



## SEQUENCE OF OPERATION FOR CONSTANT VOLUME MAKE-UP AIR HANDLING UNIT (1-MAU-29)

### 1. GENERAL

1.1 UNIT IS NORMALLY STARTED AND STOPPED REMOTELY AT THE ECC. H-O-A SWITCH SHALL BE KEPT IN THE "AUTO" POSITION. "HAND" AND "OFF" POSITIONS SHALL BE USED ONLY FOR MAINTENANCE. WHEN THE UNIT IS "OFF" D-1 SHALL BE FULLY CLOSED. WHEN THE UNIT IS "ON" D-1 SHALL BE FULLY OPEN. A DAMPER END SWITCH SHALL PREVENT SUPPLY FAN FROM STARTING UNTIL DAMPER IS 50% OPEN.

### 2. TEMPERATURE CONTROL

2.1 THE PREHEAT VALVE V-2 SHALL CONSIST OF TWO VALVES (A & B) SIZED FOR 1/3 AND 2/3 (RESPECTIVELY) OF THE TOTAL CAPACITY. THE PAIR SHALL OPERATE IN SEQUENCE WITH THE SMALLER VALVE OPENING FIRST. PROVIDE ANALOG FEEDBACK SIGNAL FOR EACH VALVE TO MONITOR VALVE POSITION.

2.2 PREHEAT COIL IF THE OUTSIDE AIR TEMPERATURE (AS MEASURED BY TT-1) IS BELOW 35°F [1.7°C]; STEAM VALVE V-2 SHALL GO TO FULL OPEN AND THE PREHEAT COIL FACE-AND-BYPASS DAMPER (D-2) SHALL MODULATE TO MAINTAIN A TEMPERATURE SETPOINT OF 70°F (AS MEASURED BY TT-5) WHICH IS ADJUSTABLE.

2.3 PREHEAT COIL IF THE OUTSIDE AIR TEMPERATURE (AS MEASURED BY TT-1) IS GREATER THAN 70°F; STEAM VALVE V-2 SHALL GO TO FULL CLOSED AND THE PREHEAT COIL FACE-AND-BYPASS DAMPER (D-2) SHALL GO TO FULL BYPASS.

2.4 PREHEAT COIL IF THE OUTSIDE AIR TEMPERATURE (AS MEASURED BY TT-1) IS BETWEEN 35°F AND 70°F; THE PREHEAT COIL FACE-AND-BYPASS DAMPER (D-2) SHALL GO OPEN TO FULL AIRFLOW ACROSS THE FACE OF THE COIL AND STEAM VALVE V-2 SHALL MODULATE TO MAINTAIN A TEMPERATURE SETPOINT OF 70°F (AS MEASURED BY TT-5) WHICH IS ADJUSTABLE. DEHUMIDIFICATION, IF REQUIRED, WILL OVERRIDE THIS SETPOINT AS DESCRIBED IN PARAGRAPH 4.2.

2.5 COOLING COIL: IF THE OUTSIDE AIR TEMPERATURE (AS MEASURED BY TT-1) RISES ABOVE 70°F (ADJUSTABLE), THE DX COOLING STAGES WILL BE ACTIVATED TO MAINTAIN DISCHARGE AIR (AS MEASURED BY TT-5) AT 70°F (ADJUSTABLE). THE FOUR DX COOLING STAGES WILL BE ACTIVATED SEQUENTIALLY AND ALLOW FOR A CONFIGURABLE TIME DELAY BETWEEN EACH STAGE. ONCE ACTIVATED, EACH STAGE WILL NOT BE DEACTIVATED UNTIL THE CONTROL ALGORITHM HAS CALCULATED A DECREMENT OF A FULL STAGE. COOLING WILL BE LOCKED OUT WHEN OUTSIDE AIR TEMPERATURE (AS MEASURED BY TT-1) FALLS BELOW THE COOLING LOCKOUT SETPOINT OF 50°F (ADJUSTABLE).

### 3. AIR FLOW CONTROL

3.1 THE MAKE-UP AIR FLOW SHALL BE CONTROLLED BY THE DIGITAL CONTROL PANEL MODULATING THE SUPPLY FAN'S VARIABLE SPEED MOTOR CONTROLLER TO MAINTAIN 8,000 CFM (FIELD ADJUSTABLE), SENSED BY FT-1.

3.2 HIGH PRESSURE SWITCH SPS-1 LOCATED AT THE SUPPLY FAN DISCHARGE SHALL PREVENT THE SUPPLY FAN FROM DEVELOPING OVER 2" (75mm) OF STATIC PRESSURE (FIELD ADJUSTABLE). IF STATIC PRESSURE AT SPS-1 DOES EXCEED 2" (75mm) THE SUPPLY AIR FAN SHALL STOP. SPS-1 SHALL BE HARDWIRED TO THE SUPPLY FAN'S VARIABLE SPEED MOTOR CONTROLLER (STARTING DEVICE) AND UNIT SHALL BE SHUTDOWN IN HAND, AUTO OR BYPASS MODE. SPS-1 WILL REQUIRE MANUAL RESET AT THE DEVICE.

### 4. DEHUMIDIFICATION

4.1 ON A RISE OF THE DISCHARGE AIR HUMIDITY (AS MEASURED BY SENSOR H-1) ABOVE 50% RELATIVE HUMIDITY (ADJUSTABLE), THE DX COOLING STAGES SHALL BE ACTIVATED AS DETERMINED BY ITS PID LOOP TO DEHUMIDIFY THE DISCHARGE AIR. DURING DEHUMIDIFICATION, IF THE DISCHARGE AIR TEMPERATURE DROPS BELOW 70°F (ADJUSTABLE), THE HOT GAS REHEAT V-1 SHALL MODULATE TO REHEAT THE DISCHARGE AIR AS REQUIRED TO MAINTAIN DISCHARGE AIR SETPOINT. PROVIDE ANALOG FEEDBACK FOR THE HOT GAS REHEAT FUNCTION.

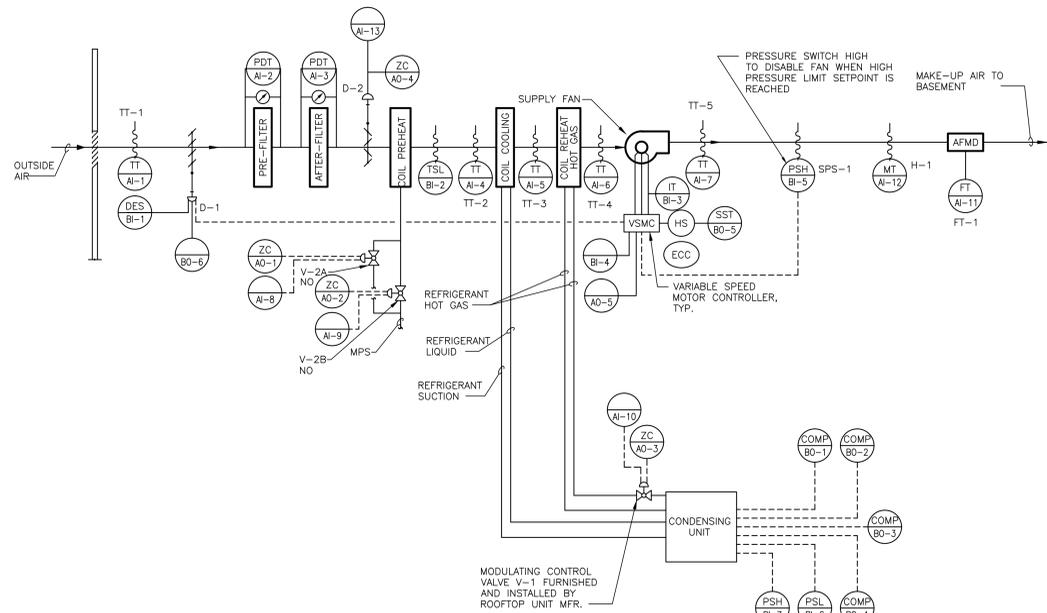
4.2 DURING DEHUMIDIFICATION, THE PREHEAT COIL DISCHARGE TEMPERATURE SETPOINT SHALL BE LOWERED TO 55°F. AFTER COMPLETION OF DEHUMIDIFICATION, PREHEAT COIL DISCHARGE TEMPERATURE SETPOINT SHALL RETURN TO THE VALUE GIVEN IN PARAGRAPH 2.

### 5. FREEZE PROTECTION

5.1 IF THE AIR TEMPERATURE AS SENSED BY TT-2 FALLS BELOW 45°F [7°C], AN ALARM SIGNAL SHALL INDICATE AT THE DDC PANEL AND ECC. IF THIS TEMPERATURE FALLS BELOW 40°F [4.4°C], AS SENSED BY THE TSL, THE SUPPLY FAN SHALL SHUT DOWN AND A CRITICAL ALARM SHALL INDICATE AT THE DIRECT DIGITAL CONTROL PANEL AND ECC. TSL SHALL BE HARDWIRED TO THE SUPPLY FAN VFD AND UNIT SHALL BE SHUTDOWN IN HAND, AUTO, OR BYPASS MODE. TSL WILL REQUIRE MANUAL RESET AT THE DEVICE.

### 6. EMERGENCY CONSTANT SPEED OPERATION

6.1 UPON FAILURE OF THE VFD, THE SUPPLY FAN SHALL BE STARTED/STOPPED MANUALLY AT THE DIRECT DIGITAL CONTROL PANEL OR THE ECC THROUGH THE BY-PASS STARTER. FAN SHALL THEN BE OPERATED AT CONSTANT SPEED.



