industrial and Commercial Power Systems.
   2. National Fire Protection Association (NFPA):
      a. 70 - National Electrical Code (NEC): Comply with applicable local electrical code requirements of the authority having jurisdiction, and NEC as applicable to electrical grounding and bonding, pertaining to systems, circuits, and equipment.
   3. Underwriters Laboratories (UL): Comply with applicable requirements of the following standards. Provide grounding and bonding products which are UL-listed and labeled for their intended usage.
      a. 467 - Electrical Grounding and Bonding Equipment.

b. 486A-486B - Wire Connector.
c. 869 - Electrical Service Equipment.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Subject to compliance with requirements, provide grounding and bonding products of one of the following (for each type of product):
   1. Grounding Products:
      a. Adalet-PLM Div; Scott Fetzer Co.
      b. Anderson/Square D.
      c. Burndy Corporation.
      d. Cadweld Div; Erico Products Inc.
      e. Crouse-Hinds Div; Cooper Industries.
      f. Ideal Industries, Inc.
      g. Joslyn Corporation.
      h. Myers Electric Products, Inc.
      i. O. Z. Gedney Div; General Signal Corp.
      j. Thomas and Betts Corp.

2.02 GROUNDING AND BONDING:

A. Materials and Components:
   1. General: Except as otherwise indicated, provide electrical grounding and bonding systems indicated; with assembly of materials, including, but not limited to, cables/wires, connectors, solderless lug terminals, grounding electrodes, bonding jumper braid, surge arresters, and additional accessories needed for a complete installation. Where more than one type component product meets indicated requirements, selection is Contractor's code-compliance option. Where materials or components are not indicated, provide products which comply with NEC, UL, and IEEE requirements and with established industry standards for those applications.
   2. Conductors: Unless otherwise indicated, provide insulated electrical grounding conductors for equipment grounding conductor connections that match power supply wiring materials and as a minimum are sized according to the NEC. Provide uninsulated, stranded, tinned, copper cable for ground electrode conductors.
   3. Electrical Grounding Connection Accessories: Provide electrical insulating tape, heat-shrinkable insulating tubing, welding materials, bonding straps, as recommended by accessories manufacturers for type service required or indicated.

PART 3 - EXECUTION

3.01 APPLICATIONS:

A. Install electrical grounding and bonding systems as indicated, in accordance with manufacturer's instructions and applicable portions of NEC, NECA's "Standard of Installation," and in accordance with recognized industry practices to ensure that products comply with requirements.
B. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
C. Conductor Terminations and Connections:
   1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.

3.02 EQUIPMENT GROUNDING:

A. Install insulated equipment grounding conductors with all feeders and branch circuits.
B. Terminate feeder and branch circuit insulated equipment grounding conductors with grounding lug on switchgear, switchboard, or panelboard ground bus. When conduit enters from below and is not connected to the enclosure, ground equipment grounding conductor on conduit grounding bushing and then bond to ground bus (or grounded enclosure if there is no ground bus).
C. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
    1. Feeders and branch circuits.
    2. Lighting circuits.
    3. Receptacle circuits.
    4. Single-phase motor and appliance branch circuits.
    5. Three-phase motor and appliance branch circuits.
    6. Flexible raceway and power cords runs.
    7. X-Ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.
    8. Ground wireway at least once and at 10-foot intervals.

3.03 INSTALLATION:

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
C. Ground electrical service system neutral at service entrance equipment to grounding electrodes.
D. Ground each separately derived system neutral to:
    1. Main building ground system.
E. Bond the system neutral to service entrance equipment enclosures.
F. Ground all exposed noncurrent carrying metal parts of electrical equipment, metal raceway systems, grounding conductors in raceways and cables, receptacle ground conductors, and metallic plumbing systems.
G. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torqueing requirements are not indicated, tighten connections to comply with tightening torque values specified in UL 486A-486B to assure permanent and effective grounding.
H. Apply corrosion-resistant finish to field connections, buried metallic grounding and bonding products, and places where factory applied protective coatings have been destroyed, which are subjected to corrosive action.

3.04 LABELING:

A. Comply with requirements in SECTION 260553 – ELECTRICAL IDENTIFICATION for instruction signs. The label or its text shall be green.

3.05 FIELD QUALITY CONTROL:

A. Perform tests and inspections.

B. Tests and Inspections:
   1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
   2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
   3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
      a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
      b. Perform tests by fall-of-potential method according to IEEE 81.
C. Grounding system will be considered defective if it does not pass tests and inspections.
D. Prepare test and inspection reports.
E. Report measured ground resistances that exceed the following values:
   1. 5 ohms.
F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

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 specifies hangers, supports, and anchors, for electrical equipment and systems as well as construction requirements for concrete bases specified in other DIVISION 26 SECTIONS.
B. Types of hangers, supports, anchors, sleeves, and seals specified in this SECTION include the following:
   1. Clevis hangers.
   2. Riser clamps.
   3. Steel rod coupling.
   4. C-clamps.
   5. I-beam clamps.
   6. One-hole conduit straps.
   7. Two-hole conduit straps.
   8. Hexagonal nuts.
   9. Round threaded steel rods.
   10. Conduit clamps.
   11. U-bolts.
   12. Toggle bolts.
   13. Conduit cable supports.
   14. U-channel strut system.
   15. Fire and smoke stop compounds.

1.03 RELATED REQUIREMENTS:

A. Supports, anchors, sleeves, and seals furnished as part of factory-fabricated equipment, are specified as part of that equipment assembly in other DIVISION 26 SECTIONS.
B. SECTION 260526 - GROUNDING.

1.04 REFERENCE STANDARDS:

A. Applicable Standards: Comply with the following standards.
   1. ASTM International:
      a. A 36/A 36M-04: Carbon Structural Steel.
      b. A 325-04: Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
      c. A 780-01: Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
      d. E 84-13a: Test Method for Surface Burning Characteristics of Building Materials
      e. D 635-10: Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position
      f. E 814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.

2. Manufacturers Standardization Society of The Valve Fitting Industry Inc.
   a. MSS SP-58: Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.
3. National Electrical Contractors Association
   a. 1: Standard Practices for Good Workmanship in Electrical Construction
   b. 101: Standard for Installing Steel Conduits (Rigid, IMC, EMT)
4. National Fire Protection Association (NFPA):
   a. 70 - National Electrical Code (NEC).
5. National Electrical Contractors Association (NECA):
   a. Standard of Installation - Pertaining to anchors, fasteners, hangers, supports, and equipment mounting.
6. Underwriters Laboratories (UL):
   a. Provide electrical devices, components, and fire stops which are UL-listed and labeled.

1.05 PERFORMANCE/DESIGN CRITERIA:

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.06 QUALITY ASSURANCE:

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
B. Comply with NFPA 70.

1.07 COORDINATION:

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete specifications.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Anchor Manufacturers: Subject to compliance with requirements, provide anchors of one of the following manufacturers.
   1. Cooper B-Line, Inc.; a division of Cooper Industries.
   2. Empire Industries, Inc.
   3. Hilti, Inc.
   4. Unistrut; Atkore International.
B. Channel System Manufacturers: Subject to compliance with requirements, provide channel system of one of the following manufacturers.

1. Allied Tube & Conduit Corp.
2. Eaton/Cooper; B-Line Systems, Industries.
3. Erico International Corp.
4. Kindorf; Thomas & Betts Corp.
5. Power-Strut; Power Engineering Co.
6. Unistrut; Atkore International.

C. Fire and Smoke Stop Compounds: Subject to compliance with requirements, provide channel system of one of the following manufacturers.
1. 3M Company.
2. Hilti, Inc.

2.02 MATERIALS:

A. General: Provide supporting devices which comply with manufacturer's standard materials, design, and construction in accordance with published product information, as required for complete installation, and as herein specified. All supports shall be designed for the support of the maximum number of conduits and their maximum conductor weights for maximum conduit loading. Where more than one type of supporting device meets indicated requirements, selection is Contractor's option. Do not use perforated metal straps for supports.

B. Supports: Supporting devices of types, sizes, and materials indicated, and having the following construction features.
1. Clevis Conduit Hangers: For supporting conduit; galvanized steel; with 3/8-, 1/2-, 5/8- or 3/4-inch rod, size of clevis and rod as required.
2. Riser Clamps: For supporting conduit, galvanized steel, with two bolts and nuts.
3. Steel Rod Couplings: Provide 3/8-, 1/2-, 5/8- or 3/4-inch straight rod couplings, size as required.
4. C-Beam Clamps: Malleable iron, 3/8-, 1/2-, 5/8-, or 3/4-inch rod, size as required.
5. I-Beam Clamps: Galvanized steel, with 3/8, 1/2-, 5/8-, or 3/4-inch rod, size as required; 3/8-inch horizontal "J" hook safety rod that bolts across the flange, flange width as required.
6. One-Hole Conduit Straps: For supporting conduit; stamped plated steel, size as required.
7. Two-Hole Conduit Straps: For supporting conduit, stamped plated steel, size as required.
8. Hexagonal Nuts, Flat Washers and Lock Washers: For 3/8-, 1/2-, 5/8-, or 3/4-inch rod, size as required; galvanized steel.
9. Round Threaded Steel Rod: Galvanized steel, 3/8-, 1/2-, 5/8-, or 3/4-inch diameter, size as required. Minimum size is 3/8-inch diameter.
10. Conduit Clamps: For supporting conduit; galvanized stamped steel, size as required.
11. U-Bolts: For supporting conduit; galvanized, size as required.

C. Anchors: Anchors of types, sizes and materials as required, with the following construction features.
1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
3. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A325.
4. Toggle Bolts: Springhead, 3/16 by 4 inch or larger size as required.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A36 & A36M, steel plates, shapes, and bars; black and galvanized.
F. Steel U-Channel Strut Systems: Unless indicated otherwise, U-channel strut system for supporting electrical equipment, 12-gauge steel hot-dip galvanized after fabrication for wet and outdoor locations, 12-gauge standard green paint finish for dry and indoor locations, of types and sizes indicated; construct with 9/16-inch diameter holes, 8 inch o.c. on top surface, and with the fittings as required which mate and match with U-channel.
    1. Comply with MFMA-4, factory-fabricated components for field assembly.
    2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
    3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
    4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
    5. Channel Dimensions: Selected for applicable load criteria.
G. Fire and Smoke Stop Compounds: Comply with Owner’s firestopping program guidelines and procedures.

PART 3 - EXECUTION

3.01 ERECTION, INSTALLATION, APPLICATION:

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this SECTION are stricter.
B. Install hangers and anchors as specified, required, indicated, in accordance with manufacturer's written instructions and with recognized industry practices to ensure supporting devices comply with requirements
C. Install hangers, supports, clamps, and attachments to support conduit properly from building structure. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze type hangers where possible. Install supports with spacings indicated and as required by the NEC or as indicated when less than NEC required spacing.
D. Design trapeze type supports, including fasteners to the structure to carry the following loads:
    1. The greater of the following:
        a. The total calculated load multiplied by a factor of 4.
        b. The total calculated load +200 pounds.
E. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
    1. To Wood: Fasten with lag screws or through bolts.
    2. To New Concrete: Bolt to concrete inserts.
    3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
    4. To Existing Concrete: Expansion anchor fasteners.
    5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
    6. To Light Steel: Sheet metal screws.
    7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.
F. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

G. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
H. Repair damage to painted finishes with paint recommended by manufacturer.
I. Install fire and smoke stop compounds at all penetrations of fire rated walls, floors, ceilings and roofs. Install fire and smoke stop compounds in accordance with manufacturer's instructions to provide a fire seal rating equal to or greater than that of the surface penetrated.
J. Zip ties are not allowed and shall not be utilized for the support of metal-clad (MC) cable except where attached to chain supports for pendant mounted light fixture.

