ADDENDUM NO. 2

November 7, 2022

CENTRAL HIGH SCHOOL HVAC IMPROVEMENTS
2432 North Drake Road
Kalamazoo, MI, 49006

TO: ALL BIDDERS OF RECORD

****BIDS DUE DATE CHANGED TO NOVEMBER 22, 2022****

This Addendum forms a part of and modifies the Bidding Requirements, Contract Forms, Contract Conditions, the Specifications, and the Drawings dated October 3, 2022, by TowerPinkster. Acknowledge receipt of the Addendum in the space provided on the Bid Form. Failure to do so may subject the Bidder to disqualification.

This Addendum consists of Pages ADD 2-1 through ADD 2-2, RFI Log, and TowerPinkster Addendum No. 2 dated, October 28, 2022, consisting of 60 pages and Drawings: AD 102D2, A102D2, A 104, MD 100C, MD 100D1, MD 100D2, MD 102C, MD102D1, MD 102D2, MD 102E, MD150C, MD 150D1, MD 150D2, MD 150E, P 100C, P 102D2, M 102C, M 102D1, M 102D2, M 102E, M 150C, M 150D2, M 150E, M 200C, M 200D2, M 202, M 202C, M 202D1, M 202D2, M 202E, M 301, M 302, M 303, M 304, M 305, M 306, M310, M401, M 502, M 503, M 504, M 505, M 506, M 507, M601, M602, M 603, M 604, M 605, M 606, E150, E403, E501, and E502.

A. SPECIFICATION SECTION 00 00 10 – TITLE PAGE

1. All references to the **Bids Received Date** are to change from November 8, 2022, to **November 22, 2022**. Bids remain due at 2:00 PM (EST) and will be publicly read aloud immediately following the deadline.

B. SPECIFICATION SECTION 00 02 00 – NOTICE TO BIDDERS

1. All references to the **Bids Received Date** are to change from November 8, 2022, to **November 22, 2022**. Bids remain due at 2:00 PM (EST) and will be publicly read aloud immediately following the deadline.

C. SPECIFICATION SECTION 00 10 00 – INSTRUCTIONS TO BIDDERS

1. Part 1.18 Time of Commencement and Completion

   Revise the following:

1. It is anticipated that construction will start within **202** calendar days after receipt of bids.

D. SPECIFICATION SECTION 01 12 00 - MULTIPLE CONTRACT SUMMARY

1. Part 1.16 Time of Commencement and Completion

   Revise the following:

1. It is anticipated that construction will start within **202** calendar days after receipt of bids.

E. RFI LOG AND SUBSTITUTION REQUESTS

1. Refer to the attached Request for Information (RFI Log), dated November 7, 2022.

KPS Kalamazoo Central High School HVAC Improvements - Pre-Bid RFI Log
TSC PN: #
Date - 11/7/2022

RFI #	Company Submitting RFI	Date Received	RFI Description	RFI Response
1	RW Lapine	10/19/2022	Due to the complexity of the pneumatic control system currently in place, please clarify if bid package 6 will be covering the demolition and cut/cap and modifications needed to the existing system	Demolition of the pneumatics in the areas of work is required. The intent is to remove all pneumatics in units C, D1, D2, and E with the exception of the boiler room. Demoltion of pneumatic system will be by Controls Contractor.
2	RW Lapine	10/19/2022	Equipment schedules for the project do not coincide with the drawings for actual hydronic flow rates on equipment throughout multiple drawings and equipment types. Please clarify actual hydronic flow rates required. This is seen throughout fin tube, cabinet heaters, convectors etc.	Refer to Addendum 2
3	RW Lapine	10/19/2022	M305 Detail 2 appears to be shown incomplete. Piping has no labels on some, no sizes on others, and no system types. Please advise	Refer to Addendum 2
4	RW Lapine	10/19/2022	Drawing M202D1 has numerous piping branches as well as mains without line sizes. Please advise. Branches noted - heating coil 505, FR-508, FR-506, and mains above Vestibule 24 have no designated sizing	Refer to Addendum 2
5	RW Lapine	10/19/2022	Drawing M202C indicates no piping sizes on the chilled water return line in the corridor headed north to unit D2. Mains are depicted as continuation on M202C drawing, but they appear to be dead ends within the lower fan room without pipe sizing as well. This is shown in detail 2 Print M301	Refer to Addendum 2
6	RW Lapine	10/19/2022	Heating supply and Heating return are depicted in detail 2 Print M301 coming from unit C are not indicated where to be routed for tie in to the existing system. Piping appears to be dead ended within the mechanical space. Please clarify	Refer to Addendum 2
7	RW Lapine	10/19/2022	M301 Upper fan room detail 3-200 shows 4" HS, 4" HR, 4"CWR, 4" CWS turning down within the upper right hand corner. Are we to assume 4" connections continued through drawing M202 in the office 419 to the connecting corridor to Mechanical room 423? No line sizes are noted on these drawings. Please clarify.	Refer to Addendum 2
8	RW Lapine	10/19/2022	Drawing M200C, plan southeast indicates the junction of unit C and F zones. Upon site visit, Unit F is fed from these steam lines. Are we to reconnect or abandon these branches for the project? Please clarify	Refer to Addendum 2
9	RW Lapine	10/20/2022	Pump details. There are no details for base mounted pumps. Will this be issued in the addendum? Please advise	Refer to Addendum 2
10	RW Lapine	10/20/2022	Steam, steam condensate, chilled water supply, and chilled water return all appear to be entering the boiler room via a tunnel on drawing M200, M200D2, M202D2. There isn't a noted point of connection, or detail on location of tie in associated with these 4 mains. Is the intent to create an isolation point with flanges and valves on or near the risers, or within the boiler room space? Please advise	Refer to Addendum 2
11	RW Lapine	10/20/2022	with indicated continuation. Are these pipe sizes correct? Specifically the 6" condensate, as it is being pumped from CR-1 and CR-2. There isn't a noted point of connection, or detail on location of tie in associated with these 4 mains. Is the intent to create an isolation point with flanges and valves? Please advise.	Refer to Addendum 2
12	RW Lapine	10/20/2022	M200C print indicates 8" Steam, 2-1/2" Steam condensate, 8" Chilled water supply, and 8" Chilled Water return entering unit B by what appears to be above the tunnels within the connecting corridor. Is this exposed or above ceiling space? There isn't a noted point of connection, or detail on location of tie in associated with these 4 mains. Is the intent to create an isolation point with flanges and valves? Please advise.	Refer to Addendum 2
13	RW Lapine	10/20/2022	Drawing M200C indicates CR-2 in the tunnel on the south end of the building. Drawing M200D2 indicates another CR-2 on the north end of unit D2 as well as CR-1 on the south end of unit D2. There are no scheduled items referencing condensate receivers. M506 shows a detail on condensate receiver piping and notes CR-1, but not CR-2. Please advise.	Refer to Addendum 2

14	RW Lapine	10/20/2022	M202E print within classroom 540 shows VUV-540. No piping is shown servicing this unit. Please indicate connection points to the system and sizing needed	Refer to Addendum 2
15	RW Lapine	10/21/2022	Expansion joints and anchorage points. Specifications state manufacturers and types, but drawings indicate no expansion or anchorage points for any of the hydronic heating lines, any steam condensate or steam mains within the project. Please advise	Expansion of steam lines is intended to be deligated design, to contractor is responsible for achorage points and expansion compensation. Further explaination with be addressed in Addendum 2.
16	RW Lapine	10/21/2022	Radiant fin tube. Details shown on M505 depict single row radiant fin tube, but all Finned tube scheduled is 2 row design. Please clarify and/or provide a detail for 2 row finned tube panels.	Detail shows an optional return line with in the enclosure for the contractors convinience
17	RW Lapine	10/21/2022	M506 drawing shows AHU heating coil piping detail. The detail notes accessible above ceilings, and also notes dropping pipes in brick columns which I believe refers to HUV items. Please advise.	Refer to Addendum 2
18	RW Lapine	10/21/2022	There is no piping detail for Horizontal univents. Please provide appropriate piping schematic/detail.	Refer to Addendum 2
19	RW Lapine	10/21/2022	Drawing M200D2 shows UH-3 in Receiving 413 without any piping serving it. There is also no piping detail for these unit heaters as well. Please advise.	Refer to Addendum 2
20	Havel	10/24/2022	Regarding bidding category 06 – could you please provide the control drawings for the pre-purchased equipment: AHUs, 18, 19, and 20. The control drawings provided in the plans include AHUs 3, 4, 5, 7 and RTU-500, but not the other AHUs.	Refer to Addendum 2
21	Havel	10/24/2022	Could you also please provide the contractor who was awarded the contract to pre-purchase AHUs 18, 19, and 20 so we may receive the submittals for those units as well.	Carrier will be providing Air Handling Units
22	RW Lapine	10/25/2022	In spec section 230700 HVAC Insulation, there is nothing mentioned for duct insulation. Can you please confirm that duct is to be insulated, per the standard?	Refer to Addendum 2
23	RW Lapine	10/25/2022	Please clarify note 25 on drawing MD102D2. We are not finding where these valves are noted to be replaced on the drawings with new valves?	Refer to Addendum 2
24	RW Lapine	10/25/2022	Please clarify note 23 on drawing MD100D2. We are not finding where these valves are noted to be replaced on the drawings with new valves?	Bottom row of glazing shall be insulated metal panel, custom color to match existing. Glazed into the storefront system. See specifications.
25	Midwest Glass	11/2/2022	Type 2 and 3 Frames on A501 bottom glass is that to be ISP-1 or should this be insulated metal panel framed into the storefront?	No specific threshold specified. Clear anodized aluminum and ADA complant.
26	Midwest Glass	11/2/2022	What is the ADA threshold type for entrance 25A?	

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ADDENDUM NO. 2

DATE OF ISSUANCE:	**October 28th, 2022**
PROJECT:	**Kalamazoo Central High School -Mechanical Upgrades** **2432 N Drake RD** **Kalamazoo, MI 49009**
OWNER:	**Kalamazoo Public Schools**
ARCHITECT'S PROJECT NO.:	**21-806.00**
ORIGINAL BID ISSUE DATE:	**September 23rd, 2022**

SCOPE OF WORK

This Addendum includes changes to, or clarifications of, the original Bidding Documents and any previously issued addenda, and shall be included in the Bid. All of these Addendum items form a part of the Contract Documents. The Bidder shall acknowledge receipt of this Addendum in the appropriate space provided on the Bid Form. Failure to do so may result in disqualification of the Bid.

DOCUMENTS INCLUDED IN THIS ADDENDUM

This Addendum includes **5 pages** of text and the following documents:

- Bidding Documents: **None**
- Contract Conditions: **None**
- Specification Sections: **None**
- Drawings: **AD 102D2, A102D2, A 104, MD 100C, MD 100D1, MD 100D2, MD 102C, MD102D1, MD 102D2, MD 102E, MD150C, MD 150D1, MD 150D2, MD 150E, P 100C, P 102D2, M 102C, M 102D1, M 102D2, M 102E, M 150C, M 150D2, M 150E, M 200C, M 200D2, M 202, M 202C, M 202D1, M 202D2, M 202E, M 301, M 302, M 303, M 304, M 305, M 306, M310, M401, M 502, M 503, M 504, M 505, M 506, M 507, M601, M602, M 603, M 604, M 605, M 606, E150, E403, E501, and E502**

CHANGES TO PREVIOUSLY ISSUED ADDENDA

None

CHANGES TO BIDDING REQUIREMENTS

None

CHANGES TO CONTRACT CONDITIONS

None

CHANGES TO SPECIFICATIONS

ADD-2 Item No. S-1 - Add Aaon to Available Manufacturers

Refer to Specification Section: 23 7413

Add Aaon to the list of available manufacturers of RTUs

ADD-2 Item No. S-2 - Add Daikin to Available Manufacturers

Refer to Specification Section: 23 8126

Add Daikin to the list of available mini-split systems.

ADD-2 Item No. S-3 - Duct Insulation Schedule

Add the following to section 23 0700.

1.1 DUCT INSULATION SCHEDULE, GENERAL

Plenums and Ducts Requiring Insulation: Insulate the following in accordance with insulation schedule:

1. **Supply air.**
2. **Outdoor air.**
3. **Return air.**
4. **Relief air.**
5. **Duct mounted reheat coils.**
6. **Slot and linear diffuser plenums.**
7. **Outdoor air to horizontal unit ventilators.**

Items Not Insulated:

8. **Factory-insulated flexible ducts.**
9. **Factory-insulated plenums and casings, except as indicated.**
10. **Flexible connectors.**
11. **Vibration-control devices.**
12. **Factory-insulated access panels and doors.**
13. **Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.**
14. **Exposed return metal ducts within rooms they are serving except mechanical rooms.**
15. **Exposed supply metal ducts within rooms they are serving down stream of duct mounted coils and VAV terminal units except mechanical rooms.**
16. **Fibrous-glass ducts.**
17. **Volume control balancing damper lever handles.**

Definitions:

18. **Concealed: Above solid ceiling and not visible from below.**
19. **Exposed: In rooms with no ceilings or with partial ceilings (i.e. "cloud type ceilings") and visible from below.**
20. **Finished Spaces: Spaces with room finishes accessible by building occupants.**
21. **Unfinished Spaces: Spaces with no or limited room finishes accessible by building maintenance and support staff only.**

ADD-2 Item No. S-4 - Add Guardian Glass Industries SN-68

Refer to Specification Section: 08 8000 (not reissued)

Add Guardian Glass Industries: SN-68 to the list of available manufacturers of Insulating Glass Units.

Solar-Control Low-E Insulating-Glass Units IG-1:

Products:

a. AFG Industries: Comfort Ti-AC 36.
b. Cardinal Glass Industries: LoE-172.
c. Guardian Industries Corp.: NP-61.
d. Interpane: ILE-174.
e. PPG: Solarban 60.
f. Guardian Industries Corp.: SN-68

CHANGES TO DRAWINGS

ADD-2 Item No. D-1 - HVAC Piping Thermal Compensation

Refer to Sheet(s): HVAC Piping Drawings

Steam and condensate piping shall have anchor points and thermal expansion compensation devices, both of which are specified in Section 23 0516 as delegated design. The contractor is responsible for placement of both anchors and compensators to accommodate the thermal expansion.

ADD-2 Item No. D-2 - Re-issued Sheets

Refer to Sheet(s):M202C, M202D2, M202, M202C, M202D1, M202D2, M202E, M301, M 303, M601, M602, M 603, M 604, M 605, M606.

The above sheets have been re-issued in their entirety.

ADD-2 Item No. D-3 - Revised Sheets

Refer to Sheet(s): MD 100C, MD 100D1, MD 100D2, MD 102C, MD102D1, MD 102D2, MD 102E, P 100C, P 102D2, MD150C, MD 150D1, MD 150D2, MD 150E, M 102C, M 102D1, M 102D2, M 102E, M 150C, M 150D2, M 150E, M 302, M 304, M 305, M 306, M 310, M 401, M 501, M 502, M 503, M 504, M 505, M 506

The above sheets have been revised. Refer to the bubbled areas for revisions.

ADD-2 Item No. D-4 - Newly Issued Sheets

Refer to Sheet(s): P 100C, P 102D2, M 507, M 604, M 605, M606

The above sheets are issued for the first time.

ADD-2 Item No. D-5 - Revise Electrical Feed to AHU-19

Refer to Sheet(s): E150, E403, and E501

Added two additional connections to AHU-19. Revised electrical HVAC feeder schedule and 5Z panelboard schedule.

ADD-2 Item No. D-6 - Revise Electrical Connections in Mechanical 554

Refer to Sheet(s): E150, E403, E501, and 502

Added circuit for receptacles to 5ZL-21

Revised pump locations to coordinate with mechanical

Removed connection to pumps P1 and P2 to coordinate with mechanical.

ADD-2 Item No. D-7 - Added Through Roof Penetrations

Refer to Sheet(s): A 104 (reissued)

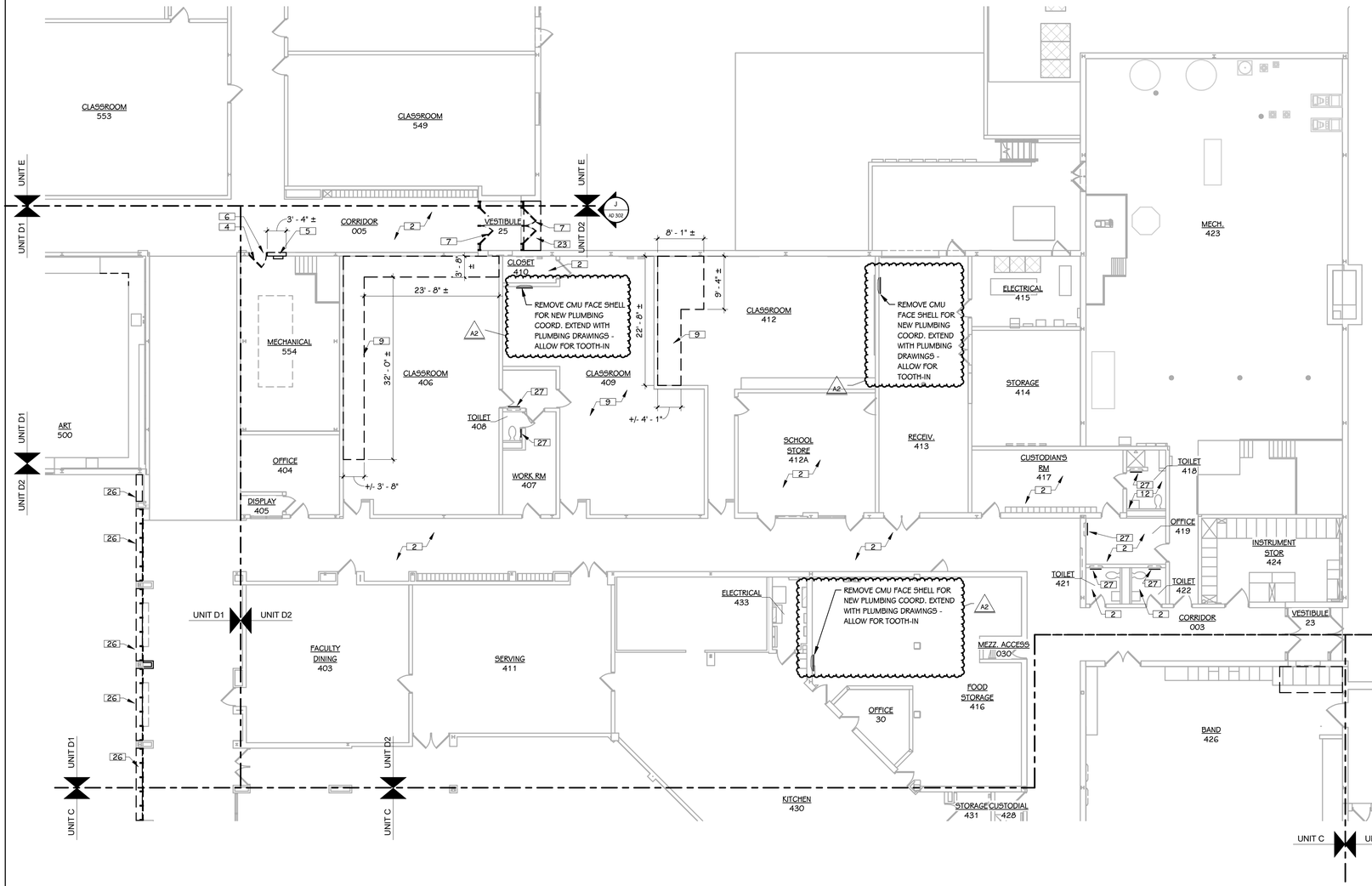
Added two roof penetration demo, flashing, steel framing, etc.

ADD-2 Item No. D-8 - Added Multiple Pipe Routings Through Walls

Refer to Sheet(s): AD 102D2, & A 102D2 (reissued)

Added multiple face shell removal and reinstallation of new. Tooth-in, prime and paint to match existing.

END OF ADDENDUM.



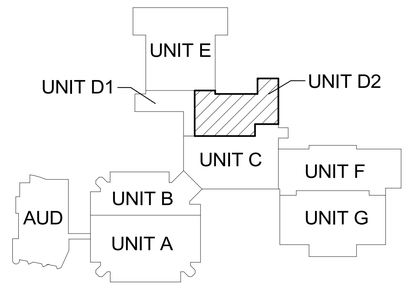
UPPER SECOND FLOOR DEMOLITION PLAN - UNIT D2

3/32" = 1'-0"

KEYED NOTES - DEMOLITION

1. REMOVE AND DISCARD ALUMINUM STOREFRONT SYSTEM - PREPARE OPENING FOR NEW SYSTEM
2. REMOVE AND SALVAGE CEILING TILE AND GRID ENTIRE ROOM OR TO EXTEND SHOWN ON PLANS FOR WORK ABOVE CEILING - PROTECT AND STORE THROUGHOUT CONSTRUCTION - REFER TO OTHER DISCIPLINES FOR ADDITIONAL CEILING FIXTURE SCOPE INFORMATION.
3. REMOVE AND DISCARD ALUMINUM LOUVER SYSTEM - PREPARE OPENING FOR NEW LOUVER
4. REMOVE AND DISCARD DOOR, FRAME AND HARDWARE
5. REMOVE AND DISCARD PORTION OF WALL - HEIGHT 7'-4" - COORDINATE WITH NEW CONSTRUCTION
6. REMOVE AND DISCARD LINTEL - PREPARE OPENING FOR NEW LINTEL - COORDINATE WITH NEW CONSTRUCTION - REFER TO STRUCTURAL
7. REMOVE AND SALVAGE ALUMINUM DOOR, FRAME, SIDELITE, TRANSOM AND DOOR HARDWARE FOR REUSE - STORE AND PROTECT THROUGHOUT CONSTRUCTION
8. REMOVE AND DISCARD PORTION OF PLASTER CEILING AND FRAMING FOR WORK ABOVE THE CEILING - COORDINATE WITH MECHANICAL
9. REMOVE AND SALVAGE CEILING TILES AS REQUIRED FOR WORK ABOVE CEILING - CEILING GRID TO REMAIN - PROTECT AND STORE THROUGHOUT CONSTRUCTION
10. EXISTING HOUSEKEEPING PAD TO REMAIN. GRIND EXISTING BOLDS FLUSH AND SMOOTH WITH CONCRETE PAD. REFER TO MECHANICAL DRAWINGS FOR EQUIPMENT REMOVAL.
11. REMOVE AND SALVAGE BRICK FOR REUSE - DISCARD CMU - PREPARE OPENING FOR NEW LOUVER
12. REMOVE AND DISCARD PLASTER CELING AND ALL ASSOCIATED FRAMING
13. REMOVE AND DISCARD PORTION OF EXISTING SHELVING OR CASEWORK - COORDINATE WITH NEW CONSTRUCTION
14. REMOVE AND DISCARD PORTION OF CMU WALL FOR NEW LOUVER AND DUCTWORK - COORDINATE WITH NEW CONSTRUCTION AND MECHANICAL. ALLOW FOR TOOTH-IN OF SURROUNDING CMU.
15. REMOVE AND DISCARD MASONRY CAVITY WALL CONSTRUCTION
16. REMOVE AND DISCARD CONCRETE FOUNDATION WALL AND FOUNDATIONS
17. REMOVE AND DISCARD PORTION OF THE PRECAST AGGREGATE PANEL AND SUPPORT SYSTEM
18. REMOVE AND DISCARD PORTION OF METAL FASCIA AND BLOCKING - COORDINATE WITH NEW CONSTRUCTION
19. REMOVE AND DISCARD EXISTING TACK BOARDS AND PREP WALL FOR NEW FINISH.
20. REMOVE AND SALVAGE BRICK PIER FOR REUSE ELSEWHERE IN THE PROJECT FULL HEIGHT FROM TOP OF TERRAZZO BASE TO DECK ABOVE. SEE DETAILS. BRICK REMOVAL TO FOLLOW TOOTH-IN PATTERN.
21. REMOVE AND DISCARD EXISTING SECTION OF WALL AS REQUIRED FOR NEW LOUVER AND LINTEL - REFER TO MECHANICAL AND STRUCTURAL DRAWINGS
22. REMOVE AND SALVAGE EXISTING SOUND PANELS FOR REUSE THIS AREA.
23. REMOVE AND DISCARD PORTION OF W.P. CEMENT PLASTER SOFFIT AND FRAMING FOR WORK ABOVE THE SOFFIT
24. REMOVE AND SALVAGE CASEWORK - COORDINATE WITH NEW CONSTRUCTION
25. REMOVE AND SALVAGE CABINET FOR REUSE
26. REMOVE AND DISCARD PLASTER SOFFIT AND FRAMING AND PREP FOR NEW
27. AT EXISTING REMOVED RECESSED CABINET HEATHER REMOVE SECTION OF WALL AT BOTTOM OF EXISTING OPENING AS REQUIRED FOR NEW MECHANICAL CABINET HEATHER. PREP NEW OPENING FOR NEW CABINET HEATHER.

KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN
SCALE: NO SCALE

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ADDENDUM No. 2 OCTOBER 28, 2022

ISSUED FOR **DATE**

PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

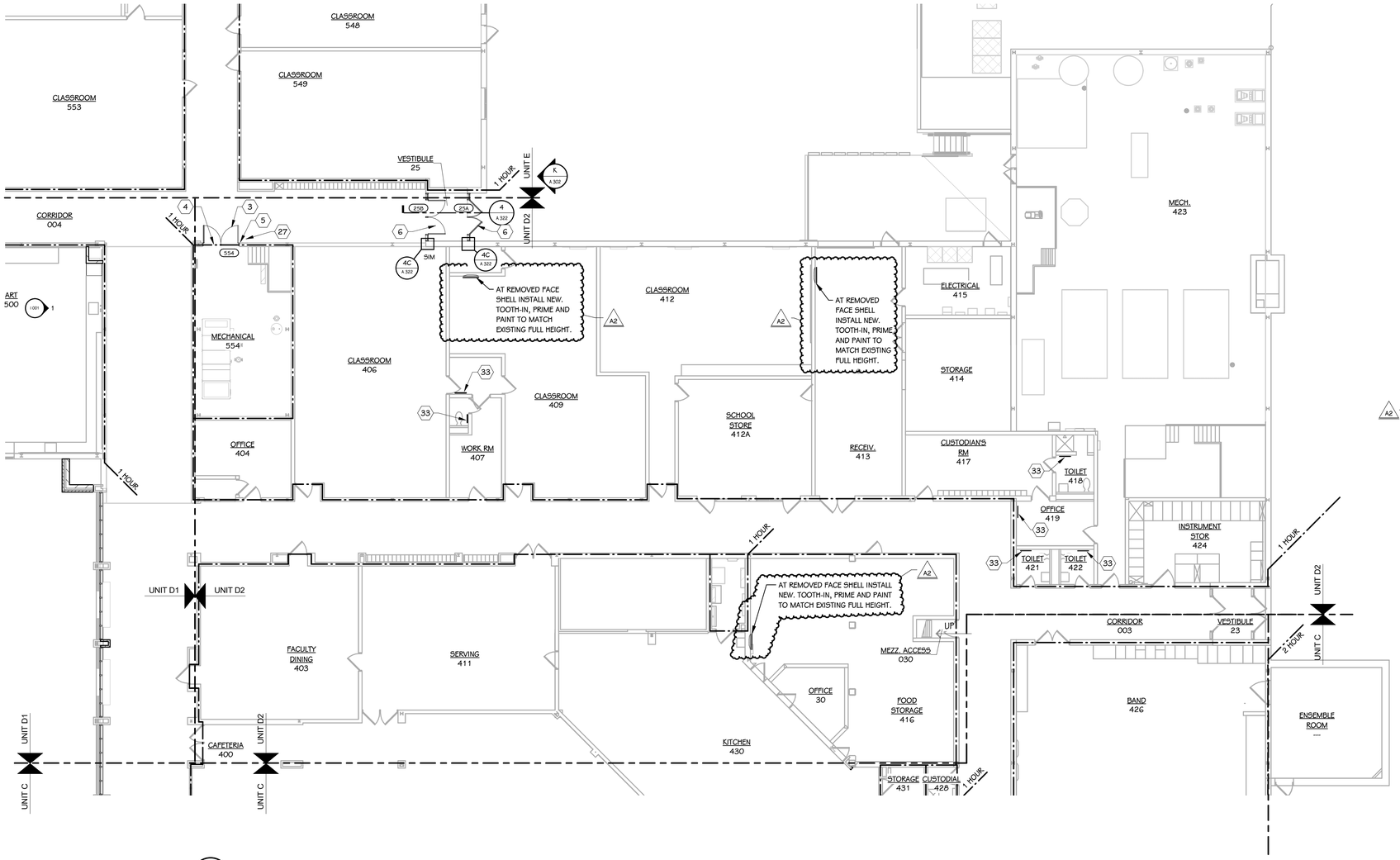
OWNER
KALAMAZOO PUBLIC SCHOOLS

Kalamazoo, Michigan

SHEET TITLE
UPPER SECOND FLOOR DEMOLITION PLAN - UNIT D2

DATE
OCTOBER 3, 2022

SHEET NUMBER
AD 102D2
21-806.00



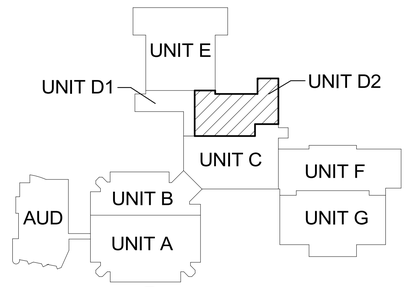
SECOND FLOOR PLAN - UNIT D2

3/32" = 1'-0"

KEYED NOTES - NEW CONSTRUCTION

1. NEW CLEAR ANODIZED ALUMINUM STOREFRONT - MATCH EXISTING MULLION LOCATIONS.
2. REINSTALL SALVAGED CEILING TILE AND GRID SYSTEM AT EXISTING HEIGHT AND LAYOUT.
3. REINSTALL SALVAGED CASEWORK.
4. NEW STEEL LINTEL, PRIME AND PAINT EXPOSED TO MATCH WALL.
5. PRIME AND PAINT NEW WALL TO MATCH EXISTING. ADD WALL BASE TO MATCH EXISTING.
6. REINSTALL SALVAGED DOOR, FRAME, SIDELITE, TRANSOM AND HARDWARE.
7. NEW CLEAR ANODIZED ALUMINUM LOUVER SYSTEM - COORDINATE WITH MECHANICAL. WITH BIRD SCREEN.
8. NEW PLASTER CEILING AND SUSPENDED FRAMING SYSTEM - PAINT TO MATCH EXISTING CEILING. PAINT ENTIRE CEILING IF ONLY PARTIAL CEILING REPLACEMENT.
9. REINSTALL SALVAGED CEILING TILE IN EXISTING GRID.
10. TOOTH-IN SALVAGED BRICK AND CMU AT EXISTING DUCT PENETRATION.
11. 3" INSULATED METAL BLANKOFF PANEL (BLACK) - CAULK ALL SIDES TO EXISTING WALL CONSTRUCTION. SECURE WITH CLIP ANGLES INTO MASONRY.
12. NEW 24x24 ROOF OPENING, STRUCTURAL FRAMING, ROOF CURB, PATCH ROOF WEATHER TIGHT AND MATCH EXISTING CONDITIONS - COORDINATE WITH MECHANICAL.
13. NEW ROOF TOP UNIT (SEE MECHANICAL). PROVIDE NEW ROOF OPENINGS, ROOF CURB AND PREP FOR NEW RTU. SEE MECHANICAL AND STRUCTURAL FOR MORE INFORMATION.
14. NEW RETURN GRILLE IN NEW 4" CMU WALL. TOOTH CMU WALL INTO EXISTING. BULL NOSE REQUIRED. - SEE MECH FOR ADDITIONAL INFO. PROVIDE STEEL LINTEL PER STRUCTURAL DRAWINGS ABOVE NEW GRILLE. PRIME AND PAINT NEW WALL TO MATCH EXISTING.
15. NEW CAVITY WALL - BRICK, 1 3/4" AIR GAP, 3" RIGID INSULATION - MATCH EXISTING BRICK COLOR.
16. NEW 6" METAL FASCIA OVER TREATED WOOD 2X BLOCKING - SEE DETAILS.
17. NEW EPDM ROOF MEMBRANE WITH 1 1/2" RIGID INSULATION ON 1 1/2" METAL DECK - WRAP MEMBRANE UP AND OVER PARAPET.
18. INFILL EXISTING OPENING THROUGH EXISTING CMU WALL ABOVE CEILING. APPROX. OPENING SIZE IS 10" DIA. INFILL TO MATCH EXISTING CONSTRUCTION. - REFER TO MECH. DWGS. FOR MORE INFORMATION.
19. NEW 4" CMU WALL FULL HEIGHT WITH BULLNOSE CORNER. WITH NEW RETURN GRILL (SEE MECHANICAL DRAWINGS). PROVIDE STEEL LINTEL PER STRUCTURAL DRAWINGS ABOVE NEW GRILLE. PRIME AND PAINT NEW WALL TO MATCH EXISTING.
20. NEW LOUVER IN EXISTING WALL. SEE STRUCTURAL FOR LINTEL INFORMATION. SEE MECHANICAL FOR MORE INFORMATION.
21. NEW MECH. CONDENSING UNIT WITH PIPE PENETRATIONS THROUGH ROOF SET NEW CONDENSING UNIT ON SLIP SHEET, SLIP SHEET TO MATCH EXISTING ROOF. PATCH ROOF WEATHER TIGHT AND MATCH EXISTING CONDITIONS - COORDINATE WITH MECHANICAL.
22. NEW EXHAUST FAN ON EXISTING ROOF CURB - SEE MECH. FOR MORE INFORMATION.
23. EXISTING MECHANICAL EQUIPMENT TO REMAIN - SEE MECHANICAL DRAWINGS FOR MORE INFORMATION.
24. NEW RELIEF HOOD ON NEW ROOF CURB WITH EXISTING OPENING THROUGH ROOF. PATCH WALL WEATHER TIGHT.
25. NEW AIR INTAKE OR RELIEF HOOD ON NEW ROOF CURB - PATCH ROOF WEATHER TIGHT TO MATCH EXISTING. REFER TO STRUCTURAL.
26. AT REMOVED MECHANICAL ROOF EQUIPMENT PATCH EXISTING ROOF WEATHER TIGHT.
27. MINOR TERRAZZO REPAIR REQUIRED AT NEWLY EXPOSED FLOOR AREA
28. NEW MECHANICAL LOUVER, SILL AT 8" AFF. PAINT TO MATCH WALL - SEE MECHANICAL DRAWINGS
29. PATCH PRIME AND PAINT WALL SUROUNDING NEW LOUVER TO MATCH EXISTING ALL SIDES OF NEW LOUVER.
30. PRIME AND PAINT EXISTING WALLS TO MATCH EXISTING AS REQUIRED FROM NEW CONSTRUCTION DAMAGE ALL SIDES.
31. INSTALL SALVAGED SOUND PANELS AT NEW WALLS. HEIGHT TO MATCH EXISTING SURROUNDING PANELS.
32. PROVIDE A CLEAR ANODIZED ALUM. CHASE UP ALONG THE SIDE OF THE COLUMN FULL HEIGHT. SIZE TO BE MINIMUM REQUIRED FOR MECHANICAL PIPES. MATCH EXISTING CHASES. FULL HEIGHT.
33. AT ENLARGED OPENING PREP WALL FOR NEW MECH. UNIT. REFINISH WALL AS REQUIRED TO MATCH EXISTING

KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN
SCALE: NO SCALE

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ADDENDUM No. 2 OCTOBER 28, 2022

ISSUED FOR DATE

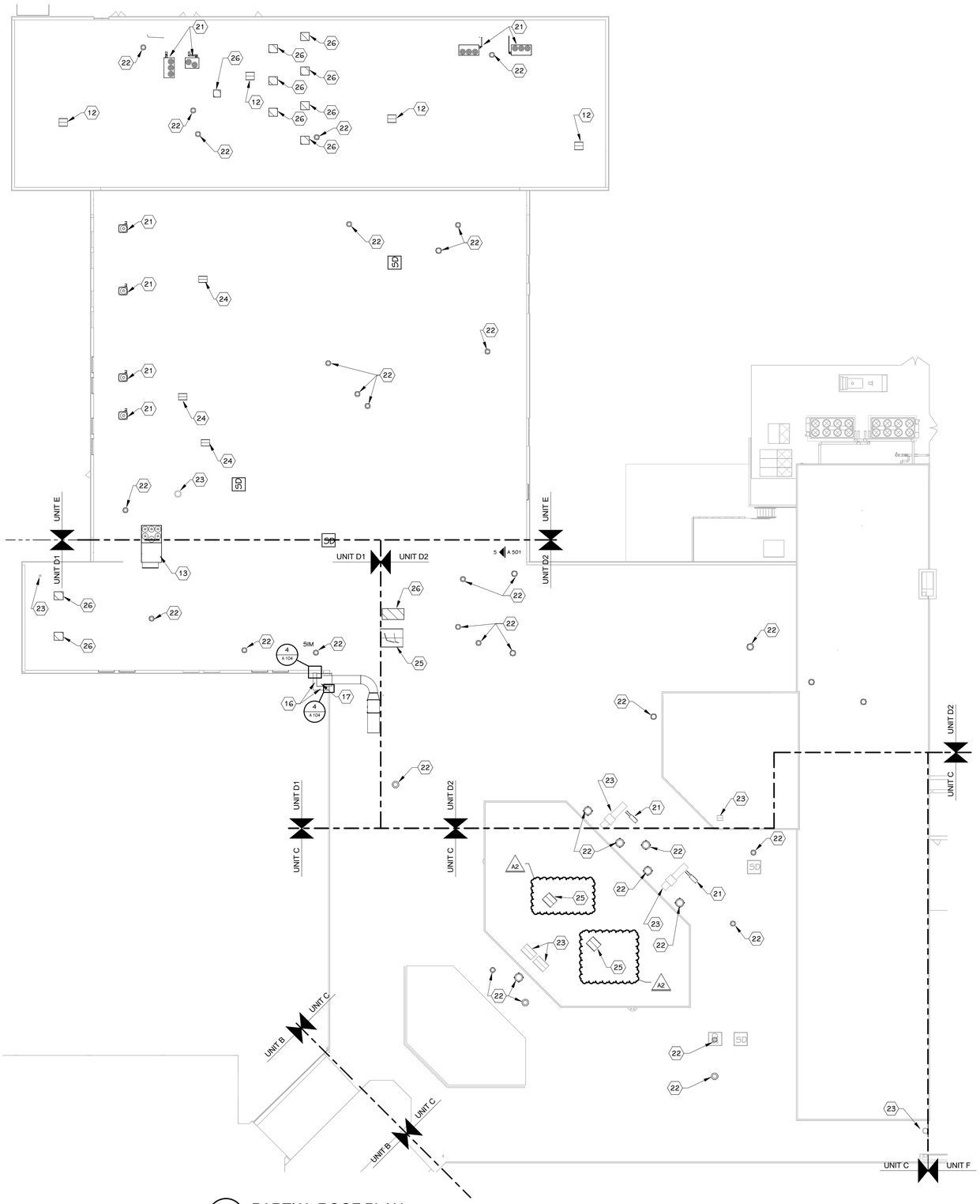
PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

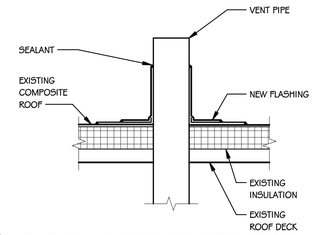
SHEET TITLE
UPPER SECOND FLOOR PLAN - UNIT D2

DATE
OCTOBER 3, 2022

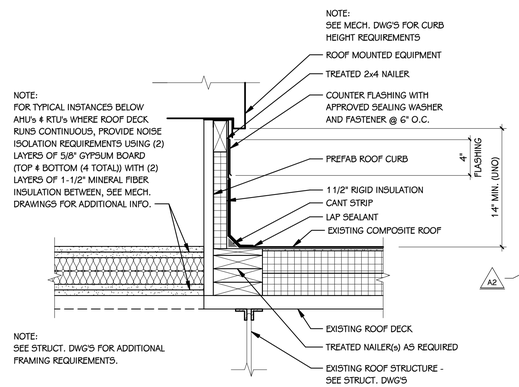
SHEET NUMBER
A 102D2
21-806.00



PARTIAL ROOF PLAN
1" = 20'-0"

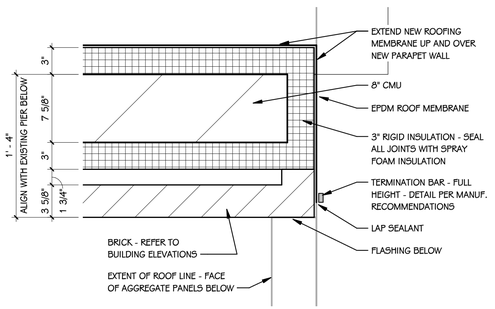


3 / A 104 TYPICAL ROOF PENETRATION
1 1/2" = 1'-0"



2 / A 104 TYPICAL ROOF CURB
1 1/2" = 1'-0"

ROOF TYPE IDENTIFICATION PICTURE FOR ROOF PATCHING AND NEW ROOF PENETRATIONS

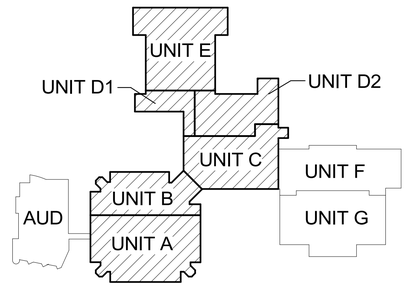


4 / A 104 PLAN DETAIL
1 1/2" = 1'-0"

KEYED NOTES - NEW CONSTRUCTION

1. NEW CLEAR ANODIZED ALUMINUM STOREFRONT - MATCH EXISTING MULLION LOCATIONS.
2. REINSTALL SALVAGED CEILING TILE AND GRID SYSTEM AT EXISTING HEIGHT AND LAYOUT.
3. REINSTALL SALVAGED CASEWORK.
4. NEW STEEL LINTEL, PRIME AND PAINT EXPOSED TO MATCH WALL.
5. PRIME AND PAINT NEW WALL TO MATCH EXISTING. ADD WALL BASE TO MATCH EXISTING.
6. REINSTALL SALVAGED DOOR, FRAME, SIDELITE, TRANSOM AND HARDWARE.
7. NEW CLEAR ANODIZED ALUMINUM LOUVER SYSTEM - COORDINATE WITH MECHANICAL. WITH BIRD SCREEN.
8. NEW PLASTER CEILING AND SUSPENDED FRAMING SYSTEM - PAINT TO MATCH EXISTING CEILING. PAINT ENTIRE CEILING IF ONLY PARTIAL CEILING REPLACEMENT.
9. REINSTALL SALVAGED CEILING TILE IN EXISTING GRID.
10. TOOTH-IN SALVAGED BRICK AND CMU AT EXISTING DUCT PENETRATION.
11. 3" INSULATED METAL BLANKOFF PANEL (BLACK) - CAULK ALL SIDES TO EXISTING WALL CONSTRUCTION. SECURE WITH CLIP ANGLES INTO MASONRY.
12. NEW 24x24 ROOF OPENING, STRUCTURAL FRAMING, ROOF CURB, PATCH ROOF WEATHER TIGHT AND MATCH EXISTING CONDITIONS - COORDINATE WITH MECHANICAL.
13. NEW ROOF TOP UNIT (SEE MECHANICAL). PROVIDE NEW ROOF OPENINGS, ROOF CURB AND PREP FOR NEW RTU. SEE MECHANICAL AND STRUCTURAL FOR MORE INFORMATION.
14. NEW RETURN GRILLE IN NEW 4" CMU WALL. TOOTH CMU WALL INTO EXISTING. BULL NOSE REQUIRED. - SEE MECH FOR ADDITIONAL INFO. PROVIDE STEEL LINTEL PER STRUCTURAL DRAWINGS ABOVE NEW GRILLE. PRIME AND PAINT NEW WALL TO MATCH EXISTING.
15. NEW CAVITY WALL - BRICK, 1 3/4" AIR GAP, 3" RIGID INSULATION - MATCH EXISTING BRICK COLOR.
16. NEW 6" METAL FASCIA OVER TREATED WOOD 2X BLOCKING - SEE DETAILS.
17. NEW EPDM ROOF MEMBRANE WITH 1 1/2" RIGID INSULATION ON 1 1/2" METAL DECK - WRAP MEMBRANE UP AND OVER PARAPET.
18. INFILL EXISTING OPENING THROUGH EXISTING CMU WALL ABOVE CEILING. APPROX. OPENING SIZE IS 10" DIA. INFILL TO MATCH EXISTING CONSTRUCTION. - REFER TO MECH. DWGS. FOR MORE INFORMATION.
19. NEW 4" CMU WALL FULL HEIGHT WITH BULLNOSE CORNER. WITH NEW RETURN GRILL (SEE MECHANICAL DRAWINGS). PROVIDE STEEL LINTEL PER STRUCTURAL DRAWINGS ABOVE NEW GRILLE. PRIME AND PAINT NEW WALL TO MATCH EXISTING.
20. NEW LOUVER IN EXISTING WALL. SEE STRUCTURAL FOR LINTEL INFORMATION. SEE MECHANICAL FOR MORE INFORMATION.
21. NEW MECH. CONDENSING UNIT WITH PIPE PENETRATIONS THROUGH ROOF SET NEW CONDENSING UNIT ON SLIP SHEET, SLIP SHEET TO MATCH EXISTING ROOF. PATCH ROOF WEATHER TIGHT AND MATCH EXISTING CONDITIONS - COORDINATE WITH MECHANICAL.
22. NEW EXHAUST FAN ON EXISTING ROOF CURB - SEE MECH. FOR MORE INFORMATION.
23. EXISTING MECHANICAL EQUIPMENT TO REMAIN - SEE MECHANICAL DRAWINGS FOR MORE INFORMATION.
24. NEW RELIEF HOOD ON NEW ROOF CURB WITH EXISTING OPENING THROUGH ROOF. PATCH WALL WEATHER TIGHT.
25. NEW AIR INTAKE OR RELIEF HOOD ON NEW ROOF CURB - PATCH ROOF WEATHER TIGHT TO MATCH EXISTING. REFER TO STRUCTURAL.
26. AT REMOVED MECHANICAL ROOF EQUIPMENT PATCH EXISTING ROOF WEATHER TIGHT.
27. MINOR TERRAZZO REPAIR REQUIRED AT NEWLY EXPOSED FLOOR AREA
28. NEW MECHANICAL LOUVER, SILL AT 8" AFF. PAINT TO MATCH WALL - SEE MECHANICAL DRAWINGS
29. PATCH PRIME AND PAINT WALL SUROUNDING NEW LOUVER TO MATCH EXISTING ALL SIDES OF NEW LOUVER.
30. PRIME AND PAINT EXISTING WALLS TO MATCH EXISTING AS REQUIRED FROM NEW CONSTRUCTION DAMAGE ALL SIDES.
31. INSTALL SALVAGED SOUND PANELS AT NEW WALLS. HEIGHT TO MATCH EXISTING SURROUNDING PANELS.
32. PROVIDE A CLEAR ANODIZED ALUM. CHASE UP ALONG THE SIDE OF THE COLUMN FULL HEIGHT. SIZE TO BE MINIMUM REQUIRED FOR MECHANICAL PIPES. MATCH EXISTING CHASES. FULL HEIGHT.
33. AT ENLARGED OPENING PREP WALL FOR NEW MECH. UNIT. REFINISH WALL AS REQUIRED TO MATCH EXISTING

KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN
SCALE: NO SCALE

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ADDENDUM No. 2 OCTOBER 28, 2022

ISSUED FOR DATE

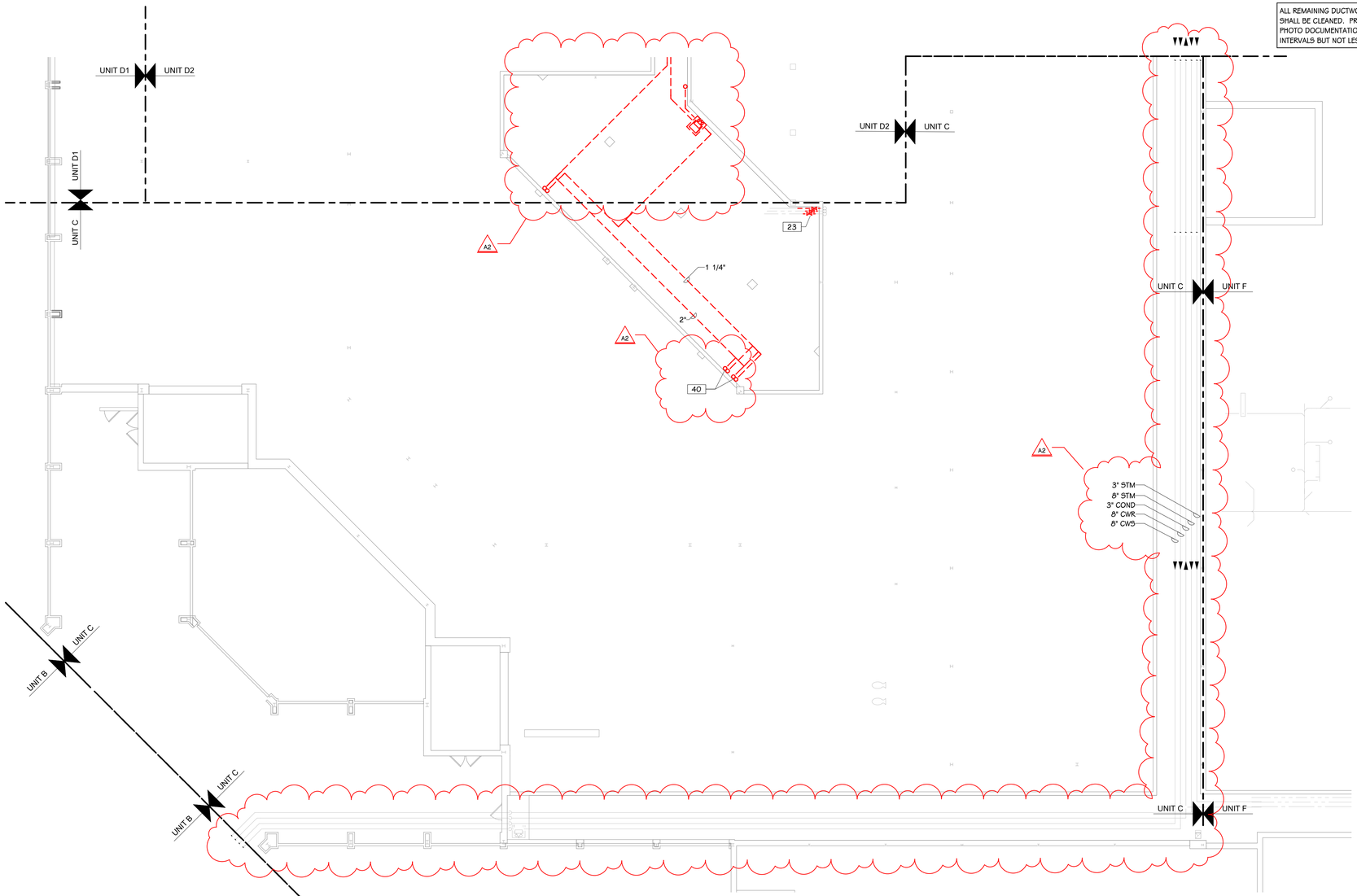
PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

DATE
OCTOBER 3, 2022

SHEET TITLE
ROOF PLAN

SHEET NUMBER
A 104
21-806.00

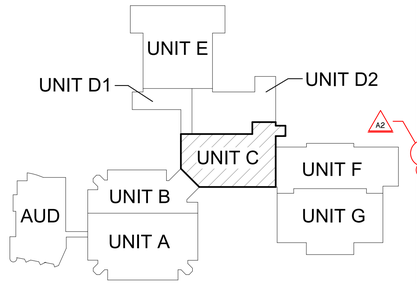


ALL REMAINING DUCTWORK AFTER DEMOLITION SHALL BE CLEANED. PROVIDE PRE AND POST PHOTO DOCUMENTATION AT A MINIMUM OF 20' INTERVALS BUT NOT LESS THAN EACH BRANCH.

TUNNEL MECHANICAL DEMOLITION PLAN - UNIT C
3/32" = 1'-0"

THIS DRAWING SHEET IS INTENDED TO BE PLOTTED IN COLOR. IF THIS TEXT APPEARS IN BLACK AND WHITE, IT IS PLOTTED INCORRECTLY. DISCARD AND OBTAIN AN ACCURATE DRAWING

KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN
SCALE: NO SCALE

KEYED NOTES - DEMOLITION

1 REMOVE EXISTING EXHAUST FAN AND CONTROLS. CURB AND DUCTWORK SHALL REMAIN. PREP FOR INSTALLATION OF NEW.

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3 REMOVE ALL PIPING SYSTEMS ASSOCIATED WITH AHU'S IN THIS ROOM.

4 REMOVE EXISTING FINNED TUBE RADIATOR INCLUDING PIPING, CONTROLS, AND ACCESSORIES.

5 REMOVE EXISTING WALL CONVECTOR, INCLUDING PIPING, CONTROLS, AND ACCESSORIES

6 REMOVE EXISTING CABINET UNIT HEATER, INCLUDING PIPING, CONTROLS, AND ACCESSORIES.

7 REMOVE EXISTING UNIT VENTILATOR, INCLUDING PIPING, CONTROLS, AND ACCESSORIES.

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9 REMOVE EXISTING WALL MOUNTED RETURN AIR GRILLE.

10 REMOVE EXISTING DUAL DUCT MIXING BOX AND DUCTWORK AS INDICATED.

11 REMOVE EXISTING FAN COIL UNIT, INCLUDING PIPING, CONTROLS, AND ACCESSORIES.

12 REMOVE EXISTING EXHAUST FAN, CURB, DUCTWORK, CONTROLS AND ACCESSORIES. PATCH ROOF PENETRATION. REFER TO ARCH DRAWINGS.

13 REMOVE EXISTING RETURN AIR GRILLE AND RETURN AIR DUCT AS INDICATED.

14 REMOVE EXISTING DUCTWORK AND DIFFUSER.

15 EXISTING MECHANICAL EQUIPMENT TO REMAIN.

16 REMOVE EXISTING EXHAUST FAN, CURB, AND ALL CONTROLS. ROOF PENETRATION TO BE REUSED FOR NEW EQUIPMENT. COORDINATE OPENING SIZE WITH NEW CONSTRUCTION PLANS.

17 REMOVE EXISTING EXHAUST DUCT THRU ROOF. PATCH ROOF PENETRATION. REFER TO ARCH DRAWINGS.

18 EXISTING FUME HOOD EXHAUST DUCT THRU ROOF TO REMAIN.

19 REMOVE EXISTING UNIT HEATER, HEATING WATER PIPING, AND CONTROL.

20 REMOVE EXISTING HEATING WATER PIPING AND CHILLED WATER PIPING MAINS.

21 REMOVE EXISTING DIFFUSER FROM DUCT. PREP FOR INSTALLATION OF NEW.

22 REMOVE DUST COLLECTOR AND ENTIRE DUST COLLECTOR SYSTEM INCLUDING DUCTWORK, HANGERS, AND CONTROLS. PATCH WALL TO MATCH.

23 REMOVE EXISTING BALANCING VALVES ON DOMESTIC HW, CW, AND HWR LINES. PREP FOR REPLACEMENT.

24 REMOVE EXISTING SHUT OFF VALVES IN HW/CW PIPE RISERS.

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28 REMOVE EXISTING PAINT BOOTH AND EXHAUST SYSTEM, INCLUDING FAN, CONTROLS, AND ACCESSORIES. PATCH ROOF.

29 REMOVE ENTIRE DUCT DISTRIBUTION SYSTEM, INCLUDING HANGERS AND ACCESSORIES.

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32 EXISTING EXHAUST FAN TO REMAIN IN SERVICE.

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34 ABANDON CONTROLS IN PLACE.

35 REMOVE EXISTING EXHAUST FAN SWITCH.

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37 REMOVE EXISTING STEAM CONDENSATE RECEIVER.

38 EXISTING 36"Ø EXHAUST DUCT BELOW FLOOR TO REMAIN AND BE REUSED. PREP FOR CONNECTION TO NEW DUCTWORK.

39 REMOVE ABANDONED EXHAUST SYSTEM. PATCH ROOF.

40 CONTRACTOR SHALL INVESTIGATE THE END USE OF THESE STEAM AND CONDENSATE RISERS. PRIOR TO DEMOLITION, NOTIFY ENGINEER OF DEVICES SERVED.

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ADDENDUM No. 2 **October 28, 2022**

ISSUED FOR **DATE**

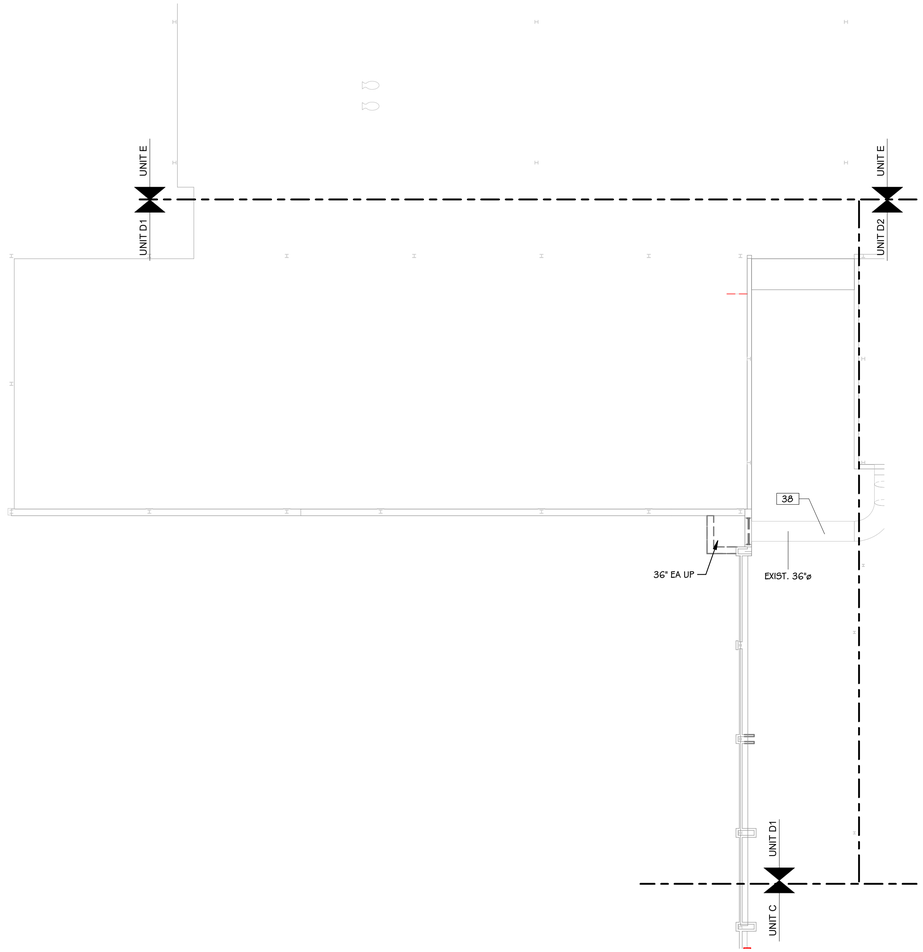
PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

SHEET TITLE
TUNNEL MECHANICAL DEMOLITION PLAN - UNIT C

DATE
OCTOBER 3, 2022

SHEET NUMBER
MD 100C
21-806.00



TUNNEL MECHANICAL DEMOLITION PLAN - UNIT D1
3/32" = 1'-0"

ALL REMAINING DUCTWORK AFTER DEMOLITION SHALL BE CLEANED. PROVIDE PRE AND POST PHOTO DOCUMENTATION AT A MINIMUM OF 20' INTERVALS BUT NOT LESS THAN EACH BRANCH.

KEYED NOTES - DEMOLITION

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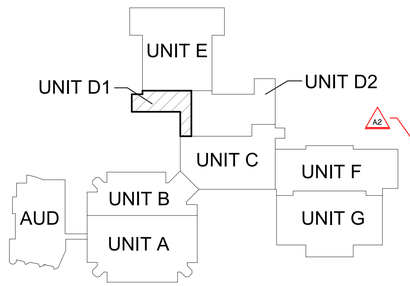
KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN
SCALE: NO SCALE

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ADDENDUM No. 2 October 28, 2022

ISSUED FOR DATE

PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

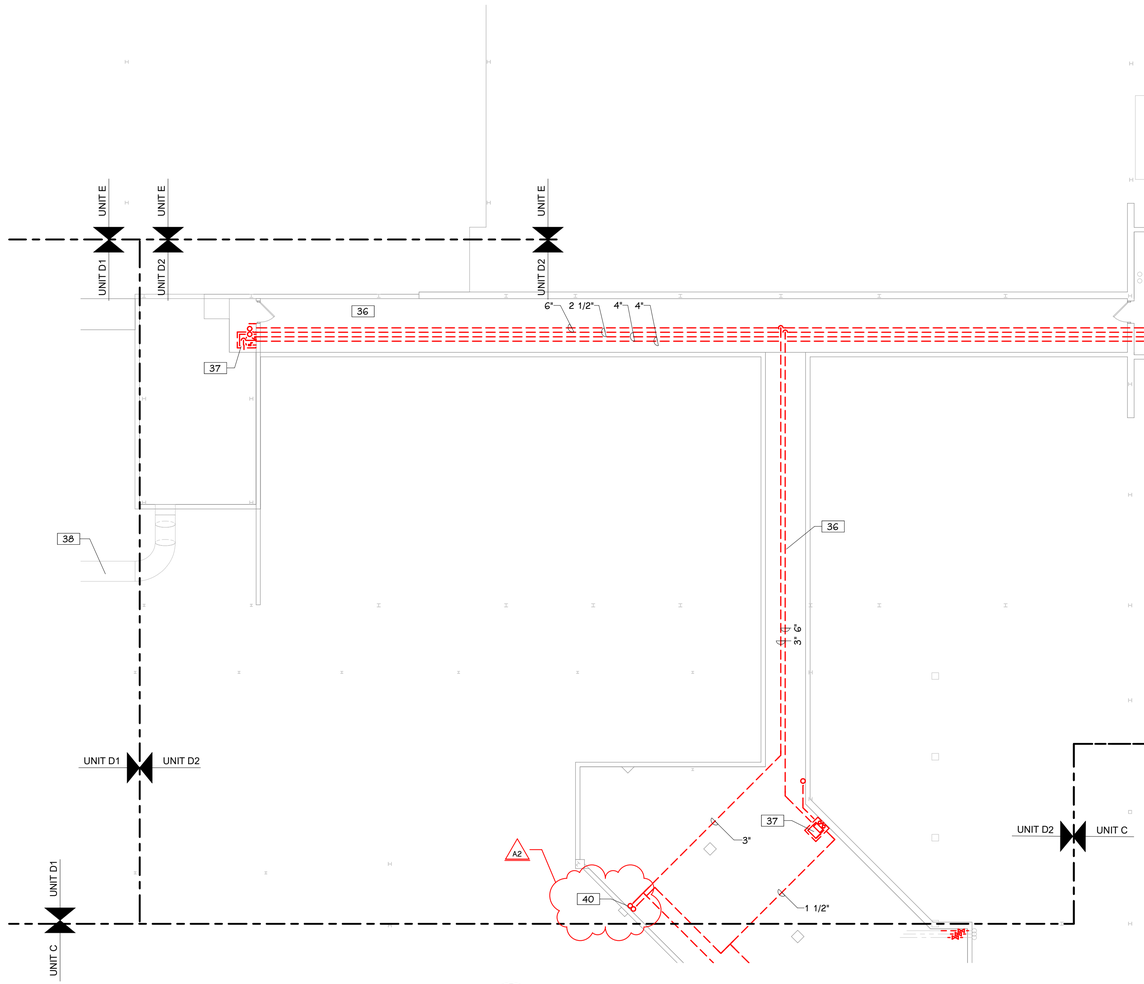
SHEET TITLE
TUNNEL MECHANICAL DEMOLITION PLAN - UNIT D1

DATE
OCTOBER 3, 2022

SHEET NUMBER
MD 100D1

21-806.00

ALL REMAINING DUCTWORK AFTER DEMOLITION SHALL BE CLEANED. PROVIDE PRE AND POST PHOTO DOCUMENTATION AT A MINIMUM OF 20' INTERVALS BUT NOT LESS THAN EACH BRANCH.



TUNNEL MECHANICAL DEMOLITION PLAN - UNIT D2
3/32" = 1'-0"

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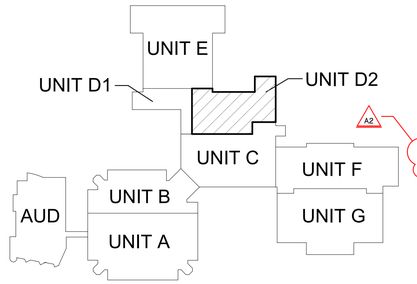
KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN
SCALE: NO SCALE

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ADDENDUM No. 2 October 28, 2022

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OWNER
KALAMAZOO PUBLIC SCHOOLS

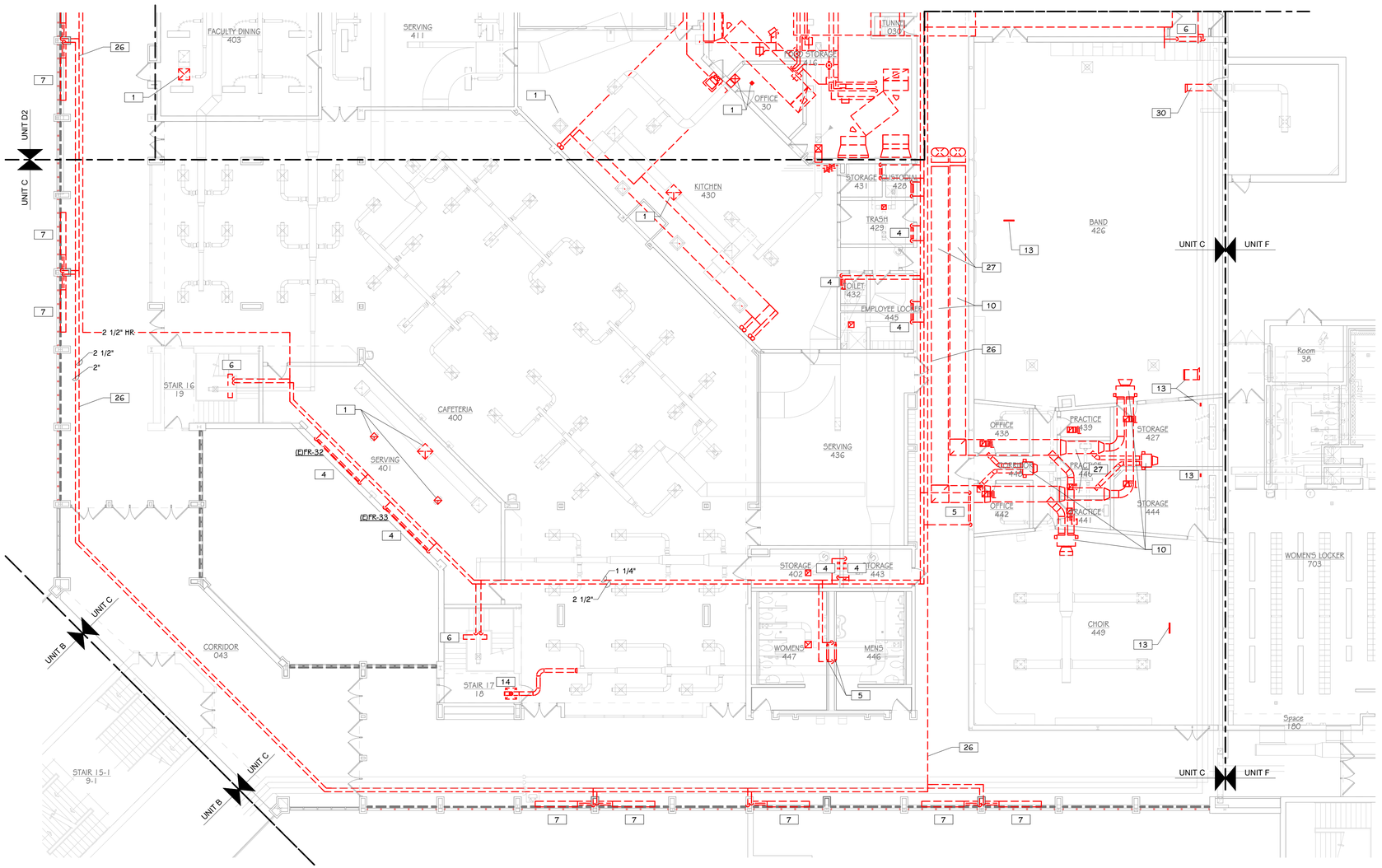
Kalamazoo, Michigan

SHEET TITLE
TUNNEL MECHANICAL DEMOLITION PLAN - UNIT D2

DATE
OCTOBER 3, 2022

SHEET NUMBER
MD 100D2

21-806.00



SECOND FLOOR MECHANICAL DEMOLITION PLAN - UNIT C

3/32" = 1'-0"

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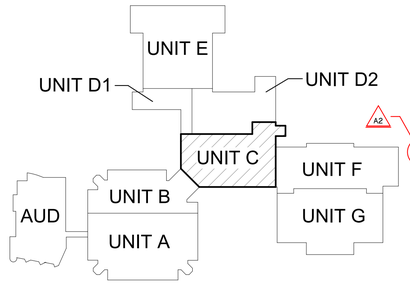
KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN

SCALE: NO SCALE

KEYED NOTES - DEMOLITION

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6 REMOVE EXISTING CABINET UNIT HEATER, INCLUDING PIPING, CONTROLS, AND ACCESSORIES.

