PROJECT MANUAL
FOR

HUMPHREY HIGH PERFORMING ARTS HVAC IMPROVEMENTS
PROJECT NO.
200691.07

4/24/2024

DATE: April 24, 2024

PREPARED BY:
IMS Engineers
126 EAST AMITE STREET
JACKSON, MS 39201

END OF SECTION

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INVITATION FOR BIDS

Sealed Proposals for furnishing all labor and materials as required by the drawings and specifications for the Humphrey County High Performing Arts HVAC Improvements located at 700 Cohn Street, Belzoni, MS 39038, funded by District and ESSER funding, will be received by the Mississippi Achievement School District at 401 Fourth Street, Belzoni, Mississippi 39038 until 10:30 AM on May 23, 2024, and then publicly opened and read aloud. Single stipulated sum bids will be received for all work required bythe contract documents in accordance with the Instructions to Bidders.

Bidders must be qualified under Mississippi Law and shall hold current Certificates of Responsibility as issued by law and be registered on SAM.gov. Mississippi Achievement School District encourages Minority and/or Women-owned Business Enterprise contractors and subcontractors.

Bids may be submitted by either of the following methods:

1. Electronic Bids will be accepted until 10:30 AM on May 23, 2024, by electronic submission as a PDF file at imsengineersbids.com each bidder submitting a bid electronically shall include a cover document titled Bid: Humphrey County High Performing Arts HVAC Improvements and shall list the bidder's Certificate of Responsibility Number as part of its PDF bid submittal. Any electronic PDF bid that does not include the bidder's Certificate of Responsibility Number shall not beconsidered.

2. Sealed bids will be received until 10:30 AM on May 23, 2024 at the Mississippi Achievement School District at 401 Fourth Street, Belzoni, Mississippi 39038. All sealed bids shall be marked on the outside face of the envelope "Bid: Humphrey County High Performing Arts HVAC Improvements and shall have the bidder's Certificate of Responsibility Number written on the outside of the envelope. If any envelope is not so marked, said bid shall not be opened or considered.

A Pre-Bid conference will be held at Mississippi Achievement School District, 401 Fourth Street, Belzoni, Mississippi 39038 at 2:00 P.M., on May 7, 2024.

Proposals must be submitted on the form as shown in the specifications and must be accompanied by a Bid Security in the form of a Bid Bond, Certified Check or Cashier's Check in an amount equal to 5% of the Bid and as required by the Contract Documents.

Performance and Payment Bond, in the full amount of the contract, will be required for contract security.

The Contract or Contracts will be awarded to the lowest acceptable bidder, except that the Owner reserves the right to waive any informalities and the Owner reserves the right to reject any and all bids. The Owner reserves the right to hold all bids for examination for a period not to exceed Thirty (30) days and to award the Contract based on the best bid. All Bids shall be in compliance and subject to Sections 31-3-15 and 31-3-21 of the Mississippi Code of 1972 as annotated and amended, and in all case law pertaining thereto.

Advertisement dates: April 24th, 2024 and May 1st, 2024.

SECTION 00 3000

FORM OF PROPOSAL

SUBMIT THIS ENTIRE FORM IN TRIPLICATE ON BUSINESS LETTERHEAD.

BIDDER INFORMATION:

COMPANY NAME: _____

MAILING ADDRESS: _____

CITY, STATE, ZIP: _____

PHONE: FAX: _____

EMAIL: _____

CERTIFICATE OF REPONSIBILITY NUMBER: _____

PROJECT INFORMATION:

HUMPHREY HIGH PERFORMING ARTS HVAC

IMPROVEMENTS 700 COHN AVENUE

BELZONI, MS 39038

OWNER INFORMATION:

MISSISSIPPI ACHIEVEMENT SCHOOL DISTRICT

1133 CALHOUN AVENUE

YAZOO CITY, MS 39194

TO WHOM IT MAY CONCERN:

WE, THE BIDDER, HAVE CAREFULLY EXAMINED THE DRAWINGS AND SPECIFICATIONS PREPARED BY INTEGRATED MANAGEMENT SERVICES (IMS) ENGINEERS, FOR THE PROJECT ENTITLED:

HUMPHREY HIGH PERFORMING ARTS HVAC

IMPROVEMENTS Project No. 200691.07

THE UNDERSIGNED, AS BIDDER, HEREBY DECLARES THAT THE ONLY PERSON OR PERSONS INTERESTED IN THIS BID AS PRINCIPAL OR PRINCIPALS, IS OR ARE NAMED HEREIN. NO PERSON OTHER THAN HEREIN MENTIONED HAS ANY INTEREST IN THIS BID OR IN THE CONTRACT TO BE ENTERED INTO; THAT THIS BID IS MADE WITHOUT CONNECTION WITH ANY OTHER PERSON, COMPANY OR PARTIES MAKING A BID; AND THAT IT IS IN ALL RESPECTS FAIR AND IN GOOD FAITH WITHOUT COLLUSION OR FRAUD.

THE BIDDER FURTHER REPRESENTS THAT HE HAS EXAMINED THE SITE OF THE WORK AND INFORMED HIMSELF FULLY CONCERNING ALL CONDITIONS PERTAINING TO THE PLACE WHERE THE WORK IS TO BE COMPLETED. THE BIDDER HAS EXAMINED THE PLANS AND SPECIFICATIONS FOR THE WORK AND OTHER CONTRACT DOCUMENTS RELATIVE THERETO, HAS READ ALL OF THE ADDENDA FURNISHED PRIOR TO THE OPENING OF THE BIDS, AS ACKNOWLEDGED BELOW; AND HE HAS OTHERWISE FULLY INFORMED HIMSELF REGARDING THE NATURE, EXTENT, SCOPE AND DETAILS OF THE WORK EXPECTED TO BE PERFORMED. THE BIDDER PROPOSES TO PROVIDE THE NECESSARY TOOLS, MACHINERY, APPARATUS AND OTHER MEANS OF CONSTRUCTION, AND TO FURNISH ALL LABOR, MATERIALS AND SERVICES SPECIFIED IN THE CONTRACT OR CALLED FOR IN THE DOCUMENTS (INCLUDING ALL TAXES, BONDS AND INSURANCE) NECESSARY FOR THE CONSTRUCTION OF THE WORK.

IF PROVIDED WITH A FORM OF AN "INTENT TO AWARD" TO THE BIDDER BY THE OWNER, THEN THE BIDDER SHALL CONTRACT WITH THE MISSISSIPPI ACHIEVEMENT SCHOOL DISTRICT IN THE FORM OF THE AMERICAN INSTITUTE OF ARCHITECTS (AIA) CONTRACT AGREEMENT FORM "AIA A101 STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR." THE DESIGN PROFESSIONAL OR ENGINEER WILL HANDLE THIS CONTRACT PREPARATION AND DELIVERY. THE CONTRACTOR SHALL PAY FOR AND FURNISH ALL NECESSARY PERMITS, LICENSES, MATERIALS, EQUIPMENT, MACHINERY, MAINTENANCE, TOOLS, APPARATUS, MEANS OF TRANSPORTATION AND LABOR NECESSARY TO COMPLETE THE WORK WITHIN THE SPECIFIED CONTRACT TIME AND AS PROVIDED FOR IN THE CONTACT DOCUMENTS. CONTRACTOR SHALL ALSO FURNISH THE PRESCRIBED PERFORMANCE BOND AND PAYMENT BOND IN THE FORM CONTAINED IN THE CONTRACT DOCUMENTS EACH FOR NOT LESS THAN THE TOTAL CONTRACT PRICE, AND THE CONTRACTOR SHALL FURNISH THE REQUIRED EVIDENCE OF THE SPECIFIED INSURANCE COVERAGE'S AS REQUIRED IN THE INSTRUCTIONS TO BIDDERS.

IF THE BIDDER FAILS OR REFUSES TO EXECUTE THE CONTRACT DOCUMENTS OR FURNISH THE BONDS AND OTHER REQUIRED DOCUMENTS AS SET FORTH IN THE INSTRUCTIONS TO BIDDERS WITHIN FIFTEEN (15) CALENDAR DAYS AFTER A "NOTICE OF INTENT TO AWARD" HAS BEEN ISSUED TO THE CONTRACTOR BY THE OWNER, THEN THE BID GUARANTY ACCOMPANYING THIS BID AND THE MONEY PAYABLE THEREON SHALL BECOME THE PROPERTY OF THE OWNER. OTHERWISE, THE BID GUARANTY WILL BE RETURNED TO THE BIDDER.

IF THE BIDDER FAILS TO COMPLETE THE WORK WITHIN THE SCHEDULED TIME OR ANY AUTHORIZED EXTENSION THEREOF, THERE SHALL BE DEDUCTED FROM THE TOTAL CONTRACT PRICE, AS LIQUIDATED DAMAGES BUT NOT AS PENALTY, A SUM CONSISTING OF ONE THOUSAND AND FIVE HUNDRED DOLLARS AND ZERO CENTS ($1,500.00) PER CALENDAR DAY BASED UPON THE AMOUNT OF THE CONTRACT; PLUS ALL COSTS FOR ANY ADDITIONAL RESIDENT PROJECT REPRESENTATIVES OBSERVATION, CONSTRUCTION MANAGER OR OWNER RELATED EXPENSES INCURRED FOR EACH CALENDAR DAY ELAPSING BEYOND THE SPECIFIED TIME FOR CONTRACT COMPLETION, IN ACCORDANCE WITH THE CONTRACT DOCUMENTS AS FIXED, AGREED, AND LIQUIDATED DAMAGES.

IN ANY EVENT, THE OWNER SHALL HAVE THE RIGHT TO COMPENSATORY AND CONSEQUENTIAL DAMAGES RESULTING FROM THE BIDDER'S DELAY IN COMPLETING THE WORK OR OTHERWISE RESULTING FROM THE BIDDER'S FAILURE TO PERFORM IN

ACCORDANCE WITH THE TERMS AND CONDITIONS OF THE CONTRACT DOCUMENTS.

ADDENDA:

ACKNOWLEDGMENT IS HEREBY MADE OF THE FOLLOWING ADDENDA (IDENTIFIED BY NUMBER) RECEIVED SINCE ISSUANCE OF THE PLANS AND SPECIFICATIONS.

ADDENDUM NUMBER	DATE ON ADDENDUM	ADDENDUM NUMBER	DATE ON ADDENDUM

THE BIDDER DECLARES THAT THE PRICES BID HEREIN REFLECT THE CURRENT MINIMUM WAGE RATES ESTABLISHED FOR THE PROJECT'S LOCATION SITE AREA BY THE SECRETARY OF LABOR OF THE UNITED STATES DEPARTMENT OF LABOR.

THE OWNER RESERVES THE RIGHT TO CANCEL THE AWARD OF A CONTRACT ANY TIME PRIOR TO THE EXECUTION BY ALL PARTIES WITHOUT LIABILITY AGAINST THE OWNER.

1. PURSUANT TO AND IN COMPLIANCE WITH THE INVITATION TO BID AND THE PROPOSED CONTRACT DOCUMENTS RELATING TO CONSTRUCTION OF: HUMPHREY HIGH ATHLETIC COMPLEX HEADQUARTERS LOCATED IN BELZONI, MISSISSIPPI.

THE UNDERSIGNED, HEREBY PROPOSES AND AGREES TO FULLY PERFORM THE WORK WITHIN THE TIME STATED AND IN STRICT ACCORDANCE WITH THE PROPOSED CONTRACT DOCUMENTS, INCLUDING FURNISHING ANY AND ALL LABOR AND MATERIALS, AND TO DO ALL OF THE WORK REQUIRED TO CONSTRUCT AND COMPLETE SAID WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS. THE OWNER RESERVES THE RIGHT TO ACCEPT OR REJECT ANY OF THE BID ALTERNATES BELOW WITHIN THIRTY (30) DAYS OF SIGNING THE AGREEMENT WITH THE GENERAL CONTRACTOR TO COMPLETE THE BASE BID WORK.

B A S E B I D:

FOR "BASE BID" WORK, WE PROPOSE THE LUMP SUM PRICE AS FOLLOWS:

(PRICE IN WRITTEN WORD) _____

_____(PRICE IN NUMBER $_____)

ALTERNATE 1:

FOR "ALTERNATE 1" WORK, WE PROPOSE THE LUMP SUM PRICE AS FOLLOWS:

(PRICE IN WRITTEN WORD)

_____(PRICE IN NUMBER $_____)

TIME FOR PROJECT COMPLETION:

WE, THE BIDDER, AGREE TO OBTAIN APPROVED SUBSTANTIAL COMPLETION IN 270 CALENDAR DAYS.

BID FORM SUPPLEMENTS:

THE FOLLOWING SUPPLEMENTS ATTACHED TO THE BID FORM ARE AN INTEGRAL PART OF THIS BID FORM. I UNDERSTAND THAT FAILURE TO COMPLETE AND SUBMIT THESE FORMS WITH THE BID PROPOSAL WILL CAUSE THE BID TO BE REJECTED AND CONSIDERED NON-RESPONSIVE.

A. Certified check, Cashier's Check, or Bid Bond payable to the Owner

B. Non-Collusion Affidavit

C. Debarment Form

D. Contractor's Qualification Statement

E. Non-resident Contractor's copy of current laws from state domiciled

F. Subcontractor and Supplier List

ADDITIONAL PROVISIONS:

I UNDERSTAND THAT THE OWNER RESERVES THE RIGHT TO REJECT THIS BID, BUT THAT THIS BID SHALL REMAIN OPEN AND NOT BE WITHDRAWN FOR A PERIOD OF SIXTY (60) DAYS FROM THE DATE PRESCRIBED FOR ITS RECEIVING.

IF WRITTEN NOTICE OF THE ACCEPTANCE OF THIS BID IS MAILED OR DELIVERED TO THE UNDERSIGNED WITHIN THIRTY DAYS AFTER THE DATE SET FOR THE RECEIVING OF THIS BID, OR AT ANY OTHER TIME THEREAFTER BEFORE IT IS WITHDRAWN, THEN THE UNDERSIGNED SHALL EXECUTE AND DELIVER THE CONTRACT DOCUMENTS TO THE OWNER IN ACCORDANCE WITH THIS BID AS ACCEPTED. THE UNDERSIGNED WILL ALSO FURNISH AND DELIVER TO THE OWNER THE PERFORMANCE BOND, LABOR AND MATERIAL PAYMENT BOND, AND PROOF OF INSURANCE COVERAGE, ALL WITHIN FIFTEEN DAYS AFTER PERSONAL DELIVERY OR AFTER DEPOSIT IN THE MAILS OF THE NOTIFICATION OF ACCEPTANCE OF THIS BID.

THE NAMES OF ALL PERSONS INTERESTED IN THE FOREGOING BID AS PRINCIPALS ARE:

(IMPORTANT NOTICE: IF BIDDER OR OTHER INTERESTED PERSON IS A CORPORATION, GIVE LEGAL NAME OF CORPORATION, STATE WHERE INCORPORATED, AND NAMES OF PRESIDENT AND SECRETARY; IF A PARTNERSHIP, GIVE NAME OF FIRM AND NAMES OF ALL INDIVIDUAL CO-PARTNERS COMPOSING THE FIRM; IF BIDDER OR OTHER INTERESTED PERSON IS AN INDIVIDUAL, GIVE FIRST AND LAST NAMES IN FULL)

_____

_____

_____

_____

_____

_____

LICENSED IN ACCORDANCE WITH AN ACT FOR THE REGISTRATION OF CONTRACTORS, AND WITH LICENSE NUMBER [_____] IN THE STATE OF MISSISSIPPI.

RESPECTFULLY SUBMITTED,

_____

(CONTRACTING COMPANY'S BUSINESS NAME - PRINTED)

_____

(CONTRACTING COMPANY'S OWNER'S NAME - PRINTED)

_____

(CONTRACTING COMPANY'S BUSINESS ADDRESS - PRINTED)

(TEL)_____ (FAX)_____

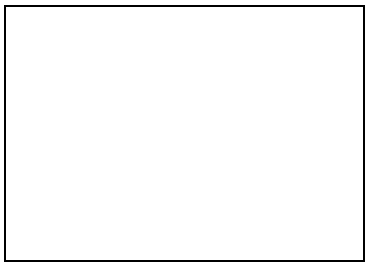
(CONTRACTING COMPANY'S TELEPHONE AND FAX NUMBER)

_____

(CONTRACTING COMPANY'S AUTHORIZING AGENT'S SIGNATURE AND TITLE)

_____(TITLE)_____

(CONTRACTING COMPANY'S AUTHORIZING AGENT'S NAME AND TITLE - PRINTED)



PROVIDE SEAL IN BOX ABOVE IF BID IS BY A CORPORATION

SUBCONTRACTOR AND SUPPLIER LIST

OWNER: **MISSISSIPPI ACHIEVEMENT SCHOOL DISTRICT**

DESIGN TEAM: **IMS ENGINEERS**

PROJECT: **HUMPHREY HIGH PERFORMING ARTS HVAC IMPROVEMENTS**

Note: Produce this page as many times as necessary to complete the Subcontractor and Supplier list for the entire bid package.

BIDDER: _____

WORK CATEGORY OR PRODUCT DESCRIPTION BY SECTION	SUBCONTRACTOR OR SUPPLIER NAME	SUBCONTRACTOR CERTIFICATE OF RESPONSIBILITY NUMBER

END OF SECTION

SECTION 00 4000

BID BOND

PART 1 - GENERAL

1.01 DESCRIPTION:

A. The standard form of Bid Bond published by the American Institute of Architects (AIA) entitled "AIA Document A310 – 2010 Bid Bond", or a Surety's standard form containing substantially the same provisions shall be used.

B. A Draft form of the above said document(s) has been attached at the end of this section for reference and review. A draft copy can also be reviewed, and an original may be purchased from the AIA Bookstore + Design Center at www.aiabookstore.com under the AIA Documents tab.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION

SECTION 00 4400

CONTRACTOR'S QUALIFICATION STATEMENT

PART 1 - GENERAL

1.01 DESCRIPTION:

A. The standard form of Contractor's Qualification Statement published by the American Institute of Architects (AIA) entitled "AIA Document A305 – Contractor's Qualification Statement, or a Surety's standard form containing substantially the same provisions shall be used.

B. To demonstrate qualifications to perform the work, the BIDDER must submit, the AIA DocumentA305 Contractor's Qualification Statement with the bid as, evidence required by the OWNER, to, financial data and previous experience.

C. A Draft form of the above said document(s) has been attached at the end of this section for reference and review. A draft copy can also be reviewed, and an original may be purchased from the AIA Bookstore + Design Center at www.aiabookstore.com under the AIA Documents tab.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION

STATEMENT OF BIDDER'S QUALIFICATIONS

All bidders are required to file this form, properly completed, WITH THEIR PROPOSAL. Failure of a bidder to answer any question or provide required information may be grounds for the awarding authority to disqualify and reject their bid. If a question or request for information does not pertain to your organization in any way, use the symbol "NA" (Not Applicable). Use additional 8½" x 11" sheets with your letterhead as necessary.

1. Indicate exactly the name by which this organization is known:

Name _____

2. How many years has this organization been in business under its present business name?

Years _____

3. How many years has this organization been in business as a General Contractor?

Years_____

4. List three (3) projects of similar magnitude, include brief description of Scope, owner name, address and contact information.

   a. _____

   b. _____

   c. _____

5. If this organization has not always been a General Contractor, list the trade(s) that your firm customarily performed prior to the time that you became a General Contractor:

   a. _____

   b. _____

   c. _____

6. Indicate all other names by which this organization has been known and the length of time known by each name:

    1. _____

    2. _____

    3. _____

7. This firm is a
    ___ Corporation
    ___ Partnership
    ___ Sole Proprietorship
    ___ Joint Venture
    ___ Other

8. Attach resumes of all supervisory personnel, such as Principals, Project Managers, and Superintendents, who will be directly involved with projects on which you are now a bidder. Indicate the number of years of construction experience and number of years of which they were in a supervisory capacity.

9. Identify all licenses (excluding driver's licenses, marriage licenses and fishing licenses) held by the respondent and the individuals to be assigned to the Project.

10. Have you ever failed to complete any work awarded to you?

11. Have you ever been declared in default of a contract?

12. List all litigation, arbitration or mediation proceedings to which you have been a party in the past five (5) years.

13. List all sub-trades which your firm customarily performs with own employees.

    1. _____

    2. _____

    3. _____

Trade References: Names, addresses and telephone numbers of three (3) firms with whom your organization has regular business dealings.

(Attach separate sheet)

"General Decision Number: MS20240046 01/05/2024

Superseded General Decision Number: MS20230046

State: Mississippi

Construction Type: Building
BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Counties: Attala, Bolivar, Carroll, Coahoma, Grenada, Holmes, Humphreys, Leflore, Montgomery, Panola, Quitman, Sunflower, Tallahatchie, Washington and Yalobusha Counties in Mississippi.

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $17.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2024.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $12.90 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2024.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.

Modification Number | Publication Date
0 | 01/05/2024

IRON0167-012 05/01/2022

	Rates	Fringes
IRONWORKER, STRUCTURAL	$ 30.00	16.28

PLUM0568-003 11/01/2023

	Rates	Fringes
PLUMBER	$ 29.41	11.37

SUMS2015-007 04/03/2017

	Rates	Fringes
CARPENTER	$ 18.11	1.69
CEMENT MASON/CONCRETE FINISHER	$ 20.00	0.00
ELECTRICIAN	$ 17.03 **	9.10
LABORER: Common or General	$ 10.00 **	0.00
LABORER: Mason Tender - Cement/Concrete	$ 12.98 **	0.00
LABORER: Pipelayer	$ 12.52 **	0.75
OPERATOR: Backhoe/Excavator/Trackhoe	$ 18.00	0.00
PAINTER (Brush and Roller)	$ 15.17 **	0.00
PIPEFITTER	$ 22.77	6.96
SHEET METAL WORKER, Includes HVAC Duct Installation	$ 21.86	11.18
TRUCK DRIVER: Dump Truck	$ 13.92 **	1.91

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 ($17.20) or 13658 ($12.90). Please see the Note at the top of the wage determination for more information. Please also note that the minimum wage requirements of Executive Order 14026 are not currently being enforced as to any contract or subcontract to which the states of Texas, Louisiana, or Mississippi, including their agencies, are a party.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours

they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the

wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION"

EMPLOYEE RIGHTS

UNDER THE DAVIS-BACON ACT

FOR LABORERS AND MECHANICS EMPLOYED ON FEDERAL OR FEDERALLY ASSISTED CONSTRUCTION PROJECTS

PREVAILING WAGES

You must be paid not less than the wage rate listed in the Davis-Bacon Wage Decision posted with this Notice for the work you perform.

OVERTIME

You must be paid not less than one and one-half times your basic rate of pay for all hours worked over 40 in a work week. There are few exceptions.

ENFORCEMENT

Contract payments can be withheld to ensure workers receive wages and overtime pay due, and liquidated damages may apply if overtime pay requirements are not met. Davis-Bacon contract clauses allow contract termination and debarment of contractors from future federal contracts for up to three years. A contractor who falsifies certified payroll records or induces wage kickbacks may be subject to civil or criminal prosecution, fines and/or imprisonment.

APPRENTICES

Apprentice rates apply only to apprentices properly registered under approved Federal or State apprenticeship programs.

PROPER PAY

If you do not receive proper pay, or require further information on the applicable wages, contact the Contracting Officer listed below:

or contact the U.S. Department of Labor's Wage and Hour Division.

WAGE AND HOUR DIVISION
UNITED STATES DEPARTMENT OF LABOR

1-866-487-9243
TTY: 1-877-889-5627
www.dol.gov/whd

WH1321 REV 10/17

SECTION 00 4500

NON-COLLUSION AFFIDAVIT

PART 1 - GENERAL

1.01 SUMMARY

A. The Non-Collusion Affidavit, attached at the end of this section, must be included with the Bid Form. Failure to submit an Affidavit with the Bid may result in disqualification of the Bid.

1.02 INSTRUCTIONS

A. This Non-Collusion Affidavit is material to any contract awarded pursuant to this bid.

B. This Non-Collusion Affidavit must be executed by either the member, officer, or employee of the bidder who makes the final decision on prices and the amount quoted in the bid.

C. Bid rigging and other efforts to restrain competition, and the making of false sworn statements in connection with the submission of bids are unlawful and may be subject to criminal prosecution. The person who signs the Affidavit should examine it carefully before signing and assure himself or herself that each statement is true and accurate, making diligent inquiry, as necessary, of all other persons employed by or associated with the bidder with responsibilities for the preparation, approval or submission of the bid.

D. In the case of a bid submitted by a joint venture, each party to the venture must be identified in the bid documents, and an affidavit must be submitted separately on behalf of each party.

E. The term “complementary bid” as used in the affidavit has the meaning commonly associated with that term in the bidding process, and includes the knowing submission of bids higher that the bid of another Fixed, an intentionally high or non-competitive bid, and any other form of bid submitted for the purpose of giving a false appearance of competition.

F. Failure to file an Affidavit in compliance with these instructions may result in disqualification of the bid.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION

SECTION 00 4501

NON-COLLUSION AFFIDAVIT (ATTACHMENT)

NON-COLLUSION AFFIDAVIT

Contract Requisition No. _____

State of: _____

County of: _____

I state that I am _____*(Title)*_____ of _____*(Name of Firm)*_____ and that I am authorized to make this AFFIDAVIT on behalf of my firm, and its owners, directors, and officers. I am the person responsible in my firm for the price(s) and the amount of this proposal.

I state the following to be true to the best of my knowledge:

1. The price(s) or any other monetary amounts shown in this bid proposal have been arrived at independently and without consultation, communication or agreement with any other contractor, bidder, or potential bidder to this bid proposal.
2. Neither the price(s) nor the amount of the bid proposal, and neither the approximate budgets nor approximate amounts in this bid proposal, have been disclosed to any other firm or person who is a bidder or potential bidder to this bid proposal, and they will not be disclosed before the proposal opening.
3. No attempt has been made or will be made to induce any firm or person to refrain from responding to this bid proposal, or to induce them to submit a budget that is higher than the budget in this bid proposal, or to submit any intentionally high or noncompetitive bid proposal or other form of non-responsive bid proposal.
4. The bid proposal and budget prepared by my firm is made in good faith and not pursuant to any agreement or discussion with, or inducement from, any firm or person to submit a complementary or other noncompetitive bid proposal.
5. _____*(Name of Firm)*_____ its affiliated, subsidiaries, officers, directors, and employees are not currently under investigation by any governmental agency and have not in the last four years been convicted or found liable for any act prohibited by State or Federal law in any jurisdiction, involving conspiracy or collusion with respect to bidding or proposing on any public contract, except as follows:

I state that _____*(Name of Firm)*_____ understands and acknowledges that the above representations are material and important, and will be relied on by (Name of Purchasing Agent) in awarding the contract(s) for which this proposal is submitted. I understand and my firm understands that any misstatement in this affidavit is and shall be treated as fraudulent concealment from the Purchasing Agent stated herein of the true facts relating to the submission of proposals for this contract.

_____ _____

(Signature) (Signatory's Printed Name)

_____

(Signatory's Title)

SWORN TO AND SUBSCRIBED

BEFORE ME THIS_____ DAY OF _____, 20_____

_____ My Commission Expires_____

(Notary Public)

END OF SECTION

INDEPENDENT CONTRACTOR DEBARMENT VERIFICATION FORM

(Please print clearly or type)

Contractor's Name	
Authorized Official's Name	
Complete Address	
Contact Number	
Are you currently registered with www.sam.gov ? (Yes or No)	
Are you currently registered to do business in the State of Mississippi? (Yes or No) If yes, attach supporting documentation of registration status. *If not, please register and provide documentation of registration status.* **(sole proprietor exempt)**	
All vendors authorized to do business with a State Agency must be registered in the MS Accountability Government Information and Collaboration (MAGIC), please provide supplier number.	

***Appropriate signatures shall certify statements below.*

FEDERAL DEBARMENT CERTIFICATION:

CONTRACTOR hereby certify that at the execution of a contract with the Mississippi Department of Education, CONTRACTOR is not on the list for federal debarment on www.sam.gov – System for Award Management.

STATE OF MISSISSIPPI REGISTRATION:

CONTRACTOR hereby certify that at the execution of a contract with the Mississippi Department of Education, CONTRACTOR is not on the list for debarment on www.sos.ms.gov for doing business with the State of Mississippi or with any Mississippi State Agency.

PARTNERSHIP DEBARMENT CERTIFICATION:

CONTRACTOR hereby certify that all entities who are in partnership through this contract or grant with the Mississippi Department of Education (MDE) (subcontractors, subrecipients, et al.) are not on the federal debarment list on www.sam.gov – System for Award Management or the State of Mississippi debarment list. Proof of documentation of partnership verification with SAM shall be kept on file and the debarment status shall be checked prior to submission of every contract/subgrant and modification to MDE.

_____ _____

Original Signature of Contractor or Authorized Official *Date*

SECTION 00 5000

AGREEMENT FORM

PART 1 - GENERAL

1.01 DESCRIPTION:

A. The American Institute of Architects (AIA) standard document entitled “AIA Document A101 – 2007 Standard Form of Agreement Between Owner and Contractor” where basis for payment will be stipulated sum will be used for this Contract.

B. A copy of this document is on file at IMS Engineers’ office. All Bidders shall read and understand the referenced document.

C. A copy can also be reviewed, and an original may be purchased from the AIA Bookstore + Design Center at www.aiabookstore.com under the AIA Documents tab.

PART 2 – PRODUCTS

2.01 NOT USED

PART 3 – EXECUTION

3.01 NOT USED

END OF SECTION

DRAFT

AIA® Document A101™ – 2017

Standard Form of Agreement Between Owner and Contractor

where the basis of payment is a Stipulated Sum

AGREEMENT made as of the « » day of « » in the year « »
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

Mississippi Achievement School District (Humphreys County School District)
Attn: Earl Watkins, Superintendent
401 4th Street
Belzoni, MS 39038
ewatkins@masd.k12.ms.us

and the Contractor:
(Name, legal status, address and other information)

for the following Project:
(Name, location and detailed description)

The Design Professional:
(Name, legal status, address and other information)

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

The parties should complete A101™–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201™–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

TABLE OF ARTICLES

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EXHIBIT A INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

§ 1.1 The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), all sections of the Project Manual, including Drawings, Specifications, and Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all as amended and all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

§ 1.2 To the extent any Contract Documents reference decisions or approvals to be made by the Design Professional, such references to the Design Professional shall be replaced with the "Owner" unless the Owner elects to retain an Design Professional and so advises Contractor in writing. This Agreement, as amended, represents the entire and integrated agreement between the Owner and the Contractor and supersedes all prior negotiations, representations or agreements, either written or oral. In the event of conflict, terms and conditions contained in the Agreement, as amended, shall take precedence over terms and conditions contained in the General Conditions, as amended, and the terms and conditions in the General Conditions, as amended, shall take precedence over all other terms and conditions contained in the other Contract Documents. In the event of any conflict between this Agreement, the Contractor's bid proposal, the drawings and/or specifications, the more stringent, costly, strict and/or beneficial to the Owner shall control.

