



# DANE COUNTY DEPARTMENT of PUBLIC WORKS, HIGHWAY and TRANSPORTATION

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**Commissioner / Director**  
Gerald J. Mandli

APRIL 17, 2009

## ATTENTION ALL REQUEST FOR BID (RFB) HOLDERS

### RFB NO. 109054 - ADDENDUM NO. 1

## PUBLIC SAFETY COMMUNICATIONS CENTER INFRASTRUCTURE UPGRADES - AIR HANDLING EQUIPMENT

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**BIDS DUE:** THURSDAY, APRIL 23, 2009, 2:00 PM. DUE DATE AND  
TIME ARE NOT CHANGED BY THIS ADDENDUM.

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This Addendum is issued to modify, explain or clarify the original Request for Bid (RFB) and is hereby made a part of the RFB. Please attach this Addendum to the RFB.

### PLEASE MAKE THE FOLLOWING CHANGES:

#### 1. Document Index

Under DIVISION 23, Change:

“ 23 05 48 - Vibration Controls For HVAC Piping and Equipment ”,  
to:

“ 23 05 48 - Vibration and Seismic Controls For HVAC Piping and Equipment ”

Change:

“ 23 73 13 - Modular Indoor Central-Station Air Handling Units ”  
to:

“ 23 73 13 - Custom Indoor Central-Station Air Handling Units ”.

After: 23 73 13 - Custom Indoor Central-Station Air Handling Units, insert the following:  
“ 23 84 13 - Humidifiers ”.

#### 2. Section 23 05 48 - Vibration Controls for HVAC Piping and Equipment

Page 1 - Line 2:

Change: “ **VIBRATION CONTROLS** ”, to: “ **VIBRATION AND SEISMIC  
CONTROLS** ”

Page 1 - Line 29:

Change: “ Modular ”, to: “ Custom ”.

Page 2 - Lines 44-46: Delete these lines.

Page 2 - Lines 6-11: Delete these lines & replace with the following:

“Structural steel base, rectangular in shape may be "T" or "L" shaped. Use perimeter steel members with a minimum depth equal to 1/10 of the longest dimension of the base. Base depth need not exceed 14" provided that the deflection and misalignment is kept within acceptable limits as determined by the manufacturer. Use height saving brackets in all mounting locations to provide a base clearance of at least one inch above the floor of the unit.”

Page 2 - Lines 56-57: Delete these lines & replace with the following:

“Set steel base for one inch clearance between the unit floor and the base.”

Page 3 - Lines 1-4: Delete these lines & replace with the following:

**“AIR HANDLING UNIT**

Attach horizontal thrust restraints at the centerline of thrust and symmetrically on either side of the unit. ”

**3. Section 23 41 00 - Particulate Air Filtration**

Page 1 - Line 35:

Change: “ 01 91 01 or 01 91 02 ”, to: “ Section(s) 01 91 01 or 01 91 02 ”.

Page 1 - Line 36:

Change: “ Modular ”, to: “ Custom ”.

Page 2 - Line 26:

Change: “ 2” ”, to: “ 4” ”.

Page 3 - Line 9:

Change: “Direct reading, 3-1/2 inch ”, to: “Direct reading, magnahelic, 3-1/2 inch ”.

**4. Section 23 73 12 - Air Handling Unit Coils**

Page 1 - Line 9:

Change: “ units for pre-purchase ”, to: “ units and field erected air handling units for pre-purchase ”.

Page 1 - Line 29:

Change: “ Modular ”, to: “ Custom ”.

Page 1 - Line 61:

Delete: “ **CHILLED/** ”.

Page 2 - Lines 7-9: Delete these lines & replace with the following:

“Coil headers may be constructed of cast iron, steel, or seamless copper. Where cast iron headers are used, expand tubes into the headers. Where steel or copper headers are used braze tubes to header.

#### **CHILLED WATER COILS**

Use galvanized steel casing, end supports, top channel, and bottom channel to produce a rigid frame with allowance for expansion and contraction of the finned tube section.

Construct coils of 0.025 inch tube wall seamless copper tubes of 5/8 inch maximum outside diameter with maximum of 8 aluminum fins suitable for working pressures to 200 psig. Coil fins may be the continuous serpentine or plate fin type.

Coil headers may be constructed of cast iron, steel, or seamless copper. Where cast iron headers are used, expand tubes into the headers. Where steel or copper headers are used braze tubes to header.

Coils shall be drainable type with drain and vent plugs for each header.”

Page 2 - Line 14:

Delete: “ **CHILLED/** ”.

Page 2 - Line 15:

Delete: “ for field erected units ”.

Page 2 - Line 16:

Delete: “ field erected ”.

Page 2 - Line 26: Insert the following:

#### **“CHILLED WATER COILS**

Install in central station air handling unit casings or on structural support frames for units, making allowance for pitching as recommended by the manufacturer. Mount coils in units to allow individual removal.

Comb bent or crushed fins after installation. Clean dust and debris from each coil to ensure its cleanliness.

Install a separate air vent and drain valve for each coil header in such a manner that the vent and drain valves are located outside of air handling unit casing. Provide offsets in piping to facilitate coil removal.

Unless otherwise specified, pipe coils for counter flow arrangement.

Provide a 1-1/2" deep 18 gauge welded stainless steel drain pan as an integral part of the coil support.”

### **5. Section 23 73 13 - Modular Indoor Central-Station Air-Handling Units**

Page 1 - Line 2:

Change: “ MODULAR ”, to: “ CUSTOM ”.

Page 1 - Lines 8-20: Delete these lines & replace with the following:

“This section includes specifications for indoor central station package air handling units for pre-purchase. Contractor shall be responsible for installation. Included are the following topics:”

Page 1 - Line 31: Delete this line.

Page 2 - Line 14:

Change: “ packaged ”, to: “ custom ”.

Page 2 - Line 15:

Change: “ filter sections, access sections, ”, to: “ humidifier, filter sections, access sections, ”.

Page 2 - Lines 30-39: Delete these lines.

Page 3 - Lines 1-2: Delete these lines & replace with the following:

“Fans shall be centrifugal plenum type, statically and dynamically balanced through entire range of operation.”

Page 3 - Line 18:

Change: “ package ”, to: “ custom ”.

Page 3 - Lines 45-55: Delete these lines.

Page 3 - Line 59:

Change: “ blade type with interconnecting linkage. ”, to: “ or opposed blade type as indicated on the drawings. ”.

Page 4 - Line 9: Insert the following:

**“ADDITIONAL SECTION**

A supply air plenum with the same construction of the casing with a 72” x 24” access door. Door shall swing inward. Section shall be double height with one single section for both units and shall enclose both isolation dampers, as shown on the drawings.”

**6. Section 23 84 13 - Humidifiers**

Add new Section 23 84 13, issued with this Addendum.

**7. Sheet H1.1**

Delete current Sheet H1.1; replace with new Sheet H1.1, issued with this Addendum.

Changes include:

- Switched from single heating / cooling coil to separate heating and cooling coils;
- Added isolation damper after supply fan;
- Clarified dampers are to be provided by manufacturer;
- Added isolation damper to AHU-2 after outdoor air section;
- Changed filter type;
- Changed disconnect provider;
- Added steam generator and dispersion tubes to General Note;
- Removed ‘Premanufactured curb’ note from AHU schedule;

- Added notes 10 and 11 to AHU schedule; and
- Changed from centrifugal to plenum fans.

**8. Sheet H1.2**

Delete current Sheet H1.2; replace with new Sheet H1.2, issued with this Addendum.

