MIDDLETON ASSOCIATES INCORPORATED
ARCHITECTURAL SERVICES
1702 W. COLLEGE AVE., SUITE E, NORMAL, IL 61761-2793
309/452-1271 FAX 309/454-8049
E-MAIL: rand@middletonassociates.net
Website: www.middletonassociates.net

MMEA ENGINEERS
Mid MO Engineering Alliance, Inc
203 Eastland Drive
Jefferson City, MO 65101
Wayne Strope, President
Office: 573/636-2116
Cell: 573/645-0567
E-mail: wayne@mmeaeng.com
Website: mmeaeng.com

KLINGNER & ASSOCIATES, P.C.
MEP ENGINEERING GROUP
616 N. 24th Street
Quincy, IL 62301
Joseph A. Knochel, P.E.
Office: 217/223.3670
Cell: 573/406.8998
E-mail: jak@klingner.com
Website: www.klingner.com

SPECIFICATIONS FOR LABOR AND MATERIALS

FOR

KINGSLEY JUNIOR HIGH SCHOOL
HVAC RENOVATION AND GEOTHERMAL

303 KINGSLEY STREET, NORMAL, IL 61761

FOR

McLEAN COUNTY UNIT DISTRICT NO. 5
MAINTENANCE OFFICE: 1999 EAGLE RD., NORMAL, IL 61761
DISTRICT OFFICE: 1809 W. HOVEY, NORMAL, IL 61761

PROJECT NUMBER: 23152318

ISSUE DATE: JANUARY 14, 2020

PRE-BID: **10:00 a.m., Monday, January 20, 2020 (Martin Luther King Day) at Kingsley Junior High School. (Meet at the Mechanical Room. Park on West Service Drive.)**

SITE VISITS: Other than Pre-Bid Meeting, arrange ahead of desired visit.

BID DATE: **Thursday, February 6, 2020 – 1:30 p.m. in prevailing time.**
Maintenance Office
1999 Eagle Road
Normal, Illinois 61761

Expiration Date
11/30/20

[Seal and Signature]

PROJECT: Kingsley Junior High School HVAC Renovation and Geothermal

FOR: McLean County Unit District No. 5
1809 W. Hovey
Normal, IL 61761

SUPERINTENDENT OF SCHOOLS: Dr. Mark Daniel

ARCHITECT: Middleton Associates Incorporated
1702 W. College Avenue, Suite E
Normal, IL 61761-3028
309/452-1271 FAX: 309/454-8049
e-mail: rand@middletonassociates.net
website: www.middletonassociates.net

MMEA ENGINEERS
Mid MO Engineering Alliance, Inc
203 Eastland Drive
Jefferson City, MO 65101
Wayne Strope, President
Office: 573/636-2116
Cell: 573/645-0567
E-mail: wayne@mmeaeng.com
Website: mmeaeng.com

KLINGNER & ASSOCIATES, P.C.
MEP ENGINEERING GROUP
616 N. 24th Street
Quincy, IL 62301
Joseph A. Knochel, P.E.
Office: 217/223.3670
Cell: 573/406.8998
E-mail: jak@klingner.com
Website: www.klingner.com

A/E PROJECT NO: 23152318

ISSUE DATE: January 14, 2020

DRAWINGS:

T1.0 Title Sheet – Job Information – Job Location

G1.0 Photo Gallery

C1.0 Site Plan
C1.0 Site Plan

D1.0 Demolition Floor Plan – Area 2 & 3
D1.1 Demolition Floor Plan – Area 4
D1.1 Demolition Floor Pane – Area 4

A1.0 Floor Plan – Area 1 Not in Contract/For Reference
A1.1 Floor Plan – Area 2 & 3
A1.2 Floor Plan – Area 4
A1.2 Floor Plan – Area 4
A7.0 Reflected Ceiling Plan – Area 2 & 3
A7.1 Reflected Ceiling Plan – Area 4

R1.0 Roof Plan – Area 2 & 3
R1.1 Roof Plan – Area 4

MECHANICAL – ELECTRICAL – PLUMBING
M1.1 Demolition Floor Plan – HVAC Area 2 & 3
M1.2 Demotion Floor Plan – HVAC Area 4
M1.3 Renovation Floor Plan – HVAC Area 2 & 3
M1.4 Renovation Floor Plan – HVAC Area 4
M1.5 Renovation Floor Plan – HVAC Piping Area 2 & 3
M1.6 Renovation Floor Plan – HVAC Piping Area 4
M3.1 HVAC Details
M3.2 HVAC Details
M3.3 HVAC Details
M4.1 HVAC Schedules and Notes
M4.2 HVAC Schedules and Notes

END 00 01 10

Sealed proposals will be received by: McLean County Unit District No. 5

For Project: Kingsley Junior High School HVAC Renovation and Geothermal
303 Kingsley St., Normal, IL 61761

Proposals to be submitted prior to **1:30 p.m., prevailing time, Thursday, February 6, 2020.**

Submit to: Maintenance Office
1999 Eagle Road
Normal, IL 61761

Pre-Bid Meeting: **10:00 a.m., January 20, 2020, (Martin Luther King Day) at Kingsley Junior High School, 303 Kingsley St., Normal, IL. Meet at Mechanical Room. Park on the West Service Drive.**

Proposals shall be delivered to the above McLean County Unit District No. 5 Office prior to the time of opening. Proposals shall be clearly identified on the outside of the envelope as "Sealed Proposal" and list the project title as shown above. Immediately following the stated time, proposals will be opened and publicly read.

Terms of the proposal:
- Bid Security is required, 5% Bid Bond or Certified Check.
- Owner protective bonds are required in the amount of 100% of the Contract value after award.
- Illinois Prevailing Wage Act 820 ILCS 130/.01 *et seq*. applies to this job.
- 1992 Revised Statutes Illinois Criminal Code 720 ILCS: Article 33E Public Contracts: Bid Rigging (5/33E-3); Bid Rotating (5/E-4) Disclosure (5/33E-5); Interference (5/33E-1); Kickbacks (5/33E-7); Bribery (5/33E-8); Change Orders (5/33E-8), Drug-free Work Place Act 30 ILCS 580/1, Educational Loan Default 5 ILCS 385/1, Felony/Bribery Conviction 30 ILCS 505/10.2 and 505/10.3 apply to this job.
- The Board of Education has the right to reject or accept the bids submitted or to waive any bidding irregularities.
- The Board of Education has the right to reject or accept the bids submitted and to waive any bidding irregularities.

Plans and specifications are available at Middleton Associates Incorporated, 1702 W. College Avenue, Normal, Illinois 61761-2793, Phone 309/452-1271, FAX 309/454-8049, and at www.middletonassociates.net. Scroll down and click on “Contractors”. Refundable deposit for one printed set is $50.00.

END 00 11 16

1. GENERAL

1.1. QUALIFICATION

A. Competency and responsibility of the Bidder, and of their proposed subcontractors, may be considered in making awards. Determination of responsibility prior to award may include:

1. A detailed statement regarding the business, technical organization, crew availability and evidence of capability for the work that is contemplated.
2. Evidence of successful experience of personnel and previously completed construction projects

    a. Contractor and personnel, five years or more commercial construction experience, including recent projects of similar or greater value, similarity of types of work, technical content, and complexity
    b. Evidence that recent projects as described above have been scheduled and delivered on time, aggressively pursued to conclusion without delay.
    c. Experience does not include frivolous claims for additional costs, or work requiring abnormal or extensive corrections.
    d. Evidence that equipment was properly installed and started and functioned without abnormal warranty calls for installation related problems.
    e. Evidence that the contractor coordinated with the Owner, scheduled work in a progressive manner to allow Owner reasonable access to get facilities ready for occupancy in a timely manner.
    f. Evidence that phased projects have been completed without loss of services between phases.

3. Information pertaining to the financial resources of the contractor to pursue the work may be considered prior to making the award:

    a. Evidence of financial resources to cover retainage, meet payrolls, contract for and acquire or pre-pay materials. Resources and Contractor net worth available to this project less than 35% of the contract award may be grounds to disqualify the bid.
    b. Evidence of unpaid bills, unresolved liens, outstanding claims by the Department of labor for wage, benefits or workman compensation violations or failure to provide accurate payroll information.

2. CONTRACT CONDITIONS

2.1. EXAMINATION OF DOCUMENTS, SITE AND WORK INCLUDED

A. LOCATION OF THE PROJECT: McLean County Unit District No. 5 Kingsley Junior High School, 303 Kingsley Street, Normal, IL.

B. PRE-BID MEETING

1. **Pre-Bid Meeting is scheduled for 10:00 a.m., Monday, January 20, 2020, (Martin Luther King Day), Kingsley Junior High School, 303 Kingsley Street, Normal, IL.**
2. Building may be available for inspection after 4:00 p.m. on school days, or all day on no school days when staff is available.

    a. Call ahead to schedule. (Maintenance Office, phone 309/557-4101, Joe Adelman, Executive Director of Operations.)

C. EXAMINATION OF SITE AND CONTRACT DOCUMENTS

1. Bidder shall carefully examine bidding documents and inspect the site to obtain first-hand knowledge of existing conditions.
2. Access may not be available on short notice.
3. Do not ask for directions or interpretations of the work during these visits unless in combination with a pre-bid meeting, you may discuss the work but if any clarifications or questions become evident these must be handled through the A/E and no change to the project requirements will result from verbal clarifications of the work during a visit.
4. Each Bidder, by submitting his bid, represents that he has examined the bidding documents, inspected the site and premises, compared task requirements and time constraints to installation conditions and that he understands the obligations of the bidding documents. By providing a proposal he is certifying that he has familiarized himself with the local conditions under which the work is to be performed. Bidders will not be given extra payment or contract time for conditions that could have been determined by on site examination.

D. INTERPRETATION OF DOCUMENTS

1. Anyone having a doubt concerning the meaning of the Contract Documents, or any other questions, may submit a request for interpretation from the Architect/Engineer. All pre-bid interpretation shall be requested not later than FIVE (5) DAYS prior to the bid due date. Response, other than minor clarification, will be in the form of Addenda and will be mailed to each Bidder.
2. It shall be the Architect/Engineer's responsibility to clarify conflicts in requirements as may be reported to the Architect/Engineer. After bid due date, the Architect/Engineer shall determine the course to

be followed for said clarification with no cost change to the Owner.

E. ADDENDA

1. Addenda may be issued before the bid opening date to clarify or modify the Contract Documents. Addenda are posted at www.middletonassociates.net
2. Addenda will be issued electronically. Email address is required to receive addenda.
3. If you have not registered your interest in the bid with the Architect, and do not receive or seek out the addendums then failure to recognize any Addendum may disqualify the bid.
4. Said addenda shall become a part of the Contract documents and supersede any conflicting specifications and/or clarify intent of same.

F. INTENT, ERRORS AND OMISSIONS

1. Any known conflict between requirements of various portions of the Contract Documents shall be reported to the Architect/Engineer prior bid due date and shall fall under the authority of Interpretation of Documents.
2. The Drawings are descriptive and directive in concept and are not intended to exhaust all detail situations required to complete the work. The procedures detailed shall establish the general character of solutions needed for typical, non-typical, and peculiar situations at the job site.
3. It is the intent of the documents that specified work and equipment be installed in a proper and finished manner, fully operational, at a minimum of generally accepted standards for good quality commercial construction. All necessary materials, labor, controls, accessories, brackets, fasteners, sealants, etc., to properly install and complete the work shall be provided unless specifically noted otherwise.
4. Each Contractor and Subcontractor shall coordinate and cooperate with the other Contractors to provide proper installation. Verify dimensions, services, installation conditions, obstacles to the work and modifications necessary to complete the work and coordinate the fit, finish and scheduling of the work.

G. DOCUMENT INTENT, PROJECT COMPLETION, FITTING AND FINISHING FULLY FUNCTIONAL, USER READY

1. It is the intent that all items of work included in the project are to be completely finished and all necessary associated components and accessories for proper completion are to be included in the work.
2. Drawings are schematic in nature; every single element needed is not necessarily labeled, dimensioned or positioned. Unless specifically exempted, the Contractor shall provide as follows:

3. Good quality fit, finish and workmanship at a level of competency and quality equal to or exceeding commercial construction in the area.

    a. Sealants, caulks, flashings, transitions, closures and components to assure infiltration and weather tight result and finished appearance inside and out.
    b. Sealants, flashings, closures at building connections.
    c. Upper and lower flashings, in new construction and whenever possible, to shed water outward.

4. All components and assemblies to assure proper installation and performance of manufactured equipment, per manufacturer's or industry association standards as a minimum.

    a. Mechanical equipment, plumbing, piping, ventilation, valves back checks, connections etc.
    b. Mechanical and electrical coordination, coordination of installation locations, hidden where possible, routed through the construction in the most expedient but concealed manner,

        1) Minor relocation of piping, equipment, installations shall be provided without cost change within 10’ either way or reasonable pathways of similar distance.

    c. All other equipment, kitchen, doors, hardware, windows and any other operable equipment
    d. Service access, filters, repairs always allow for reasonable repair and maintenance access.

5. Proper protection of dissimilar materials or components for bond problems, galvanic action, movement, moisture, and/or chemical reaction.
6. New finished appearance for all new work and work abutting existing where applicable.
7. Code compliance:

    a. All equipment and installations.
    b. Electrical NEC, circuit protection, grounding, disconnecting means, GFI, and installation practices
    c. Water, back checks, vacuum breakers, back flow preventers, service valves, hammer arrestors, expansion tanks.

8. Construction assembly details, setting forth special requirements, keyed to a specific section, detail or I.D. number, shall be considered applicable to similar assemblies throughout the contracted work unless specifically designated otherwise.

2.2. DRAWINGS & SPECIFICATIONS

A. OBTAINING INFORMATION

1. Drawings and Specifications may be obtained from the Architect, Middleton Associates Incorporated, 1702 W. College Ave., Suite E, Normal, IL 61761-2793, Telephone 309/452-1271, Fax 309/454-8049.
2. Deposit required for each set from Architect: $50.00. Contractor may purchase additional documents directly from The Copy Shop in Bloomington, or print on-line.
3. To obtain documents provide the A/E all contact information as well as an email address for delivery of addendums and bidding information during the bid period.
4. Method of document distribution is at the option of the Owner and the Architect whether it is paper, or digital.
5. Replacement value $50.00

B. RETURNING DOCUMENTS

1. All documents remain the property of the Architect and shall be promptly returned after the bidding. The low bidder may keep documents and sub bidders may retain same until awards have been made.
2. Failure to return documents within 20 days after bidding will result in loss of deposit or compensation will be required for the replacement cost in the event there was not a plan deposit.

2.3. ALTERNATES

A. The Bidder shall submit a proposal for every alternate listed in the Contract Documents. Failure to provide alternate prices may disqualify the bid.

B. See Section 00 24 13, Scope of Bids, for a description of Alternates.

2.4. BID SECURITY

A. The Bidder shall furnish bid security, along with his proposal:

1. Form of security to be bid bond or certified check payable to the Owner.
2. Amount 5% of the base bid proposal
3. Said security shall serve as a guarantee that the Contractor will enter into the Contract with the Owner as per his bid and the contract terms should the job be awarded to him.

B. Should said Contractor refuse or fail to enter into a Contract with Owner per his bid for the work included in these Contract Documents within fifteen days following notification of award and/or receipt of a contract for signature, said bid security shall become collectible, in full, by the Owner

in payment for damages.

1. Failure to enter into an agreement shall mean failure to return or submit:

    a. A signed agreement.
    b. Owner’s protective bond(s) for Labor, materials and performance.
    c. Approved subcontractor/supplier lists.
    d. Certificates of insurance within stated time period.
    e. Evidence that this contractor intends to pursue this contract in a timely and deliberate manner, including ordering of materials and committing or arranging for necessary manpower to accomplish the work.

2.5. WITHDRAWAL OF BIDS

A. Bids may be withdrawn by an authorized person prior to the bid due date and time, after which time no bids may be withdrawn for a period of forty-five (45) days unless a Bidder has been released by the Owner's action.

B. Authorized person shall mean an Owner or Officer of the Contractor offering the proposal or other evidence of authority.

2.6. PROPOSAL (BID) FORMS

A. Each bidder shall submit his proposal, on proposal form provided.

1. Submitted bid forms may be copied
2. All applicable blank spaces on forms shall be filled out fully.
3. Numbers shall be stated in writing where noted and in figures.
4. Signatures shall be live in longhand by person authorized to sign bids as Owner or corporate officer or shall include Power of Attorney to sign the bid.
5. No facsimile proposals or modifications can be considered per Illinois School Code on public school projects.

B. Completed forms shall be without delineation, clarification, alteration or modification.

1. Correction of contractor inserted is acceptable if clearly identified and initialed by the signatory to the bid. Irregularities of such corrections may be grounds to disqualify the bid.
2. Offers to clarify or modify may be made on voluntary alternates and substitution forms if provided in the bid package, but in no case should the base bid or requested alternate bids offered be based on anything but the document requirements.

C. Voluntary alternates or offers for substitutions may be attached on forms provided or on the bidder’s letterhead. These will be considered at the

Owners option. Additional information may be requested prior to consideration.

1. Voluntary alternates or substitutions cannot and will not affect or change the Base Bid Proposal. Voluntary alternates and/or substitutions will be implemented after the low bid proposal is accepted if the voluntary alternate and/or substitutions is beneficial to the owner.

2.7. AWARD OF REJECTION OF BIDS

A. Although it is the intention of the Owner to accept the lowest qualified bid the Owner specifically reserves the right to waive all formalities and/or informalities, to reject any and all bids and/or accept the bid that, in the Owner's judgment is the lowest responsible bid.

1. The low bidder shall submit references if requested by Architect.

B. Contractor will note all alternates that are applicable, or as may become applicable by addendum, should be bid. Failure to bid an alternate may be grounds to disqualify the proposal, at the Owners discretion.

C. Should the time for award exceed the time stated for the proposal's expiration period, the Owner reserves the right to continue to negotiate with bidders in the line of award succession as a prior option rather than re-bid.

2.8. RETURN OF BID SECURITY

A. After bids have been read along with alternates as applicable and a successful Bidder has been approved by Owner, a Letter of Intent will be sent to the successful bidder and bid security may be returned to the unsuccessful bidders except the deposits of the two (2) most advantageous bidders will be retained until Owner/Contractor agreements have been consummated.

B. Following the signing of the Contracts and receipt of bonds, remaining bid security will be returned. If the successful Bidder fails to accept the Contract and submit acceptable bonds, same will be grounds for forfeiture of his bid security.

2.9. OWNER'S PROTECTIVE BONDS: A 100% of value Labor and Material Payment Bond and Performance Bond including all alternates accepted is required in the Contract and shall be included in the Contractor's Proposal

A. Periodic Change Orders that may occur to the Contract shall be included in each respective bond.

B. Bonds shall cover the entire Contract without regard to the Contractor's assignment of work of Subcontractors or Suppliers.

C. Inclusive of all awarded Alternates accepted.

2.10. CONTRACT AWARD

A. The Owner will make an award based on the selection of the lowest cost responsible bidder. After award is approved by the Board of Education, the contract timeline is as follows:

1. The Architect will fill in the Contract Form of Agreement (specification section 00 41 13). The Architect will obtain the signature of the person designated by the Board of Education.
2. The Architect will send two (2) Forms of Agreement, and the Contractor shall sign both, keep one (1) for their file, send one (1) back to Architect. This shall happen within seven (7) calendar days of the date of award.
3. When the Contractor has signed both copies of the Form of Agreement, the project starts.
4. The Contractor shall immediately obtain Proof of Insurance, Labor and Materials, Payment and Performance Bonds. All of the above to be completed fifteen (15) days after award.
5. Master Cost Breakdown (CVS), thirty (30) days after award.
6. Proposed Schedule and timeline: Contractor to present at Pre-Construction meeting, fifteen (15) days after award.
7. Contractor to send Shop Drawings and Catalog Cuts/Samples or bring same to Pre-Construction meeting.

B. Failure or refusal to provide the preceding Contract information in a timely manner may be cause for cancellation of the award or termination of the agreement if signed and the Owner will be entitled to compensation under the terms of the Bid Security for failure to execute contract terms in good faith.

2.11 SCHEDULING

A. Contractors' Master Schedule

1. The Contractor shall prepare and maintain a Master Schedule, including the work of all sub contractors.
2. Upon preparation of a detailed schedule, same shall be reviewed by the Architect and the Owner. Once accepted, it shall become the basis for determining the on time progress of the work.

a. Provide manpower crews, overtime double shift, and equipment as needed to maintain the schedule. The Owner will not authorize additional payment for overtime or additional manpower needed to maintain, achieve, or make up time to meet the schedule. The General Contractor shall notify the Architect and the Owner promptly of any deficiency in performance, which is unacceptably impacting the schedule or delaying progress, and provide a plan of action to regain performance to meet the schedule.

b. The Subcontractor(s) shall immediately notify the General Contractor, in the event any trade area Contractor's progress is impeding their ability to maintain the schedule.
c. The Prime Contractor shall immediately provide notification of this report to the Architect and the Owner and shall include a plan of action to regain schedule.

B. Construction Schedule

1. Submittals of shop drawings shall be prepared immediately following award.
2. Material acquisition may begin immediately following Award.
3. Upon return of review submittals, schedule material and equipment for timely delivery.

a. Materials and equipment delivered on site or suitably stored with proof of insurance may be submitted for payment, subject to inspection.
b. The Owner requests that equipment and materials to do the work be on site or readily available for delivery prior to the start of operations.

C. Manning the work

1. Contractors shall work full crews or partial crews as indicated in the schedule developed for paragraph 2.11. A.

2.12. COMMENCEMENT OF CONSTRUCTION

A. Contractor shall not commence work until the agreement has been executed by both Owner and Contractor and Insurance Certificate and Owner's Protective Bonds have been accepted by the Owner and the Architect.

1. **All insurance certificates shall specifically list McLean County Unit District No. 5 and the Architect, Middleton Associates Incorporated and their consultants and sub-consultants to the work, as added insureds or named insureds.**
2. The start date of the project will be the date of Bid acceptance. The completion date will be August 20, 2021.
3. Work can be done at all times when students are not in the building during regular class attendance times. This would be from 8:15 a.m. to 4:15 p.m. during the regular school attendance days.

2.13. ALLOWANCE

A. The General Contractor shall include in his bid an allowance of $50,000.00 for additional time and material or Change Order work as directed and approved IN WRITING by the Owner and A/E. $50,000.00 to be added to the bid.

1. This is primarily for ceiling repair.
2. Unused portion of allowance will be returned to owner at time of Final Payment request via Change Order.

B. This is not for assignment or use by the Contractor or Subcontractors for any work that either perceives as additional effort unless the Owner is in concurrence IN WRITING.

2.14. PROGRESS PAYMENTS

A Pay Requests must be approved by the Architect / Engineer and the District Maintenance Supervisor, Doug Johnson. Submit all Pay Requests to the Architect, five (5) business days before the end of each month. Pay Requests will be accepted once per month.

B. Payment will be made within thirty (30) days following approval.

C. In accordance with the terms of the Contract periodic partial progress payments may be made monthly to the Contractor for: 90% of the value of the labor, materials, and/or equipment incorporated in the construction. Payment will be for installed materials only.

D. After Contract award and before commencement of work, the Contractor shall submit a complete master cost breakdown. Said cost breakdown shall be used by the Owner only for the purpose of checking and certifying requests for payment.

E. Pay requests shall indicate amounts completed of all items listed from the master breakdown.

F. Submit notarized Contractor's affidavits with each pay request showing that total owed on Contract by Owner (after subject request has been paid to Contractor) is more than the amount to become due the Contractor for material, subcontractors and labor.

1. 10% of each request will be retained by Owner until work has been satisfactorily completed. After 75% of the Contract has been satisfactorily completed retainage reduction will be considered.

G. All the applications for payment shall be made in two (2) copies with all copies bearing live seals and signatures, notarized and complete and accurately filled in.

1. See AIA General Conditions, Paragraph 9.3.1, 9.3.2 and 9.3.3.
2. Applications for payment shall be submitted to Architect/Engineer on AIA G-702A Forms.
3. EACH SUCCESSIVE PAY REQUEST SHALL BE ACCOMPANIED BY PARTIAL WAIVERS OF LIEN, DOLLAR FOR DOLLAR MATCHING THE PRECEDING PAY REQUEST.
4. Attach one (1) copy of Contractor’s Payroll with Pay Request in accord with Dept. of Labor requirements. Include Payroll for the

major Subcontractors and upon request any minor or intermittent on-site Subcontractor.

2.15. CHANGE ORDERS

A. Changes to the scope of work may occur after Contract Award. Contractor may initiate a Change Order by send an RFI to the Architect. The Architect and Owner may initiate a Change Order by verbal or written inquiry to the Contractor.

B. When a change to the scope must occur the following procedure shall apply:

1. The Change Order may be indicated as a fixed price or time and material. In all cases a written summation of work to be done shall be submitted to the Architect or written by the Architect. In all case the Contractor shall be provided a signed Letter to Proceed before accruing any expenses toward the Change Order.
2. The Architect will try to provide the Letter to Proceed within twenty-four (24) hours of the time of origination of the request.

C. Cost of Change Orders

1. Cost of Change Orders shall be broken down into Labor, Material and Mark-up.
2. The Mark-up will include a percentage of the cost of Labor and Material and shall include everything (bonds, insurance, project management, overhead and profit, etc.). Mark-up allowed is:

a. Prime Contractor on own labor and materials – maximum 15%.
b. Subcontractor on own labor and material – maximum 15%.
c. Prime Contractor on labor and material of Subcontractor – maximum 7.5%.
d. Change Orders may be by T & M with above add-on.

2.16. LIST OF SUBCONTRACTORS AND SUPPLIERS

A. Within seven (7) business days after notification of intent to award, and prior to the Contract being signed, the Contractor shall submit to the Architect/Engineer, a list of proposed subcontractors and major equipment suppliers and other persons or organizations to be assigned part(s) of the contract.

B. This list is subject to the review and approval of the Owner. Basis for this review may include supporting evidence the proposed Subcontractor or Supplier has experience and adequate resources to accomplish the assigned responsibilities on time and in compliance with the requirements.

1. The Owner reserves the right to request justifiable changes in the list.

2. The changes requested are intended to be made at no additional cost to the Owner.
3. If it is not possible to make requested changes at no additional cost, the Owner reserves the right to terminate the award and negotiate with the next successive bidder based on his original proposal.

2.17. MATERIALS SPECIFIED AND QUALITY OF WORK

A. Materials shall be as specified or approved equal.

1. Approved equal" and "or equal" shall mean that the Contractor shall be required to receive the approval (via the Architect) on any substitute materials.
2. Requests for substitution approval shall be submitted to the Architect/Engineer, seven (7) days prior to the bid due date.
3. Prior to considering substitutions, the Owner and/or the Architect/Engineer may require submission of samples, descriptive, technical and catalog data and lab reports of tests for verification of equivalency.
4. If approved and selected, all adaptations to fit and accommodate the substitute or equal equipment including coordinating other trades is the responsibility of the Contractor requesting the change.

2.18. PROGRESS PAYMENTS

A. Will be made not more frequently than monthly, per the Owners payment schedule.

2.19 PROJECT ACCESS: The Contractor shall be aware that the Town/City, Township, County or State has authority over various approach roads for site access and the Contractor is responsible to:

A. Observe load limits and arrange for any exceptions to load restrictions that may be required for this project.

B. Make arrangements for road cleanup, barricades and surface patches and repairs shall comply with applicable regulations and be subject to the governing authority approval.

2.20. EQUAL OPPORTUNITY EMPLOYMENT: The following clause is applicable unless this Contract is exempt under the rules and regulations of the Secretary of Labor of the State of Illinois.

A. During the Performance of this Contract, the Contractor agrees as follows:

1. The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, age or national origin. The Contractor will take affirmative action to ensure that all applicants are considered and that employees are treated, during employment, without regard to their race, color, religion, sex, age or national origin."

2.21. ILLINOIS DEPARTMENT OF LABOR AND LABOR RELATED REQUIREMENTS

A. IDLR regulations apply to all work on site without exception.

B. Publicly funded projects or projects managed by Public Bodies require the following:

1. PREVAILING WAGE 820 ILCS 130/4: The Contractor shall pay and shall require his subcontractors to pay the prevailing hourly wages as is determined by the Illinois Department of Labor pursuant to the Illinois Prevailing Wage (820 ILCS 130/1 et. seq.) included at the end of this section.

2. CERTIFIED PAYROLL REPORTS: Will be required with each successive pay application for payroll periods preceding the application date.

3. SUBSTANCE ABUSE PREVENTION ON PUBLIC WORKS 820 ILCS 265: All Contractors must be prepared to certify upon request that they have complied with the Illinois Substance Abuse Act, including a written program that meets or exceeds the requirements of this act for the prevention of substance abuse among its employees.

2.22. ILLINOIS STEEL PROCUREMENT ACT 30 ILCS 565/1

The Contractor is to be aware that a point of origin certification to show compliance with 30 ILCS 565/1 may be requested for any steel fabricated item and shall demonstrate compliance with the law.

A. Exemptions:

1. Products costing less than $500
2. Products not produced in the United States in sufficient quantity to meet schedules
3. Products purchased or produced in the United States would increase purchase cost by more than 10%

2.23. SALES TAX

A. Materials supplied to a public school district are exempt from state sales taxes. The Contractor shall determine the extent of exemption and shall comply with the regulations established by the Illinois Department of Revenue.

1. Sales tax exemption number for Unit District No. 5 is: E9994909106

2.24. TOBACCO AND ALCOHOL FOR CONSUMPTION PRODUCTS

A. Smoking, chewing, etc. of ANY tobacco or medical marijuana shall not be permitted anywhere on school property by State Statute.

B. Alcoholic beverages are not allowed on school property.

1. Working under the influence of any of the above and/or a legal prescription that causes impairment is not allowed.

C. Violators may be removed from the job sites subject to conditional return privileges in the future.

D. The Contractor shall comply with 820 ILCS 265/. The Contractor shall have a place in a written program that meets the requirements of the ACT.

2.25. SUBSTANCE ABUSE PREVENTION ON PUBLIC WORKS PROJECTS

A. The Contractor shall comply with 820 ILCS 265/ which establishes a process for Drug Abuse on Public Projects. The Contractor shall have in place a written program that meets the requirement of this Act.

2.26. SEXUAL HARASSMENT POLICY

A. The Owner will not tolerate sexual harassment in any form. Sexual harassment is defined, for the purpose of this policy, as "unsolicited, deliberate or repeated sexually derogatory statements, gestures or physical or implied physical contact that cause discomfort or humiliation. Sexual harassment may involve pressure from a person of either sex against a person of the opposite sex or same sex . . ."

1. Should evidence that a Contractor, or a Contractor's employee, has harassed staff, student or other individuals, that employee shall be removed from the job site permanently or until such time that the circumstances have been determined to have been resolved satisfactorily.

2.27. EMPLOYEE-STUDENT RELATIONSHIPS

A. Except in an emergency situation involving safety, intermingling of the Contractors' employees and the school faculty, staff and students is be avoided. Contractor or Subcontractor personnel violating this requirement shall be removed from employment at this site. The Contractor Superintendent shall monitor this to the best of his ability. Contractor employees experiencing problems with students or faculty shall report same to their Project Superintendent, who shall promptly report the problem to an authorized representative of the Owner and the Architect/Engineer.

1. Avoid profanity and inappropriate subject matter in conversation as students and staff may be within audible range and walls or ceiling spaces may allow sound transmission.
2. Verbal or physical action interpreted as sexual in nature or as sexual harassment will be grounds for removal of the employee. Further legal action remains the option of the persons affected.

3. In all aspects of this provision, the Contractor's employees as adults have the greater responsibility and should not respond to inappropriate student behavior.

2.28. BACKGROUND INVESTIGATION AND SEX OFFENDERS ON SCHOOL GROUNDS

A. Illinois Criminal Background checks are applicable to this Contract. The Contractor or subcontractor shall only send construction workers to the site that have successfully passed an Illinois Criminal Background check, per 105 ILCS 5/10-21.9 and 105 ILCS 5/14-7.02

B. The Contractor shall provide:

1. Prior to start of work; maintain a list available to the Owner of all the employees who will be or are anticipated will be employed on site. This list shall be updated when new persons not originally listed will be working on site. This list shall also include names of personnel employed by subcontractors.
2. Persons temporarily on site such as truck drivers or employees making deliveries do not need to be listed, but the Owner reserves the right to request a background check.
3. Provide an affidavit to the Owner that the Contractor or his subcontractor has performed an ISP approved background check by name on all personnel on site.
4. Copies of employee lists and affidavits shall be promptly provided to the owner upon request.

C. The Contractor shall not knowingly employ on school grounds any person who has not signed or will not sign an authorization for a criminal background check.

D. The Owner or Regional Office of Education, reserves the right to run fingerprint background checks on any or all employees on site, randomly or specifically, and the cost of this check will be borne by the Owner. Upon request, provide information, which will not be shared, as needed to complete checks. This may include SSN, home addresses, fingerprint, address, etc. and any alias or former names used.

E. The Contractor shall assume the responsibility to notify all on site employees or potential employees of this provision, and of the consequences of this provision.

2.29. BUILDING PERMITS

A. This project is exempt from local permit fees associated with the construction.

1. This Contractor shall fully cooperate with the local authorities and shall apply for and obtain all required permits and comply with local regulations and requirements. Only the fee is exempt.

2. Provide necessary permit related information to local city authorities.
3. Architect will provide Drawings and Specifications to Town of Normal Building Safety Dept.
4. Architect will assist Owner in obtaining a Building Permit from the Regional Office of Education, DeWitt, Livingston, and McLean Counties.

2.30. CONTRACT DOCUMENTS CHECK LIST

A. Proposal

1. Proposal Form properly filled out and signed, (live signatures)
2. Bid Bond/Bid Security for 5% of base bid amount (live signatures)
3. Low bidders exempt, return of documents within fifteen (15) working days after bid due date

B. Letter of Intent

1. Supplier - Subcontractors List, (10 days after Award)
2. Employee list and criminal background affidavit, (prior to start on site.)
3. Proposal & Contract Form prepared by the Architect, (signed and returned 10 days after receipt).
4. Labor and Material Payment Bond, two copies (10 days after award)
5. Performance Bond, two copies (10 days after Award)
6. Insurance Certificates, liability and hold harmless, three copies (10 days after award)
7. CSV - Master Cost Breakdown (Preconstruction meeting)
8. Bar Graph/Progress Schedule, copies as required (Preconstruction meeting)

C. Periodically as needed

1. Update employee list and criminal background affidavit as needed.

D. Periodic Application for Payment

1. Submit per the monthly scheduling, to be determined
2. Application and Certificate for Payment, 2 copies (AIA G702A)
3. Contractor's Affidavit, 2 copies (AIA G706)
4. Breakdown Estimate, 3 copies
5. Partial Waivers of Lien, 2 copies

    a. Partial Waiver of Lien from Subcontractors/Suppliers for previous payment, 2 copies.
    b. Updated Progress Schedule, submit with each pay request

6. Certified Payroll for all trades employed on site. Certified Payrolls may be e-mailed to our office at:

middleton@middletonassociates.net.

E. Substantial Completion

1. Notification work is ready for inspection.
2. List of deficiencies or incomplete work.

F. Final Application for Payment:

1. Letter to Architect that deficiency work is complete
2. Final Lien Waiver from the Contractor, 2 copies
3. Final Lien Waivers from Subcontractors/Suppliers, 2 copies
4. Final Affidavit showing $0.00 due to Subcontractors and $0.00 due to Suppliers, 2 copies
5. Final Payment Approval Letter from Bonding Co., 2 copies
6. Certification of all guarantees, warrantees and service contracts, O & M Manual
7. Final Application & Certificate for Payment, 3 copies (AIA G702A)
8. Additional certifications as may be requested, 2 copies
9. Operating manuals & instructions, 3 copies-indexed and bound
10. Figure Bonus / Penalty and Liquidated Damages if applicable.

2.31. PREVAILING WAGE: The Contractor shall pay and shall require his subcontractors to pay the prevailing hourly wages for the type of work performed in the job locality as is determined by the Illinois Department of Labor pursuant to the Illinois Prevailing Wage (820 ILCS 130/.01 et.seq.) see section 00045. **Provide Certified Payroll data per Dept. of Labor and HB 188.**

2.32. FINAL PAYMENT: The final application for payment shall not be made until all work and deficiency (punch list) items have been satisfactorily completed and approved by the Architect/Engineer for documents compliance.

A. Contractor to submit Operation Manuals and As-Built Drawings to Architect, prior to Final Payment.

END 00 21 13

1. GENERAL

1.1. DESCRIPTION OF DRAWINGS AND LAYOUT

A. Drawing data is intended to be reasonably accurate, however, strict accuracy in detail is not guaranteed.

1. Drawings, particularly Mechanical and Electrical drawings are schematic in nature.
2. The Contractor must verify all of the actual conditions, measurements, dimensions, rough-in requirements; fitting of piping, conduit, wiring, and duct work and coordination necessary for each item, system or piece of equipment in the Contract Documents.
3. Verification is the Contractor's responsibility and shall be completed prior to the fabrication or installation processes.
4. Coordination of all elements of the work must be allowed for with cooperation between the trades particularly for conflicts of limited flexibility of installation. The general priority unless fixed conditions conflict is as follows: structure, placement of equipment, service access, mechanical piping, plumbing piping, and electrical piping. Trade priority in the preceding list does not supersede field cooperation to collectively and most expediently install the work.
5. All corrections necessary to provide properly installed, finished and operable system, in accordance with the intent of the Documents, shall be made at no additional cost.

B. All measurements and conditions must be verified by actual observation at the site.

1. The Contractor shall be responsible for all of his work fitting into place in a satisfactory and workmanlike manner in every aspect and detail subject to the approval of the Architect. The Contractor shall provide layout work and verification measurement at his own cost.
2. The Contractor shall perform all layout work pursuant to site, building, grades and levels, and furnish such engineering services as he may require executing the intent of the work included.

C. Before starting his work, the Contractor shall examine all Contract Area Drawings and Specifications and if discrepancies or conflicts are apparent or occur during the progress of the work:

1. Work first with the conflicting trades or installations to fit and coordinate the work.
2. If there appear to be no practical or agreeable way to coordinate the fitting of the work report same to the Architect as a Request for Instruction, RFI, and obtain direction or interpretation to proceed.

D. The Drawings are instructive and diagrammatic and shall be followed as closely as actual construction will permit. All changes from Drawings

necessary to complete the work shall be done at no added cost charge to the Owner above the amount shown on the Owner/Contractor Agreement.

1.2. OVERLOADING OF BUILDING

A. Care shall be taken that completed structures are not overloaded during Contractor operations. It shall not be the Owner's, or Architect/Engineer's responsibility to observe and check construction processes and temporary loading conditions that may temporarily occur in the pursuit of the completed installations.

1. Structural design, unless noted otherwise, is designed to accommodate design loads, per code, after completion.
2. Bracing and shoring for loading or stability prior to the installation of lateral support elements and diaphragm assemblies is the responsibility of the Contractor.
3. All structural damage done by overloading the system shall be repaired by the Contractor or Subcontractor overloading the system.

1.3. MEANS AND METHODS

A. The Architect/Engineer and Owner shall have no authority over the means, methods and procedures of the work and shall make no determination pursuant thereto nor render opinions concerning same.

1. The Architect’s Field Representative does not have authority to render opinions on structural questions.
2. If questions arise submit a Request for Information, RFI, for direction.

B. The Architect/Engineer and Owner and representatives of same shall have no authority over methods employed or safety conditions related to:

1. Erection loads and as they relate to the Contractor’s interest and shall provide no observation of same.
2. Upon request the Architect can provide the design loads employed for the final installation.
3. The contractor shall designate an employee of the contractor as the person in charge of and responsible for directing the work and safety procedures on site.

1.4. PROTECTION OF WORK AND BUILDING

A. The Contractor shall protect all work and stored materials from injury or loss caused by or resulting from operations under this Contract, including but not limited to:

1. Physical damage

a. Poor stacking practices

b. Abuse damage due to adjacent operations or exposures
c. Weather related damage

2. Failure to have reasonably secured stored and in progress work.

1.5. MOVING OF MATERIAL

A. Contractor materials which are temporarily located or stored shall be relocated as needed to allow access by the Contractor, other Contractors and the Owner's personnel in and around the construction area.

1. Prior to storing materials coordinate the operations to avoid conflicts.
2. Such moving of any material shall be at no additional cost to the Owner.

B. At no time shall tools, materials or workmen block an exit unless same has been coordinated with other trades on site and reasonable alternative options are maintained.

1.6. SHORING, BRACING, AND BARRICADES

A. The Contractor shall provide, construct and finally remove all temporary shoring, bracing, underpinning, scaffolding, needling, barricades, etc. as required by local restrictions and as necessary for to protect persons and property from damage or injury.

1. The Contractor shall determine the need for these items.
2. The Contractor shall be responsible for the performance or failure of performance of same and shall repair damages caused by failure or absence of same.

B. Specific temporary shoring supports, etc., may be noted in the Documents, such as for new openings or certain renovations in existing work.

1. All such needed shoring is always not noted but the responsibility of the Contractor or Sub Contractor making the opening or installing the new work as needed
2. Notation on the drawings is an observation that existing support conditions are being impacted by the work and shall be attended to by the Contractor as needed by conditions discovered.
3. In all cases, observe actual conditions of the work, same may be different than the anticipated conditions and may require shoring bracing and barricades.

1.7. MATERIALS, WORKMANSHIP, AND LABOR

A. All installed materials and equipment shall be new and shall be installed and completed in a first class, workmanlike manner.

B. The Architect reserves the right to direct the removal and the replacement of any item which, in his opinion, does not present a proper, orderly or reasonably neat installation. Such removal and replacement shall be done promptly when directed by the Architect or the Owner. All installations will be subject to the Architect's and Owner's inspections, tests, and approval at all times from commencement of the work to Final Acceptance of the completed Contract.

C. Work needing correction or replacement that is not corrected with reasonable promptness shall be subject to written notice thereof by the Architect. The Contractor by virtue of having tendered his bid for the work, agrees that progress payments by the Owner may be held (no payment made) until said faults have been corrected.

1.8. ALIGNMENT BALANCING

A. The Contractor shall be responsible for supervision of the installation of equipment.

1. Level, adjust, balance and align new equipment and reinstalled or relocated equipment.

a. Laser align electric motors with adjacent pumps.

2. Provide all alignment per manufacturer set up recommendations, align and balance pumps, belts and pulleys and adjust equipment to work properly.

1.9. CLEANING UP

A. Work areas shall be maintained reasonably clear of accumulated debris, cartons and unused equipment to allow orderly pursuit of the Work.

B. All surfaces shall be cleaned of any paint, plaster, mortar, gook and other stains.

1. Care shall be taken that no surface is scratched, marred or damaged by the cleaning process.
2. Damaged, marred or scratched surfaces of any type shall be repaired to new or original condition or replaced if necessary to provide a final installation acceptable to the Architect.

1.10. OPENINGS IN CONSTRUCTION

A. Openings required for construction work shall be provided by the Contractor, complete with all necessary reinforcing, lintels, trim, finishing, etc. as shall be needed to complete the Work including openings required for electrical and mechanical work.

1. Openings to be provided for other trades must be laid out and noted by the trade needing same prior to construction of the surface

through which the opening is needed.

2. Untimely note of required openings shall be the responsibility of the Contractor or Subcontractor not requesting same.
3. All sleeves, flanges and forms, etc., shall be furnished by the Contractor requiring the opening.

B. Concrete slabs, joists, concrete floors, finished floors, walls and structural elements, and other structural items shall not be cut or disturbed, except as approved by the Architect IN WRITING.

C. Pipes or elements passing through floors or partitions shall have sufficient clearance around pipes to prevent damage to the adjacent finish from expansion and contraction.

1.11. FIRE SEALS

A. All penetrations of fire walls, smoke barriers and floors shall be properly fire sealed to prevent the passage of smoke and maintain the integrity of fire barriers.

1. Such seals are the responsibility of the contractor for whom the penetration is provided.

1.12. SUPPORTS

A. The Contractor shall provide all concrete, steel bases and anchorage except as herein specified otherwise: vibration absorbing foundation bases, hangers, platforms, anchor bolts, etc. for all equipment which he furnishes. These foundations or supports shall be as specified under their respective headings, as shown on the drawings and/or as recommended by manufacturers.

1. Materials and installation requirements for curbs and pads shall be commensurate with the need.
2. Concrete shall be 3500 psi minimum strength, air entrained 5% to 8% by volume. Install following commercial practices.
3. Framed curbs or foundations shall be properly supported.

1.13. PROTECTION OF WORK

A. The Contractor shall protect his work and adjacent existing work from injury by keeping all piping, ductwork, etc. capped, plugged, drained, or otherwise protected from injury including damage done by freezing and damage from building materials, cement and/or dirt, concrete traffic or exposure.

1.14. ELECTRICAL SERVICES TO EQUIPMENT

A. Unless otherwise specified the Contractor shall furnish and install electrical feeders of proper size, and furnish, install and complete all power wiring and the control wiring for each motor, electrified signage and/or piece of

equipment affected by the Contract.

1. Although circuits may be called for on the drawings, ALWAYS verify the final equipment requirements before pulling wire in the event it needs to be increased in size.
2. Contractors providing equipment shall verify the circuits and protection level and need for safety switches matches what they are providing.

B. All electrical procedures shall comply with the National Electric Code, whether temporary or permanent.

1.15. SEALANTS

A. Provide sealants in all locations where shown on the Drawings or called for in the Specifications and as necessary for infiltration tight and weather tight building envelope and finished visual appearance.

B. Sealants shall be provided in locations as directed by the Architect, where equipment components or fixtures fit to surrounds, and when cracks between equipment and surrounds are undesirable or excessive. Provide sealants in all interior locations, as necessary to properly trim out.

C. Sealants shall be installed and tooled in strict accordance with the Sealant Manufacturer's recommendations for joint preparation, using foam rope backer bars, etc. Sealant shall be installed by the respective Contractor providing the item requiring sealant installation.

1.16. PAINTING

A. All exposed surfaces or equipment reworked and installations leaving damaged or unfinished surfaces shall be painted or have a corrosion resistant or factory applied finish.

1. Unfinished non ferrous metals such as aluminum and stainless steel do not require painting.
2. Field paint unfinished equipment and surfaces for corrosion protection and visual appearance, except where clearly stated to the contrary on the Drawings.

END 00 22 13

1. BASE BID

1.1. DESCRIPTION

A. The Base Bid is to provide the Owner with all materials equipment and labor to complete the specified contract work in a single contract.

