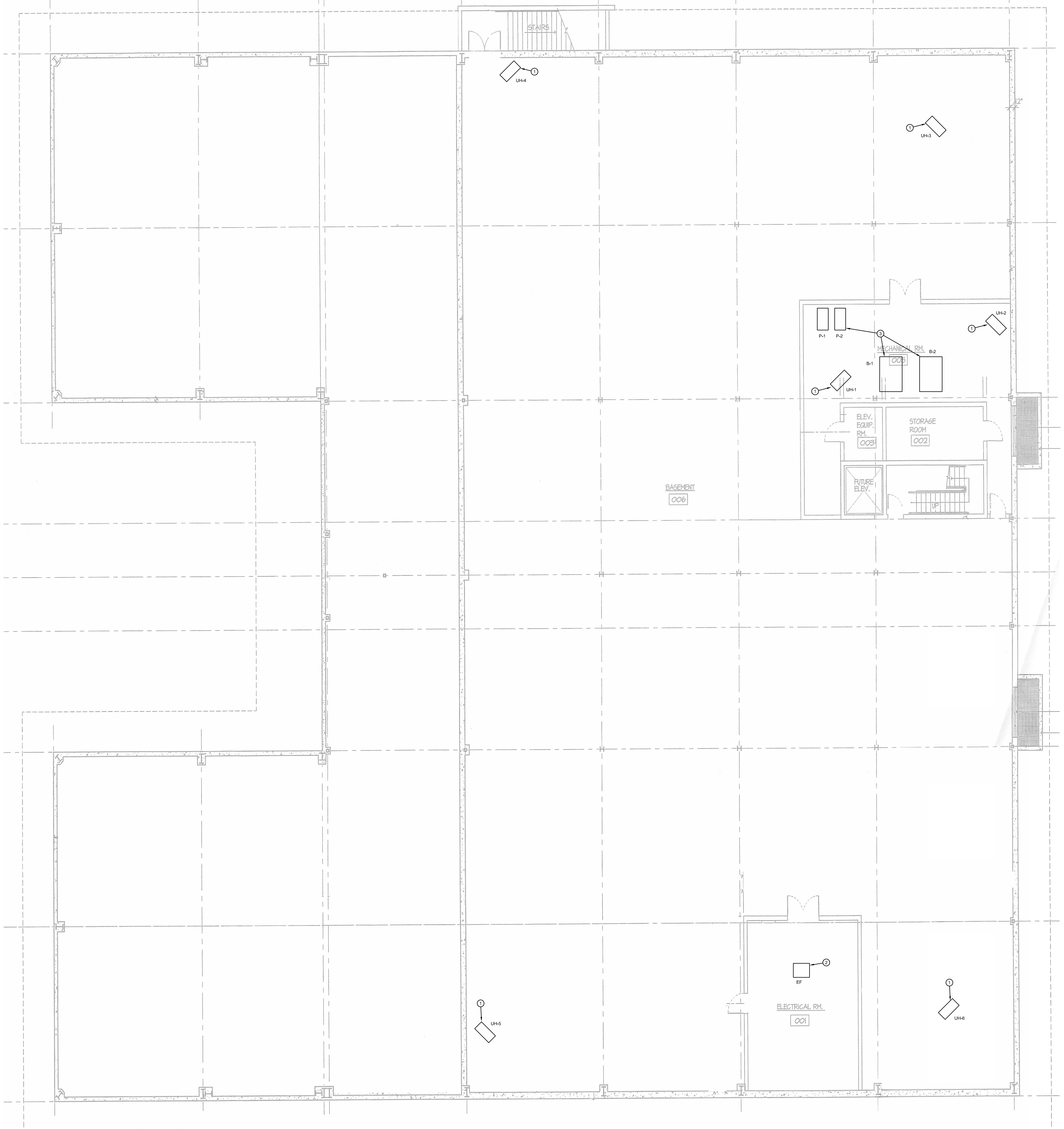

1
M1.0

BASEMENT PLAN - MECHANICAL

SCALE: 1/8" = 1'-0'

NORTH

GENERAL NOTES

A. ALL EQUIPMENT TAGS ARE BASED OFF OF EXISTING DRAWING TAGS FOR REFERENCE ONLY. NO MECHANICAL EQUIPMENT IS BEING REPLACED, ONLY CONTROLS AND SENSORS. SEE SPECIFICATIONS FOR CONTROL SEQUENCES.

(#) SHEET NOTES

1. PROVIDE NEW UNIT HEATER OPERATING CONTROL AND CONTROL VALVE ACTUATOR. REPLACE EXISTING TEMPERATURE SENSOR.
2. PROVIDE NEW EXHAUST FAN OPERATING CONTROL.
3. PROVIDE NEW CONTROLS FOR BOILERS AND HOT WATER HEATING PUMPS.

Joseph R. Hewgley & Associates, Inc.
702 South Bailey • North Platte, Ne. 69101
Phone: 308/534-4983 • Fax: 308/534-4944

SEAL:

40874
8/19/24

08.19.24

CONSULTANTS:

Engineering Technologies Inc.
Mechanical & Electrical Building Solutions
825 M Street, Suite 200 | Lincoln, NE 68508
P 402-476-1273 | F 402-476-1274
1111 N. 13th St, Suite 216 | Omaha, NE 68102
P 402-330-2772 | F 402-330-2630

ETI Project No: 2024-039

MORGAN COUNTY DEPARTMENT OF HUMAN SERVICES

FORT MORGAN, COLORADO

PROJECT #
DATE: 8.19.24
DRAWN: RJH / RS
CHECKED: JH
REVISIONS

DATE	DESCRIPTION

MEMBER
AMERICAN
INSTITUTE
of ARCHITECTS

M1.0 SHEET

FIRST FLOOR PLAN - MECHANICAL

1
M1.1

SCALE: 1/8" = 1'-0'

NORTH

GENERAL NOTES

A. ALL EQUIPMENT TAGS ARE BASED OFF OF EXISTING DRAWING TAGS FOR REFERENCE ONLY. NO MECHANICAL EQUIPMENT IS BEING REPLACED, ONLY CONTROLS AND SENSORS. SEE SPECIFICATIONS FOR CONTROL SEQUENCES.

