Furnish Labor and Materials for Campus Wide Direct Digital HVAC Control System RFQ-0000002785

LAGC Plan Room - North

Project Manual – Public Bid

LSU Solicitation Number RFQ-0000002785

Furnish Labor and Materials for

Campus Wide Direct Digital HVAC Control System, Item 54
Louisiana State University Alexandria, Louisiana
Project No. 01-107-24-05, F. 01004604

Baton Rouge, Louisiana

April 6, 2026

M & E Consulting, LLC

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ADVERTISEMENT FOR BIDS

Bids will be received by the Office of Purchasing, Room 213 Thomas Boyd Hall, Louisiana State University and Agricultural and Mechanical College 70803 until **11:00 AM on Tuesday, June 2, 2026.**

**** Refer to www.centerlinebidconnect.com for bid submission instructions. All bids must be submitted via email to lsubids@lsu.edu ****

ANY PERSON REQUIRING SPECIAL ACCOMMODATIONS SHALL NOTIFY LOUISIANA STATE UNIVERSITY, OFFICE OF PURCHASING OF THE TYPE(S) OF ACCOMMODATION REQUIRED NOT LESS THAN SEVEN (7) DAYS BEFORE THE BID OPENING.

FOR: **Furnish Labor and Materials for Campus Wide Direct Digital HVAC Control System, Item 54 Louisiana State University Alexandria, Louisiana Project No. 01-107-24-05, F.01004604**

LSU SOLICITATION NUMBER: RFQ-0000002785

Complete Bidding Documents for this project may be obtained from: **www.centerlinebidconnect.com**. Printed copies are not available from the Designer, but arrangements can be made to obtain them through most reprographic firms.

Contractors unable to access bidding documents at **www.centerlinebidconnect.com** should contact

M & E Consulting, LLC
Skye Miller
1304 Bertrand Drive, Ste F7
Lafayette, LA 70506
337.362.3979
skye@meconsulting.com

All bids must be accompanied by bid security equal to five percent (5%) of the sum of the base bid and all alternates, and must be in the form of a certified check, cashier's check or Bid Bond Form written by a surety company licensed to do business in Louisiana, signed by the surety's agency or attorney-in-fact. Surety must be listed on the current U.S. Department of the Treasury Financial Management Service list of approved bonding companies as approved for an amount equal to or greater than the amount for which it obligates itself in the Bond, or must be a Louisiana domiciled insurance company with at least an A- rating in the latest printing of the A.M. Best's Key Rating Guide. If surety qualifies by virtue of its Best's listing, the amount of the Bond may not exceed ten percent of policyholders' surplus as shown in the latest A.M. Best's Key Rating Guide. The Bid Bond shall be in favor of the Louisiana State University and Agricultural and Mechanical College, and shall be accompanied by appropriate power of attorney. No Bid Bond indicating an obligation of less than five percent (5%) by any method is acceptable.

The successful Bidder shall be required to furnish a Performance and Payment Bond written by a company licensed to do business in Louisiana, in an amount equal to 100% of the Contract amount. Surety must be listed currently on the U.S. Department of Treasury Financial management Service List (Treasury List) as approved for an amount equal to or greater than the contract amount, or must be an insurance company domiciled in Louisiana or owned by Louisiana residents. If surety is qualified other than by listing on the Treasury list, the contract amount may not exceed fifteen percent of policyholders' surplus as shown by surety's most recent financial statements filed with the Louisiana Department of Insurance and may not exceed the amount of $500,000. However, a Louisiana domiciled insurance company with at least an A- rating in the latest printing of the A.M. Best's Key Rating Guide shall not be subject to the $500,000 limitation, provided that the contract amount does not exceed ten percent of policyholders' surplus as shown in the latest A.M.

Best's Key Rating Guide nor fifteen percent of policyholder's surplus as shown by surety's most recent financial statements filed with the Louisiana Department of Insurance. The Bond shall be signed by the surety's agent or attorney-in-fact.

A PRE-BID CONFERENCE WILL BE HELD

10:30 AM, Thursday, May 14, 2026
LSU - Alexandria, Facility Services Building,
Conference Room, 8209 Acorn Drive, Alexandria, LA 71302

Bids shall be accepted from Contractors who are licensed under LA. R.S. 37:2150-2163 for the classification of **MECHANICAL.** Bidder is required to comply with provisions and requirements of LA R.S. 38:2212 (A)(1)(c). No bid may be withdrawn for a period of thirty (30) days after receipt of bids, except under the provisions of LA. R.S. 38:2214.

The Owner reserves the right to reject any and all bids for just cause. In accordance with La. R.S. 38:2212 (A)(1)(b), the provisions and requirements of this Section, those stated in the advertisement for bids, and those required on the bid form shall not be considered as informalities and shall not be waived by any public entity.

When this project is financed either partially or entirely with State Bonds or federal funds, the award of this Contract is contingent upon the granting of lines of credit, the sale of bonds by the Bond Commission or the commitment of federal funds. The University shall incur no obligation to the Contractor until the Contract Between Owner and Contractor is fully executed.

AD RUN DATES: April 29, May 6, May 13, 2026

LOUISIANA UNIFORM PUBLIC WORK BID FORM

TO: LSU Procurement Services
Via email: lsubids@lsu.edu

BID FOR: Furnish Labor and Materials for
Campus Wide Direct Digital HVAC Control System, Item 54, Louisiana State University Alexandria, Louisiana, Project No. 01-107-24-05, F.01004604
RFQ- 0000002785

The undersigned bidder hereby declares and represents that she/he; a) has carefully examined and understands the Bidding Documents, b) has not received, relied on, or based his bid on any verbal instructions contrary to the Bidding Documents or any addenda, c) has personally inspected and is familiar with the project site, and hereby proposes to provide all labor, materials, tools, appliances and facilities as required to perform, in a workmanlike manner, all work and services for the construction and completion of the referenced project, all in strict accordance with the Bidding Documents prepared by: **M & E Consulting, LLC.** and dated: **April 6, 2026**

Bidders must acknowledge all addenda. The Bidder acknowledges receipt of the following **ADDENDA:** (Enter the number the Designer has assigned to each of the addenda that the Bidder is acknowledging)_____.

TOTAL BASE BID: For all work required by the Bidding Documents (including any and all unit prices designated "Base Bid" * but not alternates) the sum of:

_____Dollars ($ _____)

ALTERNATES: For any and all work required by the Bidding Documents for Alternates including any and all unit prices designated as alternates in the unit price description.

Alternate No. 1 *(Owner to provide description of alternate and state whether add or deduct)* for the lump sum of:

Not Applicable _____Dollars ($ _____)

Alternate No. 2 *(Owner to provide description of alternate and state whether add or deduct)* for the lump sum of:

Not Applicable _____Dollars ($ _____)

Alternate No. 3 *(Owner to provide description of alternate and state whether add or deduct)* for the lump sum of:

Not Applicable _____Dollars ($_____)

NAME OF BIDDER: _____

ADDRESS OF BIDDER:_____

_____

LOUISIANA CONTRACTOR'S LICENSE NUMBER: _____

NAME OF AUTHORIZED SIGNATORY OF BIDDER: _____

TITLE OF AUTHORIZED SIGNATORY OF BIDDER: _____

SIGNATURE OF AUTHORIZED SIGNATORY OF BIDDER **: _____

DATE: _____

THE FOLLOWING ITEMS ARE TO BE INCLUDED WITH THE SUBMISSION OF THIS LOUISIANA UNIFORM PUBLIC BID FORM:

* The Unit Price Form shall be used if the contract includes unit prices. Otherwise it is not required and need not be included with the form. The number of unit prices that may be included is not limited and additional sheets may be included if needed.

****A CORPORATE RESOLUTION OR WRITTEN EVIDENCE** of the authority of the person signing the bid for the public work as prescribed by LA R.S. 38:2212(B)(5).

BID SECURITY in the form of a bid bond, certified check or cashier's check as prescribed by LA RS 38:2218 (A) is attached to and made a part of this bid.

INSTRUCTIONS TO BIDDERS

COMPLETION TIME:

The Bidder shall agree to fully complete the contract within _____ (____) consecutive calendar days, subject to such extension as may be granted under Paragraph 8.3, in the General Conditions and the Supplementary Conditions, and acknowledges that this Construction work may start on or after the date specified in the "Notice to Proceed." Contractor may mobilize to the site before the date set forth on the notice to proceed only with the prior written consent of Owner.

LIQUIDATED DAMAGES:

The Bidder shall agree to pay as Liquidated Damages the amount of:

_____ Dollars _____ for each consecutive calendar day for which the work is not complete, beginning with the first day beyond the completion date or days stated on the "Notice to Proceed" or as amended by change order.

ARTICLE 1

DEFINITIONS

1.1 The Contract Documents include the following:

Advertisement for Bids
Instructions to Bidders
Bid Form
Bid Bond
General Conditions of the Contract for Construction
AIA Document A201, 2007 Edition
Supplementary Conditions
Contract Between Owner and Contractor and Performance and Payment Bond
Contractor's Affidavit
Owner Documents (if applicable)
Change Order Form
Partial Occupancy Form
Recommendation of Acceptance
Asbestos Abatement (if applicable)
Other Documents (if applicable)
Specifications & Drawings
Addenda issued during the bid period and acknowledged in the Bid Form
Affidavit regarding Verification of Employees
Attestation Clause (Past Criminal Convictions of Bidders and Verification of Employees)

1.2 All definitions set forth in the General Conditions of the Contract for Construction, AIA Document A201, and the Supplementary Conditions are applicable to the Bid Documents.

1.3 Addenda are written and/or graphic instruments issued by the Prime Designer prior to the opening of bids, which modify or interpret the Bid Documents by addition, deletions, clarifications, corrections and prior approvals.A bid is a complete and properly signed proposal to do the work or designated portion thereof for the sums stipulated therein supported by data called for by the Bid Documents.

1.4 The base bid is the sum stated in the bid for which the Bidder offers to perform the Work described as the base bid, to which work may be added, or deleted for sums stated in alternate bids.

1.5 An alternate bid (or alternate) is an amount stated in the bid to be added to or subtracted from the amount of the base bid if the corresponding change in project scope or materials or methods of construction described in the Bid Documents, is accepted.

1.6 A Bidder is one who submits a bid for a prime Contract with the Owner for the work described in the proposed Bid Documents.

1.7 A Sub-bidder is one who submits a bid to a Bidder for materials, equipment and/or labor for a portion of the Work.

1.8 Where the word "Architect" is used in any of the documents, it shall refer to the Prime Designer of the project, regardless of discipline.

1.9 The Owner is defined as Board of Supervisors of Louisiana State University and Agricultural and Mechanical College and hereinafter referred to as Owner (University.)

ARTICLE 2

PRE-BID CONFERENCE

2.1 A Pre-Bid Conference may be held at the project site at least ten (10) days before the date for receipt of bids. The Prime Designer shall coordinate the setting of the date, time and place for the Pre-Bid Conference with the Owner and shall invite in writing the Owner, and all who have received sets of the Bid Documents to attend. The purpose of the Pre-Bid Conference is to familiarize Bidders with the requirements of the Project and the intent of the Bid Documents, and to receive comments and information from interested Bidders. If the Pre-Bid Conference is stated in the Advertisement for Bids to be a Mandatory Pre-Bid Conference, bids shall be accepted only from those bidders who attend the Pre-Bid Conference. Contractors who are not in attendance for the **entire** Pre-Bid Conference will be considered to have not attended.

2.1.1 For projects located on the LSU Campus, a parking fee will be assessed for any parking spaces provided, in the sole discretion of Owner, outside of the Work Area, as defined in the contract documents, if spaces are available. Contact the LSU Office of Parking and Transportation (Phone 225-578-5000).

2.2 Any revision of the Bid Documents made as a result of the Pre-Bid Conference shall not be valid unless included in an addendum.

ARTICLE 3

BIDDER'S REPRESENTATION

3.1 Each Bidder by making a bid represents that:

3.1.1 The Bidder has read and understands the Bid Documents and the bid is made in accordance therewith.

3.1.2 The Bidder has visited the site and is familiar with the local conditions under which the work is to be performed.

3.1.3 The Bidder's bid is based solely upon the materials, systems, equipment and labor described in the Bid Documents as advertised and as modified by addenda.

3.1.4 The Bidder's bid is not based on any verbal instructions contrary to the Bid Documents and Addenda.

3.1.5 The Bidder is familiar with Code of Governmental Ethics requirement that prohibits public servants and/or their immediate family members from bidding on or entering into contracts; he is aware that the Prime Designer and its principal owners are considered Public Servants under the Code of Governmental Ethics for the limited purposes and scope of the Design Contract with the Owner on this Project (see Ethics Board Advisory Opinion, No. 2009-378 and 2010-128); and neither he nor any principal of the Bidder with a controlling interest therein has an immediate family relationship with the Prime Designer or any principal within the Prime Designer's firm. (see La. R.S. 42:1113). Any Bidder submitting a bid in violation of this clause shall be disqualified and any contract entered into in violation of this clause shall be null and void.

3.2 The Bidder must be fully qualified under any State or local licensing law for Contractors in effect at the time and at the location of the work before submitting a bid. In the State of Louisiana, Revised Statutes 37:2150; et seq. will be considered, if applicable.

The Contractor shall be responsible for determining that all of the Sub-bidders or prospective Subcontractors are duly licensed in accordance with law.

ARTICLE 4

BIDDING DOCUMENTS

4.1 COPIES

4.1.1 Bid Documents may be obtained from the Prime Designer for a deposit as stated in the Advertisement for Bids. The deposit will be refunded as stated in the Advertisement for Bids. No deposits will be refunded on Bid Documents returned later than ten (10) days after receipt of bids.

4.1.2 As an alternative method of distribution, the Prime Designer may provide the Bidding Documents in electronic format. They may be obtained without charge and without deposit as stated in the Advertisement for Bids.

4.1.2.1. If electronic distribution is available, printed copies will not be available from the Prime Designer, but arrangements can be made to obtain them through most reprographic firms and/or plan rooms.

4.1.3 Complete sets of Bid Documents shall be used in preparing bids; neither the Owner nor the Prime Designer assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bid Documents.

4.1.4 The Owner or Prime Designer in making copies of the Bid Documents available on the above terms, do so only for the purpose of obtaining bids on the work and do not confer a license or grant for any other use.

4.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

4.2.1 Bidders shall promptly notify the Prime Designer in writing of any ambiguity, inconsistency or error which they may discover upon examination of the Bid Documents or of the site or local conditions.

4.2.2 Bidders requiring clarification or interpretation of the Bid Documents shall make a written request to the Prime Designer, to reach him at least seven (7) calendar days prior to the date for receipt of the bids.

4.2.3 Any interpretation, correction, or change of the Bid Documents will be made by addendum. Interpretations, corrections or changes of the Bid Documents made in any other manner will not be binding and Bidders shall not rely upon such interpretations, corrections, and changes.

4.3 SUBSTITUTIONS

4.3.1 The materials, products and equipment described in the Bid Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution. No substitutions shall be allowed after bidding.

4.3.2 No substitution will be considered unless written request for approval has been submitted by the Proposer and has been received by the Prime Designer at least seven (7) working days prior to the opening of Bids. (R.S. 38:2295C) Each such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitute including model numbers, drawings, cuts, performance and test data and any other information necessary for an evaluation. A statement setting forth any changes in other materials, equipment or work that incorporation of the substitute would require shall be included. It shall be the responsibility of the proposer to include in his proposal all changes required of the Bid Documents if the proposed product is used. Prior approval is given contingent upon supplier being responsible for any costs which may be necessary to modify the space or facilities needed to accommodate the materials and equipment approved. The burden of proof of the merit of the proposed substitution is upon the Proposer.

4.3.3 If the Prime Designer approves any proposed substitution, such approval will be set forth in an addendum. Bidders shall not rely upon approvals made in any other manner.

4.4 ADDENDA

4.4.1 Addenda will be mailed or delivered to all who are known by the Prime Designer to have received a complete set of Bid Documents.

4.4.2 Copies of addenda will be made available for inspection wherever Bid Documents are on file for that purpose.

4.4.3 Except as described herein, addenda shall not be issued within a period of seventy-two (72) hours prior to the advertised time for the opening of bids, excluding Saturdays, Sundays, and any other legal holidays. If the necessity arises of issuing an addendum modifying plans and specifications within the seventy-two (72) hour period prior to the advertised time for the opening of bids, then the opening of bids shall be extended at least seven (7) but no more than twenty-one (21) working days, without the requirement of re-advertising. The Owner shall be consulted prior to issuance of such an addendum and shall approve such issuance. The revised time and date for the opening of bids shall be stated in the addendum.

4.4.4 Each Bidder shall ascertain from the Prime Designer prior to submitting his bid that he has received all addenda issued, and he shall acknowledge their receipt on the Bid Form.

4.4.5 The Owner shall have the right to extend the bid date by up to thirty (30) days without the requirement of re-advertising. Any such extension shall be made by addendum issued by the Prime Designer.

4.5 MANUFACTURERS OR BRAND NAMES

4.5.1 Whenever manufacturers' brand names appear in these specifications, they are used only to denote the quality standard of product desired and they do not restrict bidders to the specific brand, make, manufacturer, or specification named; they are used only to set forth and convey to prospective bidders the general style, type, character and quality of product desired, and equivalent products will be acceptable, provided prior approval is obtained as provided herein.

ARTICLE 5

BIDDING PROCEDURE

5.1 FORM AND STYLE OF BIDS

5.1.1 Bids shall be submitted on the Louisiana Uniform Public Work Bid Form provided by the Prime Designer.

5.1.2 All blanks on the Bid Form shall be filled in by typewriter or manually in ink.

5.1.3 Bid sums shall be expressed in both words and figures, and in case of discrepancy between the two, the written words shall govern.

5.1.4 Any interlineations, alteration or erasure must be initialed by the signer of the bid or his authorized representative.

5.1.5 Bidders are cautioned to complete all alternates should such be required in the Bid Form. Failure to submit alternate prices will render the bid non-responsive and shall cause its rejection.

5.1.6 Bidders are cautioned to complete all unit prices should such be required in the Bid Form. Unit prices represent a price proposal to do a specified quantity and quality of work. Unit prices are incorporated into the base bid but are not the sole components thereof.

5.1.7 Bidders are strongly cautioned to ensure that all blanks on the bid form are completely and accurately filled in.

5.1.8 Bidder shall make no additional stipulations on the Bid Form nor qualify his bid in any other manner.

5.1.9 The bid shall include the legal name of Bidder and shall be signed by the person or persons legally authorized to bind the Bidder to a Contract. The authority of the signature of the person submitting the bid shall be deemed sufficient and acceptable under any of the following conditions:
(a) Signature on bid is that of any corporate officer or member of a partnership or partnership in commendam listed on most current annual report on file with Secretary of State.
(b) Signature on bid is that of authorized representative of corporation, partnership, or other legal entity and bid is accompanied by corporate resolution, certification as to the corporate principal, or other documents indicating authority.
(c) Corporation, partnership, or other legal entity has filed in the records of the Secretary of State, an affidavit, resolution or other acknowledged or authentic document indicating the names of all parties authorized to submit bids for public contracts. A bid submitted by an agency shall have a current Power of Attorney attached certifying agent's authority to bind Bidder. The name and license number on the envelope shall be the same as the entity identified on the Bid Form.

5.1.10 On any bid in excess of fifty thousand dollars ($50,000.00), the Contractor shall certify that he is licensed under R.S. 37:2150-2173 and show his license number on the bid above his signature or his duly authorized representative.

5.2 BID SECURITY

5.2.1 No bid shall be considered or accepted unless the bid is accompanied by bid security in an amount of not less than five percent (5%) of the base bid and all alternates.

The bid security shall be in the form of a certified check or cashier's check drawn on the bank insured by the Federal Deposit Insurance Corporation, or a Bid Bond written by a surety company licensed to do business in Louisiana and signed by the surety's agent or attorney-in-fact. The Bid Bond and the surety for the bond must meet the qualifications stated thereon. The Bid Bond shall include the legal name of the Bidder be in favor of the Louisiana State University and Agricultural and Mechanical College and shall be accompanied by appropriate power of attorney. The Bid Bond must be signed by both the bidder/principal and the surety in the space provided on the Bid Bond Form. Failure by the bidder/principal or the surety to sign the bid bond shall result in the rejection of the bid.

Bid security furnished by the Contractor shall guarantee that the Contractor will, if awarded the work according to the terms of his proposal, enter into the Contract and furnish Performance and Payment Bonds as required by these Bid Documents, within ten (10) days after written notice that the instrument is ready for his signature.Should the Bidder refuse to enter into such Contract or fail to furnish such bonds, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as penalty.

5.2.2 The Owner will have the right to retain the bid security of Bidders until either (a) the Contract has been executed and bonds have been furnished, or (b) the specified time has elapsed so that bids may be withdrawn, or (c) all bids have been rejected.

5.3 SUBMISSION OF BIDS

All bids must be submitted electronically to LSU Procurement Services. Bids must be received at the "Return Bid To" email address no later than the due date and time specified herein. Bids must be emailed to lsubids@lsu.edu (This email address should be used for bid submissions only). Any bids sent directly to the Buyer of record will not be forwarded to the “Return Bid To” email.

When submitting electronically, the RFQ number and solicitation title should be listed in the subject line of the email. An original and redacted copy (if applicable) must be submitted electronically. Hard copies of bids will not be accepted; therefore, they will not be evaluated.

It is the responsibility of the Supplier to ensure the bid is received by LSU Procurement by the indicated due date and time. Any delays that may occur in transmission of the bid is the responsibility of the supplier. A bid will be considered late if it is not received at the “Return Bid To” email address by the indicated due date and time.

The maximum email attachment size accepted is 125 MB. It is the supplier’s responsibility to ensure bid submission is sized such that it is successfully transmitted and received by LSU. If the bid response is too large to be emailed as one document, the bid must be sent as separate documents. Each submittal should be labeled. (Example – Bid Submittal 1 out of 3 for RFQ-000000XXXX - Title; Bid Submittal 2 out of 3 for RFQ-000000XXXX - Title, etc.). If any submittal is received late, LSU will not consider the late submittal(s). Only the submittal(s) received by the due date and time will be considered Late bids will not be accepted per LAC 34:XIII.515.B.

5.4 MODIFICATION OR WITHDRAWAL OF BID

5.4.1 A bid may not be modified, withdrawn or canceled by the Bidder during the time stipulated in the Advertisement for Bids, for the period following the time and bid date designated for the receipt of bids, and Bidder so agrees in submitting his bid, except in accordance with R.S. 38:2214, which states, in part:

> Bids containing patently obvious, unintentional, and substantial mechanical, clerical, or mathematical errors, or errors of unintentional omission of a substantial quantity of work, labor, material, or services made directly in the compilation of the bid, may be withdrawn by the contractor if clear and convincing sworn, written evidence of such errors is furnished to the public entity within forty-eight hours of the bid opening excluding Saturdays, Sundays, and legal holidays. Such errors must be clearly shown by objective evidence drawn from inspection of the original work papers, documents, or materials used in the preparation of the bid sought to be withdrawn. If the public entity determines that the error is a patently obvious mechanical, clerical, or mathematical error, or unintentional omission of a substantial quantity of work, labor, material, or services, as opposed to a judgment error, and that the bid was submitted in good faith it shall accept the withdrawal and return the bid security to the contractor.

5.4.2 Prior to the time and date designated for receipt of bids, bids submitted early may be modified or withdrawn only by notice to the party receiving bids at the place and prior to the time designated for receipt of bids.

5.4.3 Withdrawn bids may be resubmitted up to the time designated for the receipt of bids provided that they are then fully in conformance with these Instructions to Bidders.

5.4.4 Bid Security shall be in an amount sufficient for the bid as modified or resubmitted.

ARTICLE 6

CONSIDERATION OF BIDS

6.1 OPENING OF BIDS

6.1.1 The properly identified Bids received on time will be opened publicly and will be read aloud, and a tabulation abstract of the amounts of the base bids and alternates, if any, will be made available to Bidders.

6.2 REJECTION OF BIDS

6.2.1 The Owner shall have the right to reject any or all bids as allowed by La. R.S. 38:2214 and in particular to reject a bid not accompanied by the required bid security or data required by the Bidding Documents or a bid in any way incomplete or irregular.

6.3 ACCEPTANCE OF BID

6.3.1 It is the intent of the Owner, if he accepts any alternates, to accept them in order in which they are listed in the Bid Form. Determination of the Low Bidder shall be on the basis of the sum of the base bid and the alternates accepted. However, the Owner shall reserve the right to accept alternates in any order which does not affect determination of the Low Bidder.

ARTICLE 7

POST-BID INFORMATION

7.1 SUBMISSIONS

7.1.1 At the Pre-Construction Conference, the Contractor shall submit the following information to the Prime Designer.

7.1.1.1 A designation of the work to be performed by the Contractor with his own forces.

7.1.1.2 A breakdown of the Contract cost attributable to each item listed in the Schedule of Values. No payments will be made to the Contractor until this is received.

7.1.1.3 The proprietary names and the suppliers of principal items or systems of material and equipment proposed for the work.

7.1.1.4 A list of names and business domiciles of all Subcontractors, manufacturers, suppliers or other persons or organizations (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the work. It is the preference of the Owner that, to the greatest extent possible or practical, the Contractor utilize Louisiana Subcontractors, manufacturers, suppliers and labor.

7.1.2 The Contractor will be required to establish to the satisfaction of the Prime Designer the reliability and responsibility of the proposed Subcontractors to furnish and perform the work described in the sections of the Specifications pertaining to such proposed Subcontractor's respective trades. The General Contractor shall be responsible for actions or inactions of Subcontractors and/or material suppliers.

The General Contractor is totally responsible for any lost time or extra expense incurred due to a Subcontractor's/or Material Supplier's failure to perform. Failure to perform includes, but is not limited to, a Subcontractor's financial failure, abandonment of the project, failure to make prompt delivery, or failure to do work up to standard. Under no circumstances shall the Owner mitigate the General Contractor's losses or reimburse the General Contractor for losses caused by these events.

7.1.3 Subcontractors and other persons and organizations selected by the Bidder must be used on the work for which they were proposed and shall not be changed except with the written approval of the Owner and the Prime Designer.

7.1.4 The lowest responsive and responsible bidder shall submit to the Prime Designer and the Owner within ten days after the bid opening a letter/letters from the manufacturer stating

that the manufacturer will issue the roof system guarantee complying with the requirements of Owner based on the specified roof system and include the name of the applicator acceptable to the manufacturer at the highest level of certification for installing the specified roof system. This manufacture shall be one that has received prior approval or is named in the specifications.

In accordance with La. R.S. 23:1726(B), LA. R.S. 38:2227 and LA. R.S. 38:2212.10, each bidder on this project must submit the completed Affidavit regarding Verification of Employees and Attestation Form (Past Criminal Convictions of Bidders, Verification of Employees, and Certification Regarding Unpaid Worker's Comp.), found within this bid package. The completed Affidavit and Attestation forms shall be submitted to the Office of Procurement, Room 213 Thomas Boyd Hall, Louisiana State University and Agricultural and Mechanical College within ten (10) days after the opening of bids.

ARTICLE 8

PERFORMANCE AND PAYMENT BOND

8.1 BOND REQUIRED.

8.1.1 The Contractor shall furnish and pay for a Performance and Payment Bond written by a company licensed to do business in Louisiana, which shall be signed by the surety's agent or attorney-in-fact, in an amount equal to 100% of the Contract amount. Surety must be listed currently on the U.S. Department of the Treasury Financial Management Service List (Treasury List) as approved for an amount equal to or greater than the contract amount, or must be an insurance company domiciled in Louisiana or owned by Louisiana residents. If surety is qualified other than by listing on the Treasury list, the contract amount may not exceed fifteen percent of policyholders' surplus as shown by surety's most recent financial statements filed with the Louisiana Department of Insurance and may not exceed the amount of $500,000. However, a Louisiana domiciled insurance company with at least an A- rating in the latest printing of the A.M. Best's Key Rating Guide shall not be subject to the $500,000 limitation, provided that the contract amount does not exceed ten percent of policyholders' surplus as shown in the latest A.M. Best's Key Rating Guide nor fifteen percent of policyholders' surplus as shown by surety's most recent financial statements filed with the Louisiana Department of Insurance. The Bond shall be signed by the surety's agent or attorney-in-fact. The bond shall be in favor of the Louisiana State University and Agricultural and Mechanical College.

8.2 TIME OF DELIVERY AND FORM OF BOND.

8.2.1 The Bidder shall deliver the required bond to the Owner simultaneous with the execution of the Contract.

8.2.2 Performance Bond and Labor and Materials Payment Bond shall be executed on the AIA Standard Form; Document A311 or A312-2010 forms.

8.2.3 The Bidder shall require the Attorney-In-Fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the Power of Attorney.

ARTICLE 9

FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

9.1 FORM TO BE USED

9.1.1 Form of the Contract to be used shall be furnished by the Owner.

9.2 AWARD

9.2.1 Before award of the Contract, the successful Bidder shall furnish to the Owner a copy of a Disclosure of Ownership Affidavit stamped by the Secretary of State, a certified copy of the minutes of the corporation or partnership meeting which authorized the party executing the bid to sign on behalf of the Contractor.

9.2.2 In accordance with Louisiana Law, when the Contract is awarded, the successful Bidder shall, at the time of the signing of the Contract, execute the Non-Collusion Affidavit included in the Contract Documents.

9.2.3 When this project is financed either partially or entirely with State Bonds the award of this Contract is contingent upon the sale of bonds by the State Bond Commission. The Owner shall incur no obligation to the Contractor until the Contract Between Owner and Contractor is duly executed.

ARTICLE 10

MATERIAL SALVAGE AND DISPOSAL

10.1 The University shall have priority for the selection of salvaged materials and equipment. Any excess dirt, equipment and material selected to remain the property of the University, shall be removed and delivered to a location on the campus as designated by the University. Material and equipment not retained by the University shall become the property of the Contractor and shall be removed from the campus by the Contractor.

ARTICLE 11

OCCUPATIONAL AND ENVIRONMENTAL SAFETY

11.1 The Contractor shall keep the construction site free from hazards and shall conduct his work with the least effect on the environment and faculty, staff and students of the University. The Contractor shall maintain the project and the various sites in compliance with the applicable OSHA Standards.

11.2 The Contractor shall initiate and forward a copy of the site safety plan (written documentation of a working and active employee safety program as defined by the OSHA Construction Standard),

along with the site safety supervisor's name and a 24-hour phone number, to the LSU Office of Occupational and Environmental Safety (OES).

11.3 The construction site shall be restricted to unauthorized personnel. High hazard areas involving machinery, hot work, electrical hazards, overhead work, excavations, etc., shall be barricaded and the barricade must be enforced at all times.

11.4 LSU students, faculty and staff shall not be exposed to any harmful construction debris or hazardous materials (i.e., lead-based paint, asbestos, dust, noise, vapors, etc.). Where contaminants generated by construction may enter adjacent occupied building spaces, the Contractor shall erect a containment system sufficient to protect LSU faculty, staff and students from exposure. The containment system shall also be subject to approval by LSU Facility and Safety Personnel.

11.5 Any injury requiring medical attention which occurs on site must be reported to OES, and the Contractor shall conduct an investigation and develop action plan for prevention. This action plan may be reviewed by OES upon request and/or OES may be an observer in this investigation.

End of Instructions to Bidders.

GENERAL CONDITIONS

The 2007, Edition of the General Conditions of the Contract for Construction, American Institute of Architects Document A-201, are hereby made part of this Specification to the same extent as if bound herein.

Where the Supplementary Conditions conflict or contradict the AIA General Conditions, the Supplementary Conditions are to take precedence. Only those portions of the General Conditions specifically mentioned in the Supplementary Conditions shall be changed.

For those persons not familiar with or are without complete understanding of all the conditions as set forth in the 2007 AIA General Conditions, a copy of this document may be examined at the LSU Office of Planning, Design and Construction, located in the LSU Planning, Design and Construction Building or the appointed Prime Designer's office.

A copy of the 2007 AIA General Conditions, along with all other Contract Documents shall be kept on the jobsite by Contractor at all times.

SUPPLEMENTARY CONDITIONS

These Supplementary Conditions modify, change, delete from or add to the General Conditions of the Contract for Construction, AIA Document A201, 2007 Edition. Where any Article of the General Conditions is modified or any Paragraph, Subparagraph or Clause thereof is modified or deleted by these supplements, the unaltered provisions of that Article, Paragraph, Subparagraph or Clause shall remain in effect.

Articles, Paragraphs, Subparagraphs or Clauses modified or deleted have the same numerical designation as those occurring in the General Conditions.

ARTICLE 1

GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS

Delete the third sentence, and add the following sentence:

The Contract Documents shall include the Bidding Documents as listed in the Instructions to Bidders and any modifications made thereto by addenda. The contractor Documents shall not include any exclusions, exception or changes by Contractor that have not been accepted in writing by Owner pursuant to Addenda or change order.

1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE [REFER TO LA. R.S. 38:2317]

1.5.1 Delete the first sentence; In the last sentence: delete the remainder after the word "publication".

1.5.3 Add **1.5.3** as follows:

1.5.3 Architect will furnish Contractor one (1) complete set of Contract Documents for construction, either electronically or on paper. Contractor shall pay reproduction costs for additional sets required by him.

ARTICLE 2

OWNER

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

2.2.1 Delete **2.2.1**

2.2.2 In the first sentence, delete everything before "the Owner shall secure."

ARTICLE 3

CONTRACTOR

3.4 LABOR AND MATERIALS

3.4.2 Delete **3.4.2**

3.4.3 Delete **3.4.3** and replace with the following:

3.4.3 Contractor and its employees, officers, agents, representatives, and Subcontractors shall conduct themselves in an appropriate and professional manner, in accordance with the Owner's requirements, at all times while working on the Project. Any such individual who behaves in an inappropriate manner or who engages in the use of inappropriate language or conduct while on Owner's property, as determined by the Owner, shall be removed from the Project at the Owner's request. Such individual shall not be permitted to return without the written permission of the Owner. The Owner shall not be responsible or liable to Contractor or any Subcontractor for any additional costs, expenses, losses, claims or damages incurred by Contractor or its Subcontractor as a result of the removal of an individual from the Owner's property pursuant to this paragraph. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

3.7 PERMITS, FEES, NOTICES AND COMPLIANCE WITH LAWS [R.S. 40:1724(A)]

3.7.1 Delete **3.7.1**

3.7.2 Replace the word "public" with the word "University".

Delete **3.7.5** and replace with the following:

3.7.5 If, during the course of the Work, the Contractor discovers human remains, unmarked burial or archaeological sites, burial artifacts, or wetlands, which are not indicated in the Contract Documents, the Contractor shall follow all procedures mandated by State and Federal law, including but not limited to La. R.S. 8:671 *et seq.* and Sections 401 and 404 of the Federal Clean Water Act. Request for adjustment of the Contract Sum and Contract Time arising from the existence of such remains or features shall be submitted in writing to the Owner pursuant to the Contract Documents. Owner may elect to have another contractor perform any or all additional work or remediation arising from such condition and Contractor shall stop work at Owners request, at no additional cost to Owner, while such additional work or remediation is performed.

3.8 ALLOWANCES

Delete **3.8.1**, **3.8.2** and **3.8.3** in their entirety and add **3.8.1** as follows:

3.8.1 Allowances shall not be made on any of the Work.

3.9 SUPERINTENDENT

3.9.1 Add the following to the end of the paragraph: Important communications shall be confirmed in writing. Other communications shall be similarly confirmed on written request in each case.

3.9.4 Add **3.9.4** as follows:

3.9.4 The Superintendent shall remain on the project when any work is being performed or materials are being delivered. The Superintendent shall be approved by the Owner. Should the approved Superintendent be unable to complete project his replacement(s) shall also be approved by the Owner. For good cause Owner may require Contractor to replace Superintendent at no additional cost to Owner.

3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

3.10.1 Add the following to the end of the paragraph:

The Contractor shall include with the schedule, for the Owner's and Architect's information, an analysis to identify those tasks which are on the critical path, i.e. where any delay in the completion of these tasks will lengthen the project timescale, unless action is taken. A revised schedule shall be submitted with each Application and Certificate for Payment. No payment will be made until this schedule is received. To the extent Contractor claims that it has been delayed in performing its work in whole or in part by Owner or Architect, then Contractor shall specifically list such delays with each revised schedule.

3.10.3 Delete the word "...general..." and add the following:

If the work is not on schedule, as determined by the Architect, and the Contractor fails to take action to bring the work on schedule, then the Contractor shall be deemed in default under this Contract and the progress of the work shall be deemed unsatisfactory. Such default may be considered grounds for termination by the Owner for cause in accordance with 14.2.

3.10.4 Add **3.10.4** as follows:

3.10.4 Submittal by the contractor of a schedule or other documentation showing a completion date for his work prior to the completion date stated in the contract shall not impose any obligation or responsibility on the Owner or Architect for the earlier completion date unless the changed completion date is accepted by the owner in a change order.

3.10.5 Add **3.10.5** as follows:

3.10.5 In the event the Owner employs a commissioning consultant, the Contractor shall cooperate fully in the commissioning process and shall require all subcontractors and others under his control to cooperate. The purpose of such services shall be to ensure that all systems perform correctly and interactively according the provisions of the Contract Documents.

3.11 DOCUMENTS AND SAMPLES AT THE SITE

Add the following to the end of the paragraph:

This requirement is of the essence of the contract. The Architect shall determine the value of these documents and this amount shall not be approved for payment to the Contractor until all of the listed documents are delivered to the Architect in good order, completely marked with field changes and otherwise complete in all aspects.

ARTICLE 4

ARCHITECT

4.1 GENERAL

Delete **4.1.1** and replace with the following:

4.1.1 The term Architect, when used in the Contract Documents, shall mean the Architect (Architect, Engineer or Landscape Architect), or his authorized representative, lawfully licensed to practice architecture, engineering or landscape architecture in the State of Louisiana, identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number.

4.1.3 Delete the words "as to whom the Contractor has no reasonable objection and"

4.2 ADMINISTRATION OF THE CONTRACT

4.2.1 In the first sentence, delete the phrase "the date the Architect issues the final Certificate for Payment" and replace with the phrase "final payment is due, and with the Owner's concurrence, from time to time during the one-year period for correction of Work described in Section 12.2."

4.2.2 In the first sentence, after the phrase "become generally familiar with" insert the following: "and to keep the Owner informed about".

In the first sentence, after the phrase "portion of the Work completed," insert the following: "to endeavor to guard the Owner against defects and deficiencies in the Work,"

4.2.2.1 Add **4.2.2.1** as follows:

4.2.2.1 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for meetings and site visits made necessary by the fault of the Contractor or by defects and deficiencies in the Work.

4.2.10 Add the following sentence to the end of **4.2.10**: There will be no restriction on the Owner having a Representative.

4.2.11 Add the following sentence to the end of **4.2.11**:

If no agreement is made concerning the time within which interpretation required of the Architect shall be furnished in compliance with this Section 4.2, then delay shall not be recognized on account of failure by the Architect to furnish such interpretation until 15 days after written request is made for them.

4.2.14 Insert the following sentence between the second and third sentence of **4.2.14**:

If no agreement is made concerning the time within which interpretation required of the Architect shall be furnished in compliance with this Section 4.2, then delay shall not be recognized on account of failure by the Architect to furnish such interpretation until 15 days after written request is made for them.

ARTICLE 5

SUBCONTRACTORS

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

Delete **5.2.1** and replace with the following:

5.2.1 Unless otherwise required by the Contract Documents, the Contractor shall furnish at the Pre-Construction Conference, to the Owner and the Architect, in writing, the names of the persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each of the principal portions of the work. No Contractor payments shall be made until this information is received.

Delete **5.2.2** and replace with the following:

5.2.2 The Contractor shall be solely responsible for selection and performance of all subcontractors, and shall verify that all subcontractors maintain the required insurance coverages. The Contractor shall not be entitled to claims for additional time and/or an increase in the contract sum due to a problem with performance or non-performance of a subcontractor.

Delete **5.2.3** and **5.2.4** and add the following:

5.2.3 The Contractor shall notify the Owner when a subcontractor is to be changed and substituted with another subcontractor.

5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTORS

Delete **5.4.1**, **5.4.2** and **5.4.3**

ARTICLE 7

CHANGES IN THE WORK

7.1 GENERAL

Add **7.1.4** as follows:

7.1.4 As part of the pre-construction conference submittals, the Contractor is to submit the following prior to the commencement of work.

(1) Fixed job site overhead cost itemized with documentation to support daily rates.
(2) Bond Premium Rate with supporting information from the General Contractor's carrier.
(3) Labor Burden by trade for both Subcontractors and General Contractor.
(4) Internal Rate Charges for all significant company owned equipment.

Failure to submit this information as part of the pre-construction submittals shall prohibit the Contractor from claiming these items as costs on any change order issued on the project.

7.2 CHANGE ORDERS

Delete **7.2.1** and replace with the following:

7.2.1 A Change Order is a written order to the Contractor prepared by the Architect and signed by the Owner and the Architect, issued after execution of the Contract, authorizing a change in the work or an adjustment in the Contract Sum or the Contract Time. The Contract Sum and the Contract Time may be changed only by Change Order. A Change Order signed by the Contractor indicates his agreement therewith, including the adjustment in the Contract Sum or the Contract Time. Any reservation of rights, stipulation, or other modification made on the change order by the contractor will have no effect.

Insert **7.2.2** as follows:

7.2.2 **"**Cost of Work" for the purpose of Change Orders shall be costs required to be incurred in performance of the work and paid by the Contractor and Subcontractors which shall consist of:

1. Wages paid direct labor personnel, delineating a labor burden markup for applicable payroll taxes, worker's compensation insurance, unemployment compensation, and social security taxes.
2. Cost of all materials and supplies, including the identification of each item and its cost including taxes.
3. Identify each necessary piece of machinery and equipment and its individual cost including taxes.
4. Increases in insurance premiums
5. Bond costs.

