PROJECT MANUAL FOR:
KUMMER FOUNDATION EXECUTIVE BOARDROOM– PHASE ONE

PROJECT NUMBER: **RC000488**

AT

MISSOURI UNIVERSITY OF SCIENCE & TECHNOLOGY
ROLLA, MISSOURI

FOR:

THE CURATORS OF THE UNIVERSITY OF MISSOURI

PREPARED BY:

Gray Design Group
9 Sunnen Drive – Suite 110
Saint Louis, MO. 63143
314-646-0400

DATE: **August 17, 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: 

Toby Heddinghaus, Architect, A-2007011296

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DIVISION 28 ELECTRONIC SAFETY AND SECURITY

EXHIBITS Exhibit 1 - ASBESTOS INSPECTION REPORT
Exhibit 2 - MECHANICAL PRE-CHECKS & PROCEDURE OVERVIEW
Exhibit 3 - DAIKIN COMMISSIONING GUIDE

END OF SECTION

ADVERTISEMENT FOR BIDS

Sealed Bids for:

KUMMER FOUNDATION EXECUTIVE BOARD ROOM – PHASE ONE
MISSOURI UNIVERSITY OF SCIENCE and TECHNOLOGY
PROJECT NO. RC000488

will be received by the Curators of the University of Missouri, Owner, at Design, Construction and Space Management, Room 120 General Services Building, 901 Facilities Avenue, Rolla, Missouri 65409, at **2:00 p.m. on Thursday, September 2, 2021** and immediately opened and publicly read aloud in Room 101A General Services Building, 901 Facilities Avenue, Missouri University of Science and Technology, Rolla, Missouri.

Drawings and specifications and other related contract information may be viewed and ordered online at https://www.adsplanroom.net/ or by contacting American Document Solutions (ADS), 1400 Forum Boulevard, Suite 7A, Columbia, Missouri 65203, phone (573) 446-776, or email orders@adsmo.net for a refundable deposit of $100, **CHECK ONLY**, payable to ADS. Mailing cost are the responsibility of the purchaser. Only documents returned within fourteen (14) calendar days after the bid opening, in good condition will be refunded. **A download is available for a (non-refundable) purchase.** Neither owner nor Engineer will be responsible for full or partial sets of Bidding Documents, including Addenda (if any) obtained from sources other than the issuing office. All Contract Documents must be obtained by the Bidder from ADS to be an Eligible Bidder.

A Mandatory Pre-Bid Meeting will be held 10:00 am. on Tuesday, August 24, 2021 in Room 101A General Services Building, Missouri University of Science and Technology, Rolla, Missouri. A tour of the project site will follow the meeting.

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

Questions regarding the scope of work and commercial conditions should be directed to
Pat Litty at (573) 341-4865 or littyp@mst.edu.

Information regarding bid results will be available the day following the bid opening by calling (573) 341-7619.

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

Estimate: $140,000.00

Advertisement Date: August 17, 2021

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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: The Curators of the University of Missouri
Missouri University of Science and Technology
901 Facilties Avenue
Rolla, MO. 65409

1. Bidder, in compliance with invitation for bids for construction work in accordance with Drawings and Specifications prepared by **GRAY DESIGN GROUP**, entitled "**KUMMER FOUNDATION EXECUTIVE BOARDROOM-PHASE ONE**", project number **RC000488**, dated **AUGUST 17, 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 abate all environmental hazardous materials, demolish walls, ceiling and floors and install new piping for daiken system; all as indicated on the Drawings and described in these Specifications for sum of:

_____

_____ DOLLARS ($_____).

4. PROJECT COMPLETION

a. Contract Period - Contract period begins on the day the Contractor receives unsigned Contract, Performance Bond, Payment Bond, and "Instructions for Execution of Contract, Bonds, and Insurance Certificates." Bidder agrees to complete project within seventy-five (75) calendar days from receipt of aforementioned documents. Fifteen (15) calendar days have been allocated in construction schedule for receiving aforementioned documents from Bidder.

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

5. SUPPLIER DIVERSITY PARTICIPATION GOALS

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

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

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

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

SDVE PERCENTAGE PARTICIPATION: _____ percent (_____%)

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

6. BIDDER'S ACKNOWLEDGMENTS

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

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

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

d. Accompanying the bid is a bid bond, or a certified check, or 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.

7. BIDDER'S CERTIFICATE

Bidder hereby certifies:

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

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

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

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

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

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

8. BIDDER'S SIGNATURE

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

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

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

END OF SECTION

UNIVERSITY OF MISSOURI
BIDDER'S STATEMENT OF QUALIFICATIONS

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

1. Company Name _____

   Phone# _____ Fax #: _____

   Address _____

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

   _____

   _____

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

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

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

   _____

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

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

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

   _____

   _____

7. No default has been made in any contract complete or incomplete except as noted below:

(a) Number of contracts on which default was made _____

(b) Description of defaulted contracts and reason therefor

_____

_____

8. (a) Have you or your company participated in any contract subject to an equal opportunity clause similar to that described in the General Conditions?

Yes _____ No ____

(b) Have you filed all required compliance reports?

Yes _____ No ____

(c) Is fifty percent or more of your company owned by a minority?

Yes _____ No ____

(d) Is fifty percent or more of your company owned by a woman?

Yes _____ No ____

(e) Is fifty percent or more of your company owned by a service-disabled veteran?

Yes _____ No ____

(f) Is fifty percent or more of your company owned by a veteran?

Yes _____ No ____

(g) Is your company a Disadvantaged Business Enterprise?

Yes _____ No ____

9. Have you or your company been suspended or debarred from working at any University of Missouri campus?

Yes _____ No ____ (If the answer is "yes", give details.)

_____

_____

10. Have any administrative or legal proceedings been started against you or your company alleging violation of any wage and hour regulations or laws?

Yes _____ No ____ (If the answer is "yes", give details.)

_____

_____

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

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

12. List banking references.

_____

_____

13. (a) Do you have a current confidential financial statement on file with Owner?

Yes _____ No _____ (If not, and if desired, Bidder may submit such statement with bid, in a separate sealed and labeled envelope.)

(b) If not, upon request will you file a detailed confidential financial statement within three (3) days?

Yes _____ No _____

Dated at _____ this _____ day of _____ 20____

_____
Name of Organization

_____
Signature

_____
Printed Name

_____
Title of Person Signing

END OF SECTION

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

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

1. Company Name_____ Phone# _____

   Address _____

2. State of Missouri Registration number_____

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

   _____

   _____

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

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

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

   _____

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

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

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

   _____

   _____

8. No default has been made in any contract complete or incomplete except as noted below:

(a) Number of contracts on which default was made _____

(b) Description of defaulted contracts and reason therefor

_____

_____

9. (a) Have you or your company participated in any contract subject to an equal opportunity clause similar to that described in the General Conditions?

Yes _____ No ____

(b) Have you filed all required compliance reports?

Yes _____ No ____

(c) Is fifty percent or more of your company owned by a minority?

Yes _____ No ____

(d) Is fifty percent or more of your company owned by a woman?

Yes _____ No ____

(e) Is fifty percent or more of your company owned by a service disabled veteran?

Yes _____ No ____

(f) Is fifty percent or more of your company owned by a veteran?

Yes _____ No ____

(g) Is your company a Disadvantaged Business Enterprise?

Yes _____ No ____

10. Have you or your company been suspended or debarred from working at any University of Missouri campus?

Yes _____ No ____ (If the answer is "yes", give details.)

_____

_____

11. Have any administrative or legal proceedings been started against you or your company alleging violation of any wage and hour regulations or laws?

Yes _____ No ____ (If the answer is "yes", give details.)

_____

_____

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

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

13. List banking references.

_____

_____

14. (a) Do you have a current confidential financial statement on file with Owner?

Yes _____ No _____ (If not, and if desired, Bidder may submit such statement with bid, in a separate sealed and labeled envelope.)

(b) If not, upon request will you file a detailed confidential financial statement within three (3) days?

Yes _____ No _____

Dated at _____ this _____ day of _____ 20____

_____
Name of Organization

_____
Signature

_____
Printed Name

_____
Title of Person Signing

END OF SECTION

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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 Disable 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 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.

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

8. 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.

9. 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 _____, 20_____,

before me appeared (name) _____ to me personally known, who,

being duly sworn, did execute the foregoing affidavit, and did state that he or she was properly authorized by (name of firm)

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

(Seal)

Notary Public _____

Commission expires _____

AFFIDAVIT FOR AFFIRMATIVE ACTION

State of Missouri)
) ss.
County of)

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

_____

Subscribed and sworn before me this _____ day of _____, 20_____.

My commission expires _____, 20_____.

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., Suite 2000
St. Louis, MO 63101
314/657-3700; 314/613-7011 (Fax)
CONTACT: Minority Business Development Manager

Metro
One Metropolitan Square
211 North Broadway, Suite 700
St. Louis, MO 63102-2759
314/982-1400
CONTACT: Disadvantaged Business Enterprise Coordinator

St. Louis Minority Business Council
211 N. Broadway, Suite 1300
St. Louis, MO 63102
314/231-5555
CONTACT: Executive Director

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

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

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

Mid-States Minority Supplier Development Council
One U.S. Bank Plaza #1820
St. Louis, MO 63101
317/923-2110
CONTACT: info@midstatesmsdc.org

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

Missouri Department of Transportation
Division of Construction
P.O. Box 270
Jefferson City, MO 65102
573/751-6801; 573/526-5640-6555 (Fax)
CONTACT: Disadvantaged Business Enterprise Coordinator

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

State of Missouri-Office of Administration
Office of Supplier & Workforce Diversity
P.O. Box 809
Jefferson City, MO 65102
573/751-8130; 573/522-8078 (Fax)
CONTACT: MBE/WBE Certification Coordinator

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.:_____email:_____

   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 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.

General 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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August 2020 Edition

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TABLE OF ARTICLES

ARTICLE 1
GENERAL PROVISIONS

1.1 Basic Definitions

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

1.1.1 Owner

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

1.1.2 Contracting Officer

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

1.1.3 Owner's Representative

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

1.1.4 Architect

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

1.1.5 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 **August 17, 2021, KUMMER FOUNDATION EXECUTIVE BOARDROOM – PHASE ONE**

b. Architect
Gray Design Group
9 Sunnen Drive – Suite 110
St Louis, MO. 63143
314-646-0400

c. Mechanical & Electrical Engineer
McClure Engineering
1000 Clark Avenue
St Louis MO. 63102
314-645-6232

2. SPECIAL SCHEDULING REQUIREMENTS used if applicable to project and as approved by the Project Manager. Describe Special Scheduling requirements supplemental to the PROJECT COMPLETION section of the Bid Form

a. Special scheduling requirements supplemental to the bid form

Contractor shall perform all work in the designated areas between **September 15, 2021** and **November 17, 2021.**

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) Demolition including walls, doors, interior finishes, ceilings, some electrical and some plumbing per Demolition Plan. Patch and repair as required to receive new construction.

4. LOCATION

Work shall be performed under this Contract on campus of
Missouri University of Science & Technology, Parker Hall, 300 West 13th Street. Rolla, MO. 65409

5. NUMBER OF CONSTRUCTION DOCUMENTS

a. The Owner's Representative will furnish the Contractor a copy of executed Contract and **five (5)** complete sets of Drawings and Specifications.

b. Additional sets may be obtained from the architect at cost of reproduction.

c. The Owner will furnish five (5) sets of explanatory and changed Drawings at no cost to Contractor as issued during project.

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

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

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

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

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

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

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

6. SUBMITTALS

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

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

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

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

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

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

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

7. NOTIFICATION

Before beginning Demolition Work or service outages, the Contractor shall provide, at minimum, seventy-two (72) hours advance notice to Owner's Representative for purpose of verifying utility locations including, but not limited to, gas, telecommunications, electric, water, 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: Contractor shall be issued parking permits for **two (2)** service vehicles to park in location directed by the Owner's Representative. Employee parking shall be on public streets or where directed by the Owner's Representative.

(1) 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.

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

c. Storage of materials: The Contractor shall store all materials within project limits. The Contractor shall confine apparatus, materials, and operation of workers to location established by the Owner's Representative. The Contractor shall not unreasonably encumber premises with materials.

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

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

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

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

j. 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.

k. **"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.

l. COVID -19: Missouri S&T is committed to suppressing the spread of COVID-19 and providing a safe campus for employees, students and visitors.

Please visit coronavirus.mst.edu for updated guidance on S&T's commitment to stop the spread of COVID-19. Please email covid@mst.edu, with any questions.

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

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

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 any item described in the Contract Documents will be allowed only prior to the receipt of bids 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.

11. CODES AND STANDARDS

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

a. City of Rolla – Water and Electric contact Rolla Municipal Utilities. Storm and Sanitary Sewer Standards - Department of Public Works.

12. PERMITS

a. 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/ .

b. Before commencement of **Environmental Hazardous Material and DNR NESHAP** the University will have initiated and paid the fee for the permit for abatement. The Contractor will be required to update the permit prior to start of work on site.

13. SPECIALTIES

a. This building is the campus administration building. On this floor where work is to occur is the Chancellors Office and the CFO. The south stair of the building is not to be used and contractors work is to be sensitive to the offices on this floor as well as the Registrars suite directly below the second floor.

b. The work to install Daiken service line and material furnished by the Contractor.

c. Temporary cooling for areas supplied by University.

d. Contractor to coordinate the time for the system to be down and reenergized with the Owner.

14. MANDATORY PRE-BID MEETING

The mandatory pre-bid meeting shall be attended for discussion and walk-through. Pre-bid meeting shall be held at General Services Building, Room 101A, 901 Facilities Ave., Rolla, MO. 65409, **Tuesday, August 24, 2021 at 10:00 AM.** Following meeting we will then meet on site for a walk-through.

15. MODIFICATIONS TO GENERAL CONDITIONS

a. General Conditions:

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

(2) Add to the Insurance Requirements in General Conditions Article 11, Pollution

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

16. PROJECT SCHEDULING

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 1: Contractor Schedule (Small Projects only) – Contractor is responsible for the schedule and must comply with the Owner's requirements. See Contractor Schedule Specification included in these documents.

17. PROJECT MANAGEMENT/COMMUNICATION REQUIREMENTS

a. The Contractor shall be represented at the site by a competent full-time 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.

18. ABATEMENT THIRD PARTY AIR MONITORING

a. Owner will retain a third-party air monitoring consultant during all abatement activities for this project. Contractor to provide personnel at site during the abatement to assist in coordination.

19. HVAC SYSTEM TESTING and BALANCE

a. Owner will retain a third-party test and balance agent for this project. Contractor to provide personnel at site during the commissioning to assist in coordination.

20. 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

b. 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.

c. 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.

21. 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.

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

c. 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.

d. 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.

e. 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.

f. *Special hot work requirements: Use thermal imaging cameras after hot work operations- describe criteria in detail (for historically significant buildings of wood construction); designate additional fire watch monitoring beyond the NFPA 30 minute post hot work requirement (project has a greater potential for reflash or smoldering fire due to concealed combustible building elements, etc.).*

22. 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. 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).

END OF SECTION

Option #1 – 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 SureTrack or P3, Microsoft Project, Oracle P6, or other standard industry scheduling software, approved by the Owner's Representative.
      (2) Schedule Development
      Within 2 weeks of the NTP, contractor shall prepare a schedule, preferably in CPM format, but in detailed bar chart format at a minimum, that reflects the contractor's and each subcontractors plan for performing the contract work.

Contractor shall review each major subcontractor's schedule with the sub and obtain the subcontractor's concurrence with the schedule, prior to submitting to the University.

(3) Schedule Updates.
   (a) Schedule Updates will be conducted once a month, at a minimum. Actual Start and Finish dates should be recorded regularly during the month. Percent Complete, or Remaining Duration shall be updated as of the data date, just prior to Contractor's submittal of the update data.
   (b) Contractor will copy the previous months schedule and will input update information into the new monthly update version.
   (c) Contractor will meet with the Owner's Representative to review the draft of the updated schedule. At this meeting, Owner's Representative and Contractor will:
      (i) Review out of sequence progress, making adjustments as necessary,
      (ii) Add any fragnets necessary to describe changes or other impacts to the project schedule 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.
o) Area Separations: Use Activity Codes to identify each major area of construction for each major portion of the Work. For the purposes of this Article, a "major area" is a story of construction, a separate building, or a similar significant construction element.

4. TIME EXTENSION REQUEST
a) Refer to General Conditions of the Contract for Construction, Article 4.7 Claims for Additional Time.
b) Changes or Other Impacts to the Contractor's Work Plan
The Owner will consider and evaluate requests for time extensions due to changes or other events beyond the control of the Contractor on a monthly basis only, with the submission of the Contractor's updated schedule, in conjunction with the monthly application for payment. The Update must include:
    (1) An activity depicting the event(s) impacting the Contractors work plan shall be added to the CPM schedule, using the actual start date of the impact, along with actually required predecessors and successors.
    (2) After the addition of the impact activity(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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CLOSEOUT LOG

Project: KUMMER FOUNDATION EXECUTIVE BOARDROOM – PHASE ONE
Project Number: RC000488
Contractor:

Section	Description	Contractor/Subcontractor	Date Rec'd	# of Copies	CPM Initials	Remarks
GC /3.11	As-Built Drawings					
GC /13.5.6	Final Affidavit of Supplier Diversity Participation for each Diverse firm					
282000	Waste Disposal Manifest Log					
	State Permit for Abatement					

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SECTION 1.F

INDEX OF DRAWINGS

Drawings referred to in consist of following sheets dated **August 17, 2021.**

Sheet A-000 –	COVER SHEET
Sheet A-001 –	ABBREVIATIONS / LEGEND / GENERAL NOTES
Sheet A-101 –	2nd FLOOR DEMOLITION PLAN
Sheet A-102 –	2nd FLOOR DEMOLITION REFLECTED CEILING PLAN
Sheet DM3.01 –	SECOND FLOOR HVAC DEMO PLAN
Sheet M1.00 –	SYMBOLS & ABBREVIATIONS
Sheet M1.01 –	STANDARD DETAILS
Sheet M3.01 –	SECOND FLOOR PLAN - MECHANICAL
Sheet M4.00 –	EXISTING FIRST FLOOR HVAC PLAN
Sheet M4.01 –	EXISTING SECOND FLOOR HVAC PLAN
Sheet M5.00 –	CONTROL DIAGRAMS
Sheet M6.00 –	SCHEDULES AND DETAILS
Sheet E0.00 –	ELECTRICAL SYMBOLS & ABBREVIATIONS
Sheet ED1.01 –	SECOND FLOOR PLAN – ELECTRICAL DEMOLITION PLAN

END OF SECTION

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Missouri
Division of Labor Standards
WAGE AND HOUR SECTION

MICHAEL L. PARSON, Governor

Annual Wage Order No. 28

Section 081
PHELPS 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.

Originals Signed by
Taylor Burks, Director
Division of Labor Standards

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

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

Prepared by Missouri Department of Labor and Industrial Relations

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	$58.62
Boilermaker	*$24.78
Bricklayer	$50.74
Carpenter	$56.83
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	*$24.78
Plasterer	
Communications Technician	$52.56
Electrician (Inside Wireman)	$52.62
Electrician Outside Lineman	*$24.78
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	*$24.78
Glazier	*$24.78
Ironworker	$58.73
Laborer	*$24.78
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	*$24.78
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	*$24.78
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	*$24.78
Plumber	$67.41
Pipe Fitter	
Roofer	$51.45
Sheet Metal Worker	$61.25
Sprinkler Fitter	$60.32
Truck Driver	*$24.78
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
PHELPS County

Section 081

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	*$24.78
Millwright	
Pile Driver	
Electrician (Outside Lineman)	*$24.78
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	$48.04
General Laborer	
Skilled Laborer	
Operating Engineer	$59.86
Group I	
Group II	
Group III	
Group IV	
Truck Driver	*$24.78
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.

SECTION 02080

FRIABLE AND NON-FRIABLE ASBESTOS REMOVAL
Project RC000488-Parker Hall 2nd Floor Board Room

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

1.1 SCOPE OF WORK

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

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

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

3. The work shall include:

   1. The removal and disposal of friable asbestos:
      A. Removal of 30 Linear feet of asbestos pipe insulation and joints. Method of removal must be coordinated with the General Contractor for the project.

   2. The removal and disposal of non-friable asbestos**:**
      A. Removal 200 sq. ft. of ACM Floor tile and ACM mastic located under 400 linear feet of finished wall to be demolished. This includes the walls in the current Provost Office and Enrollment Management office. Removal of the tile must be coordinated with the General Contractor of the project.

1.2 DEFINITIONS

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

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

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

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

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

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

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

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

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

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

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

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

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

14. Decontamination Area - Enclosed area adjacent and connected to the regulated area which is used for decontamination of workers, materials, and equipment that are contaminated with asbestos.

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

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

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

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

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

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

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

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

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

24. Outside Air - Air outside of the containment.

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

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

27. Owner's Air Sampling Technician - An individual who has been trained by and is under the supervision of an air sampling professional to do air monitoring before, during, and after the asbestos abatement project. The air sampling technician must hold a 40 hour AHERA Asbestos Contractor/Supervisor Certificate, and be supervised by the Owner's ASP.

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

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

30. Removal – To permanently take out RACM or facility components that contain or are covered with RACM from any facility.

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

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

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

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

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

1.3 CODES AND REGULATIONS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

4. State of Missouri including but not limited to:

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

2. Missouri Air Conservation Law Chapter 643.

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

(1) 10 CSR 10-6.020, Definitions
(2) 10 CSR 10-6.080, Emission Standards for Hazardous Air Pollutants
(3) 10 CSR 10-6.230, Administrative Penalties
(4) Volume 18, Missouri Register, Page 44
(5) 10 CSR 10-6.250, Asbestos Abatement Projects - Certification, Accreditation, and Business Exemption Requirements

1.4 NOTIFICATIONS

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

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

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

1.5 SUBMITTALS

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

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

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

2. Friable Abatement:

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

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

    3. Submit a detailed plan of the procedures proposed for use in complying with requirements of this specification and Volume 18, Missouri Register, page 44, and 29 CFR 1926.1101. Include in the plan the layout and location of barriers, decontamination units, route of ingress and egress for work area, methods used to assure safety of building occupants and visitors, methods

used to isolate or closing out of HVAC system, personal air monitoring strategy, method of removal of material, and engineering controls utilized to prevent emissions from the work area.

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

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

3. Non-Friable Abatement**:**

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

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

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

4. One copy of the Negative Initial Exposure Assessment.

4. Upon completion of the abatement work, the following information shall be submitted to the Owner's Representative.

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

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

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

2. Written certification from the Owner's ASP.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 SUPERVISION OF ABATEMENT

1. The Contractor shall designate a competent supervisor subject to the approval of the Owner's ASP. The supervisor shall be the Contractor's representative on the

project and shall meet the requirements of all applicable regulations and perform the following minimum requirements.

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

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

3. Conduct all OSHA required air monitoring.

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

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

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

3.2 NEGATIVE INITIAL EXPOSURE ASSESSMENT

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

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

    1. Visible emissions are observed

    2. Sanding, grinding, cutting, or abrading of the material

    3. Air samples exceed 0.1 f/cc

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

3.3 WORKER PROTECTION & TRAINING

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

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

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

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

3.4 INDEPENDENT TESTING LABORATORY

1. Testing Laboratories utilized by the Contractor for sample analysis during the project shall meet the following minimum requirements and be approved by the Owner's C.I.H. This information shall be submitted to the Owner's Representative for review.

    1. All air monitoring samples shall be analyzed by a testing laboratory accredited by the American Industrial Hygiene Association (AIHA) or by an individual who is currently on the Asbestos Analyst Registry.

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

3.5 OWNER'S AIR SAMPLING PROFESSIONAL & CERTIFIED INDUSTRIAL HYGIENIST

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

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

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

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

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

5. Issue final air clearance.

3.6 EMERGENCY PROTECTION PLAN

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

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

3.7 LOCAL AREA PROTECTION & SITE SECURITY

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

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

3. The contractor shall have control of site security during abatement operations in order to protect work environment and equipment. Contractor shall have the owners assistance in notifying building occupants of impending activity and enforcement of restricted access by owners employees.
4. The contractor shall keep a minimum of two 10 lbs. type ABC fire extinguishers on site. One shall be maintained outside the work area and one inside the work area. The employees shall be trained in the operation of extinguishers.

5. Where areas cannot be isolated by existing walls and doors from employees, clients, or the public, barriers must be constructed of ½" plywood and 2"x4" framing 16" o.c. to isolate the area. The barriers must be installed in such a manner to prevent damage to existing walls, floors, or ceilings. Barrier may have a lockable door.

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

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

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

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

3.8 FINAL CLEARANCE REQUIREMENTS (FRIABLE ASBESTOS)

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

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

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

    2. P.C.M. samples analyzed on site shall be counted by an accredited registered microscopist.

    3. For areas specifically specified for clearance by Transmission Electron Microscopy, the method shall be NIOSH 7402.

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

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

3.9 REESTABLISHMENT OF THE WORK AREA AND SYSTEMS

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

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

3.10 WASTE DISPOSAL

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

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

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

3.11 DRAWINGS

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

3.12 REPORTS

1. Reports, when provided, are intended to be used as a basis for the type and composition of the asbestos present for both bidding purposes and for the information required for the notifications to the governing agencies.

END OF SECTION

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20 00 00 BASIC MECHANICAL CONDITIONS

20 00 01 GENERAL

A. This Section includes procedural requirements for the Work of Divisions 20 – 29 to supplement the requirements specified in Division 1.

B. The organization of the Specifications into Divisions, Sections and Subsections, and the arrangement of the Plans shall not in and of itself divide the Work among the Contractors and Subcontractors nor establish the Work to be performed by any trade.

C. The “Scope of Work” and “Work Included” under each respective sectional heading, nevertheless, attempts to segregate the Work by known contracting activities. In the final analysis, the General Contractor shall be responsible for scoping the work for each trade based on local practice to include all the Work of a given type in the related proposal, regardless of where and how identified in the Bid Documents.

20 00 02 SCOPE OF WORK

A. This project is for a demolition package for the existing office area for Parker Hall at Missouri S&T. The design, defined by the Project Documents, provides for a demolition package**.**

B. The Mechanical Work for this project shall include all material, labor and services necessary for and incidental to providing the following systems (respective Sections of the Specifications are noted in the right hand column):

1. Basic Mechanical Materials and Methods 20
2. Temperature Control Systems 25

20 00 03 REFERENCES

A. The Plans, the general provisions of the Contract, including the General, Supplementary and/or Special Conditions and specification sections of Division 1 shall apply to Work of Divisions 20 - 29 of the Specifications.

B. All provisions and conditions cited in this Section shall apply to Work for all other sections of Divisions 20 – 29 of these Specifications.

20 00 04 REFERENCES, REGULATORY REQUIREMENTS

A. All material and equipment shall be listed, labeled or certified by Underwriters Laboratories, Inc., where relevant standards have been established (see also Paragraph 20 00 60). Material and equipment, which are not covered by UL Standards, will be acceptable provided they meet safety requirements of a nationally recognized testing laboratory. Products which no nationally recognized testing laboratory accepts, lists, labels, certifies or determines to be safe will be considered if inspected or tested in accordance with national industrial standards such as NEMA or ANSI. Evidence of compliance shall include test reports and definitive submittals.

B. Pressure vessels and pressure retaining safety devices shall be certified in accordance with applicable requirements of the ASME Boiler Code.

C. Definitions:

1. **“Listed”:** A product is “listed” if of a kind mentioned in a list which: Is published by a nationally recognized laboratory which makes periodic inspections of such production.

States that such product meets nationally recognized standards or has been tested and found safe for use in a specified manner.

2. **"Labeled":** The product is "labeled" if: It embodies a valid label or other identifying mark of a nationally recognized testing laboratory such as UL, Inc. Production is inspected periodically by a nationally recognized testing laboratory. The labeling indicates compliance with nationally recognized standards or tests to determine safe use in a specified manner.
3. **"Certified":** The product is "certified" if: The product has been tested and found by a nationally recognized testing laboratory to meet nationally recognized standards or to be safe for use in specific manner. Production is inspected periodically by a nationally recognized testing laboratory. The product bears a label, tag or other record of certification.
4. **"Nationally recognized testing laboratory:"**

20 00 05 DEFINITIONS

A. The term **"unfinished space"** as used in Division 20 - 25 of the Specifications shall be a mechanical or electrical equipment room. These are rooms that are generally unpainted and accessible only to building maintenance personnel.

B. The term **"finished space"** as used in Division 20 - 25 of the Specifications shall mean any space not defined as "unfinished space" (i.e. occupied rooms, corridors, stairways, closets, etc.).

C. The term **"exterior"** or **"outdoors"** as used in Division 20 - 25 of the Specifications shall mean exposed to atmospheric weather conditions.

D. The term **"interior"** or **"indoors"** as used in Division 20 - 25 of the Specifications shall mean not exposed to atmospheric weather conditions.

E. The term **"concealed"** as used in Division 20 - 25 of the Specifications shall mean anything that is not visible in a "finished space".

F. The term **"inaccessible"** as used in Division 20 - 25 of the Specifications shall mean located within walls or above non-lay-in ceiling (i.e., drywall, plaster).

G. The term **"packaged"** as used in Division 20 - 25 of the Specifications shall be construed to be a factory manufactured piece of equipment for which all components are totally assembled, prepiped and prewired within its own structure and ready to operate when connected to proper external mechanical and electrical services.

H. The term **"cold piping system"** as used in Division 20 - 25 of the Specifications shall be a piping system containing media at or below 79 degrees F temperature.

I. The term **"ambient piping system"** as used in Division 20 - 25 of the Specifications shall be a piping system containing media which is neither heated nor chilled and remains at a temperature range between 80 and 109 degrees F temperature.

J. The term **"hot piping system"** as used in Division 20 - 25 of the Specifications shall be a piping system containing media at or above 110 degrees temperature.

K. The term **"medical gas"** as used in Division 20 - 25 of the Specifications shall include gaseous oxygen, nitrous oxide and medical (clinical) air, all installed per NFPA 99.

L. The term **"medical vacuum"** as used in Division 20 - 25 of the Specifications shall include vacuum, installed in accordance with NFPA 99.

20 00 06 CODES, STANDARDS, ETC.

A. The material, workmanship and systems for Work of this Division shall comply with all applicable codes, standards, regulations and laws of the legal governmental jurisdiction at the project site.

B. Should the Contractor perform any work that does not comply with the requirements of the applicable codes, standards, regulations, statutes, laws, acts, or which does not receive the approval of the responsible inspection authority, Contractor shall bear all costs arising in correcting the deficiencies.

C. Applicable requirements of the current and accepted edition of the following codes shall apply to the Work for Divisions 20 – 29:

- International Building Code – 2018
- International Plumbing Code - 2018
- International Mechanical Code – 2018
- International Existing Building Code – 2018 (Level 1 & Level 2 Alterations only with pre-approval of AHJ)
- International Fire Code - 2018
- International Fuel Gas Code – 2018
- National Electric Code/NFPA 70 – 2011 & 2017
- NFPA 110 – 2010 & 2016
- NFPA 101 – 2012
- NFPA 99 – 2012
- NFPA 96 – 2011 & 2017
- NFPA 90A – 2012 & 2018
- NFPA 72 – 2010 & 2016
- NFPA 51B - 2014
- NFPA 45 – 2011 & 2015
- NFPA 20 - 2016
- NFPA 14 – 2010 & 2016
- NFPA 13 – 2010 & 2016
- ASHRAE 90.1 – Energy Standard for Buildings – 2016

D. Applicable requirements of the current and accepted edition of the following industry standards, codes and specifications shall apply to the Work for Divisions 20 - 29:

ANSI	American National Standards Institute	**20 10 00**
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers	
ASME	American Society of Mechanical Engineers	**20 10 00**
ASTM	American Society of Testing and Materials	**20 10 00**
IEEE	Institute of Electrical & Electronic Engineers	
IPCEA	Insulated Power Cable Engineers Association	
MSS	Manufacturers Standardization Society of Valve and Fitting Industry	**20 10 00**
NIST	Institute of Science and Technology	**20 10 00**
NEC	National Electric Code, including amendments by local authority having jurisdiction	
NEMA	National Electrical Manufacturers Association	
NIOSH	National Institute of Occupational Safety and Health	
OSHA	Occupational Safety and Health Act	
SMACNA	Sheet Metal and Air Conditioning Contractors	
UL	Underwriters Laboratory, Inc.	

20 10 00 BASIC MECHANICAL MATERIALS and METHODS

20 10 01 GENERAL

A. This Section describes and specifies basic mechanical materials and methods to be utilized in the Work included in other sections of Divisions 20 - 25.

B. The Plans, the general provisions of the Contract including the General, Supplementary and/or Special Conditions and specification sections of Division 1 shall apply to Work of Divisions 20 - 25 of the Specifications.

C. Provisions and conditions cited in this Section shall apply, where and when relevant, to Work of other sections of Divisions 20 - 25 of these Specifications.

20 10 02 REGULATORY REQUIREMENTS

A. Work for this section of the Specifications shall be performed in accordance with the Codes, Standards, etc. as identified in Division 20.

20 10 03 RELATED SECTIONS of the SPECIFICATIONS

A. Requirements of the following Section(s) of the Specifications apply to Work of this Section:

B. Division 20 - Basic Mechanical Conditions

C. Requirements of this Section of the Specifications shall apply to Work of the following sections of Divisions 20 - 29:

1. Division 20 - Insulation Work
2. Division 25 - Temperature Control System

20 10 04 WORK INCLUDED

A. Furnish material, labor and services necessary for and incidental to the installation of the following work where shown on the Plans and as hereinafter specified. Include all necessary work in related sections of the Specifications (sub-section 20 10 03) to perform the Work completely.

B. Identification of piping and equipment for the work of Divisions 20 - 25.

C. Testing, adjusting and balancing of systems for the work of Divisions 20 - 25.

D. Cleaning of piping and equipment for the work of Divisions 20 - 25.

E. Painting of piping and equipment for the work of Divisions 20 - 25.

F. Demolition for the work of Divisions 20 - 25.

20 10 05 WORK NOT INCLUDED

A. Materials and methods are specified in this section for the work of Divisions 20 - 25. The Work, itself, is specified in the respective sections of Divisions 20 - 25 of the Specifications.

20 10 06 SUBMITTALS

A. The Contractor shall submit materials for the Work of Divisions 20 - 25 for approval in accordance with Section 20 00 43. The requirements are enumerated in the respective sections of Divisions 20 - 25 of the Specifications.

B. Single and multiple manufacturers are cited in this Sub-section as acceptable sources of piping material. While “or equivalent” is not included, the intent of this Section is to permit substitution

as defined in Sub-section 20 00 51, EQUIPMENT MANUFACTURERS, unless "no substitution allowed " is noted.

C. The following shall be submitted under this section of the specification:

1. Firestop schedule and product data, see Section 20 10 20 for specific requirements.
2. Coordination drawings, see Section 20 10 53 for specific requirements.

20 10 07 SPECIAL REQUIREMENTS

A. Special requirements for work shall be specified in the respective sections of Divisions 20 - 25 of the Specifications.

20 10 10 BASIC PIPING MATERIALS

A. General:

1. The intent of sub-sections 20 10 11, 20 10 12, and 20 10 13 is to identify materials that may be utilized for Divisions 20 - 25 Work as specified for each specific piping system. Piping, hangers, valves, fittings and joining materials for Division 21 Fire Protection shall be FM Global and U.L. listed as specified in Division 21 and may not necessarily be as specified in this section; however all methods and procedures which are not in conflict with those permitted by NFPA shall govern.
2. Respective piping materials shall be manufactured, fabricated and/or provided in accordance with the ANSI, ASTM, ASME or other accepted industry standard as specified herein.

20 10 11 PIPE AND TUBE

A. General:

1. All pipe and tube material shall be uncoated, unless specified otherwise.
2. Manufacturer's mill reports and applicable documents to certify the validity of procured piping materials shall be on file at the Contractor's office.

B. Copper tube:

1. Type K, L, and M copper tube shall be in accordance with ASTM B88. Tubing is available in various finished products and wall thickness, which must be called out as well as sizes being either "nominal" or "outside diameter" (O.D.) since there are overlaps in smaller sizes.

2.

type	size range	annealed hard	annealed soft	application
L	¼"-8"	x		general use, HVAC, refrig., plumbing (ASTM B-88)

20 10 12 FITTINGS

C. Miscellaneous

1. Dielectric flanges and unions:
2. Dielectric unions and flange unions shall be required in piping systems where an electrically insulated connection is needed to separate dissimilar metals from producing galvanic or electrolytic action. Unions shall be rated for 250#; flange unions for 175#. Range: unions ½" - 2"; flange unions 1-1/2" - 12".
3. Steel threaded nipples:

4. General use: Made from ASTM A-120 pipe in standard (schedule 40) and extra strong (schedule 80). Available black and galvanized, range 1/8" - 6" pipe diameters.
5. High-pressure application: Made from ASTM A-53 seamless pipe and ASTM A106 seamless pressure tube in standard (schedule 40) and extra strong (schedule 80). Available black only, range 2" - 6" pipe diameters.
6. Close nipples are not permitted.

20 10 13 VALVES

A. General:

1. It is indented that valves specifications are for high quality HVAC / Plumbing applications, not lesser quality "Contractor / Value / Economy" series. Valves produced internationally shall be from the Manufacturer's owned facilities. Valves shall not be manufactured by third party OEM suppliers. Valve submittal shall indicate where the valve is assembled and tested.
2. When two or more valves of the same type are to be used in the same service, all valves of this type shall be of the same manufacturer.
3. Only general valve series are specified. Valves shall have all options, trim, seat material, and accessories as specified whether or not listed as a prefix, suffix or valve number.
4. All valve manufacturers and models listed shall be considered as "acceptable manufacturers" and may be submitted without concern from subsection 20 00 62
5. All valves for use in "cold" piping shall have stem or neck extensions allowing proper insulation and a continuous vapor barrier.
6. No asbestos packing allowed.

B. Ball Valve:

1. 2" and smaller: Bronze ASTM B584 (or low lead bronze for lead-free), 2-piece body, 600 psi WOG, quarter turn lever handle, blow-out proof stem, stem extension (for "cold" applications), full port, virgin TFE seats, all stainless steel trim, threaded or soldered ends. Nibco S-585-70-66, Apollo 77-240, Watts Series B-6081, Hammond 8311 or approved equivalent. Full port valves 2 ½" and 3" the same model numbers as the 2" and smaller valves are also acceptable.
2. Gauge cocks where not specified or specifically identified shall be ¼" bronze 2 piece body ball valves with lever handle and threaded ends per the above specification.
3. Drain valves and air vents shall be ¾" bronze 2 piece body ball valves per the above specification, with ¾" hose end adapter cap and chain. In ½" through 2" pipe, contractor may use Webstone model T-drain.

20 10 23 FIRESTOPS AND SMOKESTOPS, FIRE RATED/SMOKE PARTITIONS.

A. All penetrations through rated assemblies, walls, shafts, floors, roofs, etc., shall be firestopped in accordance with Local Building Codes, NFPA, U.L. Fire Resistant Directory, and manufacturer's instructions.

B. Provide a FIRESTOP PRODUCT SCHEDULE consisting of the following minimum information:

1. Type – indicate the type of materials, or system.
2. Manufacturer – manufacturer's name, product name and product number.

3. Mechanical System – indicate which Divisions 20 - 25 items the product is utilized for.
4. Rating – indicate the fire rating and UL detail numbers.

C. Submit the following with the above FIRESTOP PRODUCT SCHEDULE:

1. Manufacturer's specifications and technical data including installation instructions.
2. Details of each proposed assembly.
3. Manufacturer's representative who shall provide qualified engineering judgments and drawings for non-standard applications.
4. Contractor's qualifications and related experience.

D. Materials shall be stored per the manufacturer's recommendations and as specified for General Project storage in Division 20.

20 10 24 SEALS, NON-FIRE RATED

A. All penetrations through non-rated walls, floors, etc., shall be sealed for draft stopping with caulk, putty, etc., designed for this use.

20 10 29 RESTRICTIONS, GENERAL FOR ALL PIPING SYSTEMS

B. Mechanical contractor is required to show proof of having attended Daikin VRV install training within in the last 2 years

C. Do not over tighten pipe clamps. Piping must be able to move for expansion and contraction

A. Do not use gaskets or packing containing asbestos.

B. 90's should be kept 20" from ref nets, fan coils & headers. Ref nets should be kept 40" from B.S. Boxes.

C. Selections of material and equipment and options for substitution shall conform to the requirements of Sub-section 20 00 60, MATERIAL and EQUIPMENT.

D. Solder for use in joints of copper piping shall not contain lead.

E. Black and galvanized pipe, fittings, nipples and specialties are not permitted in water piping systems where copper and/or brass are the basic materials.

F. Cast brass/copper fittings are not permitted for gaseous applications including refrigerant lines.

G. Short radius 90-degree elbows and 180-degree returns are not permitted, unless specified and/or specifically noted.

H. The use of pipe hooks, chain and perforated band iron are not permitted for hanging or supporting piping.

I. Power driven inserts and attachments are not permitted unless approved by the Architect/Engineer on express request by the Contractor.

20 10 30 JOINTS AND CONNECTION METHODS

20 10 34 SOLDERED AND BRAZED

A. Soldered and brazed connections shall be made in accordance with recommendations of the current edition of the Copper Tube Handbook of the Copper Development Association or as hereinafter specified.

B. General criteria for soldered and brazed joints shall be as follows:

1. Copper tubing shall be square-end cut by varied methods at the Contractor's option. The ends of the tubing shall be reamed to remove both internal and external burrs.
2. Joints for copper piping for hydronic systems, domestic water, temperature controls, DWV systems and other applications of fluids below 250 degrees F. shall be soldered with 95-5 Tin Antimony. 50-50 Tin Lead solder shall not be used.
3. Cleaning of tubing and fittings, application of flux and heat, purging and cooling shall be in accordance with recommendations of solder and brazing alloy manufacturers for the joint type and material specified in the respective “PIPING MATERIAL SCHEDULE” in Section 155000.

20 10 40 HANGERS, SHIELDS, SUPPORTS AND ANCHORS

A. General:

1. All hanger devices (e.g. - concrete inserts, expansion anchors, clamps, pipe hangers, strut, etc.) shall be UL approved for the intended service. Material shall be applied within the load limitations prescribed by the respective manufacturer. Loads transmitted to the building shall be within the limitations of the structure.
2. Acceptable manufacturers of hanger material are Anvil International, B-Line Systems, Inc., Tolco, PHD Manufacturing, ERICO/Michigan Hanger Co., National Pipe Hanger Corp.

20 10 41 HANGERS

A. Piping shall be supported from the building structure, walls, and floors. Piping shall not be supported from other piping, ductwork, conduits, etc. Loads shall be within the allowable load of building component that is connected to. Piping loads shall include, but not limited to, the weight of the piping, valves, specialties, insulation, pipe covering, pipe content, pressure test media content, wind, snow, seismic, etc.

B. Where piping is indicated on common trapeze hangers, racks, stanchions or brackets, the various trade contractors involved shall agree to a mutually acceptable arrangement among themselves, but each shall be responsible for the correctness and compliance of their work.

C. Pipe hangers, supports, etc. for “cold” or “hot” piping systems shall have hangers sized for the outside diameter of the insulation in order to maintain a continuous vapor barrier.

D. Hangers, and other supports, anchors, guides, etc. in direct contact with copper piping material shall be copper plated. All others shall be electro-plated for indoor use.

E. The use of pipe hooks, chain, perforated band iron, wire, or cable are not permitted for hanging or supporting piping.

F. Singular, horizontal, suspended piping above grade shall be hung with pipe hangers per the following schedule, unless noted otherwise:

pipe sizes	piping application	Anvil International type and figure number
4” and smaller	copper pipe/tubing	adjustable ring, #CT-99

1. hanger to be sized for outside diameter of insulation and to be used with insulation protection shield, figure 167.

G. Hangers, supports, etc. shall position the piping properly in the work, and provide for expansion and contraction.

H. Vertical piping shall be supported at each floor level with riser clamps bearing on the building structure or pipe sleeve.

I. Pipe stands shall be field fabricated to meet the anticipated loads. The base plate shall be spaced 1” minimum above the finished floor with concrete or grout.

J. Wall brackets shall be field fabricated to meet the anticipated loads. The minimum brace angle shall be 45° from the horizontal.

20 10 42 HANGER RODS AND HANGER SPACING

A. Where “All-thread” rod is used it shall be galvanized, cadmium or zinc electro-plated. Where plain rod is used the threads shall be a minimum of 2” in length on each end.

B. Hangers and hanger rod spacing for metallic piping shall be provided and installed in accordance with the Building Codes or the following schedule, whichever is more stringent:

pipe size	rod diameter	max. hanger spacing
1-1/4” & smaller	3/8” diameter	8' on centers
1-1/2” & 2”	3/8” “	10' oc

C. Hangers for non-metallic piping shall be spaced in accordance with the Building Codes or the following schedule, whichever is more stringent:

pipe size	rod diameter	max. hanger spacing
1” & smaller	3/8” diameter	4' oc
1-1/4” - 2”	3/8” “	5’ oc

20 10 43 ANCHORING

A. Anchors for piping in new concrete construction may be suspended at the Contractor’s option, or as shown on the plans, from inserts placed in the concrete as it is poured-in-place. Mechanical equipment rooms shall have inserts placed at a maximum of 4 ft. centers.

hanger rod size	Grinnell insert figure number
7/8” or smaller	single - CB universal, figure #282
7/8” or smaller	multiple - 1-5/8” x 1” continuous strut, #PS 449

B. Anchors for piping in new concrete construction, existing concrete construction shall be suspended from epoxy resin set anchors, installed per the manufacturer's recommendations set into holes drilled into the concrete. Anchors shall be UL and/or FM approved, and applied within the allowable working load ratings for the respective size. Cataloged load values shall be derated by one third for seismic allowances. Minimum embedment depth shall be 2/3 of concrete thickness. Field pullout test shall be performed when requested by the Engineer. Anchors shall be Hilti type HVA.

C. Anchors for piping shall be attached to the steel by bolting directly through the void in the bar joist chord or by using the appropriate cataloged type C-clamp or beam clamp. The roof deck shall not be used for supporting the piping or ductwork.

D. Welded attachments to the structural steel of the building are not permitted unless otherwise noted on the Construction Documents or where approved by the Architect/Engineer on specific request of the Contractor.

E. Anchors for piping shall be suspended from inserts placed as the panels/planks are set in place. Where attachment to the “flexicore” is needed where the continuous strut is not available then, specifically designed “toggle bolt” anchors with oversized washers may be used provided that they are placed in the center of the hollow cores located 8” on center within the planks.

hanger rod size	Grinnell insert figure number
7/8” or smaller	multiple - 1-5/8” x 1” continuous galvanized strut, #PS 400S

F. Power driven inserts and attachments are not permitted unless approved by the Architect/Engineer on express request by the Contractor.

G. In all cases, anchor loading shall be based on hanger spacing, weight of the pipe to be supported when full and insulated, weight of any additional loads imposed upon the anchor, wind loading, seismic loading, quality of the material that the anchor is being installed in, etc. The Contractor shall verify in the field that the anchors used and the materials that they are being installed in are suitable for the load imposed and shall bring any problems to the attention of the Owner's Representative in writing immediately.

H. Where anchors are loaded in shear in existing concrete structure, suitably sized and installed wedge type anchors may be used. Wedge type anchors shall be Hilti Kwik Bolt II.

20 10 44 SEISMIC RESTRAINT

A. All materials and workmanship shall specifically comply with the above listed Building Code with respect to seismic requirements for the support and anchorage of all mechanical systems and equipment as installed on this project. Lateral forces to be restrained shall be as required by ASCE 7 Section 11 and 13 Architectural, Mechanical, and Electrical Components and Systems. Refer to structural drawings and/or Geotechnical Report for design values.

-Site Class (ASCE 7-05, Table 11.4-1 and 11.4-2)D

- Seismic Use Group III

- Seismic Design Category D

B. All piping support and restraint details and practices shall conform to the publication “Seismic Restraint Manual Guidelines for Mechanical Systems” by SMACNA, 2008 Edition, and/or “Seismic Restraints” by B-Line systems, Inc.