SHEET NOTES

1. REMOVE EXISTING HVAC ZONE THERMOSTAT AND INSTALL NEW TEMPERATURE SENSOR IN THE SAME LOCATION.
2. PROVIDE NEW UNIT HEATER OPERATIONAL CONTROL AND CONTROL VALVE ACTUATOR. REPLACE EXISTING TEMPERATURE SENSOR.

Joseph R. Hewgley & Associates, Inc.
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FORT MORGAN, COLORADO

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REVISIONS

DATE	DESCRIPTION

MEMBER
AMERICAN
INSTITUTE
of ARCHITECTS

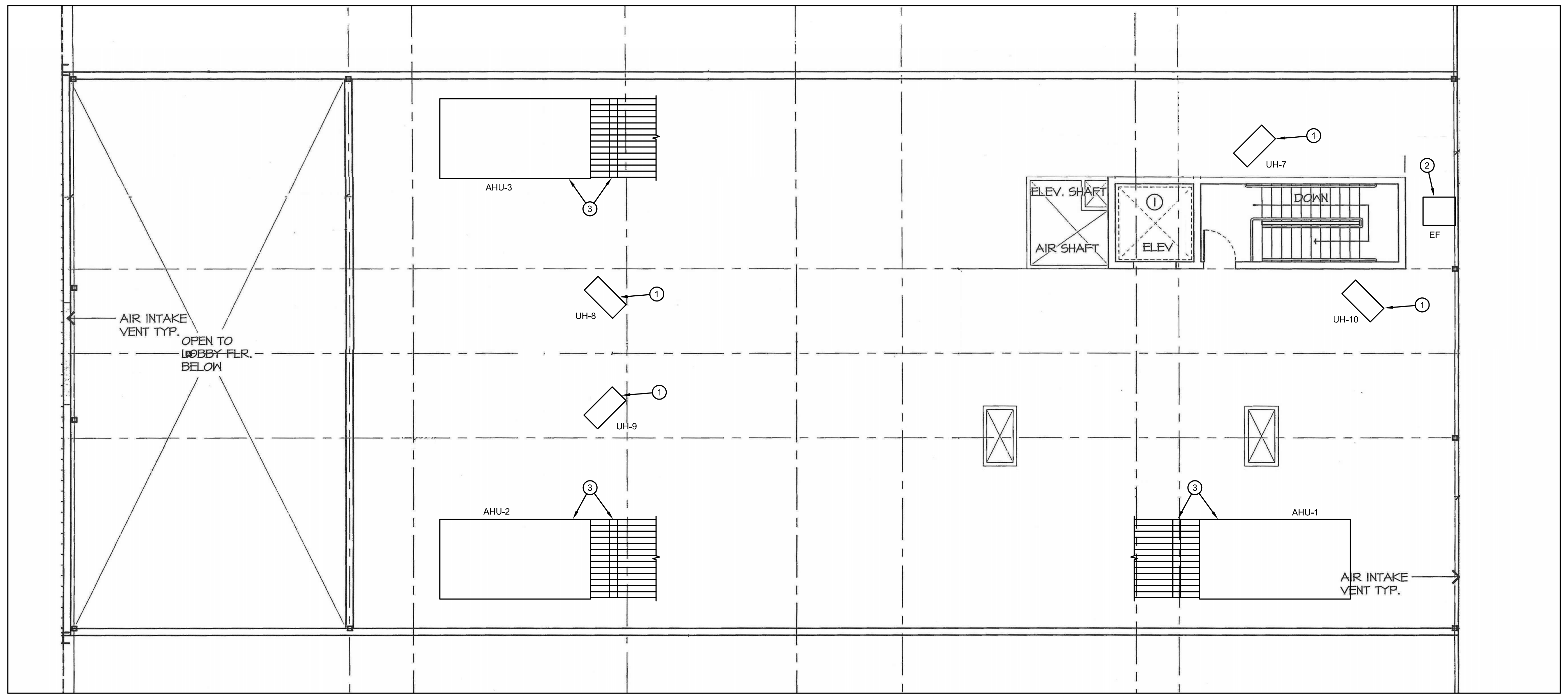
M1.1 SHEET

GENERAL NOTES

A. ALL EQUIPMENT TAGS ARE BASED OFF OF EXISTING DRAWING TAGS FOR REFERENCE ONLY. NO MECHANICAL EQUIPMENT IS BEING REPLACED, ONLY CONTROLS AND SENSORS. SEE SPECIFICATIONS FOR CONTROL SEQUENCES.

(#) SHEET NOTES

1. PROVIDE NEW UNIT HEATER OPERATIONAL CONTROL AND CONTROL VALVE ACTUATOR. REPLACE EXISTING TEMPERATURE SENSOR.
2. PROVIDE NEW EXHAUST FAN OPERATIONAL CONTROL.
3. PROVIDE NEW AIR HANDLING UNIT OPERATIONAL CONTROL AND NEW CONTROL VALVE AND FRESH AIR AND RELIEF AIR DAMPER ACTUATORS. UNIT IS A 13-ZONE MULTIZONE UNIT. PROVIDE NEW ACTUATORS ON ZONE DAMPERS AND ZONE CONTROLS.