§ 1.3 Owner is a Mississippi Achievement School District. Owner's current superintendent (or his successor) is the individual authorized to sign documents on behalf of Owner and the only representative of the Owner having the power and authority to enter into or amend this Agreement, to approve and execute a Change Order or Construction Change Directive modifying the Contract Sum, or to agree to an extension to the date of Substantial or Final Completion.

ARTICLE 2 THE WORK OF THIS CONTRACT

§ 2.1 The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

§ 2.2 Contractor shall, at its own expense as part of the Contract Sum, secure all licenses, furnish all labor, material, plant, office space, tools, equipment, machinery, scaffolding, cartage, electric current for power purposes and provide all other things and personnel necessary for the full and diligent prosecution of the Work, all in compliance with applicable statutes, building codes, ordinances and regulations and in a first class workmanlike

manner in strict accordance with the requirements of the Project as well as to the reasonable satisfaction of the Owner. Contractor shall be responsible for supervision, coordination of its sub-trades, and for the performance of all actions reasonably required to complete the Work even if not specifically shown in the plans and specifications but can be reasonably inferred.

§ 2.3 The Contractor is required to furnish a payment and performance bond. Such bonds shall be executed by it with a fidelity or surety company authorized to transact business in Mississippi in form and amount satisfactory to the Owner. The Performance Bond shall guarantee the faithful performance of all contract obligations of this Contract. The Payment Bond shall comply with the requirements of Mississippi regarding unconditional payment bonds and assure the prompt payment of all claims of lienors and laborers. The cost of the bond shall be included within the Contract Sum.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be the date of this Agreement unless a different date is stated below or provision is made for the date to be fixed in a Notice to Proceed issued by the Owner.

§ 3.2 The Contract Time shall be measured from the date of commencement.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

[« X »] Not later than « » (« ») calendar days from the date of commencement of the Work.

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be « » ( ). To the extent the Cost of the Work exceeds the Contract Sum, the Contractor shall bear such costs in excess of the Contract Sum without reimbursement or additional compensation from the Owner.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.4 Unit prices, if any:

(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

«$1,500.00 per day »

§ 4.5.1 Time is of the essence and a material consideration of the Contract. The Contractor acknowledges and recognizes that the Owner is entitled to full and beneficial occupancy and use of the completed Work following expiration of the Contract Time. The Contractor further acknowledges and agrees that if the Contractor fails to complete substantially or cause the Substantial Completion of any portion of the Work in either of the specified phases within the Contract Time, the Owner will sustain extensive damages and serious loss as a result of such failure. The exact amount of such damages will be extremely difficult to ascertain. Therefore, the Owner and the Contractor agree to liquidated damages as set forth below in this Paragraph 4.5. The term substantial completion is as defined in Article 9.8.1 of the General Conditions.

§ 4.5.2 Subject to the requirements of Article 8.3 of the General Conditions, if the Contractor fails to achieve Substantial Completion of the Work within the Contract Time, the Owner shall be entitled to retain or recover from the Contractor, as liquidated damages and not as a penalty, the per diem amount of set forth in Section 4.5 beginning the first day following expiration of the Contract Time and continuing until the actual Date of Substantial Completion.

§ 4.5.3 These Liquidated Damages are agreed to be a good faith and reasonable pre-estimate of the Owner's actual damages and are not considered to be a penalty. Contractor and Owner hereby acknowledge and agree that Owner's right to Liquidated Damages hereunder is not intended to be exclusive of any other right, power, or remedy of Owner hereunder or under any other Contract Documents for other defaults by Contractor (i.e., defaults not arising under this Subsection 4.5), but each and every such right, power and remedy shall be cumulative and concurrent and shall be in addition to the right to Liquidated Damages provided for in this Paragraph 4.5.

§ 4.5.4 The Owner may deduct liquidated damages described in this Paragraph 4.5 from any unpaid amounts then or thereafter due the Contractor under this Agreement. 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, together with interest from the date of the demand at a rate equal to the highest lawful rate of interest payable by the Contractor.

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Design Professional by the Contractor and Certificates for Payment issued by the Design Professional, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month.

§ 5.1.3 Provided that an Application for Payment is received by the Design Professional not later than the last day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the last day of the following month. If an Application for Payment is received by the Design Professional after the application date fixed above, payment of the amount certified shall be made by the Owner not later than «forty five» («45») days after the Design Professional receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Design Professional may require. This schedule, unless objected to by the Design Professional, shall be used as a basis for reviewing the Contractor's Application for payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

.1 That portion of the Contract Sum properly allocable to completed Work;

.2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and

.3 That portion of Construction Change Directives that the Design Professional determines, in the Design Professional's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Owner or Design Professional has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Owner or Design Professional may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and

.5 Retainage withheld pursuant to Section 5.1.7.

.6 If Owner is entitled to deduct liquidated damages, or any other damages or amounts provided in the Contract Documents, including clean-up fees, then Owner shall be entitled to deduct such liquidated damages, amounts and fees at any time.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

« 5% »

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

« N/A »

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

« The Owner will retain five percent (5%) of the amount due to Contractor on account of progress payments until the work is at least fifty percent (50%) complete, on schedule, and satisfactory in the Design Professional's opinion, at which time the Owner may in its discretion release fifty percent (50%) of the retainage held to date for distribution to the appropriate subcontractors and suppliers, provided that future retainage shall be withheld at the rate of two and one-half percent (2 ½ %). » »

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment

pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Substantial Completion.)

« »

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum minus disputed sums, authorized deductions and liquidated damages, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 the Contractor has provided all documents required by Sections 3.5 et seq. and 9.10.2 of the General Conditions; and

.3 a final Certificate for Payment has been issued by the Design Professional and approved by the Owner.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 45 days after the issuance of the Design Professional's final Certificate for Payment and Owner's School Board vote.

§ 5.3 Payment Procedures

§ 5.3.1. Subject to the provisions of Article 9 of the General Conditions, the following payment procedures shall also apply to both progress and final payments.

1. At the time of the submission of an Application for Payment the Contractor shall furnish to the Contractor: (1) a certification of work performed on a form approved by the Owner; (2) waivers of lien for all work done by Contractor, all lienors giving notice and any such other persons, firms or corporations performing work in accordance with the Contract Documents to the date of the application for payment; and (3) evidence of payment to all laborers working directly or indirectly for the Contractor through the date of the application for payment. The Owner shall have the right at any time and in its sole discretion to make payments directly to laborers and/or material men and/or sub-contractors of the Contractor, or to make any such payments jointly to such payees and the Contractor.

2. Payments made to the Contractor are received by it in trust to be applied first to the amount owing to any person who has performed labor or furnished materials to the Contractor for the performance and work under this agreement and before the Contractor shall use any monies received for any other purposes.

3. Partial or final payment will not be payable or due at the option of the Owner in the event that any of the following conditions exist: (1) Defective or damaged work is not remedied by Contractor; (2) Claims have been filed by laborers, material men and/or subcontractors under this agreement; (3) Contractor fails to make the proper application for payment or fails to comply with Mississippi's lien law; (4) Contractor becomes bankrupt or insolvent; (5) This agreement or any other agreement between Owner and Contractor is in breach; and (6) Any insurance required of Contractor ceases to be effective and in force.

4. Acceptance of final payment by Contractor operates as a release to the Owner of all claims and liability to the Contractor for all construction work performed by Contractor.

§ 5.3.2 The compensation payable to the Contractor hereunder shall not be increased because of the imposition of any taxes, or of increases in the price of any labor, material or services.

§ 5.3.3 No payment made hereunder shall operate as an admission on the part of the Owner that this Agreement, or any part thereof has been complied with, or preclude any action for damages against the Contractor should this Agreement not be faithfully executed in every respect or should the Work furnished and installed by the Contractor not meet with the approval of the Owner

§ 5.4 Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate applicable under Mississippi law.

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

Any claim, dispute, or other matter in question arising out of or related to this Agreement, if not resolved within 14 days following the notice of claim through discussions among the parties' officers having authority to resolve the claim, dispute, or other matter, shall be subject to mediation as a condition precedent to litigation. The parties shall work in good faith to select and agree upon a mediator within thirty (30) days after a demand for mediation is made by either party. If the parties cannot agreement upon a mediator, then each party shall designate their preferred mediator as a representative. Each party's mediator representative shall then select a mediator that will conduct the mediation between the parties. If such matter relates to or is the subject of a lien arising out of the Contractor's services, the Contractor may proceed in accordance with applicable law to comply with the lien notice or filing deadlines prior to resolution of the matter by mediation or litigation. The Design Professional will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201+2017, unless the parties appoint below another individual, not a party to the Agreement, to serve as the Initial Decision Maker.

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017 or this Agreement, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[«X»] Litigation in a court of competent jurisdiction solely and exclusively in Humphreys County, Mississippi.

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

The Parties agree that a condition precedent to any binding dispute resolution that they will attempt Mediation with a mutually agreed Mediator. The obligation to mediate shall be satisfied if the parties cannot agree on a Mediator or the date of Mediation within thirty days of the notice of a claim and a request for mediation.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner for cause or for convenience after ten (10) calendars days' written notice to Contractor. Further, Owner or the Contractor may terminate this Agreement as provided in Article 14 of AIA Document A201–2017.

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

Mississippi Achievement School District (Humphreys County School District)
Attn: Dr. Earl Watkins, Superintendent
401 4th Street
Belzoni, MS 39038
(662) 247-6000
ewatkins@masd.k12.ms.us

§ 8.3 The Contractor's representative:

(Name, address, email address, and other information)

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

§ 8.7 Other provisions:

§ 8.7.1 The Agreement shall be governed by the laws of the State of Mississippi, and the mandatory and exclusive venue of any and all litigation shall be in Humphreys County, Mississippi.

§ 8.7.2 As a material consideration of the making of this Agreement, the modifications to this Agreement shall not be construed against the maker of said modifications.

§ 8.7.3 Notwithstanding anything to the contrary in this Agreement, or in any document forming a part hereof, there shall be no mandatory arbitration for any dispute arising hereunder.

§ 8.7.4 Article 1 of the General Conditions shall govern Contractor's use of the Construction Documents.

§ 8.7.5 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors. As part of that responsibility, Contractor shall enforce the Owner's alcohol-free, drug-free, tobacco-free, harassment-free and weapon-free policies and zones, which will require compliance with those policies and zones by Contractor's employees, subcontractors, and all other persons carrying out the Contract. Further, Contractor shall use commercially reasonable efforts to perform background checks on all Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors and for which will be present at the jobsite for the Project.

§ 8.7.6 Contractor shall require all construction workers, whether Contractor's own forces or the forces of Contractor's subcontractors, to wear identification tags on the front of their persons during all times that they are on Owner's property. Such identification tags shall contain a current photograph and the worker's full name in a typeface large enough to be seen from a reasonable distance.

§ 8.7.7 Contractor shall require all construction workers, whether Contractor's own forces or the forces of

Contractor's subcontractors, to park their personal motor vehicles on Owner's property only in the parking places designated by the Owner's campus principal. Any vehicles not parked in the appropriate locations shall be towed at the vehicle owner's sole expense.

§ 8.7.8 Contractor shall follow, and shall require all employees, agents or subcontractors to follow applicable ordinances of the municipality in which the Project is located.

§ 8.7.9 Contractor shall institute a theft deterrence program designed to restrict construction worker access to properties of Owner that are currently in use, to maintain supervision of Contractor's and Contractor's subcontractor's forces, and to reimburse the Owner or those persons suffering a theft loss which results from Contractor's forces or Contractor's subcontractor's forces' actions, omissions, or failure to secure the Work or adjoining property.

§ 8.7.10 The Contractor may not assign its responsibilities, duties, obligations and rights under this Agreement, without the express written consent of the Owner. This does not prevent Contractor from engaging subcontractors to perform various phases of the Project, but Contractor shall be fully responsible to Owner for the work, actions and omissions of all such subcontractors.

§ 8.7.11 This Agreement, in its entirety, shall be binding upon all the parties hereto, their respective successors, heirs, executors, administrators or assigns.

§ 8.7.12 Execution of this Agreement shall constitute approval and acceptance of all terms, covenants and conditions as modified and contained in the Contract Documents.

§ 8.7.13 This Agreement is subject to all applicable federal and state laws, rules, and regulations. Invalidity of any portion of this Agreement under the laws of the State of Mississippi or of the United States shall not affect the validity of the remainder of this Agreement.

§ 8.7.14 By signing this Agreement, Contractor represents and warrants the following to the Owner (in addition to any other representations and warranties contained in the Contract Documents), as a material inducement to the Owner to execute this Agreement, which representations and warranties shall survive the execution and delivery of this Agreement, any termination of this Agreement, and the final completion of the Work

.1 The Contractor is authorized to do business in Mississippi under Mississippi Code §31-3-1 et seq. and is otherwise properly licensed by all necessary governmental and public and quasi-public authorities having jurisdiction over the Contractor and over the Work and the Project.

.2 Contractor is financially solvent, able to pay all debts as they mature, and possessed of sufficient working capital to complete the Work and perform all obligations hereunder and that it has no reasonable belief that any of its subcontractors are not are financially solvent, able to pay all debts as they mature, and possessed of sufficient working capital to complete their respective portion of the Work.

.3 The Contractor is able to furnish the plant, tools, materials, supplies, equipment, and labor required to complete the Work and perform its obligations hereunder and has sufficient experience and competence to do so.

.4 The Contractor’s execution of this Agreement and performance thereof is within the Contractor’s duly authorized powers.

.5 The Contractor’s duly authorized representative has visited the site of the Project, is familiar with the local conditions under which the Work is to be performed, and has correlated observations with the requirements of the Contract Documents.

.6 The Contractor possesses a high level of experience and expertise in the business administration,

construction, construction management, and superintendence of projects of the size, complexity, and nature of this particular Project and will perform the Work with the care, skill, and diligence of such a contractor.

.7 The Contractor will, as it relates to its employees, contractors, subcontractors, and consultants comply with all e-verify requirements set forth at Mississippi Code Section 71-11-1 et. seq.

§ 8.7.15 No delay or omission by Owner in exercising any right or power accruing upon the noncompliance or failure of performance by Contractor of any of the provisions of this Agreement shall impair any such right or power or be construed to be a waiver thereof. A waiver by Owner of any of the covenants, conditions or agreements hereof to be performed by Contractor shall not be construed to be a waiver of any subsequent breach thereof or of any other covenant, condition or agreement herein contained.

§ 8.7.16 Contractor stipulates that Owner is a political subdivision of the State of Mississippi, and as such, enjoys immunities from suit and liability as provided by the Constitution and laws of the State of Mississippi. By entering into this Agreement, Owner does not waive any of its immunities from suit and/or liability, except as otherwise specifically provided herein and as specifically authorized by law.

§ 8.7.17 If the State Auditor or any other governmental agency having supervisory authority over the Owner determines that the Work under this Contract should have been procured through Mississippi's public bid procedures, then Contractor hereby waives any and all claims arising from or related to Owner's failure to procure the Work through such process. However, should the contract be found to be void, Owner agrees to pay for Work performed up through termination of the Contract.

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction

.4 n/a

.5 Drawings:

Number	Title	Date

.6 Specifications:

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[« »] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

« »

[« »] The Sustainability Plan:

Title	Date	Pages

[« »] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

« »

This Agreement entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
«Dr. Earl Watkins»«, Superintendent»	« , »
(Printed name and title)	*(Printed name and title)*

SECTION 00 6000
CONTRACT BONDS

PART 1 - GENERAL

1.01 DESCRIPTION:

A. The American Institute of Architects (AIA) standard document entitled “AIA Document A312 – 2010 Performance Bond” will be used for this Contract.

B. The American Institute of Architects (AIA) standard document entitled “AIA Document A312 – 2010 Payment Bond” will be used for this Contract.

C. The American Institute of Architects (AIA) standard document entitled "AIA Document A313-2020 Warranty Bond" will be used for this Contract.

D. Draft copies can be reviewed, and originals may be purchased from the AIA Bookstore + Design Center at www.aiabookstore.com under the AIA Documents tab.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION

AIA® Document A101™ – 2017 Exhibit A

Insurance and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the « » day of « » in the year « »
(In words, indicate day, month and year.)

for the following **PROJECT**:
(Name and location or address)

THE OWNER:
(Name, legal status and address)

Mississippi Achievement School District (Humphreys County School District)
Attn: Earl Watkins, Superintendent
401 4th Street
Belzoni, MS 39038
ewatkins@masd.k12.ms.us

THE CONTRACTOR:
(Name, legal status and address)

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Document A201™–2017, General Conditions of the Contract for Construction. Article 11 of A201™–2017 contains additional insurance provisions.

TABLE OF ARTICLES

A.1 GENERAL

A.2 OWNER'S INSURANCE

A.3 CONTRACTOR'S INSURANCE AND BONDS

A.4 SPECIAL TERMS AND CONDITIONS

ARTICLE A.1 GENERAL

The Owner and Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term General Conditions refers to AIA Document A201™–2017, General Conditions of the Contract for Construction.

ARTICLE A.2 OWNER'S INSURANCE

§ A.2.1 General

Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Article A.2 and, upon the Contractor's

request, provide a copy of the property insurance policy or policies required by Section A.2.3. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

§ A.2.2 Liability Insurance
The Owner shall be responsible for purchasing and maintaining the Owner's usual general liability insurance.

§ A.2.3 Required Property Insurance
§ A.2.3.1 Unless this obligation is placed on the Contractor pursuant to Section A.3.3.2.1, the Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.

§ A.2.3.1.1 Causes of Loss. The insurance required by this Section A.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire, explosion, theft, vandalism, malicious mischief, collapse, earthquake, flood, or windstorm. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, design, specifications, workmanship, or materials. Sub-limits, if any, are as follows:
(Indicate below the cause of loss and any applicable sub-limit.)

Causes of Loss	Sub-Limit
N/A	

§ A.2.3.1.2 Specific Required Coverages. The insurance required by this Section A.2.3.1 shall provide coverage for loss or damage to falsework and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and reasonable compensation for the Architect's and Contractor's services and expenses required as a result of such insured loss, including claim preparation expenses. Sub-limits, if any, are as follows:
(Indicate below type of coverage and any applicable sub-limit for specific required coverages.)

Coverage	Sub-Limit
N/A	

§ A.2.3.1.3 Unless the parties agree otherwise, upon Substantial Completion, the Owner shall continue the insurance required by Section A.2.3.1 or, if necessary, replace the insurance policy required under Section A.2.3.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 12.2.2 of the General Conditions.

§ A.2.3.1.4 Deductibles and Self-Insured Retentions. If the insurance required by this Section A.2.3 is subject to deductibles or self-insured retentions, the Owner shall be responsible for all loss not covered because of such deductibles or retentions.

§ A.2.3.2 Occupancy or Use Prior to Substantial Completion. The Owner's occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.2.3.1 have consented in writing to the continuance of coverage. The Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

§ A.2.3.3 Insurance for Existing Structures
If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 12.2.2 of

the General Conditions, "all-risks" property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage from the causes of loss identified in Section A.2.3.1, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties.

§ A.2.4 Intentionally Deleted

§ A.2.5 Intentionally Deleted

ARTICLE A.3 CONTRACTOR'S INSURANCE AND BONDS

§ A.3.1 General

§ A.3.1.1 Certificates of Insurance. The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section A.3.2.1 and Section A.3.3.1. The certificates will show the Owner as an additional insured on the Contractor's Commercial General Liability and excess or umbrella liability policy or policies.

§ A.3.1.2 Deductibles and Self-Insured Retentions. The Contractor shall disclose to the Owner any deductible or self-insured retentions applicable to any insurance required to be provided by the Contractor.

§ A.3.1.3 Additional Insured Obligations. To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage to include (1) the Owner, the Architect, and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, CG 20 32 07 04.

§ A.3.2 Contractor's Required Insurance Coverage

§ A.3.2.1 The Contractor shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain insurance for a duration other than the expiration of the period for correction of Work, state the duration.)

« »

§ A.3.2.2 Commercial General Liability

§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than « one million dollars » ($ « 1,000,000 ») each occurrence, « two million dollars » ($ « 2,000,000 ») general aggregate, and « two million dollars » ($ « 2,000,000 ») aggregate for products-completed operations hazard, providing coverage for claims including

- **.1** damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;
- **.2** personal injury and advertising injury;
- **.3** damages because of physical damage to or destruction of tangible property, including the loss of use of such property;
- **.4** bodily injury or property damage arising out of completed operations; and
- **.5** the Contractor's indemnity obligations under Section 3.18 of the General Conditions.

§ A.3.2.2.2 The Contractor's Commercial General Liability policy under this Section A.3.2.2 shall not contain an exclusion or restriction of coverage for the following:

- **.1** Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.
- **.2** Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.
- **.3** Claims for bodily injury other than to employees of the insured.
- **.4** Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured.
- **.5** Claims or loss excluded under a prior work endorsement or other similar exclusionary language.
- **.6** Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.
- **.7** Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.
- **.8** Claims related to roofing, if the Work involves roofing.
- **.9** Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.
- **.10** Claims related to earth subsidence or movement, where the Work involves such hazards.
- **.11** Claims related to explosion, collapse and underground hazards, where the Work involves such hazards.

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than « one million dollars » ($ « 1,000,000 ») per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

§ A.3.2.4 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ A.3.2.5 Workers' Compensation at statutory limits.

§ A.3.2.6 Employers' Liability with policy limits not less than « one million dollars » ($ « 1,000,000 ») each accident, « one million dollars » ($ « 1,000,000 ») each employee, and « one million dollars » ($ « 1,000,000 ») policy limit.

§ A.3.2.7 Jones Act, and the Longshore & Harbor Workers' Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and docks

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than « one million dollars » ($ « 1,000,000 ») per claim and « one million dollars » ($ « 1,000,000 ») in the aggregate.

§ A.3.2.9 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than « one million dollars » ($ « 1,000,000 ») per claim and « one million dollars » ($ « 1,000,000 ») in the aggregate.

§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than « one million dollars » ($ « 1,000,000 ») per claim and « one million dollars » ($ « 1,000,000 ») in the aggregate.

§ A.3.2.11 Insurance for maritime liability risks associated with the operation of a vessel is not required.

§ A.3.2.12 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than « one million dollars » ($ « 1,000,000 ») per claim and « one million dollars » ($ « 1,000,000 ») in the aggregate.

§ A.3.3 Contractor's Other Insurance Coverage

§ A.3.3.1 Insurance selected and described in this Section A.3.3 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance through Final Completion until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions.

§ A.3.3.2 The Contractor shall purchase and maintain the following types and limits of insurance in accordance with Section A.3.3.1.
(Select the types of insurance the Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)

[« X »] **§ A.3.3.2.1** Property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3. The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions.

§ A.3.4 Performance Bond and Payment Bond

The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, as follows:
(Specify type and penal sum of bonds.)

Type	Penal Sum ($0.00)
Payment Bond (A312 Form)	100% of the Contract Sum
Performance Bond (A312 Form)	100% of the Contract Sum
Warranty Bond (A313 Form)	1 year from Substantial Completion

Payment and Performance Bonds shall be AIA Document A312™, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312™, current as of the date of this Agreement and ensure that, among other requirements, Owner is entitled to recovery of legal, design and delay costs resulting from default thereunder. Contractor shall also provide a Warranty Bond on an A313 standard form without revisions.

ARTICLE A.4 SPECIAL TERMS AND CONDITIONS

Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:

« Not applicable »

SECTION 00 6020

NOTICE OF LIEN WAIVER

PART 1 - GENERAL

1.01 DESCRIPTION:

A. The standard form of Bid Bond published by the American Institute of Architects (AIA) entitled “AIA Document G706A – 1994 Contractor’s Affidavit of Release of Liens”, or a Surety’s standard form containing substantially the same provisions shall be used.

B. A Draft form of the above said document(s) has been attached at the end of this section for reference and review. A draft copy can also be reviewed, and an original may be purchased from the AIA Bookstore + Design Center at www.aiabookstore.com under the AIA Documents tab.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION

SECTION 00 6500

INSURANCE AND BOND CHECK LIST

PART 1 - GENERAL

Upon possible acceptance of a bid by the Owner, a completed Contract as called for in Section 00500 will be delivered to the successful Contractor. The following insurance certificates and bonds must be completed and returned with the signed copies of the Contract, within seven (7) days, in order to be considered for execution. This completed checklist must be attached to your company transmittal and returned with the contracts with all the check boxes completed certifying that the required insurance certificates and bonds are complete and included. Include contact information from Bonding Company completing the checklist. The attached Standard Construction Contract Certificate of Insurance must be filled out according to the attached instructions and included with the submission of this checklist.

Contract Bonds in accordance with Specification Section 00600. Number of originals needed (3).

Name and Phone Number of Agency Contact:

_____

Certificate of Commercial General Liability (CGL) policy in accordance with Article 11.1 of the General Conditions with Owner and Design Professional named as additional insured under CGL. Number of originals needed (3).

Name and Phone Number of Agency Contact:

_____

Certificate of Business Auto and Umbrella Insurance in accordance with 11.2.1 of the General Conditions. Number of originals needed (3).

Name and Phone Number of Agency Contact:

_____

Certificate of Workers Compensation Insurance in accordance with Articles 11.5 through 11.7.3 of the General Conditions. Number of originals needed (3).

Name and Phone Number of Agency Contact:

_____

Contact Information of individual completing checklist:

_____

(Name)

_____

(Company)

_____

(Phone and Fax Number)

END OF SECTION

SECTION 00 7000
GENERAL CONDITIONS

PART 1 - GENERAL

1.01 DESCRIPTION:

A. The General Conditions of the Contract for Construction, AIA Document A201 (15th Edition) dated 1997 of the American Institute of Architects as revised at Section 00800, if not bound in this volume are incorporated by reference as though fully written herein.

B. Contractors are required to be familiar with this document.

C. A draft copy may be examined at the office of the Design Professional or Engineer.

D. Draft copies of these documents are attached for reference and review. Draft copies can also be reviewed, and originals may be purchased from the AIA Bookstore + Design Center at www.aiabookstore.com under the AIA Documents tab.

E. All persons intending to provide goods or services in connection with this work are required to read and understand the referenced document prior to proceeding.

F. See Section 00800 - Supplementary Conditions. In the event of a conflict between the General Conditions of the Contract for Construction, AIA Document A201 (15th Edition) and Section 00800, Section 00800 shall control even if the conflicting provision in the General Conditions of the Contract for Construction, AIA Document A201 (15th Edition) is not expressly deleted or revised by reference in Section 00800.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION

SECTION 00 8000

SUPPLEMENTARY CONDITIONS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The following Supplementary Conditions modify the General Conditions of the Contract for Construction AIA Document A201, 15th Edition (1997). In the event of a conflict between the General Conditions of the Contract for Construction, AIA Document A201 (15thEd.) and Section 008000, Section 008000 shall control even if the conflicting provision in the General Conditions of the Contract for Construction, AIA Document A201 (15th Ed.) is not expressly deleted or revised by reference in Section 008000.

B. The General Conditions may also be supplemented or amplified elsewhere in the Contract Documents by provisions located in, but not necessarily limited to, Division 1 of the specifications.

1.02 SUPPLEMENTS & MODIFICATIONS

A. Article 1 - General Provisions:
   1. Delete the last sentence in Article 1.1.1 and add the following:
      a. The Contract Documents shall include the Instructions to Bidders, plans, the Project Manual, including Division O and the specifications, Divisions 1 through 16, all Addenda and modifications to the plans and/or specifications, the Agreement between Owner and Contractor, the performance and payment bonds, the notice to proceed and any executed change orders. Information and documentation pertaining to soil investigation data, laboratory investigations, soil borings and related information included herein are part of the Contract Documents. In the event of a conflict between the provisions of Division 0 and any other section of the Contract Documents, such other sections(s) shall govern.
   2. Add the following to the end of Article 1.2.1:
      a. Large-scale drawings shall govern over small-scale drawings where there are differences or conflicts between such drawings. Where the word "similar" appears on the plans, it shall not be interpreted to mean "identical" and shall require the Contractor to coordinate the actual conditions and dimensions of the location where the "similar" conditions are shown to occur.

B. Article 2 - Owner:
   1. Delete Article 2.1, including Articles 2.1.1 and 2.1.2, entirely and insert in lieu thereof the following:
      a. 2.1 The Owner is as indicated on the Advertisement for Bids.
   2. Delete Article 2.2, including Articles 2.2.1 to 2.2.5, entirely and insert in lieu thereof the following:
      a. 2.2 The Contractor will be furnished, free of charge, such copies of the plans and specifications as are reasonably necessary for execution of the Work. Contractor must request the total number of sets required from the Design Professional or Engineer in writing at the beginning of construction of the project. Any additional copies requested will be provided to the Contractor by the Design Professional or Engineer at the cost of reproduction.
   3. Change Article 2.3.1 to read as follows:
      a. Modify Article 2.3.1 by deleting the word "persistently" adding the following language after the words “carry out work in accordance with the "Contract Documents" and before the words “the Owner may issue a written order:
         1) or fails to perform any of its obligations under the Contract Documents,
      b. Add a new sentence at the end of Article 2.3.1, as follows:
         1) The rights and remedies under this Article 2.3.1 are in addition to and do not in any respect limit any other rights of the Owner, including its termination rights under Article 14.
   4. Change Article 2.4 to read as follows:

a. Modify Article 2.4.1 by deleting the first and second sentences and by adding the following language:
    1) If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails, within a 7-day period, after receipt of written notice from the Owner, to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies.

C. Article 3 - Contractor:
1. Add the following at the end of Article 3.1.1.
    a. The relationship of Contractor to Owner shall be that of an independent Contractor, and nothing in the Contract Documents is intended to nor should be construed as creating any other relationship, expressed or implied, between Owner and Contractor.
2. Add the following at the end of Article 3.2.3:
    a. In no event shall the Owner be liable to the Contractor for alleged errors, omissions, inconsistencies, defects, or inadequacies in the Contract Documents to any greater extent than the Design Professional or Engineer is liable to the Owner for same, and the limit of the Owner's liability to the Contractor shall not exceed the amount actually recovered by the Owner from the Architect.
3. Add the following Article 3.4.4 as modified in article 3.4.2:
    a. Where "or equal" substitution is allowed by the technical specifications, the request for the substitution of materials, products or equipment in place of those specified will only be considered if made in strict accordance with all requirements of Section 01631 Substitutions.
4. Delete Article 3.7.1 and insert in lieu thereof the following:
    a. The Contractor shall secure and pay for the building permit and all other permits, fees, licenses, inspections and all other approvals and charges necessary for proper execution and completion of the Work.
5. Delete Article 3.7.3 and insert in lieu thereof the following:
    a. At no additional cost to the Owner, the Contractor shall comply with all laws, statutes, ordinances, building codes, safety requirements, rules and regulations of whatever nature that apply to the project, whether enacted or adopted before or after bid opening. If the Contractor observes that portions of the Contract Documents are at variance therewith, the Contractor shall promptly notify the Design Professional or Engineer and Owner in writing, and necessary changes shall be accomplished by appropriate modification.
6. Delete from Article 3.7.4 the words “knowing it to be”.
7. Add the following at the end of Article 3.9.1:
    a. The Contractor shall also employ a competent project manager who shall be primarily responsible for the Contractor's home office activities in connection with the Contract.
    b. The Owner shall have the right, which shall be exercised in a reasonable fashion, to approve the project manager and/or superintendent employed by the Contractor, either before or during the progress of construction.
    c. The superintendent and project manager for the project shall be designated by the Contractor at the pre-construction conference. After Owner's approval of such project manager and superintendent, they shall not be replaced by the Contractor without the Owner's prior written consent, which consent is required unless the Contractor submits proof satisfactory to the Owner that the superintendent and/or the project manager should be terminated by the Contractor for cause.