Credit will not be required for Overhead and Profit.

Insert **7.2.3** as follows:

7.2.3 "Overhead and Profit" The Contractor and Subcontractor shall be due job-site and home office fixed overhead and profits on the Cost of the Work, but shall not exceed a total of 25% of the direct cost of any portion of Work:

The credit to the Owner resulting from a change in the work shall be the sum of those items above, except credit will not be required for Overhead and Profit. Where a change results in both credits to the Owner and extras to the Contractor for related items, overhead and profit will only be computed on the net extra cost to the Contractor.

Insert **7.2.4** as follows:

7.2.4 The cost to the Owner resulting from a change in the Work shall be the sum of: "Cost of the Work" (as defined at 7.2.2) and "Overhead and Profit" (as defined at 7.2.4), and shall be computed as follows:

Insert **7.2.4.1** as follows:

7.2.4.1 When all Work is General Contract Work; 15% markup on the Cost of the Work.

Insert **7.2.4.2** as follows:

7.2.4.2 When the Work is all Subcontract Work; 15% markup on the Cost of the Work for Subcontractor's Overhead and Profit plus 10% markup on the Cost of the Work, not including the Subcontractor's Overhead and Profit markup, for General Contractor's Overhead and Profit.

Insert **7.2.4.3** as follows:

7.2.4.3 When the Work is a combination of General Contract Work and Subcontract Work; that portion of the direct cost that is General Contract Work shall be computed per 7.2.4.1 and that portion of the direct cost that is Subcontract Work shall be computed per 7.2.4.2.

Premiums for the General Contractor's bond may be included, but after the markup is added to the Cost of the Work.

Insert **7.2.4.4** as follows:

7.2.4.4 Subcontract cost shall consist of the items in 7.2.2 above plus Overhead and Profit as defined in 7.2.4.

Insert **7.2.5** as follows:

7.2.5 Before a Change Order is prepared, the Contractor shall provide and deliver to the Architect the following information concerning the Cost of the Work, not subject to waiver, within ten (10) business days after being notified to prepare said Change Order:

A detailed itemized list of labor, material and equipment costs for the General Contractor's Work including quantities and unit costs for each item of labor, material and equipment.

An itemized list of labor, material and equipment costs for each Subcontractor's and/or Sub-Subcontractor's Work including quantities and unit costs for each item of labor, material, and equipment.

Insert **7.2.6** as follows:

7.2.6 After a Change Order has been approved, no future requests for extensions of time or additional cost shall be considered for the materials and scope of work included in that Change Order.

Insert **7.2.7** as follows:

7.2.7 The Contractor will be due extended fixed job-site overhead for time delays only when complete stoppage of work occurs causing a contract completion extension, and the Contractor is unable to mitigate financial damages through replacement Work. The stoppage must be due to acts or omissions solely attributable to the Owner. In all cases the Contractor is to notify the Architect in writing as required by Article 15.1.2. Reasonable proof may be required by the Architect that

alternate Work could not be performed. Reasonable proof may be required by the Architect that the stoppage affected the Completion Date.

Insert **7.2.8** as follows:

7.2.8 "Cost of the Work" whether General Contract cost or Subcontract cost shall not apply to the following:

- Salaries or other compensation of the Contractor's personnel at the Contractor's principal office and branch offices.
- Any part of the Contractor's capital expenses, including interest on the Contractor's capital employed for the Work.
- Overhead and general expenses of any kind or the cost of any item not specifically and expressly included above in cost of the Work.
- Cost of supervision not specifically required by the Change Order.

Insert **7.2.9** as follows:

7.2.9 When applicable as provided by the Contract, the cost to Owner for Change Orders shall be determined by quantities and unit prices. The quantity of any item shall be as submitted by the Contractor and approved by the Architect. Unit prices shall cover cost of Material, Labor, Equipment, Overhead and Profit.

7.3 CONSTRUCTION CHANGE DIRECTIVES

7.3.3 In the first sentence after "following methods" add: ", but not to exceed a specified amount."

7.3.7 Delete the following from .1 of the list: "fringe benefits required by agreement or custom,"

Delete the following from .4 of the list: "permit fees,"

Delete the following from .5 of the list: "and field office personnel"

7.3.9 Delete **7.3.9** and substitute the following:

7.3.9 Pending final determination of the total costs of a Construction Change Directive to the Owner, amounts not in dispute for such changes in the Work shall be included in Applications for Payment accompanied by a Change Order indicating the parties' agreement with part or all of such costs.

ARTICLE 8

TIME

8.1 DEFINITIONS

Add the following:

8.1.5 The Contract Time shall not be changed by the submission of a schedule that shows an early completion date unless specifically authorized by change order.

8.2 PROGRESS AND COMPLETION

Add to **8.2.1** the following:

Completion of the work must be within the Time for Completion stated in the Agreement, subject to such extensions as may be granted under Section 8.3. The Contractor agrees to commence work not later than fourteen (14) days after the transmittal date of Written Notice to Proceed from the Owner and to substantially complete the project within the time stated in the Contract. The Owner will suffer financial loss if the project is not substantially complete in the time set forth in the Contract Documents. The Contractor and the Contractor's Surety shall be liable for and shall pay to the Owner the sum stated in the Contract Documents as fixed, agreed and liquidated damages for each consecutive calendar day (Saturdays, Sundays and holidays included) of delay until the work is substantially complete. The Owner shall be entitled to the sum stated in the Contract Documents. Such Liquidated Damages shall be withheld by the Owner from the amounts due the Contractor for progress payments.

Delete **8.2.2**

8.3 DELAYS AND EXTENSIONS OF TIME

8.3.1 In the first sentence after the words "Owner Pending" delete the words "mediation and arbitration" and add the word "litigation" and delete the last word "determine" and add the following: "recommend, subject to Owner's approval of Change Order. If the claim is not made within limits of Article 15, all right for future claims for that month are waived."

8.3.3 Delete **8.3.3**

ARTICLE 9

PAYMENTS AND COMPLETION

9.2 SCHEDULE OF VALUES

Delete **9.2** and replace with the following:

9.2 At the Pre-Construction Conference, the Contractor shall submit to the Owner and the Architect a Schedule of Values prepared as follows:

Add **9.2.1** as follows:

9.2.1 The attached Schedule of Values Format shall be used. If applicable, the cost of Work for each section listed under each division, shall be given. The cost for each section shall include Labor, Materials, Overhead and Profit.

Add **9.2.2** as follows:

9.2.2 The Total of all items shall equal the Total Contract Sum. This schedule, when approved by the Architect, shall be used as a basis for the Contractor's Applications for Payment and it may be used for determining the cost of the Work in deductive change orders, when a specific item of Work listed on the Schedule of Values is to be removed. Once the Schedule of Values is submitted at the Pre-Construction Conference, the schedule may not be modified without approval from the Owner and Architect.

9.3 APPLICATIONS FOR PAYMENT

Delete **9.3.1** and replace with the following:

9.3.1 Monthly, the Contractor shall submit to the Architect an Application & Certificate for Payment on the AIA Document G702-1992, accompanied by AIA Document G703-1992, and supported by any additional data substantiating the Contractor's right to payment as the Owner or the Architect may require. Application for Payment shall be submitted on or about the first of each month for the value of labor and materials incorporated into the Work and of materials, suitably stored, at the site as of the twenty-fifth day of the preceding month, less normal retainage as follows, per R.S. 38:2248:

Delete **9.3.1.1** and replace with the following:

9.3.1.1 Projects with Contract price up to $500,000.00 - 10% of the Contract price.

Delete **9.3.1.2** and replace with the following:

9.3.1.2 Projects with Contract price of $500,000.00, or more - 5% of the Contract price.

Add **9.3.1.3** as follows:

9.3.1.3 No payment will be made until the revised schedule required by 3.10.1 is received.

The normal retainage shall not be due the Contractor until after formal notice of acceptance is properly recorded and expiration of the forty-five (45) day period and submission to the Architect of a clear lien certificate and invoice for retainage.

Delete **9.3.2** and replace with the following:

9.3.2 Payments shall only be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work confirmed by the Architect. Payments for materials or equipment stored on the site shall be conditioned upon submission by the Contractor of bills of sale or such other procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, including applicable insurance.

Add **9.3.4** as follows:

9.3.4 Applications for Payment shall not include requests for payment for any costs or damage for delay, shutdown or startup.

9.5 DECISIONS TO WITHHOLD CERTIFICATION

9.5.1 Delete the word "repeated" from .7 of the list

9.5.3 Delete **9.5.3**

9.6 PROGRESS PAYMENTS

Delete **9.6.1** and replace with the following:

9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment within twenty days except for projects funded fully or in part by a Federal reimbursement program. For such projects the Owner will make payment in a timely manner consistent with reimbursement.

9.6.2 Delete the phrase: "no later than seven days" from the first sentence.

After the end of the second sentence, add the following:

R.S. 9:2784 (A) and (C) requires a Contractor or Subcontractor to make payment due to each Subcontractor and supplier within fourteen (14) consecutive days of the receipt of payment from the Owner. If not paid, a penalty in the amount of ½ of 1% per day is due, up to a maximum of 15%, from the expiration date until paid. The Contractor or Subcontractor, whichever is applicable, is solely responsible for payment of a penalty.

9.6.4 Delete the first two sentences of **9.6.4** and add the following to the end:

Pursuant to La. R.S. 38:2242, when the Owner receives any claim of nonpayment arising out of the Contract, the Owner may deduct 125% of such claim from the Contract Sum.

The Contractor, or any interested party, may deposit security, satisfactory to the Owner and in accordance with La. R.S. 38:2242.2, guaranteeing payment of the claim with the recorder of mortgages of the parish where the Work has been done. When the Owner receives original proof of such guarantee from the recorder of mortgages, the claim deduction will be added back to the Contract Sum.

9.7 FAILURE OF PAYMENT

Delete **9.7**

9.8 SUBSTANTIAL COMPLETION

Delete **9.8.1** and replace with the following:

9.8.1 Substantial Completion is the stage in the progress of the Work when the Work is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the

Work for its intended use. The Architect shall determine if the project is substantially complete in accordance with this Subparagraph.

Delete **9.8.2** and replace with the following:

9.8.2 When the Contractor considers that the Work is Substantially Complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

Delete **9.8.3** and replace with the following:

9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work is substantially complete. A prerequisite to the Work being considered as substantially complete is the Owner's receipt of the executed Roofing Contractor's and Roofing Manufacturer's guarantees, where roofing work is part of the Contract. Prior to inspection by the Architect, the Contractor shall notify the Architect that the project is ready for inspection by the State Fire Marshall's office. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use, the Contractor shall, before the Work can be considered as Substantially Complete, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

Delete **9.8.4** and replace with the following:

9.8.4 When the Architect determines that the project is Substantially Complete, he shall prepare a "punch list" of exceptions and the dollar value related thereto. The monetary value assigned to this list will be the sum of the cost estimate for each particular item of Work the Architect develops based on the mobilization, labor, material and equipment costs of correcting the item and shall be retained from the monies owed the Contractor, above and beyond the standard lien retainage. The cost of these items shall be prepared in the same format as the schedule of values. At the end of the 45-day lien period payment shall be approved for all punch list items completed up to that time. After that payment, none of the remaining funds shall be due the Contractor until all punch list items are completed and are accepted by the Architect. If the dollar value of the punch list exceeds the amount of funds, less the retainage amount, in the remaining balance of the Contract, then the Project shall not be considered as substantially complete. If funds remaining are less than that required to complete the Work, the Contractor shall pay the difference.

Delete **9.8.5** and replace with the following:

9.8.5 When the preparation of the "punch list" is complete the Architect shall prepare a "Recommendation of Acceptance" incorporating the punch list and submit it to the Owner. Upon approval of the Recommendation of Acceptance, the Owner may issue a Notice of Acceptance of Building Contract, which shall establish the Date of Substantial Completion. The Contractor will record the Notice of Acceptance with the Clerk of Court in the Parish in which the work has been performed. If the Notice of Acceptance has not been recorded seven (7) days after issuance, the Owner may record the acceptance at the Contractor's expense. All additive change orders must be processed before issuance of the Recommendation of Acceptance. The Owner will not be responsible for payment for any work associated with change orders that is not incorporated into the contract at the time of the Recommendation of Acceptance.

Add **9.8.6** as follows:

9.8.6 Warranties required by the Contract Documents shall commence on the date of Acceptance of the Work unless otherwise agreed to in writing by the Owner and Contractor. Unless otherwise agreed to in writing by the Owner and Contractor, security, maintenance, heat, utilities, damage to the Work not covered by the punch list and insurance shall become the Owner's responsibility on the Date of Substantial Completion.

Add **9.8.7** as follows:

9.8.7 If all punch list items have not been completed by the end of the 45-day lien period, through no fault of the Architect or Owner, the Owner may hold the Contractor in default. If the Owner finds the Contractor is in default, the Surety shall be notified. If within forty-five (45) days after notification, the Surety or Contractor has not completed the punch list, through no fault of the Architect or Owner, the Owner may, at his option, contract to have the balance of the Work completed and pay for such work with the unpaid funds remaining in the Contract sum.

Finding the Contractor in default shall constitute a reason for disqualification of the Contractor from bidding on future University contracts. If the Surety fails to complete the punch list within the stipulated time period, the Owner may not accept bonds submitted, in the future, by the Surety.

9.9 PARTIAL OCCUPANCY OR USE

Delete **9.9.1** and replace with the following:

9.9.1 Partial Occupancy is that stage in the progress of the Work when a designated portion of the Work is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the designated portion of the Work for its intended use. The Owner may occupy or use any substantially completed portion of the Work so designated by separate agreement with the Contractor and authorized by public authorities having jurisdiction over the Work. Such occupancy or use may commence provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period of correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers the designated portion substantially complete the Contractor shall prepare and submit a list to the Architect as provided under Subparagraph 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld.

9.10 FINAL COMPLETION AND FINAL PAYMENT

After the first sentence in **9.10.1,** add the following:

If the Architect does not find the work acceptable under the Contract Documents, the Architect shall make one additional inspection; if the Work is still not acceptable, the Architect, and each of the Architect's principal consultants, shall be paid $175.00/hour for their time at the project site, for each additional inspection, to be withheld from the unpaid funds remaining in the Contract sum. The payment shall be deducted from the construction contract funds.

Replace **9.10.4** with the following:

The making of final payment shall not constitute a waiver of claims by the Owner for the following:

Delete “liens” from .1 of the list.

Delete “;or” from .2 of the list and add “irrespective of when such failure is discovered; or”

ARTICLE 10

PROTECTION OF PERSONS AND PROPERTY

10.2 SAFETY OF PERSONS AND PROPERTY

10.2.2 In the first sentence, between the words "bearing on" and "safety", add the words "the health and",

10.3 HAZARDOUS MATERIALS

10.3.1 In the first sentence after "(PCB)" add "or lead"

Insert the following after the first sentence:

Prior to commencing any work on site the Contractor shall obtain a completed "Contractor Notification of Asbestos Containing Building Materials Form" from the LSU Office of Facility Services, call 578-3186. This completed form indicates asbestos or polychlorinated biphenyl (PCB) that has been removed or its known location relevant to the construction project. The Contractor shall sign the form and return copies to the Architect, and the LSU Office of Facility Services prior to construction. Some asbestos or polychlorinated biphenyl (PCB) may not be identified. If, at any time, suspect material is encountered, the Contractor shall immediately stop Work and report the condition to the Architect, the LSU Office of Facility Services at 578-3186, and Environmental Health and Safety at 578-5640.

10.3.2 After the first sentence, delete all remaining sentences. Add at the end: The Contract time shall be extended appropriately.

10.4 EMERGENCIES

Delete **10.4** and replace with the following:

10.4 In an emergency affecting the safety of persons or property, the Contractor shall notify the Owner and Architect immediately of the emergency, simultaneously acting at his discretion to prevent damage, injury, or loss. Any additional compensation or extension of time claimed by the Contractor on account of emergency work shall be determined as provided in Article 15 and Article 7.

ARTICLE 11

INSURANCE AND BONDS

Delete all of **11.1, 11.2** and **11.3** and replace with the following:

INSURANCE REQUIREMENTS FOR NEW CONSTRUCTION, ADDITIONS AND RENOVATIONS

11.1 The Contractor shall purchase and maintain without interruption for the duration of the contract insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the Work hereunder by the Contractor, its agents, representatives, employees or subcontractors. The duration of the contract shall be from the inception of the contract until the date of final payment.

The policies and the certificates required herein shall name the Owner and Architect as an additional insureds and shall be subject to the approval of the Owner. Such insurance shall be primary to any other insurance policies of the Owner covering the same liabilities. The Contractor shall furnish the Owner copies of any endorsements that are subsequently issued amending coverage or limits.

To the extent of Contractors assumed liabilities, the Contractor's Insurance shall provide a waiver of subrogation in favor of the Owner and state that the Contractor's Insurance is primary to any other valid insurance available to the Owner and shall give Owner 30-day written notice of cancellation or material change.

The indemnity provisions shall be separate obligations of Contractor, and the enforceability or non-enforceability of the indemnity shall not prejudice any additional insured's rights under insurance.

Notwithstanding any other contrary language in this Agreement, Owner (as principal employer) and Contractor (as direct employer) mutually agree that it is their intention to recognize Owner as the statutory employer of Contractor's employees (whether these be direct employees or statutory employees of Contractor) while Contractor's employees are providing work and/or services to or on behalf of Owner under this Agreement. It is also recognized that the work contemplated by this Agreement is a part of the trade, business or occupation of Owner and is an integral part of and essential to the ability of the Owner to generate its goods, products and/or services. It is the express intention of Owner and Contractor that Owner enjoy the exclusive remedy protection afforded by La. R.S. 23:1032, and the designation of Owner as the statutory employer of Contractor's employees is included for the sole purpose of establishing a statutory employer relationship in accordance with the provisions of La. R.S. 23:1061(A)(3). This provision is not intended to create an employer/employee relationship for any other purpose(s). Contractor shall require in its contracts with Subcontractors that that it is their intention to recognize Owner as the statutory employer of Subcontractor's employees (whether these be direct employees or statutory employees of Subcontractor) while Subcontractor's employees are providing work and/or services to or on behalf of Owner. It is also recognized that the work contemplated is a part of the trade, business or occupation of Owner and is an integral part of and essential to the ability of the Owner to generate its goods, products and/or services. It is the express intention of Subcontractor that Owner enjoy the exclusive remedy protection afforded by La. R.S. 23:1032, and the designation of Owner as the statutory employer of Subcontractor's employees is included for the sole purpose of establishing a statutory employer relationship in accordance with the provisions of La. R.S. 23:1061(A)(3).

11.2 MINIMUM SCOPE AND LIMITS OF INSURANCE

Add **11.2.1** as follows:

11.2.1 Worker's Compensation

Worker's Compensation insurance shall be in compliance with the Worker's Compensation law of the State of Louisiana. Employers Liability is included with a minimum limit of $500,000 per accident/per disease/per employee. If work is to be performed over water and involves maritime exposure, applicable LHWCA, Jones Act or other maritime law coverage shall be included and the Employers Liability limit increased to a minimum of $1,000,000. A.M. Best's insurance company rating requirement may be waived for Worker's compensation coverage only.

Add **11.2.2** as follows:

11.2.2 Commercial General Liability

Commercial General Liability Insurance, including Personal and Advertising Injury Liability and Products and Completed Operations Liability, shall have a minimum limit per occurrence based on the project value. The Insurance Services Office (ISO) Commercial General Liability occurrence coverage form CG 0001 (current form approved for use in Louisiana), or equivalent, is to be used in the policy. Claims -Made form is unacceptable.

The aggregate loss limit must apply to each project. ISO form CG 2503 (current form approved for use in Louisiana), or equivalent, shall also be submitted. The State project number, including part number, and project name shall be included on this endorsement.

COMBINED SINGLE LIMIT (CSL) PER OCCURRENCE

Type of Construction	Projects up to $1,000,000	Projects over $1,000,000 up to $10,000,000	Projects over $10,000,000
New Buildings:			
Each Occurrence Minimum Limit	$1,000,000	$2,000,000	$4,000,000
Per Project Aggregate This Contract ONLY	$2,000,000	$4,000,000	$8,000,000
Renovations: The building(s) value for this Project is $_____.			
Each Occurrence Minimum Limit	$1,000,000**	$2,000,000**	$4,000,000**
Per Project Aggregate	2 times per occur limit**	2 times per occur limit**	2 times per occur limit**

**While the minimum Combined Single Limit of $1,000,000 is required for any renovation, the limit is calculated by taking 10% of the building value and rounding it to the nearest $1,000,000 to get the insurance limit. Example: Renovation on $33,000,000 building would

have a calculated $3,000,000 combined single limit of coverage (33,000,000 times .10 = 3,300,000 and then rounding down to $3,000,000). If the calculated limit is less than the minimum limit listed in the above charge, then the amount needed is the minimum listed in the chart. Maximum per occurrence limit required is $10,000,000 regardless of building value. The per project aggregate limit is then calculated as twice the per occurrence limit.

Add **11.2.3** as follows:

11.2.3 Automobile Liability

Automobile Liability Insurance shall have a minimum combined single limit per occurrence of $1,000,000. ISO form number CA 00 01 (current form approved for use in Louisiana.), or equivalent, is to be used in the policy. This insurance shall include third-party bodily injury and property damage liability for owned, hired and non-owned automobiles.

Add **11.2.4** as follows:

11.2.4 Excess Umbrella

Excess Umbrella Insurance may be used to meet the minimum requirements for General Liability and Automobile Liability only.

Add **11.2.5** as follows:

11.2.5 Builder's Risk

Builder's Risk Insurance shall be in an amount equal to the greater of the fully-completed project value or the amount of the construction contract including any amendments and shall be upon the entire Work included in the contract. The policy shall provide coverage equivalent to the ISO form number CP 10 20, Broad Form Causes of Loss (extended, if necessary, to include the perils of wind, earthquake, collapse, vandalism/malicious mischief, and theft, including theft of materials whether or not attached to any structure). The policy must include architects' and engineers' fees necessary to provide plans, specifications and supervision of Work for the repair and/or replacement of property damage caused by a covered peril, not to exceed 10% of the cost of the repair and/or replacement.

Flood coverage shall be provided by the Contractor on the first floor and below for projects North of the Interstate Corridor beginning at the Texas-Louisiana border at Interstate 10 East to the Baton Rouge junction of Interstate 12, East to Slidell junction with Interstate 10 to the Louisiana-Mississippi border. Flood is included in the builder's risk insurance policy, then the sub-limit shall not be less than ten percent (10%) of the total contract cost per occurrence. If flood is purchased as a separate policy, the limit shall be ten percent (10%) of the total contract cost per occurrence (with a max of $500,000 if NFIP). Coverage for roofing only projects shall **not** require flood coverage.

On projects South of this corridor, flood coverage shall be provided by the State of Louisiana as the owner. The Contractor will be liable for the $5,000 policy deductible from the Notice to Proceed date through the date of final payment of the project in the event of a flood loss.

A Specialty Contractor may provide an installation floater in lieu of a Builder's Risk policy, with the similar coverage as the Builder's Risk policy, upon the system to be installed in an amount equal

to the greater of the fully-completed project value or the amount of the contract including any amendments. Flood coverage is not required.

The policy must include coverage for the University, Contractor and any subcontractors as their interests may appear.

Add **11.2.6** as follows:

11.2.6 ***Pollution Liability*** *(required when asbestos or other hazardous material abatement is included in the contract*).

Pollution Liability insurance, including gradual release as well as sudden and accidental, shall have a minimum limit of not less than $1,000,000 per claim. A claims-made form will be acceptable. A policy period inception date of no later than the first day of anticipated Work under this contract and an expiration date of no earlier than 30 days after anticipated completion of all Work under the contract shall be provided. There shall be an extended reporting period of at least 24 months, with full reinstatement of limits, from the expiration date of the policy. The policy shall not be cancelled for any reason, except non-payment of premium.

11.3 OTHER INSURANCE PROVISIONS

Delete **11.3** and replace with the following:

11.3 OTHER INSURANCE PROVISIONS

Delete **11.3.1** and replace with the following:

11.3.1 The policies are to contain, or be endorsed to contain, the following provisions:

Delete **11.3.1.1** and replace with the following:

11.3.1.1 Worker's Compensation and Employer's Liability Coverage

Add **11.3.1.1.1** as follows:

11.3.1.1.1 The insurer shall agree to waive all rights of subrogation against the University, its board, officers, officials, employees and volunteers for losses arising from Work performed by the Contractor for the University.

Delete **11.3.1.2** and replace with the following:

11.3.1.2 General Liability Coverage

Add **11.3.1.2.1** as follows:

11.3.1.2.1 The University, its board, officers, agents, employees, and volunteers are to be added as additional insureds as respects liability arising out of activities performed by or on behalf of the Contractor; products and completed operations of the Contractor, premises owned, occupied or used by the Contractor. ISO Form CF 20 10 (current form approved for use in Louisiana), or equivalent, is to be used.

Add **11.3.1.2.2** as follows:

11.3.1.2.2 The Contractor's insurance shall be primary as respects to University, its board, officers, agents, employees and volunteers. The coverage shall contain no special limitations on the scope of protection afforded to the University, its board, officers, officials, employees or volunteers. Any insurance or self-insurance maintained by the University shall be excess and non-contributory of the Contractor's insurance.

Add **11.3.1.2.3** as follows:

11.3.1.2.3 The Contractor's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the policy limits.

Delete **11.3.1.3** and replace with the following:

11.3.1.3 Builder's Risk

The policy must include an endorsement providing the following:

In the event of a disagreement regarding a loss covered by this policy which may also be covered by a State of Louisiana self-insurance or commercial property policy through the Office of Risk Management (ORM), Contractor and its insurer agree to follow the following procedure to establish coverage and/or the amount of loss:

Any party to a loss may make written demand for an appraisal of the matter in disagreement. Within 20 days of receipt of written demand, the Contractor's insurer and either ORM or its commercial insurance company shall each select a competent and impartial appraiser and notify the other of the appraiser selected. The two appraisers will select a competent and impartial umpire. The appraisers will then identify the policy or policies under which the loss is insured and, if necessary, state separately the value of the property and the amount of the loss that must be borne by each policy. If the two appraisers fail to agree, they shall submit their differences to the umpire. A written decision by any two shall determine the policy or policies and the amount of the loss. Each insurance company agrees to at the decision of the appraisers and the umpire if involved will be binding and final and that neither party will resort to litigation. Each of the two parties shall pay its chosen appraiser and bear the cost of the umpire equally.

Delete **11.3.1.4** and replace with the following:

11.3.1.4 All Coverages

Add **11.3.1.4.1** as follows:

11.3.1.4 Coverage shall not be canceled, suspended, or voided by either party (the Contractor or the insurer) or reduced in coverage or in limits except after 30 days written notice has been given to the University. Ten-day written notice of cancellation is acceptable for nonpayment of premium. Notifications shall comply with the standard cancellation provisions in the Contractor’s policy.

Add **11.3.1.4.2** as follows:

11.3.1.4.2 Neither the acceptance of the completed Work nor the payment thereof shall release the Contractor from the obligations of the insurance requirements or indemnification agreement.

Add **11.3.1.4.3** as follows:

11.3.1.4.3 The insurance companies issuing the policies shall have no recourse against the University for payment of premiums or for assessments under any form of the policies.

Add **11.3.1.4.4** as follows:

11.3.1.4.4 Any failure of the Contractor to comply with reporting provisions of the policy shall not affect coverage provided to the University, its officers, agents, employees and volunteers.

Delete **11.3.2** and replace with the following:

11.3.2 Acceptability of Insurers

All required insurance shall be provided by a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located. Insurance shall be placed with insurers with an A.M. Best's rating of **A-:VI or higher.** This rating requirement may be waived for the Worker's Compensation coverage only.

If at any time an insurer issuing any such policy does not meet the minimum A.M. Best rating, the Contractor shall obtain a policy with an insurer that meets the A.M. Best rating and shall submit another certificate of insurance as required in the contract.

Delete **11.3.3** and replace with the following:

11.3.3 Verification of Coverage

Contractor shall furnish the University with Certificates of Insurance reflecting proof of required coverage. The Certificates for each insurance policy are to be signed by a person authorized by that insurer to bind coverage on its behalf. The Certificates are to be received and approved by the University before Wok commences and upon any contract renewal thereafter. The Certificate Holder must be listed as follows:

Board of Supervisors of
Louisiana State University and Agricultural and Mechanical College
Office of Procurement
213 Thomas Boyd Hall
Baton Rouge, LA 70803-3001
Attn: Project # _____

In addition to the Certificates, Contractor shall submit the declarations page and the cancellation provision endorsement for each insurance policy. The University reserves the right to request complete certified copies of all required insurance policies at any time. Upon failure of the Contractor to furnish, deliver and maintain such insurance as above provided, this contract, at the election of the University, may be suspended, discontinued or terminated. Failure of the Contractor to purchase and/or maintain any required insurance shall not relieve the Contractor from any liability of indemnification under the contract.

If the Contractor does not meet the insurance requirements at policy renewal, at the option of the University, payment to the Contractor may be withheld until the requirements have been met, OR

the University may pay the renewal premium and withhold such payment from any monies due the Contractor, OR the contract may be suspended or terminated for cause.

Delete **11.3.4** and replace with the following:

11.3.4 Subcontractors

Contractor shall include all subcontractors as insureds under its policies OR shall be responsible for verifying and maintaining the certificates provided by each subcontractor. Subcontractors shall be subject to all requirements stated herein. The University reserves the right to request copies of subcontractor's certificates at any time.

If Contractor does not verify subcontractors' insurance as described above, University has the right to withhold payments to Contractor until the requirements have been met.

Delete **11.3.5** and replace with the following:

11.3.5 Worker's Compensation Indemnity

Contractor hereby agrees to protect, defend, indemnify and hold the University, its departments, agencies, agents and employees harmless from any worker's compensation claim from any employee of Contractor or one of its subcontractors, that may arise from the performance of this contract.

Delete **11.3.6** and replace with the following:

11.3.6 Indemnification/Hold Harmless Agreement

Contractor agrees to protect, defend, indemnify, save, and hold harmless, the University, its board, officers, agents, servants, employees and volunteers, from and against any and all claims, damages, expenses, attorney's fees and liability arising out of injury or death to any person or the damage, loss or destruction of any property which may occur, to the extent caused by any act, omission, or breach of this Agreement by Contractor, its agents, servants, subcontractors and employees, except and only to the extent those claims, demands, suits or causes of action are caused by the negligence of the University, its officers, agents, servants, employees and volunteers. Contractor agrees to investigate, handle, respond to, provide defense for an defend any such claims demands, suits or causes of action at its sole expense and agrees to bear all other costs and expenses related thereto, even if the claims, demands, suits, or causes of action are groundless, false or fraudulent.

11.4 PERFORMANCE AND PAYMENT BOND

Add **11.4.3** as follows:

11.4.3 Recordation of Contract and Bond [38:2241a(2)]

The Contractor shall record within thirty (30) days the Contract Between Owner and Contactor and Performance and Payment Bond with the Clerk of Court in the Parish in which the work is to be performed.

ARTICLE 12

UNCOVERING AND CORRECTION OF WORK

12.2.1 Before or After Substantial Completion

At the end of **12.2.1.** add the following:

If the Contractor fails to correct Work identified as defective within a thirty (30) day period, through no fault of the Architect, the Owner may hold the Contractor in default. If the Owner finds the Contractor in default, the Surety shall be notified.

If within thirty (30) days after notification, the Surety has not corrected the nonconforming work, through no fault of the Architect or Owner, the Owner may contract to have the nonconforming work corrected and hold the surety and Contractor responsible for the cost, including architectural fees and other indirect costs. If the Surety fails to correct the work within the stipulated time period and fails to meet its obligation to pay the costs, the owner may elect not to accept bonds submitted in the future by the Surety. Finding the Contractor in default shall constitute a reason for disqualification of the Contractor from bidding on future University contracts.

12.2.2 After Substantial Completion

12.2.2.1 Delete the last sentence and add the following:

If the Contractor fails to correct nonconforming Work within a thirty (30) day period, through no fault of the Architect or Owner, the Owner may hold the Contractor in default. If the Owner finds the Contractor is in default, the Surety shall be notified. If within thirty (30) days after notification, the Surety has not corrected the nonconforming Work, through no fault of the Architect or Owner, the Owner may contract to have the nonconforming work corrected and hold the Surety responsible for the cost including architects fees and other indirect costs. Corrections by the Owner shall be in accordance with Section 2.4. If the Surety fails to correct the nonconforming Work within the stipulated time period and fails to meet its obligation to pay the costs, the Owner may not accept bonds submitted, in the future, by the Surety.

12.2.2.2 Delete **12.2.2.2** and replace with the following:

If the Contractor fails to correct Work covered by warranties within a thirty (30) day period, through no fault of the Architect or Owner, the Owner may hold the Contractor in default. If the Owner finds the Contractor is in default, the Surety shall be notified. If within thirty (30) days after notification, the Surety has not corrected the warranty Work, through no fault of the Architect or Owner, the Owner may contract to have the warranty Work corrected and hold the Surety responsible for the cost including Architect's fees and other indirect costs. Corrections by the Owner shall be in accordance with Section 2.4. If the Surety fails to correct the warranty Work within the stipulated time period and fails to meet its obligation to pay the costs, the Owner may not accept bonds submitted, in the future, by the Surety.

ARTICLE 13

MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

Delete everything after the word "located".

13.2 SUCCESSORS AND ASSIGNS

13.2.1 In the second sentence, delete "Except as… 13.2.2".

Delete entire **13.2.2**

13.4 RIGHTS AND REMEDIES

Add **13.4.3** as follows:

13.4.3 The Nineteenth Judicial Court in and for the Parish of East Baton Rouge, State of Louisiana shall have sole jurisdiction and venue in any action brought under this Contract.

13.5 TESTS AND INSPECTIONS

In **13.5.1** delete the second sentence and substitute the following:

Tests, inspections and approvals of portions of the Work required by the Contract Documents or by laws, ordinances, rules, regulations or orders of public authorities having jurisdiction shall be made at an appropriate time. Unless otherwise specified, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contactor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures.

Delete the last sentence of **13.5.1**

13.6 INTEREST

Delete **13.6**

13.7 TIME LIMIT ON CLAIMS

Delete **13.7** (See La.R.S. 38:2189)

Add the **13.8.1** as follows:

13.8 LIENS/PRIVILEGES

13.8.1 Contractor shall at all times promptly pay for all services, labor, materials and equipment used or furnished by or through Contractor in the performance of the Work under this Contract,

and shall, at its sole expense, keep the Project and all property belonging to Owner free and clear of any and all liens and claims arising out of services, labor, materials and/or equipment furnished by or through Contractor or its employees, subcontractors, or suppliers in performance of the Work. If Contractor fails to release and discharge any such lien or claim made against the Project or the property of Owner arising out of performance of the Work within seven working days after receipt of written notice from Owner to remove such lien or claims of privilege, Owner may, at its sole option, declare Contractor in default. Contractor shall be liable to Owner, as applicable, for any and all costs and expenses incurred by Owner in resolving lien claims including reasonable attorney fees and court costs. Owner shall be entitled to deduct such costs from payments otherwise due to Contractor as a back charge.

ARTICLE 14

TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR

14.1.1 delete **.4** from the list

14.1.3 after the word "profit" add "for Work completed prior to stoppage".

14.2 TERMINATION BY THE OWNER FOR CAUSE

Add **.5** to the list as follows:

.5 failure to complete the punch list within the lien period as provided in 9.8.2.3.

14.2.3 Add the following sentence:

Termination by the Owner shall not suspend assessment of liquidated damages against the surety.

Add **14.2.5** as follows:

14.2.5 If an agreed sum of liquidated damages has been established, termination by the Owner under this Article will not relieve the Contractor and/or surety of his obligations under the liquidated damages provisions and the Contractor and/or surety shall be liable to the Owner for per diem liquidated damages.

ARTICLE 15

CLAIMS AND DISPUTES

15.1 CLAIMS

In the first sentence of **15.1.1**, after the word "money", add the phrase "extension of time,".

15.1.2 Add the following to the end of the paragraph:

A Reservation of Rights and similar stipulations shall not be recognized under this contract as having any effect. A party must make a claim as defined herein within the time limits provided.

15.1.3 In the second sentence, delete "the decisions of the initial Decision Maker" and replace with "his/her decision".

Delete the **15.1.5.2** and replace with the following:

15.1.5.2 If adverse weather conditions are the basis for a claim for additional time, the Contractor shall document that weather conditions had an adverse effect on the scheduled construction. An increase in the contract time due to weather shall not be cause for an increase in the contract sum. At the end of each month, the Contractor shall make one Claim for any adverse weather days occurring within the month. The Claim must be accompanied by sufficient documentation evidencing the adverse days and the impact on construction. Failure to make such Claim within twenty-one (21) days from the last day of the month shall prohibit any future claims for adverse days for that month.

Add **15.1.5.3** as follows:

15.1.5.3 The following are considered reasonably anticipated days of adverse weather on a monthly basis:

January	11 days	July	6 days
February	10 days	August	5 days
March	8 days	September	4 days
April	7 days	October	3 days
May	5 days	November	5 days
June	6 days	December	8 days

The Contractor may ask for total adverse weather days; however, the Contractor's request shall be considered only for days over the allowable number of days stated above. *Note: Contract is on a calendar day basis.*"

Delete **15.1.6** and replace with the following:

15.1.6 Owner shall not be liable to any Subcontractor for claims or damages of any nature caused by or arising out of delays. The sole remedy against the Owner for excusable delays shall be the allowance of additional time for completion of the Work, the amount of which shall be subject to a determination under the claims procedure set forth herein. Furthermore, the Owner shall not be liable to Contractor for consequential damages arising out of this Agreement, including, but not limited to, damages incurred by the Contractor for principal office expenses, such as compensation of personnel stationed there or on the job site, for losses of financing, business and/or reputation, and for loss of profit.

Add **15.1.7** as follows:

15.1.7 Should Owner be compelled to institute legal proceedings to enforce its rights under this Agreement, to the extend the Owner prevails, it shall be entitled to recover its reasonable attorney's fees and court costs from the Contractor.

15.2 INITIAL DECISION

15.2.1 In second sentence delete the word "will" and replace with “shall always”;
delete the phrase "unless otherwise indicated in the Agreement."
In the third sentence, delete the word "mediation" and replace with "litigation"; delete the phrase "unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no decision having been rendered."

15.2.5 In the middle of the first sentence, delete everything after the phrase "rejecting the Claim".

In the second sentence, delete the phrase "and the Architect, if the Architect is not serving as the Initial Decision Maker".

In the third sentence, delete everything after "binding on the parties" and add the following "except that the Owner may reject the solution or suggest a compromise or both."

Delete **15.2.6**

Delete **15.2.6.1**

15.3 MEDIATION.

Delete **15.3**

15.4 ARBITRATION

Delete **15.4**

Add **Article 16** as follows:

ARTICLE 16

EQUAL OPPORTUNITY

16.1 The Contractor and all Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex or national origin. The Contractor shall take affirmative action to insure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, sex, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of nondiscrimination.

16.2 The Contractor and all Subcontractors, shall, in all solicitations or advertisement for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex or national origin.

BID BOND FOR BOARD OF SUPERVISORS OF LOUISIANA STATE UNIVERSITY AND AGRICULTURAL AND MECHANICAL COLLEGE

Date: _____

KNOW ALL MEN BY THESE PRESENTS:

That _____ of _____, as Principal and _____, as Surety, are held and firmly bound unto the Board of Supervisors of Louisiana State University and Agricultural and Mechanical College (Obligee), in the full and just sum of five (5%) percent of the total amount of this proposal, including all alternates, lawful money of the United States, for payment of which sum, well and truly be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally firmly by these presents.

Surety represents that it is listed on the current U. S. Department of the Treasury Financial Management Service list of approved bonding companies as approved for an amount equal to or greater that the amount for which it obligates itself in this instrument or that it is a Louisiana domiciled insurance company with at least an A- rating in the latest printing of the A. M. Best's Key Rating Guide. If surety qualifies by virtue of its Best's listing, the Bond amount may not exceed ten percent of policyholders' surplus as shown in the latest A. M. Best's Key Rating Guide.

Surety further represents that it is licensed to do business in the State of Louisiana and that this Bond is signed by surety's agent or attorney in fact. This Bid Bond is accompanied by appropriate power of attorney.

THE CONDITION OF THIS OBLIGATION IS SUCH that, whereas said Principal is herewith submitting its proposal to the Obligee on a Contract for:

_____

NOW, THEREFORE, if the said Contract be awarded to the Principal and the Principal shall, within such time as may be specified, enter into the Contract in writing and give a good and sufficient bond to secure the performance of the terms and conditions of the Contract with surety acceptable to the Obligee, then this obligation shall be void; otherwise this obligation shall become due and payable.

_____	_____
PRINICIPAL (BIDDER)	SURETY
BY: _____	_____
AUTHORIZED OFFICER/OWNER/ PARTNER	AGENT OR ATTORNEY IN FACT (SEAL)

CONTRACTOR'S AFFIDAVIT AS REQUIRED BY TITLE 38 LOUISIANA REVISED STATUTES

Louisiana State University
and A & M College
Baton Rouge, Louisiana

I, _____ representing
(Name of Individual)

_____
(Company)

as its _____ certify in compliance with Louisiana
(Title of Position)

R.S. 38:2224 that as Contractor for Louisiana State University and Agricultural and Mechanical College on

Bid # _____ entitled: _____

_____

By: _____
(Architect or Engineer)

that I/we employ no person, corporation, firm, association, or other organization, either directly or indirectly, to secure the contract for the above mentioned public project other than persons regularly employed by affiant, whose services in connection with the construction of the public building or project or in securing the contract for same were in regular course of their duties for affiant; and that no part of the contract price received, or to be received, by affiant was paid or will be paid to any person, corporation, firm, association, or other organization for soliciting the contract, other than the payment of their normal compensation to persons regularly employed by affiant, whose services in connection with the construction of said public project were in the regular course of their duties for affiant.

