

ADDENDUM

ADDENDUM NO: 02

PROJECT: Center Grove HS Renovations – Package 2

PROJECT NO: 2025075

DATE: August 28, 2026

BY: Jack Leibham

This Addendum is issued in accordance with the provisions of "The General Conditions of the Contract for Construction," Article 1, "Contract Documents" and becomes a part of the Contract Documents as provided therein. This Addendum includes:

Addendum Pages:

ADD2-1 through ADD2-5

Attached Specifications: 01 12 00, 01 23 00, EXHIBIT D, 23 34 23, 23 09 00, 23 74 23

Attached Drawing Sheets: A201E, A500, A600, E101, E101E, E102J, E201A.2, E201E, E202J, M500, M301A.2, M600A.2

PART 0 - GENERAL INFORMATION

0.1 NOT USED

PART 1 - BIDDING REQUIREMENTS

1.1 NOT USED

PART 2 - SPECIFICATIONS

2.1 01 12 00 – MULTIPLE CONTRACTS SUMMARY

A. Reissue spec section.

2.2 01 23 00 – ALTEERNATES

A. Add Alternate No. 2.

2.3 EXHIBIT D – BID SCHEDULE

A. Reissue project schedule

2.4 10 11 00 – VISUAL DISPLAY UNITS

A. Add manufacturers to section 2.01Ag as follows:

'g. Platinum Visual Solutions'

'h. Ghent, a GMi Company'

2.5 10 51 13 – METAL LOCKERS

- A. Add manufacturer to section 2.03A1 as follows:

1. Lockers Manufacturing, Open Angle Front

- B. Add manufacturer to section 2.04A6 as follows:

6. Lockers Manufacturing

2.6 23 34 23 – POWER VENTILATORS

- A. Replace spec section complete.

2.7 23 09 00 – Environmental Controls

- A. Add spec section.

2.8 23 74 23 – Packaged Outdoor Makeup Air Units

- A. Add spec section.

PART 3 - DRAWINGS

STRUCTURAL

3.1 NOT USED

ARCHITECTURAL

3.2 A201E – LOWER LEVEL FLOOR PLAN – UNIT E

- A. Revise Demolition Note 7 to read "REMOVE CASEWORK/COUNTERTOP COMPLETE. SALVAGE TALL STORAGE CABINETS FOR REINSTALLATION."

3.3 A500 – DOOR SCHEDULE, ELEVATIONS, & DETAILS

- A. Add glass type B. 1/4" Laminated Glass to glass schedule.
- B. Change glass types for doors 152A, 152B-1, 152B-2, and 152C doors and frames to glass type B.

3.4 A600 – EQUIPMENT & CASEWORK SCHEDULES, ELEVATIONS, & DETAILS

- A. Add type comment "REINSTALL SALVAGED CASEWORK" to T1 in casework schedule.

MECHANICAL

3.5 M500 – MECHANICAL SCHEDULES

- A. Adjusted mechanical equipment voltages to coordinate with electrical.

3.6 M301A.2 – LOWER LEVEL MECHANICAL PLAN UNIT A – ALTERNATE 2

- A. Added alternate sheet to the set. Only to be included as part of alternate bid.

3.7 M600A.2 – AHU CONTROLS

- A. Added alternate sheet to the set. Only to be included as part of alternate bid.

ELECTRICAL

3.8 E101 – ELECTRICAL OVERALL PLAN – LOWER LEVEL

- A. Added panel name tags on view 5 ELECTRICAL/MECHANICAL room.

3.9 E101E - LOWER LEVEL ELECTRICAL DEMOLITION PLANS - UNIT E

- A. Views from E102J has been moved to this sheet.

3.10 E102J - UPPER LEVEL ELECTRICAL DEMOLITION PLANS - UNIT J

- A. Views from E101E has been moved to this sheet.

3.11 E201A-2 - LOWER LEVEL ELECTRICAL DEMOLITION PLANS - UNIT A – ALTERNATE 2

- A. Added new sheet and views to capture Alternate 2
- B. Added Tag note ENC69
- C. Added tag note ENC70
- D. Added new disconnect to power MUA
- E. Added panel name to panel 6H1 located in Electrical 123A.

3.12 E201E - LOWER LEVEL ELECTRICAL NEW WORK PLANS - UNIT E

- A. Views from 202J has been moved to this sheet.
- B. Added additional verbiage to AV_EQUIPMENT SCHEDULE.

3.13 E202J - UPPER LEVEL ELECTRICAL NEW WORK PLANS - UNIT J

- A. Views from 201E has been moved to this sheet.

PART 4 - OTHER ITEMS

4.1 NOT USED

PART 5 - QUESTIONS AND ANSWERS

5.1 Question #1

- A. On the plans you have B1 Tarket 4in coved Grey base listed. In Spec Section 096213 Resilient Base and Accessories it states to refer to section 096566 Resilient Athletic Flooring installed with Vent coved base, but this only comes in 2 colors black and brown. Please advise if the grey base should be used or if the athletic floor base should follow the spec. If it follows the spec, which color should be used?

1. Use grey cove base listed on finish legend.

5.2 Question #2

- A. The HM frames in Control Room 152B are called out to have an STC rating of 47 on the door schedule.
Glass called out for these on prints is 1/4" clear tempered which has little to no STC rating. I would think for these door frames and the F8 window frames they would want a glass that has some STC properties. There isn't a standard glass that will rate that high. Below are some standard products that will have some STC rating and how high those ratings go. Price goes up as you go down the list.
1/4" clear laminated glass (1/8" glass plys with .030 PVB interlayer) STC = 35
9/16" clear laminated glass (1/4" glass plys with .060 PVB interlayer) STC = 39.
11/16" clear laminated glass (3/8" glass - .060 PVB interlayer – 1/4" glass) STC= 40
1" clear laminated insulated glass (1/4" laminated inboard and outboard lites with 1/2" air spacer) STC = 42

1. Glass Type to be 1/4" laminated glass.

5.3 Question #3

- A. In room 581 - Staff Fitness, after the wood athletic flooring gets removed does this room need to be built up to maintain finish floor elevation?

1. The floor that is being removed is a wood grain LVT, there isn't a recessed floor in that area.

5.4 Question #4

- A. In spec section 262400 Distribution under sequencing it mentions Power studies section 260573. This spec section is not included. Is a power studies required?

1. Power Systems Studies Will not be Required

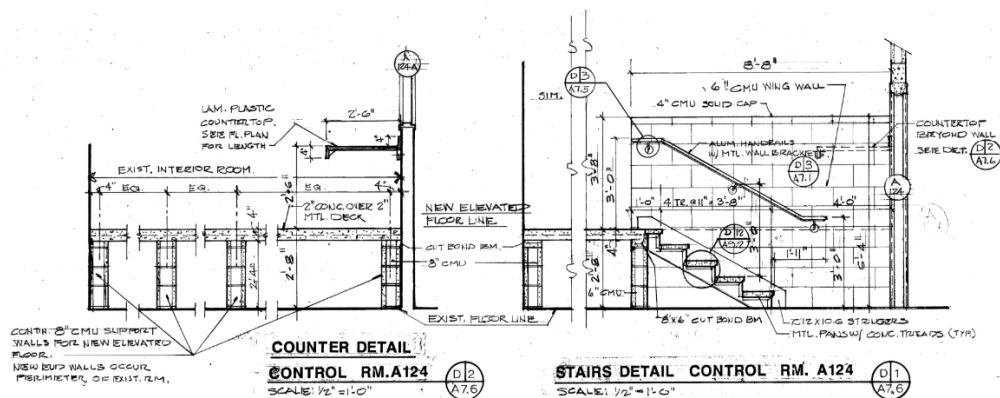
5.5 Question #5

- A. Do the football lockers, LK1 to have shoulder pad holders or not? These are not mentioned in the specs, but are shown on the elevation drawing Detail 9, A600. Please confirm.

1. Football lockers, LK1, to have shoulder pad holders as shown in elevation drawing.

5.6 Question #6

- A. Are there any as-built drawings available showing the construction of the control booth slab that is to be demolished? I assume that is a concrete slab on metal deck with minimal structural steel around the perimeter (an angle or channel attached to masonry that will have to be patched). I assume that is a concrete slab on metal deck with minimal structural steel around the perimeter (an angle or channel attached to masonry that will have to be patched). I also want to be sure there is in fact an existing slab on grade and that we aren't responsible for a new slab.



- 1.
2. Details from existing drawings show the floor is a concrete slab on metal deck supported by CMU walls without any fill material shown. Drawing do not show removal of existing slab when new platform was added. These details are from design drawings without a set of as-builts saying otherwise.

END ADDENDUM #2

SECTION 01 12 00 - MULTIPLE CONTRACT SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes a summary of each contract, including responsibilities for coordination and temporary facilities and controls.
- B. Specific Requirements for work of each contract are also indicated in individual Specification Sections and Drawings.
- C. Related Sections:
 - 1. Division 01 Section "Summary" for:
 - a. Identification of the Construction Manager
 - b. The work covered by the Contract Documents
 - c. Restrictions on use of the Project site.
 - d. Coordination with occupant.
 - e. Work restrictions.
 - 2. Division 01 Section "Project Management and Coordination" for:
 - a. General coordination requirements.
 - b. Requirements for coordination drawings.

1.3 DEFINITIONS

- A. Permanent Enclosure: As determined by CM and A/E, the condition at which roofing is insulated and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures equivalent in weather protection to permanent construction.

1.4 GENERAL

- A. Work Covered by Total Contract Documents:
- B. Project Description:
 - 1. The project consists of a renovation of Construction Lab, Publications Lab, Girls Wrestling Locker Room, and Football Locker Room in accordance with plans and specifications prepared by CSO Architecture.
 - 2. Work for the complete construction of this project will be under multiple prime contracts with the Owner. AECOM Hunt will manage the construction of the project.
- C. Prime Contracts:
 - 1. The multiple prime contracts are defined by bid packages, which designate one or more various disciplines of work. These bid packages are being created to maintain job scheduling. Time is of the essence in performing this work. Each Bidder will expedite the manpower, materials, and equipment necessary to execute their scope of work within the project schedule.
 - 2. The Bid Packages being considered under this phase of work are listed on the Bid Package Schedule in this Section.
 - 4. Divisions 00 and 01 of the Specifications shall be included in the scope of work of each Bid Package.
 - 5. Each contractor should review the scope of work of each Bid Package Contractor (BP).
 - 6. The general scope of each contractor's work is defined in the description of each contract in Section 01 12 00 of this project manual. Each contractor should keep in mind

- that their work might require coordination with the work of a previous contractor, or with the work of a subsequent contractor.
7. Instances of perceived improper assignment of work, or dispute(s) where work could be claimed by more than one contractor, should be brought to the attention of the Construction Manager prior to bid. Otherwise, it will be expected that the contractors will either subcontract this work or directly employ members of the appropriate trade to perform that scope-of-work.
 8. Should a duplication of any portion of the work occur in the Drawings or the Specifications, as a result of the assignment of work to separate prime contracts and the duplication is not clarified prior to bidding, each BP shall include the work until such time that a modification is made to one or all of the Contract(s).
 9. If a contractor is assigned work of a trade they do not normally employ, he shall either subcontract the work to a contractor employing that trade or directly employ members of the appropriate trade to perform that scope-of-work. This shall in no case result in a slow-down or stoppage of work of any contractor on the project.
 10. If the drawings are in conflict within themselves or with the Specifications, the higher quality or greater quantity of equipment and/or materials shall be provided in your Base Bid or Bid Alternate, unless specified in writing.
- D. Owner Requirements and Use of Premises
1. It is the intention of the Owner to award contracts to the lowest, responsible, responsive bidder. Included in evaluation of bids, will be the Contractor's past performance.
 2. The Construction Manager will assign parking areas, and construction trailer staging areas. No parking or loitering will be permitted on access roads and mobilization areas.
 3. No smoking or tobacco products are allowed on School property.
 4. Use only bathrooms designated for construction use.
- E. License Requirements
1. All Contractors shall be licensed as required by Local and State agencies and shall verify these requirements with the respective governing agencies.

CGHS Renovations Package 2

BP	BID PACKAGE TITLE
BP - 01	General Trades
BP - 02	Mechanical, Plumbing
BP - 03	Electrical & Technology
BP - 04	Fire Protection

BP – 01 General Trades

The summaries of work of this contractor include but are not necessarily limited to, the following:

Division 00 – Bidding Documents	All Sections
Division 01 – General Requirements	All Sections
Division 02 – Existing Conditions	
02 41 19	Selective Demolition
Division 03 – Concrete	
03 30 00	Cast-In-Place Concrete
03 35 00	Polished Concrete Surface Treatment
03 54 16	Hydraulic Cement Underlayment
Division 04 – Masonry	
04 20 00	Unit Masonry
Division 05 – Metals	
	Not Used
Division 06 – Wood, Plastics, and Composites	
06 10 53	Misc. Rough Carpentry
Division 07 – Thermal and Moisture Protection	
07 92 00	Joint Sealants
Division 08 – Openings	
08 11 13	Hollow Metal Doors and Frames
08 14 19	Flush Wood Doors
08 31 13	Access Doors and Frames
08 71 00	Door Hardware
08 71 00A	Door Index
08 80 00	Glazing
Division 09 – Finishes	
09 22 16	Non-Structural Metal Framing
09 29 00	Gypsum Board
09 30 00	Tiling
09 51 13	Acoustical Panel Ceilings
09 65 13	Resilient Base and Accessories
09 65 66	Resilient Athletic Flooring
09 67 23	Resinous Flooring
09 68 13	Tile Carpeting
09 84 00	Acoustic Room Components
09 91 23	Interior Painting
09 96 00	High-Performance Coatings
Division 10 – Specialties	
10 11 00	Visual Display Surfaces
10 14 23	Panel Signage
10 21 13	Toilet Partitions
10 26 00	Wall and Door Protection – Corner Guards
10 28 00	Toilet, Bath, and Laundry Accessories
10 51 13	Metal Lockers

Division 11 – Equipment

11 61 45	Acoustical Curtains
11 62 00	Entertainment Equipment
11 62 43	Pipe Grid

Division 12 – Furnishings

12 32 16	Manufactured Plastic-Laminate-Faced Casework
12 36 63	Solid Surface Countertops

Division 13 – Special Construction

Not Used

Division 14 – Conveying Systems

Not Used

BP – 01 Clarifications:

1. If there are discrepancies between these General Clarifications and other areas of the Contract Documents, the more stringent requirement shall prevail.
2. At any utility installation, relocation, material delivery or general work which impedes normal traffic patterns or daily operations of the Owner, traffic control will be required, which will include all barricades, flashers, flaggers, etc. necessary to safely install and complete the work.
3. Deliveries of any materials and/or equipment cannot be done during the hours of student/bus drop-off (7:00AM – 8:00AM) and pick-up (2:00PM – 3:15 PM) when school is in session. Contractor shall coordinate and cooperate with Construction Manager regarding all deliveries.
4. No equipment and/or trucks will be allowed to block access to the jobsite. Coordinate all site access with CM. Because of limited site storage space, this contractor is required to have his subcontractors and material suppliers schedule “**just-in-time**” shipments of materials to the job site. Laydown area to be designated by the Construction Manager.
5. Provide all temporary protection, barricades, barriers, signage, dust control, erosion control, safety pre-cautions and/or procedures related to the execution of work by this contractor.
6. Contractor is responsible to furnish, install and maintain fall protection as applicable for their scope of work.
7. Responsible for providing all hoisting and rigging for erection of materials provided by this contractor including but not limited to crane paths, pads, and cribbing. Removal of all required materials is included in this scope of work.
8. Contractor must obtain a “Hot Permit” from the Construction Manager before hot work can begin. When using torches, it is mandatory that a fire watch is used at all times. Hot work shall stop 1 hour prior to quitting time and a watch maintained until quitting time. Areas with hot work shall not be abandoned during breaks or lunch.
9. Provide cleaning of the project site and work areas daily, including common areas as it pertains to this contractor’s scope of work. Maintain project site free of waste materials and debris. Remove debris from concealed spaces before enclosing the space. Dispose of materials lawfully. Trash containers and dumpsters are being provided by BP-01 General Trades. It is the responsibility of every contractor to get their trash to those containers.
10. Contractor is responsible to provide all dumpsters and portapots on project site. CM to determine locations.
11. Contractors use of the owners restroom facilities is strongly prohibited.
12. Contractor is responsible to provide demo carts sized appropriately for existing building areas.
13. Concrete truck waste material shall be confined to one location or as determined by the Construction Manager. Concrete washout dumpsters are not acceptable. All concrete waste material shall be removed from the site by this contractor.
14. Contractor is responsible for dust control during all phases of construction.
15. All utility shutdowns that would affect the existing facility must occur outside of Owner

- operating hours. All utility shutdowns must be coordinated with Construction Manager and Owner 72 hours prior to shut down.
16. All layout as required for this scope of work.
 17. Coordinate any required rough openings, in-wall rough-ins, or penetrations with appropriate trades.
 18. Contractor is responsible for coordination with all bid packages as required to meet all dates depicted on project Bid Schedule.
 19. Contractor is responsible to coordinate with other trades and CM before any demolition to ensure all required Owner items are properly removed and salvaged.
 20. Provide fire extinguishers that will be located within each construction phase throughout the duration of the project as required by I.O.S.H.A. regulations.
 21. Responsible for all demolition as applicable to their scope of work.
 22. Responsible for demolition, salvage and installation of all items noted on the contract documents, as it pertains to their scope of work.
 23. Provide for and maintain protection of your products until substantial completion.
 24. Contractor is responsible for protecting all existing floors as it pertains to their scope of work.
 25. Responsible for protecting/patching/repairing existing finishes to remain due to any damage caused by construction activities as it pertains to their scope of work.
 26. Responsible for paying for and obtaining all permits and scheduling inspections with the Authorities Having Jurisdiction.
 27. Contractor is responsible for furnishing and installing all bulkheads required for construction.
 28. This contractor provides and installs all floor transitions as required for their scope of work.
 29. Include sealants and backer rods under Section 07 92 00 for the materials you install and also sealants that are integral with or adjacent to your installations.
 30. Contractor required to caulk where two dissimilar materials meet.
 31. Contractor is responsible for ensuring that all doors operate correctly after new flooring installation.
 32. Contractor is responsible for providing and installing doors and door hardware as indicated on the contract documents.
 33. Contractor is responsible to reference the Contract Documents for door hardware details.
 34. Responsible for final cleaning of completed areas prior to substantial completion as defined by 01 77 00.
 35. Contractor is to paint all hollow metal door frames within the affected area.
 36. Contractor is responsible for patching and painting existing walls to create like new condition.
 37. Contractor is responsible for all floor patching as required.
 38. Contractor to seal all penetrations in ceiling deck to rooms above.
 39. Contractor is responsible for all masonry work as indicated on the project documents.
 40. Contractor is responsible for all concrete work shown on the project documents.
 41. Contractor is responsible to provide and install all access panels shown on the project documents.
 42. Contractor is responsible to remove drywall and grid ceilings, and reinstall grid ceilings below girls locker room to accommodate mechanical work as shown in Exhibit E.
 43. Contractor is responsible to install owner furnished paper towel dispensers, soap dispensers, and toilet paper dispensers. Contractor provides and installs all other bathroom accessories shown on the contract documents.
 44. Contractor use of elevators is prohibited.
 45. Contractor shall coordinate and cooperate with Construction Manager field personnel relative to this Contractor's deliveries.
 46. Contractor is responsible to implement and maintain a site evacuation and emergency response plan covering all job-site construction workers.
 47. Contractor is responsible to furnish and install all loose lintels, as needed, regardless if shown on the contract documents.

48. Contractor is responsible for providing and installing temporary enclosures and partitions to maintain security and weather tightness.
49. Contractor is responsible for installing owner provided welding booths.
50. Contractor is responsible for installation of owner provided WL2 Located on A201A Detail 2.
51. Contractor is responsible for room signage as depicted in Exhibit F.
52. Contractor is responsible to coordinate with owners preferred vendor (ERS) for access controls door and frame preparation.
53. Contractor is responsible for preparation in existing door frames for electronic hardware as depicted in Exhibit C.
54. Contractor is responsible to provide and install all lockers shown in the contract documents.
55. Contractor is responsible to provide and install Rosco Green Chroma Vinyl Flooring in Video Studio room 152C.
56. Contractor is responsible to provide and install Cyclorama Cove and all associated substructure as recommended by the manufacture in the Video Studio room 152C.
57. Contractor is responsible for providing and installing all doors, door frames, and non-electrified hardware as shown on the contract documents.
58. Contractor is responsible for providing Masonite and 3/4" Plywood to protect Vandy Gym floors.
59. Contractor is responsible for floor protection for all material handling paths as directed by the CM.
60. Contractor is responsible for patching and repairing masonry walls after demolition in room 102A.
61. Contractor is responsible for concrete slab in room 102A.
62. Contractor is responsible for salvaging existing marker boards and tack boards and storing it in a location designated by the CM.

Exclusions:

1. BP-02 Mechanical is responsible for cutting and patching of concrete floors as it pertains to their scope of work.
2. Any access doors/panels not shown on the contract documents are provided and installed by the contractor who requires it.
3. Owner provides and installs all electronic door hardware.

BP – 02 Mechanical and Plumbing

The summaries of work of this contractor include, but are not necessarily limited to, the following:

Division 00 – Bidding Documents	All Sections
Division 01 – General Requirements	All Sections
Division 02 – Existing Conditions	
02 41 19	Selective Demolition (As-Applicable)
Division 03 – Concrete	
03 30 00	Cast-In-Place Concrete
03 35 00	Polished Concrete Surface Treatment
03 54 16	Hydraulic Cement Underlayment
Division 07 – Thermal and Moisture Protection	
07 92 00	Joint Sealants
Division 22 – Plumbing	
22 05 00	Basic Plumbing Materials and Methods
22 05 17	Sleeves and Sleeve Seals for Plumbing
22 05 18	Escutcheons for Plumbing Piping
22 05 23	General-Duty Valves for Plumbing Piping
22 05 53	Identification for Plumbing Piping and Equipment
22 07 19	Plumbing Piping Insulation
22 42 14	Commercial Water Closets and Wall Mounted Flush
22 42 15	Commercial Lavatories
22 42 16	Commercial Sinks
22 42 17	Drinking Fountains
22 42 23	Commercial Showers, Receptors, and Basins
22 62 14	Compressed Air Piping
Division 23 – Heating Ventilating and Air Conditioning	
23 05 00	Common Work Results for HVAC
23 05 13	Common Motor Requirements for HVAC Equipment
23 05 19	Meters and Gages for HVAC
23 05 23	General Duty Valves for HVAC Piping
23 05 29	Hangers and Supports for HVAC Piping and Equipment
23 05 53	Identification for HVAC Piping and Equipment
23 05 93	Testing Adjusting and Balancing for HVAC
23 07 00	HVAC Insulation
23 21 13	Hydronic Piping
23 31 13	Metal Ducts
23 33 00	Air Duct Accessories
23 34 23	HVAC Power Ventilators
23 37 13	Diffusers Registers and Grilles
23 81 41	Water Source Heat Pump

BP – 02 Clarifications:

1. If there are discrepancies between these General Clarifications and other areas of the Contract Documents, the more stringent requirement shall prevail.
2. At any utility installation, relocation, material delivery or general work which impedes normal traffic patterns or daily operations of the Owner, traffic control will be required, which will include all barricades, flashers, flaggers, etc. necessary to safely install and complete the work.
3. Deliveries of any materials and/or equipment cannot be done during the hours of

- student/bus drop-off (7:00AM – 8:00AM) and pick-up (2:00PM – 3:15 PM) when school is in session.
4. Contractor shall coordinate and cooperate with Construction Manager regarding all deliveries.
 5. No equipment and/or trucks will be allowed to block access to the jobsite. Coordinate all site access with CM. Because of limited site storage space, this contractor is required to have his subcontractors and material suppliers schedule “just-in-time” shipments of materials to the job site. Laydown area to be designated by the Construction Manager.
 6. Provide all temporary protection, barricades, barriers, signage, dust control, erosion control, safety pre-cautions and/or procedures related to the execution of work by this contractor.
 7. Contractor is responsible to furnish, install and maintain fall protection as applicable for their scope of work.
 8. Responsible for providing all hoisting and rigging for erection of materials provided by this contractor including but not limited to crane paths, pads, and cribbing. Removal of all required materials is included in this scope of work.
 9. Contractor must obtain a “Hot Permit” from the Construction Manager before hot work can begin. When using torches, it is mandatory that a fire watch is used at all times. Hot work shall stop 1 hour prior to quitting time and a watch maintained until quitting time. Areas with hot work shall not be abandoned during breaks or lunch.
 10. Contractors use of the owners restroom facilities is strongly prohibited.
 11. Provide cleaning of the project site and work areas daily, including common areas as it pertains to this contractor’s scope of work. Maintain project site free of waste materials and debris. Remove debris from concealed spaces before enclosing the space. Dispose of materials lawfully. Trash containers and dumpsters are being provided by BP-01 General Trades. It is the responsibility of every contractor to get their trash to those containers.
 12. Contractor is responsible for dust control during all phases of construction, as it pertains to their scope of work.
 13. All utility shutdowns that would affect the existing facility must occur outside of Owner operating hours. All utility shutdowns must be coordinated with Construction Manager and Owner 72 hours prior to shut down. This includes putting the fire alarm system in test, or draining the sprinkler system.
 14. All layout as required for this scope of work.
 15. Coordinate any required rough opening, in-wall rough-ins, or penetrations with appropriate trades.
 16. Contractor is responsible for coordination with all bid packages as required to meet all dates depicted on project Bid Schedule.
 17. Contractor is responsible to coordinate with other trades and CM before any demolition to ensure all required Owner items are properly removed and salvaged.
 18. Responsible for all demolition as applicable to their scope of work.
 19. Provide for and maintain protection of your products until substantial completion.
 20. Contractor is responsible for any damages caused by installation of their scope of work.
 21. Contractor is responsible for protecting all existing floors as it pertains to their scope of work.
 22. Responsible for patching/repairing existing finishes to remain due to any damage caused by construction activities as it pertains to their scope of work.
 23. Contractors are responsible for providing water to complete their scope of work.
 24. Contractor is responsible for dewatering as required for this scope of work.
 25. Contractor is responsible for cutting and patching as it pertains to their scope of work.
 26. Responsible for caulking and sealing as it pertains to their scope of work. This includes all penetrations by this contractor.
 27. Responsible for furnishing and applying sealant and/or fire-stopping around your installations and penetrations.
 28. Include sealants and backer rods under Section 07 92 00 for the materials you install and also sealants that are integral with or adjacent to your installations.
 29. Furnish and install all mechanical vents and piping per the contract documents. This contractor to provide all rigging and lifting required for mounting mechanical equipment.

30. This Contractor is responsible for furnishing and installing any steel framing, wood blocking or other material which is required for support of mechanical equipment.
31. Responsible for installing pipe sleeves for this Contractor's installations.
32. Responsible for adding, relocating, modifying, and adjusting duct work to appropriate locations to accommodate new work.
33. Contractor is responsible for test and balance.
34. Coordinate layout and installation of all rough-ins, penetrations and openings (plumbing, mechanical, window, door, etc.) with BP 01 General Trades. This contractor is to furnish material per approved shop drawings in accordance with the contract documents.
35. Responsible for firestopping your penetrations at fire-rated areas.
36. Contractor is responsible for cutting and patching of concrete floors to complete their scope of work.
37. Any access doors/panels not shown on the contract documents are provided and installed by the contractor who requires it.
38. Contractor is responsible to X-ray all concrete slabs prior to cutting as it pertains to their scope of work.
39. Contractor is responsible to provide and install all heat pumps shown on the contract documents.
40. Contractor is responsible for protecting all existing floors as it pertains to their scope of work.
41. Contractor responsible for removal / reinstallation / repair / replacement of ceiling grid and/or tile that is damaged while completing their scope of work.
42. It is the responsibility of this Contractor to remove and repair any ceiling tile or grid needed to be removed to complete their scope of work but is not shown on the Contract Documents to be removed.

Exclusions:

BP – 03 Electrical

The summaries of work of this contractor include, but are not necessarily limited to, the following:

Division 00 – Bidding Documents	All Sections
Division 01 – General Requirements	All Sections
Division 02 – Existing Conditions	
02 41 19	Selective Demolition (As-Applicable)

Division 07 – Thermal and Moisture Protection	
07 92 00	Joint Sealants (As-Applicable)

Division 26 – Electrical	
26 05 01	General Provisions
26 05 02	Common Work Results for Electrical
Systems	
26 05 05	Demolition, Restoration, and Salvage
26 05 19	Conductors, Identifications, Splicing
Devices and Connections	
26 05 26	Grounding and Bonding
26 05 33	Raceways and Fittings
26 05 53	Identification
26 24 00	Electrical Distribution Equipment
26 27 26	Wiring Devices and Plates

Division 27 – Communications	
27 15 00	Communications Horizontal Cabling

Division 28 – Electronic Safety and Security	
28 33 00	Lab Safety System

BP – 03 Clarifications:

1. If there are discrepancies between these General Clarifications and other areas of the Contract Documents, the more stringent requirement shall prevail.
2. At any utility installation, relocation, material delivery or general work which impedes normal traffic patterns or daily operations of the Owner, traffic control will be required, which will include all barricades, flashers, flaggers, etc. necessary to safely install and complete the work.
3. Deliveries of any materials and/or equipment cannot be done during the hours of student/bus drop-off (7:00AM – 8:00AM) and pick-up (2:00PM – 3:15 PM) when school is in session. Contractor shall coordinate and cooperate with Construction Manager regarding all deliveries.
4. No equipment and/or trucks will be allowed to block access to the jobsite. Coordinate all site access with CM. Because of limited site storage space, this contractor is required to have his subcontractors and material suppliers schedule “just-in-time” shipments of materials to the job site. Laydown area to be designated by the Construction Manager.
5. Provide all temporary protection, barricades, barriers, signage, dust control, erosion control, safety pre-cautions and/or procedures related to the execution of work by this contractor.
6. Contractor is responsible to furnish, install and maintain fall protection as applicable for their scope of work.
7. Responsible for providing all hoisting and rigging for erection of materials provided by this

contractor including but not limited to crane paths, pads, and cribbing. Removal of all required materials is included in this scope of work.

8. Contractor must obtain a "Hot Permit" from the Construction Manager before hot work can begin. When using torches, it is mandatory that a fire watch is used at all times. Hot work shall stop 1 hour prior to quitting time and a watch maintained until quitting time. Areas with hot work shall not be abandoned during breaks or lunch.
9. Provide cleaning of the project site and work areas daily, including common areas as it pertains to this contractor's scope of work. Maintain project site free of waste materials and debris. Remove debris from concealed spaces before enclosing the space. Dispose of materials lawfully. Trash containers and dumpsters are being provided by BP-01 General Trades. It is the responsibility of every contractor to get their trash to those containers.
10. Contractor is responsible for dust control during all phases of construction, as it pertains to their scope of work.
11. Contractors use of the owners restroom facilities is strongly prohibited.
12. All utility shutdowns that would affect the existing facility must occur outside of Owner operating hours. All utility shutdowns must be coordinated with Construction Manager and Owner 72 hours prior to shut down. This includes putting the fire alarm panel into test.
13. The fire alarm panel CANNOT be in test while students are in the building.
14. All layout as required for this scope of work.
15. Coordinate any required rough opening, in-wall rough-ins, or penetrations with appropriate trades.
16. Contractor is responsible for coordination with all bid packages as required to meet all dates depicted on project Bid Schedule.
17. Contractor is responsible to coordinate with other trades and CM before any demolition to ensure all required Owner items are properly removed and salvaged.
18. Responsible for securing all light fixtures and devices either in the ceiling or salvaged for re-installations as applicable. This includes, but is not limited to, fire alarm devices, speakers, light fixtures, air purifiers, wireless access points, equipment, etc.
19. Responsible for all demolition as applicable to their scope of work.
20. Contractor is responsible to salvage existing lights and air purifiers as indicated on the contract documents.
21. Provide for and maintain protection of your products until substantial completion.
22. Contractor is responsible for any damages caused by installation of their scope of work.
23. Contractor is responsible for protecting all existing floors as it pertains to their scope of work.
24. Responsible for patching/repairing existing finishes to remain due to any damage caused by construction activities as it pertains to their scope of work.
25. Contractor is responsible for all electrical work as indicated on the Architectural, Electrical, Technology, Mechanical, Plumbing & Fire Protection contract plans.
26. Responsible for all electrical power shown on Contract Documents.
27. Responsible for all fire alarm work.
28. Contractor is responsible for providing temporary lighting as required in construction phases.
29. Contractor is responsible for any required cutting and patching of concrete floors as it pertains to their scope of work.
30. Responsible for caulking and sealing as it pertains to their scope of work. This includes all penetrations by this contractor.
31. Responsible for furnishing and applying sealant and/or fire-stopping around your installations and penetrations, including "open" conduit.
32. Responsible for firestopping your penetrations at fire-rated areas.
33. Include sealants and backer rods under Section 07 92 00 for the materials you install and also sealants that are integral with or adjacent to your installations.
34. Responsible for furnishing and installing protective rings at the ends of this Contractor's embedded conduits prior to pulling cable.
35. Contractor is responsible for all pathways, circuits, conduits, and boxes as required for this bid package's scope.
36. This contractor is responsible for all connections between fixtures and junction boxes.
37. Responsible for installation and relocation of all lighting fixtures and controls as depicted on

- the contract documents.
38. Contractor is responsible to label and index each cable and provide photo documentation of all switches prior to relocation. This contractor is responsible to relocate switches to new location as shown on E101A Detail 1 note ED1. Owner is responsible for provided new switches only.

Exclusions:

1. BP-01 supplies doors and non-electrified hardware.
2. Owner is responsible for providing and installing all access control hardware and wiring shown on the contract documents.

BP – 04 Fire Protection

The summaries of work of this contractor include, but are not necessarily limited to, the following:

Division 00 – Bidding Documents All Sections

Division 01 – General Requirements All Sections

Division 02 – Existing Conditions

02 41 19 Selective Demolition (As-Applicable)

Division 07 – Thermal and Moisture Protection

07 92 00 Joint Sealants (As-Applicable)

Division 08 – Openings

08 31 13 Access Doors and Frames (As-applicable)

DIVISION 20 - FIRE SUPPRESSION, PLUMBING AND HVAC

NOT USED

Division 21 – Fire Protection

21 05 00	Basic Fire Protection Materials and Methods
21 05 17	Sleeves and Sleeve Seals for Fire-Suppression Piping
21 05 18	Escutcheons for Fire-Suppression Piping
21 05 53	Identification for Fire-Suppression Piping and Equipment
21 13 13	Wet-Pipe Sprinkler Systems

BP – 04 CLARIFICATIONS:

1. If there are discrepancies between these General Clarifications and other areas of the Contract Documents, the more stringent requirement shall prevail.
2. At any utility installation, relocation, material delivery or general work which impedes normal traffic patterns or daily operations of the Owner, traffic control will be required, which will include all barricades, flashers, flagmen, etc. necessary to safely install and complete the work.
3. Deliveries of any materials and/or equipment cannot be done during the hours of student/bus drop-off (8:00AM – 9:00AM) and pick-up (3:00PM – 4:00 PM) when school is in session.
4. No equipment and/or trucks will be allowed to block access to the jobsite. Coordinate all site access with CM. Because of limited site storage space, this contractor is required to have his subcontractors and material suppliers schedule “just-in-time” shipments of materials to the job site. Laydown area to be designated by the Construction Manager.
5. Responsible for providing all hoisting and rigging for erection of materials provided by this contractor including but not limited to crane paths, pads and cribbing. Removal of all required materials is included in this scope of work.
6. Contractor shall coordinate and cooperate with Construction Manager relative to all deliveries.
7. Contractor is responsible for coordination with all bid packages as required to meet all dates depicted on project Bid Schedule.
8. Contractor is responsible for furnishing, install and maintain fall protection as applicable for their scope of work.
9. Contractor is responsible for providing water service access to complete their scope of work.

10. Provide cleaning of the project site and work areas daily, including common areas as it pertains to this contractor's scope of work. Maintain project site free of waste materials and debris. Remove debris from concealed spaces before enclosing the space. Dispose of materials lawfully. Trash containers and dumpsters are being provided by BP 01 General Trades. It is the responsibility of **every contractor** to get their trash to those containers.
11. Coordinate layout and installation of all rough-ins, penetrations and openings (plumbing, mechanical, window, door, etc.) with BP 01 General Trades. This contractor is to furnish material per approved shop drawings in accordance with the contract documents.
12. All utility shutdowns that would affect the existing facility must occur outside of Owner operating hours. This includes putting the fire alarm system in test or draining the sprinkler system.
13. The fire alarm panel CANNOT be in test while students are in the building.
14. All utility shutdowns must be coordinated with Construction Manager and Owner 72 hours prior to shut down.
15. Responsible for cutting all sprinkler heads into acoustical ceiling tile.
16. Responsible for firestopping your penetrations at fire-rated areas.
17. Responsible for caulking and sealing of all penetrations by this contractor.
18. BP-01 General Trades is responsible for providing and installing all access doors/panels that are shown on the contract documents. Any additional access panels/doors not shown on the contract documents are the responsibility of the Contractor as it pertains to their scope of work.
19. Responsible for adding, relocating, modifying, and adjusting fire sprinklers heads to appropriate locations to accommodate new work.
20. Contractor to install new flexible sprinkler heads as required.
21. Contractor is responsible for any damage caused by installation of their scope of work.
22. Contractor is responsible for providing and maintaining protection of their products until substantial completion.
23. Contractor is responsible for protecting all existing floors as it pertains to their scope of work.
24. Contractor is responsible to coordinate with other trades and CM before any demolition to ensure all required Owner items are properly removed and salvaged.
25. Contractor is responsible for cutting and patching as it pertains to their scope of work.
26. Contractor is responsible for removal / reinstall / repair / replacement of ceiling grid and/or tile that is damaged while completing their scope of work.
27. Contractor is responsible for removing the existing flex head and replacing with rigid pipe as shown in Exhibit E.
28. Contractor is responsible for installing flex heads in existing coaches' bathroom and shower as shown in Exhibit E.

Exclusions:

SECTION 01 23 00 - ALTERNATES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

1. Section includes administrative and procedural requirements for alternates.

1.03 DEFINITIONS

1. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.04 PROCEDURES

1. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
2. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.
3. Execute accepted alternates under the same conditions as other work of the Contract.
4. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 SCHEDULE OF ALTERNATES

1. Alternate No. 1: Water Source Heat Pump Manufacturer Alternate

1A: WSHP to be provided by BOD Trane as scheduled.

1B: WSHP to be provided by Water Furnace similar to Versatec model.

1C: WSHP to be provided by Climate Master similar to Tranquility SE model.

2. Alternate No. 2: Welding Exhaust Alternate

Base Bid: Provide point of use welding fume collectors as shown on M301A, M600A, E201A.

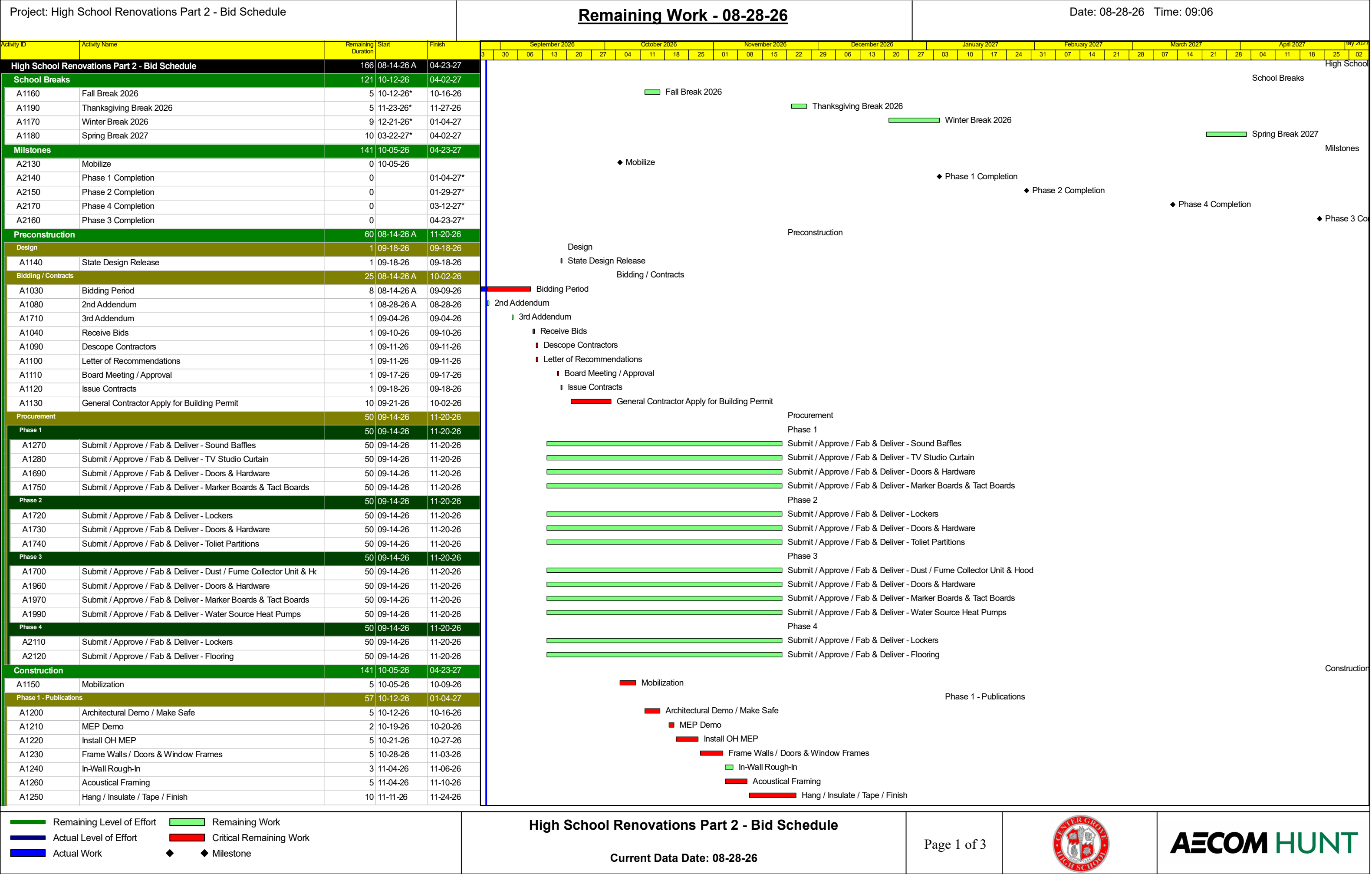
Alternat Bid: Provide make-up air unit and exhaust fan for welding equipment as shown on sheets M301A.2, M600A.2, and E201A.2.