1
M1.2

MEZZANINE PLAN - MECHANICAL

SCALE: 1/8" = 1'-0"

NORTH

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MORGAN COUNTY DEPARTMENT OF HUMAN SERVICES

FORT MORGAN, COLORADO

PROJECT #
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DATE	DESCRIPTION

MEMBER
AMERICAN
INSTITUTE
of ARCHITECTS

SHEET
M1.2

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

SECTION 230050 - GENERAL MECHANICAL PROVISIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. The work required under Heating, Ventilating, and Air Conditioning Contract shall include all material, labor, equipment and services necessary and reasonably incidental to the proper completion of the systems, and all special work as hereinafter specified and indicated on the drawings.

B. All work shall be executed in such a manner as to interfere as little as possible with the normal functioning of the facility, including operations of all utility services and any equipment, and with work being done by others. Roads shall be kept clear of materials, etc., at all times so that there will be no interference with the usual traffic. Where necessary, on account of new work connecting to existing pipes, where utility services are required to be cut, they shall be cut and capped at suitable places where indicated by drawings, or in the absence of such indication, where directed by the Architect/Engineer. No road traffic or utility service such as water, gas, or steam shall be interrupted without prior approval of the Owner, and all arrangements for work which will involve such interference shall be made in advance with the Owner so that same can be effected in a minimum of time and interference.

1.2 RELATED SECTIONS

A. Section 01 0000 - General Requirements

B. Section 007200 - General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.

C. Section 013000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

D. Section 017000 - Execution and Closeout Requirements: Contract closeout procedures.

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

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

1.3 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

A. Drawings and specifications shall be taken together. Provide work specified and not indicated, or work indicated and not specified as though mentioned in both.

B. In case of discrepancy between drawings and specifications, or within either document, the greater quantity of work and/or better quality shall be used for estimating and the matter brought to the Architect/Engineer's attention for a written decision.

C. Drawings are to be interpreted as diagrammatic only, intended to convey the scope of the work and to indicate the general arrangements and locations of equipment, outlets, etc., and the approximate sizes of equipment. It should be understood that the Contractor shall determine the exact locations of equipment and rough-ins, and the exact routing of pipes and ducts so as to best fit the layout of the job. Scaling of the drawings will not be sufficient or accurate for determining these locations. Contractor shall refer to the Architectural drawing for dimensions of walls, foundations, structural beams, and other structural building members. Where job conditions require reasonable changes in indicated arrangements and locations, such changes shall be made by the Contractor at no additional cost to the Owner.

D. Because of the scale of the drawings, certain basic items, such as fittings, boxes, valves, unions, etc., may not be shown, but where such items are required by other sections of the specifications or where they are required for proper installation of the work, such items shall be furnished and installed.

E. The determination of quantities of material and equipment required shall be made by the Contractor from the drawings. Schedules on the drawings and in the specifications are completed as an aid to the Contractor but where discrepancies arise, the greater number shall govern.

F. Where words "provide", "install", or "furnished" are used on the drawings or in the specifications, it shall be taken to mean, to furnish, install and connect up complete and ready for operation, the items mentioned.

1.4 COOPERATION AND PROGRESS

A. Keep informed about the work of all other trades engaged in the project and execute the work in such a manner as not to delay or interfere with the progress of other contractors. This contractor shall schedule his work so that no other contractor is delayed in the execution of his work. Complete cooperation of all trades is expected. Employ a competent foreman on job throughout the entire project to ensure that coordination is maintained.

B. Schedule and coordinate the work of this Division with the schedule of the contractor to progress the work expeditiously, and to avoid unnecessary delays.

C. Examine fully the drawings and specifications for other contractors for other trades, and coordinate the installation of this work with the work of the other contractors. Consult and cooperate with other contractors for determining space requirements and for determining that adequate clearance is allowed with respect to his equipment, other equipment, and the building. The Owner's representative reserves the right to determine space priority in the event of interference between piping, conduit, ducts, and equipment of the various contractors.

D. Conflicts between the drawings and the specification shall be called to the attention of the Owner's representative and Architect/Engineer. If clarification is not asked for prior to the taking of bids, it will be assumed that none is required and that the contractor is in agreement with the drawings and specifications as issued. If clarification is required after the Contract is awarded, such clarification will be made by the Architect/Engineer and his decision will be final.

E. Coordinate the installation of all mechanical system components with all other trades, including structural components and electrical trades. Allocate space in the different areas to allow for the installation of ductwork, piping, sprinklers, waste and vents, and mechanical equipment above ceilings and in equipment spaces. Recommend rerouting, resizing or relocation of mechanical components, if necessary, so all trades can install their systems in the space allotted. Any proposed changes from the systems layout, on the drawings, shall be done in accordance with the design criteria specified in the applicable codes and shall be subject to the review and acceptance of the Architect/Engineer.

F. After award of the Contract, and prior to start of construction, the General Contractor shall schedule a meeting with the contractor and all subcontractors responsible of the work items listed above. The purpose of the meeting is to introduce the coordination program and to determine its implementation in relation to the progress schedule.

G. All contractors and subcontractors shall participate in the coordination process. Participation is mandatory. If a contractor or subcontractor fails to participate in the coordination process, the Owner reserves the right to do the following:
1. Stop any and all construction progress payments for any work performed by the contractor. Such payments will be reinstated only after the contractor or subcontractor resumes participation in the coordination drawing process.
2. Relocate and resize contractor's work components as necessary to ensure all components will be installed as intended. In the event the contractor did not participate in the coordination process, he will not be entitled to any contract cost increases or time extensions due to Owner initiated changes in the work.

H. The contractor shall also be held responsible for any unnecessary rework by other trade contractors that is attributable to his failure to participate in the coordination process.

