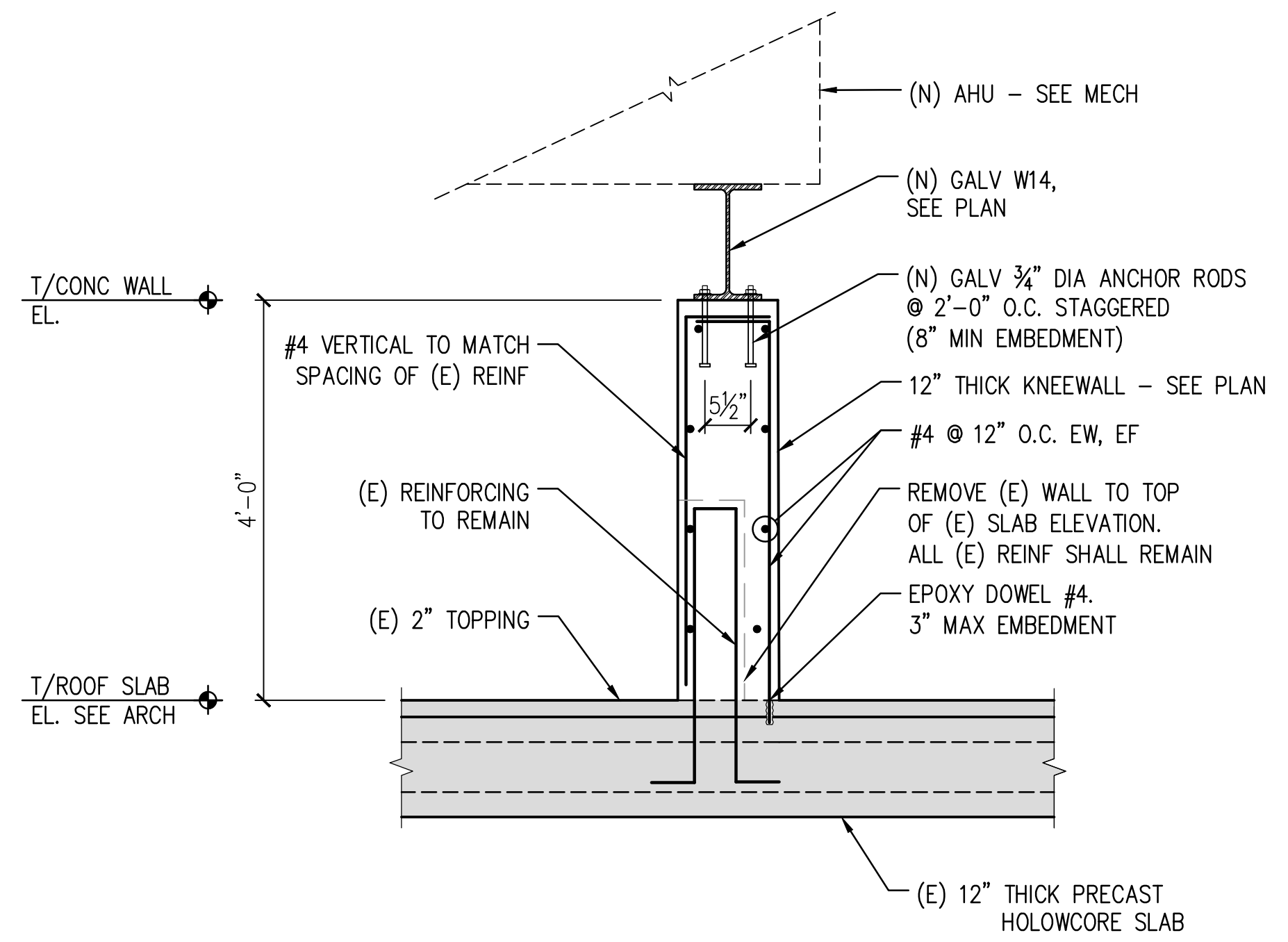


ROOF SLAB SHALL BE FULLY SHORED UNTIL NEW KNEE WALL IS INSTALLED. REFER TO MECHANICAL DEMO DRAWINGS FOR EXTENT OF EXISTING DUCTWORK AND LOCATION AND MECHANICAL UNITS IN THE SPACE BELOW THE EXISTING ROOF. THE DESIGN OF THE SHORING SHALL BE COMPLETED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF MARYLAND AND SUBMITTED FOR APPROVAL PRIOR TO THE START OF DEMOLITION. REFER TO MP-1-01 FOR SHORING COORDINATION.

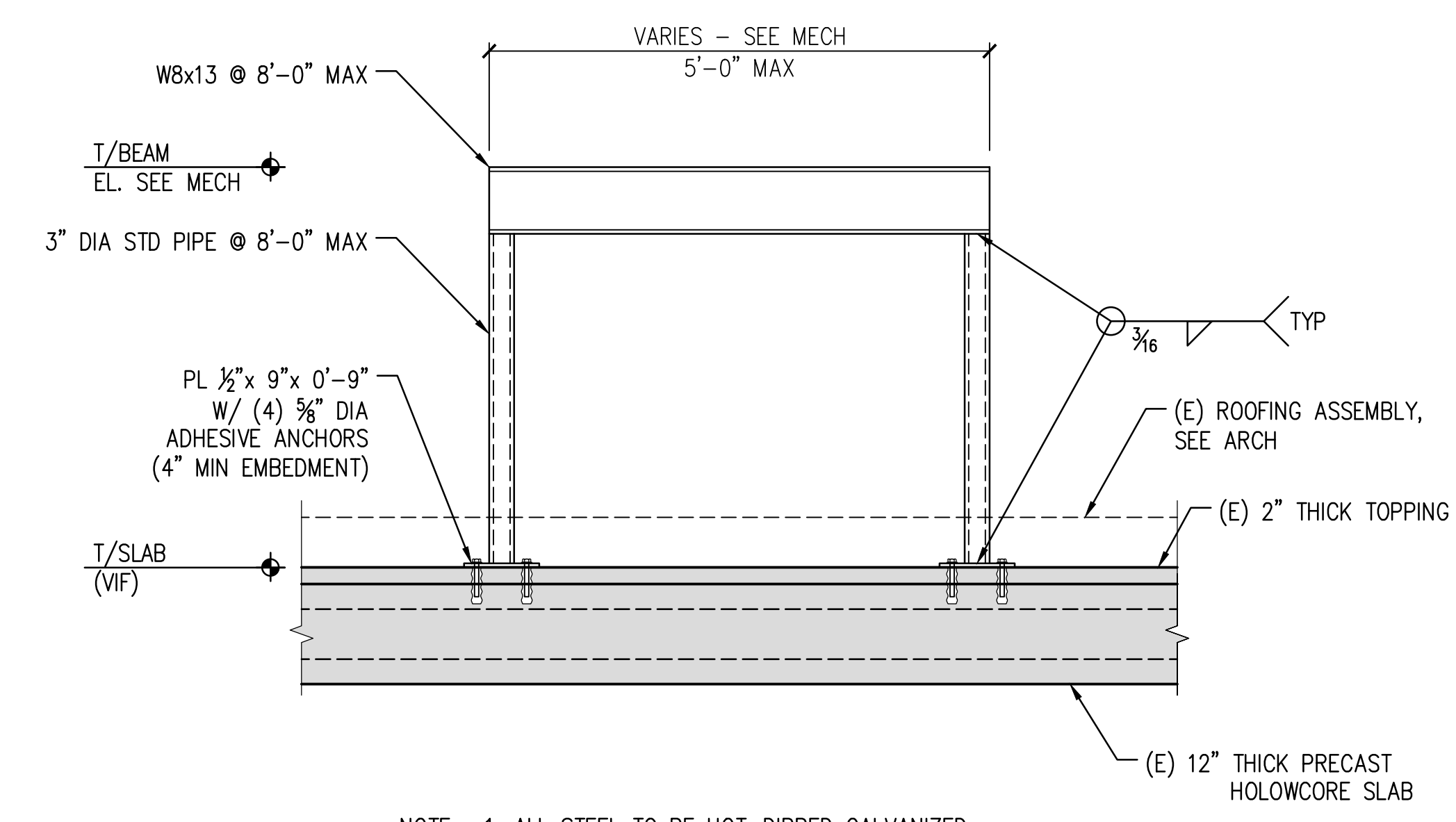
EXISTING ROOF LEVEL DEAD LOAD (PER EXISTING DRAWINGS): 94 PSF + 15 PSF SUPERIMPOSED = 109 PSF TOTAL DEAD LOAD  
 EXISTING 2ND FLOOR LIVE LOAD (PER EXISTING DRAWINGS): 100 PSF  
 EXISTING GROUND FLOOR LIVE LOAD (PER EXISTING DRAWINGS): 470 PSF

CONTRACTOR SHALL DETERMINE EXTENT OF SHORING TO THE LEVELS BELOW AND COORDINATE WITH OWNER IF ARTIFACTS REQUIRE TEMPORARY RELOCATION.

**1** KNEE WALL DETAIL  
 S-5-01 SCALE: 3/4" = 1'-0"

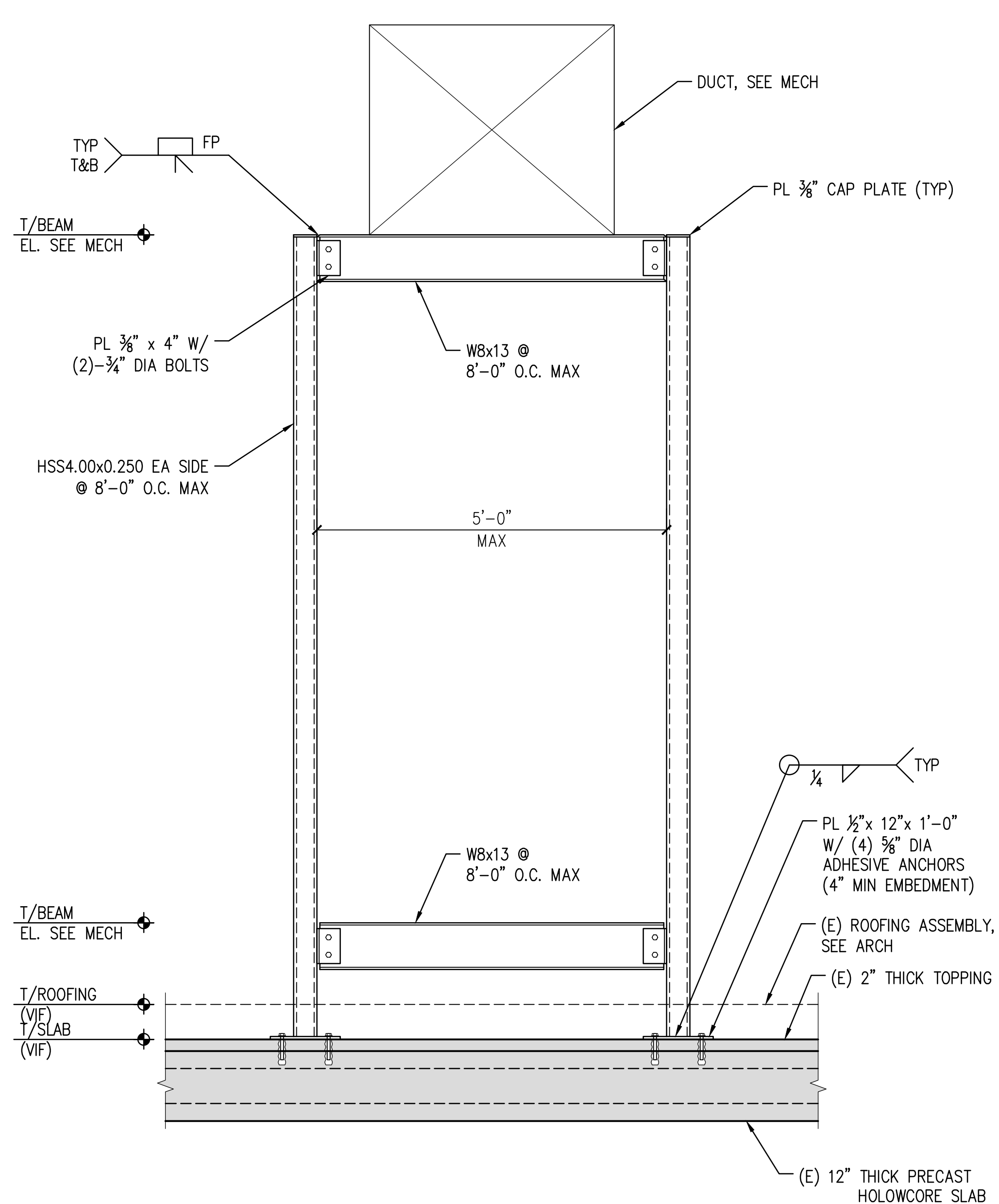


**2** KNEE WALL DETAIL  
 S-5-01 SCALE: 3/4" = 1'-0"



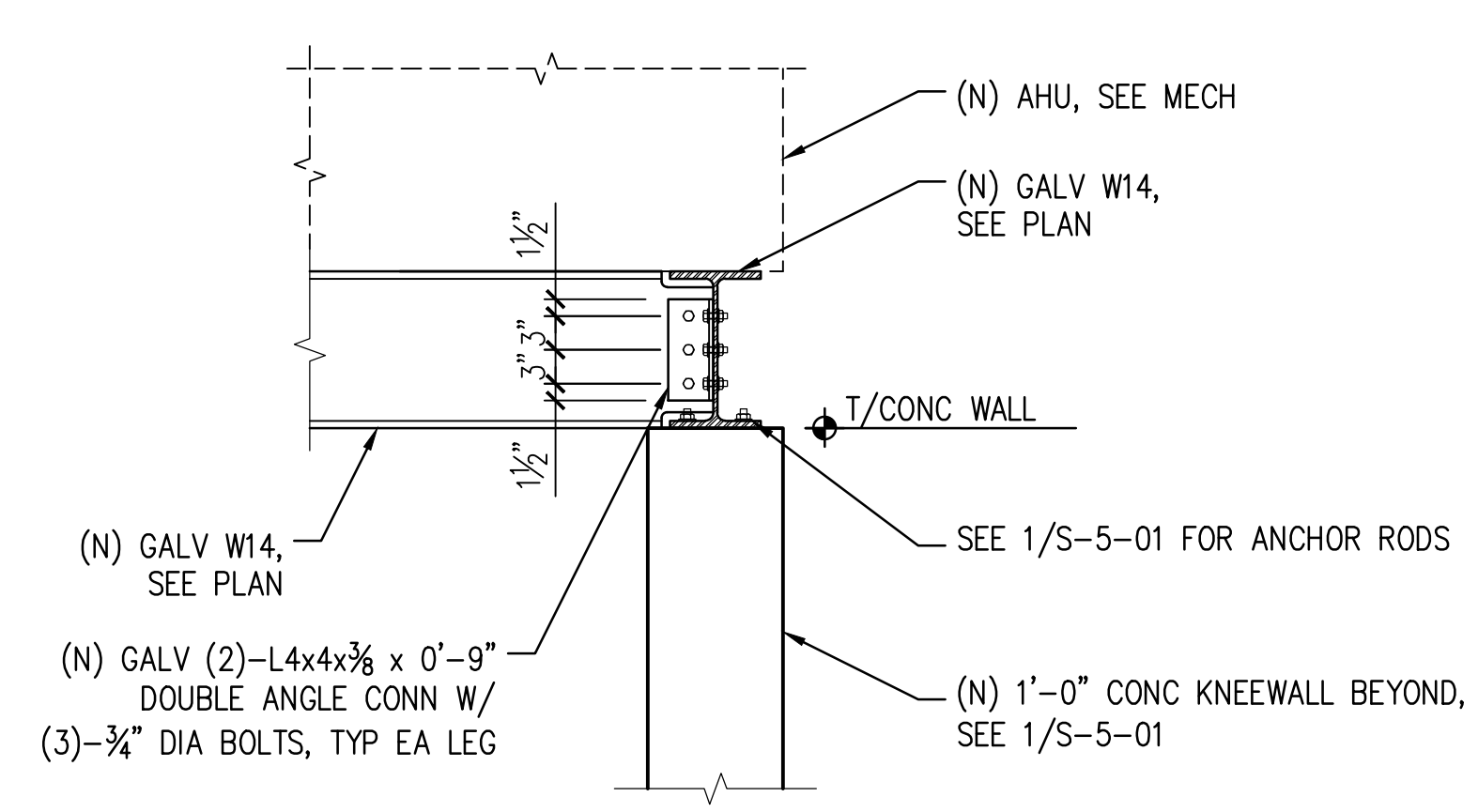
NOTE: 1. ALL STEEL TO BE HOT-DIPPED GALVANIZED.  
 2. SEE ARCH AND MEP FOR LOCATIONS.

**3** TYPICAL PIPE SUPPORT DETAIL  
 S-5-01 SCALE: 3/4" = 1'-0"

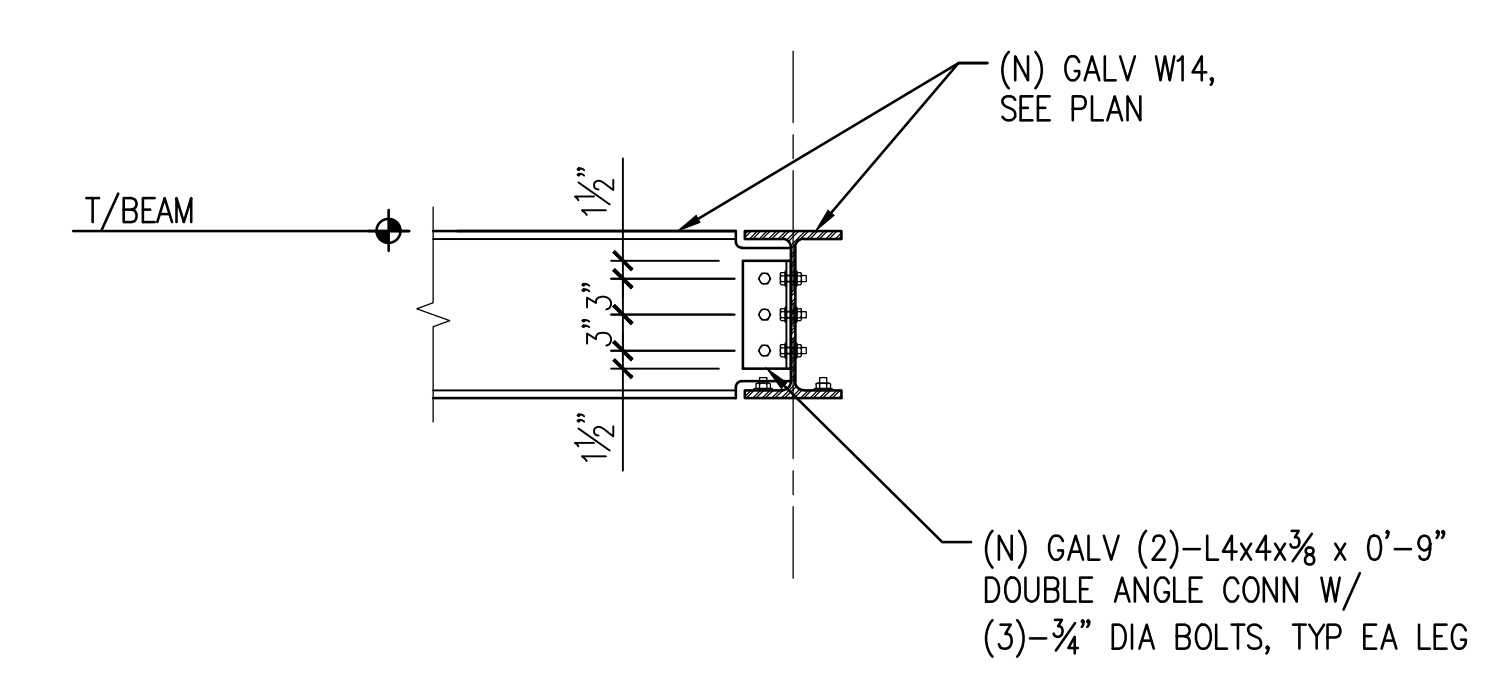


NOTE: 1. ALL STEEL TO BE HOT-DIPPED GALVANIZED.  
 2. SEE ARCH AND MEP DRAWINGS FOR LOCATION.

**6** TYPICAL DUCT SUPPORT FRAME  
 S-5-01 SCALE: 3/4" = 1'-0"



**4** CONNECTION DETAIL  
 S-5-01 SCALE: 3/4" = 1'-0"



**5** CONNECTION DETAIL  
 S-5-01 SCALE: 3/4" = 1'-0"

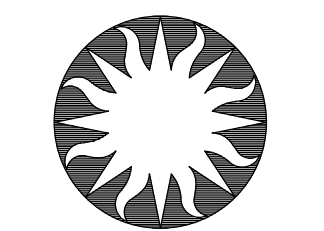


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 MARYLAND, LICENSE NUMBER 44363,  
 EXPIRATION DATE 9/19/2025.

KEY PLAN

GRAPHIC SCALE(S)

DATE	02/02/24	REVISION	BID SET
REVISION		REVISION	AMENDMENT 2 - 03/29/2024



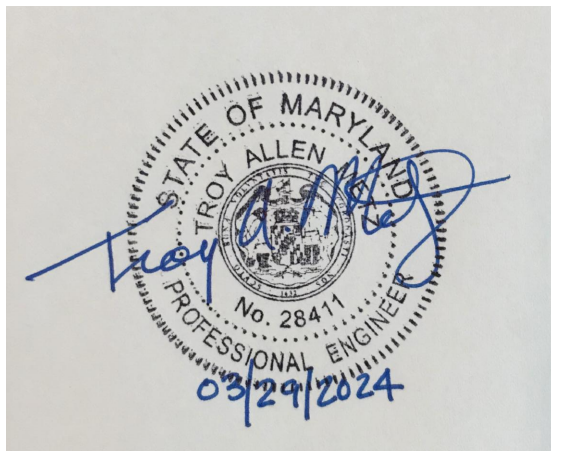
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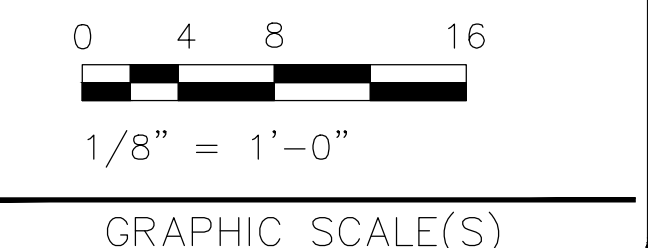
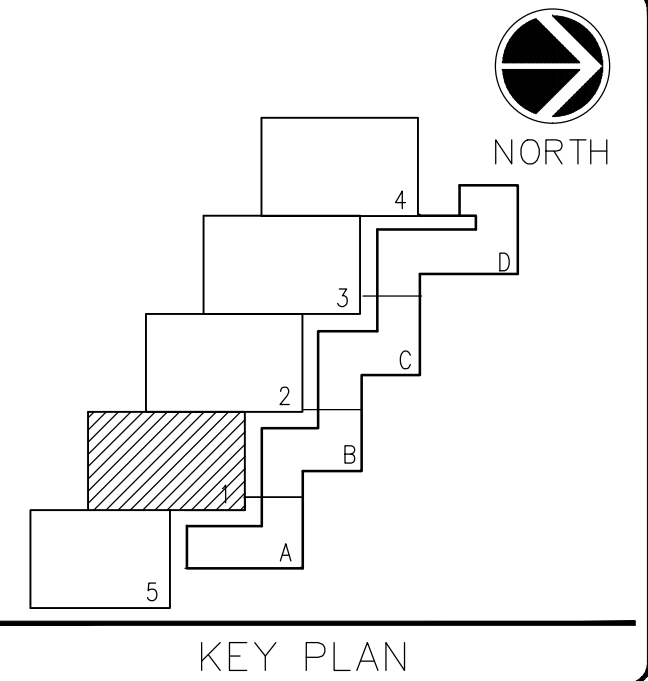
BUILDING NAME	MUSEUM SUPPORT CENTER
ADDRESS	4210 SILVER HILL ROAD SUITLAND, MD 20746
PROJECT TITLE	MSC REPLACE AHUS POD 1
BY PROJECT NUMBER	1530103
DATE PROJECT NUMBER	60516569

DRAWING TITLE	SECTIONS AND DETAILS
DRAWING TYPE	STRUCTURAL
WORKING STAFF	JPA VR MWZ
DESIGNED BY	JPA
CHECKED BY	VR

SHEET NO.	18 OF 71
DISCIPLINE	S 5 01
THICK	
SOURCE	



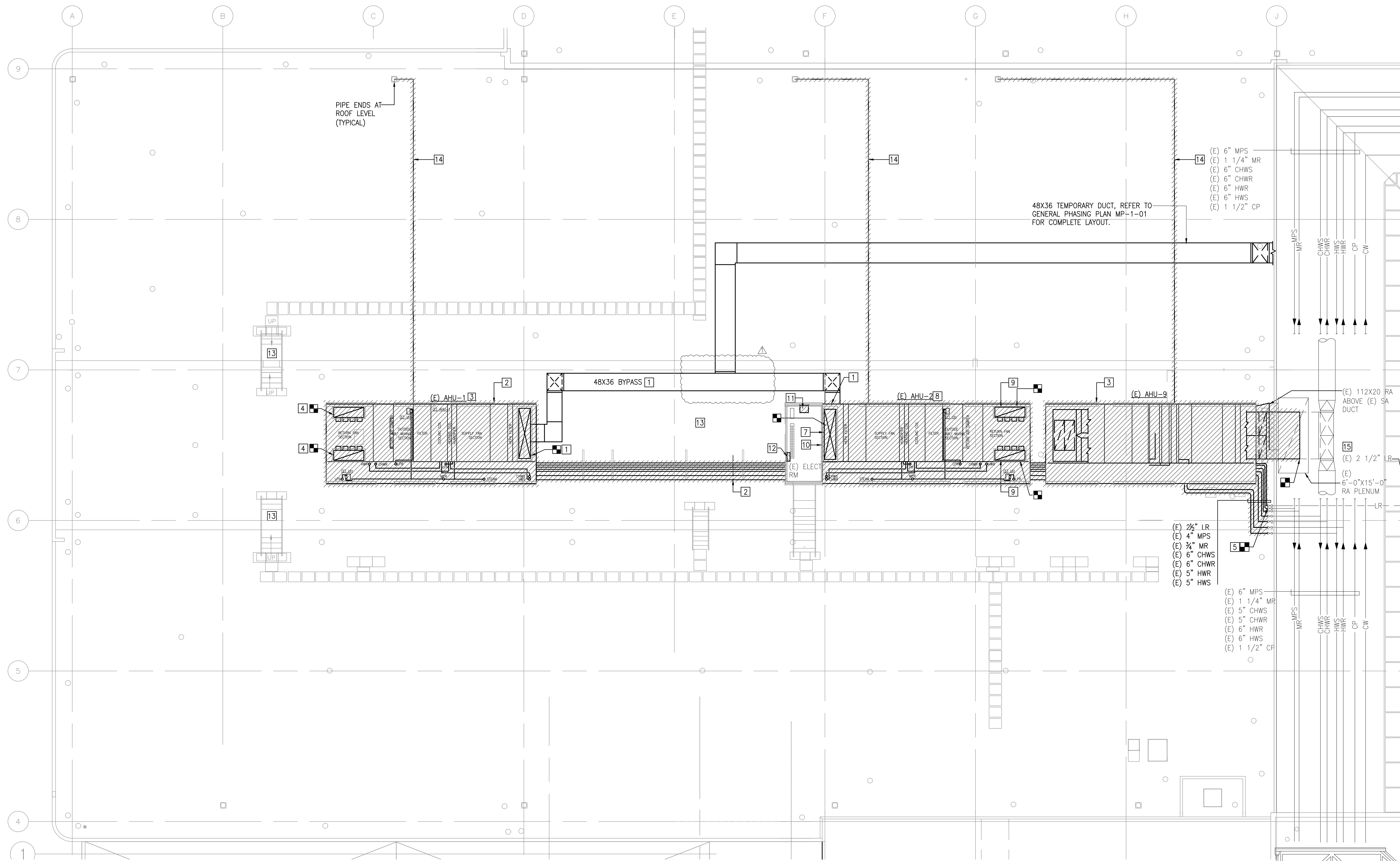
PROFESSIONAL CERTIFICATION.  
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THAT I AM A DULY LICENSED  
PROFESSIONAL ENGINEER UNDER THE  
LAWS OF THE STATE OF MARYLAND,  
LICENSE NUMBER 28411, EXPIRATION  
DATE 1/13/2025.



DATE	02/02/24	SUBMISSION	BID SET
REVISION 1		REVISION	AMENDMENT 2 - 03/29/2024
REVISION 2			
REVISION 3			
REVISION 4			
REVISION 5			
REVISION 6			
REVISION 7			



PROJECT NAME	MUSEUM SUPPORT CENTER
ADDRESS	4210 SILVER HILL ROAD SUITLAND, MD 20746
PROJECT TITLE	MSC REPLACE AHUS POD 1
SP PROJECT NUMBER	1530103
USE PROJECT NUMBER	60516569
DRAWING TITLE	MECHANICAL POD 1 ROOF LEVEL - DEMO
DRAWING TYPE	MECHANICAL
WORKING STUDY	FDL FDL DP
DESIGNED BY	
DRAWN BY	
CHECKED BY	
SHEET NO.	MD 1.1 01
15 OF 71	DISCIPLINE TYPE SOURCE



**A** MECHANICAL POD 1 ROOF LEVEL - DEMO  
MD-1.1-01 SCALE = 1/8"=1'-0"

**GENERAL NOTES:**

- FOR DETAILED POD-1 PHASING SEQUENCE PLAN REFER TO DRAWINGS MP-1-01, MP-1.1-01, 02, 03, 04 AND 05.
- ALL DEMOLITION AND NEW WORK SHALL BE PERFORMED DURING WINTER AND MILD WEATHER TIME, BETWEEN OCTOBER AND APRIL.
- DEMOLITION AND INSTALLATION OF AHU SHALL BE PERFORMED DURING NIGHT TIME ON WEEKDAYS. WORK INSIDE NEW UNIT CAN BE PERFORMED DURING DAYTIME ON WEEKDAYS.
- CONTRACTOR SHALL PROVIDE DOUBLE WALL DUCT WITH TEMPORARY CONNECTIONS BETWEEN AHU SUPPLY DUCTS. TEMPORARY AIR SUPPLY SHALL BE BALANCED TO PROVIDE 50% AIR SUPPLY TO BOTH SIDES OF THE POD FROM ONE AIR-HANDLING UNIT OPERATIONAL WHILE THE OTHER AIR-HANDLING UNIT BEING REPLACED. CONTRACTOR SHALL BE RESPONSIBLE TO ESTABLISH AIRFLOW PRIOR TO DEMOLISH EXISTING UNIT.
- NEW AIR HANDLING UNIT SHALL BE COMMISSIONED PRIOR TO SECOND AIR-HANDLING UNIT SERVING THE SAME POD IS DEMOLISHED. AFTER BOTH AHUS INSTALLED THE TWO UNITS SHALL BE RECOMMISSIONED TOGETHER.
- EXISTING ELECTRICAL CONDUITS SHALL BE PROVIDED WITH NEW SUPPORT SYSTEM AND ACCESSORIES AS A RESULT OF DEMOLITION OF EXISTING PIPE SUPPORT THAT ARE CURRENTLY USED ALSO BY EXISTING ELECTRICAL CONDUIT. AFTER REMOVING PIPE SUPPORTS PATCH AND RESTORE ROOF TO EXISTING CONDITIONS.
- ANY WORK REQUIRES TO SHUT DOWN BOTH AIR-HANDLING UNITS, THE SHUT DOWN TIME AND DURATION SHALL BE COORDINATED WITH CONTR. INTERRUPTION OF CONDITIONED AIR SUPPLY TO POD SHALL BE LIMITED 8 TO 12 HOURS.

**CODED NOTES:**

- PHASE 1A (AHU-1 AND AHU-2):**
- REFER TO POD-1 PHASING SEQUENCE MP-1.1-01. REUSED THE EXISTING TEMPORARY UNIT (E)AC-T1 TO PROVIDE TEMPORARY SA TO POD-1 AREA SERVED BY AHU-1. PROVIDE DOUBLE WALL BYPASS DUCT BETWEEN (E) AHU-2 AND (E) AHU-1 WITH TEMPORARY CONNECTIONS TO UNITS. PROVIDE TEMPORARY RELIEF AIR DUCT TO EXISTING RA DUCT RISER UNDERNEATH THE UNIT. COORDINATE DUCT SUPPORTS WITH NEW PIPE SUPPORTS BELOW DUCT. REMOVE/RECONFIGURE EXISTING AHU DUCTS TO MAKE TEMPORARY CONNECTIONS. REMOVE EXISTING 12X28 SA DUCT 12 INCHES ABOVE ROOF LEVEL.
  - REMOVE EXISTING PIPING SERVING (E) AHU-1 AND CAP PIPES AT (E) AHU-2 TO SERVE THE POD-1 DURING THIS PHASE.
  - REMOVE EXISTING AIR HANDLING UNITS AHU-1 AND AHU-9 INCLUDING ASSOCIATED STEAM PIPING, CHILLED WATER PIPING, HOT WATER PIPING, CONTROLS, UNIT HEATER, ELECTRICAL WIRING AND ACCESSORIES. REMOVE ALL CONTROLS FROM BAS. IN AHU-9, REMOVE THE UNIT AND CLOSE THE VALVE WITHOUT CUTTING THE HYDRONIC PIPING UNDERNEATH THE UNIT. PROVIDE TEMPORARY SUPPORT FOR PIPES.
  - PROVIDE EIGHT 12X12 TEMPORARY RELIEF AIR DUCT ON TWO EXISTING RA DUCT RISER UNDERNEATH THE UNIT. PROVIDE TEMPORARY INSULATED CAP ON REMAINING RA DUCT.
  - REMOVE EXISTING PIPING INCLUDING SUPPORTS TO POINT INDICATED. CAP OFF PIPING OPENING.