D. Article 4 - Administration of the Contract:
1. Time Extension for Weather: Conditions to Satisfy:
    a. This provision specifies the procedure for determination of time extensions for unusually severe weather. In order for the Owner and Design Professional or Engineer to award a time extension under this clause, the following conditions must be satisfied:

1) The weather experienced at the project site during the contract period must be found to be unusually severe, that is, more severe than the adverse weather anticipated for the project location during any given month.
2) The unusually severe weather must actually cause a delay to the completion of the project. The delay must be beyond the control and without the fault or negligence of the contractor.

b. The following schedule of monthly anticipated adverse weather delays is based on National Oceanic and Atmospheric Administration (NOAA) or similar data for the project location and will constitute the base line for monthly weather time evaluations. The contractor's activity durations provided for inclusion in the progress schedule must reflect these anticipated adverse weather delays in all weather dependent activities.

MONTHLY ANTICIPATED ADVERSE WEATHER DELAY WORK DAYS BASED ON FIVE (5) DAY WORK WEEK

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
(6)	(6)	(5)	(5)	(5)	(5)	(5)	(7)	(4)	(4)	(4)	(7)

c. Upon acknowledgement of the Notice to Proceed (NTP) and continuing throughout the contract, the Contractor shall record on the daily report, the occurrence of adverse weather and resultant impact to normally scheduled work. Actual adverse weather delay days must prevent work on the overall project's critical activities for 50 percent or more of the contractor’s scheduled work day. The number of actual adverse weather days shall include days impacted by actual adverse weather (even if adverse weather occurred in previous month), be calculated chronologically from the first to the last day of each month, and be recorded as full days. If the number of actual adverse weather delay days exceeds the number of days anticipated in paragraph B, above, the Owner and the Design Professional or Engineer will convert any qualifying delays to calendar days, giving full consideration for equivalent fair weather work days, and issue a modification in accordance with the contract.

2. Article 4.4.1 - Delete references to mediation and arbitration.
3. Add to the end of Article 4.4.4 as follows:
   a. " Within 30 days”.
4. Article 4.5 - Delete Article 4.5, including Articles 4.5.1 through 4.5.3, entirely and insert in lieu thereof the following:
   a. 4.5 Wherever "mediation" is referenced in these General Conditions, the word is hereby deleted and replaced by the word "litigation".
5. Article 4.6 - Delete Article 4.6, including Articles 4.6.1 to 4.6.6 entirely and insert in lieu thereof the following:
   a. 4.6 Wherever “arbitration” is referenced in these General Conditions, the word is hereby deleted and replaced with the word “litigation”.

E. Article 5 - Subcontractor:
   1. Delete Article 5.2.3 in its entirety and insert in lieu thereof the following:
      a. The Contractor shall make no substitution for any subcontractor, supplier, person, or entity previously listed by Contractor on its bid without written consent of the Owner. The Contractor's unauthorized substitution of any subcontractor, supplier, person or entity previously listed by Contractor in its bid shall entitle Owner to reject the work of such subcontractor and/or the materials, product or equipment furnished by such supplier as nonconforming and to require removal and replacement at no additional cost to the Owner.

F. Article 6 - Construction by Owner or by Separate Contractors:
   1. Delete Articles 6.1, including Articles 6.1.1 to 6.1.4, and 6.2, including Articles to 6.2.5, entirely and insert in lieu thereof the following:
      a. 6.1 Owner's Right to Perform Construction and to Award Separate Contracts. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces and to award separate Contracts either in connection with other portions of the Project or other construction or operations on the site. In

such event, the Contractor shall coordinate its activities with those of the Owner and of other Contractors so as to facilitate the general progress of all work being performed by all parties. Cooperation will be required in the arrangement for the storage of materials, and in the detailed execution of the work.

b. The Contractor, including his subcontractors, shall keep informed of the progress and the detailed work of other Contractors and shall immediately notify the Design Professional or Engineer of lack of progress or delays by other Contractors which are affecting Contractor's Work. Failure of Contractor to keep informed of the progress of the work of other Contractors and/or failure of Contractor to give notice of lack of progress or delays by other Contractors shall be deemed to be acceptance by Contractor of the status of progress by other Contractors for the proper coordination and completion of Contractor's Work. If, through acts or neglect on the part of the Contractor, any other Contractor or subcontractor shall suffer loss or damage or assert any claims of whatever nature against the Owner, the Contractor shall defend, indemnify and hold harmless the Owner from any such claims or alleged damages, and the Contractor shall resolve such alleged damages or claims directly with the other Contractors or Subcontractors.

G. Article 7 - Changes in the Work:
   1. Add the following Article 7.2.3:
      a. In order to facilitate consideration of change order requests, all such requests, except those so minor that their propriety can be seen by inspection, must be accompanied by a complete itemization of costs including labor, materials and Subcontracts which shall be itemized also. In no case will a change involving over $500.00 be approved without such itemization.
   2. Revise Article 7.3.4 to add the phrase "and the Owner" following the words "advise the Architect."
   3. In the first sentence of Paragraph 7.3.6, delete the words "a reasonable allowance for overhead and profit" and substitute "an allowance for overhead and profit in accordance with the schedule set forth in Subparagraph 7.3.6.6 below."
   4. Add the following Article 7.3.6.6:
      a. 7.3.6.6: In subparagraph above, the allowance for overhead and profit combined, included in the total cost to the Owner, shall be based on the following schedule:
         1) For the Contractor, for work performed by the Contractor’s own forces, fifteen percent of the cost.
         2) For the Contractor, for work performed by the Subcontractor, ten percent of the amount due the Subcontractor.
         3) For each Subcontractor or Sub-subcontractor involved, for work performed by that Contractor's own forces, ten percent of the cost.
         4) For each Subcontractor, for work performed by his Subsubcontractors' five percent of the amount due the Subsubcontractors.
         5) Cost to which overhead and profit is to be applied shall be determined in accordance with Subparagraph 7.3.6.
   5. Delete the first sentence of Article 7.3.7 and add the following:
      a. The amount of credit to be given by the Contractor to the Owner for a deletion or change which results in a net decrease in the Contract Sum shall be the actual net cost plus reasonable allowance for overhead and profit as net costs saved as approved by the Architect or Engineer and Owner.

H. Article 8 - Time:
   1. Article 8.1.3 - Change the word "Architect" to read "Architect or Engineer and Owner."
      a. Add the following at the end of the second sentence of Article 8.2.1:
      b. and that the Contractor is fully capable of properly completing the Work within the Contract Time.
   2. Delete Article 8.3.1, 8.3.2 and 8.3.3 in their entirety and insert in lieu thereof the following:
      a. 8.3.1 If the contractor is delayed, hindered or impeded at any time in the progress of the Work for any reason or by any alleged act or neglect of the Owner or the Design

Professional or Engineer, or by any employee of either or by a separate Contractor employed by the Owner, or by changes ordered in the scope of the Work, or by other causes beyond the Contractor’s control, then the Contract Time may be extended by Change Order for such reasonable time as is agreed to by the Owner. However, to the fullest extent permitted by law, and notwithstanding any other provisions in the Contract Documents, the Owner and its agents and employees shall not be liable for any damages for delay whether for direct or indirect costs, extended home office overhead, idle or inefficient labor or equipment, cost escalations, or monetary claims of any nature arising from or attributable to delay by any cause whatsoever, The Contractor's sole and exclusive right and remedy for delay by any cause whatsoever is an extension the Contract Time but no increase in the Contract Sum.

b. 8.3.2 No delay, interference, hindrance or disruption, from whatever source or cause, in the progress of the Contractor's Work shall be a basis for an extension of time unless the delay, interference, hindrance or disruption is (1) without the fault and not the responsibility of the Contractor, its subcontractors and suppliers and directly affects the overall completion of the Work as reflected on the critical path of the Contractor's updated and accepted construction schedules. The Contractor expressly agrees that the Owner shall have the benefit of any float in the construction schedule and delay to construction activities which do not affect the overall completion of the Work does not entitle the Contractor to any extension in the Contract Time.

I. Article 9 - Payments and Completion:
   1. Add the following Articles 9.3.1.3 and 9.3.1.4:
      a. 9.3.1.3 The Owner will pay 95 percent (or that percent required by law, whichever is greater) of the amount due the Contractor on account of progress payments. If the manner of completion of the Work and its progress are and remain satisfactory to the Design Professional or Engineer, and in the absence of other good and sufficient reasons, when the Work is shown to be 50 percent or more complete in the Application for Payment, the Owner shall allow retainage to be reduced to 2.5% until final payment.
      b. 9.3.1.4 The full Contract retainage may be reinstated if the manner of completion of the Work and its progress do not remain satisfactory to the Design Professional or Engineer and Owner or if the Surety withholds its consent, or for other good and sufficient reasons.
   2. Add the following to the end of Article 9.3.2:
      a. Proof of payment of stored materials verified by the supplier must be furnished to the Design Professional or Engineer within 30 days of the Application for Payment on which payment for said materials was made. If proof of payment is not furnished within the 30-day period, payment for said materials will be deducted from the next Application for Payment and withheld until proof of payment is provided.
   3. Article 9.5.1.7 - Delete the word "persistent."
   4. Add the following Articles 9.6.1.1 and 9.6.1.2:
      a. 9.6.1.1 Subject to the conditions of the Contract, the Owner shall make payment to the Contractor in the amount certified within thirty (30) days after receipt of Certificate for Payment from the Design Professional. Payment shall not be considered late until 30 days after Owner's receipt of Certificate for Payment from the Design Professional or Engineer.
      b. 9.6.1.2 Contractor's Applications for Payment shall be submitted on or before the 25th day of each month. Any Application not submitted on or before this date may not be approved or processed until the following month.
   5. Add the following to Article 9.8.1:
      a. 9.8.1 Substantial completion for purposes of this Contract occurs when the Design Professional or Engineer certifies that the Work is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended purpose. Such certification shall be given through issuance of a "Certificate of Substantial Completion".

6. Delete the last sentence of Article 9.8.4 and add the following:
    a. Except where otherwise noted warranty time periods shall be as follows: General Construction - One (1) year from date of Substantial Completion; Roof System - Three (3) years from date of Substantial Completion.
7. Add the following after the first sentence and before the second sentence of Article 9.8.5:
    a. Contractor's execution of the Certificate of Substantial Completion constitutes Contractor's representation that the items on the list accompanying the Certificate can and will be completed by Contractor and his subcontractors within thirty (30) days of Contractor's execution of the Certificate. Based upon this representation by Contractor and upon the acknowledgment of the Design Professional or Engineer that the listed items remaining can be completed within thirty (30) days, the Owner agrees to execute the Certificate of Substantial Completion. If Contractor fails to complete the items on the list within thirty (30) days of Contractor's execution of the Certificate, then the Owner, at its option and without prejudice to any other rights or remedies it may have under this Contract' or otherwise and without notice to Contractor, may proceed to have same completed and to deduct the reasonable costs thereof from the amounts then due or thereafter to become due to Contractor.
8. Add the following Article 9.8.2.1:
    a. 9.8.2.1 Contractor Responsibility for Additional Services of the Design Professional or Engineer for Failure to Achieve Final Acceptance/Completion of Project:
    b. The Contractor shall be responsible for the costs of inspections made by the Design Professional or Engineer including any and all other related services expenses incurred by the Design Professional or Engineer for providing services for the project required by failure of the contractor to achieve final acceptance/completion of the project within 30 days after the first occurring of the below described events:
        1) Date of estimated/specified date of substantial completion.
        2) Date of actual substantial completion.
    c. The above described costs of the Design Professional's or Engineer’s additional services shall be deducted by the Owner from the Contractor's final application for payment to pay the Design Professional or Engineer for additional services required by the Contractor's failure to achieve final completion of the project within the 30 day period described above.
9. Add the following Article 9.8.5.1:
    a. 9.8.5.1 Upon the Owner’s acceptance of the Work as substantially complete and upon Contractor's compliance with all conditions precedent to substantial completion as stated in Section 00800, Paragraph 1.2.1.5. and upon application by the Contractor, the Owner will pay to the Contractor all retainage held by the Owner less an amount equal to the greater of (a) two and one-half percent (2.5%) of the Contract sum, or (b) two hundred percent (200%) of the cost of the Work remaining to be performed by the Contractor in accordance with the Design Professional's or Engineer’s determination. Final payment, including all retainage, shall be made at the time and in the manner provided for final payment in accordance with the provisions of Article 9.10. and as additional conditions precedent to final acceptance/payment of the Project appear in Section 00800, Paragraph 1.2.1.6.
10. Add the following Article 9.9.1.2:
    a. 9.9.1.2 The Owner's occupancy or use of any completed or partially completed portions of the Work shall not affect Contractor's obligation to complete incomplete items on the list attached to the Certificate of Substantial Completion within the time fixed in the certificate and does not waive Owner's right to obtain completion of incomplete items at Contractor's expense upon Contractor's failure to timely complete same.
11. Add the following to Article 9.10:
    a. 9.10.2.1 Final acceptance/completion for purposes of this Contract occurs only upon Contractor's compliance with the following conditions precedent: (a) the Contractor furnishes to the Design Professional or Engineer all required close out documents in a form satisfactory to the Design Professional or Engineer and the Owner; (b) the

Contractor furnishes the required manufacturers' certifications (c) the Contractor furnishes the signed Guarantee of Work required by Section 00800, Paragraph 1.2.K.2; (d) the Design Professional or Engineer certifies final acceptance/completion through issuance of a "Certificate of Final Completion".

12. Add the following Article 9.11, Liquidated and Consequential Damages:
    a. 9.11.1 Liquidated Damages. Time being of the essence of this Contract and a matter of material consideration thereof, a reasonable estimate in advance is established to cover losses incurred by the Owner if the project is not substantially complete on the date set forth in the Contract Documents. The Contractor and his Surety will be liable for and will pay the Owner the sums hereinafter stipulated as fixed and agreed as liquidated damages for each calendar day for delay until the Work is substantially complete. The Contractor and his Surety acknowledge that the Owner's losses caused by the Contractor's delay are not readily ascertainable and that the amount estimated per day for liquidated damages is reasonable and is not a penalty.
    b. The amount estimated per calendar day for liquidated damages is: $1,500.00

J. Article 11 - Insurance and Bonds:
1. In the first sentence of Article 11.1.1, delete the words "jurisdiction in which the Project is located" and insert in its place "State of Mississippi."
2. In Article 11.1.1.5 delete the words, "other than to the Work itself."
3. Add the following new Article 11.1.1.9:
    a. Liability insurance will include all major divisions of coverage and be on a comprehensive basis including:
        1) Premises - Operations (including X-C-U)
        2) Independent Contractor's Protective
        3) Products and Completed Operations
        4) Contractual (including specified provisions for the Contractor's obligations under Paragraph 3.18)
        5) Owned, Non-Owned and Hired Motor Vehicles
        6) Broad Form Coverage for Property Damage
4. Delete the first sentence in Article 11.1.2 and substitute the following:
    a. The insurance required by subparagraph 11.1.1 will be written for not less than the following or will be greater if required by law:
        1) .1 Workmen's Compensation
            (a) Workmen's Compensation-Statutory Coverage
            (b) Employer's Liability = $100,000 each accident or occurrence
        2) .2 Comprehensive General Liability
            (a) Bodily Injury = $500,000 each person
$500,000 each occurrence
            (b) Personal Injury = $500,000 each person
$500,000 aggregate
            (c) Property Damage = $100,000 each occurrence
$100,000 aggregate
            (d) Umbrella = For projects whose Contract amount is in excess of $500,000, provide a $1,000,000 umbrella coverage.
        3) .3 Independent Contractors - Same limits as above.
        4) .4 Products and Completed Operations - Same limits as above, commencing with issuance of Final Certificate of Payment.
        5) .5 Automobile Liability
            (a) Bodily Injury = $250,000 each person
$500,000 each occurrence or $500,000 combined single unit
            (b) Property Damage = $100,000 each occurrence
        6) .6 Contractual Liability - Same limits as above.
5. Add the following Article 11.1.4:

a. 11.1.4 The Owner shall be named as an additional insured and Contractor shall furnish one copy of certificate herein required for each copy of the Agreement, specifically setting forth evidence of all coverage required by Articles 11.1.1, 11.1.2, and 11.1.1.8. Furnish to the Owner copies of any endorsements that are subsequently issued amending coverage.

6. Delete Article 11.2.1 in its entirety and insert in lieu thereof the following:
   a. 11.2.1. The Contractor will pay for and maintain such insurance as will protect the Owner from his contingent liability to others for damages because of bodily injury, including death, which may arise from operations under this Contract and other liability for damages which the Contractor is required to insure under any provisions of this Contract. Certificate of this insurance will be filed with the Owner and will be the same limits set forth in 11.1.2.
7. Delete Article 11.4.1 in its entirety and insert in lieu thereof the following:
   a. 11.4.1 The Contractor will purchase and maintain property insurance upon the entire work at the site but limited to the Work covered under his Contract and the value thereof.
   b. Such insurance will be in a company or companies acceptable to the Owner. The insurance will include interest of the Owner, Contractor, subcontractors, and sub-subcontractors in the Work and will insure against the perils of fire and extended coverage and will include "all risk" insurance for physical loss or damage, including, without duplication of coverage, vandalism and malicious mischief. If not covered under "all risk" insurance or otherwise provided in the Contract Documents, the Contractor will effect and maintain similar property insurance on portions of the Work stored off the site or in transit when such portions of the Work are included in an Application for Payment under Article 9.3.2.
8. Delete Articles 11.4.1.1,11.4.1.2,11.4.1.3, and 11.4.1.4 in their entirety.
9. Add the following Article 11.4.1.1:
   a. 11.4.1.1 The form of policy for this coverage will be completed value.
10. Add the following Article 11.4.1.2:
    a. 11.4.1.2 If by the terms of this insurance any mandatory deductibles are required, or if the Contractor should elect, with the concurrence of the Owner, to increase the mandatory deductible amounts or purchase this insurance with voluntary deductive amounts, the Contractor will be responsible for payment of the amount of the deductible in the event of a paid claim.
11. Delete Articles 11.4.2, 11.4.3, 11.4.4, 11.4.5 and 11.4.6 in their entirety.
12. In Article 11.4.10, delete the part of the Article after the words "Owner's exercise of this power."

K. Article 12 - Uncovering and Correction of Work:
1. Add the following Article 12.2.2.4:
   a. 12.2.2.4 Prior to the end of the one-year period (three-year for roofs), the Design Professional or Engineer may schedule a warranty inspection which shall be attended by the Design Professional or Engineer, the Owner, the Contractor and all major subcontractors. During this inspection, the parties shall identify all defective and/or nonconforming items and fix a time within which all defective and/or nonconforming items shall be repaired and/or replaced.
2. Add the following Article 12.2.2.5:
   a. 12.2.2.5 As a condition to final completion of the Work under Section 00800, Paragraph 1.2.1.6, Contractor, upon completion of the Work, shall prepare and submit to the Owner a Guarantee of Work, sworn to by the Contractor, stating:
   b. As required by Section 00800, Paragraphs 1.2.K.2 and 1.2.K.3, Contractor and Contractor’s Surety hereby guarantee that all Work performed on the above captioned project is free from defective and/or nonconforming materials and workmanship and that for a period of one year for building construction, three years for roof system from the date of substantial completion or such longer period of time as may be called for in the Contract Documents for such portions of the Work, Contractor will repair and/or

replace any defective and/or nonconforming materials and workmanship in accordance with the requirements of the Contract Documents."

3. Add the following Article 12.2.2.6:
    a. 12.2.2.6 Within the one-year period (three-year for roofs), if repairs or replacement are requested by Owner in connection with guaranteed Work which, in the opinion of the Owner, are rendered necessary as a result of the use of materials, equipment or workmanship which are inferior, defective or not in accordance with the Contract Documents, the Contractor shall promptly, upon receipt of notice from and without expense to the Owner, place in satisfactory condition in every particular, all such guaranteed Work, correct all defects therein and make good all damages to the building, site, equipment or contents thereof which, in the opinion of the Owner, are the result of the use of materials, equipment or workmanship which are inferior, defective or not in accordance with the terms of the Contract Documents; and make good any work or materials or the equipment and contents of said buildings or site disturbed in fulfilling any such guaranty. If, after notice or within the time agreed upon by the parties at the warranty inspection, the Contractor and/or its Surety fail to proceed promptly to comply with the terms of the guarantee, the Owner may have the defects corrected in accordance with Article 2.4 and the Contractor and his Surety shall be liable for all expenses incurred. All special guarantees applicable to definite parts of the Work stipulated in the Contract Documents shall be subject to the terms of this paragraph during the first year of the life of such special guarantee.

L. Article 13 - Miscellaneous Provisions:
1. Delete Article 13.6.1 and replace with the following:
    a. 13.6.1 Payments due and unpaid under the Contract Documents shall bear interest as provided by Mississippi Code, Section 31-5-25 or Section 87-7-3, whichever applies.
2. Add the following Article 13.8:
    a. 13.8 The prevailing party in any dispute between the parties arising out of or related to this Agreement, or the breach thereof, shall be entitled to reasonable attorneys' fees and expenses incurred in pursuing or defending any claim.

M. Article 14 - Termination and Suspension of the Contract:
1. Delete Article 14.1. in its entirety, including Articles 14.1.1 to 14.1.4.
2. Delete the words "persistently or repeatedly" from Article 14.2.1.1.
3. Delete the words "persistently" from Article 14.2.1.3.
4. Add the following Articles 14.2.1.5 and 14.2.1.6:
    a. .5 fails to achieve substantial completion of the Project as described in Article 9.8 within the time limit agreed upon and/or fails to complete the list of items attached to the Certificate of Substantial Completion within the time fixed in the Certificate of Substantial Completion;
    b. .6 fails to meet any deadline required by the Contract. Contractor acknowledges that time is of the essence of this Contract and that all deadlines required by the Contract are critical to timely completion of the Contract. Therefore, Contractor agrees that its failure to meet any deadline constitutes a substantial and material breach of this Contract, entitling the Owner to terminate the Contract.
5. Make the following revision to Article 14.2.2:
    a. Change the first sentence to read, "upon advice by the Design Professional or Engineer that sufficient cause existsto justify such actions,"
6. Add the following Article 14.2.5:
    a. 14.2.5 If the Owner terminates the Contract for cause, and it is determined for any reason that the Contractor was not actually in default under the Contract at the time of termination, the Contractor shall be entitled to recover from the Owner the same amount as the Contractor would be entitled to receive under a termination for convenience as provided by Article
    b. 14.4.3. The foregoing shall constitute the Contractor's sole and exclusive remedy for termination of the Contract. In no event shall the Contractor be entitled to special,

consequential, or exemplary damages, nor shall the Contractor be entitled to anticipated profits resulting from termination of this Contract.

7. Delete Article 14.4 in its entirety, including Article 14.4.1 to 14.4.3 and add a new Article 14.4 as follows:
   a. 14.4 Termination by the Owner for Convenience
   b. 14.4.1 The Owner may, without cause or fault of either the Contractor or the Owner, terminate the Contract in whole or in part if the Owner, in its sole discretion, determines it to be in the Owner's best interest.
   c. 14.4.2 Upon the Owner's termination for convenience, the Contractor shall only be entitled to payment as provided in Subparagraph 14.1.2.
   d. 14.4.3 In case of such termination for the Owner’s convenience, the Contractor shall be entitled to receive payment for reasonable profit and overhead on work performed. The Contractor shall not be entitled to receive any payment for either overhead or profit on work not performed.

END OF SECTION

SECTION 01 2100
ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Contingency allowance.

1.02 CONTINGENCY ALLOWANCE

A. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from this Contingency Allowance.

B. Funds will be drawn from the Contingency Allowance only by Change Order.

C. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order.

1.03 ALLOWANCES SCHEDULE

A. Contingency Allowance: Include a contingency allowance of $25,000 for use according to the Owner's written instructions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
   4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   5. Waives claims for additional costs or time extension that may subsequently become apparent.
   6. Agrees to reimburse Owner and Design Professional for review or redesign services associated with re-approval by authorities.

B. A Substitution Request for specified installer constitutes a representation that the submitter:
   1. Has acted in good faith to obtain services of specified installer, but was unable to come to commercial, or other terms.

C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
   1. Note explicitly any non-compliant characteristics.

D. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. No specific form is required. Contractor's Substitution Request documentation must include the following:
      a. Project Information:
         1) Official project name and number, and any additional required identifiers established in Contract Documents.
         2) Owner's, Design Professional's, and Contractor's names.
      b. Substitution Request Information:
         1) Discrete and consecutive Substitution Request number, and descriptive subject/title.
         2) Issue date.
         3) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
         4) Description of Substitution.
         5) Reason why the specified item cannot be provided.
         6) Differences between proposed substitution and specified item.
         7) Description of how proposed substitution affects other parts of work.
      c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
         1) Physical characteristics.

2) In-service performance.
3) Expected durability.
4) Warranties.
5) Other salient features and requirements.
6) Include, as appropriate or requested, the following types of documentation:
(a) Product Data:
(b) Samples.
(c) Certificates, test, reports or similar qualification data.
(d) Drawings, when required to show impact on adjacent construction elements.

d. Impact of Substitution:
1) Savings to Owner for accepting substitution.
2) Change to Contract Time due to accepting substitution.

E. Limit each request to a single proposed substitution item.
1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Submittal Time Restrictions:

B. Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period, and the documents required.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Design Professional will consider requests for substitutions only within 15 days after date of Agreement.

B. Submit request for Substitution for Cause immedately upon discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Design Professional, in order to stay on approved project schedule.

C. Submit request for Substitution for Convenience within 14 days of discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Design Professional, in order to stay on approved project schedule.
1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
3. Bear the costs engendered by proposed substitution of:
a. Owner's compensation to the Design Professional for any required redesign, time spent processing and evaluating the request.
b. Other construction by Owner.
c. Other unanticipated project considerations.

D. Substitutions will not be considered under one or more of the following circumstances:
1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
2. Without a separate written request.
3. When acceptance will require revisions to Contract Documents.

3.04 RESOLUTION

A. Design Professional may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Design Professional will notify Contractor in writing of decision to accept or reject request.
1. Design Professional's decision following review of proposed substitution will be noted on the submitted form.

3.05 ACCEPTANCE

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

END OF SECTION

SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.

B. Preconstruction meeting.

C. Progress meetings.

D. Construction progress schedule.

E. Progress photographs.

F. Coordination drawings.

G. Submittals for review, information, and project closeout.

H. Number of copies of submittals.

I. Requests for Interpretation (RFI) procedures.

J. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. Section 01 6000 - Product Requirements: General product requirements.

1.03 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 01 7000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

B. Make the following types of submittals to Design Professional:
   1. Requests for Interpretation (RFI).
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Design data.
   6. Manufacturer's instructions and field reports.
   7. Applications for payment and change order requests.
   8. Progress schedules.
   9. Coordination drawings.
   10. Correction Punch List and Final Correction Punch List for Substantial Completion.
   11. Closeout submittals.

1.04 PROJECT COORDINATOR

A. Project Coordinator: Construction Manager.

B. During construction, coordinate use of site and facilities through the Project Coordinator.

C. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.

D. Coordinate field engineering and layout work under instructions of the Project Coordinator.

E. Make the following types of submittals to Design Professional through the Project Coordinator:
   1. Requests for Interpretation.
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Design data.
   6. Manufacturer's instructions and field reports.
   7. Applications for payment and change order requests.
   8. Progress schedules.

9. Coordination drawings.
10. Correction Punch List and Final Correction Punch List for Substantial Completion.
11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

A. Project Coordinator will schedule a meeting after Notice of Award.

B. Attendance Required:
   1. Owner.
   2. Design Professional.
   3. Contractor.

C. Agenda:
   1. Execution of Owner-Contractor Agreement.
   2. Submission of executed bonds and insurance certificates.
   3. Distribution of Contract Documents.
   4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
   5. Submission of initial Submittal schedule.
   6. Designation of personnel representing the parties to Contract and Design Professional.
   7. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
   8. Scheduling.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Design Professional, Owner, participants, and those affected by decisions made.

3.02 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at maximum monthly intervals.

B. Attendance Required:
   1. Contractor.
   2. Owner.
   3. Design Professional.
   4. Special consultants.
   5. Contractor's superintendent.
   6. Major subcontractors.

C. Agenda:
   1. Review minutes of previous meetings.
   2. Review of work progress.
   3. Field observations, problems, and decisions.
   4. Identification of problems that impede, or will impede, planned progress.
   5. Review of submittals schedule and status of submittals.
   6. Review of RFIs log and status of responses.
   7. Review of off-site fabrication and delivery schedules.
   8. Maintenance of progress schedule.
   9. Corrective measures to regain projected schedules.
   10. Planned progress during succeeding work period.
   11. Coordination of projected progress.
   12. Maintenance of quality and work standards.
   13. Effect of proposed changes on progress schedule and coordination.
   14. Other business relating to work.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Design Professional, Owner, participants, and those affected by decisions made.

3.03 CONSTRUCTION PROGRESS SCHEDULE

A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of work, with a general outline for remainder of work.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
   1. Include written certification that major contractors have reviewed and accepted proposed schedule.

D. Within 10 days after joint review, submit complete schedule.

E. Submit updated schedule with each Application for Payment.

3.04 PROGRESS PHOTOGRAPHS

A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.

B. Photography Type: Digital; electronic files.

C. In addition to periodic, recurring views, take photographs of each of the following events:

D. Take photographs as evidence of existing project conditions as follows:
   1. Interior views: ____.
   2. Exterior views: ____.

E. Views:
   1. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
   2. Consult with Design Professional for instructions on views required.
   3. Provide factual presentation.
   4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.

F. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
   1. Delivery Medium: Via email.
   2. File Naming: Include project identification, date and time of view, and view identification.
   3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
   4. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.

3.05 COORDINATION DRAWINGS

A. Provide information required by Project Coordinator for preparation of coordination drawings.

B. Review drawings prior to submission to Design Professional.

3.06 REQUESTS FOR INTERPRETATION (RFI)

A. Definition: A request seeking one of the following:
   1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
   2. A resolution to an issue which has arisen due to field conditions and affects design intent.

B. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
   1. Prepare a separate RFI for each specific item.

a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
b. Do not forward requests which solely require internal coordination between subcontractors.

2. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

C. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
a. Approval of submittals (use procedures specified elsewhere in this section).
b. Approval of substitutions (see Section - 01 6000 - Product Requirements)
c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).

D. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
1. Official Project name and number, and any additional required identifiers established in Contract Documents.
2. Owner's, Design Professional's, and Contractor's names.
3. Discrete and consecutive RFI number, and descriptive subject/title.
4. Issue date, and requested reply date.
5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

E. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

F. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
1. Indicate current status of every RFI. Update log promptly and on a regular basis.
2. Note dates of when each request is made, and when a response is received.
3. Highlight items requiring priority or expedited response.
4. Highlight items for which a timely response has not been received to date.
5. Remove improper or frivolous RFIs.

G. Review Time: Design Professional will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

H. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.

3.07 SUBMITTAL SCHEDULE

A. Submit to Design Professional for review a schedule for submittals in tabular format.

1. Coordinate with Contractor's construction schedule and schedule of values.
2. Format schedule to allow tracking of status of submittals throughout duration of construction.
3. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.

3.08 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.

B. Submit to Design Professional for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.

C. Samples will be reviewed for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

3.09 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Certificates.
   3. Test reports.
   4. Inspection reports.
   5. Manufacturer's instructions.
   6. Manufacturer's field reports.
   7. Other types indicated.

B. Submit for Design Professional's knowledge as contract administrator or for Owner.

3.10 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Other types as indicated.

D. Submit for Owner's benefit during and after project completion.

3.11 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Design Professional.
   1. After review, produce duplicates.
   2. Retained samples will not be returned to Contractor unless specifically so stated.

3.12 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Sequentially identify each item. For revised submittals use original number and a sequential combination numberical and alphabetical suffix.

2. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
3. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
4. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
    a. Send submittals in electronic format via email to Design Professional.
5. When revised for resubmission, identify all changes made since previous submission.

B. Product Data Procedures:
1. Submit only information required by individual specification sections.
2. Collect required information into a single submittal.
3. Submit concurrently with related shop drawing submittal.
4. Do not submit (Material) Safety Data Sheets for materials or products.

C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
2. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

3.13 SUBMITTAL REVIEW

A. Submittals for Review: Design Professional will review each submittal, and approve, or take other appropriate action.

B. Submittals for Information: Design Professional will acknowledge receipt and review. See below for actions to be taken.

C. Design Professional's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.

D. Design Professional's actions on items submitted for review:
1. Authorizing purchasing, fabrication, delivery, and installation:
    a. "Approved", or language with same legal meaning.
    b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
        1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
    c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
2. Not Authorizing fabrication, delivery, and installation:
    a. "Revise and Resubmit".
        1) Resubmit revised item, with review notations acknowledged and incorporated.
        2) Non-responsive resubmittals may be rejected.

E. Design Professional's actions on items submitted for information:
1. Items for which no action was taken:
    a. "Received" - to notify the Contractor that the submittal has been received for record only.
2. Items for which action was taken:
    a. "Reviewed" - no further action is required from Contractor.

END OF SECTION

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.

B. Testing and inspection agencies and services.

C. Control of installation.

D. Tolerances.

E. Manufacturers' field services.

F. Defect Assessment.

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.03 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.

B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Design Professional before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Design Professional before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.03 TESTING AND INSPECTION

A. Testing Agency Duties:

1. Provide qualified personnel at site. Cooperate with Design Professional and Contractor in performance of services.
2. Perform specified sampling and testing of products in accordance with specified standards.
3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
4. Promptly notify Design Professional and Contractor of observed irregularities or non-compliance of Work or products.
5. Perform additional tests and inspections required by Design Professional.
6. Submit reports of all tests/inspections specified.

B. Limits on Testing/Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the Work.
3. Agency may not assume any duties of Contractor.
4. Agency has no authority to stop the Work.

C. Contractor Responsibilities:
1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
3. Provide incidental labor and facilities:
   a. To provide access to Work to be tested/inspected.
   b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
   c. To facilitate tests/inspections.
   d. To provide storage and curing of test samples.
4. Notify Design Professional and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

D. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Design Professional.

E. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.04 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.05 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

B. If, in the opinion of Design Professional, it is not practical to remove and replace the work, Design Professional will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 5000

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities.

B. Temporary sanitary facilities.

C. Temporary Controls: Barriers, enclosures, and fencing.

D. Security requirements.

E. Vehicular access and parking.

F. Waste removal facilities and services.

1.02 TEMPORARY UTILITIES

A. Owner will provide the following:

1. Electrical power and metering, consisting of connection to existing facilities.
2. Water supply, consisting of connection to existing facilities.

B. Existing facilities may be used.

C. New permanent facilities may be used.

D. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.03 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Use of existing facilities is permitted.

C. New permanent facilities may be used during construction operations.

D. Maintain daily in clean and sanitary condition.

E. At end of construction, return facilities to same or better condition as originally found.

1.04 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Provide protection for plants designated to remain. Replace damaged plants.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.05 FENCING

A. Construction: Contractor's option.

B. Provide 6 foot (1.8 m) high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.06 EXTERIOR ENCLOSURES

A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.07 INTERIOR ENCLOSURES

A. Provide temporary partitions and ceilings as indicated to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.

B. Construction: Framing and reinforced polyethylene sheet materials with closed joints and sealed edges at intersections with existing surfaces:

1.08 SECURITY

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

B. Coordinate with Owner's security program.

1.09 VEHICULAR ACCESS AND PARKING

A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.

B. Coordinate access and haul routes with governing authorities and Owner.

C. Provide and maintain access to fire hydrants, free of obstructions.

D. Provide means of removing mud from vehicle wheels before entering streets.

E. Designated existing on-site roads may be used for construction traffic.

F. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

G. Existing parking areas may be used for construction parking.

1.10 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids. Remove trash from site periodically.

C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.11 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet (600 mm). Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition.

E. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Re-use of existing products.

B. Transportation, handling, storage and protection.

C. Product option requirements.

D. Substitution limitations.

E. Procedures for Owner-supplied products.

F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 01 2500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.

1.03 SUBMITTALS

A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
   1. Submit within 15 days after date of Agreement.
   2. For products specified only by reference standards, list applicable reference standards.

B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.

B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.

C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

B. Use of products having any of the following characteristics is not permitted:
   1. Containing lead, cadmium, or asbestos.

2.03 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. See Section 01 2500 - Substitution Procedures.

3.02 OWNER-SUPPLIED PRODUCTS

A. Owner's Responsibilities:
   1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
   2. Arrange and pay for product delivery to site.
   3. On delivery, inspect products jointly with Contractor.
   4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
   5. Arrange for manufacturers' warranties, inspections, and service.

B. Contractor's Responsibilities:
   1. Review Owner reviewed shop drawings, product data, and samples.
   2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
   3. Handle, store, install and finish products.
   4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

A. Provide protection of stored materials and products against theft, casualty, or deterioration.

B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 7419.
   1. Structural Loading Limitations: Handle and store products and materials so as not to exceed static and dynamic load-bearing capacities of project floor and roof areas.

C. Store and protect products in accordance with manufacturers' instructions.

D. Store with seals and labels intact and legible.

E. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

F. For exterior storage of fabricated products, place on sloped supports above ground.

G. Provide off-site storage and protection when site does not permit on-site storage or protection.

H. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

I. Comply with manufacturer's warranty conditions, if any.

J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

K. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

L. Prevent contact with material that may cause corrosion, discoloration, or staining.

M. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

N. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 7000

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.

C. Cutting and patching.

D. Surveying for laying out the work.

E. Cleaning and protection.

F. Starting of systems and equipment.

G. Demonstration and instruction of Owner personnel.

H. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

1.02 RELATED REQUIREMENTS

A. Section 01 7900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

B. Section 07 8400 - Firestopping.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
   3. Submit surveys and survey logs for the project record.

C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.
   4. Visual qualities of sight exposed elements.
   5. Work of Owner or separate Contractor.

1.04 QUALIFICATIONS

A. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Design Professional. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

1.05 PROJECT CONDITIONS

A. Use of explosives is not permitted.

B. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

C. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
   1. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.

D. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
   1. At All Times: Excessively noisy tools and operations will not be tolerated on site anywhere at any time of day; excessively noisy includes jackhammers, pile drivers, and diesel engines.

1.06 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Design Professional of any discrepancies discovered.

C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

D. Promptly report to Design Professional the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Design Professional.

F. Utilize recognized engineering survey practices.

G. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations; and _____.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations, and _____.

H. Periodically verify layouts by same means.

I. Maintain a complete and accurate log of control and survey work as it progresses.

3.04 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.05 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Design Professional before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
   1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
   2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.

C. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.
   2. Relocate items indicated on drawings.
   3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.

4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
   2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
   3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
      a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
      b. Provide temporary connections as required to maintain existing systems in service.
   4. Verify that abandoned services serve only abandoned facilities.
   5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

E. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.

F. Adapt existing work to fit new work: Make as neat and smooth transition as possible.

G. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

H. Refinish existing surfaces as indicated:
   1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
   2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

I. Clean existing systems and equipment.

J. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

K. Do not begin new construction in alterations areas before demolition is complete.

L. Comply with all other applicable requirements of this section.

3.06 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
   4. Match work that has been cut to adjacent work.
   5. Repair areas adjacent to cuts to required condition.
   6. Repair new work damaged by subsequent work.

7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-complying work.

D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

G. Restore work with new products in accordance with requirements of Contract Documents.

H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material , to full thickness of the penetrated element.

J. Patching:
1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
2. Match color, texture, and appearance.
3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.07 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.08 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Prohibit traffic from landscaped areas.

H. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.09 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

D. Verify that wiring and support components for equipment are complete and tested.

E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

F. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

G. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

A. See Section 01 7900 - Demonstration and Training.

3.11 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

B. Testing, adjusting, and balancing HVAC systems: See Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.

3.12 FINAL CLEANING

A. Use cleaning materials that are nonhazardous.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

E. Replace filters of operating equipment.

F. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.

G. Clean site; sweep paved areas, rake clean landscaped surfaces.

H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
   1. Provide copies to Design Professional.

B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

C. Notify Design Professional when work is considered ready for Design Professional's Substantial Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Design Professional's Substantial Completion inspection.

E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Design Professional's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Design Professional.

F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

G. Notify Design Professional when work is considered finally complete and ready for Design Professional's Substantial Completion final inspection.

H. Complete items of work determined by Design Professional listed in executed Certificate of Substantial Completion.

END OF SECTION

SECTION 01 7800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project record documents.

B. Operation and maintenance data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Individual Product Sections: Specific requirements for operation and maintenance data.

C. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Design Professional with claim for final Application for Payment.

B. Operation and Maintenance Data:
   1. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   2. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Design Professional comments. Revise content of all document sets as required prior to final submission.
   3. Submit two sets of revised final documents in final form within 10 days after final inspection.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Changes made by Addenda and modifications.

F. Record Drawings: Legibly mark each item to record actual construction including:
   1. Field changes of dimension and detail.

2. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
   1. Product data, with catalog number, size, composition, and color and texture designations.
   2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

D. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

E. Provide servicing and lubrication schedule, and list of lubricants required.

F. Include manufacturer's printed operation and maintenance instructions.

G. Include sequence of operation by controls manufacturer.

H. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

I. Provide control diagrams by controls manufacturer as installed.

J. Include test and balancing reports.

K. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch (216 by 280 mm) three D side ring binders with durable plastic covers; 2 inch (50 mm) maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Design Professional, Consultants, Contractor and subcontractors, with names of responsible parties.

F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

J. Arrangement of Contents: Organize each volume in parts as follows:
   1. Project Directory.
   2. Table of Contents, of all volumes, and of this volume.
   3. Operation and Maintenance Data: Arranged by system, then by product category.
      a. Source data.
      b. Product data, shop drawings, and other submittals.
      c. Operation and maintenance data.
      d. Field quality control data.
      e. Photocopies of warranties and bonds.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Manual: Bind in commercial quality 8-1/2 by 11 inch (216 by 279 mm) three D side ring binders with durable plastic covers.

F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

SECTION 01 7900

DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

A. Demonstration of products and systems to be commissioned and where indicated in specific specification sections.

B. Training of Owner personnel in operation and maintenance is required for:
   1. HVAC systems and equipment.

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures; except:
   1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
   2. Submit one copy to the Commissioning Authority, not to be returned.
   3. Make commissioning submittals on time schedule specified by Commissioning Authority.
   4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of overall Training Plan; submit in editable electronic format, Microsoft Word 2003 preferred.

B. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit to Commissioning Authority for review and inclusion in overall training plan.
   2. Submit not less than four weeks prior to start of training.
   3. Revise and resubmit until acceptable.
   4. Provide an overall schedule showing all training sessions.
   5. Include at least the following for each training session:
      a. Identification, date, time, and duration.
      b. Description of products and/or systems to be covered.
      c. Name of firm and person conducting training; include qualifications.
      d. Intended audience, such as job description.
      e. Objectives of training and suggested methods of ensuring adequate training.
      f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
      g. Media to be used, such a slides, hand-outs, etc.
      h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
   1. Include applicable portion of O&M manuals.
   2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
   3. Provide one extra copy of each training manual to be included with operation and maintenance data.

1.03 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
   1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
   2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.

B. Demonstrations conducted during Functional Testing need not be repeated unless Owner personnel training is specified.

C. Demonstration may be combined with Owner personnel training if applicable.

D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.
   2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.02 TRAINING - GENERAL

A. Conduct training on-site unless otherwise indicated.

B. Owner will provide classroom and seating at no cost to Contractor.

C. Provide training in minimum two hour segments.

D. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.

E. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. The location of the O&M manuals and procedures for use and preservation; backup copies.
   2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   3. Typical uses of the O&M manuals.

F. Product- and System-Specific Training:
   1. Review the applicable O&M manuals.
   2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
   3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
   4. Provide hands-on training on all operational modes possible and preventive maintenance.
   5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
   6. Discuss common troubleshooting problems and solutions.
   7. Discuss any peculiarities of equipment installation or operation.
   8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
   9. Review recommended tools and spare parts inventory suggestions of manufacturers.
   10. Review spare parts and tools required to be furnished by Contractor.
   11. Review spare parts suppliers and sources and procurement procedures.

G. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

SECTION 02 4100

DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selective demolition of building elements for alteration purposes.

1.02 SUBMITTALS

A. Site Plan: Indicate:
   1. Areas for temporary construction and field offices.

PART 3 EXECUTION

2.01 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   3. Provide, erect, and maintain temporary barriers and security devices.
   4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   5. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
   6. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
   7. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Protect existing structures and other elements to remain in place and not removed.
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.

D. Minimize production of dust due to demolition operations. Do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

E. If hazardous materials are discovered during removal operations, stop work and notify Design Professional and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

F. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

2.02 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify construction and utility arrangements are as indicated.
   2. Report discrepancies to Design Professional before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Separate areas in which demolition is being conducted from areas that remain occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction _____ _____.

C. Maintain weatherproof exterior building enclosure, except for interruptions required for replacement or modifications; prevent water and humidity damage.

D. Remove existing work as indicated and required to accomplish new work.
   1. Remove items indicated on drawings.

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

F. Protect existing work to remain.
   1. Prevent movement of structure. Provide shoring and bracing as required.
   2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch to match new work.

2.03 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 23 0529

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment components.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2019.

D. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2018.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.

F. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

G. MFMA-4 - Metal Framing Standards Publication; 2004.

H. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018.

I. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   5. Notify Design Professional of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 3000.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.
   1. Fiberglass Channel (Strut) Framing Systems: Include requirements for strength derating according to ambient temperature.

1.06 QUALITY ASSURANCE

A. Comply with applicable building code.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
   2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
   3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
   4. Do not use chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
   5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
      a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
      b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
      c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Prefabricated Trapeze-Framed Metal Strut Systems:
   1. Comply with MFMA-4.
   2. Strut Channel or Bracket Material:
      a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
      b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
   3. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm).
   4. Minimum Channel Dimensions: 1-5/8 inch (41 mm) width by 13/16 inch (21 mm) height.
   5. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.

C. Prefabricated Trapeze-Framed Fiberglass Strut Systems:
   1. MSS SP-58 type 59, prefabricated continuous-slot fiberglass strut channel, associated fittings, and related accessories.
   2. Flammability: Fire retardant with NFPA 101, Class A flame spread index (maximum of 25) when tested in accordance with ASTM E84; self-extinguishing in accordance with ASTM D635.

D. Hanger Rods:
   1. Threaded zinc-plated steel unless otherwise indicated.
   2. Minimum Size, Unless Otherwise Indicated or Required:
      a. Equipment Supports: 1/2 inch (13 mm) diameter.
      b. Piping up to 1 inch (25 mm, DN): 1/4 inch (6 mm) diameter.
      c. Piping larger than 1 inch (25 mm, DN): 3/8 inch (10 mm) diameter.
      d. Trapeze Support for Multiple Pipes: 3/8 inch (10 mm) diameter.

E. Thermal Insulated Pipe Supports:
   1. General Requirements:

a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
c. Pipe supports to be provided for nominally sized, 1/2 to 30 inch (15 to 750 mm, DN) iron pipes.
d. Insulation inserts to consist of rigid polyisocyanurate (urethane) insulation surrounded by a 360 degree, PVC jacketing.

2. PVC Jacket:
a. Pipe insulation protection shields to be provided with a ball bearing hinge and locking seam.
b. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
c. Maximum Service Temperature: 180 degrees F (82 degrees C).
d. Moisture Vapor Transmission: 0.0071 perm inch (0.0092 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
e. Thickness: 60 mil (1.524 mm).
f. Connections: Brush on welding adhesive.

3. Pipe insulation protection shields to be provided at the hanger points and guide locations on pipes requiring insulation as indicated on drawings.

F. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
4. Hollow Masonry: Use toggle bolts.
5. Hollow Stud Walls: Use toggle bolts.
6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
7. Sheet Metal: Use sheet metal screws.
8. Plastic and lead anchors are not permitted.
9. Powder-actuated fasteners are not permitted.
10. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
a. Comply with MFMA-4.
b. Channel Material: Use galvanized steel.
c. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm) minimum base metal thickness.
d. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
11. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

D. Unless specifically indicated or approved by Design Professional, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Design Professional, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

H. Equipment Support and Attachment:
   1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
   2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 03 3000.
   5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

I. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.

J. Secure fasteners according to manufacturer's recommended torque settings.

K. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 23 0553
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Stencils.

D. Pipe markers.

1.02 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2015.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Air Handling Units/Indoor Units: Nameplates.

B. Condensing Units/Outdoor Units: Stencilled painting.

C. Control Panels: Nameplates.

D. Piping: Pipe markers.

E. Small-sized Equipment: Tags.

F. Thermostats: Nameplates.

2.02 NAMEPLATES

A. Letter Color: White.

B. Letter Height: 1/4 inch (6 mm).

C. Background Color: Black.

D. Plastic: Comply with ASTM D709.

2.03 TAGS

A. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.

2.04 STENCILS

A. Stencils: With clean cut symbols and letters of following size:
   1. Ductwork and Equipment: 2-1/2 inch (65 mm) high letters.

2.05 PIPE MARKERS

A. Color: Comply with ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

END OF SECTION

SECTION 23 0593

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

1.02 REFERENCE STANDARDS

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.

B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008 (Reaffirmed 2017).

C. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
   1. Include at least the following in the plan:
      a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
      b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
      c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
      d. Final test report forms to be used.
      e. Procedures for formal deficiency reports, including scope, frequency and distribution.

C. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
   1. Revise TAB plan to reflect actual procedures and submit as part of final report.
   2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Design Professional and for inclusion in operating and maintenance manuals.
   3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
   4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
   5. Units of Measure: Report data in I-P (inch-pound) units only.
   6. Include the following on the title page of each report:
      a. Name of Testing, Adjusting, and Balancing Agency.
      b. Address of Testing, Adjusting, and Balancing Agency.
      c. Telephone number of Testing, Adjusting, and Balancing Agency.
      d. Project name.
      e. Project location.
      f. Project Design Professional.
      g. Project Contractor.
      h. Report date.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
   1. AABC (NSTSB), AABC National Standards for Total System Balance.
   2. SMACNA (TAB).

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

D. TAB Agency Qualifications:
   1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
   2. Having minimum of three years documented experience.
   3. Certified by one of the following:
      a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
      b. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
   5. Duct systems are clean of debris.
   6. Fans are rotating correctly.
   7. Fire and volume dampers are in place and open.
   8. Air coil fins are cleaned and combed.
   9. Access doors are closed and duct end caps are in place.
   10. Air outlets are installed and connected.
   11. Duct system leakage is minimized.
   12. Hydronic systems are flushed, filled, and vented.
   13. Pumps are rotating correctly.
   14. Proper strainer baskets are clean and in place.
   15. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.03 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Design Professional to facilitate spot checks during testing.

B. Provide additional balancing devices as required.

3.04 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.05 RECORDING AND ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.

B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.06 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

H. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

I. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

J. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

K. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

3.07 SCOPE

A. Test, adjust, and balance the following:
   1. Air Handling Units/Indoor Units (IDU).
   2. Dedicated Outdoor Air System/Units (DOAS).

3.08 MINIMUM DATA TO BE REPORTED

A. Air Moving Equipment:
   1. Location.
   2. Manufacturer.
   3. Model number.
   4. Serial number.
   5. Air flow, specified and actual.
   6. Outside air flow, specified and actual.
   7. Total static pressure (total external), specified and actual.

B. Return Air/Outside Air:
   1. Identification/location.
   2. Design air flow.
   3. Actual air flow.
   4. Design outside air flow.

5. Actual outside air flow.
6. Outside air temperature.
7. Actual mixed air temperature.

END OF SECTION

SECTION 23 0713
DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct insulation.

B. Duct liner.

1.02 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2017.

B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2020.

C. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

D. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 2020.

E. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2019.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.

G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

H. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.

I. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).

J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.05 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, FLEXIBLE

A. Manufacturer:
   1. CertainTeed Corporation: www.certainteed.com/#sle.
   2. Johns Manville: www.jm.com/#sle.
   3. Knauf Insulation: www.knaufinsulation.com/#sle.
   4. Owens Corning Corporation: www.ocbuildingspec.com/#sle.

5. Substitutions: See Section 01 6000 - Product Requirements.

B. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. K (Ksi) value: 0.36 at 75 degrees F (0.052 at 24 degrees C), when tested in accordance with ASTM C518.
   2. Maximum Service Temperature: 1,200 degrees F (649 degrees C).
   3. Maximum Water Vapor Absorption: 5.0 percent by weight.

C. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.
   3. Secure with pressure-sensitive tape.

D. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.

2.03 DUCT LINER

A. Elastomeric Foam Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.
   1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
   2. Maximum Service Temperature: 180 degrees F (82 degrees C).
   3. Fungal Resistance: No growth when tested according to ASTM G21.
   4. Apparent Thermal Conductivity: Maximum of 0.28 at 75 degrees F (0.045 at 24 degrees C).
   5. Connection: Waterproof vapor barrier adhesive.

B. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation. Comply with ASTM C916.

C. Glass Fiber Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; flexible blanket, rigid board, and preformed round liner board; impregnated surface and edges coated with poly vinyl acetate polymer, acrylic polymer, or black composite.
   1. Fungal Resistance: No growth when tested according to ASTM G21.
   2. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F (0.045 at 24 degrees C).
   3. Service Temperature: Up to 250 degrees F (121 degrees C).
   4. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm (25.4 m/s), minimum.

D. Adhesive: Waterproof, fire-retardant type, ASTM C916.
   1. Manufacturers:
      a. Design Polymerics; DP 2502 Water Based, Low VOC, Duct Liner Adhesive: www.designpoly.com/#sle.

E. Liner Fasteners: Galvanized steel, self-adhesive pad, impact applied, or welded with integral head.

PART 3 EXECUTION

3.01 EXAMINATION

A. Test ductwork for design pressure prior to applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Insulated Ducts Conveying Air Below Ambient Temperature:
   1. Provide insulation with vapor barrier jackets.
   2. Finish with tape and vapor barrier jacket.
   3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.

4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

C. Insulated Ducts Conveying Air Above Ambient Temperature:
   1. Provide with or without standard vapor barrier jacket.
   2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

D. Duct Liner Application:
   1. Adhere insulation with adhesive for 90 percent coverage.
   2. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.
   3. Seal and smooth joints. Seal and coat transverse joints.
   4. Seal liner surface penetrations with adhesive.
   5. Duct dimensions indicated are net inside dimensions required for airflow. Increase duct size to allow for insulation thickness.

END OF SECTION

SECTION 23 0900

INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 GENERAL

1.01 1 SECTION INCLUDES

A. 1 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

B. 2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

C. 3 PRODUCTS NOT FURNISHED OR INSTALLED UNDER BUT INTEGRATED WITH THE WORK OF THIS SECTION

D. 4 BUILDING AUTOMATION SYSTEM - GENERAL DESCRIPTION

E. 5 APPROVED CONTROL SYSTEM MANUFACTURES

F. 6 QUALITY ASSURANCE

G. 7 CODES AND STANDARDS

H. 8 SYSTEM PERFORMANCE

I. 9 SUBMITTAL REQUIREMENTS

J. 10 WARRANTY REQUIREMENTS

K. 11 SYSTEM MAINTENANCE AND REMOTE ANALYSIS

L. 12 OWNERSHIP OF PROPRIETARY MATERIAL

M. 13 DEFINITIONS

1.02 2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 23220 –Refrigeration Equipment
   1. Pressure Transmitters
   2. Temperature Transmitters

B. B. Section 23240 –Air Handling Equipment
   1. Field Sensors
   2. Field mounted Operator Interface Devices

1.03 3 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 23406 – Hydronic Piping
   1. Control Valves
   2. Flow Switches
   3. Temperature Sensor Wells and Sockets
   4. Hydronic Pressure Taps
   5. Hydronic Flow meters

B. B. Section 23500 – Refrigerant Piping
   1. Pressure and Temperature Sensor Wells and Sockets

C. C. Section 23611 – Ductwork Accessories
   1. Automatic Dampers
   2. Airflow Stations
   3. Terminal Unit Controls

1.04 4 PRODUCTS NOT FURNISHED OR INSTALLED UNDER BUT INTEGRATED WITH THE WORK OF THIS SECTION

A. Section 23700 –Heat generation Equipment
   1. Boiler Controls

B. B. Section 23720 –Refrigeration Equipment
   1. Chiller Controls

1.05 5 BUILDING AUTOMATION SYSTEM - GENERAL DESCRIPTION

A. Provide a new Building Automation System (BAS) to integrate and control all mechanical equipment associated with this project.
   1. The Building Automation System shall be as indicated on the drawings and described in these specifications. System must be fully integrated and coordinated with mechanical equipment DDC controllers furnished and installed in the equipment manufacturer's factory as specified in those sections. The intent of the BAS is to integrate all mechanical equipment into one system for global monitoring, control, and alarming associated with the building. It is the BAS manufacturer's responsibility to provide all the design, engineering, and field coordination required to ensure all equipment sequence of operations are met as specified and the designated BAS operators have the capability of managing the building mechanical system to ensure occupant comfort while maintaining energy efficiency.
   2. The BAS shall meet open standard protocol communication standards (As defined in System Communications Section) to ensure the system maintains "interoperability" to avoid proprietary arrangements that will make it difficult for the Owner to consider other BAS manufacturers in future projects.
   3. Direct Digital Control (DDC) technology shall be used to provide the functions necessary for control of mechanical systems and terminal devices on this project.
   4. The BAS shall accommodate simultaneous multiple user operation. Access to the control system data should be limited only by the security permissions of the operator role. Multiple users shall have access to all valid system data. An operator shall be able to log onto any workstation on the control system and have access to all appropriate data.

1.06 6 APPROVED CONTROL SYSTEM MANUFACTURES

A. Approved BAS Manufacturers
   1. Trane Tracer®– Basis of Design

1.07 7 QUALITY ASSURANCE

A. BAS Manufacturer Qualifications
   1. The BAS manufacturer shall have an established business office within 50.00 miles of the project site and must provide 24 hours/day, 7 days/week response in the event of a customer warranty or service call.
   2. The BAS Manufacturer shall have factory trained and certified personnel providing all engineering, service, startup, and commissioning field labor for the project from their local office location. BAS manufacturer shall be able to provide training certifications for all local office personnel upon request.
   3. The BAS shall be provided by a single manufacturer and this manufacturer's equipment must consist of operator workstation software, Web-based hardware/software, Open Standard Protocol hardware/software, Custom application Programming Language, Graphical Programming Language, Building Controllers, Custom Application Controllers, and Application Specific Controllers. All other products specified herein (i.e., sensors, valves, dampers, actuators, etc.) need not be manufactured by the BAS manufacturer listed in this specification.
   4. Independent representatives of BAS manufacturers are not acceptable. BAS vendor must be corporate owned entity of BAS manufacturer.

1.08 8 CODES AND STANDARDS

A. Codes and Standards: Meet requirements of all applicable standards and codes, except when more detailed or stringent requirements are indicated by the Contract Documents, including requirements of this Section.
   1. Underwriters Laboratories: Products shall be UL-916-PAZX listed.
   2. National Electrical Code -- NFPA 70.
   3. Federal Communications Commission -- Part J.
   4. ASHRAE/ANSI 135-2012 (BACnet) - (System Level Devices) - Building Controllers shall conform to the listed version of the BACnet specification in order to improve interoperability with various building system manufacturers' control systems and devices.

5. ASHRAE/ANSI 135-2012 (BACnet) - (Unit Level Devices) - Unit Controllers shall conform to the listed version of the BACnet specification in order to improve interoperability with various building system manufacturers' control systems and devices.

1.09 9 SYSTEM PERFORMANCE

A. Performance Standards. The BAS system shall conform to the following:
   1. Graphic Display. The system shall display a graphic with a minimum of 20 dynamic points. All current data shall be displayed within 10 seconds of the operator's request.
   2. Graphic Refresh. The system shall update all dynamic points with current data within 10 seconds.
   3. Object Command. The maximum time between the command of a binary object by the operator and the reaction by the device shall be 5 seconds. Analog objects shall start to adjust within 5 seconds.
   4. Object Scan. All changes of state and change of analog values shall be transmitted over the high-speed network such that any data used or displayed at a controller or workstation will be current within the prior 10 seconds.
   5. Alarm Response Time. The maximum time from when an object goes into alarm to when it is annunciated at the workstation shall not exceed 10 seconds.
   6. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 seconds. The Contractor shall be responsible for selecting execution times consistent with the mechanical process under control.
   7. Programmable Controllers shall be able to execute DDC PID control loops at a selectable frequency from at least once every 5 seconds. The controller shall scan and update the process value and output generated by this calculation at this same frequency.
   8. Multiple Alarm Annunciations. All workstations on the network shall receive alarms within 5 seconds of each other.
   9. Reporting Accuracy. Table 1 lists minimum acceptable reporting accuracies for all values reported by the specified system.

1.10 10 SUBMITTAL REQUIREMENTS

A. BAS manufacturer shall provide shop drawings and manufacturers' standard specification data sheets on all hardware and software being provided for this project. No work may begin on any segment of this project until the Engineer and Owner have reviewed submittals for conformity with the plan and specifications.
   1. Provide electronic submittal package in PDF format for review and approval.