3.02 CONCRETE BASES:

A. Provide concrete bases for all floor mounted electrical equipment of dimensions not less than 4 inches larger in both directions than supported unit, minimum of 4 inches high, with 3/4" chamfered edges, and so anchors will be a minimum of 10 bolt diameters from edge of the base. Reinforce concrete base with #4 bars at 18" on center with 1-1/2" clear from top of base.
B. All cement shall be Type I cement and conform to ASTM C150 and have a minimum 28-day compressive strength of 4000-psi with the following requirements:
   1. Maximum slump shall be 4" +/- 1"
   2. Maximum water cement ratio shall be 0.45
C. Aggregates for normal weight concrete shall conform to ASTM C33 "Specification for Concrete Aggregates". The nominal maximum size of aggregate shall not be more than 3/4".
D. Horizontal concrete surfaces shall be wood floated to depress coarse aggregate and steel troweled to a smooth finish.
E. Use Hilti Hit-RE 500 adhesive or approved equal for dowelled connections to existing concrete.
F. Install dowel rods to connect concrete bases to concrete floor. Provide #3 bars for dowels and embed into existing slab 3" with standard ACI hook centered in concrete base. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of base.
G. Reinforcing shall be ASTM A615 Grade 60.
H. Contractor shall detail and place all reinforcement in accordance with ACI SP-66 Details and Detailing for Concrete Reinforcement.
I. Anchor equipment to concrete base.
   1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   2. Install anchor bolts to elevations required for proper attachment to supported equipment.
   3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
   4. Anchor switchgear assemblies to channel-iron floor sills embedded in concrete bases and attach by bolting. Install sills level and grout flush with floor or base. Select sills to suit switchgear assemblies.

3.03 PAINTING:

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
   1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION 260529

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SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

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

1.02 SUMMARY:

A. This SECTION specifies the following:
   1. Conduit.
   2. Wireway.
   3. Outlet and device boxes.
   4. Weatherproof boxes.
   5. Junction boxes.
   6. Pull boxes.
   7. Fittings.
   8. Bushings and ground bushings.
   9. Locknuts
   10. Knockout closures.
   11. Supports and accessories.

1.02 RELATED REQUIREMENTS:

A. SECTION 078413 – PENETRATION FIREPROOFING for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.
B. SECTION 260526 - GROUNDING.
C. SECTION 260529 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS.
D. SECTION 260553 – ELECTRICAL IDENTIFICATION.

1.03 DEFINITIONS

A. EMT: Electrical metallic tubing.
B. FMC: Flexible metal conduit.
C. GRC: Galvanized rigid steel conduit.
D. LFMC: Liquid-tight flexible metal conduit.
E. RNC: Rigid nonmetallic conduit.

1.04 REFERENCE STANDARDS:

A. Applicable Standards: Comply with applicable requirements of the following standards:
   1. National Electrical Manufacturers Association (NEMA):
      a. FB1 – Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable (ANSI)
      b. FB2 – Selection and Installation Guidelines – Fittings for use with Non-Flexible Metallic Conduit or Tubing (Rigid Metal Conduit, Intermediate Metal Conduit and Electrical Metallic Tubing).
      c. FB2.20 – Selection and Installation Guidelines for Fittings for use with Flexible electrical Conduit and Cable.

d. RV3 – Application and Installation Guidelines for Flexible and Liquidtight Flexible Metal and Nonmetallic Conduits.
e. OS 1 – Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports.
f. 250 – Enclosures for Electrical Equipment (1,000V Maximum).

2. National Fire Protection Association (NFPA):
   a. NFPA 70 - National Electrical Code, (NEC). Comply with applicable requirements of NEC pertaining to construction and installation of raceway systems.
3. Underwriters Laboratories (UL):
   a. Provide all raceways which are UL listed and labeled.
   b. 1 - Flexible Metal Electrical Conduit.
   c. 6 - Rigid Metal Electrical Conduit.
   d. 360 - Liquidtight Flexible Steel Conduit.
   e. 467 – Grounding and Bonding Equipment.
   f. 514A – Metallic Outlet Boxes
   g. 514B - Fittings for Conduit and Outlet Boxes.
   h. 797 - Electrical Metallic Tubing.
   i. 870 - Electrical Wireways, Auxiliary Gutters, and Associated Fittings.
   j. 1773 – Termination Boxes.

1.04 SUBMITTALS:

A. Refer to DIVISION 01 and SECTION 260510 - Basic Electrical Requirements for administrative and procedural requirements for submittals.
B. Submittals shall include, but not be limited to, the following:
   1. Product Data: Submit manufacturer's technical product data, including specifications and installation instructions, for each type of raceway system required. Include data substantiating that materials comply with requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURER:

A. Manufacturer:
   1. Subject to compliance with requirements, provide each type of raceway from one of the following:
      a. Rigid Steel Conduit:
         1) Allied Tube and Conduit.
         2) Triangle PWC Inc.
         3) Wheatland Tube Co.
      b. EMT:
         1) Allied Tube and Conduit.
         2) Triangle PWC Inc.
         3) Wheatland Tube Co.
      c. Flexible Metal Conduit:
         1) Anaconda Metal Hose, Div. of ANAMET, Inc.
         2) Electri-Flex Co.
         3) Steelflex Electro Corp.
      d. Rigid Metal Conduit Fittings:
         1) Appleton Electric Co.
         2) Raco Inc.
         3) Thomas & Betts Corp.
      e. Flexible Metal Conduit Fittings:

1) Appleton Electric Co.
2) Electri-Flex Co.
3) O. Z. Gedney Co.

f. EMT Fittings:
1) Appleton Electric Co.
2) Raco Inc.
3) Thomas & Betts Corp.

g. Wireway:
1) Hoffman Engineering Co.
2) Square D Co.

h. Conduit Bodies:
1) Appleton Electric; Div. of Emerson Electric Co.
2) Arrow-Hart Div; Crouse Hinds Co.
3) Bell Electric Div; Square D Co.
4) Gould, Inc.
5) Killark Electric Mfg. Co.
6) O.Z./Gedney Div; General Signal Co.
7) Spring City Electrical Mfg. Co.

i. Interior Boxes:
1) Appleton; EGS Electrical Group.
2) Bell; Hubblell, Inc.
3) O.Z./Gedney; EGS Electrical Group.
4) Pass and Seymore; Legrand.
5) Raco: Hubbell, Inc.
6) Steel City; Thomas & Betts Corp.

j. Weatherproof Boxes:
1) Appleton; EGS Electrical Group.
2) Arrow Hart; Eaton
3) Hubblell, Inc.
4) O.Z./Gedney; EGS Electrical Group.
5) Pass and Seymore; Legrand.

k. Junction and Pull Boxes:
1) Appleton; EGS Electrical Group.
2) Arrow Hart; Eaton
3) Bell Electric Div; Square DCo.
4) Hoffman Engineering Company.
5) Killark Electric Mfg. Co.
6) O.Z./Gedney Div; EGS Electrical Group.

l. Bushings, Grounding Bushings and Locknuts:
1) Appleton Electric; Div. of Emerson Electric Co.
2) Arrow-Hart Div; Crouse Hinds Co.
3) O.Z./Gedney Div; EGS Electrical Group.
4) Raco: Hubbell, Inc.
5) Steel City; Thomas & Betts Corp.

m. Electrical Enclosures:
1) Hoffman; Pentair Equipment Protection.
2) Wiegmann; Hubbell, Inc.

2.02 METAL CONDUIT AND TUBING:

A. General: Provide metal conduit, tubing, and fittings of types, grades, sizes, and weights (wall thicknesses) for each service indicated. Where types and grades are not specified or indicated, provide proper selection to fulfill specified requirements, and comply with applicable portions of NEC for raceways. Minimum size shall be 3/4 inch, unless indicated or specified otherwise.
   1. Raceways for the following systems shall be identified with factory applied finish:
      a. Life Safety branch: Red with uncolored junction boxes.
      b. Critical branch: Orange.
      c. Equipment branch: Yellow.
      d. Fire Alarm: Red.
B. Rigid Steel Conduit: Rigid steel, zinc coated, threaded type conforming to UL6.
   1. Zinc coating fused to inside and outside walls.
C. Electrical Metallic Tubing (EMT): UL797.
D. Flexible Metal Conduit: UL1. Formed from continuous length of spirally-wound, interlocked zinc-coated strip steel. Minimum size shall be 3/4 inch unless indicated or specified otherwise. Approved as a grounding path for circuits rated 20 amperes or less and in lengths of 6 feet and less.
E. Rigid Metal Conduit Fittings: Threaded cast-malleable iron, galvanized or cadmium plated, conforming to UL514B.
   1. Provide steel fittings for steel conduit.
F. Flexible Metal Conduit Fittings: Threadless hinged clamp type. Provide conduit fittings for use with flexible steel conduit. Fittings shall be approved for grounding per NEC 350-5.
   1. Straight Terminal Connectors: One-piece body, female end with clamp and deep slotted machine screw for securing conduit, and male threaded end provide with locknut.
   2. 45º or 90º Terminal Angle Connectors: Two-piece body construction with removable upper section, female end with clamp and deep slotted machine screw for securing conduit, and male threaded end provided with locknut.
G. EMT Fittings: Steel compression type.
H. Conduit Bodies: Galvanized cast-metal conduit bodies of types, shapes, and sizes as required to fulfill job requirements and NEC requirements. Construct conduit bodies with threaded conduit entrance ends, removable covers, either cast or of galvanized steel, and corrosion-resistant screws.
I. Conduit and Tubing Accessories: Provide conduit and tubing accessories of types, sizes, and materials, complying with manufacturer's published product information which mate and match conduit and tubing.
J. Conduit Bushings: Provide insulated throat for all bushings. Grounding bushings shall have an integral copper set-screw type cable grounding lug.

2.03 FABRICATED MATERIALS:

A. Outlet Boxes: Galvanized, coated, flat rolled, sheet-steel outlet wiring boxes, of shapes, cubic inch capacities, and sizes, including box depths as required, indicated, and specified, suitable for installation at respective locations. Construct outlet boxes with mounting holes and with conduit knockout openings in bottom and sides. Provide boxes with threaded screw holes for grounding screws, fastening devices, box covers, and for equipment grounding. Minimum box size shall be 4-inch by 4-inch by 2.25 inches, provide larger box if required, specified or indicated otherwise.
B. Device Boxes: Galvanized, coated, flat rolled, sheet-steel gangable device boxes, of shapes, cubic inch capacities, and sizes, including box depths as required, indicated, and specified, suitable for installation at respective locations. Construct device boxes for flush mounting with

mounting holes, with conduit knockout openings in bottom and sides, and with threaded screw holes for fastening devices and box covers. Provide corrosion-resistant screws for equipment grounding. Minimum box size shall be 4-inch by 4-inch by 2.25 inches, provide larger box if required, specified or indicated otherwise.

1. Device Box Accessories: Provide as required for each installation, including mounting brackets, device box extensions, switch box supports, plaster ears, and plaster board expandable grip fasteners (use only in existing walls) which are compatible with device boxes being utilized to fulfill installation requirements for individual wiring situations. Choice of accessories is Contractor's code-compliance option.

C. Weatherproof Boxes: Corrosion-resistant, cast-metal, weatherproof, outlet wiring boxes, of types, shapes, and sizes, including depth of boxes as required with threaded conduit hubs for fastening electrical conduit. Provide cast-metal face plates with spring-hinged, watertight caps suitably configured for each application, including face plate gaskets and corrosion-resistant fasteners.

D. Junction and Pull Boxes: Galvanized, code-gage sheet steel junction and pull boxes, with screw-on covers; of types, shapes, and sizes, to suit each respective location and installation; with welded seams and equipped with manufacturer's standard corrosion resistant steel nuts, bolts, screws and washers.

E. Floor Boxes: Cast-iron, raintight, adjustable floor boxes as indicated, with threaded-conduit-entrance ends and vertical adjusting rings, gaskets, brass floor plates with flush screw-on covers with ground flange and stainless steel cover screws.

1. Floor Boxes Accessories: Flush type, duplex, 2-pole, 3-wire, grounding, 125V, 20 ampere, floor-type receptacles with flanges.

F. Bushings: Provide threaded, nylon insulated metallic bushings. Provide steel bushings for conduit sizes 1.5 inches and smaller. Provide malleable iron bushings for conduit sizes 2 inches and larger.

G. Grounding Bushings: Provided where indicated, specified and required by NEC. Provide threaded, insulated, malleable iron bushing with lay-in screw clamp lug.

H. Locknuts: Provide steel locknuts for conduit sizes 2 inches and smaller. Provide malleable iron for conduit sizes 2.5 inches and larger.

I. Sealing Hub: Provide watertight, threaded, insulated sealing hub connectors for all outdoor and indoor wet locations where conduit enters into enclosures. Sealing hub threaded lengths shall be adequate to allow installation of bushing.

J. Knockout Closures: Provide steel press-in knockout seals for all unused punched out knockouts 2 inches and smaller. Provide steel two-piece bolt on knockout seals for all unused punched out knockouts 2.5 inches and larger.

K. Fittings: Provide all threaded nipples, insulated short elbows, offset nipples, offset connectors, enlargers and reducers as required. Provide EMT compression type connectors with insulated throat. Provide EMT compression type insulated short elbows as required. Provide EMT set-screw type offset connectors as required.