SWORN TO AND SUBSCRIBED, before me

this _____ day of _____ _____
Signature of Affiant

20 ____.

_____ Seal of Notary

Notary Public

(NOT TO BE SUBMITTED WITH BID)
(SUBMITTED BY ALL BIDDERS WITHIN 10 DAYS AFTER BID OPENING)

AFFIDAVIT

_____

NAME OF PROJECT

Appearer, as a Bidder on the above-entitled Public Works Project, does hereby attest that:

LA. R.S. 38:2212.10 Verification of Employees

A. Appearer is registered and participates in a status verification system to verify that all employees in the state of Louisiana are legal citizens of the United States or are legal aliens.

B. If awarded the contract, Appearer shall continue, during the term of the contract, to utilize a status verification system to verify the legal status of all new employees in the state of Louisiana.

C. If awarded the contract, Appearer shall require all subcontractors to submit to it a sworn affidavit verifying compliance with Paragraphs (A) and (B) of this Subsection.

_____ _____

NAME OF BIDDER **NAME OF AUTHORIZED SIGNATORY OF BIDDER**

_____ _____

DATE **TITLE OF AUTHORIZED SIGNATORY OF BIDDER**

_____

SIGNATURE OF AUTHORIZED SIGNATORY OF BIDDER

_____

WITNESS

_____

WITNESS

_____

NOTARY PUBLIC

(NOT TO BE SUBMITTED WITH BID)
SUBMIT BY ALL BIDDERS WITHIN 10 DAYS AFTER BID OPENING

_____ _____

NAME OF PROJECT **PROJECT NO.**

ATTESTATIONS

Appearer, as a Bidder on the above-entitled Public Works Project, does hereby attest that:

LA. R.S. 38:2227 PAST CRIMINAL CONVICTIONS OF BIDDERS

A. No sole proprietor or individual partner, incorporator, director, manager, officer, organizer, or member who has a minimum of a ten percent (10%) ownership in the bidding entity named below has been convicted of, or has entered a plea of guilty or nolo contendere to any of the following state crimes or equivalent federal crimes:

(a) Public bribery (R.S. 14:118)
(b) Corrupt influencing (R.S. 14:120)
(c) Extortion (R.S. 14:66)
(d) Money laundering (R.S. 14:230)

B. Within the past five years from the project bid date, no sole proprietor or individual partner, incorporator, director, manager, officer, organizer, or member who has a minimum of a ten percent (10%) ownership in the bidding entity named below has been convicted of, or has entered a plea of guilty or nolo contendere to any of the following state crimes or equivalent federal crimes, during the solicitation or execution of a contract or bid awarded pursuant to the provisions of Chapter 10 of Title 38 of the Louisiana Revised Statutes:

(a) Theft (R.S. 14:67)
(b) Identity Theft (R.S. 14:67.16)
(c) Theft of a business record (R.S.14:67.20)
(d) False accounting (R.S. 14:70)
(e) Issuing worthless checks (R.S. 14:71)
(f) Bank fraud (R.S. 14:71.1)
(g) Forgery (R.S. 14:72)
(h) Contractors; misapplication of payments (R.S. 14:202)
(i) Malfeasance in office (R.S. 14:134)

LA. R.S. 38:2212.10 Verification of Employees

C. At the time of bidding, Appearer is registered and participates in a status verification system to verify that all new hires in the state of Louisiana are legal citizens of the United States or are legal aliens.

D. If awarded the contract, Appearer shall continue, during the term of the contract, to utilize a status verification system to verify the legal status of all employees in the state of Louisiana.

E. If awarded the contract, Appearer shall require all subcontractors to submit to it a sworn affidavit verifying compliance with Paragraphs (A) and (B) of this Subsection.

LA. R.S. 23:1726(B) Certification Regarding Unpaid Workers Compensation Insurance

A. R.S. 23:1726 prohibits any entity against whom an assessment under Part X of Chapter 11 of Title 23 of the Louisiana Revised Statutes of 1950 (Alternative Collection Procedures & Assessments) is in effect, and whose right to appeal that assessment is exhausted, from submitting a bid or proposal for or obtaining any contract pursuant to Chapter 10 of Title 38 of the Louisiana Revised Statutes of 1950 and Chapters 16 and 17 of Title 39 of the Louisiana Revised Statutes of 1950.

Name of Project	**Project No.**

B. By signing this bid /proposal, Affiant certifies that no such assessment is in effect against the bidding / proposing entity.

NAME OF BIDDER	**NAME OF AUTHORIZED SIGNATORY OF BIDDER**
DATE	**TITLE OF AUTHORIZED SIGNATORY OF BIDDER**

SIGNATURE OF AUTHORIZED BIDDER

SCHEDULE OF VALUES

The Contractor is to use the following format.
The total Contract Cost is to be itemized in each Subsection listed (as applicable).

DIVISION 01 – GENERAL REQUIREMENT		
01 00 00 General Requirements	$	-
01 32 50 Record Drawings, Shop Drawings, Product Data, Samples and other submittals	$	-
DIVISION 01 SUB-TOTAL	**$**	**-**
DIVISION 02 – EXISTING CONDITIONS		
02 30 00 Subsurface Investigation	$	-
02 41 00 Demolition	$	-
DIVISION 02 SUB-TOTAL	**$**	**-**
DIVISION 03 – CONCRETE		
03 01 00 Maintenance of Concrete	$	-
03 11 00 Concrete Forming	$	-
03 15 00 Concrete Accessories	$	-
03 20 00 Concrete Reinforcing	$	-
03 30 00 Cast-in-place Concrete	$	-
03 40 00 Precast Concrete	$	-
03 50 00 Cast Decks & Underlayment	$	-
DIVISION 03 SUB-TOTAL	**$**	**-**
DIVISION 04 – MASONRY		
04 01 00 Maintenance of Masonry	$	-
04 05 13 Masonry Mortaring	$	-
04 05 19 Masonry Anchorage & Reinforcing	$	-
04 05 23 Masonry Accessories	$	-
04 20 00 Unit Masonry	$	-
DIVISION 04 SUB-TOTAL	**$**	**-**
DIVISION 05 – METALS		
05 05 23 Metal Fastenings	$	-
05 10 00 Structural Metal Framing	$	-
05 20 00 Metal Joists	$	-
05 30 00 Metal Decking	$	-
05 50 00 Metal Fabrications	$	-
05 58 00 Formed Metal Fabrications	$	-
DIVISION 05 SUB-TOTAL	**$**	**-**
DIVISION 06 – WOOD, PLASTICS, & COMPOSITES		
06 05 23 Fastening and Adhesives	$	-
06 10 00 Rough Carpentry	$	-
06 13 00 Heavy Timber	$	-
06 17 00 Shop-fabricated Structural Wood06 20 00	$	-
06 20 00 Finish Carpentry	$	-
06 40 00 Architectural Woodwork	$	-
06 60 00 Plastic Fabrications	$	-
06 80 00 Composite Fabrications	$	-
DIVISION 06 SUB-TOTAL	**$**	**-**

DIVISION 07 – THERMAL AND MOISTURE PRETECTION

07 10 00	Dampproofing and Waterproofing	$ -
07 18 00	Traffic Coatings	$ -
07 19 00	Water Repellents	$ -
07 21 00	Thermal Insulation	$ -
07 24 00	Exterior Insulation & Finish Systems	$ -
07 25 00	Weather Barriers	$ -
07 31 00	Shingles and Shakes	$ -
07 32 00	Roof Tiles	$ -
07 40 00	Roofing and Siding Panels	$ -
07 50 00	Membrane Roofing	$ -
07 60 00	Flashing and Sheet Metal	$ -
07 61 00	Sheet Metal Roofing	$ -
07 70 00	Roof & Wall Specialties and Accessories	$ -
07 80 00	Fire and Smoke Protection	$ -
07 90 00	Joint Protection	$ -
07 95 00	Expansion Control	$ -
	DIVISION 07 SUB-TOTAL	**$ -**

DIVISION 08 – OPENINGS

08 11 00	Metal Doors and Frames	$ -
08 14 00	Wood Doors	$ -
08 15 00	Plastic Doors	$ -
08 30 00	Specialty Doors and Frames	$ -
08 41 00	Entrances and Storefronts	$ -
08 44 00	Curtain Wall and Glazed Assemblies	$ -
08 51 00	Metal Windows	$ -
08 52 00	Wood Windows	$ -
08 53 00	Plastic Windows	$ -
08 56 00	Special Function Windows	$ -
08 60 00	Roof Windows and Skylights	$ -
08 70 00	Hardware	$ -
08 80 00	Glazing	$ -
08 90 00	Louvers and Vents	$ -
	DIVISION 08 SUB-TOTAL	**$ -**

DIVISION 09 – FINISHES

09 22 00	Supports for Plaster and Gypsum Board	$ -
09 23 00	Gypsum Plastering	$ -
09 24 00	Portland Cement Plastering	$ -
09 29 00	Gypsum Board	$ -
09 30 00	Tiling	$ -
09 50 00	Acoustical Ceilings	$ -
09 54 00	Specialty Ceilings	$ -
09 61 00	Flooring Treatment	$ -
09 62 00	Specialty Flooring	$ -
09 63 00	Masonry Flooring	$ -
09 64 00	Wood Flooring	$ -
09 65 00	Resilient Flooring	$ -
09 66 00	Terrazzo Flooring	$ -
09 68 00	Carpeting	$ -
09 69 00	Access Flooring	$ -
09 97 00	Wall Finishes	$ -
09 91 00	Painting	$ -
09 97 00	Special Coatings	$ -
	DIVISION 09 SUB-TOTAL	**$ -**

DIVISION 10 – SPECIALTIES		
10 11 00 Visual Display Surfaces		$ -
10 14 00 Signage		$ -
10 21 00 Compartments and Cubicles		$ -
10 22 00 Partitions		$ -
10 26 00 Wall and Door Protection		$ -
10 28 00 Toilet, Bath, and Laundry Accessories		$ -
10 44 00 Fire Protection Specialties		$ -
10 51 00 Lockers		$ -
10 56 00 Storage Assemblies		$ -
10 82 00 Grilles and Screens		$ -
	DIVISION 10 SUB-TOTAL	**$ -**
DIVISION 11 – EQUIPMENT		
11 15 00 Security, Detention, and Banking Equipment		$ -
11 19 00 Detention Equipment		$ -
11 23 00 Commercial Laundry and Dry Cleaning Equipment		$ -
11 26 00 Unit Kitchens		$ -
11 27 00 Photographic Processing Equipment		$ -
11 40 00 Foodservice Equipment		$ -
11 51 00 Library Equipment		$ -
11 52 00 Audio-Visual Equipment		$ -
11 53 00 Laboratory Equipment		$ -
11 61 00 Theater and Stage Equipment		$ -
11 65 00 Athletic and Recreational Equipment		$ -
11 70 00 Healthcare Equipment		$ -
	DIVISION 11 SUB-TOTAL	**$ -**
DIVISION 12 – FURNISHINGS		
12 20 00 Window Treatments		$ -
12 30 00 Casework		$ -
12 40 00 Furnishings and Accessories		$ -
	DIVISION 12 SUB-TOTAL	**$ -**
DIVISION 13 –SPECIAL CONSTRUCTION		
13 10 00 Special Facility Components		$ -
13 34 00 Fabricated Engineered Structures		$ -
13 49 00 Radiation Protection		$ -
	DIVISION 13 SUB-TOTAL	**$ -**
DIVISION 14 – CONVEYING EQUIPMENT		
14 20 00 Elevators		$ -
14 30 00 Escalators and Moving Walks		$ -
14 40 00 Lifts		$ -
14 80 00 Scaffolding		$ -
	DIVISION 14 SUB-TOTAL	**$ -**
DIVISION 21 – FIRE SUPPRESSION		
21 10 00 Water-Based Fire-Suppression Systems Piping		$ -
21 20 00 Fire-Extinguishing Systems		$ -
21 30 00 Fire Pumps		$ -
	DIVISION 21 SUB-TOTAL	**$ -**
DIVISION 22 – PLUMBING		
22 07 00 Plumbing Insulation		$ -
22 11 00 Facility Water Distribution		$ -
22 13 00 Facility Sanitary Sewerage		$ -
22 14 00 Facility Storm Drainage		$ -
22 30 00 Plumbing Equipment		$ -
22 40 00 Plumbing Fixtures		$ -
	DIVISION 22 SUB-TOTAL	**$ -**

DIVISION 23 – HEATING, VENTILATING, & AIR CONDITIONING

23 05 93	Testing, Adjusting, & Balancing for HVAC	$ -
23 07 00	HVAC Insulation	$ -
23 09 00	Instrumentation & Control for HVAC	$ -
23 13 00	Facility Fuel-Storage Tanks	$ -
23 20 00	HVAC Piping and Pumps	$ -
23 30 00	HVAC Air Distribution	$ -
23 40 00	HVAC Air Cleaning Devices	$ -
23 50 00	Central Heating Equipment	$ -
23 60 00	Central Cooling Equipment	$ -
23 70 00	Central HVAC Equipment	$ -
	DIVISION 23 SUB-TOTAL	**$ -**

DIVISION 26 – ELECTRICAL

26 09 00	Instrumentation & Control for Electrical Systems	$ -
26 10 00	Medium-Voltage Electrical Distribution	$ -
26 20 00	Low-Voltage Electrical Transmission	$ -
26 27 00	Low-Voltage Distribution Equipment	$ -
26 30 00	Facility Electrical Power Generating & Storage Equipment	$ -
26 40 00	Electrical and Cathodic Protection	$ -
26 50 00	Lighting	$ -
	DIVISION 26 SUB-TOTAL	**$ -**

DIVISION 27 – COMMUNICATIONS

27 10 00	Structured Cabling	$ -
27 20 00	Data Communications	$ -
27 30 00	Voice Communications	$ -
27 40 00	Audio-Video Communications	$ -
27 50 00	Distributed Communications & Monitoring Systems	$ -
	DIVISION 27 SUB-TOTAL	**$ -**

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

28 10 00	Electronic Access Control & Intrusion Detection	$ -
28 20 00	Electronic Surveillance	$ -
28 30 00	Electronic Detection and Alarm	$ -
28 40 00	Electronic Monitoring and Control	$ -
	DIVISION 28 SUB-TOTAL	**$ -**

DIVISION 31 – EARTHWORK

31 10 00	Site Clearing	$ -
31 20 00	Earth Moving	$ -
31 31 00	Soil Treatment	$ -
31 32 00	Soil Stabilization	$ -
31 40 00	Shoring and Underpinning	$ -
31 50 00	Excavation Support and Protection	$ -
31 60 00	Special Foundations and Load-Bearing Elements	$ -
	DIVISION 31 SUB-TOTAL	**$ -**

DIVISION 32 – EXTERIOR IMPROVEMENTS

32 10 00	Bases, Ballasts, and Paving	$ -
32 30 00	Site Improvements	$ -
32 90 00	Planting	$ -
	DIVISION 32 SUB-TOTAL	**$ -**

	TOTAL	**$ -**

SECTION 01 10 00 – SUMMARY OF WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Contract documents

1. Related requirements and conditions that are indicated on the Contract Documents include, but are not necessarily limited to the following:

a. Applicable codes and regulations.

b. Notices and permits.

c. Existing site conditions and restrictions on use of the site.

d. Requirements for Owner and occupancy during the Contractor Work.

e. LSU PDC Contract Documents.

1.2 PROJECT IDENTIFICATION

A. The name of the Project is: **Campus Wide Direct Digital HVAC Control System, Item 54, Louisiana State University, Alexandria, LA**.

B. The project is located at: Louisiana State University, Alexandria, Louisiana.

1.3 SUMMARY BY REFERENCE

A. The work documents can be summarized by reference to the requirements of the various contract documents, which in turn make reference to the requirement of other applicable provisions which control or influence the work, and these references can be summarized but are not necessarily limited to the following:

1. The Executed Owner-Contractor Agreement
2. The General and Supplementary Conditions and Miscellaneous Documents
3. The Drawings
4. This Project Manual
5. The addenda and modifications to the contract documents which have been either bound herewith or distributed by transmittal subsequent to the binding hereof
6. Submittals, copies of which are retained by the Contractor at the site.

1.4 SUMMARY OF SITE CONDITIONS

A. The contractor shall verify site conditions, scope of work, and requirements of the Project. The work is located throughout the campus at 8100 US-71, Alexandria, LA on LSU Campus in Alexandria, Louisiana. Power and water are available at the Site however the Contractor is responsible for supplying the necessary electrical power and water to the Work Areas to complete the Work.

1.5 SCOPE OF WORK

A. The work under this Contract shall consist of furnishing and installing all materials and labor required to complete **Campus Wide Direct Digital HVAC Control System, Item 54, Louisiana State University, Alexandria, LA.**

B. **Base Bid:**

1. This work is a campus wide upgrade of the DDC control system with new front-end graphics for the HVAC systems.

C. **Alternates:**

1. This project does not include any Alternates.

D. Work shall be in accordance with LSU Design Standards and all Contract Documents Referenced.

E. Unless otherwise specified, the Contractor shall supply all labor, transportation, materials, apparatus, fuel, energy, light, and tools necessary for the entire, proper and substantial completion of the Work shown on the drawings and described this Project Manual. The Contractor shall install, maintain, and remove all construction equipment and auxiliary devices and shall be responsible for the safe, proper and lawful maintenance and use of sums; and shall construct in the best and most workmanlike manner a complete job and everything properly incidental thereto, as shown on the plans, stated in the Project Manual or reasonably implied therefrom, all in accordance with the Contract Documents.

F. The Owner will furnish water and electricity which may be required by the Contractor during construction operations. The Contractor shall provide any necessary connections and extensions from existing utility lines or outlets at the site. Temporary discontinuance of any utility services shall be coordinated with LSU.

1.6 COMPLETION TIME

A. Substantial Completion will be **210 days** from the date of the written “Notice to Proceed.”

B. There will be no restrictions on working times. Contractor can work days, nights, and weekends. The space will be unoccupied.

C. Contractor shall coordinate the construction schedule with LSU at the preconstruction conference. RE: Section 01 33 23 Submittals.

1.7 LIQUIDATED DAMAGES

A. Liquidated damages are set at **$1,000.00 for each consecutive calendar day** for which work is not complete, beginning with the first day beyond the completion date stated on the written “Notice to Proceed.”

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01 23 00 – ALTERNATES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Requirements and descriptions for products and scope of Work identified as Alternate in the Drawings and Specifications and listed as “Alternate” on the Project Bid Form.

1.2 RELATED DOCUMENTS

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

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept the alternate(s).

1. Bidding documents shall include no more than three alternates.
2. Determination of the low bidder shall be on the basis of the sum of the base bid and any alternates accepted.
3. Alternates, if accepted, shall be accepted in the order in which they are listed on the bid form. However, the Owner shall have the right to accept alternates in any order which does not affect determination of the low bidder.

1.4 DESCRIPTION OF ALTERNATES

A. This project does not include any alternates.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.2 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.3 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use form that is part of web-based Project management software.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design

characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of Engineers and owners.
h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Engineer will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
   a. Use product specified if Engineer does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.5 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.6 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Engineer will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Engineer will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 01 26 00 – CHANGE ORDERS AND PAYMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.
B. Documentation of changes in Contract Sum and Contract Time.

1.2 RELATED REFERENCES

A. Section 00 72 00 – General Conditions: Additional requirements for progress payments, final payment, changes in the Work.
B. Section 00 73 00 – Supplementary Conditions: Percentage allowances for Contractor's overhead and profit.
C. Section 01 77 00 – Project Closeout: Project record documents.

1.3 SCHEDULE OF VALUES

A. Use schedule of Values form: AIA G703, edition stipulated in the Agreement.
B. Revise schedule to list approved Change Orders, with each Application for Payment.

1.4 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.
B. Execute certification by signature of authorized officer.
C. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
D. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.
E. Submit one electronic copy of each Application for Payment.
F. Include the following with the application:
    a. Construction progress schedule, revised and current.
G. When Architect requires substantiating information, submit data justifying dollar amounts in question.

1.5 CHANGE ORDER REQUEST

A. Architect shall request Change Order Requests which shall be provided by the Contractor on the form provided at www.lsu.edu/pdc.
B. Instructions for filling a Change Order Request are included in the "Instructions" tab on the form.
C. The Contractor must furnish a PDF per the "Instructions" to the Architect for each requested COR.

1.6 CHANGE ORDERS

A. Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

1.7 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted contract sum, previous payments, and sum remaining due.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
2. Submit the schedule of values to Engineer at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Arrange schedule of values consistent with format of AIA Document G703.
2. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum. Provide breakdown by buildings.
3. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

    a. Differentiate between items stored on-site and items stored off-site.
4. Overhead Costs: Include total cost and proportionate share of general overhead and profit for each line item.
5. Overhead Costs: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
6. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
7. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.3 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Engineer and paid for by Owner.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

1. Submit draft copy of Application for Payment seven days prior to due date for review by Engineer.

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Engineer will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Engineer by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from [**entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment**] [**subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application**].

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Products list (preliminary if not final).
5. Sustainable design action plans, including preliminary project materials cost data.
6. Schedule of unit prices.
7. Submittal schedule (preliminary if not final).
8. List of Contractor's staff assignments.
9. List of Contractor's principal consultants.
10. Copies of building permits.
11. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
12. Initial progress report.
13. Report of preconstruction conference.

H. Application for Payment at Substantial Completion: After Engineer issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

I. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706.
5. AIA Document G706A.
6. AIA Document G707.
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. RFIs.
4. Digital project management procedures.
5. Project meetings.

B. Related Requirements:

1. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.2 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

1.3 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.

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

B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

1.4 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Owner name.
2. Owner's Project number.
3. Name of Engineer.
4. Engineer's Project number.
5. Date.
6. Name of Contractor.
7. RFI number, numbered sequentially.
8. RFI subject.
9. Specification Section number and title and related paragraphs, as appropriate.
10. Drawing number and detail references, as appropriate.
11. Field dimensions and conditions, as appropriate.
12. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
13. Contractor's signature.
14. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Engineer.

D. Engineer's Action: Engineer will review each RFI, determine action required, and respond. Allow seven days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Architect's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

2. Engineer's action may include a request for additional information, in which case Engineer's time for response will date from time of receipt by Engineer of additional information.
3. Engineer's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Engineer in writing within five days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use software log that is part of web-based Project management software.

1. Project name.
2. Name and address of Contractor.
3. Name and address of Engineer.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Engineer's response was received.

F. On receipt of Engineer's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Engineer within seven days if Contractor disagrees with response.

1.5 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. Use of Engineer's Digital Data Files: Digital data files of Engineer's CAD drawings will be provided by Engineer for Contractor's use during construction.

1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project record Drawings.

2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
3. Digital Drawing Software Program: Contract Drawings are available in AutoCAD.
4. Contractor shall execute a data licensing agreement in the form of M&E AutoCAD release. Request form from engineer's office.

B. PDF Document Preparation: Where PDFs are required to be submitted to Engineer, prepare as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.6 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

B. Preconstruction Conference: Engineer will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.

1. Attendees: Authorized representatives of Owner, Engineer, Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Responsibilities and personnel assignments.
    b. Tentative construction schedule.
    c. Phasing.
    d. Critical work sequencing and long lead items.
    e. Designation of key personnel and their duties.
    f. Lines of communications.
    g. Use of web-based Project software.
    h. Procedures for processing field decisions and Change Orders.
    i. Procedures for RFIs.
    j. Procedures for testing and inspecting.
    k. Procedures for processing Applications for Payment.
    l. Distribution of the Contract Documents.
    m. Submittal procedures.
    n. Use of the premises and existing building.
    o. Work restrictions.
    p. Working hours.
    q. Owner's occupancy requirements.

r. Responsibility for temporary facilities and controls.
s. Procedures for moisture and mold control.
t. Procedures for disruptions and shutdowns.
u. Construction waste management and recycling.
v. Parking availability.
w. Office, work, and storage areas.
x. Equipment deliveries and priorities.
y. First aid.
z. Security.
aa. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

4. Attendees: Authorized representatives of Owner, Engineer, Contractor and its superintendent and sustainable design coordinator; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

5. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Progress Meetings: Conduct progress meetings at biweekly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.

4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site use.
8) Temporary facilities and controls.
9) Progress cleaning.
10) Quality and work standards.
11) Status of correction of deficient items.
12) Field observations.
13) Status of RFIs.
14) Status of Proposal Requests.
15) Pending changes.
16) Status of Change Orders.
17) Pending claims and disputes.
18) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

    a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's Construction Schedule.
2. Construction schedule updating reports.
3. Daily construction reports.
4. Site condition reports.

1.2 DEFINITIONS

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

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

1.3 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file.
2. PDF file.

B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.

C. Construction Schedule Updating Reports: Submit with Applications for Payment.

D. Daily Construction Reports: Submit at weekly intervals.

E. Site Condition Reports: Submit at time of discovery of differing conditions.

1.4 COORDINATION

A. Coordinate Contractor's Construction Schedule with the schedule of values,list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

1.5 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Computer Scheduling Software: Prepare schedules using current version of a program that is capable of managing construction schedules.

B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.

1. Contract completion date to not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Engineer's administrative procedures necessary for certification of Substantial Completion.

6. Punch List and Final Completion: Include not more than 45 days for completion of punch list items and final completion.

D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
3. Work Restrictions: Show the effect of the following items on the schedule:

    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use-of-premises restrictions.
    f. Provisions for future construction.
    g. Seasonal variations.
    h. Environmental control.

E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.

F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and the Contract Time.

G. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

H. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule.

Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.

I. Distribution: Distribute copies of approved schedule to Engineer, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.6 GANTT-CHART SCHEDULE REQUIREMENTS

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.
2. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule to coordinate with the Contract Time.

1.7 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Testing and inspection.
8. Accidents.
9. Meetings and significant decisions.
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.

15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013200

SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Concealed Work photographs.
3. Periodic construction photographs.
4. Final Completion construction photographs.

B. Related Requirements:

1. Section 017700 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.

1.2 INFORMATIONAL SUBMITTALS

A. Contractor is advised to document conditions in areas of work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013233

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.3 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Engineer and additional time for handling and reviewing submittals required by those corrections.

1.4 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:

1. Project name.
2. Date.
3. Name of Engineer.
4. Name of Contractor.
5. Name of firm or entity that prepared submittal.
6. Names of subcontractor, manufacturer, and supplier.
7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
8. Category and type of submittal.
9. Submittal purpose and description.

10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
11. Drawing number and detail references, as appropriate.
12. Indication of full or partial submittal.
13. Location(s) where product is to be installed, as appropriate.
14. Other necessary identification.
15. Remarks.
16. Signature of transmitter.

B. Options: Identify options requiring selection by Engineer.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Engineer on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

1.5 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Email: Prepare submittals as PDF package, and transmit to Engineer by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
2. Resubmittal Review: Allow 15 days for review of each resubmittal.

D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Engineer's action stamp.

1.6 SUBMITTAL REQUIREMENTS

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams that show factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before Shop Drawings, and before or concurrent with Samples.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Identification of products.
b. Schedules.
c. Compliance with specified standards.
d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.

C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

D. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

1.7 CONTRACTOR'S REVIEW

A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Engineer

B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

1. Engineer will not review submittals received from Contractor that do not have Contractor's review and approval.

1.8 ENGINEER'S REVIEW

A. Action Submittals: Engineer will review each submittal, indicate corrections or revisions required, and return it.

B. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Engineer.

C. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

D. Architect will discard submittals received from sources other than Contractor.

E. Submittals not required by the Contract Documents will be returned by Engineer without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013300

SECTION 01 33 23 – SUBMITTALS

PART 1 GENERAL

1.1 PRE-CONSTRUCTION CONFERENCE SUBMITTALS

A. Per the Supplementary Conditions of the Contract, the Contractor is to furnish to the Architect the following prior to the commencement of Work before or at the Pre-Construction Conference:
   1. Construction Schedule.
   2. Schedule of Values.
   3. List of Subcontractors.
   4. Fixed job site overhead cost itemized with documentation to support daily rates.
   5. Bond Premium Rate with supporting information from the General Contractor's carrier.
   6. Labor Burden by trade for both subcontractors and General Contractor.
   7. Internal Rate Changes for all significant company-owned information.

B. Failure to submit the Construction Schedule and SOV shall prohibit Contractor mobilization onsite.

C. Failure to submit this information as part of the pre-construction submittals shall prohibit the Contractor from claiming these items as costs on any change order issued on the project.

1.2 SHOP DRAWINGS, PRODUCT DATA, SAMPLES AND SUBMITTALS

A. Submittals are required on this project for all paint specifications, finish floor, lighting and plumbing fixture selections for architect review and approval prior to ordering.

B. Submittals are required as noted in the plans.

C. Submit samples to Architect review of color and texture only. Compliance with all other requirements is the exclusive responsibility of the Contractor. Provide a listing of the material and application for each coat of each finish sample.

D. The contractor is responsible for reviewing shop drawings prior to transmittal to the architect. All submitted data will bear the contractor's approval stamp plus his review notes prior to transmittal to the architect. During the progress of the work, the architect shall promptly take action upon submittal data and advise the contractor of any submittal data that is required resubmittal.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 013516 - ALTERATION PROJECT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes special procedures for alteration work.

1.2 DEFINITIONS

A. Alteration Work: This term includes remodeling, renovation, repair, and maintenance work performed within existing spaces or on existing surfaces as part of the Project.

B. Consolidate: To strengthen loose or deteriorated materials in place.

C. Design Reference Sample: A sample that represents the Architect's prebid selection of work to be matched; it may be existing work or work specially produced for the Project.

D. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

E. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by Architect.

F. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.

G. Repair: To correct damage and defects, retaining existing materials, features, and finishes. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.

H. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.

I. Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.

J. Reproduce: To fabricate a new item, accurate in detail to the original, and from either the same or a similar material as the original, unless otherwise indicated.

K. Retain: To keep an element or detail secure and intact.

L. Strip: To remove existing finish down to base material unless otherwise indicated.

1.3 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered or uncovered during the Work, regardless of whether they were previously documented, remain Owner's property.

1.4 STORAGE AND HANDLING OF SALVAGED MATERIALS

A. Salvaged Materials:

1. Clean loose dirt and debris from salvaged items unless more extensive cleaning is indicated.
2. Pack or crate items after cleaning; cushion against damage during handling. Label contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area on-site.
5. Protect items from damage during transport and storage.

B. Salvaged Materials for Reinstallation:

1. Repair and clean items for reuse as indicated.
2. Pack or crate items after cleaning and repairing; cushion against damage during handling. Label contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make items functional for use indicated.

C. Existing Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work. Where permitted by Architect, items may be dismantled and taken to a suitable, protected storage location during construction work and reinstalled in their original locations after alteration and other construction work in the vicinity is complete.

D. Storage: Catalog and store items within a weathertight enclosure where they are protected from moisture, weather, condensation, and freezing temperatures.

1. Identify each item for reinstallation with a nonpermanent mark to document its original location. Indicate original locations on plans, elevations, sections, or photographs by annotating the identifying marks.
2. Secure stored materials to protect from theft.
3. Control humidity so that it does not exceed 85 percent. Maintain temperatures 5 deg F (3 deg C) or more above the dew point.

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION

3.1 PROTECTION

A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from alteration work.

1. Use only proven protection methods, appropriate to each area and surface being protected.
2. Provide temporary barricades, barriers, and directional signage to exclude the public from areas where alteration work is being performed.
3. Erect temporary barriers to form and maintain fire-egress routes.
4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during alteration work.
5. Contain dust and debris generated by alteration work, and prevent it from reaching the public or adjacent surfaces.
6. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
7. Protect floors and other surfaces along hauling routes from damage, wear, and staining.
8. Provide supplemental sound-control treatment to isolate demolition work from other areas of the building.

B. Temporary Protection of Materials to Remain:

1. Protect existing materials with temporary protections and construction. Do not remove existing materials unless otherwise indicated.
2. Do not attach temporary protection to existing surfaces except as indicated as part of the alteration work program.

C. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.

D. Utility and Communications Services:

1. Notify Owner, Architect, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by alteration work before commencing operations.
2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for alteration work.
3. Maintain existing services unless otherwise indicated; keep in service, and protect against damage during operations. Provide temporary services during interruptions to existing utilities.

E. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or

blockage. Do not begin work in an area until the drainage system is functioning properly.

1. Prevent solids such as adhesive or mortar residue or other debris from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from alteration work.
2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

3.2 GENERAL ALTERATION WORK

A. Record existing work before each procedure (preconstruction). Use digital preconstruction documentation photographs. Comply with requirements in Section 013233 "Photographic Documentation."

B. Notify Architect of visible changes in the integrity of material or components whether from environmental causes including biological attack, UV degradation, freezing, or thawing or from structural defects including cracks, movement, or distortion.

1. Do not proceed with the work in question until directed by Engineer.

END OF SECTION 013516

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1.2 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced" unless otherwise further described means having successfully completed a minimum of ten previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.

1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.

E. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) in accordance with 29 CFR 1910.7, by a testing agency accredited in accordance with NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.

G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."

H. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

I. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Engineer[**or Construction Manager**].

1.3 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Engineer regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Engineer for clarification before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Engineer for a decision before proceeding.

1.4 INFORMATIONAL SUBMITTALS

A. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.5 REPORTS AND DOCUMENTS

A. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Statement that equipment complies with requirements.
2. Results of operational and other tests and a statement of whether observed performance complies with requirements.
3. Other required items indicated in individual Specification Sections.

1.6 QUALITY ASSURANCE

A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.2 USE CHARGES

A. Installation, removal, and use charges for temporary facilities to be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Engineer, testing agencies, and authorities having jurisdiction.

1.3 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

1.4 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

A. Contractor to provide port-o-lets for use by contractors work force. Use of university facilities is not allowed.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 SUPPORT FACILITIES INSTALLATION

A. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

B. Storage and Staging: Use designated areas of Project site for storage and staging needs.

C. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

D. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

E. Existing Elevator Use: Use of Owner's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.

1. Do not load elevators beyond their rated weight capacity.
2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.

F. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.

G. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

C. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.

D. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

3.4 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of This Section Includes: Administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

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1. Section 012500 "Substitution Procedures" for requests for substitutions.

1.2 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products unless otherwise indicated.
3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.

C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named

product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.

D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:

1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
2. Data indicating compliance with the requirements specified in "Comparable Products" Article.

E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."

F. Substitution: Refer to Section 012500 "Substitution Procedures" for definition and limitations on substitutions.

1.3 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

1.5 PRODUCT WARRANTIES

A. Warranties specified in other Sections are to be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of Owner or endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of Owner or endorsed by manufacturer to Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Engineer will make selection.
5. Descriptive, performance, and reference standard requirements in Specifications establish salient characteristics of products.

B. Product Selection Procedures:

1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

    a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:

1. Construction layout.
2. Field engineering.
3. Installation.
4. Cutting and patching.
5. Coordination of Owner's portion of the Work.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.
9. Correction of the Work.
10. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.

1.2 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.3 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Engineer of locations and details of cutting and await directions from Engineer before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Engineer's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Engineer for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.

C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

B. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

B. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Engineer in accordance with requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Engineer promptly.

Insert other special field-engineering requirements, such as damage surveys, settlement surveys and reports, environmental impact surveys, and similar requirements, as needed.

3.4 INSTALLATION

A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb, and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of [**96 inches (2440 mm)**] <**Insert dimension**> in occupied spaces and [**90 inches (2300 mm)**] <**Insert dimension**> in unoccupied spaces, unless otherwise indicated on Drawings.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure satisfactory results as judged by Engineer. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.

F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.

G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Engineer.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

3.5 CUTTING AND PATCHING

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of Work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Section 011000 "Summary."

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Engineer. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

    a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.6 PROGRESS CLEANING

A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, in accordance with regulations.

    a. Use containers intended for holding waste materials of type to be stored.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces in accordance with written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."

H. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

3.7 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

C. Comply with manufacturer's written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.

C. Restore permanent facilities used during construction to their specified condition.

D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

END OF SECTION 017300

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:
   1. Disposing of nonhazardous demolition and construction waste.

1.2 DEFINITIONS

A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.

C. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner's property.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Contractor to properly dispose of any waste in approved landfill.

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General:. Provide handling, containers, storage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

3.2 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged or recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

END OF SECTION 017419

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final Completion procedures.
3. List of incomplete items.
4. Submittal of Project warranties.
5. Final cleaning.

B. Related Requirements:

1. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
2. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
3. Section 017900 "Demonstration and Training" for requirements to train Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of cleaning agent.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.3 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest-control inspection.

1.4 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Engineer. Label with manufacturer's name and model number.
5. Submit testing, adjusting, and balancing records.
6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Complete startup and testing of systems and equipment.
2. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
3. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
4. Complete final cleaning requirements.
5. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Engineer, that must be completed or corrected before certificate will be issued.

1.5 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:

1. Submit a final Application for Payment in accordance with Section 012900 "Payment Procedures."

2. Certified List of Incomplete Items: Submit certified copy of Engineer's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Engineer. Certified copy of the list will state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1.6 LIST OF INCOMPLETE ITEMS

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, listed by Building, room number, etc
2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Engineer.
    d. Name of Contractor.
    e. Page number.

4. Submit list of incomplete items in the following format:

    a. MS Excel Electronic File: Engineer will return annotated file.

1.7 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Engineer for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

C. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

1. Submit on digital media acceptable to Engineer.

D. Warranties in Paper Form:

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.

E. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
b. Remove labels that are not permanent.

B. Construction Waste Disposal: Comply with waste-disposal requirements in Section 017419 "Construction Waste Management and Disposal."

3.2 CORRECTION OF THE WORK

A. Complete repair and restoration operations required by "Correction of the Work" Article in Section 017300 "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION 017700

SECTION 01 77 00 – PROJECT CLOSEOUT

PART 1 GENERAL

1.1 CLOSEOUT DOCUMENTS

A. Contractor shall provide digital copies to Engineer of the following documents: Final Occupancy certificate, General Contractor's Warranty, All Subcontractor and Specialty Contractor Warranties, All Manufacturer Warranties, Executed Certificate of Substantial Completion, Executed Consent of Surety, Executed Wavers of Liens, Maintenance Manuals, Record drawings, Record Specifications, and any other information required by LSU.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory manuals.
2. Systems and equipment operation manuals.
3. Systems and equipment maintenance manuals.
4. Product maintenance manuals.

1.2 CLOSEOUT SUBMITTALS

A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Engineer will comment on whether content of operation and maintenance submittals is acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operation and maintenance manuals in the following format:

1. Submit on digital media acceptable to Engineer. Enable reviewer comments on draft submittals.
2. Submit two paper copies. Engineer will return two copies.

C. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.3 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite

bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, post-type binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
2. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

1.4 REQUIREMENTS FOR OPERATION, AND MAINTENANCE MANUALS

A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual to contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect.
8. Name and contact information for Commissioning Authority.
9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.5 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.

B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.

3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

1.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds, as described below.

C. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

    a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

H. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1.7 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.

5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record specifications.
3. Record Product Data.

B. Related Requirements:

1. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set(s) of marked-up record prints.

B. Record Specifications: Submit annotated PDF electronic files and one paper copie of Project's Specifications, including addenda and Contract modifications.

C. Record Product Data: Submit annotated PDF electronic files and directories and One paper copie of each submittal.

1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

1.3 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation, where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an acceptable drawing technique.

c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.
e. Cross-reference record prints to corresponding photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Depths of foundations.
d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order or Construction Change Directive.
k. Changes made following Architect's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Engineer.

1.4 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation, where installation varies from that indicated in Specifications, addenda, and Contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

B. Format: Submit record specifications as annotated PDF electronic file.

1.5 RECORD PRODUCT DATA

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.

B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

C. Format: Submit Record Product Data as annotated PDF electronic file.

1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

1.6 MAINTENANCE OF RECORD DOCUMENTS

A. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Engineer's reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Instruction in operation and maintenance of systems, subsystems, and equipment.
2. Demonstration and training video recordings.

1.2 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

1.3 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.

1. At completion of training, submit complete training manual(s) for Owner's use prepared in same paper and PDF file format required for operation and maintenance manuals specified in Section 017823 "Operation and Maintenance Data."

1.4 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination."

1.5 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Engineer.

1.6 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Systems and equipment operation manuals.
    c. Systems and equipment maintenance manuals.
    d. Product maintenance manuals.
    e. Project Record Documents.
    f. Identification systems.
    g. Warranties and bonds.

h. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems.
    f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

    a. Startup procedures.
    b. Equipment or system break-in procedures.
    c. Routine and normal operating instructions.
    d. Regulation and control procedures.
    e. Control sequences.
    f. Safety procedures.
    g. Instructions on stopping.
    h. Normal shutdown instructions.
    i. Operating procedures for emergencies.
    j. Operating procedures for system, subsystem, or equipment failure.
    k. Seasonal and weekend operating instructions.
    l. Required sequences for electric or electronic systems.
    m. Special operating instructions and procedures.

5. Adjustments: Include the following:

    a. Alignments.
    b. Checking adjustments.
    c. Noise and vibration adjustments.
    d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

    a. Diagnostic instructions.
    b. Test and inspection procedures.

7. Maintenance: Include the following:

    a. Inspection procedures.
    b. Types of cleaning agents to be used and methods of cleaning.
    c. List of cleaning agents and methods of cleaning detrimental to product.
    d. Procedures for routine cleaning.
    e. Procedures for preventive maintenance.
    f. Procedures for routine maintenance.
    g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

1.7 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

1.8 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner, through Engineer, with at least seven days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.

F. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

1.9 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full HD mode with vibration reduction technology.

1. Submit video recordings on CD-ROM or thumb drive.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

E. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017900

SECTION 23 90 20 – TEMPERATURE CONTROLS

PART 1 - GENERAL

SCOPE OF WORK

Furnish totally native BACnet-based Distech Upper-level Field panels, known as MLN (Management level network) including server graphics, schedules, alarms and trend logs On All LSUA buildings with upper-level controllers. This Work shall be by a Distech, and Tridium Certified Dealer. All Distech Native Bacnet vav controls are to be tied in to the new (FMS) frontend. The System shall be used to display all graphics, schedules, alarms and trendlogs. Communications between the new (DDC) system and the Bacnet server shall be defined by using the protocols and network standards as defined by ANSI/ASHRAE Standard 135–2008, BACnet. In other words, all workstations, and controllers, including unitary controllers, shall be Distech Native Bacnet devices. No other than Distech gateways shall be used for communication to controllers installed with the new (DDC) system. Provide and install all hardware/software to allow for direct access to the (FMS) utilizing any standard web browser via the intranet and internet. The web browser shall be set up to access the (FMS) system via the local network or via the internet to allow for remote operation including scheduling, programming, data archiving, etc. Multiple users shall be able access the system simultaneously. All aspects of the user interface shall be via standard web browsers. User interface to be available for access on cell phone as available. Any computer/phone used as operator interface shall not require the purchase of any special software from the manufacturer in order to provide the complete user interface as described herein. The user interface will be complete as described herein, providing complete tool sets, operational features, multi- panel displays, and other display features. Systems which merely provide HTML based web pages as the operator interface will not be acceptable. A BACnet Protocol Implementation Conformance Statement shall be provided for each controller device (master or slave) that will be supplied for this project. Contractor shall coordinate with owner for all points on the BAS.

QUALITY ASSURANCE

Bids by wholesalers, contractors, dealers, or any firm whose principal business is not that of installing Distech Direct Digital Temperature Control Systems shall not be acceptable.

The system shall be installed by a Distech, and Tridium and checked out by trained, experienced Distech technicians directly employed by the (DDC) installing contractor.

Single source responsibility of the (DDC) contractor shall include installation, calibration, programming, and check-out of the stand-alone subsystems, as well as the complete operation of the integrated system.

This contractor shall have in-place, local support facility with technical staff, service vehicles, spare parts inventory, and all necessary testing and diagnostic equipment.

Contractor must have at minimum of ten year’s building automation experience.

REFERENCED STANDARDS, CODES AND ORDINANCES

It is the responsibility of the FMS contractor to be familiar with all codes, rules, ordinances, and regulations of the Authority Having Jurisdiction and their interpretations which are in effect at the site of the work.

The latest issue of applicable standards and recommended practices of the following agencies in effect shall form a part of the specification to the extent each agency’s relative standards or recommended practices apply to the Systems and its components as specified herein.

1. Federal Communications Commission (FCC)

2. American National Standards Institute (ANSI)
3. American Society of Mechanical Engineers (ASME)
4. Electronic Industries Association (EIA)
5. Institute of Electrical and Electronics Engineers (IEEE)
6. National Electrical Manufacturers Association (NEMA)
7. National Fire Protection Association (NFPA)
8. Underwriters Laboratories (UL)
9. Occupational Safety and Health Administration (OSHA)
10. American Society of Heating, Refrigeration and Air Conditioning Engineers 11. State of La Building Code

This contractor shall be solely responsible for compliance with all health and safety regulations, performing the work in a safe and competent manner, and the use industry accepted installation procedures required for the work as outlined in these documents.

All systems equipment, components, accessories, and installation hardware shall be new and free from defects and shall be UL listed where applicable. All components shall be in current production and shall be a standard product of the system or device manufacturer. Refurbished or reconditioned components are unacceptable. Each component shall bear the make, model number, device tag number (if any), and the UL label as applicable. All system components of a given type shall be the product of the same manufacturer.

SUBMITTALS
Provide copies of submittal data electronically.

Submittals shall consist of:
Data sheets of all products, including software and hardware.
Valve schedule, including sizing calculations and actuator information.
Damper schedule, including actuator information.
Wiring and piping interconnection diagrams including panel and device power, and sources.
List of materials of all proposed devices and equipment.
Software documentation:
a. Sequence of operation, in text form.
b. Control layouts and shop drawings
Point schedules
Controls schematics and system diagrams

Control Valves
Existing control valves too remain in place and tested for functionality.

PART 2 – PRODUCTS

All Distech parts shall be supplied by a Distech, and Tridium Certified Dealer and installed by a Distech, and Tridium certified contractor.

FACILITY MANAGEMENT SYSTEM GENERAL DESCRIPTION

The Native Bacnet (FMS) shall be the standard for use in this project; this system is currently in use by the end user and will be the basis for operating the new (DDC) system installed.

OPERATOR INTERFACE

OPERATOR’S WORKSTATION

A. General structure of workstation interaction shall be a standard client/server relationship. Server shall be used to archive data and store system database. Clients shall access server for all archived data. Each client shall include flexibility to access graphics from server or local drive. Server shall support a minimum of 50 simultaneous clients.

B. BACnet Conformance

1. Operator Work Station shall be approved by the BTL as meeting the BACnet Advanced Work Station requirements.

2. Please refer to Section 22.2, BACnet Functional Groups, in the BACnet standard, for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

3. Standard BACnet object types accessed by the workstation shall include as a minimum: Analog Value, Analog Input, Analog Output, Binary Value, Binary Input, Binary Output, Calendar, Device, Event Enrollment, File, Notification Class, Program, and Schedule object types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

4. The operator's workstation shall comply with Annex J of the BACnet specification for IP connections. Must support remote connection to server using a thick client application. This device shall use Ethernet to connect to the IP internetwork, while using the same Ethernet LAN for non-IP communications to other BACnet devices on the LAN. Must support interoperability on wide area networks (WANs) and campus area networks (CANs). Workstation shall support Foreign Device Registration to allow temporary workstation connection to IP network.

C. Displays

1. Operator's workstation shall display all data associated with project as called out on drawings and/or object type list. Graphic files shall be created using digital, full color photographs of system installation, AutoCAD or Visio drawing files of field installation drawings and wiring diagrams from as-built drawings. Operator's workstation shall display all data using three-dimensional graphic representations of all mechanical equipment. System shall be capable of displaying graphic file, text, and dynamic object data together on each display and shall include animation. Information shall be labeled with descriptors and shall be shown with the appropriate engineering units. All information on any display shall be dynamically updated without any action by the user. Workstation shall allow user to change all field-resident BAS functions associated with the project, such as setpoints, weekly schedules, exception schedules, etc., from any screen, no matter if that screen shows all text or a complete graphic display. This shall be done without any reference to object addresses or other numeric/mnemonic indications.

2. All displays and programming shall be generated and customized by the local BAS supplier and installer. Systems requiring factory development of graphics or programming of DDC logic are specifically prohibited.

3. Binary objects shall be displayed as ACTIVE/INACTIVE/NULL or with customized text such as Hand-Off-Auto. Text shall be justified left, right or center as selected by the user. Also, allow binary

objects to be displayed as individual change-of-state graphic objects on the display screen such that they overlay the system graphic. Each binary object displayed in this manner shall be assigned up to three graphic files for display when the point is ON, OFF or in alarm. For binary outputs, toggle the object's commanded status when the graphic item is selected with the system mouse. Similarly, allow the workstation operator to toggle the binary object's status by selecting with the mouse, for example, a graphic of a switch or light, which then displays a different graphic (such as an "ON" switch or lighted lamp. Additionally, allow binary objects to be displayed as an animated graphic. Animated graphic objects shall be displayed as a sequence of multiple graphics to simulate motion. For example, when a pump is in the OFF condition, display a stationary graphic of the pump. When the operator selects the pump graphic with the mouse, the represented object's status is toggled and the graphic of the pump's impeller rotates in a time-based animation. The operator shall be able to click an animated graphical object or switch it from the OFF position to ON, or ON to OFF. Allow operator to change graphic file assignment and also create new and original graphics online. System shall be supplied with a library of standard graphics, which may be used unaltered or modified by the operator. Systems that do not allow customization or creation of new graphic objects by the operator (or with third-party software) shall not be allowed.

4. Analog objects shall be displayed with operator modifiable units. Analog input objects may also be displayed as individual graphic items on the display screen as an overlay to the system graphic. Each analog input object may be assigned a minimum of five graphic files, each with high/low limits for automatic selection and display of these graphics. As an example, a graphic representation of a thermometer would rise and fall in response to either the room temperature or its deviation from the controlling setpoint. Analog output objects, when selected with the mouse, shall be displayed as a prompted dialog (text only) box. Selection for display type shall be individual for each object. Analog object values may be changed by selecting either the "increase" or "decrease" arrow in the analog object spinner box without using the keypad. Pressing the button on the right side of the analog object spinner box allows direct entry of an analog value and accesses various menus where the analog value may be used, such as trendlogs.

5. Analog objects may also be assigned to a system graphic, where the color of the defined object changes based on the analog object's value. For example, graphical thermostat device served by a single control zone would change color with respect to the temperature of the zone or its deviation from setpoint. All editing and area assignment shall be created or modified online using simple icon tools.
6. A customized menu label (push-button) shall be used for display selection. Menu items on a display shall allow penetration to lower level displays or additional menus. Dynamic point information and menu label pushbuttons may be mixed on the same display to allow sub-displays to exist for each item. Each display may be protected from viewing unless operator has appropriate security level. A security level may be assigned to each display and system object. The menu label shall not appear on the graphic if the operator does not have the appropriate security level.

7. The BAS displays shall have the ability to link to content outside of the BAS system. Such content shall include but is not limited to: Launching external files in their native applications (for example, a Microsoft Word document) and launching a Web browser resolving to a specified Web address.

8. The BAS system shall have the ability to run multiple, concurrent displays windows showing continuously updated data.

D. Password Protection

1. Provide security system that prevents unauthorized use unless operator is logged on. Access shall be limited to operator's assigned functions when user is logged on. This includes displays as outlined above.

2. Each operator's terminal shall provide security for a minimum of 200 users. Each user shall have an individual User ID, User Name, and Password. Entries are alphanumeric characters only and are case sensitive (except for User ID). User ID shall be 0–8 characters, User Name shall be 0–29 characters, and Password shall be 4–8 characters long. Each system user shall be allowed individual assignment of only those control functions, menu items, and user specific system start display, as well restricted access to *discrete BACnet devices* to which that user requires access. All passwords, user names, and access assignments shall be adjustable online at the operator's terminal. Users should have the capability to be assigned to specific user type "groups" that can share the same access levels to speed setup. Users who are members of multiple "groups" shall have the ability to activate/deactivate membership to those groups while using the BAS (without logout). Users shall also have a set security level, which defines access to displays and individual objects the user may control. System shall include 10 separate and distinct security levels for assignment to users.

3. System shall include an Auto Logout Feature that shall automatically logout user when there has been no keyboard or mouse activity for a set period of time. Time period shall be adjustable by system administrator. Auto Logout may be enabled and disabled by system administrator. Operator terminal shall display message on screen that user is logged out after Auto Logout occurs.
4. The system shall permit the assignment of an effective date range, as well as an effective time of day, that the User IDs are permitted to authenticate.

E. Operator Activity Log

1. Operator Activity Log that tracks all operator changes and activities shall be included with system. System shall track what is changed in the system, who performed this change, date and time of system activity, and value of the change before and after operator activity. Operator shall be able to display all activity, sort the changes by user and also by operation. Operator shall be able to print the Operator Activity log display.

2. Log shall be gathered and archived to hard drive on operator's workstation as needed. Operator shall be able to export data for display and sorting in a spreadsheet.

3. Any displayed data that is changeable by the operator may be selected using the right mouse button and the operator activity log shall then be selectable on the screen. Selection of the operator activity log using this method shall show all operator changes of just that displayed data.

F. Scheduling

1. Operator's workstation shall show all information in easy-to-read daily format including calendar of this month and next. All schedules shall show actual ON/OFF times for day based on scheduling priority. Priority for scheduling shall be events, holidays and daily, with events being the highest.

2. Holiday and special event schedules shall display data in calendar format. Operator shall be able to schedule holidays and special events directly from these calendars.

3. Operator shall be able to change all information for a given weekly or exception schedule if logged on with the appropriate security access.

4. System shall include a Schedule Wizard for set up of schedules. Wizard shall walk user through all steps necessary for schedule generation. Wizard shall have its own pull-down selection for startup or may be started by right-clicking on value displayed on graphic and then selecting Schedule.

5. Scheduling shall include optimum start based on outside air temperature, current heating/cooling setpoints, indoor temperature and history of previous starts. Each and every individual zone shall

have optimum start time independently calculated based on all parameters listed. User shall input schedules to set time that occupied setpoint is to be attained. Optimum start feature shall calculate the startup time needed to match zone temperature to setpoint. User shall be able to set a limit for the maximum startup time allowed.

6. Any displayed data that is changeable by the operator may be selected using the right mouse button and the schedule shall then be selectable on the screen. Selection of the schedule using this method shall allow the viewing of the assigned schedule or launch the Schedule Wizard to allow the point to be scheduled.

G. Alarm Indication and Handling.

1. Operator's workstation shall provide audible, visual, printed, and email means of alarm indication. The alarm dialog box shall always become the top dialog box regardless of the application(s) currently running. Printout of alarms shall be sent to the assigned terminal and port. Alarm notification can be filtered based on the User ID's authorization level.

2. System shall provide log of alarm messages. Alarm log shall be archived to the hard disk of the system operator's terminal. Each entry shall include a description of the event-initiating object generating the alarm. Description shall be an alarm message of at least 256 characters in length. Entry shall include time and date of alarm occurrence, time and date of object state return to normal, time and date of alarm acknowledgment, and identification of operator acknowledging alarm.

3. Alarm messages shall be in user-definable text (English or other specified language) and shall be delivered either to the operator's terminal, client or through remote communication using email (Authenticated SMTP supported).

4. System shall include an Alarm Wizard for set up of alarms. Wizard shall walk user through all steps necessary for alarm generation. Wizard shall have its own pull-down selection for startup or may be started by right-clicking on value displayed on graphic and then selecting alarm setup.

5. Any displayed data that is changeable by the operator may be selected using the right mouse button and the alarm shall then be selectable on the screen. Selection of the alarm using this method shall allow the viewing of the alarm history or launch the Alarm Wizard to allow the creation of a new alarm.

H. Trendlog Information

1. System server shall periodically gather historically recorded data stored in the building controllers and store the information in the system database. Stored records shall be appended with new sample data, allowing records to be accumulated. Systems that write over stored records shall not be allowed unless limited file size is specified. System database shall be capable of storing up to 50 million records before needing to archive data. Samples may be viewed at the operator's workstation. Operator shall be able to view all trended records, both stored and archived. All trendlog records shall be displayed in standard engineering units.

2. Software that is capable of graphing the trend logged object data shall be included. Software shall be capable of creating two-axis (X, Y) graphs that display up to 10 object types at the same time in different colors. Graphs shall show object values relative to time. Each trendlog shall support a custom scale setting for the graph view that is to be stored continuously. System shall be capable of trending on an interval determined by a polling rate, or change-of value.

3. Operator shall be able to change Trendlog setup information. This includes the information to be logged as well as the interval at which it is to be logged. All input, output, and value object types in the system may be logged. All operations shall be password protected. Setup and viewing may be

accessed directly from any and all graphics on which object is displayed.

4. System shall include a Trend Wizard for setup of logs. Wizard shall walk user through all necessary steps. Wizard shall have its own pull-down selection for startup, or may be started by right-clicking on value displayed on graphic, and then selecting Trendlogs from the displayed menu.

5. System shall be capable of using Microsoft SQL as the system database.

6. Any displayed data that is changeable by the operator may be selected using the right mouse button and the trendlog shall then be selectable on the screen. Selection of the trendlog using this method shall allow the viewing of the trendlog view or launch the Trendlog wizard to allow the creation of a new trend.

j. Reports

1. System server shall be capable of periodically producing reports of trendlogs, alarm history, tenant activities, device summary, energy logs, and override points. The frequency, content, and delivery are to be user adjustable.

2. All reports shall be capable of being delivered in multiple formats including text and comma-separated value (CSV) files. The files can be printed, emailed, or saved to a folder, either on the server hard drive or on any network drive location.

k. Configuration/Setup

1. Provide means for operator to display and change system configuration. This shall include, but not be limited to, system time, day of the week, date of daylight savings set forward/set back, printer termination, port addresses, modem port and speed, etc. Items shall be modified using understandable terminology with simple mouse/cursor key movements.

l. Field Engineering Tools

1. Operator’s workstation software shall include field engineering tools for programming all controllers supplied. All controllers shall be programmed using graphical tools that allow the user to connect function blocks on screen that provide sequencing of all control logic. Function blocks shall be represented by graphical displays that are easily identified and distinct from other types of blocks. Graphical programming that uses simple rectangles and squares is not acceptable.

2. User shall be able to select a graphical function block from menu and place on screen. Provide zoom in and zoom out capabilities. Function blocks shall be downloaded to controller without any reentry of data.

3. Programming tools shall include a real-time operation mode. Function blocks shall display real-time data and be animated to show status of data inputs and outputs when in real-time operation. Animation shall show change of status on logic devices and countdown of timer devices in graphical format.

4. Field engineering tools shall also include a database manager of applications that include logic files for controllers and associated graphics. Operator shall be able to select unit type, input/output configuration and other items that define unit to be controlled. Supply minimum of 250 applications as part of workstation software.

5. Field engineering tool shall include Device Manager for detection of devices connected anywhere on the BACnet network by scanning of the entire network. This function shall display device instance, network identification, model number, and description of connected devices. It shall record and display software file loaded into each controller. A copy of each file shall be stored on the computer's hard drive. If needed, this file shall be downloaded to the appropriate controller using the mouse.
6. System shall automatically notify the user when a device that is not in the database is added to the network.
7. System shall include backup/restore function that will back up entire system to selected medium and then restore system from that media. The system shall be capable of creating a backup for the purpose of instantiating a new client PC.
8. The system shall provide a means to scan, detect, interrogate, and edit 3rd party BACnet devices and BACnet objects within those devices.

A. Display of Data

1. Graphics shown on PC shall be replicas of the BAS displays. User shall need no additional training to understand information presented on Web pages when compared to what is shown on BAS displays. Web page displays shall include animation just as BAS displays. Fans shall turn, pilot lights shall blink, coils shall change colors, and so on.

2. Real-time data shall be shown on all browser Web pages. This data must be directly gathered using the BACnet network and automatically updated on browser Web page displays without any user action. Data on the browser shall automatically refresh as changes are detected without re-drawing the complete display.

3. It shall be possible for user from browser Web page to change data if the user is logged on with the appropriate password. Clicking on a button or typing in a new value shall change digital data. Using pull-down menus or typing in a new value shall change analog data.

4. Data displays shall be navigated using pushbuttons on the displays that are simply clicked on with the mouse to select a new display. Alternatively, the standard back and forward buttons of the browser can be used for display navigation.

B. Time Schedule Adjustment

1. Web access shall allow user to view and edit all schedules in the system. This includes standard, holiday and event schedules as described in BAS specification. Display of schedules shall show interaction of all schedules on a single display so user sees an overview of how all work together. User shall be able to edit schedules from this display.

2. Display of all three schedules must show all ON times for standard, holiday and event schedules in different colors on a given day. In addition, OFF times for each must also be shown in additional colors. User shall be able to select from standard calendar what days are to be scheduled and same display shall show all points and zones affected. User shall be able to set time for one day and select all days of the week that shall be affected as a recurrence of that same schedule for that given day.
3. Schedule list shall show all schedules currently defined. This list shall include all standard, holiday and event schedules. In addition, user shall be able to select a list that shows all scheduled points and zones.

C. Logging of Information

User shall use standard browser technology to view all trendlogs in system. User shall be able to

view logged data in tabular form or graphical format. User shall be able to adjust time interval of logged data viewed and shall be able to adjust Y axis of data viewed in graphical format. User shall also be able to download data through the Web interface to local computer. Data shall be in CSV format.

D. Alarm Handling

Web interface shall display alarms as they occur. User shall be able to acknowledge alarms using browser technology. In addition, user shall be able to view history of alarm occurrence over a user-selected time frame. In addition, those alarms may be filtered for viewing per user-selected options. A single selection shall display all alarms that have not been acknowledged.

E. Password Security and Activity Log

Access through Web browser shall utilize the same hierarchical security scheme as BAS system. User shall be asked to log on once the browser makes connection to Web page host. Once the user logs in, any and all changes that are made shall be tracked by the BAS system. The user shall be able to change only those items he or she has authority to change. A user activity report shall show any and all activity of the users who have logged in to the system, regardless of whether those changes were made using a browser or through the BAS workstation.

F. BACnet Communication

Web server shall directly communicate to all devices on the BAS network using BACnet protocol. No intermediate devices shall be necessary for BACnet communication.

BUILDING CONTROLLER

A. General Requirements

1. BACnet Conformance

a. Building Controller shall be approved by the BTL as meeting the BACnet Building Controller requirements.

b. Please refer to section 22.2, BACnet Functional Groups, in the BACnet standard, for a complete list of the services that must be directly supported to
provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

2. Building controller shall be of modular construction such that various modules may be selected to fit the specific requirements of a given project. At a minimum, modules shall consist of a power supply module, a BACnet Ethernet-MS/TP (master slave token passing) module, and a BACnet MS/TP-only module. Those projects that require special interfaces may use Modbus modules as needed. However, all Ethernet communications and all controllers—including central plant controllers, advanced application controllers and unitary controllers—supplied by BAS manufacturer shall utilize the BACnet protocol standard.

3. Modules shall be selected to fit the particular project application. Up to seven modules shall be powered by a single power supply module. All modules shall be panel-mounted on DIN rail for ease of addition and shall be interconnected using a simple plug-in cable. A module in the middle shall be replaceable without removing any other modules.

4. All modules shall be capable of providing global control strategies for the system based on information from any objects in the system, regardless if the object is directly monitored by the

building controller module or by another controller. The software program implementing these strategies shall be completely flexible and user-definable. All software tools necessary for programming shall be provided as part of project software. Any systems utilizing factory pre-programmed global strategies that cannot be modified by field personnel on-site, using a WAN or downloaded through remote communications are not acceptable. Changing global strategies using firmware changes is also unacceptable.

5. Programming shall be object-oriented using control function blocks, and support DDC functions, 1000 Analog Values and 1000 Binary Values. All flowcharts shall be generated and automatically downloaded to controller. Programming tool shall be supplied and be resident on workstation. The same tool shall be used for all controllers.

6. Provide means to graphically view inputs and outputs to each program block in real-time as program is executing. This function may be performed using the operator's workstation or field computer.

7. Controller shall have sufficient memory to ensure high performance and data reliability. Battery shall provide power for orderly shutdown of controller and storage of data in nonvolatile flash memory. Battery backup shall maintain real time clock functions for a minimum of 20 days.

8. Global control algorithms and automated control functions shall execute using 32-bit processor.

9. Schedules

10. Each building controller module shall support a minimum of 80 BACnet Schedule Objects and 80 BACnet Calendar Objects.

11. Building controller modules shall provide normal seven-day scheduling, holiday scheduling and event scheduling.

12. Logging Capabilities

a. Each building controller shall log as minimum 320 values. Any object in the system (real or calculated) may be logged. Sample time interval shall be adjustable at the operator's workstation.

b. Logs may be viewed both on-site or off-site using WAN or remote communication.

c. Building controller shall periodically upload trended data to networked operator's workstation for long-term archiving if desired.

d. Archived data stored in database format shall be available for use in third-party spreadsheet or database programs.

13. Alarm Generation

e. Alarms may be generated within the system for any object change of value or state (either real or calculated). This includes things such as analog object value changes, binary object state changes, and various controller communication failures.

f. Each alarm may be dialed out as noted elsewhere.

g. Alarm log shall be provided for alarm viewing. Log may be viewed on-site at the operator's terminal or off-site using remote communications.

h. Controller must be able to handle up to 320 alarm setups stored as BACnet event enrollment objects, with system destination and actions individually configurable.

14. Demand Limiting

a. Demand limiting of energy shall be a built-in, user-configurable function. Each controller module shall support shedding of up to 200 loads using a minimum of two types of shed programs.

b. Load shedding programs in building controller modules shall operate as defined in section 2.1.J of this specification.

15. Tenant Activity Logging

a. Tenant Activity logging shall be supported by building controller module. Each independent module shall support a minimum of 80 zones.

b. Tenant Activity logging shall function as defined in section 2.1.K of this specification.

B. Ethernet – MS/TP Module

1. Ethernet – MS/TP Module shall support every function as listed under paragraph A, General Requirements, of this section and the following.

2. All communication with operator's workstation and all application controllers shall be through BACnet. Building controller Ethernet – MS/TP module shall incorporate as a minimum, the functions of a 2-way BACnet router. Controller shall route BACnet messages between the high-speed LAN (Ethernet 10/100MHz) and MS/TP LAN. Ethernet – MS/TP module shall also route messages from all other building controller modules onto the BACnet Ethernet network.

a. MS/TP LAN must be software-configurable from 9.6 to 76.8Kbps.

b. The RJ-45 Ethernet connection must accept either 10Base-T or 100Base-TX BACnet over twisted pair cable (UTP).

3. BACnet Conformance

a. Ethernet – MS/TP module shall, as a minimum, support MS/TP and Ethernet BACnet LAN types. It shall communicate directly using these BACnet LANs as a native BACnet device and shall support simultaneous routing functions between all supported LAN types. Global controller shall be approved by the BACnet Testing Laboratory (BTL) as meeting the BACnet Building Controller requirements.

b. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

c. The building controller shall comply with Annex J of the BACnet specification for IP connections. This device shall use Ethernet to connect to the IP internetwork, while using the same Ethernet LAN for non-IP communications to other BACnet devices on the LAN. Must support interoperability on WANs and CANs and function as a BACnet Broadcast Management Device (BBMD).

C. MS/TP Module

1. MS/TP Module shall support every function as listed under paragraph A, General Requirements, of this section and the following.

2. Building controller MS/TP module communications shall be though BACnet MS/TP LAN to all advanced application and application-specific controllers. MS/TP module shall also route messages to Ethernet - MS/TP module for communication over WAN.

a. MS/TP LAN must be software configurable from 9.6 to 76.8Kbps b. Configuration

shall be through RS-232 connection.

3. BACnet Conformance

a. MS/TP module shall be approved by the BTL (BACnet Testing Laboratory) as meeting the BACnet Building Controller requirements. MS/TP module shall as a minimum support MS/TP BACnet LAN type. It shall communicate directly using this BACnet LAN as a native BACnet device and shall support simultaneous routing functions between all supported LAN types.

b. Standard BACnet object types supported shall include, as a minimum, Analog Value, Binary Value, Calendar, Device, File, Group, Notification Class, Program, and Schedule object types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

C. Application controllers shall include universal inputs with 12-bit resolution that accept 3K and 10K thermistors, 0–10VDC, Platinum 1000 ohm RTD, 0–5VDC, 4–20mA and dry contact signals. Any input on a controller may be either analog or digital with a minimum of three inputs that accept pulses. Controller shall also include support and modifiable programming for interface to intelligent room sensor with digital display. Controller shall include binary and analog outputs on board. Analog outputs with 12- bit resolution shall support either 0–10VDC or 0–20mA. Binary outputs shall have LED indication of status. Software shall include scaling features for analog outputs. Application controller shall include 20VDC voltage supply for use as power supply to external sensors.

1. All outputs must have onboard Hand-Off-Auto (HOA) switches and a status indicator light. HOA switch position shall be monitored. Each analog output shall include a potentiometer for manually adjusting the output when the HOA switch
is in the Hand position. The position of each and every HOA switch shall be available system wide as a BACnet object property.

D. All program sequences shall be stored on board application controller in EEPROM. No batteries shall be needed to retain logic program. All program sequences shall be executed by controller up to 20 times per second (minimum of 10 times per second) and capable of multiple PID loops for control of multiple devices. All calculations shall be completed using floating-point math and system shall support display of all information in floating-point nomenclature at operator’s terminal.

1. The following control blocks shall be supported:
a. Natural Log

b. Exponential

c. Log base 10

d. X to the power of Y

e. Nth square root of X

f. 5th Order Polynomial Equations

g. Astronomical Clock (sunrise/sunset calculation)

h. Time based schedules

E. Programming of application controller shall be completely modifiable in the field over installed BACnet LANs or remotely using modem interface. Operator shall program logic sequences by graphically moving function blocks on screen and tying blocks together on screen. Application controller shall be programmed using programming tools as described in operator's terminal section.

F. Application controller shall include support for intelligent room sensor (see Section 2.9.B.) Display on intelligent room sensor shall be programmable at application controller and include an operating mode and a field service mode. All button functions and display data shall be programmable to show specific controller data in each mode, based on which button is pressed on the sensor. See sequence of operation for specific display requirements at intelligent room sensor.

G. Schedules

1. The controller shall support a minimum of 3 BACnet Schedule Objects and have a real time clock on board with battery backup to maintain time through a power loss.

H. Logging Capabilities

1. Controller shall support a minimum of 50 trendlogs. Any object in the controller (real or calculated) may be logged. Sample time interval shall be adjustable at the operator's workstation.

2. Controller shall periodically upload trended data to system server for long-term archiving if desired. Archived data stored in (MS Jet Database or SQL) database form and shall be available for use in third-party spreadsheet or database programs.

I. Alarm Generation

1. Alarms may be generated within the controller for any object change of value or state (either real or calculated). This includes things such as analog object value changes, and binary object state changes.

2. Alarm log shall be provided for alarm viewing. Log may be viewed on-site at the operator's terminal or off-site using remote communications.

3. Controller must be able to handle up to 25 alarm setups stored as BACnet event enrollment objects, with system destination and actions individually configurable.

J. The controller processor shall be a 32-bit processor.

TERMINAL UNIT APPLICATION CONTROLLERS

A. All existing lower-level network controllers to be reused and seamless integration into the new controls such as VAV,FCU, ,etc. and tested for proper operations

CONTROL VALVES

1. All existing valves to be reused and tested for proper operations

ACTUATORS
1. All existing actuators to be reused and tested for proper operations.

FIELD SENSING DEVICES

All sensors to be replaced on Ahu's, Room sensors and humidistats to remain.

PART 3 - EXECUTION

GENERAL
All work described in this section shall be mounted, terminated, circuit tested and calibrated by factory trained technicians and mechanics qualified for this work and in the regular employ of the installing contractor.

All temperature control and interlock wiring and cable shall be installed in accordance with approved wiring diagrams. Power or interlock wiring shall be run in separate conduit(s) from sensor wiring and cables.

Thermostats or sensors mounted on outside walls shall be mounted on 1" minimum thickness rigid fiberglass insulation base (or equal).

All thermostat bulbs in water lines shall be installed in separable wells packed with heat conductive compound.

INSTALLATION

All wiring, conduit and tubing shall be properly supported and run in a neat and workmanlike manner.

1. All wiring, conduit and tubing exposed in equipment rooms shall run parallel to or at right angles to the building structure.
2. All piping and wiring within enclosures shall be neatly bundled and anchored to prevent restriction to devices and terminals.

The FMS contractor shall be responsible for all electrical installation which is necessary to a fully functional system. All wiring shall also be in accordance with applicable local and national codes.

1. All wiring in mechanical rooms shall be installed in conduit. Plenum rated cable is acceptable above ceilings and concealed locations.
2. Electrical power for control panels and the Operator Workstation shall be provided via dedicated circuits at a power panel specifically for controls.

Control wiring:
Include all low voltage wiring (100 volts and less) required for the FMS and temperature control systems under this section.
Conductors for control signals: No. 18 AWG copper conductors or larger as required.
a. Connector may be assembled in cable with PVC insulation minimum of 0.016 IN thick.
b. Cable outer sheathing as standard with manufacturer.
Line voltage wire for temperature control suitable for 600 volts, 168 deg. F temperature with
Type THW plastic covering, minimum No. 18 AWG.
3. Conduit:

Conduit: Electrical metallic tubing or rigid.
b. Couplings: Compression.
c. Flexible conduit: Steel armor or sealtight.
4. Supporting devices:
a. Conduit supports
1.) Must conform to seismic restraint criteria established by governing authority.
2.) Single runs: Galvanized conduit straps or ring bolt type hangers with specialty spring clips. Do not use plumber's perforated straps.
3.) Multiple runs: Conduit rack with 25 percent spare capacity.
4.) Vertical runs: Channel support with conduit fittings.
b. Anchor methods:
1) Hollow masonry: Toggle bolts or spider type expansion anchors.
2) Solid masonry: Lead expansion anchors or present inserts.
3) Metal surfaces: Machine screws, bolts, or welded studs.
4) Wood surfaces: Wood screws.
5) Concrete surfaces: Self drilling anchors or power driver studs.
Equipment

1. Temperature sensing wells:
a. Provide list with shop drawing(s) of well locations to mechanical contractor.

2. In general, locate temperature sensors, humidity sensors, thermostats and humidistats for room control immediately inside of door, above light switch, or where shown. Comply with applicable ADA regulations.

3. Mount local control panels at convenient locations adjacent to equipment served. a. Mount all relays, transformers, controllers, pressure switches, etc., internal to the temperature control panels

4. Mounting of field microprocessors (ASC's) directly on air handling units shall not be allowed.

TRAINING

Provide a minimum of 16 hours of instructions to Owner's personnel in the operation and maintenance of the control system. Provide training after the system has been installed and checked out.

WARRANTY

At completion of final test of installation and acceptance by Owner, provide any service incidental to proper performance for a period of one year.

Equipment shall be warranted for one year (including defects in workmanship and material) under normal use and service. During warranty period supplier shall also replace or repair, free of charge, any equipment proven to be defective in workmanship or material.

Certain electronic devices not manufactured by the FMS supplier, such as computers, printers, and CRT's display, shall carry the original manufacturer's warranty. Pass any registration and warranty
documents and warranty rights to the Owner.

SEQUENCES OF OPERATIONS

VAV boxes with Zone Reheats: Existing

Supply fan start/stop: The fan shall run on call for heat. The electronic actuators shall modulate to maintain space temp. The airflow shall be reset to a heating min during heating and modulate to a cfm max during cooling

Shutdown:
When the unit is shutdown by either a stop command or system safety the unit will be set as follows:
Supply fan will be off
damper will close

VAV / ZONE REHEATS:

Fans Start/Stop Binary Output
Discharge Air Temperature Analog Input
Space Temps Analog Input
Space Setpoint Analog Input
Hot water valve Analog Input
Cfm Analog Input
Damper Analog Output

SECTION 23 90 93 – SEQUENCE OF OPERATIONS FOR HVAC DDC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes control sequences for DDC for HVAC systems, subsystems, and equipment.

B. Related Requirements:

1. Section 23 90 20 "Temperature Controls" for control equipment.

1.3 DEFINITIONS

A. Analog Output: Proportional output signal (zero- to 10-V dc, 4 to 20 mA).

B. Binary Output: On/off output signal or contact closure.

C. DDC: Direct digital control.

D. Digital Output: Data output that must be interpreted digitally.

1.4 ACTION SUBMITTALS

A. Product Data:

1. An instrumentation list for each controlled system. Label each element of the controlled system in table format. Show, in the table element name, type of device, manufacturer, model number, and control device product data sheet number.
2. A complete description of the operation of the control system, including sequences of operation. Include and reference a schematic diagram of the controlled system.

B. Shop Drawings:

1. Riser diagrams showing control network layout, communication protocol, and wire types.
2. Schematic diagram of each controlled system. Include all control points labeled with point names shown or listed. Show the location of control elements in the system.
3. Wiring diagram for each controlled system. Show all control elements labels. Where a control element is the same as that shown on the control system schematic, label with the same name. Label all terminals.

4. Remaining articles below are examples of operation sequences, which are presented in the following order: central plant equipment, distribution systems and subsystems, terminal heating-and-cooling units, and ventilation. The sequences are written in the form of performance requirements, without specifying the devices needed to accomplish the performance. Revise the operation sequences and add others if necessary to suit Project.

C. CENTRAL PLANT

CHILLERS NO. 1, 2 and 3: Provide individual points for each chiller (Total of 3)

A. On a call for looking from any building (as determined by the Campus FMCS), a chiller shall be enabled.
B. On a call for chiller operation, a distribution chilled water pump (2 of 3) shall start and proof of flow thru chiller shall occur thru chiller differential pressure switch.
C. Distribution chilled water pumps shall be programmed thru a 2 lead/ 1 lag sequence of operation. Distribution chilled water pumps shall be alternated on a weekly basis (adjustable). In the event that the lead pump fails to operate, when commanded by the FMCS, as determined by pump "status", then an alarm will be sent to the FMCS and a LAG chilled water distribution pump will operate in lieu of the lead pump.
D. Also, on a call for chiller operation, the respective condenser water pump shall start and proof of flow thru chiller shall occur thru chiller condenser water flow switch.
E. After proof of flow in chilled water and condenser water systems, the chiller shall be enabled in accordance with chiller manufacturers recommendations.
F. Chilled water supply temperature shall be reset thru chiller controls and interface panel by the temperature controls contractor. Reset Temperature shall be initiated by the F.M.C.S. The temperature controls contractor shall coordinate interface requirements of new and existing chiller with chiller manufacturers.
G. A chiller 2 lead/ 1 lag sequence shall be programmed to alternate between chiller(s). Chillers shall alternate on a weekly basis (adjustable).
H. Chilled water flow meters and temperature sensors associated with the Central Plant and each individual building shall be used to provide instanteous and cumulative BTUH (and tonnage) valves for use with the campus chiller lead/lag and chiller optimization programs and controls. Charts shall be integrated into the existing control systems. Provide graphics to monitor Central Plant chilled water flows (one per chiller and total), temperature, and tonnage production. A chart shall also be integrated into graphics to monitor all buildings water flows (one per building and total), temperatures, and tonnage requirements.
I. The chiller lead/lag and sequencing programming shall be coordinated with chiller control panel reaction requirements. For chillers to operate properly during chiller sequencing, proper start/stop timing and flow stabilization shall occur in accordance within chiller manufacturer's recommendations. Programming by T.C.C. shall be incorporated to meet chiller manufactures recommendation. Provide on site coordination with chiller manufacturer's start-up representative to properly execute sequencing operation per manufacturer's recommendations.

COOLING TOWERS NO. 1, 2 and 3: Provide individual points for each cooling tower (Total of 3)

A. Condenser water pump shall start on a call for chiller operation.
B. Condenser system shall start in the full open-bypass position. As the cooling tower basin leaving water temperature rises above set point, the bypass valve shall close and allow flow thru the tower.
C. Basin leaving water temperature shall be reset based on outside air wet bulb temperature. Provide minimum temperature lock out to operate chiller based on chiller manufacturer's low condenser water temperature limit.
D. As basin leaving water temperature rises above set point, the cooling tower fan shall be energized and accelerated to minimum position. As the basin leaving water temperature continues to rise, the fan speed shall increase to maintain set approach temperature above outside air wet bulb temperature (2 degrees F offset-adjustable).
E. The cooling tower fan VFD shall be programmed to eliminate all resonance frequencies which set-up unwanted harmonics or vibration. Each frequency shall be tested and bypassed if unacceptable operation is notice.
F. The two-way bypass valve shall modulate open to the basin when leaving condenser water temperature drops below low temperature limit. The bypass shall be open to the basin on start-up, then modulate open to the tower based on L.W.T. setpoint. The valve shall be normally closed to the basin.
G. The FMCS shall monitor temperatures and incorporate signals into the control sequence of operation.
H. The vibration switch shall be hard wired to the V.F.D. and monitored to stop the cooling tower fan upon excessive vibration.
I. The basis heater shall be energized to maintain minimum basin temperature based on chiller manufacturer's recommendations.
J. For freeze protection, when outdoor dry bulb temperature reaches 34 degrees F, (adjustable) the condenser pump shall start and the bypass valve shall be open to the basin. The basin heaters shall be energized. The freeze protection sequence shall continue until O.A. temperature rises above 36 degrees F (adjustable). The bypass valve should modulate open to the tower as required to maintain condenser water temperature below high limit setpoint (85 degrees F adjustable). Freeze protection program shall be incorporated for cooling tower no. 3.
K. Chiller 2 shall be programmed to operate with cooling tower 3. Chiller 3 shall be programmed to operate with cooling tower 2.