7 REMOVE EXISTING UNIT VENTILATOR, INCLUDING PIPING, CONTROLS, AND ACCESSORIES.

8 REMOVE EXISTING CEILING HUNG HORIZONTAL UNIT VENTILATOR, INCLUDING PIPING, CONTROLS, AND ACCESSORIES.

9 REMOVE EXISTING WALL MOUNTED RETURN AIR GRILLE.

10 REMOVE EXISTING DUAL DUCT MIXING BOX AND DUCTWORK AS INDICATED.

11 REMOVE EXISTING FAN COIL UNIT, INCLUDING PIPING, CONTROLS, AND ACCESSORIES.

12 REMOVE EXISTING EXHAUST FAN, CURB, DUCTWORK, CONTROLS AND ACCESSORIES. PATCH ROOF PENETRATION. REFER TO ARCH DRAWINGS.

13 REMOVE EXISTING RETURN AIR GRILLE AND RETURN AIR DUCT AS INDICATED.

14 REMOVE EXISTING DUCTWORK AND DIFFUSER.

15 EXISTING MECHANICAL EQUIPMENT TO REMAIN.

16 REMOVE EXISTING EXHAUST FAN, CURB, AND ALL CONTROLS. ROOF PENETRATION TO BE REUSED FOR NEW EQUIPMENT. COORDINATE OPENING SIZE WITH NEW CONSTRUCTION PLANS.

17 REMOVE EXISTING EXHAUST DUCT THRU ROOF. PATCH ROOF PENETRATION. REFER TO ARCH DRAWINGS.

18 EXISTING FUME HOOD EXHAUST DUCT THRU ROOF TO REMAIN.

19 REMOVE EXISTING UNIT HEATER, HEATING WATER PIPING, AND CONTROL.

20 REMOVE EXISTING HEATING WATER PIPING AND CHILLED WATER PIPING MAINS.

21 REMOVE EXISTING DIFFUSER FROM DUCT. PREP FOR INSTALLATION OF NEW.

22 REMOVE DUST COLLECTOR AND ENTIRE DUST COLLECTOR SYSTEM INCLUDING DUCTWORK, HANGERS, AND CONTROLS. PATCH WALL TO MATCH.

23 REMOVE EXISTING BALANCING VALVES ON DOMESTIC HW, CW, AND HWR LINES. PREP FOR REPLACEMENT.

24 REMOVE EXISTING SHUT OFF VALVES IN HW/CW PIPE RISERS.

25 REMOVE EXISTING VALVES DOWNSTREAM OF DOMESTIC CW METERS AND ON EITHER SIDE OF BACKFLOW PREVENTERS.

26 REMOVE HEATING WATER PIPING SYSTEM IN ITS ENTIRETY. INCLUDING HANGERS AND ACCESSORIES.

27 REMOVE ENTIRE SUPPLY DUCT SYSTEM UPSTREAM OF DUAL DUCT MIXING BOX, INCLUDING HANGERS, FIRE DAMPERS, AND ACCESSORIES.

28 REMOVE EXISTING PAINT BOOTH AND EXHAUST SYSTEM, INCLUDING FAN, CONTROLS, AND ACCESSORIES. PATCH ROOF.

29 REMOVE ENTIRE DUCT DISTRIBUTION SYSTEM, INCLUDING HANGERS AND ACCESSORIES.

30 REMOVE EXISTING SUPPLY AIR DUCT SECTION AS INDICATED.

31 REMOVE EXISTING THERMOSTAT.

32 EXISTING EXHAUST FAN TO REMAIN IN SERVICE.

33 EXISTING RETURN AIR GRILLE TO REMAIN. ABANDON IN PLACE.

34 ABANDON CONTROLS IN PLACE.

35 REMOVE EXISTING EXHAUST FAN SWITCH.

36 REMOVE ALL EXISTING STEAM, STEAM CONDENSATE, CHILLED WATER SUPPLY, AND CHILLED WATER RETURN PIPING IN TUNNEL. REMOVE ALL ASSOCIATED PIPE HANGERS, SUPPORTS, AND ACCESSORIES.

37 REMOVE EXISTING STEAM CONDENSATE RECEIVER.

38 EXISTING 36"Ø EXHAUST DUCT BELOW FLOOR TO REMAIN AND BE REUSED. PREP FOR CONNECTION TO NEW DUCTWORK.

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40 CONTRACTOR SHALL INVESTIGATE THE END USE OF THESE STEAM AND CONDENSATE RISERS. PRIOR TO DEMOLITION, NOTIFY ENGINEER OF DEVICES SERVED.

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ADDENDUM No. 2 October 28, 2022

ISSUED FOR DATE

PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

OWNER
KALAMAZOO PUBLIC SCHOOLS

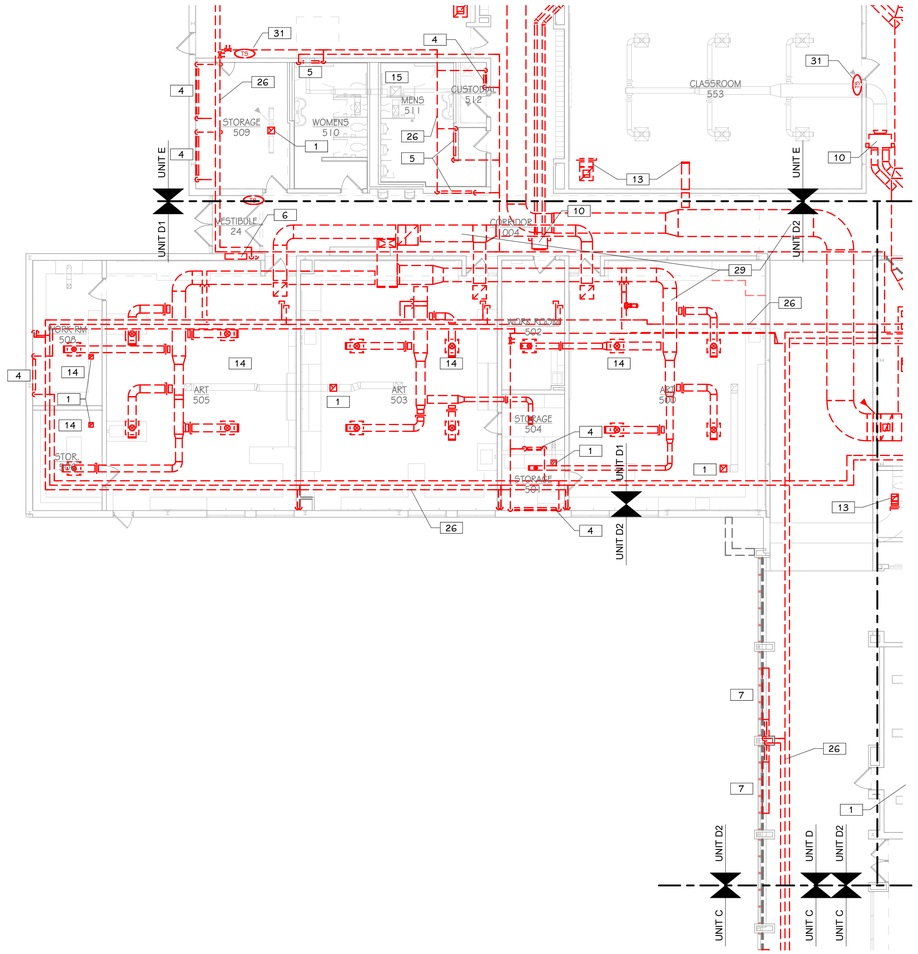
Kalamazoo, Michigan

SHEET TITLE
SECOND FLOOR MECHANICAL DEMOLITION PLAN - UNIT C

DATE
OCTOBER 3, 2022

SHEET NUMBER
MD 102C

21-806.00



SECOND FLOOR MECHANICAL DEMOLITION PLAN - UNIT D1

3/32" = 1'-0"

ALL REMAINING DUCTWORK AFTER DEMOLITION SHALL BE CLEANED. PROVIDE PRE AND POST PHOTO DOCUMENTATION AT A MINIMUM OF 20' INTERVALS BUT NOT LESS THAN EACH BRANCH.

KEYED NOTES - DEMOLITION

1 REMOVE EXISTING EXHAUST FAN AND CONTROLS. CURB AND DUCTWORK SHALL REMAIN. PREP FOR INSTALLATION OF NEW.

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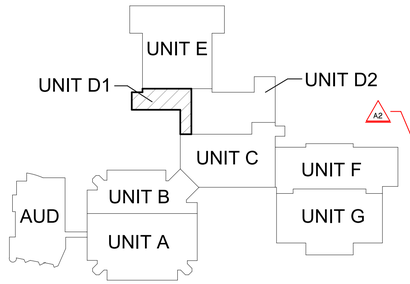
KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN

SCALE: NO SCALE

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ADDENDUM No. 2 October 28, 2022

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OWNER
KALAMAZOO PUBLIC SCHOOLS

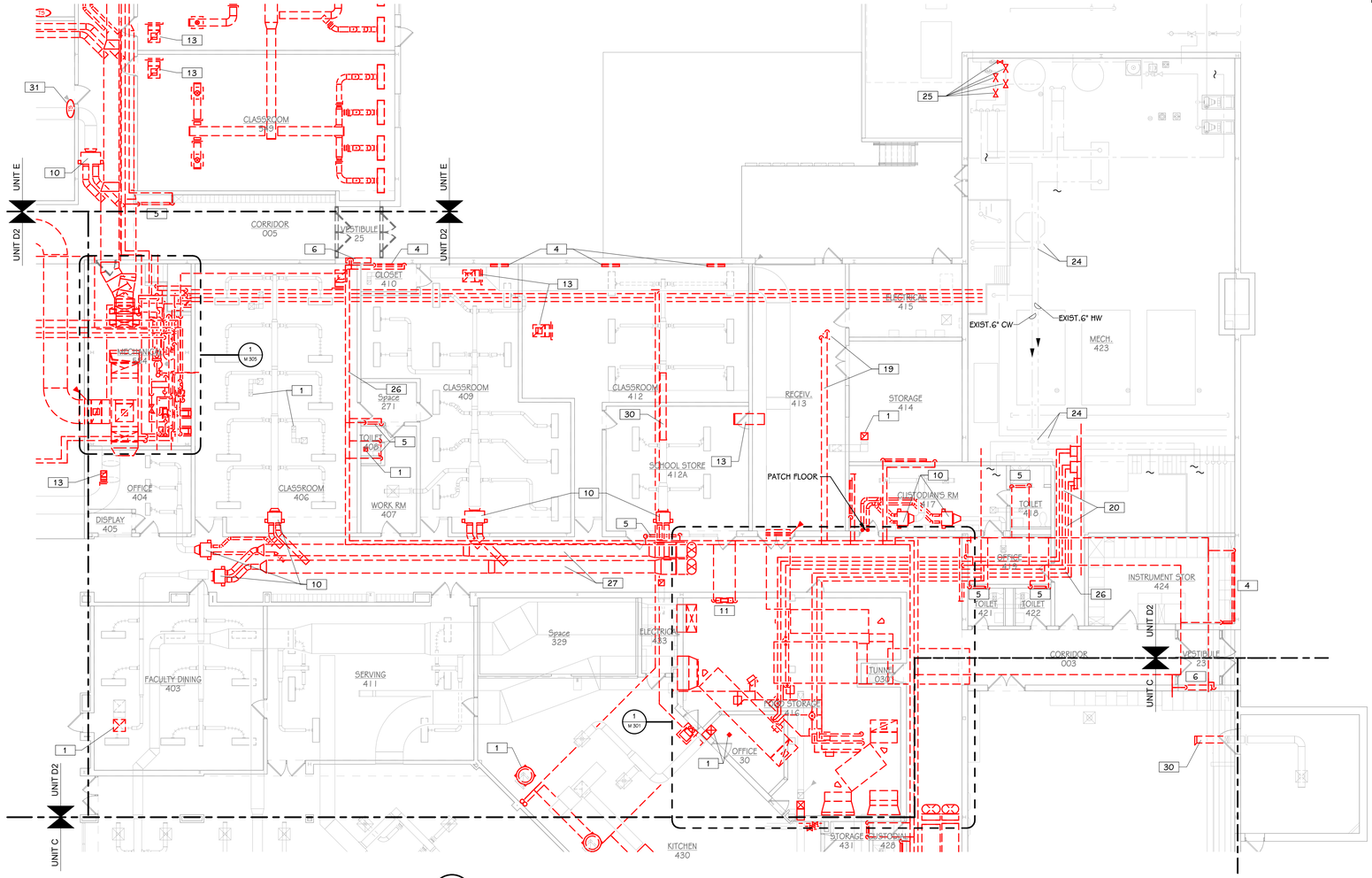
Kalamazoo, Michigan

SHEET TITLE
SECOND FLOOR MECHANICAL DEMOLITION PLAN - UNIT D1

DATE
OCTOBER 3, 2022

SHEET NUMBER
MD 102D1

21-806.00



SECOND FLOOR MECHANICAL DEMOLITION PLAN - UNIT D2

3/32" = 1'-0"

ALL REMAINING DUCTWORK AFTER DEMOLITION SHALL BE CLEANED. PROVIDE PRE AND POST PHOTO DOCUMENTATION AT A MINIMUM OF 20' INTERVALS BUT NOT LESS THAN EACH BRANCH.

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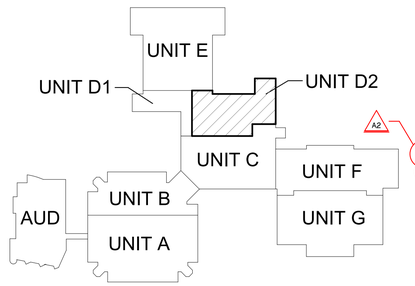
KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN

SCALE: NO SCALE

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ADDENDUM No. 2 October 28, 2022

ISSUED FOR DATE

PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

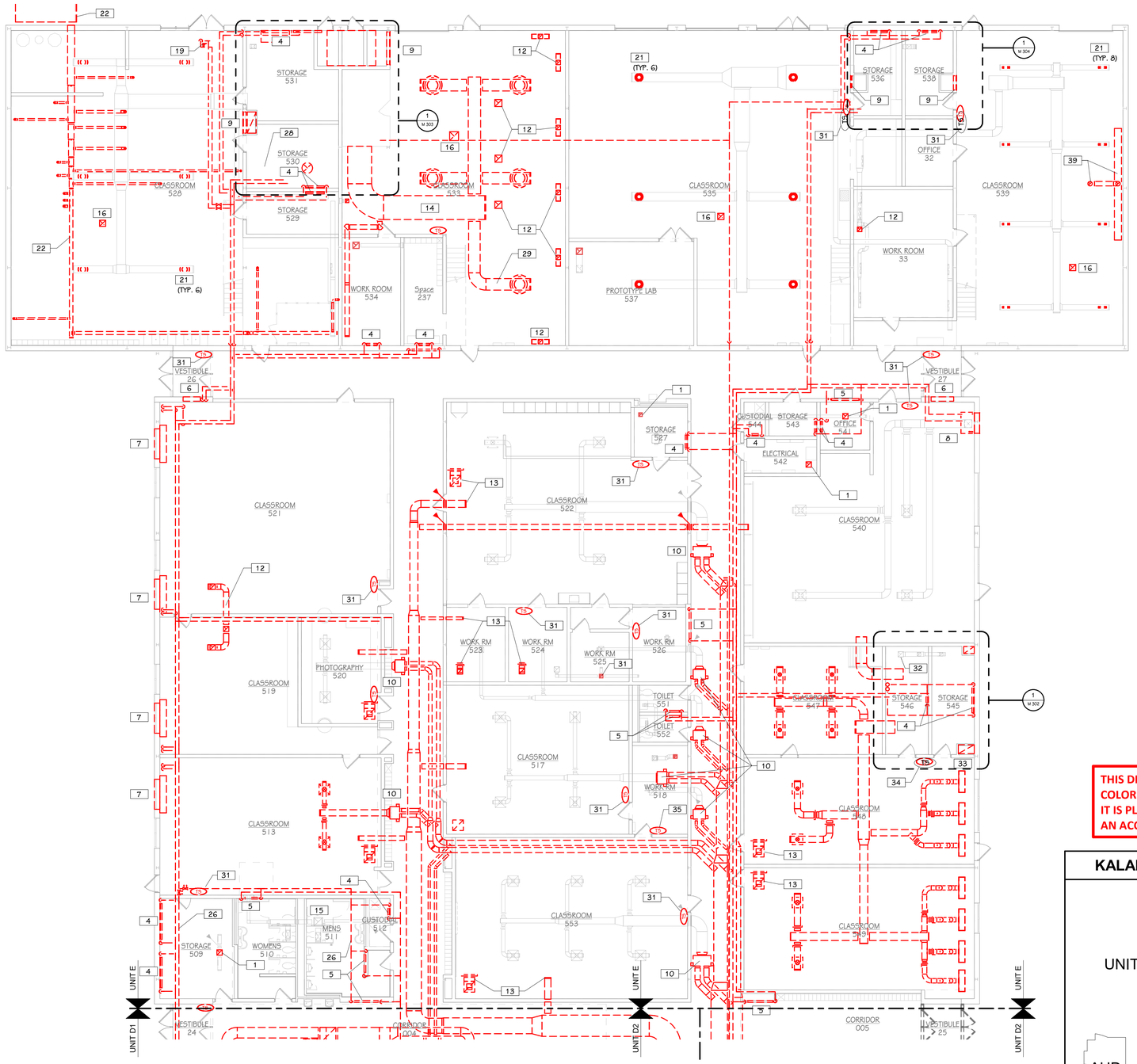
SHEET TITLE
SECOND FLOOR MECHANICAL DEMOLITION PLAN - UNIT D2

DATE
OCTOBER 3, 2022

SHEET NUMBER
MD 102D2

21-806.00

ALL REMAINING DUCTWORK AFTER DEMOLITION SHALL BE CLEANED. PROVIDE PRE AND POST PHOTO DOCUMENTATION AT A MINIMUM OF 20' INTERVALS BUT NOT LESS THAN EACH BRANCH.



SECOND FLOOR MECHANICAL DEMOLITION PLAN - UNIT E
3/32" = 1'-0"

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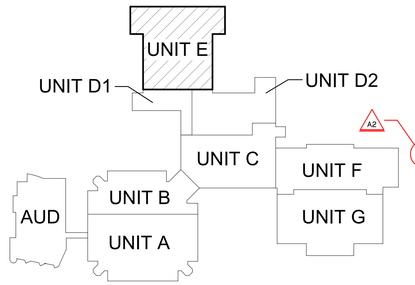

KEY PLAN
SCALE: NO SCALE

KEYED NOTES - DEMOLITION

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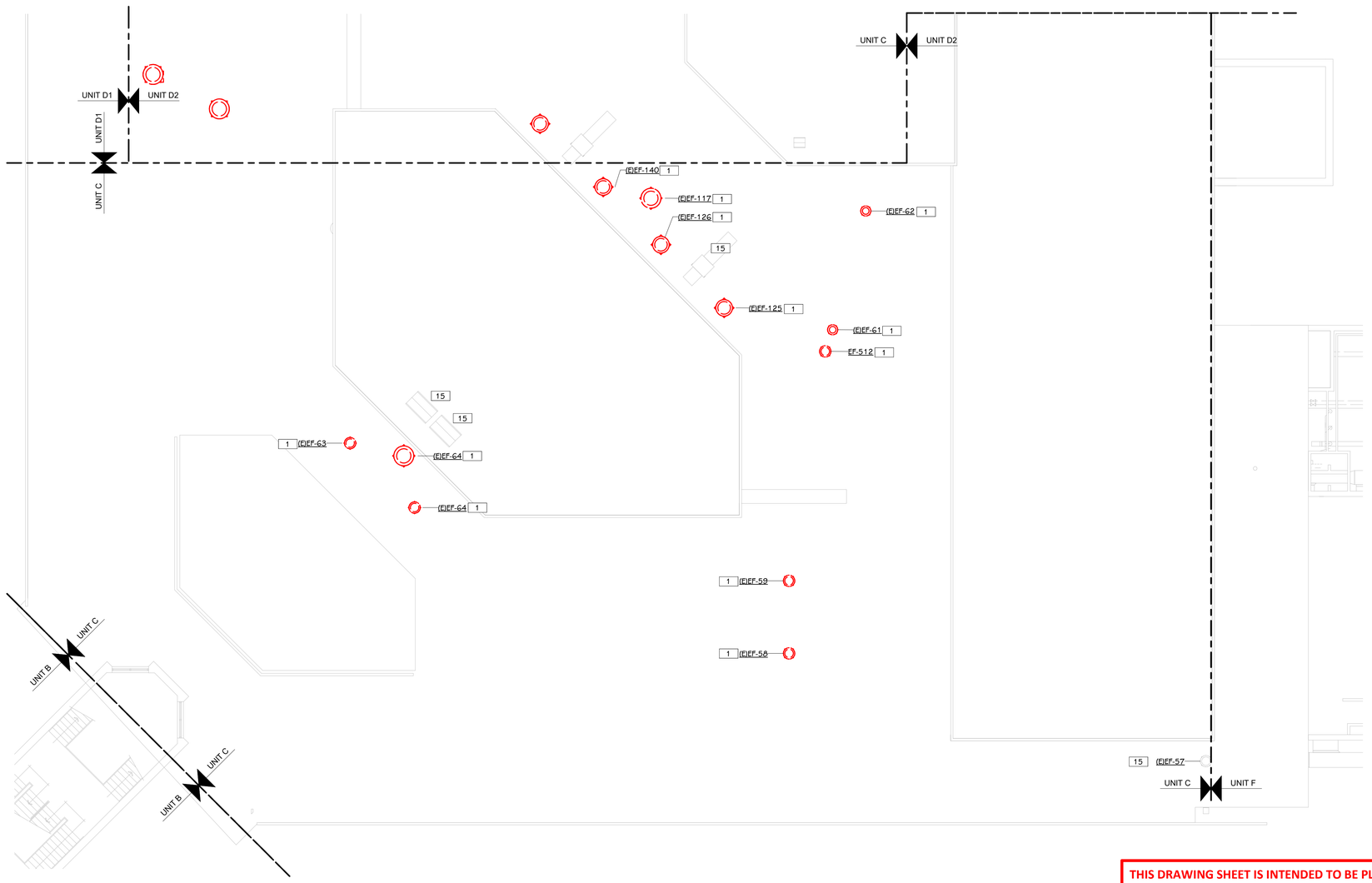

ROOF MECHANICAL DEMOLITION PLAN - UNIT C
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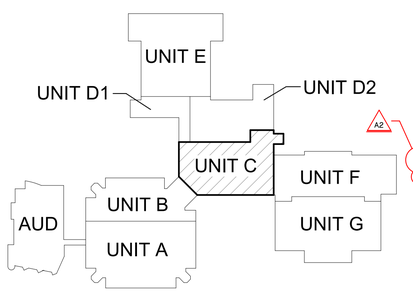
KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN
SCALE: NO SCALE

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ADDENDUM No. 2 **October 28, 2022**

ISSUED FOR **DATE**

PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

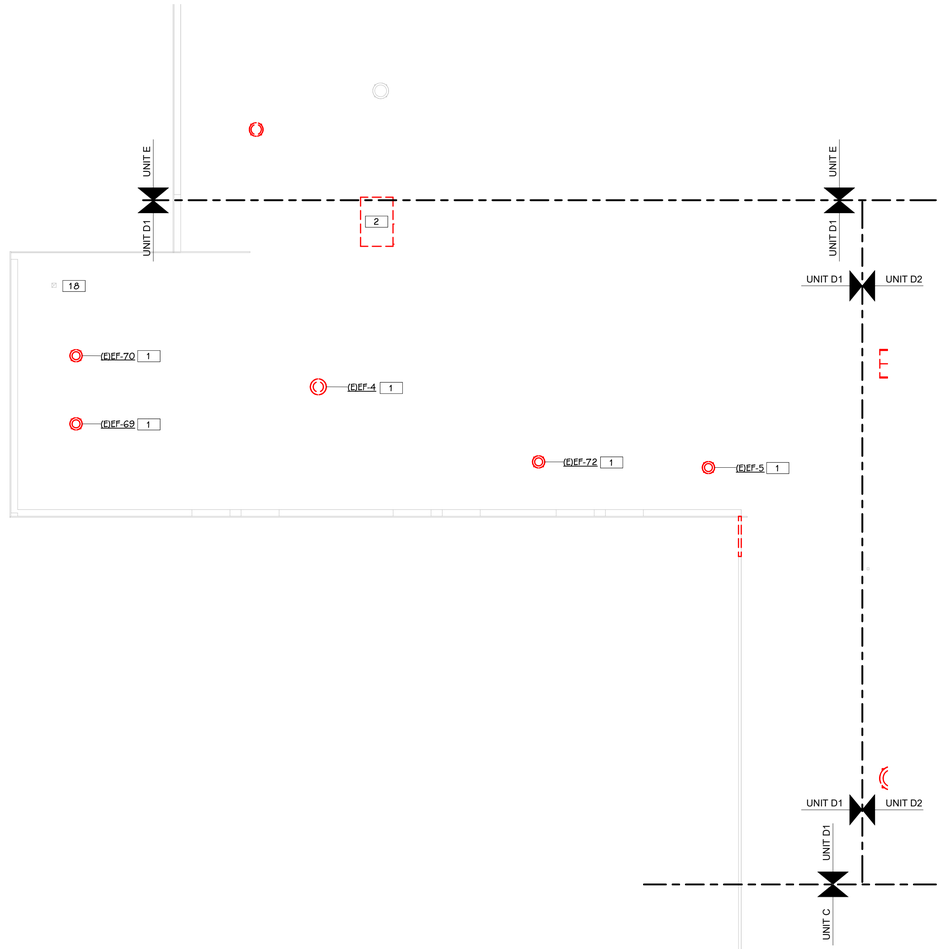
OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

SHEET TITLE
ROOF DEMOLITION PLAN - UNIT C

DATE
OCTOBER 3, 2022

SHEET NUMBER
MD 150C
21-806.00

ALL REMAINING DUCTWORK AFTER DEMOLITION SHALL BE CLEANED. PROVIDE PRE AND POST PHOTO DOCUMENTATION AT A MINIMUM OF 20' INTERVALS BUT NOT LESS THAN EACH BRANCH.



ROOF MECHANICAL DEMOLITION PLAN - UNIT D1
3/32" = 1'-0"

KEYED NOTES - DEMOLITION

1 REMOVE EXISTING EXHAUST FAN AND CONTROLS. CURB AND DUCTWORK SHALL REMAIN. PREP FOR INSTALLATION OF NEW.

2 REMOVE ALL DUCT SYSTEMS ASSOCIATED WITH AHU'S IN THIS ROOM.

3 REMOVE ALL PIPING SYSTEMS ASSOCIATED WITH AHU'S IN THIS ROOM.

4 REMOVE EXISTING FINNED TUBE RADIATOR INCLUDING PIPING, CONTROLS, AND ACCESSORIES.

5 REMOVE EXISTING WALL CONVECTOR, INCLUDING PIPING, CONTROLS, AND ACCESSORIES

6 REMOVE EXISTING CABINET UNIT HEATER, INCLUDING PIPING, CONTROLS, AND ACCESSORIES.

7 REMOVE EXISTING UNIT VENTILATOR, INCLUDING PIPING, CONTROLS, AND ACCESSORIES.

8 REMOVE EXISTING CEILING HUNG HORIZONTAL UNIT VENTILATOR, INCLUDING PIPING, CONTROLS, AND ACCESSORIES.

9 REMOVE EXISTING WALL MOUNTED RETURN AIR GRILLE.

10 REMOVE EXISTING DUAL DUCT MIXING BOX AND DUCTWORK AS INDICATED.

11 REMOVE EXISTING FAN COIL UNIT, INCLUDING PIPING, CONTROLS, AND ACCESSORIES.

12 REMOVE EXISTING EXHAUST FAN, CURB, DUCTWORK, CONTROLS AND ACCESSORIES. PATCH ROOF PENETRATION. REFER TO ARCH DRAWINGS.

13 REMOVE EXISTING RETURN AIR GRILLE AND RETURN AIR DUCT AS INDICATED.

14 REMOVE EXISTING DUCTWORK AND DIFFUSER.

15 EXISTING MECHANICAL EQUIPMENT TO REMAIN.

16 REMOVE EXISTING EXHAUST FAN, CURB, AND ALL CONTROLS. ROOF PENETRATION TO BE REUSED FOR NEW EQUIPMENT. COORDINATE OPENING SIZE WITH NEW CONSTRUCTION PLANS.

17 REMOVE EXISTING EXHAUST DUCT THRU ROOF. PATCH ROOF PENETRATION. REFER TO ARCH DRAWINGS.

18 EXISTING FUME HOOD EXHAUST DUCT THRU ROOF TO REMAIN.

19 REMOVE EXISTING UNIT HEATER, HEATING WATER PIPING, AND CONTROL.

20 REMOVE EXISTING HEATING WATER PIPING AND CHILLED WATER PIPING MAINS.

21 REMOVE EXISTING DIFFUSER FROM DUCT. PREP FOR INSTALLATION OF NEW.

22 REMOVE DUST COLLECTOR AND ENTIRE DUST COLLECTOR SYSTEM INCLUDING DUCTWORK, HANGERS, AND CONTROLS. PATCH WALL TO MATCH.

23 REMOVE EXISTING BALANCING VALVES ON DOMESTIC HW, CW, AND HWR LINES. PREP FOR REPLACEMENT.

24 REMOVE EXISTING SHUT OFF VALVES IN HW/CW PIPE RISERS.

25 REMOVE EXISTING VALVES DOWNSTREAM OF DOMESTIC CW METERS AND ON EITHER SIDE OF BACKFLOW PREVENTERS.

26 REMOVE HEATING WATER PIPING SYSTEM IN ITS ENTIRETY. INCLUDING HANGERS AND ACCESSORIES.

27 REMOVE ENTIRE SUPPLY DUCT SYSTEM UPSTREAM OF DUAL DUCT MIXING BOX, INCLUDING HANGERS, FIRE DAMPERS, AND ACCESSORIES.

28 REMOVE EXISTING PAINT BOOTH AND EXHAUST SYSTEM, INCLUDING FAN, CONTROLS, AND ACCESSORIES. PATCH ROOF.

29 REMOVE ENTIRE DUCT DISTRIBUTION SYSTEM, INCLUDING HANGERS AND ACCESSORIES.

30 REMOVE EXISTING SUPPLY AIR DUCT SECTION AS INDICATED.

31 REMOVE EXISTING THERMOSTAT.

32 EXISTING EXHAUST FAN TO REMAIN IN SERVICE.

33 EXISTING RETURN AIR GRILLE TO REMAIN. ABANDON IN PLACE.

34 ABANDON CONTROLS IN PLACE.

35 REMOVE EXISTING EXHAUST FAN SWITCH.

36 REMOVE ALL EXISTING STEAM, STEAM CONDENSATE, CHILLED WATER SUPPLY, AND CHILLED WATER RETURN PIPING IN TUNNEL. REMOVE ALL ASSOCIATED PIPE HANGERS, SUPPORTS, AND ACCESSORIES.

37 REMOVE EXISTING STEAM CONDENSATE RECEIVER.

38 EXISTING 36"Ø EXHAUST DUCT BELOW FLOOR TO REMAIN AND BE REUSED. PREP FOR CONNECTION TO NEW DUCTWORK.

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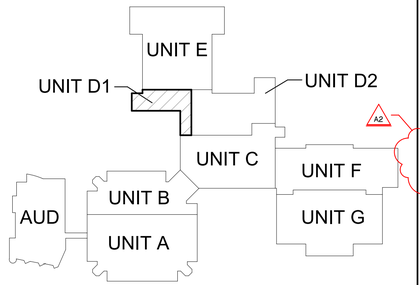
KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN
SCALE: NO SCALE

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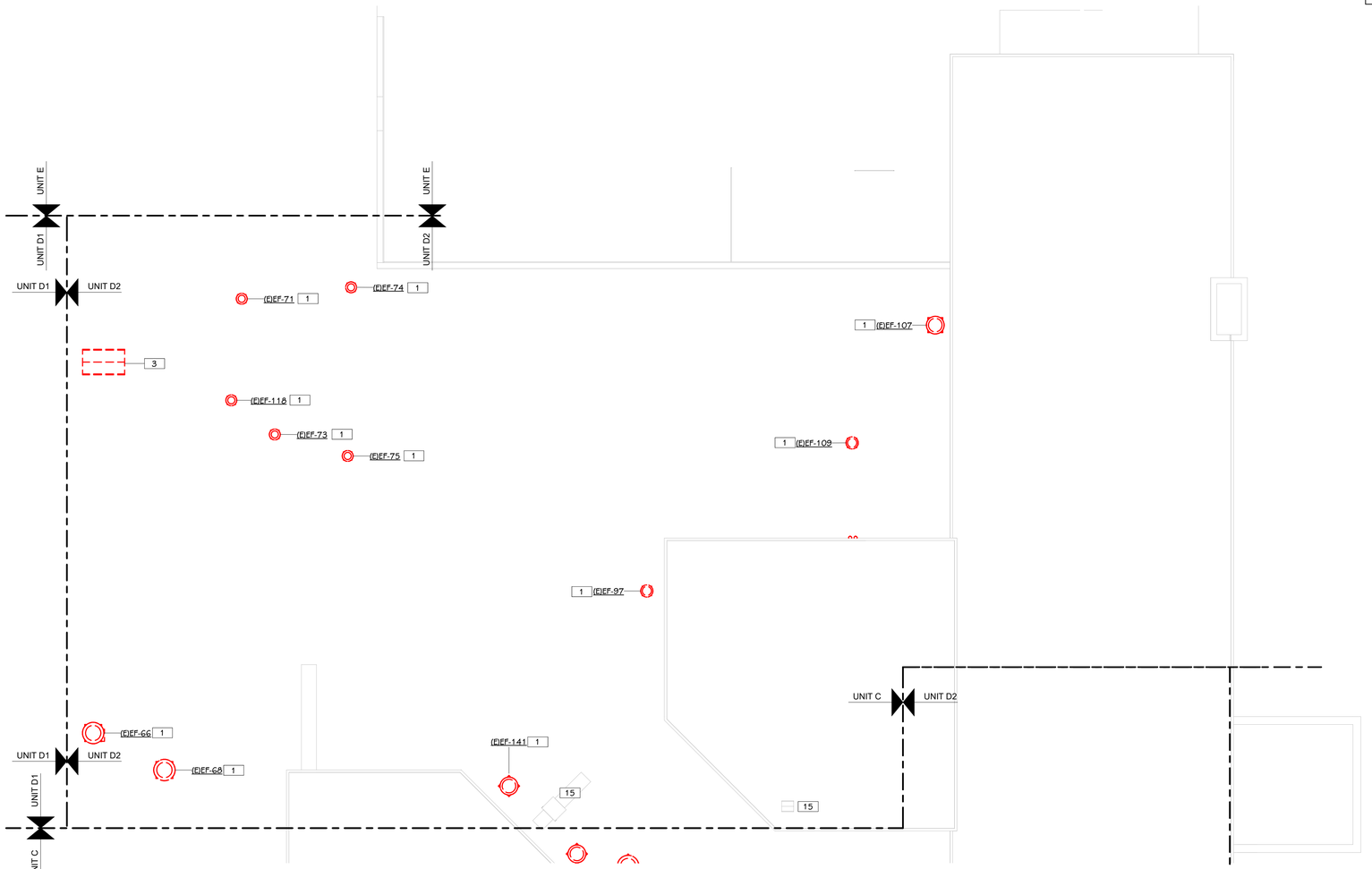
OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

SHEET TITLE
ROOF DEMOLITION PLAN - UNIT D1

DATE
OCTOBER 3, 2022

SHEET NUMBER
MD 150D1

21-806.00



ROOF MECHANICAL DEMOLITION PLAN - UNIT D2

3/32" = 1'-0"

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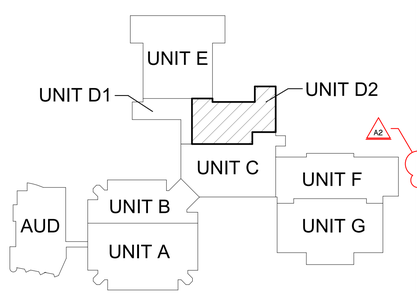

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ADDENDUM No. 2 October 28, 2022

ISSUED FOR DATE

PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

OWNER
KALAMAZOO PUBLIC SCHOOLS

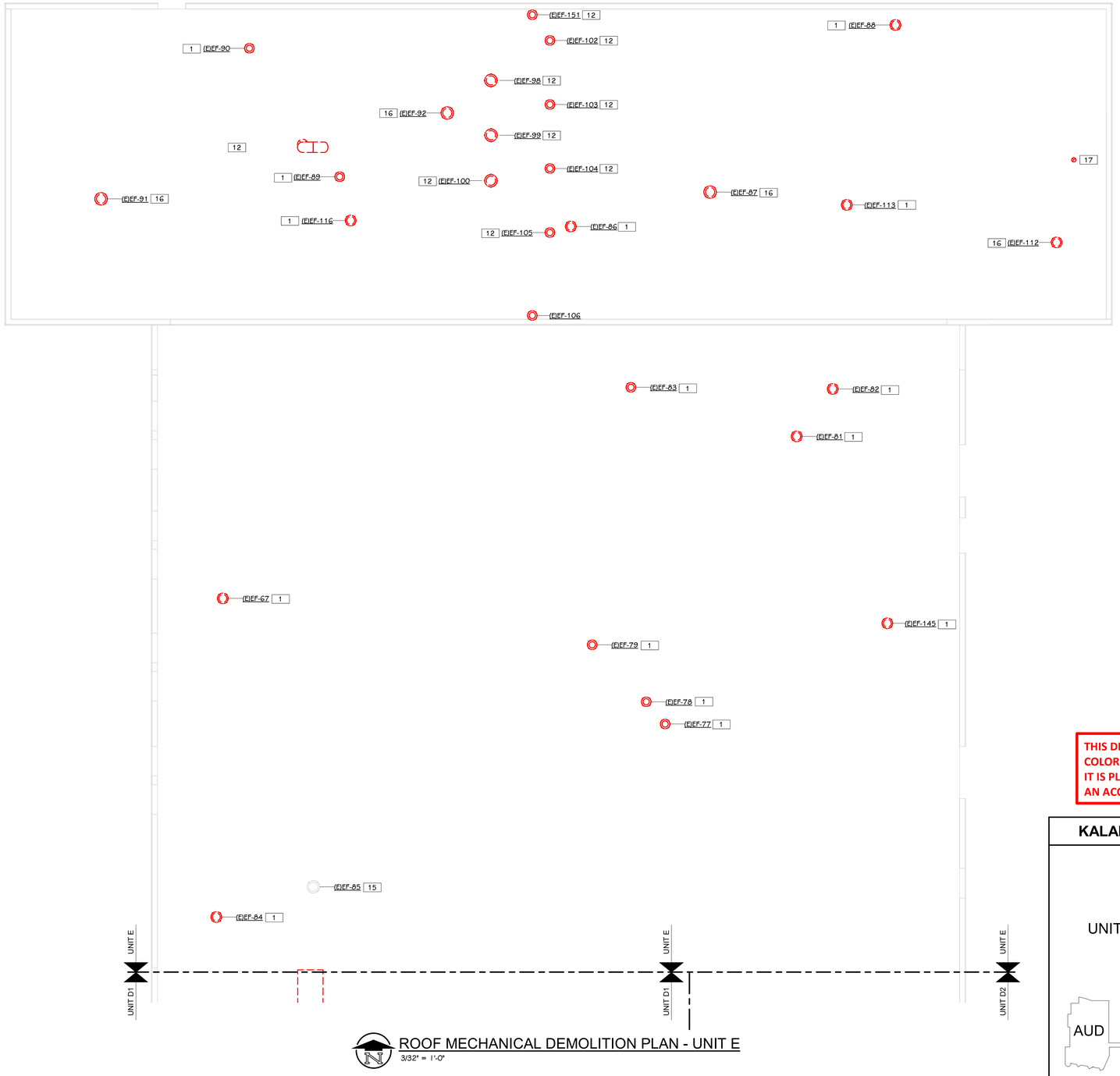
Kalamazoo, Michigan

SHEET TITLE
ROOF DEMOLITION PLAN - UNIT D2

DATE
OCTOBER 3, 2022

SHEET NUMBER
MD 150D2

21-806.00



ROOF MECHANICAL DEMOLITION PLAN - UNIT E

3/32" = 1'-0"

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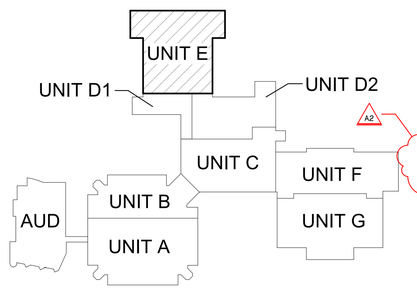
KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN

SCALE: NO SCALE

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OWNER
KALAMAZOO PUBLIC SCHOOLS

Kalamazoo, Michigan

SHEET TITLE
ROOF DEMOLITION PLAN - UNIT E

DATE
OCTOBER 3, 2022

SHEET NUMBER
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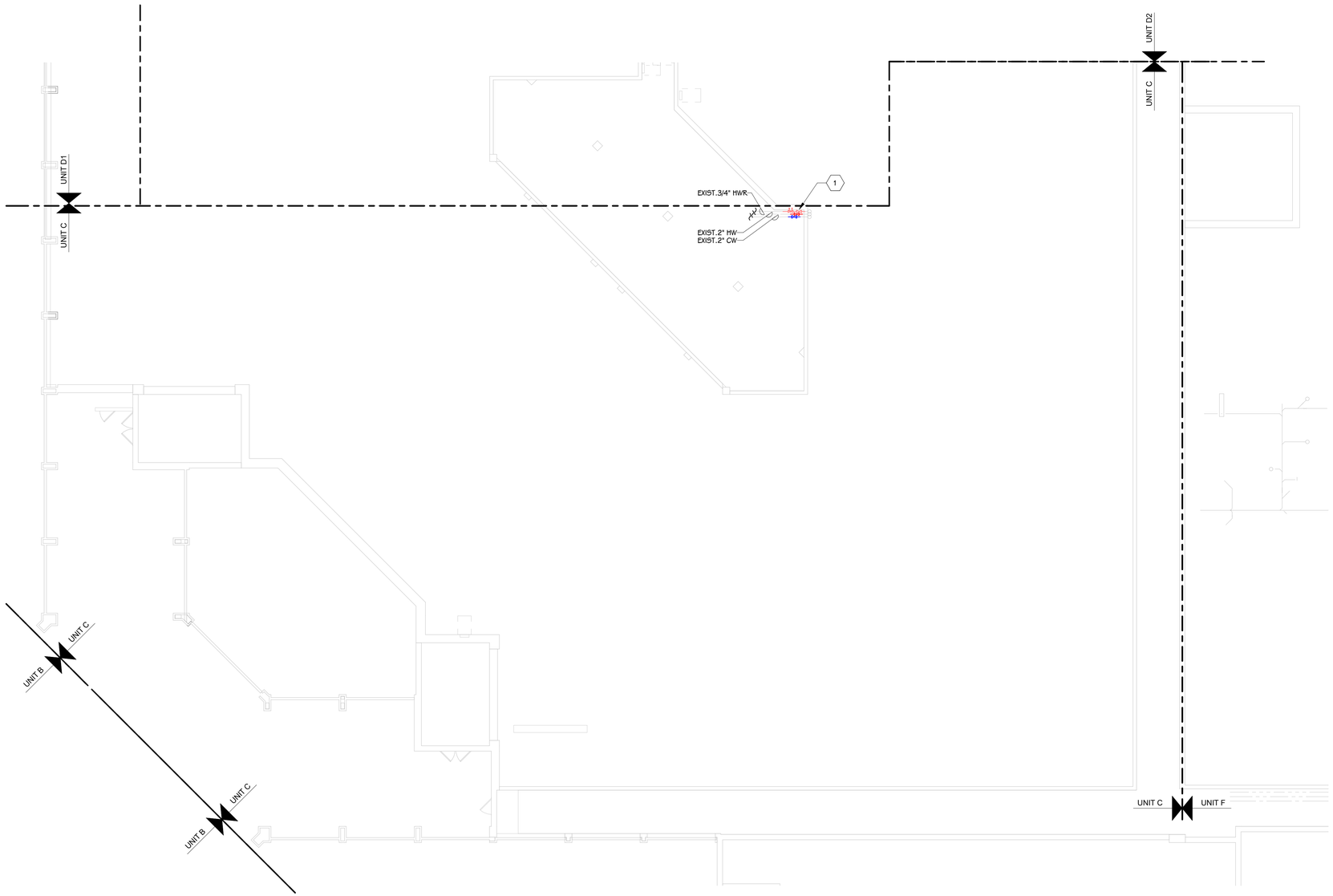
21-806.00



TUNNEL PLUMBING PLAN - UNIT C
3/32" = 1'-0"

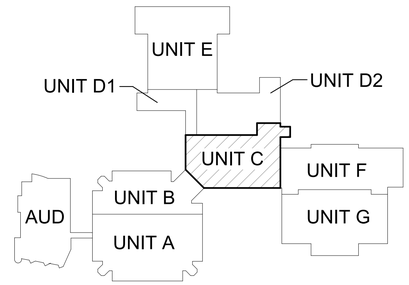
KEYED NOTES - PLUMBING

1 INSTALL NEW 2" (FIELD VERIFY SIZE) ISOLATION VALVES ON HW AND CW PIPING LINES, AND NEW 3/4" BALANCING VALVE ON HWR PIPING LINES UNDER KITCHEN IN CRAWL SPACE. INSTALL NEW 3/4" (FIELD VERIFY SIZE) ISOLATION VALVE IN HWR PIPING DOWNSTREAM OF NEW BALANCING VALVE.

2 INSTALL NEW 4" (FIELD VERIFY SIZE) ISOLATION VALVES ON HW AND CW PIPING MAINS AS INDICATED.

3 INSTALL NEW 3" (FIELD VERIFY SIZE) ISOLATION VALVES ON HW AND CW PIPING MAINS AS INDICATED.

KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN
SCALE: NO SCALE

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KALAMAZOO PUBLIC SCHOOLS
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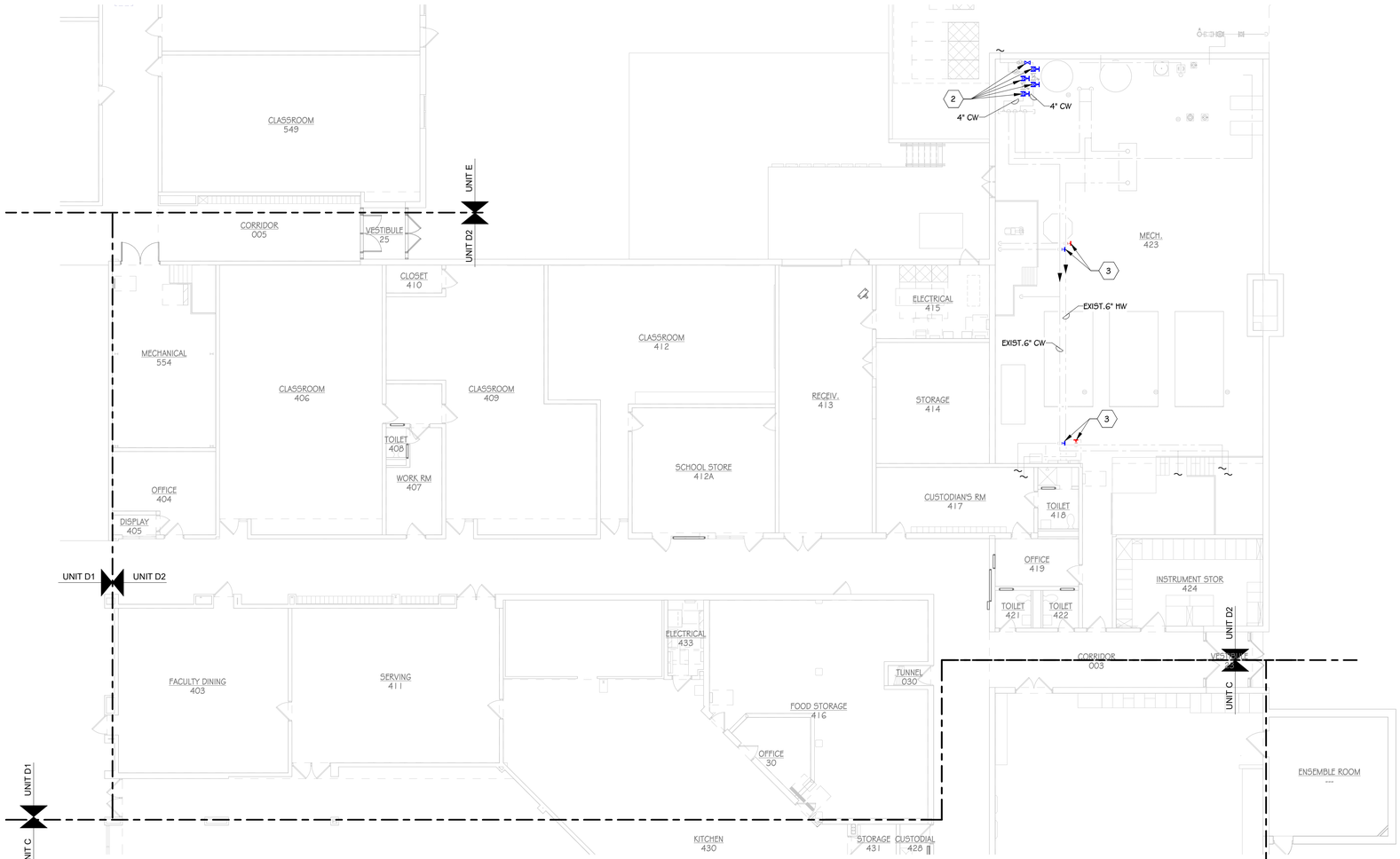

SECOND FLOOR PLUMBING PLAN - UNIT D2

3/32" = 1'-0"

KEYED NOTES - PLUMBING

1 INSTALL NEW 2" (FIELD VERIFY SIZE) ISOLATION VALVES ON HW AND CW PIPING LINES, AND NEW 3/4" BALANCING VALVE ON HWR PIPING LINES UNDER KITCHEN IN CRAWL SPACE. INSTALL NEW 3/4" (FIELD VERIFY SIZE) ISOLATION VALVE IN HWR PIPING DOWNSTREAM OF NEW BALANCING VALVE.

2 INSTALL NEW 4" (FIELD VERIFY SIZE) ISOLATION VALVES ON HW AND CW PIPING MAINS AS INDICATED.

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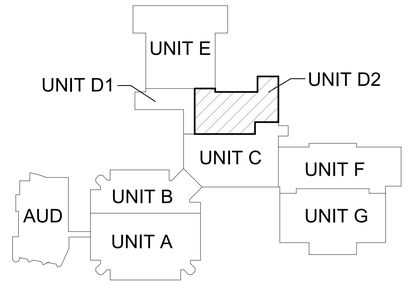

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Kalamazoo, Michigan

SHEET TITLE
SECOND FLOOR PLUMBING PLAN - UNIT D2

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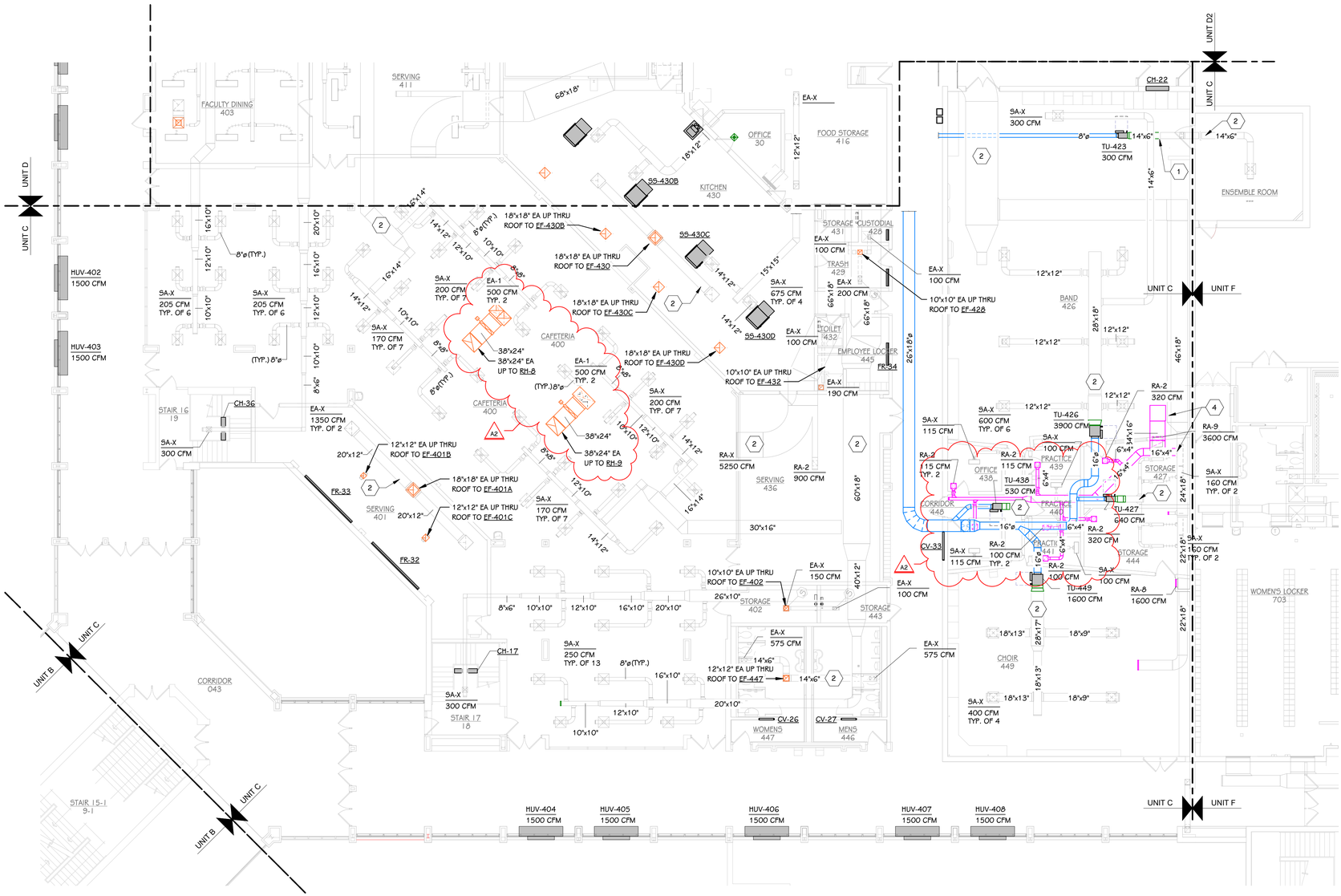

SECOND FLOOR SHEET METAL PLAN - UNIT C

3/32" = 1'-0"

KEYED NOTES - MECHANICAL

1 CONNECT TO EXISTING DUCTWORK.

2 CLEAN EXISTING SUPPLY, RETURN, AND EXHAUST DUCTWORK. PROVIDE PHOTO DOCUMENTATION.

3 NEW EXHAUST FAN CONTROLLED BY TWIST TIMER.

4 CONNECT NEW RETURN DUCTWORK TO EXISTING RETURN AIR GRILLE. COORDINATE LOCATION OF GRILLE IN NEW CEILING WITH ARCH.

5 CAP EXHAUST DUCT CONCEALED IN WALL.

6 REFRIGERANT LIQUID AND SUCTION PIPING DOWN THROUGH ROOF TO AHU/UV. REFRIGERANT PIPING SIZE BY MANUFACTURER.

7 INSTALL NEW EXHAUST FAN ON EXISTING CURB. CONNECT TO EXISTING DUCTWORK BELOW ROOF.

8 INSTALL NEW RELIEF/INTAKE HOOD ON ROOF.

9 EXISTING TO REMAIN.

10 DROP DUCT FOR RA GRILLED MOUNTED AT 6" AFF.

11 PAINT NEW GRILLE/DIFFUSER TO MATCH EXISTING DUCTWORK. TYPICAL OF ALL THIS ROOM.

12 EXTEND EXISTING OUTSIDE AIR INTAKE TO ACHIEVE 10' OF SEPARATION FROM EXHAUST FANS.

13 PROVIDE INTEGRAL DAMPER.

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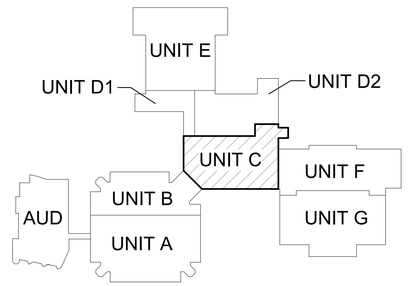

KEY PLAN

SCALE: NO SCALE

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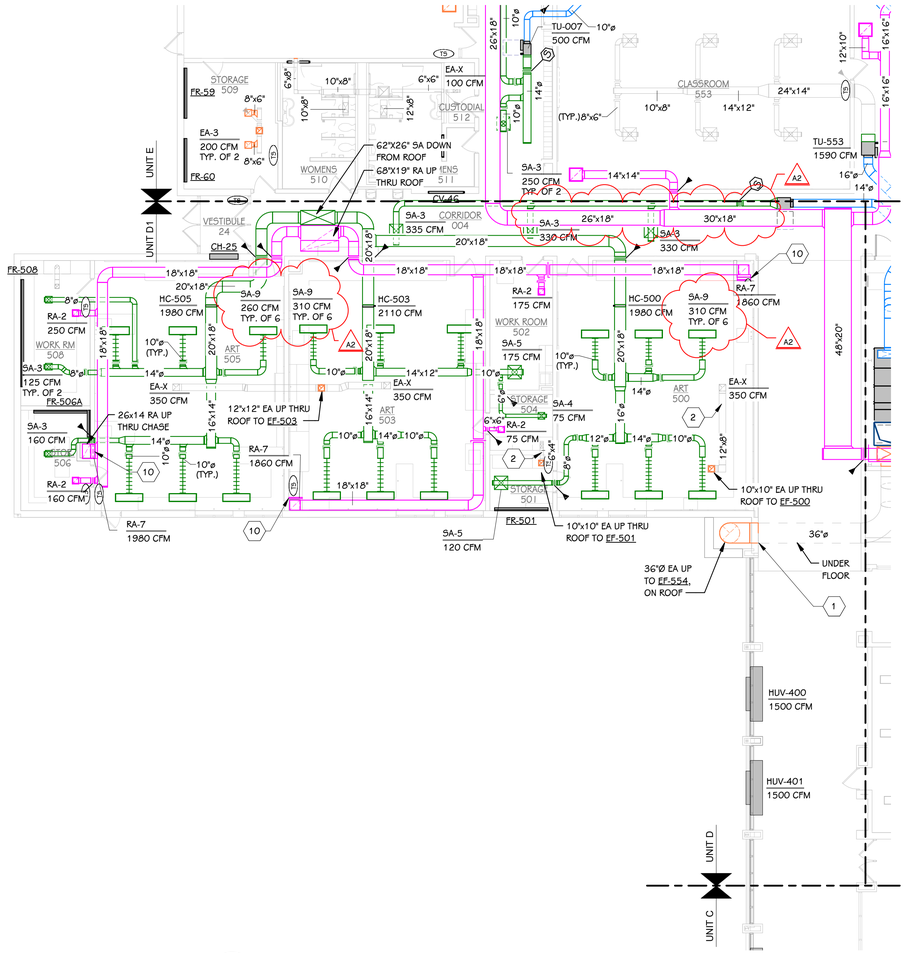

SECOND FLOOR SHEET METAL PLAN - UNIT D1

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1 CONNECT TO EXISTING DUCTWORK.

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6 REFRIGERANT LIQUID AND SUCTION PIPING DOWN THROUGH ROOF TO AHU/UV. REFRIGERANT PIPING SIZE BY MANUFACTURER.

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8 INSTALL NEW RELIEF/INTAKE HOOD ON ROOF.

9 EXISTING TO REMAIN.

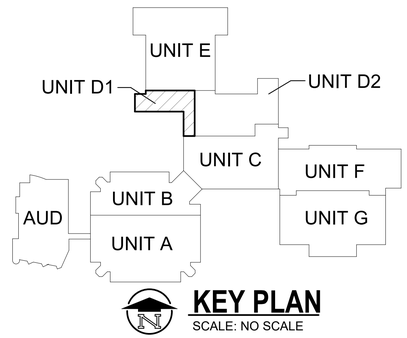
10 DROP DUCT FOR RA GRILLED MOUNTED AT 6" AFF.

11 PAINT NEW GRILLE/DIFFUSER TO MATCH EXISTING DUCTWORK. TYPICAL OF ALL THIS ROOM.

12 EXTEND EXISTING OUTSIDE AIR INTAKE TO ACHIEVE 10' OF SEPARATION FROM EXHAUST FANS.

13 PROVIDE INTEGRAL DAMPER.

KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN

SCALE: NO SCALE

THIS DRAWING SHEET IS INTENDED TO BE PLOTTED IN COLOR. IF THIS TEXT APPEARS IN BLACK AND WHITE, IT IS PLOTTED INCORRECTLY. DISCARD AND OBTAIN AN ACCURATE DRAWING

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ADDENDUM No. 2 October 28, 2022

ISSUED FOR DATE

PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

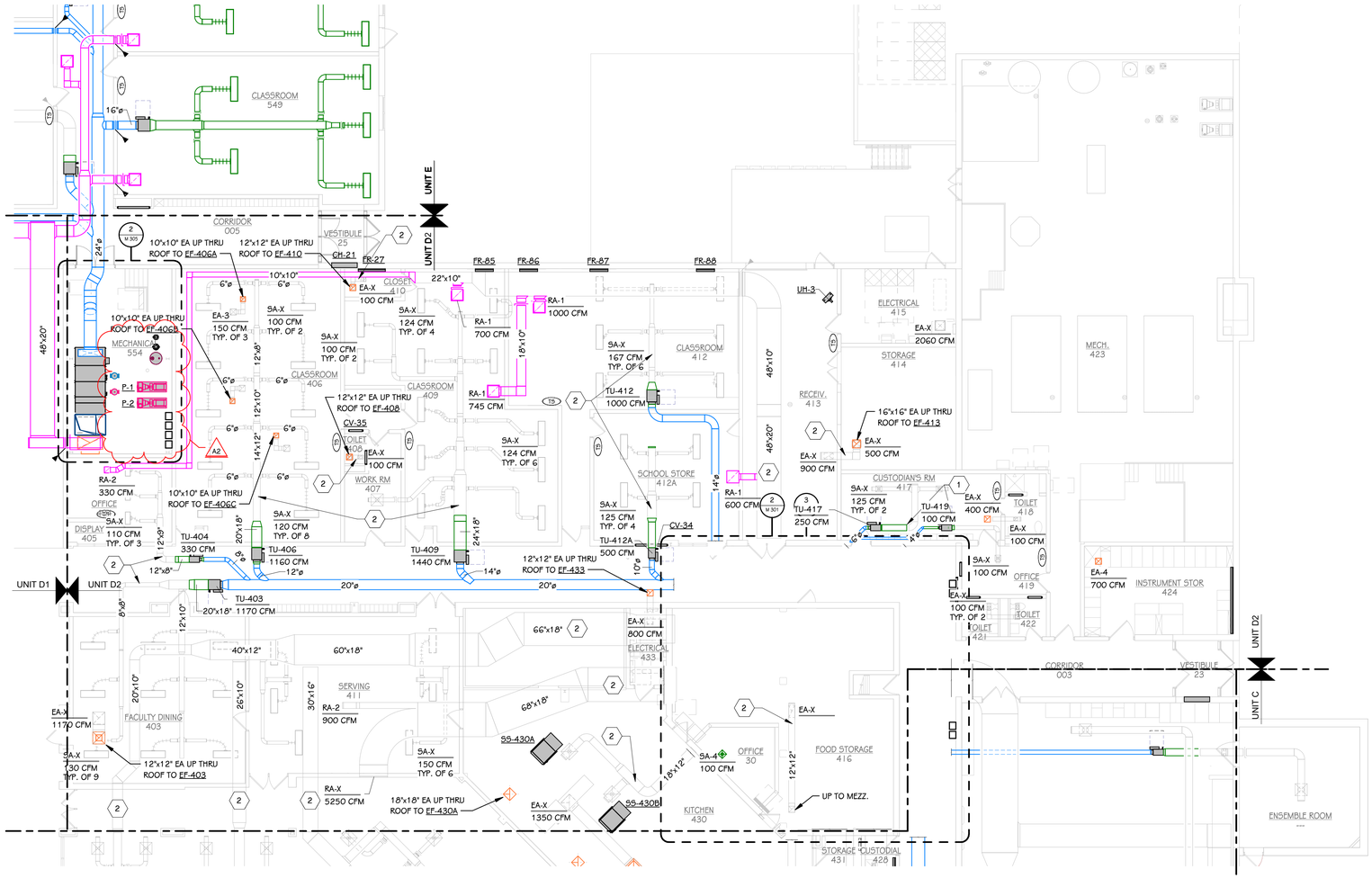
OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

SHEET TITLE
SECOND FLOOR SHEET METAL PLAN - UNIT D1

DATE
OCTOBER 3, 2022

SHEET NUMBER
M102D1

21-806.00



SECOND FLOOR SHEET METAL PLAN - UNIT D2

3/32" = 1'-0"

THIS DRAWING SHEET IS INTENDED TO BE PLOTTED IN COLOR. IF THIS TEXT APPEARS IN BLACK AND WHITE, IT IS PLOTTED INCORRECTLY. DISCARD AND OBTAIN AN ACCURATE DRAWING

KEYED NOTES - MECHANICAL

1 CONNECT TO EXISTING DUCTWORK.

2 CLEAN EXISTING SUPPLY, RETURN, AND EXHAUST DUCTWORK. PROVIDE PHOTO DOCUMENTATION.

3 NEW EXHAUST FAN CONTROLLED BY TWIST TIMER.

4 CONNECT NEW RETURN DUCTWORK TO EXISTING RETURN AIR GRILLE. COORDINATE LOCATION OF GRILLE IN NEW CEILING WITH ARCH.

5 CAP EXHAUST DUCT CONCEALED IN WALL.

6 REFRIGERANT LIQUID AND SUCTION PIPING DOWN THROUGH ROOF TO AHU/UV. REFRIGERANT PIPING SIZE BY MANUFACTURER.

7 INSTALL NEW EXHAUST FAN ON EXISTING CURB. CONNECT TO EXISTING DUCTWORK BELOW ROOF.

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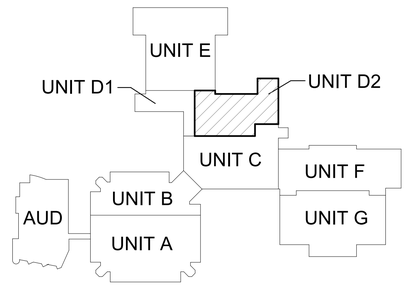
13 PROVIDE INTEGRAL DAMPER.

KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN

SCALE: NO SCALE

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ADDENDUM No. 2 October 28, 2022

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PROJECT TITLE
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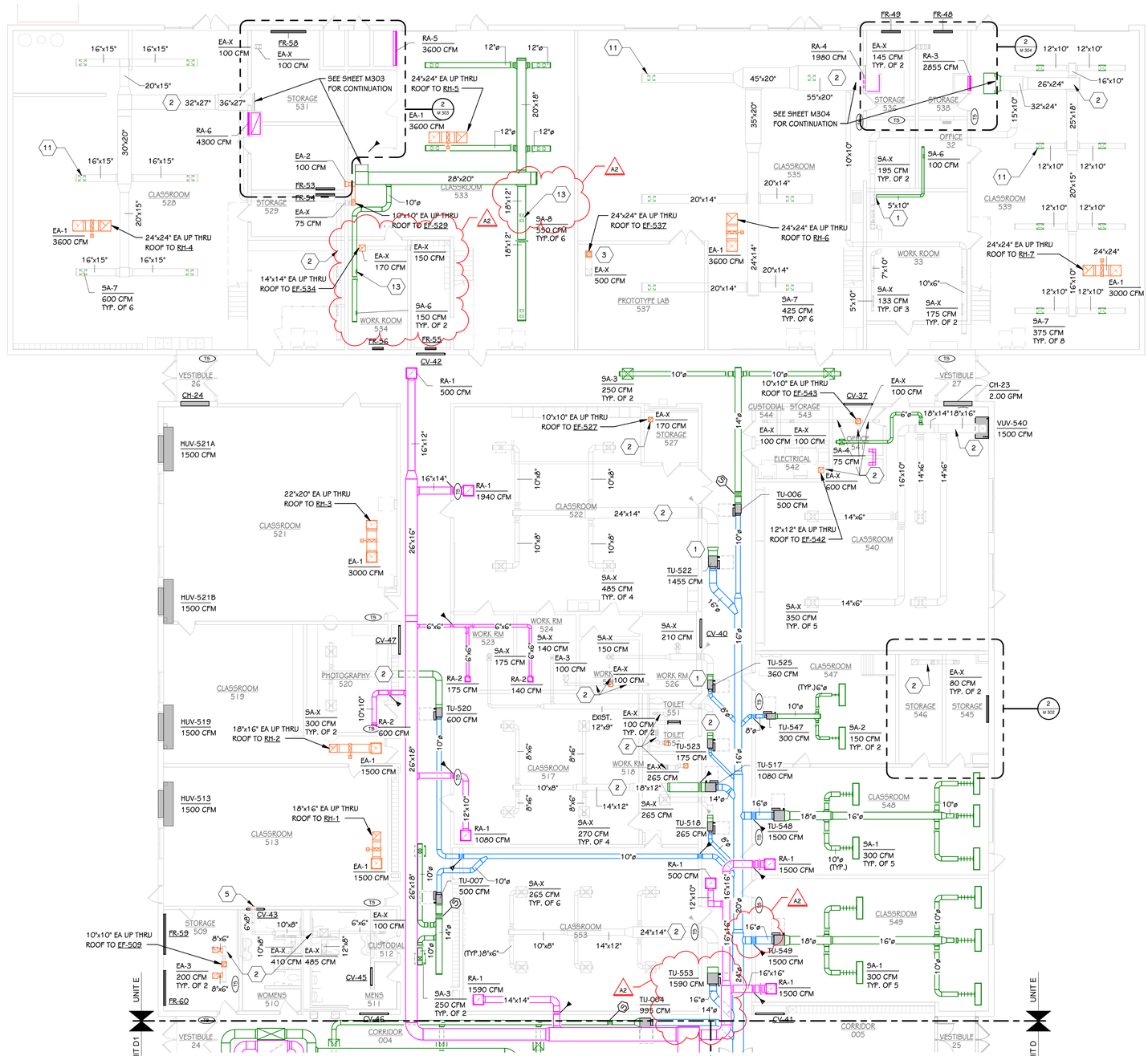
OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

SHEET TITLE
SECOND FLOOR SHEET METAL PLAN - UNIT D2

DATE
OCTOBER 3, 2022

SHEET NUMBER
M 102D2

21-806.00



SECOND FLOOR SHEET METAL PLAN - UNIT E

3/32" = 1'-0"

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KEYED NOTES - MECHANICAL

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2 CLEAN EXISTING SUPPLY, RETURN, AND EXHAUST DUCTWORK. PROVIDE PHOTO DOCUMENTATION.

3 NEW EXHAUST FAN CONTROLLED BY TWIST TIMER.

4 CONNECT NEW RETURN DUCTWORK TO EXISTING RETURN AIR GRILLE. COORDINATE LOCATION OF GRILLE IN NEW CEILING WITH ARCH.

5 CAP EXHAUST DUCT CONCEALED IN WALL.

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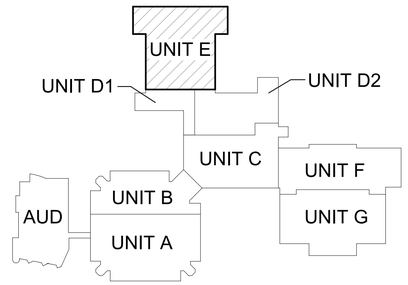
13 PROVIDE INTEGRAL DAMPER.

A2

KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN
SCALE: NO SCALE

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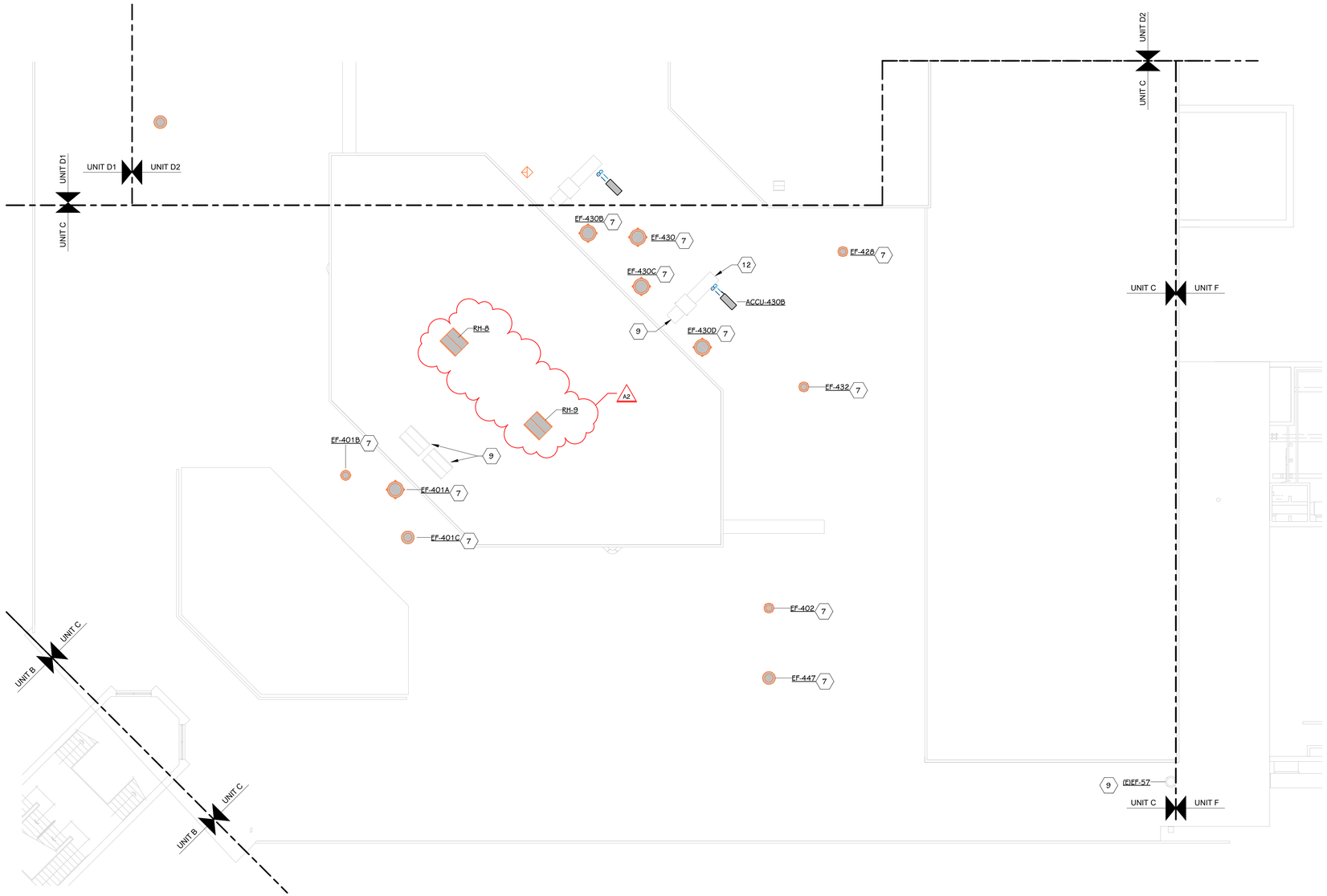
OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

SHEET TITLE
SECOND FLOOR SHEET METAL PLAN - UNIT E

DATE
OCTOBER 3, 2022

SHEET NUMBER
M 102E
21-806.00



ROOF MECHANICAL PLAN - UNIT C
3/32" = 1'-0"

KEYED NOTES - MECHANICAL

1 CONNECT TO EXISTING DUCTWORK.

2 CLEAN EXISTING SUPPLY, RETURN, AND EXHAUST DUCTWORK. PROVIDE PHOTO DOCUMENTATION.

3 NEW EXHAUST FAN CONTROLLED BY TWIST TIMER.

4 CONNECT NEW RETURN DUCTWORK TO EXISTING RETURN AIR GRILLE. COORDINATE LOCATION OF GRILLE IN NEW CEILING WITH ARCH.

5 CAP EXHAUST DUCT CONCEALED IN WALL.

6 REFRIGERANT LIQUID AND SUCTION PIPING DOWN THROUGH ROOF TO AHU/UV. REFRIGERANT PIPING SIZE BY MANUFACTURER.

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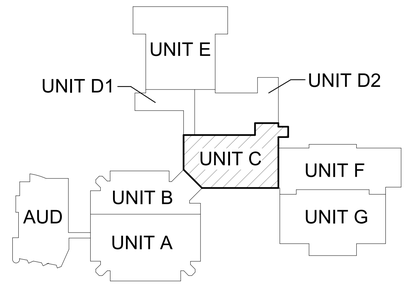
KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN
SCALE: NO SCALE

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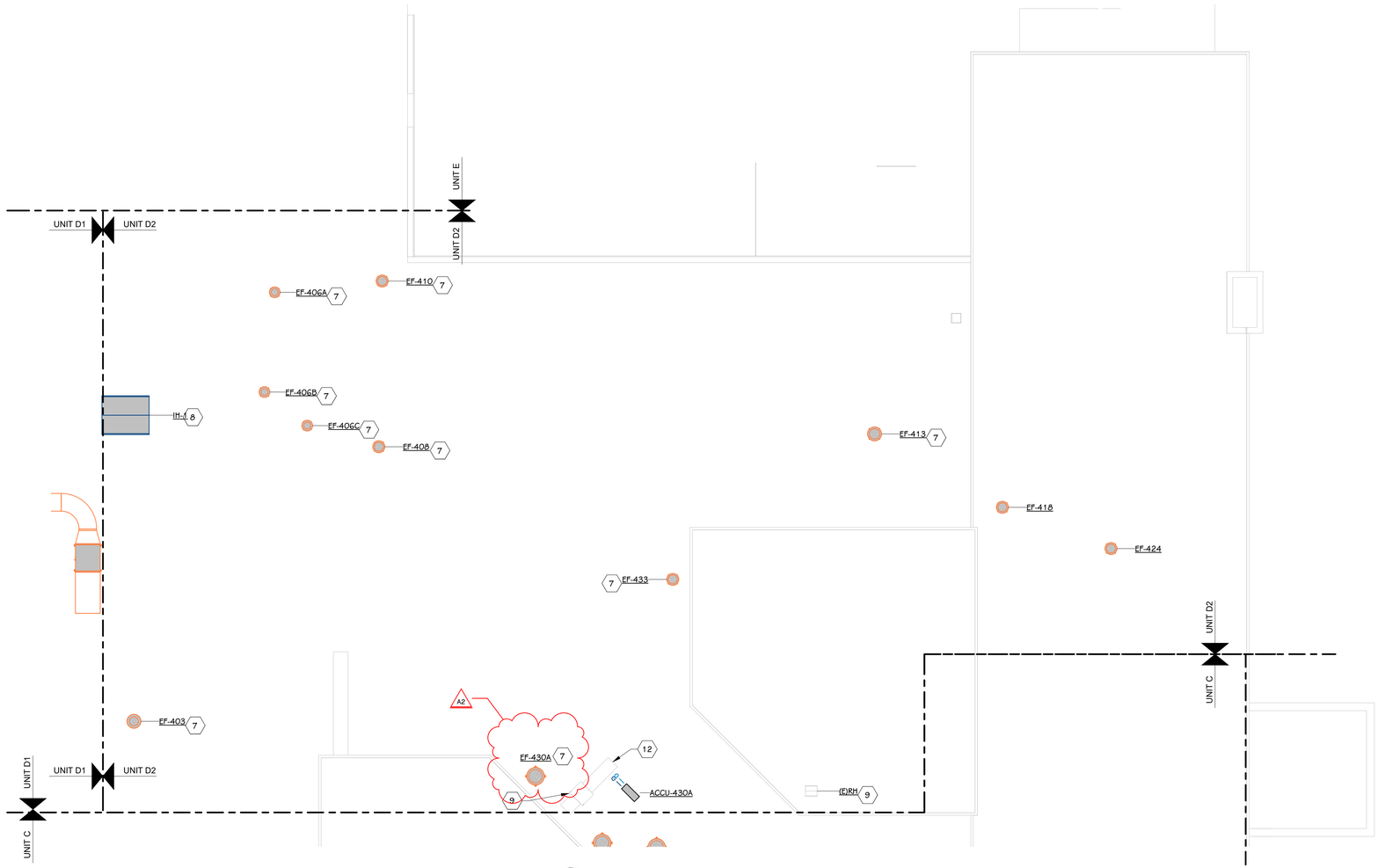
OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

SHEET TITLE
ROOF MECHANICAL PLAN - UNIT C

DATE
OCTOBER 3, 2022

SHEET NUMBER
M 150C
21-806.00



ROOF MECHANICAL PLAN - UNIT D2

3/32" = 1'-0"

KEYED NOTES - MECHANICAL

1 CONNECT TO EXISTING DUCTWORK.

2 CLEAN EXISTING SUPPLY, RETURN, AND EXHAUST DUCTWORK. PROVIDE PHOTO DOCUMENTATION.

3 NEW EXHAUST FAN CONTROLLED BY TWIST TIMER.

4 CONNECT NEW RETURN DUCTWORK TO EXISTING RETURN AIR GRILLE. COORDINATE LOCATION OF GRILLE IN NEW CEILING WITH ARCH.

5 CAP EXHAUST DUCT CONCEALED IN WALL.

6 REFRIGERANT LIQUID AND SUCTION PIPING DOWN THROUGH ROOF TO AHU/UV. REFRIGERANT PIPING SIZE BY MANUFACTURER.

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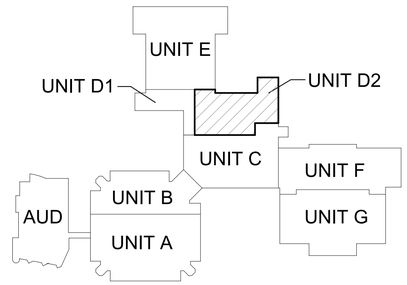
KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN

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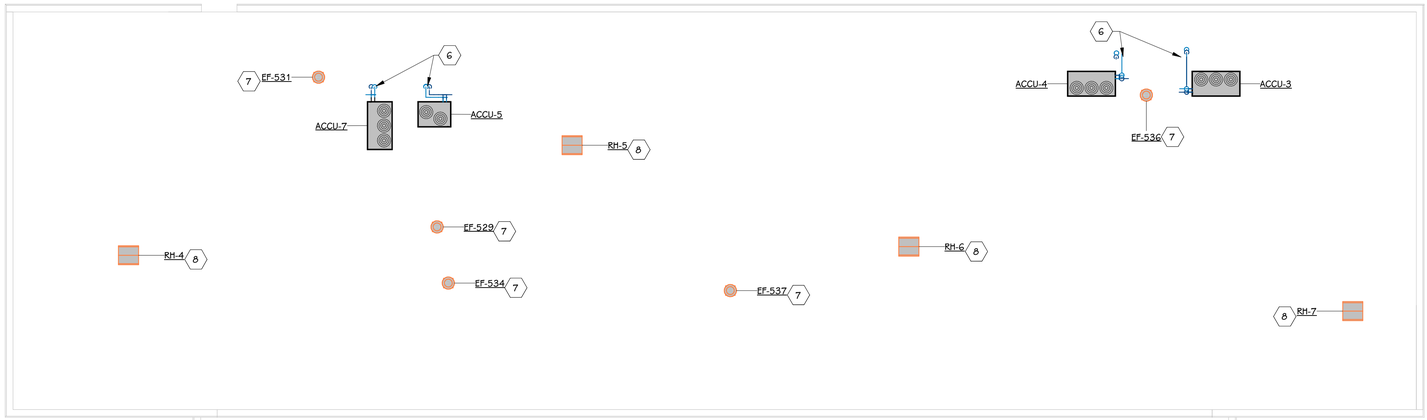
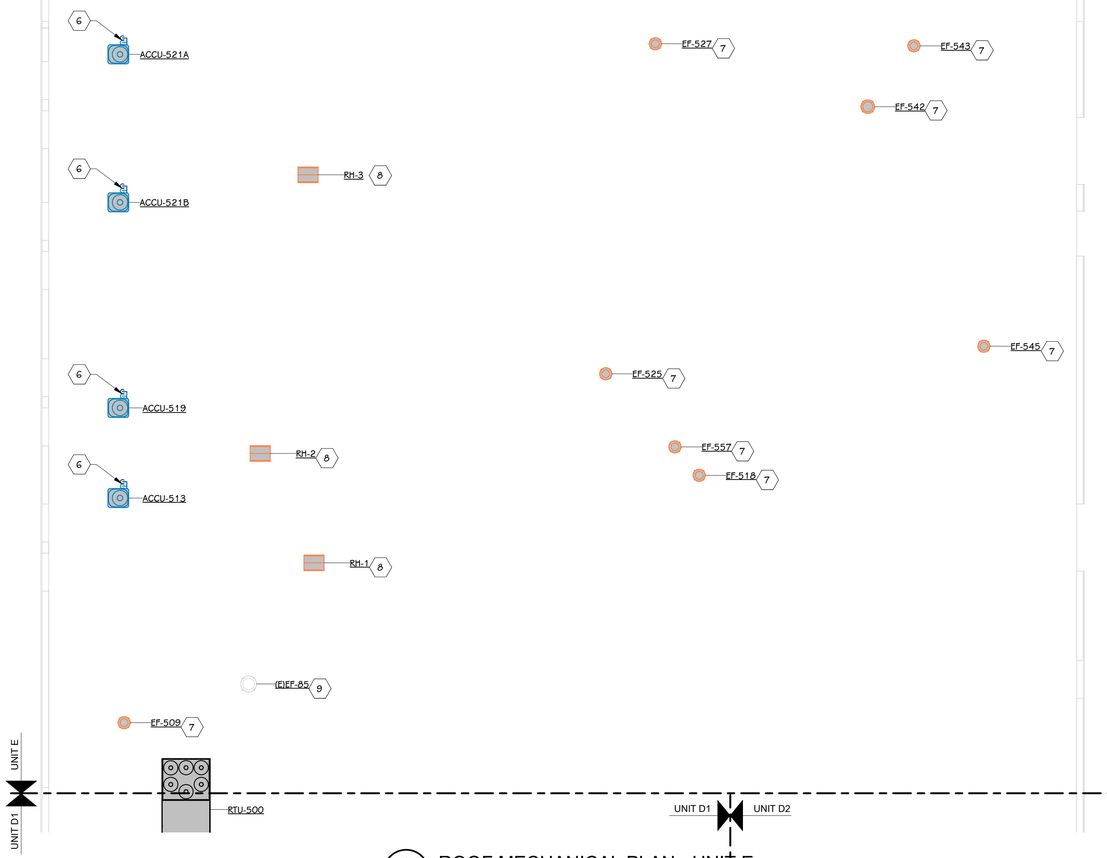
OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

SHEET TITLE
ROOF MECHANICAL PLAN - UNIT D2

DATE
OCTOBER 3, 2022

SHEET NUMBER
M 150D2
21-806.00





ROOF MECHANICAL PLAN - UNIT E
3/32" = 1'-0"

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5 CAP EXHAUST DUCT CONCEALED IN WALL.

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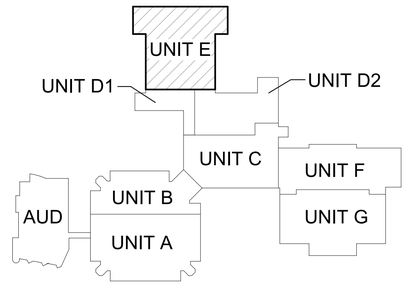
13 PROVIDE INTEGRAL DAMPER.

KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN
SCALE: NO SCALE

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PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

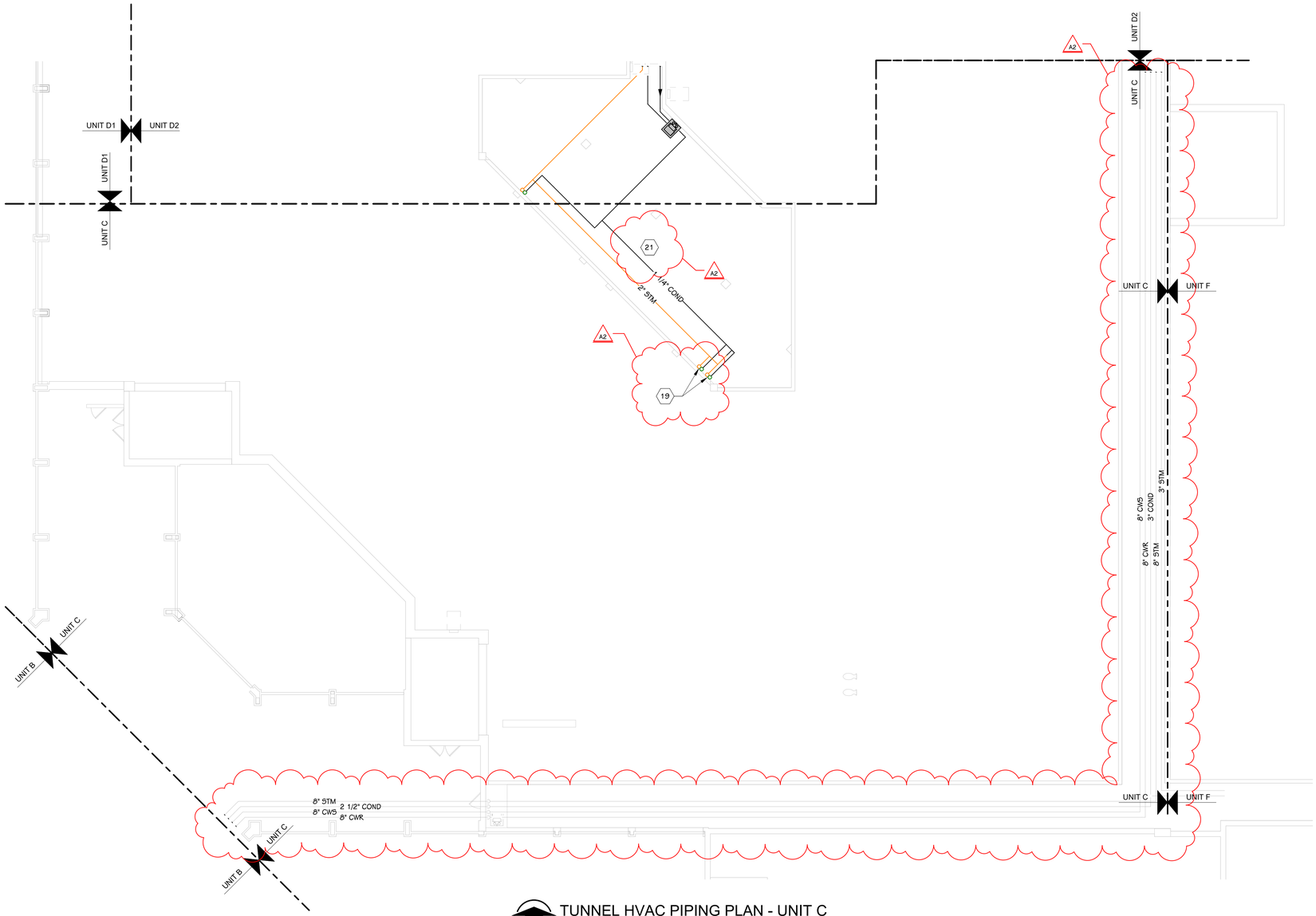
OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

SHEET TITLE
ROOF MECHANICAL PLAN - UNIT E

DATE
OCTOBER 3, 2022

SHEET NUMBER
M 150E
21-806.00

ALL REMAINING DUCTWORK AFTER DEMOLITION SHALL BE CLEANED. PROVIDE PRE AND POST PHOTO DOCUMENTATION AT A MINIMUM OF 20' INTERVALS BUT NOT LESS THAN EACH BRANCH.



TUNNEL HVAC PIPING PLAN - UNIT C
3/32" = 1'-0"

KEYED NOTES - MECHANICAL

1 ROUTE CHILLED WATER SUPPLY AND RETURN, HEATING WATER SUPPLY AND RETURN DOWN IN COLUMN TO UNIT VENTILATORS. REFER TO DETAIL.

2 ROUTE WIRE MOLD EXPOSED DOWN WALL TO TS. PAINT TO MATCH WALL.

3 PROVIDE HORIZONTAL PIPE CHASE. ROUTE PIPE EXPOSED ON WALL TO CEILING. SEE ARCH FOR VERTICAL PIPE COVER.

4 PROVIDE HORIZONTAL PIPE CHASE.

5 DROP HS/HR PIPING DOWN IN WALL TO TUNNEL BELOW.

6 PROVIDE HORIZONTAL PIPE CHASE. ROUTE PIPING UP IN CASEWORK. EXPOSED ABOVE CASEWORK TO CEILING.

7 ROUTE PIPE EXPOSED ON WALL UP TO CEILING. SEE ARCH FOR VERTICAL PIPE COVER.

8 REUSE EXISTING WALL PENETRATIONS, PROVIDE ESCUTEONS, FIRE SEALS.

9 NEW STEAM CONDENSATE RECEIVER. REFER TO DETAIL.

10 CONNECT NEW CWS/CWR TO EXISTING PIPE MAINS.

11 COPPER PIPE TRANSITIONS TO PEX AT WALL, FISH PEX PIPING DOWN IN EXISTING WALL OPENINGS.

12 CONNECT NEW STEAM PIPING TO EXISTING STEAM PIPING HEADER.

13 CONNECT NEW PUMPED STEAM CONDENSATE PIPING TO EXISTING SURGE TANK.

14 ROUTE PIPING DOWN IN UNIT VENTILATOR DUCT SHROUD.

15 HS UP TO UNIT ABOVE.

16 HR DOWN FROM UNIT ABOVE.

17 HS DOWN FROM UNIT ABOVE.

18 ROUTE PIPING EXPOSED ON WALL WITH PVC INSULATION JACKET. TYPICAL.

19 TIE INTO EXISTING EQUIPMENT.

20 PROVIDE 3-WAY CONTROL VALVE.

21 STEAM , CONDENSATE, AND HEATING WATER THERMAL EXPANSION COMPENSATION DESIGN IS DELEGATED TO THE CONTRACTOR.

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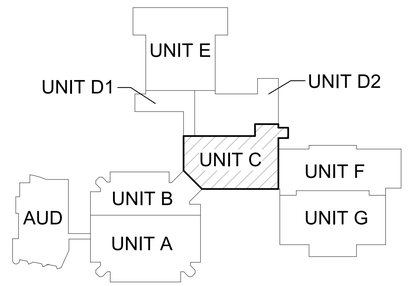
KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN
SCALE: NO SCALE

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ADDENDUM No. 2 October 28, 2022

ISSUED FOR DATE

PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

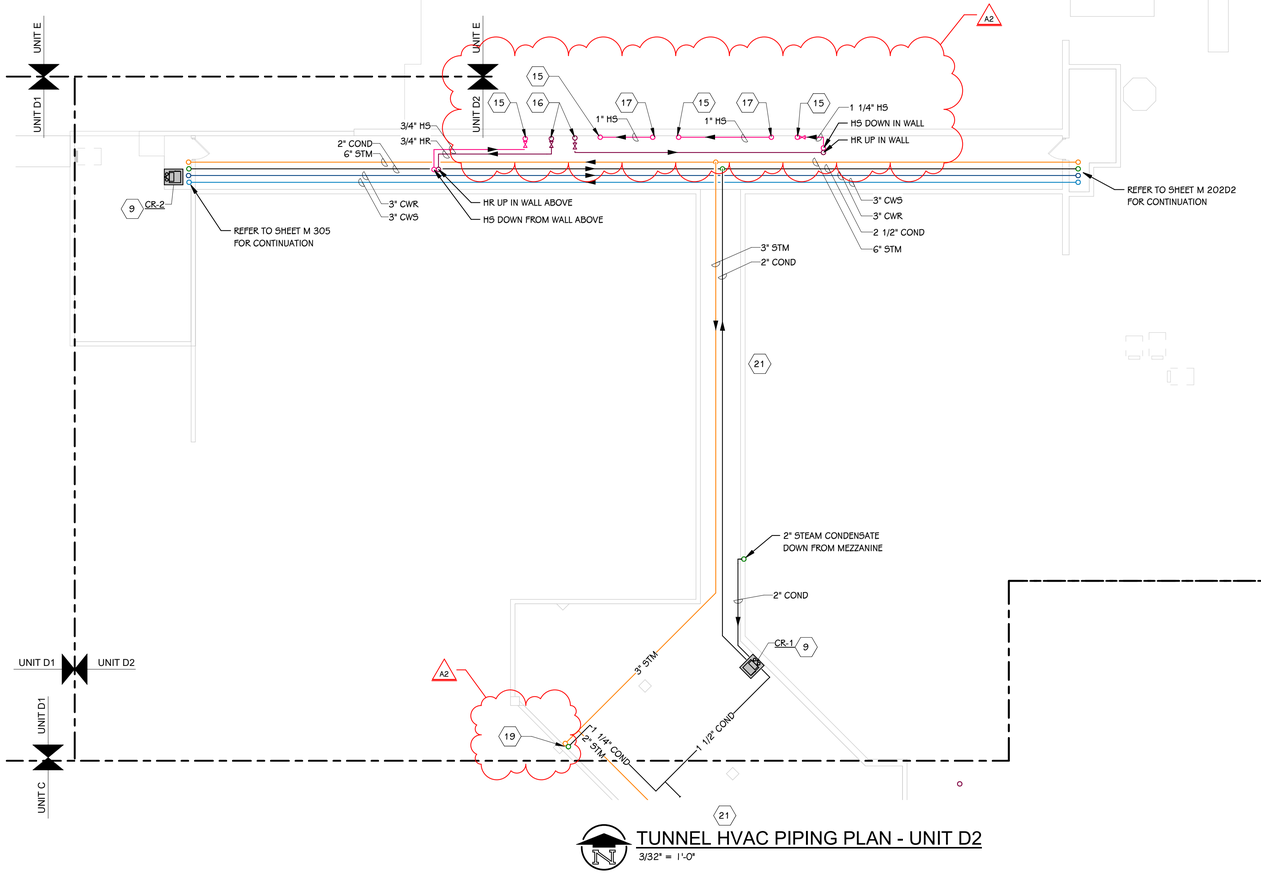
OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

SHEET TITLE
TUNNEL HVAC PIPING PLAN - UNIT C

DATE
OCTOBER 3, 2022

A2

SHEET NUMBER
M 200C
21-806.00



TUNNEL HVAC PIPING PLAN - UNIT D2

3/32" = 1'-0"

KEYED NOTES - MECHANICAL

1 ROUTE CHILLED WATER SUPPLY AND RETURN, HEATING WATER SUPPLY AND RETURN DOWN IN COLUMN TO UNIT VENTILATORS. REFER TO DETAIL.

2 ROUTE WIRE MOLD EXPOSED DOWN WALL TO TS. PAINT TO MATCH WALL.

3 PROVIDE HORIZONTAL PIPE CHASE. ROUTE PIPE EXPOSED ON WALL TO CEILING. SEE ARCH FOR VERTICAL PIPE COVER.

4 PROVIDE HORIZONTAL PIPE CHASE.

5 DROP HS/HR PIPING DOWN IN WALL TO TUNNEL BELOW.

6 PROVIDE HORIZONTAL PIPE CHASE. ROUTE PIPING UP IN CASEWORK. EXPOSED ABOVE CASEWORK TO CEILING.

7 ROUTE PIPE EXPOSED ON WALL UP TO CEILING. SEE ARCH FOR VERTICAL PIPE COVER.

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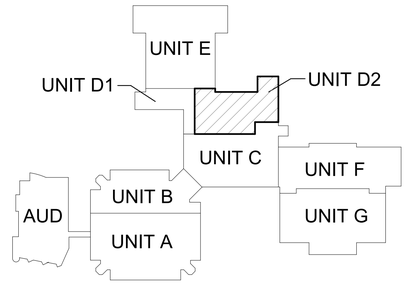
KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN
SCALE: NO SCALE

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ADDENDUM No. 2 October 28, 2022

ISSUED FOR DATE

PROJECT TITLE
KALAMAZOO CENTRAL
HIGH SCHOOL
MECHANICAL
IMPROVEMENTS
PROJECT

OWNER
KALAMAZOO PUBLIC
SCHOOLS

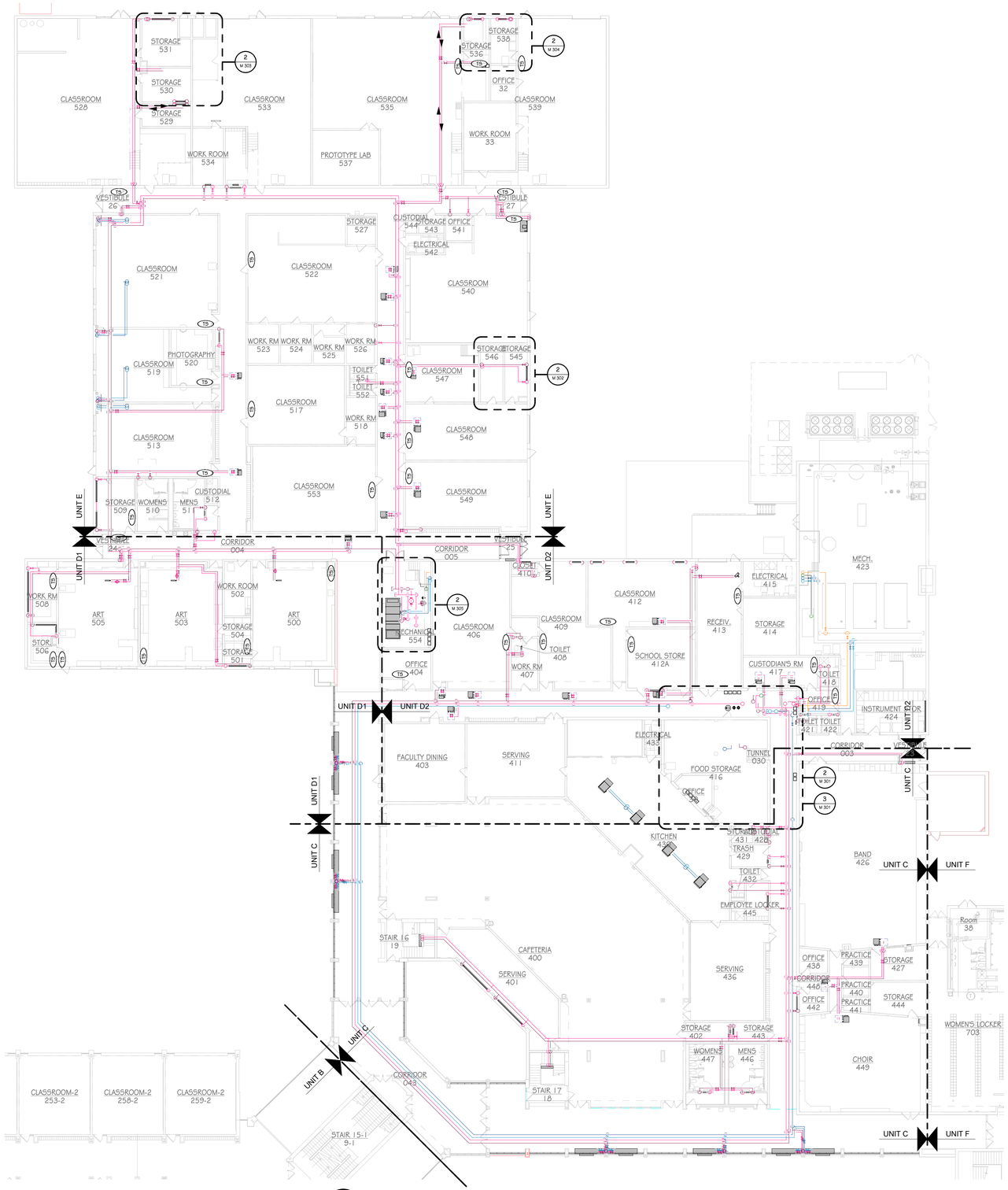
Kalamazoo, Michigan

SHEET TITLE
TUNNEL HVAC PIPING PLAN - UNIT D2

DATE
OCTOBER 3, 2022

A2

SHEET NUMBER
M 200D2
21-806.00



SECOND FLOOR HVAC PIPING PLAN - OVERALL

1" = 20'-0"

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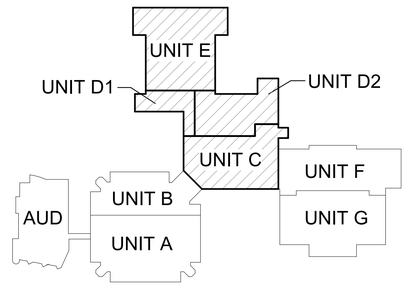
KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN

SCALE: NO SCALE

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OWNER
KALAMAZOO PUBLIC SCHOOLS

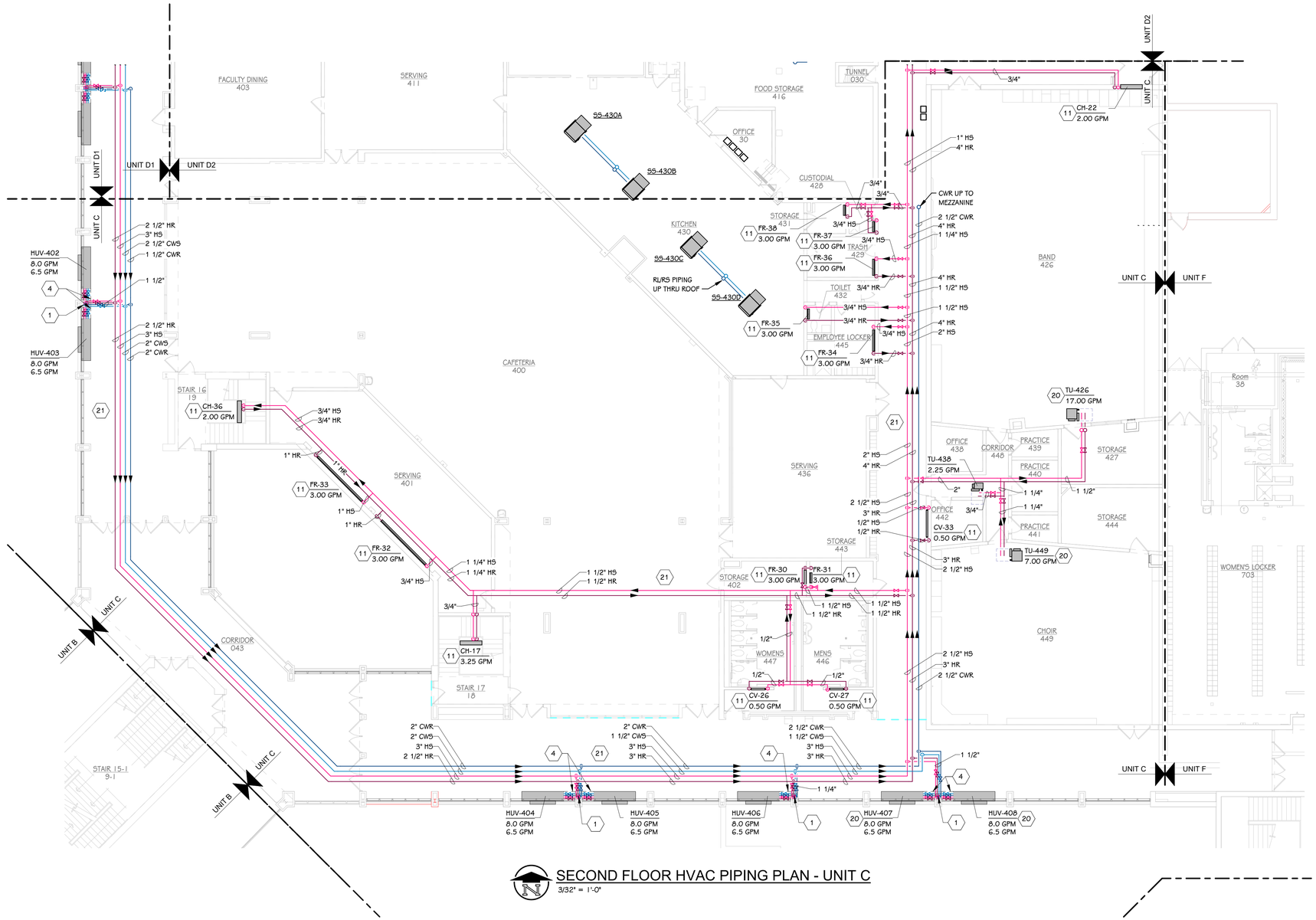
Kalamazoo, Michigan

SHEET TITLE
SECOND FLOOR HVAC PIPING PLAN - OVERALL

DATE
OCTOBER 3, 2022

A2

SHEET NUMBER
M 202
21-806.00



SECOND FLOOR HVAC PIPING PLAN - UNIT C

3/32" = 1'-0"

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2 ROUTE WIRE MOLD EXPOSED DOWN WALL TO T5. PAINT TO MATCH WALL.

3 PROVIDE HORIZONTAL PIPE CHASE. ROUTE PIPE EXPOSED ON WALL TO CEILING. SEE ARCH FOR VERTICAL PIPE COVER.

4 PROVIDE HORIZONTAL PIPE CHASE.

5 DROP HS/HR PIPING DOWN IN WALL TO TUNNEL BELOW.

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7 ROUTE PIPE EXPOSED ON WALL UP TO CEILING. SEE ARCH FOR VERTICAL PIPE COVER.

8 REUSE EXISTING WALL PENETRATIONS, PROVIDE ESCUTEONS, FIRE SEALS.

9 NEW STEAM CONDENSATE RECEIVER. REFER TO DETAIL.

10 CONNECT NEW CWS/CWR TO EXISTING PIPE MAINS.

11 COPPER PIPE TRANSITIONS TO PEX AT WALL, FISH PEX PIPING DOWN IN EXISTING WALL OPENINGS.

12 CONNECT NEW STEAM PIPING TO EXISTING STEAM PIPING HEADER.

13 CONNECT NEW PUMPED STEAM CONDENSATE PIPING TO EXISTING SURGE TANK.

14 ROUTE PIPING DOWN IN UNIT VENTILATOR DUCT SHROUD.

15 HS UP TO UNIT ABOVE.

16 HR DOWN FROM UNIT ABOVE.

17 HS DOWN FROM UNIT ABOVE.

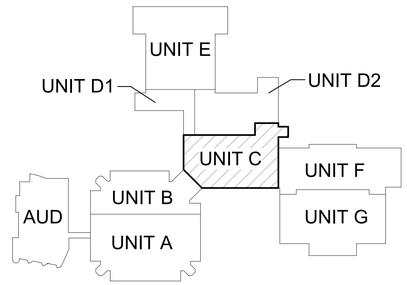
18 ROUTE PIPING EXPOSED ON WALL WITH PVC INSULATION JACKET. TYPICAL.

19 TIE INTO EXISTING EQUIPMENT.

20 PROVIDE 3-WAY CONTROL VALVE.

21 STEAM , CONDENSATE, AND HEATING WATER THERMAL EXPANSION COMPENSATION DESIGN IS DELEGATED TO THE CONTRACTOR.

KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN
SCALE: NO SCALE

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ADDENDUM No. 2 October 28, 2022

ISSUED FOR DATE

PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

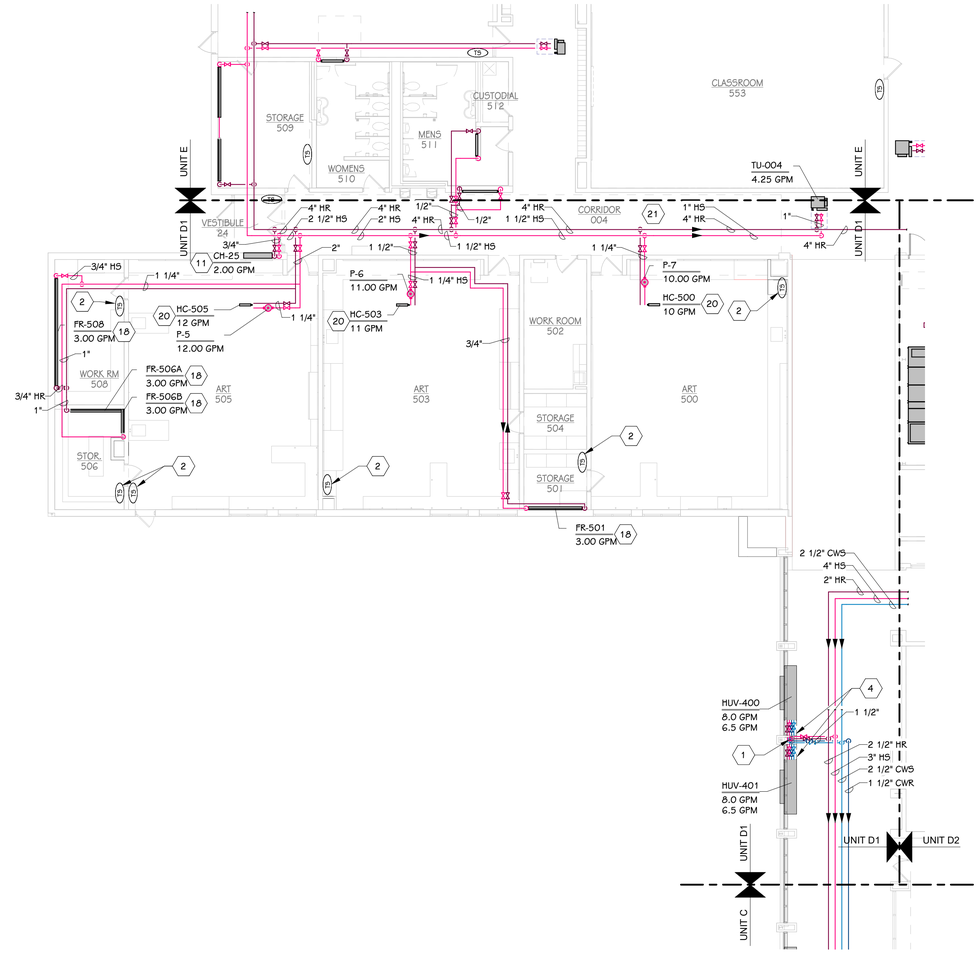
OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

SHEET TITLE
SECOND FLOOR HVAC PIPING PLAN - UNIT C

DATE
OCTOBER 3, 2022

A2

SHEET NUMBER
M 202C
21-806.00



SECOND FLOOR HVAC PIPING PLAN - UNIT D1

3/32" = 1'-0"

KEYED NOTES - MECHANICAL

1 ROUTE CHILLED WATER SUPPLY AND RETURN, HEATING WATER SUPPLY AND RETURN DOWN IN COLUMN TO UNIT VENTILATORS. REFER TO DETAIL.

2 ROUTE WIRE MOLD EXPOSED DOWN WALL TO T5. PAINT TO MATCH WALL.

3 PROVIDE HORIZONTAL PIPE CHASE. ROUTE PIPE EXPOSED ON WALL TO CEILING. SEE ARCH FOR VERTICAL PIPE COVER.

4 PROVIDE HORIZONTAL PIPE CHASE.

5 DROP HS/HR PIPING DOWN IN WALL TO TUNNEL BELOW.

6 PROVIDE HORIZONTAL PIPE CHASE. ROUTE PIPING UP IN CASEWORK. EXPOSED ABOVE CASEWORK TO CEILING.

7 ROUTE PIPE EXPOSED ON WALL UP TO CEILING. SEE ARCH FOR VERTICAL PIPE COVER.

8 REUSE EXISTING WALL PENETRATIONS, PROVIDE ESCUTEONS, FIRE SEALS.

9 NEW STEAM CONDENSATE RECEIVER. REFER TO DETAIL.

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11 COPPER PIPE TRANSITIONS TO PEX AT WALL, FISH PEX PIPING DOWN IN EXISTING WALL OPENINGS.

12 CONNECT NEW STEAM PIPING TO EXISTING STEAM PIPING HEADER.

13 CONNECT NEW PUMPED STEAM CONDENSATE PIPING TO EXISTING SURGE TANK.

14 ROUTE PIPING DOWN IN UNIT VENTILATOR DUCT SHROUD.

15 HS UP TO UNIT ABOVE.

16 HR DOWN FROM UNIT ABOVE.

17 HS DOWN FROM UNIT ABOVE.

18 ROUTE PIPING EXPOSED ON WALL WITH PVC INSULATION JACKET. TYPICAL.

19 TIE INTO EXISTING EQUIPMENT.

20 PROVIDE 3-WAY CONTROL VALVE.

21 STEAM , CONDENSATE, AND HEATING WATER THERMAL EXPANSION COMPENSATION DESIGN IS DELEGATED TO THE CONTRACTOR.

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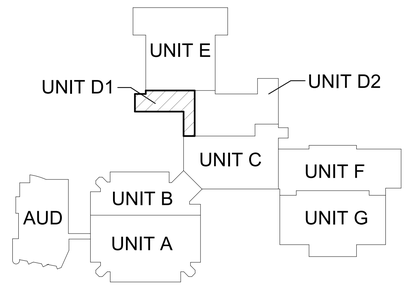
KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN

SCALE: NO SCALE

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ADDENDUM No. 2 October 28, 2022

ISSUED FOR DATE

PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

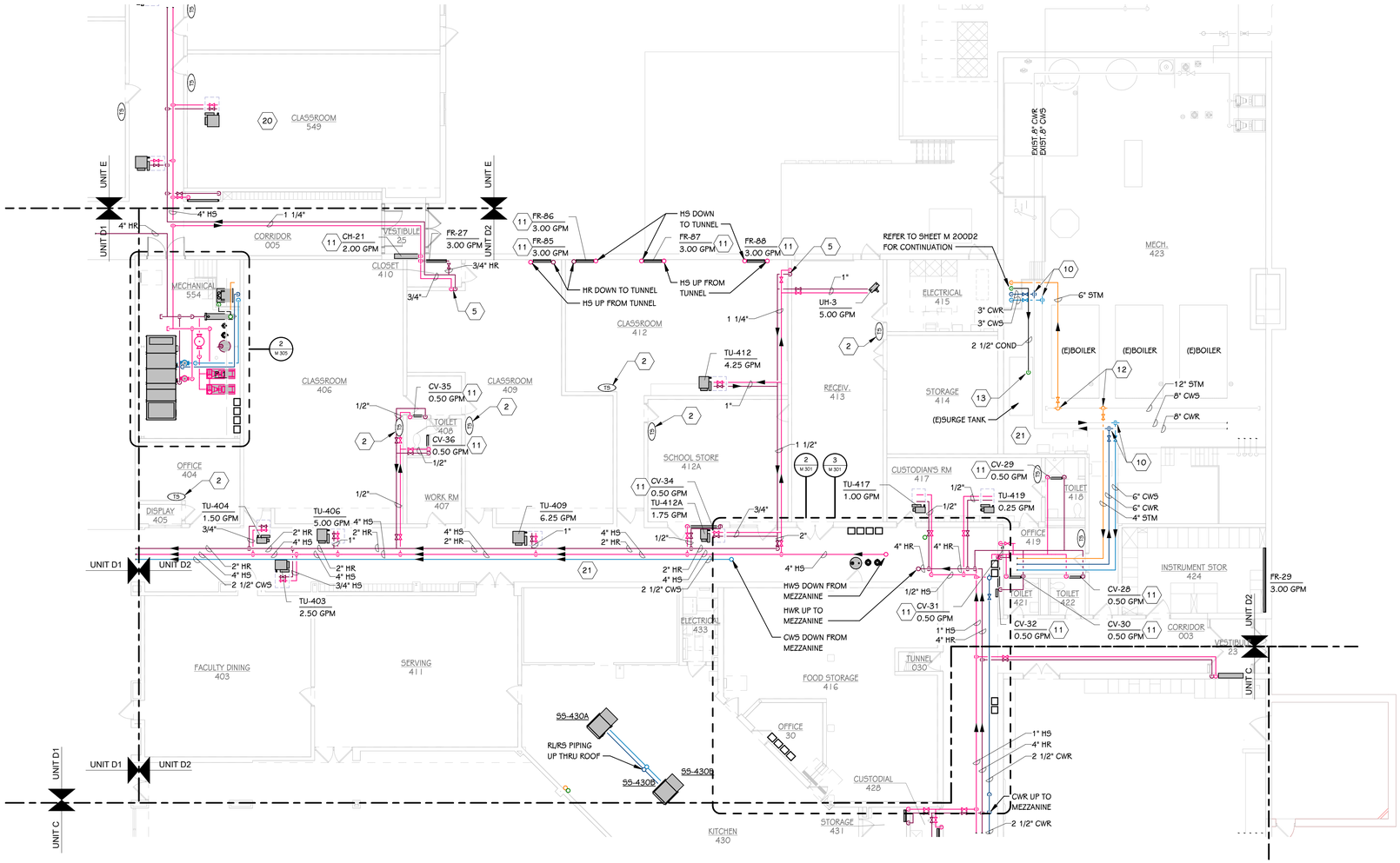
OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

SHEET TITLE
SECOND FLOOR HVAC PIPING PLAN - UNIT D1

DATE
OCTOBER 3, 2022

A2

SHEET NUMBER
M 202D1
21-806.00



SECOND FLOOR HVAC PIPING PLAN - UNIT D2

3/32" = 1'-0"

KEYED NOTES - MECHANICAL

1 ROUTE CHILLED WATER SUPPLY AND RETURN, HEATING WATER SUPPLY AND RETURN DOWN IN COLUMN TO UNIT VENTILATORS. REFER TO DETAIL.

2 ROUTE WIRE MOLD EXPOSED DOWN WALL TO T5. PAINT TO MATCH WALL.

3 PROVIDE HORIZONTAL PIPE CHASE. ROUTE PIPE EXPOSED ON WALL TO CEILING. SEE ARCH FOR VERTICAL PIPE COVER.

4 PROVIDE HORIZONTAL PIPE CHASE.

5 DROP HS/HR PIPING DOWN IN WALL TO TUNNEL BELOW.

6 PROVIDE HORIZONTAL PIPE CHASE. ROUTE PIPING UP IN CASEWORK. EXPOSED ABOVE CASEWORK TO CEILING.

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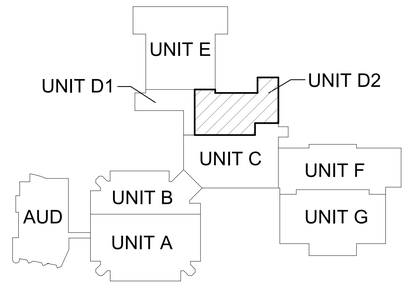
KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN
SCALE: NO SCALE

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ADDENDUM No. 2 October 28, 2022

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PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

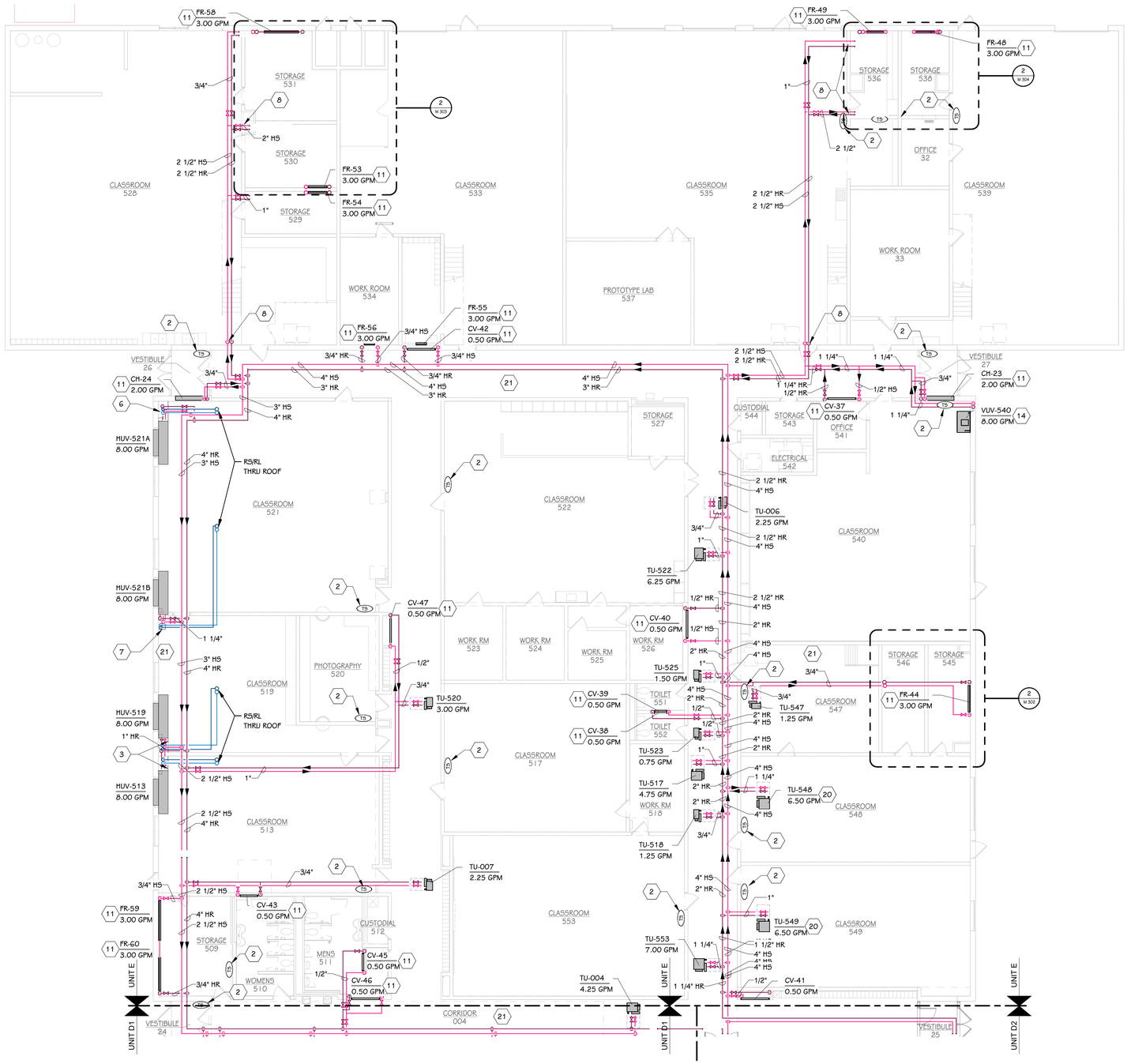
OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

SHEET TITLE
SECOND FLOOR HVAC PIPING PLAN - UNIT D2

DATE
OCTOBER 3, 2022

A2

SHEET NUMBER
M 202D2
21-806.00



SECOND FLOOR HVAC PIPING PLAN - UNIT E

3/32" = 1'-0"

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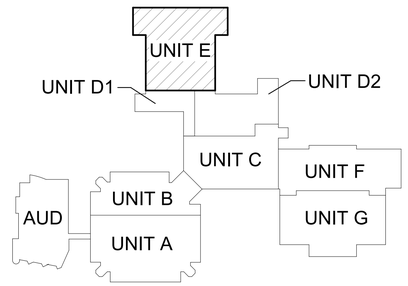
21 STEAM , CONDENSATE, AND HEATING WATER THERMAL EXPANSION COMPENSATION DESIGN IS DELEGATED TO THE CONTRACTOR.

KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN
SCALE: NO SCALE

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ADDENDUM No. 2 October 28, 2022

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PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

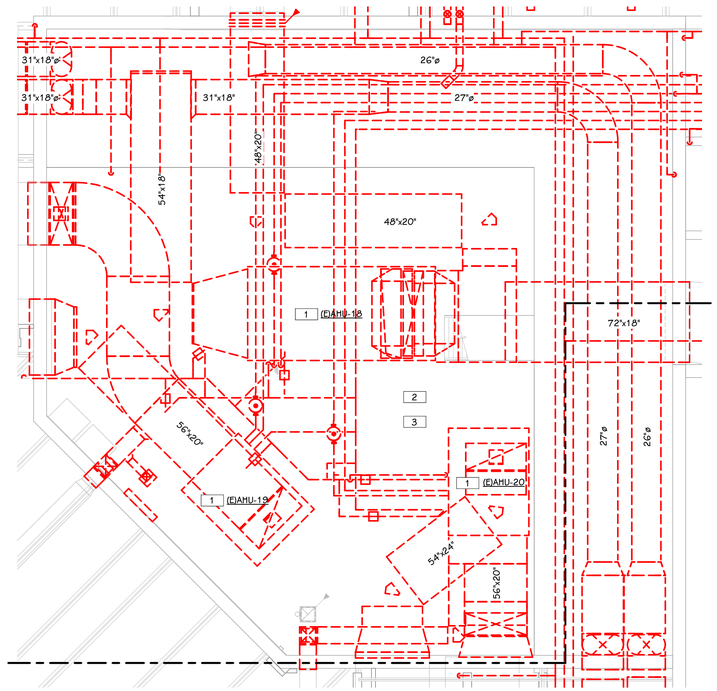
OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

SHEET TITLE
SECOND FLOOR HVAC PIPING PLAN - UNIT E

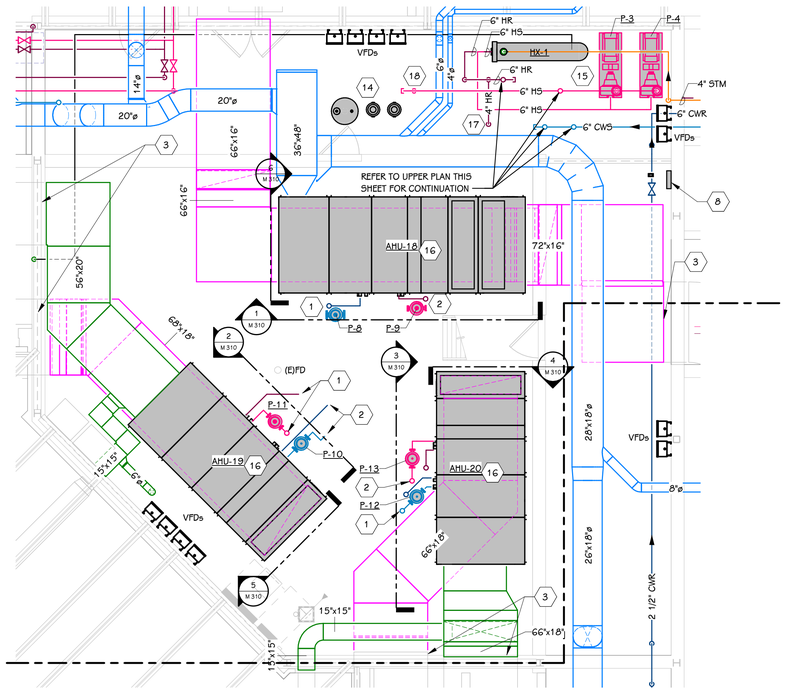
DATE
OCTOBER 3, 2022

A2

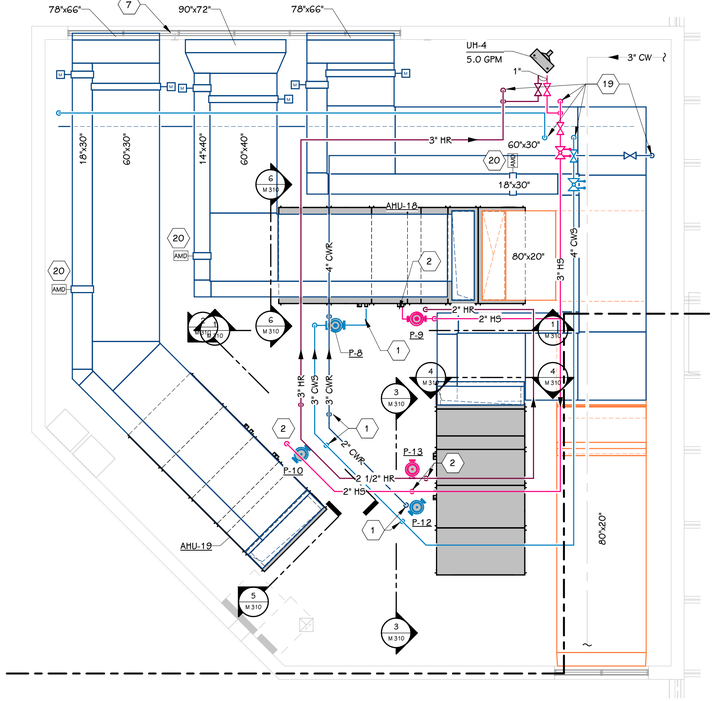
SHEET NUMBER
M 202E
21-806.00



ENLARGED DEMOLITION PLAN - FAN ROOM 3-200
3/16" = 1'-0"



ENLARGED MECHANICAL PLAN - LOWER FAN ROOM 3-200
3/16" = 1'-0"



ENLARGED MECHANICAL PLAN - UPPER FAN ROOM 3-200
3/16" = 1'-0"

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KEYED NOTES - ENLARGED DEMOLITION

1 REMOVE ENTIRE AHU, ACCESSORIES, AND CONTROLS. SALVAGE, STORE, AND PROTECT BI-POLAR IONIZATION DEVICE(S).

2 REMOVE ALL DUCT SYSTEMS ASSOCIATED WITH AHU'S IN THIS ROOM.

3 REMOVE ALL PIPING SYSTEMS ASSOCIATED WITH AHU'S IN THIS ROOM.

4 EXISTING EXHAUST FAN AND DUCTWORK TO REMAIN.

5 REMOVE EXISTING 24" MAKEUP AIR DUCT THROUGH ROOF.

KEYED NOTES - ENLARGED MECHANICAL

1 CHILLED WATER PIPING UP/DOWN TO AHU COOLING COIL.

2 HEATING WATER PIPING UP/DOWN TO AHU HEATING COIL.

3 CONNECT TO EXISTING DUCTWORK.

4 ACCU MOUNTED ON "PATE" RAILS.

5 OFFSET PIPING SO AS TO LEAVE CLEARANCE FOR AHU ACCESS DOOR.

6 REFRIGERANT LINES, SIZES, AND QUANTITY BY MANUFACTURER.

7 BLANK OF UNUSED PORTION OF LOUVER WITH INSULATED METAL PANEL.

8 NEW TEMPERATURE CONTROLS PANEL.

9 ROUTE CONDENSATE TO NEAREST FLOOR DRAIN.

10 CONNECT TO EXISTING.

11 CONNECT NEW RETURN AIR DUCTWORK TO TOP OF EXISTING RETURN AIR SHAFT.

12 NEW HEAT EXCHANGER. REFER TO SCHEMATIC FOR PIPING DETAILS.

13 NEW CONDENSATE RECEIVER. REFER TO DETAIL.

14 NEW EXPANSION TANK, CARTIDGE FILTER, AND CHEMICAL POT FEEDER.

15 STEAM , CONDENSATE, AND HEATING WATER THERMAL EXPANSION COMPENSATION DESIGN IS DELEGATED TO THE CONTRACTOR.

16 INSTALL SALVAGED BIPOLAR IONIZATION DEVICE IN NEW EQUIPMENT.

17 HR UP FROM LEVEL BELOW.

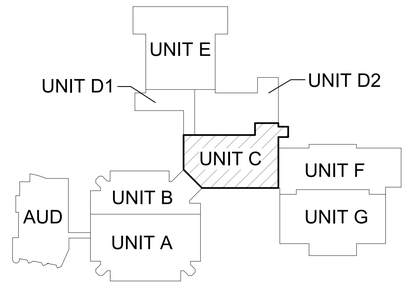
18 HS DOWN TO LEVEL BELOW.