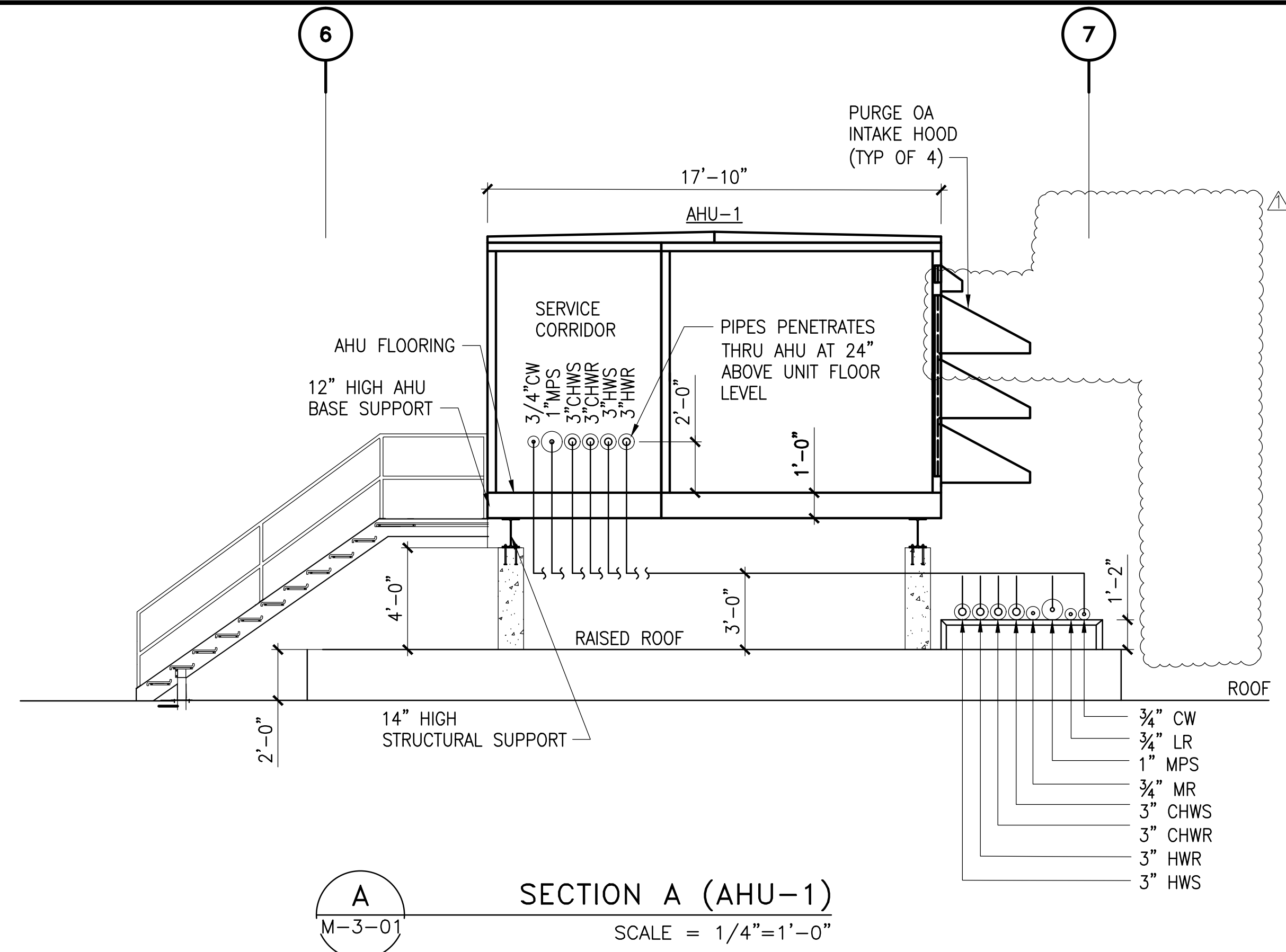
**PHASE 1B (AHU-2):**

- REFER TO PHASING SEQUENCE POD-1 MP-1.1-03 PROVIDE POD-1 AREA SERVED BY (E)AHU-2 WITH TEMPORARY SA FROM TEMPORARY UNIT (E)AC-T1. REMOVE FIRST THE (E) AHU-2 DISCHARGE PLENUM.
- REMOVE EXISTING AIR HANDLING UNIT AHU-2 INCLUDING ASSOCIATED STEAM PIPING, CHILLED WATER PIPING, HOT WATER PIPING, CONTROLS, UNIT HEATER, PIPE SUPPORTS, ELECTRICAL WIRING AND ACCESSORIES. REMOVE ALL CONTROLS FROM BAS.
- PROVIDE EIGHT 12X12 TEMPORARY RELIEF AIR DUCT ON TWO EXISTING RA DUCT RISER UNDERNEATH THE UNIT. DISCONNECT THE RA TO UNIT. PROVIDE TEMPORARY INSULATED CAP ON REMAINING DUCT.
- REMOVE EXISTING PERFORATED PANEL AND INSULATION FROM ELECTRICAL ROOM WALL. INSTALL NEW INSULATION AND COVER WITH SHEET METAL.
- REMOVE EXISTING EXHAUST FAN IN THE ELECTRICAL ROOM INCLUDING PNEUMATIC CONTROLS, ELECTRICAL WIRING AND ACCESSORIES. EXISTING LOUVER TO REMAIN.
- REMOVE EXISTING 24X24 OA INTAKE DAMPER AND PNEUMATIC ACTUATOR. EXISTING LOUVER TO REMAIN.

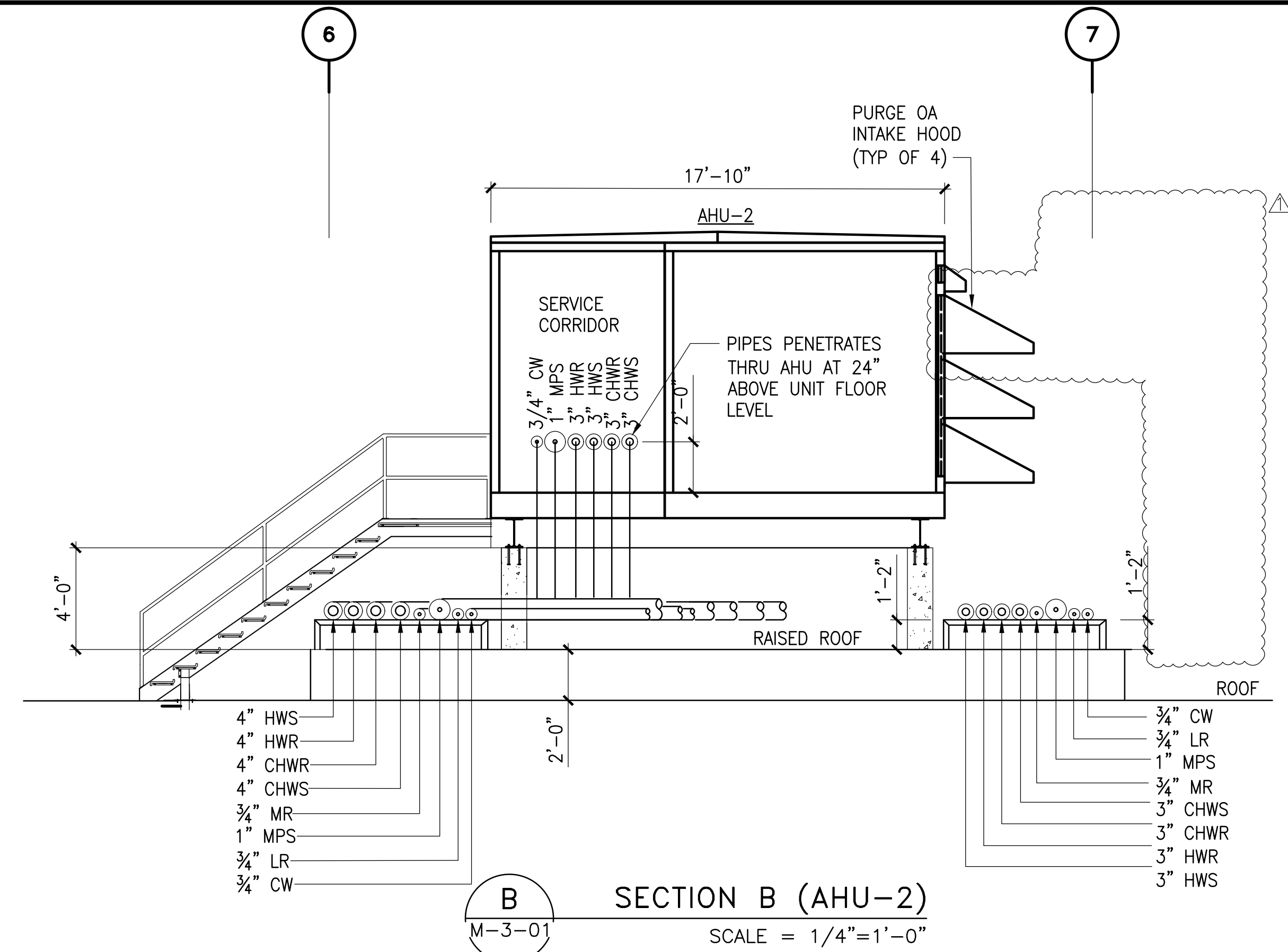
**13** REFER TO ARCHITECTURAL DRAWINGS AND RECONFIGURE/RELOCATE EXISTING PAVERS AND STAIRS TO ALLOW INSTALLATION OF NEW AHU AND PIPES.

**14** DEMOLISH EXISTING DRAIN LINE ON TOP OF ROOF ATTACHED TO THE MEMBRANE ROOF WITH MEMBRANE PATCHES. DO NOT DISTURB MEMBRANE ROOF.

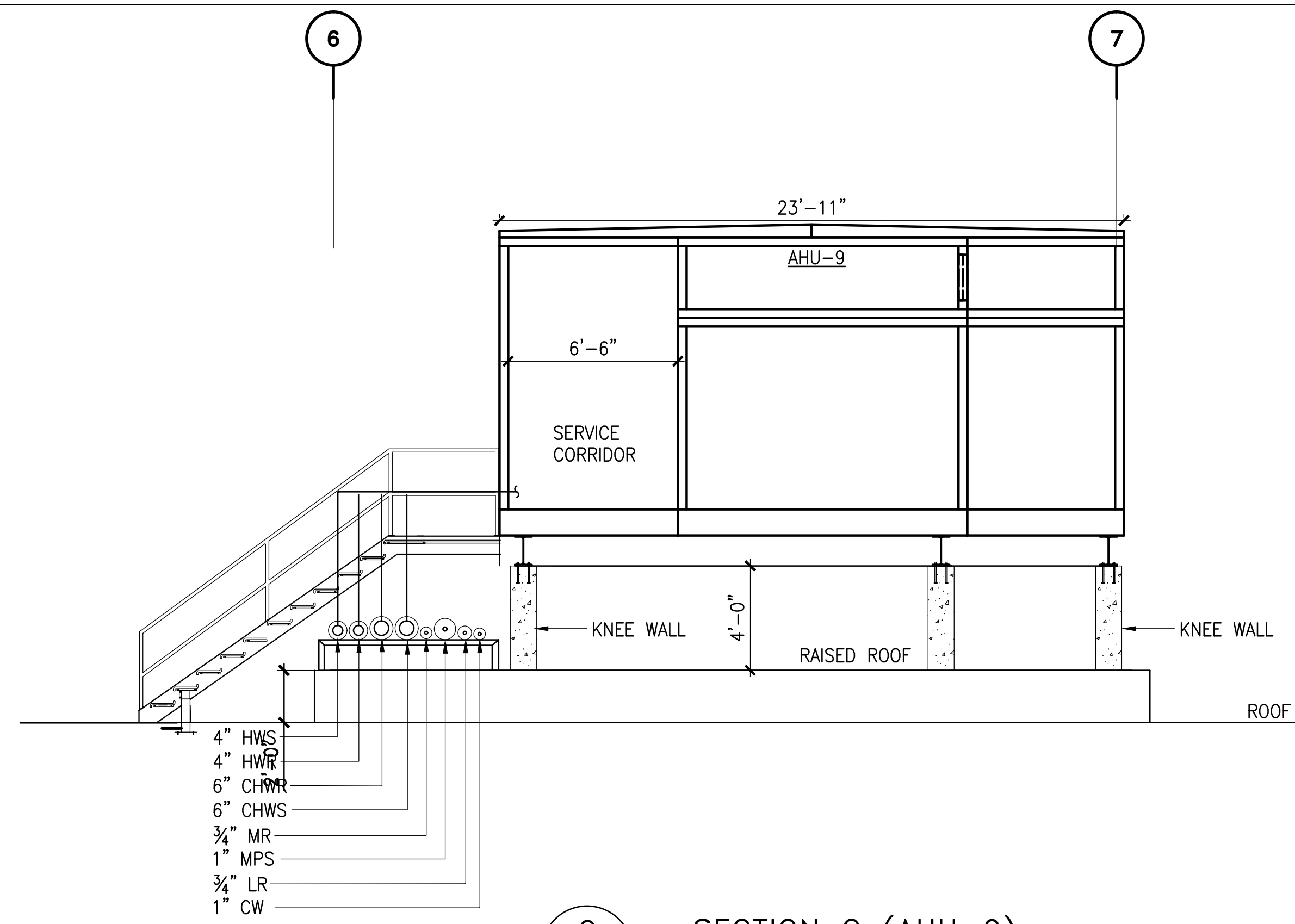
**15** LOW PRESSURE CONDENSATE RETURN (LR) TO PUMP P-6 AND TO PUMPED CONDENSATE PIPE (CP).



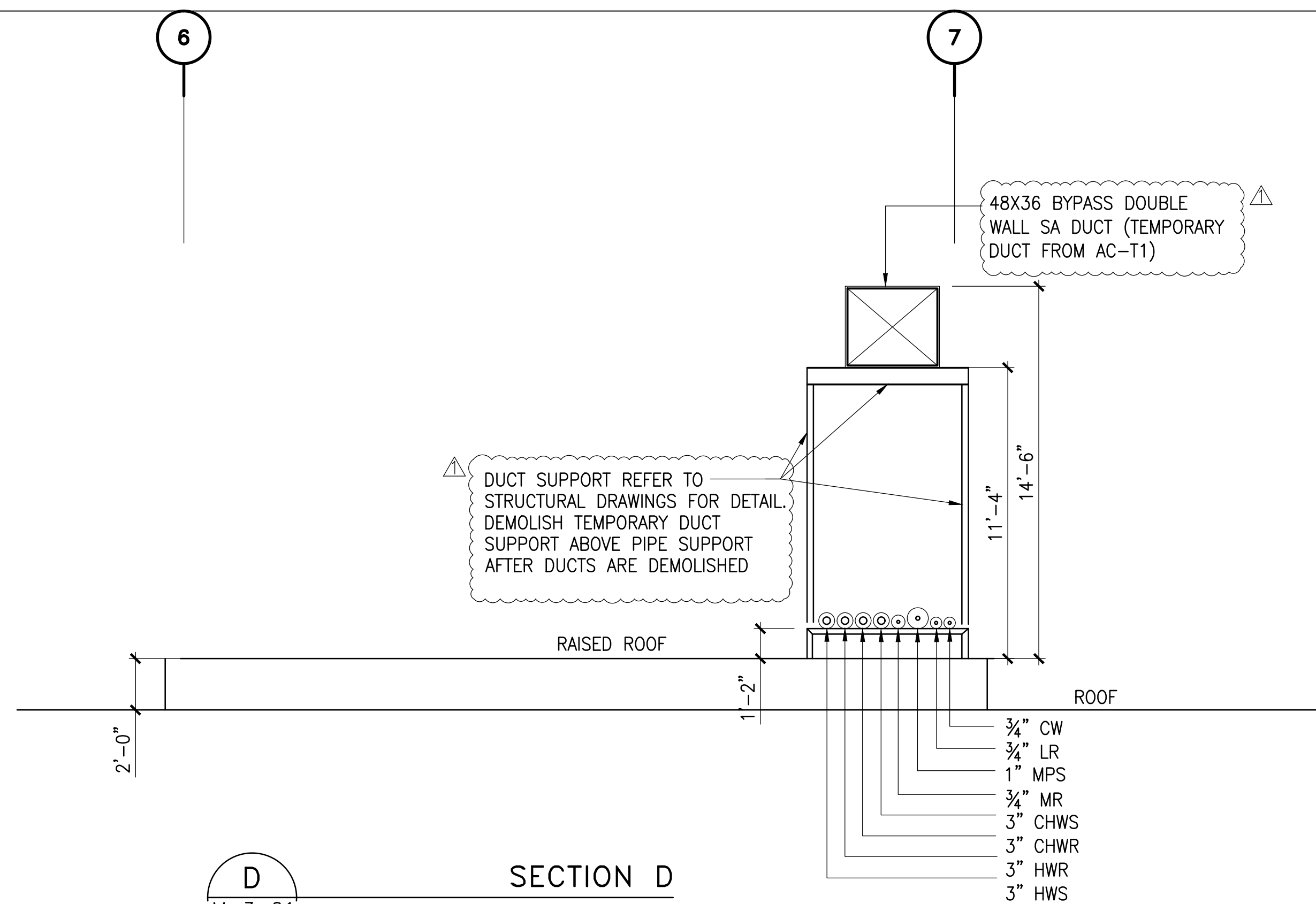
**A** SECTION A (AHU-1)  
M-3-01 SCALE = 1/4"=1'-0"



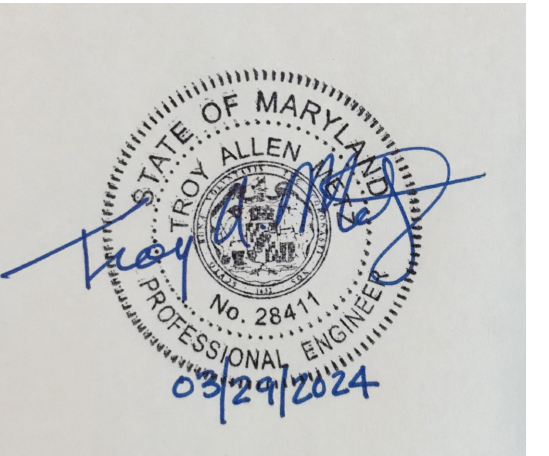
**B** SECTION B (AHU-2)  
M-3-01 SCALE = 1/4"=1'-0"



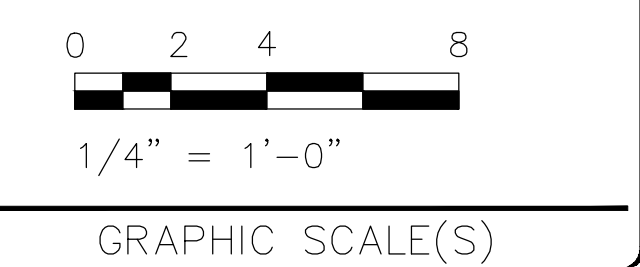
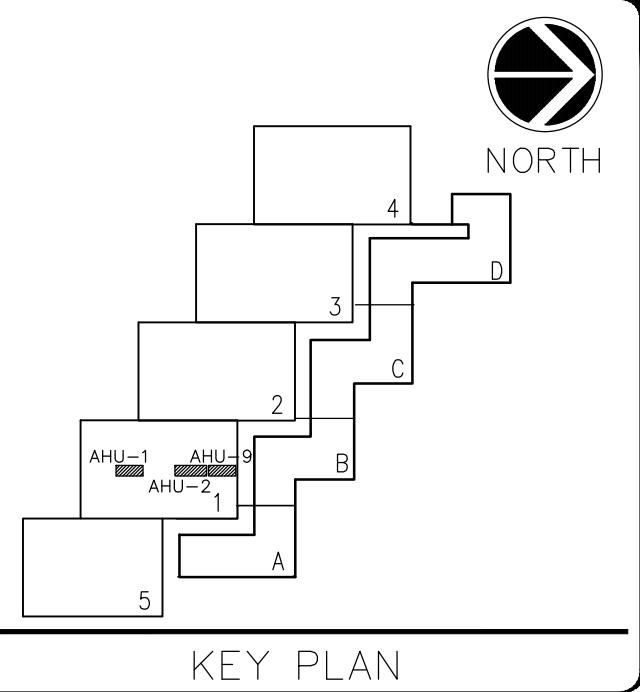
**C** SECTION C (AHU-9)  
M-3-01 SCALE = 1/4"=1'-0"



**D** SECTION D  
M-3-01 SCALE = 1/4"=1'-0"



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DATE	DESCRIPTION
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REVISION 1	AMENDMENT 2 - 03/29/2024
REVISION 2	
REVISION 3	
REVISION 4	
REVISION 5	
REVISION 6	
REVISION 7	

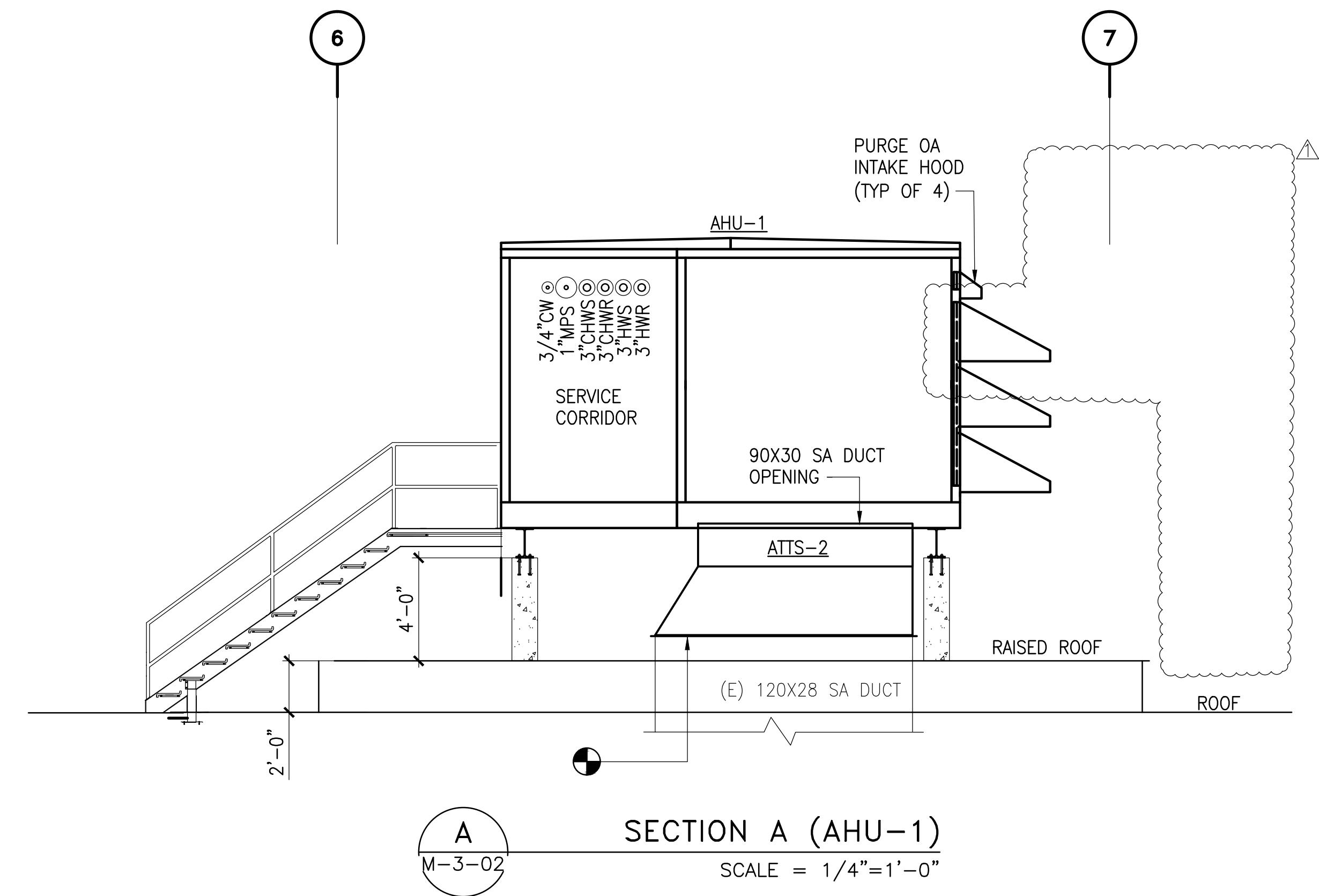


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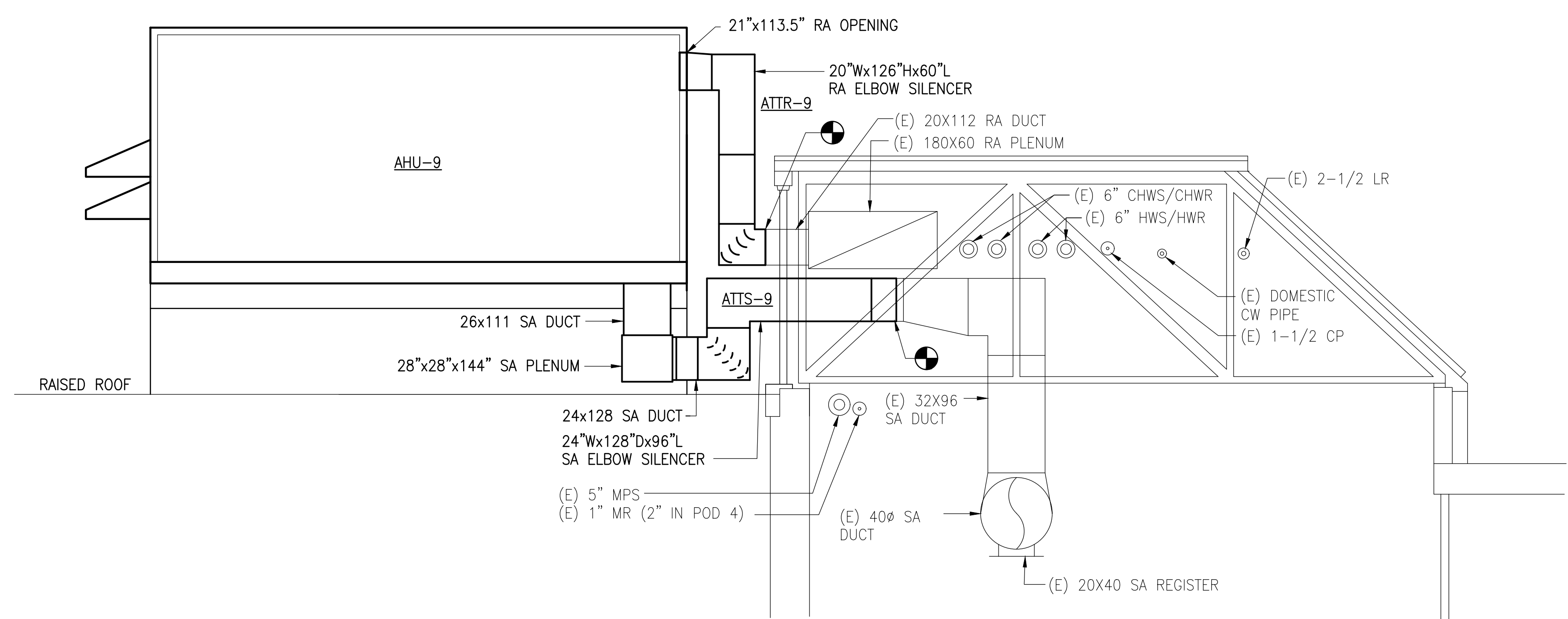
PAKING NAME	MUSEUM SUPPORT CENTER
ADDRESS	4210 SILVER HILL ROAD SUITLAND, MD 20746
PROJECT TITLE	MSC REPLACE AHUS POD 1
SP. PROJECT NUMBER	1530103
A/C PROJECT NUMBER	60516569

DRAWING TITLE	MECHANICAL SECTIONS
DRAWING TYPE	MECHANICAL
WORKING STAFF	FDL FDL DP
DESIGNED BY	DRAWN BY
CHECKED BY	CREATED BY

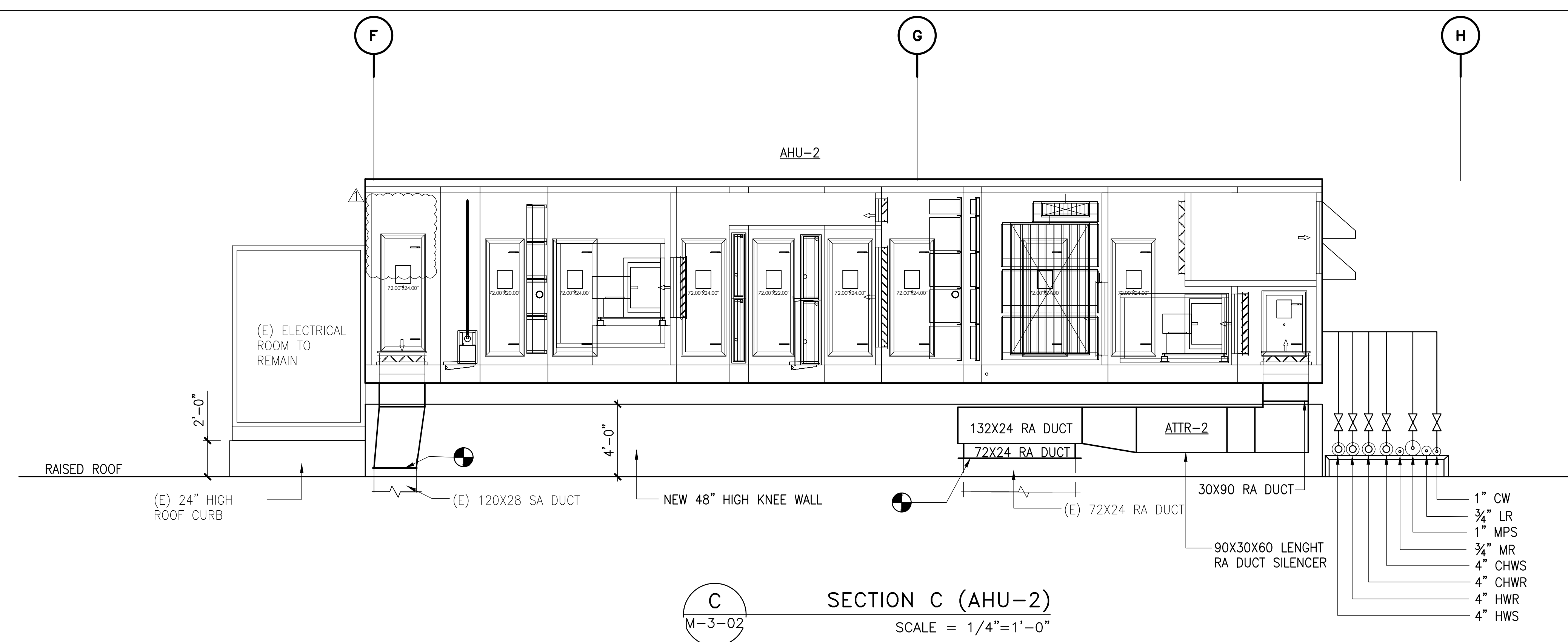
SHEET NO.	M 3 01
23 OF 71	GROUPLINE TITLE SEQUENCE



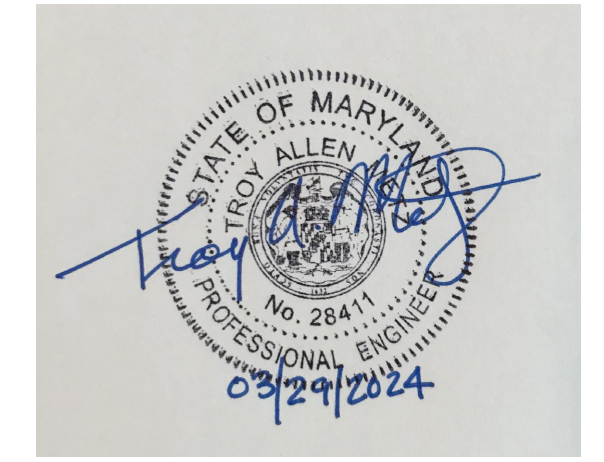
**A** SECTION A (AHU-1)  
M-3-02 SCALE = 1/4"=1'-0"



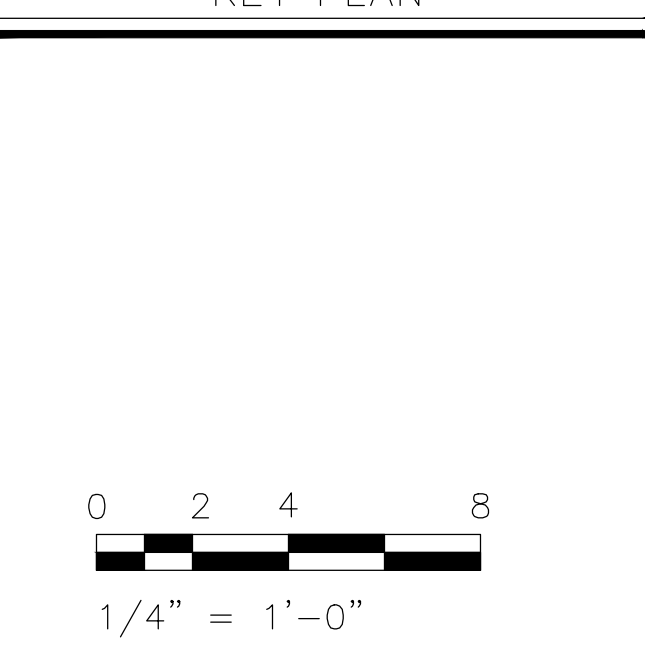
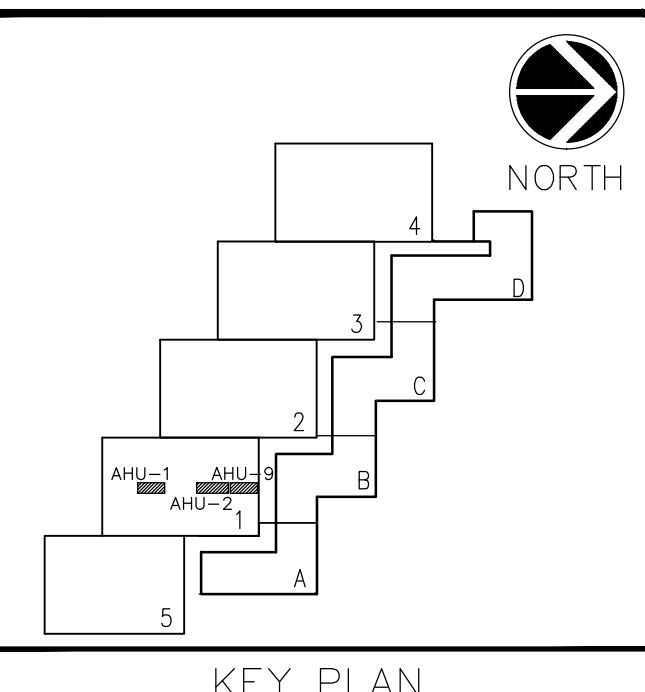
**B** SECTION B (AHU-9)  
M-3-02 SCALE = 1/4"=1'-0"