END OF SECTION

AECOM HUNT

Schedule

EXHIBIT D



Activity ID	Activity Name	Remaining Duration	Start	Finish
A1300	Painting	3	11-25-26	12-01-26
A1290	Acoustic Ceilings	3	12-02-26	12-04-26
A1350	Install MEP Finishes	2	12-07-26	12-08-26
A1320	Install Casework & Countertops	1	12-09-26	12-09-26
A1330	Install Carpet Flooring	2	12-10-26	12-11-26
A1310	Install Base	1	12-14-26	12-14-26
A1360	Install TV Studio Curtain	2	12-14-26	12-15-26
A1370	Install Sound Baffles	2	12-14-26	12-15-26
A1340	Install Doors & Hardware	2	12-15-26	12-16-26
A1680	Install Marker Boards & Tact Boards	2	12-15-26	12-16-26
A1380	Final Clean	2	12-17-26	12-18-26
A1390	Punch	5	12-21-26	12-28-26
A1400	Owner Move In	4	12-29-26	01-04-27
Phase 2 - Girls Wrestling Locker Room		76	10-12-26	01-29-27
A1410	Architectural Demo / Make Safe	5	10-12-26	10-16-26
A1420	Stock Construction Material	3	10-12-26	10-14-26
A1440	Main Level Ceiling Demo Mens Wrestling, Coaches Offices, & Locker Rooms	5	10-12-26	10-16-26
A1630	Core Slab for Sanitary Tie-In	2	10-19-26	10-20-26
A1430	MEP Demo	3	10-21-26	10-23-26
A1450	Upper Level Sanitary Rough-In	8	10-21-26	10-30-26
A1460	Install CMU Walls	15	11-02-26	11-20-26
A1470	Electrical & Plumbing CMU Walls Rough-In	15	11-02-26	11-20-26
A1490	Install Door Frames	15	11-02-26	11-20-26
A1670	Reinstall Main Level Ceilings	3	11-02-26	11-04-26
A1500	Install OH MEP	8	11-23-26	12-04-26
A1480	Install Concrete Locker Benches	10	12-07-26	12-18-26
A1530	Install Ceramic Tile	3	12-07-26	12-09-26
A1550	Painting	3	12-21-26	12-23-26
A1510	Install Ceilings	3	12-24-26	12-29-26
A1540	Install Counter Top	1	12-24-26	12-24-26
A1620	Install Ceiling MEP Finishes	2	12-30-26	12-31-26
A1520	Install Epoxy Flooring / Base	5	01-04-27	01-08-27
A1560	Install Plumbing Fixtures	3	01-11-27	01-13-27
A1590	Install Lockers	6	01-11-27	01-18-27
A1600	Install Carpet & Base in Coaches Office	1	01-11-27	01-11-27
A1610	Install Doors & Hardware	2	01-12-27	01-13-27
A1570	Install Toilet Partitions	1	01-14-27	01-14-27
A1580	Install Toilet Accessories	2	01-15-27	01-18-27
A1640	Final Clean	2	01-19-27	01-20-27
A1650	Punch	5	01-21-27	01-27-27
A1660	Owner Move In	2	01-28-27	01-29-27
Phase 3 - Manufacturing Lab		79	01-05-27	04-23-27
A1760	Architectural Demo / Make Safe	13	01-05-27	01-21-27
A1770	MEP Demo	13	01-05-27	01-21-27
A1780	Cut Slab	4	01-22-27	01-27-27
A1790	Sanitary Tie-In	5	01-28-27	02-03-27
A1800	Pour Back Slab	4	02-04-27	02-09-27
A1810	Install OH MEP Rough-In	7	02-10-27	02-18-27
A1820	Install CMU Block Walls & In-Fills	5	02-19-27	02-25-27
A1830	Plumbing & Electrical Rough-In Block Walls	5	02-19-27	02-25-27
A1840	Set Door Frames	5	02-19-27	02-25-27
A1850	Painting	4	02-26-27	03-03-27
A1860	Install Ceilings	3	03-04-27	03-08-27

Architectural Demo / Make Safe

Stock Construction Material

Main Level Ceiling Demo Mens Wrestling, Coaches Offices, & Locker Rooms

Core Slab for Sanitary Tie-In

MEP Demo

Upper Level Sanitary Rough-In

Install CMU Walls

Electrical & Plumbing CMU Walls Rough-In

Install Door Frames

Reinstall Main Level Ceilings

Install OH MEP

Install Concrete Locker Benches

Install Ceramic Tile

Painting

Install Ceilings

Install Counter Top

Install Ceiling MEP Finishes

Install Epoxy Flooring / Base

Install Plumbing Fixtures

Install Lockers

Install Carpet & Base in Coaches Office

Install Doors & Hardware

Install Toilet Partitions

Install Toilet Accessories

Final Clean

Punch

Owner Move In

Architectural Demo / Make Safe

MEP Demo

Cut Slab

Sanitary Tie-In

Pour Back Slab

Install OH MEP Rough-In

Install CMU Block Walls & In-Fills

Plumbing & Electrical Rough-In Block Walls

Set Door Frames

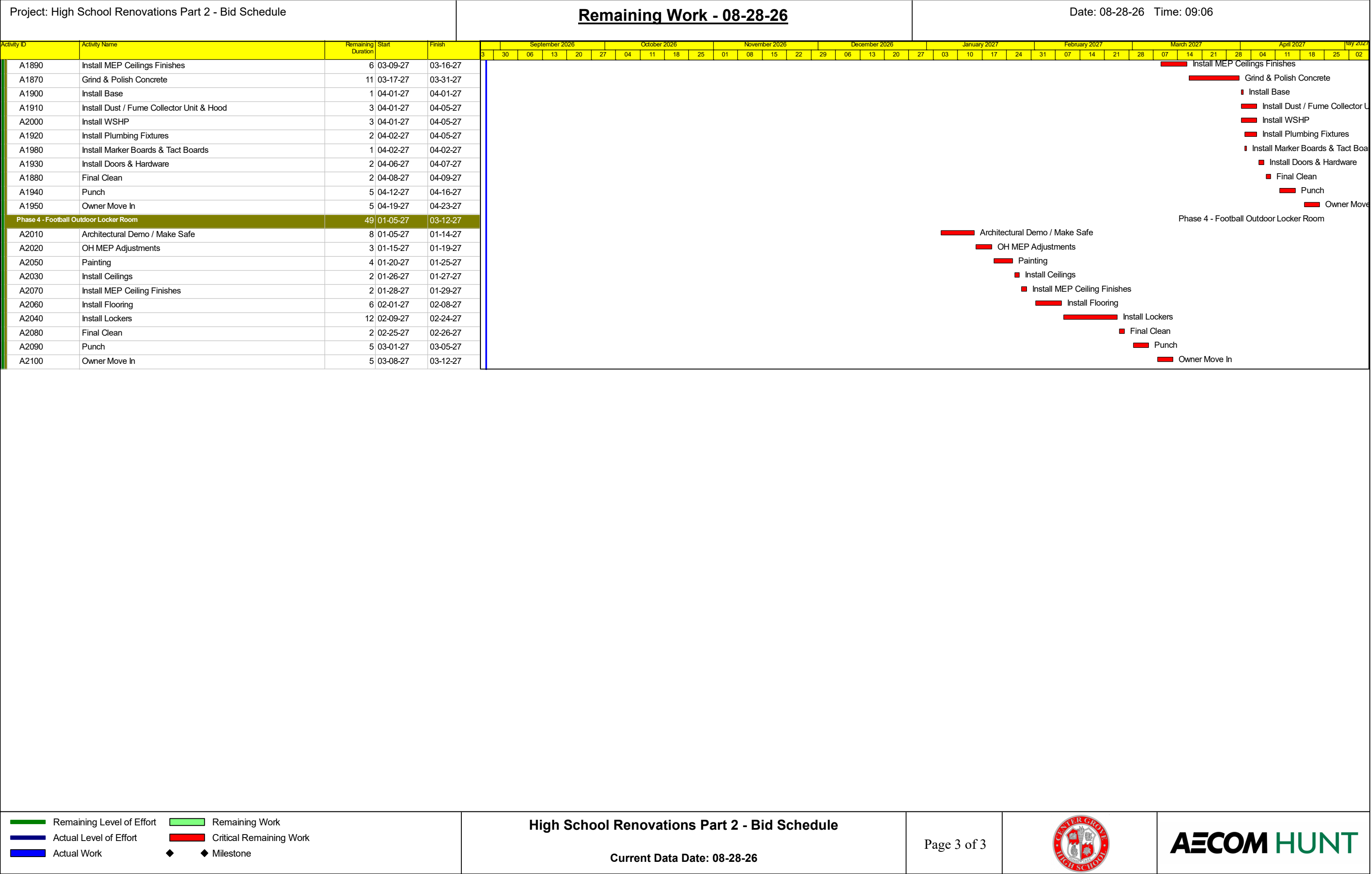
Painting

Install Ceilings

Phase 2 - Girls Wrestling Locker Room

Phase 3 - Manufacturing Lab





SECTION 23 09 00 – ENVIRONMENTAL CONTROL SYSTEM

GENERAL

I. WORK DESCRIPTION

A. Scope of Work:

1. The Environmental Control Contractor (ECC) shall furnish, install complete, program, and place in totally acceptable operation an environmental control system as shown or implied on the Contract Documents.

B. Work Included:

1. Furnish and install electric, and direct digital control temperature, humidity and pressure controls, and accessories as required to provide a complete operable system to obtain the operational sequence described.
2. All control and interlock wiring by ECC to be in full compliance with all sections of electrical specifications.
3. ECC shall prepare electric wiring diagram on all controls, starters, and mechanical equipment detailing all terminals in each component.
4. Any relays or auxiliary contacts required, but not furnished by suppliers of mechanical equipment or starters shall be furnished by ECC.
5. Note that schematic control diagrams on drawings are presented to show the intent of all control loops and to illustrate the operational sequences described. The electric signals are diagrammatic only and each bidder shall be required to furnish such cabling and air lines as required to meet their specific equipment. ECC is directed to building drawings and all schedules for complete coordination of project requirements.
6. All standards of quality and operation shown, described, and implied are to be fully met. Any questions relative to deviations to be submitted in writing to the Architect/Engineer at least 14 days prior to bid date.
7. The ECC is responsible for coordinating data integration with third party equipment/systems shown on the Contract Documents to be integrated with the ECC's Building Automation System. This coordination includes verifying communication protocol compatibility with each equipment/system manufacturer and/or supplier and verifying the list of available points through the integration/interface. Refer to related specification sections below for project specific integration requirements.
 - a) Section 23 25 00 – HVAC Water Treatment.
 - b) Section 23 33 00 – Air Duct Accessories
 - c) Section 23 81 19 – Self-Contained Air Conditioners
 - d) Section 26 09 13 – Electrical Power Monitoring and Control.
 - e) Section 26 56 00 – Exterior Lighting.
2. This Contractor/Supplier is directed to all General Conditions of the Contract.

B. Work Not Included:

C. Electrical Contractor shall provide all power wiring to and from all motor starters, variable frequency controllers, and motor control centers.

D. Electrical Contractor to provide 120/60 power to all Direct Digital Controllers.

E. Additional 120 Volt power wiring and conduit that is required beyond that which the Electrical Contractor provides shall be furnished and installed by the Environmental Control Supplier/Engineering Contractor.

F. Sheet Metal Contractor shall install motorized dampers and duct mounted airflow measuring stations furnished by the Environmental Control Contractor.

G. Mechanical Contractor to install all temperature sensing wells and control valves furnished by the Environmental Control Contractor.

H. Related Work Specified Elsewhere:

1. Basic mechanical materials and methods.
2. Hangers and supports.
3. Mechanical identification.
4. Testing, adjusting and balancing.
5. Enclosed switches and circuit breakers.
6. Enclosed controllers.
7. Motor control centers.

II. QUALITY ASSURANCE

A. Acceptable Supervisory Level Control Manufacturer

1. Trane Controls – Bacnet IP

B. Acceptable Building Level Control Manufacturer

1. Trane Controls

C. Acceptable Installation and Service Contractor:

1. Indianapolis
 - a) Trane

D. The entire electric, electronic, and direct digital control system shall be approved and listed by Underwriters Laboratories, Inc. All equipment shall bear the appropriate UL listing marking to insure compliance. In addition to the UL listing requirement, all work shall conform to the following codes and standards as applicable:

1. National Fire Protection Agency (NFPA) Standards.
2. National Electrical Code (NEC) and applicable local electrical codes.
3. UL 268 Smoke Detectors.
4. UL 916 Energy Management.
5. NFPA 70 – National Electrical Code.
6. NFPA 90A – Standard for the Installation of Air Conditioning and Ventilating Systems.
7. American National Standards Institute (ANSI).
8. National Electrical Manufacturer's Association (NEMA).
9. American Society of Mechanical Engineers (ASME).
10. ASHRAE.
11. Air Movement and Control Association (AMCA).

12. American Standard Code for Information Interchange (ASCII).
 13. Institute of Electrical and Electronic Engineers (IEEE).
 14. Electronic Industries Associates (EIA).
 15. Occupational Safety and Health Administration (OSHA).
 16. American Society of Testing and Materials (ASTM).
 17. Federal Communications Commission (FCC).
 18. American Disability Act (ADA).
 19. ANSI/EIA 909.1-A-1999 (Lon Works).
 20. ANSI/ASHRAE Standard 195-2008 (BACnet).
 21. UL 864 UUKL Smoke Control.
 22. NFPA 92A and 92B – Smoke Purge/Control Equipment.
- E. Except where certain controls are specified by manufacturer and product numbers (and no substitute is permitted in those cases), all products shall be of a common manufacturer and no mixing of manufacturers is permitted. It should be noted that all quality requirements noted in this specification shall be equally met; any variance shall be submitted in writing 14 days prior to bidding and, if approved, notice will be given in writing. Failure to meet the 14-day requirement will negate any consideration of variance.
- F. All engineering, project management, system programming, system checkout and project commissioning (if required) shall be performed by experienced full-time professional employees of the Control Supplier/Engineering Contractor. Installation of all electric, electronic, and DDC controls including all electric wiring shall be the responsibility of the ECC. Installation may be subcontracted at the Contractor's discretion, but full and complete responsibility for the quality and workmanship rests with the ECC. Where work is subcontracted, the ECC shall make a complete inspection before the system is placed in operation to insure that all sections of Part 3 - Execution are met and such documentation shall be made a part of the final operation and maintenance manuals.
- G. The Control Supplier/Engineering Contractor shall have a minimum of 15 years of experience in the design and installation of Environmental Control Systems equal in scope and size to that herein specified and shall be prepared to provide documented proof of such history. Contractor to be full factory branch or provide written proof that control manufacturer assumes full liability for any product fault or defect.
- H. Service and installation personnel to be permanently located within 100 miles of job site and to be available 24 hours each day and respond on-site within 4 hours' notice. Contractors who rely on third party vendors for maintenance/service staff and expertise on any major component are not acceptable.
- I. Installer Qualifications:
1. Licensed contractor with at least five years of working experience in the installation of Building Automation Systems.
 2. Demonstrated specific experience shall include cabling systems and pathways of electrical and telecommunications systems.
 3. Demonstrated expertise in the installation, functional checkout, point to point verification, calibration, troubleshooting and startup of Building Automation Systems.
 4. In addition to the technical capabilities described herein, demonstrate a production capability to plan, control and integrate manpower and other resources necessary for successful contract completion.

5. The Owner may ask to verify the qualifications and experience for all field installation technicians and installation contractors assigned to the project prior to the installation work commencing.
6. Installation personnel working this specific project shall attend a one hour familiarization session with the Owner's control system personnel immediately following the project preconstruction meeting. This meeting shall include the ECC's assigned Project Manager.

J. SYSTEM PERFORMANCE

1. Comply with the following performance requirements:

- a) Graphic display: Display graphic with minimum 20 dynamic points with current data within 10 seconds.
- b) Graphic refresh: Update graphic with minimum 20 dynamic points with current data within 8 seconds.
- c) Object command: Reaction time of less than two seconds between operator command of a binary object and device reaction.
- d) Object scan: Transmit change of state and change of analog values to control units or workstation within six seconds.
- e) Alarm response time: Annunciate alarm at workstation within 45 seconds. Multiple workstations must receive alarms within five seconds of each other.
- f) Program execution frequency: Run capability of applications as often as five seconds, but selected consistent with mechanical process under control.
- g) Performance: Programmable controllers shall execute DDC PID control loops, and scan and update process values and outputs at least once per second.
- h) Reporting accuracy and stability of control: Report values and maintain measured variables within tolerances as follows:

- (1) Water temperature: Plus or minus 1 deg F.
- (2) Water flow: Plus or minus 5 percent of full scale.
- (3) Water pressure: Plus or minus 2 percent of full scale.
- (4) Space temperature: Plus or minus 1 deg F.
- (5) Ducted air temperature: Plus or minus 1 deg F.
- (6) Outside air temperature: Plus or minus 2 deg F.
- (7) Dew point temperature: Plus or minus 3 deg F.
- (8) Temperature differential: Plus or minus 0.25 deg F.
- (9) Relative humidity: Plus or minus 5 percent.
- (10) Airflow (pressurized spaces): Plus or minus 3 percent of full scale.
- (11) Airflow (measuring stations): Plus or minus 5 percent of full scale.
- (12) Airflow (terminal): Plus or minus 10 percent of full scale.
- (13) Air pressure (space): Plus or minus 0.01-inch wg.
- (14) Air pressure (ducts): Plus or minus 0.1-inch wg.
- (15) Carbon monoxide: Plus or minus 5 percent of reading.
- (16) Carbon dioxide: Plus or minus 50 ppm.
- (17) Electrical: Plus or minus 5 percent of reading.

K. SUBMITTALS

1. Product:

2. Submit descriptive literature and shop drawings in accordance with Section 01 33 00.
3. Submittals shall include the following data:
 4. Dimensions and electrical characteristics.
 5. Installation instructions.
 6. Product description, operational capacities, and accuracies.
 7. For each component located within the occupant's space provide dimensions, colors, and scaled drawings of the faceplate with each feature identified. Provide this information for all space sensors, pressure monitors, carbon dioxide sensors, and humidity sensors.
 8. For each terminal controller, floor level controller, network controller and operators workstation (hardware and software) type, provide the following:
 - a) Date introduced on the market.
 - b) Expected date which product will cease to be produced.
 - c) Expected date that successor product is expected to be available.
 - d) Expected date that support of the product will end.
9. Shop Drawings:
10. Submit shop drawings to the Architect/Engineer which completely illustrate:
 - a) Full schematic presentation of all systems with location of all sensors, relays, dampers, valves, and actuators. All components to be designated to a code similar to Engineer's design on HPE drawings.
 - b) Full wiring diagrams with point to point designation. Number, size, and type of wiring with designation as to exact enclosure and support to be clearly noted.
 - c) All DDC analog and binary points to be cross referenced to the same code designation (AI-X, AO-X, BI-X, and BO-X) shown on Engineer's HPE drawings.
 - d) All operating systems shall include the sequence of operation that will be employed. This will parallel, as a minimum, the sequence detailed on Engineer's HPE drawings and shall include any virtual points, timers, lookup tables, startup and shutdown sequences, and other control means required. This sequence shall be written in sentence format on the shop drawings similar to that noted on the HPE drawings.
 - e) All pneumatic sensing and activating air lines to be clearly denoted with sizing and reference to specified installation standards.
 - f) Hydronic and steam valve schedules with flowrate, design differential pressure at the design flowrate, valve body maximum pressure rating, maximum working differential pressure at which control can be maintained.
 - g) Damper schedule including design maximum and minimum flowrates, opposed/parallel blade configuration, insulation, and leakage characteristics.
 - h) Building control system architecture illustrating each DDC controller; the type of communication between each DDC controller; all 120V power requirements; network, phone, fiber and internet connections; and operator's workstations and printer locations.
 - i) Color graphic samples shall be included in initial submittal package. Floor plan graphics and system graphics depicting mechanical, electrical and plumbing systems similar to those utilized in this project shall be included.
 - j) Data Communication Protocol Certificates: Certify that each proposed DDC system component complies with ASHRAE 135 (BACNet).

11. ECC to schedule a presubmittal presentation of all proposed formal submittal diagrams and data with A/E prior to said formal submittal. This meeting shall be scheduled and conducted at CMTA Indy.

12. Maintenance Manuals:

- a) Submit maintenance and operating manuals in accordance with Section 01 78 23.
- b) Submit software and firmware operating and upgrade manuals.
- c) Submit program backup software on compact disc, complete with data files.
- d) Device address list.
- e) Software license required by and installed for DDC workstations and internet access.

13. Owner Instruction and Training Report:

- a) Submit the written "Owner Instruction and Training Report" in accordance with this specification section.

14. Field Quality Control Test Reports:

- a) Submit the written "Owner Instruction and Training Report" in accordance with this specification section.

L. PRE-INSTALLATION COORDINATION MEETING

1. A pre-installation coordination meeting shall be held after submittal approval and before installation of the control system beings. The location of this meeting will be determined at a later date and will be appropriate for all parties participating. The following people/roles are required attendees at this meeting:

- a) Owner: Director of Facilities/Engineering/Maintenance or equivalent role, key users/operators of the controls/BAS system as designated by the Director of Facilities/Engineer/Maintenance.
- b) ECC: Project Manager, Lead Field Technician, Design Engineer and Sales Engineer.
- c) Construction Manager/General Contractor: Project Manager and MEP Coordinator.

2. The intent of the pre-installation coordination meeting is to address, discuss and resolve controls/BAS items with all key parties in attendance that historically have caused conflict and delays during the closeout/completion phase of projects.

M. DEFINITIONS

1. BAS System: An automatic, programmable building automation system that consists of an open framework Supervisory Level and a system of BACnet compliant Building Level Controllers. The system architecture shall use an IP based Supervisory Level system that connects to the internet and is web based for ease of access while the Building Level

network shall be MSTP, twisted pair network integrating with the Supervisory Level through BACnet protocol and open framework drivers.

a) Supervisory Level: an open framework platform utilizing Tridium Niagara or similar that provides a web based operator graphical interface for supervision, data logging, trending, alarming, scheduling, and network management of all Building Level controllers.

b) Building Level: BACnet compliant, programmable controllers located at terminal devices and systems. The Building Level is connected through a MSTP, twisted pair network.

N. SEQUENCE OF OPERATION

1. Note that all operational sequences are noted on the Drawings.

PRODUCTS

III. FIELD EQUIPMENT

A. Control Instruments:

1. All control instruments, unless otherwise specified, shall be fully proportioning with adjustable sensitivity. Note that P, PI, and PID loops shall be required wherever necessary to afford final stable control within acceptable parameters to satisfaction of Architect/Engineer.

B. Thermostat:

1. Low limit thermostats:
2. Low limit safety thermostats shall be manually reset, line voltage with maximum 23'-0" flexible sensing elements responsible to lowest temperature along entire length. Furnish minimum two (2) wired in series on the discharge side of the first hydronic coils (i.e., a 4-section coil requires eight low limit thermostats wired in series). Contractor to note that the operating head of such instruments shall be shielded from conditions whereby it could be activated by low temperature. Clarify location of low limits with the Engineer during submittal review if HPE Sheets illustrate a location other than the discharge side of the first hydronic coil.
3. All flexible averaging sensors shall be attached by wire ties to a suspended wire or insulated cable to prevent sensor contact with metal or other unit components.
4. Install flexible sensors across all coils at a maximum of 6" from the bottom of the bottom coil and a minimum of 7" diameter to turn the sensor. Install the detector with a maximum free distance of 12" between each pass.
5. Staggered coils shall utilize multiple sensors. Each sensor shall cover one section of the staggered coil. Sensing elements shall be a minimum of 17' long.
6. All flexible sensors shall be protected at point of penetration of unit via a section of poly tubing to prevent contact of the sensor and the unit.

7. Mount detector within 6" of the face of the coil unless noted otherwise. For staggered coil banks, this requirement applies for each half of the bank
8. ECC to note that when any low limit controls are above an elevation 7'-0" above floor level or otherwise inaccessible, they shall employ automatic reset and shall be wired to an auxiliary control panel of a 5'-0" elevation. The control panel with piano hinged door shall utilize a latching reset relay for each individual low limit control which insures that the fan is de-energized even as the low limit resets automatically. The panel face shall utilize a red alarm pilot light that remains lit until the 10 second time delay reset relay momentary contact switch is activated. An LED inside the panel shall indicate which of low limits has signaled the alarm.

C. Temperature Sensors:

1. Duct sensors for critical spaces shall utilize averaging elements, 1000 OHM platinum Resistance Temperature Detectors (RTD) having an accuracy of ± 0.5 deg F.
2. Duct sensors for non-critical spaces may utilize 10,000 OHM or 20,000 OHM thermistor having an accuracy of ± 1.0 deg F. 1000 OHM RTDs are also acceptable for non-critical applications.
3. Immersion sensors to be furnished with companion wells separable stainless steel. Well pressure rating shall be consistent with and extend the system pressure it will be immersed in. Wells shall withstand pipe design flow velocities.
4. Outdoor sensors to utilize Vaisala DTR 503A shields.

D. Space Sensors:

1. Space sensors located in private offices, conference rooms, other areas deemed "non-public" and as noted on the drawings shall have exposed external set-point adjustment and digital LCD display capable of displaying setpoint and actual sensed temperature.
2. In areas deemed "public" or where indicated on the drawings, space sensors shall have exposed external setpoint adjustment, but be without LCD displays.
3. Set-point adjustment to be a maximum plus and minus 4 degrees from the null setpoint programmed through the DDC system.
4. Space sensors may be (RTD) 1,000 Ohm platinum with an accuracy of ± 0.5 deg F or 10,000 OHM thermistor with accuracy of ± 0.5 deg. F for all spaces unless noted otherwise on the HPE Drawings.
5. Space sensor shall be of a neutral color (white, beige or other customer approved color) unless noted otherwise on the HPE Drawings.
6. Provide insulating bases for all sensors located on exterior walls and on exterior column wraps. Foam seal cavity and junction box prior to installing insulating base.
7. Provide locking, ventilated guards where indicated on the HPE Drawings. It is the ECC's responsibility to coordinate color of all space sensors with the Owner prior to installation of same.
8. Provide washdown resistant sensors where indicated on the HPE Drawings and for all wet locations.
9. Provide occupancy override button on face of space sensor where indicated on the sequence and on the HPE Drawings.
10. Space sensors with occupant set-point adjustment shall be adjustable from the operator's work station as to the deadband of adjustability allowed to the occupants.

E. Electronic Actuators:

1. Manufactured, brand labeled or distributed by Belimo or Johnson Controls, Inc. or Siemens.

2. Size for torque required for damper seal at load conditions.
3. Coupling: V-bolt dual nut clamp with a V-shaped, toothed cradle.
4. Mounting: Actuators shall be direct shaft mount type. Actuators shall be capable of being mechanically and electrically paralleled to increase torque if required.
5. Overload protected electronically throughout rotation.
6. Fail safe operation: Mechanical, spring return mechanism.
7. Power requirements (spring return): 24 VAC, maximum 15 VA at 24 VAC or 8 W at 24 VDC.
8. Proportional actuators shall be fully programmable through an EEPROM without the use of actuator mounted switches.
9. Temperature rating: -22 deg. F to +122 deg. F.
10. Housing: Minimum requirement NEMA Type 2/IP54 mounted in any orientation. NEMA 4/4X (IP67) required for outdoor applications.
11. Agency listings: ISO 9001 or UL.
12. The manufacturer shall warrant all components for a period of 5 years from the date of production with the first two years unconditional.
13. All damper actuators used on equipment introducing outdoor air shall be furnished with mechanical spring return mechanism as indicated in "fail safe operation" above.
14. All actuators shall have external adjustable stops to limit the travel in either direction and a gear release to allow manual positioning.
15. Actuators shall be provided with position feedback signal (2-10 VDC or 4-20 mA) where indicated on HPE drawings. Feedback signal shall be independent of the input signal and shall provide true position indication.

F. Control Valves:

1. Manufacturer: Manufactured, brand labeled or distributed by Belimo or Johnson Controls, Inc. or Siemens.
2. Control valve actuators:
 - a) Size for valve close off at 150 percent of total system (head) pressure for two-way valves and 100 percent of pressure differential across the valve or 100 percent of total system (pump) head differential pressure for three-way valves.
 - b) Coupling: Directly couple and mount to valve stem and shaft ISO style direct-coupled mounting pad.
 - c) Shall meet all the requirements of 2.1.E Electronic Actuators.
3. Control valves:
 - a) Factory fabricated of type, body material and pressure class based on maximum pressure and temperature rating of piping system unless otherwise indicated.
 - b) Sizing:
 - (1) Two-position: Line size or size using a pressure differential of 1 psi.
 - (2) Two-way modulating: 5 psid or twice the load pressure drop, whichever is more.
 - (3) Three-way modulating: Twice the load pressure drop, but not more than 5 psid.
 - c) Close-off pressure rating: Combination of actuator and trim shall provide minimum close-off pressure rating of 150 percent of total system head pressure for two-way valves and 150 percent of the design pressure differential across the

three-way valves. Combination of actuator and trim shall provide minimum close-off pressure rating of 100 psid.

d) The control valve assembly shall be provided and delivered from a single manufacturer as a complete assembly.

4. The manufacturer shall warrant all components for a period of 5 years from the date of production with the first two years unconditioned (except as noted).

G. Characterized control valves:

1. NPS 2 and smaller: Nickel plated forged brass body rated at no less than 400 psi, stainless steel ball and blowout proof stem may be female NPT, sweat connection or pressure connect end fittings with a dual EPDM O-ring packing design, fiberglass reinforced Teflon seat or graphite reinforced PTFE seats and a flow characterizing disc.
2. NPS 2-1/2 through 3: GG25 cast iron body according to ANSI Class 125, Standard Class B, stainless steel ball and blowout proof stem, flange to match ANSI 125 with a dual EPDM O-ring package design, PTFE seats and a stainless steel flow characterizing disc.
3. Flow characteristics: Equal percentage characteristics.
4. Six-way control valves shall have the following characteristics:
5. NPS 1/2" and 3/4": Nickel plated forged brass body rated at no less than 600 psi, dual chrome plated brass ball and blowout proof stems and female NPT end fittings. Each three-way portion of the 6-way valve body shall have EPDM O-ring packing design, fiberglass reinforced Teflon seats and a flow characterizing disc.
6. The six-way control valve shall be controlled by a rotary actuator for managing two media in a switching application. The valve shall be closed to flow at mid-rotation.
7. Globe valves shall have the following characteristics:
 - a) NPS 2 and smaller: ANSI Class 250 bronze body, stainless steel stem, brass plug, bronze seat and a TFE packing.
 - b) NPS 2-1/2 and larger: ANSI Class 125 cast iron body, stainless steel stem, bronze plug, bronze seat and a TFE V-ring packing.
 - c) Flow characteristics: Two-way valves shall have equal percentage characteristics. Three-way valves shall have linear characteristics.
 - d) Two and three way globe valves shall be used only if characterized control valves do not fit the sizing criteria or application.
8. Butterfly valves – resilient seat:
 - a) NPS 2 and 12: Valve body shall be full lugged cast iron 200 psig body with a 304 stainless steel disc, EPDM seat, extended neck and shall meet ANSI Class 125/150 flange standards. Disc-to-stem connection shall utilize an internal spine. The shaft shall be supported at four locations by RPTFE bushings.
 - b) Sizing:
 - (1) Two position: Line size or size using a pressure differential of 1 psi.
 - (2) Modulating: 5 psig or twice the load pressure drop, whichever is more. Size for the design flow with the disc in a 60 degree open position and a design velocity not-to-exceed 12 feet per second.

c) Close off pressure rating:

- (1) NPS 2-12" 200 psi bubble tight shutoff.
- (2) NPS 14 and larger: 150 psi bubble tight shutoff.

H. Butterfly valves:

1. Valve body shall be full lugged carbon steel ANSI Class [150][300] body with a 316 stainless steel disc without a nylon coating, RTFE seat and be ANSI Class 150/300 flange standards. Blowout proof shaft shall be 17-4 ph stainless steel and shall be supported at four locations by glass backed TFE bushings. Valve packing shall be Chevron TFE and shall include fully adjustable packing flange and separable packing gland. Valve body shall have long stem design to allow for 2" insulation (minimum). Valve face-to-face dimensions shall comply with API 609 and MSS-SP-68. Valve assembly shall be completely assembled and tested, ready for installation.
2. Sizing:
 3. Two position: Line size or size using a pressure differential of 1 psi.
 4. Modulating: 5 psig or twice the load pressure drop, whichever is more. Size for the design flow with the disc in a 60 degree open position and a design velocity not-to-exceed 12 feet per second.
5. Flow characteristics: Modified equal percentage, unidirectional.
6. Close off pressure rating: 150 psi bubble tight shutoff.
7. Media temperature range: ANSI Class 150 limitations.
8. Max differential pressure: 285 psi at 100 deg. F for ANSI 150 (725 psi at 100 deg. F. for ANSI 300).

I. Dampers:

1. All automatic dampers furnished by this Contractor for modulating control shall be of the proportioning type with opposed or parallel blades depending on the application or as shown on the drawings. Dampers for two position action shall be of the opposed blade type for all applications except those located immediately at the inlet of fans and as noted otherwise on the drawings. Dampers for generator radiator fan exhaust shall be opposed blade type.
2. All dampers for outdoor air service and exhaust air service to be equal to TAMCO Series 9000 aluminum and have the following features:
 - a) Frames shall be 4" deep X 1" and no less than .080" in thickness, mill finish extruded aluminum 6063-T5 with mounting flanges on both sides of the frame. Frame to be assembled using plated steel mounting fasteners.
 - b) Entire frame shall be thermally broken by means of two polyurethane resin pockets complete with thermal cuts.
 - c) Blades shall be extruded aluminum 6063-T5, mill finish air foil profiles, internally insulated with expanded polyurethane foam and shall be thermally broken.
 - d) Blade and frame seals shall be of extruded silicone and shall be secured in an integral slot within the aluminum extrusions. Blade and frame seals are to be mechanically fastened to eliminate shrinkage and movement over the life of the damper. Adhesive or clip on type blade seals shall not be approved.
 - e) Maintenance free bearings are to be composed of an inner bearing fixed to a 7/16" aluminum hexagon blade pivot pin, rotating within a polycarbonate outer

- bearing inserted into the frame. There shall be no metal-to-metal or metal-to-plastic contact.
- f) Adjustable 7/16" hexagonal drive rod, U-bolt fastener and hexagonal retaining nuts shall be corrosion resistant, zinc plated steel to provide positive connection to blades and linkage.
 - g) Linkage hardware shall be installed in the frame side. All linkage crank arm and rod hardware parts shall be constructed of mill finished aluminum, complete with corrosion resistant, zinc plated trunnions and cup point trunnion screws for a slip-proof grip.
 - h) Dampers are to be designed for operation in temperatures ranging between - 40 deg. F (-40 deg. C) and 212 deg. F (100 deg. C).
 - i) Dampers shall be rated Leakage Class 1A at 1 in. w.g. (0.25 kPa) static pressure differential. Standard air leakage data shall be certified under the AMCA Certified Ratings Program.
 - j) Dampers shall be made to size required without blanking off free area.
 - k) Dampers shall be available as "flanged to duct" mounting type.
 - l) Installation of dampers must be in accordance with manufacturer's installation guidelines provided with each damper shipment.
 - m) Intermediate or tubular steel structural support is required to resist applied pressure loads for dampers that consist of two or more sections in both height and width. (See manufacturer's installation guidelines).

3. Dampers for all other applications to be equal to TAMCO Series 1500 Ultra Low Leakage Air Foil Aluminum and have the following features:

- a) Frames shall be 4" deep X 1" and no less than .080" in thickness, mill finish extruded aluminum 6063-T5 with mounting flanges on both sides of the frame. Frame to be assembled using plated steel mounting fasteners.
- b) Entire frame shall be thermally broken by means of two polyurethane resin pockets complete with thermal cuts.
- c) Blades shall be extruded aluminum 6063-T5, mill finish air foil profiles, internally insulated with expanded polyurethane foam and shall be thermally broken.
- d) Blade and frame seals shall be of extruded silicone and shall be secured in an integral slot within the aluminum extrusions. Blade and frame seals are to be mechanically fastened to eliminate shrinkage and movement over the life of the damper. Adhesive or clip on type blade seals shall not be approved.
- e) Maintenance free bearings are to be composed of an inner bearing fixed to a 7/16" aluminum hexagon blade pivot pin, rotating within a polycarbonate outer bearing inserted into the frame. There shall be no metal-to-metal or metal-to-plastic contact.
- f) Adjustable 7/16" hexagonal drive rod, U-bolt fastener and hexagonal retaining nuts shall be corrosion resistant, zinc plated steel to provide positive connection to blades and linkage.
- g) Linkage hardware shall be installed in the frame side. All linkage crank arm and rod hardware parts shall be constructed of mill finished aluminum, complete with corrosion resistant, zinc plated trunnions and cup point trunnion screws for a slip-proof grip.
- h) Dampers are to be designed for operation in temperatures ranging between - 40 deg. F (-40 deg. C) and 212 deg. F (100 deg. C).
- i) Dampers shall be rated Leakage Class 1A at 1 in. w.g. (0.25 kPa) static pressure differential. Standard air leakage data shall be certified under the AMCA Certified Ratings Program.

- j) Dampers shall be made to size required without blanking off free area.
 - k) Dampers shall be available with either opposed blade action or parallel blade action.
 - l) Dampers shall be available as "flanged to duct" mounting type.
 - m) Installation of dampers must be in accordance with manufacturer's installation guidelines provided with each damper shipment.
 - n) Intermediate or tubular steel structural support is required to resist applied pressure loads for dampers that consist of two or more sections in both height and width. (See manufacturer's installation guidelines).
- 4. Automatic dampers (modulating) shall be designed for face velocity that varies from 1,200 fpm to 2,000 fpm in most cases as approved by the design engineer. Dampers to be selected by the supplier with blade shaft lengths that prevent torsion that will create a leakage of more than 2 percent of the rated leakage capacity. Beyond that point, the dampers shall be broken into multiple sections. Field supplied mullions are required on large dampers exceeding 200 square feet.
 - 5. Individual damper section actuators are preferred unless access to actuators is difficult and then jack shafting is acceptable. ECC to note that drive shafts between dampers of different air paths (i.e., outdoor air and return air or return air and exhaust air) is not acceptable. Jack shafting between sections is permitted when such shafting is designed to accommodate and eliminate the effects of torsion.
 - 6. ECC to note that free access to all actuators is the responsibility of the ECC.
 - 7. Each damper shall be equipped with an individual damper operator of the size and style required for the service intended.
 - 8. Actuators to be designed for modulating control with spring return to the fail "safe" position. Actuators to be low voltage with 100% surplus torque (submittals to incorporate calculations to prove 100 percent closure under 4.0" wg status pressure differential for modulating service and 2.0" wg for two position application).
 - 9. Terminal box/AFCV damper actuators to be low voltage, non-spring return and incremental control with 200 percent torque. All control actuators to utilize auto zero program to insure total accuracy of damper actuator. The feature to be activated during periods of low or no occupancy.
 - 10. Pneumatic damper actuators to be piston type of the size and style to meet application. All modulating dampers to be equipped with pilot positioners to make the full power of the actuator available as well as to allow the operating range and starting point of the actuator to be field adjusted.
 - 11. Smoke Damper and Combination Fire Smoke Dampers full open and full closed status signal shall be displayed at the operators work station, generate a report of this status and generate an alarm when they are not in the open (normal) position.

J. Humidity Sensors:

- 1. Space and duct humidity sensors to utilize this film capacitor structure on glass substrate element to operate with an accuracy of $\pm 2\%$ within a range of 20 and 95% RH. Sensitivity to be 0.1% RH, repeatability 0.5% RH with hysteresis less than 1%.
- 2. Sensors to be Vaisala.
 - a) Space sensors: HMW80 Series.
 - b) Duct sensors: HMD 60 U.
- 3. Outdoor sensors (temperature and humidity) to be Vaisala Model HMP 60 Series with DTR500 radiation shield.

K. Carbon Dioxide Sensors:

1. Units to be capable of sensing carbon dioxide from 0 to 2000 ppm with an accuracy of $\pm 2\%$ of range plus 2% of reading. Output to be 4-20 ma.
2. The unit shall be guaranteed to maintain accuracy of $\pm 5\%$ of range for 60 months before requiring recalibration.
3. Sensors:
 - a) Space: Vaisala GMW 20 (GMW 21 includes temperature sensor option).
 - b) Duct: Vaisala GMD 20 (GMD 21 includes temperature sensor option).

L. Control Panels:

1. Control panels for electric and electronic controls shall be located as detailed on drawings or otherwise adjacent to air handling units, heat exchangers, or other mechanical systems served. Panels shall utilize unistrut support from floor brackets such that the center of the panel is at a 48" height.
2. Panel frames shall be extruded alloy with fluted surfaces. All corners to be securely riveted and supported by an internal angle bracket. The door shall be hinged the entire length of the cabinet with key locking latch. The panels shall contain all thermostats, regulators, relays, etc., with all instruments associated with each unit mounted on a common panel inside panel. All thermometers and gages shall be arranged for flush mounting on panel face. Furnish descriptive nameplates below each item on equipment. All instrument capillaries shall be installed in protective channels. Detailed drawings shall be submitted for each panel before beginning construction.

M. Differential Pressure Transmitter:

1. Liquid: Furnish field mounted differential pressure transmitters as indicated on plans for measuring differential pressure and transmitting an isolated 4 to 20 mA dc output linear with differential pressure. The unit shall be accurate to $\pm 0.2\%$ of calibrated span. It shall withstand static pressures of 2000 psig with negligible change in output. The flanges shall be made of stainless steel with stainless steel wetted sensing components. A 3-valve bypass manifold shall be utilized for easier on-site equalization and calibration. Unit shall be protected against radio frequency interference and shall have a watertight (NEMA Type 4) electrical enclosure with 1/2" NPT conduit connection. The transmitter shall be a standard process grade transmitter as manufactured by Rosemount.
2. Air: Furnish field mounted differential pressure transmitters using a 4-20 mA (or 0-10 Vdc) output linear with measured differential pressure. Accuracy shall be $\pm 0.8\%$ of calibrated span. Response time shall be 250 milliseconds. Transmitter shall be in a standard grade transmitter manufactured by Ashcroft.

N. Airflow Measuring Stations:

1. All air flow measuring stations to be furnished under this contract as shown on control schematics and as scheduled.

- a) Approved manufacturers are Tek-Air Systems, Air Monitor, Paragon, Ebtron, and Farr, providing they have approved representation within 100 miles of job site.
2. Duct-mounted stations shall be installed by the Sheet Metal Contractor while fan inlet station installation responsibility shall be by this Contractor.
3. Sizing and physical location of stations shall be the responsibility of this Contractor. ECC to insure that sufficient distance is available both upstream and downstream such that turbulence is not a factor in the velocity pressure measurement. Sizing shall insure that the minimum velocity across the station affords accuracy of measurement and the design engineer shall be notified within 30 days of contract award if any modifications are required to the field ductwork.
4. ECC to insure that a proper access door upstream of the station is provided in the ductwork such that the inlet face of the unit may be cleaned as necessary.
5. Duct-mounted air flow measuring stations:
 - a) Furnish and install air flow measuring stations constructed of 16 gage sheet metal casing and a copper velocity pressure traverse section.
 - b) The velocity pressure traverse section shall consist of air straightening tubes, total pressure sensors and static pressure sensors, all interconnected to form a traverse by copper manifolds which shall equalize and integrate each type sensor measurement into one (1) total pressure and one (1) static pressure metering port. There shall be one static pressure sensor for each total pressure sensor.
 - c) A minimum of one static and one total pressure sensor shall be used for every 16 square feet in cross section. For larger ducts, a minimum of one static and one total pressure sensor shall be used for every 36" of duct cross sectional area up to a maximum as recommended by ASHRAE guide for traverse measurement.
 - d) Identification: Each air flow measuring station shall have a nameplate with the following information:
 - (1) Unit size.
 - (2) Unit designation.
 - (3) Design air quantity.
 - (4) Direction of air flow.
 - (5) Design air velocity.
6. Fan inlet air flow sensing (non-intrusive piezometer type):
 - a) Accuracy: Within 2% throughout the velocity range of 600 fpm and over, when installed in accordance with published recommendations
 - b) Temperature: 350 deg F continuous operation; 400 deg F intermittent operation
 - c) Humidity: 0-100% continuous operation
 - d) Corrosion resistance: Good salt air and mild acid resistance, excellent solvent and aromatic hydrocarbon resistance
 - e) Material: 6063-T5 anodized aluminum, galvanized mounting brackets

O. Thermal Dispersion Air Flow Measurement:

1. Air volume measurement system to consist of multiple sensors designed to average velocity using thermal dispersion principles. System to be designed to be totally independent of temperature, density, and humidity. Tek-Air or Ebtron.
2. The quantity of sensing tubes shall conform to manufacturer's requirements for spacing based on the specified accuracy and the actual inlet and outlet conditions.