Changes include:

- Modifications shown on Sheet H1.1;
- Refer to H1.2 regarding economizer mode; and
- Provide differential pressure sensor across damper, to verify damper position.

If any additional information about this Addendum is needed, please call Scott Carlson at 608/266-4179, Carlson.Scott@co.dane.wi.us.

Sincerely,  
*Scott Carlson*  
Project Manager

Enclosures:  
Section 23 84 13  
Sheets H1.1, H1.2

S:\PubWork\Shared\Engineering Division\Scott Carlson\109054 - 911 Ctr AHU Pkg\RFB\Add'm 1\109054 - Addendum 1.doc

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**SECTION 23 84 13  
HUMIDIFIERS**

**PART 1 - GENERAL**

**SCOPE**

This section includes specifications for humidifiers for pre-purchase. Included are the following topics:

**PART 1 - GENERAL**

Scope  
Related Work  
Reference  
Quality Assurance  
Submittals  
Operation and Maintenance Data

**PART 2 - PRODUCTS**

Short Absorption Dispersion Grids  
Electric Steam Humidifiers

**PART 3 - EXECUTION**

Short Absorption Dispersion Grids  
Electric Steam Humidifiers  
Construction Verification Items  
Functional Performance Testing  
Agency Training

**REFERENCE**

Applicable provisions of Division 1 govern work under this Section.

**QUALITY ASSURANCE**

Refer to division 1, General Conditions, Equals and Substitutions.

**SUBMITTALS**

Refer to division 1, General Conditions, Submittals.

Include data concerning dimensions, capacities, materials of construction, ratings, weights, wiring diagrams, and appropriate identification.

**OPERATION AND MAINTENANCE DATA**

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

**PART 2 - PRODUCTS**

**HUMIDIFIER DISPERSION GRIDS**

**SHORT ABSORPTION DISPERSION GRIDS**

Manufacturers: Armstrong, Dri-Steem, Nortec, Pure Humidifier or approved equal.

Factory-assembled steam dispersion unit shall include the following components:

1. Steam supply header/separator.
2. Condensate collection header.
3. Steam dispersion tubes spanning distance between two headers.

Each dispersion tube shall be fitted with steam discharge nozzles inserted into tube wall. Each nozzle shall be metallic or thermoplastic material designed for high steam temperatures. Two rows of nozzles in each dispersion tube shall discharge steam in diametrically opposite directions, perpendicular to airflow.

Each nozzle shall extend through wall of and into center of dispersion tube and contain steam orifice sized for its required steam capacity.

Furnish unit complete with normally closed electric control valve, inlet strainer, float and thermostatic trap sized in accordance with manufacturer's recommendations.

1  
2 Each packaged humidifier panel assembly of tubes and headers shall be contained within galvanized metal  
3 casing to allow duct mounting, or to facilitate stacking of and/or end-to-end mounting of multiple  
4 humidifier panels in ducts or air handling unit casings.

5  
6 Tubes and headers shall be 304 stainless steel and be welded.

7  
8 **STEAM HUMIDIFIERS**

9 **ELECTRIC STEAM HUMIDIFIERS**

10 Manufacturers: Dri-Steem, Armstrong, Nortec, Carel, Pure Humidifier Co. or approved equal.

11  
12 Unit shall be self contained, electric steam generating humidification system. Steam shall be generated by  
13 boiling off softened water.

14  
15 Unit shall be completely pre-wired and include built-in transformer to provide 24 volt supply for control  
16 circuit. Provide fused disconnect switch.

17  
18 Vaporizing chamber, cover and fittings shall be constructed of series 300 stainless steel with welded seams  
19 and fitted for quick access for cleaning. Immersion Heaters shall be INCOLOY alloy-sheathed resistance  
20 type designed for no more than 80 watts per square inch. A single element shall be provided for each  
21 electrical phase.

22  
23 Electronic water level control system shall provide for automatic refill, low water cut off and skimmer  
24 bleed-off functions. System shall consist of:

- 25 1. Water level sensing unit comprised of three Teflon-coated stainless steel probes screwed into  
26 threaded probe head.
- 27 2. A solenoid operated fill valve factory mounted on front of the humidifier.
- 28 3. Microprocessor controls.
- 29 4. Heater Protection:
  - 30 a. First step shall be low water probe. In the event of failure, second step shall be a manual reset  
31 over-temperature switch factory installed on the humidifier.

32  
33 Surface water skimmer system shall be furnished to provide for optimum precipitated mineral removal with  
34 minimum water waste. An after cooler shall temper drain water.

35  
36 Control cabinet shall be UL-and CUL-listed JIC enclosure. Control devices shall be mounted on sub-panel  
37 within enclosure isolated from vaporizing chamber. Control devices shall include microprocessor, magnetic  
38 contactor for each heater group, control circuit transformer, fuses for each heater, numbered terminal strip  
39 and all internal wiring. As-built wiring diagram is to be included.

40  
41 Microprocessor controls shall be factory mounted and wired in humidifier control panel. Mounting  
42 instructions and wiring diagram shall be included. The following features and functions shall be provided:

- 43 1. LED fault indicator. Performs software self diagnosis at every start-up.
- 44 2. Water make-up valve control and low-water safety shut down.
- 45 3. Auto drain valve with after cooler and drain/flush sequence whereby microprocessor accumulates  
46 actual humidifying "on" time, and activates auto drain/flush sequence.
- 47 4. End of season drain.
- 48 5. Switch on microprocessor board for, "AUTO", "STANDBY", "DRAIN", "TEST".
- 49 6. Airflow proven switch.
- 50 7. 100% solid state, power controller shall be mounted and wired in control cabinet. A compatible  
51 humidity sensor shall be shipped loose for field installation in return duct. System shall modulate  
52 humidifier output from 0% to 100% of maximum capacity.
- 53 8. A two position high limit humidistat shall be shipped loose for field installation. Humidistat shall  
54 sense humidity level within duct and protect against saturation of air stream.

55  
56 Furnish associated steam dispersion unit as scheduled.

57  
58 Furnish unit with condensate after cooler.

1  
2  
3 **PART 3 - EXECUTION**

4 **SHORT ABSORPTION DISPERSION GRIDS**

5 Mount units in air handling units as indicated on the drawings. Provide additional duct reinforcing or  
6 support required for the humidifier body and/or distribution manifold(s). Install piping specialties and  
7 controls as detailed and in accordance with manufacturer's instructions.

8 Install steam and condensate branch lines with a minimum of three elbows to allow for expansion and  
9 contraction. Use pipe size recommended by the manufacturer. Ream pipe and blow out at full steam  
10 pressure before making final connection to humidifier.

11  
12 Mount units in air handling units or ductwork with sufficient elevation to drain condensate by non-  
13 pressurized gravity condensate lines. Condensate from this type of dispersion grid shall not be wasted to  
14 drain. Install condensate piping and specialties as detailed and in accordance with manufacturer's  
15 instructions.

16  
17 **ELECTRIC STEAM HUMIDIFIERS**

18 Mount manifold(s) in air handling units as indicated on the drawings with proper pitch for condensate  
19 drainage. Mount steam generating cylinder assembly and control panel on wall or angle iron stand where  
20 indicated. Provide duct reinforcing or support required for the humidifier body and/or distribution  
21 manifold(s) as required. Install piping specialties and controls as detailed and in accordance with  
22 manufacturer's instructions. Install make-up water line with solenoid control and shutoff valves,  
23 coordinating final connection point with the Plumbing Contractor. Install drain line to nearest drain  
24 location or as indicated on the drawings.