**C** SECTION C (AHU-2)  
M-3-02 SCALE = 1/4"=1'-0"



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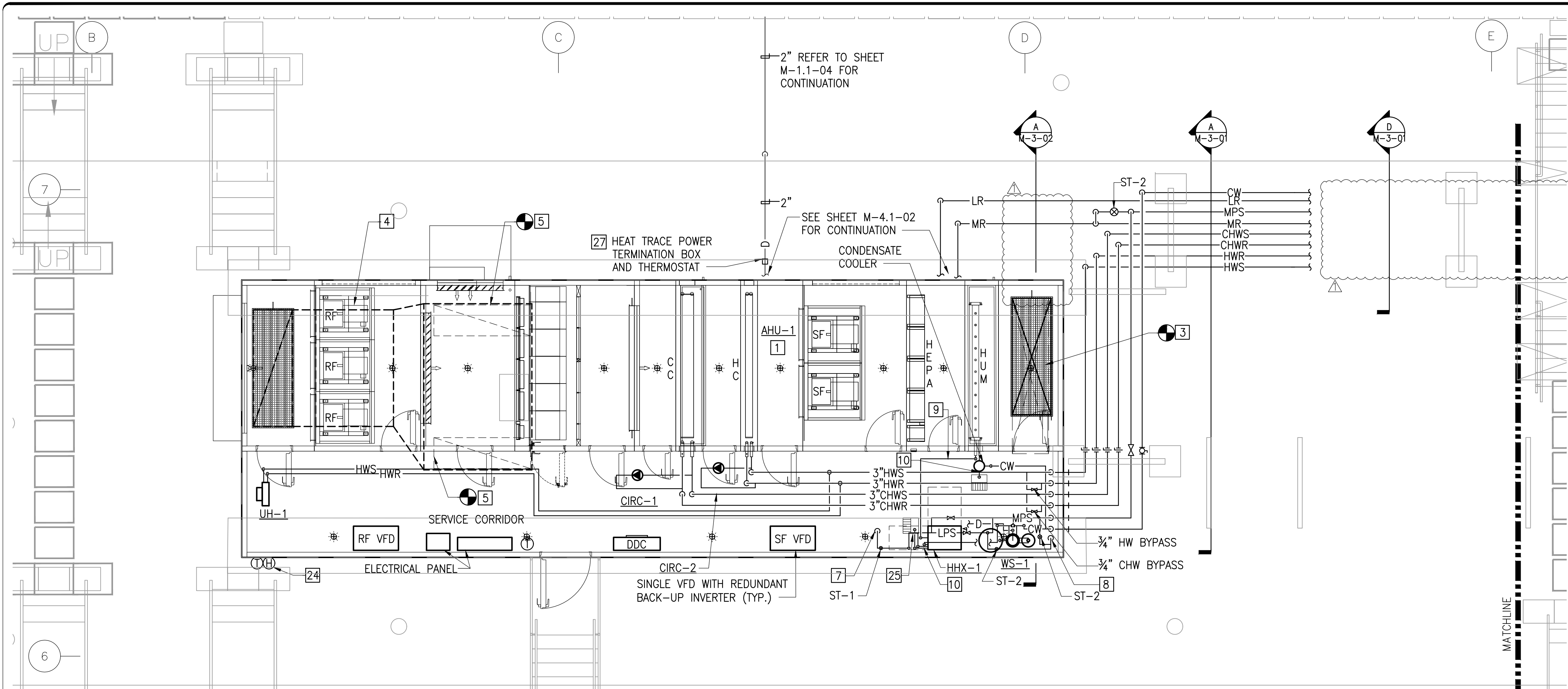


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SP PROJECT NUMBER	1530103
A/E PROJECT NUMBER	60516569
ISSUING TITLE	MECHANICAL SECTIONS
ISSUING TYPE	MECHANICAL
ISSUING STAFF	FDL FDL DP
ISSUED BY	DRWN BY
CHECKED BY	
SHEET NO.	M 3 02
24 OF 71	GROUPLINE TYPE SEQUENCE



**A** POD 1 PARTIAL ROOF LEVEL (AHU-1) - ENLARGED  
M-4.1-01 SCALE = 1/4"=1'-0"

- 24 OUTDOOR AIR BAS TEMPERATURE/HUMIDITY SENSORS SHALL BE INSTALLED TO PROTECT THEM FROM DIRECT SUNLIGHT.
- 25 12" SQUARE HALF GRATE FLOOR SINK. COORDINATE ALL FLOOR DRAIN LOCATIONS. PROVIDE P-TRAP WITH ALL FLOOR DRAINS. HEAT TRACE AND INSULATE FLOOR DRAIN BODY. DO NOT RUN DRAIN PIPE TO FLOOR SINK CROSSING WALKWAY PATH OR PROVIDE STEP OVER PLATFORM OVER PIPE.
- 26 COORDINATE PIPE RUN AND ROUTE PIPES BELOW STAIRS.
- 27 HEAT TRACE CAPACITY: 3 W/LF, 120V/1PH/60HZ, 20 AMPS.
- 28 HEAT TRACE CAPACITY EACH OF FOUR LOOPS: 5 W/LF, 120V/1PH/60HZ, 20 AMPS. PROVIDE PLATFORM OVER PIPES TO ACCESS ALL CONTROLS INCLUDING CW PIPE.
- 21 CONNECT NEW SUPPLY DUCT TO EXISTING 112X24 SA DUCT, BELOW RA DUCT, TO STREET CORRIDOR. CONTRACTOR SHALL VERIFY AND MAKE SURE THE EXISTING DUCT PENETRATION TO WALL IS WATER TIGHT.
- 22 CONNECT NEW RETURN DUCT TO EXISTING 112X20 RA DUCT TO STREET CORRIDOR. CONTRACTOR SHALL VERIFY AND MAKE SURE THE EXISTING DUCT PENETRATION TO WALL IS WATER TIGHT.
- 23 PROVIDE NEW PIPING, CONNECT TO PIPING INSTALLED IN PHASE 1A. FLUSH AND CLEAN ALL NEW PIPING, THEN OPEN VALVES FOR OPERATION. INSTALL CONSTRUCTION STRAINERS IN NEW PIPING. AFTER ONE WEEK OF OPERATION INSTALL FINAL STRAINERS.

**GENERAL NOTES:**

1. FOR POD 1 PHASING NOTES: REFER TO DRAWINGS MP-1.1-01, 02, 03, 04 AND 05

**CODED NOTES:**

**PHASE 1A (AHU-1):**

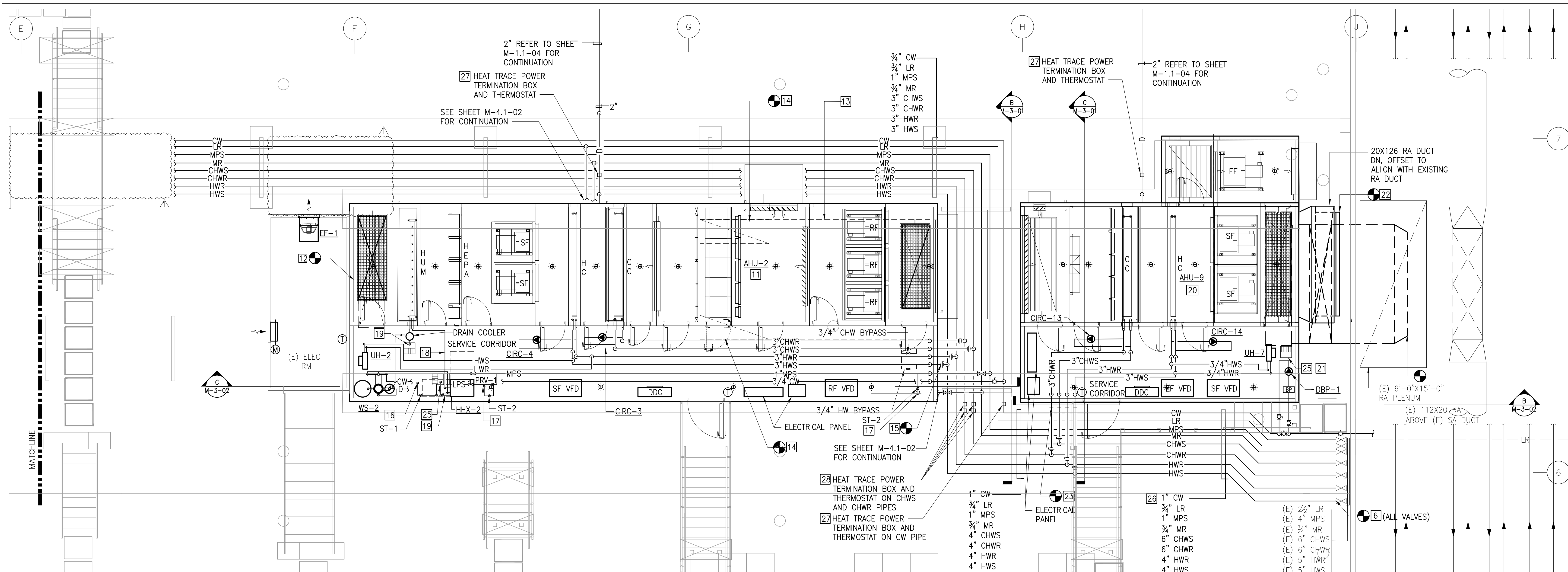
- 1 PROVIDE NEW CUSTOM BUILT AIR HANDLING UNIT AHU-1 INCLUDING STEAM TO STEAM HUMIDIFIER, WATER SOFTENER, VFDs, ASSOCIATED CONTROLS, REQUIRED PIPING, SHUT OFF VALVES, ACCESSORIES, AND ELECTRICAL POWER REQUIREMENT. INSTALL UNIT ON CONCRETE KNEE WALL 48 INCHES HIGH FROM RAISED ROOF LEVEL.
- 2 NOT USED
- 3 CONNECT NEW 90X30 SUPPLY DUCT TO EXISTING 120X28 SA DUCT UNDERNEATH THE UNIT.
- 4 PROVIDE RETURN AIR PLENUM UNDERNEATH THE UNIT.
- 5 CONNECT EXISTING 72X24 RETURN DUCT TO RETURN AIR PLENUM.
- 6 PROVIDE NEW PIPING TO POINT INDICATED. FLUSH AND CLEAN ALL NEW PIPING THEN OPEN VALVES FOR OPERATION. INSTALL CONSTRUCTION STRAINERS IN ALL NEW PIPING. AFTER ONE WEEK OF OPERATION INSTALL FINAL STRAINERS. PROVIDE HEAT TRACE ON ALL CHWS, CHWR, CW AND D PIPES.
- 7 3/4" LR, DN
- 8 3/4" MR, DN
- 9 1 3/4" ATMOSPHERIC STAINLESS STEEL CLEAN STEAM PIPE
- 10 1" HUMIDIFIER BLENDED CONDENSATE DRAIN (TYPE L, COPPER), DN TO FLOOR SINK.

**PHASE 1B (AHU-2):**

- 11 PROVIDE NEW CUSTOM BUILT AIR HANDLING UNIT AHU-2 INCLUDING STEAM TO STEAM HUMIDIFIER, WATER SOFTENER, VFDs, ASSOCIATED CONTROLS, REQUIRED PIPING, SHUT OFF VALVES, ACCESSORIES, AND ELECTRICAL POWER REQUIREMENT. INSTALL UNIT ON CONCRETE KNEE WALL 48 INCHES HIGH FROM RAISED ROOF LEVEL.
- 12 CONNECT NEW 90X30 SUPPLY DUCT TO EXISTING 120X28 SA DUCT UNDERNEATH THE UNIT.
- 13 PROVIDE RA PLENUM UNDERNEATH THE UNIT
- 14 CONNECT EXISTING 72X24 RETURN DUCT TO RETURN AIR PLENUM
- 15 CONNECT UNIT PIPING TO PIPING INSTALLED IN PHASE 1A. FLUSH AND CLEAN NEW PIPING THEN OPEN THE VALVES FOR OPERATION. INSTALL CONSTRUCTION STRAINERS IN ALL NEW PIPING. AFTER ONE WEEK OF OPERATION INSTALL FINAL STRAINERS.
- 16 3/4" LR, DN
- 17 3/4" MR, DN
- 18 1 3/4" ATMOSPHERIC STAINLESS STEEL CLEAN STEAM PIPE
- 19 1" HUMIDIFIER BLENDED CONDENSATE DRAIN (TYPE L, COPPER), DN TO FLOOR DRAIN.

**PHASE 1C (AHU-9):**

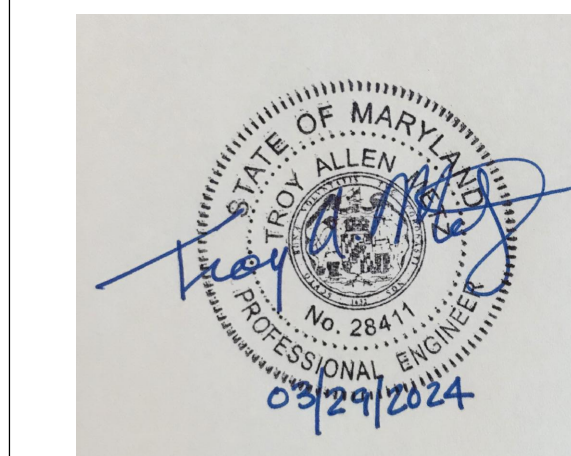
- 20 PROVIDE NEW CUSTOM BUILT AIR HANDLING UNIT AHU-9 INCLUDING VFDs, ASSOCIATED CONTROLS, THE REQUIRED PIPING, SHUT OFF VALVES, ACCESSORIES, AND ELECTRICAL POWER REQUIREMENTS. INSTALL UNIT ON CONCRETE KNEE WALL 48 INCHES HIGH FROM RAISED ROOF LEVEL.



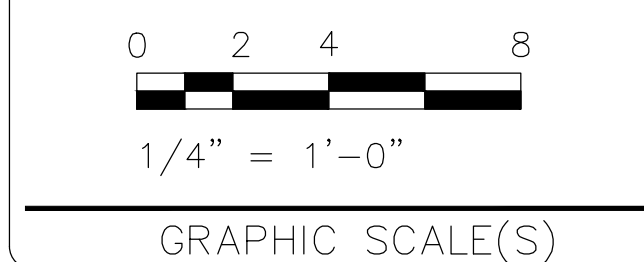
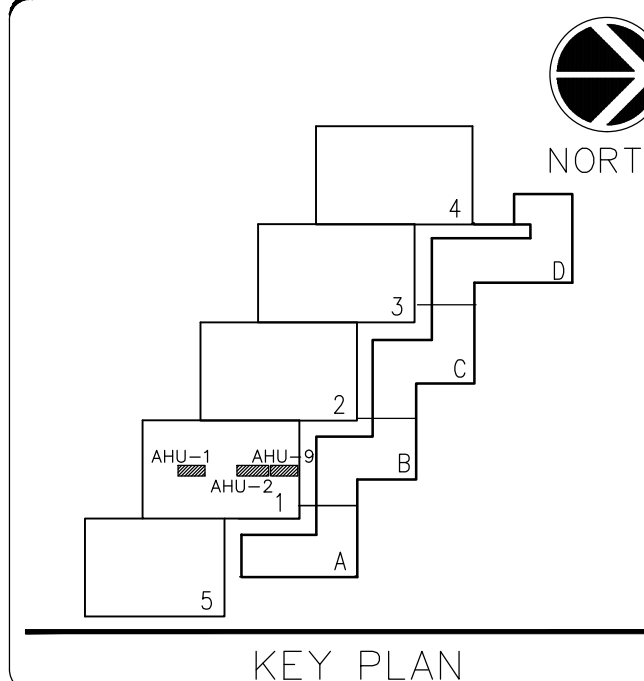
**B** POD 1 PARTIAL ROOF LEVEL (AHU-2 AND AHU-9) - ENLARGED  
M-4.1-01 SCALE = 1/4"=1'-0"

- 28 HEAT TRACE POWER TERMINATION BOX AND THERMOSTAT ON CHWS AND CHWR PIPES
- 27 HEAT TRACE POWER TERMINATION BOX AND THERMOSTAT ON CW PIPE
- 1" CW
- 3/4" LR
- 1" MPS
- 3/4" MR
- 4" CHWS
- 4" CHWR
- 4" HWR
- 4" HWS
- 26 1" CW
- 3/4" LR
- 1" MPS
- 3/4" MR
- 4" CHWS
- 6" CHWR
- 4" HWR
- 4" HWS
- (E) 2 1/2" LR
- (E) 4" MPS
- (E) 3/4" MR
- (E) 6" CHWS
- (E) 6" CHWR
- (E) 5" HWR
- (E) 5" HWS

- 6 (ALL VALVES)



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DATE	02/02/24
REVISION	BID SET
REVISION 1	AMENDMENT 2 - 03/29/2024
REVISION 2	
REVISION 3	
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REVISION 5	
REVISION 6	
REVISION 7	



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ISSUE NAME	MUSEUM SUPPORT CENTER
ADDRESS	4210 SILVER HILL ROAD SUITLAND, MD 20746
PROJECT TITLE	MSC REPLACE AHUS POD 1
SF PROJECT NUMBER	1530103
A/E/C PROJECT NUMBER	60516569

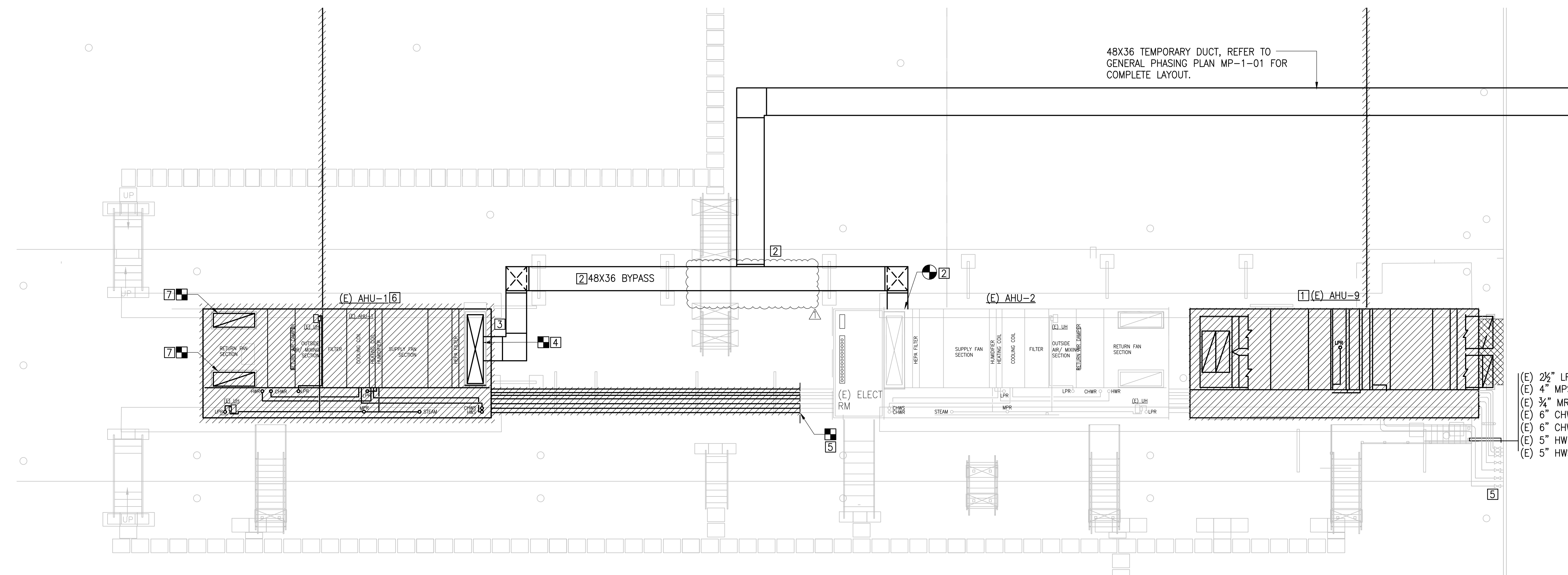
ISSUE DATE	M	4.1	O1
ISSUE TYPE	MECHANICAL	MECHANICAL	DP
ISSUE BY	FDL	FDL	DP
ISSUE DATE	26 OF 71		

**PHASING NOTES:**

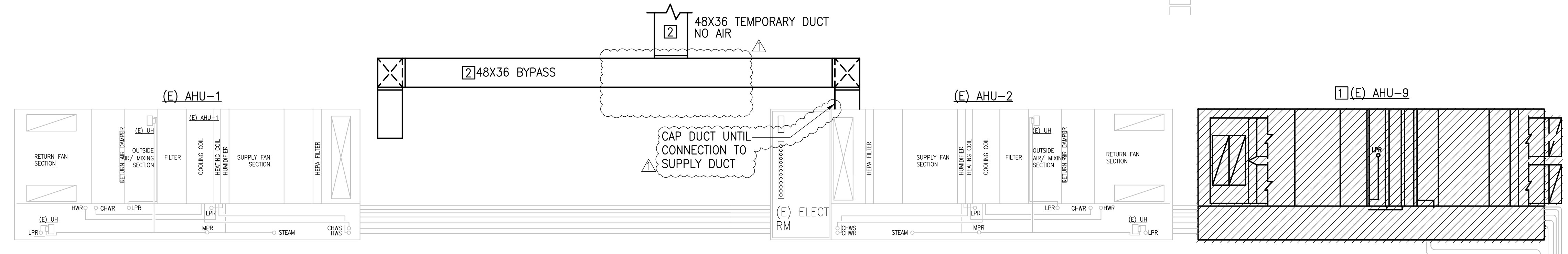
**PHASE 1A (AHU-1) SEQUENCE #1:**

- 1 FIRST DEMO (E) AHU-9, CLOSE THE VALVES SERVING THE UNIT WITHOUT CUTTING THE MAIN PIPING UNDERNEATH THE UNIT. REMOVE AHU-9 112X24 SA AND 112X20 RA DUCTS AS SHOWN ON THE DEMO DRAWINGS.
- 2 PROVIDE TEMPORARY DUCT IN PREPARATION FOR TEMPORARY SUPPLY OF 20,000 CFM TO POD-1 AREA SERVED BY (E) AHU-1.
- 3 SHUT DOWN (E) AHU-1 AND FIRST DEMO THE EXISTING DISCHARGE PLENUM AS INDICATED. PREPARE DUCT FOR TEMPORARY BYPASS DUCT CONNECTION TO (E) AHU-1. PROVIDE TEMPORARY RELIEF AIR OPENINGS WITH WIREMESH SCREEN TO EXISTING TWO RA DUCT RISERS UNDERNEATH THE UNIT. DISCONNECT 72X24 RA DUCT CONNECTION TO UNIT AND PROVIDE TEMPORARY INSULATED CAPS ON REMAINING EXISTING RA DUCT.
- 4 PROVIDE TEMPORARY BYPASS DUCT CONNECTION TO (E) AHU-1 120X28 SUPPLY DUCT. CONTRACTOR TO COORDINATE TO RUN THE EXISTING TEMPORARY UNIT AC-T1. (SEE MP-1-01 GENERAL NOTE 6)
- 5 CLOSE THE MAIN VALVES, REMOVE EXISTING PIPING SERVING (E) AHU-1, DRAIN THE REMAINING PIPES AND PREPARE TO CAP PIPES AT (E) AHU-2 TO SERVE THE POD-1 DURING THIS PHASE.
- 6 REMOVE EXISTING AIR HANDLING UNIT AHU-1 INCLUDING ASSOCIATED STEAM PIPING, CHILLED WATER PIPING, HOT WATER PIPING, CONTROLS, UNIT HEATERS, ELECTRICAL WIRING AND ACCESSORIES. REMOVE ALL CONTROLS FROM BAS.
- 7 WHILE REMOVING THE (E) AHU-1, CAP THE PIPING SERVING THE (E) AHU-2. PROVIDE DRIP LEG ON STEAM PIPE. OPEN THE MAIN VALVES.
- 8 NOT USED

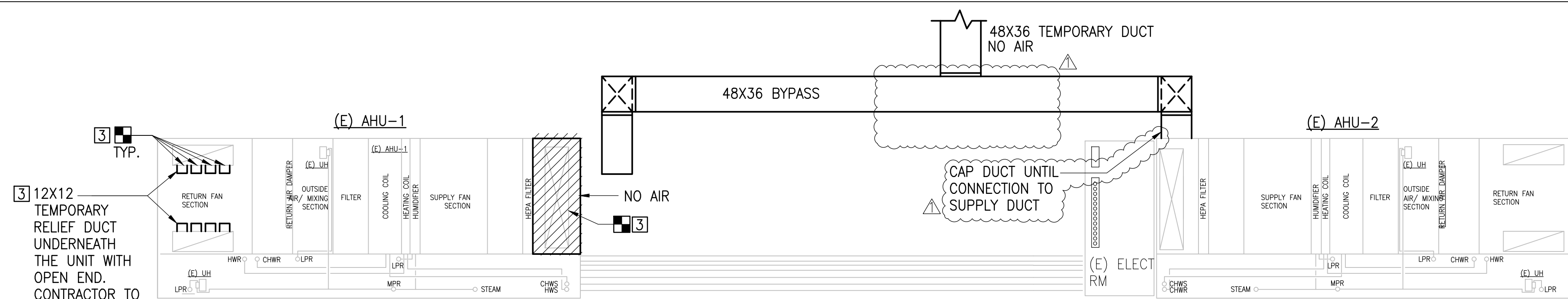
- (E) 2 1/2" LR
- (E) 4" MPS
- (E) 3/4" MR
- (E) 6" CHWS
- (E) 6" CHWR
- (E) 5" HWR
- (E) 5" HWS



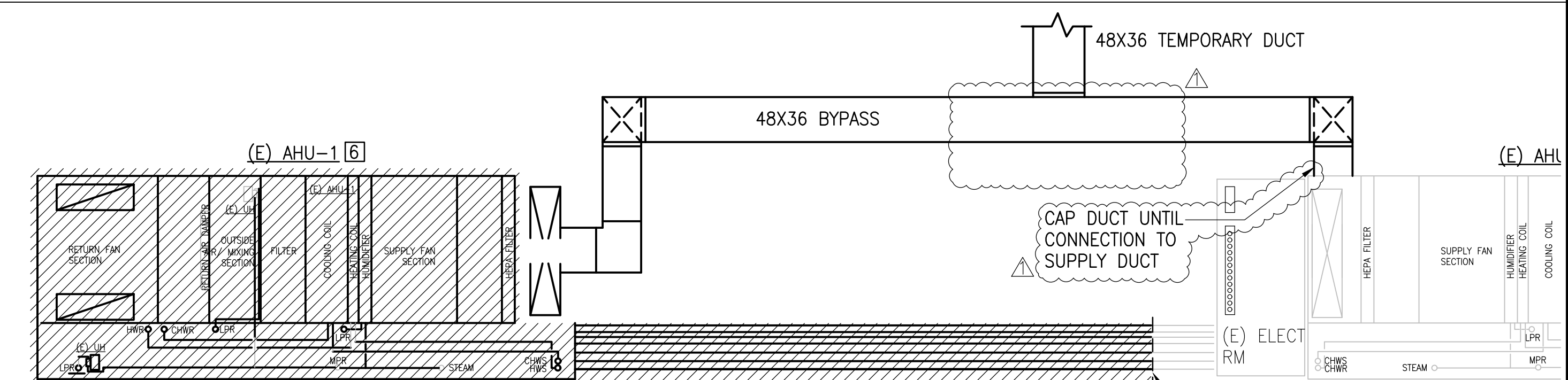
**A PHASE 1A SEQUENCE 1 - POD 1**  
MP-1.1-01 SCALE = 1/8"=1'-0"



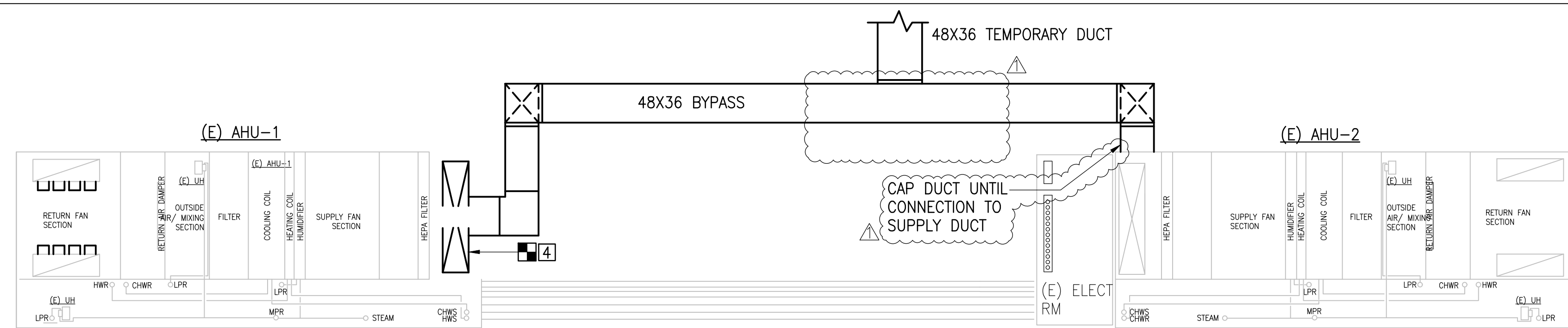
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MP-1.1-01 SCALE = 1/8"=1'-0"



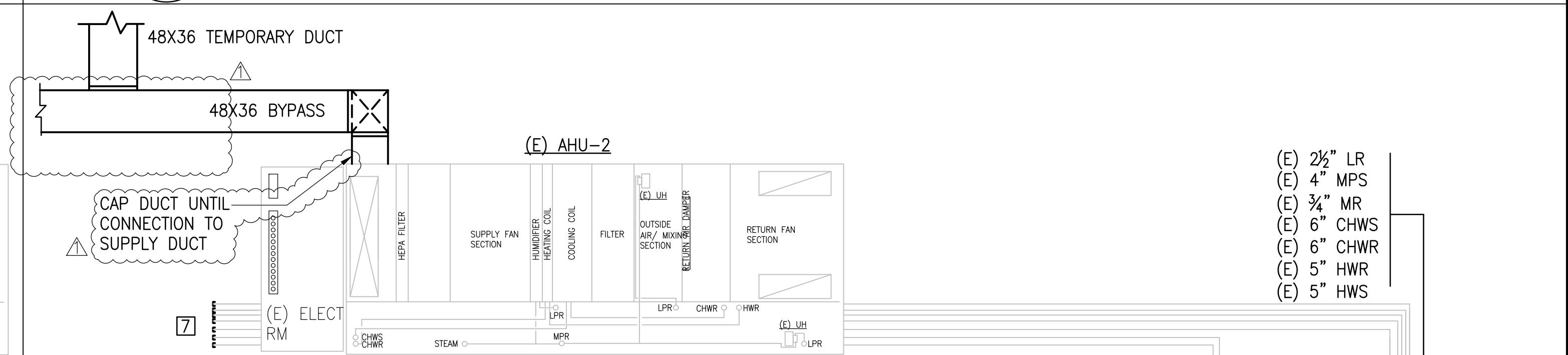
**2 DETAIL: PHASING NOTE 3**  
MP-1.1-01 SCALE = 1/8"=1'-0"



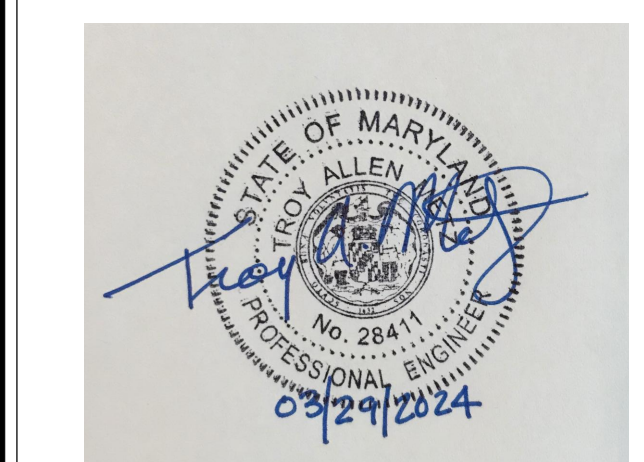
**4 DETAIL: PHASING NOTES 5, 6**  
MP-1.1-01 SCALE = 1/8"=1'-0"



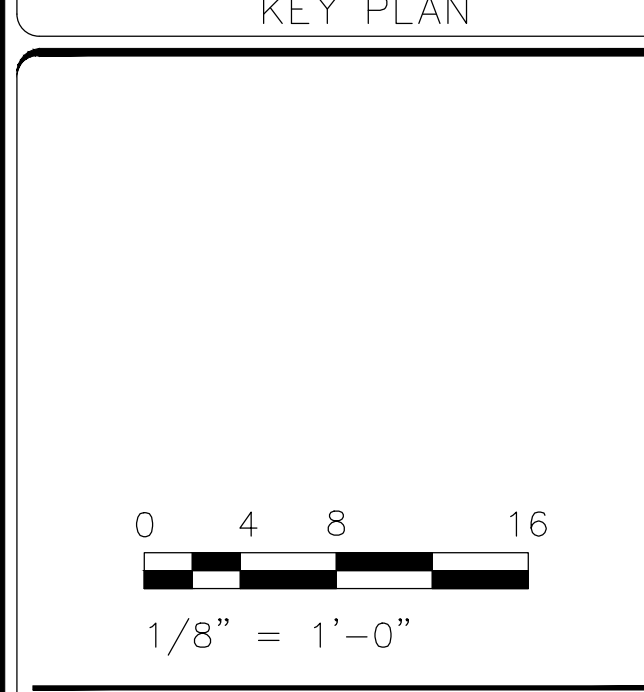
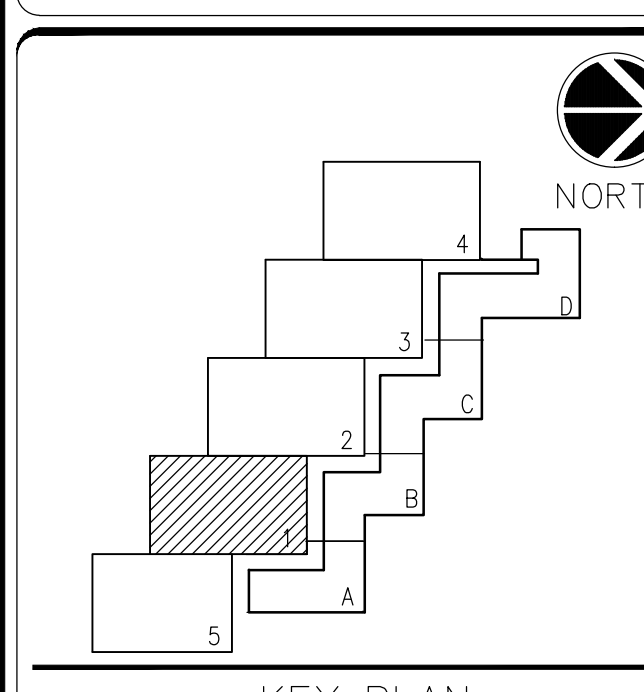
**3 DETAIL: PHASING NOTE 4**  
MP-1.1-01 SCALE = 1/8"=1'-0"



**5 DETAIL: PHASING NOTE 7**  
MP-1.1-01 SCALE = 1/8"=1'-0"



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DATE	02/02/24	REVISION	BID SET
REVISION 1		REVISION	AMENDMENT 2 - 03/29/2024
REVISION 2		REVISION 3	
REVISION 4		REVISION 5	
REVISION 6		REVISION 7	



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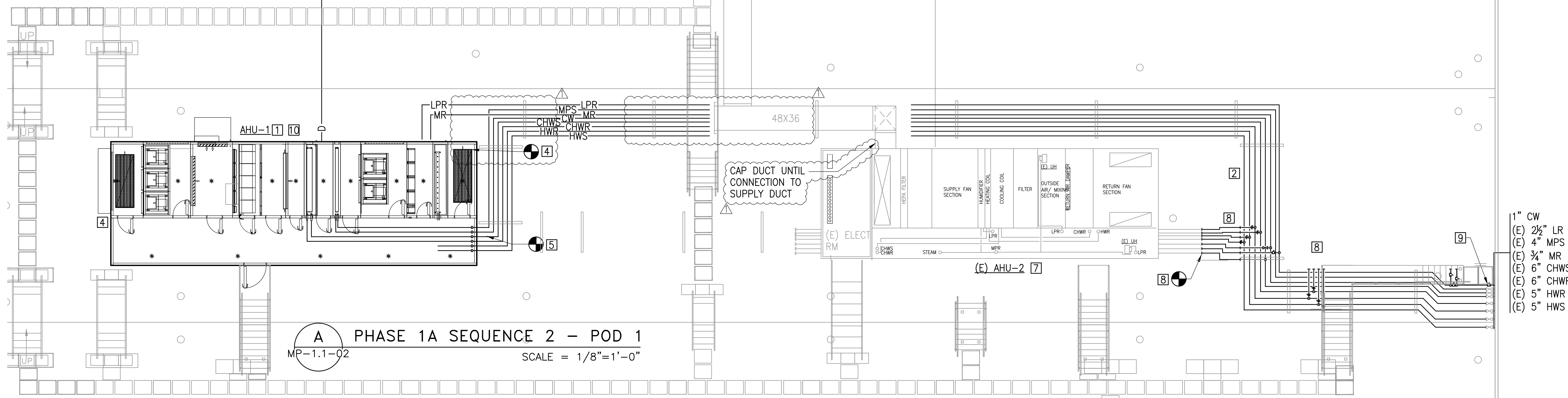
ISSUING NAME	MUSEUM SUPPORT CENTER
ADDRESS	4210 SILVER HILL ROAD SUITLAND, MD 20746
PROJECT TITLE	MSC REPLACE AHUs POD 1
SP PROJECT NUMBER	1530103
AVE PROJECT NUMBER	60516569
DRAWING TITLE	MECHANICAL POD 1 PHASING SEQUENCE PLAN
DRAWING TYPE	MECHANICAL
WORKING STAGE	FDL FDL DP
DESIGNED BY	DRAWN BY
CHECKED BY	
SHEET NO.	MP 1.1 01
29 OF 71	DISCIPLINE TYPE SEQUENCE

48X36 TEMPORARY DUCT, REFER TO GENERAL PHASING PLAN MP-1-01 FOR COMPLETE LAYOUT.

