

**GENERAL NOTES** DEMOLITION

1. PRIOR TO BIDDING, THE CONTRACTOR SHALL VISIT THE SITE TO BECOME FAMILIAR WITH EXISTING CONDITIONS, AND TO VERIFY LOCATION, SIZE AND QUANTITY OF ITEMS TO BE REMOVED. SUBMITTAL OF A BID SHALL SIGNIFY WILLINGNESS TO COMPLY WITH THE DESIGN AND ACCEPTANCE OF ON-SITE CONDITIONS AS THEY EXIST.
2. IN GENERAL, EXISTING MECHANICAL SYSTEMS SHALL BE REMOVED AND MODIFIED TO ACCOMMODATE THE RENOVATION, WHETHER OR NOT SHOWN ON THESE PLANS. UNO, DOCUMENTATION OF EXISTING SYSTEMS IS BASED ON AVAILABLE RECORD DRAWINGS AND CASUAL FIELD OBSERVATION. MAJOR DISCREPANCIES SHALL BE REFERRED TO THE ARCHITECT/ENGINEER FOR RESOLUTION PRIOR TO PROCEEDING WITH THE WORK.
3. COMPONENTS EMBEDDED WITHIN OR BENEATH THE EXISTING STRUCTURE MAY BE ABANDONED IN PLACE, CUT BEHIND WALL/FLOOR/CEILING/ROOF SURFACE AS REQUIRED FOR PATCHING OF FINISH. SYSTEMS SHALL BE CAPPED WATER/AIR TIGHT.
4. WHERE EXISTING MECHANICAL SYSTEMS PENETRATE EXTERIOR WALLS/ROOF, CONTRACTOR SHALL BE RESPONSIBLE FOR PATCHING SUCH PENETRATIONS TO MATCH EXISTING, UNO.
5. THE CONTRACTOR SHALL AVOID DISRUPTION OF THE ACTIVITIES OF THE OCCUPANTS TO THE BEST EXTENT POSSIBLE. SCHEDULE WORK TO AVOID PROLONGED DISRUPTION OF THE USE OF THE SPACE. COORDINATE NEW WORK REQUIREMENTS WITH OTHER TRADES TO ACCOMPLISH THE WORK WHILE THE FACILITY REMAINS IN OPERATION. SCHEDULE ANY DISRUPTIONS TO THE SPACES ADJACENT TO THE PROJECT AREA WITH THE PROJECT MANAGER.

**GENERAL NOTES**

1. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH VUSBC 2012, IEBC 2012, IMC 2012.
2. CONTRACTOR SHALL COORDINATE LOCATION OF ALL EQUIPMENT, PIPING AND DUCTWORK WITH OTHER TRADES. MAINTAIN REQUIRED SERVICE ACCESS.
3. VERIFY ROUTING OF PIPING WITH CEILING HEIGHTS, STRUCTURAL SYSTEM, AND OTHER TRADES PRIOR TO INSTALLATION. UNLESS OTHERWISE NOTED, ALL PIPING MAINS SHALL BE INSTALLED AS HIGH AS POSSIBLE TO UNDERSIDE OF STRUCTURE.
4. HVAC CONTRACTOR(S) SHALL COORDINATE THEIR WORK WITH ALL OTHER TRADES AND EXISTING COMPONENTS PRIOR TO FABRICATIONS OF SYSTEMS AND COMMENCEMENT OF INSTALLATION. IT SHALL BE THE RESPONSIBILITY OF EACH CONTRACTOR TO REVIEW THE WORK OF OTHER TRADES (INCLUDING, BUT NOT LIMITED TO ELECTRICAL) AS IT AFFECTS THEIR WORK, AND AS THEIR WORK AFFECTS OTHER TRADES, TO INSURE THAT THE CONSTRUCTION DOCUMENTS ARE CLOSELY FOLLOWED. WHERE DISCREPANCIES ARISE, THEY SHALL BE REFERRED TO THE A/E FOR RESOLUTION BEFORE PROCEEDING WITH THE WORK.
5. WATER SEAL ALL CEILING, FLOOR & WALL PENETRATIONS. PENETRATIONS THRU FIRE RATED CEILINGS, FLOORS & WALLS SHALL BE SEALED TO MAINTAIN FIRE RATING INTEGRITY.
6. DO NOT INSTALL BULL HEAD TEES IN PIPING SYSTEMS.
7. FIRESTOP ALL NEW PENETRATIONS THROUGH EXISTING FIRE RATED PARTITIONS TO MAINTAIN EXISTING RATING.
8. CONTRACTOR SHALL PROVIDE COORDINATED SHOP DRAWINGS OF DIVISION 23 SYSTEMS. SHOP DRAWINGS SHALL BE PREPARED IN ELECTRONIC FORMAT AND SUBMITTED IN PRINTED AND ELECTRONIC FORM.
9. THE DESIGN IS BASED ON MANUFACTURERS AND MODELS INDICATED, AND IS INTENDED TO SHOW THE GENERAL SIZE, CONFIGURATION, LOCATION, CONNECTIONS AND/OR SUPPORT FOR EQUIPMENT OR SYSTEM OR SYSTEMS SPECIFIED WITH RELATION TO THE OTHER BUILDING SYSTEMS. SEE SPECIFICATION SECTIONS FOR TECHNICAL REQUIREMENTS.
10. ALL HEATING WATER PIPING SHALL BE SCHEDULE 40 BLACK STEEL

- OR TYPE L COPPER TUBING.
11. ALL EQUIPMENT SHALL BE RECYCLED OR DISPOSED OF IN ACCORDANCE WITH FEDERAL, STATE, AND LOCAL LAWS.
  12. ALL CONTROL WIRING SHALL BE CONCEALED IN WALLS OR ABOVE CEILINGS OF FINISHED SPACES. UNLESS NOTED OTHERWISE, IN SPACES WITH EXPOSED STRUCTURE CEILINGS, CONTRACTOR SHALL CLOSELY COORDINATE ROUTING WITH OTHER TRADES
  13. ALL CONTROL WIRING SHALL BE RUN IN CONDUIT. CONDUIT FROM THE WALL OUTLET BOX MAY TERMINATE SEVERAL INCHES ABOVE THE CEILING WHERE LAY-IN CEILING TILES ARE TO BE USED. CABLING ABOVE THE CEILING SHALL BE NEATLY BUNDLED AND ATTACHED TO OR INDEPENDENTLY SUPPORTED FROM THE BUILDING STRUCTURE ABOVE.
  14. MOUNTING HEIGHTS, UNO, ARE CENTERLINE OF EQUIPMENT OR SENSOR.
  15. ALL WALL-MOUNTED SENSORS SHALL BE 48" AFF UNO.
  16. CONTRACTOR SHALL COORDINATE 120V ELECTRICAL REQUIREMENTS. CONTRACTOR SHALL PROVIDE ANY 120 VOLT CIRCUITS AS REQUIRED FOR CONTROL POWER.
  17. ALL CONTROLS, SENSORS, FLOW METERS, AND VFDS SHALL BE PROVIDED BY THE CONTRACTOR. CONTRACTOR SHALL PROVIDE ADDITIONAL POINTS & COMPONENTS AS NEEDED TO ACHIEVE THE SPECIFIED SEQUENCE OF OPERATION AND SYSTEM GRAPHIC DISPLAY.

**ABBREVIATIONS**

A/E	ARCHITECT/ENGINEER
ADJ	ADJUSTABLE
ADS	AIR DIRT SEPARATOR
AFF	ABOVE FINISHED FLOOR
AHRI	AIR-CONDITIONING, HEATING, AND REFRIG INSTITUTE
AI	ANALOGUE INPUT
AO	ANALOGUE OUTPUT
BAS	BUILDING AUTOMATION SYSTEM
BFP	BACKFLOW PREVENTER
BI	BINARY INPUT
BO	BINARY OUTPUT
BOD	BASIS OF DESIGN
BTUH	BRITISH THERMAL UNITS PER HOUR
CHK	CHECK
CHW	CHILLED WATER
CHWR	CHILLED WATER RETURN
CHWS	CHILLED WATER SUPPLY
COEF	COEFFICIENT
CONC	CONCRETE
CONFIG	CONFIGURATION
CSR	CURRENT SENSING RELAY
CW	COLD WATER
DB	DRY BULB
DCW	DOMESTIC COLD WATER
DELTA-T	TEMPERATURE DIFFERENCE DESIGN
DES	DOMESTIC HOT WATER
DHW	DIAHETER
DIA, DIAM	DIAMETER
DR	DRAIN
DRF	DRAFTING
DWH	DOMESTIC WATER HEATER
EC	ELECTRONICALLY COMMUNICATED EQUIPMENT
EQUIP	EQUIPMENT
ET	EXPANSION TANK
ETC	ETCETERA
EWT	ENTERING WATER TEMPERATURE
EX	EXISTING
F	DEGREE FAHRENHEIT
FM	FLOW METER
FS	FLOW SWITCH
FT	FEET OR FOOT
GAL	GALLON
GALV	GALVANIZED
GPM	GALLONS PER MINUTE
HP	HORSEPOWER
HVAC	HEATING, VENTILATING & AIR CONDITIONING
HW	HOT WATER
IEBC	INTERNATIONAL EXISTING BUILDING CODE
IFB	ISSUE FOR BIDS
IMC	INTERNATIONAL MECHANICAL CODE
IN	INCH, INCHES
IPLV	INTEGRATED PART LOAD VALUE
KW	KILOWATT
LBS	POUNDS
LWT	LEAVING WATER TEMPERATURE
MAX	MAXIMUM
MBH	THOUSAND BTUH
MCA	MINIMUM CIRCUIT AMPS
MFR	MANUFACTURER
MIN	MINIMUM
MOP	MAXIMUM OVERCURRENT PROTECTION
NEC	NATIONAL ELECTRIC CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NO	NUMBER
NPT	NATIONAL PIPE THREAD
OA	OUTDOOR AIR
OAT	OUTDOOR AIR TEMPERATURE
PPM	PARTS PER MILLION
PROJ	PROJECT
PRV	PRESSURE REDUCING VALVE
PSI	POUNDS PER SQUARE INCH
PSIG	POUNDS PER SQUARE INCH GAGE
REFRIG	REFRIGERATION
RPM	REVOLUTIONS PER MINUTE
RWW	REVIEW
T	TONS
TAB	TESTING, ADJUSTING, BALANCING
TEMP	TEMPERATURE
TS	TEMPERATURE SENSOR
TTL	TOTAL
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
V-PH	VOLTAGE-PHASE
VFD	VARIABLE FREQUENCY DRIVE
VOL	VOLUME
VUSBC	VIRGINIA UNIFORM STATEWIDE BUILDING CODE
WPD	WATER PRESSURE DROP
WT	WEIGHT

**MECHANICAL LEGEND**

	TEMPERATURE & HUMIDITY SENSOR WITH SET POINT CONTROL, 48" AFF. COORDINATE EXACT LOCATION WITH A/E PRIOR TO ROUGH-IN.		DUCTWORK RECTANGULAR DUCT, FIRST DIMENSION IS SIDE SHOWN, DIMENSION IN INCHES
	TEMPERATURE SENSOR WITH SET POINT CONTROL, 48" AFF. COORDINATE EXACT LOCATION WITH A/E PRIOR TO ROUGH-IN.		ROUND DUCT, DIMENSION IN INCHES
	TEMPERATURE & HUMIDITY SENSOR WITHOUT SET POINT CONTROL, 48" AFF. COORDINATE EXACT LOCATION WITH A/E PRIOR TO ROUGH-IN.		FLEXIBLE CONNECTION
	LINE-VOLTAGE THERMOSTAT		TRANSITION, SLOPE NOT TO EXCEED 4:10-1. FOT = FLAT ON TOP, FOB = FLAT ON BOTTOM
	CARBON DIOXIDE SENSOR		CHANGE OF ELEVATION IN DIRECTION OF AIR FLOW (R = RISE, D = DROP)
	EXISTING TO BE REMOVED		TURNING VANES
	EXISTING TO REMAIN		STANDARD BRANCH, SUPPLY OR RETURN, NO SPLITTER
	POINT OF CONNECTION, NEW-TO-EXISTING		MANUAL VOLUME DAMPER
	POINT OF DISCONNECTION FOR DEMOLITION		MOTORIZED DAMPER
<b>PIPING</b>			FIRE DAMPER WITH SLEEVE, PROVIDE ACCESS DOOR.
	HEAT PUMP WATER		SMOKE DETECTOR
	HEAT PUMP SUPPLY		DUCT ACCESS DOOR
	HEAT PUMP RETURN		RECTANGULAR DUCT SECTION (SUPPLY)
	HEATING WATER SUPPLY		RECTANGULAR DUCT SECTION (RETURN)
	HEATING WATER RETURN		RECTANGULAR DUCT SECTION (EXHAUST)
	CONDENSATE DRAIN		RECTANGULAR ELBOW TURNING UP (SUPPLY)
<b>FITTINGS</b>			RECTANGULAR ELBOW TURNING UP (RETURN)
	CAP		RECTANGULAR ELBOW TURNING UP (EXHAUST)
	CONNECTION, BOTTOM		RECTANGULAR ELBOW TURNING DOWN (SUPPLY)
	CONNECTION, TOP		RECTANGULAR ELBOW TURNING DOWN (RETURN)
	ELBOW, 90° TURNED UP		RECTANGULAR ELBOW TURNING DOWN (EXHAUST)
	ELBOW, 90° TURNED DOWN		ROUND DUCT SECTION (SUPPLY)
	UNION		ROUND DUCT SECTION (RETURN)
<b>VALVES</b>			ROUND DUCT SECTION (EXHAUST)
	BALL		ROUND ELBOW TURNING UP (SUPPLY)
	BUTTERFLY		ROUND ELBOW TURNING UP (RETURN)
	BALANCING VALVE		ROUND ELBOW TURNING UP (EXHAUST)
	UNION		ROUND ELBOW TURNING DOWN (SUPPLY)
<b>PIPING SPECIALTIES</b>			ROUND ELBOW TURNING DOWN (RETURN)
	AIR SEPARATOR		ROUND ELBOW TURNING DOWN (EXHAUST)
	PRESSURE GAUGE		RETURN GRILLE, TYPE AS INDICATED
	THERMOMETER		EXHAUST GRILLE, TYPE AS INDICATED
	AIRVENT, AUTOMATIC/MANUAL		RECTANGULAR CEILING SUPPLY DIFFUSER, ROUND CONNECTION, TYPE AS INDICATED
	PUMP		SIDEWALL SUPPLY REGISTER
	STRAINER		SIDEWALL RETURN GRILLE
	BACKFLOW PREVENTER		
	FLEXIBLE CONNECTOR		

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 05/16/2016

**MONUMENT TERRACE BUILDING  
 AIR HANDLER & CONTROLS REPLACEMENT**  
 CITY OF LYNCHBURG  
 LYNCHBURG, VIRGINIA

sheet title

**LEGEND AND NOTES**

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des	drf	chk
JPC	JPC	JPC

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23 0719: HYDRONIC PIPING INSULATION SCHEDULE					
SYSTEM	INSULATION				
	TYPE	PIPE SIZE, IN	THICKNESS, IN	JACKET	NOTES
HEATING WATER PIPING	GLASS FIBER, RIGID	LESS THAN 2	1 1/2	-	-
HEATING WATER PIPING	GLASS FIBER, RIGID	2 OR GREATER	2	-	-

23 2114 BUFFER TANK SCHEDULE					
MARK	SERVES	MODEL	CONFIG	MOUNTING	TANK VOLUME GAL
BT-1	HEATING WATER	V120SEB	VERTICAL	FLOOR	120

NOTES:

- DESIGN AND PERFORMANCE BASED ON OEMLINE.
- TANK SHALL BE ASME RATED TO 125 PSIG.
- PROVIDE 1/2" FLEXIBLE ELASTOMERIC THERMAL INSULATION.
- PROVIDE LEGS FOR VERTICAL INSTALLATION.
- PROVIDE AUTOMATIC AIR VENT.

23 2114: EXPANSION TANK SCHEDULE											
MARK	SERVICE	MODEL	TYPE	CONFIG	MOUNTING	TTL VOL GAL	ACCEPT VOL GAL	PHYSICAL			
								MAX LENGTH, IN	MAX HEIGHT, IN	MAX WIDTH, IN	MAX WT, LBS
ET-4	HEATING WATER	D-40V	DIAPHRAGM	VERTICAL	FLOOR	21.7	11.3	29	16.25	16.25	263

NOTES:

- DESIGN AND PERFORMANCE BASED ON BELL AND GOSSETT.
- ET SHALL BE PRECHARGED TO 12 PSIG AND BE RATED 125 PSIG.
- ET SIZING BASED ON 42"-70" F FOR HEATING WATER.
- ADJUST ET CHARGE TO MATCH SYSTEM PRESSURE.

23 3100: DUCT & INSULATION SCHEDULE					
SYSTEM	MATERIAL	PRESSURE CLASS, IN WC	INSULATION		NOTES
			TYPE	THICKNESS, IN	
SUPPLY	GALV	VARIES	GLASS FIBER, FLEXIBLE	1 1/2	1, 4, 5
RETURN	GALV	VARIES	NONE	-	4
SUPPLY REHEAT BOX	GALV	VARIES	LINER - GLASS FIBER, FLEXIBLE	1"	3, 4
DAU INTAKE	GALV	VARIES	GLASS FIBER, FLEXIBLE	1 1/2	2, 4

NOTES:

- PROVIDE 1 1/2 IN RIGID GLASS FIBER DUCT INSULATION WITHIN EXPOSED AREAS, UNO.
- PROVIDE 1 1/2 INCH FLEXIBLE GLASS FIBER DUCT IN UNCONDITIONED SPACES, I.E. CEILING CAVITIES BELOW INSULATED ROOFS.
- MINIMUM 1 INCH THICK NEOPRENE OR VINYL COATED FIBROUS GLASS INSULATION, 1.5 LB/CU FT. DENSITY MEETING NFPA 901 REQUIREMENTS AND UL 181 EROSION REQUIREMENTS.
- PROVIDE DUCT PRESSURE CLASS IN ACCORDANCE WITH EQUIPMENT SCHEDULES AND ASSOCIATED SMACNA RECOMMENDATIONS.
- SUPPLY DUCT IN ATTIC IS LINED. MATCH EXISTING LINER.

23 8216: AIR COIL SCHEDULE														
MARK	SERVES	MODEL	TTL CFM	ESP. IN H2O	SUMMER DB / WB °F			WINTER DB / WB °F			WPD	MAX FT	MAX HEIGHT, IN	ROWS
					EAT	LAT	EAT	LAT	GPM	FT				
RH-1A	REHEAT-FIRST FLOOR	D5WB21	5470	0.539	55	76.53	55	76.53	12.81	0.68	40	21	2	
RH-2A	REHEAT-SECOND FLOOR	D5WB21	4585	0.582	55	74.89	55	74.89	9.92	0.53	32	21	2	
RH-2A	REHEAT-SECOND FLOOR	D5WB21	4025	0.522	55	75.27	55	75.27	8.87	0.49	30	21	2	
RH-3A	REHEAT-THIRD FLOOR	D5WB21	5530	0.549	55	76.41	55	76.41	12.87	0.69	40	21	2	
RH-3B	REHEAT-THIRD FLOOR	DP4B12	1670	0.445	55	73.96	55	73.96	3.44	0.26	24	12	2	
RH-4A	REHEAT-FOURTH FLOOR	D5WB18	2475	0.437	55	75.04	55	75.04	5.39	0.41	24	18	2	

NOTES:

- DESIGN AND PERFORMANCE BASED ON TRANE.

23 7313: AIR HANDLING UNIT SCHEDULE																														
MARK	SERVICE	MODEL	LOCATION	SUPPLY FAN					RETURN FAN					CHILLED WATER COIL				FILTERS SA	ELECTRICAL (CIRCUIT 1)			ELECTRICAL (CIRCUIT 2)			DIMENSIONS			WEIGHT LBS.		
				CFM	OA CFM (MIN)	ERV CFM	SA ESP. IN WC	HP	CFM	CFM	CFM	IN WC	HP	WPD	EAT	LAT	SENS		TTL	V-PH	MCA	MOP	V-PH	MCA	MOP	LENGTH (IN.)	WIDTH (IN.)		HEIGHT (IN.)	
AHU-1	MON TERRACE	SEE SPECIFICATIONS	ATTIC	28675	2500	N/A	6	15 11	27000	N/A	N/A	0.5	15 11	201	9.4	8467	55/54	915.1	1136.8	2"	208-3			208-3			342	126	89	16533

NOTES:

- CUSTOM UNIT. SELECTION BASED ON PERFORMANCE AND SPECIFICATIONS.
- COOLING COIL CAPACITY IS BASED ON 42°/56° F EWT/LWT.
- HEATING COIL CAPACITIES ARE BASED ON 180°/140° F EWT/LWT.
- HEATING COIL AND REHEAT COIL PERFORMANCE DATA BASED ON WATER (0% GYLOOL).
- FAN SHALL BE A FACTORY ASSEMBLED KNOCKDOWN UNIT WITH ASSEMBLY IN PLACE BY MECHANICAL CONTRACTOR.
- ALL COMPONENTS MUST FIT THROUGH STANDARD DOORWAYS AND PEDESTAL ELEVATORS FOR MOVEMENT TO ATTIC OF BUILDING FOR ASSEMBLY.
- PROVIDE FLEXIBLE DUCT CONNECTOR AT ALL DUCT CONNECTIONS.
- PROVIDE CONDENSATE DRAIN SIZED TO MATCH DRAIN PAN DISCHARGE AT AHU. TERMINATE CONDENSATE AT ROOF DRAIN.
- MECHANICAL CONTRACTOR TO PROVIDE PIPING PACKAGE. BAS CONTRACTOR TO FURNISH CONTROL VALVE & ACTUATOR, INSTALLED BY MECHANICAL CONTRACTOR.
- DDC CONTROLS FURNISHED AND FIELD INSTALLED BY BAS CONTRACTOR.
- FAN HP IS TOTAL FOR ALL FANS IN FAN WALL.
- MAXIMUM ASSEMBLED DIMENSIONS 28" LONG X 11" WIDE X 6'10" TALL.
- MAXIMUM WEIGHT 16,300 POUNDS.