25  
26 **CONSTRUCTION VERIFICATION ITEMS**

27 Contractor is responsible for utilizing the construction verification checklists supplied under specification  
28 Section 01 91 01 or 01 91 02 in accordance with the procedures defined for construction verification  
29 checklists.

30  
31 **FUNCTIONAL PERFORMANCE TESTING**

32 Contractor is responsible for utilizing the functional performance test procedures supplied under  
33 specification Section 01 91 01 or 01 91 02 in accordance with the procedures defined for functional  
34 performance test procedures.

35  
36 **AGENCY TRAINING**

37 All training provided for agency shall comply with the format, general content requirements and submission  
38 guidelines specified under Section 01 91 01 or 01 91 02.

39  
40  
41 **END OF SECTION**



HUMIDIFIER SCHEDULE									
MARK	DESCRIPTION	QUANTITY	PERFORMANCE			ELECTRICAL		BASIS OF DESIGN MANUFACTURER & MODEL	NOTES:
			STEAM CAPACITY (lbs/hr)	STAGES	CURRENT DRAW	VOLTS	PHASE		
H-1	ELECTRIC TO STEAM HUMIDIFIER	1	55	1.00	25.3	480	3	DRI-STEEM VM-21	
H-2	ELECTRIC TO STEAM HUMIDIFIER	1	55	1.00	25.3	480	3	DRI-STEEM VM-21	

AIR HANDLING UNIT SCHEDULE				
TAG		AHU-1	AHU-2	
TYPE		VAV	VAV	
SERVICE		STANDBY	PRIMARY	
LOCATION		MECHANICAL ROOM	MECHANICAL ROOM	
ARRANGEMENT		DRAW-THRU	DRAW-THRU	
SYSTEM AIRFLOW		10,000	10,000	
	MIN. OUTDOOR AIRFLOW (CFM)	1500	1500	
SUPPLY FAN	FAN	QUANTITY	1	1
		FAN TYPE / WHEEL DIAM (IN)	AF PLENUM / 24.5	AF PLENUM / 24.5
		AIRFLOW (CFM)	10,000	10,000
		FAN SPEED (RPM)	2199	2199
		E.S.P. (IN WG)	2.50	2.50
		T.S.P. (IN WG)	4.28	4.28
	MOTOR	QUANTITY	1	1
		FAN HORSEPOWER (BHP)	12.11	12.11
		MOTOR HORSEPOWER (HP)	15	15
		SPEED (RPM)	1750	1750
		DRIVE	VFD	VFD
		VOLTS / PHASE / HERTZ	480/3/60	480/3/60
RETURN FAN	FAN	QUANTITY	1	1
		FAN TYPE / WHEEL DIAM (IN)	AF PLENUM / 24.5	AF PLENUM / 24.5
		AIRFLOW (CFM)	10,000	10,000
		FAN SPEED (RPM)	1691	1691
		E.S.P. (IN WG)	1.50	1.50
	MOTOR	QUANTITY	1	1
		FAN HORSEPOWER (BHP)	6.45	6.45
		MOTOR HORSEPOWER (HP)	7.5	7.5
		SPEED (RPM)	1,750	1,750
		DRIVE	VFD	VFD
		VOLTS / PHASE / HERTZ	480/3/60	480/3/60
COOLING COIL DATA	TYPE		STANDARD	STANDARD
	COIL	MIN. FACE AREA (SQ FT)	20.12	20.12
		MAX. FACE VELOCITY (FPM)	497	497
		ROWS	6	6
		FINS PER INCH	1	1
	CAPACITY	NET TOTAL (MBH)	350	350
		NET SENSIBLE (MBH)	270	270
	FLUID	PERCENT GLYCOL & TYPE	0% / WATER	0% / WATER
		E.W.T. / L.W.T. (°F)	44/54	44/54
		FLOW RATE (GPM)	70	70
		MAX. P.D. (FT WG)	9.4	9.4
	AIR	UNIT E.A.T. DB / WB (°F)	77.4/64.2	77.4/64.2
		UNIT L.A.T. DB / WB (°F)	52.9/52.3	52.9/52.3
		MAX. A.P.D. (IN WG)	0.70	0.70
HEATING COIL DATA	TYPE		STANDARD	STANDARD
	COIL	MIN. FACE AREA (SQ FT)	19.25	19.25
		MAX. FACE VELOCITY (FPM)	519	519
		ROWS	1	1
		FINS PER INCH	6	6
	CAPACITY (MBH)		228	228
	FLUID	PERCENT GLYCOL & TYPE	0% / WATER	0% / WATER
		E.W.T. / L.W.T. (°F)	160/140	160/140
		FLOW RATE (GPM)	23	23
		MAX. P.D. (FT WG)	3.5	3.5
	AIR	UNIT E.A.T. / L.A.T. (°F)	42/63	42/63
		MAX. A.P.D. (IN WG)	0.60	0.60
HUMIDIFIER DATA	STEAM CAPACITY (LBS/HR)		54	54
	CURRENT DRAW		25.3	25.3
	ABSORPTION DISTANCE (IN)		24	24
	VOLTS/PHASE/HERTZ		480/3/60	480/3/60
	THICKNESS & TYPE		2" PLEATED	2" PLEATED
	MIN. EFF. RATING VALUE		30%	30%
	MIN. FACE AREA (SQ FT)		23.0	23.0
	MAX. FACE VELOCITY (FPM)		435	435
	DESIGN A.P.D. (DIRTY) (IN WG)		1.0	1.0
	CLEAN A.P.D. (IN WG)		0.6	0.6
	THICKNESS & TYPE		4" PLEATED	4" PLEATED
	MIN. EFF. RATING VALUE		65%	65%
	MIN. FACE AREA (SQ FT)		23.0	23.0
	MAX. FACE VELOCITY (FPM)		435	435
	DESIGN A.P.D. (DIRTY) (IN WG)		1.0	1.0
	CLEAN A.P.D. (IN WG)		0.6	0.6
MAX. UNIT DIMENSIONS	LENGTH (IN)		244	244
	WIDTH (IN)		84	84
	HEIGHT (IN)		64	64
	WEIGHT (LBS)		4788	4788
DESIGN SPACE TEMPERATURE	SUMMER, DB / %RH		68/50	68/50
	WINTER, DB		72	72