3. Unit to be accurate to 1.5% between 50 fpm and 6000 fpm. Output to be 4-20 mA.

P. Status Sensors:

1. Status inputs for pumps: Differential-pressure switch with pilot-duty rating and with adjustable pressure-differential range of 8 to 60 psig (55 to 414 kPa), piped across pump.
2. Voltage transmitter (100- to 600-V ac): Comply with ISA 50.00.01, single-loop, self-powered transmitter, adjustable, with suitable range and 1 percent full-scale accuracy.
3. Power monitor: 3-phase type with disconnect/shorting switch assembly, listed voltage and current transformers, with pulse kilowatt hour output and 4- to 20-mA kW output, with maximum 2 percent error at 1.0 power factor and 2.5 percent error at 0.5 power factor.
4. Water-flow switches: Bellows-actuated mercury or snap-acting type with pilot-duty rating, stainless-steel or bronze paddle, with appropriate range and differential adjustment, in NEMA 250, Type 1 enclosure.

Q. Miscellaneous Controls and Relays:

1. High and low limit static pressure safety pressure differential switches to be equal to elevated AFS-460 (0.5 – 12.0 in wc field adjustable) with manual reset. All devices to be mounted so as to allow full access to reset mechanism while standing on the floor.
2. Current sensing controls to be equal to Hawkeye H708 to operate between -15 and 85°C. Trip set point to be adjustable $\pm 1\%$ of scale, amperage 1-135A, N.O. solid state, output rating 0.5A at 30VDC.
3. Liquid level alarm switch to be equal to Dwyer Flotect Model L6 with stainless steel flow lever arm and float. Switch to be sensitive to level change of 0.5".
4. Damper end switches: End switches for dampers to be MicroSwitch BZ-2RW863-A2 with a 3PAI enclosure unit to be totally field adjustable.
5. Water sensors to be equal to Ademco No. 470.
6. Occupancy sensors to be equal to Watt Stopper CI-24 passive infrared model having N.O. and N.C. contacts and having proper power pack. Units to incorporate field adjustable time delay (adjustable from 30 seconds to 30 minutes) that allows the area being monitored to remain on Occupied Mode. Unit to also allow the sensitivity to be field adjusted.

IV. NETWORK EQUIPMENT

A. General:

1. The controls systems shall consist of multiple network supervisory controllers and associated equipment connected by industry standard digital and communication network arrangements.
2. The operator user interface devices, servers, and principal network computer equipment shall be standard products of recognized major manufacturers available through normal PC and computer vendor channels. ("Clones" assembled by a third-party subcontractor are not acceptable.)
3. Provide licenses for all software residing on and used by the controls systems and transfer these licenses to the Owner prior to completion.
4. The networks shall, at minimum, comprise, as necessary, the following:
 - a) Data servers: Where network capacity, concurrent users and data storage requirements deem necessary.
 - b) Operator's user interface devices: Fixed and portable as required by the specifications.

- c) Network computer processing, data storage, and communication equipment including servers and digital data processors.
 - d) Routers, bridges, switches, hubs, modems, interfaces and the like communication equipment. Verify hardware and configuration requirements with Owner's IT/IS Department.
 - e) Network supervisory controllers including programmable field panels and controllers together with their power supplies and associated equipment.
 - f) Configurable and application specific field-level controllers including power supplies, enclosures and associated equipment.
 - g) Local display devices.
 - h) Addressable elements, sensors, transducers, and end devices.
 - i) Third-party equipment interfaces as required by the Contract Documents.
 - j) Other components required for a complete and working control systems as specified.
5. The specifications for the individual elements and component subsystems shall be minimum requirements and shall be augmented as necessary by the Contractor to achieve both compliance with all applicable codes, standards, the requirements of the authority having jurisdiction (AHJ) at the site and to meet all requirements of the Contract Documents.
6. The system shall be modular in nature and shall permit expansion of both capacity and functionality through addition of sensors, actuators, controllers and operator devices while reusing existing controls equipment.
7. The system shall comply with the following NFPA Codes and Standards as applicable:
- a) NFPA 70 National Electrical Code.
 - b) NFPA 72 National Fire Alarm Code.
 - c) NFPA 101 Life Safety Code.
 - d) NFPA 90A Standard for the Installation of Air Conditioning and Ventilation Systems.
 - e) NFPA 92B Guide for Smoke Management Systems in Malls, Atria and Large Areas.
 - f) UL 864 (UUKL) Ninth Edition Smoke Control Listing including the UL 864 Ninth Edition Standard for Controls Units and Accessories for Fire Alarm Systems.
8. The system shall comply with the following International Code Council (ICC) Codes:

B. SUPERVISORY LEVEL

- 1. Open framework Tridium Niagara 4 or similar system consisting of JACE 8000 controllers.
 - a) Niagara or similar Software Licenses for the Supervisory Level shall be open to the owner to allow access from any provider and any associated programming tool set and manufacturer specific devices and controllers.
- 2. JACE 8000 controllers:
 - a) TI AM3352; 1000MHZ ARM Cortex-A8, 1GB DDR3 SDRAM, Wi-Fi capable, real time clock, battery less.
 - b) Provide expansion modules for each JACE 8000 as required to provide necessary networks or IO modules.
- 3. DEVICE/POINT CAPACITY:
 - a) Provide JACE 8000 with device and point license capacity as required for each installation
 - b) MAINTENANCE AGREEMENT:
 - (1) Provide JACE 8000 with a standard 18 month service agreement

- c) Supervisor:
- d) Provide a Supervisor license for installations with more than one JACE
- 4. MAINTENANCE AGREEMENT:
 - a) Provide Niagara Supervisor or similar with a standard 18 month service agreement
 - b) Provide a Supervisor license with network connections as required

C. Automation Network:

1. The automation network shall be based on a PC industry standard of Ethernet TCP/IP. Where used, LAN controller cards shall be standard "off the shelf" products available through normal PC vendor channels.
2. The BMS shall network multiple user interface clients, automation engines, system controllers and application specific controllers. Provide application and data server(s) as required for systems operation, data storage and required number of concurrent users.
3. All BMS devices on the automation network shall be capable of operating at a communication speed of 100 Mbps with full peer-to-peer network communication.
4. Network supervisory controllers and operator user interfaces.
5. The automation network will be compatible with other enterprise-wide networks. Where indicated, the automation network shall be connected to the enterprise network and share resources with it by way of standard networking devices and practices.

D. Control Network:

1. Network supervisory controllers (NSC) shall provide supervisory control over the control network and shall support all three (3) of the following communication protocols:
 - a) BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9.
 - (1) The NSC shall be BACnet Testing Labs (BTL) certified and carry the BTL label.
 - (2) The NSC shall be tested and certified as BACnet Building Controller (B-BC).
 - b) LonWorks enabled devices using the Free Topology Transceiver (FTT-10a).
2. Control networks shall provide either "peer-to-peer", master slave or supervised token passing communications and shall operate at a minimum communication speed of 9600 baud.
3. DDC controllers shall reside on the control network.
4. Control network communication protocol shall be BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135.
5. A BACnet Protocol Implementation Conformance Statement (PICS) shall be provided for each controller device (master or slave) that will communicate on the BACnet MS/TP Bus.
6. The PICS shall be submitted 10 days prior to bidding.

E. Integration:

1. Hardwired:

- a) Analog and digital signal values shall be passed from one system to another via hardwired connections.
- b) There will be one separate physical point on each system for each point to be integrated between the systems.

2. Direct protocol (integrator panel):

- a) The BAS system shall include appropriate hardware equipment and software to allow bi-directional data communications between the system and the third party manufacturer's control panels. The BAS shall receive, react to and return information from multiple building systems, including, but not limited to, chillers, boilers, variable frequency drives, power monitoring system and medical gas.
- b) All data required by the application shall be mapped into the automation engine's database and shall be transparent to the operator.
- c) Point inputs and outputs from the third party controllers shall have real-time interoperability with BAS software features such as control software, energy management, custom process programming, alarm management, historical data and trend analysis, totalization and local area network communications.

3. BACnet Protocol Integration – BACnet:

- a) The neutral protocol used between systems will be BACnet over Ethernet and comply with the ASHRAE BACnet Standard 135-2008.
- b) A complete Protocol Implementation Conformance Statement (PICS) shall be provided for all BACnet system devices.
- c) The ability to command, share point object data, change of state (COS) data and schedules between the host and BACnet systems shall be provided.

V. DDC SYSTEMS EQUIPMENT

A. Tier 1 – Network Supervisory Controller (NSC):

- 1. The NSC shall be designed, packaged, installed, programmed, and commissioned in consideration of their specific service and prevailing operating conditions. They shall be proven standard product of their original manufacturer and not a custom product for this project.
- 2. The NSC shall support a minimum of 200% of the project's installed field points together for fully functional distributed processing operations.
- 3. The controls systems shall be designed and implemented entirely for use and for operation on the Internet and the Owner's Intranet. This functionality for operational access shall extend down to the field panel and field point level.
- 4. The primary controls systems nodes (NSC) shall be fully IT compatible nodes operating over the industry standard IT infrastructure provided for the project. The Controls Contractor shall coordinate with the IT infrastructure support staff or trade contractors to ensure compatibility and performance of the operation of the controls systems over the LAN/WAN made available for its shared use.
- 5. The controls systems Tier 1 network shall be configured on IT industry standard off-the-shelf technologies compatible with other building systems and project network arrangements.
- 6. The primary NSC shall manage and direct all information traffic on the Tier 1 network, between the Tier 1 and Tier 2 networks and to the server(s). The NSC shall monitor the network of application specific, configurable and programmable field level

controllers. Provide global strategy and direction and communicate on a peer-to-peer basis with the other NSCs on the Tier 1 network.

7. All NSC on the Tier 1 network shall be equipped with all software and functionality necessary to operate the complete user interface, including graphics, via a browser connected to the node on the network or directly via a local port on the NSC.
8. A failure at a primary NSC shall not cause failures or non-normal operation at any other system NSC other than the possible loss of active real-time information from the failed NSC.
9. Tier 1 primary NSC shall maintain all programming in non-volatile or battery backed memory and shall automatically resume normal monitoring and control following the restoration of stable electrical power after a power outage. ECC to supply uninterruptible power supplies (UPS) on all NSC where noted. UPS to allow a minimum of 12 minutes of full operation before the emergency power is in full operation. Software shall allow an orderly shutdown to save all data in the event power is not restored before the battery is fully discharged.
10. All communication between controls application nodes shall be digital.
11. All controls systems application facilities and features shall be accessible via Intranet and Internet browser with user ID or password access control for user access.
12. The primary NSC shall be capable of direct connection to multiple field busses using different protocols simultaneously as indicated below. Should the NSC not support multiple field busses then install multiple NSC in parallel to achieve this functionality.
 - a) BACnet Standard MS/TP Protocol ASHRAE SSPC-135.
 - b) A LON field bus for supervision and control of LON based controllers that conform to the LonTalk standard.
13. Manufacturer's legacy proprietary field bus if adding to existing legacy network
14. The NSC shall integrate data from all field busses into a common and conformal object structure. Data from all field busses shall appear in common displays throughout the Operator Interface in the same format. Conformal formatting shall be provided for each type of data not dependent on the type of field bus from which the data originated.
15. The controls systems application shall support auto-dial/auto-answer communications to allow controls systems nodes to communicate with other remote controls systems nodes via standard telephone lines.
16. Downloading and Uploading:
 - a) Provide the capability to generate and modify the controls systems application software-based sequences, database elements, associated operational definition information and user-required revisions to same at any designated workstation together with the means to download same to the associated NSC.
 - b) The controls systems application software tool provided for the generation of custom and database definitions shall be resident in both the NSC and controls systems application server(s).
 - c) Provide the capability to upload controls systems application operating software information, database items, sequences, and alarms to designated server(s).
 - d) The functions of this Part shall be governed by the codes, approvals, and regulations applying to this controls systems application as provided.
17. ASHRAE 135 Compliance: Control units shall use ASHRAE 135 protocol and communicate using ISO 8802-3 (Ethernet) datalink/physical layer protocol.

18. LonWorks Compliance: Control units shall use LonTalk protocol and communicate using EIA/CEA 709.1 datalink/physical layer protocol.

B. Tier 2 – HVAC System Specific Application Node (AN):

1. Tier 2 HVAC system AN shall provide both standalone and networked direct digital control of mechanical and electrical building systems as required by the system design.

2. A dedicated HVAC system AN shall be configured and provided for each primary HVAC system (air handler, chiller, boiler, etc.). At the ECC's option, the AN for primary HVAC system(s) may reside on the Tier 1 network, however, it is the ECC's responsibility to coordinate the additional network "drops" and associated IP addressing with the Owner's IT Department. The ECC will also be responsible for any costs necessary to compensate the Owner, or Subcontractor hired by the Owner to provide and install the additional network connections not shown on construction documents.

- a) The system AN shall have a built-in panel interface that allows the user to monitor status as well as adjust setpoints locally, in addition to the ability to temporarily override input and output points for troubleshooting and maintenance.
- b) The system AN shall have expandable point capacity with multiple configurations allowing for 25% future analog and binary input/output points. Additional points shall be eligible for use in any control strategy that resides in the AN.
- c) Local Display on all Primary AHU systems plus primary hot water and chilled water systems:

- (1) The display shall allow the user to view and change set points, modes of operation and parameters of all binary and analog points associated with respective AN.
- (2) A local display terminal that allows for multiple lines of text and graphical representation of the equipment being controlled by the AN including actual data from all points residing on the system controller.
- (3) The display terminal shall have the ability to view an alarm summary for current alarms as well as alarm history.

3. A dedicated HVAC system AN shall be configured and provided for each terminal HVAC system (unit heater, fan coil unit, cabinet heater, heat pump, chilled beam, etc.).

- a) The terminal AN shall have a library of control strategies capable of performing sequences specified.
- b) The terminal AN shall support a connection directly at the node or its associated temperature sensor for a portable user interface.

4. A dedicated HVAC system AN shall be configured and provided for each terminal box (VAV, CAV, F/P, and AFCV) application.

- a) The terminal box AN shall include an integral pressure transducer and damper actuator and the entire assembly shall be mounted or removed as one piece.
- b) The damper actuator shall be capable of stroking 90 degrees in 30 seconds.
- c) The terminal box AN shall have the auto zero ability to automatically calibrate the flow sensor to eliminate pressure transducer offset error due to ambient temperature and humidity effects.

5. Each HVAC system AN shall retain program, control algorithms, and setpoint information for at least 72 hours in the event of a power failure and shall return to normal operation upon stable restoration of normal line power.
6. Each HVAC system AN (AHU, hot water, chilled water, terminal box, etc.) shall monitor and report its communication status to the controls system application. The controls systems shall provide a system advisory upon communication failure and restoration.
7. Provide a means to prevent unauthorized personnel from accessing setpoint adjustments and equipment control definitions at the HVAC system AN.
8. The HVAC system AN shall perform the functional monitoring of all controls application variables, both from real hardware points, software variables, and controller parameters such as setpoints.
9. A failure at an HVAC AN shall not cause failures or non-normal operation at any other system AN other than the possible loss of active real-time information from the failed AN.
10. ASHRAE 135 Compliance: Communicate using read (execute and initiate) and write (execute and initiate) property services defined in ASHRAE 135. Reside on network using MS/TP datalink/physical layer protocol and have service communication port for connection to diagnostic terminal unit.
11. LonWorks Compliance: Communicate using EIA/CEA 709.1 datalink/physical layer protocol using LonTalk protocol.
12. Enclosure: Dustproof rated for operation at 32 to 120 deg F.

C. Servers:

1. As required for the functional operation of the control systems, the Controls Contractor shall provide all necessary digital processor programmable server(s). These server(s) shall be utilized for controls systems application configuration, for archiving, reporting, and trending of data, for operator transaction archiving and reporting, for network information management, for alarm annunciation, for operator interface tasks, for controls application management and the like. These server(s) shall utilize IT industry standard data base platforms such as Microsoft SQL server and Microsoft data engine (MSDE) or approved equal.
2. Provide controls systems application server(s) to archive historical data including trends, alarm, and event histories and transaction logs.
3. Equip these server(s) with the same software tool set that is located in the primary controls systems application nodes for system configuration and custom logic definition.
4. Equip these server(s) with the same software tool set that is located in the primary application nodes for color graphic configuration.
5. Access to all information on the control systems server(s) shall be through the same operator interface functionality used to access individual nodes. When logged onto a server, the Operator will be able to also interact with any of the primary nodes on the controls systems application.
6. Server disc shall have capacity to store all programmed trends, alarm history, user graphics, etc., for a minimum of 18 months minimum. The server shall allow a hard copy printout of all alarms as they occur.

D. Time Clock: Solid-state, programmable time control with 8 separate programs each with up to 100 on-off operations; 1-second resolution; lithium battery backup; keyboard interface and manual override; individual on-off-auto switches for each program; 365-day calendar with 20 programmable holidays; choice of fail-safe operation for each program; system fault alarm; and communications package allowing networking of time controls and programming from PC.

E. Operator Interface:

1. The Operator Interface provided shall include the functionality to selectively combine data and information from any system element or component in the controls systems application on a single browser window display panel at the operator's option. This shall include both current information and historical data stored on the server(s).
2. All aspects of the controls systems operator interface shall be provided to operate through an IT industry standard web browsers such as Internet Explorer or Chrome or approved equivalent.
3. The web browser based operator interface provided shall incorporate complete tool sets, operational information displays, multi-window displays, and other interactive aids to assist interpretation and ease of use. Simple HTML based web page displays are not acceptable; all values must be dynamic such that they are constantly changing.
4. The web browser based operator interface provided shall not require the procurement or licensing of any special or proprietary software from the Controls Contractor or its suppliers for the controls systems OWS.
5. The controls systems application OWS shall operate on Microsoft Windows 2000/XP or other approved platform.
6. Each controls systems application fixed and portable OWS shall be on-line configurable for specific functionalities and associated groups of system points and elements.
7. The controls systems application portable OWS shall operate identically and have equal functionality to the fixed OWS. All Operator access into the controls systems from portable OWS shall be the same browser format and functionality as provided for the fixed OWS.
8. File and system management display (navigation trees):
 - a) The operator interface shall include the ability to display system names in a hierarchal (navigation tree) format that allows logical grouping of systems and point names. This hierarchal organization shall represent the logical system network layout.
 - b) Provide the capability to display multiple navigation trees that aid the operator in navigating throughout all systems and points connected. At minimum provide a tree that identifies all systems on the controls systems networks.
 - c) Provide the capability for the Operator to add custom trees. The Operator shall be able to define any logical grouping of systems or points and arrange them on the tree in any selected order. Provide the capability to nest groups within other groups. Provide at minimum for 5 levels of nesting.
 - d) The navigation trees shall be "dockable" to other displays in the operator interface including graphic displays. The trees shall appear as part of the display and may be individually detached and minimized to the Windows task bar or closed. Provide for a single keystroke to reattach the navigation tree to a primary display.
9. Divisible display windows:
 - a) Provide for the operator to divide the display area within a single browser window into multiple display panels. The content of each display panel can be any of the standard summaries and graphics provided in the controls systems application.
 - b) Provide each display panel with minimize, maximize, and close icons.
10. Alarms:

a) Alarms shall be routed directly from primary controls systems application nodes to OWS and server(s). Provide for specific alarms from specific points to be routed to selectable OWS and server(s). The alarm management portion of the controls systems software shall, at minimum, provide the following functions:

- (1) Log date and time of alarm occurrence.
- (2) Generate a "Pop-Up" window on the browser display panel, with audible alarm, informing the operator that an alarm has been received.
- (3) Allow an operator, with the appropriate password, to acknowledge, temporarily silence or cancel an alarm.
- (4) Provide an audit trail on hard drive for alarms by recording user acknowledgement, deletion, or canceling of an alarm. The audit trail shall include the ID of the user, the alarm, the action taken on the alarm and a time/date stamp.
- (5) Provide the ability to direct alarms to an e-mail address or alpha-numeric pager. This must be provided in addition to the pop-up window described herein. Controls systems that use e-mail and pagers as the exclusive means of annunciating alarms are not acceptable.
- (6) Provide for any attribute of any object in the controls systems to be designated to report as an alarm.

b) The controls systems application shall annunciate systems diagnostic alarms indicating system failures and non-normal operating conditions.

c) The controls systems application shall annunciate controls alarms at minimum as required by Part 3.

d) Provide the on-line means to display alarms within the browser windows by date/time of occurrence, priority class, point designation, value, or other defined text keywords.

11. Operator transaction archiving:

a) Provide the means to automatically archive all operator activities on the controls systems application and for the recall of same for reporting.

b) Provide the means to sort and report archived activities by operator, date/time, activity type and system area.

c) Provide access protection to preclude the unauthorized removal or tampering with archived records.

d) Provide management support facilities for the deletion and reinitializing of archived record logs under master password control or equal means.

12. Reports:

a) Reports shall be generated and directed to one or more of the following: User interface displays, printers archived at the Owner's defined option. As a minimum, the controls systems application shall provide the following reports:

- (1) All points in the controls systems application.
- (2) All points in a specific controls systems AN.
- (3) All points in a user-defined group of points.
- (4) All points currently in alarm.
- (5) All points locked out.
- (6) All controls systems application schedules.

(7) All user defined and adjustable variables, schedules, interlocks, diagnostics, systems status reports, and the like.

- b) Provide all applicable original manufacturer's standard reports for the controls systems.
- c) Provide any custom report as specified.

13. Dynamic Color Graphics:

- a) Provide for any number of real-time color graphic displays shall be able to be generated and displayed in the controls systems application limited only by memory data storage capacity.
- b) Graphics shall be based on Scalar Vector Graphics (SVG) technology.
- c) Values of real-time attributes displayed on the graphics shall be dynamic and updated on the displays.
- d) The graphic displays shall be able to display and provide animation based on real-time data that is acquired, derived, or entered into the operating controls systems.
- e) Provide for the Owner to be able to change values (setpoints) and states in system controlled equipment directly from the graphic display.
- f) Provide a graphic editing tool that allows for the creation and editing of graphic files. It shall be possible to edit the graphics directly while they are on line, or at an off line location for later downloading to the AN.
- g) Provide a complete user expandable symbol library containing all of the basic symbols used to represent components of a typical system. Implementing these symbols in a graphic shall involve dragging and dropping them from the library to the graphic.
- h) ECC Project Manager and/or programmer/technician shall meet with the Owner's Maintenance and Facility Staff prior to graphic development. Graphics shall not be installed on BAS system until the Owner's Staff has reviewed, commented and approved graphic appearances, layouts, etc. including floor plan graphics.

14. Schedules:

- a) Provide multiple schedule input forms for automatic time-of-day scheduling and override scheduling of operations. At a minimum, the following spreadsheet types shall be accommodated:
 - (1) Weekly schedules.
 - (2) Temporary override schedules.
 - (3) Special "Only Active If Today Is A Holiday" schedules.
 - (4) Monthly schedules.
- b) Schedules shall be provided for each group, system, and sub-system in the controls systems application. It shall be possible to include all of any commandable points residing within the controls systems in any custom schedule. Each point shall have a unique schedule of operation relative to the system use schedule, allowing for sequential starting and control of equipment within the system. Scheduling and rescheduling of points shall be accomplished easily via the system schedule spreadsheets.
- c) Multiple monthly calendars for a 12-month period shall be provided that allow for simplified scheduling of holidays and special days in advance. Holidays and

special days shall be user-selected with the pointing device or keyboard, and shall automatically reschedule equipment operation as previously defined on the weekly schedules.

15. Historical trending and data collection:

- a) Trend and store point history data for all actual and virtual (software) points and values as required by the Owner.
- b) The trend data shall be stored in a manner that allows custom queries and reports using industry-standard software tools.
- c) At a minimum, provide the capability to perform statistical functions on the historical database:

- (1) Average.
- (2) Arithmetic mean.
- (3) Maximum/minimum values.
- (4) Range – difference between minimum and maximum values.
- (5) Standard deviation.
- (6) Sum of all values.
- (7) Variance.

16. Operator access security (combined password and user ID):

- a) Provide for Operator access into the controls systems via the use of on-line Owner defined software password and user identification (ID) pairs, unique for each operator and unique throughout the controls systems application, to supplement standard password access control.
- b) Stored password/user ID definitions shall be stored in encrypted formats whether at the controls server or at the AN.
- c) Password logins shall not be echoed on any screen or printer except during master password definition processes. An operator defining a password shall be required to re-enter to confirm authenticity.
- d) Operator access privileges shall be definable in terms of functions and project areas.
- e) As part of the access privileges definition for each user the Owner shall be able to define at minimum the following:

- (1) Access times by day.
- (2) Permanent or temporary, with expire date, password.
- (3) Number of incorrect access attempts allowed before the password is disabled.
- (4) Whether or not the operator is able to redefine their own password.
- (5) A field for the operator's e-mail address.
- (6) A field for the operator's contact phone number.
- (7) Definition of the operator's access privilege functionalities including viewing only, fully control, selected functions, etc.

17. Primary DDC Issues:

- a) All analog and binary signaling to be wired and piped to DDC panels as detailed on plans. Bidder to verify total of points scheduled. Global communication trunk LAN to allow sharing of data between individual panels.

- b) DDC controllers to have points as scheduled on plans as a minimum. ECC to note that additional analog and binary points may be required to achieve the operating sequence of operation or as dictated by standards and codes.
- c) A separate application node controller shall be required for each individual air-handling unit unless detailed to the contrary.
- d) Miscellaneous requirements:
 - (1) All analog points to have applicable high and low alarm points programmed to identify operation out of acceptable ranges.
 - (2) Status of all motors to be programmed to consider programmed off cycle as non-alarm. Normal status of all motors to be shown.
 - (3) Flow sensing for BTU calculations to be performed with turbine meters or magnetic inductive transmitter as detailed.
 - (4) All safety thermostats and pressure switches to have manual reset requiring manual reset on restart.
 - (5) Each DDC controller of each type shall be equipped with an integral "ON-OFF" switch that disconnects it from the primary electrical service.
- e) The entire DDC system shall employ capability for compatibility to BAC net technology.
- f) Where specifically called for and where detailed in the unit specification, this Contractor to furnish gateways that allow for the integration of data into the BAS system.
- g) Furnish to Owner at project completion a CD incorporating the entire software system.
- h) The operating system requires that the operator shall have access to all analog and binary data points through the global LAN. This shall include all points contained in all application node controllers, and such other points as are integral in auxiliary mechanical and electrical components. Access to be accomplished through integral network terminals or separate laptop computers. The resulting communication network shall allow the ability to read and adjust all binary and analog points throughout the entire network through any interface. Refer to architecture detailed on HPE drawings.

EXECUTION

VI. INSTALLATION

A. Instrumentation Mounting:

1. All sensing capillaries on coils shall be rigidly supported as directed by the Architect/Engineer to prevent capillary vibration and to accurately sense coil temperature.
2. All sensors except where installed in finished areas shall have bakelite plates identifying their function keyed to control schematics.
3. All sensors where duct or unit housing 30" or more in width or height shall utilize flexible averaging bulb elements installed to sense average temperature. Element to cover entire coil surface with multiple passes to insure accurate average. Multiple sensors to be utilized as required. Elements to be mounted on field fabricated frame or cable support with nylon tie wraps.

4. Room thermostats, humidistats, and other space sensors shall be installed where shown on the Drawings. These components shall not be installed between a light switch and doorway when they are co-located on the Drawings. These components shall be installed at a height of 46" above finished floor to the center of the component, unless indicated otherwise.
5. Sensors located in fire-resistance rated walls shall be installed within steel electrical boxes. Boxes shall be protected with listed firestop putty pads if located less than 24" from other electrical boxes on the opposite side of the wall. Install putty pads on all boxes (existing or by other trades) within 24" of the box with the sensor.
6. This Contractor shall be responsible for exact field location of all airflow measuring stations, water flow turbine meters, vortex shedding sensors, pitot tubes, airflow sensors, thermal sensors, humidity sensors, pressure sensors, and any other variables required as a part of the environmental control system. This Contractor shall coordinate the sensors with devices furnished and installed under other sections of the project. Any conflicts to be brought to Architect/Engineer prior to installation.
7. All controllers, alarms, and sensors, except in finished areas, shall carry plastic laminate identifying tags describing their function and keyed to automation diagrams.
8. Vortex shedding sensors to be field installed by ECC.
9. All controllers and control panels shall utilize mounting support that insures no vibration from the structure or mechanical equipment. Back boxes or backing panels are required as appropriate. Where walls are plaster or drywall, channels shall be utilized screwed to studs with laminated panel facing to support instruments or control panels; all such assemblies to be crafted to present easy access to controls. Proper engraved identification nameplates are required.
10. ECC is responsible to coordinate with Mechanical, Sheet Metal, and Electrical Contractors the proper location of all air, water, and steam measurements and control components to insure that sizing and locations meet all manufacturer's standards for maximum accuracy of sensing and control. Instances where piping or duct sizing and location need be modified from what is shown on drawings to achieve required accuracy shall be brought to designer's attention prior to bidding; failure to so notify designer requires ECC to accommodate required field modifications.
11. Instrument operating assemblies located within finished spaces intended to be accessed by personnel shall be installed at a height of 46" above finished floor to the center of the assembly. This applies for all controllers, readout components, pressure monitors, and safety devices.
12. Within mechanical rooms, all instrument operating assemblies for all controllers, readout components, and safety devices shall be installed in locations that are easily accessible to maintenance and operating personnel. Locations such as those on remote sides of air handling units or other mechanical systems are not acceptable.

B. Electrical Wiring:

1. Under this division, furnish and install interlock, LAN, sensor, and actuator wiring. Connect controls in accordance with approved wiring diagrams. Install wiring inside panels to terminal strips.
2. Configure LAN as either a bus, star, or combination of the two. Use twisted pair, coax, or fiberoptic cable to meet noise immunity and/or distance requirements. Design system for data transfer rate of no less than 1 megabaud. LAN wiring requires shielded cable or shall be cable certified for LON or BAC net. All LAN wiring must meet supplier's standards of operation and quality.

- a) Use Belden No. 22 gage or larger Beldfoil or equal for runs up to 250 feet.

- b) Use Belden No. 18 gage or larger Beldfoil or equal for runs 250 feet to 500 feet.
 - c) All input/output wiring shall have sufficient strength to meet all operational requirements.
- 3. Sensor wiring over 50 feet, where run in a common conduit or near inductive loads, shall be shielded cable.
 - a) Use Belden No. 24 gage or larger Beldfoil or equal for runs up to 100 feet.
 - b) Use Belden No. 18 gage or larger Beldfoil or equal for runs up to 500 feet.
 - c) All input/output wiring shall have sufficient strength to meet all operational requirements.
- 4. Power Wiring for 24volt power trunk shall be minimum two conductor No. 14 gage plenum rated wiring.
- 5. Install all control and interlock wiring in addition to low voltage sensor and LAN wiring in accordance with local requirements, the National Electrical Code and Division 26 of project specifications.
- 6. Installation minimum requirements:
 - a) Mechanical and service areas plus any areas without finished ceilings: All wiring including cables in EMT.
 - b) Space sensors and alarms: All wiring and cables in EMT within wall construction.
 - c) Ceiling returns (accessible or drop ceilings - ducted returns): Approved non-plenum cable.
 - d) Ceilings (open returns): Approved plenum-rated cable.
 - e) Ceiling returns (non-accessible): EMT or code compliant equal solid conduit.
 - f) Inside air handling units: All wiring including cables in EMT or code compliant equal solid conduit.
 - g) Note that the use of cable is limited to low voltage service less than 24 volt only.
 - h) In no case shall cables be allowed to lay on ceiling grid.
 - i) Note that all conduit junctions and terminations shall utilize compression fittings.
 - j) Installation of all cabling in ceilings and walls shall be run in a professional workmanlike fashion acceptable to Architect/Engineer. Cables to be supported with tie wraps such that droop and sag is within acceptable degrees and shall be securely fastened to fixed members of the building structure at sufficient points to avoid excessive freedom of movement.
- 7. Grounding:
 - a) Provide suitable grounding for all digital equipment.
 - b) Install a separate ground to earth using existing water piping or a copper rod driven into the ground as indicated by the equipment manufacturer. In no situation may the ground be connected to the building neutral conductors, either at the breaker or at the main feeder entrance to the building (no exceptions).
- 8. Transient protection:
 - a) All electronic equipment including processors, relays, monitoring devices, temperature sensors, and other non-computerized solid state equipment will be

adequately protected against power line transients or RFI interference. All components to meet IEEE/ANSI standards.

b) Equipment that fails to operate properly due to transient or other electrical interference, in the opinion of the Engineer, will be required to be retrofitted with the appropriate protection device(s).

c) Provide an isolation transformer as a separate component, on the 110 VAC power supply to the digital controllers to protect all controllers to manufacturer's requirements.

d) All control wiring that must be routed in EMT shall be separate from any power feed wiring.

e) The sizing type and provision of cable, conduit, cable trays, and trunking shall be the design responsibility of the ECC. If complications arise, however, due to the incorrect selection of cable, cable trays, trunking, and/or conduit by the ECC, the Contractor shall be responsible for all costs incurred in replacing the selected components.

f) Note that any disconnect switches between variable frequency drives and operating motors shall be interlocked such that drive inverter returns to zero position when motor is disconnected. Interlock wiring between disconnect and VFD by EC. Refer to VFD Specifications Section.

9. General:

a) Any penetration of an air handling unit enclosure for passage of tubing, conduit, or sensing elements shall be sealed with an appropriate grommet and caulked.

b) Contractor to insure that all instruments requiring reset or field adjustment are mounted with the operating heads located on the exterior of air handling units in positions of ready access. In instances of rooftop assemblies, all such devices to be inside unit enclosures with access via manufacturer's access panels.

C. DEMOLITION

1. Existing controls systems to be demolished shall be physically removed complete by the ECC. Reuse of existing conduits and raceways is permitted, if they do not interfere with the work of other trades.

2. The ECC shall install temporary measures as required for phasing and temporary operating conditions. The ECC shall examine the complete document set and verify phasing with other subcontractors prior to submitting a bid. These measures may include temporary wiring to maintain floor level networks.

a) Any pneumatic lines cut during demolition must be checked and refed as required to keep the existing equipment in operation.

b) Any pneumatic lines removed must be plugged and capped immediately to avoid excessive compressor run time.

D. FIELD QUALITY CONTROL

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
2. Perform the following field tests and inspections and prepare test reports:
 - a) Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.
 - b) Test and adjust controls and safeties.
 - c) Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - e) Pressure test high-pressure control air piping at 150 psig and low-pressure control air piping at 30 psig for 2 hours, with maximum 1-psig loss.
 - f) Test calibration of pneumatic and electronic controllers by disconnecting input sensors and stimulating operation with compatible signal generator.
 - g) Test each point through its full operating range to verify that safety and operating control set points are as required.
 - h) Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.
 - i) Test each system for compliance with sequence of operation.
 - j) Test software and hardware interlocks.
3. DDC Verification:
 - a) Verify that instruments are installed before calibration, testing, and loop or leak checks.
 - b) Check instruments for proper location and accessibility.
 - c) Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.
 - d) Check instrument tubing for proper fittings, slope, material, and support.
 - e) Check installation of air supply for each instrument.
 - f) Check flow instruments. Inspect tag number and line and bore size, and verify that inlet side is identified and that meters are installed correctly.
 - g) Check pressure instruments, piping slope, installation of valve manifold, and self-contained pressure regulators.
 - h) Check temperature instruments and material and length of sensing elements.
 - i) Check control valves. Verify that they are in correct direction.
 - j) Check air-operated dampers. Verify that pressure gages are provided and that proper blade alignment, either parallel or opposed, has been provided.
 - k) Check DDC system as follows:
 - l) Verify that DDC controller power supply is from emergency power supply, if applicable.
 - m) Verify that wires at control panels are tagged with their service designation and approved tagging system.
 - n) Verify that spare I/O capacity has been provided.
 - o) Verify that DDC controllers are protected from power supply surges.
 - p) Verify all supervisory and application controllers are operating on the latest version of software/firmware. If newer versions of software and/or firmware are released during the project's duration, the ECC shall upgrade/update those controllers to the newer version at no additional cost to the Owner. The ECC shall

submit a spreadsheet as part of the project closeout documents listing the software version of each controller.

4. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

E. ADJUSTING

1. Calibrating and Adjusting:
 2. Calibrate instruments.
 3. Make three-point calibration test for both linearity and accuracy for each analog instrument.
 4. Calibrate equipment and procedures using manufacturer's written recommendations and instruction manuals. Use test equipment with accuracy at least double that of instrument being calibrated.
 5. Control System Inputs and Outputs:
 - a) Check analog inputs at 0, 50, and 100 percent of span.
 - b) Check analog outputs using milliampere meter at 0, 50, and 100 percent output.
 - c) Check digital inputs using jumper wire.
 - d) Check digital outputs using ohmmeter to test for contact making or breaking.
 - e) Check resistance temperature inputs at 0, 50, and 100 percent of span using a precision-resistant source.
6. Flow:
 - a) Set differential pressure flow transmitters for 0 and 100 percent values with 3-point calibration accomplished at 50, 90, and 100 percent of span.
 - b) Manually operate flow switches to verify that they make or break contact.
7. Pressure:
 - a) Calibrate pressure transmitters at 0, 50, and 100 percent of span.
 - b) Calibrate pressure switches to make or break contacts, with adjustable differential set at minimum.
8. Temperature:
 - a) Calibrate resistance temperature transmitters at 0, 50, and 100 percent of span using a precision-resistance source.
 - b) Calibrate temperature switches to make or break contacts.
9. Stroke and adjust control valves and dampers without positioners, following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed.
10. Stroke and adjust control valves and dampers with positioners, following manufacturer's recommended procedure, so that valve and damper is 0, 50, and 100 percent closed.
11. Provide diagnostic and test instruments for calibration and adjustment of system.

12. Provide written description of procedures and equipment for calibrating each type of instrument. Submit procedures review and approval before initiating startup procedures.

13. Adjust initial temperature and humidity set points.

14. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three visits to Project during other than normal occupancy hours for this purpose.

F. DEMONSTRATION

1. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC instrumentation and controls. Refer to Section 017900 "Demonstration and Training."

2. When the project encompasses a formal commissioning process, this Environmental Control Contractor shall furnish, as a requirement of the contract, the services of an approved Engineer/Technician who will demonstrate the complete operation of the Environmental Control Installation including all hardware and software in the presence of the Commissioning Agent.

a) The services of a qualified representative of the Control Contractor shall be provided to demonstrate the installation, startup of system and instruct the Owner's maintenance personnel in the care and proper operation of the system. This shall require the Contractor to demonstrate the installed accuracy of all controlled variables as herein detailed, i.e.,

b) All temperature, pressure, humidity and flow sensors, controllers, alarms, relays, and safety devices.

c) All actuators functioning with control loops. All actuators to be demonstrated for complete travel from full open to full closure; all actuators to have 200% power for intended functionality.

d) All hardware and software of all DDC controllers and BAS control loops.

e) Current sensors to be field calibrated to insure alarm status on loss of electrical power or loss of drive sheaves or belts.

f) Other control features installed as part of the contract and as requested by Design Engineer.

g) Provide an override report indicating that all controls are fully automatic.

h) The installation and Service Contractor shall provide the Owner with 40 hours of instruction and training. This shall be done as follows:

(1) Job completion – 24 hours.

(2) 30 days later – 4 hours.

(3) 3 months later – 4 hours.

(4) The remaining 8 hours as requested by Owner.

H. WARRANTY

1. At completion of final test of installation and acceptance by Owner, provide any service incidental to proper performance for a period of 24 months beginning with the project's last, final Certificate of Substantial Completion which has been signed by the Owner. This final Certificate of Substantial Completion utilized for the start of the warranty period shall not contain an attached list of punch list items which includes any items for the Environmental Control System.
2. Warrant equipment for 24 months for defects in workmanship and material under normal use and service. During warranty period, replace or repair, free of charge, equipment proven to be defective in workmanship or material.
3. Certain electronic devices not manufactured by the Environmental Control Supplier, such as computers, printers, and CRTs display, shall carry the same warranty as above. Pass any registration and warranty documents and warranty rights to the Owner.
4. All valve and damper actuators to carry a warranty of 60 months after project acceptance. Warranty to cover both labor and material without exception.
5. Control Supplier/Engineering Contractor to provide written documentation of availability of repair parts for all material installed under this contract for a period of 60 months after project acceptance. In the event a component is obsolete, it shall be replaced with the new generation at no cost to the Owner.

END OF SECTION 23 09 00

SECTION 23 34 23 - HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Centrifugal roof ventilators.
 - 2. In-line centrifugal fans

1.3 PERFORMANCE REQUIREMENTS

- A. Project Altitude: Base fan-performance ratings on 700 feet above sea level.
- B. Operating Limits: Classify according to AMCA 99.

1.4 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:
 - 1. Certified fan performance curves with system operating conditions indicated.
 - 2. Certified fan sound-power ratings.
 - 3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
 - 4. Material thickness and finishes, including color charts.
 - 5. Dampers, including housings, linkages, and operators.
 - 6. Roof curbs.
 - 7. Fan speed controllers.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Wiring Diagrams: Power, signal, and control wiring.
- C. Seismic Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
- D. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.

- E. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Roof framing and support members relative to duct penetrations.
 - 2. Ceiling suspension assembly members.
 - 3. Size and location of initial access modules for acoustical tile.
 - 4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- F. Field quality-control test reports.
- G. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.
- C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.
- D. UL Standard: Power ventilators shall comply with UL 705.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.
- B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.
- C. Lift and support units with manufacturer's designated lifting or supporting points.

1.7 COORDINATION

- A. Coordinate size and location of structural-steel support members.
- B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- C. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Final Fan Belts: Two sets for each belt-driven fan. Field installed and sized by the Testing, Adjusting and Balancing Contractor. Sized as required to deliver the necessary airflow through the system accounting for all system losses.
 - 2. Final Fan Sheave: One set for each belt-driven fan. Field installed and sized by the Testing, Adjusting and Balancing Contractor. Sized as required to deliver the necessary airflow through the system accounting for all system losses.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Aerovent; a Twin City Fan Company.
 - 2. Greenheck.
 - 3. Loren Cook Company.
 - 4. JencoFan; Div. of Breidert Air Products.
 - 5. Penn Barry.
 - 6. Twin City Fan and Blower.