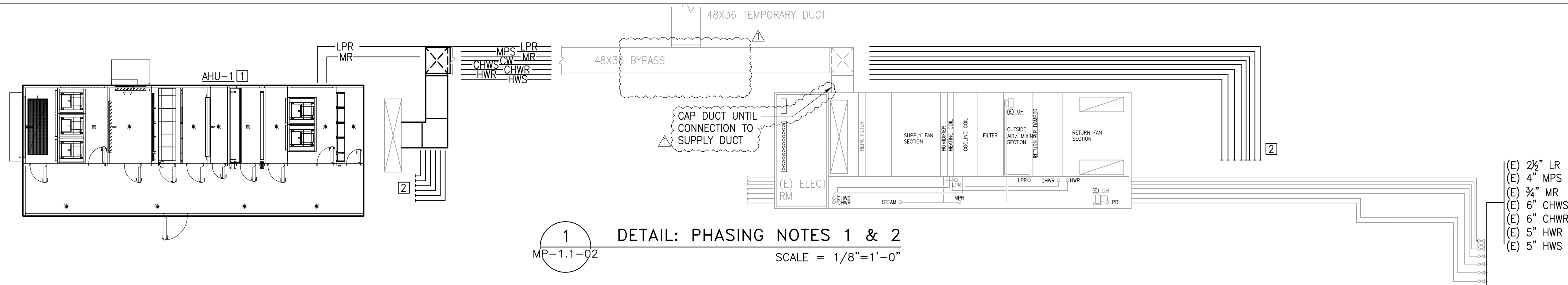
**PHASING NOTES:**

**PHASE 1A (AHU-1) SEQUENCE # 2:**

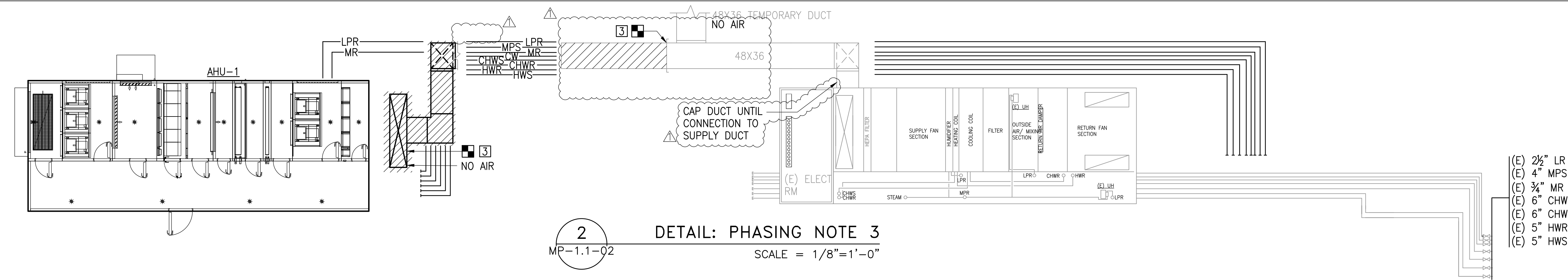
- 1 EXCEPT DISCHARGE PLENUM SECTION, INSTALL NEW CUSTOM BUILT AIR HANDLING UNIT AHU-1 INCLUDING STEAM TO STEAM HUMIDIFIER, WATER SOFTENER, VFDs, ASSOCIATED CONTROLS, THE REQUIRED PIPING AND ACCESSORIES, AND ELECTRICAL POWER. THE UNIT WILL BE INSTALLED IN SECTIONS. THE DISCHARGE PLENUM SECTION WILL BE THE LAST SECTION TO BE INSTALLED AFTER DISCONNECTION OF TEMPORARY BYPASS DUCT.
  - 2 INSTALL NEW PIPING WITH TEMPORARY CAP AS INDICATED WHILE THE NEW AHU-1 IS BEING CONSTRUCTED.
  - 3 COORDINATE TO DEENERGIZED/STOP THE TEMPORARY UNIT AC-T1. REMOVE TEMPORARY BYPASS DUCT CONNECTION AS INDICATED. REMOVE THE TEMPORARY RELIEF DUCT, PATCH THE OPENING WITH SAME DUCT MATERIALS AND INSULATE THE RA DUCT.
  - 4 INSTALL AHU DISCHARGE AIR PLENUM SECTION. CONNECT NEW SUPPLY DUCT TO EXISTING. CONNECT THE RA DUCT TO AHU.
  - 5 INSTALL PIPING TO AHU AS INDICATED.
  - 6 CLOSE THE EXISTING MAIN VALVES AND REMOVE EXISTING PIPING AS INDICATED.
  - 7 KEEP THE (E) AHU-2 SUPPLY AND RETURN FAN OPERATIONAL WITHOUT COOLING AND HEATING. CLOSE THE OA INTAKE DAMPER. THE NEW AHU-1 SUPPLY AND RETURN FANS MAY ALSO ENERGIIZED AT THIS POINT IN PREPARATION FOR TESTING AND AIR BALANCING.
  - 8 AFTER THE EXISTING PIPING HAVE BEEN REMOVED, PROVIDE NEW PIPING. CONNECT TO NEW PIPING INSTALLED IN PHASING NOTE 2, PROVIDE BRANCH PIPING TO AHU-2 AND AHU-9 WITH SHUT OFF VALVES, AND CONNECT TO EXISTING MAIN VALVES. TEMPORARY CONNECT AHU-2 TO NEW PIPES TO ALLOW UNIT OPERATION WHILE AHU-1 IS COMMISSIONED.
  - 9 INSTALL DOMESTIC LINE FOR HUMIDIFIER MAKE UP WATER. OPEN THE MAIN VALVES.
- PERFORM TESTING AND BALANCING, COMMISSION NEW AIR-HANDLING UNIT AND COMPONENTS, VERIFY NEW CONTROL INTERFACE WITH EXISTING SIEMENS BAS.



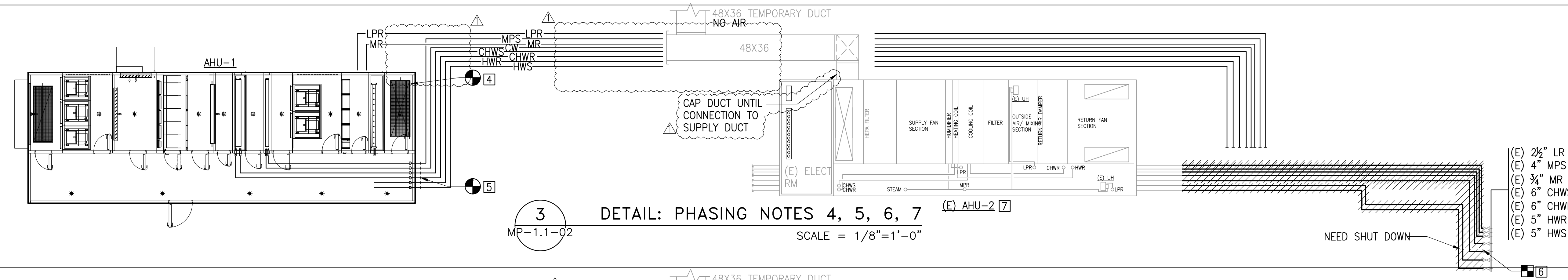
**A PHASE 1A SEQUENCE 2 - POD 1**  
MP-1.1-02 SCALE = 1/8"=1'-0"



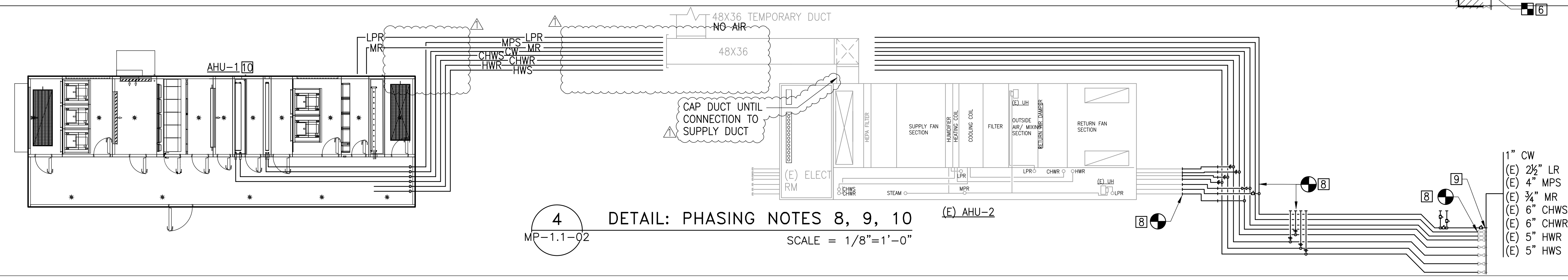
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MP-1.1-02 SCALE = 1/8"=1'-0"



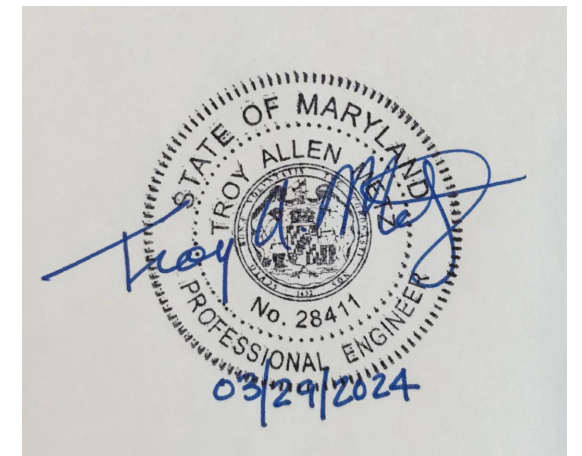
**2 DETAIL: PHASING NOTE 3**  
MP-1.1-02 SCALE = 1/8"=1'-0"



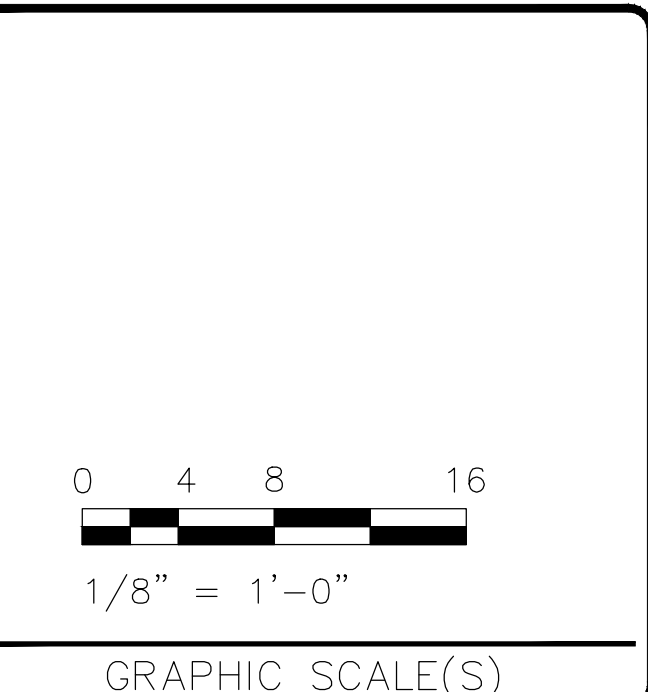
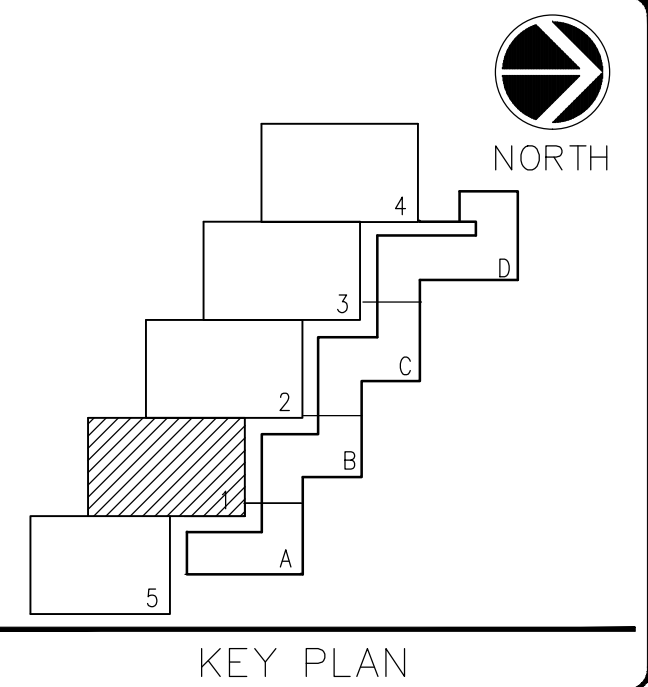
**3 DETAIL: PHASING NOTES 4, 5, 6, 7**  
MP-1.1-02 SCALE = 1/8"=1'-0"



**4 DETAIL: PHASING NOTES 8, 9, 10**  
MP-1.1-02 SCALE = 1/8"=1'-0"



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DATE	02/02/24	REVISION	BID SET
REVISION 1		REVISION	AMENDMENT 2 - 03/29/2024
REVISION 2			
REVISION 3			
REVISION 4			
REVISION 5			
REVISION 6			
REVISION 7			



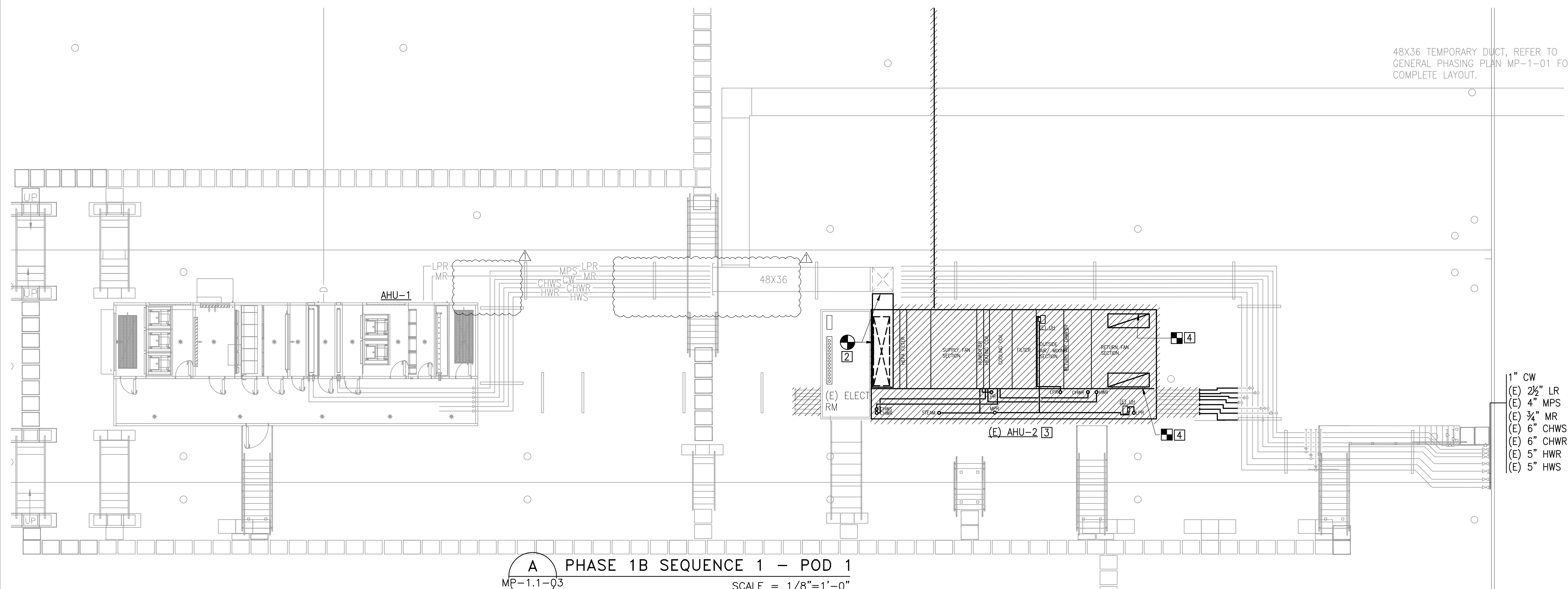
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Washington, DC 20024-2520

ISSUING NAME	MUSEUM SUPPORT CENTER
ADDRESS	4210 SILVER HILL ROAD SUITLAND, MD 20746
PROJECT TITLE	MSC REPLACE AHUS POD 1
SP PROJECT NUMBER	1530103
AVE PROJECT NUMBER	60516569
DRAWING TITLE	MECHANICAL POD 1 PHASING SEQUENCE PLAN
DRAWING TYPE	MECHANICAL
WORKING STATUS	FCL FDL DP
DESIGNED BY	DRAWN BY
CHECKED BY	
SHEET NO.	MP 1.1 02
30 OF 71	DISCIPLINE TYPE SEQUENCE

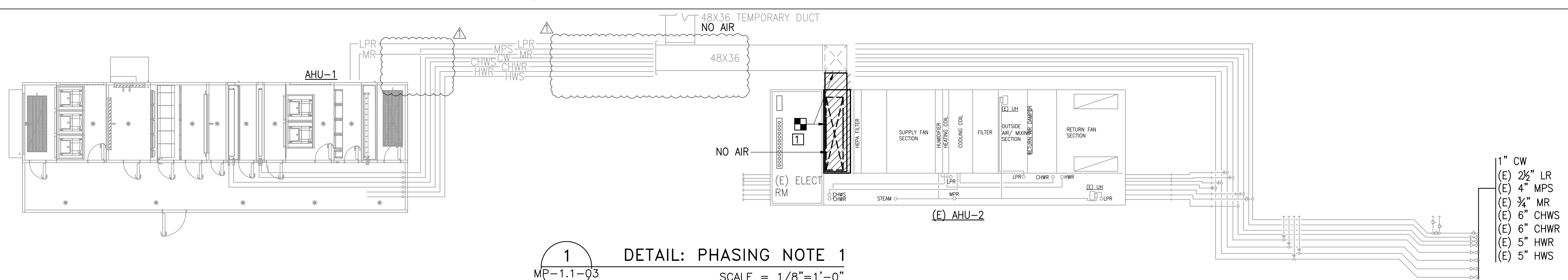
**PHASING NOTES:**

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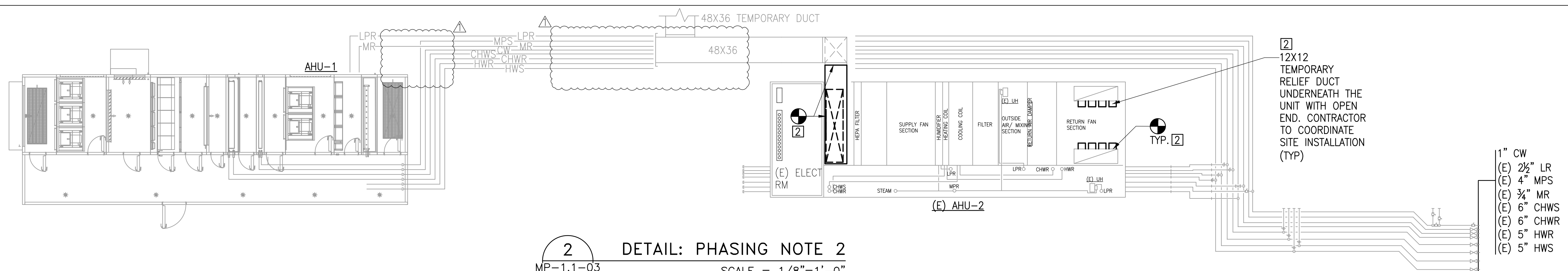
- 1 SHUT DOWN (E) AHU-2. FIRST DEMO THE EXISTING AHU DISCHARGE PLENUM AS INDICATED. PREPARE FOR TEMPORARY BYPASS DUCT CONNECTION TO EXISTING AHU SUPPLY DUCT.
- 2 PROVIDE TEMPORARY BYPASS DUCT CONNECTION TO (E) AHU-2 12X28 SUPPLY DUCT. PROVIDE TEMPORARY RELIEF OPENINGS WITH WIREMESH SCREEN TO EXISTING TWO RA DUCT RISERS UNDERNEATH THE UNIT. DISCONNECT EXISTING RA DUCT CONNECTION TO UNIT AND PROVIDE TEMPORARY INSULATED CAP ON REMAINING RA DUCT. CONTRACTOR TO COORDINATE TO RUN THE EXISTING TEMPORARY UNIT AC-T1. (SEE MP-1-01 GENERAL NOTE 6)
- 3 AFTER THE TEMPORARY SUPPLY AIR FROM AC-T1 HAS BEEN ESTABLISHED FOR AHU-2 EXISTING SA DUCT, REMOVE (E) AHU-2 INCLUDING ASSOCIATED STEAM PIPING, CHILLED WATER PIPING, HOT WATER PIPING, CONTROLS, UNIT HEATER, ELECTRICAL WIRING AND ACCESSORIES. REMOVE ALL CONTROLS FROM BAS.



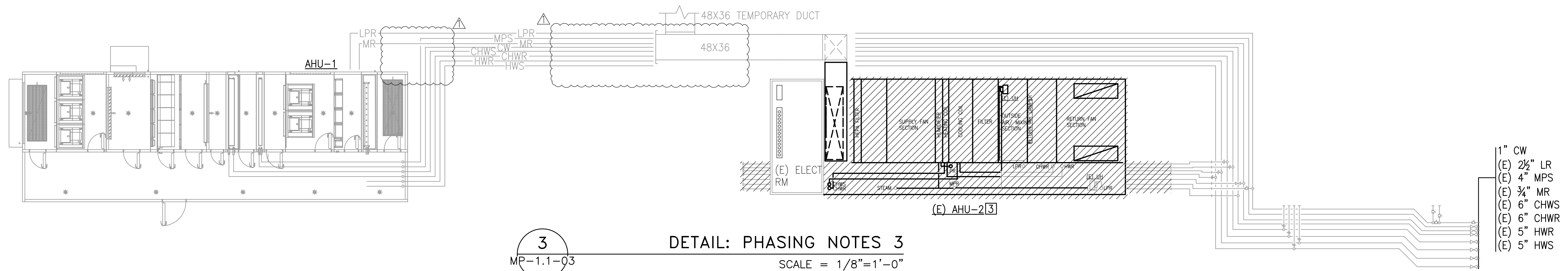
**A PHASE 1B SEQUENCE 1 - POD 1**  
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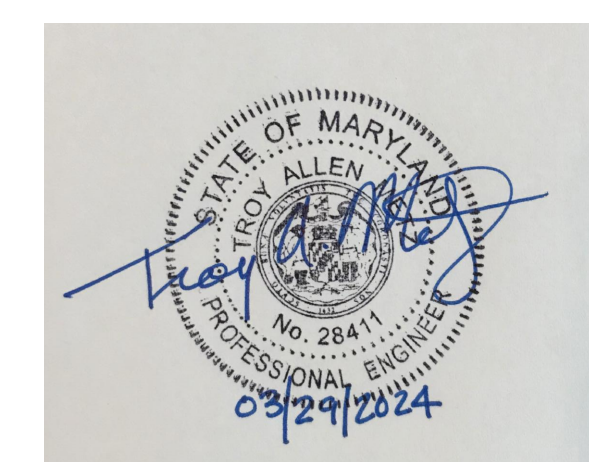
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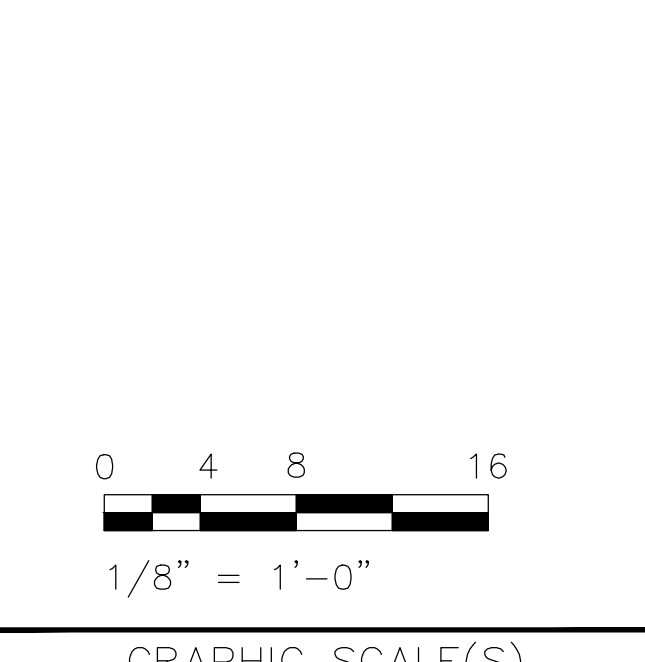
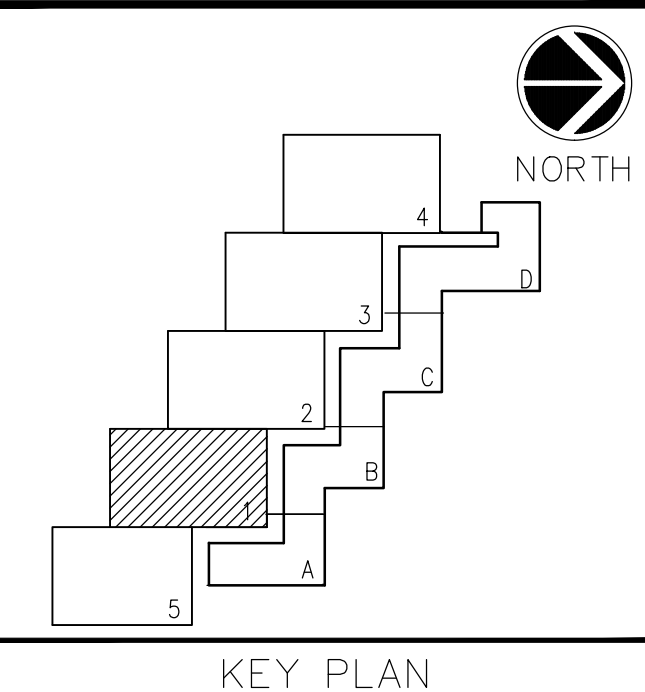
**2 DETAIL: PHASING NOTE 2**  
MP-1.1-03 SCALE = 1/8"=1'-0"



**3 DETAIL: PHASING NOTES 3**  
MP-1.1-03 SCALE = 1/8"=1'-0"



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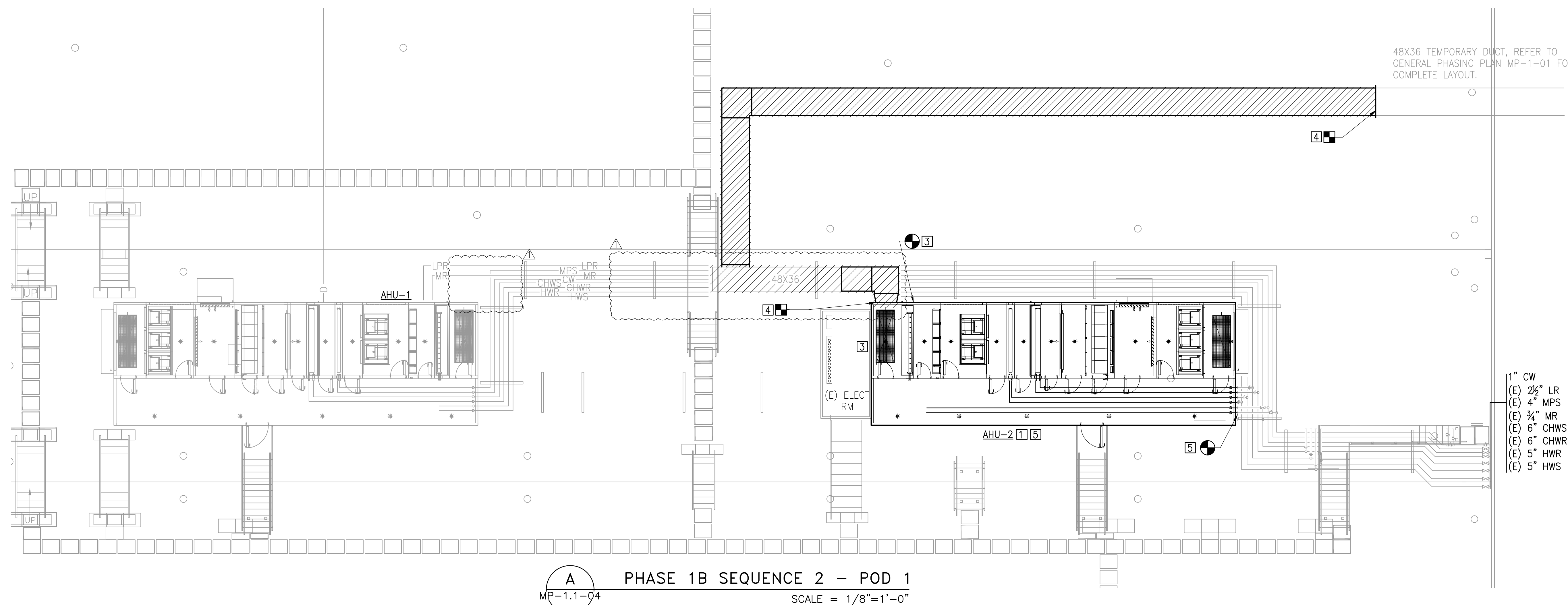


DATE	02/02/24	REVISION	BID SET
REVISION 1		REVISION	AMENDMENT 2 - 03/29/2024
REVISION 2		REVISION 3	
REVISION 4		REVISION 5	
REVISION 6		REVISION 7	