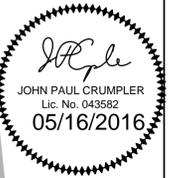
233600: AIR TERMINAL UNIT - EXISTING AIR FLOWS							
MARK VAV.	AIR FLOW		INLET SIZE (IN)	HOT WATER FLOW GPM	FAN HP	HEAT TYPE NONE, HW, ELECTRIC	NOTES
	MAX (CFM)	MIN (CFM)					
101	95	60	5			NONE	1, 2, 7
102	85	60	5			NONE	1, 2, 7
103	190	60	5			NONE	1, 2, 7
104	495	90	6			NONE	1, 2, 7
105	200	60	5			NONE	1, 2, 7
106	300	120	6			ELECTRIC	1, 2, 6, 9
107	180	120	6			ELECTRIC	1, 2, 6, 9
108	190	120	6			ELECTRIC	1, 2, 6, 9
109	495	90	6			NONE	1, 2, 7
110	385	90	6			NONE	1, 2, 7
111	145	60	5			NONE	1, 2, 7
112	1020	170	8			NONE	1, 2, 7
113	130	60	5			NONE	1, 2, 7
114	575	90	6			NONE	1, 2, 7
115	690	170	8			NONE	1, 2, 7
116	400	90	6			NONE	1, 2, 7
201	400	90	6			NONE	1, 2, 7
202	255	60	5			NONE	1, 2, 7
203	245	60	5			NONE	1, 2, 7
204	235	60	5			NONE	1, 2, 7
205	235	60	5			NONE	1, 2, 7
206	255	60	5			NONE	1, 2, 7
207	915	170	8			NONE	1, 2, 7
208	250	60	5			NONE	1, 2, 7
209	160	60	5			NONE	1, 2, 7
210	240	60	5			NONE	1, 2, 7
211	625	170	8			NONE	1, 2, 7
212	295	60	5			NONE	1, 2, 7
213	455	90	6			NONE	1, 2, 7
214	345	90	6			NONE	1, 2, 7
215	335	90	6			NONE	1, 2, 7
216	335	90	6			NONE	1, 2, 7
217	340	90	6			NONE	1, 2, 7
218	480	90	6			NONE	1, 2, 7
219	225	60	5			NONE	1, 2, 7
220	290	60	5			NONE	1, 2, 7
221	90	60	5			NONE	1, 2, 7
222	460	90	6			NONE	1, 2, 7
223	1000	170	8			NONE	1, 2, 7
224	155	60	5			NONE	1, 2, 7
301	1230	270	10			NONE	1, 2, 7
302	425	90	6			NONE	1, 2, 7
303	290	60	5			NONE	1, 2, 7
304	295	60	5			NONE	1, 2, 7
305	290	60	5			NONE	1, 2, 7
306	275	60	5			NONE	1, 2, 7
307	225	60	5			NONE	1, 2, 7
308	305	60	5			NONE	1, 2, 7
309	325	60	5			NONE	1, 2, 7
310	340	60	5			NONE	1, 2, 7
311	315	60	5			NONE	1, 2, 7
312	415	90	6			NONE	1, 2, 7
313	800	170	8			NONE	1, 2, 7
314	1135	170	10			NONE	1, 2, 7
315	535	90	6			NONE	1, 2, 7
316	680	170	6			NONE	1, 2, 7
317	210	60	5	1.0		HW	1, 2, 4, 7
318	425	90	6	1.0		HW	1, 2, 4, 7
401	490	90	6	1.0		HW	1, 2, 4, 7
402	235	60	5	1.0		HW	1, 2, 4, 7
403	250	60	5	1.0		HW	1, 2, 4, 7
404	195	60	5	1.0		HW	1, 2, 4, 7
405	675	170	8	1.0		HW	1, 2, 4, 7
FB-2	300	30	6		1/15 HP 120V	NONE	1, 2, 4, 7, 8
FB-3	500	50	10	0.5	1/4 HP 120V	HW	1, 2, 4, 7, 8
FB-4	1500	159	12		1/3 HP 120V	NONE	1, 2, 4, 7, 8
FB-5	900	90	10	0.5	1/4 HP 120V	HW	1, 2, 4, 7, 8
FB-6	900	90	10	0.5	1/4 HP 120V	HW	1, 2, 4, 7, 8

NOTES:

- EXISTING VAV TERMINAL UNITS ARE MANUFACTURED BY CARRIER.
- ACTUATORS, SENSORS, AND CONTROLLERS ARE REPLACED IN THIS PROJECT.
- REPLACE EXISTING STRAINER ARE PART OF THIS PROJECT.
- 1 ROW HEATING COIL.
- TWO STAGE ELECTRIC HEAT 2.5 KW 208V / 3PH / 60HZ.
- THREE STAGE ELECTRIC HEAT 4 KW 208V / 3PH / 60HZ.
- MINIMUM CFM IS FOR HEATING.
- BAS TO CONTROL FAN SPEED ENABLE, DISABLE, AND SPEED (HIGH, MED, LOW)
- MAXIMUM AIR FLOW IS FOR HEATING WITH ELECTRIC RESISTANCE COIL.



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MONUMENT TERRACE BUILDING  
AIR HANDLER & CONTROLS REPLACEMENT

CITY OF LYNCHBURG  
LYNCHBURG, VIRGINIA

sheet title

SCHEDULES

e-file: 12221A-M

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JPC	JPC	JPC

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scale	AS NOTED

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revision	date
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REVISION 1  
A. ADDED CLARIFICATIONS TO VAV LIST  
B. MODIFIED NOTES CONCERNING DUCT INSULATION.  
C. MODIFIED AHU SPECIFICATION AND NOTES

sheet title

DETAILS

e-file: 12221A-M

des	drf	chk
JPC	JPC	JPC

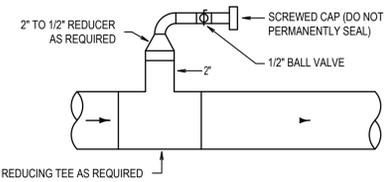
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date	02/22/2016
scale	AS NOTED

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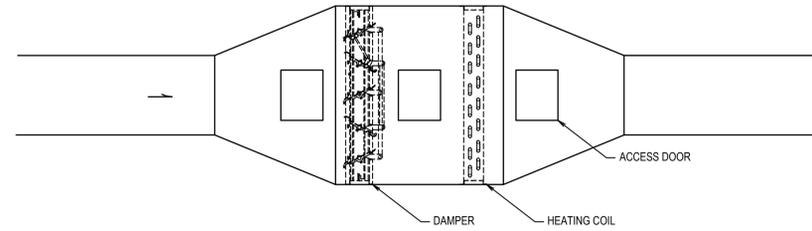
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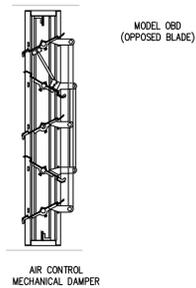
**9** PIPING AIR VENT/DRAIN DETAIL  
SCALE: NONE

- NOTES:  
1. INSTALL AIR VENT AT ALL HIGH POINTS IN PIPING.



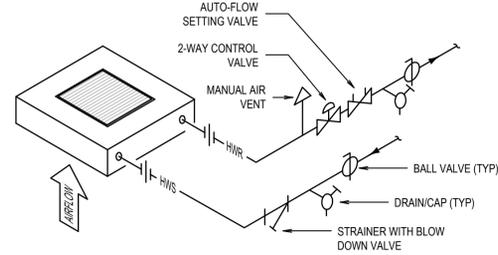
**10** REHEAT BOX DETAIL  
SCALE: NONE

- NOTES:  
1. SEE SPECIFICATION SECTION 23 3600 - AIR TERMINAL UNITS FOR GENERAL CONSTRUCTION AND INSULATION REQUIREMENTS  
2. SUPPLY ACCESS DOOR AS INDICATED, ON EACH SIDE OF DAMPER AND HEATING COIL.  
3. PROVIDE MEANS OF REMOVING COILS AND DAMPERS FOR MAINTENANCE OR REPLACEMENT  
4. INSULATE EXPOSED EXTERIOR PORTION OF HEATING TUBES AND DAMPER TO PREVENT CONDENSATION.  
5. SEE HEATING WATER COIL PIPING DETAILS FOR VALVE AND PIPING ARRANGEMENT.  
6. DAMPER ACTUATORS ARE TWO POSITION, OPEN OR CLOSED.  
7. SUPPORT REHEAT BOX FROM BUILDING STRUCTURE.



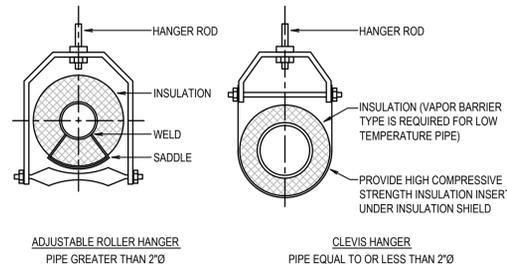
**5** MECHANICAL DAMPER  
NO SCALE

- NOTES:  
1. PROVIDE DAMPER AT REHEAT COILS 2A, 2B, 3A, 3B, AND 4A.  
2. DAMPERS ARE EITHER FULLY OPEN OR FULLY CLOSED.  
3. PROVIDE DAMPER ACTUATOR CONTROLLED BY BAS WITH EACH DAMPER.

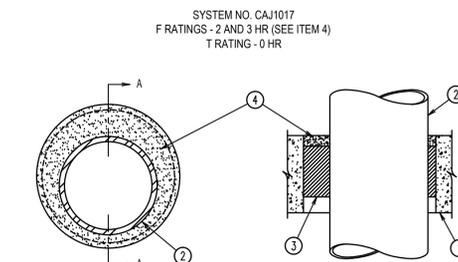


**6** HEATING WATER COIL PIPING DETAILS  
SCALE: NONE

- NOTES:  
1. DETAILS ARE TYPICAL FOR ALL INTERIOR HEATING WATER COILS.  
2. CONTROL VALVES SHALL BE FURNISHED BY EMS CONTRACTOR, INSTALLED BY MECHANICAL CONTRACTOR.  
3. INSTALL TWO-WAY VALVE UNLESS NOTED OTHERWISE.

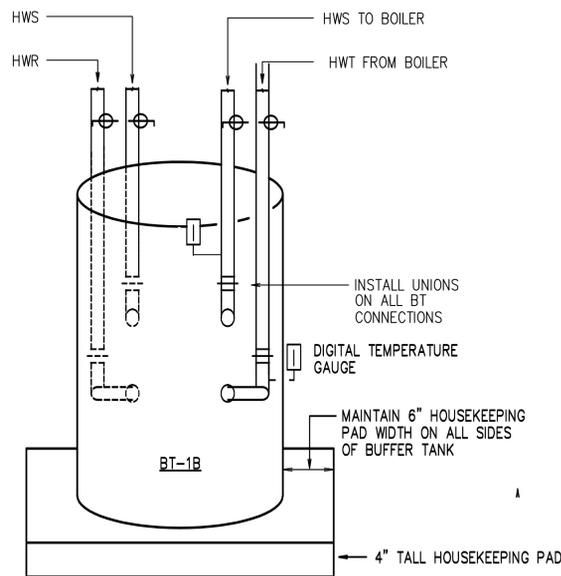


**7** PIPE HANGER DETAILS  
SCALE: NONE



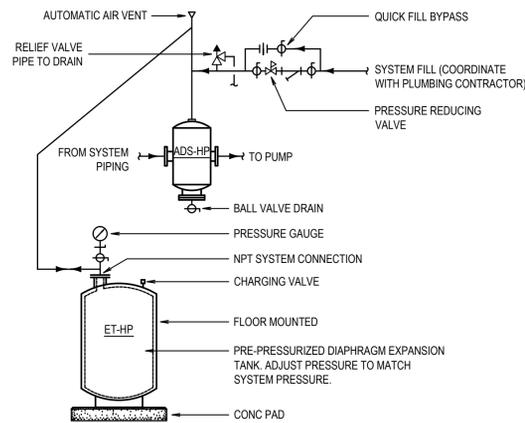
**8** FIRE STOP DETAIL  
NO SCALE

- FLOOR OR WALL ASSEMBLY - MIN 4-1/2 IN. THICK LIGHTWEIGHT OR NORMAL WEIGHT (100-150 PCF) CONCRETE WALL ASSEMBLY MAY ALSO BE CONSTRUCTED OF ANY UL CLASSIFIED CONCRETE BLOCKS. MAX DIAM OF OPENING IS 12 IN. SEE CONCRETE BLOCKS (CATZ) CATEGORY IN THE FIRE RESISTANCE DIRECTORY FOR NAMES OF MANUFACTURERS.
- PIPE OR CONDUIT - NOM 10 IN. DIAM (OR SMALLER) SCHEDULE 40 (OR HEAVIER) STEEL PIPE, NOM 6 IN. DIAM (OR SMALLER) SCHEDULE 10 (OR HEAVIER) STEEL PIPE OR RIGID STEEL CONDUIT, NOM 4 IN DIAM (OR SMALLER) STEEL EMT OR NOM 2 IN. DIAM (OR SMALLER) TYPE L (OR HEAVIER) COPPER TUBING. MAX ONE PIPE OR CONDUIT PER THROUGH OPENING. MIN ANNULAR SPACE BETWEEN PIPE OR CONDUIT AND EDGE OF THROUGH OPENING SHALL BE 1/4 IN.
- PACKING MATERIAL - NOM 3 IN. THICKNESS OF MINERAL-WOOL BATT INSULATION OR CERAMIC (ALUMINA SILICA) FIBER BLANKET FIRMLY PACKED INTO OPENING AS A PERMANENT FORM. PACKING MATERIAL TO BE RECESSED FROM TOP SURFACE OF FLOOR OR FROM BOTH SURFACES OF WALL AS REQUIRED TO ACCOMMODATE THE REQUIRED THICKNESS OF CAULK FILL MATERIAL (ITEM 4).
- FILL, VOID OR CAVITY MATERIAL - FILL MATERIAL PUMPED OR TROWELED INTO ANNULAR SPACE TO FILL OPENING ON TOP SURFACE OF FLOOR OR ON BOTH SURFACES OF WALL WITH AN ADDITIONAL BEAD OF CAULK AROUND PERIMETER OF THROUGH OPENING LAPPING 1/4 TO 1/2 IN. ON FLOOR OR WALL SURFACES. WHEN MAX ANNULAR SPACE IS 1 IN. AND WHEN MIN FILL MATERIAL THICKNESS IS 1/2 IN., F RATING IS 2 HR. WHEN NOM PIPE OR CONDUIT DIAM IS 6 IN. OR LESS AND WHEN MIN FILL MATERIAL THICKNESS IS 1 IN., F RATING IS 3 HR.



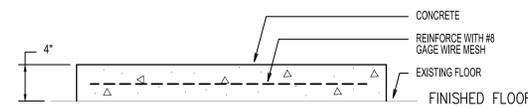
**1** BUFFER TANK DETAIL  
SCALE: NONE

- NOTES:  
1. LEAVE EXISTING EXPANSION TANK IN PLACE.



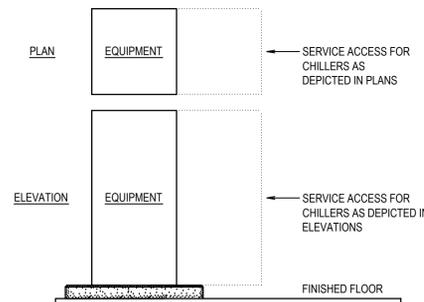
**2** EXPANSION TANK DETAIL  
SCALE: NONE

- NOTES:  
1. LEAVE EXISTING EXPANSION TANK IN PLACE.  
2. INSTALL NEAR NEW BUFFER TANK



**3** EQUIPMENT PAD DETAIL  
SCALE: NONE

- NOTES:  
1. EXTEND PAD MIN. 6" BEYOND EQUIPMENT ON ALL SIDES OF NEW EQUIPMENT.  
2. COORDINATE SIZE WITH CHILLER MANUFACTURER.



**4** EQUIPMENT SERVICE CLEARANCE DETAIL  
SCALE: NONE

- NOTES:  
1. LOCATE ALL EQUIPMENT, WHICH MUST BE SERVICED, OPERATED, OR MAINTAINED IN FULLY ACCESSIBLE POSITIONS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.  
2. MAINTAIN A CLEAR PATH WITHOUT OBSTRUCTION TO ALLOW FOR ACCESS TO EQUIPMENT.  
3. PROVIDE A MINIMUM OF TWO FEET OF CLEARANCE IN FRONT OF EQUIPMENT ACCESS DOORS AND COMPONENTS REQUIRING SERVICE.

# DEMO NOTES

## BASEMENT:

### BOILER SYSTEM PIPING:

- CUT AND REMOVE BOILER PRIMARY AND SECONDARY PIPING ONLY AS NECESSARY TO ALLOW INSTALLATION OF A BUFFER TANK AND EXPANSION TANK.
- PUMP MOTOR P-2 AND DISCONNECT SHALL BE REMOVED TO ALLOW INSTALLATION OF A NEW INVERTER DUTY MOTOR AND VARIABLE FREQUENCY DRIVE. REMOVE EXISTING MOTOR STARTER AND DISCONNECT.
- REMOVE EXISTING BAS CONTROLS AS REQUIRED IN PREPARATION OF NEW CONTROLS INSTALLATION. BOILER AND CHILLER ONBOARD CONTROL PANELS TO REMAIN.

### ATTIC:

#### AC-1

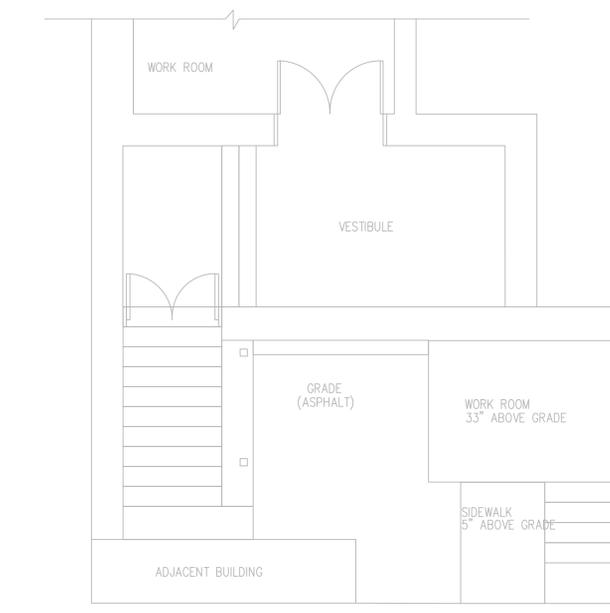
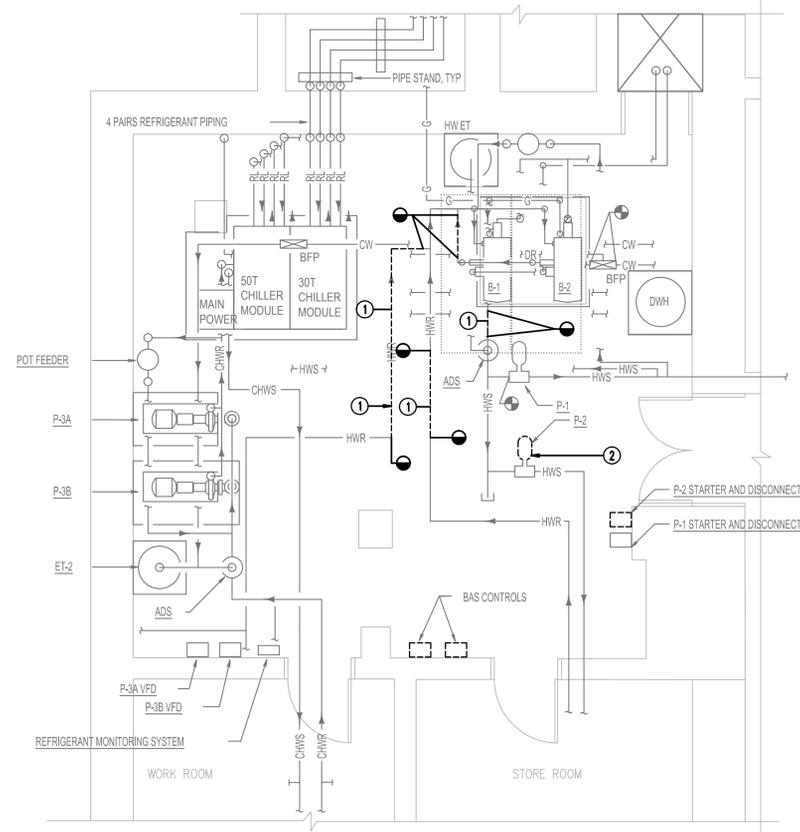
- AC-1 SHALL BE REMOVED IN ITS ENTIRETY INCLUDING CONTROL VALVES. MANUAL SHUT OFF VALVES TO REMAIN.
- REMOVE EXISTING ELECTRIC CONDUITS, WIRING, CIRCUIT BREAKERS, CONTROLS, AND VFDS.
- REMOVE EXISTING SUPPLY AND RETURN SMOKE DETECTORS AND WIRING.
- EXHAUST, SUPPLY, OUTSIDE AIR, AND RETURN DUCTS SHALL REMAIN UNLESS INDICATED ON DRAWING BY HATCHING.
- CUT AND REMOVE OUTSIDE AIR DUCT ONLY AS NECESSARY FOR CONNECTION TO NEW AHU-1. PATCH HOLES IN REMAINING DUCTING.