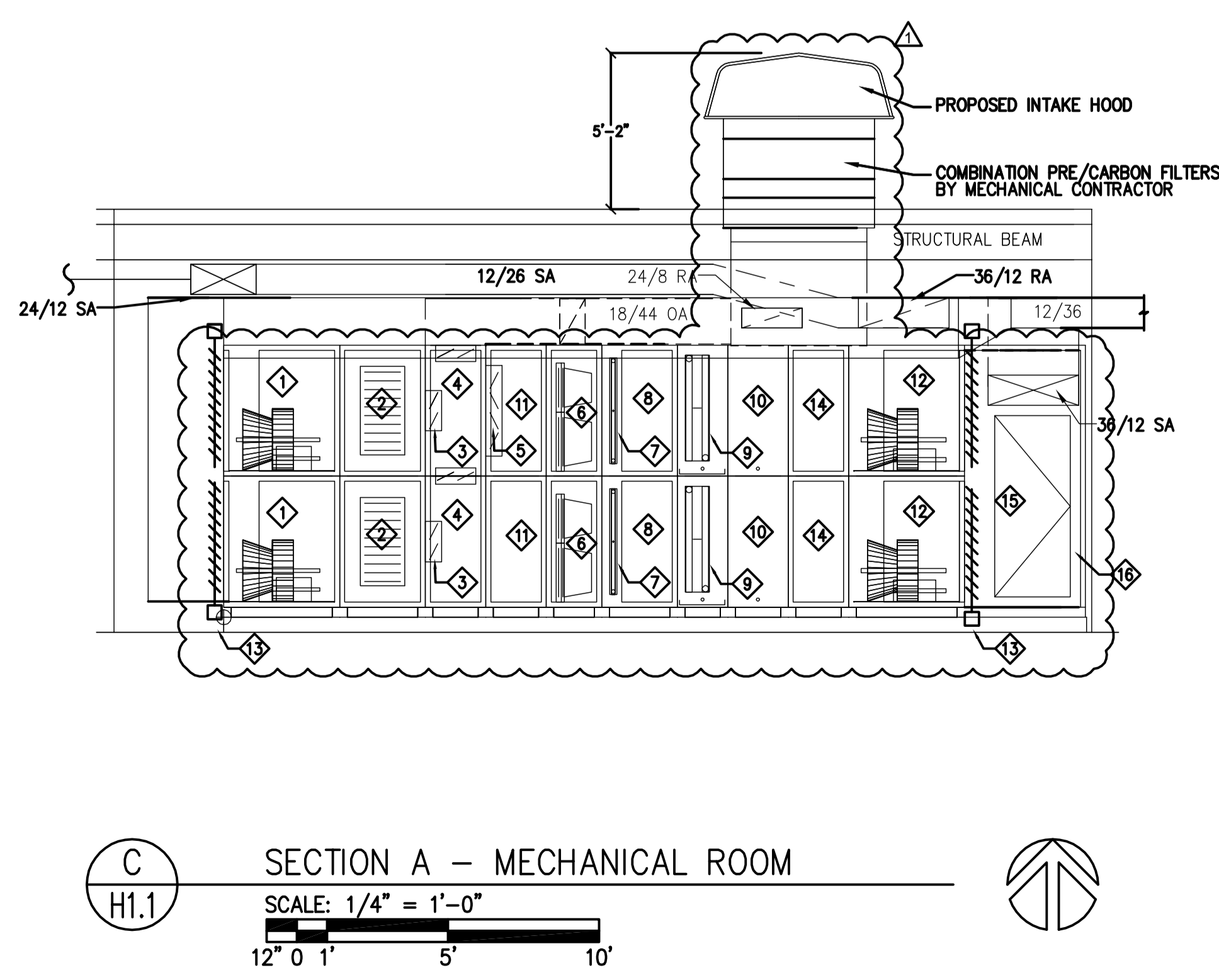
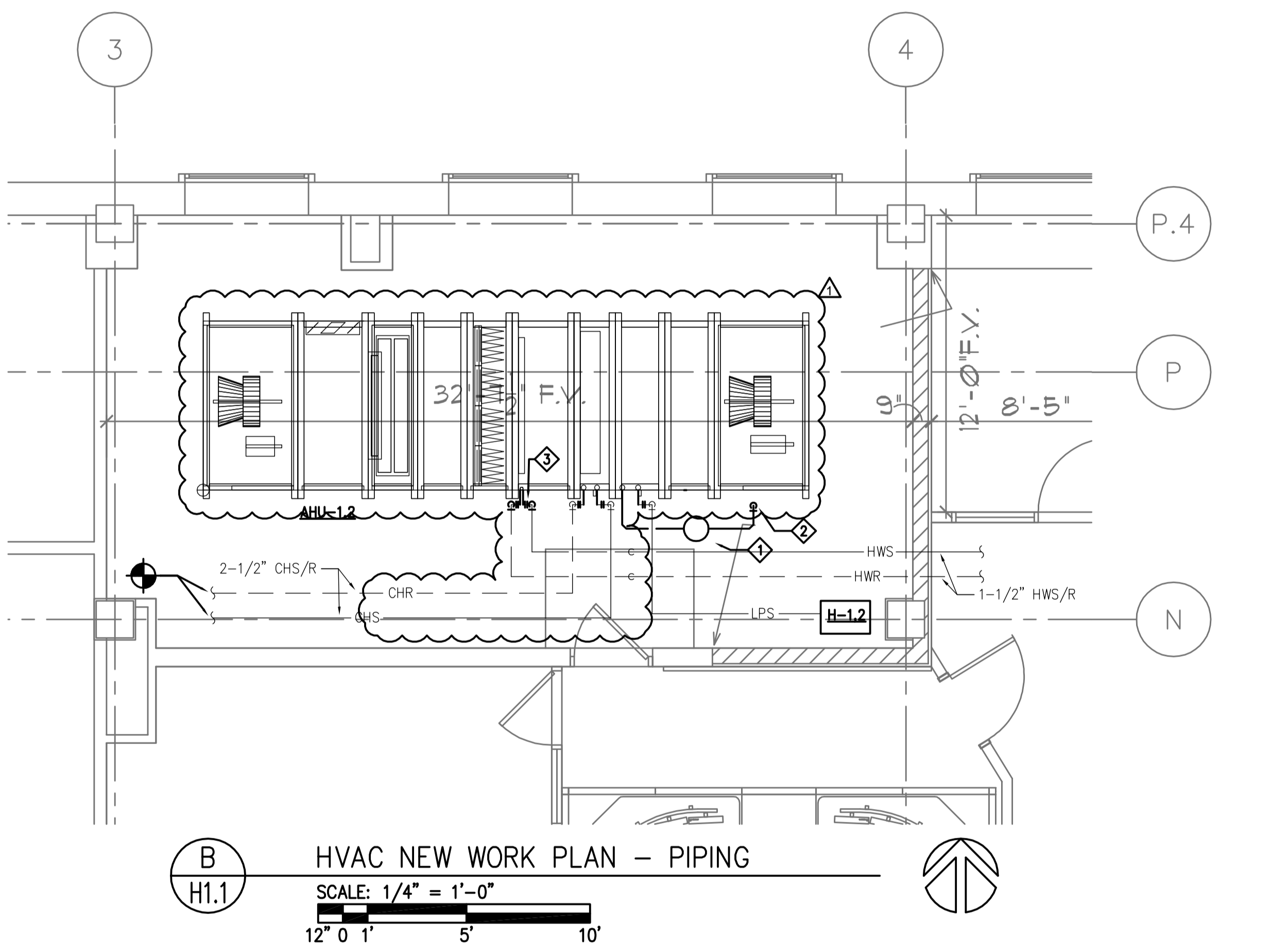
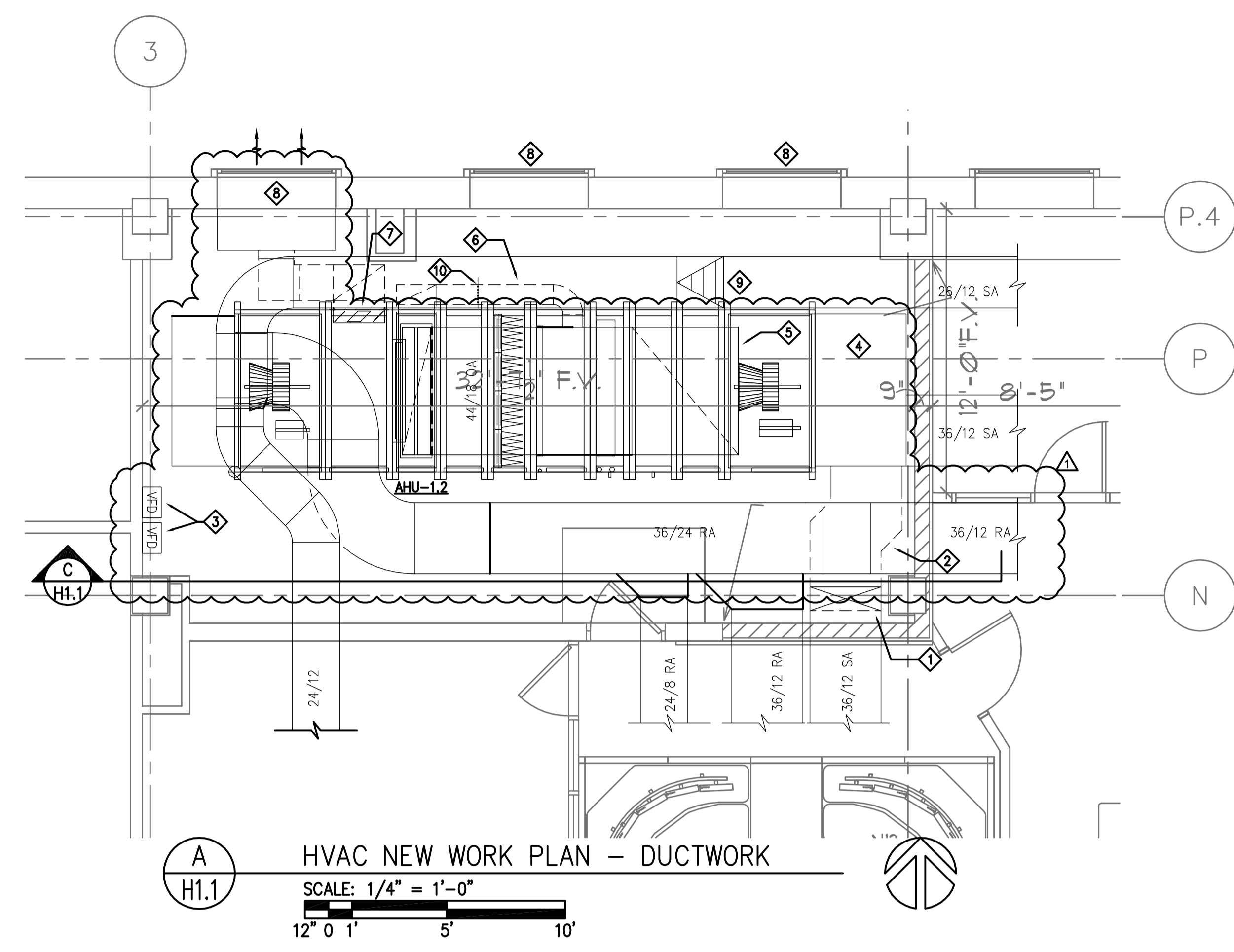
- REMARKS
- PROVIDE UNIT WITH VARIABLE SPEED FANS. VARIABLE FREQUENCY DRIVE BY MECHANICAL CONTRACTOR.
  - DIRTY FILTER STATIC PRESSURE SHALL BE UTILIZED TO DETERMINE FAN TOTAL STATIC PRESSURE.
  - FAN MUST BE STABLE DOWN TO 30% OF CFM.
  - COIL SHALL BE CAPABLE OF BEING REMOVED FROM WITHIN THE UNIT ENCLOSURE.
  - COIL FRAMES SHALL HAVE MOUNTING ANGLES FOR SHEET-METAL.
  - CONTRACTOR TO VERIFY ACCESS TO MECHANICAL ROOM FOR COORDINATION.
  - ALL CONTROL DAMPERS, INCLUDING BUT NOT LIMITED TO SUPPLY FAN ISOLATION DAMPERS, ALL RELIEF AIR DAMPERS, ALL RETURN AIR DAMPERS, THE MINIMUM OA DAMPER, THE ECONOMIZER DAMPER, AND THE OA PASS THROUGH DAMPER SHALL BE PROVIDED BY THE AIR HANDLING UNIT MANUFACTURER.
  - AHU-1 SHALL BE CAPABLE OF STRUCTURALLY SUPPORTING AHU-2.
  - ALL AHU SECTIONS SHALL BE CAPABLE OF ENTERING THE SPACE THROUGH EXISTING 60" X 80" LOUVERS.