Central Plant Points List:

BI	Chiller Alarm (typical of 3)
BO	Chiller Enable (typical of 3)
BI	Chiller Status (typical of 3)
BO	Chiller isolation valve (typical of 3)
BO	Chilled Water Pump Start/Stop (typical of 3)
BI	Chilled Water Pump Status (typical of 3) (
BI	Chilled Water Pump Alarm (typical of 3)
AI	Chiller Chilled Water Entering Water Temperature (typical of 3)
AI	Chiller Chilled Water Leaving Water Temperature (typical of 3)
AO	Chiller Chilled Water Leaving Water Temperature Reset (typical of 3)
AI	Chiller Condenser Water Entering Water Temperature (typical of 3)
AI	Chiller Condenser Water Leaving Water Temperature (typical of 3)
BI	Chiller Chilled Water Differential Pressure Sensor
BI	Chiller Condenser Water Flow/Differential Pressure Sensor
BO	Cooling Tower Fan Start/Stop (typical of 3)

BI	Cooling Tower Fan Status (typical of 3)
BI	Cooling Tower Fan Alarm (typical of 3)
AO	Fan VFD Speed (Minimum speed 30% or as directed by manufacturer) (typical of 3)
AO	Cooling Tower Bypass Valve (Two way modulating) (typical of 3)
BO	Condenser Water Pump Start/Stop (typical of 3)
BI	Condenser Water Pump Status (typical of 3)
AI	Leaving Condenser Water Temperature at Chiller (typical of 3)
AI	Entering Condenser Water Temperature at Chiller (typical of 3)
BI	Cooling Tower Vibration Switch (typical of 3)
AI	Cooling Tower Basin Leaving Water Temperature (typical of 3)
AI	Cooling Tower Basin Entering Water Temperature (typical of 3)
AO	Cooling Tower Basin Leaving Water Temperature-Reset (typical of 3)
BO	Cooling Tower Basin Heaters (typical of 3)
DI	Cooling Tower Fan Alarm (typical of 3)

D. MULDER HALL

CHILLED WATER SYSTEM

A. COOLING MODE OFF: When the building is not in the cooling mode (as determined by the Campus FMCS), the building chilled water pumps shall be off. The Building Chilled Water two-way isolation control valves shall be closed.
B. COOLING MODE ON: When the building is in the cooling mode (as determined by the Campus FMCS), the Building chilled water two-way isolation control valves shall open and the chilled water lead pump shall be started. The building control valves shall be modulated as required to maintain building CWS temperature set point (45º F adjustable).
C. CHILLED WATER PUMPS: The FMCS system shall select the lead chilled water pump (alternate each week). The status of the pump shall be monitored through a C.S.R. switch. In the event that the lead pump fails to operate when commanded by the FMCS, as determined by pump "status", then an alarm will be sent to the Campus front end located in the Central Plant and the lag chilled water pump will operate in lieu of the lead chiller water pump. The lead pump shall be able to be selected by the operator at the operator workstation and automatically alternated by the FMCS.
D. The FMCS shall use chilled water flow (varying central plant flow in the MPAC building) and central plant CWS vs. CWR temperature differential (as monitored in the MPAC building) to compute the instantaneous chilled water tonnage requirement of the building and monitor this value at the central plant work station.
E. In addition to the MPAC building the Temperature Control Contractor (TCC) shall incorporate a chilled water demand screen on the Central Plant work station that indicates CWS/R temperatures for each building on campus with the total instantaneous tonnage requirement for each building. The flow and temperature monitoring for this screen shall be the central plant building tonnage produced vs. tonnage demanded from the following: MPAC, H.&P.E., Bolton Library, Student Center (West, Center, & East), Abrams Hall, Oakland Hall, Coughlin Hall, Chambers Hall, & Science Building. The control points for all buildings (except MPAC) are existing points that shall be incorporated into this summary screen for the Central Plant Chilled Water Demand requirements.

Chilled Water System Points List:

BO	Pump Start/Stop (Typical for 2, Lead/Lag)
BI	Pump Status (on/off) (Typical for 2)
BO	Pump Lead/Lag
AO	Chilled Water 2-Way Valves (total of 2)
AI	MPAC Building CWS Temperature
AI	MPAC Building CWR Temperature
AI	Central Plant CWS Temperature
AI	Central Plant CWR Temperature
AI	Central Plant CWR Flow (GPM) (monitored in the MPAC building)
AI	Instantaneous Tonnage (flow X temperature differential)

HOT WATER SYSTEM

A. HOT WATER SYSTEM: The hot water system will be enabled through the FMCS (as determined by the FMCS). The FMCS will monitor building hot water supply and return temperatures. The FMCS shall enable the Hot Water System when the outside air temperature drops below set point (55 degrees F – adjustable) or by building high humidity levels sensed by any and or all space humidity sensors. The lead hot water pump shall be started by the FMCS and the building HWS temperature shall be monitored. The Boiler shall be enabled to maintain building HWS temperature.
B. BOILER: The Building's hot water supply temperature shall be monitored and the boiler 3-way hot water control valve shall modulate to maintain building hot water supply temperature at set point (180 degrees F adjustable). Building HWS temperature shall be reset based on O.A. temperature (180 degrees F HWS temperature at 35 degrees F - O.A. temperature and 140 degrees F HWS temperature at 55 degrees F - O.A. temperature). Coordinate final programming of reset range with engineer/owner. The hot water pump shall maintain constant flow of building hot water supply through the boiler when hot water system is enabled.
C. HOT WATER PUMPS: The FMCS system shall select the lead hot water pump (alternate each week). The operation of the building's hot water pump(s) is for the lead pump to run continuously. The lead pump shall be able to be selected by the operator at the operator workstation and automatically alternated by the FMCS. The status of the pump shall be monitored through a C.S.R. switch. If the lead pump fails, the lag pump will be started after a 60-second delay and an alarm will be generated at the operator workstation. If the lag pump also fails an alarm will be generated at the operator workstation, and the hot water system will be disabled. The lead pump shall be able to be selected by the operator at the operator workstation and automatically alternated by the FMCS.
D. The heating system shall be programmed to be initiated by the outside air temperature for freeze protection. When the outside air temperature drops below freeze protection set point (40 degrees – adjustable). The Hot Water System shall be enabled and Unit Heaters, F.C.U.'s and V.A.V. Boxes (with hot water heating) shall be initiated for building Freeze protection.
E. The boiler shall have an Emergency shut off switch located at the exit of the Boiler room in accordance with ASME CSD-1 requirements. The remote Emergency shut-off switch shall be covered with a clear plastic cover to prevent accidental activation of the switch. Activation of the switch shall sent an alarm to the EMS central computer located in the Utilities Plant Builsing.

Hot Water Heating System Points List:

BO	Boiler Enable
BI	Boiler Status (on/off)
BO	HW Pump Start/Stop (Typical for 2)
BI	HW Pump Status (Typical for 2)
BO	HW Pump (Lead/Lag)
AI	BLDG HWR Temperature
AI	BLDG HWS Temperature
AI	Boiler HWS Temperature
AI	Boiler HWR Temperature
AO	HWS Temperature 3-Way Control Valve
AI	O.A. Temperature (Dry Bulb)
AI	O.A. Temperature (Wet Bulb)
BI	Boiler Emergency shut off switch

VARIABLE AIR VOLUME AIR HANDLING UNITS (1-1, 1-2, 1-3, 2-1, 2-2, 3-1, 3-2)

A. STARTUP: VAV AHU shall be started and stopped by the FMCS through the local ASC located adjacent to the respective air handling unit through the HOA switch mounted in cover of the variable frequency drive. One (1) ASC will be required per AHU. Spare control points in the ASC shall be for future expansion. A current sensing relay shall indicate air handling unit fan status back to local ASC and place automatic controls in operation.

B. SAFETIES: High limit thermostat in return air located at the AHU shall stop the AHU fan upon detection of temperature above its set point. A low limit thermostat shall stop the AHU fan upon detection of temperature below its set point. A manual reset static pressure high limit sensor in the discharge duct downstream of the AHU fan shall stop the AHU fan upon detection of duct static pressure above its set point (2.5" – adjustable). Duct mounted smoke detector(s) shall stop the AHU fan and associated ERV upon detection of products of combustion. Emergency drain pan float switch shall stop the unit fan on a rise in water level in the emergency drain pan above float switch set point.

   On AHU 2-2, interlock fire/smoke dampers (FSD) with AHU and fire alarm system. AHU shall shut off and FSD shall close on actuation of smoke detector(s) (duct or space mounted detectors). Coordinate with fire alarm system.

C. TEMPERATURE CONTROL: A temperature sensor in the duct downstream of the AHU discharge shall transmit temperature changes to the local ASC. The ASC shall modulate the chilled water valve(s) to maintain discharge air temperature set point (55 degrees F – adjustable – see AHU submittals for required L.A.T. to meet scheduled capacities). One coil sensor shall be used to monitor LAT of each cooling coil. One sensor will be provided for each cooling coil. AHU's with staggered or multiple coils shall be required to have multiple LAT sensors, in addition to the discharge air temperature sensor. Where multiple coils and valves are used, the coil L.A.T. shall be controlled by the coil sensor and the duct sensor shall allow reset of the coil L.A.T. to compensate for the heat gain through the fan section.

D. STATIC PRESSURE CONTROL: Differential pressure transmitter(s) shall sense duct differential pressure(s) of the air distribution system at locations near the end of the duct, and shall transmit pressure changes back to the AHU ASC controller. The ASC controller shall modulate the variable frequency drive to maintain duct static pressure set point (3/4" at the end of the duct - adjustable). ASC shall provide a 4-20mA signal to the variable frequency drive to modulate the fan speed. The lower reading of the two static

pressure sensors shall be used to control the VFD. All units shall have two duct static pressure sensors.

E. The respective ERV shall be enabled separately from the respective AHU(s).
F. Space humidity shall be monitored by the ASC and initiate start-up of the chilled water system and AHU when the space humidity rises above set point (75% RH – adjustable).

VAV Air Handling Units Points List (1-1, 1-2, 1-3, 2-1, 2-2, 3-1, 3-2):

BO	Fan/ VFD Start/Stop
BI	FAN/VFD Status
AO	Variable Frequency Drive Speed Control
AO	CHW Valve (3-Way) (one per coil)
AI	Entering Air Temperature (AHU)
AI	Leaving Air Temperature (coil) (one per coil)
AI	Leaving Air Temperature (AHU) (discharge of AHU)
AI	Duct Static Pressure (2 per unit)
DI	Duct Static High Limit (at unit discharge)
AI	Entering Air Temperature High Limit
DI	Low Limit Temperature
BI	Emergency Drain Pan Float Switch
BI	Smoke Detector (AHU/ERV Shut down)
AI	Space Humidity (monitoring)
AI	Space Humidity Set point (monitoring to initiate cooling mode and / or heating mode)

PARALLEL FAN POWERED VAV BOXES (Hot Water Heating)

A. Cooling Mode: The VAV box cooling damper shall modulate open as the space temperature rises above the space temperature cooling set point and close as space temperature drops below the space temperature cooling set point.
B. Heating Mode: The VAV box cooling damper shall be at minimum position (0 CFM – adjustable). The parallel fan shall start as the space temperature drops below the space temperature heating set point. If the space temperature continues to drop below the heating set point, the hot water heating coil control valve shall modulate open to the coil as required to maintain the heating set point.
C. Fan powered VAV boxes shall close the cooling damper 100% and open 3-way control valve on the heating coil to the bypass when it's respective AHU is shutdown.
D. Each VAV box shall have an independent setback control schedule. Each box shall be programmed independently as directed by the owner. Programming shall be by the TCC. Each box shall have an independent setback temperature set point. Each Space sensor shall have a programmed high and low space temperature setpoint range programmed by the TCC. The final range shall be as directed by the owner.
E. Freeze protection: During the unoccupied mode, and when initiated by the outdoor air sensor, each box shall be enabled (with the respective AHU off) to allow for building freeze protection. Each box fan shall turn on and the 3-way hot water heating control valve shall modulate open to the heating coil to maintain a space temperature set point (65 degrees F – adjustable).

Parallel Fan Powered VAV Boxes (Hot Water Heating) Points List:

BO	VAV Box Start/Stop
AI	Cooling CFM

AO Cooling Damper Control
AI Space Temperature
AI Space Temperature Set point
BO Fan Start/Stop
AO Hot Water Coil Control Valve (3-Way)

VAV BOXES (Cooling Only)

A. Cooling Mode: The VAV box cooling damper shall modulate open as the space temperature rises above the space temperature set point and close as space temperature drops below space temperature set point.
B. VAV boxes shall close damper 100% when it's respective AHU is shutdown.
C. Provide programming to restart respective air handing unit, pumps (CW and/or HW), etc. and open box when the VAV box override button on space temperature sensor is pushed. Each VAV box override shall be programmed independently for active or inactive status per direction by owner. Active or inactive status shall be selected by the owner on an individual box basis.
D. Each VAV box shall have an independent setback control schedule. Each box shall be programmed independently as directed by the owner. Programming shall be by the TCC. Each box shall have an independent setback temperature set point. Each Space sensor shall have a programmed high and low space temperature setpoint range programmed by the TCC. The final range shall be as directed by the owner.

VAV Boxes (cooling only) Points List:

BO Box Start/Stop
AI Cooling CFM
AO Cooling Damper Control
AI Space Temperature
AI Space Temperature Set point
BI Space Temperature Override Button

SINGLE ZONE AIR HANDLING UNIT (1-4, 1-5, 1-6)

A. START/STOP CONTROL: The AHU shall be started and stopped by the FMCS through the local ASC located adjacent to the respective air handling unit through the HOA switch mounted in the cover of the starter/VFD cover. One (1) ASC shall be required per AHU. Spare control points in the ASC shall be used for future expansion. Current sensing relay shall indicate AHU run status and set automatic temperature controls into operation.
B. SAFETIES: A high limit thermostat in the return air shall stop the AHU upon detection of temperature above its set point. A low limit thermostat shall stop the AHU upon detection of temperature below its set point. Duct mounted smoke detector(s) shall stop the AHU, associated ERV (where required) and dehumidifier (AHU 1-4) upon detection of products of combustion. Emergency drain pan float switch shall stop the AHU on a rise in water level in the emergency drain pan.
D. TEMPERATURE CONTROL: Cooling Mode: A sensor in the discharge duct on the AHU shall transmit temperature changes to the ASC panel, which shall modulate the chilled water control valve(s) to maintain a discharge air temperature set point (55 degrees F –adjustable – see AHU submittals for required L.A.T. to meet scheduled capacities). The ASC panel shall increase the AHU fan motor speed when the space temperature rises above the space

temperature cooling set point (73 degrees – adjustable) and reduce fan speed when the space temperature drops below the space temperature cooling set point. A space temperature sensor in the space shall transmit temperature changes to the ASC panel, which shall control the AHU fan speed. One cooling coil LAT sensor shall be used to monitor LAT of each cooling coil. Where multiple coils and control valves are used, the coil L.A.T. shall be controlled by the coil sensor and the duct sensor shall allow reset of the coil L.A.T. to compensate for the heat gain through the fan section. The heating coil control valve(s) shall be closed to the heating coil during the cooling mode.

E. Heating Mode: When the space temperature drops below the space temperature heating set point (68 degrees F – adjustable) the ASC panel shall increase the AHU fan speed to a fixed CFM set point (75% of maximum – adjustable) and the ASC panel shall modulate the hot water control valve(s) as required to maintain the space temperature heating set point. The chilled water control valve(s) shall be closed to the cooling coil(s) during the heating mode. Separate sensors shall be provided for each cooling or heating coil(s). AHU's with staggered or multiple coils shall be required to have multiple LAT sensors, in addition to the discharge air temperature sensor.
E. SHUTDOWN CONTROL: Stopping the AHU supply fan shall de-energize the control system. The chilled water control valve(s) and hot water control valve(s) shall close to their respective coils.
F. The ERV shall be enabled separately from the respective AHU.
G. Space humidity shall be monitored by the ASC and initiate start-up of the chilled water system, hot water system, and AHU when the space humidity rises above space humidity set point (75% RH – adjustable). When space humidity levels rise above the space humidity set point, the AHU fan speed shall increase to a fixed CFM set point (75% of maximum – adjustable), the chilled water control valve(s) shall modulate open to the coil(s) to maintain a set cooling coil LAT (53 degrees F – adjustable), and the heating coil control valve(s) shall modulate open to the heating coil(s) as required to maintain space temperature set point. When the space humidity level drops 3% below the space humidity set point, the controls shall return to the cooling or heating mode, or unoccupied mode.
H. Provide programming to start respective AHU, pumps (CW and/or HW), etc. when the override button on the space temperature sensor is pushed. Each AHU override shall be programmed independently for active or inactive status as directed by the owner. Active or inactive status shall be selected by the owner on an individual AHU basis.
I. Each AHU shall have an independent setback control schedule. Each AHU shall be programmed independently as directed by the owner. Programming shall be by the TCC. Each AHU shall have an independent setback temperature set point and humidity set point. Each Space sensor shall have a programmed high and low space temperature setpoint range programmed by the TCC. The final range shall be as directed by the owner.
J. Freeze protection: During the unoccupied mode, and when initiated by the outdoor air sensor, each AHU shall be enabled to allow for building freeze protection. Each AHU shall be in the heating mode to maintain a space temperature set point (55 degrees F – adjustable).

Single Zone Air Handling Units Points List (1-4, 1-5, 1-6):

BO Fan/VFD Start/Stop
BI Fan/VFD Status
AO Variable Frequency Drive Speed Control
AO CHW Control Valve (3-Way) (one per coil)

AO HW Control Valve (3-Way) (one per coil)
AI Space Temperature
AI Space Temperature Set point
BI Space Temperature Override Button
AI Entering Air Temperature (AHU)
AI Leaving Air Temperature (coil) (one per coil)
AI Leaving Air Temperature (AHU) (discharge of AHU)
BI Entering Air Temperature High Limit
BI Low Temperature Limit
BI Emergency Drain Pan Float Switch
BI Smoke Detector (AHU/ERV Shutdown)
AI Space Humidity (monitoring)
AI Space Humidity Set point (monitoring to initiate de-humidification mode)

FAN COIL UNITS:

A. START/STOP CONTROL: The FCU shall be started and stopped by the local DDC panel through the HOA switch in the starter cover. A Current sensing relay shall indicate FCU run status and set automatic temperature controls into operation.
B. SAFETIES: A high limit thermostat shall stop the FCU upon detection of temperature above its set point. A low limit thermostat shall stop the unit upon detection of temperature below its set point. Duct mounted smoke detector(s) shall stop the FCU upon detection of products of combustion.
D. ZONE TEMPERATURE: Cooling Mode: A space temperature sensor shall transmit temperature changes to the ASC panel, which shall control the chilled water two-way control valve to maintain space temperature set point (75 degrees F -adjustable). The ASC panel shall open the chilled water two-way control valve to 100% open to the cooling coil when space temperature rises above the space temperature cooling set point. The two-way valve shall close 100% to the cooling coil when the space temperature drops below the space temperature cooling set point. The hot water heating control valve shall be closed to the heating coil during the cooling mode.
Heating Mode: When the space temperature drops below the space temperature heating set point (68 degrees F – adjustable) the ASC panel shall modulate the hot water control valve as required to maintain space temperature heating set point. The chilled water valve shall be closed to the cooling coil.
Each Space sensor shall have a programmed high and low space temperature setpoint range programmed by the TCC. The final range shall be as directed by the owner.

K. SHUTDOWN CONTROL: Stopping the unit supply fan shall de-energize the control system. The chilled water valve and hot water valve shall close to the respective coils.
L. Freeze protection: During the unoccupied mode, and when initiated by the outdoor air sensor, each FCU shall be enabled to allow for building freeze protection. Each FCU shall be in the heating mode to maintain a space temperature set point (55 degrees F – adjustable).

Fan Coil Units Points List (1-1, 3-1, 3-2):

BO Fan Start/Stop
BI Fan Status
AO CHW Control Valve (2-Way) (snap action control)

AO HW Control Valve (3-Way) (modulating control)
AI Space Temperature
AI Space Temperature Set point
BI Space Temperature Override Button
BI Entering Air High Temperature Limit
BI Low Temperature Limit
BI Smoke Detector (FCU Shutdown)

ENERGY RECOVERY VENTILATORS:

A. START/STOP CONTROL: The ERV shall be start and stop by the ASC at the ERV through the HOA switch mounted in the cover of the starter/control panel.
B. SAFETIES: High limit thermostat(s) shall stop the ERV upon detection of temperature above its set point (2 per unit). Energy recovery unit shall operate under its own controls. ERV shall be shut down when associated AHU is shut down due to the respective AHU smoke detector or due to AHU start/stop time of day schedule. Smoke detectors shall shutdown ERV upon detection of particles of combustion (either by the E.R.V. smoke detector or respective AHU smoke detector).
C. Energy Recovery unit shall be started and stopped independently of AHU's. ERV's shall have independent programming time of day schedules.
D. The FMCS shall monitor the status of ERV fan motor(s) through current sensing relays.
E. Inlet and outlet temperatures shall be monitored by the FMCS.
F. E.R.V. shall be on during scheduled occupied times. Provide programming to allow E.R.V. to be enabled if approved override push buttons are pressed (push button associated with respective AHU).
G. If an AHU is initiated due to space humidity (high humidity level), then the respective ERV shall be turned off until the humidity is below set point.
H. Motor operated dampers on the intake and exhaust sides of the ERV shall close when the ERV is off and shall be open when the ERV is on.

Energy Recovery Ventilators Points List:

BO Fan(s) Start/Stop
BI Fan(s) Status
AI Exhaust EAT
AI Exhaust LAT
AI O.A. Supply EAT
AI O.A. Supply LAT
BI Smoke Detector(s)
BI High limit temperature limit (2 each unit)
BO Motor Operated Damper(s) (open/close)

HOT WATER UNIT HEATER

A. Unit heater(s) shall be start and stop based on space temperature heating set point. When the space temperature drops below the space temperature heating set point (60 degrees F – adjustable) the ASC panel shall initiate the start up of the heating system, turn on the unit heater fan, and modulate the hot water control valve as required to maintain space temperature heating set

point (65 degrees F – adjustable). Hot water control valve (2-way) shall modulate open to the heating coil as required to maintain space temperature heating set point. The FMCS shall monitor the status of the unit heater fan motor through current sensing relays. Stopping the fan shall de-energize the unit heater control system.

Hot Water Unit Heater Points List:

BO	Fan Start/Stop
BI	Fan Status
AI	Space Temperature
AI	Space Temperature Set point
AO	Hot Water Control Valve (2-Way)

SPLIT SYSTEM DX EQUIPMENT (Piano Storage, Archive Storage, & Black Box Electrical Room)

A. Split System DX A/C units shall be started and stopped based on a programmed schedule. The FMCS shall monitor space temperature and humidity. Override push button shall allow system to be operated outside of programmed times. The split system shall be controlled by a thermostat provided by AHU manufacturer and shall be wired by TCC. High limit thermostat in return air shall stop the respective unit upon detection of temperature above its set point. A low limit thermostat shall stop the AHU upon detection of temperature below its set point. Duct mounted smoke detector(s) shall stop the AHU upon detection of products of combustion. Emergency drain pan float switch (where required) shall stop the unit on a rise in water level in the emergency drain pan. Each Space sensor shall have a programmed high and low space temperature and humidity setpoint range programmed by the TCC. The final range shall be as directed by the owner. Equipment may be turned off by the FMCS when in the acceptable temperature and humidity range.

Split System DX Equipment Points List:

BO	Unit Start/Stop
BI	Unit Status
AI	Space Temperature (Monitoring)
BI	Space Temperature Override Button
AI	Space Humidity (monitoring)
BI	Smoke Detector (all units)
BI	Emergency Drain Pan Float Switch
BI	Return air temperature high limit
BI	Low Temp Limit

EXHAUST FAN (Kiln Room) (EF 1-5)

A. Fan shall be started and stopped based on programmed schedule.
B. Fan shall be controlled by the local wall switch in Kiln room. FMCS switch shall be in series to limit run time of exhaust fan outside of time of day schedule.

Exhaust Fan Points List: (Kiln Room) (EF 1-5)

BO	Fan Start/Stop
BI	Fan Status

BOILER ROOM SUPPLY FAN (SF 1-8)

A. Fan shall start and stop base on space temperature set point. The fan shall be on when the space temperature rises above space temperature set point (80 degrees F – adjustable). The fan shall be off when the space temperature drops below set point.

Boiler Room Supply Fan Points List (SF 1-8):

BO	Fan Start/Stop
BI	Fan Status
AI	Boiler Room Space Temperature
AI	Boiler Room Space Temperature (Set point)

EQUIPMENT ROOM EXHAUST FANS (Tele-Com, Elevator Equipment and Electrical)

A. Fan shall be started and stopped based on space temperature set point. The fan shall be on when room temperature rises above space temperature set point (80º degrees F - adjustable). The fan shall be off when the room temperature is below the space temperature set point.

Equipment Room Exhaust Fans Points List (Tele-Com, Elevator Equipment and Electrical):

BO	Fan Start/Stop
BI	Fan Status
AI	Space Temperature
AI	Space Temperature Set point

ELEVATOR PIT:

A. Provide a float switch in the pit to alarm if the pit fills with water (liquid).
B. Interlock elevator sump pump with manual wall switch at locations shown on drawings.

Elevator Pit Points List:

BI	Water Level Alarm
BI	Status

DE-HUMIDIFIER UNITS:

A. Units shall be started and stopped by the FMCS.
B. Space humidity shall be monitored to start and stop the unit.

    a. unit shall be wired in the field to accept start/stop of the unit thru the FMCS humidity sensor in accordance with manufacturer's recommendations. Each Space sensor shall have a programmed high and low

space humidity setpoint range programmed by the TCC. The final range shall be as directed by the owner. The equipment may be turned off when space humidity is within the acceptable humidity range

C. "Portage" De-Humidifiers shall not be controlled by the FMCS. They shall operate independently under the control of independent unit mounted humidistats.

De-Humidifier Points List:

BO De-Humidifier Start/Stop
AI Space Humidity (monitoring)

DOMESTIC WATER BOOSTER SYSTEM:

A. The FMCS shall coordinate with equipment supplier and provide controls interface panel to control pump system and receive pump set points and operating parameters and associated feed back. The FMCS shall start/stop the system and monitor system performance. System pressure set points shall be reset with the FMCS from the front end located at the Campus Central Plant Building.

Domestic Water Booster System Points List:

BO Pump(s) Start/Stop
BI Pump(s) Status
AI Pump Pressure (Building side of booster system)
AO Pump Pressure Set point
AI Pump Pressure (suction side of booster system)

LIGHTING CONTROLS SYSTEM:

A. The FMCS shall control on/off control of lighting system. Verify current control extent and provide same control extent.

Lighting Controls System Points List:

BO Lights On/Off
BI Light Status

E. ABRAMS HALL

CHILLED WATER SYSTEM

A. COOLING MODE OFF: When the building is not in the cooling mode (as determined by the Campus FMCS), the building chilled water pumps shall be off.
B. COOLING MODE ON: When the building is in the cooling mode (as determined by the Campus FMCS), the building chilled water water pump shall be started.
C. CHILLED WATER PUMP: The FMCS system shall start the chilled water pump. The status of the pump shall be monitored through a C.S.R. switch. In the event that the pump fails to operate when commanded by the FMCS,

as determined by pump "status", then an alarm will be sent to the Campus front end located in the Central Plant

Chilled Water System Points List:

BO	Pump Start/Stop
BI	Pump Status (on/off)
BI	Pump Alarm
AI	Building CWS Temperature
AI	Building CWR Temperature

HOT WATER SYSTEM

A. The boilers shall be reintegrated into the system via their BacNET IP connections and all points shall be provided at FMCS workstation.
B. HOT WATER SYSTEM: The hot water system will be enabled through the FMCS (as determined by the FMCS). When the boiler is energized through the FMCS, the boiler control panel shall start the boiler circulating pump and the building hot water pump. The FMCS will monitor building hot water supply and return temperatures. The FMCS shall enable the Hot Water System when reheat coils call for need or by building high humidity levels sensed by any and or all space humidity sensors. The lead building hot water pump shall be started by the FMCS and the building HWS temperature shall be monitored. The Boiler shall be enabled to maintain building HWS temperature.
C. BOILER: The Building's hot water supply temperature shall be monitored and the boiler 3-way hot water control valve shall modulate to maintain building hot water supply temperature at set point (180 degrees F adjustable). Building HWS temperature shall be reset based on O.A. temperature (180 degrees F HWS temperature at 35 degrees F - O.A. temperature and 140 degrees F HWS temperature at 55 degrees F - O.A. temperature). Coordinate final programming of reset range with engineer/owner.
D. HOT WATER PUMPS: The FMCS system shall select the lead hot water pump (alternate each week). The operation of the building's hot water pump(s) is for the lead pump to run continuously. The lead pump shall be able to be selected by the operator at the operator workstation and automatically alternated by the FMCS. The status of the pump shall be monitored through a C.S.R. switch. If the lead pump fails, the lag pump will be started after a 60-second delay and an alarm will be generated at the operator workstation. If the lag pump also fails an alarm will be generated at the operator workstation, and the hot water system will be disabled. The lead pump shall be able to be selected by the operator at the operator workstation and automatically alternated by the FMCS.
E. The heating system shall be programmed to be initiated by the outside air temperature for freeze protection. When the outside air temperature drops below freeze protection set point (40 degrees – adjustable). The Hot Water System shall be enabled and Unit Heaters, F.C.U.'s and V.A.V. Boxes (with hot water heating) shall be initiated for building Freeze protection.

Hot Water Heating System Points List:

BO	Boiler Enable
BI	Boiler Status (on/off)
BI	Boiler Alarm
BO	BLDG HW Pump Start/Stop
BI	BLDG HW Pump Status

BI	BLDG HW Pump Alarm
AI	BLDG HWR Temperature
AI	BLDG HWS Temperature
AI	Boiler HWS Temperature
AI	Boiler HWR Temperature
AO	Boiler HWS Temperature 3-Way Control Valve
AI	O.A. Temperature (Dry Bulb)
AI	O.A. Temperature (Wet Bulb)

MULTI-ZONE VARIABLE AIR VOLUME (MZVAV) – AIR HANDLING UNIT

A. STARTUP: MZVAV shall be started and stopped by the BMS through the local Control Panel through the HOA switch mounted in the variable frequency drive. The VFD shall be located within the AHU equipment room. One (1) Control Panel Application Specific Controllers (ASC) will be required per AHU. Spare control points in the ASC shall be for future expansion. A current sensing relay shall indicate air handling unit fan status back to local ASC and place automatic controls in operation.

B. SAFETIES: High limit thermostat in return air located at the RTU shall stop the RTU fan upon detection of temperature above its set point. A low limit thermostat in the mixed return air stream shall stop the AHU fan upon detection of temperature below its set point. A manual reset static pressure high limit sensor in the discharge duct downstream of the AHU fan shall stop the AHU fan upon detection of duct static pressure above its set point (2.5@ B adjustable). Duct mounted smoke detector(s) shall stop the AHU fan upon detection of products of combustion (one in R.A. per IMC and one in S. A. Per NFPA). Emergency drain pan float switch shall stop the unit fan on a rise in water level in the emergency drain pan above float switch set point. Interlock fire/smoke dampers (FSD) with respective AHU and fire alarm system. AHU shall shut off and FSD shall close on actuation of smoke detector(s) (supply duct, return air, or space mounted detectors via a signal from the Fire Alarm system). Coordinate with fire alarm system contractor. Stopping the Unit fan shall de-energize the control system. The chilled water control valve(s) shall close to their respective coils. An alarm shall be sent to the workstation upon activation of any or all safety devices.

C. TEMPERATURE CONTROL: A temperature sensor in the supply duct downstream of the RTU discharge shall transmit temperature changes to the local ASC.

1. Cooling Mode: The ASC shall modulate the chilled water control valve(s) (one per coil) to maintain discharge air temperature set point (52 degrees F adjustable see AHU submittals for required L.A.T. to meet scheduled capacities). One coil sensor shall be used to monitor LAT of each cooling coil. One sensor and one 3-way control valve shall be provided for each cooling coil. AHU's with staggered or multiple coils shall be required to have multiple LAT sensors and multiple 3-way control valves, in addition to the discharge air temperature sensor located downstream of the fan section. Where multiple coils and valves are used, the coil L.A.T. shall be controlled by the coil sensor and the duct sensor shall allow reset of the coil L.A.T. to compensate for the heat gain through the fan section. All control valves shall be closed to the cooling coil when the AHU is OFF.
2. Heating Mode: The ASC shall modulate the hot water control valve(s) (one per coil) to maintain discharge air temperature set point (90 degrees F adjustable) One coil sensor shall be used to monitor LAT of each cooling coil. One sensor and one 3-way control valve shall be provided for each cooling coil. When space temperature drops below the heating set point (68 degrees F - Adjustable), the hot water heat-

ing coil control 3-way valve shall modulate as required to maintain space temperature heating set point. The cooling coil control valve shall be closed to the cooling coil during the heating mode.

3. Pre-Heating Mode (if applicable): When outside air temperature is below (36 degrees F - Adjustable), the pre heating coil two way control valve shall modulate open to heat mixed return/outside air to unit set LAT. (52 Degrees – Adjustable) One coil sensor shall be used to monitor LAT of each pre-heating coil. One sensor and one 2-way control valve shall be provided for each pre-heating coil. AHU=s with staggered or multiple coils shall be required to have multiple LAT sensors and multiple 2-way control valves

D. Space humidity shall be monitored by the ASC and initiate start-up of the chilled water system, and AHU when the space humidity rises above set point (70% RH adjustable).

MZVAV Air Handling Units Point List:
(Each Unit shall have similar but independent control points)

BO Fan - Start/Stop
BI Fan - Status (On/Off)
AO Chilled Water Coil - Control Valve (3-Way) (on per cooling coil)
AI Entering Air Temperature (at AHU)
AI Leaving Air Temperature (Cooling coil) (one per cooling coil)
AI Leaving Air Temperature (AHU) (duct mounted on discharge side of AHU fan)
AO Leaving Air Temperature Reset Programming
BI Duct Static Pressure - High Limit (at unit discharge)
AI Duct Static Pressure (VFD control) (sensor at 2/3 downstream in duct system)
BI Entering Air Temperature - High Limit
BI Entering Air Temperature - Low Limit
BI Smoke Detector (AHU Shut down)(one in supply per NFPA and one in return per IMC)
AI Space Humidity (general space humidity monitoring)(1 required per unit)
AI Space Humidity Set point (monitoring to initiate cooling mode and / or heating mode)
BI Smoke Damper (AHU Shutdown where required)

MZVAV ZONE DAMPER Points Lists:

A. Cooling/Heating Mode: The VAV zone damper shall modulate open as the space temperature rises above the space temperature set point and close as space temperature drops below space temperature set point (72 degrees F - Adjustable).

B. VAV zone dampers shall close damper 100% when it's respective AHU is shutdown.

C. Provide programming to restart respective air handing unit, pumps, etc. and open damper when the VAV zone damper override button on space temperature sensor is pushed. Each VAV zone damper override shall be programmed independently for active or inactive status per direction by owner. Active or inactive status shall be selected by the owner on an individual box basis.

D. Each VAV zone damper shall have an independent setback control schedule. Each box shall be programmed independently as directed by the owner. Programming shall be by the TCC. Each box shall have an independent setback temperature set point. Each Space sensor shall have a programmed high and low space temperature set point range programmed by the TCC. The final range shall be as directed by the owner. When authorized and there is a call for cooling, the respective AHU shall start and be controlled to satisfy the setback cooling requirements of the space controlled by the individual VAV zone damper.

E. Damper position feedback shall be provided for each zone for AHU duct static pressure reset programming.

MZVAV Zone Damper Points List:

BO	Box Start/Stop
AI	CFM
AO	Damper Control
AI	Space Temperature

DUAL DUCT AIR HANDLING UNIT

A. AHU fan shall be started and stopped by the Facility Management Control System (FMCS) through the local EMS control panel located adjacent to the respective AHU, and through the local hand-off-auto switch located in the Variable Frequency Drives (VFD's).
B. A current Sensing Relay (CSR) shall indicate AHU fan(s) status back to the FMCS Control Panel and place controls in operation. An alarm shall be sent to the FMCS should a fan fail to start.
C. Cold Deck: Temperature sensor(s) in the cold deck(s) shall transmit temperature changes to the AHU Control Panel. The Control Panel shall modulate chilled water coil three (3)-way chilled water control valve to maintain cold deck temperature set points (49degrees F. - Adjustable).
D. Hot Deck: Temperature sensor in the hot deck shall transmit temperature changes to the AHU Control Panel. The Control Panel shall modulate hot water coil three (3)-way hot water control valve to maintain hot deck temperature set point (106 degrees F. - Adjustable). Hot deck temperature shall be reset based on outdoor air temperature.
E. The fan motor(s) shall be controlled by VFD(s). Differential pressure transmitter(s) shall sense cold and hot ductwork differential static pressure(s) of the air distribution ductwork, and shall transmit pressure changes back to the AHU Controller. The Controller shall modulate the VFD(s) to maintain duct static pressure set point. The lowest reading of the duct static pressure sensors shall be used to control the VFD(s). The fan VFD(s) shall be programmed to eliminate all resonance frequencies which set up unwanted harmonics and/or vibration. Each frequency shall be tested and bypassed if unacceptable operation is noticed.
F. High Temperature Limit: The high limit thermostat located in the return air of the AHU shall stop the fan(s) upon detection of a temperature above its set point.
G. Low Temperature Limit: The low limit thermostat located in the return air of the AHU shall stop the fan(s) upon detection of a temperature below its set point.
H. High Static Limit - Cold Deck: A manual reset static pressure sensor in the discharge supply plenum downstream of the chilled water coils shall stop the AHU upon detection of duct static pressure above set point.
I. High Static Limit - Hot Deck: A manual reset static pressure sensor in the discharge supply plenum downstream of the chilled water coils shall stop the AHU upon detection of duct static pressure above set point.
J. Smoke Detector: Duct mounted smoke detector(s) shall stop the AHU fans upon detection of products of combustion.
K. Emergency Drain Pan Float Switch shall stop the AHU fans upon a rise in water level in the emergency drain pan above the float switch set point.
L. An alarm shall be sent to the EMS front end upon activation of any or all safety devices.
M. Outside Air Motor Operated Damper(s) shall be scheduled to operate independent of the AHU

Dual Duct AHU Points List:

BO	Fan Start/Stop
BI	Fan Status
BI	Fan Alarm
AO	Fan VFD Speed Control
AI	Chilled Water Coil Leaving Air Temperature
AO	Chilled Water Coil Three (3) Way Chilled Water Control Valve
AI	Hot Water Coil Leaving Air Temperature
AO	Hot Water Coil Three (3) Way Hot Water Control Valve
AI	AHU Return Air Temperature
AI	AHU Mixed Air Temperature
BI	AHU Return Air Temperature Low Limit Controller
AI	Static Pressure Sensors Cold Duct
AI	Static Pressure Sensors Hot Duct
BI	Static Pressure High Limit Cold Deck
BI	Static Pressure High Limit Hot Deck
BI	Smoke Detector(s)
BI	AHU Emergency Drain Pan Float Switch
BO	Outside Air MotorizedDamper

DUAL DUCT VARIABLE AIR VOLUME TERMINAL

A. Start-up: When the zone is occupied, the VAV controller modulates the hot and cold dampers to maintain the zone temperature set point within the occupied deadband.
B. Cooling Mode: When the zone temperature rises above the occupied set point. The hot duct damper shall modulate to its minimum heating air flow position. The cold duct damper shall modulate to increase cold airflow form its minimum position toward its maximum position. This modulation shall be proportional to the zone temperature's rise above the cooling setpoint. The total airflow to the zone will increase as the cooling demand increases. When the zone temperature fails back into the deadband range, the cold duct airflow will decrease to its minimum setpoint.
C. Heating Mode: When the zone temperature rises above the occupied set point. The cold duct damper shall modulate to its minimum cooling air flow position. The hot duct damper shall modulate to increase hot airflow form its minimum position toward its maximum position. This modulation shall be proportional to the zone temperature's fall below the heating setpoint. The total airflow to the zone will increase as the heating demand increases. When the zone temperature rises back into the deadband range, the hot duct airflow will decrease to its minimum setpoint.
D. Deadband Mode: The hot and cold duct dampers shall both be at their minimum airflow positions. The controller shall maintain a constant airflow for ventilation, mixing the minimum hod and cold air volumes. This ensures proper ventilation while minimizing energy consumption from heating and cooling.
E. Unoccupied Mode: Based on the building's time of day schedule, the VAV terminal will enter unoccupied mode. All dampers shall close to preprogrammed unoccupied minimum airflows. Or close entirely if ventilation is not required. The zone temperature shall be allowed to float to a wider setback range to conserve energy. Unoccupied cooling 78 degrees F (Adjustable) and unoccupied heating 64 degrees F (Adjustable). If zone temperature rises or fall below temperature setpoints, VAV terminal shall operate to maintain unoccupied setpoint deadband range.
F. Each VAV box shall have an independent setback control schedule. Each box shall be programmed independently as directed by the owner. Programming shall be by the TCC. Each box shall have an independent setback temperature set point. Each Space sensor shall have a programmed high and low space temperature setpoint range programmed by the TCC. The final range shall be as directed by the owner.

Dual Duct VAV Points List:

BO Box Start/Stop
AI Cooling CFM
AO Cooling Damper Control
AI Heating CFM
AO Heating Damper Control
AI Space Temperature
AI Space Temperature Set point
BI Space Temperature Override Button

MINI – SPLIT SYSTEM (RM: IET Rooms)

A. The FMCS shall monitor space temperature and humidity. Override push button shall allow system to be operated outside of programmed times. The split system shall be controlled by a thermostat provided by AHU manufacturer and shall be wired by TCC. High limit thermostat in return air shall stop the respective unit upon detection of temperature above its set point. A low limit thermostat shall stop the AHU upon detection of temperature below its set point. Emergency drain pan float switch (where required) shall stop the unit on a rise in water level in the emergency drain pan. Each Space sensor shall have a programmed high and low space temperature and humidity setpoint range programmed by the TCC. The final range shall be as directed by the owner. Equipment may be turned off by the FMCS when in the acceptable temperature and humidity range.
B. Provide thermostat kits for all mini-split systems to allow for integration with new control system.