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BUILDING NAME	MUSEUM SUPPORT CENTER
ADDRESS	4210 SILVER HILL ROAD SUITLAND, MD 20746
PROJECT TITLE	MSC REPLACE AHUS POD 1
IF PROJECT NUMBER	1530103
USE PROJECT NUMBER	60516569
DRAWING TITLE	MECHANICAL POD 1 PHASING SEQUENCE PLAN
DRAWING TYPE	MECHANICAL
WORKING STATUS	FDL FDL DP
DESIGNED BY	DRAWN BY
CHECKED BY	
SHEET NO.	MP 1.1 03
31 OF 71	DISCIPLINE TYPE SEQUENCE



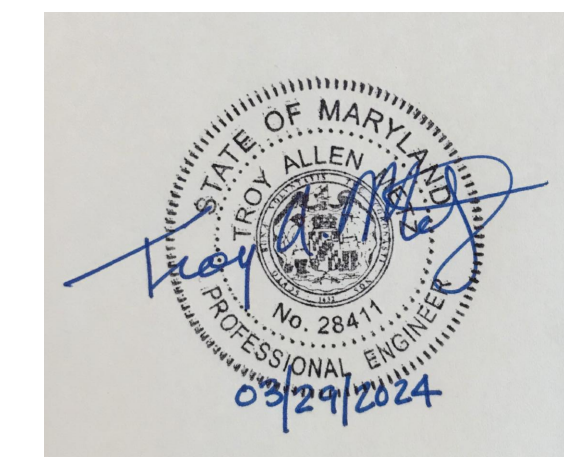


**A** PHASE 1B SEQUENCE 2 - POD 1  
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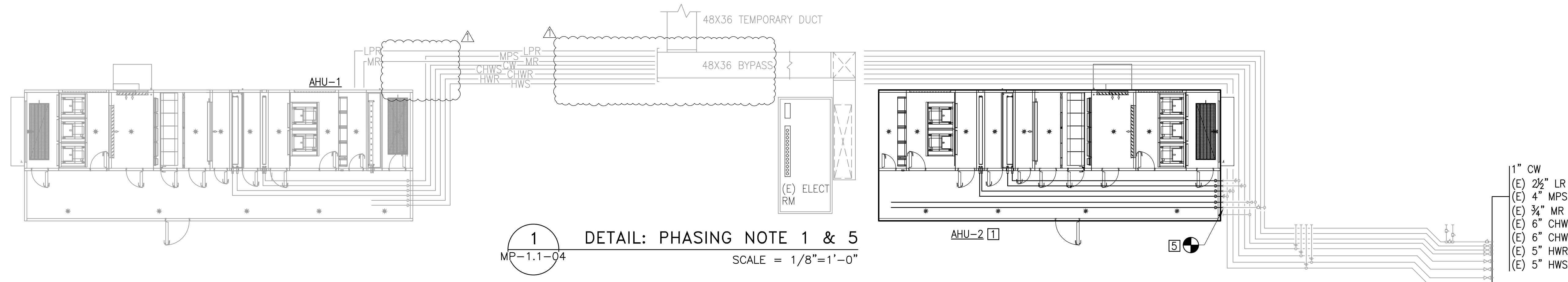
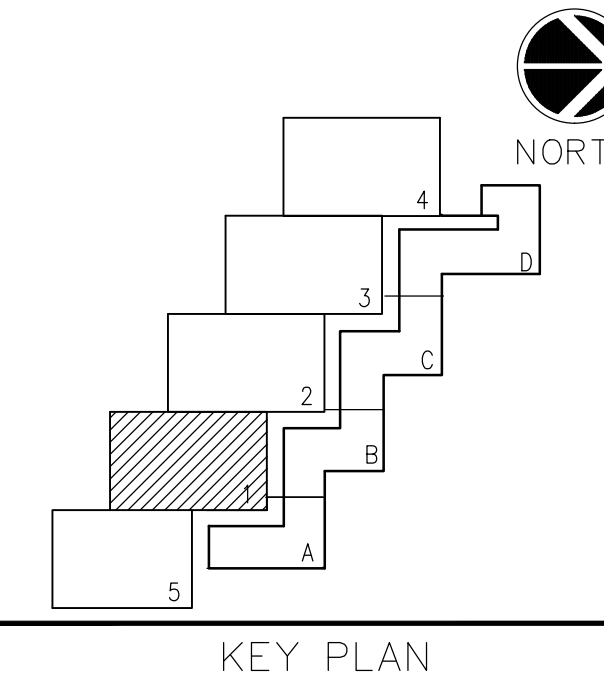
**PHASING NOTES:**

**PHASE 1B (AHU-2) SEQUENCE # 2:**

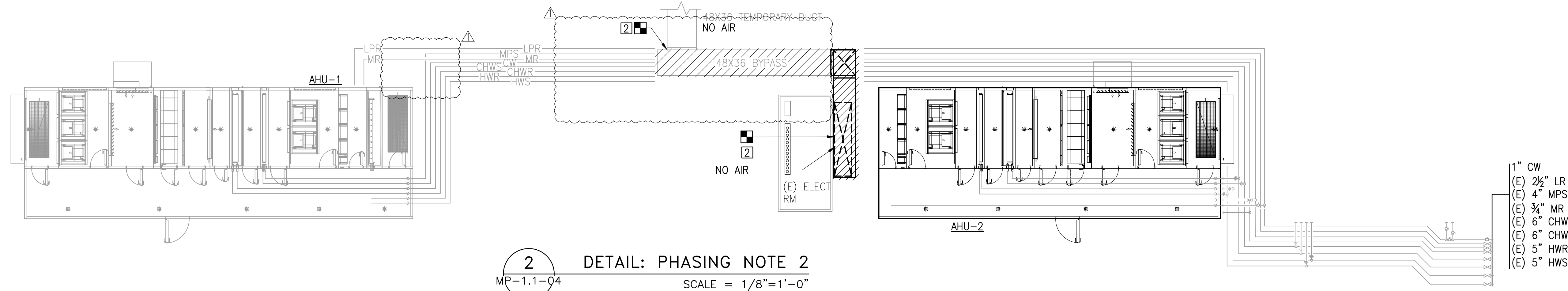
- 1 EXCEPT DISCHARGE PLENUM SECTION, INSTALL NEW CUSTOM BUILT AIR HANDLING UNIT AHU-2 INCLUDING STEAM TO STEAM HUMIDIFIER, WATER SOFTENER, VFDs, ASSOCIATED CONTROLS, THE REQUIRED PIPING AND ACCESSORIES, AND ELECTRICAL POWER. THE UNIT WILL BE INSTALLED IN SECTIONS. THE DISCHARGE PLENUM SECTION WILL BE THE LAST SECTION TO BE INSTALLED AFTER DISCONNECTION OF TEMPORARY BYPASS DUCT.
- 2 COORDINATE TO DE-ENERGIZE/STOP THE TEMPORARY UNIT AC-T1. REMOVE TEMPORARY BYPASS AIR DUCT CONNECTION TO AHU-2 AS INDICATED. REMOVE THE TEMPORARY RELIEF DUCT UNDERNEATH THE UNIT, PATCH THE OPENING WITH SAME DUCT MATERIALS AND INSULATE RA DUCT.
- 3 INSTALL AHU DISCHARGE PLENUM, CONNECT NEW SUPPLY DUCT TO EXISTING. CONNECT RA DUCT TO UNIT.
- 4 DISCONNECT TEMPORARY DUCT FROM BYPASS DUCT AND DEMOLISH TEMPORARY DUCT UP TO POINT OF DISCONNECTION AS INDICATED AND CAP THE REMAINING TEMPORARY DUCT FOR FUTURE USE FOR POD 2 AHU REPLACEMENT.
- 5 INSTALL NEW PIPING, CONNECT TO AHU-2 FROM PRE-INSTALLED PIPING.
- 6 PERFORM TESTING AND BALANCING, COMMISSION NEW AIR-HANDLING UNIT AND COMPONENTS, VERIFY NEW CONTROL INTERFACE WITH EXISTING SIEMENS BAS. SET THE AFMS OF BYPASS DUCT TO 17,000 CFM WHICH IS 50% OF AHUS AIR FLOW RATE.



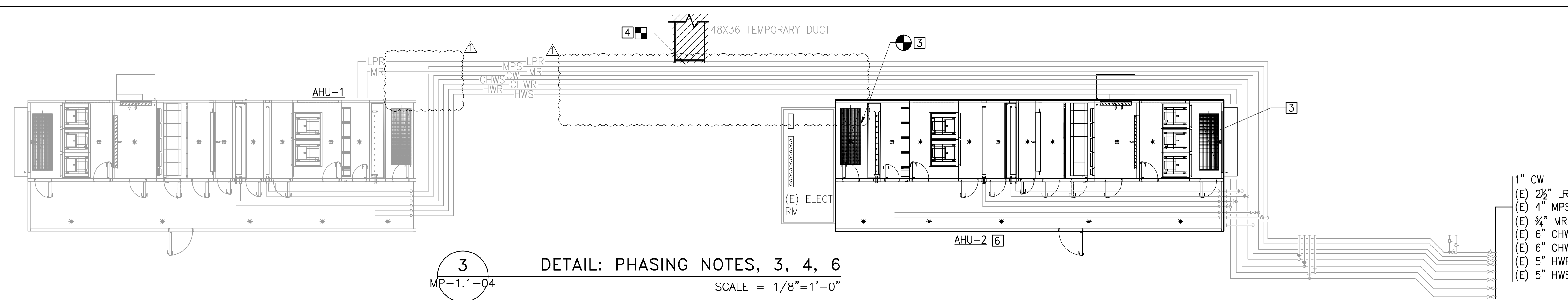
PROFESSIONAL CERTIFICATION.  
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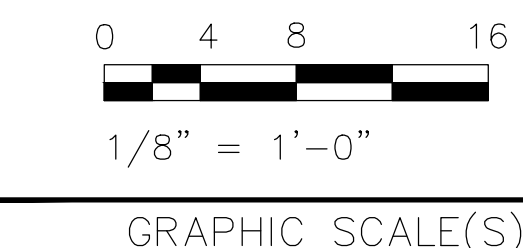
**1** DETAIL: PHASING NOTE 1 & 5  
MP-1.1-04 SCALE = 1/8"=1'-0"



**2** DETAIL: PHASING NOTE 2  
MP-1.1-04 SCALE = 1/8"=1'-0"



**3** DETAIL: PHASING NOTES, 3, 4, 6  
MP-1.1-04 SCALE = 1/8"=1'-0"

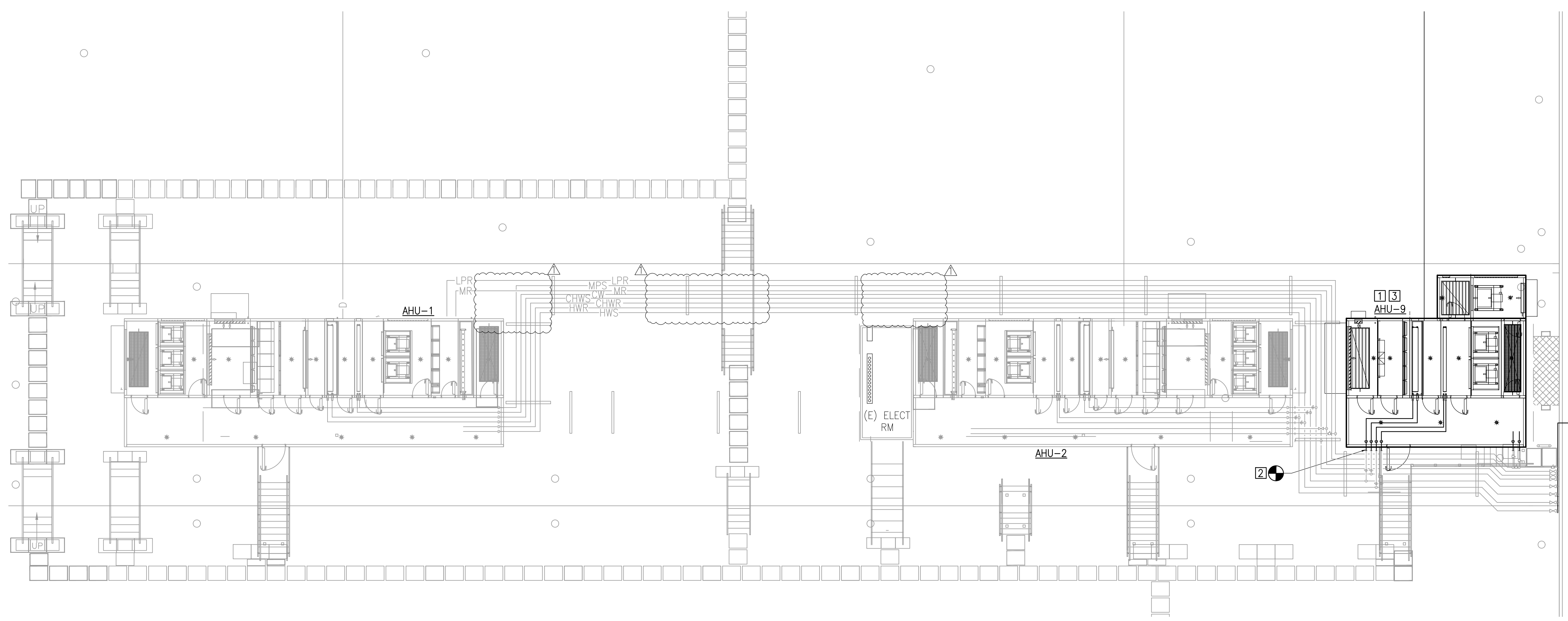


DATE	02/02/24	REVISION	BID SET
REVISION 1		REVISION	AMENDMENT 2 - 03/29/2024
REVISION 2		REVISION 3	
REVISION 4		REVISION 5	
REVISION 6		REVISION 7	



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BUILDING NAME	MUSEUM SUPPORT CENTER
ADDRESS	4210 SILVER HILL ROAD SUITLAND, MD 20746
PROJECT TITLE	MSC REPLACE AHUS POD 1
SP PROJECT NUMBER	1530103
AVE PROJECT NUMBER	60516569
DRAWING TITLE	MECHANICAL POD 1 PHASING SEQUENCE PLAN
DRAWING TYPE	MECHANICAL
WORKING STATUS	FDL FDL DP
DESIGNED BY	DRAWN BY
CHECKED BY	
SHEET NO.	MP 1.1 04
32 OF 71	DISCIPLINE TYPE SEQUENCE



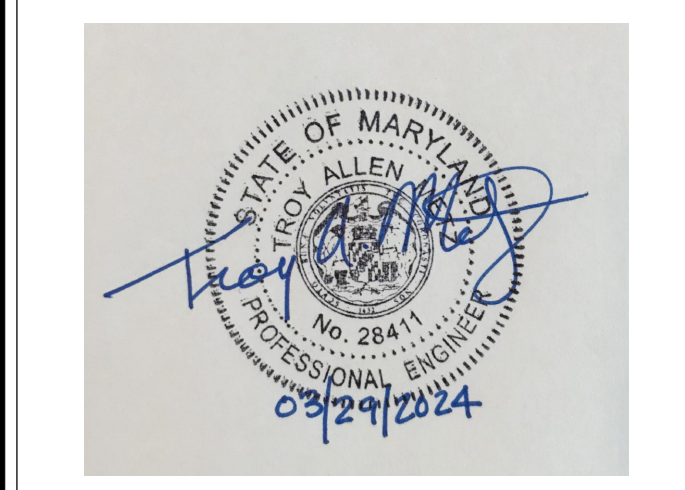
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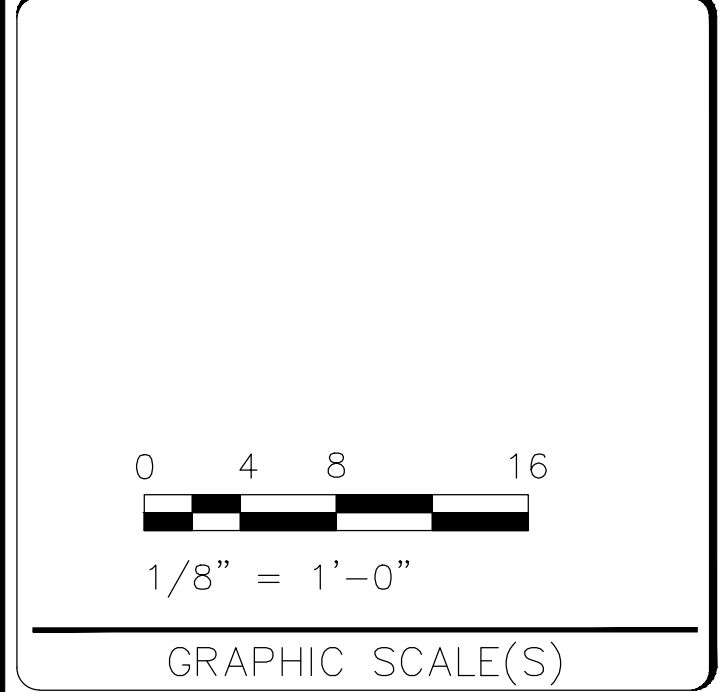
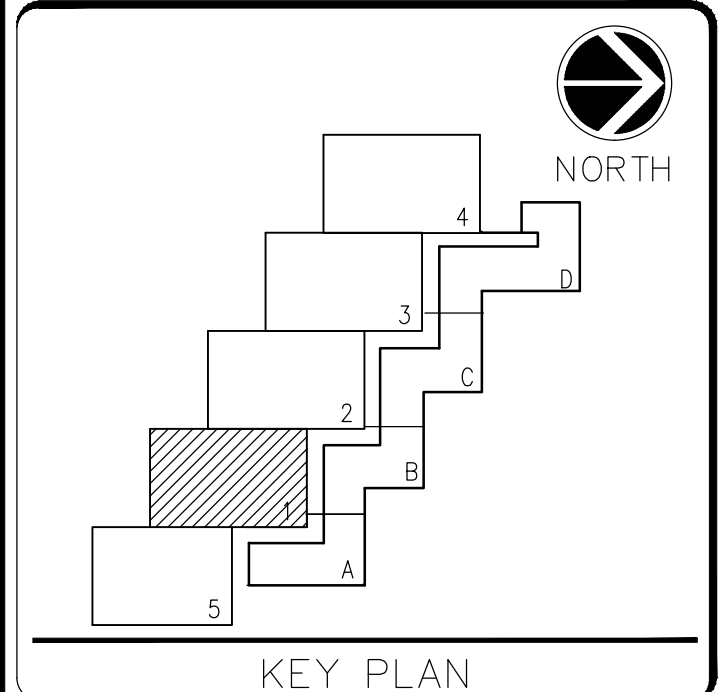
- 1] INSTALL NEW CUSTOM BUILT AIR HANDLING UNIT AHU-9 INCLUDING VFDs, ASSOCIATED CONTROLS, REQUIRED PIPING, ACCESSORIES, AND ELECTRICAL POWER.
- 2] INSTALL NEW PIPING, CONNECT TO AHU-9 FROM PRE-INSTALLED PIPING.
- 3] PERFORM TESTING AND BALANCING, COMMISSION NEW AIR-HANDLING UNIT AND COMPONENTS, VERIFY NEW CONTROL INTERFACE WITH EXISTING SIEMENS BAS.

- 1" CW
- (E) 2 1/2" LR
- (E) 4" MPS
- (E) 3/4" MR
- (E) 6" CHWS
- (E) 5" CHWR
- (E) 5" HWS

**A** PHASE 1C SEQUENCE 1 - POD 1  
MP-1.1-05 SCALE = 1/8"=1'-0"



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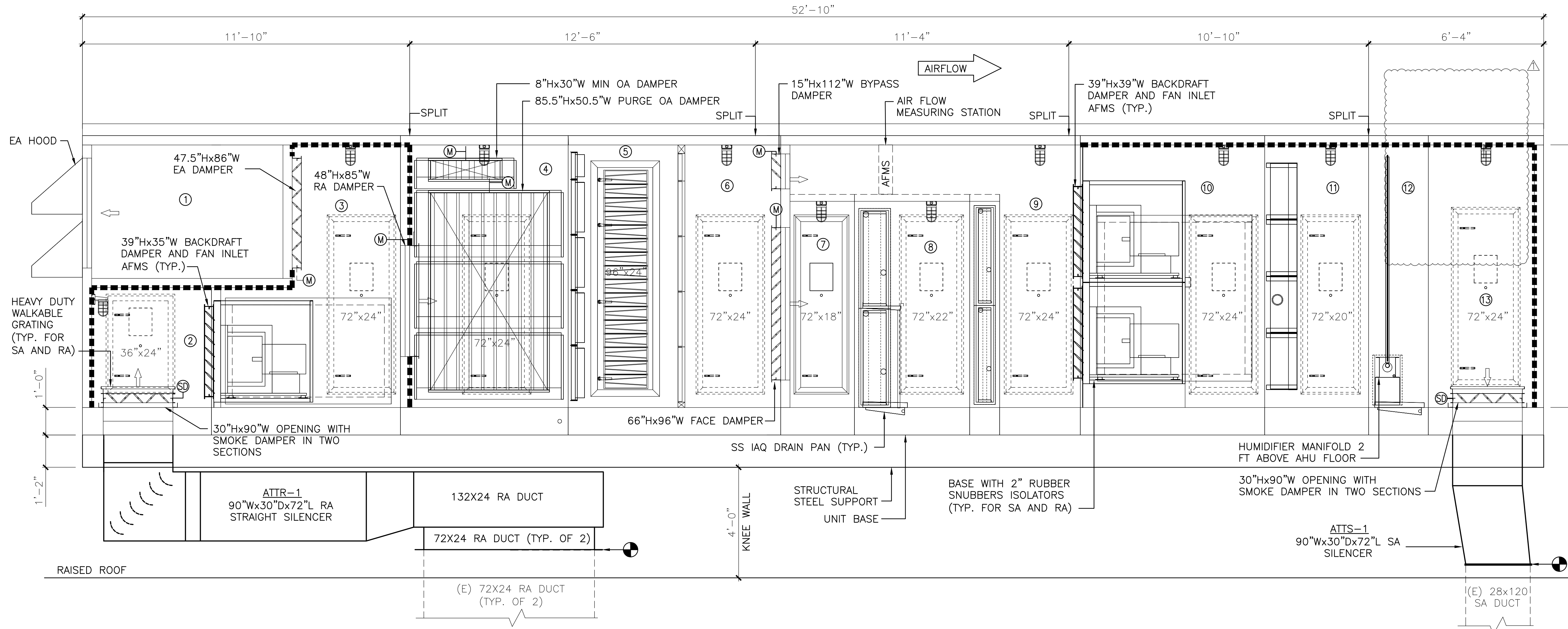


DATE	02/02/24	SUBMISSION	BID SET
REVISION 1		REVISION	AMENDMENT 2 - 03/29/2024
REVISION 2			
REVISION 3			
REVISION 4			
REVISION 5			
REVISION 6			
REVISION 7			

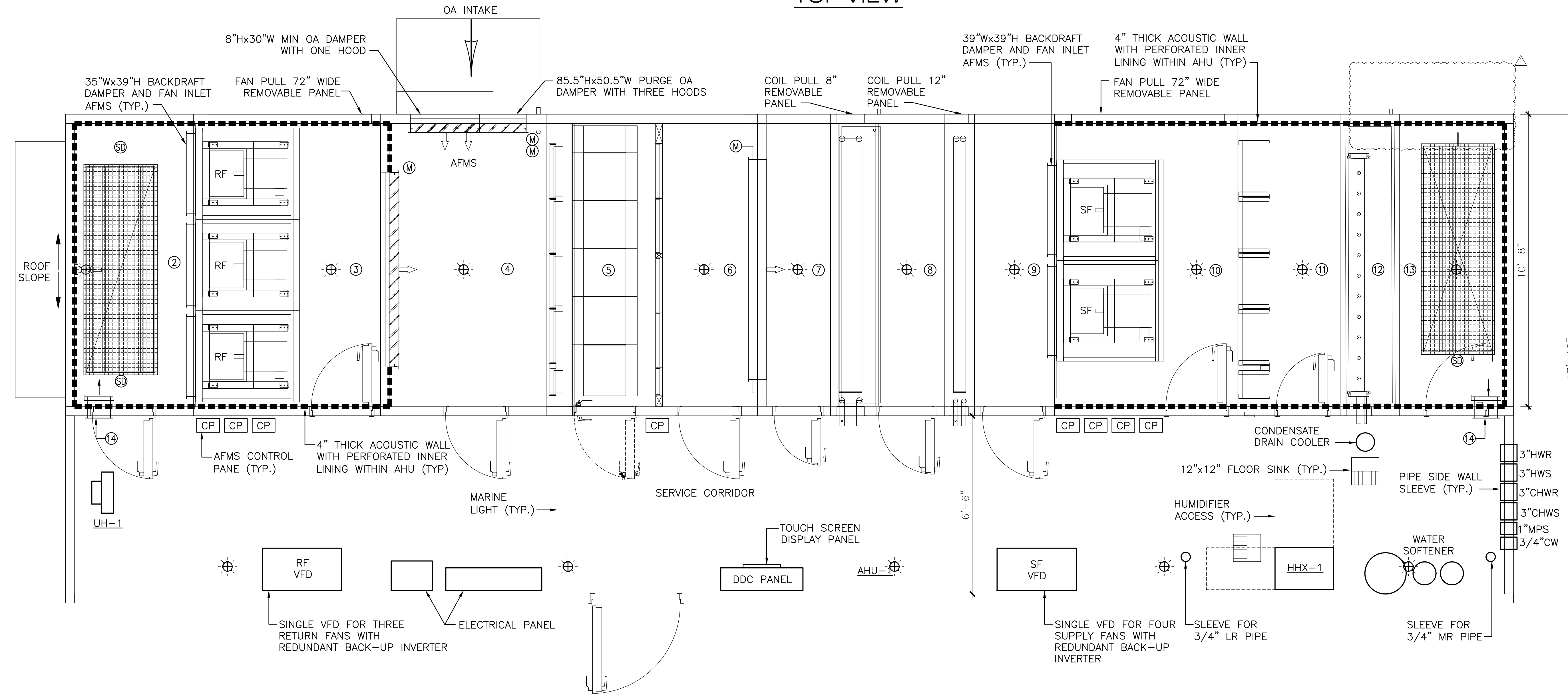
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600 Maryland Avenue S.W. Suite 5001  
Washington, DC 20024-2520

BUILDING NAME	MUSEUM SUPPORT CENTER
ADDRESS	4210 SILVER HILL ROAD SUITLAND, MD 20746
PROJECT TITLE	MSC REPLACE AHUs POD 1
SP PROJECT NUMBER	1530103
AVE PROJECT NUMBER	60516569
DRAWING TITLE	MECHANICAL POD 1 PHASING SEQUENCE PLAN
DRAWING TYPE	MECHANICAL
WORKING STATE	DESIGNED BY: FDL DRAWN BY: FDL CHECKED BY: DP
SHEET NO.	MP 1.1 05
33 OF 71	DISCIPLINE TYPE SEQUENCE

# ELEVATION VIEW



# TOP VIEW



**AHU-1 DETAIL**  
SCALE = 1/2"=1'-0"

### GENERAL NOTES:

- AIR HANDLING UNIT SHALL BE BUILT IN COMPLIANCE WITH ETL AND SHALL BEAR AN TUV LABEL.
- UNIT SHALL BE UL LISTED AS WELL AS EACH COMPONENTS WHERE APPLICABLE SHALL BE UL LISTED AND SHALL HAVE UL LABEL.
- PROVIDE 4" THICK INJECTED FOAM WALLS, ROOF AND FLOOR HEAVY DUTY CONSTRUCTION.
- PROVIDE 12" HIGH HEAVY DUTY BASE SUPPORT.
- PROVIDE ROOF SLOPPING TOWARDS LONG SIDE WALLS OF THE UNIT WITH 1/4" SLOPE, GUTTER AND FOUR DOWN SPOUT.
- ALL NEW SA AND RA DUCTWORK SHALL BE DOUBLE WALL #10 GAUGE WITH 2" THICK SOUND LINING AND PERFORATED INNER WALL.
- PROVIDE 4" THICK ACOUSTIC WALL WITH PERFORATED INNER LINING IN SUPPLY AND RETURN FAN SECTIONS TO MEET NC45 NOISE LIMIT IN THE SPACE.
- SIZE AIR INTAKE AND RELIEF HOODS TO AIR FLOWS LISTED IN SCHEDULE.
- ALL AHU FLOOR AND WALL PENETRATIONS SHALL BE COORDINATED WITH EQUIPMENT AND PIPE LAYOUT INSIDE THE AHU.

### COMPONENT SCHEDULE

- PURGE CYCLE TUNNEL WITH 47.5"x86" EA DAMPER, 47.75"x100.25" EXTERIOR OPENING AND EA HOOD WITH WIRE MESH IN OPENING.
- RETURN AIR SECTION WITH 30"x90" RA OPENING AND COMBINATION SHUT OFF AND SMOKE DAMPERS IN 2 SECTIONS, ALUMINUM WALKING GRATE, AND 24"x36" ACCESS DOOR. RA INTAKE OPENING SHALL BE FIELD COORDINATE TO MAKE CONNECTION TO EXISTING DUCTWORK.
- RETURN FAN SECTION WITH (3) DIRECT DRIVE PLENUM FANS, TECFC INVERTER DUTY, PREMIUM EFFICIENCY MOTORS, GROUNDING SHAFTS, RUBBER SNUBBERS ISOLATION, 39"x34" FAN INLET BACKDRAFT DAMPER AND THERMAL DISPERSION TYPE AFMS, 48"x85" RETURN AIR DAMPER, 24"x72" ACCESS DOOR, AND 6 FT WIDE FAN PULL REMOVABLE PANEL.
- MIXED AIR SECTION WITH 8"x30" MINIMUM OA DAMPER AND AIRFLOW STATION, 85.5"x50.5" PURGE CYCLE OA DAMPER, 48"x85" RETURN AIR DAMPER, FOUR (4) OA INLET HOODS WITH WIRE MESH AND 24"x72" ACCESS DOOR.
- FILTER SECTION WITH 24"x96" ACCESS DOOR.
  - MERV-8 PRE-FILTERS: QTY. (16) 24"x24"x2" & (8) 12"x24"x2".
  - MERV-14 INTERMEDIATE FILTERS: QTY. (16) 24"x24"x4" & (8) 12"x24"x4".
  - GAS FILTER: QTY. (96) 6"x24"x18" & (16) 6"x12"x18" CASSETTES WITH 50/50 MIX OF COCONUT SHELL CARBON AND POTASSIUM PERMANGANATE. TOTAL GAS FILTER MEDIA CONTENT 2,300 POUNDS.
  - MERV-8 POST-FILTERS: QTY. (16) 24"x24"x2" & (8) 12"x24"x2".
- BYPASS SECTION WITH 15"x112" BYPASS DAMPER, 66"x96" FACE DAMPER, AND 24"x72" ACCESS DOOR.
- CHILLED WATER COIL SECTION WITH QTY. (2) CHILLED WATER COILS W/ 14G SS DOUBLE WALL INSULATED PRIMARY PAN, SEAM WELDED 16G SS SECONDARY PAN, 1/4" THICK SS COIL SUPPORT RACK TO ALLOW FOR INDEPENDENT REMOVAL OF COILS, AND 18"x72" ACCESS DOOR.
- HOT WATER COIL SECTION WITH QTY.(2) HOT WATER COILS AND 22"x72" ACCESS DOOR.
- FAN INLET SECTION WITH 24"x72" ACCESS DOOR.
- SUPPLY FAN SECTION WITH (4) DIRECT DRIVE PLENUM FANS, TECFC INVERTER DUTY, PREMIUM EFFICIENCY MOTORS, GROUNDING SHAFTS, RUBBER SNUBBERS ISOLATION, 39"x39" FAN INLET BACKDRAFT DAMPER AND THERMAL DISPERSION TYPE AFMS, 24"x72" ACCESS DOOR, AND 6 FT WIDE FAN PULL REMOVABLE PANEL.
- HEPA FILTER SECTION WITH 20"x72" ACCESS DOOR:
  - HIGH CAPACITY, 99.97% HEPA FILTERS: (16) 24"x24"x11.5" & (4) 12"x24"x11.5".
- HUMIDIFIER MANIFOLD SECTION WITH SS INNER WALL, CEILING AND FLOOR.
- SUPPLY AIR SECTION WITH 30"x90" SA OPENING AND COMBINATION SHUT OFF AND SMOKE DAMPERS IN 2 SECTIONS, ALUMINUM WALKING GRATE, AND 24"x72" ACCESS DOOR. SA DISCHARGE OPENING SHALL BE FIELD COORDINATE TO MAKE CONNECTION TO EXISTING DUCTWORK.
- 10x10 REGISTERS IN SUPPLY AND RETURN SECTIONS. BALANCED TO 200 CFM TO CONDITION SERVICE CORRIDOR.

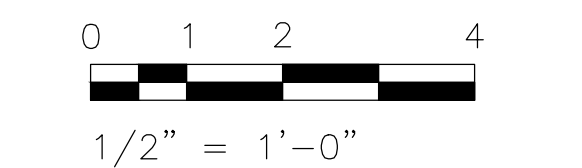
MUSEUM SUPPORT CENTER  
SMITHSONIAN INSTITUTION

**URS | HCA**  
URS Group, Inc./Hartman-Cox  
Architects LLP JV  
2020 K Street, NW  
Suite 300  
Washington, D.C. 20006



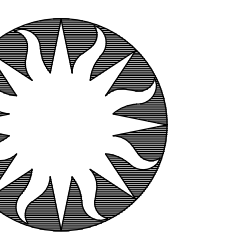
PROFESSIONAL CERTIFICATION.  
I CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NUMBER 28411, EXPIRATION DATE 1/13/2025.