**2** CONSTANT VOLUME MAKE-UP AIR HANDLING UNIT CONTROL DIAGRAM (1-MAU-29)  
NTS

JOB: 517-11-105 BUILDING: #1 - HVAC NEGATIVE AIR CORRECTIONS	POINT LEGEND	SYSTEM OUTPUTS		SYSTEM INPUTS		SYSTEM SOFTWARE/CONTROL		PAGE:
		BINARY	ANALOG	BINARY	ANALOG	ALARM PROCESSING	APPLICATION/FUNCTION	
SYSTEM:								
MAKE-UP AIR UNIT 1-MAU-29								
SYSTEM COMPONENT:								
OUTSIDE AIR TEMPERATURE	AI-1	OAT						
PRE-FILTER DIFF. PRESSURE	AI-2	PF-DP						+DWYER MANOMETER
AFTER-FILTER DIFF. PRESSURE	AI-3	AF-DP						+DWYER MANOMETER
PRE-HEAT TEMPERATURE	AI-4	PHT						
COOLING COIL TEMPERATURE	AI-5	CCT						
RE-HEAT TEMPERATURE	AI-6	RHT						
DISCHARGE AIR TEMPERATURE	AI-7	DAT						
VALVE V-2A FEEDBACK	AI-8	PHTV2A-ST5						
VALVE V-2B FEEDBACK	AI-9	PHTV2B-ST5						
VALVE V-1 FEEDBACK	AI-10	HGRHT1-ST5						
MAKE-UP AIR FLOW (CFM)	AI-11	MAF						
DISCHARGE AIR HUMIDITY	AI-12	DAH						
DAMPER D-2 FEEDBACK	AI-13	FBD2-ST5						
OUTSIDE AIR DAMPER STATUS	BI-1	OAD-ST5						
PREHEAT AIR LOW LIMIT	BI-2	TSL						
SUPPLY FAN STATUS	BI-3	SF-ST5						
SUPPLY FAN VSMC ALARM	BI-4	SF-ALA						
STATIC PRESSURE HIGH LIMIT	BI-5	SPS						
DX LOW PRESSURE ALARM	BI-6	LP-ALA						
DX HIGH PRESSURE ALARM	BI-7	HP-ALA						
PRE-HEAT VALVE V-2A	AO-1	PHT-V2A						
PRE-HEAT VALVE V-2B	AO-2	PHT-V2B						
HOT GAS REHEAT VALVE	AO-3	HGRHT-V1						
FACE AND BYPASS DAMPER	AO-4	FBD						
SUPPLY FAN VSMC	AO-5	SF-SPD						
DX COMPRESSOR #1 ON/OFF	BO-1	COMP1						
DX COMPRESSOR #2 ON/OFF	BO-2	COMP2						
DX COMPRESSOR #3 ON/OFF	BO-3	COMP3						
DX COMPRESSOR #4 ON/OFF	BO-4	COMP4						
SUPPLY FAN START/STOP	BO-5	SF-SST						
OUT. AIR DAMP. OPEN/CLOSE	BO-6	OAD						

**1** POINTS LIST FOR MAKE-UP AIR UNIT (1-MAU-29)  
NTS

**COL**  
Collaborative Design, Ltd.  
2727 Tuller Parkway, Suite 200  
Dublin, Ohio 43017  
Tel 614.798.1515  
Project Number: 11025

**M.W.E. MONKS & CO.**  
ENGINEERS  
3075 NORTH HIGH STREET  
COLUMBUS, OHIO 43202-1180  
Phone: 614-267-4928 www.mwemonks.com Fax: 614-267-9617

APPROVED: SAFETY MANAGER  
JUSTIN GREENE  
APPROVED: INFECTION CONTROL  
SHAWN M. MILLS  
APPROVED:

APPROVED: CHIEF, FACILITIES MANAGEMENT SERVICE LINE  
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APPROVED: ASSOCIATE DIRECTOR  
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DRAWING TITLE:  
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TEMPERATURE CONTROL DETAILS  
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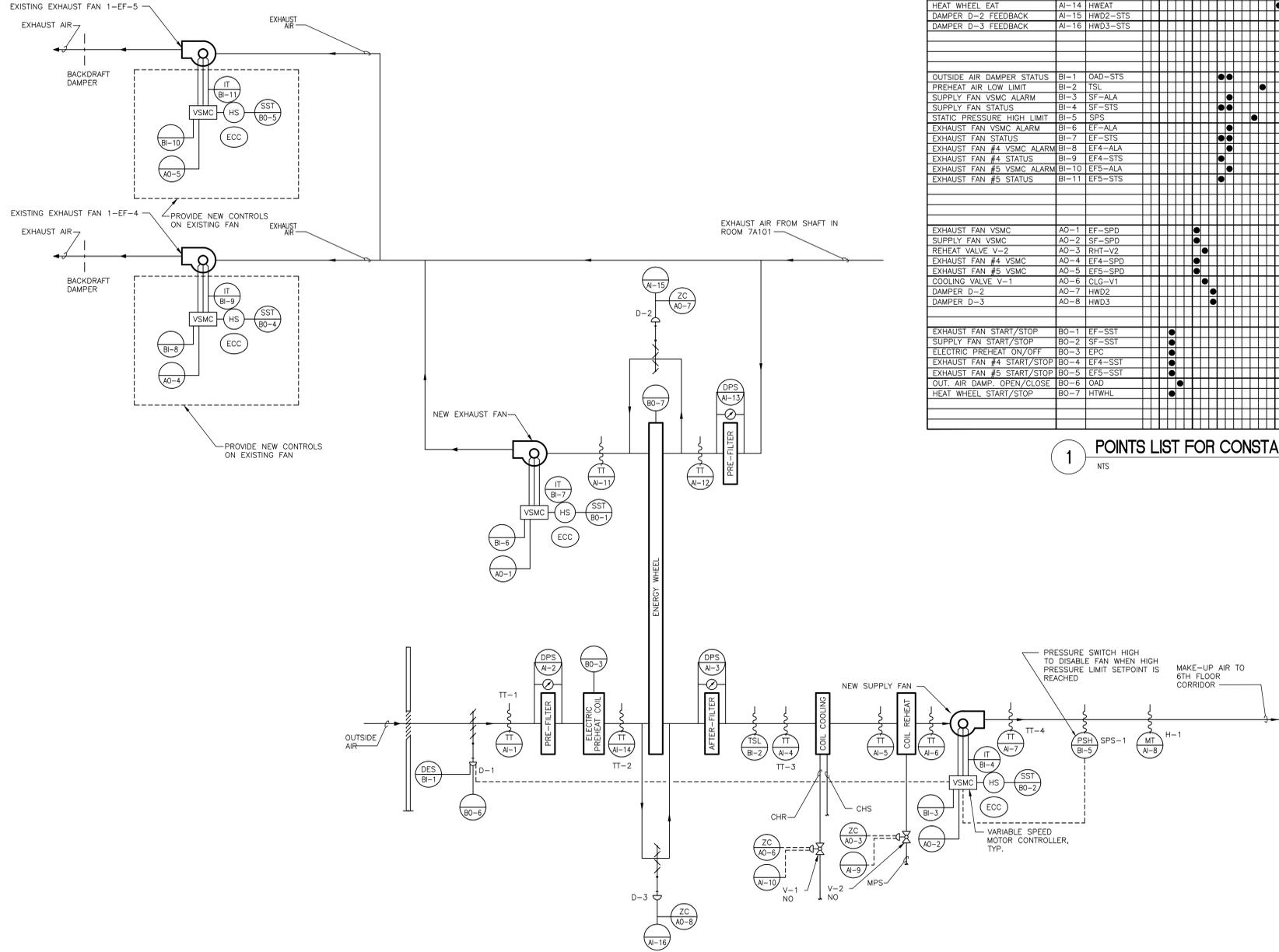
DRAWING No.  
MH702  
PROJECT No.  
517-11-105  
DRAWN BY:  
JPA  
CHECKED BY:  
JPA

Veterans Affairs  
Medical Center  
200 Veterans Av  
Beckley, WV.  
25801



# SEQUENCE OF OPERATION FOR MAKE-UP AIR UNIT (1-MAU-30)

1. GENERAL
  - 1.1 UNIT IS NORMALLY STARTED AND STOPPED REMOTELY AT THE ECC. H-O-A SWITCH SHALL BE KEPT IN THE "AUTO" POSITION. "HAND" AND "OFF" POSITIONS SHALL BE USED ONLY FOR MAINTENANCE. WHEN THE UNIT IS "OFF" D-1 SHALL BE FULLY CLOSED. WHEN THE UNIT IS "ON" D-1 SHALL BE FULLY OPEN. A DAMPER END SWITCH SHALL PREVENT SUPPLY FAN FROM STARTING UNTIL DAMPER IS 50% OPEN.
  - 1.2 THE EXHAUST FAN AND ENERGY WHEEL SHALL RUN WHEN THE SUPPLY FAN IS RUNNING.
2. TEMPERATURE CONTROL
  - 2.1 WHEN THE OUTSIDE AIR TEMPERATURE (AS MEASURED BY TT-1) FALLS BELOW 15°F (ADJUSTABLE), THE ELECTRIC PREHEAT COIL SHALL BE ENERGIZED. WHEN THE OUTSIDE AIR TEMPERATURE RISES ABOVE 17°F (ADJUSTABLE), THE ELECTRIC PREHEAT COIL SHALL BE DEENERGIZED. THE PREHEAT COIL IS USED TO PREVENT FROST FORMATION ON THE HEAT WHEEL.
  - 2.2 COOLING MODE (WHEN OUTSIDE AIR TEMPERATURE IS GREATER THAN OR EQUAL TO THE DISCHARGE AIR SETPOINT): MODULATE HEAT WHEEL BYPASS DAMPERS D-2 & D-3 AND CHILLED WATER VALVE V-1 OPEN IN SEQUENCE TO MAINTAIN A TEMPERATURE SETPOINT OF 70°F (AS MEASURED BY TT-4) WHICH IS ADJUSTABLE. PROVIDE ANALOG FEEDBACK SIGNAL FOR V-1 TO MONITOR VALVE POSITION AND D-2/D-3 TO MONITOR DAMPER POSITION.
  - 2.3 HEATING MODE (WHEN OUTSIDE AIR TEMPERATURE IS LESS THAN THE DISCHARGE AIR SETPOINT): MODULATE HEAT WHEEL BYPASS DAMPERS D-2 & D-3 AND REHEAT STEAM VALVE V-2 OPEN IN SEQUENCE TO MAINTAIN A TEMPERATURE SETPOINT OF 70°F (AS MEASURED BY TT-4) WHICH IS ADJUSTABLE. PROVIDE ANALOG FEEDBACK SIGNAL FOR V-2 TO MONITOR VALVE POSITION AND D-2/D-3 TO MONITOR DAMPER POSITION.
  - 2.4 DISCHARGE AIR SETPOINT SHALL BE 70°F (ADJUSTABLE) AS MEASURED BY TT-4.
3. AIR FLOW CONTROL
  - 3.1 THE SUPPLY FAN AND EXHAUST FAN SHALL BE OPERATED AT CONSTANT SPEED. THE AIR BALANCE CONTRACTOR SHALL SET THE VFD SPEED FOR 1400 CFM OF SUPPLY AIR AND 1350 CFM OF EXHAUST AIR.
  - 3.2 HIGH PRESSURE SWITCH SPS-1 LOCATED AT THE SUPPLY FAN DISCHARGE SHALL PREVENT THE SUPPLY FAN FROM DEVELOPING OVER 2" [75mm] OF STATIC PRESSURE (FIELD ADJUSTABLE). IF STATIC PRESSURE AT SPS-1 EXCEEDS 2" [75mm] THE SUPPLY AIR FAN SHALL STOP. SPS-1 SHALL BE HARDWIRED TO THE SUPPLY FAN'S VARIABLE SPEED MOTOR CONTROLLER (STARTING DEVICE) AND UNIT SHALL BE SHUTDOWN IN HAND, AUTO OR BYPASS MODE. SPS-1 WILL REQUIRE MANUAL RESET AT THE DEVICE.
4. DEHUMIDIFICATION
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5. FREEZE PROTECTION
  - 5.1 IF THE AIR TEMPERATURE AS SENSED BY TT-3 FALLS BELOW 45°F [7°C], AN ALARM SIGNAL SHALL INDICATE AT THE DDC PANEL AND ECC. IF THIS TEMPERATURE FALLS BELOW 40°F [4.4°C], AS SENSED BY THE TSL THE SUPPLY FAN SHALL SHUT DOWN AND A CRITICAL ALARM SHALL INDICATE AT THE DIRECT DIGITAL CONTROL PANEL AND ECC. TSL SHALL BE HARDWIRED TO THE SUPPLY FAN VFD AND UNIT SHALL BE SHUTDOWN IN HAND, AUTO, OR BYPASS MODE. TSL WILL REQUIRE MANUAL RESET AT THE DEVICE.
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SYSTEM COMPONENT:	POINT ID	ABBREVIATION	POINT LEGEND		SYSTEM OUTPUTS		SYSTEM INPUTS		SYSTEM SOFTWARE/CONTROL		PAGE:
			BINARY	ANALOG	BINARY	ANALOG	ALARM PROCESSING	APPLICATION/FUNCTION			
OUTSIDE AIR TEMPERATURE	AI-1	OAT									
PRE-FILTER DIFF. PRESSURE	AI-2	PF-DP									
AFTER-FILTER DIFF. PRESSURE	AI-3	AF-DP									
HEAT WHEEL LAT	AI-4	HWLAT									
COOLING COIL TEMPERATURE	AI-5	CCOT									
DISCHARGE AIR TEMPERATURE	AI-7	DAT									
DISCHARGE AIR HUMIDITY	AI-8	DAH									
VALVE V-2 FEEDBACK	AI-9	RHTV2-ST5									
VALVE V-1 FEEDBACK	AI-10	CLGV1-ST5									
EXHAUST LEAVING AIR TEMP.	AI-11	ELAT									
EXHAUST ENTERING AIR TEMP.	AI-12	EELAT									
EXH PRE-FILT. DIFF. PRESS.	AI-13	EPF-DP									
HEAT WHEEL EAT	AI-14	HWEAT									
DAMPER D-2 FEEDBACK	AI-15	HWDD2-ST5									
DAMPER D-3 FEEDBACK	AI-16	HWDD3-ST5									
OUTSIDE AIR DAMPER STATUS	BI-1	OAD-ST5									
PREHEAT AIR LOW LIMIT	BI-2	TSL									
SUPPLY FAN VSMC ALARM	BI-3	SF-ALA									
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STATIC PRESSURE HIGH LIMIT	BI-5	SPS									
EXHAUST FAN VSMC ALARM	BI-6	EF-ALA									
EXHAUST FAN STATUS	BI-7	EF-ST5									
EXHAUST FAN #4 VSMC ALARM	BI-8	EF4-ALA									
EXHAUST FAN #4 STATUS	BI-9	EF4-ST5									
EXHAUST FAN #5 VSMC ALARM	BI-10	EF5-ALA									
EXHAUST FAN #5 STATUS	BI-11	EF5-ST5									
EXHAUST FAN VSMC	AO-1	EF-SPD									
SUPPLY FAN VSMC	AO-2	SF-SPD									
REHEAT VALVE V-2	AO-3	RHT-V2									
EXHAUST FAN #4 VSMC	AO-4	EF4-SPD									
EXHAUST FAN #5 VSMC	AO-5	EF5-SPD									
COOLING VALVE V-1	AO-6	CLG-V1									
DAMPER D-2	AO-7	HWDD2									
DAMPER D-3	AO-8	HWDD3									
EXHAUST FAN START/STOP	BO-1	EF-SST									
SUPPLY FAN START/STOP	BO-2	SF-SST									
ELECTRIC PREHEAT ON/OFF	BO-3	EPC									
EXHAUST FAN #4 START/STOP	BO-4	EF4-SST									
EXHAUST FAN #5 START/STOP	BO-5	EF5-SST									
OUT. AIR DAMP. OPEN/CLOSE	BO-6	OAD									
HEAT WHEEL START/STOP	BO-7	HTWHL									