2.2 CENTRIFUGAL ROOF VENTILATORS

- A. Description: Direct- or belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.
- B. Housing: Removable, spun-aluminum, dome top and outlet baffle square, one-piece, aluminum base with venturi inlet cone.
 - 1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains.
- C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.
- D. Belt-Driven Drive Assembly: Resiliently mounted to housing, with the following features:
 - 1. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub. Stainless steel where scheduled.
 - 2. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
 - 3. Pulleys: Cast-iron, adjustable-pitch motor pulley.
 - 4. Fan and motor isolated from exhaust airstream.
- E. Accessories: Refer to Fan Schedule on drawings for individual fan requirements.

- F. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.
 - 1. Overall Height: Minimum 16 inches.
 - 2. Pitch Mounting: Manufacture curb for roof slope.
 - 3. Metal Liner: Galvanized steel.

2.3 IN-LINE CENTRIFUGAL FANS

- A. Description: In-line, belt-driven centrifugal fans consisting of housing, wheel, outlet guide vanes, fan shaft, bearings, motor and disconnect switch, drive assembly, mounting brackets, and accessories.
- B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.
- C. Direct-Driven Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing[; with wheel, inlet cone, and motor on swing-out service door.
- D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.
- E. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.
- F. Accessories: Refer to Fan Schedule on drawings for individual fan requirements.

2.4 MOTORS

- A. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
- B. Roof Ventilator Direct Drive Fans with Single Phase Motors: Furnish electronically commutated (EC) motor to convert AC power to DC power. Furnish a speed controller matched to the motor which allows for at least a 50% speed reduction adjustment via a manual potentiometer. Provide all transformers and wiring factory mounted for a completely functional unit.
- C. Fan Motor Wiring:
 - 1. Each fan shall be wired separately to a non-fused disconnect mounted with thermal overload protection on the exterior of the fan section per NEC requirements.
 - 2. Provide conduit sized for motor conductors routed from the fan motor to the disconnect. Provide power wiring inside the conduit.
 - 3. For fans indicated to be driven by variable frequency controllers (VFC), the disconnect shall incorporate a remote contact connection for the interlock of the variable frequency controller.
 - 4. Penetrations of junction boxes and disconnects shall be sealed watertight inside (around the wires) and outside of the conduit.

2.5 SOURCE QUALITY CONTROL

- A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.
- B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install power ventilators level and plumb.
- B. Support units as scheduled on the drawings and as specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
 - 1. Secure vibration and seismic controls to concrete bases using anchor bolts cast in concrete base.
- C. Install floor-mounting units on concrete bases. Concrete, reinforcement, and formwork requirements are specified in Division 03 Section "Cast-in-Place Concrete."
- D. Secure roof-mounting fans to roof curbs with cadmium-plated hardware. Refer to Division 07 Section "Roof Accessories" for installation of roof curbs.
- E. Install units with clearances for service and maintenance.
- F. Label units according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

- A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Air Duct Accessories."
- B. Install ducts adjacent to power ventilators to allow service and maintenance.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
1. Verify that shipping, blocking, and bracing are removed.
 2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
 3. Verify that cleaning and adjusting are complete.
 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
 5. Adjust belt tension.
 6. Adjust damper linkages for proper damper operation.
 7. Verify lubrication for bearings and other moving parts.
 8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
 9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
 10. Shut unit down and reconnect automatic temperature-control operators.
 11. Remove and replace malfunctioning units and retest as specified above.
- B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Adjust belt tension.
- C. Refer to Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.
- D. Replace fan and motor pulleys as required to achieve design airflow.
- E. Lubricate bearings.

END OF SECTION 23 34 23

SECTION 23 74 23 PACKAGED OUTDOOR MAKEUP AIR UNIT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes packaged outdoor makeup air handling units with natural gas heat exchanger, centrifugal fan, motor and drive assembly, and required controls and safeties to provide a complete operational system.
- B. Related Sections include the following:
 - 1. Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment" for isolation pads, spring isolators, and seismic restraints.
 - 2. Division 23 Section "HVAC Instrumentation and Control for HVAC" for control devices not packaged with units.

1.3 SUBMITTALS

- A. Product Data: Include rated capacities, required maintenance clearances, ducted sound power ratings, furnished specialties, and accessories for each type of product indicated.
- B. Shop Drawings:
 - 1. Dimensions, weights, method of field assembly, location, and size of field connections.
 - 2. Diagram power, signal, and control wiring.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For self-contained air-conditioners to include in emergency, operation, and maintenance manuals.
- F. Warranty: Special warranty specified in this Section.
- G. Coordination Drawings: Plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Structural members to which RTU's will be attached.
 - 2. Roof openings.
 - 3. Roof curbs and flashing.
 - 4. Pipe penetrations.

5. Conduit penetrations.

1.4 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. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2007
- D. ETL Certified
- E. Factory test heat exchanger

1.5 COORDINATION

- A. Coordinate size and location of concrete bases for units. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Division 3 Section "Cast-in-Place Concrete."

1.6 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of self-contained air-conditioners that fail in materials or workmanship within specified warranty period.
 1. Provide ten (10) year material and labor warranty on heat exchanger.
 2. Provide one (1) year minimum material and labor warranty on all remaining components from date of substantial completion.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Filters: One set of filters for each unit.
 2. Final fan belts: Two (2) sets for each belt driven fan. Field installed and sized by the Testing, Adjusting, and Balancing Contractor. Sized as required to deliver the necessary airflow through the system accounting for all system losses.

3. Final fan sheave: One (1) set for each belt driven fan. Field installed and sized by the Testing, Adjusting, and Balancing Contractor. Sized as required to deliver the necessary airflow through the system accounting for all system losses.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Trane Co. (The); North American Commercial Group.3
 - b. Valent
 - c. KCC Manufacturing

2.2 GENERAL DESCRIPTION

- A. Description: Self-contained, factory-assembled, packaged rooftop dedicated makeup air unit consisting of cabinet, heat exchanger, supply air fan, air filters, and unit controls.
- B. Disconnect Switch: Factory mounted inside control panel.

2.3 CABINET

- A. Frame and Panels: Structural-steel frame with double wall galvanized-steel panels with baked-enamel finish in color selected by Architect, and with access doors or panels. Exterior and interior panels shall be constructed of G90 Galvanized steel Provide pitched roof panels and lifting lugs. Cabinet leakage shall not exceed 1% following AHRI Standard 340/360. Exterior paint shall be capable of withstanding at least 2500 hours when tested in accordance with ASTM B 117-95.
- B. Insulation: Minimum 2-inch thick to provide a R value of 13 for the assembly. Insulate coils sections. Provide solid metal liner on all surfaces exposed to the airstream.
- C. Discharge Plenum: Cabinet extension with bottom outlet.
- D. Corrosion-Resistant Treatment: Phenolic coating on unit interior and exterior.
- E. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2010.

2.4 FANS

- A. Material: Galvanized steel.
- B. Configuration: Double-width, double-inlet, backward curved or airfoil centrifugal fan; statically and dynamically balanced.

- C. Drive: Belt, with fan mounted on permanently lubricated bearings or Direct, with fan and motor resiliently.
- D. Fan Sheaves: Cast-iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed.
- E. Motor Sheave: Variable and adjustable pitch selected so required rpm are obtained when set at mid-position.
- F. Rating: As recommended by the manufacturer or a minimum of one and one-half times nameplate rating of motor.
- G. Bearings: Grease lubricated with grease lines extended to exterior of unit.
- H. Variable Air Volume: Variable-frequency motor controller.
- I. Fan Motor:
 - 1. Each fan shall be wired separately to a non-fused disconnect mounted on the interior of the fan section per NEC requirements.
 - 2. A conduit shall be routed to the exterior of the unit from each disconnect to a junction box for field connection. Penetration shall be sealed watertight.
 - 3. Disconnect shall incorporate remote contact connection to interlock variable frequency drive. Interlock shall be routed in separate conduit to the exterior of the unit to a junction box.
 - 4. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
- J. Isolation: Mount fan and motor on common subbase and mount assembly on spring isolators with minimum static deflection of 1 inch (25 mm).

2.5 AIRFLOW MEASURING PROBES

- A. Provide on all fans, airflow measuring probes capable of continuously monitoring the air-handling capacity of the respective fan.
- B. Each airflow probe shall contain multiple, averaged velocity pressure taps located symmetrically around the throat of the fan inlet(s) and a single static pressure tap located on the fan housing. The entire airflow monitoring probe must be located outside the inlet throat as to not obstruct airflow.
- C. The probes shall be capable of producing steady, non-pulsating signal of the velocity pressure, independent of the upstream static pressure without adversely affecting the performance of the fan. The sensing probes shall be accurate to 5 percent of actual fan airflow.
- D. Provide output signal from fan probe to outside of unit to be interfaced with building controls. Coordinate with control contractor.

2.6 HEAT EXCHANGER

- A. Electric resistance heater. Heater shall meet the requirements of the National Electrical Code and shall be listed by Underwriters Laboratories for zero clearance to combustible surfaces. Unit controller to modulate electric heater to maintain the supply temperature set point.

2.7 DAMPERS

- A. Damper Operators: Division 23 Section "Instrumentation and Control for HVAC."
- B. Low-Leakage, Outside Air: Double-skin, airfoil-blade galvanized-steel dampers with compressible jamb seals and extruded-vinyl blade edge seals, in parallel blade arrangement with steel operating rods rotating in sintered bronze or nylon bearings mounted in a single galvanized-steel frame, and with operating rods connected with a common linkage. Leakage rate shall not exceed 3 cfm/sq. ft. at 1-inch wg. differential.

2.8 FILTERS

- A. ASHRAE Compliance:
 - 1. Comply with ASHRAE 52.1 for arrestance and ASHRAE 52.2 for MERV for methods of testing and rating air filter units.
 - 2. All filter efficiencies scheduled and specified shall be maintained or increase over the life of the filter. Each MERV rating scheduled shall also require the corresponding MERV-A rating when tested in accordance with Appendix J of the Standard.
- B. Pleated Panel Filters:
 - 1. Description: Factory fabricated, self-supported, extended surface, pleated, panel type, disposable air filters with holding frames.
 - 2. Filter unit class: UL 900, Class 2.
 - 3. Media: Interlaced glass or synthetic fibers coated with non-flammable adhesive.
 - a. Adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - b. Media shall be coated with an anti-microbial agent.
 - c. Separators shall be bonded to the media to maintain pleat configuration.
 - d. Welded wire grid shall be on downstream side to maintain pleat.
 - e. Media shall be bonded to frame to prevent air bypass.
 - f. Support members on upstream and downstream sides to maintain pleat spacing.
 - 4. Filter media frame: Cardboard frame with perforated metal retainer sealed or bonded to the media.

2.9 SIDE-SERVICE HOUSINGS

- A. Description: Factory-assembled, side-service housings, constructed of internally insulated double wall galvanized steel, with flanges to connect to duct system.
- B. Prefilters: Integral tracks to accommodate 2-inch (50-mm) disposable filters.

- C. Access Doors: Continuous gaskets on perimeter and positive-locking devices. Arrange so filter cartridges can be loaded from either access door.
- D. Sealing: Incorporate positive-sealing gasket material on channels to seal top and bottom of housing.
- E. Include access doors on both sides of the air handling unit.

2.10 FILTER GAGES

- A. Description: Diaphragm type with dial and pointer to metal case, vent valves, black figures on white background, and front recalibration adjustment.
 - 1. Diameter: 4-1/2 inches (115 mm).
 - 2. Range:
 - a. Filter up to MERV 8: 0-2.0-inch wg (0 to 500 Pa).
 - b. MERV 9 and higher filter: 0- to 4.0-inch wg (0 to 1000 Pa).
- B. Accessories: Static-pressure tips, tubing, gage connections, and mounting bracket.
- C. Provide filter gage mounted across individual each filter bank.

2.11 CONTROLS

- A. Control Package: Factory wired, including contactor, high- and low-pressure cutouts, internal-winding thermostat for compressor, control-circuit transformer, and non-cycling reset relay.
- B. Adjustable Thermostat: Unit mounted to control the following:
 - 1. Supply fan.
- C. Microprocessor Control Panel: Controls unit functions, including refrigeration and safety controls and the following:
 - 1. Supply fan.
 - 2. Supply-fan motor speed - Variable volume
 - 3. Modulating electric heat
 - 4. Panel-mounted control switch to operate unit in remote or local control mode, or to stop or reset.
 - 5. Panel-mounted indication and adjustable control of the following:
 - a. Operating status.
 - b. System diagnostics and safety alarms.
 - c. Supply-air temperature set point.
 - d. Supply-air pressure set point.
 - e. Supply-air-pressure, high-limit set point.
 - 6. Time-of-day control to cycle unit on and off.
 - a. Unit to be energized when kitchen hoods are energized.
 - b. Unit to be deenergized when kitchen hoods are de-energized

7. Power interruption restart mode.
8. Unit diagnostics and diagnostic code storage.
9. Controller shall have volatile-memory backup.
10. Safety control operation:
 - a. Smoke detectors: Stop fan and close outdoor air damper if smoke is detected.
 - b. Provide additional contacts for alarm interface to fire alarm control panel.
 - c. Fire alarm control panel interface: Provide control interface.
 - d. Outdoor air damper operation:
 - 1) Active periods: Open outdoor air damper.
 - 2) Inactive periods: Close outdoor air damper.
11. Interface requirements for HVAC instrumentation and control system:
 - a. Interface relay for scheduled operation.
 - b. Interface relay to provide indication of fault at the central workstation and diagnostic code storage.

D. Sequence of Operation:

1. Rooftop unit to be supplied with all operating and safety controls to supply 55 deg F upon a call for makeup air from the exhaust fan operation. The supply air will be distributed to space diffusers and command room heat pump to operate.
2. RTU is indexed for on/off from a binary signal generated from the Building Automation System Operator's Work Station and DDC system.
3. Run cycle:
 - a. The unit and all associated exhaust fans operate at a call for exhaust.
 - b. The unit delivers room neutral air 68F (adjustable) to the building.
4. Off cycle:
 - a. The unit is completely powered down.
5. The unit supplier shall be responsible for furnishing, installing, wiring, and adjusting 100 percent off all the controls required for the rooftop unit to perform the operating sequence. The indexing for the programmed occupied-unoccupied cycles shall be coordinated with ECC to receive the external input from the Building Automation System.

E. The Manufacturer/Supplier is responsible for including and providing the following related to data integration with and to the building automation system/environmental control system (Specification Section 23 09 00).

1. All hardware, firmware and software components required to provide the BACnet MS/TP interface necessary to transmit the specified data points to the BAS system. The equipment manufacturer and/or equipment supplier is responsible for identifying and coordinating the required controls protocol with the successful ECC Contractor. The final result of the coordination shall be indicated on the written equipment submittal.
2. On-site technical labor to assist the ECC Contractor with the data integration and to verify the specified data points, including data values, change of state values and units and are communicated properly and completely to the BAS system. On-site technical assistance shall not be less than a minimum of 4 hours total time on the job site for each piece of equipment installed with this time split over two separate site visits. Allow a minimum of 2

- hours to assist the ECC Electrician and coordinate wiring terminations and a minimum of 2 hours to assist the ECC Programmer to confirm data connectivity. On-site technical assistance shall continue beyond these minimum times stated at no cost to the Owner nor revisions to the Contract amount nor schedule until such time as the Engineer of Record determines that the equipment operation, startup and graphics are satisfactory.
3. The equipment submittal shall state whether the equipment manufacturer or the equipment supplier is providing each of these items with personnel names and mobile phone numbers included in the submittal:
 - a. On-site technical labor to assist the ECC Electrician.
 - b. On-site technical labor to assist the ECC Programmer with data connectivity and graphics.

2.12 OUTDOOR AIR INTAKE

- A. Located in accordance with ASHRAE 62.1 from known contaminants.
- B. Designed to resist all rain penetration at 100 percent airflow.

2.13 ELECTRICAL

- A. General:
 1. All wiring and components inside air handling plenums shall be weatherproof and rated for such use. All equipment shall contain a grounding conductor.
 2. Wiring: 600 volt rated, type #12 THHN copper (minimum) size.
 3. All wiring shall be run within flexible or rigid conduit inside the unit housing.
- B. Lighting and Convenience Outlets:
 1. Manufacturer shall provide a complete lighting and outlet system to one (1) 120 volt feed connection. System shall include fixtures, switches, and GFCI receptacles.
 2. Light Fixture: LED fixture with impact resistant diffuser.
 3. Light Switches: 20 Amp, single pole, specification grade, toggle switch with weatherproof cover. All lights shall be wired to a single illuminated switch on exterior of unit. Switch shall be located on the supply fan section.
 4. GFCI Convenience Outlets: 20 Amp, specification grade NEMA 5-20R, duplex receptacle with weatherproof cover. An outlet shall be placed inside each fan section, in the discharge section and exterior to the supply fan section.
 5. All lights, convenience outlets, and switches shall be wired to a single junction box mounted on the exterior of the unit. A conduit shall be provided through base of unit for field connection.
 6. A minimum of one (1) light fixture shall be provided in each section with an access door. Fan sections shall be provided with a minimum of two (2) light fixtures. Refer to drawings for additional requirements.
- C. Unit shall have a minimum interruption rating of 32 KA at 480V.
- D. Variable frequency drives shall be provided in accordance with Division 26 sections.

2.14 EQUIPMENT CURB

- A. Galvanized steel, insulated with metal insulation liner, gasketing and factory installed wood nailer; complying with NRCA standards; minimum height of 18 inches. Secure units to curbs and secure curbs to roof structure.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install units level and plumb. Install according to ARI Guideline B.
- B. Anchor units to structure.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to unit to allow service and maintenance.
- C. Duct Connections: Duct installation requirements are specified in Division 23 Section "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply and return ducts to self-contained air-conditioners with flexible duct connectors. Flexible duct connectors are specified in Division 23 Section "Air Duct Accessories."
- D. Provide ductwork connections with 45 degree angle transition beginning from the casing inner surface. Fitting and shall be provided by mechanical contractor. AHU manufacturer to adjust opening to accept fitting and duct.
- E. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
- F. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- G. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Complete the following:
 - a. Inspect for visible damage to unit casing.
 - b. Verify that labels are clearly visible.
 - c. Verify that clearances have been provided for servicing.
 - d. Verify that controls are connected and operable.
 - e. Verify that filters are installed.
 - f. Clean outside coils and inspect for construction debris.
 - g. Adjust vibration isolators.
 - h. Inspect operation of dampers.
 - i. Lubricate bearings on fan.
 - j. Inspect fan wheel rotation for movement in correction direction without vibration and binding.
 - k. Adjust fan belts to proper alignment and tension.
 - l. Start unit according to manufacturer's written instructions:
 - 1) Complete startup sheets and attach copy with Contractor's startup report.
 - m. Inspect and record performance of interlocks and protective devices; verify sequences.
 - n. Commission variable frequency drives for ramp settings, over/under voltage settings, auto restart, start on the fly and other settings as available.
 - o. Operate unit for an initial period as recommended or required by manufacturer.
 - p. Calibrate thermostats.
 - q. Adjust and inspect high temperature limits.
 - r. Inspect outside air dampers for proper stroke and interlock with return air dampers.
 - s. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.
 - 1) Supply air volume.
 - 2) Outside air intake volume.
 - t. Verify operation of remote panel, including pilot light operation and failure modes. Inspect the following:
 - 1) High limit heat exchanger.
 - 2) Alarms.

- u. After startup and performance testing, change filters, vacuum heat exchanger and cooling and outside coils, lubricate bearings, adjust belt tension and inspect operation of power vents.

3.5 ADJUSTING

- A. Adjust initial temperature and humidity setpoints, building pressure control, scheduled unoccupied cycles and all other control features.
- B. Set field adjustable switches and circuit breaker trip ranges as indicated.
- C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two (2) visits to site outside normal occupancy hours for this purpose, without additional cost.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION 23 81 19



DEMOLITION NOTES

- ### PLAN NOTES

- Ⓡ# FINISH PLAN NOTES**

- F1 NO FINISH WORK IN THIS AREA UNO O
- F2 TOUCH UP PAINT AS REQUIRED DUE TO EQUIPMENT AND/OR LOCKER REMOVAL. PAINT TO MATCH EXISTING COLOR AND SHEEN. ALL WALL GRAPHICS EXISTING TO REMAIN.
- F3 WALLS SURROUNDING CUSTODIAL MOP SINK TO RECEIVE (PFP) LENGTH AS NECESSARY, MINIMUM OF 2'-0" ON EITHER SIDE OF SINK. FRP TO START AT TOP OF BASE AND RUN FULL PANEL WIDTH (4'-0").
- F4 PAINT CONCRETE BENCHES TO MATCH (AFP)
- F5 INSTALL (CH) OVERLAPPING FLOOR PROVIDE 18"x78" PEECE OF (SV) (CH) FLOOR AND (2) ROLLS OF CHROMA GRAFT TAPE FOR SCHOOL TO USE AS DESIRED.
- F6 ACUSTIC PANELS IN THIS SPACE TO BE WRAPPED WITH MATERIAL IDENTICAL TO ADJACENT FINEST (AFP)
- F7 INSTALL WALL TILE IN RANDOM GRADIENT AS SHOWN ON ELEVATION, (W1) TO BE MORE DENSE NEAR FLOOR, (W2) AND (W3) TO BE MORE DENSE NEAR FLOOR.
- F8 EXISTING STONE TRANSITION EXISTING TO REMAIN.

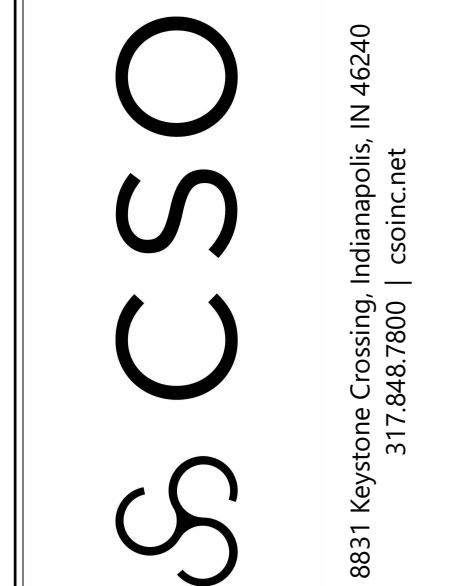
	FLUORESCENT LIGHT FIXTURES. RECESSED OR SURFACED MOUNTED. SEE ELECTRICAL DRAWINGS DOWN/LIGHT HIGH BAY LIGHT FIXTURE. SEE ELECTRICAL DRAWINGS
	CEILING MOUNTED PROJECTOR. SEE TECHNOLOGY DRAWINGS
	RETURN/EXHAUST GRILL. SEE MECHANICAL DRAWINGS
	SUPPLY AIR GRILL. SEE MECHANICAL DRAWINGS
	LINEAR SLOT SUPPLY AIR GRILL. SEE MECHANICAL DRAWINGS
1.1 SUSPENDED ACoustICAL LAY-IN CEILING MFG: ARMSTRONG MODEL H1713 STYLE: SCHOOL ZONE HIGH CAC, HIGH RNC DESCRIPTION: SQUARE EGG COLOR: WHITE SIZE: 24" x 24" x 1" LOCATION: PUBLICATIONS, STORAGE	
2.2 SUSPENDED ACoustICAL LAY-IN CEILING MFG: ARMSTRONG MODEL #1935 STYLE: ULTIMA HEALTH-ZONE DESCRIPTION: SQUARE EGG COLOR: WHITE SIZE: 24" x 24" x 1" LOCATION: RESTROOMS/LOCKER ROOMS	
3.3 SUSPENDED ACoustICAL LAY-IN CEILING MFG: ARMSTRONG MODEL #8352 STYLE: OPTIMA DESCRIPTION: SQUARE EGG COLOR: WHITE SIZE: 24" x 24" x 1" LOCATION: VIDEO STUDIO	

- | | | |
|---|-----|--|
|  | CL4 | SUSPENDED GYPSUM WALLBOARD CEILING SYSTEM
USE 5/8" WALLBOARD
PAINT: (P2) SW7005 PURE WHITE |
|  | CL5 | GYPSUM WALLBOARD BULKHEAD
PAINT: (P2) SW7005 PURE WHITE |
|  | CL6 | EXPOSED STRUCTURE
PAINT: (P2) SW7005 PURE WHITE |

- The diagram illustrates a double ceiling system. It features a grid of acoustic sealant (CL3) and a suspended pipe grid (CL4). The sealant is applied at the perimeter and at all penetrations of the CL4. The suspended pipe grid is shown with a color black and a size of 4" x 4". The pipe is 1" DIA. The location is video studio, and the system is used for more info. The diagram also shows a detail of the sealant application at a penetration, with a note that the sealant is applied at the perimeter and at all penetrations of the CL4.

MANUFACTURING MARK ABOVE FINISHED FLOOR (AT THE LOCATION 1 MULTIPLE FLOOR LEVELS ARE PRESENT)

A map of the United Kingdom showing the locations of the six regions. The regions are labeled A through F. Region E, the East Midlands, is shaded grey. A compass rose in the bottom right corner indicates North.



PROJECT: CENTER GROVE COMMUNITY SCHOOL CORPORATION
CENTER GROVE HIGH SCHOOL
RENOVATIONS - PACKAGE 2
2717 S MORGANTOWN RD
GREENWOOD, IN. 46143

SCOPE DRAWINGS:

- On the basis of the general scope indicated or described, the trade contractors shall furnish all drawings, general floor plan, section, elevation and details of the work.

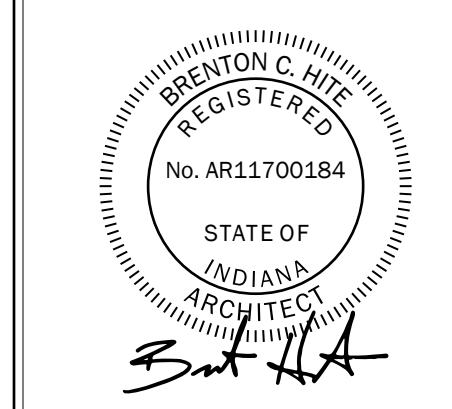
 REVISIONS:

- | | | |
|---|-------------|------------|
| 1 | ADDENDUM #1 | 08/21/2021 |
| 2 | ADDENDUM #2 | 08/28/2021 |

ISSUE DATE 07/31/2026	DRAWN BY JTL	CHECKED BY BCH
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DRAWING TITLE:
LOWER LEVEL
FLOOR PLAN -
UNIT E

CERTIFIED BY:

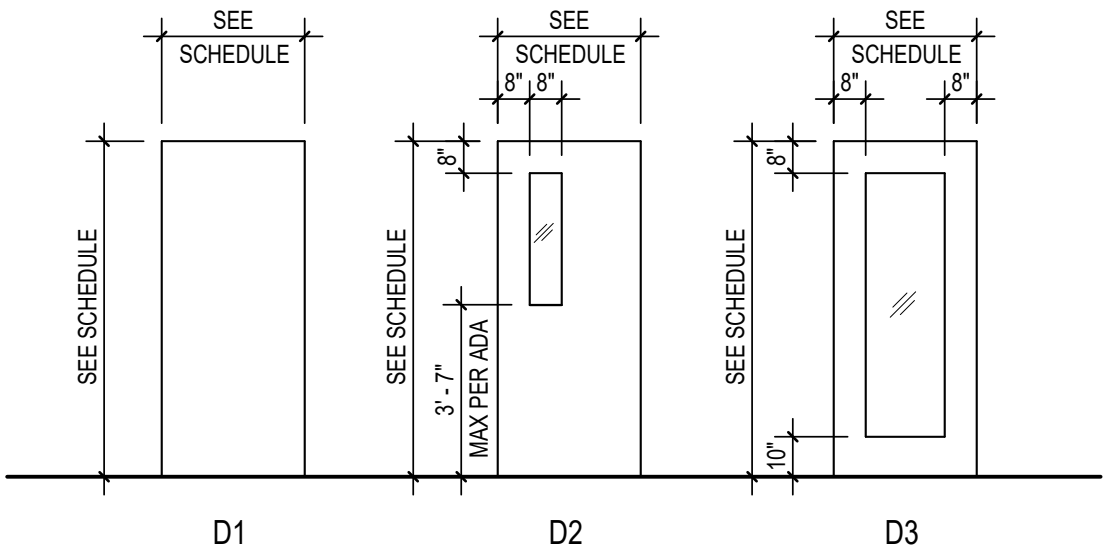


DRAWING NUMBER
A201E

PROJECT NUMBER
2025075

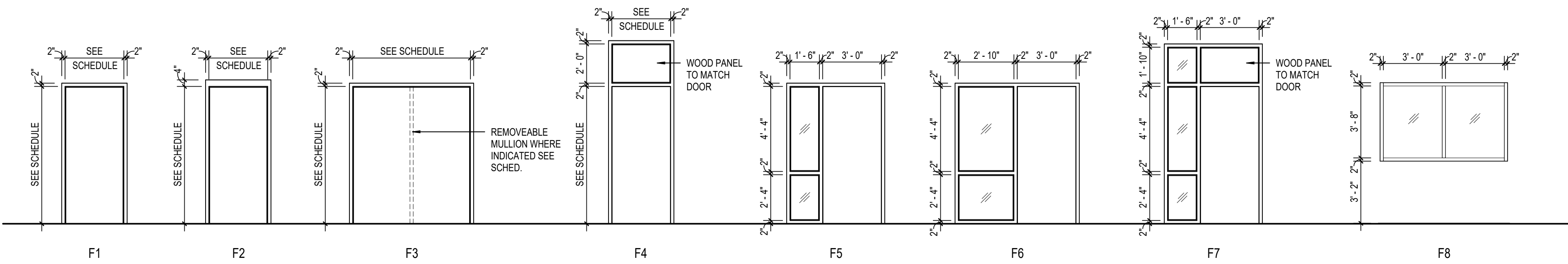
DOOR AND FRAME SCHEDULE - PACKAGE 2

DOOR		SIZE			FRAME										DETAIL			UL RATING	STC RATING	REMARKS
MARK		WIDTH	HEIGHT	THICKNESS	MATERIAL	FINISH	ELEVATION	> GLASS	MATERIAL	FINISH	ELEVATION	> GLASS	HEAD	JAMB	SILL					
102	PAIR	3'-0"	9'-2"	1 3/4"	WD	ST	D2	-	HM	PT	F2	-	H1	-	-	-	-	-	-	
102-1	SGL	3'-0"	7'-0"	1 3/4"	-	-	D1	-	-	-	ETR	-	ETR	ETR	J1	-	-	-	2, 6	
102A	SGL	3'-0"	7'-0"	1 3/4"	WD	ST	D1	-	HM	PT	F4	-	H1	J1	-	-	-	-	5	
152-1	SGL	3'-0"	7'-0"	1 3/4"	WD	ST	D1	-	HM	PT	F4	-	H1	J1	-	-	-	-	-	
152-2	SGL	3'-0"	7'-0"	1 3/4"	WD	ST	D1	-	HM	PT	F4	-	H1	J1	-	-	-	-	-	
152A	SGL	3'-0"	7'-0"	1 3/4"	WD	ST	D3	D2	B	HM	PT	F1	B	H3	J3	-	-	47	1	
152B-1	SGL	3'-0"	7'-0"	1 3/4"	WD	ST	D2	B	HM	PT	F7	B	H1	J1	-	-	-	47	2, 1	
152B-2	SGL	3'-0"	7'-0"	1 3/4"	WD	ST	D2	B	HM	PT	F5	B	H3	J3	-	-	-	47	1	
152C	SGL	3'-0"	7'-0"	1 3/4"	WD	ST	D2	B	HM	PT	F1	-	H3	J3	-	-	-	47	1	
152D-1	INEQ. PAIR	3'-0"	7'-0"	1 3/4"	WD	ST	D1	-	HM	PT	F3	-	H1	J1	-	-	-	-	-	
152D-2	SGL	3'-0"	7'-0"	1 3/4"	WD	ST	D1	-	HM	PT	F1	-	H2	J2	-	-	-	-	-	
581	SGL	3'-0"	7'-0"	1 3/4"	WD	ST	D2	A	HM	PT	F6	A	H5	J5	-	-	-	-	2	
581A	SGL	3'-0"	7'-0"	1 3/4"	WD	ST	D1	-	HM	PT	F2	-	H6	J1	-	-	-	-	-	
581B	SGL	3'-0"	7'-0"	1 3/4"	WD	ST	D1	-	HM	PT	F2	-	H6	J1	-	-	-	-	-	
582	SGL	3'-0"	7'-0"	1 3/4"	WD	ST	D1	-	HM	PT	F2	-	H5	J5	-	-	-	-	2	
582A	SGL	3'-0"	7'-0"	1 3/4"	WD	ST	D1	-	HM	PT	F2	-	H6	J1	-	-	-	-	-	



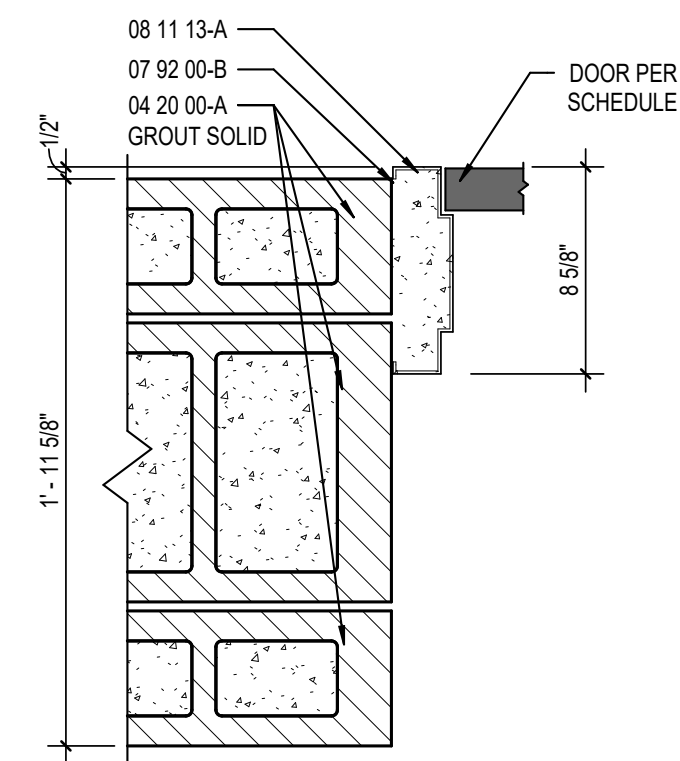
DOOR ELEVATIONS

SCALE: 1/4" = 1'-0"



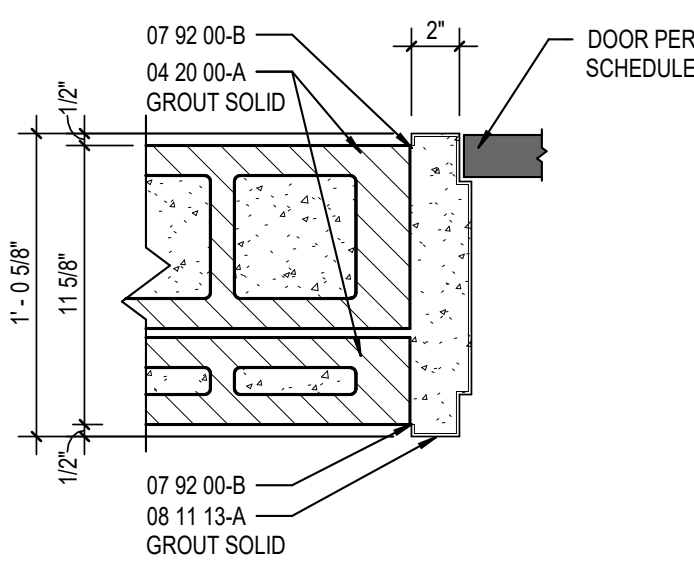
FRAME ELEVATIONS

SCALE: 1/4" = 1'-0"



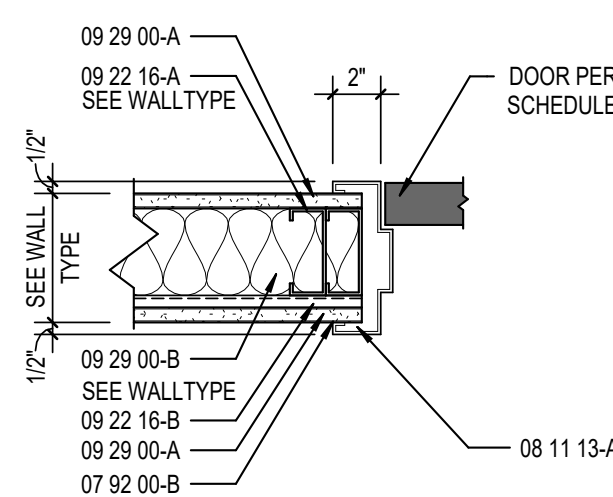
J5 - JAMB DETAIL

SCALE: 1 1/2" = 1'-0"



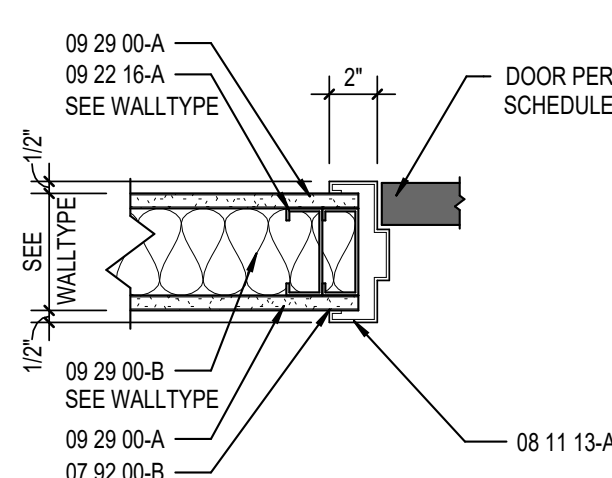
J4 - JAMB DETAIL

SCALE: 1 1/2" = 1'-0"



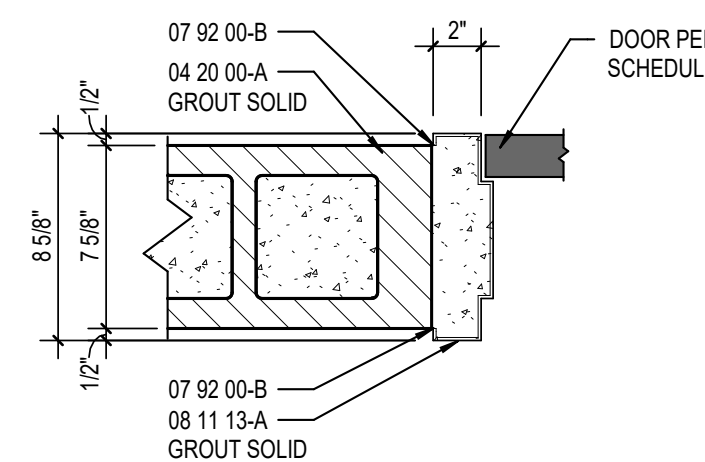
J3 - JAMB DETAIL

SCALE: 1 1/2" = 1'-0"



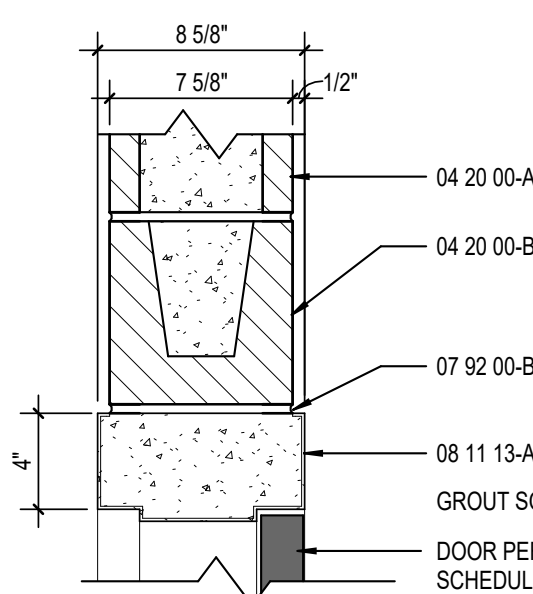
J2 - JAMB DETAIL

SCALE: 1 1/2" = 1'-0"



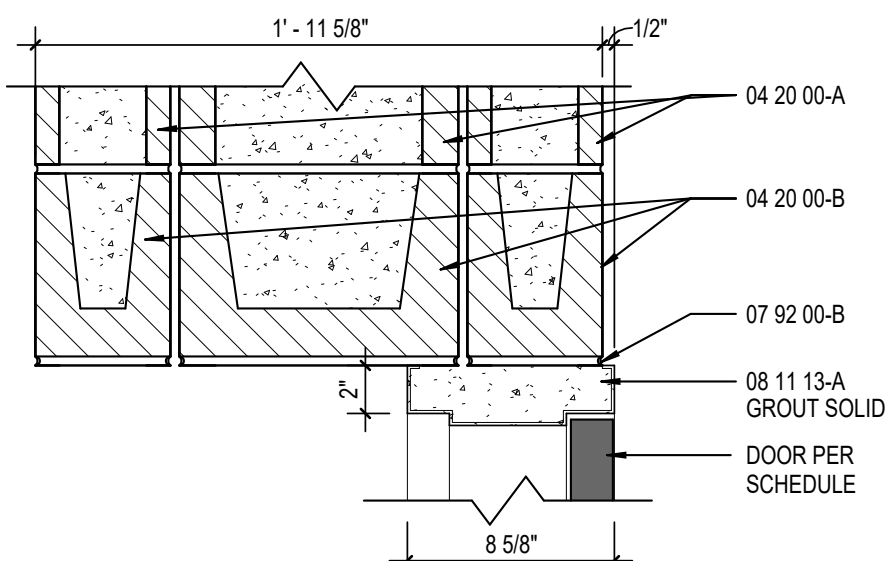
J1 - JAMB DETAIL

SCALE: 1 1/2" = 1'-0"



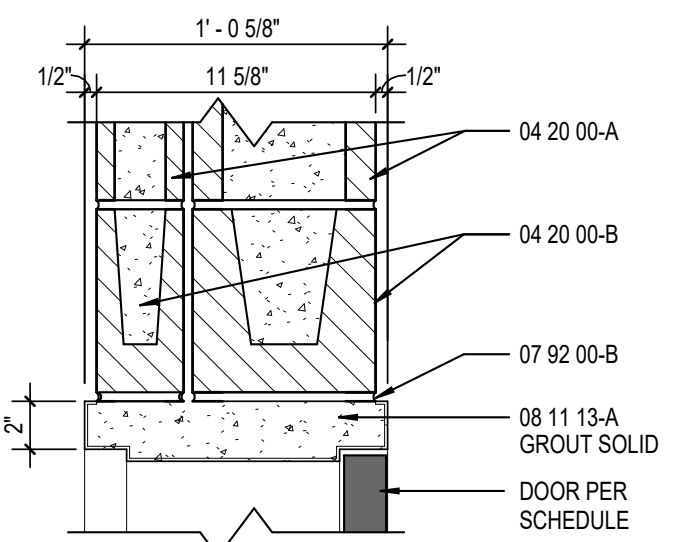
H6 - HEAD DETAIL

SCALE: 1 1/2" = 1'-0"



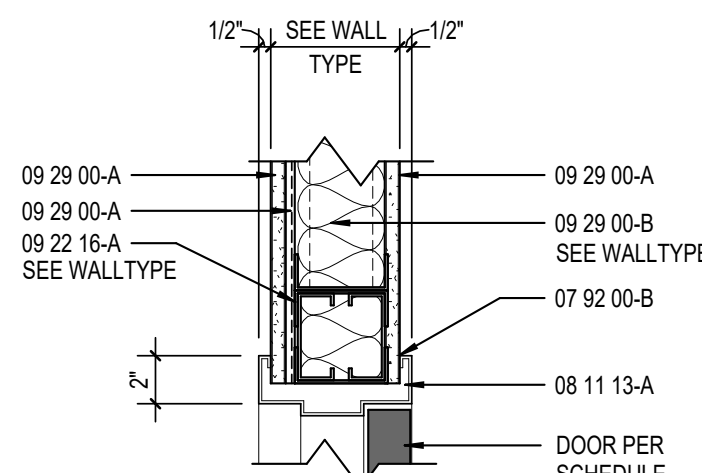
H5 - HEAD DETAIL

SCALE: 1 1/2" = 1'-0"



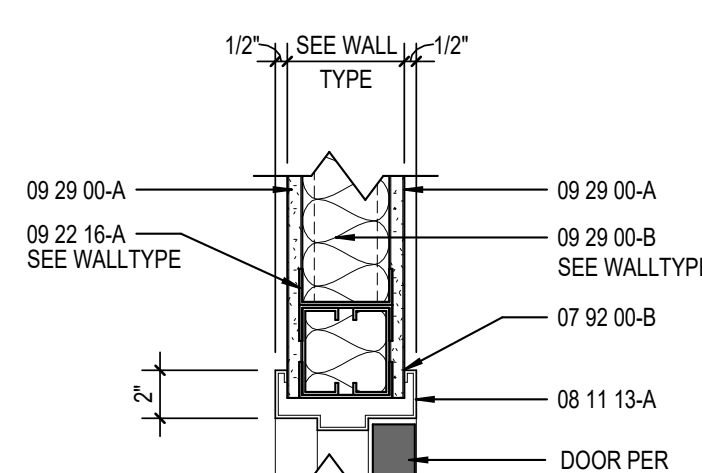
H4 - HEAD DETAIL

SCALE: 1 1/2" = 1'-0"



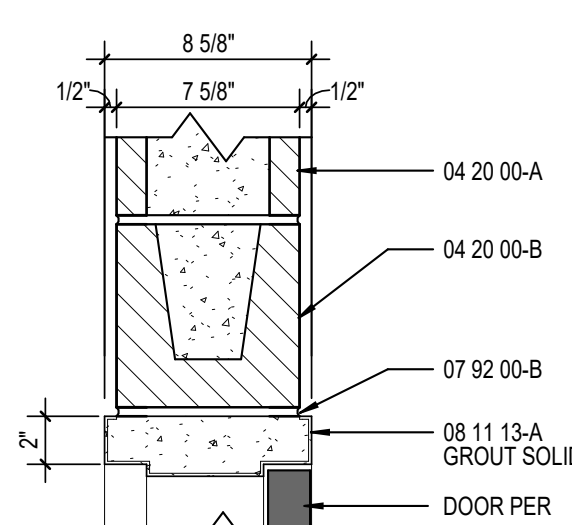
H3 - HEAD DETAIL

SCALE: 1 1/2" = 1'-0"



H2 - HEAD DETAIL

SCALE: 1 1/2" = 1'-0"



H1 - HEAD DETAIL

SCALE: 1 1/2" = 1'-0"

GLASS SCHEDULE

- A. 1/4" CLEAR TEMPERED GLASS.
B. 1/4" CLEAR LAMINATED GLASS.