GENERAL NOTE:  
 THE MANUFACTURER IS RESPONSIBLE TO PROVIDE ALL AIR HANDLER UNIT SCHEDULED EQUIPMENT SPECIFIED FOR THIS BID. THIS INCLUDES, BUT NOT LIMITED TO: FANS, MOTORS, BELTS, FILTERS, HUMIDIFIERS (STEAM GENERATOR AND DISPERSION TUBES), COILS, DRAIN PANS, ACCESS DOORS FOR EACH SECTION, AND DAMPERS IN AND ADJACENT TO THE AIR HANDLER. THE MANUFACTURER IS RESPONSIBLE FOR THE SHIPPING OF THE EQUIPMENT TO THE PROJECT SITE OR STORAGE LOCATION AT THE REQUEST OF THE GENERAL CONTRACTOR. THE CARBON FILTERS AND VARIABLE FREQUENCY DRIVES ARE PROVIDED BY THE MECHANICAL CONTRACTOR. THE MECHANICAL CONTRACTOR IS RESPONSIBLE FOR THE INSTALLATION OF ALL EQUIPMENT. THE GENERAL CONTRACTOR IS RESPONSIBLE FOR RIGGING AND SETTING THE AIR HANDLING UNITS. THE MANUFACTURER SHALL PROVIDE WRITTEN DOCUMENT INDICATING THE AIR HANDLERS CAN STRUCTURALLY WITHSTAND THE WEIGHT OF THE SECOND AIR HANDLER AS INDICATED ON DRAWING H1.1 DETAIL C. THE AIR HANDLING UNIT SHALL BREAK DOWN IN ORDER TO FIT ALL COMPONENTS THROUGH THE LOUVER. THE LOUVER OPENINGS ARE APPROXIMATELY 60" BY 80". THE MANUFACTURER SHALL VISIT THE SITE TO VERIFY THE LOUVER OPENINGS. REFER TO FRONT END DOCUMENTS FOR DATE AND TIME.

- GENERAL NOTES:
- CONTRACTOR TO VERIFY ALL EXISTING CONDITIONS.
  - CONTRACTOR TO ENSURE AREAS REMAIN OPERATIONAL DURING CONSTRUCTION.
- KEYED NOTES:
- 36/12 SUPPLY AIR UP
  - OFFSET SUPPLY AIR DUCT AROUND COLUMN AS SHOWN.
  - VARIABLE FREQUENCY DRIVES PROVIDED BY MECHANICAL CONTRACTOR.
  - SUPPLY AIR PLENUM BY MANUFACTURER.
  - 54/66 OA DOWN FROM INTAKE ON LOW ROOF. SEE C/H1.1.
  - TAP 18/10 OA DUCT TO SIDE OF OA PLENUM AND CONNECT FULL SIZE ON AHU-1 AND AHU-2 SIDE OA INTAKE AS SHOWN.
  - ROUTE RELIEF AIR FULL SIZE OF AHU-1 AND AHU-2 OUT THROUGH NEW LOUVER AS SHOWN.
  - BLANK OFF AND INSULATE UNUSED LOUVER OR WINDOW AS SHOWN.
  - SLOPE SUPPLY AIR DUCT UP APPROXIMATELY 1"-2" AS REQUIRED TO AVOID OA INTAKE DUCT. SEE C/H1.1.
  - AIRFLOW MEASURING STATION. MAINTAIN 1'-8" CLEAR FROM TAPS, BENDS, OR TRANSITIONS, BEFORE AND AFTER TO MAINTAIN ACCURACY.
  - EXISTING 60" X 80" LOUVER.