I. The contract drawings are schematic in nature and do not show every fitting and appurtenance for each utility because of the scale of the drawings. Each contractor is expected to have included in his bid sufficient fittings, material, and labor to allow for adjustments in routing of utilities made necessary by the coordination process. The contractor will not be allowed any contract cost extra or time extension for changes dictated by the coordination process.

J. Utility installation in congested areas is dependent on the sequence of utility installation as much as it is dependent on the physical size of the utilities. The contractors shall use the coordination process to properly sequence the installation of utilities as appropriate to ensure the above ceiling and congested area utility installation is satisfactory.

1.5 GUARANTEE

A. The Contractor, by the acceptance of this specification and the signing of the Contract, acknowledges his acquaintance with all the requirements and guarantees that every part going to make up the system, will be the best of its respective kind and will be erected in a most thorough and substantial manner by none but experienced labor.

B. The Contractor guarantees that all piping as provided in this specification will be free from all obstructions, and that all piping will be tight and drip free.

C. The Contractor guarantees that, in the entire hydronic piping system, a continuous and noiseless circulation of water will be established to all fixtures; and that water may be drawn from any fixture without hammering.

D. The Contractor guarantees that the entire system of ductwork will provide free circulation of air without objectionable noise and that all air distribution within the conditioned space will be draftless and reasonably quiet.

E. The Contractor guarantees that all equipment and appliances will successfully and acceptably perform the work for which they are installed and that each will operate smoothly and quietly up to its rated capacity.

F. The Contractor further guarantees himself responsible for any defects which may develop in any part of the system, including equipment, piping, fixtures and appliances, due to faulty workmanship, design or material; and to replace and make good, without cost to the Owner, any such faulty parts or construction which develop defects at any time within one (1) year from the date of substantial completion. The date of substantial completion shall be as defined in the Contract Documents. Any repairs or replacement required on account of defects, as outlined in this paragraph shall be made promptly upon written notice from the Architect.

G. Natural wear, accident, or carelessness on the part of others, however, shall not be made good by the Contractor.

1.6 PROTECTION OF INSTALLED WORK AND MATERIAL STORED ON SITE

A. The Contractor is responsible for all work installed by him until his contract is complete and shall protect it from injury by others.

B. All piping, fittings, equipment and material to be stored on the jobsite for any period of time shall be protected from the weather in a manner that is acceptable to the Architect.

1.7 SITE VISIT

A. Bidders are advised to visit the site and inform themselves as to all conditions, and failure to do so will in no way relieve the successful bidder from the necessity of furnishing any material or performing any work that may be required to complete the work in accordance with the true intent and meaning of the drawings and specifications without additional cost to the Owner.

B. Before bidding the job, investigate, determine and verify locations and invert elevations of sanitary and storm sewers, city water mains and any other buried or overhead utilities on or near site. Determine such locations in conjunction with all public and private utility companies and with all authorities having jurisdiction.

C. On projects where remodeling of an existing structure is in the scope of the project, the contractor shall field verify locations of existing piping and ductwork. The contractor shall verify the exact locations of existing piping and ductwork to which the new ductwork and new piping are to connect and if the locations of the existing piping and ductwork are different than that shown on the drawings, the contractor shall include the additional cost in his bid proposal. The contractor shall also field verify the locations of existing piping and ductwork that are in conflict with the routing of the new work, and include in his bid proposal monies for the rerouting of the existing work in order to accommodate the new work.

1.8 RULES, REGULATIONS AND CODES

A. The Contractor shall become acquainted with the local codes, and in case of a discrepancy between plans or specifications and the local codes, the Contractor shall use the code requirements. The greater quantity of work and material and/or better quality shall be used for estimating and the matter brought to the Architect's attention for a written decision.

B. Perform all work in strict accordance with all rules, regulations, codes, ordinances, or laws of Local, State, and Federal governments, or of other authorities having lawful jurisdiction. Comply therewith. Such rules, regulations, codes, ordinances, or laws include, but are not necessarily limited to, the following:
1. State building and fire codes.
2. State plumbing and mechanical codes.
3. City building and fire codes.
4. City plumbing and mechanical codes.
5. American Gas Association.
6. National Electric Code.
7. National Fire Protection Association.
8. Occupation Safety and Health Act.

C. If the Contractor notes, at the time of bidding, any parts of the plans and specifications which are not in accord with the applicable codes or regulations, he shall inform the Architect/Engineer in writing, requesting a clarification. If there is insufficient time to follow this procedure, he shall submit with his proposal a separate price required to make the system shown on the drawings comply with the codes and regulations.

D. All changes to the system made after the letting of the contract, in order to comply with the applicable codes or the requirements of the inspector, shall be made by the Contractor without cost to the Owner.

1.9 SUBSTITUTIONS

A. The Architect/Engineer shall be the sole and final judge as to the suitability of items substituted for those specified.

B. The entire cost of all changes of any type due to substitutions for materials specified shall be borne by the Contractor at no extra cost to the Owner.

C. Unsolicited and voluntary deducts, on the part of the Contractor for substituting unapproved equipment, shall not be considered for the purpose of awarding the Contract.

D. When the drawings and/or specifications refer to any item, article, material, method, fabrication, assembly or construction by means of one or more manufacturer's trade name, catalog reference or similar means of identification of manufacturer, the Contractor shall furnish one of the makes so identified without substitution unless other make or makes have been approved by addendum to the contract documents prior to the receipt of bids. Requests for the approval of items of equal quality are requested to be made in writing to the Architect/Engineer five days prior to the date of the receipt of bids so that a list of acceptable equal quality items can be made known to all bidders by an addendum. If substitution for names items, articles, materials, methods, fabrications, assembly or construction are approved, the Contractor assumes all responsibility for coordination and performing the related changes in the work necessitated by such substitutions and shall include in his bid all costs involved therein.