#### AC-2

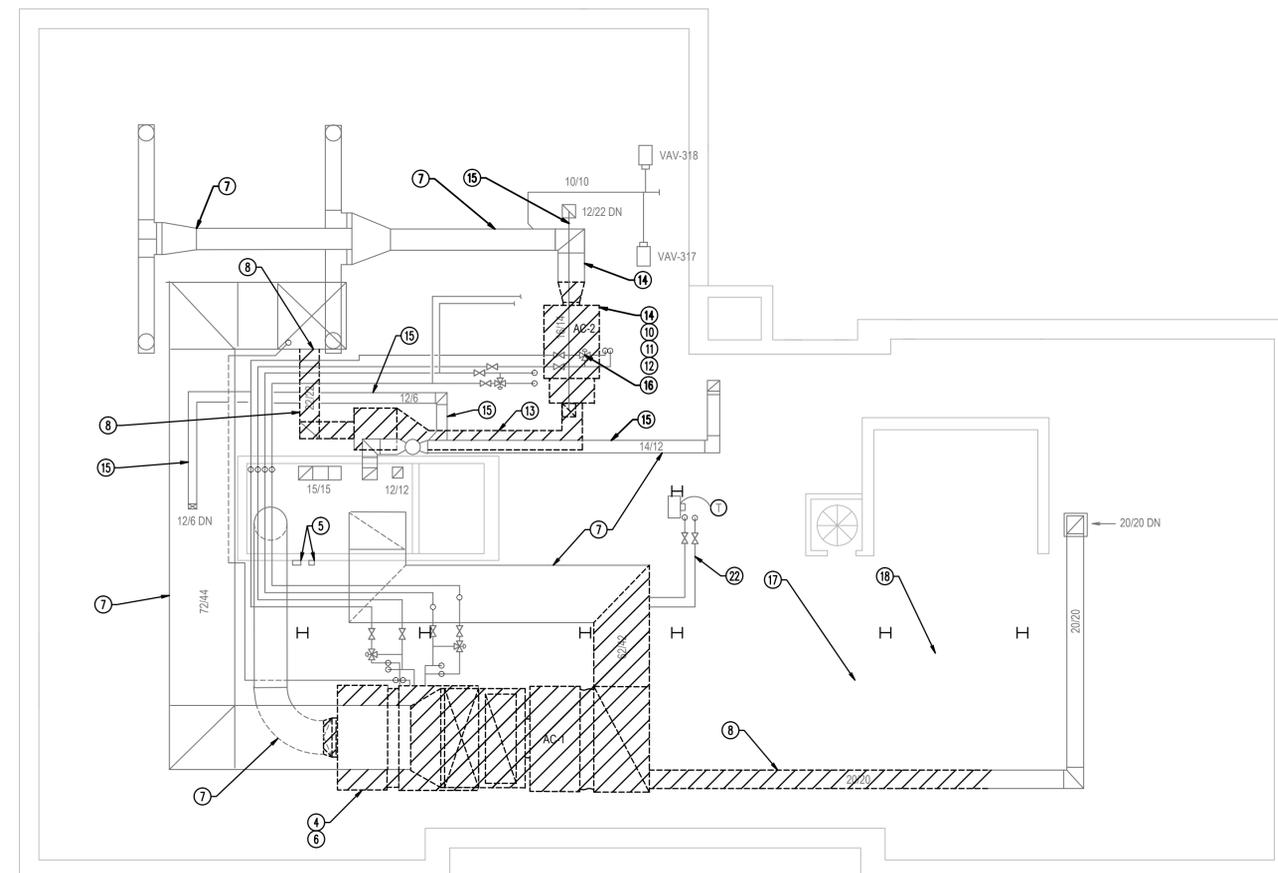
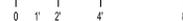
- AHU-2 SHALL BE REMOVED IN ITS ENTIRETY. CUT AND CAP CHILLED WATER LINES TO AC-2.
- REMOVE EXISTING ELECTRIC CONDUIT, WIRING, MOTOR STARTER, DISCONNECT, AND POWER BREAKERS.
- REMOVE EXISTING SUPPLY AND RETURN SMOKE DETECTORS AND WIRING.
- REMOVE EXISTING POWERED CONTROL DAMPERS.
- REMOVE DUCT AS INDICATED BY HATCHING.
- SUPPLY DUCT DOWN STREAM OF AC-2 SHALL REMAIN.
- EXHAUST DUCT AND SYSTEM SHALL REMAIN.
- REMOVE EXISTING THREE-WAY CONTROL VALVE AND STRAINER IN PREPARATION OF INSTALLATION OF ADDITIONAL NEW PIPING, NEW THREE-WAY CONTROL VALVE AND STRAINER.

### ATTIC GENERAL

- REMOVE AND RELOCATE EXISTING VENT, AND ROOF DRAIN PIPING AS NECESSARY.
- REMOVE AND RELOCATE EXISTING FIRE SPRINKLER PIPING TO SPACE ABOVE CEILING ON 3RD FLOOR.
- EXISTING ELEVATOR ROOM CONDENSING UNIT. RELOCATE AS NECESSARY INCLUDING ELECTRIC SERVICE AND REFRIGERATION PIPING.
- PATCH HOLES IN REMAINING DUCTS AS NEEDED.
- PROTECT DUCTS AND INSULATION FROM DAMAGE, DUST, AND DEBRIS.
- REMOVE HORIZONTAL SUPPLY AND RETURN LINES AS NECESSARY FOR INSTALLATION OF RETURN DUCT. HOT WATER LINES ARE TO BE REROUTED.



**1 BASEMENT DEMOLITION**  
 - MED 1.0 SCALE: 1/4" = 1'-0"



**2 ATTIC DEMOLITION**  
 - MED 1.0 SCALE: 1/8" = 1'-0"



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**MONUMENT TERRACE BUILDING  
 AIR HANDLER & CONTROLS REPLACEMENT**



**CITY OF LYNCHBURG  
 LYNCHBURG, VIRGINIA**

sheet title

**FLOOR PLANS**

e-file: 12221A-M

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JPC	JPC	JPC

proj no.	12221A
date	02/22/2016
scale	AS NOTED

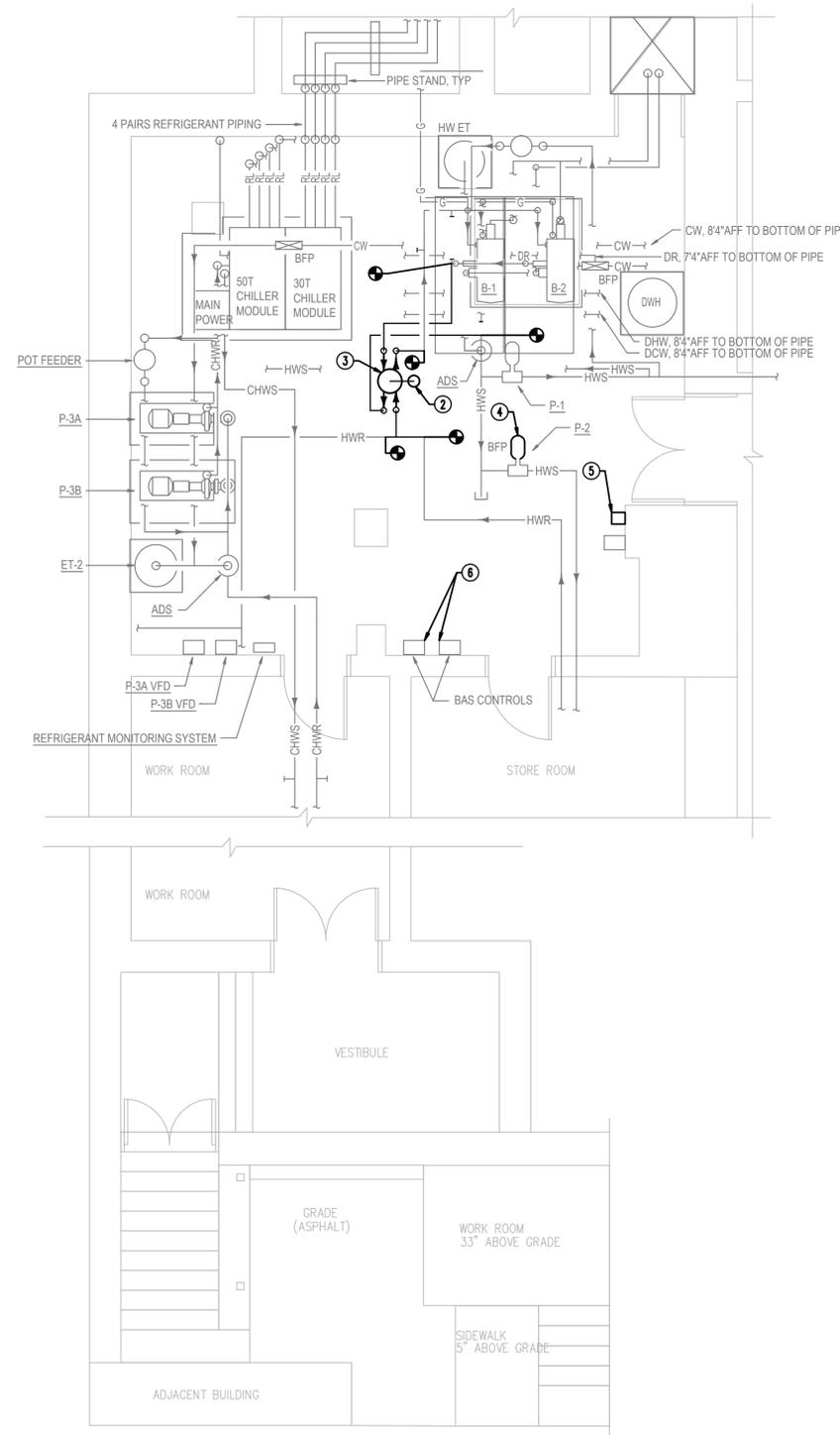
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**MED1.0**

**NEW WORK NOTES** (X)

1. MODIFY AND INSTALL NEW HOT WATER SUPPLY AND RETURN PIPING. ALL NEW PIPES SHALL BE 3" UNLESS OTHERWISE NOTED.
  2. PROVIDE AND INSTALL NEW EXPANSION TANK.
  3. PROVIDE AND INSTALL NEW BUFFER TANK. PROVIDE HOUSEKEEPING PAD FOR FLOOR MOUNTED UNITS.
  4. PROVIDE AND INSTALL A NEW 1 1/2 HP INVERTER DUTY RATED ELECTRIC MOTOR FOR THE EXISTING SECONDARY HEATING WATER PUMP (P2).
  5. PROVIDE AND INSTALL NEW VARIABLE FREQUENCY DRIVE ON PUMP MOTOR P2.
  6. PROVIDE AND INSTALL NEW CONTROLS PER SPECIFICATIONS.
  7. PROVIDE AND INSTALL A NEW PRESSURE SENSOR TO BE INSTALLED NEAR REHEAT BOX 4A IN THE ATTIC IN HEATING WATER PIPING SYSTEM. BUILDING AUTOMATION SYSTEM TO CONTROL PUMP P2 SPEED. VARIABLE SPEED DRIVE TO BE LOCATED AT SITE OF EXISTING DISCONNECT. ALL WIRING SHALL BE INSTALLED IN NEW CONDUIT PER APPLICABLE CODES.
- AIR AND WATER BALANCING
8. BALANCE ALL AIR AND WATER FLOWS PER SCHEDULE.



**1** NEW WORK PLAN - BASEMENT  
SCALE: 1/4" = 1'-0"



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**MONUMENT TERRACE BUILDING**  
**AIR HANDLER & CONTROLS REPLACEMENT**  
 CITY OF LYNCHBURG  
 LYNCHBURG, VIRGINIA



sheet title	
FLOOR PLANS	
e-file: 12221A-M	
des JPC	drf JPC
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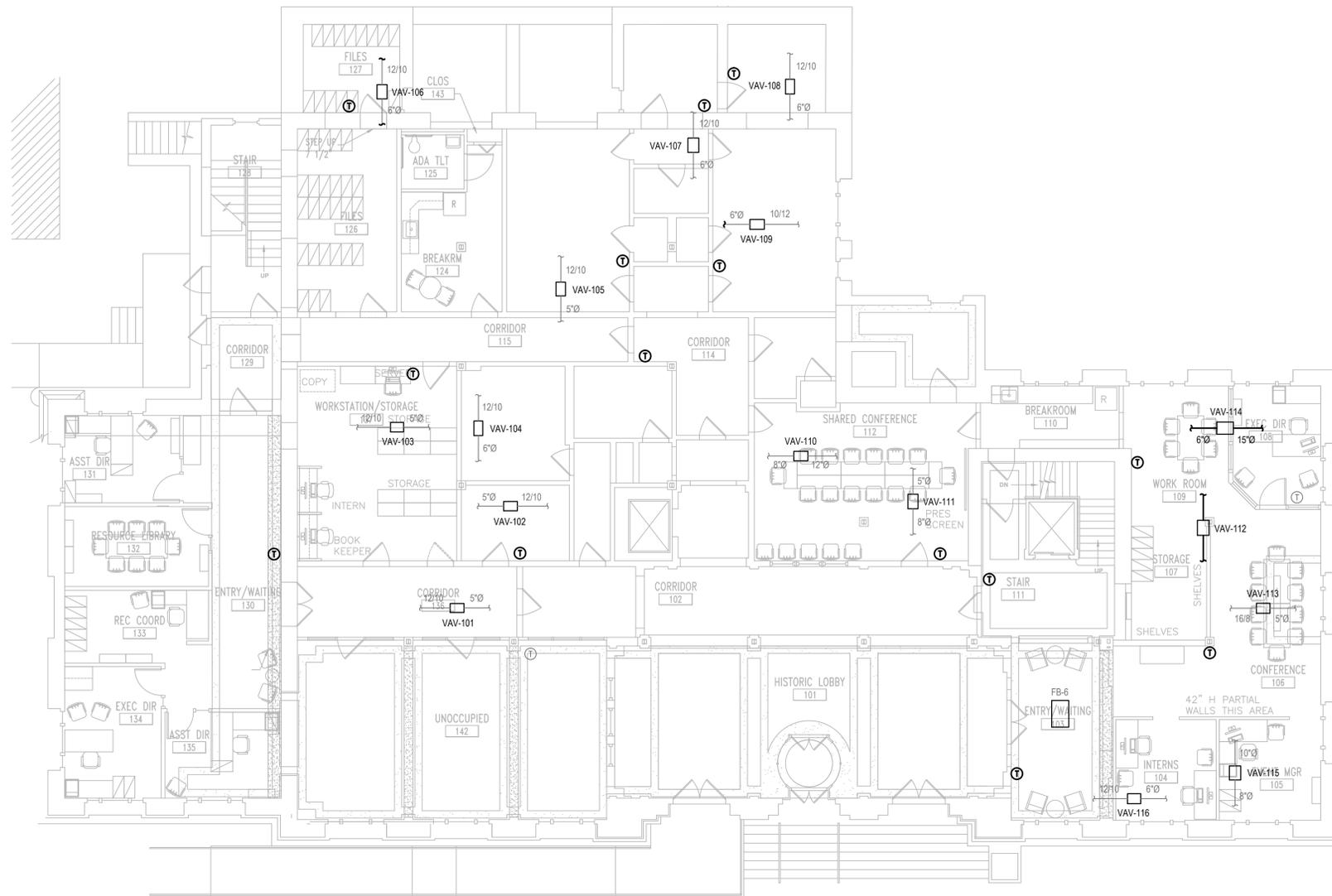
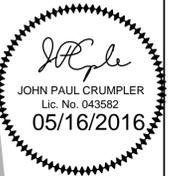
**NEW WORK NOTES** (X)

EXISTING VAV AND FAN POWERED TERMINAL UNITS

1. REMOVE EXISTING TERMINAL UNIT CONTROLLER, DAMPER MOTOR, HEATING WATER VALVE, HEATING WATER VALVE ACTUATOR, HEATING WATER STRAINER, MANUAL INLET ISOLATION VALVE, MANUAL OUTLET ISOLATION VALVE.
  2. INSTALL NEW TERMINAL UNIT CONTROLLER, DAMPER MOTOR, HEATING WATER VALVE, HEATING WATER VALVE ACTUATOR, HEATING WATER STRAINER, MANUAL INLET ISOLATION VALVE, MANUAL OUTLET ISOLATION VALVE.
  3. INSTALL NEW THERMOSTAT FOR EACH VAV AND FAN POWERED TERMINAL UNIT IN LOCATION OF EXISTING THERMOSTAT.
  4. INSTALL NEW DATA CABLE AS REQUIRED TO CONNECT TERMINAL UNIT CONTROLLERS WITH BAS.
- AIR AND WATER BALANCING
5. BALANCE ALL AIR AND WATER FLOWS PER SCHEDULE.



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**1** NEW WORK PLAN - FIRST FLOOR  
SCALE: 1/8" = 1'-0"  
0 2 4 8 16

**MONUMENT TERRACE BUILDING**  
**AIR HANDLER & CONTROLS REPLACEMENT**  
 CITY OF LYNCHBURG  
 LYNCHBURG, VIRGINIA



sheet title

**FIRST FLOOR PLAN**

e-file: 12221A-M1

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**NEW WORK NOTES**

ⓧ

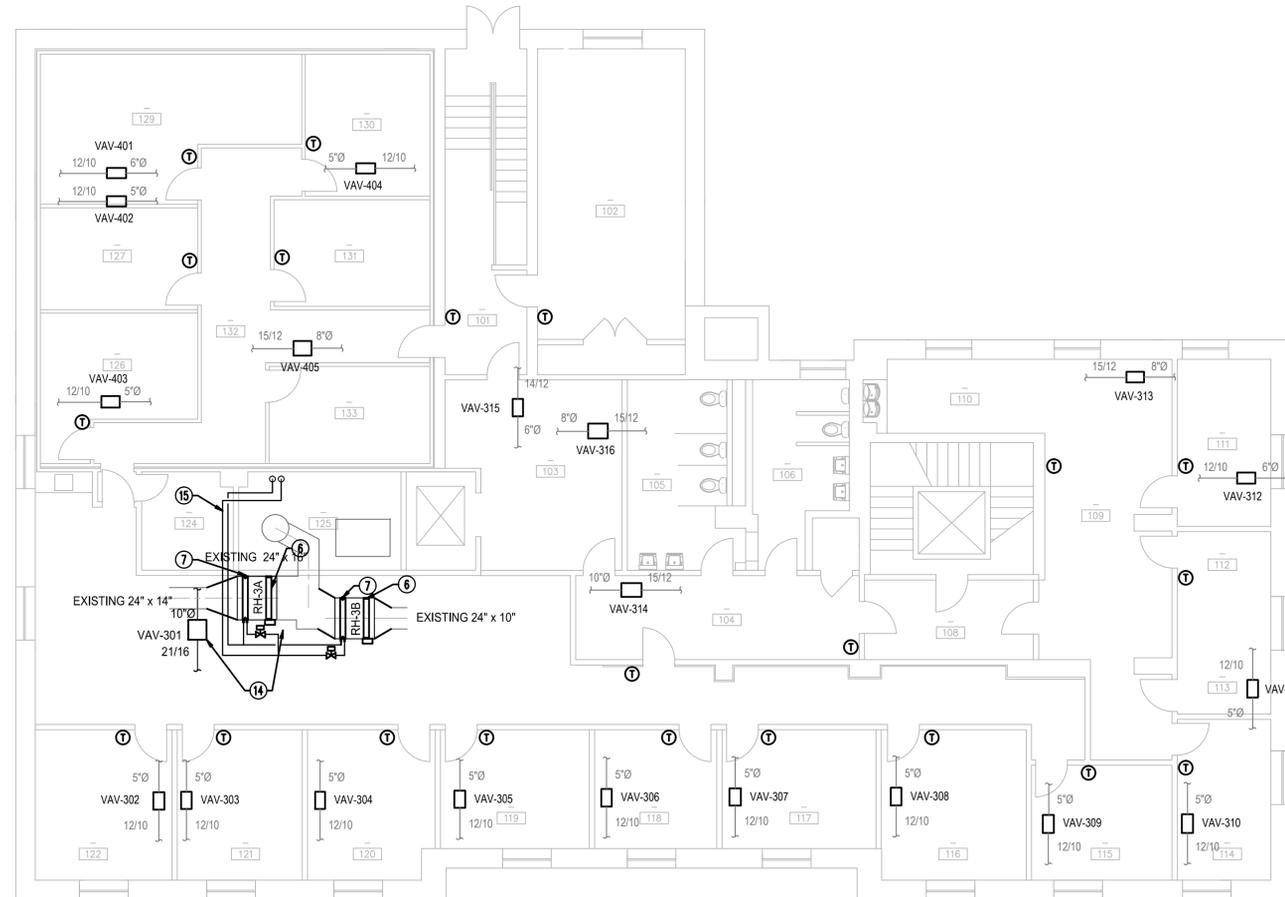
- EXISTING VAV AND TERMINAL UNITS
1. REMOVE EXISTING TERMINAL UNIT CONTROLLER, DAMPER MOTOR, HEATING WATER VALVE, HEATING WATER VALVE ACTUATOR, HEATING WATER STRAINER, MANUAL INLET ISOLATION VALVE, MANUAL OUTLET ISOLATION VALVE.
  2. INSTALL NEW TERMINAL UNIT CONTROLLER, DAMPER MOTOR, HEATING WATER VALVE, HEATING WATER VALVE ACTUATOR, HEATING WATER STRAINER, MANUAL INLET ISOLATION VALVE, MANUAL OUTLET ISOLATION VALVE.
  3. INSTALL NEW THERMOSTAT FOR EACH VAV AND FAN POWERED TERMINAL UNIT IN LOCATION OF EXISTING THERMOSTAT.
  4. INSTALL NEW DATA CABLE AS REQUIRED TO CONNECT TERMINAL UNIT CONTROLLERS WITH BAS.