L. Hinged-Cover Enclosures:

1. Comply with UL 50 and NEMA 250, TYPE 1, TYPE 3R with continuous-hinge cover with flush latch unless otherwise indicated.
    a. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
    b. Nonmetallic Enclosures: Fiberglass.
    c. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

M. Cabinets:

1. NEMA 250, Type 1, Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.

3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.01 INSTALLATION OF RACEWAYS:

A. General:
1. Install raceways as indicated in accordance with manufacturer's written installation instructions and in compliance with NEC. Install raceways plumb and level, and maintain NEC recommended clearances. Provide raceway supports in accordance with the NEC and Section 260529 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS.

B. Coordinate with other work including wires/cables, boxes, and panel work as necessary to interface installation of electrical raceways and components with other work.

3.02 INSTALLATION OF CONDUITS:

A. General: Install concealed conduits in new construction work - in walls, in slabs, or above suspended ceilings. Run conduits concealed in existing work where practicable. Where conduits cannot be concealed in finished areas, use surface metal raceways only where indicated. Provide holes for conduit in all boxes, panels and enclosures as required.
1. All conduit installed above grade including exposed and concealed above removable suspended ceilings shall be identified in accordance with Section 260553 - Electrical Identification.
2. Mechanically fasten together metal conduits, enclosures, and raceways to form continuous electrical conductor. Connect to electrical boxes, fittings, and cabinets to provide electrical continuity and firm mechanical assembly.
3. Avoid use of dissimilar metals throughout system to eliminate possibility of galvanic corrosion. Where dissimilar metals are in contact, coat surfaces with corrosion inhibiting compound before assembling.
4. Install miscellaneous fittings such as reducers, close nipples, 3-piece unions, split couplings, and plugs that have been specifically designed and manufactured for their particular application. Install telescoping type linear expansion fittings in raceways every 200 foot linear run and wherever structural expansion joints are crossed.
5. Use roughing-in dimensions of electrically powered units furnished by unit manufacturer. Set conduit and boxes for connection to units only after receiving dimensions and after checking location with other trades.
6. Test conduits (witnessed by the Owner) required to be installed but left empty with ball mandrel. Clear any conduit which rejects ball mandrel. Pay costs involved for restoration of conduit and surrounding surfaces to original condition. Provide 200 pounds tensile strength nylon conduit fish line throughout the entire length of all empty conduits. Leave 12 inch of slack at each end.
7. Do not install conduit in front of covers of new and existing electrical equipment, pull boxes, and junction boxes.
8. Provide all openings in floors, walls, ceilings and roofs for passage of conduit. Fire ratings of walls, floors, ceiling and roofs shall be maintained when passing through them by providing fire seals in accordance with Section 078413 – PENETRATION FIRESTOPPING.

9. Where different conduits contain circuits of different noise levels the horizontal and vertical spacing in inches between the outside surfaces of the conduits or conduit to cable tray shall not be less than indicated below unless specified otherwise, indicated otherwise, or required otherwise by the equipment manufacturer:
   a. Noise Level 1 Circuits: Analog circuits less than 50V, digital circuits less than 12V or telephone circuits.
   b. Noise Level 2 Circuits: Analog circuits greater than 50V or digital circuits greater than 12V.
   c. Noise Level 3 Circuits: 120Vac or dc circuits operating at less than 20 amperes.
   d. Noise Level 4 Circuits: Ac or dc circuits less than 800V operating with currents less than 800 amperes.
   e. Noise Level 5 Circuits: Circuits over 800Vac or dc and/or over 800 amperes.

MINIMUM HORIZONTAL AND VERTICAL SPACING BETWEEN
DIFFERENT CONDUIT OUTSIDE SURFACES
(OR CONDUIT TO CABLE TRAY) IN INCHES

Noise Level	1	2	3	4	5
1	*	1	3	12	12
2	1	*	3	9	12
3	3	3	*	*	6
4	12	9	*	*	*
5	12	12	6	*	*

10. Provide a weatherproof duct seal compound between the conductors and the inner walls of all conduit that are routed to NEMA 3, 3R, 3S, 4 and 4X enclosures to prohibit moisture and/or humid air from entering the raceway and condensing.
11. Repair damage to galvanized finishes with a zinc-rich paint recommended by the manufacturer.
12. Repair damage to PVC finishes with matching touch-up coating recommended by the manufacturer.
13. Where metallic conduit leaves cast-in-place concrete to air, to earth, or to compacted fill coat the conduit 2 inches on either side of the line formed by the finished concrete surface with a bitumastic asphalt coating.

3.03 RACEWAY APPLICATION:

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed Conduit: RMC.
   2. Concealed Conduit, Aboveground: RMC.
   3. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
B. Indoors: Apply raceway products as specified below unless otherwise indicated:
   1. Raceways for circuits above 600V shall be RMC
   2. Exposed (600V and below): EMT.
   3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
   4. Concealed in Existing to Remain Interior Walls and Partitions: EMT
   5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
   6. Damp or Wet Locations: RMC.

7. Hazardous storage, flammable storage, and Class 1, Division 2 Electrical Classification areas: RMC.
8. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 in institutional and commercial kitchens and damp or wet locations. Explosion-proof for hazardous locations.

3.04 INSTALLATION:

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
C. Complete raceway installation before starting conductor installation.
D. Comply with requirements in SECTION 260529 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS for hangers and supports.
E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
H. Support conduit within 12 inches of enclosures to which attached.
I. Conduit installed above suspended ceilings shall comply with the following:
   1. Install exposed conduit work so as not to interfere with ceiling inserts, windows, doors, lights, ventilation ducts or outlets.
   2. Support exposed conduits by use of hangers, clamps, or clips. Support conduits on each side of bends and on spacing not to exceed NEC requirements.
J. Stub-ups to Above Recessed Ceilings:
   1. Use EMT or RMC for raceways.
   2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
M. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
N. Terminate conduits square to enclosures into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install locknuts hand tight plus 1/4 turn more. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
O. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
P. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
Q. Conduits shall not cross pipe shafts, access openings or ductwork openings.
R. Support riser conduit at each floor level with clamp hangers.

S. Field-bend conduit with benders designed for purpose so as not to distort nor vary internal diameter.
T. Size conduits as indicated, unless no size is indicated then size per NEC, except no conduit smaller than 3/4 inch shall be embedded in concrete or masonry.
U. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
V. Install conduits so as not to damage or run through solid structural members. Avoid horizontal or cross runs in building partitions or side walls.
W. Expansion-Joint Fittings:
    1. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100ºF and that has straight-run length that exceeds 100 feet.
    2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
        a. Outdoor Locations Not Exposed to Direct Sunlight: 125ºF temperature change.
        b. Outdoor Locations Exposed to Direct Sunlight: 155ºF temperature change.
        c. Indoor Spaces Connected with Outdoors without Physical Separation: 125ºF temperature change.
        d. Attics: 135ºF temperature change.
    3. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
    4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
    5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
X. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed luminaires, the final 24 inches for connection to equipment subject to vibration, noise transmission, or movement; and for transformers and motors in nonhazardous locations. Provide a "green" insulated equipment ground wire suitably sized per NEC 250.122 unless indicated otherwise in all flexible steel conduit.
Y. Provide explosionproof flexible metal conduit where indicated or required.
Z. Concealed Conduits:
    Install underground conduits a minimum of 24 inches below finished grade.
AA. Conduits in Concrete Slabs: Prohibited.
BB. Exposed Conduits:
    1. Install exposed conduits and extensions from concealed conduit systems neatly and parallel with or at right angles to walls of building or structure.
    2. Install exposed conduit work so as not to interfere with ceiling inserts, windows, doors, lights, ventilation ducts or outlets.
    3. Support exposed conduits by use of hangers, clamps, or clips. Support conduits on each side of bends and on spacing not to exceed NEC requirements.
    4. Run conduit for outlets on waterproof walls exposed. Set anchors for supporting conduit on waterproof wall in waterproof cement.
    5. Above requirements for exposed conduits also apply to conduits installed in space above suspended ceilings and in crawl spaces.
CC. Conduit Fittings:
    1. Provide locknuts for securing conduit to metal enclosures with a sharp edge for digging into metal and ridged outside circumference for proper fastening. Standard locknuts are not acceptable.

2. Provide threaded, nylon insulated bushings for terminating conduits which have flared bottom and ribbed sides, with smooth upper edges to prevent injury to cable insulation.
3. Provide threaded, grounding bushings of insulated type with copper set screw clamp type lay-in grounding terminal where required by NEC, where indicated or specified.
4. Provide miscellaneous fittings such as reducers, close nipples, 3-piece unions, split couplings, and plugs as required which are specifically designed for their particular application.
5. Provide grounding in accordance with SECTION 260526 - GROUNDING.
6. Provide raintight hubs on all outdoor conduit that are terminated in a nonthreaded enclosure hole.
7. Provide identification of all raceways as specified in SECTION 260553 - ELECTRICAL IDENTIFICATION.
8. EMT shall have galvanized compression type box connectors at all boxes.

3.05 INSTALLATION OF ELECTRICAL BOXES AND FITTINGS:

A. General: Install electrical boxes, bushings, locknuts, nipples, connectors, sealing hubs, and fittings as required, indicated, in accordance with applicable requirements of NEC and in accordance with recognized industry practices to fulfill project requirements.
B. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
C. Coordinate installation of electrical boxes and fittings with wire/cable, wiring devices, and raceway installation work.
D. Provide weatherproof boxes for interior and exterior locations exposed to weather or moisture.
E. All boxes containing emergency power and lighting circuits shall be identified as specified in SECTION 260553 – ELECTRICAL IDENTIFICATION.
F. Provide knockout closures to cap unused knockout holes where blanks have been removed.
G. Install electrical boxes in only those locations which ensure ready accessibility to enclosed electrical wiring.
H. Maximum box size in a fire-rated wall shall be 4 inches by 4 inches square. Do not install boxes back-to-back in walls. In nonfire-rated and nonacoustic- rated walls, provide not less than 6 inches horizontal separation between boxes installed in opposite sides of wall. Provide not less than 24 inches horizontal separation between boxes installed in opposite sides of fire-rated and acoustic- rated walls.
I. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
J. Do not install aluminum products in concrete.
K. Position recessed outlet boxes accurately to allow for surface finish thickness.
L. Set floor boxes level and flush with finish flooring material.
M. Fasten electrical boxes firmly and rigidly to the surfaces to which attached, structural surfaces to which attached, or solidly embed them in concrete or masonry. Do not support boxes by conduits.
N. Provide electrical connections for installed boxes.
O. Locate boxes so that cover or plate will not span different building finishes.
P. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
Q. Subsequent to installation of boxes, protect boxes from construction debris and damage.

3.06 GROUNDING:

A. Properly ground electrical boxes and demonstrate compliance with NEC requirements. Bond all non-isolated equipment grounding conductors to all electrical boxes.

END OF SECTION 260533

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SECTION 260553 – ELECTRICAL IDENTIFICATION

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 specifies electrical identification work including the following:
   1. Electrical power, control, and communication conductors and raceways.
   2. Operational instructions and warnings.
   3. Danger, caution and warning signs.
   4. Equipment/system identification nameplates.

1.03 REFERENCE STANDARDS:

A. Applicable Standards: Comply with the applicable requirements of the following standards.
   1. American National Standards Institute (ANSI):
      a. Z535.1 - Safety Color Code.
   2. ASME International:
      a. A13.1 - Scheme for the Identification of Piping Systems.
   3. Federal Specifications (FS):
      a. FS L-P-387 - Polyethylene Low and Medium Density - Molding Material (for designation plates).
   4. National Fire Protection Association (NFPA):
      a. 70 - National Electrical Code (NEC), as applicable to installation of identifying labels and markers for wiring and equipment.
      b. 72 – National Electric Safety Code (NESC) – IEEE C2.
   5. Occupational Safety and Health Administration (OSHA):
      a. 29 CFR 1910.144 – Safety Color Code for Marking Physical Hazards.
      b. 29 CFR 1910.145 - Specifications for Accident Prevention Signs and Tags.
   6. Underwriters Laboratories (UL), pertaining to electrical identification systems:
      a. 969 – Standards for Marking and Labeling Systems.

1.04 SUBMITTALS:

A. Refer to DIVISION 01 and SECTION 260510 - BASIC ELECTRICAL REQUIREMENTS for administrative and procedural requirements for submittals.
B. Includes, but not limited to, the following:
   1. Product Data: Submit manufacturer's data on electrical identification materials and products.