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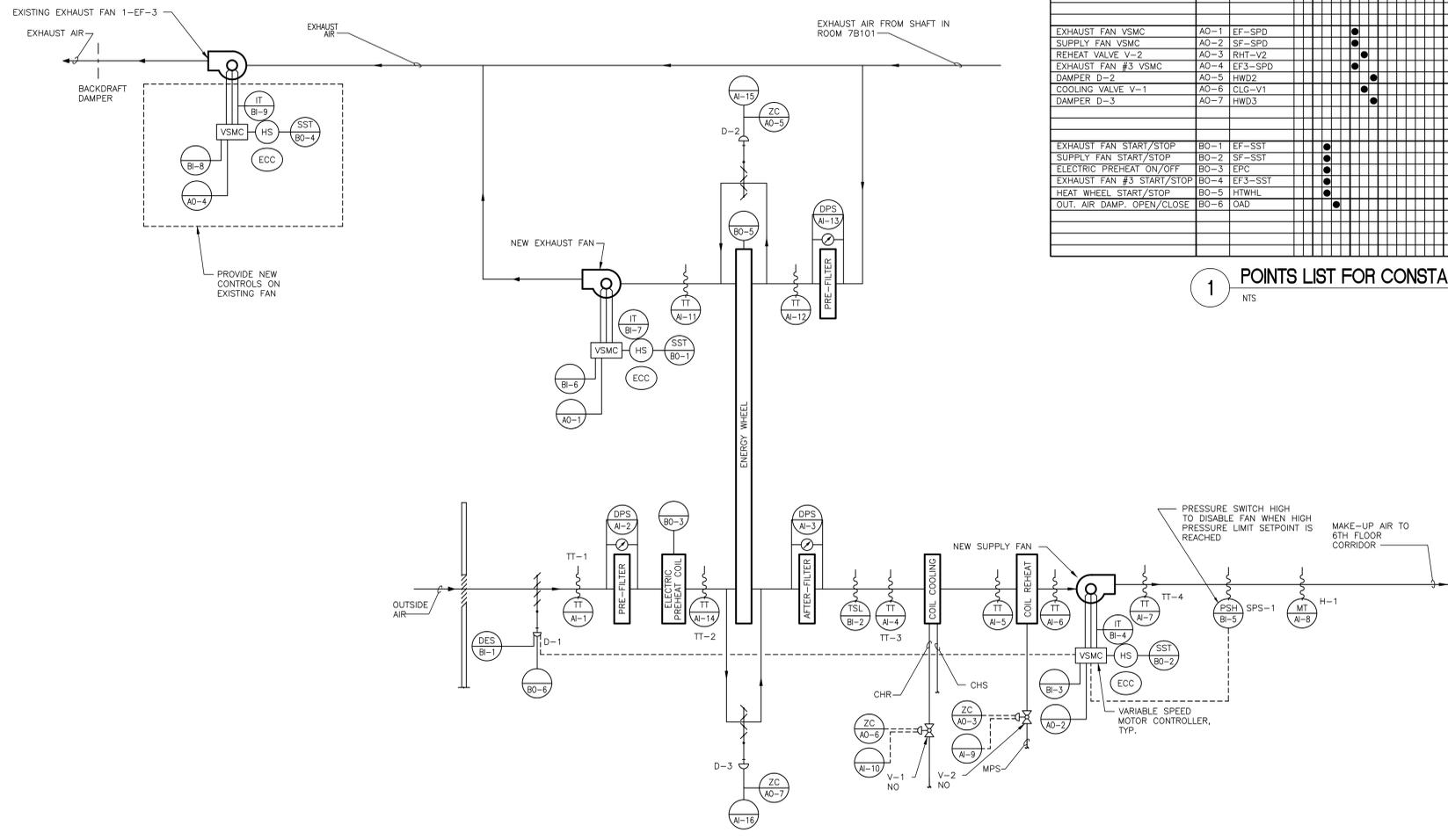
DRAWING No.  
MH703  
PROJECT No.  
517-11-105  
DRAWN BY:  
JPA  
CHECKED BY:  
JPA

Veterans Affairs  
Medical Center  
200 Veterans Av  
Beckley, WV.  
25801

PUTTING VETERANS FIRST

# SEQUENCE OF OPERATION FOR MAKE-UP AIR UNIT (1-MAU-31)

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2 CONSTANT VOLUME MAKE-UP AIR UNIT CONTROL DIAGRAM (1-MAU-31)  
NTS

SYSTEM COMPONENT:	POINT ID	ABBREVIATION	POINT LEGEND		SYSTEM OUTPUTS		SYSTEM INPUTS		SYSTEM SOFTWARE/CONTROL		PAGE:
			BINARY	ANALOG	BINARY	ANALOG	ALARM PROCESSING	APPLICATION/FUNCTION			
SYSTEM:	MAKE-UP AIR UNIT 1-MAU-31										
SYSTEM COMPONENT:	OUTSIDE AIR TEMPERATURE AI-1 OAT PRE-FILTER DIFF. PRESSURE AI-2 PF-DP AFTER-FILTER DIFF. PRESSURE AI-3 AF-DP HEAT WHEEL LAT AI-4 HWLAT COOLING COIL TEMPERATURE AI-5 CCT RE-HEAT TEMPERATURE AI-6 RHT DISCHARGE AIR TEMPERATURE AI-7 DAT DISCHARGE AIR HUMIDITY AI-8 DAH VALVE V-2 FEEDBACK AI-9 RHTV2-ST5 VALVE V-1 FEEDBACK AI-10 CLGV1-ST5 EXHAUST LEAVING AIR TEMP. AI-11 ELAT EXHAUST ENTERING AIR TEMP. AI-12 EEAT EXH PRE-FILT. DIFF. PRESS. AI-13 EPF-DP HEAT WHEEL EAT AI-14 HWEAT DAMPER D-2 FEEDBACK AI-15 HWD2-ST5 DAMPER D-3 FEEDBACK AI-16 HWD3-ST5  OUTSIDE AIR DAMPER STATUS BI-1 OAD-ST5 PREHEAT AIR LOW LIMIT BI-2 TSL SUPPLY FAN VSMC ALARM BI-3 SF-ALA SUPPLY FAN STATUS BI-4 SF-ST5 STATIC PRESSURE HIGH LIMIT BI-5 SPS EXHAUST FAN VSMC ALARM BI-6 EF-ALA EXHAUST FAN STATUS BI-7 EF-ST5 EXHAUST FAN #3 VSMC ALARM BI-8 EF3-ALA EXHAUST FAN #3 STATUS BI-9 EF3-ST5  EXHAUST FAN VSMC AO-1 EF-SPD SUPPLY FAN VSMC AO-2 SF-SPD REHEAT VALVE V-2 AO-3 RHT-V2 EXHAUST FAN #3 VSMC AO-4 EF3-SPD DAMPER D-2 AO-5 HWD2 COOLING VALVE V-1 AO-6 CLGV-V1 DAMPER D-3 AO-7 HWD3  EXHAUST FAN START/STOP BO-1 EF-SST SUPPLY FAN START/STOP BO-2 SF-SST ELECTRIC PREHEAT ON/OFF BO-3 EPC EXHAUST FAN #3 START/STOP BO-4 EF3-SST HEAT WHEEL START/STOP BO-5 HTWHL OUT. AIR DAMP. OPEN/CLOSE BO-6 OAD										

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**COL**  
Collaborative Design, Ltd.  
2727 Tuller Parkway, Suite 200  
Dublin, Ohio 43017  
Tel 614.798.1515  
Project Number: 110025

**W.E. MONKS & CO.**  
ENGINEERS  
3073 NORTH HIGH STREET  
COLUMBUS, OHIO 43202-1180  
Phone: 614-297-4928 www.wmonks.com Fax: 614-297-5817

APPROVED: SAFETY MANAGER  
JUSTIN GREENE  
APPROVED: INFECTION CONTROL  
SHAWN M. MILLS  
APPROVED:

APPROVED: CHIEF, FACILITIES MANAGEMENT SERVICE LINE  
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APPROVED: ASSOCIATE DIRECTOR  
J. BRIAN NIMMO, MS  
APPROVED: CHIEF OF STAFF  
JOHN D. BERRYMAN, M. D.