Mini - Split System Equipment Points List:

BO	Unit Start/Stop
BI	Unit Status
AI	Space Temperature (Monitoring)
BI	Space Temperature Override Button
BI	High Temp Alarm
AI	Space Humidity

F. BO NIPPERS TECHNOLOGY CENTER

DX SPLIT SYSTEM AIR HANDLING UNIT WITH HOT WATER HEATING

A. Split System DX A/C units shall be started and stopped based on a programmed schedule. The FMCS shall monitor space temperature and humidity. Override push button shall allow system to be operated outside of programmed times. The split system shall be controlled by a thermostat provided by AHU manufacturer and shall be wired by TCC. High limit thermostat in return air shall stop the respective unit upon detection of temperature above its set point. A low limit thermostat shall stop the AHU upon detection of temperature below its set point. Duct mounted smoke detector(s) shall stop the AHU upon detection of products of combustion. Emergency drain pan float switch (where required) shall stop the unit on a rise in water level in the emergency drain pan. Each Space sensor shall have a programmed high and low space temperature and humidity setpoint range programmed by the TCC. The final range shall be as directed by the owner. Equipment may be turned off by the FMCS when in the acceptable temperature and humidity range.
B. Heating Mode: The reheat coil shall be at minimum position (0 CFM – adjustable). The control valve shall begin opening as the space temperature drops below the space temperature heating set point. If the space tempera-

ture continues to drop below the heating set point, the hot water heating coil control valve shall modulate open to the coil as required to maintain the heating set point.

DX Split System Equipment Points List:

BO	Unit Start/Stop
BI	Unit Status
AI	Space Temperature (Monitoring)
BI	Space Temperature Override Button
AI	Space Humidity (monitoring)
BI	Smoke Detector (all units)
BI	Emergency Drain Pan Float Switch
BI	Return air temperature high limit
BI	Low Temp Limit
AO	Hot Water Coil Control Valve (3-Way)

HOT WATER SYSTEM

A. The boilers shall be reintegrated into the system via their BacNET IP connections and all points shall be provided at FMCS workstation.
B. HOT WATER SYSTEM: The hot water system will be enabled through the FMCS (as determined by the FMCS). When the boiler is energized through the FMCS, the boiler control panel shall start the boiler circulating pump and the building hot water pump. The FMCS will monitor building hot water supply and return temperatures. The FMCS shall enable the Hot Water System when reheat coils call for need or by building high humidity levels sensed by any and or all space humidity sensors. The lead building hot water pump shall be started by the FMCS and the building HWS temperature shall be monitored. The Boiler shall be enabled to maintain building HWS temperature.
C. BOILER: The Building's hot water supply temperature shall be monitored and the boiler 3-way hot water control valve shall modulate to maintain building hot water supply temperature at set point (180 degrees F adjustable). Building HWS temperature shall be reset based on O.A. temperature (180 degrees F HWS temperature at 35 degrees F - O.A. temperature and 140 degrees F HWS temperature at 55 degrees F - O.A. temperature). Coordinate final programming of reset range with engineer/owner.
D. HOT WATER PUMPS: The FMCS system shall select the lead hot water pump (alternate each week). The operation of the building's hot water pump(s) is for the lead pump to run continuously. The status of the pump shall be monitored through a C.S.R. switch. If the pump fails, after a 60-second delay an alarm will be generated at the operator workstation and the hot water system will be disabled. The lead pump shall be able to be selected by the operator at the operator workstation and automatically alternated by the FMCS.
E. The heating system shall be programmed to be initiated by the outside air temperature for freeze protection. When the outside air temperature drops below freeze protection set point (40 degrees – adjustable). The Hot Water

System shall be enabled and Unit Heaters, F.C.U.'s and V.A.V. Boxes (with hot water heating) shall be initiated for building Freeze protection.

Hot Water Heating System Points List:

BO	Boiler Enable (Typical for 2)
BI	Boiler Status (on/off) (Typical for 2)
BI	Boiler Alarm (Typical for 2)
AI	BLDG HWR Temperature
AI	BLDG HWS Temperature
BO	BLDG HW Pump Start/Stop (Typical for 2)
BI	BLDG HW Pump Status (Typical for 2)
BO	BLDG HW Pump (Lead/Lag)
BI	BLDG HW Pump Alarm (1 per pump)
AI	Boiler HWS Temperature (Typical for 2)
AI	Boiler HWR Temperature (Typical for 2)
AO	Boiler HWS Temperature 3-Way Control Valve (Typical for 2)
AI	O.A. Temperature (Dry Bulb)
AI	O.A. Temperature (Wet Bulb)

MINI – SPLIT SYSTEM

C. The FMCS shall monitor space temperature and humidity. Override push button shall allow system to be operated outside of programmed times. The split system shall be controlled by a thermostat provided by AHU manufacturer and shall be wired by TCC. High limit thermostat in return air shall stop the respective unit upon detection of temperature above its set point. A low limit thermostat shall stop the AHU upon detection of temperature below its set point. Emergency drain pan float switch (where required) shall stop the unit on a rise in water level in the emergency drain pan. Each Space sensor shall have a programmed high and low space temperature and humidity set-point range programmed by the TCC. The final range shall be as directed by the owner. Equipment may be turned off by the FMCS when in the acceptable temperature and humidity range.
D. Provide thermostat kits for all mini-split systems to allow for integration with new control system.

Mini - Split System Equipment Points List:

BO	Unit Start/Stop
BI	Unit Status
AI	Space Temperature (Monitoring)
BI	Space Temperature Override Button
BI	High Temp Alarm
AI	Space Humidity

THROUGH-THE-WALL HEAT PUMP UNITS

Through-The-Wall Heat Pumps Points List:

BO	Unit Start/Stop
BI	Unit Status

G. BOLTON LIBRARY

CHILLED WATER SYSTEM

A. COOLING MODE OFF: When the building is not in the cooling mode (as determined by the Campus FMCS), the building chilled water pumps shall be off. The Building Chilled Water two-way isolation control valves shall be closed.
B. COOLING MODE ON: When the building is in the cooling mode (as determined by the Campus FMCS), the Building chilled water two-way isolation control valves shall open and the chilled water lead pump shall be started. The building control valves shall be modulated as required to maintain building CWS temperature set point (45º F adjustable).
C. CHILLED WATER PUMPS: The FMCS system shall select the lead chilled water pump (alternate each week). The status of the pump shall be monitored through a C.S.R. switch. In the event that the lead pump fails to operate when commanded by the FMCS, as determined by pump "status", then an alarm will be sent to the Campus front end located in the Central Plant and the lag chilled water pump will operate in lieu of the lead chiller water pump. The lead pump shall be able to be selected by the operator at the operator workstation and automatically alternated by the FMCS.
D. The FMCS shall use chilled water flow (varying central plant flow in the building) and central plant CWS vs. CWR temperature differential (as monitored in the building) to compute the instantaneous chilled water tonnage requirement of the building and monitor this value at the central plant work station.
E. In addition to the building the Temperature Control Contractor (TCC) shall incorporate a chilled water demand screen on the Central Plant work station that indicates CWS/R temperatures for each building on campus with the total instantaneous tonnage requirement for each building. The flow and temperature monitoring for this screen shall be the central plant building tonnage produced vs. tonnage demanded from the following: MPAC, H.&P.E., Bolton Library, Student Center (West, Center, & East), Abrams Hall, Oakland Hall, Coughlin Hall, Chambers Hall, & Science Building.

Chilled Water System Points List:

BO	Pump Start/Stop (Typical for 2, Lead/Lag)
BI	Pump Status (on/off) (Typical for 2)
BO	Pump Lead/Lag
BI	Pump Alarm (1 per pump)
AO	Chilled Water 2-Way Isolation Valve
AO	Chilled Water 3-way Bypass Valve

AI	Building CWS Temperature
AI	Building CWR Temperature
AI	Central Plant CWS Temperature
AI	Central Plant CWR Temperature
AI	Differential Pressure
AI	Central Plant CWR Flow (GPM) (monitored in the building)
AI	Instantaneous Tonnage (flow X temperature differential)

HOT WATER SYSTEM

F. The boilers shall be reintegrated into the system via their BacNET IP connections and all points shall be provided at FMCS workstation.
G. HOT WATER SYSTEM: The hot water system will be enabled through the FMCS (as determined by the FMCS). When the boiler is energized through the FMCS, the boiler control panel shall start the boiler circulating pump and the building hot water pump. The FMCS will monitor building hot water supply and return temperatures. The FMCS shall enable the Hot Water System when reheat coils call for need or by building high humidity levels sensed by any and or all space humidity sensors. The lead building hot water pump shall be started by the FMCS and the building HWS temperature shall be monitored. The Boiler shall be enabled to maintain building HWS temperature.
H. BOILER: The Building's hot water supply temperature shall be monitored and the boiler 3-way hot water control valve shall modulate to maintain building hot water supply temperature at set point (180 degrees F adjustable). Building HWS temperature shall be reset based on O.A. temperature (180 degrees F HWS temperature at 35 degrees F - O.A. temperature and 140 degrees F HWS temperature at 55 degrees F - O.A. temperature). Coordinate final programming of reset range with engineer/owner.
I. HOT WATER PUMPS: The FMCS system shall select the lead hot water pump (alternate each week). The operation of the building's hot water pump(s) is for the lead pump to run continuously. The lead pump shall be able to be selected by the operator at the operator workstation and automatically alternated by the FMCS. The status of the pump shall be monitored through a C.S.R. switch. If the lead pump fails, the lag pump will be started after a 60-second delay and an alarm will be generated at the operator workstation. If the lag pump also fails an alarm will be generated at the operator workstation, and the hot water system will be disabled. The lead pump shall be able to be selected by the operator at the operator workstation and automatically alternated by the FMCS.
J. The heating system shall be programmed to be initiated by the outside air temperature for freeze protection. When the outside air temperature drops below freeze protection set point (40 degrees – adjustable). The Hot Water System shall be enabled and Unit Heaters, F.C.U.'s and V.A.V. Boxes (with hot water heating) shall be initiated for building Freeze protection.

Hot Water Heating System Points List:

BO	Boiler Enable (Typical for 2)
BI	Boiler Status (on/off) (Typical for 2)
BI	Boiler Alarm (Typical for 2)

AI	BLDG HWR Temperature
AI	BLDG HWS Temperature
BO	BLDG HW Pump Start/Stop (Typical for 2)
BI	BLDG HW Pump Status (Typical for 2)
BO	BLDG HW Pump (Lead/Lag)
BI	BLDG HW Pump Alarm (1 per pump)
AI	Boiler HWS Temperature (Typical for 2)
AI	Boiler HWR Temperature (Typical for 2)
AO	Boiler HWS Temperature 3-Way Control Valve (Typical for 2)
AI	O.A. Temperature (Dry Bulb)
AI	O.A. Temperature (Wet Bulb)

MULTI-ZONE AIR HANDLING UNITS (AHU-1, AHU-2 and AHU-3)

A. STARTUP: MZVAV shall be started and stopped by the BMS through the local Control Panel through the HOA switch mounted in the variable frequency drive. The VFD shall be located within the AHU equipment room. One (1) Control Panel Application Specific Controllers (ASC) will be required per AHU. Spare control points in the ASC shall be for future expansion. A current sensing relay shall indicate air handling unit fan status back to local ASC and place automatic controls in operation.

B. SAFETIES: High limit thermostat in return air located at the RTU shall stop the RTU fan upon detection of temperature above its set point. A low limit thermostat in the mixed return air stream shall stop the AHU fan upon detection of temperature below its set point. A manual reset static pressure high limit sensor in the discharge duct downstream of the AHU fan shall stop the AHU fan upon detection of duct static pressure above its set point (2.5@ B adjustable). Duct mounted smoke detector(s) shall stop the AHU fan upon detection of products of combustion (one in R.A. per IMC and one in S. A. Per NFPA). Emergency drain pan float switch shall stop the unit fan on a rise in water level in the emergency drain pan above float switch set point. Interlock fire/smoke dampers (FSD) with respective AHU and fire alarm system. AHU shall shut off and FSD shall close on actuation of smoke detector(s) (supply duct, return air, or space mounted detectors via a signal from the Fire Alarm system). Coordinate with fire alarm system contractor. Stopping the Unit fan shall de-energize the control system. The chilled water control valve(s) shall close to their respective coils. An alarm shall be sent to the workstation upon activation of any or all safety devices.

C. TEMPERATURE CONTROL: A temperature sensor in the supply duct downstream of the RTU discharge shall transmit temperature changes to the local ASC.

1. Cooling Mode: The ASC shall modulate the chilled water control valve(s) (one per coil) to maintain discharge air temperature set point (52 degrees F adjustable see AHU submittals for required L.A.T. to meet scheduled capacities). One coil sensor shall be used to monitor LAT of each cooling coil. One sensor and one 3-way control valve shall be provided for each cooling coil. AHU's with staggered or multiple coils shall be required to have multiple LAT sensors and multiple 3-way control valves, in addition to the discharge air temperature sensor located downstream of the fan section. Where multiple coils and

valves are used, the coil L.A.T. shall be controlled by the coil sensor and the duct sensor shall allow reset of the coil L.A.T. to compensate for the heat gain through the fan section. All control valves shall be closed to the cooling coil when the AHU is OFF.

2. Heating Mode: The ASC shall modulate the hot water control valve(s) (one per coil) to maintain discharge air temperature set point (90 degrees F adjustable) One coil sensor shall be used to monitor LAT of each cooling coil. One sensor and one 3-way control valve shall be provided for each cooling coil. When space temperature drops below the heating set point (68 degrees F - Adjustable), the hot water heating coil control 3-way valve shall modulate as required to maintain space temperature heating set point. The cooling coil control valve shall be closed to the cooling coil during the heating mode.
3. Pre-Heating Mode (if applicable): When outside air temperature is below (36 degrees F - Adjustable), the pre heating coil two way control valve shall modulate open to heat mixed return/outside air to unit set LAT. (52 Degrees – Adjustable) One coil sensor shall be used to monitor LAT of each pre-heating coil. One sensor and one 2-way control valve shall be provided for each pre-heating coil. AHU=s with staggered or multiple coils shall be required to have multiple LAT sensors and multiple 2-way control valves

D. Space humidity shall be monitored by the ASC and initiate start-up of the chilled water system, and AHU when the space humidity rises above set point (70% RH adjustable).

MZVAV Air Handling Units Point List:
(Each Unit shall have similar but independent control points)

BO	Fan - Start/Stop
BI	Fan - Status (On/Off)
AO	Chilled Water Coil - Control Valve (3-Way) (on per cooling coil)
AI	Entering Air Temperature (at AHU)
AI	Leaving Air Temperature (Cooling coil) (one per cooling coil)
AI	Leaving Air Temperature (AHU) (duct mounted on discharge side of AHU fan)
AO	Leaving Air Temperature Reset Programming
BI	Duct Static Pressure - High Limit (at unit discharge)
AI	Duct Static Pressure (VFD control) (sensor at 2/3 downstream in duct system)
BI	Entering Air Temperature - High Limit
BI	Entering Air Temperature - Low Limit
BI	Smoke Detector (AHU Shut down)(one in supply per NFPA and one in return per IMC)
AI	Space Humidity (general space humidity monitoring)(1 required per unit)
AI	Space Humidity Set point (monitoring to initiate cooling mode and / or heating mode)
BI	Smoke Damper (AHU Shutdown where required)

HOT WATER REHEAT AIR COILS (DUCT MOUNTED)

A. The reheat coil shall be controlled by the respective space temperature and space humidity sensors associated with the respective Reheat Coil sensors.

The Reheat Coil shall provide minimum or maximum cooling CFM as scheduled. The Reheat Coil shall provide re-heat control.

B. Humidity Control: When the respective space humidity is above set point (70% RH - adjustable), the heating coil 2-way control valve shall modulate as required to maintain a Reheat Coils Leaving Air Temperature at Humidity Control set point (74 degrees F - Adjustable). The Reheat Coil shall return to the required mode of operation (Occupied, Un-Occupied, or Off) after the space humidity drops below set point (60% RH - Adjustable).
C. Hot Water Heating Coil Valve position feed back shall be provided for each Reheat Coil for temperature reset programming.

Hot Water Reheat Coil System Points List:

AI	O.A. Temperature (Wet Bulb)
AI	Space Temperature
AO	Space Temperature Setpoint
AI	Space Humidity
AO	Space Humidity Setpoint
AO	Space override Push Button
AO	Hot Water Heating Coil Modulating Control Valve (3 Way)
AI	Reheat Coil Leaving Air Temperature

MINI – SPLIT SYSTEM (RM: IET 112, Archives 202)

A. The FMCS shall monitor space temperature and humidity. Override push button shall allow system to be operated outside of programmed times. The split system shall be controlled by a thermostat provided by AHU manufacturer and shall be wired by TCC. High limit thermostat in return air shall stop the respective unit upon detection of temperature above its set point. A low limit thermostat shall stop the AHU upon detection of temperature below its set point. Emergency drain pan float switch (where required) shall stop the unit on a rise in water level in the emergency drain pan. Each Space sensor shall have a programmed high and low space temperature and humidity setpoint range programmed by the TCC. The final range shall be as directed by the owner. Equipment may be turned off by the FMCS when in the acceptable temperature and humidity range.
B. Provide thermostat kits for all mini-split systems to allow for integration with new control system.

Mini - Split System Equipment Points List:

BI	Unit Status
AI	Space Temperature (Monitoring)
BI	Space Temperature Override Button
AI	Space Humidity
BI	High Temp Alarm

H. CHAMBERS HALL

CHILLED WATER SYSTEM

A. COOLING MODE OFF: When the building is not in the cooling mode (as determined by the Campus FMCS), the building chilled water pump shall be off. The Building Chilled Water two-way isolation control valves shall be closed.
B. COOLING MODE ON: When the building is in the cooling mode (as determined by the Campus FMCS), the building chilled water two-way isolation control valves shall open and the chilled water pump shall be started. The building control valves shall be modulated as required to maintain building CWS temperature set point (45º F adjustable).
C. CHILLED WATER PUMPS: The FMCS system shall select the chilled water pump. The status of the pump shall be monitored through a C.S.R. switch. In the event that the pump fails to operate when commanded by the FMCS, as determined by pump "status", then an alarm will be sent to the Campus front end located in the Central Plant.
D. The FMCS shall use chilled water flow (varying central plant flow in the building) and central plant CWS vs. CWR temperature differential (as monitored in the building) to compute the instantaneous chilled water tonnage requirement of the building and monitor this value at the central plant work station.
E. In addition to the building the Temperature Control Contractor (TCC) shall incorporate a chilled water demand screen on the Central Plant work station that indicates CWS/R temperatures for each building on campus with the total instantaneous tonnage requirement for each building. The flow and temperature monitoring for this screen shall be the central plant building tonnage produced vs. tonnage demanded from the following: MPAC, H.&P.E., Bolton Library, Student Center (West, Center, & East), Abrams Hall, Oakland Hall, Coughlin Hall, Chambers Hall, & Science Building.

Chilled Water System Points List:

BO	Pump Start/Stop
BI	Pump Status (on/off)
BI	Pump Alarm
AO	Chilled Water 2-Way Isolation Valve
AO	Chilled Water 3-way Bypass Valve
AI	Building CWS Temperature
AI	Building CWR Temperature
AI	Central Plant CWS Temperature
AI	Central Plant CWR Temperature
AI	Differential Pressure
AI	Central Plant CWR Flow (GPM) (monitored in the building)
AI	Instantaneous Tonnage (flow X temperature differential)

HOT WATER SYSTEM

A. The boilers shall be reintegrated into the system via their BacNET IP connections and all points shall be provided at FMCS workstation.
B. HOT WATER SYSTEM: The hot water system will be enabled through the FMCS (as determined by the FMCS). When the boiler is energized through the FMCS, the boiler control panel shall start the boiler circulating pump and the building hot water pump. The FMCS will monitor building hot water supply and return temperatures. The FMCS shall enable the Hot Water System when reheat coils call for need or by building high humidity levels sensed by any and or all space humidity sensors. The lead building hot water pump shall be started by the FMCS and the building HWS temperature shall be monitored. The Boiler shall be enabled to maintain building HWS temperature.
C. BOILER: The Building's hot water supply temperature shall be monitored and the boiler 3-way hot water control valve shall modulate to maintain building hot water supply temperature at set point (180 degrees F adjustable). Building HWS temperature shall be reset based on O.A. temperature (180 degrees F HWS temperature at 35 degrees F - O.A. temperature and 140 degrees F HWS temperature at 55 degrees F - O.A. temperature). Coordinate final programming of reset range with engineer/owner.
D. HOT WATER PUMPS: The FMCS system shall select the lead hot water pump (alternate each week). The operation of the building's hot water pump(s) is for the lead pump to run continuously. The lead pump shall be able to be selected by the operator at the operator workstation and automatically alternated by the FMCS. The status of the pump shall be monitored through a C.S.R. switch. If the lead pump fails, the lag pump will be started after a 60-second delay and an alarm will be generated at the operator workstation. If the lag pump also fails an alarm will be generated at the operator workstation, and the hot water system will be disabled. The lead pump shall be able to be selected by the operator at the operator workstation and automatically alternated by the FMCS.
E. The heating system shall be programmed to be initiated by the outside air temperature for freeze protection. When the outside air temperature drops below freeze protection set point (40 degrees – adjustable). The Hot Water System shall be enabled and Unit Heaters, F.C.U.'s and V.A.V. Boxes (with hot water heating) shall be initiated for building Freeze protection.

Hot Water Heating System Points List:

BO	Boiler Enable
BI	Boiler Status (on/off)
BI	Boiler Alarm
BO	BLDG HW Pump Start/Stop
BI	BLDG HW Pump Status
BI	BLDG HW Pump Alarm
AI	BLDG HWR Temperature
AI	BLDG HWS Temperature
AI	Boiler HWS Temperature
AI	Boiler HWR Temperature
AO	Boiler HWS Temperature 3-Way Control Valve

AI O.A. Temperature (Dry Bulb)
AI O.A. Temperature (Wet Bulb)

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MINI – SPLIT SYSTEM (RM: 132, 145,146)

C. The FMCS shall monitor space temperature and humidity. Override push button shall allow system to be operated outside of programmed times. The split system shall be controlled by a thermostat provided by AHU manufacturer and shall be wired by TCC. High limit thermostat in return air shall stop the respective unit upon detection of temperature above its set point. A low limit thermostat shall stop the AHU upon detection of temperature below its set point. Emergency drain pan float switch (where required) shall stop the unit on a rise in water level in the emergency drain pan. Each Space sensor shall have a programmed high and low space temperature and humidity setpoint range programmed by the TCC. The final range shall be as directed by the owner. Equipment may be turned off by the FMCS when in the acceptable temperature and humidity range.
D. Provide thermostat kits for all mini-split systems to allow for integration with new control system.

Mini - Split System Equipment Points List:

BI Unit Status
AI Space Temperature (Monitoring)
BI Space Temperature Override Button
AI Space Humidity
BI Low Temp Alarm
BI High Temp Alarm

I. CHILDREN'S CENTER

DX SPLIT SYSTEMS AIR HANDING UNIT WITH ELECTRIC HEAT (3 UNITS)

C. Split System DX A/C units shall be started and stopped based on a programmed schedule. The FMCS shall monitor space temperature and humidity. Override push button shall allow system to be operated outside of programmed times. The split system shall be controlled by a thermostat provided by AHU manufacturer and shall be wired by TCC. High limit thermostat in return air shall stop the respective unit upon detection of temperature above its set point. A low limit thermostat shall stop the AHU upon detection of temperature below its set point. Duct mounted smoke detector(s) shall stop the AHU upon detection of products of combustion. Emergency drain pan float switch (where required) shall stop the unit on a rise in water level in the emergency drain pan. Each Space sensor shall have a programmed high and low space temperature and humidity setpoint range programmed by the TCC. The final range shall be as directed by the owner. Equipment may be

turned off by the FMCS when in the acceptable temperature and humidity range.

DX Split System Equipment Points List:

BO	Unit Start/Stop
BI	Unit Status
AI	Space Temperature (Monitoring)
BI	Space Temperature Override Button
AI	Space Humidity (monitoring)
BI	Smoke Detector (all units)
BI	Emergency Drain Pan Float Switch
BI	Return air temperature high limit
BI	Low Temp Limit

J. COUGHLIN HALL

CHILLED WATER SYSTEM

A. COOLING MODE OFF: When the building is not in the cooling mode (as determined by the Campus FMCS), the building chilled water pump shall be off. The Building Chilled Water two-way isolation control valves shall be closed.
B. COOLING MODE ON: When the building is in the cooling mode (as determined by the Campus FMCS), the building chilled water two-way isolation control valves shall open and the chilled water pump shall be started. The building control valves shall be modulated as required to maintain building CWS temperature set point (45º F adjustable).
C. CHILLED WATER PUMPS: The FMCS system shall select the chilled water pump. The status of the pump shall be monitored through a C.S.R. switch. In the event that the pump fails to operate when commanded by the FMCS, as determined by pump "status", then an alarm will be sent to the Campus front end located in the Central Plant.
D. The FMCS shall use chilled water flow (varying central plant flow in the building) and central plant CWS vs. CWR temperature differential (as monitored in the building) to compute the instantaneous chilled water tonnage requirement of the building and monitor this value at the central plant work station.
E. In addition to the building the Temperature Control Contractor (TCC) shall incorporate a chilled water demand screen on the Central Plant work station that indicates CWS/R temperatures for each building on campus with the total instantaneous tonnage requirement for each building. The flow and temperature monitoring for this screen shall be the central plant building tonnage produced vs. tonnage demanded from the following: MPAC, H.&P.E., Bolton Library, Student Center (West, Center, & East), Abrams Hall, Oakland Hall, Coughlin Hall, Chambers Hall, & Science Building.

Chilled Water System Points List:

BO	Pump Start/Stop
BI	Pump Status (on/off)
BI	Pump Alarm
AO	Chilled Water 2-Way Isolation Valve
AO	Chilled Water 3-way Bypass Valve
AI	Building CWS Temperature
AI	Building CWR Temperature
AI	Central Plant CWS Temperature
AI	Central Plant CWR Temperature
AI	Differential Pressure
AI	Central Plant CWR Flow (GPM) (monitored in the building)
AI	Instantaneous Tonnage (flow X temperature differential)

HOT WATER SYSTEM

D. The boilers shall be reintegrated into the system via their BacNET IP connections and all points shall be provided at FMCS workstation.
E. HOT WATER SYSTEM: The hot water system will be enabled through the FMCS (as determined by the FMCS). When the boiler is energized through the FMCS, the boiler control panel shall start the boiler circulating pump and the building hot water pump. The FMCS will monitor building hot water supply and return temperatures. The FMCS shall enable the Hot Water System when reheat coils call for need or by building high humidity levels sensed by any and or all space humidity sensors. The lead building hot water pump shall be started by the FMCS and the building HWS temperature shall be monitored. The Boiler shall be enabled to maintain building HWS temperature.
F. BOILER: The Building's hot water supply temperature shall be monitored and the boiler 3-way hot water control valve shall modulate to maintain building hot water supply temperature at set point (180 degrees F adjustable). Building HWS temperature shall be reset based on O.A. temperature (180 degrees F HWS temperature at 35 degrees F - O.A. temperature and 140 degrees F HWS temperature at 55 degrees F - O.A. temperature). Coordinate final programming of reset range with engineer/owner.
G. HOT WATER PUMPS: The FMCS system shall select the lead hot water pump (alternate each week). The operation of the building's hot water pump(s) is for the lead pump to run continuously. The lead pump shall be able to be selected by the operator at the operator workstation and automatically alternated by the FMCS. The status of the pump shall be monitored through a C.S.R. switch. If the lead pump fails, the lag pump will be started after a 60-second delay and an alarm will be generated at the operator workstation. If the lag pump also fails an alarm will be generated at the operator workstation, and the hot water system will be disabled. The lead pump shall be able to be selected by the operator at the operator workstation and automatically alternated by the FMCS.
H. The heating system shall be programmed to be initiated by the outside air temperature for freeze protection. When the outside air temperature drops below freeze protection set point (40 degrees – adjustable). The Hot Water System shall be enabled and Unit Heaters, F.C.U.'s and V.A.V. Boxes (with hot water heating) shall be initiated for building Freeze protection.

Hot Water Heating System Points List:

BO	Boiler Enable
BI	Boiler Status (on/off)
BI	Boiler Alarm
BO	BLDG HW Pump Start/Stop
BI	BLDG HW Pump Status
BI	BLDG HW Pump Alarm
AI	BLDG HWR Temperature
AI	BLDG HWS Temperature
AI	Boiler HWS Temperature
AI	Boiler HWR Temperature
AO	Boiler HWS Temperature 3-Way Control Valve
AI	O.A. Temperature (Dry Bulb)
AI	O.A. Temperature (Wet Bulb)

SINGLE ZONE AIR HANDLING UNIT (2 UNITS)

A. START/STOP CONTROL: The AHU shall be started and stopped by the FMCS through the local ASC located adjacent to the respective air handling unit through the HOA switch mounted in the cover of the starter/VFD cover. One (1) ASC shall be required per AHU. Spare control points in the ASC shall be used for future expansion. Current sensing relay shall indicate AHU run status and set automatic temperature controls into operation.
B. SAFETIES: A high limit thermostat in the return air shall stop the AHU upon detection of temperature above its set point. A low limit thermostat shall stop the AHU upon detection of temperature below its set point. Duct mounted smoke detector(s) shall stop the AHU, associated ERV (where required) and dehumidifier (AHU 1-4) upon detection of products of combustion. Emergency drain pan float switch shall stop the AHU on a rise in water level in the emergency drain pan.
D. TEMPERATURE CONTROL: Cooling Mode: A sensor in the discharge duct on the AHU shall transmit temperature changes to the ASC panel, which shall modulate the chilled water control valve(s) to maintain a discharge air temperature set point (55 degrees F –adjustable – see AHU submittals for required L.A.T. to meet scheduled capacities). The ASC panel shall increase the AHU fan motor speed when the space temperature rises above the space temperature cooling set point (73 degrees – adjustable) and reduce fan speed when the space temperature drops below the space temperature cooling set point. A space temperature sensor in the space shall transmit temperature changes to the ASC panel, which shall control the AHU fan speed. One cooling coil LAT sensor shall be used to monitor LAT of each cooling coil. Where multiple coils and control valves are used, the coil L.A.T. shall be controlled by the coil sensor and the duct sensor shall allow reset of the coil L.A.T. to compensate for the heat gain through the fan section. The heating coil control valve(s) shall be closed to the heating coil during the cooling mode.
F. Heating Mode: When the space temperature drops below the space temperature heating set point (68 degrees F – adjustable) the ASC panel shall increase the AHU fan speed to a fixed CFM set point (75% of maximum – ad-

justable) and the ASC panel shall modulate the hot water control valve(s) as required to maintain the space temperature heating set point. The chilled water control valve(s) shall be closed to the cooling coil(s) during the heating mode. Separate sensors shall be provided for each cooling or heating coil(s). AHU's with staggered or multiple coils shall be required to have multiple LAT sensors, in addition to the discharge air temperature sensor.

M. SHUTDOWN CONTROL: Stopping the AHU supply fan shall de-energize the control system. The chilled water control valve(s) and hot water control valve(s) shall close to their respective coils.
N. The ERV shall be enabled separately from the respective AHU.
O. Space humidity shall be monitored by the ASC and initiate start-up of the chilled water system, hot water system, and AHU when the space humidity rises above space humidity set point (75% RH – adjustable). When space humidity levels rise above the space humidity set point, the AHU fan speed shall increase to a fixed CFM set point (75% of maximum – adjustable), the chilled water control valve(s) shall modulate open to the coil(s) to maintain a set cooling coil LAT (53 degrees F – adjustable), and the heating coil control valve(s) shall modulate open to the heating coil(s) as required to maintain space temperature set point. When the space humidity level drops 3% below the space humidity set point, the controls shall return to the cooling or heating mode, or unoccupied mode.
P. Provide programming to start respective AHU, pumps (CW and/or HW), etc. when the override button on the space temperature sensor is pushed. Each AHU override shall be programmed independently for active or inactive status as directed by the owner. Active or inactive status shall be selected by the owner on an individual AHU basis.
Q. Each AHU shall have an independent setback control schedule. Each AHU shall be programmed independently as directed by the owner. Programming shall be by the TCC. Each AHU shall have an independent setback temperature set point and humidity set point. Each Space sensor shall have a programmed high and low space temperature setpoint range programmed by the TCC. The final range shall be as directed by the owner.
R. Freeze protection: During the unoccupied mode, and when initiated by the outdoor air sensor, each AHU shall be enabled to allow for building freeze protection. Each AHU shall be in the heating mode to maintain a space temperature set point (55 degrees F – adjustable).

Single Zone Air Handling Units Points List (10 UNITS):

BO	Fan/VFD Start/Stop
BI	Fan/VFD Status
AO	Variable Frequency Drive Speed Control
AO	CHW Control Valve (3-Way) (one per coil)
AO	HW Control Valve (3-Way) (one per coil)
AI	Space Temperature
AI	Space Temperature Set point
BI	Space Temperature Override Button
AI	Entering Air Temperature (AHU)
AI	Leaving Air Temperature (coil) (one per coil)
AI	Leaving Air Temperature (AHU) (discharge of AHU)
BI	Entering Air Temperature High Limit

BI Low Temperature Limit
BI Emergency Drain Pan Float Switch
BI Smoke Detector (AHU/ERV Shutdown)
AI Space Humidity (monitoring)
AI Space Humidity Set point (monitoring to initiate de-humidification mode)

DUAL DUCT AIR HANDLING UNIT (2 UNITS)

A. AHU fan shall be started and stopped by the Facility Management Control System (FMCS) through the local EMS control panel located adjacent to the respective AHU, and through the local hand-off-auto switch located in the Variable Frequency Drives (VFD's).
B. A current Sensing Relay (CSR) shall indicate AHU fan(s) status back to the FMCS Control Panel and place controls in operation. An alarm shall be sent to the FMCS should a fan fail to start.
C. Cold Deck: Temperature sensor(s) in the cold deck(s) shall transmit temperature changes to the AHU Control Panel. The Control Panel shall modulate chilled water coil three (3)-way chilled water control valve to maintain cold deck temperature set points (49degrees F. - Adjustable).
D. Hot Deck: Temperature sensor in the hot deck shall transmit temperature changes to the AHU Control Panel. The Control Panel shall modulate hot water coil three (3)-way hot water control valve to maintain hot deck temperature set point (106 degrees F. - Adjustable). Hot deck temperature shall be reset based on outdoor air temperature.
E. The fan motor(s) shall be controlled by VFD(s). Differential pressure transmitter(s) shall sense cold and hot ductwork differential static pressure(s) of the air distribution ductwork, and shall transmit pressure changes back to the AHU Controller. The Controller shall modulate the VFD(s) to maintain duct static pressure set point. The lowest reading of the duct static pressure sensors shall be used to control the VFD(s). The fan VFD(s) shall be programmed to eliminate all resonance frequencies which set up unwanted harmonics and/or vibration. Each frequency shall be tested and bypassed if unacceptable operation is noticed.
F. High Temperature Limit: The high limit thermostat located in the return air of the AHU shall stop the fan(s) upon detection of a temperature above its set point.
G. Low Temperature Limit: The low limit thermostat located in the return air of the AHU shall stop the fan(s) upon detection of a temperature below its set point.
H. High Static Limit - Cold Deck: A manual reset static pressure sensor in the discharge supply plenum downstream of the chilled water coils shall stop the AHU upon detection of duct static pressure above set point.
I. High Static Limit - Hot Deck: A manual reset static pressure sensor in the discharge supply plenum downstream of the chilled water coils shall stop the AHU upon detection of duct static pressure above set point.
J. Smoke Detector: Duct mounted smoke detector(s) shall stop the AHU fans upon detection of products of combustion.
K. Emergency Drain Pan Float Switch shall stop the AHU fans upon a rise in water level in the emergency drain pan above the float switch set point.

L. An alarm shall be sent to the EMS front end upon activation of any or all safety devices.
M. Outside Air Motor Operated Damper(s) shall be scheduled to operate independent of the AHU

Dual Duct AHU Points List:

BO	Fan Start/Stop
BI	Fan Status
BI	Fan Alarm
AO	Fan VFD Speed Control
AI	Chilled Water Coil Leaving Air Temperature
AO	Chilled Water Coil Three (3) Way Chilled Water Control Valve
AI	Hot Water Coil Leaving Air Temperature
AO	Hot Water Coil Three (3) Way Hot Water Control Valve
AI	AHU Return Air Temperature
AI	AHU Mixed Air Temperature
BI	AHU Return Air Temperature Low Limit Controller
AI	Static Pressure Sensors Cold Duct
AI	Static Pressure Sensors Hot Duct
BI	Static Pressure High Limit Cold Deck
BI	Static Pressure High Limit Hot Deck
BI	Smoke Detector(s)
BI	AHU Emergency Drain Pan Float Switch
BO	Outside Air Motorized Damper

DUAL DUCT VARIABLE AIR VOLUME TERMINAL

A. Start-up: When the zone is occupied, the VAV controller modulates the hot and cold dampers to maintain the zone temperature set point within the occupied deadband.
B. Cooling Mode: When the zone temperature rises above the occupied set point. The hot duct damper shall modulate to its minimum heating air flow position. The cold duct damper shall modulate to increase cold airflow form its minimum position toward its maximum position. This modulation shall be proportional to the zone temperature's rise above the cooling setpoint. The total airflow to the zone will increase as the cooling demand increases. When the zone temperature fails back into the deadband range, the cold duct airflow will decrease to its minimum setpoint.
C. Heating Mode: When the zone temperature rises above the occupied set point. The cold duct damper shall modulate to its minimum cooling air flow position. The hot duct damper shall modulate to increase hot airflow form its minimum position toward its maximum position. This modulation shall be proportional to the zone temperature's fall below the heating setpoint. The total airflow to the zone will increase as the heating demand increases. When the zone temperature rises back into the deadband range, the hot duct airflow will decrease to its minimum setpoint.
D. Deadband Mode: The hot and cold duct dampers shall both be at their minimum airflow positions. The controller shall maintain a constant airflow for

ventilation, mixing the minimum hod and cold air volumes. This ensures proper ventilation while minimizing energy consumption from heating and cooling.

E. Unoccupied Mode: Based on the building's time of day schedule, the VAV terminal will enter unoccupied mode. All dampers shall close to pre-programmed unoccupied minimum airflows. Or close entirely if ventilation is not required. The zone temperature shall be allowed to float to a wider set-back range to conserve energy. Unoccupied cooling 78 degrees F (Adjustable) and unoccupied heating 64 degrees F (Adjustable). If zone temperature rises or fall below temperature setpoints, VAV terminal shall operate to maintain unoccupied setpoint deadband range.
F. Each VAV box shall have an independent setback control schedule. Each box shall be programmed independently as directed by the owner. Programming shall be by the TCC. Each box shall have an independent set-back temperature set point. Each Space sensor shall have a programmed high and low space temperature setpoint range programmed by the TCC. The final range shall be as directed by the owner.

Dual Duct VAV Points List:

BO	Box Start/Stop
AI	Cooling CFM
AO	Cooling Damper Control
AI	Heating CFM
AO	Heating Damper Control
AI	Space Temperature
AI	Space Temperature Set point
BI	Space Temperature Override Button

K. HEALTH & FITNESS BUILDING

CHILLED WATER SYSTEM

A. COOLING MODE OFF: When the building is not in the cooling mode (as determined by the Campus FMCS), the building chilled water pumps shall be off. The Building Chilled Water two-way isolation control valves shall be closed.
B. COOLING MODE ON: When the building is in the cooling mode (as determined by the Campus FMCS), the Building chilled water two-way isolation control valves shall open and the chilled water lead pump shall be started. The building control valves shall be modulated as required to maintain building CWS temperature set point (45º F adjustable).
C. CHILLED WATER PUMPS: The FMCS system shall select the lead chilled water pump (alternate each week). The status of the pump shall be monitored through a C.S.R. switch. In the event that the lead pump fails to operate when commanded by the FMCS, as determined by pump "status", then an alarm will be sent to the Campus front end located in the Central Plant and the lag chilled water pump will operate in lieu of the lead chiller water pump.

The lead pump shall be able to be selected by the operator at the operator workstation and automatically alternated by the FMCS.

D. The FMCS shall use chilled water flow (varying central plant flow in the building) and central plant CWS vs. CWR temperature differential (as monitored in the building) to compute the instantaneous chilled water tonnage requirement of the building and monitor this value at the central plant work station.
E. In addition to the building the Temperature Control Contractor (TCC) shall incorporate a chilled water demand screen on the Central Plant work station that indicates CWS/R temperatures for each building on campus with the total instantaneous tonnage requirement for each building. The flow and temperature monitoring for this screen shall be the central plant building tonnage produced vs. tonnage demanded from the following: MPAC, H.&P.E., Bolton Library, Student Center (West, Center, & East), Abrams Hall, Oakland Hall, Coughlin Hall, Chambers Hall, & Science Building.

Chilled Water System Points List:

BO	Pump Start/Stop (Typical for 2, Lead/Lag)
BI	Pump Status (on/off) (Typical for 2)
BO	Pump Lead/Lag
BI	Pump Alarm (1 per pump)
AO	Chilled Water 2-Way Isolation Valve
AO	Chilled Water 3-way Bypass Valve
AI	Building CWS Temperature
AI	Building CWR Temperature
AI	Central Plant CWS Temperature
AI	Central Plant CWR Temperature
AI	Differential Pressure
AI	Central Plant CWR Flow (GPM) (monitored in the building)
AI	Instantaneous Tonnage (flow X temperature differential)

HOT WATER SYSTEM

A. The boilers shall be reintegrated into the system via their BacNET IP connections and all points shall be provided at FMCS workstation.
B. HOT WATER SYSTEM: The hot water system will be enabled through the FMCS (as determined by the FMCS). When the boiler is energized through the FMCS, the boiler control panel shall start the boiler circulating pump and the building hot water pump. The FMCS will monitor building hot water supply and return temperatures. The FMCS shall enable the Hot Water System when reheat coils call for need or by building high humidity levels sensed by any and or all space humidity sensors. The lead building hot water pump shall be started by the FMCS and the building HWS temperature shall be monitored. The Boiler shall be enabled to maintain building HWS temperature.
C. BOILER: The Building's hot water supply temperature shall be monitored and the boiler 3-way hot water control valve shall modulate to maintain building hot water supply temperature at set point (180 degrees F adjustable). Building HWS temperature shall be reset based on O.A. temperature (180 degrees F HWS temperature at 35 degrees F - O.A. temperature and 140

degrees F HWS temperature at 55 degrees F - O.A. temperature). Coordinate final programming of reset range with engineer/owner.