1.05 QUALITY ASSURANCE:

A. Comply with ANSI A13.1 and IEEE C2.
B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
D. Comply with ANSI Z535.4 for safety signs and labels.
E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.06 COORDINATION:

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other SECTIONS requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
C. Coordinate installation of identifying devices with location of access panels and doors.
D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Subject to compliance with requirements, provide electrical identification products of one of the following (for each type marker):
1. Brady Worldwide, Inc.
2. Panduit Corp.
3. Seton Identification Products.
4. Thomas & Betts Corp.

2.02 ELECTRICAL IDENTIFICATION MATERIALS:

A. General: Except as otherwise indicated, provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for an application, selection is Installer's option; but provide single selection for each application.
B. Raceway Identification Materials:
1. Raceways connected to unit substations, switchgear, automatic transfer switches, and distribution panels:
a. Self-adhesive vinyl tape marker not less than 3 mils thick. Provide minimum 1-1/8 inch wide by 4-1/2 inch long marker for 2 inch and smaller conduit. Provide minimum 2-1/4 inch wide by 9 inch long marker for 2-1/2 inch and larger conduit.
1) Provide machine printed white lettering on red field for raceways carrying life safety power, critical power, or equipment power circuit cables and indicate “Life Safety Power”, “Critical Power”, or “Equipment Power” on label.
2) Provide machine printed black lettering on white field for raceways and cable tray carrying normal power circuit cables and indicate "Normal Power" on label.
3) Provide machine printed lettering as described above which indicates load and source raceway is connected to.
4) Identify raceway at source, load, and 50-foot intervals where located in accessible locations.
5) Critical power example (red field, white lettering):

CRITICAL POWER
ATS-CH1 FED FROM PSG1

6) Normal power example (white field, black lettering):
NORMAL POWER
ATS-CH1 FED FROM USS-HNB

2. Labels for branch circuit raceways connected to lighting and appliance panelboards at 600V or less: Permanent, waterproof, machine printed, self-adhesive label with white field and black filled letters. Identify circuit number(s) of conductor(s) contained in the raceway. The use of handheld label makers is acceptable for this application.

C. Conductor Identification Materials:
1. Conductors 600V or less: Provide factory applied, color coded, conductor insulation. Colored, self-adhesive vinyl tape is not acceptable.
2. Wire/Cable Identification Bands:
a. Vinyl-cloth self-adhesive cable/conductor markers of wrap-around type, either prenumbered plastic coated type or machine printed type with clear plastic self-adhesive cover flap; numbered to show circuit identification number indicated on Drawings or Shop Drawings.

D. Plasticized Tags:
1. General: Preprinted or partially preprinted accident-prevention and operational tags, on plasticized card stock with matt finish suitable for writing, approximately 3-1/4 inches by 5-5/8 inches, with brass grommets and wire fasteners, and with appropriate preprinted wording, including large-size primary wording, e.g., "DANGER, DO NOT OPERATE." Tags shall comply with OSHA requirements.

E. Self-Adhesive Plastic Signs:
1. General: Self-adhesive or pressure-sensitive, preprinted, flexible vinyl signs for operational instructions or warnings; of sizes suitable for application areas and adequate for visibility, with proper wording for each application, e.g., "EXHAUST FAN."
a. Colors: Unless otherwise indicated or required by governing regulations, provide white signs with black lettering for equipment connected to normal power. Provide red signs with white lettering for equipment connected to life safety power, critical power, and equipment branch power.

F. Baked Enamel "Danger" Signs:
1. "DANGER" signs of baked enamel finish on 20-gauge steel unless specified otherwise; of standard safety red, safety black, and safety white as defined by ANSI Z535.1; 14 inches by 10 inches size, except where 10 inches by 7 inches is the largest size which can be applied where needed, and except where larger size is needed for adequate vision; with recognized standard explanation wording, e.g., "_____VOLTS, KEEP AWAY." Sign shall conform to OSHA and ANSI Z535.1.

G. Baked Enamel "Caution" Signs:
1. "CAUTION" signs of baked enamel finish on 20 gauge steel unless specified otherwise; of standard safety yellow with safety black letters; 14 inches by 10 inches size, except where 10 inches by 7 inches is the largest size which can be applied where needed, and except where larger size is needed for adequate vision; with recognized standard explanation wording, e.g., "Caution: Ear Protection Required in this Area."

H. Baked Enamel "WARNING" Signs:
1. "WARNING" signs of baked enamel finish on 20 gauge steel unless specified otherwise; of standard safety orange with safety black letters; 14 inches by 10 inches size, except where 10 inches by 7 inches is largest size that can be applied where needed and except where larger size is needed for adequate vision; with recognized standard explanation wording. Sign shall conform to OSHA and ANSI Z535.1.

I. Engraved Plastic-Laminate Nameplates:

1. General: Engraving stock melamine plastic laminate nameplates, in sizes (minimum height of characters shall be 3/16 inch) and thicknesses specified or indicated, engraved with engraver's standard letter style of sizes and wording indicated, white face and black core plies (letter color) for normal power except as otherwise indicated, specified or required. Nameplate shall be punched for mechanical fastening except where adhesive mounting is necessary because of surface it is mounted to.
    a. Thickness: 1/16-inch, for units up to 20 square inches or 8 inch length; 1/8-inch for larger units.
    b. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate surface it is mounted to.
2. Lettering and Graphics:
    a. Coordinate names, abbreviations, and other designations used in electric identification work with corresponding designations shown, specified, or scheduled. Provide numbers, lettering, and wording as indicated or, if not otherwise indicated, as recommended by manufacturer or as required for proper identification and operation/maintenance of electrical systems and equipment.

PART 3 - EXECUTION

3.01 APPLICATION AND INSTALLATION:

A. General Installation Requirements:
    1. Install electrical identification products as indicated, in accordance with manufacturer's written instructions and requirements of NEC.
    2. Coordination: Where identification is to be applied to surfaces which require finish painting, install identification after completion of painting.
    3. Regulations: Comply with governing regulations and requests of governing authorities for identification of electrical work.
B. Conduit Identification Markers:
    1. General: Where electrical conduit is exposed or installed in accessible locations, apply identification markers on electrical conduit at 50 foot intervals visible from the floor and within 3 feet of all panelboards, switchboards, switchgear, automatic transfer switches, substations, switches, devices, and circuit breakers readily visible when standing in front of equipment.
    2. Medium Voltage raceways shall be identified with color coded label at 25 foot intervals and within 3 feet of all switchgear connections.
    3. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
C. Wire/Cable Identification Bands:
    1. General: Apply cable/conductor identification bands, including circuit number, on each wire/cable in each box/enclosure/cabinet/panelboard where wires of more than one circuit or communication/signal system are present. Match identification with marking system used in panelboards, shop drawings, contract documents, and similar previously established identification for project's electrical work.
D. Operational Identification and Warning Plasticized Tags and Metal Signs and Plastic Signs:
    1. General: Wherever reasonably required to ensure safe and efficient operation and maintenance of electrical systems, and electrically connected mechanical systems and

general systems and equipment, including prevention of misuse of electrical facilities by unauthorized personnel, install signs with instruction or warnings. When signs are installed on switches, outlets, controls, devices and covers of electrical enclosures they may be self-adhesive vinyl or plastic. Where detailed instructions or explanations are needed, provide plasticized tags with clearly written messages adequate for intended purposes.

E. Danger Signs:
   1. General: In addition to installation of danger signs specified, indicated, and required by governing regulations and authorities, install appropriate danger signs at locations indicated and at locations subsequently identified by Installer of electrical work as constituting similar dangers for persons in or about Project.
   2. XXXX Volts: Install danger signs (with actual circuit voltage) on all building doors, substations, switchgear, switchboards, panelboards switches, circuit breakers, etc., wherever it is possible (under any circumstances) for persons to come into contact with electrical voltages to ground greater than 277V.
   3. Critical Switches/Controls: Install danger signs on switches and similar controls, regardless of whether concealed or locked up, where untimely or inadvertent operation (by anyone) could result in significant danger to persons or damage to or loss of property.
   4. Provide the following danger sign on the equipment indicated:
      a. "Danger This Machine Starts Automatically" on all pumps, air handlers, fan arrays, exhaust fans, and emergency generators.
   5. Provide the following danger signs on the doors leading to the equipment indicated:
      a. "Danger Hearing Protection Required" on all emergency generator room doors.
      b. "Danger: No Smoking, Matches or Open Flames" on all emergency generator room doors and battery room doors.

F. Warning Signs:
   1. Provide an orange background sign with black letters reading "WARNING: LOAD SIDE OF SWITCH MAY BE ENERGIZED BY BACKFEED" on all tie switches and tie circuit breakers.

G. Caution Signs:
   1. Provide the following yellow background caution sign with black letters on all panelboards, substations, switches, circuit breakers, and switchboards where turning off a circuit will automatically start an emergency generator:
      a. "Caution: Turning Off this Circuit will Automatically Start Emergency Generators".
   2. Provide the following yellow background caution sign with black letters on all automatic transfer switches, uninterruptible power systems, switches, circuit breakers, equipment, and emergency panelboards that are energized by the emergency power system:
      a. "Caution: Automatically Energized by the Emergency Power System."

H. Equipment/System Identification Nameplates:
   1. General: Install engraved plastic-laminated nameplates on each major unit of electrical equipment, central or master unit of each electrical system including communication/ control/signal/alarm systems in the building as specified in paragraph 2.02, I.
   2. Provide text matching terminology and numbering included in the contract documents and shop drawings. Nameplate shall include unit designation, power source and room number ("Fed from *panel name; room number*"), circuit voltage, and other data specifically indicated on nameplate details included on Drawings. Provide nameplates for each unit of the following categories of electrical work:
      a. Unit substations.
      b. Switchgear.
      c. Switchboards.
      d. Distribution panelboards.

e. Lighting and appliance panelboards.
f. Transformers.
g. Disconnect switches.
h. Variable frequency motor controllers.
i. Motor starters.
j. Contactors.
k. Enclosed switches and circuit breakers.
l. Enclosed controllers.
m. Lighting control equipment, including remote controlled switches and control devices.
n. Uninterruptible power supplies (UPS).
o. Main switches and all circuit breakers located in unit substations, switchgear, switchboards, and distribution panelboards.
p. Electrical cabinets, and enclosures.
q. Access panel/doors to electrical facilities.

3. Install markers, tags, nameplates, and signs at locations indicated or, where not otherwise indicated, at location for best convenience of viewing without interference with operation and maintenance of equipment. Secure the identification with fasteners, except use adhesive where fasteners should not or cannot penetrate surface.

3.02 IDENTIFICATION SCHEDULE:

A. Exposed or Accessible Raceways, connected to unit substations, switchgear, automatic transfer switches, and distribution panels at 600V or less: Identify with self-adhesive vinyl label as specified in paragraph 2.02, B, 1.
B. Exposed or Accessible Raceways, for branch circuit raceways connected to lighting and appliance panelboards at 600V or less: Identify with self-adhesive vinyl label as specified in paragraph 2.02, B, 2.
C. Exposed or Accessible Raceways and Junction Boxes within Buildings: Identify the covers of each junction and pull box with paint as follows:
   1. Fire Alarm – red.
   2. Building Automation System/Temperature Controls – blue.
D. Junction and pull box covers shall include and identify circuit numbers, panelboard designation, system voltage, and service (normal, life safety, critical, or equipment power).
E. Raceways for the following systems shall be identified with color-coded, self-adhesive vinyl tape applied in bands or factory applied finish:
   1. Fire Alarm System: Red, factory applied finish.
   2. Life Safety System: Red, factory applied finish.
   3. Critical Branch System: Orange, factory applied finish.
   4. Equipment Branch System: Yellow, factory applied finish.
   5. Fire-Suppression Supervisory and Control System: Red, factory applied finish.
   6. Control Wiring: Blue.
F. Power-Circuit Conductor Identification, 600 V or Less: For all conductors in pull and junction boxes, manholes, and handholes, use factory applied color-coding to identify the phase.
   1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit conductors.
      a. Color shall be factory applied.
      b. Colors for 208/120-V Circuits:
         1) Phase A: Black.
         2) Phase B: Red.

3) Phase C: Blue.
4) Neutral: White.
5) Ground: Green.
6) Switch Legs: Pink.

c. Colors for 480/277-V Circuits:
1) Phase A: Brown.
2) Phase B: Orange.
3) Phase C: Yellow.
4) Neutral: White or Gray.
5) Ground: Green.
6) Switch Legs: Purple.

G. Conductors to Be Extended in the Future: Attach write-on tags and/or marker tape to conductors and list source and circuit number.

H. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

END OF SECTION 260553

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SECTION 26 08 00 – COMMISSIONING OF ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 DESCRIPTION

A. The purpose of this section is to specify the Contractor's responsibilities and participation in the commissioning process.

B. Commissioning testing shall be performed by this division Sub contractor and documented by the Commissioning Authority. Commissioning is primarily the responsibility of the Commissioning Authority, with start-up, testing and support for commissioning the responsibility of Division 26. The commissioning process does not relieve the Sub contractor from participation in the process or diminish the role and obligations to complete all portions of work in a satisfactory and fully operational manner.

C. Work of Division 26 includes:

1. Testing and start-up of the electrical equipment.
2. Assistance in functional testing to verify equipment/system performance.
3. Providing qualified personnel to assist in commissioning tests required after the initial commissioning.
4. Completion and endorsement of Pre-functional Construction Checklists provided by the Commissioning Authority to verify that Division 26 equipment and systems are fully operational and ready for functional testing.
5. Providing equipment, materials and labor necessary to correct deficiencies found during the commissioning process which fulfill contract and warranty requirements.
6. Providing operation and maintenance information and as-built drawings to the Commissioning Authority for review verification and organization prior to distribution.
7. Providing assistance to the Commissioning Authority to develop, edit and document system operation descriptions.
8. Provide a detailed start up plan for BMcD's review, comment and recommendation.
9. Provide at the end of the job the following items for inclusion in the systems manual.
    a. Control drawings, sequences of control, and coordination studies with as-left overcurrent protective device settings
    b. A table of all set points
    c. Schedules, instructions for operation of each piece of equipment for emergencies, seasonal adjustment, startup and shutdown
    d. A list of all manufacture recommended preventive maintenance procedures for all equipment and systems.
10. Use web-based Facility Grid Commissioning application to fill out Construction Checklists and to track issues resolutions. Attendance at one training class is required for all Sub contractors. This training will take place at the construction Cx kick off. Sub contractor to provide laptop, tablet, or cellular smartphone for their respective use in the field. Software application costs shall be borne by Commissioning Agent.
11. Providing training for the systems specified in this Division.

1.02 RELATED WORK

A. All installation, testing and start-up procedures and documentation requirements specified within Division 26 and related portions of this project.

B. Section 019113 – General Commissioning Requirements

C. Commissioning Functional Test Procedures that require participation of the Division 26 Contractors.

D. Cooperate with the Commissioning Authority in the following manner:

1. Provide all testing and start-up procedures and documentation requirements specified within Division 01 and Division 26 and related portions of this project.
2. Allow sufficient time before final completion dates so electrical systems start-up and commissioning can be accomplished.
3. Provide labor and material to make corrections when required without undue delay.
4. Put all electrical systems and equipment into full operation and continue the operation of the same during each working day of the testing and commissioning.
5. Include the costs of load banks, metering equipment, and specialty test equipment to obtain satisfactory system performance as requested by the Owner, Engineer of Record, or the Commissioning Authority.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

A. Standard test equipment for commissioning will be provided by the Sub Contractor.

B. Division 26 Sub Contractor or 3rd party NETA certified agency shall provide standard and specialized test equipment as necessary to test and start up the electrical systems.

C. Proprietary test equipment required by the manufacturer, whether specified or not, shall be provided by the manufacturer of the equipment through the installing Sub Contractor. Manufacturer shall provide the test equipment, demonstrate its use, and assist the Commissioning Authority in the commissioning process.

D. The Sub Contractor shall provide all equipment, software and all test programming support as necessary to start up, calibrate, debug and verify proper function of electrical control systems and integration with the control/facility management system. This equipment and software shall be provided for use by both the testing Sub Contractor and the Commissioning Authority.

PART 3 EXECUTION

3.01 WORK PRIOR TO COMMISSIONING

A. Complete all phases of work so the systems can be energized, started, tested and otherwise commissioned. Division 26 has primary start-up responsibilities with obligations to complete systems, including all sub-systems, so they are functional. This includes the complete installation of all equipment materials, raceways, wire, terminations, controls, etc., per the Contract Documents and related directives, clarifications, change orders, etc.

B. A Commissioning Plan will be developed by the Commissioning Authority. Upon request of the Commissioning Authority, the Sub Contractor shall provide assistance and consultation. The Commissioning Plan will be developed prior to completion of the installation. The Sub Contractor is obligated to assist the Commissioning Authority in preparing the Commissioning Plan by providing all necessary information pertaining to

the actual equipment and installation. If Sub Contractor-initiated system changes have been made that alter the commissioning process, the Commissioning Authority will notify the Engineer of Record and the Sub Contractor may be obligated to compensate the Commissioning Authority to test the revised product or confirm the suitability/unsuitability of the substitution or revision.

C. Specific pre-commissioning responsibilities of Division 26 are as follows:
   1. Normal start-up services required bringing each system into a fully operational state. This includes electrical rotational check, motor rotational check, cleaning, lug and termination torqueing, insulation resistance testing for wiring, electrical phasing check, control sequences of operation, etc. The Commissioning Authority will not begin the commissioning process until each system is complete, including normal Subcontractor start-up and debugging.
   2. The Subcontractor shall perform pre-functional construction checklists on the systems to be commissioned to verify that all aspects of the work are complete in compliance with the plans and Specifications. Subcontractor start-up forms may be substituted for the pre-functional test forms with prior approval by the Commissioning Authority.
   3. Factory start-up services will be provided for key equipment and systems specified in Division 26. Factory start-up activities shall be documented and submitted. The Subcontractor shall coordinate this work with the manufacturer and the Commissioning Authority.
   4. Notify General Contractor and Commissioning Authority when systems are ready for functional testing.

D. Commissioning is intended to begin upon completion of a system. Commissioning may proceed prior to the completion of systems and/or sub-systems, if expediting this work is in the best interests of the Owner. Commissioning activities and schedule will be coordinated with the Sub Contractor. Start of commissioning before system completion will not relieve the Sub Contractor from completing those systems as per the schedule.

3.02 PARTICIPATION IN COMMISSIONING

A. Commissioning testing shall be performed by this Division Sub Contractor and documented by the Commissioning Authority. Provide skilled technicians to start up and debug all systems within this division of work. These same technicians shall be made available to assist the Commissioning Authority in completing the commissioning program as it relates to each system and their technical specialty. Work schedules, time required for testing, etc., will be requested by the Commissioning Authority and coordinated by the Sub Contractor. Sub Contractor will ensure the qualified technician(s) are available and present during the agreed-upon schedules and of sufficient duration to complete the necessary tests, adjustments and/or problem resolutions.

B. System problems and discrepancies may require additional technician time, Commissioning Authority time, redesign and/or reconstruction of systems and system components. The additional technician time shall be made available for the subsequent commissioning periods until the required system performance is obtained.

C. The Commissioning Authority reserves the right to judge the appropriateness and qualifications of the technicians relative to each item of equipment, system and/or sub-system. Qualifications of technicians include expert knowledge relative to the specific equipment involved, adequate documentation and tools to service/commission the equipment and an attitude/willingness to work with the Commissioning Authority to get

the job done. A liaison or intermediary between the Commissioning Authority and qualified factory representatives does not constitute the availability of a qualified technician for purpose of this work.

3.03 WORK TO RESOLVE DEFICIENCIES

A. In some systems, maladjustments, misapplied equipment, and/or deficient performance under varying loads will result in a system that does not meet the original design intent. Correction of work will be completed under direction of the Engineer of Record, with input from the Sub Contractor, equipment supplier and Commissioning Authority. Whereas all members will have input and the opportunity to discuss, debate and work out problems, the Engineer of Record will have final jurisdiction on the necessary work to be done to achieve performance.

3.04 ADDITIONAL COMMISSIONING

A. Additional commissioning activities may be required after system adjustments, replacements, etc., are completed. The Sub Contractor, suppliers, and Commissioning Authority shall include a reasonable reserve to complete this work as part of their standard contractual obligations.

B. The cost of compensation of the Commissioning Authority for repeat testing or troubleshooting due to systems that do not meet specified performance shall be borne by the Sub Contractor.

C. Corrective work shall be completed in a timely fashion to permit the timely completion of the commissioning process.

3.05 SYSTEMS TO BE COMMISSIONED

A. Refer to specification section 019113.

3.06 TRAINING

A. This Sub Contractor will be required to participate in the training of the Owner's engineering and maintenance staff for each system and the related components. Training may be conducted in a classroom setting, with system and component documentation, and suitable classroom training aids, or in the field with the specific equipment. The type of training will be per the Owner's option.

3.07 SYSTEMS DOCUMENTATION

A. Maintain as-built red-lines on the job site as required in Division 01. Given the size and complexity of this project, red-lining of the drawings at completion of construction based on memory of key personnel is not satisfactory. Continuous and regular red-lining and/or posting of drawings is considered essential and mandatory.

B. In addition to the stated requirements for operation and maintenance data, provide one (1) copy of equipment technical literature, operation and maintenance literature and shop drawings to the Commissioning Authority as soon as they are available. This requirement is for review of these documents prior to distribution of multiple copies for the Owner's final use.

C. Provide schedules, instructions for operation of each piece of equipment for emergencies, seasonal adjustment, startup and shutdown.

D. A list of all manufacture recommended preventive maintenance procedures for all equipment and systems.

END OF SECTION 260800

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SECTION 262213 - TRANSFORMERS

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 specifies transformer work as indicated by drawings and schedules.
B. Types of transformers specified in this SECTION include the following:
   1. Dry-type transformers, 600V and less.

1.03 RELATED REQUIREMENTS:

A. SECTION 260526 – GROUNDING for grounding.

1.04 REFERENCE STANDARDS:

A. American National Standards Institute (ANSI):
   1. C2 - National Electrical Safety Code.
   2. C57.12.01 - General Requirements for Dry-Type Distribution and Power Transformers.
   3. C57.12.50 - Requirements for Ventilated Dry-Type Distribution Transformers 1-500 kVA, Single-Phase, and 15-500 kVA, Three-Phase with High-Voltage 601-34,500V, Low Voltage 120-600V.
   4. C57.12.51 – Requirements for Ventilated Dry-Type Power Transformers, 501 kVA and larger, Three-Phase, with High-Voltage 601V to 34,500V; Low-Voltage 208Y/120V to 4160V.
   5. C57.12.91 - Test Code for Dry-Type Distribution and Power Transformers.
B. National Electrical Manufacturers Association (NEMA):
   1. TP1 - Guide to Determining Energy Efficiency for Distribution Transformers.
   2. TP2 - Standard Test Method for Measuring the Energy Consumption of Distribution Transformers.
   3. TR1 - Transformers, Regulators, and Reactors. (Supplements ANSI C57 - Series Standards.)
   4. TR27 - Commercial, Institutional, and Industrial Dry-Type Transformers.
   5. ST20 - Dry-type Transformers for General Applications.
   6. 250 - Enclosures for Electrical Equipment.
C. National Fire Protection Association (NFPA):
   1. 70 - National Electrical Code (NEC). Comply with NEC as applicable to installation and construction of electrical power/distribution transformers.
D. Underwriters Laboratories (UL): Comply with applicable requirements of ANSI/UL 506 Safety Standard for Specialty Transformers. Provide transformers and components which are UL-listed and labeled.
   1. UL 1561 - Large General Purpose Transformers.

1.05 SUBMITTALS:

A. Refer to DIVISION 01 and SECTION 260510 - BASIC ELECTRICAL REQUIREMENTS for administrative and procedural requirements for submittals.
B. Include, but not limited to, the following:
   1. Product Data: Submit manufacturer's technical product data including rated kVA, frequency, primary and secondary voltages, wiring diagram, percent taps, polarity, impedance and certification of transformer performance efficiency at 100% load,

percentage voltage regulation at 100% load at 75ºC, full-load losses in watts, percent impedance at 75ºC, hot-spot and average temperature rise above 40ºC ambient temperature, sound level in decibels, and standard published data.
2. Submit all field test data.
3. Submit Operation and Maintenance manuals.

1.06 QUALITY ASSURANCE:

A. Source Limitations: Obtain each transformer type through one source from a single manufacturer.
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
C. Comply with IEEE C57.12.91, "Test Code for Dry-Type Distribution and Power Transformers."

1.07 DELIVERY, STORAGE, AND HANDLING:

A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

1.08 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete bases are specified in SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS.
B. Coordinate installation of wall-mounting and structure-hanging supports with actual transformer provided.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, provide products of one of the following (for each type of transformer):
1. Eaton Cutler-Hammer.
2. Square D, a brand of Schneider Electric.
3. GE/ABB.