REHEAT COIL AND ISOLATION DAMPER RH-3A AND RH-3B

5. CUT EXISTING SUPPLY DUCTS ABOVE CEILING AS INDICATED.
6. INSTALL ISOLATION DAMPERS TWO PLACES.
7. INSTALL REHEAT COIL TWO PLACES.
8. INSTALL MANUAL ISOLATION VALVES, STRAINER, AND TWO-WAY CONTROL VALVE FOR EACH REHEAT COIL.
9. INSTALL NEW HEATING WATER SUPPLY AND RETURN LINES CONNECTING TO EXISTING HEATING WATER SUPPLY AND RETURN LINES IN CHASE. PENETRATIONS THROUGH WALL SHALL BE FIRE STOPPED.
10. INSTALL PIPE SUPPORTS AND PIPE INSULATION.
11. INSULATE NEW DUCTING, DUCT TRANSITION, AND ALL EXPOSED PORTIONS OF REHEAT COIL TO PREVENT CONDENSATION.
12. INSTALL NEW DISCHARGE AIR TEMPERATURE SENSOR IN DUCT DOWNSTREAM OF EACH REHEAT COIL.
13. INSTALL CONTROLLER, POWER SUPPLY AND DATA CABLES AS REQUIRED FOR CONTROL VALVES, CONTROLLERS, AND TEMPERATURE SENSORS TO CONNECT ALL COMPONENTS TO BAS.
14. RELOCATE VAV-301 TO BE DOWNSTREAM OF REHEAT BOX 3A. PATCH ANY OPENING IN DUCT DUE TO RELOCATION OF VAV-301.
15. ALL NEW HEATING WATER PIPE IS 1 1/2" UNLESS OTHERWISE NOTED

AIR AND WATER BALANCING

16. BALANCE ALL AIR AND WATER FLOWS PER SCHEDULE.



**1**  
- M1.4  
**NEW WORK PLAN - THIRD FLOOR**  
SCALE: 1/8" = 1'-0"



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**MONUMENT TERRACE BUILDING**  
**AIR HANDLER & CONTROLS REPLACEMENT**  
 CITY OF LYNCHBURG  
 LYNCHBURG, VIRGINIA



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**THIRD FLOOR PLAN**

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NEW WORK NOTES

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EXISTING VAV AND TERMINAL UNITS

1. REMOVE EXISTING TERMINAL UNIT CONTROLLER, DAMPER MOTOR, HEATING WATER VALVE, HEATING WATER VALVE ACTUATOR, HEATING WATER STRAINER, MANUAL INLET ISOLATION VALVE, MANUAL OUTLET ISOLATION VALVE.
2. INSTALL NEW TERMINAL UNIT CONTROLLER, DAMPER MOTOR, HEATING WATER VALVE, HEATING WATER VALVE ACTUATOR, HEATING WATER STRAINER, MANUAL INLET ISOLATION VALVE, MANUAL OUTLET ISOLATION VALVE.
3. INSTALL NEW THERMOSTAT FOR EACH VAV TERMINAL UNIT IN LOCATION OF EXISTING THERMOSTAT LOCATED IN ROOM SERVED.
4. INSTALL NEW DATA CABLE AS REQUIRED TO CONNECT TERMINAL UNIT CONTROLLERS WITH BAS.

REHEAT COIL AND ISOLATION DAMPER RH-4A

5. INSTALL ISOLATION DAMPER NEAR LOCATION OF AC-2 HEATING WATER LINES
6. INSTALL REHEAT COIL
7. INSTALL MANUAL ISOLATION VALVE, STRAINER, AND THREE-WAY CONTROL VALVE FOR REHEAT COIL.
8. INSTALL 1 1/2" NEW HEATING WATER SUPPLY AND RETURN LINES CONNECTING TO EXISTING HEATING WATER SUPPLY AND RETURN LINES IN ATTIC.
9. INSTALL PIPE SUPPORTS AND PIPE INSULATION.
10. INSULATE NEW DUCTING, DUCT TRANSITION, AND ALL EXPOSED PORTIONS OF REHEAT COIL TO PREVENT CONDENSATION.
11. INSTALL NEW DISCHARGE AIR TEMPERATURE SENSOR IN DUCT DOWNSTREAM OF EACH REHEAT COIL.
12. INSTALL NEW HEATING WATER PRESSURE SENSOR IN PIPING NEAR RH-4A
13. INSTALL CONTROLLER, POWER SUPPLY AND DATA CABLES AS REQUIRED FOR CONTROL VALVES, CONTROLLERS, AND TEMPERATURE SENSORS TO CONNECT ALL COMPONENTS TO BAS.

AHU-1

14. INSTALL NEW STEEL FRAMING AND SUPPORTS AS INDICATED IN STRUCTURAL PLAN.
15. INSTALL NEW AHU WITH ADDITIONAL STAINLESS STEEL OVERFLOW PAN BENEATH AHU.
16. INSTALL NEW 4" CHILLED AND 2" HEATING WATER PIPING FROM EXISTING LOCATION IN ATTIC TO NEW COIL LOCATION.
17. INSTALL NEW 2" CONDENSATE DRAIN FROM AHU TO EXISTING DRAIN NEAR VERTICAL CHASE. INSTALL DRAIN LINE FROM OVERFLOW PAN TO DRAIN.
18. INSTALL NEW ELECTRIC SERVICE FROM EXISTING PANEL IN ATTIC TO NEW AHU FAN CONTROLLERS (RETURN FAN EP-1 AND SUPPLY FAN EP-2 PROVIDED WITH AIR HANDLER) AND RUN NEW CONDUIT AND WIRING TO SUPPLY FAN, AND RETURN FAN INCLUDING CONDUIT, DISCONNECT, AND ALL CONDUIT SUPPORTS. EP-1 AND EP-2 ARE SUPPLIED WITH AIR HANDLER. LOCATE EP-1 AND EP-2 NEAR EXISTING ELECTRIC PANEL. INSTALL CONTROLS IN TOTAL FOR NEW AHU INCLUDING SMOKE DETECTORS.
19. INSTALL NEW ELECTRIC SERVICE FROM EXISTING ELECTRIC PANEL, THREE 20 COPPER CONDUCTORS AND ONE 6 AWG EQUIPMENT GROUND IN 3/4" CONDUIT. INSTALL NEW CIRCUIT BREAKER IN PANEL.
20. INSTALL NEW ELECTRIC SERVICE FROM EXISTING ELECTRIC PANEL, THREE 6 AWG COPPER CONDUCTORS AND ONE 10 AWG EQUIPMENT GROUND IN 2" DIAMETER CONDUIT. INSTALL NEW CIRCUIT BREAKER IN PANEL.
21. INSTALL CONDUIT FOR ELECTRIC AND CONTROLS CONNECTION PER MANUFACTURERS INSTRUCTIONS FROM EP 1 AND EP 2 TO AIR HANDLER SUPPLY AND RETURN FANS.
22. MODIFY AND EXTEND EXISTING SUPPLY, RETURN, AND OUTSIDE AIR DUCTING TO CONNECT TO NEW AHU. EXISTING SUPPLY AND OUTSIDE AIR DUCTS MAY HAVE A LINER PRESENT, SEAL OR OTHERWISE PROTECT LINER AT JOINT TO PREVENT AIR LEAKAGE AND DAMAGE TO LINER DUE TO AIR FLOW OVER THE LINER EDGE. NEW SUPPLY AND OUTSIDE AIR DUCTS TO BE PROVIDED WITH SIMILAR DUCT LINING AS EXISTING DUCT.
23. EXTEND RETURN AIR DUCT FORMERLY CONNECTED TO AC-2 TO CONNECT TO AHU-1 RETURN DUCT. INSTALL BALANCING DAMPER IN NEW DUCT.
24. EXTEND SUPPLY DUCT FORMERLY CONNECTED TO AC-2 TO CONNECT TO AHU-1 SUPPLY DUCT. INSTALL BALANCING DAMPER IN NEW DUCT. EXISTING DUCT MAY HAVE A LINER PRESENT, SEAL OR OTHERWISE PROTECT LINER AT JOINT TO PREVENT AIR LEAKAGE AND DAMAGE TO LINER DUE TO AIR FLOW OVER THE LINER EDGE. NEW SUPPLY DUCT TO BE PROVIDED WITH SIMILAR DUCT LINING AS EXISTING DUCT.

CHILLED WATER PIPING

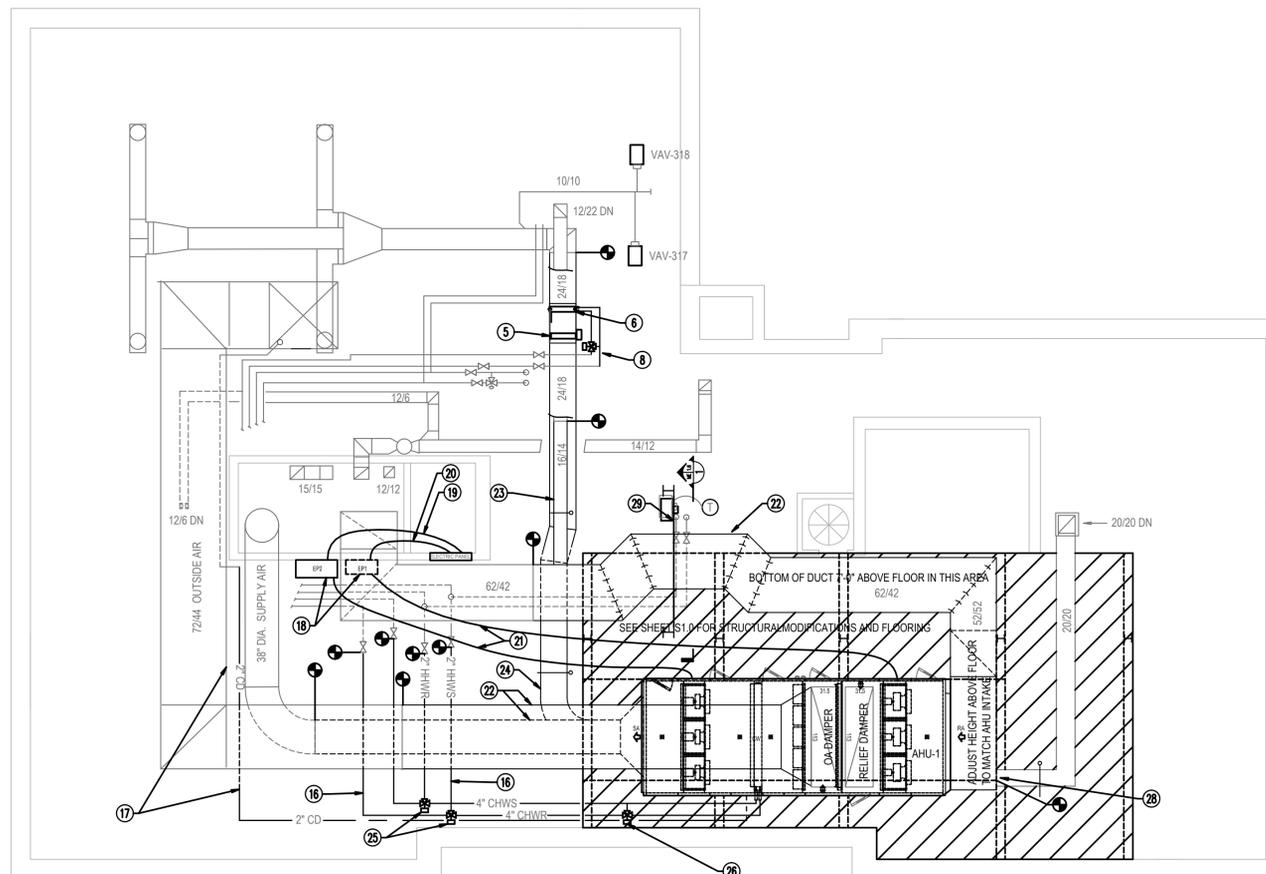
25. INSTALL TWO NEW THREE WAY CONTROL VALVES IN CHILLED WATER LINES, AND CONNECT TO HEATING WATER SUPPLY AND RETURN FOR USE IN FREEZE PROTECTION.
26. INSTALL NEW THREE WAY CONTROL VALVE IN CHILLED WATER LINE TO CONTROL CHILLED WATER FLOW TO COIL.
27. INSTALL PIPE SUPPORTS AND PIPE INSULATION ON ALL NEW PIPING. REPAIR OR REPLACE ANY DAMAGED INSULATION AND SUPPORTS ON EXISTING PIPING.

HOT WATER UNIT HEATER

29. INSTALL NEW HOT WATER PIPING OR RELOCATE EXISTING PIPING TO HOT WATER UNIT HEATER. DUCT WILL INTERFERE WITH PIPE LOCATION.

AIR AND WATER BALANCING

30. BALANCE ALL AIR AND WATER FLOWS PER SCHEDULE.



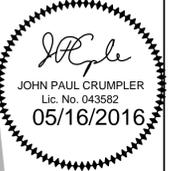
1 NEW WORK PLAN - ATTIC  
SCALE: 1/8" = 1'-0"

REVISION 1

- A. INSTALL NEW AHU WITH ADDITIONAL STAINLESS STEEL OVERFLOW PAN BENEATH AHU.
- B. REROUTED RETURN AIR DUCT THROUGH FRAMING REQUIRING DEMOLITION AND REROUTING OF HW SUPPLY AND RETURN PIPING TO UNIT HEATER
- C. ADDED SECTION 1.
- D. CORRECTED IDENTIFICATION OF SUPPLY DUCT. PREVIOUSLY MARKED 38" DIAMETER OUTSIDE AIR DUCT



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MONUMENT TERRACE BUILDING  
AIR HANDLER & CONTROLS REPLACEMENT



CITY OF LYNCHBURG  
LYNCHBURG, VIRGINIA

sheet title

ATTIC PLAN

e-file: 12221A-M1

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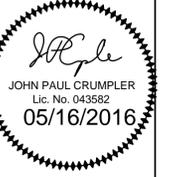
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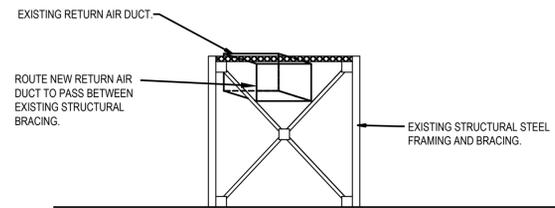
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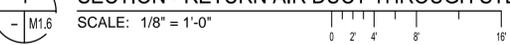
MONUMENT TERRACE BUILDING  
AIR HANDLER & CONTROLS REPLACEMENT



CITY OF LYNCHBURG  
LYNCHBURG, VIRGINIA



**1** SECTION - RETURN AIR DUCT THROUGH STEEL FRAMING  
SCALE: 1/8" = 1'-0"



sheet title

SECTIONS

e-file: 12221A-M1

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SEQUENCE OF OPERATIONS

CONVENTIONS

1. UNLESS OTHERWISE NOTED THE FOLLOWING CONVENTIONS SHALL APPLY FOR ALL HVAC SYSTEM SEQUENCES OF OPERATION CONTAINED HEREIN.
2. IF A SENSED CHANGE RESULTS IN A PRESCRIBED ACTION, THE OPPOSITE OF THE SENSED CHANGE SHALL RESULT IN THE OPPOSITE ACTION.
3. OCCUPIED/UNOCCUPIED 365 DAY SCHEDULING, ROOM NAMES/NUMBERS, EQUIPMENT NAMES/NUMBERS, POINT/SENSOR NAMES, AND GRAPHICS SHALL BE COORDINATED WITH THE OWNER PRIOR TO COMPLETION OF CONSTRUCTION.
4. SPECIFIC DIAGNOSTIC MESSAGES, AT A MINIMUM, SHALL INCLUDE:
  - a. SENSOR FAILURE - IDENTIFY SENSOR.
  - b. PUMP IN HAND OPERATION - IDENTIFY PUMP.
  - c. PUMP FAILURE - IDENTIFY PUMP.
  - d. OUT OF LIMIT FOR NORMAL SYSTEM OPERATION - ALL SENSORS.
  - e. LOSS OF COMMUNICATION - IDENTIFY COMPONENT.
5. ALL POINTS, COMPLETE WITH GRAPHICS, SHALL BE ACCESSIBLE REMOTELY VIA THE CITY OF LYNCHBURG NETWORK. ALL SET POINTS SHALL BE ADJUSTABLE THROUGH THE EMS. TYPICAL SET POINTS SHALL BE AS FOLLOWS:
  - a. OCCUPIED SET POINT RANGE FOR ROOM TEMPERATURES IS 70°F DB HEATING, 75°F DB COOLING, AND 50% RH.
  - b. UNOCCUPIED SET POINT SHALL BE 55°F DB HEATING, 85°F DB COOLING AND 50%RH.
  - c. ALARM RANGE: 5°F DB ABOVE OR BELOW SET POINT.
  - d. MINIMUM ON/OFF TIME: 5/10 MINUTES.
6. CALL FOR COOLING/HEATING: SPACE TEMPERATURE RISES/FALLS 1°F FROM COOLING/HEATING SET POINT.
7. CALL FOR DEHUMIDIFICATION: SPACE RELATIVE HUMIDITY RISES 5% FROM DEHUMIDIFICATION SET POINT.
8. UPON DETECTION OF ELECTRICAL LOSS OF PHASE, PHASE REVERSAL, OR HIGH OR LOW VOLTAGE THE EMS SHALL STOP ALL MOTOR DRIVEN EQUIPMENT UNDER ITS CONTROL. UPON RESTORATION OF POWER, THE EMS SHALL ENABLE COMPONENTS TO RESUME OPERATION IN STAGES, TO AVOID UNNECESSARY ELECTRICAL DEMAND SPIKES.
9. THE EMS SYSTEM SHALL BE INSTALLED TO FAIL SAFE TO HEATING MODE.
  - a. HEATING WATER SYSTEM SHALL FAIL WITH LEAD PUMP AND LEAD BOILER ENABLED.
  - b. CHILLED WATER SYSTEM SHALL FAIL WITH CHILLER, COOLING TOWER, CHILLED WATER PUMPS, CONDENSER WATER PUMPS, AND ASSOCIATED COMPONENTS DISABLED.
  - c. ALL AIR HANDING SYSTEMS SHALL FAIL ON WITH THE OUTSIDE AIR DAMPERS CLOSED, RETURN DAMPERS OPEN, AND HEATING WATER VALVES OPEN WHERE APPLICABLE.
  - d. ALL INTERLOCKED FANS SHALL BE DE-ENERGIZED WITH DAMPERS CLOSED.
10. PROVIDE BUILDING COLOR CODED FLOOR PLANS, COMPLETE WITH COLOR CHANGING NUMERICAL VALUES BASED ON ZONE TEMPERATURE/SET POINT DIFFERENCE, ZONED BY HVAC EQUIPMENT. EQUIPMENT TAGS SHALL BE COORDINATED WITH THE OWNER SHORTLY AFTER CONSTRUCTION IS COMPLETE.
11. REFER TO SPECIFICATIONS FOR ADDITIONAL EMS PERFORMANCE REQUIREMENTS.



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MONUMENT TERRACE BUILDING  
AIR HANDLER & CONTROLS REPLACEMENT

CITY OF LYNCHBURG  
LYNCHBURG, VIRGINIA

sheet title  
**CONTROLS**

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des	drf	chk
JPC	JPC	JPC

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# SEQUENCE OF OPERATIONS

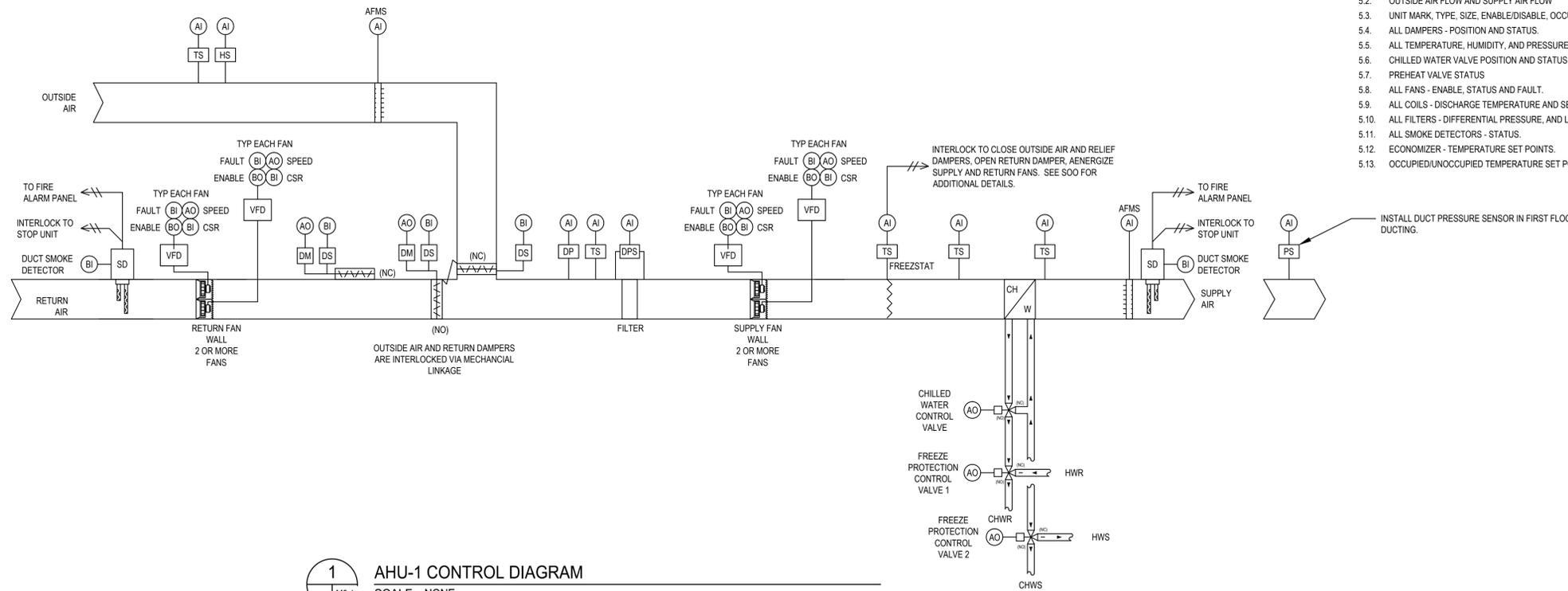
## NEW AHU-1 - SEQUENCE OF OPERATION.