C. DELEGATED DESIGN: Design hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, herein referred to as Seismic engineer. Prepare drawings, calculations and details for any anchorage, bracing and/or sway bracing for seismic restraint as required by the local codes and Authority Having Jurisdiction. Seismic engineer shall inspect the final installation for compliance with the approved Seismic shop drawings. Seismic engineer to identify items that need to be corrected or changed and provide contractor additional/revised drawings as required.

D. SUBMITTALS:

1. SHOP DRAWINGS: Submit drawings, calculations and details shall be signed and sealed by a Professional Engineer licensed in the State of the Project's location.
2. CLOSEOUT: As-built seismic drawings with Letter from Seismic engineer stating that the completed installation meets the design.

E. INSTALLATION: Contractor shall only use those materials submitted and approved. Contractor shall notify Seismic Engineer when actual installation differs from the approved Seismic shop drawing.

20 10 50 BASIC MECHANICAL METHODS - GENERAL

20 10 51 INTENT OF PROJECT DOCUMENTS

A. Install the Work in accordance with the Project Documentation and considerations enumerated in Subsection 20 00 01, GENERAL (Project Documents).

20 10 52 ARRANGEMENT OF WORK

A. All Work shall be arranged so that hangers and supports for the mechanical equipment and materials shall be within the load limitations of the structure and the respective hanger and/or support.

B. Contractor shall not scale from drawings to determine the exact locations for devices, piping, ductwork, etc., but shall follow the architectural drawings, the structural drawings and the actual building conditions, in establishing dimensions and lines of run. The work shall be adjusted to accommodate interferences anticipated and encountered. The Contractor shall verify the exact material quantities and lengths required.

C. Piping that is required to pitch shall have priority over piping that does not pitch. Work which cannot be changed in elevation shall have priority over that which can be moved. Offsets, transitions and changes in direction shall be made in piping and ductwork to maintain headroom and pitch whether or not indicated on the Plans. The Contractor shall provide air vents, traps, dirt legs, drains, lifts, sanitary vents, mechanical vent lines, etc. as required to install the mechanical systems for proper operation and maintenance.

D. Do not install work in the immediate proximity of electrical components (e.g. - panels, switches, controls, boxes, etc.) in equipment rooms. Drip pans above and/or around electrical equipment are not permitted.

E. Aluminum and copper products shall not be encased in concrete.

F. Work in “finished spaces” shall be concealed within walls, chases or above the ceiling unless specifically indicated otherwise. Install the Work to coordinate with other trades and to conform to the architectural reflected ceiling plan.

G. The work shall be installed parallel with the building lines unless specifically shown or noted otherwise.

20 10 53 COORDINATION

A. Each Contractor shall prepare and submit coordination drawings (at a scale equal to or larger than the project documents) to the Architect/Engineer for review prior to any fabrication or installation.

B. It shall be the Contractor's responsibility to coordinate their work with the work of other trades, and with the architectural and structural drawings. Where physical interferences cannot be

resolved between the trades, or when encountered in the field, the Contractor shall prepare composite drawings at a scale of not less than 3/8" = 1'-0" clearly showing the Work of Divisions 20 - 29 in relation to the Work of others to identify the conflict. Submit a proposed resolution to the Architect/Engineer for approval in accordance with Sub-sections 20 00 01, GENERAL (Project Documents) and 20 10 06, SUBMITTALS.

1. Do not proceed with Work in question until the matter is mutually resolved among the involved parties, and adequate information has been submitted to the Architect/Engineer for review. No additional compensation shall be granted for modifications and execution of the resolution(s). Modifications are to be incorporated in the "as-built" drawings.

C. Contractor shall review the Project Documents, site conditions, and the requirements of other disciplines, and shall report any discrepancies between them to the Architect/Engineer and obtain from him written permission for changes necessary in the Mechanical Work. Subsequent clarification(s) by the Architect/Engineer will not be a change in scope of the Work. The Contractor at no addition in the contract price shall perform any such modifications required.

D. Contractor shall verify tie-in locations to verify sizes, direction of flow (via pressure or physical tracing, not labels), materials, elevations, etc. prior to commencing new work. Contractor shall notify Architect/Engineer upon discovery of discrepancy. Work performed prior to verification will be corrected at no cost to Owner.

E. The drawings shall not be scaled; obtain detailed information, shop drawings, installation and maintenance bulletins, etc. to determine exact requirements and to satisfactorily achieve the intent of the Project Documents.

F. The Contractor shall furnish and properly install all sleeves, slots, chases, openings, recesses, supports, anchors and anchor bolts required for his Work in coordination with the other trades as the building is erected.

G. The expenses for changes required by neglect in executing, coordinating or scheduling the Work properly or avoiding conflicts shall be borne by the Contractor precipitating the issue requiring the changes.

20 10 54 DELIVERY, STORAGE AND HANDLING

A. Delivery, storage and handling of equipment and material are the Contractor's responsibilities. The Contractor shall perform the Work in accordance with the following criteria:

1. Delivery shall be arranged by the Contractor (including Owner furnished items) for the expeditious and economical pursuit of the Work and to meet the scheduling requirements of the Contract.
2. The Contractor will be assigned a "lay-down" area at the job site and shall confine temporary storage to this area.
3. The Contractor may take delivery of equipment and material at his "shop" or an off-site location as suits the performance and schedule of the Work.
4. Regardless of where and how equipment and material are temporarily stored prior to installation, or if installed at the job site prior to acceptance, the Contractor is responsible for the following:
    a. All equipment and material shall be accessible to the Architect/Engineer for inspection.
    b. All equipment and material shall be protected adequately and properly from the weather, dirt and water, chemical, mechanical or comprehensive damages.
    c. The Contractor shall be liable for the repair and/or replacement (including labor) of any equipment and material lost, damaged or defective prior to acceptance.

5. The Contractor shall arrange all labor, tools, services and scheduling to perform the handling of equipment and material for his Work.

20 10 55 GENERAL CLEANING

A. Each Contractor and Subcontractor shall be responsible for progress and final clean-up of his respective Work in accordance with the Contract Documents, requisite ordinances and regulations. Clean-up and legal disposal of debris from the Work, excess refuse and presence at the job site shall be performed in a timely and satisfactory manner. If not, the Contractor shall be notified of the unsatisfactory condition. If the matter persists, the Contractor will be back charged for the clean-up performed by others.

B. Clean exposed exteriors and limited access interior surfaces of all equipment, piping and ductwork of foreign matter to provide an “as new” condition.

20 10 56 CLEANING OF PIPING SYSTEMS

A. The Contractor shall clean the respective piping system(s) that are included in his scope of work. All systems shall be flushed with water or air (depending on ultimate use) to relieve any congestion and internally cleanse the respective piping system. The Contractor shall provide all flushing media in sufficient quantity, inlet connections, discharge or drainage outlets and any temporary provisions to protect components, or remove it, to facilitate the flushing. Clean and replace all strainer screens and filters. Flush clean and drain all low points in the piping.

B. Owner’s representative shall be present for flushing, cleaning, and rinsing. Water treatment representative must check water after rinsing to insure all chemical cleaner has been removed and the Alkalinity of the rinse water is equal to that of the make-up water.

20 10 57 PRESSURE TESTING

A. The Contractor shall submit a schedule at the beginning of the Work of the piping systems that are to be pressure tested, and indicate whether tests will be for an entire or partial system. Entire piping systems shall be pressure tested at one time unless it is not possible or practical.

B. All piping to be insulated or concealed shall be pressure tested prior to the application of the insulation or concealment.

C. A representative of the Architect/Engineer shall witness all pressure testing. The Contractor shall notify the Architect/Engineer at least three (3) days prior to the test date.

D. Each piping system shall be tested per the method, test pressure, and test duration as specified in the Piping Material Schedules.

E. The Contractor shall provide all test media, measuring devices, inlet connections, test measurement connections, and disposal of test media. The Contractor shall protect, isolate and/or remove piping system components that can not be subjected to test pressures.

F. Hammer each joint in welded or soldered piping while under test. Leaks shall be repaired and the test(s) repeated until the respective piping system is tight.

20 10 58 LEAK TESTING OF REFRIGERANT PIPING

A. After the refrigerant piping connections have all been made, the entire refrigerant system shall be put under pressure and tested for leaks using dry nitrogen to develop the test pressure and the refrigerant charge as the tracer gas for leak testing.

B. A pressure regulator and a relief valve set at the test pressure (see Pipe Material Schedules) shall be used in the nitrogen test hookup.

C. The nitrogen shall be admitted to the system through the gage port on one of the refrigerant valves. All valves in the system shall be back seated so that holding charge refrigerant gas and nitrogen can diffuse throughout the piping.

D. If any leaks are discovered, the joint shall be broken and re-soldered. If possible, the section of piping containing the leaking joint should be isolated from the rest of the system. Dry nitrogen shall be passed through the joint being remade to prevent the formation of copper oxide.

1. Occasionally, a joint may be suspected of leaking, but the leak is so small that it is difficult to get a positive indication with the halide detector. When this happens, completely enclose the joint with a small plastic bag. Tape the open ends of the bag securely to the piping to insure a gas tight seal. Leave the bag in place for several hours.
2. To test a leak, make a small hole in the bag at the lowest point and insert the exploring tube of your halide detector. Make another hole at the top of the bag to admit air. If the joint does have a slow leak, enough refrigerant gas will collect in the bag to give a positive indication.

20 10 59 CHARGING REFRIGERATION SYSTEMS

A. Evacuation and Dehydration. The Contractor shall evacuate and dehydrate the refrigerant system to remove any air and moisture from the system. The manufacturer's literature shall be referred to for the evacuation procedure for each system installed.

1. Pressurize the suction gas pipe, high/low pressure gas pipe and liquid pipe from the service ports of each stop valve to 550 PSI. If the pressure does not drop within 24 hours, the system passes the test. If there is a pressure drop, check for leaks, make repairs and perform the airtight test again.
2. Evacuate the system from the suction gas pipe, high/low pressure gas pipe and liquid pipe stop valve service ports by using a vacuum pump for more than 2 hours and bring the system to 500 microns or less. After keeping the system under that condition for more than 1 hour, check if the vacuum gauge rises or not. If it rises, the system may either contain inside or have leaks.
3. Due to Warranties MC is required to contact TMI Representative Chris Swallow or Chad Wunsch at (636) 532-1110, to set up a field coordination visit for a check, testing, and start-up.
4. Complete Mechanical Pre-checks & Procedure Overview per Exhibit 2 prior to charging.

B. Charging. The Contractor shall determine the weight of a full charge of refrigerant and oil for the equipment plus refrigerant charge based on the length of refrigerant piping and in accordance with the unit manufacturer's literature.

The following charging procedure shall be used:

1. Due to Warranties MC is required to contact TMI Representative Chris Swallow or Chad Wunsch at (636) 532-1110, to set up a field coordination visit for a check, testing, and start-up.
2. The Contractor shall follow the manufacturer’s installation instructions and/or industry standards in charging and start-up of equipment.
3. The contractor shall follow the Commissioning guide per Exhibit 3.

20 10 60 BASIC MECHANICAL METHODS - INSTALLATION

20 10 61 GENERAL

A. The Contractor shall install all equipment and material as specified in the Project Documents. The Contractor shall review the installation requirements, and provide all of the appurtenances and accessories required for complete systems and a functioning installation. The Contractor shall be prepared to submit installation details and procedures where specified or requested for approval by the Architect/Engineer.

B. The Contractor shall follow the manufacturer's instructions for the handling, temporary storage, protection and installation of the respective equipment and material. The Contractor shall promptly notify the Architect/Engineer in writing of any discrepancy or conflict between the Project Documents and the manufacturer's instructions, and request clarification. Unless there is a specific change in the scope of work, no additional compensation shall be granted for modification(s) and execution of the clarification.

C. Work performed that does not comply with the manufacturer's instructions, any approval or instructions from the Architect/Engineer, or that causes a significant and/or unapproved deviation from the intent of the Project Documents shall not be grounds for additional compensation for costs to modify the Work in a manner directed by and to the satisfaction of the Architect/Engineer.

D. All Work shall be installed to permit access and/or removal of components coils, fan units, filters, motors, mechanical drives, etc. that require periodic maintenance, servicing, repair and/or replacement. Equipment, piping, ductwork, conduit and raceways shall be arranged to permit access to valves, motors, motor and temperature controls, and to clear the opening of doors and access panels.

E. Welded attachments to the building structure are not permitted.

20 10 62 PIPING

A. All piping shall be properly installed and supported with adequate provisions for clearance from other work, for expansion, contraction, slope, anchorage and prevention of transmission of vibration.

B. Piping shall be generally installed parallel to building lines in the most expeditious and economical manner and to facilitate servicing. Piping shall be positioned and installed to provide noiseless circulation, and pitched to provide drainage and avoid air pockets. Valves and specialties shall be located to provide proper function and be readily accessible for servicing and maintenance.

C. All piping connecting to equipment shall be installed without springing and any strain at final connections. The Contractor may be requested to disconnect piping to demonstrate that the piping has been so installed.

D. Changes in direction in the piping shall be made with manufactured fittings only. All elbows shall be long radius (1.5 x diameter) unless specifically noted otherwise. Bending may be permitted on submittal for approval of a satisfactory procedure to the Architect/Engineer for approval. Bending is to be accomplished with hydraulic type equipment producing no malformations in the piping.

E. Changes in direction in piping systems using hard temper copper tubing shall be made with manufactured and cataloged elbow fittings. Branch connections and reductions in all copper tubing systems shall be made with tee and reducer fittings. At the Contractor's option, utilizing

a “Tee Turner” tool and corresponding procedure may provide branch connections. These joints shall be brazed and not soldered.

F. All piping materials shall be physically cleaned internally and externally of mill scale, oxidation, grease, oil, dirt, mud, loose and foreign matter before fabrication and installation.

G. All open ends of piping and equipment shall be closed during fabrication and installation to keep dirt and foreign matter out of the Work.

20 10 63 VALVES

A. Shut-off valves shall be provided at all inlet and outlet connections to equipment, at major branch connections to mains, where required for normal service, and where shown on the drawings, flow diagrams or details.

B. Valves shall be the same size as the adjacent piping, except for control valves furnished in Division 25.

C. Valves shall be accessible and free from interference when operated. Valves shall be installed with the stem on or above horizontal.

D. Valves shall be packed and glands adjusted before final acceptance.

20 10 65 MISCELLANEOUS

A. Sleeves, inserts, etc.

1. The Contractor shall furnish and properly install sleeves, inserts, supports, anchors and anchor bolts required for his Work. The size, quantity and location of chases, openings and recesses in the building structure shall be the responsibility of the Contractor performing the Work that requires these considerations. Patching of oversized openings and finishing thereof shall be the responsibility of the trade or Contractor requiring the opening. Material and labor for openings requiring structural framing including lintels and angles shall be furnished by the trade requiring the opening and installed by the General Contractor. Lintels shall be structural steel angles, channels, or tees of proper size and sections for the load supported.
2. Sleeves shall be provided for all penetrations through the building structure. Sleeves through floors shall extend 1” above the finished floor except where otherwise noted; sleeves through walls, partitions or structural members shall be flush with the exterior surface on both sides. Sleeves shall sized to include the pipe/duct insulation.
3. The space between the sleeve (or opening in the structure) and the pipe/duct or outside of the insulation of penetrations through fire rated components of the building shall be fire stopped, see Section 20 10 20 Miscellaneous Piping Materials. Penetrations through non-rated components of the building shall be draft stopped, see Section 20 10 20 Miscellaneous Piping Materials.

B. Unions and flanges:

1. A ground joint type union shall be provided in threaded and sweat joint piping, 2” and smaller pipe or tube size, down-stream of each branch shut-off valve, control valve and specialty item, the inlet and outlet connections of each piece of equipment, and where shown on the drawings.
2. Flanged connections shall be provided in piping 2-1/2” and larger at each manual valve, control valve, specialty item and the inlet and outlet of each piece of equipment.

C. Interconnections between dissimilar piping material systems shall be made with fittings manufactured for the specific application.

20 10 70 BASIC MECHANICAL METHODS - RELATED WORK

20 10 71 DEMOLITION

A. Work Included:

1. The Owner shall keep possession of the designated equipment, apparatus and/or piping as shown on the Plans, or as indicated during construction, or as hereinafter specified. The Contractor shall deliver, off-load and store this property as directed by the Owner.

   AND

2. The Contractor shall legally dispose of the designated equipment, apparatus and/or piping. Any cost of removal or salvage value shall be credited to the Contractor's account and shall be considered accordingly in the Contractor's bid.
   a. Recovery and reclaim of refrigerant shall be performed by the Contractor in accordance with EPA regulations. The Contractor shall submit to the Owner a certificate stating the names and license numbers of the personnel performing the removal of the refrigerant, the machine and serial number of the reclaim equipment used, type and quantity of reclaimed refrigerant, and all other required data.
3. Perform comparable and necessary electrical dismantling and disconnections only to make the equipment inoperable for abandoning-in-place of electrical components of previously designated mechanical systems.
4. Remove externally applied insulation only as required to facilitate dismantling and ultimate removal of the designated mechanical equipment and material. Do not include removal of any asbestos-based insulation.

B. Work Not Included:

1. The removal and disposal of asbestos based insulation or other hazardous materials applied to, or contained in, the mechanical equipment, material and piping designated to be demolished shall not be included in the scope of the work regardless if known ahead of time or discovered in the course of performing the Work. In the latter case, the Contractor shall notify the Architect/Engineer and shall not pursue that portion of the Work until others have removed the asbestos-based material. The removal and disposal of asbestos-based material shall be arranged by and to the account of the Owner, and conducted separately from the demolition work.

C. Miscellaneous:

1. Loose ends of mechanical systems shall be capped and/or sealed in a safe and secure manner approved by the Architect/Engineer.
2. Dead legs of branch piping are not permitted unless a cap is specifically shown on the drawings. Where a cap is not shown and the drawings indicate to cap piping, the Contractor shall remove branch piping back to the main and cap at that point.

20 10 72 CUTTING AND PATCHING

A. The basic premise of this Sub-section is that the cutting and patching (where required) are performed in existing building components.

B. The Contractor requiring the penetration of or the access way in the building structure to fulfill the intent of the Project Documents for his Work shall be responsible for the cutting and the subsequent patching in accordance with the following criteria:

1. .No structural component of the building shall be cut or violated without express approval of the Architect/Engineer.
2. The Contractor shall verify the presence of any concealed utility or service within the structure (walls, roof, floor, etc.) in question, and shall be responsible for maintaining continuity and/or replacing it.

C. Cutting of work-in-place in “new” construction because of error, neglect or damage inflicted shall be the responsibility of the Contractor precipitating the issue.

D. “Patching” shall be construed as the repairing or replacing of the building structure to return it to an original or new condition, in the opinion of the Owner and/or Architect/Engineer, as existed prior to the cutting.

E. Patching and finishing work shall be the responsibility of the Contractor requiring the cutting. The patching shall match all the substantive and visual aspects of the structure and adjacent surfaces. Restoration and finishes shall be as specified and executed in the respective sections, schedules and/or details of the Project Documents for the general construction work. Completed work and any special requirements shall be subject to approval by and satisfaction of the Architect/Engineer.

20 10 76 LUBRICATION

A. Provide all oil and grease for the operation of all equipment until acceptance. The Mechanical Contractor and Subcontractors shall be held responsible for all damage to bearing while the equipment is being operated by them up to the date of acceptance of the equipment. Protect all bearings during installation and thoroughly grease steel shafts and other unpainted steel surfaces to prevent corrosion. All motors and other equipment shall be provided with covers as required for proper protection during construction. For equipment that is received void (dry) of lubrication the Contractor shall lubricate the equipment before storing to prevent internal damage to the equipment.

20 10 80 TESTING, ADJUSTING AND BALANCING

20 10 81 GENERAL

A. At the completion of the installation work, the Contractor shall execute tests and make adjustments to qualify and quantify that all mechanical systems and subsystems installed or modified under this project function to their respective specified performance and the intent of the Project Documents. All systems shall be operated and tested systematically for capacity, calibration, balancing and sequence as close to design conditions as possible with maximum attainable internal load. Adjustment to system components shall be made including replacing motor drives, if necessary, to achieve specified performance.

B. Work shall be conducted under the supervision of an individual certified by NEBB or AABC and trained technicians. All test results shall be documented per the previously approved procedure and transmitted to the Architect/Engineer for review as a requisite for final acceptance and payment. Final inspection shall follow completion and acceptance of the test results.

C. The balancing contractor shall review plans and specifications for balancing dampers, balancing valves, gauge connections, airflow/pitot sections. The Contractor shall notify the Engineer if the Contractor cannot perform the Work because of inadequate provisions so that the inadequacy can be corrected by change order during project construction without any cost over and above the device itself. No excuses during the testing and balancing procedure will be accepted for Contractor's lack of performance, and the Contractor shall be responsible for the additional cost of adding the required device(s) into the completed systems.

D. Employment of a Balancing Subcontractor by the Contractor shall not relieve him of obligations to perform Work in accordance with the Project Documents.

20 10 82 REFERENCES

A. National Standards for Total System Balance, by the Associated Air Balance Council (AABC), latest edition.

B. Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems, by the National Environmental Balancing Bureau (NEBB), latest edition.

C. 1999 Application Handbook, Chapter 36, Testing, Adjusting and Balancing by the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).

20 10 83 WORK INCLUDED

A. Testing and adjusting each air handling unit to achieve the design airflow rates as scheduled.

B. Testing and adjusting each coil to achieve design flow rate and capacity as scheduled.

C. Testing and adjusting each air device to achieve design airflow rate as indicated on the plans.

D. Provide sufficient labor and resources required to assist in the commissioning process, refer to commissioning specification section.

20 10 84 SUBMITTALS

A. The Contractor shall submit to the Architect/Engineer for approval the following within thirty (30) days of his notice to proceed:

1. Name and address of the proposed Balancing Contractor and their credentials.
2. Name of the Mechanical Contractor's representative responsible for the balancing work.
3. The Contractor shall certify that each system is installed in accordance with the Project Documents, is operable and is prepared for testing and balancing; and that products and systems meet or exceed specified requirements.

B. The Contractor shall submit the following prior to commencing any testing, adjusting and balancing work:

1. Name of Balancing Contractor's representative for coordination with the Mechanical Contractor.
2. The Contractor shall certify that: all instruments, measuring devices, meters, etc. to be used for his Work have been calibrated to NIST standards including Mechanical Contractor provided permanently installed and portable devices; that supervisor is certified by a recognized national organization; and that personnel are qualified technicians.
3. At least 60 days prior to the beginning of testing the work, the Contractor shall submit to the Architect/Engineer for approval:
    a. Written proposed procedures of testing, adjusting, balancing and documentation including techniques, methods and responsibilities.
    b. List of each instrument to be used and latest date and method of calibration to verify accuracy. If more than one (1) year old or accuracy is in question, instrument shall be recalibrated.
    c. Sample forms for all pieces of equipment to be tested.

20 10 85 RESPONSIBILITIES AND COORDINATION

A. Work by Contractor, which installed the respective system to be tested, shall include the following:

1. Schedule, coordinate and sequence the testing, adjusting and balancing of the respective systems. Prepare and distribute a schedule.
2. Verify that the respective equipment, ductwork, piping and temperature control systems have been provided, each is operable and apparently functioning all in accordance with and to the intent of the Project Documents. In particular, the following shall be checked and noted as having been accomplished prior to the testing, adjusting and balancing:
   - Initial checkout and start-up of all equipment.

   - Pressure and leak testing, and cleaning of all systems.

   - Alignment and adjustment of motor drives, and lubrication of bearings.

   - All dampers, manual line valves, control valves and balancing valves are in the “open” position.

3. Verify that all instruments, measuring devices, meters, immersion wells, taps, valves, specialties, dampers, measuring and sensing elements, access openings, etc. have been provided in correct quantities and locations to permit commencement of the testing, adjusting and balancing of the Work. Correct deficiencies and/or modify the Work, as required.
4. Provide the Balancing Contractor with all pertinent shop drawings on equipment to be tested, adjusted and balanced.
5. Provide the Balancing Contractor with a set of “as-built” drawings or the Mechanical Contractor's marked-up “record” set showing all changes to the mechanical systems.

B. Work by Balancing Contractor shall include the following:

1. Perform a total system balance in accordance with NEBB or AABC National Standards for Field Measurement and Instrumentation, Total System Balance.
2. Direct measurement of temperatures, pressures, air and fluid quantitative flow rates and any other values necessary to establish the status of each system in comparison with the Project Documents.
3. Adjust components and devices to achieve design operating conditions within acceptable tolerances for each system. Do not use shut-off devices for balancing unless indexed. Lock memory stops or mark set points of balancing devices. Replace all system components removed temporarily during the testing and balancing effort, set all temperature controls properly and generally leave the systems in working order and “as-new” condition.
4. Report to the Architect/Engineer any existing installed or operating condition that deviates from the design or intent of the Project Documents, and that the Balancing Subcontractor believes to be beyond the scope of his work.
5. Furnish fixed sheaves to the Owner, upon acceptance of the balancing report, for fans furnished with adjustable sheaves where the balancing contractor was able to make the required speed adjustments with the factory sheave.
6. Furnish and install fixed sheaves for fans furnished with adjustable sheaves where a speed change, beyond that obtainable with the adjustable sheave, is required to obtain design airflow. The system shall be proportionally balanced, then the required fan speed shall be calculated based upon the fan laws. Contractor shall also calculate the required brake

horsepower at the design airflow, if this exceeds the nameplate horsepower the Architect/Engineer shall be notified.

7. Furnish and install fixed sheaves for fans furnished with fixed sheaves where a speed change is required to obtain design airflow. The system shall be proportionally balanced, then the required fan speed shall be calculated based upon the fan laws. Contractor shall also calculate the required brake horsepower at the design airflow, if this exceeds the nameplate horsepower the Architect/Engineer shall be notified.

20 10 86 REPORTS

A. Reports shall be submitted in 9" x 12" binder complete with cover identification, index page, and indexing tabs. Reports shall not contain footnotes explaining why the system was not balanced to the required performance.

B. The form of the testing and the report shall be submitted and approved prior to testing work. Reports shall be submitted on pre-approved forms.

C. Diagrams, as required, to clarify locations of measurements and/or reading shall be included in the report.

D. Final acceptance and payment of the contract shall not be issued before final report is approved.

20 10 87 PROCEDURES

A. The procedures listed herein are presented to enhance the procedures of the referenced agencies and the lack of a procedure being presented herein does not relieve the Contractor from following the procedures of the referenced agencies.

B. In general, balancing dampers shall not be used to adjust the cfm quantity of fans but rather only to adjust the proportion of the airflow within the system. The fan speed shall be adjusted, with all of the dampers open, to a cfm slightly greater than design cfm. Then the dampers shall be adjusted to move more air towards the end of the system. The balancing damper at the furthest points of the system should be nearly full open. If these furthest dampers are not open then the fan speed shall be reduced and the process repeated until a satisfactory result is achieved.

C. Systems with diversity shall be tested in accordance to a method agreed upon by Engineer and is to be established when the Contractor submits his procedures to the Engineer for approval. Typically this may be: to force the East zones to operate design capacity while west zones are left to operate at their given load; or that some air handling units would be forced to operate at design capacity while other units may be off or left to operate at their given load.

D. When the Contractor has any questions regarding how the systems operate or cannot obtain design performance, they should contact the Engineer for clarifications or further instruction. The work shall not be considered complete until all systems and components achieve design performance unless the Engineer issues written direction otherwise.

E. All systems shall be adjusted between 10% above the design value as a maximum, to the design value as a minimum.

20 10 90 BASIC MECHANICAL METHODS - IDENTIFICATION

20 10 91 GENERAL

A. This Sub-section specifies basic materials and methods for identification that shall apply to systems specified in other sections of Divisions 20 - 29 of the Specifications.

B. The Contractor shall submit schedules and listings of Work to be identified indicating color code, material, name plate information and method of application for approval prior to performing the Work.

20 10 92 REFERENCES

A. All provisions and conditions cited in this Sub-section shall apply to Work of all other sections of Divisions 20 - 29 of these Specifications, where and when relevant.

B. Applicable requirements of the current and accepted edition of the following codes and standards shall apply to the Work of this Sub-section:

1. ANSI/ASME A 13.1 - “Scheme for the Identification of Piping Systems”.

20 10 93 WORK INCLUDED

A. Each respective Contractor and Subcontractor shall identify the applicable components of his Work in accordance with specifications hereinafter enumerated or where required by other sections of Divisions 20 - 29 of the Specifications.

1. All piping systems identifying the system type and direction of flow.
2. All control devices and panels.

20 10 94 SUBMITTALS

A. Contractor shall submit shop drawings for approval in accordance with Section 20 00 43 submittals.

B. Provide an Identification Product Schedule consisting of the following minimum information:

- Material - type of identification product.
- System - indicate which system or equipment materials will be used for.
- Manufacturer - Manufacturer's name, product name and model numbers.
- Accessories - Miscellaneous materials used in affixing identification.

C. Provide manufacturer's technical product sheet and recommended installation instructions.

D. Provide color list/schedule and lettering sizes for pipe markers, valve tags, and equipment nameplates.

E. Provide a valve tag list for approval prior to ordering or making valve tags.

20 10 95 GENERAL METHODS FOR IDENTIFICATION

A. All surfaces to receive identification nameplates or markers shall be clean, degreased, dry, free of oxidation and prepared per manufacturer's recommendations.

B. Plastic nameplates shall be installed with corrosion-resistant mechanical fasteners. Do not use adhesives.

C. Tags shall be installed with corrosion-resistant chain and end fasteners.

D. Pipe and duct markers shall be installed in accordance with the manufacturer's recommendations.

E. Valve tag list for each separate trade i.e., mechanical, and temperature control shall each provide a valve tag list in electronic format or under glass in a suitable frame located in a location approved by Architect/Engineer.

F. Valve tag information is required on “as-built” drawing submittals.

G. Acceptable Manufacturers:

Products of the following manufacturers may be considered

1. Seton Nameplate Corp.
2. Brady Signmark Division
3. Craftmark Identification Systems
4. D & G Sign and Label

20 10 96 PIPING IDENTIFICATION

A. All piping, bare pipe or insulated, exposed or concealed, shall be identified by one of the methods specified herein.

B. Markers shall be installed in clear view; aligned with axis of pipe; located at not more than twenty-five foot (25') intervals on straight runs, risers and drops; located adjacent to each valve, control device and tee fitting; and located on each side of penetrations of the building structure and non-accessible enclosures.

C. The following schedule shall govern label types for each application:

Location	Type
Mechanical Rooms	II
Above Lay-in Ceilings	I
Exterior/Outdoors	III

1. Pressure Sensitive Tape (Type I): Vinyl pressure sensitive tape color coded and lettered in accordance with ANSI A13.1 for label of service. Flow direction shall be separately labeled with 2” wide pressure sensitive tape. The flow arrow band shall overlap the service label to secure it in place and shall not be less than two complete wraps around the pipe.
2. Plastic Pipe Markers (Type II): Manufactured in accordance with ANSI A13.1 requirements, semi-rigid plastic, pre-formed to fit curvature of pipe or pipe insulation, color coded and imprinted with media identification and flow direction. Available in varied sizes for pipe diameter, wording and inclusion of arrow.
3. Outdoor Pipe Markers (Type III): Non-vinyl chloride markers specifically design for outdoor use. Color coded and lettered in accordance with ANSI A13.1 for label of service with direction of flow arrows.
4. Stencil Lettering (Type IV):

Outside diameter of bare pipe or insulated pipe	Size of letters	Length of color field
¾”- 1-1/4”	½”	8”
1-1/2” - 2”	¾”	8”

D. All underground metallic piping shall be identified with continuous 6" wide x 0.004" polyethylene film, color coded, and imprinted for type of utility buried below located in the same trench as the piping and/or utility and positioned approximately 6" to 12" below finished grade.

E. All underground non-metallic piping shall be identified with continuous 6" wide x 0.035 metallic detection tape, color coded and imprinted for type of utility buried below located in the same trench as the piping and/or utility and positioned approximately 6" to 12" below finished grade.

F. The following legend, color, and lettering shall be used:

Service and Legend	Color of Field	Letters
Materials Inherently Hazardous:		
Refrigerant	Yellow	Black

20 10 97 VALVE IDENTIFICATION

A. All valves exposed or concealed shall be identified with brass valve tags indicating the service of system the valve is in and the number of the valve.

B. Valve tags shall be minimum 1-1/2" diameter brass stock with ¼" legend identifying and ½" valve number both shall be black enamel filled. Legends shall be HVAC, PLBG, SPR, and GAS.

C. Valve tags shall be secured in place with a No. 6 brass bead chain or No. 16 brass jack chain. Chains shall be attached to the valve lever handle or around the valve stem.

D. An additional 10 consecutively numbered tags for each service shall be provided to the Owner for future use.

E. Balance valves that are not used as a combination balance/service valve are not required to be labeled.

F. Temperature control valves shall be identified with a ¼" "T.C." legend and shall be numbered consecutively starting with major equipment and then terminal units (i.e., AHU-1 preheat, cooling, reheat control valves shall be numbered 1, 2, 3 respectively).

20 10 98 EQUIPMENT IDENTIFICATION

A. All major equipment items (i.e., chillers, air handling units, fans, terminal units, pumps, boilers, etc.) shall be identified with appropriately sized nameplates permanently attached to the respective equipment.

B. Small equipment items (i.e., in-line pumps, pot feeders, etc.) shall be identified with brass valve tags, see requirements for valve tags and chains.

C. Equipment that is controlled by the Building Automation Control System shall be labeled with a 2" x 5" yellow label with black letters:

"CAUTION – THIS EQUIPMENT IS UNDER COMPUTER CONTROL AND MAY CYCLE AT ANY TIME."

D. Interior equipment nameplates shall be 1/16" thick two-ply acrylic plastic 2-1/2" x 1" size minimum with white letters on a black background. Tag size shall be appropriate for equipment name, letters shall be a minimum of ½" high.

E. Exterior equipment shall be identified with nameplates suitable for exterior use or shall be engraved aluminum plates .020" thick, minimum size shall be 4" x 1-1/2" plates.

F. Nameplates shall be attached with corrosion-resistant No. 3 round head or No. 4 sheetmetal screws.

20 10 100 CONTROL DEVICES IDENTIFICATION

A. The materials specified herein Section 20 10 90 shall apply to Division 25 Temperature Control Systems. Additional identification work is specified in Division 25.

20 20 10 ELECTRICAL REQUIREMENTS

20 20 11 GENERAL

A. This Subsection specifies the basic requirements for electrical components which are an integral part of "packaged" mechanical equipment. These components include, but are not limited to, factory installed motors, starters, disconnect switches, control panels and related prewiring of power and control wiring for a single external electrical service connection. All material and equipment shall be provided for the application and service intended.

B. Specific electrical requirements (e.g. horsepower, electric characteristics, etc.) for mechanical equipment shall be specified within the respective equipment specifications or shall be scheduled on the Plans.

C. The Contractor shall verify that electrical characteristics of material and equipment furnished for Divisions 20 - 25 equipment are in accordance with the electric service and comply with the specifications and requirements of Division 26 - 29.

D. Unless otherwise specified as an integral part of packaged mechanical equipment, motor control centers, motor starters and disconnect switches and the power wiring from power source to motor starting equipment (including variable frequency drive packages) and wiring from that equipment to the respective motors including final connections shall be performed as Electrical Work of Division 26 - 29.

E. The field installation of electrical components, not included in Division 26 - 29, that are specified to be provided with the mechanical equipment and are shipped separately shall be the responsibility of the Contractor furnishing the base equipment.

F. All electrical components and material shall be UL labeled.

G. Submittals for the applicable electrical equipment shall include the following: identification of the equipment which the electrical material is to serve, application, voltage, phases, full load amperage, wattage and NEMA enclosure. For motors: horsepower, RPM, full load power factor and efficiency, frame size and service factor.

H. Identification of electrical components of mechanical equipment shall be in accordance with Subsection 20 10 90, "Basic Mechanical Methods - Identification".

20 20 12 REFERENCES

A. Electrical material and equipment provided for Divisions 20 - 29 shall meet the applicable requirements of the latest accepted edition of the following codes and standards:

ANSI	American National Standards Institute
EEI	Edison Electrical Institute
IEEE	Institute of Electrical and Electronic Engineers
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association

UL Underwriter's Laboratories, Inc.

20 20 25 INSTALLATION AND OPERATION

A. Install, balance and align all drives in accordance with the respective manufacturer's instructions and recommendations.

B. The balancing and alignment of drives including pinning, doweling and grouting shall be the responsibility of the Contractor furnishing the equipment. Any adversities arising from executing the Work shall be resolved/remedied by the Contractor.

C. Verify all electrical characteristics prior to running electric motor driven equipment. Check motor amperage draw and rotation for proper operation.

END OF SECTION

20 25 00 INSULATION

20 25 01 GENERAL

A. This Section specifies mechanical insulation of piping, equipment and ductwork.

B. The Plans, the general provisions of the Contract including the General, Supplementary and/or Special Conditions and specification sections of Division 1 shall apply to Work of Divisions 20 - 29 of the Specifications.

C. Provisions and conditions cited in this Section shall apply to Work for other sections of Divisions 20 - 29 of these Specifications.

20 25 02 REFERENCES, REGULATORY REQUIREMENTS

A. Work for this Section of the Specifications shall be performed in accordance with the Codes, Standards, etc. as identified in Division 20 in addition to the following:

1. State and local Air Pollution Codes and Regulations.
2. NFPA 255/UL 723/ASTM E-84 Surface Burning Characteristics of Building Materials.
3. UL 1479/ASTM E-814 Fire Test of Through-Penetration Firestops.

20 25 03 RELATED SECTIONS OF THE SPECIFICATIONS

A. Requirements of the following Sections of the Specifications apply to Work for this Section:
.1 Division 20 - Basic Mechanical Conditions
.2 Division 20 - Basic Mechanical Materials and Methods

20 25 04 DEFINITIONS

A. The term **"fitting"** where used in this Section of the Specifications shall be construed as an elbow, tee or reducer. Unions, flanges and valves shall not be considered as fittings.

B. The term **"cold"** shall be defined as the temperature of a surface that may result in the formation of condensation.

C. The term **"accessory"** shall include staples, bands, wire, mesh, clips, pins, studs, tape, anchors, corner angles, cements, adhesives, coatings, sealers, mastics, finishes, etc.

D. The term **"ASJ"** where used in this Section of the Specifications shall mean a reinforced vapor retarding All Service Jacket.

E. The term **"SSL"** where used in this Section of the Specifications shall mean Self-sealing Lap Joint closure system for longitudinal jacket joints.

F. The term **"supply air"** where used in this Section of the Specifications shall mean downstream of a coil.

G. The term **"outdoor air"** where used in this Section of the Specifications shall mean ambient air that has not been conditioned.

H. The term **"return air"** where used in this Section of the Specifications shall mean conditioned air that is returned from the space.

I. The term **"mixed air"** where used in this Section of the Specifications shall mean air streams that are a mixture of "outdoor air" and "return air".

J. The term **"relief air"** where used in this Section of the Specifications shall mean excess return air that is relieved from the building.

K. The term **"exhaust air"** where used in this Section of the Specifications shall mean air that is removed due to contaminates, odors, or heat.

20 25 05 WORK INCLUDED

A. Furnish material, labor and services necessary for and incidental to the insulation of the following systems where shown on the Plans and as hereinafter specified. Include all necessary considerations in the related sections of the Specifications (Subsection 20 25 03) to perform the Work completely.

1. Refrigerant piping **suction, hot gas/discharge, heat recycling and reheat.**

20 25 06 SUBMITTALS

A. The Contractor shall submit shop drawings for approval in accordance with Subsection 20 00 43, Duties of Contractor - Submittals.

B. Provide an INSULATION PRODUCT SCHEDULE consisting of the following minimum information:

Material - type of insulation material, jackets, or covers.
Manufacturer - manufacturers name, product name, and K-value where applicable.
Accessories - tapes, staples, coatings, adhesives including manufacturer's name and product name.
Systems - indicate systems where product is used.

C. Provide an INSULATION THICKNESS SCHEDULE consisting of the following minimum information:

System - indicate which system insulation is installed.
Location - inside, outside, concealed, exposed, etc.
Size - indicate size range of pipe, insulation type used.
Thickness - indicate insulation thickness in inches.

D. Provide manufacturer's technical product data of each material and accessory item with engineering support information and recommended installation procedure. Indicate product number, "K" value, thickness and required accessories for each application.

E. At the completion of the project, submit a letter stating all materials are asbestos free, and meet the specified ASTM E-84 flame/smoke rating of 25/50, and that all piping and duct penetrations are smoke or fire stopped as required by the Code.

20 25 07 SPECIAL REQUIREMENTS

A. Contractor's Qualifications: Contracting company shall be one specializing in insulation application and have a minimum of three (3) years experience in this work.

20 25 10 INSULATION MATERIALS

20 25 11 GENERAL

A. Materials and accessories furnished for this Section of the Specifications shall be standard cataloged products, new, commercially available and suitable for the service specified.

B. Insulation material and/or accessories containing asbestos are prohibited.

20 25 12 FIRE SAFETY STANDARDS

A. All insulation material shall have composite fire and smoke hazard ratings in accordance with NFPA 255 and UL 723 not exceeding the following values as tested by the latest procedures of ASTM E-84: flame spread of 25; smoke developed of 50.

B. Accessories such as adhesives, mastics, cements, tapes and cloths for seams, joints and fittings shall have the same ratings as hereinbefore listed. All products and their respective shipping cartons shall have indications that flame and smoke ratings meet the aforementioned requirements. Any treatment of jackets or facings to impart acceptable flame and smoke safety values shall be permanent; water-soluble applications are prohibited. The Insulation Contractor shall bear responsibility that all products to be used meet the foregoing criteria.

20 25 13 TYPES OF INSULATION MATERIALS

The following types of insulation material are enumerated in the respective INSULATION MATERIAL SCHEDULE. K values listed are in units of (Btu in/hr ft.2 °F) and are based on specific products and are to be met or exceed. ANSI/ASTM types or class shall not provide relief for any K value specified.

A. Type F1: Flexible elastomeric foamplastic with smooth exterior surface, preformed for pipe and tube application, ASTM C534, Type I, “k” value of 0.28 at 75 deg. F. Armstrong AP Armaflex pipe insulation, K-Flex LS tube, Aerocel EDPM tube.

B. Type F2: Flexible elastomeric foamplastic with smooth exterior surface, sheet material, ASTM C534, type II, “k” value of 0.28 at 75 degrees F. Armstrong AP Armaflex sheet material, K-Flex LS sheet, Aerocel EDPM sheet.

C. Type FG: Rigid foamglass preformed for pipe applications ASTM C552, K value of 0.33 at 75°F with all-purpose vapor retarder jacket. Pittsburgh Corning Foamglass.

20 25 15 DELIVERY AND STORAGE OF MATERIALS

A. All of the insulation materials and accessories covered by this specification shall be delivered to the job site and stored in a safe, dry place with appropriate labels and/or other product identification.

B. The Contractor shall use whatever means are necessary to protect the insulation materials and accessories before, during, and after installation. No insulation material shall be installed that has become damaged in any way. The Contractor shall also use all means necessary to protect work and materials installed by other trades.

C. If any insulation material has become wet because of transit or job site exposure to moisture or water, the Contractor shall not install such material, and shall remove it from the job site. An exception may be allowed in cases where the Contractor is able to demonstrate that wet insulation when fully dried out (either before installation, or afterward following exposure to system operating temperatures) will provide installed performance that is equivalent in all respects to new, completely dry insulation. In such cases, consult the insulation manufacturer for technical assistance and provide the Architect/Engineer with a copy of manufacturer's recommendation for approval.

20 25 16 ACCEPTABLE MANUFACTURERS

The following are acceptable manufacturers for products specified in this section of the specification.

D. Adhesives and Coatings:

1. Alpha Associates
2. Miracle Adhesives
3. Vimasco Corporation

E. Fasteners

1. ACS Industries
2. GEMCO
3. Midwest Fasteners

F. Fire Stop

1. 3M
2. Metacaulk
3. Specified Technologies, Inc.
4. USG Interior, Inc.

20 25 20 INSULATION MATERIAL SCHEDULE I-1

O.	Refrigeration Piping:		Type F1
	Suction - 2” and smaller	1-1/2”	
	2-1/2” and larger	1-1/2”	
	Hot gas/discharge - All sizes where piping is 8'-0” or less AFF	1-1/2”	

20 25 24 INSULATION MATERIAL SCHEDULE I-4

A. Service: Ductwork, 0 to 250 degrees F.

	Location	Thickness
C.	Conditioned Spaces and Return Air Plenums	
	1. Supply Air, Heated or Cooled Make-up/Ventilation Air	1”
E.	Insulation Material	
	1. Rectangular ducts	Type GF2
	2. Round and Oval Ducts	Type GF3

20 25 31 INSULATION APPLICATION - GENERAL

A. Respective piping system and duct system shall be pressure tested, proved tight and accepted, as specified in section for installation of such, before insulation is applied. Sheet metal ductwork joints shall be sealed prior to insulating. Coordination among the respective contractors is essential.

B. Insulation materials and accessories shall be applied in accordance with respective manufacturer's recommendations and recognized industry practice for the insulation to serve its intended purpose. All surfaces to receive insulation shall be clean, dry, free of oxidation and prepared as required.

C. The insulation work shall be subject to inspection during the various applications and construction phases. Material, accessories, finishes, methods and workmanship that are not in compliance with these Specifications and/or approved submittals may lead to rejection of the Work and replacement at the Contractor's expense.

D. Tie-ins to existing systems and all new work shall be insulated to provide a complete and functional system. Finishes shall be compatible wherever possible.

1. When existing insulation thickness is different than the specified thickness herein, the Contractor shall notify the Architect/Engineer. It is the intent that the existing piping would be restored to its original condition (thickness and finish) as if new work had not been performed.

20 25 32 INSULATION APPLICATION - PIPING

A. Insulate each piping section with single thickness full-length units of insulation, with a single cut piece to complete the run where a fitting is encountered. Do not use cut pieces or scraps abutting each other.

B. Extend piping insulation without interruptions through walls, floors, and similar piping penetrations, except where otherwise specified.

C. Insulation on unions, flanges, valves, strainers, expansion joints, pump impeller housings and other equipment requiring accessible servicing shall be removable and reusable without damage. Items requiring periodic attention shall have covers and/or casings to contain the insulation.

D. All “cold” piping systems shall be insulated with type and thickness of material herein specified and shall have a continuous vapor retarder through all fittings, hangers, supports and sleeves.

E. In cold systems flanges, unions, valves, etc., shall be covered with an oversized pipe insulation section sized to provide the same thickness as on the main piping section. An oversized insulation section shall be used to form a collar between two insulation sections with low-density blanket insulation being used to fill gaps. Jacketing shall match that used on main piping system. Rough cut ends shall be coated with suitable weather and/or vapor resistant mastic as required by the system location and service. All valve stems must be sealed with caulking that allows free movement of the stem but provides a seal against moisture incursion.

F. In hot system flanges, unions, valves, etc., shall be left exposed; insulation ends shall be tapered and sealed to allow bolts to be removed or other required access.

G. The installation of cold piping systems shall use oversize (outside the thickness of the insulation) pipe hangers.

1. Piping systems 3” and smaller, the Insulation Contractor shall replace temporary wood blocking with insulation of thickness as scheduled in this section of the specification. Metal pipe shields shall be placed between the pipe hanger and the insulation.
2. Piping systems 4” and larger, the Insulation Contractor shall replace the temporary wood blocking with high density pre-formed insulation (i.e. calcium silicate, cellular glass) inserts with suitable characteristics for the weight, temperature and application and insulation protection shields at each hanger. The specified insulation should stop and start at the insert at the hanger locations. The insert shall be wrapped with vapor barrier jacketing. Circumferential joints shall be taped with vapor barrier tape and coated with vapor barrier sealant. B-Line, or equivalent, figure B-3380 through B-3384, 360 deg. calcium silicate insert/shields and figure B-3153 protection shields may be used or equivalent may be field fabricated per details submitted for approval.