2.02 TRANSFORMERS

A. General: Except as otherwise specified or indicated, provide manufacturer's standard materials and components as indicated by published product information, designed and constructed as recommended by manufacturer, and as required for complete installation. Comply with NEMA TP 1, Class 1 efficiency levels for all transformers 15 kVA and larger. Core material shall be grain-oriented, non-aging silicon steel. Coils shall be continuous windings without splices except for taps. Internal coil connections shall be brazed or pressure type.
B. Dry-Type Transformers (45 kVA or less): Factory-assembled and -tested, general-purpose, air-cooled, dry-type transformers; of sizes, characteristics, and rated capacities indicated.
1. Single-phase transformer (where indicated):
a. 60-hertz.
b. 10-kV BIL.

c. Manufacturer's standard impedance.
d. 480V primary and 240/120V secondary with grounded neutral.

2. Three-phase transformer (where indicated):
   a. 60-hertz.
   b. 10-kV BIL.
   c. Manufacturer's standard impedance.
   d. 480V delta connected primary and 208/120V wye connected secondary with grounded neutral.
   e. Copper primary and secondary windings.
   f. Provide primary winding with 4 full capacity taps; two 2-1/2% increments below and above full-rated voltage for deenergized tap-changing operation.
   g. Insulate with 220ºC, UL-component-recognized insulation system with a maximum of 115ºC rise above 40ºC ambient temperature.
   h. Rate transformer for continuous operation at rated kVA.
   i. Limit transformer surface temperature rise to maximum of 65ºC.
   j. Provide terminal enclosure, with cover, to accommodate primary and secondary winding connections and raceway connectors. Equip terminal leads with connectors installed.
   k. Limit terminal compartment temperature to 75ºC when transformer is operating continuously at rated load with ambient temperature of 40ºC.
   l. Provide wiring connectors suitable for copper wiring.
   m. Cushion-mount transformers with external vibration isolation supports; sound-level ratings shall not exceed ANSI/NEMA standards.
   n. Electrically ground core and coils to transformer enclosure by means of flexible metal grounding strap.
   o. Provide transformers with ventilated or fully enclosed sheet steel enclosures. Apply manufacturer's standard light gray indoor enamel over cleaned and phosphatized steel enclosure.
3. Provide transformers suitable for wall mounting, floor mounting, or suspended from structure. Provide all accessories including wall brackets for mounting location indicated on Drawings.

C. Dry-Type Transformers (above 45 kVA): Factory-assembled and -tested, general-purpose, ventilated, dry-type transformers; of sizes, characteristics, and rated capacities indicated.
1. 3-phase.
2. 60-hertz.
3. 10-kV BIL.
4. 5.75% impedance.
5. 480V delta-connected, primary; and 208Y/120V 4-wire, wye-connected secondary with grounded neutral.
6. Provide primary windings with a minimum of 6 full capacity taps; four 2-1/2% increments above full-rated voltage and two 2-1/2% increments below full-rated voltage for deenergized tap-changing operation.
7. Copper primary and secondary windings.
8. Insulate with 220ºC, UL-component-recognized insulation system with a maximum of 115ºC rise above 40ºC ambient temperature.
9. Rate transformer for continuous operation at rated kVA.
10. Limit transformer surface temperature rise to maximum of 65ºC.

11. Provide terminal enclosure, with hinged cover, to accommodate primary and secondary winding connections and raceway connectors. Provide terminal board with clamp type connectors.
12. Limit terminal compartment temperature to 75ºC when transformer is operating continuously at rated load with ambient temperature of 40ºC.
13. Provide wiring connections suitable for copper wiring.
14. Integrally mount vibration isolation supports between core and coil assembly and transformer enclosure.
15. Electrically ground core and coils to transformer enclosure by means of flexible metal grounding strap.
16. Do not exceed maximum sound-level rating in accordance with ANSI/NEMA standards.
17. Provide transformers with ventilated steel enclosures and lifting lugs.
18. Apply manufacturer's standard light gray outdoor enamel over cleaned and phosphatized steel enclosure.
19. Provide transformers suitable for wall mounting, floor mounting, or suspended from structure. Provide all accessories including wall brackets for mounting location indicated on Drawings.

D. Equipment/System Identification: Provide equipment/system identification nameplates complying with SECTION 260553 - ELECTRICAL IDENTIFICATION.
E. Finishes: Coat interior and exterior surfaces of transformer, including bolted joints, with manufacturer's standard color gray baked-on enamel.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.
B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.
C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.
D. Verify that ground connections are in place and requirements in SECTION 260526 – GROUNDING have been met. Maximum ground resistance shall be 5 ohms at location of transformer.
E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install transformers as indicated, complying with manufacturer's written instructions, applicable requirements of NEC, NESC, NEMA, ANSI and IEEE standards, and in accordance with recognized industry practices to ensure that products fulfill requirements. Arrange equipment to provide adequate space for access and for cooling air circulation.
B. Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A-486B.
C. Construct concrete bases and anchor floor-mounting transformers according to manufacturer's written instructions and requirements in SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS.

3.03 CONNECTIONS

A. Provide equipment grounding connections for transformers as specified, indicated, and as required. Tighten connections to comply with tightening torques specified in UL 486A-486B to assure permanent and effective grounding. Provide grounding in accordance with SECTION 260526 - GROUNDING.

B. Connect wiring according to SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES.

3.04 IDENTIFICATION

A. Provide identification of transformers as specified in SECTION 260553 - ELECTRICAL IDENTIFICATION.

3.05 TESTING

A. Prior to energization of transformers, check all accessible connections for compliance with manufacturer's torque tightening specifications. Clean out any dust and dirt.

B. Prior to energization, check circuitry for electrical continuity and for short circuits.

C. Adjust transformer primary taps for nominal system voltage at initial installation.

END OF SECTION 262213

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SECTION 262416 - PANELBOARDS

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 specifies panelboards, including cabinets and boxes, as indicated by drawings and schedules, and as specified herein.

B. Types of panelboards and enclosures required for the project include the following:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.03 RELATED REQUIREMENTS:

A. Wires/cables, electrical boxes, fittings, and raceways required in conjunction with the installation of panelboards and enclosures: Other DIVISION 26 SECTIONS.

B. SECTION 260526 - GROUNDING for grounding.

C. SECTION 260553 - ELECTRICAL IDENTIFICATION for electrical identification.

1.04 REFERENCE STANDARDS:

A. National Electrical Manufacturers Association (NEMA):

1. 250 - Enclosures for Electrical Equipment (1,000V Maximum).
2. PB1 - Panelboards.
3. PB1.1 - Instructions for Safe Installation, Operation, and Maintenance of Panelboards Rated 600V or Less.
4. PB2.2 - Application Guide for Ground-Fault Protective Devices for Equipment.

B. National Fire Protection Association (NFPA):

1. 70 - National Electrical Code (NEC): Comply with applicable local code requirements of the authority having jurisdiction and NEC as applicable to installation and construction of electrical panelboards and enclosures.

C. Underwriters Laboratories (UL): Provide panelboard units which are UL listed and labeled.

1. 50 - Electrical Cabinets and Boxes.
2. 67 - Electrical Panelboards.
3. 486A-486B - Wire Connectors.
4. 489 - Molded Case Circuit Breakers and Circuit Breaker Enclosures.
5. 1449 – Surge Protective Devices.

D. Federal Specification (FS) Compliance: Comply with applicable requirements of the following standards.

1. FS W-C-375 Series - Molded-Case Circuit-Breakers, Branch Service and Circuit.

1.05 SUBMITTALS:

A. Refer to DIVISION 01 and SECTION 260510 - BASIC ELECTRICAL REQUIREMENTS for administrative and procedural requirements for submittals.

B. Includes, but not limited to, the following:

1. Product Data: Submit manufacturer's data on panelboards and enclosures.
   a. Panelboard dimensions and weight.
   b. Complete data on circuit breakers and fuses. Submit time - current characteristic curves of all devices.

c. Panelboard short-circuit interrupting capacity, and information on buses: phase, neutral, and ground.
d. Information on whether panelboard is fed from top or bottom.
e. Data on maximum and minimum incoming and outgoing feeder and branch circuit wire size.
f. Data on door, locks, and mounting: surface or flush.
g. Data on total number of poles and number of unused poles that are available for future use.

C. All Field Test Data.

1.06 MAINTENANCE MATERIAL SUBMITTALS:

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Keys: Two spares for each type of panelboard cabinet lock.

B. Operation and Maintenance Manual.

1.07 QUALITY ASSURANCE:

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

1.08 DELIVERY, STORAGE, AND HANDLING:

A. Handle and prepare panelboards for installation according to NEMA PB 1.

1.09 PROJECT CONDITIONS:

A. Environmental Limitations:
1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
a. Ambient Temperature: Not exceeding -23ºF to +104ºF.
b. Altitude: Not exceeding 6,600 feet.

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6,600 feet.

C. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to ASCD/SEI 7.
1. The term “withstand” means “the unit will remain in place without separation of any parts from the device when subjected to the seismic forces applied.”

1.10 COORDINATION:

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete bases are specified in SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS.

1.11 WARRANTY:

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace surge protective devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Subject to compliance with requirements, provide panelboard products of one of the following (for each type and rating of panelboard and enclosure):

1. Eaton Cutler-Hammer.
2. Square D, a brand of Schneider Electric.
3. GE/ABB

2.02 GENERAL REQUIREMENTS FOR PANELBOARDS:

A. Except as otherwise indicated, provide panelboards, enclosures, and ancillary components of types, size, and ratings indicated, which comply with manufacturer's standard materials and with the design and construction in accordance with published product information.

B. Where types, sizes, or ratings are not indicated, comply with NEC, UL, and established industry standards for those applications indicated.

C. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces.

D. Equip with proper number of panelboard switching and protective devices as required for complete installation.

E. Provide ground fault circuit interrupter type circuit breakers where indicated.

F. Enclosures: Flush- and surface-mounted cabinets as indicated.

1. Provide enclosures fabricated by same manufacturer as panelboards which mate and match properly with panelboards.
2. Rated for environmental conditions at installed location. Provide NEMA type as described below, unless indicated or specified otherwise.
   a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
   b. Outdoor Locations: NEMA 250, Type 3R.
3. Materials: Galvanized sheet steel cabinet type enclosures, in sizes required. Provide code gage, minimum 16-gage, thickness steel.
4. Front: Secured to box with adjustable, concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
5. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Front doors shall have flush locks with three keys per panelboard, all panelboard enclosures keyed alike.

6. Finishes:
   a. Color: Baked gray enamel finish over a rust inhibitor coating.
   b. Panels and Trim: Galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
   c. Back Boxes: Galvanized steel.
7. Directory Card: Inside panelboard door, equip with interior circuit directory frame and removable card with clear plastic covering.

G. Phase, Neutral, and Ground Buses:
1. Bus shall be braced to withstand available short circuit currents as indicated.
2. Provide suitable lugs on neutral bus for incoming and outgoing feeders requiring neutral connections.
3. Equipment Ground Bus: Bare, uninsulated, adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
4. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box. Provide as indicated.
5. Extra-Capacity Neutral Bus and Lugs: Neutral bus and lugs rated 200% of phase bus and UL listed as suitable for nonlinear loads. Provide as indicated.
6. Material: Hard-drawn copper, 98% conductivity.

H. Conductor Connectors: Suitable for use with conductor material and sizes.
1. Material: Hard-drawn copper, 98% conductivity, suitable for use with copper conductors.
2. Main and Neutral Lugs: Mechanical type.
3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
4. Feed-Through Lugs: Prohibited.
5. Subfeed (Double) Lugs: Mechanical.
6. Extra-Capacity Neutral Lugs: Rated 200% of phase lugs mounted on extra-capacity neutral bus. Provide as indicated.
7. Provide terminals UL rated for 75ºC (Minimum) conductors.

I. Overcurrent Protection Devices: All devices on essential power system shall allow for electrical coordination.

J. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

K. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals as indicated. Series rated devices are not permitted. Panelboards rated 250 Vac or less shall have short-circuit current rating as indicated on drawings or as scheduled herein, but not less than 10,000 amperes RMS symmetrical. Panelboards rated 480/277 Vac shall have short-circuit current rating as indicated on drawings or as scheduled herein, but not less than 14,000 amperes RMS symmetrical.