ABBREVIATIONS LEGEND

- AL = ALUMINUM
AN = ANODIZED
BL = BORROWED LITE
GHM = GALVANNEALED HOLLOW METAL
GL = GLASS
HM = HOLLOW METAL
PT = PAINT
ST = STAIN
SS = STAINLESS STEEL
STL = STEEL
WD = WOOD
90M = 90 MINUTE ASSEMBLY RATING
* = SEE REMARKS COLUMN FOR NOTES

GENERAL DOOR NOTES

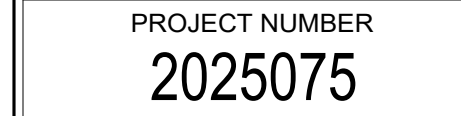
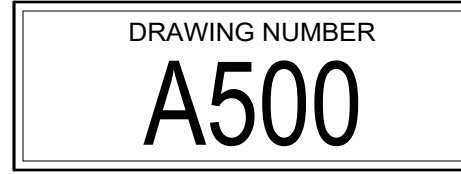
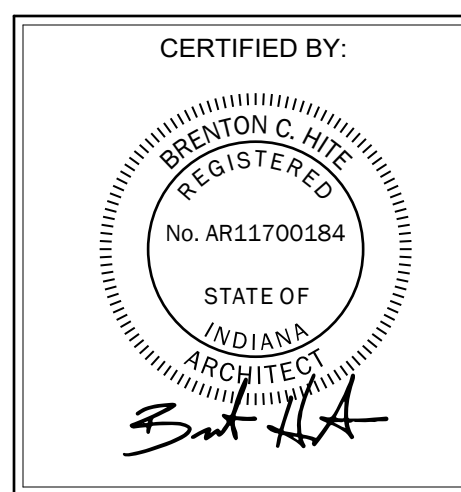
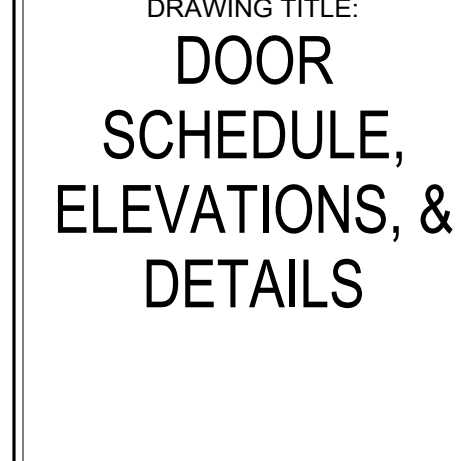
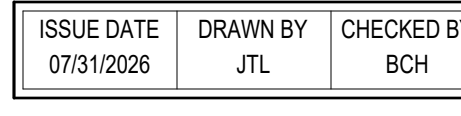
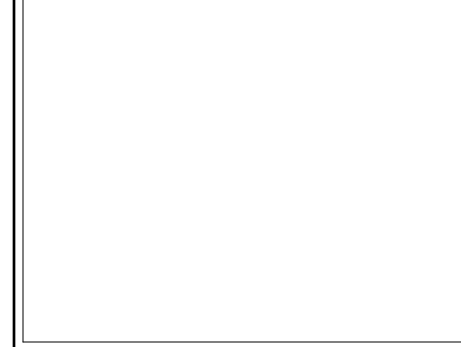
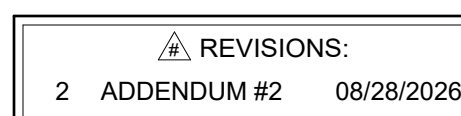
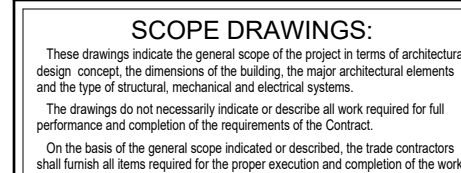
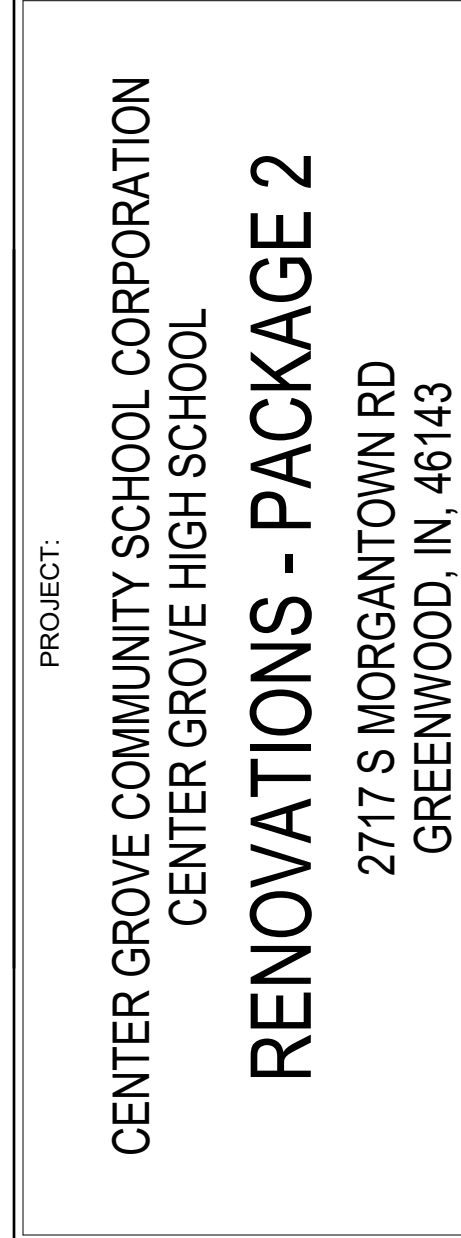
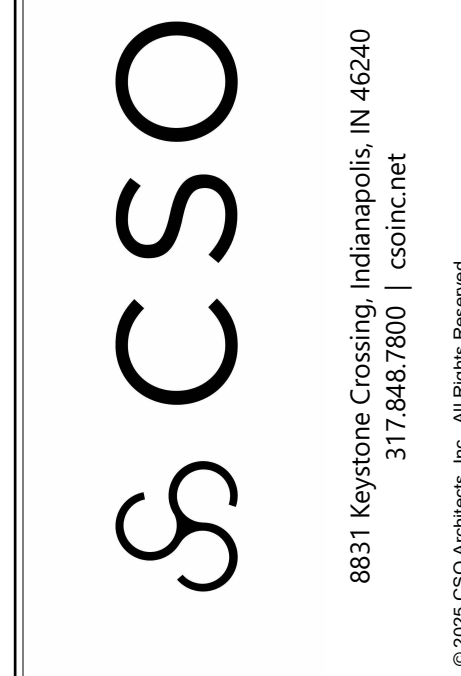
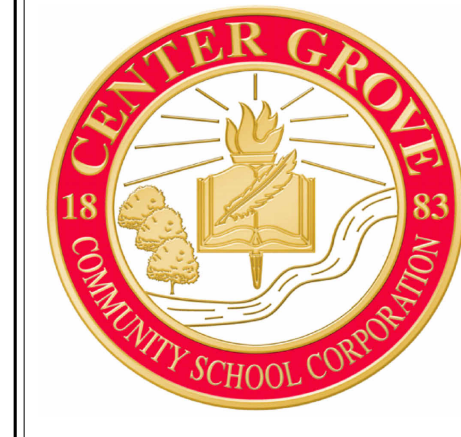
- A. THESE GENERAL NOTES APPLY TO THE DOOR SCHEDULE.
B. DOOR AND FRAME NUMBERS CORRESPOND TO RESPECTIVE ROOM NUMBER. IN ROOMS WITH MULTIPLE OPENINGS, A NUMERICAL SUFFIX HAS BEEN ADDED TO DOOR NUMBERS.
C. VERTICAL FRAMING MEMBERS AT ALL DOOR FRAMES SHALL EXTEND TO STRUCTURE ABOVE.
D. UNDERCUT ALL DOORS AS REQUIRED BY FINAL FINISH.
E. PROVIDE CONTINUOUS SEALANT BETWEEN HOLLOW METAL FRAME PERIMETERS AND SURROUNDING WALL CONSTRUCTION.
F. PROVIDE CONTINUOUS SEALANT BETWEEN INTERIOR AND EXTERIOR WINDOW, CURTAINWALL AND STOREFRONT FRAME PERIMETERS AND SURROUNDING CONSTRUCTION UNLESS NOTED OTHERWISE.
G. GROUT FULL HOLLOW METAL FRAMES IN MASONRY CONSTRUCTION.
H. SPOT GROUT HOLLOW METAL FRAMES IN GYPSUM WALLS.
I. WHERE A FIRE RATING IS INDICATED ON THE DOOR SCHEDULE, HARDWARE AND DOOR ASSEMBLY COMPONENTS SHALL MEET THE REQUIREMENTS OF THAT LABEL.
J. WHERE AN STC RATING IS INDICATED ON THE DOOR SCHEDULE, HARDWARE AND DOOR ASSEMBLY COMPONENTS SHALL MEET THE REQUIREMENTS OF THAT LABEL.
K. INSTALL DOOR GLASS USING WET GLAZING METHOD.
L. ALL LINTELS ABOVE EXTERIOR OPENINGS SHALL BE GALVANIZED.
M. COORDINATE THROAT OPENINGS WITH WALL WIDTH FOR ALL WRAP AROUND FRAMES.
N. SCHEDULED HARDWARE FOR ALUMINUM DOORS SHALL BE PROVIDED BY HARDWARE SUPPLIER AND INSTALLED BY ALUMINUM SUPPLIER. ALUMINUM DOORS TO BE PREPARED BY ALUMINUM DOOR SUPPLIER IN ACCORDANCE WITH THE SCHEDULED HARDWARE.
O. ALL NEW HOLLOW METAL DOORS, FRAMES AND BORROWED LITE FRAMES TO BE PAINTED AS INDICATED ON THE FINISH LEGEND. SEE FINISH LEGEND FOR WOOD DOOR FINISHES.
P. PROVIDE SILENCERS ON ALL DOOR FRAMES.
Q. SEE STRUCTURAL DRAWINGS FOR REQUIREMENTS FOR MASONRY AND STEEL LINTELS. PROVIDE STRUCTURAL STEEL LINTELS AT OPENINGS WHERE INDICATED ON THE STRUCTURAL STEEL DRAWINGS IN LIEU OF MASONRY LINTEL AS SHOWN IN THESE DETAILS.
R. VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS IN THE FIELD PRIOR TO FABRICATION OF DOORS AND FRAMES. BRING DISCREPANCIES TO THE ATTENTION OF THE ARCHITECT.

REMARKS

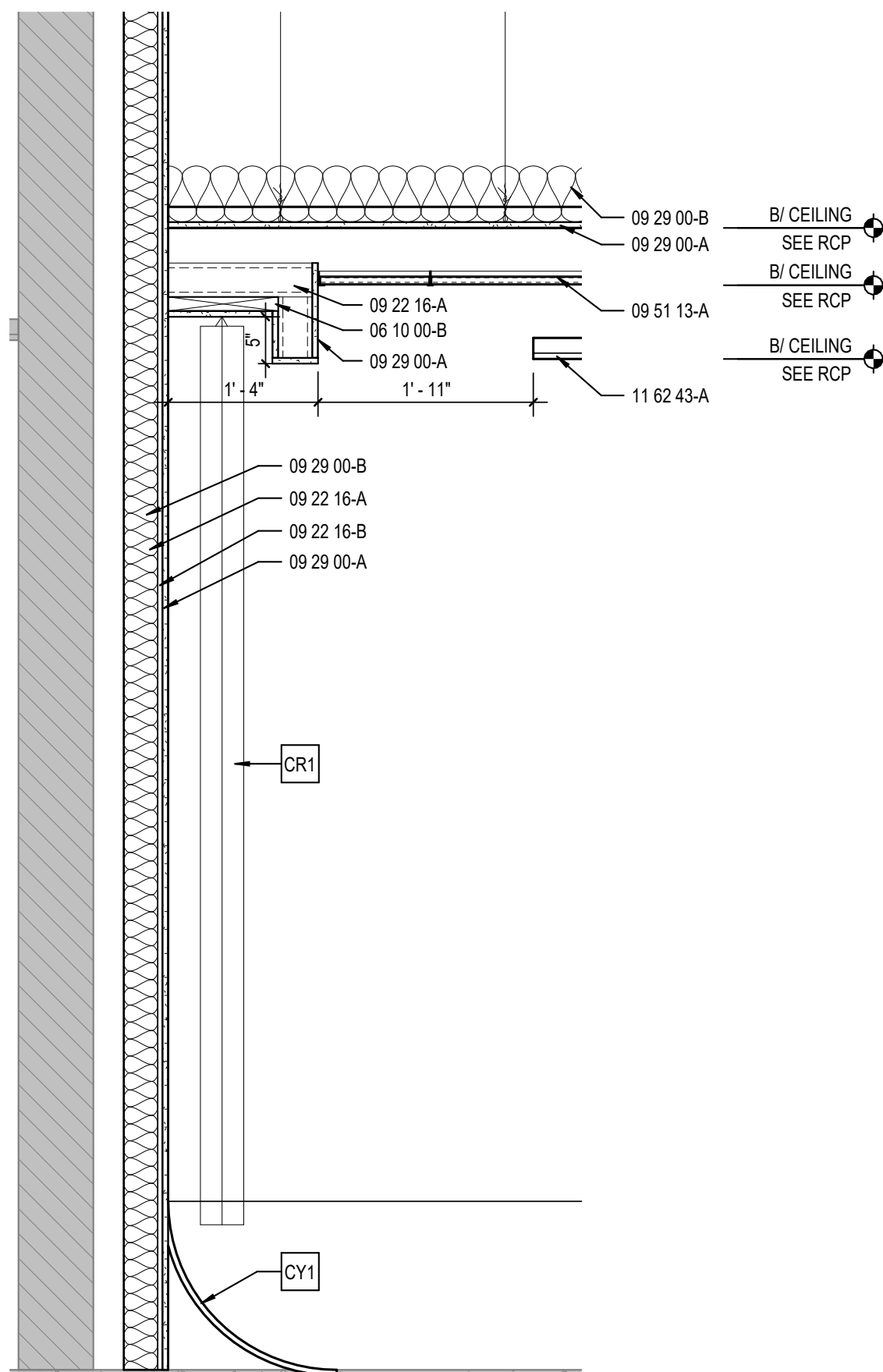
1. ACOUSTICAL SEALANT.
2. CARD READER ACCESS. ELECTRIFIED HARDWARE BY OWNER. OTHER HARDWARE BY CONTRACTOR.
3. 180/DEGREE SWING.
4. 3/0 ACTIVE LEAF / 1/8 FIXED LEAF.
5. PLASTIC LAMINATE TRANSOM TO MATCH DOOR.
6. NEW DOOR WITH UPGRADED HARDWARE IN EXISTING HOLLOW METAL FRAME. FIELD VERIFY HEIGHT AND WIDTH. PAINT EXISTING FRAME.

KEYNOTE LEGEND

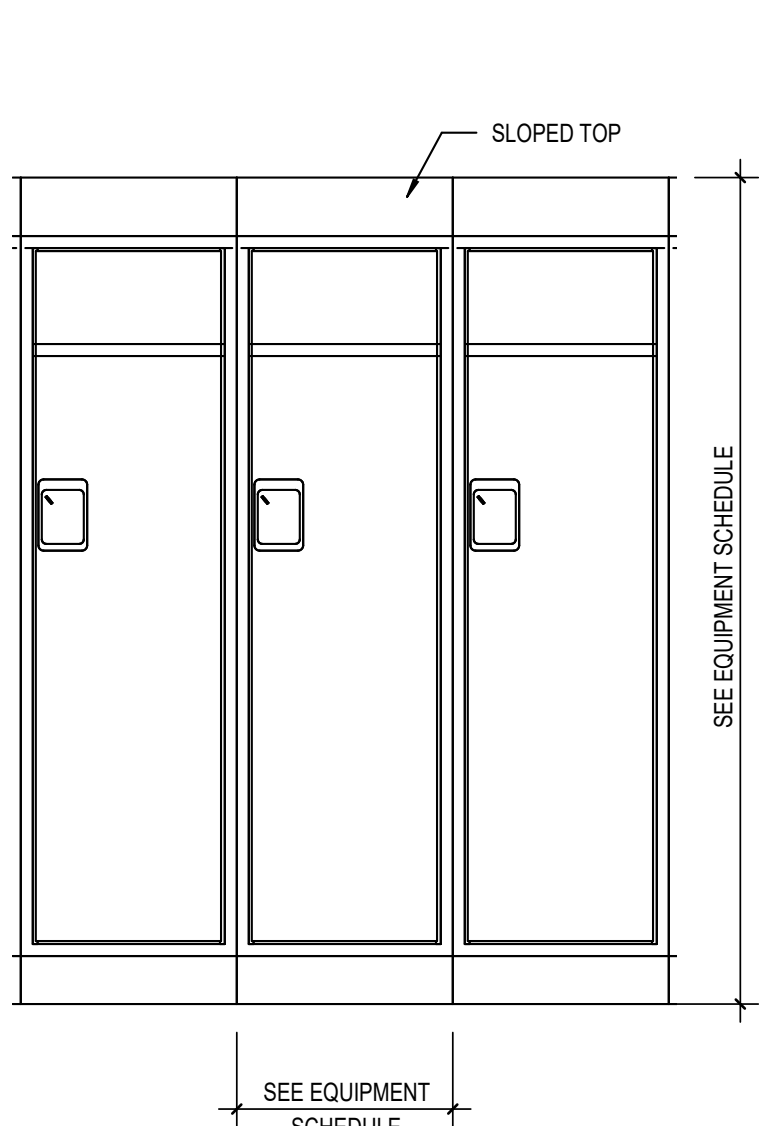
- 03 30 00-C CONCRETE SLAB ON METAL DECK- SEE STRUCTURAL
04 20 00-A CONCRETE MASONRY UNIT
04 20 00-B BOND BEAM MASONRY UNIT
06 10 00-A 1X WOOD BLOCKING
06 10 00-B 2X WOOD BLOCKING
07 92 00-B SEALANT EACH SIDE, TYPICAL
08 11 13-A HOLLOW METAL DOOR FRAME
09 22 16-A 3/8" STEEL STUD
09 22 16-B RESILIENT CHANNEL
09 29 00-A 5/8" GYPSUM WALL BOARD (SEE SPECS FOR TYPE)
09 29 00-B SOUND ATTENUATION INSULATION
09 51 13-A ACOUSTICAL CEILING SUSPENSION ASSEMBLY
09 51 13-A METAL LOCKER- SEE EQUIPMENT SCHEDULE
11 62 43-A PIPE GRID
12 36 61-A SOLID SURFACE COUNTERTOPS



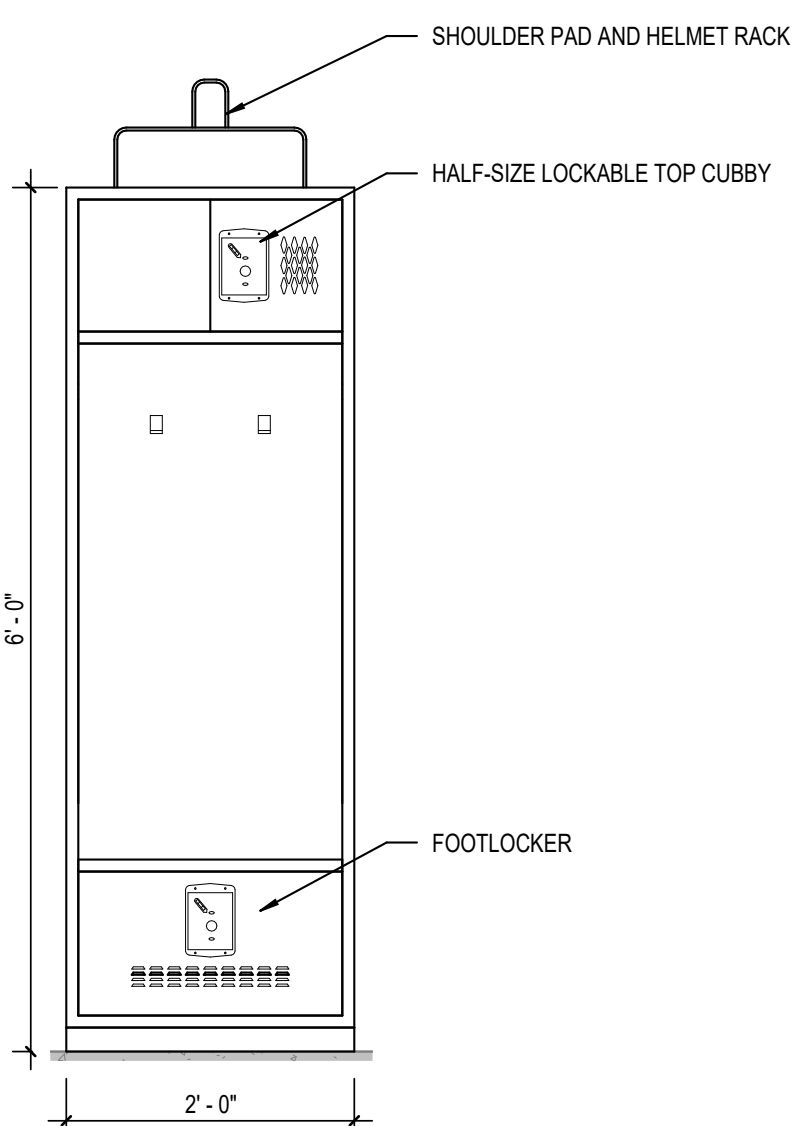
EQUIPMENT SCHEDULE - PACKAGE 2							
TYPE MARK	DESCRIPTION	SPEC SECTION	MANUFACTURER	MODEL NO.	REMARKS	FURNISHED BY	INSTALLED BY
AC1	7'-0" HIGH FABRIC WRAPPED ACOUSTICAL PANEL	09 84 33	GOLTERMAN & SABO	RESOLUTE (R)	HIGH-IMPACT; WIDTH AS SHOWN IN ELEVATION, 1" DEPTH. MOUNT TOP @ 8'-0" A.F.F.	CONTRACTOR	CONTRACTOR
BN1	FLOOR ANCHORED BENCH	10 51 13	ASI STORAGE	916A804	48" LENGTH - 24" DEPTH - 17.75" HEIGHT	CONTRACTOR	CONTRACTOR
CR1	ACOUSTICAL CURTAIN	11 61 45	FRED KRIEGER & COMPANY	SEE SPEC	-	CONTRACTOR	CONTRACTOR
CY1	CYCLORAMA BUILT-IN COVE BASE WALL SYSTEM	11 62 00	PRO-CYC	-	-	CONTRACTOR	CONTRACTOR
FA	FIRST AID KIT	12 32 16	AMERICAN RED CROSS	90661	-	CONTRACTOR	CONTRACTOR
FB	FIRE BLANKET CABINET	12 32 16	JL INDUSTRIES	ROYAL SERIES	-	CONTRACTOR	CONTRACTOR
GC	GOOGLE CABINET	12 32 16	STEVENS INDUSTRIES	S2192	-	CONTRACTOR	CONTRACTOR
MB1	4'-0" HIGH FIXED MARKER BOARD	10 11 00	CLARIDGE	SERIES 1	MOUNT TOP @ 7'-0" A.F.F., WIDTH AS INDICATED ON PLAN SHEETS	CONTRACTOR	CONTRACTOR
MB2	5'-0" HIGH FIXED MARKER BOARD	10 11 00	CLARIDGE	SERIES 1	MOUNT TOP @ 7'-0" A.F.F., WIDTH AS INDICATED ON PLAN SHEETS	CONTRACTOR	CONTRACTOR
MB3	4'-0" HIGH FIXED MARKER BOARD	10 11 00	CLARIDGE	SERIES 1	MOUNT TOP @ 7'-0" A.F.F., WIDTH AS INDICATED ON PLAN SHEETS	SALVAGED	CONTRACTOR
TB	TWO-WALL SHOWER STALL GRAB BAR	102813	BOBRICK	B-6861	-	CONTRACTOR	CONTRACTOR
T14	24" x 24" ACCESS PANEL	-	NYSTROM	NTL 24x24	-	CONTRACTOR	CONTRACTOR
TV1	TV MONITOR AND MOUNT	-	-	-	MOUNT TOP @ 7'-0" A.F.F., WIDTH AS INDICATED ON PLAN SHEETS	OWNER	CONTRACTOR
TV2	TV MONITOR AND MOUNT	-	-	-	MOUNT TOP @ 6'-0" A.F.F., WIDTH AS INDICATED ON PLAN SHEETS	OWNER	CONTRACTOR
WL1	WELDING BOOTH	-	-	-	-	OWNER	CONTRACTOR
WL2	WELDING TABLE	-	-	-	-	OWNER	CONTRACTOR



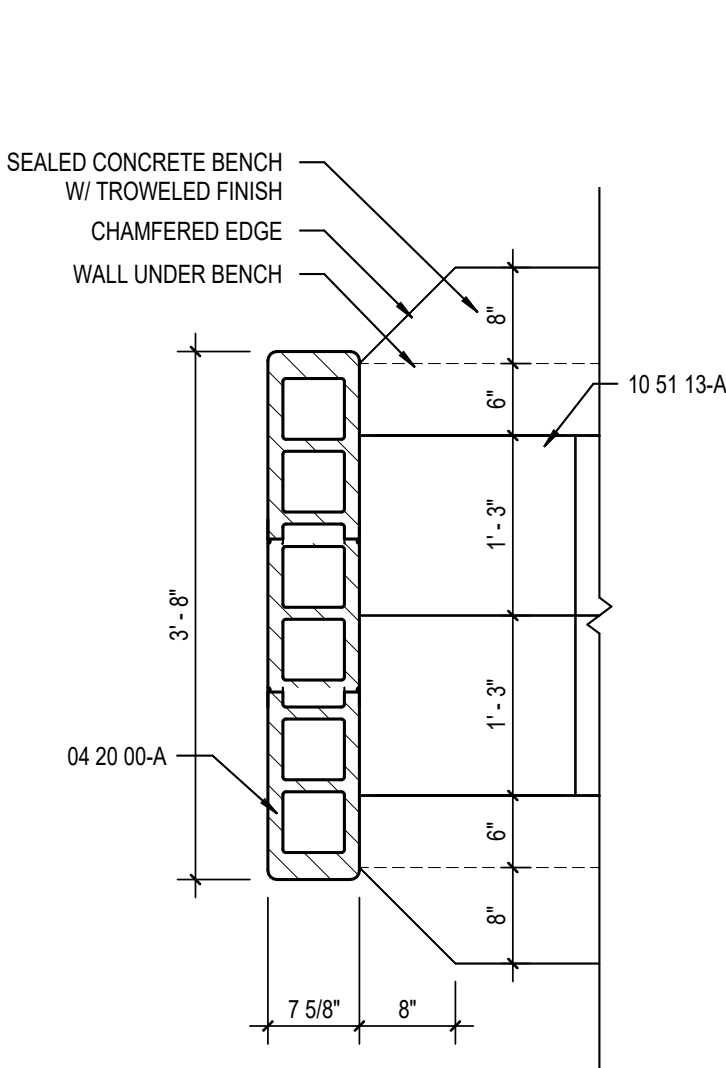
11 WALL SECTION
A600 SCALE: 3/4" = 1'-0"



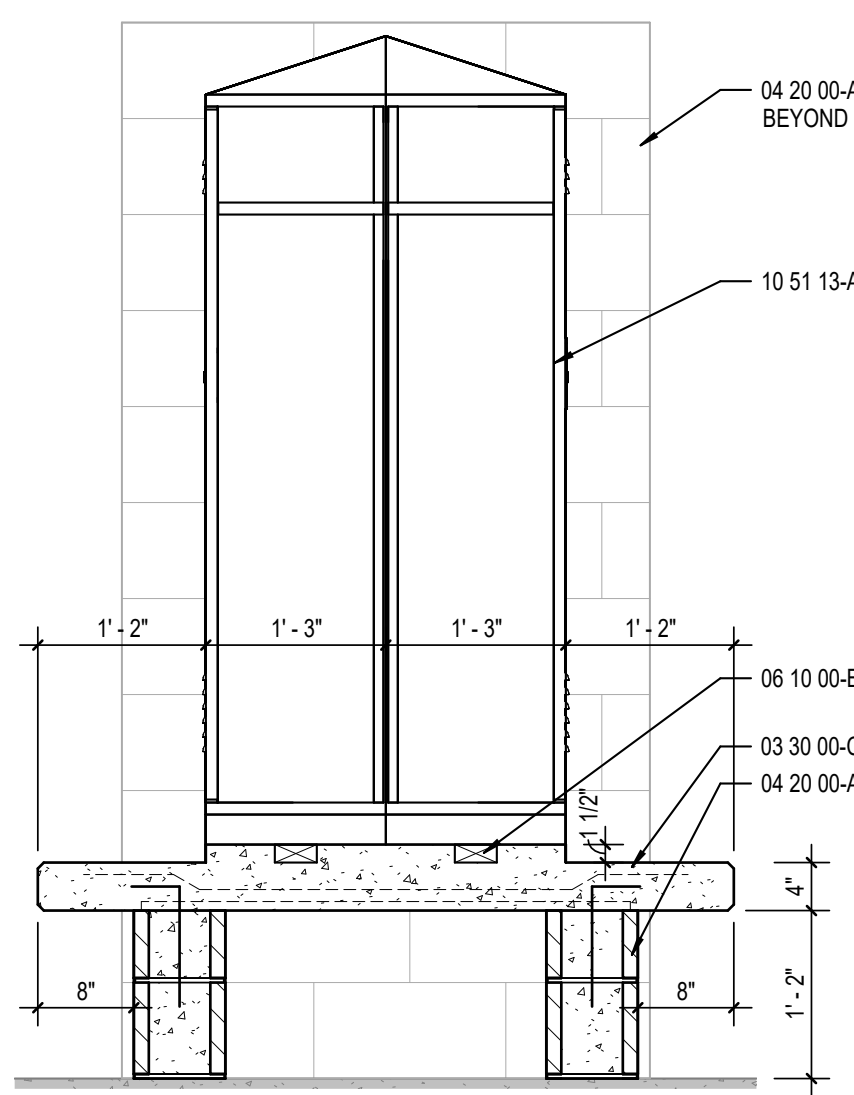
10 SINGLE-TIER LOCKER ELEVATION
A600 SCALE: 3/4" = 1'-0"



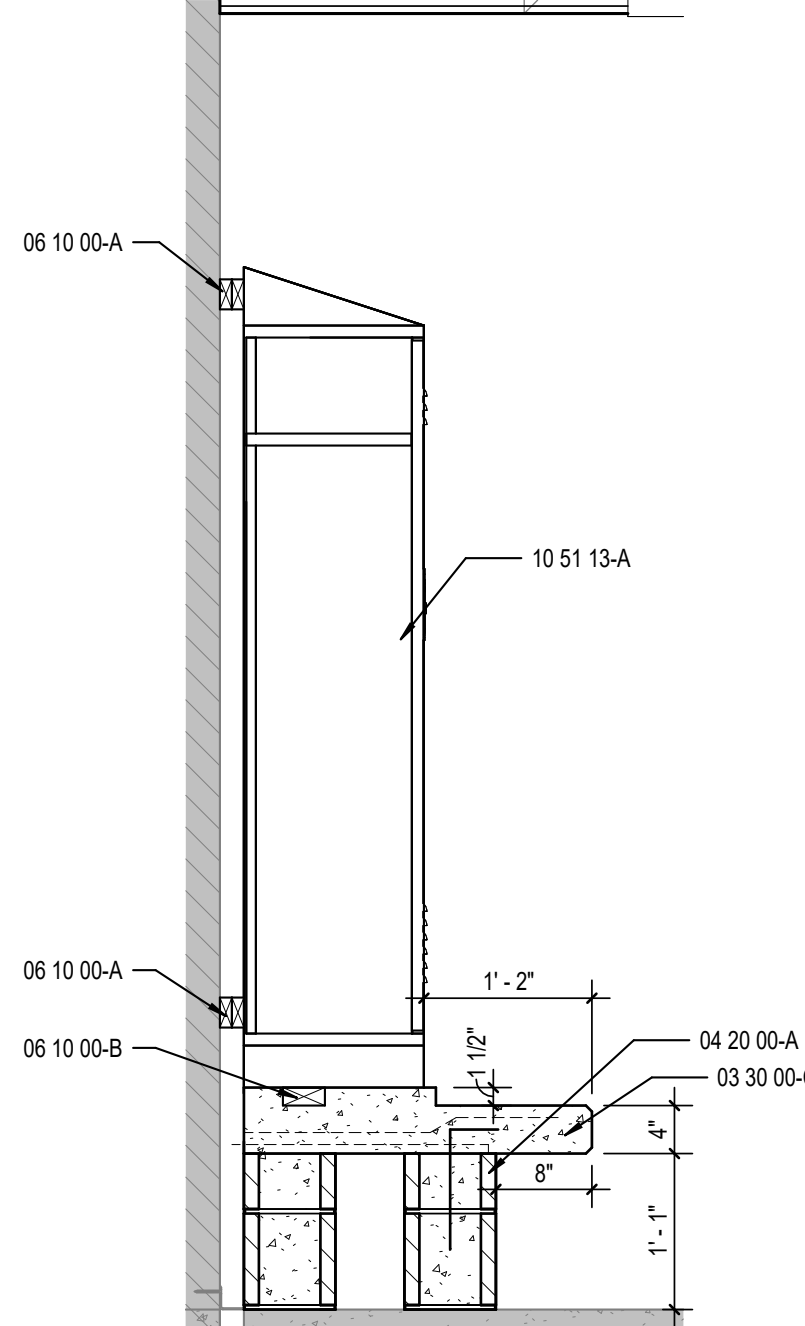
9 OPEN-FRONT LOCKER ELEVATION
A600 SCALE: 3/4" = 1'-0"



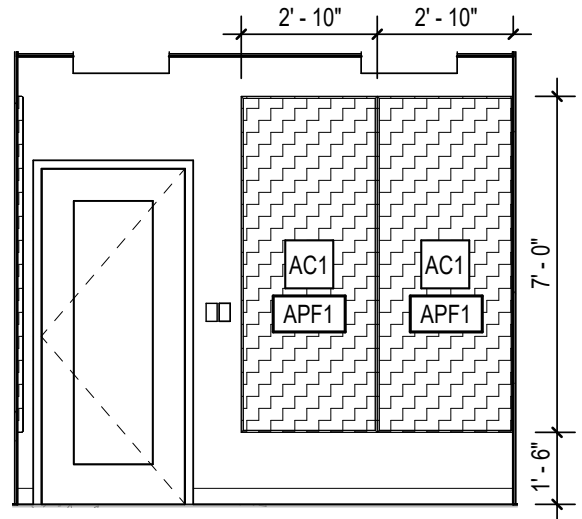
8 LOCKER END WALL DETAIL
A600 SCALE: 3/4" = 1'-0"



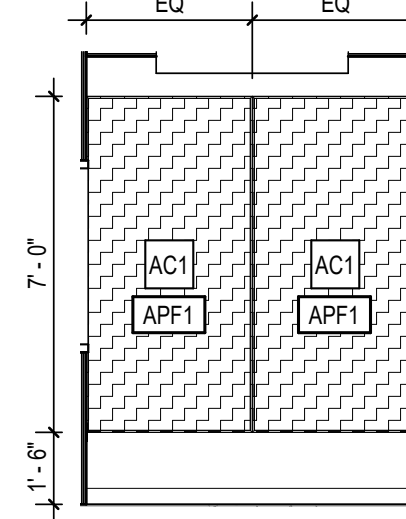
7 LOCKER SECTION
A600 SCALE: 3/4" = 1'-0"



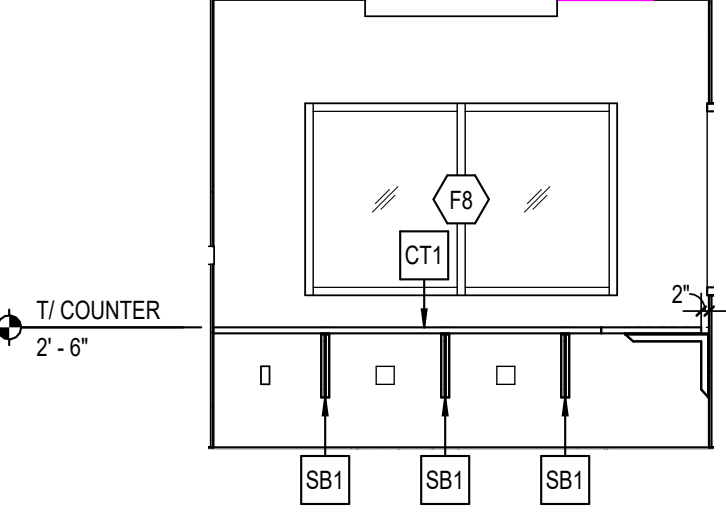
6 LOCKER SECTION
A600 SCALE: 3/4" = 1'-0"



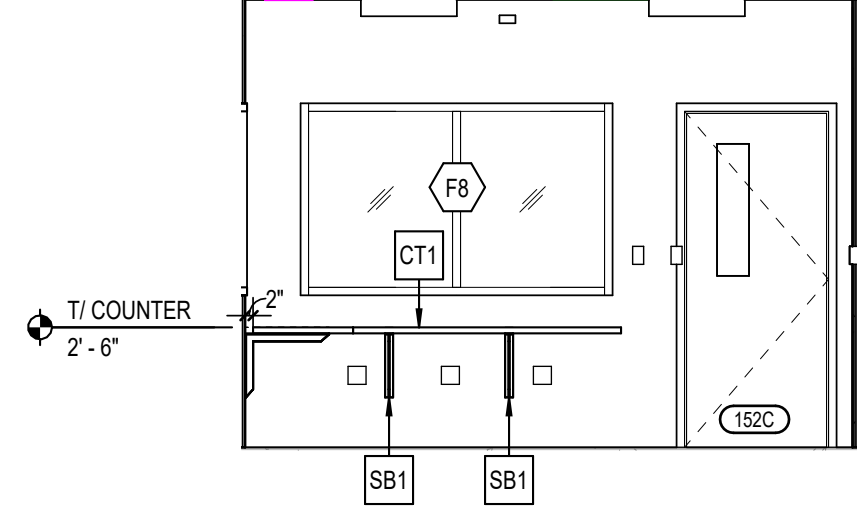
5 PODCAST
A600 SCALE: 1/4" = 1'-0"



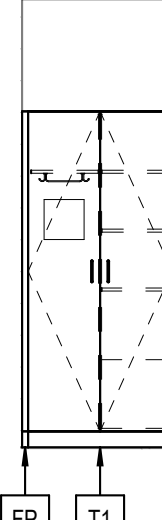
4 PODCAST
A600 SCALE: 1/4" = 1'-0"



3 CASEWORK ELEVATION
A600 SCALE: 1/4" = 1'-0"



2 CASEWORK ELEVATION
A600 SCALE: 1/4" = 1'-0"



1 CASEWORK ELEVATION
A600 SCALE: 1/4" = 1'-0"

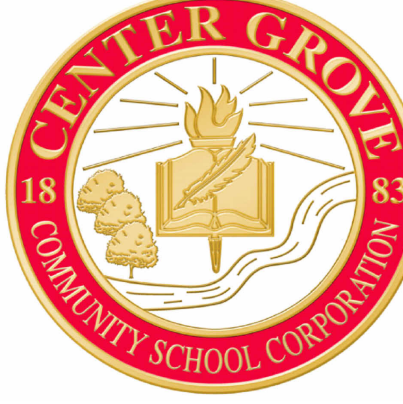
CASEWORK SCHEDULE - TALL								
TYPE MARK	DESCRIPTION	SPEC. SECTION	MANUFACTURER	MODEL	SIZE			TYPE COMMENTS
					W	H	D	
T1	WARDROBE/STOR. / 2 DRS / ADJ. SHELF / HANGER / ADJ. SHELVES / 2 DRWRS	12 32 16	STEVENS INDUSTRIES	25667 / 25668	36"	84"	24"	REINSTALL SALVAGED CASEWORK

CASEWORK SCHEDULE - COUNTER TOPS AND ACCESSORIES							
TYPE MARK	DESCRIPTION	SPEC. SECTION	MANUFACTURER	MODEL	SIZE	TYPE COMMENTS	
CT1	PLASTIC LAMINATE COUNTER TOP	12 32 16	-	-			
CT2	SOLID SURFACE COUNTERTOP	12 36 61					
FP	FILLER PANEL	12 32 16	STEVENS INDUSTRIES				
SB1	COUNTER TOP SUPPORT BRACKET	12 32 16	RAKKS	EH-1818			

CASEWORK SCHEDULE - LOCKER								
TYPE MARK	DESCRIPTION	SPEC. SECTION	MANUFACTURER	MODEL	SIZE			TYPE COMMENTS
					W	H	D	
LK1	FLEX ELITE PREMIUM OPEN-FRONT LOCKERS	10 51 13	DEBOURGH	FLEX ELITE	24"	72"	24"	
LK2	SINGLE TIER, SLOPE TOP LOCKER	10 51 13	DEBOURGH	CORE	18"	60"	15"	
LK3	SINGLE TIER, SLOPE TOP LOCKER	10 51 13	DEBOURGH	CORE	12"	72"	15"	

KEYNOTE LEGEND

03 30 00-C	CONCRETE SLAB ON METAL DECK- SEE STRUCTURAL
04 20 00-A	CONCRETE MASONRY UNIT
06 10 00-B	BOND BEAM MASONRY UNIT
06 10 00-A	1X WOOD BLOCKING
06 10 00-B	2X WOOD BLOCKING
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09 51 13-A	ACOUSTICAL CEILING SUSPENSION ASSEMBLY
10 51 13-A	METAL LOCKER- SEE EQUIPMENT SCHEDULE
11 62 43-A	PIPE GRID
12 36 61-A	SOLID SURFACE COUNTERTOPS



PROJECT:
CENTER GROVE COMMUNITY SCHOOL CORPORATION
CENTER GROVE HIGH SCHOOL
RENOVATIONS - PACKAGE 2
2717 S MORGANTOWN RD
GREENWOOD, IN. 46143

SCOPE DRAWINGS:
These drawings include the general scope of the project in terms of architectural design, including the design of the building, the major mechanical systems and the type of material, mechanical and electrical systems.
The drawings do not necessarily include or describe all details required for full construction and installation.
On the basis of the general scope indicated or described, the trade contractors and labor at large, required for the proper execution and completion of the work.