3. If in the event pipe hangers are not oversized, this Contractor shall notify the Engineer and the Contractor(s) who provided and/or installed hangers. Hangers shall be corrected before pipe is insulated.
4. Where size on size hangers have been approved by the Engineer in writing for use in special situations, the insulator shall insulate the hanger and hanger rod with ½" Type F insulation. Pipe insulation shall terminate at each side of the hanger and have vapor barrier end joint butt strips. Hanger insulation shall overlap pipe insulation a minimum of 4" on each side of the hanger and secured to the pipe insulation with contact adhesive. Hanger rods shall be insulated for a minimum of 12" secured to the rod with contact adhesive and the end sealed with a bead of caulk.
5. The Contractor shall adjust hangers after the insulation and pipe shields have been installed to provide an evenly supported piping system. No hanger shall bear the entire weight or not carry any weight of piping system.

H. Special requirements for fiberglass pipe insulation:

1. Fiberglass pipe insulation, All Service Jacket/Self Sealing Lap (ASJ w/SSL) type, shall be installed with laps positioned to shed water, position at either 10 o'clock or 2 o'clock and shall not be visible to view. End joint butt strips shall be installed on all piping with ½" adhesive to adhesive overlap.
2. For piping systems using fiberglass insulation, the fittings shall be insulated with: double thickness molded fiberglass fittings, or preformed cellular glass fittings secured with twine or wire; or with flexible elastomeric foamplastic; at the Contractor's option. The pre-molded PVC fitting covers shall be installed over the fiberglass inserts and secured with SS tacks. Victaulic fittings or couplings shall be insulated with sheet elastomeric foam plastic insulation formed to the fitting and formed "collars" over all couplings encountered.
3. For piping systems using fiberglass insulation, butt joints in hot piping shall be made with 2" wide vapor barrier tape over butt joints. Butt joints in cold piping shall be made with a wet coat of vapor barrier lap cement on butt joints and seal joints with 2" vapor barrier tape. All pipe insulation ends shall be tapered and sealed.
4. On "cold" applications only, the following additional requirements shall apply: the premolded fittings shall be sealed with an approved vapor barrier retardant prior to installing the jacket materials. Premolded PVC fitting covers shall then be installed over the premolded inserts, all joints shall be sealed with vapor barrier cement and 2" vapor barrier tape on lap joints. Premolded stainless steel or aluminum fitting covers shall be installed per the manufacturer's instructions and a bead of clear silicon caulk applied to all joints. Straight lengths of insulation abutting all fittings shall have both ends sealed with vapor barrier cement to prevent "wicking" or moisture migration. At a maximum of twenty-one foot (21') intervals, joining ends of the butt joints shall be sealed with vapor barrier cement prior to butting together to prevent "wicking" or moisture migration.

I. For piping systems using elastomeric foamplastic insulation, joints and seams shall be sealed with manufacturer's recommended contact adhesive. Fittings shall be insulated from segments fabricated from pipe insulation or sheet material, secured and sealed with contact adhesive. Termination points and ends shall be sealed to the pipe to prevent backflow of condensation on the inside of the insulation. Any piping outdoors or otherwise exposed to UV or ozone provide two (2) coats of WB Armaflex or Rubatex 374 finish.

20 25 33 INSULATION APPLICATION - EQUIPMENT

A. Manufactured equipment (i.e. air handling equipment, terminal units, air device plenums, etc.) requiring insulation shall be specified in the respective equipment specifications to be factory insulated with internally applied liner or double wall casing.

20 25 34 INSULATION APPLICATION - DUCTWORK

A. Ductwork systems shall be insulated in accordance with the insulation schedules. Insulate each duct section with single thickness full length pieces. Do not use scraps abutting each other.

B. Extend insulation without interruptions through walls, floors, and similar penetration, except where otherwise specified.

C. “Cold” duct systems shall have insulation with a continuous vapor retarder through all fittings, hangers, supports, air devices, fire dampers, duct mounted coils, dampers, and other devices in the ductwork system, etc.

D. In “cold” duct systems, using rigid board or sheet elastomeric foam insulation, support angles, stiffener angles, ductmate flanges, etc. they shall be covered with an oversized insulation strip sized to provide the same insulation thickness as on the duct. Provide a minimum of 2” of overlap on each side of the obstruction.

E. Board insulation shall be properly cut and dry fitted to the surface to be insulated. Edges shall be neat and clean cut. No intermediate cut pieces shall be allowed on the bottom and sides of the ductwork. Insulation board shall be secured in place using mechanical fasteners such as welded pins or speed clips. Locate not less than 3” from each edge or corner and approximately 12” on centers on all sides. There shall be a minimum of two (2) rows of pins on the bottom of the duct and one (1) on the sides. Additional pins may be needed on the bottom to prevent sagging. All seams, joints, penetrations and breaks in the vapor retarder jacket shall be sealed with pressure sensitive tape matching insulation facing. Edges shall be provided with 28 ga. 1” x 1” aluminum corner beading properly secured and shall have the same facing material as the insulation board.

F. Flexible duct wrap insulation shall be cut properly and fitted to “stretchout” dimensions and a 2” piece of insulation removed from the facing at the end of the piece to form an overlapping staple and tape flap. Insulation shall be installed with facing outside so tape flap overlaps facing at the other end. Insulation shall be butted tightly. Seams shall be stapled on 6” centers with outward clinching staples. Adjacent sections of duct wrap insulation shall be butted tightly with the 2” tape flap overlapping and stapled. For horizontal oval ducts over 30” wide, duct wrap insulation shall be secured additionally to the bottom of the duct with mechanical fasteners such as pins and speed clip washers spaced on 18” centers to prevent sagging. All seams, joints, tears, punctures and other penetrations in the vapor retarder jacket shall be sealed with FRK backing pressure sensitive tape.

G. Stop and point insulation around access doors and damper operators to allow operation without disturbing insulation.

H. Where a duct run changes from interior lining to exterior application (or vice versa), there shall be a 6” overlap of insulation.

I. In "cold" duct system with internal duct insulation, with 1 1/2 " thickness flexible duct wrap, insulate air devices, fire dampers, duct mounted coils, dampers, and other devices in the ductwork system that are not internally insulated.

20 25 35 PVC PIPING INSULATION PLENUM FIRE WRAP

A. Provide 1/2 inch minimum thickness fire resistant blanket wrap consisting of inorganic blanket encapsulated with a scrim-reinforced aluminum foil and overlap seam to provide a flexible, non-combustible enclosure for cables and PVC non-plenum rated pipe in return air plenums as tested to UL 910.

B. Plenum Wrap shall be tested in accordance with the following:

ASTM C 411, ASTM C 518, ASTM E 84, ASTM E 136, and UL 910
• Maximum Flame Spread (Ft.) 0.01
• Maximum Smoke (Optical Density) 0.01
• Average Smoke (Optical Density) 0.00
Surface Burning Characteristics (ASTM E 84)

C. Cut Fire Barrier Plenum Wrap to a length sufficient to wrap completely around the perimeter of the pipe, plus provide a longitudinal overlap of not less than 1 inch and an overlap of 1 inch, minimum, over the adjacent wrap section. Use aluminum foil tape to seal cut edges of the blanket. Temporarily secure Plenum Wrap in place using 3/4 inch wide filament tape. Install minimum 1/2 inch wide by 0.015 inch (28 gauge) thick stainless steel metal banding with stainless steel metal band clamp or 16 gauge galvanneal tie wire around the Plenum Wrap to hold it in place. Place the bands or tie wires 1/4 inch from each edge of the blanket and at the midpoint of the blanket, 11-3/4 in. on center. Tension the banding or tie wire to hold the Plenum Wrap snugly in place, compressing the foil but not cutting the foil.

D. PVC Piping Insulation Plenum Fire Wrap shall be 3M Fire Barrier Plenum Wrap 5A or approved equivalent.

END OF SECTION

23 00 00 HVAC PIPING AND EQUIPMENT

23 00 01 GENERAL

A. The Plans, the general provisions of the Contract including the General, Supplementary and/or Special Conditions and specification sections of Division 1 shall apply to Work of Division 20 of the Specifications.

B. Provisions and conditions cited in this Section shall apply to Work for other sections of Division 20 of these Specifications.

23 00 02 REFERENCES, REGULATORY REQUIREMENTS

A. Work for this Section of the Specifications shall be performed in accordance with the Codes, Standards, etc., as identified in Division 20.

23 00 03 REFERENCES, RELATED SECTIONS OF THE SPECIFICATIONS

Requirements of the following Sections of the Specifications apply to Work for this Section:

1. Division 20 - Basic Mechanical Conditions and Basic Mechanical Materials and Methods
2. Division 24 – Air Distribution
3. Division 25 - Temperature Controls

23 00 04 DEFINITIONS

(none)

23 00 05 WORK INCLUDED

A. Furnish material, labor and services necessary for, and incidental to, installing the following systems where shown on the Plans and as hereinafter specified. Include all necessary work in the related sections of the Specifications (Sub-section 23 00 03 to provide for complete systems.

1. Draining, filling, and venting of all modified systems as required for the above work. This includes scheduling shutdowns with the Owner (Refer to Section 20 10 70).
2. All seismic restraints for the above work (Refer to Section 20 10 40).
3. Smoke stopping of all penetrations of pipes and ductwork, and firestopping of the same through fire rated partitions as shown on the Architectural drawings including, but not limited to stairways, shafts, corridors, floors, roofs, and required exits (Refer to Section 20 10 20).
4. Cleaning and pressure testing equipment, piping, and accessories installed under this section of the specification. (Refer to Section 20 10 50).
5. Leak testing and charging of field piped refrigerant systems (Refer to Section 20 10 50).
6. Provide sufficient labor and resources required for the testing and balancing (Refer to Section 20 10 80) and for the commissioning process (Refer to Section 152300).

23 00 06 SUBMITTALS:

A. The Contractor shall submit the following for approval in accordance with Subsection 20 00 43, Duties of the Contractor - Submittals.

1. Piping materials, valves, and accessories as specified in Piping Materials Schedule(s) in this section of the specification.
2. All specialties including, but not limited to, thermometers, gauges, relief valves, pressure regulators, backflow preventers, flow switches, and vacuum breakers.

23 23 00 MISCELLANEOUS PIPING

A. Itemization of the piping materials for specific system application are enumerated in the following sub-sections for the respective PIPING MATERIAL SCHEDULE. Specific requirements for materials shall be as listed in Division 20 10 00 Basic Materials and Methods.

B. Manufacturer's mill reports and applicable documents to certify the validity of the procured piping materials shall be on file at the Contractor's office.

C. Gaskets and packings containing asbestos are not acceptable.

23 23 02 PIPE MATERIAL SCHEDULE M-1

A.	Service:	Refrigerant
B.	Installation:	Refer to “TMI Mechanical Pre-Checks & Procedure Overview” and “TMI Commissioning Guide” attached to Section 20 Specifications
C.	Design:	Pressure: 550 psig Maximum temperature: 300°F
D.	Pipe:	Type ACR copper pipe
E.	Fittings:	Wrought copper, brazed
F.	Pressure Test:	Refer to Section 20 10 60.

END OF SECTION

25 00 00 TEMPERATURE CONTROL SYSTEMS

25 00 01 GENERAL

A. This Section specifies an Automation/Energy Management System to control and monitor HVAC systems.

B. The Plans, the general provisions of the Contract including the General, Supplementary and/or Special Conditions and specification sections of Division 1 shall apply to Work of Divisions 20 - 29 of the Specifications.

C. Provisions and conditions cited in this Section shall apply to Work for other sections of Divisions 20 - 29 of these Specifications.

25 00 02 REFERENCES, REGULATORY REQUIREMENTS

A. Work for this Section of the Specifications shall be performed in accordance with the Codes, Standards, etc. as identified in Division 20 in addition to the following:

1. N.E.C., NFPA 70 – 1996
2. FCC rules, Part 15, Subpart J, regarding Class A radiation for computing devices and low power communication equipment operating in commercial environments.
3. UL 916 Underwriters Laboratories Standard for Energy Management Equipment.
4. ASHRAE Standard 135-2016, BACnet – A Data Communication Protocol for Building Automation and Control Networks.

25 00 03 REFERENCES, RELATED SECTIONS OF THE SPECIFICATIONS

Requirements of the following Sections of the Specifications apply to Work for this Section:

A. Division 20 - Basic Mechanical Conditions and Basic Mechanical Materials and Methods

25 00 04 DEFINITIONS

A. The term “DDC” or “Direct Digital Control” where used in this Section of the Specifications shall be defined as a control technique through which the process variable is continuously monitored by a digital computer which accomplishes loop control by calculating a control solution for output to a control device.

B. The terms “EMS” Energy Management System, “BAS” Building Automation System, may be used interchangeably in this Section of the Specifications to mean a system to control mechanical equipment using DDC. This definition includes both hardware and software components that are integrated to form a working system.

C. The term “Control Wiring” where used in this Section of the Specifications shall be defined as all wiring, 120 VAC line voltage or lower other than power wiring, required for the proper operation of the mechanical system and the BAS. This includes applications where line voltage serves as the control circuit such as a line voltage thermostat or involves interlocking with a damper.

D. The term “Power Wiring” where used in this Section of the Specifications shall be defined as all line voltage wiring to the mechanical and BAS equipment that is required for proper operation of the equipment. Typically, this wiring will support voltage at or above 120 VAC and is connected to the equipment for the purpose of providing motive power.

25 00 05 WORK INCLUDED

A. Furnish material, labor and services necessary for and reasonably incidental to the installation of the following work where shown on the Plans and as hereinafter specified. Include all

necessary work in the related sections of the Specifications (section 25 00 03) to perform the Work completely.

B. All engineering, labor, material, components, tubing, wiring, software, data base generation, graphics development, etc., as required for a complete operational control system as described on the drawings, in the specification, and as required by good practice.

C. Furnishing of sensor wells, calibration wells, valve bodies, control dampers, smoke dampers, air flow measuring stations, etc. for installation, by the respective trade contractors, under other sections of the specification.

D. Coordination with other Divisions 20 - 29 sections as required to assure proper equipment interlocking and installation including, but not limited to, damper installations, mixing box arrangements, terminal unit controls, and adjustment required by the testing and balancing work.

E. Provide technicians to assist the balancer, and to adjust the economizer dampers to maintain design cfm during economizer modulation with no greater than a 10% variation.

25 00 06 WORK NOT INCLUDED

A. The following considerations are not included in the Scope of Work for the proposal for this Section of the Specifications:

1. Installation of sensor wells, calibration wells, valve bodies, control dampers, and smoke dampers furnished under this section of the specification for installation under other sections of the specification.

2. Power wiring and relays shown on the electrical drawings furnished and installed under Division 26.

25 00 10 SUBMITTAL

A. The Contractor shall submit the following for approval in accordance with Section 20 00 40, Duties of Contractor, sub-section 20 00 43.

B. Schematic diagrams for each system, identifying by make and model number, size, capacity, performance, range, accuracy, etc., of each device. Each device shall have an identifying number unique to that device.

C. Detailed sequence of operation of each system or device including specific references to each of the components in the system describing specifically how the component affects system operation in the various operating modes. This detailed sequence shall be preceded by a generalized overview of the sequence describing in broad terms how the system functions.

D. Complete engineering data and descriptive literature for each component.

E. Complete wiring diagrams including: the system riser diagram showing the network architecture; floor diagrams showing sensor locations, panel locations, and equipment locations; point to point wiring diagrams for each electrical and electronic device showing all internal wiring and all interlock wiring required to complete the intent of the sequence of operations of the systems described in this section of the specifications.

F. Control panel layout drawings showing internal and external component arrangements, entry and exit points for wiring and tubing, and a list of all cover mounted labels indicating label size and inscription.

G. Startup report outline to be used at completion of installation.

H. After the shop drawings have been approved and system startup is complete, the Contractor shall prepare and submit four (4) copies of Catalog Data per Section 20 00 47, four (4) copies of Operations and Maintenance Manuals per Section 20 00 46, and two (2) copies of Software Manuals.

I. After the installation is complete the Contractor shall prepare and submit Operations and Maintenance Manuals and Record Drawings for the Owner's records in accordance with Division 20.

J. At each control panel, include one (1) copy of the panel's Record Drawing inside the panel. Record drawings shall contain the actual field point names and numbers as determined by the Control Contractor and the Owner, and plans shall show all cable routing and all device locations, panel locations, and equipment locations.

25 00 11 SPECIAL REQUIREMENTS

A. START-UP

1. Due to Warranties MC is required to contact TMI Representative Chris Swallow or Chad Wunsch at (636) 532-1110, to set up a field coordination visit for each step of doing field checks, testing, and start-up.
2. Mechanical contractor is required to show proof of having attended Daikin VRV install training within in the last 2 years.
3. The contractor shall evaluate the existing equipment on the I-Touch manager to delete the equipment that is no longer existing after demolition.
4. At completion of the installation, and before final acceptance by the Owner, the temperature control subcontractor shall test all control devices in a systematic manner. A complete report showing each device by identification number (T-41, V-20, etc.) shall be listed, its use or function identified (discharge air controller, damper motor, etc.), system (S-1, P-8, etc.), test result, date of test, and initial of technician. The format of this calibration report shall be included with the submittal drawings.
5. Upon completion of the installation, the Contractor shall start up the system and perform all necessary testing and run diagnostics to ensure proper operation. A start-up test in the presence of the Owner's representative and the Engineer shall be performed. When the system performance is deemed satisfactory the system will be placed into operation.

B. TESTS AND ADJUSTMENTS

1. Due to Warranties MC is required to contact TMI Representative Chris Swallow or Chad Wunsch at (636) 532-1110, to set up a field coordination visit for each step of doing field checks, testing, and start-up.
2. This subcontractor shall adjust and regulate all control devices relating to the work contained herein and shall instruct the Owner's representative in the proper operation and care of the control system. The subcontractor shall test and operate each component of the control system under actual performance conditions to assure proper function of all devices.
3. Proportional plus integral plus derivative (PID) control loops shall be tuned for minimum error and no hunting under all load conditions. The control contractor shall simulate various load conditions at the time of initial calibration and demonstrate that upsetting the control loop results in a typical PID response with stable control reestablished following two or three oscillations of decreasing amplitude around set point.
4. During the first year of operation, the control subcontractor shall be available upon request to answer questions regarding the system, and shall assist the Owner in diagnosing any problems or difficulty encountered in the operation or care of same, in addition to the scheduled visits outline in the preceding paragraphs.

C. TRAINING

1. Mechanical contractor is required to show proof of having attended Daikin VRV install training within in the last 2 years.

2. The contractor shall provide a representative from the company used as the source for the electronic controllers used in the systems installed under this contract. The representative shall conduct the training class on the project site at a time scheduled in advance with the Owner and shall occur during or immediately following system start up. These instructions are to be conducted during normal working hours. All pertinent costs shall be included in this contract.

D. COORDINATION WITH OTHER TRADES

1. Control contractor shall cooperate with unit manufacturers to assure proper arrangement of control items. Control valves, dampers, thermostat wells, and other control devices that are to be built into the field assembled ductwork or piping systems shall be furnished by the temperature control subcontractor and installed by the Mechanical or Electrical Contractor as directed by the supplier and indicated in other portions of the specifications and drawings.

2. The control contractor shall provide coordination as required for a properly functioning system and as specified in this section via shop drawings, coordination drawings, site visits, etc. Final responsibility for proper application, installation, and operation of all control system components falls under this section of the specification including equipment provided for installation by others.

3. Where it is specifically mentioned that design and engineering work associated with equipment provided under this section of the specification is by others, then the responsibility for only the performance and application of the equipment provided to the defined interface point falls under this section of the specification. Responsibility for proper application of the equipment and proper performance of the system controlled by the equipment from the interface point is the responsibility of the designer, installer and equipment supplier.

E. INTERFACES TO EQUIPMENT PROVIDED BY OTHERS

1. All equipment and control panels provided under this section of the specification and under other sections of the specification shall be provided with terminal strips. These terminal strips shall serve as the contract boundary between sections of the specification for trouble shooting purposes and bidding purposes. All wiring and connections external to the device shall be the responsibility of the section responsible for field wiring of the device. All internal wiring, connections, and internal components shall be the responsibility of the section providing the piece of equipment. The requirements of this section are intended to apply to but are not limited to motor starters, motor control centers, unit mounted control panels by the unit manufacturer, and control panels.

25 00 12 ACCEPTANCE TESTING AND WARRANTEE

A. Acceptance testing shall consist of demonstrating to the Owner's Representative at their request that the complete system has been available for operation and operating satisfactorily for at least 99% of the time during a continuous 60 day period. The Contractor shall provide the Owner's Representative with acceptable records and logs of operations to substantiate the availability of the system at their request. Failure of one or more DDC panels, or software, or the main CPU, or the Network shall constitute system unavailability.

B. The building control system, including all hardware and software components shall be warranted for a period of one year following the date of acceptance. Any manufacturing or installation defects arising during this period shall be corrected without cost to the Owner.

25 10 00 CONTROL SYSTEM REQUIREMENTS

25 10 01 GENERAL

A. This specification defines the minimum equipment and performance requirements for a direct digital control building control system.

B. This project is the revision of an existing building VRV control system present at the Owner's site. The work described in the drawings and specifications shall be seamlessly integrated with that existing system for inclusion in the building and/or campus network.

C. The control system shall consist of a high-speed network of DDC controllers, a control system server, and a graphical user interface.

D. System software shall be based on a server/thin-client architecture, designed around the open standards of web technology. The control system server shall be accessed using a Web browser over the control system network, the Owner's local area network, and remotely over the Internet (through the Owner's LAN).

E. The intent of the thin-client architecture is to provide operators complete access to the control system via a Web browser. No special software other than a Web browser shall be required to access graphics, point displays, trends, configure trends, configure points and controllers, or to edit programming.

F. All products will be as specified in the following portions of the specification. Equivalent devices will not be substituted or accepted without review and approval by the Engineer prior to the bid date. Not all of the items presented in the products paragraphs will be required for the specified sequence of operation, depending on the specific design selected by the successful contractor. However, all items used in a design by the contractor must be from the list or approved by the engineer prior to the bid date.

G. Model numbers specified are based on information currently available. The Bidders are responsible for confirming that the equipment they are supplying will conform to the specifications presented. Deviations from the specifications should be brought to the attention of the Engineer.

H. In addition, suppliers should feel free to present to the Engineer for approval, equipment that meets the specifications or could meet the specifications if minor adjustments were made to the specification but is not listed as acceptable. The intention of the specifications is not to exclude manufacturers or equipment but rather to provide an opportunity for various suppliers to bid the job while at the same time retain control over the level of quality.

I. All materials and equipment used shall be standard components, regularly manufactured for this system and shall not be custom designed especially for this project. All components shall have been thoroughly tested and proven in actual use. The building control system shall possess a fully modular architecture, permitting expansion through the addition of more stand-alone control units, sensors, actuators, operator terminals, and/or a general purpose CPU.

J. The general design concept for the control systems to be provided under this section of the specification includes the use of non-proprietary equipment used throughout the field sensing system and the field actuation system to allow the Owner more than one source of supply for field devices associated with the control system.

K. Input and output to all control loops shall reside in the field panel in which the control loop algorithm is operating. Communication trunks shall not be a part of any control loop.

L. The building control system specified herein shall be a direct digital control system, which can, without additional equipment, perform all of the automatic temperature control and energy management functions as required in this specification. The system, as specified, shall independently control the building's HVAC and auxiliary equipment to maintain a comfortable

environment in an energy efficient manner. Stand-alone control units shall be capable of performing all specified control functions in a completely independent manner.

M. Control systems installed under this section of the specification shall be directly engineered, designed, and installed; or directly engineered, designed and installed under the direct supervision of companies or their authorized branch offices or distributors. These companies, and/or their branch offices or distributors shall have been in the control contracting business for a minimum of 8 years unless otherwise approved by the Engineer prior to the bid date.

N. All controllers provided under this section shall be certified by the BACnet Testing Lab, and shall be listed in their online listing database at the time of submittal.

25 10 08 LABELING AND IDENTIFICATION

A. All devices relating to the work or systems included herein, including controllers, valves, motors, relays, auxiliary panels, etc., shall be identified with a unique identification number or name on the submitted engineering drawings. This identification number or name, along with the service of the device (discharge air controller, mixed air controller, etc.), shall be permanently affixed adjacent to the respective device. Identification shall be vinyl labels printed with thermal transfer printers, ½" high labels minimum.

B. Terminal strips shall be labeled using plastic labels designed to snap into the label mounting slots on the terminals. For input/output wiring, cabling, or tubing, the panel side of the terminals shall be labeled with the automation panel circuit board and terminal numbers associated with the point.

C. All wiring, tubing, and cabling both inside and outside of control panels shall be labeled at both ends using Thomas and Betts EDP printable wire and cable markers using style WSL self-laminating vinyl. Input and output cables and wiring shall be labeled with the point number and the point description such as:

CPDPS005
Primary Heating Water
Pump #1 Proof of Operation

Cable and wiring not specifically associated with an input or output shall be labeled with a number and a function description such as:

+120 VAC power
Panel DP2 Ckt. 1

25 10 09 CALIBRATION REQUIREMENTS

A. The contractor shall evaluate the existing equipment on the I-Touch manager to delete the equipment that is no longer existing after demolition

B. Calibration shall be checked at a minimum of one point on the span of the device for temperature, pressure, and humidity sensors.

C. Specified accuracy shall be achieved at the field termination points of the device and shall include both sensor errors and transmitter errors.

25 50 00 WIRING MATERIALS AND METHODS

25 50 02 WIRING

A. New wiring shown on the drawings. Install new wiring per diagram

B. All wiring required for work under this section of the specification shall be provided under this section of the specification unless otherwise specified.

C. Interlock wiring as shown on the electrical drawings is the responsibility of Division 26 utilizing equipment provided under this section of the specification. Generally this will mean that

Division 26 wires the series safety circuit in the starter as shown on the drawings using switches and devices furnished by this section. Equipment not normally mounted by Division 26 shall be mounted as well as furnished by this section. Starter automation as required by the sequences of operation shall be provided and wired by this section with connections made to terminals on the automatic side of the selector switch and on starter coil auxiliary contacts. It is the intention that Division 26 provide all wiring necessary to make the starter run with the selector switch in the hand position and this section provide all additional automation required. Relays, electro-pneumatic switches, etc., required by this section to operate in parallel with the starter coil shall be piloted by auxiliary contacts on the starter furnished under Division 26 and shall not be directly paralleled with the starter coil.

25 50 04 CONDUIT AND WIRE

A. All wiring will comply with applicable codes and regulations and will be as specified in the applicable portions of this section of the specification, the electrical section of the specification, and as indicated on the drawings.

1. Open wiring will be permitted: above lay-in ceilings, and unfinished spaces above 8' AFF. Cables shall be supported with "J-Hooks" a minimum of every six feet. Bridal rings can be used when supporting a maximum of 6 wires. Support devices are to be attached to permanent structure.

B. Conduit Material:

1. Electrometallic tubing shall be installed for all exposed work and for all concealed work in applications where conduit is required.

C. Conduit Installation:

1. Conduit bends shall be made with standard hickeys of proper size; radius of bends to be at least 6 times the diameter of the conduit. Runs between outlets shall not contain more than the equivalent of three-quarter bends. Conduit runs shall be continuous from outlet to outlet, outlet to cabinet, etc.
2. Conduits shall be installed with pitch toward outlet box wherever possible. All heavy wall conduits shall have two locknuts and a bushing at each termination outlet box, junction box, etc., except where terminated in a threaded hub. Fittings on electrometallic tubing shall be compression type.
3. A bushing shall be used where conduit enters a panel box. Bushing for No. 4 AWG or larger shall be insulated type with provisions for grounding as type "BL" made by O-Z Electric Company, or approved equal.
4. All exposed conduits shall be installed parallel or at right angles to the building walls or floors
5. Expansion fittings shall be provided at all conduits across the building expansion joints. Fittings shall be Type "AX" or "TX" as made by O-Z Electric Company, or approved equal. Provide copper bonding jumper at each expansion fitting.
6. Exposed conduit shall be securely fastened in place on maximum 5 ft. intervals for ¾" through 2-1/2" nominal sizes. Supports may be one hole malleable straps or other approved devices. No perforated metal straps will be permitted.
7. Pull boxes and junction boxes shall be installed where indicated on the drawings or where required to facilitate wire installation. Locate in conjunction with other trades so as to install without conflict with other materials or equipment.
8. Care shall be used to avoid proximity to heat ducts and/or steam lines. Where crossings are unavoidable, conduit shall clear covering of line by at least six inches.

9. All conduit for automation wiring shall be identified by painting junction box covers as follows: Voltages above 24 shall be blue and red, voltages at 24 or below shall be blue.

D. Provisions for Wiring: Wire and cable of the sizes and types shown on the plans and/or hereinafter specified shall be furnished and installed by the Contractor. All wire and cable shall be new soft drawn copper and shall conform to all the latest requirements of the National Electrical Code, IPCEA, and shall meet the specifications of the ASTM.

E. Power Conductors: All feeder and branch circuit wire shall be 600 V insulated of THHN type unless shown or specified to be otherwise. No wires less than No. 12 gauge shall be used except for control circuits or low voltage wiring. Wire sizes No. 14 to No. 10 shall be solid except where otherwise indicated. Wire sizes No. 8 and larger shall be stranded. All wire sizes shown are American Wire Gauge sizes. Where power conductors are run in cable tray, furnish and install conductors or multi-conductor cable rated for use in cable trays per NEC articles 318 and/or 725.

1. Acceptable Manufacturers: Cable and wire shall be a standard type as manufactured by General Electric Company, National Electric Company, U. S. Rubber Company, Simplex, General Cable Company, Carol, Anaconda, Rome, Southwire, Belden, Alpha, Houston Wire and Cable, or ITT Royal.

F. Motor Interlock Wiring: Interlock circuit wiring shall be No. 14 solid or stranded wire. Stranded wire only shall be used where wiring is used for flexible wiring harnesses. Stranded control wire shall be provided with crimp type spade terminators. Interlock circuit wiring shall be color-coded or numbered using an identical number on both ends of the conductor. Wire numbers shall be installed before conductors are pulled. Where motor interlock conductors are run in cable tray, furnish and install conductors or multi-conductor cable rated for use in cable trays per NEC articles 318 and/or 725.

G. Automation Input/Output Wiring: Wiring serving inputs and outputs from the automation system shall be cables consisting of single or multiple twisted pairs, an overall aluminum foil type shield with a 22 AWG stranded drain wire. Cables installed without conduit shall be plenum rated and comply with NEC article 725. Multi-conductor cable shall only be used where all the points are at a single location and for the same device (i.e., variable frequency drives, each individual motor starter). Single conductor cables shall be used for all temperature transmitters, pressure transmitters, flow meters, differential pressure switches, control valves and any other locations where the points are not grouped together at the same device. Where automation input/output wiring is run in cable tray furnish and install conductors or multi-conductor cable rated for use in cable trays per NEC articles 318 and/or 725. Conductors shall be minimum #18 wire gauge, strained copper. All wires shall be continuous from outlet to outlet and there shall be no unnecessary slack in the conductors.

H. Floor level network (FLN): Wiring serving communication trunks from the automation system shall be as required by the network protocol. Cables installed without conduit shall be plenum rated and comply with NEC article 725. Where wiring is run in cable tray furnish and install conductors or multi-conductor cable rated for use in cable trays per NEC articles 318 and/or 725.

I. Splices: All splices, taps, and terminations shall be made at outlet, junction, or pull boxes. Wire to No. 6 gauge shall be spliced using Scotchlok wire nuts. No Bakelite wirenuts shall be used. Wire No. 6 and larger shall be spliced using solderless connectors as manufactured by Penn Union Company. Splices No. 6 and larger shall be insulated by taping with plastic vinyl tape as manufactured by (3M) Minnesota Mining and Manufacturing Company. Splices shall not be permitted in automation input and output wiring without specific written authorization from the Engineer. If such a splice is approved, the location of the splice shall be clearly documented on the “As Built” drawings. Splices in automation wiring, if necessary, shall be made using Thomas & Betts STA-KON connectors installed per the manufacturer’s directions to maintain NEMA specified voltage drops and wire retention forces.

25 50 05 JUNCTION BOXES, FITTINGS AND WIREWAYS

A. Quality: All switch, pull, junction boxes, etc., shall be hot dipped galvanized or sherardized, concrete tight, with interlocking ring or multiple point locking devices. Connectors shall be three piece. Indentation fittings are not acceptable.

B. Attaching: Boxes shall be attached by fasteners designed for the purpose and shall provide adequate mechanical strength for future maintenance.

C. Size: Junction and pull boxes not dimensioned shall be minimum 4 inch square.

D. Furnish and install at all control panel locations a NEMA 1 lay in wire way system to bring cable into and out of the panel as detailed on the drawings and specified here-in. Furnish 3 wire-ways at each panel location; one for tubing, one for Class 1 wiring, and 1 for Class 2 and Class 3 wiring.

E. Wireway systems at locations where cables are to be run without conduit or in a cable tray shall consist of a connection to the control panel with a vertical extension to 8'-0" or the pipe rack or cable tray level, whichever is higher. The vertical section shall terminate in a 90° fitting with a closure plate. The closure plate shall be provided with a conduit nipple with locknuts and bushings as a wire entry point into the square duct. The conduit nipple shall be 1 size smaller than the wireway it is associated with.

F. Wireway systems at locations where cables are to be run in conduit shall consist of a horizontal section of wire way with a length equal to the control panel width and located above the control panel and connected to the control panel with 3 conduit nipples, locknuts, and bushings; one for tubing, one for Class 1 wiring and one for Class 2 and 3 wiring. Conduits for cable runs shall terminate on the wireway.

G. The intent of the wireway configurations outlined above is to provide a method for adding input and output wiring to the control panel without having to drill directly into the electronics enclosure after the system is on line and running. The installation of the wireway shall be made with this consideration in mind.

25 50 08 HANGERS AND ANCHORS

A. Where control system tubing is run on trapezes and/or hangers used by and or installed by other trades, supports for the trapezes shall be coordinated by all trades using the trapeze to assure that the anchor system is not overloaded and is sufficient for the load imposed including a margin of safety and seismic considerations. Under no circumstances shall a trapeze or hanger system installed by the electrical trades be used to support work by any other trade, nor shall the electrical trades use the trapezes installed by any of the other trades for the support of electrical equipment, all as required by the National Electric Code. Similarly, under no circumstances shall a trapeze or hanger system installed by the sprinkler trades be used to support work by any other trade, nor shall the sprinkler trades use the trapezes installed by any of the other trades for the support of sprinkler systems or equipment, all as required by NFPA 13, Standard For The Installation Of Sprinkler Systems.

B. Anchors to be loaded in tension for use in existing concrete structure and anchors loaded in tension and not cast in place shall be epoxy resin set anchors installed per the manufacturers recommendations for technique, size, loading, embedment, etc. Where anchors are loaded in shear at these locations, suitably sized and installed wedge type anchors may be used.

C. In all cases, anchor loading shall be based on hanger spacing, weight of the pipe to be supported when full and insulated, weight of any additional loads imposed upon the anchor, wind loading, seismic loading, quality of the material that the anchor is being installed in, etc. The contractor shall verify in the field that the anchors used and the materials that they are being installed in are suitable for the load imposed and shall bring any problems to the attention of the Owner's Representative in writing immediately and not proceed without direction from the Owner's representative.

D. Wedge type anchors shall be Hilti Kwik Bolt II. Adhesive anchors shall be Hilti HVA.

END OF SECTION

DIVISION 26 - ELECTRICAL

26 00 00 ELECTRICAL

26 00 01 GENERAL

A. The Plans, the general provisions of the Contract including the General, Supplementary and/or Special Conditions and specification sections of Division 1 shall apply to Work of Division 26 of the Specifications.

B. Provisions and conditions cited in this Section shall apply to Work for other sections of Division 26 of these Specifications.

C. The organization of the Specifications into Divisions, Sections and Subsections, and the arrangement of the Plans shall not in and of itself divide the Work among the Contractors and Subcontractors nor establish the Work to be performed by any trade. The “Scope of Work” and “Work Included” under each respective sectional heading, nevertheless, attempts to segregate the Work by known contracting activities. In the final analysis, the General Contractor shall be responsible for scoping the work for each trade based on local practice to include all the Work of a given type in the related proposal, regardless of where and how identified in the Bid Documents.

26 00 02 SCOPE OF WORK

A. This project is for renovations to Patient Care Tower Pharmacy at the University of Missouri Teaching Hospital.

B. The Electrical Work for this project shall include all material, labor and services necessary for and incidental to providing the following systems (respective Sections of the Specifications are noted in the right hand column):

1. Basic Electrical Requirements	26 00 00
2. Common Work Results for Electrical	26 05 00
3. Low Voltage Electrical Transmission	26 20 00
4. Lighting	26 50 00
5. Communications and Systems	27 00 00
6. Electronic Safety and Security	28 00 00

26 00 03 REFERENCES, RELATED SECTIONS of the SPECIFICATIONS

A. The Plans, the general provisions of the of the Contract, including the General, Supplementary and/or Special Conditions and specification sections of Division 1 shall apply to Work of Division 26 of the Specifications.

B. All provisions and conditions cited in this Section shall apply to Work for all other sections of Division 26 of these Specifications.

C. Requirements of the following Sections of the Specifications apply to Work for this Section:

1. Division 27 – Communications
2. Division 28 – Electronic Safety and Security

26 00 04 REFERENCES, REGULATORY REQUIREMENTS

A. All material and equipment shall be listed, labeled or certified by Underwriters Laboratories, Inc., where relevant standards have been established (see also Paragraph 26 00 60). Material and equipment, which are not covered by UL Standards, will be acceptable provided they meet safety requirements of a nationally recognized testing laboratory. Products which no nationally recognized testing laboratory accepts, lists, labels, certifies or determines to be safe will be considered if inspected or tested in accordance with national industrial standards such as NEMA or ANSI. Evidence of compliance shall include test reports and definitive submittals.

B. Definitions:

1. **"Listed":** A product is "listed" if of a kind mentioned in a list which: Is published by a nationally recognized laboratory which makes periodic inspections of such production. States that such product meets nationally recognized standards or has been tested and found safe for use in a specified manner.
2. **"Labeled":** The product is "labeled" if: It embodies a valid label or other identifying mark of a nationally recognized testing laboratory such as UL, Inc. Production is inspected periodically by a nationally recognized testing laboratory. The labeling indicates compliance with nationally recognized standards or tests to determine safe use in a specified manner.
3. **"Certified":** The product is "certified" if: The product has been tested and found by a nationally recognized testing laboratory to meet nationally recognized standards or to be safe for use in specific manner. Production is inspected periodically by a nationally recognized testing laboratory. The product bears a label, tag or other record of certification.

26 00 05 DEFINITIONS

A. The term **"Work"** used in this Division shall be the furnishing of material, labor and/or services necessary for and reasonably incidental to providing specific component(s), consideration(s) and/or system(s) of the design for the mechanical facilities for this Project as hereinafter defined by the Project Documents.

B. The term **"Project Documents"** used in this Division shall be the compilation of the Specifications, the Plans and any Attachment and Addendum which collectively define the design and the intent of the Work to construct the Project.

C. The terms **"Architect"** and **"Engineer"** as used in this Division of the Specifications shall be the professional individual and/or company developing the respective portion(s) of the Project Documents and administering the responsibility for the adherence to the intent of these documents. The "Architect/Engineer" is the agent of the "Owner" and shall represent and discharge authority on all matters unless the matter is referred to the Owner or the Owner elects to perform in their own behalf.

D. The term **"General Contractor, Construction Manager, or Prime Contractor"** as used in Division 26 shall mean the Contractor who has the prime contract with the Owner and who is responsible for general conditions of the project and is responsible for seeking experienced and qualified Trade Subcontractors to perform the Work.

E. The terms **"Contractor"** and **"Subcontractor"** where used in this Division shall mean any Company, regularly in business, to perform the type of work for which the Contract was sought, who has contracted with the Owner or General Contractor to perform the work included in and defined by this section and any other section or sections of this Division.

F. The term **"submittal"** as used in this Section of the Specifications shall be construed to be information in various forms compiled by the Contractor to transmit to the Architect/Engineer for review, comment and/or approval and return same to the Contractor with notice to react. The information shall support and/or substantiate that the given product complies with the intent of the Project Documents, should be incorporated in the Work and therefore, warrants approval to permit proceeding with that Work. The information may be any form or accepted practice of shop drawings, data, published catalogs, etc. that sufficiently provide the Architect/Engineer with basis of making a determination.

G. The term **"unfinished space"** as used in Division 26 - 28 of the Specifications shall be a mechanical or electrical equipment room. These are rooms that are generally unpainted and accessible only to building maintenance personnel.

H. The term **"finished space"** as used in Division 26 - 28 of the Specifications shall mean any space not defined as "unfinished space" (i.e. occupied rooms, corridors, stairways, closets, etc.).

I. The term **"exterior"** or **"outdoors"** as used in Division 26 - 28 of the Specifications shall mean exposed to atmospheric weather conditions.

J. The term **"interior"** or **"indoors"** as used in Division 26 - 28 of the Specifications shall mean not exposed to atmospheric weather conditions.

K. The term **"concealed"** as used in Division 26 - 28 of the Specifications shall mean anything that is not visible in a "finished space".

L. The term **"inaccessible"** as used in Division 26 - 28 of the Specifications shall mean located within walls or above non-lay-in ceiling (i.e., drywall, plaster).

M. The term **"packaged"** as used in Division 26 - 28 of the Specifications shall be construed to be a factory manufactured piece of equipment for which all components are totally assembled, pre-piped and prewired within its own structure and ready to operate when connected to proper external mechanical and electrical services.

26 00 06 CODES, STANDARDS, etc.

A. The material, workmanship and systems for Work of this Division shall comply with all applicable codes, standards, regulations and laws of the legal governmental jurisdiction at the project site.

B. Should the Contractor perform any work that does not comply with the requirements of the applicable codes, standards, regulations, statutes, laws, acts, or which does not receive the approval of the responsible inspection authority, Contractor shall bear all costs arising in correcting the deficiencies.

C. Applicable requirements of the current and accepted edition of the following codes shall apply to the Work for Divisions 26 - 28:

- International Building Code – 2018
- International Plumbing Code - 2018
- International Mechanical Code – 2018
- International Existing Building Code – 2018 (Level 1 & Level 2 Alterations only with pre-approval of AHJ)
- International Fire Code - 2018

- International Fuel Gas Code – 2018
- International Swimming Pool and Spa Code - 2018
- National Electric Code/NFPA 70 – 2017
- NFPA 150 Fire and Life Safety in Animal Housing Facilities Code - 2016
- NFPA 110 Standard for Emergency and Standby Power Systems – 2016
- NFPA 96 Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations – 2017
- NFPA 90A Installation of Air Conditioning and Ventilation Systems – 2018
- NFPA 72 National Fire Alarm Code – 2016
- NFPA 51B Standard for Fire Prevention During Welding, Cutting, and Other Hot Work – 2014
- NFPA 45 Standard on Fire Protection for Laboratories Using Chemicals – 2015
- NFPA 20 Standard for Installation of Stationary Fire Pumps and Fire Protection – 2016
- NFPA 14 Standard for the Installation of Standpipe, Private Hydrants and Hose Systems -2016
- NFPA 13 Installation of Fire Sprinkler Systems – 2016
- ASHRAE 90.1 – Energy Standard for Buildings - 2016
- ASME A17.1 – Safety Code for Elevators and Escalators (per State of Missouri)
- Americans with Disabilities Act – Standards for Accessible Design 2010

D. Applicable requirements of the current and accepted edition of the following industry standards, codes and specifications shall apply to the Work for Division 26-28:

ANSI	American National Standards Institute
ASTM	American Society of Testing and Materials
IEEE	Institute of Electrical & Electronic Engineers
IPCEA	Insulated Power Cable Engineers Association
NIST	Institute of Science and Technology
NEC	National Electric Code, including amendments by local authority having jurisdiction
NEMA	National Electrical Manufacturers Association
NIOSH	National Institute of Occupational Safety and Health
OSHA	Occupational Safety and Health Act
UL	Underwriters Laboratory, Inc.

E. Applicable requirements of all the relevant Federal laws including current and accepted edition of the Americans with Disabilities Act (ADA).

26 00 10 CONDITIONS, BID

26 00 11 REQUEST for PROPOSAL

A. The terms for Contractor's proposal shall be as described in the General Conditions, Supplementary and/or Special Conditions and Specification Sections of Division 1.

26 00 14 PERMITS and FEES

A. The respective Contractor or Subcontractor shall coordinate so as to be included as part of the MS&T permitting process, including, but not limited to:

1. The Contractor shall coordinate and provide reasonable scheduling and access to the Work for the Owner's Inspection.
2. Re-inspection of work as a result of either failed inspection or work not ready as scheduled may be at the Contractor's expense.

B. Any deficiency arising from the improper administering or complying with requirements for permits or inspections shall be corrected by the Contractor without additional compensation.

26 00 30 PROJECT DOCUMENTS

26 00 31 GENERAL

A. The Plans and the Specifications are intended to define complete and satisfactorily functioning systems. The Contractor shall be responsible for providing all necessary material, labor and services to provide the completed, operating systems at no additional compensation even though each and every element thereof is not specifically identified.

B. The Plans are diagrammatic and indicate general arrangements, approximate sizes and relative locations of principal equipment and materials to provide for the design and intent of the Electrical Work and shall be followed as closely as actual building and site conditions and work of other trades will permit. The Work shall conform to the requirements and intent of the Project Documents. Because of the scale of the drawings, the Plans do not represent every offset, fitting, accessory, etc. that may be required for the conduit or other appurtenances, nor is it implied that all conflicts between elements of the Work or building components have been resolved. The Contractor shall prepare details and/or coordination drawings where it may be required and submit to the Architect/Engineer for approval before proceeding with the Work.

C. To the extent contained in the Project Documents, elevations, sections, typical details, and schematic diagrams are included for instructions to the craftsperson. If any additional diagrams are desired and/or required for further instruction to the craftsperson, for permit applications, or for any other reason, the Contractor shall develop the drawings.

D. Significant discrepancies and/or changes required to accomplish the intent of the Project Documents, in the opinion of the Contractor, shall be identified and submitted to the Architect/Engineer for approval before proceeding with the Work in question. Changes originated by the Architect/Engineer shall be processed under the subsection heading "Changes in the Work".

E. The Plans and the Specifications are mutually complementary. Work required by one, but not the other, shall be performed as if required by both.

F. In the event of conflict between the Plans and the Specifications, the Contractor shall notify the Engineer for clarification. Prior to clarification, the Contractor shall assume that the stricter requirements apply.

26 00 33 SPECIFICATIONS

A. Referenced sections of other Divisions whether attached or in separate volumes or binders shall be a part of the Contract Documents.

26 00 34 ADDENDA

A. The Architect/Engineer may issue revisions, modifications, attachments or other documentation in the form of addenda to the Project (Bid) Documents during the bidding phase only to change, detail or clarify the scope of the Work.

B. The addenda shall become a part of the Contract Documents.

26 00 35 INTERPRETATIONS

A. The electrical Engineer shall be the sole source of interpretation of the electrical design and intent of the Project Documents.

26 00 37 AS-BUILT DRAWINGS

A. The Contractor shall maintain a separate set of plans at the jobsite, and mark thereon as an As-Built of Work as the construction proceeds. These As-Built, "redline" drawings shall include exact locations and relevant details (i.e. elevations, sizes, dimensions related to building lines, etc.) of all underground work, concealed feeders, pull/junction boxes, cable tray, all considerations requiring periodic attention and access thereto.

B. At the completion of the project, the Contractor shall provide the "redline", As-Built drawings and/or scanned color PDF of the As-Built, flattened to the Engineer.

C. At the completion of the project, the Architect/Engineer will provide PDF drawings (including all issued revisions to the Contract) for the Contractor's use to transfer all of the information from the As-Built drawings to a final, clean set.

