



# University of Missouri

Project Manual For:

Patient Care Tower - 8<sup>th</sup> Floor

**Bone Marrow Transplant Unit Renovation**

**#CP221933**

**At**

**University of Missouri**

**Columbia, MO**

**For**

**The Curators of the University of Missouri**

ISSUE FOR BID SET

MAY 09, 2024

ADDENDUM #01 MAY 31, 2024

**BSA**

PREPARED BY:

ARCHITECT

BSA LifeStructures  
12645 Olive Boulevard, Suite 100  
Creve Coeur, MO 63141  
314-754-6306

MEP ENGINEER

McClure Engineering.  
1000 Clark Ave St.  
St. Louis, MO 63102  
314-645-6232

**McCLUREENGINEERING**

# CERTIFICATION PAGE

PATIENT CARE TOWER – 8<sup>TH</sup> FLOOR BONE MARROW TRANSPLANT UNIT RENOVATION

BSA LifeStructures #14110006 .02A

COLUMBIA, MO  
MU PROJECT #: CP221933

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## Design Professional of Record: ARCHITECTURE / INTERIORS

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

Responsible for Divisions 01-10 Sections except where indicated as prepared by other design professionals of record.



Matthew Jeans - Architect  
MO# A-2017014317

Design Professional Signature:

Design Professional Name: Matthew Jeans

State of Missouri License Number: 2017014317

# CERTIFICATION PAGE

PATIENT CARE TOWER – 8<sup>TH</sup> FLOOR BONE MARROW TRANSPLANT UNIT RENOVATION

BSA LifeStructures #14110006 .02A

COLUMBIA, MO  
MU PROJECT #: CP221933

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## Design Professional of Record: MECHANICAL, PLUMBING, FIRE PROTECTION

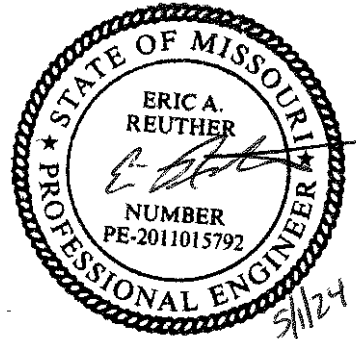
The following Specifications have been prepared by me or under my direct supervision. I further certify that to the best of my knowledge these Specifications are as required and in compliance with Building Codes of the University of Missouri.

Responsible for Divisions 20-24 Sections except where indicated as prepared by other design professionals of record.

**Design Professional Signature:**

**Design Professional Name:** Eric Reuther

**State of Missouri License Number:** 000087



## Design Professional of Record: ELECTRICAL AND TECHNOLOGY

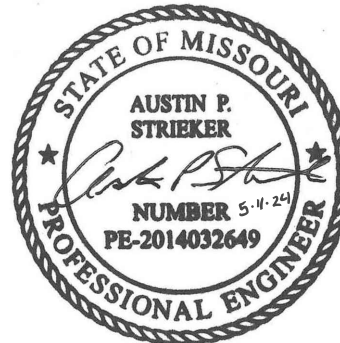
The following Specifications have been prepared by me or under my direct supervision. I further certify that to the best of my knowledge these Specifications are as required and in compliance with Building Codes of the University of Missouri.

Responsible for Divisions 26-28 Sections except where indicated as prepared by other design professionals of record.

**Design Professional Signature:**

**Design Professional Name:** Austin Strieker

**State of Missouri License Number:** 000087



PROJECT MANUAL FOR:  
PATIENT CARE TOWER - 8<sup>TH</sup> FLOOR BONE MARROW TRANSPLANT UNIT RENOVATION

UM PROJECT NUMBER:  
#CP221933

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END OF SECTION TOC

CAMPUS FACILITIES

General Services Bldg.  
Columbia, Missouri 65211  
Telephone: (573) 882-6800

ADVERTISEMENT FOR BIDS

Sealed bids for:

PATIENT CARE TOWER –  
8<sup>TH</sup> FLOOR BONE MARROW TRANSPLANT UNIT RENOVATION  
UNIVERSITY OF MISSOURI  
COLUMBIA, MISSOURI  
PROJECT NUMBER: CP221933

CONSTRUCTION ESTIMATE \$1,569,390 - \$1,743,766

will be received by the Curators of the University of Missouri, Owner, at Campus Facilities, Planning, Design & Construction, Room L100 (Front Reception Desk), General Services Building, University of Missouri, Columbia, Missouri 65211, until 1:30 p.m., C.T., June 5, 2024 and then immediately opened and publicly read aloud.

Bids will be accepted from Prequalified Health Care General Contractors **only**. A list of Prequalified Health Care General Contractors may be obtained at <http://operations-webapps.missouri.edu/pdc/adsite/ad.html>.

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

Questions regarding the scope of work should be directed to Matthew Jeans with BSA LifeStructures at (314) 754-6306 or [mjeans@bsalifestructures.com](mailto:mjeans@bsalifestructures.com). Questions regarding commercial conditions should be directed to Ben Myers at (573) 884-8458 or [bmyers@missouri.edu](mailto:bmyers@missouri.edu).

A prebid meeting will be held at 1:30 p.m., C.T., May 16, 2024 in Room 131 General Services Building followed by a site walk-through. All interested bidders are invited to attend this meeting.

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

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

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

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

Advertisement Date: May 9, 2024

SECTION 1.A

BID FOR LUMP SUM CONTRACT

Date: \_\_\_\_\_

BID OF \_\_\_\_\_

(hereinafter called "Bidder") a corporation\* organized and existing under laws of the State of \_\_\_\_\_

\_\_\_\_\_,  
a partnership\* consisting of \_\_\_\_\_,

an individual\* trading as \_\_\_\_\_,

a joint venture\* consisting of \_\_\_\_\_

\_\_\_\_\_.

\*Insert Corporation(s), partnership or individual, as applicable.

TO: Curators of the University of Missouri  
Front Desk Reception Desk, Room L100, General Services Building

1. Bidder, in compliance with invitation for bids for construction work in accordance with Drawings and Specifications prepared by BSA LifeStructures, entitled "Patient Care Tower – 8<sup>th</sup> Floor Bone Marrow Transplant Unit Renovation", project number CP221933, dated 08 April 2024, 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 provide a renovation of the Patient Care Tower 8<sup>th</sup> Floor Bone Marrow Transplant Unit at the University of Missouri Hospital; all as indicated on the Drawings and described in these Specifications for sum of:

---

DOLLARS (\$\_\_\_\_\_).

b. Additive Alternate Bids:

Above Base Bid may be changed in accordance with following Alternate Bids as Owner may elect. Alternates are as described in Section 1.H of Project Manual. The Owner is not required to accept or reject in order listed. This is a one (1) contract project, therefore, Alternates shall be studied by each Bidder to determine effect on Bids of Contractor and each Subcontractor and/or Material supplier.

(1) Additive Alternate No. 1: Add new branch 1/2" heating water piping to each radiant ceiling panel of the Patient room ceilings.

All for sum of:

---

DOLLARS (\$\_\_\_\_\_).

d. Allowance:

Bidder shall include in the base bid sum an allowance of \$10,000 for unforeseen field-directed fire-stopping, or similar scope, not included in the Construction Documents, as authorized by the owner's representative. This allowance amount shall not include contractor's overhead and profit. The Contractor shall include overhead and profit on the allowance amount in his bid.

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 Three Hundred and Fifty Seven (357) calendar days from receipt of aforementioned documents. Fifteen (15) calendar days have been allocated in the construction schedule for receiving aforementioned documents from Bidder.

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

c. Special scheduling requirements:

1. UM Patient Care Tower 8<sup>th</sup> Floor Bone Marrow Transplant Unit

Occupancy - The University of Missouri Patient Care Tower (PCT) 8<sup>th</sup> Floor will continue to be occupied during the course of this project. All existing Bone Transplant Unit operations in adjacent areas and on other floors are to be maintained at all times.

2. Utility Outages – Any and all utility outages in portions of the PCT BMT outside of the defined PCT BMT project area, required to complete any work shall be reviewed in advance with the Owner's Representative and then submitted at least fourteen (14) calendar days in advance .

3. Construction Access & Staging – Refer to the Drawings for construction access and routing.

4. Work Hours – Weekday daytime work hours for this project are considered as hours Monday-Friday, 7:00am – 5:00pm. Nighttime hours are considered as hours 5:00pm – 4:00am. Weekend hours are considered as hours Friday 7:00pm – Monday 4:00am. Other work hours are acceptable if submitted, reviewed, coordinated, scheduled and approved at least 48-hours in advance with the Owner's Representative.

5. Excessive Noisy Work – The PCT BMT unit will be occupied by patients throughout the duration of this project and is occupied 24 hours per day, 7 days per week patient floor, as well as the floors above and below the 8<sup>th</sup> floor.

a. Noisy Work on the PCT BMT unit is to be completed during the daytime work hours Monday-Friday 7:00am-5:00pm. This is due to patients sleeping during nighttime hours. Noisy work during the day may be stopped by designated individuals if it negatively affects patient care.

6. Work Occurring on Floors Below (8<sup>th</sup>) – Generally, all necessary work to occur on floors below the 8th Floor shall be reviewed, submitted, approved and scheduled to occur after normal business hours at least fourteen (14) calendar days in advance with the Owner's Representative.

Certain minor access and/or work that needs to occur on any floors below may be allowed to occur during normal business hours upon review, approval, and advance scheduling with the Owner's Representative.

7. The Owner's internal cleaning team will be coordinated to perform a final cleaning and make-ready of the 8<sup>th</sup> floor BMT Unit area and other areas as affected by contractors work.

5. SUBCONTRACTOR LIST:

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

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

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

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

6. SUPPLIER DIVERSITY PARTICIPATION GOALS

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

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

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

MBE PERCENTAGE PARTICIPATION: \_\_\_\_\_ (    %)

SDVE PERCENTAGE PARTICIPATION: \_\_\_\_\_ (    %)

WBE, DBE, and/or VETERAN PERCENTAGE PARTICIPATION: \_\_\_\_\_

\_\_\_\_\_ (    %)

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

7. BIDDER'S ACKNOWLEDGMENTS

a. Bidder declares that he has had an opportunity to examine the site of the work and he has examined Contract Documents; therefore, that he has carefully prepared his bid



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

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

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

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

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

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

#### 8. BIDDER'S CERTIFICATE

Bidder hereby certifies:

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

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

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

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

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

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

9. BIDDER'S SIGNATURE

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

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.)

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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.)

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

Incidence Rates (last 3 years): \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

12. List banking references.

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

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

Dated at \_\_\_\_\_ this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_

\_\_\_\_\_  
Name of Organization

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Printed Name

\_\_\_\_\_  
Title of Person Signing

END OF SECTION

## **SUPPLIER DIVERSITY COMPLIANCE EVALUATION FORM**

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

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

- I. Project: \_\_\_\_\_
- II. Name of General Contractor: \_\_\_\_\_
- III. Name of Diverse Firm: \_\_\_\_\_  
Address: \_\_\_\_\_  
Phone No.: \_\_\_\_\_ Fax No.: \_\_\_\_\_  
Status (check one) MBE \_\_\_\_\_ WBE \_\_\_\_\_ Veteran \_\_\_\_\_ Service Disabled Veteran \_\_\_\_\_ DBE \_\_\_\_\_
- IV. Describe the subcontract work to be performed. (List Base Bid work and any Alternate work separately):  
Base Bid: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- V. Dollar amount of contract to be subcontracted to the Diverse firm:  
Base Bid: \_\_\_\_\_  
Alternate(s), (Identify separately): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- VI. Is the proposed subcontractor listed in the Directory of M/W/DBE Vendors, Directory of Served Disabled Veterans and/or the Directory of Veterans maintained by the State of Missouri?  
Yes \_\_\_\_\_ No \_\_\_\_\_

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

Yes \_\_\_\_\_

No \_\_\_\_\_

If yes, please provide details and attach a copy of the certification.

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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.

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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.

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

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

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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.

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

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

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

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

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

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

Signature\_\_\_\_\_

Name\_\_\_\_\_

Title\_\_\_\_\_

Company\_\_\_\_\_

Date\_\_\_\_\_

## AFFIDAVIT

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

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

Signature \_\_\_\_\_

Name \_\_\_\_\_

Title \_\_\_\_\_

Date \_\_\_\_\_

Corporate Seal (where appropriate)

Date \_\_\_\_\_

State of \_\_\_\_\_

County of \_\_\_\_\_

On this \_\_\_\_\_ day of \_\_\_\_\_, 19\_,  
before me appeared (name) \_\_\_\_\_ to me personally known, who, being  
duly sworn, did execute the foregoing affidavit, and did state that he or she was properly authorized by (name of firm)

\_\_\_\_\_  
\_\_\_\_\_ to execute the affidavit and did so as his or her own free act and deed.

(Seal)

Notary Public \_\_\_\_\_

Commission expires \_\_\_\_\_

**AFFIDAVIT FOR AFFIRMATIVE ACTION**

State of Missouri                    )  
  )  
County of                                )                   ss.

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

\_\_\_\_\_  
Subscribed and sworn before me this \_\_\_\_\_ day of \_\_\_\_\_, 19\_\_\_\_\_.

My commission expires \_\_\_\_\_, 19\_\_\_\_\_.

## CERTIFYING SUPPLIER DIVERSITY AGENCIES

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

St. Louis Development Corporation  
1520 Market St., Ste. 2000  
St. Louis, MO 63103  
P: 314.982.1400  
W: [www.stlouis-mo.gov/slhc/](http://www.stlouis-mo.gov/slhc/)

Bi-State Development  
211 N. Broadway, Ste. 700  
St. Louis, MO 63102  
P: 314.982.1400  
W: [www.metrostlouis.dbesystem.com](http://www.metrostlouis.dbesystem.com)

St. Louis Minority Business Council  
211 N. Broadway, Ste. 1300  
St. Louis, MO 63102  
P: 314.231.5555  
W: [www.slmhc.org](http://www.slmhc.org)

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

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

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

Mid-States Minority Supplier Development Council  
505 N. 7<sup>th</sup> Street, Ste. 1820  
St. Louis, MO 63101  
P: 314.278.5616  
W: [midstatesdc.org](http://midstatesdc.org)

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

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

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

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

## Minority Newspapers

Dos Mundos Bilingual Newspaper  
902A Southwest Blvd.  
Kansas City, MO 64108  
816-221-4747  
[www.dosmundos.com](http://www.dosmundos.com)

Kansas City Hispanic News  
2918 Southwest Blvd.  
Kansas City, MO 64108  
816/472-5246  
[www.kchispanicnews.com](http://www.kchispanicnews.com)

The Kansas City Globe  
615 E. 29th Street  
Kansas City, MO 64109  
816-531-5253  
[www.thekcglobe.com/about\\_us.php](http://www.thekcglobe.com/about_us.php)

St. Louis American  
4144 Lindell  
St. Louis, MO 63108  
314-533-8000  
[www.stlamerican.com](http://www.stlamerican.com)

St. Louis Chinese American News  
1766 Burns Ave, Suite 201  
St. Louis, MO 63132  
314-432-3858  
[www.scanews.com](http://www.scanews.com)

St. Louis Business Journal  
815 Olive St., Suite 100  
St. Louis, MO 63101  
314-421-6200  
[www.bizjournal.com/stlouis](http://www.bizjournal.com/stlouis)

Kansas City Business Journal  
1100 Main Street, Suite 210  
Kansas City, MO 64105  
816-421-5900  
[www.bizjournals.com/kansascity](http://www.bizjournals.com/kansascity)

## **AFFIDAVIT OF SUPPLIER DIVERSITY PARTICIPATION**

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

1. Diverse Firm: \_\_\_\_\_

Contact Name: \_\_\_\_\_

Address: \_\_\_\_\_

Phone No.: \_\_\_\_\_ E-Mail: \_\_\_\_\_

Status (check one) MBE ☐ WBE ☐ Veteran ☐ Service Disabled Veteran ☐ DBE ☐

If MBE, Certified as (circle one): 1) Black American 2) Hispanic American 3) Native American 4) Asian American

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

Agency: \_\_\_\_\_ [attach copy of certification authorization from agency]

Certification Number: \_\_\_\_\_

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

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

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

General Contractor: \_\_\_\_\_ Diverse Firm: \_\_\_\_\_

Signature: \_\_\_\_\_ Signature: \_\_\_\_\_

Name: \_\_\_\_\_ Name: \_\_\_\_\_

Title: \_\_\_\_\_ Title: \_\_\_\_\_

Date: \_\_\_\_\_ Date: \_\_\_\_\_

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

Contractor: \_\_\_\_\_ Diverse Firm: \_\_\_\_\_

Signature: \_\_\_\_\_ Signature: \_\_\_\_\_

Name: \_\_\_\_\_ Name: \_\_\_\_\_

Title: \_\_\_\_\_ Title: \_\_\_\_\_

Date: \_\_\_\_\_ Date: \_\_\_\_\_

INFORMATION FOR BIDDERS

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**1. Contract Documents**

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

**2. Bidder Obligations**

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

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

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

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

**3. Interpretation of Documents**

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

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

**3.3** Bids shall be based only on interpretations issued in the form of addenda mailed to each person who is on the

Architect's record as having received a set of the contract documents.

**4. Bids**

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

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

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

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

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

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

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

## **5. Modification and Withdrawal of Bids**

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

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

## **6. Signing of Bids**

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

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

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

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

## **7. Bid Security**

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

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

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

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

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

## **8. Bidder's Statement of Qualifications**

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

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

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

## **9. Award of Contract**

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

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

## **10. Contract Execution**

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

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



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

#### **11. Contract Security**

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

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

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

#### **12. Time of Completion**

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

#### **13. Number of Contract Documents**

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

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

#### **14. Missouri Products and Missouri Firms**

**14.1** The Curators of the University of Missouri have adopted a policy which is binding upon all employees and departments of the University of Missouri, and which by contract, shall be binding upon independent contractors and subcontractors with the University of Missouri whereby all other things being equal, and when the same can be secured without additional cost over foreign products, or products of other states, a preference shall be granted in all construction, repair and purchase contracts, to all products, commodities,

materials, supplies, and articles mined, grown, produced, 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.

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

##### **15.2 List of Supplier Diversity Firms**

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

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

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

##### **15.3 Supplier Diversity Percentage Goal**

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

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

#### **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. Bidders who demonstrate that they have made a good faith effort to include Supplier Diversity participation may be awarded the contract regardless of the percent of Supplier Diversity participation, provided the bid is otherwise acceptable and is determined to be the best bid.

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

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

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

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

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

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

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

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

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

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

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

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

## **15.7 Submittal of Forms**

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

## **15.8 Additional Bid/Proposer Information**

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

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

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

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

## **16. List of Subcontractors**

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

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

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

University of Missouri

General Conditions

of the

Contract

for

Construction

December 2021 Edition

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## **ARTICLE 1 GENERAL PROVISIONS**

### **1.1 Basic Definitions**

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

#### **1.1.1 Owner**

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

#### **1.1.2 Contracting Officer**

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

#### **1.1.3 Owner's Representative**

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

#### **1.1.4 Architect**

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

#### **1.1.5 Owner's Authorized Agent**

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

#### **1.1.6 Contractor**

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

#### **1.1.7 Subcontractor and Lower-tier Subcontractor**

A Subcontractor is a person or organization who has a contract with the Contractor to perform any of the Work. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or its authorized representative. The term "Subcontractor" also is applicable to those furnishing materials to be incorporated in the Work whether work performed is at the Owner's site or off site, or both. A lower-tier Subcontractor is a person or organization who has a contract with a Subcontractor or another lower-tier

Subcontractor to perform any of the Work at the site. Nothing contained in the Contract Documents shall create contractual relationships between the Owner or the Architect and any Subcontractor or lower-tier Subcontractor of any tier.

### **1.1.8 Supplier Diversity Definitions**

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

#### **.1 Minority Business Enterprises (MBE)**

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

**.1.1** "African Americans", which includes persons having origins in any of the black racial groups of Africa.

**.1.2** "Hispanic Americans", which includes persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race.

**.1.3** "Native Americans", which includes persons of American Indian, Eskimo, Aleut, or Native Hawaiian origin.

**.1.4** "Asian-Pacific Americans", which includes persons whose origins are from Japan, China, Taiwan, Korea, Vietnam, Laos, Cambodia, the Philippines, Samoa, Guam, the U.S. Trust Territories of the Pacific, or the Northern Marianas.

**.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 Served-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 Served-Disabled Veterans.

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

U.S. citizens that are African Americans, Hispanics, Native Americans, Asian-Pacific and Subcontinent Asian Americans, and women are presumed to be socially and economically disadvantaged. Also recognized as DBE's are Historically Black Colleges and Universities (HBCU) and small businesses located in Federal HUB Zones.

To be regarded as economically disadvantaged, an individual must have a personal net worth that does not exceed \$1.32 million. To be seen as a small business, a firm must meet Small Business Administration (SBA) size criteria (500 employees or less) and have average annual gross receipts not to exceed \$22.41 million. To be considered a DBE/SDB, a small business owned and controlled by socially and/or economically disadvantaged individuals must receive DBE certification from one of the recognized Missouri state agencies to be recognized in this classification.

#### **1.1.9 Work**

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

#### **1.1.10 Approved**

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

#### **1.1.11 Contract Documents**

The Contract Documents consist of (1) the executed Contract for Construction, (2) these General Conditions of

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

#### **1.1.12 Contract**

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

#### **1.1.13 Change Order**

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

#### **1.1.14 Substantial Completion**

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

#### **1.1.15 Final Completion**

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

#### **1.1.16 Supplemental and Special Conditions**

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

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

#### **1.1.17 Day**

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

#### **1.1.18 Knowledge.**

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

#### **1.1.19 Punch List**

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

#### **1.1.20 Public Works Contracting Minimum Wage**

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

#### **1.1.21 Force Majeure**

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

### **1.2 Specifications and Drawings**

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

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

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

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

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

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

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

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

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

- .1 conditions bearing upon transportation, disposal, handling, and storage of materials;
- .2 the availability of labor, materials, equipment, water, electrical power, utilities and roads;
- .3 uncertainties of weather, river stages, flooding and similar characteristics of the site;
- .4 conditions bearing upon security and protection of material, equipment, and Work in progress;
- .5 the form and nature of the Work site, including the surface and sub-surface conditions;
- .6 the extent and nature of Work and materials necessary for the execution of the Work and the remedying of any defects therein; and
- .7 the means of access to the site and the accommodations it may require and, in general, shall be deemed to have obtained all information as to risks, contingencies and other circumstances.
- .8 the ability to complete work without disruption to normal campus activities, except as specifically allowed in the contract documents.

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

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

### **1.3 Required Provisions Deemed Inserted**

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

## **ARTICLE 2 OWNER**

### **2.1 Information and Services Required of Owner**

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

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

### **2.2 Owner's Right to Stop the Work**

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

### **2.3 Owner's Right to Carry Out the Work**

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

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

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

## **2.4 Extent of Owner Rights**

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

**2.4.2** In no event shall the Owner have control over, charge of, or any responsibility for construction means, methods, techniques, sequences or procedures or for safety precautions and programs in connection with the Work, notwithstanding any of the rights and authority granted the Owner in the Contract Documents.

## **ARTICLE 3 CONTRACTOR**

### **3.1 Contractor's Warranty**

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

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

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

**3.1.4** Neither the final payment nor any provision in the Contract Documents nor partial or entire occupancy of the premises by the Owner, nor expiration of warranty stated herein, will constitute an acceptance of Work not

done in accordance with the Contract Documents or relieve the Contractor of liability in respect to any responsibility for non-conforming work. The Contractor shall immediately remedy any defects in the Work and pay for any damage to other Work resulting therefrom upon written notice from the Owner. Should the Contractor fail or refuse to remedy the non-conforming work, the Owner may perform, or cause to be performed the work necessary to bring the work into conformance with the Contract Documents at the Contractor's expense.

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

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

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

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

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

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

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

### **3.3 Anti-Kickback**

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

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

### **3.4 Supervision and Construction Procedures**

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

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

**3.4.3** The Contractor and each of its Subcontractors of any tier shall submit to the Owner such schedules of quantities and costs, progress schedules in accordance

with 3.17.2 of this document, payrolls, reports, estimates, records, and other data as the Owner may request concerning Work performed or to be performed under the Contract.

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

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

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

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

- .1** All shutting of valves, switches, etc., shall be by the Owner's personnel.
- .2** Contractor shall submit its preliminary outage/tie-in schedule with its baseline schedule.
- .3** The Contractor shall request an outage/tie-in meeting at least two weeks before the outage/tie-in is required.
- .4** The Owner's Representative will schedule an outage/tie-in meeting at least one week prior to the outage/tie-in.

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

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

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

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

**3.4.11** The Contractor shall maintain at his own cost and expense, adequate, safe and sufficient walkways, platforms, scaffolds, ladders, hoists and all necessary, proper, and adequate equipment, apparatus, and appliances useful in carrying on the Work and which are necessary to make the place of Work safe and free from avoidable danger for students, faculty, staff, the public and construction personnel, and as may be required by safety provisions of applicable laws, ordinances, rules regulations and building and construction codes.

**3.4.12** During the performance of the Work, the Contractor shall be responsible for providing and maintaining warning signs, lights, signal devices, barricades, guard rails, fences, and other devices appropriately located on site which shall give proper and understandable warning to all persons of danger of entry onto land, structure, or equipment, within the limits of the Contractor's work area.

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

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

**3.4.15** When requested by the Owner's Representative, the Contractor, at no extra charge, shall provide scaffolds

or ladders in place as may be required by the Architect or the Owner for examination or inspection of Work in progress or completed.

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

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

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

### **3.5 Use of Site**

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

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

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

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

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

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

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

### **3.6 Review of Contract Documents and Field Conditions by Contractor**

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

**3.6.2** The Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Errors, inconsistencies, or omissions discovered shall be reported in writing to the Architect and Owner's Representative within twenty-four (24) hours. During the progress of work, Contractor shall verify all field measurements prior to fabrication of building components or equipment and proceed with the fabrication to meet field conditions. Contractor shall consult all Contract Documents to determine the exact location of all work and verify spatial relationships of all work. Any question concerning said

location or spatial relationships shall be submitted to the Owner's Representative. Specific locations for equipment, pipelines, ductwork and other such items of work, where not dimensioned on plans, shall be determined in consultation with Owner's Representative and Architect. Contractor shall be responsible for the proper fitting of the Work in place.

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

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

### **3.7 Cleaning and Removal**

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

### **3.8 Cutting and Patching**

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

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

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

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

### **3.9 Indemnification**

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

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

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

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

### **3.10 Patents**

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

**3.10.2** If the Contractor uses any design, device, or material covered by letters patent or copyright, he shall provide for such use by suitable agreement with the Owner of such patented or copyrighted design, device, or material. It is mutually agreed and understood, without exception, that the Contract Sum include, and the Contractor shall pay all royalties, license fees or costs arising from the use of such design, device, or material in any way involved in the Work. The Contractor and/or sureties shall indemnify and save harmless the Owner from any and all claims for infringement by reason of the use of such patented or copyrighted design, device, or material or any trademark or copyright in connection with Work agreed to be performed under this Contract and shall indemnify the Owner for any cost, expense, or damage it may be obligated to pay by reason of



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

### **3.11 Delegated Design**

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

### **3.12 Materials, Labor, and Workmanship**

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

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

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

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

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

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

**3.12.7** Unless otherwise specifically noted, the Contractor shall provide and pay for supervision, labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other

facilities and services necessary for the proper execution and completion of the Work.

### **3.12.8 Substitutions**

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

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

- .1** Full explanation of the proposed substitution and submittal of all supporting data including technical information, catalog cuts, warranties, test results, installation instructions, operating procedures, and other like information necessary for a complete evaluation of the substitution.
- .2** Reasons the substitution is advantageous and necessary, including the benefits to the Owner and the Work in the event the substitution is acceptable.
- .3** The adjustment, if any, in the Contract Sum, in the event the substitution is acceptable.
- .4** The adjustment, if any, in the time of completion of the Contract and the construction schedule in the event the substitution is acceptable.
- .5** An affidavit stating that (a) the proposed substitution conforms to and meets all of the Contract Document requirements and is code compliant, except as specifically disclosed and set forth in the affidavit and (b) the Contractor accepts the warranty and correction obligations in connection with the proposed substitution as if originally specified by the Architect. Proposals for substitutions shall be submitted to the Architect and Owner's Representative in sufficient time to allow the Architect and Owner's Representative no less than ten (10) working days for review. No substitution will be considered or allowed without the Contractor's submittal of complete substantiating data and information as stated herein.

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

- .1** Required for compliance with interpretation of code requirements or insurance regulations then existing;
- .2** Unavailability of specified products, through no fault of the Contractor;
- .3** Material delivered fails to comply with the Contract Documents;
- .4** Subsequent information discloses inability of specified products to perform properly or to fit in designated space;

- .5 Manufacturer/fabricator refuses to certify or guarantee performance of specified product as required; or
- .6 When in the judgment of the Owner or the Architect, a substitution would be substantially to the Owner's best interests, in terms of cost, time, or other considerations.

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

### **3.13 Approved Equal**

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

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

**3.13.3** No approvals or action taken by the Architect or Owner's Representative shall relieve Contractor from its obligation to ensure that an "or equal" article, appliance, device, or material strictly complies with the requirements of the Contract Documents. Contractor shall not propose "or equal" items in connection with Shop Drawings or

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

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

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

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

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

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

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

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

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

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

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

**3.14.9** By approving and submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents such Submittals strictly comply with the requirements of the Contract Documents and that the

Contractor has determined and verified field measurements and field construction criteria related thereto, that materials are fit for their intended use and that the fabrication, shipping, handling, storage, assembly and installation of all materials, systems and equipment are in accordance with best practices in the industry and are in strict compliance with any applicable requirements of the Contract Documents. Contractor shall also coordinate each Submittal with other Submittals.

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

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

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

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

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

### **3.15 Record Drawings**

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

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

### **3.16 Operating Instructions and Service Manuals**

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

- .1** Start-up and Shutdown Procedures: Provide a step-by-step write up of all major equipment. When manufacturer's printed start-up, trouble shooting and shut-down procedures are available, they may be incorporated into the operating manual for reference.
- .2** Operating Instructions: Written operating instructions shall be included for the efficient and safe operation of all equipment.
- .3** Equipment List: List of all major equipment as installed shall include model number, capacities, flow rate, and name-plate data.
- .4** Service Instructions: The Contractor shall be required to provide the following information for all pieces of equipment.
  - (a)** Recommended spare parts including catalog number and name of local suppliers or factory representative.
  - (b)** Belt sizes, types, and lengths.
  - (c)** Wiring diagrams.
- .5** Manufacturer's Certificate of Warranty: Manufacturer's certificates of warranty shall be obtained for all major equipment. Warranty shall be obtained for at least one year from the date of Substantial Completion. Where longer period is required by the Contract Documents, the longer period shall govern.
- .6** Parts catalogs: For each piece of equipment furnished, a parts catalog or similar document shall be provided which identifies the components by number for replacement ordering.

### **3.16.2 Submission**

- .1** Manuals shall be bound into volumes of standard 8 1/2" x 11" hard binders. Large drawings too bulky to be folded into 8 1/2" x 11" shall be separately bound or folded and in brown

envelopes, cross-referenced and indexed with the manuals.

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

### **3.17 Taxes**

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

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

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

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

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

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

### **3.18 Contractor's Construction Schedules**

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

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

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

- .1** The schedule shall be prepared using Primavera P3, Oracle P6, Microsoft Project or other software acceptable to the Owner's Representative.
- .2** The schedule shall be prepared and maintained in CPM format, in accordance with Construction CPM Scheduling, published by the Associated General Contractors of American (AGC).
- .3** Prior to submittal to the Owner's Representative for review, Contractor shall obtain full buy-in to the schedule from all major subcontractors, in writing if so, requested by Owner's Representative.
- .4** Schedule shall be updated, in accordance with Construction CPM Scheduling, published by the AGC, on a monthly basis at minimum, prior to, and submitted with, the monthly pay application or as requested by the Owner's Representative.
- .5** Along with the update the Contractor shall submit a narrative report addressing all changes, delays and impacts, including weather to the schedule

during the last month, and explain how the end date has been impacted by same.

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

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

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

## **ARTICLE 4**

### **ADMINISTRATION OF THE CONTRACT**

#### **4.1 Rights of the Owner**

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

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

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

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

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

**4.1.6** The Owner does not allow smoking on university property.

#### **4.2 Rights of the Architect**

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

#### **4.3 Review of the Work**

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

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

**4.3.3** The fact that the Architect or the Owner's Representative observed, or failed to observe, faulty Work, or Work done which is not in accordance with the Contract Documents, regardless of whether or not the Owner has released final payment, shall not relieve the

Contractor from responsibility for all damages and additional costs of the Owner as a result of defective or faulty Work.

#### **4.4 Claims**

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

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

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

#### **4.5 Claims for Concealed or Unknown Conditions**

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

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

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

#### **4.6 Claim for Additional Cost**

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

#### **4.7 Claims for Additional Time**

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

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

**4.7.2** If weather days are the basis for a Claim for additional time, such Claim shall be documented by the Contractor by data acceptable to the Owner's Representative substantiating that weather conditions for the period of time in question, had an adverse effect on the critical path of the scheduled construction. Weather days shall be defined as days on which critical path work cannot proceed due to weather conditions (including but not limited to rain, snow, etc.), in excess of the number of days shown on the Anticipated Weather Day schedule in the Special Conditions. To be considered a weather day,

at least four working hours must be lost due to the weather conditions on a critical path scope item for that day.-Weather days and Anticipated weather days listed in the Special Conditions shall only apply to Monday through Friday. A weather day claim cannot be made for Saturdays, Sundays, New Year's Day, Martin Luther King Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the day after Thanksgiving Day and Christmas Day, unless that specific day was approved in writing for work by the Owner's Representative.

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

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

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

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

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



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

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

#### **4.8 Resolution of Claims and Disputes**

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

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

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

#### **4.9 Administrative Review**

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

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

appropriate documentation will be signed by the parties to resolve the Claim.

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

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

## **ARTICLE 5 SUBCONTRACTORS**

### **5.1 Award of Subcontracts**

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



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

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

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

## **5.2 Subcontractual Relations**

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

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

forms to be signed by any Subcontractors of any tier or suppliers, Contractor shall obtain the same.

## **5.3 Contingent Assignment of Subcontract**

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

## **ARTICLE 6 SEPARATE CONTRACTS AND COOPERATION**

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

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

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

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

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

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

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

## **ARTICLE 7 CHANGES IN THE WORK**

### **7.1 CHANGE ORDERS**

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

- .1** a change in the Work
- .2** the amount of an adjustment, if any, in the Contract amount
- .3** an adjustment, if any, in the Contract time

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

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

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

- .1** By a lump sum proposal from the Contractor and the Subcontractors of any tier, including overhead and profit.
- .2** By a time and material basis with or without a specified maximum. The Contractor shall submit to the Owner's Representative itemized time and material sheets depicting labor, materials, equipment utilized in completing the Work on a daily basis for the Owner's Representative approval. If this pricing option is utilized, the Contractor may be required to submit weekly reports summarizing costs to

date on time and material change orders not yet finalized.

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

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

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

- .1** Labor: The Contractor's proposal shall include breakdowns by labor, by trade, indicating number of hours and cost per hour for each Subcontractor as applicable. Such breakdowns shall only include employees in the direct employ of Contractor or Subcontractors in the performance of the Work. Such employees shall only include laborers at the site, mechanics, craftsmen and foremen. Payroll cost shall include base rate salaries and wages plus the cost of fringe benefits required by agreement or custom and social security contributions, unemployment, payroll taxes and workers' or workmen's compensation insurance and other customary and legally required taxes paid by the Contractor or Subcontractors. Any item or expense outside of these categories is not allowed. The expense of performing Work after regular working hours, on Saturdays, Sundays or legal holidays shall not be included in the above, unless approved in writing and in advance by Owner.
- .2** Material, supplies, consumables and equipment to be incorporated into the Work at actual invoice cost to the Contractor or Subcontractors; breakdowns showing all material, installed equipment and consumables fully itemized with number of units installed and cost per unit extended. Any singular item or items in aggregate greater than one thousand dollars (\$1,000) in cost shall be supported with supplier invoices at the request of the Owner's Representative. Normal hand tools are not compensable.
- .3** Equipment: Breakdown for required equipment shall itemize (at a minimum) delivery / pick-up charge, hourly

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

## **7.2 Construction Change Directive**

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

- .1** A lump sum agreement, properly itemized and supported by substantiating documents of sufficient detail to allow evaluation.
- .2** By unit prices contained in the Contractor's original proposal and incorporated in the Construction Contract or subsequently agreed upon.
- .3** A method agreed to by both the Owner and the contractor with a mutually agreeable fee for overhead and profit.
- .4** In the absence of an agreement between the Owner and the Contractor on the method of establishing an adjustment of the contract amount, the Owner, with the assistance of the architect, shall determine the adjustment amount on the basis of expenditures by the Contractor for labor, materials, equipment, and other costs consistent with other provisions of the Contract. The contractor shall keep and submit to the Owner an itemized accounting of all cost components, either expended or saved, while performing the Work covered under the Construction Change Directive.

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

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

## **7.3 Overhead and Profit**

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

- .1** The overhead and profit charged by the Contractor and Subcontractors shall be considered to include, but not limited to, job site office and clerical expense, normal hand tools, incidental job supervision, field supervision, payroll costs and other compensation for project manager, officers, executives, principals, general managers, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, time-keepers, and other personnel employed whether at the site or in principal or a branch office for general superintendent and administration of the Work.
- .2** The percentages for overhead and profit charged on Change Orders shall be negotiated and may vary according to the nature, extent, and complexity of the Work involved but in no case shall exceed the following:
  - 15% To the Contractor or the Subcontractor of any tier for Work performed with their respective forces or materials purchased
  - 5% To the Contractor on Work performed by other than his forces
  - 5% To first tier Subcontractor on Work performed by his Subcontractor
- .3** The Contractor will be allowed to add 2% for the cost of bonding and insurance to their cost of work. This 2% shall be allowed on the total cost of the added work, including overhead and profit.
- .4** Not more than three mark-ups, not to exceed individual maximums shown above, shall be allowed regardless of the number of tier subcontractors. Overhead and profit shall be shown separately for each subcontractor of any tier and the Contractor.
- .5** On proposals covering both increases and decreases in the amount of the Contract, the application of overhead and profit shall be on the net change in direct cost for the Contractor or Subcontractor of any tier performing the Work.
- .6** The percentages for overhead and profit credit to the Owner on Change Orders that are strictly decreases in the quantity of work or materials shall be negotiated and may vary according to the nature, extent, and complexity of the Work involved, but shall not be less than the following:

Overhead and Profit

  - 7.5% Credit to the Owner from the Contractor or Subcontractor of any tier for Work performed with their respective forces or materials purchased
  - 2.5% Credit to the Owner from the Contractor on Work performed by other than his forces
  - 2.5% Credit to the Owner from the first tier Subcontractor on Work performed by his Subcontractor of any tier

## **7.4 Extended General Conditions**

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

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

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

- .1** For the portion of the direct payroll cost of the Contractor's project manager expended in completing the Work and the direct payroll cost of other onsite administrative staff not included in Article 7.3.1. Direct payroll cost shall include base rate salaries and wages plus the cost of fringe benefits required by agreement or custom and social security contributions, unemployment, payroll taxes and workers' or workmen's compensation insurance and other customary and legally required taxes paid by the Contractor;
- .2** Cost of Contractor's temporary office, including temporary office utilities expense;
- .3** Cost of temporary utilities required in the performance of the work;
- .4** Profit not to exceed 5% of the total extended overhead direct costs;

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

## **7.5 Emergency Work**

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

## **ARTICLE 8 TIME**

### **8.1 Progress and Completion**

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

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

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

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

### **8.2 Delay in Completion**

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

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

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

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

**8.2.4** Notwithstanding anything to the contrary in the Contract Documents, except as otherwise noted in these General Conditions, an extension in the Contract Time, to the extent permitted under this Article, shall be the sole remedy of the Contractor for any (1) delay in the commencement, prosecution or completion of the Work, (2) hindrance or obstruction in the performance of the Work, (3) loss of productivity, or (4) other claims due to or caused by any events beyond the control of both the Owner and Contractor defined herein as Force Majeure. In no event shall the Contractor be entitled to any compensation or recovery of any damages or any portion of damages resulting from delays caused by or within the control of Contractor or by acts or omissions of Contractor or its Subcontractors of any tier or delays beyond the control of both Owner and Contractor. If the Contractor contends that delay, hindrance, obstruction or other adverse condition results from acts or omissions of the Owner, the Owner's Representative or the Architect, Contractor shall provide written notice to the Owner within seven (7) calendar days of the event giving rise to such claim. Contractor shall only be entitled to an adjustment in the Contract Sum to the extent that such acts or omissions continue after the Contractor's written notice to the Owner of such acts or omissions, but in no case shall Force Majeure be the basis of an increase in the Contract sum. The Owner's exercise of any of its rights or remedies under the Contract

Documents (including, without limitation, ordering changes in the Work, or directing suspension, rescheduling or correction of the Work) regardless of the extent or frequency of the Owner's exercise of such rights or remedies, shall not be the basis of any Claim for an increase in the Contract Sum or Contract Time. In the event Contractor is entitled to an adjustment in the Contract Sum for any delay, hindrance, obstruction or other adverse condition caused by the acts or omissions of the Owner, the Owner's Representative or the Architect, Contractor shall only be entitled to its actual direct costs caused thereby and Contractor shall not be entitled to and waives any right to special, indirect, or consequential damages including loss of profits, loss of savings or revenues, loss of anticipated profits, labor inefficiencies, idle equipment, home office overhead, and similar type of damages.

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

### **8.3 Liquidated Damages**

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

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

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

## **ARTICLE 9 PAYMENTS AND COMPLETION**

### **9.1 Commencement, Prosecution, and Completion**

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

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

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

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

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

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

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

**9.1.6** Any successful bidder which is a corporation organized in a state other than Missouri or any bidder doing business in the State of Missouri under a fictitious name shall furnish, at no cost to the Owner, no later than the time at which the executed Contract for Construction, the Payment Bond, and the Performance Bond are returned, a properly certified copy of its current Certificate of Authority and License to do business in the State of Missouri. No contract will be executed by the

Owner until such certificate is furnished by the bidder, unless there already is on file with the Owner a current certificate, in which event, no additional certificate will be required during the period of time for which such current certificate remains in effect.

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

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

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

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

## **9.2 Contract Sum**

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

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

### **9.3 Schedule of Values**

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

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

- .1** Enough detail as necessary to adequately evaluate the actual percent complete of any line item on a monthly basis, as determined by the Owner's Representative.
- .2** Line items, when being performed by a subcontractor or material supplier, shall correlate directly back to the subcontract or purchase order amount if requested by the Owner's Representative.

### **9.4 Applications for Payment**

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

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

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

**9.4.4** If approved in writing and in advance by Owner, progress payments may be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. Owner may in its sole discretion refuse to grant approval for payments for materials and equipment stored at the Project site but not yet incorporated in the Work. Any approval by Owner for payment for materials and equipment delivered and suitably stored at the site, or stored offsite as noted below,

for subsequent incorporation in the Work shall be conditioned upon Contractor's demonstrating that such materials and equipment are adequately protected from weather, damage, vandalism and theft and that such materials and equipment have been inventoried and stored in accordance with procedures established by or approved by the Owner. Nothing in this clause shall imply or create any liability on the part of the Owner for the Contractor's inventory and storage procedures or for any loss or damage to material, equipment or supplies stored on the site, whether incorporated into the work or not. In the event any such loss or damage occurs, the Contractor remains solely responsible for all costs associated with replacement of the affected materials, supplies and equipment including labor and incidental costs, and shall have no claim against the Owner for such loss.

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

- .1** Items considered to be major items of considerable magnitude, if suitably stored, may be allowed in project pay requests on the basis of ninety percent (90%) of invoices
- .2** Determination of acceptable "major items of considerable magnitude" and "suitably stored" shall be made by the Owner's Representative.
- .3** Aggregate quantities of materials not considered unique to this project will not be considered for offsite storage payment.
- .4** Contractor shall submit to the Owner's Representative a list of the material for which application for payment for offsite storage is anticipated no less than forty-five days prior to the submission of the applicable pay request. The list shall include a material description, applicable division, quantity, and discounts offered to the Owner for early payment. Contractor shall also submit the location the material will be stored and the method of protection
- .5** The storage facility shall be subject to approval by the Owner's representative, shall be located within an acceptable distance of the project sites as established by the Owner's Representative and all materials for the Owner's project must be stored separately from all other items within the storage facility and shall be labeled and stored in the name of The Curators of the University of Missouri.
- .6** The Owner's representative shall be provided a minimum of two weeks' notice to visit the storage facility and inspect the stored material prior to submission of the pay request.
- .7** Upon favorable inspection by the Owner's Representative, the Contractor shall, at the Owner's option, submit a Bill of Sale and Bailment Agreement on forms provided by the Owner's

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

- .8 An invoice provided by the supplier shall be included with the applicable pay request.
- .9 The contractor shall remain fully responsible for all items, until acceptance of the project by the Owner.
- .10 The contractor shall reimburse all costs incurred by the Owner in inspecting and verifying all material stored offsite, including mileage, airfare, meals, lodging and time, charged at a reasonable hourly rate.
- .11 The Contractor shall furnish and maintain insurance covering the replacement cost of the material stored offsite against all losses and shall furnish proof of coverage with the application for payment for material stored offsite.
- .12 The Contractor is responsible for all costs related to storage and handling of material stored offsite unless otherwise directed by the Owner's Representative.

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

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

## **9.5 Approval for Payment**

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

## **9.6 Decisions to Withhold Approval**

**9.6.1** The Owner's Representative may decide not to certify payment and may withhold approval in whole or in part, to the extent reasonably necessary to protect the Owner. If the Owner's Representative is unable to approve payment in the amount of the Application, the Owner's Representative will notify the Contractor as provided in Paragraph 9.5.1. If the Contractor and Owner's Representative cannot agree on a revised amount, the

Owner's Representative will promptly issue approval for payment for the amount for which the Owner's Representative is able to determine is due Contractor. The Owner's Representative may also decide not to approve payment or, because of subsequently discovered evidence or subsequent observations, may nullify the whole or a part of approval for payment previously issued, to such extent as may be necessary in the Owner's Representative opinion to protect the Owner from loss because of:

- .1 defective or non-compliant Work not remedied, or damage to completed Work;
- .2 failure to supply sufficient skilled workers or suitable materials;
- .3 third party claims filed or reasonable evidence indicating probable filing of such claims;
- .4 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment, Owner may, at its sole option issue joint checks to subcontractors who have presented evidence that it has not been paid in accordance with the Contract;
- .5 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .6 damage to the Owner or another contractor;
- .7 reasonable evidence that the Work will not be completed within the Contract Time or an unsatisfactory rate of progress made by Contractor;
- .8 Contractor's failure to comply with applicable Laws;
- .9 Contractor's or Subcontractor's failure to comply with contract Prevailing Wage requirements; or
- .10 Contractor's failure to carry out the Work in strict accordance with the Contract Documents.

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

## **9.7 Progress Payments**

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

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

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

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



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

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

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

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

## **9.8 Failure of Payment**

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

## **9.9 Substantial Completion**

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

**9.9.2** When the Contractor considers the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall notify the Owner and the Architect. The Owner's

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

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

## **9.10 Partial Occupancy or Use**

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

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

## **9.11 Final Completion and Final Payment**

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

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

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

- .1** Labor costs, prevailing wage rates, fringe benefits and material costs have been paid.
- .2** Subcontractors of any tier and manufacturers furnishing materials and labor for the project have fully completed their Work and have been paid in full.
- .3** The project has been fully completed in accordance with the Contract Documents as modified by Change Orders.
- .4** The acceptance by Contractor of its Final Payment, by check or electronic transfer, shall be and operate as a release of all claims of Contractor against Owner for all things done or furnished or relating to the Work and for every act or alleged neglect of Owner arising out of the Work.

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

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

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

## **ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY**

### **10.1 Safety Precautions and Programs**

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

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

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

### **10.2 Safety Of Persons and Property**

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

- .1** students, faculty, staff, the public, construction personnel, and other persons who may be affected thereby;
- .2** the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor or the Contractor's Subcontractors of any tier; and
- .3** other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

**10.2.2** The Contractor shall give notices and comply with applicable laws, standards, codes, ordinances, rules, regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury, or loss.

**10.2.3** The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, safeguards for safety and protection, including, but not limited to, posting danger signs and other warnings against hazards, promulgating safety regulations, and notifying owners and users of adjacent sites and utilities.

**10.2.4** When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise the highest degree of care and carry on such activities under supervision of properly qualified personnel.

**10.2.5** The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Article 10 caused in whole or in part by the Contractor, a Subcontractor of any tier, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable, and for which the Contractor is responsible under Article 10, except damage or loss attributable solely to acts or omissions of Owner or the Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's other obligations stated elsewhere in the Contract.

**10.2.6** The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents, and the maintaining, enforcing and supervising of safety precautions and programs. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner's Representative and Architect. The Contractor shall hold regularly scheduled safety meetings to instruct Contractor personnel on safety practices, accident avoidance and prevention, and the Project Safety Program. The Contractor shall furnish safety equipment and enforce the use of such equipment by its employees and its subcontractors of any tier.

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

**10.2.8** The Contractor shall promptly report in writing to the Owner all accidents arising out of or in connection with

the Work which cause death, lost time injury, personal injury, or property damage, giving full details and statements of any witnesses. In addition, if death, serious personal injuries, or serious property damages are caused, the accident shall be reported immediately.

**10.2.9** The Contractor shall promptly notify in writing to the Owner of any claims for injury or damage to personal property related to the work, either by or against the Contractor.

## **ARTICLE 11 INSURANCE & BONDS**

### **11.1 Insurance**

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

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

### **11.2 Commercial General Liability**

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

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

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

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

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

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

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

### **11.3 Licensed for Use Vehicle Liability**

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

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

### **11.4 Workers' Compensation Insurance**

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

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

### **11.5 Liability Insurance General/Other Requirements**

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

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

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

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

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

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

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

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

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

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

**11.5.10** By requiring the insurance set forth herein and in the Contract Documents, Owner does not represent or warrant that coverage and limits will necessarily be adequate to protect Contractor, and such coverages and

limits shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

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

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

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

## **11.6 Builder's Risk Insurance**

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

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

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

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

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

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

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

- .1 the date which all persons and organization who are insureds under the policy agree in writing that it shall be terminated;
- .2 the date on which final payment of this Contract has been made by Owner to Contractor; or
- .3 the date on which the insurable interests in the property of all insureds other than the Owner have ceased.

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

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

## **11.7 Bonds**

**11.7.1** When the Contract sum exceeds Fifty Thousand Dollars (\$50,000), the Contractor shall procure and

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

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

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

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

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

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

**ARTICLE 12**  
**UNCOVERING AND CORRECTION OF THE**  
**WORK**

**12.1 Uncovering of the Work**

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

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

**12.2 Correction of the Work**

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

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

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

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

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

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

**12.3 Acceptance of Nonconforming Work**

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

## **ARTICLE 13 MISCELLANEOUS PROVISIONS**

### **13.1 Written Notice**

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

### **13.2 Rights and Remedies**

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

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

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

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

### **13.3 Tests and Inspections**

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

Architect, the Owner's Representative and/or the Owner's Authorized Agent may observe procedures or perform the necessary tests or inspections.

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

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

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

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

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

### **13.4 Nondiscrimination in Employment Equal Opportunity**

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



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

### **13.5 Supplier Diversity Goal Program**

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

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

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

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

**13.5.5** The Contractor and his subcontractors shall develop, implement, maintain, and submit in writing to the Director of Facilities Planning & Development, an affirmative action program if at least fifty (50) persons in the aggregate are employed under this contract. If less than fifty (50) persons in the aggregate are to be employed under this contract, the Contractor shall submit, in lieu of the written affirmative action program, a properly executed "Affidavit for Affirmative Action" in the form as included in the Contract Documents. For the purpose of this section, an "Affirmative Action Program"

means positive actions to influence all employment practices (including, but not limited to, recruiting, hiring, promoting, and training) in providing equal employment opportunity regardless of race, color, sex, national origin, religion, age (where the person affected is between 40 and 70), disabled and Vietnam-era veteran status, and handicapped otherwise qualified status. Such affirmative action program shall include:

- .1** A written policy statement committing the total organization to affirmative action and assigning management responsibilities and procedures for evaluation and dissemination.
- .2** The identification of a person designated to handle affirmative action.
- .3** The establishment of non-discriminatory selection standards, objective measures to analyze recruitment, an upward mobility system, a wage and salary structure, and standards applicable to lay-off, recall, discharge, demotion, and discipline.
- .4** The exclusion of discrimination from collective bargaining agreements.
- .5** Performance of an internal audit of the reporting system to monitor execution and to provide for future planning.

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

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

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

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

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

result in the debarment of the contractor or subcontractor from future work with the University.

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

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

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

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

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

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

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

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

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

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

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

**13.6.13** Time and one-half overtime will be paid on all hours over 10 hours per day or 40 hours per week. The wage rate is the total of the "Basic Hourly Rate" plus "Total Fringe Benefits" or the "public works contracting minimum wage". For all work performed on a Sunday or

Holiday, not less than twice the prevailing hourly rate of pay or public works contracting minimum wage will apply. Holidays are as follows: January first, the last Monday in May, July fourth, the first Monday in September, November 11, the fourth Thursday in November, December twenty-fifth. If any holiday falls on a Sunday, the following Monday shall be considered a holiday.

### **13.7 Records**

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

### **13.8 Codes and Standards**

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

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

- .16 National Electrical Manufacturers Association (NEMA)
- .17 Underwriter's Laboratories, Inc. (UL), Federal Specifications
- .18 Williams Steiger Occupational Safety and Health Act of 1970 (OSHA)

### **13.9 General Provisions**

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

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

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

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

**13.9.5** Contractor agrees that Owner shall not be liable to Contractor for any special, indirect, incidental, or consequential damage whatsoever, whether caused by

Owner's negligence, fault, errors or omissions, strict liability, breach of contract, breach of warranty or other cause or causes whatsoever. Such special, indirect, incidental or consequential damages include, but are not limited to loss of profits, loss of savings or revenue, loss of anticipated profits, labor inefficiencies, idle equipment, home office overhead, and similar types of damages.

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

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

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

### **13.10 Certification**

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

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

**ARTICLE 14**  
**TERMINATION OR SUSPENSION OF THE**  
**CONTRACT**

**14.1 Termination by Owner for Cause**

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

- .1** refuses or fails to supply enough properly skilled workers, superintendents, foremen, or managers;
- .2** refuses or fails to supply sufficient or proper materials;
- .3** fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
- .4** disregards laws, ordinances, rules, codes, regulations or orders of an authority having jurisdiction;
- .5** disregards the authority of the Owner's Representative, Architect, or Owner's Authorized Agent;
- .6** breaches any warranty or representations made by the Contractor under or pursuant to the Contract Documents;
- .7** fails to furnish the Owner with assurances satisfactory to the Owner evidencing the Contractor's ability to complete the Work in compliance with all the requirements of the Contract Documents;
- .8** fails after commencement of the Work to proceed continuously with the construction and completion of the Work for more than ten (10) days, except as permitted under the Contract Documents;
- .9** fails to maintain a satisfactory rate of progress with the Work or fails to comply with approved progress schedules; or
- .10** violates in any substantial way any provisions of the Contract Documents.

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

- .1** take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2** accept assignment of subcontracts pursuant to Paragraph 5.3; and
- .3** finish the Work by whatever reasonable method the Owner may deem expedient, including turning the Work over to the surety.

**14.1.3** The Contractor, in the event of a termination under Section 14.1, shall not be entitled to receive any further payments under the Contract until the Work is completed in its entirety. Then, if the unpaid balance

under the Contract shall exceed all expenses of the Owner in finishing the Work, including additional compensation for the Architects services and expenses made necessary thereby, such excess will be paid to the Contractor; but, if such expenses of Owner to finish the Work shall exceed the unpaid balance, the Contractor and its surety shall be liable for, and shall pay the difference and any damages to the Owner. The obligation of the Contractor and its surety for payment of said amounts shall survive termination of the Contract.

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

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

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

**14.2 Suspension by the Owner for Convenience**

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

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

- .1** that performance is, was, or would have been so suspended, delayed or interrupted by another cause for which the Contractor in whole or in part is responsible, or
- .2** that an equitable adjustment is made or denied under another provision of this Contract.

**14.3 Owner's Termination for Convenience**

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

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

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

- .1 cease operation as specified in the notice;
- .2 place no further orders and enter into no further subcontracts for materials, labor, services or facilities except as necessary to complete Work not terminated;
- .3 terminate all subcontracts and orders to the extent they relate to the Work terminated;
- .4 proceed to complete the performance of Work not terminated; and
- .5 take actions that may be necessary, or that the Owner may direct, for the protection and preservation of the terminated Work.

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

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

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

SECTION 1.E  
SPECIAL CONDITIONS

1. DEFINITIONS

a. "Drawings"

1. Drawings referred to in and accompanying Project Manual consist of Drawings prepared by and bearing name of below defined Architect, bearing 26 April 2024, University of Missouri Patient Care Tower 8<sup>th</sup> Floor BMT Unit Phase 1B Renovation.

b. Architect  
BSA LifeStructures  
12645 Olive Blvd., Suite 100  
Creve Coeur, MO 63141  
Ph: 314.754.6306  
Fx: 314.754.4452

c. Mechanical & Electrical Engineer  
McClure Engineering  
1000 Clark Ave.  
St. Louis, MO 63102  
Ph: 314.645.6232

d. Structural Engineer  
ASDG LLC  
1009 Lincoln Hwy.  
Fairview Heights, IL 62208

2. SPECIAL SCHEDULING REQUIREMENTS

a. Special scheduling requirements supplemental to the bid form.

- (1) Weekday daytime work hours are considered as hours Monday-Friday, between the hours of 7:00 a.m. and 5:00 p.m.
- (2) Night hours are defined as Monday through Thursday, after 5:00 p.m. and before 4:00 a.m.
- (3) Weekend hours are defined as after 7:00 p.m. on Friday until 4:00 a.m. Monday.
- (4) Excessive Noisy Work hours – All interior concrete demolition work shall occur between 7:00 a.m. and 5:00 p.m. Such work shall be coordinated and approved at least 72 hours in advance with Owner's Representative.
- (5) Utility outages must be coordinated with Owners Representative with a minimum of 14 calendar days' notice.
- (6) Electrical outages may only occur between the hours of **10:00 p.m. Thursday and 4:00 a.m. Friday** unless approved by Owners Representative. Electrical feeders may be acceptable to be combined into a single outage while other feeders may require individual outages.

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.

General Description of Work:

- (1) Project consists of the construction of partial renovation of the 8<sup>th</sup> floor of the Patient Care Tower as well as utility and infrastructure work in the penthouses and on the roof. A duct bridge and enclosed duct chase on the roof to contain new ductwork are part of the work. The area to be renovated with in patient care areas is 2,114 square feet.
- (2) Demolition shall consist of the existing finishes within the patient care area. Also demolition of portions of select metal panels on the exterior walls of the penthouses to allow the installation of new duct work. Saw cutting to remove a portion of the existing concrete roof deck is required to allow for the new ducts to be traverse to the ceiling space of the 8<sup>th</sup> floor below. An existing med gas zone valve will need to be removed to accommodate the installation of new door.
- (3) Architectural work shall consist of new finishes in the patient care areas, moving an existing door, and erecting a new partition to separate the BMT space from adjacent patient care areas. Other work includes new metal panels for the pipe bridge enclosure and duct chase enclosure on the roof.
- (4) Structural work shall consist of new structural steel for the new duct bridge and chase.
- (5) Mechanical work shall consist of a new air handler in the penthouse as well as new associated duct work. Additional work will consist of duct work modifications to connect the new duct feed to the existing ducts. The new AHU will be tied into the existing chilled water system in the existing penthouse. The med gas zone valve will be installed in a new location.
- (6) Electrical work shall consist of installing new electrical panels and associated VFDs. Other work will include modifications to lights and electrical conduits to coordinate with the new work.

4. LOCATION

Work shall be performed under this Contract on campus of the University of Missouri – **Patient Care Tower – 8<sup>th</sup> Floor and Mechanical Penthouse and Roof.**

5. NUMBER OF CONSTRUCTION DOCUMENTS

- a. The Owner will provide electronic data files to the Contractor for their convenience and use in progressing the Work and the preparation of shop drawings or other submittal requirements required for construction of the referenced project. The electronic data files



shall reflect Construction Documents and Bid Addenda only. These files will be transmitted subject to the following terms and conditions:

- (1) The Owner makes no representation as to the compatibility of these files with the Contractor's hardware or software.
- (2) Data contained on these electronic files shall not be used by the Contractor or anyone else for any purpose other than as a convenience in progressing the Work or in the preparation of shop drawings or other required submittals for the referenced project. Any other use or reuse by the Contractor or by others will be at their own sole risk and without liability or legal exposure to Owner. The Contractor agrees to make no claim and hereby waive, to the fullest extent permitted by law, any claim or cause of action of any nature against the Owner and its consultants, contractors, agents, employees, and representatives that may arise out of or in connection with the use of the electronic files transmitted.
- (3) Furthermore, the Contractor shall, to the fullest extent permitted by law, indemnify and hold harmless the Owner and its consultants, contractors, agents, employees, and representatives, against all damages, liabilities or costs, including reasonable attorney's fees and defense costs, arising out of or resulting from the use of these electronic files.
- (4) These electronic files are not contract documents. Differences may exist between these electronic files and corresponding hard-copy construction documents. The Owner makes no representation regarding the accuracy or completeness of the electronic files you receive. In the event that a conflict arises between the signed or sealed hard-copy construction documents prepared by the Consultant and the electronic files, the signed and sealed hard-copy construction documents shall govern. The Contractor is responsible for determining if any conflict exists. By use of these electronic files, the Contractor is not relieved of their duty to fully comply with the contract documents.
- (5) Because information presented on the electronic files can be modified, unintentionally or otherwise, the Owner reserves the right to remove all indications of ownership and/or involvement from each electronic display.
- (6) Under no circumstances shall delivery of the electronic files be deemed a sale by the Owner and no warranties are made, either expressed or implied, of merchantability and fitness for any particular purpose. In no event shall the Owner be liable for any loss of profit, or any consequential damages as a result of use or reuse of these electronic files.

## 6. SUBMITTALS

- a. The Contractor shall submit for approval to the Architect, equipment lists and Shop Drawings, as expediently as possible. Failure of the Contractor to submit Shop Drawings in a timely manner will result in the Owner holding back Contractor payments. (See General Conditions)
- b. The material and equipment lists shall be submitted and approved before any material or equipment is purchased and shall be corrected to as-built conditions before the completion of the project.
- c. The Contractor shall submit electronic versions of all required Shop Drawings, material and equipment lists. The Contractor shall upload all Shop Drawings to a secure information sharing website determined by the Owner notifying the Owner and Consultant that these shop drawings are available for review. Each submittal shall have the General Contractors

digital stamp affixed to the first page signifying their review and acceptance. Review comments, approvals, and rejections will be posted on this same site with notification to the contractor. Submittals requiring a professional seal shall be submitted hard copy with a manual seal affixed.

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

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

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

- d. The Contractor shall submit one electronic 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 it 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 the construction site shall be as indicated on Drawings and as directed by the Owner's Representative. CONTRACTOR ACCESS PLAN
- b. Parking: Contractor shall be issued parking permits for 0 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. The contractor parking lot (if available), may also be utilized for employee parking.
  - (1) Sidewalk(s) and Hardscape – Parking/driving on hardscapes is strictly prohibited unless specifically directed by the Owner's Representative through the MU

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

- (2) Free parking for contractor employees is available in the Ashland Road Contractor lot on an as available basis. This space is for use by contractor employees for parking their personal vehicles only and is not to be used for staging or storage.
- (3) Vendor Permits may be purchased by contractor management personnel on an as available basis by contacting the Parking and Transportation office in the General Services Building. These permits will allow contractor management personnel to park in various University lots while conducting business on University construction projects.
- (4) Temporary University parking permits may be purchased by contractor employees for use with their personal vehicles on an as available basis by contacting the Parking and Transportation office in the General Services Building.
- (5) Conley Avenue between Missouri Avenue and University Avenue and Hitt Street between University Avenue and the Memorial Union are designated for pedestrian use only during the work week between the hours of 8:15 AM and 3:45 PM. Unless otherwise indicated in the contract documents, this area is strictly off limits to vehicular traffic without authorization from the Owner's Representative.

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

If allowed by MUHC and the Owner's Representative, an exterior staging area may be utilized. The determination on whether the staging area(s) are allowed will be after bid. See the locations on the Contract Drawings. If allowed, the Contractor shall be responsible for the preparation of the space (filter cloth, gravel) and the erection of a 5' tall chain-link fence, properly embedded with screening on the fence. See also, paragraph 9.b for further information.

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- d. Utilities: Drinking water, water required to carry on work, and 120 volt electrical power required for small tool operation may be obtained without cost to the Contractor from existing utilities at locations designated by the Owner's Representative. Provisions for obtaining power, including temporary extensions, shall be furnished and maintained by the Contractor. Upon completion of work such extensions shall be removed and any damage caused by use of such extensions shall be repaired to satisfaction of the Owner's Representative, at no cost to the Owner.
- c. Restroom: Existing toilet facilities within Project Limits or Restrooms designated by the Owner's Representative for use by the Contractor will be available. Failure of the Contractor to maintain restrooms in a clean condition will be cause for the Contractor's discontinued use of the restroom
- f. Smoking is prohibited at the University of Missouri and all properties owned, operated,

leased or controlled by the University of Missouri. Violation of the policy is defined as smoking any tobacco products, including e-cigarettes.

- g. Landfill: The Contractor shall not use the Owner's landfill. Dumping or disposal of excavated or demolition materials on Owner's property shall not be permitted. The Contractor shall remove and legally dispose of excavated or demolished materials off the Owner's property.
- h. Care of Project Work Site: The contractor shall be responsible for maintaining the construction site in a reasonably neat and orderly condition by regular cleaning and mowing of the premises as determined by the Owner's Representative.
- i. Discharge to Sewer Request: The University of Missouri's MS4 permit and NPDES Storm Water Discharge Permits along with the City of Columbia's POTW Operating Permit as well as local ordinances, and state and federal environmental regulations prohibit hazardous materials from being disposed into either the storm water or sanitary sewer systems. Unless specifically approved, all chemical products such as paints, dyes, lawn care products, maintenance products, and oil ~~is~~ are prohibited from drain disposal. Any product, including contaminated water, being discarded into the storm water or sanitary sewer systems requires written approval from the Owner through a formal "Discharge to Sewer Request" form obtained at [Discharge to Sewer Request Form](#). The contractor should submit the form to the Owner's Representative, not to the Department of Environmental Health and Safety as the form indicates.
- j. All concrete waste material including washout water shall be totally contained and removed from the Owner's property.
- l. **"Permit Required Confined Space" Entry Communication and Coordination**  
(See OSHA 1926 subpart aa – Construction Confined Space for the definition of "permit required confined spaces" - Note: OSHA does not apply to the University. However, the University will provide a list of all known "permit required confined spaces")

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

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

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

## 9. PROTECTION OF OWNER'S PROPERTY

- a. The Contractor shall be responsible for repair of damage to building exterior and interior, drives, curbs, streets, walks, grass, shrubbery and trees, which was caused by workmen or equipment employed during progress of work. All such repairs shall be made to satisfaction of the Owner's Representative, at no cost to the Owner, or reimburse the Owner if the Owner elects to make repairs. For landscape damage, the Owner shall make such repairs. Compensation for these repairs shall be determined by the Owner's Representative using the "Valuation of Landscape Trees, Shrubs, and other Plants" as published by the International Society of Arboriculture, as last revised.
  
- b. Construction Project Fencing:
  - (1) Project staging area shall be kept continuously protected with, at minimum, a temporary portable fence constructed of woven wire fencing not less than five (5) feet in height and supported by metal tee posts spaced not more than ten (10) feet apart and imbedded in five (5) gallon buckets of concrete or an equivalent method of support. In lieu of five gallon buckets of concrete, metal posts may be driven into ground or asphalt. Portions of fence shall be reinstalled when work activities cease and during all non-work periods. Coordinate fencing with Owner's Representative before installing.
  - (2) Using existing landmarks, lamp posts, trees or other Owner property for support of fencing is strictly prohibited unless a written waiver is obtained from Owner's Representative.
  - (3) Use of ribbon, snow fence, chicken wire, rope, and wooden barricades as fencing is prohibited.
  - (4) Fencing shall be maintained in an "as-installed" condition throughout the life of the project.
  - (5) The Contractor may use used fencing provided it is in good condition and is satisfactory to the Owner's Representative.
  
- c. Preserving and Protecting Existing Vegetation:
  - (1) Protection and compensation for damages:
    - (a) Trees and shrubs within work area designated to remain shall be protected from damage during construction by fixed chain link fencing or armoring as indicated on Drawings or specified herein. Plant protection devices shall be installed before work has begun and shall be maintained for duration of work unless otherwise directed by Owner's Representative.
    - (b) In the event that damage(s) to the Owner's trees, shrubs or vegetation occurs as a result of the Contractor's unauthorized operations, the Contractor shall pay or allow to the Owner compensation for said damage(s). Compensation shall be determined by the Owner's Representative using the "Valuation of Landscape Trees, Shrubs, and other Plants" as published by the

- (2) Plants within work area designated for removal shall be removed by Contractor.
- (3) To prevent compaction of soil over tree roots, vehicles or equipment shall not at any time park or travel over, nor shall any materials be stored within drip line of trees designated to remain.
- (4) Owner's Representative will stop work immediately when proper measures are not being employed to protect trees and shrubs. Contractor will be notified to resume work after required protection measures are implemented.
- (5) Pruning of limbs necessary to repair damage or provide clearance for work shall be **done by the MU Landscape Services Department** done by approved, trained tree maintenance personnel at the direction of the Owner's Representative. Limbs shall be cut off cleanly and cut surfaces treated according to established horticultural standards.

10. SUBSTITUTIONS and EQUALS

- a. Substitutions are defined in General Conditions article 3.11.8 for and Equals are defined General Conditions Article 3.12 .
- b. Substitutions and/or Equals of the item(s) listed below will be allowed only prior to receipt of bids provided that a written request for approval has been received by both the Architect and the Owner at least ten calendar days prior to the date for receipt of Bids. All other substitution and/or Equals items shall follow the procedures set forth in the General Conditions.
- c. If the Architect and Owner approve a proposed substitution prior to receipt of Bids, such approval will be set forth in an Addendum. Bidders shall not rely upon approval made in any other manner.
- d. No substitutions and/or equal will be allowed for the following items:

<u>Item</u>	<u>Specification Section</u>
Lock Cylinders [Best]	08710
List of items as approved by the Project Manager.	
Fire Alarm (Siemens)	283000

11. CODES AND STANDARDS

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

- a. City of Columbia - Sewer Line Installation Standards - Department of Public Works

"All sanitary sewer construction shall be in accordance with the City of Columbia Specifications and Standards and in conformance with the rules and regulations of the Missouri Clean Water Commission."

12. PERMITS

- a. The University of Missouri System will be the third-party Code Inspection Agency for this project. The owner will secure a building permit and furnish to the Contractor prior to construction commencing on site. A temporary certificate of occupancy and certificate of occupancy process will be incorporated into this project.

13. SPECIALTIES

- a. Blower Door Testing: The contractor is responsible for ensuring that the below listed rooms are sealed tight enough to maintain the listed pressures. The owner will hire a 3rd party agent to blower door test the room to these specifications. This testing must occur after the walls and doors are installed, but before the ceilings are installed. If any of the spaces fail to meet the below criteria, the contractor will be responsible for covering costs associated with any necessary return trips by the owner's 3rd party testing agent to verify compliance after additional sealing/remediation work is completed. The contractor must prove that these rooms meet leakage criteria prior to installing ceilings.

(1) Patient Rooms: +0.01" w.c. relative to the corridor with an air leakage rate of no more than 150 CFM

14. PRE-BID INSPECTION

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

15. ROOF WARRANTY REQUIREMENT

- a. The Contractor shall submit, before the first progress payment, a copy of University of Missouri Roof System Manufacturer's Certification, which shall be manually signed by an authorized representative of Manufacturer of each proposed roofing system. Certification shall have original signature.
- b. Following final inspection and acceptance of the roofing system(s) by the Owner and the roofing system manufacturer(s), the Contractor shall submit a manually signed standard warranty agreement provided and executed by the roofing system manufacturer for each roofing system provided. Standard warranty agreement(s) shall be of the duration specified in Division 7.
- c. University of Missouri three (3) year Contractor's Roofing/Flashing/ Sheetmetal Guarantee shall be signed by the roofing contractor after final inspection and acceptance of each roofing system by Manufacturer and by Owner.
- d. The Roofing contractor or subcontractor shall provide the Owner with an Application for a Roof Warranty.

16. MODIFICATIONS TO INFORMATION TO BIDDERS

a. Information to Bidders:

- (1) Referenced Information to Bidders, Page IFB/5.  
Add new Article 15.8.5 as follows:

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

17. MODIFICATION TO INFORMATION FOR BIDDERS: BIDDERS STATEMENT OF QUALIFICATIONS – NOT USED

18. MODIFICATIONS TO GENERAL CONDITIONS – NOT USED

19. PROJECT SCHEDULING look at the updated version for this section

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

20. PROJECT COORDINATION new version to be reviewed for additional info

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

- (1) Schedule construction operations in the sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
- (2) Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.
- (3) Make provisions to accommodate items scheduled for later installation.

b. Coordination Drawings: Provide coordination drawings in (2 packages) for the integration of the Work, including work first shown in detail on shop drawings or product data:



1. Package 1 to include all work within the penthouse area. (within sixty (60) days of Notice to Proceed)
2. Package 2 to include all work within the 8th Floor area. (within sixty (60) days of starting work on the 8<sup>th</sup> Floor)
- (1) Coordination drawings shall accurately depict existing conditions in both packages. Field verification is required for existing conditions prior to completion of coordination drawings. For scope on the 8th floor, each room within the scope area will be made available by the Owner 1 at a time for existing conditions verification. Closely coordinate scheduling activities and infection control with Owner personnel.
- (2) Coordination drawing package shall include all trades and existing conditions to ensure complete review of potential conflicts and impacts to scope. Provide proposed resolutions to conflicts with coordination drawings submittal to the Architect/Engineer.
- (3) Coordination drawing package shall be submitted to the Architect/Engineer prior to any fabrication or installation. Contractor's schedule shall account for coordination drawing activities and review. Each package shall be submitted separately in correlation with project scheduling.
- c. Provide CAD drawings (plan view) showing sizes, dimensions and heights of the various new and existing elements. Provide section views at 5-foot intervals to reflect the intended layout.
- d. Show sequencing and relationship of separate unit of work which must interface in a restricted manner to fit in the space provided, or function as indicated.
  - (1) Show the interrelationship of components shown on separate shop drawings.
  - (2) Indicate required installation sequences.
  - (3) Call attention in advance to Architect of any dimensional or detail information needed to complete the coordination drawings.

21. PROJECT PARTNERING – NOT USED

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22. VALUE ENGINEERING – NOT USED

23. BUILDING SYSTEM QUALITY ASSURANCE AND COMMISSIONING

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

- b. The contractor shall designate a competent person, either the superintendent or Project Manager, to act as the contractor's Quality Assurance coordinator. The Quality Assurance coordinator is responsible for planning, scheduling, coordinating, conducting and verifying all Quality Assurance activities required by the Quality Assurance and ensuring all building systems are complete, operable and ready for use by the Owner. At a minimum, building ventilation systems, chilled/hot water generation systems, hydronic distribution systems, power distributions systems and fire detection and alarm systems, as applicable.
  - c. Commissioning services will be performed by third party only.
24. MECHANICAL, ELECTRICAL, PLUMBING (MEP) PRE-INSTALLATION MEETING(S)
- a. Before the start of MEP installation, the Owner's Representative will convene an MEP pre-installation meeting. Meeting participants to include contractor (including MEP subcontractors), Owner's Representative and additional contractor and University operational staff invited by the Owner's Representative. Topics will include underground rough-ins, steam piping, chilled water piping, sprinkler piping, hot water piping, electrical system, duct, telephone/data wiring, control wiring. Additional meetings will be conducted as required for the review of coordination drawings and scope specific installations. Cross section drawings of corridor ceilings and other congested areas will be of highest priority and will be reviewed prior to the start of installations in the affected areas. Meeting minutes and sign-up sheet will be transcribed by contractor and distributed to attendees.
25. COST BREAKOUT FOR OWNER'S ACCOUNTING PURPOSES – NOT USED
26. PROJECT MANAGEMENT/COMMUNICATION REQUIREMENTS
- a. The Contractor shall be represented at the site by a competent superintendent 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. The superintendent shall visit the project daily and be available at all times, during the workday, to participate in issue resolutions and manage the project.
- b. The Contractor shall use a current industry standard Phoenix project scheduling software which provides as a minimum: Critical paths, milestones, estimated and actual start and completion dates, scheduled vs. actual progress, and detailed task and subtask breakdown. The following schedules shall be provided as a minimum and kept current: Overall project schedule, four- (4-) week look-ahead, and two- (2-) week look-ahead.
  - c. The Contractor will be able to utilize the owner's WIFI or can furnish on-site Internet access for use by his Project Manager and superintendent. The contractor shall utilize the Owner's secure information sharing system for submittals, construction payment process, change orders, RFI's/ASI's, O&M manuals and all other project manual requirements as directed by the Owner's Representative. Field staff are also required to utilize this software as directed by the Owner's Representative.
  - d. The Contractor shall provide the on-site superintendent with a mobile phone.