B. Bid packages

1. Base bid proposals will be taken as follows:

   a. Base bid proposal for Kingsley Junior High School HVAC Renovation and Geothermal, 303 Kingsley Street, Normal, IL.
   b. Deliver Bids to Joe Adelman, Executive Director of Operations, Unit 5 Maintenance Office, 1999 Eagle Road, Normal, IL prior to 1:30 p.m. prevailing time on February 6, 2020.
   c. The Owner will review the proposals and retain the right to accept or reject any and all proposals, waive minor irregularities in the bidding and award the work as deemed to be in the best interest of the District.

2. The Base Bid proposal must be for the specified work as may be modified prior to the bid time and date by addendum.

   a. Do not add any additional description of what is included or excluded from the bid on the proposal form, this may disqualify the bid.
   b. Fully fill out the proposal/bid form, omissions and failure to sign will disqualify the bid.

      1) Minor irregularities in filling out the bid form may be considered by the Owner as inconsequential to the intended bid and may be declared as such and the bid be considered valid.

3. Voluntary Alternates or Substitutions may be offered on the Voluntary alternate and substitution form if provided or on the Contractor's letterhead if desired. Such options should not materially change the intent of the proposal. These may be considered or disregarded at the Owner's discretion without explanation.

   a. See 00 21 13 paragraph 2.6.C

1.2. UNIT PRICES

A. Remove ceiling grid and ceiling panels (sq. ft.)

B. Replace ceiling grid (lineal foot).

C. Install new 2 x 2 ceiling panels

D. Remove and reinstall 1 x 4 or 2 x 4 light fixtures, not adding new fixtures.

1.3. ALLOWANCES

A. Include the following allowances for use by the A/E or Owner for work determined to be unexpected or additional work needed to accommodate unexpected conditions.

1. Project Number: 23152318 / Allowance: $50,000.00.
2. Authorized use will be by approved change order only, and is not to be assigned at the discretion of the contractor in any case.
3. Unexpected or additional work needed to accommodate unexpected conditions generally shall include repair of ceilings and unforeseen conditions. The determination of unforeseen conditions will be determined by the Owner, and the Architect.

1.4 ALTERNATE BIDS

B. Alternates are to provide the Owner with options expanding or reducing the project scope and content and for comparative material or equipment prices for use in determining the final construction contract.

C. Work included in alternates shall be commensurate with and in compliance with all the applicable and similar project specifications and conditions and shall include all necessary adjustments and additional labor and/or material as may become apparent to properly complete the alternate into the work. No additional charge will be considered after bidding for the purposes of making additional construction or adjustments in order to accomplish alternative work which has been included in the Contract.

D. Incidental Work: All necessary adjustment in the work shall be made to accommodate accepted alternates without cost change in and above the alternate cost.

END 00 24 13

1. GENERAL

1.1. SCHEDULING

A. Master Schedule

1. The Mechanical Contractor will be the General Contractor and the Coordinating Pacesetting Contractor and shall maintain a Master Schedule.
2. Prior to preparation of the Master Schedule, all Subcontractors shall coordinate scheduling needs with the General Contractor.
3. Upon preparation of a detailed schedule, same shall be reviewed by the Architect, the Assigned Contractors, and the Owner. Once accepted, it shall become the basis for determining the on time progress of the work.

    a. Provide manpower, overtime, and equipment as needed to maintain the schedule. The Owner will not authorize additional payment for overtime or additional manpower needed to maintain, achieve, or make up time to meet the schedule.
    b. The General Contractor shall notify the Architect and the Owner promptly of any deficiency in performance, which is unacceptably impacting the schedule or delaying progress.
    c. The Subcontractor(s) shall immediately notify the General Contractor, in the event any trade area Contractor's progress is impeding their ability to maintain the schedule.
    d. The General Contractor shall immediately provide notification of this report to the Architect and the Owner and shall include a plan of action to regain schedule.

B. Schedule

1. Contractors proposed schedule and timeline shall be delivered for review within seven (7) days or at the Pre-Construction meeting.

    a. Schedule will be subject to review and negotiated revision after Owner and Architect input are considered.
    b. Schedule should be available for the Preconstruction meeting.

2. Submittals shall be delivered forty-five (45) days following award.

    a. This schedule is adjustable shorter or longer depending on the size and content of the project.

3. Upon receipt of review submittals, schedule material and equipment for delivery as early as possible.

4. Confirm that manpower is available and Contractor has adequate capacity to complete the work on a timely basis.

    a. Materials and equipment may be stored on site in trailers or in suitable insured warehouses in the vicinity.
    b. Materials and equipment delivered on site or suitably stored with proof of insurance may be submitted for payment subject to inspection.
    c. The Owner requests that equipment and materials to do the work be on site or readily available for delivery prior to the start of operations.

5. Schedule

    a. Project is planned for execution over the Summer of 2020 and the Summer of 2021, with the schedule to be coordinated with the Owners schedule and an orderly fashion.
    b. Cooperation, always include in your schedule for manning the work and planning completion, not less than five days of flex time in the event the coordination, delivery issues or unusual weather impact on the work or unexpected Owner occupancy issues occur which will impact access (See Section 00 21 13). This is over and above the allowances you might include for you own operations such as weather, vacations, delays in delivery materials or equipment and illness. There is no intent or expectation of the Owner to abuse this allowance and every intent to cooperate to get the work complete, but an unexpected or uncontrollable time impact prior to August will not change owner occupancy schedules.
    c. Work to be Substantially completed for partial operation August 15, 2020. Final completion for full system operation, August 21, 2021. For Fall 2020 the school building must have functioning HVAC in all rooms.
    d. It is intended all work to be complete and fully operational 15 days after receipt of punch list.
    e. See requirements for Manning the work described hereafter.

C. Manning the work

1. Contractors shall work overtime, Saturday and/or double shifts if work falls one (1) week behind prepared schedule or agreed to revision and shall continue to work Saturday and double shifts, full crews or with additional crews until lost time is recovered.
2. Prepare a plan of action to recoup lost time for the A/E and Owner.

END 00 30 00

PROJECT TITLE: Kingsley Junior High School HVAC Renovation and Geothermal
Kingsley Junior High School

BID DATE: Thursday, February 6, 2020 TIME: **1:30 p.m. Prevailing Time**

LOCATION OF BID: MAINTENANCE OFFICE
McLean County Unit District No. 5
1999 Eagle Rd.
Normal, IL 61761

NAME OF FIRM _____

PROPOSAL FOR: All work single contract

A/E PROJECT NO. 23152318

THE BID ACKNOWLEDGES THE FOLLOWING ADDENDA:
Failure to acknowledge may cause bid rejection

NO. 1 _____, NO. 2 _____ , NO. 3_____ , NO. 4_____NO 5 _____

EACH BID SHALL INCLUDE:

A. THE BID FORMS AND CERTIFICATIONS COMPLETED AND SIGNED, (*this form may be copied.)*

B. BID SECURITY (*standard industry forms may be employed)*

C. BIDS SHALL INCLUDE ALLOWANCE – SEE 00 24 13

BASE BID – KINGSLEY JUNIOR HIGH SCHOOL HVAC RENOVATION AND GEOTHERMAL. THE BIDDER AGREES TO PERFORM ALL BASE BID WORK, INCLUSIVE OF ALL TRADES AND INCLUSIVE OF THE ALLOWANCE (PER SPECIFICATION 00 24 13) FOR THE SUM OF:

_____**Dollars $**_____
written amount

A. **Unit Price:** Remove existing ceiling grid and panels. $ _____/sq. ft.

B. **Unit Price:** Install new 2 x 2 grid ceiling; see specification Section 09 51 23 $_____/lineal ft,

C. **Unit Price:** Install new 2 x 2 ceiling panels; see Section 09 51 23 $ _____/sq. ft

D. **Unit Price:** Remove and reinstall 1 x 4 or 2 x 4 light fixtures, not adding new fixtures. . $ _____/unit

VOLUNTARY ALTERNATES OR SUBSTITUTIONS

Did you include voluntary alternates or product substitution offers on form provided.

YES _____ **NO** _____

1. SEE following section 00 40 10 Voluntary Alternate and Substitution Form. ATTACH IF ANY ARE OFFERED. Voluntary alternates or substitutions may or may not be considered in making the award and are not required.

THE BIDDER AGREES TO:

1. Hold this bid open for forty (40) calendar days after bid opening date.
2. Enter into and execute a contract with McLean County Unit District No. 5 if awarded this contract.
3. Comply with the contract and bidding documents with respect to bid security, all bonds, insurance, work requirements, schedule and Bonus / Penalty Clause
4. Comply with the Contract Documents with respect to Contract Time as specified in Scope of Bid Section 00 24 13.

THE BIDDER MAKES THE FOLLOWING REPRESENTATIONS AND CERTIFICATIONS:

A. A surety company has agreed to issue payment and performance bonds to fulfill the contracting requirements.
B. The Bidder is not barred from contracting with any unit of state or local government as a result of violating the bid rigging or bid rotating provisions contained in 720 ILCS 5/33E.
C. The Bidder is not barred from contracting with the State of Illinois as a result of a bribery conviction per 30 ILCS 505/10.2.
D. All on site labor and wage compensation provided by this contractor or his subcontractors will comply with the Illinois Prevailing Wage Act (820 ILCS 130E).
E. This proposal is made without any connection with any person making another bid for the same contract, that the bid is in all respects fair and without collusion or fraud, that no member of the McLean County Unit District No. 5 School Board, other officer or any person in the employment of McLean County Unit District No. 5 is directly or indirectly interested in the bid or any portion of the profit there from, except as allowed by the Illinois Law or the Illinois School Code.
F. I agree to provide a drug-free workplace as required by the Illinois Drug-free Workplace Act.
H. I do hereby certify that I am either the bidder or duly authorized agent of the referenced bidder, and I am authorized to execute the certifications hereon.
G. I certify that by submission of this proposal the bidder confirms that he is familiar with the site, existing conditions, the Bid Documents, requirements and the project schedule.

CONTRACTOR:

Firm Name: _____

Address: _____

_____

FEIN: _____

Telephone: _____

Email:

FAX: _____

Date: _____

LIST OF SUBCONTRACTORS

_____

_____

_____

SIGNATURE:

_____

TITLE:_____
For Corporations only.

END 00 40 00

The Bidder should include this form with the Bid Forms if a material substitution is offered at that time.

The Base Bid and Alternate Bids include only those products specified in the bidding documents. Following is a list of substitute products which bidder proposes to furnish on this project, with the difference in price being added to or deducted from the Base Bid or Alternate Bids.

Bidder understands that acceptance of any proposed substitution is at Owner's option. Approval or rejection of any substitutions listed below will be subject to review after Contract award. Hold open for thirty-five (35) days from Bid Date.

SUBSTITUTIONS

MANUFACTURER'S NAME AND PRODUCT	ADD OR (DEDUCT)
_____	_____
_____	_____
_____	_____
_____	_____

VOLUNTARY ALTERNATE

DESCRIPTION	ADD OR (DEDUCT)
_____	_____
_____	_____
_____	_____
_____	_____

EVALUATION. Contract award will be made in accord with Instructions To Bidders. Only the lowest responsible bidder's Proposed Product Substitution Voluntary Alternates Form will be evaluated.

Attach with herewith or submit on day of bid a general description of the proposed option being offered.

Provide detailed information promptly upon request.

END 00 40 10

OWNER - CONTRACTOR AGREEMENT
To be filled out upon award

Between:

The Owner: McLean County Unit District No. 5
1809 W. Hovey
Normal, Illinois 61761

And the General Contractor: _____
_____
_____

For the Project:

KINGSLEY JUNIOR HIGH SCHOOL HVAC RENOVATION AND GEOTHERMAL FOR McLEAN COUNTY UNIT DISTRICT NO. 5

The Owner and Contractor agree to enter into a contract in accordance with the terms and conditions of the Documents (Plans & Specifications), A/E Project Number 23152318 and the Contractor's Bid Proposal dated February 6, 2020 which become the Contract for completion of the project as follows:

Base Bid Partial Substantial Completion Date: **August 15, 2020.**
Base Bid Final Completion Date: **August 20, 2021.**

Additional Terms & Conditions: None (or as applicable)

Addenda: #1_____ #2_____ #3_____ #4_____ (list as applicable)

Contract Amount: (to be listed as appropriate)

Base Bid Proposal	$_____
Alternate Bids as awarded to be listed	$_____
Total Contract Amount	$_____

(Written)_____ Dollars

Date of Agreement:_____

Signatures:

Owner: **McLean County Unit District No. 5**	**Contractor:**
_____	_____
_____	_____
Date: _____	**Date:** _____

Contractor's Seal
(Corporation Only)

This Agreement must be signed and returned with the Contractor's Performance Labor and Materials Payment Bonds within fifteen (15) days of notice or the Contractor will be considered in default on acceptance of the award.

END 00 41 13

1. GENERAL

1.1. GENERAL CONDITIONS

A. The conditions outlined in this and following paragraphs are to supplement and complement the conditions found in the articles of the AIA Document A201, 2007 Edition.

1. Included in these Specifications by reference is AIA Document A201 General Conditions.

B. AIA Document A201, 2007 Edition, can be purchased directly on line from a variety of vendors including the AIA and are available in electronic format as well as printed.

1. AIA A201 2007 version can be reviewed at the Architects office without charge.

C. To the page one of the AIA A201 General conditions Document:

1. Project: Kingsley Junior High School HVAC Renovation and Geothermal Project
   Kingsley Junior High School, 303 Kingsley St., Normal, IL 61761
2. The Owner: McLean County Unit School District No.5, 1809 W. Hovey, Normal, IL 61761
3. The Architect: Middleton Associates Incorporated, 1702 W. College Ave., Suite E, Normal, IL 61761

1.2. SIGNING OF DOCUMENTS AND INSTRUMENTS OF THE CONTRACT

A. All documents shall be signed by persons fully and duly authorized to so sign. Any documents signed by a person other than person prescribed by the Contractor's legal organization shall enclose with his signature the evidence of "Power of Attorney."

2. SUPPLEMENTARY GENERAL CONDITIONS

2.1. SUPPLEMENTS TO AIA DOCUMENT A201 (2007 EDITION) THE GENERAL CONDITIONS OF THE CONTRACT.

A. The following sections represent modifications or additions to the AIA A201 -2007 Document.

B. TO ARTICLE 2/OWNER

1. Add Subparagraph 2.2.2.1 Easements off site required by the Contractor to execute the work, such as space for storage, access, scaffolding, lane enclosure, etc., shall be arranged for by the Contractor and included in the contract amount.

C. TO ARTICLE 3 CONTRACTOR

1. To Subparagraph 3.3.1, delete the last two (2) sentences listed under 3.3.1 in their entirety.
2. To Subparagraph 3.3.1 insert: If the Contractor determines that such means, methods, techniques, sequences or proceedings may not be safe, or may not be appropriate to the equipment and task as becomes apparent, then said Contractor shall have included in his proposal amount allowance to complete this work per a revised plan for which he can assume responsibility and shall notify the Owner and Architect before proceeding. In no case do the Owner and Architect take responsibility for directing Contractor Operations.
3. To Subparagraph 3.12

    a. Add 3.12.6.1 Submittals unmarked will not be reviewed at the Architect's option. Said unmarked submittals may be returned to the Contractor for re-submittal and the time loss shall not extend the time of completion of the project.
    b. Add 3.12.6.2 Submittals reviewed by the A/E and returned or held as a record copy presume the Contractor responsibilities in paragraph 3.12.6 have been included whether noted or not.

D. TO ARTICLE 5 SUBCONTRACTORS

1. To Subparagraph 5.2

    a. Add 5.2.5 The assignment of work or a portion of the work by the Contractor to Subcontractor(s) is the election of the Contractor and in no way changes or reduces the Contractor's obligations under the Contract to properly complete the work and/or provide clear title to the work, including the work by said Subcontractor(s).

E. TO ARTICLE 7 CHANGES IN THE WORK

1. To Subparagraph 7.1.2

    a. Add 7.1.2.1 The Contractor and/or his Subcontractor shall not proceed with any work, directive or change for which he intends to claim extra cost without providing written notice to the Architect.
    b. Add 7.1.2.2 The Architect and Owner shall provide response to claims for additional cost within a reasonable time period upon receipt of notice or quote.
    c. Add 7.1.2.3 Work for which an agreement cannot be reached prior to implementation can proceed as time and material work with all parties to agree on what is additional work over that which should have been included to complete

the work as originally intended.

2. To Subparagraph 7.2.2

a. Add 7.2.2.1 Change Order quotes shall be based on an approved quote or estimate which shall be based on labor and material cost, actual or estimated as prior agreed upon, and:

b. Add 7.2.2.2 Overhead and profit may be charged proportional to this category of work on the Contractor's CSV or not to exceed the greater of:

1) Eighteen percent (18%) for the Contractor's own work forces
2) Ten percent (10%) Subcontractor plus ten percent (10%) Contractor, for twenty percent (20%) total for work completed under a Subcontractor arrangement.
3) These allowances shall include all off site and indirect costs, including insurance, project management, bonds and profit.

F. TO ARTICLE 9 PAYMENT AND COMPLETION

1. To Subparagraph 9.6.1

a. Add 9.6.1.1 Wherein the Owner is governed by a public Board, payment requests must be received by the A/E 5 days prior to the established time for entering into agenda prior to the next regular Board Meeting. Payments will be made within twenty-five (25) days following Board approval. Failure to make agenda dates will result in a minimum one (1) month delay in payment.

G. TO ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

1. To Subparagraph 10.2.1

a. Add 10.2.1.4 The Contractor shall be responsible to provide and maintain on site MSDS Sheets for all required materials to be brought on site.

1) These sheets shall be readily available upon request to the owner on remodeling renovation projects which are Owner occupied.
2) Comply with VOC regulations.
3) Comply with IEPA regulations.

2. To Subparagraph 10.2.3

a. Add 10.2.3.1 Provide for the general safety of public and Owners employees, such safety provision shall be adjusted as appropriate to the age and volume of public anticipated in the project vicinity.

b. Add 10.2.3.1 Provide for traffic safety as appropriate to the operations; cooperate with the governing authorities on road activities, lane closures, excavations, surface cleaning etc.

H. TO ARTICLE 11 INSURANCE & BONDS

1. To Subparagraph 11.1.2

a. Add 11.1.2.1 Minimum Limits of Liability for preceding coverage are:

1) Workers Compensation - Statutory Limit
2) Applicable Federal *(such as Longshoreman's)* Statutory limits.
3) Liability Insurance may be written as Comprehensive General Liability policy form or Commercial General Liability policy form with the following coverages:

a) Bodily Injury - $1,000,000 each occurrence, $2,000,000 aggregate
b) Property Damage - $1,000,000 each occurrence, $5,000,000 aggregate.
c) Property Damage – Broad Form - $1,000,000 each occurrence, $2,000,000 aggregate.
d) Personal injury (*with employment clause deleted*) $1,000,000 aggregate.
e) Products and completed operations $1,000,000 to be maintained one year following final completion.
f) Business Automobile Liability, (*including owned and non-owned and hired vehicles*)
g) Bodily Injury and Property damage $1,000,000 each person, $1,000,000 each occurrence.

4) Umbrella Insurance $10,000,000 over primary insurance limits.
5) $10,000 Retention for self insured hazards each occurrence
6) In the event that a claim is filed or a settlement reached whether related to this project or not which compromises the aggregate limits of liability then the Owner and Architect shall be notified and arrangements shall be made to provide additional insurance as needed to keep aggregate limits in

force for the remainder of the Contract.

2. To Subparagraph 11.1.4

   a. Add 11.1.4.1 The Owner, Architect, and Consulting Engineers including their employees and representatives shall be included as Additional Insureds or Named Insureds on the insurance and shall be shown as such on the Certificate.

3. To Article 11

   a. Add 11.1.5 Contractor's insurance shall be maintained in force through basic warranty and guarantee periods, not less than one (1) year following Final Completion.

4. To 11.3. Property Insurance

   a. Add 11.3.1.1 The Owner's property and vandalism insurance has $1,000 deductible. The Contractor shall insure and thus pay the costs not covered by the Owner's deductibles.
   b. Add 11.3.1.2 The Owner's Builder's Risk will cover only normally included Owner risks, on site, Owner's interest only, excluding tools and property of the Contractor and improperly stored or unsecured materials.

5. To Paragraph 11.4.1 add the following Subparagraphs:

   a. Add 11.4.1.1The Contractor shall furnish Performance and Labor and Material Payment Bonds covering the faithful performance by the Contractor of the work specified in accordance with the plans and specifications and according to the time and terms and Conditions of the Contract, and also that the Contractor shall properly pay all debts incurred in the prosecution of the work, including those for labor and materials furnished and including labor obligations as interpreted by the Illinois Department of Labor and/or the courts.
   b. Add 11.4.1.2 The cost of each bond shall be included in the Contract Sum plus any changes to the Contract Sum. The Contractor shall include in all bonds provisions as will guarantee faithful performance of the prevailing wage provisions of the Contract if applicable.
   c. Add 11.4.1.3 Bonds shall be written by surety, approved by Owner, with a minimum rating of B or better, Financial Class V, or higher, in A.M. Best's Insurance Guide, current edition. The company must also be licensed in the State of Illinois.
   d. Add 11.4.1.4 The Contractor shall require the attorney-in-fact who executes the bonds on behalf of the surety to affix

thereto a certified and current copy of power-of-attorney.

e. Add 11.4.1.5 The Contractor shall deliver the required bonds to the Owner not later than fifteen (15) days following the date the agreement is executed.

I. TO ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

1. To Subparagraph 12.2.2.1 After Substantial Completion:

a. Add 12.2.2.1.1 Latent Defects, for a period of 10 years after Substantial Completion, upon demand by the Owner, the Contractor shall promptly repair or replace, including associated work repairs and cleanup necessary, defective or non-conforming work resulting from or constituting latent defects, fraud, fraudulent concealment or gross negligence.

b. Add 12.2.2.1.2 Seasonal equipment such as temperature controls and building systems subject to seasonal loads such as heating equipment and air conditioning, shall be warranted to perform as intended for two years. Exception would be equipment damaged by incorrect operation or maintenance procedures, specifically covered in training, but improperly implemented by the Owner.

a. Add 12.2.2.1.3 Prompt Repair. Upon notice from the Owner or Architect of defects or nonconforming work, the Contractor shall promptly visit the site in the company of the Owner's representative to determine the extent of all defects or nonconforming work. The Contractor shall provide all labor, material and equipment to promptly repair or replace the defective or nonconforming work. The repair shall include all adjacent work not necessarily provided by the Contractor, but damaged as a result of correcting or remedying such defects or non-conforming work. If the Contractor does not promptly pursue correction, the Owner may repair or replace such work and charge the cost to the Contractor. Work which is repaired or replaced by the Contractor shall be inspected and shall be warranted by the Contractor in accordance with this Article.

b. Add 12.2.2.1.4 The warranties set forth herein are in addition to all warranties or guarantees expressed or implied by operation of law, statute or ordinance.

2. To Subparagraph 12.2.2.3, Delete the word ‘not’. Clarification; all materials and equipment are expected to perform satisfactorily for one year, items or equipment needing periodic attention during the first year of use, shall continue to be serviced by the Contractor until such time that the material, item or equipment is deemed to be doing its intended purpose without repeated service.

3. To Subparagraph 12.2.5

a. Add 12.2.5.1 Extended Warranties and Commercial Warranties. The Contractor shall deliver all commercial and extended warranties received from manufacturers to the A/E prior to Final Payment. Extended warranties and guarantees will be as described under the various trade work sections of these documents, and may be the responsibility of third parties to the contract such as dealers or manufacturer's from whom such extended coverage is specified or as advertised such as a commercial limited warranty of performance or service. Such extended warranties may or may not include labor unless specified, or in the case of commercially advertised warranties as offered by the party selling the product or equipment.

b. 12.2.5.2 Prompt Repair. Upon notice from the Owner or Architect of such defects or nonconforming work, the Contractor shall promptly visit the site in the company of the Owner's representative to determine the extent of all defects or nonconforming work. The Contractor shall provide all labor, material and equipment to promptly repair or replace the defective or nonconforming work. The repair shall include all adjacent work not necessarily provided by the Contractor, but damaged as a result of such defects or non-conforming work or as a result of remedying them. If the Contractor does not promptly repair or replace defective or non-conforming work, the Owner may repair or replace such work and charge the cost thereof to the Contractor. Work which is repaired or replaced by the Contractor shall be inspected and shall be warranted by the Contractor in accordance with this Article. The warranties set forth herein are in addition to all warranties or guarantees expressed or implied by operation of law, statute or ordinance.

B. TO ARTICLE 13 MISCELLANEOUS PROVISIONS

1. To Subparagraph 13.1

a. Add 13.1.1 Location of the project is Illinois.

b. Add 13.1.2 The Contractor shall, to the best of his knowledge and capability, perform all work encompassed by the documents, in compliance with the Environmental Barriers Act (Ill. Rev. Stat. 1985, ch. 111-1/2, pars. 3711 et seq. as amended), the Illinois Accessibility Code, 71 Illinois Administrative Code 400; The Uniform Federal Accessibilities Standards (UFAS); Section 504 of the Rehabilitation Act of 1973, and the Americans with Disabilities Act of 1990 (effective January 26, 1992) known as ADA requirements. This obligation shall apply to the contractual work described as the project and the conduct of work processes initiated to accomplish the work.

c. Add 13.1.3 All parties to this Contract are subject to the rules

and regulations of the Illinois Department of Human Rights and the statutory requirements thereof, including the requirement that every party to a public contract shall have adopted written sexual harassment policies (PA 87-1257).

d. Add 13.1.4 It shall be mandatory that the Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin or ancestry, age, marital status, physical or mental disabilities.

e. Add 13.1.5 Illinois Department of Labor requirements. It shall be mandatory upon the Contractor to whom the Contract is awarded and upon any Subcontractors thereof to be in compliance with applicable wage and reporting regulations. This project is a Prevailing Wage Public Works contract.

2. To Subparagraph 13.3.

a. Add 13.3.1 Notice served by facsimile (fax) to facsimile number used during bidding and construction shall be official written notice.

b. Add 13.3.2 Notice served by electronic means (email) to the electronic address used during bidding and construction shall be official written notice.

c. Add 13.3.3 The Bidder shall notify the Architect and/or the Owner at anytime of changes in the facsimile or electronic contact addresses that will reach the contractor. Failure to so notify is the Contractors responsibility.

C. TO ARTICLE 15 CLAIMS AND DISPUTES

1. To Subparagraph 15.3.1 Delete the word ‘SHALL’ and Insert the word ‘MAY’.

a. Add 15.3.1.1 Mediation may be employed to resolve disputes if agreed to by both parties to the Contract.

2. To Subparagraph 15.4.1 Delete the word Shall and insert the word ‘MAY’.

a. Add 15.4.1.1 Arbitration may be employed to resolve disputes if agreed to by both parties to the Contract.

End 00 70 00

1. GENERAL

1.1. REQUIREMENTS INCLUDE

A. Base Bid: Kingsley Junior High School HVAC Renovation and Geothermal, approximately 82,750 sq. ft. Contractor verify sq. ft.

1. Provide demolition of all components of the existing heating and cooling system including piping, pumps, boilers, chillers, and Fan Room supply, return, intake, and exhaust equipment. No work in Area 1 (see key plan).

   a. See Drawings for location of existing duct work to remove.
   b. See R-1.0 for equipment on roof to be removed on roof curbs.
   c. In some rooms in Building Area 2, 3 & 4 duct work and piping may remain.

2. Remove existing kitchen roof mounted exhaust fan and other roof equipment and curbs as noted.
3. Modify (remove, alter, install) electrical system as noted on plan and/or to make new system operable.
4. Install new loop piping and heat pumps for hew heating system.

   a. Install new ductwork as indicated.
   b. Install condensate drain from each heat pump.

5. Cover openings with masonry material to match surrounding walls. Wall openings left by work under this control may be repaired with galvanized 16 ga sheet metal if opening is less than 400 sq. in. Install building improvements to facilitate HVAC & Electrical Systems.
6. Remove ceilings as shown on plans. Where ceiling are completely removed in a room or corridor, new grid and 2 x 2 panels are to be reinstalled. Where ceilings are partially removed in a room or corridor, the grid is to be repaired and ceiling panels in good condition may be reused.
7. Install building improvements to facilitate HVAC & Electrical Systems.

1.2. PRODUCTS FURNISHED BY OTHERS: All products, components, spaces, and equipment furnished by the Owner are currently in place and are to be relocated, disconnected and reconnected as set forth in these Documents (Specifications and Drawings) and/or required to accomplish these Documents. All added components shall be new and furnished by the Contractor.

A. Contractor's Incidental Duties

1. Designate specific delivery date for each product in approved

construction schedule.

2. Promptly inspect delivered products, report damaged or defective items.
3. Handle material at site, including unloading, uncrating, and storage.
4. Protect from exposure to elements, from damage.
5. Repair or replace items damaged as result of Contractor's operations.
6. Install, connect and finish products in assembly function ready including incidental related work.

1.3. WORK SEQUENCE

A. The Owner will occupy the adjacent school facilities at varied occupation levels (full occupation during school year minimal occupation summer) during construction.

B. It is anticipated that AREA 2 & 3 comprising the Newman Gym, the Cafeteria, the Kitchen, IMC, and Office Rooms will be completed and fully operating with new equipment by August 15, 2020. This will be referred to as Phase 1. Area 4 comprising the Arends Gym, FACS, Art, & Music Classrooms will be fully operable with new equipment by August 15, 2021. This will be referred to Phase 2. The school will be occupied August 15, 2020 – May 30, 2021 and August 15. 2021 to May 30, 2022. The North Area comprising Arends Gym and classrooms known as Area 4. There is no work planned for Area 1.

1. The sequence of construction that is Phase 1 & Phase 2 will be discussed at the Pre-Construction meeting and may be changed by agreement of Owner and Contractors

C. Coordinate the work schedule with the Owner and building administrator.

1.4. SCHEDULE

A. Work may commence: See Section 00 21 13 paragraph 2.12

B. Project Schedule: See Specification Section 00 21 13 paragraph 2.12 and Section 00 30 00.

1. Substantially Complete Phase 1: **August 15, 2020.**
2. Final Completion Phase 1 & 2: **August 20, 2021.**
3. **All work after classes begin must be scheduled for second shift.**

C. Work not completed prior to student occupancy to be completed:

1. Second shift
2. Weekends
3. Arrange schedule with Owner that will not disturb the learning environment.

1.5. CONTRACTOR USE OF PREMISES

A. Confine operations at site to areas permitted by:

1. Law
2. Contract
3. The Owner's Representative, per 1.3.B. above.

B. Do not unreasonably encumber site with materials or equipment. Do not block the Owner's pedestrian traffic patterns except as prior arranged with the Owner's approval.

C. Do not load structure, or components thereof, with weight that will endanger or damage structure.

D. Assume full responsibility for protection and safekeeping of products stored on premises.

E. Move and relocate as necessary all stored products or equipment that interferes with operations of the Owner.

F. Obtain and pay for use of additional off site storage or work area needed for operations.

G. Limited use of site for work and storage

1. Use public access ONLY, now in service. Parking ONLY as prearranged with the Owner.
2. All vehicular on site activity shall have been prearranged and approved by the Owner.

H. Cooperate with the Owner’s use of the premises and other Contractors providing work on site under separate Contracts with the Owner.

1.6. CONTINUOUS OCCUPANCY BY OWNER

A. Owner will occupy areas for purposes of conducting educational, athletic, physical education, and general maintenance during construction.

1. Generally, the school class day is from 8:15 a.m. to 4:15 p.m.

B. Contractors shall provide

1. Access by Owner's personnel and pupils when applicable.
2. Operation of Mechanical and Electrical systems with a minimum of down time.
3. Operation of exhaust systems with a minimum of down time.
4. Adequate security of the premises in which work is in progress.

C. Upon (after) the work being completed and accepted by Owner, the Owner shall provide:

1. Custodial services
2. Security
3. General custodial maintenance

1.7. ASBESTOS

A. The building has been extensively evaluated by IDEAL Environmental, Inc. In areas accessible for construction operations the building has had ACM removed.

B. The contractor may perform his own examination of the buildings of concern on the project prior to bidding and be responsible for the determination of the existence or nonexistence of suspect asbestos in a state that is likely to be interrupted or become hazardous to the health of the Contractor, his employees, his subcontractors and their employees.

1. Exposed Piping (Domestic water and HVAC) have been tested and found ACM free. Exposed includes piping above ceiling. Piping covered in existing CMU walls contains ACM insulation.
2. Some 9” x 9” floor tile is ACM and adhesive for such tile is also ACM.
3. Piping above plaster ceilings probably contains ACM insultation.

C. The Contractor may deem it advisable to contact the Office of Superintendent of Schools and request access to the Asbestos Management Survey applicable to the building pursuant to Section 855.30 (including updated amendments thereto) of AN ACT KNOWN AS THE ASBESTOS ABATEMENT ACT: P.A. 83-1325, approved and eff. Sept. 5, 1984, amended by P.A. 84-0951, approved and eff. Sept. 20, 1985, and amended by P.A. 84-1096, approved eff. Dec. 9, 1985, amended by P.A. 84-1245, approved and eff. July 29, 1986, amended by P.A. 84-1346, and approved and eff. Sept. 10, 1986, inclusive of such amendments and regulations applicable since 1986.

1. Upon determination prior to bidding, or after bidding discovery by the Contractor that an asbestos hazardous condition does exist in the path of execution of the work of his Contract, he shall so notify the Owner IN WRITING.
2. Pursuant to Item 1.6.B.1 above, the Owner may implement the following action:

    a. Eliminating that portion of the work by revision and change order to these documents.
    b. Institute removal or acceptance encapsulation.

3. Wherein concealed asbestos is discovered, the Contractor shall notify the Owner of the existence of said apparent asbestos which may require analysis for hazardous determination. This notification shall be IN WRITING at no cost to the Owner. Should analysis indicate that hazardous substance does prevail the procedure shall be set forth under Item 1.6.B.2. above.

a. NOTE: DELAY IN THE CONTRACTOR'S WORK DUE TO SUCH CONCEALED DISCOVERY AND/OR OWNER RESPONSE THERETO SHALL NOT BE GROUNDS FOR CLAIM FOR EXTRA EXPENSE BY THE CONTRACTOR CHARGEABLE TO THE OWNER AS AN EXTRA TO THE CONTRACT AMOUNT.

1.8. COORDINATION AND COOPERATION

A. It is the intent and purpose of the Owner to cooperate with the Contractor to the extent feasible under existing applicable laws and regulations and the Owner and the Contractor alike shall not construe this portion of the documents, that is, Section Paragraph 1.6.A, and B to the disadvantage of the other.

B. Should the bidding Contractor not understand the foregoing, he shall notify the Architect/Engineer for clarification prior to bidding in accordance with Section 00040, Paragraph 1.3, 1.4, and 1.15.

C. This Contractor shall cooperate with other Contractors and their Subcontractors working on site duly employed by the Owner to perform service related and unrelated to work outlined by these Documents.

D. The Owner has the right to employ other contractors or his own forces to be working on site in concurrence with this Contractor's work. Coordinate and cooperate to the extent reasonable under the contract so all parties can collectively accomplish the work scheduled.

1.9. FITTING AND FINISHING THE WORK

A. Contractor shall verify all field conditions, dimensions, elevations that relate to the work and properly accommodate these in the work as appropriate to the intended result within the Contract amount.

1. In place construction, obstacles and site conditions and elements which can be seen and reasonably inferred.
2. New construction, obstacles and conditions that can be seen or are to occur in the completion of the work.
3. Allow to fit structural elements and all equipment as occur or will occur during the implementation of the Contract.
4. Make adjustments as needed to fit and properly complete the work. This includes coordination of work by all trades.

B. Contractor and his Subcontractors shall coordinate, accommodate, adjust and fit as appropriate all work to achieve the intended finished intent to normal commercial industry standards.

1. Provide finishing elements, trim, sealants, scribes, receivers and accessories necessary and normal to the installations proposed and as recommended by manufacturers for proper use of products.
2. All construction (all trades) to be weather and infiltration tight.

Include appropriate weather seals, infiltration barriers, sealants, non-corrosive flashings and sealants to properly complete the intent of the project.

3. Provide all necessary work to complete all installations, equipment and parts of the work to be complete and properly operable, under control for motorized equipment, in a finished appearance and condition, unless specifically noted otherwise.

    a. Conceal piping and conduit to the extent possible
    b. Run piping and conduit and supports parallel and/or perpendicular to main structural elements when possible.
    c. Avoid creating trip hazards or low headroom hazards when possible
    d. Always allow for service access.

4. Always comply with the Illinois Energy Code

    a. Infiltration tight
    b. Watertight
    c. Insulation and continuous insulation, types and assembly U or R values as well as component ratings.
    d. Air barriers continuous to the extent possible at assembly junctures, windows to walls, walls to roof assembly, walls floor to floor.

END 01 01 00

1. GENERAL

1.1. SUPERINTENDENT OF THE PROJECT WORK

A. The Contract shall designate a person who shall be the General Superintendent of on site construction work encompassed by the Contract Documents.

1. Said designated superintendent shall have prior served as project superintendent of construction of similar nature and size. Qualifications shall be subject to the Owner's and Architect's review.
2. Superintendent shall remain superintendent for the duration of the project unless said persons shall become disabled, no longer employed and/or the Contractor provides notice to the Architect and the Architect approves the change.
3. Owner can request superintendent replacement for cause at any time

1.2. DESCRIPTION OF DRAWINGS AND LAYOUT

A. Drawing data is intended to be reasonably accurate, however, strict accuracy in detail is not guaranteed. The Contractor must verify all of the conditions, measurements, dimensions, rough-in requirements, piping, conduit, wiring, duct work requirements and coordination necessary for each item or piece of equipment in the Contract Documents. Verification is the Contractor's responsibility and shall be completed prior to the fabrication or installation processes. All corrections necessary to provide properly installed, finished and operable system, in accordance with the intent of the Documents, shall be made at no cost beyond the contract agreement.

1. Unseen conditions when encountered by the Contractor after uncovering will be allowed for extra compensation.
2. See Specification Section 00 21 13, paragraph 2.15.C., details regarding change orders.

B. All measurements and conditions must be verified by actual observation at the building and the Contractor shall be responsible for all of his work fitting into place in a satisfactory and workmanlike manner in every aspect and detail subject to the approval of the Architect. The Contractor shall provide layout work and verification measurement at his own cost.

C. Before starting his work, the Contractor shall examine all Contract Area Drawings and Specifications and if any discrepancies occur, he shall report same to the Architect IN WRITING and obtain WRITTEN INSTRUCTIONS for interpretation of the work. The Contractor shall perform all layout work pursuant to site, building, grades and levels, and furnish such engineering services as he may require to execute the intent of the work included.

D. The Drawings are instructive and diagrammatic and shall be followed as closely as actual construction will permit. All changes from Drawings necessary to make the work of the Contractor conform to the documents shall be done at no added cost charge to the Owner above the amount shown on the Owner/Contractor Agreement.

1.1. PROJECT ACCESS: The Contractor shall be aware that the Town/City, Township, County or State has authority over various approach roads for site access and the Contractor is responsible to:

A. Observe load limits and arrange for any exceptions to load restrictions that may be required for this project.

B. Make arrangements for road cleanup, barricades and surface patches and repairs shall comply with applicable regulations and be subject to the governing authority approval.

1.3. OVERLOADING OF BUILDING

A. Care shall be taken that completed structures are not overloaded during Contractor operations and the Contractor shall promptly remove all materials, which, in his opinion, may overload any part of the work. It shall not be the Owner's, or Architect/Engineer's responsibility to observe and check construction processes and temporary loading conditions that this Contractor may implement as director of his operations.

B. Structural design, unless noted otherwise, is designed to accommodate design loads, per code, after all bracing and construction is in place.

1. Temporary bracing and shoring for erection loads is the responsibility of the Contractor.
2. Bracing and shoring for loading prior to the installation of lateral support and diaphragm assemblies is the responsibility of the Contractor.

C. All structural damage done by overloading the system shall be repaired by the Contractor overloading the system.

D. The Architect/Engineer shall have no authority over the means, methods and procedures of the work and shall make no determination pursuant thereto nor render opinions concerning same.

1. The Architect’s Field Representative does not have authority to render opinions on structural questions.

E. The Architect/Engineer and members of his staff shall have no authority over safety conditions related to erection loads and as they relate to the Contractor’s interest, shall provide no observation of same, and make no comment regarding same.

1. The contractor shall designate an employee of the contractor as the person in charge of and responsible for safety procedures on site.

1.4. PROTECTION OF WORK AND BUILDING

A. The Contractor shall protect all work and stored materials from injury caused by or resulting from operations under this Contract, including physical damage or weather-caused damage through the opened up areas.

1.5. MOVING OF MATERIAL

A. Contractor materials that are temporarily located or stored shall be relocated as needed to allow access by the Contractor, other Contractors and the Owner's personnel in and around the construction area. Such moving of any material shall be at no additional cost to the Owner.

B. At no time shall tools, materials or workmen be allowed to block an exit.

1.6. SHORING, BRACING, AND BARRICADES

A. The Contractor shall provide, construct and finally remove all temporary shoring, bracing, underpinning, scaffolding, needling, barricades, etc. as required by local restrictions and as necessary for general safety to protect all property and persons from damage or injury. The Contractor shall determine the need for these items and shall be fully responsible for the performance or failure of them and shall make good damages caused by failure or absence of same.

B. Specific temporary shoring, supports, etc., called for elsewhere in the Documents shall be considered a minimum but shall not override Contractor's responsibility to provide adequate shoring, if actual construction conditions and processes so dictate.

1.7. MATERIALS, WORKMANSHIP, AND LABOR

A. All installed materials and equipment shall be new and shall be installed and completed in a first class, workmanlike manner.

B. The Architect reserves the right to direct the removal and the replacement of any item which, in his opinion, does not present a proper, orderly or reasonably neat installation. Such removal and replacement shall be done promptly when directed by the Architect or the Owner. All installations will be subject to the Architect and Owner's inspections, tests, and approval at all times from commencement of the work to Final Acceptance of the completed Contract.

C. Work needing correction or replacement that is not corrected with reasonable promptness shall be subject to written notice thereof by the Architect. The Contractor by virtue of having tendered his bid for the work, agrees that progress payments by the Owner may be held (no payment

made) until said faults have been corrected.

1.8. CLEANING UP

A. All surfaces shall be cleaned of any paint, plaster, mortar, gook and other stains. Care shall be taken that no surface is scratched, marred or damaged in cleaning.

B. Damaged, marred or scratched surfaces of any type shall be made right, sanded smooth (to bright metal for metal surfaces) and primed and painted as directed or replaced if necessary to provide a final installation acceptable to the Architect.

1.9. OPENINGS IN CONSTRUCTION

A. Openings required for construction work shall be provided by the Rehab Contractor, complete with all necessary reinforcing, lintels, trim, finishing, etc. as shall become applicable including openings required for electrical and mechanical work.

B. Concrete slabs, joists, concrete floors, finished floors, walls and structural elements, and other structural items shall not be cut or disturbed, except as approved by the Architect IN WRITING. The Contractor shall be held responsible for and correct any such damage that he may cause.

C. Pipes passing through floors or partitions shall have sufficient clearance around pipes to prevent damage to the adjacent finish from expansion and contraction. All sleeves, flanges and forms, etc., shall be furnished by the Contractor requiring the opening.

1. A Contractor or Subcontractor penetrating a wall, floor or ceiling surface shall provide sleeves, flanges and trim to provide a finished installation.

1.10. SUPPORTS

A. The Contractor shall provide all concrete, steel bases and anchorage except as herein specified otherwise: vibration-absorbing foundation bases, hangers, platforms, anchor bolts, etc. for all equipment which he furnishes. These foundations shall be as specified under their respective headings or shown on the drawings and/or as recommended by Equipment Manufacturer.

1. All such supports which penetrate the roof shall be flashed in to meet roof material warranty requirements.

B. Materials and installation requirements for curbs and pads shall be commensurate with the need. Concrete shall be 4,000 PSI minimum strength, installed at a slump not exceeding six inches (6"). Concrete shall not be retempered sixty (60) minutes after that time at which water was first added to the mix. Air entrainment additives shall be employed to provide

a seven percent (7%) by volume air content at time of placement.

1.11. PROTECTION OF WORK

A. The Contractor shall protect his work and adjacent existing work from injury by keeping all piping, ductwork, etc. capped, plugged, drained, or otherwise protected from injury including damage done by freezing and damage from building materials, cement and/or dirt and concrete.

1.12. MOVING OF MATERIALS

A. Moving of in-place materials that are located or stored in the path of construction shall be relocated as needed to allow construction and construction access in and around the construction area. Relocation of said materials shall be subject to Owner approval and whereby relocation is Owner designated as temporary, a post construction final location shall be determined by the Owner. Such moving of material shall be at no additional cost to the Owner.

1.13. ELECTRICAL SERVICES TO EQUIPMENT

A. Unless otherwise specified (see 01 01 00 Summary of Work) the Contractor shall furnish and install electrical feeders of proper size, and furnish, install and complete all power wiring and the control wiring for each motor, electrified signage and/or piece of equipment affected by the Contract.

B. All such electrical procedures (temporary and permanent) shall comply with the National Electric Code, whether temporary or permanent.

C. The Contractor shall extend or install temporary electrical service for his use during construction or he shall provide his own portable generator at his own expense. Wherein the Owner's electrical services are used, extended or tapped, the current consumed shall be at the Owner's expense provided same is metered through the Owner's meter.

1.14. SEALANTS

A. Provide sealants in all locations where shown on the Drawings or called for in the Specifications and as necessary for infiltration-tight/weathertight building envelope and good visual appearance.

B. Sealants shall be provided in locations as directed by the Architect, where equipment components or fixtures fit to surrounds, and when cracks between equipment and surrounds are undesirable or excessive. Provide sealants in all interior locations, as necessary to properly trim out.

C. Sealants shall be installed and tooled in strict accordance with the Sealant Manufacturer's recommendations for joint preparation, using foam rope backer bars, etc. Sealant shall be installed by the respective Contractor providing the item requiring sealant installation.

D. See the Sealant Specification Section 07900 or consult the Architect for the type of sealant materials to be employed.

1.15. PAINTING

A. All exposed surfaces or equipment reworked and installations leaving damaged or unfinished surfaces shall be painted or have a corrosion resistant factory-applied coating or finish.

1. Aluminum and stainless steel shall not require painting.

B. Field paint unfinished equipment and surfaces for corrosion protection and visual appearance, except where clearly stated to the contrary on the Drawings.