B. B. Quantities of items submitted shall be reviewed by the Engineer and Owner. Such review shall not relieve the BAS manufacturer of furnishing quantities required based upon contract documents.

C. C. Provide the Engineer and Owner, any additional information or data which is deemed necessary to determine compliance with the specifications or which is deemed valuable in documenting and understanding the system to be installed.

D. D. All shop drawings shall be provided to the Owner electronically as .dwg or .dxf file formats once they have been approved and as-built drawings have been completed.

E. E. Submit the following within 90 days of contract award:
   1. A complete bill of materials of equipment to be used indicating quantities, manufacturers and model numbers.
   2. A schedule of all control valves including the valve size, pressure drop, model number (including pattern and connections), flow, CV, body pressure rating, and location.
   3. A schedule of all control dampers including damper size, pressure drop, manufacturer, and model number.
   4. Provide all manufacturers' technical cut sheets for major system components. When technical cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Include:
      a. Building Controllers

b. Custom Application Controllers
c. Application Specific Controllers
d. Operator Workstations
e. Portable Operator Terminals
f. Auxiliary Control Devices

5. 5. Provide proposed Building Automation System architectural diagram depicting various controller types, workstations, device locations, addresses, and communication cable requirements
6. 6. Provide detailed termination drawings showing all required field and factory terminations, as well as terminal tie-ins to DDC controls provided by mechanical equipment manufacturers. Terminal numbers shall be clearly labeled.
7. 7. Provide a sequence of operation for each controlled mechanical system and terminal end devices.
8. 8. Provide a BACnet Protocol Implementation Conformance Statement (PICS) for each BACnet system level device (i.e. Building Controller & Operator Workstations) type. This defines the points list for proper coordination of interoperability with other building systems if applicable for this project.

F. F. Project Record Documents: Upon completion of installation, submit three (3) copies of record (as-built) documents. The documents shall be submitted for approval prior to final completion and include:
1. Project Record Drawings - These shall be as-built versions of the submittal shop drawings. One set of electronic media including CAD .dwg and .pdf drawing files shall be provided.
2. Testing and Commissioning Reports and Checklists signed off by trained factory (equipment manufacturers) and field (BAS) commissioning personnel.
3. Operating and Maintenance (O & M) Manuals - These shall be as-built versions of the submittal product data. In addition to the information required for the submittals, Operating & Maintenance manual shall include:
a. Procedures for operating the BAS including logging on/off, alarm management, generation of reports, trends, overrides of computer control, modification of setpoints, and other interactive system requirements.
b. Explanation of how to design and install new points, new DDC controllers, and other BAS hardware.
c. Documentation, installation, and maintenance information for all third party hardware/software products provided including personal computers, printers, hubs, sensors, valves, etc.
d. Original issue media for all software provided, including operating systems, programming language, operator workstation software, and graphics software.
e. Licenses, Guarantee, and Warranty documents for all equipment and systems.

G. G. Training Manuals: The BAS manufacturer shall provide a course outline and copies of training manuals at least two weeks prior to the start of any corporate training class to be attended by the Owner.

1.11 11 WARRANTY REQUIREMENTS

A. Warrant all work as follows:
1. BAS system labor and materials shall be warranted free from defects for a period of twelve (12) months after final completion acceptance by the Owner. BAS failures during the warranty period shall be adjusted, repaired, or replaced at no charge to the Owner. The BAS manufacturer shall respond to the Owner's request for warranty service within 24 hours of the initiated call and will occur during normal business hours (8AM-5PM).
2. At the end of the final start-up/testing, if equipment and systems are operating satisfactorily to the Owner and Engineer, the Owner shall sign certificates certifying that the BAS is operational, and has been tested and accepted in accordance with the terms of this specification. The date of Owner's acceptance shall be the start of the warranty period.
3. To ensure that the owner will have the most current operating system provided by the manufacturer, the BAS manufacturer shall include licensing and labor costs to facilitate

software/firmware updates throughout the warranty period at no charge to the owner. These updates shall include upgrades for functional enhancements associated with the following: operator workstation software, project specific software, graphics, database, firmware updates, and all security related service packs. Written authorization by the Owner must be granted prior to the installation of these updates.

4. The BAS manufacturer shall provide a web-accessible Users Network for the proposed System and give the Owner free access to question/answer forum, user tips, upgrades, and training schedules for a one year period of time correlating with the warranty period.

1.12 12 SYSTEM MAINTENANCE AND REMOTE ANALYSIS

A. The BAS Manufacture shall provide Building Automation System remote support and system analysis for a period of 1 year (beginning the date of substantial completion).

B. The BAS manufacturer shall setup a secure remote connection for data collection, analytics and remote technical support for the HVAC systems included in this contract.
   1. Provide technician support during the warranty period to diagnose issues remotely through the secure remote connection.
   2. The building owner is responsible for providing adequate internet access.

C. C. Connectivity / Remote Access / Network Security
   1. Provide and maintain secure remote access to the facilities Building Automation System (BAS) or other building systems. Users accessing service through this connection shall not have access to the building owners network. Secure remote access to the BAS shall not require ANY inbound ports on a firewall to be “exposed” or “forwarded”.
   2. Secure remote access to the BAS shall be available anywhere, anytime, using a compatible client device (PC/tablet/phone)
   3. The Owner will provide up to Three (3) IP drops and IP addresses on the owners network to gain access to the internet. The BAS manufacture shall coordinate with the Owners IT team, verify the proposed system shall meet all network security requirements and any other network configuration information necessary to each control contractor for the purpose of configuring each Area Controller on the network. It shall be the responsibility of the BAS manufacture to coordinate with the owner for network connectivity.

D. D. The BAS Manufacture shall provide a professional analysis for the facility HVAC systems.
   1. The analysis shall consist of an evaluation of HVAC systems including charts and graphs which indicate both current building performance and opportunities for building and HVAC system performance improvement.

E. E. The following shall be provided after substantial completion of the project:
   1. Orientation meeting with the building owner’s representative to identify the HVAC systems that will be evaluated.
   2. System setup for data collection and analytics. BAS Manufacture to setup a secure remote data collection and analytics for identified systems.
   3. Assessment analysis shall be performed by trained personnel with relevant professional credentials in HVAC systems, energy management and building optimization methodologies.
   4. Consultation meeting with owner to review performance reports and improvement opportunities.

F. F. Do not assign or transfer maintenance service to agent or subcontractor without prior written consent of owner.

1.13 13 OWNERSHIP OF PROPRIETARY MATERIAL

A. Project specific software and documentation shall become the owner’s property upon project completion. This includes the following:
   1. Operator Graphic files
   2. As-built hardware design drawings
   3. Operating & Maintenance Manuals
   4. BAS System software database

1.14 14 DEFINITIONS

A. DDC: Direct digital control
B. I/O: Input/output.
C. MS/TP: Manager Subordinate / Token Passing.
D. POT: Portable Operator's Terminal.
E. PID: Proportional plus integral plus derivative.
F. RTD: Resistance temperature detector.
G. BAS/ATC: Building Automation System/Automatic Temperature Controls.

PART 2 PRODUCTS

2.01 1 SECTION INCLUDES

A. 1 MATERIALS:
B. 2 SYSTEM COMMUNICATION:
C. 3 OPERATOR INTERFACE:
D. 4 BUILDING CONTROLLER SOFTWARE:
E. 5 BUILDING / SYSTEM CONTROLLERS:
F. 6 ADVANCED APPLICATION CONTROLLERS
G. 7 APPLICATION SPECIFIC CONTROLLERS:
H. 8 INPUT/OUTPUT INTERFACE:
I. 9 POWER SUPPLIES:
J. 10 WIRING AND RACEWAYS:

2.02 2 MATERIALS:

A. Use new products that the manufacturer is currently manufacturing and that have been installed in a minimum of 25 installations. Do not use this installation as a product test site unless explicitly approved in writing by the owner or the owner's representative. Spare parts shall be available for at least five years after completion of this contract.

2.03 3 SYSTEM COMMUNICATION:

A. System Communications
   1. Each workstation, building controller, and equipment/plant controller communication interface shall utilize the BACnet™ protocol with an Ethernet (IEEE 802.3) or RS485 (EIA-485) physical interface and an appropriate data link technology as defined in ANSI®/ASHRAE® Standard 135-2012. (e.g. BACnet over IP, BACnet over IPv6, BACnet SC, BACnet over MS/TP).
   2. All system controllers shall be BTL listed as a BACnet Building Controller (B-BC) as defined in ANSI®/ASHRAE® Standard 135-2012.
   3. All documented status and control points, schedule, alarm, and data-log services or objects shall be available as standard object types as defined in ANSI®/ASHRAE® Standard 135-2012.
   4. Each System Controller shall communicate with a network of Custom Application and Application Specific Controllers utilizing one or more of the interfaces documented within Field Bus Communications below.
   5. All Operator Workstations (B-OWS, B-AWS) and Building Controllers (B-BC) shall support BACnet Secure Connect (BACnet SC), a secure and encrypted datalink layer specifically designed for those networks.

B. B. Field Bus Communications
   1. BACnet™

a. All equipment and plant controllers shall be BTL listed as a BACnet Application Specific Controller (B-ASC) or a BACnet Advanced Application Controller (B-AAC) as defined in ANSI®/ASHRAE® Standard 135-2012.
b. All communication shall conform to ANSI®/ASHRAE® Standard 135-2012.
c. System Controller shall function as a BACnet router to each unit controller providing a globally unique BACnet Device ID for all BACnet controllers within the system.
d. Communication between System Controller and equipment/plant controllers shall utilize BACnet MS/TP as defined in ANSI®/ASHRAE® Standard 135-2012.

2.04 4 OPERATOR INTERFACE:

A. Provide Building Operator Web Interface
1. Manufacturer shall provide a user interface with time-of-day schedules, data collection, dashboards, reports and building summary, system applications, and self-expiring timed overrides. Manufacturer shall provide a published user and applications guide(s) that detail the system application operation, configuration, setup and troubleshooting.
2. The building operator web interface shall be accessible via a web browser without requiring any “plug-ins” (i.e. JAVA Runtime Environment (JRE), Adobe Flash).
3. User Roles
   a. The system shall include pre-defined “roles” that allow a system administrator to quickly assign permissions to a user.
   b. User logon/logoff attempts shall be recorded.
   c. The system shall protect itself from unauthorized use by automatically logging off following the last keystroke. The delay time shall be user definable.
4. 4. On-Help and Training
   a. Provide a context sensitive, on line help system to assist the operator in operation and configuration of the system.
   b. On-line help shall be available for all system functions and shall provide the relevant data for each particular screen.
5. 5. Equipment and Application Pages
   a. The building operator web interface shall include standard pages for all equipment and applications. These pages shall allow an operator to obtain information relevant to the operation of the equipment and/or application, including:
      1) Animated Equipment Graphics for each major piece of equipment and floor plan in the System. This includes:
         (a) Each Chiller, Air Handler, VAV Terminal, Fan Coil, Boiler, and Cooling Tower. These graphics shall show all points dynamically as specified in the points list.
         (b) Animation capabilities shall include the ability to show a sequence of images reflecting the position of analog outputs, such as valve or damper positions. Graphics shall be capable of launching other web pages.
      2) 2) Alarms relevant to the equipment or application without requiring a user to navigate to an alarm page and perform a filter.
      3) 3) Historical Data (As defined in Trend Logs section of CONTROLLER SOFTWARE) for the equipment or application without requiring a user to navigate to a Data Log page and perform a filter.
6. 6. System Graphics. Building operator web interface shall be graphically based and shall include at least one graphic per piece of equipment or occupied zone, graphics for each chilled water and hot water system.
   a. Graphic imagery – graphics shall use 3D images for all standard and custom graphics. The only allowable exceptions will be photo images, maps, schematic drawings, and selected floor plans.
   b. Animation. Graphics shall be able to animate by displaying different Image lies for changed object status.
   c. Alarm Indication. Indicate areas or equipment in an alarm condition using color or other visual indicator.

7. 7. Graphics Library. Furnish a library of standard HVAC equipment such as chillers, air handlers, terminals, fan coils, unit ventilators, rooftop units, and VAV boxes, in 3-dimensional graphic depictions. The library shall be furnished in a file format compatible with the graphics generation package program.
8. 8. Manual Control and Override
    a. Point Control. Provide a method for a user to view, override, and edit if applicable, the status of any object and property in the system. The point status shall be available by menu, on graphics or through custom programs.
    b. Temporary Overrides. The user shall be able to perform a temporary override wherever an override is allowed, automatically removing the override after a specified period of time.
    c. Override Owners. The system shall convey to the user the owner of each override for all priorities that an override exists.
    d. Provide a specific icon to show timed override or operator override, when a point, unit controller or application has been overridden manually.
9. 9. Scheduling. - The scheduling application shall provide graphical representation of the day, week, month and exception events.
10. 10. Alarm/Event Notification
    a. Alarm/Event Log. The operator shall be able to view all logged system alarms/events from any building operator web interface.
        1) The operator shall be able to sort and filter alarms from events. Alarms shall be sorted in a minimum of 4 categories based on severity.
        2) The operator shall be able to acknowledge and add comments to alarms
        3) Alarm/event messages shall use full language, easily recognized descriptors.
    b. b. Alarm Suppression. Alarms shall be able to be suppressed based on load/source relationships to present the likely root cause to the building operator as described in ASHRAE Guideline 36. Load/Source relationships shall be configurable by the user through a web interface.
11. 11. Reports and Logs.
    a. The building operator web interface shall provide a reporting package that allows the operator to select reports.
    b. The building operator web interface shall provide the ability to schedule reports to run at specified intervals of time.
    c. The following standard reports shall be available without requiring a user to manually configure the report:
        1) All Points in Alarm Report: Provide an on demand report showing all current alarms.
        2) All Points in Override Report: Provide an on demand report showing all overrides in effect.
        3) Commissioning Report: Provide a one-time report that lists all equipment with the unit configuration and present operation.
        4) Points report: Provide a report that lists the current value of all points
    d. d. The controls vendor shall provide a hardening report that summarizes the port configuration details to ensure sites have not been exposed to the Internet in alignment with Cyber Security best practices.

B. B. Provide Mobile App Interface
1. Provide mobile (smart phone or tablet) interfaces to the building automation system, compatible with iOS and Android™ operating systems.
2. Controls manufacturer shall provide a phone/tablet interface with the ability to view/override status and setpoints, view/change schedules, view/acknowledge/comment on alarms, and view graphics for all spaces and equipment.
3. This phone/tablet interface shall resize itself appropriately for the size of the interface (i.e. no "pinching and zooming" required).
4. This phone/tablet interface shall function remotely from the facility while following IT security best practices (e.g. no ports exposed to the internet).

5. The operator interface shall support system access on a mobile device via a mobile app to:
    a. Alarm log
    b. System Status
    c. Equipment status
    d. Space Status
    e. Standard Equipment graphics
    f. Override set points
    g. Override occupancy
    h. Acknowledge Alarms
    i. Add Comment(s) to Alarms

2.05 5 BUILDING CONTROLLER SOFTWARE:

A. Manufacturer shall provide standard applications to deliver HVAC system control. Standard applications include Time of Day Scheduling with Optimal Start/Stop, VAV Air Systems Control, Chiller Plant Control, Historical Trend Logs and Trim and Respond. Manufacturer shall provide system optimization strategies for functions such as fan pressure optimization and ventilation optimization.

B. Furnish the following applications software for building and energy management. All software applications shall reside and run in the system controllers. Editing of applications shall occur at the building operator interface.
    1. Trend Logs
        a. The system shall harvest trend logs for defined key measurements for each controlled HVAC device and HVAC application. Trend logs shall be captured for a minimum of 5 key operating points for each piece of HVAC equipment and HVAC application and stored for no less than 1 year at 15-minute intervals. Data Logs shall be capable of being configured on an interval or change of value basis.
            1) Fan Coil / Cabinet Unit Heater / Unit Ventilator / WSHP Unit
                (a) Discharge Air Temperature
                (b) Space Temperature Active
                (c) Space Temperature Setpoint Active
                (d) Air Flow Setpoint Active
                (e) Discharge Air Flow
            2) 2) Air Handling Unit/Rooftop (VAV)
                (a) Discharge Air Temperature
                (b) Discharge Air Temperature Setpoint Active
                (c) Space Temperature Active
                (d) Cooling Capacity Status
                (e) Discharge Air Flow
            3) 3) Air Handling Unit/Rooftop (CV)
                (a) Discharge Air Temperature
                (b) Space Temperature Active
                (c) Space Temperature Setpoint Active
                (d) Cooling Capacity Status
                (e) Heating Capacity Primary Status
                (f) Outdoor Air Damper Position
            4) 4) VAV Terminal Unit
                (a) Discharge Air Temperature
                (b) Space Temperature Active
                (c) Space Temperature Setpoint Active
                (d) Air Flow Setpoint Active
                (e) Discharge Air Flow
            5) 5) Variable Air System (VAS)
                (a) VAS Operating Mode

(b) Duct Static Optimization Duct Static Setpoint
(c) Duct Pressure Optimization Maximum
(d) Space Temperature Average
(e) Ventilation Optimization Air Setpoint

2.06 6 BUILDING / SYSTEM CONTROLLERS:

A. There shall be one or more independent, standalone microprocessor based System Controllers to manage the global strategies described in CONTROLLER SOFTWARE section.
   1. The controller shall provide a USB communications port for connection to a PC.
   2. The operating system of the Controller shall manage the input and output communications signals to allow distributed controllers to share real and virtual point information and allow central monitoring and alarms.
   3. All System Controllers shall have a real time clock and shall be able to accept a BACnet time synchronization command for automatic time synchronization.
   4. Data shall be shared between networked System Controllers.
   5. Serviceability – The System Controller shall have a display on the main board that indicates the current operating mode of the controller.

B. B. Controls manufacturer shall provide secure remote access to the Building Automation System (BAS). Secure remote access shall not require IP ports to be "exposed" (i.e. port-forwarded or external public IP addresses) to the Internet. Controls manufacturer shall update secure remote access software as necessary to follow cyber security best practices and respond to cyber security events.

2.07 7 ADVANCED APPLICATION CONTROLLERS

A. Advance Application Controllers shall be used to control all equipment or applications of medium and high complexity, including but not limited to Air Handlers, Boiler Plants and Chiller Plants.

B. The Advanced Application Controller shall be capable of operating as a stand-alone controller or as a member of a Building Automation System (BAS).

C. When the Advanced Application Controller is operating as a member of a Building Automation System (BAS), the application controller shall operate as follows:
   1. Application Controller will receive operation mode commands from the BAS network controller. The BAS commands shall include but not be limited to the follow: Occupied Heat/Cool, Unoccupied Heat/Cool, Morning Warm-up, / Pre-cool, Occupied Bypass).
   2. Application Controller will provide equipment status parameters to the BAS through BACnet communication.
   3. Application Controller will operate as a stand-alone controller in the event of communication failure with the BAS.
   4. In case of communications failure, stand-alone operation shall use default values or last known values for remote sensors read over the network such as outdoor air temperature.

D. D. For Stand-Alone Operation of Advanced Application Controllers:
   1. Shall operate a schedule in a standalone application using a Real Time Clock with a 7 day power backup.
      a. The Controller shall have a built in schedule (assessable with or without a display)
      b. Support will be for at least 3 schedules with up to 10 events for each day of the week.
      c. Each of the 3 schedules can be Analog, Binary or Multi-State
      d. The controller shall support a minimum of 25 exceptions each with up to 10 events.

E. E. For ease of troubleshooting, the Controller shall support data trend logging.
   1. Trends shall be capable of being collected at a minimum sample rate of once every second
   2. Shall be capable of trending all BACnet points used by controller
   3. Trends shall be capable of being scheduled or triggered.
   4. With a minimum of 20,000 trending points total on a controller

F. F. To meet the sequence of operation for each application, the Controller shall use library programs provided by the controller manufacturer that are either factory loaded or downloaded with service tool to the controller.

G. G. Environment. Controller hardware shall be suitable for the anticipated ambient conditions.
   1. Operating conditions:
      a. Temperature: -40°F to 158°F (-40°C to 70°C)
      b. Relative Humidity: Between 5% to 100% RH (non-condensing)
   2. 2. Controllers used indoors shall be mounted in a NEMA 1 enclosure at a minimum.
   3. 3. Controllers used outdoors and/or in wet ambient shall be mounted within NEMA 4 type waterproof enclosures, and shall be rated for operation at -40° F to 158° F [-40° C to 70° C].

H. H. Input/Output: The Controller shall have on board or through expansion module all I/O capable of performing all functionality needed for the application. Controls provided by the equipment manufacture must supply the required I/O for the equipment. In addition other controls must meet the following requirements:
   1. Shall support flexibility in valve type, the controllers shall be capable of supporting the following valve control types: 0-10VDC, 0-5VDC, 4-20mA, 24VAC - 2 position.
   2. Shall support flexibility in sensor type, the Controller shall be capable of reading sensor input ranges of 0 to10V, 0 to 20mA, 50ms or longer pulses, 200 to 20Kohm and RTD input.
   3. Shall support flexibility in sensor type, all Analog Outputs shall have the additional capability of being programmed to operate as Universal Inputs or Pulse Width Modulation Outputs.
   4. Shall support flexibility in sensor type, the Controller and/or expansion modules shall support dry and wetted (24VAC) binary inputs.
   5. The controller shall support pulse accumulator for connecting devices like energy meters.
   6. In order to support a wide range of devices, the Controller's binary output shall be able to drive at least 10VA each.
   7. Any unused I/O that is not needed for the functionality of the equipment shall be available to be used by custom programs on the Controller and by any other controller on the network.
   8. The Controller shall provide 24VAC and 24VDC power terminals sensors and other devices required.
   9. The Controller shall provide a dedicated static pressure input.

I. I. Input/Output Expandability – The Controller shall provide the following functionality in order to meet current and future application needs:
   1. For the application flexibility, the Controller shall be capable of expanding to a total of at least 100 hardware I/O terminations.
   2. Expansion I/O can be mounted up to 650 ft. (200m) from control.
   3. To keep BACnet MS/TP network traffic to a minimum, expansion I/O must communicate via an internal controller communication bus (point expansion via the BACnet MS/TP network is not allowed).

J. J. Serviceability – The Controller shall provide the following in order to improve serviceability of the Controller.
   1. Diagnostic LEDs for power/normal operation/status, BACnet communications, sensor bus communications, and binary outputs. All wiring connections shall be clearly labeled and made to be field removable.
   2. Binary and analog inputs and outputs shall use removable connectors or be connected to terminal strip external to the control box.
   3. Software service tool connection through the following methods: direct cable connection to the Controller, connection through another controller on BACnet link.
   4. For safety purposes, the controller shall be capable of being powered by a portable computer's USB port for the purposes of configuration, programming and testing programs so that this work can be accomplished with the power off to the associated equipment.

5. The Controller software tool service port shall utilize standard off-the-shelf USB printer cable.
6. Capabilities to temporarily override the BACnet point values with built-in time expiration in the Controller.
7. To aid in service replacement, the Controller shall easily attached to standard DIN rail mounting.
8. For future expansion, the Controller shall be capable of adding sequence of operation programming utilizing service tools software with a graphical programming interface (editing or programming in line code is not permissible).
9. To aid in service replacement, the Controller shall allow for setting its BACnet address via controller mounted rotary switches that correspond to the numerical value of the address. (DIP switch methodologies are not allowed). Setting of the address shall be accomplished without the need of a service tool or power applied to the controller.
10. Controller data shall be maintained through a power failure.

K. K. Software Retention: All Controller operating parameters, setpoints, BIOS, and sequence of operation code must be stored in non-volatile memory in order to maintain such information for months without power.

L. L. Controller must meet the following Agency Compliance:
1. UL916 PAZX, Open Energy Management Equipment
2. UL94-5V, Flammability
3. FCC Part 15, Subpart B, Class B Limit
4. BACnet Testing Laboratory (BTL) listed as BACnet Advanced Application Controller (B-AAC)

2.08 8 APPLICATION SPECIFIC CONTROLLERS:

A. General Description
1. Application Specific Controllers (ASC) shall be microprocessor-based DDC controllers which, through hardware or firmware design, control specified equipment. They are not user programmable, but are customized for operation within the confines of the equipment they are designed to serve.
2. Zone Controllers are controllers that operate equipment that control the space temperature of single zone. Examples are controllers for VAV, Fan coil, Blower Coils, Unit Ventilators, Heat Pumps, and Water Source Heat Pumps.

B. B. The Application Specific Controller shall be capable of operating as a stand-alone controller or as a member of a Building Automation System (BAS).

C. C. When the Application Specific Controller is operating as a member of a Building Automation System (BAS), the application controller shall operate as follows:
1. Application Controller will receive operation mode commands from the BAS network controller. The BAS commands shall include but not be limited to the follow: Occupied Heat/Cool, Unoccupied Heat/Cool, Morning Warm-up, / Pre-cool, Occupied Bypass).
2. Application Controller will provide equipment status parameters to the BAS through BACnet communication.
3. Application Controller will operate as a stand-alone controller in the event of communication failure with the BAS.
4. In case of communications failure stand-alone operation shall use default values or last known values for remote sensors read over the network such as outdoor air temperature.

D. D. Stand-Alone Operation: Each piece of equipment specified in section “A” shall be controlled by a single controller and provide stand-alone control in the event that a BAS is not present.

E. E. Software
1. To meet the sequence of operation for each zone control, the controller shall use programs developed and tested by the controller manufacturer that are either factory loaded or downloaded with service tool to the controller.

2. For controlling ancillary devices and for flexibility to change the sequence of operation in the future, the controller shall be capable running custom programs written in a graphical programming language.

F. F. Environment: Controller hardware shall be suitable for the anticipated ambient conditions.
   1. Storage: -55° to 203° F (-48° to 95° C) and 5 to 95% Rh, non-condensing.
   2. Operating: -40° to 158° F (-40 to 70° C) and 5 to 95% Rh, non-condensing.
   3. Controllers used indoors shall be mounted in a NEMA 1 enclosure at a minimum.
   4. Controllers used outdoors and/or in wet ambient shall be mounted within NEMA 4 type waterproof enclosures, and shall be rated for operation at -40° to 158° F [-40° to 70° C].

G. G. Input/Output:
   1. For flexibility in selection and replacement of valves, the controllers shall be capable of supporting all of the following valve control types 0-10VDC, 0-5VDC, 4-20mA, 24VAC floating point, 24VAC - 2 position (Normally Open or Normally Closed).
   2. For flexibility in selection and replacement of sensors, the controllers shall be capable of reading sensor input ranges of 0 to10V, 0 to 20mA, pulse counts, and 200 to 20Kohm.
   3. For flexibility in selection and replacement of binary devices, the controller shall support dry and wetted (24VAC) binary inputs.
   4. For flexibility in selection and replacement devices, the controller's shall have binary output which are able to drive at least 12VA each.
   5. For flexibility in selection and replacement of motors, the controller shall be capable of outputting 24VAC (binary output), DC voltage (0 to 10VDC minimum range) and PWM (in the 80 to 100 Hz range).
   6. For future needs, any I/O that is unused by functionality of equipment control shall be available to be used by custom program on the controller and by another controller on the network.
   7. For future expansion and flexibility, the controller shall have either on board or through expansion, 20 hardware input/output points. Expansion points must communicate with the controller via an internal communications bus. Expansion points must be capable of being mounted up to 650ft. (200 m) from the controller. Expansion points that require the BACnet network for communication with the controller are not allowed.

H. H. Serviceability – The controller shall provide the following in order to improve serviceability of the controller.
   1. Diagnostic LEDs shall indicate correct operation or failures/faults for all of the following: power, sensors, BACnet communications, and I/O communications bus.
   2. All binary output shall have LED's indicating the output state.
   3. All wiring connectors shall removable without the use of a tool.
   4. Software service tool connection through all of the following methods: direct cable connection to the controller, connection through another controller on BACnet link
   5. For safety purposes, the controller shall be capable of being powered by a portable computer for the purposes of configuration, programming, and testing programs so that this work can be accomplished with the power off to the equipment.
   6. Capabilities to temporarily override of BACnet point values with built-in time expiration in the controller.
   7. BACnet MAC Address shall be set using decimal (0-9) based rotary switches.
      a. Configuration change shall not be made in a programming environment, but rather by a configuration page utilizing dropdown list, check boxes, and numeric boxes.
   8. 8. For ease of troubleshooting, the Controller shall support BACnet data trend logging.
      a. With a minimum of 20,000 trending points total on controller
      b. Trends shall be capable of being collected at a minimum sample rate of once every second.
      c. Shall be capable of trending all BACnet points used by controller
      d. Trends shall be capable of being scheduled or triggered

I. I. Software Retention: All Zone Controller operating parameters, setpoints, BIOS, and sequence of operation code must be stored in non-volatile memory in order to maintain such information for months without power.

J. J. Application controller shall meet the following Agency Compliance:
   1. UL916 PAZX, Open Energy Management Equipment
   2. UL94-5V, Flammability
   3. FCC Part 15, Subpart B, Class B Limit
   4. BACnet Testing Laboratory (BTL) listed as BACnet Application Specific Controller (B-ASC)

2.09 9 INPUT/OUTPUT INTERFACE:

A. Hardwired inputs and outputs may tie into the system through building, custom application, or ASCs.

B. All input points and output points shall be protected such that shorting of the point to itself, to another point, or to ground will cause no damage to the controller. All input and output points shall be protected from voltage up to 24V of any duration, such that contact with this voltage will cause no damage to the controller.

C. Binary inputs shall allow the monitoring of on/off signals from remote devices. The binary inputs shall provide a wetting current of at least 12 mA to be compatible with commonly available control devices and shall be protected against the effects of contact bounce and noise. Binary inputs shall sense “dry contact” closure without external power (other than that provided by the controller) being applied.

D. Pulse accumulation input objects. This type of object shall conform to all the requirements of binary input objects and also accept up to 10 pulses per second for pulse accumulation.

E. Analog inputs shall allow the monitoring of low voltage (0 to 10 VDC), current (4 to 20 mA), or resistance signals (thermistor, RTD). Analog inputs shall be compatible with and field configurable to commonly available sensing devices.

F. Binary outputs shall provide for on/off operation or a pulsed low-voltage signal for pulse width modulation control. Binary outputs on building and custom application controllers shall have status lights. Outputs shall be selectable for either normally open or normally closed operation.

G. Analog outputs shall provide a modulating signal for the control of end devices. Outputs shall provide either a 0 to 10VDC or a 4 to 20 mA signal as required to provide proper control of the output device. Analog outputs shall not exhibit a drift of greater than 0.4% of range per year.

H. Tri-State Outputs. Provide tri-state outputs (two coordinated binary outputs) for control of three-point floating type electronic actuators without feedback. Use of three-point floating devices shall be limited to zone control and terminal unit control applications (VAV terminal units, duct-mounted heating coils, zone dampers, radiation, etc.). Control algorithms shall run the zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.