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27. SAFETY PRECAUTIONS AND PROGRAMS

- a. The Bidder's Statement of Qualifications includes a requirement that the Bidder provide its Worker's Compensation Experience Modification Rates (EMR) and Incidence Rates for the three recent years. The Bidder shall also include the EMR and Incidence Rates of listed major subcontractors on the Bid for Lump Sum Contract. If the EMR exceeds 1 or the Incidence Rate exceeds 13, the Contractor or major subcontractor shall take additional safety measures including, but not limited to, developing a site specific safety plan and assigning a Safety Manager to the Project to perform inspections on a schedule as determined acceptable by the Owner with written reports to be submitted to the Owner. The Owner reserves the right to reject a Bidder or major subcontractor whose rates exceed these stated rates.
- b. The contractor shall provide Emergency Contact Information for the Contractor's on-site staff and home office management as well as contact information for all major subcontractor personnel. This information shall contain business and personal phone numbers for each individual for contact during or after hours in case of an emergency. This information shall be submitted within 15 days of the Notice to Proceed.

28. HOT WORK PERMITTING AND GENERAL REQUIREMENTS

- 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 MUHC Engineering Services 24 hours prior to starting hot work in buildings with operational fire alarm or fire suppression systems.
- e. MUHC will collect and file Hot Work Permits.

# HOT WORK PERMIT

**STOP!**

**Avoid hot work when possible! Consider using an alternative cold work method.**

This Hot Work Permit is required for any temporary operation involving open flames or producing heat and/or sparks conducted outside a Hot Work Designated Area. This includes, but is not limited to brazing, cutting, grinding, soldering, torch-applied roofing and welding.

## Instructions for Permit Authorizer

1. Specify the precautions to take.
2. Fill out and keep **Part 1** during the hot work process.
3. Issue **Part 2** to the person doing the job.
4. Keep **Part 2** on file for future reference, including signed confirmation that the post-work fire watch and monitoring have been completed.
5. Sign off the final check on **Part 2**.

### HOT WORK BY

- ☐ Employee  
☐ Contractor

DATE

JOB NUMBER

LOCATION OF WORK (BUILDING/FLOOR/OBJECT)

WORK TO BE PERFORMED

NAME OF PERSON PERFORMING HOT WORK

NAME OF PERSON PERFORMING FIRE WATCH

I verify the above location has been examined, the Required Precautions have been taken, and permission is authorized for this work.

PERMIT AUTHORIZER (PRINT AND SIGN)

THIS PERMIT EXPIRES ON (LIMIT AUTHORIZATION TO ONE SHIFT):

DATE:

TIME:

☐ AM

☐ PM

**Note:** Emergency notification on back of form.

### Additional FM Global Resources:

Property Loss Prevention Data Sheet 10-3, *Hot Work Management*  
Hot Work Permit form (F2630) via [fmglobalcatalog.com](http://fmglobalcatalog.com)  
Online training at [training.fmglobal.com](http://training.fmglobal.com)  
FM Approved equipment via [fmapprovals.com](http://fmapprovals.com)



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## Part 1

Y NA

## Required Precautions

- ☐ The fire pump is in operation and switched to automatic.  
☐ Control valves to water supply for sprinkler system are open.  
☐ Extinguishers are in service/operable.  
☐ Hot work equipment is in good working condition.

### Requirements within 35 ft. (10 m) of hot work

- ☐ Shield combustible construction using listed (e.g., FM Approved) welding pads, blankets and curtains.  
☐ Remove or shield nonremovable combustibles using listed (e.g., FM Approved) welding pads, blankets and curtains.  
☐ Isolate potential sources of flammable gas, ignitable liquid or combustible dust/lint (e.g., shut down equipment).  
☐ Remove ignitable liquid, combustible dust/lint and combustible residues.  
☐ Shut down ventilation and conveying systems.  
☐ Remove combustibles and consider a second fire watch on opposite side of floor, wall, ceiling or roof when openings exist or thermally conductive materials pass through.  
☐ Is work on a combustible building assembly (e.g., torch-applied roofing)? If yes, provide **ADDITIONAL REQUIRED PRECAUTIONS** below.

### Hot work on/in closed equipment, ductwork or piping

- ☐ Isolate equipment from service.  
☐ Remove ignitable liquid and purge flammable gas/vapor.  
☐ Prior to work, and/or during work, monitor for flammable gas/vapor. LEL reading(s):  
☐ Remove combustible dust/lint or other combustible materials.  
☐ Is work on/in equipment with nonremovable combustible linings or parts? If yes, provide **ADDITIONAL REQUIRED PRECAUTIONS** below.

### Fire watch/fire monitoring the hot work area

Times listed are sufficient for majority. Use Table at back of permit for guidance for combustible concealed cavities, roof work or favorable factors.

- ☐ Perform a continuous fire watch during hot work.  
☐ Perform a continuous fire watch post-work for  
☐ 1 hour or Other hours.  
☐ Perform fire monitoring for  
☐ 3 hours or Other hours.

### ADDITIONAL REQUIRED PRECAUTIONS:

16942009

# WARNING

## HOT WORK IN PROGRESS!

### Watch for fire!

In case of emergency, call the contacts listed below before attempting to extinguish the fire.

Contact	Number

### Construction and Occupancy Factors for Post-Work Fire Watch and Monitoring Periods

		Construction Factors					
		Noncombustible construction or FM Approved Class 1 building materials		Combustible construction without concealed cavities		Combustible construction with unprotected concealed cavities	
		Watch	Monitor	Watch	Monitor	Watch	Monitor
Occupancy Factors	Noncombustible with any combustibles contained within closed equipment (e.g., ignitable liquid within piping)	30 minutes	0 hours	1 hour	3 hours	1 hour	5 hours
	Office, retail or manufacturing with limited combustible loading	1 hour	1 hour	1 hour	3 hours	1 hour	5 hours
	Manufacturing with moderate to significant combustible loading except as noted below	1 hour	2 hours	1 hour	3 hours	1 hour	5 hours
	Warehousing	1 hour	2 hours	1 hour	3 hours	1 hour	5 hours
	Exceptions: Occupancies with processing or having bulk storage of combustible materials capable of supporting slow-growing fires (e.g., paper, pulp, textile fibers, wood, bark, grain, coal or charcoal)	1 hour	3 hours	1 hour	3 hours	1 hour	5 hours

When performing torch-applied roofing, apply additional precautions and conduct a minimum 2-hour fire watch and 2 hours fire monitoring.  
 If an infrared camera is utilized, reduce to a 1-hour fire watch and 1 hour fire monitoring.

When performing hot work on/in equipment containing nonremovable combustible linings or parts, apply additional precautions and conduct a minimum 1-hour fire watch and 3 hours fire monitoring within the equipment, and in the surrounding areas per Table above.



29. GENERAL REQUIREMENTS FOR CRANE AND HOISTING OPERATIONS

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

- a. Only fully certified and evaluated Operators shall perform equipment operations. Operators in an “Operator in Training” status shall not be used.
- b. Submittal requirements:
  1. Submit copies of Operator certifications, licenses, and evaluations to the Owners Representative.
  2. Submit Rigger and Signal Person qualifications to the Owners Representative.
  3. Unless otherwise directed by the Owners Representative, submit a lift plan and conduct a lift coordination meeting for hoisting or crane operations for any lift greater than 2,000 pounds, or for any multi pick lift. Include protective measures for existing underground utilities, occupied buildings, pedestrian and vehicle pathways, adjacent buildings and overhead power lines. If the lift is to occur over an occupied building, provide a registered structural engineer’s review and verification that the building can resist the impact of a dropped load for the intended lift. If evacuation of an occupied building is necessary to conduct the lift, the decision for building evacuation or scheduling the lift for off-hours will be determined by the Owner.

30. CONSTRUCTION WASTE MANAGEMENT – NOT USED

31. WARRANTY WALKTHROUGH

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

**END OF SECTION**



## Option #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 ensure that a well-conceived plan, that addresses the milestone and completion dates spelled out in these documents, is developed with input from all stakeholders in the project. Input is limited to all reasonable requests that are consistent with the requirements of the contract documents, and do not prejudice the Contractor's ability to perform its work consistent with the contract documents.

Further, the plan must be documented in an understandable format that allows for each stakeholder in the project to understand the plan for the construction and/or renovation contained in the Project.

b) Contractor Requirements

(1) Schedule Development

Contractor shall prepare the Project Schedule using Primavera 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.

UNIVERSITY OF MISSOURI  
ROOF SYSTEM MANUFACTURERS CERTIFICATION  
(Revised 12/94)

TO: \_\_\_\_\_ Title \_\_\_\_\_  
Project No. \_\_\_\_\_  
Location \_\_\_\_\_

Our technical staff has examined the Architect/Engineer's Drawings, Specifications and required warranty for the roofing work on this project. We do not wholly endorse the building design or any materials or services not part of our advertised roofing system.

CERTIFICATION

We hereby certify that:

1. All materials we will furnish and deliver to the project shall be of good merchantable quality, shall meet or exceed the Specifications required and shall, if properly applied by one of our approved roofing applicator firms in accord with our instructions, provide a sound weather/watertight roofing system.
2. Upon completion of the installation in accord with the Drawings and specifications and our recommended installation procedures, we shall issue a total system warranty specified in the project Specifications.
3. The Drawings and Specifications follow the recommendations of our roofing manual for this type of roofing system with:

No exceptions.

The following exceptions: (The roofing system will be approved for this project if the following changes are made to the Contract Documents. The bid provided with this Document includes the required changes).

NOTE: Exceptions may cause Owner to reject bid.  
Exceptions are as follows:

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4. The Warranty will be issued for the following proposed roofing system:

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ROOFING SYSTEM MANUFACTURER: \_\_\_\_\_

Authorized Signature: \_\_\_\_\_

Title: \_\_\_\_\_ Date \_\_\_\_\_

Telephone Number: ( ) \_\_\_\_\_

Fax Number: ( ) \_\_\_\_\_



**Johns Manville**

**Peak Advantage Guarantee**



**Building Owner:**

University of Missouri-Columbia, MO  
General Services Building, Planning, Design & Construction 111  
Columbia, MO 65211

**Building Name:**

UMHC PATIENT CARE TOWER - CP070093  
MONK DR  
COLUMBIA, MO 65201

**Guarantee Number:** ANP121088738

**Expiration Date:** January 18, 2033

**Job Name:** UMHC PATIENT CARE TOWER - CP070093

**Approved Roofing Contractor:**

**Date of Completion:** January 18, 2013

MISSOURI BUILDERS SERVICE INC.  
PO Box 104205  
Jefferson City, MO 65110

**Terms & Maximum Monetary Obligation to Maintain a Watertight Roofing System.**

**Years:** 20 Year

**\$ No Dollar Limit**

**Coverage:**

The components of the Roofing System covered by this Guarantee are:

**Total Squares:** 472

Sec.	Sqs.	Roof Type	Membrane Spec.	Insulation Type			Cover Board
				Layer 1	Layer 2	Layer 3	
1	472	PVC	SP6RA	Tapered ENRGY 3	None	Securock	

Accessories:	Type	Product Name	Quantity
	Expand-O-Flash (1) Style:		lin. ft.
	Expand-O-Flash (2) Style:		lin. ft.
	Expand-O-Flash (3) Style:		lin. ft.
	Drains (1) Style:		ea.
	Drains (2) Style:		ea.
	Vents Style:		ea.
	Fascia Style:		lin. ft.
	Copings Style:		lin. ft.
	Gravel Stop Style:		lin. ft.

These Johns Manville Guaranteed components are referred to above as the "Roofing System" and ALL OTHER COMPONENTS OF THE OWNER'S BUILDING ARE EXCLUDED FROM THE TERMS OF THIS GUARANTEE, including any amendments thereto.

Johns Manville\* guarantees to the original Building Owner that during the Term commencing with the Date of Completion (as defined above), JM will pay for the materials and labor reasonably required in Johns Manville's sole and absolute discretion to repair the Roofing System to return it to a watertight condition if leaks occur due to: ordinary wear and tear, or deficiencies in any or all of the Johns Manville component materials of the Roofing System, or workmanship deficiencies only to the extent they arise solely out of the application of the Roofing System. Non-leaking blisters are specifically excluded from coverage. Should any investigation or inspection reveal the cause of a reported leak to be outside the scope of coverage under this Guarantee, then all such investigation and inspection costs shall be borne solely by the Building Owner.



**Johns Manville**

A Berkshire Hathaway Company

10100 W Ute Ave (80127)  
PO Box 625001  
Littleton, CO 80162-5001  
800-922-5922  
877-403-1747 Fax

Dear Building Owner:

Attached to this letter is the Peak Advantage Roofing Systems Guarantee for the new roof recently installed on your building. We believe your building is now protected by one of the finest commercial roofing systems available on the market today. We appreciate the opportunity to provide you with a level of protection unmatched in the industry.

There are some things you should be aware of before you file this document away in a safe place:

1. This is NOT a maintenance agreement or an insurance policy. Johns Manville liability is strictly governed by the terms of the Guarantee. If you have any questions about this Guarantee, contact Johns Manville Guarantee Services at the appropriate number given below.
2. You are required to perform routine maintenance on the roofing system to keep the coverage to the Guarantee intact. For your convenience, a list of maintenance items is printed on the back of the Guarantee.

We hope that you never experience any difficulty with your roofing system. If you do have a problem, you should contact Johns Manville Guarantee Services at the appropriate numbers provided. Please have the Guarantee on hand so that we may more efficiently handle your inquiry.

Our Technical Services Department is staffed by some of the most experienced roofing professionals in the roofing industry. Please call on them for any questions you might have about commercial and industrial roofing and Johns Manville products.

Sincerely,

Richard Gustin  
Manager, Guarantee Services  
Johns Manville Roofing Systems Group

(800) 922-5922

[www.jm.com](http://www.jm.com)

[gsu@jm.com](mailto:gsu@jm.com)

#### WHAT TO DO IF YOUR ROOF LEAKS

If you should have a roof leak please refer to directions on the reverse side. Failure by the Building Owner to comply with any of the directions on the reverse side of this document will render the coverage provided under this Guarantee, including any applicable amendments and/or riders, null and void.

#### LIMITATIONS AND EXCLUSIONS

This Guarantee is not a maintenance agreement or an insurance policy; therefore, routine inspections and maintenance are the Building Owner's sole responsibility (see reverse side of this document). Failure to follow the Maintenance Program on the reverse side of this document will void the Guarantee in its entirety. This Guarantee does not obligate JM to repair or replace the Roofing System, or any part of the Roofing System, for leaks or appearance issues resulting, in whole or in part, from one or more of the following (a) natural disasters including but not limited to the direct or indirect effect of lightning, flood, hail storm, earthquake, tornados, hurricanes or other extraordinary natural occurrences and/or wind speeds in excess of 55 miles per hour; (b) misuse, abuse, neglect or negligence; (c) installation or material failures other than those involving the component materials expressly defined above as the Roofing System or exposure of the Roofing System components to damaging substances such as oil, fertilizers, or solvents or to damaging conditions such as vermin; (d) any and all (i) changes, alterations, repairs to the Roofing System, including, but not limited to, structures, penetrations, fixtures or utilities (including vegetative and solar overlays) based upon or through the Roofing System as well as any (ii) changes to the Building's usage that are not pre-approved in writing by JM; (e) failure of the Building substrate (mechanical, structural, or otherwise and whether resulting from Building movement, design defects or other causes) or improper drainage; (f) defects in or faulty/improper design, specification construction or engineering of the Building or any area over which the Roofing System is installed; (g) defects in or faulty/improper architectural, engineering or design flaws of the Roofing System or Building, including, but not limited to, design issues arising out of improper climate or building code compliance; or (h) in instances of a recover project, Johns Manville is not responsible for the performance of pre-existing materials that predated the recover. Instead, Johns Manville's sole responsibility in recover systems where JM materials are adhered to existing materials is limited to the installed recover JM Roofing materials up to the wind speed listed herein. Guarantee coverage is limited to replacing recover JM Roofing materials only (and not the pre-existing materials - which is the Owner's responsibility) as required to return the roofing system to a watertight condition due to a claim covered under the terms and conditions herein. Johns Manville is not responsible for leaks, injuries or damages resulting from any water entry from any portion of the Building structure not a part of the Roofing System, including, but not limited to, deterioration of the roofing substrate, walls, mortar joints, HVAC units and all other non-Johns Manville materials and metal components. Moreover, the Building Owner is solely and absolutely responsible for any removal and/or replacement of any overburdens, super-strata or overlays, in any form whatsoever, as reasonably necessary to expose the Roofing System for inspection and/or repair.

This Guarantee becomes effective when (1) It is delivered to Owner; and (2) all bills for installation, materials, and services have been paid in full to the Approved Roofing contractor and to JM. Until that time, this Guarantee is not in force, has no effect - and JM is under no obligation whatsoever to perform any services/work.

The Parties agree that any controversy or claims relating to this Guarantee shall be first submitted to mediation under the Construction Industry Arbitration and Mediation Rules of the American Arbitration Association (Regular Track Procedures) or to such other mediation arrangement as the parties mutually agree. No court or other tribunal shall have jurisdiction until the mediation is completed. In any action or proceeding brought against the Building Owner to enforce this Guarantee or to collect costs due hereunder, Johns Manville shall be entitled to recover its reasonable costs, expenses and fees (including expert witness' fees) incurred in any such action or proceeding, including, without limitation, attorneys' fees and expenses, and the Building Owner shall pay it.

TO THE FULLEST EXTENT PERMITTED BY LAW, JM DISCLAIMS ANY IMPLIED WARRANTY, INCLUDING THE WARRANTY OF MERCHANTABILITY AND THE WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, AND LIMITS SUCH WARRANTY TO THE DURATION AND TO THE EXTENT OF THE EXPRESS WARRANTY CONTAINED IN THIS GUARANTEE.

THE EXCLUSIVE RESPONSIBILITY AND LIABILITY OF JM UNDER THIS GUARANTEE IS TO MAKE REPAIRS NECESSARY TO MAINTAIN THE ROOFING SYSTEM IN A WATERTIGHT CONDITION IN ACCORDANCE WITH THE OBLIGATIONS OF JM UNDER THIS GUARANTEE. JM AND ITS AFFILIATES WILL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES TO THE BUILDING STRUCTURE (UPON WHICH THE ROOFING SYSTEM IS AFFIXED) OR ITS CONTENTS AND OR OCCUPANTS, LOSS OF TIME OR PROFITS OR ANY INCONVENIENCE, INJURY. JM SHALL NOT BE LIABLE FOR ANY CLAIM MADE AGAINST THE BUILDING OWNER BY ANY THIRD PARTY AND THE BUILDING OWNER SHALL INDEMNIFY AND DEFEND JM AGAINST ANY CLAIM BROUGHT BY ANY THIRD PARTY AGAINST JM RELATING TO OR ARISING OUT OF THE ROOFING SYSTEM OR JM'S OBLIGATIONS UNDER THIS GUARANTEE. JM AND ITS AFFILIATES SHALL NOT BE LIABLE FOR ANY DAMAGES WHICH ARE BASED UPON NEGLIGENCE, BREACH OF WARRANTY, STRICT LIABILITY OR ANY OTHER THEORY OF LIABILITY OTHER THAN THE EXCLUSIVE LIABILITY SET FORTH IN THIS GUARANTEE. THIS GUARANTEE DOES NOT COVER, AND EXPLICITLY EXCLUDES, ANY AND ALL INJURIES, CLAIMS AND/OR DAMAGES RESULTING, IN WHOLE OR IN PART, FROM ANY WATER ENTRY FROM ANY PORTION OF THE BUILDING STRUCTURE INCLUDING, BUT NOT LIMITED TO, THE ROOFING SYSTEM.

No one is authorized to change, alter, or modify the provision of this Guarantee other than the Manager, Guarantee Services or authorized delegate. JM's delay or failure in enforcing the terms and conditions contained in this Guarantee shall not operate as a waiver of such terms and conditions. This Guarantee is solely for the benefit of the Building Owner identified above and Building Owner's rights hereunder are not assignable. Upon sale or other transfer of the Building, Building Owner may request transfer of this Guarantee to the new owner, and JM may transfer this Guarantee, in its sole and absolute discretion only after receiving satisfactory information and payment of a transfer fee, which must be paid no later than 30 days after the date of Building ownership transfer.


In the event JM pays for repairs which are required due to the acts or omissions of others, JM shall be subrogated to all rights of recovery of the Building Owner to the extent of the amount of the repairs.

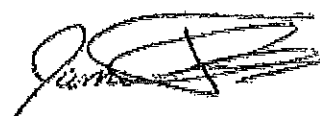
Because JM does not practice Engineering or Architecture, neither the issuance of this Guarantee nor any review of the Building's construction or inspection of roof plans (or the Building's roof deck) by JM representatives shall constitute any warranty by JM of such plans, specifications, and construction or in any way constitute an extension of the terms and conditions of this Guarantee. Any roof inspections are solely for the benefit of JM.

JM does not supervise nor is it responsible for a roofing contractor's work except to the extent stated herein, and roofing contractors are not agents of JM.

\*JOHNS MANVILLE ("JM") is a Delaware corporation with its principal mailing address at P.O. Box 5108, Denver, Colorado 80217-5108.

This guarantee has been amended to include wind speeds up to 60 mph under the terms and conditions herein.

By:   
Title: Vice President & General Manager  
Roofing Systems Group

  
Jamie Fredericks  
Attorney-in-Fact

UNIVERSITY OF MISSOURI  
CONTRACTOR'S ROOFING/FLASHING/SHEETMETAL GUARANTEE

WHEREAS Missouri Builders Service, Inc. P.O. Box 104205, Jefferson City, MO 65110 herein referred to as Roofing Contractor, certify that they have furnished and installed all roofing, flashing, sheet metal and related components in accordance with the Contract Documents and as required by the Roofing System Manufacturer's installation instructions on the facility described below:

Facility: Patient Care Tower – Shell & Core-Roofing, Project #CP07009305

Owner: University of Missouri  
Columbia, Missouri

Date of Full Completion: January 18, 2013

Approximate Area of Roof: 472 squares

Type of Roofing Material: Johns Manville PVC Spec #SP6RA

Thickness and Type of Roof Insulation: Tapered ENRGY 3 and Securock

NOW, THEREFORE, Roofing Contractor guaranties to the Owner, subject only to the exclusions stated hereinafter, that all roofing, flashing and sheet metal work is fully and integrally watertight and is free from faults and defects in material or workmanship, and is guaranteed for a period of three (3) years from date of full completion of work.

EXCLUSIONS: This guarantee does not cover, and Roofing Contractor shall not be liable for the following:

1. Damage to the roofing system caused by fire, lightning, tornado, hurricane or hailstorm.
2. Damage to roofing system caused by significant settlement, distortion or failure of roof deck, walls, or foundations of building, excepting normal building expansion and contraction is not a part of this exclusion.
3. Abuse by the Owner and/or third parties.

REPAIRS: Owner shall promptly notify Roofing Contractor, in writing, of the need for repair of roofing, flashing, or sheet metal:

1. Roofing Contractor, within eight (8) hours after receipt of such notice, shall make emergency repairs at its expense, as required to render the facility watertight.
2. Within five (5) days after receipt of such notice, Roofing Contractor shall at its expense correct any faults or defects in material or workmanship.
3. Should needed repairs not be covered by this guarantee, Roofing Contractor, after having obtained Owner's written consent, shall make such repairs at Owner's expense. Following said repairs, this guarantee shall thereafter remain in effect for the unexpired portion of the original term. If Owner does not so consent or repairs are made by others than Roofing Contractor, this guarantee shall terminate for those parts of the roof affected by the repair.
4. In the event that Owner has notified the Roofing Contractor of the need for repairs and (i) Roofing Contractor does not immediately make repairs, or (ii) Roofing Contractor disclaims responsibility for the repairs and Owner disagrees, or (iii) Owner considers Roofing Contractor's quoted cost for repairs not covered by this guarantee to be unreasonable and, and emergency condition exists which requires prompt repair to avoid substantial damage or loss to Owner, then,

Owner may make such temporary repairs as he finds necessary and such action shall not be a breach of the provisions of this guarantee.

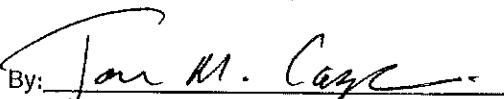
ANNUAL INSPECTIONS: Roofing Contractor shall inspect roof installation prior to each of the three anniversary dates from date of full completion of the work.

1. Inspection team to include Roofing Contractor, Roof Manufacturer, and Owners Representative.
2. Inspection of total roof system will be included in the annual inspections.
3. All defects in total roof system will be corrected by the Roofing Contractor within 30 days of inspection.
4. Roof manufacturer will certify by written report that roof inspection has been completed, defects are acknowledged, and will warrant any repairs.
5. All corrective work completed by Roofing Contractor shall be warranted as approved by the Roofing Manufacturer.

ROOF MODIFICATION: Should Owner require work to be done on roof of said facility including modifications, alternations, extensions, or additions to roof and including installation of vents, platforms, equipment, bracings or fastenings, Owner shall notify Roofing Contractor and give Roofing Contractor an opportunity to make recommendations as to methods necessary to safeguard against damage to roofing covered by this guarantee. Failure of Owner to give Roofing Contractor such opportunity or failure to follow methods recommended by Roofing Contractor shall render this guarantee null and void to the extent such failure should result in damage to roofing covered by this guarantee.

NOTICES: Notification of Roofing Contractor by Owner, shall be fulfilled by sending notice to Roofing Contractor.

IN WITNESS WHEREOF, we set our hands this 22nd day of February 2013 .

By: 

Tom M. Caspari, President

For Roofing Contractor

Name: Missouri Builders Service, Inc.

Address: P.O. Box 104205, Jefferson City, MO 65110-4205

Phone: 573-636-7733

UNIVERSITY OF MISSOURI  
CONTRACTORS ROOFING/FLASHING/SHEET METAL GUARANTEE  
(Revised 12/94)

WHEREAS (NAME AND ADDRESS OF COMPANY)

herein referred to as Roofing Contractor, certify that they have furnished and installed all roofing, flashing, sheet metal and related components in accordance with the Contract Documents and as required by the Roofing System Manufacturer=s installation instructions on the facility described below:

Facility: \_\_\_\_\_

Owner: University of Missouri-(CAMPUS)  
(CAMPUS ADDRESS)

Date of Full Completion: \_\_\_\_\_

Approximate Area of Roof: \_\_\_\_\_

Type of Roofing Material: \_\_\_\_\_

Manufacturer’s Specification Number: \_\_\_\_\_

Thickness and Type of Roof Insulation: \_\_\_\_\_

NOW, THEREFORE, Roofing Contractor guaranties to the Owner, subject only to the exclusions stated hereinafter, that all roofing, flashing and sheet metal work is fully and integrally watertight and is free from faults and defects in material or workmanship, and is guaranteed for a period of three (3) years from date of full completion of work.

EXCLUSIONS: This guarantee does not cover, and Roofing Contractor shall not be liable for the following:

1. Damage to the roofing system caused by fire, lightning, tornado, hurricane or hailstorm.
2. Damage to roofing system caused by significant settlement, distortion or failure of roof deck, walls, or foundations of building, excepting normal building expansion and contraction is not a part of this exclusion.
3. Abuse by the Owner and/or third parties.

REPAIRS: Owner shall promptly notify Roofing Contractor, in writing, of the need for repair of roofing, flashing, or sheet metal:

1. Roofing Contractor, within eight (8) hours after receipt of such notice, shall make emergency repairs at its expense, as required to render the facility watertight.
2. Within five (5) days after receipt of such notice, Roofing Contractor shall at its expense correct any faults or defects in material or workmanship.
3. Should needed repairs not be covered by this guarantee, Roofing Contractor, after having obtained Owner’s written consent, shall make such repairs at Owner’s expense. Following said repairs, this guarantee shall thereafter remain in effect for the unexpired portion of the original term. If Owner does not so consent or repairs are made by others than the Roofing Contractor, this guarantee shall terminate for those parts of the roof affected by the repair.



4. In the event that Owner has notified the Roofing Contractor of the need for repairs and (i) Roofing Contractor does not immediately make repairs, or (ii) Roofing Contractor disclaims responsibility for the repairs and Owner disagrees, or (iii) Owner considers Roofing Contractor=s quoted cost for repairs not covered by this guarantee to be unreasonable and, an emergency condition exists which requires prompt repair to avoid substantial damage or loss to Owner, then, Owner may make such temporary repairs as he finds necessary and such action shall not be a breach of the provisions of this guarantee.

ANNUAL INSPECTIONS: Roofing Contractor shall inspect roof installation prior to each of the three anniversary dates from date of full completion of the work.

1. Inspection team to include Roofing Contractor, Roof Manufacturer, and Owner=s Representative.
2. Inspection of total roof system will be included in the annual inspections.
3. All defects in total roof system will be corrected by the Roofing Contractor within 30 days of inspection.
4. Roof manufacturer will certify by a written report that roof inspection has been completed, defects are acknowledged, and will warrant any repairs.
5. All corrective work completed by Roofing Contractor shall be warranted as approved by the Roofing Manufacturer.

ROOF MODIFICATION: Should Owner require work to be done on roof of said facility including modifications, alternations, extensions or additions to roof and including installation of vents, platforms, equipment, bracings or fastenings, Owner shall notify Roofing Contractor and give Roofing Contractor an opportunity to make recommendations as to methods necessary to safeguard against damage to roofing covered by this guarantee. Failure of Owner to give Roofing Contractor such opportunity or failure to follow methods recommended by Roofing Contractor shall render this guarantee null and void to the extent such failure should result in damage to roofing covered by this guarantee.

NOTICES: Notification of Roofing Contractor by Owner, shall be fulfilled by sending notice to Roofing Contractor.

IN WITNESS WHEREOF, we set our hands this \_\_\_\_ day of \_\_\_\_\_, 20\_\_.

By: \_\_\_\_\_

Title: \_\_\_\_\_

For Roofing Contractor

Name: \_\_\_\_\_

Address: \_\_\_\_\_

Phone: \_\_\_\_\_

**1.E.1**  
**Healthcare Construction Guideline**  
August 2023 Edition

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## **1. Contractor Orientation**

The purpose of Contractor orientation is to ensure that project work in and around the healthcare environment is managed in such a way to minimize health and safety risks associated with construction activities.

### **Required Training**

1. Project managers, superintendents and subcontractor foremen assigned to the project will be required to attend a minimum of one (1) hour training session related to “Infection Control & Dust Barriers” and “Healthcare Construction Training for Contractors”.
2. Individuals that receive training will be required to sign their name on a training acknowledgement form stating that they have been oriented to the training requirements.
3. Project managers, superintendents and subcontractor foremen have the responsibility for ensuring that Contractor employees and subcontractor trade workers are knowledgeable of the training requirements and direct their employees and manage their work accordingly.
4. Contractors are required to sign in and out at the designated location per building location each workday upon arrival and exit of the work location.

## **2. Emergency Contact Information & Phone Numbers**

Contractor shall provide list of emergency contacts and phone numbers for individuals responsible for responding to emergency situations which may occur 24/7.

Contact list to be included as a topic of discussion during the Pre-Construction Meeting and included in the meeting minutes.

## **3. Contractor Identification Badge**

Contractor employees and subcontractor trade workers working on the project are required to wear a “Contractor Identification Badge” as outlined below.

### **Contractor ID Badge**

1. Contractor shall produce ID badges for all its employees and subcontractor trade workers conducting work on an MUHC job site. It is the responsibility of the Contractor to provide the computer and color printer for reproduction of badges required. Consult the Owner’s Representative for the electronic file. (Contractor to validate employee with proof of ID).
2. Contractor to edit the information, print in color, cut out the badges, fold in the center and insert in Contractor provided badge holders.
3. Contractor shall keep a log of badged employees by trade/subcontractor at the jobsite for reference by the Owners Representative.
4. Contractor employees are to wear the badge on the upper chest facing forward unless approved otherwise for safety reasons.
5. Project Managers, superintendents, and subcontractor foreman shall attend “Healthcare Construction Training” and affix issued “T” sticker in the circle area on badge as shown. This will show evidence that the employee has completed training. All badges to be collected by the Contractor and disposed of at the end of the project.
6. See Figure 2, Section 1.E. for “Example Contractor Badge”.

## **4. General Requirements for Health Care Projects**

The Contractor is responsible for understanding, planning and implementing the following requirements in the management of the project.

1. On-site worker clothing must be clean and free of holes or fraying.
2. On-site workers shall be fitted with a Contractor furnished shirt containing company name and logo.
3. On-site worker shoes/boots must be free of dirt/debris before entering and leaving the construction area.
4. If track-out occurs in an occupied area of the healthcare facility, you must stop and clean immediately by using a HEPA filtered vacuum and/or a clean dampened floor mop with a MUHC approved cleaning solution. All cleaning solutions must be approved by the Owner.
5. Assure that all construction material, equipment and tools are cleaned and covered with a clean cloth while transporting through the healthcare facility.
6. Ensure that wheels on delivery and trash carts are clean before leaving the construction area.
7. Patients, visitors, and staff ALWAYS have priority and the “Right of Way” in the elevators and corridors.

## 5. **Construction-Renovation-Maintenance Risk Assessment (CRMRA)**

The “Construction-Renovation-Maintenance Risk Assessment” (CRMRA) planning process establishes criteria and measures to protect patients, visitors and staff from construction activities that could lead to infections or impact life safety systems in the healthcare facility.

The Owner’s Representative will work with the Contractor to coordinate and facilitate these CRMRA planning activities with MUHC Engineering Services, Infection Control Department and others as required during the duration of the project.

See Figure 3, Section 1.E. for a copy of the “*eMeditrack Assessment Checklist*”.

## 6. **Construction/Renovation/Maintenance Infection Control Risk Mitigation Criteria**

The “Construction–Renovation-Maintenance Infection Control Risk Mitigation Criteria” (CRMICRMC) is a process to evaluate projects for required interventions during construction. The goals are to minimize Hospital Acquired Infections (HAI’s) and control dispersal of air/water-borne infectious agents concealed within the building components.

All construction activities shall be defined and managed in such a way that exposure to dust, moisture, and accompanying hazards are mitigated.

1. Any work done outside the main project limits will require a NEW Infection Control Risk Assessment. See Figure 3, Section 1.E. for a copy of the “*eMeditrack Assessment Checklist*”.
2. The Owner’s Representatives and Contractor will work together to coordinate the assessment and determine if MUHC permits (hot work, energized work, above ceiling, etc.) and associated requirements are needed.
3. The Owner’s Representative will ensure that all required infection control interventions and life safety measures required for the project are in place by the Contractor prior to starting work. (i.e., barrier walls, tacky mats, required exits, etc.)
4. The Contractor shall follow all requirements to support the “Construction – Renovation-Maintenance Infection Control Risk Mitigation Criteria”.
5. CRMIC Permit will provide requirements specific to the project.
6. See Figure 5, Section 1.E. for a copy of the “Infection Control Contractor Check List”, utilized as a tool to aid understanding of good infection control processes through various phases of construction.

7. On-site workers that violate the requirements of the “Construction – Renovation-Maintenance Infection Control Risk Mitigation Criteria/Permit” will be removed from the project.

## **7. Construction Barriers**

To protect patients, visitors, and staff from construction dust, fumes, and other exposures, an isolation barrier with or without negative air may be required to be established before construction activities may begin. Barriers are meant to strictly delineate the work area. When necessary, construction barriers will be called out by Infection Control in the Infection Control Risk Mitigation Criteria (ICRMC).

1. A copy of the ICRMC describing barrier requirements shall be visibly posted on the barrier of the work area for the duration of the project.
2. Required barriers may include one or more of the following:
  - a. Existing wall assemblies;
  - b. Rooms with doors that separate from adjacent spaces;
  - c. Commercial rigid construction barrier assemblies;
  - d. Constructed stud and wall board walls;
  - e. Fire-resistant 6-mil polyethylene sheeting; or
  - f. Portable containment units / HEPA carts.
3. Contractors are responsible for:
  - a. Ensuring barriers are properly constructed and maintained for the duration of the project;
  - b. Keeping the exterior of the barrier clean and free of damage;
  - c. Securing entrances through the barrier to the work site (doors, zippers, etc.)
  - d. Posting and maintaining signage on the barriers to
    - i. Indicate “Construction Area, Authorized Personnel Only”; and
    - ii. directional for staff and patient traffic, when necessary.
  - e. Ensure that barrier entrances are kept closed and always secured.
4. Upon installation of barriers, before beginning work, the Contractor shall notify the Owner’s Representative to coordinate an inspection. The Infection Control in the Infection Control Risk Mitigation Criteria (ICRMC) may require approval from Infection Control before beginning work.
5. Upon the completion of work, the Contractor shall notify the Owner’s Representative to coordinate the removal of barriers. The Infection Control in the Infection Control Risk Mitigation Criteria (ICRMC) may require approval from Infection Control before removing barriers.

## **8. Ventilation and Negative Air Requirements**

Establishing negative air means that the area under construction is negative relative to surrounding areas; this pressure difference prevents dust, fumes, and airborne contaminants and pathogens from escaping the construction area. When necessary, negative air requirements will be called out by Infection Control in the Infection Control Risk Mitigation Criteria (ICRMC).

1. A copy of the ICRMC describing negative air requirements shall be visibly posted on the barrier of the work area for the duration of the project.
2. Negative air requirements may include one or more of the following:

- a. HEPA-filtered negative air ventilation units
    - i. Exhausted directly outside;
    - ii. Exhausted into an adjacent space or corridor;
    - iii. Recirculating (scrubbing) air within the work area; or
    - iv. Integrated into portable containment units / HEPA carts.
3. Negative air pressure may not:
  - a. Be achieved by using filtered HVAC air returns in any room, including isolation rooms; or
  - b. Be exhausted into the HVAC system unless it is a portion of the exhaust that leads directly outdoors.
4. Contractors are responsible for:
  - a. Sealing all HVAC supply and returns within the work area.
    - i. Maintaining these seals may require Engineering Services to close dampers or disconnect ducts serving the work area.
  - b. Regular maintenance of HEPA-filtered negative air ventilation units;
  - c. Regularly cleaning prefilters and filters;
  - d. Furnishing and installing a manometer on the outside of the barrier;
  - e. Ensuring that negative air pressure in the work area is at least -0.01 inches of water column (WC);
  - f. Daily documentation of the negative air pressure on the "Negative Air Pressure and Filter Change Log," posted next to the manometer.
    - i. Logs will be collected by Infection Control at completion of the project.
    - ii. See Figure 1, Section 1.E. for a copy of the "Negative Air Pressure and Filter Change Log".
5. If the installation of a barrier is also required, the negative air units should be turned on before barrier construction begins.
6. Once negative air units are in place, the Infection Control in the Infection Control Risk Mitigation Criteria (ICRMC) may require approval from Infection Control before beginning work.
7. Upon the completion of work, barriers should be removed before negative air units are removed; the Infection Control in the Infection Control Risk Mitigation Criteria (ICRMC) may require approval from Infection Control before the removal of negative air units.

## **9. ICRM Equipment and Product Information**

### **Approved Equipment and Product Information**

#### **RIGID BARRIER SYSTEMS**

- Lightweight modular wall system that meets or exceeds ICRA Class IV and ASTM E84 requirements. STARC Systems, (844)596-1784
- RealWall for sound attenuating and noise control.
- LiteBarrier sensitive patient occupied areas.
- FireblockWall for One-hour Fire-rated containment.

#### **NEGATIVE AIR HEPA FILTERED VENTILATION UNIT**

- HEPA filter equipped negative air machines that provide rough in filters, primary filters and a HEPA final filter.
- Rating of 300 to 2000 cubic feet per minute, (CFM).

- HEPA filters must be a minimum 99.97% efficient @ 0.3 microns.
- Differential pressure alarm required if not installed in another fashion to monitor construction site negative air of – 0.01 water column. Or approved equal.
- MICRO Trap Corporation, Models MT 1000 or Model MT 2000. 1300 W. Steel Road, No. 2 Morrisville, PA 19067 (215) 295-8208 or (877) 646-8208.
- ABATEMENT Technologies, Inc. Model HEPA-AIRE PAS2400HC Portable Air Scrubber or Model PAS1200HC 605 Satellite Blvd. Suite 300 Suwanee, GA 30024 (800) 634-9091

#### HEPA VACUUM

- Shop style vacuum with HEPA filter cartridge at 99.97% filtration @ 0.3 microns. Or approved equal.
- ABATEMENT Technologies Inc. Model V8000WD Canister Style Wet/Dry HEPA Vacuum. 605 Satellite Blvd. Suite 300 Suwanee, GA 30024 (800) 634-9091.
- ABATEMENT Technologies Inc. Model V1300H Hip Mounted HEPA Vacuum, designed for use on scaffolding and mobile conditions such as ceiling tile type cleaning. Lightweight at 6.4 lbs.
- 605 Satellite Blvd. Suite 300 Suwanee, GA 30024 (800) 634-9091.

#### ADHESIVE WALK OFF MATS

- 24" x 36" Tacky Mat.
- Peel up dirty layer and dispose to reveal a new, fresh clean tacky mat.
- Tacky walk off mat No. 5838 24" x 36", 60 tacky mats to a unit. Four units per case.
- 3M Company, St. Paul, MN 55144 (888) 364-3577. Or approved equal.

#### NEGATIVE AIR PRESSURE INDICATOR

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

#### PORTABLE WORK ENCLOSURE

- For temporary fire-resistant polyethylene dust barrier.
- System components supplier of zip poles, door opening access zippers, dust sealing system parts, etc.
- Contact info: Zip Wall, LLC. 37 Broadway, Arlington, MA 02474 (800) 718-2255. Or approved equal.

#### FIRE RESISTANT POLYETHYLENE

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

## **10. Alternate Life Safety Measures Assessment (ALSM)**

Alternate Life Safety Measures (ALSM) are a series of administrative actions that must be taken to compensate temporarily for the hazards posed by existing NFPA Life Safety Code 101, 2012 edition deficiencies, other building code issues or construction activities. Examples of construction activities that require ALSM's to be implemented are as follows:

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

Whenever an ***“Alternate Life Safety Measure”*** is identified for implementation during the construction project, there will typically be measures or actions required by both the MUHC Engineering Services department and the Contractor.

Prior to the beginning of work and throughout the project, the Contractor must be familiar with the ALSM to plan and identify construction related activities that will require an evaluation of ALSM's as noted in the ALSM. The ***“Alternate Life Safety Measures Evaluation”*** is a required team effort.

## **11. Noise and Vibration Control Management**

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

## **12. Above Ceiling Work**

Access to areas above the ceiling must be coordinated with the Owner's Representative. Depending upon the location and purpose of accessing areas above the ceiling, the Contractor may need to follow a standing protocol or obtain an *Above Ceiling Work Permit*.

1. Standing protocol
  - a. Above Ceiling Inspection Criteria / Minimal Dust Producing Protocol
    - i. To be used for visual inspection of mechanical, electrical, plumbing, structural components.
    - ii. May be used with fireproofing and VAV damper adjustment.
    - iii. Applies to all contractors, and vendors.
    - iv. See Figure 4, Section 1.E. for a copy of the ***“Infection Prevention & Control Program – Above Ceiling Inspection Criteria (Minimal, Dust Producing) ICRA – Protocol”***.
2. Above Ceiling Work Permit
  - a. Must be requested for
    - i. Any cable or wiring pulls through the healthcare facility.
    - ii. Other above ceiling work beyond the scope of visual inspection.
3. Contractors are responsible for:



- a. Notifying the Owner's Representative three (3) business days prior to the need for above ceiling access.
- b. Replacing ceiling tiles as soon as possible. Displaced ceiling tiles shall not be left unattended in areas not contained by a construction barrier.
- c. Notifying the Owner's Representative to acquire replacement ceiling tiles if they are damaged during work.

### **13. Utility Systems Shutdown & Service Permit**

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

See Figure 6, Section 1.E for "Request for Outage" form.

#### **Utility Outage**

Utility or system connections, shut offs, or interruptions must be scheduled with the Owner's Representative prior to commencement of the work. This work shall be defined as either a "Planned" or "Unplanned Utility Outage" and notice shall be made to the Owner's Representative to coordinate the request and facilitation.

#### **Utility Service**

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

#### **Electrical Safety**

In accordance with National Fire Protection Association (NFPA) 70E, *Standard for Electrical Safety in the Workplace*, MUHC requires all contractors and service personnel performing services on MUHC owned or managed properties to always comply with OSHA and NFPA 70E (current edition).

The contractor shall complete the "Contractor/Vendor Acknowledgement of Electrical Safety Requirements & Training" form before mobilizing to the site, see Figure 7, Section 1.E.

### **14. Hot Work & Permit**

Hot Work shall be defined as welding, brazing, cutting soldering, grinding, or other flame or sparking producing activities which are capable of initiating fires or explosions.

All Contractors performing construction activities in MUHC Facilities are required to follow the requirements and provisions of *NFPA 51B – 2019* and the Owner's Representative procedures related to Hot Work.

The following are the requirements for a Contractor to obtain a "Hot Work Permit":

1. Contractors shall contact the Owner's Representative prior to requesting a "Hot Work Permit".
2. Hot work permit requests for complex projects requiring extensive planning on behalf of the Owner and Owner's Representative may require several days' notice.

3. MUHC Engineering Services will issue a *“Hot Work Permit”* to be posted in the vicinity of the hot work being performed. Upon completion, the hot work permit shall be returned to MUHC Engineering Services.
4. All hot work sites are inspected by the Owner using the requirements printed on the hot work permit.
5. Hot work permits are issued for each work shift unless other arrangements have been made with Owner’s Representative.
6. If hot work cannot be completed within one work shift, the Contractor is responsible for obtaining approval for a revised permit extension from MUHC Engineering Services. The Contractor is responsible for meeting all safety requirements required by the permit for any extensions granted.
7. The Contractor shall be responsible for supplying a trained fire watch for the duration of hot work, including during lunch and/or scheduled breaks, with no other assigned duties.  
**The fire watch’s only responsibility will be as a fire watch.**
8. All permits require a 1-hour fire watch following completion of hot work activity.
9. Contractor shall provide at a minimum a ten-pound (10) ABC fire extinguisher that has a current, valid inspection tag at each hot work location.
10. A copy of the *“Hot Work Permit”* shall be kept in the general Contractor’s project file for future review as may be required.
11. The Contractor shall upload completed Hot Work Permits to the Owner’s electronic construction program (Projex4) in the Hot Work Permit folder on a weekly basis.

## **15. Helicopter Approach/Take-off**

Construction related activities on the hospital’s grounds, property, or building roofs must follow the guidelines regarding construction activities during helicopter landings and take-offs at the helipad. The Contractor shall coordinate the following with the Owner’s Representative:

- Roof access
- Roof protection
- Air care traffic safety precautions to be taken when conducting work on roofs.
- In addition, the placement of vertical installations such as tall lighting poles and the use of project cranes or hoisting on the hospital property might affect the “Approach and Take Off” of air care traffic. It is essential that the Contractor coordinate these types of activities in advance with the Owner’s Representative prior to the beginning of work.

## 16. Required Forms, Permits, Postings, and Documentation

**Note:** Refer to sections within the “Healthcare Construction Guideline” for detailed information on each form and permit approval procedure.

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

The Contractor will be required to furnish and install a “Project Safety Information” bulletin board on their project site for posting of required safety information. Small, short duration projects may have this requirement waived by the Owner’s Representative.

**LEGEND** CRM = Construction-Renovation-Maintenance

## **17. Health Care Construction Cleaning Definitions**

### **Construction Clean (Contractor Responsibility)**

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

### **Thorough Clean (Contractor Responsibility)**

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

### **Terminal Clean (Owner Responsibility)**

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

## Figure 1 Negative Air Pressure and Filter Change Log

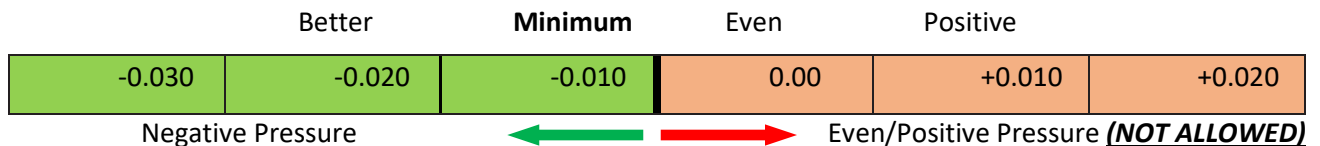
UM Project Number: \_\_\_\_\_ Project Name: \_\_\_\_\_

Location (Building/Floor/Rooms): \_\_\_\_\_

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

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

Pressure Relationship Illustration



**Figure 2 Example Contractor Badge**

		
<b>Enter Name</b>		
<b>Enter Company Name</b>		
Project#:	Enter Project #	
Project Name:	Enter Project Name	
• Expires:	Enter Expiration	

		
<b>Enter Name</b>		
<b>Enter Company Name</b>		
Project#:	Enter Project #	
Project Name:	Enter Project Name	
• Expires:	Enter Expiration	

		
<b>Enter name</b>		
<b>Enter Company Name</b>		
Project#:	Enter Project #	
Project Name:	Enter Project Name	
• Expires:	Enter Expiration	

Protocol for Hospital Contractor Badges:

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

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

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

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

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

**Figure 3 eMeditrack Request Checklist**

<b>EMEDITRACK ASSESSMENT REQUEST ENTRY CHECKLIST</b>				
<b>Project Work Name</b>				
<b>Project#/Work Order #</b>		<b>Date of Request</b>		
<b>Trade/Vendor/Project Manager</b>		<b>Start Date</b>		
<b>Name:</b>		<b>End Date</b>		
<b>Email:</b>				
<b>Phone:</b>				
<b>Location of Work</b>				
<b>Building</b>				
<b>Floor</b>				
<b>Specific Site for Work – Be as specific as possible; include Room #'s</b>				
<b>Activity Scope and Comments</b>				
<b>File Upload – Insert up to four (4) documents</b>				
<b>--- IMPORT SPECIFIC PLANS ---</b>				
Will this activity be dust generating? (if yes, comment with any mitigating efforts)		Y	N	N/A
Comments:				
Will any fire protection systems be impaired or be taken out of service?		Y	N	N/A
Comments:				
Will building access or egress be impaired?		Y	N	N/A
Comments:				
Will there be impediments to or corridor restrictions?		Y	N	N/A
Comments:				

**Figure 3 eMeditrack Request Checklist (cont'd)**

Will there be flammable hazards or increased combustible fuel loads in the activity area?	Y	N	N/A
Comments:			
Will the activity require "Hot Work"?	Y	N	N/A
Comments:			
Will existing horizontal or vertical fire or smoke barriers be breached?	Y	N	N/A
Comments:			
Will the activity require the use and/or storage of hazardous chemicals?	Y	N	N/A
Comments:			
Will there be HVAC modifications? (If so, required testing & balancing or recertification may be mandated)	Y	N	N/A
Comments:			
Will the activity require asbestos, lead, or mold abatement? (Please specify)	Y	N	N/A
Comments:			
Will the activity require confined-space entry?	Y	N	N/A
Comments:			
Will the activity require utility outages? (Electrical, domestic water, HVAC, med gas, sanitary sewer, steam, etc.)	Y	N	N/A
Comments:			
Will the activity generate noise or vibration levels that may affect patient safety?	Y	N	N/A
Comments:			
Will the activity require off-hours work?	Y	N	N/A




**Figure 3 eMeditrack Request Checklist (cont'd)**

Comments:			
Will modifications or additions to security technology be required? (Cameras, panic device, card access system, etc.)	Y	N	N/A
Comments:			
Will the work require hoisting of equipment and/or use of crane(s)?	Y	N	N/A
Comments:			
Will the work require the use of scaffolding?	Y	N	N/A
Comments:			
Will the work interrupt normal pedestrian or vehicular traffic?	Y	N	N/A
Comments:			
Will the work displace soiled linen or trash storage rooms?	Y	N	N/A
Comments:			
The information received in the PCRA will be included in the overall assessment. MUHC Infection Control completes the ICRA that designates installation of required construction or infection control barriers.			

Work request must be properly submitted and **APPROVED with documents issued via Soleran System** prior to commencement of building demolition, construction, renovation, planned system outages, and facility maintenance work.   

- Request shall be submitted as soon as possible to begin processing and allow full vetting.
- Submissions are preferred at minimum Three (3) working days prior to date for work to begin.
- No request will be approved with less than twenty-four (24) hours' notice unless approved by Executive Director of Support Services.

## **Figure 4** – Infection Prevention & Control Program - Above Ceiling Inspection Criteria (Minimal, Dust Producing) ICRA - Protocol

 <b>Health Care</b>	Document Owner:	Last Approved Date:
	Kirsten Hann	04/11/2022
	Content Expert:	
	Cathy Schlotzhauer	Ref# 22516

**Printed copies are for reference only. Please refer to the electronic copy for the latest version.**

### **Purpose Statement**

- a. To provide a process for ensuring a safe environment for patients, visitors and staff when undergoing construction.
  - b. The standardization of this protocol is to be used as the infection control risk assessment (ICRA) with interventions for planned or unplanned above ceiling access for inspection with minimal to no dust production.
- II. Definitions
- a. Above ceiling access protocol: should be utilized for inspections of VAV dampers, pipes, ceiling, cables; or fireproofing.
  - b. Work area: space directly below an open ceiling tile; encompasses a 6-foot radius.
  - c. Portable Containment Unit (PCU): mobile containment equipment with the ability to extend up to ceiling to seal off work areas to prevent the spread of dust.
  - d. Polyethylene sheeting: light plastic covering utilized to prevent contamination of stationary equipment during work periods. Removal involves folding the polyethylene into itself to reduce the risk of debris falling onto surfaces in the room/space. Contaminated polyethylene shall not be reused.
- III. For use by
- a. This protocol applies to all construction staff and outside vendors performing duties at University of Missouri Health Care facilities.
- IV. Content
- a. Non-Patient Care Areas (e.g., office, clinic off hours, electrical, mechanical rooms, corridor of ground floor at UH, corridors in non-patient care areas, cafeteria, chapel, lobbies).
    - i. May remove one tile at a time from the suspended ceiling system.
    - ii. Remove portable equipment/items from under the work area. Items that cannot be removed shall be covered with polyethylene sheeting.
    - iii. “Clean as you go” utilizing a HEPA filtered vacuum to clean up any debris.
  - b. Patient Care Areas (ex. General care units, diagnostic testing areas, emergency department, pharmacy)
    - i. There shall be no patient in the room/space. Off hours work may be warranted due to delays in access to the specific space.
    - ii. May remove one tile at a time from the suspended ceiling system.
    - iii. Remove portable equipment/items from the work area. Items that cannot be removed shall be covered with polyethylene sheeting.
    - iv. “Clean as you go” utilizing a HEPA filtered vacuum to remove tile debris.
  - c. Sub Sterile/Sterile Environment (e.g., Operating room, sterile processing, Intensive Care, procedure room, laboratory, and compounding pharmacy).
    - i. All work activities shall be conducted during off hours. The off hours are determined by individual departments and are subject to change.

- ii. All workers shall wear appropriate surgical attire. The attire includes disposable head cover, surgical mask for persons with facial hair, approved freshly laundered scrub suit for disposable surgical coverall, and shoe covers.
  - iii. May remove one tile at a time from the suspended ceiling system utilizing a portable containment unit (PCU) whenever possible. If the ceiling is too high or area too small for PCU, remove portable equipment/supplies from the work area. Items that cannot be removed shall be covered with polyethylene sheeting.
  - iv. Corridor doors adjacent to the work area shall be closed during the work period.
  - v. "Clean as you go" utilizing a HEPA filtered vacuum to remove tile debris.
  - vi. If more than one tile is lifted in these areas, contact EVS for regular cleaning.
- V. Reference Documents or Attachments
  - a. Guidelines for Environmental Infection Control in Healthcare Facilities. CDC. (2019). <https://www.cdc.gov/infectioncontrol/pdf/guidelines/environmental-guidelines-P.pdf>.
  - b. Infection Control Risk Assessment Matrix of Precautions for Construction & Renovation. ASHE. (2009). [https://www.ashe.org/sites/default/files/ashe/assessment\\_icra.pdf](https://www.ashe.org/sites/default/files/ashe/assessment_icra.pdf)
  - c. Construction and Renovation. APIC. Chapter 118. (2019). <https://text.apic.org/toc/infection-prevention-for-support-services-and-the-care-environment/construction-and-renovation>

## **Figure 5 – Infection Control Contractor Check List**

### **Start Up Sequence Check List for Precaution Class II, III, and IV Projects**

- ☐ Locate and lay-down, storage, or cutting rooms, if available for the project.
- ☐ Movable equipment, furniture, and supplies have been removed from the work area.
  - This may include beds, chairs, tables, privacy curtains, and carts.
- ☐ If necessary, any fixtures are removed from the work area, put in storage *outside* of the work area if they are to be re-installed.
  - Examples include window treatments and light fixtures.
- ☐ Check that the barrier meets project requirements outlined in issued ICRMC.
  - Barriers shall be sealed *with tape* from top to bottom and side to side.
  - Drywall barriers have edges sealed to prevent breakdown and debris, should be painted and clean.
  - The project ICRMC and a manometer with negative air log, if necessary, are installed in an easy-to-see place on the exterior of the project barrier. Negative air logs must be logged by the contractor at least daily.
- ☐ If indicated, an ante room is available to clean boots, carts, people, and supplies leaving the work area.
- ☐ Tacky mats are located appropriately to prevent tracking.
- ☐ Ensure HVAC supplies and returns are securely covered; supplies and returns may not be uncovered until Infection Control approval.
  - Airflow may need to be reduced to keep returns and supplies securely covered.
  - New HVAC ductwork or equipment must be securely covered (duct wrap) until installation.
- ☐ Negative air machines shall have clean HEPA filters (and pre-filters, if used) on project start up. A filter log shall be kept and should be attached to each negative air machine.
- ☐ Negative air is always HEPA filtered and shall be discharged to a adjacent space or directly to the outdoors. Discharge into the HVAC system is not allowed.

### **General Site Maintenance Checklist for Precaution Class II, III, and IV Projects**

- ☐ Barrier integrity and cleanliness must be maintained for the duration of the project.
- ☐ Supplies or returns that become uncovered must be secured immediately.
- ☐ Tacky mats must be pulled frequently enough so that there is always a tacky surface to step on.
- ☐ Inspect the area around the project site and the path from the project site to waste disposal at least once per day to look for tracking of dust and debris.
  - Contractor clothing and footwear, as well as equipment and carts should be vacuumed clean of all dust and debris before leaving the project site. Vacuuming to be done inside the project containment.
- ☐ Negative air must remain in place until completion of all dust generating activities and must remain in place for barrier cleaning and/or removal.

**Figure 6 – Request for Outage**

Engineering Services



**Request For Outage**

**Today's Date:** \_\_\_\_\_ **Attention:** \_\_\_\_\_

This Request for Outage (RFO) form should be utilized to request a planned outage. A planned outage is a system or service outage or disruption that has been planned and scheduled. Non-emergency outage requests should be made no later than 10 working days prior to the requested date to ensure all those affected by the outage have adequate time to notify occupants and put in place any required contingency plans.

<b>Contractor</b> (Name, Phone & Email)	
<b>Project Name</b> <i>(if applicable)</i>	
<b>Project # / Work Order</b> # <i>(if applicable)</i>	
<b>Reason for Outage</b>	

For any questions, please contact the University Health Care Engineering Services Office 573-882-3639

Please scan and email to UMHC Outage-Request email address: [umhcoutage-request@health.missouri.edu](mailto:umhcoutage-request@health.missouri.edu)

**Outage Details**

<b>Type of Outage:</b> <i>(system or systems affected)</i>				
<b>Location of Outage:</b> <i>(Building Name/Floor/Room)</i>				
<b>Proposed Start Date &amp; Time:</b>	Date:		Time:	
<b>Estimated End Date &amp; Time:</b>	Date:		Time:	

**Outage Contacts *(complete all applicable)***

<b>Outage Project Manager:</b>		
<b>Outage Proj.Mgr. Phone # &amp; Email:</b>		
<b>Supervisor Contact Name:</b>		
<b>Supervisor Phone # &amp; Email:</b>		
<b>1<sup>st</sup> Alternate Contact Name:</b>		
<b>1<sup>st</sup> Alternate Phone # &amp; Email:</b>		

## **Figure 7 – Contractor-Vendor Acknowledgement of Electrical Safety Requirements Training**

<b>Contractor/Vendor:</b>
<b>Representative Name:</b>
<b>Representative Title:</b>
<b>Date:</b>

The **University of Missouri Health Care's (MUHC)** Electrical Safety Program is written to be consistent with OSHA and National Fire Protection Association 70E, Standard for Electrical Safety in the Workplace - 2021 Edition (NFPA 70E).

In accordance with NFPA 70E requirements, the MUHC requires that all contract employer representatives or any subcontractor under their authority, follow the work practices required by NFPA 70E and safety-related work rules required by the Host Employer, MUHC.

The following requirements must be agreed to before the performance of any tasks that may involve electrical hazards on MUHC managed properties:

<b>The contract employer shall ensure that each of their employees or any subcontractor under their authority:</b>	<b>Do you agree? Y/N</b>	<b>Initials</b>
are instructed in any hazards communicated to the contract employer by <b>MU Health Care</b> representatives.		
will notify an appropriate <b>MU Health Care</b> representative of any unique hazards presented by the contractor's work.		
will notify the appropriate <b>MU Health Care</b> representative of any unanticipated hazards discovered during the course of their work.		
have received updated electrical safety training in accordance with NFPA 70E, 2021 Edition.		
will provide proof of updated electrical safety training for every employee before they perform any work that may involve electrical hazards on <b>MU Health Care</b> managed properties.		

**Contractor / Vendor Representative:**

\_\_\_\_\_  
Signature

**MU Health Care Representative:**

\_\_\_\_\_  
Name and Title

\_\_\_\_\_  
Signature

**SHOP DRAWING AND SUBMITTAL LOG**

Project: PATIENT CARE TOWER – 8<sup>TH</sup> FLOOR BONE MARROW TRANSPLANT UNIT RENOVATION

Project Number: CP221933

Contractor:

Section	Description	Contractor	Date Rec'd	Date Sent to Cons.	Date Ret'd	Remarks	Date ret'd
03 30 53	Miscellaneous Cast-In-Place Concrete – Product Data						
03 30 53	Miscellaneous Cast-In-Place Concrete – Design Mixtures						
05 12 00	Structural Steel Framing – Product Data						
05 12 00	Structural Steel Framing – Shop Drawings						
05 40 00	Cold-Formed Metal Framing – Product Data						
05 40 00	Cold-Formed Metal Framing – Shop Drawings						
05 40 00	Cold-Formed Metal Framing – Delegated Design Submittal						
05 50 00	Metal Fabrications – Product Data						
05 50 00	Metal Fabrications – Shop Drawings						
05 50 00	Metal Fabrications – Delegated Design						
06 10 53	Sheathing - Product Data						
06 41 16	Plastic Laminate Clad Architectural Cabinets- Product Data						
06 41 16	Plastic Laminate Clad Architectural Cabinets- Shop Drawings						
06 41 16	Plastic Laminate Clad Architectural Cabinets- Samples						
07 21 00	Thermal Insulation - Product Data						

07 27 26	Fluid-Applied Membrane Air Barriers- Product Data						
07 84 13	Penetration Firestopping- Shop Drawings						
07 84 13	Penetration Firestopping- Product Schedule						
07 92 00	Joint Sealants- Product Data						
07 92 00	Joint Sealants- Schedule						
07 95 13.16	Exterior Expansion Joint Cover Assemblies						
08 11 13	Hollow Metal Doors and Frames- Product Data						
08 11 13	Hollow Metal Doors and Frames- Shop Drawings						
08 11 13	Hollow Metal Doors and Frames- Samples						
08 14 16	Flush Wood Doors- Product Data						
08 14 16	Flush Wood Doors- Shop Drawings						
08 14 16	Flush Wood Doors- Schedule						
08 71 00	Door Hardware- Product Data						
08 71 00	Door Hardware- Hardware Schedule						
09 01 90.52	Maintenance Repainting						
09 05 60	Common Work Results for Flooring Preparation						
09 22 16	Non-Structural Metal Framing - Product Data						
09 29 00	Gypsum Board- Product Data						
09 51 13	Acoustical Panel Ceilings- Product Data						
09 51 13	Acoustical Panel Ceilings- Samples						



09 67 23	Resinous Flooring – Product Data						
09 67 23	Resinous Flooring – Shop Drawing						
09 67 23	Resinous Flooring – Samples						
09 91 23	Interior Painting – Product Data						
09 91 23	Interior Painting – Sample						
10 26 00	Wall And Door Protection						
20 10 11	Pipe And Tube Product Data						
20 10 12	Fittings Product Data						
20 10 13	Valves Product Data						
20 10 14	Strainers Product Data						
20 10 26	Access Doors Product Data						
20 10 30	Basic Mechanical - Joints And Connections Methods - Product Data						
20 10 40	Basic Mechanical - Hangars, Shields, Supports And Anchors - Product Data						
20 10 80	Testing, Adjusting And Balancing - Final Report						
20 10 80	Testing, Adjusting And Balancing – Record Documents						
20 10 90	Identification – Product Data						
20 25 10	Insulation Materials - Product Data						
21 00 06	Fire Protection System - Layout Drawings						
21 00 06	Fire Protection System - Working Drawings						
21 00 06	Fire Protection System - Product Data						

22 20 00	Plumbing Piping Systems – Product Data						
22 20 00	Plumbing Piping Systems – Material Schedule						
22 3000	Drains - Product Data						
22 40 00	Plumbing Fixtures – Product Data						
22 80 00	Plumbing Specialties - Product Data						
23 10 00	Hydronic Piping - Product Data						
23 10 00	Hydronic Piping – Material Schedules						
23 10 03	Hydronic Specialties Data						
23 21 40	Pumps - Product Data						
23 22 00	Steam Piping – Product Data						
23 22 00	Steam Piping - Material Schedule						
23 22 05	Steam Piping - Steam Specialties						
23 23 00	Miscellaneous Piping - Product Data						
23 23 00	Miscellaneous Piping - Piping Material Schedules						
23 23 03	Medical Gas And Medical Vacuum Testing						
23 23 04	Medical Gas And Medical Vacuum Valves And Specialties – Product Data						
23 82 00	Terminal Units – Product Data						
23 84 00	Humidifiers – Product Data						
23 85 00	Radiant Panels – Product Data						
24 31 00	Sheetmetal Ductwork – Product Data						

24 31 03	Sheetmetal Ductwork – Sealing						
24 31 04	Duct Leakage Testing						
24 31 06	Fittings						
24 33 00	Air Distribution Accessories – Product Data						
24 34 00	Fans – Product Data						
24 37 00	Air Devices – Product Data						
24 41 00	Filter Assemblies – Product Data						
25 09 00	Temperature Control Systems - Shop Drawings						
25 09 00	Temperature Control Systems - Product Data						
25 09 00	Schematic Flow Diagrams						
25 09 00	Details Of Faces						
25 09 00	Sequence Of Operation						
25 09 00	Wiring Diagrams						
25 09 00	Field Routing Of Proposed Network Bus Diagram						
Drawing M604	Room Pressure Monitor – Product Data						
26 05 26	Grounding And Bonding						
26 05 48	Seismic Restraint						
26 05 73	Arc Flash Hazard Analysis, Short Circuit And Selective Coordination						
26 24 16	Panelboards						
26 27 26	Wiring Devices						



### OPERATING INSTRUCTIONS AND SERVICE MANUAL LOG

Project: PATIENT CARE TOWER – 8<sup>TH</sup> FLOOR BONE MARROW TRANSPLANT UNIT RENOVATION

Project Number: CP221933

Contractor:

Section	Description	Catalog Data	Wiring Diagrams	Installation Instructions	Service & Maintenance Instructions	Parts List & Availability	Performance Curves	Startup & Operating Instructions
064116	Plastic Laminate Clad Architectural Cabinets- Maintenance Data	X			X			
079513.16	Exterior Expansion Joint Cover Assemblies - Maintenance Data	X			X			
081416	Flush Wood Doors- Product Data - Maintenance and Operations Data	X			X			
087100	Door Hardware- Maintenance Data	X			X			
095113	Acoustical Panel Ceilings- Maintenance Data	X			X			
096723	Resinous Flooring – Maintenance Data	X			X			
20 10 30	Basic Mechanical - Joints And Connections Methods	X						
20 10 40	Basic Mechanical - Hangars, Shields, Supports And Anchors	X						
20 25 10	Insulation Materials	X						
21 00 30	Wet-Pipe Sprinkler System	X						
22 20 00	Plumbing Piping	X						
22 80 00	Plumbing Specialties	X						
23 10 00	Hydronic Piping	X						

23 21 40	Pumps	X	X	X	X	X	X	X
23 22 00	Steam Piping	X						
23 23 00	Miscellaneous Piping	X						
23 82 00	Terminal Units	X	X	X	X	X	X	X
23 84 00	Humidifiers	X	X	X	X	X	X	X
23 85 00	Radiant Panels	X	X	X	X	X	X	X
24 31 00	Sheetmetal Ductwork	X						
24 33 00	Air Distribution Accessories	X						
24 34 00	Fans	X	X	X	X	X	X	X
24 37 00	Air Devices	X						
Drawing M604	Room Pressure Monitor	X						
26 24 16	Panelboards	X		X	X			
26 29 23	Variable Frequency Drive	X	X	X	X			X
26 51 13	Interior Lighting Fixtures	X	X	X	X			
26 52 13	Emergency Battery Backup Ballasts	X	X	X	X			X
28 31 00	Fire Detection and Alarm	X	X	X	X			X

**CLOSEOUT LOG**

Project: PATIENT CARE TOWER – 8<sup>TH</sup> FLOOR BONE MARROW TRANSPLANT UNIT RENOVATION

Project Number: CP221933

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					
06 41 16	Plastic Laminate Clad Architectural Cabinets - Warranty					
07 42 13.16	Standing Seam Metal Roof Panels – Maintenance Data					
07 42 13.19	Insulated Metal Wall Panels – Maintenance Data					
07 84 13	Penetration Firestopping- Installer Certificates					
07 92 00	Joint Sealants - Warranty					
08 14 16	Flush Wood Doors- Warranty					
09 01 90.52	Maintenance Repainting – Maintenance Material					
09 05 60	Common Work Results for Flooring Preparation - Warranty					
09 51 13	Acoustical Panel Ceilings – Maintenance Material					
09 67 23	Resinous Flooring - Maintenance Material and Warranty					
09 91 23	Interior Painting – Maintenance Material					
10 26 00	Wall and Door Protection – Maintenance Material					
20 10 80	Testing, Adjusting And Balancing					

21 00 30	Wet-Pipe Sprinkler System					
23 21 40	Pumps					
23 23 03	Medical Gas and Medical Vacuum Testing					
23 23 10	Medical Gas and Medical Vacuum Valves and Specialties					
23 82 00	Terminal Units					
23 84 00	Humidifiers					
23 85 00	Radiant Panels					
24 33 00	Air Distribution Accessories					
24 34 00	Fans					
24 37 00	Air Devices					
25 00 00	Controls					
Drawing M604	Room Pressure Monitor					
26 24 16	Panelboards					
26 28 16	Disconnects					
26 29 23	Variable Frequency Drives					
26 51 13	Interior Lighting Fixtures					
28 31 00	Fire Detection And Alarm					
28 31 00	Fire Detection And Alarm					



# CP221933 PCT 8th Flr BMT Phase 1B Rnvtn Quality Assurance Log

Verified by:		Date compl	Coord Initial	Documentation Required	Owner Witness Required
Quality Assurance Items by CSI Division	Name	Firm			
<b>I</b>					
<b>Building System Quality Assurance</b>					
Quality Assurance Agent - Conduct pre-installation meetings per specifications.					Meeting Minutes <input checked="" type="checkbox"/>
<b>33053</b>					
<b>Miscellaneous Cast-In-Place Concrete</b>					
Provide a Copy Of Field Cured Concrete Cylinder Test Report to Owner's Rep Prior to Stripping Any Load Bearing Formwork					Test Report From Independent Testing Lab <input checked="" type="checkbox"/>
Submit concrete mix designs prepared by a qualified testing laboratory for approval prior to placement.					mix design reports <input checked="" type="checkbox"/>
<b>51200</b>					
<b>Structural Steel Framing</b>					
Perform Field Quality Control section of specifications					Test Report <input checked="" type="checkbox"/>
Provide welder qualification report for each welder on site					Welder Qualifications <input checked="" type="checkbox"/>
<b>54000</b>					
<b>Cold-Formed Metal Framing</b>					
Hold PreInstallation Meetings as specified					Meeting Minutes <input checked="" type="checkbox"/>
Perform Field Quality Control section of specifications					Test Report <input checked="" type="checkbox"/>
Provide welder qualification report for each welder on site					Welder Qualifications <input checked="" type="checkbox"/>

Quality Assurance Items by CSI Division	Verified by:		Date compl	Coord Initial	Documentation Required	Owner Witness Required
	Name	Firm				
<b>64116</b>						
<b>Plastic-Laminate-Clad Architectural Cabinets</b>						
Hold Pre-Installation meeting as specified					Transmittal	<input checked="" type="checkbox"/>
Protect surfaces from damage until Substantial Completion						<input type="checkbox"/>
<b>64219</b>						
<b>Plastic-Laminate-Faced Wood Paneling</b>						
Hold Pre-Installation meeting as specified					Transmittal	<input checked="" type="checkbox"/>
<b>72726</b>						
<b>Fluid-Applied Membrane Air Barriers</b>						
Hold Preinstallation meeting as specified					Meeting Minutes	<input checked="" type="checkbox"/>
Perform Field Quality Control section of specifications					test report	<input checked="" type="checkbox"/>
<b>74113</b>						
<b>Standing-Seam Metal Roof Panels</b>						
Build Mockups as specified					Inspection Report	<input checked="" type="checkbox"/>
Hold Preinstallation meeting as specified					Meeting Minutes	<input checked="" type="checkbox"/>
Perfrom Field Quality Control section of specifications					Meeting Minutes	<input checked="" type="checkbox"/>

Quality Assurance Items by CSI Division	Verified by:		Date compl	Coord Initial	Documentation Required	Owner Witness Required
	Name	Firm				
<b>74213</b>						
<b>Insulated Metal Wall Panels</b>						
Hold Preinstallation meeting as specified					Meeting Minutes	<input checked="" type="checkbox"/>
Perform Field Quality Control section of specifications					test report	<input checked="" type="checkbox"/>
<b>75419</b>						
<b>Polyvinyl-Chloride (PVC) Roofing</b>						
Hold Preinstallation meeting as specified					Meeting Minutes	<input checked="" type="checkbox"/>
Perform Field Quality Control section of specifications					test report	<input checked="" type="checkbox"/>
Perform Final Roof Inspection (Manufacturer's Rep)					field report	<input checked="" type="checkbox"/>
<b>76200</b>						
<b>Sheet Metal Flashing and Trim</b>						
Conduct a preinstallation conference at project site per specifications					Meeting Minutes	<input checked="" type="checkbox"/>
<b>78413</b>						
<b>Penetration Firestopping</b>						
Conduct a preinstallation conference at project site per specifications					Meeting Minutes	<input checked="" type="checkbox"/>
Help third party perform Field Quality Control section of specifications					Third Party Test Report	<input checked="" type="checkbox"/>

Quality Assurance Items by CSI Division	Verified by:		Date compl	Coord Initial	Documentation Required	Owner Witness Required
	Name	Firm				
<b>79200</b>						
<b>Joint Sealants</b>						
Conduct a preinstallation conference at project site per specifications					Meeting Minutes	<input checked="" type="checkbox"/>
Perform Adhesion Tests per Field Quality Control section of specifications					field report	<input checked="" type="checkbox"/>
<b>79513</b>						
<b>Exterior Expansion Joint Cover Assemblies</b>						
Build Mockups as specified					Inspection Report	<input checked="" type="checkbox"/>
<b>81416</b>						
<b>Flush Wood Doors</b>						
Conduct a preinstallation conference at project site per specifications					Meeting Minutes	<input checked="" type="checkbox"/>
Inspect label for fire rated doors and frames					Door List	<input checked="" type="checkbox"/>
<b>83400</b>						
<b>Special Function Doors</b>						
Test emergency release (if applicable)						<input type="checkbox"/>
<b>90190</b>						
<b>Maintenance Repainting</b>						
Conduct a preinstallation conference at project site per specifications					Meeting Minutes	<input checked="" type="checkbox"/>
Perform Field Quality Control section of specifications					Test Report	<input checked="" type="checkbox"/>

Quality Assurance Items by CSI Division	Verified by:		Date compl	Coord Initial	Documentation Required	Owner Witness Required
	Name	Firm				
Provide Extra Material as specified					Transmittal	<input checked="" type="checkbox"/>
<b>90560</b>						
<b>Common Work Results for Flooring Preparation</b>						
Conduct a preinstallation conference at project site per specifications					Meeting Minutes	<input checked="" type="checkbox"/>
Perform Field Quality Control section of specifications					Test Report	<input checked="" type="checkbox"/>
<b>92900</b>						
<b>Gypsum Board</b>						
Conduct a preinstallation conference at project site per specifications					Meeting Minutes	<input checked="" type="checkbox"/>
Ensure Walls are stenciled with smoke/fire rating					Inspection report	<input checked="" type="checkbox"/>
Verify fire rating compliance is maintained, including all wall penetrations						<input type="checkbox"/>
<b>95113</b>						
<b>Acoustical Panel Ceilings</b>						
Conduct a preinstallation conference at project site per specifications					Meeting Minutes	<input checked="" type="checkbox"/>
<b>Acoustical Panel Ceilings</b>						
Complete all above ceiling inspections prior to installation of tiles						<input checked="" type="checkbox"/>
Provide Extra Material as specified					Transmittal	<input checked="" type="checkbox"/>

Quality Assurance Items by CSI Division	Verified by:		Date compl	Coord Initial	Documentation Required	Owner Witness Required
	Name	Firm				
<b>96723</b>						
<b>Resinous Flooring</b>						
Hold pre-installation conference per specifications					Meeting Minutes	<input checked="" type="checkbox"/>
Perform Field Quality Control section of specifications					Test Report	<input checked="" type="checkbox"/>
<b>99123</b>						
<b>Interior Painting</b>						
Hold pre-installation conference per specifications					Meeting Minutes	<input checked="" type="checkbox"/>
Periodically Check Wet Film Thickness To Assure Conformance With Manufacturer's Requirements To Achieve Dry Film Thickness per field quality control section of specs.					field report	<input checked="" type="checkbox"/>
Provide Extra Material as specified					Transmittal	<input checked="" type="checkbox"/>
<b>102600</b>						
<b>Wall and Door Protection</b>						
Provide Extra Material as specified					Transmittal	<input checked="" type="checkbox"/>
<b>200000</b>						
<b>Basic Mechanical Conditions</b>						
Hold MEP pre-installation meeting(s).					Meeting Minutes and Sign-up Sheet	<input checked="" type="checkbox"/>
<b>200004</b>						
<b>Mechanical References, Regulatory Requirements</b>						

Contractor to pull pressure vessel permit if any pressure vessels meet state requirements					PV Permit	<input checked="" type="checkbox"/>
---	--	--	--	--	-----------	-------------------------------------

Quality Assurance Items by CSI Division	Verified by:		Date compl	Coord Initial	Documentation Required	Owner Witness Required
	Name	Firm				
<b>201055</b>						
<b>Cleaning of Piping Systems</b>						
Clean pipe as speciied per this section					Flush Report	<input checked="" type="checkbox"/>
<b>201056</b>						
<b>Pressure Testing</b>						
Perform Pressure testing per this specification and each particular pipe specification and plumbing / mechanical code					Test Report	<input checked="" type="checkbox"/>
<b>201080</b>						
<b>Testing, Adjusting and Balancing</b>						
Balance systems per specifications and produce specified reports					Third Party Report	<input checked="" type="checkbox"/>
<b>201090</b>						
<b>Basic Mechanical Methods -Identification</b>						
Install valve tags on valves and control devices per specifications					Valve Schedule framed/posted	<input type="checkbox"/>
<b>202013</b>						
<b>Mechanical - Motors</b>						
Verify basic motor requiremets are in accordance with documents					Inspection Report	<input checked="" type="checkbox"/>
<b>202500</b>						
<b>Insulation</b>						
Verify correct type, thickness and jacket installed						<input type="checkbox"/>
<b>210013</b>						
<b>Fire Protection System - Testing</b>						



Perform this section of specifications.  
Hydrostatically test sprinkler system with owner  
witness

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NFPA 13 Certification



Quality Assurance Items by CSI Division	Verified by:		Date compl	Coord Initial	Documentation Required	Owner Witness Required
	Name	Firm				
<b>210014</b>						
<b>Fire Protection System - Acceptance</b>						
Perform this section of specifications					NFPA 13 Certification	<input checked="" type="checkbox"/>
<b>220000</b>						
<b>Plumbing Work</b>						
Hold MEP pre-installation meeting(s).					Inspection Reports	<input checked="" type="checkbox"/>
<b>222000</b>						
<b>Plumbing Piping Systems</b>						
Pressure test per specs and applicable codes. Clean system and perform bacteria test					Test Report	<input checked="" type="checkbox"/>
<b>230000</b>						
<b>HVAC Piping and Equipment</b>						
Hold MEP pre-installation meeting(s).					Meeting Minutes	<input checked="" type="checkbox"/>
<b>231000</b>						
<b>Hydronic Piping</b>						
Clean piping per specifications					Flush Report	<input checked="" type="checkbox"/>
Test piping per specifications					Test Report	<input checked="" type="checkbox"/>
<b>232140</b>						
<b>Pumps</b>						
Verify correct motor rotation and amp draw					test report	<input checked="" type="checkbox"/>

Quality Assurance Items by CSI Division	Verified by:		Date compl	Coord Initial	Documentation Required	Owner Witness Required
	Name	Firm				
<b>232200</b>						
<b>Steam Piping Materials</b>						
Test per specifications					Test Report	<input checked="" type="checkbox"/>
<b>232303</b>						
<b>Medical Gas and Medical Vacuum Testing</b>						
Inspect, test and certify per specifications					Certification	<input type="checkbox"/>
Provide factory training					On-site or Training video	<input type="checkbox"/>
<b>233400</b>						
<b>Fans</b>						
Verify Motor rotation and amp draw					Test Report	<input checked="" type="checkbox"/>
<b>237300</b>						
<b>Air Handling Units</b>						
Provide factory training					Sign In Sheet	<input checked="" type="checkbox"/>
Provide Startup					Startup Report	<input checked="" type="checkbox"/>
<b>243100</b>						
<b>Sheetmetal Ductwork</b>						
test for duct leakage per "Field Quality Control" section of spec. Ducts shall meet leakage requirement prior to testing and balancing					test report	<input checked="" type="checkbox"/>
<b>243300</b>						
<b>Air Distribution Accessories</b>						

**Demonstrate Proper Operation of All Fire Dampers  
per NFPA-90A.**

test report



Quality Assurance Items by CSI Division	Verified by:		Date compl	Coord Initial	Documentation Required	Owner Witness Required
	Name	Firm				
<b>260000</b>						
<b>Electrical</b>						
Train all End Users on the equipment they will use on a periodic basis per Demonstration section of specifications					Sign-in Sheet	<input checked="" type="checkbox"/>
Verify that every penetration through fire walls (re: life safety plans) has been properly firestopped					certification	<input type="checkbox"/>
<b>260090</b>						
<b>Testing and Adjusting</b>						
Perform this section of specifications					Test Reports and Sign In Sheets	<input checked="" type="checkbox"/>
<b>260519</b>						
<b>Low-Voltage Electrical Power Conductors and Cables</b>						
Ensure wires are color coded per specifications						<input type="checkbox"/>
<b>260526</b>						
<b>Grounding and Bonding for Electrical Systems</b>						
Conduct grounding tests per specifications					test reports	<input type="checkbox"/>
<b>260573</b>						
<b>Arc Flash Hazard Analysis, Short Circuit and Selective Coordination</b>						
Factory certified technician to set electronic overcurrent devices to approved coordination study setpoints					Inspection Report	<input checked="" type="checkbox"/>
Perform "Testing" section of specifications					Test Report	<input checked="" type="checkbox"/>

Place arcflash labels on equipment as specified					
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Quality Assurance Items by CSI Division	Verified by:		Date compl	Coord Initial	Documentation Required	Owner Witness Required
	Name	Firm				
SKM data to be e-mailed to MU Quality Assurance Engineer					SKM Data	<input checked="" type="checkbox"/>
Train owners representatives in setting of overcurrent devices					Sign-up Sheet	<input checked="" type="checkbox"/>
<b>262416</b>						
<b>Panelboards</b>						
Perform Testing Per spec					Test Report	<input checked="" type="checkbox"/>
<b>262726</b>						
<b>Wiring Devices</b>						
Check all GFI receptacles for proper operation (including test and reset)						<input type="checkbox"/>
Check all receptacles for proper operation						<input type="checkbox"/>
<b>262923</b>						
<b>Variable-Frequency Drives</b>						
Provide factory trained start-up, testing and training per specifications					start-up & test log; service rep report	<input checked="" type="checkbox"/>
<b>265000</b>						
<b>Lighting</b>						
All Lighting shall be in accordance with specifications						<input checked="" type="checkbox"/>
Furnish Extra Material as specified					Transmittal	<input checked="" type="checkbox"/>
Test all fixtures for proper operation; replace as required and per field quality Control section of specifications					Test reports	<input checked="" type="checkbox"/>

Quality Assurance Items by CSI Division	Verified by:		Date compl	Coord Initial	Documentation Required	Owner Witness Required
	Name	Firm				
<b>265213</b>						
<b>Emergency Battery Backup Ballast</b>						
Illuminate emergency lights for 90 minutes on battery power.					Test Report	<input checked="" type="checkbox"/>
<b>283100</b>						
<b>Fire Detection and Alarm</b>						
Provide factory training					Sign in sheet	<input checked="" type="checkbox"/>
Test system operation of pull stations horns/strobes by factory trained representative					Written certification of fire alarm system per NFP	<input checked="" type="checkbox"/>
Verify battery power available						<input type="checkbox"/>
Verify door hardware interlock						<input checked="" type="checkbox"/>
Verify smoke dampers installed						<input type="checkbox"/>
Verify tamper/flow switches operational						<input checked="" type="checkbox"/>



Please see following website for suggested Quality Assurance forms:

<https://operations.missouri.edu/facilities/Quality Assurance-forms>

SECTION 1.F

INDEX OF DRAWINGS

Drawings referred to in and accompanying Project Manual consist of following sheets dated April 26, 2024.