2.03 DISTRIBUTION PANELBOARDS:

A. Panelboards: NEMA PB 1, dead front, safety type, power and feeder distribution type, 480Y/277V and 208Y/120V (voltage rating as required), 3 phase, 4 wire, 60 hertz with full-sized neutral bus, as indicated with panelboard switching and protective devices in quantities, ratings, types, and with arrangement shown; with anti-turn solderless pressure type main lug connectors approved for use with copper conductors. Provide full height panels for all distribution panels.

B. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
1. For doors more than 36 inches high, provide two latches, keyed alike.

C. Incoming Mains Location: Top or Bottom as required.

D. Mains: Electronic trip circuit breaker with field replaceable rating plug or field adjustable trip unit.
E. Branch Overcurrent Protective Devices:
   1. Bolt-on, molded-case circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal. Electronic trip type with field replaceable rating plug or field adjustable trip unit.
   2. Molded-case circuit breakers shall have toggle handles that indicate when tripped.
   3. Where multiple pole breakers are indicated, provide with common trip so overload on one pole will trip all poles simultaneously.
   4. Circuit breakers shall be replaceable without disturbing adjacent units.
   5. Provide double branch mounting configuration for all branch circuit breakers. Single mounting (center mounted) configuration is not permitted.
F. Provide distribution panels with minimum enclosure height of 86" tall.

2.04 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS:

A. Panelboards: NEMA PB 1, dead front, safety type, 480Y/277V and 208Y/120V (voltage rating as required), 3 phase, 4 wire, 60 hertz with full-sized neutral bus, lighting and appliance branch-circuit type as indicated with switching and protective devices in quantities, ratings, types, and arrangements shown.
B. Incoming Mains Location: Top or Bottom as required.
C. Mains: Electronic trip circuit breaker with field replaceable rating plug or field adjustable trip unit.
D. Branch Overcurrent Protective Devices:
   1. Bolt-on, molded-case circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.
   2. Molded-case circuit breakers shall have toggle handles that indicate when tripped.
   3. Where multiple pole breakers are indicated, provide with common trip so overload on one pole will trip all poles simultaneously.
   4. Circuit breakers shall be replaceable without disturbing adjacent units.
   5. Provide electronic trip type circuit breakers with field replaceable rating plug or field adjustable trip unit for circuits 30 amps and larger and where required for coordination to the 0.1 second interval for panelboards connected to the essential electrical system.
E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.05 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES:

A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
   1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 125 A and larger.
   2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
   3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
      a. Instantaneous trip.
      b. Long- and short-time pickup levels.
      c. Long- and short-time time adjustments.
      d. Ground-fault pickup level, time delay, and I^2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
6. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
7. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
    a. Factory assembled, bolt-on, standard frame sizes, trip ratings, and number of poles.
    b. Voltage Ratings:
        (1) All circuit breakers applied at 208Vac or 240Vac shall be rated 250Vac.
        (2) All circuit breakers applied at 480Vac shall be rated 480Vac.
    c. Interrupt Ratings:
        (1) Minimum of 10,000 A rms, symmetrical for 120Vac, 208Vac, and 240Vac unless indicated otherwise.
        (2) Minimum of 14,000 A rms, symmetrical for 277Vac, 480Vac, and 600Vac unless indicated otherwise.
    d. Lugs: Mechanical style, suitable for number, size, trip ratings, and rated for use with copper conductor materials.
    e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
    f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
    g. Shunt Trip: 120V trip coil energized from separate circuit, set to trip at 75% of rated voltage.
    h. Undervoltage Trip: Set to operate at 35 to 75% of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
    i. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
    j. Alarm Switch: Single-pole, normally open contact that actuates only when circuit breaker trips.
    k. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
    l. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
    m. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

B. Arc Energy Reduction: Provide circuit breakers rated, or can be adjusted to, 1200A or higher with means to reduce circuit breaker clearing time using maintenance switching with local status indicator.

2.06 PANELBOARD SUPPRESSORS:

A. Surge Protection Device: IEEE C62.41-compliant, externally mounted, wired-in, solid-state, parallel-connected, modular (with field-replaceable modules) type, with sine-wave tracking suppression and filtering modules, UL 1449, second edition, short-circuit current rating matching or exceeding the panelboard short-circuit rating, and with the following features and accessories:
    1. Accessories:
        a. Fuses rated at 200-kA interrupting capacity.

b. Fabrication using bolted compression lugs for internal wiring.
c. Integral disconnect switch.
d. Redundant suppression circuits.
e. Redundant replaceable modules.
f. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
g. LED indicator lights for power and protection status.
h. Audible alarm, with silencing switch, to indicate when protection has failed.
i. Form-C contacts rated at 5 A and 250Vac, one normally open and one normally closed, for remote monitoring of system operation. Contacts shall reverse position on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
j. Four-digit, transient-event counter set to totalize transient surges.

2. Peak Single-Impulse Surge Current Rating: 120 kA per mode/240 kA per phase.
3. Minimum single-impulse current ratings, using 8- by 20-mic.sec. waveform described in IEEE C62.41.2.
   a. Line to Neutral: 70,000 A.
   b. Line to Ground: 70,000 A.
   c. Neutral to Ground: 50,000 A.
4. Protection modes and UL 1449 SVR for grounded wye circuits with 480Y/277V, 208Y/120V, three-phase, four-wire circuits shall be as follows:
   a. Line to Neutral: 800V for 480Y/277, 400V for 208Y/120.
   b. Line to Ground: 800V for 480Y/277, 400V for 208Y/120.
   c. Neutral to Ground: 800V for 480Y/277, 400V for 208Y/120.

2.07 ACCESSORY COMPONENTS AND FEATURES:

A. Accessories: Provide panelboard accessories and devices including, but not limited to, cartridge and plug time-delay type fuses, ground fault circuit interrupter (GFCI) breakers, split bus construction, circuit breaker handle locks, etc., as recommended by panelboard manufacturer for ratings and applications as indicated. Provide circuit breaker handle locks on all circuits that supply night lights, exit signs, emergency lights, emergency power, public address system panels, energy management and control system (EMCS) panels, and fire alarm panels.
B. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.
B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION OF PANELBOARDS:

A. Install panelboards and enclosures as indicated, providing NEC required working space, in accordance with manufacturer's written instructions, applicable requirements of NEC and in compliance with recognized industry practices to ensure that products fulfill requirements.

B. Construct concrete bases and anchor floor-mounting panelboards according to manufacturer's written instructions and requirements in SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS.
C. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torqueing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A-486B.
D. Fasten enclosures firmly to walls and structural surfaces, ensuring that they are permanently and mechanically anchored.
E. Provide properly wired electrical connections for panelboards within enclosures.
F. Install numbers on all circuit breakers, and type the panelboard's circuit directory card upon completion of installation work. Clearly identify the load on each circuit and the circuit number.
G. Insert fuses if any, of ratings indicated, within installed panelboards.
H. Provide filler plates in all unused spaces.
I. Provision for future circuits at all flush mounted panelboards (unless indicated otherwise): Extend four 1-inch empty conduit from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Extend four 1-inch conduit into raised floor space or below floor slab (not required for slabs on grade or basement floor slabs).

3.03 GROUNDING:

A. Provide equipment grounding connections for panelboard enclosures as indicated and as required by NEC. Tighten connections to comply with tightening torques specified in UL 486A-486B to assure permanent and effective grounds. Provide grounding as specified in SECTION 260526 - GROUNDING.

3.04 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with SECTION 260553 – ELECTRICAL IDENTIFICATION.
B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in SECTION 260553 - ELECTRICAL IDENTIFICATION.
D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified SECTION 260553 - ELECTRICAL IDENTIFICATION.

3.05 FIELD QUALITY CONTROL:

A. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
B. Acceptance Testing Preparation:
   1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each feeder and branch circuit 30 amps and larger.
C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Prior to energization of electrical circuitry, check all accessible connections to manufacturer's tightening torque specifications.
4. Prior to energization, check panelboard circuits for short circuits, electrical continuity of circuits, enclosure grounding and neutral grounding at service entrance and at incoming derived source transformer.
5. Prior to energization of panelboards, check with insulation resistance tester: phase-to-phase and phase-to-ground insulation resistance levels of each phase bus to ensure requirements are fulfilled. Record and submit test results.
6. Perform the following infrared scan tests and inspections and prepare reports:
   a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
   b. Instruments and Equipment:
      (1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
7. Panelboards will be considered defective if they do not pass tests and inspections.
8. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.06 ADJUSTING AND CLEANING:

A. Set field-adjustable overcurrent device trip characteristics according to overcurrent protective device study results.
B. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.
C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.
   1. Measure as directed during period of normal system loading.
   2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
   3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
   4. Tolerance: Difference exceeding 20% between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.
D. Upon completion of installation, clean interior and exterior of panelboards. Remove paint splatters, spots, dirt and debris.
E. Touch-up scratched or marred surfaces to match original finishes.

END OF SECTION 262416

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262813 - FUSES

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. SECTION Includes:
   1. Cartridge fuses rated 600-V ac and less for use in control circuits, enclosed switches, and enclosed controllers.

1.03 REFERENCE STANDARDS:

A. Applicable Standards: Comply with applicable requirements of following standards.
   1. American National Standards Institute (ANSI):
      a. C97.1 - Low-Voltage Cartridge Fuses 600V or Less.
   2. National Electrical Manufacturer's Association (NEMA):
      a. FU1 - Low-Voltage Cartridge Fuses.
   3. National Fire Protection Association (NFPA):
      a. 70 - National Electrical Code (NEC). Comply with NEC as applicable to construction and installation of fusible devices.
   4. Underwriters Laboratories (UL): Provide overcurrent protective devices which are UL-listed and labeled.
      a. 198C - High-Interrupting-Capacity-Limiting Type Fuses.
      b. 198E - Class R Fuses.
      c. 198G - Fuses for Supplementary Overcurrent Protection.
      d. 198L - DC Fuses for Industrial Use.

1.04 SUBMITTALS:

A. Product Data: For each type of product indicated. Include construction details, material, dimensions, and descriptions of individual components. Include the following for each fuse type indicated:
   1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
      a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
      b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
   2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
   3. Current-limitation curves for fuses with current-limiting characteristics.
   4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
   5. Coordination charts and tables and related data.
   6. Fuse sizes for disconnect switches.

1.05 QUALITY ASSURANCE:

A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
C. Comply with NEMA FU 1 for cartridge fuses.
D. Comply with NFPA 70.
E. Comply with UL 248-11 for plug fuses.

1.06 PROJECT CONDITIONS:

A. Where ambient temperature to which fuses are directly exposed is less than 40ºF or more than 100ºF, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.07 COORDINATION:

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper Bussmann, Inc.
2. Edison Fuse, Inc.
3. Ferraz Shawmut, Inc.
4. Littelfuse, Inc.

2.02 CARTRIDGE FUSES:

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

2.03 PLUG FUSES:

A. Characteristics: UL 248-11, nonrenewable plug fuses; 125-V ac.

2.04 PLUG-FUSE ADAPTERS:

A. Characteristics: Adapters for using Type S, rejection-base plug fuses in Edison-base fuseholders or sockets; ampere ratings matching fuse ratings; irremovable once installed.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.
C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 FUSE APPLICATIONS:

A. For applications less than or equal to 600A: Class RK1 Current-Limiting and Time-Delay Fuses.
   1. UL Class RK1 time-delay fuses rated 250 or 600 volts (voltage rating as required), 60 hertz, amperes as indicated, with 200,000 RMS amperes symmetrical interrupting current rating for protecting motors, transformers, and circuit breakers.
B. For applications less than or equal to 600A: Class J Fast-Acting Current-Limiting Fuses.
   1. UL Class J current-limiting fuses rated 600 volts, 60 hertz, amperes as indicated with 200,000 RMS amperes symmetrical interrupting current rating.
C. For applications greater than 600A: UL Class L, time-delay, current limiting type.

3.03 INSTALLATION:

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
B. Install plug-fuse adapters in Edison-base fuseholders and sockets. Ensure that adapters are irremovable once installed.

3.04 IDENTIFICATION:

A. Install labels complying with requirements for identification specified in SECTION 260553 ELECTRICAL IDENTIFICATION and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 262813

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262816 - CIRCUIT AND MOTOR DISCONNECT SWITCHES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other DIVISION 01 Specification SECTIONS, apply to this SECTION.

1.02 SUMMARY:

A. SECTION Includes:
   1. Fusible switches.
   2. Non-fusible switches.
   3. Molded-case circuit breakers (MCCBs).
   4. Molded-case switches.
   5. Enclosures.

1.03 RELATED REQUIREMENTS:

A. SECTION 260553 - ELECTRICAL IDENTIFICATION.
B. SECTION 262726 - WIRING DEVICES for manual switches used as motor disconnects.
C. SECTION 262813 - FUSES.