REVISIONS:
2 ADDENDUM #2 08/28/2026

ISSUE DATE 07/31/2026 DRAWN BY JTL CHECKED BY BCH

DRAWING TITLE:
EQUIPMENT & CASEWORK SCHEDULES, ELEVATIONS, & DETAILS

CERTIFIED BY:
BRENTON C. HITE
REGISTERED
No. AR11700184
STATE OF INDIANA
ARCHITECT
Brent Hite

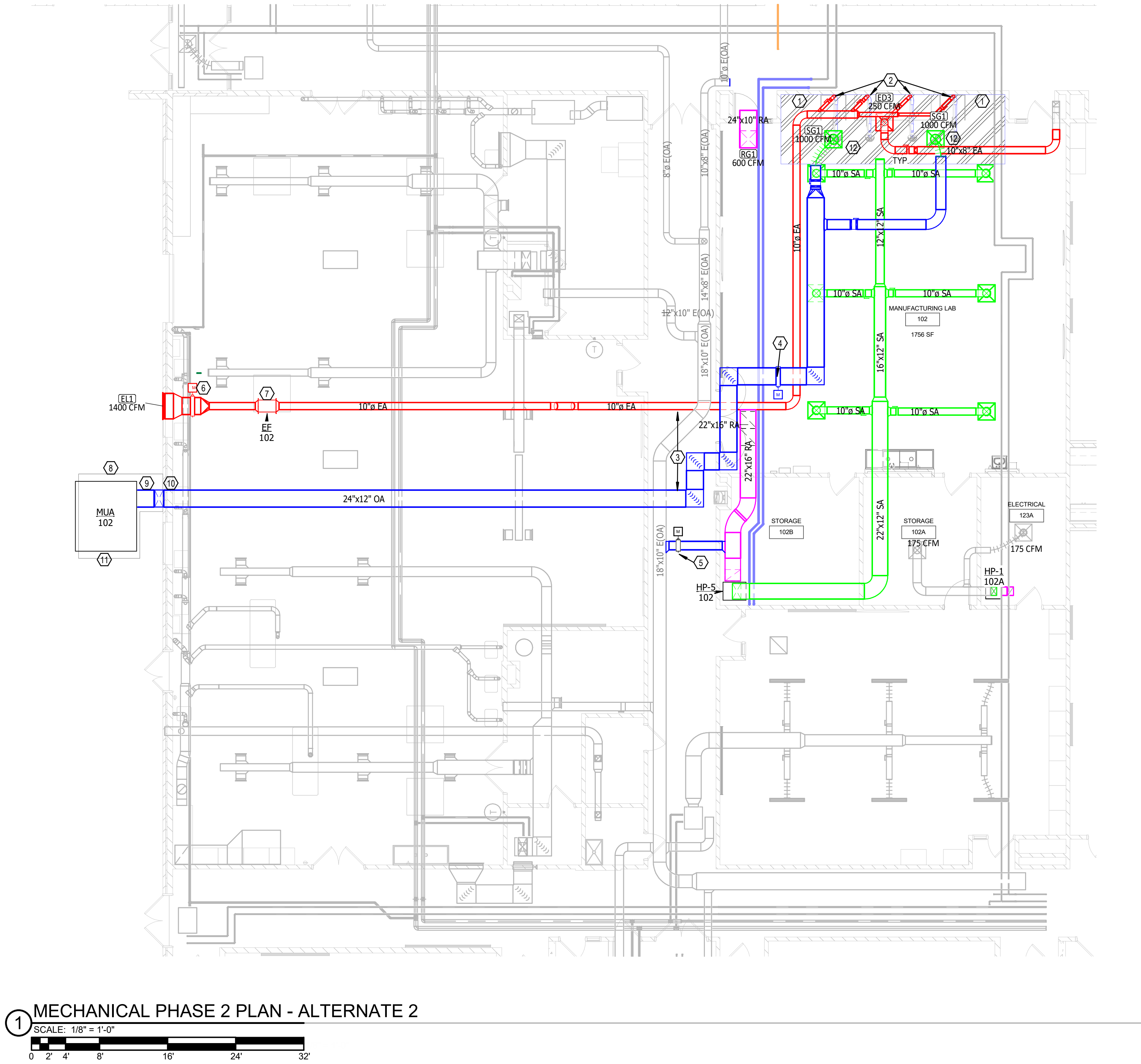
DRAWING NUMBER
A600

PROJECT NUMBER
2025075

FAN SCHEDULE																																												
TYPE	TAG	AREA SERVED	CFM	OUTLET VEL. (FPM)	T.S.P. (IN. WG.)	FAN TYPE	ARRANGEMENT	WHEEL		FAN RPM	MAX. BHP	MOTOR					SOUND POWER (MAX. DB) PER OCTAVE BAND (NOTE: INLET SOUND FOR RETURN AND EXHAUST FANS; OUTLET SOUND FOR SUPPLY FANS)							ACCESS DOOR	BELT DRIVE	DIRECT DRIVE	BELT GUARD	BIRD SCREEN	OUTLET GUARD	DRAIN	GRAVITY BOD	MOTORIZED DAMPER	ROOF CURB	VIBRATION ISOLATION	ROOF PROTECTION SYS.	UNIT MTD. DISC. SW.	ALL ALUMINUM	SPECIAL COATING	WEATHER COVER	WEIGHT (LBS)	DESIGN REFERENCE		NOTES	
								TYPE	MIN. DIA. (IN.)			HP	RPM	VOLTS	PHASE	CYCLE	EMERGENCY POWER	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz																		4000Hz	MANUFACTURER		MODEL
EF	102	102	2000	3600	5.00	CONSTANT	INLINE	BI	15"	3199	2.6	3		460	3	60	NO		88	84	74	66	65	62	58	No	Yes	No	Yes	No	No	No	No	Yes	No	Yes	No	No	Yes	262	GREENECK	OE12	ALL	

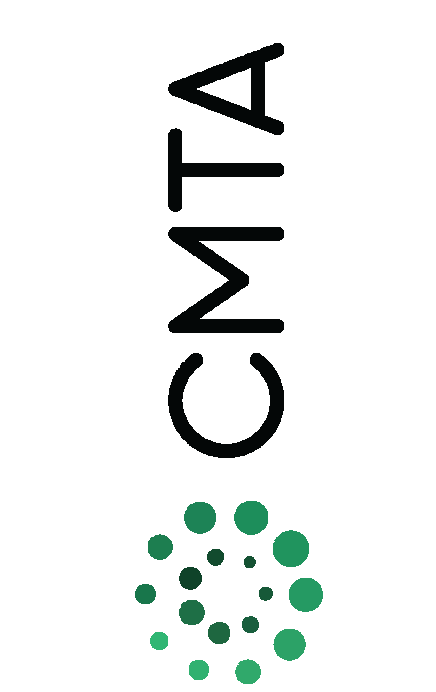
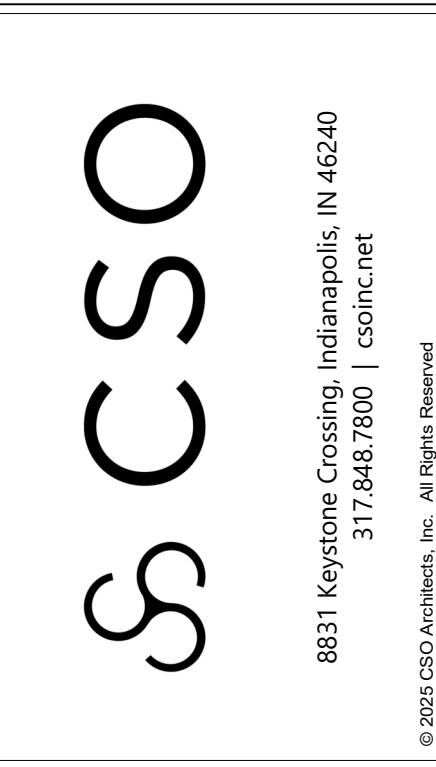
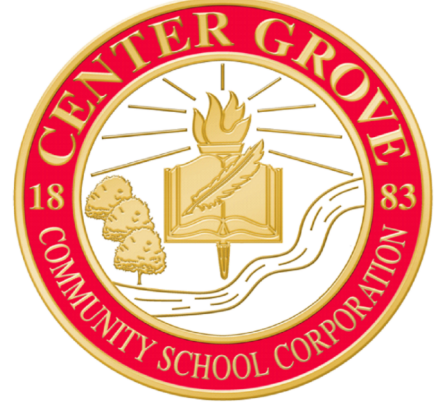
				MAKE-UP AIR UNIT SCHEDULE																																														
TAG	INSTAN CE	AREA SERVED	SUPPLY CFM	FAN							SOUND POWER (MAX. DB) PER OCTAVE BAND (NOTE: INLET SOUND FOR RETURN AND EXHAUST FANS; OUTLET SOUND FOR SUPPLY FANS)											DX COOLING COIL											HEATING COIL							FINAL FILTERS		ELECTRICAL CONNECTION				OPERATING WEIGHT	DESIGN REFERENCE			NOTES
				ESP (IN WG.)	FAN RPM	MOTOR RPM	MOTOR HP	MAX BHP	VSC	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz	COOLING CFM	ENTERING AIR		LEAVING AIR		MIN. NET TOTAL MBH	MIN. NET SENSIBLE MBH	AMBIENT TEMP	FACE VEL. (MAX)	MIN SEER	HEATING CFM	EAT TEMP	LAT TEMP	MIN MBH	KW	HEATING CONTROL STEP	TYPE	EFFICIENCY (MERV)	MCA	MOC	VOLT	PHASE	MANUFACTURER	MODEL									
MUA	102	102	1400 CFM	0.30 in-wg	788	1150	1	1.5	YES	71	66	59	54	50	46	68	52	1400 CFM	95 °F	76 °F	DB	WB	DB	WB	111	61	95 °F	119 FPM	13	1400 CFM	0 °F	68 °F	102	35	SCR	4" PLEATED	8	49 A	50 A	460 V	3	2100	VALENT	VX-112-101-F3	ALL					

HVAC DIFFUSER/GRILLE SCHEDULE									
TAG	NECK/INLET SIZE (IN.)	FACE SIZE (IN.)	MATERIAL	FINISH	MAX. NC	MAX THROW (FT)	DESIGN REFERENCE		NOTES
							MANUFACTURER	MODEL	
EL1	32X36	32X36	ALUMINUM	BLACK FACTORY PAINTED	30	-	GREENHECK	ESD-635-32X36	ALTERNATE
SG1	14	24 X 24	STEEL	WHITE	30	15	PRICE	80	ALTERNATE



PLAN NOTES - M301A.2

- LOCATION RESERVED FOR BASE BID POINT OF USE WELDING FUME COLLECTORS. REFER TO BASE BID PLANS.
- BALANCE EACH WELDING CAPTURE ARM EXHAUST TO 500 CFM.
- NEW EA AND OA DUCTWORK TO WEST EXTERIOR WALL TO BE FIELD VERIFIED FOR PROPER ROUTING. RELOCATE ALL EXISTING UTILITIES THROUGH CORRIDORS AND EXISTING TO REMAIN SPACES AS NECESSARY TO ROUTE NEW DUCTWORK. UTILITY RELOCATION TO INCLUDE BUT IS NOT LIMITED TO: DOMESTIC WATER, SANITARY VENT AND STORM FROM LEVELS ABOVE, HYDRONIC PIPING, EXISTING OUTSIDE AIR DUCTWORK, ELECTRICAL CONDUITS, DATA CONDUITS, FIRE SPRINKLER, FIRE ALARM WIRING, ETC.
- OUTSIDE AIR TO BE PROVIDED WITH MOTORIZED DAMPER INTERLOCKED WITH EXHAUST FAN OPERATION. WHEN EXHAUST FAN IS IN OPERATION MOTORIZE DAMPER TO OPEN TO ALLOW 1400 CFM OF MAKE-UP AIR INTO THE SYSTEM.
- OUTSIDE AIR TO BE PROVIDED WITH MOTORIZED DAMPER DURING NORMAL OCCUPANCY. THE OUTSIDE AIR DAMPER IS TO ACTUATE TO ALLOW 800 CFM OF VENTILATION AIR INTO THE SYSTEM. WHEN THE EXHAUST FAN IS IN OPERATION THE DAMPER IS TO REMAIN OPEN AND ALLOW 600 CFM OF VENTILATION AIR INTO THE SYSTEM. WHEN THE EXHAUST FAN IS NOT IN OPERATION THE ACTUATED DAMPER MAY CLOSE IN RESPONSE TO NO OCCUPANCY.
- ACTUATED BACKDRAHT DAMPER TO OPEN UPON A CALL FOR EXHAUST AT THE WELDING STATIONS AND BE INTERLOCKED WITH THE EXHAUST FAN OPERATION.
- NEW INLINE EXHAUST FAN WITH INTEGRAL DISCONNECT LOCATED ABOVE CONSTRUCTION LAB. PROVIDE VIBRATION ISOLATION AT SUPPORT FROM STRUCTURE. EXHAUST FAN TO ONLY OPERATE ON CALL FOR EXHAUST AT WELDING STATION.
- PROVIDE NEW EQUIPMENT PAD IN EXISTING PARKING LOT AND CONSTRUCTION LAB FABRICATION SPACE. COORDINATE.
- NEW INSULATED DUCTWORK TO BE SUPPORTED FROM EQUIPMENT PAD BY MEANS OF METAL EQUIPMENT CURB. PROVIDE UNISTRUT SUPPORT AROUND ALL FOUR SIDES OF DUCTWORK WITH INSULATION AND EXTERNAL JACKETING AND SECURE TO THE METAL EQUIPMENT CURB. VERTICAL DUCTWORK TO BE SUPPORTED TO EXISTING EXTERIOR WALL BY MEANS OF ANGLE IRON SECURED TO EXTERIOR WALL AND UNISTRUT SUPPORTS FASTENED TO GUTTER.
- EXPOSED EXTERIOR DUCTWORK TO BE PROVIDED WITH TWO LAYERS OF POLYISOCYANURATE INSULATION AND ALUMINUM PROTECTIVE JACKETING. UPON PENETRATION OF EXTERIOR WALL THE EXTERIOR JACKET IS TO BE TURNED UP WITH FLASHING ON THE EXTERIOR WALL SIDE. CONTINUE INSULATION THROUGH PENETRATION AND TRANSITION TO INTERIOR FIBERGLASS INSULATION AFTER PENETRATION.
- OUTSIDE AIR INTAKE TO BE LOCATED AT LEAST 10' AWAY FROM ANY EXHAUST SOURCE. COORDINATE LOCATION WITH EXISTING EXHAUST FANS AND NEW AT EXTERIOR WALL.
- SUPPLY AIR GRILLES TO PROVIDE MAKEUP AIR TO WELDING SPACE WHEN WELDING EXHAUST IS ACTIVATED BY PUSHBUTTON ON WALL BY DOOR.



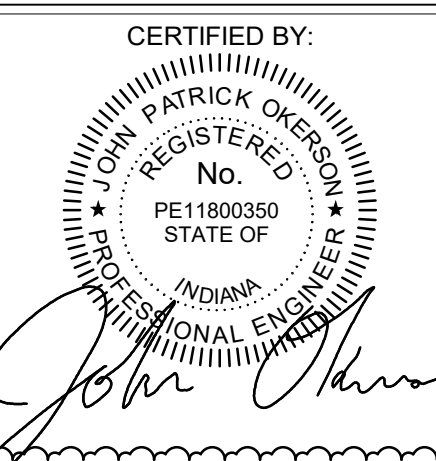
PROJECT:
CENTER GROVE COMMUNITY SCHOOL CORPORATION
CENTER GROVE HIGH SCHOOL
RENOVATION PROJECT - PACKAGE 2
2717 S MORGANTOWN RD
GREENWOOD, IN. 46143

SCOPE DRAWINGS:
These drawings include the general scope of the project in terms of architectural design, structural, mechanical, electrical, and plumbing. The drawings are not intended to be used for construction without the approval of the architect and the engineer. On the basis of the general scope indicated in these drawings, the trade contractors shall furnish all items required for the proper execution and completion of the work.

REVISIONS:
1 ADDENDUM #2 08.29.2026

ISSUE DATE 7/16/26 DRAWN BY JFO CHECKED BY JFO

DRAWING TITLE:
LOWER LEVEL MECHANICAL PLAN UNIT A - ALTERNATE 2



DRAWING NUMBER
M301A.2

PROJECT NUMBER
2025075

NOTES:

1. EXISTING EXHAUST FAN TO RUN CONTINUOUSLY.
2. VERIFY EXHAUST FAN IS A MIN OF 15' SEPARATED FROM ANY INTAKES
3. PROVIDE WITH FACTORY MOUNTED DISCONNECT. MC RESPONSIBLE FOR DISCONNECT OTHERWISE

NOTES:

1. UNDER ALTERNATE BID 1 PROVIDE SEPARATE PRICING FOR THE OWNER FOR EACH OF THE FOLLOWING MANUFACTURERS:
 - A. ALTERNATE 1A: TRANE EXV
 - B. ALTERNATE 1B: WATER FURNACE VERSATEC
 - C. ALTERNATE 1C: CLIMATE MASTER TRANQUILITY SE
2. PROVIDE WITH INTEGRAL FACTORY MOUNTED DISCONNECT.
3. PROVIDE WITH COMPRESSOR ACOUSTIC BLANKET.
4. PROVIDE HEAT PUMP WITH CONDENSATE OVERFLOW SWITCH.
5. PROVIDE HEAT PUMPS WITH 12" STANDS UNLESS OTHERWISE INDICATED.

NOTES:

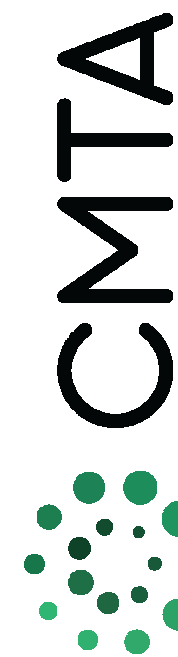
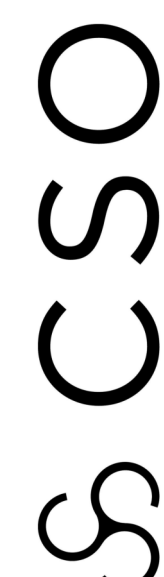
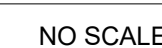
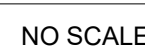
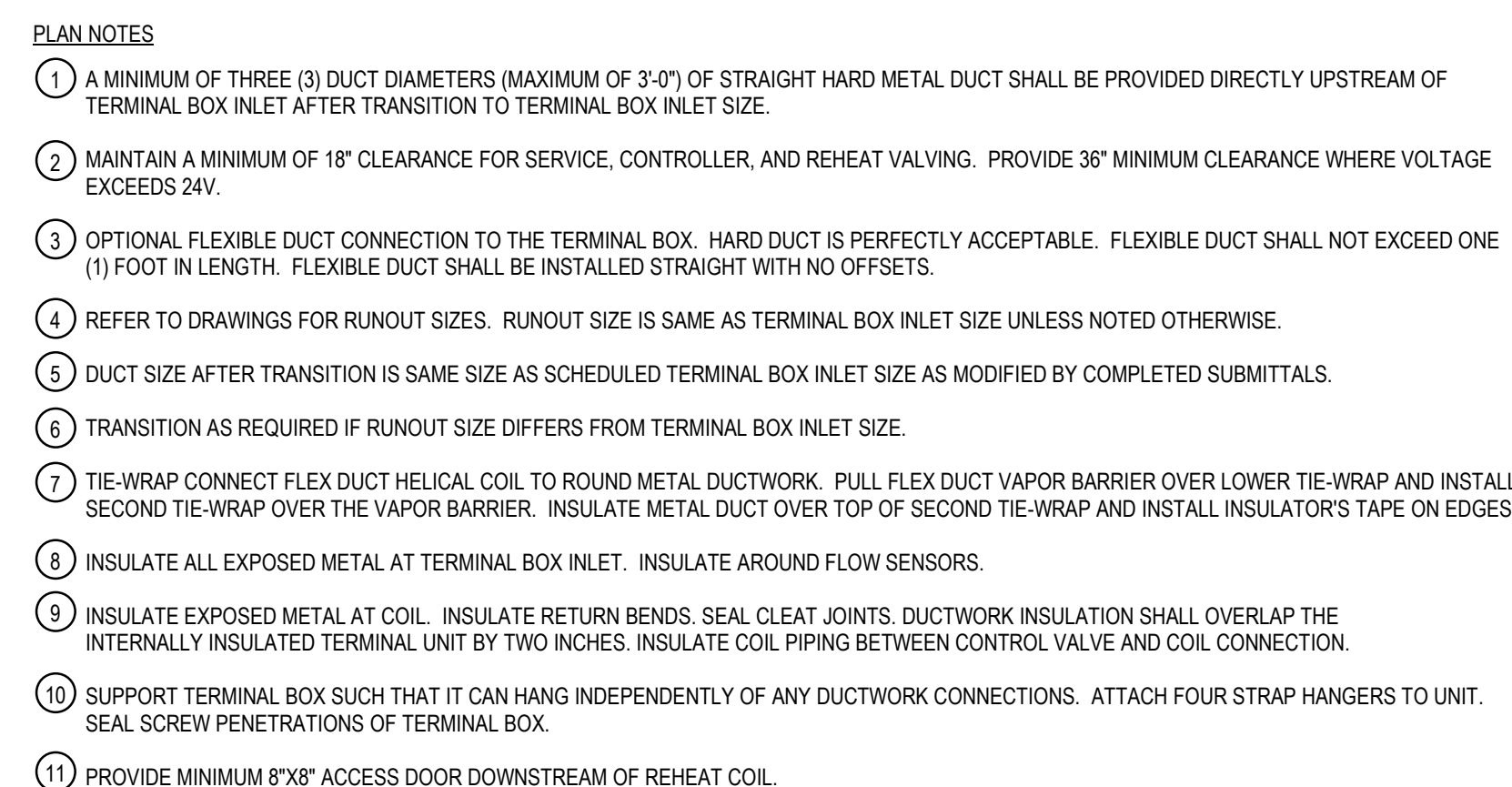
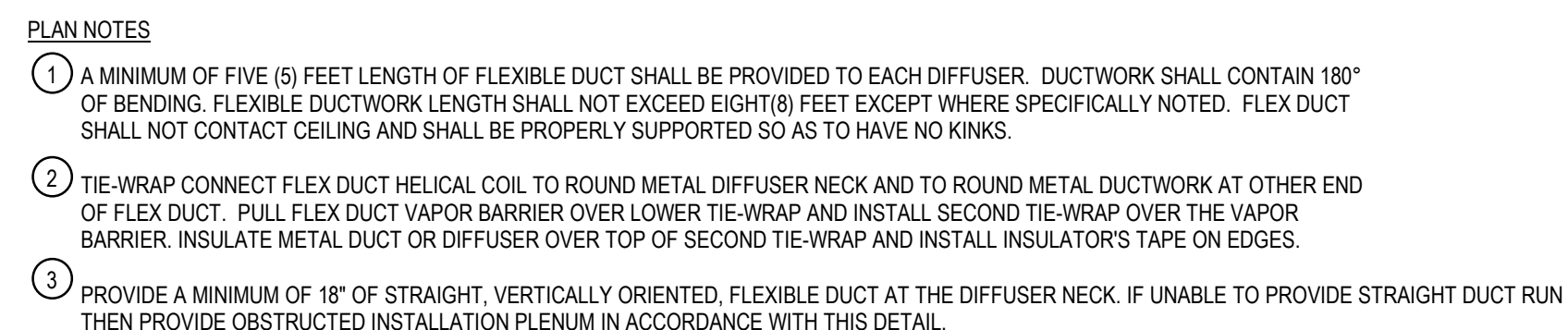
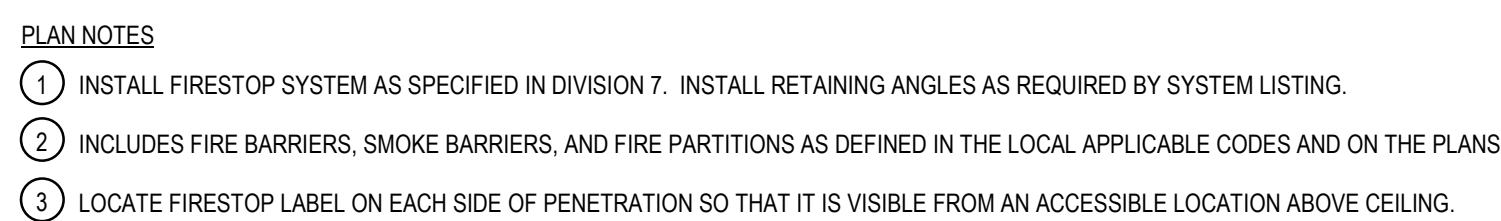
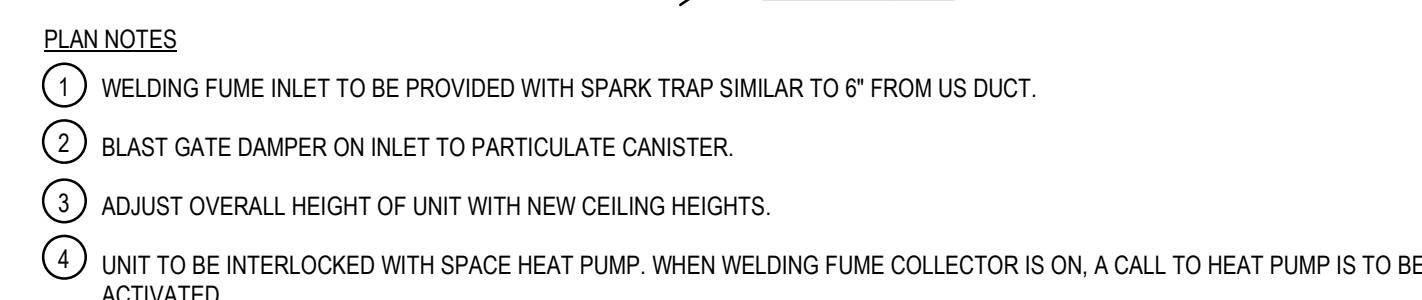
1. RGD LOCATED ABOVE DOUBLE GYP CEILING TO BE PROVIDED WITH ACCESS DOORS IN GYP CEILING FOR BALANCING. LOCATE ACCESS DOORS IN COORDINATION WITH ALL ITEMS REQUIRING MAINTENANCE.
2. COLOR LISTED ON SCHEDULE IS TO BE COORDINATED WITH ARCH. FINAL COLOR IS TO BE SELECTED BY ARCH.
3. COORDINATE ANY REQUIRED BORDER WITH CEILING TYPE AND INSTALLATION.
4. PROVIDE MOLDED INSULATED BLANKET ON ALL SUPPLY RGD.

NOTES:

1. ALL BOXES SHALL BE SINGLE WALL WITH 1/2" FOIL FACED INSULATION
2. PROVIDE BOX WITH INDEPENDENT CONTROLLER. NO BOX SHALL BE OPERATED BY ANOTHER CONTROLLER LOCATED ON ANOTHER BOX.
3. PROVIDE WITH BOTTOM ACCESS PANEL.

NOTES:

1. ACCEPTABLE MANUFACTURERS TO INCLUDE:
 - A. MICROHAR
 - B. DONALDSON
 - C. FUME DOG
2. WELD FUME COLLECTOR SHALL BE FILTERED TO 99.999% EFFICIENCY AND IS TO INCLUDE A SPARK ARRESTOR PER NFPA REQUIREMENTS
3. TO BE CO MOUNTED ON WALL/FLOOR AND SOURCE CAPTURE RECTIONS INDICATED ON PLANS.
4. PROVIDE FILTER CHANGE INDICATOR VIA MAGNANIC PRESSURE GAUGE.
5. 1 FULL YEAR OF REPLACEMENT FILTERS TO THE OWNER.
6. SOURCE CAPTURE ARMS ARE TO BE PROVIDED BY THE SAME MANUFACTURER AS THE WELD COLLECTOR / FILTER. SOURCE CAPTURE ARMS ARE TO BE EQUAL TO MICROHAR SCA 407.



PROJECT:
CENTER GROVE COMMUNITY SCHOOL CORPORATION
CENTER GROVE HIGH SCHOOL
RENOVATION PROJECT - PACKAGE 2
2717 S MORGANTOWN RD
GREENWOOD, IN, 46143

SCOPE DRAWINGS:

These drawings indicate the general scope of the project in terms of architectural design concept, the dimensions of the building, the major architectural elements and the type of structural, mechanical and electrical systems.

The drawings do not necessarily indicate or describe all work required for full performance and completion of the requirements of the Contract.

On the basis of the general scope indicated or described, the Trade contractors shall furnish all items required for the proper execution and completion of the work.

 REVISIONS:

1	ADDENDUM #2	08.29.2026
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ISSUE DATE 7/16/26	DRAWN BY JPO	CHECKED BY JPO
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DRAWING TITLE:
**MECHANICAL
SCHEDULES
AND DETAILS**

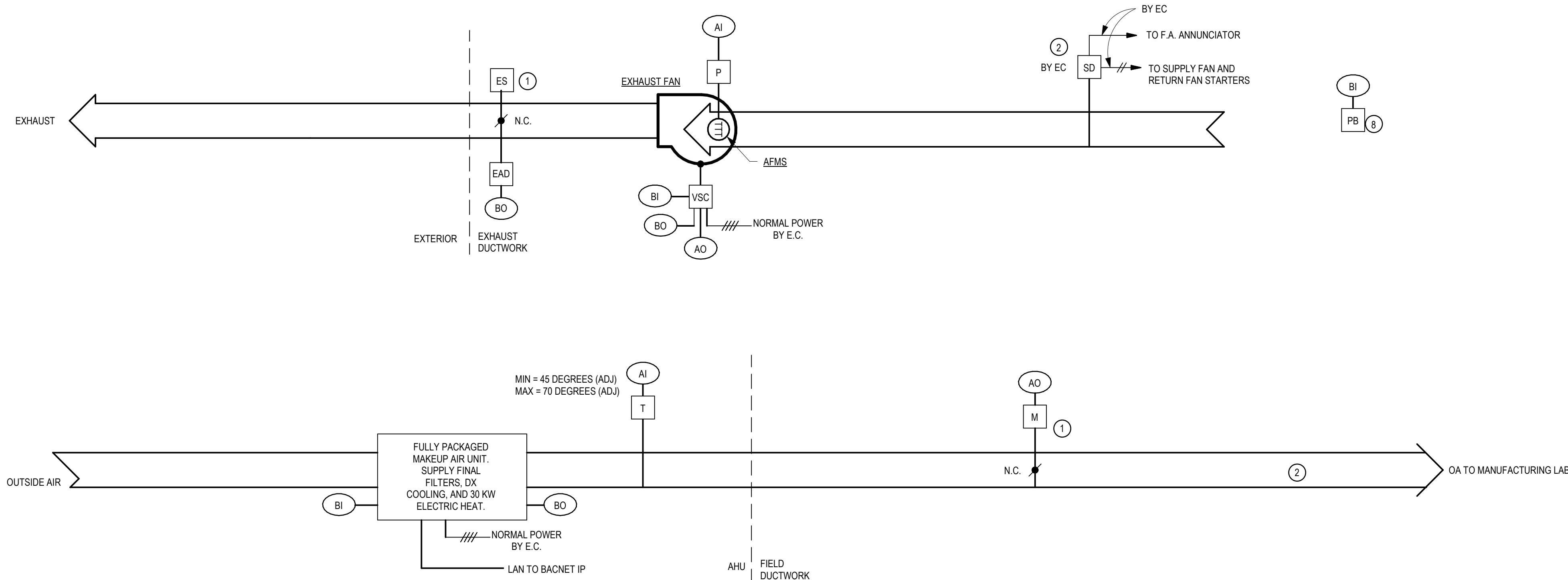
CERTIFIED BY:



JOHN PATRICK OKERSON
REGISTERED
No. PE11800350
STATE OF INDIANA
PROFESSIONAL ENGINEER

DRAWING NUMBER
M500

PROJECT NUMBER
2025075



SEQUENCE OF OPERATION:

ALL CONTROLS, SAFETIES, SENSORS, ACTUATORS, ETC ARE FACTORY INSTALLED AND INTEGRAL WITH THE UNIT.

ON CYCLE

1. A CALL FROM THE WELDING EXHAUST PUSH BUTTON SHALL ENERGIZE EXHAUST FAN AND OPEN EXTERIOR LOUVER.

OFF CYCLE

1. OFF CYCLE IS CONSTANT UNLESS EXHAUST FAN IS ACTIVATED.
2. DURING THE OFF CYCLE SUPPLY, RETURN AND EXHAUST FANS SHALL BE INDEXED OFF AND OUTSIDE AND EXHAUST AIR DAMPERS SHALL BE CLOSED.

SCHEDULE OF DDC POINTS:

ANALOG IN

- | | | | |
|----|---|----|-------------------------------------|
| AI | SUPPLY AIR TEMPERATURE | BI | EXHAUST FAN STATUS |
| AI | SUPPLY AIR STATIC PRESSURE | BI | SUPPLY FAN STATUS |
| AI | SUPPLY AIR VOLUME | BI | AHU STATUS POINTS |
| AI | STATIC PRESSURE 90% THROUGH THE SUPPLY DUCT | BI | EXHAUST FAN STATUS |
| AI | OUTSIDE AIR VOLUMES | BI | WELDING EXHAUST ON/OFF PUSH BUTTON. |
| AI | GLOBAL OUTSIDE AIR TEMPERATURE | BO | SUPPLY FAN START-STOP |
| AI | | BO | EXHAUST FAN START-STOP |

ANALOG OUT

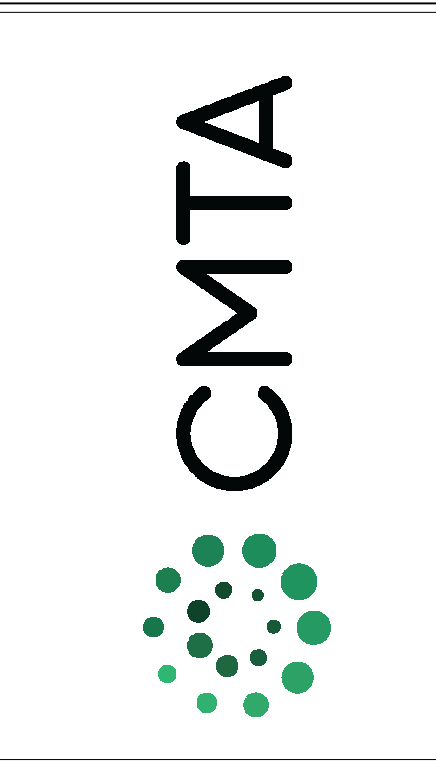
- | | | | |
|----|--------------------------------------|----|------------------------------|
| AO | EXHAUST FAN VARIABLE FREQUENCY DRIVE | BO | AHU COMMANDS |
| AO | SUPPLY FAN VARIABLE FREQUENCY DRIVE | BO | OUTDOOR AIR MOTORIZED DAMPER |
| AO | ELECTRIC HEAT CONTROL | BO | EXHAUST AIR MOTORIZED DAMPER |
| AO | DX COOLING COIL CONTROL | | |
| AO | OUTSIDE AIR DAMPER | | |
| AO | EXHAUST AIR DAMPER | | |

PLAN NOTES

1. END SWITCH TO REPORT DAMPER POSITION AND ALARM UPON FAILURE. ALARM TO SHUT DOWN SYSTEM AND ALARM WORKSTATION.
2. PRESSURE SENSOR TO BE LOCATED 90% THROUGH THE DUCTWORK.
3. VARIABLE SPEED DRIVE FURNISHED, INSTALLED AND COMMISSIONED BY UNIT MANUFACTURER.
4. BALANCE CONTRACTOR TO FIELD VERIFY STATIC PRESSURE SETPOINT REQUIREMENTS AND COORDINATE WITH ECC.
5. AIRFLOW MEASURING STATION INSTALLED AND WIRED BY UNIT MANUFACTURER.
6. THROUGH THE LAN, VSC SHALL TRANSMIT TO DDC CONTROLLER AND OWS STATUS OF ALL FAN DATA MONITORED IN ADDITION TO ALL ALARMS ASSOCIATED WITH VSC OPERATION. POINTS TO BE MAPPED SHALL BE SELECTED BY OWNER. NOTE THAT STATUS, START-STOP AND SPEED CONTROL ARE DIRECT WIRED DDC POINTS.
7. ALL VALVE AND DAMPER ACTUATORS TO BE LOW VOLTAGE ELECTRIC, FULLY MODULATING SPRING RETURN HAVING 200% TORQUE.
8. PUSH BUTTON LOCATED IN SPACE TO OPERATE UNIT AND EXHAUST FAN TO "ON" CYCLE.
9. PRESSURE SENSOR TO BE ASHROFT OR EQUAL WITH 0.25% ACCURACY. FURNISHED BY ECC.

1 AHU STANDARD DX CONTROL SCHEMATIC

NO SCALE



PROJECT:
CENTER GROVE COMMUNITY SCHOOL CORPORATION
CENTER GROVE HIGH SCHOOL
RENOVATION PROJECT - PACKAGE 2
2717 S MORGANTOWN RD
GREENWOOD, IN, 46143

SCOPE DRAWINGS:
These drawings include the general scope of the project in terms of architectural design, interior, the placement of the building, the major mechanical systems and the type of mechanical, mechanical and electrical systems.
The drawings do not necessarily indicate a detailed design required for full construction of the project.
On the basis of the general scope indicated or described, the trade contractors shall furnish all items required for the proper execution and completion of the work.