1.10 SHOP DRAWING REVIEW

A. Shop drawings will be reviewed only to extent of information indicated. This check is only for review of general conformance with the design concept of the project and general compliance with the information given the contract documents. The contractor is responsible for confirming and correlating all quantities and dimensions, selecting fabrication processes techniques of construction, coordinating his work in a safe and satisfactory manner.

B. Review of shop drawings shall not relieve Contractor of responsibility for providing all controls, wiring, components, etc., which are shown or specified, or all additional controls, wiring, components, etc., required to provide complete and correctly operating mechanical systems.

C. In cases where substituted equipment has been installed in place of specified equipment the Contractor shall bear the entire cost of all changes of any type due to the substitution, even though the shop drawings have been reviewed by the Architect/Engineer.

D. Shop drawings in no way relieve the contractor from performing on the job as to the intent of the construction documents.

1.11 CONNECTING NEW WORK TO EXISTING WORK

A. Connect new work to existing work in a neat workmanlike manner. In every case where any part of the existing work must be cut to install new work, or is damaged, same must be patched and repaired in a manner satisfactory to the Architect. Where relocation of existing equipment and piping systems is necessary in areas providing uninterruptible services, schedule work during slack periods. Anticipate scheduling work at a period which will result in additional construction cost, such as overtime for work to be done at night or on weekends. Include cost in the bid proposal.

B. Do not cut into existing services without first informing the Owners representative as to the time and duration of shutdown of the existing services.

C. Perform work that interrupts any service at a time that will cause least interference to the operation of the building.

D. Maintain all existing services and equipment unless indicated to be removed.

1.12 ACCESS TO EQUIPMENT FOR MAINTENANCE

A. Install all equipment, piping, etc., to permit access for normal maintenance. Maintain easy access to filters, motors, drive compressors, coils, etc. Install all such equipment and accessories to facilitate maintenance. Perform any relocation of pipes, ducts, etc. required to permit access at request of Architect/Engineer at no additional cost to Owner.

B.

1.13 FIRE AND SMOKE STOPPAGE

A. It shall be the responsibility of this Contractor to maintained and fire and smoke integrity of all walls, ceilings, floors, etc., through which this work passes through or into. Fire and smoke barriers shall be provided in and around as required by Codes.

B. Where holes are required to be patched, or conduit, piping, ducts, etc., are required to be patched around, it shall be filled with a material that is UL Classified Standard 1479 for this use and Factory Mutual System approved.

C. Fire and smoke stoppage material shall be water based with intumescent properties. Material may be in the form of caulking, putty pads or wrap strips. Materials shall be installed in accordance to manufacturers and UL standards.

1.14 **TEMPORARY HEAT/COOLING**

A. Where temporary heating/cooling is needed after the building is enclosed, this may be provided through the use of the project's permanent heating/cooling equipment, but only after permission is obtained from the Owner/Architect.

B. The cost of fuel/energy for the temporary heating/cooling shall be included in the project. The Mechanical Contractor shall coordinate these costs with the General Contractor as required.

C. The Mechanical Contractor assumes responsibility for the operation and maintenance of the equipment during the temporary heating/cooling period. This operation shall not alter or void the specified warranty period from the time of acceptance of the entire project by the Owner.

D. Temporary filters shall be placed in all equipment and in all return air openings and they shall be kept clean during operation. New filters shall be installed, unused, at the time of project completion.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION- NOT USED

END OF SECTION 230050

SECTION 230501 - CLOSEOUT SUBMITTALS FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Project Record Documents.

B. Operation and Maintenance Data.

C. Warranties and bonds.

1.2 RELATED SECTIONS

A. Section 007200 - General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.

B. Section 013000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

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

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

1.3 SUBMITTALS

A. Project Record Documents: Submit documents to Engineer .

B. Operation and Maintenance Data:
1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one copy with comments.
2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Engineer comments. Revise content of all document sets as required prior to final submission.
4. Submit two sets of revised final documents in final form within 10 days after final inspection.

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PROJECT RECORD DOCUMENTS

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

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

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

D. Record information concurrent with construction progress.

E. Record Drawings : Legibly mark each item to record actual construction including:
1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
3. Field changes of dimension and detail.

3.2 OPERATION AND MAINTENANCE DATA

A. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

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

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

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

3.3 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

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

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

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

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

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

F. Include sequence of operation by controls manufacturer.

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

H. Provide control diagrams by controls manufacturer as installed.

I. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.

J. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

K. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

L. Include test and balancing reports.

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

3.4 OPERATION AND MAINTENANCE MANUALS

A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

B. Prepare data in the form of an instructional manual.

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

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

E. Provide tabbed dividers for each separate product and system, with typed description of product and major component parts of equipment.

F. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
1. Part 1: Directory, listing names, addresses, and telephone numbers of Engineer, Contractor, Subcontractors, and major equipment suppliers.
2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
a. Significant design criteria.
b. List of equipment.
c. Parts list for each component.
d. Operating instructions.
e. Maintenance instructions for equipment and systems.
3. Part 3: Project documents and certificates, including the following:
a. Shop drawings and product data.
b. Air and water balance reports.
c. Photocopies of warranties and bonds.

3.5 WARRANTIES AND BONDS

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

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

C. Co-execute submittals when required.

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

E. Include originals of each in operation and maintenance manuals, indexed separately on Table of Contents.

END OF SECTION 230501

SECTION 230502 - DEMONSTRATION AND TRAINING FOR HVAC SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

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

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

1.2 RELATED SECTIONS

A. Section 220501 - Closeout Submittals: Operation and maintenance manuals.

B. Other Specification Sections: Additional requirements for demonstration and training.

1.3 SUBMITTALS

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

B. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
1. Format: DVD Disc.
2. Label each disc and container with session identification and date.