C. The Contractor shall paint specific components indicated in the contract documents.

1. See drawing notes and these specifications Section 09900.

1.16. ALIGNMENT

A. The Contractor shall be responsible for supervision of the reinstallation of equipment, as applicable to these Documents.

END 01 04 00

1. GENERAL

1.1. DESCRIPTION

A. Related work specified elsewhere

1. Always verify existing conditions prior to start of work.

1.2. WORK INCLUDED

A. Execute cutting (including excavating), filling or patching of work, required to:

1. Make several parts fit properly.
2. Uncover work to provide for installation of ill-timed work.
3. Remove and replace defective work.
4. Remove and replace work not conforming to Contract requirements.
5. Remove existing construction as needed.
6. Install specified work in existing construction.
7. Install lintels in masonry opening cut by mechanical trades including masonry work.

B. In addition to Contract requirements, upon written instruction of Architect/Engineer:

1. Uncover work to provide for observation of covered work.
2. Remove samples of installed materials for testing when required.
3. Remove work to provide for alteration of existing work.

C. Do not endanger structural work by cutting or altering steel members unless indicated on Drawings.

D. Do not cut or alter work of another contractor without WRITTEN CONSENT of the Architect/Engineer.

E. Where the Contractor hauls material or drives trucks or equipment over sidewalks, pavement, streets or curbs, he shall protect same from damage and where such surfaces have been damaged, he shall neatly cut out, remove and replace same. Where the Contractor damages or defaces streets, sidewalks or curbs, he shall, as a part of his Contract, re-lay all such surfaces at the same thickness and manner as the original pavement, sidewalk or curb and in a manner that will be approved and accepted by the Owner, Architect/Engineer and governing authority.

1.3.

The Contractor shall provide such cutting and patching as shall be needed to complete the Contract to make the various and several parts and/or components fit together.

1.4. SUBMITTALS

A. Prior to cutting which affects structural safety to project submit WRITTEN NOTICE to the Architect/Engineer requesting consent to proceed with cutting, including:

1. Project identification.
2. Description of affected work.
3. Necessity for cutting.
4. Effect on other work and structural integrity of project.
5. Description of proposed work. Designate:

    a. Scope of cutting and patching.
    b. Contractor and trades to execute the work.
    c. Products proposed to be used.
    d. Extent of refinishing.

6. Alternatives to cutting and patching.
7. Designation of party responsible for cost of cutting and patching.

B. Prior to cutting and patching to implement change order work in contract scope, done on instruction of Architect/Engineer, submit cost estimate to the Architect/Engineer.

C. Should conditions of work or schedule indicate change in materials or methods, submit recommendation to Architect/Engineer including:

1. Condition indicating change.
2. Recommendation for alternative materials or methods.
3. Submittals as required for substitutions.

D. Submit WRITTEN NOTICE to Architect/Engineer designating time work will be uncovered to provide for observation.

1.5. PAYMENT OF EXTRA EXPENSE

A. Costs caused by ill-timed work, defective work or work not conforming to Contract Documents, including costs for additional services of the Architect/Engineer, shall be borne by the Contractor.

B. Work done on instruction of the Architect/Engineer (by change order) other than defective or nonconforming work shall be paid for by Owner pursuant to prior written agreement via change order.

2. PRODUCTS

2.1. MATERIALS: Materials for replacement of work removed shall be equal to original and to match surrounds or shall comply with specifications for the type of work being replaced, whichever is the most stringent requirement.

3. EXECUTION

3.1. PREPARATION PRIOR TO CUTTING

A. Prior to cutting

1. Provide shoring, bracing, and support as required to maintain structural integrity of project or surrounds.
2. Provide protection for other portions of the project.
3. Provide protection from elements, if applicable.

3.2. PERFORMANCE

A. Execute fitting and adjustment of products to provide finished installation to comply with specified tolerances, finishes, etc.

B. Execute cutting and demolition by methods which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs and new work.

C. Execute excavating and backfilling by methods that will prevent damage to other work and will prevent settlement.

D. Restore work that has been cut or removed; install new products to provide completed work in accord with Contract Documents.

E. Refinish entire surfaces as necessary to provide an even finish.

1. Continuous surfaces: To nearest intersection(s).
2. Assembly: Entire refinishing.

F. Refinish entire surfaces as necessary to provide an even finish.

1. Continuous surfaces: To nearest intersection.
2. Assembly: Entire refinishing.

END 01 04 50

1. GENERAL

1.1. DESCRIPTION

A. Provide adequate anchorage and fastenings throughout the work commensurate with the installation conditions, and manufacturer warranties.

B. Anchorage systems shown on the Drawings or specified herein shall be considered a minimum based on theoretical design conditions. The actual field conditions may require additional fastenings to properly accomplish the work.

C. NOTICE:

1. THESE DOCUMENTS DO NOT PERMIT THE INSTALLATION OF PLASTIC ANCHORS UNLESS SPECIFICALLY ASSIGNED.
2. THE DOCUMENTS REQUIRE THAT IMPACT ANCHORAGE (DRIVEN NAILS AND PNEUMATICALLY DRIVEN ANCHORS) ARE TO BE NON-CORROSIVE TYPE, STAINLESS STEEL AND ¼" DIAMETER MINIMUM.

1.2. SUBMITTALS

A. The Contractor shall identify all fastening systems he intends to employ, and provide specification sheets on the fasteners upon request.

1.3. QUALITY CONTROL

A. All anchorage, fastenings and support systems are the Contractor's responsibility.

B. All devices, components and associated parts shall be made secure against in-service failure. In no installation shall the fastenings, anchorage and support system be less than what is specifically called for on the Drawings or set forth in the Specifications.

C. In no case, however, shall the fastenings, anchorage and support systems be less than the Product Manufacturer's recommendations pursuant to the stability of finished assembly or component thereof.

1. Securing of wood framework shall be in accordance with the carpentry trade industry practice, Drawings or the recommendations of the Manufacturer, whichever is the more demanding.
2. Securing of the structural steel systems, steel joists, and the decking shall be performed in accordance with industry practice, standards set forth in the specific Specifications section, the

Drawings, and the recommendations of the Manufacturer, whichever is the more demanding.

D. The Contractor shall replace, rework, or reinforce or otherwise correct the fastenings which do not perform adequately.

E. In general, fastening sizes and spaces are set forth on the Drawings. Wherein same are not, the Architect shall make a determination.

2. PRODUCTS

2.1. MATERIALS

A. Generally, nails shall be appropriately selected for the service condition.

1. Interior or protected framing: cement-coated box nails.
2. Exterior framing: galvanized box nails.
3. Interior finish work: finish nails.
4. Exterior finish work: painted galvanized box nails for wood and aluminum nails for securing aluminum to wood such as cladding.
5. Interior construction subject to corrosion: nails for exterior work.
6. See Drawings for specific overriding designations materials and spacing limitations.

B. Generally, screws shall be appropriately selected for the service condition to minimize corrosion, galvanic action or loosening. This includes wood screws, sheet metal screws and machine screws.

1. Interior or exterior protected areas: cadmium plated screws.
2. Exterior weathering conditions: stainless steel, aluminum, or brass screws. See specific designation on Drawings.
3. Head type shall typically be flat head except as detailed, for conditions such as sheet metal or for equipment mounting.
4. Stop bead washers, surface and/or countersunk, shall be provided wherever practical and as specifically called out.
5. See Drawings for specific overriding designations materials and spacing limitations.

C. Bolts shall be selected for the applicable service condition. In general, bolts shall be cadmium or galvanized A 307 NC thread, except as specified otherwise. Structural bolts shall be as specified. Provide washers for all bolts, and provide lock washers where appropriate. Embedded anchor bolts may be unplated, except where specified otherwise.

D. Pop rivets may be employed only as specifically approved by the Architect. In general, pop rivets shall be aluminum alloy. Use the largest size pop rivets which can be adapted to the work.

E. Pneumatic driven hardened steel anchors may be used where specifically approved. Provide washers.

2.2. ASSOCIATED MATERIAL REQUIREMENTS

A. Washers shall be provided at all locations where practical.

B. Washers shall be of like material to the fasteners selected.

C. Use self-sealing neoprene washers at all applications required to be environment-proof.

D. Use self-sealing neoprene washers wherever galvanic action is possible under normal circumstances. Isolate between unlike fastened material with minimum 20 mil duct tape material or similar.

E. Select appropriately pre-finished, plated, or use base material for the visual exposure condition where fasteners are exposed to view.

F. All exposed screws and bolts shall be coordinated with the hardware finish. In place field finish to achieve coordination with the hardware finish where necessary.

2.3. PRODUCT SELECTION

A. Fastener materials shall be as specified previously. The most appropriate selection shall be made from the table below. The fasteners listed are not interchangeable, unless so approved by the Architect/Engineer.

1. FASTENER RECEIVING MATERIAL: APPROPRIATE FASTENER
2. Wood framing: cement coated nails, galvanized nails, screws, lag bolts, thru bolts.
3. Steel: thru bolts, pneumatic driven fasteners, where detailed or where prior approval is made.
4. Sheet metal: sheet metal screws, thru bolts.
5. Masonry: embedded anchor bolts, pneumatic driven fasteners where approved, metallic expansion anchors, metallic wedge anchors, or toggle bolts.
6. Concrete: embedded anchor bolts, pneumatic driven fasteners where approved, metallic expansion anchors, or metallic wedge anchors.
7. Drive-pins **(NOT USED);** only detail specific if used at all.

2.4. SPECIAL ANCHORAGE & FASTENERS

A. Self Tapping Cap Screw - Pre-Tap Drill.

1. CF #14 X required length, "B" carbon structural tap seal screws.
2. Counter bore wood to receive head and washer to flush.
3. Tap-cons as listed on Drawings (stainless steel or high carbon).

3. EXECUTION

3.1. INSTALLATION

A. The anchor receiving construction material shall be substantial and have the capability to withstand the in-service stress demand placed upon it.

B. Fastener size shall be appropriate for the intended service. Verify all conditions in the field and increase the anchorage as needed.

C. Anchorage patterns shall be appropriate to resist wiggling or prying loose during service. Use a uniform anchorage pattern for all exposed-to-view conditions; offset from centers as needed for maximum strength. A minimum of two (2) anchors shall be provided in each segment length or piece of material.

D. Replace any fasteners which are crooked or do not properly engage the base material.

E. Provide isolators between adjacent materials or fasteners and materials where electrolytic action is possible.

END 01 05 50

1. GENERAL

1.1. SPECIFIED PRODUCTS

A. All bids shall be based on providing products exactly as specified or equal as prior approved.

B. Products specified only by reference or performance standards, shall be met or exceeded by the standards of any manufacturer's material and subject to the Architect/Engineer's approval.

C. Products specified by naming several products or manufacturers shall be selected from any product and manufacturer named.

1.2. SUBSTITUTIONS, BIDDER/CONTRACTOR OPTIONS

A. PRIOR TO BID OPENING - The Architect/Engineer will consider requests to amend the bidding documents to add products not specified, provided such requests are received in adequate time prior to bid opening date.

1. Requests received after ten (10) days before bid due date will not be considered.
2. If a request is approved, the Architect/Engineer will endeavor to issue an appropriate addendum not less than seven (7) calendar days prior to bid opening date.
3. Ten (10) days is based on the start bid date, and will not be extended by bid extension unless same is extended more than ten (10) days.

B. WITH BID - Substitutions will not be considered with the base bids, but may be offered on voluntary forms.

C. AFTER AWARD OF CONTRACT - No substitutions will be considered after Notice of Award, except under one or more of the following conditions:

1. Substitution is required for compliance with final interpretations of code requirements or insurance regulations.
2. Unavailability of specified products, through no fault of the Contractor.
3. Subsequent information discloses inability of specified product to perform properly or to fit in designated space.
4. Manufacturer/fabricator refusal to certify or guarantee performance of specified product as required. This does not alter the requirement.
5. When a substitution would be substantially to the Owner's best interest.

1.3. SUBSTITUTION REQUIREMENTS

A. Submit four (4) copies of each request for substitution. Include in each request for substitution:

1. Complete data substantiating compliance of proposed substitution with Contract Documents.

2. For products:

    a. Product identification, including Manufacturer's name and address.
    b. Manufacturer's literature.

        1) Product description.
        2) Performance and test data.
        3) Reference standards.

    c. Samples, if applicable.
    d. Name and address of similar projects on which product was used and date of installation.

3. For construction methods substitution:

    a. Detailed description of proposed methods.

4. Itemized comparison of proposed substitution with product or method specified, including accurate and true cost data on proposed substitution in comparison with product or methods specified.
5. Data relating to changes in construction schedule.
6. Identify:

    a. List other contracts affected, if applicable.
    b. List changes or coordination required.

B. In making requests for substitution, bidder/contractor represents:

1. He has personally investigated proposed product or method and determined that it is equal or superior in all respects to that specified.
2. He will provide the same guarantee for substitutions as for product or method specified.
3. He will coordinate installation of accepted substitutions into work, making all such changes as may be required for work to be complete in all respects.
4. He will provide complete cost data including all related costs under his contract (and other Prime Contract's, as applicable) whose work may also be affected by the substitution in product or method.
5. He will assume full responsibility for all additional costs and expenses to the Owner, Architect/Engineer (and other contractors employed on the same project, as applicable).
6. The Contractor agrees that it is the Contractor's sole responsibility

to stand any costs that may be attributable to an allowed substitution that may surface as construction proceeds toward finalization.

C. Substitution will not be considered if:

1. It is indicated or implied on shop drawings or product data submittals without formal request submitted in accordance with Paragraph 1.4 above.
2. Acceptance will require substantial revision of Contract Documents.

END 01 25 00

1. GENERAL

1.1. MANAGEMENT OF THE CONTRACT

A. The contractor shall provide necessary project support to manage necessary support documentation in an accurate and timely fashion.

1. Following award, ten (10) calendar days, submit two (2) copies:

   a. Signed contracts
   b. Insurance
   c. Bonds, Labor and Material payment and Performance or approved Owner protective bond.
   d. Subcontractor/supplier List – provide promptly prior to signing the of contract
   e. Contractor Schedule of Values, labor and materials and by trade and task breakdown.

2. Preconstruction meeting:

   a. Provide proposed schedules
   b. Project access for remodel/renovation projects
   c. Project security plans, fences, storage facilities, public access control.
   d. Proposed schedule
   e. Contact information
   f. Identify Project management team, Superintendent of the work,

3. Prior to start of the work on site:

   a. NOI permit from IEPA as applicable on projects excavating over 1 acre or more.
   b. Background check information as applicable to this project.
   c. Permits
   d. Have in place the safety plan and assigned safety person on the site. Safety is the responsibility of the contractor, and is not monitored or directed by the Owner or the A/E except in apparent emergency situations where the Owner or the A/E might assist in determination of safety accommodations as identified by the contractor.
   e. Have in place the fences and barricades to control public or non-contractor access to the site.

1.2. SUPERINTENDENT OF WORK

A. The Contract shall designate a person who shall be General Superintendent of on site construction work encompassed by the Contract Documents.

1. Said designated superintendent shall have prior served as project superintendent of construction of similar nature and size. Qualifications shall be subject to the Owner's and Architect's review.

2. Superintendent shall remain superintendent for the duration of the project unless said person shall become disabled, no longer employed by the Contractor. The Contractor shall provide notice to the Architect and the Architect and Owner shall approve the personnel change.
3. Owner can request superintendent replacement for cause at any time.

1.3. AWARD AND LETTER OF INTENT

A. The Owner will make an award based on the selection of the lowest cost responsible bidder that has demonstrated past experience and evidence of adequate resources to accomplish the work. After the award, and the issuance of a Letter of Intent, the contract timeline is as follows:

1. Return signed agreement seven (7) days
2. Sub Contractor, Supplier, or any entity to be assigned a part of the work, provide list, addresses and contact information. Seven (7) days. Provide references upon request. Seven (7) days:
3. Labor and Materials, Payment, and Performance bonds, 15 days
4. Insurance, 15 days
5. Master Cost Breakdown (CSV), 15 days
6. Proposed Schedule and time line, 15 days

B. Failure or refusal to provide the preceding Contract information in a timely manner may be cause for cancellation of the award or termination of the agreement if signed and the Owner will be entitled to compensation under the terms of the bid security for failure to execute contract terms in good faith.

1.4. MATERIALS SPECIFIED AND QUALITY OF WORK

A. Materials shall be as specified or approved equal.

B. "Approved equal" and "or equal" shall mean that the Contractor shall be required to receive the Owner's approval (via the Architect) on any substitute materials seven (7) days prior to the bid due date.

C. Requests for substitution approval shall be submitted to the Architect/Engineer.

1. Prior to considering substitutions, the Owner and/or the Architect/Engineer may require submission of samples, descriptive, technical and catalog data and lab reports of tests for verification of equivalency.

2. Said submittals shall be presented to Architect/ Engineer.

1.5. PROGRESS PAYMENTS

A. All payments by the Board of Education require Board approval.

1. Payment requests must be submitted prior to the first Monday of the month for consideration and entry into the agenda.
2. Untimely submission of payment request will result in a one (1) month delay for consideration.
3. The Contractor will be notified of the regular Board meeting schedule upon request.
4. Payment will be made within thirty (30) days following board approval, or a notice of board concerns will be provided.

B. In accordance with the terms of the Contract periodic partial progress payments may be made monthly to the Contractor for: 90% of the value of the labor, materials, and/or equipment incorporated in the construction.

1. Payment will be for completed progress materials only.
2. Materials properly stored and protected on site may be billed
3. Payment for Materials off site may be considered if properly warehoused, dedicated to this project and insured. Submit all information and same will be reviewed and may be approved or denied for payment.
4. Progress pay requests shall indicate amounts completed of all items listed from the master breakdown.
5. 10% of each request will be retained by Owner until work has been satisfactorily completed.
6. Submit lien waivers for preceding payments made.
7. Submit lien waivers from subcontractors and suppliers.
8. Submit notarized Contractor's affidavits with each pay request showing that total owed on Contract by Owner (after subject request has been paid to Contractor) is more than the amount to become due the Contractor for material, subcontractors and labor.

C. All the applications for payment shall be made in three (3) copies with all copies bearing live seals and signatures, notarized and complete and accurately filled in.

1. Applications for payment shall be submitted to Architect/Engineer on AIA G-702A Forms or other standard formats containing similar information.

D. Public Projects only: Attach one (1) copy of Contractor’s Certified Prevailing Payroll with Pay Request in accord with Dept. of Labor requirements. Include Payroll for the major Subcontractors and upon request any minor or intermittent on-site Subcontractor.

1. Submit beginning with the first application for payment for all workers employed on site

2. Submit for each successive month with each pay request.

1.6. FINAL PAYMENT: The final application for payment shall not be made until all work and deficiency (punch list) items have been satisfactorily completed and approved by the Architect/Engineer for documents compliance.

1.7. EMPLOYEE-STUDENT RELATIONSHIPS

A. Except in an emergency situation involving safety, there is to be no intermingling of the Contractors' employees and the school faculty, staff and students violating this requirement shall be removed from employment at this site. Contractor employees experiencing problems with students or faculty shall report same to their project superintendent, who shall promptly report the problem to an authorized representative of the Owner and the Architect/Engineer.

1. Avoid profanity and inappropriate subject matter in conversation as students and staff may be within audible range and walls or ceiling spaces may allow sound transmission.
2. Verbal or physical action interpreted as sexual or sexually suggestive in nature or as sexual harassment will be grounds for removal of the employee from the site. Further legal action remains the option of the persons affected.
3. In all aspects of this provision, the Contractor's employees as adults have the greater responsibility and should not respond to inappropriate student behavior.

B. Authorized agents of the Owner include the District Superintendent, District Building and Grounds Supervisor, the District Financial Services Director and the Architect/Engineer. The School Principal is authorized to discuss concerns regarding operations on site, but is not authorized to order changes in the work.

End 01 30 00

1. GENERAL

1.1. DESCRIPTION

A. Prior to commencing the work, the Contractor shall provide submittals on all materials and equipment proposed for the work.

1.2. Shop Drawings, Submittals, and Submittal Brochures

A. Submit two (2) copies minimum unless notes otherwise in a particular section.

B. Architect will retain one (1) copy. Owner will be provided one (1) copy of all Shop Drawings at project closeout prior to Final Payout. See Paragraph 1.5.1.b.

C. Contractor will receive remaining copies for his use.

D. Shop drawings and material schedules shall be accompanied by catalog cuts or literature providing all data, description, function, and capacity of item or component submitted.

E. Catalogs and fliers with multiple component descriptions shall be clearly and precisely marked as to submittal item. The Architect/Engineer's office will provide no sorting to assure the submittals match with documents requirements.

1.3. Samples

A. When samples are requested submit two (2), minimum.

B. All samples will be retained unless otherwise noted in the documents or requested by the vendor. Samples for return may be held until the material is installed on site.

1.4. Project record information

A. The Contractor shall, within seven (7) days of Notice of Award, submit to the Architect the following:

1. Name of person under Contractor employment at the job site in charge of the work and safety.
2. Provide a contact list including emergency contact information for all relative parties to the work, including the superintendent, the project manager, subcontractors, and major vendors.

1.5. Project Record Documents

1. Operating and Maintenance Manuals.

a. Submit three (3) bound, indexed copies minimum.
b. These manuals shall include all Shop Drawings and all Submittals, all Equipment Brochures, Operating Manuals, Operating Instructions, names, addresses, and telephone numbers for guarantee work, all bound into a good quality binder or loose-leaf notebook, clearly labeled.
c. THE SHOP DRAWINGS RETAINED BY THE OWNER AND ARCHITECT ARE NOT AVAILABLE FOR PREPARING THESE MANUALS. If additional copies are required for this, the Contractor shall make allowance and copy additional sets.
d. Include warranty information and warranty contact information.

2. Record drawings: Maintain as work proceeds record drawings marked to show any variances in installations, particularly underground and concealed services.

1.6. AS-BUILT DRAWINGS

A. The Contractor shall provide the Architect/Engineer's Office with one marked set of drawings showing changes from the original drawings. Marked As-Built Drawings shall be submitted upon progress having Substantial Completion progress.

1. Preferably markings should be in red, clearly legible and easily understood.
2. Clearly and boldly label the set As Built or Record Drawings.

1.7. IDENTIFICATION OF SUBMITTALS

A. The Contractor shall clearly mark each submittal of the Shop Drawings, Catalog Cuts, Pamphlet, or Specification Sheet for identification and record, for example:

a. DATE: As submitted
b. BUILDING: Project Name
c. LOCATION: City
d. TYPE OF EQUIPMENT: (Example – AHU 1)
e. SUBMITTED BY: Contractor's Name and contact information for questions.

2. Data shall also indicate model number selected for furnishing and indicate capacities or conditions or operation.

a. Catalog data of general advertising nature, without specific outline or rating for equipment, will be rejected.
b. Marked product manufacturer's catalogs and engineering data shall accompany the submittal.

1.8. REVIEW OF SUBMITTALS

1. Submittals will be reviewed by the Architect and/or the Owner and will be checked for Contract compliance and the basic fabrication methods.
2. The Contractor must verify all the dimensions, field conditions, field clearances, and rough-in requirements with adaptations as necessary.
3. Submittals are to be reviewed and corrected first by the Contractor. If submittals contain obvious oversights or conditions that make it apparent they have not been checked, they will be returned for re-submittal.
4. Architect/Engineer review of a submittal shall not relieve the Contractor of contract compliance unless any variance is specifically brought to the attention of the Architect and/or Owner IN A LETTER FORM attached to the submittal data and subsequently approved by the Architect/Engineer IN WRITING.
5. An omission on the shop drawings or a review oversight by the Architect/Engineer shall not be construed as the calling of specific attention thereto.
6. It is not the responsibility of the Architect Engineer to request submittals, failure to submit presumes contract compliance is understood.
7. It is not the responsibility of the Architect Engineer to provide rapid review turnaround on a delayed submittal to maintain schedule. The Contractor shall make submittals in a timely manner generally allowing at least ten (10) days for review.

END 01 33 00

1. GENERAL

1.1. REQUIREMENTS INCLUDE

A. Contractor:

1. Coordinate work of all crafts including that of subcontractors and his crafts as applicable.
2. Schedule elements of remodeling and renovation work to expedite completion.
3. Schedule noisy or hazardous work to avoid problems with the Owner's day-to-day building functions and general maintenance operations.
4. In addition to required incidental demolition specified in various sections, and that shown on Drawings, cut, move or remove existing construction to provide access or to allow remodeling and new work to proceed. Include:

    a. Removal of temporarily or permanent Electrical and Plumbing devices, circuits and piping plus the reinstallation of same as required to continue service.
    b. Removal of unsuitable or extraneous materials and non-functioning components not marked for salvage, such as abandoned furnishings and equipment, and debris such as rotted wood, rusted metals, abandoned electrical and mechanical components, and deteriorated concrete.
    c. Cleaning of surfaces. Remove surface finishes to install new work and finishes.

5. Patch, repair and refinish existing items to remain, to the specified condition for each material, with a neat transition to adjacent new construction.
6. Move room furnishings to allow access to specified floor, wall and ceiling work. Relocate same in place at the completion of specified rehab work.
7. Cooperate with the Owner and schedule ahead pursuant to rehab work at locations involving preparatory work by Owner - see 1.1.B. of this section.

B. Owner:

1. Remove, store and replace books, files, and furniture to allow Contractor access to floors, walls and ceiling, room by room, on schedule determined by the Contractor.
2. Cooperate with the Contractor pursuant to providing Contractor access to rooms and areas scheduled for rehab - see 1.1.A. 6 & 7 this section.

1.2. RELATED REQUIREMENTS

A. Specified elsewhere:

1. DIVISION 0 - PROCUREMENT REQUIREMENTS
2. DIVISION 1 - ADMINISTRATIVE REQUIREMENTS

1.3. SEQUENCE AND SCHEDULES: Schedule work in sequences within times specified in 01 10 00.

1.4. ALTERATIONS, CUTTING AND PROTECTION

A. Assign moving, removal, cutting and patching work to crafts qualified to perform the work in a manner to cause least damage to each type of work, and provide means of restoring surfaces to appearance of new work.

B. Perform cutting and removal work to minimize removals, and in a manner to avoid damage to adjacent work.

1. Cut finish surfaces such as masonry, tile, plaster or metals by methods to terminate surfaces in a straight line at a natural point of division.

C. Perform cutting and patching in accordance with the general and supplementary General Conditions.

D. Protect from damage existing finishes, equipment and adjacent work which is scheduled to remain.

1. Protect existing and new work from weather and temperature extremes.
2. Provide weather protection, waterproofing, heat and humidity control to prevent damage to remaining existing work and to new work.

2. PRODUCTS

2.1. SALVAGED MATERIALS

A. The Contractor shall:

1. Remove all existing demolished material including boilers and chillers from the site.

2.2. MATERIALS FOR PATCHING, EXTENDING AND MATCHING

A. Ensure that work is complete:

1. Provide same materials or types of construction as that in existing structure, to patch, extend or match existing work.

a. Contract Documents may not define products or standards of workmanship present in existing construction.
b. Consult the Drawing Details and/or consult the Architect/Engineer.

2. Presence of a product, finish or type of construction requires that patching, extending or matching be performed to make work complete and consistent to identical or better quality standards.

3. EXECUTION

3.1. REMOVE EXISTING CONSTRUCTION

A. Consult the drawings for removals and replacements as set forth.

3.2. PERFORMANCE

A. Patch and extend existing work using skilled craftsmen capable of matching existing quality of workmanship.

B. For patched or extended work, provide quality equal to that specified for new work.

3.3. ADJUSTMENTS

A. Where existing construction and components are removed, patch floors, walls, doors, trim, and ceilings with finish materials to match existing as closely as possible.

3.4. DAMAGED SURFACES RESULTING FROM CONTRACTOR WORK

A. Patch and replace all portions of the existing finished surfaces found to be damaged, lifted, discolored or showing other imperfections, with matching material.

1. Provide adequate support prior to patching the finish.
2. Refinish patched portions of painted or coated surfaces in a manner to produce uniform color and texture over entire surface.
3. When existing surface cannot be matched, refinish entire surface to nearest intersections.

3.5. TRANSITION FROM EXISTING TO NEW WORK

A. When new work abuts or finishes flush with existing work, make a smooth transition. Patched work shall match existing adjacent work in texture and appearance as closely as possible.

1. When finished surfaces are cut in such a way that a smooth transition with new work is not possible, terminate existing surface in a neat manner along a straight line at a natural line of division, and provide trim appropriate to finished surface.

2. Refinished surfaces must be weathertight as appropriate to the exposure.

3.6. CLEANING

A. Perform construction cleaning as specified in Section 01561.

1. Clean Owner occupied areas, where work prevails, daily.

2. Clean all spillage, overspray and heavy dust collections in Owner's occupied areas immediately.

B. At completion of work of each craft, clean area and make surfaces ready for work of successive crafts.

C. At completion of alterations work in each area, provide final cleaning for occupancy and return space to a condition suitable for use of Owner.

END 01 35 16

1. GENERAL

1.1. GENERAL TERMS USED IN THE CONTRACT

A. OWNER: McLean County Unit District No. 5
1809 W. Hovey Ave.
Normal, IL 61761
Telephone: 309/557-4101 Fax: 309-557-4537

B. CONTRACTOR: A person, firm or corporation with whom a Contract or Agreement is made by the Owner.

C. GENERAL CONTRACTOR: The General Contractor furnishes all of the work in the documents. Pursuant to these Documents the Designating Contractor, General Contractor and Prime Contractor shall be one and the same.

D. ARCHITECT OR A/E: Middleton Associates, Incorporated, 1702 W. College Ave., Suite E, Normal, IL 61761 - Telephone 309/452-1271, Fax 309/454-8049, e-mail: rand@middletonassociates.net

E. HVAC ENGINEERING CONSULTING ENGINEER: MMEA Engineers, Mid MO Engineering Alliance, Inc., 1203 Eastland Drive, Jefferson City, MO 65101, Mayne Strope, President, Tel.: 573/636-2116, E-mail: wayne@mmeaeng.com, Website: mmeaeng.com.

F. PLUMBING & ELECTRICAL ENGINEER CONSULTING ENGINEER: Klingner & Associates, P.E., 616 N. 24th Street, Quincy, IL 62301, Joseph A. Knochel, P.E., Tel.:217/223-3670, Cell: 573/406-8998, E-mail: jak@klinger.com, Website: www.klingner.com.

G. DOCUMENTS: The Drawings, Specifications and Contract apply to all areas of the work.

1. Shop drawings do not become part of the Contract Document.

H. WORK: All obligations undertaken by the Contractor, pursuant to the Contract Documents.

1. Work includes, but is not limited to, the furnishing of all of the materials, labor, equipment, supplies, plant, tools, scaffolding, transportation, unloading, superintendence, insurance, bonds, taxes and all other services, facilities, required demolition (major and minor as applicable) and expenses necessary for the full performance and completion of requirements of the Contract Documents.

2. Work also means that which is produced, built, or constructed, pursuant to the Contract Documents.
3. Work includes all labor and materials to properly install and make functional.

I. PROVIDE: Furnish and install (including materials, accessories and labor) ready for the Owner's use. Comply with manufacturer's installation requirements as minimum standard, Drawings and Specifications where installation requirements exceed manufacturer's recommendations.

J. EQUAL, APPROVED EQUAL: Alternative products meeting or exceeding the base specification product or process and approved by the Architect/Engineer IN WRITING as suitable for this application. If not accepted prior to bidding, acceptance is discretionary.

K. SUBSTANTIALLY COMPLETE: When work progress has arrived at the point where the Owner may have full use of the installation for the purpose for which the same was installed, all components installed, equipment operating under control and minimum code compliance achieved, then, the work may be declared substantially complete if so requested by the Contractor and specifically approved by the Owner.

L. PUNCH LIST: Those items, components, installation inclusive of labor and materials (in place) which, in the opinion of the Architect/Engineer or the Owner do not conform to the intent of the Contract Documents and/or adequately satisfy the purpose and intent of the Owner.

M. DESIGNATED WORK: Wherein the documents designate that one contractor shall provide specified material and labor for another trade area contractor, the cost of the work and material shall be included in the bid of the contractor that is designated to provide the material and labor.

N. AND/OR: Wherein employed in the documents shall be either and both, singularly and together, as applicable to the intent of the Project Documents.

O. CONCEALED: Concealed building components, services, and obstacles subject to Change Orders, shall be limited to those components, services, obstacles, etc., not designated or known to exist, not typical to the type of construction observed and not available for inspection without destructive action. Opening of access panels, looking above accessible ceiling systems or inside chase walls is not considered concealed items.

1.2. In general, definitions of words employed in the Contract Documents shall be as defined in "Webster's New World Dictionary" the latest edition. The Architect shall be the interpreter in the case of multiple meanings. Exceptions to this shall include longstanding meanings in the construction industry but have not been so defined in Webster's Dictionary. Determination shall be in accordance with these Specifications.

END 01 42 16

1. GENERAL

1.1. WORK INCLUDES

A. Contractor shall provide and maintain specified temporary utilities.

B. Contractor may extend electrical and water services from Owner's existing sources.

1. Tap on and extension of services shall be implemented and paid for by the Contractor requiring utility.
2. Return tap on surrounds to original or contracted configuration and circumstances at close of job by the Contractor.
3. Extension shall not compromise Owner’s operations.

C. Contractor shall furnish (included in his Base Bid):

1. The cost of all utilities required by him which:

   a. Are in excess of existing available at the building and are necessary for the completion of his work.
   b. Exceed the capacity of existing or permanent systems and are necessary for the completion of his work.
   c. Required prior to permanent enclosure.

2. Extension cords, extension lights and lamps from approved temporary power centers to his work.
3. Ventilation for his storage spaces containing volatile or hazardous materials.
4. Security for materials and equipment.
5. Heating as needed to protect construction form freezing or frost damage.

D. Furnished by Owner

1. Authorization of existing facilities for temporary use.

   a. Electrical power service
   b. Water service extended from existing outlets by the Contractor

2. Owner will pay all costs of power and water consumables used for construction purposes for utilities properly extended.
3. The Contractor requiring Owner-furnished services, shall provide and pay for extension or modification of services to perform the work and for restoration of services and Owner equipment at completion of the work.

4. Heating consumables

    a. Only after building is fully enclosed with finished envelope elements, windows, doors, etc.
    b. Only through Owner's equipment and/or new equipment.
    c. Only when under control, 55 deg. max.
    d. Only when protected from damage, dirt, infiltration, etc.
    e. Do not extend the Owner's utilities for temporary heat.

E. Enclosure - Definition

1. Temporary: Sufficient preliminary enclosure of an area structure, or of an entire building, to prevent entrance or infiltration of rainwater, wind and other elements, and which will prevent undue heat loss from within enclosed areas.
2. Permanent: Stage of construction at which all moisture and weather protection elements of construction have been installed in accordance with the Contract, either for a portion of structure or for entire building.

F. Lighting: The Contractor shall provide the specified minimum lighting levels required by OSHA for the type of work under construction.

1. Adequate illumination for safe movement of authorized persons through project.
2. Adequate illumination for public safety.
3. Special warning lighting for hazardous conditions.
4. Task lighting by crew requiring same.

G. Security: To protect project from unauthorized entry.

H. Telephone: Contractor on site telephone services land line or cell to be provided by the Contractor.

I. Water Service:

1. For construction purposes:

    a. The Contractor shall provide and maintain temporary water service connection throughout construction period.
    b. The Contractor shall supply adequate water hoses from hose bibbs to the point of his operations.

2. For temporary fire protection and cleaning.
3. Maintain adequate volume of water for all purposes.
4. The Contractor provides drinking water for his own forces.
5. Water source: On or off site.

J. Toilets: Contractors' personnel may use existing restroom facilities at the building in the construction project, provided that:

1. Provide portable toilets.

K. Heating Consumables

1. Provide appropriate temporary heating and distribution to protect new construction from damage at Contractor's expense prior to permanent enclosure.

1.2. COST OF INSTALLATION, OPERATION, MAINTENANCE & CONSUMABLES

A. Installation, operation and maintenance:

1. The Contractor requiring service extensions shall pay all costs of installation, operation, maintenance, restoration and equipment warranty extension of temporary utilities for designated time periods.
2. The Contractor shall not overload the system.

B. Consumables:

1. Contractor pay all costs of consumables for temporary utilities, as designated:

a. Heating Fuel via Temporary Heating Units: Contractor requiring same.
b. Heating
c. Electrical Energy Contractor except as properly extended.
d. Lamps: Contractor requiring same.
e. Water: Owner as properly extended.
f. Toilets and Supplies: Contractor.

1.3. MONITORING OF TEMPORARY UTILITIES

A. The Contractor extending or providing a temporary utility extension shall be responsible for all damage to his work or to the existing facility caused by a defect in temporary utilities or utility extensions.

1. Enforce compliance with specified codes and standards.
2. Enforce safe practices.
3. Prevent abuse of services and utilities.
4. Prevent damage to finishes.

B. Upon completion of work, or when directed by Architect/Engineer, restore existing systems to original condition.

2. PRODUCTS (Not applicable)

3. EXECUTION

3.1. ALL TEMPORARY UTILITIES AND EXTENSIONS

A. Comply with DIVISION 15 and DIVISION 16 Specifications and Federal and State regulations.

B. Install work in a neat and orderly manner.

C. Be made structurally, mechanically and electrically sound throughout.

D. Be maintained to give safe, continuous service, and to provide safe working conditions.

E. Be modified and extended as work progresses.

3.2. INSTALLATION

A. Electrical:

1. Protect branch circuits or extension wiring on floor or on ground from damage.
2. Wiring for temporary heating and ventilating equipment:

    a. Wire all safety devices specified for operation or equipment.
    b. Verify proper operation of all safety devices.

B. Lighting:

1. Control lighting at Contractor installed secondary power centers or unless otherwise specified.
2. Install exterior security lighting at vertical conveyances left in place overnight.

C. Water services:

1. Do not run unprotected piping on floor or on ground.
2. Provide drip pan under each water service connection located within buildings.
3. Provide insulation, or other means, to prevent pipes from freezing.
4. When necessary to maintain pressure, the Contractor requiring same to complete his work shall provide temporary pumps, tanks and compressors.

3.3. REMOVAL & REINSTALLATION

A. At the conclusion of the work, completely remove temporary materials and equipment.

B. Repair all damage caused by installation. Restore to original condition or better.

END 01 50 00

1. GENERAL

1.1. WORK INCLUDES

A. Completed Deficiency List

B. Final Cleaning

C. Project Record Drawings

1. Contact list of Installing Contractor and/or Subcontractors.

D. Guarantees, Warranties and Bonds

1. Contact list for warranty claims.

E. Submittal

1. All materials shall be submitted in multiple copies in an orderly and labeled fashion.
2. Generic documents not filled in, dated, and job specific are not acceptable.

1.2. EVIDENCE OF COMPLETION OF THE CONTRACT

A. Equipment and Building

1. All equipment operational as intended, under control, installed per Manufacturer's recommendations.
2. All construction completed, finished and in new condition.
3. All deficiencies addressed to the satisfaction of the A/E and Owner.

a. Return Punch List with each completed item initialed by the Contractor representative who has inspected the corrective work.

1.3. COORDINATE FINAL CODE INSPECTIONS

A. Work with governing authorities for occupancy inspection.

1. Municipality
2. Regional Superintendent of Schools (school project).
3. IDPH for plumbing and any other IDPH permitted work.
4. A/E for called inspection when applicable.
5. Fire Marshall, local / state for:

a. Elevator, if applicable
b. Sprinklers, if applicable.
c. Fire alarm, if applicable.

d. Walk-through
e. Boilers

1.4. WARRANTIES

A. Extended warranties beyond the one (1) year 100% labor and material overall warranty shall be provided showing:

1. Terms and dates
2. Contact information
3. Installing Contractor
4. Exact system / material as applicable.

B. Extended warranties

1. As listed in various Specification Sections.
2. As advertised by Manufacturers.
3. As required for:

a. Hardware – five (5) years
b. Refrigeration equipment – five (5) years.
c. Boilers
d. Roofing
e. Mechanical BAS controls – two (2) years.

4. Items requiring chronic repair during the warranty period shall have an extended 12-month warranty until repairs are not needed over a 12-month period.

1.5. PROJECT RECORD DOCUMENTS

A. Submit Project Record Documents to reasonably provide information on:

1. Hidden utilities
2. Products used.
3. Any hidden from view structural or mechanical or electrical variations from plans.
4. Notation of alternates where same impacted the Base Bid Drawings.

B. Provide listing:

1. Contractor / Subcontractor / Vendor list with:

a. Product or service.
b. Contact information.

1.6. FINAL PAY APPLICATION

A. Final Lien Waivers – all Subcontracts and direct Suppliers.

B. Final Affidavit showing $0.00 due to all vendors.

C. Letter from Bond holder approving closeout payment.

D. Final paperwork on allowances, adds or deductions agreed upon by Change Order.

E. Final acceptance as applicable.

END 01 78 00

1 GENERAL

1.1. DESCRIPTION

A. Prime Contractor provide all exterior paving and sidewalk work and curb work of every nature on the Drawings.

B. Prime Contractor provide two slabs in Room 2000, approximately 2’ x 4’.

C. Cut asphalt along north side of kitchen. Remove two concrete steps. Remove steel railing. Pour level concrete sidewalk about 30’ x 6’including curb. Install new steel railing.

1.2. QUALITY ASSURANCE

A. No paving shall be installed over a soft, uncompacted, or frozen base. Any paving section not complying with this requirement, showing sinking, or suffering from cracking greater than shrinkage cracking, shall be removed and replaced at no additional charge.

B. Grade shall be continually checked during concrete operations to assure natural drainage of all surfaces without any ponding.

C. All gravel base shall be full thickness and compacted thoroughly in 12” lifts.

2 PRODUCTS

2.1. MATERIALS

A. Exterior slabs – IDOT PV
1. Seven (7) days strength = 3000 psi
2. Twenty-eight (28) day strength = 4000 psi
3. Minimum cement content per cu. yd. = 600 lbs. (6½ bag)
4. Air entrainment admixture (installed per Manufacturer’s recommendations) 6% to 8%, required
5. Max. water content per bag cement 6 gal. bag
6. Min. slump = 3”
7. Max. slump = 6”

2.2. INTERIOR SLABS

A. Same as exterior slabs above except air entrainment not required.

2.3. REINFORCEMENT

A. Provide #4 deformed bar epoxy coated around perimeter.

1. Provide #4 bars 4’ long to tie slabs supporting exit / entrance platform to main slab, and provide horizontal tie in curbs and gutters.

B. All concrete for pavement & slabs shall have Fibermesh 150 or equal incorporated into the mix at the batch plant at the rate of 1.5 lbs. per cu. yd.

1. In lieu of Fibermesh the Contractor can install 6 X 6 – 10/10 welded wire mesh.

C. At all expansion joints and cold joints drill slab edge for 20” epoxy #4 bars at 24” o.c.

2.4. FORMS

A. Use steel or wood forms for slabs.

1. Make sure forms are straight ands set at correct elevation.
2. Make sure forms for curved areas are consistently curved.

2.5. EXPANSION JOINT MATERIAL – minimum ASTM A185, Grade 60.

A. Two (2) part/top ½” removable to allow S-4 sealant installation, or one part tube or gun applied.

3 EXECUTION

3.1. PREP AND POUR

A. Before pouring ensure the earth base for slabs is compacted to 85% Procter.

B. Sidewalk slabs to be five inches (5”) thick. Vehicular slabs to be 7” thick.

1. Sidewalk, pavement, & curb cast for excavation to be 6’0” wide.

C. Protect from inclement, rain or cold weather.

3.2. FINISH

A. Interior and exterior slab finish shall be light broom finish after steel troweling. Please to not mist or apply water to surface during finishing.

B. Exterior curbs & sidewalks to be broom finish after bull float.

1. Apply SL Urethane sealant to all cut joints.

C. Avoid loading slabs for seven (7) days.

D. Remove forms and add earth fill to level finish. Apply seed after work is completed.

3.3. CURING/SEALING CONCRETE

A. All floors shall receive the following cure and seal treatment.

1. APPLY CURING COMPOUND SEALTIGHT CS-309 OR EQUAL AFTER CONCRETE SURFACE WATER HAS DISAPPEARED AND/OR AS SOON AS THE SURFACE CAN BE WALKED ON. APPLY AT MANUFACTURER'S RECOMMEND RATE.
2. Check with floor finish subcontractor before applying curing/sealing product.

B. All exterior surfaces shall receive Anti-Spalling Protection

1. Apply anti-spalling compound on all new exterior concrete slabs in **October the year of Owner occupancy.** Apply no sooner than twenty-one (21) days following placement on all exterior slabs placed later than October when Owner occupancy is scheduled during that winter or spring season.

a. W.R. Meadows Lin-Seal Anti-Spalling Compound.
b. Or, approved equal.

END 03 61 40

1. GENERAL

1.1. BASE BID WORK INCLUDES:

A. Work primarily includes masonry infill for removed duct work, and infill masonry for removed louvers and cutting new duct and pipe openings.

1. Coordination between Prime Mechanical Contractor and General Sub Contractor will be important.

B. See drawings for extent of work.

1. Sizes and dimensions
2. Details of installation

C. Coordination

1. Provide openings requested by various trades through walls.
2. Install sleeves or lintels.

D. Provide openings in existing masonry ducts.

1.2. RELATED REQUIREMENTS

A. Specified elsewhere

1. 05 55 00 – Metal Fabrication
2. 07 05 15 -- Insulation

1.3. QUALITY ASSURANCE

A. Code Compliance

1. International Building Code (IBC)
2. ACI 530-92 / ASCE 5-92
3. ACI 530.1-92 / ASCE 6-92

1.4. SUBMITTALS

A. Mortar – each type, data sheet
B. Grout – each type, data sheet
C. Brick – samples, at architect office

1. Material samples to A/E
2. After material acceptance, provide cut samples of each shape – samples at job site.
3. Clips

1.5. DELIVERY AND HANDLING

A. Store materials in a manner to prevent damage.

1. Protect from excess moisture exposure.
2. Keep clean; do not employ muddy units.
3. Protect from excess handling, chippage or unit edge damage.
4. Mortar cement and lime to be kept dry prior to use.

2. PRODUCTS

2.1. STANDARD MODULAR BRICK

A. ASTM C216 Grade SW, type FBS, 3 1/2” X 2 1/2” X 7 1/2”, match existing where brick is visible.

B. Match existing brick

1. Submit samples to architect office

2.2. WALL REPAIR AND INFILL

A. Standard size brick

2.3. COMMON BRICK, BEARING BRICK, MASONRY BEARINGS

A. Common brick and concrete brick shall be sound and of uniform size. Brick shall be employed in all locations shown on Drawings or called for in these Specifications. Where not exposed to view, common brick or sound face brick which does not conform to chippage for dimensional requirements may be employed in locations calling for common brick, if this brick conforms to the following requirements.