I. System Object Capacity. The system size shall be expandable to at least twice the number of input/ output objects required for this project. Additional controllers (along with associated devices and wiring) shall be all that is necessary to achieve this capacity requirement. The operator interfaces installed for this project shall not require any hardware additions or software revisions in order to expand the system.

2.10 10 POWER SUPPLIES:

A. Control transformers shall be UL listed. Furnish Class 2 current-limiting type or furnish overcurrent protection in both primary and secondary circuits for Class 2 service in accordance with NEC requirements. Limit connected loads to 80% of rated capacity.
   1. DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100-microsecond response time for 50% load changes. Unit shall have built-in overvoltage and overcurrent protection and shall be able to withstand a 150% current overload for at least three seconds without trip-out or failure.

a. Unit shall operate between 0°C and 50°C (32°F and 120°F). EM/RF shall meet FCC Class B and VDE 0871 for Class B and MIL-STD 810C for shock and vibration.
b. Line voltage units shall be UL recognized and CSA approved.

2.11 11 WIRING AND RACEWAYS:

A. General: Provide copper wiring, plenum cable, and raceways as specified in the applicable sections of this specification.

B. All insulated wire to be copper conductors, UL labeled for 90°C (194°F) minimum service.

C. Fiber Optic Cable. Optical cables shall be duplex 900 mm tight-buffer construction designed for intra-building environments. The sheath shall be UL Listed OFNP in accordance with NEC Article 770. The optical fiber shall meet the requirements of FDDI, ANSI X3T9.5 PMD for 62.5/125 µm.

PART 3 EXECUTION

3.01 1 SECTION INCLUDES

A. 1 EXAMINATION:

B. 2 PROTECTION:

C. 3 COORDINATION:

D. 4 GENERAL WORKMANSHIP:

E. 5 FIELD QUALITY CONTROL:

F. 6 COMMUNICATION WIRING:

G. 7 FIBER OPTIC CABLE:

H. 8 INSTALLATION OF SENSORS:

I. 9 FLOW SWITCH INSTALLATION:

J. 10 WARNING LABELS:

K. 11 IDENTIFICATION OF HARDWARE AND WIRING:

L. 12 CONTROLLERS:

M. 13 PROGRAMMING:

N. 14 CONTROL SYSTEM CHECKOUT AND TESTING:

O. 15 CLEANING:

P. 16 TRAINING:

3.02 2 EXAMINATION:

A. The Contract Documents shall be thoroughly examined for coordination of control devices, their installation, wiring, and commissioning. Coordinate and review mechanical equipment specifications, locations, and identify any discrepancies, conflicts, or omissions that shall be reported to the Architect/Engineer for resolution before rough-in work is started.

B. The BAS manufacturer shall inspect the jobsite in order to verify that control equipment can be installed as required, and any dis¬crepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started.

3.03 3 PROTECTION:

A. The BAS installation contractor shall protect all work and material from damage by their work or personnel, and shall be liable for all damage thus caused.

B. The BAS manufacturer shall be responsible for their work and equipment until final inspection, testing, and acceptance. The BAS installing contractor shall protect their work against theft or damage, and shall carefully store material and equipment received on site that is not immediately installed. The Contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.04 4 COORDINATION:

A. Site
   1. Where the mechanical work will be installed in close proximity to, or will interfere with, work of other trades, the contractor shall assist in working out space conditions to make a satisfactory adjustment. If the contractor installs his/her work before coordinating with other trades, so as to cause any interference with work of other trades, the contractor shall make the necessary changes in his/her work to correct the condition without extra charge.
   2. Coordinate and schedule work with all other work in the same area, or with work that is dependent upon other work, to facilitate mutual progress.

B. B. Submittals. Refer to the “Submittals,” section of this specification for requirements.

C. C. Test and Balance
   1. The contractor shall furnish a single set of all tools necessary to interface to the control system for test and balance purposes.
   2. The contractor shall provide training in the use of these tools. This training will be planned for a duration of 4 hours.
   3. In addition, the contractor shall provide a qualified technician to assist in the test and balance process, until the first 20 terminal units are balanced.
   4. The tools used during the test and balance process shall be returned to the contractor at the completion of the testing and balancing.

D. D. Life Safety
   1. Duct smoke detectors required for air handler shutdown shall be supplied under Section 26100 of this specification. The contractor shall interlock smoke detectors to air handlers for shutdown as described in the Sequences of Operation for this project.
   2. Smoke dampers and actuators required for duct smoke isolation are provided under Section 26100. The contractor shall interlock these dampers to the air handlers as described in the Sequences of Operation for this project as applicable.
   3. Fire/smoke dampers and actuators required for fire rated walls are provided under another Section 26100. Control of these dampers shall be by 26100

E. E. Coordination with Controls Specified in Other Sections or Divisions. Other sections and/or divisions of this specification include controls and control devices that are to be part of or interfaced to the control system specified in this section. These controls shall be integrated into the system and coordinated by the contractor as follows:
   1. All communication media and equipment shall be provided as specified in the “Communication” section of this specification.
   2. Each supplier of a controls product is responsible for the configuration, programming, start-up, and testing of that product to meet the sequences of operation described in this section.
   3. The Contractor shall coordinate and resolve any incompatibility issues that arise between the control products provided under this section and those provided under other sections or divisions of this specification.

3.05 5 GENERAL WORKMANSHIP:

A. Install equipment, piping, wiring/conduit, parallel to building lines (i.e. horizontal, vertical, and parallel to walls) wherever possible.

B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.

C. Install all equipment in readily accessible locations as defined by National Electric Code (NEC). Control panels shall be attached to structural walls or properly supported in a free-standing configuration, unless mounted in equipment enclosure specifically designed for that purpose. Panels shall be mounted to allow for unobstructed access for service.

D. Verify integrity of all control wiring to ensure continuity and freedom from shorts and grounds prior to commencing the startup and commissioning procedures.

E. All control device installation and wiring shall comply with Contract Documents, acceptable industry specifications, and industry standards for performance, reliability, and compatibility.

Installation and wiring shall be executed in strict adherence to local codes and standard practices referenced in Contract Documents.

3.06 6 FIELD QUALITY CONTROL:

A. All work, materials, and equipment shall comply with the rules and regulations of applicable local, state, and federal codes and ordinances as identified in Contract Documents.

B. BAS manufacturer shall continually monitor the field installation for building code compliance and quality of workmanship. All visible piping and or wiring runs shall be installed parallel to building lines and properly supported.

C. BAS installing Contractor(s) shall arrange for field inspections by local and/or state authorities having jurisdiction over the work.

3.07 7 COMMUNICATION WIRING:

A. All cabling shall be installed in a neat and workmanlike manner. Follow manufacturer's installation recommendations for all communication cabling.

B. Do not install communication wiring in raceway and enclosures containing Class 1 or other Class 2 wiring.

C. Maximum pulling, tension, and bend radius for cable installation, as specified by the cable manufacturer shall not be exceeded during installation.

D. Contractor shall verify the integrity of the entire network following cable installation. Use appropriate test measures for each particular cable.

E. When a cable enters or exits a building, a lighting arrestor must be installed between the line and ground.

F. All runs of communication wiring shall be unspliced length when the length is commercially available.

G. All communication wiring shall be labeled to indicate origin and destination.

3.08 8 FIBER OPTIC CABLE:

A. All cabling shall be installed in a neat and workmanlike manner. Minimum cable and unjacketed fiber bend radii as specified by cable manufacturer shall be maintained.

B. Maximum pulling tensions as specified by the cable manufacturer shall not be exceeded during installation. Post installation residual cable tension shall be within cable manufacturer's specifications.

C. Fiber optic cabinets, hardware, and cable entering the cabinet shall be installed in accordance with manufacturers' instructions. Minimum cable and unjacketed fiber bend radii as specified by cable manufacturer shall be maintained.

3.09 9 INSTALLATION OF SENSORS:

A. Sensors required for mechanical equipment operation shall be factory installed and wired as specified in mechanical equipment specifications. BAS manufacturer shall be responsible for coordinating these control devices and ensuring the sequence of operations will be met. Installation and wiring shall be in accordance with the BAS manufacturer's recommendations.

B. Sensors that require field mounting shall meet the BAS manufacturer's recommendations and be coordinated with the mechanical equipment they will be associated.

C. Mount sensors rigidly and adequately for the environment the sensor will operate.

D. Room temperature sensors shall be installed on concealed junction boxes properly supported by the block wall framing. For installation in dry wall ceilings, the low voltage sensor wiring can be installed exposed and must meet applicable National and Local Electrical Codes.

E. All wires attached to wall mounted sensors shall be sealed off to prevent air from transmitting in the associated conduit and affecting the room sensor readings.

F. Install duct static pressure tap with tube end facing directly down-stream of air flow.

G. Install space static pressure sensor with static sensing probe applicable for space installation where applicable.

H. Sensors used in mixing plenums, and hot and cold decks shall be of the averaging type. Averaging sensors shall be installed in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip.

I. All pipe mounted temperature sensors shall be installed in matched thermowells. Install all liquid temperature sensors with heat conducting fluid in thermal wells for adequate thermal conductance.

J. Wiring for space sensors shall be concealed in building drywall. EMT conduit is acceptable within mechanical equipment and service rooms.

K. Install outdoor air temperature sensors on north wall complete with sun shield at manufacturer's recommended location and coordinated with Engineer.

3.10 10 FLOW SWITCH INSTALLATION:

A. Coordinate installation of flow switch with Mechanical Contractor who will be responsible for installing a thread o let in steel piping applications. Copper pipe applications will require the use CxCxF Tee, and no pipe extensions or substitutions will be allowed.

B. Mount a minimum of 5 pipe diameters upstream and 5 pipe diameters downstream, or two feet, whichever is greater, from pipe fittings and other inline potential obstructions.

C. Install in accordance with manufacturers' instructions, which will require proper flow direction, horizontal alignment with flow switch mounting on the top of pipe.

3.11 11 WARNING LABELS:

A. Permanent warning labels shall be affixed to all equipment that can be automatically started by the BAS system.

B. Permanent warning labels shall be affixed to all motor starters and all control panels that are connected to multiple power sources utilizing separate disconnects.

3.12 12 IDENTIFICATION OF HARDWARE AND WIRING:

A. All field wiring and cabling, including that within factory mounted, and wired control panels and devices for mechanical equipment, shall be labeled at each end within 2" of termination with a cable identifier and other descriptive information for troubleshooting, maintenance, and service purposes. BAS manufacturer to coordinate this labeling requirement with mechanical equipment manufacturer as it relates to controls.

B. Permanently label or code each point of field terminal strips to show the instrument or item served and correlate them to the BAS design drawings.

C. Identify control panels with minimum 1-cm letters on laminated plastic nameplates.

D. Identifiers shall match record documents. All plug-in components shall be labeled such that removal of the component does not remove the label.

3.13 13 CONTROLLERS:

A. Provide a separate DDC Controller for individual HVAC mechanical equipment. BAS manufacturer shall furnish and coordinate DDC controllers and control devices and ensure that installation and wiring adhere to BAS manufacturer's design recommendations. For those mechanical equipment units that do not have factory installed controls specified, the BAS manufacturer shall field mount controls and coordinate all installation and termination information to ensure the specified sequence of operations are met.

B. Building Controllers and Custom Application Controllers shall be selected to provide a minimum of 15% spare I/O point capacity for each point type (analog or digital) found at each location. If input points are not universal, 15% of each type is required. If outputs are not universal, 15% of each type is required. A minimum of one spare is required for each type of point used in each controller.

1. Future use of spare I/O point capacity shall require providing the field instrument and control device, field wiring, engineering, programming, and commissioning. No additional Controller boards or point modules shall be required to implement use of these spare points.

3.14 14 PROGRAMMING:

A. Provide sufficient internal memory for all controllers to ensure specified sequence of operations, alarming, trending, and reporting requirements are achieved. BAS manufacturer shall provide a minimum of 25% spare memory capacity for future use.

B. Point Naming: System point names shall be modular in design, allowing easy operator interface without the use of a written point index.

C. Software Programming
   1. Provide programming for individual mechanical systems to achieve all aspects of the sequence of operation specified. It is the BAS manufacturer's responsibility to ensure all mechanical equipment functions and operates as specified in sequence of operations. Provide sufficient programming comments in controller application software to clearly describe each section of the program. The comment statements shall reflect the language used in the sequence of operations.

D. D. BAS Operator's Interface
   1. When Operator Workstation is specified, provide color graphics for each piece of mechanical equipment depicting sufficient I/O to monitor and troubleshoot operation. Operator color graphics shall include Chiller Plant, Cooling Tower System, Boiler Plant, Air Handling Units, Rooftop Units, VAV Terminal Boxes, Fan Coil Units, Unit Ventilators, Heat Exchangers, Exhaust Fans, etc. These standard graphics shall depict all points dynamically as specified in the points list and/or indicated in sequence of operation.
   2. The BAS manufacturer shall provide all the labor necessary to install, initialize, start up, and trouble-shoot all operator interface software and their functions as described in this section. This includes any operating system software, the operator interface data base, and any third party software installation and integration required for successful operation of the operator interface.
   3. As part of this execution phase, the BAS manufacturer shall perform a complete test of the operator interface.

3.15 15 CONTROL SYSTEM CHECKOUT AND TESTING:

A. Start-up testing. All testing in this section shall be performed by the contractor and shall make up part of the necessary verification of an operating control system. This testing shall be completed before the owner's representative is notified of the system demonstration.
   1. The contractor shall furnish all labor and test apparatus required to calibrate and prepare for service all of the instruments, controls, and accessory equipment furnished under this specification.
   2. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.
   3. Enable the control systems and verify calibration of all input devices individually. Perform calibration procedures according to manufacturer's recommendations.
   4. Verify all binary output devices (relays, solenoid valves, two-position actuators and control valves, magnetic starter, etc.) operate properly and normal positions are correct.
   5. Verify all analog output devices (I/Ps, actuators, etc) are functional, that startand span are correct, and that direection and normal positions are correct. The contractor shall check all control valves and autoatic dampers to ensure proper action and closure. The contractor shall make any necessary adjustments to valve stem and damper blade travel.
   6. Verify the system operation adheres to the sequences of operation. Simulate and observe all modes of operation by overriding and varying inputs and schedules. Tune all DDC loops and optimal start/stop routimes.
   7. Alarms and Interlocks

a. Check each alarm separately by including an appropriate signal at a value that will trip the alarm.
b. Interlocks shall be tripped using field contacts to check the logic, as well as to ensure that the fail-safe condition for all actuators is in the proper direction.
c. Interlock actions shall be tested by simulating alarm conditions to check the initiating value of the variable and interlock action.

3.16 16 CLEANING:

A. The BAS manufacturer's installing contractor(s) shall clean up all debris resulting from their installation activities on a daily basis. The installation contractors shall remove all cartons, containers, crates, etc. under his control as soon as their contents have been removed. Waste shall be collected and placed in a location designated by the Owner, Construction Manager, General Contractor, and/or Mechanical Contractor.

B. At the completion of work in any area, the installation contractor shall clean all of their work, equipment, etc., making it free from dust, dirt and debris.

C. At the completion of work, all equipment furnished under this Section shall be checked for paint damage. Any factory finished paint that has been damaged shall be repaired to match the adjacent areas. Any metal cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

3.17 17 TRAINING:

A. Provide minimum of (4) hours of operator training throughout the contract period. The training will be provided for personnel designated by the Owner.

B. These objectives will be divided into logical groupings; participants may attend one or more of these, depending on level of knowledge required:
1. Day-to-day BAS Operators
2. BAS Troubleshooting & Maintenance

END OF SECTION

SECTION 23 2113
HYDRONIC PIPING

PART 2 PRODUCTS

1.01 HYDRONIC SYSTEM REQUIREMENTS

A. Comply with ASME B31.9 and applicable federal, state, and local regulations.

B. Piping: Provide piping, fittings, hangers, and supports as required, as indicated, and as follows:
   1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
   2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
   3. Grooved mechanical joints may be used in accessible locations only.
      a. Accessible locations include those exposed on interior of building, in pipe chases, and in mechanical rooms, aboveground outdoors, and as approved by Design Professional.
      b. Use rigid joints unless otherwise indicated.
   4. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.

C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, unions, or grooved couplings to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.

D. Valves: Provide valves where indicated:

1.02 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.

1.03 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

A. Unions for Pipe of 2 Inches (50 mm, DN) and Less:

B. Flanges for Pipe 2 Inches (50 mm, DN) and Greater:

C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
   1. Dimensions and Testing: In accordance with AWWA C606.
   2. Mechanical Couplings: Comply with ASTM F1476.
   3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
   4. When pipe is field grooved, provide coupling manufacturer's grooving tools.

END OF SECTION

SECTION 23 2300
REFRIGERANT PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping.

B. Refrigerant.

C. Moisture and liquid indicators.

D. Valves.

E. Strainers.

F. Filter-driers.

1.02 REFERENCE STANDARDS

A. ASHRAE Std 34 - Designation and Safety Classification of Refrigerants; 2019.

B. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2018.

C. ASME B31.9 - Building Services Piping; 2017.

D. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2020.

E. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011 (Amended 2012).

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION

A. Filter-Driers:

1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.

2.02 REGULATORY REQUIREMENTS

A. Comply with ASME B31.9 for installation of piping system.

2.03 PIPING

A. Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.

1. Fittings: ASME B16.22 wrought copper.
2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.

2.04 REFRIGERANT

A. Refrigerant: _____ as defined in ASHRAE Std 34.

2.05 MOISTURE AND LIQUID INDICATORS

A. Indicators: Single port type, UL listed, with copper or brass body, flared or soldered ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F (93 degrees C) and maximum working pressure of 500 psi (3450 kPa).

2.06 VALVES

A. Ball Valves:

1. Two piece bolted forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi (3450 kPa) and maximum temperature of 300 degrees F (149 degrees C).

2.07 STRAINERS

A. Straight Line or Angle Line Type:

1. Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass; for maximum working pressure of 430 psi (2960 kPa).

PART 3 EXECUTION

3.01 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.

B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and avoid interference with use of space.

D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

END OF SECTION

SECTION 23 3100
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal ducts.

B. Metal ductwork.

1.02 RELATED REQUIREMENTS

A. Section 23 3319 - Duct Silencers.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.

D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.

E. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for duct materials.

1.05 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.

B. Provide metal duct unless otherwise indicated. Fibrous glass duct can be substituted at the Contractor's option.

C. Acoustical Treatment: Provide sound-absorbing liners and sectional silencers for metal-based ducts in compliance with Section 23 3319.

D. Duct Shape and Material in accordance with Allowed Static Pressure Range:

E. Duct Sealing and Leakage in accordance with Static Pressure Class:

F. Duct Fabrication Requirements:

1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.
2. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
3. Construct tees, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.
4. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.

5. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
6. Provide turning vanes of perforated metal with glass fiber insulation when an acoustical lining is required.
7. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

G. Regulatory Requirements: Construct ductwork to comply with 1 standards.

H. Ducts: Galvanized steel, unless otherwise indicated.

I. Low Pressure Supply (Heating Systems): 1/2 inch w.g. (125 Pa) pressure class, galvanized steel.

J. Low Pressure Supply (System with Cooling Coils): 1/2 inch w.g. (125 Pa) pressure class, galvanized steel.

K. Return and Relief: 1/2 inch w.g. (125 Pa) pressure class, galvanized steel.

L. Outside Air Intake: 1/2 inch w.g. (125 Pa) pressure class, galvanized steel.

2.02 MATERIALS

A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
2. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.

C. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.03 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.

B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

D. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).

2.04 METAL DUCTS

A. Material Requirements:
1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

B. Flexible Ducts: Two ply vinyl film supported by helically wound spring steel wire.
1. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
2. Pressure Rating: 10 inches WG (2.50 kPa) positive and 1.0 inches WG (250 Pa) negative.
3. Maximum Velocity: 4000 fpm (20.3 m/sec).
4. Temperature Range: Minus 10 degrees F to 160 degrees F (Minus 23 degrees C to 71 degrees C).

C. Round Duct Connection System: Interlocking duct connection system in accordance with SMACNA (DCS).

PART 3 EXECUTION

3.01 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA (DCS).

B. Install products following the manufacturer's instructions.

C. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.

D. Flexible Ducts: Connect to metal ducts with draw bands.

E. Duct sizes indicated are inside precise dimensions. For lined ducts, maintain sizes inside lining.

F. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

END OF SECTION

SECTION 23 3300
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct access doors.

B. Duct test holes.

C. Flexible duct connectors.

D. Volume control dampers.

E. Miscellaneous products:
   1. Duct opening closure film.

1.02 RELATED REQUIREMENTS

A. Section 23 3100 - HVAC Ducts and Casings.

1.03 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.

B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide for shop fabricated assemblies including volume control dampers, duct access doors, and hardware used. Include electrical characteristics and connection requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.01 DUCT ACCESS DOORS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Access doors with sheet metal screw fasteners are not acceptable.

2.02 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.03 FLEXIBLE DUCT CONNECTORS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Flexible Duct Connections: Fabric crimped into metal edging strip.
   1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz/sq yd (1.0 kg/sq m).
      a. Net Fabric Width: Approximately 2 inches (50 mm) wide.

2.04 VOLUME CONTROL DAMPERS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Splitter Dampers:
   1. Material: Same gauge as duct to 24 inches (600 mm) size in either direction, and two gauges heavier for sizes over 24 inches (600 mm).
   2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.

3. Operator: Minimum 1/4 inch (6 mm) diameter rod in self aligning, universal joint action, flanged bushing with set screw.

C. Single Blade Dampers:
   1. Fabricate for duct sizes up to 6 by 30 inch (150 by 760 mm).
   2. Blade: 24 gauge, 0.0239 inch (0.61 mm), minimum.

D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch (200 by 1825 mm). Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

E. End Bearings: Except in round ducts 12 inches (300 mm) and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

F. Quadrants:
   1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
   2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
   3. Where rod lengths exceed 30 inches (750 mm) provide regulator at both ends.

2.05 MISCELLANEOUS PRODUCTS

A. Duct Opening Closure Film: Mold-resistant, self-adhesive film to keep debris out of ducts during construction.
   1. Thickness: 2 mils (0.6 mm).
   2. High tack water based adhesive.
   3. UV stable light blue color.
   4. Elongation Before Break: 325 percent, minimum.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 23 3100 for duct construction and pressure class.

B. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide minimum 8 by 8 inch (200 by 200 mm) size for hand access, size for shoulder access, and as indicated. Provide 4 by 4 inch (100 by 100 mm) for balancing dampers only. Review locations prior to fabrication.

C. Provide duct test holes where indicated and required for testing and balancing purposes.

D. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

E. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

F. Use splitter dampers only where indicated.

G. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

SECTION 23 7213

AIR COOLED HEAT PUMP UNITS

GENERAL

1.01 SECTION INCLUDES

A. Condensing unit package.

B. Charge of refrigerant and oil.

C. Controls and control connections.

D. Refrigerant piping connections.

E. Motor starters.

F. Electrical power connections.

1.02 REFERENCES

A. ANSI/ASHRAE/IES 90.1 - Energy Standard for buildings except low rise residential buildings.

B. ANSI/AHRI 340/360- Performance rating of commercial and industrial unitary air-conditioning and heat pump equipment (heat pumps and condensing units greater than 65,000BTUh and below 250,000Btuh

C. UL1995 - Unitary Air Conditioning Standard for safety requirements.

D. California Energy Commission Administrative Code - Title 20/24 - Establishes the minimum efficiency requirements for HVAC equipment installed in new buildings in the State of California.

E. AHRI 270 - Sound Rating of Outdoor Unitary Equipment, (units less than 135,000 Btuh).

F. AHRI 370 - Sound Rating of Large Outdoor Refrigerating and Air Conditioning Equipment (equipment above 135,000 Btuh).

1.03 SUBMITTALS

A. Submit unit performance data including: capacity, nominal and operating performance.

B. Submit Mechanical Specifications for unit and accessories describing construction, components and options.

C. Submit shop drawings indicating overall dimensions as well as installation, operation and service clearances. Indicate lift points and recommendations and center of gravity. Indicate unit shipping, installation and operating weights including dimensions.

D. Submit data on electrical requirements and connection points. Include recommended wire and fuse sizes or MCA, sequence of operation, safety and start-up instructions.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

B. Protect units on site from physical damage. Protect coils.

1.05 WARRANTY

A. Provide one year parts warranty.

B. Provide 5-year limited compressor warranty.

1.06 MAINTENANCE SERVICE

A. Furnish complete parts and labor service and maintenance of unit(s)or one year from Date of Substantial Completion by contractor.

1.07 REGULATORY REQUIRMENTS

A. Unit shall conform to UL 1995 for construction of packaged air conditioner.

1. In the event the unit is not UL approved, the manufacturer must, at his expense, provide for a field inspection by a UL representative to verify conformance to UL standards. If

necessary, contractor shall perform modifications to the unit to comply with UL, as directed by the UL representative, at no additional expense to the Owner.

1.08 PRODUCTS

1.09 SUMMARY

A. The contractor shall furnish and install air-cooled condensing units as shown as scheduled on the contract documents. The unit(s) shall be installed in accordance with this specification and perform at the specified conditions as scheduled.

B. APPROVED MANUFACTURERS
   1. Trane:
   2. Substitutions: [prior approval required] as indicated under the general and/or supplemental conditions of these specifications.

1.10 GENERAL UNIT DESCRIPTION

A. Provide self-contained, packaged, factory-assembled and pre-wired units suitable for outdoor use consisting of cabinet, compressor(s), condensing coil and fan(s), integral subcooling circuit(s), filter drier(s), and controls. Provide expansion valve(s) and check valves for split system heat pump unit(s).

B. Performance Ratings: Energy Efficiency Rating (EER) [and Coefficient of Performance (COP)] not less than prescribed by ANSI/ASHRAE 90.1

1.11 CASING

A. House components in heavy gauge galvanized steel frame and panels with weather resistant, baked enamel finish. Units surface shall be tested 672 hours in salt spray test.

B. Casing shall have removable single side maintenance access panels, lifting handles, and provision for forklift and/or crane lifting.

C. Mount controls in weatherproof panel provided with removable panels and/or access doors with quick opening fasteners.

1.12 CONDENSER COILS

A. Coils: Microchannel-Parallel flow aluminum tubes that are mechanically brazed to enhanced aluminum fins. Provide subcooling circuit(s). Factory leak test (at supplier), and vacuum dehydrate. Seal with holding charge of nitrogen.

1.13 FANS AND MOTORS

A. Vertical discharge direct driven propeller type condenser fans with fan guard on discharge. Fans shall be statically and dynamically balanced.

B. Weatherproof motors suitable for outdoor use, with permanently lubricated open air over (OAO) motors shall be provided and shall have built in thermal overload protection. Motors shall be rated IPX4 and shall have full contact ball bearings.

C. Compressors: Provide two passively manifolded, direct drive scroll compressors with integral centrifugal oil pump. Provide suction gas cooled motor with winding temperature limits and compressor overloads. Provide external high and low pressure cutout devices.

1.14 CONTROLS

A. The control shall be a centralized microprocessor with indoor and outdoor temperature sensors that drive algorithms, making decisions for all heating, cooling, and ventilation.
   1. The control shall have an integrated anti-short-cycle timer and integrated time delay between compressors.
   2. Connectors shall be colored and keyed with colored wires.

1.15 BUILDING MANAGEMENT SYSTEM

A. Unit shall be provided with BACnet communication ability, able to communicate with BACnet IP or BACnet MS/TP.
   1. BACnet option is to be factory installed.

B. Unit shall be provided with LonTalk Communication Interface.
   1. Lontalk interface can be factory or field installed.

1.16 EXECUTION

1.17 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide for connection to electrical service.

C. Install units on vibration isolation.

D. Install units on concrete base as indicated.

E. Provide connection to refrigeration piping system and evaporators.

END OF SECTION

SECTION 23 7313

MODULAR INDOOR CENTRAL STATION AIR HANDLING UNITS

GENERAL

1.01 WORK INCLUDED

A. Applied Air Handling Units.

1. REFERENCES
   a. AMCA Publication 99 - Standards Handbook.
   b. AMCA Publication 611 - Certified Ratings Program - Airflow Measurement Performance
   c. AMCA Standard 500-D - Laboratory Methods of Testing Dampers for Rating.
   d. ANSI/ABMA Standard 9 - Load Ratings and Fatigue Life for Ball Bearings.
   e. ANSI/AMCA Standard 204 - Balance Quality and Vibration Levels for Fans.
   f. ANSI/AMCA Standard 610 - Laboratory Methods of Testing Airflow Measuring Stations for Rating.
   g. ANSI/AHRI Standard 410 - Forced Circulation Air-Cooling and Air-Heating Coils.
   h. ANSI/AHRI Standard 430 - Central Station Air Handling Units.
   i. ANSI/ASHRAE Standard 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.
   j. ANSI/ASHARE Standard 62.1 - Ventilation for Acceptable Indoor Air Quality.
   k. ANSI/ASHARE Standard 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.
   l. ANSI/NEMA MG 1 - Motors and Generators.
   m. ANSI/UL 900 - Standard for Safety Air Filter Units.
   n. AHRI Standard 260 - Sound rating of Ducted Air Moving and Conditioning Equipment.
   o. ASHRAE Standard 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems.
   p. ASTM B117 - Standard Practice for Operation Salt Spray Apparatus.
   q. ASTM C1071 - Thermal and Acoustic Insulation (Mineral Fiber, Duct Lining Material).
   r. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Material and Facings.
   s. ASTM E477 - Standard Test Method for Measure Acoustical and Airflow Performance of Duct Liner
   t. NFPA 70 - National Electrical Code
   u. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilation Systems.
   v. UL 1995 - Standard for Safety Heating and Cooling Equipment
2. QUALITY ASSURANCE
   a. Air Coils: Certify capacities, pressure drops and selection procedures in accordance with current AHRI Standard 410.
   b. Air handling units shall be rated in accordance with AHRI Standard 430 for airflow, static pressure, and fan speed performance.
3. SUBMITTALS
   a. No equipment shall be fabricated or delivered until the receipt of approved shop drawings from the Owner or Owner's approved representative.
   b. AHU manufacturer shall provide the following information with each shop drawing/product data submission:
      1) Dimensioned arrangement drawings for each AHU including a plan and elevation view of the assembled unit with overall dimensions, lift points, unit shipping split locations and dimensions, installation and operating weights, and installation, operation and service clearances.
      2) All electrical, piping, and ductwork requirements, including sizes, connection locations, and connection method recommendations.