### KEY PLAN



GRAPHIC SCALE(S)

DATE	02/02/24	REVISION	BID SET
REVISION 1		REVISION	AMENDMENT 2 - 03/29/2024
REVISION 2		REVISION	
REVISION 3		REVISION	
REVISION 4		REVISION	
REVISION 5		REVISION	
REVISION 6		REVISION	
REVISION 7		REVISION	

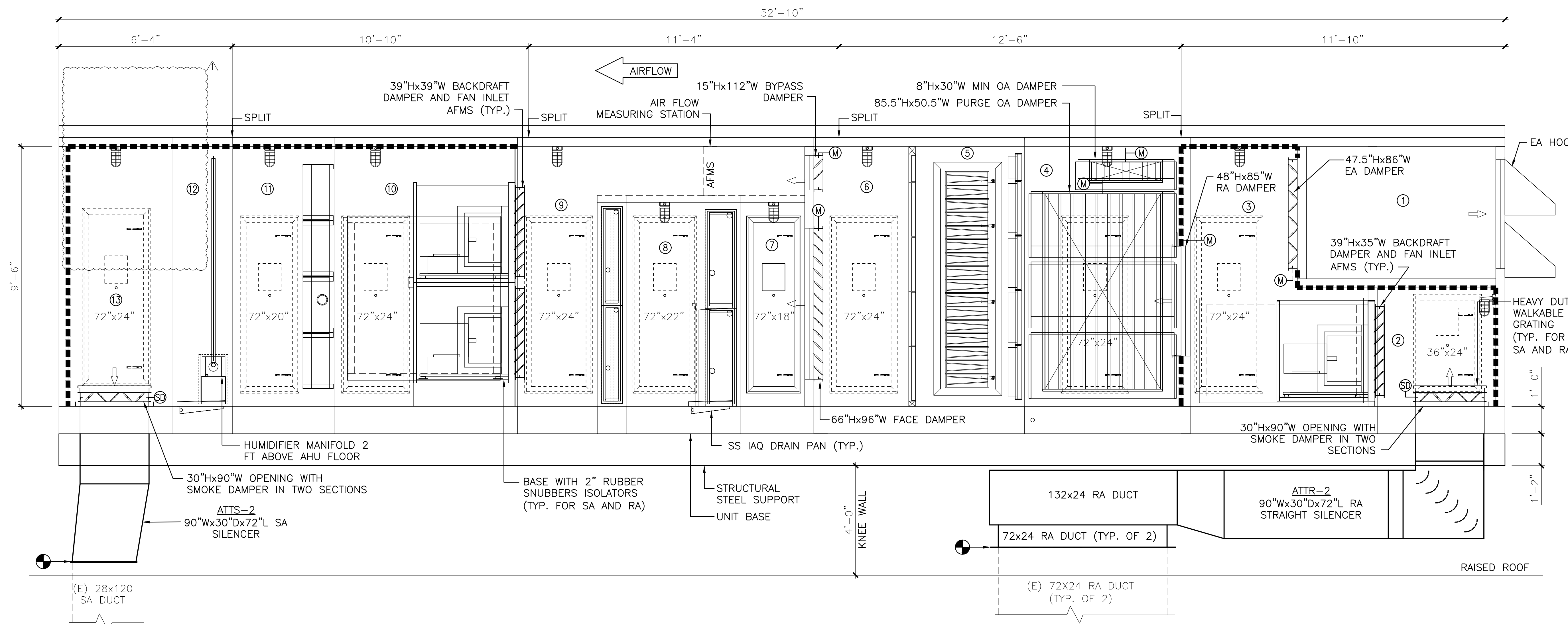


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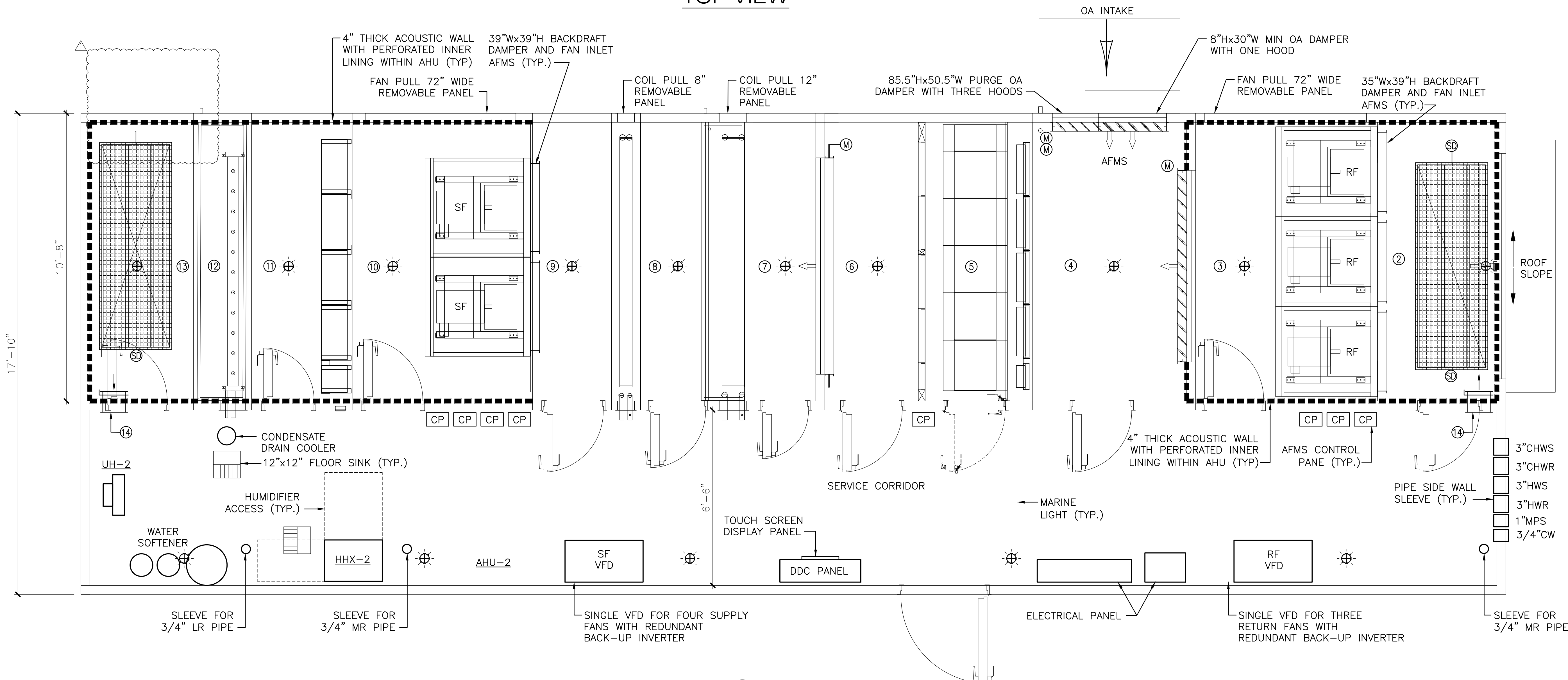
SMITHSONIAN FACILITIES  
600 Maryland Avenue S.W. Suite 5001  
Washington, DC 20024-2520

BUILDING NAME	MUSEUM SUPPORT CENTER
ADDRESS	4210 SILVER HILL ROAD SUITLAND, MD. 20746
PROJECT TITLE	MSC REPLACE AHUS POD 1
PROJECT NUMBER	1530103
REV PROJECT NUMBER	60516569
DRAWING TITLE	MECHANICAL DETAILS
DRAWING TYPE	MECHANICAL
WORKING STATE	FDL FDL DP
DESIGNED BY	DRAWN BY
CHECKED BY	
SHEET NO.	34 OF 71
DISCIPLINE	M
TYPE	5
SEQUENCE	01

ELEVATION VIEW



TOP VIEW



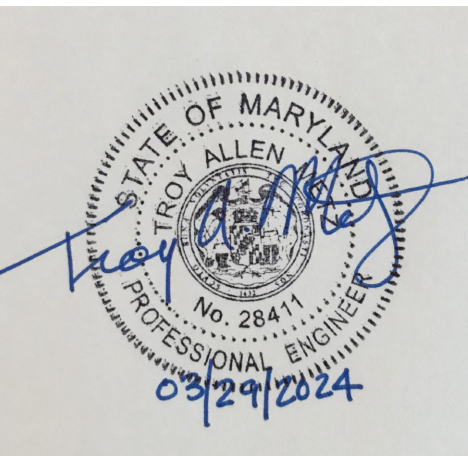
AHU-2 DETAIL  
SCALE = 1/2"=1'-0"

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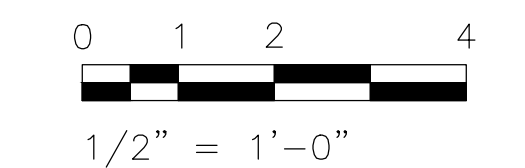
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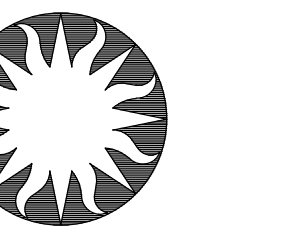
PROFESSIONAL CERTIFICATION.  
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LICENSE NUMBER 28411, EXPIRATION  
DATE 1/13/2025.

KEY PLAN



1/2" = 1'-0"  
GRAPHIC SCALE(S)

DATE	02/02/24	REVISION	02
DESCRIPTION	BID SET		
REVISION 1		REVISION	01
REVISION 2		DESCRIPTION	AMENDMENT 2 - 03/29/2024
REVISION 3			
REVISION 4			
REVISION 5			
REVISION 6			
REVISION 7			



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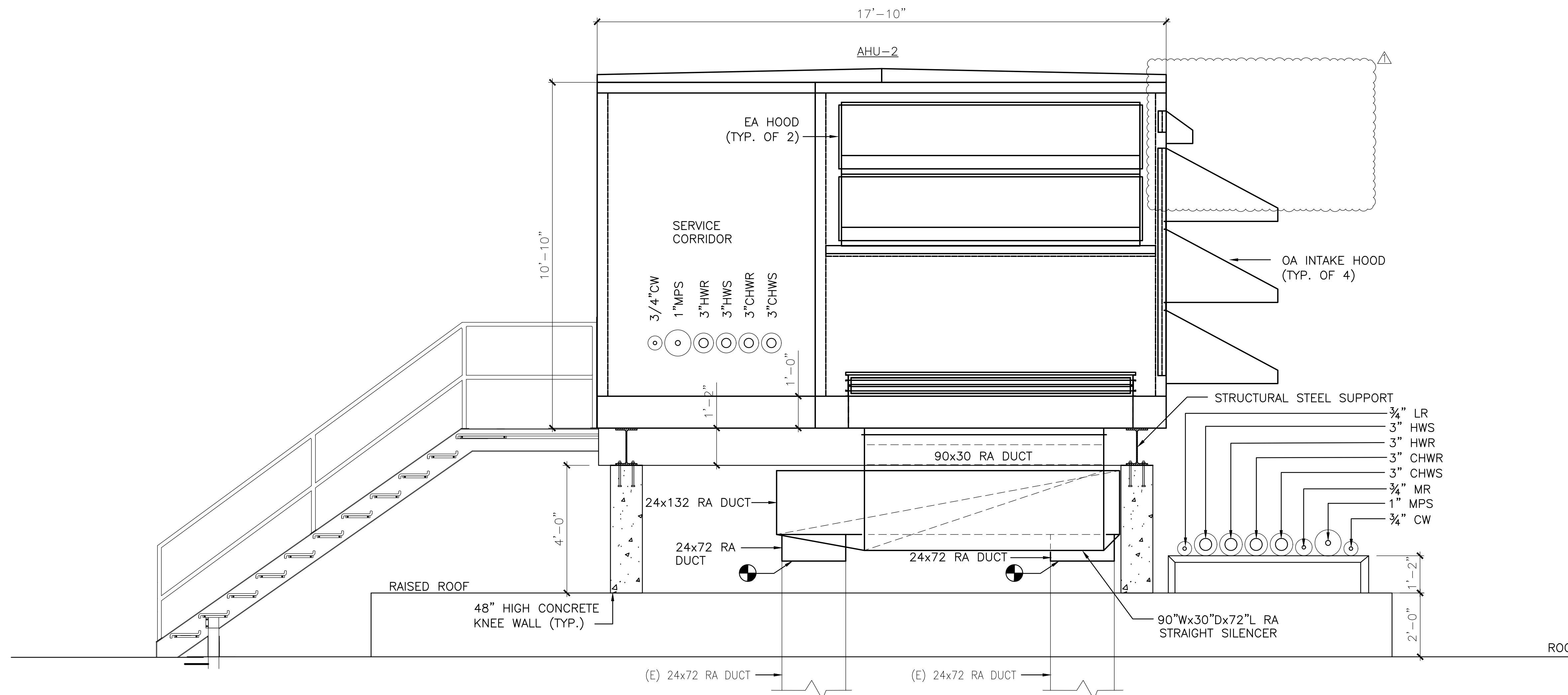
BUILDING NAME	MUSEUM SUPPORT CENTER
ADDRESS	4210 SILVER HILL ROAD SUITLAND, MD. 20746
PROJECT TITLE	MSC REPLACE AHUS POD 1
IF PROJECT NUMBER	1530103
USE PROJECT NUMBER	60516569

DRAWING TITLE	MECHANICAL DETAILS
DRAWING TYPE	MECHANICAL
WORKING STATUS	FDL    FDL    DP
DESIGNED BY	DRAWN BY
CHECKED BY	

SHEET NO.	M    5    02
35 OF 71	DISCIPLINE    TYPE    SOURCE

GENERAL NOTES:

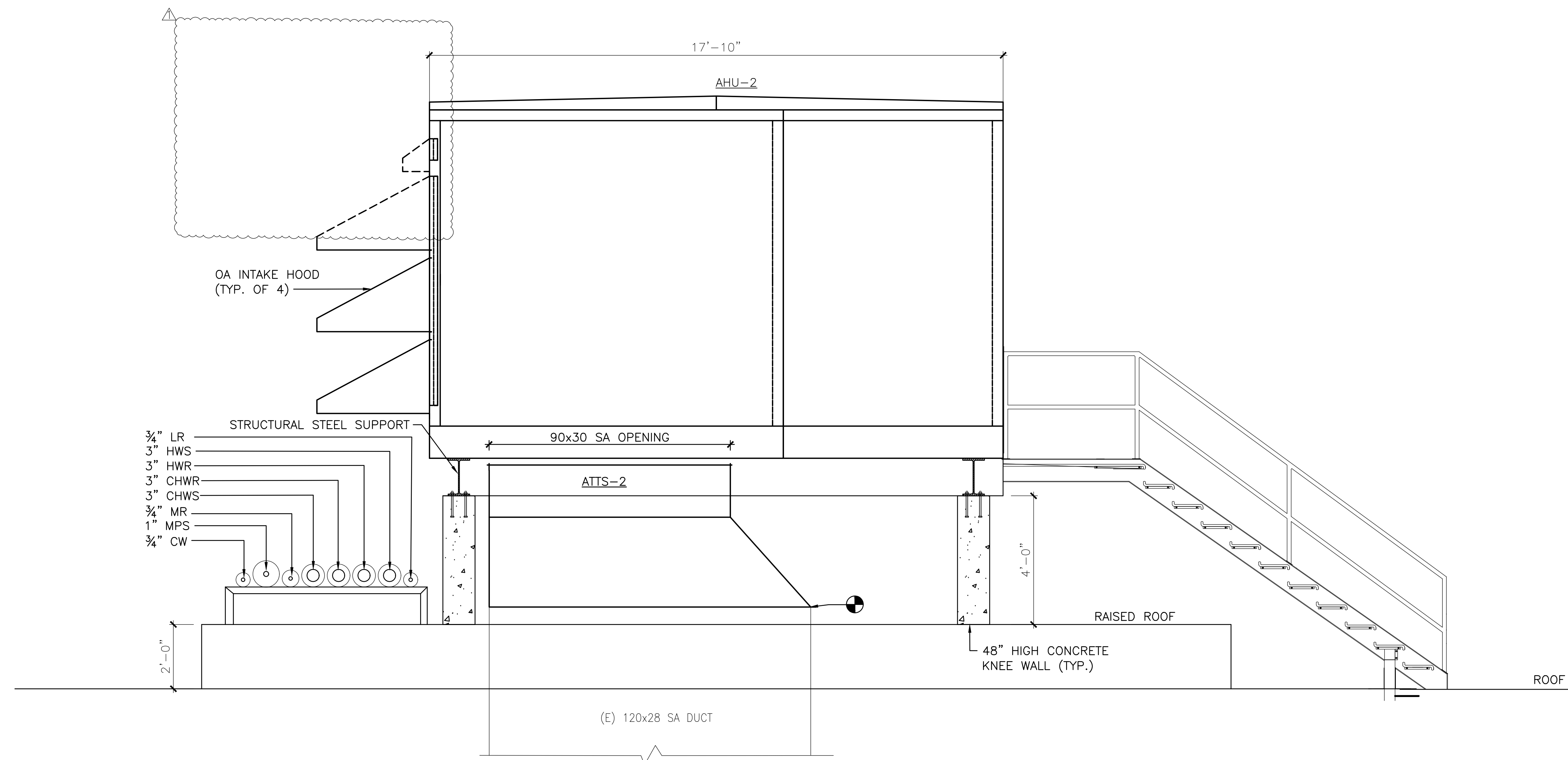
- REFER TO ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR AHU KNEE WALL AND STRUCTURAL STEEL SUPPORT AS WELL AS TYPICAL PIPE AND DUCT SUPPORT REQUIREMENTS.
- VIEWS SHOW AHU-2 LAYOUT. AHU-1 LAYOUT IS SIMILAR WITH DIFFERENT PIPING CONFIGURATION FOR THE MIRRORED AHU.



A  
M-5-03

AHU-2 DETAIL: RIGHT SIDE VIEW

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



B  
M-5-03

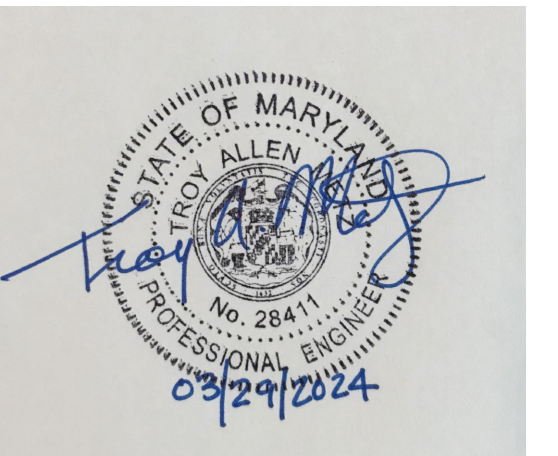
AHU-2 DETAIL: LEFT SIDE VIEW

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

MUSEUM SUPPORT CENTER  
SMITHSONIAN INSTITUTION

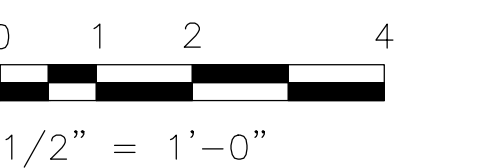
**URS|HCA**

URS Group, Inc./Hartman-Cox  
Architects LLP JV  
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Suite 300  
Washington, D.C. 20006



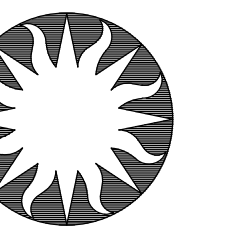
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DATE 1/13/2025.

KEY PLAN



GRAPHIC SCALE(S)

DATE	02/02/24	SUBMISSION	BID SET
REVISION 1		REVISION	AMENDMENT 2 - 03/29/2024
REVISION 2		REVISION	
REVISION 3		REVISION	
REVISION 4		REVISION	
REVISION 5		REVISION	
REVISION 6		REVISION	
REVISION 7		REVISION	



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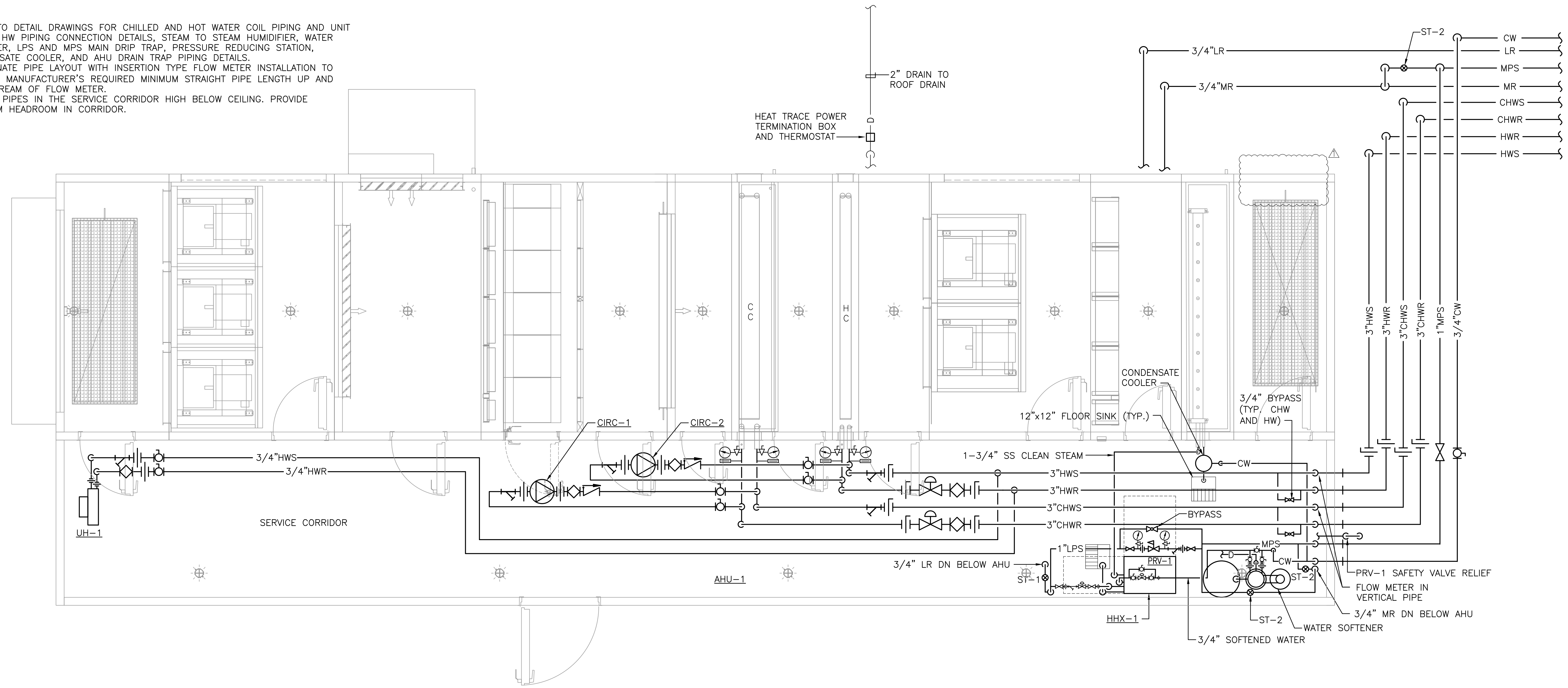
BUILDING NAME	MUSEUM SUPPORT CENTER
ADDRESS	4210 SILVER HILL ROAD SUITLAND, MD 20746
PROJECT TITLE	MSC REPLACE AHUs POD 1
SP PROJECT NUMBER	1530103
AVE PROJECT NUMBER	60516569

DRAWING TITLE	MECHANICAL DETAILS
DRAWING TYPE	MECHANICAL
WORKING STATE	FDL FDL DP
DESIGNED BY	DRAWN BY
CHECKED BY	

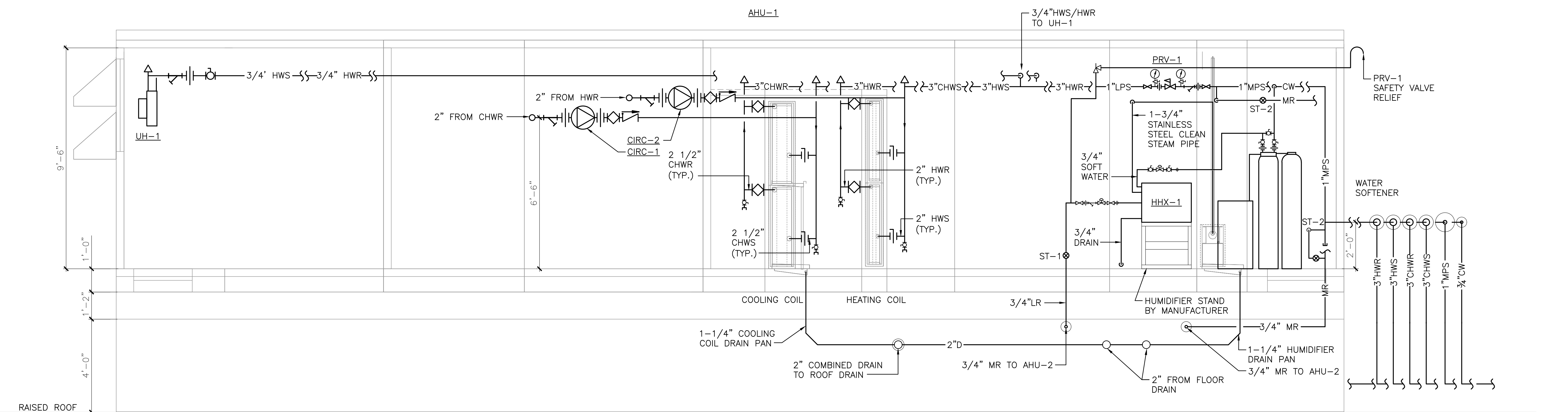
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36 OF 71	DISCIPLINE	TYPE	SEQUENCE

**NOTES:**

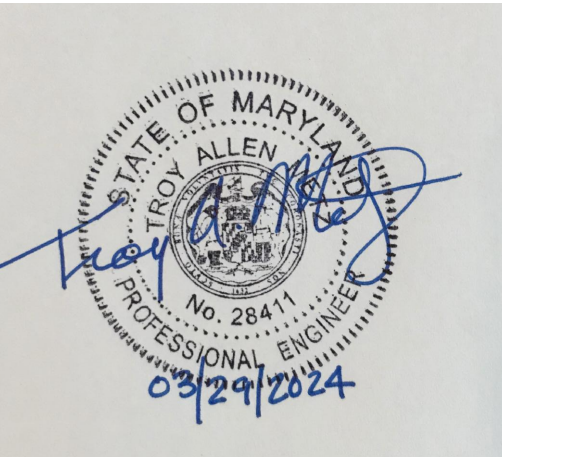
- REFER TO DETAIL DRAWINGS FOR CHILLED AND HOT WATER COIL PIPING AND UNIT HEATER HW PIPING CONNECTION DETAILS, STEAM TO STEAM HUMIDIFIER, WATER SOFTENER, LPS AND MPS MAIN DRIP TRAP, PRESSURE REDUCING STATION, CONDENSATE COOLER, AND AHU DRAIN TRAP PIPING DETAILS.
- COORDINATE PIPE LAYOUT WITH INSERTION TYPE FLOW METER INSTALLATION TO PROVIDE MANUFACTURER'S REQUIRED MINIMUM STRAIGHT PIPE LENGTH UP AND DOWNSTREAM OF FLOW METER.
- INSTALL PIPES IN THE SERVICE CORRIDOR HIGH BELOW CEILING. PROVIDE MAXIMUM HEADROOM IN CORRIDOR.



**A**  
M-5-06  
**AHU-1 PIPING PLAN DETAIL**  
SCALE = 1/2"=1'-0"

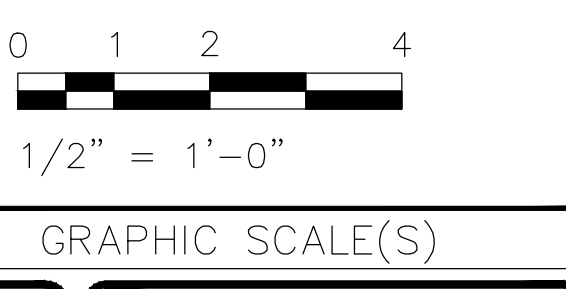


**B**  
M-5-06  
**AHU-1 PIPING ELEVATION DETAIL**  
SCALE = 1/2"=1'-0"



PROFESSIONAL CERTIFICATION  
I CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND. LICENSE NUMBER 28411, EXPIRATION DATE 1/13/2025.

KEY PLAN



DATE	02/02/24
REVISION	BID SET
REVISION 1	AMENDMENT 2 - 03/29/2024
REVISION 2	
REVISION 3	
REVISION 4	
REVISION 5	
REVISION 6	
REVISION 7	

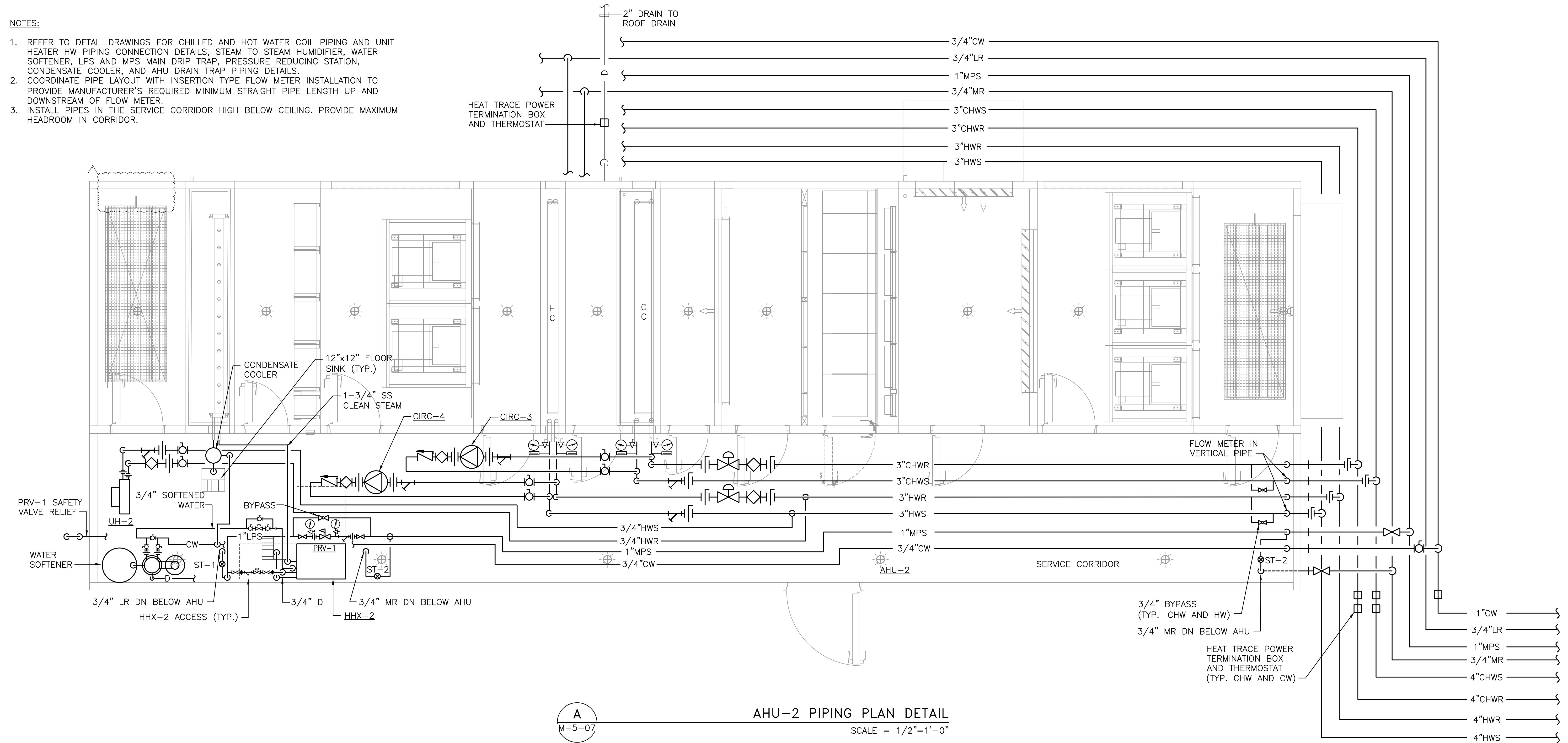


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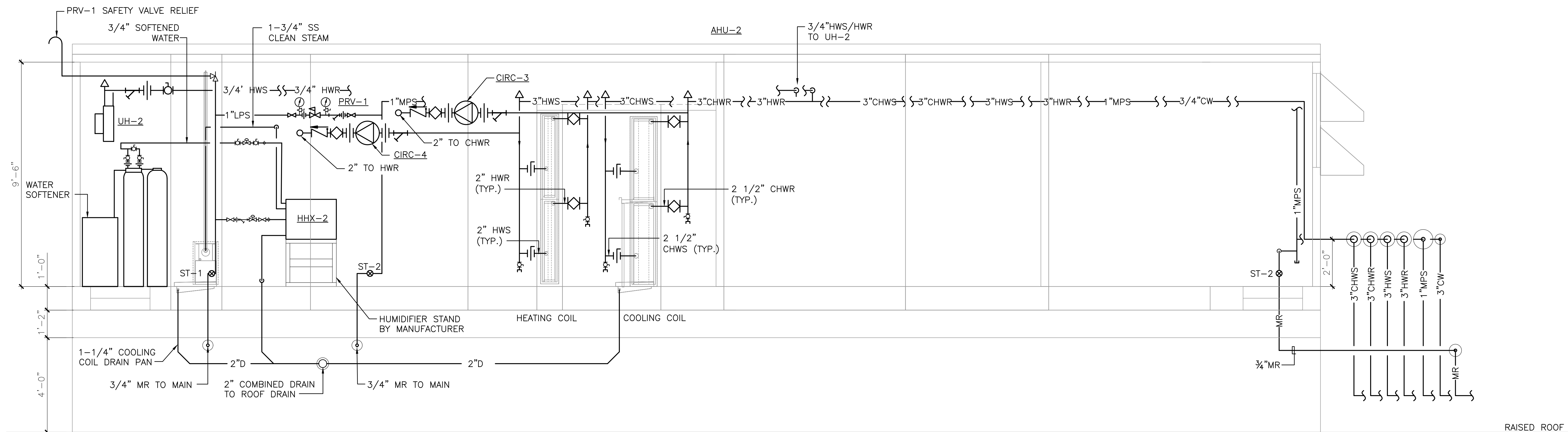
ISSUE DATE	MUSEUM SUPPORT CENTER
ADDRESS	4210 SILVER HILL ROAD SUITLAND, MD 20746
PROJECT TITLE	MSC REPLACE AHUS POD 1
SP PROJECT NUMBER	1530103
A/E PROJECT NUMBER	60516569
DRAWING TITLE	MECHANICAL AHU PIPING DETAIL
DRAWING TYPE	FDL
WORKING STAFF	FDL FDL DP
DESIGNED BY	DRAWN BY
CHECKED BY	CREATED BY
SHEET NO.	M 5 06
39 OF 71	GROUP TITLE SOURCE

**NOTES:**

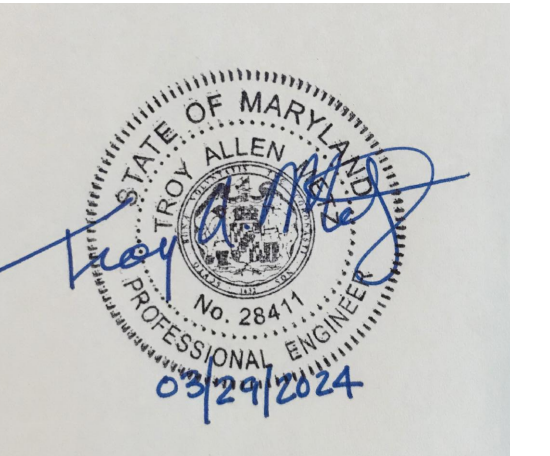
1. REFER TO DETAIL DRAWINGS FOR CHILLED AND HOT WATER COIL PIPING AND UNIT HEATER HW PIPING CONNECTION DETAILS, STEAM TO STEAM HUMIDIFIER, WATER SOFTENER, LPS AND MPS MAIN DRIP TRAP, PRESSURE REDUCING STATION, CONDENSATE COOLER, AND AHU DRAIN TRAP PIPING DETAILS.
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**A**  
M-5-07  
**AHU-2 PIPING PLAN DETAIL**  
SCALE = 1/2"=1'-0"

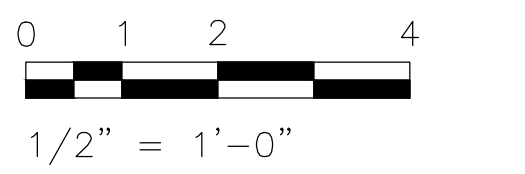


**B**  
M-5-07  
**AHU-2 PIPING ELEVATION DETAIL**  
SCALE = 1/2"=1'-0"



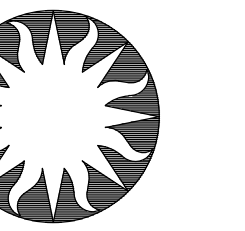
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LICENSE NUMBER 28411, EXPIRATION  
DATE 1/13/2025.