1. Bricks employed shall be full units, except where cut to fit. Joints shall be of a consistent nature not exceeding 1/2" in thickness nor less than 1/4" for head and bed joints.
2. Brick may be Type FBA, Grade NW except that Grade SW shall be employed, if exposed to weather in any manner, meeting ASTM C62 or C216 requirements for performance and strength. An average of five (5) bricks shall be 3000 psi minimum. Brick shall be solid concrete brick where exposed to view in block walls.

2.4. INSULATION (N.I.C.)

A. Insulation to be used in walls where infill masonry is installed (coil door removal, louvers, etc.) shall be 2” Polyisocyanurate closed cell, cut to fit snugly.

B. See Section 07 05 15 for description.

2.5. CONCRETE BLOCK

A. All block used shall be:

1. Standard sand/gravel aggregate below grade. Above grade optional.
2. Optional lightweight Haydite aggregate may be used above grade - interior.

3. Single "V" score required in all areas exposed to view, except mechanical, custodial and utility areas may be standard block.

2.6. MORTAR

A. All prepared mortar shall conform to ASTM C270, Portland Cement/lime mortar.

1. Face brick and stone exterior or veneers, Type N, 750 psi at twenty-eight (28) days.

a. Type N mortars or masonry cement shall contain approximately equal proportions of Portland and hydrated lime; multi-use mixes that adjust sand ratio for N and S are not acceptable.

B. Prepared masonry cement may be employed, such as "Brixment" as manufactured by Louisville Cement Company, Lone Star, Lehigh, or approved equal, in proportions of one (1) part masonry cement to not more than three (3) parts damp loose sand. Sand shall have a fineness modulus of 1.96.

1. Type ‘S’, all CMU and brick work except exterior veneers.
2. Type ‘N’ exterior veneer work.

C. All mortar shall include a water-reducing plasticizer as manufactured by Master Builders or approved equal, in strict accordance with the Manufacturer's directions.

D. The mortar shall be installed within 2-1/2 hours of adding moisture to the mix. Mortar 2-1/2 hours old shall be discarded and replaced with new.

E. USE OF CEMENT ACCELERATOR OR ANTIFREEZE WILL NOT BE ALLOWED.

2.7. FLASHING (N.I.C.)

A. Through wall flashings or termite shield shall be two (2) oz. copper sheet, coated with modified asphalt both sides.

1. York ‘Copperseal” Representative Lance Construction Specialties (312) 522-1900.

2. Afco “Cop-A-Cote” Afco Products Inc., 44 Park St., Somerville MA 02143 (617) 623-7700.
3. Advanced Building Products “Cop-R-Cote” PO Box 98, Springvale, ME 04083 (800) 252-2306.
4. Approved equal, EPDM may be allowed for some applications.

B. Splicing cement shall be modified asphalt cement for all horizontal laps. Not required for joints lapped shingle fashion.

C. Drip flashings, 26-gauge stainless steel for **ALL** unprotected exterior wall openings, full length of lintel. This required at coiling door infill at Room #151.

1. No exception unless directed IN WRITING.
2. Seal laps.
3. Provide end dams

D. Drip flashing splice seal

E. At through wall louvers provide:

1. Full wall width sill flashing. Coordinate with Mechanical Contractor. Flashing shall be 30 gauge stainless steel or as detailed. Provide 1/2" turned up back edge and jamb edges and seal corner where possible.
2. Drip flashings above louver. Coordinate with louver style.

2.8. MOISTURE REPELLENT: Install one coat of:

A. Evonik Industries Protectosil Chem-Trete

B. No mixed on site products to be used.

2.9. WEEP ROPES: 1/4” – 5/16” cotton rope at 24” o.c.

3. EXECUTION

3.1 PREPARATION / LAYOUT

A. General Contractor shall furnish all labor and materials and complete all masonry work, of every nature, called for on the accompanying drawings or specified herein these Specifications.

B. The Contractor shall leave or cut all of the openings in masonry construction required for work by the other Contractors and/or Subcontractors.

1. Provide and install lintels of proper size over all openings needed.
2. Where said lintel sizes are not established by schedule on the

Drawings or herein these Specifications, sizes shall be determined in conference with the Architect.

3. Install sleeves in the walls as provided by the various Contractors and Subcontractors at locations as directed.

C. Installation of Masonry

1. This Contractor shall make all repairs needed at masonry openings, etc., after other Contractors and Subcontractors have completed their work.

2. All masonry work shall be laid straight, plumb and true, and in a workmanlike manner, employing full head joints and continuous bed joints.

3. Wherein the Drawings show masonry fill-in at the abandoned openings, the same shall comply with these documents, with each face finished to match the existing adjacent wall finish.

D. Weather-tight

1. Where sealants or flashings are to be employed, joints shall be raked to proper dimensions. Sealants employed shall be as per sealant specifications.

2. Install flashings at all exterior openings.

a. Flexible flash from CMU and lap over lintel and drip flash.
b. Drip flashing to extend length of lintel (uniform each end)
c. Weeps at all exterior flashing at 32” spacing (uniform space and not more than 16” from ends).

3.2. INSTALLATION (A, B, D & E – N.I.C.)

A. BONDING

1. All masonry work shall be bonded unless specifically indicated otherwise on the accompanying Drawings or herein these Specifications.

2. All piers shall be bonded each course, insofar as this is practical. All walls and piers intersecting structural walls shall be bonded with structural wall every other course.

3. Where bonding is not practical, approved galvanized metal ties shall be used and the ties shall be set approximately one (1) per 1¾ square feet of wall surface.

4. All block work shall be laid in common bond.

B. CLEANING DOWN FINISHED MASONRY: All block work shall be cleaning of mortar drippings, joints finished down, and the entire surface stoned or brushed as required and chips repaired.

C. Moisture Proofing

1. See Paragraph 2.8 Moisture Repellent

    a. Apply waterproofing to **ALL** new exterior masonry surfaces.
    b. Lap onto adjacent masonry walls/min. 2'-0" unless designated otherwise on the Drawings.

D. Provide through-wall flashing at all exterior masonry wall lintels and continuous within eight inches (8") of grade at exterior masonry walls combined with top side weep cords, spaced 32" o.c.

1. Flashing shall rise vertically a min. of 6" (8" preferred), against the interior back-up masonry and leg there-into a min. of 2".
2. Flexible flashing in block joint above lintel to lay 4” into block joint, extend out 4” or as needed to lap rigid drip flashing.
3. Locate to avoid through-wall reinforcing.
4. Flashing laps to be min. 4"/asphalt coated.
5. Drip flashing to lap up under flexible flashing.
6. Weeps near ends and at 32” spacing.

E. Windbreak and wall to wall anchorage

1. Wherein the Drawings indicate new exterior masonry wall abutting existing masonry walls, provide the following system:

    a. For windbreak provide 4” X 1/4” steel plate full height of intersecting wall. Cut relief into existing wall 3/8” X 2”. Install plate in grove and mortar or grout existing wall and plate.
    b. Provide corrugated anchors/wall to wall at 8" spacing/each wythe.
    c. Provide foam rope and sealant bead struck smooth/full height at exposed wall intersections.

2. Wherein the Drawings indicate interior new masonry walls abutting existing masonry walls,

    a. Provide 1/4” drilled shear pins spaced max. 16" vertically per wythe/two (2) ties per wythe where masonry wythe exceeds 6".
    b. Where new walls abut existing masonry walls exposed to view/rake the joint and provide paintable sealant bead struck smooth.

END 04 20 00

1. GENERAL

1.1. WORK INCLUDES

A. Base Bid:

1. Contractor shall provide:

a. Framing for new wall at east end and west end of Cafeteria / Newman Gym Corridor.

2. Metal deck for closed or removed mechanical equipment curbs.

1.1. RELATED WORK

A. Specified elsewhere:

1. 09 21 16 - Gypsum Wallboard

1.2. SYSTEM DESCRIPTION

A. Performance Requirements

1. Specification for the Design of Cold-Formed Steel Structural Members, 1968, with Addendum No. 1 and 2, American Iron and Steel Institute.
2. Cold-Formed Steel Design Manual, 1977 Edition, American Iron and Steel Institute.

1.3. QUALITY ASSURANCE

A. Qualifications of Erector:

1. Minimum of three (3) years successful experience on comparable cold-formed metal framing projects.

B. Welders qualified in accordance with AWS D.1.Regulatory Requirements: Erect cold-formed metal framing to meet requirements of IBC 2006.

1.4. REFERENCES

A. ASTM A446, Grade D, minimum yield 50,000 psi - Structural Steel.

B. AWS D1.1 - Structural Welding Code.

C. SDI Standard #1 - Steel Deck Institute.

D. ASTM A446-76 - Steel Sheet, Zinc-coated (galvanized) by hot dip process,

physical structural quality.

E. ASTM A90-69 - Weight of Coating on Zinc-coated galvanized iron or steel articles.

1.5. DELIVERY, STORAGE & HANDLING

A. Deliver products to site in accord with Standard Documents for Construction.

B. Store products on site in accord with Standard Documents for Construction.

2. PRODUCTS

2.1. ACCEPTABLE MANUFACTURERS

A. Clark Cincinnati-Inc., Cincinnati, OH 45246 513/874-9631, 800/543-7140

B. Dale Industries Inc., Dearborn, MI 48128 313/846-9400, 800/882-7883

C. Unimast Inc., Franklin Park, IL 60131 708/451-1410, 800/323-0746

D. Dietrich Industries Inc., Pittsburgh, PA 15219 412/281-2805, 800/873-2443

E. United States Steel Deck, Inc., Summit, NJ 07902, 908/277-0662

2.2. MATERIALS

A. Steel Framing

1. Studs, Formed galvanized sheet steel, typical:

a. CSJ 550S132-33 (5 1/2" X 1-5/8" X 20-gauge – for walls of corridors
b. Other sizes and gauges may be detailed but never less than 33 (20-gauge).
c. Clips and accessories as associated.

2. Studs, Interior Wall: typical 362S162-33, depth to provide total wall thickness shown in conjunction with finish surfaces or cladding indicated.

a. Other sizes may be noted on the Plans and Details.

3. Track: Formed galvanized steel; channel shaped; same width as studs, for tight fit; 20-gauge or other thickness indicated solid web.

4. Furring (hat) channel – 24-gauge X size as appropriate to allow space for electrical boxes at furred walls.

B. Accessories

1. Bracing, Furring, Bridging: Formed galvanized sheet steel; channel and strip shaped as indicated or as appropriate to conditions.
2. Plates, Gussets, Clips: Galvanized formed steel, thickness determined for conditions encountered as detailed, use manufacturer's standard shapes when available.

C. Fastenings

1. Self-drilling, self-tapping screws, bolts, nuts and washers: hot-dipped galvanized: ASTM A90-69.
2. Anchorage Devices: Power driven or powder actuated, drilled expansion bolts; screws with sleeves or tapcons.
3. Welding: AWS D1.1.

D. Finishes

1. Galvanizing: ASTM A90-69, 1.25 oz./sq. ft.
2. Primer: Zinc chromate touch-up for galvanized surfaces.

E. Metal Deck Specifications for Roof Curb Alterations

1. Deck shall be “B” for “J” series.
2. Material shall be ASTM A653 Grade 33 (min 33,000 psi) galvanized G60.
3. Deflection of deck not to exceed l/240
4. Ends (North and South) may be secured with #10 self-drilling stainless steel screws. Screw dia. .190 and head diameter of .415 or .400. Average tested tensile strength 2.56 kips. One (1) screw in each trough not to exceed 12” o.c.
5. Installation to provide for bearing of minimum 2”

2.3. FABRICATION

A. Form members to manufacturer's standard shapes meeting design criteria.

B. Cut right angle connections of framing components to fit squarely against abutting members. There shall be no gaps in structural walls.

C. Connect members together by self-drilling #8 pan head screws--four (4) screws per connection in structural walls.

D. Galva-Prime non-galvanized steel to 1.5 mil minimum dry film thickness.

E. Field fabrication of complex parts.

1. Box beams – make up (2) track (2) c studs 20 gauge unless noted otherwise.

3. EXECUTION

3.1. ERECTION

A. Align floor and ceiling tracks, locating to wall layout. Secure in place with screws or welding at maximum 16 inches o.c.

1. Sixteen inches (16") o.c. maximum non-structural

B. Place studs at sixteen inches (16") o.c. and not more than two inches (2") from abutting walls and at each side of openings. Connect studs to tracks using clips and ties, screws, or welding, in accordance with manufacturer's recommendations. Check manufacturer's recommendations for structural stud for mezzanine and follow.

C. Construct corners using minimum three (3) studs. Double studs at door, window and sidelight jambs. Install intermediate studs above and below openings to match wall stud spacing.

D. Provide deflection allowance below supported horizontal building framing in ceiling or head track for non-load bearing framing.

E. Attach cross studs or furring channels to studs for attachment of fixtures behind lavatory basins, toilet and bathroom accessories, grab bars and other items anchored to partitions or walls.

F. Install additional framing between studs for attachment of:

1. Electrical boxes and other mechanical and electrical items
2. Door bumper stops
3. Hardware
4. Wall supported equipment and accessories

G. Erect load bearing studs one piece full length. Splicing and wire tying of framing components is not permitted. Join members forming trusses by welding.

H. Erect load bearing studs, brace, and reinforce to develop full strength to meet design requirements.

I. Set floor or ceiling joists parallel and level, with end bearing, lateral bracing, and bridging in accordance with manufacturer's recommendations.

J. Extend stud framing to ceiling only. Attach ceiling channel to ceiling framing securely.

K. Make provision for erection stresses. Provide temporary alignment and bracing. Touch-up field welds and scratched or damaged galvanizing.

L. Ensure framing provides true and flat surfaces, ready to receive gypsum board finish.

END 05 40 00

1. GENERAL

1.1. WORK INCLUDES

A. Base Bid

1. Contractor shall provide incidental metal work required and shown on the Drawings.
2. Contractor shall:

   a. Provide steel railing for cafeteria exit.
   b. Remove existing railing at Cafeteria exit.
   c. Provide support for HP-147.
   d. Take field measurements and submit Shop Drawings.
   e. Provide steel insert lintels as noted on Drawings.

1.2. RELATED WORK

A. Specified elsewhere

1. 03 30 00 -- Concrete
2. 04 20 00 -- Unit Masonry
3. 05 51 33 – Fixed Wall Ladders
4. DIVISION 22 & 23 -- MECHANICAL
5. DIVISION 26 – ELECTRICAL

1.3. REFERENCES

A. ASTM A36-77a - Structural Steel

B. ASTM A325-80a - High Strength Bolts for Structural Steel Joints

C. AWS D1.1 - Structural Welding Code

D. Prime - Paint – all steel after fabrication

1.4. QUALITY ASSURANCE. Regulatory Requirements: Illinois Steel Products Procurement Act, as amended (Illinois Revised Statutes, ch. 48, par. 1801 et. seq.).

1.5. SUBMITTALS

A. Submit Shop Drawings in accordance with 01 33 00.

1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

1.6. DELIVERY, STORAGE AND HANDLING

A. Deliver and store products to site in accordance with 00 22 13.

2. PRODUCTS

2.1. MATERIALS

A. Steel Sections: ASTM A36-77a.

B. Steel Tubing: ASTM A53, Grade B.

C. Bolts, Nuts, and Washers: ASTM A36-77a minimum.

D. Welding Materials: AWS D1.1; use correct type for materials being welded.

E. Primer: Red for shop application and field touch-up. See Section 09 90 00.

2.2. FABRICATION

A. Verify dimensions on site prior to shop fabrication.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed welds flush and smooth with adjacent finished surface finished surface. Ease exposed edges to a 1/8" uniform radius.

D. Exposed Mechanical Fastenings: Flush countersink screws or bolts, unobtrusively located, consistent with design of structure, except where specifically noted otherwise.

E. Make exposed joints butt tight, flush and hairline.

F. Supply all components for anchorage of metal fabrications. Fabricate anchorage and related components of same material and finish as metal fabrication, except where specifically noted otherwise.

2.3. PRIMING PROTECTIVE COATINGS

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Clean all ferrous metal in accordance with applicable requirements of SSPC-SP1 (Solvent Cleaning) followed by cleaning with applicable requirements of SSPC-SP2 (Hand Tool Cleaning).

C. Apply specified primer to all ferrous metal surfaces by brush or spray to a dry film thickness of 2 mils. (100% cover)

3. EXECUTION

3.1. INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

3.2. WALKWAY AND PLATFORM RAILINGS

A. Install per manufacturer's instructions for manufactured items.

B. Wall - bracket mounted handrails shall be 1½" O.D. at 32" above stair nosings.

1. Railings to meet OSHA regulations and 2018 Illinois Accessibility Code.

C. Provide top guard railing at level elevated openings, forty-two inches (42") high 1-1/2" O.D. pipe with bottom 1½" at O.D. pipe at four inches (4") above base and 1/2" X 1/2" steel balustrades weld pipe to pipe at four inches (4") o.c. max. spacing.

1. Pipe railing to be 14’-6”s parallel to building and approx. 6’ return to building at door.

3.3. MISCELLANEOUS FRAMES AND SUPPORTS

A. Provide miscellaneous metal angles, plates and assemblies shown on Drawings with anchors, bolts and accessories required, including but not necessarily limited to the following:

1. Steel lintels at all openings/typical per opening shown on the Drawings. Steel lintels will be insert type with plate on top and two side plates welded to it.
2. Shelf angles
3. Clip angles
4. Seat angles
5. Sub-structural members per Detail Drawings
6. Pipe hangers

END 05 55 00

1. GENERAL

1.1. REQUIREMENTS INCLUDE

A. The Contractor shall provide treated lumber as shown on the Drawings, specified herein, and as needed to complete the work.

1. There are several new equipment curbs to be built, see Drawing.
2. There are several roof curbs to be modified from present configuration to new size. See drawing.
3. There are several roof curbs that need to be removed. See drawing.
4. Provide base framing and plywood for HP 130 and provide plywood for HP 147.

1.2. RELATED WORK

A. Specified elsewhere

1. See Mechanical and Architectural Drawings

1.3. PRODUCT DELIVERY, STORAGE AND HANDLING

A. Immediately upon delivery to site, place materials in area protected from weather.

B. Store materials a minimum of 6 in. (150 mm) above ground on framework or blocking and cover with protective waterproof covering, providing adequate air circulation or ventilation.

1. Do not install wet materials

C. Seasoned materials shall not be stored in wet or damp areas.

2. PRODUCTS

2.1. MATERIALS

A. Lumber

1. Dimensions

a. Specified lumber dimensions are nominal: verify actual filed conditions and field verify dimensions and provide materials required to accomplish the intent of the details shown.

1) Rip or adjust sizes as needed to accomplish detail results.

b. Lumber dimensions conform to industry standards established by the American Lumber Standards Committee and the rule writing agencies.

2. Moisture content: Nineteen percent (19%) maximum at time of permanent close in of building or structure, for lumber 2" or less nominal thickness.

3. Surfacing: surface four sides (S4S), unless otherwise shown, or specified.

B. Plywood: CDX exposure rated and clearly stamped on material, thicknesses and listed on Drawings.

1. 5 ply minimum.

C. Rough Hardware:

1. Any hardware used in treated lumber or plywood shall be stainless steel or finish rated for treated lumber use.
2. Any fasteners used in exposed to weather applications shall be stainless steel, or other corrosion finished appropriate for the application, zinc plated is not a weathering corrosion finish.
3. Drawings may detail framing plates, and accessories:

a. Modifications to existing Mechanical curbs and installation of new curbs may be secured to existing concrete deck and existing curbs using 12 ga. galvanized angles.

4. Bolts: FS FF-B-575C
5. Nuts: FS FF-N-836C
6. Expansion Shields: FS FF-B-561C (limited use, see Drawings)
7. Lag Screws and Bolts: FS FF-B-561C
8. Toggle Bolts: FS FF-B-588C
9. Wood Screws: FS FF-S-111C
10. Nails and Staples: FS FF-N-105B
11. RED HEAD, Fastenal, Hilti or approved equal, structural rated stud anchors

a. Wedge type, double wedge when noted
b. Epoxy
c. Drive in type

3. EXECUTION

3.1. PREPARATION

A. Examine receiving surfaces and verify that no rot or detrimental condition such as poor anchorage exists.

1. Application or installation of materials constitutes acceptance of existing application conditions.

B. Verify all dimensions of in place and subsequent construction.

1. Adjust framing or additional framing as needed to accomplish the intent of the work and as needed to complete the work properly.

C. See Drawing Details.

3.2. INSTALLATION

A. Frame wood members to be close fit, set accurately to required lines and levels and secured rigidly in place in accordance with the Drawings.

1. In continuous runs, stagger members of such as multiple member plates or curbs.
2. Anchor all members typical to industry standards as a minimum.

a. As detailed
b. Sill plates not more than 48” anchor spacing, ½” bolts nor 12” from plate ends.
c. Roof edge curbs, not less than 60 pounds per lineal foot pull off resistance any direction.

3. Cut and fit framing, blocking etc. to accommodate the other work, other trades and MEP work.
4. Interlock plate and curbing corners.

B. Framing Roof

1. Provide dimensioned wood for all framing, blocking, furring, nailing strips built into, or adjacent to, exterior masonry walls, wood in contact with concrete and wood in conjunction with roofing.
2. In reroof applications, existing perimeter blocking may remain in the final assembly.

a. Should same, or segments of same, be discovered to have deteriorated or have loose anchorage then said segments shall be replaced of material as specified herein above and by properly secured in place by the Contractor as a part of the Base Bid.
b. Additional materials only will be reimbursed.

3. Demolition of existing assemblies may be listed in Drawings to accommodate new detailing or conditions.

END 06 10 00

1. GENERAL

1.1. BASE BID INCLUDES

A. The Contractor shall repair roofs and curbs indicated on drawings. This includes new insulation over curbs and 60 mil EPDM Roofing.

B. The roof over Area 2, 3 & 4 have a 20 year Firestone Warranty. Repair over this area must be compatible to the warranty in effect. This roof installed by Union Roofing Co. (815) 945-2141.

2. PRODUCT

2.1. INSULATION

A. Insulation for roof curb repair shall be 4’ polyisocyanurate

B. Description – base insulation:

1. One 2.5” polyisocyanurate adhered to deck. See Drawings for thickness.
2. Fiber reinforced facers, sheet size, 4’ X 8’.
3. Multiple layers where noted on the Drawings and as recommended by roof system Manufacturer to complete job.

C. Specification:

1. Federal specification HH-I-1972/1.
2. Factory Mutual Class 1 per FM 4450.
3. Condition ‘R’ value 5.88 minimum per ASTM C 518 Test Methods and PIMA Conditioning Procedure 101 or RICTIMA Bulletin 281-1.
4. 25 psi crush zone board if required by warranty ro walkway.

D. Compliance: insulation system must comply with roofing manufacturer’s standards for uplift, delamination, warranty and general compatibility.

1. Comply with warranty requirements for full system warranty.
2. Coordinate material selections for full system warranty.
3. System aged R value to meet or exceed R25 as a minimum. Thinner board may not be used. Use thicker if needed for R-25 (average system).

E. Attachment of the product:

1. Urethane made by the manufacturer of the EPDM roof material may be used.
2. Screws may be used. Provide stainless steel screws only.

2.2. ROOFING MEMBRANE SYSTEM

A. Repair shall be made with 60 mil EPDM rubber

B. Flashing, seam tape, RUSS stripe adhesive and anchors all must be by same manufacturer.

1. Firestone Building Products, Co., Carmel, IN - Firestone Rubbergard

C. Resilient Flashing: 60-mil uncured formable EPDM shall be of same source by name as the membrane system.

1. Use only where required for manufacturer's warranty.

D. Reinforced edge strip (RUSS) or (RS), 45-mil .045” reinforced EPDM 6” wide.

1. Where required for edge anchorage.

E. Adhesives

1. Adhesives for adhering membrane shall be the manufacturer recommended contact type adhesive for the substrate condition.
2. Seam adhesive shall be the membrane manufacturer's top grade butyl base type contact seam adhesive or manufacturer self vulcanizing seam tape.

F. Seam sealant and seam tape shall be manufacturer's recommended seam sealant or tape.

1. Min. three-inch (3") seam tape, with six-inch (6") cover – ALL SEAMS. One (1) 7” wide seam tape may be used in lieu of 3” and 6”.
2. Provide necessary seam work or seam primers as recommended.

G. Anchor bars

1. Manufacturer's recommended type as a minimum standard unless detailed otherwise.
2. First and last anchor hole in any bar segment shall be 1" from ends.

3. INSTALLATION

A. Install roofing and flashing system(s) and all accessory items in strict accordance with system Manufacturer's printed instructions current at date of bidding documents.

END 07 05 15

1. GENERAL

1.1. WORK INCLUDES

A. Contractor shall provide metal closure panels along each side of new Bard Heat Pumps close to wall.

B. Contractor shall provide metal trim associated with the flue caps and other roof curb covers.

C. Contractor shall verify on site flashing and trim dimensions to accomplish the design intent of the drawing details.

1.2. RELATED WORK

A. Specified elsewhere

1. 01 01 00 – Summary of Work
2. 07 92 00 -- Sealants & Caulks

1.3. QUALITY ASSURANCE

A. Sheet metal flashing and trim shall conform with the following:

1. Specified requirements of the manufacturer of the metal.
2. Recommended practices contained in "Aluminum Construction", from the Aluminum Association, 750 Third Avenue, New York, NY 10017, latest edition.
3. Anodized quality ASTM B-136, ASTM-B-137 or ASTM-B-244.

B. SMACNA standards for Architectural Sheet Metal

1.4. REFERENCE STANDARDS

A. ASTM B209-79, Alloy 3003-H14: Aluminum

2. PRODUCTS

2.1. MATERIALS – See Drawings for applications

A. Aluminum: Comply with reference standards.

1. Closure panels at Bard unit to wall glazing 0.40 aluminum
2. Kynar 5000 finish for exposed sides.
3. 0.40" hemmed aluminum.

3. EXECUTION

3.1. FABRICATION

A. All exposed to view materials to be aluminum.

1. Always hem exposed edges.
2. Includes edge flashings, drips, closures, trim, and/or assemblies.

B. Verify dimensions at site prior to shop production fabrications. The closure panels could be 6” to 12” depth. Height will always be 100” except in classrooms: 106, 108, 110, 114, 116, 120, 122, 138, 140, 144 and 146 the closure panel will be 70” high.

3.2. INSTALLATION

A. Examine all surfaces to receive the metal flashing and trim.

1. Verify all dimensions of existing and subsequent constructions.
2. Installation of metal flashing and trim shall constitute acceptance of existing conditions.
3. Coordinate work with work of HVAC, Plumbing and Electrical Subcontractors.

B. Erect all the members plumb, level and in line securely anchored and properly related to other parts of the work.

C. Secure closure panel to CMU wall where possible with screws.

1. The sheet metal trim shall completely cover the space between the exterior wall panel and the water source heat pump.
2. The water source heat pump must remain movable to allow repairs.

D. All holes in sheet metal flashing anchored by screws exposed to temperature change and which is applied in segments in excess of 4’-0” lengths shall be 1/16” diameter over size to accommodate expansion and contraction.

E. Anchor holes in material segments shall commence and end on minimum of 3" form the ends of the segment.

END 07 60 00

1. GENERAL

1.1. WORK INCLUDED

A. Contractor shall provide caulking and sealing of joints as shown on Drawings and specified herein, including backup fillers where required.

1.2. RELATED WORK

A. Specified elsewhere:

1. 07 60 00 - Sheet Metal Flashing & Trim

1.3. SUBMITTALS.

Submit the Manufacturer's literature, materials description and installation instructions for each compound and filler in accordance with 01340.

1.4. HANDLING & STORAGE

A. When the Contractor chooses a product for a particular use for a sealant or caulk specified, that same product shall be used throughout the project for that specific assignment.

1.5. WARRANTY

A. Sealant Manufacturer: Contractor shall certify per Section 01 78 00, as applicable.

1. Material performance (warranty) - twenty (20) years against shrinkage and hardening - implied and advertised.
2. Loss of bond to substrate - five (5) years - Contractor or Manufacturer's Warranty.

2. PRODUCTS

2.1. MATERIALS

A. Exterior for metal-to-metal, metal-to-glass and for glass-to-glass installations.

1. Sealants shall be one (1) part type - silicone
2. Serviceable life expectancy shall be twenty (20) year minimum in Manufacturer's printed material for applications proposed.
3. Approved products are as follows: (Select proper product from product family).

a. General Electric Silicone Series 1200.
b. Dow Chemical 780 Silicone Rubber Sealant.
c. Products Research & Chemical Corp. (PRC) 4588 Polyisobutylene.

B. Exterior grade for masonry-to-masonry, metal-to-masonry, wood-to-masonry, and glass-to-masonry.

1. Material's serviceable life expectancy shall be twenty (20) year minimum in Manufacturer's printed material for the applications proposed – one (1) part urethane.

2. Approved products are as follows:

a. Sonneborn NP-1
b. Silaflex 1A
c. Vulkem 116
d. Tremco Mono

C. Interior grade caulk shall be one (1) part, paintable.

1. Chemical make-up shall permit 5% joint movement from 20-deg. F to 110 degrees F and shall be skinning type.
2. Approved products are as follows:

a. DAP Latex Caulk
b. Pecora BC 158
c. Tremco Butyl Sealant

D. On grade horizontal joints, exterior/interior grade sealant shall be one (1) part, self-leveling for concrete contraction/expansion joints.

1. Approved products are as follows:

a. Sonneborn Sonolastic S.L.1
b. Vulkem 45
c. Dow Chemical 880

2. If slope will cause flow, use one (1) part urethane listed above.

2.2. JOINT FILLER / BACKER

A. Joint Filler F-3, closed-cell polyethylene approved products shall be as follows:

1. Ethafoam by Dow Chemical.
2. Expand-O-Foam by Williams Products, Inc.
3. Filler Foam FF-4 by Progress Unlimited, Inc.
4. Safe-T-Grip Filler Gasket by Structural Specialties Corp.

2.3. JOINT CLEANER. Joint cleaner shall be that cleaner recommended by Sealant Manufacturer for specific joint surface and conditions.

2.4. JOINT PRIMER AND SEALER. Joint primer and sealer shall be those compounds recommended by Sealant Manufacturer for the specific joint surface and conditions.

3. EXECUTION

3.1. PREPARATION

A. Examine all surfaces to receive the parts of the work specified herein. The application or installation of materials constitutes acceptance of the substrate.

B. Clean surfaces and remove protective coatings that may fail in adhesion or interfere with bond of compound so surfaces are free of deleterious substances which might impair the work.

C. Prime surfaces per the Sealant Manufacturer's instructions.

D. Install bond breakers in locations and of type recommended by the Sealant Manufacturer to prevent bond or sealant to surfaces where such bond might impair the performance of the sealant.

3.2. INSTALLATION

A. Install all materials in accordance with Manufacturer's printed instructions. Unless otherwise directed, conform as follows:

1. Compounds shall not be installed at temperatures below 40 deg. F unless the Manufacturer specifically permits the application of his materials at a lower temperature.
2. If job conditions require installation of compounds below the minimum installation temperatures recommended by the Manufacturer, consult the Manufacturer's Representative and establish the minimum provisions required to ensure the satisfactory work.
3. Confine compounds to joint areas shown. Use masking tape to prevent staining of adjoining surfaces, spillage and/or migration of the compound out of joints. Tool surfaces to shape shown or, if none is shown, to a flush or slightly concave surface. Remove excess compound and clean adjoining surfaces as may be required to eliminate any indication of soiling or migration.
4. In joints which are not subject to traffic, apply sealants to a minimum depth of 50% of the normal joint width but not less than 3/8" or more than 1/2" deep.
5. Apply non-elastomeric compounds in exposed joints with the depth of compound not less than the joint width.
6. Use appropriate sealants for all exterior joints and for the interior joints subject to movement, except traffic expansion and contraction joints and for all exterior and interior expansion traffic joints in concrete and tile work.
7. Use paintable sealant for all interior joints at locations to be painted not subject to movement in excess of 5%.
8. Pouring sealants shall be poured over a bond breaker tape joint filler. The joint shall be masked off adequately to assure a clean, flush and finished installation.
9. Sealants and caulks shall be a color selected to blend with adjacent

material color.

B. Installations shall be neatly executed, smooth and regular in appearance, no lumps or globs or smears onto adjacent surfaces. Tool when appropriate.

3.3. SEALANT COLOR SELECTION

A. Sealant shall match surrounds for color.

1. Coordinate with Architect/Engineer regarding colors to insure approval.
2. Once a Manufacturer's product has been established for a use, that same product shall be used throughout the project for the particular situation and background.

3.4. SEALANT APPLICATION

A. For exterior/building envelope conditions: Select the proper sealant to provide resistance to air or water infiltration at all exterior envelope joints, connections of dissimilar materials:

1. Wall expansion joints
2. Door & windows

a. Bed all thresholds in urethane sealant.

3. Wall penetration
4. Abutting dissimilar materials
5. As needed to control infiltration

a. Water
b. Air
c. Vermin and insects

B. Appearance conditions: Throughout the interior of the construction provide sealants as needed to visually finish all installations.

1. Wall expansion joints
2. Construction joints
3. Abutting dissimilar materials
4. Wall, floor and ceiling penetrations
5. Joints subject to water penetration
6. Irregular joints
7. Unintended gaps, cracks or openings such as at poorly executed electrical device cover plates

C. Kitchen, Restrooms, etc.

1. Use appropriate approved sealants as needed for compliance with regulations and good housekeeping practice.

END 07 92 00

1. GENERAL

1.1. WORK INCLUDED

A. The General Contractor shall provide five (5) hollow metal doors, three (3) frames, and vision panel frames as shown on the Drawings and specified herein.

1. Install new double steel door at Cafeteria SW exit with vision panel 6” X 18” or nearest dimension available (“B” label).
2. Install new double steel door at Cafeteria/Newman Gym Corridor with vision panel 6” x 18” or nearest dimension available (“B” label) at West.
3. Install new single steel door with vision panel 6” x 18” “B” Label.

B. General Contractor shall provide adequate and suitable hardware and accessories at doors shown on the Drawings.

1.2. RELATED WORK

A. Specified elsewhere:

1. 01 05 50 - Anchorage & Fasteners
2. 07 92 00 - Sealants & Caulks

2. PRODUCTS

2.1. MATERIALS

A. Structural Steel Shapes: ASTM A36-70a.

B. Galvanized Steel ASTM A 366-72 .5 oz/square foot per side. N.I.C.

C. Primer: Phosphate treated, gray zinc chromate baked on inside and outside of all sections. Galvanize instead of primer if possible.

2.2. MANUFACTURERS

A. Acceptable manufacturers of standard 16-gauge galvanized doors and frames:

1. Steelcraft - Cincinnati, Ohio
2. The Ceco Corporation - Chicago, Illinois
3. Mesker Door Co., Inc., Huntsville, AL
4. Fenestra Corporation - Erie, Pennsylvania
5. Curries Co., Mason City, IA
6. Amweld Building Products, Garrettsville, OH
7. S & S Builders Hardware, Normal, IL

B. Hinges:

1. Interior Application:

a. Hager BB1279, 4-1/2” x 4-1/2” US32D or US26D.
b. Lawrence BB4101, 4-1/2” x 4-1/2” US32D or US26D
c. Stanley FB179, 4-1/2” x 4-1/2” US32D or US26D.

C. New doors, hardware, and metal frame located in Cafeteria/Newman Gym Corridor.

1. Latchsets/Locksets: 2-3/4” backset, dead-locking spring bolts where keyed.
2. Extra heavy-duty commercial grade, ANSI A156.2, Series 4000, Grade 1.
3. Schlage D Series D53PD x US32D or US26D – always locked from outside – always open from inside.

a. Provide removable mullion.
b. 5-3/4” lever radius X Rhodes trim with 2-9/16” diameter rose.
c. New doors provided with closers.

D. New metal doors (2) and frame located at SW corner of Cafeteria

1. Double egress “B” label.
2. Von Duprin KR95 Removeable Mullion
3. Von Duprin 300L Lever/Lock with Von Dupri 99EO Rim exit device.

E. Cylinder Locks: Renovation areas to be keyed to Owner’s Primus Schlage system to provide building keying coordinated with existing, master keying, match existing, grand master keying and individual keying as directed in conference with Owner prior to delivery, see 2.2.A.

F. Closers:

1. Normal closers, fully adjustable and applicable accessories with no hold open. Adjustable delay action at all closers.

a. LCN 1461H

G. KEYING

1. Door Locks: New cylinders keyed differently, keyed alike, master keyed, and grand master keyed. Match existing building keying and master keying as directed by Owner.

a. Match Primus system
b. All cores to be keyed by S & S Builders Hardware, Normal, IL.

c. All doors to have Primus locks.

H. PANIC HARDWARE

1. Von Duprin 99L with removable mullion

I. VISION GLAZING – EACH DOOR SHALL HAVE A 24” X 24” VISION PANEL.

2.3. FABRICATION

A. Fabricate hollow metal doors and frames as shown on the Drawings and in accordance with best shop practices. Frames shall be welded rigid, neat in appearance, and free from defects. Field measurements shall be taken as required for coordination with adjoining work.

B. Unless otherwise shown, fabricate all interior frames of 16 gauge galvanized steel.

C. All corners shall be welded and ground smooth exhibiting a neat smooth flush finish.

1. Provide proper returns at all edges.

D. Doors and frames shall be mortised and reinforced for hardware in accordance with the Hardware Manufacturer's instructions and templates. Reinforcing shall be drilled and tapped to receive hinges, locks, strikes, and closers. Cover boxes shall be provided for hardware cutouts. The hinge reinforcements shall be 7-gauge. Angle floor clips have two holes each for 3/8" anchor.

E. Door and frame will be painted unless galvanized frame and door is called for.

END 08 10 08

1. GENERAL

1.1. WORK INCLUDES

A. Base Bid:

1. All new gypsum wallboard and any accessories as needed to complete the work as shown on the drawings and specified herein.

   a. Cabinets around heat pumps as shown on drawings.
   b. At corridor between Cafeteria and Newman Gym: Construct new walls with 14 ga. steel studs (2 x 6) size and install ¾" impact resistant gypsum wall board on both wall sides at the East (single door at Main Corridor) and West (at double door exit from Cafeteria).

1.2. QUALITY ASSURANCE

A. Gypsum wallboard construction shall comply with all laws, ordinances, rules, regulations and orders of public authorities having jurisdiction over this part of the work.

B. All materials shall be from a single manufacturer unless others are approved by the Architect/Engineer, to insure total unit responsibility. Installer shall be acceptable to the Manufacturer of the wallboard materials. All gypsum board installed shall be 5/8" impact resistant, 5/8" MR on Fan Room Interior walls.

1.3. PRODUCT DELIVERY, STORAGE & HANDLING

A. Acceptance at site:

1. All materials shall be delivered to the job in their original, unopened containers or bundles; stored in a place providing protection from damage and exposure to the elements.
2. Damaged or otherwise unsuitable material, when so ascertained, shall be immediately removed from the job site.

B. Protection prior to installation:

1. Since the Owner will be occupying the building, storage of materials will be difficult. Coordinate deliveries to match use.
2. Protection must be provided by General Contractor against moisture, impact, etc.

1.4. SUBMITTALS. Submit product data for review.

2. PRODUCTS

2.1. ACCEPTABLE MANUFACTURERS

A. Gypsum wallboard, joint compound, etc.

1. U.S. Gypsum
2. Gold Bond
3. Georgia Pacific
4. Celotex

B. Adhesive

1. Contech PL200
2. DAP 4000
3. Miracle Adhesives Corp. DSA-20
4. Ohio Sealants Inc., Formula 38

2.2. MATERIALS

A. Gypsum Drywall: All material to be 4' X 8' (or larger) X 5/8" thick Moisture Resistant.

1. Lower 4' all wall applications to be “Fiberbond” or abuse resistant, hard faced gypsum board.
2. DEFS System, Dens Glas, or equal.

B. Tape, Joint Compounds, Screws, Corner Edge Guards, etc.: Shall be manufactured by the manufacturer of the gypsum wall board or shall be manufactured to be compatible with all other system components.

C. Trim items

1. 3/4” round corner beads for heat pumps
2. Corner beads flush taping style, galvanized.
3. Expansion joints, flush taping style, galvanized or PVC.
4. Edge beads, taping style, galvanized, selected for condition.

2.3. ACCESSORY MATERIALS

A. Screws: Type W and GWB; sized to suit thickness.

1. Galvanized or coated for exterior or moist applications.
2. Bugle head
3. #6 or larger only

B. Corner Reinforcements, Casing Beads and Metal Trim: fabricated from 26-gauge galvanized sheet steel with perforated flanges, designed to receive joint compound.

1. Use 3/4” round edge beads on heat pump cabinets.

C. Joint Treatment Materials: ASTM C475-64 (1975).

D. Concrete nails: One-inch (1") long plus adhesive.

3. EXECUTION

3.1. PREPARATION. Ensure that studs are aligned and adequately braced so that resulting installation will be smooth and straight. Attachment shall be by screws ONLY, with spacing of screws per manufacturer's recommendations or these specifications whichever is more demanding.

3.2. INSTALLATION

A. Single or Double Layer Systems; Gypsum Panel Erection-Direct Attachment to metal studs and metal furring channels:

1. Place panels horizontally at right angles to framing, offset joints.

a. Position all ends centered on vertical framing members.
b. Use maximum practical lengths to minimize end joints.
c. Fit ends and edges closely, but not forced together. Stagger end joints in successive courses.
d. Place end joints on opposite sides of partitions on different studs.
e. When necessary, cut ends, edges and cutouts within the field of the panel in a workmanlike manner.

2. Screw fasteners in panel field first, work toward ends and edges.

a. Hold panel in place with firm contact and install screw fasteners at least 3/8" in from ends and edges.
b. Apply panels with power driven screws.
c. Attach gypsum panels to framing supports with 1-1/4" Type W screws at 8" o.c.

B. Wall systems shall employ 5/8" thick, MR gypsum board unless noted otherwise.

C. Accessories:

1. 3/4” round edge corner beads shall be installed on all exterior corners and at dissimilar materials, attached with suitable fasteners spaced 9" o.c. on both sides up to 60" above floor and shall be in single lengths unless corner exceeds standard stock lengths. Dimple set allowed only above 60".

D. Joint treatment compounds shall be mixed according to the Manufacturer's directions and applied as follows:

1. All "V" grooves formed by abutting eased radial edges of wallboard

shall be filled flush with plane of taper with pre-fill compound. Excess compound beyond the "V" groove shall be wiped clean leaving a flat joint for taping.

a. Reinforcing tape shall be applied immediately, centered over joint, seated into compound.
b. A skim coat shall follow immediately, but shall not function as a fill or second coat.
c. Tape shall be properly folded and embedded in all angles to provide a true angle.
d. Tape all corner and edge beads with tape fully embedded into compound.

2. After taping compound has hardened, topping compound shall be applied, filling board taper flush with surface.

a. Fill coat shall cover tape and feather out slightly beyond taper.
b. On joints with no taper, fill coat shall cover tape and feather out at least 6" on either side of tape.
c. Sanding or wet wiping shall be done after material has hardened.

3. A finishing coat of taping compound shall be spread evenly over and extending slightly beyond fill coat on all joints and feathered to a smooth, uniform finish.

a. Over tapered edges, finished joint shall not protrude beyond plane or surface.
b. All taped angles shall receive a finish coat to cover tape and taping compound, and provide a true angle.
c. Sanding or wet wiping shall be done after final application of compound to provide a smooth surface, ready for decoration. Use wet wiping in all occupied areas.

4. Fastener depressions shall have at least two (2) coats of taping compound, leaving all depressions level with surface plane. Sand or wet wipe fastener depressions after each application hardens.

5. Taping compound shall be applied to all bead and trim and shall be feathered out from ground to plane of surface.

a. When hardened, this shall be followed by two (2) coats of taping compound applied separately and allowed to dry between coats.
b. Each coat shall extend slightly beyond previous coat.

6. Joints concealed from sight shall be fire taped - smoothing shall not be required.

7. Apply joint sealants as appropriate at edge beads to dissimilar

materials and expansion beads.

8. Installation of gypsum board shall be left in paint ready condition.

3.3. FINISHING. All exposed gypsum board installation shall receive finish coating per finish schedule.

A. See Section 09 90 00 - Finish Coatings.

3.4. CLEAN UP. Remove all sanding dust and any excess or spilled material from all surfaces.

END 09 21 16

1. GENERAL

1.1. WORK INCLUDES

A. Base Bid

1. Area shown on plans shall have existing ceiling removed and new grid and panels installed.
2. Provide UNIT PRICE for new grid, new 2 X 4 panels, and new 2 X 2 panels installed.

    a. UNIT PRICE described above shall include demolition and removal of damaged grid and ceiling tiles.
    b. In all areas repair or replace only as encountered and impacted by the work.

3. Provide Unit Price for removing and reinstalling 1 X 4 or 2 X 4 existing light fixtures.

    a. This unit price is for handling existing fixtures (one for one) not providing and installing new fixtures.

1.2. RELATED WORK

A. Specified elsewhere

1. Division 23 Heating, Ventilating and Air Conditioning (HVAC)
2. Division 26 Electrical

1.3. QUALITY ASSURANCE

A. All materials of any type, single source, (single run if possible).

B. All materials certified upon request by an independent NVLAP accredited laboratory.

1. Fire rated materials: Underwriters Laboratories, Inc. Design P-202 RC13-1 Hour except spring clips are not required.
2. Humidity resistance, mold resistance.
3. STC, SA and reflectance factors

1.4. SUBMITTALS

A. Required:

1. Manufacturer's Literature: Materials description and recommended installation and maintenance instructions.

2. PRODUCTS

2.1. MATERIALS

A. Acoustical Tile: Fissured surface, mineral fiber tile, fire code rated, 24" X 48" X 5/8", square edged, also meeting ASTM E-84 and ASTM E-119 of material certified to contain no asbestos.

1. USG
2. Conwed Corp.
3. Celotex Corp. – Fine Fissured
4. Armstrong

    a. 2’ x 4’ x 5/8” or 3/4” mineral fiber and 2’ x 2’ x 5/8” or ¾” mineral fiber
    b. Humidity rated non-sag 100 deg. F, 90% R.H.
    c. Anti-microbial
    d. Fine fissured, match existing building for non-directional style.
    e. Sound Absorption: ASTM CA23-66, NRC .50-.60.
    f. Sound Attenuation: AIMA, Test I-II, 35-39 range.
    g. Light Reflectance: ASTM C 523-68, .70-.74. (LR-1).
    h. Flame Spread smoke developed: class A
    i. R thermal value = 1.36

B. Suspended Grillage

1. Hangers: Minimum 10-gauge, soft annealed, steel wire, galvanized. See paragraph F. below.
2. Provide support at 48" on center along main runners.

    a. Provide necessary sub-framing where needed to achieve 48" support spacing under ducts, openings, etc.