**GENERAL**

G000	COVER SHEET
G210	LIFE SAFETY PLAN - 8TH FLOOR
G250	UL ASSEMBLIES
G251	UL ASSEMBLIES
G252	UL ASSEMBLIES
G253	UL ASSEMBLIES
G254	UL ASSEMBLIES
G301	TYPICAL MOUNTING HEIGHTS
S100	SITE/LOGISTICS PLAN

**ARCHITECTURAL**

A000	GENERAL NOTES AND ABBREVIATIONS
A002	INTERIOR PARTITION TYPES
A107	7TH FLOOR INFECTION CONTROL & DEMOLITION REFLECTED CEILING PLAN
A108	8TH FLOOR - DEMOLITION PLANS & ELEVATIONS
A109	8TH FLOOR - DEMOLITION REFLECTED CEILING PLAN
A118	8TH FLOOR - NEW WORK PLANS, ELEVATIONS & DETAIL
A119	EXISTING PENTHOUSE AND NEW WORK OVERALL PLAN
A120	ENLARGED PENTHOUSE NEW WORK PLAN
A121	MECHANICAL DUCT ENCLOSURE PLANS
A122	EXISTING PENTHOUSE CONDITION & PROPOSED OPENINGS
A123	MECHANICAL DUCT ENCLOSURE ELEVATIONS
A124	DUCT ENCLOSURE CHASE WALL SECTIONS
A125	DUCT ENCLOSURE WALL SECTIONS
A130	SECTION DETAILS
A131	PLAN & SECTION DETAILS

**MECHANICAL**

M000	MECHANICAL AND PLUMBING SYMBOLS AND ABBREVIATIONS
M001	MECHANICAL DETAILS
M002	SEISMIC CODE BLOCK SCHEDULE
MD108	EIGHTH FLOOR MED GAS PLAN-DEMOLITION
MD208	EIGHTH FLOOR PLUMBING PLAN - DEMOLITION
MD209	PENTHOUSE FLOOR PLUMBING PLAN -DEMOLITION
MD308	EIGHTH FLOOR HVAC PLAN -DEMOLITION
MD309	PENTHOUSE FLOOR HVAC PLAN -DEMOLITION
M108	EIGHTH FLOOR MED GAS PLAN - NEW WORK
M208	EIGHTH FLOOR PLUMBING PLAN -NEW WORK

M209	PENTHOUSE FLOOR PLUMBING PLAN -NEW WORK
M308	EIGHTH FLOOR HVAC PLAN - NEW WORK
M309	PENTHOUSE FLOOR HVAC PLAN - NEW WORK
M401	MECHANICAL SECTIONS
M402	MECHANICAL SECTIONS
M500	AIR FLOW DIAGRAM
M501	CHILLED WATER FLOW DIAGRAM
M502	HEATING WATER FLOW DIAGRAM
M503	CLEAN STEAM FLOW DIAGRAM
M600	MECHANICAL SCHEDULES
M600	MECHANICAL SCHEDULES
M601	MECHANICAL SCHEDULES
M602	TEMP. CONTROLS DIAGRAMS AND POINTS LIST
M603	TEMP. CONTROLS DIAGRAMS AND POINTS LIST
M604	TEMP. CONTROLS DIAGRAMS AND POINTS LIST
M605	TEMP. CONTROLS DIAGRAMS AND POINTS LIST
M606	TEMP. CONTROLS DIAGRAMS AND POINTS LIST
M808	EIGHTH FLOOR FIRE PROTECTION PLAN
M809	PENTHOUSE FLOOR FIRE PROTECTION PLAN

#### **ELECTRICAL**

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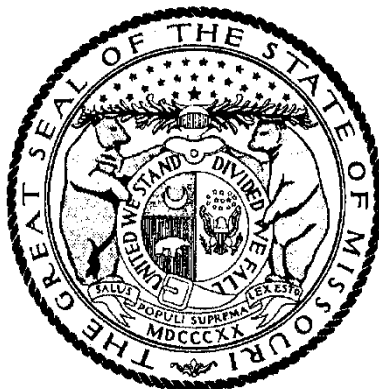
E000	ELECTRICAL SYMBOLS AND ABBREVIATIONS
E010	SEISMIC CODE BLOCK, FIRE ALARM AND LOW VOLTAGE MATRIX
E020	LIGHTING SCHEDULES AND DETAILS
E030	EMERGENCY POWER ONE-LINE
E031	EMERGENCY SCHEDULES
E032	ELECTRICAL DETAILS
DE208	8TH FLOOR PLAN - LIGHTING - DEMOLITION
DE308	8TH FLOOR PLAN - ELECTRICAL - DEMOLITION
DE309	PENTHOUSE FLOOR PLAN - ELECTRICAL - DEMOLITION
E208	8TH FLOOR PLAN - LIGHTING - NEW WORK
E308	8TH FLOOR PLAN - ELECTRICAL - NEW WORK
E309	PENTHOUSE FLOOR PLAN - ELECTRICAL - NEW WORK

END OF SECTION

# Missouri

## Division of Labor Standards

### WAGE AND HOUR SECTION



MICHAEL L. PARSON, Governor

## Annual Wage Order No. 31

Section 010  
**BOONE COUNTY**

In accordance with Section 290.262 RSMo 2000, within thirty (30) days after a certified copy of this Annual Wage Order has been filed with the Secretary of State as indicated below, any person who may be affected by this Annual Wage Order may object by filing an objection in triplicate with the Labor and Industrial Relations Commission, P.O. Box 599, Jefferson City, MO 65102-0599. Such objections must set forth in writing the specific grounds of objection. Each objection shall certify that a copy has been furnished to the Division of Labor Standards, P.O. Box 449, Jefferson City, MO 65102-0449 pursuant to 8 CSR 20-5.010(1). A certified copy of the Annual Wage Order has been filed with the Secretary of State of Missouri.

Original Signed by

Todd Smith, Director  
Division of Labor Standards

Filed With Secretary of State: March 8, 2024

Last Date Objections May Be Filed: April 8, 2024

Prepared by Missouri Department of Labor and Industrial Relations

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	\$61.30
Boilermaker	\$32.35*
Bricklayer-Stone Mason	\$55.22
Carpenter	\$51.42
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	\$45.65
Plasterer	
Communication Technician	\$57.87
Electrician (Inside Wireman)	\$58.36
Electrician Outside Lineman	\$32.35*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	\$32.35*
Glazier	\$65.64
Ironworker	\$69.98
Laborer	\$43.79
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	\$59.96
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	\$65.05
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	\$41.79
Plumber	\$72.46
Pipe Fitter	
Roofer	\$55.00
Sheet Metal Worker	\$58.29
Sprinkler Fitter	\$65.10
Truck Driver	\$32.35*
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

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

\*\*The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title as defined in RSMo Section 290.210.

Heavy Construction Rates for  
BOONE County

Section 010

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	\$63.45
Millwright	
Pile Driver	
Electrician (Outside Lineman)	\$80.19
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	\$50.35
General Laborer	
Skilled Laborer	
Operating Engineer	\$66.32
Group I	
Group II	
Group III	
Group IV	
Truck Driver	\$32.35*
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 fewer 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 1.H - ALTERNATES

Base Bid may be increased in accordance with following Additive Alternate proposal(s) as Owner may elect:

1. Additive Alternate NO. 1:
  - a. Add new branch 1/2" heating water piping to each radiant ceiling panel of the Patient room ceilings.

END OF SECTION



## SECTION 01 73 29 - CUTTING AND PATCHING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. The Contractor or trade responsible for cutting or damaging existing work shall patch the Work to match its unaltered condition at no additional cost to the Owner. The party or parties responsible for the cutting or damaging existing work shall be responsible for the costs associated with repairs and correction of the damaged existing work
- C. Related Sections include the following:
  - 1. Section 02 41 19, "Selective Demolition" for demolition of selected portions of the building for alterations.
  - 2. Section 07 84 13, "Penetration Firestopping" for patching fire-rated construction.
  - 3. Divisions 02 through 26 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

#### 1.3 DEFINITIONS

- A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

#### 1.4 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
- C. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to

perform as intended, or that results in increased maintenance or decreased operational life or safety.

1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Exterior curtain-wall construction.
4. Equipment supports.
5. Piping, ductwork, vessels, and equipment.
6. Noise- and vibration-control elements and systems.

- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect/Engineer's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

## 1.5 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections of these Specifications.
- B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
  2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to minimize or avoid interruption of services to occupied areas.

### 3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
  - 2. Costs for cutting and patching due to ill-timed or defective work shall be the responsibility of party responsible for ill-timed, rejected or non-conforming work.
- B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
  - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  - 2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  - 3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond core drill.
  - 4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
  - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  - 6. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
  - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
6. Fire Separation: Patched areas shall maintain original or proposed fire separation ratings.

END OF SECTION 01 73 29

## SECTION 02 01 00 - MAINTENANCE OF EXISTING CONDITIONS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Protection of existing buildings, facilities, utilities and site improvements to remain.
2. Verification of existing utilities, site improvements and site conditions.

##### B. Related Requirements:

1. Section 01 73 29 "Cutting and Patching."
2. Section 02 41 19 "Selective Demolition."

#### 1.2 ACTION SUBMITTALS

- ##### A. Shop Drawings:
- Submit drawings showing details of any proposed construction which is necessary to protect existing construction and utilities.

#### 1.3 INFORMATIONAL SUBMITTALS

##### A. Engineering Design:

1. If required by job conditions, Contractor shall retain the services of a licensed Professional Engineer registered in the state in which the project is located to design temporary and permanent installations as required to protect existing improvements and conditions.
2. All information required for the design shall be the Contractor's responsibility to obtain.
3. Submit design drawings and calculations to the Architect/Engineer for review. Review by the Architect/Engineer shall not relieve Contractor of full responsibility for design or work. The purpose of the Architect/Engineer review shall be only to protect the Owner from inadequate or insufficient protection for existing improvements and conditions. By reviewing the design, the Architect/Engineer assumes no responsibility for the design or adequacy thereof.
4. All design drawings and calculations submitted shall be signed and sealed by the Contractor's Engineer.

#### 1.4 PROJECT CONDITIONS

##### A. Existing Site Conditions:

1. Information shown on the Drawings was obtained from drawings of previous construction projects and/or a site survey provided by the Owner.
2. Recorded information concerning existing construction is available for examination in the Architect/Engineer office.
3. Existing structures:

- a. Bottom of existing footing elevations are unknown.
    - b. Loads on existing footings and foundations are unknown.
    - c. Dimensions of existing foundations are unknown.
  - 4. Utilities include all underground and above ground piping, conduits, cables and related structures and appurtenances. Utilities also include sewers.
- B. Contractor is responsible for field verifying all existing site conditions.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General:
- 1. Contractor may use materials and systems recognized as suitable for protection of existing improvements and conditions.
  - 2. Untreated wood may only be used for temporary protection, bracing, supports, shores, etc.
  - 3. The Owner or Architect/Engineer may prohibit certain materials and systems if they interfere with the Owner's operations.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Pre-Bid Site Inspection:
- 1. Contractor shall examine the site, inspect existing buildings, review existing plans and become familiar with all conditions under which the contract work will be performed.
  - 2. This shall be completed during the bidding phase in order that bids include all costs for protection of existing improvements and conditions.
  - 3. Contractor shall notify Architect/Engineer during the bidding phase of any discrepancies in bidding documents, existing conditions documents and field conditions.
  - 4. No later claim for extra compensation will be allowed, unless it is determined by the Owner and Architect/Engineer to be unforeseen conditions.
- B. Pre-Construction Verification of Existing Conditions:
- 1. Contractor shall verify all existing site conditions and improvements prior to construction, which includes field verifying locations of existing utilities and all other existing above grade and below grade improvements which may affect proposed construction activities.
  - 2. Contractor shall notify Architect/Engineer immediately with conflicts or discrepancies from existing field conditions, existing conditions documentation and proposed new construction.
  - 3. These verifications are to be done well in advance of construction activities in order to allow time for revising design if required.

3.2 GENERAL

- A. Contractor shall have underground utilities marked prior to beginning any excavation or other underground work in area of proposed activity.
- B. Provide all permanent and temporary construction necessary to protect existing improvements and conditions as required by construction activities.
- C. Install all protection in a manner which will not interfere with the Owner's operations or adjacent work.
- D. If at any time movement or other failure is observed in existing improvements or conditions, cease operations, provide all additional protection necessary to stabilize and retain said existing installations and notify Owner immediately.

3.3 JOB COMPLETION

- A. Upon completion of construction activities, leave the site in a neat and orderly condition.
- B. Restore all areas disrupted by construction activities, which were to remain and not be altered, to their original condition at no additional cost to Owner.

END OF SECTION 02 01 00

## SECTION 02 41 19 - SELECTIVE DEMOLITION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Demolition and removal of selected portions of building or structure.
  - 2. Repair procedures for selective demolition operations.
  - 3. Removal of all debris from the site.
  - 4. Non-destructive removal of materials, items, components, and equipment for reuse or salvage as shown on the drawings or as requested by the Owner. Repair and modification of existing openings, pits or depressions in floor as shown on the drawings and as required for installation of new work.
  - 5. Construction of dust barriers, barricades or temporary partitions where shown on the drawings, or where required for separation from occupied spaces or activities.
- B. Related Requirements:
  - 1. Owners 1.E "Special Conditions"
  - 2. Owners 1.E.1 "Healthcare Construction Guidelines"
  - 3. Section 01 73 29 "Cutting and Patching" for cutting and patching procedures for selective demolition operations.
  - 4. Divisions 22, 23 and 24 Sections for demolishing, cutting, patching, or relocating plumbing and HVAC items.
  - 5. Division 26 Sections for demolishing, cutting, patching, or relocating electrical items.

#### 1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse, unless otherwise directed.
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.



- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

#### 1.4 MATERIALS OWNERSHIP

- A. Except for items or materials to be reused, salvaged, reinstalled or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.
  - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

#### 1.5 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.
  - 1. Inspect and discuss condition of construction to be selectively demolished.
  - 2. Review structural load limitations of existing structure.
  - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
  - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
  - 5. Review areas where existing construction is to remain and requires protection.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers. Identify options if proposed measures are later determined to be inadequate.
- B. Schedule of Selective Demolition Activities: Indicate the following:
  - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's building manager's on-site operations are uninterrupted.
  - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
  - 3. Coordination for shutoff, capping, and continuation of utility services.
  - 4. Use of elevator and stairs.
  - 5. Locations of temporary partitions and means of egress.
  - 6. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- C. Predemolition Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by demolition operations. Submit before Work begins.

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

#### 1.7 CLOSEOUT SUBMITTALS

- A. Inventory: After selective demolition is complete, submit a list of items that have been removed, salvaged and delivered to Owner.

#### 1.8 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.
  - 1. Engineering survey services are defined as those performed for evaluation of existing structures for strength and stability during demolition operations.
  - 2. Engineering design services are defined as those performed for design of shoring or rigging necessary to ensure stability and safety of structures during demolition operations.
- C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Standards: Comply with ANSI A10.6 and NFPA 241.

#### 1.9 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted. Provide not less than 48 hours' notice to Owner of activities that will affect Owner's operations.
  - 1. Demolition phasing, if required, shall be scheduled by the Contractor with the approval of the Architect/Engineer and Owner.
- B. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
  - 1. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from authorities having jurisdiction.
  - 2. The removal of debris and construction traffic will be limited to the designated routes that shall be resolved with and approved by the Owner.
- C. Owner assumes no responsibility for condition of areas to be selectively demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- D. Notify Architect/Engineer of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- E. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
  1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect/Engineer and Owner. Hazardous materials will be removed by Owner under a separate contract.
- F. Storage or sale of removed items or materials on-site is not permitted.
- G. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
  1. Maintain fire-protection facilities in service during selective demolition operations.

#### 1.10 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding.
- B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.

#### 2.2 REPAIR MATERIALS

- A. Use repair materials identical to existing materials.
  1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
  2. Use materials whose installed performance equals or surpasses that of existing materials.

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

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
  - 1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
- D. Survey of Existing Conditions: Record existing conditions by use of measured drawings preconstruction photographs or video.
  - 1.
  - 2. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
  - 3. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect/Engineer.

### 3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
- B. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.
  - 1. Provide at least 48 hours' notice to Owner if shutdown of service is required during changeover.
- C. Utility Requirements: Refer to Division 20, 22, 23, 24 and 26 Sections for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

### 3.3 PROTECTION

- A. Dangerous Materials: Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  - 1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
  - 2. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
- C. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
  - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
  - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
  - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
  - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
- D. Remove temporary barricades and protections where hazards no longer exist.

### 3.4 POLLUTION CONTROLS

- A. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations and infection control procedures.
  - 1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
  - 2. Wet mop floors to eliminate trackable dirt and wipe down walls and doors of demolition enclosure. Vacuum carpeted areas.
- B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
  - 1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
  - 2. Lockers, casework, fixed equipment that must be removed or relocated through interior areas outside the construction limits shall be encapsulated utilizing shrink wrapping,

stretch wrapping, sealed bags, or other methods to seal item and prevent transfer of dust or contamination outside the construction area.

- C. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations begin.

### 3.5 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
  - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
  - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
  - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  - 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
  - 5. Maintain fire watch during and for at least 48 hours after flame-cutting operations.
  - 6. Maintain adequate ventilation when using cutting torches.
  - 7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
  - 8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
  - 9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
  - 10. Dispose of demolished items and materials promptly.
  - 11. Return elements of construction and surfaces that are to remain to condition existing before selective demolition operations begin.
- B. The items listed below have unique or may have regulated disposal requirements and are to be removed and disposed of in the manner dictated by law or in the most environmentally responsible manner. Typical concerns are listed in parentheses:
  - 1. Fluorescent light ballasts manufactured prior to 1978: PCB.
  - 2. Fluorescent lamps: Mercury.
  - 3. Refrigeration, air-conditioning, and other equipment containing refrigerants: CFC recovery.
  - 4. Batteries: Lead, acid, mercury.
  - 5. Paints, solvents, and other hazardous fluids.
  - 6. Corrugated cardboard.

7. Asbestos based materials.
  8. Materials with lead based finishes.
- C. Existing Facilities: Comply with Owner's building manager requirements for using and protecting elevators, stairs, walkways, loading docks, building entries, and other building facilities during selective demolition operations.
- D. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- E. Removed and Salvaged Items: Comply with the following
1. Use caution during removal of salvaged items to eliminate possibility of damage to such items. All existing items, equipment, materials and fixtures shall remain the property of the Owner. All reusable items salvaged during demolition operations shall be retained for Owner's inspection. Only items so inspected and rejected by the Owner shall be disposed. All other such items shall be turned over to Owner for his disposition.
  2. Clean salvaged items.
  3. Pack or crate equipment items after cleaning. Identify contents of containers.
  4. Store items in a secure area until delivery to Owner.
  5. Transport items to Owner's storage area designated by Owner.
  6. Protect items from damage during transport and storage.
- F. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse.
  2. Pack or crate items after cleaning and repairing. Identify contents of containers.
  3. Protect items from damage during transport and storage.
  4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- G. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect/Engineer, items may be removed to a suitable, protected storage location during selective demolition[ **and cleaned**] and reinstalled in their original locations after selective demolition operations are complete.

### 3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

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

- C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings" and its Addenda. Do not use methods requiring solvent-based adhesive strippers.

### 3.7 PATCHING AND REPAIRS

- A. General: Promptly repair damage to adjacent construction caused by selective demolition operations.
- B. Patching: Comply with Section 01 73 29 "Cutting and Patching."
- C. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.
- D. Floors and Walls: Where walls or partitions that are demolished extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
  - 1. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
  - 2. Where patching occurs in a painted surface, apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface containing patch. Provide additional coats until patch blends with adjacent surfaces.
  - 3. Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
- E. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

### 3.8 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction. and recycle or dispose of them
  - 1. Do not allow demolished materials to accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
  - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.



- B. Burning: Do not burn demolished materials.

### 3.9 CLEANING

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

END OF SECTION 02 41 19

SECTION 033053 - MISCELLANEOUS CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes cast-in-place concrete, including reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture.

1.3 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. Comply with ACI 301 (ACI 301M).
- B. Comply with ACI 117 (ACI 117M).

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 CONCRETE MATERIALS

- A. Cementitious Materials:

1. Portland Cement: ASTM C 150/C 150M, **Type I**.
  2. Fly Ash: ASTM C 618, Class C or F.
- B. Normal-Weight Aggregate: ASTM C 33/C 33M, [**1-1/2-inch (38-mm)**] nominal maximum aggregate size.
- C. Air-Entraining Admixture: ASTM C 260/C 260M.
- D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
  2. Retarding Admixture: ASTM C 494/C 494M, Type B.
  3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
  4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
  5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
  6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- E. Water: ASTM C 94/C 94M.

## 2.4 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth or cotton mats.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- F. Clear, [**Waterborne**] [**Solvent-Borne**], Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

## 2.5 CONCRETE MIXTURES

- A. Normal-Weight Concrete:
1. Minimum Compressive Strength: **4000 psi (27.6 MPa)** at 28 days.
  2. Maximum W/C Ratio: **0.50**.
  3. Slump Limit: **4 inches (100 mm)**, plus or minus **1 inch (25 mm)**.
  4. Air Content: Maintain within range permitted by **ACI 301 (ACI 301M)**. Do not allow air content of trowel-finished floor slabs to exceed 3 percent.

## 2.6 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M[ and ASTM C 1116/C 1116], and furnish batch ticket information.
  - 1. When air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

## PART 3 - EXECUTION

### 3.1 FORMWORK INSTALLATION

- A. Design, construct, erect, brace, and maintain formwork according to ACI 301 (ACI 301M).

### 3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

### 3.3 STEEL REINFORCEMENT INSTALLATION

- A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

### 3.4 CONCRETE PLACEMENT

- A. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M).
- B. Do not add water to concrete during delivery, at Project site, or during placement.
- C. Consolidate concrete with mechanical vibrating equipment according to ACI 301 (ACI 301M).

### 3.5 FINISHING FORMED SURFACES

- A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch (3 mm).
- B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

### 3.6 FINISHING UNFORMED SURFACES

- A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.
  - 1. Do not further disturb surfaces before starting finishing operations.
- C. Trowel Finish: Apply a hard trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.

### 3.7 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with **ACI 305.1 (ACI 305.1M)** for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching **0.2 lb/sq. ft. x h (1 kg/sq. m x h)** before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure formed and unformed concrete for at least seven days by one or a combination of the following methods:
  - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with **12-inch (300-mm)** lap over adjacent absorptive covers.
  - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least **12 inches (300 mm)**, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
  - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

### 3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Tests: Perform according to **ACI 301** (**ACI 301M**).
  1. Testing Frequency: Obtain at least one composite sample for each **100 cu. yd.** (**76 cu. m**) or fraction thereof of each concrete mixture placed each day.

END OF SECTION 033053

## SECTION 051200 - STRUCTURAL STEEL FRAMING

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Structural-steel materials.

#### 1.2 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

#### 1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

#### 1.4 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. Shop primer.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment Drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For **Installer**.

- B. Welding certificates.
- C. Survey of existing conditions.
- D. Field quality-control reports.

#### 1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
  - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Comply with applicable provisions of the following specifications and documents:
  - 1. ANSI/AISC 303.
  - 2. ANSI/AISC 360.
- B. Connection Design Information:
  - 1. Option 1: Connection designs have been completed and connections indicated on the Drawings.

#### 2.2 STRUCTURAL-STEEL MATERIALS

- A. Channels, Angles, S-Shapes: **ASTM A36/A36M.**
- B. Plate and Bar: **ASTM A36/A36M.**
- C. Cold-Formed Hollow Structural Sections: **ASTM A500/A500M, Grade B** structural tubing.
- D. Welding Electrodes: Comply with AWS requirements.



## 2.3 PRIMER

- A. Steel Primer:
  - 1. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

## 2.4 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.
  - 1. Fabricate beams with rolling camber up.
  - 2. Mark and match-mark materials for field assembly.
  - 3. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
  - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with **SSPC-SP 2**.

## 2.5 SHOP CONNECTIONS

- A. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
  - 1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

## 2.6 SHOP PRIMING

- A. Shop prime steel surfaces, except the following:
  - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of **2 inches (50 mm)**.
  - 2. Surfaces to be field welded.
  - 3. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
- B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:
  - 1. **SSPC-SP 2**.

## 2.7 SOURCE QUALITY CONTROL

- A. Testing Agency: **Owner will engage** a qualified testing agency to perform shop tests and inspections.
  - 1. Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
  - 2. Welded Connections: Visually inspect shop-welded connections in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
    - a. Liquid Penetrant Inspection: ASTM E165/E165M.
    - b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
    - c. Ultrasonic Inspection: ASTM E164.
    - d. Radiographic Inspection: ASTM E94/E94M.
    - e. tested.
  - 3. Prepare test and inspection reports.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated on Drawings.

### 3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.
- B. Maintain erection tolerances of structural steel within ANSI/AISC 303.
- C. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

D. Splice members only where indicated.

E. Do not use thermal cutting during erection.

### 3.4 FIELD CONNECTIONS

A. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

### 3.5 REPAIR

A. Touchup Painting:

1. Immediately after erection, clean exposed areas where primer is damaged or missing, and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
  - a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

### 3.6 FIELD QUALITY CONTROL

A. Testing Agency: **Owner will engage** a qualified testing agency to perform tests and inspections.

1. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.
  - a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
    - 1) Liquid Penetrant Inspection: ASTM E165/E165M.
    - 2) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
    - 3) Ultrasonic Inspection: ASTM E164.
    - 4) Radiographic Inspection: ASTM E94/E94M.

END OF SECTION 051200

## SECTION 05 40 00 - COLD-FORMED METAL FRAMING

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:

- 1. Exterior wall framing.
- 2. Exterior roof and soffit framing.

- B. Related Requirements:

- 1. Section 05 50 00 "Metal Fabrications" for miscellaneous steel shapes, masonry shelf angles, and connections used with cold-formed metal framing.
- 2. Section 07 42 13.13 "Formed Metal Wall Panels."
- 3. Section 09 21 16.23 "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies, with height limitations.
- 4. Section 09 22 16 "Non-Structural Metal Framing" for standard, interior non-load-bearing, metal-stud framing, and ceiling-suspension assemblies.

#### 1.3 DEFINITIONS

- A. Structural Studs: Studs with metal thickness of 0.0329 inch (20 gage) or greater and a minimum flange width of 1-5/8 inches.

#### 1.4 PREINSTALLATION MEETINGS

- A. Pre-Installation Conference: Conduct conference at Project site. Review methods and procedures related to framing including, but not limited to, the following:
  - 1. Coordination of interior wall and drywall work.
  - 2. Coordinate intersections with other materials or work performed under other Sections
  - 3. Pre-installation meeting shall include installers of exterior wall cladding, gypsum board, sheathing and other trades that will apply to or intersect with cold-formed metal framing.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
    - a. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
  3. Provide elevations for each building elevation, indicating anchorage locations, stud sizes, sills and lintels.
  4. Provide details including anchorages, splices, boxed members, bracing, and other framing and fabrication details necessary to fully describe construction.
- C. Delegated-Design Submittal: For cold-formed steel framing.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Product Certificates: For each type of code-compliance certification for studs and tracks.
- D. Engineering Calculations: Signed and sealed Design calculations or certification by a professional engineer indicating compliance of stud selection with design criteria specified.

#### 1.7 QUALITY ASSURANCE

- A. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment, indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- B. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association, or the Steel Stud Manufacturers Association.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
  1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- D. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
  1. Where products other than the reference standards are provided, fire-rated construction is indicated, and a specific UL or GA Design Classification is designated, provide only

products listed in the Design Classification or an equivalent UL or GA Design Classification, acceptable to the Architect/Engineer.

- B. Comply with the following AISI Specifications and Standards:
  - 1. AISI S100 "North American Specification for the Design of Cold-Formed Steel Structural Members."
  - 2. AISI S201 "North American Standard for Cold-Formed Steel Framing - Product Standard."
  - 3. AISI S202 "Code of Standard Practice for Cold-Formed Steel Structural Framing."
  - 4. AISI S240 "North American Standard for Cold-Formed Steel Structural Framing."
  
- C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.
  - 1. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

## 1.8 DELIVERY, STORAGE AND HANDLING

- A. Delivery, Handling, & Protection:
  - 1. Deliver materials to the project site in their original unopened packages with manufacturer's labels intact and legible.
  - 2. Deliver fire-rated materials bearing testing agency label and required fire classification numbers.
  
- B. Storage:
  - 1. Store materials under cover, stack flat, off grade or floor.
  - 2. Damaged or deteriorated materials shall be removed from the premises.

## 1.9 COORDINATION

- A. General:
  - 1. Consult with other trades to ascertain if they require "extra" metal studs or blocking for attachment of their Work or framed openings and coordinate locations of such.
  - 2. All wall mounted equipment or accessories typically require additional bracing, strap or blockings. The specific type and size of the proposed bracing, straps or blocking shall be reviewed with the Architect/Engineer prior to fabrication or installation.
  - 3. Coordinate locations and types of blocking and supports provided under other Sections of this Specification.

## PART 2 – PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AllSteel & Gypsum Products, Inc.
2. CEMCO; California Expanded Metal Products Co.
3. ClarkDietrich.
4. Consolidated Fabricators Corp.; Building Products Division.
5. Craco Manufacturing, Inc.
6. Custom Stud.
7. Design Shapes in Steel.
8. Formetal Co. Inc. (The).
9. Jaimes Industries.
10. MarinoWARE.
11. MBA Building Supplies.
12. Mill Steel Framing.
13. MRI Steel Framing, LLC.
14. Nuconsteel, A Nucor Company.
15. Olmar Supply, Inc.
16. SCAFCO Steel Stud Company.
17. Southeastern Stud & Components, Inc.
18. State Building Products, Inc.
19. Steel Construction Systems.
20. Steeler, Inc.
21. Super Stud Building Products Inc.
22. Telling Industries.
23. The Steel Network, Inc.
24. United Metal Products, Inc.
25. United Steel Deck, Inc.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Member Selection:

1. General: Select member gages from the manufacturer's published design properties and load/span tables, based on the deflection limit and the selection criteria, for the wall span indicated on the Drawings.
2. Stud selection criteria:
  - a. Member properties shall not be less than specified for members of depth indicated.
  - b. Furnish members of depth indicated.
  - c. Furnish members of yield strength, profile, gage and spacing required to meet deflection criteria at the design load.
    - 1) Stud flange widths and profiles are minimum. Wider flanges and alternative, proprietary profiles of equivalent or greater strength to the minimum profile may be used to meet design criteria, if approved by the Architect/Engineer.

- d. Stud spacing shall not exceed 16 inches on center.
- 3. Exterior wall loads, based on the wind load formulas published in the ASCE 7-16 Chapter 30 – Equation 30.5-1:
  - a. Design wind pressure = 49 psf.
- B. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
  - 1. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
    - a. Exterior framing for walls: Horizontal deflection of 1/360 of the wall height.
    - b. Exterior Soffit Framing: Vertical deflection of 1/360 of the span for live loads and 1/240 for total loads of span.
- C. Cold-Formed Steel Framing Design Standards:
  - 1. Floor and Roof Systems: AISI S210.
  - 2. Wall Studs: AISI S211.
  - 3. Headers: AISI S212.
- D. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and **AISI S240**.
- E. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

## 2.3 COLD-FORMED STEEL FRAMING MATERIALS

- A. Framing Members, General: Comply with AISI S240 for conditions indicated.
- B. Cold Formed Sheet Metal Gages: Provide cold formed sheet metal studs, runners, furring channels, and accessories manufactured from galvanized sheet steel with design base metal thicknesses conforming to the following schedule. Actual minimum metal thickness shall not be less than 95 percent of the design metal thickness.
  - 2. 20 gage: 0.0329 inch (33 mil).
  - 3. 18 gage: 0.0451 inch (43 mil).
  - 4. 16 gage: 0.0538 inch (54 mil).
  - 5. 14 gage: 0.0713 inch (68 mil).
  - 6. 12 gage: 0.1017 inch (97 mil).
- C. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:
  - 1. Grade: As required by structural performance.



2. Coating: G90 or equivalent.

- D. Steel Sheet for Vertical Deflection or Drift Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
1. Grade: As required by structural performance.
  2. Coating: G90.

## 2.4 EXTERIOR WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0329 inch.
  2. Flange Width: 1-5/8 inches.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and same minimum base-metal thickness as steel studs.

## 2.5 ROOF AND SOFFIT FRAMING

- A. Exterior Roof and Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0329 inch.
  2. Flange Width: 1-5/8 inches, minimum.

## 2.6 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members, unless otherwise indicated.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
- C. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- D. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts, carbon-steel nuts, and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- E. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

- F. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

- G. Welding Electrodes: Comply with AWS standards.

## 2.7 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A780.

- B. Cement Grout: Portland cement, ASTM C 150/C 150M, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

- C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.

- D. Shims: Load-bearing, high-density, multi-monomer, non-leaching plastic.

- E. Sealer Gaskets: Closed-cell neoprene foam insulation in unfaced rolls, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

1. Basis-of-Design Product: Sill Seal by Insulation Corporation of America.
2. Size: 1/4 inch x 100 foot rolls in the width as required for the sill plate size.
3. Location: Install between [sill plate] [runner track] and [foundation] [floor slabs].

## 2.8 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
  - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
  - b. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.
4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.
- C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet and as follows:
  - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
  - 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

### PART 3 – EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, conditions, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.
- B. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud.

#### 3.3 INSTALLATION, GENERAL

- A. Install cold-formed metal framing according to ASTM C1007 and AISI S200 "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.
- B. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
  - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
  - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
  - b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- D. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed.
  1. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- F. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- G. Install insulation, specified in Section 07 21 00 "Thermal Insulation," in in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work as indicated on Drawings.
- H. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

### 3.4 EXTERIOR WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
  1. Stud Spacing: 16 inches.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
  1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
  2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
  3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

- E. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

### 3.5 ERECTION TOLERANCES

- A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
  - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

### 3.6 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- E. Remove and replace work where test results indicate that it does not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### 3.7 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 40 00

## SECTION 05 50 00 - METAL FABRICATIONS

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Steel framing and supports for mechanical and electrical equipment.
  - 2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
  - 3. Patient lift support system.
  - 4. Loose bearing and leveling plates for applications where they are not specified in other Sections.
- B. Products furnished, but not installed, under this Section include the following:
  - 1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
  - 2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
- C. Related Requirements:
  - 1. Section 05 12 00 "Structural Steel Framing."
  - 2. Section 09 91 23 "Interior Painting" for painting interior items.

#### 1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
  - 1. Paint products.

- B. Shop Drawings: Before any metal is fabricated, submit shop drawings to show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
- C. Delegated-Design Submittal: For metal fabrications, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Welding certificates.
- C. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

## 1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
  - 3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

## 1.7 FIELD CONDITIONS

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

# PART 2 – PRODUCTS

## 2.1 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Stainless-Steel Sheet, Strip, and Plate: ASTM A240/A240M or ASTM A666, Type 304.
- D. Stainless-Steel Bars and Shapes: ASTM A276, Type 304.
- E. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.
- F. Rolled-Stainless-Steel Floor Plate: ASTM A793.
- G. Abrasive-Surface Floor Plate: Steel plate with abrasive granules rolled into surface or with abrasive material metallurgically bonded to steel.

1. Products: Subject to compliance with requirements, provide one of the following:
    - a. IKG Industries, a division of Harsco Corporation; Mebac.
    - b. SlipNOT Metal Safety Flooring; W.S. Molnar Company; SlipNOT.
  - H. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.
  - I. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.
  - J. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
    1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      - a. Atkore Unistrut.
    2. Size of Channels: As indicated on drawings.
    3. Material: Galvanized steel, ASTM A653/A653M, commercial steel, Type B structural steel, Grade 33, with G90 coating; 0.108-inch nominal thickness.
    4. Material: Cold-rolled steel, ASTM A1008/A1008M, structural steel, Grade 33; 0.0966-inch minimum thickness.
  - K. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.
  - L. Aluminum Plate and Sheet: ASTM B209, Alloy 6061-T6.
  - M. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.
  - N. Aluminum-Alloy Rolled Tread Plate: ASTM B632/B632M, Alloy 6061-T6.
  - O. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.
- 2.2 FASTENERS
- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
    1. Provide stainless-steel fasteners for fastening aluminum.
    2. Provide stainless-steel fasteners for fastening stainless steel.
  - B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.
  - C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 1.
  - D. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.



1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- E. Anchors: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.
1. Basis-of-Design Product: The design for anchors is based on products by manufacturers indicated below. Products incorporated in the work shall have equivalent allowable tension and shear load values as the products indicated in the substrate indicated. Alternative diameters and embedment depths may be used, subject to Architect/Engineer approval. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
    - a. Hilti, Inc.
    - b. ITW Ramset/Red Head, division of Illinois Toolworks.
    - c. Powers Fasteners
  2. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329.
    - a. Design anchors in compliance with ACI 318 Appendix D.
  3. Bolts into concrete or masonry:
    - a. Adhesion Anchor: Subject to compliance with requirements, provide products by one of the following:
      - 1) Hilti HIT RE 500 EPOXY ADHESIVE Anchor; Hilti Fastening Systems.
      - 2) Epcon System; ITW Ramset/Red Head.
    - b. Expansion Anchor: Subject to compliance with requirements, provide products by one of the following:
      - 1) Hilti KWIK BOLT III Expansion Anchor; Hilti Fastening Systems.
      - 2) Trubolt Wedge; ITW Ramset/Red Head.
    - c. Drop-in anchor: Subject to compliance with requirements, provide products by one of the following:
      - 1) Hilti Drop-in Anchor; Hilti Fastening Systems.
      - 2) Multi-Set II Drop-In Anchor; ITW Ramset/Red Head.
    - d. Self-drilling anchors: Subject to compliance with requirements, provide products by the following:
      - 1) Self-Drill Anchor; ITW Ramset/Red Head.

- e. Sleeve anchors: Subject to compliance with requirements, provide products by one of the following:

- 1) Hilti Sleeve Anchors; Hilti Fastening Systems.
- 2) Dynabolt Sleeve; ITW Ramset/Red Head.

## 2.3 MISCELLANEOUS MATERIALS

- A. Universal Shop Primer: Fast curing, lead and chromate free, universal modified alkyd primer complying with MPI#79 and compatible with topcoat.
  - 1. Use primer containing pigments that make it easily distinguishable from zinc rich primer.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

## 2.4 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

## 2.5 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
  - 1. Fabricate units from slotted channel framing where indicated.
  - 2. Furnish inserts for units installed after concrete is placed.
- C. Fabricate supports for operable partitions from continuous steel beams of sizes recommended by partition manufacturer with attached bearing plates, anchors, and braces as recommended by partition manufacturer. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.
- D. Galvanize miscellaneous framing and supports where indicated.

## 2.6 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

## 2.7 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Shop prime iron and steel items unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with universal shop primer.
- D. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
  1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

## PART 3 – EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
  1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove welding flux immediately.
  4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
  1. Cast Aluminum: Heavy coat of bituminous paint.
  2. Extruded Aluminum: Two coats of clear lacquer.

### 3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for any mechanical, electrical, or plumbing systems not specified in other sections securely to, and rigidly brace from, building structure.

### 3.3 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

### 3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC PA 1 for touching up shop painted surfaces.
  - 1. Apply by brush or spray to provide a minimum 2.0 mil dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 05 50 00

## SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Wood blocking and nailers.
  - 2. Wood furring.
  - 3. Utility shelving.
  - 4. Plywood backing panels.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
  - 1. Fire-retardant-treated wood.
  - 2. Power-driven fasteners.

### PART 2 - PRODUCTS

#### 2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  - 1. Factory mark each piece of lumber with grade stamp of grading agency.
  - 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
  - 3. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness unless otherwise indicated.

## 2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
  - 1. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.
- C. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- D. Application: Treat all miscellaneous carpentry unless otherwise indicated.

## 2.3 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
  - 1. Blocking.
  - 2. Nailers.
  - 3. Utility shelving.
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.
- C. Utility Shelving: Lumber with 15 percent maximum moisture content of eastern white pine, Idaho white, lodgepole, ponderosa, or sugar pine; Premium or No. 2 Common (Sterling)] grade; NeLMA, NLGA, WCLIB, or WWPA.
- D. Concealed Boards: 15 percent maximum moisture content of any of the following species and grades:
  - 1. Mixed southern pine or southern pine, No. 2 grade; SPIB.
  - 2. Eastern softwoods, No. 2 Common grade; NELMA.
  - 3. Northern species, No. 2 Common grade; NLGA.
  - 4. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.

## 2.4 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.5 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
- B. Screws for Fastening to Metal Framing: ASTM C 1002 or ASTM C 954, length as recommended by screw manufacturer for material being fastened.

VERIFY THE USE OF POWER-DRIVEN FASTENERS WITH THE OWNER.

- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
- C. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  - 1. ICC-ES evaluation report for fastener.

END OF SECTION 061053



## SECTION 06 16 00 – SHEATHING

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Wall sheathing.
  - 2. Roof sheathing.
  - 3. Parapet sheathing.
  - 4. Sheathing joint and penetration treatment.
- B. Related Requirements:
  - 1. Section 06 10 53 "Miscellaneous Rough Carpentry" for plywood backing panels.
  - 2. Section 07 27 26 "Fluid-Applied Membrane Air Barriers" for air and water resistive barrier applied over sheathing.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
  - 1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
  - 2. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
  - 1. Fire-retardant-treated plywood.
- B. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications:

1. For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.
2. For testing and inspecting agency providing tests and inspections related to air-barrier and water-resistant glass-mat gypsum sheathing: an independent agency, qualified according to ASTM E 329 for testing indicated, and certified by Air Barrier Association of America, Inc.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 – PRODUCTS

DELETE REFERENCE TO SUSTAINABLE DESIGN REQUIREMENTS BELOW IF NOT REQUIRED FOR PROJECT.

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 FIRE-RETARDANT-TREATED PLYWOOD

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
1. Use treatment that does not promote corrosion of metal fasteners.
  2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.

- a. Basis Basis-of-Design: Subject to compliance with requirements, provide the following:
  - 1) Arch Wood Protection, Inc, a Lonza Company; FRX wood.
- 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201/D 3201M at 92 percent relative humidity. Use where exterior type is not indicated.
  - a. Basis Basis-of-Design: Subject to compliance with requirements, provide the following:
    - 1) Arch Wood Protection, Inc, a Lonza Company; Dricon FS wood.
- C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.
- E. Application: Treat all plywood unless otherwise indicated.

## 2.3 WALL SHEATHING

- A. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. CertainTeed Corporation; GlasRoc.
    - b. Georgia-Pacific Gypsum LLC; Dens-Glass Gold.
    - c. National Gypsum Company; Gold Bond eXP Extended Exposure Sheathing.
    - d. USG Corporation; Securock.
  - 2. Type and Thickness: Type X, 5/8 inch thick.
  - 3. Edges: Square.
  - 4. Size: 4'-0" by length required to minimize joints.
  - 5. Location: Exterior wall studs and soffit framing.

## 2.4 ROOF SHEATHING

- A. Fiberglass Faced Gypsum Sheathing: Specified in Section 075419 "Polyvinyl Chloride(PVC) Roofing.

## 2.5 PARAPET SHEATHING

- A. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. CertainTeed Corporation; GlasRoc Roof Board.

- b. Georgia-Pacific Gypsum LLC; Dens-Deck Prime.
- c. National Gypsum Company; DEXcell FA Glass Mat Roof Board.
- d. USG Corporation; Securock Glass Mat Roof Board.

2. Type and Thickness: Type X, 5/8 inch thick.

## 2.6 SOFFIT SHEATHING FOR DIRECT APPLIED EXTERIOR FINISH SYSTEM (DEFS)

A. Exterior Cement Board: Not less than 7/16-inch- (11-mm-) thick, fiber cement board complying with ASTM C 1325, Type A, for exterior applications.

1. Products: Subject to compliance with requirements, provide one of the following acceptable in writing by DEFS manufacturer:

- a. C-Cure; C-Cure Board 990.
- b. Custom Building Products; Wonderboard.

## 2.7 FinPan, Inc.; Util-A-Crete Concrete Backer Board.FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

- 1. For roof parapet and wall sheathing, provide fasteners of Type 304 Stainless Steel.
- 2. For roof parapet and wall sheathing, provide fasteners with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B117.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

E. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.

- 1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C 1002.
- 2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C 954.

## 2.8 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

## PART 3 – EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
  1. ICC-ES evaluation report for fastener.
- D. Coordinate wall parapet and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

### 3.2 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
  1. Fasten gypsum sheathing to cold-formed metal framing with screws.
  2. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
  3. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
- C. Horizontal Installation: Abut ends over centers of studs, and stagger end joints of adjacent panels not less than one stud spacing. Attach at perimeter and within field of panel to each stud.
  1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.

- D. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.
1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.
  2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.
- E. Seal sheathing joints according to sheathing manufacturer's written instructions.
1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
  2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.
- F. Air-Barrier and Water-Resistant Glass-Mat Gypsum Sheathing:
1. Install accessory materials according to sheathing manufacturer's written instructions and details to form a seal with adjacent construction, to seal fasteners, and ensure continuity of air and water barrier.
    - a. Coordinate the installation of sheathing with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
    - b. Install transition strip on roofing membrane or base flashing, so that a minimum of 3 inches of coverage is achieved over each substrate.
  2. Connect and seal sheathing material continuously to air barriers specified under other Sections as well as to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
  3. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
  4. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply **[transition strip]** **[preformed silicone extrusion]**, so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames, with not less than 1 inch of full contact.
    - a. Transition Strip: Roll firmly to enhance adhesion.
    - b. Preformed Silicone Extrusion: Set in full bed of silicone sealant applied to walls, frame, and air-barrier material.
  5. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations of sheathing material with foam sealant.
  6. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

7. Seal top of through-wall flashings to sheathing with an additional 6-inch- wide, transition strip.
8. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
9. Repair punctures, voids, and deficient lapped seams in strips and transition strips extending 6 inches beyond repaired areas in strip direction.

### 3.3 EXTERIOR CEMENT-BOARD INSTALLATION AT SOFFITS TO RECEIVE DEFS

- A. Install panels and treat joints according to panel and DEFS manufacturer's written instructions for type of application indicated.
  1. Install on metal framing to comply with cement-board manufacturer's written instructions and evaluation report acceptable to authorities having jurisdiction. Install board with steel drill screws spaced no more than 8 inches (203 mm) o.c. along framing with perimeter fasteners at least 3/8 inch (9.6 mm) but less than 5/8 inch (15.9 mm) from edges of boards.

### 3.4 Joints: Prefill panel joints with DEFS basecoat, immediately embed tape into basecoat and level basecoat as flush to board surface as tape will allow. Feather basecoat from edges of tape into field of board minimum of 4 inches as recommended by system manufacturer. Allow treated joints to cure for minimum of 4 hours before applying DEFS base coat.

FIELD QUALITY CONTROL

- A. Inspections: Air-barrier and water-resistant glass-mat gypsum sheathing, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:
  1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
  2. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fish mouths.
  3. Termination mastic has been applied on cut edges.
  4. Strips and transition strips have been firmly adhered to substrate.
  5. Compatible materials have been used.
  6. Transitions at changes in direction and structural support at gaps have been provided.
  7. Connections between assemblies (sheathing and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
  8. All penetrations have been sealed.
- B. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.
- C. Prepare test and inspection reports.

END OF SECTION 06 16 00

## SECTION 06 41 16 - PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Plastic-laminate-clad architectural cabinets.
  - 2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-clad architectural cabinets that are not concealed within other construction.
- B. Related Requirements:
  - 1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets that are concealed within other construction before cabinet installation.
  - 2. Section 09 29 00 "Gypsum Board".

#### 1.3 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.
- B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Section 08 71 00 "Door Hardware" to manufacturer of architectural cabinets; coordinate Shop Drawings and fabrication with hardware requirements.
- C. Blocking:
  - 1. Coordinate location of blocking behind all casework mounting.
  - 2. Provide all blocking required for anchorage or support of all woodwork items where such blocking is not to be installed concealed in walls or bulkheads.
  - 3. Coordinate all concealed blocking to be provided under Division 06 Section "Miscellaneous Rough Carpentry".

#### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.



## 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plan that treated materials comply with requirements.
- B. Shop Drawings:
  - 1. Include plans, elevations, sections, and attachment details.
  - 2. Show large-scale or full-size details.
  - 3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
  - 4. Show locations and sizes of cutouts and holes for items installed in plastic-laminate architectural cabinets.
  - 5. Show casework in complete elevations showing all interconnected units, corresponding base and upper units, tops, casework supported equipment, and building elements on same elevation.
  - 6. Show centerlines of all cutouts, locating them from adjacent finished walls or floors, or both.
  - 7. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other sections.
- C. Samples for Verification: For the following:
  - 1. Plastic Laminates: 8 by 10 inches, for each type, color, pattern, and surface finish required.
    - a. Provide one sample applied to core material with specified edge material applied to one edge.
  - 2. Thermoset Decorative Panels: 12 by 12 inches, for each color, pattern, and surface finish.
    - a. Provide edge banding on one edge.
  - 3. Exposed Cabinet Hardware and Accessories: One full-size unit for each type and finish.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.
- B. Product Certificates: For each type of product.
- C. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

## 1.7 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

- B. Installer Qualifications: An experienced installer who has completed architectural woodwork similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- D. Quality Standard: Provide custom casework and factory finishing complying with the applicable requirements of the Architectural Woodwork Standards, Edition 2, 2014 (AWS), published by the Architectural Woodwork Institute (AWI), Architectural Woodwork Manufacturers Association of Canada and the Woodwork Institute.
- E. Surface-Burning Characteristics: Finished products shall not exceed values indicated below, tested per ASTM E84 for standard time period.
  - 1. Flame spread: 75.
  - 2. Smoke developed: 450.
  - 3. Identify fire-retardant-treated material with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.
- B. Storage and Protection:
  - 1. Store materials in fabricator's protective packaging or covered with tarps or covers suitable to prevent damage from incidental moisture, abrasion, or other mechanical damage.
    - a. Tarps shall permit the passage of water vapor and shall not accumulate moisture beneath them.
  - 2. Store materials indoors at temperatures between 60 degrees F and 80 degrees F and less than 60 percent relative humidity.
    - a. Provide temporary heating, cooling or humidity control if necessary to maintain required conditions.
  - 3. Before installing woodwork, permit it to reach room temperature and stabilized moisture content.
  - 4. Handle products carefully to avoid damaging edges or units in any way.
    - a. Replace damaged materials with new materials prior to installation of the Work.

## 1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
  - 1. Maintain temperature and humidity, so that woodwork will be within plus or minus 1.0 percent of optimum moisture content from date of installation through remainder of construction period.
- B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

## PART 2 – PRODUCTS

### 2.1 ARCHITECTURAL CABINET FABRICATORS

- A. AWI Certified Fabricators: fabricator shall be currently listed as an AWI Certified Fabricator for the type of work specified.

### 2.2 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of cabinets indicated for construction, finishes, installation, and other requirements.
  - 1. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.
- B. Architectural Woodwork Standards Grade: Premium.
- C. Type of Construction: Frameless.
- D. Door and Drawer-Front Style: Flush overlay.
- E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.

1. Basis-of-Design: Subject to compliance with requirements, provide products indicated on Drawings.
- F. Laminate Cladding for Exposed Surfaces:
1. Vertical Surfaces: Grade VGS.
  2. Edges: PVC tape, 0.018-inch minimum thickness, matching laminate in color, pattern, and finish.
  3. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.
- G. Materials for Semiexposed Surfaces:
1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade CLS.
    - a. Edges of Thermoset Decorative Panel Shelves: PVC edge banding.
    - b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade CLS.
- H. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
- I. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. As indicated on Drawings.
- 2.3 WOOD MATERIALS
- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
1. Wood Moisture Content: 5 to 10 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.
  2. Particleboard: ANSI A208.1, Grade M-2.
  3. Softwood Plywood: DOC PS 1, medium-density overlay.
  4. Thermally Fused Laminate (TFL) Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10.
- C. Core Board:
1. Description: Unless otherwise indicated, all cabinet components shall be constructed of three-ply fine surfaced, particleboard of at least 45 lbs. per cubic foot, complying with ANSI A208.1, Grade M-3 or M-2.
    - a. Plastic laminate finished casework or cabinets at locations with sinks, ice machines, or other water producing appliances shall be constructed of water-resistant particleboard.

2. Typical thickness shall be 3/4 inch; 1/2 inch for cabinet backs and drawer bottoms unless noted otherwise.
3. Seal all faces and edges prior to lamination.

## 2.4 CABINET HARDWARE AND ACCESSORY SCHEDULE

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except as otherwise indicated.
- B. Hardware Standard: Comply with BHMA A156.9 for items indicated by reference to BHMA numbers or referenced standard.
- C. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA code number indicated.
  1. Satin chromium plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
  2. Satin stainless steel, stainless steel base: BHMA 630.
  3. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements of BHMA A156.9
- D. Lift-Off Panel Support Clips:
  1. Products: Monarch Metal Fabrication, Inc.; MF375 Panel Z-Clips.
  2. Extruded aluminum 'Z' clip with extruded aluminum receiver.
    - a. Lift distance: 3/8-inch.
  3. Provide clips in lengths and number required to fully support panels.
    - a. Provide a minimum of 2 clips per panel.

## 2.5 MISCELLANEOUS MATERIALS

- A. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- B. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
  1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

## 2.6 FABRICATION

- A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.
- B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect/Engineer seven days in advance of the dates and times architectural cabinet fabrication will be complete.
  2. Trial fit assemblies at manufacturer's shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.
- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
- D. Cabinets:
1. Construct each cabinet as an individual unit, completely integral and equipped with it's own sides, back, bottom and top (separate from countertop).
  2. Where cabinet ends are exposed to view, provide finished end panels.
  3. Conceal nailing, screwing, and other methods of fastening wherever possible or practical. Install such nails, screws, and other fasteners to securely join members together and neatly and uniformly arrange them.
  4. Use method of joinery that will permit easy removal of a panel should it be damaged.
  5. Predrill system holes for hinge attachment into cabinet sides.
  6. Trim rabbets for cabinet mounted shelf standards with plastic laminate before installing shelf standard and brackets. Exposed wood is not permitted. Install standards flush with inside face of cabinet.
  7. Make neat and accurate cutouts in cabinet backs and bottoms in order to accommodate piping and other work extending into or through, or both, cabinets.
  8. Construct all wall cabinets 14 inches deep with flush bottoms; no recess will be permitted unless specifically detailed.
  9. Seal all base construction prior to installing laminate.
  10. Provide removable panels with four stainless steel screws and grommets at all sink base cabinets and where necessary for access to service.
- E. Hardware:
1. Adjustment: Keep items straight, vertical, and horizontal and so that all items operate freely and smoothly without binding. Adjust items so that tops and bottoms of doors and drawers line up and so that vertical spaces between doors and drawers are even.

## PART 3 – EXECUTION

### 3.1 PREPARATION

- A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

### 3.2 INSTALLATION

- A. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.
- C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.
- D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches using concealed shims.
  - 1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
  - 2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
  - 3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips or No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish. Provide toggle bolts through metal backing or metal framing behind wall finish where required.

### 3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION 06 41 16

## SECTION 064219 - PLASTIC-LAMINATE-FACED WOOD PANELING

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-faced wood paneling.

#### 1.2 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that paneling can be installed as indicated.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.4 ACTION SUBMITTALS

A. Product Data:

1. Plastic-laminate-faced wood paneling.

B. Product Data Submittals: For each product.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

C. Shop Drawings: For plastic-laminate-faced wood paneling.

1. Include plans, elevations, sections, and attachment details.
2. Show details full size.
3. Show locations and sizes of furring and blocking, including concealed blocking specified in other Sections.

D. Samples for Verification: For each type of exposed laminate, 8 by 10 inches.

#### 1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and fabricator.

B. Product Certificates: For each type of product.



- C. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

## 1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
  - 1. Shop Certification: AWI's Quality Certification Program accredited participant.
- B. Installer Qualifications: Fabricator of products.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver paneling until painting and similar operations that might damage paneling have been completed in installation areas. Store paneling in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

## 1.8 FIELD CONDITIONS

- A. Environmental Limitations with Humidity Control: Do not deliver or install paneling until building is enclosed, wet-work is complete, and HVAC system is operating and will maintain temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.
- B. Field Measurements: Where paneling is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Locate concealed framing, blocking, and reinforcements that support paneling by field measurements before being enclosed/concealed by construction and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where paneling is indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

## PART 2 - PRODUCTS

### 2.1 PANELING, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of plastic-laminate-faced wood paneling (decorative laminate surfacing) indicated for construction, finishes, installation, and other requirements.

1. The Contract Documents contain requirements that are more stringent than the referenced woodwork quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.

## 2.2 PLASTIC-LAMINATE-FACED WOOD PANELING

- A. Grade: Premium.
- B. Plastic Laminate: High-pressure decorative laminate complying with ISO 4586-3.
  1. Faces: Grade VGS.
  2. Backs: Balance material with thickness matching exposed surface.
  3. Exposed Edges: Same as faces.
- C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed surfaces complying with the following requirements:
  1. As indicated on Drawings.
- D. Panel Core: Particleboard or MDF.
  1. Thickness: 3/4 inch.
- E. Exposed Panel Edges: Match existing surrounding construction.
- F. Adhesives for Bonding Plastic Laminate: as selected by fabricator to comply with requirements.
  1. Adhesive for Bonding Edges: Hot-melt adhesive.
- G. Fire-Retardant-Treated Paneling: Panels are to consist of fire-retardant plastic laminate and fire-retardant particleboard or fire-retardant, medium-density fiberboard (MDF). Panels are to have a flame-spread index of 25 or less and a smoke-developed index of 450 or less per ASTM E84, and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
- H. Assemble panels by gluing and concealed fastening.

## 2.3 MATERIALS

- A. Materials, General: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.
- B. Wood Moisture Content: 5 to 10 percent.
- C. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.
  1. MDF: ANSI A208.2, Grade 130.
  2. Particleboard (Medium Density): ANSI A208.1, Grade M-2-Exterior Glue.

## 2.4 INSTALLATION MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls.
- C. Installation Adhesive: Product recommended by panel fabricator for each substrate for secure anchorage.

## 2.5 FABRICATION

- A. Complete fabrication, including assembly, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
  - 1. Notify Architect seven days in advance of the dates and times paneling fabrication will be complete.
- B. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Before installation, condition paneling to humidity conditions in installation areas.
- B. Before installing paneling, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

### 3.2 INSTALLATION

- A. Grade: Install paneling to comply with quality standard grade of paneling to be installed.
- B. Install paneling level, plumb, true in line, and without distortion. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches. Install with no more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane.
  - 1. For flush paneling with revealed joints, install with variations in reveal width, alignment of top and bottom edges, and flushness between adjacent panels not exceeding 1/32 inch.

- C. Anchor paneling to supporting substrate with concealed panel-hanger clips. Do not use face fastening unless otherwise indicated.

### 3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective paneling, where possible, to eliminate defects. Where not possible to repair, replace paneling. Adjust for uniform appearance.
- B. Clean paneling on exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064219

## SECTION 07 21 00 - THERMAL INSULATION

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
- B. Related Requirements:
  - 1. Section 03 30 00 "Cast-in-Place Concrete."
  - 2. Section 04 20 00 "Unit Masonry" for insulation installed in masonry cells.
  - 3. Section 07 13 26 "Self-Adhering Sheet Waterproofing" for insulated drainage panels.
  - 4. Section 07 54 19 "Polyvinyl-Chloride (PVC) Roofing" for insulation specified as part of roofing construction.
  - 5. Section 07 84 13 "Penetration Firestopping," for insulation installed as part of a fire-resistive joint system, including curtain wall insulation, or a through-penetration firestop.
  - 6. Section 09 29 00 "Gypsum Board" for sound attenuation blanket used as acoustic insulation.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Submit manufacturer's product data showing compliance with specifications and installation instructions.
  - 2. Furnish with Operating and Maintenance Manuals.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original unopened packing, with all labels intact.

- B. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- C. Protect foam-plastic board insulation as follows:
  - 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
  - 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
  - 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

## PART 2 – PRODUCTS

### 2.1 POLYISOCYANURATE FOAM-PLASTIC BOARD

- A. Type 7 - Polyisocyanurate Board, Glass-Fiber-Mat Faced: ASTM C 1289, Type II, Class 1, Grade 3 (25 psi), felt or glass-fiber mat facer on both major surfaces, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E84.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Atlas Roofing Corporation; EnergyShield CGF Pro.
    - a. [Carlisle Coatings & Waterproofing Inc](#); R2+ Matte.
    - b. Firestone Building Products; Enverge CI Glass Exterior Wall Insulation.
    - c. Rmax, Inc.; Durasheath.
  - 2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
  - 3. Width: 48"
  - 4. Thickness: 2 inches minimum or as indicated on Drawings.
  - 5. Thermal resistance: R=6.5/inch.
  - 6. Locations: Exterior metal panel cavity walls with continuous outboard insulation.

### 2.2 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
  - 1. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
  - 2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.
- B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.

1. Angle: Formed from 0.030-inch- thick, perforated, galvanized carbon-steel sheet with each leg 2 inches square.
  2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.
- C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
- D. Screw Attached, Washer Type Anchors: Washer screwed into backup metal studs; capable of holding insulation of specified thickness securely in position with self-locking washer in place. Designed to minimize number of penetrations through insulation facer to maintain integrity of water-resistive and air barriers.
1. Basis of Design: TRUFAST Walls (formally Rodenhouse Inc.)
    - a. Framed Walls: TRUFAST Walls Thermal-Grip ci Prong Washer with Grip Deck Ci Screws.
      - 1) For attaching rigid insulation to steel studs for insulation that is designed and installed as an air barrier system.
      - 2) Corrosion resistant ceramic coating.
      - 3) Carbon Black for UV resistance.
    - b. Framed Walls: TRUFAST Walls Plasti-Grip Ci Prong Washers.
      - 1) For attaching rigid insulation to steel studs that is not acting as an air barrier system.
      - 2) UV inhibitors.
      - 3) Use for continuous insulation (Ci) or EIFS (PM).
    - c. CMU/Concrete Walls: TRUFAST Walls Thermal Grip ci Washer
      - 1) Installed with tap-con or masonry screw.
    - d. CMU/Concrete Walls: TRUFAST Walls Plasti-Grip PMF Anchors.
      - 1) Solid plastic design with no thermal-bridging
      - 2) Predrill and tap in. No adhesives required.
    - e. Minimum two (2) inch diameter washer.
    - f. Minimum 18 gauge metal studs.
- E. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

## 2.3 ACCESSORIES

- A. Expanding Foam Insulation for Filling Miscellaneous Voids
1. Pour-in-Place Foam: Two-component low-expansion polyurethane foam:

- a. Basis-of-Design: Subject to compliance with requirements, provide the following:
    - 1) Fomo Products, Inc.; Handi-Flow Pour-In-Place Foam.
  - b. Locations: Use to fill blind cavities and narrow openings, not exposed in completed construction.
2. Exposed Location Foam: Two-component expanding foam for exposed installation:
- a. Basis-of-Design: Subject to compliance with requirements, provide the following:
    - 1) Fomo Products, Inc.; Handi-Foam E-84 Class 1 Two-Component Polyurethane Foam.
  - b. Surface Burning Characteristics: ASTM E 84; Class A flame spread rating 25; smoke developed 450.
  - c. Locations: General use where cured product will be exposed in completed construction.
3. Window Sealing Foam: Single-component low-expansion polyurethane foam:
- a. Products: Subject to compliance with requirements, provide one of the following:
    - 1) Fomo Products, Inc.; Window and Door Sealant.
    - 2) Hilti, Inc.; CF 812.
  - b. Comply with AAMA 812 test specifications for low pressure window and door sealant foams.
  - c. Locations: use to fill frame cavities and narrow openings around windows and doors, not exposed in completed construction.
- B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

## PART 3 – EXECUTION

### 3.1 PREPARATION

- A. Examine surfaces to be covered with insulation; ensure preceding work is completed.
- B. Verify that available space is of sufficient depth for required insulation thickness.
- C. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.
- D. Do not proceed with installation in areas of discrepancy until such conditions are fully resolved.



### 3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

### 3.3 INSTALLATION OF SLAB INSULATION

- A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
  - 1. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
  - 1. If not otherwise indicated, extend insulation a minimum of 24 inches in from exterior walls.

### 3.4 INSTALLATION OF FOUNDATION WALL INSULATION

- A. Butt panels together for tight fit.
- B. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.
- C. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
  - 1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..
  - 2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

### 3.5 INSTALLATION OF CURTAIN-WALL INSULATION

- A. Install board insulation in curtain-wall construction according to curtain-wall manufacturer's written instructions.
  - 1. Hold insulation in place by securing metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to

- hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated on Drawings between insulation and glass.
2. Install insulation to fit snugly without bowing.

### 3.6 INSPECTION

- A. At completion of installation, visually inspect each area of work and verify that all insulation is complete and properly installed.
- B. Replace damaged insulation with new material of same type.

### 3.7 CLEANING

- A. Remove adhesive splatters and smears.
- B. Remove debris from project site.

### 3.8 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 21 00

## SECTION 07 27 26 - FLUID-APPLIED MEMBRANE AIR BARRIERS

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Vapor-retarding, fluid-applied membrane air barriers.
- B. Related Requirements:
  - 1. Section 06 16 00 "Sheathing" for wall sheathings and wall sheathing joint-and-penetration treatments.
  - 2. Section 07 21 00 "Thermal Insulation."
  - 3. Section 07 62 00 "Sheet Metal Flashing and Trim."
  - 4. Section 07 92 00 "Joint Sealants."
  - 5. Section 09 29 00 "Gypsum Board" for sheathing.

#### 1.3 DEFINITIONS

- A. BAA: Air Barrier Association of America.
- B. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.
- C. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.
- D. Air-Barrier Assembly: The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

#### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; dry film thickness; and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of air barrier.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.
- C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.
- D. Field quality-control reports.

## 1.7 QUALITY ASSURANCE

- A. Manufacturer Certification: Manufacturer shall certify that the fluid applied membrane air barrier is compatible for use on the indicated substrate.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

## 1.8 PRECONSTRUCTION TESTING

- A. Mockup Testing: Air barrier assemblies shall comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency.
  1. Owner will engage a qualified testing agency.
  2. Adhesion Testing: Mockups will be tested for required air barrier adhesion to substrate according to ASTM D 4541.
  3. Notify Architect 7 days in advance of the dates and times when mockup testing will take place.

## 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air barrier manufacturer.

- B. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- C. Store rolls according to manufacturer's written instructions.
- D. Protect stored materials from direct sunlight.

#### 1.10 FIELD CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.
  - 1. Protect substrates from environmental conditions that affect air-barrier performance.
  - 2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

### PART 2 – PRODUCTS

#### 2.1 MATERIALS

- A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

#### 2.2 PERFORMANCE REQUIREMENTS

- A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, if any, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

- 2.3 Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E2357.

#### 2.4 HIGH-BUILD AIR BARRIERS, VAPOR RETARDING

- A. High-Build, Vapor-Retarding Air Barrier: Modified bituminous or synthetic polymer membrane with an installed dry film thickness, according to manufacturer's written instructions, of 35 mils or thicker over smooth, void-free substrates.

- 1. Modified Bituminous Type:
  - a. Products: Subject to compliance with requirements, provide one of the following:
    - 1) Carlisle Coatings & Waterproofing Inc; Barriseal Series.
    - 2) Henry Company; Air-Bloc 06 WB.
    - 3) Tremco Incorporated; ExoAir 120.

- 4) W.R. Meadows, Inc; Air-Shield LM Series.
2. Synthetic Polymer Type:
  - a. Products: Subject to compliance with requirements, provide one of the following:
    - 1) Carlisle Coatings & Waterproofing Inc; Fire Resist Barritech NP.
    - 2) GCP Applied Technologies Inc.; Perm-A-Barrier Liquid.
    - 3) Henry Company; Air-Bloc 32MR.
    - 4) Hohmann & Barnard, Inc; Enviro-Barrier.
    - 5) Rubber Polymer Corporation, Inc.; Rub-R-Wall Airtight.
    - 6) Sto Corp; Sto VaporSeal®.
    - 7) W.R. Meadows, Inc; Air-Shield LSR.
3. Physical and Performance Properties:
  - a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E2178.
  - b. Ultimate Elongation: Minimum 500 percent; ASTM D412, Die C.
  - c. Adhesion to Substrate: Minimum 16 lbf/sq. in. when tested according to ASTM D4541.
  - d. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
  - e. UV Resistance: Can be exposed to sunlight for 30 days according to manufacturer's written instructions.

## 2.5 ACCESSORY MATERIALS

- A. Requirement: Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.
- B. Primer: Liquid primer recommended for substrate by air-barrier material manufacturer.
- C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0187 inch thick, and Series 300 stainless-steel fasteners.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
  1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.

2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
  3. Verify that substrates are visibly dry and free of moisture. Test concrete substrates for capillary moisture by plastic sheet method according to ASTM D 4263.
  4. Verify that masonry joints are flush and completely filled with mortar.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 SURFACE PREPARATION

- A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.
- B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching material.
- E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
- G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

### 3.3 JOINT TREATMENT

- a. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 1193 and air barrier manufacturer's written instructions.
  - b. Gypsum Sheathing: Fill joints greater than 1/4 inch with sealant according to ASTM C 1193 and with air barrier manufacturer's written instructions. Apply first layer of fluid air barrier membrane at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid air barrier membrane over joint reinforcing strip.
- B. ridge expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

### 3.4 ACCESSORIES INSTALLATION

- A. Install accessory materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.

1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
  2. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.
  3. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
  4. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
- B. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
- C. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.
- D. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- E. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames, with not less than 1 inch of full contact.
1. Modified Bituminous Transition Strip: Roll firmly to enhance adhesion.
- F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.
- G. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.
- H. Seal top of through-wall flashings to air barrier with an additional 6-inch- wide, transition strip.
- I. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
- J. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

### 3.5 AIR-BARRIER MATERIAL INSTALLATION

- A. Apply air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.