D. HOT WATER PUMPS: The FMCS system shall select the lead hot water pump (alternate each week). The operation of the building's hot water pump(s) is for the lead pump to run continuously. The lead pump shall be able to be selected by the operator at the operator workstation and automatically alternated by the FMCS. The status of the pump shall be monitored through a C.S.R. switch. If the lead pump fails, the lag pump will be started after a 60-second delay and an alarm will be generated at the operator workstation. If the lag pump also fails an alarm will be generated at the operator workstation, and the hot water system will be disabled. The lead pump shall be able to be selected by the operator at the operator workstation and automatically alternated by the FMCS.

E. The heating system shall be programmed to be initiated by the outside air temperature for freeze protection. When the outside air temperature drops below freeze protection set point (40 degrees – adjustable). The Hot Water System shall be enabled and Unit Heaters, F.C.U.'s and V.A.V. Boxes (with hot water heating) shall be initiated for building Freeze protection.

Hot Water Heating System Points List:

BO	Boiler Enable (Typical for 2)
BI	Boiler Status (on/off) (Typical for 2)
BI	Boiler Alarm (Typical for 2)
AI	BLDG HWR Temperature
AI	BLDG HWS Temperature
BO	BLDG HW Pump Start/Stop (Typical for 2)
BI	BLDG HW Pump Status (Typical for 2)
BO	BLDG HW Pump (Lead/Lag)
BI	BLDG HW Pump Alarm (1 per pump)
AI	Boiler HWS Temperature (Typical for 2)
AI	Boiler HWR Temperature (Typical for 2)
AO	Boiler HWS Temperature 3-Way Control Valve (Typical for 2)
AI	O.A. Temperature (Dry Bulb)
AI	O.A. Temperature (Wet Bulb)

SINGLE ZONE AIR HANDLING UNITS (10 UNITS)

A. START/STOP CONTROL: The AHU shall be started and stopped by the FMCS through the local ASC located adjacent to the respective air handling unit through the HOA switch mounted in the cover of the starter/VFD cover. One (1) ASC shall be required per AHU. Spare control points in the ASC shall be used for future expansion. Current sensing relay shall indicate AHU run status and set automatic temperature controls into operation.

B. SAFETIES: A high limit thermostat in the return air shall stop the AHU upon detection of temperature above its set point. A low limit thermostat shall stop the AHU upon detection of temperature below its set point. Duct mounted smoke detector(s) shall stop the AHU, associated ERV (where required) and dehumidifier (AHU 1-4) upon detection of products of combustion. Emergency drain pan float switch shall stop the AHU on a rise in water level in the emergency drain pan.

D. TEMPERATURE CONTROL: Cooling Mode: A sensor in the discharge duct on the AHU shall transmit temperature changes to the ASC panel, which shall modulate the chilled water control valve(s) to maintain a discharge air temperature set point (55 degrees F –adjustable – see AHU submittals for required L.A.T. to meet scheduled capacities). The ASC panel shall increase the AHU fan motor speed when the space temperature rises above the space temperature cooling set point (73 degrees – adjustable) and reduce fan speed when the space temperature drops below the space temperature cooling set point. A space temperature sensor in the space shall transmit temperature changes to the ASC panel, which shall control the AHU fan speed. One cooling coil LAT sensor shall be used to monitor LAT of each cooling coil. Where multiple coils and control valves are used, the coil L.A.T. shall be controlled by the coil sensor and the duct sensor shall allow reset of the coil L.A.T. to compensate for the heat gain through the fan section. The heating coil control valve(s) shall be closed to the heating coil during the cooling mode.

G. Heating Mode: When the space temperature drops below the space temperature heating set point (68 degrees F – adjustable) the ASC panel shall increase the AHU fan speed to a fixed CFM set point (75% of maximum – adjustable) and the ASC panel shall modulate the hot water control valve(s) as required to maintain the space temperature heating set point. The chilled water control valve(s) shall be closed to the cooling coil(s) during the heating mode. Separate sensors shall be provided for each cooling or heating coil(s). AHU's with staggered or multiple coils shall be required to have multiple LAT sensors, in addition to the discharge air temperature sensor.

S. SHUTDOWN CONTROL: Stopping the AHU supply fan shall de-energize the control system. The chilled water control valve(s) and hot water control valve(s) shall close to their respective coils.

T. The ERV shall be enabled separately from the respective AHU.

U. Space humidity shall be monitored by the ASC and initiate start-up of the chilled water system, hot water system, and AHU when the space humidity rises above space humidity set point (75% RH – adjustable). When space humidity levels rise above the space humidity set point, the AHU fan speed shall increase to a fixed CFM set point (75% of maximum – adjustable), the chilled water control valve(s) shall modulate open to the coil(s) to maintain a set cooling coil LAT (53 degrees F – adjustable), and the heating coil control valve(s) shall modulate open to the heating coil(s) as required to maintain space temperature set point. When the space humidity level drops 3% below the space humidity set point, the controls shall return to the cooling or heating mode, or unoccupied mode.

V. Provide programming to start respective AHU, pumps (CW and/or HW), etc. when the override button on the space temperature sensor is pushed. Each AHU override shall be programmed independently for active or inactive status as directed by the owner. Active or inactive status shall be selected by the owner on an individual AHU basis.

W. Each AHU shall have an independent setback control schedule. Each AHU shall be programmed independently as directed by the owner. Programming shall be by the TCC. Each AHU shall have an independent setback temperature set point and humidity set point. Each Space sensor shall have a programmed high and low space temperature setpoint range programmed by the TCC. The final range shall be as directed by the owner.

X. Freeze protection: During the unoccupied mode, and when initiated by the outdoor air sensor, each AHU shall be enabled to allow for building freeze protection. Each AHU shall be in the heating mode to maintain a space temperature set point (55 degrees F – adjustable).

Single Zone Air Handling Units Points List (10 UNITS):

BO	Fan/VFD Start/Stop
BI	Fan/VFD Status
AO	Variable Frequency Drive Speed Control
AO	CHW Control Valve (3-Way) (one per coil)
AO	HW Control Valve (3-Way) (one per coil)
AI	Space Temperature
AI	Space Temperature Set point
BI	Space Temperature Override Button
AI	Entering Air Temperature (AHU)
AI	Leaving Air Temperature (coil) (one per coil)
AI	Leaving Air Temperature (AHU) (discharge of AHU)
BI	Entering Air Temperature High Limit
BI	Low Temperature Limit
BI	Emergency Drain Pan Float Switch
BI	Smoke Detector (AHU/ERV Shutdown)
AI	Space Humidity (monitoring)
AI	Space Humidity Set point (monitoring to initiate de-humidification mode)

EXHAUST FAN (Girls Locker Room, SW Attic, Central Attic, Above Gym

A. Fan shall be started and stopped based on programmed schedule.

Exhaust Fan Points List (Girls Locker Room, SW Attic, Central Attic, Above Gym)

BO	Fan Start/Stop
BI	Fan Status

L. OAKLAND HALL

CHILLED WATER SYSTEM

A. COOLING MODE OFF: When the building is not in the cooling mode (as determined by the Campus FMCS), the building chilled water pumps shall be off.
B. COOLING MODE ON: When the building is in the cooling mode (as determined by the Campus FMCS), the building chilled water water pump shall be started.
C. CHILLED WATER PUMP: The FMCS system shall start the chilled water pump. The status of the pump shall be monitored through a C.S.R. switch. In the event that the pump fails to operate when commanded by the FMCS,

as determined by pump "status", then an alarm will be sent to the Campus front end located in the Central Plant

Chilled Water System Points List:

BO	Pump Start/Stop
BI	Pump Status (on/off)
BI	Pump Alarm
AI	Building CWS Temperature
AI	Building CWR Temperature

HOT WATER SYSTEM

A. The boilers shall be reintegrated into the system via their BacNET IP connections and all points shall be provided at FMCS workstation.
B. HOT WATER SYSTEM: The hot water system will be enabled through the FMCS (as determined by the FMCS). When the boiler is energized through the FMCS, the boiler control panel shall start the boiler circulating pump and the building hot water pump. The FMCS will monitor building hot water supply and return temperatures. The FMCS shall enable the Hot Water System when reheat coils call for need or by building high humidity levels sensed by any and or all space humidity sensors. The lead building hot water pump shall be started by the FMCS and the building HWS temperature shall be monitored. The Boiler shall be enabled to maintain building HWS temperature.
C. BOILER: The Building's hot water supply temperature shall be monitored and the boiler 3-way hot water control valve shall modulate to maintain building hot water supply temperature at set point (180 degrees F adjustable). Building HWS temperature shall be reset based on O.A. temperature (180 degrees F HWS temperature at 35 degrees F - O.A. temperature and 140 degrees F HWS temperature at 55 degrees F - O.A. temperature). Coordinate final programming of reset range with engineer/owner.
D. HOT WATER PUMPS: The FMCS system shall start the hot water pump The status of the pump shall be monitored through a C.S.R. switch.
E. The heating system shall be programmed to be initiated by the outside air temperature for freeze protection. When the outside air temperature drops below freeze protection set point (40 degrees – adjustable). The Hot Water System shall be enabled and Unit Heaters, F.C.U.'s and V.A.V. Boxes (with hot water heating) shall be initiated for building Freeze protection.

Hot Water Heating System Points List:

BO	Boiler Enable
BI	Boiler Status (on/off)
BI	Boiler Alarm
BO	BLDG HW Pump Start/Stop
BI	BLDG HW Pump Status
AI	BLDG HWR Temperature
AI	BLDG HWS Temperature
AI	Boiler HWS Temperature

AI	Boiler HWR Temperature
AO	Boiler HWS Temperature 3-Way Control Valve
AI	O.A. Temperature (Dry Bulb)
AI	O.A. Temperature (Wet Bulb)

MULTI-ZONE VARIABLE AIR VOLUME (MZVAV) – AIR HANDLING UNIT

A. STARTUP: MZVAV shall be started and stopped by the BMS through the local Control Panel through the HOA switch mounted in the variable frequency drive. The VFD shall be located within the AHU equipment room. One (1) Control Panel Application Specific Controllers (ASC) will be required per AHU. Spare control points in the ASC shall be for future expansion. A current sensing relay shall indicate air handling unit fan status back to local ASC and place automatic controls in operation.

B. SAFETIES: High limit thermostat in return air located at the RTU shall stop the RTU fan upon detection of temperature above its set point. A low limit thermostat in the mixed return air stream shall stop the AHU fan upon detection of temperature below its set point. A manual reset static pressure high limit sensor in the discharge duct downstream of the AHU fan shall stop the AHU fan upon detection of duct static pressure above its set point (2.5@ B adjustable). Duct mounted smoke detector(s) shall stop the AHU fan upon detection of products of combustion (one in R.A. per IMC and one in S. A. Per NFPA). Emergency drain pan float switch shall stop the unit fan on a rise in water level in the emergency drain pan above float switch set point. Interlock fire/smoke dampers (FSD) with respective AHU and fire alarm system. AHU shall shut off and FSD shall close on actuation of smoke detector(s) (supply duct, return air, or space mounted detectors via a signal from the Fire Alarm system). Coordinate with fire alarm system contractor. Stopping the Unit fan shall de-energize the control system. The chilled water control valve(s) shall close to their respective coils. An alarm shall be sent to the workstation upon activation of any or all safety devices.

C. TEMPERATURE CONTROL: A temperature sensor in the supply duct downstream of the RTU discharge shall transmit temperature changes to the local ASC.

1. Cooling Mode: The ASC shall modulate the chilled water control valve(s) (one per coil) to maintain discharge air temperature set point (52 degrees F adjustable see AHU submittals for required L.A.T. to meet scheduled capacities). One coil sensor shall be used to monitor LAT of each cooling coil. One sensor and one 3-way control valve shall be provided for each cooling coil. AHU's with staggered or multiple coils shall be required to have multiple LAT sensors and multiple 3-way control valves, in addition to the discharge air temperature sensor located downstream of the fan section. Where multiple coils and valves are used, the coil L.A.T. shall be controlled by the coil sensor and the duct sensor shall allow reset of the coil L.A.T. to compensate for the heat gain through the fan section. All control valves shall be closed to the cooling coil when the AHU is OFF.
2. Heating Mode: The ASC shall modulate the hot water control valve(s) (one per coil) to maintain discharge air temperature set point (90 degrees F adjustable) One coil sensor shall be used to monitor LAT of each cooling coil. One sensor and one 3-way control valve shall be

provided for each cooling coil. When space temperature drops below the heating set point (68 degrees F - Adjustable), the hot water heating coil control 3-way valve shall modulate as required to maintain space temperature heating set point. The cooling coil control valve shall be closed to the cooling coil during the heating mode.

3. Pre-Heating Mode (if applicable): When outside air temperature is below (36 degrees F - Adjustable), the pre heating coil two way control valve shall modulate open to heat mixed return/outside air to unit set LAT. (52 Degrees – Adjustable) One coil sensor shall be used to monitor LAT of each pre-heating coil. One sensor and one 2-way control valve shall be provided for each pre-heating coil. AHU=s with staggered or multiple coils shall be required to have multiple LAT sensors and multiple 2-way control valves

D. Space humidity shall be monitored by the ASC and initiate start-up of the chilled water system, and AHU when the space humidity rises above set point (70% RH adjustable).

MZVAV Air Handling Units Point List:
(Each Unit shall have similar but independent control points)

BO Fan - Start/Stop
BI Fan - Status (On/Off)
AO Chilled Water Coil - Control Valve (3-Way) (on per cooling coil)
AI Entering Air Temperature (at AHU)
AI Leaving Air Temperature (Cooling coil) (one per cooling coil)
AI Leaving Air Temperature (AHU) (duct mounted on discharge side of AHU fan)
AO Leaving Air Temperature Reset Programming
BI Duct Static Pressure - High Limit (at unit discharge)
AI Duct Static Pressure (VFD control) (sensor at 2/3 downstream in duct system)
BI Entering Air Temperature - High Limit
BI Entering Air Temperature - Low Limit
BI Smoke Detector (AHU Shut down)(one in supply per NFPA and one in return per IMC)
AI Space Humidity (general space humidity monitoring)(1 required per unit)
AI Space Humidity Set point (monitoring to initiate cooling mode and / or heating mode)
BI Smoke Damper (AHU Shutdown where required)

MZVAV ZONE DAMPER Points Lists:

A. Cooling/Heating Mode: The VAV zone damper shall modulate open as the space temperature rises above the space temperature set point and close as space temperature drops below space temperature set point (72 degrees F - Adjustable).

B. VAV zone dampers shall close damper 100% when it's respective AHU is shutdown.

C. Provide programming to restart respective air handing unit, pumps, etc. and open damper when the VAV zone damper override button on space temperature sensor is pushed. Each VAV zone damper override shall be programmed independently for active or inactive status per direction by owner. Active or inactive status shall be selected by the owner on an individual box basis.

D. Each VAV zone damper shall have an independent setback control schedule. Each box shall be programmed independently as directed by the owner. Programming shall be by the TCC. Each box shall have an independent setback temperature set point. Each Space sensor shall have a programmed high and low space temperature set point range programmed by the TCC. The final range shall be as directed by the owner. When authorized and there is a call for cooling, the respective AHU shall start and be controlled to satisfy the setback cooling requirements of the space controlled by the individual VAV zone damper.

E. Damper position feedback shall be provided for each zone for AHU duct static pressure reset programming.

MZVAV Zone Damper Points List:

BO	Box Start/Stop
AI	CFM
AO	Damper Control
AI	Space Temperature

M. SCIENCE BUILDING

CHILLED WATER SYSTEM

A. COOLING MODE OFF: When the building is not in the cooling mode (as determined by the Campus FMCS), the building chilled water pumps shall be off. The Building Chilled Water two-way isolation control valves shall be closed.

B. COOLING MODE ON: When the building is in the cooling mode (as determined by the Campus FMCS), the Building chilled water two-way isolation control valves shall open and the chilled water lead pump shall be started. The building control valves shall be modulated as required to maintain building CWS temperature set point (45º F adjustable).

C. CHILLED WATER PUMPS: The FMCS system shall select the lead chilled water pump (alternate each week). The status of the pump shall be monitored through a C.S.R. switch. In the event that the lead pump fails to operate when commanded by the FMCS, as determined by pump "status", then an alarm will be sent to the Campus front end located in the Central Plant and the lag chilled water pump will operate in lieu of the lead chiller water pump. The lead pump shall be able to be selected by the operator at the operator workstation and automatically alternated by the FMCS.

D. The FMCS shall use chilled water flow (varying central plant flow in the building) and central plant CWS vs. CWR temperature differential (as monitored in the building) to compute the instantaneous chilled water tonnage requirement of the building and monitor this value at the central plant work station.

E. In addition to the building the Temperature Control Contractor (TCC) shall incorporate a chilled water demand screen on the Central Plant work station that indicates CWS/R temperatures for each building on campus with the total instantaneous tonnage requirement for each building. The flow and temperature monitoring for this screen shall be the central plant building tonnage pro-

duced vs. tonnage demanded from the following: MPAC, H.&P.E., Bolton Library, Student Center (West, Center, & East), Abrams Hall, Oakland Hall, Coughlin Hall, Chambers Hall, & Science Building.

Chilled Water System Points List:

BO	Pump Start/Stop (Typical for 2, Lead/Lag)
BI	Pump Status (on/off) (Typical for 2)
BO	Pump Lead/Lag
BI	Pump Alarm (1 per pump)
AO	Chilled Water 2-Way Isolation Valve
AO	Chilled Water 3-way Bypass Valve
AI	Building CWS Temperature
AI	Building CWR Temperature
AI	Central Plant CWS Temperature
AI	Central Plant CWR Temperature
AI	Differential Pressure
AI	Central Plant CWR Flow (GPM) (monitored in the building)
AI	Instantaneous Tonnage (flow X temperature differential)

HOT WATER SYSTEM

A. The boilers shall be reintegrated into the system via their BacNET IP connections and all points shall be provided at FMCS workstation.
B. HOT WATER SYSTEM: The hot water system will be enabled through the FMCS (as determined by the FMCS). When the boiler is energized through the FMCS, the boiler control panel shall start the boiler circulating pump and the building hot water pump. The FMCS will monitor building hot water supply and return temperatures. The FMCS shall enable the Hot Water System when reheat coils call for need or by building high humidity levels sensed by any and or all space humidity sensors. The lead building hot water pump shall be started by the FMCS and the building HWS temperature shall be monitored. The Boiler shall be enabled to maintain building HWS temperature.
C. BOILER: The Building's hot water supply temperature shall be monitored and the boiler 3-way hot water control valve shall modulate to maintain building hot water supply temperature at set point (180 degrees F adjustable). Building HWS temperature shall be reset based on O.A. temperature (180 degrees F HWS temperature at 35 degrees F - O.A. temperature and 140 degrees F HWS temperature at 55 degrees F - O.A. temperature). Coordinate final programming of reset range with engineer/owner.
D. HOT WATER PUMPS: The FMCS system shall select the lead hot water pump (alternate each week). The operation of the building's hot water pump(s) is for the lead pump to run continuously. The lead pump shall be able to be selected by the operator at the operator workstation and automatically alternated by the FMCS. The status of the pump shall be monitored through a C.S.R. switch. If the lead pump fails, the lag pump will be started after a 60-second delay and an alarm will be generated at the operator workstation. If the lag pump also fails an alarm will be generated at the operator workstation, and the hot water system will be disabled. The lead pump shall

be able to be selected by the operator at the operator workstation and automatically alternated by the FMCS.

E. The heating system shall be programmed to be initiated by the outside air temperature for freeze protection. When the outside air temperature drops below freeze protection set point (40 degrees – adjustable). The Hot Water System shall be enabled and Unit Heaters, F.C.U.'s and V.A.V. Boxes (with hot water heating) shall be initiated for building Freeze protection.

Hot Water Heating System Points List:

BO	Boiler Enable (Typical for 2)
BI	Boiler Status (on/off) (Typical for 2)
BI	Boiler Alarm (Typical for 2)
AI	BLDG HWR Temperature
AI	BLDG HWS Temperature
BO	BLDG HW Pump Start/Stop (Typical for 2)
BI	BLDG HW Pump Status (Typical for 2)
BO	BLDG HW Pump (Lead/Lag)
AI	Boiler HWS Temperature (Typical for 2)
AI	Boiler HWR Temperature (Typical for 2)
AO	Boiler HWS Temperature 3-Way Control Valve (Typical for 2)
AI	O.A. Temperature (Dry Bulb)
AI	O.A. Temperature (Wet Bulb)

VARIABLE AIR VOLUME AIR HANDLING UNIT

A. STARTUP: VAV AHU shall be started and stopped by the FMCS through the local Control Panel through the HOA switch mounted in the variable frequency drive. The VFD shall be located within the AHU equipment room. Spare control points in the ASC shall be for future expansion. A current sensing relay shall indicate air handling unit fan status back to local FMCS and place automatic controls in operation.

B. SAFETIES: High limit thermostat in return air located at the RTU shall stop the RTU fan upon detection of temperature above its set point. A low limit thermostat in the mixed return air stream shall stop the AHU fan upon detection of temperature below its set point. A manual reset static pressure high limit sensor in the discharge duct downstream of the AHU fan shall stop the AHU fan upon detection of duct static pressure above its set point (2.5" – adjustable). Duct mounted smoke detector(s) shall stop the AHU fan upon detection of products of combustion (one in R.A. per IMC and one in S. A. Per NFPA). Emergency drain pan float switch shall stop the unit fan on a rise in water level in the emergency drain pan above float switch set point. Interlock fire/smoke dampers (FSD) with respective AHU and fire alarm system. AHU shall shut off and FSD shall close on actuation of smoke detector(s) (supply duct, return air, or space mounted detectors via a signal from the Fire Alarm system). Coordinate with fire alarm system contractor. Stopping the Unit fan shall de-energize the control system. The chilled water control valve(s) shall close to their respective coils. An alarm shall be sent to the workstation upon activation of any or all safety devices.

C. TEMPERATURE CONTROL: A temperature sensor in the supply duct downstream of the RTU discharge shall transmit temperature changes to the local ASC.

1. Cooling Mode: The ASC shall modulate the chilled water control valve(s) to maintain discharge air temperature set point (52 degrees F – adjustable). All control valves shall be closed to the cooling coil when the AHU is OFF.

D. Space humidity shall be monitored by the ASC and initiate start-up of the chilled water system, and AHU when the space humidity rises above set point (70% RH adjustable).

VARIABLE VOLUME AIR HANDING UNITS (1-1, 1-2, 1-3, 2-1, 2-2 and 2-3)

VAV Air Handling Units Points List: (1-1, 1-2, 1-3, 2-1, 2-2, and 2-3):

BO	Fan Start/Stop
BI	Fan Status
BI	Fan Alarm
AO	Variable Frequency Drive Speed
AO	CHW Valve (2-Way)
BI	Smoke Detector
AI	Entering Air Temp
AI	Leaving Air Temp
BI	Emergency Drain Float
AI	Duct static Pressure
DI	Duct Static High Limit
DI	Low Limit Temp
BO	O.A. Damper
AI	Space Humidity
AI	Space Humidity Setpoint

CONSTANT VOLUME AIR HANDLING UNIT (1-4)

Constant Volume Air Handing Units (1-4) and Fan Coil Unit (FCU-1) Points List:

BO	Start/Stop
BI	Status
BI	Alarm
AO	CHW Valve (2-Way)
AO	HW Valve (3-Way)
AI	Space Temp
AI	Space Temp Setpoint
BI	Smoke Detector
AI	Entering Air Temp (AHU)
AI	Leaving Air Temp (AHU)
BI	Low Temp Limit Alarm
BI	Emergency Drain Float
BO	O.A. Damper
AI	Space Humidity
AI	Space Humidity Setpoint

100% OUTSIDE AIR AIR HANDLING UNIT

100% O.A. Air Handling Unit Points List: (STOCK ROOM 236):

BO	Start/Stop
BI	Status
BI	Alarm
AO	CHW Valve (2-Way)
AO	HW Valve (3-Way)
AI	Space Temp
AI	Space Temp Setpoint
BI	Smoke Detector
AI	Entering Air Temp (AHU)
AI	Leaving Air Temp (AHU)
BI	Low Temp Limit Alarm
BI	Emergency Drain Float
BO	O.A. Damper
AI	Space Humidity
AI	Space Humidity Setpoint

EXHAUST FANS

Exhaust Fans Points List: (NO. 1-4):

BO	Fan Start/Stop
BI	Fan Status
BI	Alarm

PARALELL VAV TERMINAL BOX WITH HOT WATER HEAT

A. Time of Day programmed - Occupied Mode: The VAV box damper shall modulate open to the maximum scheduled CFM set point.

B. Cooling Mode: The VAV box cooling damper shall modulate open as the space temperature rises above the space temperature cooling set point (74 degrees F-Adjustable) and close as space temperature drops below the space temperature cooling set point.

C. Heating Mode: The VAV box cooling air flow damper shall be at minimum set position. When the space temperature drops below the heating set-point, the fan shall be energized. If the space temperature continues to drop below set point, the hot water heating coil valve shall modulate open to maintain space temperature heating set point.

D. Fan powered VAV boxes shall close the colling damper 100% and close the hot water heating coil valve when the VAV box is scheduled off.

E. Provide programming to restart respective air handing unit, pumps, etc. and open box when the VAV box override button on space temperature sensor is pushed. Each VAV box override shall be programmed independently for active or inactive status per direction by owner. Active or inactive status shall be selected by the owner on an individual box basis. VAV boxes shall be programmed independent from the respective AHU. VAV boxes shall be initiated for a warm up mode without the AHU being on. The programming shall allow the VAV box fan to operate and hot water

heating valve to be modulated to maintain space temperature while the respective AHU (and/or RTU) remains off.

F. Each VAV box shall have an independent setback control schedule. Each box shall be programmed independently as directed by the owner. Programming shall be by the TCC. Each box shall have an independent setback temperature set point. Each Space sensor shall have a programmed high and low space temperature set point range programmed by the TCC. The final range shall be as directed by the owner. When authorized and there is a call for cooling, the respective AHU shall start and be controlled to satisfy the setback cooling requirements of the space controlled by the individual VAV Box.

G. The VAV Box shall be controlled by the respective space temperature and space humidity sensors associated with the respective VAV Box sensors. The VAV Box shall provide minimum or maximum cooling CFM as scheduled. The VAV Box shall provide re-heat control – Hot Water heating shall modulate as required to maintain space temperature as sensed by the respective VAV Box space temperature sensor.

H. Freeze protection: During the unoccupied mode, and when initiated by the outdoor air sensor, each box shall be enabled (with the respective AHU off) to allow for building freeze protection. Each box fan shall turn on and the hot water heating valve shall modulate to maintain a space temperature set point (65 degrees F – adjustable).

I. Humidity Control: When the respective space humidity is above set point (70% RH - adjustable), the heating coil shall modulate as required to maintain a VAV Box Leaving Air Temperature at Humidity Control set point (74 degrees F - Adjustable). The VAV Box shall return to the required mode of operation (Occupied, Un-Occupied, or Off) after the space humidity drops below set point (60% RH - Adjustable).

J. Damper position feed back shall be provided for each box for AHU duct static pressure reset programming.

Fan Powered VAV Boxes Points List:

BO	Box Start/Stop
AO	Maximum CFM Set Point
AO	Minimum CFM Set point
AI	Cooling CFM
AO	Cooling Damper
AI	Space Temp
AO	Space Temp Setpoint
AI	Space Humidity (From respective space Humidity Sensor)
AO	Space Humidity Set Point
BO	Fan Start/Stop
AO	Hot Water Coil Valve (3-Way)

THROUGH-THE-WALL HEAT PUMP UNITS

Through-The-Wall Heat Pumps Points List:

BO	Unit Start/Stop
BI	Unit Status

MINI – SPLIT SYSTEM (RM: 108)

A. The FMCS shall monitor space temperature and humidity. Override push button shall allow system to be operated outside of programmed times. The split system shall be controlled by a thermostat provided by AHU manufacturer and shall be wired by TCC. High limit thermostat in return air shall stop the respective unit upon detection of temperature above its set point. A low limit thermostat shall stop the AHU upon detection of temperature below its set point. Emergency drain pan float switch (where required) shall stop the unit on a rise in water level in the emergency drain pan. Each Space sensor shall have a programmed high and low space temperature and humidity setpoint range programmed by the TCC. The final range shall be as directed by the owner. Equipment may be turned off by the FMCS when in the acceptable temperature and humidity range.
B. Provide thermostat kits for all mini-split systems to allow for integration with new control system.

Mini - Split System Equipment Points List:

BI	Unit Status
AI	Space Temperature (Monitoring)
BI	Space Temperature Override Button
AI	Space Humidity
BI	High Temp Alarm

K. STUDENT CENTER – WEST WING

CHILLED WATER SYSTEM

A. COOLING MODE OFF: When the building is not in the cooling mode (as determined by the Campus FMCS), the building chilled water pump shall be off. The Building Chilled Water two-way isolation control valves shall be closed.
B. COOLING MODE ON: When the building is in the cooling mode (as determined by the Campus FMCS), the building chilled water two-way isolation control valves shall open and the chilled water pump shall be started. The building control valves shall be modulated as required to maintain building CWS temperature set point (45º F adjustable).
C. CHILLED WATER PUMPS: The FMCS system shall select the chilled water pump. The status of the pump shall be monitored through a C.S.R. switch. In the event that the pump fails to operate when commanded by the FMCS, as determined by pump "status", then an alarm will be sent to the Campus front end located in the Central Plant.
D. The FMCS shall use chilled water flow (varying central plant flow in the building) and central plant CWS vs. CWR temperature differential (as monitored in

the building) to compute the instantaneous chilled water tonnage requirement of the building and monitor this value at the central plant work station.

E. In addition to the building the Temperature Control Contractor (TCC) shall incorporate a chilled water demand screen on the Central Plant work station that indicates CWS/R temperatures for each building on campus with the total instantaneous tonnage requirement for each building. The flow and temperature monitoring for this screen shall be the central plant building tonnage produced vs. tonnage demanded from the following: MPAC, H.&P.E., Bolton Library, Student Center (West, Center, & East), Abrams Hall, Oakland Hall, Coughlin Hall, Chambers Hall, & Science Building.

Chilled Water System Points List:

BO	Pump Start/Stop
BI	Pump Status (on/off)
BI	Pump Alarm
AO	Chilled Water 2-Way Isolation Valve
AO	Chilled Water 3-way Bypass Valve
AI	Building CWS Temperature
AI	Building CWR Temperature
AI	Central Plant CWS Temperature
AI	Central Plant CWR Temperature
AI	Differential Pressure
AI	Central Plant CWR Flow (GPM) (monitored in the building)
AI	Instantaneous Tonnage (flow X temperature differential)

HOT WATER SYSTEM

A. The boilers shall be reintegrated into the system via their BacNET IP connections and all points shall be provided at FMCS workstation.

B. HOT WATER SYSTEM: The hot water system will be enabled through the FMCS (as determined by the FMCS). When the boiler is energized through the FMCS, the boiler control panel shall start the boiler circulating pump and the building hot water pump. The FMCS will monitor building hot water supply and return temperatures. The FMCS shall enable the Hot Water System when reheat coils call for need or by building high humidity levels sensed by any and or all space humidity sensors. The lead building hot water pump shall be started by the FMCS and the building HWS temperature shall be monitored. The Boiler shall be enabled to maintain building HWS temperature.

C. BOILER: The Building's hot water supply temperature shall be monitored and the boiler 3-way hot water control valve shall modulate to maintain building hot water supply temperature at set point (180 degrees F adjustable). Building HWS temperature shall be reset based on O.A. temperature (180 degrees F HWS temperature at 35 degrees F - O.A. temperature and 140 degrees F HWS temperature at 55 degrees F - O.A. temperature). Coordinate final programming of reset range with engineer/owner.

D. HOT WATER PUMPS: The FMCS system shall start the hot water pump The status of the pump shall be monitored through a C.S.R. switch.

E. The heating system shall be programmed to be initiated by the outside air temperature for freeze protection. When the outside air temperature drops

below freeze protection set point (40 degrees – adjustable). The Hot Water System shall be enabled and Unit Heaters, F.C.U.'s and V.A.V. Boxes (with hot water heating) shall be initiated for building Freeze protection.

Hot Water Heating System Points List:

BO	Boiler Enable
BI	Boiler Status (on/off)
BI	Boiler Alarm
BO	BLDG HW Pump Start/Stop
BI	BLDG HW Pump Status
BI	BLDG HW Pump Alarm
AI	BLDG HWR Temperature
AI	BLDG HWS Temperature
AI	Boiler HWS Temperature
AI	Boiler HWR Temperature
AO	Boiler HWS Temperature 3-Way Control Valve
AI	O.A. Temperature (Dry Bulb)
AI	O.A. Temperature (Wet Bulb)

VARIABLE VOUME AIR HANDLING UNIT

A. STARTUP: VAV AHU shall be started and stopped by the FMCS through the local ASC located adjacent to the respective air handling unit through the HOA switch mounted in cover of the variable frequency drive. One (1) ASC will be required per AHU. Spare control points in the ASC shall be for future expansion. A current sensing relay shall indicate air handling unit fan status back to local ASC and place automatic controls in operation.
B. SAFETIES: High limit thermostat in return air located at the AHU shall stop the AHU fan upon detection of temperature above its set point. A low limit thermostat shall stop the AHU fan upon detection of temperature below its set point. A manual reset static pressure high limit sensor in the discharge duct downstream of the AHU fan shall stop the AHU fan upon detection of duct static pressure above its set point (2.5" – adjustable). Duct mounted smoke detector(s) shall stop the AHU fan and associated ERV upon detection of products of combustion. Emergency drain pan float switch shall stop the unit fan on a rise in water level in the emergency drain pan above float switch set point.
   On AHU 2-2, interlock fire/smoke dampers (FSD) with AHU and fire alarm system. AHU shall shut off and FSD shall close on actuation of smoke detector(s) (duct or space mounted detectors). Coordinate with fire alarm system.
C. TEMPERATURE CONTROL: A temperature sensor in the duct downstream of the AHU discharge shall transmit temperature changes to the local ASC. The ASC shall modulate the chilled water valve(s) to maintain discharge air temperature set point (55 degrees F – adjustable – see AHU submittals for required L.A.T. to meet scheduled capacities). One coil sensor shall be used to monitor LAT of each cooling coil. One sensor will be provided for each cooling coil. AHU's with staggered or multiple coils shall be required to have multiple LAT sensors, in addition to the discharge air temperature sensor. Where multiple coils and valves are used, the coil L.A.T. shall be controlled

by the coil sensor and the duct sensor shall allow reset of the coil L.A.T. to compensate for the heat gain through the fan section.

G. STATIC PRESSURE CONTROL: Differential pressure transmitter(s) shall sense duct differential pressure(s) of the air distribution system at locations near the end of the duct, and shall transmit pressure changes back to the AHU ASC controller. The ASC controller shall modulate the variable frequency drive to maintain duct static pressure set point (3/4" at the end of the duct - adjustable). ASC shall provide a 4-20mA signal to the variable frequency drive to modulate the fan speed. The lower reading of the two static pressure sensors shall be used to control the VFD. All units shall have two duct static pressure sensors.
H. The respective ERV shall be enabled separately from the respective AHU(s).
I. Space humidity shall be monitored by the ASC and initiate start-up of the chilled water system and AHU when the space humidity rises above set point (75% RH – adjustable).

VAV Air Handling Units Points List:

BO	Fan/ VFD Start/Stop
BI	FAN/VFD Status
AO	Variable Frequency Drive Speed Control
AO	CHW Valve (3-Way) (one per coil)
AI	Entering Air Temperature (AHU)
AI	Leaving Air Temperature (coil) (one per coil)
AI	Leaving Air Temperature (AHU) (discharge of AHU)
AI	Duct Static Pressure (2 per unit)
DI	Duct Static High Limit (at unit discharge)
AI	Entering Air Temperature High Limit
DI	Low Limit Temperature
BI	Emergency Drain Pan Float Switch
BI	Smoke Detector (AHU/ERV Shut down)
AI	Space Humidity (monitoring)
AI	Space Humidity Set point (monitoring to initiate cooling mode and / or heating mode)

VARIABLE VOLUME AIR TERMINAL

A. Cooling Mode: The VAV box cooling damper shall modulate open as the space temperature rises above the space temperature set point and close as space temperature drops below space temperature set point (74 degrees F - Adjustable).
B. VAV boxes shall close damper 100% when it's respective AHU is shutdown.
C. Provide programming to restart respective air handing unit, pumps (CW and/or HW), etc. and open box when the VAV box override button on space temperature sensor is pushed. Each VAV box override shall be programmed independently for active or inactive status per direction by owner. Active or inactive status shall be selected by the owner on an individual box basis.
D. Each VAV box shall have an independent setback control schedule. Each box shall be programmed independently as directed by the owner. Programming shall be by the TCC. Each box shall have an independent setback temperature

set point. Each Space sensor shall have a programmed high and low space temperature set point range programmed by the TCC. The final range shall be as directed by the owner. When authorized and there is a call for cooling , the respective AHU shall start and be controlled to satisfy the setback cooling requirements of the space controlled by the individual VAV Box.

E. Damper position feedback shall be provided for each box for AHU duct static pressure reset programming.

Variable Air Volume Terminal Boxes (Cooling Only)

BO	Box Start/Stop
AI	Cooling CFM
AO	Cooling Damper Control
AI	Space Temperature
AI	Space Temperature Setpoint
AI	Space Humidity
AI	Space Humidity Setpoint
AI	VAV Box Leaving Air Temperature

STUDENT CENTER – CENTRAL WING

CHILLED WATER SYSTEM

A. COOLING MODE OFF: When the building is not in the cooling mode (as determined by the Campus FMCS), the building chilled water pumps shall be off. The Building Chilled Water two-way isolation control valves shall be closed.
B. COOLING MODE ON: When the building is in the cooling mode (as determined by the Campus FMCS), the Building chilled water two-way isolation control valves shall open and the chilled water lead pump shall be started. The building control valves shall be modulated as required to maintain building CWS temperature set point (45º F adjustable).
C. CHILLED WATER PUMPS: The FMCS system shall select the lead chilled water pump (alternate each week). The status of the pump shall be monitored through a C.S.R. switch. In the event that the lead pump fails to operate when commanded by the FMCS, as determined by pump "status", then an alarm will be sent to the Campus front end located in the Central Plant and the lag chilled water pump will operate in lieu of the lead chiller water pump. The lead pump shall be able to be selected by the operator at the operator workstation and automatically alternated by the FMCS.
D. The FMCS shall use chilled water flow (varying central plant flow in the building) and central plant CWS vs. CWR temperature differential (as monitored in the building) to compute the instantaneous chilled water tonnage requirement of the building and monitor this value at the central plant work station.
E. In addition to the building the Temperature Control Contractor (TCC) shall incorporate a chilled water demand screen on the Central Plant work station that indicates CWS/R temperatures for each building on campus with the total instantaneous tonnage requirement for each building. The flow and temperature monitoring for this screen shall be the central plant building tonnage produced vs. tonnage demanded from the following: MPAC, H.&P.E., Bolton Li-

brary, Student Center (West, Center, & East), Abrams Hall, Oakland Hall, Coughlin Hall, Chambers Hall, & Science Building.

Chilled Water System Points List:

BO	Pump Start/Stop (Typical for 2, Lead/Lag)
BI	Pump Status (on/off) (Typical for 2)
BO	Pump Lead/Lag
BI	Pump Alarm (1 per pump)
AO	Chilled Water 2-Way Isolation Valve
AO	Chilled Water 3-way Bypass Valve
AI	Building CWS Temperature
AI	Building CWR Temperature
AI	Central Plant CWS Temperature
AI	Central Plant CWR Temperature
AI	Differential Pressure
AI	Central Plant CWR Flow (GPM) (monitored in the building)
AI	Instantaneous Tonnage (flow X temperature differential)

HOT WATER SYSTEM

A. The boilers shall be reintegrated into the system via their BacNET IP connections and all points shall be provided at FMCS workstation.
B. HOT WATER SYSTEM: The hot water system will be enabled through the FMCS (as determined by the FMCS). When the boiler is energized through the FMCS, the boiler control panel shall start the boiler circulating pump and the building hot water pump. The FMCS will monitor building hot water supply and return temperatures. The FMCS shall enable the Hot Water System when reheat coils call for need or by building high humidity levels sensed by any and or all space humidity sensors. The lead building hot water pump shall be started by the FMCS and the building HWS temperature shall be monitored. The Boiler shall be enabled to maintain building HWS temperature.
C. BOILER: The Building's hot water supply temperature shall be monitored and the boiler 3-way hot water control valve shall modulate to maintain building hot water supply temperature at set point (180 degrees F adjustable). Building HWS temperature shall be reset based on O.A. temperature (180 degrees F HWS temperature at 35 degrees F - O.A. temperature and 140 degrees F HWS temperature at 55 degrees F - O.A. temperature). Coordinate final programming of reset range with engineer/owner.
D. HOT WATER PUMPS: The FMCS system shall select the start all three hot water pumps. The status of the pump shall be monitored through a C.S.R. switch.
E. The heating system shall be programmed to be initiated by the outside air temperature for freeze protection. When the outside air temperature drops below freeze protection set point (40 degrees – adjustable). The Hot Water System shall be enabled and Unit Heaters, F.C.U.'s and V.A.V. Boxes (with hot water heating) shall be initiated for building Freeze protection.