1. THE AHU SHALL BE PROVIDED WITH A CONTROLLER WHICH SHALL CONTROL THE UNIT AS DIRECTED BY THE BAS OR UPON A FAILURE OF THE BASE IN A STAND-ALONE MODE.
2. THE AHU SHALL OPERATE IN OCCUPIED AND UNOCCUPIED MODE ACCORDING TO BAS SCHEDULING.
  - 2.1. BAS SCHEDULING SHALL BE CAPABLE OF 365 DAY SCHEDULING. OCCUPIED MODE SHALL INITIALLY BE ESTABLISHED AS FOLLOWS:
    - 2.1.1. MONDAY - FRIDAY FROM 7AM UNTIL 7PM (ADJ)
    - 2.1.2. UNOCCUPIED MODE SHALL BE ALL OTHER TIMES AND DURING CITY-OBSERVED HOLIDAYS. COORDINATE WITH OWNER FOR FINAL SCHEDULING.
3. OCCUPIED OPERATION:
  - 3.1. ALL FUNCTIONS SHALL BE ENABLED.
  - 3.2. THE RETURN AIR DAMPERS SHALL FIRST MODULATE OPEN, AND THE SUPPLY AND RETURN FAN WALLS SHALL ENERGIZE AT THEIR MINIMUM SPEED.
  - 3.3. SUPPLY FAN WALL OPERATION:
    - 3.3.1. WHENEVER THE SUPPLY FAN WALL IS ENERGIZED, THE VARIABLE SPEED DRIVES SHALL MODULATE TO MAINTAIN THE DOWN DUCT PRESSURE SETPOINT DETERMINED DURING TAB (4 IN WG) ADJUSTABLE.
    - 3.3.2. THE RETURN FAN SPEED SHALL TRACK THE SUPPLY FAN SPEED WITH AN OFFSET DETERMINED AT TAB TO PROVIDE PROPER CORRECT PRESSURIZATION
    - 3.3.2. IF THE SUPPLY OR FANS SPEED DECREASES TO THEIR MINIMUM SPEED AND THE PRESSURE REMAINS ABOVE SETPOINT FOR MORE THAN 5 MINUTES (ADJUSTABLE), ONE FAN LOCATED IN THE CENTER OF THE FAN WALL ARRAY WILL TURN OFF, AND THE REMAINING FANS SHALL CONTINUE TO OPERATE TO MAINTAIN STATIC PRESSURE. ADDITIONAL FANS SHALL TURN OFF AS REQUIRED FOLLOWING THE SAME PROCESS.
    - 3.3.3. IF ONE OR MORE FANS IN THE SUPPLY ARRAY OR THE RETURN ARRAY ARE OFF, AND THE ENERGIZED FANS ARE OPERATING AT 60% (ADJ) OR GREATER SPEED FOR FIVE MINUTES (ADJ), THEN ONE OF THE FANS THAT ARE OFF SHALL ENERGIZE.
  - 3.4. DAMPER OPERATION:
    - 3.4.1. THE OUTSIDE AIR DAMPERS AND RETURN AIR DAMPERS SHALL BE INTERLOCKED WITH A MECHANICAL LINKAGE OR THROUGH CONTROLS SO THAT WHEN THE OUTSIDE AIR DAMPER IS N% OPEN, THE RETURN DAMPER IS (100-N)% OPEN.
    - 3.4.2. THE RELIEF DAMPER POSITION SHALL TRACK THE RETURN AIR DAMPER POSITION SO THAT WHEN THE RETURN DAMPER IS FULLY CLOSED, THE RELIEF DAMPER IS FULLY OPEN.
    - 3.4.3. SUPPLY AND RETURN FANS ON FAN WALL SHALL BE FITTED WITH IBACKDRAFT DAMPERS THAT WILL CLOSE WITH THE FAN IS OFF AND OPEN WHEN THE FAN IS ENERGIZED.
  - 3.5. AN OUTSIDE AIR FLOW MONITORING STATION SHALL BE PROVIDED IN THE OUTSIDE AIR DUCT. THE BAS SHALL MODULATE THE OUTSIDE AIR AND RETURN AIR DAMPERS TO ACHIEVE THE OUTSIDE AIR FLOW SETPOINT.
  - 3.6. ECONOMIZER: IF THE UNIT IS IN COOLING MODE AND THE DRY BULB TEMPERATURE OF THE OUTDOOR AIR TEMPERATURE IS LESS THAN 69° (ADJ) F, THE OUTSIDE AND RETURN AIR DAMPER SHALL MODULATE UP TO 100% OUTSIDE AIR TO SATISFY THE UNIT SUPPLY SET POINT. IF MORE COOLING IS REQUIRED, THE TWO-WAY CHILLED WATER CONTROL VALVE SHALL MODULATE AS REQUIRED TO ACHIEVE THE DAT SETPOINT. 55F ADJUSTABLE.
  - 3.7. DEHUMIDIFICATION MODE:
    - 3.7.1. THE UNIT SHALL MONITOR THE DEW POINT OF THE MIXED AIR. IF THE DEW POINT EXCEEDS 53°F (ADJ.), THE UNIT SHALL BE INDEXED INTO DEHUMIDIFICATION MODE, OVERRIDING ANY SUPPLY AIR TEMPERATURE RESET.
    - 3.7.2. THE TWO-WAY CHILLED WATER CONTROL VALVE SHALL MODULATE TO MAINTAIN 53°F DB DOWNSTREAM OF THE COOLING COIL.

1. UNOCCUPIED OPERATION:
  - 1.1. WHEN THE BAS INITIATES UNOCCUPIED OPERATION, THE UNIT SHALL TURN OFF AND CLOSE ITS OUTSIDE AND RELIEF AIR DAMPERS; THE RETURN AIR DAMPER SHALL MODULATE FULLY OPEN.
  - 1.2. THE AHU SHALL CYCLE ON, AS DIRECTED BY THE BAS, TO MAINTAIN UNOCCUPIED SPACE HEATING AND COOLING SET POINTS DETERMINED BY AVERAGING ALL ASSOCIATED SPACE TEMPERATURE SENSORS.
  - 1.3. UNOCCUPIED COOLING MODE:
    - 1.3.1. MECHANICAL COOLING: IF THE OA DB TEMPERATURE IS GREATER THAN OR EQUAL TO THE NOMINAL OCCUPIED COOLING SET POINT OR THE OA DEW POINT TEMPERATURE IS GREATER THAN 53°F (ADJ), THE TWO WAY CHILLED WATER CONTROL VALVE SHALL MODULATE TO MAINTAIN DISCHARGE AIR TEMPERATURE SET POINT OF 55°F (ADJ). THE OUTSIDE AIR AND RELIEF DAMPERS SHALL REMAIN CLOSED AND THE RETURN AIR DAMPER SHALL REMAIN OPEN.
    - 1.3.2. ECONOMIZER: IF THE OA DB TEMPERATURE IS BETWEEN THE NOMINAL DAYTIME SET POINT AND 55°F AND THE OA DEW POINT IS BELOW 53°F, THE OA AND RA DAMPERS SHALL OPEN TO PROVIDE FREE COOLING. THE RA AND OA THE TWO-WAY CHILLED WATER VALVE SHALL BE LOCKED OUT. IF THE NOMINAL OCCUPIED COOLING SET POINT IS REACHED, DETERMINED BY AVERAGING ALL ASSOCIATED SPACE TEMPERATURE SENSORS, THE SYSTEM SHALL SHUT DOWN.
    - 1.3.3. PRE COOLING: IF THE OA TEMPERATURE IS BELOW 55°F DB, THE EXHAUST FAN SHALL ENERGIZE AND THE OUTSIDE AIR AND RETURN AIR DAMPERS SHALL MODULATE TO MAINTAIN A SUPPLY AIR TEMPERATURE OF 55°F. THE TWO-WAY CHILLED WATER CONTROL VALVE SHALL BE LOCKED OUT. IF THE NOMINAL OCCUPIED COOLING SET POINT IS REACHED, DETERMINED BY AVERAGING ALL ASSOCIATED SPACE TEMPERATURE SENSORS, THE SYSTEM SHALL SHUT DOWN.
    - 1.3.4. IF THE OUTSIDE AIR TEMPERATURE IS LESS THAN 20°F(ADJ), THE OUTSIDE AIR DAMPER SHALL REMAIN FULLY CLOSED DURING UNOCCUPIED OPERATION.
  - 1.4. UNOCCUPIED HEATING MODE:
    - 1.4.1. IF A SPACE TEMPERATURE SENSOR FALLS BELOW THE UNOCCUPIED HEATING SET POINT, THE OUTSIDE AIR DAMPER SHALL REMAIN CLOSED AND THE RETURN AIR DAMPER SHALL REMAIN OPEN. THE SUPPLY FAN SHALL ENERGIZE TO MAINTAIN DUCT PRESSURE SETPOINT.
    - 1.4.2. OUTSIDE AIR LOCKOUT: IF THE OUTSIDE AIR TEMPERATURE IS LESS THAN 34°F (ADJUSTABLE), THE OUTSIDE AIR DAMPER SHALL REMAIN FULLY CLOSED DURING ALL UNOCCUPIED PERIODS AND UNOCCUPIED OPERATION.
  - 1.5. TEMPORARY OCCUPIED STATE
    - 1.5.1. OCCUPANTS SHALL BE ABLE TO RETURN THE SYSTEM TO A TEMPORARY OCCUPIED STATE FOR 4 HOURS (ADJUSTABLE) BY DEPRESSING A BUTTON LOCATED IN THE ZONE. WHEN REQUESTED BY AN OCCUPANT, THE SYSTEM AND ZONES SHALL RETURN TO A NORMAL OCCUPIED SETTING.
    - 1.5.2. THE OUTSIDE AIR AND RETURN AIR DAMPERS SHALL ADJUST TO PROVIDE THE FOLLOWING FLOW OF OUTSIDE AIR DURING TEMPORARY OCCUPANCY PERIODS. IF MORE THAN ONE ZONE IS TEMPORARILY OCCUPIED, THE VOLUME OF OUTSIDE AIR FLOW IS THE SUM OF THE FLOWS FOR EACH DAMPER.
 

DAMPER 1A	566 CFM OUTSIDE AIR
DAMPER 2A	475 CFM OUTSIDE AIR
DAMPER 2B	417 CFM OUTSIDE AIR
DAMPER 3A	571 CFM OUTSIDE AIR
DAMPER 3B	173 CFM OUTSIDE AIR
DAMPER 4A	280 CFM OUTSIDE AIR

2. MORNING PRE-COOL / WARM-UP
  - 2.1. ON A TRANSITION FROM UNOCCUPIED OPERATION TO MORNING PRE-COOL / WARM-UP, THE UNIT SHALL BRING ALL ZONES/SPACES TO OCCUPIED SET POINTS. THE SUPPLY FAN SHALL ENERGIZE. THE OUTSIDE AIR DAMPER SHALL BE CLOSED. THE RETURN AIR DAMPER SHALL MODULATE FULLY OPEN.
    - 2.1.1. PRE-COOL: THE TWO-WAY CHILLED WATER CONTROL VALVE SHALL MODULATE IF COOLING IS REQUIRED BASED ON AN AVERAGE OF ALL ZONE TEMPERATURES
    - 2.1.2. WARM-UP: IF HEAT IS REQUIRED, HEAT SHALL BE SUPPLIED BY THE VAV TERMINAL UNIT REHEAT COILS, AND THE ZONE REHEAT COIL VALVES. SEE ZONE REHEAT SEQUENCE OF OPERATION
  - 2.2. OPTIMUM START: THE BAS SHALL INSTITUTE OPTIMUM START STRATEGIES FOR MORNING WARM-UP/PRE-COOL FUNCTIONS. EQUIPMENT SHALL START EARLY ENOUGH TO RESTORE OCCUPIED SET POINTS, DETERMINED BY AVERAGING ALL ASSOCIATED SPACE TEMPERATURE SENSORS, BY THE START OF OCCUPIED OPERATION. THE BAS SHALL STAGGER THE START-UP OF EQUIPMENT TO AVOID UNNECESSARY ELECTRICAL SPIKES.
3. SMOKE DETECTION SHUTDOWN: SHOULD EITHER DUCT SMOKE DETECTOR DETECT SMOKE, THE UNIT SHALL SHUTDOWN, AND AN ALARM SHALL BE GENERATED AT THE BAS AND FIRE ALARM CONTROL PANEL.
4. FREEZE PROTECTION: A HARD-WIRED, FREEZESTAT SHALL BE ELECTRICALLY INTERLOCKED WITH THE UNIT OPERATION. IF THE FREEZESTAT SET POINT OF 38 (ADJ) °F IS TRIPPED, THE OUTSIDE AIR DAMPER SHALL FULLY CLOSE, THE RETURN AIR DAMPER SHALL FULLY OPEN, THE ZONE REHEAT DAMPERS SHALL FULLY OPEN, THE SUPPLY FAN SHALL ENERGIZE, AND THE RETURN FAN SHALL ENERGIZE. THE CHILLED WATER VALVE SHALL MODULATE FULLY OPEN. THE FREEZE PROTECTION THREE-WAY VALVES IN THE ATTIC SHALL MODULATE POSITION TO SUPPLY HEATING WATER TO THE CHILLED WATER COIL. THE HEATING WATER PUMPS SHALL ENABLE. ALL VAV TERMINAL UNITS SHALL MODULATE TO THEIR MAXIMUM AIR FLOW SETTINGS. THE ZONE REHEAT HOT WATER VALVES SHALL MODULATE CLOSED. THE UNIT SHALL CONTINUE TO OPERATE IN FREEZE PROTECTION MODE UNTIL A MANUAL RESET IS IMPLEMENTED.
5. SYSTEM GRAPHIC DISPLAY:
  - 5.1. OUTSIDE AIR DRY BULB TEMPERATURE, DEW POINT TEMPERATURE, AND RELATIVE HUMIDITY (CALCULATED) - GLOBAL.
  - 5.2. OUTSIDE AIR FLOW AND SUPPLY AIR FLOW
  - 5.3. UNIT MARK, TYPE, SIZE, ENABLE/DISABLE, OCCUPANCY SCHEDULE, AND OVERRIDE STATUS.
  - 5.4. ALL DAMPERS - POSITION AND STATUS.
  - 5.5. ALL TEMPERATURE, HUMIDITY, AND PRESSURE SENSORS.
  - 5.6. CHILLED WATER VALVE POSITION AND STATUS.
  - 5.7. PREHEAT VALVE STATUS
  - 5.8. ALL FANS - ENABLE, STATUS AND FAULT.
  - 5.9. ALL COILS - DISCHARGE TEMPERATURE AND SET POINT.
  - 5.10. ALL FILTERS - DIFFERENTIAL PRESSURE, AND LOADED PRESSURE SET POINT.
  - 5.11. ALL SMOKE DETECTORS - STATUS.
  - 5.12. ECONOMIZER - TEMPERATURE SET POINTS.
  - 5.13. OCCUPIED/UNOCCUPIED TEMPERATURE SET POINTS



**1**  
AHU-1 CONTROL DIAGRAM  
SCALE: NONE

- NOTES:
1. CHW CONTROL VALVES SHALL BE FURNISHED BY EMS CONTRACTOR, INSTALLED BY MECHANICAL CONTRACTOR.
  2. UNIT CONTROLLER, ALL DAMPERS, ACTUATORS, AND INTERNAL UNIT SENSORS SHALL PROVIDED BY EQPT MFR - FACTORY INSTALLED, TESTED, AND CALIBRATED, UNO.
  3. FREEZESTAT SHALL BE HARDWIRE INTERLOCKED TO UNIT.
  4. LOCATE DUCT STATIC PRESSURE SENSOR IN THE FIRST FLOOR SUPPLY DUCT SUPPLY MAIN, APPROXIMATELY 75% OF THE DISTANCE FROM THE FIRST TO MOST REMOTE AIR TERMINAL UNIT. FIELD VERIFY EXACT LOCATION.
  5. NOTE THAT BOTH SUPPLY AND RETURN FAN WALL WILL HAVE 2 OR MORE INDIVIDUAL FANS AND MOTOR; EACH FAN MOTOR SHALL BE PROVIDED WITH ITS OWN DEDICATED VFD.

- REVISION 1
- A. MODIFIED SEQUENCE OF OPERATION TO DESCRIBE FAN WALL OPERATION.
  - B. MODIFIED NOTES TO DESCRIBE FAN WALL AND ASSOCIATED VFD FOR EACH FAN MOTOR.



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MONUMENT TERRACE BUILDING  
AIR HANDLER & CONTROLS REPLACEMENT

CITY OF LYNCHBURG  
LYNCHBURG, VIRGINIA

sheet title  
**CONTROLS**

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des	drf	chk
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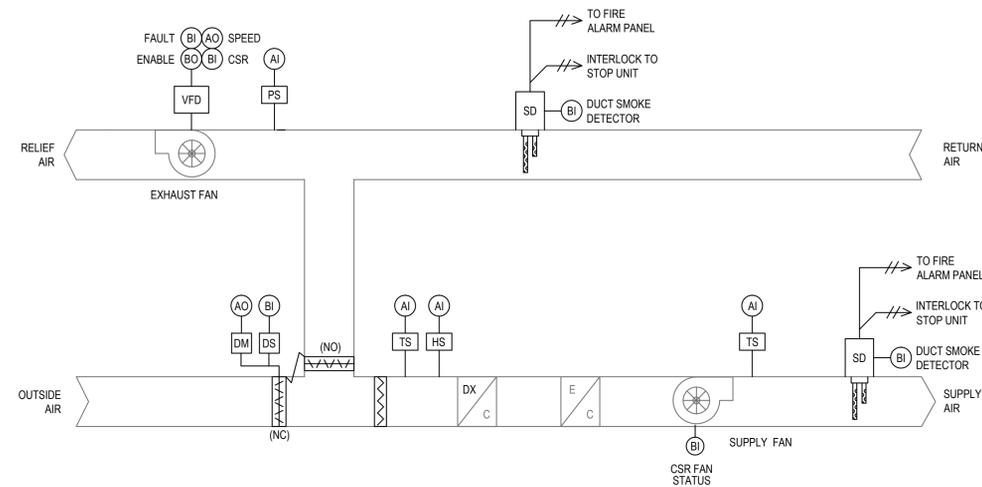
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# SEQUENCE OF OPERATIONS