C. System Diagrams: Require system diagrams to be mounted in each mechanical equipment room with stainless steel frame and clear acrylic front, with all operating piping, valves, controls, and air and water flows shown. Final balance flows, pressures, temperatures, motor horsepower, pump and fan curves, and belt sizes shall be shown.

1.4 QUALITY ASSURANCE

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 DEMONSTRATION - GENERAL

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

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

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

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

3.2 TRAINING - GENERAL

A. Conduct training on-site unless otherwise indicated.

B. Provide training in minimum two hour segments.

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

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

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

END OF SECTION 230502

SECTION 230913 - INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Thermostats.

B. Temperature and humidity sensors.

1.2 RELATED REQUIREMENTS

A. Section 262726 - Wiring Devices: Elevation of exposed components.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

C. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.

D. Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors. Accurately record actual location of control components, including panels, thermostats, and sensors.

E. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

1.4 QUALITY ASSURANCE

A. System will require the installation of control components of the temperature control/energy management system in addition to other work as specified herein. The installing Contractor shall have factory trained personnel for the application, engineering installation, and programming of the Control System.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Johnson Controls.

B. Schneider Electric.

C. Honeywell Controls.

2.2 EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.3 DAMPER OPERATORS

A. General: Provide smooth proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to provide tight seal against maximum system pressures. Provide spring return for two position control and for fail safe operation.

2.4 INPUT/OUTPUT SENSORS

A. Temperature Sensors:
1. Resistance temperature detectors with resistance tolerance of plus or minus 0.1 percent at 70 degrees F, interchangeability less than plus or minus 0.2 percent, time constant of 13 seconds maximum for fluids and 200 seconds maximum for air.
2. Use insertion elements in ducts not affected by temperature stratification or smaller than one square meter. Use averaging elements where larger or prone to stratification sensor length 8 feet or 16 feet as required.
3. Insertion elements for liquids shall be with brass socket with minimum insertion length of 2-1/2 inches.
4. Room sensors: Locking cover .
5. Outside air sensors: Watertight inlet fitting, shielded from direct rays of sun.
6. Room sensors: Provide temperature setpoint adjust for +/- 3 deg. (adjustable) of control setpoint and occupied/unoccupied override button.

B. Static Pressure Sensors:
1. Unidirectional with ranges not exceeding 150 percent of maximum expected input.
2. Accuracy: One percent of full scale with repeatability 0.3 percent.

C. Equipment Operation Sensors:
1. Status Inputs for Fans: Differential pressure switch with adjustable range of 0 to 5 inches wg.
2. Status Inputs for Pumps: Differential pressure switch piped across pump with adjustable pressure differential range of 8 to 60 psi.
3. Status Inputs for Electric Motors: Current sensing relay with current transformers, adjustable and set to 175 percent of rated motor current.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that systems are ready to receive work.

C. Beginning of installation means installer accepts existing conditions.

D. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.

E. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check and verify location of thermostats and exposed control sensors with plans and room details before installation. Locate 48 inches above floor. Align with lighting switches. Refer to Section 262726.

C. Mount outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.

D. Provide separable sockets for liquids and flanges for air bulb elements.

E. Provide flat plate security sensors on temperature sensors in public areas.

F. Mount control panels adjacent to associated equipment on vibration free walls or free standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.

G. Provide all control wiring in conduit. Conduit and electrical wiring shall be in accordance with Section 262717. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

END OF SECTION 230913

SECTION 230923 - DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

A. HVAC control programs.

B. Control equipment.

C. Software.

1.2 RELATED REQUIREMENTS

A. Section 230913 - Instrumentation and Control Devices for HVAC.

B. Section 230993 - Sequence Of Operations for HVAC Controls.

C. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code.

1.4 SYSTEM DESCRIPTION

A. Automatic temperature control field monitoring and control system using field programmable micro-processor based units .

B. Base system on distributed system of fully intelligent, stand-alone controllers, operating in a multi-tasking, multi-user environment on token passing network, with central and remote hardware, software, and interconnecting wire and conduit.

C. Include computer software and hardware, operator input/output devices, control units, local area networks (LAN), sensors, control devices, actuators.

D. Provide control systems consisting of thermostats, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical systems, and to perform functions specified.

E. Include installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for each system component and software module.

C. Shop Drawings:
1. Indicate trunk cable schematic showing programmable control unit locations, and trunk data conductors.
2. List connected data points, including connected control unit and input device.
3. Indicate system graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations. Provide demonstration digital media containing graphics.
4. Show system configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
5. Indicate description and sequence of operation of operating, user, and application software.

D. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors.
1. Revise shop drawings to reflect actual installation and operating sequences.

E. Operation and Maintenance Data:
1. Include interconnection wiring diagrams complete field installed systems with identified and numbered, system components and devices.
2. Include keyboard illustrations and step-by-step procedures indexed for each operator function.
3. Include inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with NFPA 70.

B. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.

1.7 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a one year period after Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Honeywell International, Inc: www.honeywell.com/#sle.