KEY PLAN



GRAPHIC SCALE(S)

DATE	DESCRIPTION
02/02/24	BID SET
REVISION 1	AMENDMENT 2 - 03/29/2024
REVISION 2	
REVISION 3	
REVISION 4	
REVISION 5	
REVISION 6	
REVISION 7	



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ISSUING TITLE	MUSEUM SUPPORT CENTER
ADDRESS	4210 SILVER HILL ROAD SUITLAND, MD 20746
PROJECT TITLE	MSC REPLACE AHUS POD 1
SP PROJECT NUMBER	1530103
A/C PROJECT NUMBER	60516569
DRAWING TITLE	MECHANICAL AHU PIPING DETAIL
DRAWING TYPE	FDL
WORKING STAFF	FDL FDL DP
DESIGNED BY	DRAWN BY
CHECKED BY	
SHEET NO.	M 5 07
40 OF 71	GROUP TITLE SOURCE

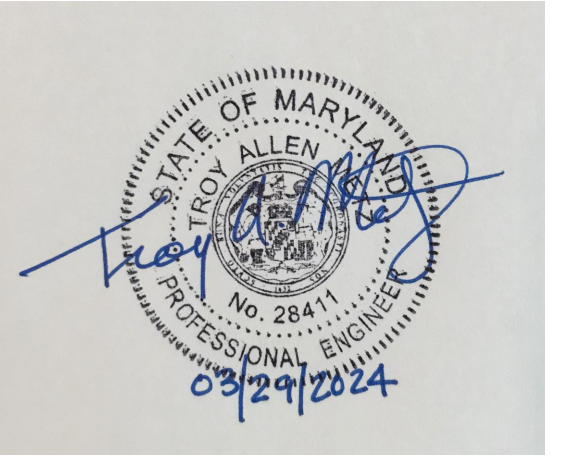
MECHANICAL CONTROLS LEGEND	
SYMBOL	DESCRIPTION
	AIR FLOW PICKUP - TERMINAL UNIT
	AXIAL VANE FAN
	CENTRIFUGAL FAN
	CENTRIFUGAL FAN W/BELL INLET MOUNTED AFMS
	CONDENSER/COMPRESSOR
	DIRECT EXPANSION COOLING COIL
	ENERGY RECOVERY WHEEL
	AIR FLOW MONITORING STATION
	FLOW METER - LIQUID
	GAS DETECTOR AND GAS DETECTOR REMOTE UNIT
	COILING COIL
	HOT WATER COIL
	INLINE PUMP
	MOTORIZED CONTROL VALVE - 2-WAY
	MOTORIZED DAMPER WITH DAMPER ACTUATOR - TERMINAL UNIT
	MOTORIZED DAMPER WITH DAMPER ACTUATOR AND POSITION SWITCH - OPPOSED BLADE
	VARIABLE FREQUENCY DRIVE
	MOTOR STARTER
	HUMIDIFIER MANIFOLD AND CONTROLLER
	EXHAUST FAN WITH GRAVITY BACK DRAFT DAMPER

MECHANICAL CONTROLS LEGEND	
SYMBOL	DESCRIPTION
	AUXILIARY CONTACT
	FLOW SWITCH - LIQUID
	CARBON DIOXIDE SENSOR - PROBE
	CONTROL MODULE (FIRE ALARM SYSTEM)
	CURRENT SWITCH
	DUCT SMOKE DETECTOR
	ENABLE/DISABLE
	FIELD RELAY
	HUMIDITY SENSOR - DUCT
	HUMIDITY SENSOR
	LOW TEMPERATURE LIMIT SWITCH WITH MANUAL RESET
	PRESSURE DIFFERENTIAL SENSOR
	PRESSURE SWITCH WITH MANUAL RESET
	PULSED CONTACT
	ROTATION SENSOR
	START/STOP
	SUCTION PRESSURE
	SWITCH/PUSH BUTTON
	TEMPERATURE SENSOR - AVERAGING AIR
	TEMPERATURE SENSOR - IMMERSION WATER
	TEMPERATURE SENSOR - PROBE AIR
	TEMPERATURE SENSOR
	VOLTAGE INPUT
	VOLTAGE OUTPUT
	ANALOG INPUT
	ANALOG OUTPUT
	DIGITAL INPUT
	DIGITAL OUTPUT
	NETWORK COMMUNICATION INPUT/OUTPUT
	DDCS CONTROL SYSTEM WIRING
	ELECTRONIC INTERLOCK WIRING
	ELECTRIC MOTOR
	PRESSURE - LIQUID
	LIMIT SWITCH OPEN(O)/CLOSED(C) POSITION INDICATION
	ACTUATOR POSITION INDICATION
	CALCULATED VALUE
	NETWORK POINTS XX-ANALOG VALUE (AV), BINARY VALUE (BV), MULTI-VARIABLE (MV)

MECHANICAL CONTROLS LEGEND	
ABBREVIATION	DESCRIPTION
AC	AIR CONDITIONING
ACCUM.	ACCUMULATION
ADJ	ADJUSTMENT
AHU	AIR HANDLING UNIT
ALRM	ALARM
B	BOILER
BAS	BUILDING AUTOMATION SYSTEM
CAV	CONSTANT AIR VOLUME
CFM	CUBIC FEET PER MINUTE
COV	CHANGE OF VALUE
CP	CIRCULATION PUMP
CR	CRITICAL
CTRL	CONTROL
DDCS	DIRECT DIGITAL CONTROL SYSTEM
DHWS	DOMESTIC HOT WATER SUPPLY
DIFF	DIFFERENTIAL
DX	DIRECT EXPANSION
EA	EXHAUST AIR
ED	ENABLE/DISABLE
EF	EXHAUST FAN
EUH	ELECTRIC UNIT HEATER
FACP	FIRE ALARM CONTROL PANEL
FIP	FAIL IN PLACE
G	GENERAL
GPM	GALLONS PER MINUTE
GUH	GAS FIRED UNIT HEATER
GWH	GAS FIRED WATER HEATER
HTG	HEATING
HW	HOT WATER
HWP	HOT WATER PUMP
HWR	HOT WATER RETURN
HWS	HOT WATER SUPPLY
HWUH	HOT WATER UNIT HEATER
I/O	INPUT/OUTPUT
IRC	GAS FIRED RADIANT HEATER
LCS	LAST COMMANDED STATE
MOD	MODULATING
NC	NORMALLY CLOSED
NG	NATURAL GAS
NO	NORMALLY OPEN
NTS	NOT TO SCALE
OA	OUTDOOR AIR
OAH	OUTDOOR AIR HUMIDITY
OAT	OUTDOOR AIR TEMPERATURE
PSI	POUNDS PER SQUARE INCH
RA	RETURN AIR
REC	RECOVERY
RSC	ROTARY SCREW COMPRESSOR
SA	SUPPLY AIR
TEMP	TEMPERATURE
VFD	VARIABLE FREQUENCY DRIVE

GENERAL NOTES:

- COORDINATE SENSORS LOCATED WITHIN THE SPACE IN THE FIELD BASED ON EXISTING CONDITIONS AND REQUIREMENTS. COORDINATE LOCATION OF TEMPERATURE SENSORS, HUMIDITY SENSORS, AND OTHER EXPOSED CONTROL SENSORS WITH PLANS AND ROOM DETAILS BEFORE INSTALLATION.
- SETPOINT ADJUSTMENT: THE SET POINTS LISTED IN THE SEQUENCE OF OPERATION ARE INITIAL SETTINGS, WHICH SHALL BE ADJUSTABLE. CONTROL SET POINTS SHALL BE INCLUDED ON THE GRAPHICAL DISPLAYS FOR EACH SYSTEM, ALONG WITH THE ANALOG VALUE OF EACH CONTROLLED VARIABLE. AN OPERATOR WITH THE PROPER PASSWORD SHALL BE ABLE TO RAISE OR LOWER THESE CONTROL SET POINTS THROUGH THE SYSTEM GRAPHIC DISPLAY. IT SHALL NOT BE NECESSARY TO REVISE THE SYSTEM CONTROL PROGRAMS TO ADJUST CONTROL SET POINTS.
- ALARM LIMITS: ALARM LIMITS SHALL BE PROGRAMMED INTO THE SYSTEM WHERE REQUIRED BY THE SEQUENCE OF OPERATION. ALARM LIMITS SHALL BE INITIALLY SET BY THE CONTROL SYSTEM INSTALLER AS INDICATED. THE ALARM LIMITS SHALL BE CHANGED DURING START-UP, AS REQUIRED, TO MEET ACTUAL OPERATING CONDITIONS.
- CONTROLS CONTRACTOR TO COORDINATE CONNECTION TO FIRE ALARM SYSTEM WITH FIRE ALARM CONTRACTOR.
- CONTROL SYSTEM IS AN EXISTING SIEMENS CONTROL SYSTEM WHICH WILL BE RECONFIGURED AND PROVIDED WITH NEW CONTROLS FOR NEW EQUIPMENT. NEW CONTROL POINTS AND WIRING SHALL BE PROVIDED FOR NEW SYSTEMS.
- REFER TO DRAWING M.6.02 FOR OUTDOOR AND INDOOR DESIGN CONDITIONS FOR TEMPERATURE AND HUMIDITY.

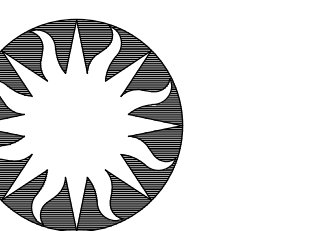


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KEY PLAN

GRAPHIC SCALE(S)

DATE	02/02/24	REVISION	BID SET
DATE		REVISION	
DATE		REVISION	AMENDMENT 2 - 03/29/2024
DATE		REVISION	
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ADDRESS	MUSEUM SUPPORT CENTER 4210 SILVER HILL ROAD SUITLAND, MD 20746
PROJECT TITLE	MSC REPLACE AHUs POD 1
SP PROJECT NUMBER	1530103
U/L PROJECT NUMBER	60516569
DRAWING TITLE	COVER SHEET
DRAWING TYPE	MECHANICAL
DRAWING STAFF	PR PR TM
DESIGNED BY	DRAWN BY
CHECKED BY	
SHEET NO.	M 7 01
76 OF 71	DISCIPLINE TITLE SEQUENCE



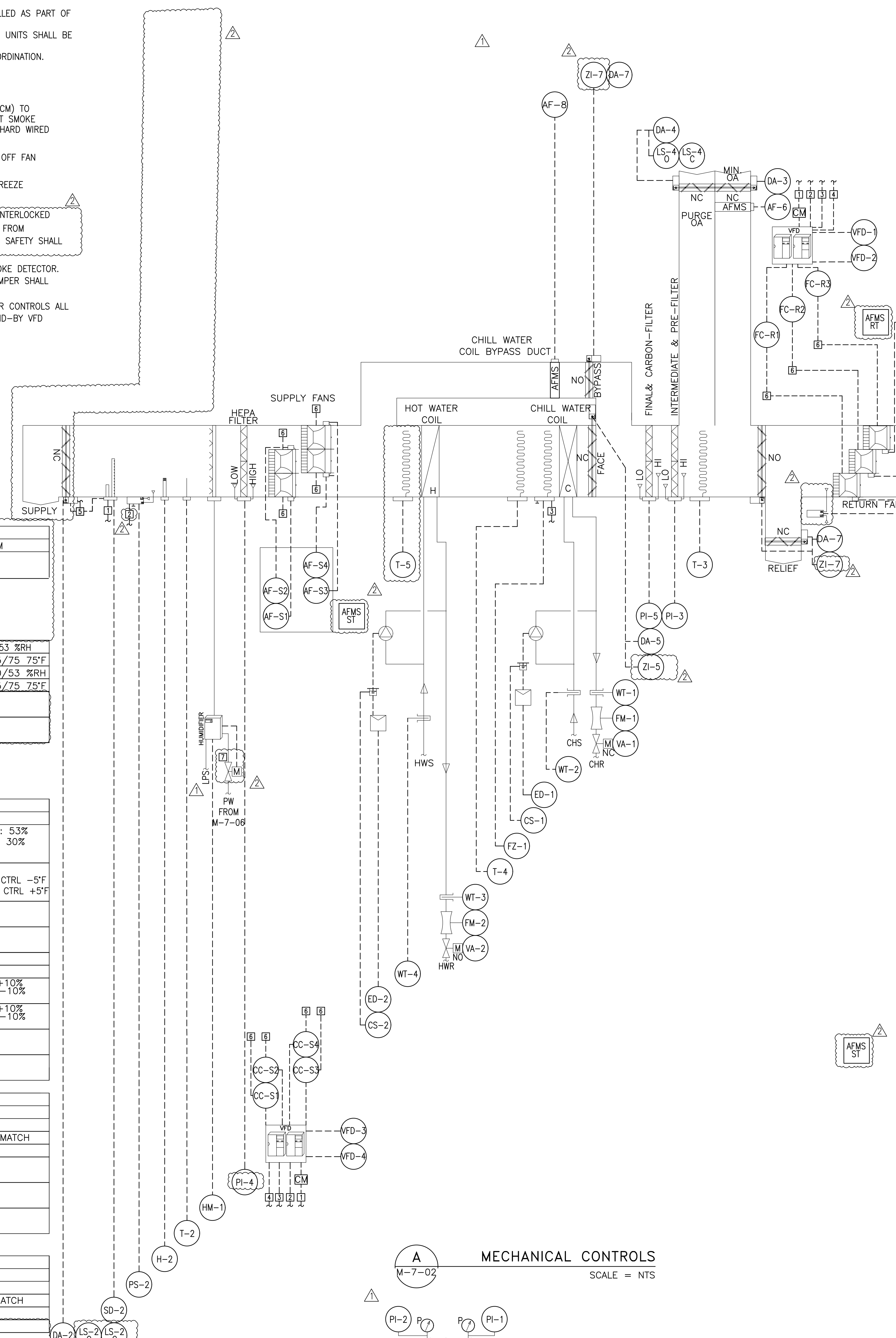
GENERAL NOTES:

- FOR DIRECT DIGITAL CONTROL SYSTEM (DDCS) SYMBOLS AND ABBREVIATIONS SEE SHEET M-7-1.
- CONTROL MODULES AND DUCT SMOKE DETECTORS FURNISHED AND INSTALLED AS PART OF THE FIRE ALARM SYSTEM UNDER DIVISION 28.
- ALL SPACE AND HUMIDITY SENSORS SUPPLIED AND MONITORED BY THESE UNITS SHALL BE REPLACED. SEE MECHANICAL FLOOR PLANS FOR SENSOR LOCATIONS.
- REFER TO MECHANICAL SCHEDULE ON M.6.01 AND AHU DETAILS FOR COORDINATION.

CODED NOTES:

- INTERLOCK UNIT WITH FIRE ALARM SYSTEM THROUGH A CONTROL MODULE (CM) TO STOP THE SUPPLY AND RETURN FANS WHEN THE SUPPLY OR RETURN DUCT SMOKE DETECTOR SENSES PARTICLES OF COMBUSTION. THIS INTERLOCK SHALL BE HARD WIRED AND NOT PERFORMED THROUGH THE DDCS.
- HARDWARE INTERLOCK FAN WITH ASSOCIATED PRESSURE SENSORS TO SHUT OFF FAN WHEN SENSORS TRIPS.
- HARDWARE INTERLOCK FANS WITH FREEZESTAT. WHEN SENSORS INDICATES FREEZE CONDITION, FANS SHALL SHUTDOWN.
- THE DAMPER RETURN/SUPPLY CLOSED LIMIT SWITCH SHALL BE HARDWARE-INTERLOCKED WITH THE RETURN/SUPPLY FAN TO PREVENT THE RETURN OR SUPPLY FAN FROM OPERATING WHEN THE RETURN OR SUPPLY DAMPER IS CLOSED. HARDWARE SAFETY SHALL OVERRIDE BOTH BAS AND LOCAL HOA CONTROL.
- THE DAMPER SHALL BE HARDWARE-INTERLOCKED WITH THE ASSOCIATED SMOKE DETECTOR. WHEN DUCT SMOKE DETECTOR SENSES PARTICLES OF COMBUSTION, THE DAMPER SHALL CLOSE.
- VFD WITH PRIMARY AND STAND-BY INVERTERS. THE PRIMARY VFD INVERTER CONTROLS ALL FANS IN THE SET. UPON A FAILURE OF PRIMARY VFD INVERTER, THE STAND-BY VFD INVERTER CONTROLS ON FANS IN THE SET.
- INTERLOCK THE HUMIDIFIER'S VALVE OPEN (CALL FOR WATER) COMMAND WITH BOOSTER PUMP ACTIVATION. SEE BOOSTER PUMP SEQUENCE FOR ADDITIONAL DETAILS.

AIR HANDLING UNIT CONTROLS: AHU-1 & 2



DDCS POINTS LIST				
TYPE	DESCRIPTION	QTY	TREND	ALARM
T-5	AI HEATING COIL TEMPERATURE SENSOR	15	MIN	
H-1	AI AHU-1 SPACE HUMIDITY	9	15 MIN	LO/HI: 30/53 %RH
T-1	AI AHU-1 SPACE TEMPERATURE	9	15 MIN	LO/HI: 65/75 75°F
H-2	AI AHU-2 SPACE HUMIDITY	9	15 MIN	LO/HI: 30/53 %RH
T-2	AI AHU-2 SPACE TEMPERATURE	9	15 MIN	LO/HI: 65/75 75°F
NET	OUTDOOR AIR HUMIDITY VALUE FROM EXISTING			
NET	OUTDOOR AIR TEMPERATURE VALUE FROM EXISTING			

DDCS SOFTWARE POINTS				
TYPE	DESCRIPTION	TREND	SETPOINTS	ALARM
AV	AVERAGE SPACE HUMIDITY	15 MIN	DE-HUMID: 45% HUMIDIFY: 37%	G-HIGH: 53% G-LOW: 30%
AV	AVERAGE SPACE TEMP.	15 MIN	TEMP CTRL: 70°F CLG MAX: CTRL +2°F HEATING: CTRL -2°F	G-LOW: CTRL -5°F G-HIGH: CTRL +5°F
AV	OUTDOOR AIR HUMIDITY (AVE. OF AHU-1 & AHU-2)			
AV	OUTDOOR AIR TEMPERATURE (AVE. OF AHU-1 & AHU-2)			
AV	CHILLED WATER SUPPLY TEMP.			
AV	HEATING WATER SUPPLY TEMP.			
AV	RETURN AIR FLOW (AF-1 + AF-2)	15 MIN	RA: TBD RA=SA SP OA SP	G-HI: +10% G-LO: -10%
AV	SUPPLY AIR FLOW (AF-3 + AF-4)	15 MIN	SA: TBD	G-HI: +10% G-LO: -10%
AV	CHILLED WATER LOAD	YES		
AV	HOT WATER LOAD	YES		

VARIABLE FREQUENCY DRIVE INTERFACE				
TYPE	DESCRIPTION	TREND	SETPOINTS	ALARM
DO	COMMAND (START/STOP)			
DI	STATUS (RUNNING/STOP)			CR-MISMATCH
DI	FAULT OR ALARM (ON/OFF)			CR
AO	CONTROL OUTPUT (HZ)	15 MIN		
AV	STATUS FREQUENCY (HZ)	15 MIN		
AV	POWER (KW)	YES		

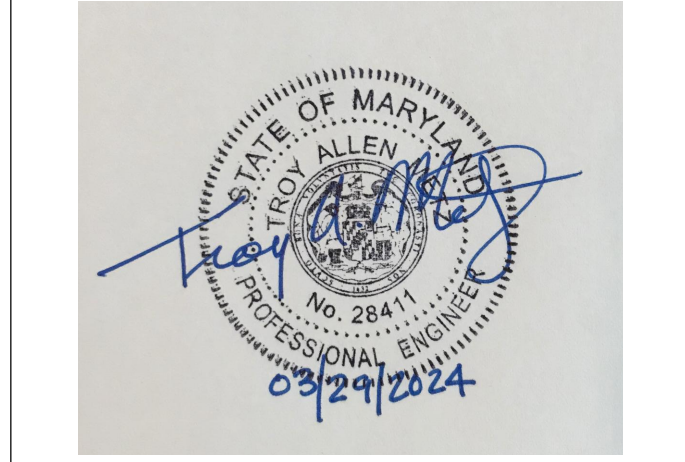
HUMIDIFIER INTERFACE				
TYPE	DESCRIPTION	TREND	SETPOINTS	ALARM
DO	COMMAND (START/STOP)			
DI	STATUS (RUNNING/STOP)			G-MISMATCH
DI	FAULT OR ALARM (ON/OFF)			G
AO	CONTROL CAPACITY	15 MIN	SEE ABOVE	
AV	STATUS (%)	15 MIN		

M-7-02 MECHANICAL CONTROLS SCALE = NTS

DDCS POINTS LIST				
TYPE	DESCRIPTION	TREND	SETPOINTS	ALARM
AO	AI COOLING COIL BYPASS DAMPER CONTROL	15 MIN		
AI	AI BYPASS AIR FLOW MONITORING STATION	15 MIN	BA MIN: 40% OF SA BA MAX: 70% OF SA	
DO	DO 100% OUTDOOR AIR PURGE DAMPER CONTROL	COV		
DI	DI 100% OUTDOOR AIR PURGE LIMIT SWITCH - OPEN			G-MISMATCH
DI	DI MINIMUM OUTDOOR AIR DAMPER CONTROL	15 MIN		
AI	AI MINIMUM OUTDOOR AIR FLOW MONITORING STATION	15 MIN	OA: TBD	G-HI: +10% G-LO: -10%
NET	NET RETURN FAN VFD INTERFACE			
NET	NET RETURN FAN VFD INTERFACE			
BO	BO CONTROL CONTACTOR-REF 1			
BO	BO CONTROL CONTACTOR-REF 2			
BO	BO CONTROL CONTACTOR-REF 3			
AI	AI RETURN FAN AFMS - TOTAL AIR FLOW - RETURN FAN 1	15 MIN		
AI	AI AIR FLOW - RETURN FAN 1	15 MIN		
AI	AI AIR FLOW - RETURN FAN 2	15 MIN		
AI	AI AIR FLOW - RETURN FAN 3	15 MIN		
DI	DI RETURN AIR SMOKE DETECTOR			CR
DI	DI RETURN SMOKE LIMIT SWITCH - OPEN			G-MISMATCH
DI	DI RETURN SMOKE LIMIT SWITCH - CLOSED			G-MISMATCH
DO	DO RETURN SMOKE DAMPER CONTROL	COV		
AI	AI RETURN AIR TEMPERATURE SENSOR	15 MIN		
AI	AI RETURN AIR HUMIDITY SENSOR	15 MIN		
DI	DI RETURN AIR LOW PRESSURE SWITCH			
DI	DI PRESSURE INDICATION			
AO	AO RETURN OR RELIEF DAMPER CONTROL	15 MIN		
AI	AI ZI-7 RETURN OR RELIEF POSITION INDICATION	15 MIN		
AI	AI T-3 MIXED AIR TEMPERATURE SENSOR	15 MIN		
AI	AI PI-5 FILTER PRESSURE INDICATION	15 MIN		G
AI	AI DA-5 COOLING COIL FACE DAMPER CONTROL	15 MIN		
AI	AI ZI-5 COOLING COIL FACE DAMPER POSITION INDICATION	15 MIN		
AI	AI WT-1 CHILLED WATER RETURN TEMPERATURE SENSOR	15 MIN		
AI	AI FM-1 CHILLED WATER RETURN FLOW SENSOR	15 MIN		
AO	AO VA-1 CHILLED WATER RETURN CONTROL VALVE	15 MIN		
AI	AI WT-2 CHILLED WATER SUPPLY TEMPERATURE SENSOR	15 MIN		
DO	DO ED-1 FREEZE PROTECTION PUMP ENABLE/DISABLE	COV		
DI	DI CS-1 FREEZE PROTECTION PUMP CURRENT SENSOR			G-MISMATCH
DI	DI FZ-1 LOW TEMPERATURE LIMIT SWITCH WITH MANUAL RESET	37°F		CR
AI	AI T-4 COOLING COIL DISCHARGE TEMPERATURE SENSOR	15 MIN	CLG COIL MIN: 47°F CLG COIL MAX: 47°F	
AI	AI WT-3 HOT WATER RETURN TEMPERATURE SENSOR	15 MIN		
AI	AI FM-2 HOT WATER RETURN FLOW SENSOR	15 MIN		
AO	AO VA-2 HOT WATER REHEAT CONTROL VALVE	15 MIN		
AI	AI WT-4 HOT WATER SUPPLY TEMPERATURE SENSOR	15 MIN		
DO	DO ED-2 FREEZE PROTECTION PUMP ENABLE/DISABLE	COV		
DI	DI CS-2 FREEZE PROTECTION PUMP CURRENT SENSOR			G-MISMATCH
AI	AI AF-1 SUPPLY FAN AFMS - TOTAL AIR FLOW - SUPPLY FAN 1	15 MIN		
AI	AI AF-2 AIR FLOW - SUPPLY FAN 2	15 MIN		
AI	AI AF-3 AIR FLOW - SUPPLY FAN 3	15 MIN		
AI	AI AF-4 AIR FLOW - SUPPLY FAN 4	15 MIN		
BO	BO CONTROL CONTACTOR-SF 1			
BO	BO CONTROL CONTACTOR-SF 2			
BO	BO CONTROL CONTACTOR-SF 3			
BO	BO CONTROL CONTACTOR-SF 4			
NET	NET VFD-3 SUPPLY FAN VARIABLE FREQUENCY DRIVE INTERFACE			
NET	NET VFD-4 SUPPLY FAN VARIABLE FREQUENCY DRIVE INTERFACE			
AI	AI PI-4 HEPA DIRTY FILTER PRESSURE INDICATION	15 MIN		G
NET	NET HM-1 HUMIDIFIER INTERFACE			
AI	AI T-2 SUPPLY AIR TEMPERATURE SENSOR	15 MIN		
AI	AI H-2 SUPPLY AIR HUMIDITY SENSOR	15 MIN		
DI	DI PS-2 SUPPLY AIR HIGH PRESSURE SWITCH			CR
DI	DI SD-2 SUPPLY AIR SMOKE DETECTOR			CR
BO	BO BI DA-2 DAMPER CONTROL - SUPPLY LIMIT SWITCH - OPEN			
BO	BO BI LS-2 LIMIT SWITCH - OPEN			
AI	AI PI-1 PRESSURE INDICATION (MPS)	15 MIN		LOW
AI	AI PI-2 PRESSURE INDICATION (LPS)	15 MIN		LOW

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KEY PLAN

GRAPHIC SCALE(S)

DATE	02/02/25
REVISION	
DESCRIPTION	
DATE	
REVISION	
DESCRIPTION	AMENDMENT 1 - 03/22/2024
DESCRIPTION	AMENDMENT 2 - 03/29/2024



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ALIAS	MUSEUM SUPPORT CENTER
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PROJECT TITLE	MSC REPLACE AHUS
POD	POD 1
SP PROJECT NUMBER	1530103
SP PROJECT NUMBER	60516569
ISSUED TITLE	AIR HANDLING UNIT TYPICAL MECHANICAL CONTROLS
ISSUED DATE	PR PR TM
ISSUED BY	ISSUED BY
ISSUED BY	ISSUED BY
SHEET NO.	M 7 02
77 OF 71	



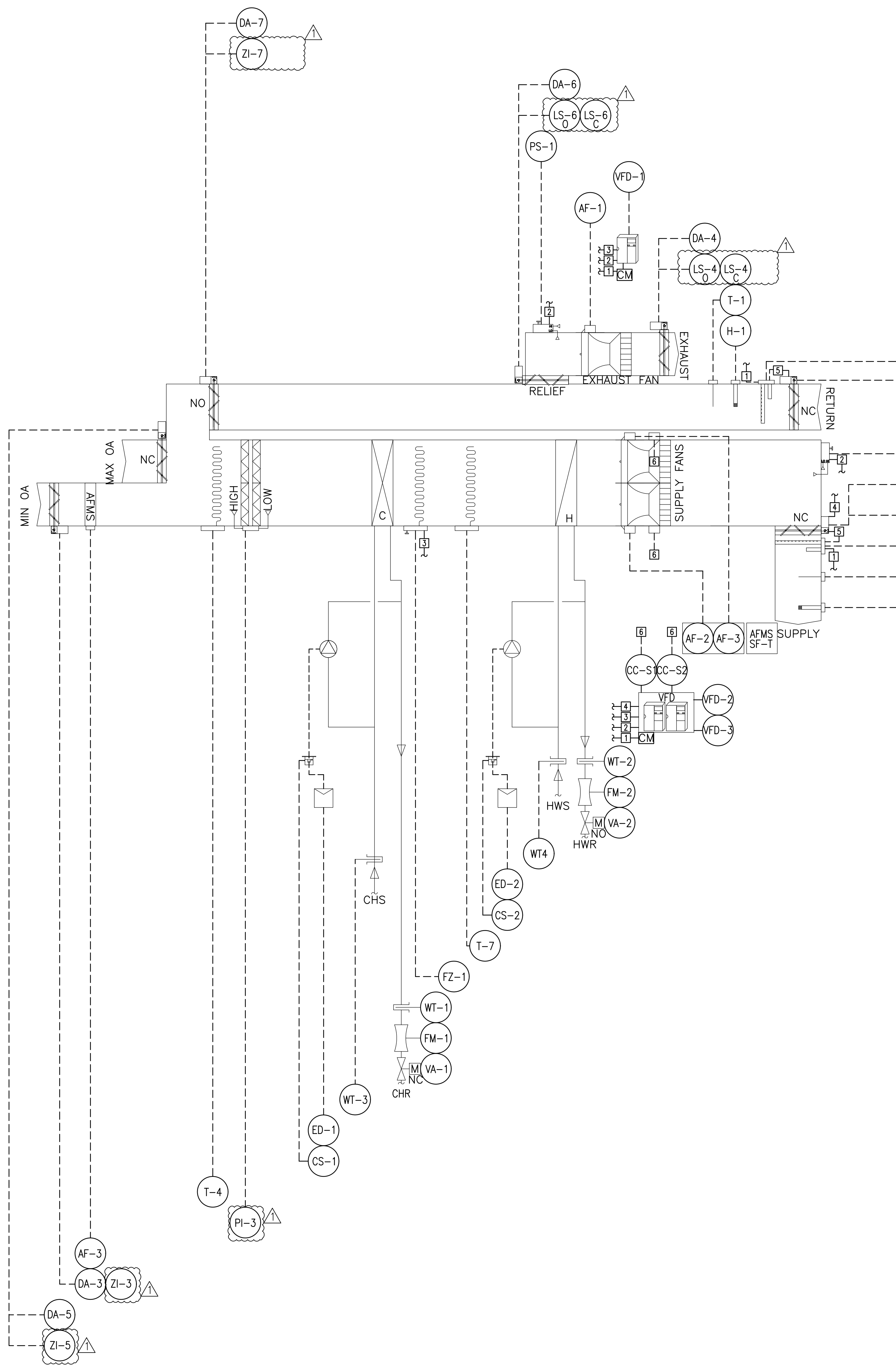
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- REFER TO MECHANICAL SCHEDULE ON M.6.01 AND AHU DETAILS FOR COORDINATION.