1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
  2. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
  3. Where multiple prime coats are needed to achieve required bond, allow adequate drying time between coats.
- B. High-Build Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply air-barrier material in full contact around protrusions such as masonry ties.
1. Vapor-Retarding, High-Build Air Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, but not less than 40 mils, applied in one or more equal coats.
- C. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.
- D. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

### 3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:
1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
  2. Air-barrier dry film thickness.
  3. Continuous structural support of air-barrier system has been provided.
  4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
  5. Site conditions for application temperature and dryness of substrates have been maintained.
  6. Maximum exposure time of materials to UV deterioration has not been exceeded.
  7. Surfaces have been primed, if applicable.
  8. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
  9. Termination mastic has been applied on cut edges.
  10. Strips and transition strips have been firmly adhered to substrate.
  11. Compatible materials have been used.
  12. Transitions at changes in direction and structural support at gaps have been provided.
  13. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
  14. All penetrations have been sealed.
    - a. Manufacturer's Field Services: Obtain field services of a site representative qualified by membrane manufacturer to inspect substrate conditions; surface

preparation; membrane application, flashings, protection, and drainage components; and to furnish reports to Architect.

- 1) Representative shall make a minimum of 3 site inspections.
- 2) Inspect substrates, substrate preparation, and initial application at start of Work.
- 3) Provide subsequent field inspections as Work progresses.
- 4) Inspect installation at completion.

C. Tests: As determined by testing agency from among the following tests:

1. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate according to ASTM D4541 for each 600 sq. ft. of installed air barrier or part thereof.

D. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

E. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

F. Prepare test and inspection reports.

### 3.7 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials according to air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 07 27 26

## SECTION 07 41 13.16 - STANDING-SEAM METAL ROOF PANELS

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

Section includes standing-seam metal roof panels:

Related Sections:

1. Section 05 12 00 "Structural Steel Framing."
2. Section 05 50 00 "Metal Fabrications."
3. Section 06 10 53 "Miscellaneous Rough Carpentry."
4. Section 07 62 00 "Sheet Metal Flashing and Trim."
5. Section 07 29 00 "Joint Sealants."

#### 1.3 PREINSTALLATION MEETINGS

Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect/Engineer, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of roof accessories and roof-mounted equipment.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review structural loading limitations of deck during and after roofing.
6. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.
7. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
8. Review temporary protection requirements for metal panel systems during and after installation.
9. Review procedures for repair of metal panels damaged after installation.
10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. Shop Drawings:
  2. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
  3. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.
- C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.
  4. Include similar Samples of trim and accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
  5. Metal Panels: 12 inches long by actual panel width. Include clips, fasteners, closures, and other metal panel accessories.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Certificates for portable roll-forming equipment.
- B. Qualification Data: For Installer.
- C. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- D. Field quality-control reports.
- E. Sample Warranties: For special warranties.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panels to include in maintenance manuals.

#### 1.7 QUALITY ASSURANCE

- A. Roof Installer Qualifications: Entity that employs [a supervisor who is an NRCA ProCertified Roofing Foreman or installers who are NRCA ProCertified Metal Panel Roof Systems Installers] [a supervisor who is an NRCA ProCertified Roofing Foreman] [a supervisor who is an NRCA ProCertified Roofing Foreman and not less than 20 percent of installers who are NRCA ProCertified Metal Panel Roof Systems Installers].
- B. Portable Roll-Forming Equipment Certification: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of Work.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.

## 1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

## 1.10 COORDINATION

- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.
- B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

## 1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including rupturing, cracking, or puncturing.
    - b. Deterioration of metals and other materials beyond normal weathering.
  - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 3. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.

- b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
  - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
4. Finish Warranty Period: 20 years from date of Substantial Completion.

## PART 2 – PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Watertightness: No water penetration when tested in accordance with ASTM E2140 for hydrostatic-head resistance.
- B. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
  - 1. Wind Loads: As indicated on Structural Drawings.
  - 2. Other Design Loads: As indicated on Structural Drawings.
  - 3. Deflection Limits: For wind loads, no greater than 1/180 of the span.
- C. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
  - 1. Uplift Rating: UL 90.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

### 2.2 STANDING-SEAM METAL ROOF PANELS, GENERAL

- A. Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
  - 1. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1637.
- B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.
  - 1. Basis-of-Design: Subject to compliance with requirements, provide the following:
    - a. Centria SDP 175.

2. Comparable Manufacturer: Subject to compliance with requirements, the following manufacturers shall be considered comparable:
  - a. AEP Span; A BlueScope Steel Company.
  - b. Berridge Manufacturing Company.
  - c. Dimensional Metals, Inc.
  - d. Fabral.
  - e. IMETCO.
  - f. MBCI; NCI Building Systems Company.
  - g. McElroy Metal, Inc.
  - h. PAC-CLAD; Petersen Aluminum Corporation.
3. Aluminum Sheet: Coil-coated sheet, ASTM B 209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
  - a. Thickness: 0.050 inch.
  - b. Surface: Smooth, flat finish.
  - c. Exterior Finish: Two-coat fluoropolymer.
  - d. Color: As selected by Architect/Engineer from manufacturer's full range.
4. Clips: One-piece fixed or two-piece floating to accommodate thermal movement.
  - a. Material: Manufacturer's standard, stainless-steel.
5. Joint Type: As standard with manufacturer.
6. Panel Coverage: 12 inches.
7. Panel Height: 2.5 inches.

## 2.3 VAPOR RETARDER

- A. Rubberized-Asphalt-Sheet Vapor Retarder, Self-Adhering: ASTM D1970/D1970M polyethylene film laminated to layer of rubberized asphalt adhesive, minimum 40-mil total thickness; maximum permeance rating of 0.1 perm; cold applied, with slip-resisting surface and release paper backing. Provide primer when recommended by vapor-retarder manufacturer.

## 2.4 ROOF INSULATION

- A. Insulation over Solid Deck:
  - 1) Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
    - a. Atlas EPS; a Division of Atlas Roofing Corporation.
    - b. Atlas Roofing Corporation.
    - c. Carlisle SynTec Incorporated.
    - d. Dyplast Products.
    - e. Firestone Building Products.
    - f. GAF.
    - g. Hunter Panels.
    - h. Insulfoam-a division of Carlisle Construction Materials Inc.

- i. Rmax, Inc.
  - a) Compressive Strength: 20 psi.
  - b) Size: 48 by 96 inches.
  - c) Thickness:
    - (1) Base Layer: 1-1/2 inches].
    - (2) Upper Layer: <2 inches>.

## 2.5 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.
  - 1. Thermal Stability: Stable after testing at 240 deg F; ASTM D 1970.
  - 2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D 1970.
  - 3. Products: Subject to compliance with requirements, provide one of the following:
    - a. Carlisle Residential; a division of Carlisle Construction Materials; WIP 300HT.
    - b. GCP Applied Technologies Inc. (formerly Grace Construction Products); Grace Ice and Water Shield HT.
    - c. Henry Company; Blueskin PE200 HT.
    - d. Kirsch Building Products, LLC; Sharkskin Ultra SA.
    - e. Owens Corning; WeatherLock Metal High Temperature Underlayment. Titanium PSU30.

## 2.6 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 coating designation or ASTM A 792/A 792M, Class AZ50 coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
  - 1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
  - 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
  - 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.



- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Gutters: Formed from same material as roof panels, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- long sections, of size and metal thickness in accordance with manufacturer's recommendations. Furnish gutter supports spaced a maximum of 36 inches o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels.
- E. Downspouts: Formed from same material as roof panels. Fabricate in 10 ft. long sections, complete with formed elbows and offsets, of size and metal thickness in accordance with manufacturer's recommendations. Finish downspouts to match gutters.
- F. Roof Curbs: Fabricated from same material as roof panels, 0.048-inch nominal thickness; with bottom of skirt profiled to match roof panel profiles and with welded top box and integral full-length cricket. Fabricate curb subframing of 0.060-inch-nominal thickness, angle-, C-, or Z-shaped steel sheet. Fabricate curb and subframing to withstand indicated loads of size and height indicated. Finish roof curbs to match metal roof panels.
  - 1. Insulate roof curb with 1-inch-thick, rigid insulation.
- G. Panel Fasteners: Self-tapping screws designed to withstand design loads.
- H. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
  - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
  - 2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
  - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

## 2.7 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
  - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

## 2.8 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Aluminum Panels and Accessories:
  1. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
  1. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
    - a. Verify that air or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

### 3.3 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.
  - 1. Apply over the entire roof surface.
- B. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 07 62 00 "Sheet Metal Flashing and Trim."

### 3.4 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
  - 1. Shim or otherwise plumb substrates receiving metal panels.
  - 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
  - 3. Install screw fasteners in predrilled holes.
  - 4. Locate and space fastenings in uniform vertical and horizontal alignment.
  - 5. Install flashing and trim as metal panel work proceeds.
  - 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
  - 7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
  - 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
  - 1. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
- C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

- D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
  - 1. Install clips to supports with self-tapping fasteners.
  - 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
  - 3. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
- F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
  - 1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.
- G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
  - 1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.
  - 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
- H. Roof Curbs: Install flashing around bases where they meet metal roof panels.
- I. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

### 3.5 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.6 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.
- B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.
- C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- D. Prepare test and inspection reports.

3.7 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 41 13.16

## SECTION 07 42 13.19 - INSULATED METAL WALL PANELS

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Foamed-insulation-core metal wall panels.
- B. Related Requirements:

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
  - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
  - 4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
  - 5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
  - 6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
  - 7. Review temporary protection requirements for metal panel assembly during and after installation.
  - 8. Review procedures for repair of metal panels damaged after installation.
  - 9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
  - B. Shop Drawings:
    1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
    2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.
  - C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.
    1. Include similar Samples of trim and accessories involving color selection.
  - D. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below.
    1. Metal Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal panel accessories.
- 1.5 INFORMATIONAL SUBMITTALS
- A. Sustainable Design Submittal Requirements: See Section 01 81 13 "Sustainable Design Requirements" for submittal requirements.
  - B. Qualification Data: For Installer.
  - C. Product Test Reports: For each product, tests performed by a qualified testing agency.
  - D. Field quality-control reports.
  - E. Sample Warranties: For special warranties.
- 1.6 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For metal panels to include in maintenance manuals.
- 1.7 QUALITY ASSURANCE
- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
  - B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical metal panel assembly as shown on Drawings, including corner, soffits, supports, attachments, and accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.

#### 1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

#### 1.10 COORDINATION

- A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

#### 1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Structural failures including rupturing, cracking, or puncturing.
    - b. Deterioration of metals and other materials beyond normal weathering.
  2. Warranty Period: Two years from date of Substantial Completion.



- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

## PART 2 – PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 72:
  - 1. Wind Loads: As indicated on Structural Drawings.
  - 2. Other Design Loads: As indicated on Structural Drawings.
  - 3. Deflection Limits: For wind loads, no greater than 1/180 of the span.
- B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 283 at the following test-pressure difference:
  - 1. Test-Pressure Difference: 6.24 lbf/sq. ft.
- C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
  - 1. Test-Pressure Difference: 6.24 lbf/sq. ft..
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- E. Fire-Test-Response Characteristics: Provide metal wall panels and system components with the following fire-test-response characteristics, as determined by testing identical panels and system components per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.
  - 1. Fire-Resistance Characteristics: Provide materials and construction tested for fire resistance per ASTM E 119.

2. Radiant Heat Exposure: No ignition when tested according to NFPA 268.
3. Potential Heat: Acceptable level when tested according to NFPA 259.
4. Surface-Burning Characteristics: Provide wall panels with a flame-spread index of 25 or less and a smoke-developed index of 450 or less, per ASTM E 84.

## 2.2 FOAMED-INSULATION-CORE METAL WALL PANELS

- A. General: Provide factory-formed and -assembled metal wall panels fabricated from two metal facing sheets and insulation core foamed in place during fabrication, and with joints between panels designed to form weathertight seals. Include accessories required for weathertight installation.
  1. Insulation Core: Modified isocyanurate or polyurethane foam using a non-CFC blowing agent, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively.
    - a. Closed-Cell Content: 90 percent when tested according to ASTM D 6226.
    - b. Density: 2.0 to 2.6 lb/cu. ft. when tested according to ASTM D 1622.
    - c. Compressive Strength: Minimum 20 psi when tested according to ASTM D 1621.
    - d. Shear Strength: 26 psi when tested according to ASTM C 273/C 273M.
- B. Flush, Concealed-Fastener, Foamed-Insulation-Core Metal Wall Panels: Formed with tongue-and-groove panel edges; designed for sequential installation by interlocking panel edges and mechanically attaching panels to supports using concealed clips or fasteners.
  1. Basis-of-Design Product: Subject to compliance with requirements, provide CENTRIA Architectural Systems; Formawall Dimension Series or the following:
    - a. DS60 Horizontal Profile Series, two inches (2") thick for wall application
    - b. FWDS Profile Series, two inches (2") thick for soffit application
  2. Steel for Painting/Coating: Hot-dip zinc coated steel sheet, ASTM A 446, Grade B, with smooth finish, G90 zinc coating, surface treated for maximum coating performance.

## 2.3 METAL FINISHES:

- A. General: Apply coatings either before or after forming and fabricating panels, as required by coating proGess and as required for maximum coating performance capability. Apply coatings to gratings after fabrication. Protect coating promptly after application and cure, by application of strippable film or removable adhesive cover, and retain until installation has been completed.
- B. Fluoropolymer Coating: Full-strength 70% polyvinylidene fluoride (PVF2) coating baked-on, three coat system, 30% reflective gloss (ASTM D 523), over min. 0.2 mil baked-on epoxy primer.
  1. Color: Custom color as selected by the Architect, and matching samples approved by the Architect.
  1. Durability: Provide coating which has been field tested under normal range of

weathering conditions for minimum of 20 years without significant peel, blister, flake, chip, crack or check in finish, and without chalking in excess of 8 (ASTM D 659), and without fading in excess of 5 NBS units.

- C. Interior finish shall be a white polyester coating over an epoxy primer. No less than 0.3 mil dry film thickness.

#### 2.4 THERMAL INSULATION:

- A. Insulation: Poured-in-place urethane modified isocyanurate foam core with a 93% closed cell structures with following physical properties:

1. Density: 2.3 lbs./cu. ft. (minimum).
2. Compressive Strength: 20 psi (minimum).
3. Tensile Strength: 30 psi (minimum).
4. Aging at 122 to 158 degrees F. and 100% R.H. for not less than 250 hours, 6.6% volume increase.
5. Heat aging at 180 to 200 degrees F. for not less than 250 hours, 4% volume increase (maximum).

#### 2.5 STEEL SUPPORTS:

- A. All steel supports necessary for attachment of panel system shall be designed, furnished and erected by this supplier.
- B. Support steel shall be standard mill-rolled structural sections as required by structural design. Size any thickness of all steel structural sections is to be in accordance with the appropriate accepted design practices of the American Institute of Steel Construction, American Iron and Steel Institute.
- C. Attachment of all support steel shall be as required to meet wind loading requirements.
- D. Fasteners: Type and size recommended by the panel manufacturer. All fasteners shall be concealed.

#### 2.6 MISCELLANEOUS MATERIALS:

- A. Accessories: Provide components required for a complete panel system, including trim, copings, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips and similar items. Match materials/ finishes of panels.

B. Caulking and Sealant: Provide one part silicone sealant complying with the following:

1. Low Modulus, Non-Acid Curing Silicone: ASTM C 920, Type S; Grade NS; Class 25. Tensile strength of not less than 45 nor more than 75 psi or less at 100% elongation when tested after 14 days at 77 degrees F (22 degrees C) and 50% relative humidity per ASTM D 412. Uses TN, A and O.
2. Provide primers and backer rod material as recommended by the sealant manufacturer for specific use with his product.

2.7 PANEL FABRICATION; PERFORMANCES:

- A. General: Fabricate and finish panels, and accessories at the factory by manufacturer's standard procedures and processes, and as required to fulfill specified performance requirements which have been demonstrated by factory testing. Comply with specified profiles and dimensional requirements, and with structural requirements.

1. Metal Gages: Thicknesses required for structural performances, but not less than manufacturer's recommended minimums for profiles and applications indicated, and not less than 22 gage (0.0299") for exterior panels and for interior liner panels, with a smooth flat finish.
- B. Panels shall be tongue and groove and shi lap design permitting the use of fasteners installed from the exterior that are completely concealed within the side joint. This side joint design shall have a plus or minus coverage adjustment to meet building tolerances. The side joint shall permit the use of self-tapping fasteners and clips to lock the unit to the structural supports and provide positive resistance to negative load pull off. Interior female joints factory caulked.
- C. All corners shall be factory fabricated, square and true, straight lines.

### PART 3 – EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
  1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
  2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
    - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

#### 3.3 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal wall panel manufacturer.

1. Seal metal wall panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal wall panel manufacturer.
2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."

### 3.4 INSULATED METAL WALL PANEL INSTALLATION

A. General: Apply continuous ribbon of sealant to panel joint on concealed side of insulated metal wall panels as vapor seal; apply sealant to panel joint on exposed side of panels for weather seal.

1. Fasten foamed-insulation-core metal wall panels to supports with fasteners at each lapped joint at location and spacing and with fasteners recommended by manufacturer.
2. Apply panels and associated items true to line for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
3. Provide metal-backed washers under heads of exposed fasteners on weather side of insulated metal wall panels.
4. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
5. Provide sealant tape at lapped joints of insulated metal wall panels and between panels and protruding equipment, vents, and accessories.
6. Apply a continuous ribbon of sealant tape to panel side laps and elsewhere as needed to make panels weathertight.

- B. Foamed-Insulation-Core Metal Wall Panels: Fasten metal wall panels to supports with concealed clips at each joint at location and spacing and with fasteners recommended by manufacturer. Fully engage tongue and groove of adjacent panels.
  - 1. Install clips to supports with self-tapping fasteners.
- C. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
  - 1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.
- D. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level. Install work with laps, joints, and seams that are permanently watertight.
  - 1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to achieve waterproof performance.
  - 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

### 3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Water-Spray Test: After installation, test area of assembly as directed by Architect for water penetration according to AAMA 501.2.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.
- D. Metal wall panels will be considered defective if they do not pass test and inspections.
- E. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- F. Prepare test and inspection reports.

### 3.6 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of

metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

- B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 42 13.19



## SECTION 07 54 19 - POLYVINYL-CHLORIDE (PVC) ROOFING

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Adhered polyvinyl chloride (PVC) roofing system.
  - 2. Substrate board.
  - 3. Vapor retarder.
  - 4. Roof insulation.
  - 5. Cover board.
  - 6. Flexible walkways.
  - 7. Coordination with the work of other Sections of these Specifications that pertain to roofing.
- B. Related Requirements:
  - 1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
  - 2. Section 06 16 00 "Sheathing" for wood-based, structural-use roof deck panels.
  - 3. Section 07 62 00 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
  - 4. Section 07 92 00 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

#### 1.3 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D 1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

#### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Roofing Conference: Conduct conference at Project site.
  - 1. Meet with Owner, Architect/Engineer, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
  - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.

3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product, including installation instructions.
- B. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:
  1. Base flashings and membrane terminations.
  2. Flashing details at penetrations.
  3. Tapered insulation thickness and slopes.
  4. Roof plan showing orientation of steel roof deck and orientation of roof membrane.
    - a. Show blocking and flashing conditions/details.
    - b. Exterior wall cavity flashing: Show details of elastic sheet flashing.
    - c. Show location of all splices, penetrations, and walkways.
  5. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
  6. Tie-in with air barrier.
- C. Samples for Verification: For the following products:
  1. Roofing membrane: 8-inch by 10-inch minimum sample of roofing membrane, of color required.
  2. Roofing seam: 3-inch by 10-inch minimum sample of seam.
  3. Walkways: 6-inch by 6-inch minimum, sufficient to indicate non-slip pattern.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Manufacturer Certificates:
  1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
    - a. Submit evidence of compliance with performance requirements.

- 2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.
  - C. Product Test Reports: For roof membrane and insulation, tests performed by independent qualified testing agency indicating compliance with specified requirements.
  - D. Research/Evaluation Reports: Provide test reports indicating compliance with referenced standards for components of roofing system, from ICC-ES.
  - E. Test reports shall be derived by engineering calculation on other means acceptable to the Architect/Engineer so as to demonstrate application to the loading and fire resistance requirements specific to the Project.
    - 1. Test reports shall therein indicate rationale for all fastening and anchoring requirements specific to the Project.
  - F. Field quality-control reports.
    - 1. Fastener-pullout test results and manufacturer's revised requirements for fastener patterns.
  - G. Sample Warranties: For manufacturer's special warranties.
- 1.7 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For roofing system to include in maintenance manuals.
  - B. Certified statement from existing roof membrane manufacturer stating that existing roof warranty has not been affected by Work performed under this Section.
- 1.8 QUALITY ASSURANCE
- A. Single Source Responsibility:
    - 1. Provide roofing material, membrane flashing, adhesives, sealants, and accessory components manufactured by a single source.
  - B. Manufacturer Qualifications: A qualified manufacturer that is UL listed for roofing system identical to that used for this Project.
  - C. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.
- 1.9 DELIVERY, STORAGE, AND HANDLING
- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
  - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

#### 1.10 FIELD CONDITIONS

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

#### 1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
  - 1. Special warranty includes roofing, base flashings, roof insulation, fasteners, cover boards, substrate board, roofing accessories, and other components of roofing system.
  - 2. Warranty Period: 20 years from date of Substantial Completion.
- B. Roof Insulation: Provide 15-year warranty on roof insulation thermal performance.

### PART 2 – PRODUCTS

#### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain components including roof insulation and fasteners for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

#### 2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.
  - 1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.

2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D 3746, ASTM D 4272/D 4272M.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.
- C. Wind Uplift Resistance: Design roofing system to resist the following wind uplift pressures when tested according to, UL 580, or UL 1897:
  1. Zone 1 (Roof Area Field): As indicated on Drawings or, if not indicated, as directed by Project Structural Engineer of Record.
  2. Zone 2 (Roof Area Perimeter): As indicated on Drawings or, if not indicated, as directed by Project Structural Engineer of Record.
  3. Zone 3 (Roof Area Corners): As indicated on Drawings or, if not indicated, as directed by Project Structural Engineer of Record.
1. Fire/Windstorm Classification: Class 1A-90.
4. Hail-Resistance Rating: SH.
- D. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  1. Roofing assembly to satisfy requirement of UL # TGFU.R20739, Class A
- E. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

## 2.3 POLYVINYL CHLORIDE (PVC) ROOFING

- A. PVC Sheet: ASTM D4434/D4434M, Type III, fabric reinforced.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Carlisle SynTec Incorporated.
    - b. Duro-Last Roofing, Inc.
    - c. Flex Membrane International Corp.
    - d. GAF.
    - e. Sika Sarnafil.
    - f. Soprema, Inc.
    - g. Versico Roofing Systems.
  2. Membrane Thickness: 60 mils.
  3. Exposed Face Color: White.

## 2.4 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.
  - 1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
- B. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet.
- C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.
- D. Bonding Adhesive: Manufacturer's standard.
- E. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel bars, approximately 1 by 1/8 inch thick; with anchors.
- F. Fasteners: Factory-coated steel fasteners and metal or plastic plates designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.
- G. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.
  - 1. Provide flashing accessories to match roofing color.

## 2.5 SUBSTRATE BOARDS

- A. Thermal Barrier (Substrate Board): ASTM C1177/C1177M, glass-mat, water-resistant gypsum board or ASTM C1278/C1278M fiber-reinforced gypsum board.
  - 1. Product: Provide one of the following:
    - a. CertainTeed Corporation; GlasRoc Roof board Type X.
    - b. Continental Building Products; Weather Defense Platinum Sheathing, Weather Defense Platinum Sheathing Type X.
    - c. Georgia-Pacific Corporation; DensDeck Roof Board.
    - d. National Gypsum company; DEXcell FA Glass Mat Roof Board.
    - e. Temple-Inland, Inc.; GreenGlass Exterior Sheathing.
    - f. United States Gypsum Company, Securock Gypsum-Fiber Roof Board.
  - 2. Thickness: 5/8 inch.
  - 3. Size: 4'-0" by length required to minimize joints.
  - 4. Location: between metal deck and insulation.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates designed for fastening substrate board to roof deck.

## 2.6 VAPOR RETARDER

- A. Self-Adhering-Sheet Vapor Retarder: Cold applied, with slip-resisting surface and release paper backing. Provide primer when recommended by vapor-retarder manufacturer.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Carlisle Syntec Systems; VapAir Seal 725TR.
    - b. Firestone Building Products; V-Force Vapor Barrier Membrane.
  - 2. Primer: Firestone; V-Force Primer.
  - 3. Perm rating: 0.02 maximum.

## 2.7 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by PVC roofing manufacturer, selected from manufacturer's standard sizes suitable for application,. Provide polyisocyanurate board insulation.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, 20 psi, felt or glass-fiber mat facer on both major surfaces.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Atlas EPS; a Division of Atlas Roofing Corporation.
    - b. Atlas Roofing Corporation.
    - c. Carlisle SynTec Incorporated.
    - d. Dyplast Products.
    - e. Firestone Building Products.
    - f. GAF.
    - g. Hunter Panels.
    - h. Insulfoam-a division of Carlisle Construction Materials Inc.
    - i. Rmax, Inc.
  - 2. Sheet Insulation boards: Factory pre-cut polyisocyanurate foam insulation board.
    - a. Base layers: 6" inches, minimum.
    - b. Build-up under tapered boards: 2 inches, minimum.
    - c. Aged R value at 75 degrees F: 5.5 per inch thickness.
    - d. Compressive strength: 35 psi, minimum.
  - 3. Tapered Insulation Boards: Factory pre-cut formed-taper polyisocyanurate foam insulation board.
    - a. Minimum thickness: 1/2 inch.
    - b. Aged R value at 70 degrees F: 5.5 per inch thickness.
    - c. Compressive strength: 20 psi, minimum.
    - d. Standard taper:
      - 1) Field of roof: 1/4 inch per foot.
      - 2) Counterslopes, hogbacks, crickets, etc.: 1/2 inch per foot.

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

## 2.8 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates, designed for fastening first layer of roof insulation to substrate, and acceptable to roofing system manufacturer.
- C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach subsequent layers of roof insulation and cover boards to substrate or to another insulation layer by one of the following methods:
  - 1. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.
  - 2. Full-spread, spray-applied, low-rise, two-component urethane adhesive.
- D. Cover Board: ASTM C1177/C1177M, glass-mat, water-resistant gypsum board or ASTM C1278/C1278M fiber-reinforced gypsum board.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. CertainTeed Corporation; GlasRoc Roof Board.
    - b. Georgia-Pacific Building Products; DensDeck Prime Roof Board.
    - c. National Gypsum Company; DEXcell FA Glass Mat Roof Board.
    - d. USG Corporation; Securock Gypsum-Fiber Board.
  - 2. Thickness: 1/2 inch thick, factory primed.
  - 3. Type: Type X.
  - 4. Size: 4'-0" by length required to minimize joints.
  - 5. Location: between roof insulation and roofing membrane.

## 2.9 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick and acceptable to roofing system manufacturer.
  - 1. Walkway shall be heat-weldable to roofing membrane.
  - 2. Size: Approximately 36 by 60 inches.
  - 3. Color: Contrasting with roof membrane.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.



1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 05 31 00 "Steel Decking."

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

### 3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

### 3.3 ROOFING INSTALLATION, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions, FM Approvals' RoofNav assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.
- C. Coordinate installation and transition of roofing system component serving as an air barrier with air barrier specified under Section 07 27 26 "Fluid-Applied Membrane Air Barriers."

### 3.4 SUBSTRATE BOARD INSTALLATION

- A. Install substrate board with long joints in continuous straight lines, with end joints staggered not less than 24 inches in adjacent rows. Tightly butt substrate boards together.
  1. At steel roof decks, install substrate board at right angle to flutes of deck.
    - a. Locate end joints over crests of steel roof deck.
  2. Tightly butt substrate boards together.
  3. Cut substrate board to fit tight around penetrations and projections, and to fit tight to intersecting sloping roof decks.
  4. Fasten substrate board to top flanges of steel deck for specified Windstorm Resistance Classification.

### 3.5 VAPOR RETARDER INSTALLATION

- A. Self-Adhering-Sheet Vapor Retarder: Prime substrate if required by manufacturer. Install self-adhering-sheet vapor retarder over area to receive vapor retarder, side and end lapping each sheet a minimum of 3-1/2 and 6 inches, respectively.
  - 1. Extend vertically up parapet walls and projections to a minimum height equal to height of insulation and cover board.
  - 2. Seal laps by rolling.
- B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.
- C. Install vapor retarder and cover with substrate board and roofing in a manner to prevent accumulation of water from precipitation.
  - 1. Remove standing water on the vapor retarder prior to installing covering work.

### 3.6 INSULATION INSTALLATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.
- B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Installation Over Metal Decking:
  - 1. Install base layer of insulation with joints staggered not less than 24 inches in adjacent rows and with long joints continuous at right angle at flutes of decking.
    - a. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
    - b. Make joints between adjacent insulation boards not more than 1/4 inch in width.
    - c. At internal roof drains, slope insulation to create a rectangular flat drain sump as detailed.
    - d. Fill gaps exceeding 1/4 inch with insulation.
    - e. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
    - f. Adhere upper layers of insulation for specified Windstorm Resistance Classification, as follows:
      - 1) Set insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
      - 2) Set insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.
    - g. Mechanically attach base layer of insulation and substrate board using mechanical fasteners specifically designed and sized for fastening specified board type roof insulation to metal decks.
      - 1) Fasten insulation for specified Windstorm Resistance Classification.
  - 2. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.

- a. Staggered end joints within each layer not less than 24 inches in adjacent rows for 48 x 48-inch insulation boards and install with long joints continuous and with end joints staggered not less than 12 inches in adjacent rows for 48 x 96-inch insulation boards.
- b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
- c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
- d. At internal roof drains, slope insulation to create a rectangular flat drain sump as detailed.
- e. Fill gaps exceeding 1/4 inch with insulation.
- f. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- g. Adhere upper layer of insulation for specified Windstorm Resistance Classification, as follows:
  - 1) Set insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
  - 2) Set insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

### 3.7 INSTALLATION OF COVER BOARDS

- A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction.
  1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
  2. At internal roof drains, slope insulation to create a rectangular flat drain sump as detailed.
  3. Cut and fit cover board tight to nailers, projections, and penetrations.
  4. Adhere cover board to substrate using adhesive for specified Windstorm Resistance Classification, as follows:
    - a. Set cover board in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
    - b. Set cover board in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

### 3.8 ADHERED ROOFING INSTALLATION

- A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.
- B. Unroll roof membrane and allow to relax before installing.
- C. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- D. Bonding Adhesive: Apply to substrate and underside of roof membrane at rate required by manufacturer, and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.

- E. Fabric-Backed Roof Membrane Adhesive: Apply to substrate at rate required by manufacturer, and install fabric-backed roof membrane.
- F. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.
- G. Apply roof membrane with side laps shingled with slope of roof deck where possible.
- H. Seams: Clean seam areas, overlap roofing, and hot-air weld side and end laps of roof membrane and sheet flashings to ensure a watertight seam installation.
  - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roof membrane and sheet flashings.
  - 2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
  - 3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.
- I. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

### 3.9 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

### 3.10 ROOF ACCESSORIES INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. Install roof accessories to fit substrates and to result in watertight performance.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
  2. Underlayment: Where installing exposed-to-view components of roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene underlayment.
  3. Bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturers for waterproof performance.
- D. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.

### 3.11 WALKWAY INSTALLATION

- A. Flexible Walkways: Install walkway products according to manufacturer's written instructions.
1. Install flexible walkways at the following locations:
    - a. Locations indicated on Drawings.
    - b. As required by roof membrane manufacturer's warranty requirements.
  2. Provide 6-inch clearance between adjoining pads.
  3. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

### 3.12 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, roof membrane application, sheet flashings, protection, and drainage components, and to furnish reports to Architect/Engineer.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect/Engineer, and to prepare inspection report.
- C. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

### 3.13 PROTECTING AND CLEANING

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

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

END OF SECTION 07 54 19

## SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:

- 1. Manufactured through-wall flashing with snaplock receiver.
  - 2. Manufactured reglets with counterflashing.
  - 3. Formed roof-drainage sheet metal fabrications.
  - 4. Formed low-slope roof sheet metal fabrications.
  - 5. Formed equipment support flashing.

- B. Related Requirements:

- 1. Section 042000 "Unit Masonry" for flashing furnished and installed with brick veneer.
  - 2. Section 06 10 00 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
  - 3. Section 055000 "Metal Fabrications" for downspout guards and downspout boots.
  - 4. Section 074213.23 "Metal Composite Material Wall Panels" for metal flashing and trim integral with metal wall panels.
  - 5. Section 074250 "Terracotta Rainscreen Cladding" for metal flashing furnished and/or installed as part of terracotta rainscreen.
  - 6. Section 075419 "Polyvinyl-Chloride (PVC) Roofing" for PVC clad metal and for installation of sheet metal flashing and trim integral with roofing.
  - 7. Section 079200 "Joint Sealants" for field-applied sealants between flashing and adjacent materials.
  - 8. Section 079513.13 "Interior Expansion Joint Cover Assemblies" for manufactured expansion-joint cover assemblies for interior floors, walls, and ceilings.
  - 9. Section 079513.16 "Exterior Expansion Joint Cover Assemblies" for manufactured expansion-joint cover assemblies for exterior building walls, soffits, and parapets.

#### 1.3 COORDINATION

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

#### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

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

## 1.5 ACTION SUBMITTALS

### A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

### B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
10. Include details of special conditions.
11. Include details of connections to adjoining work.
12. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches.

### C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.

### D. Samples for Verification: For each type of exposed finish.

1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
4. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.



1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Product Certificates: For each type of coping and roof edge flashing that is SPRI ES-1 tested and FM Approvals approved.
- C. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- D. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.8 QUALITY ASSURANCE

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

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.10 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

## PART 2 – PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. FM Approvals Listing: Manufacture and install copings roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with name of fabricator and design approved by FM Approvals.
- D. SPRI Wind Design Standard: Manufacture and install copings roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:
  - 1. Design Pressure: As indicated on Structural Drawings.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

### 2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
  - 1. Clear Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
  - 2. Color Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
    - a. Color Range: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
  - 3. Exposed Coil-Coated Finish:
    - a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply

- coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
4. Color: As indicated for each type of flashing or, if not indicated, as selected by Architect/Engineer's from manufacturer's full range.
  5. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.
- C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed; with smooth, flat surface.
1. Finish: 2D (dull, cold rolled).
- D. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 coating designation; prepainted by coil-coating process to comply with ASTM A 755/A 755M.
1. Surface: Smooth, flat.
  2. Exposed Coil-Coated Finish:
    - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  3. Color: As selected by Architect/Engineer's from manufacturer's full range.
  4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

## 2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
1. Basis-of-Design: Subject to compliance with requirements, provide the following:
    - a. GCP Applied Technologies Inc.; Grace Ice and Water Shield HT.
  2. Comparable Manufacturer: Subject to compliance with requirements, the following manufacturers shall be considered comparable:
    - a. Carlisle Coatings & Waterproofing Inc.
    - b. Carlisle Residential; a division of Carlisle Construction Materials.
    - c. Henry Company.
  3. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.

4. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.

## 2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
  1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
    - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
    - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
  2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
  3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
  4. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.
- C. Solder:
  1. For Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
  2. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- E. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- H. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.
- I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

## 2.5 MANUFACTURED SHEET METAL FLASHING AND TRIM

- A. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet.
1. Basis-of-Design: Subject to compliance with requirements, provide the following:
    - a. Fry Reglet Corporation; Springlok Flashing System Type SM-Surface Mounted; Type CO-Concrete; Type MA-Masonry.
  2. Comparable Manufacturer: Subject to compliance with requirements, the following manufacturers shall be considered comparable:
    - a. Cheney Flashing Company.
    - b. Heckmann Building Product, Inc.
    - c. Hickman Company, W.P.
    - d. Hohmann & Barnard, Inc.
    - e. Keystone Flashing Company, Inc.
  3. Material: Stainless steel, 0.019 inch thick.
  4. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
  5. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
  6. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
  7. Accessories:
    - a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
    - b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge.
  8. Finish: With manufacturer's standard color coating.
  9. It may be the Contractor's option, with review and approval by the Architect/Engineer, to furnish and install a custom fabricated prefinished two-piece counterflashing system. The custom fabricated system shall match the profile, dimensions, and finish as the manufactured system.

## 2.6 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
  2. Obtain field measurements for accurate fit before shop fabrication.
  3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
  4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
  2. Use lapped expansion joints only where indicated on Drawings.
- D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.
- G. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
- H. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.
- I. Do not use graphite pencils to mark metal surfaces.

## 2.7 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- long sections. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.
1. Gutter Profile: Style F according to cited sheet metal standard.
  2. Expansion Joints: Butt type with cover plate.

3. Accessories: Hangers, end caps, expansion caps, gutter straps, brackets and outlet tubes as detailed or recommended by SMACNA.
  4. Gutters with Girth up to 15 Inches: Fabricate from the following materials:
    - a. Aluminum: 0.032 inch thick.
  5. Gutters with Girth 16 to 20 Inches: Fabricate from the following materials:
    - a. Aluminum: 0.040 inch thick.
  6. Gutters with Girth 21 to 25 Inches: Fabricate from the following materials:
    - a. Aluminum: 0.050 inch thick.
- B. Downspouts: Fabricate rectangular downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows.
1. Fabricated Hanger Style: Fig 1-35B according to SMACNA's "Architectural Sheet Metal Manual."
  2. Elbows: SMACNA Style "A" or style "B".
  3. Fabricate from the following materials:
    - a. Aluminum: 0.024 inch thick.
- C. Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inch- wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper.
1. Fabricate from the following materials:
    - a. Aluminum: 0.032 inch thick.
  2. Seams: Provide common lock or single corner seams.
    - a. Flat seams: Weld or solder seam watertight.
    - b. Lock Seams: Solder or seal seam watertight
  3. Provide perforated gravel stops at ballasted roofs.
- D. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes and built-in overflows.
1. Profile: Rectangular, SMACNA Figure 1-25C, with overflow opening in face.
  2. Fabricate from the following materials:
    - a. Aluminum: 0.032 inch thick.
- E. Splash Pans: Fabricate to dimensions and shape required and from the following materials:
1. Aluminum: 0.040 inch thick.

2.8 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Roof Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch- long, but not exceeding 12-foot- long sections. Furnish with 6-inch- wide, joint cover plates. Shop fabricate interior and exterior corners.
1. Joint Style: Butted with expansion space and 6-inch- wide, concealed backup plate.
  2. Fabricate with scuppers spaced 10 feet apart, to dimensions required with 4-inch- wide flanges and base extending 4 inches beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper.
  3. Fabricate from the Following Materials:
    - a. Aluminum: 0.019 inch thick.
  4. It may be the Contractor's option, with review and approval by the Architect/Engineer, to furnish and install a manufactured gravel stop and fascia system. The manufactured system shall match the profile, dimensions, and finish as the custom system.
- B. Copings: Fabricate in minimum 96-inch- long, but not exceeding 12-foot- long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, fasten and seal watertight. Shop fabricate interior and exterior corners.
1. Coping Profile: Fig 3-4A according to SMACNA's "Architectural Sheet Metal Manual."
  2. Joint Style: Butted with expansion space and 6-inch- wide, concealed backup plate.
  3. Fabricate from the Following Materials:
    - a. Aluminum:
      - 1) 0.063 inch minimum, for up to 10 inch wall thickness.
      - 2) 0.080 inch minimum, for 10 inch to 16 inch wall thickness.
  4. It may be the Contractor's option, with review and approval by the Architect/Engineer, to furnish and install a manufactured coping system. The manufactured system shall match the profile, dimensions, and finish as the custom system.
- C. Roof-Penetration Flashing: Fabricate from the following materials:
1. Stainless Steel: 0.019 inch thick.
- D. Roof-Drain Flashing: Fabricate from the following materials:
1. Stainless Steel: 0.016 inch thick.



## PART 3 – EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
  - 1. Verify compliance with requirements for installation tolerances of substrates.
  - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
  - 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.

### 3.3 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
  - 1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
  - 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
  - 3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
  - 4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
  - 5. Torch cutting of sheet metal flashing and trim is not permitted.
  - 6. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of uncoated-aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
  2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
  2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
  2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."

### 3.4 ROOF-DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- B. Hanging Gutters: Join sections with joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.
1. Fasten gutter spacers to front and back of gutter.
  2. Anchor and loosely lock back edge of gutter to continuous cleat.
  3. Anchor gutter with straps spaced not more than 24 inches apart to roof deck, unless otherwise indicated, and loosely lock to front gutter bead.
  4. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.
- C. Downspouts: Join sections with 1-1/2-inch telescoping joints.

1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c.
  2. Provide elbows at base of downspout to direct water away from building.
  3. Connect downspouts to underground drainage system.
- D. Parapet Scuppers: Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
1. Anchor scupper closure trim flange to exterior wall and solder or seal with elastomeric sealant to scupper.
  2. Loosely lock front edge of scupper with conductor head.
  3. Solder or seal with elastomeric sealant exterior wall scupper flanges into back of conductor head.
- E. Conductor Heads: Anchor securely to wall, with elevation of conductor head rim at minimum of 1 inch below scupper or gutter discharge.

### 3.5 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.
- C. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.
- D. Copings: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated.
1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate as recommended by manufacturer.
  2. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch centers.
- E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches. Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant or interlocking folded seam or blind rivets and sealant unless otherwise indicated.
- F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric or butyl sealant and clamp flashing to pipes that penetrate roof.

3.6 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Reglets: Installation of reglets is specified in Section 04 20 00 "Unit Masonry."

3.7 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.8 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean off excess sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00

## SECTION 07 84 13 - PENETRATION FIRESTOPPING

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Penetrations in fire-resistance-rated walls, including both empty opening and openings containing cables, pipes, ducts, conduits, and other penetrating items.
  - 2. Penetrations in horizontal assemblies, including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
  - 3. Penetrations in smoke barriers enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.
- B. Related Requirements:
  - 1. Section 07 92 00 "Joint Sealants."
  - 2. Section 09 29 00 "Gypsum Board".
  - 3. Section 09 91 23 "Interior Painting" for labeling joint firestopping locations.
  - 4. Division 23 – Heating, Ventilating and Air Conditioning.
  - 5. Division 26 – Electrical.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop drawings detailing materials, installation methods, and relationships to adjoining construction for each through-penetration firestop system, and each kind of construction condition penetrated and kind of penetrating item. Include firestop design designation of qualified testing and inspecting agency evidencing compliance with requirements for each condition indicated.
  - 1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop configuration for construction and penetrating items.
    - a. Documentation shall include an illustration of the condition being firestopped and written description of system components and installation requirements.

2. Where there is no specific third party tested and classified Firestop System available for particular firestop configuration, the firestopping contractor shall obtain from the firestop manufacturer an Engineering Judgment (EJ) or Equivalent Fire Resistance Rated Assembly (EFRA).
- C. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.
  1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Photographic documentation of firestopping installed in concealed locations.
- B. Qualification Data: For Installer.
- C. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

#### 1.6 CLOSEOUT SUBMITTALS

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

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary experience, staff, and training to install manufacturer's products per specified requirements.
  1. A manufacturer's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.
- B. Provide firestopping products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy."

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multi-component materials.

- B. Store and handle firestopping materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

#### 1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

#### 1.10 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

#### 1.11 SEQUENCING AND SCHEDULING

- A. Do not cover up those firestopping installations that will become concealed behind other construction until Architect/Engineer and authorities having jurisdiction, if required, have examined each installation.
  - 1. Dated photographs may be submitted for verbal approval by the Architect/Engineer, in lieu of on-site examination, prior to proceeding with construction.
  - 2. Provide photographs as required for Construction Photographs in Section 01 32 33 "Photographic Documentation."

### PART 2 – PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
  - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
  - 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
    - a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
      - 1) UL in its "Fire Resistance Directory."
      - 2) Intertek Group in its "Directory of Listed Building Products."
      - 3) FM Global in its "Building Materials Approval Guide."

## 2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Products: Subject to compliance with requirements, provide one of the following:
1. A/D Fire Protection Systems Inc.; FireBarrier.
  2. Hilti, Inc.
  3. Nelson Firestop Products.
  4. RectorSeal Corporation (The), Bio Fireshield and Metacaulk Firestopping Products.
  5. Specified Technologies, Inc. (STI); SpecSeal.
  6. 3M; Fire Protection Products Division.
  7. Tremco; Fire Protection Systems Group; TremStop.
- B. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- C. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- D. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
  2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
  3. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at and no more than 50-cfm cumulative total for any 100 sq. ft. at both ambient and elevated temperatures.
- E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.
- F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
1. Permanent forming/damming/backing materials.
  2. Substrate primers.
  3. Collars.
  4. Steel sleeves.

## 2.3 FILL MATERIALS

- A. Mineral Wool (Fire Safing) Insulation:
1. Description: Mineral wool semi-rigid blanket.
    - a. ASTM C 612, Class 1.
    - b. Provide material complying with firestop system listing for hour and temperature rating indicated on Drawings.



2. Facing:
    - a. Scrim-reinforced aluminum foil faced at exterior wall and floor intersection.
    - b. Unfaced at interior head-of-wall and poke-through locations.
  3. Density: 4.0 lbs./cu. ft.
  4. Thickness: 4 inches.
  5. Widths: Maximum usable width up to 24 inches.
  6. Attachment:
    - a. Compressed 25 percent friction fit, unless noted otherwise
    - b. Uncompressed with galvanized steel impaling pins as required for the fire-rated assembly test for the floor to wall condition.
  7. Acceptable products:
    - a. Fibrex Insulations Inc.; Fibrex Safing Insulation.
    - b. IIG MinWool. LLC; MinWool - 1200 Safing.
    - c. Roxul Inc.; RXL Safe.
    - d. Thermafiber LLC; Thermafiber Safing Insulation.
  8. Locations:
    - a. Exterior wall and floor intersections, and as indicated on Drawings.
    - b. Interior head-of-wall intersections with corrugated metal deck or as part of a head-of-wall firestopping system.
    - c. Interior "poke-thru" locations except where protected by alternative Firestop systems.
- B. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- C. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- D. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- E. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.
- F. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.
1. Putty may be preformed into self-adhering, relocatable sheets or pads for installation around penetrating objects.
  2. Firestop Putty Pad: Moldable firestop putty to protect electrical outlet boxes.
- G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

- H. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- I. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
- J. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- K. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

## 2.4 RE-ENTERABLE SLEEVE DEVICES

- A. System consisting of one or more sheet metal or split-tube sleeves forming an enclosed pathway, intumescent firestopping materials, and smoke seal, intended for use with low-voltage cabling or other non-metallic penetrants.
  - 1. Device shall be rated for visual fill capacities from 0 to 100 percent.
  - 2. Device shall automatically adjust to cable fill volume.
  - 3. Device shall permit cables to be installed, removed, or retrofitted without the need to adjust, remove or reinstall firestop materials.
  - 4. Device shall carry a UL Classified L rating and limit the passage of smoke through the penetration.
- B. Provide device suitable for retrofit application for encasing existing wiring without requiring their removal, where existing cabling penetrates new or existing fire-rated floors or partitions.
- C. Products:
  - 1. 3M; Fire Protection Products Division; Fire Barrier Pass-Through Devices.
  - 2. Hilti, Inc.; CP 653 Speed-Sleeve (walls only).
  - 3. Nelson Firestop Products; MCT/MGS System, with RGS frames and Tecron gasket.
  - 4. RectorSeal Corporation (The), Metacaulk Cast-In-Place Firestop Device (through-floor only).
  - 5. Specified Technologies, Inc. (STI); EZ-Path System.

## 2.5 CAST-IN SLEEVE DEVICES

- A. System for use in cast-in-place concrete floor systems, consisting of plastic sleeve forming an enclosed pathway, intumescent firestopping materials, water and smoke seal, intended for use with floor penetrants.
  - 1. Provide device designed for metal or plastic pipe, conduit, or cabling penetrants, as indicated.
  - 2. Device shall be field adjustable or adaptable to required sleeve height.
  - 3. Device shall be sized to fit preset annular space for penetrant size.
  - 4. Device shall permit penetrants to be installed, removed, or retrofitted without the need to adjust, remove or reinstall firestop materials.

5. Device shall carry a UL Classified L and W rating and limit the passage of smoke and water through the penetration.
6. Device shall be designed for placement adjacent to additional sleeves (ganged penetrations). Spacing of ganged units shall provide not less than 1 inch concrete between sleeves.
7. Sleeve shall be provided with removable cap to prevent damage or contamination during construction, prior to installation of penetrant.

## 2.6 LABELS

- A. Provide permanent, self-adhesive, water-resistant labels indicating the following information:
  1. Assembly F and T rating.
  2. Assembly Certification number or Engineering Judgment number.
  3. Name of organization certifying assembly.
  4. Test method used to certify assembly.
  5. Name of installing contractor.
  6. Date of installation.
  7. Name of manufacturer of assembly components.

## 2.7 MIXING

- A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

# PART 3 – EXECUTION

## 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

- A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:
  1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.

2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
  3. Remove laitance and form-release agents from concrete.
- B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

### 3.3 INSTALLATION

- A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- C. Install fill materials by proven techniques to produce the following results:
1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
  2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
  3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.
- D. Corridor Walls
1. In Group I-2 Occupancies, seal corridor-side perimeters and penetrations of corridor walls with materials capable of providing an effective barrier to the passage of smoke.
    - a. Provide bond breaker tape, backer rod or safing insulation fill or backup where required by sealant manufacturer to support sealant or prevent three-sided bonding of sealant.
    - b. Seal perimeters of walls and around penetrating items with acoustical sealant, fire-resistive latex sealant, or fire-resistive elastomeric sealant.
      - 1) Seal corridor side end of open sleeves.
    - c. Tool sealants where required to ensure proper bond to substrates.
      - 1) Sealant visible in finished construction shall be properly tooled for a smooth and uniform appearance.
      - 2) Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
    - d. Remove excess sealant from surfaces adjacent to joint.

### 3.4 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

### 3.5 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

### 3.6 PENETRATION FIRESTOPPING SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to the alpha-alpha-numeric designations listed in UL's "Fire Resistance Directory" under product Category XHEZ.

PENETRATION DESCRIPTION	UL CLASSIFIED SYSTEM	FILL MATERIAL
No Penetrating Items	C-AJ-0001-0999 C-BJ-0001-0999 F-A-0001-0999 W-J-0001-0999 W-L-0001-0999	Latex sealant Silicone sealant Mortar Intumescent putty
Metallic Pipes, Conduit, or Tubing	C-AJ-1001-1999 C-BJ-1001-1999 C-B-K1001-1999 F-A-1001-1999 F-B-1001-1999 F-C-1001-1999 W-J-1001-1999 W-K-1001-1999 W-L-1001-1999	Latex sealant Silicone sealant Mortar Intumescent putty

Nonmetallic Pipe, Conduit, or Tubing	C-AJ-2001-2999 C-BJ-2001-2999 F-A-2001-2999 F-B-2001-2999 F-C-2001-2999 W-J-2001-2999 W-L-2001-2999	Latex sealant Silicone sealant Intumescent putty Intumescent wrap strips Firestop device
Firestop Systems for Electrical Cables	C-AJ-3001-3999 C-BJ-3001-3999 F-A-3001-3999 F-B-3001-3999 F-C-3001-3999 W-J-3001-3999 W-L-3001-3999	Latex sealant Silicone sealant Intumescent putty Silicone foam
Firestop Systems for Cable Trays	C-AJ-4001-4999 C-BJ-4001-4999 F-A-4001-4999 F-B-4001-4999 F-C-4001-4999 W-J-4001-4999 W-K-4001-4999 W-L-4001-4999	Latex sealant Intumescent putty Silicone foam Pillows/bags
Firestop Systems for Insulated Pipes	C-AJ-5001-5999 C-BJ-5001-5999 F-A-5001-5999 F-C-5001-5999 W-J-5001-5999 W-L-5001-5999	Latex sealant Intumescent putty Intumescent wrap strips Silicone foam
Miscellaneous Electrical Penetrants	C-AJ-6001-6999 F-A-6001-6999 W-L-6001-6999	Latex sealant Intumescent putty Mortar
Miscellaneous Mechanical Penetrations	C-AJ-7001-7999 F-C-7001-7999 W-J-7001-7999 W-L-7001-7999	Latex sealant Mortar
Groupings of Penetrations	C-AJ-8001-8999 C-BJ-8001-8999 F-A- 8001-8999 F-C-8001-8999 W-J-8001-8999 W-L-8001-8999	Latex sealant Mortar Intumescent wrap strips Firestop device Intumescent composite sheet.

END OF SECTION 07 84 13

## SECTION 07 92 00 - JOINT SEALANTS

### PART 1 – GENERAL

#### RELATED DOCUMENTS

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

#### SUMMARY

- B. Section Includes:
  - 1. Furnishing and installing field-applied sealants as indicated or implied by the Contract Documents.
  - 2. Sealant for interior joints.
- C. Related Requirements:
  - 1. Section 07 84 13 "Penetration Firestopping."
  - 2. Section 09 29 00, "Gypsum Board."
  - 3. Section 09 67 23, "Resinous Flooring."

#### COORDINATION

- D. The work of this Section requires close coordination with the work of other Sections of these Specifications and the work of other trades to obtain the proper sequence of operations and installation of materials.

#### PREINSTALLATION MEETINGS

- E. Preinstallation Conference: Conduct conference at Project site.

#### ACTION SUBMITTALS

- F. Product Data: For each joint-sealant product.
- G. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- H. Joint-Sealant Schedule: Include the following information:
  - 1. Joint-sealant application, joint location, and designation.
  - 2. Joint-sealant manufacturer and product name.
  - 3. Joint-sealant formulation.
  - 4. Joint-sealant color.
  - 5. Joint sealant primer requirement.

6. Substrate materials on each side of joint.

#### INFORMATIONAL SUBMITTALS

- I. Certifications: Submit certification from the Installer indicating compliance with installer qualifications specified.
- J. Qualification Data: For qualified testing agency.
- K. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.
- L. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
- M. Field-Adhesion-Test Reports: For each sealant application tested.
- N. Sample Warranties: For special warranties.

#### QUALITY ASSURANCE

- O. All Work of this Section shall be done by a qualified sealant Subcontractor and shall be done by the same Subcontractor
- P. Provide products by one manufacturer for each type of sealant.
- Q. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- R. Product Testing: Test joint sealants using a qualified testing agency.
  - 1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.
- S. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

#### PRECONSTRUCTION TESTING

- T. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
  - 1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
  - 2. Conduct field tests for each kind of sealant and joint substrate.
  - 3. Notify Architect seven days in advance of dates and times when test joints will be erected.
  - 4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.



- a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
  - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
- 5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
- 6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

#### FIELD CONDITIONS

- U. Do not proceed with installation of joint sealants under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
  - 2. When joint substrates are wet.
  - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
  - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

#### WARRANTY

- V. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section without specified warranty period.
  - 1. Warranty Period: Two years from the date of Substantial Completion.
- W. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Polyurethane sealants: 3 years or manufacturer's maximum term, whichever is greater.
  - 2. Silicone sealants: 20 years or manufacturer's maximum term, whichever is greater.
  - 3. Other sealants: 2 years or manufacturer's maximum term, whichever is greater.
- X. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
  - 1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
  - 2. Disintegration of joint substrates from causes exceeding design specifications.

3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

## PART 2 – PRODUCTS

### JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

### ELASTOMERIC JOINT SEALANTS

- C. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- D. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- E. Single-Component Neutral-Curing Silicone Sealant ES-3:
  1. Products:
    - a. Dow Corning Corporation; 799.
    - b. GE Silicones; SilGlaze II SCS2800.
    - c. Pecora Corporation; 896.
    - d. Tremco; Spectrem 2.
  2. Type and Grade: S (single component) and NS (nonsag).
  3. Class: 25.
  4. Use Related to Exposure: NT (nontraffic).
  5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
    - a. Use O Joint Substrates: color anodic aluminum aluminum coated with a high-performance coating.
- F. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant ES-4:
  1. Products:
    - a. Pecora Corporation; 898.
    - b. Tremco; Tremsil 600 White.
  2. Type and Grade: S (single component) and NS (nonsag).
  3. Class: 25.

4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
  - a. Use O Joint Substrates: color anodic aluminum aluminum coated with a high-performance coating.
6. Applications: See Application Locations at the end of this section.

G. Multicomponent Nonsag Urethane Sealant ES-6:

1. Products:
  - a. Sika Corporation, Inc.; Sikaflex - 2c NS TG.
  - b. Sonneborn, Division of ChemRex Inc.; NP 2.
  - c. Tremco; Vulkem 227.
2. Type and Grade: M (multicomponent) and NS (nonsag).
3. Class: 25.
4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
  - a. Use O Joint Substrates: Color anodic aluminum aluminum coated with a high-performance coating wood.
6. Applications: See Application Locations at the end of this section.

LATEX JOINT SEALANTS

7. Products:
  - a. GE Silicones; Acryseal.
  - b. Pecora Corporation; AC-20+.
  - c. Sonneborn, Division of ChemRex Inc.; Sonolac.
  - d. Tremco; Tremflex 834.

ACOUSTICAL SEALANT

- H. Acoustical Sealant AC-1: Nondrying, non-hardening, non-skinning, non-staining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.
1. United States Gypsum Co.; Sheetrock Acoustical Sealant.
  2. Pecora Corp.; BA-98.
  3. Tremco, Inc.; Tremco Acoustical Sealant.

EPOXY JOINT FILLERS

- I. Epoxy Sealant EP-1: 2-part flexible epoxy, self-leveling.
  1. Products:

- a. Sonneborn; Epolith P.
- 2. Applications: horizontal joints; see Application Locations at the end of this section.
- J. Epoxy Sealant EP-2: 2-part flexible epoxy.
  - 1. Products:
    - a. Sonneborn; Epolith G.
  - 2. Applications: sloped joints; see Application Locations at the end of this section.

#### JOINT-SEALANT BACKING

- K. Bond Breaker: Polyethylene tape.
- L. Backer Rod:
  - 1. Preformed rod, tube, or bar shape of flexible, closed cell polyurethane or polyethylene foam of the non-adhering type, free from oil, tar bitumen, solvents, or other non-compatible foreign material and sized as recommended by manufacturer.
    - a. Sonneborn-Sonofoam Soft Backer Rod.
    - b. Dow Chemical-Etnafoam "SB" rod.
- M. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

#### MISCELLANEOUS MATERIALS

- N. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- O. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- P. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

### PART 3 – EXECUTION

#### EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### PREPARATION

- C. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    - a. Concrete.
  - 3. Remove laitance and form-release agents from concrete.
  - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

RETAIN NONPOROUS SUBSTRATES IN SUBPARAGRAPHS BELOW IF APPLICABLE. INSERT ADDITIONAL ITEMS TO SUIT PROJECT.

- a. Metal.
  - b. Porcelain enamel.
  - c. Glazed surfaces of ceramic tile.
- D. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- E. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.
- F. Backer Rods:

1. Install firmly and evenly in place where indicated or required to depths and contours recommended by sealant manufacturer. Use backer rods for all exterior sealant Work.
2. Exercise care and caution not to puncture rod.

G. Sequence:

1. All exterior sealant work shall precede painting or waterproofing.

## INSTALLATION OF JOINT SEALANTS

- H. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- I. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- J. Joint Design:
1. Joints shall have depth equal to one-half the width.
- K. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
1. Do not leave gaps between ends of sealant backings.
  2. Do not stretch, twist, puncture, or tear sealant backings.
  3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- L. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- M. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
1. Place sealants so they directly contact and fully wet joint substrates.
  2. Completely fill recesses in each joint configuration.
  3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- N. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
  2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

## FIELD QUALITY CONTROL

- O. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
1. Extent of Testing: Test completed and cured sealant joints as follows:
    - a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
    - b. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.
  2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
    - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
  3. Inspect tested joints and report on the following:
    - a. Whether sealants filled joint cavities and are free of voids.
    - b. Whether sealant dimensions and configurations comply with specified requirements.
    - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
  4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
  5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- P. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

## CLEANING

- Q. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

R. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

S. Interior Sealants:

1. Typical narrow joint, 1/4 inch (6mm) or less at walls and adjacent components: LS-1.
2. Perimeter of doors, windows, access panels to adjacent materials: LS-1.
3. Countertops, backsplashes, endsplashes and adjacent walls, except at toilet rooms, showers and other wet areas: LS-1.
4. Joints at masonry walls, columns, piers and concrete walls: [ES-6] [ES-3].
5. Exposed isolation joints at top of full height, non-fire rated walls: [ES-3] [ES-6].
6. Drywall trim joints: LS-1.
7. Concrete flatwork control joints[ **and cracks over 1/16 inch wide**]: EP-1 or EP-2.
8. Walls to plumbing fixtures and at fixtures installed in countertops: ES-4.
9. Countertops to walls, at toilet rooms, showers, kitchens and other wet areas: ES-4.
10. Pipe and plumbing fitting penetrations in non-fire rated walls: ES-4.
11. Non-fire-rated full-height walls and walls containing sound attenuation blankets: AC-1.
12. Full-height walls indicated as Smoke Partitions: [ES-3] [AC-1].

LOCATION	SEALANT TYPE	COLOR
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## JOINT SEALANTS



SECTION 07 95 13.16 - EXTERIOR EXPANSION JOINT COVER ASSEMBLIES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes exterior building expansion joint cover assemblies.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for expansion joint cover assemblies.
- B. Shop Drawings: For each expansion joint cover assembly.
  - 1. Include plans, elevations, sections, details, splices, block-out requirement, attachments to other work, and line diagrams showing entire route of each expansion joint.
  - 2. Where expansion joint cover assemblies change planes, provide isometric or clearly detailed drawing depicting how components interconnect.
- C. Samples: For each exposed expansion joint cover assembly and for each color and texture specified, full width by 6 inches long in size.
- D. Expansion Joint Cover Assembly Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:
  - 1. Manufacturer and model number for each expansion joint cover assembly.
  - 2. Expansion joint cover assembly location cross-referenced to Drawings.
  - 3. Nominal, minimum, and maximum joint width.
  - 4. Movement direction.
  - 5. Materials, colors, and finishes.
  - 6. Product options.

1.4 QUALITY ASSURANCE

- A. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockup of typical expansion joint cover assembly as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect/Engineer specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## PART 2 – PRODUCTS

### 2.1 ASSEMBLY DESCRIPTION

- A. Furnish units in longest practicable lengths to minimize field splicing.
- B. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion joint cover assemblies.

### 2.2 MANUFACTURERS

- A. Acceptable Manufacturers: Provide exterior joint covers by acceptable manufacturers that match the specified joint cover in general profile, attachment and movement range. Joint covers that vary significantly from the reference standard shall not be accepted.
  1. Balco, Inc.
  2. Construction Specialties, Inc., a C/S Group Company.
  3. JointMaster USA, InPro Corporation.
  4. MM Systems Corporation.
  5. Nystrom Building Products.
  6. Watson Bowman Acme Corporation.

### 2.3 EXTERIOR EXPANSION JOINT COVERS

- A. Basis-of-Design Product: Construction Specialties, Inc. model VF
  1. Type: Pre-compressed joint filler.
    - a. Seal Material: Silicone - not to exceed 25 pts (+/-5)
      - 1) Durometer: ASTM C661, Shore A1
      - 2) Weatherometer: ASTM C510, ASTM G26-77, Xenon Arc Weatherometer 2000 hrs
      - 3) Primary Surface Weathering: ASTM G26-77, Atlas Weatherometer 6000 hrs
      - 4) Wind loading: ASTM E330
      - 5) R-Value: Astm C518-04
      - 6) Water Penetration: ASTM: E331-00
      - 7) STC Rating: ASTM E90-09, STC 52 (in a STC 56 wall)
      - 8) OITC Rating: ASTM E90-09, OTIC 38 (in a =OITC 38 wall)
    - b. Color: As selected by Architect from manufacturer's standard range or custom colors.
  2. All miters and changes in direction to be field fabricated.
  3. Fire-Resistance Rating: Provide joint system and fire-barrier assembly with a rating not less than that of adjacent construction. For fire resistance use VFR

B. Finishes

1. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
2. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
3. Appearance of Finished Work: Noticeable variations in same piece are not acceptable.

2.4 ACCESSORIES

- A. Moisture Barriers: Manufacturer's standard continuous, waterproof membrane within joint and attached to substrate on sides of joint.
1. Provide where indicated on Drawings.
- B. Manufacturer's standard attachment devices. Include anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine surfaces where expansion joint cover assemblies will be installed for installation tolerances and other conditions affecting performance of the Work.
- B. Notify Architect/Engineer where discrepancies occur that will affect proper expansion joint cover assembly installation and performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to expansion joint cover assembly manufacturer's written instructions.
- B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion joint cover assemblies. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion joint cover assemblies.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for storing, handling, and installing expansion joint cover assemblies and materials unless more stringent requirements are indicated.
- B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion joint cover assemblies.

1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
  2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation.
  3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
  4. Install frames in continuous contact with adjacent surfaces.
    - a. Shimming is not permitted.
  5. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.
- C. Seals: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.
1. Provide in continuous lengths for straight sections.
  2. Seal transitions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
  3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.
- D. Install with hairline mitered corners where expansion joint cover assemblies change direction or abut other materials.
- E. Terminate exposed ends of expansion joint cover assemblies with field- or factory-fabricated termination devices.

### 3.4 CONNECTIONS

- A. Transition to Roof Expansion Joint Covers: Coordinate installation of exterior wall and soffit expansion joint covers with roof expansion joint covers specified in Section 07 71 29 "Manufactured Roof Expansion Joints." Install factory-fabricated units at transition between exterior walls and soffits and roof expansion joint cover assemblies.

### 3.5 PROTECTION

- A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.
- B. Protect the installation from damage by work of other Sections.

END OF SECTION 07 95 13.16

## SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

### PART 1 – GENERAL

#### 1.1 SUMMARY

A. Section includes:

1. Interior standard steel doors and frames.

B. Related Requirements:

1. Section 08 14 16 "Flush Wood Doors" for wood doors installed in hollow metal frames.
2. Section 08 71 00 "Door Hardware" for door hardware for hollow-metal doors.

#### 1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

#### 1.3 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

#### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
7. Details of anchorages, joints, field splices, and connections.
8. Details of accessories.
9. Details of moldings, removable stops, and glazing.

- C. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Certificates: Submit certificates of compliance with fabrication and test requirements.
- B. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
  - 1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

### PART 2 – PRODUCTS

#### 2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Steelcraft; an Allegion brand ; Steelcraft Hollow Metal Doors and Frames. or a comparable product by one of the following:
  - 1. Black Mountain Door, LLC.
  - 2. Ceco Door; ASSA ABLOY.
  - 3. Curries Company; ASSA ABLOY.
  - 4. MPI Group, LLC (The).
  - 5. Republic Doors and Frames.

#### 2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
- B. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.50 deg Btu/F x h x sq. ft. when tested according to ASTM C1363 or ASTM E1423.

## 2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Doors: SDI A250.8, Level 2; SDI A250.4, Level B.
  - 1. Doors:
    - a. Type: As indicated in the Door and Frame Schedule.
    - b. Thickness: 1-3/4 inches.
    - c. Face: Uncoated steel sheet, minimum thickness of 0.042 inch.
    - d. Edge Construction: Model 2, Seamless.
    - e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
    - f. Core: Manufacturer's standard.
    - g. Fire-Rated Core: Manufacturer's standard laminated mineral board core for fire-rated doors.
  - 2. Exposed Finish: Prime.
  - 3. Locations: All interior doors unless otherwise indicated.
- C. Extra-Heavy-Duty Frames: SDI A250.8, Level 3; SDI A250.4, Level A.
  - 1. Frames:
    - a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
    - b. Frames: Fabricated from same thickness material as adjacent door frame.
    - c. Construction: Full profile welded.
  - 2. Exposed Finish: Prime.
  - 3. Locations: At all door or opening widths up to 4'-0" unless otherwise indicated.

## 2.4 FRAME ANCHORS

- A. Jamb Anchors:
  - 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
  - 2. Quantity: Minimum of three (3) anchors per jamb, with one (1) additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
  - 3. Postinstalled Expansion Anchor: Minimum 3/8-inch-diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
- C. Material: ASTM A 879, Commercial Steel (CS), 04Zcoating designation; mill phosphatized.
  - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008 or ASTM A 1011; hot-dip galvanized according to ASTM A 153, Class B.

## 2.5 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653, Commercial Steel (CS), Type B.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153.
- E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- F. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

## 2.6 FABRICATION

- A. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
  - 1. Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
  - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
  - 3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
    - a. Single-Door Frames: Drill stop in strike jamb to receive three (3) door silencers.
    - b. Double-Door Frames: Drill stop in head and jamb to receive two (2) door silencers.
- B. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
  - 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
  - 2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.

## 2.7 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
  - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.



2. Color and Gloss: As selected by Architect from manufacturer's full range.

## PART 3 – EXECUTION

### 3.1 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

### 3.2 INSTALLATION

- A. General: Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with SDI A250.11 or NAAMM-HMMA 840.
  1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
    - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
    - b. Install frames with removable stops located on secure side of opening.
  2. Fire-Rated Openings: Install frames according to NFPA 80.
  3. Floor Anchors: Secure with post installed expansion anchors.
    - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
  4. Solidly pack mineral-fiber insulation inside frames.
  5. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
  6. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
    - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

- C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
  - 1. Non-Fire-Rated Steel Doors: Comply with SDI A250.8 or NAAMM-HMMA 841 and NAAMM-HMMA guide specification indicated.
  - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

### 3.3 CLEANING AND TOUCHUP

- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- C. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 08 11 13

## SECTION 08 14 16 - FLUSH WOOD DOORS

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Solid-core doors with wood-veneer faces.
  - 2. Factory finishing flush wood doors.
  - 3. Factory fitting flush wood doors to frames and factory machining for hardware.
- B. Related Requirements:
  - 1. Section 08 80 00 "Glazing" for glass view panels in flush wood doors.
  - 2. Section 08 88 13 "Fire-Resistant Glazing" for fire protective glass in view panels in fire-rated wood doors.
  - 3. Section 13 49 00 "Radiation Protection" for lead-lined flush wood doors.

#### 1.3 DEFINITIONS

- A. Oversized Doors: Doors exceeding size limitation are supplied with a Classification Mark for Oversized Fire Door which indicates compliance (except for size), with all requirements for design, materials and construction of the maximum size door fire tested.

#### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.5 ACTION SUBMITTALS

- A. Product Data Submittals: For each product, include the following:
  - 1. Door core materials and construction.
  - 2. Door edge construction.
  - 3. Door face type and characteristics.
  - 4. Door louvers.
  - 5. Door trim for openings.
  - 6. Door frame construction.
  - 7. Factory-machining criteria.
  - 8. Factory-priming specifications.

- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
  - 1. Door schedule indicating door location, type, size, fire protection rating, and swing.
  - 2. Door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.
  - 3. Details of frame for each frame type, including dimensions and profile.
  - 4. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
  - 5. Dimensions and locations of blocking for hardware attachment.
  - 6. Dimensions and locations of mortises and holes for hardware.
  - 7. Clearances and undercuts.
- C. Samples for Verification:
  - 1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons.
- C. Mark each door on bottom rail with opening number used on Shop Drawings.

#### 1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during remainder of construction period.

#### 1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
    - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

## PART 2 – PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis-of-Design: Subject to compliance with requirements, provide the following:
  1. Masonite Architectural: Aspiro Series / Marshfield-Algoma
- B. Comparable Manufacturer: Subject to compliance with requirements, the following manufacturers shall be considered comparable:
  1. Eggers Industries.
  2. Graham Wood Doors; ASSA ABLOY Group company.
  3. VT Industries Inc.
- C. Source Limitations: Obtain flush wood doors from single manufacturer.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
  1. Smoke-and-Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.
  2. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
  3. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
  4. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
- B. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.

### 2.3 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with ANSI/WDMA I.S. 1A.
  1. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with those selections and requirements in addition to quality standard.

B. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-2.
2. Blocking: Provide wood blocking in particleboard-core doors as follows:
  - a. 5-inch top-rail blocking, in doors indicated to have closers.
  - b. 5-inch bottom-rail blocking, in doors indicated to have kick, mop, or armor plates.
3. Provide doors with structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

C. Structural-Composite-Lumber-Core Doors:

1. Structural Composite Lumber: WDMA I.S.10.
  - a. Screw Withdrawal, Face: 700 lbf.
  - b. Screw Withdrawal, Edge: 400 lbf.

D. Mineral-Core Doors:

1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as follows:
  - a. 5-inch top-rail blocking.
  - b. 5-inch bottom-rail blocking, in doors indicated to have protection plates.
  - c. 5-inch midrail blocking, in doors indicated to have armor plates.
  - d. 5-inch midrail blocking, in doors indicated to have exit devices.
3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
  - a. Screw-Holding Capability: 550 lbf per WDMA T.M.-10.

E. Thickness:

1. Typical door thickness to be 1-3/4".

## 2.4 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Performance Grade: ANSI/WDMA I.S. 1A Extra Heavy Duty.
2. Grade: Premium, with Grade A faces.
3. Species: Selection by Interior Designer.
4. Cut: Plain sliced (flat sliced).
5. Match between Veneer Leaves: Book match.

6. Assembly of Veneer Leaves on Door Faces: Balance match.
7. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
8. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 20 feet or more.
9. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
10. Exposed Vertical and Top Edges: Same species as faces - edge Type A.
11. Core: Particleboard.
12. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.

## 2.5 LITE FRAMES AND LOUVERS

- A. Wood-Veneered Beads for Lite Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.
- B. Metal Frames for Lite Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048 inch thick, cold rolled steel sheet; factory primed for paint; and approved for use in doors of fire protection rating indicated.
- C. Wood Louvers: Door manufacturer's standard solid-wood louvers unless otherwise indicated.
  1. Wood Species: Same species as door faces.
  2. Profile: Chevron.
- D. Metal Louvers:
  1. Blade Type: Vision-proof, inverted V.
  2. Metal and Finish: Hot-dip galvanized steel, 0.040 inch thick, with baked-enamel- or powder-coated finish.
  3. Metal and Finish: Extruded aluminum with Class II, clear anodic finish, AA-M12C22A31.
  4. Metal and Finish: Extruded aluminum with light bronze, Class II, color anodic finish, AA-M12C22A32/A34.

## 2.6 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
  1. Comply with NFPA 80 requirements for fire-rated doors.

- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
  - 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
  - 2. Metal Astragals: Factory machine astragals and formed steel edges for hardware for pairs of fire-rated doors.
- C. Openings: Factory cut and trim openings through doors.
  - 1. Lite Openings: Trim openings with moldings of material and profile indicated.
  - 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 08 80 00 "Glazing."

## 2.7 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
  - 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on edges of cutouts, and mortises.
- B. Factory finish doors.
- C. Transparent Finish:
  - 1. Grade: Premium.
  - 2. Finish: WDMA TR-6 catalyzed polyurethane.
  - 3. Staining: Match Architect/Engineer's sample.
  - 4. Effect: Open-grain finish.
  - 5. Sheen: Match Architect/Engineer's sample.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
  - 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
  - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.



### 3.2 INSTALLATION

- A. Hardware: For installation, see Section 08 71 00 "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
  - 1. Install fire-rated doors according to NFPA 80.
  - 2. Install smoke- and draft-control doors according to NFPA 105.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

### 3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08 14 16

## **SECTION 087100 – DOOR HARDWARE**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. This Section includes finish hardware for the proper operation and control of all doors in the Project. Prior to bidding, notify Architect of any doors that do not have hardware meeting this intention.
- B. Hardware supplier will be responsible to furnish and install hardware on labeled doors to satisfy State and Local Building Codes.
- C. Related Sections include the following:
  - 1. Division 8 Section "Hollow Metal Doors and Frames."
  - 2. Division 8 Section "Flush Wood Doors."

#### **1.3 SUBMITTALS**

- A. Product Data: For each product and material indicated, submit manufacturer's technical product data. Include information necessary to show compliance with requirements, installation instructions and maintenance instructions.
- B. Hardware Schedule: Submit a hardware schedule organized into sets, including the information below. Designations for door numbers and hardware sets shall match those used in the construction documents.
  - 1. Opening Number
  - 2. Door Type and Size
  - 3. Frame Type and Size
  - 4. Frame Anchoring Method
  - 5. Hardware Set
  - 6. Assembly Rating
- C. Hardware Schedule shall be coordinated with the doors, frames and related work to ensure proper size, thickness, hand function and finish of door hardware

#### **1.4 QUALITY ASSURANCE**

- A. Supplier Qualifications: A recognized Architectural Finish Hardware Supplier, with warehousing facilities, who has been furnishing hardware in the Project's vicinity for a period of not less than two (2) years. Supplier shall be or employ an experienced Architectural Hardware Consultant (AHC) who is certified by and member of the Door and Hardware Institute. The Architectural hardware Consultant shall be available, at reasonable times during the course of the work, for consultation about Project's hardware requirements, to Owner, Architect and Con-

tractor.