DRAWING TITLE:  
MECHANICAL  
TEMPERATURE CONTROL DETAILS  
PROJECT TITLE:  
HVAC NEGATIVE AIR CORRECTIONS  
DATE: 07/06/2012  
REV.  
SCALE

DRAWING No.  
MH704  
PROJECT No.  
517-11-105  
DRAWN BY:  
JPA  
CHECKED BY:  
JPA

Veterans Affairs  
Medical Center  
200 Veterans Av  
Beckley, WV.  
25801



11007  
one-eighth inch = one foot  
one-quarter inch = one foot  
one-half inch = one foot  
three-quarters inch = one foot  
one inch = one foot  
one and one-half inch = one foot  
two inches = one foot  
two and one-half inch = one foot  
three inches = one foot  
three and one-half inch = one foot  
four inches = one foot  
four and one-half inch = one foot  
five inches = one foot  
five and one-half inch = one foot  
six inches = one foot  
six and one-half inch = one foot  
seven inches = one foot  
seven and one-half inch = one foot  
eight inches = one foot  
eight and one-half inch = one foot  
nine inches = one foot  
nine and one-half inch = one foot  
ten inches = one foot  
ten and one-half inch = one foot  
eleven inches = one foot  
eleven and one-half inch = one foot  
twelve inches = one foot

three inches = one foot  
 one and one-half inch = one foot  
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 three-quarters inch = one foot  
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**ELECTRICAL SYMBOL LIST**

- PANELBOARD CABINET, FLUSH MOUNTED
- PANELBOARD CABINET, SURFACE MOUNTED
- BRANCH CIRCUIT HOMERUN. LINES INDICATE NUMBER OF CIRCUITS, NEUTRAL, AND SWITCH LEG CONDUCTORS. ONE SEPARATE GREEN GROUNDING CONDUCTOR SHALL BE PROVIDED FOR EACH HOMERUN; NOT SHOWN
- JUNCTION BOX
- DISCONNECT SWITCH, UNFUSED
- STARTER, COMBINATION WITH DISCONNECT SWITCH
- CONDUIT RUN CONCEALED IN GROUND OR FLOOR. #12 WIRES IN 3/4" CONDUIT. OTHER SIZES AS NOTED.
- FLEXIBLE CONDUIT - FINAL CONNECTION TO EQUIPMENT.
- USED FOR IDENTIFICATION OF ASSOCIATED PLAN NOTES.
- RECEPTACLE, DUPLEX
- RECEPTACLE, DUPLEX WITH GROUND FAULT CIRCUIT INTERRUPTER  
WP = WEATHERPROOF.  
GFI
- FIRE ALARM DUCT TYPE SMOKE DETECTOR.

**ELECTRICAL GENERAL DEMOLITION NOTES**

1. THE DEMOLITION ITEMS ON THE DRAWINGS ARE APPROXIMATE AND WERE COMPILED BY OBSERVATIONS MADE DURING A WALK THROUGH TOUR AT THE SITE. THE INTENT IS TO GENERALLY INDICATE DEMOLITION ITEMS AND AREAS AND IS NOT INTENDED TO COMPLETELY INDICATE ALL THE WORK REQUIRED.
2. IN GENERAL, DISCONNECT AND REMOVE ELECTRICAL ITEMS IN THE DEMOLITION AREAS INCLUDING, BUT NOT LIMITED TO CONDUIT AND WIRING, ETC. ALL AS REQUIRED TO ACCOMMODATE REMODELING AND CONSTRUCTION AS SHOWN ON THE DRAWINGS. REMOVE ALL UNUSED CONDUIT AND WIRING COMPLETE BACK TO SOURCE. ELECTRICAL CONTRACTOR SHALL INCLUDE TIME TO INVESTIGATE, TRACE AND IDENTIFY ALL CIRCUITS, FEEDERS AND OTHER SYSTEM WIRING PRIOR TO REMOVALS AND INSTALLATIONS. MAINTAIN SERVICES TO AREAS NOT BEING REMODELED. REUSE EXISTING WHERE REQUIRED. UNUSED BREAKERS AND SWITCHES TO REMAIN AS SPARE. SEE PLAN NOTES FOR ITEMS TO BE RETAINED AND REUSED OR RELOCATED. MAINTAIN ANY THROUGH WIRING TO SYSTEMS IN AREAS NOT BEING REMODELED.
3. SEE PLUMBING AND HVAC DRAWINGS FOR ALL DEMOLISHED EQUIPMENT.
4. PROVIDE NEW BLANK MATCHING COVERPLATES FOR ALL EXISTING BOXES WHERE THE DEVICE IS REMOVED AND NOT REPLACED WITH A NEW DEVICE.
5. WORK INVOLVING A POWER OUTAGE SHALL BE PERFORMED ON WEEKENDS AND NIGHTS AND MUST BE COORDINATED WITH THE OWNER WITH A MINIMUM OF 14 DAYS NOTICE. OTHER WORK IN OCCUPIED AREAS OF THE HOSPITAL MAY ALSO REQUIRE NIGHT AND WEEKEND HOURS, COORDINATE SCHEDULE WITH COTR PRIOR TO THE START OF ANY WORK. THE SCHEDULING AND COORDINATION OF OUTAGES ARE TO BE DONE IN ADVANCE WITH THE COTR BY WRITTEN REQUEST STATING WORK TO BE PERFORMED, TIME REQUESTED TO PERFORM WORK, TOTAL DURATION OF INTERRUPTION AND AREAS TO BE AFFECTED.

**ELECTRICAL GENERAL NOTES**

1. ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL ANY NEW WORK RELATED TO REPLACING EXISTING CONDUIT AND WIRING PRIOR TO ASSOCIATED DEMOLITION. IN GENERAL, DISCONNECT ELECTRICAL EQUIPMENT, FURNISH AND INSTALL NEW WORK, MAKE ALL CONNECTIONS, AND REMOVE EXISTING WORK TO BE DEMOLISHED. THIS WORK IS TO BE SEQUENCED SO AS TO MINIMIZE THE AMOUNT AND DURATION OF OUTAGES.
2. FOR ANY UNUSED EMPTY BOXES, FURNISH AND INSTALL A BLANK COVER PLATE.
3. FOR ALL EXISTING PANELBOARDS AFFECTED BY CIRCUITING CHANGES AS SHOWN ON THE DRAWINGS, PROVIDE A NEW UPDATED TYPEWRITTEN PANEL DIRECTORY PER SPECIFICATIONS.
4. ALL NEW VARIABLE SPEED DRIVES ARE FURNISHED BY THE TEMPERATURE CONTROLS SUBCONTRACTOR, INSTALLED AND WIRED BY THE ELECTRICAL CONTRACTOR. LOW VOLTAGE WIRING BY TEMPERATURE CONTROLS SUBCONTRACTOR.

**ELECTRICAL ABBREVIATIONS**

A	AMPERES
AFF	ABOVE FINISHED FLOOR
E.C.	ELECTRICAL CONTRACTOR
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GRD.	GROUND
MCA	MINIMUM CIRCUIT AMPACITY
MFR.	MANUFACTURER
N.C.	NORMALLY OPEN CONTACT
N.O.	NORMALLY CLOSED CONTACT
N.T.S.	NOT TO SCALE
S.F.	SUBFEED TO PANEL
W (AT EQUIPMENT)	WATTS
W (AT DISTRIBUTION)	WIRE
V	VOLTS
VA	VOLT AMPERES
Z	IMPEDANCE
∅	PHASE
TYP.	TYPICAL
AHJ	AUTHORITY HAVING JURISDICTION
A.C.	ABOVE COUNTER

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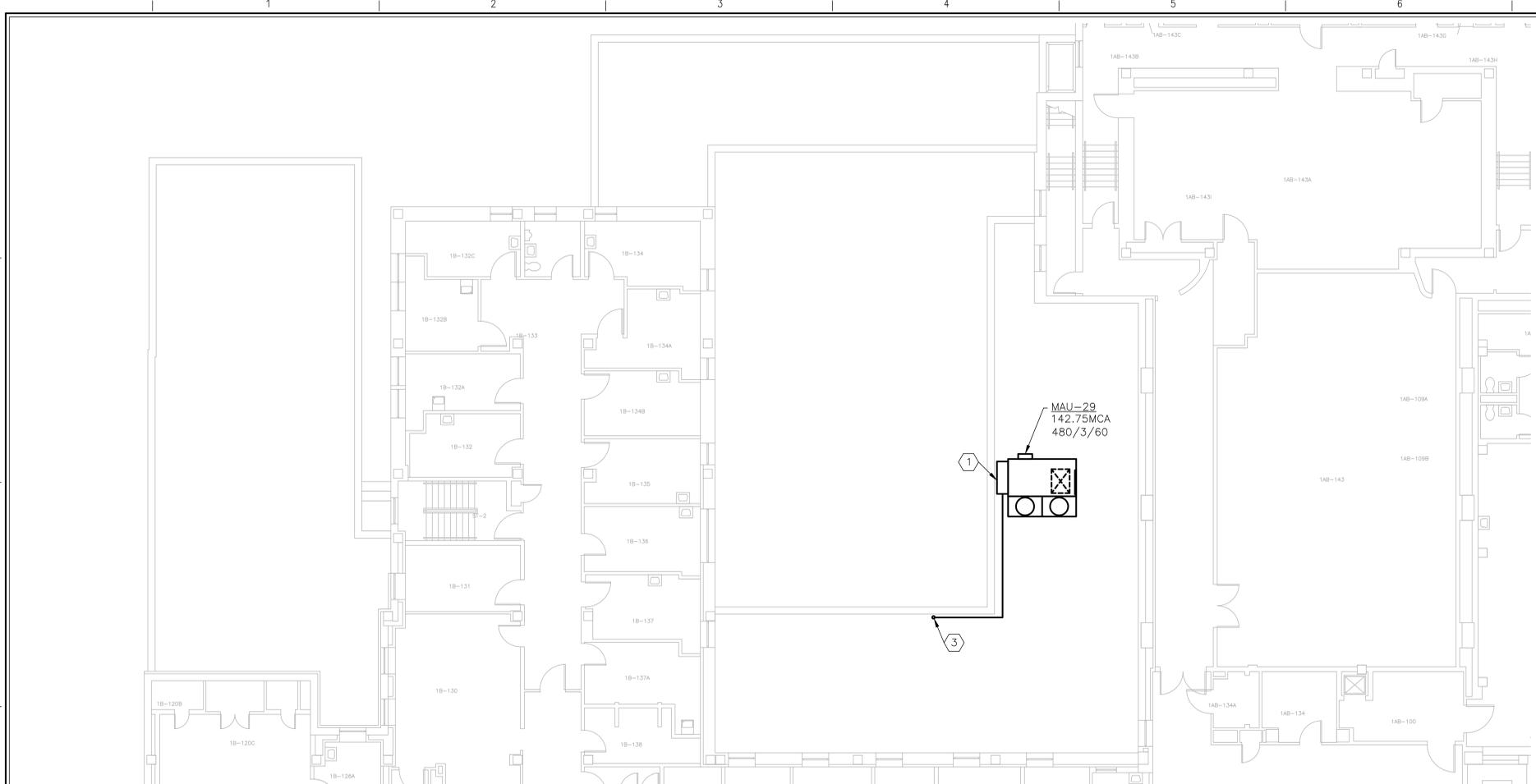
DRAWING TITLE:  
 ELECTRICAL SYMBOLS, ABBREV.  
 & GENERAL NOTES  
 PROJECT TITLE:  
 HVAC NEGATIVE AIR CORRECTIONS  
 DATE: 07/06/2012  
 REV.  
 SCALE