3) Each component of the unit shall be identified and mechanical specifications shall be provided for unit and accessories describing construction, components, and options.
4) All performance data, including capacities and airside and waterside pressure drops, for components.
5) Fan curves shall be provided for fans with the design operating points indicated. Data shall be corrected to actual operating conditions, temperatures, and altitudes.
6) For units utilizing multiple fans in a fan section, a fan curve shall be provided showing the performance of the entire bank of fans at design conditions. In addition, a fan curve shall be provided showing the performance of each individual fan in the bank of fans at design conditions. Also a fan curve shall be provided showing the performance of the bank of fans, if one fan is down. The percent redundancy of the bank of fans with one fan down shall be noted on the fan curve or in the tabulated fan data.
7) A filter schedule must be provided for each air handling unit supplied by the air handling unit manufacturer. Schedule shall detail unit tag, unit size, corresponding filter section location within the AHU, filter arrangement (e.g. angled/flat), filter depth, filter type (e.g. pleated media), MERV rating, and filter quantity and size.
8) A schedule detailing necessary trap height shall be provided for each air handling unit. Schedule shall detail unit tag, unit size, appropriate trap schematic with recommended trap dimensions, and unit supplied base rail height. Contractor shall be responsible for additional trap height required for trapping and insulation beyond the unit supplied base rail height by adequate housekeeping pad.
9) A coil valve coordination schedule shall be provided for each air handling unit supplied by the air handling unit manufacturer. Schedule shall detail unit tag, coil type and corresponding section location within the AHU, valve style (e.g. global, ball), valve type (e.g. electronic 2-way/3-way), valve position (e.g. normally open/closed), size, flow coefficient (CV), and close-off pressure.
10) An electrical MCA - MOP schedule shall be provided for each electrical circuit to which field-power must be supplied. Schedule to detail unit tag, circuit description, voltage/phase/hertz, Minimum Circuit Ampacity (MCA), and calculated Maximum Overcurrent Protection (MOP).
11) Sound data shall be provided using AHRI 260 test methods. Unit discharge, inlet, and radiated sound power levels in dB shall be provided for 63, 125, 250, 500, 1000, 2000, 4000 and 8000Hz.

c. The AHU manufacturer shall provide appropriate sets of submittals as referenced in the General Conditions and shall submit to the Owner electronic copies of the IOM.
d. The AHU manufacturer shall list any exceptions to the specification.

4. REGULATORY REQUIREMENTS
   a. Agency Listings/Certifications
      1) Unit shall be manufactured to conform to UL 1995 and shall be listed by either UL/CUL or ETL. Units shall be provided with listing agency label affixed to the unit. In the event the unit is not UL/CUL or ETL approved, the contractor shall, at his/her expense, provide for a field inspection by a UL/CUL or ETL representative to verify conformance. If necessary, contractor shall perform modifications to the unit to comply with UL/CUL or ETL as directed by the representative, at no additional expense to the owner.
      2) Certify air handling units in accordance with AHRI Standard 430. Units shall be provided with certification label affixed to the unit. If air handling units are not certified or fans are not rated in accordance with AHRI Standard 430 contractor shall be responsible for expenses associated with testing of units after installation to verify performance of fan(s). Any costs incurred to adjust fans to meet scheduled capacities shall be the sole responsibility of the contractor.

3) Certify air handling coils in accordance with AHRI Standard 410. Units shall be provided with certification label affixed to the unit. If air handling coils are not certified in accordance with AHRI Standard 410, contractor shall be responsible for expenses associated with testing of coils after installation to verify performance of coil(s). Any costs incurred to adjust coils to meet scheduled capacities shall be the sole responsibility of the contractor.

5. DELIVERY, STORAGE, AND HANDLING
   a. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.
   b. Units shall ship fully assembled up to practical shipping and rigging limitations. Units not shipped fully assembled shall have tags and airflow arrows on each section to indicate location and orientation in direction of airflow. Shipping splits shall be clearly defined on submittal drawings. Cost associated with non-conformance to shop drawings shall be the responsibility of the manufacturer. Each section shall have lifting lugs for field rigging, lifting and final placement of AHU section(s). AHU's less than 100-inches wide shall allow for forklift transport and maneuverability on the jobsite.
   c. Unit shall be stretch or shrink wrapped to protect unit from in-transit rain and debris per ASHRAE 62.1 recommendations.
   d. Installing contractor shall be responsible for storing AHU in a clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.
6. START-UP AND OPERATING REQUIREMENTS
   a. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters in place, bearings lubricated (if applicable), condensate properly trapped, piping connections verified and leak-tested, belts aligned and tensioned, all shipping braces removed, bearing set screws torqued, and fan has been test run under observation.
7. WARRANTY
   a. AHU manufacturer shall provide, at no additional cost, a standard parts warranty that covers a period of one year from unit start-up or 18 months from shipment, whichever occurs first. This warrants that all products are free from defects in material and workmanship and shall meet the capacities and ratings set forth in the equipment manufacturer's catalog and bulletins.

B. PRODUCTS
1. ACCEPTABLE MANUFACTURERS
   a. The approved manufacturer shall be Trane, with pre-approved alternates considered. Manufacturers not pre-approved, must obtain pre-approval in writing from consulting engineer prior to bid day. Alternates must comply with all performance and features as called for in this specification. Job awarded on basis of specified equipment. Alternate will be evaluated and considered after job is awarded.
   b. Manufacturer must clearly define any exceptions made to Plans and Specifications. Any deviations in layout or arrangement shall be submitted to consulting engineer prior to bid date. Acceptance of deviation(s) from specifications shall be in the form of written approval from the consulting engineer. Mechanical Contractor is responsible for expenses that occur due to exceptions made.
2. GENERAL
   a. Unit layout and configuration shall be as defined in project plans and schedule.
   b. Manufacturer to provide a full perimeter integral base frame for either ceiling suspension of units or to support and raise all sections of the unit for proper trapping. Base frame will either be bolted construction or welded construction. Refer to schedule for base height and construction type. Contractor will be responsible for providing a housekeeping pad when unit base frame is not of sufficient height to properly trap unit. Unit base frames not constructed of galvanized steel shall be chemically cleaned and coated with both a rust-inhibiting primer and finished coat of

rust-inhibiting enamel. Unit base height to be included in total height required for proper trap height.

3. UNIT CASING
   a. Unit manufacturer shall ship unit in segments as specified by the contractor for ease of installation in tight spaces. The entire air handler shall be constructed of galvanized steel. Casing finished to meet ASTM B117 125-hour salt-spray test. The removal of access panels or access doors shall not affect the structural integrity of the unit. All removable panels shall be gasketed. All doors shall have gasketing around full perimeter to prevent air leakage. Contractor shall be responsible to provide connection flanges and all other framework that is needed to properly support the unit.
   b. Casing performance - Casing air leakage shall not exceed leak class 6 (CL = 6) per ASHRAE 111 at specified casing pressure, where maximum casing leakage (cfm/100 ft2 of casing surface area) = CL X P0.65.
   c. Air leakage shall be determined at 1.00 times maximum casing static pressure up to 8 inches w.g. Specified air leakage shall be accomplished without the use of caulk. Total estimated air leakage shall be reported for each unit in CFM, as a percentage of supply air, and as an ASHRAE 111 Leakage Class.
   d. Under 55F supply air temperature and design conditions on the exterior of the unit of 81F dry bulb and 73F wet bulb, condensation shall not form on the casing exterior. The AHU manufacturer shall provide tested casing thermal performance for the scheduled supply air temperature plotted on a psychrometric chart. The design condition on the exterior of the unit shall also be plotted on the chart. If tested casing thermal data is not available, AHU manufacturer shall provide, in writing to the Engineer and Owner, a guarantee against condensation forming on the unit exterior at the stated design conditions above. The guarantee shall note that the AHU manufacturer will cover all expenses associated with modifying units in the field should external condensate form on them. In lieu of AHU manufacturer providing a written guarantee, the installing contractor must provide additional external insulation on AHU to prevent condensation.
   e. Unit casing (wall/floor/roof panels and doors) shall be able to withstand up to 1.5 times design static pressure, or 8-inch w.g., whichever is less, and shall not exceed 0.0042 per inch of panel span (L/240).
   f. Floor panels shall be double-wall construction and designed to support a 300-lb load during maintenance activities and shall deflect no more than 0.0042 per inch of panel span.
   g. Unit casing panels shall be 2-inch double-wall construction, with solid galvanized exterior and solid galvanized interior, to facilitate cleaning of unit interior.
   h. Unit casing panels (roof, walls, floor) and doors shall be provided with a minimum thermal resistance (R-value) of 13 Hr*Ft2*°F/BTU.
   i. Unit casing panels (roof, walls, floor) and external structural frame members shall be completely insulated filling the entire panel cavity in all directions so that no voids exist. Panel insulation shall comply with NFPA 90A.
   j. Casing panel inner liners must not extend to the exterior of the unit or contact the exterior frame. A mid-span, no-through-metal, internal thermal break shall be provided for all unit casing panels.
   k. Access panels and/or access doors shall be provided in all sections to allow easy access to drain pan, coil(s), motor, drive components and bearings for cleaning, inspection, and maintenance.
   l. Access panels and doors shall be fully removable without the use of specialized tools to allow complete access of interior surfaces.
4. ACCESS DOORS
   a. Access doors shall be 2-inch double-wall construction. Interior and exterior shall be of the same construction as the interior and exterior wall panels.
   b. All doors shall be provided with a thermal break construction of door panel and door frame.

c. Gasketing shall be provided around the full perimeter of the doors to prevent air leakage.
d. Door hardware shall be surface-mounted to prevent through-cabinet penetrations that could likely weaken the casing leakage and thermal performance.
e. Handle hardware shall be designed to prevent unintended closure.
f. Access doors shall be hinged and removable without the use of specialized tools.
g. Hinges shall be interchangeable with the door handle hardware to allow for alternating door swing in the field to minimize access interference due to unforeseen job site obstructions.
h. Door handle hardware shall be adjustable and visually indicate locking position of door latch external to the section.
i. All doors shall be a 60-inch high when sufficient unit height is available, or the maximum height allowed by the unit height.
j. Multiple door handles shall be provided for each latching point of the door necessary to maintain the specified air leakage integrity of the unit.
k. An optional shatterproof window shall be provided in access doors where indicated on the plans. Window shall either be single pane, or thermal dual pane, as defined on schedule. Window shall be capable of withstanding unit operating pressures and shall be safe for viewing UV-C lamps.
l. Test ports shall be supplied in access doors as defined in the unit schedule to facilitate the field commissioning by the test and balance contractor. Test ports shall not compromise the ASHRAE leakage class of the unit.

5. PRIMARY DRAIN PANS
   a. All cooling coil sections shall be provided with an insulated, double-wall, galvanized drain pan.
   b. The drain pan shall be designed in accordance with ASHRAE 62.1 being of sufficient size to collect all condensation produced from the coil and sloped in two planes, pitched toward drain connections, promoting positive drainage to eliminate stagnant water conditions when unit is installed level and trapped per manufacturer's requirements.
   c. The outlet shall be located at the lowest point of the pan and shall be sufficient diameter to preclude drain pan overflow under any normally expected operating condition.
   d. All drain pan threaded connections shall be visible external to the unit. Threaded connections under the unit floor shall not be accepted.
   e. Drain connections shall be of the same material as the primary drain pan and shall extend a minimum 2-1/2-inch beyond the base to ensure adequate room for field piping of condensate traps.
   f. The installing contractor is responsible to ensure the unit is installed level, trapped in accordance with the manufacturer's requirements, and visually inspected to ensure proper drainage of condensate.
   g. Coil support members inside the drain pan shall be of the same material as the drain pan and coil casing.
   h. If drain pans are required for heating coils, access sections, or mixing sections they will be indicated in the plans.
6. FANS
   a. Fan sections shall have a minimum of one hinged and latched access door located on the drive side of the unit to allow inspection and maintenance of the fan, motor, and drive components.
   b. Provide fans of type and class as specified on the schedule. All fans shall be statically and dynamically tested by the manufacturer for vibration and alignment as an assembly at the operating RPM to meet design specifications. Fans that are selected with inverter balancing shall first be dynamically balanced at design RPM. The fans then will be checked in the factory from 25% to 100% of design RPM to insure they are operating within vibration tolerance specifications, and that there are

no resonant frequency issues throughout this operating range. Inverter balancing that requires lockout frequencies inputted into a variable frequency drive to in order to bypass resonant frequencies shall not be acceptable. If supplied in this manner by the unit manufacturer, the contractor will be responsible for rebalancing in the field after unit installation. Fans selected with inverter balancing shall have a maintenance free grounding assembly installed on the fan motor to discharge both static and induced shaft currents to ground.

c. Direct drive plenum fans with integral frame motors, shall be mounted on isolation bases. Fan shall be dynamically balanced throughout the operating range to a BV-3 (0.20 in/s) per AMCA 204 test standard. Fan and motor shall be internally isolated with spring isolators. A flexible connection shall be installed between fan and unit casing to ensure complete isolation. Flexible connection shall comply with NFPA 90A and UL 181 requirements. If fans and motors are not internally isolated, then the entire unit shall be externally isolated from the building, including supply and return duct work, piping, and electrical connections. External isolation shall be furnished by the installing contractor in order to avoid transmission of noise and vibration through the ductwork and building structure.

d. MOTORS AND DRIVES
   1) Motors shall meet or exceed all NEMA Standards Publication MG 1 - 2006 requirements and comply with NEMA Premium efficiency levels when applicable. Motors shall comply with applicable requirements of NEC and shall be UL Listed.
   2) Fan Motors shall be heavy duty, open drip-proof operable at scheduled voltage. If applicable, motor efficiency shall meet or exceed NEMA Premium efficiencies.
   3) Direct driven fans utilizing integral frame motors shall use 2-pole (3600 rpm), 4-pole (1800 rpm) or 6-pole (1200 rpm) motors, NEMA Design B, with Class B insulation capable to operate continuously at 104 deg F (40 deg C) without tripping overloads.
   4) Motors shall have a +/- 10 percent voltage utilization range to protect against voltage variation.

7. COILS
   a. Coils section header end panel shall be removable to allow for removal and replacement of coils without impacting the structural integrity of the unit.
   b. Install coils such that headers and return bends are enclosed by unit casing to ensure that if condensate forms on the header or return bends, it is captured by the drain pan under the coil.
   c. Coils shall be manufactured with plate fins to minimize water carryover and maximize airside thermal efficiency. Fin tube holes shall have drawn and belled collars to maintain consistent fin spacing to ensure performance and air pressure drop across the coil as scheduled. Tubes shall be mechanically expanded and bonded to fin collars for maximum thermal conductivity. Use of soldering or tinning during the fin-to-tube bonding process is not acceptable due to the inherent thermal stress and possible loss of bonding at that joint.
   d. Construct coil casings of galvanized steel. End supports and tube sheets shall have belled tube holes to minimize wear of the tube wall during thermal expansion and contraction of the tube.
   e. All coils shall be completely cleaned prior to installation into the air handling unit. Complete fin bundle in direction of airflow shall be degreased and steam cleaned to remove any lubricants used in the manufacturing of the fins, or dirt that may have accumulated, in order to minimize the chance for water carryover.
   f. Refrigerant Cooling Coils
      1) Coils shall be proof tested to 450 psig and leak tested to 300 psig air pressure under water. After testing, insides of tubes shall be air dried, charged with dry nitrogen or dry air, and sealed to prevent contamination.
      2) Refrigerant suction and liquid headers shall be constructed of copper tubing. Suction and liquid connections shall penetrate unit casings to allow for sweat connections to refrigerant lines.

3) Tubes shall be 1/2-inch with aluminum fins.
4) Tubes shall be 3/8-inch .012 copper, with aluminum fins.
5) Coils shall have equalizing type vertical distributors sized in conjunction with capacities of coils.

8. FILTERS
   a. Provide factory-fabricated filter section of the same construction and finish as unit casings. Filter section shall have side access filter guides and access door(s) extending the full height of the casing to facilitate filter removal. Construct doors in accordance with Section 2.04. Provide fixed filter blockoffs as required to prevent air bypass around filters. Blockoffs shall not need to be removed during filter replacement. Filters to be of size, and quantity needed to maximize filter face area of each particular unit size.
   b. Filter type, MERV rating, and arrangement shall be provided as defined in project plans and schedule.
9. DAMPERS
   a. All dampers, with the exception of external bypass and multizones (if scheduled), shall be internally mounted. Dampers shall be premium ultra low leak and located as indicated on the schedule and plans. Blade arrangement (parallel or opposed) shall be provided as indicated on the schedule and drawings. Dampers shall be Ruskin CD60 double-skin airfoil design or equivalent for minimal air leakage and pressure drop. Leakage rate shall not exceed 3 CFM/square foot at one inch water gauge complying with ASHRAE 90.1 maximum damper leakage and shall be AMCA licensed for Class 1A. All leakage testing and pressure ratings shall be based on AMCA Standard 500-D. Manufacturer shall submit brand and model of damper(s) being furnished, if not Ruskin CD60.
10. ACCESS SECTIONS
    a. Access sections shall be provided where indicated in the schedule and plans to allow additional access for inspection, cleaning, and maintenance of unit components. The unit shall be installed for proper access. Procedure for proper access, inspection and cleaning of the unit shall be provided in the AHU manufacturer's maintenance manual.
11. Factory Wiring of Lights, VFDs, Motorized Impeller Control Panels, and Combination Starters/Disconnects
    a. All power wiring for voltages greater than 24V and traveling through multiple unit sections shall be contained in an enclosed, metal, power-wiring raceway or EMT. Sections less than 6-inch in length may be contained in FMC.
    b. For fan motors not supplied with a factory mounted and wired starter, MICP or VFD, the unit manufacturer shall supply a 4 X 4 NEMA 4 junction box on the exterior of the fan section(s) with wiring, prewired to the fan motor, to allow for ease of field installation of a starter or VFD.
12. Split Dehumidification Layout
    a. Air handler shall be a split dehumidification unit (SDU) with a dual – path, return air-bypass. Unit shall consist of two units that are stacked together in a draw-thru arrangement and that share one supply fan. All the ventilation (outdoor) air is directed through the upper unit where it has a pre-heat and cooling. The lower unit is sized to handle the return air and dehumidification – change rate in the space. The warmer return air in the upper unit mixes with the cooler, drier air from the lower unit. The resulting mixed air provided humidity control by achieving a sensible heat ration (SHR) of down to 0.4, but also provides sensible reheat without using any new energy.

C. EXECUTION
   1. SHIPPING
      a. Paper copies of the IOM shall also be shipped with each AHU.
      b. The AHU manufacturer shall identify all shipments with the order number. Enough information shall be provided with each shipment to enable the Mechanical Contractor

to confirm the receipt of units when they are received. For parts too small to mark individually, the AHU manufacturer shall place them in containers.

c. To protect equipment during shipment and delivery, all indoor units shall be completely stretch or shrink wrapped. Wrap shall be a minimum of 7 mil plastic. Pipe ends and pipe connection holes in the casing shall be capped or plugged prior to shipment

d. After loading the equipment for shipment, the AHU manufacturer shall contact the shipping contact on the order and provide the name of the carrier, description of equipment, order number, shipping point, and date of shipment.

2. ON-SITE STORAGE

a. If equipment is to be stored for a period of time prior to installation, the Mechanical Contractor shall remove all stretch or shrink wrap from units upon receipt to prevent unit corrosion and shall either place the units in a controlled indoor environment or shall cover the units with canvas tarps and place them in a well-drained area. Covering units with plastic tarps shall not be acceptable.

3. FIELD EXAMINATION

a. The Mechanical Contractor shall verify that the mechanical room and/or roof are ready to receive work and the opening dimensions are as indicated on the shop drawings and contract documents.

b. The Mechanical Contractor shall verify that the proper power supply is available prior to starting of the fans.

4. INSTALLATION

a. The Mechanical Contractor shall be responsible to coordinate ALL of his installation requirements with the Owner and the Owner's selected Mechanical Contractor to ensure that a complete installation for each unit is being provided. Coordination efforts shall include such items as unloading and hoisting requirements, field wiring requirements, field piping requirements, field ductwork requirements, requirements for assembly of field-bolted or welded joints, and all other installation and assembly requirements.

b. The AHU manufacturer shall provide all screws and gaskets for joining of sections in the field.

c. The Mechanical Contractor shall verify that the following items have been completed prior to scheduling the AHU manufacturer's final inspection and start up:

1) All spring-isolated components have had their shipping restraints removed and the components have been leveled.

2) On all field-joined units, that all interconnections have been completed, i.e., electrical and control wiring, piping, casing joints, bolting, welding, etc.

3) All water and steam piping connections have been completed and hydrostatically tested and all water flow rates have been set in accordance with the capacities scheduled on the Drawings.

4) All ductwork connections have been completed and all ductwork has been pressure tested for its intended service.

5) All power wiring, including motor starters and disconnects, serving the unit has been completed.

6) All automatic temperature and safety controls have been completed.

7) All dampers are fully operational.

8) All shipping materials have been removed.

9) All (clean) filter media has been installed in the units.

5. LEVELING

a. The Mechanical Contractor shall level all unit sections in accordance with the unit manufacturer's instructions. The Mechanical Contractor shall provide and install all necessary permanent shim material to ensure individual sections and entire assembled units are level.

6. FINAL INSPECTION AND START UP SERVICE

a. After the Mechanical Contractor has provided all water and steam piping connections, ductwork connections, and field control wiring, and Electrical Contractor has provided all the field power wiring, the Mechanical Contractor shall inspect the installation. The Mechanical Contractor shall then perform startup of the equipment.
b. The Automatic Temperature Control (Building Direct Digital Control) Contractor shall be scheduled to be at the job site at the time of the equipment start up.
c. The Mechanical Contractor, shall perform the following tests and services and submit a report outlining the results:
    1) Record date, time, and person(s) performing service.
    2) Lubricate all moving parts.
    3) Check all motor and starter power lugs and tighten as required.
    4) Verify all electrical power connections.
    5) Conduct a start up inspection per the AHU manufacturer's recommendations.
    6) Record fan motor voltage and amperage readings.
    7) Check fan rotation and spin wheel to verify that rotation is free and does not rub or bind.
    8) Check fan for excessive vibration.
    9) Remove all foreign loose material in ductwork leading to and from the fan and in the fan itself.
    10) Disengage all shipping fasteners on vibration isolation equipment.
    11) Check safety guards to insure they are properly secured.
    12) Secure all access doors to the fan, the unit and the ductwork.
    13) Switch electrical supply "on" and allow fan to reach full speed.
    14) Physically check each fan at start up and shut down to insure no abnormal or problem conditions exist.
    15) Check entering and leaving air temperatures (dry bulb and wet bulb) and simultaneously record entering and leaving chilled water temperatures and flow, steam pressures and flow, and outside air temperature.
    16) Check all control sequences.

END OF SECTION

SECTION 26 0100
ELECTRICAL GENERAL

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. The “General Conditions” and “Special Conditions” of Contract as written and referred to hereinbefore are adopted and made part of Division 26.

1.02 DESCRIPTION OF WORK:

A. Provide equipment, labor, etc., required to install complete working electrical systems as shown and specified.

B. Provide fixed electrical equipment, except where specifically noted otherwise.

C. Provide portable electrical equipment for complete system.

D. Provide equipment and/or wiring normally furnished or required for complete electrical systems but not specifically specified on the drawings or in specifications, as though specified by both.

E. All equipment and wiring shall be new.

F. Electrical work includes, but is not limited to:
   1. Construction of new electrical systems.
   2. 600 volt Distribution System. Provide panelboards, circuit breakers, power outlets, convenience outlets, data outlets, switches, and/or other equipment forming part of system.
   3. Connection of all appliances and equipment.
   4. Provide temporary facilities for construction power.
   5. Provide Owner training on all systems.

1.03 WORK NOT INCLUDED:

A. Furring for conduit and equipment.

B. Finish painting of conduit and equipment.

C. Installation of motors except where specifically noted.

D. Control wiring for mechanical systems, except where indicated to be provided by Electrical Contractor.

E. Flashing of conduits into roofs and outside walls. Inform General Contractor of number and size of roof penetrations prior to bidding.

1.04 REQUIREMENTS OF REGULATORY AGENCIES:

A. Obtain and pay for all permits required for the work. Comply with all ordinances pertaining to work described herein.

B. Install work under this Division per drawings, specifications, latest edition of the National Electrical Code, Local Building Codes, and any special codes having jurisdiction over specific portions within complete installation. In event of conflict, install work per most stringent code requirements determined by Engineer.

C. Arrange, pay fees for and complete work to pass required tests by agencies having authority over work. Deliver to Engineer Certificates of Inspection and approval issued by authorities.

D. Obtain and pay for any services or charges required by the local electric utility for electric services, including, but not limited to, wiring, underground trenching and backfilling, pad-mounted transformer, and primary and secondary connections.

1.05 QUALIFICATIONS OF CONTRACTOR:

A. Has completed minimum two projects of the same size and scope in the past five (5) years.

B. This qualification also applies to Sub-Contractors.

C. Use workmen experienced in their respective trade. Submit qualifications of Superintendent for review.

D. Owner reserves right to reject bid of any Contractor failing to meet these qualifications.

1.06 GENERAL JOB REQUIREMENTS:

A. Drawings and Specifications:
   1. Electrical work is shown on “ME” series drawings inclusive. Follow any supplementary drawings as though listed above.
   2. Drawings and specifications are complementary. Work called for by one is binding as if called for by both.
   3. Drawings show general run of circuits and approximate location of equipment. Right is reserved to change location of equipment and devices, and routing of conduits to a reasonable extent, without extra cost to Owner.
   4. In the event of conflict between drawings and specifications, apply the most stringent ruling and refer conflicts describing electrical work and work under other Divisions to Engineer for remedial action.
   5. Use dimensions in figures in preference to scaled dimensions. Do not scale drawings for exact sizes or locations.
   6. Execution of Contract is evidence that Contractor has examined all drawings and specifications related to work, and is informed to extent and character of work. Later claims for labor and materials required due to difficulties encountered, which could have been foreseen had examination been made, will not be recognized.
   7. Charges for extra work not allowed unless work authorized by written order from approving authority-in-charge of work.

B. Visit to Site:
   1. Visit site to survey existing conditions affecting work. Include necessary materials and labor to accomplish the electrical work, including relocation of existing services and utilities on building site in bid. No consideration given to future claims due to existing conditions, or for failure to visit the site.

C. Definitions:
   1. Provide: Furnish, install and connect complete.
   2. Furnish all necessary wiring and connect complete.
   3. Install: Set in place and wire complete.
   4. Materials completely installed and connected.
   5. American Wire Gage.
   6. National Electrical Code (latest edition).
   7. National Fire Protection Association.
   8. Occupation Safety and Health Administration.
   9. Underwriters Laboratories, Inc.
   10. National Electrical Manufacturers Association.
   11. Institute of Electrical and Electronic Engineers.

D. Workmanship, Guarantee and Approval:
   1. Work under this Division shall be first class with emphasis on neatness and workmanship.
   2. Install work using competent mechanics, under supervision of foreman, all duly certified by local authorities. Installation is subject to Engineer’s constant observation, final approval, and acceptance. Engineer may reject unsuitable work.
   3. Furnish Engineer written guarantee, stating that if workmanship and/or material executed under this Division is proven defective within one (1) year after final acceptance, such defects and other work damaged will be repaired and/or replaced at no cost to the Owner.
   4. In event that project is occupied or systems placed in operation in several phases at Owner’s request, guarantee will begin on date each system or item of equipment is accepted by Owner.

E. Observations of Work and Demonstration of Operation:
   1. At all observations of work, open panel covers, junction box cover, pull box covers, device covers, and other equipment with removable plates for check. Provide sufficient personnel to expedite cover removal and replacement.

2. Contractor to assist Engineer in demonstration of operation of new systems to satisfaction of Owner. Contractor to have manufacturer available for demonstration of systems where requested by Owner.

F. Testing of Electrical Systems:
   1. Test Completed work as follows:
      a. Perform tests required by Engineer to indicate compliance with specifications, drawings and applicable codes. Provide instruments, labor and materials for tests.
      b. Insulation – use 1000 VDC insulation tester (0-500 megohm full-scale), equal to "Megger" as manufactured by Megger Company. Test conductors and busses of all systems, including feeders, main service busway, branches, etc.
      c. Insulations test results shall be submitted and approved prior to connection of devices and equipment.
   2. Switchgear Test:
      a. Prior to acceptance of new construction, all service and distribution equipment, including lighting panelboards, individually enclosed circuit breakers, and safety switches will be tested by the manufacturer. All test results are to be included in submittal data.
      b. Tests will determine whether circuit breaker trip devices are functioning properly; contact surfaces and joints in switches and circuit breakers have minimum electrical resistance; all bolted connections are tight; bus bars properly braced.
      c. Tests shall not affect Contractor's guarantee of materials and workmanship. Contractor to replace defective new equipment and devices without additional cost to Owner
   3. Ground Testing:
      a. Testing of Made Ground Electrodes:
         1) Test all Ground Systems.
         2) Using a measuring device which generates minimum of 500 VDC, calibrated in ohms (maximum 200 ohm scale) as manufactured by Biddle or Megger/Biddle. (Biddle/Megger models DET20C and DET30C are acceptable).
         3) Provide test electrode in accordance with Measuring Device Manufacturer's instructions. Use ground rods as specified in Section "Grounding".
         4) Follow instructions of measuring device manufacturer for proper results.
         5) Test grounds only when earth is dry.
         6) Record ambient temperature, date, time, appropriate water table level (as obtained from local geologists); type of earth material.

G. Materials and Substitutions:
   1. All material shall be new, with U.L. label where available. If U.L. label is not available, material shall be manufactured in accordance with applicable NEMA, IEEE and Federal Standards.
   2. No material shall be substituted for specified, except by prior written approval of Engineer. Specified catalog numbers are used for description of equipment and standard of quality only. Equivalent material given consideration only if adequate comparison data including samples are provided. Approval required prior to bid date. Bid substituted material only if approved in writing by Engineer.
   3. Submitted items or components shall be listed on sheet 1 of submittal brochure complete with identification mark (from drawings), manufacturer, catalog number and any other pertinent information. Submittals will not be reviewed without this summary sheet.
   4. Bind each set of submittal data. Submittals will not be reviewed if not bound.

H. Shop and Erection Drawings:
   1. Submit shop drawings for all material and equipment furnished under Division 26 of specifications, to Engineer for review within 30 days after award of contract. Shop drawings shall be submitted on timely basis to allow adequate lead time for review, re-submission if necessary, manufacture and delivery to allow access of material to project at correct time based on schedule established by Contractor. Include complete descriptive

data with dimensions, operating data and weight for each item of equipment. Carefully examine shop drawings to assure compliance with drawings and specifications prior to submittal to Engineer. Shop drawings and submittals shall bear the stamp of approval of the Electrical and General Contractor as evidence drawings have been checked by them. Drawing submitted without this stamp of approval will not be considered and will be returned for proper resubmission.

2. Drawings larger than 8-1/2" x 11", submit 3 copies and 1 reproducible of each drawing. Engineer will retain 2 copies and return 1 reproducible and 1 copy to Contractor. Contractor is responsible for copying reproducible for distribution.
3. 8-1/2" x 11" drawing in brochure: Submit 6 original copies for review. Engineer will retain 2 copies and return 4 copies to Contractor.
4. Review of shop drawings does not relieve Contractor of responsibility for errors and omissions in shop drawings. Contractor is responsible for dimensions and sizes of equipment. Inform Engineer in writing of equipment differing from that shown.
5. Provide for Owner one (1) set of final shop and erection drawings, except provide 1 set of 1.5 mil Mylar sepias of shop drawings larger than 8-1/2" x 11" size.
6. Coordination shop drawings will be required for the following areas, drawn to a scale of not smaller than ¼" – 1'-0":
   a. Electrical equipment rooms and areas.
   b. Electrical and mechanical equipment areas.
   c. After the General Contractor has approved the drawings, they shall be submitted to the Engineer for approval.