D. At the completion of the project, the Architect/Engineer will provide Contractor CAD files for the Contractor's use to transfer the information on the drawings to CAD. The layering system on the drawings provided shall be strictly adhered to. The Contractor for their representation and accuracy of the final installation conditions shall certify these As-Built drawings. The As-Built CAD drawings shall be submitted to the Engineer digitally via thumb drive, shared cloud drive, etc. for review.

26 00 40 DUTIES OF CONTRACTOR

26 00 41 GENERAL (Pursuit of Work)

A. The Contractor shall thoroughly examine all Bid Documents before submitting a bid/proposal for the Work. If, in the opinion of the Contractor, there are any deficiencies in the Documents, that might impact the intent or the scope of the work, the Contractor shall bring the matter to the attention of the Architect/Engineer for clarification. If in the judgment of the Architect/Engineer clarification is warranted, an addendum to the Documents will be issued. If the Contractor fails to request clarification or otherwise submits a bid without qualifications, the Contractor thereby agrees to install a complete and functional system with no change in the contract price.

B. The Contractor shall be responsible for changes required for compliance with codes, standards, regulations, ordinances, etc. and implementing any such change at no change in contract price. In the event of conflict with the Project Documents or other requirements, the more stringent shall apply. The Contractor shall promptly notify the Architect/Engineer of any discrepancy.

C. The Contractor shall perform the Work to comply with all terms, conditions and intentions, whether explicit or implicit, of this Section and applicable requirements of other Sections of Division 26, the Plans and any other documentation so identified. Should the Contractor perform any Work that does not comply with the Project Documents or is not in accordance with common trade practices, the Contractor shall bear all costs, at no change in contract price, arising in correcting the Work.

D. The Contractor shall be responsible for all aspects of the Work for their respective contractual agreement. The Work of the respective suppliers and subcontractors shall be administered properly to assure that all elements thereof have been provided for complete and functioning system(s).

26 00 43 SUBMITTALS for APPROVAL

A. Prior to submitting shop drawings, Contractor shall verify equipment delivery for compliance with the overall project schedule. Any delays due to delivery or due to submittals being late, inadequate, or incorrect and therefore rejected by the Architect/Engineer shall be the responsibility of the Contractor making said submittal. The Contractor shall bear all cost for expediting charges or obtaining materials from another vendor to meet the overall project schedule.

B. The Engineer may take up to two (2) weeks to review a complete and properly processed submittal from the time it arrives at the Engineer's office until the time it is returned to the Architect. Resubmittals will be reviewed within two (2) weeks for a complete and properly processed resubmittal from the time they arrive at the Engineer's office until the time they are returned to the Architect.

C. The submittals shall include shop drawings, engineering data and support information to sufficiently substantiate compliance with the Project Documents. All submittals must include the following information in order to be considered for review. Submittals found to be lacking may be rejected without review.

1. Shop drawing shall be derived from manufacturers original documents. Reproductions shall be of sufficient quality to accommodate a review.

2. Stamped date of receipt by the Contractor(s).

3. Identification of the project name and/or Owner's project number.

4. Indication that the Contractor has reviewed the submittal and is satisfied that it complies with the Project Documents.

5. Identification of the Specification section or subsection that specifies the submitted item.

6. Identification of the submitted item by the same description that is used in the Project Documents.

D. Submittals shall be delivered to the Engineer digitally via email, thumb drive, shared cloud drive, or other agreed upon means for review. Submittals or submittal notices that are emailed shall be sent to CA@mcclureeng.com at a minimum.

E. The approval of the submittal shall not relieve the Contractor from complying with all of the terms and conditions of the Project Documents. The Contractor shall be responsible for all

physical and performance requirements of equipment provided, including any differences in the cost of installation for variations from these requirements.

F. Include the manufacturer's installation instructions and maintenance manual with the equipment submittal for approval for inclusion in the Operations and Maintenance Manuals as specified in Subsection 26 00 46.

G. In general, all items purchased by Contractor for installation where a make and model is specified shall require submittals. Items required for the Work such as screws, bolts, clips, etc. which are not specified are not required to be submitted unless specifically requested.

H. The following shall be submitted under this Division of the specifications:

1. Catalog Data
2. Operating and maintenance manuals.
3. As-built drawings.
4. Contractor developed details and coordination drawings (when applicable).

Division 26

1. Wiring Devices
2. Disconnect Switches

J. At the completion of the project provide a single PDF document containing only those shop drawings that were approved and incorporated into the project.

26 00 44 CHANGES IN WORK

A. The only condition under which a change in the contract price will be considered is if there is to be a change in the scope of intent of the project requirements. Such changes would be limited to revisions in the project initiated by the Owner. The Architect/Engineer will issue a proposal for the new scope of work for the Contractor to prepare a price. After approval, the Architect/Engineer will prepare change order or change orders to adjust the contract sum and/or the contract time as necessary to carry out the changes.

B. No claim for an addition to the Contract Sum will be valid unless authorized as aforesaid in writing by the Owner. Any work completed by the Contractor outside the original project scope without written approval from the Owner will be deemed as a waiver by the Contractor for additional compensation for said work.

C. **No requests for change orders will be reviewed or considered for approval that are not submitted with all of the following information. No cost associated with labor burden or manpower inefficiencies will be approved for a change order without documentation of the present labor burden, manpower requirements, and the critical path nature of the scope change.**

1. **A complete and detailed line item takeoff of materials and equipment.**
2. **A unit cost identified for each line item with material cost, labor hours, and labor rate identified separately for each line item.**
3. **All fringes and mark-ups identified separately.**

D. Where major subcontracts are involved, the respective subcontractor's calculation, including all of the above data, shall be included with the Contractor's request.

E. Where there are net differences, the above data shall be included for all items added and for all items deducted with the net calculation clearly identified. Mark-ups shall be applied only after net differences are calculated.

F. The overhead charged by the Contractor shall be considered to include, but not limited to, performance bond, insurance, job site office expense, normal hand tools, man-lifts, incidental job supervision, field supervision, safety training, general office overhead, and cost associated with the preparation of design documents, layout drawings, shop drawings, or as-built drawings.

G. In evaluating the value of the contractor's request, for comparison purposes, the Architect/Engineer may use cost and unit data from the current edition of the R. S. Means Company's Cost Data, or information from appropriate suppliers or vendors of the respective materials or equipment.

H. Any requests submitted without the above details will be returned without review for resubmittal in the proper form.

26 00 45 COMPLETION and ACCEPTANCE

A. If, at the Owner's direction, a portion of the building is to be occupied or a portion of the Electrical System is utilized for beneficial use by the Owner prior to completion and acceptance of the Project, the start of the warranty shall begin with the "beneficial use" of the related Work.

B. The Engineer shall inspect the portion of the system for approval prior to acceptance of the system or subsystem.

C. The Contractor shall prepare a certificate of acceptance for approval by the Owner for that portion of the Work and submit a copy to the Architect/Engineer for record purposes.

26 00 46 OPERATIONS AND MAINTENANCE MANUALS

A. As a part of the contractual agreement, the Contractor shall submit and receive approval for the following. This information shall be submitted as soon as practical and while the Contractor is on site.

1. Provide digital PDF documents containing information on installation operation and maintenance for each piece of equipment supplied. Operation and Maintenance Manuals shall be the manufacturers original PDF documents.
2. The Electrical Operations and Maintenance Manuals shall be submitted as separate files per specification section to the Engineer digitally via thumb drive, shared cloud drive, etc. for review.
3. The information shall list any maintenance requirements and schedule for required maintenance.
4. The information shall show all parts and part numbers of available replacement parts available for each piece of equipment.
5. A cross-index of material and equipment furnished containing:
   a. An alphabetical listing of material and equipment.

b. An alphabetical listing by manufacturer's name, address and contact person of the local sales representative.
c. An alphabetical listing of all subcontractors including name, address, contact person, and specific work performed.

26 00 48 CLOSE-OUT REQUIREMENTS

A. As a part of the contractual agreement, the Contractor shall submit and receive approval for the following before final payment will be released. This information shall be submitted prior to project completion:

1. Equipment tag list.
2. Installed Arc-Flash Labels
3. Equipment Name Plates
4. Operation and Maintenance Manuals
5. As-built drawings.
6. At the completion of the project, all contractors/subcontractors shall submit a letter stating all materials are asbestos free, and meet the specified ASTM E-84 flame/smoke rating of 25/50, and that all penetrations are smoke or fire stopped as required by the Code.

26 00 50 PAYMENTS

A. See General Conditions Article – Payment to the Contractor, and General Conditions – Contractor's Payment to the Subcontractor.

26 00 60 MATERIAL AND EQUIPMENT

A. All equipment and materials furnished and installed by Contractor shall be new. The equipment to be furnished and installed shall be standard cataloged products of manufacturers regularly engaged in the production of this type of equipment and shall be of the latest design. Equipment of the same general type shall be of the same make throughout the Project.

B. Manufacturers shall have been in business for two (2) consecutive years operating under the same name.

C. Products shall be in production at time of the bid date. A scheduled release of a new product during construction is not acceptable. Prototype, alpha or beta products shall not be used.

D. Products for which fewer than 100 units have been produced and which have been in service for less than one year shall be submitted in writing to the Engineer for approval prior to the bid date.

E. The Contractor shall be responsible for the physical fit and configuration of the equipment to suit the space available and the intent of the Work. Due consideration shall be included for external connections and service maintenance access to the equipment.

F. The Contractor shall verify in the course of preparing the submittal that the respective material and equipment comply with the following criteria of the Project Documents:

G. The performance ratings meet the specified requirements.

H. The mechanical and electrical physical characteristics meet the specified requirements.

I. The identification of the material or equipment to catalog data is correct and proper.

J. Confirm (or establish) the quantity required.

K. The application of the material or equipment is acceptable to the manufacturer and to the intent of the scope of Work.

L. Any inability of material and/or equipment to comply with the aforementioned criteria shall be promptly brought to the attention of Architect/Engineer.

26 00 61 EQUIPMENT MANUFACTURERS

A. The equipment manufacturer may be specified in any one of the following manners. Equivalent shall mean, equivalent in the opinion of the Engineer. Where equipment is scheduled on the drawings, the scheduled manufacturer is what the design is based upon:

1. Single manufacturer named, “No substitution allowed”:

2. Single manufacturer named followed by “or approved equivalent”:
The design has been based on this particular make and model for acceptable physical characteristics, performance and quality. Any other comparable and equivalent product may be substituted in accordance with procedures for submittals and approvals (Subsection 26 00 43) and conditions of Subsection 26 00 62, Equipment substitution.

3. Limited multiple manufacturers named:
The design has been based on the first named manufacturer for acceptable physical characteristics, performance and quality. Any one of the other limited named manufacturers is equally acceptable in quality and may be substituted in accordance with procedures for submittals and approvals (Subsection 26 0043) and conditions of Subsection 26 00 62, Equipment substitution.

4. Limited multiple manufacturers named followed by “or approved equivalent”:
The design is based on the first named manufacturer for acceptable physical characteristics, performance and quality. Any one of the other limited named manufacturers is equally acceptable in quality and along with other comparable and equivalent product may be substituted in accordance with procedures for submittals and approvals (Subsection 26 00 43) and conditions of Subsection 26 00 62, Equipment substitution.

5. List of “Acceptable Manufacturers”:
Where a specific product from a manufacturer is listed along with the words “Acceptable Manufacturers” and a list of manufacturers this equal product(s) of any of the limited list may be submitted without concern from Subsection 26 00 62.

B. The Contractor shall follow the option specified from above as applied to each respective material and equipment specification subsection. The Contractor shall indicate within the options allowed the respective supply source(s) for the listing requested in Subsection 26 00 43. The Contractor shall assume all responsibilities and liabilities of “or equivalent” substitutions (see Subsection 26 00 62).

C. The Contractor shall prepare and transmit submittals for approval, even for the option of Subsection 26 00 61.1.

26 00 62 EQUIPMENT SUBSTITUTION

A. General: As previously stated, the design has been based on a single manufacturer and model. Substitution, where permitted (as described above), may cause consequential effects that may impact on the Project. These effects may take various forms and may require changes in the design. These changes and any additional costs associated therewith are the responsibility of the Contractor proposing the substitution; no additional compensation shall be provided to the Contractor.

B. A possible change in design may result from the proposed substitution from one or more of, but not limited to, the following conditions:

1. Architectural: different physical configuration, size or fit, aesthetics effected.
2. Structural: different bearing or heavier loading.
3. Capacity: different performance, lesser output is unacceptable.
4. Mechanical: change in flow rates (air, water, etc.), different configuration and size of external piping or ductwork connections.
5. Electrical: different horsepower requirements, effect on distribution.
6. Controls: interconnections with control devices and equipment, additional requirements.
7. Impact on environmental or energy efficiency issues.
8. Departure from intent of original design or Project Documents.

C. Changes in loading, sizing and/or performance of the proposed substitution shall consider the total requirements served or needed by the particular equipment. A revised design to accommodate the substitution shall be extended to the point where the change has no effect on the parameters used in the original design.

D. An equipment substitution requiring a change in the design shall be processed as follows:

1. The Contractor shall prepare and submit to the Architect/Engineer for review, a proposal to provide a substitution that shall require a change in the design. Substantiate that the substitution complies with the intent of the Project Documents and include sufficient information of the changes required so that a judgment may be rendered.
2. Proposal shall include an original drawing originated by the Contractor, and shall not be a catalog cut, assembly manual, or other generic documented printed by the manufacturer or their representative. The design shall show the intended installation to the same level of detail as that of the original design.
3. Prior to submitting the proposal, the Contractor shall notify all other contractors whose work may be affected and request details and pricing for their respective changes. This information along with the Contractor's details shall be transmitted to the Architect/Engineer for approval.
4. The Contractor in preparing the proposal recognizes that they shall compensate other trades that are affected by said proposal.
5. If the proposal and the substitution are acceptable, the Architect/Engineer will approve the submittal and initiate a change order, at no additional compensation, and a notice to proceed.

E. Equipment that was listed as a multiple manufacturer with a model number shall be submitted as a shop drawing. Contractor shall be responsible for all other provisions of Section 26 00 52.

If, and only if, the material or equipment substitution requires no design change, the Work shall proceed in accordance with the Product Documents.

F. Equipment that is being proposed as 'or equivalent' or was listed as a multiple manufacturer without a model number shall be in the form of a written proposal before the shop drawing phase. 'Or equivalent' shall mean or equivalent in the opinion of the Architect/Engineer and they shall have sole discretion to determine whether or not a proposed substitute manufacturer and/or model is to be considered as acceptably equivalent and may be submitted in the form of shop drawings. If, and only if, the material or equipment substitution requires no design change, the Work shall proceed in accordance with the Project Documents.

G. If changes are in fact required or a delay in work occurs because of the material or equipment substitution which were not properly processed, the Contractor initiating the substitution shall be liable for all consequential effects and expenses to accommodate the change or delay.

26 00 64 ACCESS DOORS

A. Openings in building components for access to concealed mechanical work shall be furnished by the Contractor and installed with the building construction work. Access doors shall be located as indicated on the Plans or as strategically required for inspection, maintenance, and service. The model and style shall fit the building construction, fire rating requirements and provide adequate size and function.

B. Access doors shall be sized as shown on the drawings or shall be a minimum size of 18” x 18” and otherwise shall be large enough for purpose intended and shall be fabricated of heavy gauge steel frames and door panels with double action concealed spring hinges, 1/4 turn flush screwdriver operated cam locks and prime coat paint finish. Access doors for various applications shall be as follows:

Building Construction:	Milcor Access Door:
Flush door in dry wall construction (walls and ceilings)	Style DW
Flush door in masonry or tile walls with exposed frame flange	Style M (steel), Style MS (stainless)
Flush door in plaster construction (walls and ceilings)	Style K
Recessed door in acoustical plaster ceiling	Style AP
Recessed door in suspended drywall ceiling	Style CT (aluminum - wet locations)
Flush door in suspended drywall ceiling	Style CF (aluminum – wet locations)
Door in suspended drywall ceiling	Style ATR (fire resistive door)
Fire rated separation (walls and ceilings)	Fire Rated Door

C. Access doors are not required for Work above lay-in panel ceilings.

D. Submittals shall indicate schedule of locations, sizes, types, adjacent building construction, finish, fire rating including thickness and type of insulation, conformance to UL requirements and associated labeling, metal and gauge of fabrication. Access door shall be as manufactured by Karp Associates, Milcor, or Higgins Mfg. Company.

26 00 70 BASIC ELECTRICAL METHODS - GENERAL

26 00 71 COORDINATION OF WORK

A. The Contractor shall compare the electrical drawings and specifications with the site conditions, drawings and specifications of other trades and shall report any discrepancies between them to the Architect and obtain from him written permission for changes necessary in the electrical work. The Contractor at no addition to the contract price shall perform any such changes required. The electrical work shall be installed in cooperation with other trades installing

interrelated work. Before installation, the Contractor shall make proper provisions to avoid interference in a manner approved by the Architect. All changes required in the work of the Contractor caused by his neglect to properly coordinate the work shall be made by him at his own expense.

B. In new construction, anchor bolts, sleeves, inserts and supports required for the electrical work shall be furnished under the same Section of the Specifications as the respective items to be supported; and they shall be installed, except as otherwise specified, by the trade furnishing them in cooperation with the trade furnishing and installing the material in which they are to be located. It shall be the responsibility of the Contractor who locates the anchor bolts, sleeves, inserts and supports to also ensure that they are properly and safely installed.

C. Slots, chases, openings, and recesses through floors, walls, ceilings, partitions, and roofs shall be provided as the building is erected. It shall be the responsibility of the Contractor or trade requiring and providing the opening to verify the size and location of openings required and to furnish necessary sleeves, boxes, etc., for the equipment to be supplied. Patching of oversize openings and finished thereof shall be the responsibility of the trade or Contractor requiring the opening. All patching and finishing shall be done to match the adjacent materials as described in other respective divisions and sections of the specifications. No openings shall be cut in structural members without prior written approval of the Architect.

D. Locations of conduits, electrical raceways, switches, panels, equipment, fixtures, etc., shall be adjusted to accommodate the work to interferences anticipated and encountered. The Contractor shall determine the exact route and location of each conduit, duct and electrical raceway prior to fabrication. If the Contractor fails to do so, any relocation and reinstallation required will be directed by the Architect and must be implemented by the Contractor at no cost to the Owner.

E. Right-of-way: Lines which pitch shall have the right of way over those which do not pitch. Lines whose elevations cannot be changed shall have the right of way over lines whose elevations can be changed. Offsets, transitions and changes in direction in pipes and buss ducts shall be made as required to maintain proper head room and pitch of sloping lines whether or not indicated on the drawings. The Contractor shall furnish and install all elbows, pullboxes, turns, fittings, supports, etc., as required to effect these offsets, transitions and changes in direction.

26 00 72 STORAGE AND INSTALLATION OF EQUIPMENT AND ACCESSORIES

A. Equipment and materials shall be delivered to the site, stored in location(s) approved by the Architect, and suitably sheltered from the weather, but readily accessible for inspection by the Owner. All items subject to moisture damage shall be stored in dry, heated spaces. All equipment shall be covered and protected against dirt, water and chemical or mechanical injury in a manner approved by the manufacturer and against theft, during storage, installation, and construction. Damage or defects developing before acceptance of the work shall be made good at the Contractor's expense.

B. Manufacturer's directions shall be followed completely in the delivery, storage, protection and installation of all equipment and materials. The Contractor shall promptly notify the Architect in writing of any conflict between any requirement of the contract documents and the manufacturer's directions. They shall obtain the Architect's written instruction before proceeding with the work. In case of a difference between the installation instructions of the manufacturer and the instructions in the contract documents, the most stringent shall govern. Any costs related to changes required due to manufacturer's instructions differing from the contract documents shall be borne by the Contractor at no cost to the Owner.

C. Should the Contractor perform any work that does not comply with the manufacturer's directions, any written instructions from the Architect, or which shall cause a significant deviation from the drawings which has not been by the Architect they shall bear all costs arising in correcting the deficiencies in a manner directed by the Architect.

D. Where switchgear, motor controls, transformers, or other electrical equipment is located in a space with a concrete or other type of paved flooring, it shall be set on a raised concrete pad. Unless otherwise noted on drawings or elsewhere in these specifications, concrete pads and bases shall be furnished and installed by the Contractor furnishing the equipment. This Contractor shall establish sizes and location of the various concrete bases required and shall provide all necessary anchor bolts together with templates for holding these bolts in position. Anchor bolts shall be placed in steel pipe sleeves to allow for adjustment, with a suitable plate at bottom end of sleeve to hold the bolt. Each concrete base shall be not less than 9” high, unless noted otherwise, which shall project 1-1/2” beyond the equipment on all sides.

E. Where equipment is located in a space where it does not rest on a concrete or similar paved floor, it shall be supported from or on the available structure on a structural frame made of suitable channels, wide flange members or angles. The structural frames shall allow no deflection with the loads imposed and the respective supporting points, shall distribute the load equally to two or more major building structural elements, and shall be designed to carry all loads into the major building structural members, creating no measurable deflection on these members nor importing any vibration into the building structure.

F. All machinery which contains rotating or reciprocating parts or which is connected to other machinery with such parts shall be provided with vibration isolation mounts which shall be selected at a maximum transmissibility of 0.03 (isolation efficiency of 97%) at the lowest anticipated operating speed of the device.

G. The Contractor shall support plumb, rigid and true-to-line all work and equipment furnished under each section. The Contractor shall study thoroughly all general, structural, mechanical and electrical drawings, shop drawings and catalog data to determine how equipment, fixtures, etc., are to be supported, mounted or suspended and shall provide steel bolts, inserts, pipe stands, brackets, and accessories for proper support whether or not shown on drawings. When directed by the Architect, the Contractor shall submit drawings showing supports for approval.

H. All conduit connecting to switchgear, panels, motors, and other equipment shall be installed without strain at the connections. The Contractor may be required, as directed, to disconnect conduits piping to demonstrate that they have been so connected.

I. The Contractor shall install all electrical work to permit removal (without damage to other parts) of switches, contactors, motors, drawout circuit breakers, belt guards, sheaves and drives and all other parts requiring periodic replacement and maintenance. The Contractor shall provide conduits, pullboxes, junction boxes, bus ducts, switchgear, raceways and equipment to permit ready access to components and to clear the openings of swinging and overhead doors and of access panels.

J. The Contractor shall change the routing of conduits and buss ducts when required to meet job conditions. The Contractor shall secure approval of Owner prior to fabrication of equipment requiring such changes.

26 00 80 BASIC ELECTRICAL METHODS – RELATED WORK

26 00 81 DEMOLITION

A. Work Included:

1. The Owner shall keep possession of the designated equipment, including switchgear, transformers, motors, generators, panelboards, light fixtures, etc., as shown on the Plans, or as indicated during construction, or as hereinafter specified. The Contractor shall deliver, off-load and store this property as directed by the Owner. Machinery components not to be retained by the owner, including the above type of equipment and conduit, wire, hangers, brackets, insulation, wiring devices, etc., must be disconnected and removed from the premises, to be disposed of by the Contractor.
2. Contractor shall disconnect and remove all existing machinery, equipment, and apparatus to the extent shown on the drawings or otherwise described herein.
3. The Contractor shall legally dispose of the designated equipment, and/or apparatus. Any cost of removal or salvage value shall be credited to the Contractor's account and shall be considered accordingly in the Contractor's bid.

B. Work Not Included:

1. The removal and disposal of asbestos based insulation or other hazardous materials applied to, or contained in, the mechanical equipment, and material designated to be demolished shall not be included in the scope of the work regardless if known ahead of time or discovered in the course of performing the Work. In the latter case, the Contractor shall notify the Architect/Engineer and shall not pursue that portion of the Work until others have removed the asbestos-based material. The removal and disposal of asbestos-based material shall be arranged by and to the account of the Owner, and conducted separately from the demolition work.

C. Miscellaneous:

1. Where items are specifically identified to be abandoned, all loose ends of the system shall be trimmed clear and appropriately capped or sealed in a safe and secure manner as approved by the Architect/Engineer.

26 00 82 CUTTING AND PATCHING

A. The basic premise of this Sub-section is that the cutting and patching (where required) are performed in existing building components. In “new” construction, the premise is that the building component is already in place.

B. The Contractor requiring the penetration of or the access way in the building structure to fulfill the intent of the Project Documents for his Work shall be responsible for the cutting and the subsequent patching in accordance with the following criteria:

1. No structural component of the building shall be cut or violated without express approval of the Architect/Engineer.
2. The Contractor shall verify the presence of any concealed utility or service within the structure (walls, roof, floor, etc.) in question, and shall be responsible for maintaining continuity and/or replacing it.

C. Cutting of work-in-place in “new” construction because of error, neglect or damage inflicted shall be the responsibility of the Contractor precipitating the issue.

D. “Patching” shall be construed as the repairing or replacing of the building structure to return it to an original or new condition, in the opinion of the Owner and/or Architect/Engineer, as existed prior to the cutting.

E. Patching and finishing work shall be the responsibility of the Contractor requiring the cutting. The patching shall match all the substantive and visual aspects of the structure and adjacent surfaces. Restoration and finishes shall be as specified and executed in the respective

sections, schedules and/or details of the Project Documents for the general construction work. Completed work and any special requirements shall be subject to approval by and satisfaction of the Architect/Engineer.

26 00 83 LUBRICATION

A. This Contractor shall provide all oil for the operation of all equipment furnished by him until acceptance. Run in all bearings, and after they are run in, drain all oil from the bearings, flush out all bearings, and refill with new oil. The Electrical Contractor and Subcontractors shall be held responsible for all damage to bearings while the equipment is being operated by them up to the date of acceptance of the equipment. Protect all bearings during installation and thoroughly grease steel shafts and other unpainted steel surfaces to prevent corrosion. All motors and other equipment shall be provided with covers as required for proper protection during construction.

26 00 90 TESTING AND ADJUSTING

26 00 91 INSTRUCTIONS OF OWNER'S REPRESENTATIVE

A. Instruct the designated representative of the Owner in the proper operation and maintenance of all elements of the electrical systems. A competent representative of the Contractor shall provide such formal instruction and shall spend such additional time as directed by Architect/Engineer to fully prepare Owner to operate and maintain the electrical systems.

26 00 92 TESTING AND ADJUSTING

A. Contractor shall, at the conclusion of the project, performance test and adjust all of the electrical systems to provide performance of all systems and subsystems installed and in all areas of the building. All power systems, communication systems, control systems and other related devices and subsystems shall be operated by the Contractor for a period of no less than seventy-two (72) hours and shall be systematically tested for proper sequencing, control, connection, phasing, rotation and calibration of control devices.

B. Testing shall be systematic and thorough, and the results of these tests shall be submitted to the Architect/Engineer prior to final acceptance of the work. The format of this testing and adjusting effort, including all measurement techniques and methods, shall be submitted sixty (60) days prior to the completion of the work. After agreement with the Architect/Engineer on the format of the testing and adjusting work, the Contractor shall perform the work and resolve any and all deficiencies as they appear during the testing. It shall be the responsibility of the Contractor to provide any and all devices required for the successful testing and adjusting of the system.

26 05 00 COMMON WORK RESULTS FOR ELECTRICAL

A. Extent: The work in this division consists of furnishing material and labor required to completely execute the electrical work for this project as per drawings and as specified herein.

B. Interface with Other Trades: This contractor shall connect some items furnished in place by others such as prewired mechanical control assemblies. This will require coordination and cooperation with the other contractors. The extent of the required electrical work is shown on the drawings.

26 05 19 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

A. Material

1. Provisions for Wiring: Wire and cable of the sizes and types shown on the plans and/or hereinafter specified shall be furnished and installed by the Contractor. All wire and cable shall be new soft drawn copper and shall conform to all the latest requirements of the National Electrical Code IPCEA, and meet the specifications of the ASTM.

2. For conductors No. 10 AWG, provide stranded type THWN-2 or THHN. For conductors No. 12 AWG, provide solid type THWN-2 or THHN.

3. Power Conductors: All feeder and branch circuit wire shall be 600V 90°C insulated of the THHN & THWN-2 type unless shown or specified to be otherwise **No wire less than No. 12 AWG shall be used except for control circuits or low voltage wiring.** All wire sizes shown are American Wire Gauge sizes.

   a. 20A Branch Circuit Homeruns shall be sized as follows:
      120V: 0 – 100 feet shall be #12AWG wire minimum
      101 – 200 feet shall be #10AWG wire minimum
      In excess of 200 feet shall be #8AWG wire minimum
      277V: 0 – 250 feet shall be #12AWG wire minimum
      In excess of 250 feet shall be #10AWG wire minimum

4. Control Conductors: Control circuit wiring shall be No. 12 AWG or smaller stranded wire. Stranded control wire shall be provided with crimp type spade terminators. Control circuit wiring shall be color-coded or numbered using an identical number on both ends of the conductor.

B. Installation

1. All 120V and 277V single phase circuits require a dedicated neutral conductor. The neutral conductor shall be numbered and identified with associated phase conductor at the panelboard as well as all junction boxes.

2. Where circuit runs are combined, upsize conduit and conductors to accommodate for conduit fill and conductor derating respectively.

3. Metal Clad (MC) Cable

   a. Type MC cable is only permitted for lighting fixture whips, which shall be limited to 5 feet or less, and must be concealed above ceiling.

4. BX/AC Cable

    a. Type BX/AC cable is not permitted.

26 05 26 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

A. Material

1. Contractor shall extend the existing equipment grounding system in accordance with the National Electrical Code and shall use only UL listed grounding clamps and connectors.

B. Installation

1. The equipment grounding system shall consist of a continuous conduit installation and a green insulated equipment grounding conductor. This grounding conductor shall be installed in every conduit or raceway with the feeder or branch circuit conductors. **This grounding conductor shall be extended from the housing of every electrical load, through panelboard equipment grounding busses, to the equipment grounding bus in the main panel. The grounding bus shall be bonded to the grounded neutral bar inside the main panel using a Main Bonding Jumper.**

26 05 33 RACEWAY FOR ELECTRICAL SYSTEMS

A. General Requirements

1. Minimum conduit size shall be **¾"** trade size for branch circuits.

2. A bushing shall be used where conduit enters a panel box or equipment enclosure.

3. Grounding Bushings shall be used to bond conduits entering a panel box or equipment that are not mechanically connected.

4. Expansion fittings shall be provided at all conduits across building expansion joints. Fittings shall be Type “AX” or “TX” as made by O-Z Electric Company, or approved equivalent. Provide copper bonding jumper at each expansion fitting.

5. Conduit bends shall be made with standard benders of proper size; radius of bends to be at least 6 times the diameter of the conduit. Runs between outlets shall not contain more than the equivalent of three 90-degree bends. Conduit runs shall be continuous from outlet to outlet, outlet to cabinet, etc.

6. All exposed conduits shall be installed parallel or perpendicular to the building walls or floors.

7. Conduits shall be securely fastened to or supported from the building structure. Conduits not fastened directly to building structure shall be supported by a rigid assembly, free of sway and adequately braced, connected directly to the building structure. The use of ‘pencil’ wire, ceiling wire, and cable hangers shall not be permitted.

8. Anchor or stake down all direct burial conduits to prevent shifting during grading and concrete pours. Spacers shall be provided for trenches with 2 or more conduits with any conduit 2” or larger.

9. Install #12AWG pull wires for tracing for all underground non-metallic empty conduits with a minimum of 12 inches of slack on each end. Pull strings shall be used for empty above grade or metallic conduits.

10. All raceways installed within 1½" of the roof deck shall be GRS or IMC. Boxes shall be offset below the 1½".

10. Conduits installed horizontally in finished spaces without ceilings shall be installed above the roof deck. These spaces include gymnasium, multi-purpose rooms and natatoriums. Conduit type for this application to be GRS or IMC in accordance with Article 300.4 of the National Electrical Code. Vertical drops from the roof deck shall be EMT and be routed along and attached to the structural steel.

11. All exposed raceways installed in a finished space will be painted to match the background, unless noted otherwise. Finished spaces include all areas open to the general public. Spaces such as storage, mechanical, IT, and electrical rooms and other similar areas only accessible to qualified personnel are considered unfinished.

12. All penetrations through not rated walls shall be sealed for draft stopping with caulk, putty, etc. designed for this use.

13. Fire / Smoke seals:

    a. All penetrations through fire rated walls and floors shall be fire sealed in accordance with ASTM E814/UL1479 or manufacturer's recommendations.

    b. Materials and installation details shall be submitted for approval.

B. Electrical Metallic (EMT) Conduit

1. EMT conduit shall be installed for all work concealed in partitions or in concrete block walls and for all conduits run in ceiling plenums and exposed runs, except where noted otherwise.

2. EMT couplings and connectors shall be steel or diecast, set screw or compression type.

C. Jacketed Flexible Steel Conduit

1. Jacketed flexible steel conduit ('Sealtite') shall be used in wet areas where flexible conduit connections are required and on <u>all</u> motorized equipment and motors in all locations.

D. Flexible Steel Conduit

1. Flexible steel conduit ('Greenfield') shall be used where vibration isolation is required, including all transformers and uninterruptible power systems.

C. Surface Mounted Raceway

1. Surface mounted raceway shall be as manufactured by Wiremold, Panduit Hubbell, or equivalent. Part numbers listed in these specifications or the drawings refer to Wiremold products unless noted otherwise.

2. Furnish raceways with all elbows, fittings, boxes, clips, supports and accessories for a complete installation.

3. Furnish and install dividers in all raceways for which dividers are an option.

4. V500/V700 Series raceways shall be used on existing walls in finished spaces where conduit and wiring cannot be concealed, unless noted otherwise.

5. Where indicated on the drawings Contractor shall furnish and install Wiremold ALA4800 Aluminum raceway in the size, length, and configuration indicated.

   a. The raceway shall be furnished with covers in 12” lengths.

   b. Submit custom, project specific shop drawings for review prior to rough-in.]

26 05 34 BOXES FOR ELECTRICAL SYSTEMS

A. Outlet Boxes, Junction Boxes, Fittings

1. Mounting: Outlets must be centered with regard to paneling, furring, trim, etc. Outlets shall be set plumb or horizontal and shall extend to finished surface of wall, ceiling, or floor without projecting beyond or behind finished surface. Outlet boxes shall not be installed “back-to-back”.

2. Attaching: Boxes shall be attached by fastener designed for the purpose and shall provide adequate mechanical strength for future maintenance.

   a. Boxes installed in metal stud partitions shall be secured to the metal studs using appropriate clips, fasteners, hangers, or supports as required, and shall provide adequate far side box support to fulfill the intent of all applicable codes.

3. Pull boxes and junction boxes shall be installed where indicated on the drawings or where required to facilitate wire installation.

   a. Size: Outlet, junction, and pull boxes not dimensioned shall be 4 inch square by 2-1/8” deep minimum and comply with sizing as required by Article 314 of the National Electrical Code.

4. In fire rated drywall walls, 24” spacing must be maintained between boxes on opposite sides of walls. Moldable fire protective putty pads, firestopping coverplate gaskets, internal fire rated pads or other acceptable fire sealing means shall be installed on outlet boxes where the 24” spacing cannot be maintained.

5. Steel faceplates must be used on fire rated drywall walls and painted to match device color. Faceplates shall be Mulberry Metal Products or equivalent.

26 05 48 SEISMIC RESTRAINT

A. All materials and workmanship shall specifically comply with the above listed Building Code with respect to seismic requirements for the support and anchorage of all electrical, communications and electronic safety and security systems and equipment as installed on this project. Lateral forces to be restrained shall be as required by IBC Section 1621 Architectural, Mechanical, and Electrical Component Seismic Design Requirements and ASCE 7-02 Section 9.6 Architectural, Mechanical, and Electrical Components and Systems with the following design parameters with the design parameters as shown on the drawings:

C. All conduit support and restraint details and practices shall conform to the publication "Seismic Restraint Systems Guidelines" by Cooper B-line-TOLCO.

E. Seismic restraint submittals shall be provided for engineer review and include, but not be limited to, detailed drawings showing seismic restraint types, anchor type and attachment details, calculations and spacing requirements of unique equipment and conduit for this specific project. Submittals shall include floor plan drawings indicating equipment, ductwork and piping to be restrained, restraint locations and restraint component types. All submittals and floor plan drawings shall bear the seal of a licensed structural engineer of the State of Missouri.

28 00 00 ELECTRONIC SAFETY AND SECURITY

28 00 01 GENERAL

A. The Plans, the general provisions of the Contract including the General, Supplementary and/or Special Conditions and specification sections of Division 1 shall apply to Work of Division 28 of the Specifications.

B. Provisions and conditions cited in this Section shall apply to Work for other sections of Division 28 of these Specifications.

28 00 02 REFERENCES, REGULATORY REQUIREMENTS

A. Work for this Section of the Specifications shall be performed in accordance with the Codes, Standards, etc., as identified in Division 28.

28 00 03 REFERENCES, RELATED SECTIONS of the SPECIFICATIONS

A. Requirements of the following Sections of the Specifications apply to Work for this Section:

Division 26 – Electrical
Division 27 – Communications

28 00 04 DEFINITIONS

A. Refer to Section 26 00 05 – Definitions.

28 00 05 WORK INCLUDED

A. Furnish material, labor and services necessary for, and incidental to, installing the following systems where shown on the Plans and as hereinafter specified. Include all necessary work in the related sections of the Specifications to provide for complete systems.

28 00 06 SUBMITTALS:

A. The Contractor shall submit the following for approval in accordance with Subsection 20 00 43, Duties of the Contractor - Submittals.

B. Provide manufacturer's technical product data of each material and accessory item with engineering support information, installation manual, operation and maintenance manual. Data shall be specific to product specified and clearly identified on all data sheets, which contains multiple models or sizes.

28 05 00 COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

27 05 28 PATHWAYS FOR ELECTRONIC SAFETY AND SECURITY SYSTEMS

A. All cabling shall be as shown on plans, and per specifications.

B. Cabling may be run as open-type plenum rated cable concealed above lay-in ceiling spaces. Non plenum rated cabling shall be installed in conduit. Cabling shall be

installed in conduit in all exterior locations and in all exposed or inaccessible locations including all open to structure, cloud ceilings, inside wall partitions or above drywall, wood, and other inaccessible ceilings.

C. Cables shall be continuous from outlet to termination equipment.

D. Cables shall be terminated using tools recommended by the termination manufacturer.

E. Provide 2” minimum sleeves in all walls which cable runs pass through.

F. Furnish and install a minimum of (1) one cable pathway device through fire rated partitions and floors, and where indicated on the drawings. Device shall be Specified Technologies, Inc. EZDP33FWS, 3M QuickPass, or equivalent.

G. Refer to 26 05 29 for fire sealing of penetrations through fire rated walls.

H. Provide access panels as necessary for cable routing.

28 05 28.29 HANGERS AND SUPPORTS FOR ELECTRONIC SAFETY AND SECURITY SYSTEMS

A. Cables shall be supported with “J-Hooks” a minimum of every six feet. Bridal rings can be used when supporting (other than Cat 6) a maximum of six wires. Support devices are to be attached to existing permanent structure.

B. Cables shall be installed in cable tray where available.

C. Cables and supports shall be installed at a readily accessible location above ceilings.

28 05 28.33 CONDUITS AND BACKBOXES FOR COMMUNICATIONS SYSTEMS

A. Furnish and install conduit rough-ins at all outlets locations where shown on drawings. Rough-in shall consist of a two-gang outlet box, single gang trim ring, and a minimum 1” conduit stubbed above an accessible ceiling. Plastic bushings shall be installed on both ends of conduit. Install blank covers on all unused rough-ins.

C. All conduits serving telephone/data communication outlets shall be 1” minimum. Conduits for all other system cable runs shall be sized for 40% maximum fill, or as shown on the drawings. Redundant paths shall be installed where fill exceeds 40%.

D. Provide pull strings in all conduits.

E. Conduit bends shall accommodate radius requirements of fiber cable as necessary.

28 30 00 ELECTRONIC DETECTION AND ALARM

28 31 00 FIRE DETECTION AND ALARM

A. Description of Work

1. Install a complete and operational addressable fire alarm system as indicated by drawings, schedules, and riser diagrams.

2. The equipment supplier must be the local factory authorized representative and must also be factory authorized, trained and certified to perform warranty service for the equipment being supplied.

3. Firm shall be regularly engaged in manufacturer of fire alarm systems of types, sizes, and electrical characteristics required, and whose products have been in satisfactory use in similar service for not less than 5 years.

4. Firm with at least 5 years of successful experience on projects with fire alarm systems work similar to that required for this project providing local factory authorized service and spare parts inventory.

5. The Contractor and (equipment supplier) shall perform conductor testing in accordance with NFPA 72, table 7-2.2, Items 11a-d, prior to installation of devices. Test results shall be submitted to the Engineer.

6. Provide shop drawings showing manufacturer's technical product data, including specifications and installation instruction, for each type of fire alarm system equipment. Project specific point-to-point drawings, wiring diagrams, fire alarm matrix, device addresses and voltage drop and battery calculations shall be provided.

7. Sealed fire alarm drawings required for permit application are the responsibility of the Contractor and fire alarm system supplier.

8. The Contractor shall provide as-built drawings with final project specific point-to-point wiring diagrams, device addresses and battery calculations. The contractor shall provide all as-builts showing manufacturer's technical product data, including specifications and installation instruction, for each type of fire alarm system equipment. Refer to specification section 26 00 38 for all other as-built requirements.

B. Acceptable Manufacturers

1. Subject to compliance with requirements, provide fire alarm components from one of the following system:

Notifier

C. Initiating Devices

1. Photoelectric Detectors: Intelligent photoelectric smoke detectors shall use the photoelectric (light-scattering) principal to measure smoke density. Sensitivity shall be continuously monitored and reported to the panel. Detector shall be capable of performing a calibrated sensitivity and performance test without generating smoke. Detector shall meet UL 268 7th Edition. Provide a detector at control panel and each annunciator and remote power supply. Provide standard bases model. Provide a detector at control panel and each annunciator and remote power supply.

2. Duct Detector: Ionization duct smoke detector with sampling tube and protective housing. Provide remote test switches where noted.

3. Thermal Detector: Fixed temperature low profile type device with maximum protrusion of 2.1 inches and twist lock installation. Temperature rating to be 135 degrees or 190 degrees (H version). Detector shall meet UL 268 7th Edition. In elevator equipment rooms and shafts, heat detectors shall be located within two feet of each sprinkler head.

4. Relay Modules: Addressable relay modules with LED indicator light.

5. Control Modules: Addressable control modules with LED indicator light.

6. Monitor Modules: Addressable monitor modules with LED indicator light.

7. All initiating devices shall be identified with a black-on-clear (1/4" text minimum) printed adhesive label affixed to the device. This label shall include the device address.

D. System Wiring

1. All wiring will be as required by the Equipment Supplier. Wire color-coding and the color shall remain the same throughout the system. In general, all initiating devices such as manual stations, thermal detectors, ionization detectors and all modules will be installed across a common #18AWG twisted shielded pair. The signal circuits, door release circuits, fan shut down, etc., shall require #14AWG.

2. No conduit or raceway system will include Class I or non-power limited fire protection signaling circuits with Class II or power limited fire protection signaling circuits in accordance with N.E.C. Article 725 or 760.

3. All conduit and wiring to flow switches, tamper switches, etc., shall be furnished and installed as part of this work.

4. Test results shall be submitted to Engineer.

5. Wiring may be run as concealed open-type plenum rated cable. Exposed or inaccessible wiring shall be installed in conduit. Where possible wiring/conduit shall be concealed. Provide sleeves in all walls which cable runs pass through. Refer to 26 05 29 for fire sealing of penetrations through fire rated walls. Provide access panels as necessary for cable routing. Support devices are to be attached to existing permanent structure.

END OF SECTION

MISSOURI S&T

An equal opportunity institution

Environmental Health and Safety

108 Campus Support Facility | 1201 N. State Street | Rolla, MO 65409
573-341-4305 | bprtvm@mst.edu | ehs.mst.edu

Asbestos Inspection Report: Parker Hall Board Room Renovation

Executive Summary

An inspection of the current Provost Office and Enrollment Management and the associated conference room was conducted on 7/06/2021 to determine the composition materials for renovation of the space. Indoor materials sampled included white 12"x12" ceiling tile, brown ceiling tile mastic, various adhesive layers, light brown floor tile, black mastic, white cove base material and drop ceiling tile. Outdoor materials included two layers of window caulk under the exterior metal flashing. Hard pipe insulation in the pipe chase was assumed to be asbestos for this inspection. Asbestos containing floor tile and mastic were found under walls in the inspected area and mudded joints and hard pipe runs were assumed to be asbestos during this survey.

Asbestos Containing Materials (ACM)

ACM identified in this area includes light brown floor tile with a black mastic. This material was found in several locations under walls. The quantity documented assumes the material is under all walls in the inspected area. It is also likely under walls in other areas of the second floor and should be assumed under those walls if they are to be disturbed in the future.

The insulated pipe in the pipe chase on the first floor was assumed to contain asbestos. It was marked from a previous survey with orange paint. The previous survey was not available. The material is consistent with asbestos containing pipe insulation. The quantity is an estimate and should be field verified prior to abatement. The quantity assumes the pipe travels up two floors and crosses the space horizontally at some location. Location of the entire pipe was enclosed or inaccessible.

Table 1. ACM

Material	Friability	Quantity	% Asbestos
Light Brown Floor Tile and Black Mastic under interior walls	Non-Friable	200 Sq. ft under 400 linear feet of wall.	6%-8% Chrysotile
Pipe Insulation and pipe Joints	Friable	30 linear ft.(estimated)	Assumed

Photos

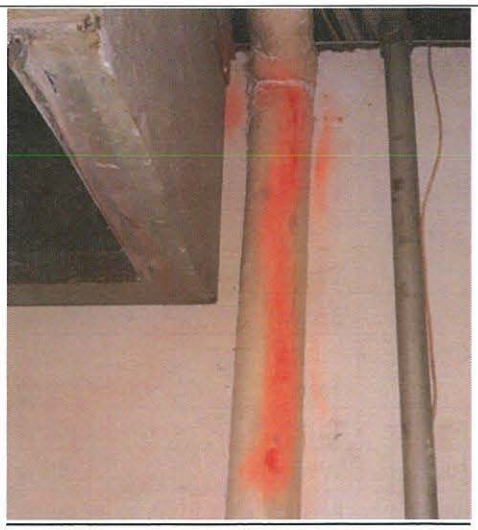
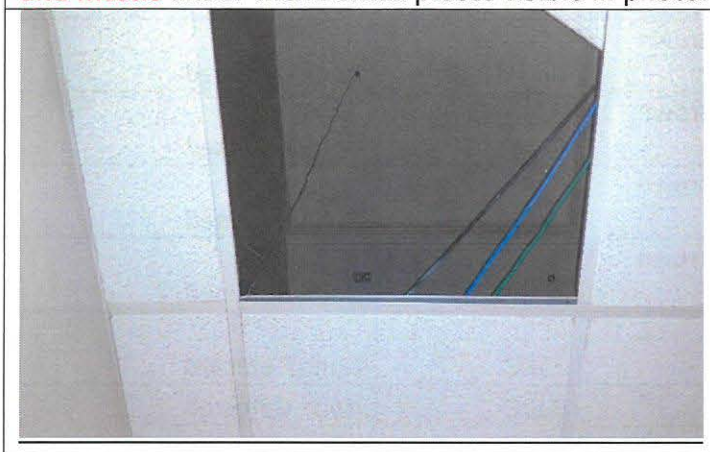
	
View of interior walls which have asbestos floor tile and mastic under them. Small pieces visible in photo.	View of Asbestos containing pipe insulation in the first floor pipe chase.
	
View of 12"x12" ceiling tile with brown mastic pucks were analyzed as a non-ACM.	