19 REFER TO LOWER FAN ROOM PLAN THIS SHEET FOR CONTINUATION.

20 COORDINATE FINAL LOCATION OF AIRFLOW MEASURING DEVICE WITH MANUFACTURER.

21 MOUNTED ON CONTRACTOR FABRICATED STEEL STRUCTURE.

KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN
SCALE: NO SCALE

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ADDENDUM No. 2 October 28, 2022

ISSUED FOR DATE

PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

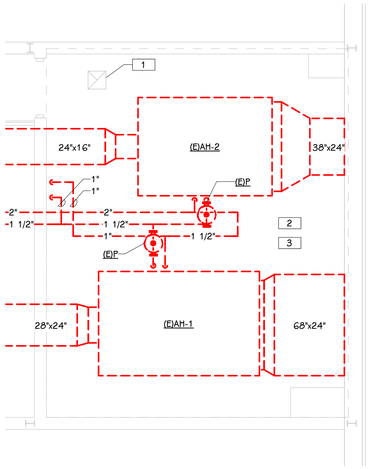
OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

DATE
OCTOBER 3, 2022

SHEET TITLE
ENLARGED MECHANICAL PLANS

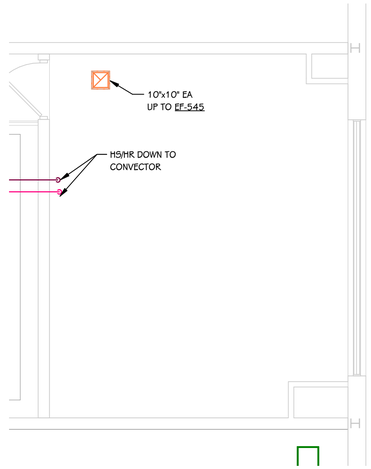
A2

SHEET NUMBER
M 301
21-806.00



ENLARGED DEMOLITION PLAN - FAN ROOM 5-200

1/4" = 1'-0"



ENLARGED MECHANICAL PLAN - FAN ROOM 5-200

1/4" = 1'-0"

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3 REMOVE ALL PIPING SYSTEMS ASSOCIATED WITH AHU'S IN THIS ROOM.

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KEYED NOTES - ENLARGED MECHANICAL

1 CHILLED WATER PIPING UP/DOWN TO AHU COOLING COIL.

2 HEATING WATER PIPING UP/DOWN TO AHU HEATING COIL.

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7 BLANK OF UNUSED PORTION OF LOUVER WITH INSULATED METAL PANEL.

8 NEW TEMPERATURE CONTROLS PANEL.

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12 NEW HEAT EXCHANGER. REFER TO SCHEMATIC FOR PIPING DETAILS.

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A2

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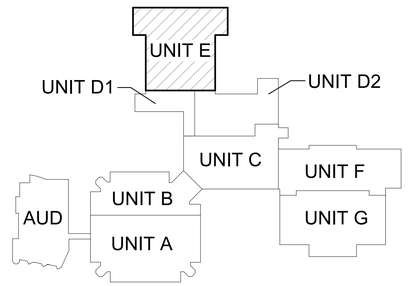
19 REFER TO LOWER FAN ROOM PLAN THIS SHEET FOR CONTINUATION.

20 COORDINATE FINAL LOCATION OF AIRFLOW MEASURING DEVICE WITH MANUFACTURER.

21 MOUNTED ON CONTRACTOR FABRICATED STEEL STRUCTURE.

KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN

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KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

OWNER
KALAMAZOO PUBLIC SCHOOLS

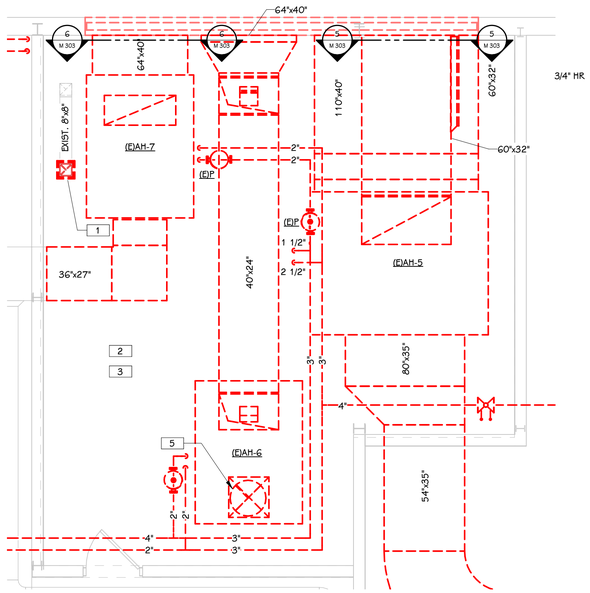
Kalamazoo, Michigan

SHEET TITLE
ENLARGED MECHANICAL PLANS

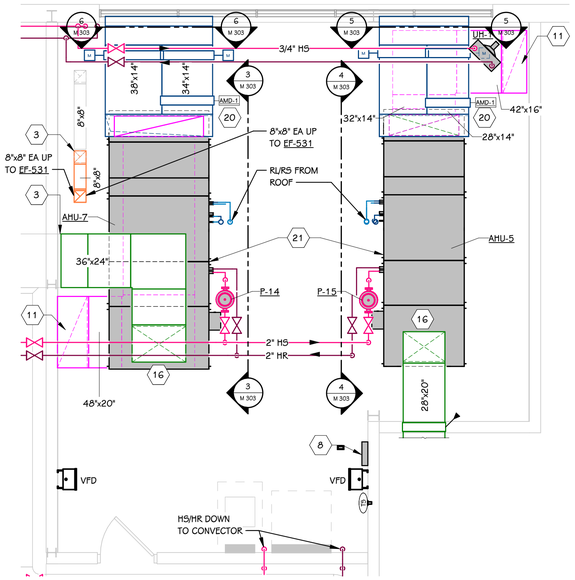
DATE
OCTOBER 3, 2022

SHEET NUMBER
M 302

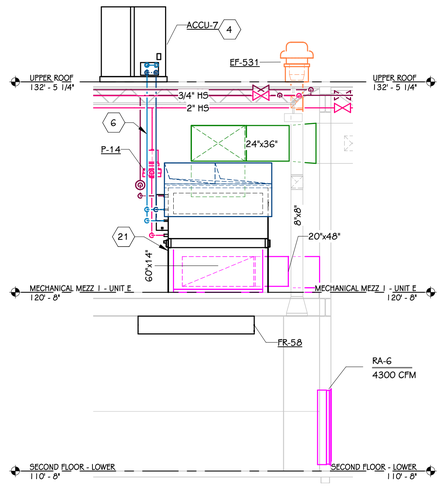
21-806.00



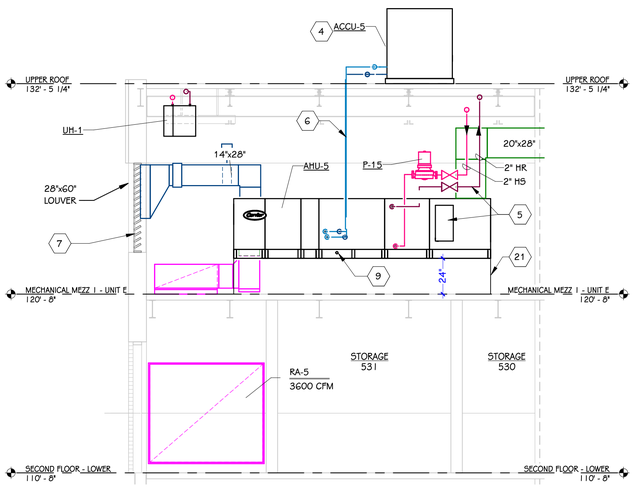
ENLARGED DEMOLITION PLAN - FAN ROOM 5-202
1/4" = 1'-0"



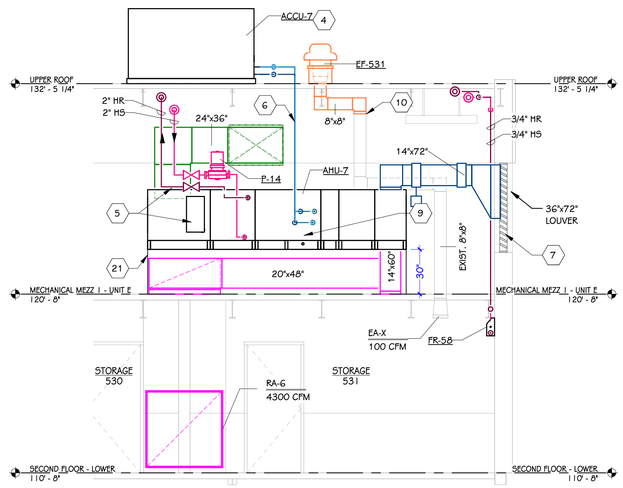
ENLARGED MECHANICAL PLAN - FAN ROOM 5-202
1/4" = 1'-0"



AHU-7 - END VIEW
1/4" = 1'-0"



AHU-5 - SECTION VIEW
1/4" = 1'-0"



AHU-7 - SECTION VIEW
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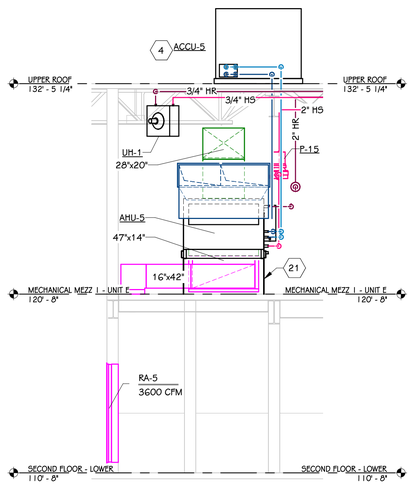

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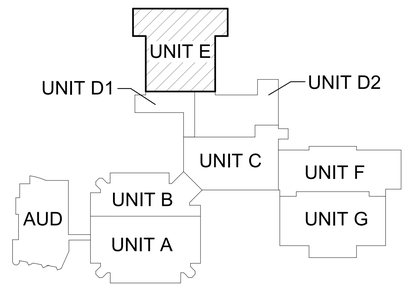
21 MOUNTED ON CONTRACTOR FABRICATED STEEL STRUCTURE.

KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN
SCALE: NO SCALE

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ADDENDUM No. 2 October 28, 2022

ISSUED FOR DATE

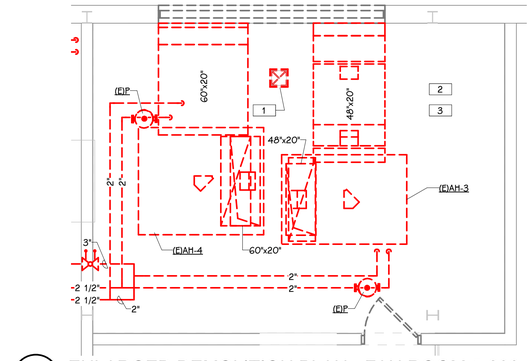
PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

SHEET TITLE
ENLARGED MECHANICAL PLANS

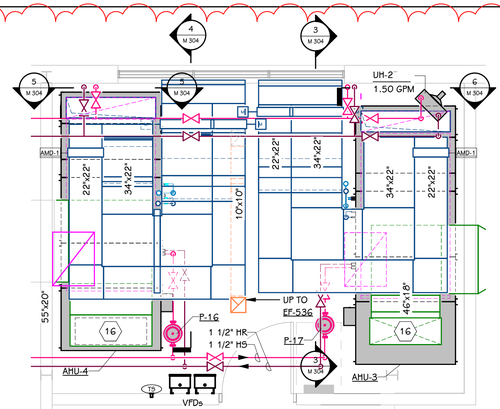
DATE
OCTOBER 3, 2022

SHEET NUMBER
M 303
21-806.00



ENLARGED DEMOLITION PLAN - FAN ROOM 5-206

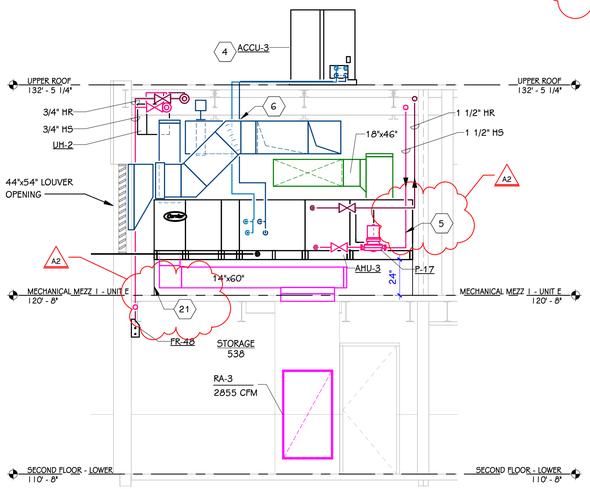
1/4" = 1'-0"



ENLARGED MECHANICAL PLAN - FAN ROOM 5-206

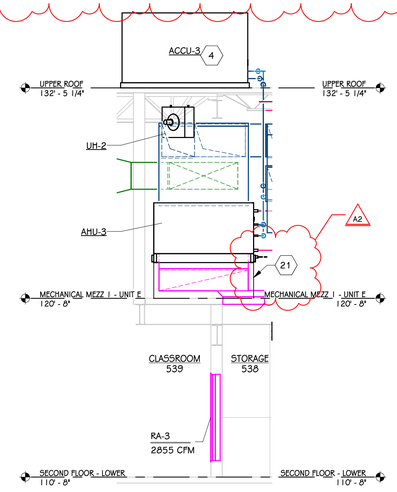
1/4" = 1'-0"

A2



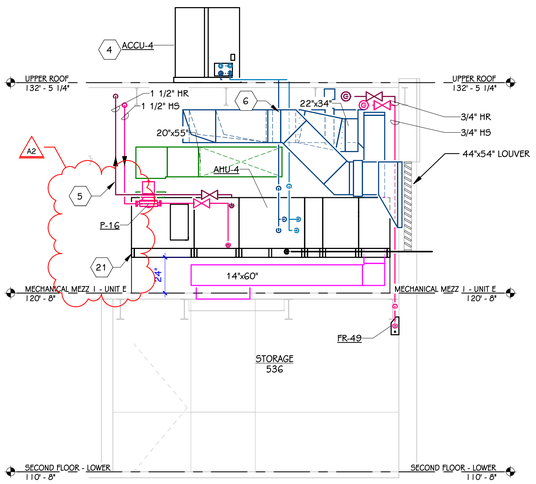
3 M 304 AHU-3 - SECTION VIEW

1/4" = 1'-0"



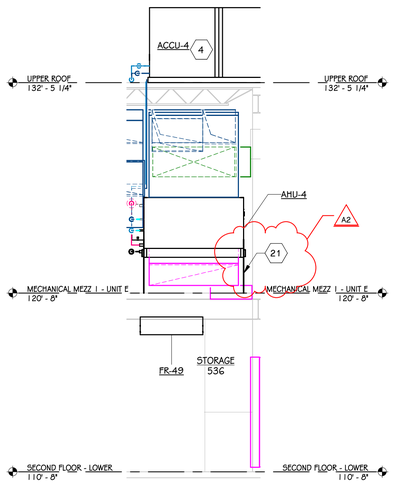
6 M 304 AHU-3 - END VIEW

1/4" = 1'-0"



4 M 304 AHU-4 - SECTION VIEW

1/4" = 1'-0"



5 M 304 AHU-4 - END VIEW

1/4" = 1'-0"

THIS DRAWING SHEET IS INTENDED TO BE PLOTTED IN COLOR. IF THIS TEXT APPEARS IN BLACK AND WHITE, IT IS PLOTTED INCORRECTLY. DISCARD AND OBTAIN AN ACCURATE DRAWING

KEYED NOTES - ENLARGED DEMOLITION

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2 REMOVE ALL DUCT SYSTEMS ASSOCIATED WITH AHU'S IN THIS ROOM.

3 REMOVE ALL PIPING SYSTEMS ASSOCIATED WITH AHU'S IN THIS ROOM.

4 EXISTING EXHAUST FAN AND DUCTWORK TO REMAIN.

5 REMOVE EXISTING 24" MAKEUP AIR DUCT THROUGH ROOF.

KEYED NOTES - ENLARGED MECHANICAL

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2 HEATING WATER PIPING UP/DOWN TO AHU HEATING COIL.

3 CONNECT TO EXISTING DUCTWORK.

4 ACCU MOUNTED ON "PATE" RAILS.

5 OFFSET PIPING SO AS TO LEAVE CLEARANCE FOR AHU ACCESS DOOR.

6 REFRIGERANT LINES, SIZES, AND QUANTITY BY MANUFACTURER.

7 BLANK OF UNUSED PORTION OF LOUVER WITH INSULATED METAL PANEL.

8 NEW TEMPERATURE CONTROLS PANEL.

9 ROUTE CONDENSATE TO NEAREST FLOOR DRAIN.

10 CONNECT TO EXISTING.

11 CONNECT NEW RETURN AIR DUCTWORK TO TOP OF EXISTING RETURN AIR SHAFT.

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13 NEW CONDENSATE RECEIVER. REFER TO DETAIL.

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17 HR UP FROM LEVEL BELOW.

18 HS DOWN TO LEVEL BELOW.

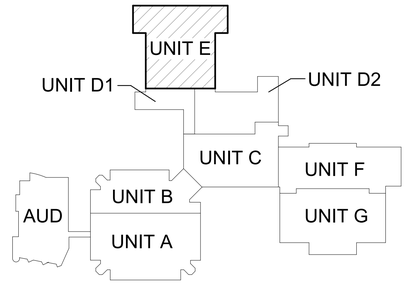
19 REFER TO LOWER FAN ROOM PLAN THIS SHEET FOR CONTINUATION.

20 COORDINATE FINAL LOCATION OF AIRFLOW MEASURING DEVICE WITH MANUFACTURER.

21 MOUNTED ON CONTRACTOR FABRICATED STEEL STRUCTURE.

A2

KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN

SCALE: NO SCALE

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HIGH SCHOOL
MECHANICAL
IMPROVEMENTS
PROJECT

OWNER
KALAMAZOO PUBLIC
SCHOOLS

Kalamazoo, Michigan

SHEET TITLE
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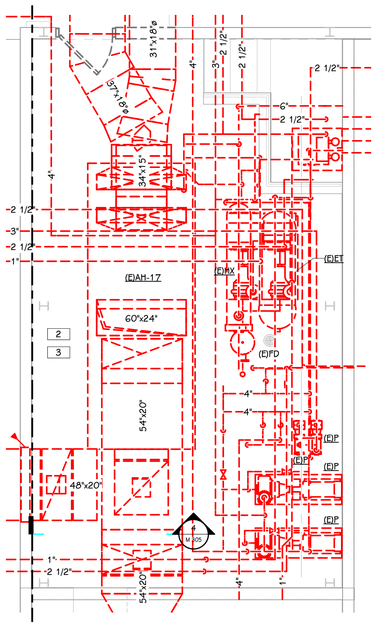
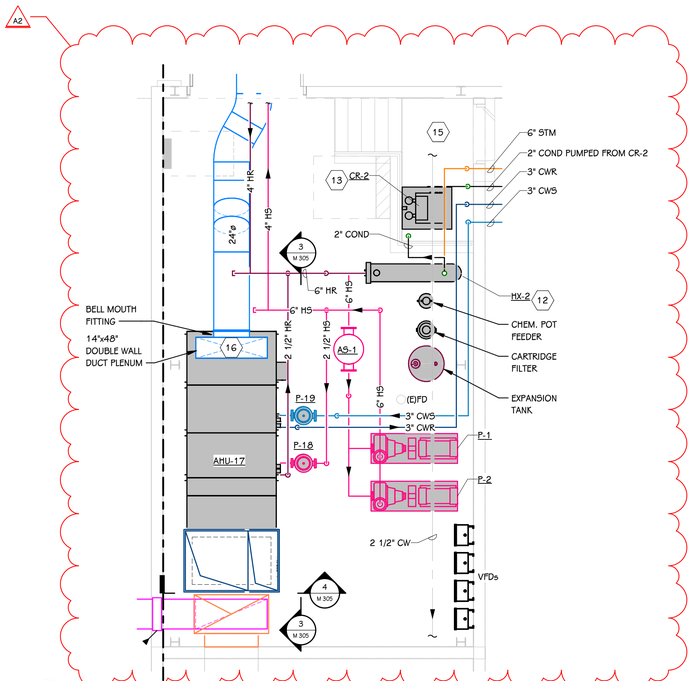
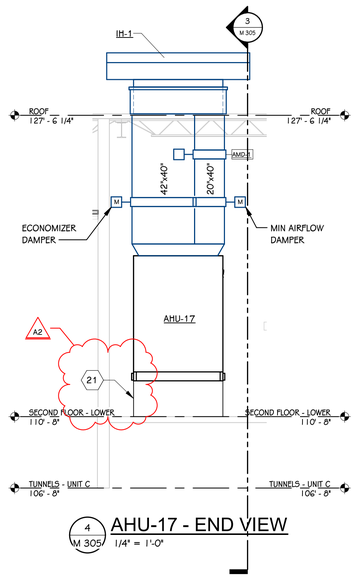


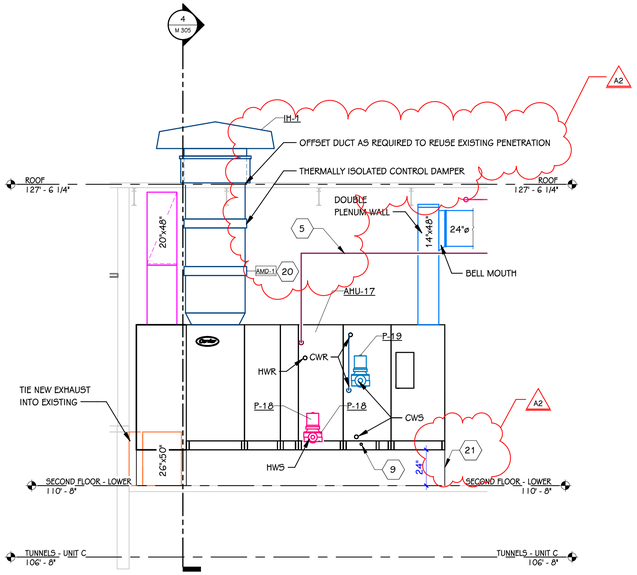
ENLARGED DEMOLITION PLAN - MECHANICAL ROOM 4109
1/4" = 1'-0"



ENLARGED MECHANICAL PLAN - MECHANICAL ROOM 4109
1/4" = 1'-0"



4 M 305 AHU-17 - END VIEW
1/4" = 1'-0"



3 M 305 AHU-17 - SECTION VIEW
SCALE: NONE

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8 NEW TEMPERATURE CONTROLS PANEL.

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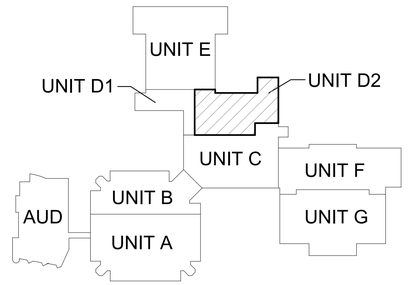
KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN
SCALE: NO SCALE

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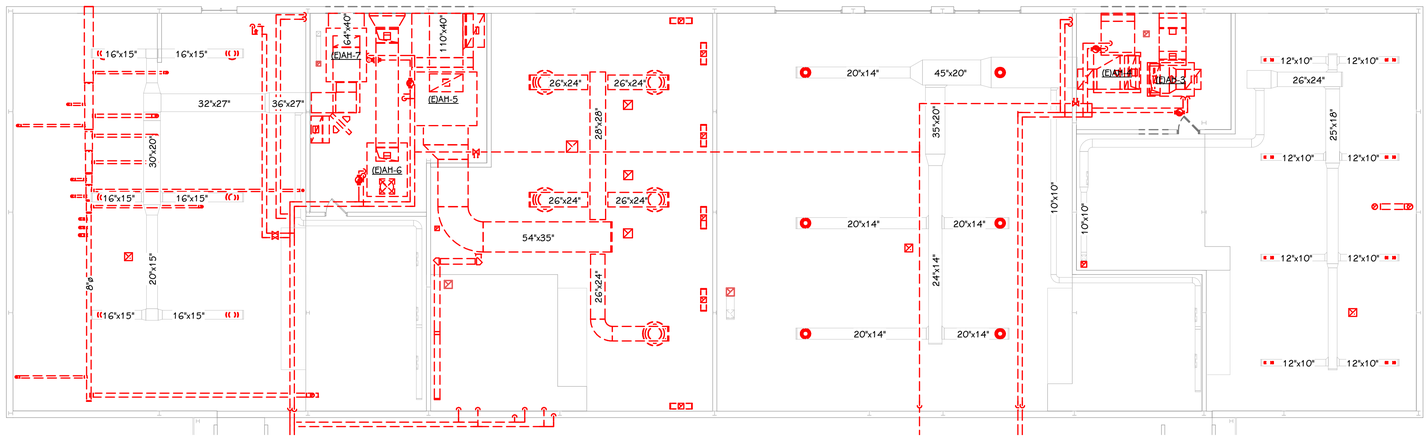
OWNER
KALAMAZOO PUBLIC SCHOOLS

Kalamazoo, Michigan

SHEET TITLE
ENLARGED MECHANICAL PLANS

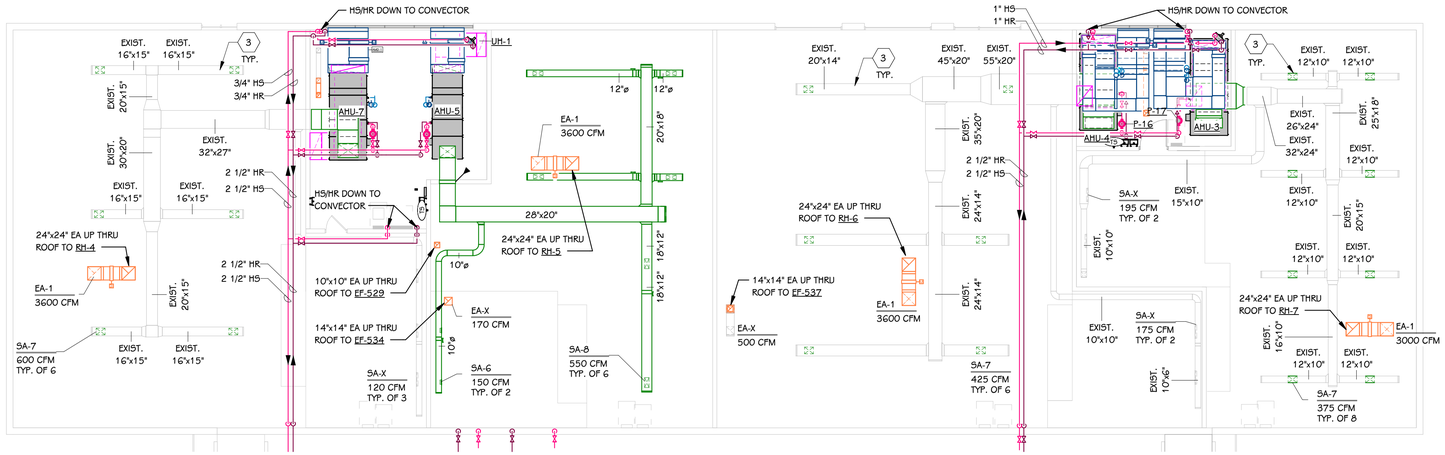
DATE
OCTOBER 3, 2022

SHEET NUMBER
M 305
21-806.00



MEZZANINE DEMOLITION PLAN - UNIT E

3/32" = 1'-0"



MEZZANINE MECHANICAL PLAN - UNIT E

3/32" = 1'-0"

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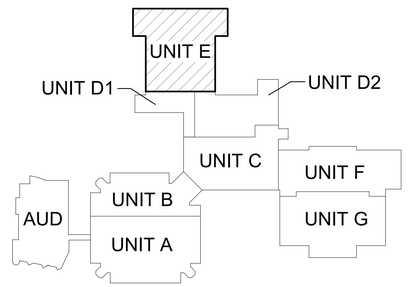
KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN

SCALE: NO SCALE

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OWNER
KALAMAZOO PUBLIC SCHOOLS

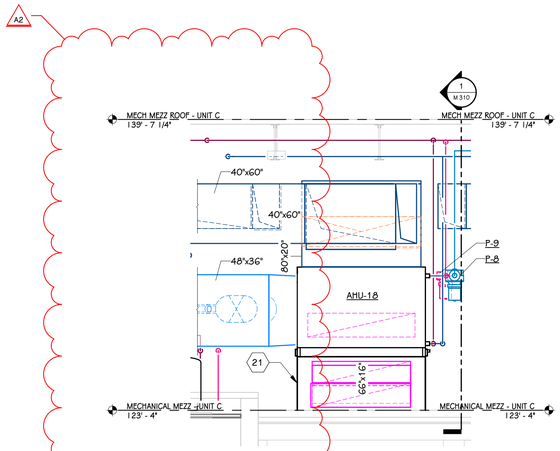
Kalamazoo, Michigan

SHEET TITLE
MEZZANINE SHEET METAL PLAN - UNIT E

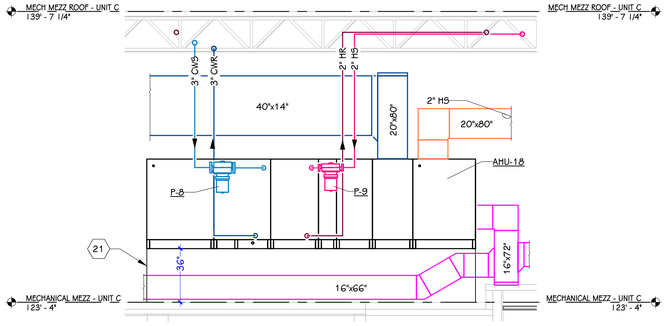
DATE
OCTOBER 3, 2022

SHEET NUMBER
M 306

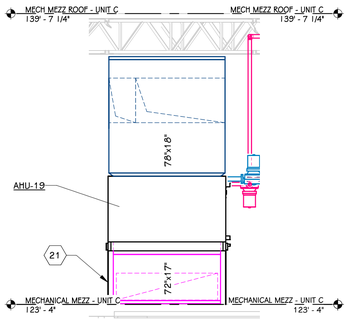
21-806.00



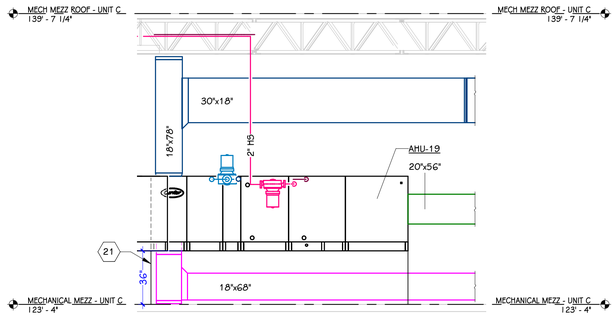
6 M 310 AHU-18 - END VIEW
1/4" = 1'-0"



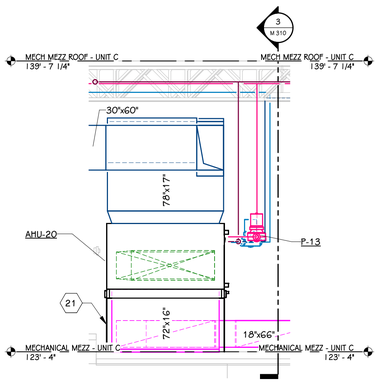
1 M 310 AHU-18 - SECTION VIEW
1/4" = 1'-0"



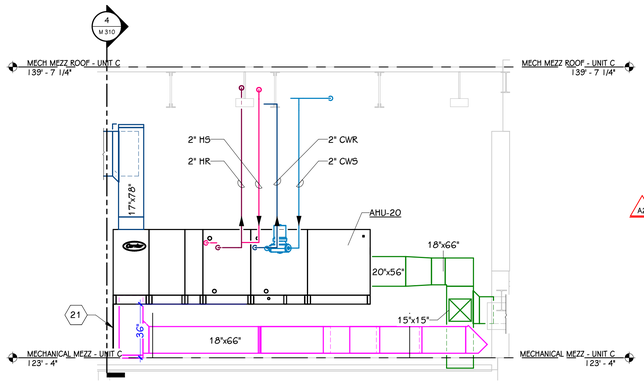
5 M 310 AHU-19 - END VIEW
1/4" = 1'-0"



2 M 310 AHU 19 - SECTION VIEW
1/4" = 1'-0"



4 M 310 AHU-20 - END VIEW
1/4" = 1'-0"



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OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

SHEET TITLE
MECHANICAL SECTIONS

DATE
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M 310
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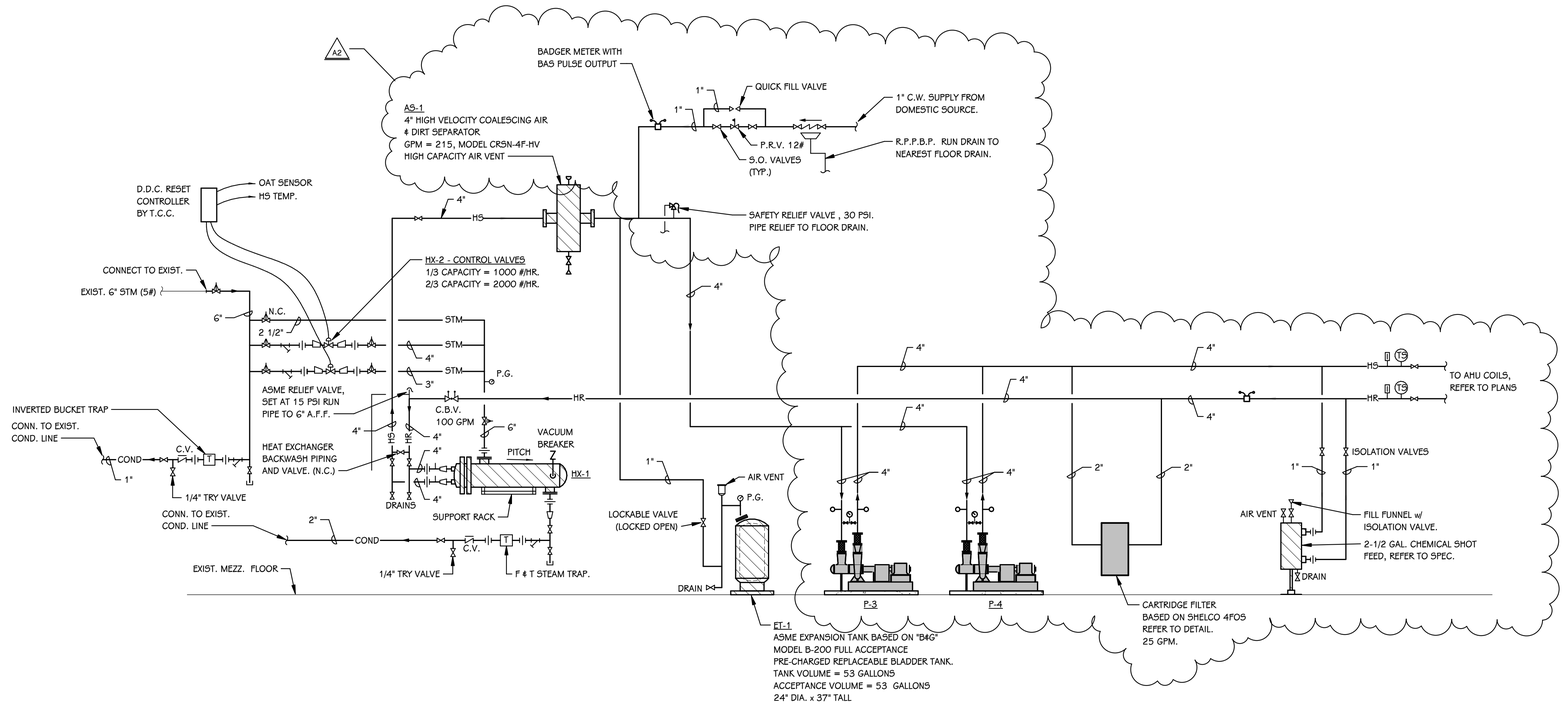
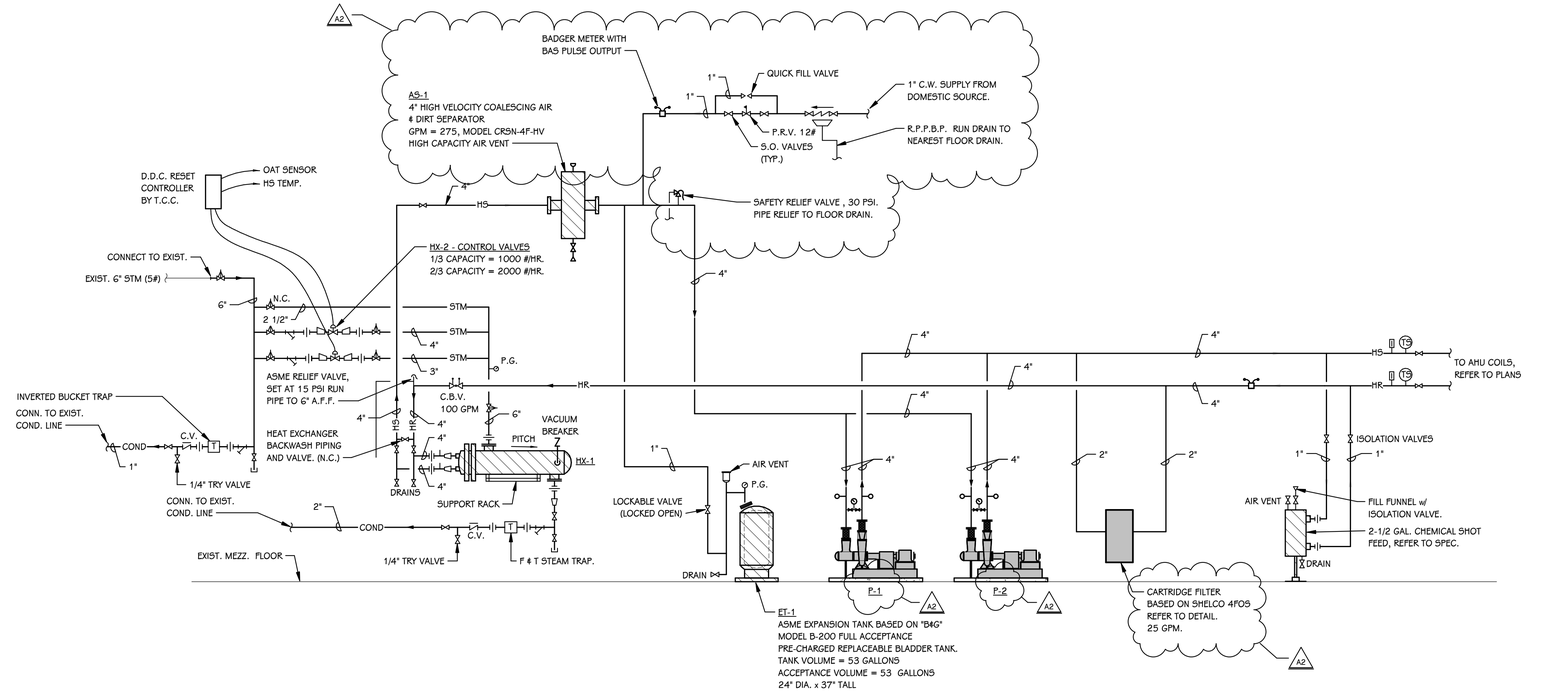


HEATING SYSTEM PIPING SCHEMATIC - MECHANICAL ROOM 3-200

SCALE: NONE



HEATING SYSTEM PIPING SCHEMATIC - MECHANICAL ROOM 4109

SCALE: NONE

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IMPROVEMENTS
PROJECT

OWNER
KALAMAZOO PUBLIC
SCHOOLS

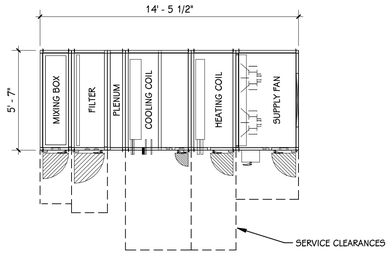
Kalamazoo, Michigan

SHEET TITLE
MECHANICAL SCHEMATICS

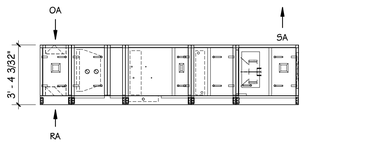
DATE
OCTOBER 3, 2022

SHEET NUMBER
M 401

21-806.00



PLAN - TOP VIEW



ELEVATION - SIDE VIEW

INDOOR VAV AIR HANDLING UNIT (AHU-3)

BASED ON: CARRIER MODEL 39 MN
AREA SERVED: CLASSROOM 539
TYPE: MODULAR, SINGLE ZONE VARIABLE AIR VOLUME 4,300 CFM NOMINAL, SIZE 10.
MINIMUM OUTSIDE AIR: 2,260 CFM - 500 CFM BASED ON CO2.
WEIGHT: 2,289 LBS
UNIT MOUNTING: CONTRACTOR FABRICATED STEEL PLATFORM.
ELECTRICAL: INDIVIDUAL FEEDS TO EACH MOTOR AND LIGHTING / OUTLET CIRCUIT.
ACOUSTICS (Hz/db):
DISCHARGE: 63/84, 125/81, 250/90, 500/86, 1K/86, 2K/86, 4K/82, 8K/78
INLET: 63/80, 125/75, 250/82, 500/78, 1K/74, 2K/71, 4K/69, 8K/67

MIXING BOX: TOP THERMALLY ISOLATED OPPOSED, RIGHT SIDE ACCESS DOOR. BOTTOM STANDARD PARALLEL, RIGHT SIDE ACCESS DOOR.

FILTERS: 2" PLEATED MERV-8 PRE-FILTER, MERV-13 FILTER, DOOR RIGHT SIDE, MAGNIHELIC DIFFERENTIAL PRESSURE GAGE 0-2" w.c. RIGHT SIDE.

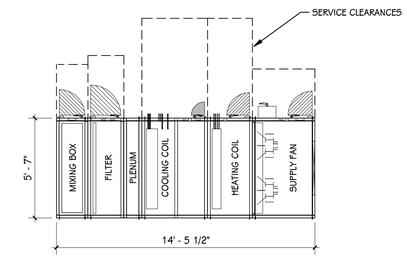
PLENUM: 12" LONG, INCLUDE RIGHT SIDE ACCESS DOOR WITH LED MARINE LIGHT.

DX COOLING COIL: 195.24 TMBH, 128.84 SMBH, 82.6°F EDB, 69.6°F EWB, 55°F LDB, 55°F LWB, 0.73" APD, 500 FPM MAX FACE VELOCITY, WITH 55 IAQ DRAIN PAN. INCLUDE RIGHT SIDE ACCESS DOOR WITH LED MARINE LIGHT.

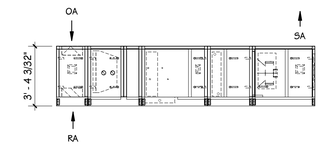
HOT WATER COIL: 326.31 MBH, 21.8 GPM, 130.0°F EWT, 100.0°F LWT, 25.1°F EDB, 95°F LDB, 0.52" APD, 7.4' WPD, 750 FPM MAX FACE VELOCITY. INCLUDE LED MARINE LIGHT AND RIGHT SIDE ACCESS DOOR.

SUPPLY FANS: TWO DIRECT DRIVE FANS TOTALING 4,300 CFM @ 1.5" ESP, 2,223 FAN RPM, 1.9 BHP EACH, TWO 2 HP PREMIUM EFF. MOTOR, 460V/3/60HZ. INCLUDE VIEW WINDOW, LED MARINE LIGHT, AND RIGHT SIDE ACCESS DOOR. TWO VFDs BY TEMPERATURE CONTROLS CONTRACTOR.

ACCU-3: BASED ON "CARRIER" MODEL 38AUD DUAL DIGITAL SCROLL COMPRESSORS CONDENSING UNIT, 15-TON NOMINAL COOLING CAPACITY, 460/3/60, SINGLE POINT POWER, 3 FAN MOTORS, 13.4 EER @ ARI CONDITIONS, 32.1 MCA, 40 MOCP, R-410A REFRIGERANT, FROSTAT, AND VIBRATION ISOLATORS, 750 LBS OPERATING WEIGHT, 7'-3"L x 3'-8"W x 4'-3"H, TURN DOWN = 8-10% IN 45 STEPS.



PLAN - TOP VIEW



ELEVATION - SIDE VIEW

INDOOR VAV AIR HANDLING UNIT (AHU-4)

BASED ON: CARRIER MODEL 39 MN
AREA SERVED: CLASSROOM 535
TYPE: MODULAR, SINGLE ZONE VARIABLE AIR VOLUME 4,300 CFM NOMINAL, SIZE 10.
MINIMUM OUTSIDE AIR: 2,540 CFM - 500 CFM BASED ON CO2.
WEIGHT: 2,289 LBS
UNIT MOUNTING: CONTRACTOR FABRICATED STEEL PLATFORM.
ELECTRICAL: INDIVIDUAL FEEDS TO EACH MOTOR AND LIGHTING / OUTLET CIRCUIT.
ACOUSTICS (Hz/db):
DISCHARGE: 63/84, 125/81, 250/90, 500/86, 1K/86, 2K/86, 4K/82, 8K/78
INLET: 63/80, 125/75, 250/82, 500/78, 1K/74, 2K/71, 4K/69, 8K/67

MIXING BOX: TOP THERMALLY ISOLATED OPPOSED, LEFT SIDE ACCESS DOOR. BOTTOM STANDARD PARALLEL, LEFT SIDE ACCESS DOOR.

FILTERS: 2" PLEATED MERV-8 PRE-FILTER, MERV-13 FILTER, DOOR RIGHT SIDE, MAGNIHELIC DIFFERENTIAL PRESSURE GAGE 0-2" w.c. RIGHT SIDE.

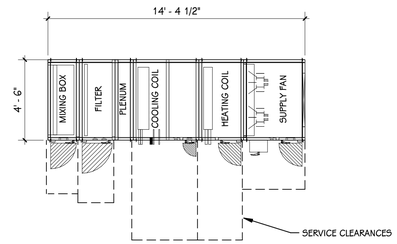
PLENUM: 12" LONG, INCLUDE LEFT SIDE ACCESS DOOR WITH LED MARINE LIGHT.

DX COOLING COIL: 203.37 TMBH, 132.72 SMBH, 83.4°F EDB, 70.1°F EWB, 55°F LDB, 55°F LWB, 0.73" APD, 500 FPM MAX FACE VELOCITY, WITH 55 IAQ DRAIN PAN. INCLUDE LEFT SIDE ACCESS DOOR WITH LED MARINE LIGHT.

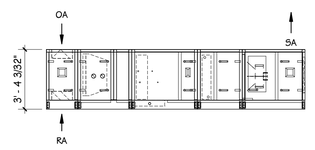
HOT WATER COIL: 346.37 MBH, 23.1 GPM, 130.0°F EWT, 100.0°F LWT, 20.7°F EDB, 95°F LDB, 0.52" APD, 8.3' WPD, 750 FPM MAX FACE VELOCITY. INCLUDE LED MARINE LIGHT AND LEFT SIDE ACCESS DOOR.

SUPPLY FANS: TWO DIRECT DRIVE FANS TOTALING 4,300 CFM @ 1.5" ESP, 2,223 FAN RPM, 1.9 BHP EACH, TWO 2 HP PREMIUM EFF. MOTOR, 460V/3/60HZ. INCLUDE VIEW WINDOW, LED MARINE LIGHT, AND LEFT SIDE ACCESS DOOR. TWO VFDs BY TEMPERATURE CONTROLS CONTRACTOR.

ACCU-4: BASED ON "CARRIER" MODEL 38AUD DUAL DIGITAL SCROLL COMPRESSORS CONDENSING UNIT, 15-TON NOMINAL COOLING CAPACITY, 460/3/60, SINGLE POINT POWER, 3 FAN MOTORS, 13.4 EER @ ARI CONDITIONS, 32.1 MCA, 40 MOCP, R-410A REFRIGERANT, FROSTAT, AND VIBRATION ISOLATORS, 750 LBS OPERATING WEIGHT, 7'-3"L x 3'-8"W x 4'-3"H, TURN DOWN = 8-10% IN 45 STEPS.



PLAN - TOP VIEW



ELEVATION - SIDE VIEW

INDOOR VAV AIR HANDLING UNIT (AHU-5)

BASED ON: CARRIER MODEL 39 MN
AREA SERVED: CLASSROOM 533
TYPE: MODULAR, VARIABLE AIR VOLUME 3,600 CFM NOMINAL, SIZE 08.
MINIMUM OUTSIDE AIR: 1,730 CFM - 500 CFM BASED ON CO2
WEIGHT: 1,949 LBS
UNIT MOUNTING: CONTRACTOR FABRICATED STEEL PLATFORM.
ELECTRICAL: INDIVIDUAL FEEDS TO EACH MOTOR AND LIGHTING / OUTLET CIRCUIT.
ACOUSTICS (Hz/db):
DISCHARGE: 63/87, 125/76, 250/84, 500/88, 1K/85, 2K/84, 4K/79, 8K/77
INLET: 63/84, 125/71, 250/77, 500/81, 1K/74, 2K/72, 4K/69, 8K/67

MIXING BOX: TOP THERMALLY ISOLATED OPPOSED, RIGHT SIDE ACCESS DOOR. BOTTOM STANDARD PARALLEL, RIGHT SIDE ACCESS DOOR.

FILTERS: 2" PLEATED MERV-8 PRE-FILTER, MERV-13 FILTER, DOOR RIGHT SIDE, MAGNIHELIC DIFFERENTIAL PRESSURE GAGE 0-2" w.c. RIGHT SIDE.

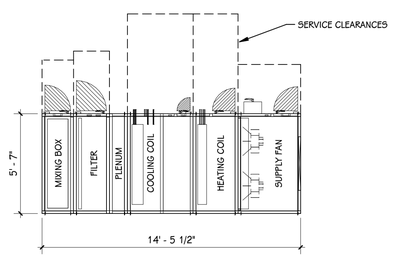
PLENUM: 12" LONG, INCLUDE ACCESS DOOR WITH VIEW WINDOW AND LED MARINE LIGHT.

DX COOLING COIL: 157.95 TMBH, 104.96 SMBH, 81.9°F EDB, 69.2 °F EWB, 55°F LDB, 55°F LWB, 0.85" APD, 500 FPM MAX FACE VELOCITY, WITH 55 IAQ DRAIN PAN. INCLUDE ACCESS DOOR WITH VIEW WINDOW AND LED MARINE LIGHT.

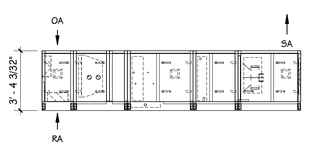
HOT WATER COIL: 257.96 MBH, 17.2 GPM, 130.0°F EWT, 100.0°F LWT, 29°F EDB, 95°F LDB, 0.58" APD, 4.2' WPD, 750 FPM MAX FACE VELOCITY. INCLUDE LED MARINE LIGHT AND RIGHT SIDE ACCESS DOOR.

SUPPLY FANS: TWO DIRECT DRIVE FANS TOTALING 3,600 CFM @ 1.5" ESP, 2,946 FAN RPM, 1.4 BHP EACH, TWO 2 HP PREMIUM EFF. MOTOR, 460V/3/60HZ. INCLUDE VIEW WINDOW, LED MARINE LIGHT AND RIGHT SIDE ACCESS DOOR. TWO VFDs BY TEMPERATURE CONTROLS CONTRACTOR.

ACCU-5: BASED ON "CARRIER" MODEL 38AUD DUAL DIGITAL SCROLL COMPRESSORS CONDENSING UNIT, 10-TON NOMINAL COOLING CAPACITY, 460/3/60, SINGLE POINT POWER, 2 FAN MOTORS, 12.4 EER @ ARI CONDITIONS, 22 MCA, 22.5 MOCP, R-410A REFRIGERANT, FROSTAT, AND VIBRATION ISOLATORS, 550 LBS OPERATING WEIGHT, 5'-0"L x 3'-10"W x 4'-3"H, TURN DOWN = 8-10% IN 45 STEPS.



PLAN - TOP VIEW



ELEVATION - SIDE VIEW

INDOOR VAV AIR HANDLING UNIT (AHU-7)

BASED ON: CARRIER MODEL 39 MN
AREA SERVED: CLASSROOM 528
TYPE: MODULAR, VARIABLE AIR VOLUME 4,300 CFM NOMINAL, SIZE 10.
MINIMUM OUTSIDE AIR: 2,000 CFM - 500 CFM BASED ON CO2.
WEIGHT: 2,297 LBS
UNIT MOUNTING: CONTRACTOR FABRICATED STEEL PLATFORM.
ELECTRICAL: INDIVIDUAL FEEDS TO EACH MOTOR AND LIGHTING / OUTLET CIRCUIT.
ACOUSTICS (Hz/db):
DISCHARGE: 63/84, 125/81, 250/90, 500/86, 1K/86, 2K/86, 4K/82, 8K/78
INLET: 63/80, 125/75, 250/82, 500/78, 1K/74, 2K/71, 4K/69, 8K/67

MIXING BOX: TOP THERMALLY ISOLATED OPPOSED, LEFT SIDE ACCESS DOOR. BOTTOM STANDARD PARALLEL, LEFT SIDE ACCESS DOOR.

FILTERS: 2" PLEATED MERV-8 PRE-FILTER, MERV-13 FILTER, DOOR RIGHT SIDE, MAGNIHELIC DIFFERENTIAL PRESSURE GAGE 0-2" w.c. RIGHT SIDE.

PLENUM: 12" LONG, INCLUDE LEFT SIDE ACCESS DOOR WITH LED MARINE LIGHT.

DX COOLING COIL: 187.12 TMBH, 124.34 SMBH, 81.7°F EDB, 69.1°F EWB, 55°F LDB, 55°F LWB, 0.73" APD, 500 FPM MAX FACE VELOCITY, WITH 55 IAQ DRAIN PAN. INCLUDE LEFT SIDE ACCESS DOOR WITH LED MARINE LIGHT.

HOT WATER COIL: 326.04 MBH, 21.7 GPM, 130.0°F EWT, 100.0°F LWT, 25.1°F EDB, 95°F LDB, 0.51" APD, 7.3' WPD, 750 FPM MAX FACE VELOCITY. INCLUDE LED MARINE LIGHT AND LEFT SIDE ACCESS DOOR.

SUPPLY FANS: TWO DIRECT DRIVE FANS TOTALING 4,300 CFM @ 1.5" ESP, 2,223 FAN RPM, 1.9 BHP EACH, TWO 2 HP PREMIUM EFF. MOTOR, 460V/3/60HZ. INCLUDE VIEW WINDOW, LED MARINE LIGHT AND LEFT SIDE ACCESS DOOR. TWO VFDs BY TEMPERATURE CONTROLS CONTRACTOR.

ACCU-7: BASED ON "CARRIER" MODEL 38AUD DUAL DIGITAL SCROLL COMPRESSORS CONDENSING UNIT, 15-TON NOMINAL COOLING CAPACITY, 460/3/60, SINGLE POINT POWER, 3 FAN MOTORS, 13.4 EER @ ARI CONDITIONS, 32.1 MCA, 40 MOCP, R-410A REFRIGERANT, FROSTAT, AND VIBRATION ISOLATORS, 750 LBS OPERATING WEIGHT, 7'-3"L x 3'-8"W x 4'-3"H, TURN DOWN = 8-10% IN 45 STEPS.

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ADDENDUM No. 2 October 28, 2022

ISSUED FOR DATE

PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

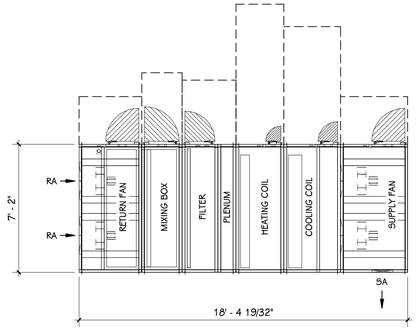
OWNER
KALAMAZOO PUBLIC SCHOOLS

Kalamazoo, Michigan

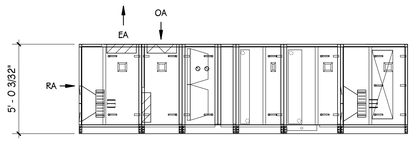
SHEET TITLE
MECHANICAL SCHEDULES

DATE
OCTOBER 3, 2022

SHEET NUMBER
M 501
21-806.00



PLAN - TOP VIEW



ELEVATION - SIDE VIEW

PRE-PURCHASED INDOOR VAV AIR HANDLING UNIT (AHU-18)

BASED ON: CARRIER MODEL 39 MN
AREA SERVED: 300 WING
TYPE: MODULAR, VARIABLE AIR VOLUME 13,000 CFM NOMINAL, SIZE 25W.
MINIMUM OUTSIDE AIR: 2,220 CFM.
WEIGHT: 4,942 LBS
UNIT MOUNTING: CONTRACTOR FABRICATED STEEL PLATFORM.
ELECTRICAL: INDIVIDUAL FEEDS TO EACH MOTOR AND LIGHTING / OUTLET CIRCUIT.
ACOUSTICS (Hz/db):
DISCHARGE: 63/97, 125/98, 250/96, 500/103, 1K/93, 2K/91, 4K/89, 8K/91
INLET: 63/94, 125/95, 250/93, 500/95, 1K/90, 2K/84, 4K/83, 8K/84

RETURN FAN: TWO DIRECT DRIVE FAN TOTALLING 13,000 CFM @ 0.5" ESP, 2,139 FAN RPM, 2.4 BHP EACH, 5 HP PREMIUM EFF. MOTOR, 460V/3Ø/60HZ. INCLUDE VIEW WINDOW, LED MARINE LIGHT AND ACCESS DOOR. VFD BY TEMPERATURE CONTROLS CONTRACTOR.

MIXING BOX: TOP THERMALLY ISOLATED OPPOSED BLADE LOW-LEAK DAMPERS.

MIXING BOX: REAR STANDARD PARALLEL, LEFT SIDE ACCESS DOOR.

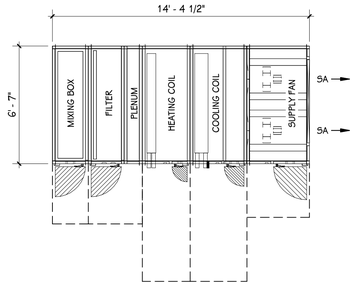
FILTERS: 2" PLEATED MERV-8 PRE-FILTER, MERV-13 FILTER, DOOR LEFT SIDE, MAGNIHELIC DIFFERENTIAL PRESSURE GAGE 0-2" w.c. RIGHT SIDE.

PLENUM: 12" LONG, INCLUDE ACCESS DOOR WITH VIEW WINDOW AND LED MARINE LIGHT.

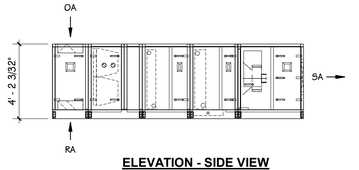
HOT WATER COIL: 634.73 MBH, 42.3 GPM, 130.0°F EWT, 100.0°F LWT, -10.0°F EDB, 52.2°F LDB, 0.38" APD, 6.9' WPD MAX, 750 FPM MAX FACE VELOCITY. INCLUDE LEFT SIDE ACCESS DOOR WITH VIEW WINDOW AND LED MARINE LIGHT.

CHILLED WATER COIL: 461.57 TMBH, 330.27 SMBH, 78.4°F EDB, 66.9°F EWB, 55°F LDB, 55°F LWB, 45°F EWT, 55°F LWT, 92.3 GPM, 14.9' WPD, 1.19" APD, 500 FPM MAX FACE VELOCITY, WITH 55 IAQ DRAIN PAN. INCLUDE ACCESS DOOR LEFT SIDE WITH VIEW WINDOW AND LED MARINE LIGHT.

SUPPLY FANS: TWO DIRECT DRIVE FANS TOTALLING 13,000 CFM @ 2.25" ESP, 2,763 FAN RPM, 7.5 BHP EACH, TWO 10 HP PREMIUM EFF. MOTOR, 460V/3/60HZ. INCLUDE VIEW WINDOW, LED MARINE LIGHT AND ACCESS DOOR LEFT SIDE. TWO VFDs BY TEMPERATURE CONTROLS CONTRACTOR.



PLAN - TOP VIEW



ELEVATION - SIDE VIEW

PRE-PURCHASED INDOOR VAV AIR HANDLING UNIT (AHU-19)

BASED ON: CARRIER MODEL 39 MN
AREA SERVED: 300 WING
TYPE: MODULAR, VARIABLE AIR VOLUME 8,000 CFM NOMINAL, SIZE 17W.
MINIMUM OUTSIDE AIR: 1,000 - 2,300 CFM.
WEIGHT: 3,347 LBS
UNIT MOUNTING: CONTRACTOR FABRICATED STEEL PLATFORM.
ELECTRICAL: INDIVIDUAL FEEDS TO EACH MOTOR AND LIGHTING / OUTLET CIRCUIT.
ACOUSTICS (Hz/db):
DISCHARGE: 63/89, 125/87, 250/90, 500/95, 1K/90, 2K/92, 4K/91, 8K/82
INLET: 63/90, 125/87, 250/88, 500/91, 1K/83, 2K/82, 4K/81, 8K/72

MIXING BOX: TOP THERMALLY ISOLATED OPPOSED BLADE LOW-LEAK DAMPERS.

MIXING BOX: BOTTOM STANDARD PARALLEL, RIGHT SIDE ACCESS DOOR.

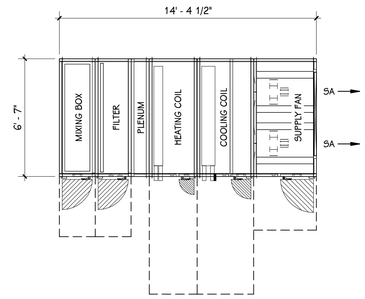
FILTERS: 2" PLEATED MERV-8 PRE-FILTER, MERV-13 FILTER, ACCESS DOOR RIGHT SIDE, MAGNIHELIC DIFFERENTIAL PRESSURE GAGE 0-2" w.c. RIGHT SIDE.

PLENUM: 12" LONG, INCLUDE RIGHT SIDE ACCESS DOOR WITH VIEW WINDOW AND LED MARINE LIGHT.

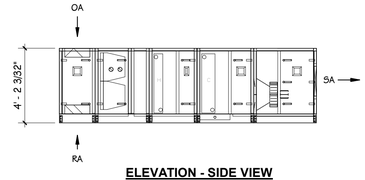
HOT WATER COIL: 447.56 MBH, 29.8 GPM, 130.0°F EWT, 100.0°F LWT, 43.4°F EDB, 95°F LDB, 0.46" APD, 1.5' WPD MAX, 750 FPM MAX FACE VELOCITY. INCLUDE LED MARINE LIGHT AND RIGHT SIDE ACCESS DOOR.

CHILLED WATER COIL: 314.64 TMBH, 223.51 SMBH, 80.8°F EDB, 68.0°F EWB, 55°F LDB, 55°F LWB, 45°F EWT, 55°F LWT, 52.4 GPM, 9.9' WPD, 0.99" APD, 500 FPM MAX FACE VELOCITY, WITH 55 IAQ DRAIN PAN. INCLUDE LED MARINE LIGHT AND ACCESS DOOR RIGHT SIDE.

SUPPLY FANS: TWO DIRECT DRIVE FANS TOTALLING 8,000 CFM @ 1.5" ESP, 2,595 FAN RPM, 3.2 BHP EACH, TWO 5 HP PREMIUM EFF. MOTOR, 460V/3/60HZ. INCLUDE VIEW WINDOW, LED MARINE LIGHT AND RIGHT SIDE ACCESS DOOR. TWO VFDs BY TEMPERATURE CONTROLS CONTRACTOR.



PLAN - TOP VIEW



ELEVATION - SIDE VIEW

PRE-PURCHASED INDOOR VAV AIR HANDLING UNIT (AHU-20)

BASED ON: CARRIER MODEL 39 MN
AREA SERVED: 300 WING
TYPE: MODULAR, VARIABLE AIR VOLUME 8,000 CFM NOMINAL, SIZE 17.
MINIMUM OUTSIDE AIR: 1,000 - 2,300 CFM
WEIGHT: 3,365 LBS
UNIT MOUNTING: CONTRACTOR FABRICATED STEEL PLATFORM.
ELECTRICAL: INDIVIDUAL FEEDS TO EACH MOTOR AND LIGHTING / OUTLET CIRCUIT.
ACOUSTICS (Hz/db):
DISCHARGE: 63/89, 125/87, 250/90, 500/95, 1K/90, 2K/92, 4K/91, 8K/82
INLET: 63/90, 125/87, 250/88, 500/91, 1K/83, 2K/82, 4K/81, 8K/72

MIXING BOX: TOP STANDARD OPPOSED BLADE LOW-LEAK DAMPERS.

MIXING BOX: BOTTOM STANDARD PARALLEL, RIGHT SIDE ACCESS DOOR.

FILTERS: 2" PLEATED MERV-8 PRE-FILTER, MERV-13 FILTER, DOOR RIGHT SIDE, MAGNIHELIC DIFFERENTIAL PRESSURE GAGE 0-2" w.c. RIGHT SIDE.

PLENUM: 12" LONG, INCLUDE ACCESS DOOR WITH VIEW WINDOW AND LED MARINE LIGHT.

HOT WATER COIL: 390.60 MBH, 26.0 GPM, 130.0°F EWT, 100.0°F LWT, 50.5°F EDB, 95°F LDB, 0.45" APD, 1.2' WPD MAX, 750 FPM MAX FACE VELOCITY. INCLUDE LED MARINE LIGHT AND RIGHT SIDE ACCESS DOOR.

CHILLED WATER COIL: 298.80 TMBH, 207.24 SMBH, 78.9°F EDB, 67.1°F EWB, 55°F LDB, 55 ° F LWB, 45°F EWT, 55°F LWT, 48.3 GPM, 9.8' WPD, 1.08" APD, 500 FPM MAX FACE VELOCITY, WITH 55 IAQ DRAIN PAN. INCLUDE LED MARINE LIGHT AND RIGHT SIDE ACCESS DOOR.