REVISIONS:
1 ADDENDUM #2 08.29.2026

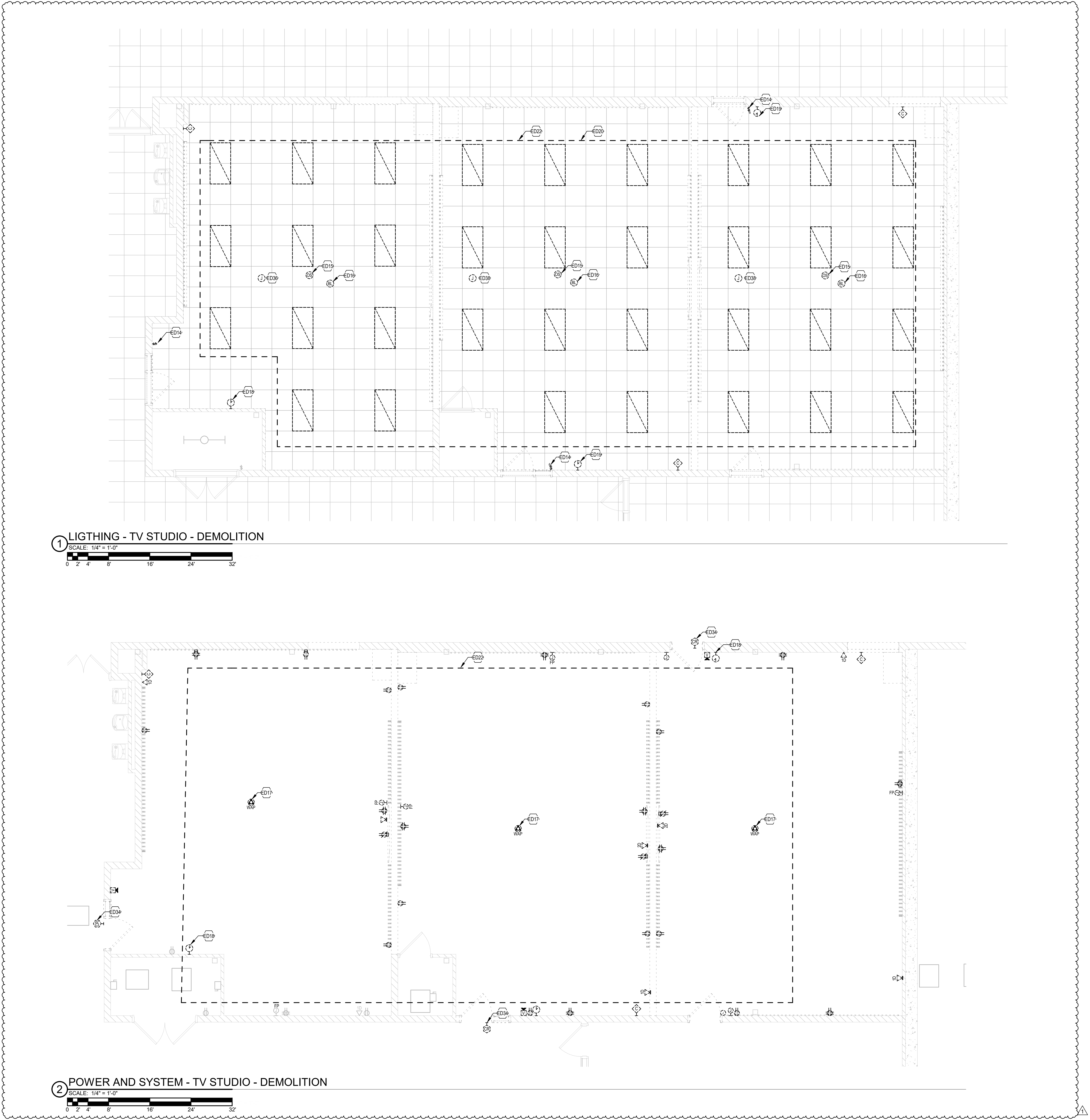
ISSUE DATE 7/16/26 DRAWN BY JFO CHECKED BY JFO

DRAWING TITLE:
AHU CONTROLS

CERTIFIED BY:
J. RICK
REGISTERED
No. PE11800350
STATE OF INDIANA
Professional Engineer

DRAWING NUMBER
M600.2

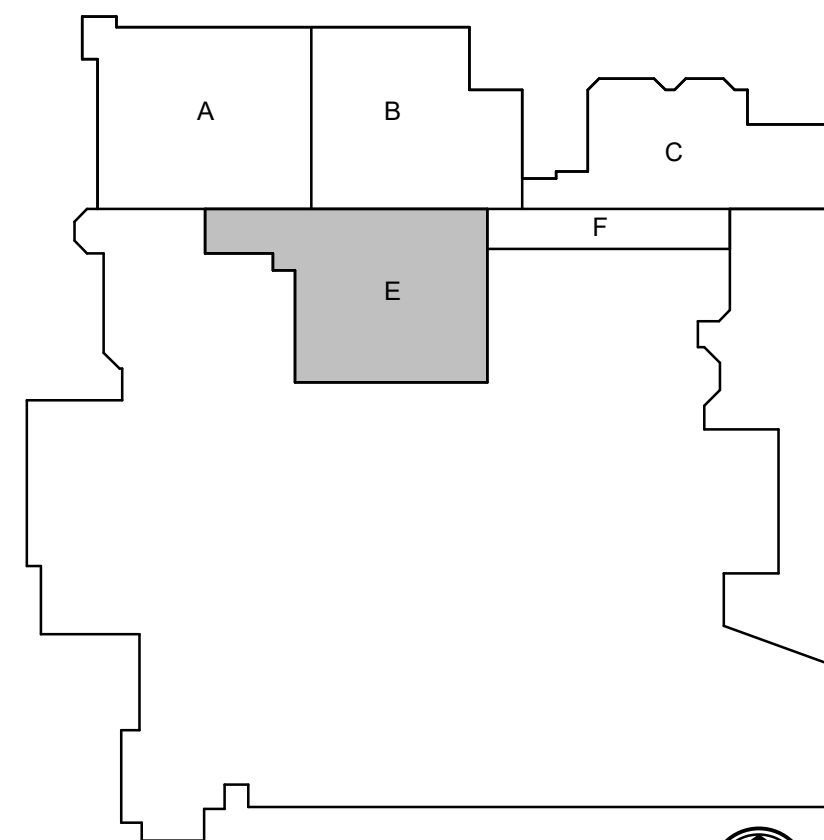
PROJECT NUMBER
2025075



- ELECTRICAL - DEMOLITION NOTES**
- A. DOTTED LINES INDICATE ITEMS FOR REMOVAL (UON) AND SOLID HALFTONE LINES INDICATE EXISTING ITEMS TO REMAIN.
- B. THE CONTRACTOR SHALL MAINTAIN THE CONTINUITY OF EXISTING CIRCUITS THAT CONTAIN DEVICES OR EQUIPMENT THAT ARE TO REMAIN. WHEN DEMOLITION OF AN ELECTRICAL DEVICE (OR CIRCUIT) IS INDICATED ON THE DRAWINGS, THE CONTRACTOR SHALL ENSURE THAT OTHER DEVICES OR EQUIPMENT "UPSTREAM" OR "DOWNSTREAM" ON THE CIRCUITS SHALL REMAIN IN "PRE-DEMOLITION" WORKING ORDER. "LEFT-OVER" CIRCUIT BREAKERS SHALL REMAIN, BE SWITCHED TO OFF POSITION, AND BE LABELED AS SPARES IN THEIR PANELS. PROVIDE NEW TYPEWRITTEN DIRECTORIES FOR ALL PANELS AFFECTED.
- C. LOCATIONS OF DEVICES, CONNECTIONS, ETC., INDICATED ON THIS DRAWING WERE TAKEN FROM VARIOUS SOURCES. THEY ARE DIAGRAMMATIC ONLY AND ARE SUBJECT TO VARIATION FROM EXISTING CONDITIONS. CERTAIN EXISTING ELEMENTS MAY NOT BE INDICATED AT ALL. THE CONTRACTOR PROPOSING TO DO ANY PART OF THE WORK INDICATED HEREON SHALL VISIT THIS SITE AND DETERMINE TO HIS SATISFACTION THAT THEY MAY COMPLETE ALL WORK REQUIRED FOR THE BID WHICH HE PROPOSES.
- D. REMOVE ALL ASSOCIATED BACKBOXES, CONDUIT AND CONDUCTORS FOR DEVICES / FIXTURES / ETC. BEING REMOVED (BACK TO SOURCE), WHETHER INDICATED OR NOT (UON). CONTRACTOR SHALL PATCH AND REPAIR ANY EXISTING WALLS, FLOORS OR CEILINGS WHERE DEVICES ARE SHOWN TO BE REMOVED (PATCH AND REPAIR TO RECEIVE NEW FINISHES - SEE ARCHITECTURAL PLANS).
- E. COORDINATE DISPOSAL OF ALL FIXTURES, DEVICES, ETC. (INDICATED FOR DEMOLITION) WITH OWNER. TURN OVER ITEMS REMOVED TO OWNER AT THEIR OPTION.
- F. COORDINATE WITH OTHER TRADES FOR THE REMOVAL AND/OR RELOCATION OF ELECTRICAL DEVICES AND CONNECTIONS ASSOCIATED WITH THEIR EQUIPMENT.
- G. PROVIDE TEMPORARY EMERGENCY EXIT LIGHTS AT CONSTRUCTION BARRIERS AS REQUIRED.
- H. CONTRACTOR SHALL PATCH AND REPAIR ALL EXISTING WALLS / CEILINGS AS REQUIRED WHERE DEVICES ARE BEING REMOVED OR INSTALLED.
- I. UNUSED/ABANDONED CONDUCTORS DISCOVERED ABOVE ACCESSIBLE CEILINGS SHALL BE REMOVED IN ACCORDANCE WITH NEC REQUIREMENTS.
- J. EXISTING ELECTRICAL SYSTEMS IN CONFLICT WITH CONSTRUCTION SHALL BE RELOCATED TO PERMIT INSTALLATION OF DEVICES AND EQUIPMENT SHOWN ON PLANS.
- K. ALL EXISTING PANELS AFFECTED BY THIS CONTRACTOR'S WORK SHALL BE PROVIDED WITH NEW TYPE-WRITTEN PANEL DIRECTORIES AND INSERT SLEEVES. PANEL DIRECTORIES SHALL NOT USE ROOM NAMES OR NUMBERS FROM THESE DRAWINGS. DIRECTORIES SHALL BE DETAILED AND COORDINATED WITH OWNER'S SUITE NUMBERS, FINAL ROOM NUMBERS, IT RACK NAMES, WORKSTATION DESIGNATIONS, ETC. UNUSED BREAKERS SHALL BE IN OFF POSITION.
- L. CONTRACTOR TO VERIFY THAT THERE ARE NO ELECTRICAL CIRCUITS IN CHASES BEING REMOVED UNDER DEMOLITION WHICH REMAIN IN SERVICE AND CANNOT BE REMOVED. SHOULD SUCH CIRCUITS BE ENCOUNTERED, THE CONTRACTOR IS TO REROUTE AND RECONNECT AS REQUIRED TO MAINTAIN SERVICE.

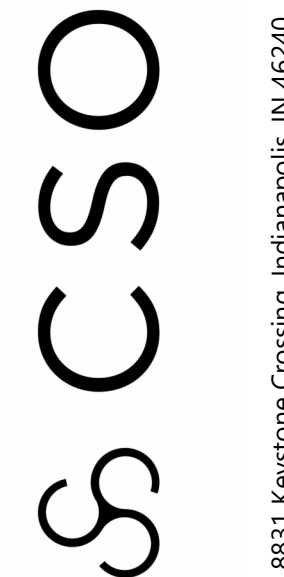
- TAGGED NOTES**
- ED14 LIGHT SWITCHES TO BE REUSED IN NEW WORK. REFER TO NEW WORK LIGHTING SHEET FOR ADDITIONAL INFORMATION.
- ED15 OCCUPANCY SENSORS TO BE REUSED IN NEW WORK. REFER TO NEW WORK LIGHTING SHEET FOR ADDITIONAL INFORMATION.
- ED16 BLUE LIGHTS TO BE REUSED IN NEW WORK. REFER TO NEW WORK LIGHTING SHEET FOR ADDITIONAL INFORMATION.
- ED17 WIRELESS ACCESS POINTS TO BE REUSED IN NEW WORK. REFER TO NEW WORK LIGHTING SHEET FOR ADDITIONAL INFORMATION.
- ED18 CONTRACTOR TO CAREFULLY REMOVE CLOCK AND PLACE A BLACK PLATE. CONTRACTOR TO TURN OVER CLOCK TO OWNER FOR FUTURE USE.
- ED19 CONTRACTOR TO CAREFULLY REMOVE CLOCK AND RELOCATE TO NEW LOCATION. REFER TO NEW WORK PLANS FOR ADDITIONAL INFORMATION.
- ED20 CONTRACTOR TO CAREFULLY REMOVE LIGHTS AND SWITCHES AND STORE THEM IN A CLEAN SPACE FOR REUSE IN NEW WORK. REFER TO NEW WORK FOR ADDITIONAL INFORMATION.
- ED22 CONTRACTOR TO DEMOLISH PULLBOX, DEVICES, AND FACEPLATES. ANY WIRING ASSOCIATED WITH THE DEVICES SHALL BE DEMOLISHED BACK TO A POINT SUITABLE FOR REUSE WITH THE NEW WORK.
- ED34 RELOCATE EXISTING CARD READER AND CONNECTION TO NEW DOOR LOCATION. REFER TO NEW WORK PLANS. PROVIDE ALL CABLING AS REQUIRED.
- ED36 CONTRACTOR TO CAREFULLY DISCONNECT AND REMOVE EXISTING POE NETWORK SWITCH ABOVE CEILING AND ASSOCIATED COMPONENTS. TURN OVER TO OWNER FOR FUTURE USE. COORDINATE STORAGE LOCATION AND TURNOVER PROCEDURE WITH OWNER PRIOR TO DEMOLITION.
- ED38 CONTRACTOR TO CAREFULLY REMOVE EXISTING POE NETWORK SWITCH LOCATED ABOVE CEILING FOR REPURPOSE IN NEW WORK. PROTECT DURING REMOVAL AND STORAGE. REFER TO NEW WORK PLANS FOR ADDITIONAL INFORMATION.

KEY PLAN

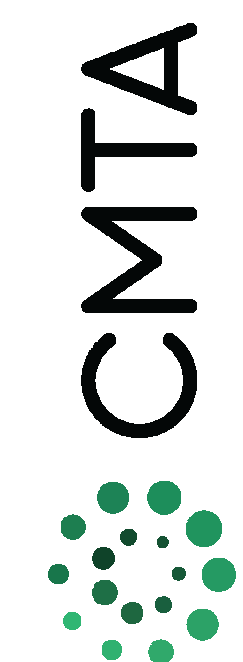




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PROJECT:

CENTER GROVE COMMUNITY SCHOOL CORPORATION
CENTER GROVE HIGH SCHOOL
RENOVATION PROJECT - PACKAGE 2
2717 S MORGANTOWN RD
GREENWOOD, IN, 46143

SCOPE DRAWINGS:

These drawings include the general scope of the project in terms of architectural design, construction, and equipment. The design and construction are subject to the final design and construction documents. The design and construction are subject to the final design and construction documents. The design and construction are subject to the final design and construction documents.

On the basis of the general scope indicated in these drawings, the trade contractors shall furnish all items required for the proper execution and completion of the work.

REVISIONS:

1	ADDENDUM #2	08.29.2026
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ISSUE DATE	DRAWN BY	CHECKED BY
7/30/26	JA	JBS

DRAWING TITLE:

**LOWER LEVEL
ELECTRICAL
DEMOLITION
PLANS - UNIT E**

CERTIFIED BY:

**NOT FOR
CONSTRUCTION**

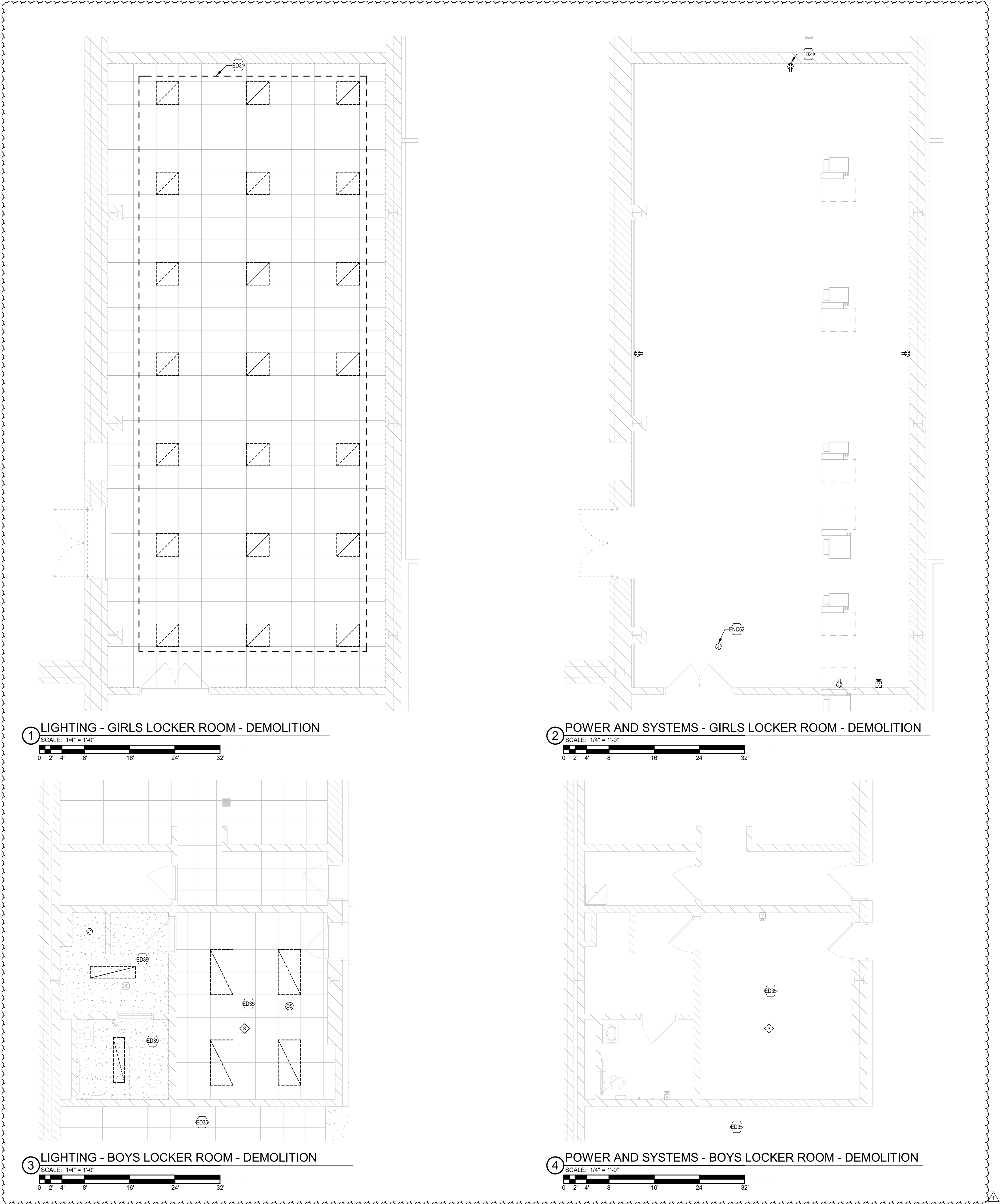
REVIEW SET

DRAWING NUMBER

E101E

PROJECT NUMBER

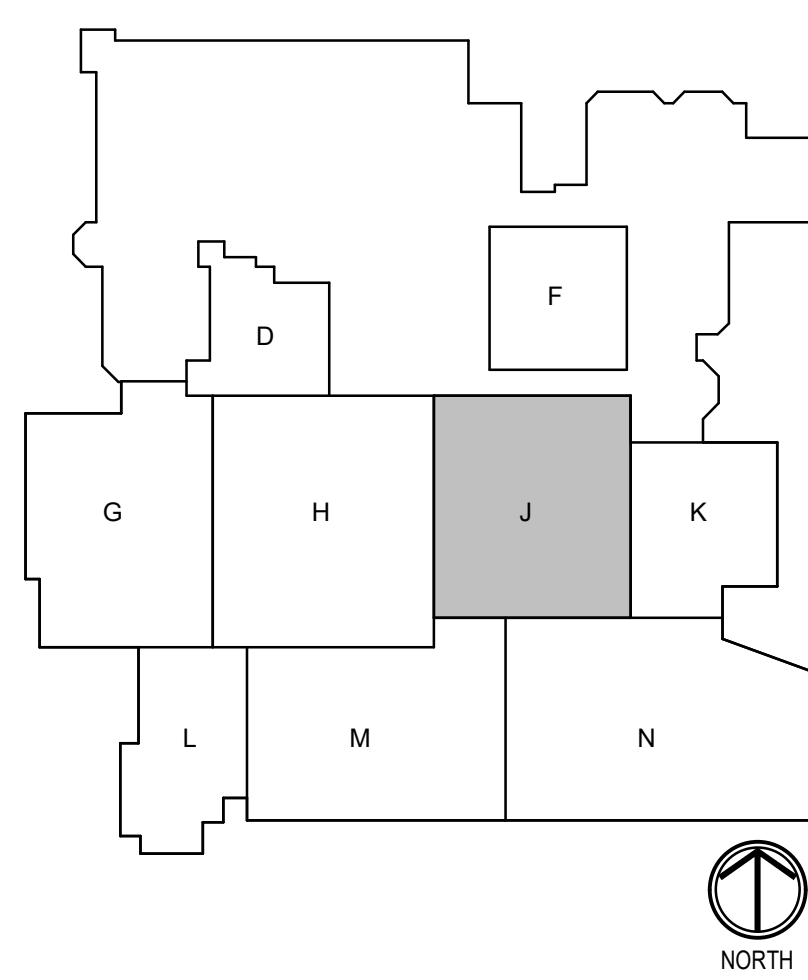
2025075



- ELECTRICAL - DEMOLITION NOTES**
- A. DOTTED LINES INDICATE ITEMS FOR REMOVAL (UON) AND SOLID HALFTONE LINES INDICATE EXISTING ITEMS TO REMAIN.
 - B. THE CONTRACTOR SHALL MAINTAIN THE CONTINUITY OF EXISTING CIRCUITS THAT CONTAIN DEVICES OR EQUIPMENT THAT ARE TO REMAIN. WHEN DEMOLITION OF AN ELECTRICAL DEVICE (OR CIRCUIT) IS INDICATED ON THE DRAWINGS, THE CONTRACTOR SHALL ENSURE THAT OTHER DEVICES OR EQUIPMENT "UPSTREAM" OR "DOWNSTREAM" ON THE CIRCUITS SHALL REMAIN IN "PRE-DEMOLITION" WORKING ORDER. "LEFT-OVER" CIRCUIT BREAKERS SHALL REMAIN, BE SWITCHED TO OFF POSITION, AND BE LABELED AS SPARES IN THEIR PANELS. PROVIDE NEW TYPEWRITTEN DIRECTORIES FOR ALL PANELS AFFECTED.
 - C. LOCATIONS OF DEVICES, CONNECTIONS, ETC., INDICATED ON THIS DRAWING WERE TAKEN FROM VARIOUS SOURCES. THEY ARE DIAGRAMMATIC ONLY AND ARE SUBJECT TO VARIATION FROM EXISTING CONDITIONS. CERTAIN EXISTING ELEMENTS MAY NOT BE INDICATED AT ALL. THE CONTRACTOR PROPOSING TO DO ANY PART OF THE WORK INDICATED HEREON SHALL VISIT THIS SITE AND DETERMINE TO HIS SATISFACTION THAT THEY MAY COMPLETE ALL WORK REQUIRED FOR THE BID WHICH HE PROPOSES.
 - D. REMOVE ALL ASSOCIATED BACKBOXES, CONDUIT AND CONDUCTORS FOR DEVICES / FIXTURES / ETC. BEING REMOVED (BACK TO SOURCE), WHETHER INDICATED OR NOT (UON). CONTRACTOR SHALL PATCH AND REPAIR ANY EXISTING WALLS, FLOORS OR CEILINGS WHERE DEVICES ARE SHOWN TO BE REMOVED (PATCH AND REPAIR TO RECEIVE NEW FINISHES - SEE ARCHITECTURAL PLANS).
 - E. COORDINATE DISPOSAL OF ALL FIXTURES, DEVICES, ETC. (INDICATED FOR DEMOLITION) WITH OWNER. TURN OVER ITEMS REMOVED TO OWNER AT THEIR OPTION.
 - F. COORDINATE WITH OTHER TRADES FOR THE REMOVAL AND/OR RELOCATION OF ELECTRICAL DEVICES AND CONNECTIONS ASSOCIATED WITH THEIR EQUIPMENT.
 - G. PROVIDE TEMPORARY EMERGENCY EXIT LIGHTS AT CONSTRUCTION BARRIERS AS REQUIRED.
 - H. CONTRACTOR SHALL PATCH AND REPAIR ALL EXISTING WALLS / CEILINGS AS REQUIRED WHERE DEVICES ARE BEING REMOVED OR INSTALLED.
 - I. UNUSED/ABANDONED CONDUCTORS DISCOVERED ABOVE ACCESSIBLE CEILINGS SHALL BE REMOVED IN ACCORDANCE WITH NEC REQUIREMENTS.
 - J. EXISTING ELECTRICAL SYSTEMS IN CONFLICT WITH CONSTRUCTION SHALL BE RELOCATED TO PERMIT INSTALLATION OF DEVICES AND EQUIPMENT SHOWN ON PLANS.
 - K. ALL EXISTING PANELS AFFECTED BY THIS CONTRACTOR'S WORK SHALL BE PROVIDED WITH NEW TYPE-WRITTEN PANEL DIRECTORIES AND INSERT SLEEVES. PANEL DIRECTORIES SHALL NOT USE ROOM NAMES OR NUMBERS FROM THESE DRAWINGS. DIRECTORIES SHALL BE DETAILED AND COORDINATED WITH OWNER'S SUITE NUMBERS, FINAL ROOM NUMBERS, IT RACK NAMES, WORKSTATION DESIGNATIONS, ETC. UNUSED BREAKERS SHALL BE IN OFF POSITION.
 - L. CONTRACTOR TO VERIFY THAT THERE ARE NO ELECTRICAL CIRCUITS IN CHASES BEING REMOVED UNDER DEMOLITION WHICH REMAIN IN SERVICE AND CANNOT BE REMOVED. SHOULD SUCH CIRCUITS BE ENCOUNTERED, THE CONTRACTOR IS TO REROUTE AND RECONNECT AS REQUIRED TO MAINTAIN SERVICE.

- TAGGED NOTES**
- ED21 CONTRACTOR TO DEMOLISH RECEPTACLE AND FACEPLATE. JUNCTION BOX AND CIRCUIT TO BE REUSED IN NEW WORK. REFER TO NEW WORK PLANS FOR ADDITIONAL INFORMATION.
 - ED31 LIGHTING TO BE REUSED IN NEW GIRLS LOCKER ROOM. REFER TO NEW WORK LIGHTING SHEET FOR MORE INFORMATION.
 - ED35 TEMPORARILY REMOVE ALL CEILING DEVICES AS REQUIRED (SUCH AS LIGHTING, MOTION SENSORS, WIRELESS ACCESS POINTS, ETC...) FOR NEW SANITARY WORK ON FLOOR ABOVE. UPON COMPLETION OF WORK, REINSTALL ALL DEVICES BACK IN CEILING AT SAME LOCATION WHERE THEY WERE REMOVED.
 - ED39 DEMOLISH LIGHT FIXTURES IN ROOM. SALVAGE OCCUPANCY SENSOR FOR INSTALLATION IN NEW CEILING.
 - ENC62 UTILIZE EXISTING CIRCUIT PREVIOUSLY SERVING DEMOLISHED EXHAUST FAN. EXTEND CONDUCTORS AND FEEDERS AS NEEDED FOR NEW LOCATION.

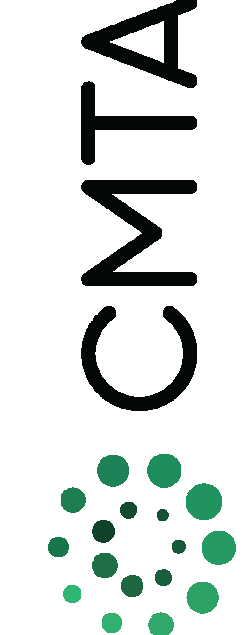
KEY PLAN





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CMTA

PROJECT:

CENTER GROVE COMMUNITY SCHOOL CORPORATION
CENTER GROVE HIGH SCHOOL

RENOVATION PROJECT - PACKAGE 2

2717 S MORGANTOWN RD
GREENWOOD, IN, 46143

SCOPE DRAWINGS:

These drawings include the general scope of the project in terms of architectural design, structural, mechanical, electrical, and plumbing systems. The drawings do not necessarily include all details and are subject to change. On the basis of the general scope indicated or described, the trade contractors shall furnish all items required for the proper execution and completion of the work.

REVISIONS:

1	ADDENDUM #2	08.29.2026
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ISSUE DATE	DRAWN BY	CHECKED BY
7/30/26	JA	JBS

DRAWING TITLE:

UPPER LEVEL
ELECTRICAL
DEMOLITION
PLANS - UNIT J

CERTIFIED BY:

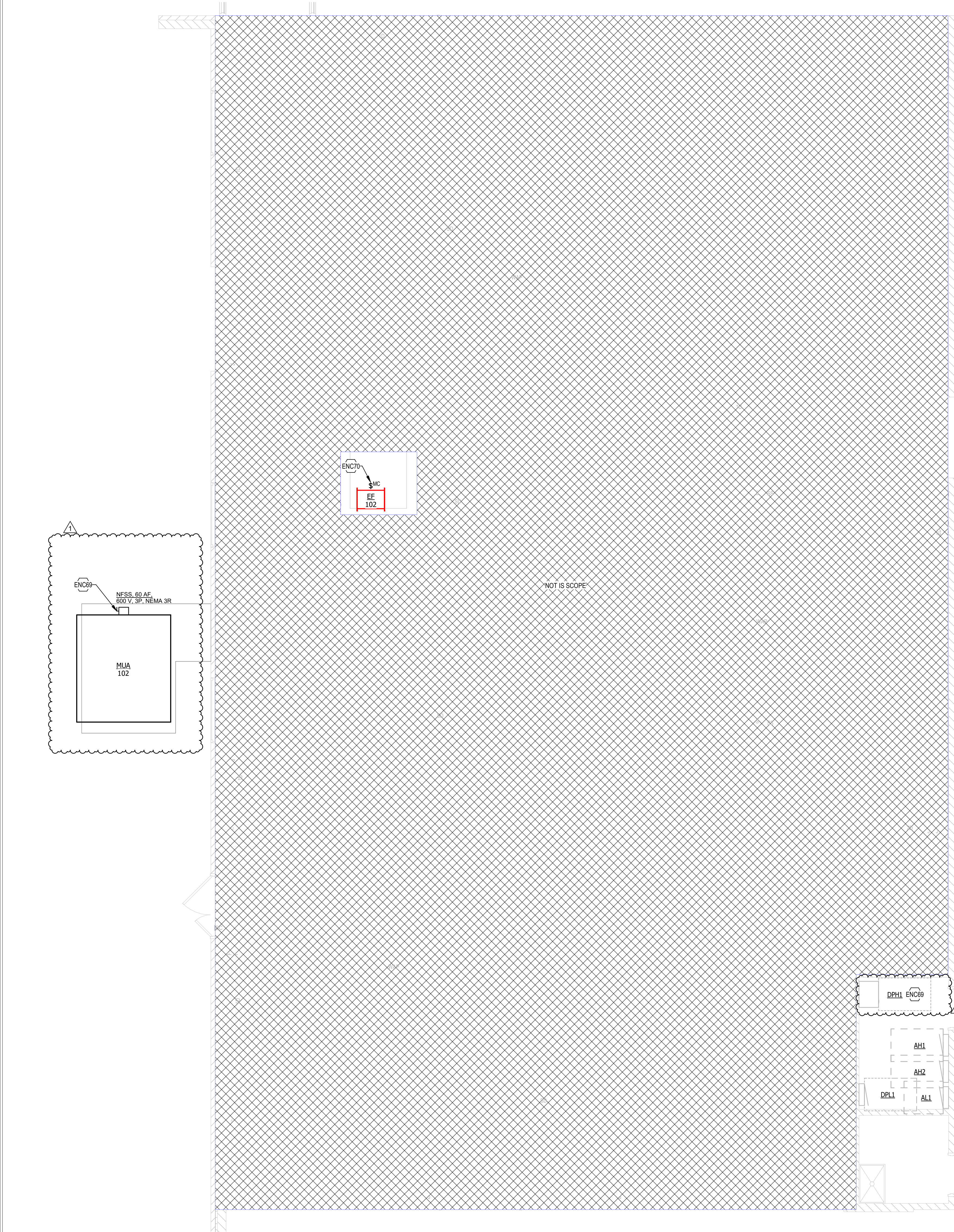
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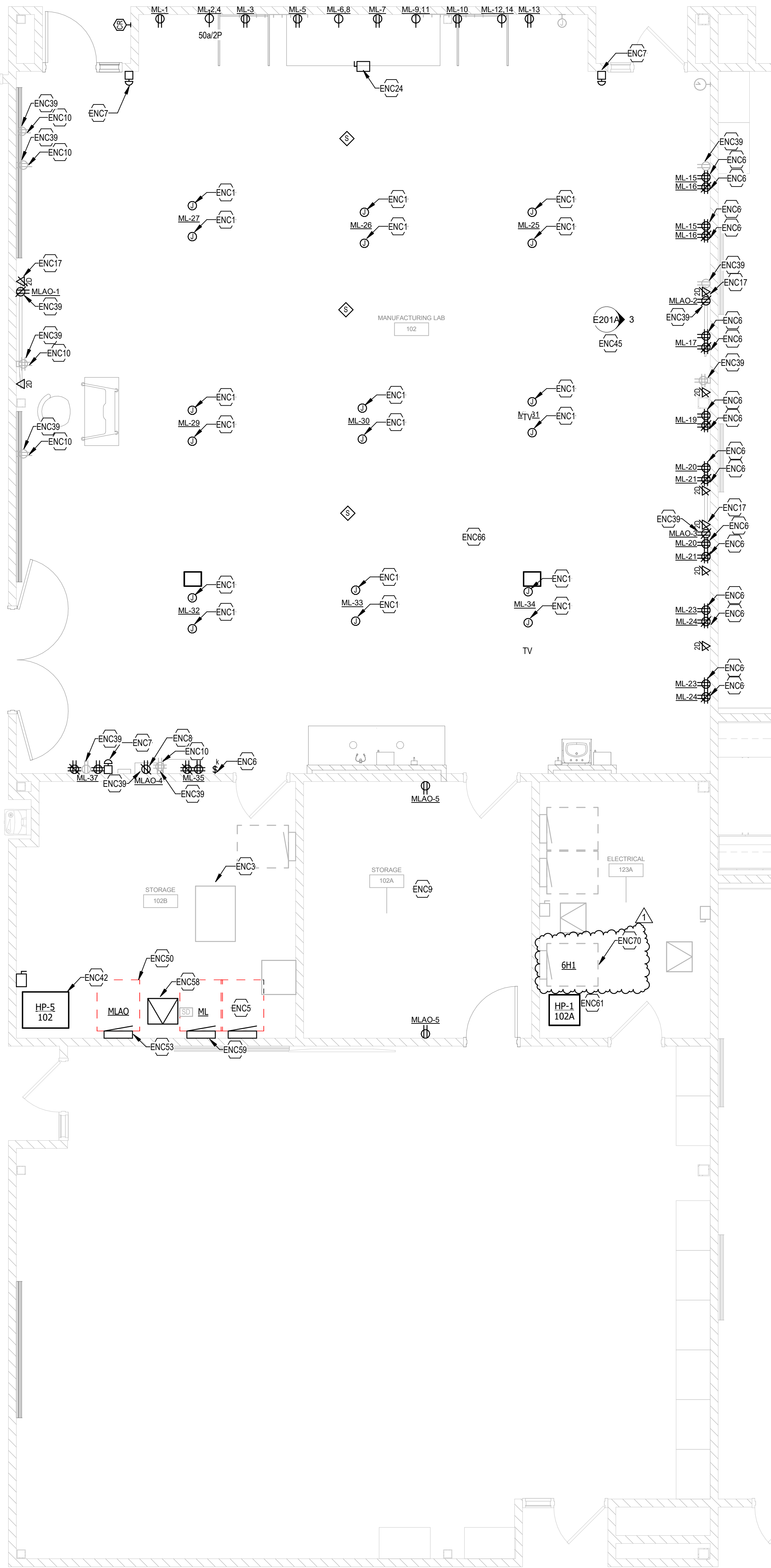
E102J

PROJECT NUMBER

2025075



1 POWER AND SYSTEM - MANUFACTURING LAB - NEW WORK



LIGHTING GENERAL NOTES

- A. REFER TO SHEET E001B FOR SYMBOLS, ABBREVIATIONS, AND MORE INFORMATION.
- B. REFER TO THE ARCHITECT'S REFLECTED CEILING PLANS, ELEVATIONS, AND CASEWORK DETAILS FOR EXACT LOCATIONS OF ALL WALL AND CEILING MOUNTED ELECTRICAL DEVICES.
- C. FOLLOW BRANCH CIRCUITING LAY-OUT, AS INDICATED ON THE FLOOR PLANS, WITH A MAXIMUM OF THREE (3) BRANCH CIRCUITS PER HOMERUN. EACH BRANCH CIRCUIT SHALL BE PROVIDED WITH A DEDICATED NEUTRAL CONDUCTOR. DEDICATED NEUTRAL CONDUCTORS SHALL BE CONSIDERED CURRENT CARRYING. IF ADDITIONAL CONDUCTORS ARE RAN IN THE SAME CONDUIT WITH THOSE INDICATED, CONTRACTOR SHALL DERATE ALL CURRENT CARRYING CONDUCTORS PER N.E.C. #310.15(B)(3), AND UPSIZE CONDUIT AS REQUIRED PER N.E.C. #300.17 AND ANNEX C. MULTIWIRED BRANCH CIRCUITS AS DEFINED IN N.E.C. #100 / 210.4 (CIRCUITS SHARING A COMMON NEUTRAL CONDUCTOR) SHALL NOT BE PERMITTED.
- D. IDENTIFY THE PANEL AND CIRCUIT NUMBER FOR ALL RECEPTACLES, SWITCHES, ETC. IN AREA OF CONSTRUCTION. PROVIDE CLEAR ADHESIVE LABELS WITH BLACK LETTERING. MARK INSIDES OF ALL DEVICE BOXES WITH PANEL AND CIRCUIT NUMBER. IN HEALTHCARE FACILITIES, ENGRAVE EMERGENCY DEVICE COVERPLATES IN PATIENT CARE AREAS.
- E. LOCATE EXIT SIGNS FOR MAXIMUM VIEWING AREA TO IDENTIFY EGRESS PATHS AS INDICATED ON PLANS. COORDINATE LOCATIONS SUCH THAT ARCHITECTURAL FEATURES OR EQUIPMENT FROM OTHER TRADES DO NOT OBSTRUCT VIEW.
- F. ALL LIGHTING FIXTURE LENSES, PARABOLIC LOUVERS, DOWNLIGHTING ALZAK CONES AND "PARACUBE" LOUVERS SHALL BE HANDLED WITH COTTON GLOVES DURING INSTALLATION AND LAMPING TO AVOID FINGERPRINTS OR DIRT DEPOSITS. IT IS PREFERRED THAT FIXTURES BE SHIPPED AND INSTALLED WITH CLEAR PLASTIC BAGS TO PROTECT LOUVERS. AT CLOSE OF PROJECT, AND AFTER CONSTRUCTION AIR FILTERS ARE CHANGED, REMOVE BAGS. ANY LOUVER OR CONE SHOWING DIRT OR FINGER PRINTS SHALL BE CLEANED WITH SOLVENT RECOMMENDED BY THE MANUFACTURER, OR REPLACED AS NECESSARY IN ORDER TO TURN OVER TO THE OWNER NEW FIXTURES AT OCCUPANCY.
- G. RECESSED LUMINAIRES SHALL BE SECURED SUCH THAT THE FORCE REQUIRED INSERTING LAMPS, TRIMS, LENSES, LOUVERS, OR DOOR FRAMES DOES NOT SHIFT HOUSING. ALL TRIMS SHALL BE COMPLETELY FLUSH WITH FINISHED CEILINGS AT COMPLETION OF CONSTRUCTION.

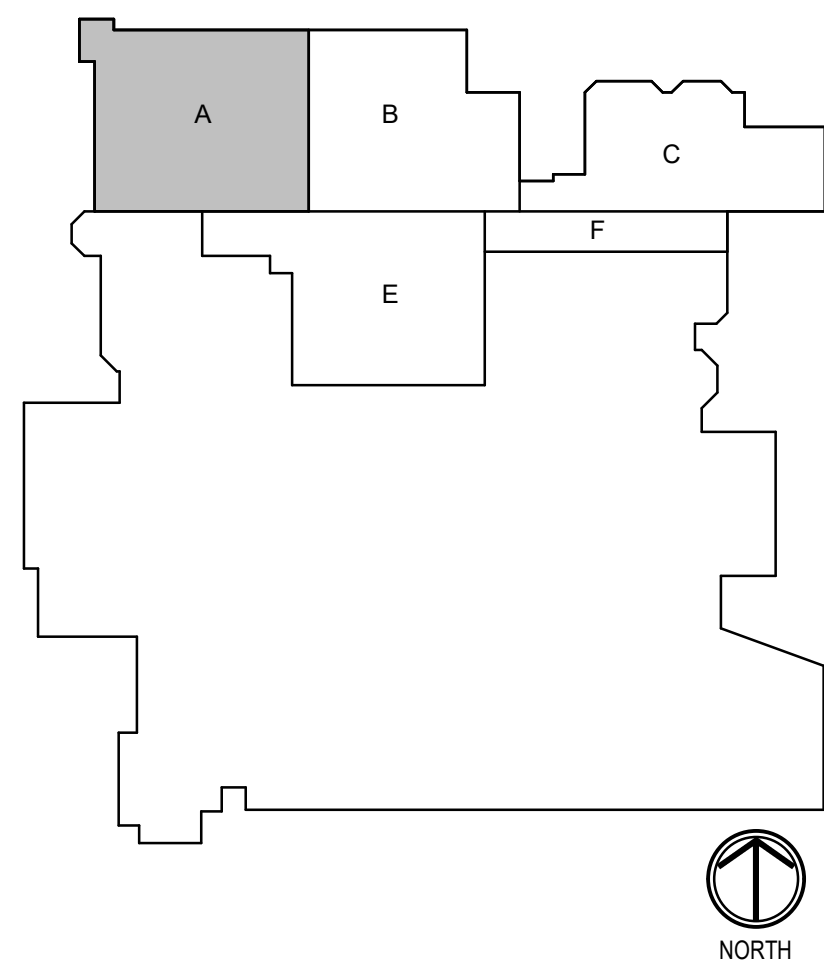
POWER - GENERAL NOTES

- A. REFER TO THE ARCHITECT'S REFLECTED CEILING PLANS, ELEVATIONS, AND CASEWORK DETAILS FOR EXACT LOCATIONS OF ALL WALL AND CEILING MOUNTED ELECTRICAL DEVICES.
- B. CONTRACTOR SHALL FOLLOW BRANCH CIRCUITING LAY-OUT, AS INDICATED ON THE FLOOR PLANS, WITH A MAXIMUM OF THREE (3) BRANCH CIRCUITS PER HOMERUN. EACH BRANCH CIRCUIT SHALL BE PROVIDED WITH A DEDICATED NEUTRAL CONDUCTOR. DEDICATED NEUTRAL CONDUCTORS SHALL BE CONSIDERED CURRENT CARRYING. IF ADDITIONAL CONDUCTORS ARE RAN IN THE SAME CONDUIT WITH THOSE INDICATED, CONTRACTOR SHALL DERATE ALL CURRENT CARRYING CONDUCTORS PER NEC 310.15(B)(3), AND UPSIZE CONDUIT AS REQUIRED PER NEC 300.17 AND ANNEX C. MULTIWIRED BRANCH CIRCUITS AS DEFINED IN NEC 100 / 210.4 (CIRCUITS SHARING A COMMON NEUTRAL CONDUCTOR) SHALL NOT BE PERMITTED.
- C. IDENTIFY THE PANEL AND CIRCUIT NUMBER FOR ALL RECEPTACLES, SWITCHES, ETC. IN AREA OF CONSTRUCTION. PROVIDE CLEAR ADHESIVE LABELS WITH BLACK LETTERING. IN HEALTHCARE FACILITIES, ENGRAVE EMERGENCY DEVICE COVERPLATES IN PATIENT CARE AREAS. MARK INSIDES OF ALL DEVICE BOXES WITH PANEL AND CIRCUIT NUMBER.
- D. LOCATIONS OF ELECTRICAL CONNECTIONS AND LOCAL DISCONNECTS SHALL BE COORDINATED WITH MECHANICAL AND PLUMBING CONTRACTORS TO ENSURE ACCESS AND WORKING CLEARANCE IS MAINTAINED PER NEC. NOTIFY OTHER TRADES OF REQUIRED CLEARANCE AREAS TO AVOID ROUTING OF OTHER SYSTEMS IN THESE AREAS. DO NOT INSTALL ELECTRICAL EQUIPMENT OVER EQUIPMENT NAMEPLATES OR ACCESS PANELS OR THROUGH ACCESS/MAINTENANCE CLEARANCES OF EQUIPMENT BY OTHER TRADES.
- E. ALL FIRE ALARM DEVICES TO BE SIEMENS TO MATCH EXISTING. TIE INTO EXISTING SYSTEM AS REQUIRED.