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 PROJECT No.  
 517-11-105  
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 TMS  
 CHECKED BY:  
 JPA

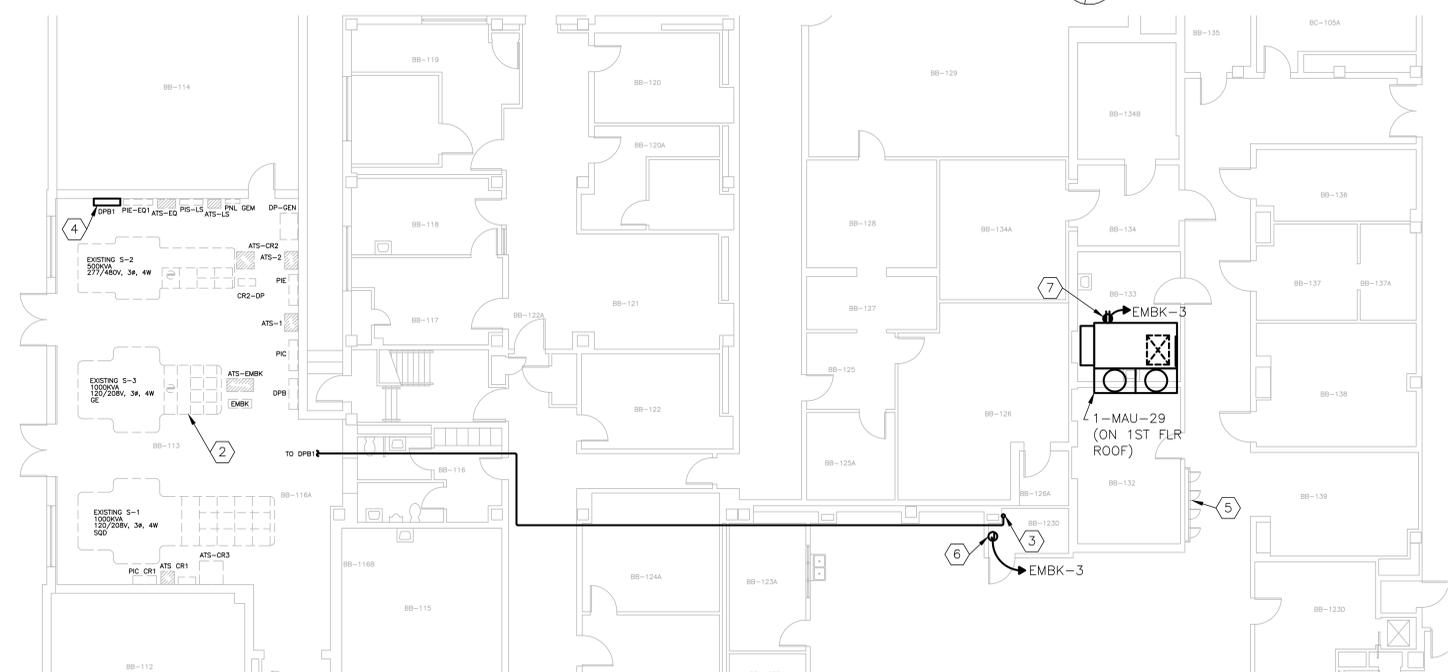
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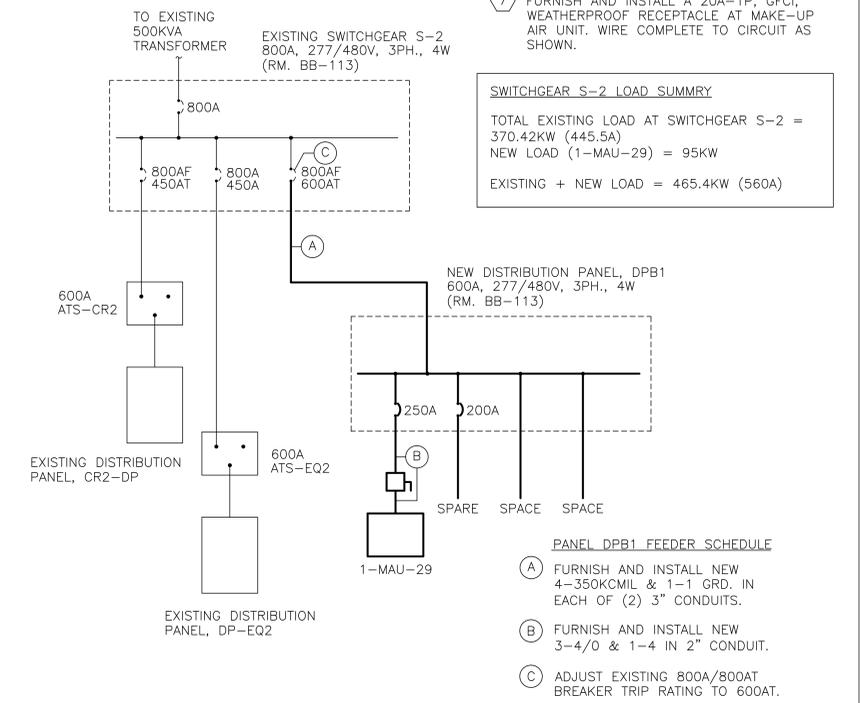
**ELECTRICAL PARTIAL FIRST FLOOR PLAN**  
 1/8" = 1'-0" NEW WORK



**ELECTRICAL PARTIAL BASEMENT ROOF PLAN**  
 1/8" = 1'-0" NEW WORK

**CODED NOTES**

- ① WIRE NEW MAU UNIT AND UNIT-MOUNTED VFD COMPLETE TO NEW DISTRIBUTION PANEL DPB1 IN BASEMENT RM BB-113. COORDINATE EXACT ROUTE OF FEEDER WITH EXISTING BUILDING CONDITIONS.
- ② EXISTING SUBSTATION, S-2, 800A, 277/480V, 3PH., 4W LOCATED IN BASEMENT, BB-113. LOCATE EXISTING SPARE 800A-3P BREAKER AND ADJUST TRIP SETTING TO 600AT. WIRE COMPLETE TO NEW DISTRIBUTION PANEL DPB.
- ③ APPROXIMATE FEEDER ROUTE FROM NEW 1-MAU-29. FEEDER TO BE ROUTED FROM 1ST FLOOR ROOF TO RM BB-123D BELOW AND CONTINUE ABOVE BASEMENT FLOOR CEILING TO NEW DISTRIBUTION PANEL DPB1 IN RM BB-113. PROVIDE JUNCTION BOX AS REQUIRED TO MEET NEC REQUIREMENTS FOR ALLOWED NUMBER OF CONDUIT BENDS. COORDINATE EXACT ROUTE OF FEEDER PRIOR TO INSTALLATION.
- ④ FURNISH AND INSTALL A NEW DISTRIBUTION, BREAKER, PANELBOARD, 600A, 277/480V, 3PH., 4W, MINIMUM 30KA SCRR RATING, DPB1. PANEL TO BE SQUARE D, TYPE HCP PANELBOARD, OR EQUAL. NEW PANEL TO BE FED FROM EXISTING SWITCHGEAR S-2. SEE NOTE 2 AND ONE-LINE DIAGRAM ON THIS SHEET FOR RELATED WORK.
- ⑤ AT EXISTING PANEL EMBK-3, 200A, 120/208V, 3PH., 4W PANELBOARD, FURNISH AND INSTALL (1) 20A-1P BREAKER AND (1) 20A-1P, GFCI, 30mA BREAKER IN AVAILABLE SPACE. BREAKERS TO MATCH EXISTING BREAKERS IN PANEL WITH RESPECT TO MANUFACTURER, TYPE, AND SCRR RATING. WIRE (1) GFCI BREAKER COMPLETE TO NEW JUNCTION BOX AND HEAT TRACE AT NOTE 6 ON THIS SHEET. WIRE OTHER BREAKER COMPLETE TO NEW RECEPTACLE AT MAKE-UP AIR UNIT, 1-MAU-29.
- ⑥ NEW JUNCTION BOX AND 120V CIRCUIT FOR NEW HEAT TRACE. WIRE COMPLETE TO NEW GFCI BREAKER IN PANEL EMBK-3. WIRE COMPLETE PER MANUFACTURER'S INSTRUCTIONS.
- ⑦ FURNISH AND INSTALL A 20A-1P, GFCI, WEATHERPROOF RECEPTACLE AT MAKE-UP AIR UNIT. WIRE COMPLETE TO CIRCUIT AS SHOWN.

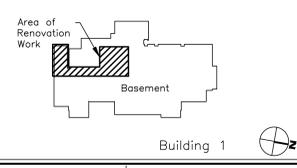


**PARTIAL SWITCHGEAR, S-2 ELECTRICAL ONELINE DIAGRAM**  
 NTS

**SWITCHGEAR S-2 LOAD SUMMARY**

TOTAL EXISTING LOAD AT SWITCHGEAR S-2 = 370.42KW (445.5A)  
 NEW LOAD (1-MAU-29) = 95KW  
 EXISTING + NEW LOAD = 465.4KW (560A)

- PANEL DPB1 FEEDER SCHEDULE**
- (A) FURNISH AND INSTALL NEW 4-350KCMIL & 1-1 GRD. IN EACH OF (2) 3" CONDUITS.
  - (B) FURNISH AND INSTALL NEW 3-4/0 & 1-4 IN 2" CONDUIT.
  - (C) ADJUST EXISTING 800A/800AT BREAKER TRIP RATING TO 600AT.