- B. Fire-Rated Openings: Provide hardware for fire-rated openings in compliance with NFPA Standard No. 80, No. 101 and local building code requirements. Provide only hardware, which has been tested and listed, by UL, FM or Warnock Hersey for types and sizes of doors required and complies with requirements of door and door frame labels.
- C. Standards: Comply with the requirements of the latest edition of the following standards unless indicated otherwise:
  - 1. American National Standards Institute Publications:
    - a. A115 Series – Door and Frame Preparation
    - b. A156 Series – Hardware
  - 2. Builders Hardware Manufacturer's Association Publications:
    - a. 1201 – Auxiliary Hardware
    - b. 1301 – Materials and Finishes
  - 3. Door and Hardware Institute Publications:
    - a. Keying – Procedures, Systems and Nomenclature
    - b. Abbreviations and Symbols
    - c. Hardware for Labeled Fire Doors
    - d. Recommended Locations for Builder's Hardware for Standard and Custom Steel Doors and Frames
    - e. Wood Door Standards W1, W2, WDHS-2, WDHS-3
  - 4. National Fire Protection Association Publications
    - a. NFPA 80 – Standards for Fire Doors and Windows
    - b. NFPA 101 – Life Safety Code
  - 5. International Building Code – 2015 Edition
  - 6. American with Disabilities Act.
- D. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 2. Inspect and discuss preparatory work performed by other trades.
  - 3. Inspect and discuss electrical roughing-in for electrified door hardware.
  - 4. Review sequence of operation for each type of electrified door hardware.
  - 5. Review required testing, inspecting, and certifying procedures.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Package each hardware item in separate containers with all screws, wrenches, installation instructions and installation templates. Mark each box with hardware heading and door number according to approved hardware schedule.
- B. Deliver individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation: Provide a complete packing list showing items, door numbers and hardware headings with each shipment.
- C. Store hardware in shipping cartons above ground and under cover to prevent damage. Provide secure lockup for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable -so that completion of the Work will not be delayed by hardware losses both before and after installation.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with delivery and/or installation when ambient and substrate temperature conditions are outside limits permitted by material manufacturers.

1.7 COORDINATION

- A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- C. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

**PART 2 - PRODUCTS**

2.1 HARDWARE GENERAL

- A. Provide the materials of products indicated by trade names, manufacturer's name, or catalog number. Substitutions will not be permitted except as described in Division 1.
- B. Provide manufacturer's standard products meeting the design intent of this Specification, free of imperfections affecting appearance or serviceability.
  - 1. Provide hardware complete with all fasteners, anchors, instructions, layout templates, and any specialized tools as required for satisfactory installation and adjustment.
  - 2. Hand of Door: Drawings show direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
  - 3. Furnish screws for installation with each hardware item. Provide Phillips flat head screws except as otherwise indicated or approved. Finish screws exposed under any condition to match hardware finish, or, if exposed in surface of other work, to match finish of such other work as closely as possible. Use machine screws for metal connections and wood screws for connections to wood. Use manufacturer's screws to secure hardware.
  - 4. Provide concealed fasteners for hardware unit with care exposed when door is closed, except to extent no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt, head or nut on opposite face is exposed in other work, except where indicated otherwise or where it is not feasible to adequately reinforce the work. In such cases, provide sleeves for each thru-bolt or use sex screw fasteners.
  - 5. Special Tools: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance and removal and replacement of finish hardware.
- C. Hardware is specified in the hardware schedule by set, type and functions, which have been selected as best meeting the application requirements. Acceptable products for each category are specified in Paragraph 2.5 "Hardware Products".

## 2.2 SPECIAL REQUIREMENTS

- A. General:
  - 1. Where new doors and hardware are scheduled to be installed in existing frames, contractor to coordinate hinge sizes and locations, lockset backsets, strikes, hardware mounting heights, etc with existing frames to ensure new door and hardware fits and functions properly in existing frame.
- B. Hinges:
  - 1. Use heavy weight hinges for all doors.
  - 2. Provide non-removable pins for all exterior doors and out-swinging corridor doors. Use nonrising pins for all other doors.
  - 3. Pre-drill pilot holes for hinge fasteners at factory to suit hinge type.
- C. Locksets:
  - 1. Locksets to be grade 1 heavy duty cylindrical or as specified.
- D. Exit Devices:
  - 1. All latchbolts to be deadlatching type.
  - 2. All touchbars to be stainless steel.
  - 3. Devices are to incorporate a flush and tapered end cap.
  - 4. Devices incorporating plastic dogging components will not be allowed.
  - 5. Provide electrical options as specified.
- E. Closers:
  - 1. Comply with manufacturer's recommendations for unit size based on door size and usage.
  - 2. Provide parallel arms for all overhead closers, except as otherwise indicated.
  - 3. All closers UL Listed Certified to be in compliance with UBC 7.2 and UL 10C.
  - 4. Closers with Pressure Relief Valves will not be acceptable.
  - 5. Provide any brackets or plates required for proper installation of door closers.
- F. Stops
  - 1. Provide heavy duty and concealed or surface mounted overhead stop or holder for interior doors as specified. Provide overhead stop for interior doors that swing more than opens against equipment, casework, sidelights, and where conditions do not allow wall stop.
- G. Thresholds and Gasketing
  - 1. Provide thresholds, weatherstripping (including door sweeps, seals, astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items.
  - 2. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
  - 3. Gasketing and astragals on aluminum frames by door manufacturer.

## 2.3 KEYING

- A. Contractor to turn all cylinders over to MU key shop for keying.

## 2.4 FINISHES

- A. Standard: Comply with BHMA A156.18
  - 1. All door hardware to be US26D/630 throughout project.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the application units of hardware.
- C. Protect finishes on exposed surfaces from any damage by applying a strippable temporary protective covering before shipping.
- D. BHMA Designations: Comply with base material and finish requirements indicated by BHMA standards.

## 2.5 HARDWARE PRODUCTS

ITEM	SPECIFIED	APPROVED EQUAL
Hinges	Ives	Stanley
Locksets	Best	Schlage, Sargent
Cylinders	Best	No Substitutions
Closers	LCN	No Substitutions
Panic Devices	Von Duprin	Sargent, Precision
Flatgoods	Ives	Burns, Rockwood
Stops	Ives	Burns, Rockwood
Overhead Stops	Glynn Johnson	Rixson
Gasket	Zero	NGP, Reese

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine doors and frames with installer present for compliance with the requirements, for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Examine rough-in for electrical source power to verify actual locations of wiring connections before electrified door hardware installation.
- C. Notify Architect of any discrepancies or conflicts between the door schedule, door types, frame types, drawings, scheduled hardware and built condition.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Steel Frames: Comply with ANSI/DHI A115 Series
- B. Wood Doors: Comply with ANSI/DHI A115-W Series.

### 3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated in the following applicable publications, or as required to comply with governing regulations:
  - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
  - 2. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builder's Hardware for Custom Steel Doors and Frames."
  - 3. Wood Doors: DHI WDHS.2 "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to complete with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage and reinstallation of surface protective trim units to with finishing work. Do not install surface mounted items until finishes have been completed on substrates involved.

### 3.4 FIELD QUALITY CONTROL

- A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in written report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

### 3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating items of door hardware and each door to ensure proper operation of function of every unit. Replace units that cannot be adjusted to operate as intended and/or required. Adjust door control devices to compensation for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

### 3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper finish, and provide final protection and maintain condition that ensure door hardware is without damage or deterioration at time of owner occupancy.

### 3.7 DEMONSTRATION AND TRAINING

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate and maintain door hardware and door hardware finishes.

### 3.8 DOOR HARDWARE SETS

**HARDWARE SET: 1**

DOOR NUMBER:

T8270A-A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	NOTE	RELOCATED DOOR, FRAME, AND HARDWARE		

NOTE: DO NOT RELOCATE EXISTING HOLD OPEN.

NOTE: REPLICATE EXISTING FUNCTIONALITY WITH CARD READER AND AUTO OPERATOR.

**HARDWARE SET: 2**

DOOR NUMBER:

T8262-A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	SFIC	OWNER PROVIDED	626	BES
1	EA	STOREROOM LOCKSET	9K37D 14D	626	BES
1	EA	ELECTRIC STRIKE	7200 SERIES	630	ADA
1	EA	CARD READER	BY ACCESS CONTROL PROVIDER		
1	EA	NOTE	RE-USE BALANCE OF HARDWARE		

END OF SECTION  
087100



## SECTION 09 01 90.52 - MAINTENANCE REPAINTING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes maintenance repainting as follows:
  - 1. Removing existing paint.
  - 2. Patching substrates.
  - 3. Repainting, including staining and varnishing of wood.

#### 1.3 DEFINITIONS

- A. Finish Sheen Definitions.
  - 1. Flat: Lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
  - 2. Eggshell: Low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
  - 3. Satin: Low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
  - 4. Semi-gloss: Medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
  - 5. High- or Full- Gloss: High-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.
- B. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.
- C. Medium-Pressure Spray: 400 to 800 psi; 4 to 6 gpm.

#### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.5 SEQUENCING AND SCHEDULING

- A. Perform maintenance repainting in the following sequence, which includes work specified in this and other Sections:

1. Dismantle existing surface-mounted objects and hardware except items indicated to remain in place. Tag items with location identification and protect.
2. Verify that temporary protections have been installed.
3. Examine condition of surfaces to be painted.
4. Remove existing paint to the degree required for each substrate and surface condition of existing paint.
5. Apply paint system.
6. Reinstall dismantled surface-mounted objects and hardware unless otherwise indicated.

#### 1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  1. Include recommendations for product application and use.
  2. Include test data substantiating that products comply with requirements.
- B. Samples: For each type of paint system and each pattern, color, and gloss; in sizes indicated below .
  1. Include stepped Samples defining each separate coat, including fillers and primers. Resubmit until each required sheen, color, and texture is achieved.
  2. Include a list of materials for each coat of each Sample.
  3. Label each Sample for location and application.
  4. Sample Size:
    - a. Painted Surfaces: 4-by-8-inch Samples for each color and material, on hardboard.
    - b. Stained or Natural Wood: 12-by-12-inch Samples of natural- or stained-wood finish, on representative surfaces.
- C. Product List: For each paint product indicated, include the following:
  1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
  2. VOC content.

#### 1.7 INFORMATIONAL SUBMITTALS

- A. Color Matching Certificate: For computer-matched colors.
- B. Preconstruction Test Reports: For cleaning materials, paint removers and paint coatings and systems.

#### 1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra paint materials, from the same production run, that match products applied and that are packaged with protective covering for storage and identified with labels describing contents, including material, finish, source, and location on building.

1. Quantity: Furnish Owner with an additional 5 percent, but not less than 1 gal. or one case, as appropriate, of each material and color applied.

#### 1.9 QUALITY ASSURANCE

- A. Color Matching: Custom computer-match paint colors to colors indicated on Drawings. For colors indicated by a standardized coding system, obtain a color chip for each color indicated from the color-coding-system company; computer match paint colors to the color chips.
- B. Mockups: Prepare mockups of maintenance repainting processes for each type of coating system and substrate indicated and each color and finish required to demonstrate aesthetic effects and to set quality standards for materials and execution. Duplicate appearance of approved Sample submittals.
  1. Locate mockups on existing surfaces where directed by Architect.
  2. Surface-Preparation Mockups: On existing surfaces using applicable specified methods of cleaning and other surface preparation, provide mockup sample of at least 100 sq. ft..
  3. Coating Mockups: Two surfaces of at least 100 sq. ft. to represent surfaces and conditions for application of each type of coating system under same conditions as the completed Work.
  4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect/Engineer specifically approves such deviations in writing.
  5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.10 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing of cleaning materials, paint removers and compatibility of paint coatings and systems for each type of painted surface.
  1. Use test areas as indicated and representative of proposed materials and existing construction.
  2. Propose changes to materials and methods to suit Project.

#### 1.11 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
  1. Maintain containers in clean condition, free of foreign materials and residue.
  2. Remove rags and waste daily.

1.12 FIELD CONDITIONS

- A. Weather Limitations: Proceed with maintenance repainting only when existing and forecasted weather conditions are within the environmental limits set by each manufacturer's written instructions and specified requirements.
- B. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- C. Do not apply paint in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
  - 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer for surface preparation and during paint application and drying periods.

PART 2 - PRODUCTS

2.1 PREPARATORY CLEANING MATERIALS

- A. Water: Potable.
- B. Hot Water: Water heated to a temperature of 140 to 160 deg F.
- C. Detergent Solution: Solution prepared by mixing 2 cups of tetrasodium pyrophosphate (TSPP), 1/2 cup of laundry detergent that contains no ammonia, 5 quarts of 5 percent sodium hypochlorite bleach, and 15 quarts of warm water for every 5 gal. of solution required.
- D. Mildewcide: Commercial proprietary mildewcide or a job-mixed solution prepared by mixing 1/3 cup of household detergent that contains no ammonia, 1 quart of 5 percent sodium hypochlorite bleach, and 3 quarts of warm water.

2.2 PAINT, GENERAL

- A. General:
  - 1. There is no attempt to define the physical properties and composition of the painting materials. Furnished product shall be the manufacturer's equivalent to those specified.
  - 2. Provide primer and topcoat listed by the manufacturer as compatible with the substrate indicated.
    - a. Where conflict arises between manufacturer's printed application recommendation and scheduled product listing, the manufacturer's recommendations shall prevail, maintaining carrier type and gloss level indicated.
  - 3. Prime walls scheduled to receive wallcoverings, using primer indicated on Painting Schedule for substrate, unless noted otherwise.

B. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. Color Standard:

1. Colors shall match color selections indicated on the Drawings.
2. The use of paint manufacturer names are for color selection only, and do not indicate selection of a particular manufacturer's products.

2.3 PAINT MATERIALS, GENERAL

- A. Transition Coat: Paint manufacturer's recommended coating for use where a residual existing coating is incompatible with the paint system.

2.4 PAINT MATERIALS

- A. Refer to Section 09 91 23 "Interior Painting" for paint materials to be used in repainting.

2.5 PATCHING MATERIALS

- A. Wood-Patching Compound: Two-part, epoxy-resin, wood-patching compound; knife-grade formulation as recommended in writing by manufacturer for type of wood repair indicated, tooling time required for the detail of work, and site conditions. Compound shall be designed for filling voids in damaged wood materials that have deteriorated from weathering and decay. Compound shall be capable of filling deep holes and spreading to feather edge.
- B. Metal-Patching Compound: Two-part, polyester-resin, metal-patching compound; knife-grade formulation as recommended in writing by manufacturer for type of metal repair indicated, tooling time required for the detail of work, and site conditions. Compound shall be produced for filling metal that has deteriorated from corrosion. Filler shall be capable of filling deep holes and spreading to feather edge.
- C. Cementitious Patching Compounds: Cementitious patching compounds and repair materials specifically manufactured for filling cementitious substrates and for sanding or tooling prior to repainting; formulation as recommended in writing by manufacturer for type of cementitious substrate indicated, exposure to weather and traffic, the detail of work, and site conditions.
- D. Gypsum-Plaster Patching Compound: Finish coat plaster and bonding compound according to ASTM C 842 and manufacturer's written instructions.

## PART 3 - EXECUTION

### 3.1 PROTECTION

- A. Comply with each manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent chemical solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.
  - 1. Cover adjacent surfaces with materials that are proven to resist chemical solutions being used unless the solutions will not damage adjacent surfaces. Use protective materials that are UV resistant and waterproof. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.
  - 2. Do not apply chemical solutions during winds of sufficient force to spread them to unprotected surfaces.
  - 3. Neutralize and collect alkaline and acid wastes before disposal.
  - 4. Dispose of runoff from operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

### 3.2 MAINTENANCE REPAINTING, GENERAL

- A. Maintenance Repainting Appearance Standard: Completed work is to have a uniform appearance as viewed by Architect/Engineer from building interior at 5 feet away from painted surface and from building exterior at away from painted surface.
- B. Execution of the Work: In repainting surfaces, disturb them as minimally as possible and as follows:
  - 1. Remove failed coatings and corrosion and repaint.
  - 2. Verify that substrate surface conditions are suitable for repainting.
  - 3. Allow other trades to repair items in place before repainting.
- C. Mechanical Abrasion: Where mechanical abrasion is needed for the work, use gentle methods, such as scraping and lightly hand sanding, that will not abrade softer substrates, reducing clarity of detail.
- D. Heat Processes: Do not use torches, heat guns, or heat plates.

### 3.3 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of painting work. Comply with paint manufacturer's written instructions for inspection.
- B. Maximum Moisture Content of Substrates: Do not begin application of coatings unless moisture content of exposed surface is below the maximum value recommended in writing by paint

manufacturer and not greater than the following maximum values when measured with an electronic moisture meter appropriate to the substrate material:

1. Concrete: 12 percent.
  2. Gypsum Board: 12 percent.
  3. Gypsum Plaster: 12 percent.
  4. Masonry (Clay and CMU): 12 percent.
  5. Portland Cement Plaster: 12 percent.
  6. Wood: 15 percent.
- C. Alkalinity: Do not begin application of coatings unless surface alkalinity is within range recommended in writing by paint manufacturer. Conduct alkali testing with litmus paper on exposed plaster, cementitious, and masonry surfaces.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
1. If existing surfaces cannot be prepared to an acceptable condition for proper finishing by using specified surface-preparation methods, notify Architect/Engineer in writing.
- E. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

### 3.4 PREPARATORY CLEANING

- A. General: Use the gentlest, appropriate method necessary to clean surfaces in preparation for painting. Clean all surfaces, corners, contours, and interstices.
- B. Detergent Cleaning: Wash surfaces by hand using clean rags, sponges, and bristle brushes. Scrub surface with detergent solution and bristle brush until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that surface remains wet. Rinse with water applied by clean rags or sponges.
- C. Mildew: Clean off existing mildew, algae, moss, plant material, loose paint, grease, dirt, and other debris by scrubbing with bristle brush or sponge and detergent solution. Scrub mildewed areas with mildewcide. Rinse with water applied by clean rags or sponges.

### 3.5 PAINT REMOVAL

- A. General: Remove paint where indicated. Where cleaning methods have been attempted and further removal of the paint is required because of incompatible or unsatisfactory surfaces for repainting, remove paint to extent required by conditions.

1. Application: Apply paint removers according to paint-remover manufacturer's written instructions. Do not allow paint removers to remain on surface for periods longer than those indicated or recommended in writing by manufacturer.
    - a. Apply materials to all surfaces, corners, contours, and interstices, to provide a uniform final appearance without streaks.
    - b. After work is complete, remove protection no longer required. Remove tape and adhesive marks.
  2. Brushes: Use brushes that are resistant to chemicals being used.
    - a. Metal Substrates: If using wire brushes on metal, use brushes of same metal composition as metal being treated.
    - b. Wood Substrates: Do not use wire brushes.
  3. Spray Equipment: Use spray equipment that provides controlled application at volume and pressure indicated, measured at nozzle. Adjust pressure and volume to ensure that spray methods do not damage surfaces.
    - a. Equip units with pressure gages.
    - b. Unless otherwise indicated, hold spray nozzle at least 6 inches from surface and apply material in horizontal, back-and-forth sweeping motion, overlapping previous strokes to produce uniform coverage.
    - c. For chemical spray application, use low-pressure tank or chemical pump suitable for chemical indicated, equipped with nozzle having a cone-shaped spray.
    - d. For water-spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.
    - e. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.
- B. Paint Removal with Hand Tools: Remove paint manually using hand-held scrapers, wire brushes, sandpaper, and metallic wool as appropriate for the substrate material.
- C. Paint Removal with Alkaline Paste Paint Remover:
1. Remove loose and peeling paint using water, scrapers, stiff brushes, or a combination of these. Let surface dry thoroughly.
  2. Apply paint remover to dry, painted surface with brushes.
  3. Allow paint remover to remain on surface for period recommended in writing by manufacturer or as determined by preconstruction testing.
  4. Use mechanical methods recommended in writing by manufacturer to remove chemicals and paint residue.
  5. Repeat process if necessary to remove all paint.
- D. Paint Removal with Covered or Skin-Forming Alkaline Paint Remover:
1. Apply paint remover to dry, painted surface with brushes or as recommended in writing by manufacturer.
  2. Apply cover according to manufacturer's written instructions.
  3. Allow paint remover to remain on surface for period recommended in writing by manufacturer or as determined by preconstruction testing.
  4. Scrape off paint and remover.



5. Use mechanical methods recommended in writing by manufacturer to remove chemicals and paint residue.
6. For spots of remaining paint, apply alkaline paste paint remover according to "Paint Removal with Alkaline Paste Paint Remover" Paragraph.

### 3.6 SUBSTRATE REPAIR

- A. General: Repair substrate surface defects that are inconsistent with the surface appearance of adjacent materials and finishes.
- B. Wood Substrate:
  1. Repair wood defects including dents and gouges more than 1/8 inch in size and all holes and cracks by filling with wood-patching compound and sanding smooth. Reset or remove protruding fasteners.
  2. Where existing paint is allowed to remain, sand irregular buildup of paint, runs, and sags to achieve a uniformly smooth surface.
- C. Cementitious Material Substrate:
  1. General: Repair defects including dents and chips more than 1/4 inch in size and all holes and cracks by filling with cementitious patching compound and sanding smooth. Remove protruding fasteners.
  2. New and Bare Plaster: Neutralize surface of plaster with mild acid solution as recommended in writing by paint manufacturer. In lieu of acid neutralization, follow manufacturer's written instruction for primer or transition coat over alkaline plaster surfaces.
  3. Concrete, Cement Plaster, and Other Cementitious Products: Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. If surfaces are too alkaline to paint, correct this condition before painting.
- D. Gypsum-Plaster and Gypsum-Board Substrates:
  1. Repair defects including dents and chips more than 1/8 inch in size and all holes and cracks by filling with gypsum-plaster patching compound and sanding smooth. Remove protruding fasteners.
  2. Rout out surface cracks to remove loose, unsound material; fill with patching compound and sand smooth.
- E. Metal Substrate:
  1. Preparation: Treat repair locations by wire-brushing and solvent cleaning. Use mechanical rust removal method to clean off rust.
  2. Defects in Metal Surfaces: Repair non-load-bearing defects in existing metal surfaces, including dents and gouges more than 1/16 inch deep or 1/2 inch across and all holes and cracks by filling with metal-patching compound and sanding smooth. Remove burrs and protruding fasteners.
  3. Priming: Prime iron and steel surfaces immediately after repair to prevent flash rusting. Stripe paint corners, crevices, bolts, welds, and sharp edges. Apply two coats to surfaces that are inaccessible after completion of the Work.

### 3.7 PAINT APPLICATION, GENERAL

- A. Comply with manufacturers' written instructions for application methods unless otherwise indicated in this Section.
- B. Prepare surfaces to be painted according to the Surface-Preparation Schedule and with manufacturer's written instructions for each substrate condition.
- C. Apply a transition coat over incompatible existing coatings.
- D. Metal Substrate: Stripe paint corners, crevices, bolts, welds, and sharp edges before applying full coat. Apply two coats to surfaces that are inaccessible after completion of the Work. Tint stripe coat different than the main coating and apply with brush.
- E. Blending Painted Surfaces: When painting new substrates patched into existing surfaces or touching up missing or damaged finishes, apply coating system specified for the specific substrate. Apply final finish coat over entire surface from edge to edge and corner to corner.

### 3.8 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage paint-remover manufacturer's factory-authorized service representative for consultation and Project-site inspection and to provide on-site assistance when requested by Architect/Engineer.
- B. Paint Material Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for composition and dry film thickness.
  - 1. Paint Composition: The following procedure may be performed at any time and as often as Owner deems necessary during the period when paints are being applied:
    - a. Testing agency will sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
    - b. Testing agency will perform tests for compliance of paint materials with product requirements.
    - c. If test results show materials being used do not comply with product requirements, Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.
  - 2. Dry Film Thickness:
    - a. Contractor shall touch up and restore painted surfaces damaged by testing.
    - b. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written instructions, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written instructions.

3.9 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect/Engineer, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION 09 01 90.52

## SECTION 09 05 60 – COMMON WORK RESULTS FOR FLOORING PREPARATION

### PART 1 - GENERAL

#### 1.1 SPECIAL CONDITIONS

- A. This section is included to show possible options for flooring preparation that may be used by the Contractor.
- B. It is the Contractors responsibility to provide all necessary floor preparation required for the project based on the selected finish flooring.
- C. The referenced materials are only options for the contractor to utilize as needed to achieve proper adhesion to the subfloor substrate.
- D. Cost for any used materials or processes are the responsibility of the Contractor. Methods may range from concrete additives to various topping solutions.
- E. Factors affecting floor adhesion issues may range from slab moisture to alkalinity, etc.
- F. Studies have found that getting the building properly enclosed and getting the HVAC operating is one of the best ways to achieve drying out of the slabs. Completion schedules may not allow proper time for this to adequately occur.
- G. It is the Contractor's responsibility to coordinate and schedule components of the work as needed to achieve the substrate conditions necessary for proper installation of floor finishes. This includes but is not limited to moisture reduction in concrete floor slabs. The Contractor may use the following or other methods necessary to achieve the necessary substrate condition for the finished flooring as required by the flooring manufacturer.

#### 1.2 RELATED DOCUMENTS

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

#### 1.3 SUMMARY

- A. Section Includes:
  - 1. Floor substrate testing for flatness, relative humidity moisture vapor transmission, and alkalinity.
  - 2. Floor substrate preparation and remediation under the Subfloor Preparation.
  - 3. Installation of self-leveling floor leveling materials.

4. Installation of moisture vapor reducing membrane under the Moisture Vapor Transmission Reducing Membrane Allowance.

B. Related Requirements:

1. Section 09 67 23 "Resinous Flooring."

#### 1.4 PREINSTALLATION MEETINGS

A. Pre-Installation Conference: Conference shall include concrete installer and finished flooring installers. Review methods and procedures including, but not limited to, the following:

1. Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays
2. Review requirements for verification and testing of subfloor condition, subfloor preparation, and environmental conditions required at time of flooring installation.
3. Review requirements for installation and protection of moisture vapor reducing membrane.
4. Review flooring product requirements for subfloor flatness, subfloor surface profile, moisture vapor transmission, and alkalinity.

#### 1.5 ACTION SUBMITTALS

A. Product Data: Manufacturer's standard printed product information, indicating compliance with requirements.

1. Preparation Instructions: Finished flooring manufacturer's written preparation instructions.

#### 1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing agency.

B. Material Test Reports: For each patching or leveling compound.

C. Field Quality-Control Test Reports. Provide test reports for each type and location of field test, indicating type of test, location of test site, test values, values required to pass, and identification of testing agency.

1. Submit copies of field test reports, with location of test indicated, for the following:
  - a. Concrete slab relative humidity moisture vapor transmission rate.
  - b. Concrete slab alkalinity.
  - c. Concrete floor flatness and levelness.

D. Certifications:

1. Submit certification of qualification from the installer.
2. Submit certification of compliance with specifications and flooring manufacturer's requirements for floor preparation.

- a. Furnish copies with operating and maintenance manual.
- E. Flooring Preparation Plan: Provide written plan indicating locations, flooring material, substrate, proposed remediation products, and proposed preparation steps based on known or anticipated conditions.
  - 1. Coordinate plan with written preparation and installation instructions provided by finished flooring manufacturer and written instructions of remediation products specified under this Section.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications:
  - 1. Installer who is approved or trained by manufacturer for application of underlayment products required for this Project.
  - 2. Minimum 3 years experience installing products specified, in projects of similar size and scope.
  - 3. Submit 3 references for similar installations completed during the last 3 years.

#### 1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to test flooring substrate for compliance with specified requirements for performance and test methods.

#### 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to jobsite or offsite warehouse in unopened wrapping, boxes or containers.
- B. Storage:
  - 1. Store materials in a covered, climate controlled facility, with temperatures between 40 degrees F and 90 degrees F.
  - 2. Store material off ground or floor in protective packaging.
  - 3. Do not permit materials to become wet.

#### 1.10 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit preparation work to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Indicate measurements on Shop Drawings.

1.11 COORDINATION

- A. Coordinate schedule and location of testing to minimize disruption of Work.
- B. Coordinate requirements for testing, preparation, and remediation work with work specified in other sections.

1.12 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of underlayment or moisture vapor reducing membrane that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including delamination or blistering.
    - b. Incompatibility with or failure of product to adhere to substrate material up to the tensile strength of concrete.
  - 2. Replacement includes removal of existing flooring and underlayment or moisture vapor reducing membrane, replacement of defective or non-performing material, and replacement of finish flooring with new flooring of the same type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of product through one source from a single manufacturer.
  - 1. Where more than one product is installed for remediation, each product shall be certified as being compatible with subsequently applied materials.

2.2 TROWELABLE POLYMER-MODIFIED CEMENTITIOUS UNDERLAYMENT

- A. Underlayment: Hydraulic-cement-based, polymer-modified, trowelable product that can be applied to a maximum uniform thickness of 3/8 inch and that can be feathered at edges to match adjacent floor elevations.
  - 1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Ardex Engineered Cements; SD-F Feather Finish.
    - b. Bonsal American; B-1 Leveler.
    - c. Degussa Construction Chemicals:
      - 1) Sonneborn Sonocrete Sonopatch PC.
      - 2) Sonneborn Sonoskim.

- 3) Thoro Underlayment (Trowel Grade).
  - d. Dayton Superior Corporation; Sure Finish.
  - e. Dependable Chemical Co., Inc.; Skimcrete.
  - f. L&M Construction Chemicals, Inc.; Durathin.
  - g. MAPEI Corporation; Planipatch SC, Planipatch FR, Mapecem Quickpatch.
  - h. TEC; VersaPatch.
- 2. Cement Binder: ASTM C 150, Portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C 219.
  - a. Do not use air entraining agents or cements.
- 3. Compressive Strength: Not less than 3500 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer formulated for use with underlayment when applied to substrate and conditions indicated.

## 2.3 SELF-LEVELING CEMENTITIOUS UNDERLAYMENTS

- A. Underlayment: Hydraulic-cement-based, polymer-modified, self-leveling product that can be applied in minimum uniform thicknesses of 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
  - 1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Ardex Engineered Cements; K-15 Self-Leveling Underlayment Concrete.
    - b. Bonsal American; ProSpec Self-Leveling Underlayment.
    - c. Degussa Construction Chemicals:
      - 1) MBT Mastertop 110 Plus Underlayment.
      - 2) Sonneborn Sonocrete Sonoflow.
      - 3) Thoro Underlayment, Self-Leveling.
    - d. Dayton Superior Corporation; LeveLayer I.
    - e. Dependable Chemical Co., Inc.; Skimflow ES.
    - f. L&M Construction Chemicals, Inc.; Levelex.
    - g. MAPEI Corporation; Ultraplan 1 Plus, Ultraplan M20 Plus, Ultraplan Easy.
    - h. Maxxon Corporation; Level-Right.
    - i. US Mix Products Company; US SPEC Self - Leveling Underlayment.
  - 2. Cement Binder: ASTM C 150, Portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C 219.
    - a. Do not use air entraining agents or cements.
  - 3. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.



4. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer formulated for use with underlayment when applied to substrate and conditions indicated.
- B. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch, or coarse sand as recommended by underlayment manufacturer.
  1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.

#### 2.4 MOISTURE VAPOR TRANSMISSION REDUCING MEMBRANE

- A. Membrane: single component, latex-based product that reduces moisture vapor transmission through concrete slabs to an acceptable level for the installation of floor covering systems, up to 8 pounds of moisture vapor transmission (when tested according to ASTM F 1869). Membrane may also be used to isolate cutback and other adhesive residue, to allow safe installation of floor covering.
  1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. All Purpose Adhesive Company; ENCapSeal
    - b. Dependable Chemical Co., Inc.; Cutdown.
  2. Warranty: 5-year limited warranty against moisture vapor transmission related failure of flooring.
    - a. Warranty shall provide for installation labor and material replacement of moisture vapor transmission reducing membrane and applied flooring.
- B. Membrane: multi-component, epoxy-based system that reduces moisture vapor transmission through concrete slabs to an acceptable level for the installation of floor covering systems, up to 12 pounds of moisture vapor transmission (when tested according to ASTM F 1869).
  1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Sinak Corporation:
      - 1) For maximum MVTR up to 3 lbs/1000 SF/24 hours: Vect-R3.
      - 2) For maximum MVTR up to 5 lbs/1000 SF/24 hours: Vect-R5.
  2. Warranty: 10-year limited warranty against moisture vapor transmission related failure of flooring.
- C. Membrane: single component, latex-based product that reduces moisture vapor transmission through concrete slabs to an acceptable level for the installation of floor covering systems, up to 25 pounds of moisture vapor transmission (when tested according to ASTM F 1869).
  1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

- a. Dependable Chemical Co., Inc.; Vaporseal.
- 2. Warranty: 25-year limited warranty against moisture vapor transmission related failure of flooring.
- .
  - D. Cementitious Grout for Use under epoxy flooring: multiple component, polymer modified, cementitious, osmotic pressure resistant grout that reduces moisture vapor transmission through concrete slabs to an acceptable level for the installation of floor covering systems.
    - 1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
      - a. Stonhard, a division of StonCor Group, Inc.; Stonfil OP2.
      - b. Flooring manufacturer's recommended cementitious grout product suitable for use under epoxy or urethane flooring systems.
  - E. Membrane for Use Under Epoxy Flooring: two-part epoxy resin based coating that reduces moisture vapor transmission through concrete slabs to an acceptable level for the installation of floor covering systems.
    - 1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
      - a. Koester American Corporation; VAP 1 2000 System.
      - b. MAPEI Corporation; Planiseal EMB, Planiseal VS, Planiseal VS Fast.
      - c. Flooring manufacturer's recommended epoxy or urethane product suitable for use under epoxy or urethane flooring systems.
- 2.5 PRIMER
  - A. Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.
- 2.6 WATER
  - A. Potable, at a temperature of not more than 70 deg F.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Flooring Installer present, for compliance with requirements for substrate condition, maximum moisture content, adhesive bond, substrate alkalinity, subfloor levelness and flatness tolerances, and other conditions affecting performance of work.

1. Ensure that existing adhesives have been totally removed prior to new installation.
2. Furnish written report to the Architect/Engineer describing and locating non-conforming substrates. Do not proceed with Work until non-conforming substrates are corrected.
3. Re-inspect corrected areas as required for initial examination, to confirm substrate is ready for application of flooring.
4. The start of flooring installation shall indicate that substrate conditions are acceptable for application of flooring, including the following conditions:
  - a. The relative humidity, moisture vapor transmission rate and alkalinity of the concrete subfloor and patching materials is within the acceptable limits as defined by the flooring manufacturer's requirements.
  - b. Proper bond will be obtained between the finished flooring, adhesive, moisture vapor reducing membrane, patching materials and concrete subfloor.
  - c. Subfloor flatness and levelness are within specified tolerances.

B. Site Verification Of Conditions:

1. Test concrete floor relative humidity using in-situ probes per ASTM F 2170 .
  - a. Pre-installation testing:
    - 1) Perform testing prior to moisture vapor reducing membrane installation flooring installation, permitting enough time for additional drying or remediation of high moisture transmittance conditions.
    - 2) Test in areas scheduled to receive resilient flooring.
    - 3) Perform a minimum of 3 tests for the first 1000 square feet per floor, with 1 test per additional 1000 square feet.
    - 4) Maximum tested value shall be acceptable to the flooring manufacturer.
    - 5) Where MVTR or relative humidity test fails, retest each non-complying area, after remediation, per requirements for initial testing.
2. Test alkalinity (pH) of concrete subfloor in accordance with ASTM F 710, or using method recommended by flooring manufacturer.
  - a. Perform test in area adjacent to each pre-installation relative humidity and MVTR test. Report alkalinity on the same form used for reporting results of adjacent relative humidity and MVTR test.
  - b. Do not apply flooring if pH is equal to or greater than 10, or maximum level acceptable to flooring manufacturer.
3. Floor flatness and levelness testing:
  - a. Verify flatness and levelness of area to receive underlayment using a 10-foot straightedge or Type I or Type II floor profilometer capable of producing a graphic record of floor elevation changes, measured in accordance with ASTM E 1155.
  - b. Tolerances: Areas exceeding tolerances shall receive cementitious underlayment to meet or exceed installation tolerances specified in the Section.
    - 1) Flatness:
      - a) Straightedge: 1/8-inch gap under a 10-foot unlevelled straightedge, when measured between any 2 high points.

- b) Profilometer: any aggregate area with a maximum flatness variation exceeding 1/8-inch from highpoint to low-point
- 2) Level Alignment: Variance in elevation of top of slab in any structural bay shall not exceed 3/4 inch.
- c. Test Sections less than 8 feet on a side or less than 320 square feet or at slab boundaries, block-outs or other discontinuities excluded by ASTM E 1155: measure surface so gap to at any point between concrete surface and an unlevelled freestanding 10-foot- long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed 1/8 inch.

### 3.2 PREPARATION FOR FLOORING INSTALLATION

- A. Concrete Substrates: Prepare according to ASTM F710.
- B. Prepare substrates according to floor covering manufacturer's written recommendations to ensure adhesion of floor coverings.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Perform tests recommended by manufacturer and as specified. Proceed with installation only after substrates pass testing.
- C. Remove existing flooring, including underlayments and setting beds to expose a sound substrate. Grind substrate if required to thoroughly remove any traces of the floor material adhesive or other foreign material.
  - 1. Remove adhesives from all existing floors receiving new covering, where recommended or required by finished flooring manufacturer, using methods recommended or approved by the flooring manufacturer.
- D. Surface Preparation:
  - 1. Concrete subfloors and cementitious underlayments shall cure a minimum of 28 days before flooring is installed.
  - 2. Scrape, grind, or otherwise remove projections from the face of subfloor to level with the subfloor.
  - 3. Neatly patch, fill, or otherwise repair all cracks, marks, irregularities, and other conditions in the subfloors that may telegraph through the finished installation.
  - 4. Apply moisture vapor reducing membrane in all areas indicated to receive [epoxy terrazzo, ] [and ] [impervious backed carpet], and where moisture vapor transmission rate or internal relative humidity exceeds limits indicated in specifications.
  - 5. Apply trowelable polymer modified cementitious underlayment where required to correct subfloor irregularities and floor depressions greater than a 1/8 inch gap under a 10 foot straightedge.
  - 6. Apply trowelable polymer modified cementitious underlayment at transition edge between resilient flooring and dissimilar flooring materials to allow for a "flush" transition. The slope of the underlayment shall provide for a gradual transition to the thicker flooring material.

7. Trowelable polymer modified cementitious fill shall be steel troweled smooth. Trowel marks showing through installed flooring shall be reason to remove flooring and sand out trowel marks.
  8. For areas scheduled to receive epoxy flooring or tile, remove concrete surface and contaminants using shot blasting methods, to a maximum profile depth of 1/8 inch.
  9. Apply topping mortar in areas scheduled to receive tile requiring slope to drain. Slope bed 1/4 inch per foot minimum.
  10. Apply self-leveling cementitious underlayment, to correct floor depressions greater than 3/8 inch where indicated
- E. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Services: Testing and inspecting of completed applications of moisture vapor reducing membrane and underlayments shall take place in successive stages, in areas of extent and using methods as specified. Do not proceed with application for the next area until test results for previously completed applications show compliance with requirements.
- C. Remove and replace applications of moisture vapor reducing membrane and underlayment where test results indicate that it does not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### 3.4 CLEANING

- A. Clean floors thoroughly, using dry methods, after completion of preparation work.
- B. Clean excess material, splatter, dust, or other foreign material from non-floor surfaces.

### 3.5 PROTECTION

- A. Protect moisture vapor transmission reducing membranes from damage until finish flooring is installed.

END OF SECTION 09 05 60

## SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Grid suspension systems for gypsum board ceilings.
- B. Related Requirements:
  - 1. Section 05 40 00 "Cold-Formed Metal Framing" for exterior load-bearing and exterior non-load-bearing wall studs.

#### 1.3 DEFINITIONS

- A. Cold Formed Sheet Metal Gages: Provide cold formed sheet metal studs, runners, furring channels, and accessories manufactured from galvanized sheet steel with design base metal thicknesses conforming to the following schedule. Actual minimum metal thickness shall not be less than 95 percent of the design metal thickness.
  - 1. 25 gage: 0.0179 inch .
  - 2. 22 gage: 0.0269 inch .
  - 3. 20 gage: 0.0329 inch for structural applications.
  - 4. 20 gage: 0.0296 inch for non-structural applications.
  - 5. 18 gage: 0.0451 inch
  - 6. 16 gage: 0.0538 inch .
  - 7. 14 gage: 0.0713 inch .

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Studs and Runners: Provide documentation that framing members' certification is according to SFIA's "Code Compliance Certification Program for Cold-Formed Steel Structural and Non-Structural Framing Members." SFIA's program certifies that studs and

runners comply with the IBC, AISI S220. Mechanical properties, coatings, dimensions, and labeling are checked.

- B. Product Certificates: For each type of code-compliance certification for studs and tracks.
- C. Evaluation Reports: For firestop tracks, post-installed anchors, and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

## 1.6 QUALITY ASSURANCE

- A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association (SFIA), or the Steel Stud Manufacturers Association.

## PART 2 – PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design non-structural metal framing.
  - 1. Delegated Design shall also include structural evaluation and recommendations for repair of field modifications to non-structural metal framing, such as but not limited to the cutting of holes in web members, that exceed the approved design or recognized industry standards.
- B. Structural Performance: Provide non-structural metal framing capable of withstanding design loads within limits under conditions indicated.
  - 1. Design Loads: As indicated on Structural Drawings.
  - 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
    - a. Interior Non-Load-Bearing Framing: Horizontal deflection of 1/360 of the wall height.
    - b. Ceiling/Soffit Framing: Vertical deflection of 1/360 of the span for live loads and 1/240 for total loads of the span.
  - 3. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
    - a. Maximum steel frame structure deflection shall be L/360, over spans indicated.
    - b. Maximum concrete frame structure deflection shall be L/600, over spans indicated.
- C. Stud Selection:

1. General: Select stud gages from manufacture's published design properties and load/span tables, based on the deflection limit and the following selection criteria, for the wall span indicated on the Drawings.
  - a. Stud Selection Criteria:
    - 1) Stud properties shall not be less than specified for stud of depth indicated.
    - 2) Furnish studs of depth indicated.
    - 3) Furnish studs of yield strength, profile, gage and spacing required to meet deflection criteria at the design load.
    - 4) Furnish studs with the most economical yield strength, profile, gage and spacing to meet selection criteria.
    - 5) Stud spacing shall not exceed 16 inches on center.
2. Interior:
  - a. General: 5 pounds per square-foot uniform load over the full height of the studs.
  - b. Partial height walls acting as guardrails:
    - 1) Uniform load acting horizontally on face of wall: 50 pounds per square foot.
    - 2) Point load acting horizontally at top of wall: 200 pounds.
    - 3) Loads are not assumed to act concurrently.

## 2.2 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.
- B. Hanger Attachments to Concrete:
  1. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on AC58, or AC308 as appropriate for the substrate.
    - a. Uses: Securing hangers to structure.
    - b. Type: adhesive anchor, or adhesive anchor.
    - c. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
- D. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Armstrong World Industries, Inc; Drywall Grid Systems.
    - b. Chicago Metallic Corporation; 640/660 Drywall Ceiling Suspension and 650/670 Fire Rated Drywall Ceiling Suspension.
    - c. USG Corporation; Drywall Suspension System.



## 2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
  - 1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
  - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.

### 3.3 INSTALLING CEILING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
  - 1. Hangers: 48 inches o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
    - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
    - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
  3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  4. Do not attach hangers to steel roof deck.
  5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
  6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
  7. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 09 22 16

## SECTION 09 29 00 - GYPSUM BOARD

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Interior gypsum board.
  - 2. Tile backing panels.
  - 3. Sound attenuation insulation.
- B. Related Requirements:

#### 1.3 PREINSTALLATION MEETINGS

- A. Pre-Installation Meeting: Conduct conference at Project site. Review methods and procedures related to drywall finishing including, but not limited to, the following:
  - 1. Coordination of drywall finishing work with specific wall coverings and finishes.
  - 2. Identify wall surfaces scheduled to receive gloss finishes, subject to critical lighting, or receiving finishes requiring special flatness or finishing tolerances.
  - 3. Coordinate finishing levels and tolerances with wall finish installers.
  - 4. Pre-installation meeting shall include wallcovering installers, painters, and other trades that will apply finishes to gypsum board assemblies.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Joint treatment for finishing system, application and installation instructions, and materials data.
  - 2. Manufacturer's data on all products is to be supplied.
  - 3. Indicate stud type, size, and gage to be used, by location or wall type
  - 4. Describe method for securing studs to tracks; blocking and framing connections.
  - 5. Copy of UL or GA Design Classification indicating products to be furnished under this Section.
- B. Samples: For the following products:
  - 1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.

2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for work.

## 1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups of as directed by the Architect in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.
  1. Build mockups for the following:
    - a. Level 5 gypsum board finish.
  2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
  3. Simulate finished lighting conditions for review of mockups.
  4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.6 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

## 1.7 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
  1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

## PART 2 – PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
  1. Where products other than the reference standards are provided, fire-rated construction is indicated, and a specific UL or GA Design Classification is designated, provide only

products listed in the Design Classification or an equivalent UL or GA Design Classification, acceptable to the Architect/Engineer.

- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

## 2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

## 2.3 INTERIOR GYPSUM BOARD

- A. Gypsum Board, Type X: ASTM C 1396/C 1396M.

- 1. Products: Subject to compliance with requirements, provide one of the following:

- a. CertainTeed Corporation; CertainTeed Type X.
    - b. Continental Building Products, LLC; Firecheck Type X.
    - c. Georgia-Pacific Gypsum LLC; Tough Rock Fireguard X.
    - d. National Gypsum Company; Gold Bond Brand Fire-Shield Gypsum Board.
    - e. USG Corporation; USG Sheetrock® Brand Firecode® X Panels.

- 2. Thickness:

- a. General: 5/8 inch, unless otherwise indicated.
    - b. Curved Fire-Rated Assemblies: 2 layers (one layer 3/8" thick and one layer 1/4" thick), for wall radius range 3 feet to 18 feet.

- 3. Long Edges: Tapered.

- 4. Locations: Where drywall is indicated, fire-rated assemblies and non-fire-rated assemblies.

- B. Abuse-Resistant Gypsum Board: ASTM C 1396/C 1396M gypsum board, tested according to ASTM C 1629/C 1629M.

- 1. Products: Subject to compliance with requirements, provide one of the following:

- a. Continental Building Products, LLC; Protecta AR 100 Type X with Mold Defense.
    - b. Georgia-Pacific Gypsum LLC; DensArmor Plus Abuse-Resistant Interior Panel.
    - c. National Gypsum Company; Gold Bond XP Hi-Abuse Gypsum Board..
    - d. USG Corporation; USG Sheetrock® Brand Mold Tough® Abuse-Resistant Firecode®.

- 2. Core: 5/8 inch, Type X.

- 3. Surface Abrasion: ASTM C 1629/C 1629M, meets or exceeds Level 3 requirements.

- 4. Indentation: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements.

- 5. Soft-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 2 requirements.

- 6. Long Edges: Tapered.

7. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- A. Impact-Resistant Gypsum Board: ASTM C1396/C1396M gypsum board, tested according to ASTM C1629/C1629M.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. CertainTeed; SAINT-GOBAIN; CertainTeed Extreme Impact Resistant Type X Gypsum Board with M2Tech Mold and Moisture Technology.
    - b. Continental Building Products Inc.; Protecta HIR 300 Type X with Mold Defense.
    - c. National Gypsum Company; Hi-Impact Brand XP Fire-Shield Wallboard.
    - d. USG Corporation; USG Sheetrock® Brand Mold Tough® VHI (Very High Impact) Firecode® Core.
  2. Core: 5/8 inch, Type X.
  3. Surface Abrasion: ASTM C1629/C1629M, meets or exceeds Level 3 requirements.
  4. Indentation: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.
  5. Soft-Body Impact: ASTM C1629/C1629M, meets or exceeds Level 3 requirements.
  6. Hard-Body Impact: ASTM C1629/C1629M, meets or exceeds Level 3 requirements according to test in Annex A1.
  7. Long Edges: Tapered.
  8. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
- C. Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. CertainTeed Corporation; ProRoc Moisture and Mold Resistant Gypsum Board. M2Tech Gypsum Board.
    - b. Continental Building Products, LLC; MDfz Mold Defense.
    - c. Georgia-Pacific Gypsum LLC; DensArmor Plus Interior Guard, Fireguard. ToughRock Mold-Guard Gypsum Board.
    - d. National Gypsum Company; Gold Bond Brand XP Wallboard.
    - e. USG Corporation; USG Sheetrock® Brand Mold Tough® Firecode® X Panels.
  2. Core: 5/8 inch, Type X.
  3. Long Edges: Tapered.
  4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
  5. Location:
    - a. Areas exposed to high moisture levels (toilets, behind counters with sinks, janitors closets).
    - b. Walls with ceramic tile wainscot, not subject to direct water exposure (public restrooms).
    - c. Ceilings in rooms subject to high moisture levels (toilet rooms, locker rooms, sterilization rooms) or exposed to direct moisture (showers, patient toilets).
    - d. Walls in rooms such as: Operating Rooms, Sterile core (between Operating Rooms), Sterile Supply Rooms, Cesarean/LDR/Delivery Rooms, General Procedure and Trauma Rooms.

## 2.4 SPECIALTY GYPSUM BOARD

- A. Gypsum Board, Type C: ASTM C 1396/C 1396M. Manufactured to have increased fire-resistive capability.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. CertainTeed Corporation; ProRoc Type C.
    - b. Continental Building Products, LLC; Firecheck Type C.
    - c. Georgia-Pacific Gypsum LLC; ToughRock Fireguard C.
    - d. National Gypsum Company; Gold Bond Fire-Shield C. Gold Bond XP Fire-Shield C .
    - e. USG Corporation; USG Sheetrock® Brand Firecode® C Gypsum Panels.
  2. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
  3. Long Edges: Tapered.
- B. Glass-Mat Interior Gypsum Board: ASTM C 1658/1658M. With fiberglass mat laminated to both sides. Specifically designed for interior use.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Georgia-Pacific Gypsum LLC; DensArmour Plus.
    - b. Continental Building Products; Weather Defense, Platinum Interior Series.
  2. Core: As Indicated.
  3. Long Edges: Tapered.
  4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- C. Acoustically Enhanced Gypsum Board: ASTM C 1396/C 1396M. Multilayer products constructed of two layers of gypsum boards sandwiching a viscoelastic sound-absorbing polymer core.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. CertainTeed Corporation; SilentFX.
    - b. National Gypsum Company; Sound Break.
    - c. Quiet Solution; Quiet Rock.
    - d. Supress Products, LLC; Sound-Engineered Drywall SED5848.
  2. Core: 5/8 inch, regular type.
  3. Long Edges: Tapered.
  4. Weight: 2.7 lbs/square foot.
  5. Minimum partition STC rating, 3-5/8 inch metal stud wall with fiberglass insulation:
    - a. Applied two sides: 55.
- D. Skim-Coated Gypsum Board: ASTM C 1396/C 1396M. Manufactured with a factory-applied skim coat.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Continental Building Products, LLC; Rapid Deco Level 5 Type X or a comparable product approved by the Architect.

2. Core: 5/8 inch, Type X.
3. Long Edges: Tapered.
4. Location: Where Level 5 finished drywall indicated, fire-rated assemblies and non-fire-rated assemblies.

## 2.5 TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. CertainTeed Corporation; GlasRoc Tile Backer.
  - b. Georgia-Pacific Gypsum LLC; DensShield Tile Backer.
  - c. National Gypsum Company; eXP Tile Backer.
  - d. USG Corporation; USG Durock™ Glass-Mat Tile Backerboard.

2. Core: 5/8 inch, Type X.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

- B. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or ASTM C 1325, with manufacturer's standard edges.

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. Custom Building Products; Wonderboard.
  - b. National Gypsum Company; PermaBase BRAND Cement Board.
  - c. USG Corporation; USG Durock® Brand Cement Board.
2. Thickness: to match existing.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
4. Location: Where indicated, at full height ceramic tile walls, and as substrate for horizontal ceramic tile or stone tile installation on casework or framed walls.

## 2.6 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.

1. Basis-of-Design: Subject to compliance with requirements, provide products by the following:
  - a. Trim-Tex, Inc.
2. Material: Mud-set vinyl.
3. Corner Bead (Drywall):
  - a. Outside corner.
  - b. Inside corner.
  - c. Bullnose corner.



- d. Fillable edge trim.
    - e. Reveal trim.
    - f. Control joint.
  - 4. Fire-Rated Control Joint (Drywall):
    - a. Control joint. Trim-Tex; 093X-V. Composite PVC control joint with a single strip of intumescent tape factory applied to the back side of the control joint.
- B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Fry Reglet Corporation.
    - b. Gordon, Inc.
    - c. Pittcon Industries.
  - 2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
  - 3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.
  - 4. Drywall Molding End Closure: Extruded aluminum.
    - a. Basis-of-Design: Subject to compliance with requirements, provide the following:
      - 1) Fry Reglet; Drywall Molding End Closures, DMEC Series.
    - b. Match profile indicated.

## 2.7 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
  - 1. Interior Gypsum Board: Paper, unless otherwise recommended by manufacturer for applications indicated.
  - 2. Glass-Mat Gypsum Sheathing Board: 10 by 10 glass mesh.
  - 3. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
  - 1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
  - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
  - 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
  - 4. Finish Coat: For third coat, use drying-type, all-purpose compound.

5. Skim Coat: For final coat of Level 5 finish, use high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

a. Products: Provide one of the following:

- 1) National Gypsum; ProForm Brand Surfacer/Primer.
- 2) Porter Paints; Maxbuild High Build Drywall Surfacer/Primer.
- 3) Sherwin-Williams; PrepRite High Build Primer/Surfacer.
- 4) United States Gypsum Company; Tuff-Hide Primer/Sealer.

D. Joint Compound for Tile Backing Panels:

1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
2. Cementitious Backer Units: As recommended by backer unit manufacturer.

## 2.8 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

E. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
  - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
  - 2. Fit gypsum panels around ducts, pipes, and conduits.
  - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

### 3.3 APPLYING INTERIOR GYPSUM BOARD

#### A. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
  - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
  - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

#### B. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

#### C. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

#### D. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch- long straight sections at ends of curves and tangent to them.
2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

### 3.4 APPLYING TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at showers, tubs, and where indicated. Install with 1/4-inch gap where panels abut other construction or penetrations.
- B. Cementitious Backer Units: ANSI A108.11, at showers, tubs, and where indicated.
- C. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

### 3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect/Engineer for visual effect and as follows:
  - 1. Install double studs with 1/2 inch minimum clearance between studs at control joint locations, full height of wall.
  - 2. At door jambs, install crippled stud at head adjacent to jamb stud, with a minimum of 1/2 inch clearance from jamb stud, for full remaining height of wall.
  - 3. At fire-rated walls:
    - a. Provide fire-blocking consisting of two layers of 5/8 inch fire-rated gypsum board or a 3 inch manumit length of safing insulation for full depth of wall, centered behind the control joint. Based on test WHI-647-3024, and WHI-651-0318.1.
    - b. Provide fire-rated control joint. Based on test UL-XHBN.WW-D-0172.
  - 4. Locations: Where indicated, or if not indicated:
    - a. Provide where partitions of dissimilar construction meet and remain in the same plane.
    - b. A maximum of 30 feet in any one direction.
    - c. Except at dissimilar partitions and where walls exceed 30 feet in length without interruption, install control joints at the door jamb adjacent to largest unbroken wall area.
    - d. At building expansion or control joints in furred masonry walls.
- C. Interior Trim: Install in the following locations:
  - 1. Cornerbead: Use at outside corners unless otherwise indicated.
  - 2. Bullnose Bead: Use at outside corners where indicated.
  - 3. LC-Bead: Use at exposed panel edges.
  - 4. U-Bead: Use at exposed panel edges where indicated.
  - 5. Curved-Edge Cornerbead: Use at curved openings.
- D. Aluminum Trim: Install in locations indicated on Drawings.

### 3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
  - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
  - 2. Level 2: Panels that are substrate for tile.
  - 3. Level 3: Where indicated on Drawings.
  - 4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
    - a. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."
  - 5. Level 5: For walls or ceilings with strong cross lighting (natural or artificial) and/or gloss sheen paint finishes and where indicated on Drawings.
    - a. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."
- E. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.
- F. Cementitious Backer Units: Finish according to manufacturer's written instructions.

### 3.7 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

## SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for interior ceilings.
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:
  - 1. Acoustical Panels and Plastic Louvers: Set of 6-inch- square Samples of each type, color, pattern, and texture.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Quality Assurance Plan:
  - 1. Furnish copies for review for conformance with requirements.
  - 2. Furnish completed record copies for project records and for distribution to authorities having jurisdiction.
  - 3. Furnish written Statement of Responsibility on Contractor's letterhead, indicating the following:
    - a. Acknowledgement of awareness of special requirements contained in the Quality Assurance Plan.
    - b. Acknowledgement that control will be exercised to obtain conformance with the Contract Documents approved by the authority having jurisdiction.
    - c. Procedures for exercising control within the Contractor's organization, the method and frequency of reporting, and the distribution of reports.

- d. Identification and qualifications of the person(s) exercising control and their position(s) within the company.
  - B. Qualification Data: For testing agency.
  - C. Product Test Reports: For each acoustical panel ceiling, for tests performed by a qualified testing agency.
  - D. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.
- 1.6 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For finishes to include in maintenance manuals.
- 1.7 MAINTENANCE MATERIAL SUBMITTALS
- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
    - 1. Acoustical Ceiling Units: Full-size panels equal to 2 percent of quantity installed. Not less than one (1) box for each type installed.
    - 2. Suspension-System Components: one cartons of 2'-0" and one cartons of 4'-0" grid.
    - 3. Hold-Down Clips: Equal to 2 percent of quantity installed.
- 1.8 DELIVERY, STORAGE, AND HANDLING
- A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
  - B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- 1.9 FIELD CONDITIONS
- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
    - 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.



## PART 2 – PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: Class A according to ASTM E 1264.
  - 2. Smoke-Developed Index: 50 or less.

### 2.3 ACOUSTICAL PANELS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Armstrong World Industries, Inc.
  - 2. CertainTeed Corporation.
  - 3. National Gypsum Company
  - 4. USG Corporation.
- B. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E 1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- C. Type 7 - Unperforated: 24" x 24" lay-in panels with square edge, vinyl face and hold-down clips.
  - 1. Acceptable Products:
    - a. Armstrong, Ceramaguard #605, White, non-perforated
  - 2. Acoustic Properties: STC: 40-44.

### 2.4 ACOUSTICAL SEALANT

- A. Acoustical Sealant: As specified in Section 07 92 00 "Joint Sealants." AC-1

## PART 3 – EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on the penetrating items.

### 3.3 INSTALLATION

- A. Install acoustical panel ceilings according to ASTM C 636/C 636M and manufacturer's written instructions.
- B. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
  - 1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
  - 2. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
  - 3. Install hold-down clips in areas indicated; space according to panel manufacturer's written instructions unless otherwise indicated.
    - a. Hold-Down Clips: Space 24 inches o.c. on all cross runners.
  - 4. Install clean-room gasketed grid system in areas indicated, sealing each panel and fixture as recommended by panel manufacturer's written instructions.

### 3.4 ERECTION TOLERANCES

- A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.5 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 13

## SECTION 09 67 23 - RESINOUS FLOORING

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes resinous flooring systems as follows:
  - 1. Trowel-applied epoxy mortar flooring.
- B. Related Sections:
  - 1. Section 09 05 60 "Common Work Results for Flooring Preparation."

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Contractor shall schedule and lead a pre-installation meeting prior to placement of concrete slabs scheduled to receive flooring.
    - a. Meeting should include parties responsible for subgrade, vapor retarder, concrete, flooring, and finished surfaces adjacent to flooring.
  - 2. Agenda: The minimum agenda shall include the following items:
    - a. Installation sequence and timeline.
    - b. Acceptance of subgrade for concrete placement.
    - c. Requirements for proper installation of vapor retarder.
    - d. Verification of concrete mix design, surface finish, joint locations and curing methods.
    - e. Acceptance criteria for the concrete slab prior to flooring installation.
    - f. Environmental requirements before, during, and after flooring installation.
    - g. Coordination of flooring installation schedule with adjacent Work.
    - h. Protection of finished surface.
    - i. Protection of work areas from construction traffic during installation.
    - j. Protection of completed flooring until date of substantial completion.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.
- B. Shop Drawings:

1. Submit manufacturers' standard details for flooring installation at drains, construction joints, crack isolation, and floor-to-wall joints.
  2. Submit dimensioned layout of divider strips, base, and border strips, where shown on Drawings.
- C. Samples for Verification: For each resinous flooring system required, 6 inches square, applied to a rigid backing by Installer for this Project.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- B. Material Certificates: For each resinous flooring component, from manufacturer.
- C. Material Test Reports: For each resinous flooring system, by a qualified testing agency, including the following:
1. Concrete slab moisture vapor transmission rate.
  2. Adhesive bond tests.
  3. Concrete slab alkalinity.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For resinous flooring to include in maintenance manuals.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer with a minimum of 4 years of experience in installing seamless flooring applications similar in type and size to that of this project.
1. Engage an Installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Apply full-thickness mockups on 96-inch- square floor area selected by Architect.
  2. Coordinate mock up with University of Missouri Healthcare. The safety department from MUHC will perform a wet static coefficient of friction test to verify and document baseline traction prior to proceeding with complete installation of product.
    - a. Include 96-inch length of integral cove base with inside and outside corner.
  3. Simulate finished lighting conditions for Architect's review of mockups.
  4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.
- B. Storage:
  - 1. Store materials in a dry, protected area with minimum temperature of 55°F (13°C) and away from fires or open flames.
  - 2. Store materials to comply with manufacturer's directions to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

## 1.9 FIELD CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
- C. Close spaces to traffic during resinous flooring application and for 24 hours after application unless manufacturer recommends a longer period.

## PART 2 – PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Slip resistance: 0.6 minimum, per ASTM D2047.
  - 1. This coefficient to apply when the floor is wet.
- B. Fire-Test-Response Characteristics: Provide products with the following surface-burning characteristics, as determined by testing identical products per UL or another nationally recognized independent testing laboratory acceptable to authorities having jurisdiction:
  - 1. NFPA 253, Critical Radiant Flux:
    - a. Class I, minimum value of 0.45 watts per square centimeter in all exit ways.
  - 2. NFPA 258, Smoke Density: Less than 450.
- C. Flammability: Self-extinguishing according to ASTM D 635.

### 2.2 MANUFACTURERS

- A. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Obtain secondary materials, including patching and fill material, joint sealant, and repair

materials, of type and from manufacturer recommended in writing by manufacturer of primary materials.

## 2.3 TROWEL-APPLIED EPOXY MORTAR FLOORING

- A. Basis-of-Design: Subject to compliance with requirements, provide the following:
  - 1. Desco Coatings, Inc
  - 2. Tnemec
- B. Color: to be selected by the Architect/Engineer from manufacturer's standard colors
- C. Aggregate: Silica sand.
- D. Trim: Manufacturer's recommended metal angle trim or zinc terrazzo screed angles to match system thickness.
- E. Abrasive Surface: Aluminum oxide granules.

## 2.4 CUSHIONED SEAMLESS RESILIENT DECORATIVE FLOORING

- A. Decorative Flooring System: Seamless, resilient and decorative flooring system combining high solids flexible epoxy resin with colored rubber chips in a troweled mortar system designed to produce a seamless floor [and integral cove base].
  - 1. Basis-of-Design: Subject to compliance with requirements, provide the following:
    - a. Sherwin Williams; Softop Decorative Flooring System.
- B. System Characteristics:
  - 1. Color and Pattern: As indicated on Drawings.
  - 2. Wearing Surface: Manufacturer's standard wearing surface.
  - 3. Overall System Thickness: 10 inch.
- C. Primer: Type recommended by resinous flooring manufacturer for substrate and resinous flooring system indicated.
  - 1. Product: Sherwin Williams; GP3579.
    - a. Resin: Epoxy.
    - b. Formulation Description: 100 percent solids.
    - c. Coats: One.
- D. Mortar Coat:
  - 1. Product: Sherwin Williams; GP3557.
    - a. Resin: Flexible epoxy.
    - b. Formulation Description: 87 percent solids.

- c. Type: Pigmented.
  - d. Application Method: Trowel.
  - e. Number of Coats: One.
  - f. Aggregates: Rubber aggregate blend.
- E. Grout Coat:
  - 1. Product: Sherwin Williams; GP4844.
    - a. Resin: Polyaspartic urethane.
    - b. Formulation Description: 97 percent solids.
    - c. Type: Clear.
    - d. Coats: One.
- F. Seal Coat: Sealing or finish coats.
  - 1. Sherwin Williams; GP4844.
    - a. Resin: Polyaspartic.
    - b. Formulation Description: 97 percent solids.
    - c. Type: Clear.
    - d. Number of Coats: One.
    - e. Finish: Gloss.
- G. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test method indicated:
  - 1. Water Absorption: 0.1 percent maximum according to ASTM D 570.
  - 2. Residual indentation: L percent thickness (140 lb. load) per ASTM F L9t4.
  - 3. impact Resistance: Greater than 160 in./lbs (160 lb. load) per ASTM D 4226.
  - 4. Resistance to Elevated Temperature: No slip or flow at required temperature of 158 degrees F according to MIL-D-3134J.
  - 5. Hardness: 80/70, Shore A according to ASTM D 2240.
  - 6. Adhesion: 300 psi, according to ACE 503R.
  - 7. Flammability: Class 1 per ASTM E 648 Critical Radiant Flux.
  - 8. Noise Reduction Coefficient: 0.05 per ASTM C423.

## PART 3 – EXECUTION

### 3.1 PREPARATION

- A. Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.
- B. Concrete Substrates: Refer to Section 09 05 60 "Common Work Results for Flooring Preparation."
- C. Patching and Filling: Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.



1. Control Joint Treatment: Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.
- D. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

### 3.2 APPLICATION

- A. Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
  1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
  2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
- B. Primer: Apply primer over prepared substrate at manufacturer's recommended spreading rate.
- C. Thickness: Install in manufacturer's standard thickness.
  1. Double Broadcast System: Double broadcast floor shall consist of granite aggregates. The system should be applied as a double broadcast to product a nominal 18" surfacing. Texture can be coarse, medium or smooth
    - a. Install system to achieve slopes
- D. Waterproofing Membrane: Apply waterproofing membrane over entire substrate surface, in manufacturer's recommended thickness.
  1. Apply waterproofing membrane to integral cove base substrates.
- E. Reinforcing Membrane: Apply reinforcing membrane to substrate cracks.
- F. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details, including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.
  1. Integral Cove Base: 6 inches high.
- G. Self-Leveling Body Coats: Apply self-leveling slurry body coats in thickness indicated for flooring system.
  1. Aggregates: Broadcast aggregates at rate recommended by manufacturer and, after resin is cured, remove excess aggregates to provide surface texture indicated.
- H. Topcoats: Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer and to produce wearing surface indicated.

### 3.3 REPAIRS

- A. Thoroughly inspect finished floors for defects after each prior and prior to application of next coat.
- B. Remove surface blush using method recommended by manufacturer.
- C. Repair, recoat or replace defective areas prior to application of following coat.
- D. Defects include, but are not limited to:
  - 1. Incomplete bond to concrete.
  - 2. Incomplete bond to prior coat.
  - 3. Insufficient coating thickness.
  - 4. Puddling or variations in coating thickness.
  - 5. Inclusion of substantial air bubbles or film surface patterned with air bubbles.
  - 6. Excessive softness or incomplete cure due to incomplete mixing or mixing at incorrect ratios.
  - 7. Cloudy or discolored coating.
  - 8. Excessive or insufficient quantities of aggregate, or excessive clumping of aggregate.
- E. Repair any damage that occurs between completion of the flooring installation and the day of Substantial Completion.

### 3.4 FIELD QUALITY CONTROL

- A. Material Sampling: Owner may, at any time and any number of times during resinous flooring application, require material samples for testing for compliance with requirements.
  - 1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
  - 2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
  - 3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.
- B. Core Sampling: At the direction of Owner and at locations designated by Owner, take one core sample per 1000 sq. ft. of resinous flooring, or portion of, to verify thickness. For each sample that fails to comply with requirements, take two additional samples. Repair damage caused by coring. Correct deficiencies in installed flooring as indicated by testing.

### 3.5 PROTECTION

- A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

END OF SECTION 09 67 23

## SECTION 09 91 23 - INTERIOR PAINTING

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates:
  - 1. Gypsum board.
- B. Related Requirements:
  - 1. Section 09 29 00 "Gypsum Board", for primer/surfacer on gypsum drywall.

#### 1.3 DEFINITIONS

- A. Finish Sheen Definitions.
  - 1. Flat: Lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
  - 2. Eggshell: Low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
  - 3. Satin: Low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
  - 4. Semi-gloss: Medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
  - 5. High- or Full- Gloss: High-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.
- B. Interior: In a conditioned space.

#### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Meeting: Participate in the preinstallation meeting for Gypsum Board assemblies specified in Section 09 29 00 "Gypsum Board".
  - 1. Provide locations for gloss paints, and finishes in critical lighting locations.
  - 2. Coordination of labeling of fire-rated walls.
  - 3. Coordination of painting exposed mechanical and electrical equipment, piping and supports.

## 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
  - 1. Indicate VOC content.
- B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
  - 1. Submit Samples on rigid backing, 8 inches square.
  - 2. Label each coat of each Sample.
  - 3. Label each Sample for location and application area.
- C. Product Schedule: Use same designations indicated on Drawings and in the Interior Painting Schedule to cross-reference paint systems specified in this Section. Include color designations.

## 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Paint Products: 5 percent, but not less than 1 gal. of each material and color applied.

## 1.7 QUALITY ASSURANCE

- A. Single-Source Responsibility: Materials selected for each coating system and type of surface shall be the product of a single manufacturer.
- B. Material Compatibility:
  - 1. Primers shall be the same manufacturer as the paint used for the final coats and shall be of the type recommended by that manufacturer for the particular application.
  - 2. Thinners, when used, shall be only those thinners recommended for that purpose by the manufacturer of the material to be thinned.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Delivery:
  - 1. Deliver all paint materials to the job site in their original unopened containers with all labels intact and legible at time of use.
- B. Storage and Handling:
  - 1. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
    - a. Maintain containers in clean condition, free of foreign materials and residue.
    - b. Remove rags and waste from storage areas daily.

2. Store only the approved materials at the job site and store only in a single designated area restricted to the storage of paint materials and related equipment.
3. All paints, varnishes, and volatile oil shall be stored in accordance with health, safety, and fire regulations.
4. “No Smoking” signs and covered waste receptacles shall be provided in the area.
5. Floor of storage area shall be covered and protected from spilled material.
6. Provide metal lockers for storage and provide two listed 2A:20BC rated multi-purpose dry chemical or a 10BC rated CO<sup>2</sup> fire extinguisher mounted in the immediate area.
7. Use all means necessary to protect paint materials before, during, and after application and to protect the installed Work and materials of all other trades.
8. Use fire-retardant treated drop cloths where flammable products are in use.

## 1.9 FIELD CONDITIONS

- A. Do not clean, prepare or paint surfaces on which condensation is evident or when environmental conditions may cause condensation to form on surfaces during finishing operations.
- B. Maintain temperature and humidity levels during finishing work at a level to prevent condensation.
- C. Apply paints and finish product within the temperature range and relative humidity acceptable to the manufacturer of the product, as listed on the product label or product data sheet.

## PART 2 – PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis-of-Design Products: Subject to compliance with requirements, provide products by The Sherwin Williams Company and as listed in the Interior Painting Schedule for the paint category indicated.
- B. Manufacturers: Furnish materials from one of the following manufacturers, unless otherwise indicated:
  1. Benjamin Moore Paint. (BM)
  2. PPG Paints. (PPG)
  3. The Sherwin Williams Company. (S-W)

### 2.2 PAINT, GENERAL

- A. General:
  1. There is no attempt to define the physical properties and composition of the painting materials. Furnished product shall be the manufacturer’s equivalent to those specified.
  2. Provide primer and topcoat listed by the manufacturer as compatible with the substrate indicated.

- a. Where conflict arises between manufacturer's printed application recommendation and scheduled product listing, the manufacturer's recommendations shall prevail, maintaining carrier type and gloss level indicated.
- 3. Prime walls scheduled to receive wallcoverings, using primer indicated on Painting Schedule for substrate, unless noted otherwise.
- 4. The use of paint manufacturer names indicated on Drawings are for color selection purposes only and do not necessarily indicate selection of a particular manufacturer's products.
- A. Material Compatibility:
  - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- B. Colors: As indicated on Drawings.

## 2.3 INTERIOR PAINTING MATERIALS AND SCHEDULE

- A. Gypsum Board Substrate:
  - 1. Walls:
    - a. One (1) coat, latex primer:
      - 1) BM: N534 Ultra Spec 500 Interior Latex Primer (0 g/L)
      - 2) PPG: 6-4900XI Speedhide Zero VOC Primer (< 50 g/L VOC).
      - 3) S-W: ProMar 200 Zero VOC Interior Latex Primer, B28W2600 (< 50 g/L VOC).
    - b. Two (2) coats, -acrylic-latex enamel (eggshell):
      - 1) BM: N538 Ultra Spec 500 Acrylic Zero VOC Eggshell Enamel (0g/L)
      - 2) PPG: 6-4310XI Speedhide Zero VOC Eggshell(< 50 g/L VOC).
      - 3) S-W: ProMar 200 Zero VOC Interior Latex EgShel, B20W12600 (< 50 g/L VOC).
  - 2. Primer for walls scheduled to receive wood veneer wallcovering:
    - a. Products: Provide one of the following products:
      - 1) Romans Decorating Products, Inc.; R-35 or Pro-935 acrylic primer.
      - 2) Zinsser Co.:
        - a) Bulls-eye 1-2-3, for use over wood substrate.
        - b) Shieldz Universal Primer.
        - c) Guardz.

3. Ceilings:

a. One (1) coat, latex primer:

- 1) BM: Coronado 40 Super Kote 5000 Acrylic Latex Primer (<50g/L) or Super Hide Zero VOC Interior Latex Primer 354 (0g/L)
- 2) PPG: 6-4900XI Speedhide Zero VOC Primer(< 50 g/L VOC).
- 3) S-W: ProMar 400 Zero VOC Interior Primer, B28W4600 (< 50 g/L VOC).

b. Two (2) coats, Acrylic-Latex (flat):

- 1) BM: Coronado 88 Super Kote 1000 Latex Flat (<50g/L) or Super Hide Zero VOC Interior Flat 355 (0g/L)
- 2) PPG: 6-4110XI Speedhide Zero VOC Flat (0g/L).
- 3) S-W: ProMar 400 Zero VOC Interior Latex Flat, B30-4600 (< 50 g/L).

2.4 SPECIAL INTERIOR FINISHES

A. Interior Epoxy Finish: Factory-formulated epoxy interior finish for interior gypsum board application.

1. Primer:

- a. Benjamin Moore: Epoxy M08/M09 or Ultra Spec 500 Interior Latex Primer N534 (0g/L)
- b. PPG: 6-4900XI Speedhide Zero VOC Primer
- c. S-W: ProMar 200 Primer, B28W8200

2. Epoxy Finish Coats: Two coats applied at 2.5 – 3.0 mils dry per coat

- a. Benjamin Moore: Epoxy M43S/M44 or Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341 ( 70g/L)
- b. PPG 16-551 Pitt Glaze WB 1 Acrylic Epoxy
- c. S-W: ProIndustrial WB Catalyzed Epoxy, Semi-gloss, B73 Series

2.5 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.



## PART 3 – EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  - 1. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
  - 1. Application of coating indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations applicable to substrates and paint systems indicated.
- B. Protection:
  - 1. Prior to all surface preparation and painting operations, completely mask, remove, or otherwise adequately protect all hardware, accessories, machined surfaces, nameplates, tags on fire-rated doors and frames, lighting fixtures, and similar items in contact with painted surfaces but not scheduled to receive paint.
- C. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- D. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- E. Priming:
  - 1. Spot prime all exposed nails and other metals that are to be painted with emulsion paints using a primer recommended by the manufacturer of the coating systems.
  - 2. Primer is not required at new gypsum drywall that has received primer/surfacer, unless required by manufacturer of finish coating.

### 3.3 PREPARATION OF GYPSUM DRYWALL

#### A. Coordination:

1. Ensure that dirt, dust, and other foreign matter have been removed. Ensure that all apparent deposits of spackling compound have been removed, taking care not to damage the paper cover of the gypsum drywall.
2. Spackle and lightly sandpaper scuffs, scratches, and nicks.

### 3.4 FINISH APPLICATION

#### A. General:

1. Paint all surfaces, except glass and similar items not finished and not called out as unfinished.
  - a. Operating Parts: Do not paint moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts, and sprinkler heads, unless otherwise specified.
2. Paint all grilles and other pre-finished items where the factory finish is not in accordance with the "Painting Schedule" and color selection.
3. Allow 48 hours drying time before recoating. Modify the periods as recommended by the material manufacturer to suit adverse weather conditions.
4. Suction and hot spots shall be touched up after first coat has been applied.
5. Where preceding coat is not completely covered by finish coat or does not adequately hide underlying finishes or marks, apply additional coats at no additional cost to the Owner.
6. Finish coats shall be smooth and uniform, completely hiding undercoats.
7. Edges adjoining different colors or materials shall be sharp and clean with no overlap.
8. Touch-up or repainting of surfaces shall cover entire item, frame, or wall area. "Spot" touch-up work will not be permitted.
9. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
10. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
11. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
12. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
13. The Contractor shall use the primer best suited for the paint products schedule under Part 2 of this section, and for compatibility with the substrate.

#### B. Environmental Conditions:

1. Do not apply paint in areas where dust is being generated.
2. Turpentine shall not be used in closed areas.
3. Temperature shall be maintained above 50°F at all times.

C. Defects:

1. Repair or fill defects between coats with appropriate fill material.
2. Sand and dust between coats to remove all defects visible to the unaided eye from a distance of five feet.

D. Identification of fire-rated construction and smoke-barrier walls:

1. Where fire-rated wall construction or smoke barrier walls are indicated on the Plans, paint wall rating a minimum of 6-inches above the ceiling line on each side of the wall.
2. Lettering shall be stencil applied, all capitals, level, and at a uniform height on each wall.
3. Letter height: 3-inches, minimum
4. Color: Black on light colored substrates, white or red on dark colored substrates.
5. Spacing: one label every 10 feet, maximum. Not less than one label per wall section, except at offsets less than 6 feet long.
6. Text: indicate hour rating and rating type.
  - a. Example: 2-HR. FIRE
  - b. Example: 1-HR FIRE AND SMOKE

E. Identification of exterior wall construction with exterior applied air/moisture/vapor barrier:

1. Where exterior wall construction with applied air/moisture/vapor retarder is indicated, paint wall notice a minimum of 6-inches above the ceiling line on the interior side of the wall in each room.
2. Lettering shall be stencil applied, all capitals, level, and at a uniform height on each wall.
3. Letter height: 2-inches, minimum
4. Color: Black on light colored substrates, white or red on dark colored substrates.
5. Spacing: one label every 20 feet, maximum. Not less than one label per wall section, except at offsets less than 6 feet long.
6. Text:

“AIR/MOISTURE/VAPOR BARRIER ON EXTERIOR  
COMPLETELY SEAL SHEATHING PENETRATIONS”

F. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

G. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

H. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in occupied spaces:
  - a. Equipment, including panelboards.
  - b. Uninsulated metal piping.
  - c. Uninsulated plastic piping.
  - d. Pipe hangers and supports.
  - e. Metal conduit.
  - f. Plastic conduit.