- GENERAL NOTES:
- CONTRACTOR TO VERIFY ALL EXISTING CONDITIONS.
  - CONTRACTOR TO ENSURE AREAS REMAIN OPERATIONAL DURING CONSTRUCTION.
- KEYED NOTES:
- DRAIN COOLER.
  - ROUTE STEAM CONDENSATE OPEN SITE TO FLOOR DRAIN.
  - HOT WATER PUMPS 1 AND 2 BY MECHANICAL CONTRACTOR.

- GENERAL NOTES:
- CONTRACTOR TO VERIFY ALL EXISTING CONDITIONS.
  - CONTRACTOR TO ENSURE AREAS REMAIN OPERATIONAL DURING CONSTRUCTION.
  - NOTES TYPICAL FOR AHU-1 AND AHU-2.
- KEYED NOTES:
- PLENUM RETURN FAN.
  - RELIEF AIR SECTION. PROVIDE DAMPER FULL SIZE OF OPENING.
  - 20X62 PARALLEL BLADE RETURN AIR DAMPER.
  - OA SECTION. PROVIDE PARALLEL BLADE DAMPERS FULL SIZE OF OPENINGS (TOP AND BACK SIDE). SECTION SHALL BE ONE SINGLE PLENUM SHARED BY AHU-1 AND AHU-2.
  - 30X72 OPPOSED BLADE ISOLATION AIR DAMPER.
  - COMBINATION FILTER SECTION (30% PREFILTER AND 65% FINAL FILTER).
  - HEATING COIL.
  - ACCESS SECTION.
  - COOLING COIL WITH DRAIN PAN.
  - HUMIDIFIER SECTION. PROVIDE DRIP PAN.
  - ACCESS SECTION. PROVIDE ACCESS DOORS ON BOTH SIDES OF UNIT.
  - PLENUM SUPPLY AIR FAN.
  - PARALLEL BLADE ISOLATION DAMPER BY MANUFACTURER.
  - ACCESS SECTION. PROVIDE ACCESS DOOR.
  - FACTORY PROVIDED 24X72 DOOR. DOOR SHALL SWING INWARD.
  - FACTORY PROVIDED SUPPLY AIR PLENUM SECTION.



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Date of Issue 04/02/09  
 No. Description Date  
 1 BP #1 04/02/09  
 2 ADDENDUM #1 04/17/09

Reference Diagram

Reference Plan

Dane County  
 Public Safety  
 Communications  
 Center Infrastructure  
 Upgrades

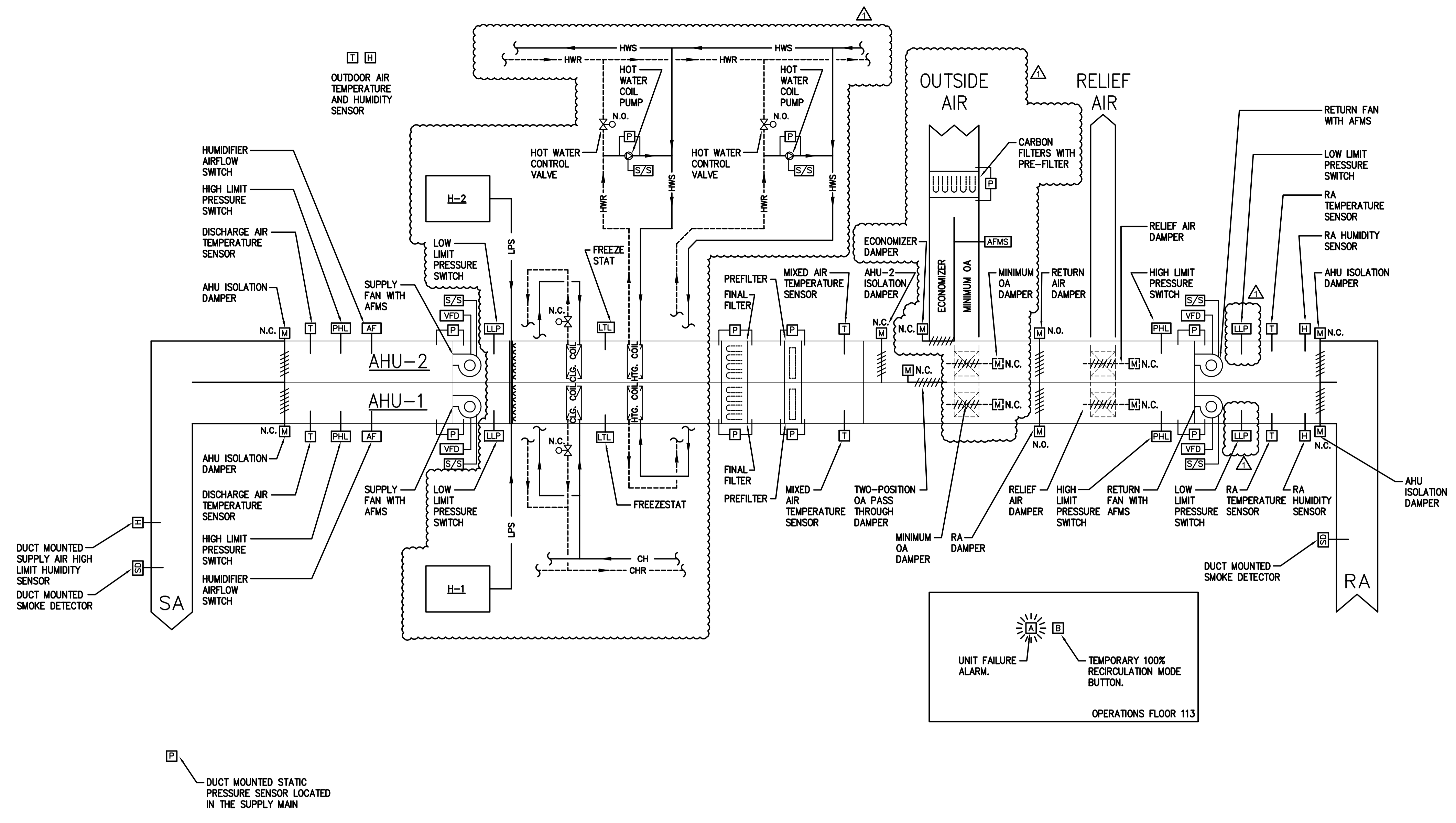
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COUNTY BID # 109054  
 VA PROJECT # 208006

Sheet Name  
 HVAC NEW WORK PLAN -  
 DUCTWORK AND PIPING

Sheet No.  
**H1.1**



DUCT MOUNTED STATIC PRESSURE SENSOR LOCATED IN THE SUPPLY MAIN

**CONTROL SEQUENCE**

PROVIDE AND INSTALL ALL CONTROLS NECESSARY TO PERFORM THE FUNCTIONS LISTED.

ALL CONTROLS SHALL BE PERFORMED BY DIRECT DIGITAL CONTROL (DDC) SYSTEMS WITH ELECTRIC ACTUATION, UNLESS NOTED OTHERWISE.