Hot Water Heating System Points List:

BO	Boiler Enable
BI	Boiler Status (on/off)
BI	Boiler Alarm
BO	BLDG HW Pump Start/Stop (Typical of 3)
BI	BLDG HW Pump Status (Typical of 3)
BI	BLDG HW Pump Alarm (Typical of 3)
AI	BLDG HWR Temperature
AI	BLDG HWS Temperature
AI	Boiler HWS Temperature
AI	Boiler HWR Temperature
AO	Boiler HWS Temperature 3-Way Control Valve
AI	O.A. Temperature (Dry Bulb)
AI	O.A. Temperature (Wet Bulb)

VARIABLE AIR VOLUME AIR HANDLING UNIT

A. STARTUP: VAV AHU shall be started and stopped by the FMCS through the local ASC located adjacent to the respective air handling unit through the HOA switch mounted in cover of the variable frequency drive. One (1) ASC will be required per AHU. Spare control points in the ASC shall be for future expansion. A current sensing relay shall indicate air handling unit fan status back to local ASC and place automatic controls in operation.

B. SAFETIES: High limit thermostat in return air located at the AHU shall stop the AHU fan upon detection of temperature above its set point. A low limit thermostat shall stop the AHU fan upon detection of temperature below its set point. A manual reset static pressure high limit sensor in the discharge duct downstream of the AHU fan shall stop the AHU fan upon detection of duct static pressure above its set point (2.5" – adjustable). Duct mounted smoke detector(s) shall stop the AHU fan and associated ERV upon detection of products of combustion. Emergency drain pan float switch shall stop the unit fan on a rise in water level in the emergency drain pan above float switch set point.

   On AHU 2-2, interlock fire/smoke dampers (FSD) with AHU and fire alarm system. AHU shall shut off and FSD shall close on actuation of smoke detector(s) (duct or space mounted detectors). Coordinate with fire alarm system.

C. TEMPERATURE CONTROL: A temperature sensor in the duct downstream of the AHU discharge shall transmit temperature changes to the local ASC. The ASC shall modulate the chilled water valve(s) to maintain discharge air temperature set point (55 degrees F – adjustable – see AHU submittals for required L.A.T. to meet scheduled capacities). One coil sensor shall be used to monitor LAT of each cooling coil. One sensor will be provided for each cooling coil. AHU's with staggered or multiple coils shall be required to have multiple LAT sensors, in addition to the discharge air temperature sensor. Where multiple coils and valves are used, the coil L.A.T. shall be controlled by the coil sensor and the duct sensor shall allow reset of the coil L.A.T. to compensate for the heat gain through the fan section.

J. STATIC PRESSURE CONTROL: Differential pressure transmitter(s) shall sense duct differential pressure(s) of the air distribution system at locations near the end of the duct, and shall transmit pressure changes back to the AHU ASC controller. The ASC controller shall modulate the variable frequency drive to maintain duct static pressure set point (3/4" at the end of the

duct - adjustable). ASC shall provide a 4-20mA signal to the variable frequency drive to modulate the fan speed. The lower reading of the two static pressure sensors shall be used to control the VFD. All units shall have two duct static pressure sensors.

K. The respective ERV shall be enabled separately from the respective AHU(s).
L. Space humidity shall be monitored by the ASC and initiate start-up of the chilled water system and AHU when the space humidity rises above set point (75% RH – adjustable).

VAV Air Handling Units Points List:

BO	Fan/ VFD Start/Stop
BI	FAN/VFD Status
AO	Variable Frequency Drive Speed Control
AO	CHW Valve (3-Way) (one per coil)
AI	Entering Air Temperature (AHU)
AI	Leaving Air Temperature (coil) (one per coil)
AI	Leaving Air Temperature (AHU) (discharge of AHU)
AI	Duct Static Pressure (2 per unit)
DI	Duct Static High Limit (at unit discharge)
AI	Entering Air Temperature High Limit
DI	Low Limit Temperature
BI	Emergency Drain Pan Float Switch
BI	Smoke Detector (AHU/ERV Shut down)
AI	Space Humidity (monitoring)
AI	Space Humidity Set point (monitoring to initiate cooling mode and / or heating mode)

VARIABLE VOLUME AIR TERMINAL

F. Cooling Mode: The VAV box cooling damper shall modulate open as the space temperature rises above the space temperature set point and close as space temperature drops below space temperature set point (74 degrees F - Adjustable).
G. VAV boxes shall close damper 100% when it's respective AHU is shutdown.
H. Provide programming to restart respective air handing unit, pumps (CW and/or HW), etc. and open box when the VAV box override button on space temperature sensor is pushed. Each VAV box override shall be programmed independently for active or inactive status per direction by owner. Active or inactive status shall be selected by the owner on an individual box basis.
I. Each VAV box shall have an independent setback control schedule. Each box shall be programmed independently as directed by the owner. Programming shall be by the TCC. Each box shall have an independent setback temperature set point. Each Space sensor shall have a programmed high and low space temperature set point range programmed by the TCC. The final range shall be as directed by the owner. When authorized and there is a call for cooling , the respective AHU shall start and be controlled to satisfy the setback cooling requirements of the space controlled by the individual VAV Box.
J. Damper position feedback shall be provided for each box for AHU duct static pressure reset programming.

Variable Air Volume Terminal Boxes (Cooling Only)

BO	Box Start/Stop
AI	Cooling CFM
AO	Cooling Damper Control
AI	Space Temperature
AI	Space Temperature Setpoint
AI	Space Humidity
AI	Space Humidity Setpoint
AI	VAV Box Leaving Air Temperature

KITCHEN EXHAUST FANS (EF-5,8)

A. Fan shall be controlled by the local wall switch on the kitchen hood. FMCS switch shall be in series to limit run time of exhaust fan outside of time of day schedule

Exhaust Fan Points List:

BO	Unit Start/Stop
BI	Unit Status
BI	Alarm

EXHAUST FANS (EF1,3)

A. Fan shall be controlled by the local wall switch on the wall. FMCS switch shall be in series to limit run time of exhaust fan outside of time of day schedule

Exhaust Fan Points List:

BO	Unit Start/Stop
BI	Unit Status
BI	Alarm

MINI – SPLIT SYSTEM (RM: Live Oaks 4A)

A. The FMCS shall monitor space temperature and humidity. Override push button shall allow system to be operated outside of programmed times. The split system shall be controlled by a thermostat provided by AHU manufacturer and shall be wired by TCC. High limit thermostat in return air shall stop the respective unit upon detection of temperature above its set point. A low limit thermostat shall stop the AHU upon detection of temperature below its set point. Emergency drain pan float switch (where required) shall stop the unit on a rise in water level in the emergency drain pan. Each Space sensor shall have a programmed high and low space temperature and humidity setpoint range programmed by the TCC. The final range shall be as directed by the owner. Equipment may be turned off by the FMCS when in the acceptable temperature and humidity range.

B. Provide thermostat kits for all mini-split systems to allow for integration with new control system.

Mini - Split System Equipment Points List:

BI	Unit Status
AI	Space Temperature (Monitoring)
BI	Space Temperature Override Button
AI	Space Humidity
BI	High Temp Alarm

STUDENT CENTER – EAST WING

CHILLED WATER SYSTEM

A. COOLING MODE OFF: When the building is not in the cooling mode (as determined by the Campus FMCS), the building chilled water pump shall be off. The Building Chilled Water two-way isolation control valves shall be closed.
B. COOLING MODE ON: When the building is in the cooling mode (as determined by the Campus FMCS), the building chilled water two-way isolation control valves shall open and the chilled water pump shall be started. The building control valves shall be modulated as required to maintain building CWS temperature set point (45º F adjustable).
C. CHILLED WATER PUMPS: The FMCS system shall select the chilled water pump. The status of the pump shall be monitored through a C.S.R. switch. In the event that the pump fails to operate when commanded by the FMCS, as determined by pump "status", then an alarm will be sent to the Campus front end located in the Central Plant.
D. The FMCS shall use chilled water flow (varying central plant flow in the building) and central plant CWS vs. CWR temperature differential (as monitored in the building) to compute the instantaneous chilled water tonnage requirement of the building and monitor this value at the central plant work station.
E. In addition to the building the Temperature Control Contractor (TCC) shall incorporate a chilled water demand screen on the Central Plant work station that indicates CWS/R temperatures for each building on campus with the total instantaneous tonnage requirement for each building. The flow and temperature monitoring for this screen shall be the central plant building tonnage produced vs. tonnage demanded from the following: MPAC, H.&P.E., Bolton Library, Student Center (West, Center, & East), Abrams Hall, Oakland Hall, Coughlin Hall, Chambers Hall, & Science Building.

Chilled Water System Points List:

BO	Pump Start/Stop
BI	Pump Status (on/off)
BI	Pump Alarm
AO	Chilled Water 2-Way Isolation Valve
AO	Chilled Water 3-way Bypass Valve
AI	Building CWS Temperature

AI	Building CWR Temperature
AI	Central Plant CWS Temperature
AI	Central Plant CWR Temperature
AI	Differential Pressure
AI	Central Plant CWR Flow (GPM) (monitored in the building)
AI	Instantaneous Tonnage (flow X temperature differential)

HOT WATER SYSTEM

A. The boilers shall be reintegrated into the system via their BacNET IP connections and all points shall be provided at FMCS workstation.
B. HOT WATER SYSTEM: The hot water system will be enabled through the FMCS (as determined by the FMCS). When the boiler is energized through the FMCS, the boiler control panel shall start the boiler circulating pump and the building hot water pump. The FMCS will monitor building hot water supply and return temperatures. The FMCS shall enable the Hot Water System when reheat coils call for need or by building high humidity levels sensed by any and or all space humidity sensors. The lead building hot water pump shall be started by the FMCS and the building HWS temperature shall be monitored. The Boiler shall be enabled to maintain building HWS temperature.
C. BOILER: The Building's hot water supply temperature shall be monitored and the boiler 3-way hot water control valve shall modulate to maintain building hot water supply temperature at set point (180 degrees F adjustable). Building HWS temperature shall be reset based on O.A. temperature (180 degrees F HWS temperature at 35 degrees F - O.A. temperature and 140 degrees F HWS temperature at 55 degrees F - O.A. temperature). Coordinate final programming of reset range with engineer/owner.
D. HOT WATER PUMPS: The FMCS system shall start the hot water pump The status of the pump shall be monitored through a C.S.R. switch.
E. The heating system shall be programmed to be initiated by the outside air temperature for freeze protection. When the outside air temperature drops below freeze protection set point (40 degrees – adjustable). The Hot Water System shall be enabled and Unit Heaters, F.C.U.'s and V.A.V. Boxes (with hot water heating) shall be initiated for building Freeze protection.

Hot Water Heating System Points List:

BO	Boiler Enable
BI	Boiler Status (on/off)
BI	Boiler Alarm
BO	BLDG HW Pump Start/Stop
BI	BLDG HW Pump Status
BI	BLDG HW Pump Alarm
AI	BLDG HWR Temperature
AI	BLDG HWS Temperature
AI	Boiler HWS Temperature
AI	Boiler HWR Temperature
AO	Boiler HWS Temperature 3-Way Control Valve
AI	O.A. Temperature (Dry Bulb)
AI	O.A. Temperature (Wet Bulb)

VARIABLE AIR VOLUME AIR HANDLING UNIT

A. STARTUP: VAV AHU shall be started and stopped by the FMCS through the local ASC located adjacent to the respective air handling unit through the HOA switch mounted in cover of the variable frequency drive. One (1) ASC will be required per AHU. Spare control points in the ASC shall be for future expansion. A current sensing relay shall indicate air handling unit fan status back to local ASC and place automatic controls in operation.
B. SAFETIES: High limit thermostat in return air located at the AHU shall stop the AHU fan upon detection of temperature above its set point. A low limit thermostat shall stop the AHU fan upon detection of temperature below its set point. A manual reset static pressure high limit sensor in the discharge duct downstream of the AHU fan shall stop the AHU fan upon detection of duct static pressure above its set point (2.5" – adjustable). Duct mounted smoke detector(s) shall stop the AHU fan and associated ERV upon detection of products of combustion. Emergency drain pan float switch shall stop the unit fan on a rise in water level in the emergency drain pan above float switch set point.
   On AHU 2-2, interlock fire/smoke dampers (FSD) with AHU and fire alarm system. AHU shall shut off and FSD shall close on actuation of smoke detector(s) (duct or space mounted detectors). Coordinate with fire alarm system.
C. TEMPERATURE CONTROL: A temperature sensor in the duct downstream of the AHU discharge shall transmit temperature changes to the local ASC. The ASC shall modulate the chilled water valve(s) to maintain discharge air temperature set point (55 degrees F – adjustable – see AHU submittals for required L.A.T. to meet scheduled capacities). One coil sensor shall be used to monitor LAT of each cooling coil. One sensor will be provided for each cooling coil. AHU's with staggered or multiple coils shall be required to have multiple LAT sensors, in addition to the discharge air temperature sensor. Where multiple coils and valves are used, the coil L.A.T. shall be controlled by the coil sensor and the duct sensor shall allow reset of the coil L.A.T. to compensate for the heat gain through the fan section.
M. STATIC PRESSURE CONTROL: Differential pressure transmitter(s) shall sense duct differential pressure(s) of the air distribution system at locations near the end of the duct, and shall transmit pressure changes back to the AHU ASC controller. The ASC controller shall modulate the variable frequency drive to maintain duct static pressure set point (3/4" at the end of the duct - adjustable). ASC shall provide a 4-20mA signal to the variable frequency drive to modulate the fan speed. The lower reading of the two static pressure sensors shall be used to control the VFD. All units shall have two duct static pressure sensors.
N. The respective ERV shall be enabled separately from the respective AHU(s).
O. Space humidity shall be monitored by the ASC and initiate start-up of the chilled water system and AHU when the space humidity rises above set point (75% RH – adjustable).

VAV Air Handling Units Points List:

BO	Fan/ VFD Start/Stop
BI	FAN/VFD Status
AO	Variable Frequency Drive Speed Control

AO CHW Valve (3-Way) (one per coil)
AI Entering Air Temperature (AHU)
AI Leaving Air Temperature (coil) (one per coil)
AI Leaving Air Temperature (AHU) (discharge of AHU)
AI Duct Static Pressure (2 per unit)
DI Duct Static High Limit (at unit discharge)
AI Entering Air Temperature High Limit
DI Low Limit Temperature
BI Emergency Drain Pan Float Switch
BI Smoke Detector (AHU/ERV Shut down)
AI Space Humidity (monitoring)
AI Space Humidity Set point (monitoring to initiate cooling mode and / or heating mode)

VARIABLE VOLUME AIR TERMINAL

K. Cooling Mode: The VAV box cooling damper shall modulate open as the space temperature rises above the space temperature set point and close as space temperature drops below space temperature set point (74 degrees F - Adjustable).
L. VAV boxes shall close damper 100% when it's respective AHU is shutdown.
M. Provide programming to restart respective air handing unit, pumps (CW and/or HW), etc. and open box when the VAV box override button on space temperature sensor is pushed. Each VAV box override shall be programmed independently for active or inactive status per direction by owner. Active or inactive status shall be selected by the owner on an individual box basis.
N. Each VAV box shall have an independent setback control schedule. Each box shall be programmed independently as directed by the owner. Programming shall be by the TCC. Each box shall have an independent setback temperature set point. Each Space sensor shall have a programmed high and low space temperature set point range programmed by the TCC. The final range shall be as directed by the owner. When authorized and there is a call for cooling , the respective AHU shall start and be controlled to satisfy the setback cooling requirements of the space controlled by the individual VAV Box.
O. Damper position feedback shall be provided for each box for AHU duct static pressure reset programming.

Variable Air Volume Terminal Boxes (Cooling Only)
BO Box Start/Stop
AI Cooling CFM
AO Cooling Damper Control
AI Space Temperature
AI Space Temperature Setpoint
AI Space Humidity
AI Space Humidity Setpoint
AI VAV Box Leaving Air Temperature

EXHAUST FANS (EF-6)

A. Fan shall be controlled by the local wall switch. FMCS switch shall be in series to limit run time of exhaust fan outside of time of day schedule

Exhaust Fan Points List:

BO	Unit Start/Stop
BI	Unit Status
BI	Alarm

Police Station/Soccer House, Oaks Club house

DX SPLIT SYSTEMS AIR HANDING UNIT WITH ELECTRIC HEAT

A. Split System DX A/C units shall be started and stopped based on a programmed schedule. The FMCS shall monitor space temperature and humidity. Override push button shall allow system to be operated outside of programmed times. The split system shall be controlled by a thermostat provided by AHU manufacturer and shall be wired by TCC. High limit thermostat in return air shall stop the respective unit upon detection of temperature above its set point. A low limit thermostat shall stop the AHU upon detection of temperature below its set point. Duct mounted smoke detector(s) shall stop the AHU upon detection of products of combustion. Emergency drain pan float switch (where required) shall stop the unit on a rise in water level in the emergency drain pan. Each Space sensor shall have a programmed high and low space temperature and humidity setpoint range programmed by the TCC. The final range shall be as directed by the owner. Equipment may be turned off by the FMCS when in the acceptable temperature and humidity range.

DX Split System Equipment Points List:

BO	Unit Start/Stop
BI	Unit Status
AI	Space Temperature (Monitoring)
BI	Space Temperature Override Button
AI	Space Humidity (monitoring)
BI	Smoke Detector (all units)
BI	Emergency Drain Pan Float Switch
BI	Return air temperature high limit
BI	Low Temp Alarm
BI	High Temp Alarm

MINI – SPLIT SYSTEM

C. The FMCS shall monitor space temperature and humidity. Override push button shall allow system to be operated outside of programmed times. The split system shall be controlled by a thermostat provided by AHU manufacturer and shall be wired by TCC. High limit thermostat in return air shall stop the respective unit upon detection of temperature above its set point. A low limit thermostat shall stop the AHU upon detection of temperature below its

set point. Emergency drain pan float switch (where required) shall stop the unit on a rise in water level in the emergency drain pan. Each Space sensor shall have a programmed high and low space temperature and humidity set-point range programmed by the TCC. The final range shall be as directed by the owner. Equipment may be turned off by the FMCS when in the acceptable temperature and humidity range.

D. Provide thermostat kits for all mini-split systems to allow for integration with new control system.

Mini - Split System Equipment Points List:

BI	Unit Status
AI	Space Temperature (Monitoring)
BI	Space Temperature Override Button
AI	Space Humidity
BI	Low Temp Alarm
BI	High Temp Alarm

Avoyelles Hall (Building 318)

DX SPLIT SYSTEMS AIR HANDING UNIT WITH ELECTRIC HEAT (3 UNITS)

A. Split System DX A/C units shall be started and stopped based on a programmed schedule. The FMCS shall monitor space temperature and humidity. Override push button shall allow system to be operated outside of programmed times. The split system shall be controlled by a thermostat provided by AHU manufacturer and shall be wired by TCC. High limit thermostat in return air shall stop the respective unit up-on detection of temperature above its set point. A low limit thermostat shall stop the AHU upon detection of temperature below its set point. Duct mounted smoke detector(s) shall stop the AHU upon detection of products of combustion. Emergency drain pan float switch (where required) shall stop the unit on a rise in water level in the emergency drain pan. Each Space sensor shall have a programmed high and low space temperature and humidity setpoint range programmed by the TCC. The final range shall be as directed by the owner. Equipment may be turned off by the FMCS when in the acceptable temperature and humidity range.

DX Split System Equipment Points List:

BO	Unit Start/Stop
BI	Unit Status
AI	Space Temperature (Monitoring)
BI	Space Temperature Override Button
AI	Space Humidity (monitoring)
BI	Smoke Detector (all units)
BI	Emergency Drain Pan Float Switch
BI	Return air temperature high limit
BI	Low Temp Alarm
BI	High Temp Alarm

KITCHEN EXHAUST FANS

B. Fan shall be controlled by the local wall switch on the kitchen hood. FMCS switch shall be in series to limit run time of exhaust fan outside of time of day schedule

Exhaust Fan Points List:

BO	Unit Start/Stop
BI	Unit Status
BI	Alarm

SECTION 26 05 00 – COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Supporting devices for electrical components.
2. Electricity-metering components.
3. Concrete equipment bases.
4. Touchup painting.

1.2 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. IMC: Intermediate metal conduit.

D. LFMC: Liquidtight flexible metal conduit.

E. RNC: Rigid nonmetallic conduit.

1.3 QUALITY ASSURANCE

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

B. Comply with NFPA 70.

1.4 COORDINATION

A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.

1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

C. Coordinate electrical service connections with buildings and grounds.

D. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

E. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

F. Coordinate connecting to all equipment with equipment provider. This includes mechanical, plumbing, owner provided and contractor provided equipment. Contractor to refer to equipment installation documents prior to any rough-in.

G. Contractor to coordinate with door hardware provider, architect and owner prior to installation of any devices associated with doors to verify door operational requirement, placement of proximity readers, motion sensors, door switches, fire alarm control, magnetic locks, hold open devices, etc..

H. Contractor to coordinate with architectural millwork shop drawings prior to rough-in for locations of under counter lighting to be installed in and around millwork. No receptacles shall be installed in an enclosed cabinet unless noted on the drawings. Outlets for refrigerators, microwaves, etc. shall be installed in the space identified on the millwork shop drawings.

I. Contractor shall not penetrate any stair wall assemble with conduit, boxes, cabling and the like, except for items that serve the stairwell.

J. The contractor shall label the main service disconnecting means with the maximum available fault current shall be listed on the device to meet the requirements of NFPA 70:110.24. The labeling shall be engraved plastic. The maximum available fault current shall be obtained from the electrical utility for the secondary side of the utility transformer.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.

B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch- (14-mm-) diameter slotted holes at a maximum of 2 inches (50 mm) o.c., in webs.

D. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

E. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.

F. Expansion Anchors: Carbon-steel wedge or sleeve type.

G. Toggle Bolts: All-steel springhead type.

H. Powder-Driven Threaded Studs: Heat-treated steel.

2.2 EQUIPMENT FOR ELECTRICITY METERING BY CONTRACTOR

A. Meter: Contractor shall provide metering per the local utility. Contractor shall provide all necessary enclosures, meter cans, etc. per the local utility requirements including any fees associated with the service.

2.3 CONCRETE BASES

A. Concrete: 3000-psi (20.7-MPa), 28-day compressive strength as specified

2.4 TOUCH-UP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.

B. Dry Locations: Steel materials.

C. Support Clamps for PVC Raceways: Click-type clamp system.

D. Selection of Supports: Comply with manufacturer's written instructions.

E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb (90-kg) design load.

3.3 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.

B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.

E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

F. Install 1/4-inch- (6-mm-) diameter or larger threaded steel hanger rods, unless otherwise indicated.

G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch (38-mm) and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.

H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

I. Simultaneously install vertical conductor supports with conductors.

J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches (610 mm) from the box.

K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:

1. Wood: Fasten with wood screws.
2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
3. New Concrete: Concrete inserts with machine screws and bolts.
4. Existing Concrete: Expansion bolts.
5. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
6. Steel: Welded threaded studs or spring-tension clamps on steel.
   a. Field Welding: Comply with AWS D1.1.
7. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
8. Light Steel: Sheet-metal screws.
9. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.4 FIRESTOPPING AND FIRE RATED WALLS/CEILINGS/FLOORS

A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.5 CONCRETE BASES

A. Provide a concrete base for all floor mounted equipment. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Section "Cast-in-Place Concrete."

3.6 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.7 REFINISHING AND TOUCH-UP PAINTING

A. Refinish and touch up paint.

1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.8 CLEANING AND PROTECTION

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

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

END OF SECTION 26 05 00

SECTION 26 05 19 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

B. Related Sections include the following:

1. Section "Medium-Voltage Cables" for single-conductor and multiconductor cables, cable splices, and terminations for electrical distribution systems with 2001 to 35,000 V.

1.3 QUALITY ASSURANCE

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

B. Comply with NFPA 70- Latest edition or edition enforced by state and local code authority.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.

B. Conductor Material: Copper; stranded conductor or solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.

C. Conductor Insulation Types: Type THHN-THWN.

2.2 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

A. Service Entrance: Type THHN-THWN, single conductors in raceway.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspaces: Type THHN-THWN, single conductors in raceway.

E. Exposed Branch Circuits, including in Crawlspaces: Type THHN-THWN, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway or MC Cable is allowed for concealed lighting and receptacle branch circuits.

G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.

H. Fire Alarm Cabling: Plenum rated in plenum areas, exposed above accessible ceilings and in conduit when concealed in finished walls, unaccessible ceilings. Secured per NFPA 70-760.

I. Low Voltage Cabling: Plenum rated in plenum areas, exposed above accessible ceilings and in conduit when concealed in finished walls, unaccessible ceilings. Secured per NFPA 70-760.

J. Single Phase Circuits: Provide a dedicated neutral. Sharing of neutrals is not allowed.

3.2 INSTALLATION

A. Conceal cables in conduit in finished walls, unaccessible ceilings, and floors.

B. 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.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Support cables according to Section "Basic Electrical Materials and Methods."

E. Identify and color-code conductors and cables according to Section "Electrical Identification."

F. Use #10 AWG conductors for 20 amperage 120 circuits when the circuit conductors are longer than 75 feet. Use #10 AWG conductors for 20 amperage 277 circuits when the circuit conductors are longer than 200 feet.

3.3 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.

1. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

END OF SECTION 26 05 19

SECTION 26 05 29 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

B. Related Sections include the following:

1. Division 26 Section "Vibration and Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.
2. Nonmetallic slotted support systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Equipment supports.

C. Welding certificates.

1.6 QUALITY ASSURANCE

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

B. Comply with NFPA 70.

1.7 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Allied Tube & Conduit.
   b. Cooper B-Line, Inc.; a division of Cooper Industries.
   c. ERICO International Corporation.
   d. GS Metals Corp.
   e. Thomas & Betts Corporation.
   f. Unistrut; Tyco International, Ltd.
   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.
5. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel and malleable-iron 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; a division of Illinois Tool Works, Inc.
        3) MKT Fastening, LLC.
        4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

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.; a division of Cooper Industries.
        2) Empire Tool and Manufacturing Co., Inc.
        3) Hilti Inc.
        4) ITW Ramset/Red Head; a division of 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.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 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 required by 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 in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other 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 two-bolt conduit clamps / single-bolt conduit clamps using spring friction action for retention in support channel.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 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 RMC 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.

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. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69 or Spring-tension clamps.
7. To Light Steel: Sheet metal screws.
8. 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.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section "Cast-in-Place Concrete."

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with requirements in Division 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 26 05 29

Section 26 05 33 – Raceways and Boxes for Electrical Systems

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following:

1. Refer to architectural for firestopping materials and installation at penetrations through walls, ceilings, and other fire-rated elements.
2. "Basic Electrical Materials and Methods" for supports, anchors, and identification products.
3. "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. ENT: Electrical nonmetallic tubing.

C. FMC: Flexible metal conduit.

D. IMC: Intermediate metal conduit.

E. LFMC: Liquidtight flexible metal conduit.

F. LFNC: Liquidtight flexible nonmetallic conduit.

G. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For surface raceways, floor boxes, and cabinets.

1.5 QUALITY ASSURANCE

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

B. Comply with NFPA 70-Latest edition or edition enforced by state and local code authority.

1.6 COORDINATION

A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 METAL WIREWAYS

A. Material and Construction: Sheet metal sized and shaped as indicated, NEMA 1 or 3R.

B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

C. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

D. Wireway Covers: Hinged type.

E. Finish: Manufacturer's standard enamel finish.

2.2 NONMETALLIC WIREWAYS

A. Description: Fiberglass polyester, extruded and fabricated to size and shape indicated, with no holes or knockouts. Cover is gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections are flanged, with stainless-steel screws and oil-resistant gaskets.

B. Description: PVC plastic, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections with plastic fasteners.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

2.3 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating and two coats of paint. Color by Architect.

B. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Floor Boxes: Cast metal, fully adjustable, rectangular with four separate wiring compartments for power outlets, voice and data outlets, and/or AV devices as indicated on the drawing. Wiremold RFB4 Series, T&B 665 Series or approved equal. Covers shall be UL Listed to U.S. and Canadian safety standards for tile, carpet, wood, bare concrete and terrazzo floors. Covers shall be selected by the architect and shall be of Nickel, Brass, Black, Gray or Bronze.

B. Poke Thru Floor Boxes: Two hour rated poke thru floor unit with capabilities of two duplex power receptacles, data and AV devices. Provide power, data and phone outlets indicated on drawing. Wiremold Evolution Series 6AT or prior approved equal. Covers shall be selected by the architect and shall be of Nickel, Brass, Black, Gray or Bronze. Poke thru floor boxes are to be utilized on upper floors unless noted otherwise. There must be accessibility in the space below the poke thru box.

C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

D. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

E. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.

F. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

G. Exterior Outlet Lock Box: Cast aluminum with self closing door withlock. All units shlal be keyed alike. 16 gauge steel housing. Unit for Interior and Exterior installation. Cole: TL-310 or equivalent.

H. In grade enclosures, boxes and covers are required to conform to all test provisions of the most current ANSI/SCTE 77 “Specification For Underground Enclosure Integrity” for Tier 22 applications. When multiple “Tiers” are specified the boxes must physically accommodate and structurally support compatible covers while possessing the highest Tier rating. All covers are required to have the Tier level rating embossed on the surface. In no assembly can the cover design load exceed the design load of the box. All components in an assembly (box & cover) are manufactured using matched surface tooling. Independent third party verification or test reports stamped by a registered Professional Engineer certifying that all test provisions of this specification have been met are required with each submittal. Cover to labeled per use of box, ie “Electrical, Communications, etc”. Communications pull boxes shall be a minimum of 24" w x 36" l x 36 “ d.

2.5 FACTORY FINISHES

A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard prime-coat finish ready for field painting.

2.6 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit: ANSI C80.1.
B. Aluminum Rigid Conduit: ANSI C80.5.
C. IMC: ANSI C80.6.
D. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.
E. Plastic Coated IMC and Fittings: NEMA RN 1.
F. EMT and Fittings: ANSI C 80.3.
G. EMT and Fittings: ANSI C80.3.
H. FMC: Aluminum
I. LFMC: Flexible steel conduit with PVC jacket.
J. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors:

1. Exposed: Rigid steel or IMC.
2. Concealed: Rigid steel or IMC.
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Boxes and Enclosures: NEMA 250, Type 4.

B. Indoors:

1. Exposed: EMT in non finished areas. Surface metal raceway in existing finished unaccessible areas unless noted otherwise.
2. Concealed: EMT. MC Cable is allowed for concealed lighting and receptacle branch circuits.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
4. Damp or Wet Locations above Ground: Rigid steel conduit.
5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
   a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.

C. Minimum Raceway Size: 3/4-inch trade size (DN 21) below grade and ½ inch trade size above grade. When combining circuits, min. 3/4-inch trade size required.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

E. Contractor to provide metal raceway in Patient Care Areas per 517.13. Raceway shall be installed as a redundant ground. Raceway shall be a considered a ground.

3.2 INSTALLATION

A. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

B. Complete raceway installation before starting conductor installation.

C. Support raceways as specified in "Basic Electrical Materials and Methods."

D. Install temporary closures to prevent foreign matter from entering raceways.

E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.

F. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

1. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.

H. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches (50 mm) of concrete cover. Conduits larger than 1” shall not be installed in the slab.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.

2. Space raceways laterally to prevent voids in concrete.
3. Run conduit larger than 1-inch trade size (DN 27) parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.

I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.

1. Run parallel or banked raceways together on common supports.
2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

J. Join raceways with fittings designed and approved for that purpose and make joints tight.

1. Use insulating bushings to protect conductors.

K. Tighten set screws of threadless fittings with suitable tools.

L. Terminations:

1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.

N. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches (150 mm) above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.

O. Flexible Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.

P. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.

Q. Set floor boxes level and flush with finished floor surface.

R. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.3 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.4 CLEANING

A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION 26 05 33

SECTION 26 05 53 – IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Identification for conductors and communication and control cable.
2. Warning labels and signs.
3. Instruction signs.
4. Equipment identification labels.
5. Miscellaneous identification products.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

C. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and ANSI C2.

B. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes and standards. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.2 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

C. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 7 by 10 inches.

D. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.3 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.4 EQUIPMENT IDENTIFICATION LABELS

A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

2.5 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.

1. Minimum Width: 3/16 inch.
2. Tensile Strength: 50 lb, minimum.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

B. Paint: Paint materials and application requirements are specified in Division 09 painting Sections.

1. Exterior Concrete Unit Masonry:
   a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a block filler.
      1) Block Filler: Concrete unit masonry block filler.
      2) Finish Coats: Exterior semigloss acrylic enamel.

2. Exterior Ferrous Metal:
   a. Semigloss Alkyd-Enamel Finish: Two finish coat(s) over a primer.
      1) Primer: Exterior ferrous-metal primer.
      2) Finish Coats: Exterior semigloss alkyd enamel.

3. Exterior Zinc-Coated Metal (except Raceways):
      1) Primer: Exterior zinc-coated metal primer.
      2) Finish Coats: Exterior semigloss alkyd enamel.

4. Interior Ferrous Metal:
   a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.
      1) Primer: Interior ferrous-metal primer.
      2) Finish Coats: Interior semigloss acrylic enamel.

5. Interior Zinc-Coated Metal (except Raceways):
   a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.
      1) Primer: Interior zinc-coated metal primer.
      2) Finish Coats: Interior semigloss acrylic enamel.

C. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 APPLICATION

A. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use color-coding conductor tape. Identify each ungrounded conductor according to source and circuit number.

B. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source and circuit number.

C. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.

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

D. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.

1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:
   a. Power transfer switches.
   b. Controls with external control power connections.

2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

E. Instruction Signs:

1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
2. Emergency Operating Instructions: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for power transfer.

F. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:
    a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where 2 lines of text are required, use labels 2 inches high.
    b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
    c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.

2. Equipment to Be Labeled:
    a. Panelboards, electrical cabinets, and enclosures.
    b. Access doors and panels for concealed electrical items.
    c. Electrical switchgear and switchboards.
    d. Transformers.
    e. Emergency system boxes and enclosures.
    f. Receptacles with panel and circuit numbers.
    g. Disconnect switches.
    h. Enclosed circuit breakers.
    i. Power transfer equipment.
    j. Contactors.

3.2 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

F. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service feeder branch-circuit service, feeder, and branch-circuit conductors.

1. Color shall be factory applied factory applied or, for sizes larger than No. 10 AWG if authorities having jurisdiction permit, field applied.
2. Colors for 208/120-V Circuits:
    a. Phase A: Black.
    b. Phase B: Red.
    c. Phase C: Blue.
3. Colors for 480/277-V Circuits:
    a. Phase A: Brown.
    b. Phase B: Orange.

c. Phase C: Yellow.

4. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

END OF SECTION 26 05 53

SECTION 26 27 26 – WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Single and duplex receptacles, ground-fault circuit interrupters and isolated-ground receptacles.
2. Single- and double-pole snap switches.
3. Device wall plates.
4. Pin and sleeve connectors and receptacles.
5. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. PVC: Polyvinyl chloride.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Receptacles, switches, plates, floor outlets, poke through assemblies, service poles and multioutlet assemblies.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device through one source from a single manufacturer.

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

C. Comply with NFPA 70 latest edition or edition enforced by state or local code authority.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Outlets - Duplex:
   a. Hubbell Incorporated- HBL 5362.
   b. Leviton Mfg. Company Inc.-5362.
   c. Pass & Seymour-CRB5362.
   d. Pass & Seymour -PT5362A (Plug Tail Device).

2. Switches-Single Pole:
   a. Hubbell Incorporated - HBL 1221.
   b. Pass & Seymour - PS20AC1.
   c. Leviton Mfg. Company, Inc.- 1221-1

3. Switches-Three Pole:
   a. Hubbell Incorporated - HBL1223
   b. Leviton Mfg. Company, Inc.-1223-2.
   c. Pass & Seymour-PS20AC3.

4. Dimmer Switches Line Voltage:
   a. Lutron Nova T
   b. Pass & Seymour CD2000

* Dimmer must be compatible with Ballast or LED Driver.

5. Dimmer Switches 0-10V:
   a. Synergy ISD
   b. Cooper SF10P

* Dimmer must be compatible with Ballast or LED Driver.

6. GFCI Receptacles: Weather Resistant:
   a. Hubbell Incorporated - GFWRST20
   b. Leviton Mfg. Company Inc.-GFWR2
   c. Pass & Seymour- 2097TRWR

7. GFCI Receptacles: Weather Resistant and Tamper Resistant:
   a. Hubbell Incorporated - GFTWRST20
   b. Leviton Mfg. Company Inc.-GFWT2
   c. Pass & Seymour- 2097TRWR

8. Receptacles: Tamper Resistant:
   a. Hubbell Incorporated - BR20TR.
   b. Leviton Mfg. Company Inc.-TBR20
   c. Pass & Seymour- TR5362.

9. USB Charger Duplex Receptacles:
   a. Hubbell Incorporated – USB20AC5
   b. Leviton – T5834
   c. Pass & Seymour - TR20USBAC6

2.2 RECEPTACLES

A. Straight-Blade-Type Receptacles: Comply with UL 498, 20 amp.

B. Straight-Blade and Locking Receptacles: Heavy-Duty grade 20 amp.

C. GFCI Receptacles: Straight blade, feed-through type, Heavy-Duty grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a 2-3/4-inch- (70-mm-) deep outlet box without an adapter.

2.3 CORD AND PLUG SETS

A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.

1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.4 SWITCHES

A. Single- and Double-Pole Switches: Comply with UL 20, 20 amp.

B. Snap Switches: Heavy-Duty grade, quiet type 20 amp, 120/277 volt.

C. Line Voltage Dimmer: 120V, 2000 watt, slide to-off. Dimmer must be compatible with ballast or driver.

D. 0-10V Dimmer: 120/277VAC, capable of three way, max wattage 1200 w 120VAC, 150000 277 VAC, Dimmer must be compatible with ballast or driver. 100% to 1% continuous.

2.5 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: **As selected by Architect**.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Wet Locations: Heavy duty die-cast metal, gasketed with powdercoat finish and lockable tab. Listed and labeled “extra duty”, “in-use”, for use in "wet locations”.

2.6 POKE-THROUGH ASSEMBLIES

A. Description: Factory-fabricated and -wired assembly of below-floor junction box with multi-channeled, through-floor raceway/firestop unit and detachable matching floor service outlet assembly.

1. Service Outlet Assembly: Recessed type with three (3) compartments that allow for up to three (3) duplex receptacles and/or 12 communication ports and/or 10 AV devices.
2. Size: Selected to fit nominal 6-inch (100-mm) cored holes in floor and matched to floor thickness.
3. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
4. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors; and a minimum of four, 4-pair, Category 6 voice and data communication cables.

2.7 FINISHES

A. Color:

1. Wiring Devices Connected to Normal Power System: As selected by Architect, unless otherwise indicated or required by NFPA 70.2.
2. Wiring Devices Connected to Emergency Power System: Red.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install devices and assemblies level, plumb, and square with building lines.

B. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

C. Remove wall plates and protect devices and assemblies during painting.

D. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

E. Install weather resistant receptacles in damp and wet locations per N.E.C. requirements.

F. Install tamper resistant receptacles in homes, apartments, hotel rooms and daycares per N.E.C. requirements.

3.2 CONNECTIONS

A. Ground equipment according to Division 16 Section "Grounding and Bonding."

B. Connect wiring according to Division 16 Section "Conductors and Cables."

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION 26 27 26

SECTION 26 28 16 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes individually mounted enclosed switches and circuit breakers used for the following:

1. Feeder and branch-circuit protection.
2. Motor and equipment disconnecting means.

1.3 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

B. RMS: Root mean square.

C. SPDT: Single pole, double throw.

1.4 SUBMITTALS

A. Product Data: For each type of switch, circuit breaker, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each switch and circuit breaker.

1. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:

a. Enclosure types and details for types other than NEMA 250, Type 1.
b. Current and voltage ratings.
c. Short-circuit current rating.
d. UL listing for series rating of installed devices.
e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

2. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.

3. Qualification Data: Submit data for testing agencies indicating that they comply with qualifications specified in "Quality Assurance" Article.

1.5 QUALITY ASSURANCE

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

B. Comply with NFPA 70- Latest edition or edition enforced by state and local code authority.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

1.6 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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. Fusible Switches:

a. Eaton Corp.; Cutler-Hammer Products, K-Series.
b. General Electric Co.; Electrical Distribution & Control Division, TH.
c. Siemens Energy & Automation, Inc., VBII.
d. Square D Co, 3110.

2.2 ENCLOSED SWITCHES

A. Enclosed, Nonfusible Switch: NEMA KS 1, Type HD, with lockable handle.

B. Enclosed, Fusible Switch, 800 A and Smaller: NEMA KS 1, Type HD, with clips to accommodate specified fuses, lockable handle with two padlocks, and interlocked with cover in closed position.

2.3 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

1. Outdoor Locations: NEMA 250, Type 3R.
2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2.4 FACTORY FINISHES

A. Manufacturer's standard prime-coat finish ready for field painting.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.

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

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in "Basic Electrical Materials and Methods."

B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

C. If the disconnect or enclosed circuit breaker is used as a Main Service Disconnect then the maximum available fault current shall be listed on the device to meet the requirements of NFPA 70:110.24. The labeling shall be engraved plastic. The maxiumum available fault current shall be obtained from the electrical utility for the secondary side of the utility transformer.

3.3 CONNECTIONS

A. Install equipment grounding connections for switches and circuit breakers with ground continuity to main electrical ground bus.

B. Install power wiring. Install wiring between switches and circuit breakers, and control and indication devices.

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.

D. Maintain all necessary clearances per NFPA-70.

3.4 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each enclosed switch, circuit breaker, component, and control circuit.
2. Test continuity of each line- and load-side circuit.

3.5 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.6 CLEANING

A. On completion of installation, inspect interior and exterior of enclosures. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 26 28 16