CODED NOTES:

- INTERLOCK UNIT WITH FIRE ALARM SYSTEM THROUGH A CONTROL MODULE (CM) TO STOP THE SUPPLY AND EXHAUST FANS WHEN THE SUPPLY OR RETURN DUCT SMOKE DETECTOR SENSES PARTICLES OF COMBUSTION. THIS INTERLOCK SHALL BE HARD WIRED AND NOT PERFORMED THROUGH THE DDCS.
- HARDWIRE INTERLOCK FAN WITH ASSOCIATED PRESSURE SENSORS TO SHUT OFF FAN WHEN SENSORS TRIPS. EXHAUST WITH LOW PRESSURE AND SUPPLY WITH HIGH PRESSURE SWITCH.
- HARDWIRE INTERLOCK FANS WITH FREEZESTAT. WHEN SENSORS INDICATES FREEZE CONDITION, FANS SHALL SHUTDOWN.
- THE DAMPER SHALL BE HARDWIRE-INTERLOCKED WITH THE SUPPLY FAN. WHEN THE FAN IS ENABLED, THE DAMPER SHALL BE COMMANDED TO OPEN. WHEN THE DAMPER STATUS HAS PROVEN OPEN, THE VFD SHALL BE ALLOWED TO RUN.
- THE DAMPER SHALL BE HARDWIRE-INTERLOCKED WITH THE ASSOCIATED SMOKE DETECTOR. WHEN DUCT SMOKE DETECTOR SENSES PARTICLES OF COMBUSTION, THE DAMPER SHALL BE CLOSE.
- WIRE THE VFD'S TWO INVERTERS AS PRIMARY AND STAND-BY. THE PRIMARY VFD INVERTER CONTROLS ALL FANS IN THE SET. UPON A FAILURE OF PRIMARY VFD INVERTER, THE STAND-BY VFD INVERTER CONTROLS ALL FANS IN THE SET.

AIR HANDLING UNIT CONTROLS: AHU-9



DDCS POINTS LIST				
TYPE	DESCRIPTION	TREND	SETPOINTS	ALARM
AO	RETURN DAMPER CONTROL	COV		
DI	RETURN DAMPER POSITION INDICATION			G-MISMATCH
DO	RELIEF DAMPER CONTROL	COV		
DI	RELIEF DAMPER POSITION SWITCH			G-MISMATCH
DI	EXHAUST AIR LOW PRESSURE SWITCH			G-MISMATCH
NET	EXHAUST FAN VFD INTERFACE			
AI	EXHAUST FAN INLET AIR FLOW MONITORING STATION	15 MIN	EA: 23,400 CFM	
DO	EXHAUST DAMPER CONTROL	COV		
DI	EXHAUST DAMPER POSITION SWITCH			G-MISMATCH
AI	RETURN AIR TEMPERATURE SENSOR	15 MIN		
AI	RETURN AIR HUMIDITY SENSOR	15 MIN	DE-HUMID: 40%	G-HIGH: 53%
DI	RETURN AIR SMOKE DETECTOR			CR
DO	RETURN SMOKE DAMPER CONTROL	COV		
DI	RETURN SMOKE DAMPER POSITION SWITCH			G-MISMATCH
DI	SUPPLY AIR HIGH PRESSURE SWITCH			CR
DO	SUPPLY SMOKE DAMPER CONTROL	COV		
DI	SUPPLY SMOKE DAMPER POSITION SWITCH			G-MISMATCH
DI	SUPPLY AIR SMOKE DETECTOR			CR
AI	SUPPLY AIR TEMPERATURE SENSOR	15 MIN		
AI	SUPPLY AIR HUMIDITY SENSOR	15 MIN		
AI	AFMS - SUPPLY FAN TOTAL AIR FLOW	15 MIN		
AI	AFMS - SUPPLY AIR FLOW	15 MIN		
BO	CONTROL CONTACTOR-SF 1			
BO	CONTROL CONTACTOR-SF 2			
NET	SUPPLY FAN VARIABLE FREQUENCY DRIVE INTERFACE			
NET	SUPPLY FAN VARIABLE FREQUENCY DRIVE INTERFACE			
AI	HOT WATER RETURN TEMPERATURE SENSOR			
AI	HOT WATER RETURN FLOW SENSOR	15 MIN		
AO	HOT WATER REHEAT CONTROL VALVE	15 MIN		
AI	CHILLED WATER SUPPLY TEMPERATURE SENSOR	15 MIN		
DO	FREEZE PROTECTION PUMP ENABLE/DISABLE			
DI	FREEZE PROTECTION PUMP CURRENT SENSOR			G-MISMATCH
AI	COOLING COIL DISCHARGE TEMPERATURE SENSOR	15 MIN	CLG COIL: 49°F	
DI	SWITCH WITH MANUAL RESET			CR-MISMATCH
AI	CHILLED WATER RETURN TEMPERATURE SENSOR			
AI	CHILLED WATER RETURN FLOW SENSOR	15 MIN		
AO	CHILLED WATER RETURN CONTROL VALVE	15 MIN		
AI	HOT WATER SUPPLY TEMPERATURE SENSOR	15 MIN		
DO	FREEZE PROTECTION PUMP ENABLE/DISABLE	COV		
DI	FREEZE PROTECTION PUMP CURRENT SENSOR			G-MISMATCH
AI	MIXED AIR TEMPERATURE SENSOR	15 MIN		
AI	DIRTY FILTER ASSEMBLY PRESSURE INDICATION	15 MIN		G
AI	MINIMUM OUTDOOR AIR FLOW MONITORING STATION		OA: 600 CFM	G-HI: NA G-LO: NA
AO	MINIMUM OUTDOOR AIR DAMPER CONTROL	15 MIN		
AI	MINIMUM OUTDOOR AIR DAMPER POSITION INDICATION	15 MIN		
AO	MAX OA DAMPER CONTROL	15 MIN		
AI	MAX OA DAMPER POSITION INDICATION	15 MIN		G-MISMATCH

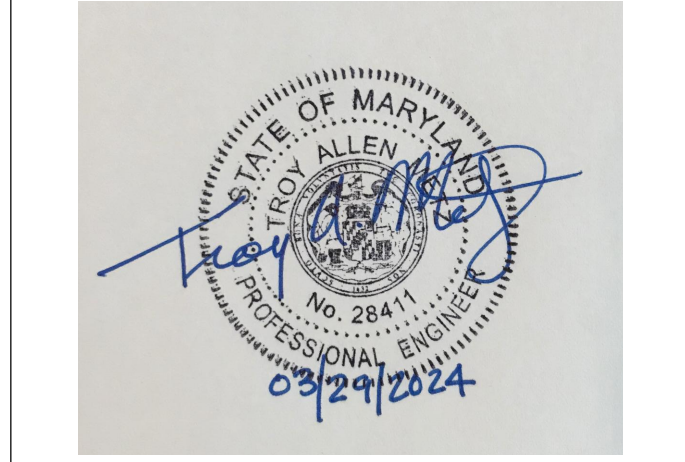
DDCS POINTS LIST				
TYPE	DESCRIPTION	QTY	TREND	ALARM
AI	SPACE HUMIDITY	1	15 MIN	LO/HI: 30/53 %RH
AI	SPACE TEMPERATURE	1	15 MIN	LO/HI: 65/75 75°F

DDCS SOFTWARE POINTS				
TYPE	DESCRIPTION	TREND	SETPOINTS	ALARM
AV	AVERAGE SPACE TEMP.	15 MIN	REHEAT: 68°F COOLING: 68°F	G-HIGH: 78°F G-LOW: 63°F
AV	OUTDOOR AIR DEW POINT (CALCULATED FROM AVERAGED OUTDOOR AIR TEMPERATURE AND OUTDOOR AIR HUMIDITY)	15 MIN	ECON: 50°F DP	
AV	OUTDOOR AIR HUMIDITY (AVERAGE OF AHU-1 & AHU-8)			
AV	OUTDOOR AIR TEMPERATURE (AVERAGE OF AHU-1 & AHU-8)		ECON MAX OA: 65°F ECON MIN OA: 50°F	
AV	CHILLED WATER SUPPLY TEMP.			
AV	HEATING WATER SUPPLY TEMP.			
AV	CHILLED WATER LOAD	YES		
AV	HOT WATER LOAD	YES		
AV	SUPPLY AIR FLOW (AF-2+AF-3)	15 MIN	SA: 24,000 CFM	

VARIABLE FREQUENCY DRIVE INTERFACE				
TYPE	DESCRIPTION	TREND	SETPOINTS	ALARM
DO	COMMAND (START/STOP)			
DI	STATUS (RUNNING/STOP)			CR-MISMATCH
DI	FAULT OR ALARM (ON/OFF)			CR
AO	SPEED CONTROL (HZ)	15 MIN		
AV	STATUS FREQUENCY (HZ)	15 MIN		
AV	POWER (KW)	YES		

A MECHANICAL CONTROLS SCALE = NTS

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KEY PLAN

GRAPHIC SCALE(S)

DATE: 02/02/24  
SUBMISSION: BID SET

REVISION: AMENDMENT 2 - 03/29/2024

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PROJECT TITLE: MSC REPLACE AHUS  
POD 1

SF PROJECT NUMBER: 1530103  
LVL PROJECT NUMBER: 60516569

ISSUED BY: PR  
DRAWN BY: PR  
CHECKED BY: TM

SHEET NO: 79 OF 71  
DISCIPLINE: M 7 04  
TITLE: MECHANICAL CONTROLS

SEQUENCE OF OPERATION: AHU-9

GENERAL

- THE SUPPLY FANS SHALL OPERATE TO PROVIDE CONSTANT VOLUME AIR FLOW. THE EXHAUST FAN SHALL REMAIN OFF DURING NORMAL OPERATION AND ENABLED DURING ECONOMIZER OPERATION.
- THE SYSTEM CONSISTS OF RETURN AIR TUNNEL, RETURN DAMPER, RELIEF DAMPER, MIXED AIR SECTION WITH MINIMUM AND MAXIMUM OA LOUVER/DAMPER, FILTER WITH MERV-8 PRE-FILTERS AND MERV-14 INT-FILTERS, HOT WATER COIL, CHILLED WATER COIL, SUPPLY FANS, AND EXHAUST FAN.
- THE VARIABLE FREQUENCY DRIVES (VFD) FOR SUPPLY FANS AND EXHAUST FAN ARE INTENDED FOR BALANCING THE UNIT AND TO PROVIDE THE AIR FLOW REQUIRED FOR NORMAL OPERATION AND PURGE OPERATION. THE PRIMARY AND STAND-BY VFD ARE WIRED TO OPERATE ALL SUPPLY FANS. WHEN THE PRIMARY VFD FAILS, THE STAND-BY VFD TAKES OVER CONTROL OF THE FANS.
- UNIT SHALL HAVE SMOKE DETECTORS IN BOTH THE SUPPLY DUCT AND RETURN DUCTS. THERE SHALL BE A SMOKE DAMPER IN THE SUPPLY DUCT AND IN THE RETURN DUCT.
- UNIT SHALL HAVE A RETURN AIR LOW PRESSURE SWITCH, SUPPLY AIR HIGH PRESSURE SWITCH, AND A LOW TEMPERATURE FREEZE PROTECTION SENSOR (FREEZESTAT).
- UNIT SHALL HAVE FULL DDC CONTROLLED OPERATION THROUGH BUILDING AUTOMATION SYSTEM (BAS).
- UNIT SHALL HAVE A GRAPHICAL REPRESENTATION TO SHOW UNIT STATUS ON UNIT'S DDC PANEL.
- SMOKE DAMPERS SHALL ALSO BE USED AND AS ISOLATION DAMPERS WHEN UNIT IS OFF.

MODE: FAN HAND-OFF-AUTO OPERATION

- HAND-OFF-AUTO SETTINGS SHALL BE PROVIDED AS PART OF THE VFD THROUGH THE DRIVE'S KEYPAD.
- IN THE HAND MODE, THE FAN SHALL START AND RUN CONTINUOUSLY AFTER THE SMOKE DAMPERS ARE PROVEN OPEN, THE FAN SPEED SHALL BE CONTROLLED THROUGH A MANUAL SPEED CONTROL LOCATED AT THE VFD CONTROL PANEL.
- IN THE OFF MODE, THE FAN SHALL BE STOPPED.
- IN THE AUTO MODE, THE FAN SHALL BE STARTED AND STOPPED AS DESCRIBED UNDER "OPERATION MODES".

MODE: UNIT OFF

- GENERAL CONTROL: THE MODE SHALL BE INITIATED FROM A BAS INTERFACE.
- FAN CONTROL: THE SUPPLY FANS AND EXHAUST FAN SHALL BE DISABLED.
- DAMPER CONTROL: THE DAMPERS SHALL GO TO THE POSITIONS INDICATED ON DAMPER POSITION SCHEDULE.
- VALVE CONTROL: THE CHILLED WATER VALVE AND HOT WATER VALVE SHALL GO TO THE CLOSED POSITION.

MODE: UNIT ON NORMAL

- GENERAL CONTROL: THE MODE SHALL BE INITIATED FROM A BAS INTERFACE. THE UNIT SHALL RUN CONTINUOUSLY IN THIS MODE UNLESS UNIT FAILS OR ANOTHER MODE IS INITIATED.
- FAN CONTROL:
  - AFTER THE RETURN AND SUPPLY SMOKE DAMPERS HAVE PROVEN OPEN, THE SUPPLY FANS RAMP UP AND MODULATES TOGETHER TO MAINTAIN SETPOINT FOR CONSTANT AIR FLOW.
  - THE SUPPLY FANS' VFDS SHALL MODULATE THEIR SPEEDS TOGETHER TO MAINTAIN SUPPLY AIR FLOW SETPOINT [SA AIRFLOW: 24,000 CFM] BASED ON THE SUM OF FAN INLET AIR FLOW MONITORING STATIONS [AF-2] AND [AF-3].
    - WHILE AIRFLOW IS WITHIN THROTTLE RANGE +/-5% CFM, THE VFD SPEED SHALL REMAIN UNCHANGED.
  - IF ONE OF THE SUPPLY FANS GOES INTO ALARM OR FAILS TO START, THE ACTIVE FAN'S VFD SHALL MODULATE ITS SPEED TO MAINTAIN SUPPLY AIR FLOW SETPOINT [SA AIRFLOW: 24,000 CFM] BASED ON ITS ASSOCIATED FAN INLET AIR FLOW MONITORING.
- FAN CONTROL CONTACTOR:
  - NORMAL OPERATION OPERATES ALL FANS. CONTROL CONTACTORS ARE INTENDED TO ALLOW OPERATOR TO REDUCE THE CAPACITY OF THE FAN WALL SYSTEM OR DISABLE AN INDIVIDUAL THAT IS NOT OPERATING PROPERLY.
  - WHEN VFD IS STOPPED, THE OPERATOR MAY SELECT ANY NUMBER OF FANS THAT WILL BE ALLOWED TO RUN.
  - WHEN VFD IS OPERATING, THE OPERATOR MAY DISABLE ANY FAN BUT WILL NOT BE ABLE TO ENABLE AN INDIVIDUAL FAN WITHOUT CONFIRMATION. WHEN OPERATOR ATTEMPTS TO ENABLE INDIVIDUAL FAN WHILE VFD IS OPERATING, GENERATE CONFIRMATION POPUP WINDOW, "WARNING, CONFIRM FAN ENABLE. ENABLING FAN WHILE FAN IS OPERATING MAY TRIP FAN'S VFD DRIVE. RECOMMEND COMMANDING VFD TO STOP AND RESTARTING WITH INCREASED NUMBER OF FANS ENABLED."
- DAMPER CONTROL:
  - THE DAMPERS SHALL GO TO THE POSITIONS INDICATED ON DAMPER POSITION SCHEDULE.
  - MINIMUM OUTDOOR AIR DAMPER [DA-3] SHALL OPEN AND MODULATE TO MAINTAIN OUTDOOR AIR FLOW SETPOINT [OA AIRFLOW: 600 CFM] MEASURED AT AFMS. WHILE AIRFLOW IS WITHIN THROTTLE RANGE +/-5% CFM, THE DAMPER POSITION SHALL REMAIN UNCHANGED.
- TEMPERATURE CONTROL:
  - THE COOLING COIL [VA-1] SHALL MODULATE TO MAINTAIN SPACE TEMPERATURE AT COOLING COIL SETPOINT [COOLING: 75°F]. WHILE TEMPERATURE IS WITHIN THROTTLE RANGE +/-1°F, THE VALVE POSITION SHALL REMAIN UNCHANGED.
  - THE HOT WATER REHEAT CONTROL VALVE [VA-2] SHALL MODULATE TO MAINTAIN SPACE TEMPERATURE SETPOINT AT HEATING SETPOINT [HEATING: 68°F]. WHILE TEMPERATURE IS WITHIN THROTTLE RANGE +/-1°F, THE VALVE POSITION SHALL REMAIN UNCHANGED.
- HUMIDITY CONTROL:
  - WHEN THE RETURN AIR HUMIDITY [H-1] RISES ABOVE DE-HUMIDIFICATION SETPOINT OF [DE-HUMID: 40%] FOR A MINIMUM OF 10 MINUTES, THE COOLING COIL CALCULATED SPACE TEMPERATURE CONTROL SHALL BE DISABLED AND THE COOLING COIL SHALL MODULATE TO MAINTAIN COOLING COIL DISCHARGE TEMPERATURE OF [CLG COIL: 49°F]. WHILE TEMPERATURE IS WITHIN THROTTLE RANGE +/-0.5°F, THE VALVE POSITION SHALL REMAIN UNCHANGED.
  - THE HOT WATER REHEAT CONTROL VALVE [VA-2] SHALL MODULATE TO MAINTAIN CALCULATED SPACE TEMPERATURE SETPOINT AT HEATING SETPOINT [HEATING: 68°F]. WHILE TEMPERATURE IS WITHIN THROTTLE RANGE +/-1°F, THE VALVE POSITION SHALL REMAIN UNCHANGED.
  - WHEN RETURN AIR HUMIDITY DROPS TO 35% RH ([DE-HUMID: 40%] MINUS 5%) FOR A MINIMUM OF 15 MINUTES, THE COOLING COIL SHALL MAINTAIN CALCULATED SPACE TEMPERATURE AS DESCRIBED IN PREVIOUS TEMPERATURE CONTROL SECTION.

MODE: UNIT ON ECONOMIZER

- ACTIVATION CONTROL: WHEN ALL OF THE FOLLOWING CONDITIONS ARE MET FOR A MINIMUM 15 MINUTES:
  - OUTDOOR AIR ENTHALPY IS LOWER THAN RETURN AIR ENTHALPY,
  - AND OUTDOOR AIR TEMPERATURE IS LESS THAN 65°F,
  - AND OUTDOOR AIR TEMPERATURE IS GREATER THAN 50°F,
  - AND OUTDOOR AIR DEW POINT TEMPERATURE IS LESS THAN 50°F,
  - AND, CALCULATED SPACE HUMIDITY IS BELOW CALCULATED SPACE HUMIDITY SETPOINT 40% RH.
- ECONOMIZER FAN AND DAMPER CONTROL:
  - THE SUPPLY FAN'S VFD SHALL RAMP THE SUPPLY FAN SPEED DOWN TO MINIMUM SPEED TO PROTECT THE EXHAUST FAN FROM ROTATING AND GOING INTO ALARM DURING THE TRANSITION TO ECONOMIZER AND TO PROTECT AGAINST PRESSURIZATION OF THE DUCT.
  - THE RETURN DAMPER [DA-7] SHALL CLOSE, RELIEF DAMPER [DA-6] SHALL OPEN, AND EXHAUST AIR DAMPER [DA-4], AND MAX OUTSIDE AIR DAMPER [DA-5] SHALL OPEN.
  - WHEN THE RELIEF AIR DAMPER [DA-6] AND EXHAUST AIR DAMPER [DA-4] HAVE BOTH PROVEN OPEN BY LIMIT SWITCH [LS-4] & [LS-6], THE EXHAUST FAN SHALL BE ENABLED AT MINIMUM SPEED, WHEN THE EXHAUST FAN HAS PROVEN ON THROUGH THE VFD, THE SUPPLY FAN'S VFDS AND EXHAUST FAN'S VFD SHALL RAMP UP SLOWLY TOGETHER.
  - THE SUPPLY FANS SHALL OPERATE AS INDICATED IN UNIT ON MODE FAN CONTROL TO MAINTAIN SUPPLY AIR FLOW SETPOINT [SA AIRFLOW: 24,000 CFM].
  - EXHAUST FAN'S VFD SHALL MODULATE SPEED BASED ON FAN INLET AIR FLOW MONITORING STATION [AF-1] TO MAINTAIN EXHAUST AIR FLOW SETPOINT OF 23,400 CFM WHICH EQUALS [SA AIRFLOW: 24,000 CFM] MINUS [OA AIRFLOW: 600 CFM].
- TEMPERATURE CONTROL:
  - THE COOLING COIL [VA-1] SHALL MODULATE TO MAINTAIN CALCULATED SPACE TEMPERATURE AT COOLING COIL SETPOINT [COOLING: 75°F]. WHILE TEMPERATURE IS WITHIN THROTTLE RANGE +/-1°F, THE VALVE POSITION SHALL REMAIN UNCHANGED.
  - THE HOT WATER REHEAT CONTROL VALVE [VA-2] SHALL MODULATE TO MAINTAIN CALCULATED SPACE TEMPERATURE SETPOINT AT HEATING SETPOINT [HEATING: 68°F]. WHILE TEMPERATURE IS WITHIN THROTTLE RANGE +/-1°F, THE VALVE POSITION SHALL REMAIN UNCHANGED.
- DE-ACTIVATION CONTROL: MODE SHALL BE DISABLED WHEN ANY OF THE FOLLOWING OCCUR FOR A MINIMUM OF 10 MINUTES:
  - WHEN CALCULATED SPACE HUMIDITY RISES ABOVE DEHUMIDIFICATION SETPOINT [DE-HUMID: 40%],
  - OR OUTDOOR AIR ENTHALPY IS HIGHER THAN RETURN AIR ENTHALPY,
  - OR OUTDOOR AIR TEMPERATURE IS GREATER THAN 67°F,
  - OR OUTDOOR AIR TEMPERATURE IS LESS THAN 48°F,
  - OR OUTDOOR AIR DEW POINT IS GREATER THAN 50°F.
- ECONOMIZER DISABLE FAN AND DAMPER CONTROL:
  - THE SUPPLY FANS' VFDS AND EXHAUST FAN VFD SHALL RAMP DOWN TO MINIMUM SPEED TO PROTECT AGAINST OVER PRESSURIZATION OF THE SYSTEM. WHEN THE VFDS HAVE RAMPED DOWN TO MINIMUM SPEED, THE EXHAUST FAN SHALL BE DISABLED.
  - THE RETURN DAMPER [DA-7] SHALL OPEN WHILE THE MAX OA DAMPER [DA-5] AND THE RELIEF AIR DAMPER [DA-6] CLOSE AND EXHAUST AIR DAMPER [DA-4] CLOSE.
  - WHEN THE RETURN AIR DAMPER [DA-7] HAS PROVEN OPEN, THE SUPPLY FAN SHALL RAMP IT'S SPEED UP TO [SA AIRFLOW: 24,000 CFM] AND OPERATE AS INDICATED IN UNIT ON FAN CONTROL.
- ECONOMIZER DISABLE VALVE CONTROL: THE COOLING COIL VALVE AND PRE-HEAT VALVE TEMPERATURE CONTROL SHALL BE ENABLED AS INDICATED UNIT ON MODE.

MODE: PURGE MODE

- PURGE ENABLE: THE MODE SHALL BE INITIATED FROM A BAS INTERFACE. THE PURGE MODE SHALL HAVE AN ADJUSTABLE DURATION. WHEN THE DURATION TIME HAS EXCEEDED, THE UNIT SHALL RETURN TO NORMAL OPERATION.
  - PURGE FAN & DAMPER CONTROL SHALL OPERATE AS INDICATED IN THE ECONOMIZER FAN AND DAMPER CONTROL.
  - THE PUMPS SHALL BE ENABLED AS INDICATED IN FREEZE PROTECTION MODE.
- PURGE DISABLE: THE PURGE MODE SHALL HAVE AN ADJUSTABLE DURATION. WHEN THE DURATION TIME HAS EXCEEDED OR HAS BEEN DISABLED FROM THE GRAPHIC INTERFACE, THE UNIT SHALL RETURN TO NORMAL OPERATION.
  - PURGE DISABLE FAN & DAMPER CONTROL SHALL OPERATE AS INDICATED IN THE ECONOMIZER DISABLE FAN AND DAMPER CONTROL.
  - THE COOLING COIL AND PRE-HEAT VALVE SHALL MODULATE AS INDICTED IN UNIT ON NORMAL MODE.

MODE: FREEZE PROTECTION

- WHEN MIXED AIR TEMPERATURE [T-4] SENSES A TEMPERATURE BELOW 42°F, THE CHILLED WATER AND HOT WATER REHEAT FREEZE PROTECTION PUMPS SHALL BE ENABLED.
  - THE PUMPS SHALL HAVE MINIMUM ON/OFF TIME OF 10 MINUTES TO PREVENT SHORT CYCLING.
  - WHEN MIXED AIR TEMPERATURE [T-4] SENSES A TEMPERATURE ABOVE 42°F FOR 10 MINUTES, THE PUMPS SHALL BE DISABLED.
- DURING PURGE MODE, WHEN MIXED AIR TEMPERATURE [T-4] SENSES A TEMPERATURE BELOW 42°F, THE CHILLED WATER AND HOT WATER REHEAT FREEZE PROTECTION PUMPS SHALL BE ENABLED AS PREVIOUSLY INDICATED AND CHILLED AND HOT WATER VALVES [VA-1] & [VA-2] SHALL BE COMMANDED TO FULL OPEN.
- FREEZESTAT: THE FREEZESTAT SHALL BE SET TO TRIP AT 37°F AND IT SHALL REQUIRE A MANUAL RESET AT THE UNIT. ON A FREEZE ALARM SIGNAL, THE FOLLOWING SHALL OCCUR:
  - SUPPLY AND EXHAUST FANS SHALL SHUT OFF.
  - THE DAMPERS SHALL GO TO THE DAMPER POSITION INDICATED ON THE DAMPER POSITION SCHEDULE.
  - THE CHILLED WATER CONTROL VALVE [VA-1] AND THE HOT WATER CONTROL VALVE [VA-2] SHALL BE COMMANDED TO 100% OPEN.
  - IF PUMPS ARE OFF, THE CHILLED WATER AND HOT WATER REHEAT FREEZE PROTECTION PUMPS SHALL BE ENABLED WITHOUT ANY DELAYS.



MODE: ENERGY MONITORING

- CALCULATE HOT WATER AND CHILLED WATER ENERGY RATES BASED ON FLOW, RETURN TEMPERATURE, AND SUPPLY TEMPERATURE. COORDINATE UNITS (BTU, TONS, KW, ETC.) WITH ENERGY SAVING PERFORMANCE CONTRACT (ESPC) REQUIREMENTS.
- MONITOR, TREND AND TRACK VFD POWER CONSUMPTION BASED ON ENERGY SAVING PERFORMANCE CONTRACT (ESPC) REQUIREMENTS.
- TREND THE UNIT'S MODE OPERATION (ON, OFF, PURGE MODE, ECONOMIZER.) IF REQUIRED FOR ESPC, PROVIDE ENERGY CONSUMPTION TOTALS DURING ECONOMIZER MODE.
- COORDINATE WITH ESPC REQUIREMENTS AND PROVIDE ADDITIONAL INPUT, FEEDBACK, TRENDING, REPORTING, ETC. AS NEEDED.
- PROVIDE AHU FAN, HOT WATER, AND CHILLED WATER, ENERGY CONSUMPTION TABLE AND COORDINATE WITH ESPC FOR ANY ADDITIONAL REQUIREMENTS:
  - SHOW CURRENT DAILY AND PREVIOUS TWO DAYS TOTAL, CURRENT WEEKLY AND PREVIOUS TWO WEEKS TOTAL, CURRENT MONTHLY AND MONTHLY TOTALS FOR EACH MONTH OF CURRENT YEAR, AND CURRENT YEARLY CONSUMPTION TOTALS.
  - SHOW EACH MONTHLY TOTAL FOR PREVIOUS YEAR AND PREVIOUS 2ND YEAR. SHOW YEARLY TOTAL FOR PREVIOUS YEAR AND PREVIOUS 2ND YEAR.

SAFETIES, ALARMS, AND INTERLOCKS

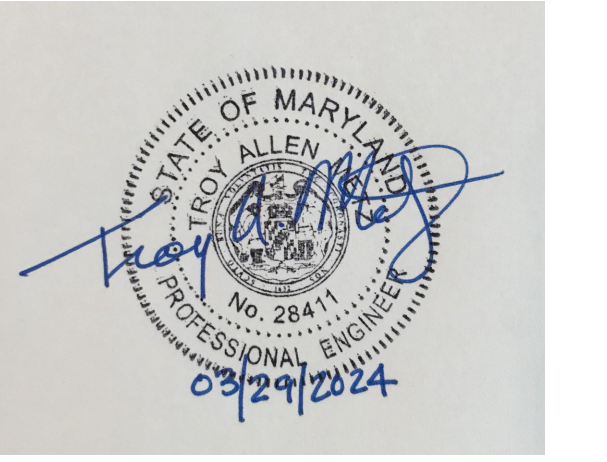
- GENERAL ALARMS INDICATED WITH G IN POINTS LIST ALARM COLUMN SHALL GENERATE AN ALARM IN THE BAS. WHEN ALARM CONDITION CLEARS, THE ALARM SHALL BE DISABLED. ACTIVATION AND DEACTIVATION OF ALARM SHALL BE LOGGED.
  - ALL GENERAL ALARMS SHALL BE DISABLED WHEN THE UNIT HAS BEEN PLACED IN UNIT OFF MODE OR UNIT DISABLE MODE.
  - WHEN UNIT HAS BEEN PLACED IN ON MODE, THE GENERAL ALARMS SHALL BE DISABLED FOR 10 MINUTE STARTUP DELAY.
  - AFTER STARTUP DELAY, THE ALARMS SHALL HAVE A 3 MINUTE DELAY.
  - THE DELAY TIMES SHALL BE ADJUSTED DURING STARTUP AND COMMISSIONING TO PREVENT NUISANCE ALARMS.
- CRITICAL(CR) ALARMS INDICATED THE POINTS LIST ALARM COLUMNS SHALL BE GENERATE AN ALARM IN THE BAS AND SHALL PROVIDE NOTIFICATION OF ALARM. ALARM NOTIFICATION SHALL HAVE STANDARD NOTIFICATION MEANS INCLUDING EMAILING AND TEXT.
- FAN, SMOKE DAMPER, AND SMOKE DETECTOR INTERLOCKS:
  - SUPPLY AND RETURN SMOKE DETECTORS SHALL BE HARDWIRED INTERLOCKED WITH UNIT'S SMOKE DETECTORS.
  - WHEN SMOKE IS DETECTED, BOTH SMOKE DAMPERS SHALL CLOSE.
- THE SUPPLY AND EXHAUST FAN SHALL BE INTERLOCKED WITH THE SUPPLY AND RETURN SMOKE DAMPER AND ASSOCIATED AIR DAMPER LIMIT SWITCHES.
  - THE FANS SHALL NOT START UNTIL SUPPLY AND RETURN SMOKE DAMPERS ARE PROVEN OPEN.
- FIRE ALARM: UPON THE RECEIPT OF A FIRE ALARM SIGNAL FROM THE FACP OR A SMOKE DUCT DETECTOR IN THE AHU SUPPLY DUCT OR RETURN DUCT, THE SUPPLY FANS AND EXHAUST FAN SHALL STOP AND THE UNIT'S SMOKE DAMPERS SHALL CLOSE. AFTER THE FIRE ALARM CONDITION HAS BEEN CLEARED AND THE FIRE ALARM SYSTEM HAS BEEN RESET, THE AIR HANDLING UNIT AND ASSOCIATED SMOKE DAMPERS SHALL BE RETURNED TO THEIR SCHEDULED OPERATION.
- HIGH STATIC SWITCH: A HIGH-LIMIT STATIC-PRESSURE SWITCH IN THE SUPPLY FAN DISCHARGE SHALL STOP THE SUPPLY FAN AND INITIATE A HIGH-STATIC ALARM WHEN THE STATIC PRESSURE EXCEEDS THE SET POINT: 9 INCH W.G. (ADJ).
- LOW STATIC SWITCH: A LOW-LIMIT STATIC-PRESSURE SWITCH IN THE RETURN DUCT SHALL STOP THE EXHAUST FAN AND INITIATE A LOW-STATIC ALARM WHEN THE STATIC PRESSURE FALLS BELOW THE SET POINT: -4 INCHES W.G. (ADJ).
- MISMATCH ALARMS: WHEN A COMMAND STATUS CHANGES AND A 3 MINUTE DELAY HAS EXPIRED, GENERATE A MISMATCH ALARM IF THE COMMAND DOES NOT MATCH STATUS.

DAMPER DESCRIPTION	DAMPER POSITION SCHEDULE		
	OPERATIONAL	MODE	POSITION
	OFF, FIRE, OR FREEZE.	ON	PURGE OR ECONOMIZER
DA-1 RETURN SMOKE	CLOSE	OPEN	OPEN
DA-2 SUPPLY SMOKE	CLOSE	OPEN	OPEN
DA-3 MINIMUM OUTDOOR AIR	CLOSE	MOD.	OPEN
DA-4 EXHAUST	CLOSE	CLOSE	OPEN
DA-5 MAXIMUM OUTDOOR AIR	CLOSE	CLOSE	OPEN
DA-6 RELIEF	CLOSE	CLOSE	OPEN
DA-7 RETURN	OPEN	OPEN	CLOSE

MUSEUM SUPPORT CENTER  
SMITHSONIAN INSTITUTION

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PROFESSIONAL CERTIFICATION  
I CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NUMBER 28411, EXPIRATION DATE 1/13/2025.

KEY PLAN

GRAPHIC SCALE(S)

DATE	02/02/24	REVISION	BID SET
DATE		REVISION	
DATE		REVISION	
DATE		REVISION	
DATE		REVISION	
DATE		REVISION	

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ADDRESS	MUSEUM SUPPORT CENTER 4210 SILVER HILL ROAD SUITLAND, MD 20746
PROJECT TITLE	MSC REPLACE AHUS POD 1
SF PROJECT NUMBER	1530103
U/L PROJECT NUMBER	60516569
ISSUED TITLE	AIR HANDLING UNIT AHU-9
ISSUED TYPE	MECHANICAL CONTROLS
ISSUED STAFF	PR PR TM
ISSUED BY	ISSUED BY