SUPPLY FANS: TWO DIRECT DRIVE FANS TOTALLING 8,000 CFM @ 1.5" ESP, 2,595 FAN RPM, 4.2 BHP EACH, TWO 2 HP PREMIUM EFF. MOTOR, 460V/3/60HZ. INCLUDE VIEW WINDOW, LED MARINE LIGHT AND RIGHT SIDE ACCESS DOOR. TWO VFDs BY TEMPERATURE CONTROLS CONTRACTOR.

A2

UNIT VENTILATOR - HOT WATER HEATING & DX COOLING — **BASED ON "AIREDALE"**

			CABINET		S.A. FAN				HOT WATER COIL					DX COOLING COIL					
MARK	MODEL	TYPE	RA INLET	OA LOUVER	SUPPLY CFM	O.A. CFM	HP	VOLTAGE	MBH	GPM	EAT	WPD	ROWS	TBMH	SMBH	LAT	EDB	EWB	REMARKS
HUV-513	ZFV1500	WALL MOUNT	FRONT	BACK	1500	380	1/2	115/1/60	78.2	8	46	2.93	2	48.0	31.7	55	78.6	67.3	(1), (3)
HUV-519	ZFV1500	WALL MOUNT	FRONT	BACK	1500	380	1/2	115/1/60	78.2	8	46	2.93	2	48.0	31.7	55	78.6	67.3	(1), (3)
HUV-521A	ZFV1500	WALL MOUNT	FRONT	BACK	1500	380	1/2	115/1/60	78.2	8	46	2.93	2	48.0	31.7	55	78.6	67.3	(1), (3)
HUV-521B	ZFV1500	WALL MOUNT	FRONT	BACK	1500	380	1/2	115/1/60	78.2	8	46	2.93	2	48.0	31.7	55	78.6	67.3	(1), (3)
VUV-540	CMD 48	VERTICAL	FRONT	BACK	1500	400	3/4	208/3/60	78.5	8	46	2.93	2	48.0	31.7	55	78.6	67.3	(2), (4)

NOTES:
1. PROVIDE WITITH MATCHING ACCU BASED ON YORK MODEL YXT48, 2-STAGE, 4-TON NOMINAL COOLING CAPACITY, R410A REFRIGERNT, ELECTRICAL = 208-V/1-PH/60-HZ, 28.2 MCA, 45 MOCP WITH POLY PAD FOR ROOF MOUNTING.
2. PROVIDE WITH TOP DUCT SHROUD TO REACH ABOVE CEILING.
3 PROVIDE WITH OPTIONAL 6" HIGH SUB BASE.
4 PROVIDE STUDY PACKAGE.

UNIT VENTILATOR - HOT WATER HEATING & CHILLED WATER COOLING — **BASED ON "AIREDALE"**

			CABINET		S.A. FAN				HOT WATER COIL					CHILLED WATER COIL							
MARK	MODEL	TYPE	RA INLET	OA LOUVER	SUPPLY CFM	O.A. CFM	HP	VOLTAGE	MBH	GPM	EAT	WPD	ROWS	TBMH	SMBH	GPM	EWT	LWT	EAT	LAT	REMARKS
HUV-400	ZFV1500	WALL MOUNT	FRONT	BACK	1500	380	1/2	115/1/60	78.2	8	46	2.93	2	38.5	32.7	6.5	45 °F	57 °F	95 °F	60 °F	(1)
HUV-401	ZFV1500	WALL MOUNT	FRONT	BACK	1500	380	1/2	115/1/60	78.2	8	46	2.93	2	38.5	32.7	6.5	45 °F	57 °F	95 °F	60 °F	(1)
HUV-402	ZFV1500	WALL MOUNT	FRONT	BACK	1500	380	1/2	115/1/60	78.2	8	46	2.93	2	38.5	32.7	6.5	45 °F	57 °F	95 °F	60 °F	(1)
HUV-403	ZFV1500	WALL MOUNT	FRONT	BACK	1500	380	1/2	115/1/60	78.2	8	46	2.93	2	38.5	32.7	6.5	45 °F	57 °F	95 °F	60 °F	(1)
HUV-404	ZFV1500	WALL MOUNT	FRONT	BACK	1500	380	1/2	115/1/60	78.2	8	46	2.93	2	38.5	32.7	6.5	45 °F	57 °F	95 °F	60 °F	(1)
HUV-405	ZFV1500	WALL MOUNT	FRONT	BACK	1500	380	1/2	115/1/60	78.2	8	46	2.93	2	38.5	32.7	6.5	45 °F	57 °F	95 °F	60 °F	(1)
HUV-406	ZFV1500	WALL MOUNT	FRONT	BACK	1500	380	1/2	115/1/60	78.2	8	46	2.93	2	38.5	32.7	6.5	45 °F	57 °F	95 °F	60 °F	(1)
HUV-407	ZFV1500	WALL MOUNT	FRONT	BACK	1500	380	1/2	115/1/60	78.2	8	46	2.93	2	38.5	32.7	6.5	45 °F	57 °F	95 °F	60 °F	(1), (2)
HUV-408	ZFV1500	WALL MOUNT	FRONT	BACK	1500	380	1/2	115/1/60	78.2	8	46	2.93	2	38.5	32.7	6.5	45 °F	57 °F	95 °F	60 °F	(1), (2)

NOTES:
1. PROVIDE WITH OPTIONAL 6" HIGH SUB BASE.
2. 3-WAY VALVE.

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ADDENDUM No. 2 October 28, 2022

ISSUED FOR DATE

PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

DATE
OCTOBER 3, 2022

SHEET TITLE
MECHANICAL SCHEDULES - PRE-PURCHASED EQUIPMENT

SHEET NUMBER
M 502
21-806.00

HEATING COILS - HOT WATER

BASED ON DAIKIN

MARK	SIZE	ROWS	CFM	TMBH (1)	E.A.T. (°F)	L.A.T. (°F)	GPM	A.P.D. (IN WC)	W.P.D. (FT)	MAX AIR VELOCITY (FPM)	REMARKS
HC-500	20"x18"	3	1,980	99.9	130	110	10.1	0.30	2.90	750	
HC-503	20"x18"	3	2,110	108.9	130	110	11.0	0.28	2.90	750	
HC-505	20"x18"	3	1,980	116.8	130	110	11.8	0.26	2.90	750	

NOTES:
1. BASED ON 130°F EWT, 20°F dT.

CABINET UNIT HEATERS - HOT WATER

BASED ON SIGMA

MARK	MODEL	TYPE	CFM	MBH (1)	GPM	HP	RPM	VOLTAGE	MAX RECESS	MOUNTING HEIGHT	REMARKS
CH-17	06	SRI	600	31.3	3.2	0.1	0	120/1/60			
CH-21	03	SRI	300	18.4	1.9	0.1	0	120/1/60			
CH-22	06	SRI	600	25	2.6	0.1	0	120/1/60			
CH-23	04	SRI	400	18.8	2	0.1	0	120/1/60			
CH-24	04	SRI	400	18.8	2	0.1	0	120/1/60			
CH-25	04	SRI	400	18.8	2	0.1	0	120/1/60			
CH-36	04	SRI	400	18.8	2	0.1	0	120/1/60			

NOTES:
1. BASED ON 130°F EWT, 20°F dT.

FINNED TUBE - WATER

BASED ON WALLFIN

MARK	HEATING ELEMENT SIZE	ROWS	LENGTH	EWT (°F)	CAPACITY (BTUH/FT) (1)	FLOW (GPM)	COVER TYPE	HEIGHT	PANEL SURFACE	MOUNT HEIGHT	REMARKS
FR-27	¾"C - 42 FINS/FT -4¼"x4¼"	2	4' - 6"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	
FR-29	¾"C - 42 FINS/FT -4¼"x4¼"	2	11' - 0"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	
FR-30	¾"C - 42 FINS/FT -4¼"x4¼"	2	3' - 0"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	
FR-31	¾"C - 42 FINS/FT -4¼"x4¼"	2	2' - 0"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	
FR-32	¾"C - 42 FINS/FT -4¼"x4¼"	2	12' - 2"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	
FR-33	¾"C - 42 FINS/FT -4¼"x4¼"	2	12' - 2"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	
FR-34	¾"C - 42 FINS/FT -4¼"x4¼"	2	4' - 2"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	
FR-35	¾"C - 42 FINS/FT -4¼"x4¼"	2	2' - 0"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	
FR-36	¾"C - 42 FINS/FT -4¼"x4¼"	2	3' - 2"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	
FR-37	¾"C - 42 FINS/FT -4¼"x4¼"	2	2' - 0"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	
FR-38	¾"C - 42 FINS/FT -4¼"x4¼"	2	2' - 0"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	
FR-44	¾"C - 42 FINS/FT -4¼"x4¼"	2	5' - 0"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	
FR-48	¾"C - 42 FINS/FT -4¼"x4¼"	2	3' - 6"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	
FR-49	¾"C - 42 FINS/FT -4¼"x4¼"	2	3' - 6"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	
FR-53	¾"C - 42 FINS/FT -4¼"x4¼"	2	3' - 6"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	
FR-54	¾"C - 42 FINS/FT -4¼"x4¼"	2	3' - 6"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	
FR-55	¾"C - 42 FINS/FT -4¼"x4¼"	2	2' - 0"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	
FR-56	¾"C - 42 FINS/FT -4¼"x4¼"	2	2' - 0"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	
FR-58	¾"C - 42 FINS/FT -4¼"x4¼"	2	6' - 6"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	
FR-59	¾"C - 42 FINS/FT -4¼"x4¼"	2	7' - 6"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	
FR-60	¾"C - 42 FINS/FT -4¼"x4¼"	2	6' - 6"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	
FR-85	¾"C - 42 FINS/FT -4¼"x4¼"	2	3' - 0"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	
FR-86	¾"C - 42 FINS/FT -4¼"x4¼"	2	3' - 0"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	
FR-87	¾"C - 42 FINS/FT -4¼"x4¼"	2	3' - 0"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	
FR-88	¾"C - 42 FINS/FT -4¼"x4¼"	2	3' - 0"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	
FR-501	¾"C - 42 FINS/FT -4¼"x4¼"	2	8' - 0"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	
FR-506A	¾"C - 42 FINS/FT -4¼"x4¼"	2	8' - 0"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	
FR-506B	¾"C - 42 FINS/FT -4¼"x4¼"	2	4' - 0"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	
FR-508	¾"C - 42 FINS/FT -4¼"x4¼"	2	16' - 0"	130 °F	728	3.00	DOUBLE SLOPED	2' - 6"	L	(1)	

NOTES:
1. BASED ON 130°F EWT, 20°F dT.
2. MOUNT UNIT AT SAME HEIGHT AS EXISTING UNIT.

PUMPS

BASED ON BELL & GOSSETT

MARK	MODEL	FLOW RATE (GPM)	HEAD (FT)	PEIcl	MOTOR DATA HP	BHP	RPM	VOLTAGE	SYSTEM	LOCATION	REMARKS
P-1	e-1510 2.5BB	275.0	52.00	0.89	7.5	4.83	1592	460/3/60	HEATING WATER	MECHANICAL ROOM 4109	(1)
P-2	e-1510 2.5BB	275.0	52.00	0.89	7.5	4.83	1592	460/3/60	HEATING WATER	MECHANICAL ROOM 4109	(1)
P-3	e-1510 2.5BB	215.0	60.00	0.89	7.5	4.3	1601	460/3/60	HEATING WATER	MECHANICAL MEZZ. 3-200	(1)
P-4	e-1510 2.5BB	215.0	60.00	0.89	7.5	4.3	1601	460/3/60	HEATING WATER	MECHANICAL MEZZ. 3-200	(1)
P-5	ECOCIRC XL 36-45	12.0	20.00	-	0.167	0.157	3376	115/1/60	HC-505	ROOM 505 - ART	
P-6	ECOCIRC XL 36-45	11.0	20.00	-	0.167	0.157	3376	115/1/60	HC-503	ROOM 503 - ART	
P-7	ECOCIRC XL 36-45	10.0	20.00	-	0.167	0.157	3376	115/1/60	HC-500	ROOM 500 - ART	
P-8	ECOCIRC XL 40-275	103.0	25.00	-	2	1.16	2648	208/1/60	AHU-18 - CHILLED WATER	MECHANICAL MEZZ. C	
P-9	ECOCIRC XL 40-275	101.0	25.00	-	2	1.16	2648	208/1/60	AHU-18 - HEATING WATER	MECHANICAL MEZZ. C	
P-10	ECOCIRC XL 110-180	71.0	20.00	-	3	0.679	2013	208/1/60	AHU-19 - CHILLED WATER	MECHANICAL MEZZ. C	
P-11	e-60-ECM 2x2x5.25	68.0	25.00	-	1	0	1708	208/1/60	AHU-19 - HEATING WATER	MECHANICAL MEZZ. C	
P-12	ECOCIRC XL 110-180	71.0	20.00	-	3	0.679	2013	208/1/60	AHU-19 - CHILLED WATER	MECHANICAL MEZZ. C	
P-13	e-60-ECM 2x2x5.25	68.0	25.00	-	1	0	1708	208/1/60	AHU-20 - HEATING WATER	MECHANICAL MEZZ. C	
P-14	e-60-ECM 1.25x1.25x5.25	28.4	20.00	-	0.5	0	1537	208/1/60	AHU-7 - HEATING WATER	FAN ROOM 5-202	
P-15	e-60-ECM 1.25x1.25x5.25	28.4	20.00	-	0.5	0	1537	208/1/60	AHU-5 - HEATING WATER	FAN ROOM 5-202	
P-16	e-60-ECM 1.25x1.25x5.25	28.4	20.00	-	0.5	0	1537	208/1/60	AHU-4 - HEATING WATER	FAN ROOM 5-206	
P-17	e-60-ECM 1.25x1.25x5.25	28.4	20.00	-	0.5	0	1537	208/3/60	AHU-3 - HEATING WATER	FAN ROOM 5-206	
P-18	e-60-ECM 1.25x1.25x5.25	37.4	20.00	-	3	0.351	1761	460/3/60	AHU-17 - HEATING WATER	MECHANICAL ROOM 554	
P-19	e-60-ECM 2x2x5.25	84.4	20.00	-	1	0.772	1570	208/1/60	AHU-17 - CHILLED WATER	MECHANICAL ROOM 554	

NOTES:
1. VFD PROVIDED BY TEMPERATURE CONTROLS CONTRACTOR.

OUTDOOR AIR INTAKE / RELIEF HOODS

BASED ON GREENHECK

MARK	MODEL	THROAT SIZE	HOOD SIZE	CURB HEIGHT	AIR FLOW (CFM)	MAX APD (IN WC)	CONTROL DAMPER	REMARKS
RH-1	FGR	18x18	32x39	2' - 0"	1,570	0.05	Yes	
RH-2	FGR	18x18	32x39	2' - 0"	1,385	0.05	Yes	
RH-3	FGR	18x24	32x39	2' - 0"	2,853	0.05	Yes	
RH-4	FGR	24x24	38x39	2' - 0"	3,600	0.05	Yes	
RH-5	FGR	24x24	38x39	2' - 0"	3,300	0.05	Yes	
RH-6	FGR	24x24	38x39	2' - 0"	2,125	0.05	Yes	
RH-7	FGR	24x24	38x39	2' - 0"	3,000	0.05	Yes	
RH-8	FGR	24x42	38x63	2' - 0"	8,000	0.05	Yes	
RH-9	FGR	24x42	38x63	2' - 0"	8,000	0.05	Yes	

EXHAUST FANS

BASED ON GREENHECK

MARK	MODEL	AIR FLOW (CFM)	ESP(IN WC)	SONES	MOTOR EC MOTOR	NOMINAL HP	BRAKE HP	RPM	VOLTAGE	REMARKS
EF-401A	G-180-VG	2700	0.50	9.6	Yes	0.75	0.43	876	115/1/60	(1)
EF-401B	G-090-VG	500	0.50	7.8	Yes	0.1	0.08	1602	115/1/60	(1)
EF-401C	G-130-VG	1000	0.50	7.7	Yes	0.25	0.13	1060	115/1/60	(1)
EF-402	G-080-VG	250	0.50	7.7	Yes	0.1	0.06	1589	115/1/60	(1)
EF-403	G-130-VG	1100	0.50	8.2	Yes	0.25	0.15	1099	115/1/60	(1)
EF-406A	G-080-VG	150	0.50	7.1	Yes	0.1	0.04	1454	115/1/60	(1)
EF-406B	G-080-VG	150	0.50	7.1	Yes	0.1	0.04	1454	115/1/60	(1)
EF-406C	G-080-VG	150	0.50	7.1	Yes	0.1	0.04	1454	115/1/60	(1)
EF-408	G-097-VG	100	0.50	4.6	Yes	0.25	0.03	1135	115/1/60	(1)
EF-410	G-097-VG	100	0.50	4.6	Yes	0.25	0.03	1135	115/1/60	(1)
EF-413	G-140-VG	1400	0.50	8.1	Yes	0.5	0.24	1053	115/1/60	(1)
EF-418	G-097-VG	100	0.50	4.6	Yes	0.25	0.03	1135	115/1/60	(1)
EF-424	G-095-VG	700	0.50	9.8	Yes	0.167	0.14	1638	115/1/60	(1)
EF-428	G-090-VG	400	0.50	7.0	Yes	0.1	0.07	1490	115/1/60	(1)
EF-430	G-180-VG	270	0.50	9.6	Yes	0.75	0.43	876	115/1/60	(1)
EF-430A	G-180-VG	2160	0.50	7.7	Yes	0.75	0.3	780	115/1/60	(1)
EF-430B	G-180-VG	2160	0.50	7.7	Yes	0.75	0.3	780	115/1/60	(1)
EF-430C	G-180-VG	2160	0.50	7.7	Yes	0.75	0.3	780	115/1/60	(1)
EF-430D	G-180-VG	2160	0.50	7.7	Yes	0.75	0.3	780	115/1/60	(1)
EF-432	G-080-VG	290	0.50	8.2	Yes	0.1	0.07	1663	115/1/60	(1)
EF-433	G-100-VG	800	0.50	6.9	Yes	0.25	0.13	1319	115/1/60	(1)
EF-447	G-130-VG	1150	0.50	8.5	Yes	0.25	0.16	1122	115/1/60	(1)
EF-500	G-080-VG	225	0.50	7.6	Yes	0.1	0.05	1553	115/1/60	(1)
EF-501	G-080-VG	200	0.50	7.4	Yes	0.1	0.05	1520	115/1/60	(1)
EF-503	G-090-VG	450	0.50	7.3	Yes	0.1	0.07	1538	115/1/60	(1)
EF-509	G-090-VG	400	0.50	7.0	Yes	0.1	0.07	1490	115/1/60	(1)
EF-518	G-080-VG	290	0.50	8.2	Yes	0.25	0.07	1663	115/1/60	(1)
EF-525	G-080-VG	275	0.50	8.0	Yes	0.1	0.06	1635	115/1/60	(1)
EF-527	G-080-VG	170	0.50	7.2	Yes	0.1	0.05	1480	115/1/60	(1)
EF-529	G-080-VG	175	0.50	7.3	Yes	0.1	0.05	1487	115/1/60	(1)
EF-531	G-080-VG	300	0.50	8.4	Yes	0.1	0.07	1681	115/1/60	(1)
EF-534	G-080-VG	320	0.50	8.7	Yes	0.1	0.07	1719	115/1/60	(1)
EF-536	G-080-VG	320	0.50	8.7	Yes	0.1	0.07	1719	115/1/60	(1)
EF-537	G-090-VG	500	0.50	7.8	Yes	0.1	0.08	1602	115/1/60	(1)
EF-542	G-095-VG	600	0.50	9.3	Yes	0.17	0.11	1545	115/1/60	(1)
EF-543	G-080-VG	220	0.50	7.6	Yes	0.1	0.05	1547	115/1/60	(1)
EF-545	G-080-VG	175	0.50	7.3	Yes	0.1	0.05	1487	115/1/60	(1)
EF-554	QEID-36	11500	1.00	13.8	No	10	2.63	547	460/3/60	(2)
EF-557	G-080-VG	220	0.50	7.6	Yes	0.1	0.05	1547	115/1/60	(1)

NOTES:
1. INTERLOCK EXHAUST FAN WITH ASSOCIATED DAMPER. THERMALLY ISOLATED DAMPER BY CONTROLS.
2. REMOTE (INDOOR) VFD BY CONTROLS, LOCAL DISCONNECT BY MANUFACTURER WITH AUX LOW VOLTAGE CONTACTS FOR VFD SIGNAL.

TERMINAL UNITS

BASED ON PRICE

MARK	MAX CFM	TYPE	NC (MAX)	SP DROP (MAX)	INLET SIZE	REHEAT COIL (1) MBH	TR	W.P.D.	GPM	MIN CFM CLG	HTG	REMARKS
TU-004	995	SDV	25	0.4"	14	43.2	40	5' MAX	4.25	498	332	
TU-006	500	SDV	25	0.4"	10	21.7	40	5' MAX	2.25	250	167	
TU-007	500	SDV	25	0.4"	10	21.7	40	5' MAX	2.25	250	167	
TU-403	1,170	SDV	25	0.4"	14	50.8	40	5' MAX	2.50	585	390	
TU-404	330	SDV	25	0.4"	06	14.3	40	5' MAX	1.50	165	110	
TU-406	1,160	SDV	25	0.4"	14	50.3	40	5' MAX	5.00	580	387	
TU-409	1,440	SDV	25	0.4"	16	62.5	40	5' MAX	6.25	720	480	
TU-412	1,000	SDV	25	0.4"	14	43.4	40	5' MAX	4.25	500	333	
TU-412A	500	SDV	25	0.4"	10	16.3	30	5' MAX	1.75	250	167	
TU-417	250	SDV	25	0.4"	06	10.9	40	5' MAX	1.00	125	83	
TU-419	100	SDV	25	0.4"	04	3.3	30	5' MAX	0.25	50	33	
TU-423	300	SDV	25	0.4"	08	14.6	45	5' MAX	1.50	150	100	
TU-426	3,900	SDV	25	0.4"	16	169.3	40	5' MAX	17.00	1950	1300	
TU-427	640	SDV	25	0.4"	08	31.2	45	5' MAX	3.00	320	213	
TU-438	530	SDV	25	0.4"	09	23.0	40	5' MAX	2.25	265	177	
TU-449	1,600	SDV	25	0.4"	16	69.4	40	5' MAX	7.00	800	533	
TU-517	1,080	SDV	25	0.4"	14	46.9	40	5' MAX	4.75	540	360	
TU-518	265	SDV	25	0.4"	06	11.5	40	5' MAX	1.25	133	88	
TU-520	600	SDV	25	0.4"	10	29.3	45	5' MAX	3.00	300	200	
TU-522	1,455	SDV	25	0.4"	14	63.1	40	5' MAX	6.25	728	485	
TU-523	175	SDV	25	0.4"	06	7.6	40	5' MAX	0.75	88	58	
TU-525	360	SDV	25	0.4"	08	15.6	40	5' MAX	1.50	180	120	
TU-547	300	SDV	25	0.4"	06	13.0	40	5' MAX	1.25	150	100	
TU-548	1,500	SDV	25	0.4"	16	65.1	40	5' MAX	6.50	750	500	3-WAY VALVE
TU-549	1,500	SDV	25	0.4"	16	65.1	40	5' MAX	6.50	750	500	3-WAY VALVE
TU-553	1,590	SDV	25	0.4"	16	69.0	40	5' MAX	7.00	795	530	
Grand total: 26						1032.2						

NOTES:
1. REHEAT COIL SIZING BASED ON 130°F EWT, 100°F LWT, W/ BOX AT MAXIMUM FLOW.

SHELL AND TUBE HEAT EXCHANGERS

BASED ON BELL AND GOSSETT

MARK	MODEL	MBH	HIGH TEMP GPM	HIGH TEMP WPD	HIGH TEMP EWT	HIGH TEMP LWT	LOW TEMP (1) GPM	LOW TEMP (1) WPD	LOW TEMP (1) EWT	LOW TEMP (1) LWT	LOCATION	REMARKS
HX-1	QSU-124-2	2820	5.6	2.94	211	211	189.6	6.5	130	100	MECHANICAL MEZZ. 3-200	
HX-2	QSU-124-2	2820	5.6	2.94	211	211	189.6	6.5	130	100	MECHANICAL ROOM 4109	

NOTES:
1. 15% EXCESS SURFACE AREA.

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ADDENDUM No. 2 October 28, 2022
ISSUED FOR DATE

PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

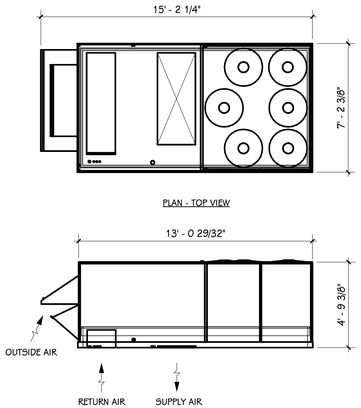
OWNER
KALAMAZOO PUBLIC SCHOOLS

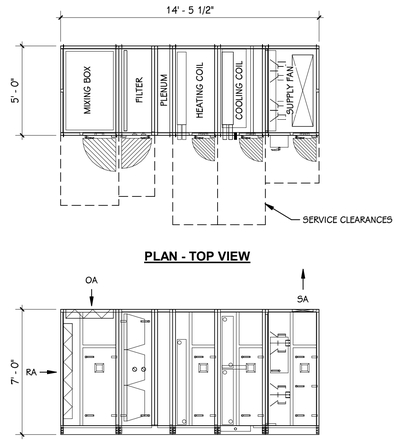
Kalamazoo, Michigan

SHEET TITLE
MECHANICAL SCHEDULES

DATE
OCTOBER 3, 2022

SHEET NUMBER
M 503
21-806.00





ROOFTOP VAV AIR HANDLING UNIT (RTU-500)

AREA SERVED: ART ROOMS
TYPE: ROOFTOP MULTIPLE ZONES, VARIABLE VOLUME, DX COOLING, VERTICAL DISCHARGE
MANUFACTURER: BASED ON YCARRIER, MODEL SOLC
WEIGHT: 2,982 LB
OUTSIDE AIR: 600 - 2,500 CFM BASED ON CO2
LOCATION: ROOFTOP
UNIT MOUNTING: 14" ROOF CURB
ACOUSTICS (Hz/db):
DISCHARGE: 63/92, 125/88, 250/80, 500/78, 1K/76, 2K/84, 4K/74, 8K/67
INLET: 63/89, 125/78, 250/71, 500/66, 1K/61, 2K/74, 4K/52, 8K/45

FILTER SECTION: 2" PLEATED MERV-13 FILTERS

DX COOLING SECTION: 281.61 TMBH, 190.69 SMBH, 80.1°F EDB, 68.2°F EWB, 55°F LDB, 55°F LWB, R-410A REFRIGERANT.

SUPPLY FAN: 1 FAN @ 7.5 HP, 5.23 BHP, 7,000 CFM @ 1.5" ESP, 1,78" TSP, 1,039 RPM, 460/3/60, PREMIUM EFFICIENCY FOR USE WITH VED, VFD PROVIDED BY TEMPERATURE CONTROLS CONTRACTOR.

ELECTRICAL: SINGLE POINT 460/3/60 (62.8 MCA, 80 MOCP) WITH SINGLE POINT 120/1/60 POWER CONNECTIONS.

OPTIONS: PROVIDE WITH MINIMUM 1 YEAR MANUFACTURER'S WARRANTY, POWERED EXHAUST, DUCT DETECTORS.

CONTROLS: PROVIDE CONTROLS WITH BACNET INTERFACE TO ACCEPT RUN SCHEDULE AND DISCHARGE AIR TEMPERATURE SETPOINT. BACNET SHALL SEND THESE POINTS TO BAS: DAT, RAT, RA HUMIDITY, FAN STATUS AND %, DX STATUS AND %, ECONOMIZER %, OAD %, ALARMS.

INDOOR VAV AIR HANDLING UNIT (AHU-17)

BASED ON: CARRIER MODEL 39 MN
AREA SERVED: 400 WING
TYPE: MODULAR, VARIABLE AIR VOLUME, 17,500 CFM NOMINAL, SIZE 22. REMOTE EXHAUST FAN.
MINIMUM OUTSIDE AIR: 1,000 - 3,710 CFM BASED ON CO2.
WEIGHT: 3,173 LBS
UNIT MOUNTING: HOUSEKEEPING PAD.
ELECTRICAL: INDIVIDUAL FEEDS TO EACH MOTOR AND LIGHTING / OUTLET CIRCUIT.
ACOUSTICS (Hz/db):
DISCHARGE: 63/94, 125/84, 250/89, 500/100, 1K/99, 2K/98, 4K/94, 8K/90
INLET: 63/88, 125/78, 250/83, 500/94, 1K/89, 2K/86, 4K/83, 8K/80

MIXING BOX: TOP BLANK OPENING, RIGHT SIDE ACCESS DOOR.

FILTERS: 2" PLEATED MERV-8 PRE-FILTER, MERV-13 FILTER, ACCESS DOOR RIGHT SIDE, MAGNIHELIC DIFFERENTIAL PRESSURE GAGE 0-2" w.c. RIGHT SIDE.

PLENUM: 12" LONG, INCLUDE RIGHT SIDE ACCESS DOOR WITH VIEW WINDOW AND LED MARINE LIGHT. REAR RETURN AIR DAMPER.

HOT WATER COIL: 561.49 MBH, 37.4 GPM, 130.0 °F EWT, 100.0°F LWT, -10°F EDB, 40.8°F LDB, 0.51" APD, 3.4' WPD, 750 FPM MAX FACE VELOCITY. INCLUDE LED MARINE LIGHT AND RIGHT SIDE ACCESS DOOR.

CHILLED WATER COOLING COIL: 470.41 TMBH, 330.06 SMBH, 81.5°F EDB, 68.4°F EWB, 55°F LDB, 55°F LWB, 45°F EWT, 55°F LWT, 78.4 GPM, 1.53" APD, 4.9' WPD, 500 FPM MAX FACE VELOCITY, WITH 95 IAQ DRAIN PAN. INCLUDE RIGHT SIDE ACCESS DOOR WITH VIEW WINDOW AND LED MARINE LIGHT.

SUPPLY FANS: FOUR DIRECT DRIVE FANS TOTALING 11,500 CFM @ 2.25" ESP, 3,958 FAN RPM, 3.4 BHP EACH, FOUR 5 HP PREMIUM EFF. MOTOR, 460V/3/60HZ. INCLUDE VIEW WINDOW, LED MARINE LIGHT AND RIGHT SIDE ACCESS DOOR. FOUR VFDs BY TEMPERATURE CONTROLS CONTRACTOR.

UNIT HEATER - HOT WATER

BASED ON RITTLING

MARK	MODEL	TYPE	CFM	MBH (1)	GPM	WPD	HP	RPM	VOLTAGE	REMARKS
UH-1	RH-63	HORIZONTAL	1,120	22	2.5	0.1	1/10	1550	120/1/60	
UH-2	RH-93	HORIZONTAL	630	12	1.5	0.1	1/15	1550	120/1/60	
UH-3	RH-121	HORIZONTAL	1,550	50	5	0.3	1/8	1095	120/1/60	
UH-4	RH-121	HORIZONTAL	1,550	50	5	0.3	1/8	1095	120/1/60	

NOTES:
1. BASED ON 130°F EWT, 60°F EAT.

GRILLES, REGISTERS, & DIFFUSERS

BASED ON PRICE

MARK	PANEL SIZE	FACE SIZE	NECK SIZE	MODEL	CFM RANGE	VCD	THROW	MATERIAL	FINISH	INSTALLATION	REMARKS
SA-1	48" LONG	4 SLOTS	10"Ø	SD575	251-320	NO	11' @ 20° DT	ALUMINUM	WHITE	LAY-IN	
SA-2	48" LONG	3 SLOTS	6" Ø	SD575	151-250	NO	11' @ 20° DT	ALUMINUM	WHITE	LAY-IN	
SA-3	24"x24"	12"x12"	8" Ø	ASCDA	125-175	NO	4-WAY	ALUMINUM	WHITE	LAY-IN	
SA-4	24"x24"	12"x12"	6" Ø	ASCDA	75-125	NO	5-10-20	ALUMINUM	WHITE	LAY-IN	
SA-5	24"x24"	22"x22"	8" Ø	ASCDA	175-315	NO	4-WAY	ALUMINUM	WHITE	LAY-IN	
SA-6	8"x4"	-	-	620	120-160	NO	4-7-10	ALUMINUM	CLR ANODIZED	SURFACE	FIELD VERIFY SIZE PRIOR TO ORDERING.
SA-7	16"x12"	-	-	620		NO	10-14-22	ALUMINUM	CLR ANODIZED	SURFACE	FIELD VERIFY SIZE PRIOR TO ORDERING.
SA-8	18"x8"	-	-	620	500-600	NO	21-30-42	ALUMINUM	CLR ANODIZED	SURFACE	FIELD VERIFY SIZE PRIOR TO ORDERING.
SA-9	48" LONG	6-1/4"x48"	10" Ø	CF	250-310	NO	20' @ 20° DT	ALUMINUM	WHITE	LAY-IN	PROVIDE WITH MODEL UP INSULATED FACTORY PLENUM.
RA-1	24"x24"	-	22"x22"	80	500 - 2000	NO	-	ALUMINUM	WHITE	LAY-IN	
RA-2	12"x12"	-	-	80	0 - 500	NO	-	ALUMINUM	WHITE	SURFACE	
RA-3	32"x58"	-	-	98	0 - 4800	NO	-	ALUMINUM	CLR ANODIZED	SURFACE	FIELD VERIFY SIZE PRIOR TO ORDERING.
RA-4	34"x74"	-	-	98	0 - 7000	NO	-	ALUMINUM	CLR ANODIZED	SURFACE	FIELD VERIFY SIZE PRIOR TO ORDERING.
RA-5	76"x66"	-	-	98	0 - 13000	NO	-	ALUMINUM	CLR ANODIZED	SURFACE	FIELD VERIFY SIZE PRIOR TO ORDERING.
RA-6	50"x50"	-	-	98	0 - 6000	NO	-	ALUMINUM	CLR ANODIZED	SURFACE	FIELD VERIFY SIZE PRIOR TO ORDERING.
RA-7	24"x36"	-	-	98	0 - 2800	NO	-	ALUMINUM	CLR ANODIZED	SURFACE	FIELD VERIFY SIZE PRIOR TO ORDERING.
RA-8	16"x36"	-	-	98	0 - 1800	NO	-	ALUMINUM	CLR ANODIZED	SURFACE	FIELD VERIFY SIZE PRIOR TO ORDERING.
RA-9	24"x48"	-	-	98	0 - 3000	NO	-	ALUMINUM	CLR ANODIZED	SURFACE	FIELD VERIFY SIZE PRIOR TO ORDERING.
EA-1	24"x24"	-	24"x24"	80	0-1000	YES	-	ALUMINUM	WHITE	SURFACE	
EA-2	12"x8"	-	12"x8"	80	0-500	NO	-	ALUMINUM	WHITE	SURFACE	
EA-3	12"x12"	-	12"x12"	80	0-500	NO	-	ALUMINUM	WHITE	SURFACE	
EA-4	12"x12"	-	12"x12"	80	0-500	NO	-	ALUMINUM	WHITE	SURFACE	

CONVECTORS - HOT WATER

BASED ON MODINE

MARK	TYPE	MBH (1)	GPM	SIZE L	SIZE H	SIZE D	MAX RECESS	MOUNTING HGT. A.F.F.	REMARKS
CV-26	CFRX	1.7	0.5	32	26	6	6	1'-2"	
CV-27	CFRX	1.7	0.5	32	26	6	6	1'-2"	
CV-28	CFRX	0.7	0.5	26	16	4	4	1'-2"	
CV-29	CFRX	0.7	0.5	26	16	4	4	1'-2"	
CV-30	CFRX	0.7	0.5	26	16	4	4	1'-2"	
CV-31	CFRX	0.7	0.5	26	16	4	4	2'-0"	
CV-32	CFRX	5	0.5	62	32	8	8	8"	
CV-33	CFRX	5	0.5	62	32	8	8	8"	
CV-34	CFRX	5	0.5	62	32	8	8	8"	
CV-35	CFRX	0.7	0.5	26	16	4	4	10"	
CV-36	CFRX	0.7	0.5	26	16	4	4	10"	
CV-37	CFRX	5	0.5	62	32	8	8	8"	
CV-38	CFRX	0.7	0.5	26	16	4	4	10"	
CV-39	CFRX	0.7	0.5	26	16	4	4	10"	
CV-40	CFRX	5	0.5	62	32	8	8	8"	
CV-41	CFRX	5	0.5	62	32	8	8	8"	
CV-42	CFRX	5	0.5	62	32	8	8	8"	
CV-43	CFRX	1.4	0.5	38	24	4	4	8"	
CV-45	CFRX	1.4	0.5	50	26	8	8	10"	
CV-46	CFRX	5	0.5	62	32	8	8	8"	
CV-47	CFRX	5	0.5	62	32	8	8	8"	

NOTES:
1. BASED ON 130°F EWT, 20°F dT.

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ADDENDUM No. 2 October 28, 2022
ISSUED FOR DATE

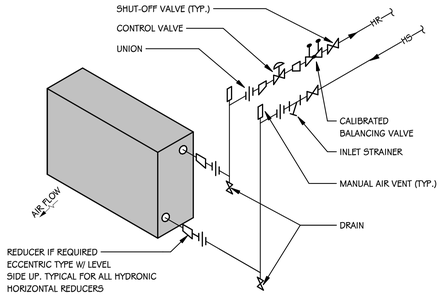
PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

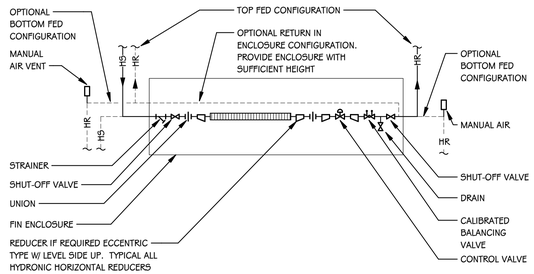
SHEET TITLE
MECHANICAL SCHEDULES

DATE
OCTOBER 3, 2022

SHEET NUMBER
M 504
21-806.00



CABINET HEATER PIPING DETAIL
SCALE: NONE



FIN RADIATION PIPING DETAIL - SINGLE ROW
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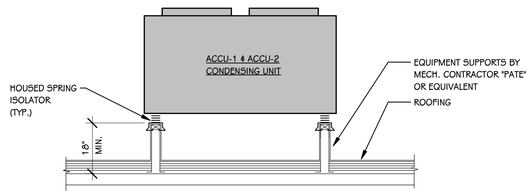
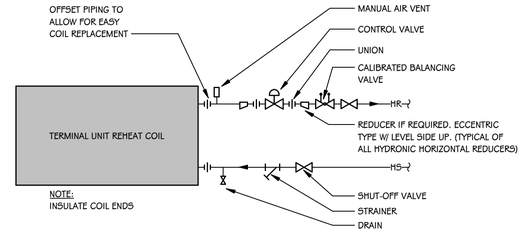


ROOF MOUNTED CONDENSING UNIT
SCALE: NONE



TERMINAL UNIT REHEAT COIL PIPING DETAIL (2-WAY)
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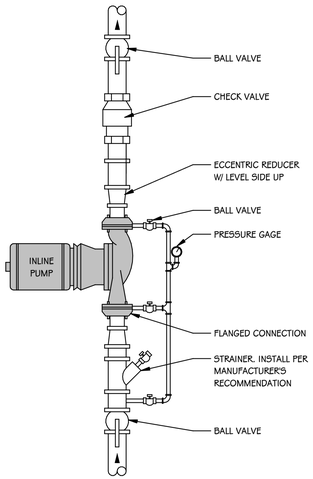

PUMP - INLINE PIPING DETAIL
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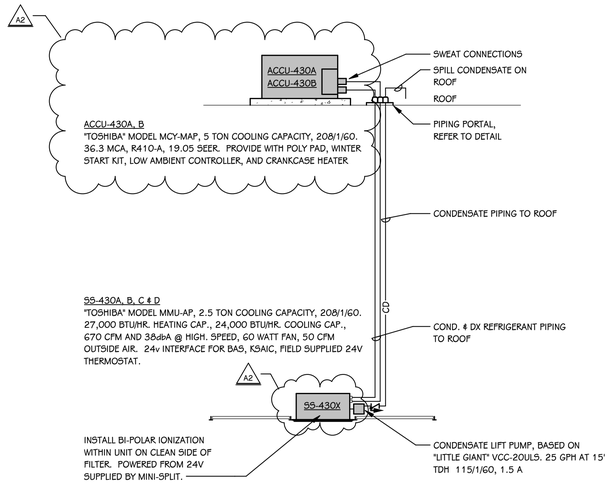

SPLIT SYSTEM UNIT PIPING DETAIL
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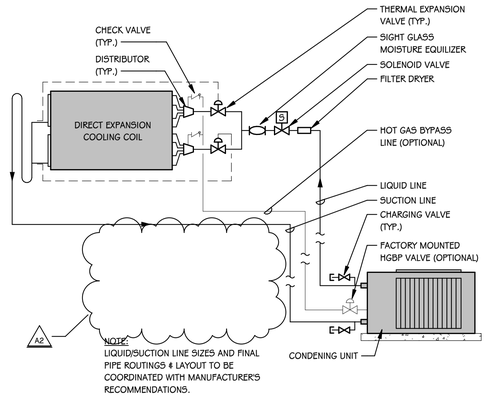
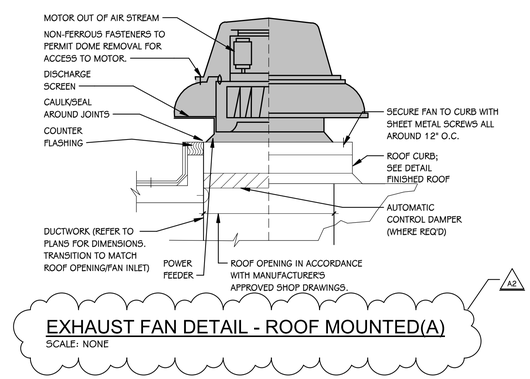


AHU DX COOLING COIL PIPING DETAIL
SCALE: NONE



EXHAUST FAN DETAIL - ROOF MOUNTED(A)
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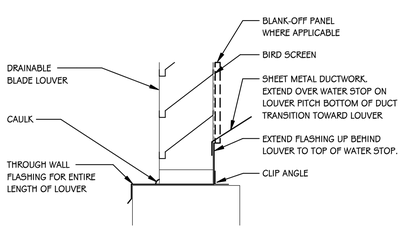

LOUVER INSTALLATION DETAIL
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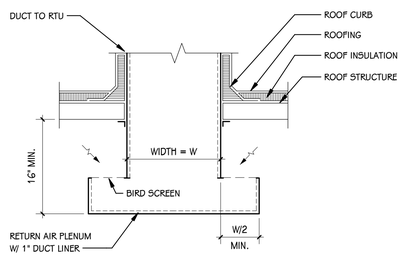

RTU RETURN AIR PLENUM DETAIL
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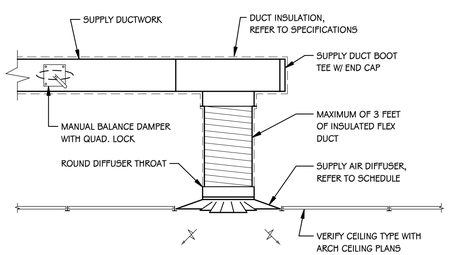
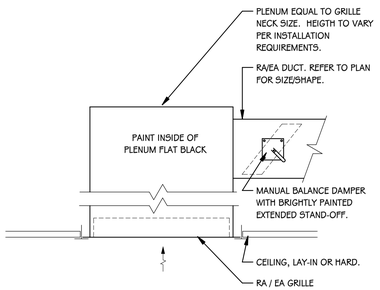


CEILING MOUNTED SUPPLY DIFFUSER DETAIL - TYPICAL
SCALE: NONE



RETURN / EXHAUST AIR GRILLE PLENUM DETAIL
SCALE: NONE

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ADDENDUM No. 2 October 28, 2022

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KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

OWNER
KALAMAZOO PUBLIC SCHOOLS

Kalamazoo, Michigan

SHEET TITLE
MECHANICAL DETAILS

DATE
OCTOBER 3, 2022

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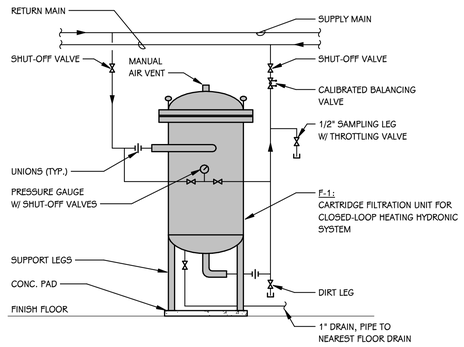
21-806.00



CARTRIDGE FILTER PIPING DETAIL
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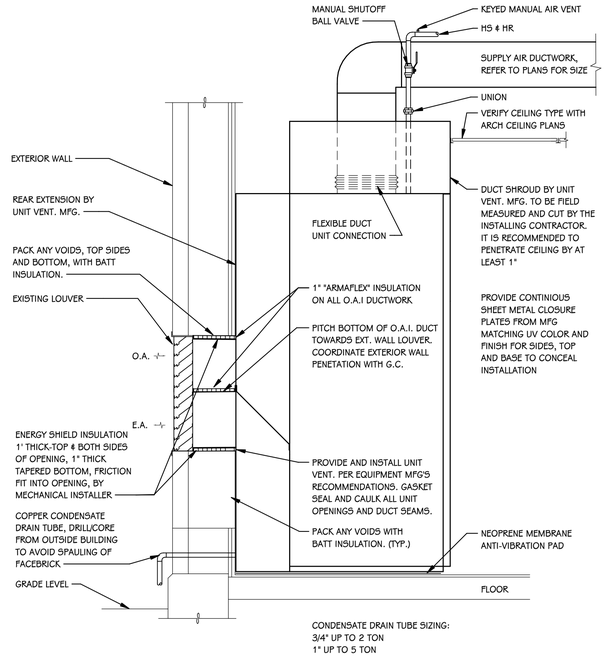
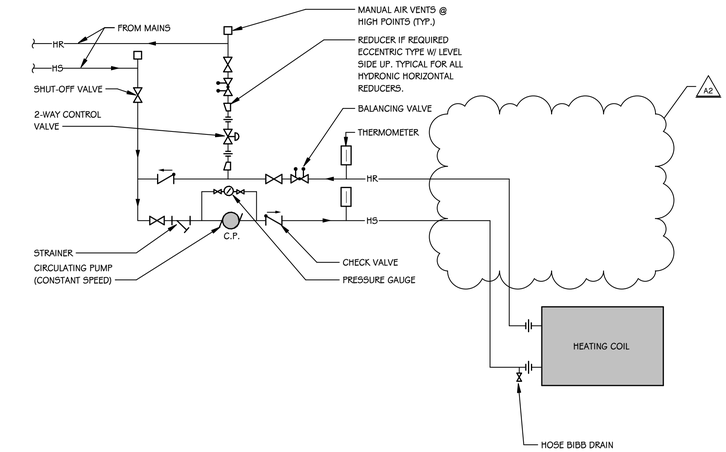
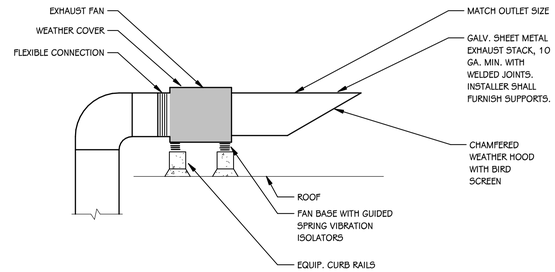


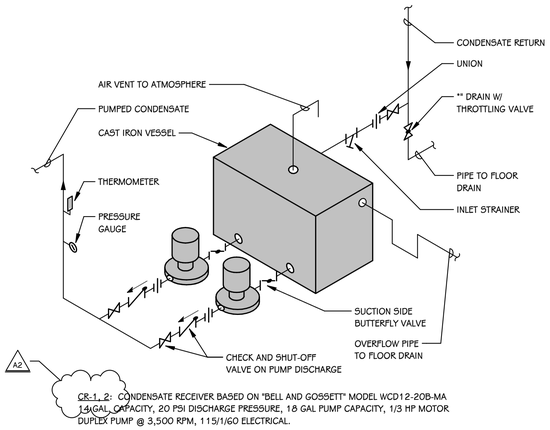
UNIT VENTILATOR DETAIL - VERTICAL
SCALE: NONE



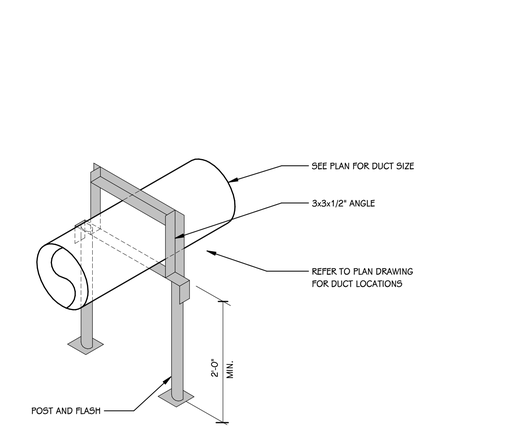
AHU HEATING COIL PIPING DETAIL - SINGLE COIL 2-WAY VALVE
SCALE: NONE



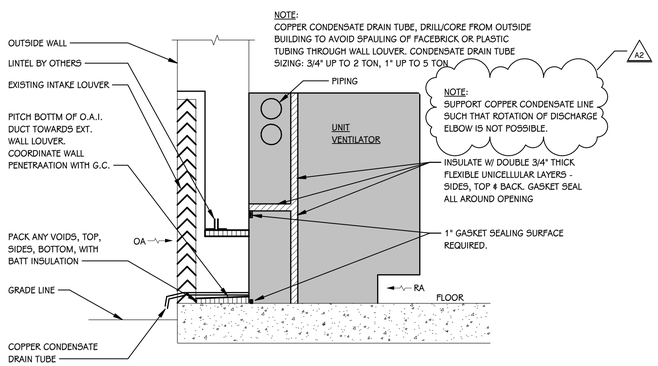
EXHAUST FAN DETAIL - ROOF MOUNTED(B)
SCALE: NONE



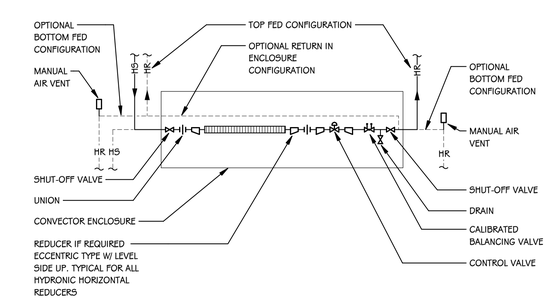
CONDENSATE RECEIVER PIPING DETAIL - DUPLEX
SCALE: NONE



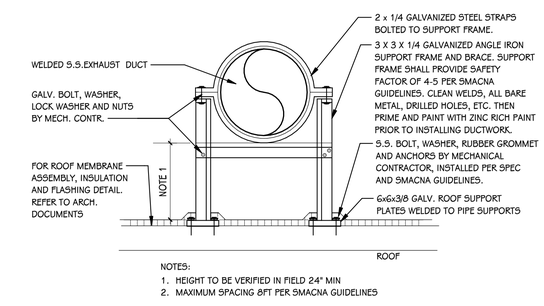
EXTERIOR DUCT SUPPORT DETAIL
SCALE: NONE



UNIT VENTILATOR DETAIL - FLOOR MOUNTED
SCALE: NONE



CONVECTOR PIPING DETAIL
SCALE: NONE



ROOF DUCT SUPPORT DETAIL
SCALE: NONE

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ADDENDUM No. 2 October 28, 2022

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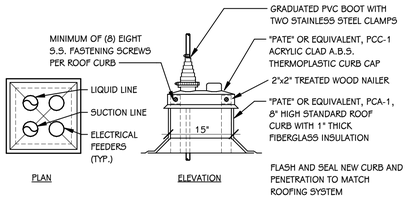
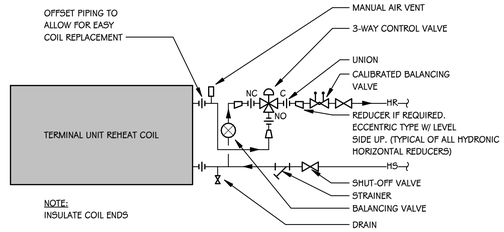


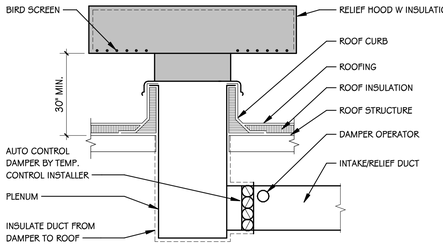
PIPING PORTAL / CURB DETAIL

SCALE: NONE



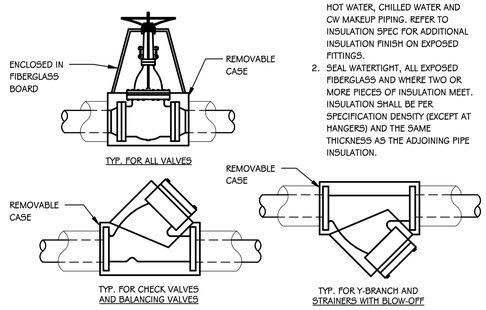
TERMINAL UNIT REHEAT COIL PIPING DETAIL (3-WAY)

SCALE: NONE



RELIEF/INTAKE VENTILATOR DETAIL

SCALE: NONE

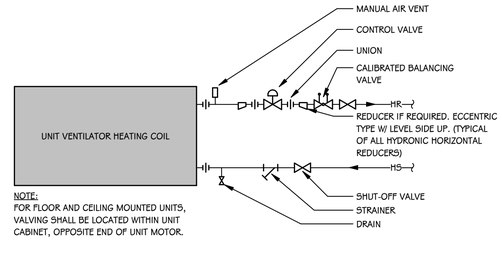


NOTES:

1. INSULATION TO BE USED ON STREAM, CONDENSATE RETURN, HOT WATER, CHILLED WATER AND CW MAKEUP PIPING. REFER TO INSULATION SPEC FOR ADDITIONAL INSULATION FINISH ON EXPOSED FITTINGS.
2. SEAL WATERTIGHT, ALL EXPOSED FIBERGLASS AND WHERE TWO OR MORE PIECES OF INSULATION MEET. INSULATION SHALL BE PER SPECIFICATION DENSITY (EXCEPT AT HANGERS) AND THE SAME THICKNESS AS THE ADJOINING PIPE INSULATION.

VALVE AND STRAINER INSULATION DETAIL

SCALE: NONE



UNIT VENTILATOR HEATING COIL PIPING DETAIL (2-WAY)

SCALE: NONE

REHEAT COIL PIPING DETAIL (3-WAY)

SCALE: NONE

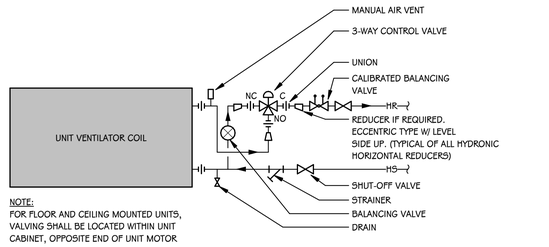
NOTES:

1. ALLOW SUFFICIENT SPACE BELOW DRAIN PAN FOR TRAP.
2. PITCH DRAIN FOR PROPER RUNOFF.
3. MANUALLY PRIME FILL TRAP BEFORE START-UP TO FORM INITIAL DRAIN SEAL.
4. SUPPORT LENGTHY DRAIN LINES TO PREVENT SAG AND CONDENSATE OVERFLOW.

A. THIS DIMENSION IN INCHES MUST BE GREATER THAN THE MAXIMUM FAN SUCTION STATIC PRESSURE IN INCHES WC (WITH DIRTY FILTERS, COILS, AND MAXIMUM AIR FLOW).
B. THIS DIMENSION IN INCHES MUST BE GREATER THAN 1/2 OF THE SAME MAXIMUM FAN SUCTION STATIC PRESSURE IN INCHES WC.
C. 1" WATER SEAL (MINIMUM)

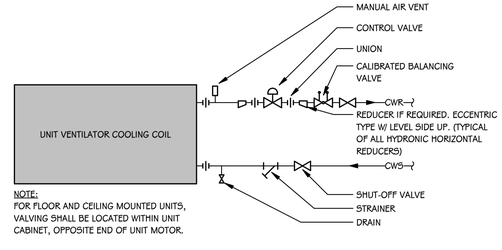
DRAW THROUGH UNIT CONDENSATE TRAP DETAIL

SCALE: NONE



UNIT VENTILATOR HEATING COIL PIPING DETAIL (3-WAY)

SCALE: NONE



UNIT VENTILATOR COOLING COIL PIPING DETAIL (2-WAY)

SCALE: NONE

TERMINAL UNIT DUCTWORK DETAIL

SCALE: NONE

NOTES

1. OFFSET WITH FLEX DUCT SHALL NOT EXCEED 30° AND SHALL BE GRADUAL. OFFSETS IN EXCESS OF 30° SHALL BE HARD DUCTED.
2. AT EXTERIOR WALLS, BLOW PATTERN SHALL BE ADJUSTED SO ONE SLOT DIRECTS AIR DOWN AGAINST THE WALL AND REMAINING SLOTS BLOW ACROSS CEILING TOWARDS INTERIOR.

TYPICAL SLOT DIFFUSER BRANCH DETAIL

SCALE: NONE

NOTE:

1. PROVIDE ABRASIVE SEPARATORS FOR MECHANICAL SEALS.

PUMP - BASE MOUNTED DETAIL WITH SUCTION DIFFUSER

SCALE: NONE

- ACCEPTABLE TO INSTALL IN VERTICAL PIPE.
- POSITION METER ANYWHERE IN UPPER 240° FOR HORIZONTAL PIPE.

MINIMUM UPSTREAM STRAIGHT RUN REQUIRED (1)	
OBSTRUCTION	UPSTREAM
SINGLE BEND PRECEDED BY ≥ 9 DIAMETERS OF STRAIGHT PIPE RUN	10 DIA
PIPE SIZE REDUCTION / EXPANSION IN STRAIGHT RUN	10 DIA
SINGLE BEND PRECEDED BY ≤ 9 DIAMETERS OF STRAIGHT PIPE RUN	15 DIA
OUTFLOWING TEE / PUMP OUTFLOW	20 DIA
MULTIPLE BENDS OUT OF PLANE	30 DIA
INFLOWING TEE	30 DIA
VALVE	30 DIA

1. BASED ON "ONICON" MODEL F3500

HD6 FLOW METER INSTALLATION DETAIL

SCALE: NONE

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ADDENDUM No. 2 October 28, 2022

ISSUED FOR DATE

PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

OWNER
KALAMAZOO PUBLIC SCHOOLS

Kalamazoo, Michigan

DATE
OCTOBER 3, 2022

SHEET TITLE
MECHANICAL DETAILS

A2

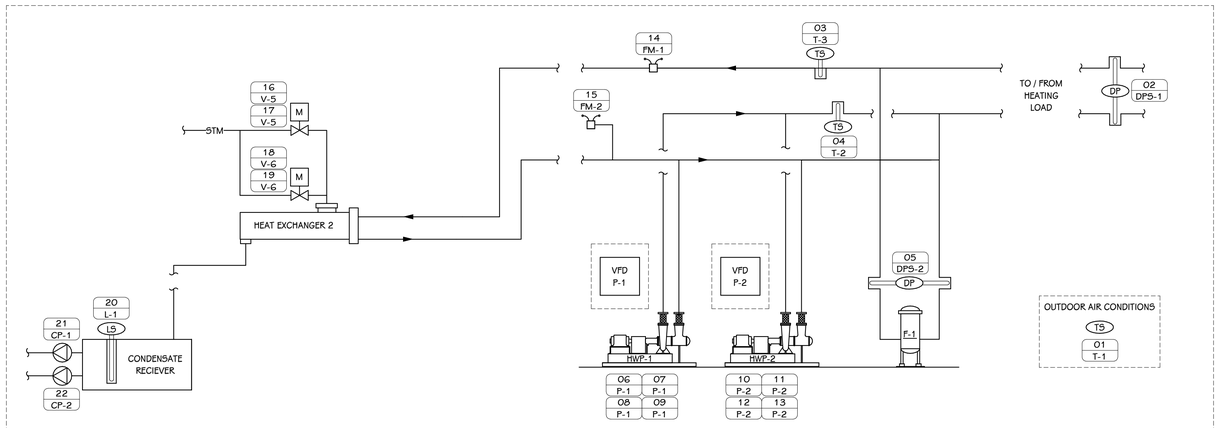
SHEET NUMBER
M 507
21-806.00

CONTROL POINTS

NUMBER	TAG	DESCRIPTION	ALARM	TREND	MISC.	REMARKS
AHU-3,4,5,7						
01	D-1	RELIEF AIR DAMPER OUTPUT		■		MODULATON TO MAINTAIN SPACE PRESSURE
02	D-1	RELIEF AIR DAMPER POSITION		■		MODULATON TO MAINTAIN SPACE PRESSURE
03	LPSL-1	LOW PRESSURE STATIC LIMIT	■	■		HARD WIRED SAFETY - MANUAL RESET
04	H-1	RETURN AIR HUMIDITY		■		DISPLAY ENTHALPY BASED ON T4H READINGS
05	T-1	RETURN AIR TEMPERATURE		■		DISPLAY ENTHALPY BASED ON T4H READINGS
06	CO2-1	RETURN AIR CARBON DIOXIDE	■	■		
07	AFM-1	TOTAL RETURN AIR FLOW		■		
08	D-5	OUTDOOR AIR DAMPER OUTPUT		■		
09	D-5	OUTDOOR AIR DAMPER POSITION		■		
10	D-3	MIXED AIR DAMPER POSITION		■		
11	D-3	MIXED AIR DAMPER OUTPUT		■		
12	DPS-1	PRE-FILTER STATUS	■	■		
13	AFM-3	OUTDOOR AIR FLOW		■		
14	D-4	OUTDOOR AIR DAMPER POSITION		■		
15	D-4	OUTDOOR AIR DAMPER OUTPUT		■		
16	DPS-2	FINAL FILTER STATUS	■	■		
17	T-2	MIXED AIR TEMPERATURE	■	■		
18	ACCU-1	COOLING SYSTEM ALARM STATUS		■		
19	ACCU-1	COOLING SYSTEM RUN STATUS		■		
20	ACCU-1	COOLING SYSTEM ENABLE/DISABLE		■		
21	ACCU-1	COOLING SYSTEM STAGING		■		
22	T-4	COOLING COIL DISCHARGE TEMPERATURE		■		
23	CP-1	PUMP STATUS	■	■		
24	CP-1	PUMP ENABLE/DISABLE		■		
25	HCV-1	HEATING CONTROL VALVE POSITION		■		
26	HCV-1	HEATING CONTROL VALVE OUTPUT		■		
27	FS-1	FREEZE STAT ALARM STATUS	■	■		HARD WIRED SAFETY - MANUAL RESET
28	T-3	HEATING COIL DISCHARGE TEMPERATURE		■		
29	SF-1	FAN AIR FLOW		■		
30	SF-1	FAN SPEED CONTROL		■		
31	SF-1	FAN ENABLE/DISABLE		■		
32	SF-1	FAN STATUS	■	■		
33	SF-2	FAN AIR FLOW		■		
34	SF-2	FAN SPEED CONTROL		■		
35	SF-2	FAN ENABLE/DISABLE		■		

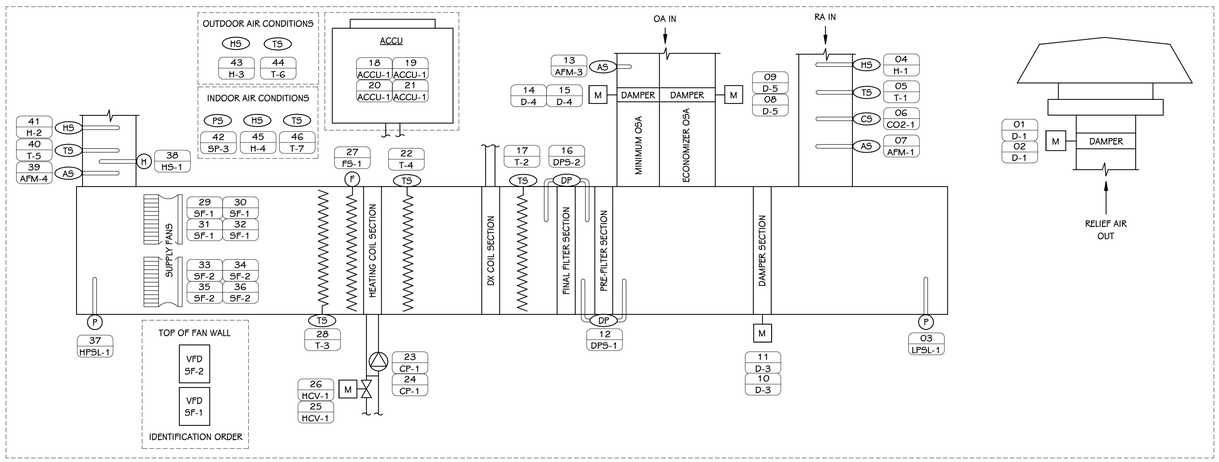
CONTROL POINTS

NUMBER	TAG	DESCRIPTION	ALARM	TREND	MISC.	REMARKS
36	SF-2	FAN STATUS	■	■		
37	HPSL-1	HIGH PRESSURE STATIC LIMIT	■	■		HARD WIRED SAFETY - MANUAL RESET
38	HS-1	HUMIDIFIER HIGH LIMIT	■	■		HARD WIRED SAFETY - MANUAL RESET
39	AFM-4	TOTAL SUPPLY AIR FLOW		■		
40	T-5	DISCHARGE AIR TEMPERATURE		■		DISPLAY ENTHALPY BASED ON T4H READINGS
41	H-2	DISCHARGE AIR HUMIDITY		■		DISPLAY ENTHALPY BASED ON T4H READINGS
42	SP-3	ROOM STATIC PRESSURE		■		
43	H-3	OUTDOOR AIR HUMIDITY		■		GLOBAL
44	T-6	OUTDOOR AIR TEMPERATURE		■		GLOBAL
45	H-4	INDOOR AIR HUMIDITY SENSOR		■		
46	T-7	INDOOR AIR TEMPERATURE		■		
STEAM HEAT EXCHANGER						
01	T-1	OUTDOOR AIR TEMPERATURE		■		GLOBAL
02	DPS-1	HEATING LOOP DIFFERENTIAL PRESSURE	■	■		
03	T-3	HEATING WATER RETURN TEMPERATURE		■		
04	T-2	HEATING SUPPLY WATER TEMPERATURE	■	■		
05	DPS-2	FILTER DIFFERENTIAL PRESSURE	■	■		
06	P-1	ENABLE/DISABLE		■		
07	P-1	RUN STATUS	■	■		
08	P-1	SPEED CONTROL		■		
09	P-1	VFD FAULT STATUS	■	■		
10	P-2	ENABLE/DISABLE		■		
11	P-2	RUN STATUS	■	■		
12	P-2	SPEED CONTROL		■		
13	P-2	VFD FAULT STATUS	■	■		
14	FM-1	LOOP FLOW (GPM)		■		
15	FM-2	MAKE UP WATER FLOW METER		■		
16	V-5	1/3 STEAM CONTROL VALVE POSITION		■		
17	V-5	1/3 STEAM CONTROL VALVE OUTPUT		■		
18	V-6	2/3 STEAM CONTROL VALVE POSITION		■		
19	V-6	2/3 STEAM CONTROL VALVE OUTPUT		■		
20	L-1	CONDENSATE LEVEL ALARM	■	■		
21	CP-1	RUN STATUS	■	■		
22	CP-2	RUN STATUS	■	■		



STEAM HEAT EXCHANGER CONTROLS DIAGRAM

SCALE: NONE



AHU-3,4,5,7 CONTROLS DIAGRAM

SCALE: NONE

SEQUENCE OF OPERATIONS

NOTE: ALL LABOR, MATERIAL, EQUIPMENT AND SOFTWARE NOT SPECIFICALLY INDICATED WITHIN CONTROLS DRAWINGS THAT IS REQUIRED TO MEET THE FUNCTIONAL INTENT OF THE SEQUENCE OF OPERATIONS SHALL BE PROVIDED WITHOUT ADDITIONAL COST. POINT LISTS SHALL BE A GUIDE TO THE POINTS REQUIRED FOR CONTROL SYSTEM. FINAL POINTS SHALL BE DETERMINED BY SEQUENCE OF OPERATIONS. ALL SET POINTS SHALL BE OPERATOR ADJUSTABLE THROUGH THE BMS. ALL POINTS SHALL BE TRENDABLE.