## EXISTING ROOF TOP UNIT - SEQUENCE OF OPERATION:

1. THE RTU SHALL BE PROVIDED WITH A CONTROLLER WHICH SHALL CONTROL THE UNIT AS DIRECTED BY THE BAS OR UPON A FAILURE OF THE BASE IN A STAND-ALONE MODE.
2. THE RTU SHALL OPERATE IN OCCUPIED AND UNOCCUPIED MODE ACCORDING TO BAS SCHEDULING.
  - 2.1. BAS SCHEDULING SHALL BE CAPABLE OF 365 DAY SCHEDULING. OCCUPIED MODE SHALL INITIALLY BE ESTABLISHED AS FOLLOWS:
    - 2.1.1. MONDAY - FRIDAY FROM 7AM UNTIL 7PM (ADJ)
    - 2.1.2. UNOCCUPIED MODE SHALL BE ALL OTHER TIMES AND DURING CITY-OBSERVED HOLIDAYS. COORDINATE WITH OWNER FOR FINAL SCHEDULING.
3. OCCUPIED OPERATION:
  - 3.1. THE SUPPLY AND EXHAUST FANS SHALL START, AND THE OUTSIDE AIR, RETURN AIR AND RELIEF AIR DAMPERS SHALL OPEN. ALL FUNCTIONS SHALL BE ENABLED.
  - 3.2. EXHAUST FAN OPERATION:
    - 3.2.1. THE EXHAUST FAN SHALL BE PROVIDED WITH A VARIABLE FREQUENCY DRIVE AND PRESSURE SENSOR LOCATED PRIOR TO THE FAN INLET. WHENEVER THE EXHAUST FAN IS ENERGIZED, THE VARIABLE SPEED DRIVE SHALL MODULATE TO MAINTAIN THE PRESSURE SETPOINT DETERMINED DURING TAB (-1 IN WG) ADJUSTABLE.
    - 3.2.2. EXHAUST FAN SHALL REMAIN OFF IF THE OUTSIDE AIR DAMPERS ARE NOT FULLY OPEN AS INDICATED BY AN ENDSWITCH ON THE OUTSIDE AIR DAMPERS.
  - 3.3. DAMPER OPERATION:
    - 3.3.1. THE OUTSIDE AIR DAMPERS AND RETURN AIR DAMPERS SHALL BE INTERLOCKED WITH A MECHANICAL LINKAGE OR THROUGH CONTROLS SO THAT WHEN THE OUTSIDE AIR DAMPER IS N% OPEN, THE RETURN DAMPER IS (100-N)% OPEN.
  - 3.4. ECONOMIZER: IF THE UNIT IS IN COOLING MODE AND THE DRY BULB TEMPERATURE OF THE OUTDOOR AIR TEMPERATURE IS LESS THAN 69° (ADJ) F, THE OUTSIDE AND RETURN AIR DAMPER SHALL MODULATE UP TO 100% OUTSIDE AIR TO SATISFY THE UNIT SUPPLY SET POINT. IF MORE COOLING IS REQUIRED, THE DX MECHANICAL COOLING VALVE SHALL BE ENABLED AS NECESSARY. THE EXHAUST FAN SHALL REMAIN ENERGIZED.
  - 3.5. DEHUMIDIFICATION MODE:
    - 3.5.1. THE UNIT SHALL MONITOR THE DEW POINT OF THE MIXED AIR. IF THE DEW POINT EXCEEDS 53°F (ADJ), THE UNIT SHALL BE INDEXED INTO DEHUMIDIFICATION MODE, OVERRIDING ANY SUPPLY AIR TEMPERATURE RESET.
    - 3.5.2. THE DX MECHANICAL COOLING SYSTEM SHALL ENERGIZE.
4. UNOCCUPIED OPERATION:
  - 4.1. WHEN THE BAS INITIATES UNOCCUPIED OPERATION, THE UNIT SHALL TURN OFF AND CLOSE ITS OUTSIDE AIR DAMPER; THE RETURN AIR DAMPER SHALL MODULATE FULLY OPEN. THE SUPPLY AND EXHAUST FANS SHALL BE DE-ENERGIZED.
  - 4.2. THE RTU SHALL CYCLE ON, AS DIRECTED BY THE BAS, TO MAINTAIN UNOCCUPIED SPACE HEATING AND COOLING SET POINTS DETERMINED BY AVERAGING ALL ASSOCIATED SPACE TEMPERATURE SENSORS.
  - 4.3. UNOCCUPIED COOLING MODE:
    - 4.3.1. DX MECHANICAL COOLING: IF THE OA DB TEMPERATURE IS GREATER THAN OR EQUAL TO THE NOMINAL OCCUPIED COOLING SET POINT OR THE OA DEW POINT TEMPERATURE IS GREATER THAN 53°F (ADJ), THE DX MECHANICAL COOLING SYSTEM SHALL ENERGIZE. THE OUTSIDE AIR AND RELIEF DAMPERS SHALL REMAIN CLOSED AND THE RETURN AIR DAMPER SHALL REMAIN OPEN. THE EXHAUST FAN SHALL REMAIN OFF.
    - 4.3.2. ECONOMIZER: IF THE OA DB TEMPERATURE IS BETWEEN THE NOMINAL DAYTIME SET POINT AND 55°F AND THE OA DEW POINT IS BELOW 53°F, THE OA AND RA DAMPERS SHALL OPEN TO PROVIDE FREE COOLING. THE DX MECHANICAL COOLING SHALL BE LOCKED OUT. IF THE NOMINAL OCCUPIED COOLING SET POINT IS REACHED, DETERMINED BY AVERAGING ALL ASSOCIATED SPACE TEMPERATURE SENSORS, THE SYSTEM SHALL SHUT DOWN.
    - 4.3.3. PRE COOLING: IF THE OA TEMPERATURE IS BELOW 55°F DB, THE EXHAUST FAN SHALL ENERGIZE AND THE OUTSIDE AIR AND RETURN AIR DAMPERS SHALL MODULATE TO MAINTAIN A SUPPLY AIR TEMPERATURE OF 55°F. THE DX MECHANICAL COOLING SYSTEM SHALL BE LOCKED OUT. IF THE NOMINAL OCCUPIED COOLING SET POINT IS REACHED, DETERMINED BY AVERAGING ALL ASSOCIATED SPACE TEMPERATURE SENSORS, THE SYSTEM SHALL SHUT DOWN.
  - 4.4. UNOCCUPIED HEATING MODE:
    - 4.4.1. IF A SPACE TEMPERATURE SENSOR FALLS BELOW THE UNOCCUPIED HEATING SET POINT, THE OUTSIDE AIR DAMPER SHALL REMAIN CLOSED AND THE RETURN AIR DAMPER SHALL REMAIN OPEN. THE SUPPLY FAN SHALL ENERGIZE. THE EXHAUST FAN SHALL REMAIN OFF. THE ELECTRIC HEATING COILS SHALL ENERGIZE TO MAINTAIN UNOCCUPIED HEATING SET POINT DETERMINED BY AVERAGING ALL ASSOCIATED SPACE TEMPERATURE SENSORS.
    - 4.4.2. OCCUPANTS SHALL BE ABLE TO RETURN THE SYSTEM TO A TEMPORARY OCCUPIED STATE FOR 4 HOURS (ADJUSTABLE) BY DEPRESSING A BUTTON LOCATED IN THE ZONE. WHEN REQUESTED BY AN OCCUPANT, THE SYSTEM AND ZONES SHALL RETURN TO A NORMAL OCCUPIED SETTING.
5. MORNING WARM-UP/PRE-COOL: ON A TRANSITION FROM UNOCCUPIED OPERATION TO MORNING WARM-UP/PRE-COOL, THE UNIT SHALL BRING ALL ZONES/SPACES TO OCCUPIED SET POINTS. THE SUPPLY FAN SHALL ENERGIZE. THE OUTSIDE AIR DAMPER AND EXHAUST DAMPERS SHALL BE CLOSED AND THE EXHAUST FAN SHALL BE OFF. THE RETURN AIR DAMPER SHALL MODULATE FULLY OPEN. THE DX MECHANICAL COOLING SYSTEM SHALL ENERGIZE IF COOLING IS REQUIRED OR THE ELECTRIC HEAT SHALL ENERGIZE IF HEAT IS REQUIRED. PRE COOLING USING OA AS DESCRIBED IN PARAGRAPH 4.3.3. SHALL BE ALLOWED.
  - 5.1. OPTIMUM START: THE BAS SHALL INSTITUTE OPTIMUM START STRATEGIES FOR MORNING WARM-UP/PRE-COOL FUNCTIONS. EQUIPMENT SHALL START EARLY ENOUGH TO RESTORE OCCUPIED SET POINTS, DETERMINED BY AVERAGING ALL ASSOCIATED SPACE TEMPERATURE SENSORS, BY THE START OF OCCUPIED OPERATION. THE BAS SHALL STAGGER THE START-UP OF EQUIPMENT TO AVOID UNNECESSARY ELECTRICAL SPIKES.
6. SMOKE DETECTION SHUTDOWN: SHOULD EITHER DUCT SMOKE DETECTOR DETECT SMOKE, THE UNIT SHALL SHUTDOWN, AND AN ALARM SHALL BE GENERATED AT THE BAS AND FIRE ALARM CONTROL PANEL.
7. SYSTEM GRAPHIC DISPLAY:
  - 7.1. OUTSIDE AIR DRY BULB TEMPERATURE, DEW POINT TEMPERATURE, AND RELATIVE HUMIDITY (CALCULATED) - GLOBAL.
  - 7.2. UNIT MARK, TYPE, SIZE, ENABLE/DISABLE, OCCUPANCY SCHEDULE, AND OVERRIDE STATUS.
  - 7.3. ALL DAMPERS - POSITION AND STATUS.
  - 7.4. ALL TEMPERATURE, HUMIDITY, AND PRESSURE SENSORS.
  - 7.5. DX MECHANICAL COOLING STATUS.
  - 7.6. ELECTRIC HEATING COIL STATUS.
  - 7.7. ALL FANS - ENABLE, STATUS AND FAULT.
  - 7.8. ALL COILS - DISCHARGE TEMPERATURE AND SET POINT.
  - 7.9. ALL FILTERS - DIFFERENTIAL PRESSURE, AND LOADED PRESSURE SET POINT.
  - 7.10. ALL SMOKE DETECTORS - STATUS.
  - 7.11. ECONOMIZER - TEMPERATURE SET POINTS.
  - 7.12. OCCUPIED/UNOCCUPIED TEMPERATURE SETPOINTS.



**1** ROOFTOP UNIT RTU-1  
SCALE: NONE  
NOTES:  
1.

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05/16/2016

MONUMENT TERRACE BUILDING  
AIR HANDLER & CONTROLS REPLACEMENT

CITY OF LYNCHBURG,  
LYNCHBURG, VIRGINIA

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**M2.2**

# SEQUENCE OF OPERATIONS

## VAV AIR TERMINALS - COOLING ONLY:

### 1. GENERAL:

- 1.1. THE VARIABLE AIR VOLUME (VAV) TERMINAL UNIT SHALL BE PROVIDED WITH A CONTROLLER WHICH SHALL CONTROL THE UNIT AS DIRECTED BY THE BAS OR UPON A FAILURE OF THE BAS IN A STAND-ALONE MODE.
- 1.2. THE VAV SHALL OPERATE IN OCCUPIED AND UNOCCUPIED MODE ACCORDING TO BAS SCHEDULING. BAS SCHEDULING SHALL BE CAPABLE OF 365 DAY SCHEDULING.
- 1.3. OCCUPIED MODE SHALL INITIALLY BE ESTABLISHED AS FOLLOWS:  
 MONDAY - FRIDAY FROM 7AM UNTIL 7PM (ADJ).  
 UNOCCUPIED MODE SHALL BE ALL OTHER TIMES AND DURING CITY-OBSERVED HOLIDAYS.  
 COORDINATE WITH THE OWNER FOR FINAL SCHEDULING .

### 2. SET POINTS:

MODE	COOLING SETPOINT	HEATING SET POINT
OCCUPIED	75(ADJ)F	70(ADJ)F
UN OCCUPIED	80(ADJ)F	60(ADJ)

### 3. OCCUPIED ZONE REHEAT VALVE CLOSED

- 3.1. UPON A RISE IN SPACE TEMPERATURE ABOVE THE SPACE TEMPERATURE SET POINT, THE VAV DAMPER WILL MODULATE OPEN TO ITS MAXIMUM AIR FLOW SET POINT AS INDICATED IN THE SCHEDULE ON SHEET M0.0 AS REQUIRED TO MAINTAIN THE ROOM TEMPERATURE SET POINT OF 75 (ADJ)°F
- 3.2. UPON A FALL IN SPACE TEMPERATURE TO BELOW THE SPACE TEMPERATURE SEPOINT, THE VAV WILL MODULATE CLOSED TO ITS MINIMUM AIR FLOW SETPOINT AS INDICATED ON THE SCHEDULES.

### 4. OCCUPIED ZONE REHEAT VALVE OPEN

- 4.1. UPON A RISE IN SPACE TEMPERATURE ABOVE THE SPACE TEMPERATURE SET POINT, THE VAV DAMPER WILL MODULATE CLOSED TO ITS MINIMUM AIR FLOW SET POINT AS INDICATED IN THE SCHEDULE ON SHEET M0.0 AS REQUIRED TO MAINTAIN THE ROOM TEMPERATURE SET POINT OF 75 (ADJ)°F
- 4.2. UPON A FALL IN SPACE TEMPERATURE TO BELOW THE SPACE TEMPERATURE SETPOINT, THE VAV WILL MODULATE OPEN TO ITS MAXIMUM AIR FLOW SETPOINT AS INDICATED ON THE SCHEDULES.

### 5. UNOCCUPIED MODE:

- 5.1. THE AIR HANDLING UNIT SERVING THE VAVS WILL BE OFF DURING UNOCCUPIED MODE.
- 5.2. UNOCCUPIED COOLING: IF ROOM TEMPERATURE RISES TO 80°F (ADJ) , THE CORRESPONDING AIR HANDLING UNIT WILL BE COMMANDED TO OPERATE IN UNOCCUPIED MODE, AND THE VAV DAMPER WILL MODULATE OPEN AS REQUIRED TO LOWER ROOM TEMPERATURE TO 75°F (ADJ). ONCE ROOM TEMPERATURE IS SATISFIED A SIGNAL WILL BE SENT TO THE CORRESPONDING AIR HANDLING UNIT TO SHUT DOWN.
- 5.3. UNOCCUPIED HEATING: IF ROOM TEMPERATURE FALLS TO 60°F (ADJ) CORRESPONDING AIR HANDLING UNIT WILL BE COMMANDED TO OPERATE IN UNOCCUPIED MODE. THE VAV DAMPER WILL GO TO ITS MINIMUM AIR FLOW POSITION AS INDICATED ON THE SCHEDULES.

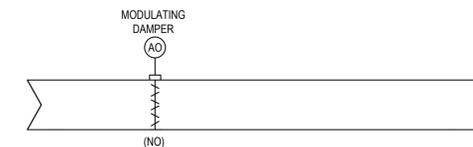
### 6. MORNING WARM UP AND COOL DOWN

- 6.1. ALL VAV TERMINAL UNITS WILL OPEN TO THEIR MAXIMUM POSITION DURING MORNING WARM UP AND COOL DOWN.

### 7. TEMPORARY OCCUPANCY OVERRIDE: IF AN OCCUPANT REQUESTS A TIMED OCCUPANCY OVERRIDE DURING UNOCCUPIED MODE OR MORNING WARMUP, THE AIR HANDLER SERVING THE VAV AND THE VAV SHALL OPERATE IN NORMAL OCCUPIED MODE FOR THE DURATION OF THE TIMED OVERRIDE. THE TIMED OVERRIDE PERIOD SHALL BE 4 HOURS (ADJ).

### 8. SYSTEM GRAPHIC DISPLAY

- 8.1. OUTSIDE AIR DRY BULB TEMPERATURE, DEW POINT TEMPERATURE, AND RELATIVE HUMIDITY (CALCULATED) - GLOBAL
- 8.2. ROOM NUMBERS SERVED BY VAV, UNIT MARK, TYPE, SIZE, ENABLE/DISABLE, OCCUPANCY SCHEDULE, AND OVERRIDE STATUS
- 8.3. DAMPER POSITION AND STATUS
- 8.4. AIR FLOW: MAXIMUM AND MINIMUM SET POINTS
- 8.5. TEMPERATURE: ZONE
- 8.6. HUMIDITY: ZONE HUMIDITY SENSOR (IF ANY)
- 8.7. OCCUPIED/UNOCCUPIED SET POINTS



1  
- M2.3

VAV BOX COOLING ONLY  
SCALE: NONE

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05/16/2016



MONUMENT TERRACE BUILDING  
AIR HANDLER & CONTROLS REPLACEMENT

CITY OF LYNCHBURG  
LYNCHBURG, VIRGINIA

sheet title

**CONTROLS**

e-file: 12221A-M2

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**M2.3**

## SEQUENCE OF OPERATIONS

### VAV AIR TERMINALS - WITH HOT WATER REHEAT:

#### 1. GENERAL:

- 1.1. THE VARIABLE AIR VOLUME (VAV) TERMINAL UNIT SHALL BE PROVIDED WITH A CONTROLLER WHICH SHALL CONTROL THE UNIT AS DIRECTED BY THE BAS OR UPON A FAILURE OF THE BAS IN A STAND-ALONE MODE.
- 1.2. THE VAV SHALL OPERATE IN OCCUPIED AND UNOCCUPIED MODE ACCORDING TO BAS SCHEDULING. BAS SCHEDULING SHALL BE CAPABLE OF 365 DAY SCHEDULING.
- 1.3. OCCUPIED MODE SHALL INITIALLY BE ESTABLISHED AS FOLLOWS:  
MONDAY - FRIDAY FROM 7AM UNTIL 7PM (ADJ).  
UNOCCUPIED MODE SHALL BE ALL OTHER TIMES AND DURING CITY-OBSERVED HOLIDAYS.  
COORDINATE WITH THE OWNER FOR FINAL SCHEDULING .

#### 2. SET POINTS:

MODE	COOLING SET POINT	HEATING SET POINT
OCCUPIED	75(ADJ)F	70(ADJ)F
UN OCCUPIED	80(ADJ)F	60(ADJ)

#### 3. OCCUPIED ZONE REHEAT VALVE CLOSED

UPON A RISE IN SPACE TEMPERATURE ABOVE THE SPACE TEMPERATURE SET POINT, THE VAV DAMPER WILL MODULATE OPEN TO ITS MAXIMUM AIR FLOW SET POINT AS INDICATED IN THE SCHEDULE ON SHEET M0.0 AS REQUIRED TO MAINTAIN THE ROOM TEMPERATURE SET POINT OF 75 (ADJ)\*F

- 3.1. UPON A FALL IN SPACE TEMPERATURE TO BELOW THE SPACE TEMPERATURE SEPOINT, THE VAV WILL MODULATE CLOSED TO ITS MINIMUM AIR FLOW SET POINT AS INDICATED ON THE SCHEDULES.
- 3.2. IF THE VAV IS AT ITS MINIMUM AIR FLOW SET POINT AND SPACE TEMPERATURE CONTINUES TO FALL THE HEATING WATER VALVE WILL MODULATE MORE OPEN TO MAINTAIN ROOM TEMPERATURE SET POINT OF 70 (ADJ \*F).

#### 4. OCCUPIED ZONE REHEAT VALVE OPEN

- 4.1. UPON A RISE IN SPACE TEMPERATURE ABOVE THE SPACE TEMPERATURE SET POINT, THE VAV DAMPER WILL MODULATE CLOSED TO ITS MINIMUM POSITION AS REQUIRED TO MAINTAIN THE ROOM TEMPERATURE SET POINT OF 75 (ADJ)\*F
- 4.2. UPON A FALL IN SPACE TEMPERATURE TO BELOW THE SPACE TEMPERATURE SET POINT, THE VAV WILL MODULATE OPEN TO ITS MAXIMUM AIR FLOW POSITION SCHEDULES.
- 4.3. IF THE VAV IS AT ITS MAXIMUM AIR FLOW SET POINT AND SPACE TEMPERATURE CONTINUES TO FALL THE THE HEATING WATER VALVE WILL MODULATE MORE OPEN TO MAINTAIN ROOM TEMPERATURE SET POINT OF 70 (ADJ \*F).

#### 5. UNOCCUPIED MODE:

- 5.1. THE AIR HANDLING UNIT SERVING THE VAVS WILL BE OFF DURING UNOCCUPIED MODE.
- 5.2. UNOCCUPIED COOLING: IF ROOM TEMPERATURE RISES TO 80°F (ADJ), THE CORRESPONDING AIR HANDLING UNIT WILL BE COMMANDED TO OPERATE IN UNOCCUPIED MODE, AND THE VAV DAMPER WILL MODULATE OPEN AS REQUIRED TO LOWER ROOM TEMPERATURE TO 75°F (ADJ). ONCE ROOM TEMPERATURE IS SATISFIED A SIGNAL WILL BE SENT TO THE CORRESPONDING AIR HANDLING UNIT TO SHUT DOWN.
- 5.3. UNOCCUPIED HEATING: IF ROOM TEMPERATURE FALLS TO 60°F (ADJ) CORRESPONDING AIR HANDLING UNIT WILL BE COMMANDED TO OPERATE IN UNOCCUPIED MODE. THE VAV DAMPER WILL GO TO ITS MINIMUM AIR FLOW POSITION AS INDICATED ON THE SCHEDULES, THE HEATING WATER VALVE WILL MODULATE MORE OPEN TO RAISE ROOM TEMPERATURE TO 65°F (ADJ). ONCE ROOM TEMPERATURE IS SATISFIED A SIGNAL WILL BE SENT TO CORRESPONDING AIR HANDLING UNIT TO SHUT DOWN.

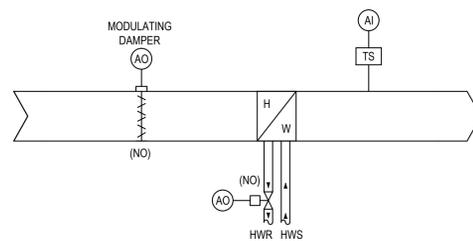
#### 6. MORNING WARM UP AND COOL DOWN

- 6.1. ALL VAV TERMINAL UNITS WILL OPEN TO THEIR MAXIMUM POSITION DURING MORNING WARM UP AND COOL DOWN. THE ELECTRIC HEATING COIL WILL ENERGIZE AS REQUIRED TO MEET ROOM TEMPERATURE SET POINT.

7. TEMPORARY OCCUPANCY OVERRIDE: IF AN OCCUPANT REQUESTS A TIMED OCCUPANCY OVERRIDE DURING UNOCCUPIED MODE OR MORNING WARMUP, THE AIR HANDLER SERVING THE VAV AND THE VAV SHALL OPERATE IN NORMAL OCCUPIED MODE FOR THE DURATION OF THE TIMED OVERRIDE. THE TIMED OVERRIDE PERIOD SHALL BE 4 HOURS (ADJ).