1.04 REFERENCE STANDARDS:

A. National Electrical Manufacturers Association (NEMA):
   1. 250 - Enclosures for Electrical Equipment (1,000V maximum).
   2. KS 1 - Enclosed Switches.
B. National Fire Protection Association (NFPA):
   1. 70 - National Electrical Code (NEC).
C. Underwriters Laboratories (UL):
   1. 98 - Enclosed and Dead-Front Switches.
   2. 869 - Electrical Service Equipment.
   3. 894 - Switches for Use in Hazardous (Classified) Locations.
   4. 977 - Fused Power-Circuit Devices.

1.05 DEFINITIONS:

A. NC: Normally closed.
B. NO: Normally open.
C. SPDT: Single pole, double throw.

1.06 SUBMITTALS:

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
   1. Enclosure types and details for types other than NEMA 250, Type 1.

2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Include evidence of U.L. listing for series rating of installed devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.07 QUALITY ASSURANCE:

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
D. Comply with NFPA 70.

1.08 PROJECT CONDITIONS:

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
   1. Ambient Temperature: Not less than minus 22ºF and not exceeding 104ºF.
   2. Altitude: Not exceeding 6600 feet.
B. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event.

1.09 COORDINATION:

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.01 FUSIBLE AND NONFUSIBLE SWITCHES:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   2. ABB / GE.
   3. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
C. Accessories:
   1. Equipment Ground Kit: Internally mounted and labeled for copper ground conductors.
      a. Provide where ground conductors are indicated in the circuit.
   2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper neutral conductors.
      a. Provide where neutral conductors are indicated in the circuit.
   3. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), 120 V, 15 A rating, arranged to activate before switch blades open.
      a. Where installed between variable frequency drives and motors, provide electrical interlock kits to break the control circuit before the main switch blades open.
   4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
   5. Fusible switches with frames 800 A through 1200 A shall be furnished with Class L fuse clips.
   6. Hookstick Handle: Allows use of a hookstick to operate the handle.
   7. Lugs: Mechanical type, suitable for number, size, and conductor material.
D. Nonfusible type for motor loads 1 hp or smaller or nonmotor loads connected to a 20 A or smaller circuit may be toggle type switches, UL listed for each specific type load.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
      b. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
      c. Leviton Mfg. Company Inc. (Leviton). d. Pass & Seymour/Legrand (Pass & Seymour).

2.04 ENCLOSURES:

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
   1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
   2. Outdoor Locations: NEMA 250, Type 3R.
   3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
   4. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION:

A. Install individual wall-mounted switches with tops at uniform height unless otherwise indicated.

B. Comply with mounting and anchoring requirements specified in SECTION 260529 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS and SECTION 260548.16 - SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS.
C. Disconnects shall be installed where specified herein, indicated on the Drawings, or required by manufacturer's written instructions.
D. Install combination disconnect/motor starters furnished under other Divisions.
E. Provide control wiring for electrical interlocks between drives and variable frequency motor disconnect switches.
F. Coordinate disconnect installation with raceways, wiring, and equipment.

3.03 LOCATION:

A. Coordinate location of disconnects with equipment being controlled.
B. When used as disconnecting means, locate as near as practicable to the load controlled.
C. Disconnects provided integral with equipment shall serve as disconnecting means where allowed by NFPA 70.
D. When used for branch circuit protection, disconnects shall be located as near as practicable to the supply end of the conductors being protected.
E. Disconnects used with motor-driven appliances, or motors and controllers shall be located within sight of controller, unless indicated otherwise on the Drawings.
F. Disconnects shall be installed in accessible locations.

3.04 FUSIBLE DISCONNECTS:

A. Fusible disconnects shall not be mounted in ceiling plenums.
B. Fuses shall be installed in fusible disconnects as specified in SECTION 262813 - FUSES.

3.05 IDENTIFICATION:

A. Comply with requirements in SECTION 260553 – ELECTRICAL IDENTIFICATION.
    1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
    2. Label each enclosure with engraved laminated-plastic nameplate.

3.06 ADJUSTING:

A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.

END OF SECTION 262816

SECTION 263600 - TRANSFER SWITCHES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and DIVISION 01 Specification SECTIONS, apply to this SECTION.

1.02 SUMMARY

A. This SECTION includes transfer switches rated 600 V and less, including the following:
   1. Automatic transfer switches.
   2. Bypass/isolation switches.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.
   1. Single-Line Diagram: Show connections between transfer switch, bypass/isolation switch, power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.
   2. Detailed description of equipment anchorage devices and their installation requirements.

C. Field quality-control test reports.

D. Seismic Qualification Certificates: For transfer switches, accessories, and components, from manufacturer.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in DIVISION 01 include the following:
   1. Features and operating sequences, both automatic and manual.
   2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain automatic transfer switches, bypass/isolation switches through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.05 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete bases are specified in SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS.

1.06 REFERENCES

A. Applicable Standards:
   1. Institute of Electrical and Electronic Engineers (IEEE): Provide components which comply with the following standards
      a. IEEE Standard 446 – IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.
   2. National Electrical Manufacturers Association (NEMA) and Insulated Cable Engineer association (IECA): Provide components which comply with the following standards.
      a. NEMA Standard ICS10 – AC Automatic Transfer Switches.
      b. IEC 947-6-1 Low-voltage Switchgear and Control gear; Multifunction equipment; Automatic Transfer Switching Equipment.
   3. National Fire Protection Association (NFPA): Comply with the following standards.
      a. NFPA 70 – National Electrical Code.
      b. NFPA 99 – Essential Electrical Systems for Health Care Facilities.
      c. NFPA 110 – Emergency and Standby Power Systems.
   4. Underwriters Laboratories (UL): Provide components which are listed and labeled by UL under the following standards.
      a. UL 1008 – Standard for Transfer Switch Equipment.
      b. UL 508 – Industrial Control Equipment.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers:
   1. Russelectric RTS-03 Series.

2.02 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

A. Automatic transfer switches shall include a 2-way bypass isolation switch and shall be closed transition type.
B. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof, which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.
C. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.
D. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.
E. Provide load shed options for all transfer switches.
F. Solid-State Controls: Repetitive accuracy of all settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.
G. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.
H. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.
I. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
   1. Switch Action: Double throw; mechanically held in both directions.

2. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts.

J. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels shall have communication capability matched with remote device.

K. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color-code or by numbered or lettered wire and cable tape markers at terminations. Color-coding and wire and cable tape markers are specified in SECTION 260553 - ELECTRICAL IDENTIFICATION.
1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.

L. Enclosures: General-purpose NEMA 250, Type 1, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.
1. Provide pull box section with buss extensions mounted to top of enclosure for front access only installation.

2.03 AUTOMATIC TRANSFER SWITCHES

A. Comply with Level 1 equipment according to NFPA 110.

B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.

C. Automatic Closed-Transition Transfer Switches: Include the following functions and characteristics:
1. Fully automatic make-before-break operation.
2. Load transfer without interruption, through momentary interconnection of both power sources not exceeding 100 ms.
3. Provide interface as required by paralleling switchgear integrator for voltage and frequency bias of generator.
4. Initiation of No-Interruption Transfer: Controlled by in-phase monitor and sensors confirming both sources are present and acceptable.
a. Source differential sensing for closed transition operating mode. The sensor shall enable transfer/retransfer between energized sources in the closed-transition mode only when the two sources have a maximum voltage differential of 5%, frequency differential of 0.2 Hz, and are within 5 electrical degrees of each other.
b. Time delay on failure to synchronize normal and emergency sources prior to closed-transition transfer (1 Min to 5 min), factory set at 5 min.
c. Voltage, frequency, and phase rotation sensing on both the normal and emergency sources.
5. Failure of power source serving load initiates automatic break-before-make transfer.

D. Switches shall have switched neutrals and shall have fully rated neutral transfer contacts which shall momentarily interconnect the neutrals of the sources and load during the transfer/retransfer operation. The neutrals shall remain so interconnected until the line contacts close on the alternate source. Line and neutral contacts shall be driven by a single main operator.

E. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.
F. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.
G. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.
H. In-Phase Monitor: Factory-wired, internal relay controls transfer so it occurs only when the two sources are synchronized in phase. Relay compares phase relationship and frequency difference between normal and emergency sources and initiates transfer when both sources are within 10 electrical degrees, and only if transfer can be completed within 60 electrical degrees. Transfer is initiated only if both sources are within 2 Hz of nominal frequency and 70 percent or more of nominal voltage.
I. Automatic Transfer-Switch Features:
    1. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
    2. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.
    3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
    4. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, factory set at 10 minutes. Automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
    5. Test Switch: Simulate normal-source failure.
    6. Switch-Position Pilot Lights: Indicate source to which load is connected.
    7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.
        a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
        b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."
    8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-Vac.
    9. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
    10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
    11. Engine Shutdown Contacts: Time delay adjustable from zero to fifteen minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
    12. Load Shed Circuit: Terminals shall be provided for a remote contact which opens to signal the automatic transfer switch to transfer to emergency and for remote contacts

which open to inhibit transfer to emergency and/or retransfer to normal. Both of these inhibit signals can be activated through the keypad or serial port.

2.04 BYPASS/ISOLATION SWITCHES

A. Comply with requirements for Level 1 equipment according to NFPA 110.

B. Description: Manual type, arranged to select and connect either source of power directly to load, isolating transfer switch from load and from both power sources. Bypass to the load-carrying source shall be accomplished with no interruption of power to the load (make before break contacts). The bypass handle shall have three operating modes: "Bypass to Normal," "Automatic," and "Bypass to Emergency." The operating speed of the bypass contacts shall be the same as the associated transfer switch and shall be independent of the speed at which the manual handle is operated. In the "Automatic" mode, the bypass contacts shall be out of the power circuit so that they will not be subjected to fault currents to which the system may be subjected. Include the following features for each combined automatic transfer switch and bypass/isolation switch:

1. Means to lock bypass/isolation switch in the position that isolates transfer switch with an arrangement that permits complete electrical testing of transfer switch while isolated. While isolated, interlocks prevent transfer-switch operation, except for testing or maintenance.
2. Drawout Arrangement for Transfer Switch: Provide physical separation from live parts and accessibility for testing and maintenance operations.
3. Bypass/Isolation Switch Current, Voltage, Closing, and Short-Circuit Withstand Ratings: Equal to or greater than those of associated automatic transfer switch, and with same phase arrangement and number of poles.
4. Contact temperatures of bypass/isolation switches shall not exceed those of automatic transfer-switch contacts when they are carrying rated load.
5. Operability: Constructed so load bypass and transfer-switch isolation can be performed by 1 person in no more than 2 operations in 15 seconds or less.
6. Legend: Manufacturer's standard legend for control labels and instruction signs shall describe operating instructions.
7. Maintainability: Fabricate to allow convenient removal of major components from front without removing other parts or main power conductors.

C. Interconnection of Bypass/Isolation Switches with Automatic Transfer Switches: Factory-installed copper bus bars; plated at connection points and braced for the indicated available short-circuit current.

2.05 SOURCE QUALITY CONTROL

A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Floor-Mounting Switch: Install transfer switches on concrete bases.

1. Anchor transfer switches to concrete bases according to manufacturer's written instructions and requirements in SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS.

2. Comply with manufacturer requirements for seismic anchoring
3. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases.
4. Provide workspace and clearances required by NFPA 70.

B. Identify components according to SECTION 260553 - ELECTRICAL IDENTIFICATION.
C. Set field-adjustable intervals, delays, and relays.

3.02 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.
B. Ground equipment according to SECTION 260526 - GROUNDING.
C. Connect wiring according to SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES.

3.03 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.
B. Perform tests and inspections and prepare test reports.
   1. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
   2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.
      a. Check for electrical continuity of circuits and for short circuits.
      b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
      c. Verify that manual transfer warnings are properly placed.
      d. Perform manual transfer operation.
   4. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.
      a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
      b. Simulate loss of phase-to-ground voltage for each phase of normal source.
      c. Verify time-delay settings.
      d. Verify pickup and dropout voltages by data readout or inspection of control settings.
      e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
      f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for 1 pole deviating by more than 50 percent from other poles.
      g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

5. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.
    a. Verify grounding connections and locations and ratings of sensors.

C. Report results of tests and inspections in writing. Record adjustable settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

D. Remove and replace malfunctioning units and retest as specified above.

3.04 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment as specified below.

B. Coordinate this training with that for generator and paralleling switchgear equipment.

END OF SECTION 263600

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