C. Snap Grid System

1. Main Runners: 15/16” wide X 3/4" high, minimum 0.020" thick steel sheet formed runner with vertical leg at top and tee shape at bottom.
2. Cross tees: 15/16” wide X 3/4" high, minimum 0.020" thick steel sheet formed runner with vertical leg at top and tee shape at bottom.
3. Clips: Steel wire clips to hold main runner to carrying channels.
4. White face finish

    a. Chicago Metallic or equal

D. Metal Wall Moldings: Galvanized sheet steel, angles or channels, minimum 0.020" thick, match grid.

1. Note 1.1.A.3. above for floating ceiling, limited edge trim is anticipated.

E. #12 Eyelet Head Screws: Length as needed for wire hanger anchors.

F. Hanging wire #10 gauge galvanized soft annealed wire.

2.2. FORMED EDGE

A. Many areas of the project will require formed white metal transitions.

1. Pre-finished white 26-guage galvanized sheet.
2. Hem edges.
3. Shape to condition.
4. Will occur in every room around ceiling cabinet ventilator, along some outside window walls, at some interior aluminum widows and framing and a few miscellaneous other conditions, and at split ductless units in computer rooms.

a. Best shape to be determined in conference with the Architect at each condition prior to installing grid

3. EXECUTION

3.1. PREPARATION

A. Examine all surfaces and spaces to receive the work specified herein.

B. Verify all dimensions of in-place and subsequent construction. Application or; installation of materials constitutes acceptance of the supporting construction.

3.2. INSTALLATION OF MECHANICAL SUSPENSION SYSTEMS

A. Install suspension system in accord with ASTM C636-76 and current AIMA recommended procedures.

1. New ceiling grid and tile will be installed at original elevation and shall blend into existing material and pattern.
2. Grid system shall be clipped or mechanically secured at intersections

a. Loose fit grid not allowed.
b. Method of securing shall avoid exposed fasteners such as screws or rivets up through grid, clip or tie together above ceiling.

B. Unless otherwise shown or recommended closer by the system's manufacturer, install hangers to construction above a maximum four feet (4') o.c. in rows four feet (4') apart.

1. All hangers shall hang in plumb position.
2. Supporting runners typically shall run perpendicular to the structural members.

C. Extend wire hangers downward.

1. At proper elevation wrap hangers around carrying channels and secure each hanger with at least three (3) turns.
2. Hanger wires shall be vertical. Wires installed at a diagonal to reach a structural member shall be balanced with diagonal ties in the opposite direction to brace the grid against side loading.

D. Coordinate spacing of hangers, carrying channels. runners and moldings with the location of electrical fixtures and other items occurring in or on the ceiling.

1. The ceiling lighting fixture locations shall determine the ceiling grid pattern, (see Drawings).
2. Provide hanger wires to structure for cross runners around light fixtures. Each fixture shall have a minimum of four (4) tie wires within sixteen inches (16") of each fixture corner.

3.3. INSTALLATION OF TILE

A. Installation of acoustical materials shall be done under temperature and relative humidity conditions that will exist when the building is occupied. Building shall be closed in and operating on permanent equipment such that temperature and humidity will be maintained at a constant and normal level.

B. Installation of grid must follow installation of ceiling closer panels (new pipe soffits) at new exterior wall.

C. The entire installation shall be free of damage of any sort at the completion of the Contract. All system sections deflecting in excess of 1/240th of the span or length shall be replaced.

D. At a time and following installation the building shall be kept at a constant temperature and DOOR TO EXTERIOR KEPT CLOSED, ventilating system functional, filters in place.

3.4. CLEANING AND PROTECTION

A. Upon completion of the work remove all unused materials, debris, containers and equipment from the project site. Clean and repair floors, walls and other surfaces that have been stained, marred or otherwise damaged by work under this section.

B. Protect acoustical ceilings during the construction period so that they will be without any indication or deterioration or damage at the time of acceptance by the Owner.

END 09 51 23

1. GENERAL

1.1. DESCRIPTION

A. Work Included: Contractor shall provide all painting, and decorating set forth on the Drawings.

1. Paint (after prime): platform for Heat Pump HP 147
2. Paint 2 coats (after prime) of all heat pumps enclosed in gypsum board cabinets.
3. Paint exposed in gypsum board repairs to interior wall openings for ducts.
4. Paint 2 coats both sides of five (5) new metal doors and frames.
5. Paint adjacent walls for new doors in Mechanical Room in former Cafeteria / Gym corridor, both east and west side.
6. Prime and paint 2 coats (material see section 2.1.G.) Cafeteria /Gym corridor from locker shelf to bottom of existing wall tile finish approximately 1315 sq. ft. Paint to lower shelf. Prime and install epoxy finish on lower concrete shelf, locker shelf approximately 75 sq. ft. Repair joints, anchor hole, cracks and chips before all paint finishes are installed.
7. See Drawings for other areas requiring paint.

B. Work Not Included unless specifically called out: Copper, bronze, chromium plate, nickel, stainless steel, lead and bright non-corroding metal surfaces and factory powder coats and fluorocarbons shall not be painted unless specifically noted.

C. Color Schedule: match existing surrounds.

D. Flame Spread - All paint finishes shall meet the following flame spread requirements:

1. Class A on non-combustible surfaces.
2. Shall not increase flame spread on other surfaces.

1.2. RELATED REQUIREMENTS

A. Specified elsewhere

1. Section 05 55 00 Metal Fabrications
2. Section 09 21 16 Gypsum Wallboard

1.3. QUALITY ASSURANCE

A. Supplier shall verify appropriateness of paint systems/surface preparation and modify as approved by Architect to properly achieve finished result.

B. Materials shall be as specified and shall be delivered to the job in

unopened, labeled containers.

C. Applicators shall be skilled in the application system employed.

D. Application: No thinning of materials will be allowed, except as specifically recommended by the Paint Manufacturer's written data to facilitate application.

E. Special Requirements: The written instructions of the Paint Manufacturer shall be carefully adhered to for all surface preparation, priming, application techniques, environmental conditions and drying conditions.

F. The surface temperature shall be 50 degrees F. minimum, dry, free of dust, dirt or any bond-breaking substance prior to the paint application.

G. Protect all surrounding surfaces from paint and the painting operations. CLEAN UP ALL PAINT SPATTER OR OVERSPRAY.

H. Factory-primed surfaces and shop primed shall be properly prepared to receive field coatings. Repair chips and nicks in factory primer before proceeding.

I. Provide all surface preparation, treatments, and all primers needed to comply with the Paint Manufacturer's recommendations. The Contractor shall seek the Paint Manufacturer recommendations and shall be responsible for compatibility of the specified coatings and receiving surface preparation.

J. Wherein these Specifications require successive coats of finishing materials, the A/E shall be notified of completion of each coating application prior to application of a successive coating. Failure to notify the Architect for on site observation of each coating prior to a successive coating application shall disallow acceptance of the successive coating.

1.4. SUBMITTALS

A. Submittals only required on paint / systems employed on this project, see 3. EXECUTION, for this project.

2. PRODUCTS

2.1. DESCRIPTION

A. It is the intent to use each Manufacturer's premium grade commercial finishes. Adjust selections accordingly.

B. Metal Primer - Interior and Exterior: VOC compliant gray interior red oxide exterior

1. Sherwin Williams Kromik Metal Primer E41N1 for penetrating conditions or B50/N2/B50W1 for faster drying conditions.
2. Equivalent Glidden, MAB, Benjamin Moore, PPG, Devoe systems.

3. Not required on factory fabricated material with factory primer.

C. Interior Enamel Surfaces (metal) - Industrial grade alkyd satin or eggshell finish.

1. Sherwin Williams ProMar 200 B 33 Series
2. Equivalent Glidden, MAB, Benjamin Moore, PPG, Devoe Systems

D. Block Filler:

1. Sherwin Williams ProMar Block Filler B25W25 Series
2. Equivalent Glidden, MAB, Benjamin Moore, PPG, Devoe systems

E. Latex Primers (Interior), Drywall, wood, plaster,

1. Sherwin Williams ProMar 200/B23W200
2. Equivalent Glidden, MAB, Benjamin Moore, PPG, Devoe systems
3. Always verify the recommendation by the Manufacturer for the proposed surface and finish coat.
4. Previously painted surfaces, proper preparation always clean foreign substances off surface, etch, neutralize or wash when appropriate.

F. Latex-Eggshell Finish (Interior), acrylic - alkyd

1. Sherwin Williams ProMar 200/B30W 200 Series
2. Equivalent Glidden, MAB, Benjamin Moore, PPG, Devoe systems

G. Latex Semi-Gloss Finish (Interior)

1. Sherwin Williams Promar 200 acrylic-alkyd
2. Equivalent Glidden, MAB, Benjamin Moore, PPG, Devoe systems

H. Gloss Latex (60% @ 60 degrees F.):

1. Sherwin Williams Promar 200 acrylic - alkyd.
2. Equivalent Glidden, MAB, Benjamin Moore, PPG, Devoe systems

I. Floor Epoxy System

1. Ceramic Carpet #554, General Polymers, Cincinnati, OH, 100% solid epoxy resin and chemical sealant.
2. Or, equal, approved prior to bidding.
3. Trowel applied seamless base system, coved to locker shelf
4. No quartz aggregate installed.

3. EXECUTION

3.1. SURFACE CONDITIONS

A. Inspect all surfaces for defects prior to starting finishing operations and

notify the appropriate persons to make suitable repair and corrections. Be responsible for all rework of finish systems made necessary by application to improperly prepared surfaces.

B. As painting operations proceed, inspect for chips, abrasions, pitch strikes, sap, knots, cracks and hot spots. All defects that are evident shall be repaired and repainted.

C. Touch up marred or worn factory primers before painting. Wash down metal with mineral spirits or approved cleaner to assure bond.

D. PROVIDE PRIMERS IN ALL LOCATIONS APPROPRIATE FOR MATERIAL BASE AND MATERIAL EXPOSURE.

E. Protect all surrounding work from damage.

F. Sand surfaces that are not smooth prior to applying succeeding coats.

G. Primer paint applied on ferrous materials, specified in Section 05500, shall be in accordance with 09900/2.1.

H. Exterior gypsum shall be primed and two (2) coats 2.1.D.

3.2. WORKMANSHIP

A. Quality workmanship is required. Only skilled mechanics shall be employed to ensure the very best workmanship. Materials to be applied by craftsmen shall be applied only by those familiar with the specific products involved.

B. Each coat called for shall be applied to achieve 100% coverage of the surface and materials shall be applied as recommended by the Paint Manufacturer.

C. One coat shall be considered to completely cover the material being finished such that the surface, including all voids and indentations such as in wood or concrete block, no longer retains the color of the surface material but only that of the finish applied. The cover achieved will be subject to the approval of the Architect/Engineer in all cases.

D. For finishes similar in color to the material or for finishes with little or no pigments, such as varnish, the coats shall be of adequate thickness to meet the approved requirements assuming that the surface and finish were of complementary colors. The cover achieved will be subject to the approval of the Architect/Engineer in all cases.

E. In the process of painting surfaces, caution shall be used to avoid discontinuity in the finish surface texture or appearance such as at lap joints, corners, etc.

F. All materials shall be applied under 100 F.C. illumination. Materials shall

be uniformly spread without runs or sags.

G. All coating called for shall be applied in back of all fixtures, cabinets and tackboards before said items are secure in place.

3.3. STORAGE

A. Flammable materials shall not be stored inside of the building, except single one-quart cans of each paint color may be kept in an approved location for touch up work at the end of the job.

B. Flammable materials storage should be kept to a minimum of currently-in-use materials only. Overnight storage shall not be allowed in the building.

3.4. APPLICATION

A. Application rates that are specified in these Specifications shall be considered as minimum rates but shall not supersede the coverage requirements specified herein or the recommendations of the Paint Manufacturer.

B. It is the intent that all finish coating systems specified (excluding primer only) present a finished uniform appearance, free of lap marks, color variation, sheen variation and irregularities. Provide additional coats as needed to accomplish this finish intent.

C. Application shall be per the following schedule except that, in no case, shall materials be applied over a base preparation not in accordance with the Paint Manufacturer's specifications. See Drawing Notes and Room Finish Schedule for finishing directions.

D. All surfaces, Interior and Exterior

1. Clean surfaces.
2. Wash off oils or foreign materials.
3. One (1) coat primer (touch up factory primers).
4. Two (2) coats minimum of finish system
5. Recoat as necessary for uniform appearance, no laps brush or roller irregularities, uniform color and sheen coverage,

E. Additional finish systems shall be as noted on the Drawings.

END 09 90 00

PART 1 - GENERAL

1.1 SUMMARY

A. Base Bid: Plumbing contractor shall furnish and install all materials, accessories, tools, equipment, transportation, labor, services, and all operations required to complete the following:

1. Condensate piping.
2. Natural gas piping.

1.2 SUBMITTALS

A. Shop Drawings – Prior to purchase, submit for Engineer/Architect's review complete shop drawings for the following:

1. Condensate piping
2. Natural Gas piping

1.3 QUALITY ASSURANCE

A. Standards: Any procedure, material or operation specified by reference to applicable standards or codes shall comply with the current or most recent edition. In conflicts between listed standards, the more stringent shall govern.

1. Applicable Standards:

a. Illinois Plumbing Code.
b. Local plumbing code.
c. 2012 International Fuel Gas Code.

B. Contractor shall obtain all necessary permits and arrange for all inspections required by State or Local authorities.

C. Materials must be new, in first class condition. Work must be done by trained, experienced, skilled journeyman (woman) under an approved full time supervisor, with every possible precaution taken by contractor to assure safety of all persons of all categories.

1.4 GUARANTEE

A. Each entire overall installation, including every special item, device, and part and every specialized system shall be fully guaranteed from standpoint of satisfactory performance, safety, workmanship and material for one year after formal written acceptance by Engineer/Architect, any unsuitable, unsatisfactory, noisy, ineffective, defective, improperly sized or applied equipment or material, or unacceptable workmanship shall be quickly replaced or modified during guarantee period or any extension thereof, as directed and as approved by Engineer/Architect in writing.

B. Individual items and systems shall be guaranteed for the same period in addition to the above regardless of any limitations of manufacturer's guarantee period.

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

A. Condensate Piping:

1. Type L, hard drawn copper tube conforming to ASTM B88 with cast or wrought copper fittings conforming to ASTM B16.18 and B16.22. Joints made from lead free solder. Piping sizes shown on the drawings are nominal pipe sizes.

B. Natural Gas (G) Piping:

1. Pipe: Schedule 40, seamless or electric resistance welded (ERW) steel pipe A53 Grade B or seamless steel pipe A106, Grade B.
2. Joints and Fittings:

   a. 2-inch and under: Joints shall be threaded. Fittings shall be wrought-steel with dimensions and tolerances conforming to ANSI B16.11. Unions shall be wrought steel. Threaded joints shall be made up with thread compound suitable for use with natural gas.
   b. 2 1/2-inch and larger: Joints shall be butt welded or flanged. Fittings shall be seamless wrought-steel butt weld type, ASTM A234, Grade WPB with dimensions, tolerances and pressure-temperature rating in accordance with ANSI/ASME B16.9. Flanges shall be steel (ASTM A105), Class 150, and manufactured in accordance with ANSI/ASME B16.5. Weld-o-let fittings may be used in lieu of tees for branch connections provided main is two sizes larger than takeoff. Couplings or half couplings are not acceptable except for non-flow connections such as thermometers or gauges.

C. Soil and Waste Lines:

1. All soil and waste pipe shall be no-hub cast iron or shall be manufactured from Type 1, Grade 1, Schedule 40 polyvinyl chloride (PVC) materials. The PVC materials shall be classified as self-extinguishing and have a flamespread rating of 0.25. Pipe shall meet the requirements of CS 272-65 of ASTM D2665 and shall be approved by NSF.
3. The pipe shall be marked in accordance with the ASTM designation and show the symbols DWV NSF.
5. Install new soil and waste lines as indicated and connect to sanitary system as required.
6. Provide cleanout branched throughout the plumbing system where indicated or required by the nature of the work.
7. Make changes in line or grade with the proper fitting.
8. All exterior pipe shall be firmly and uniformly bedded throughout its total length on 3" minimum compacted sand or gravel.
9. Backfill shall be 6" minimum compacted sand or gravel on sides and top.
10. Exterior sewers shall have minimum 4'-0" cover, unless required otherwise.
11. All interior pipe shall be firmly and uniformly supported throughout its total length using hangers as specified.

D. Vent Piping:

1. Vent piping shall be no-hub cast iron or PVC, same as specified for soil or waste lines.
3. Minimum venting shall be as shown on the drawings; otherwise, all venting shall comply with the rules of the specified codes.
4. Vent all parts of the soil and waste system of piping to prevent all liability of siphonage of traps of plumbing fixtures.
5. Sizes may be increased at contractor's option.

2.2 JOINING MATERIALS

A. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

B. Welding Filler Metals: Comply with AWS D10.12.

C. Solvent Cements for Joining Plastic Piping:

1. ABS Piping: ASTM D 2235.
2. CPVC Piping: ASTM F 493.
3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
4. PVC to ABS Piping Transition: ASTM D 3138.

2.3 PIPE COVERING

A. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Aeroflex USA Inc.; Aerocel.
b. Armacell LLC; AP Armaflex.
c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

B. Condensate: Insulate with flexible elastomeric or ASJ fiberglass. All joints sealed with manufacturer's recommended adhesive or equivalent, with 100% coverage. Applied by slipping uncut sections over piping wherever possible. Use is permitted where allowed by applicable codes. All joints shall be taped to afford an effective vapor barrier. Insulation shall have a flame spread rating of 25 or less and a smoke developed rating as permitted by codes.

1. Insulation Thickness:

a. Condensate: 1”

C. Vapor Barrier covering guarantee - covering on pipe, fittings, devices, unions, etc. must be unconditionally guaranteed to be free of condensation, water logging, water staining, water drip, water accumulation and mildew for one (1) full year after mechanical installation is accepted by Engineer/Architect. Any such defective work must be completely replaced and refinished when condition is reported to contractor within above guarantee period by Engineer/Architect without delay or cost to Owner, and guaranteed in same manner for another one (1) full year period.

2.4 VALVES AND COCKS

A. Valves shall be equal to Jenkins, Powell, Scott, Stockham, Lukenheimer, Nibco or Hammond.

B. Trim for all valves shall be selected for intended service as recommended in writing by valve manufacturer.

C. Natural Gas Valves: Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110. Comply with ASME B16.33.

1. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
2. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.

2.5 PIPE HANGERS

A. Piping shall be supported independently of all connections and sleeves by pipe hangers (PH) of Modern, Grinnell, Fee & Mason, Auto-Grip, or Crane make, as follows:

Pipe Size	Distance From Sleeve In Wall End, Offset Or Corner to Hanger (Max.)	Hanger Spacing (Max.)
Up to 1¼"	2'-0"	8'-0"
1½ , 2"	3'-0"	10'-0"
2½" & Up	3'-0"	12'-0"

B. Hangers shall be arranged to permit free, unrestrained and noiseless expansion and contraction of piping, and must be adjustable.

C. Hangers, associated equipment, etc. shall be of all steel construction, with a heavy prime coat, except that portions in contact with non-ferrous pipe shall be same construction as pipe, or plated with same metal as pipe, or covered with same metal as pipe, securely fastened in place.

D. Hangers supporting piping covered with pipe insulation that has an exterior vapor barrier (Type IA) shall encircle pipe covering and shall bear on a tight fitting, exterior steel collar, completely encircling covering.

E. Overhead hangers shall be of the solid ring, or clevis type, with adjustable steel rods, securely supported from inserts or bolted to structure.

2.6 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.7 SLEEVES

A. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

B. PVC Pipe: ASTM D 1785, Schedule 40.

2.8 FLASHING

A. Openings in roof shall be flashed as necessary to be compatible with roofing system using approved methods. Disturbed existing piping through roof shall be properly flashed and weather-tight.

2.9 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated and rough brass.

PART 3 - EXECUTION

3.1 PREPARATION

A. Quantities Required and Clarifications:

1. Contractor shall determine quantities required from drawings and job conditions except that where specifications call for specific quantities, these quantities shall also govern. If there if conflict between quantities called for on drawings and in specifications, greater quantity shall govern.
2. Where an item is specified by a manufacturer's number, such number is for general information only, and shall be modified by any additional data, size, etc., which may be shown and/or specified. Where there is conflict between number and other data, it shall be contractor's responsibility to request clarification from Engineer/Architect.
3. Where clarification is required for any purpose, including discrepancies within written specifications on drawings, or between them, it shall be contractor's responsibility to request such clarification from Engineer/Architect at least 7 days before Bids are due and in all cases subsequent interpretations or clarifications made by Engineer/Architect shall be final.

B. Cleaning:

1. Piping, conduit, equipment, devices, etc. shall be thoroughly cleaned before being offered for acceptance.

2. The following shall be thoroughly cleaned, or finished out, or blown out before installation is offered for acceptance.
   a. Plumbing equipment, fixtures, devices, etc.
3. Labels, stickers, temporary protection, etc. shall be removed and work shall be provided contractor without increase in contract price.

C. Permits, Fees, Enlargements, Extensions, Etc.:

1. Contractor shall secure and pay for all licenses, assessments, permits; shall pay for inspections required by county, state, and local utilities; and shall replace new or present paving etc. as approved by Engineer/Architect and all governmental bodies having jurisdiction. All without increase in contract price.

D. Verification of Points of Connection:

1. Before submitting his bid, contractor shall visit site to verify all exposed, concealed, and buried points of connection as to locations, flow, size, type, depth, pressure, elevation, operating characteristics, etc.
2. If contractor finds that any present point or points of connection to existing facilities are incorrectly shown on plans or incorrectly specified, he (she) shall notify Engineer/Architect in writing at least 7 days before bids are due to be submitted. Engineer/Architect will issue as addendum to all contractors, calling their attention to revised point or points of connection.
3. If contractor fails to notify Engineer/Architect in writing as outlined above, it will be assumed that his bid includes everything required to provide proper connections to all present points of connections as they actually exist and will pay for all relocations, replacements, additional runs and extensions, without increase in contract price.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install escutcheons for penetrations of walls, ceilings, and floors.

L. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

M. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.

N. Verify final equipment locations for roughing-in.

O. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

E. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

G. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402, for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
5. PVC Nonpressure Piping: Join according to ASTM D 2855.
6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.

3.4 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

END OF SECTION 220000

PART 1 GENERAL

1.01 SECTION INCLUDES

A. HVAC demolition.
   1. Exhaust Fans
   2. Equipment
   3. Ductwork
   4. Piping
   5. Controls

1.02 RELATED REQUIREMENTS

A. Additional requirements for alterations work.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify field measurements and duct arrangements are as shown on Drawings.

B. Verify that abandoned ductwork and equipment serve only abandoned facilities.

C. Demolition drawings are based on casual field observation .

D. Report discrepancies to Architect before disturbing existing installation.

E. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

A. Disconnect HVAC systems in walls, floors, and ceilings to be removed.

3.03 DEMOLITION AND EXTENSION OF EXISTING HVAC WORK

A. Remove, relocate, and extend existing installations to accommodate new construction.

B. Remove abandoned ductwork to source of supply.

C. Remove exposed abandoned ductwork, including abandoned ductwork above accessible ceiling finishes. Cut ductwork flush with walls and floors, and patch surfaces.

D. Disconnect abandoned air outlets and inlets and remove. Remove abandoned air outlets and inlets if ductwork servicing them is abandoned and removed. Provide blank covers for abandoned air outlets and inlets that are not removed.

E. Remove exhaust fans as noted.

F. Remove piping as noted.

G. Repair adjacent construction and finishes damaged during demolition and extension work.

H. Maintain access to existing HVAC installations that remain active. Modify installation or provide access panel as appropriate.

I. Extend existing installations using materials and methods as specified.

3.04 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment that remain or that are to be reused.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pressure gages and pressure gage taps.

B. Thermometers and thermometer wells.

C. Static pressure gages.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2013.

B. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014.

C. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.

1.04 SUBMITTALS

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

B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

1.05 FIELD CONDITIONS

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 PRODUCTS

2.01 PRESSURE GAGES

A. Pressure Gages: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.

2.02 PRESSURE GAGE TAPPINGS

A. Gage Cock: Tee or lever handle, brass for maximum 150 psi.

2.03 DIAL THERMOMETERS

A. Thermometer: ASTM E1, stainless steel case, adjustable angle with front recalibration, bimetallic helix actuated with silicone fluid damping, white with black markings and black pointer hermetically sealed lens, stainless steel stem.

1. Size: 3 inch diameter dial.
2. Lens: Clear glass.

2.04 THERMOMETER SUPPORTS

A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

2.05 TEST PLUGS

A. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with neoprene core for temperatures up to 200 degrees F.

2.06 STATIC PRESSURE GAGES

A. 3-1/2 inch diameter dial in metal case, diaphragm actuated, black figures on white background, front recalibration adjustment, 2 percent of full scale accuracy.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

C. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe markers.

D. Ceiling tacks.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2013.

1.04 SUBMITTALS

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

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Air Handling Units: Nameplates.

B. Control Panels: Nameplates.

C. Major Control Components: Nameplates.

D. Piping: Pipe markers.

E. Pumps: Nameplates.

F. Thermostats: Nameplates.

G. Valves: Tags and ceiling tacks where located above lay-in ceiling.

H. Water Treatment Devices: Nameplates.

2.02 NAMEPLATES

A. Manufacturers:
   1. Advanced Graphic Engraving, LLC; _____: www.advancedgraphicengraving.com.
   2. Kolbi Pipe Marker Co; _____: www.kolbipipemarkers.com.
   3. Seton Identification Products, a Tricor Direct Company; _____: www.seton.com.

B. Letter Color: White.

C. Letter Height: 1/4 inch.

D. Background Color: Black.

E. Plastic: Conform to ASTM D709.

2.03 TAGS

A. Manufacturers:
   1. Advanced Graphic Engraving; _____: www.advancedgraphicengraving.com.
   2. Brady Corporation; _____: www.bradycorp.com.
   3. Kolbi Pipe Marker Co; _____: www.kolbipipemarkers.com.
   4. Seton Identification Products, a Tricor Company; _____: www.seton.com.

B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

2.04 PIPE MARKERS

A. Manufacturers:

1. Brady Corporation; _____: www.bradycorp.com.
2. Kolbi Pipe Marker Co; _____: www.kolbipipemarkers.com.
3. MIFAB, Inc; _____: www.mifab.com.
4. Seton Identification Products, a Tricor Company; _____: www.seton.com.

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

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.05 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color coded head.

PART 3 EXECUTION

3.01 PREPARATION

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

3.02 INSTALLATION

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

B. Install tags with corrosion resistant chain.

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

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

E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

F. Use tags on piping 3/4 inch diameter and smaller.
1. Identify service, flow direction, and pressure.
2. Install in clear view and align with axis of piping.
3. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION

ENGINEER OF RECORD MUST APPROVE FINAL REPORT PRIOR TO T&B AGENT RECIVING MORE THAN 50% PAYOUT OF TESTING AND BALANCING CONTRACT TOTAL

PART 1 GENERAL

2.01 SECTION INCLUDES

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

B. Testing, adjustment, and balancing of hydronic and refrigerating systems.

C. Measurement of final operating condition of HVAC systems.

2.02 RELATED REQUIREMENTS

2.03 REFERENCE STANDARDS

A. AABC MN-1 - AABC National Standards for Total System Balance; 2002.

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

C. NEBB (TAB) - Procedural Standards for Testing Adjusting and Balancing of Environmental Systems; 2015, Eighth Edition.

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

2.04 SUBMITTALS

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

B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
   1. Submit to Architect.
   2. Submit six weeks prior to starting the testing, adjusting, and balancing work.
   3. Include certification that the plan developer has reviewed the contract documents, the equipment and systems, and the control system with the Architect and other installers to sufficiently understand the design intent for each system.
   4. Include at least the following in the plan:
      a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
      b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
      c. Identification and types of measurement instruments to be used and their most recent calibration date.
      d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
      e. Final test report forms to be used.
      f. Expected problems and solutions, etc.
      g. Details of how TOTAL flow will be determined; for example:
         1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.
         2) Water: Pump curves, circuit setter, flow station, ultrasonic, etc.
      h. Confirmation of understanding of the outside air ventilation criteria under all conditions.
      i. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).
      j. Procedures for formal deficiency reports, including scope, frequency and distribution.

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

4.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
   1. AABC MN-1, AABC National Standards for Total System Balance.
   2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
   3. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
   4. SMACNA (TAB).

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

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

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

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

4.02 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.

4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Fire and volume dampers are in place and open.
8. Air coil fins are cleaned and combed.
9. Access doors are closed and duct end caps are in place.
10. Air outlets are installed and connected.
11. Duct system leakage is minimized.
12. Hydronic systems are flushed, filled, and vented.
13. Pumps are rotating correctly.
14. Proper strainer baskets are clean and in place.
15. Service and balance valves are open.

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

C. Beginning of work means acceptance of existing conditions.

4.03 PREPARATION

A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
1. Require attendance by all installers whose work will be tested, adjusted, or balanced.

4.04 ADJUSTMENT TOLERANCES

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

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

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

4.05 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:
1. Running log of events and issues.
2. Discrepancies, deficient or uncompleted work by others.
3. Contract interpretation requests.
4. Lists of completed tests.

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

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

D. Mark on the drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

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

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

4.06 AIR SYSTEM PROCEDURE

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

B. Measure air quantities at air inlets and outlets.

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

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

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

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

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

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

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

4.07 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gages to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

C. Verify specified flow to Heat pumps then open circuit setters completely

4.08 SCOPE

A. Test, adjust, and balance the following:
   1. HVAC Pumps.
   2. Packaged Terminal Air Conditioning Units.
   3. Fans.
   4. Air Filters.
   5. Air Inlets and Outlets.

4.09 MINIMUM DATA TO BE REPORTED

A. Electric Motors:
   1. Manufacturer.
   2. Model/Frame.
   3. HP/BHP.
   4. Phase, voltage, amperage; nameplate, actual, no load.
   5. RPM.

B. Pumps:
   1. Identification/number.
   2. Manufacturer.
   3. Size/model.
   4. Design flow rate, pressure drop, BHP.
   5. Actual flow rate, pressure drop, BHP.
   6. Discharge pressure.
   7. Suction pressure.
   8. Total operating head pressure.

C. Air Moving Equipment:
   1. Location.
   2. Manufacturer.
   3. Model number.
   4. Serial number.
   5. Arrangement/Class/Discharge.
   6. Air flow, specified and actual.

7. Return air flow, specified and actual.
8. Outside air flow, specified and actual.
9. Total static pressure (total external), specified and actual.
10. Inlet pressure.
11. Discharge pressure.

D. Return Air/Outside Air:
1. Identification/location.
2. Design air flow.
3. Actual air flow.
4. Design return air flow.
5. Actual return air flow.
6. Design outside air flow.
7. Actual outside air flow.

E. Exhaust Fans:
1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Air flow, specified and actual.

F. Duct Traverses:
1. System zone/branch.
2. Duct size.
3. Area.
4. Design velocity.
5. Design air flow.
6. Test velocity.
7. Test air flow.
8. Duct static pressure.

G. Air Distribution Tests:
1. Air terminal number.
2. Room number/location.
3. Terminal type.
4. Terminal size.
5. Design velocity.
6. Design air flow.
7. Test (final) velocity.
8. Test (final) air flow.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct insulation.

B. Duct Liner.

C. Insulation jackets.

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 23 0553 - Identification for HVAC Piping and Equipment.

1.03 REFERENCE STANDARDS

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.

C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

D. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014.

E. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2012.

F. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2008.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

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

I. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

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

1.04 SUBMITTALS

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

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

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

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

1.07 FIELD CONDITIONS

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

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

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

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

2.02 GLASS FIBER, FLEXIBLE

A. Manufacturer:
   1. Knauf Insulation; _____: www.knaufinsulation.com.
   2. Johns Manville; _____: www.jm.com.
   3. Owens Corning Corporation; _____: www.ocbuildingspec.com.

B. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.

2.03 GLASS FIBER, RIGID

A. Manufacturer:
   1. Knauf Insulation; _____: www.knaufinsulation.com.
   2. Johns Manville; _____: www.jm.com.
   3. Owens Corning Corp: www.owenscorning.com.

B. Insulation: ASTM C612; rigid, noncombustible blanket.
   1. 'K' Value: 0.24 at 75 degrees F, when tested in accordance with ASTM C518.

2.04 JACKETS

A. Aluminum Jacket: ASTM B209 (ASTM B209M).

2.05 DUCT LINER

A. Manufacturers:
   1. Knauf Insulation; _____: www.knaufinsulation.com.
   2. Johns Manville; _____: www.jm.com.
   3. Owens Corning Corp: www.owenscorning.com.

B. Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; flexible blanket, rigid board, and preformed round liner board; impregnated surface and edges coated with poly vinyl acetate polymer, acrylic polymer, or black composite.
   1. Fungal Resistance: No growth when tested according to ASTM G21.
   2. Minimum Noise Reduction Coefficients:
      a. 1/2 inch Thickness: 0.30.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that ducts have been tested before applying insulation materials.

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

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Insulated ducts conveying air below ambient temperature:
   1. Provide insulation with vapor barrier jackets.
   2. Finish with tape and vapor barrier jacket.
   3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
   4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

C. Insulated ducts conveying air above ambient temperature:
   1. Provide with or without standard vapor barrier jacket.

2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

D. External Duct Insulation Application:
   1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
   2. Secure insulation without vapor barrier with staples, tape, or wires.
   3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
   4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
   5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

E. Duct and Plenum Liner Application:
   1. Adhere insulation with adhesive for 90 percent coverage.
   2. Seal and smooth joints. Seal and coat transverse joints.
   3. Seal liner surface penetrations with adhesive.
   4. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

3.03 SCHEDULES

A. See Duct insulation Schedule on Drawings

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Equipment insulation.

B. Covering.

C. Breeching insulation.

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 09 9123 - Interior Painting: Painting insulation covering.

C. Section 23 0553 - Identification for HVAC Piping and Equipment.

D. Section 23 2113 - Hydronic Piping: Placement of hangers and hanger inserts.

E. Section 23 2114 - Hydronic Specialties.

F. Section 23 2300 - Refrigerant Piping: Placement of inserts.

1.03 REFERENCE STANDARDS

A. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2014.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

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

1.04 SUBMITTALS

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

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for equipment scheduled.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

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

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

1.07 FIELD CONDITIONS

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

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

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

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

2.02 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturer:
   1. Aeroflex USA, Inc: www.aeroflexusa.com.
   2. Armacell LLC: www.armacell.us.
   3. K-Flex USA LLC: www.kflexusa.com.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 3, in sheet form.
   1. Minimum Service Temperature: Minus 40 degrees F.
   2. Maximum Service Temperature: 220 degrees F.
   3. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that equipment has been tested before applying insulation materials.

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

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Factory Insulated Equipment: Do not insulate.

C. Exposed Equipment: Locate insulation and cover seams in least visible locations.

D. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

E. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor barrier cement.

F. Insulated equipment containing fluids below ambient temperature; insulate entire system.

G. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.

H. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation so it can be easily removed and replaced without damage.

3.03 SCHEDULE

A. Ground Source System
   1. Pump Bodies:
   2. Air Separators:
   3. Expansion Tanks:

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 07 8400 - Firestopping.

C. Section 09 9123 - Interior Painting: Painting insulation jacket.

D. Section 23 2113 - Hydronic Piping: Placement of hangers and hanger inserts.

1.03 REFERENCE STANDARDS

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.

C. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2014.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

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

1.04 SUBMITTALS

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

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.06 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

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

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

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

2.02 GLASS FIBER

A. Manufacturers:
   1. Knauf Insulation; _____: www.knaufinsulation.com.
   2. Johns Manville Corporation: www.jm.com.
   3. Owens Corning Corp: www.owenscorning.com.

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturer:

1. Aeroflex USA, Inc: www.aeroflexusa.com.
2. Armacell LLC: www.armacell.us.
3. K-Flex USA LLC: www.kflexusa.com.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 3; use molded tubular material wherever possible.
1. Minimum Service Temperature: Minus 40 degrees F.
2. Maximum Service Temperature: 220 degrees F.
3. Connection: Waterproof vapor barrier adhesive.

2.04 JACKETS

A. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
1. Thickness: 0.016 inch sheet.
2. Finish: Smooth.
3. Joining: Longitudinal slip joints and 2 inch laps.
4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

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

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. Insulated pipes conveying fluids below ambient temperature; insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

D. Inserts and Shields:
1. Application: Piping 1-1/2 inches diameter or larger.
2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
3. Insert location: Between support shield and piping and under the finish jacket.
4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

E. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 8400.

F. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.03 SCHEDULE

A. Ground Source Supply & Return
1. Ground Source Water
a. 1” Fiberglass with ASJ Viton Fittings

END OF SECTION

1. GENERAL

A. DESCRIPTION

a. Work included in this section shall be commensurate with and in compliance with all the applicable project specifications and conditions and shall include all necessary related project adjustments and additional labor and/or material as may become apparent to complete the alternative work. No additional charge will be considered after bidding for the purposes of making additional construction or adjustments in order to accomplish alternative work that has been included in the Contract.

b. All Base Bid requirements and material specifications and workmanship not specifically mentioned in the alternate shall apply to the alternates as is set forth therein.

c. Incidental Work: All necessary adjustment in the work shall be made to accommodate accepted alternates.

1.2. BASE BID – Building Automation System

a. Provide a price to install the following described Building Automation System.

b. The offered price shall include a deduct for equipment provided in the base bid which will not be installed as a result of the BAS System

END 23 09 20 Cover Sheet. See following sheets 1-38 Building Automation System

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 Related Sections

A. This Section includes the Building Management System (BMS) control equipment for HVAC systems and components, including open protocol control components for terminal heating and cooling units.

1.3 Standard Terms

A. Standard

1. ASHRAE: American Society Heating, Refrigeration, Air Conditioning Engineers
2. AHU: Air Handling Unit
3. BACnet: Building Automation Controls Network
4. BMS: Building Management System
5. DDC: Direct Digital Control
6. EIA: Electronic Industries Alliance
7. GUI: Graphical User Interface
8. HVAC: Heating, Ventilation, and Air Conditioning
9. IEEE: Institute Electrical Electronic Engineers
10. MER: Mechanical Equipment Room
11. PID: Proportional, Integral, Derivative
12. VAV: Variable Air Volume Box

B. Communications and protocols

1. ARP: Address Resolution Protocol
2. CORBA: Common Object Request Broker Architecture
3. CSMA/CD: Carrier Sense Multiple Access/Collision Detect
4. DDE: Dynamic Data Exchange
5. FTT: Free Topology Transceivers
6. HTTP: Hyper Text Transfer Protocol
7. IIOP: Internet Inter-ORB Protocol
8. LAN: Local Area Network
9. LON: Echelon Communication – Local Operating Network
10. MS/TP: Master Slave Token Passing
11. ODBC: Open Database Connectivity
12. ORB: Object Request Broker
13. SNVT: Standard Network Variables Types

14. SQL: Structured Query Language
15. UDP: User Datagram Protocol
16. XML: eXtensible Markup Language

C. Controllers
1. ASD: Application Specific Device
2. AAC: Advanced Application Controller
3. ASC: Application Specific Controller.
4. CAC: Custom Application Controller.
5. DCU: Distributed Control Unit
6. LCM: Local Control Module
7. MC: MicroControllers
8. MCI: MicroInterface
9. MN-II: Microzone II direct digital controller
10. MN-FLO: Micronet 2000 Pressure Independent VAV Controller
11. NSC: Network Server Controller
12. PEM: Package Equipment Module
13. PPC: Programmable Process Controller
14. SDCU: Standalone Digital Control Units
15. SLC: Supervisory Logic Controller
16. UEC: Unitary Equipment Controller
17. VAVDDC: Variable Air Volume Direct Digital Controller

D. Tools and Software
1. AFDD: Automated Fault Detection and Diagnostic
2. APEO: Automated Predictive Energy Optimization
3. DR: Demand Response
4. CCDT: Configuration, Commissioning and Diagnostic Tool
5. BPES: BACnet Portable Engineering Station
6. LPES: LON Portable Engineering Station
7. POT: Portable Operator's Terminal
8. PEMS: Power and Energy Management Software

1.4 Qualifications of Bidder and Pre-bid Submittal

A. All bidders must be building automation contractors in the business of installing direct digital control building automation systems for a minimum of 10 years.
B. The Building Management System contractor shall have a full service facility within 50 miles of the project that is staffed with engineers trained and certified by the manufacturer in the configuration, programming and service of the automation system. The contractor's technicians shall be fully capable of providing instructions and routine emergency maintenance service on all system components.
C. All bidders must be authorized distributors or branch offices of the manufacturers specified.
D. The following bidders have been pre-qualified:
1. **SBO from Schneider Electric by Alpha Controls and Services**
E. The Pre-Bid submittal shall contain the following information as a minimum:
1. A profile of the manufacturer and the local installation and service/organization.

2. Description of how the system meets and achieves all the specified criteria in terms of configuration, operation, and control.
3. System Architecture with single line riser diagram showing all major components (digital controllers, routers, hubs, etc.) that will be required for this project.
4. Procedure for commissioning and time required to startup and commission each of the systems for this project.
5. Contractors approach for the project planning and management.
6. Product Data Sheets for all components, DDC panels, and all accessories listed per the appropriate specification sections herein.
7. Examples of actual graphic screens for other similar projects.
8. Number and types of DDC panels required for this installation.
9. Number and types of spare points provided with the proposed system.
10. Recommended spare parts list for components with list price schedule.
11. List of 2 similar systems in size, point capacity, total installed value, installed and commissioned by the local office with a list of the installers/manufacturers design team members for each project and the owners contact information.
12. Samples of service offerings and a list of current similar service contracts with contact information.
13. Resumes for the management team and all employees who will be involved with the project design, commissioning, project management, and after installation service. Resumes should include copies of manufacturer's certifications for the proposed product line.
14. Copy of this Control Specification in its entirety with a check mark beside each paragraph to signify that the manufacturer's equipment and software shall fully conform to the specified requirement. If the requirement cannot be met, indicate the reasons/limitations and the alternative proposed.

1.5 Scope of Work

A. The Contractor shall furnish and install a complete building automation system including all necessary hardware and all operating and applications software necessary to perform the control sequences of operation as called for in this specification. All components of the system – workstations, servers, application controllers, unitary controllers, etc. shall communicate using the BACnet protocol, as defined by ASHRAE Standard 135-2007, or EIA standard 709.1 or the LonTalk™ protocol. The only exception will be field controllers within the Schneider Electric I/NET and NETWORK 8000 family. No gateways shall be used for communication to controllers furnished under this section. At a minimum, provide controls for the following:
    1. Air handling units
    2. Return air fans
    3. Exhaust and supply fans
    4. Geothermal loop water system including pumps
    5. Heat pumps
    6. Cabinet unit heater controls
    7. Energy Recovery Units

B. Except as otherwise noted, the control system shall consist of all necessary Ethernet Network Controllers, Standalone Digital Control Units, workstations, software, sensors, transducers,

relays, valves, dampers, damper operators, control panels, and other accessory equipment, along with a complete system of electrical interlocking wiring to fill the intent of the specification and provide for a complete and operable system. Except as otherwise specified, provide operators for equipment such as dampers if the equipment manufacturer does not provide these. Coordinate requirements with the various Contractors.

C. The BAS contractor shall review and study all HVAC drawings and the entire specification to familiarize themselves with the equipment and system operation and to verify the quantities and types of dampers, operators, alarms, etc. to be provided.
D. All interlocking wiring, wiring and installation of control devices associated with the equipment listed below shall be provided under this Contract. When the BAS system is fully installed and operational, the BAS Contractor and representatives of the Owner will review and check out the system – see System Acceptance and Testing section of this document. At that time, the BAS contractor shall demonstrate the operation of the system and prove that it complies with the intent of the drawings and specifications.
E. Provide services and manpower necessary for commissioning of the system in coordination with the HVAC Contractor, Balancing Contractor and Owner's representative.
F. All work performed under this section of the specifications will comply with all governing codes, laws and governing bodies. If the drawings and/or specifications are in conflict with governing codes, the Contractor, with guidance from the engineer, shall submit a proposal with appropriate modifications to the project to meet code restrictions. If this specification and associated drawings exceed governing code requirements, the specification will govern. The Contractor shall obtain and pay for all necessary construction permits and licenses.

1.6 System Description

A. In accordance to the scope of work, the system shall also provide a graphical, web-based, operator interface that allows for instant access to any system through a standard browser. The contractor must provide PC-based programming workstations, operator workstations and microcomputer controllers of modular design providing distributed processing capability, and allowing future expansion of both input/output points and processing/control functions.

   For this project, the system shall consist of the following components:

   1. No third party front-end workstation software will be acceptable. Workstations must conform to the B-OWS BACnet device profile.
   2. Web-Based Operator Workstations: The BAS Contractor shall furnish licenses for web connection to the BAS system. Web-based users shall have access to all system points and graphics, shall be able to receive and acknowledge alarms, and shall be able to control setpoints and other parameters. All engineering work, such as trends, reports, graphics, etc. that are accomplished from the WorkStation shall be available for viewing through the web browser interface without additional changes. The web-based interface must conform to the B-OWS BACnet device profile. There will be no need for any additional computer based hardware to support the web-based user interface.
   3. Ethernet-based Network Router and/or Network Server Controller(s): The BAS Contractor shall furnish (qty) Ethernet-based Network Server Controllers as described in Part 2 of the specification. These controllers will connect directly to the Operator Workstation over Ethernet at a minimum of 100mbps, and provide communication to the Standalone Digital Control Units and/or other Input/Output

Modules. Network Server Controllers shall conform to BACnet device profile B-BC. Network controllers that utilize RS232 serial communications or ARCNET to communicate with the workstations will not be accepted.
Network Controllers shall be tested and certified by the BACnet Testing Laboratory (BTL) as Network Server Controllers (B-BC).

4. Standalone Digital Control Units (SDCUs): Provide the necessary quantity and types of SDCUs to meet the requirements of the project for mechanical equipment control including air handlers, central plant control, and terminal unit control. Each SDCU will operate completely standalone, containing all of the I/O and programs to control its associated equipment. Each BACnet protocol SDCU shall conform to the BACnet device profile B-AAC.
BACnet SDCUs shall be tested and certified by the BACnet Testing Laboratory (BTL) as Advanced Application Controllers (B-AAC).