#### 8. SYSTEM GRAPHIC DISPLAY

- 8.1. OUTSIDE AIR DRY BULB TEMPERATURE, DEW POINT TEMPERATURE, AND RELATIVE HUMIDITY (CALCULATED) - GLOBAL
- 8.2. ROOM NUMBERS SERVED BY VAV, UNIT MARK, TYPE, SIZE, ENABLE/DISABLE, OCCUPANCY SCHEDULE, AND OVERRIDE STATUS
- 8.3. DAMPER POSITION AND STATUS
- 8.4. AIR FLOW: MAXIMUM AND MINIMUM SET POINTS.
- 8.5. TEMPERATURE: SUPPLY AIR AND ZONE
- 8.6. HUMIDITY: ZONE HUMIDITY SENSOR (IF ANY)
- 8.7. OCCUPIED/UNOCCUPIED SET POINTS



**1** VAV BOX WITH HOT WATER REHEAT  
SCALE: NONE

## SEQUENCE OF OPERATIONS

### VAV AIR TERMINALS - WITH ELECTRIC REHEAT:

#### 1. GENERAL:

- 1.1. THE VARIABLE AIR VOLUME (VAV) TERMINAL UNIT SHALL BE PROVIDED WITH A CONTROLLER WHICH SHALL CONTROL THE UNIT AS DIRECTED BY THE BAS OR UPON A FAILURE OF THE BAS IN A STAND-ALONE MODE.
- 1.2. THE VAV SHALL OPERATE IN OCCUPIED AND UNOCCUPIED MODE ACCORDING TO BAS SCHEDULING. BAS SCHEDULING SHALL BE CAPABLE OF 365 DAY SCHEDULING.
- 1.3. OCCUPIED MODE SHALL INITIALLY BE ESTABLISHED AS FOLLOWS:  
MONDAY - FRIDAY FROM 7AM UNTIL 7PM (ADJ).  
UNOCCUPIED MODE SHALL BE ALL OTHER TIMES AND DURING CITY-OBSERVED HOLIDAYS.  
COORDINATE WITH THE OWNER FOR FINAL SCHEDULING .

#### 2. SET POINTS:

MODE	COOLING SETPOINT	HEATING SETPOINT
OCCUPIED	75(ADJ)F	70(ADJ)F
UN OCCUPIED	80(ADJ)F	60(ADJ)

#### 3. OCCUPIED ZONE REHEAT VALVE CLOSED

3.1. UPON A RISE IN SPACE TEMPERATURE ABOVE THE SPACE TEMPERATURE SETPOINT, THE VAV DAMPER WILL MODULATE OPEN TO ITS MAXIMUM AIR FLOW POSITION AS REQUIRED TO MAINTAIN THE ROOM TEMPERATURE SET POINT OF 75 (ADJ)\*F

- 3.2. UPON A FALL IN SPACE TEMPERATURE TO BELOW THE SPACE TEMPERATURE SEPOINT, THE VAV WILL MODULATE CLOSED TO ITS MINIMUM AIR FLOW SETPOINT AS INDICATED ON THE SCHEDULES.
- 3.3. IF THE VAV IS AT ITS MINIMUM AIR FLOW SET POINT AND SPACE TEMPERATURE CONTINUES TO FALL, THE VAV DAMPER WILL MODULATE TO ITS MAXIMUM FLOW POSITION AND THE ELECTRIC HEATING COIL WILL ENERGIZE TO MAINTAIN ROOM TEMPERATURE SET POINT OF 70 (ADJ \*F).

#### 4. OCCUPIED ZONE REHEAT VALVE OPEN

- 4.1. UPON A RISE IN SPACE TEMPERATURE ABOVE THE SPACE TEMPERATURE SETPOINT, THE VAV DAMPER WILL MODULATE CLOSED TO ITS MINIMUM AIR FLOW POSITION AS REQUIRED TO MAINTAIN THE ROOM TEMPERATURE SET POINT OF 75 (ADJ)\*F
- 4.2. UPON A FALL IN SPACE TEMPERATURE TO BELOW THE SPACE TEMPERATURE SEPOINT, THE VAV WILL MODULATE OPEN TO ITS MAXIMUM AIR FLOW POSITION
- 4.3. IF THE VAV IS AT ITS MAXIMUM AIR FLOW SET POINT AND SPACE TEMPERATURE CONTINUES TO FALL THE ELECTRIC HEATING COIL WILL ENERGIZE TO MAINTAIN ROOM TEMPERATURE SET POINT OF 70 (ADJ \*F).

#### 5. UNOCCUPIED MODE:

- 5.1. THE AIR HANDLING UNIT SERVING THE VAVS WILL BE OFF DURING UNOCCUPIED MODE.
- 5.2. UNOCCUPIED COOLING: IF ROOM TEMPERATURE RISES TO 80°F (ADJ), THE CORRESPONDING AIR HANDLING UNIT WILL BE COMMANDED TO OPERATE IN UNOCCUPIED MODE, AND THE VAV DAMPER WILL MODULATE OPEN AS REQUIRED TO LOWER ROOM TEMPERATURE TO 75°F (ADJ). ONCE ROOM TEMPERATURE IS SATISFIED A SIGNAL WILL BE SENT TO THE CORRESPONDING AIR HANDLING UNIT TO SHUT DOWN.
- 5.3. UNOCCUPIED HEATING: IF ROOM TEMPERATURE FALLS TO 60°F (ADJ) CORRESPONDING AIR HANDLING UNIT WILL BE COMMANDED TO OPERATE IN UNOCCUPIED MODE. THE VAV DAMPER WILL GO TO ITS MAXIMUM AIR FLOW POSITION, THE ELECTRIC HEATING COIL WILL ENERGIZE TO RAISE ROOM TEMPERATURE TO 65°F (ADJ). ONCE ROOM TEMPERATURE IS SATISFIED A SIGNAL WILL BE SENT TO CORRESPONDING AIR HANDLING UNIT TO SHUT DOWN.

#### 6. MORNING WARM UP AND COOL DOWN

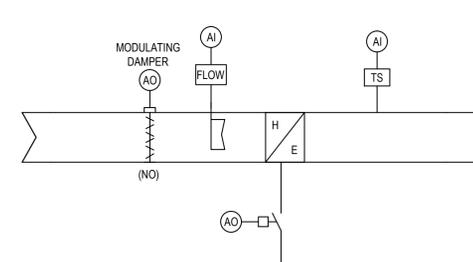
- 6.1. ALL VAV TERMINAL UNITS WILL OPEN TO THEIR MAXIMUM POSITION DURING MORNING WARM UP AND COOL DOWN. THE ELECTRIC HEATING COIL WILL ENERGIZE AS REQUIRED TO MEET ROOM TEMPERATURE SET POINT.

7. TEMPORARY OCCUPANCY OVERRIDE: IF AN OCCUPANT REQUESTS A TIMED OCCUPANCY OVERRIDE DURING UNOCCUPIED MODE OR MORNING WARMUP, THE AIR HANDLER SERVING THE VAV AND THE VAV SHALL OPERATE IN NORMAL OCCUPIED MODE FOR THE DURATION OF THE TIMED OVERRIDE. THE TIMED OVERRIDE PERIOD SHALL BE 4 HOURS (ADJ).

8. ELECTRIC REHEAT SHALL NOT ENERGIZE UNLESS THE FLOW SENSOR INDICATES THAT SUFFICIENT FLOW IS PRESENT TO PREVENT ELECTRIC REHEAT FROM OVERHEATING.

#### 9. SYSTEM GRAPHIC DISPLAY

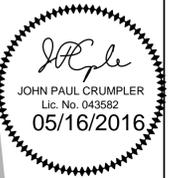
- 9.1. OUTSIDE AIR DRY BULB TEMPERATURE, DEW POINT TEMPERATURE, AND RELATIVE HUMIDITY (CALCULATED) - GLOBAL
- 9.2. ROOM NUMBERS SERVED BY VAV, UNIT MARK, TYPE, SIZE, ENABLE/DISABLE, OCCUPANCY SCHEDULE, AND OVERRIDE STATUS
- 9.3. DAMPER POSITION AND STATUS
- 9.4. AIR FLOW: MAXIMUM AND MINIMUM SET POINTS.
- 9.5. TEMPERATURE: SUPPLY AIR AND ZONE
- 9.6. HUMIDITY: ZONE HUMIDITY SENSOR (IF ANY)
- 9.7. OCCUPIED/UNOCCUPIED SET POINTS



**2** VAV BOX WITH ELECTRIC REHEAT  
SCALE: NONE

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MONUMENT TERRACE BUILDING  
AIR HANDLER & CONTROLS REPLACEMENT



CITY OF LYNCHBURG  
LYNCHBURG, VIRGINIA

sheet title

**CONTROLS**

e-file: 12221A-M2

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proj no.	12221A
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**M2.4**

## SEQUENCE OF OPERATIONS

### FAN POWERED VAV AIR TERMINALS - WITH HOT WATER REHEAT:

#### 1. GENERAL:

- 1.1. THE VARIABLE AIR VOLUME (VAV) TERMINAL UNIT SHALL BE PROVIDED WITH A CONTROLLER WHICH SHALL CONTROL THE UNIT AS DIRECTED BY THE BAS OR UPON A FAILURE OF THE BAS IN A STAND-ALONE MODE.
- 1.2. THE VAV SHALL OPERATE IN OCCUPIED AND UNOCCUPIED MODE ACCORDING TO BAS SCHEDULING. BAS SCHEDULING SHALL BE CAPABLE OF 365 DAY SCHEDULING.
- 1.3. OCCUPIED MODE SHALL INITIALLY BE ESTABLISHED AS FOLLOWS:  
MONDAY - FRIDAY FROM 7AM UNTIL 7PM (ADJ).  
UNOCCUPIED MODE SHALL BE ALL OTHER TIMES AND DURING CITY-OBSERVED HOLIDAYS.  
COORDINATE WITH THE OWNER FOR FINAL SCHEDULING .

#### 2. SET POINTS:

MODE	COOLING SETPOINT	HEATING SETPOINT
OCCUPIED	75(ADJ)F	70(ADJ)F
UN OCCUPIED	80(ADJ)F	60(ADJ)

#### 3. OCCUPIED ZONE REHEAT VALVE CLOSED

- 3.1. UPON A RISE IN SPACE TEMPERATURE ABOVE THE SPACE TEMPERATURE SETPOINT, THE VAV DAMPER WILL MODULATE OPEN TO ITS MAXIMUM AIR FLOW SET POINT AS INDICATED IN THE SCHEDULE ON SHEET M0.0 AS REQUIRED TO MAINTAIN THE ROOM TEMPERATURE SET POINT OF 75 (ADJ)\*F
- 3.2. UPON A FALL IN SPACE TEMPERATURE TO BELOW THE SPACE TEMPERATURE SEPOINT, THE VAV WILL MODULATE CLOSED TO ITS MINIMUM AIR FLOW SETPOINT AS INDICATED ON THE SCHEDULES.
- 3.3. IF THE SPACE TEMPERATURE CONTINUES TO FALL, THE PARALLEL FAN SHALL ENERGIZE.
- 3.4. IF THE VAV IS AT ITS MINIMUM AIR FLOW SET POINT AND SPACE TEMPERATURE CONTINUES TO FALL THE HEATING WATER VALVE WILL MODULATE MORE OPEN TO MAINTAIN ROOM TEMPERATURE SET POINT OF 70 (ADJ \*F).

#### 4. OCCUPIED ZONE REHEAT VALVE OPEN

- 4.1. UPON A RISE IN SPACE TEMPERATURE ABOVE THE SPACE TEMPERATURE SETPOINT, THE VAV DAMPER WILL MODULATE CLOSED TO ITS MINIMUM AIR FLOW SET POINT AS INDICATED IN THE SCHEDULE ON SHEET M0.0 AS REQUIRED TO MAINTAIN THE ROOM TEMPERATURE SET POINT OF 75 (ADJ)\*F
- 4.2. UPON A FALL IN SPACE TEMPERATURE TO BELOW THE SPACE TEMPERATURE SEPOINT, THE VAV WILL MODULATE OPEN TO ITS MAXIMUM AIR FLOW SETPOINT AS INDICATED ON THE SCHEDULES.
- 4.3. IF THE SPACE TEMPERATURE CONTINUES TO FALL, THE PARALLEL FAN SHALL ENERGIZE.
- 4.4. IF THE VAV IS AT ITS MAXIMUM AIR FLOW SET POINT AND SPACE TEMPERATURE CONTINUES TO FALL THE THE HEATING WATER VALVE WILL MODULATE MORE OPEN TO MAINTAIN ROOM TEMPERATURE SET POINT OF 70 (ADJ \*F).

#### 4. UNOCCUPIED MODE:

- 4.1. THE AIR HANDLING UNIT SERVING THE VAVS WILL BE OFF DURING UNOCCUPIED MODE.
- 4.2. UNOCCUPIED COOLING: IF ROOM TEMPERATURE RISES TO 80°F (ADJ) , THE CORRESPONDING AIR HANDLING UNIT WILL BE COMMANDED TO OPERATE IN UNOCCUPIED MODE, AND THE VAV DAMPER WILL MODULATE OPEN AS REQUIRED TO LOWER ROOM TEMPERATURE TO 75°F (ADJ). ONCE ROOM TEMPERATURE IS SATISFIED A SIGNAL WILL BE SENT TO THE CORRESPONDING AIR HANDLING UNIT TO SHUT DOWN.
  - 4.2.1. THE PARALLEL FAN SHALL REMAIN OFF.
- 4.3. UNOCCUPIED HEATING: IF ROOM TEMPERATURE FALLS TO 60°F (ADJ) CORRESPONDING AIR HANDLING UNIT WILL BE COMMANDED TO OPERATE IN UNOCCUPIED MODE, THE VAV DAMPER WILL GO TO ITS MINIMUM AIR FLOW POSITION AS INDICATED ON THE SCHEDULES. THE HEATING WATER VALVE WILL MODULATE MORE OPEN TO RAISE ROOM TEMPERATURE TO 65°F (ADJ). ONCE ROOM TEMPERATURE IS SATISFIED A SIGNAL WILL BE SENT TO CORRESPONDING AIR HANDLING UNIT TO SHUT DOWN.
  - 4.3.1. THE PARALLEL FAN SHALL REMAIN OFF.

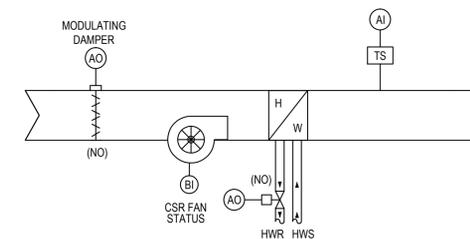
#### 5. MORNING WARM UP AND COOL DOWN

- 5.1. ALL VAV TERMINAL UNITS WILL OPEN TO THEIR MAXIMUM POSITION DURING MORNING WARM UP AND COOL DOWN. THE ELECTRIC HEATING COIL WILL ENERGIZE AS REQUIRED TO MEET ROOM TEMPERATURE SET POINT.

#### 6. TEMPORARY OCCUPANCY OVERRIDE: IF AN OCCUPANT REQUESTS A TIMED OCCUPANCY OVERRIDE DURING UNOCCUPIED MODE OR MORNING WARMUP, THE AIR HANDLER SERVING THE VAV AND THE VAV SHALL OPERATE IN NORMAL OCCUPIED MODE FOR THE DURATION OF THE TIMED OVERRIDE. THE TIMED OVERRIDE PERIOD SHALL BE 4 HOURS (ADJ).

#### 7. SYSTEM GRAPHIC DISPLAY

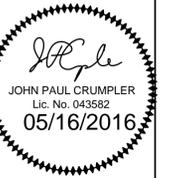
- 7.1. OUTSIDE AIR DRY BULB TEMPERATURE, DEW POINT TEMPERATURE, AND RELATIVE HUMIDITY (CALCULATED) - GLOBAL
- 7.2. ROOM NUMBERS SERVED BY VAV, UNIT MARK, TYPE, SIZE, ENABLE/DISABLE, OCCUPANCY SCHEDULE, AND OVERRIDE STATUS
- 7.3. DAMPER POSITION AND STATUS
- 7.4. AIR FLOW: MAXIMUM AND MINIMUM SET POINTS.
- 7.5. TEMPERATURE: SUPPLY AIR AND ZONE
- 7.6. HUMIDITY: ZONE HUMIDITY SENSOR (IF ANY)
- 7.7. OCCUPIED/UNOCCUPIED SET POINTS



**1** FAN POWERED VAV BOX WITH HOT WATER REHEAT  
SCALE: NONE

**2rw**

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MONUMENT TERRACE BUILDING  
AIR HANDLER & CONTROLS REPLACEMENT



CITY OF LYNCHBURG  
LYNCHBURG, VIRGINIA

sheet title

**CONTROLS**

e-file: 12221A-M2

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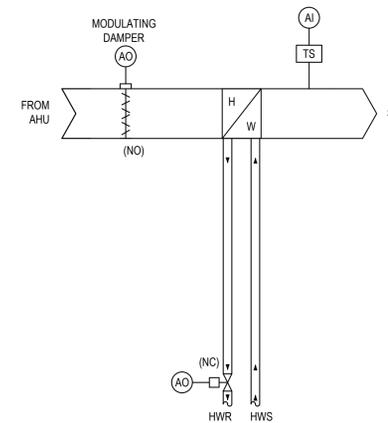
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**M2.5**

## SEQUENCE OF OPERATIONS

### ZONE REHEAT BOX WITH INTEGRAL DAMPER:

1. GENERAL:
  - 1.1. THE ZONE REHEAT BOX WITH INTEGRAL DAMPER UNIT SHALL BE PROVIDED WITH A CONTROLLER WHICH SHALL CONTROL THE UNIT AS DIRECTED BY THE BAS OR UPON A FAILURE OF THE BAS IN A STAND-ALONE MODE.
  - 1.2. THE UNIT SHALL OPERATE IN OCCUPIED AND UNOCCUPIED MODE ACCORDING TO BAS SCHEDULING. BAS SCHEDULING SHALL BE CAPABLE OF 365 DAY SCHEDULING.
  - 1.3. OCCUPIED MODE SHALL INITIALLY BE ESTABLISHED AS FOLLOWS:  
 MONDAY - FRIDAY FROM 7AM UNTIL 7PM (ADJ).  
 UNOCCUPIED MODE SHALL BE ALL OTHER TIMES AND DURING CITY-OBSERVED HOLIDAYS.  
 COORDINATE WITH THE OWNER FOR FINAL SCHEDULING.
2. OCCUPIED MODE
  - 2.1. WHEN THE SYSTEM IS IN OCCUPIED MODE, THE REHEAT BOX DAMPER SHALL OPEN FULLY AND THE REHEAT VALVE SHALL REMAIN CLOSED.
  - 2.2. WHEN THE AVERAGE OF THE SPACE TEMPERATURES IN THE ZONES SERVED BY ZONE REHEAT BOX ARE BELOW THE NORMAL SPACE TEMPERATURE SET POINT, THE REHEAT VALVE SHALL MODULATE OPEN TO BRING THE ZONES TO SET POINT.
  - 2.3. THE MAXIMUM SUPPLY AIR TEMPERATURE WHEN THE HEATING COIL IS ENERGIZED SHALL BE 75 °F (ADJ).
  - 2.4. WHEN THE AVERAGE OF THE SPACE TEMPERATURE IN THE ZONES SERVED BY THE REHEAT BOX ARE AT OR ABOVE THE NOMINAL SPACE TEMPERATURE SET POINT, THE HEATING VALVE SHALL MODULATE CLOSED.
3. UNOCCUPIED MODE
  - 3.1. ZONE REHEAT VALVE AND DAMPER SHALL REMAIN CLOSED.
  - 3.2. UNOCCUPIED COOLING:
    - 3.2.1. IF THERE IS A CALL FOR UNOCCUPIED COOLING IN THE ZONES SERVED BY THE REHEAT BOX, THE ZONE DAMPER SHALL FULLY OPEN AND THE ZONE REHEAT VALVE SHALL REMAIN CLOSED. THE AHU SHALL ENERGIZE TO PROVIDE COOLING.
  - 3.3. UNOCCUPIED HEATING:
    - 3.3.1. IF THERE IS A CALL FOR UNOCCUPIED HEATING IN THE ZONES SERVED BY THE REHEAT BOX, THE ZONE DAMPER SHALL FULLY OPEN, AND THE REHEAT VALVE SHALL MODULATE OPEN
4. MORNING PRE-COOL AND WARM-UP
  - 4.0.1. IF THE AVERAGE OF THE ZONES TEMPERATURES OF THE ZONES SERVED BY THE REHEAT BOX IS WITHIN THE NORMAL SATISFIED RANGE (NO HEATING OR COOLING REQUIRED), THE REHEAT DAMPER SHALL BE CLOSED AND THE RE-HEAT VALVE SHALL BE CLOSED
  - 4.0.2. PRE-COOL:
    - 4.0.2.1. IF THE AVERAGE OF THE ZONES TEMPERATURES OF THE ZONES SERVED BY THE REHEAT BOX IS ABOVE THE NORMAL SATISFIED RANGE , THE REHEAT DAMPER SHALL FULLY OPEN AND THE RE-HEAT VALVE SHALL BE CLOSED
  - 4.0.2. WARM-UP:
    - 4.0.2.1. IF THE AVERAGE OF THE ZONES TEMPERATURES OF THE ZONES SERVED BY THE REHEAT BOX IS BELOW THE NORMAL SATISFIED RANGE , THE REHEAT DAMPER SHALL FULLY OPEN AND THE RE-HEAT VALVE SHALL MODULATE OPEN.
  - 4.0.3. NORMAL SATISFIED TEMPERATURE RANGE
    - 4.0.3.1. 68°F TO 74°F
5. TEMPORARY OCCUPANCY OVERRIDE: IF AN OCCUPANT REQUESTS A TIMED OCCUPANCY OVERRIDE DURING UNOCCUPIED MODE OR MORNING WARMUP, THE AIR HANDLER SERVING THE VAV AND THE REHEAT BOX SHALL OPERATE IN NORMAL OCCUPIED MODE FOR THE DURATION OF THE TIMED OVERRIDE. THE TIMED OVERRIDE PERIOD SHALL BE 4 HOURS (ADJ).
6. FREEZESTAT: IF THE FREEZESTAT ON AHU-1 IS ENABLED, THE REHEAT BOX DAMPER SHALL OPEN AND THE HEATING VALVES SHALL REMAIN CLOSED.
7. SYSTEM GRAPHIC DISPLAY
  - 7.1. OUTSIDE AIR DRY BULB TEMPERATURE, DEW POINT TEMPERATURE, AND RELATIVE HUMIDITY (CALCULATED) - GLOBAL
  - 7.2. ROOM NUMBERS SERVED BY REHEAT UNIT, UNIT MARK, TYPE, SIZE, ENABLE/DISABLE, OCCUPANCY SCHEDULE, AND OVERRIDE STATUS
  - 7.3. DAMPER POSITION AND STATUS (FULLY OPEN OR FULLY CLOSED)
  - 7.4. TEMPERATURE: SUPPLY AIR AND AVERAGE ZONE TEMPERATURE



### ZONE REHEAT UNIT

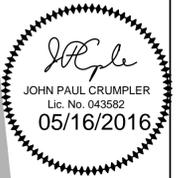
SCALE: NONE

#### NOTES:

1. TYPICAL OF ZONE REHEAT UNITS 1A, 2A, 2B, 3A, AND 3B.
2. ZONE REHEAT UNIT 4A IS SUPPLIED WITH A 3-WAY CONTROL VALVE
3. CONTRACTOR TO PROVIDE 120V ELECTRIC SERVICE AND STEP DOWN TRANSFORMERS AS REQUIRED.