Table 2. Sampling Results

Sample Number	Description/Color	Material	Location	Result
CT12-01	Gray	Ceiling Tile	Room 210C	None Detected
CT12-02	Gray	Ceiling Tile	Room 210A	None Detected
CT12-03-CT	Various Colors	12 x 12 Ceiling Tile, Plaster	Room 212C	None Detected
CT12-03-Plaster	Tan	12 x 12 Ceiling Tile, Plaster	Room 212C	None Detected
CT12-04	Various Colors	12 x 12 Ceiling Tile	Room 212	None Detected
CTM-01-Mastic	Brown	Ceiling Mastic, Plaster	210C	None Detected
CTM-01-Skim Coat	Tan	Ceiling Mastic, Plaster	210C	None Detected
CTM-01-Plaster	Tan	Ceiling Mastic, Plaster	210C	None Detected
CTM-01-Plaster	White	Ceiling Mastic, Plaster	210C	None Detected
CTM-02-Mastic	Brown	Ceiling Mastic, Plaster	210A	None Detected
CTM-02-Skim Coat	Tan	Ceiling Mastic, Plaster	210A	None Detected
CTM-02-Plaster	Various	Ceiling Mastic, Plaster	210A	None Detected
CTM-03-CT	Various Colors	12 x 12 Ceiling Tile, Brown Mastic	Room 212	None Detected
CTM-03-Mastic	Brown	12 x 12 Ceiling Tile, Brown Mastic	Room 212	None Detected
CTM-04-CT	Tan	12 x 12 Ceiling Tile, Brown Mastic	Room 216	None Detected
CTM-04-Mastic	White	12 x 12 Ceiling Tile, Brown Mastic	Room 217	None Detected
CB-01-Cove Base	Gray	Cove Base Adhesive	210C	None Detected
CB-01-Adhesive	Gray	Cove Base Adhesive	210C	None Detected
CB-02-Cove base	Gray	Cove Base Adhesive	210A	None Detected
CB-02-Adhesive	Gray	Cove Base Adhesive	210A	None Detected
CB-03-Cove Base	Gray	Cove Base Adhesive	210 Cubes	None Detected
CB-03-Adhesive	Gray	Cove Base Adhesive	210 Cubes	None Detected
CB-04-Cove base	Tan	Tan Cove Base, White Adhesive	Room 212C	None Detected
CB-04-Adhesive	White	Tan Cove Base, White Adhesive	Room 212C	None Detected
CB-05-Cove Base	Tan	Tan Cove Base, White Adhesive	Room 212C	None Detected
CB-05-Adhesive	White	Tan Cove Base, White Adhesive	Room 212C	None Detected
CB-06-Cove Base	Tan	Tan Cove Base, White Adhesive	Room 212	None Detected

Sample Number	Description/Color	Material	Location	Result
CB-06-Adhesive	White	Tan Cove Base, White Adhesive	Room 212	None Detected
CTG-01	White	White 2x2 Ceiling Tile	210C	None Detected
CTG-02	White	White 2x2 Ceiling Tile	210A	None Detected
FM-01-Adhesive	Gray	Various Layers of Flooring Adhesive	210C	None Detected
FM-01-Adhesive	Green	Various Layers of Flooring Adhesive	210C	None Detected
FM-01-Adhesive	Tan	Various Layers of Flooring Adhesive	210C	None Detected
FM-02-Adhesive	Gray	Various Layers of Flooring Adhesive	210A	None Detected
FM-02-Adhesive	Clear	Various Layers of Flooring Adhesive	210A	None Detected
FM-02-Adhesive	Tan	Various Layers of Flooring Adhesive	210A	None Detected
FM-03-Adhesive	Gray	Various Layers of Flooring Adhesive	210 Cube Area	None Detected
FM-03-Adhesive	Green	Various Layers of Flooring Adhesive	210 Cube Area	None Detected
EWCO-01-Caulk	Brown	Exterior Window Caulk, Outer Layer	210C Window	None Detected
EWCO-01-Caulk	Tan	Exterior Window Caulk, Outer Layer	210C Window	None Detected
EWCO-02	Tan	Exterior Window Caulk, Outer Layer	Room 210 Entry	None Detected
EWCO-03-Caulk	Tan	Exterior Window Caulk, Outer Layer	Room 212C	None Detected
EWCO-03-Caulk	Brown	Exterior Window Caulk, Outer Layer	Room 212C	None Detected
EWCI-01	Tan	Exterior Window Caulk, Inner Layer	210C Window	None Detected
EWCI-02-Caulk	Tan	Exterior Window Caulk, Inner Layer	Room 210 Entry	None Detected
EWCI-02-Caulk	Black	Exterior Window Caulk, Inner Layer	Room 210 Entry	None Detected
FTB-01-Tile	Brown	Brown Floor Tile/Black Mastic	210C Under Wall	8% Chrysotile
FTB-01-Mastic	Black	Brown Floor Tile/Black Mastic	210C Under Wall	8% Chrysotile
FTB-02-Mastic	Tan	Brown Floor Tile/Black Mastic	Room 216, Under Wall	6% Chrysotile
FTB-02-FT	Brown	Brown Floor Tile/Black Mastic	Room 216, Under Wall	7% Chrysotile
FTB-02-Mastic	Black	Brown Floor Tile/Black Mastic	Room 216, Under Wall	7% Chrysotile

Sample Number	Description/Color	Material	Location	Result
FTB-03-FT	Brown	Brown Floor Tile/Black Mastic	Room 212C	6% Chrysotile
FTB-03-Mastic	Black	Brown Floor Tile/Black Mastic	Room 212C	7% Chrysotile
FTB-04-FT	Brown	Brown Floor Tile/Black Mastic	Room 210 Under Wall	6% Chrysotile

Bulk Samples

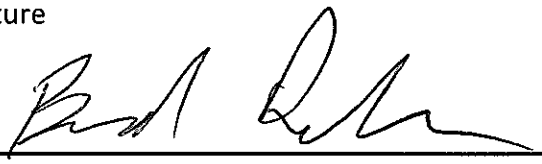
Bulk samples were analyzed by EMSL Analytical, Inc. using method Polarized Light Microscopy EPA 600/R-93/116. No previous surveys were available for this property. However, pipe insulation was marked with orange paint and was assumed to contain asbestos.

Scope and Limitations

This inspection was performed in accordance with regulations published by the EPA in 40-CFR Part 763 Subpart E and 40 CFR part 61, Subpart M(NESHAP). This meets the standard set forth in the Missouri Department of Natural Resources requirement that structures be inspected prior to renovation or demolition. Samples were analyzed by EMSL Analytical, Inc., 100 Green Park Industrial Court, Saint Louis, MO 63123. The scope of the inspection is limited to occupied areas and areas where flooring and wall material was removed and substrates could be observed. Additional removal of floors, walls and ceilings may expose additional suspect ACM. Additional suspect ACM should be tested prior to removal or disposal.

The project scope is for the demolition of this entire structure. Any other suspect materials in the remainder of the building must be assumed to be ACM until an appropriate number of samples are collected.

Signature



Insector # 711702242I MDIR14531

Brandon Rekus, Licensed Asbestos Building Inspector

Appendices

Appendix 1: Documentation of Certification
Appendix 2: Laboratory Chain of Custody Documentation
Appendix 3: Laboratory Analysis Results

CERTIFICATION NUMBER:

7117022421MOIR14531

THIS CERTIFIES

Brandon P. Rekus

HAS COMPLETED THE CERTIFICATION REQUIREMENTS FOR

Inspector

APPROVED: **03/23/2021**

EXPIRES: **03/23/2022**

TRAINING DATE: **02/24/2021**

Director of Air Pollution Control Program

CERTIFICATION NUMBER:

7117022521MOSR14531

THIS CERTIFIES

Brandon P. Rekus

HAS COMPLETED THE CERTIFICATION REQUIREMENTS FOR

Supervisor

APPROVED: **04/06/2021**

EXPIRES: **02/25/2022**

TRAINING DATE: **02/25/2021**

Director of Air Pollution Control Program

EMSL Analytical, Inc.

100 Green Park Industrial Court Saint Louis, MO 63123
Tel/Fax: (314) 577-0150 / (314) 776-3313
http://www.EMSL.com / saintlouislab@emsl.com

EMSL Order:	392105822
Customer ID:	UNIV51
Customer PO:	
Project ID:	

Attention:	Brandon Rekus	**Phone:**	(573) 341-4403
	University Of MO	**Fax:**	(573) 341-6077
	1201 State Street	**Received Date:**	06/11/2021 10:05 AM
	Suite 108-B CSF	**Analysis Date:**	06/17/2021 - 06/18/2021
	Rolla, MO 65409	**Collected Date:**	
Project:	Parker Hall 2nd Floor		

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
CT12-01 *392105822-0001*		Gray Fibrous Homogeneous	79% Min. Wool	21% Non-fibrous (Other)	None Detected
CT12-02 *392105822-0002*		Gray Fibrous Homogeneous	82% Min. Wool	18% Non-fibrous (Other)	None Detected
CTM-01-Mastic *392105822-0003*		Brown Non-Fibrous Homogeneous	3% Wollastonite	97% Non-fibrous (Other)	None Detected
CTM-01-Skim Coat *392105822-0003A*		Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
CTM-01-Plaster *392105822-0003B*		Tan Non-Fibrous Homogeneous		16% Quartz 84% Non-fibrous (Other)	None Detected
CTM-01-Plaster *392105822-0003C*		White Non-Fibrous Homogeneous		36% Quartz 64% Non-fibrous (Other)	None Detected
CTM-02-Mastic *392105822-0004*		Brown Non-Fibrous Homogeneous	5% Wollastonite	95% Non-fibrous (Other)	None Detected
CTM-02-Skim Coat *392105822-0004A*		Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
CTM-02-Plaster *392105822-0004B*		Various Non-Fibrous Homogeneous	3% Hair	23% Quartz 74% Non-fibrous (Other)	None Detected
CB-01-Cove Base *392105822-0005* *No tan or white layers present.*		Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
CB-01-Adhesive *392105822-0005A* *No tan or white layers present.*		Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
CB-02-Cove Base *392105822-0006* *No tan or white layers present.*		Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
CB-02-Adhesive *392105822-0006A* *No tan or white layers present.*		Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
CB-03-Cove Base *392105822-0007* *No tan or white layers present.*		Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Initial report from: 06/18/2021 10:35:14

EMSL Analytical, Inc.
100 Green Park Industrial Court Saint Louis, MO 63123
Tel/Fax: (314) 577-0150 / (314) 776-3313
http://www.EMSL.com / saintlouislab@emsl.com

EMSL Order: 392105822
Customer ID: UNIV51
Customer PO:
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
CB-03-Adhesive *392105822-0007A* *No tan or white layers present.*		Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
CTG-01 *392105822-0008*		White Fibrous Homogeneous	27% Cellulose 36% Min. Wool	27% Perlite 10% Non-fibrous (Other)	None Detected
CTG-02 *392105822-0009*		White Fibrous Homogeneous	28% Cellulose 37% Min. Wool	26% Perlite 9% Non-fibrous (Other)	None Detected
FM-01-Adhesive *392105822-0010*		Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
FM-01-Adhesive *392105822-0010A*		Green Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
FM-01-Adhesive *392105822-0010B*		Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
FM-02-Adhesive *392105822-0011*		Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
FM-02-Adhesive *392105822-0011A*		Clear Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
FM-02-Adhesive *392105822-0011B*		Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
FM-03-Adhesive *392105822-0012*		Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
FM-03-Adhesive *392105822-0012A*		Green Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
EWCO-01-Caulk *392105822-0013*		Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
EWCO-01-Caulk *392105822-0013A*		Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
EWCI-01 *392105822-0014*		Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
FTB-01-FT *392105822-0015*		Brown Non-Fibrous Homogeneous		92% Non-fibrous (Other)	8% Chrysotile
FTB-01-Mastic *392105822-0015A*		Black Non-Fibrous Homogeneous		92% Non-fibrous (Other)	8% Chrysotile

Initial report from: 06/18/2021 10:35:14

EMSL Analytical, Inc.
100 Green Park Industrial Court Saint Louis, MO 63123
Tel/Fax: (314) 577-0150 / (314) 776-3313
http://www.EMSL.com / saintlouislab@emsl.com

EMSL Order:	392105822
Customer ID:	UNIV51
Customer PO:	
Project ID:	

Analyst(s)
Sue Ferrario (21)
Sarah Kuper (9)

Jeff Siria, Laboratory Manager
or Other Approved Signatory

Initial report from: 06/18/2021 10:35:14

OrderID: 392105822

Asbestos Bulk Building Materials - Chain of Custody

EMSL Order Number / Lab Use Only: 392105822

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

100 Green Park Industrial Court
St Louis, MO 63123
PHONE: (314) 577-0150
EMAIL: saintlouislab@emsl.com

Customer Information		Billing Information	
Customer ID:		Billing ID:	
Company Name:	University Of MO	Company Name:	University Of MO
Contact Name:	Brandon Rekus	Billing Contact:	Brandon Rekus
Street Address:	1201 State Street Suite 108-B CSF	Street Address:	1201 State Street, Suite 108-B CSF
City, State, Zip:	Rolla MO 65409	City, State, Zip:	Rolla MO
Country:	US	Country:	US
Phone:	573-341-4403	Phone:	573-341-4403
Email(s) for Report:	bprtvm@mst.edu	Email(s) for Invoice	bprtvm@mst.edu

Project Information

Project Name/No:	Parker Hall 2nd Floor	Purchase Order:	
EMSL LIMS Project ID: (If applicable, EMSL will provide)		US State where samples collected:	MO
State of Connecticut (CT) must select project location:	☐ Commercial (Taxable) ☐ Residential (Non-Taxable)		
Sampled By Name:	Brandon Rekus	Sampled By Signature:	
No. of Samples in Shipment	17		

Turn-Around-Time (TAT)

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☐ 32 Hour ☐ 48 Hour ☐ 72 Hour ☐ 96 Hour ☑ 1 Week ☐ 2 Week

Please call ahead for large projects and/or turnaround times 8 Hours or Less. *32 Hour TAT available for select tests only, samples must be submitted by 11.30am.

Test Selection

PLM - Bulk (reporting limit)

☑ PLM EPA 600/R-93/116 (<1%)
☐ PLM EPA NOB (<1%)
☐ POINT COUNT
☐ 400 (<0.25%) ☐ 1,000 (<0.1%)
POINT COUNT w/ GRAVIMETRIC
☐ 400 (<0.25%) ☐ 1,000 (<0.1%)
☐ NIOSH 9002 (<1%)
☐ NYS 198.1 (Friable - NY)
☐ NYS 198.6 NOB (Non-Friable - NY)
☐ NYS 198.8 (Vermiculite SM-V)

TEM - Bulk

☐ TEM - Bulk
☐ TEM EPA NOB
☐ NYS NOB 198.4 (Non-Friable-NY)
☐ TEM EPA 600/R-93/116 w Milling Prep (0.1%)

Other Tests (please specify)

☑ Positive Stop - Clearly Identified Homogeneous Areas (HA)

Sample Number	HA Number	Sample Location	Material Description
CT12-01	1	Room 210C, Parker Hall	Gray 12x12 Ceiling Tile
CT12-02	1	Room 210A, Parker Hall	Gray 12x12 Ceiling Tile
CTM-01	2	Room 210C, Parker Hall	Brown Ceiling Mastic, Plaster Skim Coat
CTM-02	2	Room 210A, Parker Hall	Brown Ceiling Mastic, Plaster Skim Coat
CB-01	3	Room 210C, Parker Hall	Tan Cove Base, White Adhesive
CB-02	3	Room 210A, Parker Hall	Tan Cove Base, White Adhesive
CB-03	3	Room 210 Cube Area	Tan Cove Base, White Adhesive
CTG-01	4	Room 210C, Parker Hall	White 2x2 CT
CTG-02	4	Room 210A, Parker Hall	White 2x2 CT
FM-01	5	Room 210C, Parker Hall	Layers of flooring adhesive

Special Instructions and/or Regulatory Requirements (Sample Specifications, Processing Methods, Limits of Detection, etc.)

Method of Shipment:	Fedex		Sample Condition Upon Receipt:		
Relinquished by:		Date/Time: 6/10/21	Received by:	6/11/21	Date/Time: 1005
Relinquished by:		Date/Time:	Received by: 2802.5604		Date/Time: 0717

Controlled Document - Asbestos Bulk R5 03/18/2021

☑ AGREE TO ELECTRONIC SIGNATURE (By checking, I consent to signing this Chain of Custody document by electronic signature.)

OrderID: 392105822

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Asbestos Bulk Building Materials - Chain of Custody

EMSL Order Number / Lab Use Only

EMSL Analytical, Inc.
100 Green Park Industrial Court
St. Louis, MO 63123
PHONE: (314) 577-0150
EMAIL: saintlouislab@emsl.com

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Special Instructions and/or Regulatory Requirements (Sample Specifications, Processing Methods, Limits of Detection, etc.)

Sample Number	HA Number	Sample Location	Material Description
FM-02	5	Room 210A, Parker Hall	Layers of flooring adhesive
FM-03	5	Room 210 Cube Area	Layers of flooring adhesive
EWCO-01	6	Room 210C	Exterior Window Caulk, Outer Layer
EWCO-02	6	Room 210 Entry Window	Exterior Window Caulk, Outer Layer
EWCI-01	7	Room 210C	Exterior Window Caulk, Inner Layer
EWCI-02	7	Room 210 Entry Window	Exterior Window Caulk, Inner Layer
FTB-01	8	Room 210C under Wall	Brown FT and Black Mastic

Method of Shipment:		Sample Condition Upon Receipt:	
Relinquished by:	Date/Time:	Received by:	Date/Time
Relinquished by:	Date/Time:	Received by:	Date/Time

Controlled Document - Asbestos Bulk R5 03/16/2021

☐ AGREE TO ELECTRONIC SIGNATURE (By checking, I consent to signing this Chain of Custody document by electronic signature.)

EMSL Analytical, Inc.'s Laboratory Terms and Conditions are incorporated into this Chain of Custody by reference in their entirety. Submission of samples to EMSL Analytical, Inc. constitutes acceptance and acknowledgment of all terms and conditions by Customer.

EMSL Analytical, Inc.

100 Green Park Industrial Court Saint Louis, MO 63123
Tel/Fax: (314) 577-0150 / (314) 776-3313
http://www.EMSL.com / saintlouislab@emsl.com

EMSL Order:	392106667
Customer ID:	UNIV51
Customer PO:	
Project ID:	

Attention:	Brandon Rekus	**Phone:**	(573) 341-4403
	University Of MO	**Fax:**	(573) 341-6077
	1201 State Street	**Received Date:**	07/07/2021 10:25 AM
	Suite 108-B CSF	**Analysis Date:**	07/07/2021 - 07/08/2021
	Rolla, MO 65409	**Collected Date:**	
Project:	Parker Hall 2nd Floor		

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos % Fibrous	Non-Asbestos % Non-Fibrous	Asbestos % Type
EWCO-02 *392106667-0001*		Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
EWCO-03-Caulk *392106667-0002*		Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
EWCO-03-Caulk *392106667-0002A*		Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
EWCI-02-Caulk *392106667-0003*		Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
EWCI-02-Caulk *392106667-0003A*		Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
EWCI-03 *392106667-0004*		Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
FTB-02-Mastic *392106667-0005*		Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
FTB-02-FT *392106667-0005A*		Brown Non-Fibrous Homogeneous		94% Non-fibrous (Other)	6% Chrysotile
FTB-02-Mastic *392106667-0005B*		Black Non-Fibrous Homogeneous		93% Non-fibrous (Other)	7% Chrysotile
FTB-03-FT *392106667-0006*		Brown Non-Fibrous Homogeneous		93% Non-fibrous (Other)	7% Chrysotile
FTB-03-Mastic *392106667-0006A*		Black Non-Fibrous Homogeneous		94% Non-fibrous (Other)	6% Chrysotile
FTB-04-FT *392106667-0007*		Brown Non-Fibrous Homogeneous		93% Non-fibrous (Other)	7% Chrysotile
FTB-04-Mastic *392106667-0007A*		Black Non-Fibrous Homogeneous		94% Non-fibrous (Other)	6% Chrysotile
CT12-03-CT *392106667-0008*		Various Fibrous Homogeneous	95% Min. Wool	5% Non-fibrous (Other)	None Detected
CT12-03-Plaster *392106667-0008A*		Tan Non-Fibrous Homogeneous		20% Quartz 80% Non-fibrous (Other)	None Detected
CT12-04 *392106667-0009*		Various Fibrous Homogeneous	28% Cellulose 38% Min. Wool	24% Perlite 10% Non-fibrous (Other)	None Detected

Initial report from: 07/08/2021 11:22:31

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EMSL Order:	392106667
Customer ID:	UNIV51
Customer PO:	
Project ID:	

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos % Fibrous	Non-Asbestos % Non-Fibrous	Asbestos % Type
CTM-03-CT *392106667-0010*		Various Fibrous Homogeneous	98% Min. Wool	2% Non-fibrous (Other)	None Detected
CTM-03-Mastic *392106667-0010A*		Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
CTM-04-CT *392106667-0011*		Various Fibrous Homogeneous	82% Min. Wool	18% Non-fibrous (Other)	None Detected
CTM-04-Mastic *392106667-0011A*		Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
CB-04-Cove Base *392106667-0012*		Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
CB-04-Adhesive *392106667-0012A*		White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
CB-05-Cove Base *392106667-0013*		Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
CB-05-Adhesive *392106667-0013A*		White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
CB-06-Cove Base *392106667-0014*		Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
CB-06-Adhesive *392106667-0014A*		White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Analyst(s)
Donald Schmidt (16)
Sarah Kuper (10)

Jeff Siria, Laboratory Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 "Interim Method") but augmented with procedures outlined in the 1993 ("final") version of the method. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Analytical, Inc. Saint Louis, MO NVLAP Lab Code 200742-0

Initial report from: 07/08/2021 11:22:31

OrderID: 392106667

Asbestos Bulk Building Materials - Chain of Custody

EMSL Order Number / Lab Use Only

392106667

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

100 Green Park Industrial Court
St. Louis, MO 63123
PHONE: (314) 577-0150
EMAIL: saintlouislab@emsl.com

Customer Information		Billing Information	
Customer ID:		Billing ID:	
Company Name:	University Of MO	Company Name:	University Of MO
Contact Name:	Brandon Rekus	Billing Contact:	Brandon Rekus
Street Address:	1201 State Street Suite 108-B CSF	Street Address:	1201 State Street, Suite 108-B CSF
City, State, Zip:	Rolla MO 65409	Country: US	City, State, Zip: Rolla MO Country:
Phone:	573-341-4403		Phone: 573-341-4403
Email(s) for Report:	bprtvm@mst.edu		Email(s) for Invoice:

Project Information

Project Name/No: Parker Hall 2nd floor

Purchase Order:

EMSL LIMS Project ID: (If applicable, EMSL will provide)

US State where samples collected: MO

State of Connecticut (CT) must select project location: ☐ Commercial (Taxable) ☐ Residential (Non-Taxable)

Sampled By Name: Brandon Rekus

Sampled By Signature:

No. of Samples in Shipment

Turn-Around-Time (TAT)

☐ 3 Hour ☐ 6 Hour ☑ 24 Hour ☐ 32 Hour ☐ 48 Hour ☐ 72 Hour ☐ 96 Hour ☐ 1 Week ☐ 2 Week

Please call ahead for large projects and/or turnaround times 6 Hours or Less *32 Hour TAT available for select tests only; samples must be submitted by 11:30am.

Test Selection

PLM - Bulk (reporting limit)

- ☑ PLM EPA 600/R-93/116 (<1%)
- ☐ PLM EPA NOB (<1%)
- ☐ POINT COUNT
  - ☐ 400 (<0.25%) ☐ 1,000 (<0.1%)
- POINT COUNT w/ GRAVIMETRIC
  - ☐ 400 (<0.25%) ☐ 1,000 (<0.1%)
- ☐ NIOSH 9002 (<1%)
- ☐ NYS 198.1 (Friable - NY)
- ☐ NYS 198.6 NOB (Non-Friable - NY)
- ☐ NYS 198.8 (Vermiculite SM-V)

TEM - Bulk

- ☐ TEM - Bulk
- ☐ TEM EPA NOB
- ☐ NYS NOB 198.4 (Non-Friable-NY)
- ☐ TEM EPA 600/R-93/116 w Milling Prep (0.1%)

Other Tests (please specify)

☐ Positive Stop – Clearly Identified Homogeneous Areas (HA)

Sample Number	HA Number	Sample Location	Material Description
EWCO-02		Room 210 Entry	Window Caulk
EWCO-03		Room 212C	Window Caulk
EWCI-02		Room 210 Entry	Window Caulk
EWCI-03		Room 212C	Window Caulk
FTB-02		Rm 216-under wall	LT Brn 12x12 FT and Black Mastic
FTB-03		Rm 212-under wall	LT Brn 12x12 FT and Black Mastic
FTB-04		Rm 210 under ext wall	LT Brn 12x12 FT and Black Mastic
CT12-03		212C	12 x12 CT,Plaster
CT12-04		212C	12x12 CT
CTM-03		212	12x12 CT and Brown Mastic

Special Instructions and/or Regulatory Requirements (Sample Specifications, Processing Methods, Limits of Detection, etc.)

Method of Shipment: Fed Ex		Sample Condition Upon Receipt:	
Relinquished by:	Date/Time: 7/6/21	Received by: 7/7/21	Date/Time 1025
Relinquished by:	Date/Time:	Received by: 2P11-6531-3857	Date/Time

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OrderID: 392106667

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Asbestos Bulk Building Materials - Chain of Custody

EMSL Order Number / Lab Use Only

EMSL Analytical, Inc.
100 Green Park Industrial Court
St. Louis, MO 63123
PHONE: (314) 577-0150
EMAIL: saintlouislab@emsl.com

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Special Instructions and/or Regulatory Requirements (Sample Specifications, Processing Methods, Limits of Detection, etc.)

Sample Number	HA Number	Sample Location	Material Description
CTM-04		216	12x12 CT and Brown Mastic
CB-04		212C	Tan cove base, White Adhesive
CB-05		212C	Tan cove base, White Adhesive
CB-06		212	Tan cove base, White Adhesive

Method of Shipment		Sample Condition Upon Receipt:	
Relinquished by:	Date/Time:	Received by.	Date/Time
Relinquished by:	Date/Time:	Received by:	Date/Time

Contracted Document - Asbestos Bulk R5 03/18/2021

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Mechanical Pre-Checks & Procedure Overview - VRV

Date:

TMI Job #: **Contractor:**

Project Name: **Contractor Contact Info:**

OS/IS Sales: **Equipment to be Started:**

Project Address: **Verified by:**

	Description	Notes/Data	Checked by (int)
	Due to Warranties MC is required to contact TMI Representative Chris Swallow or Chad Wunsch at (636) 532-1110, to set up a field coordination visit for each step of doing field checks, testing, and start-up		
1	Mechanical contractors foreman's name and #. Needs to be on site for the first day of start up.		
	Project Foreman:		
	Contact Info:		
2	Control contractors foreman's name and #. Needs to be on site for the first day of start up.		
	Control Contractor:		
	Project Manager:		
	Contact Info:		
3	Electrical contractors foreman's name and #. Needs to be on site for the first day of start up.		
	EC Contractor:		
	EC Project Foreman:		
	Contact Info:		
4	Stop Valves securely closed & field refrigerant piping pressure tested to 550 psi		
	(450psi FXTQ) for 24 hours min.		
5	Triple evacuate to 500 microns or less; Include Pressure Equalization pipe on HR.		
6	All liquid lines are measured; "Additional Refrigerant Charge" is calculated and they		
	are as follows: Line length (per size/per system):		
	1/4" - 3/4" -		
	3/8" - 7/8" -		
	1/2" - 1-1/8" -		
	5/8" -		
7	How much charge was removed from the existing system?		
8	How much charge was added when breaking the final vacuum? Factory recommends		
	50% of calculated charge_____.		
9	All Remote Controllers installed and all control wiring is installed and properly .		
	connected at each terminal block		
10	Refrigerant lines (Including Pressure Equalization piping) are completely insulated		
	including flare nut connections at Indoor Units.		
11	All ductwork is connected and air filters installed.		
12	Line Voltage is checked and verified to be complete and within specified range for all		
	system components		
13	The contractor shall evaluate the existing equipment on the I-Touch manager to		
	delete the equipment that is no longer existing after		

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Commissioning Guide

VRVIII PB Series

DAIKIN AC®
absolute comfort

Dr. Daikin

Diagnostic Tool

Fault Code Identification

Three ways to help with ERROR CODES:

WEB: *www.drdaikin.com*

MOBILE WEB: *http://mobile.drdaikin.com*

SMS TEXT: **Error** plus (**code**)

- send to 32075 -

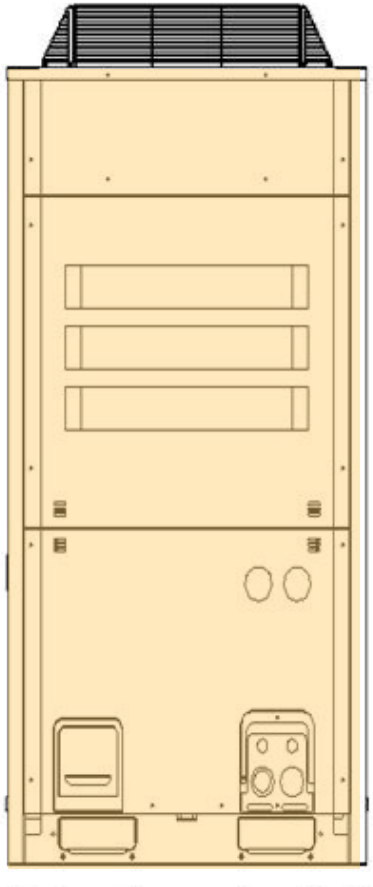
Example: Error U4

VRVIII System Components

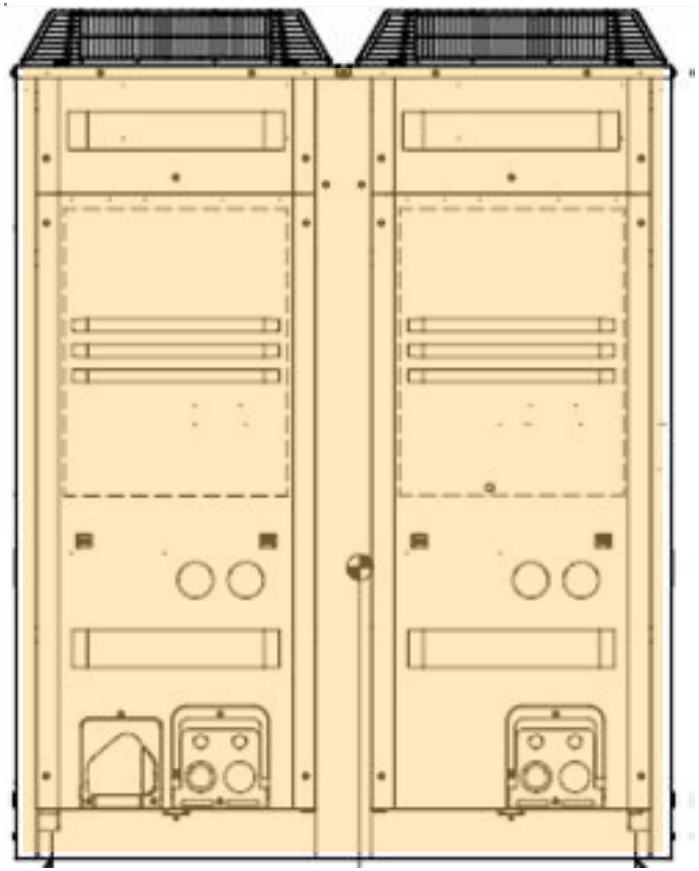
Condensers - Fan Coil Units - Branch Selector Boxes - Local Remote Controllers

VRVIII Heat Pump Condenser Styles

Base Single Modules



RXYQ72PB

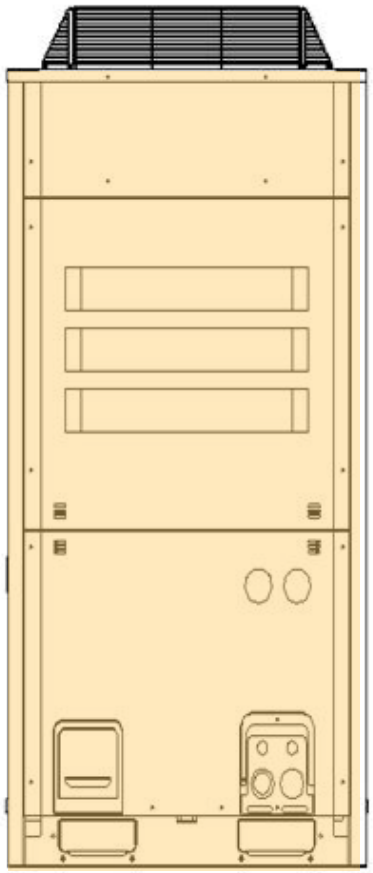


*RXYQ96,120,144PB

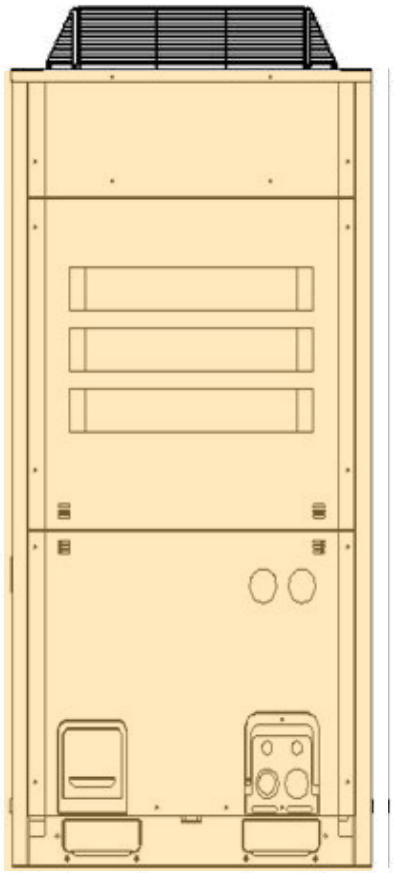
*NOTE: RXYQ144PBTJ (208/230vac.) Utilizes 2 Inverter Scroll Compressors – Dual Fan & 3 stop valves

VRVIII Heat Recovery Condenser Styles

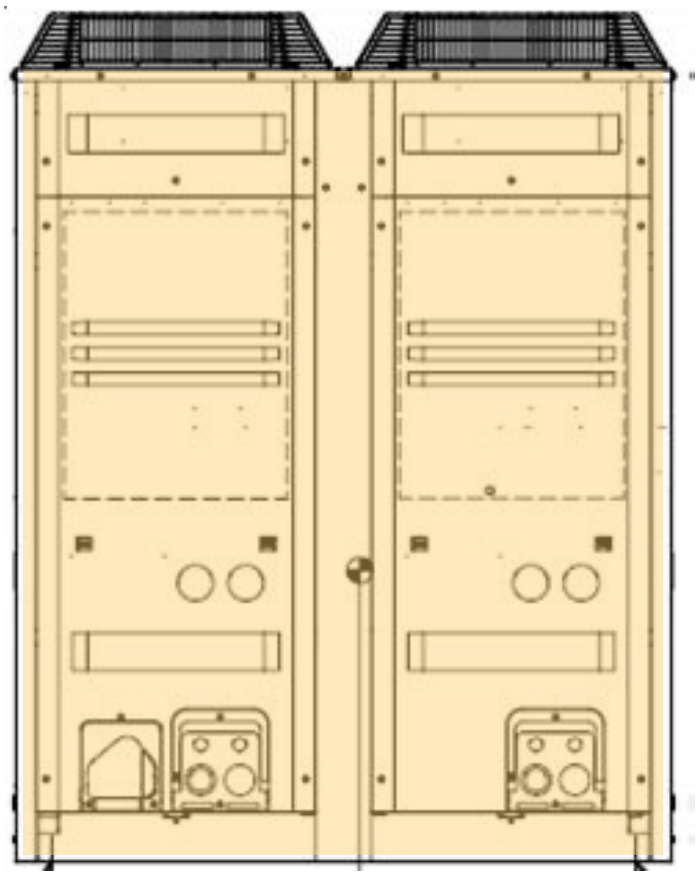
Single Modules



REMQ72PB



REMQ96/120PB



REYQ72,96,120,144PB

Heat Pump Condensers - RXYQ_PBTJ (208/230vac 3Ph)

Single Module

6 Ton

8,10,12 Ton

Double Module

14 & 16 Ton

18 & 20 Ton

Triple Module

22,24,26 Ton

Triple Module

28 & 30 Ton

NOTE: 6 Ton HP condenser has one compressor (Inverter).

Heat Recovery Condensers
REYQ /REMQ_PBTJ (208/230vac 3Ph)

Single Module

6,8,10,12 Ton

Double Module

14,16,18,20 Ton

Triple Module

22,24,26,28 Ton

Heat Pump Condensers - RXYQ_PBYD (460vac 3 Ph)

Single Module

6 Ton 8 & 10 Ton

12 Ton

Double Module

14 & 16 Ton

18 & 20 Ton

Triple Module

22,24,26 Ton

28 & 30 Ton

Heat Recovery Systems
REYQ/REMQ_PBYD (460vac 3 Ph)

Single Module

6,8,10,12 Ton

Double Module

12,14,16,18,20 Ton

Triple Module

22,24,26,28 Ton

Indoor Units

VRVIII Models & Appearance – 208/230vac 1 Ph
Fan Coils Units

Energy Recovery Ventilator

FXDQ_M Slim Duct Low Static

FXZQ 2'x2' 4-Way Ceiling Cassette

FXFQ_P Round Flow Cassette

FXAQ Wallmount

FXMQ72/96M Concealed Ceiling Medium to High Static

FXLQ Floor Standing Exposed

FXHQ Ceiling Suspended

FXMQ_P DC Ducted Concealed Ceiling Medium to High Static

FXTQ Vertical Air Handler

FXNQ Floor Standing Concealed

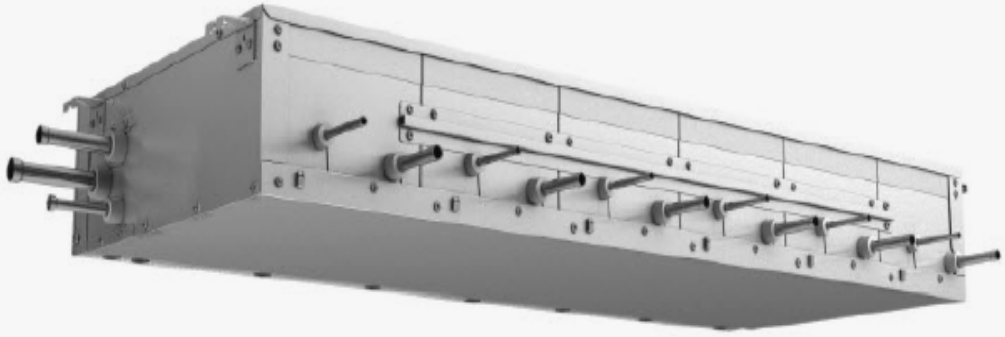
FXMQ_MF 100% OA Processing Unit

Branch Selector Boxes

VRVIII Models & Appearance – 208/230vac 1 Ph Branch Selector Boxes

BSVQ36PVJU 36,000 Btu
BSVQ60PVJU 60,000 Btu
BSVQ96PVJU 96,000 Btu

BSV4Q36PVJU 4 - Port



BSV6Q36PVJU 6 - Port

Local Remote Controllers

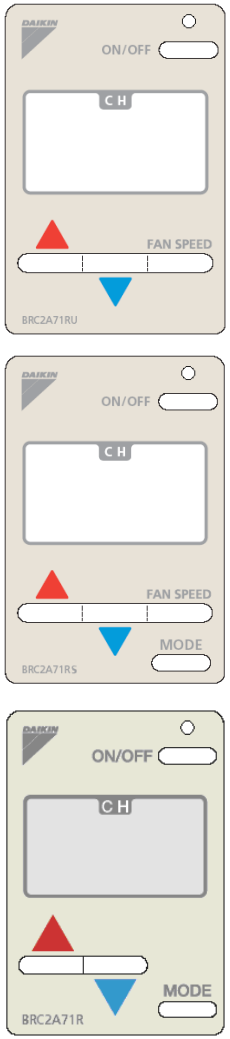
BRC1E72

Navigation Remote Controller

BRC2A71

Simplified

Remote Controller



BRC7C/7E/4C

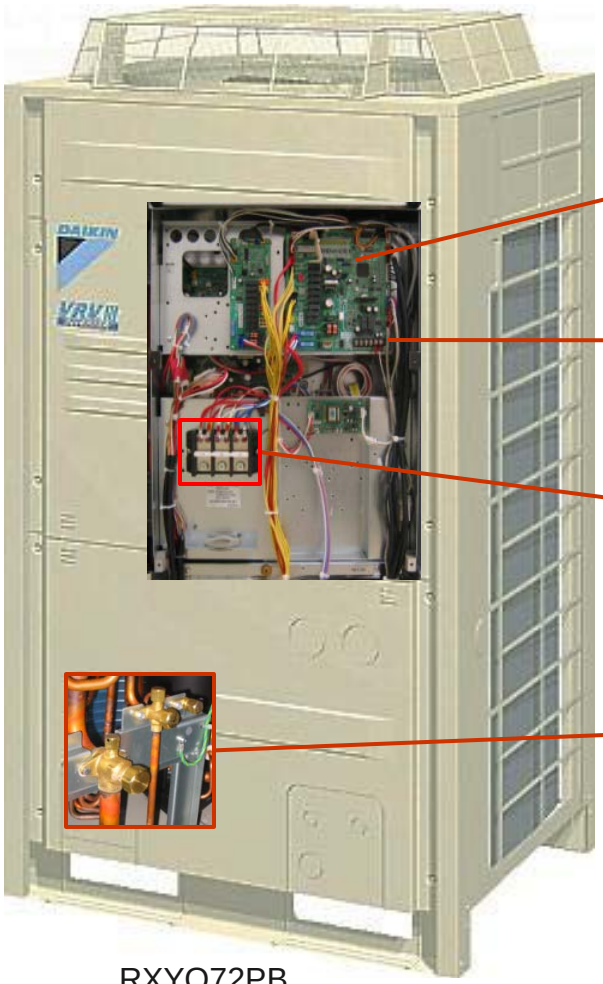
Hand-held Wireless

Remote Controller

Condenser - Unit Layout

Line & Control Voltage – Stop Valve Layout – Auto Charge Port – Control PCB

VRVIII Heat Pump – RXYQ Single & Manifolded



RXYQ72PB

Control PCB (A1P)

Control Voltage Connections

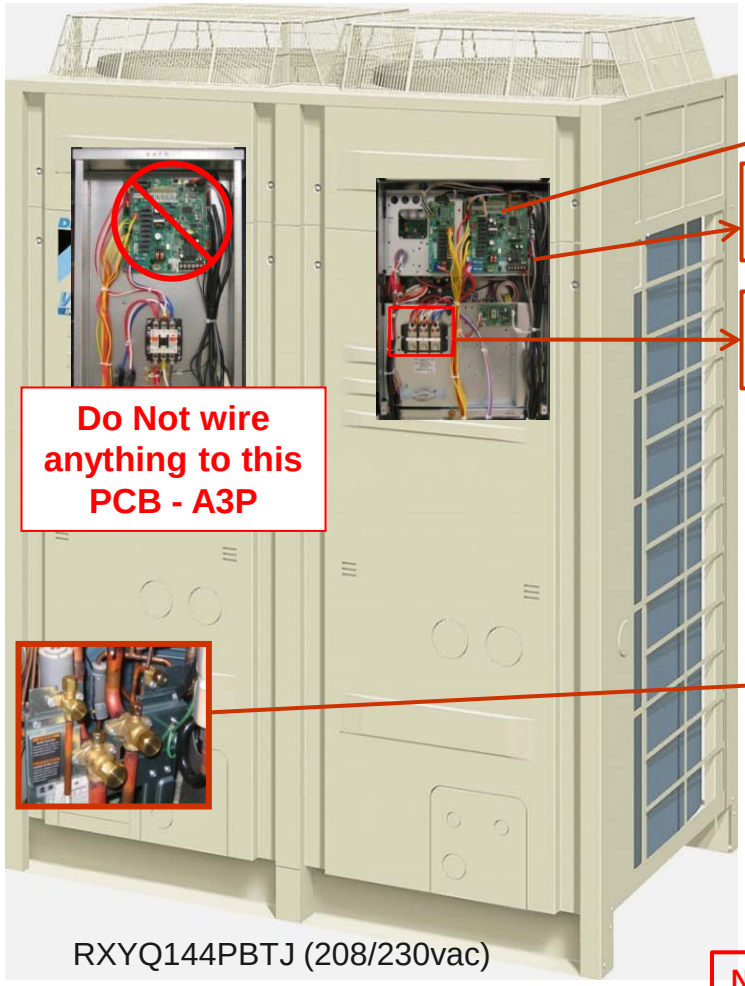
Line Voltage Connections

2 Stop Valves

HP/LP Gas Liquid

Auto Charge Port

VRVIII Heat Pump – RXYQ144PBTJ Single Module



Control Voltage Connections

Line Voltage Connections

Control PCB (A1P)

3 Stop Valves

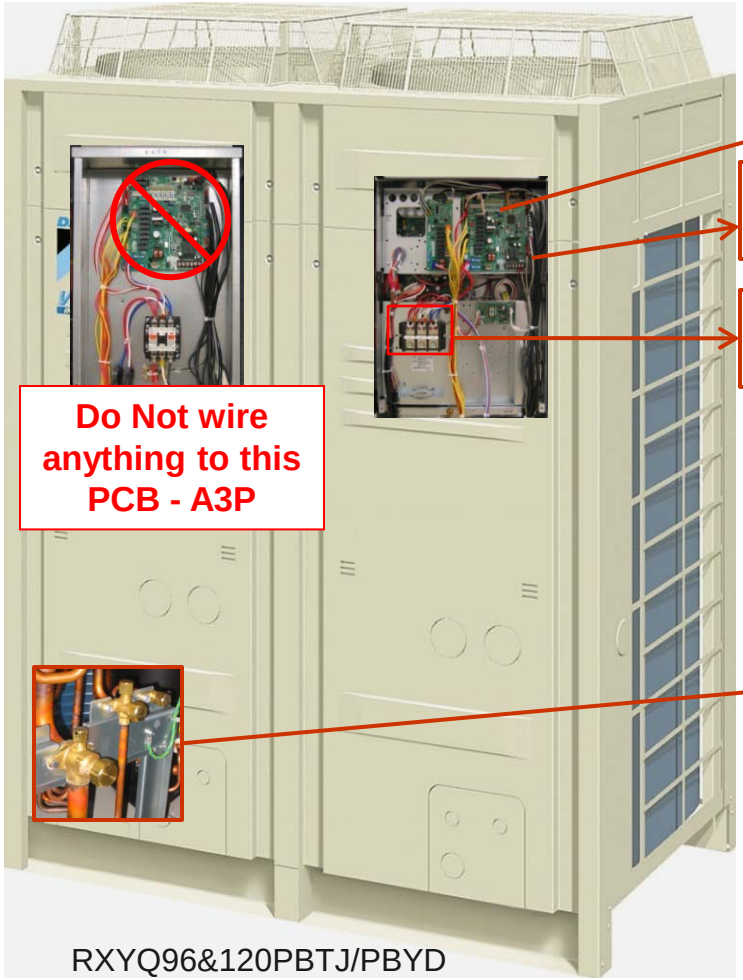
Auto Charge Port

Liq. N/A HP/LP

Not Used on this model

NOTE: This model cannot be manifolded

VRVIII Heat Pump – RXYQ Single & Manifolded



RXYQ96&120PBTJ/PBYD

Control Voltage Connections

Line Voltage Connections

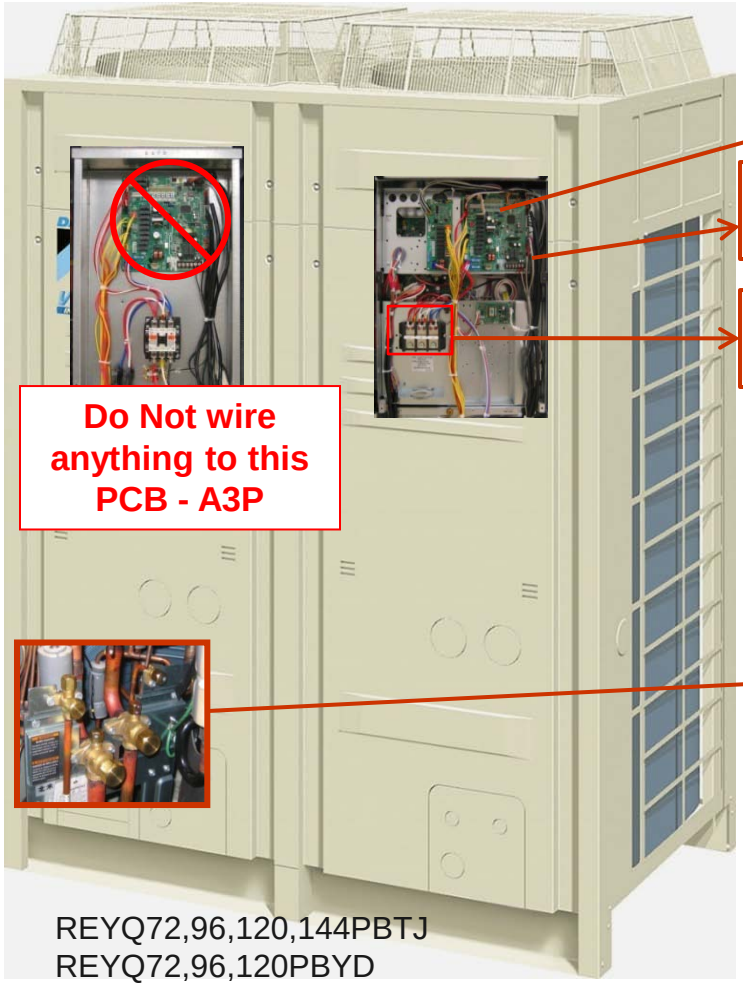
Control PCB (A1P)