B. The Local Area Network (LAN) shall be either a 10 or 100 Mpbs Ethernet network supporting BACnet, Modbus, XML, HTTP, and CORBA IIOP for maximum flexibility for integration of building data with enterprise information systems and providing support for multiple Network Server Controllers (NSCs), user workstations and a local host computer system.
C. The Enterprise Ethernet (IEEE 802.3) LAN shall utilize Carrier Sense Multiple/Access/Collision Detect (CSMA/CD), Address Resolution Protocol (ARP) and User Datagram Protocol (UDP) operating at 10 or 100 Mbps.
D. The system shall enable an open architecture that utilizes EIA standard 709.1, the LonTalk™ protocol and/or ANSI / ASHRAE™ Standard 135-2007, BACnet functionality to assure interoperability between all system components. Native support for the LonTalk™ protocol and the ANSI / ASHRAE™ Standard 135-2007, BACnet protocol are required to assure that the project is fully supported by the HVAC open protocols to reduce future building maintenance, upgrade, and expansion costs.
E. The system shall enable an architecture that utilizes a MS/TP selectable 9.6-76.8 KBaud protocol, as the common communication protocol between all controllers and integral ANSI / ASHRAE™ Standard 135-2008, BACnet functionality to assure interoperability between all system components. The AAC shall be capable of communicating as a MS/TP device or as a BACnet IP device communicating at 10/100 Mbps on a TCP/IP trunk. The ANSI / ASHRAE™ Standard 135-2008, BACnet protocol is required to assure that the project is fully supported by the leading HVAC open protocol to reduce future building maintenance, upgrade, and expansion costs.
F. LonTalk™ packets may be encapsulated into TCP/IP messages to take advantage of existing infrastructure or to increase network bandwidth where necessary or desired.
    1. Any such encapsulation of the LonTalk™ protocol into IP datagrams shall conform to existing LonMark™ guide functionality lines for such encapsulation and shall be based on industry standard protocols.
    2. The products used in constructing the BMS shall be LonMark™ compliant.
    3. In those instances in which Lon-Mark™ devices are not available, the BMS contractor shall provide device resource files and external interface definitions for LonMark devices.
G. Minimum BACnet compliance is Level 4; with the ability to support data read and write functionality. Physical connection of BACnet devices shall be via Ethernet IP or MS/TP. Physical connection of LonWorks devices shall be via Ethernet IP or FTT-10A.
H. If project is a retrofit enterprise overlay of an existing TAC Vista (Lon) system, there shall be no need to re-commission any of the devices to get the system up and running.

I. If project is a retrofit enterprise overlay of an existing TAC I/NET (proprietary) HVAC system, it shall be capable of interfacing with the legacy I/NET without use of the I/NET host tool.
J. The system shall support Modbus TCP and RTU protocols natively, and not require the use of gateways.
K. Complete temperature control system to be DDC with electronic sensors and electronic/electric actuation of Mechanical Equipment Room (MER) valves and dampers and electronic actuation of terminal equipment valves and actuators as specified herein. The BMS is intended to seamlessly connect devices throughout the building regardless of subsystem type, i.e. variable frequency drives, low voltage lighting systems, electrical circuit breakers, power metering and card access should easily coexist on the same network channel.
    1. The supplied system must incorporate the ability to access all data using HTML5 enabled browsers without requiring proprietary operator interface and configuration programs.
    2. Data shall reside on a supplier-installed server for all database access.
    3. A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer's internal Intranet network.
L. All work described in this section shall be installed, wired, circuit tested and calibrated by factory certified technicians qualified for this work and in the regular employment of the approved manufacturer's local field office. The approved manufacturer's local field office shall have a minimum of 3 years of installation experience with the manufacturer and shall provide documentation in the bid and submittal package verifying longevity of the installing company's relationship with the manufacturer when requested. Supervision, hardware and software engineering, calibration and checkout of the system shall be by the employees of the approved manufacturer's local field office and shall not be subcontracted. The control contractor shall have an in place support facility within 100 miles of the site with factory certified technicians and engineers, spare parts inventory and all necessary test and diagnostic equipment for the installed system, and the control contractor shall have 24 hours/day, 7 days/week emergency service available.
M. Deployed system must satisfy system requirements to meet DIARMF (U.S. Department of Defense Information Assurance Risk Management Framework) compliance. Only exception is if system is employing a PEMS system such as described in subsection 1.6 Q. below.
N. The system shall have the capability to provide a web-based AFDD (automated fault detection and diagnostic) system. The AFDD system shall be able to interface directly with the project BAS and energy/performance metering system to provide information on HVAC systems that are being controlled. Pricing is to be a separate line item from the BAS proposal. See specification section 25 08 01 for exact requirements.
O. The system shall have the capability to provide a web-based automated predictive analytics program. The vendor shall provide software and ongoing services that will identify actionable energy saving, maintenance, and peak reduction opportunities to assist the facility in achieving its energy and sustainability objectives, and automatically and continuously operate the systems necessary to achieve the targeted savings and reductions.
P. The system shall have the capability to provide an app running on a fixed or mobile device (iOS (iPad), Android (tablet), Windows) offering a consistent, aesthetic, customized graphical interface, that allows to aggregate in a graphical manner various types of services such as room temperature control, lighting control, curtain control, remote TV, etc. System shall communicate via web services and have the ability to be designed once and deployed to multiple devices at the same time.

1.7 Work by Others

A. The BAS Contractor shall cooperate with other contractors performing work on this project necessary to achieve a complete and neat installation. To that end, each contractor shall consult the drawings and specifications for all trades to determine the nature and extent of others' work.
B. The BAS Contractor shall furnish all control valves, sensor wells, flow meters and other similar equipment for installation by the Mechanical Contractor.
C. The BAS Contractor shall provide field supervision to the designated contractor for the installation of the following:
    1. Automatic control dampers
    2. The Electrical Contractor shall provide:
        a. All power wiring to motors, heat trace, junction boxes for power to BAS panels.
        b. Furnish smoke detectors and wire to the building fire alarm system. HVAC Contractor to mount devices. BAS Contractor to hardwire to fan shut down.

1.8 Code Compliance

A. Provide BAS components and ancillary equipment, which are UL-916 listed and labeled.
B. All equipment or piping used in conditioned air streams, spaces or return air plenums shall comply with NFPA 90A Flame/Smoke/Fuel contribution rating of 25/50/0 and all applicable building codes or requirements.
C. All wiring shall conform to the National Electrical Code.
D. All smoke dampers shall be rated in accordance with UL 555S.
E. Comply with FCC rules, Part 15 regarding Class A radiation for computing devices and low power communication equipment operating in commercial environments.
F. Comply with FCC, Part 68 rules for telephone modems and data sets.

1.9 Submittals

A. All shop drawings shall be prepared in Visio Professional submitted electronically in PDF format. Shop drawings shall include a riser diagram depicting locations of all controllers and workstations, with associated network wiring. Also included shall be individual schematics of each mechanical system showing all connected points with reference to their associated controller. Typicals will be allowed where appropriate.
B. Submittal data shall contain manufacturer's data on all hardware and software products required by the specification. Valve, damper and air flow station schedules shall indicate size, configuration, capacity and location of all equipment.
C. Software submittals shall contain narrative descriptions of sequences of operation, program listings, point lists, and a complete description of the graphics, reports, alarms and configuration to be furnished with the workstation software. Information shall be bound or in a three ring binder with an index and tabs. Diagrams shall be on 11" by 17" foldouts. If color has been used to differentiate information, the printed copies shall be in color.
D. The Engineer will make corrections, if required, and return to the Contractor. The Contractor will then resubmit with the corrected or additional data. This procedure shall be repeated until

all corrections are made to the satisfaction of the Engineer and the submittals are fully approved.

E. The following is a list of post construction submittals that shall be updated to reflect any changes during construction and re-submitted as “As-Built”.
    1. System architecture drawing.
    2. Layout drawing for each control panel
    3. Wiring diagram for individual components
    4. System flow diagram for each controlled system
    5. Instrumentation list for each controlled system
    6. Sequence of control
    7. Operation and Maintenance Manuals

F. Information common to the entire system shall be provided. This shall include but not be limited to the following.
    1. Product manuals for the key software tasks.
    2. Operating the system.
    3. Administrating the system.
    4. Engineering the operator workstation.
    5. Application programming.
    6. Engineering the network.
    7. Setting up the web server.
    8. Report creation.
    9. Graphics creation.
    10. All other engineering tasks.
    11. System Architecture Diagram.
    12. List of recommended maintenance tasks associated with the system servers, operator workstations, data servers, web servers and web clients.
    13. Define the task.
    14. Recommend a frequency for the task.
    15. Reference the product manual that includes instructions on executing the task.
    16. Names, addresses, and telephone numbers of installing contractors and service representatives for equipment and control systems.
    17. Licenses, guarantees, and warranty documents for equipment and systems.
    18. Submit one copy for each building, plus two extra copies.

G. Information common to the systems in a single building shall be provided.
    1. System architecture diagram for components within the building annotated with specific location information.
    2. As-built drawing for each control panel.
    3. As-built wiring design diagram for all components.
    4. Installation design details for each I/O device.
    5. As-built system flow diagram for each system.
    6. Sequence of control for each system.
    7. Binding map for the building.
    8. Product data sheet for each component.
    9. Installation data sheet for each component.
    10. Submit two copies for each building and two extra copies.

H. Software shall be provided:
    1. Submit a copy of all software installed on the servers and workstations.

2. Submit all licensing information for all software installed on the servers and workstations.
3. Submit a copy of all software used to execute the project even if the software was not installed on the servers and workstations.
4. Submit all licensing information for all of the software used to execute the project.
5. All software revisions shall be as installed at the time of the system acceptance.
6. Firmware Files
7. Submit a copy of all firmware files that were downloaded to or pre-installed on any devices installed as part of this project.
8. This does not apply to firmware that is permanently burned on a chip at the factory and can only be replaced by replacing the chip.
9. Submit a copy of all application files that were created during the execution of the project.
10. Submit a copy of all graphic page files created during the execution of the project.

1.10 Coordination

A. Coordinate location of thermostats, humidistats, and other exposed control sensors with plans.
B. Coordinate equipment from other divisions including "Intrusion Detection," "Lighting Controls," "Motor Control Centers," "Panel boards," and "Fire Alarm" to achieve compatibility with equipment that interfaces with those systems.
C. Coordinate supply of conditioned electrical circuits for control units and operator workstation.
D. Coordinate with the Owner's IT department on locations for network controllers, Ethernet communication cabling and TCP/IP addresses.

1.11 Ownership

A. The Owner shall retain licenses to software for this project.
B. The Owner shall sign a copy of the manufacturer’s standard software and firmware licensing agreement as a condition off this contractor. Such license shall grant use of all programs and application software to the Owner as defined by the manufacturer’s license agreement, but shall protect the manufacturer’s rights to disclosure of Trade Secrets contained within such software.
C. The licensing agreement shall not preclude the use of the software by individuals under contract to the owner for commissioning, servicing or altering the system in the future. Use of the software by individuals under contract to the owner shall be restricted to use on the owner’s computers and only for the purpose of commissioning, servicing, or altering the installed system.
D. All project developed software, files and documentation shall become the property of the Owner. These include but are not limited to:
    1. Server and workstation software
    2. Application programming tools
    3. Configuration tools
    4. Network diagnostic tools
    5. Addressing tools
    6. Application files
    7. Configuration files

8. Graphic files
9. Report files
10. Graphic symbol libraries
11. All documentation

1.12 Quality Assurance - System Startup and Commissioning

A. Each point in the system shall be tested for both hardware and software functionality. In addition, each mechanical and electrical system under control of the BAS will be tested against the appropriate sequence of operation specified herein. Successful completion of the system test shall constitute the beginning of the warranty period. A written report will be submitted to the owner indicating that the installed system functions in accordance with the plans and specifications.

B. The BAS contractor shall commission and set in operating condition all major equipment and systems, such as the chilled water, hot water and all air handling systems, in the presence of the equipment manufacturer's representatives, as applicable, and the Owner and Architect's representatives.

C. The BAS Contractor shall provide a technician for __2___ days manpower and engineering services required to assist the HVAC Contractor and Balancing Contractor in testing, adjusting, and balancing all systems in the building. The BAS Contractor shall coordinate all requirements to provide a complete air balance with the Balancing Contractor and shall include all labor and materials in his contract.

D. Startup Testing shall be performed for each task on the startup test checklist, which shall be initialed by the technician and dated upon test was completion along with any recorded data such as voltages, offsets or tuning parameters. Any deviations from the submitted installation plan shall also be recorded.

E. Required elements of the startup testing include:
    1. Measurement of voltage sources, primary and secondary
    2. Verification of proper controller power wiring.
    3. Verification of component inventory when compared to the submittals.
    4. Verification of labeling on components and wiring.
    5. Verification of connection integrity and quality (loose strands and tight connections).
    6. Verification of bus topology, grounding of shields and installation of termination devices.
    7. Verification of point checkout.
    8. Each I/O device is landed per the submittals and functions per the sequence of control.
    9. Analog sensors are properly scaled and a value is reported
    10. Binary sensors have the correct normal position and the state is correctly reported.
    11. Analog outputs have the correct normal position and move full stroke when so commanded.
    12. Binary outputs have the correct normal state and respond appropriately to energize/de-energize commands.
    13. Documentation of analog sensor calibration (measured value, reported value and calculated offset).
    14. Documentation of Loop tuning (sample rate, gain and integral time constant).

F. A performance verification test shall also be completed for the operator interaction with the system. Test elements shall be written to require the verification of all operator interaction tasks including, but not limited to the following.
    1. Graphics navigation.
    2. Trend data collection and presentation.
    3. Alarm handling, acknowledgement and routing.
    4. Time schedule editing.
    5. Application parameter adjustment.
    6. Manual control.
    7. Report execution.
    8. Automatic backups.
    9. Web Client access.

G. A Startup Testing Report and a Performance Verification Testing Report shall be provided upon test completion.

1.13 Warranty and Maintenance

A. All components, system software, and parts furnished and installed by the BMS contractor shall be guaranteed against defects in materials and workmanship for 1 year of substantial completion. Labor to repair, reprogram, or replace these components shall be furnished by the BMS contractor at no charge during normal working hours during the warranty period. Materials furnished but not installed by the BMS contractor shall be covered to the extent of the product only. Installation labor shall be the responsibility of the trade contractor performing the installation. All corrective software modifications made during warranty periods shall be updated on all user documentation and on user and manufacturer archived software disks. .

1.14 Training

A. The BAS Contractor shall provide both on-site and classroom training to the Owner's representative and maintenance personnel per the following description:

B. On-site training shall consist of a minimum of (8) hours of hands-on instruction geared at the operation and maintenance of the systems. The curriculum shall include
    1. System Overview
    2. System Software and Operation
    3. System access
    4. Software features overview
    5. Changing setpoints and other attributes
    6. Scheduling
    7. Editing programmed variables
    8. Displaying color graphics
    9. Running reports
    10. Workstation maintenance
    11. Viewing application programming
    12. Operational sequences including start-up, shutdown, adjusting and balancing.
    13. Equipment maintenance.
    14. Factory, classroom training will include a minimum of (2) training reservation for a 3 day course with material covering workstation operation tuition free with travel

expense responsibility of the owner. The option for 2-3 weeks of system engineering and controller programming shall be possible if necessary and desired.

PART 2 - Products

2.1 Pre-approved Manufacturers

A. Subject to compliance with requirements, provide products by one of the following pre-qualified manufacturers:
   1. Electronic Components
      a. Schneider-Electric Field Devices
   2. Direct Digital Control Systems Devices:
      a. Schneider Electric I/A BACnet series installed by Alpha Controls & Services.

2.2 System Architecture

A. General
   1. The Building Automation System (BAS) shall consist of Network Server/Controllers (NSCs), a family of Standalone Digital Control Units (SDCUs), Administration and Programming Workstations (APWs), and Web-based Operator Workstations (WOWs). The BAS shall provide control, alarm detection, scheduling, reporting and information management for the entire facility, and Wide Area Network (WAN) if applicable.
   2. An Enterprise Level BAS shall consist of an Enterprise Server, which enables multiple NSCs (including all graphics, alarms, schedules, trends, programming, and configuration) to be accessible from a single Workstation simultaneously for operations and engineering tasks.
   3. The Enterprise Level BAS shall be able to host up to 250 servers, or NSCs, beneath it.
   4. For Enterprise reporting capability and robust reporting capability outside of the trend chart and listing ability of the Workstation, a Reports Server shall be installed on a Microsoft Windows based computer. The Reports Server can be installed on the same computer as the Enterprise Server.
   5. The system shall be designed with a top-level 10/100bT Ethernet network, using the BACnet/IP, LonWorks IP, and/or Modbus TCP protocol.
   6. Modbus RTU/ASCII (and J-bus), Modbus TCP, BACnet MS/TP, BACnet IP, LonTalk FTT-10A, and WebServices shall be native to the NSCs. There shall not be a need to provide multiple NSCs to support all the network protocols, nor should there be a need to supply additional software to allow all three protocols to be natively supported. A sub-network of SDCUs using the BACnet MS/TP, LonTalk FTT-10A, and/or Modbus RTU protocol shall connect the local, stand-alone controllers with Ethernet-level Network Server Controllers/IP Routers.

B. TCP/IP Level
   1. The TCP/IP layer connects all of the buildings on a single Wide Area Network (WAN) isolated behind the campus firewall. Fixed IP addresses for connections to the campus WAN shall be used for each device that connects to the WAN.

C. Fieldbus Level with Standalone Digital Control Units (SDCUs)
    1. The fieldbus layer shall support all of the following types of SDCUs:
        a. BACnet SDCU requirements: The system shall consist of one or more BACnet MS/TP field buses managed by the Network Server Controller. Minimum speed shall be 76.8kbps. The field bus layer consists of an RS485, token passing bus that supports up to 127 Standalone Digital Control Units (SDCUs) for operation of HVAC and lighting equipment. These devices shall conform to BACnet standard 135-2007. The NSCs shall be capable of at least two BACnet MS/TP field buses for a total capability of 254 SDCUs per NSC.
        b. LonWorks SDCU requirements: The system shall consist of one or more LonWorks FTT-10A field buses managed by the Network Server Controller. Minimum speed shall be 76.8kbps. The field bus layer shall consist of up to 64 Lonworks SDCUs using peer-to-peer, event-driven communication for operation of HVAC and lighting equipment. If using TAC Xenta controllers, a total combination of Xenta and LonWorks SDCUs should consist of up to 64 in total, with a maximum of 30 for the Xenta line. If using I/A MNL controllers only, you may have up to 127 SDCUs per field bus level.
        c. Modbus SDCU requirements: The system shall consist of one or more Modbus RTU (RS-485 or RS-232) field buses managed by the Network Server Controller. The field bus layer shall consist of up to 31 SDCUs for operation of HVAC, power metering, and lighting equipment. If utilizing Modbus TCP, the field bus layer shall consist of up to 100 SDCUs for operation of HVAC, power metering, and lighting equipment. The NSCs shall be capable of at least two Modbus RTU field buses for a total capability of 62 SDCUs per NSC.
D. BAS LAN Segmentation
    1. The BAS shall be capable of being segmented, through software, into multiple local area networks (LANs) distributed over a wide area network (WAN). Workstations can manage a single LAN (or building), and/or the entire system with all portions of that LAN maintaining its own, current database.
E. Standard Network Support
    1. All NSCs, Workstation(s) and Servers shall be capable of residing directly on the owner's Ethernet TCP/IP LAN/WAN with no required gateways. Furthermore, the NSC's, Workstation(s), and Server(s) shall be capable of using standard, commercially available, off-the-shelf Ethernet infrastructure components such as routers, switches and hubs. With this design the owner may utilize the investment of an existing or new enterprise network or structured cabling system. This also allows the option of the maintenance of the LAN/WAN to be performed by the owner's Information Systems Department as all devices utilize standard TCP/IP components.
F. System Expansion
    1. The BAS system shall be scalable and expandable at all levels of the system using the same software interface, and the same TCP/IP level and fieldbus level controllers. Systems that require replacement of either the workstation software or field controllers in order to expand the system shall not be acceptable.
    2. Web-based operation shall be supported directly by the NSCs and require no additional software.
    3. The system shall be capable of using graphical and/or line application programming language for the Network Server Controllers.

G. Support For Open Systems Protocols

1. All Network Server Controllers must natively support the BACnet IP, BACnet MS/TP, LonWorks FTT-10, Modbus TCP, Modbus RTU (RS-485 and RS-232), and Modbus ASCII protocols.

H. Administration/Programming Workstation & Enterprise Server Requirements

1. Re-use the existing Enterprise Server shall consist of the following:
2.

I. User Interface:

1. The BAS workstation software shall allow the creation of a custom, browser-style interface linked to the user when logging into any workstation. Additionally, it shall be possible to create customized workspaces that can be assigned to user groups. This interface shall support the creation of “hot-spots” that the user may link to view/edit any object in the system or run any object editor or configuration tool contained in the software. Furthermore, this interface must be able to be configured to become a user’s “PC Desktop” – with all the links that a user needs to run other applications. This, along with the Windows user security capabilities, will enable a system administrator to setup workstation accounts that not only limit the capabilities of the user within the BAS software, but may also limit what a user can do on the PC and/or LAN/WAN. This might be used to ensure, for example, that the user of an alarm monitoring workstation is unable to shutdown the active alarm viewer and/or unable to load software onto the PC.
2. Webstations shall have the capability to automatically re-direct to an HTTPS connection to ensure more secure communications.
3. Personalized layouts and panels within workstations shall be extended to webstations to ensure consistent user experiences between the two user interfaces.
4. Workstation shall indicate at all times the communication status between it and the server.

J. User Security

1. The software shall be designed so that each user of the software can have a unique username and password. This username/password combination shall be linked to a set of capabilities within the software, set by and editable only by, a system administrator. The sets of capabilities shall range from View only, Acknowledge alarms, Enable/disable and change values, Program, and Administer. The system shall allow the above capabilities to be applied independently to each and every class of object in the system. The system must allow a minimum of 256 users to be configured per workstation. Additionally, the software shall enable the ability to add/remove users based upon Microsoft Windows Security Domains that enable the customer IT department to assist in user access.
2. Additional requirements include mandatory change of passwords:
    a) At first logon with default credentials
    b) Of admin passwords before deploying via Project Configuration Servers

K. Configuration Interface

1. The workstation software shall use a familiar Windows Explorer□-style interface for an operator or programmer to view and/or edit any object (controller, point, alarm,

report, schedule, etc.) in the entire system. In addition, this interface shall present a “network map” of all controllers and their associated points, programs, graphics, alarms, and reports in an easy to understand structure. All object names shall be alphanumeric and use Windows long filename conventions.

2. The configuration interface shall also include support for user defined object types. These object types shall be used as building blocks for the creation of the BAS database. They shall be created form the base object types within the system input, output, string variables, setpoints, etc., alarm algorithms, alarm notification objects, reports, graphics displays, schedules, and programs. Groups of user defined object types shall be able to be set up as a predefined aggregate of subsystems and systems. The configuration interface shall support copying/pasting and exporting/importing portions of the database for additional efficiency. The system shall also maintain a link to all “child” objects created. If a user wishes to make a change to a parent object, the software shall ask the user if he/she wants to update all of the child objects with the change.

L. Color Graphic Displays

1. The system shall allow for the creation of user defined, color graphic displays for the viewing of mechanical and electrical systems, or building schematics. These graphics shall contain point information from the database including any attributes associated with the point (engineering units, etc.). In addition operators shall be able to command equipment or change setpoints from a graphic through the use of the mouse.
2. Requirements of the color graphic subsystem include:
    a. At a minimum, the user shall have the ability to import .gif, .png, .bmp, .jpeg, .tif, and CAD generated picture files as background displays, and layering shall be possible.
    b. The system shall support HTML5 enabled graphics.
    c. It shall be possible for the user to use JavaScript to customize the behavior of each graphic.
    d. The editor shall use Scalable Vector Graphics (SVG) technology.
    e. A built-in library of animated objects such as dampers, fans, pumps, buttons, knobs, gauges, ad graphs which can be “dropped” on a graphic through the use of a software configuration “wizard”. These objects shall enable operators to interact with the graphic displays in a manner that mimics their mechanical equivalents found on field installed control panels.
    f. Support for high DPI icons shall be included and automatically chosen if viewing on a high definition display such as Retina or 4K displays.
    g. Using the mouse, operators shall be able to adjust setpoints, start or stop equipment, modify PID loop parameters, or change schedules.
    h. Status changes or alarm conditions must be able to be highlighted by objects changing screen location, size, color, text, blinking or changing from one display to another.
    i. Ability to link graphic displays through user defined objects, alarm testing, or the result of a mathematical expression. Operators must be able to change from one graphic to another by selecting an object with a mouse - no menus will be required.
    j. It shall be possible to create and save graphical components and JavaScript code in reusable and transferrable, customized libraries.

k. Graphics should rescale based on whatever monitor or viewing device is being used.
l. Be able to create graphics on varying layers that can be moved and repeated.
m. Be able to create graphics within varying window panes that can be moved and/or re-referenced. For example, creating the graphical menu within a pane and referencing it on every graphics page, therefore not rebuilding thus allowing for a single spot for updates that get pushed to all the pages that reference it.
n. The ability to create re-usable cascading menus.
o. The ability to have multiple instances of a graphic and edit one instance to change all.

3. Additionally, the Graphics Editor portion of the Engineering Software shall provide the following capabilities:
   a. Create and save pages.
   b. Group and ungroup symbols.
   c. Modify an existing symbol.
   d. Modify an existing graphic page.
   e. Rotate and mirror a symbol.
   f. Place a symbol on a page.
   g. Place analog dynamic data in decimal format on a page.
   h. Place binary dynamic data using state descriptors on a page.
   i. Create motion through the use of animated .gif files or JavaScript.
   j. Place test mode indication on a page.
   k. Place manual mode indication on a page.
   l. Place links using a fixed symbol or flyover on a page.
   m. Links to other graphics.
   n. Links to web sites.
   o. Links to notes.
   p. Links to time schedules.
   q. Links to any .exe file on the operator work station.
   r. Links to .doc files.
   s. Assign a background color.
   t. Assign a foreground color.
   u. Place alarm indicators on a page.
   v. Change symbol/text/value color as a function of an analog variable.
   w. Change a symbol/text/value color as a function of a binary state.
   x. Change symbol/text/value as a function of a binary state.
   y. All symbols used by Schneider Electric EcoBuilding Business in the creation of graphic pages shall be saved to a library file for use by the owner.

M. Automatic monitoring
1. The software shall allow for the automatic collection of data and reporting from any controller or NSC. The frequency of data collection shall be user-configurable.

N. Alarm Management
1. The software shall be capable of accepting alarms directly from NSCs or controllers, or generating alarms based on evaluation of data in controllers and comparing to limits or conditional equations configured through the software. Any alarm (regardless of its origination) will be integrated into the overall alarm

management system and will appear in all standard alarm reports, be available for operator acknowledgment, and have the option for displaying graphics, or reports.

2. Alarm management features shall include:
    a. A minimum of 1000 alarm notification levels at the NSC, workstation, and webstation levels. At the Enterprise level the minimum number of active and viewable alarms shall be 10,000. Each notification level will establish a unique set of parameters for controlling alarm display, distribution, acknowledgment, keyboard annunciation, and record keeping.
    b. Automatic logging in the database of the alarm message, point name, point value, source device, timestamp of alarm, username and time of acknowledgement, username and time of alarm silence (soft acknowledgement).
    c. Playing an audible sound on alarm initiation or return to normal.
    d. Sending an email page to anyone specifically listed on the initial occurrence of an alarm. The ability to utilize email paging of alarms shall be a standard feature of the software integrated with the operating system's mail application interface (MAPI). No special software interfaces shall be required and no email client software must be running in order for email to be distributed. The email notification shall be able to be sent to an individual user or a user group.
    e. Individual alarms shall be able to be re-routed to a user at user-specified times and dates. For example, a critical high temp alarm can be configured to be routed to a Facilities Dept. workstation during normal working hours (7am-6pm, Mon-Fri) and to a Central Alarming workstation at all other times.
    f. An active alarm viewer shall be included which can be customized for each user or user type to hide or display any alarm attributes.
    g. The active alarm viewer can be configured such that an operator must type in text in an alarm entry and/or pick from a drop-down list of user actions for certain alarms.
    h. The active alarm viewer can be configured such that an operator must type in text in an alarm entry and/or pick from a drop-down list of causes for certain alarms. This ensures accountability (audit trail) for the response to critical alarms.
    i. The active alarm viewer can be configured such that an operator must confirm that all of the steps in a check list have been accomplished prior to acknowledging the alarm.
    j. The active alarm viewer shall, if filtered, show the quantity of visible and total number of alarms that are not equal to 'normal' and the quantity of disabled and hidden alarms.
    k. The alarm viewer can be configured to auto hide alarms when triggered.
    l. An operator shall have the capability to assign an alarm to another user of the system.
    m. Time schedules shall be able to be used to set control notifications to users.
    n. An operator shall have the capability to save and apply alarm favorites.
    o. Alarm notifications must support multiple distribution methods within one notification.

O.Report Generation

1. The Reports Server shall be able to process large amounts of data and produce meaningful reports to facilitate analysis and optimization of each installation.

2. Reports shall be possible to generate and view from the operator Workstation, and/or Webstation, and/or directly from a reports-only web interface.
3. A library of predefined automatically generated reports that prompt users for input prior to generation shall be available. The properties and configurations made to these reports shall be possible to save as Dashboard reports, so that the configurations are saved for future used.
4. It shall be possible to create reports standard tools, such as Microsoft Report Builder 2.0 or Visual Studio, shall be used for customized reports.
5. Additional reports or sets of reports shall be downloadable, transferrable, and importable
6. All reports shall be able to be set up to automatically run or be generated on demand.
7. Each report shall be capable of being automatically emailed to a recipient in Microsoft Word, Excel, and/or Adobe .pdf format.
8. Reports can be of any length and contain any point attributes from any controller on the network.
9. Image management functionality shall be possible to enable the system administrators to easily upload new logos or images to the system.
10. It shall be possible to run other executable programs whenever a report is initiated.
11. Report Generator activity can be tied to the alarm management system, so that any of the configured reports can be displayed in response to an alarm condition.
12. Minimum supplied reports shall include:
    a. Activities Per Server Report
    b. Activities Per User Report
    c. Alarm Amount by Category Report
    d. Alarm Amount by Type Report
    e. Alarms Per Sever Report
    f. Current Alarm Report
    g. Most Active Alarm Report
    h. System Errors Per Server Report
    i. Top Activities Report
    j. Top Alarms Report
    k. Top System Errors Report
    l. Trend Log Comparison Report
    m. User Logins Report
    n. Users and Groups Reports
13. Minimum Energy Reports shall include:
    a. Energy Monitoring Calendar Consumption Report: Shall provide an interactive report that shows the energy usage on one or multiple selected days.
    b. Energy Monitoring Consumption Breakdown Report: Shall provide a report on energy consumption broken down using sub-metering.
    c. Energy Monitoring Consumption Report: Shall show the energy consumption against a specified target value.
14. Reports Server Hardware Requirements
    a. Processor
        a) Minimum: 2.0 GHz
        b) Recommended: 2.0 GHz or higher

b. Memory
    a) Minimum: 6 GB
    b) Recommended: 8GB or higher
c. Hard Disk: 500 GB

15. Reports Server Software Requirements
    a. Operating System:
        a) Microsoft Windows Server 2008 R2 64-bit (Standard, Enterprise, Datacenter, Web, or Itanium)
        b) Microsoft Windows Server 2012 64-bit (Standard)
        c) Microsoft Windows Server 2012 R2 64-bit (Standard, Datacenter)
    b. SQL Versions:
        a) Microsoft SQL Server 2008 R2 64-bit SP2 (Standard and Express with Advanced Services)
        b) Microsoft SQL Server 2012 64-bit (Standard and Express with Advanced Services)
    c. Additional required software"
        a) Microsoft .Net 4.5

P. Scheduling
1. From the workstation or webstation, it shall be possible to configure and download schedules for any of the controllers on the network.
2. Time of day schedules shall be in a calendar style and viewable in both a graphical and tabular view.
3. Schedules shall be programmable for a minimum of one year in advance.
4. To change the schedule for a particular day, a user shall simply select the day and make the desired modifications.
5. Additionally, from the operator webstations, each schedule will appear on the screen viewable as the entire year, monthly, week and day. A simple mouse click shall allow switching between views. It shall also be possible to scroll from one month to the next and view or alter any of the schedule times.
6. Schedules will be assigned to specific controllers and stored in their local RAM memory. Any changes made at the workstation will be automatically updated to the corresponding schedule in the controller.
7. It shall be possible to assign a lead schedule such that shadow/local schedules are updated based upon changes in the Lead.
8. It shall be possible to assign a list(s) of exception event days, dates, date ranges to a schedule.
9. It shall be possible to view combined views showing the calendar and all prioritized exemptions on one screen.
10. It should accommodate a minimum of 16 priority levels.
11. Values should be able to be controlled directly from a schedule, without the need for special program logic.

Q.Programmer's Environment
1. Programming in the NSC shall be either in graphical block format or line-programming format or both.
2. Programming of the NSC shall be available offline from system prior to deployment into the field. All engineering tasks shall be possible, except, of course, the viewing of live tasks or values.

3. The programmer's environment will include access to a superset of the same programming language supported in the SDCUs.
4. NSC devices will support both script programming language as well as the graphical function block programming language. For both languages, the programmer will be able to configure application software for custom program development, and write global control programs. Both languages will have debugging capabilities in their editors.
5. It shall be possible to save custom programs as libraries for reuse throughout the system. A wizard tool shall be available for loading programs from a library file in the program editor.
6. It shall be possible to view graphical programming live and real-time from the Workstation.
7. The system shall be capable of creating 'binding templates' allowing the user to bind multiple points to multiple objects all at once.
8. Key terms should appear when typing (IntelliType).
9. Applications should be able to be assigned different priorities and cycle times for a prioritized execution of different function.
10. The system shall be able to create objects that allow common objects such as power meters, VFD drives, etc. to be integrated into the system with simple import actions without the need of complicated programming or configuration setups.

R. Saving/Reloading
1. The workstation software shall have an application to save and restore NSC and field controller memory files.
2. For the NSC, this application shall not be limited to saving and reloading an entire controller – it must also be able to save/reload individual objects in the controller. This allows off-line debugging of control programs, for example, and then reloading of just the modified information.

S. Audit Trail
1. The workstation software shall automatically log and timestamp every operation that a user performs at a workstation, from logging on and off a workstation to changing a point value, modifying a program, enabling/disabling an object, viewing a graphic display, running a report, modifying a schedule, etc.
2. It shall be possible to view a history of alarms, user actions, and commands for any system object individually or at least the last 5000 records of all events for the entire system from Workstation.
3. The Enterprise server shall be able to store up to 5 million events.
4. The event view shall support viewing of up to 100,000 events.
5. It shall be possible to save custom filtered views of event information that are viewable and configurable in Workstation.
6. It shall be capable to search and view all forced values within the system.

T. Fault Tolerant Enterprise Server Operation (Top level NSC)
1. A single component failure in the system shall not cause the entire system to fail. All system users shall be informed of any detectable component failure via an alarm event. System users shall not be logged off as a result of a system failure or switchover.

U. Web-based Operator Software
1. General:

a. Day-to-day operation of the system shall be accessible through a standard web browser interface, allowing technicians and operators to view any part of the system from anywhere on the network.
b. The system shall be able to be accessed on site via a mobile device environment with, at a minimum, access to overwrite and view system values.

2. Graphic Displays
   a. The browser-based interface must share the same graphical displays as the Administration and Programming Workstations, presenting dynamic data on site layouts, floor plans, and equipment graphics. The browser's graphics shall support commands to change setpoints, enable/disable equipment and start/stop equipment.
   b. Through the browser interface, operators must be able to navigate through the entire system, and change the value or status of any point in any controller. Changes are effective immediately to the controller, with a record of the change stored in the system database.
3. Alarm Management
   a. Systems requiring additional client software to be installed on a PC for viewing the webstation from that PC will not be considered.
   b. Through the browser interface, a live alarm viewer identical to the alarm viewer on the Administration and Programming workstation shall be presented, if the user's password allows it. Users must be able to receive alarms, silence alarms, and acknowledge alarms through a browser. If desired, specific operator text must be able to be added to the alarm record before acknowledgement, attachments shall be viewable, and alarm checklists shall be available.

V. Groups and Schedules
1. Through the browser interface, operators must be able to view pre-defined groups of points, with their values updated automatically.
2. Through the browser interface, operators must be able to change schedules – change start and stop times, add new times to a schedule, and modify calendars.

W. User Accounts and Audit Trail
1. The same user accounts shall be used for the browser interface and for the operator workstations. Operators must not be forced to memorize multiple passwords.
2. All commands and user activity through the browser interface shall be recorded in the system's activity log, which can be later searched and retrieved by user, date, or both.

X. Web Services
1. The installed system shall be able to use web services to "consume" information within the Network Server/Controllers (NSCs) with other products and systems. Inability to perform web services within the NSCs will be unacceptable.
   a. Shall be able to "consume" data into the system via SOAP and REST web services.
   b. Shall be able to "serve" and "consume" data from other Schneider Electric systems such as: StruxureWare Data Center Expert

2.3 Network Server Controllers (NSCs)

A. Network Router Controllers shall combine both network routing functions, control functions, and server functions into a single unit.
B. The BACnet NSC shall be classified as a “native” BACnet device, supporting the BACnet Network Server Controller (B-BC) profile. Controllers that support a lesser profile such as B-SA are not acceptable. NSCs shall be tested and certified by the BACnet Testing Laboratory (BTL) as BACnet Network Server Controllers (B-BC).
C. The Network Server Controller shall provide the interface between the LAN or WAN and the field control devices, and provide global supervisory control functions over the control devices connected to the NRS.
D. The NSCs shall be capable of whitelisting IPs to restrict access to a pre-defined list of hosts or devices.
E. They shall also be responsible for monitoring and controlling their own HVAC equipment such as an AHU or boiler.
F. They shall also contain graphics, trends, trend charts, alarm views, and other similar presentation objects that can be served to workstations or web-based interfaces. A sufficient number of NSCs shall be supplied to fully meet the requirements of this specification and the attached point list.
G. It shall be capable of executing application control programs to provide:
    1. Calendar functions
    2. Scheduling
    3. Trending
    4. Alarm monitoring and routing
    5. Time synchronization by means of an Internet site including automatic synchronization
    6. Native integration of LonWorks controller data and Modbus controller data or BACnet controller data and Modbus controller data
    7. Network Management functions for all LonWorks based devices
H. Hardware Specifications
    1. Memory:
        a. The operating system of the controller, application programs, and all other portions of the configuration database, shall be stored in non-volatile, FLASH memory. Servers/Controllers shall contain enough memory for the current application, plus required history logging, plus a minimum of 20% additional free memory.
    2. Each NRC shall provide the following on-board hardware for communication:
        a. One 10/100bT Ethernet for communication to Workstations, other NRCs and onto the Internet
        b. Two RS-485 ports for communication to BACnet MSTP bus or serial Modbus (software configurable)
        c. One TP/FT port for communication to LonWorks devices.
        d. One device USB port
        e. One host USB port
I. Modular Expandability:
    1. The system shall employ a modular I/O design to allow expansion. Input and output capacity is to be provided through plug-in modules of various types. It shall be possible to combine I/O modules as desired to meet the I/O requirements for individual control applications.

2. One shall be able to “hot-change” (hot-swap) the I/O modules preserving the system on-line without any intervention on the software; addressing and configuration shall be automatic.
3. If for any reason the backplane of the modular I/O system were to fail, I/O module addresses will be protected.

J. Hardware Override Switches:

1. All digital outputs shall, optionally, include three position manual override switches to allow selection of the ON, OFF, or AUTO output state. These switches shall be built into the unit and shall provide feedback to the controller so that the position of the override switch can be obtained through software. In addition each analog output shall be equipped with an override potentiometer to allow manual adjustment of the analog output signal over its full range, when the 3 position manual override switch is placed in the ON position.

K. Universal Input Temperatures

1. All universal inputs directly connected to the NSC via modular expansion shall be capable of using the following thermistors for use in the system without any external converters needed.
   1) 1 k ohm (Balco)

L. Local Status Indicator Lamps:

1. The NSC shall provide as a minimum LED indication of CPU status, Ethernet LAN status, and field bus status. For each input or output, provide LED indication of the value of the point (On/Off). The LED indication shall support software configuration to set whether the illumination of the LED corresponds to On or Off or whether the color when illuminated is Red or Green.

M. Real Time Clock (RTC):

1. Each NSC shall include a real time clock, accurate to 10 seconds per day. The RTC shall provide the following: time of day, day, month, year, and day of week. Each NSC will allow for its own UTC offset, depending upon the time zone. When the time zone is set, the NSC will also store the appropriate times for daylight savings time.
2. The RTC date and time shall also be accurate, up to 30 days, when the NSC is powerless.
3. No batteries may be used to for the backup of the RTC.

N. Power Supply:

1. The 24 VDC power supply for the NSCs shall provide 30 watts of available power for the NSC and associated IO modules. The system shall support the use of more than one power supply if heavily power consuming modules are required.
2. The power supply, NSC, and I/O modules shall connect power wise and communication wise via the separate terminal base allowing for ease of replacement and no separate or loose wiring.

O. Automatic Restart After Power Failure:

1. Upon restoration of power after an outage, the NSC shall automatically and without human intervention update all monitored functions, resume operation based on current, synchronize time and status, and implement special start-up strategies as required.

P. Data Retention:

1. During a power failure, the NSC shall retain all programs, configuration data, historical data, and all other data that is configured to be retained. There shall be no time restriction for this retention and it must not use batteries to achieve it.

Q. Software Specifications

1. The operating system of the controller, application programs, and all other portions of the configuration database such as graphics, trends, alarms, views, etc., shall be stored in non-volatile, FLASH memory. There will be no restrictions placed on the type of application programs in the system. Each NSC shall be capable of parallel processing, executing all control programs simultaneously. Any program may affect the operation of any other program. Each program shall have the full access of all I/O facilities of the processor. This execution of control function shall not be interrupted due to normal user communications including interrogation, program entry, printout of the program for storage, etc.
2. Each NSC shall have an available capacity of 4 GB of memory. This shall represent 2 GB for application and historical data and 2 GB dedicated for backup storage.

R. User Programming Language:

1. The application software shall be user programmable. This includes all strategies, sequences of operation, control algorithms, parameters, and setpoints. The source program shall be either a script-based structured text or graphical function block based and fully programmable by the user. The language shall be structured to allow for the configuration of control programs, schedules, alarms, reports, telecommunications, local displays, mathematical calculations, and histories. Users shall be able to place comments anywhere in the body of either script or function block programs.
2. Network Server Controllers that use a “canned” program method will not be accepted.

S. Control Software:

1. The NSC shall have the ability to perform the following pre-tested control algorithms:
   a. Proportional, Integral plus Derivative Control (PID)
   b. Two Position Control
   c. Digital Filter
   d. Ratio Calculator
   e. Equipment Cycling Protection

T. Mathematical Functions:

1. Each controller shall be capable of performing basic mathematical functions (+, -, *, /), squares, square roots, exponential, logarithms, Boolean logic statements, or combinations of both. The controllers shall be capable of performing complex logical statements including operators such as >, <, =, and, or, exclusive or, etc. These must be able to be used in the same equations with the mathematical operators and nested up to five parentheses deep.

U. NSCs shall have the ability to perform any or all of the following energy management routines:

1. Time of Day Scheduling
2. Calendar Based Scheduling
3. Holiday Scheduling
4. Temporary Schedule Overrides
5. Optimal Start

6. Optimal Stop
7. Night Setback Control
8. Enthalpy Switchover (Economizer)
9. Peak Demand Limiting
10. Temperature Compensated Duty Cycling
11. CFM Tracking
12. Heating/Cooling Interlock
13. Hot/Cold Deck Reset
14. Hot Water Reset
15. Chilled Water Reset
16. Condenser Water Reset
17. Chiller Sequencing

V. History Logging:

1. Each NSC controller shall be capable of LOCALLY logging any input, output, calculated value or other system variable either over user defined time intervals ranging from 1 second to 1440 minutes or based upon a user configurable change of value. A minimum of 1000 logs, with a minimum of 100,000 records, shall be stored. Each log can record either the instantaneous, average, minimum or maximum value of the point. Logged data shall be downloadable to a higher level NSC long term archiving based upon user-defined time intervals, or manual command.
2. For extended trend logging a minimum of 1500 trends shall be capable, with a minimum number of 600,000 records within.
3. Management of a power meter replacement to ensure meter log data is accurate shall be possible in the NSC.
4. Every hardware input and output point, hosted within the NSC and attached I/O modules, shall be trended automatically without the requirement for manual creation, and each of these logs shall log values based upon a change of value and store at least 500 trend samples before replacing the oldest sample with new data.
5. The presentation of logged data shall be built into the server capabilities of the NSC. Presentation can be in time stamped list formats or in a chart format with fully configurable pen colors, weights, scales and time spans.
6. Tooltips shall be present, magnetic, and visible based on users preference.
7. Comments shall be visible whenever viewing the trend log list.
8. System shall give indication of memory usage and be able to alert the user if too many logs are allocated.

W. Alarm Management:

1. For each system point, alarms can be created based on high/low limits or in comparison to other point values. All alarms will be tested each scan of the NSC and can result in the display of one or more alarm messages or reports.
2. There is no limit to the number of alarms that can be created for any point
3. Alarms can be configured to be generated based upon a single system condition or multiple system conditions.
4. Alarms will be generated based on an evaluation of the alarm conditions and can be presented to the user in a fully configurable order, by priority, by time, by category, etc. These configurable alarm views will be presented to a user upon

logging into the system regardless of whether the log in takes place at a WorkStation or a Webstation.

5. The alarm management system shall support the ability to create and select cause and action notes to be selected and associated with an alarm event. Checklists shall also be possible in order to present to an operator a suggested mode of troubleshooting. When acknowledging an alarm, it shall be possible to assign it to a user of the system such that the user is notified of the assignment and is made responsible for the alarm resolution.
6. Alarms must be capable of being routed to any BACnet workstation that conforms to the B-OWS device profile and uses the BACnet/IP protocol.

X. Embedded Web Server

1.