B. Johnson Controls, Inc: www.johnsoncontrols.com/#sle.

C. Schneider Electric: www.schneider-electric.us/#sle.

2.2 CONTROLLERS

A. Building Controllers:
1. General:
a. Manage global strategies by one or more, independent, standalone, microprocessor based controllers.
b. Provide sufficient memory to support controller's operating system, database, and programming requirements.
c. Share data between networked controllers.
d. Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.
e. Utilize real-time clock for scheduling.
f. Continuously check processor status and memory circuits for abnormal operation.
g. Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.
h. Communication with other network devices to be based on assigned protocol.
2. Communication:
a. Controller to reside on a BACnet network using ISO 8802-3 (ETHERNET) Data Link/Physical layer protocol.
b. Perform routing when connected to a network of custom application and application specific controllers.
c. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.
3. Anticipated Environmental Ambient Conditions:
a. Outdoors and/or in Wet Ambient Conditions:
1) Mount within waterproof enclosures.
2) Rated for operation at 40 to 150 degrees F.
b. Conditioned Space:
1) Mount within dustproof enclosures.
2) Rated for operation at 32 to 120 degrees F.
4. Provisions for Serviceability:
a. Diagnostic LEDs for power, communication, and processor.
b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
6. Power and Noise Immunity:
a. Maintain operation at 90 to 110 percent of nominal voltage rating.
b. Perform orderly shutdown below 80 percent of nominal voltage.
c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet.

B. Application Specific Controllers:
1. General:
a. Not fully user programmable, microprocessor based controllers dedicated to control specific equipment.
b. Customized for operation within the confines of equipment served.
c. Communication with other network devices to be based on assigned protocol.
2. Communication:
a. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.
3. Provisions for Serviceability:
a. Diagnostic LEDs for power, communication, and processor.
b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
4. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.

C. Input/Output Interface:
1. Hardwired inputs and outputs tie into the DDC system through building, custom application, or application specific controllers.
2. All Input/Output Points:
a. Protect controller from damage resulting from any point short-circuiting or grounding and from voltage up to 24 volts of any duration.
b. Provide universal type for building and custom application controllers where input or output is software designated as either binary or analog type with appropriate properties.
3. Binary Inputs:
a. Allow monitoring of On/Off signals from remote devices.
b. Provide wetting current of 12 mA minimum, compatible with commonly available control devices and protected against the effects of contact bounce and noise.
c. Sense dry contact closure with power provided only by the controller.
4. Pulse Accumulation Input Objects: Comply with all requirements of binary input objects and accept up to 10 pulses per second.
5. Analog Inputs:
a. Allow for monitoring of low voltage 0 to 10 VDC, 4 to 20 mA current, or resistance signals (thermistor, RTD).
b. Compatible with and field configurable to commonly available sensing devices.
6. Binary Outputs:
a. Used for On/Off operation or a pulsed low-voltage signal for pulse width modulation control.
b. Outputs provided with three position (On/Off/Auto) override switches.
c. Status lights for building and custom application controllers to be selectable for normally open or normally closed operation.
7. Analog Outputs:
a. Monitoring signal provides a 0 to 10 VDC or a 4 to 20 mA output signal for end device control.
b. Provide status lights and two position (AUTO/MANUAL) switch for building and custom application controllers with manually adjustable potentiometer for manual override on building and custom application controllers.
c. Drift to not exceed 0.4 percent of range per year.
8. Tri State Outputs:
a. Coordinate two binary outputs to control three point, floating type, electronic actuators without feedback.
b. Limit the use of three point, floating devices to the following zone and terminal unit control applications:
c. Control algorithms run the zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.
9. System Object Capacity:
a. System size to be expandable to twice the number of input output objects required by providing additional controllers, including associated devices and wiring.
b. Hardware additions or software revisions for the installed operator interfaces are not to be required for future, system expansions.

2.3 LOCAL AREA NETWORK (LAN)

A. Provide communication between control units over local area network (LAN).

B. LAN Capacity: Not less than 60 stations or nodes.

C. Break in Communication Path: Alarm and automatically initiate LAN reconfiguration.

D. LAN Data Speed: Minimum 19.2 Kb.

E. Communication Techniques: Allow interface into network by multiple operation stations and by auto-answer/auto-dial modems. Support communication over telephone lines utilizing modems.

F. Web Server: Monitor of control system through internet IP address at any remote web browser. Passwords given to Owner and Engineer to provide system operation/monitoring access.

G. Transmission Median: Fiber optic or single pair of solid 24 gage twisted, shielded copper cable.

H. Network Support: Time for global point to be received by any station, shall be less than 3 seconds. Provide automatic reconfiguration if any station is added or lost. If transmission cable is cut, reconfigure two sections with no disruption to system's operation, without operator intervention.

2.4 HVAC CONTROL PROGRAMS

A. Optimal Run Time:
1. Control start-up and shutdown times of HVAC equipment for both heating and cooling.
2. Base on occupancy schedules, outside air temperature, seasonal requirements, and interior room mass temperature.
3. Start-up systems by using outside air temperature, room mass temperatures, and adaptive model prediction for how long building takes to warm up or cool down under different conditions.
4. Use outside air temperature to determine early shut down with ventilation override.
5. Analyze multiple building mass sensors to determine seasonal mode and worse case condition for each day.

B. Supply Air Reset:
1. Monitor heating and cooling loads in building spaces, terminal reheat systems, unit discharge temperatures.
2. Adjust discharge temperatures to most energy efficient levels satisfying measured load by:
a. Raising cooling temperatures to highest possible value.
b. Reducing heating temperatures to lowest possible level.

C. Enthalpy Switchover:
1. Calculate outside and return air enthalpy using measured temperature and relative humidity; determine energy expended and control outside and return air dampers.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that conditioned power supply is available to the control units and to the operator work station. Verify that field end devices and wiring is installed prior to installation proceeding.

3.2 INSTALLATION

A. Install control units and other hardware in position on permanent walls where not subject to excessive vibration.

B. Install software in control units and in operator work station. Implement all features of programs to specified requirements and appropriate to sequence of operation. Refer to Section 230993.

C. Provide conduit and electrical wiring in accordance with Section 260583. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

3.3 MANUFACTURER'S FIELD SERVICES

A. Start and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.

B. Provide basic operator training for Owner on data display, alarm and status descriptors, requesting data, execution of commands and request of logs. Include a minimum of 16 hours dedicated instructor time. Provide training on site.