2 Stop Valves

Auto Charge Port

HP/LP Gas Liquid

VRVIII Heat Recovery – REYQ Single Manifolded



Do Not wire anything to this PCB - A3P

REYQ72,96,120,144PBTJ
REYQ72,96,120PBYD

Control Voltage Connections

Line Voltage Connections

Control PCB (A1P)

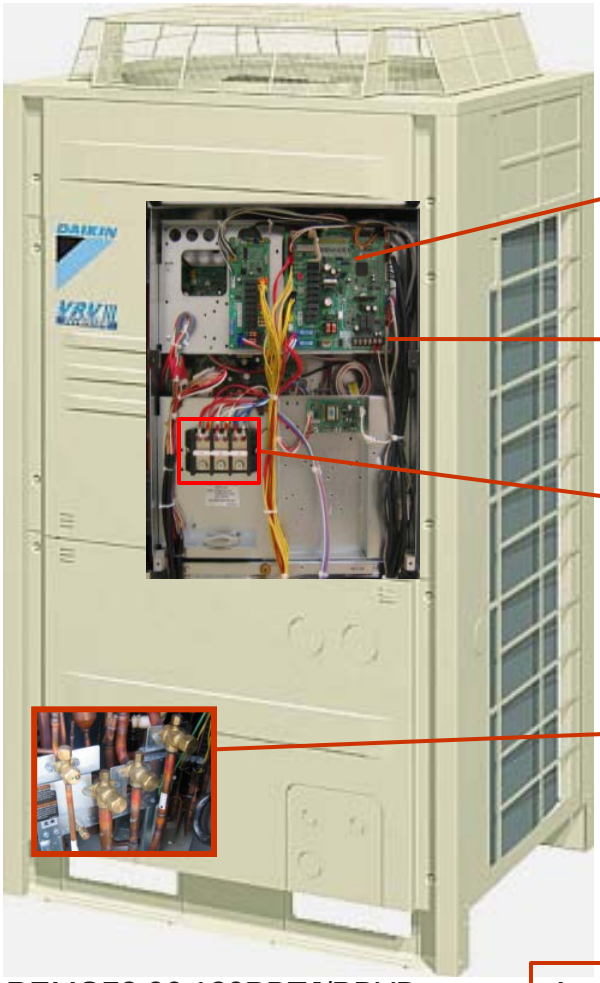
3 Stop Valves

Auto Charge Port

Liq. Suction HP/LP

NOTE: This model cannot be manifolded

VRVIII Heat Recovery – REMQ Manifolded Module



REMQ72,96,120PBTJ/PBYD

Control PCB (A1P)

Control Voltage Connections

Line Voltage Connections

4 Stop Valves

Liquid - Suction-HP/LP-Equalization

Auto Charge Port

System Commissioning

Pre-Commissioning Checks & Commissioning Steps

Pre-Commissioning Checks

DAIKIN AC absolute comfort

Pre-Commissioning Checks

1. Compressor shipping brackets removed
2. Stop Valves securely closed & field refrigerant piping pressure tested to 550 psi (450psi FXTQ) for 24 hours min. Include Pressure Equalization pipe on manifolded Heat Recovery systems (PB)
3. Triple evacuate to 500 microns or less; Include Pressure Equalization pipe on HR
4. All liquid lines are measured, "Additional Refrigerant Charge" is calculated and weighed into the system, breaking the final vacuum

   Alternate: 50% (trim charge) of the calculated charge weighed in for "*Auto Charge*" operation
5. Stop Valves opened
6. All Remote Controllers installed and all control wiring is installed and properly connected at each terminal block
7. All condensate drain piping is connected, including fan coil tie-in, and insulated as required
8. Refrigerant lines (Pressure Equalization piping) are completely insulated including flare nut connections at Indoor Units
9. All ductwork is connected and air filters installed
10. Line Voltage is checked and verified to be within specified range for all system components

Commissioning Procedures Overview

Commissioning Steps

1. Power up all indoor units – Fan Coils and Branch Selector boxes (for heat recovery only)
2. Power up Condenser(s) to energize crankcase heaters (minimum 6 hrs) Initialization sequence starts and the system addresses are set – Setup Navigation Remote Controllers
3. Count Condensers (manifolded system), Fan Coils, & Branch Selector boxes (for heat recovery only) if applicable
4. Selected Field Settings programmed at Remote Controllers (Static Pressure settings, etc.)
5. System refrigerant charge – Manual or “Auto Charge”
6. Check Operation mode
7. Remaining System Field Settings
8. Verify system operation in Cool & Heat mode as outside ambient temperature conditions allow (heat mode is prohibited above 75.2°F outside air temperature)

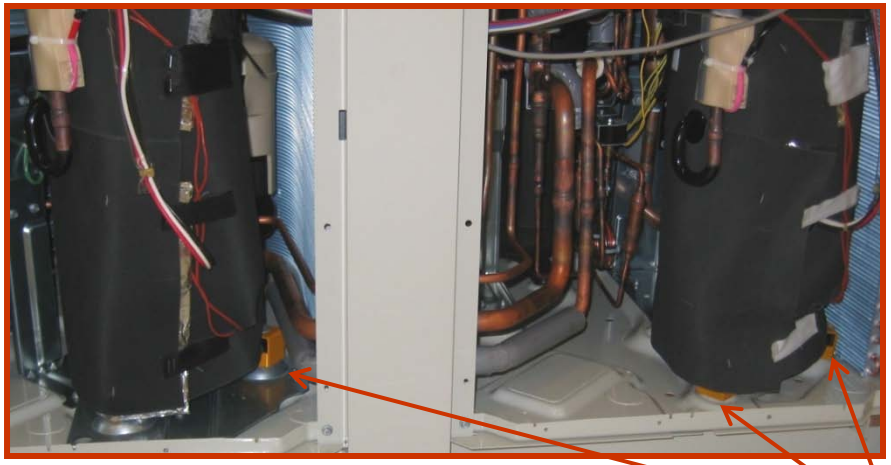
System Commissioning

Pre-Commissioning Checks

VRVIII Pre-Commissioning Check #1

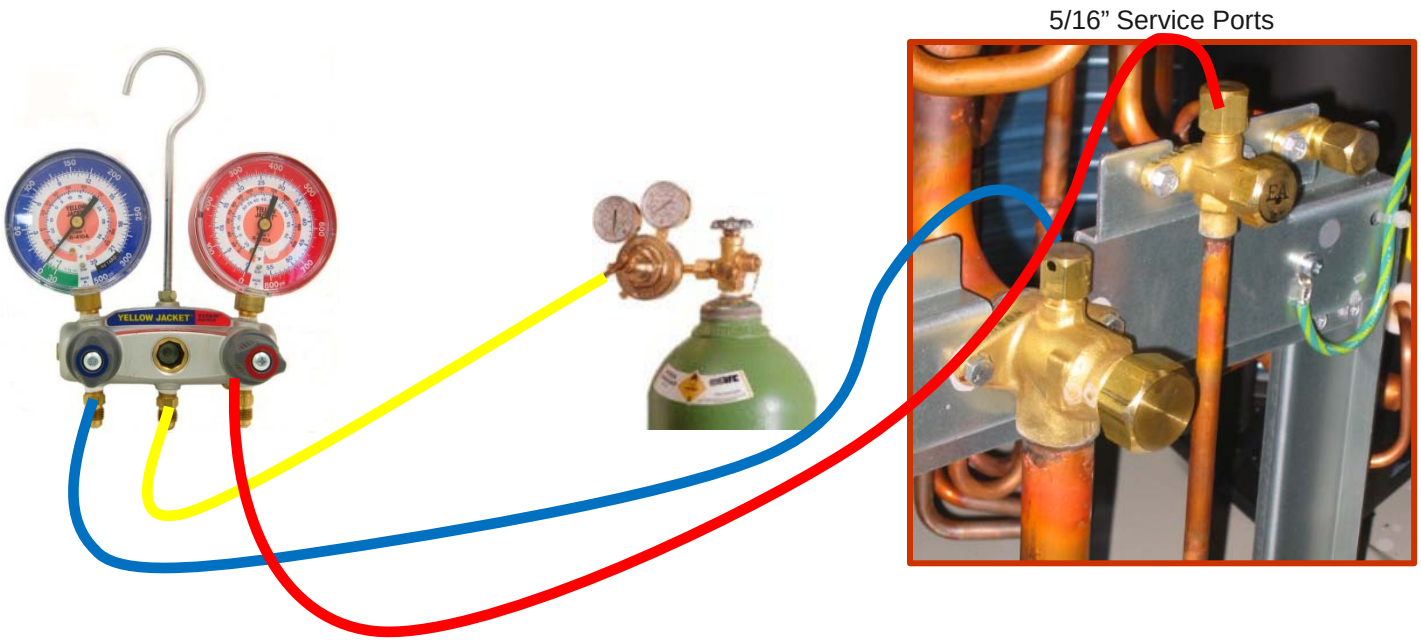
Compressor Shipping Brackets

- Compressor shipping brackets must be removed before system start up
- Each compressor is secured by 2 brackets, yellow in color, which are located under the compressor blankets
- Remove all of the brackets and retighten the compressor bolts
- Failure to remove the brackets can result in excessive noise during operation



Shipping Brackets

Pressure Test Connections
Heat Pump RXYQ - 2 Stop Valves



- Connect manifold gauges to the Liquid and Dual Pressure Gas Service Ports
  - On Manifolded systems connect gauges to the main condenser
- Connect Nitrogen cylinder with regulator to manifold
- Do not energize the indoor units. Indoor unit EEVs close when power is applied
  - If EEVs have closed use Recovery/Evacuation Mode to reopen all EEVs
- Follow the Pressure Test procedure, and perform a system leak test.

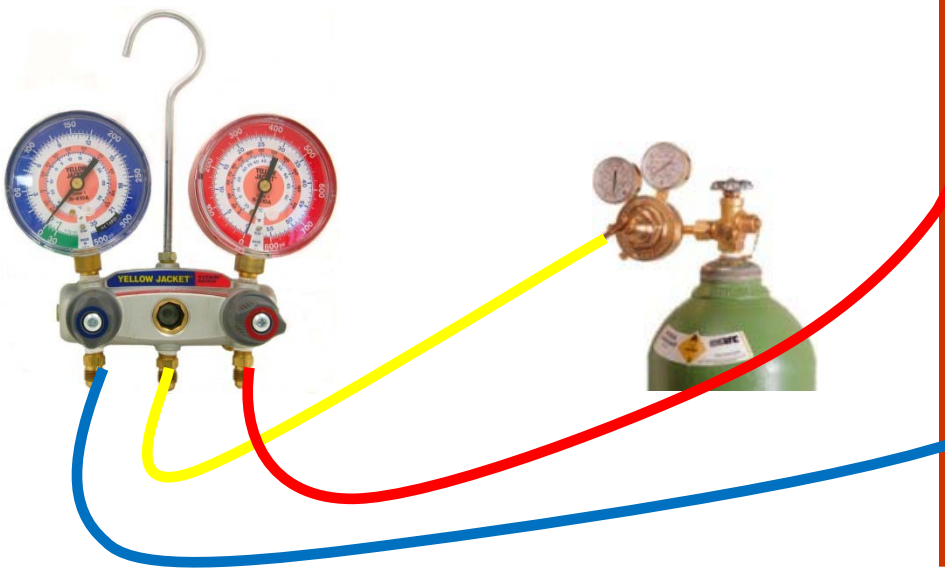
VRVIII Pre-Commissioning Check #2 Cont.

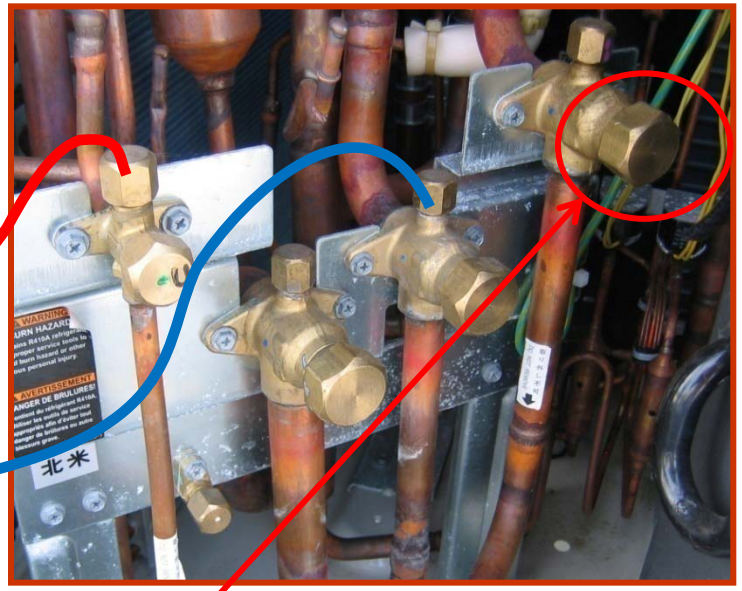
Pressure Test Connections Heat Pump & Heat Recovery
3 Stop Valves RXYQ144PBTJ, REYQ72,96,120,144PBTJ & REYQ72,96,120PBYD

- Connect manifold gauges to the Liquid and Dual Pressure Gas Service Ports
- Connect Nitrogen cylinder with regulator to manifold
- Do not energize the indoor units (or branch selector boxes for heat recovery). Indoor unit and branch selector box EEVs close when power is applied
  - If EEVs have closed use Recovery/Evacuation Mode to reopen all EEVs
- Follow the Pressure Test procedure, and perform a system leak test.

VRVIII Pre-Commissioning Check #2 Cont.

Pressure Test Connections
Heat Recovery REMQ 4 Stop Valves

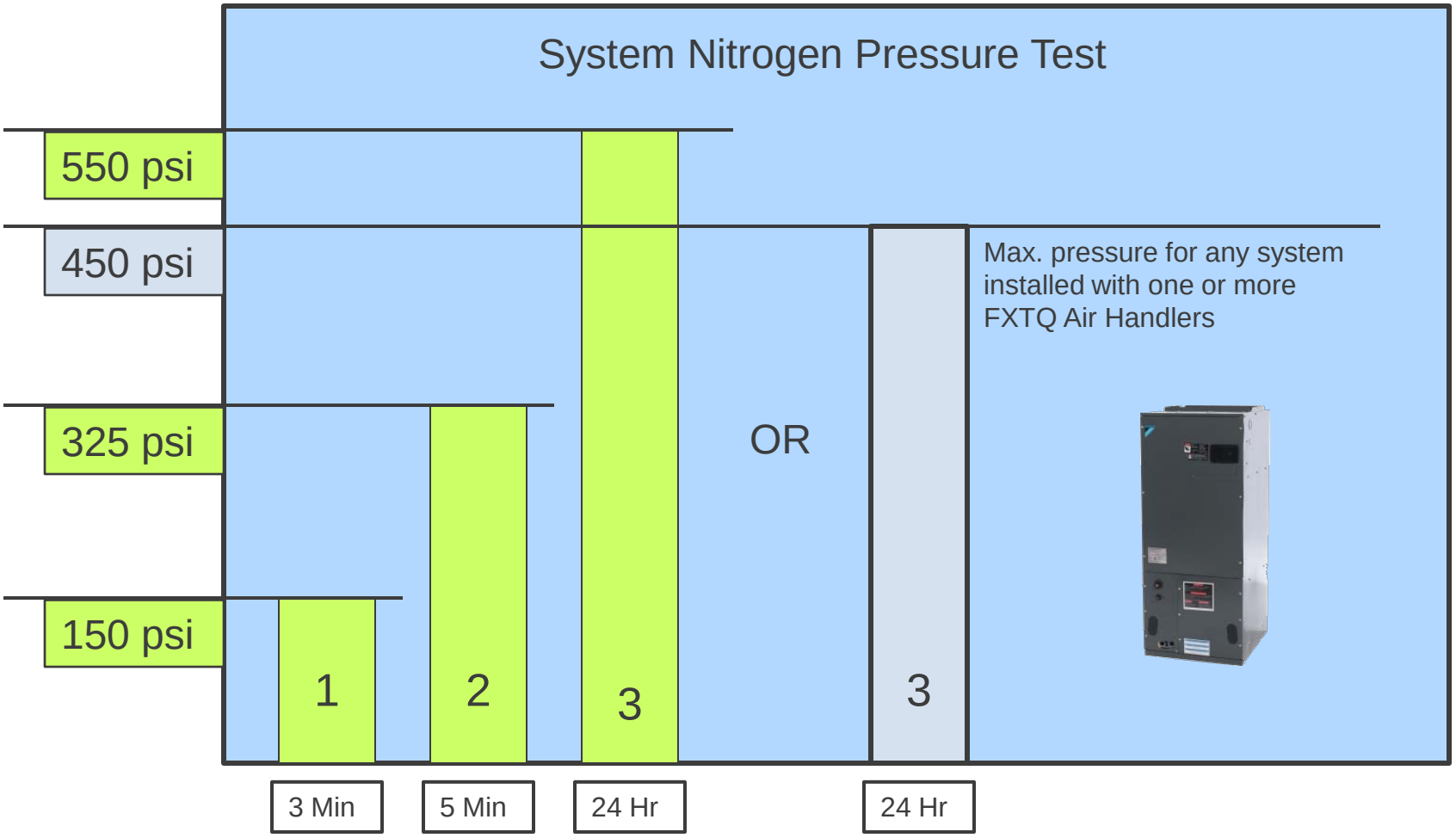




5/16" Service Ports

- Connect manifold gauges to the Liquid and Dual Pressure Gas Service Ports on the Main unit
  - Pressure test the Pressure Equalization Pipe separately
- Connect Nitrogen cylinder with regulator to manifold
- Do not energize the indoor units or branch selector boxes. Indoor unit and branch selector box EEVs close when power is applied
  - If EEVs have closed use Recovery/Evacuation Mode to reopen all EEVs
- Follow the Pressure Test procedure, and perform a system leak test.

3 Step System Pressure Test - Verify all Stop Valves are securely closed before pressure test -



Nitrogen Pressure Testing Considerations

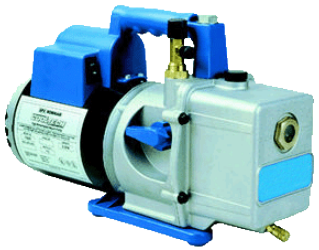
Nitrogen pressure is subject to fluctuation above 300 psi, based on ambient temperature changes. Use this formula to compensate for temperature changes from one day to the next when performing the 24 hour pressure test. The following formula will determine system pressure drop caused by low ambient temperature.

Record the **T**emperature when the system is **p**ressurized (**Tp**)
Subtract the **T**emperature when the pressure is **c**hecked (**Tc**)
Multiply by a factor of 0.80 to get the **P**ressure **D**rop (**PD**)

(**Tp – Tc**) x 0.80 = **P**ressure **D**rop

VRVIII Pre-Commissioning Check #3

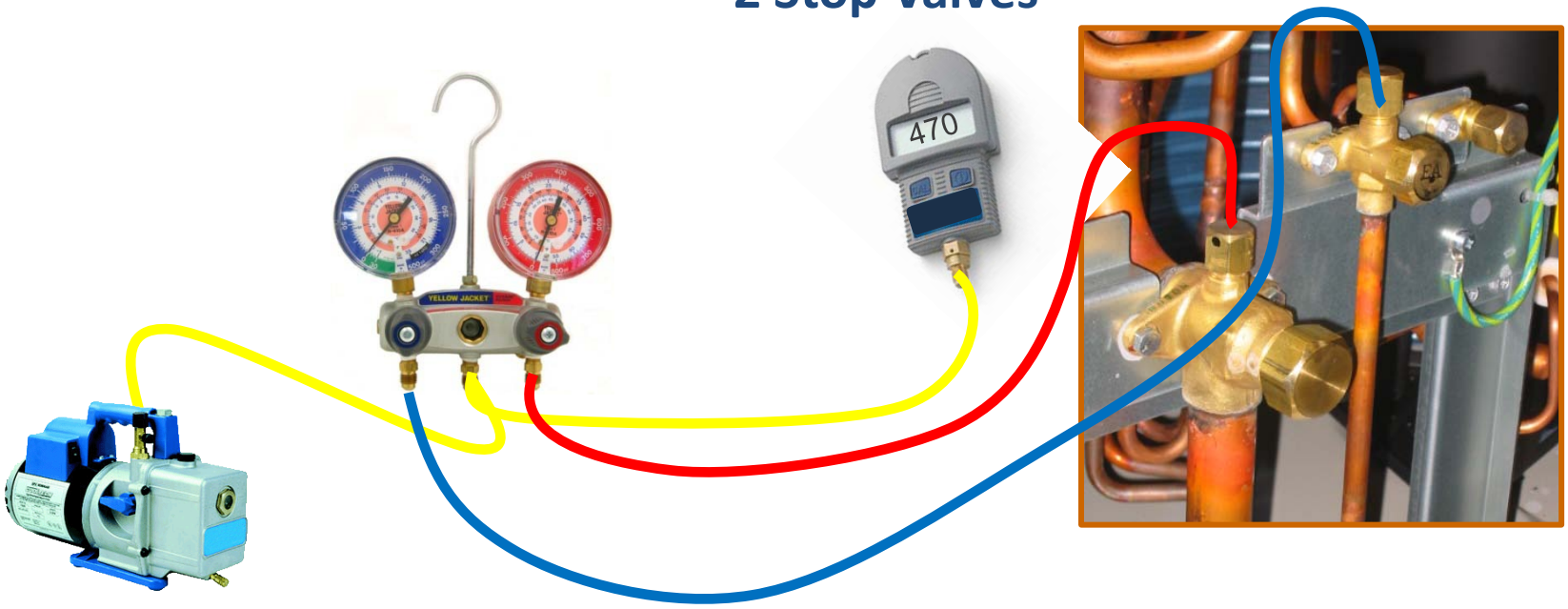
System Triple Evacuation



- Minimum 6 cfm vacuum pump with check valve
- Digital Micron Gauge
- Insure Vacuum hoses are in good condition
- Indoor units (and branch selector boxes, heat recovery only) must not be energized to insure EEVs are open
    - Evacuate the refrigerant piping to 4,000 microns
    - Break the vacuum with Dry Nitrogen to a level of 2-3 PSIG
    - Evacuate the system to 1,500 microns
    - Break the vacuum with Dry Nitrogen to a level of 2-3 PSIG
    - Evacuate the system to 500 microns or less
        - Conduct a micron rise test; system should hold below 500 microns for 1 hour
          Hold vacuum for liquid refrigerant charging – Do Not remove manifold gauges

VRVIII Pre-Commissioning Check #3 Cont.

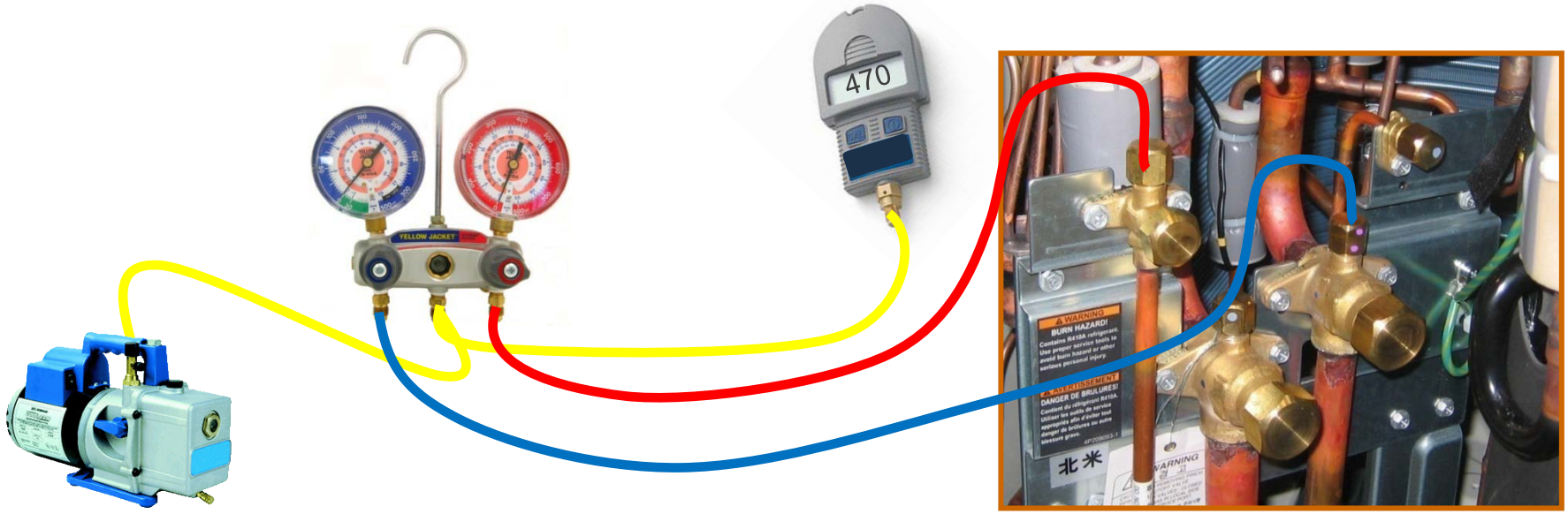
Evacuation Connections Heat Pump RXYQ
2 Stop Valves



- Connect manifold gauges to the Liquid and Dual Pressure Gas Service Ports
  - On manifolded systems connect gauges to the main condenser
- Connect vacuum pump and micron gauge
- Do not energize the indoor units. Indoor unit EEVs close when power is applied
  - If EEVs have closed use Recovery/Evacuation Mode to reopen all EEVs
- Triple evacuation down to 500 microns or less using Dry Nitrogen to break vacuum
  - The final vacuum is used to draw in the calculated “Additional Refrigerant Charge” amount by weight

VRVIII Pre-Commissioning Check #3 Cont.

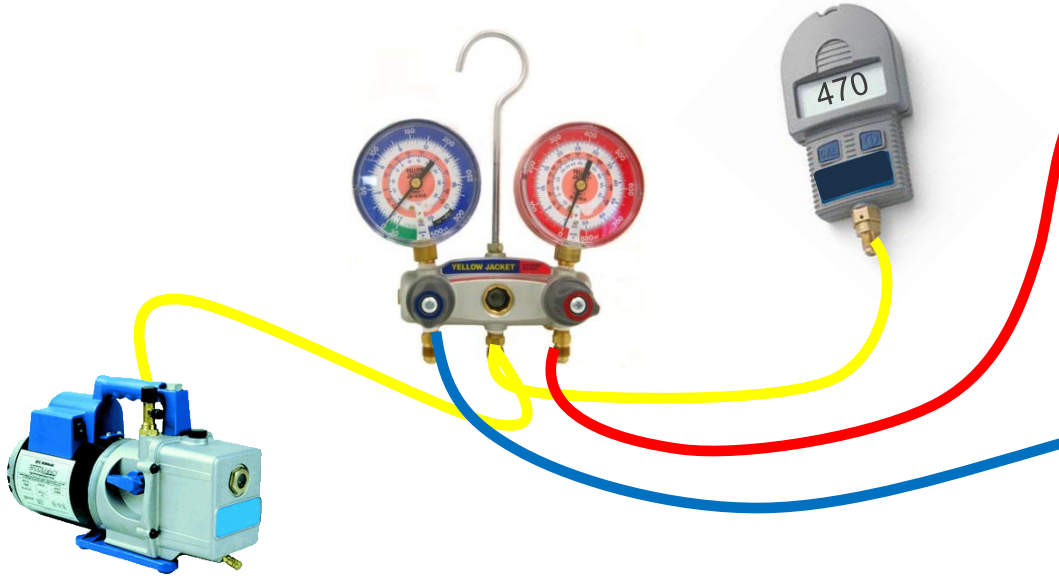
Evacuation Connections Heat Pump & Heat Recovery
3 Stop Valves RXYQ144PBTJ - REYQ72,96,120,144PBTJ & REYQ72,96,120PBYD

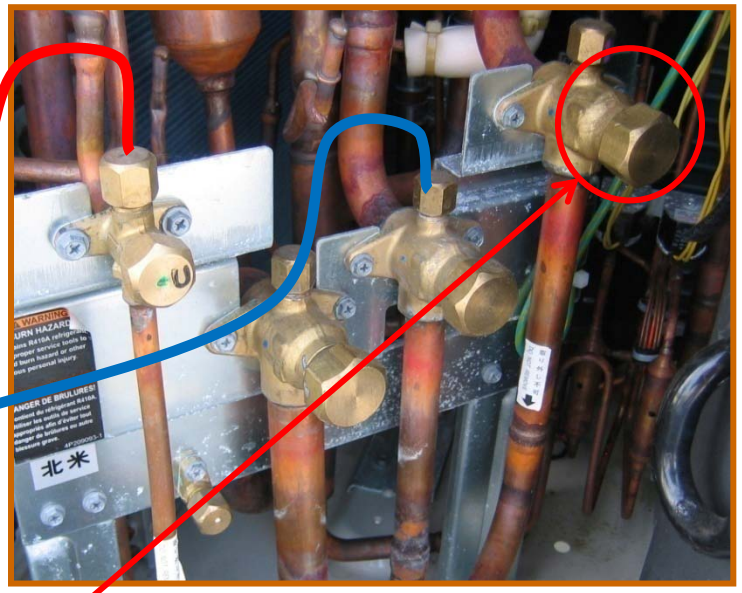


- Connect manifold gauges to the Liquid and Dual Pressure Gas Service Ports
- Connect vacuum pump and micron gauge
- Do not energize the indoor units (or branch selector boxes for heat recovery). Indoor unit EEVs close when power is applied
  - If EEVs have closed use Recovery/Evacuation Mode to reopen all EEVs
- Triple evacuation down to 500 microns or less using Dry Nitrogen to break vacuum
  - The final vacuum is used to draw in the calculated "Additional Refrigerant Charge" amount by weight

VRVIII Pre-Commissioning Check #3 Cont.

Evacuation Connections - Heat Recovery REMQ - 4 Stop Valves

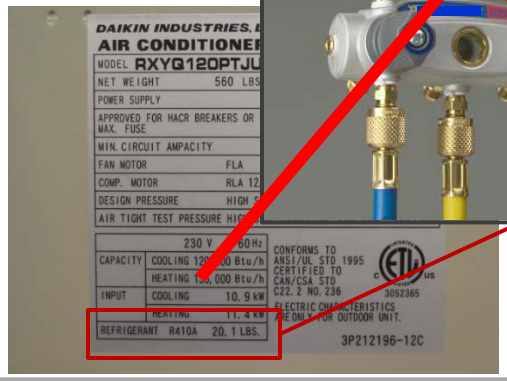




- Connect manifold gauges to the Liquid and Dual Pressure Gas Service Ports on the Main unit
  - Pressure Equalization Pipe is evacuated separately
- Connect vacuum pump and micron gauge
- Do not energize the indoor units or branch selector boxes. Indoor unit and branch selector box EEVs close when power is applied
  - If EEVs have closed use Recovery/Evacuation Mode to reopen all EEVs
- Triple evacuation down to 500 microns or less using Dry Nitrogen to break vacuum cycles
  - The final vacuum is used to draw in the calculated "Additional Refrigerant Charge" amount by weight

VRVIII System Refrigerant Charging Facts

- Accurate refrigerant charging is critical for optimum system performance
- Daikin VRV systems cannot be charged by refrigerant operating pressures, superheat or subcooling temperatures; refrigerant is weighed into the system
- All *VRVIII* condensers have a factory refrigerant charge based on the unit model
  - The ***VRVIII*** Condensers state the factory refrigerant charge on the unit ID Plate
- Proper *VRVIII* system charging requires an "Additional Refrigerant Charge" amount to be calcu n part by the tot e system Liquid line
- The total s rge is comprised ge in the condenser al Refrigerant Ch lated for that system



REFRIGERANT R

"Additional Refrigerant Charge"

TOTAL SYSTEM CHARGE

VRVIII System Refrigerant Charge Procedures

- It is recommended that all *VRVIII* systems be manually charged based on the calculated "Additional Refrigerant Charge" for the system being commissioned
  - Measure the total linear footage of each Liquid line pipe size in the entire system
  - Calculate the "Additional Refrigerant Charge" based on the three part calculation procedure for the system being commissioned
  - After determining the amount of the "Additional Refrigerant Charge", use the vacuum in the system from the final evacuation cycle, and weigh in liquid refrigerant through the Liquid service port.
    - If there is not enough vacuum to draw in the total charge, use the "Additional Refrigerant Charge Mode" to complete the system charging process
    - If *Auto Charge* is to be used, use the final vacuum to charge the system with at least 50% of the calculated "Additional Refrigerant Charge" then using *Auto Charge* to complete the charging process. (See *Auto Charge* Limitations)
  - After the system receives the full or partial charge, all of the stop valves may be opened (Pre-Commissioning Step #5)

VRVIII Pre-Commissioning Check #4 Cont.

VRVIII "Additional Refrigerant Charge" Manual Calculation

The example system for this exercise is: RXYQ144PBTJ Heat Pump
System Connection Ratio is 105%
Connection ratio can be found in the VRV Xpress file.

Calculation A

Total length (ft) of 1/4" liquid line 254 X .015 lbs/ft = 3.81
+
Total length (ft) of 3/8" liquid line 173 X .040 lbs/ft = 6.92
+
Total length (ft) of 1/2" liquid line 78 X .081 lbs/ft = 6.31
+
Total length (ft) of 5/8" liquid line 52 X .121 lbs/ft = 6.29
+
Total length (ft) of 3/4" liquid line 0 X .175 lbs/ft = 0.00
+
Total length (ft) of 7/8" liquid line 0 X .249 lbs/ft = 0.00

Liquid Line Example Total: 23.33 Lbs

Heat Pump RXYQ - Add total amount to **Calculation B**

OR

If Heat Recovery REYQ_ Multiply **Calculation A Total** by: **1.02** and add amount to **Calculation B**

VRVIII Pre-Commissioning Check #4 Cont.

NOTE: For systems with Connection Ratio above 130%, contact Service Hotline

Calculation B

Heat Pump	
MODEL NAME	**Refrigerant Amount**
RXYQ 96, 120, 216, 240, 336, 360P	0.0 lb
RXYQ 72 , 168, 192, 264, 288, 312P	1.1 lb
RXYQ 144PBYD	2.2 lb
RXYQ 144PBTJ	7.9 lb
Heat Recovery	
MODEL NAME	**Refrigerant Amount**
REYQ 72 ~ 120PBYD REYQ 72 ~ 144PBTJ	7.9 lb
REYQ 144PBYD REYQ 168 ~ 192P	2.2 lb
REYQ 216 ~ 240P	3.3 lb
REYQ 264 ~ 288P	5.5 lb
REYQ 312 ~ 336P	6.6 lb

Calculation A	+	Calculation B	+	Calculation C	=	Total
23.33 lbs.		7.9 lbs.		1.1 lbs.		32.3 lbs. (32 lbs. 5 oz.)

Note: .1 lbs. = 1.6 oz. (round up)

VRVIII Pre-Commissioning Check #4 Cont.

NOTE: For systems with Connection Ratio above 130%, contact Service Hotline

Calculation C

Heat Pump		
Connection Ratio	RXYQ 72 ~ 312PBYD RXYQ 72 ~ 312PBTJ	RXYQ 336 ~ 360PBYD RXYQ 336 ~ 360PBTJ
MORE THAN 100% AND LESS THAN 120%	1.1 LB	1.1 LB
MORE THAN 120% AND LESS THAN 130%	1.1 LB	2.2 LB

If system Connection Ratio is 100% or less, no additional refrigerant is required for Calculation C

Heat Recovery		
Connection Ratio	REYQ 72 ~ 120PBYD REYQ 72 ~ 120PBTJ REYQ 144 ~ 312PBYD REYQ 168 ~ 312PBTJ	REYQ 336PBYD REYQ 336PBTJ
MORE THAN 100% AND LESS THAN 120%	1.1 LB	1.1 LB
MORE THAN 120% AND LESS THAN 130%	1.1 LB	2.2 LB

Calculation A	+	Calculation B	+	Calculation C	=	Total
23.33 lbs.		7.9 lbs.		1.1 lbs.		32.3 lbs. (32 lbs. 5 oz.)

NOTE: .1 lbs. = 1.6 oz. (round up)

NOTE: VRV Xpress will calculate total system <u>additional</u> charge if line set lengths are entered when designing system.

VRVIII Pre-Commissioning Check #4 Cont.

VRVIII System Refrigerant Charge Procedures

- Refrigerant Charging Instructions are listed on a field installed label located in the clear plastic packet which is taped to the control box cover
- Remove the label backing and apply the clear label to the inside of the condenser's access panel.
- Enter all of the liquid line lengths, and the calculated Additional Refrigerant Charge. This information is crucial for future service work

REQUEST FOR THE INDICATION OF SETTING CONTENTS, ADDITIONAL REFRIGERANT CHARGING AMOUNT AND INSTALLATION DATE

AFTER FILLING OUT THE BELOW, PLEASE PUT IT ON THE BACK SIDE OF FRONT PANEL

1. RECORD FOR SETTING CONTENTS
FOR THE SETTING CONTENTS OF Ⓓ－Ⓗ IN THE SETTING MODE 2, MARK ○ IN THE RIGHT TABLE.

Ⓓ NIGHT－TIME LOW NOISE SETTING	OFF・LEVEL1・LEVEL2・LEVEL3
Ⓔ EXTERNAL LOW NOISE LEVEL SETTING	LEVEL1・LEVEL2・LEVEL3
Ⓕ DEMAND LEVEL SETTING	LEVEL1・LEVEL2・LEVEL3
Ⓖ EXTERNAL LOW NOISE DEMAND SETTING	OFF・ON
Ⓗ HIGH STATIC PRESSURE SETTING	OFF・ON

2. RECORD FOR ADDITIONAL REFRIGERANT CHARGING AMOUNT
MAKE SURE TO RECORD THE ADDITIONAL REFRIGERANT CHARGING AMOUNT.
(IF DO NOT USE AUTOMATIC REFRIGERANT CHARGING, CALCULATE AND CHARGE THE ADDITIONAL REFRIGERANT CHARGING AMOUNT FOLLOWING AS SHOWN ON THE BELOW.)

ADDITIONAL CHARGING AMOUNT = ____ lb (ROUND OFF TO ONE DECIMAL PLACE.)

REFRIGERANT AMOUNT FOR FIELD PIPING

LIQUID PIPE SIZE(in)	REFRIGERANT AMOUNT PER 1ft(lb/ft)	LENGTH OF LIQUID PIPE(ft)	SUB TOTAL
φ7/8	0.249	×	=
φ3/4	0.175	×	=
φ5/8	0.121	×	=
φ1/2	0.081	×	=
φ3/8	0.040	×	=
φ1/4	0.015	×	=

TOTAL ____ lb +

HEAT PUMP SYSTEM

MODEL NAME	THE AMOUNT OF REFRIGERANT
RXYQ96, 120, 216, 240, 336, 360P	0 lb
RXYQ72, 168, 192, 264, 288, 312P	1.1 lb
RXYQ144PBYD	2.2 lb
RXYQ144PBTJ	7.9 lb

+

REFRIGERANT AMOUNT FOR EXCEEDING CONNECTION CAPACITY OF INDOOR UNIT

INDOOR CONNECTION CAPACITY	MODEL NAME RXYQ72－312P	MODEL NAME RXYQ336・360P
MORE THAN 100% 120% OR LESS	1.1 lb	
MORE THAN 120% 130% OR LESS	1.1 lb	2.2 lb

3. RECORD OF INSTALLATION DATE ____ DA . ____ MO . ____ YR

3P280962-1A

VRVIII Pre-Commissioning Check #4 Cont.

Example System: RXYQ144PBTJ - Connection Ratio: 105%

REQUEST FOR THE INDICATION OF SETTING CONTENTS, ADDITIONAL REFRIGERANT CHARGING AMOUNT AND INSTALLATION DATE

AFTER FILLING OUT THE BELOW, PLEASE PUT IT ON THE BACK SIDE OF FRONT PANEL

1. RECORD FOR SETTING CONTENTS
FOR THE SETTING CONTENTS OF Ⓓ~Ⓗ IN THE [SETTING MODE 2], MARK ○ IN THE RIGHT TABLE.

Ⓓ NIGHT - TIME LOW NOISE SETTING	OFF · LEVEL1 · LEVEL2 · LEVEL3
Ⓔ EXTERNAL LOW NOISE LEVEL SETTING	LEVEL1 · LEVEL2 · LEVEL3
Ⓕ DEMAND LEVEL SETTING	LEVEL1 · LEVEL2 · LEVEL3
Ⓖ EXTERNAL LOW NOISE DEMAND SETTING	OFF · ON
Ⓗ HIGH STATIC PRESSURE SETTING	OFF · ON

2. RECORD FOR ADDITIONAL REFRIGERANT CHARGING AMOUNT
MAKE SURE TO RECORD THE ADDITIONAL REFRIGERANT CHARGING AMOUNT.
(IF DO NOT USE AUTOMATIC REFRIGERANT CHARGING, CALCULATE AND CHARGE THE ADDITIONAL REFRIGERANT CHARGING AMOUNT FOLLOWING AS SHOWN ON THE BELOW.)

ADDITIONAL CHARGING AMOUNT: **32.3** lb (ROUND OFF TO ONE DECIMAL PLACE.) =

REFRIGERANT AMOUNT FOR FIELD PIPING

LIQUID PIPE SIZE(in)	REFRIGERANT AMOUNT PER 1ft(lb/ft)		LENGTH OF LIQUID PIPE(ft)		SUB TOTAL
φ7/8	0.249	×		=	
φ3/4	0.175	×		=	
φ5/8	0.121	×	52	=	6.29
φ1/2	0.081	×	78	=	6.31
φ3/8	0.040	×	173	=	6.92
φ1/4	0.015	×	254	=	3.81

TOTAL **23.33** lb +

HEAT PUMP SYSTEM

MODEL NAME	THE AMOUNT OF REFRIGERANT
RXYQ96, 120, 216, 240, 336, 360P	0 lb
RXYQ72, 168, 192, 264, 288, 312P	1.1 lb
RXYQ144PBYD	2.2 lb
RXYQ144PBTJ	7.9 lb

+

REFRIGERANT AMOUNT FOR EXCEEDING CONNECTION CAPACITY OF INDOOR UNIT

INDOOR CONNECTION CAPACITY	MODEL NAME RXYQ72 ~312P	MODEL NAME RXYQ336 · 360P
MORE THAN 100% 120% OR LESS	1.1 lb	
MORE THAN 120% 130% OR LESS	1.1 lb	2.2 lb

3. RECORD OF INSTALLATION DATE DA 29 · MO 07 · YR 2011

- Enter the piping lengths accurately for each liquid line diameter and multiply the charge factor
- Add the refrigerant amount for the model of the unit or system you are commissioning
- Add the refrigerant amount for the connection ratio your system has – If 100% or less, no add'l refrigerant amount required
- When charging the system manually, write in the total Additional Refrigerant Charge
- If *Auto Charge* COOL mode is used, write in the charge amount taken after *Auto Charge* is complete
- Write down the system commissioning date

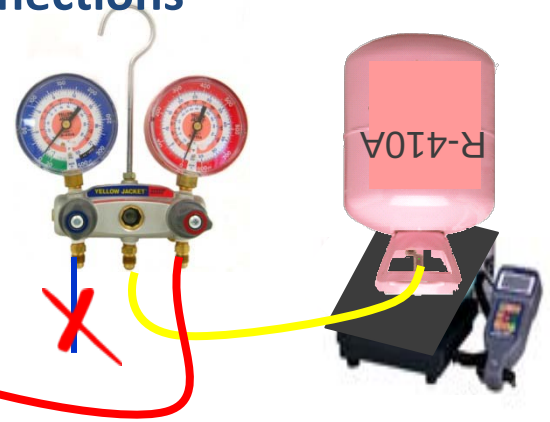
VRVIII Pre-Commissioning Check #4 Cont.

Manual Refrigerant Charging Connections

2 – Stop Valves

3 – Stop Valves

5/16” Liquid Port



4– Stop Valves

- Low side manifold hose is not used for this procedure
- The high side manifold hose should still be connected to the Liquid service port, from evacuation
- Break the final vacuum by weighing in the entire calculated charge or as much as possible into the system
  - If there is not enough vacuum to draw in the calculated charge, use the “Additional Refrigerant Charge Mode” to complete
- When using *Auto Charge*, weigh in at least 50% of the calculated charge (additional charge) to break the vacuum through the Liquid port

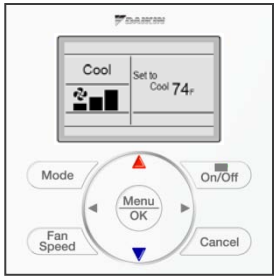
Verify Power Supply Voltage

- Before energizing any of the system components, use a Voltmeter to verify that the line voltage power supply to the Condenser(s) and all Indoor Units corresponds to the equipment nameplate
  - 208/230vac 1PH & 3PH = 187 – 253vac
  - 460vac 3PH = 416 – 508vac
- Verify all 3 phase legs to each condenser are in balance within 2%
  - A **"U1"** error code will be displayed and no system operation if the phase imbalance is 10% or higher – dropped phase – reverse phase

System Commissioning

Commissioning Steps

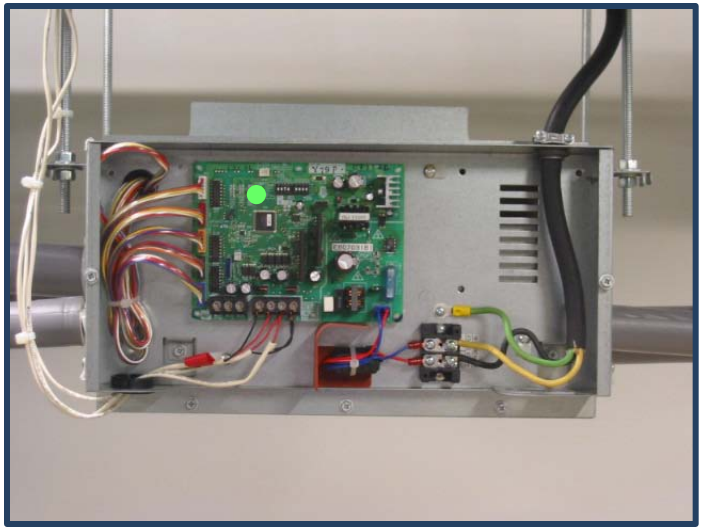
Power up Indoor Units and Branch Selector Boxes



- Power up all Indoor Units and Branch Selector Boxes (heat recover only) First
  - Verify the Fan Coil and Branch Selector box control PCB's indicate normal operation with the Green flashing status LED on the board
  - Verify all wired Remote Controllers have a display but the status LED's (Green or Red) are OFF

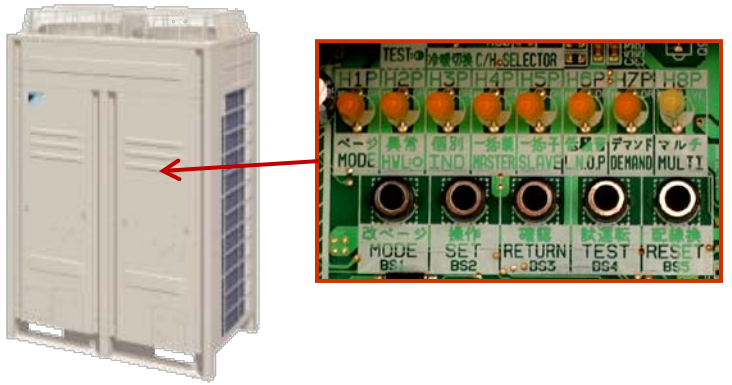
Fan Coil Control PCB

Branch Selector Box PCB



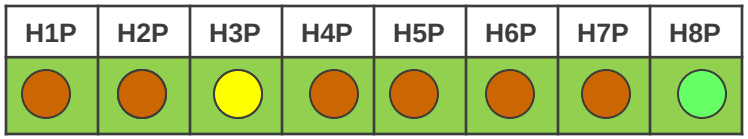
Condenser Power Up

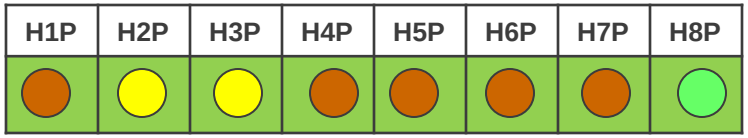
Power up condenser(s) for a period of 6 hours to insure crankcase heaters eliminate any liquid refrigerant in compressors prior to commissioning. During this time, all of the Remote Controllers can be setup. Indoor fan coils must be powered up to setup Remote Controllers.