- g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
  - h. Other items as directed by Architect.
- 2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.
- I. Identification of fire-rated construction and smoke-barrier walls:
  - 1. Where fire-rated wall construction or smoke barrier walls are indicated on the Plans, paint wall rating a minimum of 6-inches above the ceiling line on each side of the wall.
  - 2. Lettering shall be stencil applied, all capitals, level, and at a uniform height on each wall.
  - 3. Letter height: 3-inches, minimum
  - 4. Color: Black on light colored substrates, white or red on dark colored substrates.
  - 5. Spacing: one label every 10 feet, maximum. Not less than one label per wall section, except at offsets less than 6 feet long.
  - 6. Text: indicate hour rating and rating type.
    - a. Example: 2-HR. FIRE
    - b. Example: 1-HR FIRE AND SMOKE

### 3.5 REINSTALLATION OF REMOVED ITEMS

- A. Following completion of painting in each space, promptly reinstall all items removed for painting, using only workmen skilled in the particular trade.

### 3.6 FIELD QUALITY CONTROL

- A. General:
  - 1. Dry film thickness (DFT): Per manufacturer's printed recommendations and total not less than thickness indicated in manufacturer's written application instructions.
- Site Tests:
  - 2. Pre-application testing:
    - a. Moisture Content: Periodically, minimum 1 time per week, test new substrates for acceptable moisture content levels before application of first coat.
      - 1) Test areas that have been wetted or show evidence of excessive moisture or condensation.
        - a) Perform a minimum of one test for every 10 lineal feet of wall.
        - b) Do not apply paints to surfaces whose moisture content exceeds paint manufacturers recommendations.
  - 3. Periodically, minimum once daily for each painter, measure wet film thickness during application to verify required coating thickness, allowing a thickness reduction percentage equal to the non-solid percentage of the paint material being applied.
  - 4. Verification testing: provide dry film thickness verification testing, when directed by the Architect/Engineer, using one of the following methods:

- a. Non-destructive: test meter capable of measuring the thickness of coatings on the substrate to be tested.
  - 1) Calibrate meter in the presence of the Architect/Engineer prior to conducting tests.
- 5. Provide a log of all measurements taken; include the following information. Maintain log on-site and available for periodic review by the Architect/Engineer.
  - a. Test date.
  - b. Test location.
  - c. Manufacturer and type(s) of material being tested.
  - d. Moisture content.
  - e. Scheduled dry film thickness.
  - f. Measured wet or dry film thickness.
  - g. Test method.
  - h. Name of person conducting test.

### 3.7 CLEANING AND PROTECTION

- B. General: Prevent accidental spilling of paint materials, In the event of such spill, immediately remove all spilled material and the waste or other equipment used to clean up the spill, and wash the surface to its original undamaged condition, at no additional cost to the Owner
- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect/Engineer, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.
- C. Prior to Final Inspection:
  - 1. Upon completion of this portion of the Work, visually inspect all surfaces and remove all paint and traces of paint from surfaces not scheduled to be painted.

END OF SECTION 09 91 23

## SECTION 10 26 00 - WALL AND DOOR PROTECTION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Corner guards.
- B. Related Requirements:
  - 1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood blocking.
  - 2. Section 09 29 00 "Gypsum Board."

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For each type of wall and door protection showing locations and extent.
  - 1. Include plans, elevations, sections, and attachment details.
- C. Samples for Verification: For each type of exposed finish on the following products, prepared on Samples of size indicated below:
  - 1. Corner Guards: 12 inches long. Include example top caps.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of handrail.
- B. Material Certificates: For each type of exposed plastic material.
- C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of wall and door protection product to include in maintenance manuals.
  - 1. Include recommended methods and frequency of maintenance for maintaining best condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to finishes and performance.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store wall and door protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
  - 1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
  - 2. Keep plastic materials out of direct sunlight.
  - 3. Store plastic wall- and door-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.
    - a. Store corner-guard covers in a vertical position.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of wall- and door-protection units that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
    - b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.
  - 2. Warranty Period: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain wall- and door-protection products of each type from single source from single manufacturer.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Surface Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: 25 or less.
  - 2. Smoke-Developed Index: 450 or less.
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1.

### 2.3 CORNER GUARDS

- A. Flush-Mounted Metal Corner Guards: Fabricated as one piece from formed or extruded metal with formed edges; with 90- or 135-degree turn to match wall condition.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide products indicated on Drawings.
  - 2. Material: Stainless-steel sheet, Type 430.
    - a. Thickness: Minimum 0.0625 inch.
    - b. Finish: Directional satin, No. 4.
  - 3. Wing Size: As indicated on Drawings.
  - 4. Corner Radius: 3/16 inch.
  - 5. Mounting: Flat-head, countersunk screws through factory-drilled mounting holes.

### 2.4 MATERIALS

- A. Plastic Materials: Chemical- and stain-resistant, high-impact-resistant plastic with integral color throughout; extruded and sheet material as required, thickness as indicated.
- B. Solid Wood: Clear hardwood lumber of species indicated, free of appearance defects, and selected for compatible grain and color.
- C. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.



- D. Adhesive: As recommended by protection product manufacturer.

## 2.5 FABRICATION

- A. Fabricate wall and door protection according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.
- B. Factory Assembly: Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- C. Quality: Fabricate components with uniformly tight seams and joints and with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

## 2.6 FINISHES

- A. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire rating, and other conditions affecting performance of the Work.
- B. Examine walls to which wall and door protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
  - 1. For wall and door protection attached with adhesive, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing wall and door protection.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

### 3.3 INSTALLATION

- A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
- B. Mounting Heights: Install wall and door protection in locations and at mounting heights indicated on Drawings.
- C. Accessories: Provide splices, mounting hardware, anchors, trim, joint moldings, and other accessories required for a complete installation.
  - 1. Provide anchoring devices and suitable locations to withstand imposed loads.
  - 2. Where splices occur in horizontal runs of more than 20 feet, splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches apart.
  - 3. Adjust end and top caps as required to ensure tight seams.

### 3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent.
- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 10 26 00

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PATIENT CARE TOWER – 8<sup>TH</sup> FLOOR BONE MARROW TRANSPLANT UNIT RENOVATION  
COLUMBIA, MO

BSA LifeStructures #14110006 .02A

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**20 00 00 BASIC MECHANICAL CONDITIONS**

**20 00 01 GENERAL**

- B. This Section includes general contractual, administrative and procedural requirements for the Work of Divisions 20 – 29 to supplement the requirements specified in Division 1.
- 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.
- D. 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 bone marrow transplant renovation at UMC PCT for University of Missouri - Columbia, located at 1 Hospital Drive, Columbia, MO.
- 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. Insulation Work 20
  - 3. Fire protection system 21
  - 4. Plumbing Work 22
  - 5. HVAC Piping and Equipment 23
  - 6. Air Distribution 24
  - 7. 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 industry standards, codes and specifications shall apply to the Work for Divisions 20 - 29:

AMCA	Air Moving and Conditioning Association	<b>24 00 00</b>
ANSI	American National Standards Institute	<b>20 10 00</b>
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers	
ASME	American Society of Mechanical Engineers	<b>20 10 00</b>
ASSE	American Society of Sanitary Engineers	<b>22 00 00</b>
ASTM	American Society of Testing and Materials	<b>20 10 00</b>
AWS	American Welding Society	<b>23 00 00</b>
AWWA	American Water Works Association	<b>22 00 00</b>
CISPI	Cast Iron Soil Pipe Institution	<b>22 00 00</b>
IEEE	Institute of Electrical & Electronic Engineers	
IPCEA	Insulated Power Cable Engineers Association	
MSS	Manufacturers Standardization Society of Valve and Fitting Industry	<b>20 10 00</b>
NIST	Institute of Science and Technology	<b>20 10 00</b>
NEC	National Electric Code, including amendments by local authority having jurisdiction	
NEMA	National Electrical Manufacturers Association	
NFPA	National Fire Protection Association	<b>21 00 00</b>
NSF	National Sanitation Foundation	<b>22 00 00</b>
NIOSH	National Institute of Occupational Safety and Health	
OSHA	Occupational Safety and Health Act	
SMACNA	Sheet Metal and Air Conditioning Contractors National Association	<b>24 00 00</b>
UL	Underwriters Laboratory, Inc. Guidelines for Construction and Equipment of Hospital and Medical Facilities	

20 00 15 OWNER FURNISHED EQUIPMENT

- A. The Owner has elected to prepurchase the air handler. The shop drawings and the Request for Proposal will be available to the bidders upon request for reference.
- B. The Contractor shall be responsible for coordinating the delivery, receiving and installing the equipment as if they had made the purchase. If there is a problem with the equipment regarding compliance with the order or the submittals, start-up, or warranty, then the Contractor shall act



for the Owner and arrange for the necessary corrections, replacement parts, backcharges, technical support, etc. The installed equipment shall carry the warranty specified herein and as specified in other portions of the specifications. It shall be the responsibility of the Contractor during the warranty period to respond to the evident malfunction or failure of the equipment as though he had directly purchased the equipment. This includes conducting the necessary diagnostic efforts and, if the malfunction is deemed by the Contractor to be an equipment liability issue, to so resolve the problem with the supplier as the Owner's agent.

- C. The air handling unit will be shipped in pieces. The unit shall enter the room by removing a louver on the north side of the penthouse. The available opening is approximately 8' 4"H x 9' 4"W. Once in the mechanical room the minimum available opening to maneuver equipment around the room is 7' 7"H x 9' 4"W. All shipping splits must be capable of fitting through this available opening with due consideration for handling of equipment. The Contractor shall be responsible for receiving the components and rigging all of the pieces into the building and for setting and anchoring the base of the machine in place at its final location. The equipment supplier will be responsible for field assembly of the remaining pieces after they are in the building and the base of the machine is in place. The Contractor shall be responsible for field insulation following assembly as described in detail in the insulation section of the specification and on the shop drawings. The Contractor shall coordinate with the equipment supplier as required during all phases of the installation and assembly process.
- D. If the equipment arrives prior to the completion of the general construction work, the Contractor shall receive, store and temporarily protect the equipment until it can be set in place. Temporary staging and storage locations shall be brought to the Owner for review and approval at least two weeks before they are required.
- E. The manufacturer shall provide the services of a technical representative of the manufacturer for field supervision of the installation to assure that the installation is per the manufacturer's instruction and acceptable practices. Representative shall have a duty to notify if the installation is not in accordance with the manufacturer's instructions. The manufacturer representative must be a factory representative. The manufacturer representative shall supervise the unit assembly/installation and perform a quality control / final inspection of the unit prior to on-site pressure testing. Pressure testing shall be witnessed by the manufacturer representative and the Owner. The manufacturer representative shall provide a written acceptance of the unit. Final unit acceptance shall be subject to approval by the Owner.
- F. Contractor shall provide shims and pour housekeeping pad level to within manufacturer's tolerances for the air handling unit.
- G. Any penetrations made by the factory and left unsealed for transport shall be sealed in the field by the contractor using expanded foam or other manufacturer-recommended means.
- H. The following tests shall be performed in the fully assembled air handling unit in the field after manufacturer acceptance as outlined in Part E and the report shall be furnished to the engineer. The manufacturer is responsible for ensuring the unit is installed per manufacturer requirements and passes leakage testing prior to turnover to the owner. The manufacturer may include factory testing at their discretion to aid in proof of compliance.
  - 1. Unit Leakage: Leakage to be tested at 10". An auxiliary fan is to be used to pressurize/evacuate the test section to the test pressure with an auxiliary fan. Doors may be sealed/taped where testing pressure (positive/negative) goes against the operating seal. The airflow rate (i.e. leakage) shall be measured and recorded. Test airflow rates shall not exceed 0.5% of the design volume at 10".

END OF SECTION

**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 21 - Fire Protection System
  - 3. Division 22 - Plumbing Work
  - 4. Division 23 - HVAC Piping and Equipment
  - 5. Division 24 - Air Distribution System
  - 6. 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. Demolition for the work of Divisions 20 - 25.
- F. Concrete 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 SPECIAL REQUIREMENTS**

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

**20 10 07 ABOVE CEILING IDENTIFICATION**

- A. All equipment items (i.e., pumps, fire dampers, duct access panels, VAV boxes, etc.) concealed above a ceiling shall be identified with ceiling marker tacks similar to Markserv Ceiling Markers, Equipment Locator Tacks. Provide serrated makers with retention disk. Color code equipment markers for each equipment item above ceiling. Coordinate color strategy with owner.

**20 10 10 BASIC PIPING MATERIALS**

A. General:

- 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 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.
- 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:

- All pipe and tube material shall be uncoated, unless specified otherwise.
- 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. Steel pipe:

- Steel pipe shall be specified by finish, size by nominal diameter, ASTM specification number, manufacturing process, wall thickness (by schedule number or decimal dimension) and end preparation as follows:

2.

ASTM finish	mfr. spec#	wall method	size thickness	end range	prep
black	A-53	CW/ERW	Sch 40, 80	2" and smaller	T&C
black	A-53	SMLS	Std, Sch 40,80	all	
		PE/T&C			
black	A-106	SMLS Grade A	Std, Sch 40,80	all	
		PE/T&C			
galv	A-53	SMLS Grade A	Std, Sch 40,80	all	
		PE/T&C			

- Per ANSI B36.10, schedule 40 is standard weight pipe for 10" pipe size and smaller.
- Schedule 80 in this pipe size range is extra strong pipe.
- Standard weight pipe for all sizes 12" and larger is 0.375" wall thickness and are generally not referred to by schedule number.

- d. Outside diameters of pipe sizes 14" and larger are even whole numbers (e.g. - 18" O.D., 20" O.D., etc.)

CW = continuous weld  
ERW = electric resistance weld  
SMLS = seamless  
PE = plain end  
T&C = threaded and coupled

3. All steel pipe shall be mill coated and rust free.

C. 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.

type	size range	annealed hard	soft	application
L	1/4"-8"	x		general use, HVAC, refriger., plumbing (ASTM B-88)
M	1/4"-8"	x		lightest, gravity drains and vents (ASTM B-88)
DWV	1-1/4"-6"	x		plumbing drains and vents (ASTM B-306)
Refr./ACR	1/8"-4-1/8"	x		O.D. tube, refrigeration (ASTM B-280)
Oxygen Service Type L	1/4"-8"	x		Medical Gases above ground, 200 psig and less, (ASTM B-819)

D. Cast iron pipe:

1. Hub and spigot soil pipe shall be in accordance with ASTM A-74. Available in service weight and extra heavy, both with coal tar coating, 5 foot and 10 foot lengths, single and double hub ends, range 2" - 15" diameter.
2. No-hub soil pipe shall be in accordance with ASTM A-888, CISPI 301. Available with coal tar coating, 5 foot and 10 foot lengths, range 1-1/2" - 10" diameter.

E. Plastic pipe:

1. PVC pressure rated schedule 40 (white) and schedule 80 (gray) pipe shall be in conformance with ASTM D-1785.
2. CPVC pressure rated Schedule 40 and Schedule 80 pipe shall be in conformance with ASTM F-441.
3. PVC DWV pipe for non-pressure applications shall be schedule 40 pipe in conformance with ASTM D-1785.
4. SDR PVC sewer pipe outside of building shall be in conformance with ASTM D-3034 and ASTM F-477.

20 10 12 FITTINGS

A. Cast iron:

1. Screwed fittings and flange unions: 125# standard and 250# extra heavy threaded in accordance with ANSI B16.4 (except plugs and bushings which are ANSI B16.14). Available in black or galvanized, range 1/4" - 8".
  2. Flanged fittings and flanges: 125# standard, flat faced in accordance with ANSI B16.1. 250# extra heavy, raised face in accordance with ANSI B16.2. Flange facing and drilling shall be in accordance with ANSI B16.5. Available black and limited galvanized, range 1-1/2" - 12".
  3. Flanged elbows shall be long radius (1.5 x diameter), short radius elbow are not permitted, unless specifically noted.
  4. Drainage fittings: recessed pitched threads for non-pressurized applications. Available in standard black uncoated, coated or galvanized, range 1-1/4" - 8".
  5. Soil pipe hub and spigot and no-hub fittings shall be accordance with ASTM A-74, ANSI A-112.5.1, CISPI std #301 and HS-82. Hub and spigot fittings available in service weight and extra heavy, coal tar coating, range 2" - 15" diameter. No-hub fittings with coal tar coating, range 1-1/2" - 10".
- B. Forged steel:
1. Fittings: 2000#, 3000# and 6000# threaded in accordance with MSS SP49 - SP50. 3000# and 6000# socket weld in accordance with ANSI B16.11/MSS SP79. Available black and electro zinc plated; socket weld for schedule 80 bore. Range 1/8" - 4".
  2. Unions: 3000# threaded and socket weld, steel to steel and brass to steel; 6000# threaded and socket weld, steel to steel only all in accordance with MSS SP83. Available 3000# black and electro zinc plated, 6000# black only, range 1/8" - 4".
  3. "Weldolets, Threadolets, Sockolets and Elbolets": In accordance with ANSI B36.10/ASTM A216, except Elbolets which are ANSI B16.11. Weldolets available standard and extra strong, black only, range 1/8" - 24". Others available 3000# and 6000#, black only, range 1/8" - 4" (limited). Source: Bonney Forge.
- C. Butt weld:
1. Butt welding fittings shall be in accordance with ASTM A-234 and ANSI B16.9. End preparation of butt welding fittings shall be in accordance with ANSI B16.25.
  2. Elbows shall be long radius (1.5 x diameter), short radius elbows, and 180-degree returns are not permitted, unless specifically noted.
- D. Forged steel flanges:
1. 150# and 300# forged steel flanges shall be manufactured to the requirements of ASTM A-181 with dimension in accordance to ANSI B16.5. Flange faces shall be flat or raised face as required.
  2. Forged steel flanges shall be furnished as weld neck pattern. Slip-on, lightweight slip-on (drilled to 125# ANSI standards) and orifice flanges shall be provided only where specified and/or noted.
- E. Copper (alloy and bronze) shall be in conformance with the following ANSI specifications:
- |   |             |
|---|-------------|
| 1. Cast bronze threaded fittings:           | ANSI B16.15 |
| 2. Cast copper alloy solder fittings:       | ANSI B16.18 |
| 3. Wrought copper pressure solder fittings: | ANSI B16.22 |
| 4. Cast copper DWV solder fittings:         | ANSI B16.23 |
| 5. Cast bronze flanged fittings:            | ANSI B16.24 |
| 6. Cast copper alloy for flared tubing:     | ANSI B16.26 |

7. Wrought copper DWV solder fittings: ANSI B16.29
8. Short radius 90 degrees elbows and 180 degree returns are not permitted, unless specified and/or specifically noted.

F. Grooved:

1. All grooved components shall be of one manufacturer made in accordance with ANSI B-31.1, B-31.9. Fittings shall be ANSI 150#, 300# cast of ductile iron in accordance with ASTM A-536, Grade 65-45-12. Fittings shall have an enamel finish. Segmentally welded fittings are not acceptable.
2. Only the following fittings will be accepted: Long radius (1.5 x diameter) 90° and 45° elbows, tee, reducing tee, concentric/eccentric reducers, and flange adapter nipples. Flange rings, reducing couplings, saddle/mechanical/clamp branch tee, and others not listed above are not acceptable.

G. 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. Auto Balance Valve:

1. General: Auto balance valves shall be furnished with precision machined cartridge orifice to provide automatic flow balancing. Valve shall have a blow down valve to clear finite

particles from the cartridge and two, 1/4" threaded brass ports located on the inlet side of the valve use to acquire a differential pressure measurement. The ports shall have caps with O-ring seals.

2. 2" and smaller: Body shall be manufactured from brass ASTM B 283 capable of working at a maximum temperature of 370°F at 600 psi. Y type valve with cartridge shall be capable of working and maintaining flow rate at a differential pressure range between 2-45 psi. Auto balance valve shall be Nexus UltraMatic UM or approved equivalent.

C. 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 1/2" and 3" the same model numbers as the 2" and smaller valves are also acceptable.
2. 2-1/2" - 3": 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), standard port, virgin TFE seats, all stainless steel trim, threaded or soldered ends. Nibco S-585-66, Apollo 70-240, Watts Series B-6001, Hammond 8511 or approved equivalent. Full port valves 2 1/2" and 3" the same model numbers as the 2" and smaller valves are also acceptable.
3. 2-1/2" and smaller: Bronze 3 piece body, 600 psi WOG, quarter turn lever handle, blow-out proof stem, stem extension (for "cold" applications), full port, TFE seats, bronze trim, threaded or soldered ends. NIBCO figure 595-Y-66, Apollo 82-200, Milwaukee BA-360, Hammond 8613, Watts B-6800, or approved equivalent. Full port valves 2 1/2" and 3" the same model numbers as the 2" and smaller valves are also acceptable.
4. Medical Gas and Medical Vacuum 4" and smaller: Bronze 3 piece body, 400 psi WOG, vacuum service to 29" Hg, quarter turn lever handle, blow-out proof stem, full port, virgin TFE seats, bronze trim, Type K tubing extensions with soldered ends, 1/8" NPTF port on tube extension, cleaned and packaged for oxygen service per NFPA 99, valve handle shall indicate service, and pad-lockable handle for valves in concealed spaces. Medeas 6802, Allied Healthcare Products 77-03 or approved equivalent.
5. Ball valves used for chilled water shall have insulated T-handle Nibco Nib-Seal, Apollo ThermaSeal, Hammond Valve Insulator/MS.
6. Gauge cocks where not specified or specifically identified shall be 1/4" bronze 2 piece body ball valves with lever handle and threaded ends per the above specification.
7. Drain valves and air vents shall be 3/4" bronze 2 piece body ball valves per the above specification, with 3/4" hose end adapter cap and chain. In 1/2" through 2" pipe, contractor may use Webstone model T-drain.

D. Butterfly:

1. 2" - 24": Class 200 ASTM A395 ductile iron body, threaded lug type, 1/4 turn, extended neck, peroxide cured EPDM molded-in seat liner, aluminum bronze disc, 416 SS stem, lubersized bronze or Teflon bushings, and stem seals material matching the seat material. Conforms to MSS SP-67 & API 609. Bi-directional bubble tight dead end service with no downstream flange required rated at 200 psi for 2-12", or 150psi 14" and larger. Valve body shall an integrally cast top plate for direct flush mounting of manual or power actuators without the use of brackets or adapters.
  - a. Refer to subsequent paragraphs for operator type based on size and service.

- b. Valves shall be chemically compatible with: up to 4ppm of Chloramines (NH<sub>2</sub>Cl, NHCl<sub>2</sub>, NCl<sub>3</sub>) 40°F-200°F, propylene glycol 0°F-200°F; and NSF-61 rated 40°F-180°F.
    - c. Where used in potable water valve shall be “lead free” per 2011 Reduction of Lead in Drinking Water Act.
    - d. Valve submittal shall indicate where the valve is assembled and tested.
    - e. Valves shall be NIBCO figure LD 2000, Milwaukee ML-133E, Hammond 6411, Bray 31H, Apollo LD-145, Watts DBF-03, or approved equivalent. The following valves are **NOT** equivalent NIBCO N200, Milwaukee CL series, Hammond 5000 series, Apollo LC series, Watts BF series, or Crane 200 series.
  2. Service valves 6” and less shall have a 10-position lever handle; balance valves shall have infinitely adjustable lever handle with memory stop locking option. Service valves and balance valves 8” and larger shall have position indicating worm gear operators with handwheel operator. Control valves shall have actuators as specified in Division 25.
  3. Where valves are located above 15'-0” AFF provide gear operator with chain wheel and guide. Provide chain hoods where required, to prevent fouling of chains on equipment and to clear walkways. Terminate chains approximately 6'-3” above the floor.
- E. Balancing Valves:
1. General: Balance valves shall provide positive shut-off for service and shall have adjustable memory stops to allow returning to original balanced position after servicing.
  2. 3” and smaller: Body shall be bronze or Dezincification Resistant Brass rated to 300 psig. Valves shall be multi-turn, provide positive shut off; include: position indication, memory stops, integral pressure tap ports provided with “drip caps”. Quarter turn valves are not acceptable. Balance valves shall be Nibco 1810, Tour and Anderson 786/787, Apollo 59A, Armstrong CBV, Macon Balancing STV/L Series or approved equivalent.
- F. Check:
1. Check valves installed at pump discharge size 2 ½ and larger shall be Silent type, size 2” and smaller may be swing type.
  2. 2” and smaller: Class 125 (125 psi at 400°F, 200 psi at 150°F), bronze, horizontal swing, vertical up-flow, Y pattern, teflon renewable seat and disc in conformance with MSS SP80. Nibco 413, Grinnell 3300, Watts 5000, Crane 1707, Hammond IB904, Stockham B320, or approved equivalent.
  3. 2” - 12”: Class 125 (125 psi at 400°F, 200 psi at 150°F), iron body, flanged, horizontal swing, vertical up-flow, bolted bonnet, renewable seat and disc in conformance with MSS SP71, type 1. Nibco 918, Grinnell 6300A, Watts 511, Crane 373, Hammond IR1124, Jenkins 624C, Stockham G931, or approved equivalent.
  4. Silent Check Valve: 2-1/2” - 30”, Class 125 (125 psi at 400°F, 200 psi at 150°F), flanged, ASTM A-126 Class B, cast iron body, bronze trim, resilient seat. Nibco F-910, Grinnell Series 500, Milwaukee 125 Class, Mueller 91-AP, or approved equivalent.
  5. Silent Check Valve: 2-1/2 – 30”, Class 250 (500 psi at 150°F), flanged, ASTM A-126 Class B, cast iron body, bronze trim, resilient seat. Nibco F-960, Grinnell Series 550, Milwaukee 250 Class, or approved equivalent.
  6. Silent Check Valve: 2” and smaller, Class 300 (300 psi at 550°F, 600 psi at 150°F), ASTM B61 bronze body, horizontal swing, vertical upflow, regrinding type, Y pattern renewable seat and disk in conformance with MSS SP80. Nibco T-473, Grinnell 3370, Milwaukee 507, Hammond IB949, or approved equivalent.
- G. Gate:



1. 2" and smaller: Class 125 (125 psi at 400°F, 200 psi at 150°F), ASTM B-62 bronze, screw-in bonnet, rising stem, solid wedge in conformance with MSS SP80. Nibco 111, Grinnell 3010, Milwaukee 148, Hammond IB640, Watts 3100, Stockham B100, or approved equivalent.
2. 2" and smaller: Class 300 (300 psi at 550°F, 600 psi at 150°F), ASTM B-61 bronze body union bonnet, rising stem, ASTM B-61 bronze solid wedge disk, and stainless steel seat rings. Nibco T-174SS, Watts B-3030-BS, Stockham B145, Milwaukee 1184, Crane 424, or approved equivalent.

H. Globe:

1. 2" and smaller: Class 125 (125 psi at 400°F, 200 psi at 150°F), bronze, straightway pattern, screw-in bonnet, renewable seat and disc, in conformance with MSS SP80. Nibco 211, Grinnell 3210, Milwaukee 502, Hammond IB440, Watts 4000, Stockham B13, or approved equivalent.
2. 2" and smaller: Class 300 (300 psi at 550°F, 600 psi at 150°F), ASTM B-61 bronze body, straight way pattern, union bonnet, renewable bronze seat and full plug disk, in conformance with MSS SP80. Nibco T-276-AP, Grinnell 3270, Milwaukee 593A, Hammond IB444, or approved equivalent.

**20 10 14 STRAINERS**

A. General:

1. When two or more strainers of the same type are to be used in the same service, all strainers of this type shall be of the same manufacturer.
2. Only general strainer series are specified. Strainers shall have all options, trim, and accessories as specified whether or not listed as a prefix, suffix or the model number.
3. All manufacturers and models listed shall be considered as "acceptable manufacturers" and may be submitted without concern from subsection 150620.

B. "Y" Strainers:

1. 2-1/2" through 12": ANSI 125 lb. (125 psi at 353°F, 200 psi at 150°F), ASTM A126-B cast iron body and cover, ASTM A240 304 stainless steel perforated sheetmetal with .045" openings for steam and 1/4" diameter for water service. Mueller 751, Keckley A, Armstrong A-FL-125, Spirax/Sarco F-125, Watts 77F-D, or approved equivalent.
2. 2" and smaller: ANSI 250 lb. (250 psi at 400°F, 400 psi at 150°F), ASTM B62, bronze body and straight thread cap, ASTM A240 304 stainless steel perforated sheetmetal with .033" openings for steam and 1/8" diameter for water service. Mueller 352M, Keckley F-350, Armstrong F4SC, Spirax/Sarco BT, or approved equivalent.

**20 10 20 MISCELLANEOUS MATERIALS**

**20 10 21 SLEEVES (NON-WATER PROOF, NON-FIRE RATED)**

- A. Piping passing through non-fire rated interior walls or floors shall be neatly field cut round holes with hole saws for non-masonry/concrete, and core drill for masonry/concrete. "Beating" an opening in a gypsum or masonry wall shall not be accepted.
- B. Install Schedule 40 pipe sleeves where pipes passing through floors of spaces where water could leak to the area below (i.e., mechanical rooms, janitor closets, kitchens, etc.). ID of pipe sleeve shall accommodate pipe insulation. Pipe sleeve shall extend a minimum of 4" above the finished floor, grout the annular space between the oversized core drill in the floor and the sleeve.

- C. In new construction, field formed walls or floors, the contractor shall install appropriate blocking or material or pipe sleeves.

#### 20 10 22 WATER SEALS

- A. All penetrations through interior to exterior walls or floors shall be sealed water tight using the methods below.
- B. In existing construction, holes shall be core drilled to the manufacturer's recommended size for the type and size of pipe to be sealed.
- C. The annular space between pipes/conduits and interior to exterior sleeves and sleeve penetrations for service temperatures below 250°F shall be sealed with GPT Industries "Link Seal" Model S-316 EPDM rubber with 316 stainless steel hardware. For service temperatures between 250°F-450°F and model "T" shall be used. Closure seals sizing shall be in accordance with manufacturer's data and application.
- D. The Contractor shall submit a schedule of sleeves and seals to the Architect/Engineer for approval indicating the following: carrier pipe size, location, type of sleeve - fabricated with dimensional details or purchased with manufacturer's support information, seal requirements - none, fire rated, non-fire rate or "Link Seal" with respective support data.
- E. Sleeves and seals manufactured by GPT Industries/PSI, Flexicraft Industries, Advance Products & Systems, Metraflex, or equivalent.

#### 20 10 23 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 24 ESCUTCHEONS

- A. Wall, floor, and ceiling plates shall be spun brass, plain pattern, chrome plated, spring type or setscrew fastening. Provide escutcheons for all exposed piping in finished spaces.

#### 20 10 25 ROOF PENETRATIONS

- A. All roof penetrations shall be made in a manner that is consistent with the roofing installation and shall maintain the existing roof warranty. Coordinate with the roof warranty supplier as required.
- B. Supports for roof mounted equipment shall also meet the requirements listed in paragraph A. above. All roof supports shall be anchored to the existing structure in a manner that will transmit all loads including seismic and wind loads from the equipment supports through the roofing to the building structure.

#### 20 10 26 ACCESS DOORS

- A. Access to mechanical equipment and ductwork of Divisions 20 - 29 required for testing, adjusting, inspection, maintenance or servicing shall be the responsibility of the Contractor. Doors for manufactured equipment shall be an integral feature included with the respective equipment. Access openings in ductwork shall be included with the fabrication in accordance with SMACNA practices.

- B. 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.
- C. 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:
- |   |                                       |
|---|---------------------------------------|
| <u>building construction:</u>                                 | <u>Milcor access door:</u>            |
| 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  |                                       |
- D. Access doors are not required for Work above lay-in panel ceilings.
- E. 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 MfCO.

#### 20 10 27 RESTRICTIONS, GENERAL FOR ALL PIPING SYSTEMS

- A. Do not use gaskets or packing containing asbestos.
- B. Selections of material and equipment and options for substitution shall conform to the requirements of Sub-section 20 00 60, MATERIAL and EQUIPMENT.
- C. "Bull head" tee connections are not permitted, unless approved by the Engineer.
- D. Close nipples and bushing reducers are not permitted.
- E. Slip joints are permitted in sanitary drainage systems only, on the fixture side of traps.
- F. Mitered elbows are not permitted in welded pipe construction.
- G. Solder for use in joints of copper piping for domestic (sanitary) cold water, hot water, hot water recirculating and softened water shall not contain lead.
- H. Unprotected, non-smoke rated plastic piping material is not permitted in above-the-ceiling spaces used as return air plenums, or exposed in any occupied space.
- I. Black and galvanized pipe, fittings, nipples and specialties are not permitted in water piping systems where copper and/or brass are the basic materials.

- J. Cast iron fittings are not permitted for gaseous distribution applications.
- K. Cast brass/copper fittings are not permitted for gaseous applications including refrigerant lines.
- L. Short radius 90-degree elbows and 180-degree returns are not permitted, unless specified and/or specifically noted.
- M. The use of pipe hooks, chain and perforated band iron are not permitted for hanging or supporting piping.
- N. Power driven inserts and attachments are not permitted unless approved by the Architect/Engineer on express request by the Contractor.
- O. Welded attachments to the structural steel of the building are not permitted unless otherwise noted or approved by the Architect/Engineer on specific request of the Contractor.

## **20 10 30 JOINTS AND CONNECTION METHODS**

### **20 10 31 THREADED**

- A. Threads for all screwed pipe systems shall be American National Standard taper threads in accordance with ANSI B-1.201.
- B. Threads shall be full, sharp, clean and free of fins and burrs. Pipe ends shall be reamed to remove internal burrs.
- C. Threaded connections shall be joined using teflon sealing tape applied to the male threads only.
- D. This sub-section does not apply to threads for compression, flare and sanitary drainage slip type drainage fittings.
- E. Threaded fittings for CSST shall be listed for use with CSST gas piping.

### **20 10 32 WELDED**

- A. Welded joints shall be "V" type butt welds in accordance with ANSI B31.1.
- B. The Contractor shall only use welders regularly engaged in the piping trades and certified by the National Certified Welding Bureau, using procedures set forth in ASME Boiler Construction Code, Section IX, "Welding Qualifications".
- C. Contractor shall keep a copy of welder's certification on file at Contractor's office. Upon request the Architect/Engineer may request Contractor to produce certifications. Any pipe installed by a non-certified welder shall be removed if requested by Architect/Engineer.
- D. All steel piping shall be cleaned of mill scale and rust before assembly. Welds shall be chipped and hammered after each pass and joints shall be built up to at least the same thickness as that of the pipe wall. All welding shall be done in accordance with the welding procedures of the National Certified Pipe Welding Bureau conforming to the requirements of the ASA Code for Pressure Piping.
- E. Architect/Engineer shall have the authority to accept or reject the welds and require random samples of installed welds to be removed, tested and inspected.

20 10 33 GROOVED

- A. Grooved joints for grooved couplings and fittings shall be in accordance with accepted manufacturer's specifications and practices.
- B. Grooves may be cut or rolled in accordance with manufacturer's recommendations for type of pipe, sizes and thicknesses specified for respective systems.
- C. Gaskets shall be suitable for the temperature, pressure and compatibility with the fluid contained therein. Unless specifically specified otherwise or incompatibility with the system, gaskets shall be EPDM grade E.
- D. Grooved couplings shall be ASTM-A47 grooved malleable iron clamp type couplings as manufactured by Victaulic or equivalent.
- E. Grooved couplings for vibration isolation or as unions at equipment connections shall be similar to Victaulic Style 77; all others shall be similar to Victaulic Style 07.

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 medical vacuum, 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 230000.
- C. Copper connections for medical gas, medical vacuum, refrigerant systems shall be made per the following criteria:
  - 1. Work shall be performed in accordance with NFPA and CGA Medical Gas Piping Standards and Practices. At the end of each installation workday, medical gas piping shall be capped and tagged; piping shall not be left open.
  - 2. Fittings and valves shall be purchased for "oxygen" service. Material shall be factory washed, degreased and packaged separately. When material is contaminated, tubing, fittings and valves shall be washed in a hot solution of one pound of trisodium phosphate to three gallons of water and rinsed thereafter with clean hot water. Do not use hydrocarbon-based solvents. Temporarily cap to prevent recontamination before use.
  - 3. Brazed joints in medical gas systems using copper tubing shall be made with a nitrogen purge to prevent formation of copper oxide on the inside of the pipe. Do not use any flux or thread compound containing oil or an oil derivative.
  - 4. Screwed joints shall be made with teflon tape applied to the male threads.

20 10 35 FLANGED

- A. Flanges shall be flat faced or raised faced as required for mating flanges of valves, specialties, equipment connections, etc.
- B. Carbon steel hex head machine bolts, ASTM A307, grade 2, with heavy hex nuts shall be used for joining 125 and 150# flanged joints, unless otherwise specified.
- C. Alloy steel machine bolts, studs and heavy hex nuts shall be used for joining of 250 and 300# flanged joints, unless otherwise specified.
- D. Lubricate the threads of bolts and studs with an acceptable commercial product. Include data with submittal for approval for piping material.
- E. Gaskets shall be 1/16" thick non-metallic type conforming to ANSI B16.21 and shall be suitable for the pressure and temperature of the fluid contained therein, shall be provided at all flange joints. Full-faced gaskets shall be used for flat face flanges; ring gaskets shall be used for raised face flanges.

20 10 36 CAST IRON PIPE AND FITTINGS

- A. Joints for hub and spigot and no-hub cast iron soil pipe and fittings shall be installed in accordance with recommendations of the CISPI, unless noted otherwise.
- B. Do not use joint material which has deteriorated or which does not spread easily or smoothly.
- C. No-hub couplings shall be NSF Listed and conform to the requirements of CISPI 310, ASTM C1277, FM1680, IAPMO 35-89 and gaskets shall comply with ASTM C564.
  - 1. Band, screw housing, screw, and shield shall all be stainless steel.
  - 2. 1-1/2" through 4" couplings shall have a minimum of two clamps. 5" through 10" couplings shall have a minimum of four clamps. 12" through 15" coupling shall have a minimum of six clamps.
  - 3. Couplings (60 in./lbs) shall be by Anaco/Husky, Ideal Clamps, Tyler Pipe, Mission Rubber Company or approved equivalent.

20 10 37 MECHANICAL JOINTS

- A. Mechanical joints and joining material shall meet the requirements of ANSI/AWWA C111/A21.11.
- B. Clean bell and plain end, and lubricate gasket as recommended by manufacturer. The joint area must be free of dirt.
- C. All bolts and tie rods shall be galvanized. Tighten bolt to 75-90 ft.-lbs. torque alternating from top to bottom maintaining equal distance between face and gland during tightening.
- D. Where flanged joints are used to interface with equipment or other piping materials they shall be flanged joints in accordance with ANSI B16.1. The gaskets shall be full forced, made of rubber and shall meet the requirements of ANSI B16.21.
- E. Joints shall be restrained with EBBA Megalug, Romac Industries Romagrip, or approved equivalent. Thrust blocks or other restrains are not acceptable.

## 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.
3. This section shall not apply to Division 21 Fire Protection.

## 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. Pipe hangers for all “ambient” and “hot” piping systems shall be the same size as the pipe, except at roller hangers or supports where the treatment shall be the same as for “cold” piping systems.
- E. 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.
- F. The use of pipe hooks, chain, perforated band iron, wire, or cable are not permitted for hanging or supporting piping.
- G. Singular, horizontal, suspended piping above grade shall be hung with pipe hangers per the following schedule, unless noted otherwise:

<u>pipe sizes</u>	<u>piping application</u>	<u>Anvil International type and figure number</u>
3" and smaller	not subject to expansion/contraction	adjustable ring, #69
4" and larger	not subject to expansion/contraction	adjustable clevis, #260
4" and smaller	copper pipe/tubing	adjustable ring, #CT-99
5" and larger	copper pipe	adjustable clevis, #260 (1)
all	vertical risers steel copper	riser clamps #261 #CT-121

1. hanger to be sized for outside diameter of insulation and to be used with insulation protection shield, figure 167.
  2. hanger to be sized for outside diameter of insulation and to be used with insulation protection saddle, figure #160 through figure #165.
- H. Hangers, supports, etc. shall position the piping properly in the work, and provide for expansion and contraction.
- I. Vertical piping shall be supported at each floor level with riser clamps bearing on the building structure or pipe sleeve.
- J. 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.
- K. 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:

<u>pipe size</u>	<u>rod diameter</u>	<u>max. hanger spacing</u>
1-1/4" & smaller	3/8" diameter	8' on centers
1-1/2" & 2"	3/8" "	10' oc
2-1/2" & 3"	1/2" "	10' oc
4" & 5"	5/8" "	12' oc*
6" & 8"	3/4" "	12' oc*
10" and 12"	7/8" "	12' oc*

\* cast iron pipe shall have a maximum spacing of 10' oc center with the hangers located near the joint.

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

<u>pipe size</u>	<u>rod diameter</u>	<u>max. hanger spacing</u>
1" & smaller	3/8" diameter	4' oc
1-1/4" - 2"	3/8" "	5' oc
3"	1/2" "	6' oc
4"	5/8" "	7' oc
6" & larger	3/4" "	8' oc

#### 20 10 43 ANCHORING

- A. Anchors for piping, ductwork, or equipment in new concrete construction, existing concrete construction or new precast 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 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.



- B. Power driven inserts and attachments are not permitted unless approved by the Architect/Engineer on express request by the Contractor.
- 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.
- D. 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)	C
- Seismic Use Group	IV
- Seismic Design Category	C
- Spectral Acceleration, Short period ( $S_{DS}$ )	0.157

- 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. 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.
- C. 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.
- D. Aluminum and copper products shall not be encased in concrete.
- E. 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.
- F. The work shall be installed parallel with the building lines unless specifically shown or noted otherwise.

### 20 10 53 COORDINATION

- A. **Coordination Drawings:** 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. Refer to 1.E Special Conditions for additional requirements and details.
- 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.
- 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.

#### 20 10 55 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.
- C. All pipe systems for hydronic applications shall be flushed continuously with 100% city water make-up until the water runs clean from all drain locations. Each piping system shall be subsequently cleaned with recommended dosage of an approved pre-cleaning chemical designed to remove deposition such as pipe dope, oils, loose rust, mill scale and other extraneous materials for a minimum period of twenty-four (24) hours then drained, refilled, and rinsed clean. Flushing before and rinsing after cleaning shall be supplying constant make-up water while draining at all system low points and drains.
- D. Steam and condensate return piping shall be flushed continuously with 100% city water make-up until the water runs clean from all drain locations. Each piping system shall be subsequently cleaned with recommended dosage of an approved pre-cleaning chemical designed to remove deposition such as pipe dope, oils, loose rust, mill scale and other extraneous materials for a minimum period of twenty-four (24) hours then drained, refilled, and rinsed clean. Flushing before and rinsing after cleaning shall be by supplying constant make-up water while draining at all system low points and drains.
- E. New or repaired potable water systems shall be purged of deleterious matter and disinfected prior to utilization. The method to be followed shall be that prescribed by the health authority

having jurisdiction or, in the absence of a prescribed method, the procedure described in either AWWA C651 or AWWA C652, or as described in this section. This requirement shall apply to “on-site” or “in-plant” fabrication of a system or to a modular portion of a system.

1. The pipe system shall be flushed with clean, potable water until dirty water does not appear at the points of outlet.
2. The system or part thereof shall be filled with a water/chlorine solution containing at least 50 parts per million (50 mg/L) of chlorine, and the system or part thereof shall be valved off and allowed to stand for 24 hours; or the system or part thereof shall be filled with a water/chlorine solution containing at least 200 parts per million (200 mg/L) of chlorine and allowed to stand for 3 hours.
3. Following the required standing time, the system shall be flushed with clean potable water until the chlorine is purged from the system.
4. The procedure shall be repeated where shown by a bacteriological examination that contamination remains present in the system.
5. Water quality acceptance test(s) required shall include: Total Coliform, e-coli, pH, Alkalinity, Turbidity. Test potable water from nearby source as a reference sample.

#### 20 10 56 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 57 CLEANING OF DUCT SYSTEMS

- A. The Contractor shall clean all existing supply and return ductwork intended for reuse within the Bone Marrow Transplate suite, specifically all ductwork that will be reconnected to the new AHU-51. Contractor shall coordinate cleaning activities and scheduling with Owner prior to performing work.
- B. Cleaning procedures shall be in accordance with ACR, The NADCA Standard, latest version.
- C. Submittals:
  1. Duct cleaning plan: Before commencing cleaning work, submit written work plan including following information:

- a. Scope of Work identifying HVAC components are to be cleaned, as well as those components not to be cleaned.
    - b. Itemize specific environmental engineering controls required for workspace, and special work requirements.
    - c. Detail cleaning work means and methods.
    - d. Name, contact information, and functional tasks performed by each representative of each firm and contractor involved with the work.
  2. Manufacturer's Instructions: Submit cleaning agent product installation instructions.
  3. Field Quality Control Submittals:
    - a. Submit laboratory analysis results, if NADCA Vacuum Test is used for cleanliness verification.
    - b. Submit documentation detailing chain of custody for test samples, if outside laboratories or testing agencies performed sample analysis or testing.
  4. Qualification Statements: Show membership status, project experience, and certifications for:
    - a. HVAC Cleaning Contractor.
    - b. Supervisor.
    - c. Inspector.
    - d. Hygienist.
    - e. Testing Agency.
- D. Closeout Submittals:
1. Record Documentation: Submit documentation verifying compliance with this specification for work performed. This documentation may include:
    - a. Completion of cleaning work, visual inspection and verification of cleanliness.
    - b. Photo images, HVAC plans and other supporting documents such as submittal forms for materials used and/or warranties or guarantees.
    - c. System areas found to be damaged or in need of repair.
- E. Qualifications
1. HVAC System Cleaning Contractor: Current member of NADCA experienced in HVAC cleaning projects of similar size and complexity.
    - a. Supervisor: Employ NADCA-certified Air Systems Cleaning Specialist (ASCS) responsible for project.
    - b. Inspector: Employ NADCA-Certified ASCS, or NADCA-Certified Ventilation Inspector (CVI) to perform site inspections.
  2. Licensing:
    - a. Submit copy of proper licenses, required to legally perform work in [State] [Province] [Municipality] in which work is located.
    - b. Comply with applicable federal, state, provincial, and local, rules, regulations, and licensing requirements.
    - c. Comply with requirements of Authorities Having Jurisdiction.
- F. Cleaning - General
1. Perform HVAC system cleaning in accordance with ACR, The NADCA Standard.
  2. Remove visible non-adhered particulates.

- a. Clean HVAC components employing agitation device to dislodge contaminants from HVAC component surface, and then capturing contaminants with vacuum collection device.
  1. Acceptable methods include those that do not damage integrity of ductwork and other system components, and does not damage porous surface materials including internal insulation and duct lining.
  2. Clean HVAC components using source removal mechanical cleaning methods designed to extract contaminants from within HVAC system and safely remove contaminants from facility.
  3. Select source removal methods rendering HVAC system visibly clean and capable of passing cleanliness verification methods as described in ACR, The NADCA Standard.
  4. Do not employ cleaning method, or combination of methods, that can damage HVAC system components or negatively alter system integrity.
  5. Do not damage HVAC system and components with wet cleaning, power washing, steam cleaning and other wet process cleaning.
3. Apply cleaning materials in accordance with manufacturer's instructions.
  - a. Do not apply cleaning agents or water to electrical, fibrous glass or other porous HVAC system components.
4. Capture removed contamination and cleaning materials and legally dispose.
5. Verify HVAC system surface and component cleanliness in accordance NADCA Standard.
6. Particulate Collection:
  - a. Employ contaminant removal methods incorporating vacuum collection devices operated continuously during cleaning.
    1. Connect vacuum collection device to component being cleaned through service opening.
    2. Employ vacuum collection device of sufficient capacity to maintain areas being cleaned under negative pressure, containing debris is contained and preventing contaminant migration to adjacent areas.
  - b. When possible, discharge ducted exhaust air from vacuum collection devices outdoors, keeping discharge air clear of outdoor air intakes, operable windows, and other locations allowing outdoor air entry.
    1. Do not violate outdoor environmental standards, codes or regulations.
    2. Do not discharge unfiltered air from vacuum collection devices outdoors.
  - c. When necessary to exhaust vacuum collection devices indoors, including hand-held and wet-vacuum machines, keep discharge air in work area, and provide machine air discharge HEPA filtration, rated at 99.97 percent collection efficiency for 0.3 micron particles and larger.
- G. Air Duct Systems:
  1. Clean air ducts to remove non-adhered substances.
  2. Access air duct interiors through service openings in system that are large enough to accommodate mechanical cleaning procedures and allow for cleanliness verification.
  3. Use mechanical agitation methods to remove particulate, debris, and non-adhered particulate.
  4. Capture dislodged substances with vacuum collection device.
  5. Do not employ cleaning methods that damage HVAC components.
  6. Mark position of dampers and air-directional mechanical devices inside HVAC system prior to cleaning.

7. When cleaning is complete, restore dampers and devices to their marked positions.
8. After cleaning, verify cleanliness of HVAC system surfaces and components in accordance ACR, The NADCA Standard.

## **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 e.g. - coils, fan wheels and shafts, filters, guards, bearings, 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. Steel piping connections to equipment with rotating or reciprocating components shall be provided with a minimum of two grooved clamp type couplings per piping connection, which

shall be Victaulic Style 77 couplings or equivalent. Copper piping connections to equipment with rotating or reciprocating components shall be provided with Mason Industries SafetyFlex model SFDEJ flexible joint. Air handling units with internal fan isolation are not included in the above.

- E. 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.
- F. Full size branch connections and branch connections one size smaller in steel piping shall be made with manufactured fittings only. Branch connections two sizes and smaller than the main run may, in special cases with the Engineer's written permission, be made with manufactured fittings, weld-o-let or thread-o-let type fittings for welded piping construction, saddle type fittings for grooved piping construction or a pipe-to-pipe nozzle weld. Small branch connections for thermometers, pressure gauges, controls, etc. may be made with nozzle welded 3000# forged steel threaded couplings, thread-o-lets or saddle fittings. For insulated piping, provide branch connections with sufficient "neck" length to extend beyond the thickness of the insulation.
- G. 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.
- H. Minimum slope for piping shall be provided in accordance with the following schedule, unless otherwise specified, noted or shown:

Type of Piping Fluid Conveyed	System Component	Pitch	Direction of Fall
Sewer, sanitary	main/branch	1/8"/Ft.	w/flow
Steam	main	1/8"/Ft.	w/flow
Steam	branch	1/8"/Ft.	to main or drip
Steam condensate	main/branch	1/8"/Ft.	w/flow
Chilled/heating water	supply/return main	1"/40Ft.	from vent
Chilled/heating water	runouts to risers	1/8"/Ft.	back to mains
Condensate drain		1/8"/Ft.	w/flow
Domestic water		1"/40Ft.	to drain

- I. 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.
- J. 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. Globe valves shall be installed with pressure under the seat. Butterfly valves shall be free to open and close without obstruction.
- D. Valves shall be packed and glands adjusted before final acceptance.

20 10 64 EQUIPMENT

- A. The Contractor shall furnish and install the necessary frames, stands, brackets, stiff-legs, hangers, etc. to support or suspend the equipment and material that require this installation arrangement. The Contractor shall be responsible for the size, quantity, location and design of the supports and suspensions. The design shall permit no deflection of the support, the suspension arrangement or related building members, nor impart any vibration into the building structure. Loads transmitted to the building shall be within the limitations of and distributed satisfactorily to the structure. Designs for supports and suspensions shall be submitted for approval to the Architect/Engineer. Any attachment to the floor shall be provided with a minimum of 1" thick concrete or grout between the base and the floor. All associated ferrous metal parts shall be painted or galvanized. Painting shall consist of one (1) coat of base primer on properly prepared surfaces and one (1) coat of rust inhibiting enamel, color selected by the Architect/Engineer.
- B. Each exposed mechanical drive and rotating shaft shall be provided with a protective guard. The guards may be provided with the respective equipment or may be field fabricated. The guard shall be constructed to comply with the appropriate safety requirements of the National Institute of Safety and Health and OSHA. Provide adequate and proper access for speed measurements for all rotating shafts. Guards shall not interfere with the lubrication of equipment nor restrict the airflow into fan inlets. The design for field fabricated guards shall be submitted for approval to the Architect/Engineer.
- C. All equipment except pumps, having rotating or reciprocating components shall be provided with captive spring type vibration isolation mounts for seismic and restrained service. Mounts shall be selected at a maximum transmissibility of 0.03 (isolation efficiency of 97%) at the lowest anticipated operating speed of the equipment.
- D. Grease fittings for bearings shall be extended to accessible locations.
- E. Installation Instruction
  - 1. Equipment shall be set level, plumb, properly oriented, aligned and secured in the location shown on the drawings.
  - 2. Shims used for leveling shall be of size sufficient to cover the entire bearing surface except where shims are used to level preparatory to grouting. Shims used in conjunction with grouting shall be located to properly support equipment at load points to prevent any distortion.
  - 3. Assembly and installation of the equipment shall be in strict compliance with the equipment vendor's instructions.
  - 4. Where specified, equipment shall be assembled, installed, inspected and adjusted under the supervision of the Vendor's representative.
  - 5. Lugs, saddles, supports, covers or similar components which have been shipped separately or loose shall be located and attached by the Contractor by means of welds or bolting.
  - 6. Holes in structural steel required for installation of equipment shall be drilled as required.
  - 7. Contractor shall supply and install self-anchoring anchors.

8. The Contractor shall grout under the equipment to effect a firm permanent setting as required.
  9. Upon completion of installation the Contractor shall remove all staging, blocking and construction debris from the equipment.
  10. The Contractor shall check all packaged or pre-assembled equipment to make sure that all packing shims and blocking is removed before rotating, running or testing the equipment.
- F. Equipment Alignment
1. The Contractor shall do a cold final alignment of all rotating equipment shafts and coupling assemblies even when they were factory aligned. The reverse dial indicator method of alignment is preferred whenever possible. The following requirements apply to alignment:
    - a. Initial Alignment shall be checked with all piping larger than NPS 1" disconnected from the equipment. Maximum misalignment readings shall be 0.05-in. total indicator reading (TIR) on the rim and on the face of the coupling hub for all equipment unless otherwise noted in the Equipment Data Sheet instructions. Equipment shall rotate freely, all bolts shall be tight, all bearings and couplings shall be lubricated, and all safety guards shall be in place.
    - b. Soft Foot. Equipment will be checked for "soft foot". If the dial indicator indicates more than 0.05 in. (TIR) when any equipment to baseplate bolt is loosened, the equipment will be reshimed.
    - c. Final Alignment. The Architect/Engineer will witness the final alignment check on each piece of rotating equipment. Connecting pipe shall fit up to the equipment without the use of mechanical force. Connecting piping greater than NPS 1" will be bolted to the equipment one at a time, with the dial indicator attached. If the alignment changes by more than 0.05 inches (TIR), the piping will be revised until the alignment change is acceptable.
  2. Shims used for aligning the equipment shall be stainless steel and shall be stamped with the shim thickness. The shim shall be large enough to cover the complete load bearing area and the total height shall be a maximum of 1/8 inch and shall be installed between the equipment's foot and the equipment's baseplate.

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 in new construction 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 be 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. 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. 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.

20 10 73 CONCRETE WORK (CAST-IN-PLACE)

A. General:

1. This sub-section shall supplement Section 03300 – Concrete Work for the concrete work required to install the work of Divisions 20 - 25.
2. In the event of a conflict between this sub-section and Section 03300, the more stringent shall apply.

B. The Contractor shall include the following Work:

1. Provide concrete foundations, bases and/or housekeeping pads for mechanical equipment furnished in his respective scope of work where such are not indicated on the architectural or structural drawings. Concrete work shall include requisite excavation, formwork, reinforcing and contained hardware.
2. Submit for approval to the Architect/Engineer detailed and dimensioned drawings of size, location, reinforcing and hardware contained therein of concrete work to be provided.

C. Housekeeping Pads:

1. All equipment setting on concrete or other type of pave flooring shall be set upon a raised “housekeeping” pad, unless noted otherwise.
2. The Contractor shall be responsible for this size, location, and any required anchor bolts. In general, housekeeping pads shall be a minimum of 3 ½” high, a ¾” chamfer on exposed corners and edges, and a minimum of 3” beyond the equipment on all sides or as required for anchor bolt edge distance.
3. Housekeeping pads shall be 3000 psi 28-day compressive strength concrete. Pads shall be reinforced and doweled to the floor slab. Refer to ASHRAE-A Practical Guide to Seismic Restraint 1999, Chapter 6 – Housekeeping Pads for size and spacing of reinforcing and dowels.
4. Specifically designed vibration isolation/inertia concrete bases for equipment will be specified and shown separately.

20 10 75 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.
- B. After the Contractor moves on site, they shall hand rotate all existing rotating equipment at least once every week in order to make sure the equipment remains free and eliminate the risk of including a permanent set in the rotating shaft or bearing.

20 10 76 DRAINING, FILLING AND VENTING SYSTEMS

- A. The Contractor shall provide all required labor for draining, filling and venting of new or modified systems as many times as required during construction and for all phasing activities.

- B. Where draining and filling systems affects other systems or the Owner's normal operations, then they shall be scheduled at least 24 hours in advance with the Owner and shall be carried out to minimize such disruptions.

## **20 10 80 TESTING, ADJUSTING AND BALANCING**

### **20 10 81 GENERAL**

- A. TAB is by a Third Party TAB firm hired by the Owner. Contractor responsibilities are outlined in the attached specification section 230593 – TEST-ADJUST-BALANCE

## **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 - 25 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 - 25 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".
  - 2. NFPA 99 – Health Care Facilities

### **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 - 25 of the Specifications.
  - 1. All equipment items (i.e., chillers, air handling units, fans, pumps, boilers, etc.).
  - 2. All chilled water, condenser water, heating water, steam and condensate, plumbing, and fire protection valves both new and existing.
  - 3. All piping systems identifying the system type and direction of flow.
  - 4. 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, plumbing, fire protection, 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. Coordinate numbering with owner.
- F. Valve tag information is required on "as-built" drawing submittals. Valve tags shall be indicated on record drawings. Drawings shall contain either a table of valve tags or valve labels directly on plans.
- 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:

<u>Location</u>	<u>Type</u>
Mechanical Rooms	II
Above Lay-in Ceilings	I

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. Stencil Lettering (Type IV):

Outside diameter of bare pipe or insulated pipe	Size of letters	Length of color field
3/4" - 1-1/4"	1/2"	8"
1-1/2" - 2"	3/4"	8"
2-1/2" - 6"	1-1/4"	12"
8" - 10"	2-1/2"	24"
-10" and larger	3-1/2"	32"
- D. Medical gases shall be identified in addition at least once in each room, at zone station valves and at each story traversed by the piping systems.
- E. The following legend, color, and lettering shall be used:

<u>Service and Legend</u>	<u>Color of Field</u>	<u>Letters</u>
<u>Materials Inherently Hazardous:</u>		
Hot Water Supply	Yellow	Black
Hot Water Return	Yellow	Black
Low Pressure Steam	Yellow	Black
Low Pressure Steam Condensate	Yellow	Black
Domestic Hot Water	Blue	White
Domestic Hot Water Return	Blue	White
Waste	Black	White
Vent	Black	White
<u>Materials of Inherently Low Hazard:</u>		
Chilled Water Supply	White	Blue
Chilled Water Return	White	Blue
Cold Water	Green	White
Drain	Green	White
<u>Fire Quenching Materials:</u>		
Sprinkler – Fire	Red	White
<u>Health Care:</u>		
Medical Air	Yellow	Black
Oxygen	Green	White
Medical Vacuum	White	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 1/4" legend identifying and 1/2" 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. Coordinate numbering with Owner.
- E. Service valves and isolation valves shall be labeled consecutively with supply being odd and return even (i.e., chilled water pump service valves shall be No. 1 on pump discharge and No. 2 on pump suction). Where a valve does not have a match skip the next number. All single valves for make-up water, expansion tanks, etc. can be numbered consecutively and shall be last in the sequence. Coordinate numbering with Owner.
- F. Balance valves that are not used as a combination balance/service valve are not required to be labeled.
- G. Temperature control valves shall be identified with a 1/4" "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). Coordinate numbering with Owner.

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 1/2" high.
- E. Nameplates shall be attached with corrosion-resistant No. 3 round head or No. 4 sheetmetal screws.

20 10 99 DUCTWORK IDENTIFICATION

- A. Supply, return and exhaust ductwork uninsulated or insulated, exposed or concealed, shall be identified as specified herein, except for exposed ductwork in finished areas.
- B. Markers shall be installed in clear view; installed on both sides of the duct; run parallel to the ductwork; located at not more than twenty-five foot (25') intervals on straight runs at all branch



locations; and located on each side of penetrations of the building structure and non-accessible enclosures.

- C. Markers shall be pressure sensitive vinyl tape labeled for service and direction of airflow. Minimum size shall be 2" high x 8" long.
- D. Supply, return, exhaust and outdoor air ductwork labels shall be blue with white letters. Hazardous exhaust air ductwork labels shall be yellow. Outdoor air labels shall have an "air" legend.

#### 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
EEL	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 13 MOTORS

- A. The following are basic minimum requirements for all motors. Additional motors, more detailed and specific requirements may be specified with the respective equipment.
- B. Single-phase motors shall be provided for all motors 1/2 HP or less, except as specified or scheduled otherwise and shall be of the permanent split capacitor (PSC) type.
- C. Polyphase motors shall be provided for all motors 3/4 HP or larger, except as specified or scheduled otherwise with a minimum power factor of .85 at 65% of full load or shall be power factor corrected.
- D. Multi-speed motors shall have dual windings wound to the speeds scheduled or specified.
- E. Torque characteristics shall be sufficient to satisfactorily accelerate the driven load(s) with low in rush current.
- F. Motor horsepower sizes shall be large enough so that the driven load shall not require the motor to operate in the service factor range.
- G. Temperature rating: Rated for 40 deg. C environment with maximum temperature rise for continuous duty at full load of 40°C for open dripproof motors, 50°C for splash proof motors, and 55°C for totally enclosed motors (Class B insulation). Motors used with variable frequency drives/inverters shall be NEMA MG1, Part 31 Compliant and have a Class B temperature rise with Class F insulation design to resist transient spikes, high frequencies, and short rise time pulses produced by inverters.
- H. Starting capability: Frequency of starts as specified by the automatic control system. For manually controlled motors, not less than five (5) evenly time spaced starts per hour.
- I. Service factor: 1.15 for polyphase motors and 1.35 for single-phase motors.
- J. Motor construction:
1. NEMA standard frame sizes, general-purpose open dripproof (unless otherwise specified), continuous duty, Design "B" (unless "C" is required for high starting torque). Motor frame, end bells and conduit box shall be cast iron; stator windings shall be copper. Aluminum is unacceptable for any parts. Provide grounding lug in motor terminal box.
  2. Motors located outdoors or otherwise exposed to water, dust, etc where an open motor would not be suited, shall be totally enclosed fan-cooled (TEFC).
  3. Bearings: Ball or roller bearings with inner and outer shaft seals. Externally accessible inlet/outlet grease fittings. Where motors are enclosed within equipment, extend grease tubing to exterior of the enclosure. Bearings designed to resist thrust loading for drives

producing lateral or axial thrust. Fractional horsepower, light duty motors may have sleeve bearings.

4. Overload protection: Built-in thermal overload protection.
5. Noise rating: Motors shall meet IEEE, Standard 85.
6. Efficiency: Motors shall be NEMA Premium Efficiency per NEMA Standards Publication MG 1-2003, Table 12-12 and 12-13.
7. Nameplate: Indicate full identification of manufacturer's name, model number, serial number, horsepower, speed, voltage, characteristics, construction, special features, etc. Nameplates in harsh environments such as for cooling towers, or in pool equipment rooms, etc. shall be suited to the specific application.
- K. Acceptable manufacturers: Baldor, General Electric, Gould, Marathon, Magnetek, Reliance, Siemens, Toshiba, and U.S. motors.

#### 20 20 14 MOTOR CONTROLS

- A. Motor Starters: NEMA 1, general-purpose enclosures with padlock ears, unless specified otherwise. Type, size and duty shall be as specified or as recommended by the motor manufacturer and the requirements of the driven equipment for applicable protection and start-up conditions.
- B. Manual Starters: Pilot light and extra positions for multi-speed motors. Melting alloy type thermal overload relay protection.
- C. Magnetic Starters: Hand-off-Auto selector switches, pilot lights, interlock contacts, switches and other devices as required for control requirements. Trip-free thermal overload relays for each phase. Built-in 120 volt control circuit transformer, fused from line side, where power service exceeds 240 volts. Externally operated manual reset; under-voltage release of protection.
- D. Acceptable Manufacturers: Allen-Bradley, Cutler-Hammer, General Electric, Square D.

#### 20 20 15 DISCONNECT SWITCHES

- A. Fusible: For 3/4 horsepower and larger. Disconnect switch shall be horsepower rated, heavy duty, spring reinforced fuse clips each phase, quick-make/quick-break mechanism with arc quenchers, dead front line side shield, solderless lugs, silver electroplated current carrying parts, lockable hinged door, capacity and electric characteristics as specified.
- B. Non-fusible: For 1/2 horsepower motor and smaller. Disconnect switch shall be horsepower rated, toggle switch type, quantity of poles and voltage rating as specified.

#### 20 20 16 MULTI-SPEED MOTORS AND CONTROLS

- A. Multi-speed motors, when required, shall be specified under the heading of the respective equipment to be driven.
- B. Motor controls for multi-speed applications shall be specified, also, under the heading of the respective equipment, if said equipment is a "packaged" type unit.
- C. Otherwise, multi-speed motor controls shall be specified in Division 26.

#### 20 20 17 VARIABLE SPEED DRIVES

- A. Motor controls for variable speed drives shall be specified under the heading of the respective equipment, if said equipment is a "packaged" type unit.

- B. Otherwise, variable speed drives shall be specified in Division 26.

**20 20 18 CONTROL PANEL**

- A. NEMA 1 general-purpose enclosure for indoor application; NEMA 3R weather resistant enclosure for exterior location.
- B. Factory mount panel(s) and internal power and control devices. Pre-wire all devices for the operation of the related equipment so that only one main power connection shall be required in the field.
- C. Provide internal protection for each circuit, maximum 120-volt secondary control transformer(s), terminal strips for wiring terminations, identification of components and wiring diagram inside the cover.

**20 20 20 DRIVES AND GUARDS**

**20 20 21 GENERAL**

- A. This Subsection covers V-belt, sprocket-chain, gear and direct coupled drives.
- B. All drives shall be selected for 150% of specified motor nameplate horsepower.
- C. All drives shall be installed, balanced and aligned in accordance with the respective manufacturer's instructions and recommendations.

**20 20 22 DIRECT DRIVES**

- A. Wherever available, motors and related direct driven equipment shall be mounted on a common base.

**20 20 23 GUARDS**

- A. All belts, chains, pulleys, shafts, sheaves, sprockets, gears, couplings, projecting setscrews, keys and any other rotating parts shall be provided with guards by the Contractor furnishing the base equipment.
- B. Guards shall be designed and arranged in accordance with OSHA requirements.
- C. Guards shall completely enclose the drive, shall be secured to the respective equipment and shall be removable for servicing. Wherever available from the manufacturer, guards shall be provided with the equipment. If not, these shall be field fabricated.
- D. Provide reinforced openings with removable coverplates for access to motor and driven shafts for speed measurement.
- E. Extend tubing for grease fittings inside the guard to accessible locations outside the guard.

**20 20 24 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
  - .3 Division 22 - Plumbing Work
  - .4 Division 23 - HVAC Piping and Equipment
  - .5 Division 24 - Air Distribution

### **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 contaminants, 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. Chilled water piping (including chilled glycol and brine).
  - 2. Heating water piping.
  - 3. Condensate drain piping.
  - 4. Waste piping and floor drains located above grade serving condensate drains.
  - 5. Make-up cold water piping.
  - 6. Low pressure (15# and less) steam supply piping.
  - 7. LP steam condensate return and condensate pump discharge.
  - 8. Reheat coils and return bends of uncased coils, including VAV boxes.
  - 9. Heat exchangers and other heating equipment.
  - 10. Ductwork/sheetmetal systems.
  - 11. Domestic hot, hot recirculating and cold-water piping.
- B. Providing appropriate size calcium silicate/cellular glass/pipe shield manufactured inserts to the trade contractor for installation between the pipes and oversized hangers as specified in this section.
- C. Fire wrapping piping system located in occupied spaces or plenum spaces that do not meet flame spread 25 and smoke development 50.

20 25 06 SUBMITTALS

- A. The Contractor shall submit shop drawings for approval in accordance with Subsection 20 00 43, Duties of Contractor – Submittals and Division 1.
- 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.<sup>2</sup> °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 CS: Hydrous calcium silicate, molded pipe or block form, asbestos free, ANSI/ASTM C533, Type I, "k" value of 0.41 at 200 degrees F for pipe, "k" value of 0.39 at 200 degrees F for block, density of 15#/cubic foot. Owens-Corning Calcium Silicate or equivalent by Knauf, Manville or Pabco.
- B. Type GF1: Glass fiber, non-combustible, preformed for pipe and tube application, ANSI/ASTM C547, Class 1, "k" value of 0.23 at 75 degrees F. Owens-Corning type ASJ with SSL-II vapor retarder jacket or equivalent by CertainTeed, Knauf, Manville or Schuller.
- C. Type GF2: Glass fiber, non-combustible, rigid board with vapor retarder facing, ANSI/ASTM C612, "k" value of 0.24 at 75 degrees F, density of 3#/cubic foot. Owens-Corning type 703 with ASJ 25 jacket or equivalent by CertainTeed, Knauf, Manville or Schuller.



- D. Type GF3: Glass fiber, flexible blanket, laminated to reinforced kraft vapor retarder facing, ANSI/ASTM C553, Type II, “k” value of 0.27 at 75 degrees F, density of 1#/cubic foot. Owens-Corning type 100 All-Service faced duct wrap or equivalent by CertainTeed, Knauf, Manville or Schuller.
- E. 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.
- F. 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.
- G. 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.
- H. Type PI: Polyisocyanurate preformed for pipe applications ASTM C591, aged “k” value of 0.19 at 75 degrees F, density of 2#/cubic foot. Shall be ASTM E84 less than 25/50 rated. Saran 560 vapor barrier.
- I. Type PH: Phenolic preformed for pipe applications ASTM C1126, Type III, grade 1. ASTM E84 less than 25/50 rated, Saran 560 vapor varrier, 0.15@75°F.

#### 20 25 14 TYPES OF PIPING JACKET MATERIALS

- A. .0016” aluminum or 0.010” stainless steel jackets with moisture barrier shall be cut and fitted to size required. Fold a ½” safety edge on exposed side, roll to diameter required and secure with ½” x 0.020” aluminum or ½” x 0.015” stainless steel bands respectively on 9” centers (4 bands per 3 foot section of jacketing). Provide appropriate seals, and shed water toward low end of pitched piping. Install lap on top quadrant (2 or 10 o'clock position) of outside diameter of insulation and line up bands and seals to present neat and workmanlike appearance. Fitting covers shall be consistent with piping insulation jacketing. Secure in place with SS screws or banding. Seal with approved caulking. Sharp edges shall be turned under or otherwise protected.
- B. PVC jacketing 0.030” thick for pipe insulation and PVC fitting covers shall be applied over the insulation and vapor barrier system where indicated below for aesthetics or mild abuse areas.
- C. Finish piping insulation with factory or field application for respective locations as follows:
 

Dry, low abuse: (indoor)	Concealed, not exposed to view. Exposed, finish space.
Pipe: Fittings:	ASJ jacket. Pre-molded PVC covers.
High abuse area:	Exposed vertical risers in all Storage Rooms, Janitor Closets. Exposed, unfinished space.
Pipe:	Stainless steel jacket with seam away from abusive force. Apply to height of 8 feet.
Fittings:	Formed stainless steel covers.

Mechanical equipment room: All  
Pipe: PVC jacketing color coded per owner standard.  
Fittings: Pre-molded PVC covers

20 25 15 DELIVERY AND STORAGE OF MATERIALS

- D. 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.
- E. 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.
- F. 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.

- A. Metal jackets:
  - 1. Childers Products Co., Inc.
  - 2. Insul-Coustics
  - 3. Pabco Surfit Metal Corp.
  - 4. RPR Products, Inc.
- B. PVC covers:
  - 1. Proto Corp.
  - 2. Ceelco Corp.
  - 3. Speedline PVC Corp.
- C. Adhesives and Coatings:
  - 1. Alpha Associates
  - 2. Miracle Adhesives
  - 3. Vimasco Corporation
- D. Fasteners
  - 1. ACS Industries
  - 2. GEMCO

3. Midwest Fasteners

E. Fire Stop

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

**20 25 20 INSULATION MATERIAL SCHEDULES:**

20 25 21 INSULATION MATERIAL SCHEDULE I-1

A.	Service: Hot and cold piping	<u>thickness</u>	<u>insulation material</u>
B.	Chilled water supply and return piping 2" and smaller	3/4"	Type PI*, PH, F1
	2-1/2" through 5"	1"	Type PI*, PH, F1 (Contractor's option)
	6" and larger	1-1/2"	Type PI, PH
C.	Hot water (140°F and less) supply and return 1-1/4" and smaller	1"	Type GF1, F1
	1-1/2" and larger	1-1/2"	(Contractor's option)
D.	Hot water (141°F – 200°F) supply and return 1-1/4" and smaller	1-1/2"	Type GF1, F1
	1-1/2" and larger	2"	(Contractor's option)
E.	Low pressure steam condensate return piping including condensate pump discharge 1-1/4" and smaller	1-1/2"	Type GF1
	1-1/2" and larger	2"	
F.	Low pressure (15# and less) steam supply 3" and smaller	2-1/2"	Type GF1
	4" and larger	3"	
G.	Domestic water- hot, hot recirc. 2" and smaller	1"	Type GF1, F1 (Contractor's option)
	2-1/2" and larger	1-1/2"	Type GF1
H.	Domestic water-cold	1/2"	Type F1, GF1 (Contractor's option)
I.	Condensate Drain Lines:	1/2"	Type F1

All - except air handling units in Mechanical Rooms where drain line is 2'-0" or less in total length and located at the Mechanical

Room floor.

- |    |  |  |         |
|----|--|--|---------|
| J. | Waste Piping and Floor Drains:   | 1/2"   | Type F1 |
|    | Piping above grade serving floor drains, hub drains, indirect cabinets, etc., that receive condensate from cooling coils. Insulate piping to where it connects to main waste pipe. |  |         |
| K. | Fittings (hot and cold):   | Molded/preformed fittings, secured in place with twine or tape, seal all "cold" applications prior to installing jacket material.  |         |
| L. | Unions, flanges:<br>Valves: (cold piping)  | Type F1, same thickness as adjacent piping. Form external collar, minimum 1" overlap on adjacent insulation. Use adhesive to secure in place and maintain vapor barrier. |         |
| M. | Unions, flanges:<br>(hot piping)   | No insulation.   |         |
| N. | Valves (hot piping):   | Insulate valve body only.  |         |
| O. | Joints:  | Lines subject to condensation: seal longitudinal laps of jacket with adhesive and wrap butt joints between sections with 2" wide tape.                                   |         |

20 25 23 INSULATION MATERIAL SCHEDULE I-3

- |    |   |                  |
|----|---|------------------|
| A. | Service: Ductwork, 0 to 250 degrees F.                    |                  |
|    | <u>Location</u>   | <u>Thickness</u> |
| B. | Unconditioned Spaces and Mechanical Rooms                 |                  |
|    | 1. Supply Air, Heated or Cooled Make-up/Ventilation Air   | 1-1/2"           |
|    | 2. VAV box coil return bends, Duct mounted coils          | 1-1/2"           |
|    | 3. Return Air   | 1-1/2"           |
|    | 4. Outdoor Air and Mixed Air                              | 1"               |
|    | 5. Outdoor Air and Mixed Air Plenums, and Filter sections | 1"               |
|    | 6. Relief Air   | N/A              |
|    | 7. Exhaust Air  | N/A              |
| C. | Conditioned Spaces and Return Air Plenums                 |                  |
|    | 1. Supply Air, Heated or Cooled Make-up/Ventilation Air   | 1"               |
|    | 2. VAV box coil return bends, Duct mounted coils          | 1"               |
|    | 3. Return Air   | N/A              |
|    | 4. Outdoor Air and Mixed Air                              | 1"               |
|    | 5. Outdoor Air and Mixed Air Plenums, and Filter sections | 1"               |
|    | 6. Relief Air   | N/A              |
|    | 7. Exhaust Air  | N/A              |
| D. | Outside of the Building Insulation Envelope               |                  |

1.	Supply Air, Heated or Cooled Make-up/Ventilation Air	2"
2.	Duct mounted coils	2"
3.	Return Air	2"
4.	Outdoor Air and Mixed Air	N/A
5.	Outdoor Air and Mixed Air Plenums, and Filter sections	N/A
6.	Relief Air	N/A
7.	Exhaust Air	N/A
E. Insulation Material		
1.	Rectangular ducts	Type GF2
2.	Round and Oval Ducts	Type GF3

## 20 25 30 INSULATION APPLICATION

### 20 25 31 INSULATION APPLICATION - GENERAL

- A. Respective piping system, duct system and/or equipment 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.
- E. Insulation at terminal equipment shall be installed up to equipment. Piping up to terminal units and coil headers shall be fully insulated.
- F. Painting of piping for corrosion protection, where specified, shall be performed before insulation is applied.
- G. Painting of piping for color coding, where specified, shall be performed after insulation is applied.