I. Cooperation:
   1. Carefully coordinate work with other contractors. Refer conflicts between trades to Engineer.
   2. Work to be installed as progress of project will allow. Schedule of work determined by General Contractor and/or Engineer.

J. Maintenance and Operating instructions for Equipment:
   1. Submit to Engineer one (1) set of data prepared by manufacturer for each item of electrical equipment completely describing equipment. Data to include parts lists, description of operation, shop drawings, wiring diagrams, maintenance procedures and other literature required for maintenance of equipment. Bind in booklet form for presentation.

K. Record Drawings:
   1. When work starts the Engineer will furnish two complete sets of white prints of the Electrical Drawings. All corrections, variations, and deviations, including those required by change orders, if any, must be recorded in colored ink or colored pencil at the end of each working day on these drawings. The marked prints shall be available at all times for the Design Professional's inspection.
   2. Prior to examining the request for final payment or making any response thereto, the Design Professional shall receive from the Contractor one complete set of the white prints, marked as stated above, indicating the actual completed installation of the work included under this contract.
      a. Block out areas modified by change order and identify them by change order number.
   3. When work is completed, contractor shall be provided CAD files (AutoCAD Version 2004) of Electrical Drawings for use in preparing record drawings. Contractor shall transfer the information from the marked white prints to the CAD drawings, removing all superseded data in order to show the actual completed conditions. When record drawings are completed, provide one set of vellum sheets, and one complete set of CAD drawing files (AutoCAD Version 2004) on compact disks for Owner.

L. Items for Owner:
   1. Provide following items for Owner at time of substantial completion:
      a. Certificates of inspection and approval from authorities having jurisdiction.
      b. Certification of systems from installing Sub-Contractors (such as Fire Alarm, Security, etc.).

c. Written guarantees.
d. Final approved shop drawings (1 set).
e. Spare fuses (furnish receipt).
f. Maintenance data 1 set.
g. Affidavit of Owner Instruction (1 copy).

M. Marking:
1. Identify each starter, (including starters furnished under Mechanical Section), panelboard, cabinet, control device, breaker, disconnect and safety switch with ¼" high black letters cut in a white laminated phenolic strip. Use red letters for all equipment connected to emergency system. Attach to enclosure with two (2) metal screws.
2. Nameplates required for other items in this Division similar to those described above.

N. Protection and Storage:
1. Provide warning lights, bracing, shoring, rails, guards and covers necessary to prevent damage or injury.
2. Do not leave exposed or unprotected, electrical items carrying current. Protect personnel from exposure to contact with electricity.
3. Protect work and materials from damage by weather, entrance of water or dirt. Cap conduit during installation.
4. Avoid damage to materials and equipment in place. Repair, or remove replace damaged work and materials.
5. Exercise particular care when working around telephone (electronic) equipment to prevent entrance of dust, moisture and debris into the equipment. Provide dust barriers and partitions as required.
6. Deliver equipment and materials to job site in original, unopened, labeled container. Store to prevent damage and injury. Store ferrous materials to prevent rusting. Store finished materials and equipment to prevent staining and discoloring. Store materials affected by condensation in warm dry areas. Provide heaters. Storage space on site and in building designated by Owner.
7. Install equipment per manufacturer's recommendations. Conflicts between contract documents and these recommendations shall be deferred to Engineer.

O. Cutting and Repairing:
1. Cut and repair walls, floors, roof, etc., required to install work. Where work cut is finished, employ original installer of finish to repair finish. Do not cut structural members.

P. Anchors:
1. Provide anchors for all equipment, raceways, hangers, etc. to safely support weight of item involved. Anchors to consist of expansion type devices similar to "Redhead" or lead expansion anchors. Plastic anchors are not acceptable.

Q. Cleaning and Painting:
1. Clean equipment furnished in this Division after completion of work.
2. Touch-up or re-paint damaged painted finishes.
3. Remove debris, packing cartons, scrap, etc., from site.

R. Control Wiring:
1. Control Wiring, including low voltage and line voltage interlock wiring, will be furnished and installed under another Division, except where specifically shown otherwise. Carefully coordinate power and control wiring interface.

S. Code Compliance:
1. Entire electrical installation shall comply with all aspects of code including local interpretations. This includes, but is not limited to:
a. Installation adjustment to meet all code clearances between electrical equipment and such as ductwork, other HVAC, plumbing, fire protection, and structural systems.
b. Locations for items such as fire alarm appliances, exit lights, egress lighting, disconnect switches, etc.

2. No additional compensation will be allowed for code compliance. Notify engineer of difficulty encountered for assistance.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 26 0120
ELECTRICAL SUBMITTALS

PART 1 GENERAL

1.01 DESCRIPTION OF SUBMITTAL CATEGORIES:

A. Submittals required are defined below and specified in each section.

B. Shop Drawings include fabrication, layout, wiring diagrams, erection, setting, coordination, similar drawings and diagrams and performance data.

C. Samples are units of work, materials or equipment items, showing the workmanship, pattern, trim and similar qualities proposed.

D. Manufacturer's Data is standard printed product information concerning the standard portions of the manufacturer's products.

E. Certifications are written statements, executed specifically for the project application by an authorized officer of the contracting firm, manufacturer or other firm as designated, certifying to compliance with the specified requirements.

F. Test Reports are specific reports prepared by independent testing laboratories, showing the results of specified testing. Industry Standards are printed copies of the current standards in the industry.

G. Manufacturer's Product Warranties are manufacturer's standard printed commitment, in reference to a specific product and normal application, stating that certain acts of restitution will be performed by the manufacturer if the product fails under certain conditions and time limits.

H. Operating Instructions are the written instructions by the manufacturer, fabricator or installer of equipment or systems, detailing the procedures to be followed by the Owner in operation, control and shut-down.

I. Maintenance Manuals are the compiled information provided for the Owner's maintenance department of each system of operating equipment. Maintenance Materials are extra stock of parts or materials for the Owner's initial use in maintaining the equipment and systems in operation.

J. Guarantees are signed commitments to the Owner that certain acts of restitution will be performed if certain portions of work fail within certain conditions and time limits.

K. Product Data includes manufacturer's data pertaining to the products, materials and equipment of the work.

1.02 SUBMITTAL FORM AND PROCEDURES:

A. Submittals shall be made within 30 days of contract signing for project of 12 months construction time or less. Make within 60 days for longer than 12 months construction time.

B. Submit shop drawings for all material and equipment furnished under Division 26 to Engineer.

C. Multiple System Items: Where a required submittal relates to an operational item of equipment used in more than one system, increase the number of copies as necessary to complete maintenance manuals for each system.

D. Response to Submittals: Submittals will be returned with indication that documents comply with specifications or that documents do not comply and what action must be taken to be in compliance.

E. Coordinate electrical submittals through Contractor to Engineer and assist Contractor in preparation of submittal.

F. Submittals shall bear the stamp and signature of electrical and general contractor. Failure to place stamp on drawings will require re-submittal before review.

1.03 SPECIFIC SUBMITTAL REQUIREMENTS:

A. Shop Drawings are:
   1. To accurate scale except where diagrammatic representations are specifically indicated.

2. To show clearance dimensions of critical locations and show dimensions of spaces required for operation and maintenance of equipment.
3. To show conduit and conductor connections and other service connections.
4. To show interfaces with other work including structural support.
5. To include complete descriptive data, with dimensions, operating data and weight.
6. To indicate deviation from the contract documents.
7. To explain deviations.
8. To show how deviations coordinate with portions of the work, currently or previously submitted.

B. Review of shop drawings shall not relieve Contractor of responsibility for errors or omissions in shop drawings. Any equipment which will not fit into space shown on drawings shall be called to the attention of the Engineer in writing.

C. Manufacturer's Data:
1. Where pre-printed data covers more than one distinct item, mark copy to indicate which item is to be provided.
2. Delete portions of data not applicable.
3. Mark data showing portion of operating range required for project application.
4. Elaboration of standard data describing a non-standard product processed as a shop drawing.

D. For each product include:
1. Manufacturer's production specifications.
2. Installation or fabrication instructions.
3. Source of supply.
4. Sizes, weights, speeds and operating capacities.
5. Conduit and wire connection sizes and locations.
6. Statements of compliance with required standard and governing regulations.
7. Performance data, where applicable.
8. Other information needed to confirm compliance. Manufacturer's recommended parts list.

E. Certifications: Submit with notarized execution.

F. Test Reports: Submit notarized test reports signed and dated by firm performing test.

G. Manufacturer's Product Warranties: Where published warranty includes deviation from required warranty, product is disqualified from use on project, unless manufacturer issues a specific project warranty.

H. Operating Instructions submittal required:
1. Manufacturer's operating instructions for each item of electrical equipment.
2. Supplement with additional project application instructions where necessary.
3. Specific operating instructions for each electrical system which involves multiple items of equipment. Instructions for charging, start-up, control or sequencing of operation, phase or seasonal variations, shut-down, safety and similar operations.

I. Maintenance Manual Requirements:
1. Emergency instructions including addresses and telephone numbers for service sources.
2. Regular system maintenance procedures.
3. Proper use of tools and accessories.
4. Wiring and control diagram for each system.
5. Manufacturer's data for each operational item in each system.
6. Manufacturer's product warranties and guarantees relating to the system and equipment items in the system.
7. Shop drawings relating to the system.
8. Bind each maintenance manual in one or more vinyl-covered, 2", 3-ring binders, plus pocket-folders for folded drawings. Index with thumb tab for sections. Mark the back spine and front cover of each binder with system identification and volume number.
9. Deliver to Owner in fully identified containers or packages suitable for storage.

J. Guarantees: Where indicated as “Certified”, provide guarantee which, in addition to execution by an authorized officer of each guarantor, is attested to by the Secretary of each guarantor and bears the corporate seal. Submit draft of each guarantee prior to execution.

PART 2 PRODUCTS – NOT USED

PARTT 3 EXECUTION – NOT USED

END OF SECTION

SECTION 26 0140

ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.01 DESCRIPTION OF WORK:

A. Systems and equipment requiring identification are shown on the drawings, and extent of identification is specified herein and in individual sections of work.

B. Types of electrical identification include:
   1. Exposed conduit color marking.
   2. Cable/conductor identification.
   3. Operational instructions and warnings.
   4. Danger signs.
   5. Equipment/system identification signs (nameplates).

1.02 SUBMITTALS:

A. Manufacturer's Data:
   1. Product specifications and installation instructions for each material and device.

B. Samples:
   1. Provide for each color, lettering style and other graphic representation.

PART 2 PRODUCTS

2.01 ELECTRICAL IDENTIFICATION MATERIAL:

A. Color-Coded Conduit Materials:
   1. Color code all conduit with ¾ inch wide band of vinyl plastic electrical tape, 3M Company "Scotch 35", applied two (2) full turns around conduit, 6" from all conduit terminations into switchboards, panelboards, motor control centers, starters, cabinets, control panels, pull boxes, outlet boxes, etc., on each side of walls, floors or roof penetrated by conduit and where conduit enters wall to outlets below.

SYSTEM	CONDUIT	COLOR CODE
120/208-240 VOLTS	NORMAL	BLACK
FIRE ALARM		ORANGE

B. Where authority does not allow tape, use paint acceptable to authority.

C. Cable/Conductor Identification Bands:
   1. Manufacturer's standard vinyl-cloth self-adhesive cable/conductor markers, wrap-around type; pre-numbered plastic coated, or write-on type with clear plastic self-adhesive cover flap, lettered to show circuit identification.

D. Self-Adhesive Plastic Signs:
   1. Manufacturer's standard, self-adhesive, pre-printed, flexible vinyl signs for operational instructions or warnings. Sizes suitable for application and visibility, with proper wording for application.
   2. Color: Orange with black lettering.

E. Engraved Signs (Nameplates):
   1. 1/8" thick melamine plastic laminate, complying with FS LP-387, sizes as indicated, engrave with standard letter style of sizes and wording indicated (1/4" letters minimum), white field, black letters for normal service, punched for screws.
   2. Fasteners: Self-tapping stainless steel screws, except contact epoxy adhesive where screws cannot or should not penetrate substrate.

F. Lettering and Graphics:

1. Coordinate names, abbreviations and other designations used with those shown or specified. Provide numbers, lettering, and wording as indicated or required for identification and operation/maintenance.

PART 3 EXECUTION

3.01 APPLICATION AND INSTALLATION:

A. General installation requirements:
   1. After completion of painting.
   2. Comply with governing regulations and requests of governing authorities for identification of electrical work.

B. Operational Identification and Warnings:
   1. Provide operational signs for main switch.

C. Engraved Plastic Laminated Signs: Install on each major unit of electrical equipment in the building. Provide single line of text, ¼" high lettering on 1" high sign (1-1/2" high where 2 lines required). Matching terminology and numbering of contract documents. Provide signs for each unit of the following categories (signs shall identify item fed, voltage where fed from):
   1. Electrical cabinets and enclosures. Indicate voltage. This includes panelboards.
   2. Access panel/doors to electrical facilities.
   3. Safety switches and circuit breakers.
   4. Feeders in pull and junction boxes and in all switchgear. Fasten with nylon ties.
   5. All equipment furnished in this Division of the specifications.

D. Install signs where indicated or most visible. Secure with screws or epoxy adhesive. Secure to feeder cables with nylon ties.

END OF SECTION

SECTION 26 0300
COORDINATION

PART 1 GENERAL

1.01 DRAWINGS FOR MECHANICAL AND ELECTRICAL WORK:

A. Drawings contain diagrammatic layouts and indicate general arrangement of systems, piping conduit, etc.

B. Prior to installation of material and equipment, review and coordinate work with Architectural and Structural Drawings and other Division work for exact space conditions; where not readily discernable request information from Design Professional before proceeding.

C. Check drawings of all other trades to verify extent of material and equipment to be installed in spaces available and consider layout alternatives so that all requirements can be accommodated.

D. Maintain maximum headroom at all locations without finished ceilings.

E. Maintain finished ceiling heights as indicated on reflected ceiling plans, and building sections and elevation drawings.

F. Coordinate installations with other trades prior to proceeding to prevent conflict with work of other trades, and cooperate in making reasonable modifications in layout as needed.

G. Where conflicts occur with placement of mechanical and electrical materials as they relate to placement of other building materials, the Engineer shall be consulted for assistance in coordination of the available space to accommodate all trades.

H. Coordinate equipment installation to maintain manufacturer and code required working clearances.

1.02 PRIORITY OF CONSTRUCTION SPACE:

A. The following is the Order of Priority for Construction Space:
   1. First: Ductwork.
   2. Second: Fire Protection piping.
   3. Third: Other piping.
   4. Fourth: Conduit.

1.03 COORDINATION DRAWINGS:

A. The contractor shall prepare a complete set of “Cronoflex Mylar” type background drawings at scale used for construction drawings.
   1. The construction documents in their original, copies or electronic file form are the Engineer’s instrument of service and are protected under copyright laws. The reproduction of these documents for use as coordination drawings or shop drawings is prohibited without the Design Professional’s written consent and authorization.

B. Each specialty trade listed below shall prepare a coordination Mylar overlay indicating his work, with appropriate elevations and grid dimensions.

C. Each specialty trade shall sign and date the coordination drawing after the addition of his information.

D. Fabrication shall not start until receipt of completed coordination drawings is acknowledged by the Contractor in writing to the Design Professional.

E. Specialty Trades:
   1. Ductwork
   2. Fire protection piping
   3. Other piping
   4. Electrical
   5. Plumbing piping to include but not be limited to sanitary, vent, pressure storm, medical gas (if provided), compressed air, natural gas, etc.

F. Coordination drawings required for all mechanical rooms, electrical rooms, equipment rooms, corridors, horizontal exits from duct shafts, cross overs and any other areas where congestion of work may occur.

G. Coordination Schedule drawing:
   1. The mechanical and plumbing contractor(s) shall furnish to electrical contractor for coordination a schedule drawing providing all the electrical characteristics of all mechanical and plumbing equipment requiring electrical connection. The information provided shall include:
      a. Unit Designation.
      b. Voltage
      c. MCA
      d. MOCP/MFS
      e. FLA
      f. Disconnect Requirements
      g. Starter Requirement
      h. Alarm Wiring Requirements
   2. The coordination schedule drawing, once received by the electrical contractor, shall be reviewed and all pertinent electrical accommodations indicated.
      a. Breaker size.
      b. Wire size / conduit size.
      c. Disconnect with fuse size.
   3. Once the coordination schedule is completed, forward to the engineers for review and approval.

H. Conflicts that arise due to the fact that the coordination schedule drawing was not completed shall be the sole responsibility of the contractors. All costs for correction or remedial work shall be done at the contractor's expense. No added cost to the owner will be allowed.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 26 0505

SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical demolition.

1.02 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual sections.

B.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify field measurements and circuiting arrangements are as indicated.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

C. Demolition drawings are based on casual field observation and existing record documents.

D. Report discrepancies to Design Professional before disturbing existing installation.

E. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings to be removed.

B. Coordinate utility service outages with utility company.

C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
   1. Obtain permission from Owner at least 24 hours before partially or completely disabling system.
   2. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Remove, relocate, and extend existing installations to accommodate new construction.

B. Remove abandoned wiring to source of supply.

C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.

E. Repair adjacent construction and finishes damaged during demolition and extension work.

F. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

G. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

END OF SECTION

SECTION 26 0519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Building wires and cables rated 600 V and less.
   2. Connectors, splices, and terminations rated 600 V and less.

1.02 DEFINITIONS

A. VFC: Variable frequency controller.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 PRODUCTS

2.01 CONDUCTORS AND CABLES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on drawings or comparable product by one of the following (or approved equal):
   1. Alcan Products Corporation; Alcan Cable Division.
   2. Alpha Wire.
   3. Belden Inc.
   4. Encore Wire Corporation.
   5. General Cable Technologies Corporation.
   6. Southwire Incorporated.

B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type XHHW-2 and Type SO.

D. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for metal-clad cable, Type MC, with ground wire and Type SO.

E. VFC Cable:
   1. Comply with UL 1277, UL 1685, and NFPA 70 for Type TC-ER cable.
   2. Type TC-ER with oversized crosslinked polyethylene insulation, spiral-wrapped foil plus 85 percent coverage braided shields and insulated full-size ground wire, and sunlight- and oil-resistant outer PVC jacket.

2.02 CONNECTORS AND SPLICES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. AFC Cable Systems, Inc.
   2. Gardner Bender.
   3. Hubbell Power Systems, Inc.
   4. Ideal Industries, Inc.
   5. Ilsco; a branch of Bardes Corporation.
   6. NSi Industries LLC.
   7. O-Z/Gedney; a brand of the EGS Electrical Group.
   8. 3M; Electrical Markets Division.
   9. Tyco Electronics.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.03 SYSTEM DESCRIPTION

A. 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.

B. Comply with NFPA 70.

PART 3 EXECUTION

3.01 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger, except VFC cable, which shall be extra flexible stranded.

3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type XHHW-2, single conductors in raceway.

B. Exposed Feeders: Type XHHW-2, single conductors in raceway or Metal-clad cable, Type MC.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type XHHW-2, single conductors in raceway or Metal-clad cable, Type MC.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.

E. Feeders Installed below Raised Flooring: Type XHHW-2, single conductors in raceway or Metal-clad cable, Type MC.

F. Feeders in Cable Tray: Metal-clad cable, Type MC.

G. Exposed Branch Circuits, Including in Crawlspaces: Type XHHW-2, single conductors in raceway or Metal-clad cable, Type MC.

H. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type XHHW-2, single conductors in raceway or Metal-clad cable, Type MC.

I. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: XHHW-2, single conductors in raceway.

J. Branch Circuits Installed below Raised Flooring: Type XHHW-2, single conductors in raceway or Metal-clad cable, Type MC.

K. Branch Circuits in Cable Tray: Type XHHW-2, single conductors in raceway or Metal-clad cable, Type MC.

L. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

M. VFC Output Circuits: Type TC-ER cable with braided shield.

3.03 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.04 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

3.05 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.06 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.07 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section on “Penetration Firestopping."

3.08 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections:
   1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
   2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.
      a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
      b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
      c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

C. Test and Inspection Reports: Prepare a written report to record the following:
   1. Procedures used.
   2. Results that comply with requirements.
   3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION

SECTION 26 0526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes grounding and bonding systems and equipment, plus the following special applications:
   1. Underground distribution grounding.
   2. Foundation steel electrodes.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.04 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Burndy; Part of Hubbell Electrical Systems.
   2. Dossert; AFL Telecommunications LLC.
   3. ERICO International Corporation.
   4. Fushi Copperweld Inc.
   5. Galvan Industries, Inc.; Electrical Products Division, LLC.
   6. Harger Lightning and Grounding.
   7. ILSCO.
   8. O-Z/Gedney; A Brand of the EGS Electrical Group.
   9. Robbins Lightning, Inc.
   10. Siemens Power Transmission & Distribution, Inc.

2.02 SYSTEM DESCRIPTION

A. 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.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.03 CONDUCTORS

A. Bare Copper Conductors:
   1. Solid Conductors: ASTM B 3.
   2. Stranded Conductors: ASTM B 8.
   3. Tinned Conductors: ASTM B 33.
   4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
   5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
   6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
   7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

B. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart.

Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.04 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless exothermic-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.05 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet (19 mm by 3 m).

PART 3 EXECUTION

3.01 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.
   1. Bury at least 24 inches (600 mm) below grade.
   2. Duct-Bank Grounding Conductor: Bury 12 inches (300 mm) above duct bank when indicated as part of duct-bank installation.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
   1. Install bus horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.
   2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

E. Conductor Terminations and Connections:
   1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
   2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
   3. Connections to Ground Rods at Test Wells: Bolted connectors.
   4. Connections to Structural Steel: Welded connectors.

3.02 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.03 GROUNDING SEPARATELY DERIVED SYSTEMS

A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

3.04 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

3.05 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

D. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

E. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

F. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

G. Metallic Fences: Comply with requirements of IEEE C2.
   1. Grounding Conductor: Bare, tinned copper, not less than No. 8 AWG.
   2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.
   3. Barbed Wire: Strands shall be bonded to the grounding conductor.

3.06 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.
   1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
   2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor; unless otherwise shown on drawings.

D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 260543 "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches (300 mm) deep, with cover.
   1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
   1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.

2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

F. Grounding and Bonding for Piping:
1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

G. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

3.07 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:
1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
b. Perform tests by fall-of-potential method according to IEEE 81.
4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:
1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 5 ohms.
2. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 26 0529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:
   1. Hangers and supports for electrical equipment and systems.

1.03 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.04 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.05 QUALITY ASSURANCE

A. Comply with NFPA 70.

1.06 COORDINATION

A. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in section specifying "Roof Accessories" or see architectural drawings.

PART 2 PRODUCTS

2.01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Allied Tube & Conduit.
      b. Cooper B-Line, Inc.
      c. ERICO International Corporation.
      d. GS Metals Corp.
      e. Thomas & Betts Corporation.
      f. Unistrut; Atkore International.
      g. Wesanco, Inc.
   2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
   3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
   4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in

riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
   1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
      a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
         1) Hilti, Inc.
         2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
         3) MKT Fastening, LLC.
         4) Simpson Strong-Tie Co., Inc.
   2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
      a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
         1) Cooper B-Line, Inc.
         2) Empire Tool and Manufacturing Co., Inc.
         3) Hilti, Inc.
         4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
         5) MKT Fastening, LLC.
   3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
   4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
   5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
   6. Toggle Bolts: All-steel springhead type.
   7. Hanger Rods: Threaded steel.

PART 3 EXECUTION

3.01 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
   1. Secure raceways and cables to these supports with conduit clamps.

3.02 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum

static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
   1. To Wood: Fasten with lag screws or through bolts.
   2. To New Concrete: Bolt to concrete inserts.
   3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
   4. To Existing Concrete: Expansion anchor fasteners.
   5. To Steel: Spring-tension clamps.
   6. To Light Steel: Sheet metal screws.
   7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate .

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.03 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
   1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 26 1200

CONDUCTORS (LOW VOLTAGE, 600 VOLTS)

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK:

A. Furnishing, installing and testing 600 volt conductors for lighting, power, and auxiliary systems.

PART 2 – PRODUCTS

2.01 CONDUCTORS:

A. 98% conductivity copper; #12 AWG minimum; #8 AWG and smaller solid, #6 and larger stranded.

B. Conductors furnished with NEC, 600 volt, insulation as follows:
   1. Dry locations:
   2. #6 AWG and smaller – type THW, THWN or XHHW
   3. (do not intermix in circuits)
   4. #4 AWG and larger - type THW, THWN or XHHW

C. Wiring for controls and auxiliary systems #14 AWG stranded minimum with NEC type THWN insulation.

D. Color Code as follows and/or per local ordinances. Conductors #12 and smaller shall have colored insulation. Conductors #8 and larger not available in colors, color code with colored pressure sensitive tape. Apply minimum 2” of tape to each individual phase or neutral conductor in half lapped pattern. The equipment ground conductor shall be taped green for its entire exposed length. Color-code as follows:

Phase	120/240 Volts	102/208 Volts	277/480 Volts	Ungrounded	Isolated Power
A	Black	Black	Brown	Orange	Black
B	Red	Red	Orange	Brown	Red
C	Blue	Yellow	Yellow	Blue	
Neutral	White	White	White	White	White
Equip Gnd	Green	Green	Green	Green	Green

E. Manufacturers of copper conductors: Pirelli, Phelps Dodge, Capital Cable, Rome Southwire, Senator, Essex, American, or approved equal.

PART 3 – EXECUTION

3.01 APPLICATION AND INSTALLATION:

A. Install wiring complete with connections to equipment.

B. Install wiring so conductors are not in tension in completed system.

C. Form wiring neatly and group in circuits. Tie grouped conductors with nylon ties, T&B “Tyrap” or approved equal.

D. Use pulling compound of Ideal “Yellow 77”, Minerallac No. 100, or approved equal. Do not use pulling compound for circuits on secondary side of ungrounded isolation transformers.

E. Join and terminate copper conductors individually.

F. Lugs in damp locations connected to copper bus: Solid 98% conductivity long copper barrel, tin plated, compression type connectors, Thomas & Betts color keyed, Burndy “Hydent” or approved equal; applied with appropriate hydraulic tool.

G. Provide lugs where not furnished as part of equipment – furnish as specified above, to connect all conductors.

H. Furnish lugs for conductors #2/0 and larger with two bolt tongue or approved equivalent.

I. Make conductor taps #8 and larger from a second conductor with 98% conductivity bolted insulated connector, T&B “IDT”, Ilsco “KUP-L-TAP” or approved equivalent. Insulate splices with 600 volt “heat shrink” covers T&B or equal.

J. Splice conductors #8 and larger with solid copper barrel, type fittings applied with an appropriate hydraulic tool. Splices used only where approved. Splice fittings: Burndy “Hydent”. Insulate splices with 600 volt “heat shrink” covers T&B or equal.

K. Joints #10 and smaller: T&B Sta-Kon wire joints EPT66M, with insulating caps, installed with WT161 Tool or C nest of WT11M Tool; Ideal Super/Nuts; Ideal Wing Nuts; 3M “Scotchlock” or Buchanan Electric Products B Cap or Series 2000 Pressure connectors complete with nylon snap on insulators installed with C24 pressure tool. Where conductors are connected to screw terminals, use nylon insulated, locking fork, T&B Sta-Kon or approved equal. Where joints are made in damp or wet locations insulate splices with 600 volt “heat shrink” covers T&B or equal.

L. Provide cable supports: As required by NEC. Supports with malleable screwed conduit fitting and non-conductive wedges drilled for the conductors; O.Z. Manufacturing Company or approved equal. Furnish pullbox, sized per NEC for each cable support.

M. Bond circuit ground wires where installed to all devices, equipment, outlet and junction boxes, and grounding bushings (where provided) with a full size conductor and screw type connection.

N. Securely fasten non-ferrous identifying tapes, pressure sensitive labels or engraved nameplates to all cables, feeders and power circuits in vaults, pull boxes, manholes, switchboard rooms, terminations of cables, etc.

O. Mark all branch circuit conductors at panel terminations including neutrals with pressure sensitive numbers to correspond to circuit numbers connected.

P. Connect circuits and feeders as shown on drawings. Drawings are diagrammatic and do not show every detail required in the wiring system. Detail wiring accomplished per NEC.

Q. All conductors making up parallel feeders to be same size, same type, and same insulation, all cut same length. Bond each group of conductors making up a phase or neutral at both ends in an approved manner.

R. DO NOT COMBINE CIRCUITS unless specifically approved by the Engineer. No more than 3 phase or current carrying conductors in a circuit.

END OF SECTION

SECTION 26 1700

DISCONNECTS (MOTOR & CIRCUIT & SEPARATE CIRCUIT BREAKERS)

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK:

A. Safety switches and disconnects and separately mounted circuit breakers.

B. Provide shop drawing.

PART 2 – PRODUCTS

2.01 DISCONNECT SWITCHES:

A. Heavy duty rated 250 or 600 volts as required; quick-make, quick-break operation; horsepower rated. If switch is not available with proper horsepower rating, classify switch as isolating switch only and provide nameplate reading, “DO NOT OPEN UNDER LOAD”. Operating handle interlocked with switch door to prevent opening door with switch closed. Provide mechanical over-ride for authorized personnel to open switch door without operating switch handle.

B. Fusible or non-fusible as shown. Furnish Bussman “Fuse-Tron” fuses for each fusible position, size as shown. Furnish 3 spare fuses for each size.

C. Furnish with provisions for locking with padlock. Enclosures for switches NEMA 1, general purpose, NEMA 3R, raintight, or special enclosure, as shown.

D. Standard product of Siemens, Square “D”, or Cutler-Hammer. General Electric is not acceptable.

2.02 SEPARATELY MOUNTED CIRCUIT BREAKERS:

A. Furnish and install separately mounted circuit breakers for overcurrent protection of feeders and branch circuits where shown on drawings.

B. Circuit breakers: Thermal-magnetic, molded case type, rated 600 volts, with interrupting rating as indicated on the drawings.

C. Individual circuit breakers shall be mounted in NEMA 1, general purpose surface or flush enclosures as shown.

D. Circuit breakers shall be the standard product of Siemens, Square “D”, or Cutler-Hammer.

E. Provide lockable switch.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Secure disconnect switches to building or equipment surface as shown. If location shown is not suitable for installing, provide Unistrut P-1000 rack mount as directed to secure switch.

B. Disconnects shall be located to be accessible and within 5 feet or closer to equipment served.

C. Provide engraved nameplates identifying equipment being served, fuse or breaker size. Refer to specification sections 260100 and 260140.

END OF SECTION