Initialization

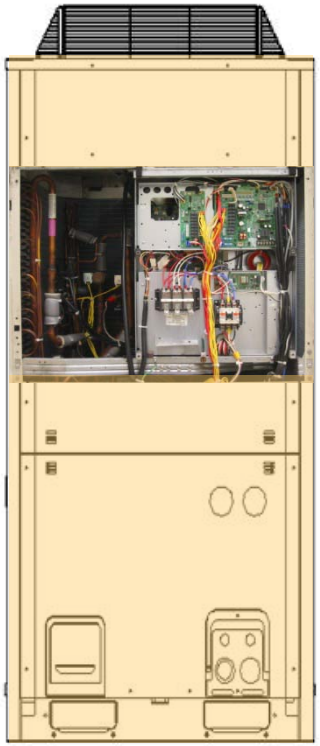
- Upon power up of the condenser, the outdoor PCB will perform a 12 to 20 minute **Initialization operation** where it assigns addresses to the outdoor unit(s) and all indoor units
- This mode is identified by **H2P** flashing and **H3P** solid
- Near completion of **Initialization,** both the **H2P** and **H3P** LED's will be on solid (this is normal during this step)
- When the **H2P** light goes out and only **H3P** remains on solid, this will indicate the **Initialization** operation has successfully completed
- If **H2P** will not go out after 30 minutes or more, there is an error in the system
  - Turn one of the Remote Controllers to ON and verify the error code and resolve the issue
  - Cycle power on Condenser which will restart **Initialization** mode again





Condenser Power Up Error

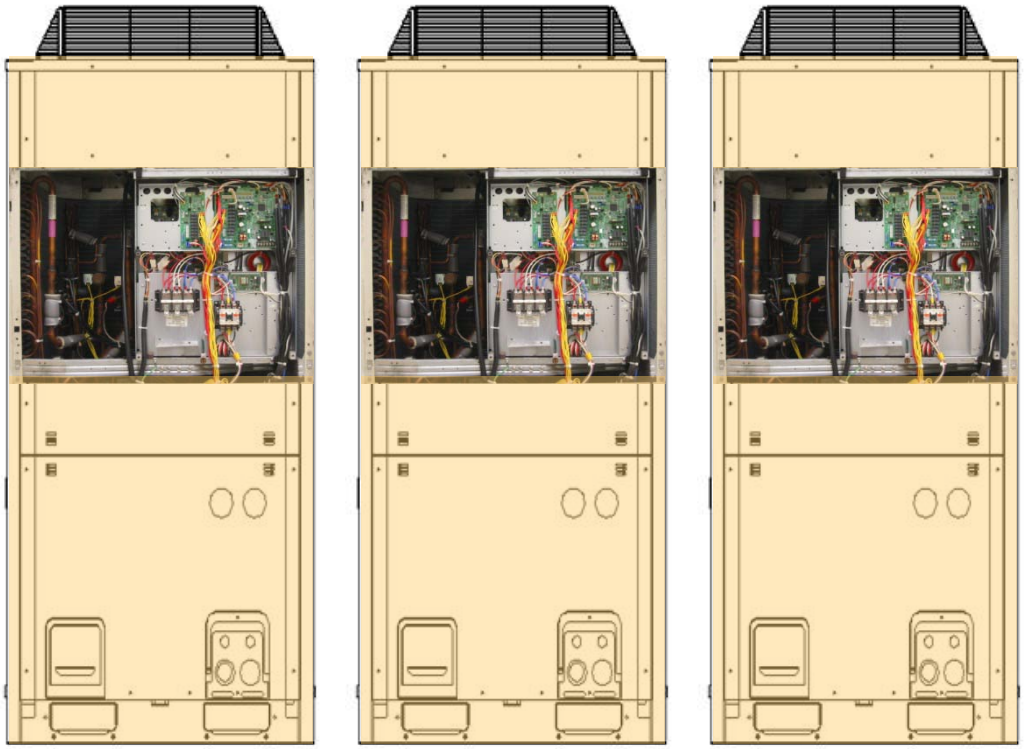
- When on power-up of a Single module condenser an immediate **“U1”** fault code is indicated, the main causes are Reversed Phase or Open Phase
- With a **“U1”** fault code, **Initialization** operation will not complete.
- To correct a Reversed Phase condition on a single module, reverse the wire connections on terminals **L2** and **L3**
- Restart condenser



NOTE: The **“U1”** fault code refers to Power Supply Reverse Phase – Open Phase – Phase out of Balance

Verify "U1" 3 Phase Error – Manifolded Systems

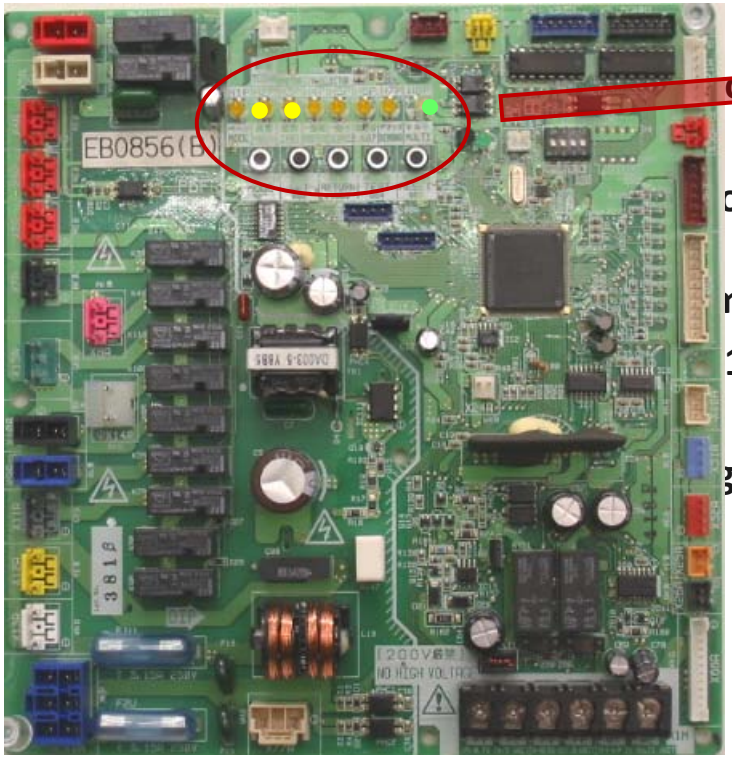
- When on power-up of a Manifolded System (Dual or Triple modules) an immediate "U1" fault code is indicated, Monitor Mode 14 on the Master PCB can be used to determine the condenser module(s) at fault (refer to Service Manual SiUS341012_A, pages 329-332 for Monitor mode.
- With a "U1" fault code, Initialization operation will not complete.
- Status LED on all Remote Controllers will be flashing with "U1" code indicated on displays



NOTE: The **"U1"** fault code refers to Power Supply Reverse Phase – Open Phase – Phase out of Balance

Verify "U1" 3 Phase Error – Manifolded Systems
Monitor Mode 14 to determine condenser(s) with "U1" fault

Master Control PCB - A1P



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- node)
- 1 first
- git of

H1P	H2P	H3P	H4P	H5P	H6P	H7P	H8P
●	○	○	●	●	●	●	○

NOTE: H2P & H3P solid indicates that the system is in a fault. Use Monitor Mode set 14 times to locate problem condenser in a manifolded condenser system.

H1P	H2P	H3P	H4P	H5P	H6P	H7P	H8P
○	○	○	●	●	●	●	○

H1P	H2P	H3P	H4P	H5P	H6P	H7P	H8P
○	●	●	○	○	○	●	○

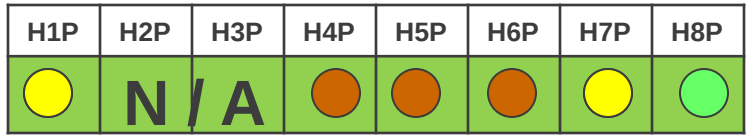
H1P	H2P	H3P	H4P	H5P	H6P	H7P	H8P
○	○	●	○	●	●	○	○

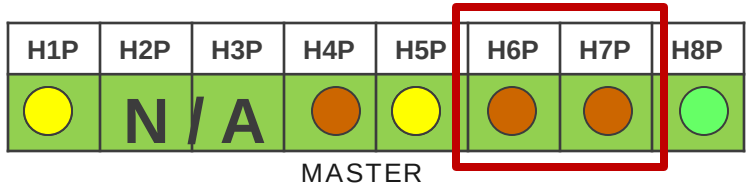
H1P	H2P	H3P	H4P	H5P	H6P	H7P	H8P
○	N / A		●	●	●	○	○

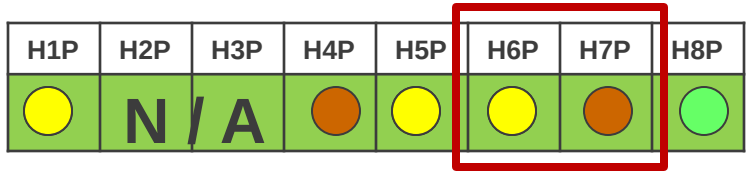
Verify "U1" 3 Phase Error – Manifolded Systems
Monitor Mode 14 to determine condenser(s) with fault continued

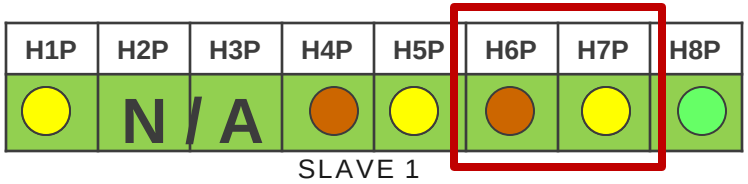
- **Press "SET" button once for Confirmation 3 to display error location (Does not apply to this fault code, move to Confirmation 4.)**

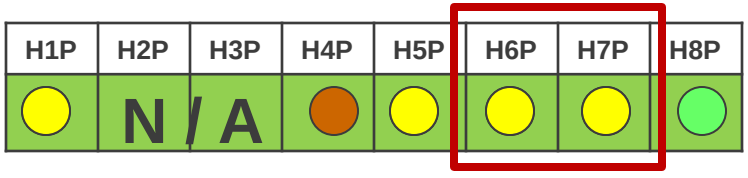
- **Press "SET" button once for Confirmation 4. This will display which Condenser(s) have phased reversed. Refer to lights H6P + H7P to determine Master/Slave1/Slave 2 or ALL are phased reversed. (refer to Service Manual SiUS341012_A, page 332)**





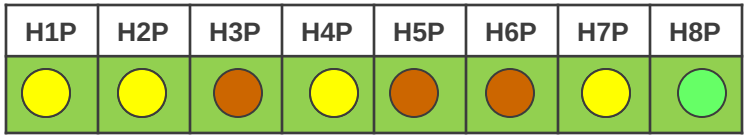


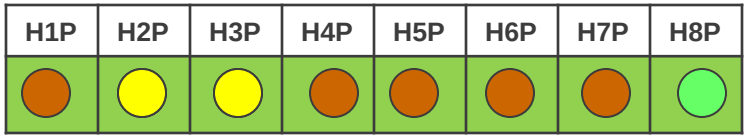




Verify “U1” 3 Phase Error – Manifolded Systems Continued

- Press “RETURN” button once to return to Monitor Mode initial status
- Press “MODE” button to return to the original power up display with error.
- Power down the condensers and correct the power issues
- Restart all Condensers and Initialization mode will start with no “U1” errors

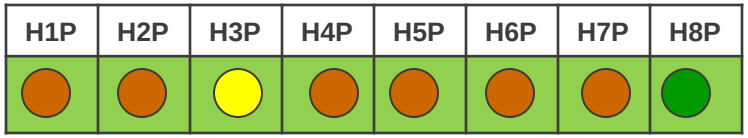




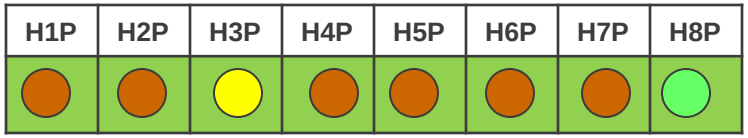
VRVIII System Commissioning – Step # 12

Condenser Control PC Board Status LED Sequence

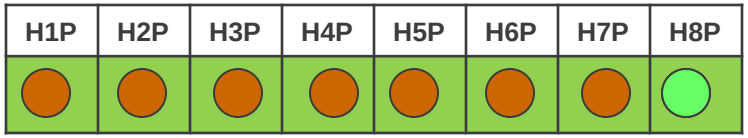
- Upon completion of the **Initialization** operation, the LED sequence on the single module HP/HR condenser will have a Solid H3P
- Upon completion of Initialization on a single module Heat Recovery REYQ, manifolded Heat Pump RXYQ or Heat Recovery REMQ modules, the following LED sequences will appear on the control PCBs
  - The Master PCB is connected to the indoor units on **F1F2 IN, HP model. On HR, F1F2 is connected to BS box F1F2 OUT.**
  - Master PCB indicates a solid H3P LED for normal status.



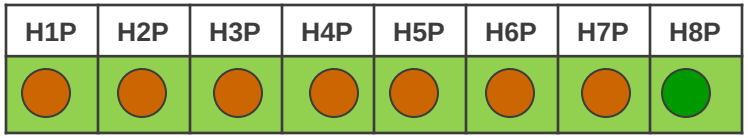
Single Module Condenser



HR Single Module or HP/HR Manifolded Module Master Condenser



HP/HR Manifolded Module 1 Condenser — Slave

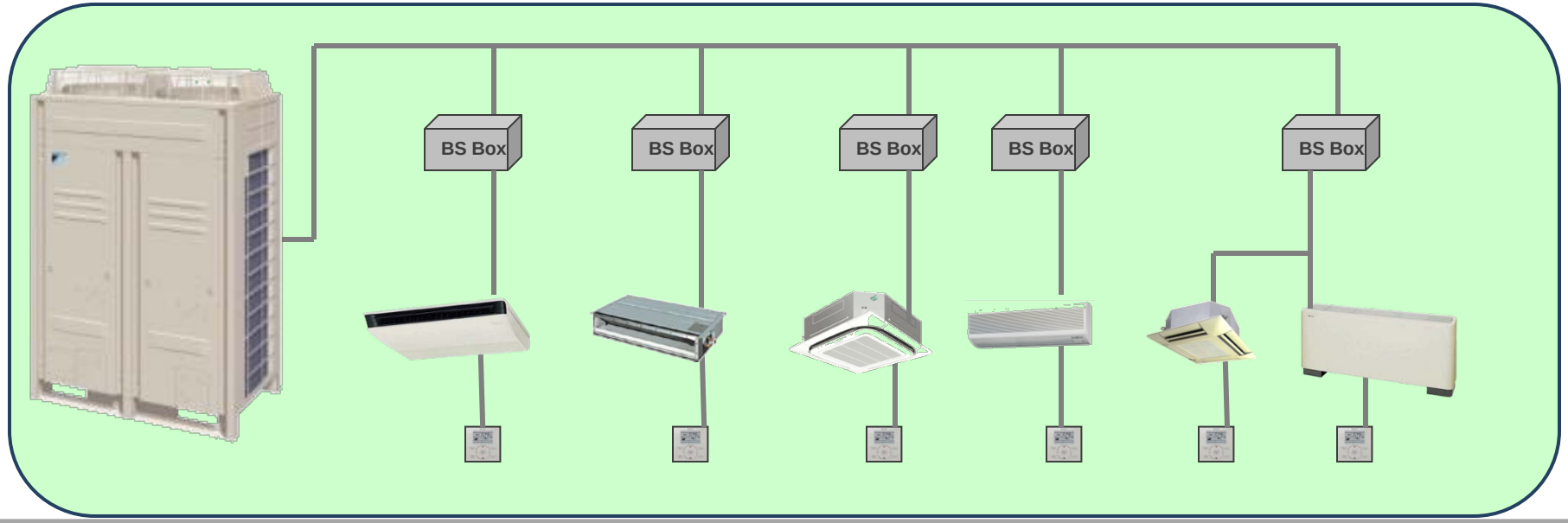


HP/HR Manifolded Module 2 Condenser — Slave

VRVIII System Commissioning – Step # 13

Verify System Control Communications

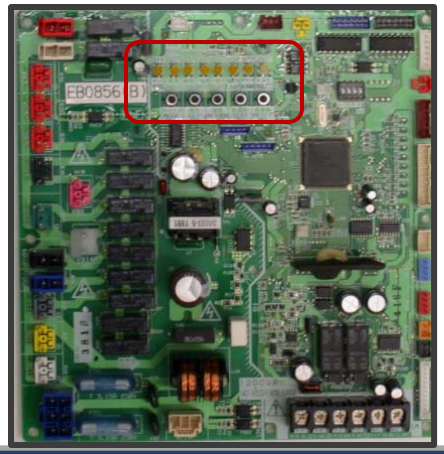
- When the **Initialization** operation has been completed the system must be checked to insure that all Condensers in a Manifolded system and all indoor units in the system are addressed and communicating.
- All system indoor and outdoor units must communicate with the control system
- Using Monitor Mode in the Control PCB of the Outdoor Condenser, the Fan Coils and Branch Selector boxes in the system can be counted, which verifies communication
  - On a manifolded system, the condensers and indoor units are counted from the Control PCB on the Master Condenser



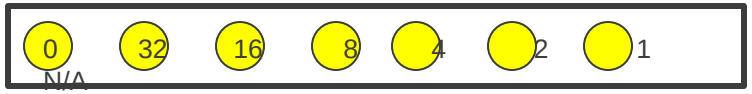
VRVIII System Commissioning – Step # 13

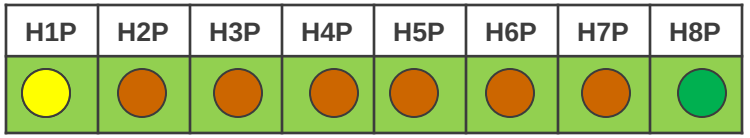
Binary Code Key for Counting Outdoor & Indoor Units (Example)

- **Using the Condenser Master PCB status LED's, a binary number is applied to each LED: H1P through H7P as read from right to left**
- **When in the "Monitor Mode 1" or "Service Mode 2", the LEDs will display, using binary numbers, the number of times the "SET" button is pressed**
- **When counting indoor and outdoor units is enabled, the flashing LED's represent the number of units recognized in the control system**
- **When in "Service Mode 2", the LEDs stay solid when pressing the "SET" button**

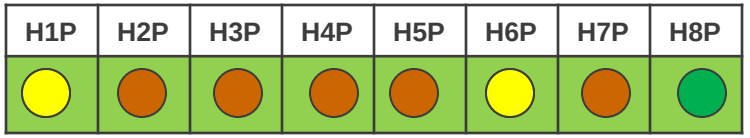


Example of binary value indications

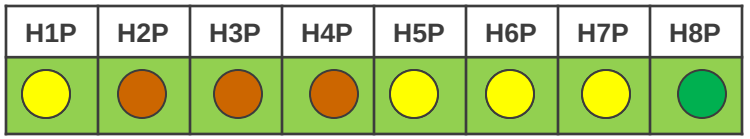




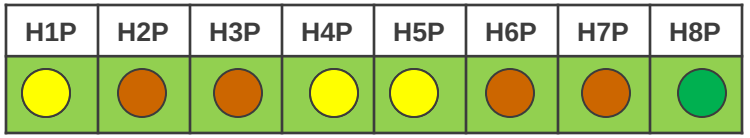
Value of "0"



Value of "2"



Value of "7"



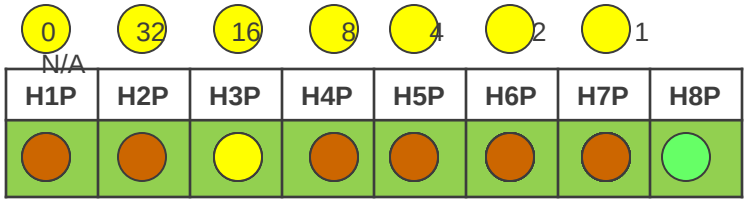
Value of "12"

VRVIII System Commissioning – Step # 13

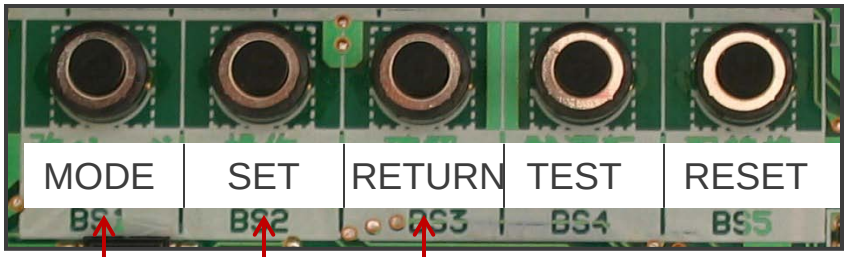
Counting Indoor Fan Coils

- System Monitor Mode is accessed by pressing the "**MODE**" button one time – H1P flashing
- The number of times the "**SET**" button is pressed will be indicated by the corresponding binary numbers
- H1P to H7P LED status is continuously updated when any button is pressed

Binary number for each LED



The number of Indoor Fan Coils counted will flash in binary code on the H1P to H7P LED's



- Press **"MODE"** 1 time
- Press **"SET"** 5 times
- Press **"RETURN"** & count up the LED's
- Press **"MODE"** one time to return to normal status : H3P solid

VRVIII System Commissioning – Service Tip

Fan Coil – Forced Fan On Mode

- A very effective procedure to help troubleshoot missing indoor Fan Coil units is to force the fan coil blowers to “ON”. By forcing the fans on, you will see what indoor units are communicating with that particular system.
- In jobs where you have multiple systems being installed, during the installation occasionally one indoor unit will get wired to the wrong outdoor unit. Using the “Forced Fan On” procedure, you will quickly see what units are connected by which fans turn on
- Using the Forced Fan ON operation, enables the control system to put the Fan Coil fan motor in High fan speed
- The fan coils that do not respond by switching on the fan motor are the units not communicating with the control system
- Use the following page to put the fan coil fan motors into this mode

VRVIII System Commissioning – Service Tip

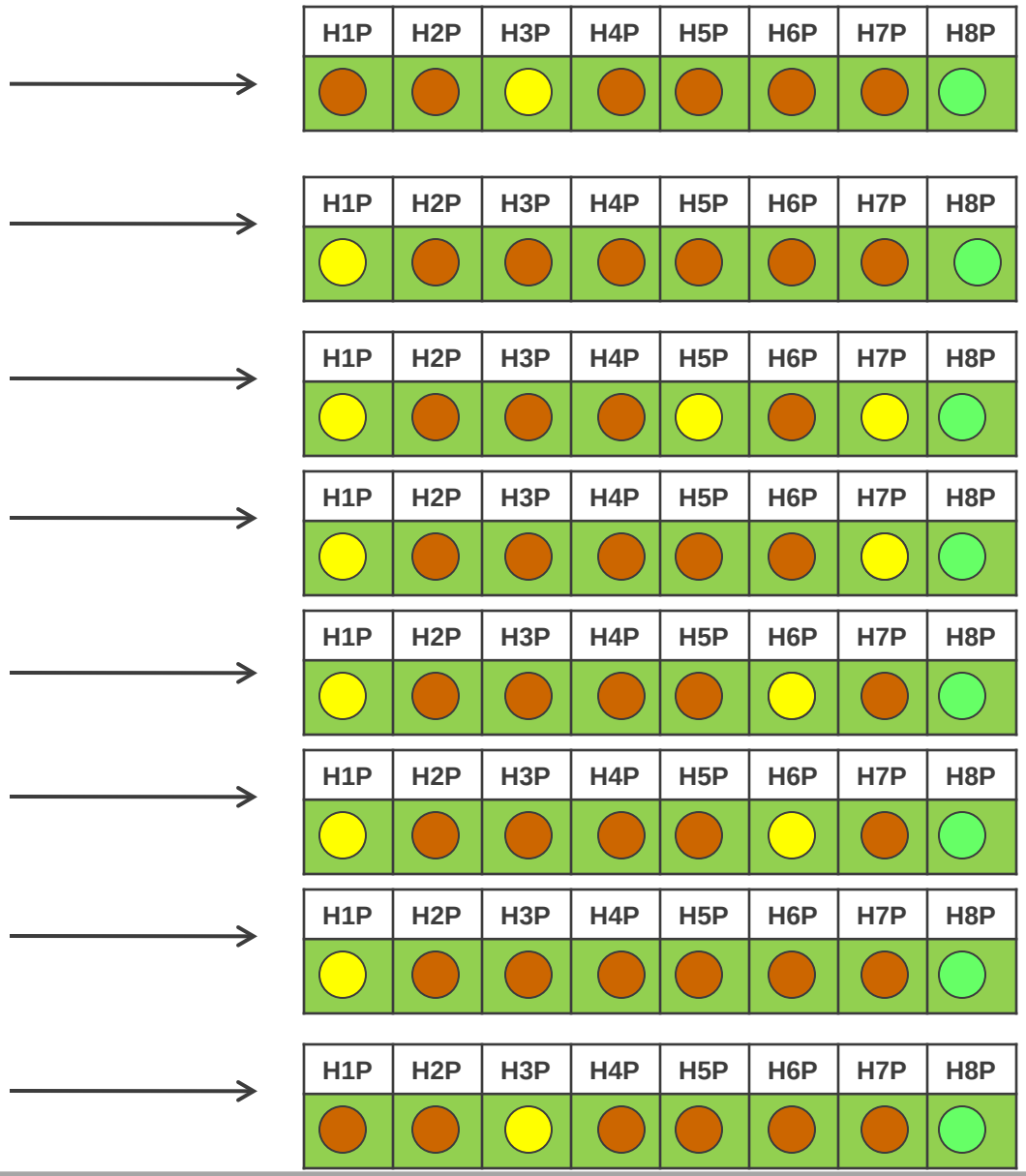
Forced Fan ON Procedure

- At start - LED status Normal – H3P solid

SERVICE MODE 2

- Press and Hold the **"MODE"** button for approx 5 seconds until you see the LEDs light status change from H3P ON to H1P ON
- Press the **"SET"** button 5 times
- Press the **"RETURN"** button once, H7P will come on flashing
- Press the **"SET"** button once to turn operation ON, H6P will come on flashing
- Press the **"RETURN"** button once to Lock the setting, H6P will be on solid
- Press the **"RETURN"** button once to Activate the setting, H6P will turn off

  STOP - Check all the fan coils for the fan motor(s) that are not running
- Press the **"MODE"** button once to return to Normal mode, H3P will come on solid

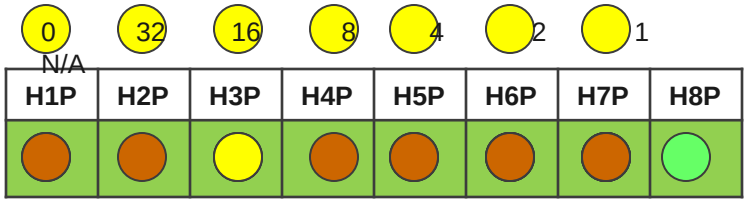


VRVIII System Commissioning – Step #13

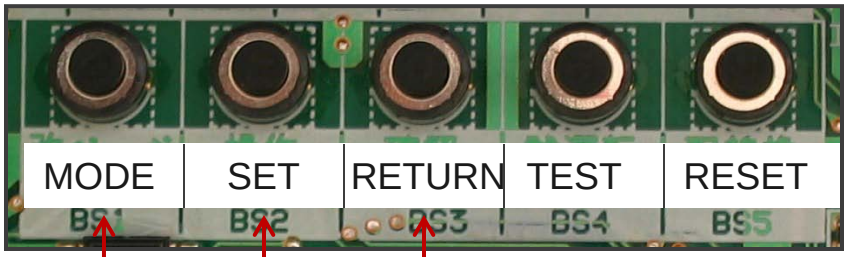
Counting Branch Selector Boxes

- System Monitor Mode is accessed by pressing the **MODE** button one time – **H1P** flashing
- The number of times the **SET** button is pressed will be indicated by the corresponding binary numbers
- **H1P** to **H7P** LED status is continuously updated when any button is pressed

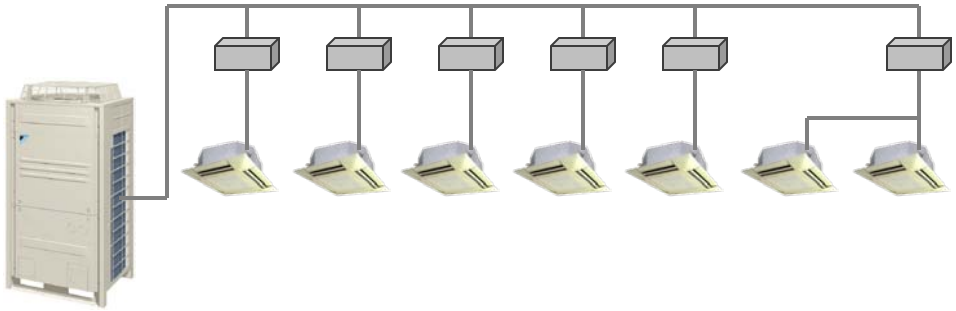
Binary number for each LED



The number of BS Boxes counted will flash in binary code on the H1P to H7P LEDs



- Press **“MODE”** 1 time
- Press **“SET”** 6 times
- Press **“RETURN”** & count up the LED’s
- Press **“MODE”** one time to return to normal status : H3P solid



VRVIII System Commissioning – Service Tip

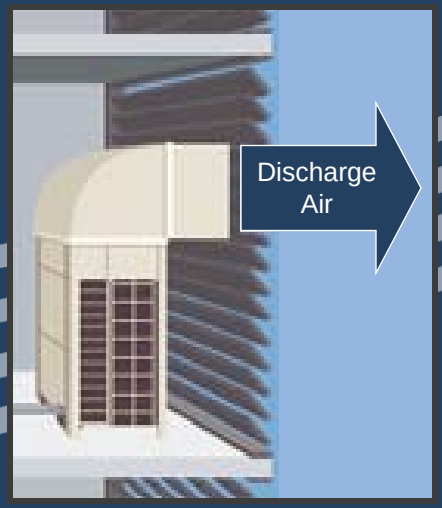
Indoor Fan Coil & BS Box - Communication Troubleshooting Tips

- Verify correct power supply voltage at fan coil
  - Green PCB status LED blinking
- Verify that all Remote Controllers have a display. This will also tell you that power is applied to the indoor units
- If there are Remote Controllers controlling more than one indoor unit, you must check the green LED on each PCB on the fan coils and branch selector boxes to see if it is flashing green. This will tell you that power is applied to the Indoor unit or BS box. Another method is to use your meter to check for voltage
- Turn on each Remote Controller one at a time. When you turn them on, note the error code if any appears on the display
- After you have turned them all on, you should see a pattern of the error codes. The pattern should show a few of the controllers with different error codes. The remote(s) with a different code is a good place to start checking your control wiring
- Check the control wiring to insure the conductors are connected to the correct terminals and 16vdc is measured
- On installations which have *VRVIII* Heat Pump and Heat Recovery systems, Branch Selector boxes should be counted on the Heat Pump systems to verify correct system control wiring – no crossover
- After the issues are corrected, recycle power to the outdoor unit (Initialization mode starts) and press the **"RESET"** button once on the Control PCB. This will enable the indoor unit or BS box to have an address assigned.

System Commissioning

Selected Condenser Field Setting Commissioning Step #14

Outdoor Fan
High Static



Required for interior condenser installations where the discharge air is ducted to outside of the building

VRVIII System Commissioning – Step #14

Condenser "Fan High Static Setting"

- **START** - Normal Status

- Press and HOLD the **"MODE"** button (Service Mode 2) until H1P light is Solid

- Press the **"SET"** button 18 times
  - LEDs will indicate binary number for every press of the "SET" button 0+16+2

- Press the **"RETURN"** button once H7P will come on flashing.

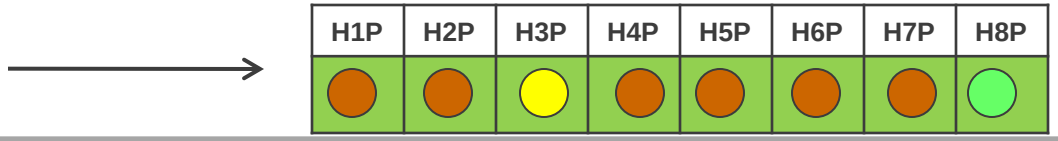
- Press the **"SET"** button once to turn ON, H6P will come on flashing

- Press the **"RETURN"** button once to lock on, H6P will go solid

- Press the **"RETURN"** button once to activate the High Static Fan setting, all yellow lights will be ON

  Outdoor Fans now operating at .32" wg.

- Press the **"MODE"** button to return to Normal mode, H3P will be on solid



System Commissioning

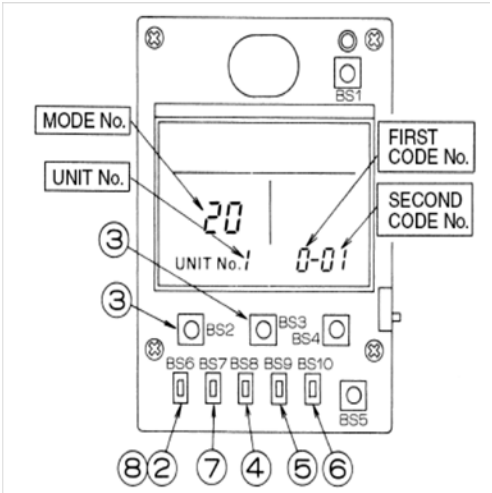
Selected Indoor Unit Field Settings Commissioning Step #14

VRVIII System Commissioning – Step #14

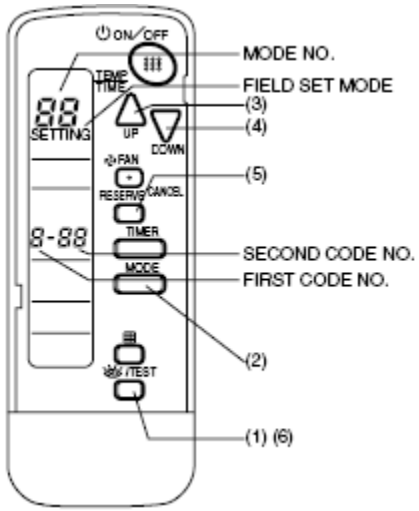
Fan Coil Field Settings

- System communications is now verified and operational
- At this point, all ductwork has been verified to be connected including all air filters installed
- Fan Coil Field Settings related to airflow static pressure adjustments must now be programmed before "Check Operation" is enabled and *Auto Charge,* if used. This is to insure maximum system performance and efficiency, and accurate system refrigerant charging when *Auto Charge* is used
  - Ducted fan coils must have static pressure adjusted or programmed if needed
  - FXMQ-P fan coils will need static pressure adjusted
  - Ceiling Cassette fan coils must be programmed for Supply Air distribution and ceiling height to properly set fan speed if needed
- For Field Setting listings, refer to Fan Coil and Remote Controller Installation Manuals

Navigation Remote



Simplified



Wireless

VRVIII System Commissioning – Step #14

Fan Coil Field Settings

- Field settings provide unique features and functions to be programmed into the control system for selected fan coil(s) connected to a remote controller.
- Only those program codes that apply to the connected fan coil(s) will appear in the Field Settings code display on the Remote Controller.
- There are two Modes for each setting; “Group” & “Individual”
- The first set of 2-digit numbers refers to **Group** and **Individual**, Group is the first number & Individual is in the parenthesis
- **“Group ##”** is used if there is only one indoor unit per Remote Control or the setting you chose is intended for all indoor units being controlled by the connected Remote Controller
- **“Individual (##)”** is used when there is more than one indoor unit being controlled by one Remote Control and the settings being programmed are intended for one of the indoor units in the group

Mode No. (Note 1)	First Code No.	Description	Second Code No. (Note 2) (Cells in bold are factory default settings)			
			01	02	03	04
10(20)	2	Priority of thermistor sensors for space temperature control	The return air thermistor is primary and the remote controller thermistor Is secondary.	Only the return air thermistor will be utilized.	Only the remote controller thermistor will be utilized.	--
	5	Room temperature value reported to multizone controllers	Return air thermistor	Thermistor designated by 10-2 above **(Note 3)**	--	--
	6	The remote controller thermistor is used in Remote Controller Group	No	Yes	--	--
12(22)	0	KRP1B71 X1-X2 status output	Indoor unit Thermo-On/Off status	--	Indoor unit Operation On/Off status	Indoor unit Alarm status
	1	Indoor unit T1-T2 input	Forced Off Closed Contact-Indoor unit is forced off and Central Control icon is displayed. Unit cannot be turned on manually. Operation can be overridden by central control. Open Contact-Indoor unit can resume normal operation. Unit must be turned on manually or by central control.	On/Off Closed Contact-Indoor unit is turned on. Open Contact-Indoor unit is turned off. Unit responds to last command, i.e., unit can be turned on manually or by central control after circuit has opened. Operation is prohibited when remote controller On/Off control is restricted by a multizone controller.	External Protection Device Closed contact-Unit shall resume normal operation. Open contact-Unit shall shut down and generate an A0 error.	
	2	Thermo-On/Off deadband **(Note 4)**	2F (1C)	1F (0.5C)	--	--
	3	Fan Speed in Heating Thermo-Off	LL	User set	Off	--
	6	Fan Speed in Cooling Thermo-Off	LL	User set	Off	--
	8	Return air sensor offset	2C	None (for remote sensor)		

Fan Coil Field Settings

- Field Setting codes are comprised of 3 segments: [Example 12 -1- 03]
  - **Mode No.** – Program Setting for 1 fan coil or Group within Setting Contents
  - **First Code No.** - Setting Contents
  - **Second Code No.** - Specific Operation or Setting
- Specific Field Setting codes for a particular fan coil can be found in the Fan Coil Installation Manual or Service Manual
  - Any Field Setting codes that do not apply to the particular fan coil will not appear or be selectable
- Field Settings are programmed to permanent memory in the Fan Coil(s) Control PCB

EXAMPLE: Field Setting for assigning the room temperature sensor

Mode No. (Note 1)	First Code No.	Description	Second Code No. (Note 2) (Cells in bold are factory default settings) 01	02	03	04
10(20)	2	Priority of thermistor sensors for space temperature control	The return air thermistor is primary and the remote controller thermistor Is secondary.	Only the return air thermistor will be utilized.	Only the remote controller thermistor will be utilized.	--
	5	Room temperature value reported to multizone controllers	Return air thermistor	Thermistor designated by 10-2 above **(Note 3)**	--	--
	6	The remote controller thermistor is used in Remote Controller Group	No	Yes	--	--

VRVIII System Commissioning – Step #14

Fan Coil Field Settings – FXMQ_P Auto Static Adjust

- Enter the Field Setting into the Remote Controller
  - **11(21) 7-03 Start Auto Adjust**
- Save Field Setting and exit to main display
- Select FAN mode
- Place Remote Controller into the ON operation with solid status LED
- Fan Coil will go into the Auto Adjust mode and run the blower for 8 to 10 mins.
- On completion of the operation, fan will shut down and status LED on the Remote Controller will go Off.
- After unit shuts down check to see that Field Setting 11(21) 7-03 has changed to 11(21) 7-02, this indicates successful completion of Auto Airflow Adjustment

MODE NO.	FIRST CODE NO.	Setting contents
11 (**21**)	7	Airflow adjustment
SECOND CODE NO.		
01	02	03
OFF	Completion of airflow adjustment	Start of airflow adjustment

NOTE: If you choose to manually set static pressure the Field Setting for Auto Adjust must be OFF. Change code to: 11(21) 7-01

VRVIII System Commissioning – Step #14

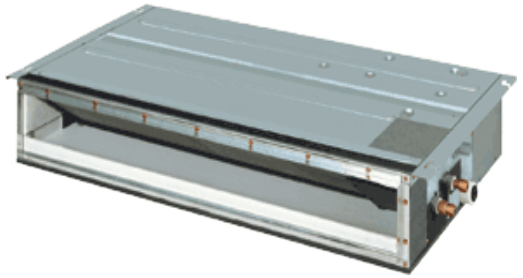
Fan Coil Field Settings – FXMQ_P Manual Static Pressure Adjust

- Specific static pressure can be programmed based on the static pressure codes provided for the specific FXMQ_P capacity model
  - Static pressure codes are listed in the Installation Manual
  - Codes which do not apply to a specific capacity model are not selectable
- Field Setting Code: **13(23) 06- ##**
- "Auto Adjust" must be OFF 11(21)7-01

External Static Pressure	MODE NO.	FIRST CODE NO.	SECOND CODE NO.
0.12 inWG (*1)	13 (23)	06	01
0.20 inWG			02
0.24 inWG			03
0.28 inWG			04
0.32 inWG			05
0.36 inWG			06
0.40 inWG			07
0.44 inWG (*2)			08
0.48 inWG (*2)			09
0.52 inWG (*2)			10
0.56 inWG (*2)			11
0.60 inWG (*2)			12
0.64 inWG (*2)			13
0.72 inWG (*2)			14
0.80 inWG (*2)			15

Fan Coil Field Settings – FXDQ Static Pressure Change

- To change static from “Standard” to “High”, a field setting must be programmed at the remote controller
- Change Field Setting **13(23) 5 – <u>01</u>** to **<u>02</u>**
- This static pressure change to HIGH is recommended for all FXDQ ducted applications



Mode No. Note 2	Setting Switch No.	Setting Contents	Second Code No.(Note 3)			
			01	02	03	04
	0	Setting of normal air flow	N	H	S	—
	1	Selection of air flow direction (Set when a blocking pad kit has been installed.)	F (4 directions)	T (3 directions)	W (2 directions)	—
13(23)	3	Operation of downward flow flap: Yes/No	Equipped	Not equipped	—	—
	4	Field set air flow position setting	Draft prevention	Standard	Ceiling Soiling prevention	—
	5	Setting of static pressure selection	Standard	High static pressure	—	—

VRVIII System Commissioning – Step #14

Fan Coil Field Settings – FXFQ Ceiling Height Setting

- To insure proper air flow delivery, it is recommended to set the actual ceiling height field setting code
- To change setting from “Standard” to “High 1” or “High 2”, a field setting must be programmed at the remote controller
- Go to Field Setting 13(23) 0 - ##
- Second Code: 01 = Standard, 02 = High 1, 03 = High 2

		FXFQ - PVJU		Mode No. Note) 1	FIRST CODE NO.	SECOND CODE NO.
		09 · 12 · 18 · 24 · 30 type	36 · 48 type			
Ceiling height (ft.)	Standard · All round outlet	≤ 8-3/4	≤ 10-1/2	13 (23)	0	01
	High ceiling 1	8-3/4 - 10	10-1/2 - 12			02
	High ceiling 2	10 - 11-1/2	12 - 13-3/4			03

VRVIII System Commissioning – Step #14

Fan Coil Field Settings – FXFQ_P & FXZQ_M7 Air Discharge Settings

- When the 4-way ceiling cassettes require changes to the discharge positions to 2-way or 3-way, a field setting change is required along with the blank-off kit
- To change setting from the factory default of 4-way discharge 13(23) 1-01, the change must be programmed at the remote controller
- Go to Field Setting 13(23) 1, and change the second code:
- Second Code: 02 = 3-way, 03 = 2-way

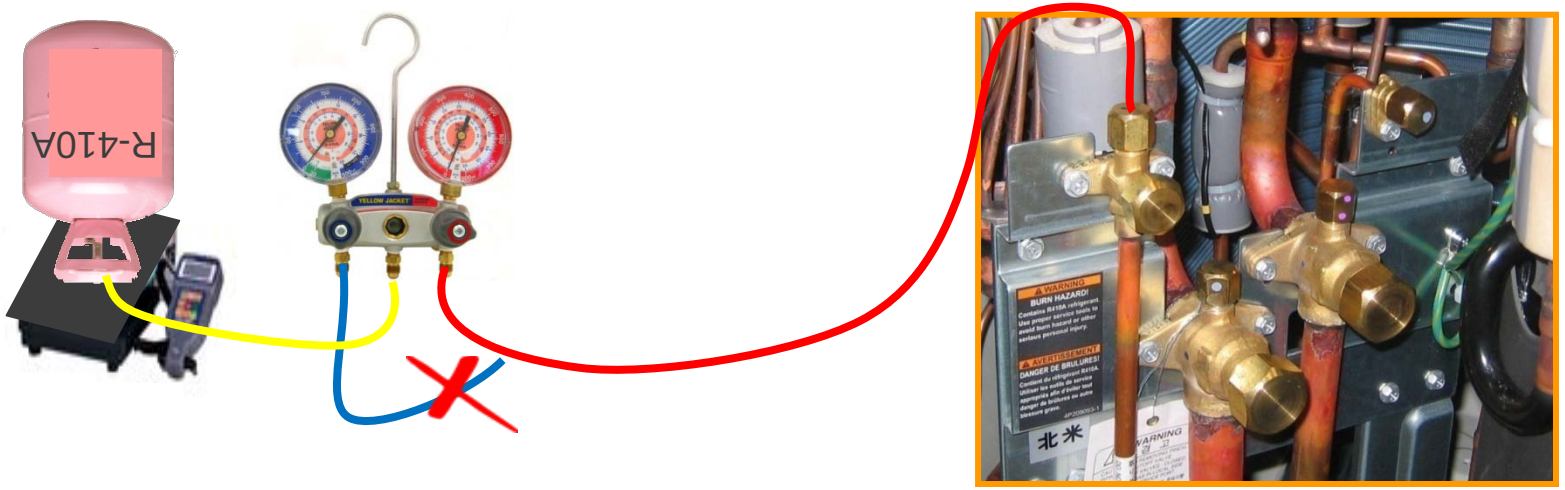
	Mode No.	First Code	Setting Contents	Second Code No.			
				01	02	03	04
	13(23)	1	Selection of airflow direction	F (4 directions)	T (3 directions)	W (2 directions)	-