AIR HANDLING UNIT AHU-3,4,5,7 CONTROLS:

A. PROVIDE DIRECT DIGITAL CONTROLS FOR AIR HANDLING SYSTEM OPERATION. UNIT IS AN INDOOR SINGLE ZONE VARIABLE VOLUME UNIT WITH RETURN FAN, ECONOMIZER, PUMPED HOT WATER PREHEAT COIL, DIRECT EXPANSION COIL, HOT WATER REHEAT COIL, SUPPLY FAN AND REMOTE RELIEF AIR DAMPER.

B. AIR HANDLING UNIT ADJUSTABLE SCHEDULE BASED ON THE FOLLOWING:
   1. TIME OF DAY (TOD) SCHEDULE.
      a. TO BE DETERMINED BY OWNER (CONSULT WITH OWNER).
   2. ENABLED AND DISABLED BASED ON MANUAL OVERRIDE FROM DDC.

C. AIR HANDLING UNIT ADJUSTABLE SETPOINTS:
   1. OCCUPIED 75°F COOLING / 70°F HEATING
   2. STANDBY 78°F COOLING / 68°F HEATING (BASED ON LIGHTING OCCUPANCY SENSOR(S))
   3. UNOCCUPIED 95°F COOLING / 55°F HEATING
   4. CO2 800 PPM MINIMUM / 1,200 PPM MAXIMUM

D. START/STOP, CONTROLLED DEVICES SHALL RESPOND AS FOLLOWS:
   1. WHEN INDEXED TO STOP:
      a. DISABLE SUPPLY AND RETURN FANS SIMULTANEOUSLY.
      b. DISABLE DX COOLING.
      c. HEATING COIL CONTROL VALVE SHALL MODULATE TO MAINTAIN COIL DISCHARGE AIR TEMPERATURE SENSOR AT 55°F (ADJ.), WHEN OUTDOOR AIR TEMPERATURE IS BELOW 45°F (ADJ.).
      d. OUTDOOR AND RELIEF AIR DAMPERS 100% CLOSED.
      e. RETURN AIR DAMPER 100% OPENED.
   2. WHEN INDEXED TO START:
      a. ENABLE SUPPLY FAN.
      b. OPERATION OF SYSTEM TO RESUME AFTER START-UP DELAY.

E. SUPPLY FAN & TEMPERATURE CONTROL - SYSTEM CONTROLLER SHALL MODULATE SUPPLY FAN MOTOR VARIABLE FREQUENCY DRIVE, HEATING AND COOLING SOURCES AND MIXED AIR DAMPERS TO MAINTAIN AN ADJUSTABLE SPACE TEMPERATURE SETPOINT MEASURED BY A SPACE TEMPERATURE THERMOSTAT.
   1. HEATING – UPON A FALL IN SPACE TEMPERATURE BELOW SPACE TEMPERATURE SETPOINT, CONTROLLER SHALL RESPOND BASED ON THE FOLLOWING:
      a. MODULATE HEATING SOURCE (AS FIRST STAGE HEATING) TO MAINTAIN SPACE TEMPERATURE SETPOINT.
         • INCLUDE A MAXIMUM HEATING DISCHARGE TEMPERATURE OF 95°F (ADJ.).
         • SUPPLY FAN AT MINIMUM CFM/SPEED SETPOINT.
      b. MODULATE SUPPLY FAN SPEED (AS SECOND STAGE HEATING) TO MAINTAIN ACTIVE CFM/SPEED SETPOINT MEASURED BY A DUCT/FAN INLET AIR FLOW MEASURING STATION TO MAINTAIN SPACE TEMPERATURE SETPOINT.
         • MINIMUM (30% OF DESIGN CFM) AND MAXIMUM (100% OF DESIGN CFM) CFM SETPOINTS (ADJ.).
      c. UPON A CALL FOR ADDITIONAL HEAT BASED ON SUPPLY FAN(S) ARE DELIVERING MAXIMUM CFM/SPEED (AS THIRD STAGE OF HEATING) OVERRIDE MAXIMUM HEATING
         • ALLOW HEATING COIL CONTROL VALVE TO MODULATE TO MAINTAIN SPACE TEMPERATE SETPOINT.
   2. COOLING – UPON A RISE IN SPACE TEMPERATURE ABOVE SPACE TEMPERATURE SETPOINT, CONTROLLER SHALL RESPOND BASED ON THE FOLLOWING:
      a. MODULATE SUPPLY FAN SPEED (AS FIRST STAGE COOLING) TO MAINTAIN ACTIVE CFM SETPOINT MEASURED BY FAN INLET AIR FLOW MEASURING STATION TO MAINTAIN SPACE TEMPERATURE SETPOINT.
         • MINIMUM (30% OF DESIGN CFM) AND MAXIMUM (100% OF DESIGN CFM) CFM SETPOINTS (ADJ.).
         • ECONOMIZER INTEGRATED WITH COOLING COIL SHALL BE UTILIZED (AS FIRST STAGE COOLING)
         • DISCHARGE AIR TEMPERATURE IS 60°F
      b. MODULATE COOLING SOURCE (AS SECOND STAGE COOLING) TO MAINTAIN SPACE TEMPERATURE SETPOINT.
         • SUPPLY FAN(S) SHALL BE AT MAXIMUM CFM SETPOINT.
         • DISCHARGE AIR TEMPERATURE MODULATED BETWEEN 60°F AND 55°F
         • ECONOMIZER INTEGRATED WITH COOLING COIL SHALL BE UTILIZED

F. FAN VARIABLE FREQUENCY CONTROLLER(S) SHALL BE MONITORED BASED ON THE FOLLOWING:
   1. VIA BACNET/MODBUS CONNECTION (POWER USAGE / SPEED % AND HZ / HOURS / FAULT / ALARM)

G. FAN(S) INITIAL START-UP CONTROL – WHEN INDEXED TO START, SYSTEM CONTROLLER SHALL ENABLE FAN(S) BASED ON THE FOLLOWING:
   1. WHEN ENABLED, AND AFTER A DELAY OF TWO (2) MINUTES (ADJ.) WITH NO STATUS SENSED, DDC SHALL INDICATE A CRITICAL ALARM.
      • IF ANY FAN (SUPPLY OR RETURN) STATUS IS NOT SENSED, THE SYSTEM SHALL BE DISABLED.
   2. WHEN ENABLED AND STATUS IS SENSED BY THE CURRENT SENSOR, A TOTALIZES OF RUN HOURS FOR FAN WILL BE ACTIVE.

H. COIL PUMP CONTROL BASED ON THE FOLLOWING:
   1. HEATING HOT WATER COIL PUMP SHALL RUN WHEN THE SYSTEM IS IN HEATING MODE (WHEN CV IS GREATER THAN 10% OPEN).
   2. PUMP SHALL RUN CONTINUOUSLY WHENEVER THE OUTDOOR AIR TEMPERATURE IS LESS THAN 36°F.

I. ECONOMIZER CONTROL - SYSTEM CONTROLLER SHALL MODULATE MIXED AIR DAMPERS TO MEET UNIT DISCHARGE AIR TEMPERATURE SETPOINT WHEN OUTDOOR AIR ENTHALPY IS BELOW THE RETURN AIR ENTHALPY BUT ABOVE ECONOMIZING SETPOINT.
   1. WHEN BTU CALCULATION FOR OUTDOOR AIR CONDITIONS EXCEEDS 25 BTUH/LB (ADJ.), ECONOMIZER SHALL BE DISABLED.

J. MINIMUM OUTDOOR AIR CONTROL - SYSTEM CONTROLLER SHALL MODULATE MIXED AIR DAMPERS TO MAINTAIN MINIMUM CFM SETPOINT MEASURED BY AN OUTDOOR AIR FLOW MEASURING STATION. LIMIT THE CLOSING OF THE OUTDOOR AIR DAMPER TO PROVIDE ABSOLUTE MINIMUM OUTDOOR AIR FLOW.
   1. OUTDOOR – RELIEF/EXHAUST – RETURN MODULATING WITH ONE SIGNAL FROM CONTROLLER.
   2. REFER TO UNIT SCHEDULE FOR THE ABSOLUTE MINIMUM OUTDOOR AIRFLOW CFM SETPOINT.

K. CO2 CONTROL - SYSTEM CONTROLLER SHALL OVERRIDE MIXED AIR DAMPER CONTROLS IN NON-ECONOMIZING MODE USING SPACE CO2 SENSOR TO INCREASE OUTDOOR MINIMUM CFM TO A MAXIMUM CFM. INCLUDE CORRESPONDING CLOSING RETURN AIR DAMPER AND OPENING OF RELIEF/EXHAUST AIR DAMPERS.
   1. UPON RETURN SPACE CO2 SENSOR EXCEEDING SETPOINT (800 PPM ADJ.), START TO MODULATE MIXED AIR DAMPERS (OUTDOOR AIR DAMPER OPENING) IN GRADUAL INCREMENTS UNTIL CO2 SENSOR SETPOINT IS SATISFIED.
      a. MODULATE MIXED AIR DAMPERS DOWN TO ITS ABSOLUTE MINIMUM POSITION UPON SATISFYING SENSOR SETPOINT.
   2. ALARM HIGH CO2, 1,200 PPM (ADJ.)
   3. REFER TO UNIT SCHEDULE FOR THE MAXIMUM OUTDOOR AIRFLOW CFM SETPOINT.

L. MIXED AIR TEMPERATURE CONTROL - SYSTEM CONTROLLER SHALL MODULATE MIXED AIR DAMPERS WHEN MIXED AIR TEMPERATURE SENSOR FALLS BELOW 45°F, THE OUTDOOR – RELIEF/EXHAUST - RETURN DAMPERS SHALL MODULATE TO MAINTAIN A MIXED AIR TEMPERATURE OF 55°F.
   1. PROVIDE OVERRIDE OF MINIMUM OUTDOOR AIR VOLUME SETPOINT IN THE HEATING MODE TO MAINTAIN A 55°F MIXED AIR TEMPERATURE.

M. FILTER MONITORING - SYSTEM CONTROLLER SHALL MONITOR AND ALARM FILTER PRESSURE DIFFERENTIAL PRESSURE DROP FOR THE FOLLOWING:
   1. FILTERS
      a. MONITORING OF DIFFERENTIAL PRESSURE
      b. ALARM SETPOINT 1.00" W.C. (ADJ.)

N. UNOCCUPIED CONTROL – SYSTEM CONTROLLER SHALL INITIATE THE FOLLOWING BASED ON A FALL OR RISE IN SPACE TEMPERATURE:
   1. HEATING - SYSTEM CONTROLLER SHALL CYCLE SYSTEM ON (UNOCCUPIED HEATING MODE) WHEN A CALL FOR HEAT IS INITIATED BY A SPACE TEMPERATURE SENSOR(S) DURING UNOCCUPIED MODE AND HEATING SYSTEM IS OR CAN BE ENABLED. SYSTEM SHALL RESPOND BASED ON THE FOLLOWING:
      a. ENABLE FAN(S) AND SYSTEM SHALL FUNCTION AS DESCRIBED IN TEMPERATURE CONTROL OPERATION TO PROVIDE HEATING TO ZONE WITH THE EXCEPTION TO THE FOLLOWING:
         • MIXED AIR DAMPERS SHALL REMAIN CLOSED WITH RETURN DAMPER 100% OPENED AND OUTDOOR AND RELIEF/EXHAUST 100% CLOSED.
         • COOLING SHALL BE DISABLED.

SEQUENCE OF OPERATIONS (CONT'D)

AIR HANDLING UNIT AHU-3,4,5,7 CONTROLS (CONT'D):

   b. SYSTEM DISABLED UPON SATISFYING THE CALL FOR HEAT AND HEATING COIL CONTROL VALVE SHALL REMAIN UNDER CONTROL OF COIL DISCHARGE AIR TEMPERATURE CONTROL.
   2. COOLING – NO UNOCCUPIED COOLING

P. INITIAL STARTUP CONTROL - SYSTEM CONTROLLER SHALL ENABLE UNIT PRIOR TO SCHEDULED OCCUPANCY UTILIZING OPTIMUM START LOGIC TO ADJUST STARTUP TIME FOR UNIT BASED ON OUTDOOR AIR TEMPERATURE, BUILDING TEMPERATUREAND HISTORIC ELAPSE TIME TO REACH SETPOINT.
   A. UNIT SHALL ENERGIZE AND PROVIDE HEATING AND COOLING BASED ON THE SPACE TEMPERATURE SENSOR(S) TO BRING SPACE TO OCCUPIED SETPOINT. THE OUTDOOR AND RELIEF/EXHAUST AIR DAMPERS SHALL BE CLOSED UNLESS ECONOMIZER IS ENABLED. ONCE OCCUPIED SETPOINT HAS BEEN REACHED, THE UNIT SHALL SWITCH TO OCCUPIED MODE.

Q. TIMED OVERRIDE CONTROL - SYSTEM CONTROLLER SHALL ENABLE UNIT WHEN ASSOCIATED TEMPERATURE SENSOR OVERRIDE BUTTON IS PUSHED. A 2 HOUR (ADJ) RUNTIME IS ENABLED, SYSTEM SHALL BE ENABLE AND FUNCTION AS IN OCCUPIED MODE.

R. SAFETY SHUTDOWNS:
   1. PROVIDE A LOW-TEMPERATURE PROTECTION THERMOSTAT(S) ON THE LEAVING SIDE OF HEATING HOT WATER COIL WHICH WILL DE-ENERGIZE UNIT, CLOSE MIXED AIR DAMPERS (CLOSING OUTDOOR/RELIEF/EXHAUST AIR DAMPER(S)), CLOSE CHILLED WATER COIL CONTROL VALVE AND THE HEATING HOT WATER COIL CONTROL VALVE SHALL BE FULLY OPENED AND COIL PUMP ENERGIZED. PROVIDE MANUAL RESET.
   2. PROVIDE A HIGH STATIC PRESSURE SENSOR IN THE SUPPLY DISCHARGE PLENUM TO DE-ENERGIZE THE UNIT UPON SENSING A HIGH STATIC PRESSURE OF 4.0" W.C.. PROVIDE MANUAL RESET.
   3. PROVIDE A LOW PRESSURE STATIC LIMIT IN THE RETURN PLENUM TO DE-ENERGIZE THE UNIT UPON SENSING A HIGH NEGATIVE STATIC PRESSURE OF -4.0" W.C.. PROVIDE MANUAL RESET.
   4. DUCT MOUNTED IONIZATION SMOKE DETECTOR(S) PROVIDED BY DIVISION 28 SHALL DE-ENERGIZE THE UNIT WHENEVER PRODUCTS OF COMBUSTION ARE SENSED.

S. THE FOLLOWING SHALL BE SUPPLIED AND INSTALLED BY TEMPERATURE CONTROL INSTALLER:
   1. CONTROL VALVE AND DAMPER ACTUATORS

T. THE FOLLOWING SHALL BE SUPPLIED BY TEMPERATURE CONTROL INSTALLER AND INSTALLED BY OTHERS:
   1. CONTROL VALVES

U. BI-POLAR IONIZATION (BPI) – ENABLE BPI WHENEVER THE SUPPLY FANS ARE PROVEN ON. DISABLE BPI WHENEVER THE SUPPLY FANS ARE OFF.

V. PRE AND POST OCCUPANCY PURGE – WHEN ENABLED BY THE OPERATOR THE UNIT CONTROLLER WILL BEGIN THE OCCUPIED OPERATION 2 HOURS (ADJ.) PRIOR TO THE SCHEDULED OCCUPANCY AND EXTEND OPERATION 2 HOURS (ADJ.) BEYOND SCHEDULED OCCUPANCY.
   1. OUTDOOR AND RELIEF AIR DAMPERS SHALL BE AT THEIR MAXIMUM OPEN POSITION WHILE MAINTAINING THE MIXED AIR TEMPERATURE LIMIT.
   2. INTEGRATE PRE-PURGE FEATURE WITH THE OPTIMUM START LOGIC TO ALLOW BOTH OPERATIONS TO FUNCTION CONCURRENTLY (OUTDOOR AND RELIEF AIR DAMPERS OPEN) THUS NOT RUNNING SEQUENCES END-TO-END.

STEAM HEAT EXCHANGER (HX-1 & 2) CONTROLS:

A. PROVIDE DIRECT DIGITAL CONTROLS (DDC) FOR HEATING HOT WATER SYSTEM OPERATION. SYSTEM IS A COMBINATION OF VARIABLE VOLUME BASE MOUNTED CENTRIFUGAL PUMP(S), VARIABLE FREQUENCY CONTROLLER(S), STEAM TO WATER HEAT EXCHANGER(S), 1/3 AND 2/3 STEAM CONTROL VALVE(S) (CV) AND ACTUATOR(S), CONDENSATE RECEIVER, SIDE STREAM FILTER WITH DIFFERENTIAL PRESSURE SENSOR AND WATER TEMPERATURE/AIR TEMPERATURE/FLOW SENSOR(S).

B. SYSTEM ENABLED/DISABLED BASED ON THE FOLLOWING:
   1. UPON A CALL FOR HEAT BY ANY PIECE OF HEATING EQUIPMENT.
      a. INCLUDE CAPABILITY TO OMIT ANY INDIVIDUAL PIECE OF HEATING EQUIPMENT.
   2. AT AN ADJUSTABLE 55°F OUTDOOR AIR TEMPERATURE.
   3. BY OPERATOR COMMAND.

C. SYSTEM START/STOP, CONTROLLED DEVICES SHALL RESPOND AS FOLLOWS:
   1. WHEN INDEXED TO STOP:
      a. DISABLE TEMPERATURE CONTROL.
      b. LEAD HEAT EXCHANGER ISOLATION CV 100% CLOSED.
      c. AFTER DELAY OF TEN (10) MINUTES, DISABLE LEAD PUMP.
   2. WHEN INDEXED TO START:
      a. LEAD HEAT EXCHANGER ISOLATION CV 100% OPEN.
      b. ENABLE LEAD PUMP.
      c. AFTER DELAY OF TEN (10) MINUTE HOLD TO ESTABLISH FLOW IN SYSTEM, ENABLE TEMPERATURE CONTROL.

D. INITIAL START-UP CONTROL – WHEN INDEXED TO START, SYSTEM CONTROLLER SHALL ENABLE LEAD PUMP BASED ON THE FOLLOWING:
   1. WHEN ENABLED, AND AFTER A DELAY OF TWO (2) MINUTES (ADJ.) WITH NO STATUS SENSED, THE DDC SHALL INDICATE A CRITICAL ALARM.
      a. START LAG PUMP SHOULD LEAD PUMP FAIL.
   2. WHEN ENABLED AND STATUS IS SENSED BY THE CURRENT SENSOR, A TOTALIZES OF RUN HOURS FOR UNIT WILL BE ACTIVE.
   3. ALTERNATE OF LEAD AND LAG PUMPS (15 DAYS ADJUSTABLE) TO EVEN OUT OPERATING TIME OF EACH PUMP.
   4. UTILIZE CALENDAR DAY(S) AND TOTALIZED HOURS TO DETERMINE LEAD PUMP FOR DURATION.

E. PUMP PRESSURE CONTROL (VALVE% RESET) – SYSTEM CONTROLLER SHALL MODULATE PUMP MOTORS VARIABLE FREQUENCY CONTROLLERS TO MAINTAIN AN ADJUSTABLE PRESSURE DIFFERENTIAL (PSID) SETPOINT MEASURED BY PRESSURE DIFFERENTIAL CONTROLLER LOCATED 75% OF MAXIMUM MAIN PIPE DISTANCE DOWNSTREAM OF SYSTEM (FINAL POSITION TO BE PROPOSED BY CONTRACTOR AND APPROVED BY ENGINEER). RESET PRESSURE DIFFERENTIAL SETPOINT BASED ON THE FOLLOWING:
   1. INITIAL STARTUP SET PRESSURE DIFFERENTIAL SETPOINT AT 6 PSID (ADJ.).
   2. PRESSURE DIFFERENTIAL SETPOINT SHALL BE RESET USING "TRIM AND RESPOND" LOGIC WITH THE RANGE OF 6 PSID (ADJ.) TO 12 PSID (ADJ.). WHEN THE SYSTEM IS OFF, THE SETPOINT SHALL BE AT MINIMUM. WHEN SYSTEM IS ON, EVERY TWO (2) MINUTES, TRIM THE SETPOINT BY 0.25 PSID IF THERE ARE TWO(2) OR FEWER REQUESTS. IF THERE ARE MORE THAN TWO (2) REQUESTS, RESPOND BY INCREASING THE SETPOINT BY 0.5 PSID.
      a. A REQUEST IS GENERATED WHENEVER ANY HEATING EQUIPMENT CONTROL VALVE POSITION IS GREATER THAN 95% (ADJ.) OPEN UNTIL IT DROPS TO 85% (ADJ.) OPEN.
   3. EXCLUDE ANY 2-POSITION CONTROL VALVES.
   4. PROVIDE THE ABILITY TO OMIT HEATING UNITS FROM "TRIM AND RESPOND" LOGIC.
   5. FINAL SETPOINTS TO BE DETERMINED BY TEST AND BALANCE CONTACTOR.

F. TEMPERATURE CONTROL (OAT RESET) – SYSTEM CONTROLLER SHALL SEND TO HEAT EXCHANGER AN ADJUSTABLE HEATING HOT WATER TEMPERATURE SETPOINT MEASURED BY MAIN SUPPLY WATER TEMPERATURE SENSOR LOCATED DOWNSTREAM OF HEATING SYSTEM. RESET HOT WATER SUPPLY TEMPERATURE SETPOINT BASED ON THE FOLLOWING:
   1. INITIAL STARTUP SET SUPPLY WATER TEMPERATURE SETPOINT AT 110°F (ADJ.)
   2. MAIN SUPPLY WATER TEMPERATURE SETPOINT SHALL BE RESET BASED ON THE FOLLOWING:
      a. AT 30°F (ADJ.) OUTDOOR AIR TEMPERATURE, SET SUPPLY WATER TEMPERATURE AT 130° F (ADJ.).
      b. AT 55°F (ADJ.) OUTDOOR AIR TEMPERATURE, SET SUPPLY WATER TEMPERATURE AT 110° F (ADJ.).

G. SYSTEM PUMP VARIABLE FREQUENCY CONTROLLER(S) SHALL BE MONITORED BASED ON THE FOLLOWING:
   1. VIA BACNET/MODBUS CONNECTION.
      a. POWER USAGE / SPEED % AND HZ / HOURS / FAULT / ALARM

H. HEAT EXCHANGER CONTROL – SYSTEM CONTROLLER SHALL MODULATE STEAM HEAT EXCHANGER(S) 1/3 AND 2/3 CV'S BASED ON AN ADJUSTABLE HEATING HOT WATER TEMPERATURE SETPOINT BASED ON THE FOLLOWING:
   1. HEAT EXCHANGER CONTROL BASED ON THE FOLLOWING:
      a. ON A FALL IN SUPPLY WATER TEMPERATURE 1/3 CONTROL VALVE MODULATES FIRST UP TO 100%, FOLLOWED BY 2/3 CONTROL VALVE MODULATION FROM 0% TO 100%.
      b. ON A RISE IN SUPPLY WATER TEMPERATURE, 2/3 CONTROL VALVE MODULATES CLOSED FOLLOWED BY 1/3 MODULATION 100% TO 0%.

I. SIDE STREAM FILTER CONTROL – SYSTEM CONTROLLER SHALL MONITOR FILTER PRESSURE DIFFERENTIAL BASED ON THE FOLLOWING:
   1. FILTER PRESSURE DIFFERENTIAL READING IS GREATER THAN FILTER ALARM SETPOINT, THE DDC SHALL INDICATE A GENERAL ALARM.
      a. ALARM SETPOINT SHALL BE 10 PSID (ADJ.).

J. SYSTEM SAFETY SHUTDOWNS - SYSTEM SHALL BE DISABLED WHEN A HARD WIRED HIGH TEMPERATURE SENSOR, WHEN SENSOR SENSES 200°F OR GREATER THE STEAM 1/3 AND 2/3 VALES SHALL BE CLOSED AND A CRITICAL ALARM GENERATED.
   a. PUMPS REMAIN ON.

K. CONDENSATE RECEIVER - PUMP STATUS AND LEVEL SENSOR SHALL BE MONITORED.

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ADDENDUM No. 2 **October 28, 2022**

ISSUED FOR **DATE**

PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

SHEET TITLE
TEMPERATURE CONTROLS

DATE
OCTOBER 3, 2022

A2

SHEET NUMBER
M 601
21-806.00

CONTROL POINTS

NUMBER	TAG	DESCRIPTION	ALARM	TREND	MISC.	REMARKS
KITCHEN MINI-SPLIT SYSTEM						
1	T-1	SPACE TEMPERATURE		■		
2	T-1	SPACE TEMPERATURE ALARM STATUS	■	■		
ROOF MOUNTED EXHAUST FAN CONTROL POINTS						
01	D-2	EXHAUST AIR DAMPER OUTPUT		■		OPEN/CLOSE
02	D-2	EXHAUST AIR DAMPER POSITION		■		OPEN/CLOSE
03	EF-1	FAN ENABLE/DISABLE		■		
04	EF-1	FAN STATUS	■	■		
VAV TERMINAL UNIT CONTROL POINTS						
01	T-1	DISCHARGE AIR TEMPERATURE		■		
02	D-1	AIR DAMPER POSITION		■		
03	AFM-1	SUPPLY AIR FLOW		■		
04	T-2	ZONE AIR TEMPERATURE		■		
05	C-1	ZONE CARBON DIOXIDE LEVEL		■		
06	V-1	HEATING COIL VALVE SIGNAL		■		
07	V-2	HEATING COIL VALVE OUTPUT		■		
08	D-1	AIR DAMPER OUTPUT		■		
HOT WATER CABINET UNIT HEATERS						
01	T-1	ZONE AIR TEMPERATURE		■		
02	SF-1	FAN STATUS	■	■		
03	SF-1	ENABLE/DISABLE		■		
04	V-1	CONTROL VALVE POSITION		■		
05	V-1	CONTROL VALVE OUTPUT		■		
HOT WATER UNIT HEATER						
01	T-1	ZONE AIR TEMPERATURE		■		
02	SF-1	FAN STATUS	■	■		
03	SF-1	ENABLE/DISABLE		■		
04	V-1	CONTROL VALVE POSITION		■		
05	V-1	CONTROL VALVE OUTPUT		■		
HOT WATER CONVECTOR						
01	T-1	ZONE AIR TEMPERATURE	■	■		
02	V-1	CONTROL VALVE POSITION		■		
03	V-2	CONTROL VALVE OUTPUT		■		
HOT WATER FINNED TUBE RADIATION						
01	T-1	ZONE AIR TEMPERATURE		■		
02	V-1	CONTROL VALVE POSITION		■		
03	V-1	CONTROL VALVE OUTPUT		■		

SEQUENCE OF OPERATIONS

NOTE: ALL LABOR, MATERIAL, EQUIPMENT AND SOFTWARE NOT SPECIFICALLY INDICATED WITHIN CONTROLS DRAWINGS THAT IS REQUIRED TO MEET THE FUNCTIONAL INTENT OF THE SEQUENCE OF OPERATIONS SHALL BE PROVIDED WITHOUT ADDITIONAL COST. POINT LISTS SHALL BE A GUIDE TO THE POINTS REQUIRED FOR CONTROL SYSTEM. FINAL POINTS SHALL BE DETERMINED BY SEQUENCE OF OPERATIONS. ALL SET POINTS SHALL BE OPERATOR ADJUSTABLE THROUGH THE BMS. ALL POINTS SHALL BE TRENDABLE.

HOT WATER UNIT HEATER CONTROLS:

A. PROVIDE WALL SENSOR AND TWO POSITION HOT WATER CONTROL VALVE TO OPERATE UNIT. ENERGIZE FAN AND OPEN VALVE WHENEVER SPACE TEMPERATURE IS BELOW SETPOINT AND HEATING HOT WATER SYSTEM IS ENABLED.
   1. NO TEMPERATURE ADJUSTMENT AND NO OVERRIDE BUTTON ON WALL SENSOR REQUIRED.

HOT WATER CABINET HEATER CONTROLS:

A. PROVIDE RETURN AIR SENSOR AND TWO POSITION HOT WATER CONTROL VALVE TO OPERATE UNIT. ENERGIZE FAN AND OPEN VALVE WHENEVER SPACE TEMPERATURE IS BELOW SETPOINT AND HEATING HOT WATER SYSTEM IS ENABLED. NO TEMP ADJUSTMENT AND NO OVERRIDE BUTTON ON WALL SENSOR.

HOT WATER FIN TUBE RADIATION CONTROLS:

A. PROVIDE DDC CONTROL SYSTEM TO OPERATE FIN TUBE RADIATION. THERE IS ONE NORMALLY OPEN 2-WAY CONTROL VALVE FOR ONE OR MORE GROUPS OF FIN TUBE (REFER TO PLANS AND DETAIL). ONE TEMPERATURE SENSOR MAY CONTROL MORE THAN ONE VALVE.
B. UPON A CALL FOR HEAT BY THE ZONE'S TEMPERATURE SENSOR, MODULATE THE FIN TUBE RADIATION ZONE CONTROL VALVE TO MAINTAIN ZONE TEMPERATURE HEATING SETPOINT. FIN TUBE RADIATION SHALL ACT WITH THE AIR SYSTEM TO MAINTAIN SETPOINT.
C. ENABLE HEATING WATER SYSTEM IF NOT ALREADY ENABLED.

HOT WATER CONVECTOR CONTROLS:

A. PROVIDE DDC CONTROL SYSTEM TO OPERATE FIN TUBE RADIATION. THERE IS ONE NORMALLY OPEN 2-WAY CONTROL VALVE FOR ONE OR MORE GROUPS OF CONVECTORS (REFER TO PLANS AND DETAIL). ONE TEMPERATURE SENSOR MAY CONTROL MORE THAN ONE VALVE.
B. UPON A CALL FOR HEAT BY THE ZONE'S TEMPERATURE SENSOR, MODULATE THE CONVECTOR ZONE CONTROL VALVE TO MAINTAIN ZONE TEMPERATURE HEATING SETPOINT. CONVECTOR SHALL ACT WITH THE AIR SYSTEM TO MAINTAIN SETPOINT.
C. ENABLE HEATING WATER SYSTEM IF NOT ALREADY ENABLED.

KITCHEN MINI-SPLIT SYSTEM CONTROLS:

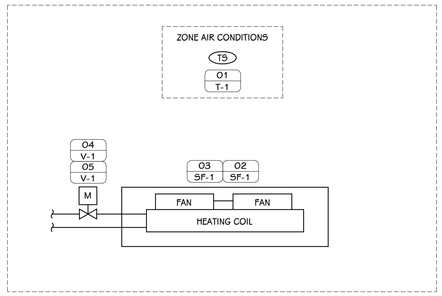
A. MANUFACTURER PACKAGED CONTROLLER(S) SHALL CONTROL SPLIT SYSTEM AIR CONDITIONER OPERATION BASED ON THE FOLLOWING:
   1. AUTOMATIC TEMPERATURE CONTROL: MANUFACTURER PROVIDED CONTROLLER(S), THERMOSTAT(S), INDOOR FAN, EVAPORATOR AND OUTDOOR CONDENSER SHALL MAINTAIN SYSTEM TEMPERATURE COOLING SETPOINT BASEDON AN ADJUSTABLE SETPOINT OF 76°F (ADJ.).
      a. MONITOR AND ALARM SPACE TEMPERATURE.

EXHAUST FAN CONTROLS:

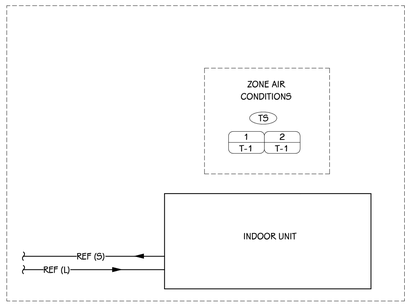
A. MONITOR AND ALARM THE OPERATION OF ALL FANS.
B. THE FOLLOWING EXHAUST FANS SHALL BE CONTROLLED BY BMS USING OCCUPIED/UNOCCUPIED TIME SEQUENCING TO CYCLE FAN MOTOR AND OPEN CONTROL DAMPER. EACH FAN SHALL HAVE ITS OWN SCHEDULE:
C. EF-710 (TOILET ROOMS)
D. THE FOLLOWING EXHAUST FANS SHALL BE CONTROLLED LOCALLY WITH A WALL SWITCH INCLUDING PILOT LIGHT. MONITOR AND ALARM FAN OPERATION.
E. EF-100A (AUTO MECHANIC SHOP)
F. EF-108B (WELDING SHOP)
G. EF-116A (MACHINE SHOP)

VAV TERMINAL UNIT CONTROLS:

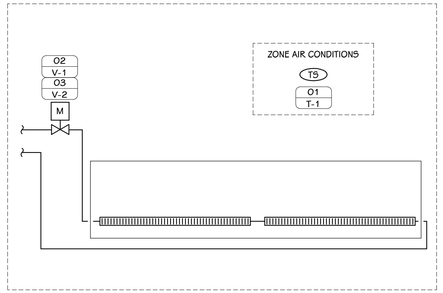
A. PROVIDE A DDC CONTROL SYSTEM FOR EACH UNIT THAT INCLUDES A BOX CONTROLLER, DAMPER OPERATOR, ELECTRONIC HEATING WATER VALVE AND ROOM SENSOR TO MAINTAIN SPACE TEMPERATURE SETPOINT BY AUTOMATICALLY SEQUENCING THE TERMINAL UNIT DAMPER AND NORMALLY CLOSED MODULATING HEATING VALVE. THE BOX CONTROLLER SHALL ALLOW ADJUSTMENT OF THE MAXIMUM AND MINIMUM SUPPLY DAMPER POSITION. REFER TO SECTION 23 3600 - AIR TERMINAL UNITS.
   1. PROVIDE 120V/24V TRANSFORMERS WITH TOGGLE SWITCH TO POWER BOX CONTROLS.
      a. MAXIMUM OF THREE TERMINAL UNITS PER TRANSFORMER.
   2. ROOM COMBINATION TEMPERATURE AND CO2 SENSOR TO HAVE LIMITED TEMPERATURE ADJUSTMENT AND OVERRIDE BUTTON.
   3. UPON A CALL FOR COOLING BY THE ROOM SENSOR, THE HEATING VALVE SHALL BE CLOSED AND THE SUPPLY DAMPER SHALL MODULATE BETWEEN THE MINIMUM DAMPER POSITION AND THE MAXIMUM DAMPER POSITION TO SATISFY SETPOINT.
   4. UPON A CALL FOR HEATING BY THE ROOM SENSOR, THE SUPPLY DAMPER SHALL MAINTAIN MINIMUM DAMPER POSITION AND THE HEATING VALVE SHALL MODULATE TO SATISFY ROOM SETPOINT WITH AN ADJUSTABLE MAXIMUM UNIT DISCHARGE AIR TEMPERATURE OF 105°F.
      a. UPON A CALL FOR ADDITIONAL HEAT BY THE ROOM SENSOR WITH HEATING VALVE DELIVERING THE MAXIMUM UNIT DISCHARGE AIR TEMPERATURE SETPOINT AND THE SUPPLYING AHU MECHANICAL COOLING IS OFF, THE SUPPLY DAMPER SHALL MODULATE BETWEEN THE MINIMUM AND MAXIMUM DAMPER POSITION TO SATISFY ROOM TEMPERATURE SETPOINT WHILE HEATING VALVE MODULATES TO MAINTAIN MAXIMUM UNIT DISCHARGE AIR TEMPERATURE SETPOINT.
B. ROOM TEMPERATURE SETPOINT SHALL BE RESET IN ROOM UNOCCUPIED STANDBY MODE AS DETERMINED BY LIGHTING OCCUPANCY SENSOR(S). THE HEATING SETPOINT SHALL BE LOWERED AND THE COOLING SETPOINT SHALL BE RAISED 5°F ADJUSTABLE. THE VAV BOX DAMPER SHALL GO FULL CLOSED WHEN THE SPACE IS UNOCCUPIED AND THE SPACE TEMPERATURE SENSOR IS IN ITS DEADBAND.
C. UPON CO2 LEVEL REACHING 800 PPM THE DAMPER RESET ITS POSITION BETWEEN MINIMUM AND MAXIMUM BETWEEN 800 AND 1200 PPM. MAINTAIN TEMPERATURE CONTROL WHILE SATISFYING CO2. MONITOR QUANTITY OF ROOMS WITH HIGH CO2 LEVEL. REFER TO AHU SEQUENCING FOR ACTIONS BY AHU DUE TO HIGH CO2 LEVELS



CABINET UNIT HEATER CONTROLS DIAGRAM
SCALE: NONE



MINI-SPLIT CONTROLS DIAGRAM
SCALE: NONE



HOT WATER CONVECTOR CONTROLS DIAGRAM
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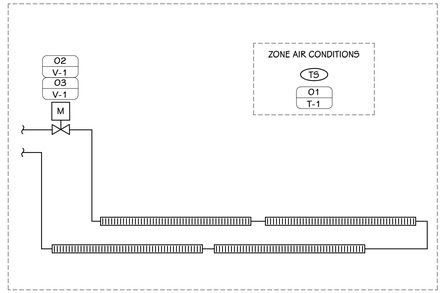
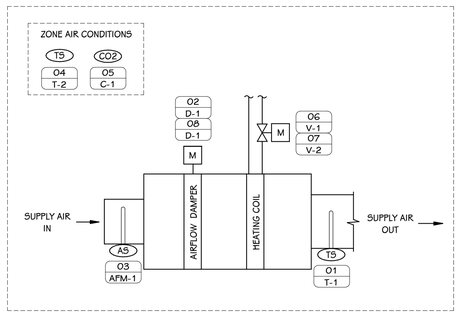


FIN TUBE CONTROLS DIAGRAM
SCALE: NONE



VAV TERMINAL UNIT CONTROLS DIAGRAM
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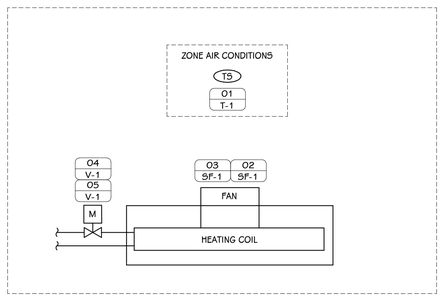
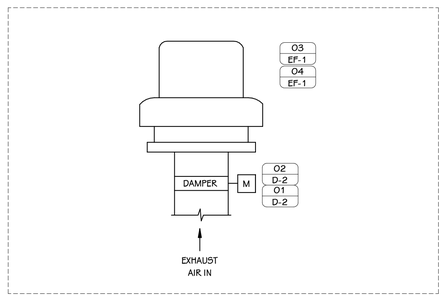


UNIT HEATER CONTROLS DIAGRAM
SCALE: NONE



EXHAUST FAN (ROOF) CONTROLS DIAGRAM
SCALE: NONE

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ADDENDUM No. 2 October 28, 2022

ISSUED FOR DATE

PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

SHEET TITLE
TEMPERATURE CONTROLS

DATE
OCTOBER 3, 2022

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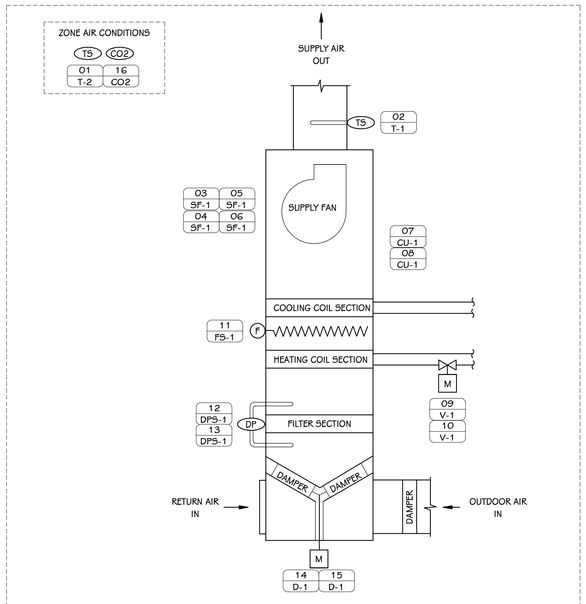
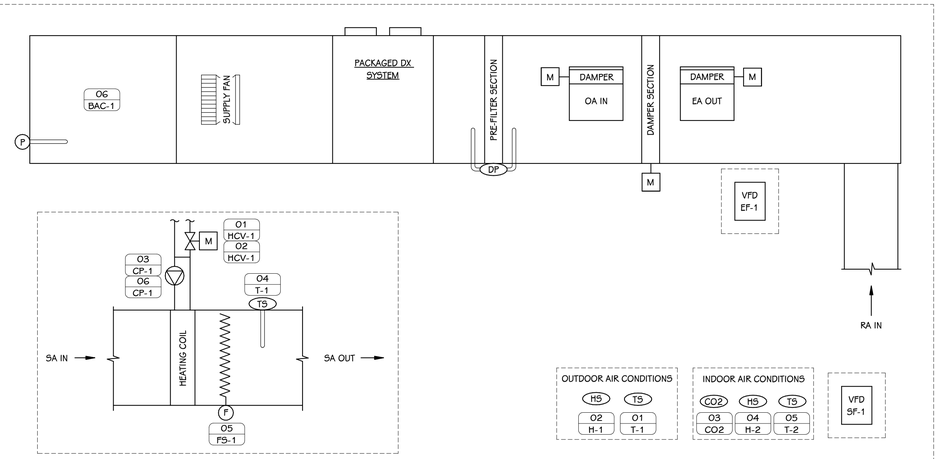
SHEET NUMBER
M 602
21-806.00



VERTICAL UNIT VENTILATOR CONTROLS DIAGRAM

SCALE: NONE



DUCT-MOUNTED HEATING COIL (HC-500,503,505)

ROOFTOP UNIT (RTU-500) CONTROLS DIAGRAM

SCALE: NONE

CONTROL POINTS

NUMBER	TAG	DESCRIPTION	ALARM	TREND	MISC.	REMARKS
DUCT-MOUNTED HEATING COIL						
01	HCV-1	HEATING CONTROL VALVE OUTPUT		∎		
02	HCV-1	HEATING CONTROL VALVE POSITION		∎		
03	CP-1	PUMP ENABLE/DISABLE		∎		
04	T-1	HEATING COIL DISCHARGE AIR TEMPERATURE		∎		
05	FS-1	FREEZE STAT ALARM STATUS	∎	∎		HARD WIRED SAFETY - MANUAL RESET
06	CP-1	PUMP STATUS	∎	∎		
PACKAGED ROOFTOP (RTU-500)						
01	T-1	OUTDOOR AIR TEMPERATURE		∎		GLOBAL
02	H-1	OUTDOOR AIR HUMIDITY		∎		GLOBAL
03	CO2	CO2 CONCENTRATION		∎		
04	H-2	INDOOR AIR HUMIDITY SENSOR		∎		
05	T-2	INDOOR AIR TEMPERATURE		∎		
06	BAC-1	BACNET INTERFACE		∎		
VERTICAL UNIT VENTILATOR						
01	T-2	ZONE AIR TEMPERATURE		∎		
02	T-1	DISCHARGE AIR TEMPERATURE		∎		
03	SF-1	FAN ENABLE/DISABLE		∎		
04	SF-1	FAN SPEED CONTROL		∎		
05	SF-1	FAN RUN STATUS		∎		
06	SF-1	SUPPLY FAN ALARM STATUS		∎		
07	CU-1	MECHANICAL COOLING CONTROL SIGNAL		∎		
08	CU-1	MECHANICAL COOLING STATUS		∎		
09	V-1	HEATING CONTROL VALVE POSITION		∎		
10	V-1	HEATING CONTROL VALVE OUTPUT		∎		
11	FS-1	FREEZE STAT ALARM STATUS		∎		HARD WIRED SAFETY - MANUAL RESET
12	DPS-1	PRE-FILTER STATUS		∎		
13	DPS-1	PRE-FILTER ALARM STATUS		∎		
14	D-1	MIXED AIR DAMPER OUTPUT		∎		MODULATING OPEN/CLOSE
15	D-1	MIXED AIR DAMPER POSITION		∎		MODULATING OPEN/CLOSE
16	CO2	CO2 CONCENTRATION		∎		

SEQUENCE OF OPERATIONS

VERTICAL UNIT VENTILATOR (VUV-540) CONTROLS:

A. PROVIDE DDC CONTROL SYSTEM FOR UNIT OPERATION. UNIT IS AN INDOOR CONSTANT VOLUME UNIT WITH SUPPLY FAN, EXHAUST FAN, HOT WATER PREHEATING COIL, AND DX COOLING COIL WITH INTEGRAL AIR COOLED CONDENSING UNIT.
B. THE UNIT SUPPLY AND EXHAUST FAN SHALL RUN CONTINUOUSLY IN OCCUPIED MODE.
C. WHEN THE UNIT FAN IS ENERGIZED DURING SCHEDULE OCCUPANCY, THE UNIT OUTDOOR AIR DAMPER SHALL OPEN.
   1. AN ADJUSTABLE MIXED AIR TEMPERATURE CONTROLLER SHALL MODULATE THE MIXED AIR DAMPER TO MAINTAIN A MIXED AIR TEMPERATURE OF 55° F. A MINIMUM POSITION CONTROLLER SHALL LIMIT THE CLOSING OF THE OUTDOOR AIR DAMPER TO PROVIDE MINIMUM INDICATED VENTILATION CFM (ADJUSTABLE) OF OUTDOOR AIR FLOW.
   2. PROVIDE INTEGRATED ENTHALPY ECONOMIZER OVERRIDE WHEN THE OUTDOOR AIR ENTHALPY IS BELOW THE RETURN AIR ENTHALPY BUT ABOVE THE ECONOMIZING SETPOINT. IN THIS ENTHALPY OVERRIDE MODE, THE DAMPERS SHALL MODULATE TO MEET UNIT DISCHARGE AIR TEMPERATURE (DAT) SETPOINT.
   3. PROVIDE OVERRIDE OF MINIMUM OUTSIDE AIR VOLUME SETPOINT IN THE HEATING MODE TO MAINTAIN A 45° F MIXED AIR TEMPERATURE.
   4. OVERRIDE ECONOMIZING DAMPER CONTROLS IN NON-ECONOMIZING MODE USING CO2 SENSOR TO INCREASE MINIMUM OUTSIDE AIR VOLUME TO PROVIDE MAXIMUM INDICATED VENTILATION CFM (ADJUSTABLE).
      a. UPON THE CO2 SENSOR EXCEEDING SETPOINT (800 PPM ADJUSTABLE), START TO MODULATE OPEN THE MIXED AIR DAMPER IN GRADUAL INCREMENTS UP TO MAXIMUM INDICATED VENTILATION CFM (ADJUSTABLE) UNTIL CO2 SENSOR SETPOINT IS SATISFIED. MODULATE THE MIXED AIR DAMPER DOWN TO ITS MINIMUM VENTILATION POSITION UPON SATISFYING ALL SENSOR SETPOINT.
D. MODULATE THE PREHEATING COIL NORMALLY OPEN CONTROL VALVE, AND CYCLE THE MECHANICAL COOLING TO MAINTAIN SPACE SETPOINT.
E. WHEN THE UNIT IS DE-ENERGIZED, THE OUTDOOR AIR DAMPER SHALL CLOSE. MECHANICAL COOLING SHALL BE OFF AND THE PREHEATING COIL CONTROL VALVE SHALL BE CONTROLLED BY UNIT DISCHARGE TEMPERATURE SENSOR WITH A SETPOINT OF 45 DEG. F.
F. THE FOLLOWING SHALL BE SUPPLIED AND INSTALLED BY TEMPERATURE CONTROL INSTALLER:
   1. OUTSIDE AIR DAMPER OPERATOR
G. THE FOLLOWING SHALL BE SUPPLIED BY TEMPERATURE CONTROL INSTALLER AND INSTALLED BY OTHERS:
   1. PREHEATING CONTROL VALVE WITH VALVE OPERATOR.
H. A LOW-TEMPERATURE PROTECTION THERMOSTAT SHALL DE-ENERGIZE THE UNIT, CLOSE OUTSIDE AIR DAMPER, DE-ENERGIZE DX COOLING, AND THE PREHEATING COIL CONTROL VALVE SHALL GO FULL OPEN TO COIL WHENEVER THE PREHEATING COIL DISCHARGE AIR TEMPERATURE DROPS BELOW 40 DEG F(4 DEG C). PROVIDE MANUAL RESET.

SEQUENCE OF OPERATIONS (CONT'D)

NOTE: ALL LABOR, MATERIAL, EQUIPMENT AND SOFTWARE NOT SPECIFICALLY INDICATED CWITHIN CONTROLS DRAWINGS THAT IS REQUIRED TO MEET THE FUNCTIONAL INTENT OF THE SEQUENCE OF OPERATIONS SHALL BE PROVIDED WITHOUT ADDITIONAL COST. POINT LISTS SHALL BE A GUIDE TO THE POINTS REQUIRED FOR CONTROL SYSTEM. FINAL POINTS SHALL BE DETERMINED BY SEQUENCE OF OPERATIONS. ALL SET POINTS SHALL BE OPERATOR ADJUSTABLE THROUGH THE BMS. ALL POINTS SHALL BE TRENDABLE.

DUCT-MOUNTED REHEAT COILS (HC-500,503,505)

A. PROVIDE DIRECT DIGITAL CONTROLS (DDC) FOR EACH REHEAT COIL OPERATION. UNIT(S) ARE A COMBINATION OR REHEAT COIL, CONTROL VALVE (CV) AND ACTUATOR AND SPACE TEMPERATURE SENSOR.
   1. SPACE SENSOR(S) SHALL HAVE FULL/LIMITED/FIXED ADJUSTABLE SETPOINT AND OVERRIDE BUTTON FUNCTIONALITY.
B. REHEAT ADJUSTABLE SCHEDULE BASED ON THE FOLLOWING:
   1. SCHEDULED WITH ASSOCIATED ZONE HVAC SYSTEM.
C. REHEAT ADJUSTABLE SETPOINTS BASED ON THE FOLLOWING:
   1. OCCUPIED 70°F HEATING
   2. STANDBY 68°F HEATING (BASED ON LIGHTING OCCUPANCY SENSOR(S))
   3. UNOCCUPIED 62°F HEATING
D. OCCUPIED TEMPERATURE CONTROL - CONTROLLER SHALL MODULATE REHEAT CV TO MAINTAIN AN ADJUSTABLE SPACE TEMPERATURE SETPOINT MEASURED BY A SPACE TEMPERATURE THERMOSTAT.
   1. HEATING – UPON A FALL IN SPACE TEMPERATURE BELOW SPACE TEMPERATURE SETPOINT, CONTROLLER SHALL RESPOND BASED ON THE FOLLOWING:
      a. MODULATE REHEAT CV TO MAINTAIN SPACE TEMPERATURE SETPOINT.
      b. PROVIDE STAGED HEATING WITH SPACES THAT HAVE ASSOCIATED RADIANT HEAT.
         • RADIANT 1ST STAGE, REHEAT COIL 2ND STAGE.
   2. VENTILATION – UPON SPACE TEMPERATURE SETPOINT BEING SATISFIED, CONTROLLER SHALL RESPOND BASED ON THE FOLLOWING:
      a. REHEAT CV 100% CLOSED.
   3. STANDBY – UPON SPACE OCCUPANCY SENSOR INDICATING UNOCCUPIED AND AFTER TIME DELAY, CONTROLLER SHALL RESPOND BASED ON THE FOLLOWING:
      a. SPACE TEMPERATURE IS SETBACK TO STANDBY SETPOINTS.
E. UNOCCUPIED TEMPERATURE CONTROL:
   1. HEATING CONTROL – UPON A FALL IN SPACE TEMPERATURE BELOW SPACE TEMPERATURE SETPOINT, CONTROLLER SHALL RESPOND BASED ON THE FOLLOWING:
      a. REQUEST THE ASSOCIATED ZONE HVAC SYSTEM TO BE ENABLED. (UNOCCUPIED HEATING MODE) WHEN A CALL FOR HEAT IS INITIATED BY SPACE TEMPERATURE SENSOR DURING UNOCCUPIED MODE AND HEATING SYSTEM IS OR CAN BE ENABLED.
         • ONCE ZONE HVAC SYSTEM IS ENABLED, MODULATE REHEAT CV TO 100% OPENED.
      b. ZONE HVAC SYSTEM ENABLE POINT SHALL BE BASED ON QUANTITY OF REQUESTS FOR HEATING.
      c. WHEN SPACE TEMPERATURE READING INCREASES ABOVE UNOCCUPIED SPACE TEMPERATURE SETPOINT, RELEASE REHEAT CV OVERRIDE AND ZONE HVAC SYSTEM REQUEST.
F. TIMED OVERRIDE CONTROL – PROVIDE LIMITED TIME OVERRIDE OF UNOCCUPIED MODE.

PACKAGED ROOFTOP UNIT (RTU-500) CONTROLS:

A. UNIT SHALL OPERATE UNDER FACTORY CONTROLS AND SEND AND RECEIVE DATA VIA BACNET CARD. REFER TO RTU SCHEDULE FOR MINIMUM POINTS.
B. RTU SHALL BE SET UP WITH THE FOLLOWING MINIMUM FEATURES: FAN POWERED RELIEF, DRY BULB ECONOMIZER, DAT RESET, VAV FAN SPEED CONTROL DEMAND CONTROLLED VENTILATION.
C. BAS SHALL FURNISH SCHEDULE OF OPERATION, DAT SETPOINT, CO2 INPUT, FAN SPEED SETPOINT.
D. INTERLOCK BI-POLAR IONIZATION WITH FAN OPERATION.

AHU-17 CONTROLS:

A. PROVIDE DDC CONTROL AND MONITORING FOR AIR HANDLING SYSTEM. SYSTEM INCLUDES INDOOR VARIABLE VOLUME UNIT WITH SUPPLY FAN, REMOTE RELIEF FAN, VFD DRIVEN MOTORS, VFD DRIVENONOMIZER, PRE-FILTER, FINAL FILTER, PUMPED HOT WATER PREHEATING COIL WITH CONTROL VALVE AND ACTUATOR, AND CHILLED WATER COIL WITH CONTROL VALVE AND ACTUATOR. TEMPERATURE, HUMIDITY, AIRFLOW, AND PRESSURE SENSORS ARE REQUIRED AND BIPOLAR IONIZATION.
B. REFER TO VARIABLE AIR VOLUME (VAV) TERMINAL UNIT CONTROL ARTICLES FOR VAV TERMINAL UNIT OPERATION.
C. AIR HANDLING UNIT ADJUSTABLE SCHEDULE BASED ON THE FOLLOWING:
   1. TIME OF DAY (TOD) SCHEDULE.
      a. TO BE DETERMINED BY OWNER (CONSULT WITH OWNER).
      b. SUGGESTED OCCUPIED SCHEDULE: 7AM-5PM M-F, OFF SAT-SUN, OFF HOLIDAYS
   2. ENABLED AND DISABLED BASED ON MANUAL OVERRIDE FROM DDC.
D. AIR HANDLING UNIT ADJUSTABLE SETPOINTS:
   1. OCCUPIED 75°F COOLING / 70°F HEATING
   2. STANDBY 77°F COOLING / 68°F HEATING (BASED ON LIGHTING OCCUPANCY SENSORS)
   3. UNOCCUPIED 85°F COOLING / 62°F HEATING
   4. CO2 800 PPM MINIMUM / 1,000 PPM MAXIMUM
E. START/STOP, CONTROLLED DEVICES SHALL RESPOND AS FOLLOWS:
   1. WHEN INDEXED TO STOP:
      a. DISABLE SUPPLY AND RETURN FANS SIMULTANEOUSLY.
      b. COOLING CV 100% CLOSED.
      c. HEATING CV SHALL MODULATE TO MAINTAIN COIL DISCHARGE AIR TEMPERATURE SENSOR AT 80°F (ADJ.), WHEN OUTDOOR AIR TEMPERATURE IS BELOW 45°F (ADJ.).
      d. OUTDOOR AND RELIEF AIR DAMPERS 100% CLOSED.
      e. RETURN AIR DAMPER 100% OPENED.
      f. UVGI IS DISABLED FOLLOWING DELAY.
      g. BPI IS DISABLED.
   2. WHEN INDEXED TO START:
      a. ENABLE RETURN FANS FIRST, THEN SUPPLY FANS AFTER A DELAY.
      b. OPERATION OF SYSTEM TO RESUME AFTER START-UP DELAY.
F. SUPPLY FAN CONTROL (STATIC RESET) - SYSTEM CONTROLLER SHALL MODULATE SUPPLY FAN VFD DRIVEN MOTORS TO MAINTAIN AN ADJUSTABLE DUCT STATIC PRESSURE SETPOINT MEASURED BY A DUCT STATIC PRESSURE CONTROLLER LOCATED 75% OF MAXIMUM MAIN DUCT DISTANCE DOWNSTREAM OF SYSTEM (FINAL POSITION TO BE PROPOSED BY CONTRACTOR AND APPROVED BY ENGINEER). RESET STATIC PRESSURE DIFFERENTIAL SETPOINT BASED ON THE FOLLOWING:
   1. STATIC PRESSURE SETPOINT SHALL BE RESET USING "TRIM AND RESPOND" LOGIC WITHIN THE RANGE OF 0.15" W.C. TO 1.75" W.C. (ADJ.). WHEN THE SYSTEM IS OFF, THE SETPOINT SHALL BE 0.5" W.C. (ADJ.). WHEN SYSTEM IS ON, EVERY TEN (10) MINUTES, TRIM THE SETPOINT BY 0.04" W.C. IF THERE ARE TWO (2) OR FEWER ZONE PRESSURE REQUESTS. IF THERE ARE MORE THAN TWO (2) ZONE PRESSURE REQUESTS, RESPOND BY INCREASING THE SETPOINT BY 0.06" W.C..
      a. A REQUEST IS GENERATED WHENEVER TERMINAL UNIT DAMPER IS GREATER THAN 90% (ADJ.) OPEN UNTIL IT DROPS TO 80% (ADJ.) OPEN.
      b. EXCLUDE ANY TERMINAL UNITS SET-UP AS CONSTANT VOLUME FROM "TRIM AND RESPOND" LOGIC.
      c. PROVIDE THE ABILITY TO OMIT ANY VAV TERMINAL UNITS FROM "TRIM AND RESPOND" LOGIC.
      d. TEST AND BALANCE CONTRACTOR SHALL PROVIDE MINIMUM AND MAXIMUM STATIC SETPOINTS, WHICH WILL BE DETERMINED DURING THE BALANCING PROCESS.
   2. DISCHARGE PRESSURE HIGH LIMIT WILL CONTROL STATIC PRESSURE AT UNIT FROM EXCEEDING 3.0" W.G. (ADJ.) WITH OVERRIDE CONTROL OF SUPPLY FANS VFD DRIVEN MOTORS.
G. RELIEF FAN CONTROL (ZONE PRESSURE) - SYSTEM CONTROLLER SHALL MODULATE RETURN FAN VFD DRIVEN MOTOR TO MAINTAIN ZONE PRESSURE SETPOINT MEASURED BY A ZONE PRESSURE CONTROLLER LOCATED IN THE ZONE SERVED.
   1. THE ZONE STATIC PRESSURE SETPOINT (ADJ.) SHALL BE A SETPOINT THAT CONTROLS TO A SLIGHTLY POSITIVE PRESSURE.
H. FAN VFD DRIVEN MOTOR CONTROLLERS SHALL BE MONITORED BASED ON THE FOLLOWING:
   1. VIA BACNET/MODBUS CONNECTION (POWER USAGE / % SPEED / HOURS / FAULT / ALARM)
I. FANS INITIAL START-UP CONTROL – WHEN INDEXED TO START, SYSTEM CONTROLLER SHALL ENABLE FANS BASED ON THE FOLLOWING:
   1. WHEN ENABLED, AND AFTER A DELAY OF TWO (2) MINUTES (ADJ.) WITH NO STATUS SENSED, DDC SHALL INDICATE A CRITICAL ALARM.
      a. IF ANY FAN (SUPPLY OR RETURN) STATUS IS NOT SENSED, THE SYSTEM SHALL BE DISABLED AND AN ALARM IS INITIATED.
   2. WHEN ENABLED AND STATUS IS SENSED BY THE CURRENT SENSOR, A RUN TIMER WILL BE ACTIVE.
J. DISCHARGE AIR TEMPERATURE CONTROL (DAT RESET) - SYSTEM CONTROLLER SHALL MODULATE HEATING AND COOLING SOURCES AND MIXED AIR DAMPERS TO MAINTAIN AN ADJUSTABLE DISCHARGE AIR TEMPERATURE SETPOINT MEASURED BY A DUCT TEMPERATURE SENSOR LOCATED DOWNSTREAM OF UNIT. RESET DISCHARGE AIR TEMPERATURE SETPOINT AS FOLLOWS:
   1. ALL TERMINAL AIR UNIT ZONE SPACE TEMPERATURES FOR THE SERVING AHU SHALL BE AVERAGED. A REVERSE ACTING PI (PROPORTIONAL, INTEGRAL) LOOP SHALL BE CONFIGURED SUCH THAT ITS INPUT SHALL BE THE AVERAGE ZONE SPACE TEMPERATURE AND ITS SETPOINT SHALL BE HALFWAY BETWEEN THE GLOBAL REHEAT AND COOLING SETPOINTS. FOR EXAMPLE, IF THE ZONE SPACE TEMPERATURE REHEAT SETPOINT IS 70°F AND THE ZONE SPACE TEMPERATURE COOLING SETPOINT IS 75°F, THE RESULTING AVERAGE SPACE TEMP SETPOINT WOULD BE 72.5°F.
      a. THE PI LOOP OUTPUT SHALL BE USED AS THE AHU DISCHARGE TEMPERATURE SETPOINT AND SHALL BE LIMITED BETWEEN 55°F AND 75°F (ADJ.).

SEQUENCE OF OPERATIONS (CONT'D)

AHU-17 CONTROLS (CONT'D):

   b. DISCHARGE AIR TEMPERATURE CONTROL SEQUENCE IS DESIGNED TO MAINTAIN MOST SPACES IN THE AHU SERVED ZONE AT OR CLOSE TO THE AVERAGE SPACE TEMPERATURE SETPOINT WHICH SHOULD POSITION MOST TERMINAL AIR UNITS AT MINIMUM CFM WITH NO REHEAT REQUIRED.