### 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. This includes piping to reheat coils. Insulation shall be fully installed on piping up to and including reheat coil headers.
- 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. 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.

END OF SECTION  
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## **21 00 00 FIRE PROTECTION SYSTEM**

### 21 00 01 GENERAL

- A. This section specifies a hydraulically calculated fire protection system designed and installed by the Contractor as described on the drawings and hereinafter.
- B. It is the intent that the drawings and specifications shall describe and provide for a working installation complete in every detail and all items necessary for such complete installation shall be furnished whether specifically mentioned or not.
- C. 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.
- D. Provisions and conditions cited in this Section shall apply to Work for other sections of Divisions 20 - 29 of these Specifications.

### 21 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. National Fire Protection Association (NFPA) 13, 2019.
  - 2. The Local Authority having jurisdiction.

### 21 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.
- B. Division 20 - Basic Mechanical Materials and Methods

### 21 00 04 DEFINITIONS

- A. The term **“layout”** where used in this Section of the Specifications shall mean drawings prepared by the Contractor showing where all piping and heads are located. These drawings should include pipe elevations, need not include pipe sizes and should not include hydraulic calculations.
- B. The term **“Authority Having Jurisdiction”** or **“AHJ”** where used in this Section of the Specification shall mean the organization, office, or individual responsible for approving equipment, an installation, or a procedure.
- C. The term **“rhythm”** where used in this Section of the Specifications shall mean spaced in a manner which would place the heads at the same location with respect to lights or diffusers (i.e., for a row of lights spaced at 12' centers heads shall also be on 12' centers so that the heads will remain the same number of ceiling tiles or distance away from the lights; where there is an odd number of tiles between lights or diffusers, it is also preferable to have heads located at the tile centered between them).

- D. The term “**working drawings**” where used in this Section of the Specifications shall mean drawing of the quality and containing all information as which would be required for approval by local official and for field construction.

21 00 05 WORK INCLUDED

- A. Furnish material, labor and services necessary for and incidental to the installation of the following systems where shown on the Plans and as hereinafter specified. Include all necessary work in the related sections of the Specifications (Subsection 21 00 03 to perform the Work completely.
- B. Furnish and install a complete hydraulically engineered extension of the building fire protection system including the relocation of existing heads on existing branch lines.
- C. Verify actual water supply with a test, preferably witnessed or performed by the local fire official.
- D. Contractor shall coordinate his work with the work of other trades, and with the architectural and structural drawings.

21 00 06 SUBMITTALS

- A. The Contractor shall prepare submittals for approval in accordance with Subsection 20 00 43, Duties of Contractor - Submittals.
- B. Submit “Layout drawings” and equipment cut sheets with 30 days from the General Contractor’s contract date.
- C. Contractor shall submit “Working drawings” coordinated with the other trades for review prior to any fabrication or installation and prior to the General Contractor’s fourth partial pay request.
- D. Fire sprinkler shop drawings shall be submitted for review and approval prior to installation. The plans will be reviewed by: Maintenance Engineer/MU Fire protection shop, and Design Engineer.

21 00 07 SPECIAL REQUIREMENTS

- A. The Contractor preparing the drawings and calculations shall be NICET Level 3 certified or a Professional Engineer licensed in the State of Missouri, whichever is required by the Authority Having Jurisdiction.
- B. All equipment shall be U.L. Listed for use in fire protection systems.
- C. Where Pipe and accessories installed under this section of the specification tie-in to existing systems, Contractor shall verify existing lines for: sizes, direction of flow (via pressure or physical tracing of piping, not labels), materials, and elevations before installing new work. Contractor shall notify Architect/Engineer upon discovery of discrepancy. Work performed prior to verification will be corrected at no cost to Owner.

21 00 08 CLOSE-OUT REQUIREMENTS

- A. Reference Section 20 00 48.
- B. Where NFPA maintenance information is utilized, it shall be edited to contain only information that is relevant to this project.

## **21 00 10 DESIGN**

### 21 00 11 LAYOUT - GENERAL TO ALL SPRINKLER SYSTEMS

- A. The “layout” shall be submitted to the Architect prior to performing hydraulic calculation, sizing pipes or seeking approvals from the authority having jurisdiction.
- B. The Architect/Engineer will review “layout” for aesthetics, and pipe routings for consistency with the construction documents.
- C. Minimum head spacing shall be as per NFPA-13. Additional heads may be required by the Architect/Engineer to create spacing that works with the reflected ceiling plans. Contractor shall layout any areas not shown on the plans with symmetry and “rhythm” in mind.
- D. Heads shall be on return bends and centered  $\pm 1"$  for 2' x 2' ceiling tiles, or on quarter points  $\pm 1"$  for 4' x 2' ceiling tiles.
- E. Contractor shall not scale the drawing, refer to architectural drawings for dimensions. Where the room dimension is at the maximum size listed for the sprinkler heads, install an additional row of sprinklers.
- F. Contractor shall locate heads in the field from the final wall locations. It shall be brought to the Architect's/Engineer's attention where the center of tile location exceeds the maximum distance of the sprinkler. Additional heads shall be added and the layout modified as directed by the Architect/Engineer at no additional cost to the Owner.
- G. All sets and rises shall be located above ceilings of adjacent spaces of rooms without ceilings as opposed to making the sets and risers in the exposed spaces.

### 21 00 12 APPROVALS

- A. Submittal drawings shall show lights, ducts, and pipes indicating all necessary rises and drops in sprinkler piping required for routing. Drawings shall be of a minimum of the same scale as the contract documents  $1/8" = 1'-0"$  scale,  $1/4" = 1'-0"$  scale.. A  $1/4"$  scale drawing of the service entrance and an elevation of the service entrance shall be required. A sprinkler riser diagram showing all control valves, test connections, supervisory switches, and drains shall be required.
- B. The “layout” submittals shall be provided as PDF drawings of the piping layout. Equipment cut sheets shall also be provided at this time.
- C. The “working drawing” submittals shall be provided as PDF drawings of the piping layout.
- D. The Contractor shall not pursue any approvals or interpretations of the design documents except through the office of the Architect/Engineer.
- E. All work shall meet the requirements of the Owner, Authority Having Jurisdiction, Architect and Engineer. These requirements may be greater than required by NFPA. Work shall not start prior to the Contractor receiving the “working drawing” shop drawings with the 'stamp' of the Engineer and approval from the authority having jurisdiction.

### 21 00 14 TESTING

- A. Preliminary testing witnessed by the Architect/Engineer shall be conducted to assure proper operation before the final test is scheduled. Prior to this testing, pipes shall be flushed, hydrostatically tested, and all valves and devices shall be operated. All requirements of “System Acceptance” of NFPA 13 shall be met in full.

- B. The sprinkler system shall be final Acceptance tested in the presence of the Owner's Representative and the governing agencies having jurisdiction for approval.

21 00 15 ACCEPTANCE

- A. Acceptance test performed as described above.
- B. Contractor shall fill out completely and sign Contractor's Material and Test Certificate provided in NFPA-13 and submit to Engineer for approval and thus system acceptance.
- C. Spurious Alarms
1. If the Owner experiences an unacceptable number of spurious or unexplained false alarms during the installation and guarantee periods, the Contractor shall be responsible for providing the necessary labor, material and technical expertise to correct the problem to the satisfaction of the Owner.
  2. Any spurious alarms associated with waterflow devices or valve supervisory switches, range hood and duct fire suppression system monitoring devices, or monitoring of special suppression systems are considered unacceptable.
  3. The Contractor shall coordinate with the fire alarm contractor to resolve spurious or unexplained false alarms.
- D. Keys and Special Tools
1. The Contractor shall supply the Owner with three complete sets of any special tools or keys necessary for normal operation and maintenance of the system. Keys and locks for equipment shall be identical.

21 00 16 SPACE CLASSIFICATION

- A. The most stringent of NFPA-13, local practices, or the following criteria shall be used in the sprinkler system design and hydraulic calculations.
- 1) Light Hazard:
    - Offices
    - Toilet Rooms
    - Lobby/Commons Area
    - Corridors
    - Meeting Rooms
    - Vending
    - Multi-Purpose Rooms
    - Vestibules
    - Stairs
    - Hospitals
  - 2) Ordinary Hazard, Group 1:
    - Mechanical Rooms
    - Janitor's Closet
  - 3) Ordinary Hazard, Group 2:
    - Storage

- B. The hazard protection level shall be increased as required for areas with hazardous materials, flammable and combustible liquids, or storage that requires additional protection per NFPA 13. The sprinkler design criteria for spaces with hazardous materials and/or flammable and combustible liquids shall be in accordance with NFPA 30 and the requirements for Extra Hazard occupancies of NFPA 13.
- C. Reduction in design area shall be permitted for quick response sprinklers in accordance with NFPA 13.

## 21 00 20 PIPING AND ACCESSORIES

### 21 00 23 PIPING MATERIAL AND FITTING SCHEDULE

- A. Size: 2-1/2" and larger above grade.
  - 1. Pipe: Schedule 40 seamless steel piping with bacterial resistant internal coating.
  - 2. Fittings: Butt-welded, groove-end, forged steel flanged, thread-o-let, weld-o-let.
  - 3. Joints: Butt welded, groove-end couplings, flanged.
  - 4. Tests: Hydrostatically at not less than 200 psi for two (2) hours per NFPA 13, Section 8-2.
- B. Size: 2" and smaller above grade.
  - 1. Pipe: Schedule 40 seamless steel piping with bacterial resistant internal coating.
  - 2. Fitting: Cast iron or malleable.
  - 3. Joints: Screwed, groove-end.
  - 4. Tests: Hydrostatically at not less than 200 psi for two (2) hours per NFPA 13, Section 8-2.2.
- C. The following types of fittings are prohibited: plain end couplings and fittings, saddle/**mechanical/clamp branch** tee, **grooved** flange rings, and **grooved** reducing couplings.
- D. Pipe velocities shall not exceed 14 feet per second in any section of the piping system.

## 21 00 30 WET PIPE SPRINKLER SYSTEM

### 21 00 31 SPRINKLER HEADS

- A. All sprinkler heads are to be quick response liquid in glass bulb type, with a minimum of 1/2 inch orifice, 1/2 inch NPT, and a K factor of 5.65. Sprinklers have an orifice larger than 1/2 inch shall be 3/4" NPT.
- B. In finished spaces with ceilings, concealed sprinklers with an adjustable white coverplate shall be used. Heads shall be equivalent to the Viking model Horizon Mirage, Tyco RF-II or Reliable model G4QR.
- C. In unfinished spaces or in concealed locations, upright and pendent sprinkler heads with a natural bronze finish shall be used. Heads shall be equivalent to the Viking Microfast Model M, Reliable model F1FR, or Tyco TY-FRB.

- D. In finished spaces without ceilings the heads shall be the same as above with the addition of a white factory finish.
- E. Sidewall sprinklers where utilized in Unobstructed Construction shall be horizontal recessed type with a white factory finish. Heads shall be equivalent to Viking Microfast model M, Reliable HSW-1, or Tyco TY-FRB.
- F. In the entire Bone Marrow Treatment Suite, clean room application “sealing” concealed sprinklers shall be used. Sprinkler heads shall include wipeable gasketed cover plate. Reliable model G5 series sprinkler with model G4 QR Gasket Cover Plate.
- G. Sprinklers locations where they are likely to be damaged shall be furnished with wire guards.
- H. Temperature range and response time shall be suitable for the location and the expected heat release. Within a space all sprinklers should be the same Temperature Range and Response Time to avoid “skipping”.
- I. Stabilizing brackets must be included in the installation of all sprinkler heads.

END OF SECTION  
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## **22 00 00 PLUMBING WORK**

### 22 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 Divisions 22 of the Specifications.
- B. Provisions and conditions cited in this Section shall apply to Work for other sections of Divisions 22 of these Specifications.
- C. Each plumbing fixture, accessory, equipment item and specialty shall be installed in accordance with the respective manufacturer's recommendations.
- D. Plumbing fixtures, equipment and specialties shall be protected against damage in the period between installation and acceptance. Any item damaged shall be removed, repaired and/or replaced at no additional compensation.
- E. All operable devices and features of plumbing fixtures, accessories, equipment and specialties provided for in the Scope of Work of this Section shall be operated and proved to function satisfactorily for a period of eight (8) hours. Adjust, balance, lubricate as required, and instruct the Owner in the proper operation and maintenance of each device.
- F. The plumbing system shall comply with the 2011 Reduction of Lead in Drinking Water Act. Components shall be "lead free" equivalent of model number specified regardless if manufacturer's prefix and suffix have been included.

### 22 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.

### 22 00 03 RELATED SECTIONS OF THE SPECIFICATIONS

The following sections of the Specifications apply to Work under this Section:  
Division 20 - Basic Mechanical Conditions and Basic Mechanical Material and Methods  
Division 25 - Temperature Control (for monitoring domestic water temperature)

### 22 00 04 DEFINITIONS

Refer to section 20 00 05.

### 22 00 05 WORK INCLUDED

- A. Furnish material, labor and services necessary for and incidental to providing the following Plumbing Work where shown on the Plans and as hereinafter specified. Include all necessary work in the related sections of the Specifications (Subsection 20 00 43) to perform the Work completely.
  - 1. Sanitary waste system, including but not limited to, sanitary piping, vent piping, plumbing fixtures, and floor drains.



2. Potable domestic water system, including but not limited to, cold water piping, hot water piping, hot water return piping, and connection to all plumbing fixtures, equipment or specialties.
3. Contractor shall coordinate his work with the work of other trades, and with the architectural and structural drawings.
4. 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).
5. Smoke stopping of all penetrations of pipes 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).
6. Sealing/draft stopping of all penetrations of pipes both existing and new to maintain room pressure ratings as defined on the drawings.
7. Cleaning and pressure testing equipment, piping, and accessories installed under this section of the specification. (Refer to Section 20 10 50).
8. All seismic restraints for the above work. (Refer to Section 20 10 40).
9. Installing accessories specified under other sections of the specification referenced in subsection 20 00 05.

22 00 06 SUBMITTALS (SEE SUBSECTION 20 00 43)

- A. The Contractor shall submit the following shop drawings for approval in accordance with Subsection 20 00 43 - Submittals.
  1. Piping materials and valves as specified in Piping Material Schedule(s) in subsection 22 20 00.
  2. All specified drains and overflows in subsection 22 30 00.
  3. All specified plumbing fixtures in subsection 22 40 00.
  4. All specified plumbing specialties in subsection 22 80 00.
  5. All general items specified under Division 20 utilized in the installation of work required by this section of the specification.
- B. Provide manufacturer's technical product data of each material and accessory item with engineering support information and recommended installation procedure. Data shall be specific to product specified and clearly identified on all data sheets, which contains multiple models or sizes.
- C. 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.

22 00 07 SPECIAL REQUIREMENTS

- A. Where lines installed under this section of the specification tie-in to existing lines Contractor shall verify all existing lines, their elevations and directions of flow before running any new lines.
  1. Contractor shall notify Architect/Engineer upon discovery if the new line cannot tie-in to the existing line due to location, elevation, size, or direction of flow.
- B. Protection:
  1. Protect drains during entire construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
  2. Place plugs in the ends of uncompleted piping at the end of each day or when work stops.

**22 00 08 CLOSE-OUT REQUIREMENTS**

- A. Refer to Division 1 General Conditions and Division 20.
- B. 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 are smoke or fire stopped as required by the Code.

**22 20 00 PLUMBING PIPING SYSTEMS**

- A. General
  - 1. Furnish and install the piping systems shown on the Plans and as hereinafter specified in the respective PIPING MATERIAL SCHEDULE. Include all necessary considerations in the related sections of the Specifications (subsection 22 00 05) to provide for complete systems.
- B. All drainage lines shall be flushed clean at the completion of the Work. Rod out any obstructions encountered.
- C. All domestic water lines shall be flushed clean at the completion of the Work. Refer to Section 20 10 56 – Cleaning of Piping Systems.
- D. Pressure test each respective piping system for tightness to the test pressure indicated without loss. Repair any leaks and retest, as required. If test pressure is not indicated, hydrostatically test to 1.5 times the system operating pressure.
- E. The Plans indicate the approximate location and arrangement of roughing-in for waste, vent and domestic water piping to serve the respective plumbing fixture, equipment and specialties. Final locations and arrangements shall be determined from approved shop drawings of the respective item.
- F. Install all piping with pitch to vent or drain. Provide drain valves at low points and air vents at high points. Drain valves and air vents shall be ¾" bronze, 2 piece body ball valves with ¾" hose end adapter, cap, and chain. In ½" through 2" pipe, contractor may use Webstone model T-drain.
- G. The plumbing system shall comply with the 2011 Reduction of Lead in Drinking Water Act. Components shall be "lead free" equivalent of model number specified regardless if manufacturer's prefix and suffix have been included.

**22 20 01 PIPING MATERIAL SCHEDULE P-1**

- A. Service: Sanitary waste (SAN) and Vent (V), above grade.  
Piping within the building perimeter.
- B. Design: Pressure: gravity vented.  
Temperature: 140 degrees F.
- C. Pipe: Cast iron soil pipe, no-hub.
- D. Fittings: Cast iron, no-hub.
- E. Joints: No-hub stainless steel coupling assembly, with neoprene rubber gasket.

- F. Test: Pressure test at not less than 15 feet static head of water for two (2) hours minimum.

**22 20 03 PIPING MATERIAL SCHEDULE P-3**

- A. Service: Domestic water, above grade.  
 Includes cold water (CW), hot water (HW), and hot water circulating (HWC)
- B. Design: Pressure: 100 psig.  
 Temperature: 180 degrees F. max. for hot water only.
- C. Pipe: Copper, hard drawn, seamless, type L.
1. Fittings: Wrought copper, solder ends.
2. Dielectric Isolation union/union flanges between Fittings: water piping and non-copper connections and at all equipment connections.
- D. Flanges: Cast bronze, 125 psi.
- E. Joints:  
 All 95/5 Solder
- F. Valves (refer to Section 20 10 13):
1. Shut-off/Service:  
 3" and smaller Ball valve, bronze body, two piece, full port, stainless steel ball and trim.
2. Balancing/Throttling:  
 All sizes Multi-turn calibrated balance valve
3. Check Valve:  
 3" and smaller Class 125 bronze, horizontal swing, Y-pattern, regrinding type, renewable seat and disc, solder ends.
4. Hose End Valve: Interior: 3/4" hose thread outlet x copper sweat inlet with integral vacuum breaker. Nibco figure 63-VB.
5. Hose End Valve: Interior: 3/4" hose thread outlet x copper sweat inlet with integral vacuum breaker. Nibco figure 63-VB.
6. Test: Hydrostatically pressure test at 150 psi for four (4) hours minimum.

**22 30 00 DRAINS**

- A. General

1. Furnish and install the following drains where shown on the Plans and as hereinafter specified. Drains shall have all options, body material, top size, top style, top material, and accessories as specified whether or not listed as a prefix, suffix, or catalog number.
- B. Drain outlets shall be compatible with respective piping material and size. Outlets below grade shall be push type. Outlets above grade may be no-hub or push type at the Contractor's option. Tops shall be compatible with the flooring system.
- C. Provide deep seal P-traps for all floor drains.
- D. Submit with products, a room by room schedule indicating floor drains and cleanouts to be used including top size, shape, floor finish material, and setting height with respect to concrete slabs. Any drain body set prior to approval shall be performed with block-outs to allow correct tops and finished heights to be adjusted.
- E. Install floor sinks and shower drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
  1. Set with grates depressed according to the following drainage area radii:
    - a. Radius, 30 Inches (750 mm) or Less: Equivalent to 1 percent slope, but not less than 1/4-inch (6.35-mm) total depression.
  2. Install drain flashing collar or flange, so no leakage occurs between drain and adjoining flooring.
    - a. Maintain integrity of waterproof membranes where penetrated.

**22 30 01 FLOOR DRAINS**

**A. Floor Sink (FS-A)**

Cast iron 8" square floor sink with 6" sump, A.R.E. interior aluminum dome strainer, and nickel bronze hinged top. Zurn ZN-1910-K, Wade W-9110, J.R. Smith 3100, MIFAB FS1520-1, or Josam 49300A-LF-NB.

**22 30 02 SHOWER DRAINS:**

**A. Shower Drain (SD-A):**

Cast iron, no-hub connection, coated ductile iron base adapter and head, adjustable strainer heads, weep holes. Provide round stainless steel ring and strainer with vandal proof fasteners for finished tile floor application. Halo 822 or approved equal.

**22 40 00 PLUMBING FIXTURES**

**A. General**

1. Furnish and install the following plumbing fixtures where shown on the Plans and as hereinafter specified. Plumbing fixtures shall be institutional/commercial grade fixtures, no residential or "trade" grade fixtures are acceptable. Plumbing fixtures and accessories shall have all options, body material, water consumption, and accessories as specified where or not listed as a prefix, suffix, or catalog number. Include all necessary work in the related

sections of the Specifications (subsection 22 00 03) and accessories to provide for complete installation and operation of the respective fixture.

2. All plumbing fixtures and non-metal accessories shall be white color, except where shown or specified otherwise.
3. Vitreous china fixtures, where specified, shall be best quality, non-absorbent. Warped or imperfect fixtures shall not be accepted. Enameled cast iron fixtures, where specified, shall be thoroughly fused and bonded to body without discoloration, chips, flaws or cracks. Finish all exposed surfaces.
4. Fixture trim shall be cast brass with polished chrome-plated finish on exposed surfaces, except where shown or specified otherwise.
5. Fixture traps shall be tubular wall type, minimum 17 gauge with integral cleanout plugs, polished chrome plated finish, except where shown or specified otherwise. Size to suit fixture tailpiece. Comply with local plumbing code.
6. All faucets for lavatories and sinks shall be from the same manufacturer. All supplies and stops for lavatories and sinks shall be from the same manufacturer.
7. Furnish accessories for fixtures requiring trim, carriers, brackets, back-up plates, specialties, etc. for respective complete installation.
8. Install all designated fixtures to respective ADA Standards requirements per Federal Register 28 CFR part 36, July 26, 1991.
9. Provide stops (valves) in all water supplies to all fixtures.
10. Provide escutcheon plates for all wall penetrations for exposed connections to fixtures.
11. Division 22 shall provide templates of openings required for countertop mounted fixtures to the General Contractor.
12. Connections between plumbing fixture outlets and respective waste piping shall be gas and watertight. Use suitable and approved setting compound or gasket; rubber gaskets or putty are not acceptable.
13. Acceptable manufacturers:
  - a. Supplies, Strainer, Traps – McGuire, Chicago Faucets, Dearborn, Brass Craft, Engineered Brass, American Standard, Kohler, Elkay.
  - b. Faucets: Chicago Faucets, Zurn

#### 22 40 01 LAVATORY FAUCETS

##### A. Small Gooseneck, Lever Handle (L-A):

Single hole, 5 1/4" swing gooseneck spout, polished chrome, vandal proof lever handle. Complies with AMSE A112.18.1. Chicago Faucets model 350 series or approved equal.

Coordinate faucet outlet with Liquitech Tap Filter Deluxe Model 322400 attachment requirements.

22 48 01 SHOWER WANDS

A. Shower (SH-A)

Shower wand: Provide shower wand with point of use integral filter. LiquiTech Shower Filter Deluxe Model 322100.

**22 60 00 SECTION NOT USED**

**22 80 00 PLUMBING SPECIALTIES**

A. General

Furnish and install the following plumbing specialties where shown on the Plans and as hereinafter specified. Include all necessary considerations in the related sections of the specifications (subsection 22 00 02) and accessories to provide for complete installation and operation of the respective item.

Specialties shall comply with the 2011 Reduction of Lead in Drinking Water Act. Components shall be "lead free" equivalent of model number specified regardless if manufacturer's prefix and suffix have been included.

22 80 01 FLOOR DRAIN TRAP SEAL

- A. Smooth, soft, flexible, elastomeric PVC material, open on top with closure at bottom. Allows wastewater to open and adequately discharge floor drain through its interior. Closes and returns to original molded shape after wastewater discharge is complete. Complies with ASSE 1072. Precsion Plumbing Products Pro-Drain Trap Seal, ProSet Trap Guard, Rectorseal SureSeal, MIFAB MI-GUARD or approved equivalent.

22 80 02 LAVATORY POINT OF USE FILTER

- A. Point of use filter outlet. Liquitech Tap Filter Deluxe Model 322400.

END OF SECTION  
071671.000

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## **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. Cooling system including, but not limited to, piping and piping specialties.
  - 2. Heating system including, but not limited to, piping, piping specialties, pumps, and terminal heating coils.
  - 3. Air handling equipment including, but not limited to, central station air handling units, terminal units, return fans, coils, and humidifiers.
  - 4. Make-up water connections including, but not limited to, piping and electronic level sensors.
  - 5. 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).
  - 6. All seismic restraints for the above work (Refer to Section 20 10 40).
  - 7. 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).
  - 8. Cleaning and pressure testing equipment, piping, and accessories installed under this section of the specification. (Refer to Section 20 10 50).



9. 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).
10. Installing accessories specified under other sections of the specification referenced in Sub-section 23 00 05, including but not limited to, flow meters, control valves, thermowells, and taps for pressure sensors.

**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, flow switches, and vacuum breakers.
  3. All HVAC equipment specified in this Division 23 including, but not limited to, pumps, air handling units, fans, terminal units and steam humidifier.
  4. All general items specified under Division 20 utilized in the installation of work required by this section of the specification.
- 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.
- C. At the point where the mechanical system has been installed and checked by the Contractor and the systems are ready for testing and adjusting, submit a letter to the Architect/Engineer stating such. Refer to Section 20 10 85.
- D. 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.

**23 10 00 HYDRONIC 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 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. Install all piping with pitch to vent or drain. Provide drain valves at low points and air vents at high points. Drain valves and air vents shall be  $\frac{3}{4}$ " bronze 2 piece body ball valves with  $\frac{3}{4}$ " hose end adapter, cap and chain. In  $\frac{1}{2}$ " through 2" pipe, contractor may use Webstone model T-drain. Use eccentric reducing fittings (installed top level) as required to avoid air pockets.
- D. Gaskets and packings containing asbestos are not acceptable.
- E. Where Pipe and accessories installed under this section of the specification tie-in to existing systems, Contractor shall verify existing for: sizes, direction of flow (via pressure or physical tracing of piping, not labels), materials, and elevations before installing new work. Contractor shall notify Architect/Engineer upon discovery of discrepancy. Work performed prior to verification will be corrected at no cost to Owner.

23 10 01 PIPING MATERIAL SCHEDULE, M-1

- A. Service: Chilled water supply and return for HVAC. (Unless specified otherwise)  
Hot water (heating) supply and return for HVAC.
- B. Rating: 125 psig at 350°F  
175 psig at 150°F
- C. Pipe: (Refer to Section 20 10 11)
  - 1. 3" and smaller Copper, type L.
  - 2. 10" and smaller Black carbon steel, schedule 40, ASTM-A53, ERW.
  - 3. Contractor has the option on piping 3" and smaller to use either copper or black carbon steel. Fittings shall be as scheduled below for the piping material chosen.
- D. Fittings: (Refer to Section 20 10 10)
  - 1. 3" and smaller Wrought copper, solder ends.
  - 2. 2-1/2" and smaller Cast iron, screwed.
  - 3. 3" and larger Black carbon steel, buttweld. Elbow fittings shall be long radius. See Division 20 for acceptable branch arrangement in lieu of tee fitting. Wall thickness consistent with connecting pipe.
- E. Joints in Steel Piping: (Refer to Section 20 10 12)
  - 1. 2-1/2" and smaller Screwed
  - 2. 3" and larger Welded, except at connections to rotating equipment where (2) Style 177 couplings shall be used at each inlet and outlet connection.
- F. Joints in Copper Piping:
  - 1. All 95/5 solder
- G. Valves: (Refer to Section 20 10 13)
  - 1. Shut-off/service:
    - A. 3" and smaller Ball valve: three piece bronze body, stainless steel ball and trim.
    - B. 3" and larger Butterfly valve, ductile iron body.
  - 2. Balancing/Throttling:
    - A. 12" and smaller Multi-turn calibrated balance valve.
    - B. 2" and smaller Auto balance valve

3. Check valve – General Duty:

A. All Class 125, swing check.

4, Check Valve – Pump Discharge:

A. 2-1/2" and smaller Class 125, swing check

B. 3" and larger Class 125, cast iron body, silent check

5. Strainers (Refer to Section 20 10 14)

A. 4" and smaller Class 125, cast iron body, Y-pattern

6. Unions:

A. 3" and smaller Wrought copper, solder ends.

7. Flanges:

A. 4" and smaller Cast copper companion type, solder end, class 125 ASME standard or class 150.

B. 2-1/2" and larger 150 lb, Black forged carbon steel, weld neck pattern (for welded pipe)

C. Pressure Test: Hydrostatic test at 200 psi for two (2) hours minimum.

23 10 02 PIPING MATERIAL SCHEDULE M-2

A. Service: Condensate drain piping.

B. Design: Atmospheric

C. Pipe: Type L copper

D. Fittings: Wrought copper, solder ends. 90° elbows are not permitted, use (2) 45° elbows or 'Y' provided with cap in unconnected straight run.

E. Valves: Two piece bronze body, stainless steel ball and trim.

F. Extend piping from all cooling coil drain pans to the location of discharging indirectly to the building drain system. Pipe size shall be unit connection size unless indicated larger on the plans.

G. Connections to the drain pans shall be made through a water seal trap with the downstream side vented to atmosphere.

23 10 03 HYDRONIC SPECIALTIES

A. Automatic Air Vent

1. Automatic air vents shall be furnished and installed for all centrifugal air separators. Automatic air vents shall be high capacity, float actuated, cast iron or cast brass body, stainless steel/brass trim and rated for 150 psi at 250°F.
2. Automatic air vents shall have their discharges piped to a drain.
3. Automatic air vents shall be Amtrol Model 720, Armstrong AAE-750, Bell & Gossett 107A, Spirotherm model Spirotop, Thrush model 720 or equivalent.

**B. Thermometers**

1. Thermometer wells and thermometers shall be provided at the inlet and outlet of all air handling unit coils, chillers, etc. and where shown on the plans, piping isometrics, flow diagrams and details.
2. Thermometers shall be organic spirit filled in a 9" polyester or aluminum case, magnified lens, glass or acrylic front, black divisions and numbers. Accuracy shall be  $\pm$  one scale division. Stem shall be tapered aluminum installed in a brass thermowell. Stem length and lagging length shall be coordinated with the piping and the insulation. A minimum 2" insertion length shall be in the moving fluid.
3. Thermometers for use in chilled water having 1°F increments are preferred with a minimum range of 30°F - 100°F, in no case shall the range be greater than 0°F - 160°F having 2°F increments.
4. Thermometers for use in heating water systems shall have 2°F increments with a range of 30-240°F.
5. The submittal data shall clearly identify the range and the service the thermometers are used for.
6. Thermometers shall be Weksler AS5, Terice model Adjustable Angle, Weiss Vari-angle, MILJOCO 935, or equivalent.
7. Where thermometer wells are installed below 5 feet they shall be installed on the side of vertical piping or on the top of horizontal piping so that they can be angled back beyond vertical to allow easy reading. Where thermometer wells are installed above 6 feet they can be installed on the face or the side of vertical piping and for horizontal piping it should be installed between 9 and 12 o'clock to allow the thermometers to be angled less than vertical without the pipe blocking the view of the thermometer.
8. Prior to installing the thermometer wells, the contractor shall have the thermometers at the jobsite and shall demonstrate to the Architect/Engineer where they intends to install them where they will be easy to read. If the Contractor fails to perform the above, any thermometers which are unreadable, in the opinion of the Architect/Engineer, it shall be modified at the Contractor's expense.

**C. Test Ports**

1. Provide pressure and temperature test plugs at locations shown on the plans, flow diagrams and details. Test ports shall be pressure and temperature test plugs. Plugs shall be self-sealing plugs. EPDM seals rated for the temperature, pressure and fluid associated with the application and shall be capable of accepting a needle type temperature or pressure probe and reclosing when the probe is removed. Furnish extensions for test ports installed in insulated piping. Plugs shall be provided with threaded protective caps. One temperature and pressure test kit suitable for the plugs used on the job shall be provided to the Owner on all installations where the plugs are used. Acceptable manufacturers and models are as follows:

Manufacturer	Model
--------------	-------

Peterson Engineering	Pete's Plug
Trerice	Pressure/Temperature Test Plug
Sisco	P/T Plugs
Bell and Gossett	Read-out Valve RV-125A

2. Alternatively, access fittings may be provided in place of the Pete's Plugs. In this case, the fittings shall be provided with a retained cap and shall be Mueller Brass A-17130 or equivalent.

#### D. Gauges

1. Provide 1/4" ball valves gauge cocks at all inlet and outlet of air handling units and across control valves of air handling units and at the inlet and outlets of pumps, etc. and where shown on piping isometrics, flow diagrams and details. Provide gauges where shown on piping isometrics, flow diagrams, and details.
2. Gauges shall be 4-1/2" diameter, flangeless aluminum/stainless steel safety case with removable ring, bottom connection, with a recalibrator, and have stainless steel tube and stainless steel movement calibrated to 1/2% accuracy, ANSI B40.1 Grade 2A with a pressure range appropriate for each system. Open water condenser systems shall have compound gauges. Gauges located at pumps shall be provided with a porous stone/metal type pressure snubber.
3. Gauges shall be Weiss Instruments UG2, Trerice 500XSS Series, Weksler AA44Y or equivalent by Marsh, or Marshalltown. Accessories from the same manufacturer shall be acceptable.
4. At pump locations utilizing factory taps in the casing or other locations where steel pipe is utilized, provide 1/4" brass screwed pipe and 1/4" 2-piece bronze threaded ball valve with lever handle for a gauge cock.
5. At locations where copper pipe is utilized, provide a 1/2" tee by line size connection in the piping and a 1/2" 2-piece bronze threaded ball valve, and 1/4" NPT bushing with lever handle for a gauge cock.
6. Gauges shall be installed as follows: 3" straight piping/nipple, service valve/gauge cock, tee with P/T plug in the run of the tee, and the gauge installed on the branch of the tee. There shall be no change in direction between the valve and the process pipe to allow cleaning an obstruction. The 3" is to create a dead leg to minimize sweating without insulating the valve.
7. All gauges shall be positioned where their view is unobstructed and can be easily read. If any gauge is unreadable, in the opinion of the Architect/Engineer, it shall be modified at the Contractor's expense.

#### E. Condensate Cooler

1. Manufacturers: Armstrong Temp-R-Drain or approved equivalent
2. Cooler tank shall be constructed of 304 stainless steel coupled with a brass bodied thermostatically controlled tempering valve. The tank shall be welded construction.
3. The cold water tempering valve shall have a brass body.
4. The temperature shall be factory preset to 140°F and be field adjustable.
5. Unit shall have integral air gap to allow hard piping into plumbing system.
6. Unit shall be installed horizontally and shall drain completely without a separate drain valve.

### **23 21 40 PUMPS**

#### A. General

1. Furnish and install circulating pumps for water service of the base mounted or in-line configuration as scheduled on the drawings. Pumps shall be factory tested, aligned, painted, and shipped complete for installation. Electrical characteristics shall be as scheduled on the plans.
2. Piping at pumps shall be arranged to facilitate pump maintenance. Piping shall be arranged so that the service valves can be closed and the piping and specialties between the service valves and pump removed for servicing and to allow clear access to the pump for removal as required. Where pump connection sizes are smaller than the line sizes associated with the suction and discharge piping, concentric reducers or increasers shall be installed immediately at the pump flanges to adapt to the indicated line size. All specialties and service valves associated with the pump such as strainers, check valves, etc., shall be line size, and not pump connection size.
3. Where pumps are from manufacturers not scheduled the following criteria shall apply: Pumps shall be picked at scheduled flow and head with working fluid of the system which the pump is in, pump impeller shall not be within ½" of the smallest or largest size for the pump body, pump efficiency shall not more than 5% less efficient than scheduled pump, operation point shall not exceed nameplate horsepower, pump motor size shall not be larger than scheduled motor (Contractor can pursue equipment substitution as required in Subsection 20 00 51 for pumps with larger motors), pumps which are used in parallel installations shall be sized such that the brake horsepower does not exceed the motor horsepower when only one pump is running. This operating point shall not be off of the manufacturers published pump curve.
4. Where existing systems are modified, provide start-up strainers at all existing pumps. Strainers shall be removed after 72 hours of operation.

#### 23 21 41 IN-LINE PUMPS

- A. General: In-line pumps and circulators shall be suitable for mounting in either vertical or horizontal piping with the motor mounted as specified below. Pumps shall be flanged and provided with a companion flange having NPT tapings or shall be ANSI Standard B16.1 flanges. Pumps shall have factory taps, shipped with plugs installed, for measuring suction and discharge pressure, and at the low point in the volute to allow draining. Where in-line pumps are installed in horizontal or vertical piping, the pump shall be rigidly mounted to the piping with pipe hangers on each side of pump, but the motor shall not be supported. Where in-line pumps are supported from the floor using a pipe stand/column then two flexible mechanical couplings shall be used on each side of the pump for vibration isolation.
- B. Cartridge type circulators shall be bronze or iron construction as scheduled. Pumps shall be maintenance free, horizontal (motor and shaft installed position) in-line, single stage, wet rotor type with the motor mounted directly to the pump volute rated for 125 psi, 230°F operation. The integral motor shall be cooled and lubricated by the pump fluid. The motor stator shall be isolated from the circulated fluid through use of a stainless steel rotor can. The pump shaft shall be ceramic supported by ceramic/carbon bearings. Pumps shall be Bell and Gossett Fox series, Taco "00" series, Armstrong Astro series, Grundfos series UP, or approved equivalent.

#### **23 22 00 STEAM PIPING MATERIALS**

- 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. Install all piping with pitch to vent or drain. Provide 150 pound ball valves with hose end adapter at all low points and manual key operated air vents at all high points. Use eccentric reducing fittings (installed bottom level) as required to avoid air pockets.
- D. Steam systems shall be defined as: low pressure when operating between 0-15 psig, medium pressure when operating between 16-50 psig, high pressure when operating above 51 psig.
- E. In steam systems service valves and strainers shall be installed with the stem/basket in the horizontal position so that condensate flow is not impeded.
- F. Install pigtail siphon at all pressure gauge and pressure transmitter locations. Refer to Section 23 10 09 for gauge specifications.
- G. Gaskets and packings containing asbestos are not acceptable.

23 22 01 PIPING MATERIAL SCHEDULE M-3

- A. Service: Steam supply: Low pressure, steam vents
- B. Rating: 125 psig at 350°F.
- C. Pipe:
  - 1. 10" and smaller Black carbon steel, Schedule 40, ASTM-A53, ERW.
- D. Fittings:
  - 1. 2" and smaller Cast iron, screwed, 125#.
  - 2. 2-1/2" and larger Black carbon steel, butt welded, standard schedule.
- E. Valves:
  - 1. Shut-off/service:
    - a. 2" and smaller Gate valve, Class 125, bronze body.
    - b. 2-1/2" thru 12" Gate valve, Class 125, iron body.
  - 2. Balancing/Throttling:
    - a. 2" and smaller Globe valve, Class 125, bronze body.
- F. Flanges: 150 lb., black forged carbon steel, weld neck pattern.
- G. Pressure Test: Hydrostatic test at 200 psig for two (2) hours minimum.

23 22 04 PIPING MATERIAL SCHEDULE M-6

- A. Service: Condensate return (all types)
- B. Design: 125 psig. (Max) temperature: 220°F
- C. Pipe:

1. 5" and smaller Black carbon steel, Schedule 80, ASTM-A53, ERW. At Contractor's option for long runs without equipment connection Type L copper pipe may be used.
- D. Fittings:
  1. 2-1/2" and smaller Extra heavy 250 lb., threaded cast iron
- E. Valves:
  1. Shut-off/service:
    - a. 2" and smaller Gate valve, Class 125, bronze body
  2. Check Valve:
    - a. 2" and smaller Swing check, Class 125, bronze body
- F. Flanges: 150 lb., black forged carbon steel, weld neck pattern.
- G. Pressure Test: Hydrostatic pressure test at 150 psig for two (2) hours minimum.

#### 23 22 05 STEAM SPECIALTIES

- A. Vacuum Breaker (Steam Heat Exchangers and Steam Coils):
  1. Furnish and install at all heat exchangers and entering side of steam coils a vacuum breaker rated for a maximum working pressure of 150 psig and 366°F operating temperature.
  2. Vacuum breakers shall be Bell and Gossett No. 26, or approved equal.
- B. Float and Thermostatic Traps (Modulation Loads):
  1. Float and Thermostatic Traps: ASTM A126, cast-iron body and bolted cap; renewable, stainless steel float mechanism with renewable, hardened stainless-steel head and seat; maximum allowable pressure of 125 psig; balanced-pressure, stainless-steel or monel thermostatic bellow element. Thermostatic air vent capable of withstanding 45°F of superheat and resisting water hammer without sustaining damage.
  2. Steam traps shall be Armstrong, Hoffman, Spirax Sarco, or Watson McDaniel.
  3. See schedule for sizes, capacities, and operating pressures.
- C. Inverted Bucket Traps: (Drip Legs)
  1. Inverted Bucket Traps: ASTM A126, cast iron body and bolted cap; renewable, stainless steel float mechanism with renewable hardened chrome steel valve and seat; maximum allowable pressure of 250 psig.
  2. Steam traps shall be Armstrong, Hoffman, Spirax Sarco, or Watson McDaniel.
  3. See schedule for sizes, capacities, and operating pressures.

#### **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 01 PIPING MATERIAL SCHEDULE M-7

- A. Service: Medical Gas, above ground  
B. Design: Pressure: 200 psig  
Maximum temperature: 150°F  
C. Pipe: Oxygen service, Type L Copper Pipe  
D. Fittings: Wrought copper, brazed

23 23 02 PIPING MATERIAL SCHEDULE M-8

- A. Service: Medical Vacuum, above ground  
B. Design: Pressure: 150 psig  
Temperature: 150°F  
C. Pipe: Type L Copper Pipe  
D. Fittings: Wrought copper, long radius 90° elbows, 'Y' type tees provided with cap for unconnected straight run.

23 23 03 MEDICAL GAS AND MEDICAL VACUUM TESTING

- A. Medical gas and medical vacuum testing shall be performed per NFPA 99, System Verification. The technical aspects associated with this contract will be furnished by the Owner. This contractor shall provide labor for the adjustment of valve, and shall provide nitrogen for testing. The Contractor shall notify the Owner in writing when all medical gas and medical vacuum systems are prepared for testing. Prior to Owner furnished testing, the Contractor shall perform Installer Performance Testing per NFPA 99. Installer performance testing includes the following:  
B. Blowdown: Prior to installing system outlets, pressure switches, etc., the contractor shall blowdown piping with dry nitrogen.  
C. Initial Pressure Test: Prior to installing pressure switches and system outlets, Contractor shall pressure test piping at 150 psig for oxygen, nitrous oxide and medical vacuum. Joints shall be tested with soapy water. Piping shall be tested until all leaks are repaired.  
D. Cross Connection Test: Contractor shall test all piping to verify that no cross connection between services exists. Each service shall be pressurized with nitrogen individually, and all services shall be tested to verify no cross connections exist. Pipe labeling shall also be verified.  
E. Piping Purge Test: At each station outlet, the Contractor shall purge the line until the purge produces no discoloration in a white cloth. Nitrogen shall be used for purging.  
F. Standing Pressure Test: After initial pressure test is performed, and all outlets and accessories are installed, the Contractor shall pressure test all services for 24 hours. Medical vacuum,

oxygen, and nitrous oxide shall be tested at 60 psig. The only allowable pressure change during a 24-hour test shall be due to ambient temperature variation. If leaks occur, the leads shall be repaired, and the pipe retested.

**23 23 04 MEDICAL GAS AND MEDICAL VACUUM VALVES AND SPECIALTIES**

- A. Medical Gas and Medical Vacuum Valves:
- B. Shut-off/service: Medical gas ball valve per 20 10 13. Valves in concealed spaces shall be provided with pad-lockable handles.
- C. Medical Gas and Medical Vacuum Pressure Gauge: Provide and install pressure gauge as indicated on plans. Pressure gauge shall comply with ANSI/ASME B-40.1 gauges< pressure indicating dial type, elastic elements, and 1-1/2" diameter face. Additional requirements are as follows:
- D. Oxygen, clinical air and nitrous oxide: Gauge shall have 0-100 psig pressure range,  $\pm 1$  psig accuracy and shall be cleaned for oxygen service. Medaes #0841-0014-300, Allied Healthcare Products #77-90-0571 or approved equal.
- E. Medical Vacuum: Gauges shall have a 0-30 inch mercury vacuum range,  $\pm 1/3$  inch mercury accuracy. Medaes #6812-2070-005 or approved equal.
- F. Medical Valve Box (MVB): Valve box shall be constructed of 18 gauge sheet steel with anodized aluminum cover frame. The frame assembly shall be capable of adjusting for variances in wall thickness. Box shall be provided with cover window and pull ring, color coded gas service labels, pressure gauges for each service per 23 23 04-B., valves per 23 23 04-A., valves shall be mounted so handles in closed position do not allow reinstallation of cover. Medaes Valve Box, Allied Healthcare Products Multiple Zone Valve Box or approved equal. Medical valve boxes shall be provided with a label stating what zone is fed by the valve box. Submit labels for approval.

**23 50 00 – 23 70 00 SECTIONS NOT USED**

**23 73 00 AIR HANDLING UNITS**

**23 73 01 MODULAR DOUBLE WALL UNITS**

- A. AHU has been prepurchased by owner. Refer to 20 00 15 Owner Furnished Equipment for additional information.

**23 82 00 TERMINAL UNITS**

**23 82 01 VARIABLE VOLUME UNIT WITH HOT WATER HEAT**

- A. Unit casing shall be welded, galvanized steel. Leak rate shall be not more than 1% of rated capacity at 4" wg. Interior surface of unit casing shall be acoustically and thermally lined with 1/2 inch thick, minimum of 1.5 lb./cu. ft. density glass fiber with foil face. Insulation shall be UL listed and meets NFPA-90A and UL 181. Factory mounted, removable panel on bottom of unit

- providing access to air valve and entering airside of coil. Straight flange or slip and drive rectangular discharge duct connection.
- B. Factory mounted one or two row coil with maximum of 12 fins per inch. Full fin collars for accurate fin spacing and maximum tube-fin contact, 5/8 inch O.D. seamless copper tubes mechanically expanded into the fin collars, leak tested at 300 psig.
  - C. Air valve shall be a 90° rotational damper flow control device with factory installed direct digital controls (DDC). All controls shall be furnished under Division 25 and mounted and wired in the factory by unit manufacturer. Manufacturer shall provide multiple point averaging flow sensing ring with high and low pressure pneumatic tubes compatible with DDC velocity pressure sensor. A calibration chart shall be provided on each unit.
  - D. At the Contractor's option Division 25 may field mount controls at no additional cost to the Owner.
  - E. Units shall be as manufactured by Trane, Titus, Price.

23 82 02 TERMINAL UNIT COIL HOOK UP

- A. Contractor to provide valves and specialties specified herein and in section 20 10 13 Valves (not valves from a HVAC hose kit manufacturer). Two service valves and an auto balance valve are required.
- B. One of the following piping and specialty configurations is acceptable (piping components installed in the order listed):
  - 1. Supply service valve, auto balance valve, tee with integral drain, hard pipe or hose to coil, hard pipe or hose from the coil, tee with integral vent, control valve, service valve.
  - 2. Supply service valve with integral drain (on coil side), auto balance valve, hard pipe or hose to coil, hard pipe or hose from the coil, control valve, service valve with integral vent (on coil side).
- C. When hoses are used at the contractors option they shall meet the following:
  - 1. Internal diameter of the hose shall be not less than 90% of the ID of copper pipe, for the pipe size on the drawings feeding the unit. Hose inner liner shall be EDPM rubber and shall be covered with stainless steel braid. Pressure rating shall not be less than 200 psig.
  - 2. Hoses shall have one fixed end male NPT connection and one swivel end. The swivel shall be a gasket-less JIC 37°F flared female connection, with companion flare x NPT fitting. Connections shall be stainless steel or brass. Hose kits shall be 24" long. Hoses using gaskets or o-rings are not acceptable. Hoses shall be Twin City Hose, ACE Hose, Hosecraft USA, Chamflex, or approved equivalent meeting the above specifications.
- D. Specialty Valves incorporating auxiliary ports for p/t, drain, vent, etc. may be utilized provided the arrangement meets the flow diagram and the products do not contain unions, gaskets, or o-rings. Valves shall be dezincification resistant brass and shall be rated for 200psig minimum at 200°F.
  - 1. Service valve with integral drain /vent – Webstone Ball Drain, Cimberio Valve model 630B less strainer basket, or approved equivalent.

2. Service valve with NPT tapping, plus separate drain cocks – Apollo 7B-100, Cimberio 200MC, or approved equivalent.
3. Tee with integral drain /vent – Webstone T-drain, or approved equivalent.

**23 82 03 VARIABLE VOLUME UNIT WITH VORTEX SHEDDING AIRFLOW MEASUREMENT**

- A. Provide terminal units of the sizes and quantities as shown on the equipment schedules.
- B. Unit casing shall be welded, minimum 22 gauge galvanized steel. Unit shall be factory leak tested and sealed. Leak rate shall be not more than 1% of rated capacity at 4" wg. Straight flange or slip and drive rectangular discharge duct connection. VAV terminal units shall be ARI certified.
- C. Air valve shall incorporate vortex style airflow sensors. Unit shall include transmitter for vortex flowmeter and be provided with integral standard response speed actuator.
- D. Terminal unit shall be supplied without the manufacturer's controller. The unit controller will be supplied separately by the owner. Unit shall be configured to allow for controls wiring to connect to AFMS transmitter for airflow input to BAS, and controls wiring connection to actuator for damper command output from BAS.
- E. Unit shall include Bluetooth option for wireless configuration.
- F. Units shall be Accuvalve AVC4000.

**23 84 00 HUMIDIFIERS**

**23 84 01 STEAM HUMIDIFIER DISPERSION GRID**

- A. A direct injection steam humidifier shall be provided for mounting within owner furnished air handler. Unit shall have a capacity as scheduled on the plans.
- B. Humidifier shall consist of steam discharge pipe(s), supported by integral unit mounted plates. Discharge pipe(s) shall be insulated and constructed of stainless steel and have dispersion nozzles across the full length of the pipe(s). The gaskets in contact with steam shall be EPDM, gaskets not in contact with steam shall be silicone with maximum temperature of continuous duty of 300°F.
- C. A full length feed pipe shall be placed inside the discharge pipe(s) to evenly distribute the incoming steam over the length of the top discharge nozzles, resulting in full separation of condensate from the steam.
- D. Control valves for humidifier are to be provided by others. Contractor shall coordinate exact quantities and locations of control valves with selected manufacturer. Contractor is responsible for a fully functional, fully operational system.
- E. Unit shall be as manufactured by CAREL UltimateSteam series or approved equivalent by Dri-Steem.

**23 85 00 RADIANT PANELS**

23 85 01 HYDRONIC RADIANT PANELS (ALTERNATE #2)

- A. Provide hydronic radiant panels as shown on drawings and specified in Radiant Panel Schedule.
- B. Panels shall be aluminum, 2'x2', white, smooth solid face finish.
- C. Panels shall have ½" sweat coil connections.
- D. Panels shall be provided with minimum 1 inch insulation.
- E. Price RPM or approved equal.

END OF SECTION  
071671.000

## **SECTION 230593 – TEST-ADJUST-BALANCE**

### **PART 1 – GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Special Conditions apply to this section.

#### **1.2 DESCRIPTION OF WORK**

- A. This scope of services specifies the requirements and procedures for mechanical systems testing, adjusting, and balancing. Requirements include measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting the results. The test and balance work will be provided separately by Owner-provided 3<sup>rd</sup> party TAB contractor. It is the Contractor's responsibility to assist as outlined below.
- B. Test, adjust and balance the following mechanical systems which are shown in the construction documents.
  - 1. Supply air systems, all pressure ranges, including variable volume and constant volume systems.
  - 2. Return air systems.
  - 3. Exhaust air systems.
  - 4. Hydronic systems.
  - 5. Steam distribution systems.
  - 6. Verify temperature control system operation.
- C. The contractor's responsibilities are as follows:
  - 1. Notify the Owner's Representative fourteen (14) days prior to the schedule date for balancing the system.
  - 2. Schedule a two (2) week allowance for the testing and balancing firm to complete the testing and balancing work when scheduling completion of all work required of the Contractor by the contract documents.
  - 3. Cooperate with the testing and balancing firm and shall make all necessary preparations for the TAB efforts.
  - 4. Complete the following work prior to requesting the TAB effort.
    - a. Clean and flush all piping systems.
    - b. Leak test and make tight all piping systems.
    - c. Fill all piping systems with clean water.
    - d. Clean and seal all ductwork systems.
    - e. Service and tag all equipment.
    - f. Set and align all motors and drives.
    - g. Start up and prove all equipment and systems.
    - h. Make preliminary settings on all control devices and have all systems operational.
    - i. Operate all systems successfully for twenty-four (24) hours minimum.
  - 5. Lubricate all motors and bearings.
  - 6. Check fan belt tension.
  - 7. Check fan rotation.
  - 8. Patch insulation, ductwork and housing, using materials identical

to those removed.

9. Seal ducts and piping, and test for and repair leaks.
10. Seal insulation to re-establish integrity of the vapor barrier.
11. Attend a coordination meeting prior to the balancing of the system and a coordination meeting following the balancing of the system.
12. Provide a complete set of as-built drawings prior to the TAB effort.
13. Provide craftsmen of the proper trade to work with the TAB firm to make adjustments and installation changes as required.
14. Change out fan sheaves when and if required by the TAB firm.
15. Dedicate the resources to accommodate all changes identified by the test and balance firm in a timely manner.
16. If a significant rebalance (Owner's determination) of the HVAC system is required due to the Contractor's failure to properly install and check out the HVAC system, the cost of rebalancing the system shall be borne by the Contractor.

### **1.3 PRE-BALANCING CONFERENCE**

- A. Prior to beginning of the testing, adjusting and balancing procedures, a conference with the Owner's representative, Engineer and the Test and Balance Agency's representative will be held. The objective of the conference is final coordination and verification of system operation and readiness for testing, adjusting and balancing.

### **1.4 SEQUENCING AND SCHEDULING OF SERVICES**

- A. Test, adjust and balance the air conditioning systems during summer season and heating systems during winter season. This includes at least a period of operation at outside conditions within 5 deg. F wet bulb temperature of maximum summer design condition, and within 10 deg. F dry bulb temperature of minimum winter design conditions. Take final temperature readings during seasonal operation.

## **PART 2 – PRODUCTS**

### **2.1 PRODUCTS (Not applicable)**

## **PART 3 – EXECUTION**

### **3.1 GENERAL (Not applicable)**

END OF SECTION 230593

## **24 00 00 AIR DISTRIBUTION**

### **24 00 01 GENERAL**

1. This Section specifies air distribution systems.
2. 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.
3. Provisions and conditions cited in this Section shall apply to Work for other sections of Divisions 20 - 29 of these Specifications.

### **24 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. ASHRAE, "Handbook 1997 Fundamentals"; Chapter 32 - Duct Design.
  2. ASHRAE, "Handbook 1996 Equipment"; Chapter 16 - Duct Construction.
  3. ASTM A90-81 (1991), "Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles".
  4. ASTM A525-91b, "Spec for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process".
  5. ASTM A527/A527M-90, "Spec for Steel Sheet, Zinc-Coated (Galvanized) by Hot-Dip Process, Lock Forming Quality".
  6. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
  7. SMACNA "HVAC Duct Construction Standard – Metal and Flexible" – Second Edition.
  8. UL 33, "Heat Responsive Links for Fire Protection Service."
  9. UL 555, "Fire Dampers and Ceiling Dampers."
  10. UL 181, "Factory Made Air Ducts and Connectors."

### **24 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 & Methods
- B. Division 23 – HVAC Piping and Equipment
- C. Division 25 - Temperature Control

### **24 00 04 DEFINITIONS**

- A. The size of the ducts shown on the drawings and in this Section of the Specifications shall be the outside dimension of the ductwork which will take into account any internal acoustical lining thickness specified for duct system or sub-system.
- B. The term **"supply air"** where used in this Section of the Specifications shall mean downstream of a coil.
- C. The term **"outdoor air"** where used in this Section of the Specifications shall mean ambient air that has not been conditioned.



- D. The term “**return air**” where used in this Section of the Specifications shall mean conditioned air that is returned from the space.
- E. 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**”.
- F. The term “**relief air**” where used in this Section of the Specifications shall mean excess return air that relieved from the building.
- G. The term “**exhaust air**” where used in this Section of the Specifications shall mean air that is removed due to contaminants, odors, or heat.

24 00 05 WORK INCLUDED

Furnish material, labor and services necessary for and incidental to the installation of the following systems where shown on the Plans and as hereinafter specified. Include all necessary considerations in the related sections of the Specifications (Sub-section 20 30 03) to perform the Work completely.

- A. Sheet metal ducts, sheet metal plenums, duct linings, flexible ductwork, dampers and accessories.
- B. Air devices including adjusting the pattern controllers.
- C. Installing accessories specified in referenced sections above.
- D. Smoke stopping of all penetrations of 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).
- E. Contractor shall coordinate his work with the work of other trades, and with the architectural and structural drawings.

24 00 06 SUBMITTALS

- A. The Contractor shall submit the following for approval in accordance with Subsection 20 00 43, Duties of Contractor - Submittals.
- B. Submittals shall include drawings showing joining methods, location of duct transverse joints, and duct support locations.
- C. Submittals shall be required for all shop fabricated balancing dampers.
- D. 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.

24 00 07 SPECIAL REQUIREMENTS

- A. Contractor shall inspect each component of the heating and air conditioning system to eliminate rattles, air whistles, vibration, and mechanical system sound transmission. Rough edges in ducts, insecure dampers, turning vanes, fire dampers, etc., shall be corrected to assure no recurrence of the noise source. Each vibration isolator and flexible connector shall be adjusted to limit transmission of sound to the occupied space.
- B. Where Ductwork and accessories installed under this section of the specification tie-in to existing systems, Contractor shall verify existing for: sizes, direction of flow (via pressure or

physical tracing of ductwork, not labels), materials, and elevations before installing new work. Contractor shall notify Architect/Engineer upon discovery of discrepancy. Work performed prior to verification will be corrected at no cost to Owner.

**24 00 08 AIR DISTRIBUTION CLEANLINESS**

- A. Contractor shall implement procedures to maintain an “Advanced Level” of ductwork cleanliness per the latest addition of the SMACNA Duct Cleanliness for New Construction Guidelines.
1. Production and Site Delivery:
    - a. Self-adhesive labels for part of identification are to be applied to the external surfaces only.
    - b. During transportation, ductwork and air distribution components shall be sealed either by blanketing or capping the duct ends, bagging small fittings, surface wrapping or shrink wrapping.
  2. Site Storage:
    - a. Temporary storage shall be located away from high dust generating processes such as masonry, tile cutters, saws, drywall sanding, mortar and plaster mixers, roof pitch kettles, portable electric generators, and main walkways that will be constantly broom swept.
    - b. Temporary storage shall include pallets or blocking to keep ductwork and air distribution components above floor surface to prevent water damage.
    - c. Coverage should be used to protect stored materials at all times.
    - d. Duct open ends and air side of air distribution components shall be securely sealed at all times.
    - e. Seals shall be visually examined and if damaged, resealed with an appropriate material.
  3. Installation:
    - a. Before installation of individual duct sections and air distribution components, they are to be inspected to ensure that they are free from debris and shall be wiped clean if debris exists.
    - b. The working area shall be clean, dry, and the airside of ductwork and air distribution components protected from dust and moisture.
    - c. Protective coverings shall only be removed immediately before installation and inspected to determine if additional wipe down is necessary.
    - d. Open ends on completed ductwork shall be sealed immediately if left for an extended period of time (work breaks, overnight, etc.).

**24 00 09 EXISTING DUCTWORK CLEANING**

- A. Cleaning of existing ductwork is required, refer to 20 10 57 CLEANING OF DUCT SYSTEMS for requirements.

**24 31 00 SHEETMETAL DUCTWORK**

**24 31 01 MATERIAL**

- A. All ducts unless specified otherwise shall be constructed from sheets or rolls of G-90 or better-galvanized steel, LFQ, Chemtreat. Fiberglass ductboard is prohibited.

- B. All supply ductwork, unless specified otherwise, shall be constructed of gauges and reinforcement to 4" w.g. static pressure in SMACNA Duct Construction Standard – Latest Edition.
- E. All return, exhaust, outdoor air, relief, and supply ductwork downstream of terminal units shall be constructed of gauges and reinforcement to 2" w.g. static pressure in SMACNA Duct Construction Standard – Latest Edition. Panels in all ducts 12" and larger shall be cross-broken or beaded on 12" centers.
- F. Where local code requires gauges heavier than required by SMACNA then the local code shall govern.

#### 24 31 02 CONSTRUCTION

- A. All ductwork shall be neatly constructed, stiffened, on the outside surfaces where necessary to prevent perceptible vibration or buckling. All ducts, housings, etc., shall be fabricated as detailed on the drawings and in the SMACNA Duct Construction Manual –Latest Edition.
- B. All rectangular ducts unless specified otherwise shall be "Pittsburgh Lock" longitudinal joints. Snaplock is not acceptable.
- C. All round ducts and flat oval ducts shall have spiral seams or continuously welded longitudinal seams.
- D. All transverse joints in rectangular ductwork 24" and larger shall be Ductmate, SMACNA T-25, or approved equivalent. All flanged ductwork, regardless of pressure class, shall use gaskets, corner closures, and be TEK screwed or riveted on 10" centers with a minimum of two (2) per side. Transverse joints in rectangular ductwork smaller than 24" shall be made in accordance with SMACNA suitable with the pressure class.
- E. All transverse joints in round and oval ductwork 24" and larger shall be Ductmate, or approved equivalent. Transverse joints in round and overall ductwork smaller than 24" shall be beaded sleeve joints.
- F. Ducts shall be securely supported in accordance with SMACNA Duct Construction Manual – Latest Edition and in no case less than double thickness 1" x #24 gauge galvanized metal. Cable hangers are not allowed.
- G. Ducts that are to be externally insulated shall not be supported on unistrut channel unless it required based upon loading. Hanger rods for trapeze bars shall be spaced to allow for insulation installation.

#### 24 31 03 SEALING

- A. Duct sealant shall be flexible, water-based, adhesive sealant designed for use in 4" static pressure systems. Sealer shall be UL listed and conform to ASTM E84. Sealer shall be equal to Ductmate PROseal, United McGill Uni-Mastic, Duro-Dyne DSW, or equivalent.
- B. All supply ductwork unless specified otherwise shall be SMACNA's seal class A.
- C. All return, exhaust, outdoor air, relief and supply ductwork downstream of terminal units shall be SMACNA's seal class B.

24 31 04 DUCTWORK LEAKAGE TESTING

- A. Installed ductwork on systems greater than 5HP shall be tested prior to installation of access door, take-offs, or other specialties.
- B. A testing shall be scheduled for witness per the general conditions.
- C. The supply trunk duct for each system shall be tested in whole or up to 100' in length whichever is lesser.
- D. The return trunk duct for each system shall be tested from 50' upstream of the fan inlet to the unit plenum box.
- E. Outdoor air and relief air ducts for each fan system shall be tested in whole.
- F. Ductwork shall be tested as follows:
  - 1. Ductwork shall be tested in accordance with SMACNA HVAC Air Duct Leakage Test Manual.
  - 2. Use a certified orifice tube for measuring the leakage.
  - 3. Define section of system to be tested and blank off.
  - 4. Determine the design airflow for the portion of the duct to be tested.
  - 5. Determine the allowable leakage (cfm) for the section being tested.
  - 6. Pressurize to operating pressure and repair any significant or audible leaks.
  - 7. Repressurize and measure leakage.
  - 8. Repeat steps 6. and 7. until the leakage measured is less than the allowable defined in step 5.
- G. The following Leak Class and Duct Pressure Class shall be used to determine the Leakage Factor in cfm/100 S.F. Duct. Ducts shall be tested at the design pressure class. Max. leakage = Leak Class x (design pressure)<sup>0.65</sup>
  - 1. 

<u>Rectangular Duct Pressure Class</u>	<u>Leak Class</u>
All	6

 (i.e. 4" duct systems shall be tested at 4" and the leakage shall not exceed 14.8 cfm/100 S.F. duct and 2" duct systems shall be tested at 2" and the leakage shall not exceed 9.4 cfm/100 S.F. duct).
  - 2. 

<u>Round Duct Pressure Class</u>	<u>Leak Class</u>
All	3

 (i.e. 4" duct systems shall be tested at 4" and the leakage shall not exceed 7.4 cfm/100 S.F. duct and 2" duct systems shall be tested at 2" and the leakage shall not exceed 4.7 cfm/100 S.F. duct).

24 31 06 FITTINGS

- A. Rectangular duct branch take-offs, or rectangular to round, shall be 45°-boot fittings, spin in fittings are not acceptable.
- B. Rectangular duct proportional splits shall be made the sizes as shown on the drawings. Where duct sizes are changed from the original design, Contractor shall proportion split equal to the split in airflow.

- B. Rectangular duct changes in direction:
1. 90 degree elbows, refer to plans, shall be mitered with turning vanes; or radiused with centerline radius to width ratio of 0.75 (inside radius/width ratio 0.25 with curve ratio 0.585) with 2 splitter vanes.
  2. 45 degree and less elbows shall be mitered without vanes.
  3. Elbows other than above shall be radiused with centerline radius to width ratio of 1 without splitter vanes.
- C. Round or Oval elbows and changes in direction shall have a minimum centerline radius of 1-1/2 that of duct size. Round or oval branch take-off shall be 45 degree booted style similar to McGill Airflow Lo-Loss Tee.
- D. When approved by the Engineer ducts may be notched at structural steel. The converging angle shall be no greater than 30°, the diverging angle shall be no greater than 15°.
- E. When approved by the Engineer objects may penetrate a duct. An airfoil shape shall be placed around the object to minimize turbulence.

#### 24 31 07 PLENUMS

- A. Sheetmetal plenums shall be constructed of a minimum of 18 ga. or greater as determined by the pressure class of the plenum. Sheetmetal and shall be braced and reinforced to support the weight of a 200-lb. person. Tie rods shall not be used.
- B. Plenums shall be constructed without air turning vanes.
- C. Plenums shall have access doors as sized on drawings, where no size is shown provide a minimum size of 18" x 36".

#### 24 31 08 AIR THERMOMETERS

- A. **Air thermometers shall be provided and in the supply air, coil discharge of all air handling unit coils, return air, mixed air, and outside air of the air handling units.**
- B. Airstream thermometers shall be bimetal type, with an accuracy of  $\pm 1^{\circ}\text{F}$  throughout the range with 5" dial size, 12" stem length,  $\frac{1}{2}$ " N.P.T. back side connector with plain slip ring case of 304 stainless steel, and recalibrator. Thermometer shall be Terice Model No. B85212 or approved equal as manufactured by Weksler, Marsh, or Marshalltown Instruments. Thermometers for use in the mixed air shall have flexible averaging elements strung with the mixed air temperature sensor and freezestat sensor elements. Mixed air thermometers shall be Terice No. V80445 with bulb number 4-3-1.
- i. Range shall be as follows:
- |                              |           |
|------------------------------|-----------|
| Outdoor air                  | -40-160°F |
| Mixed air                    | 0-100°F   |
| Supply air                   | 25-125°F  |
| Return air                   | 25-125°F  |
| Preheat coil discharge       | 25-125°F  |
| Reheat coil discharge        | 25-125°F  |
| Chilled water coil discharge | 25-125°F  |

**24 33 00 AIR DISTRIBUTION ACCESSORIES**

**24 33 01 BALANCING DAMPER**

- A. Furnish and install volume dampers at each main branch take-off and in such other locations where required to properly balance the air distribution systems.
- B. All dampers, except those located downstream from terminal units used to adjust individual grilles, shall have frames and bearings and shall have quadrant lock regulators with thread screw to allow damper to be securely locked into place.
- C. Balancing dampers downstream from terminal units that are contractor fabricated or apart of manufactured branch fitting shall be a minimum of 18-ga. plate, 3/8" continuous shaft with locking quadrant handle equal to Duro Dyne model Quadline.
- D. Rectangular dampers up to size 24" x 12" shall be Ruskin MD25, Nailor 1870, Arrow, Air Balance, NCA, or shop fabricated equal, approved by the Engineer.
- E. Round dampers up to size 20" diameter shall be Ruskin MDRS25, Nailor 1890, Arrow, Air Balance, NCA or shop fabricated equal, approved by the Engineer.
- F. Rectangular dampers larger than 24" x 12" shall be Ruskin MD35, Nailor 1820 or equivalent manufactured damper by NCA.
- G. Where volume dampers are to be adjusted through walls or ceilings, such dampers shall be operated by regulators designed for recessed installation and provided with a cover plate which shall be flush to the surface of the wall or ceiling. Concealed regulators, as manufactured by Duro Dyne Corporation or Elgen shall be of the indicator type. Regulator shall be provided with a spring washer for non-binding adjustment and hex lock nut in addition to wedge pin which shall be installed to prevent damper rattle. Cast alloy regulator housing, with "open to shut" range positioning markers, shall be secured with removable cover to expose regulator for adjustments.
- H. All automatic dampers and control dampers shall be as specified in Division 25, "Temperature Control". Dampers shall be furnished under Division 25 for installation under Division 23 30 00.
- I. Control Damper Installation
  - i. Dampers installed in walls shall be installed with wall sleeves to allow direct coupled actuator installation.
  - ii. Large damper installations with multiple actuators shall be installed with 8" sheetmetal blank-off/spacers between them to allow direct coupled actuator installation. Provide structural supports as required for a straight, true, level and square installation.
  - iii. Dampers shall be attached with fasteners on 6" centers with a minimum of 2 per side.

**24 33 03 FIRE-SMOKE DAMPERS**

- J. Fire-smoke dampers shall be provided as indicated on the plans.
- K. Combination fire-smoke dampers with steel airfoil blades meeting requirements of the latest edition of UL Standard 555 and UL Standard 555S. Each combination fire-smoke damper shall be equipped with a factory installed electrically-resettable heat responsive device rated to close the damper when the temperature at the damper reaches 165°F. Dampers shall have a

- UL555S leakage rating of Leakage Class I for airflow in either direction and shall have a minimum UL 555S differential pressure rating of 4 in. wg. Dampers shall have a minimum UL 555S velocity rating of 2000 fpm.
- L. Damper frame shall be 16 ga. galvanized steel formed into a 5" structural hat channel. Top and bottom frame members on dampers less than 17" high shall be low profile design to maximize the free area of these smaller dampers. Frame shall be 4-piece construction with 1 1/2" (minimum) integral overlapping gusset reinforcements in each corner to assure square corners and provide maximum resistance to racking.
  - D. Damper blades shall be 16 ga. galvanized steel with full length structural reinforcement and a double skin true airfoil shape. Each blade shall be symmetrical relative to its axle pivot point, presenting identical performance characteristics with air flowing in either direction through the damper. Blade seals shall be extruded silicone rubber permanently bonded to the appropriate blade edges. Jamb seals shall be flexible stainless steel compression type. Linkage shall be concealed in the jamb. Axle bearings shall be permanently lubricated stainless steel or sintered bronze sleeve type rotating in polished extruded holes in the damper frame.
  - E. Dampers sized as scheduled. If not scheduled, dampers shall be the full size of the duct they are associated with unless noted otherwise.
  - F. Actuators shall be listed with the damper assembly and be electrically operated, 120 VAC power supply. Actuators shall be 2-position and shall fail in an open direction.
  - G. Damper options
    - 1. Damper assembly shall come with a factory-mounted permanent momentary test switch to operate the damper for inspection.
  - H. Dampers shall have a UL 555 fire resistance rating of 1 1/2 hours shall be Ruskin FSD60, Greenheck FSD-311 or approved equivalent.
  - I. Dampers are to be witness tested by the Owner.

#### 24 33 05 AIR TURNING VANES

- A. Furnish and install directional air turning vanes in ductwork at all 90 degree mitered elbows and 90 degree radiused elbows.
- B. Mitered 90 degree elbows vanes shall be:
  - 1. Single rolled type with a radius of 2" with 1.5" spacing.
  - 2. Single rolled type with a radius of 4-1/2" with 3.25" spacing.
  - 3. Double thickness type with a radius of 4-1/2" with 3.25" spacing. Double thickness 2" radius is not allowed.
  - 4. Tie rods shall be used to limit the maximum unsupported width per the type of vane used per SMACNA.
  - 5. Vanes shall be solidly installed and rattle-free locked into each slot of preformed vane guide rails as manufactured by Duro Dyne Corporation or Elgen. Rails shall be constructed of 24 gauge galvanized steel, specially embossed for extra strength and sturdiness.

- C. Radiused 90 degree elbows shall have 2 vanes. Vanes shall be single thickness, Splitter Vanes for radius elbows shall be fabricated based on the "SMACNA HVAC Systems Duct Design Manual" using the appropriate curve ratio.

24 33 06 FLEXIBLE CONNECTORS

- A. Furnish and install flexible connections at the connections to air handling equipment as indicated on the plans. Flexible connections shall be U.L. listed fabric that meets NFPA 90A. It shall weigh not less than 24 oz per sq. yd and have a tensile strength of not less than 500 psi. Flexible connections shall be preassembled "Super Metal-Fab" with 6" fabric attached to 3" metal on either side by means of "Grip-Loc" seam. At least one inch of slack shall be allowed when making connection to insure that no vibration is transmitted from fan to ductwork. The flexible connectors shall be fastened to ductwork and equipment by screws, rivets or spot welding. Flexible connectors shall be No. MF6N as manufactured by Duro Dyne Corporation, or equivalent by Vent-Fabrics or Elgen.

24 33 07 ACCESS DOORS AND PANELS

- A. Access panels shall be provided at all duct mounted automatic control dampers, fire dampers, in front of duct mounted reheat coils, multizone dampers, and as shown on drawings.
1. 2" Pressure Class: Door shall be SMACNA Standard, 12" x 12", double skin, 1" fiberglass insulation, with underside duct to frame gasket for reduced leakage.  
  
With window Ruskin ADHW22, or equivalent.
  2. 4" and Higher Pressure Class: Oval shape, ultra low leakage at 8" w.c.  
  
With window Ductmate Observation Access Door.
  3. 48"x18" access door: Door and frame shall be aluminum with continuous steel hinge, two dual acting handles, neoprene sponge seal, and 3/4" urethane foam board insulation R value of 5.5. Door shall be rated for +4" w.c. and -8" w.c. Model shall be Ruskin GPAD or approved equal.
- B. Access doors in casings and housings shall be fabricated double skin doors with 1" thick insulation between inner and outer surface as detailed in the SMACNA Duct Manual. Provide two compression latches equal to Ventlok #260 on each door. Where access doors provide for personnel entry into the system, they must be provided with inside/outside latch hardware. Provide access doors at all locations indicated on the drawings and into the mixing chamber of all air handling units. Size shall be 18 x 36, unless indicated otherwise on the drawings. Ruskin GPAD or equivalent.
- C. For access panels required in ceiling, walls, etc. of the building construction, see Section 20 10 10.

24 33 08 FLEXIBLE DUCTWORK

- A. Flexible duct shall be factory fabricated units constructed of corrosion resistant coated steel spiral, permanently bonded to fabric covering. The units shall have an inside bending radius of 3/4 of the inside dimension of the pipe, and the entire installed unit, using manufacturer's apparatus and installation methods, shall be flexible duct assemblies shall be rated for working pressures of 6" w.g. positive and 5" w.g. negative (for sizes up to 16" diameter). Flexible duct assemblies shall be U.L. 181, Class I air duct listed and shall meet fire resistive standards of



- NFPA 90A. Flexible ducts shall be factory insulated with 1" thick glass fiber insulation with flame resistant, metallic vapor barrier finish.
- B. Flexible duct length shall not exceed 8' for diffusers and 3' at VAV box inlets.
  - C. Support flexible duct on 4' centers maximum.
  - D. Flexible duct shall be attached with zinc plated or stainless steel worm drive duct hose clamps.
  - E. Contractor shall ensure flexible ductwork installed for temporary applications does not collapse under negative pressure.
  - F. Flexible duct shall be Flexmaster Type 1M or equivalent.

## **24 33 50 SECTION NOT USED**

### **24 34 00 FANS**

- A. General
- B. All fans shall be licensed to bear the AMCA Performance Air and Sound Certified Ratings Seal. Fan air performance ratings shall be based on test conducted in an AMCA registered laboratory in accordance with AMCA 210 Air Performance Testing and AMCA 300 Sound Performance Testing. Fan curve families (tables will not be accepted) and octave band sound data shall be furnished with submittal data.
- C. All fans shall have premium efficiency open dripproof motor unless indicated otherwise. Fans with variable speed drives shall have inverter duty motors. All fans with V-belt drives shall be equipped with adjustable pitch sheave rated for 1.5 times the motor horsepower, shall have sliderail base, and shall have a belt-guard.
- D. All fan shafts shall be designed so that the first critical speed is at least 20% over the maximum operating speed. Bearings shall be self-aligning, grease lubricated, anti-friction, pillow block bearings with a minimum life (L50) of 200,000 hours.
- E. Where fans are other than scheduled the following criteria shall apply: Fans shall be picked at the scheduled flow and static pressure, fan efficiency shall not be more than 5% less efficiency than scheduled fan, fan motor shall not be larger than scheduled motor (manufacturer shall notify Contractor of any larger motor sizes, Contractor can pursue equipment substitution as required in subsection 20 00 52), the fan rpm shall not be within 15% of the maximum or minimum allowable rpm, and in general the fan selections shall be based upon maximum energy efficiency but in no case shall the fan wheel be smaller than what is scheduled. Where selection point is within 15% of the maximum allowable rpm of the fan class, provide a higher fan class.