System Commissioning

Manual System Refrigerant Charging Commissioning Step #15

VRVIII System Commissioning – Step #15

VRVIII Refrigerant Charging – "Additional Refrigerant Charge Mode"

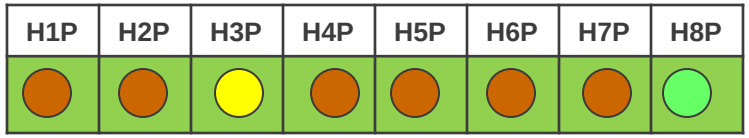


- The "Additional Refrigerant Charge Mode" is used when there is not enough system vacuum from the final evacuation cycle to completely charge the system
- Close the Liquid Stop Valve – Gas Stop Valve(s) are open
- Connect the high side manifold hose to the Liquid service port, and bleed the hose
  - Low side manifold hose is not used for this procedure
  - On manifolded systems connect high side hose to the Master condenser only
  - Refer to the weight of refrigerant taken on the last cycle of the triple evacuation operation
- Initiate the "Additional Refrigerant Charge Mode" at the condenser Control PCB
  - When the total calculated refrigerant charge is taken based on the scale reading, close off the High side gauge
  - Press the **"MODE"** button to terminate the operation
  - Close off the refrigerant bottle valve and remove the hose
  - Open the Liquid Stop Valve

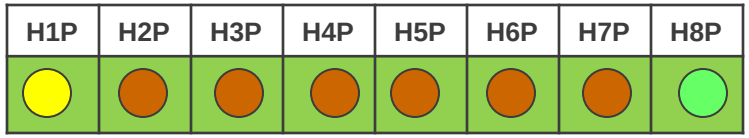
VRVIII System Commissioning

"Additional Refrigerant Charge Mode"

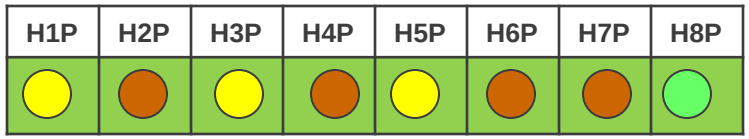
- **START** - Normal Status



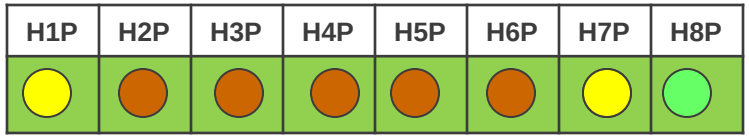
- Press and HOLD **"MODE"** button (Service Mode 2) until H1P goes Solid



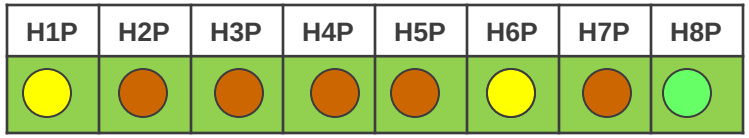
- Press the **"SET"** button 20 times
  - LED will indicate binary number for every press of the **"SET"** button 0+16+4



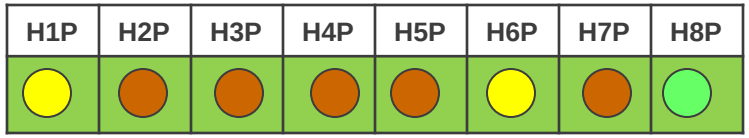
- Press the **"RETURN"** button once, H7P comes on flashing



- Press the **"SET"** button once H6P comes on flashing

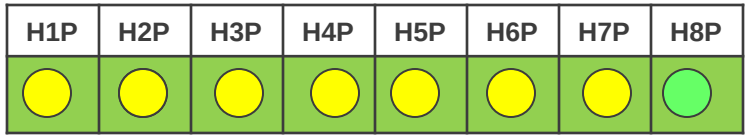


- Press the **"RETURN"** button once, H6P comes on solid



- Press the **"RETURN"** button once to activate the setting, all yellow lights come on

  Close Liq. Stop valve – HP/LP Gas stop valve(s) open. Add Liquid Refrigerant now thru Liq. Service port



- Press the **"MODE"** button to return to Normal mode, H3P comes on solid

System Commissioning

Alternate System Refrigerant Charging “Auto Charge”

Commissioning Step #15

Auto Charge Mode

NOTE: *Auto Charge* cannot be used on systems that include the FXTQ Air Handlers or the FXMQ_MF O.A. Processors

- The *Auto Charge* feature may be used as an alternative means of system refrigerant charging, however certain restrictions and limitations apply
- During *Auto Charge* Mode, the system will automatically select Cooling or Heating mode based on the following temperatures

Outdoor Temp: 32°F DB ~ 109°F DB Indoor Temp: 50°F DB ~ 90°F DB		Cool Mode
Below 32°F OD Temp / 50°F Ind. Temp		Heat Mode

- Cool Mode: *Auto Charge* will charge the system and shut off automatically
- Heat Mode: *Auto Charge* must be manually terminated when the full calculated "Additional Refrigerant Charge" amount is weighed into the system
- LED light combinations will indicate which mode is chosen

NOTE: *Auto Charge* does not display the amount of refrigerant charged

VRVIII Auto Charge Limitations

Connection Ratio Limitations When Using Auto Charge

Connection Ratio limitations are determined by the vertical separation between the Condenser and Indoor Fan Coils and the type of connected fan coils in the system

Example: FXMQ_M with 210ft vertical separation - Condenser above Fan Coil

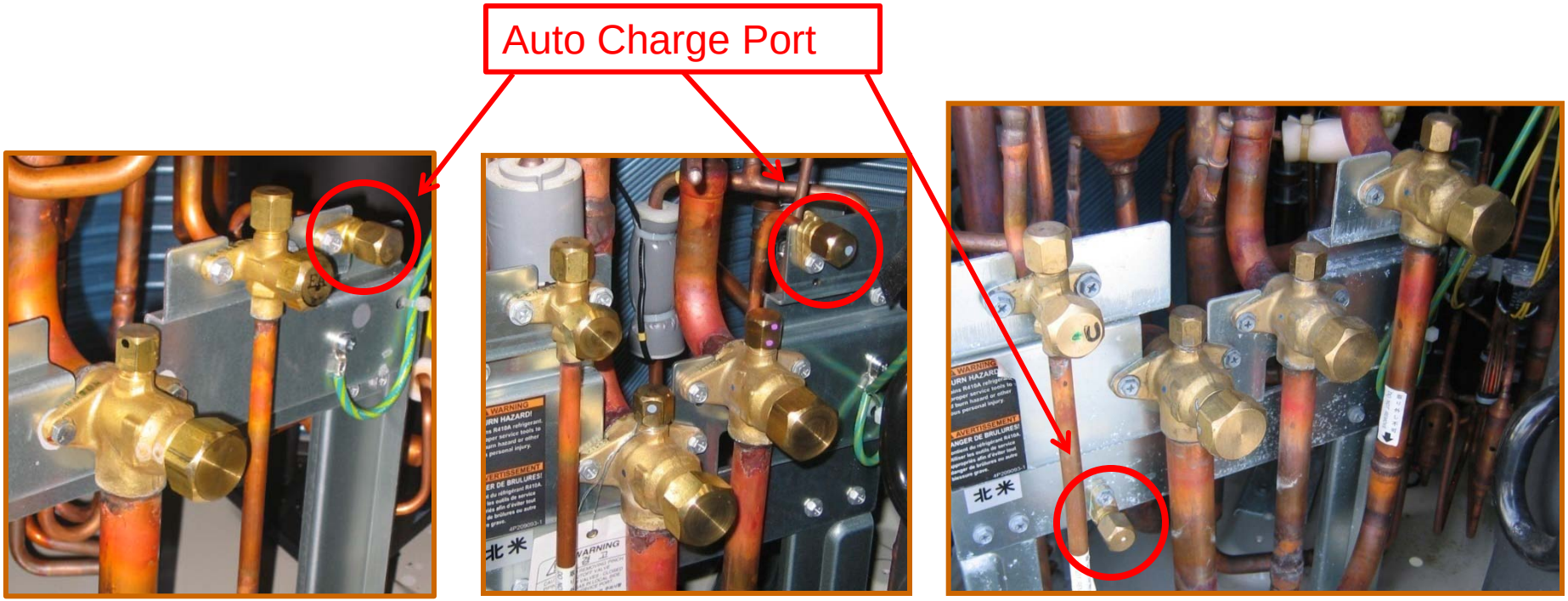
Vertical Separation Connection Ratio between Condenser and Indoor Units

	CU Located Below FC										CU Located Above FC			
	0-133ft		134-200ft		201-216ft		217-266ft		267-295ft		0-164ft		165-295ft	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
FXFQ														
FXMQ_M														
FXHQ FXL/NQ FXZQ	60%	130%	80%	130%	90%	130%	100%	130%	110%	130%	60%	130%	80%	130%
FXDQ FXMQ_P FXAQ	60%	200%	80%	200%	90%	200%	100%	200%	110%	200%	60%	200%	80%	200%

VRVIII System Commissioning – Step #15

Auto Charge Mode – Step 1

- Connect high side gauge hose to the *Auto Charge* port (5/16”) – Bleed hose
- Connect R-410A refrigerant bottle and purge the hoses
- Set refrigerant bottle on a digital scale to charge liquid only
- Install condenser front panels but leave area open to see the PCB status LEDs and access to the programming buttons



RXYQ 2-Stop Valves

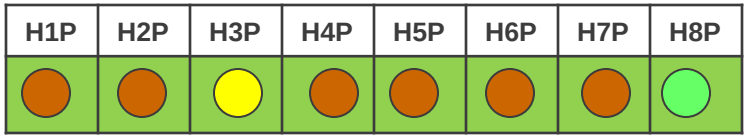
RXYQ-REYQ 3-Stop Valves

REMQ 4-Stop Valves

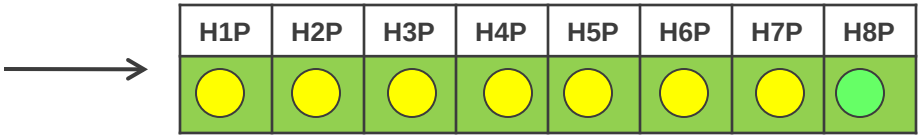
VRVIII System Commissioning – Step #15

Auto Charge Mode – Step 2

- Verify that all Remote Controllers are in the “OFF” mode before starting Auto Charge

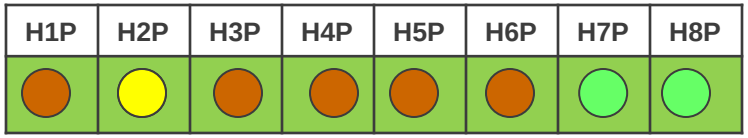


- To begin the *Auto Charge* operation Press the **“TEST”** button once, H1P to H7P go on solid

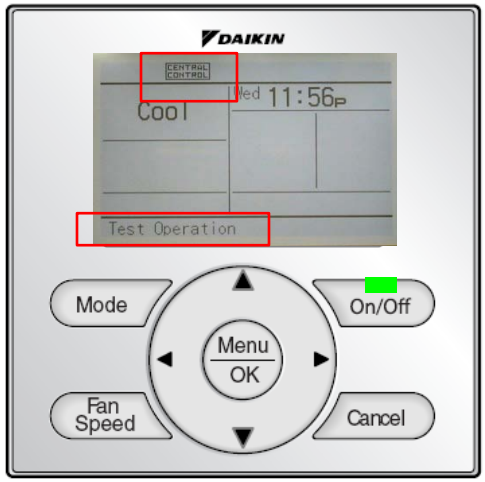


JUDGEMENT Mode

- Press and HOLD the **“TEST”** button for 5 sec. until LEDs change to H2P flashing



- The **NAV** Remote Controllers will indicate CENTRAL CONTROL and “Test Operation” with system status LEDs ON solid
- The **Simplified** remote Controllers will indicate the Central Control symbol with the status LED on solid
- All function buttons are disabled



BRC1E72

BRC2A71

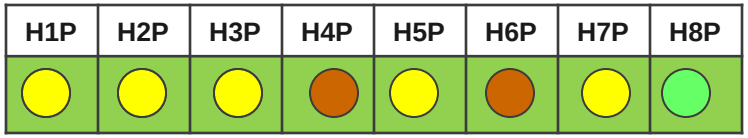
VRVIII System Commissioning – Step #15

Auto Charge Mode – Step 3 "Judgment Mode"

- *Auto Charge* will bring on all indoor & Outdoor fans, then compressor - When Indoor and Outdoor temps are verified to be within the temperature ranges (approx 15 mins.)
- *Auto Charge* will select the **Cool** mode & automatically stop when charging is complete

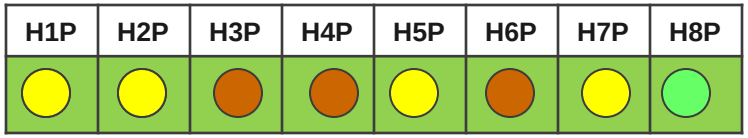
Outdoor Temp 32°F DB – 109°F DB	Indoor Temp 50°F DB – 90°F DB

COOL Mode

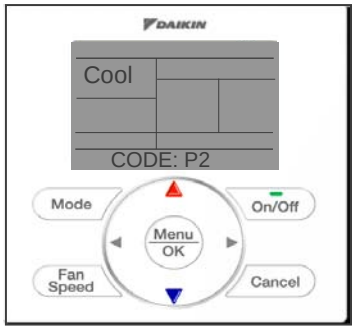


- If the Indoor/Outdoor temperatures are below the stated ranges, **Heat** mode will be selected for manual charging

HEAT Mode



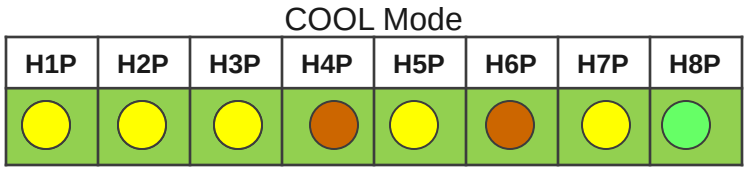
- When either of these LED light patterns appear, the **"TEST"** button must be pressed within 5 mins.
  - **"P2"** error code will appear on Remote Controllers if "TEST" button is not pressed before timeout. Operation will stop and require restarting

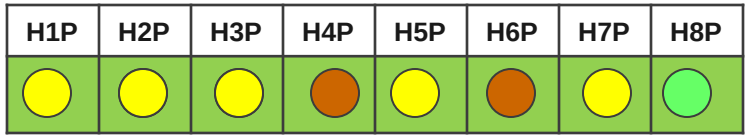


VRVIII System Commissioning – Step #15

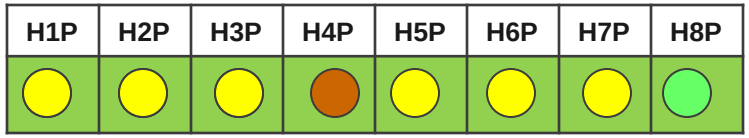
Auto Charge Mode – Step 4 Charging System in Cool Mode

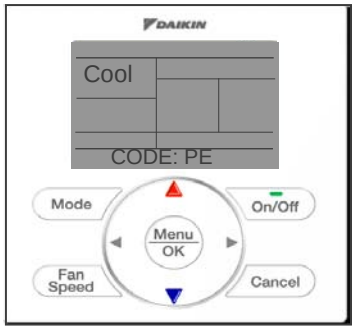
- When LED light pattern indicates charging in the COOL mode, press the **"TEST"** button within 5 min.
- After the **"TEST"** button is pressed, open refrigerant gauge to the *Auto Charge* port to allow liquid refrigerant to flow into the system





- When the LED light pattern changes to this sequence, a "PE" code will appear on the Remote Controllers. Charging is almost complete

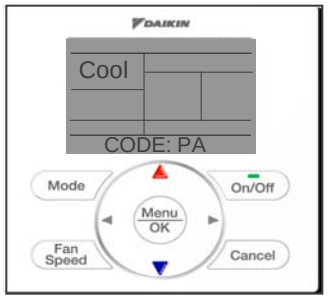




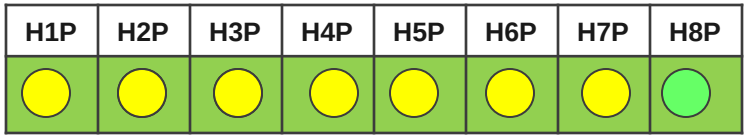
VRVIII System Commissioning – Step #15

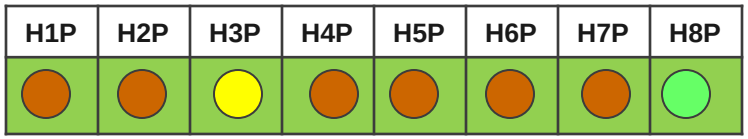
Auto Charge Mode – Step 5 Charging System in Cool Mode

- If during the charging process the refrigerant bottle becomes empty, Auto Charge will go into a 5 min. standby to change bottles and a “PA” code will appear on the Remote Controllers
- If the 5 min time frame lapses before the bottle is replaced, Auto Charge will stop and a “P2” code will appear requiring an operation restart.



- When this LED light pattern appears, charging is complete, *Auto Charge* will stop the refrigerant flow and a “P9” code will appear on the Remote Controllers
- Press the **“MODE”** button to terminate *Auto Charge* operation
  - Close off the refrigerant bottle and manifold gauge: remove charging hose
  - Document the weight of refrigerant charged from the scale





Auto Charge Mode – Step 6 Record the TOTAL Additional Charge

- When Auto Charge is complete, record the amount of the refrigerant charge from the scale including the "Additional Charge" amount in the box on the access panel label
  - It is possible for Auto Charge to draw in a slightly higher or slightly lower amount of refrigerant than the manual calculation
- Enter the system commissioning date

REQUEST FOR THE INDICATION OF SETTING CONTENTS, ADDITIONAL REFRIGERANT CHARGING AMOUNT AND INSTALLATION DATE

AFTER FILLING OUT THE BELOW, PLEASE PUT IT ON THE BACK SIDE OF FRONT PANEL

1. RECORD FOR SETTING CONTENTS
FOR THE SETTING CONTENTS OF Ⓓ~Ⓗ IN THE [SETTING MODE 2], MARK ○ IN THE RIGHT TABLE.

Ⓓ NIGHT - TIME LOW NOISE SETTING	OFF · LEVEL1 · LEVEL2 · LEVEL3
Ⓔ EXTERNAL LOW NOISE LEVEL SETTING	LEVEL1 · LEVEL2 · LEVEL3
Ⓕ DEMAND LEVEL SETTING	LEVEL1 · LEVEL2 · LEVEL3
Ⓖ EXTERNAL LOW NOISE DEMAND SETTING	OFF · ON
Ⓗ HIGH STATIC PRESSURE SETTING	OFF · ON

2. RECORD FOR ADDITIONAL REFRIGERANT CHARGING AMOUNT
MAKE SURE TO RECORD THE ADDITIONAL REFRIGERANT CHARGING AMOUNT.
(IF DO NOT USE AUTOMATIC REFRIGERANT CHARGING, CALCULATE AND CHARGE THE ADDITIONAL REFRIGERANT CHARGING AMOUNT FOLLOWING AS SHOWN ON THE BELOW.)

ADDITIONAL CHARGING AMOUNT: **36.3** lb (ROUND OFF TO ONE DECIMAL PLACE.) =

REFRIGERANT AMOUNT FOR FIELD PIPING

LIQUID PIPE SIZE(in)	REFRIGERANT AMOUNT PER 1ft(lb/ft)	LENGTH OF LIQUID PIPE(ft)	SUB TOTAL
φ7/8	0.249	×	=
φ3/4	0.175	×	=
φ5/8	0.121	× 52	= 6.29
φ1/2	0.081	× 78	= 6.31
φ3/8	0.040	× 173	= 6.92
φ1/4	0.015	× 254	= 3.81

TOTAL **23.33** lb +

HEAT PUMP SYSTEM

MODEL NAME	THE AMOUNT OF REFRIGERANT
RXYQ96, 120, 216, 240, 336, 360P	0 lb
RXYQ72, 168, 192, 264, 288, 312P	1.1 lb
RXYQ144PBYD	2.2 lb
RXYQ144PBTJ	7.9 lb

+

REFRIGERANT AMOUNT FOR EXCEEDING CONNECTION CAPACITY OF INDOOR UNIT

INDOOR CONNECTION CAPACITY	MODEL NAME RXYQ72 ~312P	MODEL NAME RXYQ336 · 360P
MORE THAN 100% 120% OR LESS	1.1 lb	
MORE THAN 120% 130% OR LESS	1.1 lb	2.2 lb

3. RECORD OF INSTALLATION DATE DA 29 · MO 07 · YR 2011

Auto Charge COOL Mode Status Codes

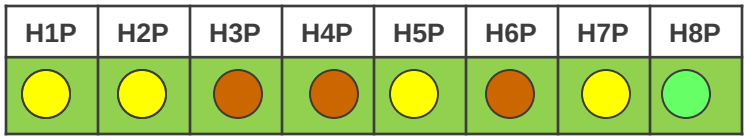
PE	**Charging is almost complete. Get ready to close refrigeration gauges.**	
PA	**The refrigeration tank is empty. Close refrigeration gauges and replace with full tank. Once tank is replaced and hose is purged, open refrigeration gauges again.**	
PH	**Fan does not stop running and the outdoor unit does not stop running.**	
P8	**Close refrigeration gauges and restart the Auto Charge procedure.**	
P2	**Operation is interrupted. Close refrigeration gauges and check below items.** **• Check to see if all stop valves are open.** **• Check that the refrigerant tank is connected and open.** **• Check indoor units for blockage of air inlet and outlet.**	**After correcting the abnormality, restart the Auto Charge from the beginning.**
P9	**Charging is complete. Push "MODE" button (BS1). Close refrigeration gauges and disconnect tank from system.**	

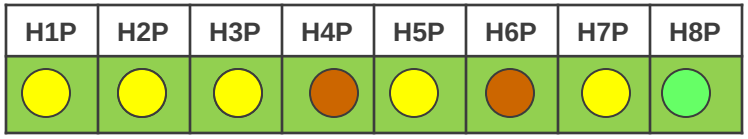
VRVIII System Commissioning – Step #15

Auto Charge –Charging System in Heat Mode

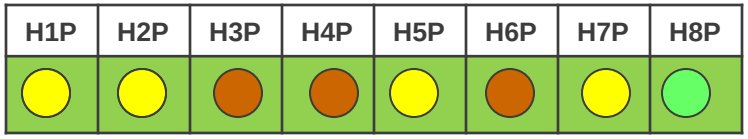
- When LED light pattern indicates charging in the HEAT mode H1P-H2P Flashing - Press the **“TEST”** button within 5 min.
- After the **“TEST”** button is pressed, open refrigerant gauge to the *Auto Charge* port to allow liquid refrigerant to flow into the system

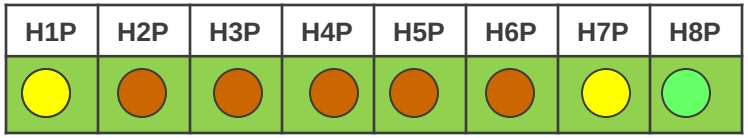
HEAT Mode





- Manually weigh in the balance of the calculated “Additional Refrigerant Charge”
- When the total amount of refrigerant is charged, close off the manifold gauge and refrigerant bottle – Remove hose
- Press the **“RETURN”** button to stop *Auto Charge*

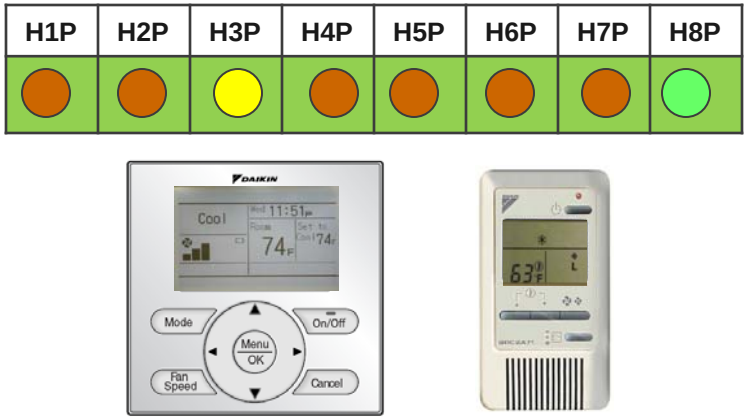




VRVIII System Commissioning – Step #15

Auto Charge Mode –Charging System in HEAT Mode

- Press the **"MODE" button** to terminate *Auto Charge* Heat operation
  - Close off the refrigerant bottle and manifoldld gauge: remove charging hose
  - Document the weight of refrigerant charged from the scale
  - The Remote Controllers return to normal display and OFF



Heat Mode Status Codes

P8	**Close refrigeration gauges and push "TEST" button (BS4) once. Restart the Auto Charge procedure.**
P2	**Operation is interrupted. Close refrigeration gauges and check below items.** • **Check to see if all stop valves are open.** • **Check that the refrigerant tank is connected and open.** • **Check indoor units for blockage of air inlet and outlet.**

System Commissioning

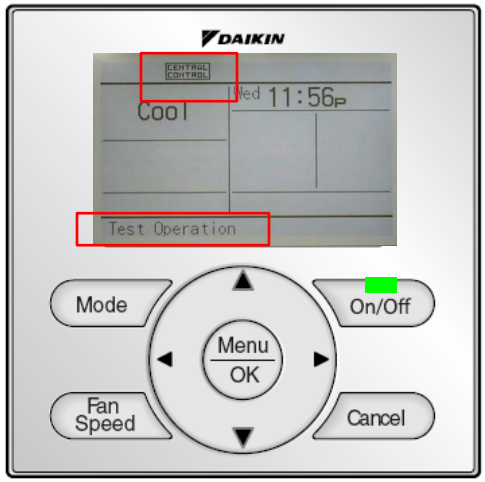
Check Operation Mode Commissioning Step #16

VRVIII System Commissioning – Step #16

Check Operation Mode

- Verify that all Remote Controllers are in the “OFF” mode before starting Check Operation mode or “U3” error will occur
- To start “Check Operation Mode Press and HOLD the **“TEST”** button for 5 sec. until LED light sequence changes to H2P flashing & H7P solid

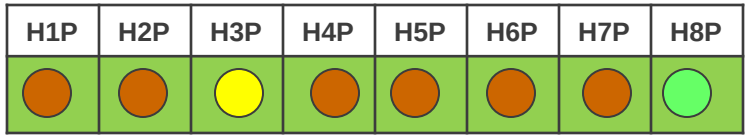
- Check Operation will take approximately 45 to 60 minutes to complete depending on the size of the system and number of indoor units
- Check Operation always runs in the COOL mode



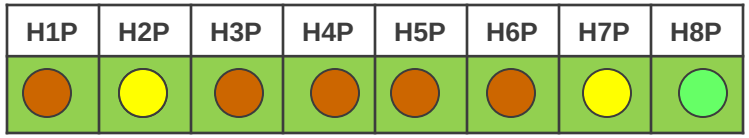
VRVIII System Commissioning – Step #16

Check Operation Mode Sequence

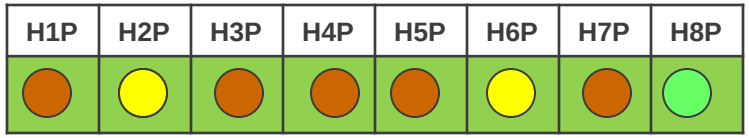
- **START** - Normal Status Press and HOLD **"TEST"** button



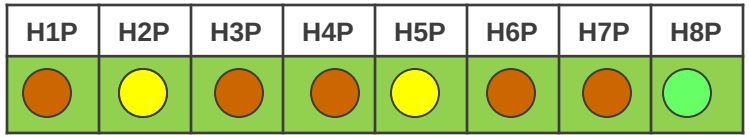
- **STEP 1** - Pressure Equalization Time: 10 sec. to 10 mins.



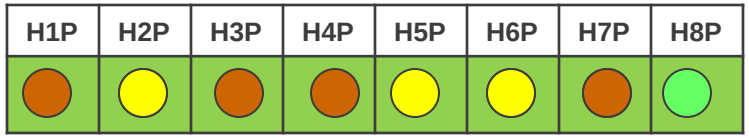
- **STEP 2** - Cooling Start Control Time: 20 sec. to 2 mins.



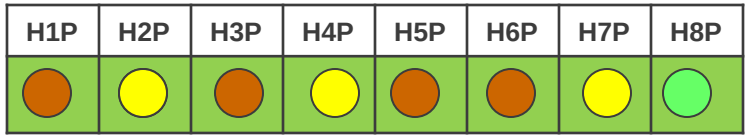
- **STEP 3** - Stop Valve Close Check



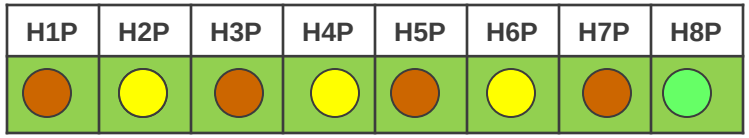
- **STEP 4 to 8** - Judgement Function
  - Wrong Wiring Check
  - Refrigerant Charge Check
  - Piping Length Check



- **STEP 9** - Pump Down Residual Op Time: 5 mins.



- **STEP 10** - Stand By for Restarting Time: 5 mins.



- Check Operation Completed Return to Normal status – Remote Controller back to normal display

System Commissioning

Additional Field Settings Commissioning Step #17

VRVIII System Commissioning – Step #17

Additional Field Settings for Commissioning

- To complete the basic Commissioning procedures, any additional system field settings can now be programmed
- Indoor Units (examples)
  - Set Master Remote Controller for Heat Pump applications
  - T1 T2 Forced OFF
  - NAV Remote Sensor Priority
  - O. A. Processor H&C Supply Temp Set
  - Fan "AUTO" Configuration ("P" Revision fan coils only)
  - Fan Coil Power Louvers Position Set

- Selected additional field settings for commissioning
- Outdoor Unit
  - Refrigerant Recovery/Evacuation Mode
  - Additional Refrigerant Charge Mode
  - Monitor Mode 14 – Manifolded Condenser Error Code Identification

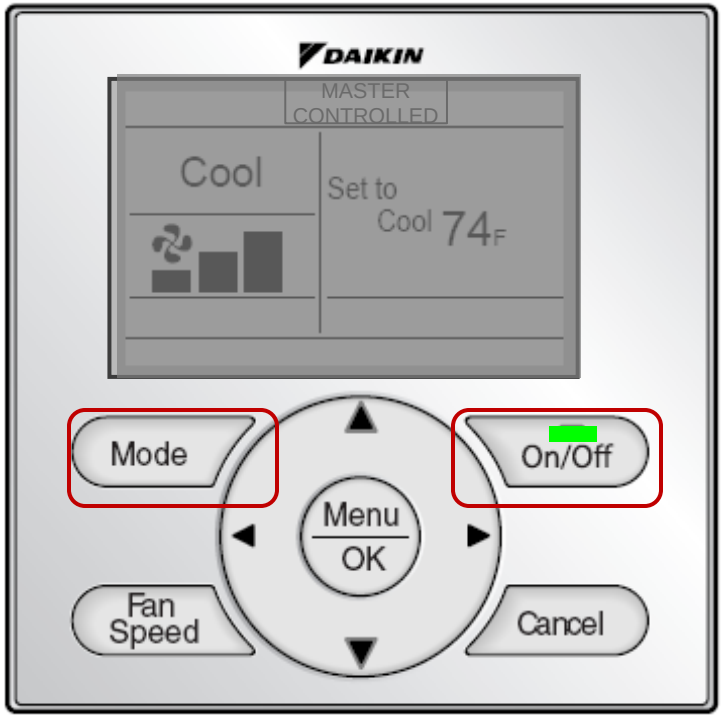
VRVIII System Commissioning – Step #17

Configure Remote Controller *Master* for Heat Pump Applications

- A designated Remote Controller must be configured as the Master in a Heat Pump system, or Heat Recovery where a Branch Selector Box is connected to multiple fan coils with individual Remote Controllers.
- To configure a **BRC1E72** (NAV Remote) as a Master
  - Press the **On/Off** button to bring on the display back light
  - The MASTER CONTROLLED icon will be flashing on all NAV remote controllers
  - Press the **"Mode"** button once and the Icon will disappear on the Master
  - All other NAV Remote Controllers (slaves) will display MASTER CONTROLLED solid
- To configure a **BRC2A71** (Simplified)
  - The Master Controlled symbol will be flashing ("Changeover Under Control") on all Simplified RC's
  - Press the **"Mode"** button once and the symbol will disappear on the Master
  - All other "Simplified" Slave Remote Controllers will display solid
- To change the Master, press & hold the **"Mode"** button for 5 sec. on the Master RC All RCs go into Master configuration mode

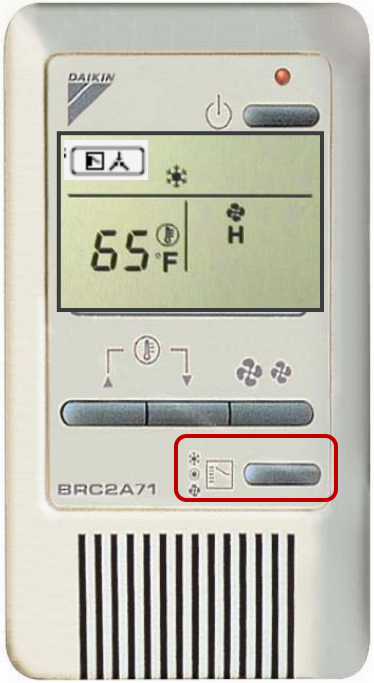
MASTER

BRC1E72 NAV Remote



MASTER

BRC2A71 Simplified



VRVIII System Commissioning – Step #17

Configure Wireless Remote Controller *Master*

- On power up of indoor units, all “Master Controlled” icons will be flashing on wired controllers ONLY. Wireless controllers will NOT display icon
- Go to the wireless controller you want set as the Master and while pointing the wireless controller at the fan coil
- Press and hold the **“MODE”** button for approx 4 seconds . You will hear “BEEP BEEP” then another “BEEP BEEP”
- To change the Master to different zone, go to the Master wireless controller and hold **“MODE”** button for 4 seconds. Listen for the “BEEP BEEP”
- Go to another remote and press **“MODE”** button

Wireless Hand-Held Remote Controller

VRVIII System Commissioning – Step #17

Fan Coil Field Settings – T1 T2 Forced Off – External Protection Device

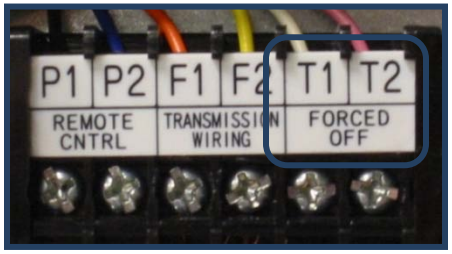
- Any fan coils utilizing the optional condensate pumps must have the "Forced Off" field setting changed to accommodate the safety float switch operation (External Protection Device N.C.)
  - T1 T2 Forced Off has a factory default of N.O. Code 01
  - NOTE: When the float switch is connected to T1 T2 the Remote Controller will display
  - CENTRAL CONTROL or ⅄ and cannot be turned on manually unless the field setting is changed to 03.
- Change the field setting to **12(22) 1-03** for condensate float switch operation: N.C. with automatic reset

EXAMPLE: Field Setting for optional condensate pump float switch connected to fan coil T1 T2 Forced Off

Mode No. Note 2	First Code No.	Setting Contents	Second Code No.(Note 3) 01	02	03	04	Details No
	0	Optional accessories output selection (field selection of output for adaptor for wiring)	Indoor unit turned ON by thermostat	—	Operation output	Malfunction output	(5)
12 (22)	1	ON/OFF input from outside (Set when ON/OFF is to be controlled from outside.)	Forced OFF	ON/OFF control	External protection device input	—	(6)

VRVIII System Commissioning – Step #17

Indoor Unit Field Settings – T1 T2 Forced Off



- Forced Off is programmed for N.O. (Code 01) Manual Reset (Factory Setting)
  - Field Setting will reprogram dry contact configuration and restart sequence
    - Code 02 - ON-OFF operation (Start/Stop)
    - Code 03 – N.C. External Field Protection Device Auto Reset (Optional Condensate Pump Float Switch)

External Input	Mode No.	1st Code No.	2nd Code No.
Forced Off	12(22)	1	01 – Default Manual Reset
ON/OFF Op	12(22)	1	02
Ext Protection Device	12(22)	1	03 Auto Reset

VRVIII System Commissioning – Step #17

Indoor Unit Field Settings – T1 T2 Forced Off

Space Sensor priority can be changed for specific applications

- Return Air thermistor disabled (Direct fresh air / High ceiling return)
- FXTQ Air handler with BRC2A71 Simplified Remote Controller
- BRC1E71 Remote Controller Sensor Priority
- No Remote Controller used

Mode No. (Note 1)	First Code No.	Description	Second Code No. (Note 2) (Cells in bold are factory default settings)			
			01	02	03	04
10(20)	2	Priority of thermistor sensors for space temperature control	**The return air thermistor is primary and the remote controller thermistor is secondary.**	Only the return air thermistor will be utilized.	Only the remote controller thermistor will be utilized.	--

VRVIII System Commissioning – Step #17

Indoor Unit Field Settings – FXMQ_MF O.A. Processor Discharge Temperature Setting

- A dedicated BRC1E72 Remote Controller is required to control the O.A. Processor Unit
  - A field Setting programs the operating discharge temperature for Heat and Cool
  - Mode No. 14 (24)
  - First Code No. 3 – Cooling 4 – Heating
  - Second Code No. Heat Discharge Temp
  - Cool Discharge Temp

NOTE: The discharge air temperature is not displayed on the Remote Controller

		for cooling	for heating
Mode No.		14 (24)	14 (24)
FIRST CODE NO.		3	4
SECOND CODE NO.	01	55°F	64°F
	02	57°F	66°F
	03	59°F	68°F
	04	61°F	70°F
	05	63°F	72°F
	06	64°F	73°F
	07	66°F	75°F
	08	68°F	77°F
	09	70°F	79°F
	10	72°F	81°F
	11	73°F	82°F
	12	75°F	84°F
	13	77°F	86°F

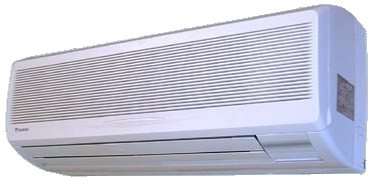
Indoor Unit Field Settings – VRV Fan "AUTO" Configuration

- The VRV fan coils operate with constant fan operation in the Thermo-off mode (zone satisfied)
  - Heat mode fan speed operates in LL speed
  - Cool mode fan speed operates on user selected speed: LL – H – HH
- Fan operation in the Thermo-off mode may be reprogrammed by changing the field setting for Heat or Cool modes

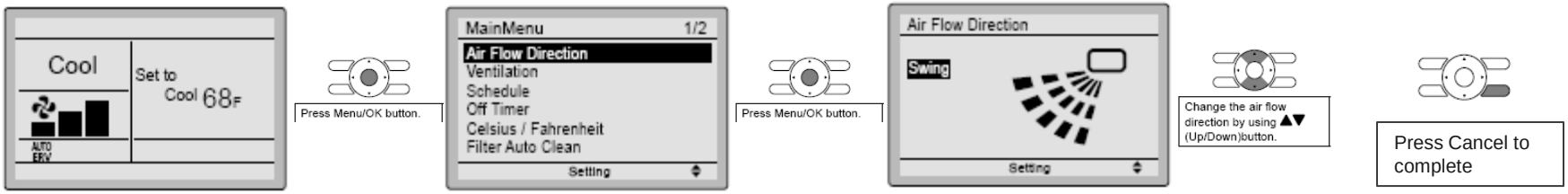
Fan Auto Configuration	Fan Speed LL	Fan Speed User Set	Fan Speed OFF
Fan Speed Heat Thermo-off	12(22)-3-01 Default	12(22)-3-02	12(22)-3-03
Fan Speed Cool Thermo-off	12(22)-6-01	12(22)-6-02 Default	12(22)-6-03

NOTE: Fan Auto Configuration is not available for the FXFQ_MVJU or FXHQ_MVJU fan coils

Indoor Unit Field Settings – Power Louver Operation




- The VRV fan coils with power louvers (flaps) can be programmed
  - Power Louver settings are programmed from the BRC1E71 Navigation Remote Controller only
  - Factory set operation: louvers oscillate up and down automatically when the fan coil is ON
  - From the Main Menu on the BRC1E71 Remote Controller, the louvers can be programmed to a selected angle when the fan coil is ON



System Commissioning

Additional Field Settings - Condensers

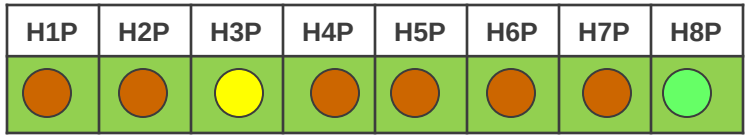
Selected Condenser Field Settings

- If during the course of system installation before commissioning, line voltage power was applied to the Fan Coils and Branch Selector Boxes, the *electronic expansion valves* will close. This will impede the pressure testing and evacuation procedures required to prepare the system for commissioning. Under these conditions, a service setting at the condenser for **"Refrigerant Recovery & Evacuation Mode"** can be used to re-open all of the system *electronic expansion valves*.
- When a system is to be manually charged with refrigerant, a service setting at the condenser for **"Additional Refrigerant Charge Mode"** can be used to manually draw in liquid refrigerant using the compressor.
  - All Remote Controllers are Off. The Liquid Stop Valve must be closed, leaving the Gas Stop Valve(s) Open. Liquid refrigerant will be manually charged through the Liquid Service Port.

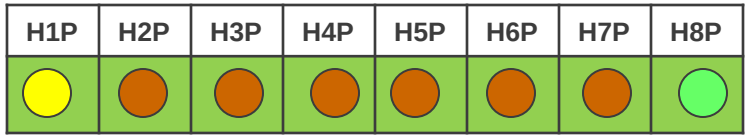
VRVIII System Commissioning

Refrigerant Recovery & Evacuation Mode

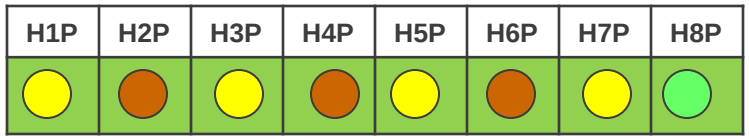
- **START** - Normal Status



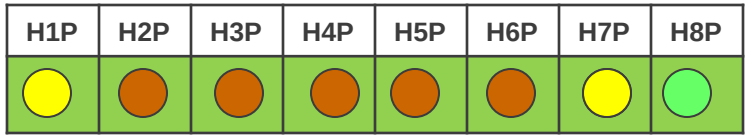
- Press and HOLD **"MODE"** button (Service Mode 2) H1P Solid



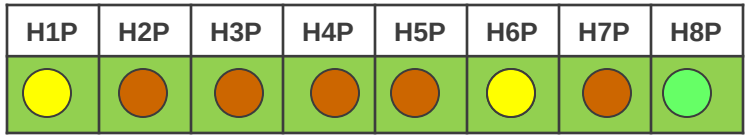
- Press the **"SET"** button 21 times
  - LED will indicate binary number for every press of the "SET" button 16+4+1



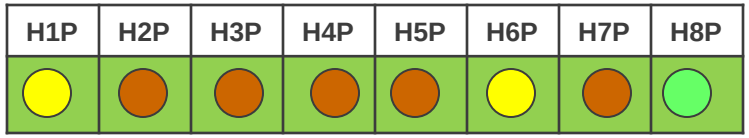
- Press the **"RETURN"** button once



- Press the **"SET"** button once to turn ON

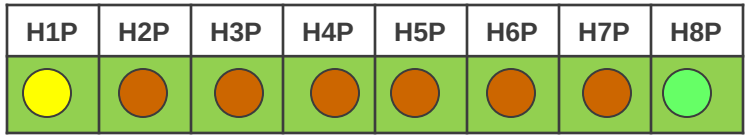


- Press the **"RETURN"** button once to lock on



- Press the **"RETURN"** button once to activate the setting

  Pressurize, Evacuate, or Recover now

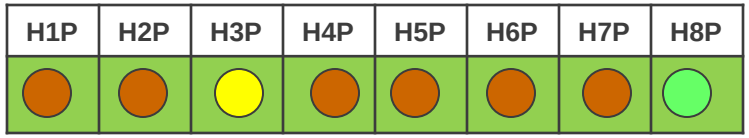


- Press the **"MODE"** button to return to Normal mode

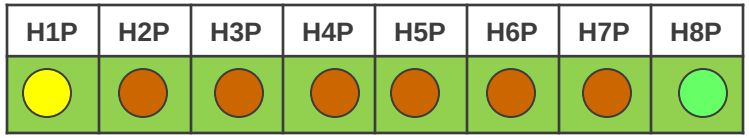
VRVIII System Commissioning

"Additional Refrigerant Charge Mode"

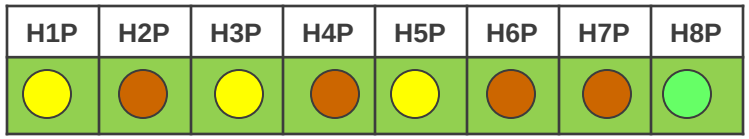
- **START** - Normal Status



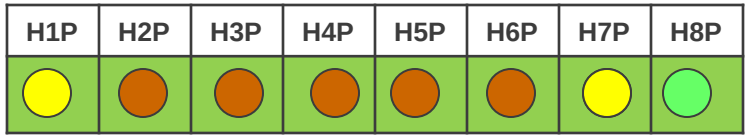
- Press and HOLD **"MODE"** button (Service Mode 2) H1P Solid



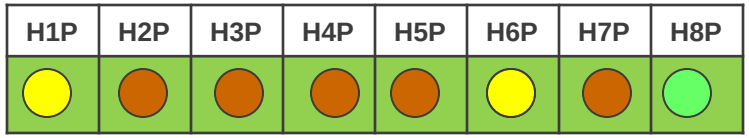
- Press the **"SET"** button 20 times
  - LED will indicate binary number for every press of the "SET" button 0+16+4



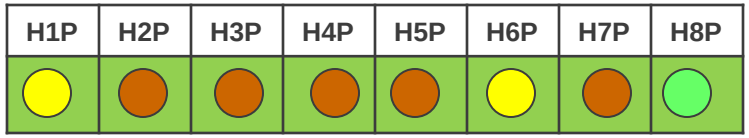
- Press the **"RETURN"** button once



- Press the **"SET"** button once to turn ON

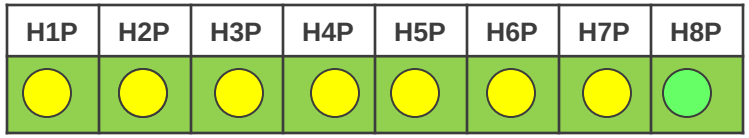


- Press the **"RETURN"** button once to lock on



- Press the **"RETURN"** button once to activate the setting

  Close Liq. Stop valve – HP/LP Gas stop valve open. Add Liquid Refrigerant now thru Liq. Service port



- Press the **"MODE"** button to return to Normal mode

VRVIII System Commissioning – Step #18

Commissioning Completion

- Before any *VRV* installation is considered complete, the *VRVIII* system should be operated in the cool mode and the heat mode to insure proper operation, depending on the outside ambient temperature limitations.
- On Heat Recovery systems, every zone should be cycled to verify that the Branch Selector Boxes are functioning properly.
- Centralized control systems should be configured and programmed after the *VRVIII* system or systems are fully operational.
- Copies of the *VRV* IOM's should be kept by the installing contractor and on the job site with the end user for future reference.

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For more detailed information, refer to the Daikin *VRVIII* Service, Installation and Engineering Manuals. These materials are available as electronic copies through www.daikinac.com and TRL.

Thank You