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DRAWING TITLE:  
 PARTIAL BSMT & 1st FLOOR PLAN  
 ELECTRICAL NEW WORK  
 PROJECT TITLE:  
 HVAC NEGATIVE AIR CORRECTIONS  
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 REV. SCALE

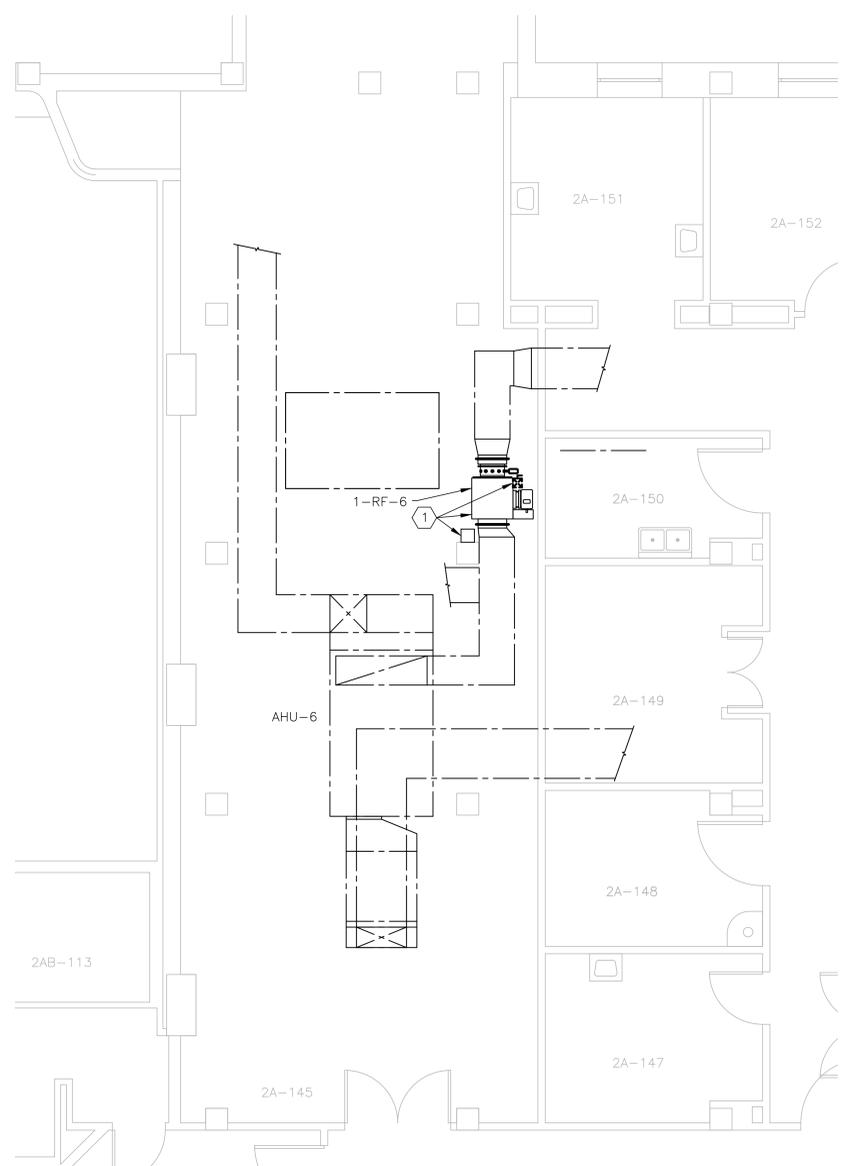
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 PROJECT No. 517-11-105  
 DRAWN BY: TMS  
 CHECKED BY: JPA

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 Medical Center  
 200 Veterans Av  
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**CODED NOTES**

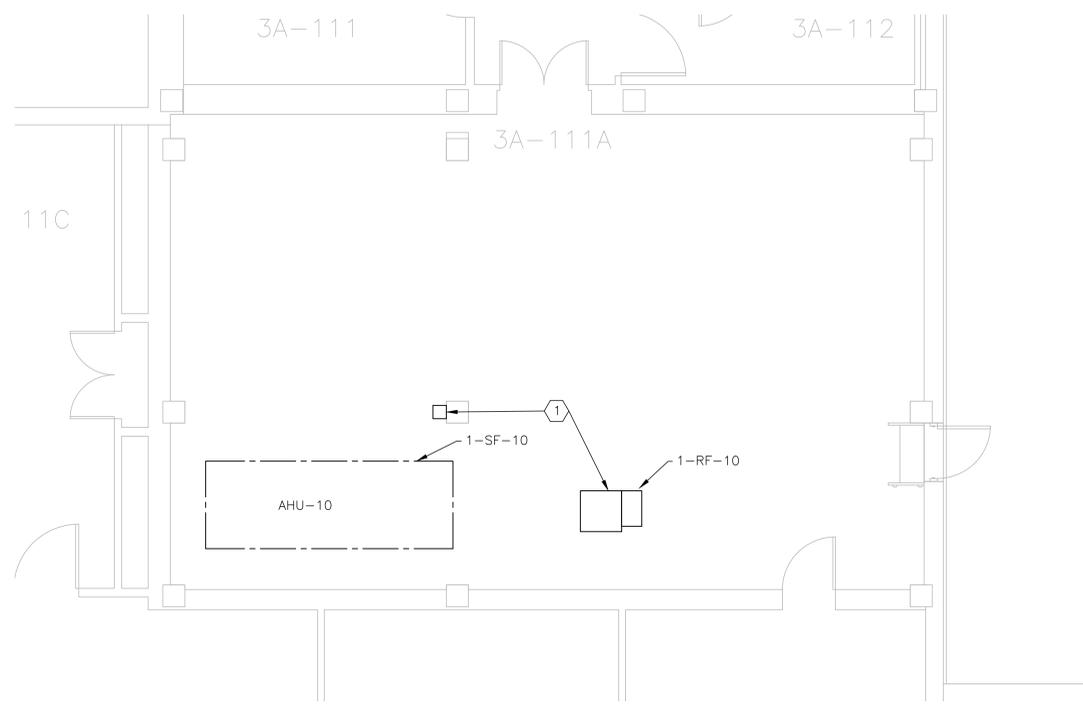
- ① DISCONNECT AND REMOVE EXISTING STARTER UNIT SERVING ASSOCIATED AHU RETURN/RELIEF FAN. REPLACE WITH NEW VFD AS SHOWN ON PLAN. RECONNECT AND WIRE COMPLETE TO EXISTING CIRCUIT TO OPERATE AS BEFORE. LOCATE NEW VFD ON COLUMN.



**ELECTRICAL PARTIAL SECOND FLOOR PLAN ROOM 2A-145**

1/4" = 1'-0"

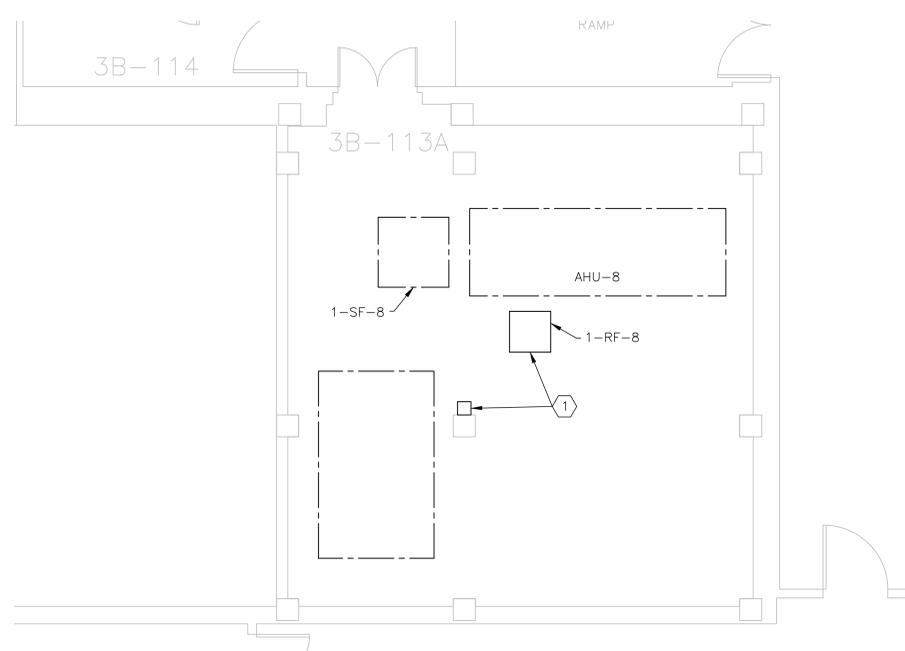
NEW WORK



**ELECTRICAL PARTIAL THIRD FLOOR PLAN ROOM 3A-111A**

1/4" = 1'-0"

NEW WORK



**ELECTRICAL PARTIAL THIRD FLOOR PLAN ROOM 3B-113A**

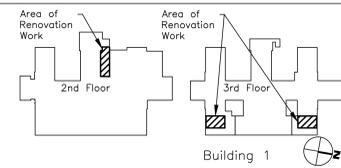
1/4" = 1'-0"

NEW WORK



three inches = one foot  
 one and one-half inch = one foot  
 one-half inch = one foot  
 three-quarters inch = one foot  
 one-half inch = one foot  
 three-eighths inch = one foot  
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DRAWING TITLE:  
 PARTIAL 2nd & 3rd FLOOR PLAN  
 ELECTRICAL NEW WORK  
 PROJECT TITLE:  
 HVAC NEGATIVE AIR CORRECTIONS  
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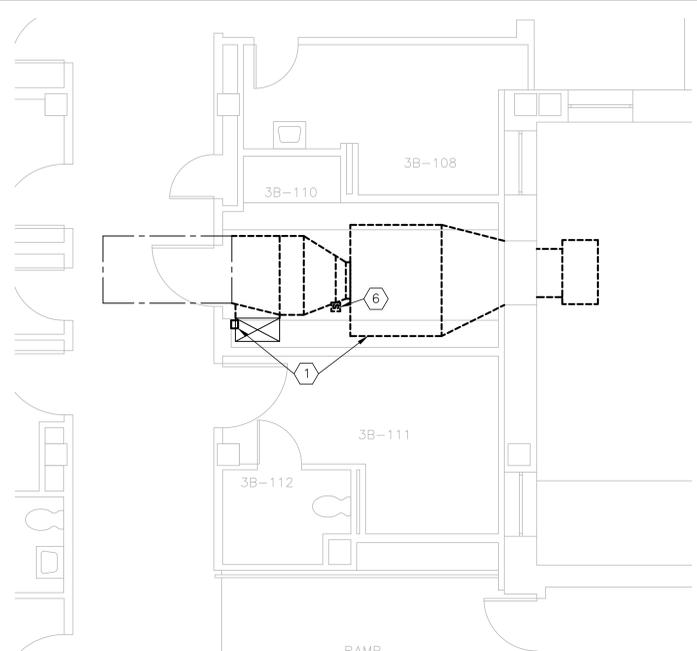
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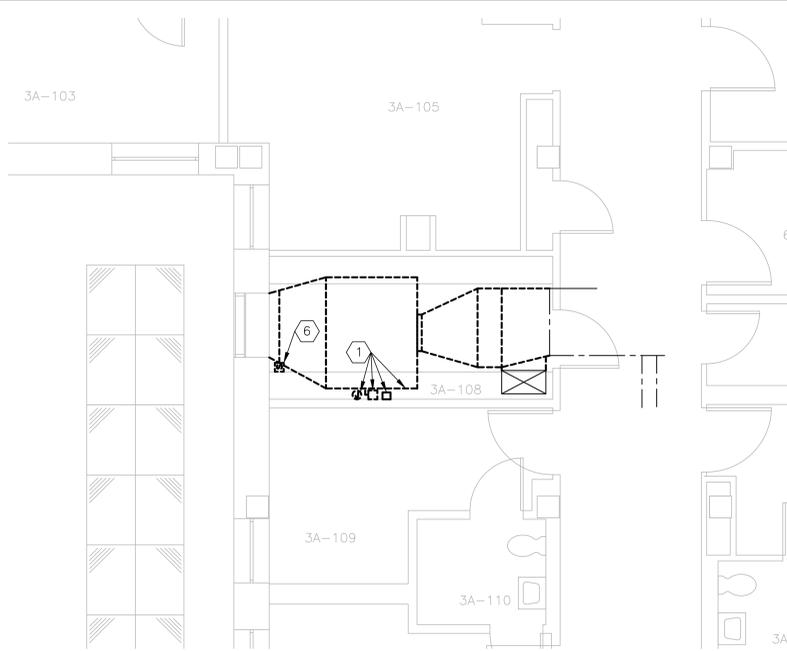