### **24 34 01 PLENUM ARRAY**

- A. Furnish and install plenum array fan of the sizes and capacities as scheduled on the drawings. Centrifugal fan wheels shall be statically and dynamically balanced aluminum airfoil blades. Fan housing shall be steel construction with hinged access door. Fan construction shall allow complete servicing without removing the fan from the ductwork. Fans shall be direct drive. Fans shall be supported from spring isolators with a flexible duct connection located at each connection to the fan. Each fan shall have a wired safety disconnect switch and gravity inlet damper.

- B. Fans shall be Greenheck HPA as scheduled, Cook MPA, Penn-Barry ESA, or approved equal.

## **24 37 00 AIR DEVICES**

### **24 37 01 GENERAL**

- A. Furnish and install diffusers, grilles, and registers as shown on the drawings and specified herein.
- B. Air devices shall be installed in the orientation and the pattern controllers adjusted as indicated on the plans, as indicated on the shop drawing, or through supplemental information.
- C. Submittal data for all distribution devices shall contain the following information:
- 1) Room Number
  - 2) Model Number
  - 3) Flow Rate
  - 4) Size: Neck and where applicable
  - 5) Throw in feet: Based on 50-fpm velocity
  - 6) Air patterns: Such as one-way, two-way opposite, corner, four-way, etc.
  - 7) Pressure drop in inches of water
  - 8) Sound rating
  - 9) Airflow factor: Such as K factor or as required for airflow rate measurements.
  - 10) Accessories: Such as volume dampers, deflectors, etc.
  - 11) Three-color charts and balance instructions shall be furnished with submittal data.
- i. Devices described below and indicated on the drawings are based on Price. Similar design characteristics as manufactured by Titus, Carnes, Metal Aire, Nailor, or Tuttle & Bailey will also be acceptable. Such substitute equipment shall be sized on the basis of ADPI performance, and shall be selected for a maximum of 0.05 inches w.c. static pressure drop and a maximum noise criterion curve of NC30. Return or exhaust devices shall not be smaller than sizes shown.
- ii. Ceiling diffusers shall be of the type, service, size, and finish as scheduled on the drawings. Border types shall be coordinated by the Contractor to be suitable for ceiling types grid width, tile types, drywall, plaster, concealed spline) in which diffusers will be installed.

### **24 37 02 SQUARE CONE DIFFUSERS**

- A. Square cone diffusers shall be aluminum construction with inner 3 cone assembly. Refer to drawings and Air Device Schedule for additional information. Diffusers shall be Price SCD, Titus TMS, Nailor RNS or approved equal.

### **24 37 03 LAMINAR FLOW DIFFUSERS**

- A. Laminar flow diffusers shall be non-aspirating, unidirectional type, providing a uniform vertical projection of air at controlled low velocities in accordance with ASHRAE Standard 170. Diffuser shall be aluminum construction with plenum. Plenum shall include an equalization baffle to promote uniform face velocity. Refer to drawings and Air Device Schedule for additional information. Diffusers shall be Price LFD or approved equal.

**24 38 00 SECTION NOT USED**

**24 41 00 FILTER ASSEMBLIES**

- A. Furnish and install for supply fan systems, filters and side loading filter housings of the types, quantity, and arrangement scheduled (or otherwise indicated on the plans).

24 41 01 FILTER HOUSING

A. Side Loading Filter Housing:

1. Housing shall be a complete factory assembled housing with upstream and downstream outwardly turned flanges for insertion into the ductwork system. The housing shall be manufactured of a minimum of 16 ga. reinforced galvanized steel. Access doors with continuous gasketing on the perimeter shall be provided at both ends of the housing. When an access door is opened, the filter cartridges shall be slid into the housing where they shall be retained on slide channels. These channels shall incorporate a positive-sealing gasket material to seal the top and bottom of the filter cartridge frames to prevent bypass. Leakage shall be prevented between cartridges, and between cartridges and doors, by factory installed gasketing. Positive-latching handles will seal the access doors to the housing. Filter cartridges shall be capable of being loaded or unloaded through either access door.
2. Housings for 4" filters shall be 12" housing depth as manufactured by Camfil-Farr Filter model 4P Glide/Pack, Flanders/Air Seal model FL4, American Air Filter model Polyseal, or approved equivalent.

B. Front Loading Filter Housing:

1. Housing shall consist of 2' x 2' frames to be installed within the ductwork in the field. Air filter holding frames shall be 16-gauge galvanized steel with filter sealing flange, corrosion resistant compression tabs for application of header final filter and/or prefilter and replaceable sealing gasket. Reference schedules and drawings for sizes. Filter cartridges shall be capable of being loaded or unloaded upstream of the filter bank.
2. Frame-to-frame installation holes shall be an integral part of the frame. The frame shall include eight integral corrosion resistant compression tabs, four on each horizontal member, to facilitate filter installation without the use of tools or other fasteners. A 3/4" filter sealing flange shall be an integral component of the holding frame. All corners shall be flush mitered. A replaceable filter-to-frame sealing gasket shall be installed on the flange to prevent air bypass and ensure that the filter seats securely against the sealing flange. The gasket shall include an overlapping configuration at each corner to prevent air bypass at each of the corners of the frame.
3. Air filter holding frames shall be Camfil-Farr Filter model FastFrame, or approved equivalent.

24 41 02 FILTERS

- A. Air filters shall be high efficiency on ASHRAE Test Standard 52.1 and MERV 11 on ASHRAE Test Standard 52.2. Filters shall be extended surface pocket style filters consisting of high loft air laid microfine glass media, reinforced ABS plastic header, ABS plastic pocket retainers, and bonding agents to prevent air bypass and ensure leak free performance.
1. Filters shall be as manufactured by Camfil-Farr Filter model Hi-FLO ES, or approved equivalent.

- iii. Final filters shall be HEPA pleat-in-pleat V-bank disposable type. Filter media shall be microfine glass formed into uniformly spaced pleats separated by fiberglass thread separators and formed into a minipleat pack design. Each minipleat pack shall be assembled into a V-bank configuration.
  - 1. 12" deep 99.99% filter efficiency at 0.3 micron at 500 fpm airflow velocity. Filters shall be as manufactured by Camfil-Farr Filter model Absolute VG, or approved equivalent.
- iv. Each filter assembly shall have a gauge arranged to measure pressure across each filter type in housings containing more than one filter. Provide all necessary pressure taps, tubing, fittings, valves, and mounting hardware. Gauges shall be Dwyer Model 2001 or equivalent (0-1" range for single stage 30% filters) (0-2" range for 65% or greater filters or multiple stages). Each filter assembly shall have an engraved plastic plate indicating what the final change-out pressure is for each type of filter.

END OF SECTION  
071671.000

**SECTION 250900 (UMC Section 230900)**

**CONTROL SYSTEMS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. University of Missouri Controls Specification.
- B. This section contains requirements for pneumatic, electric and digital control systems as indicated on the contract drawings.
- C. Contractor is responsible for providing, installing and connecting all sensors, pneumatic actuators, control valves, control dampers, electrical components and all interconnecting pneumatic tubing and electrical wiring between these devices and up to the Direct Digital Controller (DDC).
- D. DDC systems consist of Johnson Controls METASYS controllers. Contractor shall provide and install control enclosures. Owner will provide controllers for contractors to install. After all equipment has been installed, wired and piped, Owner will provide controller programming and will perform termination connections at the DDC controller's and for checking, testing, and start-up of the control system. Contractor must be on site at start-up to make any necessary hardware adjustments as required.
- E. Once each mechanical system is completely operational under the new control system, contractor shall make any final connections and adjustments. For controls renovation jobs, contractor shall remove all unused sensors, operators, panels, wiring, tubing, conduit, etc. Owner shall have the option of retaining any removed pneumatic controls.

**1.02 RELATED SECTIONS**

- A. Drawings and general provisions of Contract, including General and Special Conditions apply to work of this section.

**1.03 QUALITY ASSURANCE**

- A. Contractor's Qualifications:
  - 1. Contractor shall be regularly engaged in the installation of digital control systems and equipment, of types and sizes required. Contractor shall have a minimum of five years' experience installing digital control systems. Contractor shall supply sufficient and competent supervision and personnel throughout the project in accordance with General Condition's section 3.4.1 and 3.4.4.
- B. Codes and Standards:
  - 1. Electrical Standards: Provide electrical components of control systems which have been UL-listed and labeled, and comply with NEMA standards.
  - 2. NEMA Compliance: Comply with NEMA standards pertaining to components and devices for control systems.
  - 3. NFPA Compliance: Comply with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems" where applicable to controls and control sequences.
  - 4. NFPA Compliance: Comply with NFPA 70 "National Electric Code."

## 1.04 SUBMITTALS

- A. Shop Drawings: Submit shop drawings for each control system, containing the following information:
- B. Product data for each damper, valve, and control device.
- C. Schematic flow diagrams of system showing fans, pumps, coils, dampers, valves, and control devices.
- D. Label each control device with setting or adjustable range of control.
- E. Indicate all required electrical wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
- F. Provide details of faces on control panels, including controls, instruments, and labeling.
- G. Include written description of sequence of operation.
- H. Provide wiring diagrams of contractor provided interface and I/O panels.
- I. Provide field routing of proposed network bus diagram listing all devices on bus.

## PART 2 PRODUCTS

### 2.01 MATERIALS AND EQUIPMENT

- A. Air Piping:
  - 1. Copper Tubing: Seamless copper tubing, Type M or L, ASTM B 88; wrought-copper solder-joint fittings, ANSI B16.22; except brass compression-type fittings at connections to equipment.
  - 2. Flex Tubing: Virgin Polyethylene non-metallic tubing, ASTM D 2737, with flame-retardant harness for multiple tubing. Use compression or push-on polyethylene fittings. Tubing used above suspended ceilings to be plenum rated per NFPA 90A. See section 3.1.b for locations where flex tubing can be used.
  - 3. Copper to polyethylene connections shall be compression barbed fittings or solder barbed fittings.
- B. Conduit and Raceway:
  - 1. Electrical Metallic Tubing: EMT and fittings shall conform to ANSI C80.3.
  - 2. Surface Metal Raceway and Fittings: Wiremold 500, Ivory, or approved equal.
  - 3. Flexible Metal Conduit: Indoors, per National Electric Code for connection to moving or vibrating equipment.
  - 4. Liquidtight Flexible Conduit: Outdoors, per National Electric Code for connection to moving or vibrating equipment.
- C. Control Valves: Provide factory fabricated pneumatic or electric control valves of type, body material, and pressure class as indicated on the drawings. Butterfly style control valves are not acceptable except for two position applications. Equip control valves with heavy-duty actuators, with proper shutoff rating for each individual application.
  - 1. Steam and Hot Water
    - a) Manufacturer: Do not allow KMC valves and actuators.
    - b) Water Service Valves: Equal percentage characteristics.
    - c) Steam Service Valves: Equal percentage characteristics.

- d) Single Seated Valves: Cage type trim, providing seating and guiding surfaces for plug on "top and bottom" guided plugs.
  - e) Valve Trim and Stems: Polished stainless steel.
  - f) Packing: Spring-loaded Teflon, self-adjusting.
  - g) Control valves should have a minimum 100 psi close-off rating for chilled water applications.
- 2. Hydronic Chilled Water and Heating Water
  - a) At minimum, hydronic control valves shall be pressure independent. High performing energy monitoring control valves may be considered depending on the project. The flow through the valve shall not vary more than +/- 5% due to system pressure fluctuations across the valve in the selected operating range. The control valve shall accurately control the flow from 1 to 100% full rated flow.
  - b) The valve bodies shall be of cast iron, steel or bronze and rated for 150 PSI working pressure. All internal parts shall be stainless steel, steel, Teflon, brass, or bronze.
  - c) DeltaP Valves manufactured by Flow Control Industries, Belimo, Danfoss Series, or approved equal.
  - d) The valves shall have pressure taps across the valve for measuring the pressure drop across the valve. The pressure taps shall have 1/2-inch extensions for accessibility.
  - e) Control valves shall be installed with unions or flanges as necessary for easy removal and replacement.
  - f) Valve Tag shall include the model number, AHU being served, design flow, and maximum flow for that valve.
  - g) The control valves shall be delivered preset to the scheduled design flow and should be capable of reaching 110% of the design flow to allow for field adjustment for capacity changes.
- D. Control Dampers: Ruskin CD-50 or approved equal.
  - 1. Provide dampers with parallel blades for 2- position control.
  - 2. Provide opposed blades for modulating control.
  - 3. Dampers shall be low leakage design with blade and edge seals.
  - 4. Provide multiple sections and operators as required by opening size and sequence of operations, as indicated on the contract drawings.
- E. Electric Actuators: Johnson Controls, Bray, Belimo, TAC or approved equal. KMC actuators are not approved. Size electric actuators to operate their appropriate dampers or valves with sufficient reserve power to provide smooth modulating action or 2-position action as specified. If mixed air AHU has return air, exhaust air and outside air dampers that are not mechanically linked then static safety switch must be installed and wired to safety circuit. Spring return actuators should be provided on heat exchanger control valves or dampers or as specified on the drawings. Control signal shall be 0 to 10 VDC unless otherwise specified on drawings. Actuators with integral damper end switch are acceptable. For VAV reheat valves, actuators shall have a manual override capability to aid in system flushing, startup, and balancing.
- F. Air and Hot Water Electronic Temperature Sensors:
  - 1. All electronic temperature sensors shall be compatible with Johnson METASYS systems.
  - 2. Sensors shall be 1,000 ohm platinum, resistance temperature detectors (RTDs) with two wire connections. Duct mounted sensors shall be averaging type. Contractor may install probe type when field conditions prohibit averaging type, but must receive permission from Owner's Representative.
  - 3. Coordinate thermowell manufacturer with RTD manufacturer. Thermowells that are installed by the contractor, but are to have the RTD installed by owner, must be Johnson Controls Inc. series WZ-1000.

G. Electronic Temperature Sensors and Transmitters:

1. Chilled Water, Heating Hot Water, and Steam Temperature Sensors
  - a) General: The RTD/Temperature Transmitter/Thermowell assembly shall come as a complete assembly from a single manufacturer. The Assembly shall be suitable for use in the accurate measurement of Chilled/Tower/Hot Water and steam temperatures in a mechanical room environment.
  - b) Calibration: Each RTD must be match calibrated to the Transmitter via NIST traceable calibration standards. Results are to be programmed into the transmitter. Results are to be presented on report as after condition at the specified calibration points. Assembly shall not be approved for installation until Owner has received all factory calibration reports.
  - c) RTD:
    - (1) RTD type: 2-wire or 3-wire 100 ohm platinum class A
    - (2) Outside Diameter: 0.25 inch
    - (3) Tolerance: +/- 0.06% Type A
    - (4) Stability: +/- 0.1 % over one year.
    - (5) TCR: 0.00385 (ohm/ohm/°C).
    - (6) RTD shall be tip sensitive.
    - (7) Resistance vs. Temperature table for the RTD must be provided to the Owner.
  - d) Transmitter:
    - (1) Transmitter shall be match calibrated to the RTD and assembled as a matched pair.
    - (2) Type: 2 wire (loop powered)
    - (3) Input: 2 or 3 wire 100 ohm platinum class A or class B RTD
    - (4) Output: Output shall be a 4-20 mA signal linear to temperature
    - (5) Calibrated Span:
      - (a) Chilled Water: 30 °F to 130 °F.
      - (b) Hot Water: 100 °F to 250 °F.
      - (c) Steam: 150 °F to 450 °F
    - (6) Calibration Accuracy, including total of all errors, of the Transmitter & RTD matched pair over the entire span shall be within +/- 0.2% of the calibrated span or +/- 0.18 °F, whichever is greater.
    - (7) Supply Voltage: 24 VDC.
    - (8) Ambient Operating Temp.: 32 to 122 °F
    - (9) Epoxy potted for moisture resistance.
    - (10) Mounting: Transmitter shall be mounted in the RTD connection head.
  - e) Thermowell
    - (1) Thermowell shall be suitable for immersion in chilled/hot water and steam.
    - (2) Thermowell shall be reduced tip.
    - (3) Thermowell shall be one piece stainless steel machined from solid bar stock.
    - (4) Thermowell shall have 1/2" NPT process connection to pipe thred-o-let.
    - (5) Thermowell Insertion depth shall be ½ the inside pipe diameter but not to exceed 10".
  - f) Assembly:
    - (1) Assembly configuration: Spring loaded RTD with thermowell-double ended hex-connection head.
    - (2) Connection head shall be cast aluminum with chain connecting cap to body, have 1/2" NPT process and 3/4" NPT conduit connections, and a sealing gasket between cap and body.
  - g) RTD/Temperature Transmitter/Thermowell assembly shall be the following or approved equal:
    - (1) Manufacturer: Pyromation, Inc.
    - (2) Chilled Water: RAF185L-S4C[length code]08-SL-8HN31,TT440-385U-S(30-



- 130)F with calibration SMC(40,60)F
  - (3) Hot Water: RAF185L-S4C[length code]08T2-SL-8HN31,TT440-385U-S(100-250)F with calibration SMC(140,180)F
  - (4) Steam: RAT185H-S4C[length code]08T2-SL-8HN31,TT440-385U-S(150-450)F with calibration SMC(300,350)F
- H. Occupant Override: Provide wall mounted occupant override button in locations shown on drawings.
- I. Low Limit Controllers: Provide unit-mounted low limit controllers, of rod-and-tube type, with an adjustable set point and a manual reset. Capillary shall be of adequate length to horizontally traverse face of cooling coil every 12". Multiple low limit controllers may be required for large coils. Controller shall have an extra set of contactors for connection to control panel for alarm status. Locate the thermostat case and bellows where the ambient temperature is always warmer than the set point.
  - 1. Freeze Stats: Johnson Controls model A70HA-1 or approved equal.
- J. Humidistats: Humidistats must be contamination resistant, capable of  $\pm 2\%$  RH accuracy, have field adjustable calibration and provide a linear proportional signal.
  - 1. HD20K-T91 or equivalent.
- K. Humidity High Limit
  - 1. Multi-function device that can function as a high limit or proportional override humidity controller, as stand-alone proportional controller, or a stand-alone two-position controller.
    - a) Johnson Controls TRUERH HL-67N5-8N00P or approved equal.
- L. Fan/Pump Status: Status points for fan or pump motors with a VFD must be connected to the terminal strip of the VFD for status indication.  
Current switches: Current switches are required for fan and pump statuses that are not connected to a VFD. The switches must have an adjustable trip setpoint with LED indication and be capable of detecting broken belts or couplings. Units shall be powered by monitored line, UL listed and CE certified, and have a five year warranty.
  - 1. Kele, Hawkeye or approved equal.
- M. Relays Used for Fan and Pump Start/Stop: Must have LED indication and be mounted externally of starter enclosure or VFD.
  - 1. Kele, RIBU1C or approved equal.
- N. Power Supply Used to Provide Power to Contractor-Provided Control Devices: Shall have adjustable DC output, screw terminals, overload protection and 24 VAC and 24 VDC output.
  - 1. Kele, DCPA-1.2 or approved equal.
- O. Pressure Differential Switch:
  - 1. Fans: NECC model DP222 or approved equal.
- P. Differential Pressure Transmitter: Provide units with linear analog 4-20mA output proportional to differential pressure, compatible with the Johnson METASYS Systems.
  - 1. Water: Units shall be wet/wet differential pressure capable of a bi-directional pressure range of  $\pm 50$  psid. Accuracy shall be  $\pm 0.25\%$  full scale with a compensated temperature range of 30 to 150 deg F and a maximum working pressure of 250 psig.
  - 2. Install transmitter in a pre-manufactured assembly with shut off valves, vent valves and a bypass valve.
    - a) Setra model 230 with Kele model 3-VLV, three valve manifold or approved equal.

3. Air: Units shall be capable of measuring a differential pressure of 0 to 5 in. WC. Accuracy shall be +/- 1.0% full scale with a compensated temperature range of 40 to 149 deg F and a maximum working pressure of 250 psig.
  - a) Setra model 267, or approved equal.
  - b) Shall be installed in control panel and piped 2/3 down the duct unless shown otherwise or approved by owners representative.
- Q. Building Static Pressure: Transducer shall utilize a ceramic capacitive sensing element to provide a stable linear output over the specified range of building static pressure. Transducer shall be housed in a wall-mounted enclosure with LCD display. Transducer shall have the following capabilities:
  1. Input Power: 24 VAC
  2. Output: 0-10 VDC
  3. Pressure Range: -0.25 to +0.25 inches w.g.
  4. Display: 3-1/2 digit LCD, displaying pressure in inches w.g.
  5. Accuracy: +/- 1.0% combined linearity and hysteresis
  6. Temperature effect: 0.05% / deg C
  7. Zero drift (1 year): 2.0% max
  8. Zero adjust: Push-button auto-zero and digital input
  9. Operating Environment: 0 to 140 deg F, 90% RH (non-condensing)
  10. Fittings: Brass barbs, 1/8" O.D.
  11. Enclosure: High-impact ABS plastic
  12. Outside Air Sensor Pickup Port: UV stabilized thermoplastic or aluminum "can" enclosure to shield outdoor pressure sensing tube from wind effects. BAPI ZPS-ACC10-rooftop mount, wall mount, or equivalent.
  13. Transducer shall be Veris Industries Model PXPLX01S, equivalent from Setra, or approved equal.
- R. High Static Pressure Limit Switch: Provide pressure high limit switch to open contact in fan circuit to shut down the supply fan when the inlet static pressure rises above the set point. Provide with an adjustable set point, a manual reset button, 2 SPST (normally closed) contacts, and 1/4" compression fittings.
  1. Kele model AFS-460-DDS, or approved equal.
- S. AIRFLOW/TEMPERATURE MEASUREMENT DEVICES
  1. Provide airflow/temperature measurement devices where indicated on the plans. Fan inlet measurement devices shall not be substituted for duct or plenum measurement devices indicated on the plans.
  2. The measurement device shall consist of one or more sensor probe assemblies and a single, remotely mounted, microprocessor-based transmitter. Each sensor probe assembly shall contain one or more independently wired sensor housings. The airflow and temperature readings calculated for each sensor housing shall be equally weighted and averaged by the transmitter prior to output. Pitot tubes and arrays are not acceptable. Vortex shedding flow meters are not acceptable.
  3. All Sensor Probe Assemblies
    - a) Each sensor housing shall be manufactured of a U.L. listed engineered thermoplastic.
    - b) Each sensor housing shall utilize two hermetically sealed, bead-in-glass thermistor probes to determine airflow rate and ambient temperature. Devices that use "chip" or diode case type thermistors are unacceptable. Devices that do not have 2 thermistors in each sensor housing are not acceptable.
    - c) Each sensor housing shall be calibrated at a minimum of 16 airflow rates and have an accuracy of +/-2% of reading over the entire operating airflow range. Each

sensor housing shall be calibrated to standards that are traceable to the National Institute of Standards and Technology (NIST).

- (1) Devices whose accuracy is the combined accuracy of the transmitter and sensor probes must demonstrate that the total accuracy meets the performance requirements of this specification throughout the measurement range.
  - d) The operating temperature range for the sensor probe assembly shall be -20° F to 160 F. The operating humidity range for the sensor probe assembly shall be 0-99% RH (non-condensing).
  - e) Each temperature sensor shall be calibrated at a minimum of 3 temperatures and have an accuracy of +/-0.15° F over the entire operating temperature range. Each temperature sensor shall be calibrated to standards that are traceable to the National Institute of Standards and Technology (NIST).
  - f) Each sensor probe assembly shall have an integral, U.L. listed, plenum rated cable and terminal plug for connection to the remotely mounted transmitter. All terminal plug interconnecting pins shall be gold plated.
  - g) Each sensor assembly shall not require matching to the transmitter in the field.
  - h) A single manufacturer shall provide both the airflow/temperature measuring probe(s) and transmitter at a given measurement location.
4. Duct and Plenum Sensor Probe Assemblies
- a) Sensor housings shall be mounted in an extruded, gold anodized, 6063 aluminum tube probe assembly. Thermistor probes shall be mounted in sensor housings using a waterproof marine grade epoxy resin. All wires within the aluminum tube shall be Kynar coated.
  - b) The number of sensor housings provided for each location shall be as follows:

(1) Area (sq.ft.)	Sensors
<2	4
2 to <4	6
4 to <8	8
8 to <16	12
>=16	16
  - c) Probe assembly mounting brackets shall be constructed of 304 stainless steel. Probe assemblies shall be mounted using one of the following options:
    - (1) Insertion mounted through the side or top of the duct.
    - (2) Internally mounted inside the duct or plenum.
    - (3) Standoff mounted inside the plenum.
  - d) The operating airflow range shall be 0 to 5,000 FPM unless otherwise indicated on the plans.
5. Fan Inlet Sensor Probe Assemblies
- a) Sensor housings shall be mounted on 304 stainless steel blocks.
  - b) Mounting rods shall be field adjustable to fit the fan inlet and constructed of nickel plated steel.
  - c) Mounting feet shall be constructed of 304 stainless steel.
  - d) The operating airflow range shall be 0 to 10,000 FPM unless otherwise indicated on the plans.
6. Transmitters
- a) The transmitter shall have a 16 character alpha-numeric display capable of displaying airflow, temperature, system status, configuration settings and diagnostics. Configuration settings and diagnostics shall be accessed through a pushbutton interface on the main circuit board. Airflow shall be field configurable to be displayed as a velocity or a volumetric rate.
  - b) The transmitter shall be capable of independently monitoring and averaging up to 16 individual airflow and temperature readings. The transmitter shall be capable of displaying the airflow and temperature readings of individual sensors on the LCD display.

- c) The transmitter shall have a power switch and operate on 24 VAC (isolation not required). The transmitter shall use a switching power supply fused and protected from transients and power surges.
- d) All interconnecting pins, headers and connections on the main circuit board, option cards and cable receptacles shall be gold plated.
- e) The operating temperature range for the transmitter shall be -20° F to 120° F. The transmitter shall be protected from weather and water.
- f) The transmitter shall be capable of communicating with the host controls using one of the following interface options:
  - (1) Linear analog output signal: Field selectable, fuse protected and isolated, 0-10VDC and 4-20mA (4-wire).
  - (2) RS-485: Field selectable BACnet-MS/TP, ModBus-RTU and Johnson Controls N2 Bus.
  - (3) 10 Base-T Ethernet: Field selectable BACnet Ethernet, BACnet-IP, ModBus-TCP and TCP/IP.
  - (4) LonWorks Free Topology.
- g) The transmitter shall have an infra-red interface capable of downloading individual sensor airflow and temperature data or uploading transmitter configuration data to a handheld PDA (Palm or Microsoft Pocket PC operating systems).
- 7. The measuring device shall be UL listed as an entire assembly.
- 8. The manufacturer's authorized representative shall review and approve placement and operating airflow rates for each measurement location indicated on the plans. A written report shall be submitted to the consulting mechanical engineer if any measurement locations do not meet the manufacturer's placement requirements.
- 9. Manufacturer
  - a) Primary flow elements, sensors, meters and transducers shall be EBTRON, Inc. Model GTx116-P and GTx116-F or approved equal.
  - b) The naming of any manufacturer does not automatically constitute acceptance of this standard product nor waive their responsibility to comply totally with all requirements of the proceeding specification.
- T. Electrical Requirements: Provide electric-pneumatic switches, electrical devices, and relays that are UL-listed and of type which meet current and voltage characteristics of the project. All devices shall be of industrial/ commercial grade or better. Residential types will be rejected.
  - 1. EP Switches: Landis & Gyr Powers, Inc. Series 265 - Junction Box Type or approved equal.
  - 2. Relays: Relays shall have an LED status indicator, voltage transient suppression, Closed-Open-Auto switch, plastic enclosure, and color coded wires. Kele model RIBU1C or approved equal.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION OF CONTROL SYSTEMS**

- A. General: Install systems and materials in accordance with manufacturer's instructions, roughing-in drawings and details shown on drawings.
- B. Control Air Piping:
  - 1. All control air piping shall be copper. Exception: Flexible Tubing may be used for a maximum of two (2) feet at connections to equipment except for steam control valves and inside control cabinets.
  - 2. Provide copper tubing with a maximum unsupported length of 3'-0".
  - 3. Pressure Test control air piping at 30 psi for 24 hours. Test fails if more than 5 PSI loss

- occurs.
4. Fasten flexible connections bridging cabinets and doors, neatly along hinge side, and protect against abrasion. Tie and support tubing neatly.
  5. Number-code or color-code tubing, except local individual room control tubing, for future identification and servicing of control system.
  6. All control tubing at control panel shall be tagged and labeled during installation to assist owner in making termination connections at control panel.
  7. Provide pressure gages on each output device.
  8. Paint all exposed control tubing to match existing.
- C. Raceway: Raceway is to be installed in accordance with the National Electric Code. Use of flexible metal conduit or liquidtight flexible conduit is limited to 36" to connect from EMT to devices subject to movement. Flexible raceway is not to be used to compensate for misalignment of raceway during installation.
- D. Control Wiring: Install control wiring in raceway, without splices between terminal points, color-coded. Install in a neat workmanlike manner, securely fastened. Install in accordance with National Electrical Code.
1. Install circuits over 25-volt with color-coded No. 12 stranded wire.
  2. Install electronic circuits and circuits under 25-volts with color-coded No. 18 stranded twisted shielded pair type conductor.
  3. N2 communications bus wire shall be 18 AWG, plenum rated, stranded twisted shielded, 3 conductor, with blue outer casing, described as 18-03 OAS STR PLNM NEON BLU JK distributed by Windy City Wire, constructed by Cable-Tek, or approved equivalent.
    - a) Metastat wiring shall be minimum 20 AWG, plenum rated, stranded, 8 conductor stranded wire.
  4. FC communications bus wire shall be 22 AWG, plenum rated, stranded twisted shielded, 3 conductor, with blue outer casing, described as 22-03 OAS STR PLNM NEON BLU JK distributed by Windy City Wire, constructed by Cable-Tek, or approved equivalent.
    - a) Network sensor wiring (SA Bus) shall be 22 gauge plenum rated stranded twisted wire, 4 conductor.
  5. All control wiring at control panel shall be tagged and labeled during installation to assist owner in making termination connections at control panel. Label all control wires per bid documents.
- E. All low voltage electrical wiring shall be run as follows:
1. Route electrical wiring in concealed spaces and mechanical rooms whenever possible.
  2. Provide EMT conduit and fittings in mechanical rooms and where indicated on drawings.
  3. Low voltage electrical wiring routed above acoustical ceiling is not required to be in conduit, but wire must be plenum rated and properly supported to building structure.
  4. Provide surface raceway, fittings and boxes in finished areas where wiring cannot be run in concealed spaces. Route on ceiling or along walls as close to ceiling as possible. Run raceway parallel to walls. Diagonal runs are not permitted. Paint raceway and fittings to match existing conditions. Patch/repair/paint any exposed wall penetrations to match existing conditions.
- F. All devices shall be mounted appropriately for the intended service and location.
1. Adjustable thermostats shall be provided with base and covers in occupied areas and mounted 48" above finished floor to the top of the device. Tubing and/or wiring shall be concealed within the wall up to the ceiling where ever possible. Surface raceway may only be used with approval of Owners Representative. Wall mounted sensors such as CO2, RH, and non-adjustable temperature sensors shall be mounted 54" above finished floor. Duct mounted sensors shall be provided with mounting brackets to accommodate insulation. Mounting clips for capillary tubes for averaging sensors are required.
  2. All control devices shall be tagged and labeled for future identification and servicing of control system.

3. Preheat and mixed air discharge sensors must be of adequate length and installed with capillary tube horizontally traversing face of coil, covering entire coil every 24 inches bottom to top.
  4. All field devices must be accessible or access panels must be installed.
- G. Install magnehelic pressure gage across each air handling unit filter bank. If the air handling unit has a prefilter and a final filter, two magnehelic pressure gages are required.

### 3.02 ADJUSTING AND START-UP

- A. Start-Up: Temporary control of Air Handling Units shall be allowed only if approved by the owner's representative to protect finishes, etc., AHUs may be run using caution with temporary controls installed by contractor early in the startup process. All safeties including a smoke detector for shut down must be operational. Some means of discharge air control shall be utilized and provided by the contractor such as a temporary temperature sensor and controller located and installed by the Contractor.
- B. The start-up, testing, and adjusting of pneumatic and digital control systems will be conducted by owner. Once all items are completed by the Contractor for each system, Contractor shall allow time in the construction schedule for owner to complete commissioning of controls before project substantial completion. This task should be included in the original schedule and updated to include the allotted time necessary to complete it. As a minimum, the following items are required to be completed by the Contractor for Owner to begin controls commissioning.
1. Process Control Network
    - a) The control boards and enclosures need to be installed in the mechanical rooms.
    - b) The fiber optic conduit and box for the process control network needs to be installed. Once in place, Owner needs to be contacted so the length of the owner provided fiber cable can be determined and ordered, if required. Coordinate with Owner to schedule the pull in and termination of the fiber cable. Power should be in place at that time. (Fiber for the process control network is required to allow metering of utilities prior to turn on.)
  2. Heating System
    - a) Pumps, piping, control valves, steam and/or hot water meter, feeder conduit and wire, control panels and control wiring installed in the mechanical room. All must be in place in working order (pumps aligned, motors checked for rotation, steam regulators set to required pressure, heating system ready to circulate (all piping pressure tested, flushed, and insulated) with differential pressure sensors in place.
  3. Cooling System
    - a) Piping, control valves, feeder conduit and wire, control panels and control wiring installed in the mechanical room. All must be in place in working order (cooling system ready to circulate (all piping pressure tested, flushed, and insulated) with differential pressure sensors in place.
  4. VAVs-First Pass
    - a) Power, (FC or N2 bus), and control wire installed before owner can make first commissioning pass. First pass includes installation of VAV controller, termination of power, control and network communication wiring.
  5. Air Handlers
    - a) Prior to owner commissioning, at a minimum, the following items shall be complete: Power wiring, motor rotation check, fire/smoke dampers open, control wiring including all safeties, IO cabinet, air handler cleaned, and filters installed as required. To protect the systems from dirt, outside air with no return will be used until the building is clean enough for return air operation.
  6. VAVs-Second Pass
    - a) After the air handlers are running and under static pressure control and the heating water system is operating, a second pass can be made on the VAVs to download

- the control program and commission controllers to verify the VAV dampers, thermostat, and reheat control valves are working properly.
7. Some balance work can be done alongside the control work as long as areas are mostly complete and all diffusers are in place.

### **3.03 CLOSEOUT PROCEDURES**

- A. Contractor shall provide complete diagrams of the control system including flow diagrams with each control device labeled, a diagram showing the termination connections, and an explanation of the control sequence. The diagram and sequence shall be framed and protected by glass and mounted next to controller.
- B. Contractor shall provide as built diagram of network bus routing listing all devices on bus, once wiring is complete prior to scope completion.

END OF SECTION  
071671.000

## 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 -28 of the Specifications.
- B. Provisions and conditions cited in this Section shall apply to Work for other sections of Division 26 - 28 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 the renovation of the 8<sup>th</sup> floor bone marrow treatment area for **the University of Missouri Health Care Patient Care Tower** located at **1 Hospital Dr. Columbia, MO**.
- 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. <b>Common Work Results for Electrical</b>	<b>26 05 00</b>
3. <b>Low Voltage Electrical Transmission</b>	<b>26 20 00</b>
4. <b>Lighting</b>	<b>26 50 00</b>
5. <b>Communications and Systems</b>	<b>27 00 00</b>
6. <b>Electronic Safety and Security</b>	<b>28 00 00</b>

#### 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 - 28 of the Specifications.
- B. All provisions and conditions cited in this Section shall apply to Work for all other sections of Division 26 - 28 of these Specifications.



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.
  4. **“Nationally Recognized Testing Laboratory (NRTL)”**: An independent organization recognized by OSHA that functions to provide third-party evaluation, testing and certification of products requiring OSHA NRTL approval.

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 spaces such as a mechanical or electrical equipment rooms. 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) and as defined in Article 100 of the National Electrical Code.
- M. The term “**accessible**” as used in Division 26 – 28 of the Specifications shall mean as defined in Article 100 of the National Electrical Code.
- N. 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:

- Refer to the project drawing cover sheet for all applicable codes and standards.
- 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:
 

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

- A. The respective Contractor or Subcontractor shall pay all shipping and/or freight charges coincidental with the purchase of material and equipment for the fulfillment of their respective Work.

### 26 00 14 PERMITS and FEES

- A. The respective Contractor or Subcontractor shall coordinate so as to be included as part of the University of Missouri 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, fees, or inspections shall be corrected by the Contractor without additional compensation.

### 26 00 15 OWNER FURNISHED EQUIPMENT

- A. The Owner has elected to prepurchase AHU-51. The shop drawings will be available to the bidders upon request for reference.

- B. The AHU-51 will be shipped in pieces. The Contractor shall be responsible for coordinating delivery, rigging, and field assembly of the unit. The Contractor shall coordinate with the equipment supplier as required during all phases of the installation and assembly process.
- C. The Contractor shall be responsible for coordinating the delivery, receiving and installing the equipment as if the purchase had been made by them. If there is a problem with the equipment regarding compliance with the order or the submittals, start-up, or warranty, then the Contractor shall act for the Owner and arrange for the necessary corrections, replacement parts, back charges, technical support, etc. The installed equipment shall carry the warranty specified herein and as specified in other portions of the specifications. It shall be the responsibility of the Contractor during the warranty period to respond to the evident malfunction or failure of the equipment as though they had directly purchased the equipment. This includes conducting the necessary diagnostic efforts and, if the malfunction is deemed by the Contractor to be an equipment liability issue, to so resolve the problem with the supplier as the Owner's agent.

**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.
- G. The Contractor is responsible for coordinating electrical requirements with all other trades. Refer to Div 20 20 11.

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 Architect/Engineer shall be the sole source of interpretation of the design and intent of the Project Documents.

26 00 36 CONSTRUCTION SCHEDULE

- A. The Contractor shall furnish sufficient manpower as the schedule dictates and is required to maintain the overall project schedule. Manpower or overtime to meet the project schedule including, but not limited to, premium time, inefficiencies associated with longer days/hours, inefficiencies associated with additional manpower, or other labor burdens shall be included in the Contract Sum.
- B. The Contractor shall coordinate with their Subcontractors to develop an overall project schedule.
- C. The phasing required, dates that existing occupied spaces or buildings will be made available to the Contractor, and the anticipated delivery dates of any Owner furnished equipment, shall be used by the Contractor to perform their work. The Contractor must make the owner aware of any scheduling conflicts. The failure of any of these events to occur as scheduled will not be considered a change in scope and no additional compensation will be provided.

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 scanned color PDF of the As-Built, flattened to the Engineer.

**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 42 SEISMIC ANCHORAGE, BRACING AND SWAY BRACING

- A. The Contractor shall be responsible for preparing drawings, calculations and details for any anchorage, bracing and/or sway bracing as required by the Authority Having Jurisdiction. Submitted drawings, calculations and details shall be signed and sealed by a Professional Engineer licensed in the State of Missouri. Refer to the drawings for more information.

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](mailto: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. 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.
- G. Submittal Matrix – Refer to Division 1

1. Division 26 Required Submittal Information

SECTION	SUBMITTAL	CATALOG DATA	INSTALLATION INSTRUCTIONS	PROJECT SPECIFIC FACTORY DRAWINGS	WIRING DIAGRAMS	OPERATING INSTRUCTIONS	DIMENSIONAL DRAWINGS	DATA SHEETS (SCHEDULES, LABELING, ETC.)	COPY OF PROGRAM	ANCHORAGE DETAILS	PARTS LIST	SERVICE AND MAINTENANCE INSTRUCTIONS	ONE LINE/ THREE LINE DIAGRAMS	CERTIFICATIONS	INSTALLER	CALCULATIONS	PHOTOGRAPHS
260526	GROUNDING AND BONDING	X															
260548	SEISMIC RESTRAINT	X		X			X			X						X	
260573	ARC FLASH HAZARD ANALYSIS, SHORT CIRCUIT AND SELECTIVE COORDINATION								X							X	
262416	PANELBOARDS	X		X			X				X		X				
262726	WIRING DEVICES	X															
262816	DISCONNECTS	X	X														
262923	VARIABLE FREQUENCY DRIVES	X			X	X	X		X			X					
265113	INTERIOR LIGHTING FIXTURES	X															
265213	EMERGENCY BATTERY BACKUP BALLASTS	X															

2. Division 28 required submittal information

PATIENT CARE TOWER – 8<sup>TH</sup> FLOOR BONE MARROW TRANSPLANT UNIT RENOVATION  
COLUMBIA, MO

BSA LifeStructures #14110006 .02A

MU PROJECT #: CP221933

SECTION	SUBMITTAL	CATALOG DATA	INSTALLATION INSTRUCTIONS	PROJECT SPECIFIC FACTORY DRAWINGS	WIRING DIAGRAMS	OPERATING INSTRUCTIONS	DIMENSIONAL DRAWINGS	DATA SHEETS (SCHEDULES, LABELING, ETC.)	COPY OF PROGRAM	ANCHORAGE DETAILS	PARTS LIST	SERVICE AND MAINTENANCE INSTRUCTIONS	ONE LINE / THREE LINE DIAGRAMS	INSTALLER CERTIFICATIONS
28 31 00	FIRE DETECTION AND ALARM	X		X	X	X		X	X		X	X	X	X

- H. 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 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. Installed Arc-Flash Labels
  - 2. Operation and Maintenance Manuals
  - 3. As-built drawings.
  - 4. 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.

B. Close-out matrix:

1. Division 26

SECTION	CLOSEOUT	CATALOG DATA	HIPOT TEST RESULTS	STARTUP AND OPERATING INSTRUCTIONS	TESTING CERTIFICATE	TRAINING CERTIFICATE	PARTS LIST	START-UP COMPLETION DOCUMENTS	PROGRAM FINAL SETTING	UL MASTER LABELS
262416	PANELBOARDS	X								
262816	DISCONNECTS	X								
262923	VARIABLE FREQUENCY DRIVES	X		X				X	X	
265113	INTERIOR LIGHTING FIXTURES	X								

2. Division 28

SECTION	CLOSEOUT	CATALOG DATA	TEST RESULTS	STARTUP AND OPERATING INSTRUCTIONS	TESTING CERTIFICATE	TRAINING CERTIFICATE	PARTS LIST	START-UP COMPLETION DOCUMENTS	PROGRAM FINAL SETTING	UL MASTER LABELS	AS BUILTS
28 31 00	FIRE DETECTION AND ALARM	X	X		X	X	X	X	X		X

26 00 49 GUARANTEE

- A. The Contractor shall guarantee all material, equipment and workmanship provided for this project to be free from defects for a period of one (1) year after final acceptance. The guarantee shall include replacement of the defective part(s) and related labor. Manufacturer's written guarantees shall be provided where it is published.
- B. Any obvious defects shall be corrected before final acceptance. For additional defects after final acceptance, the Owner shall advise the Contractor in writing, unless the situation is urgent, to address the deficiency or malfunction. The Contractor shall respond promptly and with no additional compensation for a valid guarantee claim.
- C. Longer guarantee periods of time or special conditions may be specified. See particular specifications for these requirements.
- D. If a written guarantee is offered for conditions or period exceeding specified requirements; this guarantee shall be included in the "Close-out" specifications of Subsection 26 00 48.
- E. The Contractor shall not qualify the guarantee with requirements placed upon the Owner. If the Contractor has concerns with maintenance of a piece of equipment then Contractor shall allow for making periodic inspections, adjustments, etc. during the warranty period.

**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 00 43) 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 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 affect 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 3" high, unless noted otherwise, which shall project not less than 1-1/2" beyond the equipment and not less than 3" beyond anchor bolts 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.
  4. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
- 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 Owner 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. 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. All feeders and branch circuit wire installed exterior to the building or serving VFD loads shall be XHHW.
  - a. For conductors #10AWG, stranded type THWN-2 or THHN shall be used.
  - b. For conductors #12AWG, solid type THWN-2 or THHN shall be used.
  - c. For conductors #14AWG, stranded type THNN shall be used.
  - d. 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
3. Where conductors are upsized to account for deratings or voltage drop and are too large for the termination lugs, provide reducer pins equivalent to Burndy AYP or AYPO (offset pin). Reducer pins shall be compression type, dual rated for aluminum/copper conductors, and include an insulating cover.
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.
5. Aluminum conductors are strictly prohibited.

### 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. MC Cable must be hospital grade and is only allowed for lighting whips (5' or less; above ceiling only).

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.

26 05 33 RACEWAY FOR ELECTRICAL SYSTEMS

A. General Requirements

1. Minimum conduit size shall be  $\frac{3}{4}$ " trade size for branch circuits. Conduits shall be colored from factory as shown below **(Conduits cannot be painted by contractor):**
- a. Red = Life Safety Branch
- b. Orange = Critical Branch
- c. Yellow = Equipment Branch
- d. Red Conduit with Red J-boxes = Fire Alarm
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. All raceways for equipment and devices located within or on the building are to be routed through the interior of the building. Do not route conduits on the roof, surface mounted on the building exterior walls or via exterior trenches or directional bores between areas of the building, unless noted otherwise or prior approval is provided by the Architect/Engineer.
5. 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 equal. Provide copper bonding jumper at each expansion fitting.
6. 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.

7. All exposed conduits shall be installed parallel or perpendicular to the building walls or floors.
  8. 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.
  9. 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.
  10. 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.
  11. All raceways installed within 1½" of the roof deck shall be GRS or IMC. Boxes shall be offset below the 1½".
  12. All penetrations through non-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. Aluminum EMT is not approved.
  2. EMT couplings and connectors shall be steel, compression type.
- C. Galvanized Rigid Steel (GRS) Conduit
1. All GRS couplings and threaded hubs shall have no less than five threads of the coupling engaged. Running threads shall not be used. All GRS conduits shall be reamed.
  2. All GRS conduits shall have two locknuts and a bushing at each termination outlet box, junction box, etc., except where terminated in a threaded hub.
- D. Polyvinyl Chloride (PVC) Conduit
1. PVC Conduit shall not be used without engineer prior approval.
- E. Liquid-tight Flexible Steel Conduit

1. Liquid-tight flexible steel conduit ('Sealtite') shall be used in wet areas where flexible conduit connections are required and limited to 3 feet on all motorized equipment and motors in all locations.
2. Liquid-tight flexible metal conduit ('Sealtite') is not permitted for roof penetrations.

F. Flexible Steel Conduit

1. Flexible steel conduit ('Greenfield') shall be used where vibration isolation is required, including all transformers and uninterruptible power systems.

G. High Density Polyethylene (HDPE)

1. HDPE Conduit shall not be used without engineer prior approval.

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.
6. All outdoor junction boxes and condulets shall be gasketed.

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 design parameters as shown on the drawings

- B. All conduit support and restraint details and practices shall conform to the publication “Seismic Restraint Systems Guidelines” by Cooper B-line-TOLCO.
- C. 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.

#### 26 05 73 ARC FLASH HAZARD ANALYSIS, SHORT CIRCUIT AND SELECTIVE COORDINATION

##### A. RELATED DOCUMENTS

- 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

##### B. SUMMARY

- 1. The update to the existing Power Systems Studies will be prepared by the Owner's Arc Flash Consultant.
- 2. The Electrical Contractor shall be required to provide the data necessary from this project to facilitate Owner's Arc Flash Consultant performing the update to the existing Power Systems Studies.
- 3. The Electrical Contractor shall include all costs to set the new circuit breakers and relays and any existing circuit breakers settings per the results of the protective device coordination study. The relays settings shall be performed by a certified factory technician.
- 4. The Electrical Contractor shall install the new and updated arc flash hazard labels (As furnished by Owner's Arc Flash Consultant) per the results of the updated arc flash hazard analysis study.
- 5. The scope of the studies shall include the entire electrical system proposed within the contract documents.
  - a. All three-phase feeder and branch circuit overcurrent protective devices installed with a rating equal to or greater than 30 amps shall be included in study scope.
  - b. All motor circuit overcurrent protective devices for motors with a rating equal to or greater than 10 horsepower shall be included in study scope.

##### C. SUBMITTALS

- 1. Field Data

- a. Submit field data in tabular format (excel spread sheet) for the items listed in Part 3 Execution.

## PART 2 - PRODUCTS (NOT USED)

## PART 3 - EXECUTION

### A. EQUIPMENT DATA

1. Provide shop drawings of all new equipment provided by this contractor, including the overcurrent and relay data.

### B. CABLE LENGTHS

1. Gather and tabulate the following input data to support coordination study.
2. Provide all feeder cable lengths and raceway types installed for all electrical distribution equipment indicated on the one-line diagram and to all pieces of mechanical.
3. Information required will include:
  - a. Conductor lengths
  - b. Conductor material
  - c. Conductors per phase
  - d. Conductor size
  - e. Insulation Type
  - f. Conduit Material
4. Provide Data in tabular format.

### C. FIELD ADJUSTMENTS

1. The contractor shall adjust protective device settings according to recommended settings tables provided by the Power Systems Studies.
2. The contractor shall have the relay setting done by a certified factory technician from the relay manufacturer.

## 26 20 00 LOW-VOLTAGE ELECTRICAL TRANSMISSION

### A. SHORT CIRCUIT RATINGS

1. All short circuit ratings shall be Fully Rated device ratings, not Series Rated.

## 26 24 00 SWITCHBOARDS AND PANELBOARDS

### 26 24 16 PANELBOARDS

#### A. DISTRIBUTION PANELBOARDS:

1. Panelboards shall be installed as shown on the drawings and specified below.

2. Panels shall be dead front type, with fusible switches or circuit breakers furnished in sizes as indicated on drawings. Panels shall be equipped with a door-in-door type hinge.
3. The panels shall include an equipment grounding bus.
4. Main buses and connectors shall be copper of sufficient current carrying capacity to limit the temperature rise to 65KC per UL tests and have a minimum short circuit rating of 22,000A (120/208V) or 22,000A (277/480V) or as noted on the drawings.
5. All protective devices installed in the distribution panelboard shall have a kAIC rating to match the distribution panelboard kAIC rating unless otherwise noted.
6. All main bus joints, tap connections, and contact points shall be silver or tin-plated.
7. Provide a 6" wide x 2" high phenolic switchboard nameplate reading the following:

<b>PANELBOARD IDENTIFICATION</b>	<b>(5/8" Lettering)</b>
<b>__V __Ph __W __A</b>	<b>(3/8" Lettering)</b>
<b>__kAIC FULLY RATED</b>	<b>(3/8" Lettering)</b>
<b>FED FROM ____</b>	<b>(3/8" Lettering)</b>

8. Provide labeling indicating Available Fault Current with calculation date Per NEC 2020 408.6.
9. Fusible Switches and Circuit Breakers: Fusible switches and circuit breakers shall be provided in the sizes and arrangements shown on the drawings. Fusible switches shall accept Class R fuses. Provide a 3" wide x 1" high phenolic nameplate for each switch as follows:
 

<b>EQUIPMENT IDENTIFICATION</b>	<b>(3/8" Lettering)</b>
<b>__AS/ __AF (XX AMPS WITH/XX AMP FUSE)</b>	<b>(1/4" Lettering)</b>

  - a. The switches shall be provided with a door interlock to prevent access to fuses and switch when energized and manually operated interlock defeat mechanism. The door is to be furnished with "on-off" handle position markings and a means to lock the switch in the open position is to be provided.
10. Manufacturer: The panelboard shall be as manufactured by Siemens, Square D Company, General Electric by ABB, or Eaton Cutler Hammer.
11. Refer to Section 20 00 72 for support of equipment and "housekeeping pad" requirements.

#### B. CIRCUIT BREAKER PANELBOARDS

1. Panels shall be dead front, safety type, furnished with branch circuit protecting devices, equipment grounding bus, phenolic nameplate, main bus and cable lugs factory assembled, with all components in place, ready for installation. Contractor to determine top or bottom feed for lug placement. Feed locations shall not be reviewed by the Engineer.
2. Panels shall be equipped with a door-in-door type hinge.
3. The circuit breakers shall be of the molded case, bolt-on type suitable for voltage and ampere ratings indicated on drawings and in schedules and shall have a minimum



interrupting capacity of 10,000 amperes (120/208V) or 14,000 amperes (277/480V) or as noted on the drawings.

4. Provide lockable red circuit breakers on all circuits serving the fire alarm system.
5. Buses and connectors shall be silver or tin plated hard drawn copper of 98% conductivity, with current carrying capacity to maintain established rise tests as defined in UL Standard UL 67.
6. A directory frame shall be attached to inside face of hinged door. The directory card shall be neatly typed to identify circuits. A transparent plastic facing shall protect the directory card. Room numbers shall be included in directory descriptions. Furnish a copy of each panel directory to the Architect/Engineer. Where existing panelboard loads are modified, the panel directories shall be updated.
7. All flush mounted panelboards shall have spare 1" conduits stubbed up out of the panelboard and extended to above an accessible ceiling. Panelboards in interior wall shall have two conduits stubbed out on both sides of the wall (four conduits total). Panelboards in exterior walls shall have three conduits stubbed out into the building interior.
8. Provide labeling indicating Available Fault Current with calculation date Per NEC 2020 408.6.
9. Panelboards to be by Square D Corporation, Siemens, General Electric by ABB or Eaton Cutler Hammer.

## 26 27 00 LOW-VOLTAGE DISTRIBUTION EQUIPMENT

### 26 27 26 WIRING DEVICES

- A. General: Furnish and install wiring devices as scheduled in Table 1 below, in types, characteristics, grades, colors, and electrical ratings for applications indicated which are UL listed and which comply with NEMA and FedSpec standards.

1. Provide **white** color devices and nylon wall plates except as otherwise indicated.

B. Listings and Standards:

Switches - UL20, FedSpec WS896-E

Receptacles - UL948, FedSpec WC-596F, NEMA WD-1 and WD-6

GFI – UL943

Hospital Grade Receptacles - UL498, FedSpec WC-596F, NEMA WD-1 and WD-6

**TABLE NO. 1**

**Note: Ivory catalog # is listed**

Receptacles	Hubbell	Leviton	Cooper	P & S
20A Duplex	HBL5362-I	5362A-I	5362V	5362A-I
20A GFI	GF20IL	7899-I	VGF20V	2095-I
Hospital Grade	HBL8300I	8300-I	8300V	8300-IJ

PATIENT CARE TOWER – 8<sup>TH</sup> FLOOR BONE MARROW TRANSPLANT UNIT RENOVATION  
COLUMBIA, MO

BSA LifeStructures #14110006 .02A

MU PROJECT #: CP221933

Hospital Grade GFI      GF8300HI      8898-HGI      VGFH20V      2094-HGI

Switches	Hubbell	Leviton	Cooper	P & S
20A Single	1221I	1221-2I	AH2221V	PS20ACI-I
20A 3-way	1223I	1223-2I	AH2223V	PS20AC3-I
20A 4-way	1224I	1224-2I	AH2224V	PS20AC4-I
20A 2 pole	1222I	1222-2I	AH2222V	PS20AC2-I

Nylon Plates	Hubbell	Leviton	Cooper	P & S
Duplex	NP8I	80703-I	5132V	TP8-I
Quadplex	NP82I	80716-I	5150V	TP82-I
Single Toggle	NP1I	80701-I	5134V	TP1-I
2-Gang Toggle	NP2I	80709-I	5139V	TP2-I
GFI	NP26I	80401-N1	5151V	TP26-I

Weatherproof Plates	Hubbell	Leviton	Cooper	P & S
WP GFI	NWP26	6196-V	1966	WP26-I
WP In Use GFI	Bell MX4280(Z-bronze,WH-white,S-gray)			

Locking Plates	FSR
Single Gang	FSR WB-MS1G
Two-Gang	FSR WB-MS2G
Three-Gang	FSR WB-MS3G
Four-Gang	FSR WB-MS4G

- C. All receptacles and switches shall be identified with a black-on-clear. This label shall include the panel and branch circuit number supplying power to the receptacle.

## 26 28 00 LOW-VOLTAGE CIRCUIT PROTECTIVE DEVICES

### 26 28 16 DISCONNECT SWITCHES

- A. Type of Switch: Furnish and install disconnect switches as specified where shown on the drawings.
1. All disconnect switches shall be classed Heavy Duty and enclosed as required by NEMA Standards. Switch sizes and fusing shall be as shown on the drawings.
  2. Switch shall have a quick make, quick break mechanism operating through the box and not the cover. The switchblades shall be visible when the hinged door is open.
  3. The cover shall be interlocked with the operating handle to prevent opening door when switch is "ON" and a means provided to lock switch in the "OFF" position. This mechanism shall be capable of being defeated.
  4. Provide a 4" wide x 1½" high phenolic nameplate reading the following for each switch:

<b>'EQUIPMENT IDENTIFICATION'</b>	<b>(3/8" Lettering)</b>
<b>SERVICE DISCONNECT</b>	<b>(3/8" Lettering)</b>
<b>FED FROM 'SOURCE NAME'</b>	<b>(1/4" Lettering)</b>
<b>LOCATE IN 'SOURCE LOCATION'</b>	<b>(1/4" Lettering)</b>

- B. Manufacturer: Switches shall be by Siemens, Square D, Eaton Cutler Hammer, or General Electric by ABB.

## **26 29 00 LOW-VOLTAGE CONTROLLERS**

### **A. CONTROL AND INTERLOCK WIRING**

1. The Electrical Contractor shall furnish and install control and interlock wiring as shown on the electrical drawings. Control and interlock wiring required by Division 22 or 25 but not shown on the electrical drawing shall be the responsibility of the Division 22 or 25 Contractor requiring the wiring.
2. Generally, this will mean that Division 26 wires the series safety circuit to the magnetic starters, furnished with Hand-Off-Auto selector switches, using switches and devices furnished by the Mechanical Contractor.
3. Starter automation, as required by the temperature control sequence of operation, will be provided and wired by Division 22 or 25 with connections made to terminals on the automatic side of the selector switch and on starter coil auxiliary contacts.
4. The intention is that Division 26 furnish and install all wiring necessary to operate the magnetic starters with the selector switch in the Hand position and that Division 22 or 25 provide all additional automation required.
5. Relays, electropneumatic relays, and any other device required by Division 22 or 25 to operate in parallel with the starter coil shall be controlled through spare auxiliary contacts on the starter furnished by Division 26 and shall not be connected to the starter coil.
6. Single-phase motors generally are controlled by line voltage controllers furnished by the Temperature Control Contractor but installed by the Electrical Contractor. If the control sequence is more complicated than a single line voltage device such as a unit mounted thermostat, a relay or control device with a horsepower rated contact will be provided by the Temperature Control Contractor for installation by the Electrical Contractor adjacent to the motor disconnect device. The Electrical Contractor shall provide power-wiring connections to this control device. Temperature Control Contractor will provide control and interlock wiring to this control device.

### **26 29 13 MOTOR AND APPLIANCE CONTROL**

- A. Electrical Contractor shall furnish and install all electrical devices incident to the work except as otherwise stated herein. The Mechanical Contractor will furnish prewired control panels for equipment so indicated on the plans and will furnish EP switches, electrical thermostats, pressure switches and other temperature control devices as required by the specific sequence of operation for installation by the Electrical Contractor. Others will do testing and adjusting of mechanical system devices.
- B. The motor and appliance control devices shall be as follows:

1. All starters shall be installed in NEMA 1 Enclosure unless noted otherwise on the drawings. Where noted other than NEMA 1, furnish the indicated NEMA rated enclosure.
2. Single Phase Magnetic Starters - Square D Class 8536 with one overload, 120 volt coil, N.O. auxiliary contacts, heavy-duty 30 mm and hand-off-automatic selector switch in cover all in an oversized NEMA enclosure.
3. Three Phase Manual Starters - Square D Class 2510 Type M, push button operated, lock-out guard, three thermal overloads in a NEMA enclosure. Furnish with or without pilot light and auxiliary contacts as indicated on drawings.
4. Three Phase Magnetic Starters - Square D Class 8536 with three overloads, 120 volt control transformer with 2 primary and 1 secondary fuses, heavy-duty 30 mm, hand-off-automatic selector switch, heavy-duty 30 mm pilot light, and extra N.O. auxiliary contacts all in a NEMA enclosure.
5. Three Phase Combination Starter and Fusible Disconnect Switch - Square D Class 8538 with a NEMA enclosure including a three pole fusible switch and a starter with three overloads, 120 volt control transformer with 2 primary and 1 secondary fuses, heavy-duty 30 mm, hand-off-automatic selector switch and heavy-duty 30 mm pilot light and N.O. auxiliary contacts.
6. Fractional HP Single Phase Manual Starters - Square D Class 2510 Type F, toggle switch operated with lock-out guard, single thermal overload. Furnish starters single speed with or without pilot lights as indicated on the drawings. All surface mounted starters shall be mounted in a 'FS' conduit box.
7. Integral HP Single Phase Manual Starters – Square D Class 2510 Type M, push button operated, lock-out guard, single thermal overload in NEMA enclosure. Furnish with or without pilot light and auxiliary contacts as indicated on drawings.
8. Selector Switches and Pushbutton Stations - Square D Class 9001 heavy duty 30 mm in NEMA enclosure.
9. Provide a 3" wide x 1½" high phenolic nameplate reading the following for each motor starter:

<b>EQUIPMENT IDENTIFICATION</b>	<b>(3/8" Lettering)</b>
<b>Size '___', ___A Overload</b>	<b>(1/4" Lettering)</b>
<b>FED FROM _____</b>	<b>(1/4" Lettering)</b>

10. Relays - Square D Class 8501 with 120-volt coil in NEMA 1 enclosure. Furnish with number of poles indicated on the plans.
11. Provide a phenolic nameplate for each motor starter.
12. Devices of similar construction and design as manufactured by Eaton Cutler Hammer, Allen Bradley, Siemens, or General Electric by ABB are also acceptable.

#### 26 29 23 VARIABLE FREQUENCY DRIVES

- A. The Electrical Contractor shall provide variable frequency drives as shown on the drawings. The Electrical Contractor shall furnish and install the controller, control devices, and interconnection wiring as specified below.

B. Drive General Description:

1. Furnish and install variable frequency drives as specified herein. The assembly shall include motor overload relay(s) and operational options required by this specification.
2. A factory authorized trained technician shall make final adjustments and settings on the drives and shall submit a field report to the Engineer stating the setpoints and ramp time settings on each drive.

C. Drive Components:

1. The variable frequency drive system shall include a diode bridge rectifier, DC link reactor for reduction of harmonics, capacitor filter, and IGBT inverter section. The output shall be capable of a 12khz sine-coded pulse width modulated output for quiet operation. The drive ratings shall be based upon 8khz output.
2. Refer to Mechanical Electrical Interface for maximum carrier frequency rating.
3. The controller shall include the following devices:
  - a. Drive manual on-off-auto selector switch to manually energize or de-energize the drive control system.
  - b. Manual speed selector to allow a specified speed to be selected and maintained if the manual-off-automatic selector switch is in the manual position.
  - c. 4-20 milliamp output that is directly proportional to drive speed.
4. Provide a 3" wide x 1" high phenolic nameplate for each starter or disconnect as follows:
 

<b>EQUIPMENT IDENTIFICATION</b>	<b>(3/8" Lettering)</b>
<b>__AS/ __AF (XX AMP SWITCH/XX AMP FUSE)</b>	<b>(1/4" Lettering)</b>
<b>OR</b>	
<b>EQUIPMENT IDENTIFICATION</b>	<b>(3/8" Lettering)</b>
<b>Size ‘_’, __A Overload</b>	<b>(1/4" Lettering)</b>
5. The system protection as a minimum will provide the following:
  - a. Overcurrent protection of 100% continuous, 110% for 1 minute.
  - b. Instantaneous overcurrent trip at 150%.
  - c. Current limit stall prevention shall be adjustable 10 to 110%.
  - d. Ground fault protection.
  - e. Current limiting DC bus fuse.
  - f. Overvoltage protection.
  - g. Undervoltage protection.

6. When the drive faults, the drive shall activate a 1NO, 1NC-fault relay display for indication of type of trip.

- |    |       |                                |
|----|-------|--------------------------------|
| a. | OC:   | Overcurrent trip at 150%       |
| b. | OCA:  | Overcurrent on start-up        |
| c. | OCL:  | Overcurrent on output          |
| d. | OL:   | Overload                       |
| e. | OP:   | Overvoltage due to power surge |
| f. | OP2:  | Overvoltage while deceleration |
| g. | POFF: | Undervoltage                   |
| h. | OH:   | Overheat                       |
| i. | EF:   | Ground faults                  |

7. Auto restart shall be a standard feature of the drive as follows:

- a. Auto restart enabled or disabled by jumper or keypad selection.

If auto restart is selected the microprocessor shall determine, in the event of a fault, if a restart should be attempted. A restart will be attempted under the following condition:

Undervoltage (UP) - Every time as soon as voltage returns to a safe level. Fault relay is not activated.

Input Overvoltage (OPS) and DC Bus Overvoltage (OP) - Every time if voltage returns to normal within 30 seconds, fault relay is not activated.

Overcurrent (OC) - Drive delays 1 second and attempts a restart. If drive trips a second time it delays 2 seconds and attempts a second restart. Overall, five attempts are made after successive delays of 1, 2, 4, 8 and 16 seconds. If the restart fails, the drive locks out and sets the fault relay on. (Number of restarts and time delays to be adjustable via keypad or jumpers).

A restart will not be attempted for any other type of fault and the drive will trip out immediately, activate the fault relay and make the appropriate indication on the display.

8. In the event of a fault trip the microprocessor shall save the status of the drive at the time of the fault and make that information available on the display until the drive is reset or the control power is removed.
9. An undervoltage condition of less than 100 ms duration shall not affect drive operation. If main power falls below 85% of rated voltage for longer than 100 ms while control power is retained the drive shall forcibly decelerate the load in an attempt to force a higher bus voltage through regeneration. This feature, depending on the inertia of the load, shall allow the drive to "ride through" a longer condition.

10. A minimum of 3% DC link or line reactor.
  11. Operation functions shall include the following:
    - Acceleration and deceleration time independently adjustable from .1 to 1200 seconds.
    - Signal follower 0-5VDC, 0-10VDC, 4-20ma, 0-20ma, 1- 5VDC, or 0-135 ohms selectable. An increasing input signal can command increasing or decreasing frequency as required by the application.
    - Ramp to stop or coast to stop for normal operation (coast to stop on fault). Volts/Hertz patterns selectable by keypad.
    - Upper and lower frequency limit adjustments shall be available. When the drive reaches one of the limits it shall activate an open collector signal available to the user. A dry contact signal shall be available as an option.
  12. Drives shall have a Short Circuit Current Rating (SCCR) of 100,000 amps.
- D. The following catalog data shall be submitted for the controller:
1. Dimensioned drawings.
  2. Operation and installation manuals.
  3. Maintenance, adjustment, part breakdown and troubleshooting manual.
  4. Connection diagrams.
  5. Schematic diagrams including printed circuit boards, wiring harnesses, and enclosure mounted controls.
- E. **Drives shall be furnished with a BACNET IP card.**
- F. Refer to Section 26 00 72 for support of equipment and “housekeeping pad requirements”.
- G. Variable frequency drives shall be Toshiba Q9+, YASKAWA HV600, or ABB ACH 580.

## **26 50 00 LIGHTING**

### **26 51 00 LIGHT FIXTURES AND LAMPS**

#### 26 51 19 LED INTERIOR LIGHTING

##### **A. RELATED DOCUMENTS**

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

##### **B. SUMMARY**

1. Section Includes all LED Interior luminaries.
2. Related Requirements:

- a. Retain subparagraphs below to cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections.
- b. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
- c. Drawings for Luminaire Schedule.

#### C. DEFINITIONS

1. CCT: Correlated color temperature.
2. CRI: Color Rendering Index.
3. Fixture: See "Luminaire."
4. IP: International Protection or Ingress Protection Rating.
5. LED: Light-emitting diode.
6. Lumen: Measured output of lamp and luminaire, or both.
7. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

#### D. ACTION SUBMITTALS

1. Product Data: For each type of product.
  - a. Arrange in order of luminaire designation.
  - b. Include data on features, accessories, and finishes.
  - c. Include physical description and dimensions of luminaires.
  - d. Include emergency lighting units, including batteries and chargers.
  - e. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.
  - f. Include sample warranty.
2. Shop Drawings: For nonstandard or custom luminaires.
  - a. Submit factory drawings with the following additional information included:
    - i. Plans, elevations, sections, and mounting and attachment details.



- ii. Details of luminaire assemblies. Indicate dimensions of fixture including individual lens lengths, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- iii. Diagrams for power, signal, control wiring, and emergency lighting locations.
- iv. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- v. Product Certificates: for each type of Luminaire.
- vi. Product Test Reports: For each luminaire, for test performed by a qualified testing agency.
- vii. Sample warranty.

#### E. PRODUCT SUBSTITUTIONS

- 1. Product Substitutions shall be submitted 10 days in advance of bid-day. All products included in bid shall be of equal or better quality to the basis of design.

#### F. CLOSEOUT SUBMITTALS

- 1. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.
  - a. Provide a list of all Lamps/LED Light Bars & Drivers/Transformers used on Project; use ANSI and manufacturers' codes.

#### G. MAINTENANCE MATERIAL SUBMITTALS

- 1. No attic stock required for this project.

#### H. QUALITY ASSURANCE

- 1. Luminaire Photometric Data Testing Laboratory Qualifications:
  - a. Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.
  - b. Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.
- 2. Provide luminaires from a single manufacturer for each luminaire type.
- 3. Each luminaire type shall be binned within a three-step MacAdam Ellipse or better to ensure color consistency among luminaires.

#### I. DELIVERY, STORAGE, AND HANDLING

1. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

J. WARRANTY

1. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
2. Warranty Period: From date of Substantial Completion.
  - a. Manufacturer: Five years minimum, unless otherwise noted.
  - b. Installer: One year minimum, unless otherwise noted.

K. PERFORMANCE REQUIREMENTS

1. Seismic Performance:
  - a. Luminaires shall withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.
  - b. Luminaires and lamps shall be labeled vibration and shock resistant.
  - c. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified."
2. Ambient Temperature: 41 to 104 deg F.
  - a. Relative Humidity: Zero to 95 percent.

L. LUMINAIRE REQUIREMENTS

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place. Labels shall include but not limited to CCT, CRI and Lumens.
  1. CRI of minimum 80. CCT of 3500K (interior). 4000K (exterior)
  2. Related minimum luminaire life of 100,000 hrs to L70.
  3. Luminaire dimmable from 100 percent to 10 percent of maximum light output unless otherwise specified on Luminaire Schedule.
  4. All recessed fixtures less than 3" in diameter have accessibility to driver without reaching into ceiling cavity.

5. Lens:

- a. Acrylic diffusers: 100% virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- b. At least 0.125 inch minimum unless otherwise indicated on Luminaire schedule.

6. Housings: See luminaire schedule for exact requirements.

7. Recessed luminaires shall comply with NEMA LE 4.

M. MATERIALS

1. Metal Parts:

- a. Free of burrs and sharp corners and edges.
- b. Sheet metal components shall be steel unless otherwise indicated.
- c. Form and support to prevent warping and sagging.

2. Steel:

- a. ASTM A36/A36M for carbon structural steel.
- b. ASTM A568/A568M for sheet steel.

3. Stainless Steel:

- a. Manufacturer's standard grade.
- b. Manufacturer's standard type, ASTM A240/240M.

4. Galvanized Steel: ASTM A653/A653M.

5. Aluminum: ASTM B209.

6. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions.

7. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position

N. METAL FINISHES

- 1. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

O. EXAMINATION

1. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation. EC shall receive approval from engineer/lighting designer prior to luminaire installation when there is a layout change due to unforeseen conditions.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

P. TEMPORARY LIGHTING

1. If approved by the Architect, Engineer and Lighting Designer, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting.

Q. INSTALLATION

1. Comply with NECA 1.
2. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
3. Install per manufacturer's installation instructions.
4. Supports:
  - a. Sized and rated for luminaire weight.
  - b. Able to maintain luminaire position after cleaning and relamping.
  - c. Provide support for luminaire without causing deflection of ceiling or wall.
  - d. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
5. Flush-Mounted Luminaires:
  - a. Secured to outlet box.
  - b. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
  - c. Trim ring flush with finished surface.
6. Wall-Mounted Luminaires:
  - a. Attached to structural members in walls
  - b. Do not attach luminaires directly to gypsum board.
7. Ceiling-Grid-Mounted Luminaires:
  - a. Secure to any required outlet box.

- b. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
- c. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

- 8. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

#### R. FIELD QUALITY CONTROL

- 1. Perform the following tests and inspections:
  - a. After installing luminaires, lighting controls, and accessories, and after electrical circuitry has been energized, test luminaires with controls to confirm proper operation. Any defective component in the lighting systems shall be replaced and the system reprogrammed if necessary.
  - b. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- 2. Luminaire will be considered defective if it does not pass operation tests and inspections.

#### S. ADJUSTING

- 1. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
  - a. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
  - b. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

END OF SECTION

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## **27 00 00 COMMUNICATIONS**

### 27 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 27 of the Specifications.
- B. Provisions and conditions cited in this Section shall apply to Work for other sections of Division 27 of these Specifications.

### 27 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 27.

### 27 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 28 – Electronic Safety and Security

### 27 00 04 DEFINITIONS

- A. Refer to Section 26 00 05 – Definitions.

### 27 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.

### 27 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.

## **27 05 00 COMMON WORK RESULTS FOR COMMUNICATIONS**

### 27 05 28 PATHWAYS FOR COMMUNICATIONS 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 and shall be run in new j-hooks spaced no more than 5 feet apart.
- C. 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.
- D. Cables shall be continuous from outlet to termination equipment.
- 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. EZ Path 4x4.
- G. Refer to 26 05 29 for fire sealing of penetrations through fire rated walls.
- H. Provide access panels as necessary for cable routing.

#### 27 05 28.29 HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

- A. Cables shall be supported with "J-Hooks" a minimum of every five 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.

#### 27 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 1-1/4" conduit stubbed above an accessible ceiling. Plastic bushings shall be installed on both ends of conduit. Install blank covers on all unused rough-ins.
- B. 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%.
- C. Provide pull strings in all conduits.
- D. Conduit bends shall accommodate radius requirements of fiber cable as necessary.

### 27 15 00 COMMUNICATIONS HORIZONTAL CABLING

#### 27 15 13 COMMUNICATIONS COPPER HORIZONTAL CABLING

- A. Description of Work
  - 1. Refer to the Low Voltage Responsibility Matrix on the drawings for more information.
  - 2. The Contractor shall be trained and certified by the equipment manufacturer.
  - 3. The Contractor shall attend coordination meetings with the Owner and Engineer prior to installation.
- B. Acceptable Manufacturers

1. Subject to compliance with requirements, provide telephone/data cabling system components from the following manufacturers:

Homaco  
Panduit  
Hoffman

C. Rough-Ins

1. Furnish and install rough-ins where shown on drawings. Rough-in shall consist of a two-gang outlet box, single gang trim ring, and a minimum 1-1/4" conduit stubbed above an accessible ceiling. Install blank covers on all unused rough-ins.
2. Maximum fill of conduit is not to exceed forty percent.
3. Furnish and install minimum STI EZ Path 44 through fire rated partitions.
4. Refer to 260529 for fire sealing of penetrations through fire rated walls.

END OF SECTION  
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## **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**

### **28 05 28 PATHWAYS FOR ELECTRONIC SAFETY AND SECURITY SYSTEMS**

- A. All requirements listed in 27 05 28 shall apply for Electronic Safety and Security low voltage cabling unless noted below.
- B. Cabling for the following systems shall be installed in conduit:
  - 1. Fire Alarm – Red conduit and red boxes

## **28 30 00 ELECTRONIC DETECTION AND ALARM**

### **28 31 00 FIRE DETECTION AND ALARM**

#### A. Description of Work

1. Install a complete and operational extension to the existing 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. For a period of one year from date of Owner's first beneficial use, the system shall be under service contract, as authorized by the manufacturer. During that period, replacement components and labor shall be readily available during standard business hours. After the one-year guarantee period, the supplier warrants that he is capable of providing service on a 24 hour, 7-day a week basis for at least five (5) additional years.
6. 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.
7. 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. Partial submittal packages may be returned without being reviewed.
8. Sealed fire alarm drawings required for permit application are the responsibility of the Contractor and fire alarm system supplier.
9. 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 Siemens. No other manufacturer is allowed.

#### 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 7<sup>th</sup> 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: Addressable photoelectric duct mounted smoke detector with sampling tube and protective housing. Provide remote test switches or remote LED's where noted on plans. Contractor to provide all load relays necessary for fan shutdown.
  3. Relay Modules: Addressable relay modules with LED indicator light.
  4. Control Modules: Addressable control modules with LED indicator light.
  5. Monitor Modules: Addressable monitor modules with LED indicator light.
  6. 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. Signal Devices
1. Audible/Visual and Visual Signal Devices  
Wall Mounted Selectable Candela Audible/Visual Signals: Horn shall have 84 dB output at 10 feet on the high setting. Strobes shall have 15, 15/75, 30, 75, 110, and 115 candela output.  
Wall Mounted Selectable Candela Visual Signals: Strobe shall have 15, 15/75, 30, 75, 110 and 115 candela output.
  2. Signals shall meet the requirements of the Americans With Disabilities Act.
  3. The visual section shall be polarized Xenon strobe in various candela ratings. The visual candela rating shall be as indicated on the drawings.
  4. Audible signals and/or audible sections of combination signals shall be electronic multi-tone units and shall not require vibrating solenoids or contacts. The audible section shall provide for a high/medium/low setting providing different dB levels meeting the requirements of the particular room or space. Tone selection shall be continuous tones or the temporal pattern based on the ANSI S3.41 Standard shall be field selectable. Set audible signals to temporal pattern for this project and volume at high. Adjust volume for small rooms as required.
  5. Visual and audible devices shall be synchronized.
  6. The signals shall operate on 24 VDC polarized and meet UL 1971, UL464 and ADA. The signal shall be able to test circuit supervision without disconnecting wires.

7. There shall be FIRE lettering clearly visible from both sides. Red or white device color to be coordinated with Architect.
8. Provide remote power supplies as necessary. Provide dedicated 20A, 120V circuit to each remote power supply.

E. 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.

F. Sequence of Operations

1. Refer to the Input / Output matrix for more information.

END OF SECTION  
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