2.4 BACnet Fieldbus and BACnet SDCUs

A. Networking

1. IP Network: All devices that connect to the WAN shall be capable of operating at 10 megabits per second or 100 megabits per second.
2. IP To Field Bus Routing Devices
   a. A Network Server Controller shall be used to provide this functionality.
   b. These devices shall be configurable locally with IP crossover cable and configurable via the IP network.
   c. The routing configuration shall be such that only data packets from the field bus devices that need to travel over the IP level of the architecture are forwarded.

B. Field Bus Wiring and Termination

1. The wiring of components shall use a bus or daisy chain concept with no tees, stubs, or free topology.
2. Each field bus shall have a termination resistor at both ends of each segment.
3. The field bus shall support the use of wireless communications.

C. Repeaters

1. Repeaters are required to connect two segments.
2. Repeaters shall be installed in an enclosure. The enclosure may be in an interstitial space.

D. Field Bus Devices

1. General Requirements
   a. Devices shall have a light indicating that they are powered.
   b. Devices shall be locally powered. Link powered devices (power is furnished from a central source over the field bus cable) are not acceptable.
   c. Application programs shall be stored in a manner such that a loss of power does not result in a loss of the application program or configuration parameter settings. (Battery backup, flash memory, etc.)

E. Network Server Controllers (NSCs)

   a. If NSCs have embedded I/O, all of the requirements for I/O that are described under Advance Application Controllers shall apply.
   b. Shall support the export of data to NSCs from other vendors that support the data sharing, read property service.

c. Shall support the export of data using Change of Value (COV) initiation to NSCs from other vendors that support the subscription to data using the COV concept.
d. Shall support the export of data to any BACnet OWS that supports the data sharing, read property service.
e. Shall support the export of data using Change of Value (COV) initiation to any BACnet OWS that supports the subscription to data using the COV concept.
f. Shall provide trend log support for all of the devices on the field bus. They shall provide sufficient memory to store up to 300 samples for each variable required to be trended by the sequence of control.
g. Shall support the exporting of trend log data to any BACnet OWS that supports the read range BACnet service for trending.
h. Shall provide time schedule support for all of the devices on the field bus.
i. Shall support the editing of time schedule entries from any BACnet OWS that supports the BACnet service for writing of time schedule parameters.
j. Shall provide alarm message initiation for all alarms conditions from any of the field bus devices.
k. Shall deliver alarm messages to any BACnet OWS that supports the BACnet service for receiving alarm messages and is configured to be a recipient of the notification.
l. Shall support alarm acknowledgement from any BACnet OWS that supports the BACnet service for executing alarm/event acknowledgement.
m. Shall support the control of the out of service property and assignment of value or state to analog and binary objects from any BACnet OWS that supports writing to the out of service property and the value property of analog and binary objects.
n. Shall support the receipt and response to Time Synchronization commands from any device that supports the BACnet service for initiating time synchronization commands.
o. Shall support the “Who is?” and “I am.” BACnet service.
p. Shall support the “”Who has?” and “I have.” BACnet service.
q. Shall support Backup and Restore commands from any BACnet OWS that supports the initiation of Backup and Restore commands.
r. Shall be BTL certified.

F. Advance Application Controllers (B-AAC)

1. The key characteristics of a B-AAC are:
   a. They have physical input and output circuits for the connection of analog input devices, binary input devices, pulse input devices, analog output devices, and binary output devices. The number and type of input and output devices supported will vary by model.
   b. They may or may not provide support for additional input and output devices beyond the number of circuits that are provided on the basic circuit board. Support for additional I/O shall be provided by additional circuit boards that physically connect to the basic controller.
   c. The application to be executed by a B-AAC is created by an application engineer using the vendor’s application programming tool.

d. If local time schedules are embedded, the B-AAC shall support the editing of time schedule entries from any BACnet OWS that supports the BACnet service for writing of time schedule parameters.
e. If local trend logging is embedded, the B-AAC shall support the exporting of trend log data to any BACnet OWS that supports the read range BACnet service for trending.
f. If local alarm message initiation is embedded, the B-AAC shall:
    1) Deliver alarm messages to any BACnet OWS that supports the BACnet service for receiving alarm messages and is configured to be a recipient off the alarm message.
    2) Support alarm acknowledgement from any BACnet OWS that supports the BACnet service for executing alarm/event acknowledgement,
g. Shall support the reading of analog and binary data from any BACnet OWS or Building Controller that supports the BACnet service for the reading of data.
h. Shall support the control of the out of service property and assignment of value or state to analog and binary objects from any BACnet OWS that supports writing to the out of service property and the value property of analog and binary objects.
i. Shall support the receipt and response to Time Synchronization commands from a BACnet Building Controller.
j. Shall support the “Who is” and “I am.” BACnet services.
k. Shall support the “Who has” and “I have.” BACnet services.

2. Analog Input Circuits
    a. The resolution of the A/D chip shall not be greater than 0.01 Volts per increment. For an A/D converter that has a measurement range of 0 to 10 VDC and is 10 bit, the resolution is 10/1024 or 0.00976 Volts per increment.
    b. For non-flow sensors, the control logic shall provide support for the use of a calibration offset such that the raw measured value is added to the (+/-) offset to create a calibration value to be used by the control logic and reported to the Operator Workstation (OWS).
    c. For flow sensors, the control logic shall provide support for the use of an adjustable gain and an adjustable offset such that a two point calibration concept can be executed (both a low range value and a high range value are adjusted to match values determined by a calibration instrument).
    d. For non-linear sensors such as thermistors and flow sensors the B-AAC shall provide software support for the linearization of the input signal.
3. Binary Input Circuits
    a. Dry contact sensors shall wire to the controller with two wires.
    b. An external power supply in the sensor circuit shall not be required.
4. Pulse Input Circuits
    a. Pulse input sensors shall wire to the controller with two wires.
    b. An external power supply in the sensor circuit shall not be required.
    c. The pulse input circuit shall be able to process up to 20 pulses per second.
5. True Analog Output Circuits
    a. The logical commands shall be processed by a digital to analog (D/A) converter chip. The 0% to 100% control signal shall be scalable to the full output range which shall be either 0 to 10 VDC, 4 to 20 milliamps or 0 to 20

milliamps or to ranges within the full output range (Example: 0 to 100% creates 3 to 6 VDC where the full output range is 0 to 10 VDC).

b. The resolution of the D/A chip shall not be greater than 0.04 Volts per increment or 0.08 milliamps per increment.

6. Binary Output Circuits
   a. Single pole, single throw or single pole, double throw relays with support for up to 230 VAC and a maximum current of 2 amps.
   b. Voltage sourcing or externally powered triacs with support for up to 30 VAC and 0.5 amps at 24 VAC.
7. Program Execution
   a. Process control loops shall operate in parallel and not in sequence unless specifically required to operate in sequence by the sequence of control.
   b. The sample rate for a process control loop shall be adjustable and shall support a minimum sample rate of 1 second.
   c. The sample rate for process variables shall be adjustable and shall support a minimum sample rate of 1 second.
   d. The sample rate for algorithm updates shall be adjustable and shall support a minimum sample rate of 1 second.
   e. The application shall have the ability to determine if a power cycle to the controller has occurred and the application programmer shall be able to use the indication of a power cycle to modify the sequence of controller immediately following a power cycle.
8. Local Interface
   a. The controller shall support the connection of a portable interface device such as a laptop computer or vendor unique hand-held device. The ability to execute any tasks other than viewing data shall be password protected. Via this local interface, an operator shall be able to:
      1) Adjust application parameters.
      2) Execute manual control of input and output points.
      3) View dynamic data.

G. Application Specific Devices
1. Application specific devices shall have fixed function configurable applications.
2. If the application can be altered by the vendor's application programmable tool, the device is an advanced application controller and not an application specific device.
3. Application specific devices shall be BTL certified.

2.5 DDC Sensors and Point Hardware

A. Temperature Sensors
1. Acceptable Manufacturers: Veris Industries
2. All temperature devices shall use precision thermistors accurate to +/- 1 degree F over a range of –30 to 230 degrees F. Space temperature sensors shall be accurate to +/- .5 degrees F over a range of 40 to 100 degrees F.
3. Room Sensor: Standard space sensors shall be available in an off white enclosure made of high impact ABS plastic for mounting on a standard electrical box. Basis of Design: Veris TW Series

1) Where manual overrides are required, the sensor housing shall feature both an optional sliding mechanism for adjusting the space temperature setpoint, as well as a push button for selecting after hours operation.
2) Where a local display is specified, the sensor shall incorporate an LCD display for viewing the space temperature, setpoint and other operator selectable parameters. Using built in buttons, operators shall be able to adjust setpoints directly from the sensor.

4. Duct Probe Sensor: Sensing element shall be fully encapsulated in potting material within a stainless steel probe. Useable in air handling applications where the coil or duct area is less than 14 square feet. Basis of Design: Veris TD Series
5. Duct Averaging Sensor: Averaging sensors shall be employed in ducts which are larger than 14 square feet. The averaging sensor tube shall contain at least one thermistor for every 3 feet, with a minimum tube length of 6 feet. The averaging sensor shall be constructed of rigid or flexible copper tubing. Basis of Design: Veris TA Series
6. Pipe Immersion Sensor: Immersion sensors shall be employed for measurement of temperature in all chilled and hot water applications as well as refrigerant applications. Provide sensor probe length suitable for application. Provide each sensor with a corresponding pipe-mounted sensor well, unless indicated otherwise. Sensor wells shall be stainless steel for non-corrosive fluids below 250 degrees F and 300 series stainless steel for all other applications. Basis of Design: Veris TI Series
7. Outside Air Sensor: Provide the sensing element on the building's north side. Sensing element shall be fully encapsulated in potting material within a stainless steel probe. Probe shall be encased in PVC solar radiation shield and mounted in a weatherproof enclosure. Operating range -40 to 122 F, Basis of Design: Veris TO Series
8. A pneumatic signal shall not be allowed for sensing temperature.

B. Humidity Wall Transmitter
1. Acceptable Manufacturer: Veris Industries
2. Transmitters shall be accurate to +/- **[**2**]** % at full scale.
3. Transmitter shall have replaceable sensing element.
4. Sensor type shall be thin-film capacitive.
5. Sensor element shall contain multipoint calibration on-board in nonvolatile memory
6. Operating range shall be 0 - 100% RH noncondensing, 50 to 95 F
7. Output shall be field selectable 4-20 mA or 0-5/0-10 VDC.
8. Transmitter shall accept 12-30 VDC or 24 VAC supply power.
9. Transmitter shall be available in an **[**off white**] [**black**]** enclosure made of high impact ABS plastic for mounting on a standard electrical box.
10. Transmitter shall have LCD display
11. Transmitter shall be available with a certification of NIST calibration
12. **[**Transmitter shall have integrated temperature sensor**]**
13. Basis of Design: Veris HWL Series

C. Humidity Duct Transmitter
1. Acceptable Manufacturer: Veris Industries
2. Transmitters shall be accurate to +/- **[**2**]** % at full scale.
3. Transmitter shall be fully encapsulated in potting material within a stainless steel probe.

4. Transmitter shall have replaceable sensing element.
5. Sensor type shall be thin-film capacitive.
6. Sensor element shall contain multipoint calibration on-board in nonvolatile memory
7. Operating range shall be 0 - 100% RH noncondensing, -40 to 122 F
8. Output shall be 4-20 mA or 0-5/0-10 VDC.
9. Transmitter shall accept 12-30 VDC or 24 VAC supply power.
10. Transmitter shall be available with a certification of NIST calibration
11. Basis of Design: Veris HD Series

D. Humidity Outdoor Transmitter
1. Acceptable Manufacturer: Veris Industries
2. Transmitters shall be accurate to +/- 2% at full scale.
3. Transmitter shall be fully encapsulated in potting material within a stainless steel probe. Probe shall be encased in PVC solar radiation shield and mounted in a weatherproof enclosure.
4. Transmitter shall have replaceable sensing element.
5. Sensor type shall be thin-film capacitive.
6. Sensor element shall contain multipoint calibration on-board in nonvolatile memory
7. Operating range shall be 0 - 100% RH noncondensing, -40 to 122 F
8. Output shall be 4-20 mA or 0-5/0-10 VDC.
9. Transmitter shall accept 12-30 VDC or 24 VAC supply power.

E. Carbon Dioxide Wall Transmitter:
1. Acceptable Manufacturer: Veris Industries
2. Sensor type shall be Non-dispersive infrared (NDIR).
3. Accuracy shall be ±30 ppm ±2% of measured value with annual drift of ±10 ppm. Minimum five year recommended calibration interval.
4. Repeatability shall be ±20 ppm ±1% of measured value
5. Response Time shall be <60 seconds for 90% step change
6. Outputs shall be field selectable **[**Analog: 4-20mA or 0-5/0-10VDC**] [**Protocol: Modbus or BACnet**]** with **[**SPDT Relay 1A@30VDC**] [**temperature setpoint slider**]**
7. Transmitter shall accept 12-30 VDC or 24 VAC supply power.
8. Temperature Range: **[**32° to 122°F (CO2 only)**] [**50° to 95°F (with humidity option)**]**
9. Output range shall be programmable 0-2000 or 0-5000 ppm
10. Transmitter shall be available in an **[**off white**] [**black**]** enclosure for mounting on a standard electrical box.
11. Transmitter shall have LCD display for commissioning and provide additional faceplate to conceal LCD display where occupants may misinterpret CO2 readings.
12. Basis of Design: Veris CWL

F. Carbon Dioxide Duct Transmitter:
1. Acceptable Manufacturer: Veris Industries
2. Sensor type shall be Non-dispersive infrared (NDIR).
3. Accuracy shall be ±30 ppm ±2% of measured value with annual drift of ±10 ppm. Minimum five year recommended calibration interval.
4. Repeatability shall be ±20 ppm ±1% of measured value
5. Response Time shall be <60 seconds for 90% step change
6. Outputs shall be field selectable Analog: 4-20mA or 0-5/0-10VDC with SPDT Relay 1A@30VDC

7. Transmitter shall accept 12-30 VDC or 24 VAC supply power.
8. Temperature Range: 32° to 122°F
9. Output range shall be programmable 0-2000 or 0-5000 ppm
10. Enclosure shall not require remote pickup tubes and make use of integrated H-beam probe to channel air flow to sensor.
11. Enclosure lid shall require no screws and make use of snap on features for attachment
12. Enclosure shall be made of high impact ABS plastic
13. Transmitter shall have LCD display
14. Basis of Design: Veris CDL

G. Air Pressure Transmitters.

1. Acceptable Manufacturers: Veris Industries
2. Sensor shall be microprocessor profiled ceramic capacitive sensing element
3. Transmitter shall have 14 selectable ranges from 0.1 – 10" WC
4. Transmitter shall be +/- 1% accurate in each selected range including linearity, repeatability, hysteresis, stability, and temperature compensation.
5. Transmitter shall be field configurable to mount on wall or duct with static probe
6. Transmitter shall be field selectable for Unidirectional or Bidirectional
7. Maximum operating pressure shall be 200% of design pressure.
8. Output shall be field selectable 4-20 mA or 0-5/0-10 VDC linear.
9. Transmitter shall accept 12-30 VDC or 24 VAC supply power
10. Response time shall be field selectable T95 in 20 sec or T95 in 2 sec
11. Transmitter shall have an LCD display
12. Units shall be field selectable for WC or PA
13. Transmitter shall have provision for zeroing by pushbutton or digital input.
14. Transmitter shall be available with a certification of NIST calibration

H. Liquid Differential Pressure Transmitters:

1. Acceptable Manufacturer: Veris Industries
2. Transmitter shall be microprocessor based
3. Transmitter shall use two independent gauge pressure sensors to measure and calculate differential pressure
4. Transmitter shall have 4 switch selectable ranges
5. Transmitter shall have test mode to produce full-scale output automatically.
6. Transmitter shall have provision for zeroing by pushbutton or digital input.
7. Transmitter shall have field selectable outputs of 0-5V, 0-10V, and 4-20mA.
8. Transmitter shall have field selectable electronic surge damping
9. Transmitter shall have an electronic port swap feature
10. Transmitter shall accept 12-30 VDC or 24 VAC supply power
11. Sensor shall be 17-4 PH stainless steel where it contacts the working fluid.
12. Performance:

a. Accuracy shall be ±1% F.S. and ±2% F.S. for lowest selectable range
b. Long term stability shall be ±0.25%
c. Sensor temperature operating range shall be -4° to 185°F
d. Operating environment shall be 14° to 131°F; 10-90% RH noncondensing
e. Proof pressure shall be 2x max. F.S. range
f. Burst pressure shall be 5x max. F.S. range

13. Transmitter shall be encased in a NEMA 4 enclosure
14. Enclosure shall be white powder-coated aluminum

15. Transmitter shall be available with a certification of NIST calibration

I. Current Sensors

1. Current status switches shall be used to monitor fans, pumps, motors and electrical loads. Current switches shall be available in split core models, and offer either a digital or an analog signal to the automation system. Acceptable manufacturer is Veris Industries

J. Current Status Switches for Constant Load Devices

1. Acceptable Manufacturer: Functional Devices
2. General: Factory programmed current sensor to detect motor undercurrent situations such as belt or coupling loss on constant loads. Sensor shall store motor current as operating parameter in non-volatile memory. Push-button to clear memory.
3. Visual LED indicator for status.
4. Split core sensor, induced powered from monitored load and isolated to 600 VAC rms. Sensor shall indicate status from 0.5 A to 175 A.
5. Normally open current sensor output. 0.1A at 30 VAC/DC.
6. Basis of Design: Veris Model H608.

K. Control Valves

1. Provide automatic control valves suitable for the specified controlled media (steam, water or glycol). Provide valves which mate and match the material of the connected piping. Equip control valves with the actuators of required input power type and control signal type to accurately position the flow control element and provide sufficient force to achieve required leakage specification.
2. Control valves shall meet the heating and cooling loads specified, and close off against the differential pressure conditions within the application. Valves should be sized to operate accurately and with stability from 10 to 100% of the maximum design flow.
3. Trim material shall be stainless steel for steam and high differential pressure applications.
4. Electric actuation should be provided on all terminal unit reheat applications unless electric heat is provided.

L. Dampers

1. Automatic dampers, furnished by the Building Automation Contractor shall be single or multiple blade as required. Dampers are to be installed by the HVAC Contractor under the supervision of the BAS Contractor. All blank-off plates and conversions necessary to install smaller than duct size dampers are the responsibility of the Sheet Metal Contractor.
2. Damper frames are to be constructed of 13 gauge galvanized sheet steel mechanically joined with linkage concealed in the side channel to eliminate noise as friction. Compressible spring stainless steel side seals and acetyl or bronze bearings shall also be provided.
3. Damper blade width shall not exceed eight inches. Seals and 3/8 inch square steel zinc plated pins are required. Blade rotation is to be parallel or opposed as shown on the schedules.
4. For high performance applications, control dampers will meet or exceed the UL Class I leakage rating.
5. Control and smoke dampers shall be Ruskin, or approved equal.

6. Provide opposed blade dampers for modulating applications and parallel blade for two position control.

M. Damper Actuators

1. Damper actuators shall be electronic, and shall be direct coupled over the shaft, without the need for connecting linkage. The actuator shall have electronic overload circuitry to prevent damage. For power-failure/safety applications, an internal mechanical, spring return mechanism shall be built into the actuator housing. Non-spring return actuators shall have an external manual gear release to allow positioning of the damper when the actuator is not powered.

N. Smoke Detectors

1. Air duct smoke detectors shall be by Air Products & Controls or approved equal. The detectors shall operate at air velocities from 300 feet per minute to 4000 feet per minute.
2. The smoke detector shall utilize a photoelectric detector head.
3. The housing shall permit mechanical installation without removal of the detector cover.
4. The detectors shall be listed by Underwriters Laboratories and meet the requirements of UL 268A.

Execution

2.6 Contractor Responsibilities

A. General

1. Installation of the building automation system shall be performed by the Contractor or a subcontractor. However, all installation shall be under the personal supervision of the Contractor. The Contractor shall certify all work as proper and complete. Under no circumstances shall the design, scheduling, coordination, programming, training, and warranty requirements for the project be delegated to a subcontractor.

B. Demolition

1. Remove controls which do not remain as part of the building automation system, all associated abandoned wiring and conduit, and all associated pneumatic tubing. The Owner will inform the Contractor of any equipment which is to be removed that will remain the property of the Owner. All other equipment which is removed will be disposed of by the Contractor.

C. Access to Site

1. Unless notified otherwise, entrance to building is restricted. No one will be permitted to enter the building unless their names have been cleared with the Owner or the Owner’s Representative.

D. Code Compliance

1. All wiring shall be installed in accordance with all applicable electrical codes and will comply with equipment manufacturer's recommendations. Should any discrepancy be found between wiring specifications in Division 17 and Division 16, wiring requirements of Division 17 will prevail for work specified in Division 17.

E. Cleanup

1. At the completion of the work, all equipment pertinent to this contract shall be checked and thoroughly cleaned, and all other areas shall be cleaned around equipment provided under this contract.

2.7 Hardware Installation

A. Installation Practices for Wiring
B. All controllers are to be mounted vertically and per the manufacturer's installation documentation.
C. The 120VAC power wiring to each Ethernet or Remote Site controller shall be a dedicated run, with a separate breaker. Each run will include a separate hot, neutral and ground wire. The ground wire will terminate at the breaker panel ground. This circuit will not feed any other circuit or device.
D. A true earth ground must be available in the building. Do not use a corroded or galvanized pipe, or structural steel.
E. Wires are to be attached to the building proper at regular intervals such that wiring does not droop. Wires are not to be affixed to or supported by pipes, conduit, etc.
F. Conduit in finished areas will be concealed in ceiling cavity spaces, plenums, furred spaces and wall construction. Exception; metallic surface raceway may be used in finished areas on masonry walls. All surface raceway in finished areas must be color matched to the existing finish within the limitations of standard manufactured colors.
G. Conduit, in non-finished areas where possible, will be concealed in ceiling cavity spaces, plenums, furred spaces, and wall construction. Exposed conduit will run parallel to or at right angles to the building structure.
H. Wires are to be kept a minimum of three (3) inches from hot water, steam, or condensate piping.
I. Where sensor wires leave the conduit system, they are to be protected by a plastic insert.
J. Wire will not be allowed to run across telephone equipment areas.

2.8 Installation Practices for Field Devices

A. Well-mounted sensors will include thermal conducting compound within the well to insure good heat transfer to the sensor.
B. Actuators will be firmly mounted to give positive movement and linkage will be adjusted to give smooth continuous movement throughout 100 percent of the stroke.
C. Relay outputs will include transient suppression across all coils. Suppression devices shall limit transients to 150% of the rated coil voltage.
D. Water line mounted sensors shall be removable without shutting down the system in which they are installed.
E. For duct static pressure sensors, the high pressure port shall be connected to a metal static pressure probe inserted into the duct pointing upstream. The low pressure port shall be left open to the plenum area at the point that the high pressure port is tapped into the ductwork.
F. For building static pressure sensors, the high pressure port shall be inserted into the space via a metal tube. Pipe the low pressure port to the outside of the building.

2.9 Enclosures

A. For all I/O requiring field interface devices, these devices where practical will be mounted in a field interface panel (FIP). The Contractor shall provide an enclosure which protects the device(s) from dust, moisture, conceals integral wiring and moving parts.
B. FIPs shall contain power supplies for sensors, interface relays and contactors, and safety circuits.
C. The FIP enclosure shall be of steel construction with baked enamel finish; NEMA 1 rated with a hinged door and keyed lock. The enclosure will be sized for twenty percent spare mounting space. All locks will be keyed identically.
D. All wiring to and from the FIP will be to screw type terminals. Analog or communications wiring may use the FIP as a raceway without terminating. The use of wire nuts within the FIP is prohibited.
E. All outside mounted enclosures shall meet the NEMA-4 rating.
F. The wiring within all enclosures shall be run in plastic track. Wiring within controllers shall be wrapped and secured.

2.10 Identification

A. Identify all control wires with labeling tape or sleeves using words, letters, or numbers that can be exactly cross-referenced with as-built drawings.
B. All field enclosures, other than controllers, shall be identified with a Bakelite nameplate. The lettering shall be in white against a black or blue background.
C. Junction box covers will be marked to indicate that they are a part of the BAS system.
D. All I/O field devices (except space sensors) that are not mounted within FIP's shall be identified with name plates.
E. All I/O field devices inside FIP's shall be labeled.

2.11 Control System Switch-over

A. Demolition of the existing control system will occur after the new temperature control system is in place including new sensors and new field interface devices.
B. Switch-over from the existing control system to the new system will be fully coordinated with the Owner. A representative of the Owner will be on site during switch-over.
C. The Contractor shall minimize control system downtime during switch-over. Sufficient installation mechanics will be on site so that the entire switch-over can be accomplished in a reasonable time frame.

2.12 Location

A. The location of sensors is per mechanical and architectural drawings.
B. Space humidity or temperature sensors will be mounted away from machinery generating heat, direct light and diffuser air streams.
C. Outdoor air sensors will be mounted on the north building face directly in the outside air. Install these sensors such that the effects of heat radiated from the building or sunlight is minimized.

D. Field enclosures shall be located immediately adjacent to the controller panel(s) to which it is being interfaced.

2.13 Software Installation

A. General.

1. The Contractor shall provide all labor necessary to install, initialize, start-up and debug all system software as described in this section. This includes any operating system software or other third party software necessary for successful operation of the system.
2.

2.14 Database Configuration.

A. The Contractor will provide all labor to configure those portions of the database that are required by the points list and sequence of operation.

B.

2.15 Color Graphic Displays.

A. Unless otherwise directed by the owner, the Contractor will provide color graphic displays as depicted in the mechanical drawings for each system and floor plan. For each system or floor plan, the display shall contain the associated points identified in the point list and allow for setpoint changes as required by the owner.

B.

2.16 Reports.

A. The Contractor will configure a minimum of 4 reports for the owner. These reports shall, at a minimum, be able to provide:

1. Trend comparison data
2. Alarm status and prevalence information
3. Energy Consumption data
4. System user data

2.17 Documentation

A. As built software documentation will include the following:

1. Descriptive point lists
2. Application program listing
3. Application programs with comments.
4. Printouts of all reports.
5. Alarm list.
6. Printouts of all graphics
7. Commissioning and System Startup
8.

2.18 Point to Point Checkout.

A. Each I/O device (both field mounted as well as those located in FIPs) shall be inspected and verified for proper installation and functionality. A checkout sheet itemizing each device shall be filled out, dated and approved by the Project Manager for submission to the owner or owner's representative.

2.19 Controller and Workstation Checkout.

A. A field checkout of all controllers and front end equipment (computers, printers, modems, etc.) shall be conducted to verify proper operation of both hardware and software. A checkout sheet itemizing each device and a description of the associated tests shall be prepared and submitted to the owner or owner's representative by the completion of the project.

2.20 System Acceptance Testing

A. All application software will be verified and compared against the sequences of operation.
    1. Geothermal loop water system
    2. Heat Pump Control
    3. Exhaust fan Control
B. Control loops will be exercised by inducing a setpoint shift of at least 10% and observing whether the system successfully returns the process variable to setpoint. Record all test results and attach to the Test Results Sheet.
C. Test each alarm in the system and validate that the system generates the appropriate alarm message, that the message appears at all prescribed destinations (workstations or printers), and that any other related actions occur as defined (i.e. graphic panels are invoked, reports are generated, etc.). Submit a Test Results Sheet to the owner.
D. Perform an operational test of each unique graphic display and report to verify that the item exists, that the appearance and content are correct, and that any special features work as intended. Submit a Test Results Sheet to the owner.
E. Perform an operational test of each third party interface that has been included as part of the automation system. Verify that all points are properly polled, that alarms have been configured, and that any associated graphics and reports have been completed. If the interface involves a file transfer over Ethernet, test any logic that controls the transmission of the file, and verify the content of the specified information.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hydronic system requirements.

B. Pipe hangers and supports.

C. Unions, flanges, mechanical couplings, and dielectric connections.

D. Valves:
   1. Ball valves.
   2. Butterfly valves.
   3. Check valves.

1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

B. Section 09 9123 - Interior Painting.

C. Section 22 0719 - Plumbing Piping Insulation.

D. Section 23 0548 - Vibration and Seismic Controls for HVAC Piping and Equipment.

E. Section 23 0719 - HVAC Piping Insulation.

F. Section 23 2114 - Hydronic Specialties.

G. Section 23 2500 - HVAC Water Treatment: Pipe cleaning.

1.03 REFERENCE STANDARDS

A. ASME B31.9 - Building Services Piping; 2014.

B. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 1992 (Reapproved 2008).

C. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications; 2007 (Reapproved 2013).

D. AWWA C606 - Grooved and Shouldered Joints; 2011.

E. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

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

B. Product Data:
   1. Include data on pipe materials, pipe fittings, valves, and accessories.
   2. Indicate valve data and ratings.

1.06 QUALITY ASSURANCE

A. Provide all grooved joint couplings, fittings, valves, specialties, and grooving tools from a single manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.08 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 HYDRONIC SYSTEM REQUIREMENTS

A. Comply with ASME B31.9 and applicable federal, state, and local regulations.

B. Piping: Provide piping, fittings, hangers and supports as required, as indicated, and as follows:
   1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
   2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
   3. Grooved mechanical joints may be used in accessible locations only.
      a. Accessible locations include those exposed on interior of building, in pipe chases, and in mechanical rooms, aboveground outdoors, and as approved by Architect.
      b. Use rigid joints unless otherwise indicated.
   4. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.

C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, unions, or grooved couplings to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.

D. Valves: Provide valves where indicated:
   1. For throttling, bypass, or manual flow control services, use globe, ball, or butterfly valves.
   2. In heating water, chilled water, or condenser water systems, butterfly valves may be used interchangeably with gate and globe valves.

2.02 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.

B. In grooved installations, use rigid couplings with offsetting angle-pattern bolt pads or with wedge shaped grooves in header piping to permit support and hanging in accordance with ASME B31.9.

2.03 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

A. Unions for Pipe 2 Inches and Less:

B. Flanges for Pipe 2 Inches and Greater:

C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
   1. Dimensions and Testing: In accordance with AWWA C606.
   2. Mechanical Couplings: Comply with ASTM F1476.
   3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
   4. When pipe is field grooved, provide coupling manufacturer's grooving tools.

2.04 BALL VALVES

A. Up To and Including 2 Inches:
   1. Bronze one piece body, chrome plated brass ball, teflon seats and stuffing box ring, lever handle with balancing stops, solder ends with union.

2.05 BUTTERFLY VALVES

A. Body: Cast or ductile iron with resilient replaceable EPDM seat, wafer, lug, or grooved ends, extended neck.

B. Disc: Construct of aluminum bronze, chrome plated ductile iron, stainless steel, ductile iron with EPDM encapsulation, or Buna-N encapsulation.

C. Operator: 10 position lever handle.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Prepare pipe for grooved mechanical joints as required by coupling manufacturer.

C. Remove scale and dirt on inside and outside before assembly.

D. Prepare piping connections to equipment using jointing system specified.

E. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

F. After completion, fill, clean, and treat systems. Refer to Section 23 2500 for additional requirements.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Route piping in orderly manner, parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and to avoid interfere with use of space.

D. Group piping whenever practical at common elevations.

E. Slope piping and arrange to drain at low points.

F. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9, ASTM F708, or MSS SP-58.
   2. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
   3. Place hangers within 12 inches of each horizontal elbow.
   4. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   5. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
   6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
   7. Provide copper plated hangers and supports for copper piping.
   8. Prime coat exposed steel hangers and supports. Refer to Section 09 9123. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 22 0719.

3.03 SCHEDULES

A. See piping material schedule on drawings

B. Hanger Spacing for Copper Tubing.
   1. 1/2 inch and 3/4 inch: Maximum span, 5 feet; minimum rod size, 1/4 inch.
   2. 1 inch: Maximum span, 6 feet; minimum rod size, 1/4 inch.
   3. 1-1/2 inch and 2 inch: Maximum span, 8 feet; minimum rod size, 3/8 inch.

C. Hanger Spacing for Steel Piping.

1. 1/2 inch, 3/4 inch, and 1 inch: Maximum span, 7 feet; minimum rod size, 1/4 inch.
2. 1-1/4 inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.
3. 1-1/2 inches: Maximum span, 9 feet; minimum rod size, 3/8 inch.
4. 2 inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.
5. 2-1/2 inches: Maximum span, 11 feet; minimum rod size, 3/8 inch.
6. 3 inches: Maximum span, 12 feet; minimum rod size, 3/8 inch.
7. 4 inches: Maximum span, 14 feet; minimum rod size, 1/2 inch.

D. Hanger Spacing for Plastic Piping.
1. 1/2 inch: Maximum span, 42 inches; minimum rod size, 1/4 inch.
2. 3/4 inch: Maximum span, 45 inches; minimum rod size, 1/4 inch.
3. 1 inch: Maximum span, 51 inches; minimum rod size, 1/4 inch.
4. 1-1/4 inches: Maximum span, 57 inches; minimum rod size, 3/8 inch.
5. 1-1/2 inches: Maximum span, 63 inches; minimum rod size, 3/8 inch.
6. 2 inches: Maximum span, 69 inches; minimum rod size, 3/8 inch.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Expansion tanks.
B. Air vents.
C. Air separators.
D. Strainers.
E. Suction diffusers.
F. Pressure-temperature test plugs.
G. Relief valves.
H. Pressure reducing valves.
I. Glycol system.

1.02 RELATED REQUIREMENTS

A. Section 23 2113 - Hydronic Piping.
B. Section 23 2500 - HVAC Water Treatment: Pipe Cleaning .

1.03 REFERENCE STANDARDS

A. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; 2015.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description, model and dimensions.
C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
    1. See Section 01 6000 - Product Requirements, for additional provisions.
    2. Extra Glycol Solution: One container, 10 gallon size.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 SEE SECTION 01 6000 FOR ADDITIONAL REQUIREMENTS.

2.02 EXPANSION TANKS

A. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, rated for working pressure of 125 psi, with flexible EPDM diaphragm or bladder sealed into tank, and steel support stand.

B. Accessories: Pressure gage and air-charging fitting, tank drain; precharge to 12 psi.

C. Automatic Cold Water Fill Assembly: Pressure reducing valve, reduced pressure double check back flow preventer, test cocks, strainer, vacuum breaker, and valved by-pass.

2.03 AIR VENTS

A. Manual Type: Short vertical sections of 2 inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.

B. Float Type:
   1. Cast iron body and cover, float, bronze pilot valve mechanism suitable for system operating temperature and pressure; with isolating valve.

2.04 AIR SEPARATORS

A. Centrifugal Air Separators/Strainers:
   1. Steel, tested and stamped in accordance with ASME BPVC-VIII-1; for 125 psi operating pressure, with integral bronze strainer, tangential inlet and outlet connections, and internal stainless steel air collector tube.

2.05 STRAINERS

A. See flow diagram on drawings.

2.06 SUCTION DIFFUSERS

A. See flow diagram on drawings.

B. Fitting: Angle pattern, cast-iron body, threaded for 2 inch and smaller, flanged for 2-1/2 inch and larger, rated for 175 psi working pressure, with inlet vanes, cylinder strainer with 3/16 inch diameter openings, disposable 5/32 inch mesh strainer to fit over cylinder strainer, 20 mesh start up screen, and permanent magnet located in flow stream and removable for cleaning.

2.07 PRESSURE-TEMPERATURE TEST PLUGS

A. Construction: Brass body designed to receive temperature or pressure probe with removable protective cap, and Neoprene rated for minimum 200 degrees F.

B. Application: Use extended length plugs to clear insulated piping.

2.08 RELIEF VALVES

A. Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

2.09 PRESSURE REDUCING VALVES

A. Operation: Automatically feeds make-up water to the hydronic system whenever pressure in the system drops below the pressure setting of the valve. Refer to Section 23 2113.

B. Materials of Construction:
   1. Valve Body: Constructed of bronze, cast iron, brass, or iron.
   2. Internal Components: Construct of stainless steel or brass and engineered plastics or composition material.

C. Connections:
   1. NPT threaded: 0.50 inch, or 0.75 inch.
   2. Soldered: 0.50 inch.

D. Provide integral check valve and strainer.

E. Maximum Inlet Pressure: 100 psi.

F. Maximum Fluid Temperature: 180 degrees F.

G. Operating Pressure Range: Between 10 psi and 25 psi.

2.10 GLYCOL SYSTEM

A. See flow diagram on drawings.

2.11 SEE DRAWINGS

A. Glycol Solution:

1. Inhibited propylene glycol and water solution mixed [15] percent glycol - [85] percent water. Add other chemical inhibators to protect system piping and componates as needed.

PART 3 EXECUTION

3.01 INSTALLATION

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

B. Where large air quantities can accumulate, provide enlarged air collection standpipes.

C. Provide manual air vents at system high points and as indicated.

D. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.

E. Provide air separator on suction side of system circulation pump and connect to expansion tank.

F. Provide valved drain and hose connection on strainer blow down connection.

G. Clean and flush glycol system before adding glycol solution. Refer to Section 23 2500.

H. Feed glycol solution to system through make-up line with pressure regulator, venting system high points. Set to fill at 12 psi and fill system to 30 psi

I. Perform tests determining strength of glycol and water solution and submit written test results. Add chemical inhibators to protect system piping and componates as needed.

3.02 MAINTENANCE

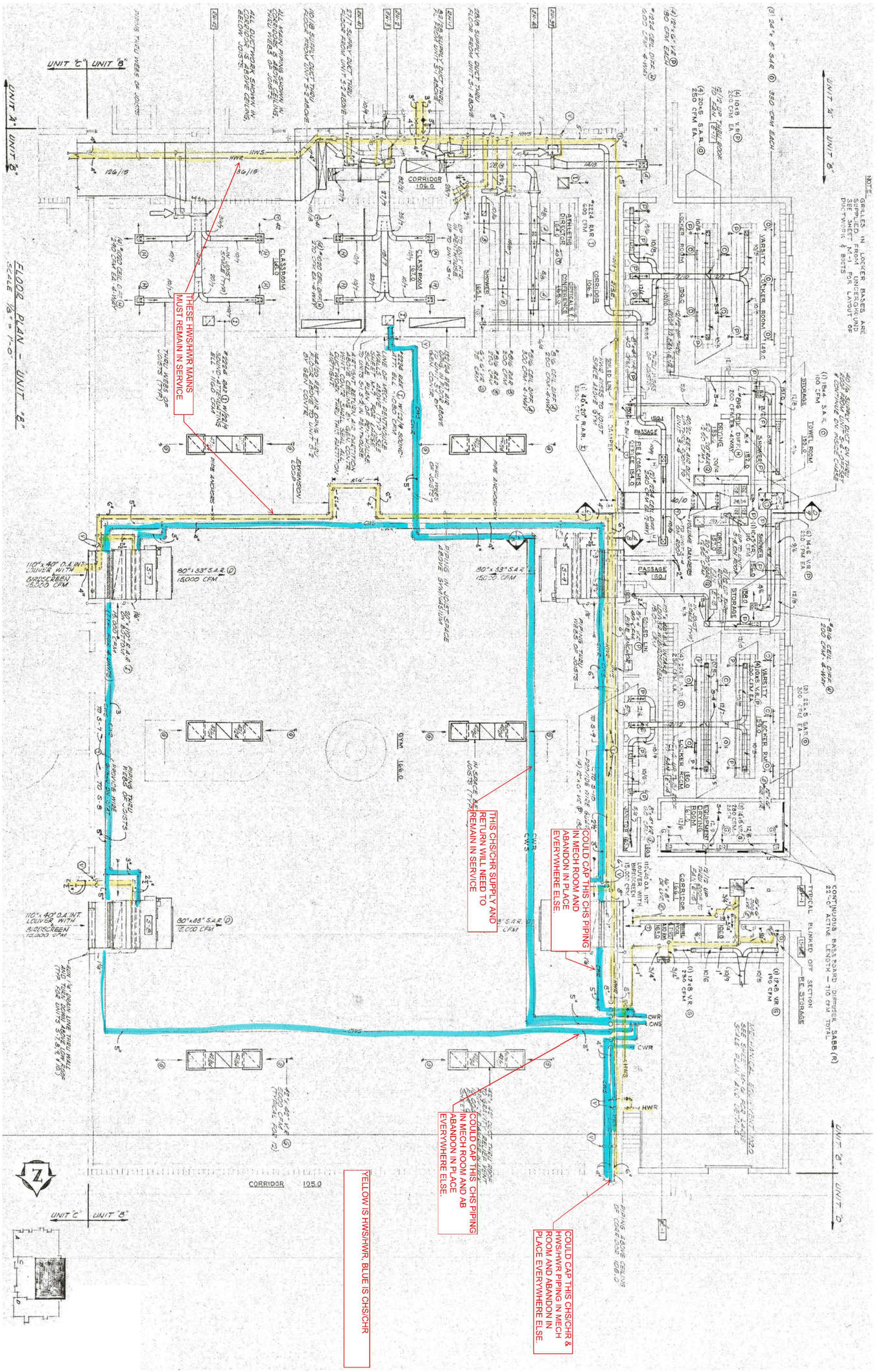
A. See Section 01 7000 - Execution Requirements, for additional requirements relating to maintenance service.

B. Provide service and maintenance of glycol system for one year from date of Substantial Completion at no extra charge to Owner.

C. Perform monthly visits to make glycol fluid concentration analysis on site with refractive index measurement instrument. Report findings in detail in writing, including analysis and amounts of glycol or water added.