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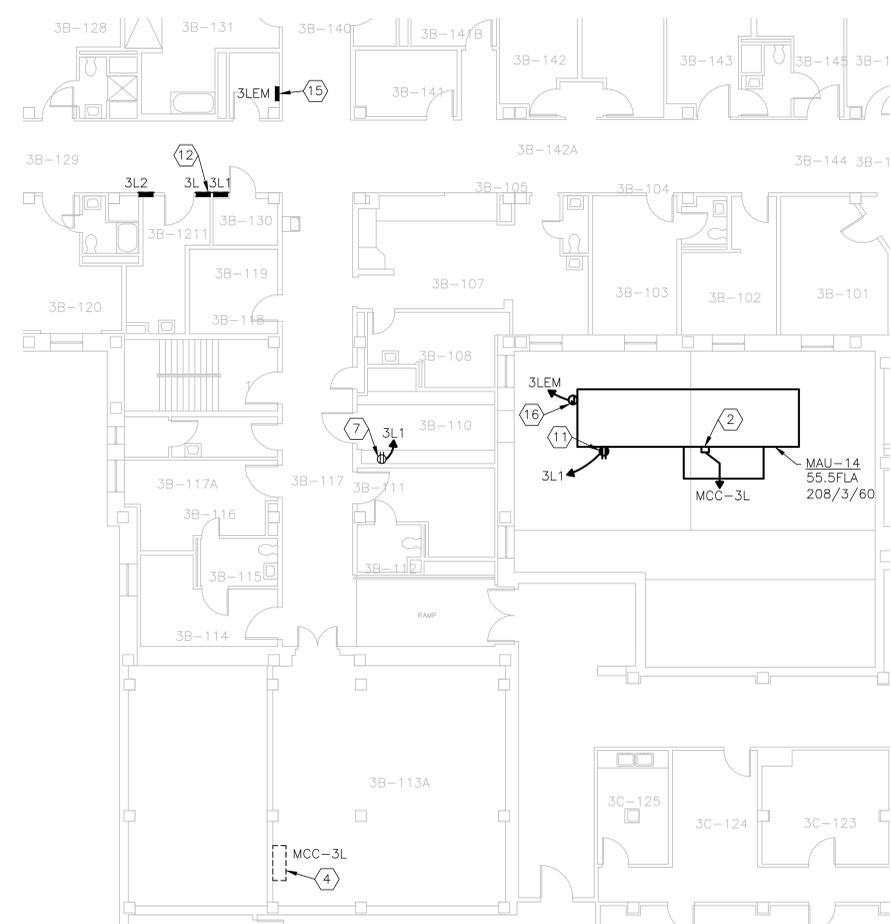
A  
B  
C  
D  
E  
F



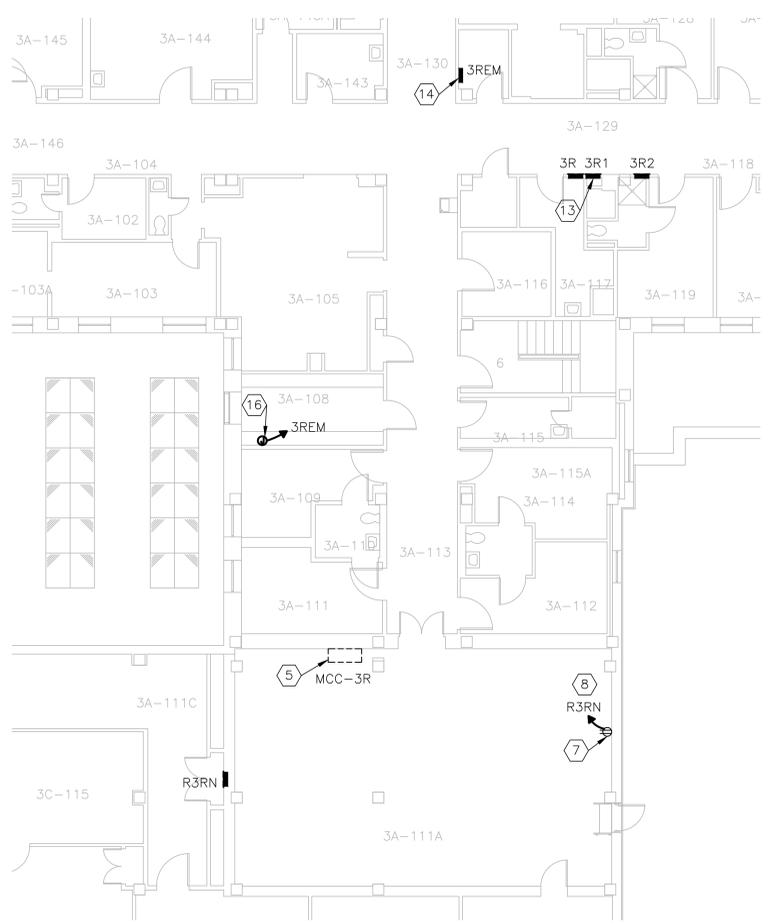
**ELECTRICAL PARTIAL THIRD FLOOR PLAN ROOM 3B-111**  
 1/4" = 1'-0" DEMOLITION



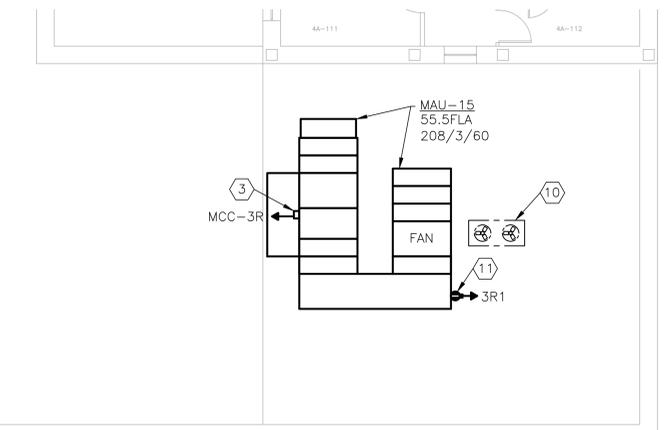
**ELECTRICAL PARTIAL THIRD FLOOR PLAN ROOM 3A-108**  
 1/4" = 1'-0" DEMOLITION



**ELECTRICAL PARTIAL THIRD FLOOR PLAN ROOM 3B-111**  
 1/8" = 1'-0" NEW WORK



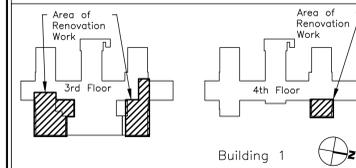
**ELECTRICAL PARTIAL THIRD FLOOR PLAN ROOM 3A-11A**  
 1/8" = 1'-0" NEW WORK



**ELECTRICAL PARTIAL FOURTH FLOOR PLAN ROOM 3A-11A**  
 1/8" = 1'-0" NEW WORK

- ⑭ AT EXISTING PANEL 3REM, 125A, 120/208V, 3PH., 4W, FURNISH AND INSTALL A NEW 20A-1P, GFCI 30mA BREAKER IN AVAILABLE SPACE. NEW BREAKER TO MATCH EXISTING BREAKERS IN PANEL WITH RESPECT TO MANUFACTURER, TYPE, AND SCCR RATING. WIRE COMPLETE TO NEW HEAT TRACE AT NOTE 16, IN RM 3A-108.
- ⑮ AT EXISTING PANEL 3LEM, 125A, 120/208V, 3PH., 4W, FURNISH AND INSTALL A NEW 20A-1P, GFCI 30mA BREAKER IN AVAILABLE SPACE. NEW BREAKER TO MATCH EXISTING BREAKERS IN PANEL WITH RESPECT TO MANUFACTURER, TYPE, AND SCCR RATING. WIRE COMPLETE TO NEW HEAT TRACE AT MAU-14.
- ⑯ NEW JUNCTION BOX AND 120V CIRCUIT FOR NEW HEAT TRACE. COORDINATE EXACT LOCATION OF JUNCTION BOX AND CIRCUIT WITH COTR PRIOR TO INSTALLATION. WIRE COMPLETE TO NEW GFCI BREAKER AT ASSOCIATED PANEL. WIRE COMPLETE PER MANUFACTURER'S INSTRUCTIONS.