3.4 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate complete and operating system to Owner.

3.5 MAINTENANCE

A. Provide service and maintenance of energy management and control systems for one years from Date of Substantial Completion.

END OF SECTION 230923

SECTION 230993 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other sections.

B. Sequence of operation for:
1. Central heating and cooling systems.
2. Central fan systems.
3. Air handling units.
4. Hydronic system circulating pumps.

1.2 RELATED REQUIREMENTS

A. Section 230913 - Instrumentation and Control Devices for HVAC.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment.

C. Control System Diagrams: Submit graphic schematic of the control system showing each control component and each component controlled, monitored, or enabled.

D. Points List: Submit list of all control points.

E. Project Record Documents: Record actual locations of components and setpoints of controls, including changes to sequences made after submission of shop drawings.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 SCHEDULING OF EQUIPMENT OPERATION

A. Night setback / Daytime Scheduling
1. Setup schedule for equipment to operate at daytime setpoints and night setback setpoints. Daytime settings shall occur prior to occupancy schedule to allow systems to recover space temperatures, without ventilation systems in operation. Night setback schedule start would typically occur at the same time as the end of the occupancy schedule.

B. Occupancy Scheduling
1. Occupancy schedule for ventilation equipment (minimum fresh air dampers, exhaust fans, energy recovery ventilators, etc.) to operate, corresponding to normal building occupied hours.

C. Special Scheduling
1. Additional schedule may be added through software interface by Owner for holidays, weekends, special event dates to override occupancy scheduling.
2. Additional operation schedules may be shown on Drawings in Air Balance Schedules or within Equipment Schedules that will dictate equipment operation for specific situations.

D. Equipment Enables with Scheduling
1. Individual equipment enables shall be issued by control system with starts staggered over a short period of time to spread out electrical demand on system. Global start commands are not acceptable.

3.2 HOT WATER HEATING SYSTEMS

A. Energize hot water heating system pump to start.

B. Energize boilers. Boilers shall start/stop to maintain hot water heating system temperature.

C. System water temperature shall be reset based on outside air temperature.

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ETI Project No: 2024-039

MORGAN COUNTY DEPARTMENT OF HUMAN SERVICES

FORT MORGAN, COLORADO

PROJECT #
DATE: 8.19.24
DRAWN: RJH / RS
CHECKED: JH
REVISIONS

DATE	DESCRIPTION

MEMBER
AMERICAN
INSTITUTE
of ARCHITECTS

SHEET
M2.1

- D. Display:
    1. System graphic.
    2. Hot water heating pump on/off switch, pump selection and indication.
    3. Boiler on/off indication.
    4. Hot water heating system supply and return temperature.
    5. Hot water heating system control point adjustment.

3.3 CENTRAL FAN SYSTEMS (AIR HANDLING UNITS)

- A. Time Schedule: Start and stop supply fan. Determine fan status by current sensing devices. If fan fails to start as commanded, signal alarm.
- B. Safety Devices:
    1. Freeze Protection: Stop fans, open coil temperature control valves and close outside air dampers if temperature downstream of preheat coil is below 37 degrees F; signal paging alarm. At start up, test emergency shutdown mode to ensure a freeze condition cannot occur.
    2. Smoke Detector: Stop fans, close outside dampers, and close smoke dampers if smoke is detected by fire alarm system; signal alarm.
- C. Hot water Heating Coil:
    1. When fan is not running and outside air temperature is below 40 degrees F, fully open coil valve to heating.
    2. When fan is running, modulate coil control valve to satisfy discharge air temperature setpoint if heat pump cannot provide adequate heating.
- D. DX Coil:
    1. Maintain discharge air temperature of 55 degrees F by energizing heat pump during a call for cooling and cycling to satisfy room temperature sensor. Energize reversing valve on heat pump for heating and cycle to satisfy room temperature sensor.
- E. Outside, Return, and Relief Dampers:
    1. When supply fan is not running, outside and relief dampers are closed and return damper is open.
    2. When supply fan is running, dampers are controlled and operate with outside and relief dampers opening, and return damper closing.
    3. When building is in an occupied mode, outside air damper shall be opened to a minimum position.
    4. For cooling and outside air temperatures below 55 degrees F, modulate dampers to maintain mixed air temperature of 55 degrees F or higher.
    5. For cooling and outside air temperatures above 55 degrees F outside and relief dampers are open and return damper is closed.
    6. For cooling and outside air temperatures above 55 degrees F compare return and outside air temperatures. If return air temperature is lower, drive outside damper to minimum, close relief damper, and open return damper.
    7. For heating, drive outside damper to minimum, close relief damper, and open return damper.
    8. Relief damper in system shall be modulated to maintain the building static pressure setpoint.
- F. Multizone System:
    1. Space sensor set at 72 degrees F, modulates zone dampers and maintains constant space temperature.
- G. Display:
    1. System graphic.
    2. System on/off indication.
    3. System fan on/off indication.
    4. Outside air temperature indication.
    5. Mixed air temperature indication.
    6. Fan discharge air temperature indication.
    7. Fan discharge temperature control point adjustment.
    8. Coil control valve indications.
    9. Return humidity control point adjustment.
    10. Supply static pressure indication.
    11. Supply static pressure control point adjustment.
    12. Supply fan speed.
    13. Building static pressure indication.
    14. Building static pressure control point adjustment.

3.4 UNIT HEATERS

- A. Room temperature sensor maintains constant space temperature of 68 degrees F by cycling unit fan motor.

3.5 POINTS LIST

- A. All control points shall be addressed according to actual mechanical equipment identification numbers and room numbers.

END OF SECTION 230993

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MORGAN COUNTY DEPARTMENT OF
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