D. Explain corrective actions to Owner's maintenance personnel in person.

END OF SECTION



23 21 20 - 1 EXISTING PIPE SCHEMATICS - REMOVE/REMAIN A/E #23152318

REVISIONS		
NO.	DATE	REMARKS

KJHS RENOVATION / GEOTHERMAL

at 303 Kingsley Street - Normal, IL 61761

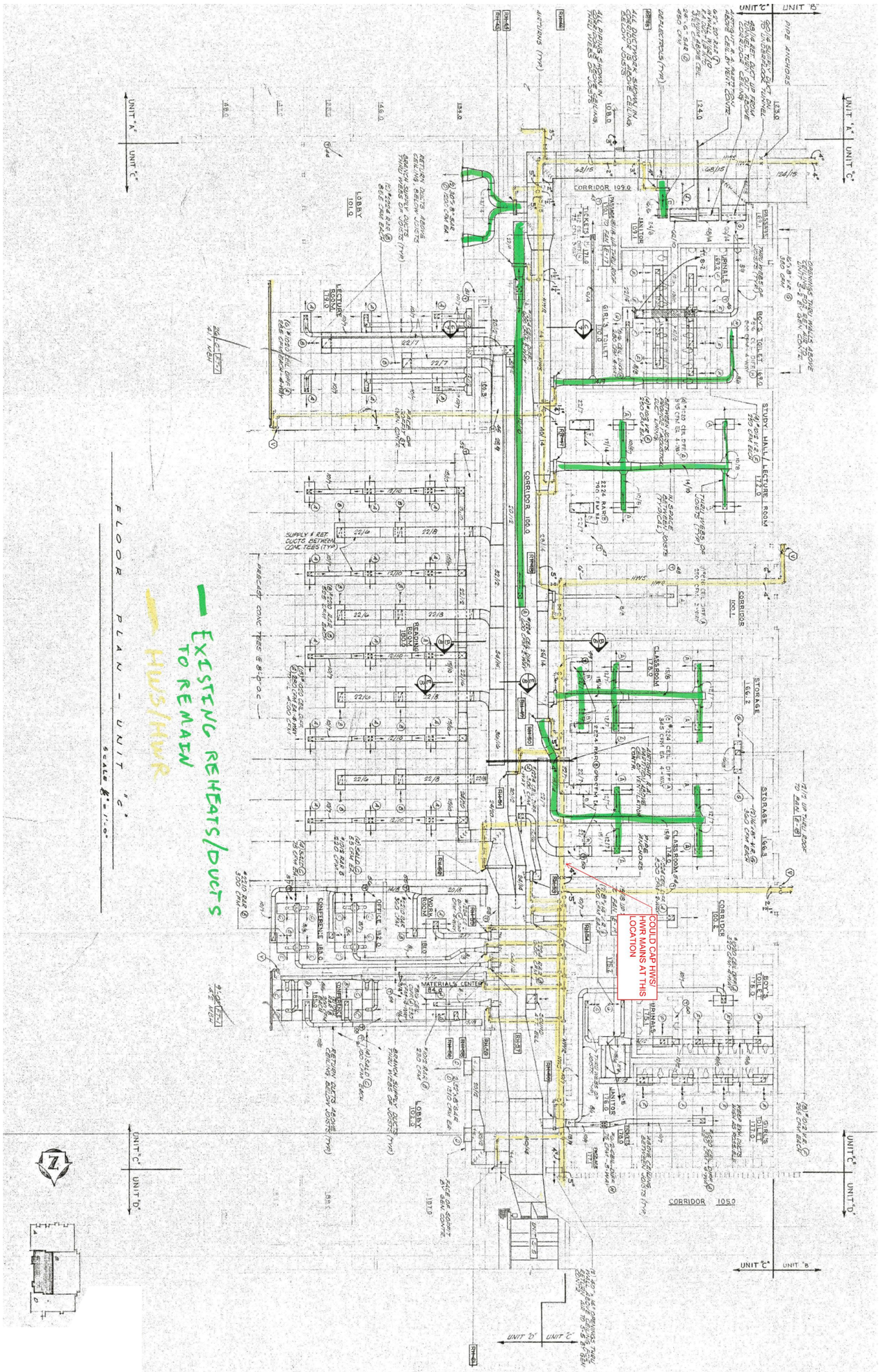
MIDDLETON ASSOCIATES · INC ARCHITECTS
1702 W. College Ave.
Suite E
Normal, IL 61761-2793
p: 309.452.1271
f: 309.454.8049
middletonassociates.net

PROJECT NO. 23152318

ISSUE DATE JANUARY 14, 2020

SHEET M5.1

OF 5 SHEETS



23 21 20 - 2 EXISTING PIPE SCHEMATICS - REMOVE/REMAIN

A/E #23152318

REVISIONS		
NO.	DATE	REMARKS

KJHS RENOVATION / GEOTHERMAL

at 303 Kingsley Street - Normal, IL 61761

MIDDLETON ASSOCIATES · INC ARCHITECTS

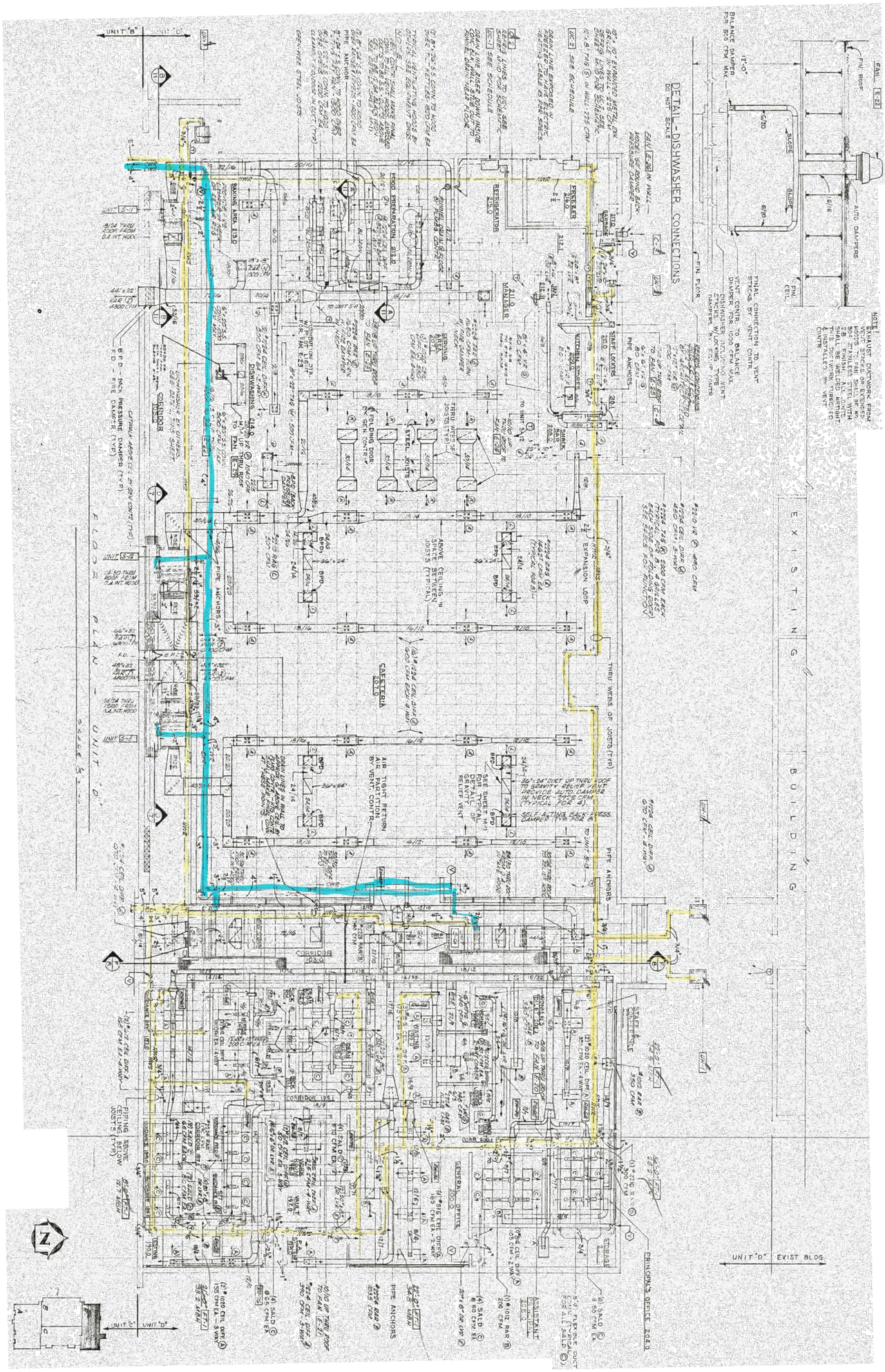
1702 W. College Ave.
Suite E
Normal, IL 61761-2793
p: 309.452.1271
f: 309.454.8049
middletonassociates.net

PROJECT NO. 23152318

ISSUE DATE JANUARY 14, 2020

SHEET M5.2

OF 5 SHEETS



23 21 20 - 3 EXISTING PIPE SCHEMATICS - REMOVE/REMAIN

A/E #23152318

REVISIONS		
NO.	DATE	REMARKS

KJHS RENOVATION / GEOTHERMAL

at 303 Kingsley Street - Normal, IL 61761

MIDDLETON ASSOCIATES · INC ARCHITECTS

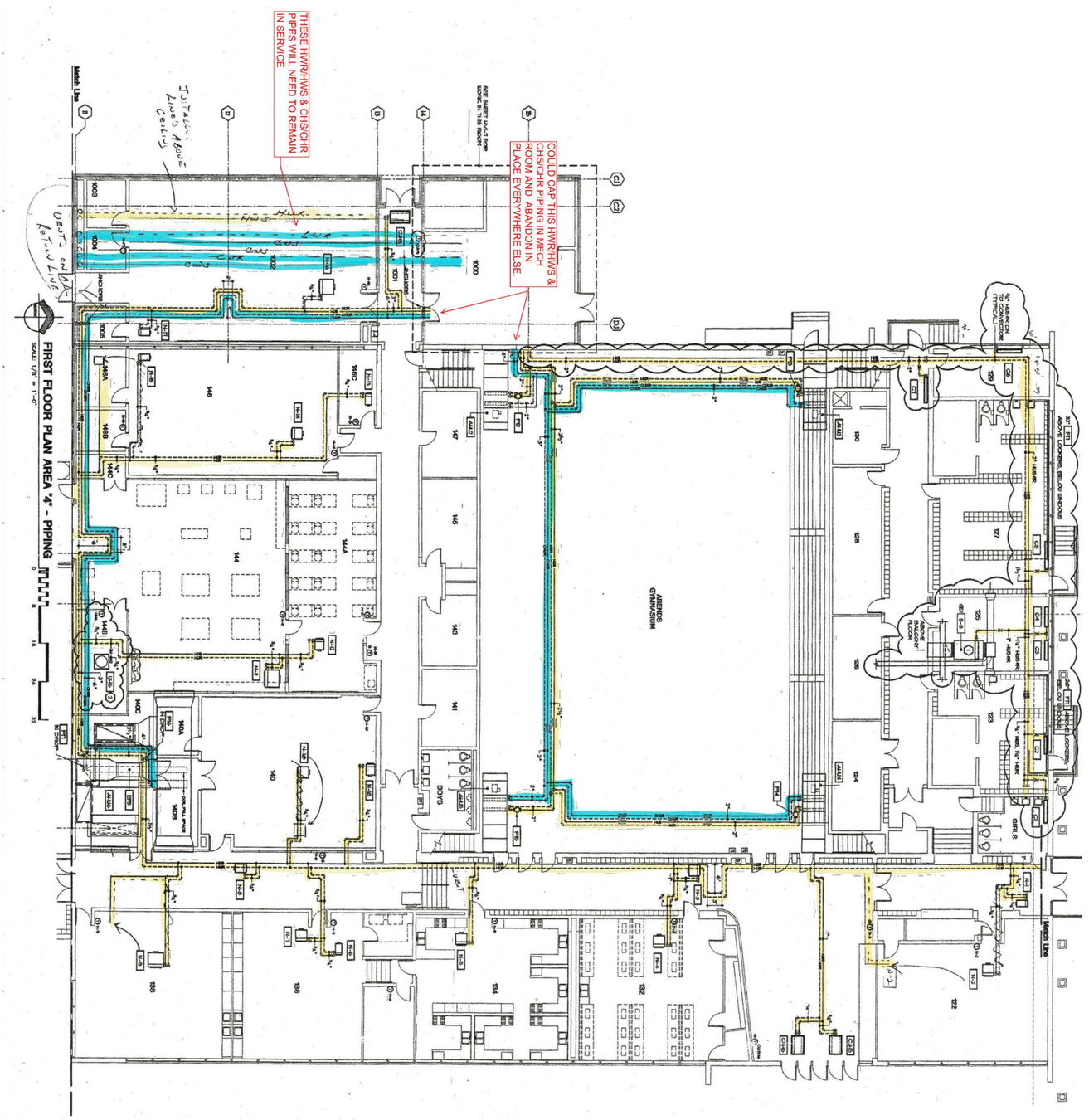
1702 W. College Ave.
Suite E
Normal, IL 61761-2793
p: 309.452.1271
f: 309.454.8049
middletonassociates.net

PROJECT NO. 23152318

ISSUE DATE JANUARY 14, 2020

SHEET M5.3

OF 5 SHEETS



23 21 20 - 4 EXISTING PIPE SCHEMATICS - REMOVE/REMAIN

A/E #23152318

REVISIONS		
NO.	DATE	REMARKS

KJHS RENOVATION / GEOTHERMAL

at 303 Kingsley Street - Normal, IL 61761

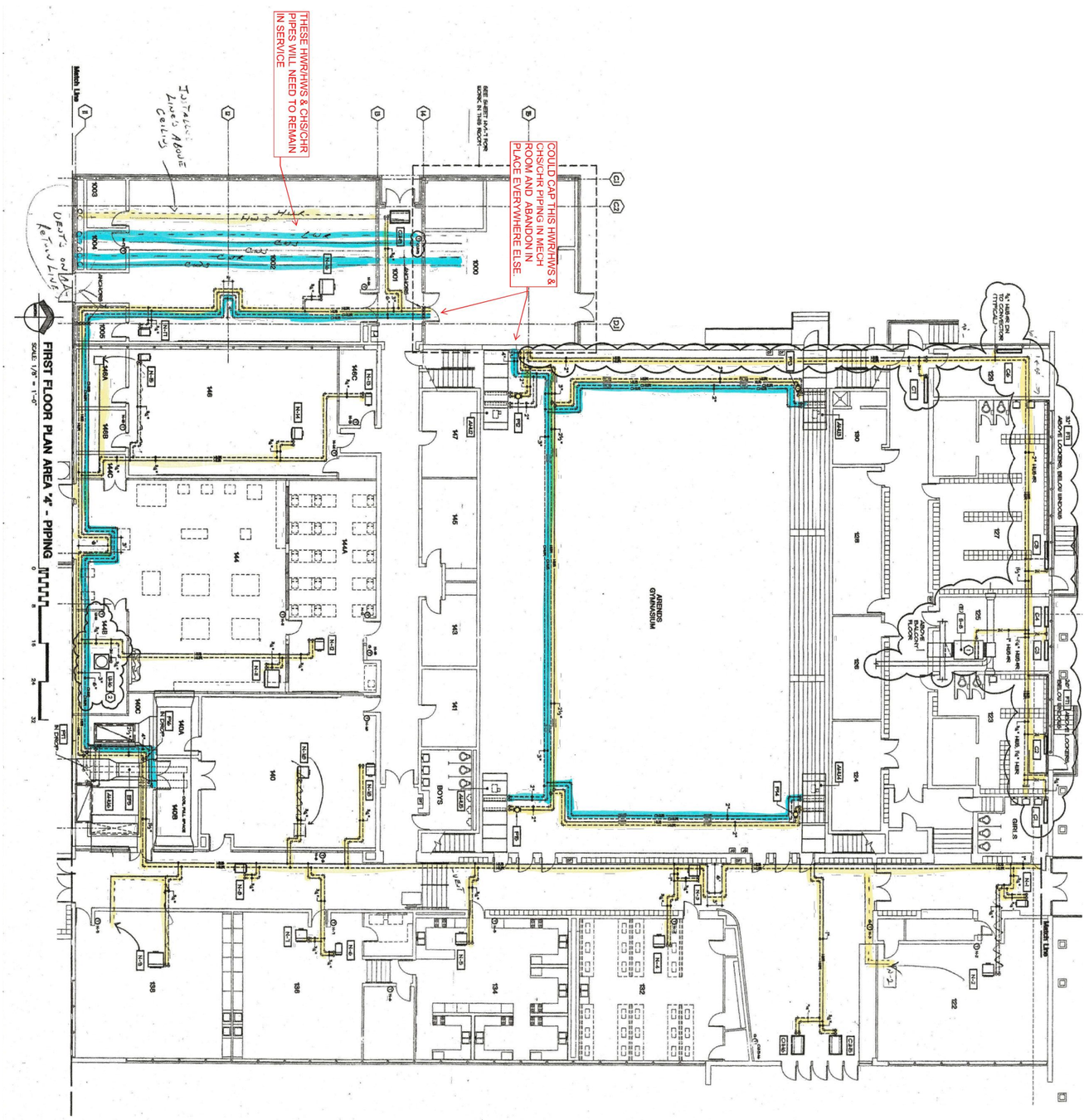
MIDDLETON ASSOCIATES · INC ARCHITECTS
1702 W. College Ave.
Suite E
Normal, IL 61761-2793
p: 309.452.1271
f: 309.454.8049
middletonassociates.net

PROJECT NO. 23152318

ISSUE DATE JANUARY 14, 2020

SHEET M5.4

OF 5 SHEETS



23 21 20 - 4 EXISTING PIPE SCHEMATICS - REMOVE/REMAIN

A/E #23152318

REVISIONS		
NO.	DATE	REMARKS

KJHS RENOVATION / GEOTHERMAL

at 303 Kingsley Street - Normal, IL 61761

MIDDLETON ASSOCIATES · INC ARCHITECTS
1702 W. College Ave.
Suite E
Normal, IL 61761-2793
p: 309.452.1271
f: 309.454.8049
middletonassociates.net

PROJECT NO. 23152318

ISSUE DATE JANUARY 14, 2020

SHEET M5.5

OF 5 SHEETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor for this work is referred to the Drawings, Bidding Requirements, General Conditions, Special Conditions, Temporary Services and other pertinent Sections of these Specifications. These sections describe work which is a part of this Contract. The following General Provisions amplify and supplement these Sections of Specifications. In cases of conflicting requirements, the stipulations set forth in Division 1 supersede and must be satisfied by the Contractor.

1.2 SUMMARY

A. Section Includes:

1. Electrical equipment coordination and installation.
2. Common electrical installation requirements.

1.3 COORDINATION

A. Contractor must read the entire Specifications covering other branches of Work. Contractor is responsible for coordination of his (her) work with work performed by other trades.

B. Consult all Contract Documents which may affect the location of any equipment or apparatus furnished under this Work and make minor adjustments in location as necessary to secure coordination.

C. System layout is schematic and exact locations shall be determined by structural and other conditions. This shall not be construed to mean that the design of the system may be arbitrarily changed. The equipment layout is to fit into the building as constructed and to coordinate with equipment included under other Divisions of Work.

D. Contractor shall contact the Owner's Representative immediately if he (she) notices any discrepancies or omissions in either the Drawings or Specifications, or if there are any questions regarding the meaning or intent thereof.

E. Submit all changes, other than minor adjustments, to the Engineer/Architect for approval before proceeding with the work.

F. The Contractor is required to visit the site and fully familiarize himself or herself concerning all conditions affecting the scope of work. Failure to visit the site shall not relieve the Contractor from any responsibility in the performance of his or her Work.

G. All workmanship to be of the highest quality in accordance with the best practices of the trade by craftsmen/ craftswomen skilled in this particular work.

H. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

I. All buried conduits passing from below the proposed building to the exterior shall pass below the proposed structural footing.

J. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.

K. Coordinate sleeve selection and application with selection and application of firestopping.

L. Where thermostat locations are shown, the electrical contractor shall provide a recessed wall box with conduit to an accessible location. Thermostat installation and the corresponding low voltage thermostat wiring shall be by the mechanical contractor.

1.4 PERMITS, INSPECTIONS AND CODES

A. File all drawings, pay all fees, and obtain permits and certificate of inspection relative to this Work.

B. Complete installation shall conform with all applicable Federal, State and Local laws, Codes and Ordinances including, but not limited to the latest approved editions of the following:

1. State Building Codes.
2. Specific Construction Safety Requirements, State Industrial Commission.
3. National Electrical Code (NFPA-70).
4. Life Safety Code, NFPA-101.
5. Occupational Safety and Health Act (OSHA) of 1971 and all amendments thereto.

C. Nothing contained in the drawings and specifications shall be construed to conflict with these laws, codes, and ordinances and they are hereby included in these specifications.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Furnish new, undeteriorated materials of a quality not less than what is specified.

B. Contractor to furnish and install only those brands of equipment mentioned specifically or accepted as substitutes.

2.2 EQUIPMENT SELECTION AND APPROVAL

A. The selection of materials and equipment to be furnished shall be governed by the following:

1. Where trade names, brands of manufacturer of equipment or materials are listed in the specification, the exact equipment listed shall be used in the bid or the contractor shall submit the necessary literature to show the alternative product meets the performance characteristics of that which has been called for. Where more than one name is listed, Contractor may select any one of the various brands specified.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Furnish all materials, labor, tools, transportation, incidentals, and appurtenances to complete in every detail and leave in working order all items of work called for herein or shown on the accompanying Drawings.

B. Include any minor items of work necessary to provide a complete and fully operative electrical system which meets all required codes.

C. Comply with NECA 1.

D. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

E. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

F. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

G. Right of Way: Give to piping systems installed at a required slope.

3.2 PROTECTION AND CLEANING

A. Protect all fixtures and equipment against damage from leaks or abuse and pay the cost of repair or replacement of fixtures or equipment made necessary by failure to provide suitable safeguards or protection.

B. After all fixtures and equipment have been set, thoroughly clean all fixtures and equipment with manufacturers recommended cleaning agents, removing stickers and other foreign matter and leave every part in acceptable condition, clean and ready for use.

C. Repair all dents and scratches in factory prime or finish coats on all electrical equipment. If damage is excessive, replacement may be required.

END OF SECTION 260500

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

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.

PART 2 - PRODUCTS

2.1 STANDARDS

A. Insulation types, ratings and usage shall be in accordance with the National Electrical Code requirements.

B. All conductors shall be copper

C. Unless otherwise noted , minimum wire size for lighting and power branch circuits shall be No. 12 AWG. For control and auxiliary systems the minimum size shall be No. 14 AWG.

D. Conductors for emergency power and exit wiring shall be a minimum No. 12 AWG.

2.2 CONDUCTORS AND CABLES

A. All wire and cable shall be UL listed.

B. Copper Conductors: Comply with NEMA WC 70.

C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN, XHHW, and SO.

1. THHN-THWN- 90 degree C temperature rating in dry or wet locations.

D. Multiconductor Cable: Comply with NEMA WC 70 for metal clad cable, Type MC and Type SO with ground wire.

2.3 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

B. All components used at wiring terminations, connections and splices shall be UL listed.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN-THWN, single conductors in raceway or Type XHHW, single conductors in raceway.

B. Feeders and Branch Circuits: Type THHN-THWN, single conductors in raceway.

C. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

D. Concealed light fixture whips: Metal clad cable (Type MC) limited to six feet in length.

E. Class 1 Control Circuits: Type THHN-THWN, in raceway.

F. Class 2 Control Circuits: Power-limited cable, concealed in building finishes.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

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. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

F. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Use oxide inhibitor in each splice, tap conductor and equipment termination for aluminum conductors.

G. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

END OF SECTION 260519

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes methods and materials for grounding systems and equipment.

B. Grounding system shall be in compliance with all requirements of the National Electrical Code.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

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 UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Rectangular bars of annealed copper, 1/4 by 2 inches in cross section, unless otherwise indicated; with insulators.

2.2 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 5/8 inch in diameter by10 feet or as noted on the Drawings.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned copper conductor. Bury at least 24 inches below grade.

C. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus on insulated spacers 1 inch, minimum, from wall 6 inches above finished floor, unless otherwise indicated.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

A. A separate equipment grounding conductor, minimum size per NEC, shall be installed in each feeder, branch circuit, and control circuit conduit. Conductor insulation shall be green. DO NOT use conduit as a means for grounding of receptacles or any other such devices.

B. Conduit system shall be electrically continuous. All enclosures and non-current carrying metals to be grounded. All locknuts must cut through enameled or painted surfaces on enclosures.

Where enclosures and non-current carrying metals are isolated from the conduit system, use bonding jumpers with approved clamps.

C. All new receptacles shall be bonded to a ground conductor using a #12 AEG min. bonding jumper between receptacle terminal and ground conductor. Metal-to-metal contact between the device yoke and the outlet box is not acceptable for either surface mounted boxes or flush type boxes.

D. Junction boxes and pull boxes shall be bonded by the use of UL listed ground screws or lugs.

E. Lighting fixtures shall be grounded by the use of a pigtail fastened on bare metal that is free of paint.

F. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

G. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

H. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

I. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.

2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

D. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

E. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

END OF SECTION 260526

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Hangers and supports for electrical equipment and systems.

1.2 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Aluminum Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
2. 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 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. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
2. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
3. Toggle Bolts: All-steel springhead type.
4. 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 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.

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, 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 Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
2. To Light Steel: Sheet metal screws.
3. 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.

F. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

END OF SECTION 260529

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.2 SUBMITTALS

A. Product Data: For surface raceways and floor boxes.

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.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit: ANSI C80.1.

B. EMT: ANSI C80.3.

C. FMC: Zinc-coated steel.

D. LFMC: Flexible steel conduit with PVC jacket.

E. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Fittings for EMT: Steel, set-screw or compression type. Die cast fittings are not acceptable.

F. LFMC: Flexible steel conduit with PVC jacket. Made from a continuous length of galvanized cold rolled steel strip, spirally wound. Adjacent strips shall have locked typed construction with all the edges turned in. With an extruded PVC jacket.

2.2 NONMETALLIC CONDUIT AND TUBING

A. PVC conduit shall be heavy wall, Schedule 40 ultra-violet resistant, UL listed under Standard 651. Conduit shall be suitable for use with 90 degree C insulated wire. Conduit fittings and cement shall be of the same manufacturer.

B. Fittings for Schedule 40 PVC: Match to conduit or tubing type and material.

2.3 METAL WIREWAYS

A. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise indicated.

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. Wireway Covers: Screw-cover type.

D. Finish: Manufacturer's standard enamel finish.

2.4 BOXES AND ENCLOSURES

A. Sheet Metal Outlet and Device Boxes: NEMA OS 1,

B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

C. Metal Floor Boxes: Cast metal, fully adjustable, rectangular.

D. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

E. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

2.5 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. Description: Comply with SCTE 77.

1. Color of Frame and Cover: Green.

2. Configuration: Units shall be designed for flush burial and have open bottom, unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, "ELECTRIC.", "TELEPHONE.", “COMMUNICATIONS as appropriate for services contained.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or a combination of the two.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: Rigid Steel Conduit.
2. Concealed Conduit: EMT.
3. Underground Conduit: Schedule 40 PVC, direct buried.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. All other exposed areas: RMC.
3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC
5. Damp or Wet Locations: RMC.
6. Raceways for Optical Fiber or Communications Cable: EMT.
7. Boxes and Enclosures: NEMA 250, Type 1, except as noted on the Drawings.

C. Minimum Raceway Size: 3/4-inch trade size Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. In finished areas, conduit must be concealed above accessible ceilings, within the building structure, or within chases. Exposed conduits to be run tight to wall or ceiling and installed in a neat workmanlike manner, ready for painting.

C. Install conduit parallel or perpendicular to building lines (except where run in or below floor slabs). Keep conduit runs as closed to underside of structure as possible.

D. Exercise necessary precautions to prevent accumulation of water, dirt, or concrete in conduits during execution of electrical work. Conduit in which water or foreign material has been permitted to accumulate shall be thoroughly cleaned, or replaced where such accumulations cannot be removed.

E. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

F. Complete raceway installation before starting conductor installation.

G. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

H. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

I. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

J. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.

3. Change from ENT rigid steel conduit before rising above the floor.

K. Raceways below slabs:

1. Minimum conduit size shall be 1”.
2. Change from PVC conduit to rigid steel conduit before rising above floor.

L. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 240-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

M. Raceways for Optical Fiber and Communications Cable: Install as follows:

1. 3/4-Inch Trade Size and Smaller: Install raceways in maximum lengths of 50 feet.
2. 1-Inch Trade Size and Larger: Install raceways in maximum lengths of 75 feet.
3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

N. Covers for all junction boxes containing emergency circuits shall be red.

O. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semi-recessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

P. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

1. Wall boxes in tile, marble, brick or other finished masonry wall shall be of welded construction and designed for installation within masonry.

Q. Weather-proof boxes shall be die cast aluminum.

R. Boxes for exposed work in finished area to be Type FS with threaded hubs and rigid conduit risers.

S. Install expansion fittings at all locations where conduits cross building expansion joints.

T. Secure rigid conduit at cabinets and boxes using insulated throat type grounding and bonding bushings. Locknuts shall be tightened to cut through painted surfaces.

U. Where a number of conduits are to be run exposed and parallel, one with another, they shall be grouped and supported by trapeze hangers or unistrut racks tight to the building structure.

V. Mount junction and pull boxes securely to building structure in a location that meets the requirements of the National Electrical Code for accessibility and work space clearance. Coordinate exact locations of work with other trades. Unless noted otherwise, mounting heights shall be (all measurements are to the top of the box):

Switches, receptacles, or telephone/data shown above a countertop	12" above countertop
Dedicated receptacles (i.e. refrigerator, microwave, etc.)	To suit equipment (see equipment/cabinetry elevation drawings where applicable)
Other interior receptacles	16" AFF
Exterior receptacles	20" above finished grade
Other switches	48" AFF
Telephone/data shown next to a doorway	56" AFF
Other telephone/data	16" AFF

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit (not concrete encased):

1. Install direct buried conduit according to Division 31 requirements for conduit installation.
2. Absent Division 31 requirements or if the following is more stringent, install direct buried conduit as follows:

a. Excavate by open cut unless otherwise directed on the Drawings.
b. Excavate to the depths necessary to provide at least the NEC required minimum burial depths upon project completion.
c. Over-excavate organic, soft, spongy, or otherwise unsuitable soils found at or below the bottom of the trench to meet firm subsoil.
d. Trenches in non-pavement and non structure areas:

1) After installing conduit, backfill and compact utilizing native backfill material. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction leaving a mound on the surface to accommodate future settling.

e. Trenches under pavement or structures and within 5'-0" of same:

1) After installing conduit, backfill with compacted aggregate to 95% standard proctor density in 8" maximum lifts. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling.

3. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

   a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.
   b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

4. Warning Planks: Bury warning tape approximately 12 inches (300 mm) above direct-buried conduits (600 mm).

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.

3.5 FIRESTOPPING

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

END OF SECTION 260533

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Identification for conductors and communication and control cable.
2. Data/Telephone outlet labels
3. Receptacle labels
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.2 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, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

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 Tape: Vinyl or vinyl -cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.2 RECEPTACLE LABELS

A. Hot stamped or engraved machine printing with black filled lettering on face of plate and durable wire markers on inside of outlet box.

2.3 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. Color Scheme

1. Emergency Warning labels: White background with red letters
2. All other warning labels: Yellow background with black letters

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."
3. Service Equipment emergency sources warning: “CAUTION – TWO SOURCES OF SUPPLY- EMERGENCY POWER SOURCE LOCATED IN GENERATOR ROOM 207 ON NORTH SIDE OF BUILDING.”
4. Automatic Transfer Switch Warning Label: “EMERGENCY TRANSFER SWITCH”
5. As noted on drawings.

2.4 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. (White letters on red background for emergency information)
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.5 EQUIPMENT IDENTIFICATION LABELS

A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for fasteners, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

B. Fasteners for Labels: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

B. Covers for all junction boxes containing emergency circuits shall be red.

PART 3 - EXECUTION

3.1 APPLICATION

A. Auxiliary Electrical Systems Conductor and Cable Identification: Use marker tape to identify field-installed alarm, control, signal, sound, intercommunications, voice, and data wiring connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and cable pull points. Identify by system and circuit designation.
2. Use system of designations that is uniform and consistent with system used by manufacturer for factory-installed connections.

B. Receptacle Identification: Use labels to identify panelboard and circuit number from which served. Label face of plate and wire markers inside of box,

C. 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.

D. Instruction Signs:

1. 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 emergency shut down of generator or remote operation of main switch.

E. 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, drilled for screw attachment. 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, drilled for screw attachment.
    c. Elevated Components: Increase sizes of labels and legend to those appropriate for viewing from the floor.

2. Equipment to Be Labeled:

    a. Panelboards, electrical cabinets, and enclosures.
    b. Electrical switchgear and switchboards.
    c. Disconnect switches.
    d. Contactors.
    e. Motor control switches including Hand/Off/Auto switches

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 non-adhesive 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 feeder, and branch-circuit conductors.

1. Color shall be factory applied or for sizes larger than No. 10 AWG 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.

G. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.

END OF SECTION 260553

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 computer-based, fault-current, overcurrent protective device coordination, and arc flash hazard studies. .

B. The fault current study shall be completed prior to ordering equipment to verify the adequacy of the equipment to meet the available fault current conditions.

C. Protective devices shall be set based on results of the protective device coordination study.

D. Arc flash warning labels shall be installed on equipment based on the results of the arc flash hazard study.

1.3 SUBMITTALS

A. Study Reports: Submit (3) hard copies and a digital copy of each report.

1. Coordination-study input data, including completed computer program input data sheets.
2. Study and Equipment Evaluation Reports.
3. Coordination-Study Report.
4. Arc flash hazard report

1.4 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are not acceptable.

B. Coordination-Study Specialist Qualifications: An entity experienced in the application of computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

C. Comply with IEEE 242 for short-circuit currents and coordination time intervals.

D. Comply with IEEE 399 for general study procedures.

E. Comply with IEEE 1584 and NFPA 70E for arc flash hazard calculations

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE PROGRAM REQUIREMENTS

A. Comply with IEEE 399 and IEEE1584.

B. Analytical features of fault-current-study computer software program shall include "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

C. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.

PART 3 - EXECUTION

3.1 POWER SYSTEM DATA

A. Gather and tabulate the following input data to support coordination study:

1. Product Data for overcurrent protective devices specified in other Division 26 Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Impedance of utility service entrance.
3. Electrical Distribution System Diagram: In hard-copy and electronic-copy formats, showing the following:

    a. Circuit-breaker and fuse-current ratings and types.
    b. Relays and associated power and current transformer ratings and ratios.
    c. Transformer kilovolt amperes, primary and secondary voltages, connection type, impedance, and X/R ratios.
    d. Generator kilovolt amperes, size, voltage, and source impedance.
    e. Cables: Indicate conduit material, sizes of conductors, conductor material, insulation, and length.
    f. Busway ampacity and impedance.
    g. Motor horsepower and code letter designation according to NEMA MG 1.

4. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram, showing the following:

    a. Special load considerations, including starting inrush currents and frequent starting and stopping.
    b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
    c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
    d. Generator thermal-damage curve.
    e. Ratings, types, and settings of utility company's overcurrent protective devices.

f. Special overcurrent protective device settings or types stipulated by utility company.
g. Time-current-characteristic curves of devices indicated to be coordinated.
h. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
j. Panelboards, switchboards, motor-control center ampacity, and interrupting rating in amperes rms symmetrical.

3.2 FAULT-CURRENT STUDY

A. Calculate the maximum available short-circuit current in amperes rms symmetrical at circuit-breaker positions of the electrical power distribution system. The calculation shall be for a current immediately after initiation and for a three-phase bolted short circuit at each of the following:

1. Electric utility's supply termination point
2. Main switchboard
3. Generators and transfer switches
4. Distribution panelboard.
5. Branch circuit panelboard.
6. Local motor disconnect

B. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Include studies of system-switching configurations and alternate operations that could result in maximum fault conditions.

C. Calculate momentary and interrupting duties on the basis of maximum available fault current.

D. Calculations to verify interrupting ratings of overcurrent protective devices shall comply with IEEE 241 and IEEE 242.

1. Transformers:

a. ANSI C57.12.22.
b. IEEE C57.12.00.
c. IEEE C57.96.

2. Low-Voltage Circuit Breakers: IEEE 1015 and IEEE C37.20.1.
3. Low-Voltage Fuses: IEEE C37.46.

E. Study Report:

1. Show calculated X/R ratios and equipment interrupting rating (1/2-cycle) fault currents on electrical distribution system diagram.

F. Equipment Evaluation Report:

1. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
2. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.
3. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
4. Equipment evaluation report shall be completed prior to ordering electrical equipment and devices to ensure that the interrupting ratings of the equipment are sufficient for the available fault currents.

3.3 COORDINATION STUDY

A. Perform coordination study using approved computer software program. Prepare a written report using results of fault-current study. Comply with IEEE 399.

1. Calculate the maximum and minimum 1/2-cycle short-circuit currents.

B. Comply with IEEE 241 recommendations for fault currents and time intervals.

C. Transformer Primary Overcurrent Protective Devices:

1. Device shall not operate in response to the following:

a. Inrush current when first energized.
b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.

2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

D. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and conductor melting curves in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

E. Coordination-Study Report: Prepare a written report indicating the following results of coordination study:

1. Tabular Format of Settings Selected for Overcurrent Protective Devices:

a. Device tag.
b. Circuit-breaker sensor rating; and long-time, short-time, and instantaneous settings.
c. Fuse-current rating and type.

2. Coordination Curves: Prepared to determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists

between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:

a. Device tag.
b. Voltage and current ratio for curves.
c. Three-phase and single-phase damage points for each transformer.
d. No damage, melting, and clearing curves for fuses.
e. Cable damage curves.
f. Transformer inrush points.
g. Maximum fault-current cutoff point.

F. Completed data sheets for setting of overcurrent protective devices.

3.4 ARC FLASH HAZARD ANALYSIS

A. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2004, Annex D.

B. The flash protection boundary and the incident energy shall be calculated at all equipment locations shown on the one-line diagram.

C. Safe working distances shall be based upon the calculated arc flash boundary considering an incident energy of 1.2 cal/cm2.

D. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Ground overcurrent relays should not be taken into consideration when determining the clearing time when performing incident energy calculations

E. The short-circuit calculations and the corresponding incident energy calculations for multiple system scenarios must be compared and the greatest incident energy must be uniquely reported for each equipment location. Calculations must be performed to represent the maximum and minimum contributions of fault current magnitude for all normal and emergency operating conditions. The minimum calculation will assume that the utility contribution is at a minimum and will assume a minimum motor contribution (all motors off). Conversely, the maximum calculation will assume a maximum contribution from the utility and will assume the maximum amount of motors to be operating. Calculations shall take into consideration the parallel operation of synchronous generators with the electric utility, where applicable.

F. The incident energy calculations must consider the accumulation of energy over time when performing arc flash calculations on buses with multiple sources. Iterative calculations must take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators should be decremented as follows:

1. Fault contribution from induction motors should not be considered beyond 3-5 cycles.
2. Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible (e.g. contributions from permanent magnet generators will typically decay from 10 per unit to 3 per unit after 10 cycles).

G. For each equipment location with a separately enclosed main device (where there is adequate separation between the line side terminals of the main protective device and the work location),

calculations for incident energy and flash protection boundary shall include both the line and load side of the main breaker.

H. When performing incident energy calculations on the line side of a main breaker (as required per above), the line side and load side contributions must be included in the fault calculation.

I. Mis-coordination should be checked amongst all devices within the branch containing the immediate protective device upstream of the calculation location and the calculation should utilize the fastest device to compute the incident energy for the corresponding location.

J. Arc Flash calculations shall be based on actual overcurrent protective device clearing time. Maximum clearing time will be capped at 2 seconds based on IEEE 1584-2002 section B.1.2. Where it is not physically possible to move outside of the flash protection boundary in less than 2 seconds during an arc flash event, a maximum clearing time based on the specific location shall be utilized.

K. Prepare a written report indicating the following results of the incident energy and flash protection boundary calculations including:

1. Arcing fault magnitude
2. Protective device clearing time
3. Duration of arc
4. Arc flash boundary
5. Working distance
6. Incident energy
7. Hazard Risk Category
8. Recommendations for arc flash energy reduction
9. Tabular Format of Settings Selected for Overcurrent Protective Devices:

L. Arc Flash Warning Labels

1. The contractor of the Arc Flash Hazard Analysis shall provide and install a 3.5 in. x 5 in. thermal transfer type label of high adhesion polyester for each work location analyzed. Label shall be waterproof and UV-resistant.
2. All labels will be based on recommended overcurrent device settings and will be provided after the results of the analysis have been presented to the owner and after any system changes, upgrades or modifications have been incorporated in the system.
3. The label shall include the following information, at a minimum:

    a. Location designation
    b. Nominal voltage
    c. Flash protection boundary
    d. Hazard risk category
    e. Incident energy
    f. Working distance
    g. PPE class required
    h. Engineering report number, revision number and issue date.

4. Labels shall be machine printed, with no field markings.
5. One arc flash label shall be provided for each piece of equipment shown in the one-line diagram.

END OF SECTION 260574

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Service and distribution switchboards rated 600 V and less.
2. Disconnecting and overcurrent protective devices.

1.2 SUBMITTALS

A. Product Data: For each type of switchboard, overcurrent protective device, transient voltage suppression device, ground-fault protector, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

B. Shop Drawings: For each switchboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
5. Include time-current coordination curves for each type and rating of overcurrent protective device included in switchboards.
6. Include schematic and wiring diagrams for power, signal, and control wiring.

C. Operation and Maintenance Data: Provide (3) hard copies in separate 3-ring binders and an electronic copy. Include the following:

1. Routine maintenance requirements for switchboards and all installed components.
2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
3. Time-current coordination curves for each type and rating of overcurrent protective device included in switchboards.

1.3 QUALITY ASSURANCE

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

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

C. Comply with NEMA PB 2.

D. Comply with NFPA 70.

E. Comply with UL 891.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Handle and prepare switchboards for installation according to NEMA PB 2.1.

1.5 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Square D; a brand of Schneider Electric.

B. Front-Connected, Front-Accessible Switchboards:

1. Main Devices: Fixed, individually mounted.
2. Sections front and rear aligned.

C. Nominal System Voltage: 120/208 V. 4-Wire

D. Main-Bus Continuous: 800 amps as shown on the drawings.

E. Enclosures: Type 1.

F. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.

G. Phase Buses and Connections: Three phase, four wire.

1. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity, silver-plated**,** with tin-plated aluminum or copper feeder circuit-breaker line connections.
2. Ground Bus: Minimum size required by UL 891, hard-drawn copper of 98 percent conductivity, equipped with mechanical connectors for feeder and branch-circuit ground conductors.
3. Main Phase Buses and Equipment Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections.
4. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.

2.2 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

a. Instantaneous trip.
b. Long- and short-time pickup levels.
c. Long- and short-time time adjustments.
d. Ground-fault pickup level, time delay, and I^2t response.

2. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
3. Provide with Arc Flash Reduction Maintenance Switch accessory. The Arc Flash Reduction Maintenance Switch shall allow the operator to enable a maintenance mode with a present accelerated instantaneous override trip to reduce arc flash energy.
4. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.

b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.

c. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
d. Shunt Trip: 120-V trip coil energized from control power circuit (when remote disconnect button is pushed), set to trip at 55 percent of rated voltage.
e. Capable of being locked in both the off and on position via external padlock.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Receive, inspect, handle, store and install switchboards and accessories according to NEMA PB2.1.

B. Equipment Mounting: Install switchboards on concrete base, as shown in Project Drawings.

C. Install filler plates in unused spaces of panel-mounted sections.

D. Install overcurrent protective devices, transient voltage suppression devices, and instrumentation.

1. Set field-adjustable switches and circuit-breaker trip ranges.

3.2 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Division 26 Section "Overcurrent Protective Device Coordination Study."

END OF SECTION 262413

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

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

1.2 SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.

1.3 QUALITY ASSURANCE

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

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

C. Comply with NEMA PB 1.

D. Comply with NFPA 70.

1.4 COORDINATION

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

Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Enclosures: Flush- and surface-mounted cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
b. Outdoor Locations: NEMA 250, Type 3R.
c. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
e. Or as noted on the plans

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
4. Finishes:

a. Panels and Trim: Steel and galvanized steel factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
b. Back Boxes: Galvanized steel.

5. Directory Card: Inside panelboard door, mounted in transparent card holder.

B. Incoming Mains Location: Top and bottom.

C. Phase, Neutral, and Ground Buses:

1. Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

D. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type.

3. Ground Lugs and Bus Configured Terminators: Mechanical type.

4. Feed-Through Lugs (When required): Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

5. Subfeed (Double) Lugs (When required): Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

E. Service Equipment Label (When applicable): NRTL labeled for use as service equipment for panelboards with one or more main service disconnecting and overcurrent protective devices.

F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

G. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

D. Mains: Circuit breaker or main lugs only as noted on Drawings.

E. Branch Overcurrent Protective Devices: For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

F. Branch Overcurrent Protective Devices: For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker or main lugs only as noted on Drawings

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.

2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Square D; a brand of Schneider Electric.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
3. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.
b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
c. Shunt Trip (When indicated): 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
d. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
e. Handle Padlocking Device (When indicated): Fixed attachment, for locking circuit-breaker handle in on or off position.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Receive, inspect, handle, store and install panelboards and accessories according to NEMA PB 1.1.

B. Mount top of trim 90 inches Insert height above finished floor unless otherwise required keep the distance from the floor to top most circuit breaker within the height limitation contained in the NEC.

C. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

D. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

E. Install filler plates in unused spaces.

F. Recessed panels: Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future.

G. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

H. Comply with NECA 1.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 26 Section "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads and incorporating Owner's final room designations. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

END OF SECTION 262416

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following individually mounted, enclosed switches and circuit breakers:

1. Fusible switches.
2. Nonfusible switches.
3. Enclosures.

1.2 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current rating.

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 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 FUSIBLE AND NONFUSIBLE SWITCHES

A. Manufacturers:

1. Eaton Corporation; Cutler-Hammer Products.
2. General Electric Co.; Electrical Distribution & Control Division.
3. Square D/Group Schneider.

B. Fusible Switch, 600 A and Smaller: NEMA KS 1, Type Heavy Duty, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Non-fusible Switch, 600 A and Smaller: NEMA KS 1, Type Heavy Duty Duty, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded, and bonded; and labeled for copper and aluminum neutral conductors. (If required)

2.2 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

1. Outdoor Locations: NEMA 250, Type 3R.
2. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
4. As noted in the drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.

B. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated. Anchor floor-mounting switches to concrete base.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Identification for Electrical Systems."

B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate as specified in Division 26 Section "Identification for Electrical Systems."

END OF SECTION 262816

SECTION 28 3100

FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire alarm system design and installation, including all components, wiring, and conduit.

B. Replacement and removal of existing fire alarm system components, wiring, and conduit indicated.
   1. As required for modifications to HVAC systems.

C. New devices and or modifications required due to renovations to HVAC systems.

1.02 RELATED REQUIREMENTS

A. Section 23 3300 - Air Duct Accessories: Smoke dampers monitored and controlled by fire alarm system.

1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Cor 1, 2012).

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. NFPA 72 - National Fire Alarm and Signaling Code; 2016.

1.04 SUBMITTALS

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

B. Evidence of designer qualifications.

C. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
   1. Copy (if any) of list of data required by authority having jurisdiction.
   2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
   3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
   4. System zone boundaries and interfaces to fire safety systems.
   5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
   6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
   7. List of all devices on each signaling line circuit, with spare capacity indicated.
   8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
   9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
   10. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
   11. Certification by the manufacturer of the control unit that the system design complies with the contract documents.
   12. Certification by Contractor that the system design complies with the contract documents.
   13. Do not show existing components to be removed.

D. Evidence of installer qualifications.

E. Inspection and Test Reports:
   1. Submit inspection and test plan prior to closeout demonstration.
   2. Submit documentation of satisfactory inspections and tests.
   3. Submit NFPA 72 "Inspection and Test Form," filled out.

F. Operating and Maintenance Data: Revise and resubmit until acceptable; have one set available during closeout demonstration:
   1. Complete set of specified design documents, as approved by authority having jurisdiction.
   2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
   3. Contact information for firm that will be providing contract maintenance and trouble call-back service.
   4. List of recommended spare parts, tools, and instruments for testing.
   5. Replacement parts list with current prices, and source of supply.
   6. Detailed troubleshooting guide and large scale input/output matrix.
   7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
   8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.

G. Project Record Documents: Have one set available during closeout demonstration:
   1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
   2. "As installed" wiring and schematic diagrams, with final terminal identifications.
   3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.

H. Closeout Documents:
   1. Certification by manufacturer that the system has been installed in compliance with his installation requirements, is complete, and is in satisfactory operating condition.
   2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer, with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.

B. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
   1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
   2. Installer Personnel: At least 2 years of experience installing fire alarm systems.
   3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Alarm Control Units - Connect new fire alarm devices indicated on plans to existing fire alarm system.

2.02 FIRE ALARM SYSTEM

A. Fire Alarm System: Provide modifications and extensions to the existing automatic fire detection and alarm system:

1. Provide all components necessary, regardless of whether shown in the contract documents or not.
2. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
    a. ADA Standards.
    b. The requirements of the local authority having jurisdiction.
    c. Applicable local codes.
    d. The contract documents (drawings and specifications).
    e. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.

B. Circuits:
1. Initiating Device Circuits (IDC): Class B, Style A.
2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 0.5.
3. Notification Appliance Circuits (NAC): Class B, Style W.

C. Power Sources:
1. Primary: Dedicated branch circuits of the facility power distribution system.
2. Secondary: Storage batteries.
3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.
4. Each Computer System: Provide uninterruptible power supply (UPS).

2.03 EXISTING COMPONENTS

A. Existing Fire Alarm System: Remove existing components indicated and incorporate remaining components into new system, under warranty as if they were new; do not take existing portions of system out of service until new portions are fully operational, tested, and connected to existing system.

B. Clearly label components that are "Not In Service."

C. Remove unused existing components and materials from site and dispose of properly.

2.04 FIRE SAFETY SYSTEMS INTERFACES

A. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
1. Duct smoke detectors.

B. HVAC:
1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.

2.05 COMPONENTS

A. General:
1. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.

B. Fire Alarm Control Units, Initiating Devices, and Notification Appliances: Conventional or addressable type; listed, classified, and labeled as suitable for the purpose intended.

C. Initiating Devices:
1. Smoke Detectors
2. Duct Smoke Detectors
3. Heat Detectors

D. Circuit Conductors: Copper or optical fiber; provide 200 feet extra; color code and label.

E. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.

F. Locks and Keys: Deliver keys to Owner.
1. Provide the same standard lock and key for each key operated switch and lockable panel and cabinet; provide 5 keys of each type

G. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.
   1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
   2. Provide one for each control unit where operations are to be performed.
   3. Obtain approval of Owner prior to mounting; mount in location acceptable to Owner.
   4. Provide extra copy with operation and maintenance data submittal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and the contract documents.

B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.

C. Obtain Owner's approval of locations of devices, before installation.

D. Install instruction cards and labels.

3.02 INSPECTION AND TESTING FOR COMPLETION

A. Notify Owner 7 days prior to beginning completion inspections and tests.

B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.

D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.

E. Provide all tools, software, and supplies required to accomplish inspection and testing.

F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.

G. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

3.03 CLOSEOUT

A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
   1. Be prepared to conduct any of the required tests.
   2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
   3. Have authorized technical representative of control unit manufacturer present during demonstration.
   4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
   5. Repeat demonstration until successful.

END OF SECTION 28 3100