PROVIDE ALL CONTROL DAMPERS WITH ELECTRIC OPERATORS AND LINKAGES, UNLESS NOTED OTHERWISE. WHENEVER FANS ARE OFF, RELATED CONTROL AIR DAMPERS SHALL MOVE TO FAIL POSITIONS.

PROVIDE ALL TEMPERATURE CONTROL VALVES WITH ELECTRIC OPERATORS, UNLESS NOTED OTHERWISE.

ALL CONTROL DAMPERS, UNIT ISOLATION DAMPERS, AND DAMPER ACTUATORS ARE PROVIDED BY THE AIR HANDLING UNIT MANUFACTURER. SMOKE DETECTORS ARE PROVIDED AND WIRED BY THE ELECTRICAL CONTRACTOR BUT INSTALLED BY THE MECHANICAL CONTRACTOR.

**AHU OPERATION:** AHU RUNS CONTINUOUSLY. AHU-1 AND AHU-2 ARE REDUNDANT SYSTEMS FOR 100% BACKUP. DDC SYSTEM SHALL DESIGNATE ONE UNIT AS PRIMARY AND ONE UNIT AS STANDBY. PRIMARY UNIT SHALL RUN CONTINUOUSLY. UNIT ISOLATION DAMPERS OF PRIMARY UNIT SHALL REMAIN FULLY OPEN. STANDBY UNIT SHALL REMAIN SHUT DOWN CONTINUOUSLY. HOT WATER CONTROL VALVE, CHILLED WATER CONTROL VALVE, UNIT ISOLATION DAMPERS, MINIMUM OA DAMPER, AND RELIEF AIR DAMPER OF STANDBY UNIT SHALL REMAIN FULLY CLOSED. WHENEVER AHU-1 IS DESIGNATED THE PRIMARY UNIT, THE OA PASS THROUGH DAMPER SHALL BE OPEN. WHENEVER AHU-1 IS DESIGNATED AS THE STANDBY UNIT, THE OA PASS THROUGH DAMPER SHALL BE CLOSED. UPON FAILURE OF PRIMARY UNIT FOR ANY REASON STANDBY UNIT SHALL BECOME PRIMARY UNIT, ALARM SHALL BE SENT TO DDC SYSTEM, AND UNIT FAILURE ALARM SHALL SOUND IN SPACE. STANDBY AND PRIMARY UNIT DESIGNATIONS SHALL BE AUTOMATICALLY ROTATED BY DDC SYSTEM ON AN ADJUSTABLE, PERIODIC BASIS.

**ECONOMIZER:** DDC SYSTEM SHALL INDEX THE SYSTEM INTO ECONOMIZER MODE WHEN OUTSIDE AIR ENTHALPY IS BELOW RETURN AIR ENTHALPY. WHEN RETURN AIR ENTHALPY IS ABOVE OUTSIDE AIR ENTHALPY, DDC SYSTEM SHALL INDEX THE SYSTEM INTO MINIMUM OUTSIDE AIR MODE. WHEN IN ECONOMIZER MODE, ECONOMIZER DAMPER SHALL BE FULLY OPEN, RETURN AIR DAMPER SHALL BE FULLY CLOSED, AND RELIEF AIR DAMPER SHALL BE FULLY OPEN. IF THE MIXED AIR TEMPERATURE FALLS BELOW 55F (ADJUSTABLE), ECONOMIZER DAMPER, RETURN AIR DAMPER, AND RELIEF AIR DAMPER SHALL MODULATE TO MAINTAIN THE MIXED AIR TEMPERATURE AT 55F (ADJUSTABLE). WHEN IN MINIMUM OUTSIDE AIR MODE, ECONOMIZER DAMPER SHALL BE FULLY CLOSED AND RETURN AIR DAMPER AND RELIEF AIR DAMPER SHALL BE IN MIN OA POSITION.

**MINIMUM OUTSIDE AIR:** WHEN SUPPLY FAN IS ON, THE MINIMUM OA DAMPER OF THE PRIMARY UNIT, THE RA DAMPER OF THE PRIMARY UNIT, AND THE RELIEF AIR DAMPER OF THE PRIMARY UNIT SHALL BE POSITIONED BY DDC SYSTEM TO FURNISH MINIMUM OUTSIDE AIR QUANTITY, AS SCHEDULED AND AS MEASURED BY MINIMUM OA AFMS.

**DURING NORMAL OPERATION** THE ECONOMIZER AND MINIMUM OA SHALL FUNCTION AS DETAILED ABOVE. DURING TEMPORARY 100% RECIRCULATION MODE, THE RELIEF AIR DAMPER, THE MINIMUM OA DAMPER, THE ECONOMIZER DAMPER, AND THE OA PASS THROUGH DAMPER SHALL CLOSE AND THE RETURN AIR DAMPER SHALL OPEN FULLY. WHEN THE TEMPORARY 100% RECIRCULATION MODE BUTTON IS PRESSED DURING NORMAL MODE, THE DDC SYSTEM SHALL OPERATE THE PRIMARY AIR HANDLING UNIT IN TEMPORARY 100% RECIRCULATION MODE FOR 15 MINUTES (ADJUSTABLE). WHEN THE TEMPORARY 100% RECIRCULATION MODE BUTTON IS PRESSED DURING TEMPORARY 100% RECIRCULATION MODE, THE DDC SYSTEM SHALL OPERATE THE PRIMARY AIR HANDLING UNIT IN TEMPORARY 100% RECIRCULATION MODE FOR 4 HOURS (ADJUSTABLE). THE PRIMARY AIR HANDLING UNIT SHALL RETURN TO NORMAL MODE FOLLOWING THE TEMPORARY 100% RECIRCULATION MODE.

**HEATING COIL:** HOT WATER CONTROL VALVE SHALL MODULATE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE AT 55F (ADJUSTABLE). HOT WATER COIL PUMP SHALL RUN CONTINUOUSLY WHENEVER THE OUTDOOR AIR TEMPERATURE FALLS BELOW 40° (ADJUSTABLE).

**COOLING COIL:** CHILLED WATER CONTROL VALVE SHALL MODULATE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE SETPOINT OF 52F (ADJUSTABLE). INTERLOCK OPERATION WITH HEATING COIL TO PREVENT SIMULTANEOUS HEATING AND COOLING.

WHENEVER THE SUPPLY FAN OF EITHER UNIT IS OFF, THE CORRESPONDING HOT WATER CONTROL VALVE AND CHILLED WATER CONTROL VALVE SHALL CLOSE.

**AHU SYSTEM SMOKE CONTROL:** ELECTRONIC SMOKE DETECTOR PROVIDED AND WIRED BY E.C. BUT INSTALLED BY MECHANICAL CONTRACTOR IN AHU SUPPLY AIR PLENUM SHALL SENSE SMOKE IN AIRSTREAM, SEND ALARM TO FIRE ALARM SYSTEM (BY E.C.) AND PROVIDE SIGNAL TO DDC TO SHUT DOWN AHU SUPPLY FAN AND RETURN FAN AND MOVE ALL ASSOCIATED CONTROL VALVES AND CONTROL DAMPERS TO FAIL POSITIONS. DUCT SMOKE DETECTOR(S) LOCATED IN THE RETURN AIR DUCT SHALL PROVIDE A SIGNAL TO THE FIRE ALARM SYSTEM WHICH SHALL CLOSE ALL SUPPLY AND RETURN SMOKE DAMPERS SERVED BY THE UNIT, TRANSMIT A SIGNAL TO THE DDC SYSTEM, AND THE UNIT FAILURE ALARM SHALL SOUND.