K. DEWPOINT CONTROL - UNIT CONTROLLER SHALL LIMIT THE UNIT DISCHARGE DEW POINT TO 60°F (ADJ.). MODULATE COOLING CONTROL VALVE TO MAINTAIN AN ADJUSTABLE DISCHARGE AIR DEWPOINT SETPOINT MEASURED BY DUCT TEMPERATURE AND HUMIDITY SENSORS LOCATED DOWNSTREAM OF UNIT.
L. COIL PUMP CONTROL BASED ON THE FOLLOWING:
   1. HEATING HOT WATER COIL PUMP SHALL RUN WHEN THE SYSTEM IS IN HEATING MODE (WHEN CV IS GREATER THAN 10% OPEN).
   2. PUMP SHALL RUN CONTINUOUSLY WHENEVER THE OUTDOOR AIR TEMPERATURE IS LESS THAN 36°F.
M. ECONOMIZER CONTROL (ENTHALPY) - SYSTEM CONTROLLER SHALL MODULATE MIXED AIR DAMPERS TO MEET UNIT DISCHARGE AIR TEMPERATURE SETPOINT WHEN OUTDOOR AIR ENTHALPY IS BELOW THE RETURN AIR ENTHALPY.
   1. WHEN BTU CALCULATION FOR OUTDOOR AIR CONDITIONS EXCEEDS 27 BTUH/LB (ADJ.), ECONOMIZER SHALL BE DISABLED.
N. MINIMUM OUTDOOR AIR CONTROL (MEASURED AIRFLOW) - SYSTEM CONTROLLER SHALL MODULATE OUTDOOR AIR DAMPER TO MAINTAIN MINIMUM CFM SETPOINT MEASURED BY AN OUTDOOR AIR FLOW MEASURING STATION.
   1. CLOSE THE RETURN AIR DAMPER AND OPENING OF RELIEF AIR DAMPERS IN EQUAL PROPORTION TO THE OUTSIDE AIR DAMPER.
   2. REFER TO UNIT SCHEDULE FOR THE MINIMUM OUTDOOR AIRFLOW CFM SETPOINT.
O. CO2 CONTROL - SYSTEM CONTROLLER SHALL OVERRIDE MIXED AIR DAMPER CONTROLS IN NON-VFD ECONOMIZING MODE USING SPACE CO2 SENSORS TO INCREASE OUTDOOR MINIMUM CFM TO A MAXIMUM CFM. INCLUDE CORRESPONDING CLOSING RETURN AIR DAMPER AND OPENING OF RELIEF AIR DAMPERS.
   1. UPON SPACE CO2 SENSOR EXCEEDING SETPOINT (800 PPM ADJ.), START TO MODULATE MIXED AIR DAMPERS (OUTDOOR AIR DAMPER OPENING) IN GRADUAL INCREMENTS UNTIL CO2 SENSOR SETPOINT IS SATISFIED.
      a. MODULATE MIXED AIR DAMPERS DOWN TO ITS ABSOLUTE MINIMUM POSITION UPON SATISFYING SENSOR SETPOINT.
      b. REFER TO VAV TERMINAL SEQUENCE FOR ADDITIONAL OPERATIONS AT THE ZONE LEVEL.
   2. ALARM HIGH CO2 AT 1,200 PPM (ADJ.)
   3. REFER TO UNIT SCHEDULE FOR THE OUTDOOR AIRFLOW CFM RANGE; HIGH AND LOW SETPOINTS.
P. DE-HUMIDIFICATION CONTROL - SYSTEM CONTROLLER SHALL ENABLE DE-HUMIDIFICATION MODE TO MAINTAIN A ZONE HUMIDITY SETPOINT OF 60%RH (ADJ.) MEASURED BY A WALL-MOUNTED HUMIDISTAT.
   1. DE-HUMIDIFICATION CONTROL SHALL OVERRIDE DISCHARGE AIR TEMPERATURE FUNCTION AND RESET DOWN TO 45°F (ADJ.).
   2. DISCHARGE AIR TEMPERATURE SHALL BE RESET BACK UP TO ITS NORMAL (NON-DEHUMIDIFICATION) SETPOINT UPON SATISFACTION OF THE ZONE HUMIDITY SENSOR.
Q. MIXED AIR TEMPERATURE CONTROL - SYSTEM CONTROLLER SHALL MODULATE MIXED AIR DAMPERS WHEN MIXED AIR TEMPERATURE SENSOR FALLS BELOW 45°F (ADJ.), THE OUTDOOR – RELIEF - RETURN DAMPERS SHALL MODULATE TO MAINTAIN A MIXED AIR TEMPERATURE OF 55°F (ADJ.).
   1. PROVIDE OVERRIDE OF MINIMUM OUTDOOR AIR VOLUME SETPOINT IN THE HEATING MODE TO MAINTAIN A 55°F (ADJ.) MIXED AIR TEMPERATURE.
R. FILTER MONITORING - SYSTEM CONTROLLER SHALL MONITOR AND ALARM FILTER DIFFERENTIAL PRESSURE FOR THE FOLLOWING:
   1. FINAL FILTERS
      a. MONITORING OF INCHES OF W.C.
      b. ALARM SETPOINT, COORDINATE WITH FILTER MFR. DIRTY FILTER VALUE, SUGGEST 1.00" W.C. (ADJ.)
   2. PRE-FILTERS
      a. MONITORING OF INCHES OF W.C.
      b. ALARM SETPOINT, COORDINATE WITH FILTER MFR. DIRTY FILTER VALUE, SUGGEST 0.5" W.C. (ADJ.)
S. UNOCCUPIED CONTROL – SYSTEM CONTROLLER SHALL INITIATE THE FOLLOWING BASED ON A FALL OR RISE IN SPACE TEMPERATURE:
   1. HEATING - SYSTEM CONTROLLER SHALL CYCLE SYSTEM ON (UNOCCUPIED HEATING MODE) WHEN A CALL FOR HEAT IS INITIATED BY ANY SPACE TEMPERATURE SENSOR DURING UNOCCUPIED MODE AND HEATING WATER SYSTEM IS OR CAN BE ENABLED. SYSTEM SHALL RESPOND BASED ON THE FOLLOWING:
      a. ENABLE FANS AND SYSTEM SHALL FUNCTION AS DESCRIBED IN OCCUPIED TEMPERATURE CONTROL OPERATION TO PROVIDE HEATING TO ZONE WITH THE EXCEPTION TO THE FOLLOWING:
         • MIXED AIR DAMPERS SHALL REMAIN CLOSED WITH RETURN DAMPER 100% OPENED AND OUTDOOR AND RELIEF 100% CLOSED.
         • COOLING SHALL BE DISABLED.
      b. SYSTEM DISABLED UPON SATISFYING THE CALL FOR HEAT AND HEATING CV SHALL REMAIN UNDER CONTROL OF COIL DISCHARGE AIR TEMPERATURE CONTROL.
   2. COOLING - SYSTEM CONTROLLER SHALL CYCLE SYSTEM ON (UNOCCUPIED COOLING MODE) WHEN A CALL FOR COOLING IS INITIATED BY ANY SPACE TEMPERATURE SENSOR DURING UNOCCUPIED MODE AND CHILLED WATER SYSTEM IS OR CAN BE ENABLED.
      a. ENABLE FANS AND SYSTEM SHALL FUNCTION AS DESCRIBED IN TEMPERATURE CONTROL OPERATION TO PROVIDE COOLING TO THE ZONE WITH THE EXCEPTION TO THE FOLLOWING:
         • MIXED AIR DAMPERS SHALL REMAIN CLOSED WITH RETURN DAMPER 100% OPENED AND OUTDOOR AND RELIEF 100% CLOSED.
         • HEATING SHALL BE DISABLED.
         • ECONOMIZER SHALL BE ENABLE IF OUTDOOR ENTHALPY IS LESS THAN THE RETURN AIR ENTHALPY.
      b. SYSTEM DISABLED UPON SATISFYING THE CALL FOR COOL.
T. HUMIDITY CONTROL - SYSTEM CONTROLLER SHALL CYCLE UNIT ON (UNOCCUPIED DE-HUMIDIFICATION MODE) WHEN A CALL FOR HIGH HUMIDITY IS INITIATED BY ANY SPACE HUMIDISTAT DURING UNOCCUPIED MODE AND CHILLED WATER SYSTEM IS OR CAN BE ENABLED.
   1. ENABLE FANS AND SYSTEM SHALL FUNCTION AS DESCRIBED IN DE-HUMIDIFICATION CONTROL OPERATIONS TO PROVIDE DE-HUMIDIFICATION TO THE ZONE WITH THE EXCEPTION TO THE FOLLOWING:
      a. MIXED AIR DAMPERS SHALL REMAIN CLOSED WITH RETURN DAMPER 100% OPENED AND OUTDOOR AND RELIEF 100% CLOSED.
      b. DISCHARGE AIR TEMPERATURE SETPOINT SHALL BE 55°F (ADJ.).
   2. SYSTEM DISABLED UPON SATISFYING THE CALL FOR HIGH HUMIDITY.
U. INITIAL STARTUP CONTROL - SYSTEM CONTROLLER SHALL ENABLE UNIT PRIOR TO SCHEDULED OCCUPANCY UTILIZING OPTIMUM START LOGIC TO ADJUST STARTUP TIME FOR UNIT BASED ON OUTDOOR AIR TEMPERATURE, BUILDING TEMPERATURE AND HISTORIC ELAPSE TIME TO REACH SETPOINT.
   1. UNIT SHALL ENERGIZE AND PROVIDE HEATING AND COOLING BASED ON THE SPACE TEMPERATURE SENSORS TO BRING SPACE TO OCCUPIED SETPOINT. THE OUTDOOR AND RELIEF AIR DAMPERS SHALL BE CLOSED UNLESS VFD ECONOMIZER IS ENABLED. ONCE OCCUPIED SETPOINT HAS BEEN REACHED, THE UNIT SHALL SWITCH TO OCCUPIED MODE.
V. PRE AND POST OCCUPANCY PURGE – WHEN ENABLED BY THE OPERATOR THE UNIT CONTROLLER WILL BEGIN THE OCCUPIED OPERATION 2 HOURS (ADJ.) PRIOR TO THE SCHEDULED OCCUPANCY AND EXTEND OPERATION 2 HOURS (ADJ.) BEYOND SCHEDULED OCCUPANCY.
   1. OUTDOOR AND RELIEF AIR DAMPERS SHALL BE AT THEIR MAXIMUM OPEN POSITION WHILE MAINTAINING THE MIXED AIR TEMPERATURE LIMIT.
   2. INTEGRATE PRE-PURGE FEATURE WITH THE OPTIMUM START LOGIC TO ALLOW BOTH OPERATIONS TO FUNCTION CONCURRENTLY (OUTDOOR AND RELIEF AIR DAMPERS OPEN) THUS NOT RUNNING SEQUENCES END-TO-END.
W. TIMED OVERRIDE CONTROL - SYSTEM CONTROLLER SHALL ENABLE UNIT WHEN ASSOCIATED TERMINAL UNIT TIMED OVERRIDE (2 HOURS (ADJ)) IS ENABLED, SYSTEM SHALL BE ENABLE AND FUNCTION AS IN OCCUPIED MODE.
X. BI-POLAR IONIZATION (BPI) – ENABLE BPI WHENEVER THE SUPPLY FANS ARE PROVEN ON. DISABLE BPI WHENEVER THE SUPPLY FANS ARE OFF.
   1. WHEN ENABLED AND STATUS IS SENSED BY THE CURRENT SENSOR, A RUN TIMER WILL BE ACTIVE.
Y. SAFETY SHUTDOWNS:
   1. PROVIDE A LOW-TEMPERATURE PROTECTION THERMOSTAT(S) ON THE LEAVING SIDE OF HEATING HOT WATER COIL WHICH WILL DE-ENERGIZE UNIT, CLOSE MIXED AIR DAMPERS (CLOSING OUTDOOR AND RELIEF AIR DAMPERS), CLOSE CHILLED WATER COIL CONTROL VALVE AND THE HEATING HOT WATER COIL CONTROL VALVE SHALL BE FULLY OPENED AND COIL PUMP ENERGIZED. PROVIDE MANUAL RESET.
   2. PROVIDE A HIGH STATIC PRESSURE SENSOR IN THE SUPPLY DISCHARGE PLENUM TO DE-ENERGIZE THE UNIT UPON SENSING A HIGH STATIC PRESSURE OF 4.0" W.C.. PROVIDE MANUAL RESET.
   3. PROVIDE A LOW-PRESSURE STATIC LIMIT IN THE RETURN PLENUM TO DE-ENERGIZE THE UNIT UPON SENSING A HIGH NEGATIVE STATIC PRESSURE OF -4.0" W.C.. PROVIDE MANUAL RESET.
   4. DUCT MOUNTED IONIZATION SMOKE DETECTOR(S) PROVIDED BY DIVISION 28 SHALL DE-ENERGIZE THE UNIT WHENEVER PRODUCTS OF COMBUSTION ARE SENSED.
   5. DISABLE THE BI-POLAR IONIZATION UPON OPENING OF THE ACCESS DOOR.
Z. THE FOLLOWING SHALL BE SUPPLIED AND INSTALLED BY TEMPERATURE CONTROL INSTALLER:
   1. SENSORS (TEMPERATURE, RELATIVE HUMIDITY, CO2, PRESSURE, AIRFLOW MEASURING DEVICES)
AA. THE FOLLOWING SHALL BE SUPPLIED BY TEMPERATURE CONTROL INSTALLER AND INSTALLED BY OTHERS:
   1. CONTROL VALVES
   2. DAMPERS

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ADDENDUM No. 2 October 28, 2022

ISSUED FOR DATE

PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

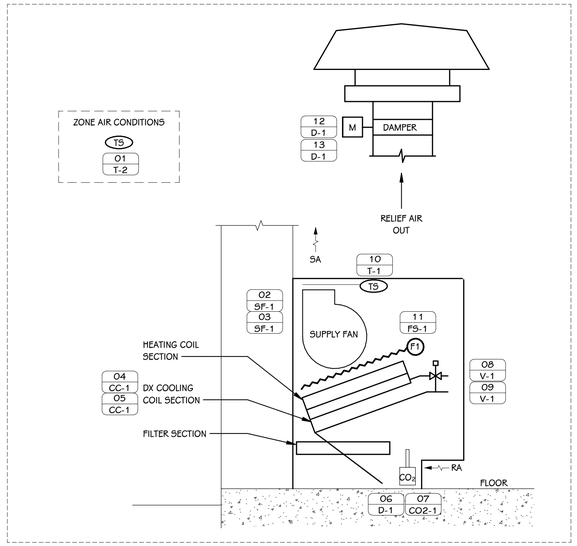
OWNER
KALAMAZOO PUBLIC SCHOOLS

Kalamazoo, Michigan

SHEET TITLE
TEMPERATURE CONTROLS

DATE
OCTOBER 3, 2022

SHEET NUMBER
M 603
21-806.00



FLOOR MOUNTED UNIT VENTILATOR (DX COOLING) CONTROLS DIAGRAM

SCALE: NONE

FLOOR MOUNTED UNIT VENTILATOR (CHILLED WATER) CONTROLS DIAGRAM

SCALE: NONE

CONTROL POINTS

NUMBER	TAG	DESCRIPTION	ALARM	TREND	MISC.	REMARKS
FLOOR MOUNTED UNIT VENTILATOR DETAIL - CHILLED WATER COOLING						
01	T-2	ZONE AIR TEMPERATURE		■		
02	SF-1	SUPPLY FAN ALARM STATUS		■		
03	SF-1	SUPPLY FAN ALARM STATUS		■		
04	V-2	COOLING COIL VALVE OUTPUT		■		
05	V-2	COOLING CONTROL VALVE POSITION		■		
06	D-1	MIXED AIR DAMPER POSITION		■		
07	CO2-1	RETURN AIR CARBON DIOXIDE		■		
08	V-1	HEATING COIL VALVE OUTPUT		■		
09	V-1	HEATING CONTROL VALVE POSITION		■		
10	T-1	DISCHARGE AIR TEMPERATURE		■		
11	FS-1	FREEZE STAT ALARM STATUS		■		
FLOOR MOUNTED UNIT VENTILATOR DETAIL - DX COOLING						
01	T-2	ZONE AIR TEMPERATURE		■		
02	SF-1	SUPPLY FAN ALARM STATUS	■	■		
03	SF-1	SUPPLY FAN ALARM STATUS	■	■		
04	CC-1	MECHANICAL COOLING STATUS	■	■		
05	CC-1	MECHANICAL COOLING STAGE		■		
06	D-1	MIXED AIR DAMPER POSITION		■		
07	CO2-1	RETURN AIR CARBON DIOXIDE		■		
08	V-1	HEATING COIL VALVE OUTPUT		■		
09	V-1	HEATING CONTROL VALVE POSITION		■		
10	T-1	DISCHARGE AIR TEMPERATURE		■		
11	FS-1	FREEZE STAT ALARM STATUS	■	■		
12	D-1	OUTSIDE AIR DAMPER OUTPUT		■		
13	D-1	OUTDOOR AIR DAMPER POSITION		■		

SEQUENCE OF OPERATIONS

NOTE: ALL LABOR, MATERIAL, EQUIPMENT AND SOFTWARE NOT SPECIFICALLY INDICATED WITHIN CONTROLS DRAWINGS THAT IS REQUIRED TO MEET THE FUNCTIONAL INTENT OF THE SEQUENCE OF OPERATIONS SHALL BE PROVIDED WITHOUT ADDITIONAL COST. POINT LISTS SHALL BE A GUIDE TO THE POINTS REQUIRED FOR CONTROL SYSTEM. FINAL POINTS SHALL BE DETERMINED BY SEQUENCE OF OPERATIONS. ALL SET POINTS SHALL BE OPERATOR ADJUSTABLE THROUGH THE BMS. ALL POINTS SHALL BE TRENDABLE.

UNIT VENTILATOR (DX COOLING) CONTROLS:

A. PROVIDE DIRECT DIGITAL CONTROLS (DDC) FOR UNIT VENTILATOR OPERATION. HORIZONTAL/VERTICAL UNIT VENTILATOR IS A COMBINATION OF A VARIABLE/CONSTANT VOLUME FAN, HEATING COIL, COOLING COIL, CONTROL VALVE(S) (CV) AND ACTUATOR(S), AND AIR TEMPERATURE SENSOR.
B. UNIT VENTILATOR ADJUSTABLE SCHEDULE BASED ON THE FOLLOWING:
   1. SCHEDULED WITH MAIN BUILDING SCHEDULE.
   2. SCHEDULED WITH ASSOCIATED ZONE HVAC SYSTEM.
   3. SCHEDULED 24/7 OCCUPIED.
C. UNIT VENTILATOR ADJUSTABLE SETPOINTS:
   1. OCCUPIED 74°F COOLING / 70°F HEATING
   2. STANDBY 76°F COOLING / 68°F HEATING (BASED ON LIGHTING OCCUPANCY SENSOR(S))
   3. UNOCCUPIED 85°F COOLING / 62°F HEATING
   4. CO2 800 PPM MINIMUM / 1,000 PPM MAXIMUM
D. START/STOP, CONTROLLED DEVICES SHALL RESPOND AS FOLLOWS:
   1. WHEN INDEXED TO STOP:
      a. DISABLE FAN.
      b. DISABLE DX COOLING.
      c. HEATING CV MODULATES TO MAINTAIN MIXED/DISCHARGE AIR TEMPERATURE SENSOR AT 80°F (ADJ.), WHEN OUTDOOR AIR TEMPERATURE IS BELOW 45°F (ADJ.).
      d. OUTDOOR AND RELIEF/EXHAUST DAMPERS 100% CLOSED.
      e. RETURN AIR DAMPER 100% OPENED.
   2. WHEN INDEXED TO START:
      a. ENABLE FAN, RUNS CONTINUOUSLY IN OCCUPIED MODE.
      b. AFTER DELAY OF FIVE (5) MINUTE HOLD, ENABLE OCCUPIED CONTROL.
E. OCCUPIED TEMPERATURE CONTROL – SYSTEM CONTROLLER SHALL MODULATE HEATING AND COOLING SOURCES AND MIXED AIR DAMPERS TO MAINTAIN AN ADJUSTABLE SPACE TEMPERATURE SETPOINT MEASURED BY A SPACE TEMPERATURE THERMOSTAT.
   1. COOLING (COOLING COIL) – UPON A RISE IN SPACE TEMPERATURE ABOVE SPACE TEMPERATURE SETPOINT, CONTROLLER SHALL RESPOND BASED ON THE FOLLOWING:
      a. MODULATE COOLING COIL CV TO MAINTAIN SPACE TEMPERATURE SETPOINT.
      b. MIXED AIR DAMPERS AT MINIMUM AIRFLOW SETPOINT.
   2. COOLING (DX COOLING) – UPON A RISE IN SPACE TEMPERATURE ABOVE SPACE TEMPERATURE SETPOINT, CONTROLLER SHALL RESPOND BASED ON THE FOLLOWING:
      a. STAGE ONE UTILIZES 67% COMPRESSOR CAPACITY AND FAN ON LOW SPEED.
      b. STAGE TWO UTILIZES 100% COMPRESSOR CAPACITY AND FAN ON LOW SPEED.
      c. STAGE THREE UTILIZES 100% COMPRESSOR CAPACITY AND FAN ON HIGH SPEED.
      d. MIXED AIR DAMPERS AT MINIMUM AIRFLOW SETPOINT FOR ALL THREE STAGES.
   3. HEATING CONTROL - UPON A FALL IN SPACE TEMPERATURE BELOW SPACE TEMPERATURE SETPOINT, CONTROLLER SHALL RESPOND BASED ON THE FOLLOWING:
      a. MODULATE HEATING COIL CV TO MAINTAIN SPACE TEMPERATURE SETPOINT.
      b. FAN ON LOW SPEED.
      c. MIX AIR DAMPERS AT MINIMUM AIRFLOW SETPOINT.
F. ECONOMIZER CONTROL (OPTIONS_ENTHALPY/OAT) - SAME AS HVAC
G. MINIMUM OUTDOOR AIR CONTROL (OPTIONS_CFM-MAD/CFM-MIN/%-MAD/%-MIN) – SAME AS HVAC
H. CO2 CONTROL (OPTION_SPACE/DUCT) – SAME AS HVAC
I. FILTER MONITORING – SAME AS HVAC
J. UNOCCUPIED CONTROL
   1. HEATING CONTROL – SYSTEM CONTROLLER SHALL CYCLE UNIT ON (UNOCCUPIED HEATING MODE) WHEN A CALL FOR HEAT IS INITIATED BY SPACE TEMPERATURE SENSOR DURING UNOCCUPIED MODE AND HEATING SYSTEM IS OR CAN BE ENABLED.
      a. ENABLE FAN (HIGH SPEED)
      b. OUTDOOR AND RELIEF/EXHAUST AIR DAMPERS 100% CLOSED, RETURN AIR DAMPER 100% OPENED.
      c. DISABLE COOLING.
      d. HEATING CV 100% OPENED.
      e. SYSTEM DISABLED UPON SATISFYING THE CALL FOR HEAT AND HEATING COIL CV SHALL REMAIN UNDER CONTROL OF MIXED/DISCHARGE AIR TEMPERATURE CONTROL.
   2. COOLING CONTROL – SYSTEM CONTROLLER SHALL CYCLE UNIT ON (UNOCCUPIED COOLING MODE) WHEN A CALL FOR COOL IS INITIATED BY SPACE TEMPERATURE SENSOR DURING UNOCCUPIED MODE AND COOLING SYSTEM IS OR CAN BE ENABLED.
      a. ENABLE FAN (HIGH SPEED)
      b. OUTDOOR AND RELIEF/EXHAUST AIR DAMPERS 100% CLOSED, RETURN AIR DAMPER 100% OPENED.
         • UNLESS ECONOMIZER IS ENABLED.
      c. COOLING CV 100% OPENED.
      d. HEATING CV 100% CLOSED.
      e. SYSTEM DISABLED UPON SATISFYING THE CALL FOR COOL.
K. INITIAL START-UP (OPTIMAL START) CONTROL – SYSTEM CONTROLLER SHALL ENABLE UNIT PRIOR TO SCHEDULED OCCUPANCY UTILIZING OPTIMUM START LOGIC TO ADJUST STARTUP TIME FOR SYSTEM.
   1. BASED ON SPACE TEMPERATURE AND HISTORIC ELAPSE TIME TO REACH SETPOINT.
   2. SYSTEM SHALL BE ENABLED AND PROVIDE HEATING AND COOLING BASED ON THE SPACE TEMPERATURE SENSOR TO BRING SPACE TO OCCUPIED SETPOINT.
      a. ENABLE FAN.
      b. OUTDOOR AND RELIEF/EXHAUST AIR DAMPERS 100% CLOSED, RETURN AIR DAMPER 100% OPENED.
         • UNLESS ECONOMIZER IS ENABLED.
      c. SYSTEM SHALL SWITCH TO OCCUPIED MODE.
L. TIMED OVERRIDE CONTROL – SYSTEM CONTROLLER SHALL ENABLE SYSTEM WHEN ASSOCIATED SPACE TIMED OVERRIDE (2 HOURS (ADJ.)) IS ENABLED, SYSTEM SHALL BE ENABLE AND FUNCTION AS IN OCCUPIED MODE.
M. SAFETY SHUTDOWN:
   1. PROVIDE A LOW-TEMPERATURE PROTECTION THERMOSTAT(S) ON THE LEAVING SIDE OF HEATING HOT WATER COIL WHICH WILL DE-ENERGIZE UNIT, CLOSE MIXED AIR DAMPERS (CLOSING OUTDOOR/RELIEF/EXHAUST AIR DAMPER(S)), CLOSE CHILLED WATER COIL CONTROL VALVE AND THE HEATING HOT WATER COIL CONTROL VALVE SHALL BE FULLY OPENED AND COIL PUMP ENERGIZED. PROVIDE MANUAL RESET.

UNIT VENTILATOR (CHILLED WATER) CONTROLS:

A. PROVIDE DIRECT DIGITAL CONTROLS (DDC) FOR UNIT VENTILATOR OPERATION. HORIZONTAL/VERTICAL UNIT VENTILATOR IS A COMBINATION OF A VARIABLE/CONSTANT VOLUME FAN, HEATING COIL, COOLING COIL, CONTROL VALVE(S) (CV) AND ACTUATOR(S), AND AIR TEMPERATURE SENSOR.
B. UNIT VENTILATOR ADJUSTABLE SCHEDULE BASED ON THE FOLLOWING:
   1. SCHEDULED WITH MAIN BUILDING SCHEDULE.
   2. SCHEDULED WITH ASSOCIATED ZONE HVAC SYSTEM.
   3. SCHEDULED 24/7 OCCUPIED.
C. UNIT VENTILATOR ADJUSTABLE SETPOINTS:
   1. OCCUPIED 74°F COOLING / 70°F HEATING
   2. STANDBY 76°F COOLING / 68°F HEATING (BASED ON LIGHTING OCCUPANCY SENSOR(S))
   3. UNOCCUPIED 85°F COOLING / 62°F HEATING
   4. CO2 800 PPM MINIMUM / 1,000 PPM MAXIMUM
D. START/STOP, CONTROLLED DEVICES SHALL RESPOND AS FOLLOWS:
   1. WHEN INDEXED TO STOP:
      a. DISABLE FAN.
      b. DISABLE DX COOLING.
      c. HEATING CV MODULATES TO MAINTAIN MIXED/DISCHARGE AIR TEMPERATURE SENSOR AT 80°F (ADJ.), WHEN OUTDOOR AIR TEMPERATURE IS BELOW 45°F (ADJ.).
      d. OUTDOOR AND RELIEF/EXHAUST DAMPERS 100% CLOSED.
      e. RETURN AIR DAMPER 100% OPENED.

SEQUENCE OF OPERATIONS (CONT'D)

UNIT VENTILATOR (CHILLED WATER) CONTROLS (CONT'D):

E. OCCUPIED TEMPERATURE CONTROL – SYSTEM CONTROLLER SHALL MODULATE HEATING AND COOLING SOURCES AND MIXED AIR DAMPERS TO MAINTAIN AN ADJUSTABLE SPACE TEMPERATURE SETPOINT MEASURED BY A SPACE TEMPERATURE THERMOSTAT.
   1. COOLING (COOLING COIL) – UPON A RISE IN SPACE TEMPERATURE ABOVE SPACE TEMPERATURE SETPOINT, CONTROLLER SHALL RESPOND BASED ON THE FOLLOWING:
      a. MODULATE COOLING COIL CV TO MAINTAIN SPACE TEMPERATURE SETPOINT.
      b. MIXED AIR DAMPERS AT MINIMUM AIRFLOW SETPOINT.
   2. COOLING (CHILLED WATER) – UPON A RISE IN SPACE TEMPERATURE ABOVE SPACE TEMPERATURE SETPOINT, CONTROLLER SHALL RESPOND BASED ON THE FOLLOWING:
      a. STAGE ONE UTILIZES 67% COMPRESSOR CAPACITY AND FAN ON LOW SPEED.
      b. STAGE TWO UTILIZES 100% COMPRESSOR CAPACITY AND FAN ON LOW SPEED.
      c. STAGE THREE UTILIZES 100% COMPRESSOR CAPACITY AND FAN ON HIGH SPEED.
      d. MIXED AIR DAMPERS AT MINIMUM AIRFLOW SETPOINT FOR ALL THREE STAGES.
   3. HEATING CONTROL - UPON A FALL IN SPACE TEMPERATURE BELOW SPACE TEMPERATURE SETPOINT, CONTROLLER SHALL RESPOND BASED ON THE FOLLOWING:
      a. MODULATE HEATING COIL CV TO MAINTAIN SPACE TEMPERATURE SETPOINT.
      b. FAN ON LOW SPEED.
      c. MIX AIR DAMPERS AT MINIMUM AIRFLOW SETPOINT.
F. ECONOMIZER CONTROL (OPTIONS_ENTHALPY/OAT) - SAME AS HVAC
G. MINIMUM OUTDOOR AIR CONTROL (OPTIONS_CFM-MAD/CFM-MIN/%-MAD/%-MIN) – SAME AS HVAC
H. CO2 CONTROL (OPTION_SPACE/DUCT) – SAME AS HVAC
I. FILTER MONITORING – SAME AS HVAC
J. UNOCCUPIED CONTROL
   1. HEATING CONTROL – SYSTEM CONTROLLER SHALL CYCLE UNIT ON (UNOCCUPIED HEATING MODE) WHEN A CALL FOR HEAT IS INITIATED BY SPACE TEMPERATURE SENSOR DURING UNOCCUPIED MODE AND HEATING SYSTEM IS OR CAN BE ENABLED.
      a. ENABLE FAN (HIGH SPEED)
      b. OUTDOOR AND RELIEF/EXHAUST AIR DAMPERS 100% CLOSED, RETURN AIR DAMPER 100% OPENED.
      c. DISABLE COOLING.
      d. HEATING CV 100% OPENED.
      e. SYSTEM DISABLED UPON SATISFYING THE CALL FOR HEAT AND HEATING COIL CV SHALL REMAIN UNDER CONTROL OF MIXED/DISCHARGE AIR TEMPERATURE CONTROL.
   2. COOLING CONTROL – SYSTEM CONTROLLER SHALL CYCLE UNIT ON (UNOCCUPIED COOLING MODE) WHEN A CALL FOR COOL IS INITIATED BY SPACE TEMPERATURE SENSOR DURING UNOCCUPIED MODE AND COOLING SYSTEM IS OR CAN BE ENABLED.
      a. ENABLE FAN (HIGH SPEED)
      b. OUTDOOR AND RELIEF/EXHAUST AIR DAMPERS 100% CLOSED, RETURN AIR DAMPER 100% OPENED.
         • UNLESS ECONOMIZER IS ENABLED.
      c. COOLING CV 100% OPENED.
      d. HEATING CV 100% CLOSED.
      e. SYSTEM DISABLED UPON SATISFYING THE CALL FOR COOL.
K. INITIAL START-UP (OPTIMAL START) CONTROL – SYSTEM CONTROLLER SHALL ENABLE UNIT PRIOR TO SCHEDULED OCCUPANCY UTILIZING OPTIMUM START LOGIC TO ADJUST STARTUP TIME FOR SYSTEM.
   1. BASED ON SPACE TEMPERATURE AND HISTORIC ELAPSE TIME TO REACH SETPOINT.
   2. SYSTEM SHALL BE ENABLED AND PROVIDE HEATING AND COOLING BASED ON THE SPACE TEMPERATURE SENSOR TO BRING SPACE TO OCCUPIED SETPOINT.
      a. ENABLE FAN.
      b. OUTDOOR AND RELIEF/EXHAUST AIR DAMPERS 100% CLOSED, RETURN AIR DAMPER 100% OPENED.
         • UNLESS ECONOMIZER IS ENABLED.
      c. SYSTEM SHALL SWITCH TO OCCUPIED MODE.
L. TIMED OVERRIDE CONTROL – SYSTEM CONTROLLER SHALL ENABLE SYSTEM WHEN ASSOCIATED SPACE TIMED OVERRIDE (2 HOURS (ADJ.)) IS ENABLED, SYSTEM SHALL BE ENABLE AND FUNCTION AS IN OCCUPIED MODE.
M. SAFETY SHUTDOWN:
   1. PROVIDE A LOW-TEMPERATURE PROTECTION THERMOSTAT(S) ON THE LEAVING SIDE OF HEATING HOT WATER COIL WHICH WILL DE-ENERGIZE UNIT, CLOSE MIXED AIR DAMPERS (CLOSING OUTDOOR/RELIEF/EXHAUST AIR DAMPER(S)), CLOSE CHILLED WATER COIL CONTROL VALVE AND THE HEATING HOT WATER COIL CONTROL VALVE SHALL BE FULLY OPENED AND COIL PUMP ENERGIZED. PROVIDE MANUAL RESET.

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ADDENDUM No. 2 **October 28, 2022**

ISSUED FOR **DATE**

PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

DATE
OCTOBER 3, 2022

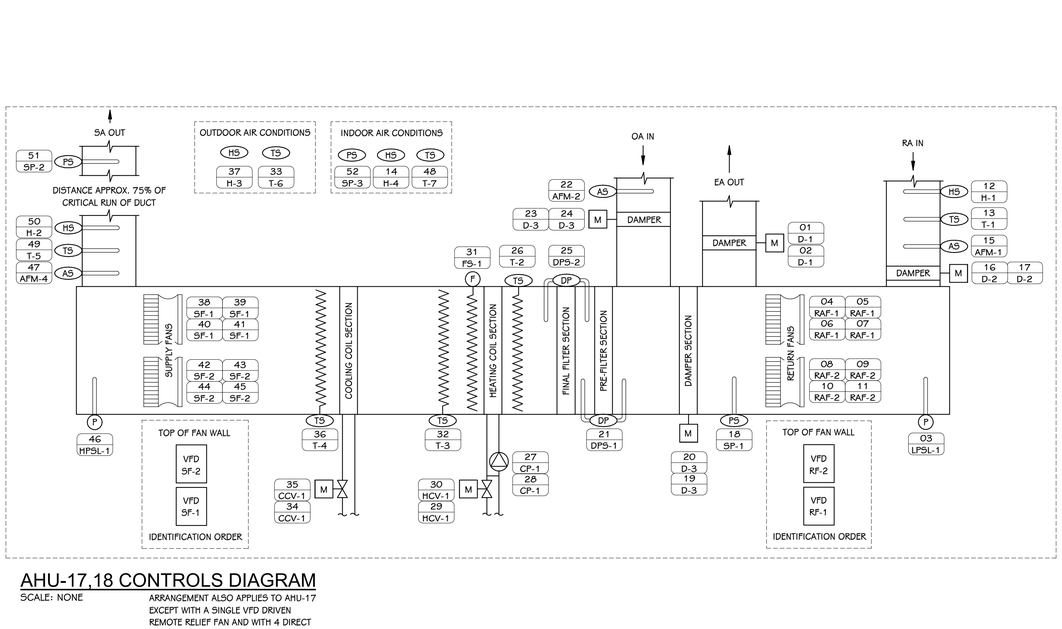
SHEET TITLE
TEMPERATURE CONTROLS

A2

SHEET NUMBER
M 604
21-806.00

CONTROL POINTS

NUMBER	TAG	DESCRIPTION	ALARM	TREND	MISC.	REMARKS
AHU-17,18						
01	D-1	EXHAUST AIR DAMPER OUTPUT		■		
02	D-1	EXHAUST AIR DAMPER POSITION		■		
03	LPSL-1	LOW PRESSURE STATIC LIMIT	■	■		HARD WIRED SAFETY - MANUAL RESET
04	RAF-1	FAN AIR FLOW		■		
05	RAF-1	FAN SPEED CONTROL		■		
06	RAF-1	FAN ENABLE/DISABLE		■		
07	RAF-1	FAN STATUS	■	■		
08	RAF-2	FAN AIR FLOW		■		
09	RAF-2	FAN SPEED CONTROL		■		
10	RAF-2	FAN ENABLE/DISABLE		■		
11	RAF-2	FAN STATUS	■	■		
12	H-1	RETURN AIR HUMIDITY		■		DISPLAY ENTHALPY BASED ON T&H READINGS
13	T-1	RETURN AIR TEMPERATURE		■		DISPLAY ENTHALPY BASED ON T&H READINGS
14	H-4	INDOOR AIR HUMIDITY SENSOR		■		
15	AFM-1	TOTAL RETURN AIR FLOW		■		
16	D-2	RETURN AIR DAMPER OUTPUT		■		
17	D-2	RETURN AIR DAMPER POSITION		■		
18	SP-1	RETURN AIR PLENUM STATIC PRESSURE		■		NOTE LOCATION ON A5-BUILTS
19	D-3	MIXED AIR DAMPER POSITION		■		
20	D-3	MIXED AIR DAMPER OUTPUT		■		
21	DPS-1	PRE-FILTER STATUS	■	■		
22	AFM-2	OUTDOOR AIR FLOW		■		
23	D-3	OUTDOOR AIR DAMPER POSITION		■		
24	D-3	OUTDOOR AIR DAMPER OUTPUT		■		
25	DPS-2	FINAL FILTER STATUS	■	■		
26	T-2	MIXED AIR TEMPERATURE	■	■		
27	CP-1	PUMP STATUS	■	■		
28	CP-1	PUMP ENABLE/DISABLE		■		
29	HCV-1	HEATING CONTROL VALVE POSITION		■		
30	HCV-1	HEATING CONTROL VALVE OUTPUT		■		
31	FS-1	FREEZE STAT ALARM STATUS	■	■		HARD WIRED SAFETY - MANUAL RESET
32	T-3	HEATING COIL DISCHARGE TEMPERATURE		■		
33	T-6	OUTDOOR AIR TEMPERATURE		■		GLOBAL
34	CCV-1	COOLING CONTROL VALVE POSITION		■		
35	CCV-1	COOLING CONTROL VALVE OUTPUT		■		
36	T-4	COOLING COIL DISCHARGE TEMPERATURE		■		
37	H-3	OUTDOOR AIR HUMIDITY		■		GLOBAL
38	SF-1	FAN AIR FLOW		■		
39	SF-1	FAN SPEED CONTROL		■		
40	SF-1	FAN ENABLE/DISABLE		■		
41	SF-1	FAN STATUS	■	■		
42	SF-2	FAN AIR FLOW		■		
43	SF-2	FAN SPEED CONTROL		■		
44	SF-2	FAN ENABLE/DISABLE		■		
45	SF-2	FAN STATUS	■	■		
46	HPSL-1	HIGH PRESSURE STATIC LIMIT	■	■		HARD WIRED SAFETY - MANUAL RESET
47	AFM-4	TOTAL SUPPLY AIR FLOW		■		
48	T-7	INDOOR AIR TEMPERATURE		■		
49	T-5	DISCHARGE AIR TEMPERATURE		■		DISPLAY ENTHALPY BASED ON T&H READINGS
50	H-2	DISCHARGE AIR HUMIDITY		■		DISPLAY ENTHALPY BASED ON T&H READINGS
51	SP-2	SUPPLY AIR STATIC PRESSURE		■		NOTE LOCATION ON A5-BUILTS
52	SP-3	ROOM STATIC PRESSURE		■		



AHU-17,18 CONTROLS DIAGRAM

SCALE: NONE

ARRANGEMENT ALSO APPLIES TO AHU-17 EXCEPT WITH A SINGLE VFD DRIVEN REMOTE RELIEF FAN AND WITH 4 DIRECT DRIVE SUPPLY FANS WITH 4 VFDs

SEQUENCE OF OPERATIONS

NOTE: ALL LABOR, MATERIAL, EQUIPMENT AND SOFTWARE NOT SPECIFICALLY INDICATED WITHIN CONTROLS DRAWINGS THAT IS REQUIRED TO MEET THE FUNCTIONAL INTENT OF THE SEQUENCE OF OPERATIONS SHALL BE PROVIDED WITHOUT ADDITIONAL COST. POINT LISTS SHALL BE A GUIDE TO THE POINTS REQUIRED FOR CONTROL SYSTEM. FINAL POINTS SHALL BE DETERMINED BY SEQUENCE OF OPERATIONS. ALL SET POINTS SHALL BE OPERATOR ADJUSTABLE THROUGH THE BMS. ALL POINTS SHALL BE TRENDABLE.

AHU-17,18 CONTROLS:

A. PROVIDE DDC CONTROL AND MONITORING FOR AIR HANDLING SYSTEM. SYSTEM INCLUDES INDOOR VARIABLE VOLUME UNIT WITH SUPPLY FAN, (REMOTE) RELIEF FAN, VFD DRIVEN MOTORS, VFD DRIVENENONMIZER, PRE-FILTER, FINAL FILTER, PUMPED HOT WATER PREHEATING COIL WITH CONTROL VALVE AND ACTUATOR, AND CHILLED WATER COIL WITH CONTROL VALVE AND ACTUATOR. TEMPERATURE, HUMIDITY, AIRFLOW, AND PRESSURE SENSORS ARE REQUIRED AND BIPOLAR IONIZATION.

B. REFER TO VARIABLE AIR VOLUME (VAV) TERMINAL UNIT CONTROL ARTICLES FOR VAV TERMINAL UNIT OPERATION.

C. AIR HANDLING UNIT ADJUSTABLE SCHEDULE BASED ON THE FOLLOWING:
   1. TIME OF DAY (TOD) SCHEDULE.
      a. TO BE DETERMINED BY OWNER (CONSULT WITH OWNER).
      b. SUGGESTED OCCUPIED SCHEDULE: 7AM-5PM M-F, OFF SAT-SUN, OFF HOLIDAYS
   2. ENABLED AND DISABLED BASED ON MANUAL OVERRIDE FROM DDC.

D. AIR HANDLING UNIT ADJUSTABLE SETPOINTS:
   1. OCCUPIED 75°F COOLING / 70°F HEATING
   2. STANDBY 77°F COOLING / 68°F HEATING (BASED ON LIGHTING OCCUPANCY SENSORS)
   3. UNOCCUPIED 85°F COOLING / 62°F HEATING
   4. CO2 800 PPM MINIMUM / 1,000 PPM MAXIMUM

E. START/STOP, CONTROLLED DEVICES SHALL RESPOND AS FOLLOWS:
   1. WHEN INDEXED TO STOP:
      a. DISABLE SUPPLY AND RETURN FANS SIMULTANEOUSLY.
      b. COOLING CV 100% CLOSED.
      c. HEATING CV SHALL MODULATE TO MAINTAIN COIL DISCHARGE AIR TEMPERATURE SENSOR AT 80°F (ADJ.), WHEN OUTDOOR AIR TEMPERATURE IS BELOW 45°F (ADJ.).
      d. OUTDOOR AND RELIEF AIR DAMPERS 100% CLOSED.
      e. RETURN AIR DAMPER 100% OPENED.
      f. UVGI IS DISABLED FOLLOWING DELAY.
      g. BPI IS DISABLED.
   2. WHEN INDEXED TO START:
      a. ENABLE RETURN FANS FIRST, THEN SUPPLY FANS AFTER A DELAY.
      b. OPERATION OF SYSTEM TO RESUME AFTER START-UP DELAY.

F. SUPPLY FAN CONTROL (STATIC RESET) - SYSTEM CONTROLLER SHALL MODULATE SUPPLY FAN VFD DRIVEN MOTORS TO MAINTAIN AN ADJUSTABLE DUCT STATIC PRESSURE SETPOINT MEASURED BY A DUCT STATIC PRESSURE CONTROLLER LOCATED 75% OF MAXIMUM MAIN DUCT DISTANCE DOWNSTREAM OF SYSTEM (FINAL POSITION TO BE PROPOSED BY CONTRACTOR AND APPROVED BY ENGINEER). RESET STATIC PRESSURE DIFFERENTIAL SETPOINT BASED ON THE FOLLOWING:
   1. STATIC PRESSURE SETPOINT SHALL BE RESET USING "TRIM AND RESPOND" LOGIC WITHIN THE RANGE OF 0.15" W.C. TO 1.75" W.C. (ADJ.). WHEN THE SYSTEM IS OFF, THE SETPOINT SHALL BE 0.5" W.C. (ADJ.). WHEN SYSTEM IS ON, EVERY TEN (10) MINUTES, TRIM THE SETPOINT BY 0.04" W.C. IF THERE ARE TWO (2) OR FEWER ZONE PRESSURE REQUESTS. IF THERE ARE MORE THAN TWO (2) ZONE PRESSURE REQUESTS, RESPOND BY INCREASING THE SETPOINT BY 0.06" W.C..
      a. A REQUEST IS GENERATED WHENEVER TERMINAL UNIT DAMPER IS GREATER THAN 90% (ADJ.) OPEN UNTIL IT DROPS TO 80% (ADJ.) OPEN.
      b. EXCLUDE ANY TERMINAL UNITS SET-UP AS CONSTANT VOLUME FROM "TRIM AND RESPOND" LOGIC.
      c. PROVIDE THE ABILITY TO OMIT ANY VAV TERMINAL UNITS FROM "TRIM AND RESPOND" LOGIC.
      d. TEST AND BALANCE CONTRACTOR SHALL PROVIDE MINIMUM AND MAXIMUM STATIC SETPOINTS, WHICH WILL BE DETERMINED DURING THE BALANCING PROCESS.
   2. DISCHARGE PRESSURE HIGH LIMIT WILL CONTROL STATIC PRESSURE AT UNIT FROM EXCEEDING 3.0" W.G. (ADJ.) WITH OVERRIDE CONTROL OF SUPPLY FANS VFD DRIVEN MOTORS.

G. RELIEF FAN CONTROL (ZONE PRESSURE) - SYSTEM CONTROLLER SHALL MODULATE RETURN FAN VFD DRIVEN MOTOR TO MAINTAIN ZONE PRESSURE SETPOINT MEASURED BY A ZONE PRESSURE CONTROLLER LOCATED IN THE ZONE SERVED.
   1. THE ZONE STATIC PRESSURE SETPOINT (ADJ.) SHALL BE A SETPOINT THAT CONTROLS TO A SLIGHTLY POSITIVE PRESSURE.

H. FAN VFD DRIVEN MOTOR CONTROLLERS SHALL BE MONITORED BASED ON THE FOLLOWING:
   1. VIA BACNET/MODBUS CONNECTION (POWER USAGE / % SPEED / HOURS / FAULT / ALARM)

I. FANS INITIAL START-UP CONTROL – WHEN INDEXED TO START, SYSTEM CONTROLLER SHALL ENABLE FANS BASED ON THE FOLLOWING:
   1. WHEN ENABLED, AND AFTER A DELAY OF TWO (2) MINUTES (ADJ.) WITH NO STATUS SENSED, DDC SHALL INDICATE A CRITICAL ALARM.
      a. IF ANY FAN (SUPPLY OR RETURN) STATUS IS NOT SENSED, THE SYSTEM SHALL BE DISABLED AND AN ALARM IS INITIATED.
   2. WHEN ENABLED AND STATUS IS SENSED BY THE CURRENT SENSOR, A RUN TIMER WILL BE ACTIVE.

J. DISCHARGE AIR TEMPERATURE CONTROL (DAT RESET) - SYSTEM CONTROLLER SHALL MODULATE HEATING AND COOLING SOURCES AND MIXED AIR DAMPERS TO MAINTAIN AN ADJUSTABLE DISCHARGE AIR TEMPERATURE SETPOINT MEASURED BY A DUCT TEMPERATURE SENSOR LOCATED DOWNSTREAM OF UNIT. RESET DISCHARGE AIR TEMPERATURE SETPOINT AS FOLLOWS:
   1. ALL TERMINAL AIR UNIT ZONE SPACE TEMPERATURES FOR THE SERVING AHU SHALL BE AVERAGED. A REVERSE ACTING PI (PROPORTIONAL, INTEGRAL) LOOP SHALL BE CONFIGURED SUCH THAT ITS INPUT SHALL BE THE AVERAGE ZONE SPACE TEMPERATURE AND ITS SETPOINT SHALL BE HALFWAY BETWEEN THE GLOBAL REHEAT AND COOLING SETPOINTS. FOR EXAMPLE, IF THE ZONE SPACE TEMPERATURE REHEAT SETPOINT IS 70°F AND THE ZONE SPACE TEMPERATURE COOLING SETPOINT IS 75°F, THE RESULTING AVERAGE SPACE TEMP SETPOINT WOULD BE 72.5°F.
      a. THE PI LOOP OUTPUT SHALL BE USED AS THE AHU DISCHARGE TEMPERATURE SETPOINT AND SHALL BE LIMITED BETWEEN 55°F AND 75°F (ADJ.).
      b. DISCHARGE AIR TEMPERATURE CONTROL SEQUENCE IS DESIGNED TO MAINTAIN MOST SPACES IN THE AHU SERVED ZONE AT OR CLOSE TO THE AVERAGE SPACE TEMPERATURE SETPOINT WHICH SHOULD POSITION MOST TERMINAL AIR UNITS AT MINIMUM CFM WITH NO REHEAT REQUIRED.

K. DEWPOINT CONTROL - UNIT CONTROLLER SHALL LIMIT THE UNIT DISCHARGE DEW POINT TO 60° F (ADJ.). MODULATE COOLING CONTROL VALVE TO MAINTAIN AN ADJUSTABLE DISCHARGE AIR DEWPOINT SETPOINT MEASURED BY DUCT TEMPERATURE AND HUMIDITY SENSORS LOCATED DOWNSTREAM OF UNIT.

L. COIL PUMP CONTROL BASED ON THE FOLLOWING:
   1. HEATING HOT WATER COIL PUMP SHALL RUN WHEN THE SYSTEM IS IN HEATING MODE (WHEN CV IS GREATER THAN 10% OPEN).
   2. PUMP SHALL RUN CONTINUOUSLY WHENEVER THE OUTDOOR AIR TEMPERATURE IS LESS THAN 36°F.

M. ECONOMIZER CONTROL (ENTHALPY) - SYSTEM CONTROLLER SHALL MODULATE MIXED AIR DAMPERS TO MEET UNIT DISCHARGE AIR TEMPERATURE SETPOINT WHEN OUTDOOR AIR ENTHALPY IS BELOW THE RETURN AIR ENTHALPY.
   1. WHEN BTU CALCULATION FOR OUTDOOR AIR CONDITIONS EXCEEDS 27 BTUH/LB (ADJ.), ECONOMIZER SHALL BE DISABLED.

N. MINIMUM OUTDOOR AIR CONTROL (MEASURED AIRFLOW) - SYSTEM CONTROLLER SHALL MODULATE OUTDOOR AIR DAMPER TO MAINTAIN MINIMUM CFM SETPOINT MEASURED BY AN OUTDOOR AIR FLOW MEASURING STATION.
   1. CLOSE THE RETURN AIR DAMPER AND OPENING OF RELIEF AIR DAMPERS IN EQUAL PROPORTION TO THE OUTSIDE AIR DAMPER.
   2. REFER TO UNIT SCHEDULE FOR THE MINIMUM OUTDOOR AIRFLOW CFM SETPOINT.

SEQUENCE OF OPERATIONS

AHU-17,18 CONTROLS (CONT'D):

O. CO2 CONTROL - SYSTEM CONTROLLER SHALL OVERRIDE MIXED AIR DAMPER CONTROLS IN NON-VFD ECONOMIZING MODE USING SPACE CO2 SENSORS TO INCREASE OUTDOOR MINIMUM CFM TO A MAXIMUM CFM. INCLUDE CORRESPONDING CLOSING RETURN AIR DAMPER AND OPENING OF RELIEF AIR DAMPERS.
   1. UPON SPACE CO2 SENSOR EXCEEDING SETPOINT (800 PPM ADJ.), START TO MODULATE MIXED AIR DAMPERS (OUTDOOR AIR DAMPER OPENING) IN GRADUAL INCREMENTS UNTIL CO2 SENSOR SETPOINT IS SATISFIED.
      a. MODULATE MIXED AIR DAMPERS DOWN TO ITS ABSOLUTE MINIMUM POSITION UPON SATISFYING SENSOR SETPOINT.
      b. REFER TO VAV TERMINAL SEQUENCE FOR ADDITIONAL OPERATIONS AT THE ZONE LEVEL.
   2. ALARM HIGH CO2 AT 1,200 PPM (ADJ.)
   3. REFER TO UNIT SCHEDULE FOR THE OUTDOOR AIRFLOW CFM RANGE; HIGH AND LOW SETPOINTS.

P. DE-HUMIDIFICATION CONTROL - SYSTEM CONTROLLER SHALL ENABLE DE-HUMIDIFICATION MODE TO MAINTAIN A ZONE HUMIDITY SETPOINT OF 60%RH (ADJ.) MEASURED BY A WALL-MOUNTED HUMIDISTAT.
   1. DE-HUMIDIFICATION CONTROL SHALL OVERRIDE DISCHARGE AIR TEMPERATURE FUNCTION AND RESET DOWN TO 45°F (ADJ.).
   2. DISCHARGE AIR TEMPERATURE SHALL BE RESET BACK UP TO ITS NORMAL (NON-DEHUMIDIFICATION) SETPOINT UPON SATISFACTION OF THE ZONE HUMIDITY SENSOR.

Q. MIXED AIR TEMPERATURE CONTROL - SYSTEM CONTROLLER SHALL MODULATE MIXED AIR DAMPERS WHEN MIXED AIR TEMPERATURE SENSOR FALLS BELOW 45°F (ADJ.), THE OUTDOOR – RELIEF - RETURN DAMPERS SHALL MODULATE TO MAINTAIN A MIXED AIR TEMPERATURE OF 55°F (ADJ.).
   1. PROVIDE OVERRIDE OF MINIMUM OUTDOOR AIR VOLUME SETPOINT IN THE HEATING MODE TO MAINTAIN A 55°F (ADJ.) MIXED AIR TEMPERATURE.

R. FILTER MONITORING - SYSTEM CONTROLLER SHALL MONITOR AND ALARM FILTER DIFFERENTIAL PRESSURE FOR THE FOLLOWING:
   1. FINAL FILTERS
      a. MONITORING OF INCHES OF W.C.
      b. ALARM SETPOINT, COORDINATE WITH FILTER MFR. DIRTY FILTER VALUE, SUGGEST 1.00" W.C. (ADJ.)
   2. PRE-FILTERS
      a. MONITORING OF INCHES OF W.C.
      b. ALARM SETPOINT, COORDINATE WITH FILTER MFR. DIRTY FILTER VALUE, SUGGEST 0.5" W.C. (ADJ.)

S. UNOCCUPIED CONTROL – SYSTEM CONTROLLER SHALL INITIATE THE FOLLOWING BASED ON A FALL OR RISE IN SPACE TEMPERATURE:
   1. HEATING - SYSTEM CONTROLLER SHALL CYCLE SYSTEM ON (UNOCCUPIED HEATING MODE) WHEN A CALL FOR HEAT IS INITIATED BY ANY SPACE TEMPERATURE SENSOR DURING UNOCCUPIED MODE AND HEATING WATER SYSTEM IS OR CAN BE ENABLED. SYSTEM SHALL RESPOND BASED ON THE FOLLOWING:
      a. ENABLE FANS AND SYSTEM SHALL FUNCTION AS DESCRIBED IN OCCUPIED TEMPERATURE CONTROL OPERATION TO PROVIDE HEATING TO ZONE WITH THE EXCEPTION TO THE FOLLOWING:
         - MIXED AIR DAMPERS SHALL REMAIN CLOSED WITH RETURN DAMPER 100% OPENED AND OUTDOOR AND RELIEF 100% CLOSED.
         - COOLING SHALL BE DISABLED.
      b. SYSTEM DISABLED UPON SATISFYING THE CALL FOR HEAT AND HEATING CV SHALL REMAIN UNDER CONTROL OF COIL DISCHARGE AIR TEMPERATURE CONTROL.
   2. COOLING - SYSTEM CONTROLLER SHALL CYCLE SYSTEM ON (UNOCCUPIED COOLING MODE) WHEN A CALL FOR COOLING IS INITIATED BY ANY SPACE TEMPERATURE SENSOR DURING UNOCCUPIED MODE AND CHILLED WATER SYSTEM IS OR CAN BE ENABLED.
      a. ENABLE FANS AND SYSTEM SHALL FUNCTION AS DESCRIBED IN TEMPERATURE CONTROL OPERATION TO PROVIDE COOLING TO THE ZONE WITH THE EXCEPTION TO THE FOLLOWING:
         - MIXED AIR DAMPERS SHALL REMAIN CLOSED WITH RETURN DAMPER 100% OPENED AND OUTDOOR AND RELIEF 100% CLOSED.
         - HEATING SHALL BE DISABLED.
         - ECONOMIZER SHALL BE ENABLE IF OUTDOOR ENTHALPY IS LESS THAN THE RETURN AIR ENTHALPY.
      b. SYSTEM DISABLED UPON SATISFYING THE CALL FOR COOL.

T. HUMIDITY CONTROL - SYSTEM CONTROLLER SHALL CYCLE UNIT ON (UNOCCUPIED DE-HUMIDIFICATION MODE) WHEN A CALL FOR HIGH HUMIDITY IS INITIATED BY ANY SPACE HUMIDISTAT DURING UNOCCUPIED MODE AND CHILLED WATER SYSTEM IS OR CAN BE ENABLED.
   1. ENABLE FANS AND SYSTEM SHALL FUNCTION AS DESCRIBED IN DE-HUMIDIFICATION CONTROL OPERATIONS TO PROVIDE DE-HUMIDIFICATION TO THE ZONE WITH THE EXCEPTION TO THE FOLLOWING:
      a. MIXED AIR DAMPERS SHALL REMAIN CLOSED WITH RETURN DAMPER 100% OPENED AND OUTDOOR AND RELIEF 100% CLOSED.
      b. DISCHARGE AIR TEMPERATURE SETPOINT SHALL BE 55°F (ADJ.).
   2. SYSTEM DISABLED UPON SATISFYING THE CALL FOR HIGH HUMIDITY.

U. INITIAL STARTUP CONTROL - SYSTEM CONTROLLER SHALL ENABLE UNIT PRIOR TO SCHEDULED OCCUPANCY UTILIZING OPTIMUM START LOGIC TO ADJUST STARTUP TIME FOR UNIT BASED ON OUTDOOR AIR TEMPERATURE, BUILDING TEMPERATURE AND HISTORIC ELAPSE TIME TO REACH SETPOINT.
   1. UNIT SHALL ENERGIZE AND PROVIDE HEATING AND COOLING BASED ON THE SPACE TEMPERATURE SENSORS TO BRING SPACE TO OCCUPIED SETPOINT. THE OUTDOOR AND RELIEF AIR DAMPERS SHALL BE CLOSED UNLESS VFD ECONOMIZER IS ENABLED. ONCE OCCUPIED SETPOINT HAS BEEN REACHED, THE UNIT SHALL SWITCH TO OCCUPIED MODE.

V. PRE AND POST OCCUPANCY PURGE – WHEN ENABLED BY THE OPERATOR THE UNIT CONTROLLER WILL BEGIN THE OCCUPIED OPERATION 2 HOURS (ADJ.) PRIOR TO THE SCHEDULED OCCUPANCY AND EXTEND OPERATION 2 HOURS (ADJ.) BEYOND SCHEDULED OCCUPANCY.
   1. OUTDOOR AND RELIEF AIR DAMPERS SHALL BE AT THEIR MAXIMUM OPEN POSITION WHILE MAINTAINING THE MIXED AIR TEMPERATURE LIMIT.
   2. INTEGRATE PRE-PURGE FEATURE WITH THE OPTIMUM START LOGIC TO ALLOW BOTH OPERATIONS TO FUNCTION CONCURRENTLY (OUTDOOR AND RELIEF AIR DAMPERS OPEN) THUS NOT RUNNING SEQUENCES END-TO-END.

W. TIMED OVERRIDE CONTROL - SYSTEM CONTROLLER SHALL ENABLE UNIT WHEN ASSOCIATED TERMINAL UNIT TIMED OVERRIDE (2 HOURS (ADJ)) IS ENABLED, SYSTEM SHALL BE ENABLE AND FUNCTION AS IN OCCUPIED MODE.

X. BI-POLAR IONIZATION (BPI) – ENABLE BPI WHENEVER THE SUPPLY FANS ARE PROVEN ON. DISABLE BPI WHENEVER THE SUPPLY FANS ARE OFF.
   1. WHEN ENABLED AND STATUS IS SENSED BY THE CURRENT SENSOR, A RUN TIMER WILL BE ACTIVE.

Y. SAFETY SHUTDOWNS:
   1. PROVIDE A LOW-TEMPERATURE PROTECTION THERMOSTAT(S) ON THE LEAVING SIDE OF HEATING HOT WATER COIL WHICH WILL DE-ENERGIZE UNIT, CLOSE MIXED AIR DAMPERS (CLOSING OUTDOOR AND RELIEF AIR DAMPERS), CLOSE CHILLED WATER COIL CONTROL VALVE AND THE HEATING HOT WATER COIL CONTROL VALVE SHALL BE FULLY OPENED AND COIL PUMP ENERGIZED. PROVIDE MANUAL RESET.
   2. PROVIDE A HIGH STATIC PRESSURE SENSOR IN THE SUPPLY DISCHARGE PLENUM TO DE-ENERGIZE THE UNIT UPON SENSING A HIGH STATIC PRESSURE OF 4.0" W.C.. PROVIDE MANUAL RESET.
   3. PROVIDE A LOW-PRESSURE STATIC LIMIT IN THE RETURN PLENUM TO DE-ENERGIZE THE UNIT UPON SENSING A HIGH NEGATIVE STATIC PRESSURE OF -4.0" W.C.. PROVIDE MANUAL RESET.
   4. DUCT MOUNTED IONIZATION SMOKE DETECTOR(S) PROVIDED BY DIVISION 28 SHALL DE-ENERGIZE THE UNIT WHENEVER PRODUCTS OF COMBUSTION ARE SENSED.
   5. DISABLE THE BI-POLAR IONIZATION UPON OPENING OF THE ACCESS DOOR.

Z. THE FOLLOWING SHALL BE SUPPLIED AND INSTALLED BY TEMPERATURE CONTROL INSTALLER:
   1. SENSORS (TEMPERATURE, RELATIVE HUMIDITY, CO2, PRESSURE, AIRFLOW MEASURING DEVICES)

AA. THE FOLLOWING SHALL BE SUPPLIED BY TEMPERATURE CONTROL INSTALLER AND INSTALLED BY OTHERS:
   1. CONTROL VALVES
   2. DAMPERS

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ADDENDUM No. 2 **October 28, 2022**

ISSUED FOR **DATE**

PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

DATE
OCTOBER 3, 2022

SHEET TITLE
TEMPERATURE CONTROLS

A2

SHEET NUMBER
M 605
21-806.00

CONTROL POINTS

NUMBER	TAG	DESCRIPTION	ALARM	TREND	MISC.	REMARKS
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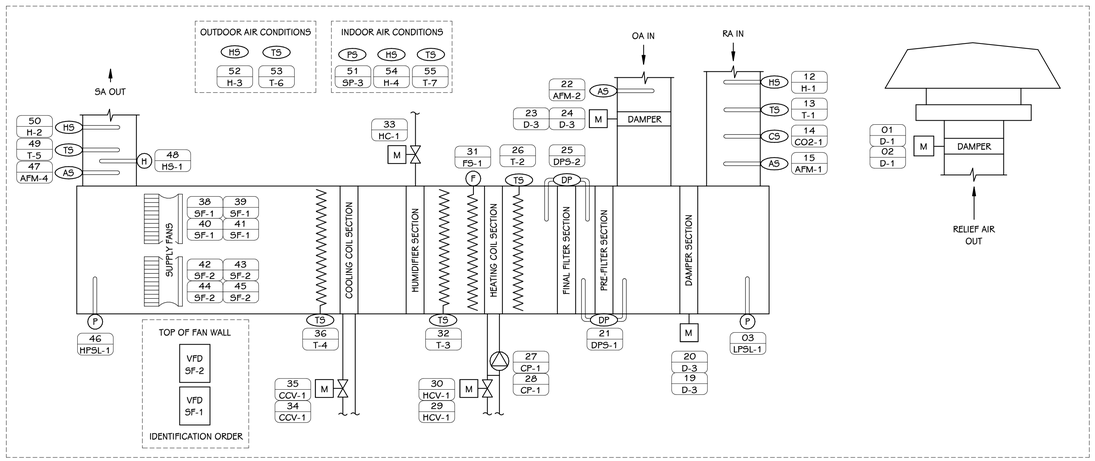
01	D-1	EXHAUST AIR DAMPER OUTPUT		∎		
02	D-1	EXHAUST AIR DAMPER POSITION		∎		
03	LPSL-1	LOW PRESSURE STATIC LIMIT	∎	∎		HARD WIRED SAFETY - MANUAL RESET
04	RAF-1	FAN AIR FLOW		∎		
05	RAF-1	FAN SPEED CONTROL		∎		
06	RAF-1	FAN ENABLE/DISABLE		∎		
07	RAF-1	FAN STATUS	∎	∎		
08	RAF-2	FAN AIR FLOW		∎		
09	RAF-2	FAN SPEED CONTROL		∎		
10	RAF-2	FAN ENABLE/DISABLE		∎		
11	RAF-2	FAN STATUS	∎	∎		
12	H-1	RETURN AIR HUMIDITY		∎		DISPLAY ENTHALPY BASED ON T4H READINGS
13	T-1	RETURN AIR TEMPERATURE		∎		DISPLAY ENTHALPY BASED ON T4H READINGS
14	H-4	INDOOR AIR HUMIDITY SENSOR		∎		
15	AFM-1	TOTAL RETURN AIR FLOW		∎		
16	D-2	RETURN AIR DAMPER OUTPUT		∎		
17	D-2	RETURN AIR DAMPER POSITION		∎		
18	SP-1	RETURN AIR PLENUM STATIC PRESSURE		∎		NOTE LOCATION ON AS-BUILTS
19	D-3	MIXED AIR DAMPER POSITION		∎		
20	D-3	MIXED AIR DAMPER OUTPUT		∎		
21	DPS-1	PRE-FILTER STATUS	∎	∎		
22	AFM-2	OUTDOOR AIR FLOW		∎		
23	D-3	OUTDOOR AIR DAMPER POSITION		∎		
24	D-3	OUTDOOR AIR DAMPER OUTPUT		∎		
25	DPS-2	FINAL FILTER STATUS	∎	∎		
26	T-2	MIXED AIR TEMPERATURE	∎	∎		
27	CP-1	PUMP STATUS	∎	∎		
28	CP-1	PUMP ENABLE/DISABLE		∎		
29	HCV-1	HEATING CONTROL VALVE POSITION		∎		
30	HCV-1	HEATING CONTROL VALVE OUTPUT		∎		
31	FS-1	FREEZE STAT ALARM STATUS	∎	∎		HARD WIRED SAFETY - MANUAL RESET
32	T-3	HEATING COIL DISCHARGE TEMPERATURE		∎		
33	T-6	OUTDOOR AIR TEMPERATURE		∎		GLOBAL
34	CCV-1	COOLING CONTROL VALVE POSITION		∎		
35	CCV-1	COOLING CONTROL VALVE OUTPUT		∎		
36	T-4	COOLING COIL DISCHARGE TEMPERATURE		∎		
37	H-3	OUTDOOR AIR HUMIDITY		∎		GLOBAL
38	SF-1	FAN AIR FLOW		∎		
39	SF-1	FAN SPEED CONTROL		∎		
40	SF-1	FAN ENABLE/DISABLE		∎		
41	SF-1	FAN STATUS	∎	∎		
42	SF-2	FAN AIR FLOW		∎		
43	SF-2	FAN SPEED CONTROL		∎		
44	SF-2	FAN ENABLE/DISABLE		∎		
45	SF-2	FAN STATUS	∎	∎		
46	HPSL-1	HIGH PRESSURE STATIC LIMIT	∎	∎		HARD WIRED SAFETY - MANUAL RESET
47	AFM-4	TOTAL SUPPLY AIR FLOW		∎		
48	T-7	INDOOR AIR TEMPERATURE		∎		
49	T-5	DISCHARGE AIR TEMPERATURE		∎		DISPLAY ENTHALPY BASED ON T4H READINGS
50	H-2	DISCHARGE AIR HUMIDITY		∎		DISPLAY ENTHALPY BASED ON T4H READINGS
51	SP-2	SUPPLY AIR STATIC PRESSURE		∎		NOTE LOCATION ON AS-BUILTS
52	SP-3	ROOM STATIC PRESSURE		∎		



AHU-19,20 CONTROLS DIAGRAM
SCALE: NONE

SEQUENCE OF OPERATIONS

NOTE: ALL LABOR, MATERIAL, EQUIPMENT AND SOFTWARE NOT SPECIFICALLY INDICATED WITHIN CONTROLS DRAWINGS THAT IS REQUIRED TO MEET THE FUNCTIONAL INTENT OF THE SEQUENCE OF OPERATIONS SHALL BE PROVIDED WITHOUT ADDITIONAL COST. POINT LISTS SHALL BE A GUIDE TO THE POINTS REQUIRED FOR CONTROL SYSTEM. FINAL POINTS SHALL BE DETERMINED BY SEQUENCE OF OPERATIONS. ALL SET POINTS SHALL BE OPERATOR ADJUSTABLE THROUGH THE BMS. ALL POINTS SHALL BE TRENDABLE.

AHU-19,20 CONTROLS:

A. PROVIDE DDC CONTROL AND MONITORING FOR AIR HANDLING SYSTEM. SYSTEM INCLUDES INDOOR VARIABLE VOLUME UNIT WITH SUPPLY FAN, VFD DRIVEN MOTORS, VFD DRIVENONOMIZER, PRE-FILTER, FINAL FILTER, PUMPED HOT WATER PREHEATING COIL WITH CONTROL VALVE AND ACTUATOR, AND CHILLED WATER COIL WITH CONTROL VALVE AND ACTUATOR. TEMPERATURE, HUMIDITY, AIRFLOW, AND PRESSURE SENSORS ARE REQUIRED AND BIPOLAR IONIZATION.

B. REFER TO VARIABLE AIR VOLUME (VAV) TERMINAL UNIT CONTROL ARTICLES FOR VAV TERMINAL UNIT OPERATION.

C. AIR HANDLING UNIT ADJUSTABLE SCHEDULE BASED ON THE FOLLOWING:
   1. TIME OF DAY (TOD) SCHEDULE.
      a. TO BE DETERMINED BY OWNER (CONSULT WITH OWNER).
      b. SUGGESTED OCCUPIED SCHEDULE: 7AM-5PM M-F, OFF SAT-SUN, OFF HOLIDAYS
   2. ENABLED AND DISABLED BASED ON MANUAL OVERRIDE FROM DDC.

D. AIR HANDLING UNIT ADJUSTABLE SETPOINTS:
   1. OCCUPIED 75°F COOLING / 70°F HEATING
   2. STANDBY 77°F COOLING / 68°F HEATING (BASED ON LIGHTING OCCUPANCY SENSORS)
   3. UNOCCUPIED 85°F COOLING / 62°F HEATING
   4. CO2 800 PPM MINIMUM / 1,000 PPM MAXIMUM

E. START/STOP, CONTROLLED DEVICES SHALL RESPOND AS FOLLOWS:
   1. WHEN INDEXED TO STOP:
      a. DISABLE SUPPLY AND RETURN FANS SIMULTANEOUSLY.
      b. COOLING CV 100% CLOSED.
      c. HEATING CV SHALL MODULATE TO MAINTAIN COIL DISCHARGE AIR TEMPERATURE SENSOR AT 80°F (ADJ.), WHEN OUTDOOR AIR TEMPERATURE IS BELOW 45°F (ADJ.).
      d. OUTDOOR AND RELIEF AIR DAMPERS 100% CLOSED.
      e. RETURN AIR DAMPER 100% OPENED.
      f. UVGI IS DISABLED FOLLOWING DELAY.
      g. BPI IS DISABLED.
   2. WHEN INDEXED TO START:
      a. ENABLE RETURN FANS FIRST, THEN SUPPLY FANS AFTER A DELAY.
      b. OPERATION OF SYSTEM TO RESUME AFTER START-UP DELAY.