- CODED NOTES**
- ① DISCONNECT AND REMOVE EXISTING VFD AND ASSOCIATED CIRCUIT COMPLETE BACK TO SOURCE FOR ASSOCIATED EXISTING AHU UNIT SO THAT AHU CAN BE REMOVED.
  - ② FURNISH AND INSTALL NEW 3-1 & 1-8 GRD. IN 1-1/4" CONDUIT TO MAU-14. WIRE CIRCUIT COMPLETE FROM UNIT-MOUNTED VFD TO EXISTING MCC-3L.
  - ③ FURNISH AND INSTALL NEW 3-1 & 1-8 GRD. IN 1-1/4" CONDUIT TO MAU-15. WIRE CIRCUIT COMPLETE FROM UNIT-MOUNTED VFD TO EXISTING MCC-3R.
  - ④ AT EXISTING MCC-3L, FURNISH AND INSTALL A NEW BUCKET WITH NEW 100A-3P BREAKER WITH H-O-A SWITCH, PILOT LIGHT, RESET SWITCH, AND CONTROL TRANSFORMER. BUCKET TO MATCH EXISTING SWITCHES IN MCC WITH RESPECT TO TYPE, SCCR RATING, AND ALL ACCESSORIES. WIRE COMPLETE TO NEW MAU-14. EXISTING MCC IS GE CR8000, 600A, 208V, 3PH., 3W, 25KA.
  - ⑤ AT EXISTING MCC-3R, FURNISH AND INSTALL A NEW BUCKET WITH NEW 100A-3P BREAKER WITH H-O-A SWITCH, PILOT LIGHT, RESET SWITCH, AND CONTROL TRANSFORMER. BUCKET TO MATCH EXISTING SWITCHES IN MCC WITH RESPECT TO TYPE, SCCR RATING, AND ALL ACCESSORIES. WIRE COMPLETE TO NEW MAU-15. EXISTING MCC IS GE CR8000, 600A, 208V, 3PH., 3W, 25KA.
  - ⑥ DISCONNECT AND REMOVE EXISTING DUCT TYPE SMOKE DETECTOR AND ASSOCIATED CONDUIT AND WIRING BACK TO NEAREST FIRE ALARM DEVICE ON SAME CIRCUIT. RELOCATE EXISTING FIRE ALARM SMOKE DETECTOR TO NEW SUPPLY DUCT SERVING MAKE-UP AIR UNIT 1-MAU-14. EXTEND EXISTING CIRCUIT, RECONNECT AND WIRE COMPLETE TO OPERATE AS BEFORE. COORDINATE WORK WITH COTR.
  - ⑦ FURNISH AND INSTALL DEDICATED 20A-1P, 120V RECEPTACLE FOR PLUG-IN CONNECTION TO R.O. WATER SYSTEM. WIRE COMPLETE.
  - ⑧ WIRE NEW RECEPTACLE COMPLETE TO SPARE 20A-1P BREAKER IN EXISTING PANEL AT INDICATED CIRCUIT.
  - ⑨ NOT USED.
  - ⑩ EXISTING CONDENSING UNIT IS TO BE RELOCATED TO CLEAR CONCRETE BEAM BELOW TO ALLOW INSTALLATION OF I-BEAM TO ACCOMMODATE THE PENETRATION FOR THE NEW SUPPLY AIR DUCT FROM MAU-15. ELECTRICAL CONTRACTOR TO REWORK, DISCONNECT AND CONNECT WIRING TO THE DISCONNECT SWITCH TO OPERATE AS BEFORE.
  - ⑪ FURNISH AND INSTALL A 20A-1P, GFCI, WEATHERPROOF RECEPTACLE AT MAKE-UP AIR UNIT. WIRE COMPLETE TO CIRCUIT AS SHOWN.
  - ⑫ AT EXISTING PANEL 3L1, 225A, 120/208V, 3PH., 4W, FURNISH AND INSTALL (2) 20A-1P BREAKERS IN AVAILABLE SPACE. NEW BREAKERS TO MATCH EXISTING BREAKERS IN PANEL WITH RESPECT TO MANUFACTURER, TYPE, AND SCCR RATING. WIRE (1) BREAKER COMPLETE TO NEW RECEPTACLE AT MAKE-UP AIR UNIT 1-MAU-14. WIRE OTHER BREAKER COMPLETE TO RECEPTACLE FOR R.O. SYSTEM AT NOTE 7 IN ROOM 3B-110 ON THIS SHEET.
  - ⑬ AT EXISTING PANEL 3R1, 225A, 120/208V, 3PH., 4W, FURNISH AND INSTALL A 20A-1P BREAKER IN AVAILABLE SPACE. NEW BREAKER TO MATCH EXISTING BREAKERS IN PANEL WITH RESPECT TO MANUFACTURER, TYPE, AND SCCR RATING. WIRE COMPLETE TO NEW RECEPTACLE AT MAKE-UP AIR UNIT 1-MAU-15.



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 3073 NORTH HIGH STREET  
 COLUMBUS, OHIO 43202-1180  
 Phone: 614-297-4928 www.wemonks.com Fax: 614-297-5617

APPROVED: SAFETY MANAGER  
 JUSTIN GREENE  
 APPROVED: INFECTION CONTROL  
 SHAWN M. MILLS  
 APPROVED:

APPROVED: CHIEF, FACILITIES MANAGEMENT SERVICE LINE  
 CLAYTON HELMS, CHFM  
 APPROVED: ASSOCIATE DIRECTOR for PATIENT CARE  
 SERVICES/EXECUTIVE NURSE  
 DEBRA LEGG, RN, MSN  
 APPROVED: SERVICE LINE CHIEF

APPROVED: MEDICAL CENTER DIRECTOR  
 KARIN L. MCGRAW, MSN, FACHE  
 APPROVED: ASSOCIATE DIRECTOR  
 J. BRIAN NIMMO, MS  
 APPROVED: CHIEF OF STAFF  
 JOHN D. BERRYMAN, M. D.

DRAWING TITLE:  
 PARTIAL 3rd & 4th FLOOR PLAN  
 ELECTRICAL DEMO & NEW WORK  
 PROJECT TITLE:  
 HVAC NEGATIVE AIR CORRECTIONS  
 DATE: 07/06/2012  
 REV. SCALE  
 CHECKED BY: JPA

DRAWING No. EP102  
 PROJECT No. 517-11-105  
 DRAWN BY: TMS  
 CHECKED BY: JPA

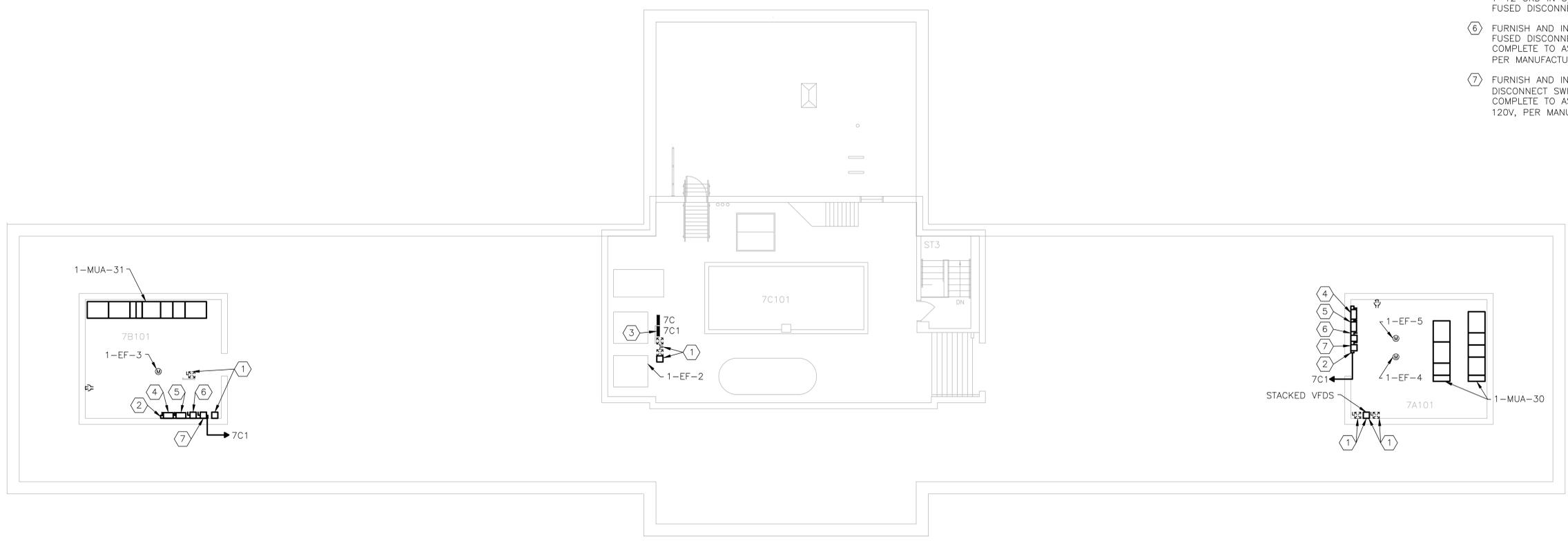
Veterans Affairs  
 Medical Center  
 200 Veterans Av  
 Beckley, WV.  
 25801



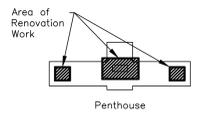
three inches = one foot  
 one and one-half inch = one foot  
 one-half inch = one foot  
 three-quarters inch = one foot  
 one-half inch = one foot  
 three-eighths inch = one foot  
 one-quarter inch = one foot  
 one-eighth inch = one foot

**CODED NOTES**

- ① DISCONNECT AND REMOVE EXISTING STARTER UNIT SERVING ASSOCIATED EXHAUST FAN IN ROOM. REPLACE WITH NEW VFD, RECONNECT AND WIRE COMPLETE TO EXISTING CIRCUIT TO OPERATE AS BEFORE.
- ② WIREWAY BELOW STARTER AND VFDS AND TAP FEEDER FOR EACH VFD. DISCONNECT SWITCH, AND TOGGLE DISCONNECT SWITCH. WIRE ALL COMPLETE.
- ③ IN EXISTING PANEL 7C1, 225A, 120/208V, 3PH, 4W, FURNISH AND INSTALL (2) NEW 40A-3P BREAKERS AT AVAILABLE SPACE. NEW CIRCUIT BREAKER TO MATCH EXISTING BRAND, TYPE, AND SCCR RATING. WIRE (1) NEW BREAKER TO WIREWAY IN RM 7A101 AND (1) BREAKER TO WIREWAY IN RM 7B101. WIRE TO BE 3-#8 & 1-#10 GRD. IN 3/4" CONDUIT. PROVIDE NEW UPDATED TYPE-WRITTEN PANEL DIRECTORY AT PANEL.
- ④ INSTALL AND WIRE NEW VFD COMPLETE TO ASSOCIATED NEW MAU SUPPLY FAN IN ROOM, WITH 3-#12 & 1-12 GRD IN 3/4" CONDUIT. VFD TO BE COMBINATION FUSED DISCONNECT TYPE FUSED AT 15A.
- ⑤ INSTALL AND WIRE NEW VFD COMPLETE TO ASSOCIATED NEW MAU EXHAUST FAN IN ROOM, WITH 3-#12 & 1-12 GRD IN 3/4" CONDUIT. VFD TO BE COMBINATION FUSED DISCONNECT TYPE FUSED AT 10A.
- ⑥ FURNISH AND INSTALL A NEW 30A-3P, 208V, NEMA 1, FUSED DISCONNECT SWITCH WITH 15A FUSES. WIRE COMPLETE TO ASSOCIATED MAU ELECTRIC HEAT SECTION PER MANUFACTURER'S INSTRUCTIONS.
- ⑦ FURNISH AND INSTALL A NEW 30A-3P, NEMA 1, FUSED DISCONNECT SWITCH WITH (1) 20A FUSE. WIRE COMPLETE TO ASSOCIATED MAU ELECTRIC HEAT WHEEL, 120V. PER MANUFACTURER'S INSTRUCTIONS.



**ELECTRICAL PENTHOUSE FLOOR PLAN**  
 1/8" = 1'-0" NEW WORK



**CDOL**  
 Collaborative Design, Ltd.  
 2727 Tuller Parkway, Suite 200  
 Dublin, Ohio 43017  
 Tel 614.798.1515  
 Project Number: 11025

**W.E. MONKS & CO.**  
 ENGINEERS  
 3073 NORTH HIGH STREET  
 COLUMBUS, OHIO 43202-1180  
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 APPROVED: CHIEF OF STAFF  
 JOHN D. BERRYMAN, M. D.

DRAWING TITLE:  
 ELECTRICAL PENTHOUSE FLR PLAN  
 ELECTRICAL NEW WORK  
 PROJECT TITLE:  
 HVAC NEGATIVE AIR CORRECTIONS  
 DATE: 07/06/2012

DRAWING No.  
 EP103  
 PROJECT No.  
 517-11-105  
 DRAWN BY:  
 TMS  
 CHECKED BY:  
 JPA

Veterans Affairs  
 Medical Center  
 200 Veterans Av  
 Beckley, WV.  
 25801



11007