**FILTERS:** MONITOR DIRT LOADING OF FILTERS VIA MEASUREMENT OF PRESSURE DIFFERENTIAL ACROSS PREFILTER, CARBON FILTERS, AND FINAL FILTER BANKS. INDICATE ALARM THROUGH THE DDC WHEN DIFFERENTIAL PRESSURE EXCEEDS (ADJUSTABLE) SETPOINT.

**SUPPLY FAN:** MODULATE SUPPLY FAN SPEED THROUGH VFD. PROVIDE STATIC PRESSURE SENSOR IN THE DISTRIBUTION DUCTWORK AT THE END OF THE SYSTEM. VFD SHALL MODULATE TO MAINTAIN STATIC PRESSURE SETPOINT. LIMIT FAN DISCHARGE STATIC PRESSURE, WHEN EXCEEDED, ALARM INDICATION SHALL BE INDICATED THROUGH THE DDC. SUPPLY AND RETURN FANS SHALL SHUT DOWN, AND ALL VALVES AND DAMPERS SHALL MOVE TO FAIL POSITIONS. DESIRED DISCHARGE STATIC PRESSURE AND DISCHARGE STATIC PRESSURE HIGH LIMIT TO BE DETERMINED DURING TESTING, ADJUSTING, AND BALANCING BY TAB CONTRACTOR.

**RETURN FAN:** AN AIR FLOW MONITOR LOCATED AT THE RETURN FAN INLET SHALL MODULATE THE VARIABLE FREQUENCY DRIVE ON THE RETURN FAN TO MAINTAIN A CONSTANT (RETURN CFM) = (SUPPLY CFM) - (EXHAUST CFM).

**HUMIDIFIER:** SHALL BE ENABLED TO OPERATE WHEN AIR HANDLING UNIT SUPPLY FAN IS ON AND CHILLED WATER CONTROL VALVE IS CLOSED. HUMIDIFIER SHALL MAINTAIN CONSTANT DISCHARGE AIR HUMIDITY SETPOINT AT HUMIDITY SENSOR LOCATED IN SUPPLY DUCT AT LEAST 6 FEET DOWNSTREAM OF HUMIDIFIER DISPERSION GRID. DISCHARGE AIR HUMIDITY SETPOINT SHALL BE RESET BY CONTROLLING HUMIDITY SENSOR BETWEEN ZERO AND 90% RH (MAX.). HUMIDIFIER SHALL BE DISABLED WHEN DISCHARGE AIR HUMIDITY EXCEEDS 90% AT 55F. CONTROLLING HUMIDITY SENSOR SHALL BE LOCATED IN MAIN RETURN AIR DUCTWORK BEFORE MIXING WITH OUTSIDE AIR. CONTROLLING HUMIDITY SETPOINT SHALL BE RESET FROM 25% RH TO 45% RH (ADJUSTABLE) AS OUTSIDE AIR TEMPERATURE VARIES FROM -10 TO 50F.

**INTERLOCKS:** REFER TO SPECIFIC EQUIPMENT CONTROL SEQUENCES SUCH AS EXHAUST FANS FOR INTERLOCK REQUIREMENTS WITH THIS UNIT.

THE FOLLOWING SAFETY INTERLOCKS SHALL BE ACCOMPLISHED THROUGH HARDWIRED RELAY CONNECTIONS OR AUXILIARY CONTACTS AND SHALL ENABLE EQUIPMENT OR SYSTEMS TO OPERATE WHEN AIR HANDLING UNIT SUPPLY FAN IS ON.

SMOKE DETECTORS  
HIGH AND LOW PRESSURE SWITCHES  
LOW TEMPERATURE LIMIT SWITCH (FREEZESTAT)  
INTERLOCK THE FOLLOWING AUXILIARY EQUIPMENT  
HUMIDIFIER VIA AIR FLOW SWITCH.

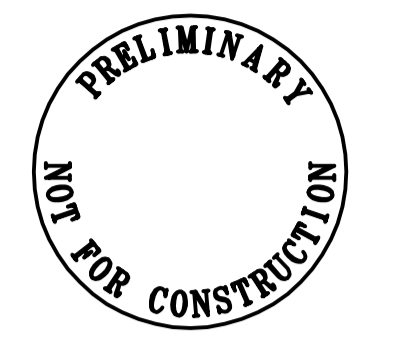
LOW TEMPERATURE LIMIT SWITCH (FREEZESTAT) SHALL BE DIRECTLY WIRED THROUGH MOTOR CONTROL CIRCUIT TO STOP AIR HANDLING UNIT AND CLOSE UNIT ISOLATION DAMPERS UPON SENSING AIR TEMPERATURE BELOW 38F (ADJUSTABLE). STATUS OF TEMPERATURE SWITCH SHALL BE REPORTED TO THE DDC SYSTEM. TEMPERATURE SWITCH MUST BE MANUALLY RESET BEFORE AIR HANDLING UNIT CAN BE STARTED.

**HIGH STATIC PRESSURE SAFETY SWITCH (2" WG, ADJUSTABLE) ON SUPPLY FAN DISCHARGE AIR, LOW LIMIT PRESSURE SWITCH (-2" WG, ADJUSTABLE) UPSTREAM OF SUPPLY FAN INLET, LOW STATIC PRESSURE SAFETY SWITCH (-1" WG, ADJUSTABLE) ON RETURN FAN SUCTION, AND HIGH LIMIT PRESSURE SWITCH (1.5" WG, ADJUSTABLE) DOWNSTREAM OF RETURN FAN DISCHARGE SHALL BE DIRECTLY WIRED THROUGH MOTOR CONTROL CIRCUIT TO SHUT DOWN UNIT IMMEDIATELY. STATUS OF EACH PRESSURE SWITCH SHALL BE REPORTED TO HVAC CONTROL DDC SYSTEM. PRESSURE SWITCHES MUST BE MANUALLY RESET BEFORE AIR HANDLING UNIT CAN BE STARTED.**

BOTH PRIMARY AND STANDBY UNITS SHALL SHUT DOWN ON TOTAL LOSS OF CONTROL POWER. ALARM SHALL BE SENT TO DDC SYSTEM, AND UNIT FAILURE ALARM SHALL SOUND IN SPACE.

**FAILURE MODE:** FAN FAILURE ALARM SHALL BE GENERATED IF SUPPLY FAN DOES NOT START WITHIN 2 MINUTES. FAILURE SHALL BE RESET MANUALLY THROUGH DDC SYSTEM SOFTWARE. FAILURE MODE SHALL BE INITIATED WHEN UNIT IS SHUTDOWN DUE TO ONE OF SAFETY CONTROLS OR FROM LOSS OF SIGNAL. UPON VFD FAILURE, FAN SHALL SHUT DOWN PER STOP SEQUENCE AND DDC SYSTEM SHALL ANNUNCIATE ALARM CONDITION FOR RESPECTIVE VFD ALARM STATUS RELAY.

THIS DRAWING IS FOR REFERENCE ONLY



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2 ADDENDUM #1	04/17/09	

Reference Diagram

Reference Plan

Dane County  
Public Safety  
Communications  
Center Infrastructure  
Upgrades

1st Floor  
City County Building  
210 Martin Luther  
King Jr. Blvd.  
Madison, Wisconsin

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COUNTY BID # 109054  
VA PROJECT # 208006

Sheet Name  
HVAC CONTROL SEQUENCES

Sheet No.  
**H1.2**