TAGGED NOTES

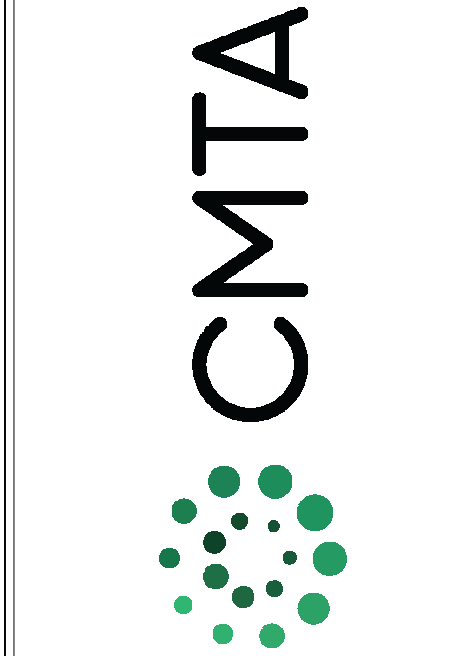
- ENC1 PROVIDE RUBBER CORD REEL (HBL125123R220M1) IN CEILING.
- ENC3 UTILIZE EXISTING IT RACK FOR NEW CAT6 CABLES.
- ENC5 PROVIDE NEW RELAY PANEL FOR MANUFACTURING LAB. REFER TO ADJACENT CONSTRUCTION LAB AND MATCH EQUIPMENT/COMPONENTS.
- ENC6 PROVIDE KEYSWITCH TO ENERGIZE/DE-ENERGIZE OUTLETS IN ROOM. REFER TO ADJACENT CONSTRUCTION LAB AND MATCH EQUIPMENT/COMPONENTS.
- ENC7 PROVIDE EPO BUTTON FOR SHUTDOWN OF RECEPTACLES IN ROOM.
- ENC8 PROVIDE 120V OUTLET FOR GOGGLE CABINET.
- ENC9 CONNECT NEW RECEPTACLES TO PREVIOUS 120V CIRCUIT.
- ENC10 EXISTING RECEPTACLE TO REMAIN, PROVIDE NEW DEVICE AND FACEPLATE.
- ENC17 PROVIDE POWER AND DATA FOR TV. COORDINATE EXACT HEIGHT AND LOCATION WITH ARCHITECT PRIOR TO ROUGH IN.
- ENC24 PROVIDE POWER FOR NEW WELDING EXHAUST.
- ENC39 PROVIDE LABEL "ALWAYS ON". PROVIDE NEW DEVICE TO MATCH NEW COLOR FOR DEVICES.
- ENC42 UTILIZE EXISTING CIRCUIT PREVIOUSLY SERVING DEMOLISHED HEATPUMP. EXTEND CONDUCTORS AND CONDUIT AS NEEDED FOR NEW LOCATION.
- ENC45 PROVIDE SURFACE MOUNT ALUMINIUM CHANNEL FOR NEW DEVICES ON WALL AND EXTEND CIRCUIT AS SEEN ON DRAWINGS.
- ENC50 RELOCATE PANEL FROM PREVIOUS ELECTRICAL ROOM 123A INTERCEPT AND EXTEND FEEDER AS REQUIRED (ASSUME 100A FEEDER) INTERCEPT ALL EXISTING TO REMAIN RECEPTACLES NOTED BY ENC10 AND EXTEND TO NEW PANEL LOCATION.
- ENC53 PANEL "MLAO" IS NOT TIED TO THE EMERGENCY SHUT-OFF SWITCHES LOCATED IN THIS ROOM. THIS PANEL FEEDS EQUIPMENT/FIXTURES THAT ARE NOT INTENDED TO BE TURNED OFF IN THE EVENT THE EMERGENCY SHUT-OFF SWITCH IS PULSED. PROVIDE 75KVA 480D TO 208Y TRANSFORMER.
- ENC58 PROVIDE 3-4/0, #2G, 2.5" CONDUIT BETWEEN TRANSFORMER AND PANEL ML.
- ENC61 TEMPORARILY REMOVE AND RECONNECT FOR HVAC UNIT REPLACEMENT.
- ENC66 PROVIDE CAT6 CABLE FOR ALL NEW NETWORK DROP FROM NEAREST RACK AS DEFINED ON PLAN. COORDINATE WITH OWNER ON RACK CABLE TYPE.
- ENC69 AS PART OF ALTERNATE, PROVIDE (3) 30A FUSES IN EXISTING 100A FUSIBLE DISCONNECT SWITCH (LABELED "ROOF CONDENSER") FOR USE AS NEW DISCONNECT SERVING MAU. SWITCH APPEARS TO BE IN THE OFF POSITION AND ASSUMED ABANDONED/AVAILABLE FOR REUSE. CONTRACTOR TO FIELD VERIFY SWITCH IS NOT IN ACTIVE USE PRIOR TO REUSE. IF SWITCH IS FOUND TO BE ENERGIZED OR IN SERVICE, DO NOT REUSE. INSTEAD CIRCUIT NEW MAU DISCONNECT TO PANEL 6H1. PROVIDED SUFFICIENT SPARE SPACES/CAPACITY EXIST. CONTACT ENGINEER IMMEDIATELY IF EXISTING SWITCH IS FOUND ENERGIZED OR IF PANEL 6H1 LACKS SUFFICIENT CAPACITY. PROVIDE (4) #6 AWG, (1) #8 AWG GROUND IN 1-1/4" CONDUIT BETWEEN PANEL AND DISCONNECT. MATCH CONDUCTOR/CONDUIT SIZE BETWEEN DISCONNECT AND MAU.
- ENC70 AS PART OF ALTERNATE, PROVIDE NEW 20A/3P BRANCH CIRCUIT FROM PANEL 6H1 TO SERVE NEW EXHAUST FAN. PROVIDE (3) #12 AWG, (1) #12 AWG GROUND IN 3/4" CONDUIT FROM PANEL TO FAN. CONTRACTOR TO FIELD VERIFY PANEL 6H1 HAS SUFFICIENT SPARE SPACES/CAPACITY (3-POLE) PRIOR TO ROUGH-IN AND NOTIFY ENGINEER IF INSUFFICIENT.

KEY PLAN



CSO

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CENTER GROVE COMMUNITY SCHOOL CORPORATION
CENTER GROVE HIGH SCHOOL
RENOVATION PROJECT - PACKAGE 2
2717 S MORGANTOWN RD
GREENWOOD, IN 46143

SCOPE DRAWINGS:

These drawings include the general scope of the project in terms of architectural design, structural, mechanical, electrical, and plumbing. The design is preliminary and subject to change. The design is not intended to be used for construction without the approval of the architect and the owner. The design is not intended to be used for construction without the approval of the architect and the owner.

REVISIONS:

1 ADDENDUM #2 08.29.2026

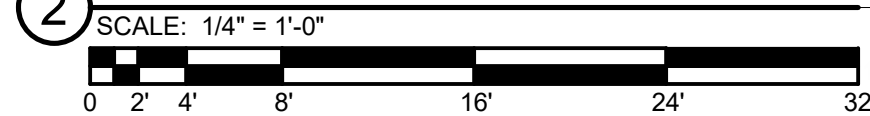
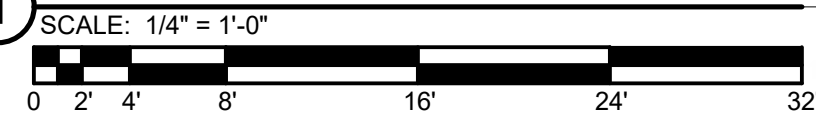
ISSUE DATE 7/30/26 DRAWN BY JA CHECKED BY JBS

DRAWING TITLE:
LOWER LEVEL ELECTRICAL NEW WORK PLANS - UNIT A - ALTERNATE 2

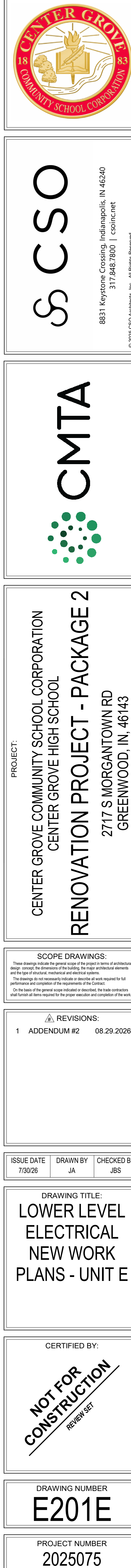
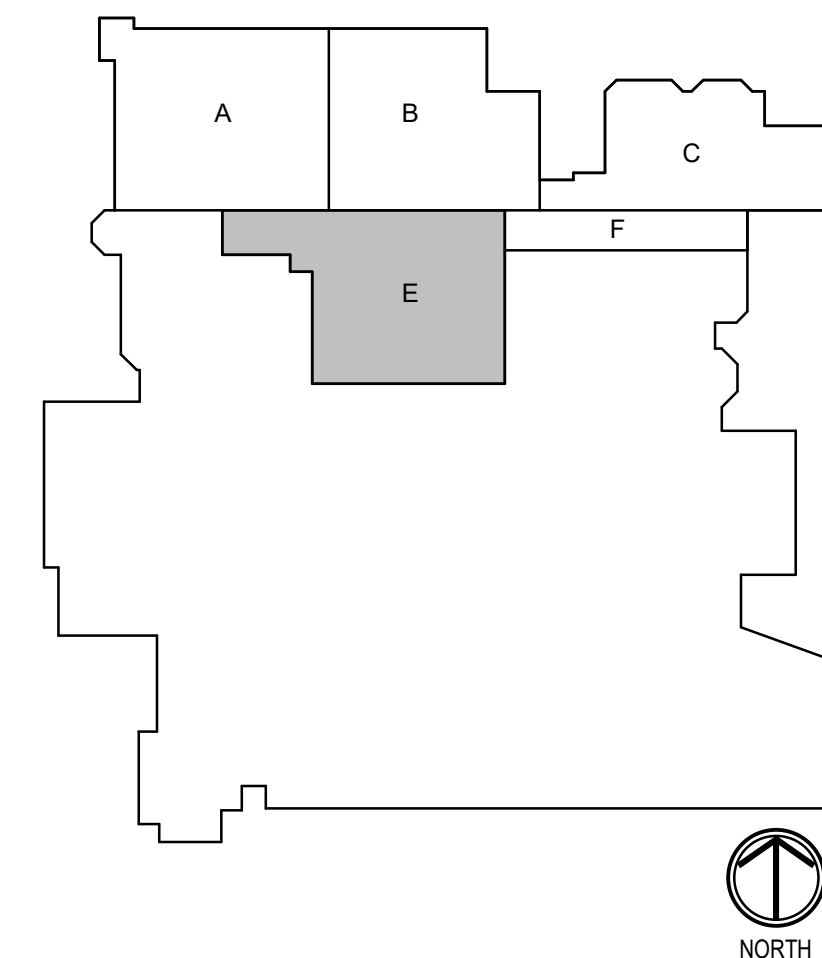
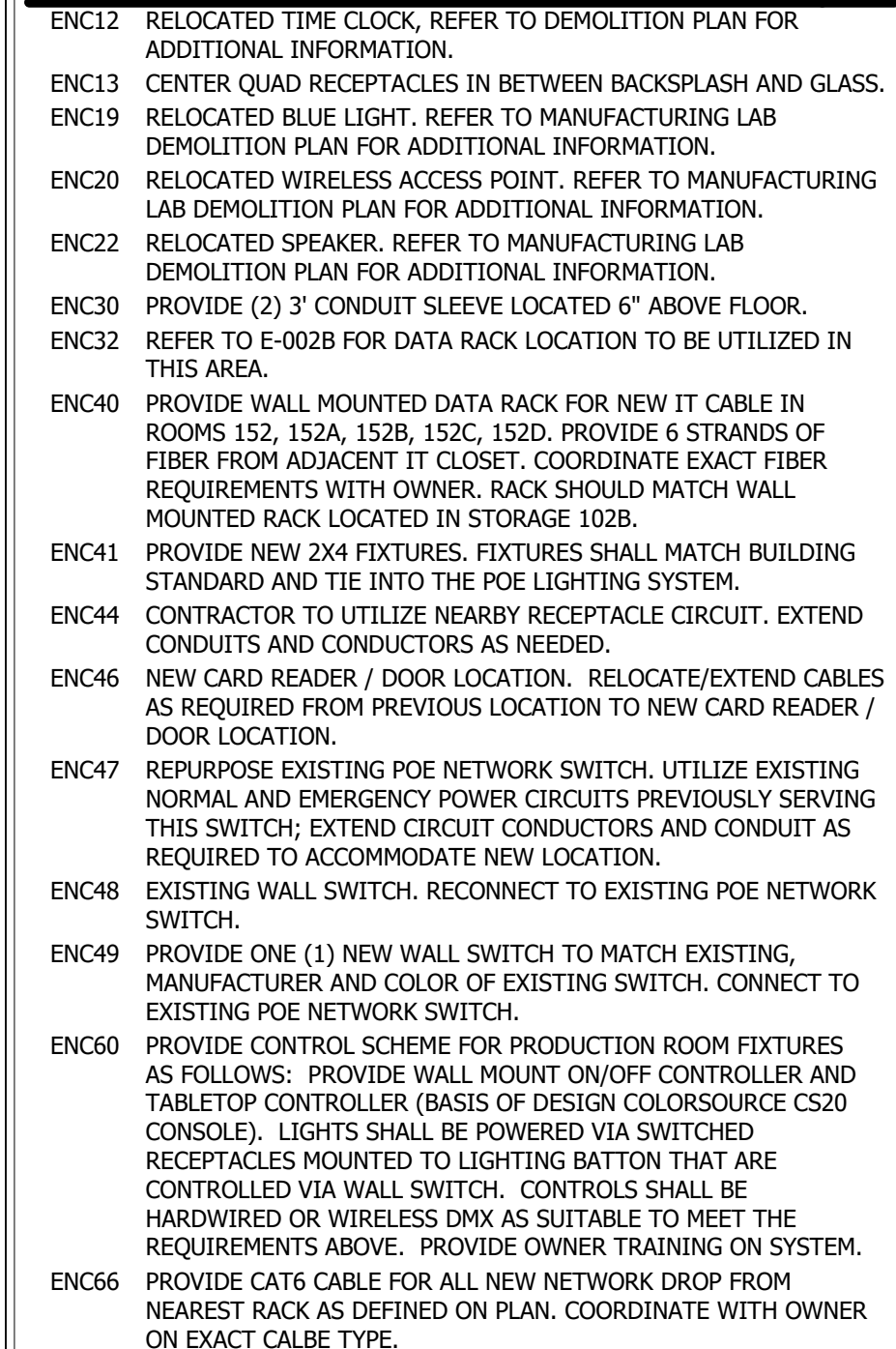
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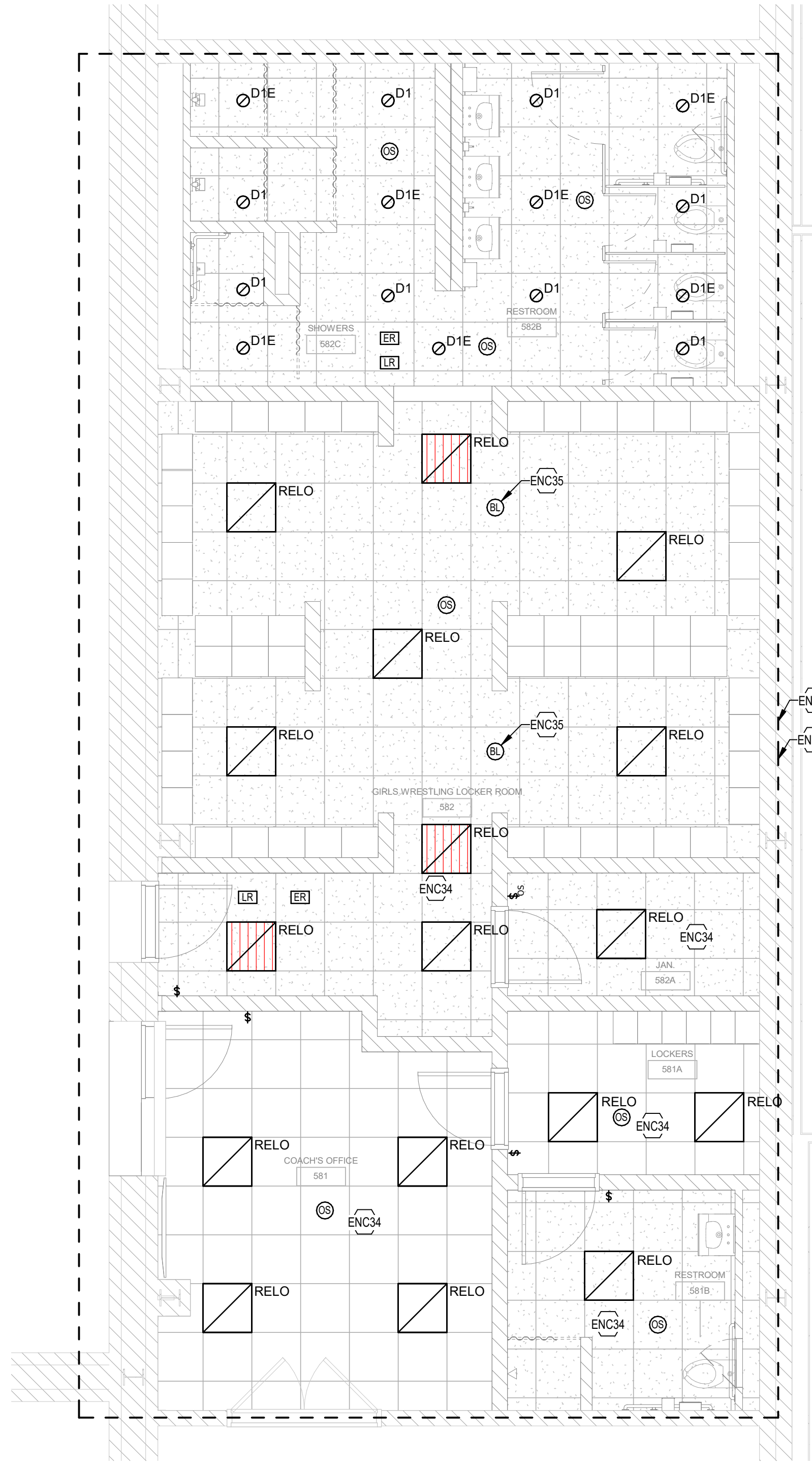
DRAWING NUMBER
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PROJECT NUMBER
2025075

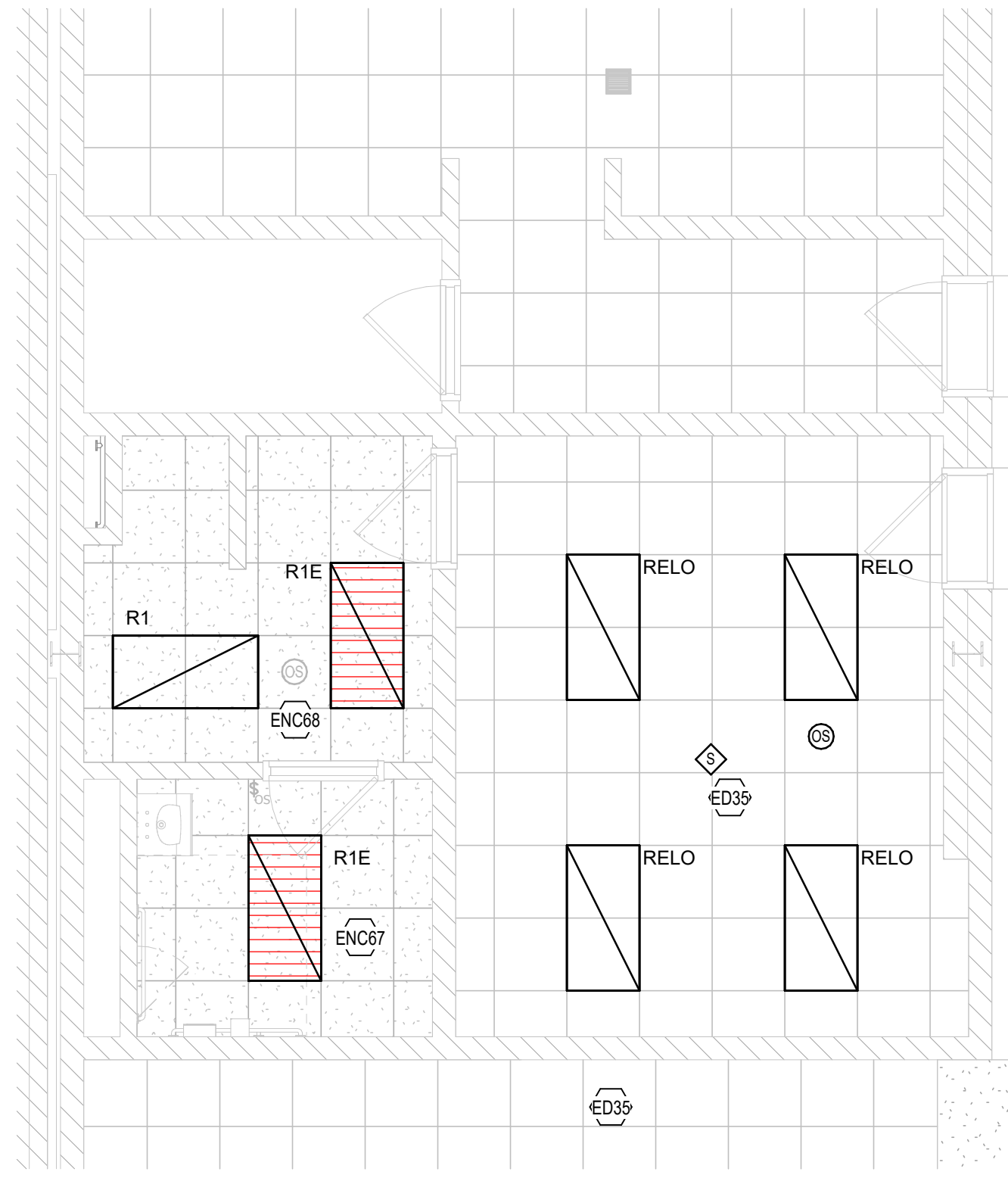
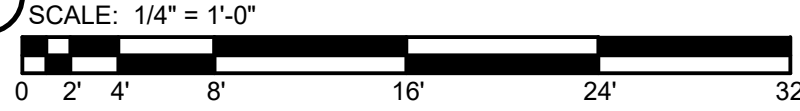


PROVIDE COMPLETE AV BROADCAST SYSTEM WITH ALL NECESSARY CABLES, CONNECTORS AND TERMINATIONS TO ALLOW FOR VIDEO PRODUCTIONS, AUDIO PRODUCTIONS AND OTHER MULTIMEDIA PRODUCTIONS. REFER TO EQUIPMENT LIST PROVIDE FOR BASIS OF DESIGN. ANY ALTERNATE PRODUCTS MUST MEET OR EXCEED THE SPECIFICATIONS OF THE ITEMS LISTED. AV CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING, INSTALLING, COMMISSIONING AND TRAINING USERS ON THE SYSTEM PRIOR TO AND FOR 36 HOURS (IN COORDINATION WITH THE OWNERS'S SCHEDULE) AFTER INSTALL WITHIN ONE YEAR OF THE SYSTEM'S OPERATION. CONTRACTOR TO PROVIDE ALL ITEMS AND COMPLETE SYSTEM AS NOTED IN AV _EQUIPMENT_ SCHEDULE UNLESS ITS NOTED "BY OTHERS"

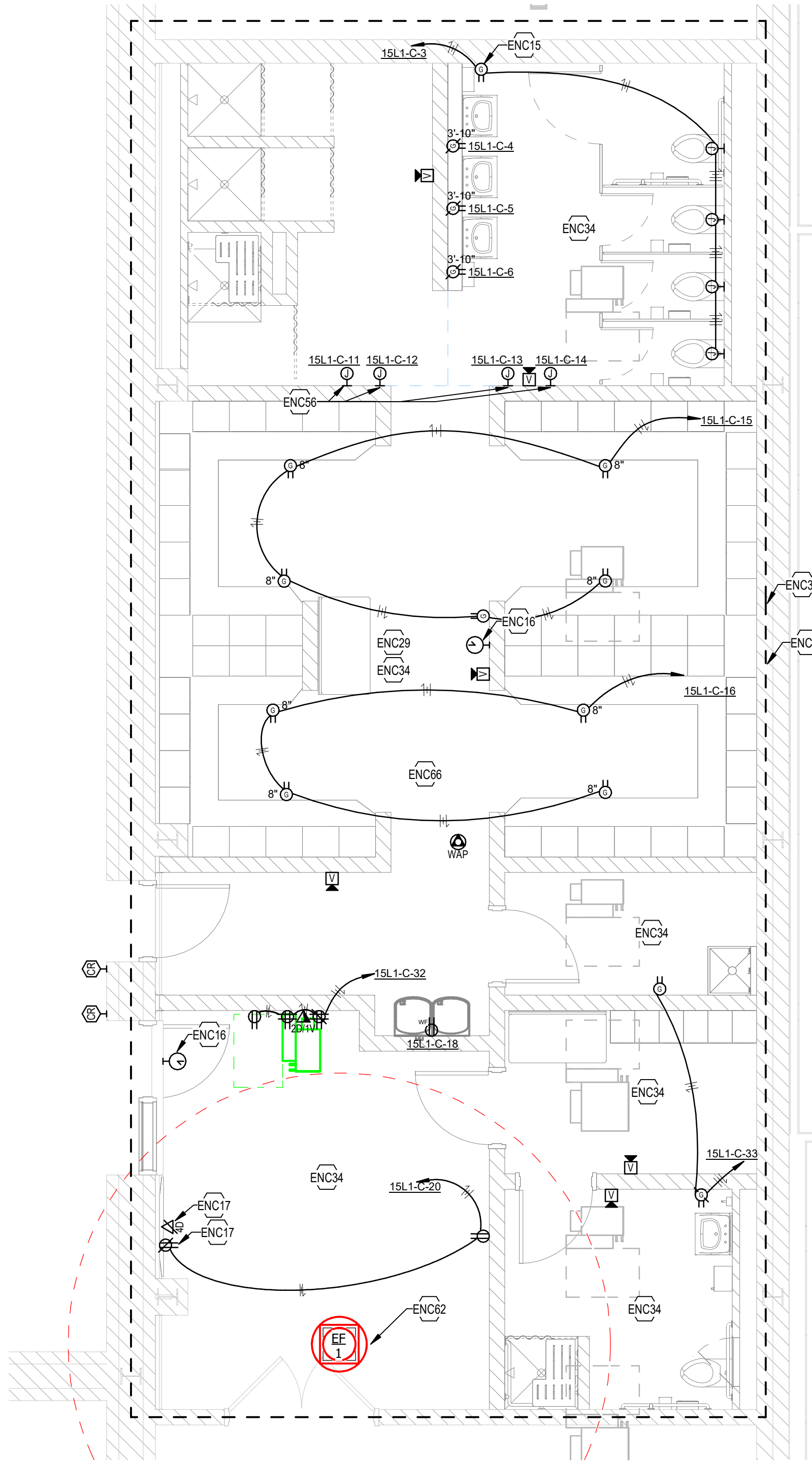




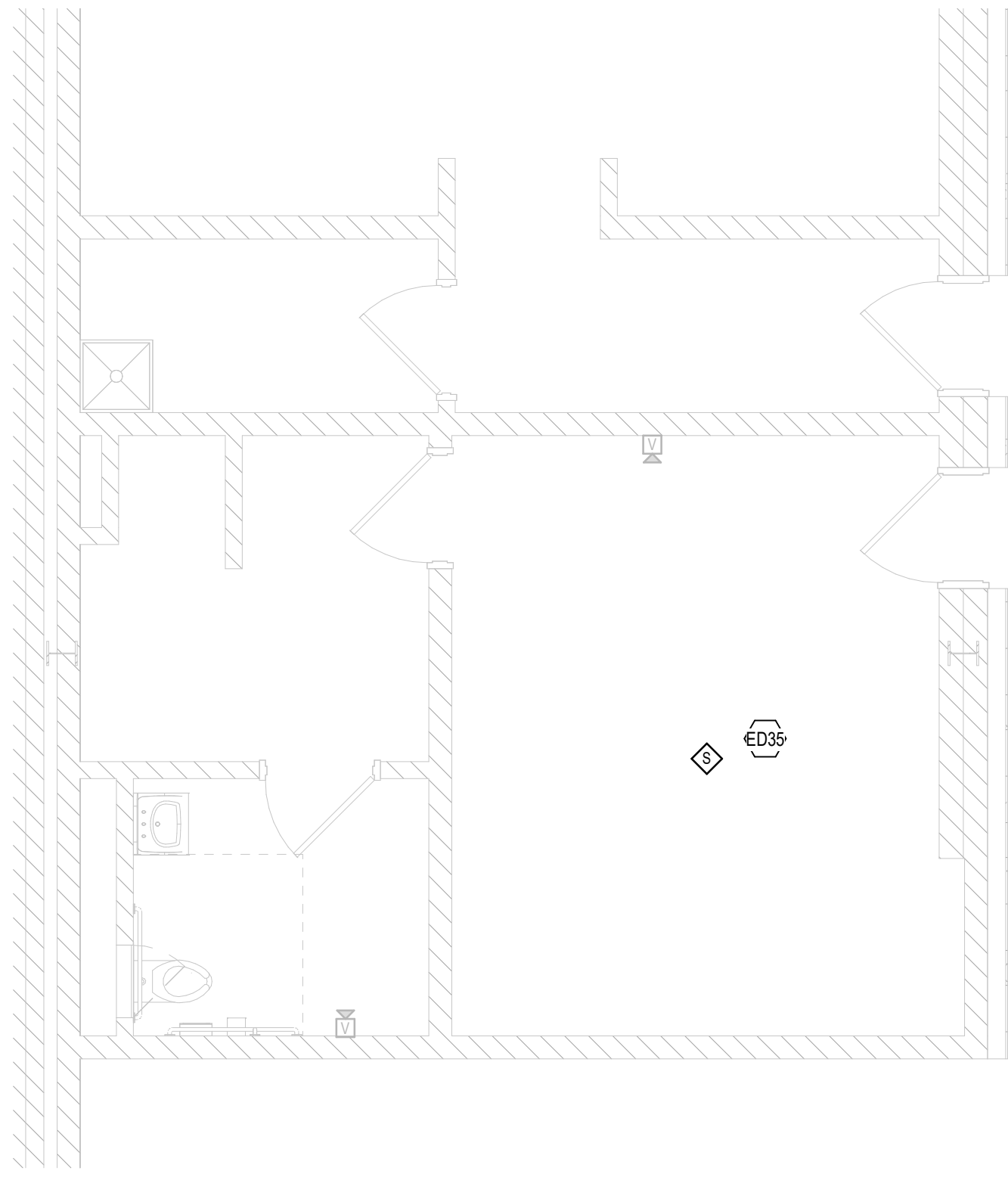
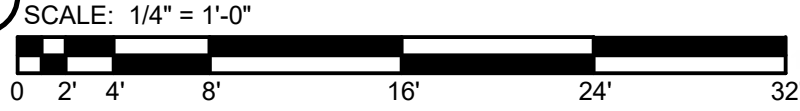
1 LIGHTING - GIRLS LOCKER ROOM - NEW WORK



4 LIGHTING - BOYS LOCKER ROOM - NEW WORK



2 POWER AND SYSTEMS - GIRLS LOCKER ROOM - NEW WORK



3 POWER AND SYSTEMS - BOYS LOCKER ROOM - NEW WORK



LIGHTING GENERAL NOTES

- REFER TO SHEET E0018 FOR SYMBOLS, ABBREVIATIONS, AND MORE INFORMATION.
- REFER TO THE ARCHITECT'S REFLECTED CEILING PLANS, ELEVATIONS, AND CASEWORK DETAILS FOR EXACT LOCATIONS OF ALL WALL AND CEILING MOUNTED ELECTRICAL DEVICES.
- FOLLOW BRANCH CIRCUITING LAY-OUT, AS INDICATED ON THE FLOOR PLANS, WITH A MAXIMUM OF THREE (3) BRANCH CIRCUITS PER HOMERUN. EACH BRANCH CIRCUIT SHALL BE PROVIDED WITH A DEDICATED NEUTRAL CONDUCTOR. DEDICATED NEUTRAL CONDUCTORS SHALL BE CONSIDERED CURRENT CARRYING. IF ADDITIONAL CONDUCTORS ARE RAN IN THE SAME CONDUIT WITH THOSE INDICATED, CONTRACTOR SHALL DERATE ALL CURRENT CARRYING CONDUCTORS PER N.E.C. #310.15(B)(3), AND UPSIZE CONDUIT AS REQUIRED PER N.E.C. #300.17 AND ANNEX C. MULTIWIRE BRANCH CIRCUITS AS DEFINED IN N.E.C. #100 / 210.4 (CIRCUITS SHARING A COMMON NEUTRAL CONDUCTOR) SHALL NOT BE PERMITTED.
- IDENTIFY THE PANEL AND CIRCUIT NUMBER FOR ALL RECEPTACLES, SWITCHES, ETC. IN AREA OF CONSTRUCTION. PROVIDE CLEAR ADHESIVE LABELS WITH BLACK LETTERING. IN HEALTHCARE FACILITIES, ENGRAVE EMERGENCY DEVICE COVERPLATES IN PATIENT CARE AREAS.
- LOCATE EXIT SIGNS FOR MAXIMUM VIEWING AREA TO IDENTIFY EGRESS PATHS AS INDICATED ON PLANS. COORDINATE LOCATIONS SUCH THAT ARCHITECTURAL FEATURES OR EQUIPMENT FROM OTHER TRADES DO NOT OBSTRUCT VIEW.
- ALL LIGHTING FIXTURE LENSES, PARABOLIC LOUVERS, DOWNLIGHTING ALZAK CONES AND "PARACUBE" LOUVERS SHALL BE HANDLED WITH COTTON GLOVES DURING INSTALLATION AND LAMPING TO AVOID FINGERPRINTS OR DIRT DEPOSITS. IT IS PREFERRED THAT FIXTURES BE SHIPPED AND INSTALLED WITH CLEAR PLASTIC BAGS TO PROTECT LOUVERS. AT CLOSE OF PROJECT, AND AFTER CONSTRUCTION AIR FILTERS ARE CHANGED, REMOVE BAGS. ANY LOUVER OR CONE SHOWING DIRT OR FINGER PRINTS SHALL BE CLEANED WITH SOLVENT RECOMMENDED BY THE MANUFACTURER, OR REPLACED AS NECESSARY IN ORDER TO TURN OVER TO THE OWNER NEW FIXTURES AT OCCUPANCY.
- RECESSED LUMINAIRES SHALL BE SECURED SUCH THAT THE FORCE REQUIRED INSERTING LAMPS, TRIMS, LENSES, LOUVERS, OR DOOR FRAMES DOES NOT SHIFT HOUSING. ALL TRIMS SHALL BE COMPLETELY FLUSH WITH FINISHED CEILINGS AT COMPLETION OF CONSTRUCTION.

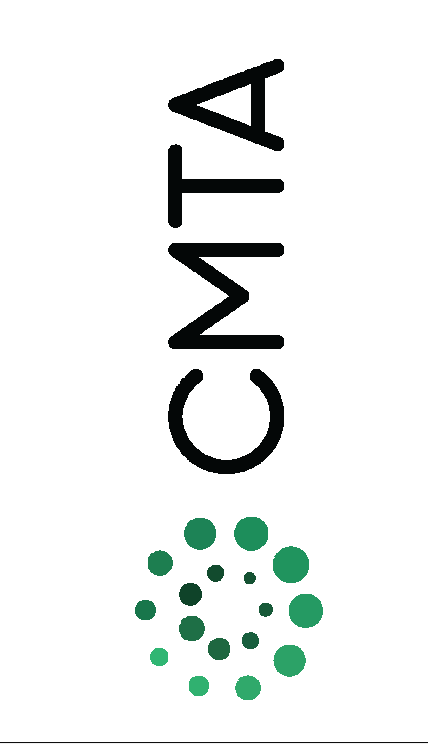
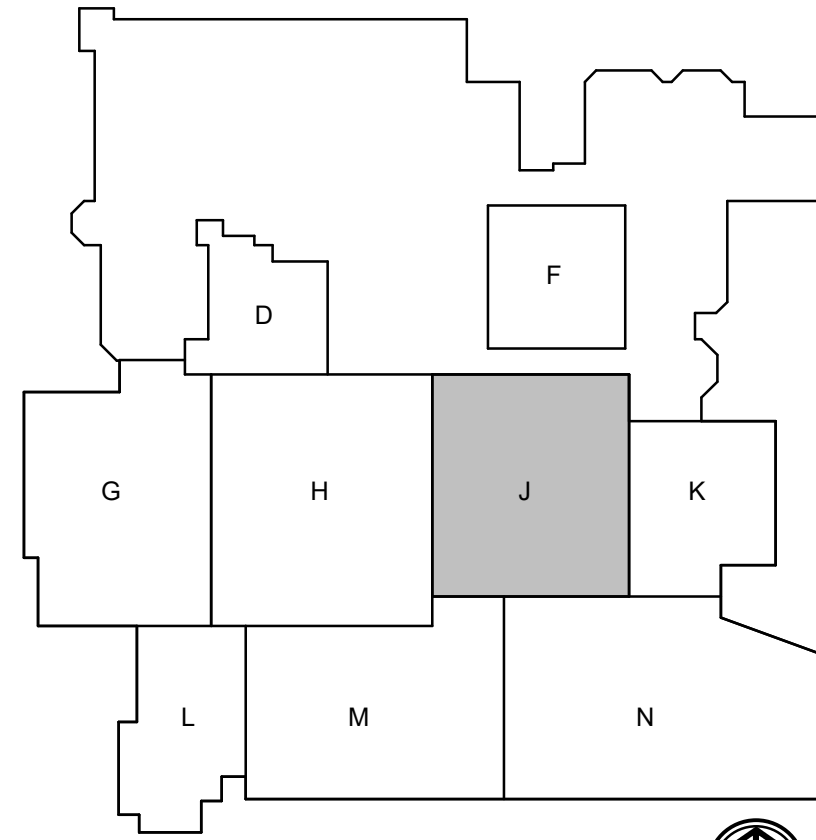
POWER - GENERAL NOTES

- REFER TO THE ARCHITECT'S REFLECTED CEILING PLANS, ELEVATIONS, AND CASEWORK DETAILS FOR EXACT LOCATIONS OF ALL WALL AND CEILING MOUNTED ELECTRICAL DEVICES.
- CONTRACTOR SHALL FOLLOW BRANCH CIRCUITING LAY-OUT, AS INDICATED ON THE FLOOR PLANS, WITH A MAXIMUM OF THREE (3) BRANCH CIRCUITS PER HOMERUN. EACH BRANCH CIRCUIT SHALL BE PROVIDED WITH A DEDICATED NEUTRAL CONDUCTOR. DEDICATED NEUTRAL CONDUCTORS SHALL BE CONSIDERED CURRENT CARRYING. IF ADDITIONAL CONDUCTORS ARE RAN IN THE SAME CONDUIT WITH THOSE INDICATED, CONTRACTOR SHALL DERATE ALL CURRENT CARRYING CONDUCTORS PER NEC 310.15(B)(3), AND UPSIZE CONDUIT AS REQUIRED PER NEC 300.17 AND ANNEX C. MULTIWIRE BRANCH CIRCUITS AS DEFINED IN NEC 100 / 210.4 (CIRCUITS SHARING A COMMON NEUTRAL CONDUCTOR) SHALL NOT BE PERMITTED.
- IDENTIFY THE PANEL AND CIRCUIT NUMBER FOR ALL RECEPTACLES, SWITCHES, ETC. IN AREA OF CONSTRUCTION. PROVIDE CLEAR ADHESIVE LABELS WITH BLACK LETTERING. IN HEALTHCARE FACILITIES, ENGRAVE EMERGENCY DEVICE COVERPLATES IN PATIENT CARE AREAS. MARK INSIDES OF ALL DEVICE BOXES WITH PANEL AND CIRCUIT NUMBER.
- LOCATIONS OF ELECTRICAL CONNECTIONS AND LOCAL DISCONNECTS SHALL BE COORDINATED WITH MECHANICAL AND PLUMBING CONTRACTORS TO ENSURE ACCESS AND WORKING CLEARANCE IS MAINTAINED PER NEC. NOTIFY OTHER TRADES OF REQUIRED CLEARANCE AREAS TO AVOID ROUTING OF OTHER SYSTEMS IN THESE AREAS. DO NOT INSTALL ELECTRICAL EQUIPMENT OVER EQUIPMENT NAMEPLATES OR ACCESS PANELS OR THROUGH ACCESS/MAINTENANCE CLEARANCES OF EQUIPMENT BY OTHER TRADES.
- ALL FIRE ALARM DEVICES TO BE SIEMENS TO MATCH EXISTING. TIE INTO EXISTING SYSTEM AS REQUIRED.

TAGGED NOTES

- ED35 TEMPORARILY REMOVE ALL CEILING DEVICES AS REQUIRED (SUCH AS LIGHTING, MOTION SENSORS, WIRELESS ACCESS POINTS, ETC...) FOR NEW SANITARY WORK ON FLOOR ABOVE. UPON COMPLETION OF WORK, REINSTALL ALL DEVICES BACK IN CEILING AT SAME LOCATION WHERE THEY WERE REMOVED.
- ENC15 CONTRACTOR TO PROVIDE NEW GFI RECEPTACLE AND FACEPLATE. UTILIZE EXISTING CIRCUIT AND JUNCTION BOX PREVIOUSLY SERVING A RECEPTACLE. REFER TO DEMOLITION PLANS FOR ADDITIONAL INFORMATION.
- ENC16 PROVIDE NEW ATLAS IED TIMECLOCK, MATCHING BUILDING STANDARD. PROVIDE WITH CAT6 CABLE TO NEAREST IT CLOSET.
- ENC17 PROVIDE POWER AND DATA FOR TV. COORDINATE EXACT HEIGHT AND LOCATION WITH ARCHITECT PRIOR TO ROUGH IN.
- ENC29 REFER TO E-0038 FOR PANEL AND DATA RACK LOCATION TO BE UTILIZED IN THIS AREA.
- ENC33 UTILIZE EXISTING LIGHTING CIRCUIT FOR ALL NEW LIGHT FIXTURES.
- ENC34 PROVIDE ALL DEVICES WITH STAINLESS STEEL FACEPLATE.
- ENC35 OWNER INSTALLED BATTERY POWERED SECURITY LIGHT.
- ENC36 TEMPORARILY REMOVE LIGHTS AND SPEAKERS AS REQUIRED FOR NEW PLUMBING INSTALLATION.
- ENC43 EXISTING LOADS TO REMAIN ON PANEL 15L1-C.
- ENC56 PROVIDE NEW HAND DRYER. HAND DRYER TO MATCH HAND DRYER IN BOYS LOCKER ROOM LOCATED IN SPACE BELOW.
- ENC62 UTILIZE EXISTING CIRCUIT PREVIOUSLY SERVING DEMOLISHED EXHAUST FAN. EXTEND CONDUCTORS AND FEEDERS AS NEEDED FOR NEW LOCATION.
- ENC66 PROVIDE CAT6 CABLE FOR ALL NEW NETWORK DROP FROM NEAREST RACK AS DEFINED ON PLAN. COORDINATE WITH OWNER ON EXACT CALBE TYPE.
- ENC67 CONNECT NEW LIGHT FIXTURE TO EXISTING SWITCH.
- ENC68 CONNECT NEW LIGHT FIXTURES TO EXISTING OCCUPANCY SENSOR.

KEY PLAN



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1 ADDENDUM #2 08.29.2026

ISSUE DATE: 7/30/26
DRAWN BY: JA
CHECKED BY: JBS

DRAWING TITLE:
UPPER LEVEL
ELECTRICAL
NEW WORK
PLANS - UNIT J

CERTIFIED BY:
NOT FOR CONSTRUCTION
REVIEW SET

DRAWING NUMBER:
E202J

PROJECT NUMBER:
2025075