F. SUPPLY FAN CONTROL (STATIC RESET) - SYSTEM CONTROLLER SHALL MODULATE SUPPLY FAN VFD DRIVEN MOTORS TO MAINTAIN AN ADJUSTABLE DUCT STATIC PRESSURE SETPOINT MEASURED BY A DUCT STATIC PRESSURE CONTROLLER LOCATED 75% OF MAXIMUM MAIN DUCT DISTANCE DOWNSTREAM OF SYSTEM (FINAL POSITION TO BE PROPOSED BY CONTRACTOR AND APPROVED BY ENGINEER). RESET STATIC PRESSURE DIFFERENTIAL SETPOINT BASED ON THE FOLLOWING:
   1. STATIC PRESSURE SETPOINT SHALL BE RESET USING "TRIM AND RESPOND" LOGIC WITHIN THE RANGE OF 0.15" W.C. TO 1.75" W.C. (ADJ.). WHEN THE SYSTEM IS OFF, THE SETPOINT SHALL BE 0.5" W.C. (ADJ.). WHEN SYSTEM IS ON, EVERY TEN (10) MINUTES, TRIM THE SETPOINT BY 0.04" W.C. IF THERE ARE TWO (2) OR FEWER ZONE PRESSURE REQUESTS. IF THERE ARE MORE THAN TWO (2) ZONE PRESSURE REQUESTS, RESPOND BY INCREASING THE SETPOINT BY 0.06" W.C..
      a. A REQUEST IS GENERATED WHENEVER TERMINAL UNIT DAMPER IS GREATER THAN 90% (ADJ.) OPEN UNTIL IT DROPS TO 80% (ADJ.) OPEN.
      b. EXCLUDE ANY TERMINAL UNITS SET-UP AS CONSTANT VOLUME FROM "TRIM AND RESPOND" LOGIC.
      c. PROVIDE THE ABILITY TO OMIT ANY VAV TERMINAL UNITS FROM "TRIM AND RESPOND" LOGIC.
      d. TEST AND BALANCE CONTRACTOR SHALL PROVIDE MINIMUM AND MAXIMUM STATIC SETPOINTS, WHICH WILL BE DETERMINED DURING THE BALANCING PROCESS.
   2. DISCHARGE PRESSURE HIGH LIMIT WILL CONTROL STATIC PRESSURE AT UNIT FROM EXCEEDING 3.0" W.G. (ADJ.) WITH OVERRIDE CONTROL OF SUPPLY FANS VFD DRIVEN MOTORS.

G. RELIEF FAN CONTROL (ZONE PRESSURE) - SYSTEM CONTROLLER SHALL MODULATE RETURN FAN VFD DRIVEN MOTOR TO MAINTAIN ZONE PRESSURE SETPOINT MEASURED BY A ZONE PRESSURE CONTROLLER LOCATED IN THE ZONE SERVED.
   1. THE ZONE STATIC PRESSURE SETPOINT (ADJ.) SHALL BE A SETPOINT THAT CONTROLS TO A SLIGHTLY POSITIVE PRESSURE.

H. FAN VFD DRIVEN MOTOR CONTROLLERS SHALL BE MONITORED BASED ON THE FOLLOWING:
   1. VIA BACNET/MODBUS CONNECTION (POWER USAGE / % SPEED / HOURS / FAULT / ALARM)

I. FANS INITIAL START-UP CONTROL – WHEN INDEXED TO START, SYSTEM CONTROLLER SHALL ENABLE FANS BASED ON THE FOLLOWING:
   1. WHEN ENABLED, AND AFTER A DELAY OF TWO (2) MINUTES (ADJ.) WITH NO STATUS SENSED, DDC SHALL INDICATE A CRITICAL ALARM.
      a. IF ANY FAN (SUPPLY OR RETURN) STATUS IS NOT SENSED, THE SYSTEM SHALL BE DISABLED AND AN ALARM IS INITIATED.
   2. WHEN ENABLED AND STATUS IS SENSED BY THE CURRENT SENSOR, A RUN TIMER WILL BE ACTIVE.

J. DISCHARGE AIR TEMPERATURE CONTROL (DAT RESET) - SYSTEM CONTROLLER SHALL MODULATE HEATING AND COOLING SOURCES AND MIXED AIR DAMPERS TO MAINTAIN AN ADJUSTABLE DISCHARGE AIR TEMPERATURE SETPOINT MEASURED BY A DUCT TEMPERATURE SENSOR LOCATED DOWNSTREAM OF UNIT. RESET DISCHARGE AIR TEMPERATURE SETPOINT AS FOLLOWS:
   1. ALL TERMINAL AIR UNIT ZONE SPACE TEMPERATURES FOR THE SERVING AHU SHALL BE AVERAGED. A REVERSE ACTING PI (PROPORTIONAL, INTEGRAL) LOOP SHALL BE CONFIGURED SUCH THAT ITS INPUT SHALL BE THE AVERAGE ZONE SPACE TEMPERATURE AND ITS SETPOINT SHALL BE HALFWAY BETWEEN THE GLOBAL REHEAT AND COOLING SETPOINTS. FOR EXAMPLE, IF THE ZONE SPACE TEMPERATURE REHEAT SETPOINT IS 70°F AND THE ZONE SPACE TEMPERATURE COOLING SETPOINT IS 75°F, THE RESULTING AVERAGE SPACE TEMP SETPOINT WOULD BE 72.5°F.
      a. THE PI LOOP OUTPUT SHALL BE USED AS THE AHU DISCHARGE TEMPERATURE SETPOINT AND SHALL BE LIMITED BETWEEN 55°F AND 75°F (ADJ.).
      b. DISCHARGE AIR TEMPERATURE CONTROL SEQUENCE IS DESIGNED TO MAINTAIN MOST SPACES IN THE AHU SERVED ZONE AT OR CLOSE TO THE AVERAGE SPACE TEMPERATURE SETPOINT WHICH SHOULD POSITION MOST TERMINAL AIR UNITS AT MINIMUM CFM WITH NO REHEAT REQUIRED.

K. DEWPOINT CONTROL - UNIT CONTROLLER SHALL LIMIT THE UNIT DISCHARGE DEW POINT TO 60° F (ADJ.). MODULATE COOLING CONTROL VALVE TO MAINTAIN AN ADJUSTABLE DISCHARGE AIR DEWPOINT SETPOINT MEASURED BY DUCT TEMPERATURE AND HUMIDITY SENSORS LOCATED DOWNSTREAM OF UNIT.

L. COIL PUMP CONTROL BASED ON THE FOLLOWING:
   1. HEATING HOT WATER COIL PUMP SHALL RUN WHEN THE SYSTEM IS IN HEATING MODE (WHEN CV IS GREATER THAN 10% OPEN).
   2. PUMP SHALL RUN CONTINUOUSLY WHENEVER THE OUTDOOR AIR TEMPERATURE IS LESS THAN 36°F.

M. ECONOMIZER CONTROL (ENTHALPY) - SYSTEM CONTROLLER SHALL MODULATE MIXED AIR DAMPERS TO MEET UNIT DISCHARGE AIR TEMPERATURE SETPOINT WHEN OUTDOOR AIR ENTHALPY IS BELOW THE RETURN AIR ENTHALPY.
   1. WHEN BTU CALCULATION FOR OUTDOOR AIR CONDITIONS EXCEEDS 27 BTUH/LB (ADJ.), ECONOMIZER SHALL BE DISABLED.

N. MINIMUM OUTDOOR AIR CONTROL (MEASURED AIRFLOW) - SYSTEM CONTROLLER SHALL MODULATE OUTDOOR AIR DAMPER TO MAINTAIN MINIMUM CFM SETPOINT MEASURED BY AN OUTDOOR AIR FLOW MEASURING STATION.
   1. CLOSE THE RETURN AIR DAMPER AND OPENING OF RELIEF AIR DAMPERS IN EQUAL PROPORTION TO THE OUTSIDE AIR DAMPER.
   2. REFER TO UNIT SCHEDULE FOR THE MINIMUM OUTDOOR AIRFLOW CFM SETPOINT.

O. CO2 CONTROL - SYSTEM CONTROLLER SHALL OVERRIDE MIXED AIR DAMPER CONTROLS IN NON-VFD ECONOMIZING MODE USING SPACE CO2 SENSORS TO INCREASE OUTDOOR MINIMUM CFM TO A MAXIMUM CFM. INCLUDE CORRESPONDING CLOSING RETURN AIR DAMPER AND OPENING OF RELIEF AIR DAMPERS.
   1. UPON SPACE CO2 SENSOR EXCEEDING SETPOINT (800 PPM ADJ.), START TO MODULATE MIXED AIR DAMPERS (OUTDOOR AIR DAMPER OPENING) IN GRADUAL INCREMENTS UNTIL CO2 SENSOR SETPOINT IS SATISFIED.
      a. MODULATE MIXED AIR DAMPERS DOWN TO ITS ABSOLUTE MINIMUM POSITION UPON SATISFYING SENSOR SETPOINT.
      b. REFER TO VAV TERMINAL SEQUENCE FOR ADDITIONAL OPERATIONS AT THE ZONE LEVEL.

SEQUENCE OF OPERATIONS

AHU-19,20 CONTROLS (CONT'D):

   2. ALARM HIGH CO2 AT 1,200 PPM (ADJ.)
   3. REFER TO UNIT SCHEDULE FOR THE OUTDOOR AIRFLOW CFM RANGE; HIGH AND LOW SETPOINTS.

P. DE-HUMIDIFICATION CONTROL - SYSTEM CONTROLLER SHALL ENABLE DE-HUMIDIFICATION MODE TO MAINTAIN A ZONE HUMIDITY SETPOINT OF 60%RH (ADJ.) MEASURED BY A WALL-MOUNTED HUMIDISTAT.
   1. DE-HUMIDIFICATION CONTROL SHALL OVERRIDE DISCHARGE AIR TEMPERATURE FUNCTION AND RESET DOWN TO 45°F (ADJ.).
   2. DISCHARGE AIR TEMPERATURE SHALL BE RESET BACK UP TO ITS NORMAL (NON-DEHUMIDIFICATION) SETPOINT UPON SATISFACTION OF THE ZONE HUMIDITY SENSOR.

Q. MIXED AIR TEMPERATURE CONTROL - SYSTEM CONTROLLER SHALL MODULATE MIXED AIR DAMPERS WHEN MIXED AIR TEMPERATURE SENSOR FALLS BELOW 45°F (ADJ.), THE OUTDOOR – RELIEF - RETURN DAMPERS SHALL MODULATE TO MAINTAIN A MIXED AIR TEMPERATURE OF 55°F (ADJ.).
   1. PROVIDE OVERRIDE OF MINIMUM OUTDOOR AIR VOLUME SETPOINT IN THE HEATING MODE TO MAINTAIN A 55°F (ADJ.) MIXED AIR TEMPERATURE.

R. FILTER MONITORING - SYSTEM CONTROLLER SHALL MONITOR AND ALARM FILTER DIFFERENTIAL PRESSURE FOR THE FOLLOWING:
   1. FINAL FILTERS
      a. MONITORING OF INCHES OF W.C.
      b. ALARM SETPOINT, COORDINATE WITH FILTER MFR. DIRTY FILTER VALUE, SUGGEST 1.00" W.C. (ADJ.)
   2. PRE-FILTERS
      a. MONITORING OF INCHES OF W.C.
      b. ALARM SETPOINT, COORDINATE WITH FILTER MFR. DIRTY FILTER VALUE, SUGGEST 0.5" W.C. (ADJ.)

S. UNOCCUPIED CONTROL – SYSTEM CONTROLLER SHALL INITIATE THE FOLLOWING BASED ON A FALL OR RISE IN SPACE TEMPERATURE:
   1. HEATING - SYSTEM CONTROLLER SHALL CYCLE SYSTEM ON (UNOCCUPIED HEATING MODE) WHEN A CALL FOR HEAT IS INITIATED BY ANY SPACE TEMPERATURE SENSOR DURING UNOCCUPIED MODE AND HEATING WATER SYSTEM IS OR CAN BE ENABLED. SYSTEM SHALL RESPOND BASED ON THE FOLLOWING:
      a. ENABLE FANS AND SYSTEM SHALL FUNCTION AS DESCRIBED IN OCCUPIED TEMPERATURE CONTROL OPERATION TO PROVIDE HEATING TO ZONE WITH THE EXCEPTION TO THE FOLLOWING:
         - MIXED AIR DAMPERS SHALL REMAIN CLOSED WITH RETURN DAMPER 100% OPENED AND OUTDOOR AND RELIEF 100% CLOSED.
         - COOLING SHALL BE DISABLED.
      b. SYSTEM DISABLED UPON SATISFYING THE CALL FOR HEAT AND HEATING CV SHALL REMAIN UNDER CONTROL OF COIL DISCHARGE AIR TEMPERATURE CONTROL.
   2. COOLING - SYSTEM CONTROLLER SHALL CYCLE SYSTEM ON (UNOCCUPIED COOLING MODE) WHEN A CALL FOR COOLING IS INITIATED BY ANY SPACE TEMPERATURE SENSOR DURING UNOCCUPIED MODE AND CHILLED WATER SYSTEM IS OR CAN BE ENABLED.
      a. ENABLE FANS AND SYSTEM SHALL FUNCTION AS DESCRIBED IN TEMPERATURE CONTROL OPERATION TO PROVIDE COOLING TO THE ZONE WITH THE EXCEPTION TO THE FOLLOWING:
         - MIXED AIR DAMPERS SHALL REMAIN CLOSED WITH RETURN DAMPER 100% OPENED AND OUTDOOR AND RELIEF 100% CLOSED.
         - HEATING SHALL BE DISABLED.
         - ECONOMIZER SHALL BE ENABLE IF OUTDOOR ENTHALPY IS LESS THAN THE RETURN AIR ENTHALPY.
      b. SYSTEM DISABLED UPON SATISFYING THE CALL FOR COOL.

T. HUMIDITY CONTROL - SYSTEM CONTROLLER SHALL CYCLE UNIT ON (UNOCCUPIED DE-HUMIDIFICATION MODE) WHEN A CALL FOR HIGH HUMIDITY IS INITIATED BY ANY SPACE HUMIDISTAT DURING UNOCCUPIED MODE AND CHILLED WATER SYSTEM IS OR CAN BE ENABLED.
   1. ENABLE FANS AND SYSTEM SHALL FUNCTION AS DESCRIBED IN DE-HUMIDIFICATION CONTROL OPERATIONS TO PROVIDE DE-HUMIDIFICATION TO THE ZONE WITH THE EXCEPTION TO THE FOLLOWING:
      a. MIXED AIR DAMPERS SHALL REMAIN CLOSED WITH RETURN DAMPER 100% OPENED AND OUTDOOR AND RELIEF 100% CLOSED.
      b. DISCHARGE AIR TEMPERATURE SETPOINT SHALL BE 55°F (ADJ.).
   2. SYSTEM DISABLED UPON SATISFYING THE CALL FOR HIGH HUMIDITY.

U. INITIAL STARTUP CONTROL - SYSTEM CONTROLLER SHALL ENABLE UNIT PRIOR TO SCHEDULED OCCUPANCY UTILIZING OPTIMUM START LOGIC TO ADJUST STARTUP TIME FOR UNIT BASED ON OUTDOOR AIR TEMPERATURE, BUILDING TEMPERATURE AND HISTORIC ELAPSE TIME TO REACH SETPOINT.
   1. UNIT SHALL ENERGIZE AND PROVIDE HEATING AND COOLING BASED ON THE SPACE TEMPERATURE SENSORS TO BRING SPACE TO OCCUPIED SETPOINT. THE OUTDOOR AND RELIEF AIR DAMPERS SHALL BE CLOSED UNLESS VFD ECONOMIZER IS ENABLED. ONCE OCCUPIED SETPOINT HAS BEEN REACHED, THE UNIT SHALL SWITCH TO OCCUPIED MODE.

V. PRE AND POST OCCUPANCY PURGE – WHEN ENABLED BY THE OPERATOR THE UNIT CONTROLLER WILL BEGIN THE OCCUPIED OPERATION 2 HOURS (ADJ.) PRIOR TO THE SCHEDULED OCCUPANCY AND EXTEND OPERATION 2 HOURS (ADJ.) BEYOND SCHEDULED OCCUPANCY.
   1. OUTDOOR AND RELIEF AIR DAMPERS SHALL BE AT THEIR MAXIMUM OPEN POSITION WHILE MAINTAINING THE MIXED AIR TEMPERATURE LIMIT.
   2. INTEGRATE PRE-PURGE FEATURE WITH THE OPTIMUM START LOGIC TO ALLOW BOTH OPERATIONS TO FUNCTION CONCURRENTLY (OUTDOOR AND RELIEF AIR DAMPERS OPEN) THUS NOT RUNNING SEQUENCES END-TO-END.

W. TIMED OVERRIDE CONTROL - SYSTEM CONTROLLER SHALL ENABLE UNIT WHEN ASSOCIATED TERMINAL UNIT TIMED OVERRIDE (2 HOURS (ADJ)) IS ENABLED, SYSTEM SHALL BE ENABLE AND FUNCTION AS IN OCCUPIED MODE.

X. BI-POLAR IONIZATION (BPI) – ENABLE BPI WHENEVER THE SUPPLY FANS ARE PROVEN ON. DISABLE BPI WHENEVER THE SUPPLY FANS ARE OFF.
   1. WHEN ENABLED AND STATUS IS SENSED BY THE CURRENT SENSOR, A RUN TIMER WILL BE ACTIVE.

Y. SAFETY SHUTDOWNS:
   1. PROVIDE A LOW-TEMPERATURE PROTECTION THERMOSTAT(S) ON THE LEAVING SIDE OF HEATING HOT WATER COIL WHICH WILL DE-ENERGIZE UNIT, CLOSE MIXED AIR DAMPERS (CLOSING OUTDOOR AND RELIEF AIR DAMPERS), CLOSE CHILLED WATER COIL CONTROL VALVE AND THE HEATING HOT WATER COIL CONTROL VALVE SHALL BE FULLY OPENED AND COIL PUMP ENERGIZED. PROVIDE MANUAL RESET.
   2. PROVIDE A HIGH STATIC PRESSURE SENSOR IN THE SUPPLY DISCHARGE PLENUM TO DE-ENERGIZE THE UNIT UPON SENSING A HIGH STATIC PRESSURE OF 4.0" W.C.. PROVIDE MANUAL RESET.
   3. PROVIDE A LOW-PRESSURE STATIC LIMIT IN THE RETURN PLENUM TO DE-ENERGIZE THE UNIT UPON SENSING A HIGH NEGATIVE STATIC PRESSURE OF -4.0" W.C.. PROVIDE MANUAL RESET.
   4. DUCT MOUNTED IONIZATION SMOKE DETECTOR(S) PROVIDED BY DIVISION 28 SHALL DE-ENERGIZE THE UNIT WHENEVER PRODUCTS OF COMBUSTION ARE SENSED.
   5. DISABLE THE BI-POLAR IONIZATION UPON OPENING OF THE ACCESS DOOR.

Z. THE FOLLOWING SHALL BE SUPPLIED AND INSTALLED BY TEMPERATURE CONTROL INSTALLER:
   1. SENSORS (TEMPERATURE, RELATIVE HUMIDITY, CO2, PRESSURE, AIRFLOW MEASURING DEVICES)

AA. THE FOLLOWING SHALL BE SUPPLIED BY TEMPERATURE CONTROL INSTALLER AND INSTALLED BY OTHERS:
   1. CONTROL VALVES
   2. DAMPERS

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ADDENDUM No. 2 **October 28, 2022**

ISSUED FOR **DATE**

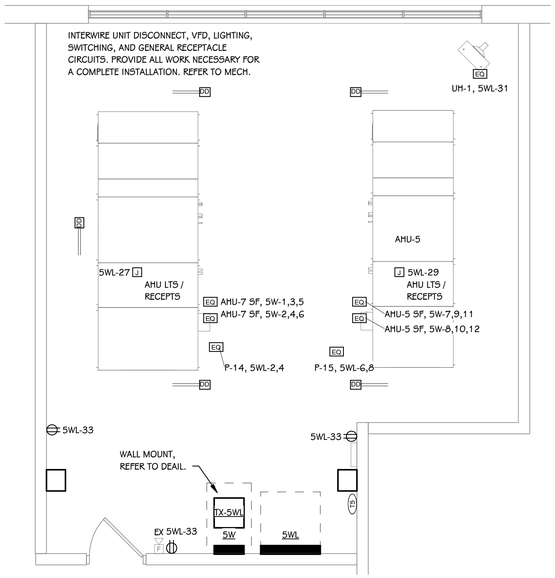
PROJECT TITLE
KALAMAZOO CENTRAL
HIGH SCHOOL
MECHANICAL
IMPROVEMENTS
PROJECT

OWNER
KALAMAZOO PUBLIC
SCHOOLS
Kalamazoo, Michigan

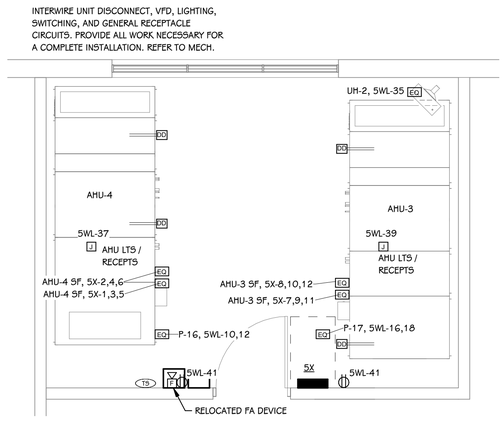
DATE
OCTOBER 3, 2022

SHEET TITLE
TEMPERATURE CONTROLS

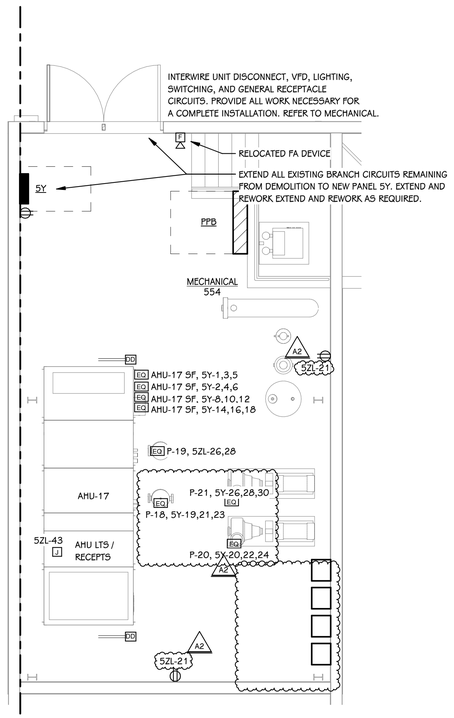
SHEET NUMBER
M 606
21-806.00



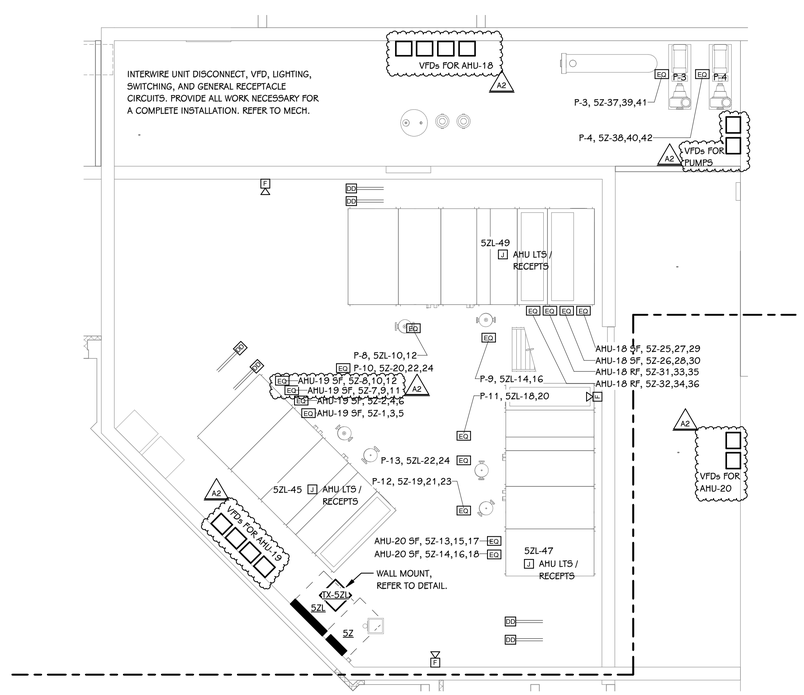
1 / E 150 MEZZANINE POWER PLAN - FAN ROOM 5-202
1/4" = 1'-0"



2 / E 150 MEZZANINE POWER PLAN - FAN ROOM 5-206
1/4" = 1'-0"



3 / E 150 MECHANICAL POWER PLAN - MECHANICAL 554
1/4" = 1'-0"



5 / E 150 MEZZANINE POWER PLAN - UPPER FAN ROOM 3-200
3/16" = 1'-0"

ELECTRICAL KEYED NOTES

1 TEMPORARILY SUPPORT EXISTING FIRE ALARM DEVICE TO REMAIN WHILE EXISTING CEILING OR GRID IS BEING DEMOLISHED. REINSTALL EXISTING DEVICE IN NEW GRID. COORDINATE WITH MECHANICAL AND GENERAL TRADES.

2 TEMPORARILY SUPPORT 4 EXISTING SOUND ENHANCEMENT SPEAKERS ALONG WITH IR INPUT DEVICE TO REMAIN WHILE EXISTING CEILING OR GRID IS BEING DEMOLISHED. REINSTALL EXISTING DEVICES IN NEW GRID. COORDINATE WITH MECHANICAL AND GENERAL TRADES.

3 TEMPORARILY SUPPORT EXISTING WIRELESS ACCESS POINT TO REMAIN WHILE EXISTING CEILING OR GRID IS BEING DEMOLISHED. REINSTALL EXISTING DEVICE IN NEW GRID. COORDINATE WITH MECHANICAL AND GENERAL TRADES.

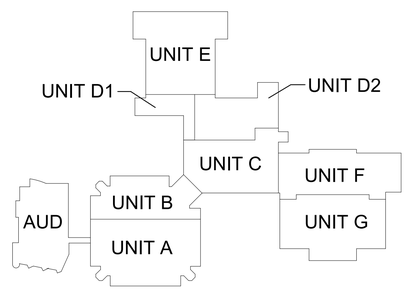
4 TEMPORARILY SUPPORT EXISTING PAGING SPEAKER TO REMAIN WHILE EXISTING CEILING OR GRID IS BEING DEMOLISHED. REINSTALL EXISTING DEVICE IN NEW GRID. COORDINATE WITH MECHANICAL AND GENERAL TRADES.

5 CONNECT EVERY 4 TO 6 TERMINAL UNITS TO A SINGLE CIRCUIT. UTILIZE CIRCUITS MADE AVAILABLE THROUGH DEMOLITION UNLESS SPECIFIED OTHERWISE. PROVIDE CIRCUIT FOR TRANSFORMER TO LOW VOLTAGE TERMINAL UNIT BY MECHANICAL, COORDINATE LOCATIONS AND QUANTITIES WITH MECHANICAL.

6 CONNECT NEW MECHANICAL EQUIPMENT TO CIRCUIT MADE AVAILABE THROUGH DEMOLITION. EXTEND CIRCUIT AS REQUIRED.

7 PROVIDE ALL WIRING BETWEEN INDOOR AND OUTDOOR SPLIT SYSTEM PER MANUFACTURER INSTRUCTIONS. CONNECT CONDENSATE PUMP TO CIRCUIT SHOWN.

KALAMAZOO CENTRAL HIGH SCHOOL



KEY PLAN
SCALE: NO SCALE

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ADDENDUM #2	10/28/2022
ISSUED FOR	DATE

PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

SHEET TITLE
MEZZANINE POWER PLANS

DATE
OCTOBER 3, 2022

SHEET NUMBER
E 150
21-806.00

ELECTRICAL HVAC FEEDER SCHEDULE

DESCRIPTION	FED FROM	DISCONNECT MEANS	CURRENT (FLA)	FEEDER BREAKER / POLES	FEEDER # OF SETS	FEEDER WIRE	FEEDER GROUND	FEEDER EMT	FEED VOLT DROP %
480 V									
HVAC - ACCU-3	5X	NEMA 3R DISCONNECT SWITCH	31 A	40 A / 3	1 SET	4 #8	#10 GND.	1"	1.27%
HVAC - ACCU-4	5X	NEMA 3R DISCONNECT SWITCH	31 A	40 A / 3	1 SET	4 #8	#10 GND.	1"	1.10%
HVAC - ACCU-5	5W	NEMA 3R DISCONNECT SWITCH	21 A	30 A / 3	1 SET	4 #10	#10 GND.	3/4"	1.08%
HVAC - ACCU-7	5W	NEMA 3R DISCONNECT SWITCH	31 A	40 A / 3	1 SET	4 #8	#10 GND.	1"	0.90%
HVAC - AHU-3 5F	5X	DISCONNECT SWITCH	3 A	20 A / 3	1 SET	4 #10	#10 GND.	3/4"	0.18%
HVAC - AHU-3 5F	5X	DISCONNECT SWITCH	3 A	20 A / 3	1 SET	4 #12	#12 GND.	3/4"	0.10%
HVAC - AHU-4 5F	5X	DISCONNECT SWITCH	3 A	20 A / 3	1 SET	4 #10	#10 GND.	3/4"	0.16%
HVAC - AHU-4 5F	5X	DISCONNECT SWITCH	3 A	20 A / 3	1 SET	4 #12	#12 GND.	3/4"	0.13%
HVAC - AHU-5 5F	5W	DISCONNECT SWITCH	3 A	20 A / 3	1 SET	4 #12	#10 GND.	3/4"	0.39%
HVAC - AHU-5 5F	5W	DISCONNECT SWITCH	3 A	20 A / 3	1 SET	4 #10	#12 GND.	3/4"	0.08%
HVAC - AHU-7 5F	5W	DISCONNECT SWITCH	3 A	20 A / 3	1 SET	4 #10	#10 GND.	3/4"	0.26%
HVAC - AHU-7 5F	5W	DISCONNECT SWITCH	3 A	20 A / 3	1 SET	4 #12	#12 GND.	3/4"	0.10%
HVAC - AHU-17 5F	5Y	DISCONNECT SWITCH	8 A	20 A / 3	1 SET	4 #10	#10 GND.	3/4"	0.22%
HVAC - AHU-17 5F	5Y	DISCONNECT SWITCH	8 A	20 A / 3	1 SET	4 #12	#12 GND.	3/4"	0.33%
HVAC - AHU-17 5F	5Y	DISCONNECT SWITCH	8 A	20 A / 3	1 SET	4 #12	#12 GND.	3/4"	0.33%
HVAC - AHU-17 5F	5Y	DISCONNECT SWITCH	8 A	20 A / 3	1 SET	4 #12	#12 GND.	3/4"	0.33%
HVAC - AHU-18 RF	5Z	DISCONNECT SWITCH	8 A	20 A / 3	1 SET	4 #12	#12 GND.	3/4"	0.38%
HVAC - AHU-18 RF	5Z	DISCONNECT SWITCH	8 A	20 A / 3	1 SET	4 #12	#12 GND.	3/4"	0.37%
HVAC - AHU-18 5F	5Z	DISCONNECT SWITCH	14 A	25 A / 3	1 SET	4 #8	#10 GND.	1"	0.30%
HVAC - AHU-18 5F	5Z	DISCONNECT SWITCH	14 A	25 A / 3	1 SET	4 #10	#10 GND.	3/4"	0.46%
HVAC - AHU-19 5F	5Z	DISCONNECT SWITCH	8 A	20 A / 3	1 SET	4 #12	#10 GND.	3/4"	0.28%
HVAC - AHU-19 5F	5Z	DISCONNECT SWITCH	8 A	20 A / 3	1 SET	4 #12	#12 GND.	3/4"	0.24%
HVAC - AHU-19 5F	5Z	DISCONNECT SWITCH	8 A	20 A / 3	1 SET	4 #12	#12 GND.	3/4"	0.24%
HVAC - AHU-19 5F	5Z	DISCONNECT SWITCH	8 A	20 A / 3	1 SET	4 #12	#12 GND.	3/4"	0.23%
HVAC - AHU-20 5F	5Z	DISCONNECT SWITCH	3 A	20 A / 3	1 SET	4 #12	#10 GND.	3/4"	0.18%
HVAC - AHU-20 5F	5Z	DISCONNECT SWITCH	3 A	20 A / 3	1 SET	4 #12	#12 GND.	3/4"	0.11%
HVAC - P-3	5Z	DISCONNECT SWITCH	11 A	20 A / 3	1 SET	4 #12	#10 GND.	3/4"	0.75%
HVAC - P-4	5Z	NEMA 3R DISCONNECT SWITCH	11 A	20 A / 3	1 SET	4 #12	#10 GND.	3/4"	0.78%
HVAC - P-10	5Z	DISCONNECT SWITCH	5 A	20 A / 3	1 SET	4 #12	#12 GND.	3/4"	0.17%
HVAC - P-12	5Z	DISCONNECT SWITCH	5 A	20 A / 3	1 SET	4 #12	#12 GND.	3/4"	0.16%
HVAC - P-18	5Y	DISCONNECT SWITCH	5 A	20 A / 3	1 SET	4 #12	#10 GND.	3/4"	0.20%
HVAC - P-20	5Y	DISCONNECT SWITCH	11 A	20 A / 3	1 SET	4 #12	#12 GND.	3/4"	0.61%
HVAC - P-21	5Y	DISCONNECT SWITCH	11 A	20 A / 3	1 SET	4 #12	#12 GND.	3/4"	0.59%
HVAC - RTU-500	5Y	NEMA 3R DISCONNECT SWITCH	63 A	80 A / 3	1 SET	4 #4	#8 GND.	1 1/4"	1.22%
208 V									
HVAC - VUV-540	5WL	MANUFACTURER	24 A	40 A / 3	1 SET	3 #8	#10 GND.	3/4"	1.24%
208 V									
HVAC - ACCU-430A	5ZL	NEMA 3R DISCONNECT SWITCH	29 A	50 A / 2	1 SET	3 #8	#8 GND.	3/4"	1.84%
HVAC - ACCU-430B	5ZL	NEMA 3R DISCONNECT SWITCH	28 A	50 A / 2	1 SET	3 #8	#8 GND.	3/4"	1.77%
HVAC - ACCU-513	5WL	NEMA 3R DISCONNECT SWITCH	23 A	45 A / 2	1 SET	3 #8	#10 GND.	3/4"	4.01%
HVAC - ACCU-519	5WL	NEMA 3R DISCONNECT SWITCH	23 A	45 A / 2	1 SET	3 #8	#10 GND.	3/4"	3.78%
HVAC - ACCU-521A	5WL	NEMA 3R DISCONNECT SWITCH	23 A	45 A / 2	1 SET	3 #8	#10 GND.	3/4"	2.97%
HVAC - ACCU-521B	5WL	NEMA 3R DISCONNECT SWITCH	23 A	45 A / 2	1 SET	3 #8	#10 GND.	3/4"	3.23%
HVAC - P-8	5ZL	VFD	4 A	20 A / 2	1 SET	3 #12	#10 GND.	3/4"	0.47%
HVAC - P-9	5ZL	VFD	4 A	20 A / 2	1 SET	3 #12	#10 GND.	3/4"	0.50%
HVAC - P-11	5ZL	VFD	4 A	20 A / 2	1 SET	3 #12	#10 GND.	3/4"	0.45%
HVAC - P-13	5ZL	VFD	8 A	20 A / 2	1 SET	3 #12	#10 GND.	3/4"	1.07%
HVAC - P-14	5WL	VFD	6 A	20 A / 2	1 SET	3 #12	#10 GND.	3/4"	1.96%
HVAC - P-15	5WL	VFD	6 A	20 A / 2	1 SET	3 #12	#10 GND.	3/4"	1.84%
HVAC - P-16	5WL	VFD	6 A	20 A / 2	1 SET	3 #12	#10 GND.	3/4"	1.28%
HVAC - P-17	5WL	VFD	6 A	20 A / 2	1 SET	3 #12	#12 GND.	3/4"	1.82%
HVAC - P-19	5ZL	VFD	8 A	20 A / 2	1 SET	3 #12	#10 GND.	3/4"	2.73%

EXHAUST FANS FEEDER SCHEDULE

DESCRIPTION	FED FROM	DISCONNECT MEANS	CURRENT (FLA)	FEEDER BREAKER / POLES	FEEDER # OF SETS	FEEDER WIRE	FEEDER GROUND	FEEDER EMT	FEED VOLT DROP %
480 V									
HVAC - EF-554	5Y	NEMA 3R DISCONNECT SWITCH	14 A	20 A / 3	1 SET	4 #12	#10 GND.	3/4"	1.01%
120 V									
HVAC - EF-401C	5ZL	MANUFACTURER	3 A	20 A / 1	1 SET	3 #10	#10 GND.	3/4"	1.21%
HVAC - EF-430	5ZL	MANUFACTURER	14 A	20 A / 1	1 SET	3 #10	#10 GND.	3/4"	2.71%
HVAC - EF-430A	5ZL	MANUFACTURER	15 A	20 A / 1	1 SET	3 #10	#10 GND.	3/4"	3.25%
HVAC - EF-430B	5ZL	MANUFACTURER	14 A	20 A / 1	1 SET	3 #10	#10 GND.	3/4"	2.91%
HVAC - EF-430C	5ZL	MANUFACTURER	15 A	20 A / 1	1 SET	3 #10	#10 GND.	3/4"	3.20%
HVAC - EF-430D	5ZL	MANUFACTURER	15 A	20 A / 1	1 SET	3 #10	#10 GND.	3/4"	3.81%
HVAC - EF-432	5ZL	MANUFACTURER	1 A	20 A / 1	1 SET	3 #10	#10 GND.	3/4"	0.19%
HVAC - EF-500	4LB	MANUFACTURER	1 A	20 A / 1	1 SET	3 #10	#10 GND.	3/4"	0.17%
HVAC - EF-501	4LB	MANUFACTURER	1 A	20 A / 1	1 SET	3 #10	#10 GND.	3/4"	0.13%
HVAC - EF-503	4LB	MANUFACTURER	1 A	20 A / 1	1 SET	3 #10	#10 GND.	3/4"	0.14%
HVAC - EF-509	4LB	MANUFACTURER	1 A	20 A / 1	1 SET	3 #10	#10 GND.	3/4"	0.15%
HVAC - EF-518	5LK	MANUFACTURER	6 A	20 A / 1	1 SET	3 #10	#10 GND.	3/4"	1.07%
HVAC - EF-525	5LK	MANUFACTURER	1 A	20 A / 1	1 SET	3 #10	#10 GND.	3/4"	0.13%
HVAC - EF-527	5LC	MANUFACTURER	1 A	20 A / 1	1 SET	3 #10	#10 GND.	3/4"	0.17%
HVAC - EF-529	5LE	MANUFACTURER	1 A	20 A / 1	1 SET	3 #10	#10 GND.	3/4"	0.13%
HVAC - EF-531	5LE	MANUFACTURER	1 A	20 A / 1	1 SET	3 #10	#10 GND.	3/4"	0.16%
HVAC - EF-534	5LE	MANUFACTURER	1 A	20 A / 1	1 SET	3 #10	#10 GND.	3/4"	0.12%
HVAC - EF-536	5LG	MANUFACTURER	1 A	20 A / 1	1 SET	3 #10	#10 GND.	3/4"	0.17%
HVAC - EF-537	5LG	MANUFACTURER	1 A	20 A / 1	1 SET	3 #10	#10 GND.	3/4"	0.21%
HVAC - EF-542	5LC	MANUFACTURER	4 A	20 A / 1	1 SET	3 #10	#10 GND.	3/4"	1.02%
HVAC - EF-543	5LC	MANUFACTURER	1 A	20 A / 1	1 SET	3 #10	#10 GND.	3/4"	0.17%
HVAC - EF-545	5LK	MANUFACTURER	1 A	20 A / 1	1 SET	3 #10	#10 GND.	3/4"	0.19%
HVAC - EF-557	5LK	MANUFACTURER	4 A	20 A / 1	1 SET	3 #10	#10 GND.	3/4"	0.78%

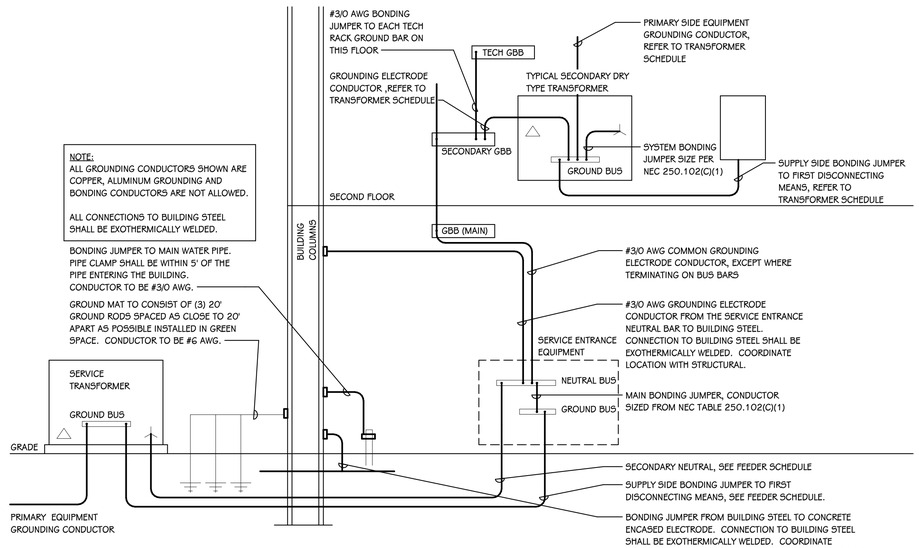
GENERAL: CONDUIT SIZES BASED ON EMT AND COPPER CONDUCTORS UNLESS OTHERWISE NOTED. UPSIZE AS REQUIRED WHERE PVC OR GALVANIZED IS USED OR REQUIRED PER SPECIFICATIONS.

ELECTRICAL PANEL FEEDER SCHEDULE

DESCRIPTION	FED FROM	CURRENT (FLA)	FEEDER BREAKER / POLES	FEEDER # OF SETS	FEEDER WIRE	FEEDER GROUND	FEEDER EMT	FEED VOLT DROP %
480 V								
5W	PPB	114 A	225 A / 3	1 SET	4 #4/0	#4 GND.	2 1/2"	1.18%
5X	PPB	75 A	225 A / 3	1 SET	4 #4/0	#4 GND.	2 1/2"	0.67%
5Y	PPB	156 A	225 A / 3	1 SET	4 #4/0	#4 GND.	2 1/2"	0.23%
5Z	PPB	167 A	225 A / 3	1 SET	4 #4/0	#4 GND.	2 1/2"	1.39%
PPB	MDP2	511 A	800 A / 3	2 SETS	4 #600 KCMIL	#1/0 GND.	4"	0.90%
TX-5WL	5W	48 A	150 A / 3	1 SET	3 #1/0	#6 GND.	2"	0.08%
TX-5ZL	5Z	54 A	150 A / 3	1 SET	3 #1/0	#6 GND.	2"	0.06%
208 V								
5WL	TX-5WL	111 A	300 A / 3	1 SET	4 #350 KCMIL	#2 G.E.C.	3"	0.11%
R2C	TX-5ZL	126 A	300 A / 3	1 SET	4 #350 KCMIL	#2 G.E.C.	3"	0.22%

ELECTRICAL TRANSFORMER SCHEDULE

TRANSFORMER NAME	FED FROM	SIZE	PRIMARY VOLTAGE (V)	PRIMARY FEEDER BREAKER / POLES	PRIMARY FEEDER # OF SETS	PRIMARY FEEDER WIRE	PRIMARY FEEDER GROUND	PRIMARY FEEDER EMT	FEED VOLT DROP %
TX-5WL	5W	75 kVA	480 V	150 A / 3	1 SET	3 #1/0	#6 GND.	2"	0.18
TX-5ZL	5Z	75 kVA	480 V	150 A / 3	1 SET	3 #1/0	#6 GND.	2"	0.1



GROUNDING DIAGRAM
SCALE: NONE

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ADDENDUM #2 10/28/2022

ISSUED FOR DATE

PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

OWNER
KALAMAZOO PUBLIC SCHOOLS
Kalamazoo, Michigan

SHEET TITLE
ELECTRICAL SCHEDULES AND DETAILS

DATE
OCTOBER 3, 2022

SHEET NUMBER
E 403
21-806.00

PANELBOARD " 5W" LOAD SCHEDULE

PANEL: 5W **MOUNTING:** SURFACE **VOLTAGE:** 480/277V, 3PH, 4W
LOCATION: MECH. ROOM 5-202 / SECOND FLOOR... **AMPS:** 225 A MLO **FED FROM:** PPB
ADDED ACCESSORIES: SPD **FEED-THRU LUGS...** **A.I.C. VALUE:** 28 KAIC
(PROVIDE 25% HIGHER A.I.C. RATING)

	CIRCUIT DESCRIPTION	TRIP (A)	POLES	A	B	C	POLES	TRIP (A)	CIRCUIT DESCRIPTION	
1	HVAC - AHU-7 SF	20	3	942	942		3	20	HVAC - AHU-7 SF	2
3	--	--	--		942	942	--	--	--	4
5	--	--	--			942	--	--	--	6
7	HVAC - AHU-5 SF	20	3	942	942		3	20	HVAC - AHU-5 SF	8
9	--	--	--		942	942	--	--	--	10
11	--	--	--			942	--	--	--	12
13	HVAC - ACCU-7	40	3	8525	5843		3	30	HVAC - ACCU-5	14
15	--	--	--		8525	5843	--	--	--	16
17	--	--	--			8525	--	--	--	18
19	TX-5WL	150	3	15396	--		1	--	SPACE	20
21	--	--	--		13624	--	1	--	SPACE	22
23	--	--	--			11106	--	1	--	SPACE	24
25	SPACE	--	1	--	--		1	--	SPACE	26
27	SPACE	--	1		--	--	1	--	SPACE	28
29	SPACE	--	1			--	1	--	SPACE	30
31	SPACE	--	1	--	0		1	20	SPARE	32
33	SPACE	--	1		--	0	1	20	SPARE	34
35	SPACE	--	1			--	1	20	SPARE	36
37	SPACE	--	1	--	0		1	20	SPARE	38
39	SPACE	--	1		--	0	1	20	SPARE	40
41	SPACE	--	1			--	1	20	SPARE	42
43	SPACE	--	1	--	0		1	20	SPARE	44
45	SPACE	--	1		--	0	1	20	SPARE	46
47	SPACE	--	1			--	1	20	SPARE	48
49	SURGE PROTECTIVE DEVICE (SPD)	20	3	0	0		1	20	SPARE	50
51	--	--	--		0	0	1	20	SPARE	52
53	--	--	--			0	0	1	20	SPARE	54
	TOTAL LOAD:			33533 VA	31761 VA	29243 VA				
	ADDITIONAL FEED THRU LUGS LOAD (IF APPLICABLE):			0 VA	0 VA	0 A				
	TOTAL AMPS:			122 A	116 A	106 A				

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
HVAC -	90738 VA	100.00%	90738 VA		
LIGHTING -	0 VA	0.00%	0 VA	**TOTAL CONNECTED LOAD:**	94538 VA
POWER -	2000 VA	100.00%	2000 VA	**TOTAL ESTIMATED DEMAND:**	94538 VA
RECEPTACLE -	1800 VA	100.00%	1800 VA	**TOTAL CONNECTED LOAD (A):**	114 A
				TOTAL ESTIMATED DEMAND...	114 A

NOTES:

PROVIDE SPD BREAKER PER ONELINE SCHEDULE. RECEPTACLE DEMAND FACTOR = FIRST 10kVA X 100% + 50% OF REMAINDER
AIC RATING IS CALCULATED VALUE, PROVIDE IC RATING AT LEAST 25% HIGHER AS PER SPECIFICATIONS.

PANELBOARD " 5X" LOAD SCHEDULE

PANEL: 5X **MOUNTING:** SURFACE **VOLTAGE:** 480/277V, 3PH, 4W
LOCATION: SECOND FLOOR - UPPER **AMPS:** 225 A MLO **FED FROM:** PPB
ADDED ACCESSORIES: SPD **FEED-THRU LUGS...** **A.I.C. VALUE:** 28 KAIC
(PROVIDE 25% HIGHER A.I.C. RATING)

	CIRCUIT DESCRIPTION	TRIP (A)	POLES	A	B	C	POLES	TRIP (A)	CIRCUIT DESCRIPTION	
1	HVAC - AHU-4 SF	20	3	942	942		3	20	HVAC - AHU-4 SF	2
3	--	--	--		942	942	--	--	--	4
5	--	--	--			942	--	--	--	6
7	HVAC - AHU-3 SF	20	3	942	942		3	20	HVAC - AHU-3 SF	8
9	--	--	--		942	942	--	--	--	10
11	--	--	--			942	--	--	--	12
13	HVAC - ACCU-4	40	3	8525	8525		3	40	HVAC - ACCU-3	14
15	--	--	--		8525	8525	--	--	--	16
17	--	--	--			8525	--	--	--	18
19	SPACE	--	1	--	--		1	--	SPACE	20
21	SPACE	--	1		--	--	1	--	SPACE	22
23	SPACE	--	1			--	1	--	SPACE	24
25	SPACE	--	1	--	--		1	--	SPACE	26
27	SPACE	--	1		--	--	1	--	SPACE	28
29	SPACE	--	1			--	1	--	SPACE	30
31	SPACE	--	1	--	--		1	--	SPACE	32
33	SPACE	--	1		--	--	1	--	SPACE	34
35	SPACE	--	1			--	1	20	SPARE	36
37	SPACE	--	1	--	0		1	20	SPARE	38
39	SPACE	--	1		--	0	1	20	SPARE	40
41	SPACE	--	1			--	1	20	SPARE	42
43	SPACE	--	1	--	0		1	20	SPARE	44
45	SPACE	--	1		--	0	1	20	SPARE	46
47	SPACE	--	1			--	1	20	SPARE	48
49	SURGE PROTECTIVE DEVICE (SPD)	30	3	0	0		1	20	SPARE	50
51	--	--	--		0	0	1	20	SPARE	52
53	--	--	--			0	0	1	20	SPARE	54
	TOTAL LOAD:			20819 VA	20819 VA	20819 VA				
	ADDITIONAL FEED THRU LUGS LOAD (IF APPLICABLE):			0 VA	0 VA	0 A				
	TOTAL AMPS:			75 A	75 A	75 A				

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
HVAC -	62458 VA	100.00%	62458 VA		
				TOTAL CONNECTED LOAD:	62458 VA
				TOTAL ESTIMATED DEMAND:	62458 VA
				TOTAL CONNECTED LOAD (A):	75 A
				TOTAL ESTIMATED DEMAND...	75 A

NOTES:

PROVIDE SPD BREAKER PER ONELINE SCHEDULE. RECEPTACLE DEMAND FACTOR = FIRST 10kVA X 100% + 50% OF REMAINDER
AIC RATING IS CALCULATED VALUE, PROVIDE IC RATING AT LEAST 25% HIGHER AS PER SPECIFICATIONS.

PANELBOARD " 5Y" LOAD SCHEDULE

PANEL: 5Y **MOUNTING:** SURFACE **VOLTAGE:** 480/277V, 3PH, 4W
LOCATION: MECHANICAL 554 / SECOND FLOOR -... **AMPS:** 225 A MLO **FED FROM:** PPB
ADDED ACCESSORIES: SPD **FEED-THRU LUGS...** **A.I.C. VALUE:** 28 KAIC
(PROVIDE 25% HIGHER A.I.C. RATING)

	CIRCUIT DESCRIPTION	TRIP (A)	POLES	A	B	C	POLES	TRIP (A)	CIRCUIT DESCRIPTION	
1	HVAC - AHU-17 SF	20	3	2133	2133		3	20	HVAC - AHU-17 SF	2
3	--	--	--		2133	2133	--	--	--	4
5	--	--	--			2133	--	--	--	6
7				2133			3	20	HVAC - AHU-17 SF	8
9					2133		--	--	--	10
11						2133	--	--	--	12
13				2133			3	20	HVAC - AHU-17 SF	14
15					2133		--	--	--	16
17						2133	--	--	--	18
19	HVAC - P-18	20	3	1333	3047		3	20	HVAC - P-20	20
21	--	--	--		1333	3047	--	--	--	22
23	--	--	--			1333	3047	--	--	--	24
25	HVAC - RTU-500	80	3	17404	3047		3	20	HVAC - P-21	26
27	--	--	--		17404	3047	--	--	--	28
29	--	--	--			17404	3047	--	--	--	30
31	HVAC - EF-554	20	3	3878	1500		1	20	EXISTING LIGHTING -	32
33	--	--	--		3878	1500	1	20	EXISTING LIGHTING -	34
35	--	--	--			3878	1500	1	20	EXISTING LIGHTING -	36
37	SPACE	--	1	--	1500		1	20	EXISTING LIGHTING -	38
39	SPACE	--	1		--	1500	1	20	EXISTING LIGHTING -	40
41	SPACE	--	1			--	1500	1	20	EXISTING LIGHTING -	42
43	SPACE	--	1	--	1500		1	20	EXISTING LIGHTING -	44
45	SPACE	--	1		--	1500	1	20	EXISTING LIGHTING -	46
47	SPACE	--	1			--	1500	1	20	EXISTING LIGHTING -	48
49	SPARE	30	3	0	1500		1	20	EXISTING LIGHTING -	50
51	--	--	--		0	1500	1	20	EXISTING LIGHTING -	52
53	--	--	--			0	1500	1	20	EXISTING LIGHTING -	54
	TOTAL LOAD:			43242 VA	43242 VA	43242 VA				
	ADDITIONAL FEED THRU LUGS LOAD (IF APPLICABLE):			0 VA	0 VA	0 A				
	TOTAL AMPS:			156 A	156 A	156 A				

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
HVAC -	111727 VA	100.00%	111727 VA		
Spare	18000 VA	100.00%	18000 VA	**TOTAL CONNECTED LOAD:**	129727 VA
				TOTAL ESTIMATED DEMAND:	129727 VA
				TOTAL CONNECTED LOAD (A):	156 A
				TOTAL ESTIMATED DEMAND...	156 A

NOTES:

PROVIDE SPD BREAKER PER ONELINE SCHEDULE. RECEPTACLE DEMAND FACTOR = FIRST 10kVA X 100% + 50% OF REMAINDER
AIC RATING IS CALCULATED VALUE, PROVIDE IC RATING AT LEAST 25% HIGHER AS PER SPECIFICATIONS.

PANELBOARD " 5Z" LOAD SCHEDULE

PANEL: 5Z **MOUNTING:** SURFACE **VOLTAGE:** 480/277V, 3PH, 4W
LOCATION: MECH ROOM - / SECOND FLOOR -... **AMPS:** 225 A MLO **FED FROM:** PPB
ADDED ACCESSORIES: SPD **FEED-THRU LUGS...** **A.I.C. VALUE:** 28 KAIC
(PROVIDE 25% HIGHER A.I.C. RATING)

	CIRCUIT DESCRIPTION	TRIP (A)	POLES	A	B	C	POLES	TRIP (A)	CIRCUIT DESCRIPTION	
1	HVAC - AHU-19 SF	20	3	2106	2106		3	20	HVAC - AHU-19 SF	2
3	--	--	--		2106	2106	--	--	--	4
5	--	--	--			2106	2106	--	--	--	6
7	HVAC - AHU-19 SF	20	3	2106	2106		3	20	HVAC - AHU-19 SF	8
9	--	--	--		2106	2106	--	--	--	10
11	--	--	--			2106	2106	--	--	--	12
13	HVAC - AHU-20 SF	20	3	942	942		3	20	HVAC - AHU-20 SF	14
15	--	--	--		942	942	--	--	--	16
17	--	--	--			942	942	--	--	--	18
19	HVAC - P-12	20	3	1333	1333		3	20	HVAC - P-10	20
21	--	--	--		1333	1333	--	--	--	22
23	--	--	--			1333	1333	--	--	--	24
25	HVAC - AHU-18 SF	25	3	3880	3880		3	25	HVAC - AHU-18 SF	26
27	--	--	--		3880	3880	--	--	--	28
29	--	--	--			3880	3880	--	--	--	30
31	HVAC - AHU-18 RF	20	3	2106	2106		3	20	HVAC - AHU-18 RF	32
33	--	--	--		2106	2106	--	--	--	34
35	--	--	--			2106	2106	--	--	--	36
37	HVAC - P-3	20	3	3047	3047		3	20	HVAC - P-4	38
39	--	--	--		3047	3047	--	--	--	40
41	--	--	--			3047	3047	--	--	--	42
43	TX-5ZL	150	3	15151	--		1	--	SPACE	44
45	--	--	--		13442	--	1	--	SPACE	46
47	--	--	--			16712	--	1	--	SPACE	48
49	SURGE PROTECTIVE DEVICE (SPD)	30	3	0	0		1	20	SPARE	50
51	--	--	--		0	0	1	20	SPARE	52
53	--	--	--			0	0	1	20	SPARE	54
	TOTAL LOAD:			46194 VA	44485 VA	47755 VA				
	ADDITIONAL FEED THRU LUGS LOAD (IF APPLICABLE):			0 VA	0 VA	0 A				
	TOTAL AMPS:			168 A	161 A	173 A				

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
HVAC -	135174 VA	100.00%	135174 VA		
LIGHTING -	0 VA	0.00%	0 VA	**TOTAL CONNECTED LOAD:**	138434 VA
POWER -	2000 VA	100.00%	2000 VA	**TOTAL ESTIMATED DEMAND:**	138434 VA
RECEPTACLE -	1260 VA	100.00%	1260 VA	**TOTAL CONNECTED LOAD (A):**	167 A
				TOTAL ESTIMATED DEMAND...	167 A

NOTES:

PROVIDE SPD BREAKER PER ONELINE SCHEDULE. RECEPTACLE DEMAND FACTOR = FIRST 10kVA X 100% + 50% OF REMAINDER
AIC RATING IS CALCULATED VALUE, PROVIDE IC RATING AT LEAST 25% HIGHER AS PER SPECIFICATIONS.

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ADDENDUM #2 10/28/2022

ISSUED FOR DATE

PROJECT TITLE
KALAMAZOO CENTRAL HIGH SCHOOL MECHANICAL IMPROVEMENTS PROJECT

OWNER
KALAMAZOO PUBLIC SCHOOLS

Kalamazoo, Michigan

SHEET TITLE
ELECTRICAL PANEL LOAD SHEETS

DATE
OCTOBER 3, 2022

SHEET NUMBER
E 501
21-806.00

PANELBOARD " 5WL" LOAD SCHEDULE

PANEL: 5WL
LOCATION: MECH. ROOM 5-202 / SECOND FLOOR...
ADDED ACCESSORIES: DOUBLE TUB, SPD

MOUNTING: SURFACE
AMPS: 300 A MB
FEED-THRU LUGS...

VOLTAGE: 208/120V, 3PH, 4W
FED FROM: TX-5WL
A.I.C. VALUE: 10 KAIC
(PROVIDE 25% HIGHER A.I.C. RATING)

	CIRCUIT DESCRIPTION	TRIP (A)	POLES	A	B	C	POLES	TRIP (A)	CIRCUIT DESCRIPTION	
1	HVAC - ACCU-521A	45	2	2413 588			2	20	HVAC - P-14	2
3	--	--	--		2413 588		--	--	--	4
5	HVAC - ACCU-521B	45	2			2413 588	2	20	HVAC - P-15	6
7	--	--	--	2413 588			--	--	--	8
9	HVAC - ACCU-519	45	2		2413 588		2	20	HVAC - P-16	10
11	--	--	--			2413 588	--	--	--	12
13	HVAC - ACCU-513	45	2	2413 900			1	20	RECEPTACLE -	14
15	--	--	--		2413 588		2	20	HVAC - P-17	16
17	HVAC - CH-24	20	1			75 588	--	--	--	18
19	HVAC - VUV-540	40	3	2931 75			1	20	HVAC - CH-21	20
21	--	--	--		2931 75		1	20	HVAC - CH-23	22
23	--	--	--			2931 75	1	20	HVAC - CH-25	24
25	HVAC - TU-548	20	1	2000 75			1	20	HVAC - P-5	26
27	AHU-7 LIGHTS AND RECEPTACLES	20	1		500 75		1	20	HVAC - P-6	28
29	AHU-5 LIGHTS AND RECEPTACLES	20	1			500 75	1	20	HVAC - P-7	30
31	HVAC - UH-1	20	1	500 0			1	20	SPARE	32
33	RECEPTACLE - FAN ROOM 5-202	20	1		540 0		1	20	SPARE	34
35	HVAC - UH-2	20	1			500 0	1	20	SPARE	36
37	AHU-4 LIGHTS AND RECEPTACLES	20	1	500 0			1	20	SPARE	38
39	AHU-3 LIGHTS AND RECEPTACLES	20	1		500 0		1	20	SPARE	40
41	RECEPTACLE - FAN ROOM 5-206	20	1			360 0	1	20	SPARE	42
43	LIGHTING - FAN ROOM 5-202 & 5-206.	20	1	0 0			1	20	SPARE	44
45	HVAC - SMOKE DAMPERS	20	1		0 0		1	20	SPARE	46
47	HVAC - SMOKE DAMPERS	20	1			0 0	1	20	SPARE	48
49	SPARE	20	1	0 0			1	20	SPARE	50
51	SPARE	20	1		0 0		1	20	SPARE	52
53	SPARE	20	1			0 0	1	20	SPARE	54
55	SPARE	20	1	0 0			1	20	SPARE	56
57	SPARE	20	1		0 0		1	20	SPARE	58
59	SPARE	20	1			0 0	1	20	SPARE	60
61	SPARE	20	1	0 0			1	20	SPARE	62
63	SPARE	20	1		0 0		1	20	SPARE	64
65	SPARE	20	1			0 0	1	20	SPARE	66
67	SPARE	20	1	0 0			1	20	SPARE	68
69	SPARE	20	1		0 0		1	20	SPARE	70
71	SPARE	20	1			0 0	1	20	SPARE	72
73	SPARE	20	1	0 0			1	20	SPARE	74
75	SPARE	20	1		0 0		1	20	SPARE	76
77	SPARE	20	1			0 0	1	20	SPARE	78
79	SURGE PROTECTIVE DEVICE (SPD)	30	3	0 0			1	20	SPARE	80
81	--	--	--		0 0		1	20	SPARE	82
83	--	--	--			0 0	1	20	SPARE	84
	TOTAL LOAD:			15396 VA	13624 VA	11106 VA				
	ADDITIONAL FEED THRU LUGS LOAD (IF APPLICABLE):			0 VA	0 VA	0 A				
	TOTAL AMPS:			132 A	117 A	93 A				

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
HVAC -	36325 VA	100.00%	36325 VA		
LIGHTING -	0 VA	0.00%	0 VA	**TOTAL CONNECTED LOAD:**	40125 VA
POWER -	2000 VA	100.00%	2000 VA	**TOTAL ESTIMATED DEMAND:**	40125 VA
RECEPTACLE -	1800 VA	100.00%	1800 VA	**TOTAL CONNECTED LOAD (A):**	111 A
				TOTAL ESTIMATED DEMAND...	111 A

NOTES:

PROVIDE SPD BREAKER PER ONELINE SCHEDULE. RECEPTACLE DEMAND FACTOR = FIRST 10kVA X 100% + 50% OF REMAINDER
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PANELBOARD " 5ZL" LOAD SCHEDULE

PANEL: 5ZL
LOCATION: MECH ROOM - / SECOND FLOOR -...
ADDED ACCESSORIES: DOUBLE TUB, SPD

MOUNTING: SURFACE
AMPS: 300 A MB
FEED-THRU LUGS...

VOLTAGE: 208/120V, 3PH, 4W
FED FROM: TX-5ZL
A.I.C. VALUE: 10 KAIC
(PROVIDE 25% HIGHER A.I.C. RATING)

	CIRCUIT DESCRIPTION	TRIP (A)	POLES	A	B	C	POLES	TRIP (A)	CIRCUIT DESCRIPTION	
1	HVAC - HUV-400	20	1	936 936			1	20	HVAC - HUV-401	2
3	HVAC - HUV-402	20	1		936 936		1	20	HVAC - HUV-403	4
5	HVAC - HUV-404	20	1			936 936	1	20	HVAC - HUV-405	6
7	HVAC - HUV-406	20	1	936 936			1	20	HVAC - HUV-407	8
9	HVAC - HUV-408	20	1		936 435		2	20	HVAC - P-8	10
11	HVAC - CH-36	20	1			75 435	--	--	--	12
13	HVAC - CH-17	20	1	75 435			2	20	HVAC - P-9	14
15	HVAC - CH-22	20	1		75 435		--	--	--	16
17	HVAC - ACCU-430A	50	2			3020 373	2	20	HVAC - P-11	18
19	--	--	--	3020 373			--	--	--	20
21	RECEPTACLE - MECHANICAL 554	20	1				2	20	HVAC - P-13	22
23	HVAC - EF-401C	20	1		360 873					24
25	HVAC - CONDESATE PUMP SS-430A, B, C, AND D	20	1	1000 873		360 873	--	--	--	26
27	HVAC - EF-430A	20	1				2	20	HVAC - P-19	28
29	HVAC - EF-430B	20	1		1836 873		--	--	--	30
31	HVAC - EF-430	20	1	1656 500		1656				32
33	HVAC - EF-430C	20	1				1	20	HVAC - TU-438	34
35	HVAC - EF-430D	20	1		1836 2912		2	50	HVAC - ACCU-430B	36
37	HVAC - EF-432	20	1	75 0		1836 2912	--	--	--	38
39	SPARE	20	1		0 0		1	20	SPARE	40
41	SPARE	20	1			0 0	1	20	SPARE	42
43	AHU-17 LIGHTS AND RECEPTACLES	20	1	500 0			1	20	SPARE	44
45	AHU-19 LIGHTS AND RECEPTACLES	20	1		500 0		1	20	SPARE	46
47	AHU-20 LIGHTS AND RECEPTACLES	20	1			500 0	1	20	SPARE	48
49	AHU-18 LIGHTS AND RECEPTACLES	20	1	500 0			1	20	SPARE	50
51	LIGHTING - MECHANICAL 554	20	1		0 0		1	20	SPARE	52
53	HVAC - TU-412A	20	1			1200 0	1	20	SPARE	54
55	HVAC - TU-004	30	1	2400 0			1	20	SPARE	56
57	HVAC - UH-3	20	1		500 0		1	20	SPARE	58
59	HVAC - TU-404	20	1			1600 0	1	20	SPARE	60
61	HVAC - SMOKE DAMPERS	20	1	0 0			1	20	SPARE	62
63	HVAC - SMOKE DAMPERS	20	1		0 0		1	20	SPARE	64
65	SPARE	20	1			0 0	1	20	SPARE	66
67	SPARE	20	1	0 0			1	20	SPARE	68
69	SPARE	20	1		0 0		1	20	SPARE	70
71	SPARE	20	1			0 0	1	20	SPARE	72
73	SPARE	20	1	0 0			1	20	SPARE	74
75	SPARE	20	1		0 0		1	20	SPARE	76
77	SPARE	20	1			0 0	1	20	SPARE	78
79	SURGE PROTECTIVE DEVICE (SPD)	30	3	0 0			1	20	SPARE	80
81	--	--	--		0 0		1	20	SPARE	82
83	--	--	--			0 0	1	20	SPARE	84
	TOTAL LOAD:			15151 VA	13442 VA	16712 VA				
	ADDITIONAL FEED THRU LUGS LOAD (IF APPLICABLE):			0 VA	0 VA	0 A				
	TOTAL AMPS:			128 A	112 A	141 A				

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
HVAC -	42044 VA	100.00%	42044 VA		
LIGHTING -	0 VA	0.00%	0 VA	**TOTAL CONNECTED LOAD:**	45304 VA
POWER -	2000 VA	100.00%	2000 VA	**TOTAL ESTIMATED DEMAND:**	45304 VA
RECEPTACLE -	1260 VA	100.00%	1260 VA	**TOTAL CONNECTED LOAD (A):**	126 A
				TOTAL ESTIMATED DEMAND...	126 A

NOTES:

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OWNER
KALAMAZOO PUBLIC
SCHOOLS

Kalamazoo, Michigan

SHEET TITLE
ELECTRICAL PANEL LOAD SHEETS

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