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MONUMENT TERRACE BUILDING  
AIR HANDLER & CONTROLS REPLACEMENT

CITY OF LYNCHBURG  
LYNCHBURG, VIRGINIA

sheet title

CONTROLS

e-file: 12221A-M2

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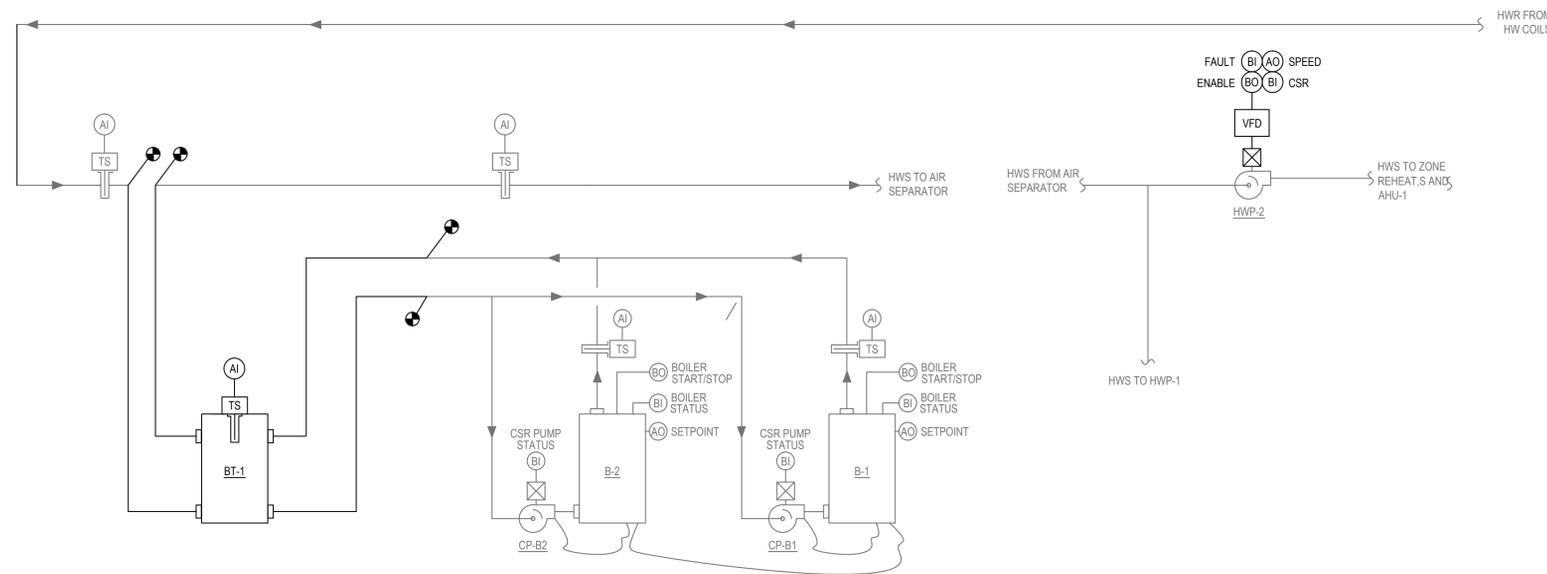
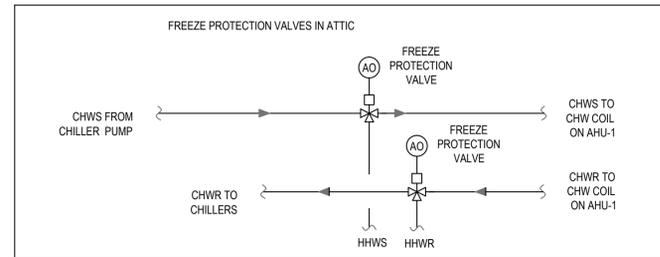
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**M2.6**

# SEQUENCE OF OPERATIONS

## HEATING WATER SYSTEM MODIFICATION:

1. HEATING WATER PUMP (HWP-2) OPERATION
  - 1.1. THE HEATING WATER PUMP (HWP-2) SHALL BE STARTED UPON A CALL FOR HEATING FROM THE ZONE REHEAT BOXES.
  - 1.2. HWP-2 SHALL START AT MINIMUM SPEED AND RAMP UP IN SPEED TO MAINTAIN SYSTEM PRESSURE SET POINT AS DETERMINED BY A HEATING WATER PRESSURE SENSOR LOCATED NEAR REHEAT BOX 4A IN THE ATTIC.
  - 1.3. THE VARIABLE SPEED DRIVE SHALL RAMP UP IN SPEED UPON A DROP IN PRESSURE AND RAMP DOWN IN SPEED UPON AN INCREASE IN PRESSURE.
  - 1.4. WHEN THERE HAS BEEN NO CALL FOR HEATING FOR 15 MINUTES (ADJ), HWP-2 SHALL DISABLE A CALL FOR HEATING SHALL BE GENERATED BY THE BAS WHEN HEAT IS REQUIRED AT CH-1 OR 2 SERVING THE STAIR WELLS, ANY VAV BOX WITH REHEAT COIL, OR ANY REHEAT BOX 1A, 2A, 2B, 3A, 3B, OR 4A
2. HEATING WATER TEMPERATURE SET POINT AND CONTROL
  - 2.1. A TEMPERATURE SENSOR SHALL BE INSTALLED IN THE NEW HEATING WATER BUFFER TANK.
  - 2.2. BOILER SEQUENCE OF OPERATION IS MODIFIED SO THAT THE BOILERS MAINTAIN THE BUFFER TANK TEMPERATURE.
    - 2.2.1. THE HEATING WATER TEMPERATURE SET POINT IS MODIFIED AS FOLLOWS:
      - 2.2.1.1. THE HEATING WATER TEMPERATURE SHALL BE 100°F WHEN THE OUTSIDE AIR TEMPERATURE IS 50°F OR GREATER.
        - 2.2.1.1.1. WHEN THERE IS A CALL FOR HEATING BY REHEAT BOXES 1A, 2A, 2B, 3A, 3B, OR 4A, THE HEATING WATER TEMPERATURE SHALL BE 120°F WHEN THE OUTSIDE AIR TEMPERATURE IS 50°F OR GREATER
      - 2.2.1.2. THE HEATING WATER TEMPERATURE SHALL BE 160°F WHEN THE OUTSIDE AIR TEMPERATURE IS 10°F OR LESS.
      - 2.2.1.3. THE HEATING WATER TEMPERATURE SHALL VARY LINEARLY BETWEEN THE HIGH AND LOW SET POINT.
3. FREEZE PROTECTION VALVES IN ATTIC
  - 3.1. THE NORMAL POSITION OF THE FREEZE PROTECTION VALVES IS TO SEGREGATE THE CHILLED AND HOT WATER SYSTEMS.
  - 3.2. UPON A SIGNAL FROM THE FREEZESTAT ON AHU-1, THE FREEZE PROTECTION VALVES SHALL MODULATE FROM THEIR NORMAL POSITION TO DIVERT HEATING WATER TO THE CHILLED WATER COIL IN AHU-1. HEATING WATER PUMP (P-2) SHALL ENABLE, AND THE BOILERS SHALL ENABLE TO MAINTAIN BUFFER TANK TEMPERATURE.
4. SYSTEM GRAPHIC DISPLAY IS MODIFIED AS FOLLOWS
  - 4.1. BUFFER TANK TEMPERATURE
  - 4.2. HEATING WATER SYSTEM PRESSURE
  - 4.3. HWP-2 STATUS AND SPEED
  - 4.4. FREEZE PROTECTION VALVE STATUS



**1**  
- M2.7

**BOILER SYSTEM CONTROL SCHEMATIC**  
SCALE: NONE

NOTES:  
1. BOILER CIRCULATOR PUMP HARD WIRED TO CORRESPONDING BOILER. COORDINATE ELECTRICAL CONNECTIONS FOR BOILERS WITH ELECTRICAL CONTRACTOR.



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proj no.	12221A
date	02/22/2016
scale	AS NOTED

revision	date

sheet  
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NEW WORK NOTES

BUILDING AUTOMATION SYSTEM:

1. THE EXISTING BUILDING AUTOMATION SYSTEM SHALL BE REPLACED WITH A NEW SYSTEM COMPLIANT WITH SPECIFICATION SECTION 23 0900..
2. EXISTING VAV BOX CONTROLLERS SHALL BE REPLACED WITH NEW CONTROLLER, DAMPER ACTUATOR, VALVE ACTUATOR (IF ANY), FAN CONTACT (IF ANY), AND ELECTRIC HEATER CONTROL (IF ANY).
3. NEW ELECTRONIC VAV BOX ZONE THERMOSTATS SHALL BE SUPPLIED.
4. VAV BOX CONTROLLERS SHALL COMMUNICATE THROUGH CABLE CONNECTION TO BAS. NEW COMMUNICATIONS CABLE SHALL BE INSTALLED CONNECTING ALL VAV BOX CONTROLLERS AND OTHER DEVICES WITH BAS.
5. ALL WIRING AND CABLES SHALL BE RUN ABOVE THE CEILING OR ENCLOSED IN WALLS. NO EXPOSED WIRING IS ALLOWED.
6. CONTRACTOR SHALL PROVIDE A NEW COMPUTER AND VIDEO DISPLAY SCREEN FOR BAS PROGRAMMING AND MONITORING PURPOSES.
7. EXISTING LOCAL CONTROLS FOR EXHAUST FANS, BASEBOARD HEATERS, UNIT HEATERS, AND CABINET HEATERS REMAIN UNCHANGED BY THIS PROJECT.

**2rw**

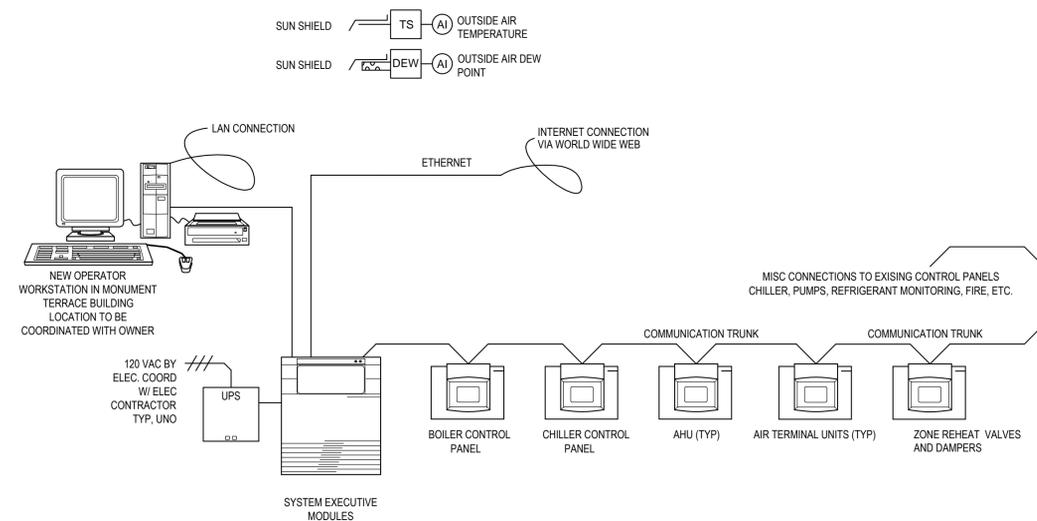
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*J.P. Crumpler*  
JOHN PAUL CRUMPLER  
Lic. No. 043582  
05/16/2016

MONUMENT TERRACE BUILDING  
AIR HANDLER & CONTROLS REPLACEMENT



CITY OF LYNCHBURG  
LYNCHBURG, VIRGINIA



1  
M2.8

SYSTEM ARCHITECTURE

SCALE: NONE

NOTES:

1. COORDINATE LOCATION OF SYSTEM EXECUTIVE MODULES AS REQUIRED TO FACILITATE PROJECT.
2. COORDINATE ETHERNET/NETWORK DROPS FOR METERS AND GATEWAYS WITH OTHER TRADES AS REQUIRED.
3. PROVIDE SYSTEM WITH CONSISTENT BAS PROTOCOL THROUGHOUT PROJECT. WHERE REQUIRED, PROVIDE GATEWAYS
4. OPERATOR WORKSTATION INSTALLED AND PROGRAMMED COMPLETE WITH ANY ADDITIONAL SOFTWARE BY EMS CONTRACTOR.
5. COORDINATE EXACT LOCATION OF OPERATOR WORK STATION WITH CITY PRIOR TO ROUGH-IN.
6. OUTSIDE AIR DRY BULB TEMPERATURE, DEW POINT TEMPERATURE, RELATIVE HUMIDITY (CALCULATED), AND CARBON DIOXIDE SENSORS ARE GLOBAL AND REFERENCED BY ALL DEVICES. SENSORS SHALL BE INSTALLED ON NORTHWEST SIDE (FACING NINTH STREET) OF THE BUILDING.

REVISION 1  
A. ADDED NOT CONCERNING EXISTING LOCAL CONTROLS OF CABINET, UNIT AND BASEBOARD HEATERS..

sheet title

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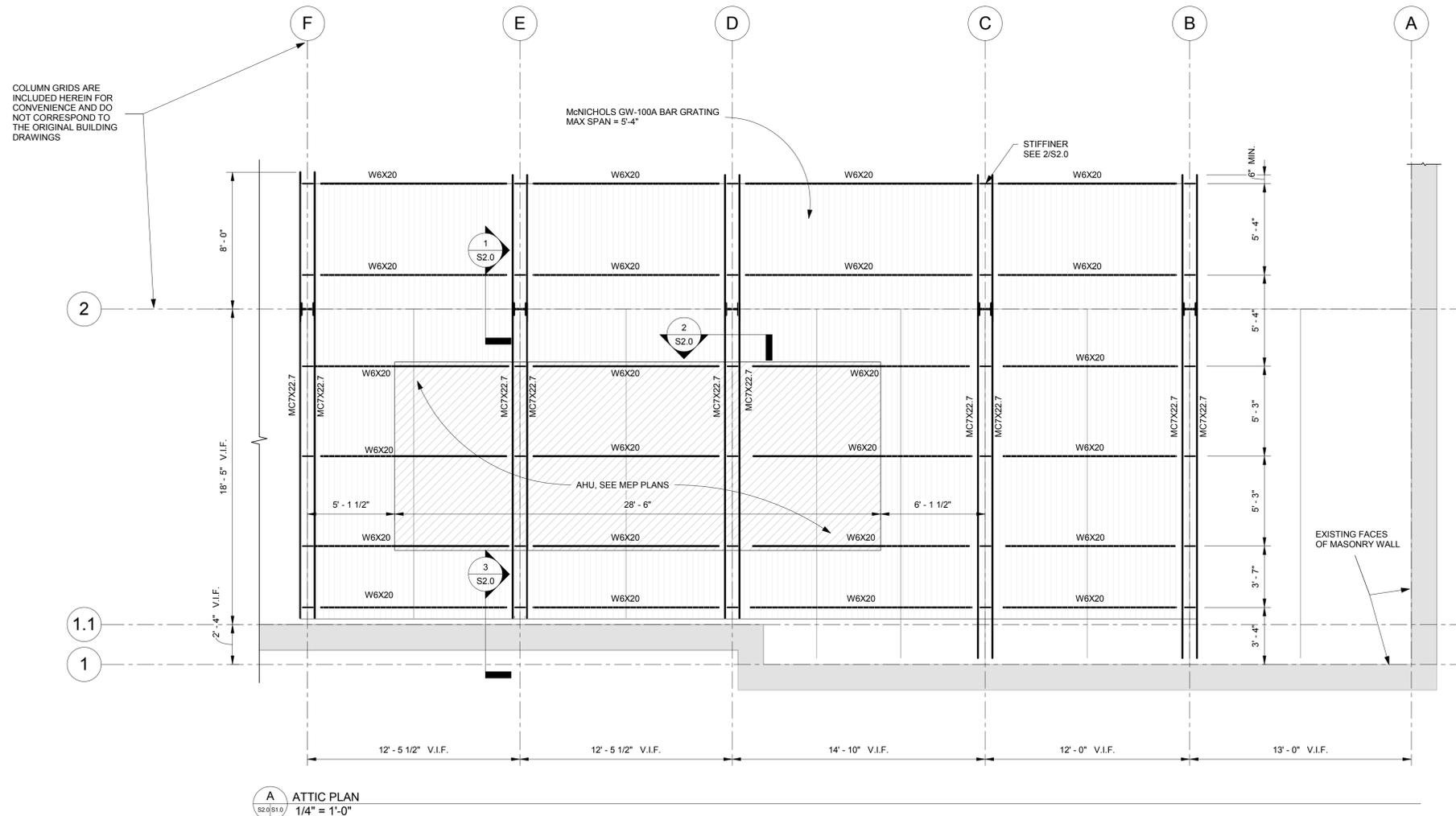
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**GENERAL NOTES**

1. ALL STRUCTURAL WORK SHALL BE COORDINATED WITH ARCHITECTURAL AND MECHANICAL DRAWINGS AND SHALL CONFORM TO THE PROJECT SPECIFICATIONS, INCLUDING THE 2012 IBC, AS MODIFIED BY THE 2012 VUSBC.
2. DIMENSIONS AND ELEVATIONS OF EXISTING CONSTRUCTION GIVEN IN STRUCTURAL DRAWINGS ARE BASED ON INFORMATION FROM FIELD OBSERVATIONS AND MEASUREMENTS. THE CONTRACTOR SHALL VERIFY ALL INFORMATION PERTAINING TO EXISTING CONDITIONS BY ACTUAL MEASUREMENTS AND OBSERVATIONS AT THE SITE.
3. PRIOR TO CONSTRUCTION, MASONRY WALL PULLOUT STRENGTH TO BE DETERMINED BY STANDARD ASTM MASONRY PULLOUT TESTING. TEST RESULTS ARE TO BE DELIVERED TO THE STRUCTURAL ENGINEER FOR MASONRY CONNECTION DETAIL. IF TEST RESULTS YIELD LOW MASONRY CAPACITY, DETAIL MAY BE ALTERED TO POCKET STEEL INTO MASONRY WALL.
4. STRUCTURAL STEEL - ALL STRUCTURAL STEEL WORK SHALL CONFORM TO THE FOLLOWING GOVERNING STANDARDS:
  - 4.1 AMERICAN WELDING SOCIETY (AWS D1.1) "STRUCTURAL WELDING CODE - STEEL"
  - 4.2 AISC 360 "SPECIFICATIONS FOR STRUCTURAL STEEL BUILDINGS" AND AISC 303 "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES"
5. ALL STRUCTURAL STEEL SHALL CONFORM TO THE FOLLOWING ASTM SPECIFICATIONS:
  - 5.1 WIDE FLANGE BEAMS: ASTM A992
  - 5.2 CHANNELS, ANGLES AND PLATES: ASTM A36 UNLESS NOTED OTHERWISE.
6. MINIMUM WELD SIZE IS 3/16" FILLET UNLESS NOTED OTHERWISE.
7. FIELD CUTTING OR BURNING OF STEEL IS PROHIBITED EXCEPT WITH THE EXPRESS WRITTEN APPROVAL OF THE STRUCTURAL ENGINEER OF RECORD.
8. WELDING SHALL BE PERFORMED BY CERTIFIED AWS-QUALIFIED WELDERS. ELECTRODES SHALL BE AWS 5.1, CLASS E70XX. WELDING ELECTRODES FOR ASTM A276-97 STAINLESS STEEL, GRADE 304, SHALL CONFORM TO AWS A5.4 FOR SHIELDED METAL ARC WELDING, ELECTRODE CLASS E304; OR AWS A5.9 FOR GAS METAL ARC WELDING, ELECTRODE CLASS ER304, F1=70KSI.
9. SHOP AND ERECTION DRAWINGS SHALL BE SUBMITTED TO THE STRUCTURAL ENGINEER FOR REVIEW AND APPROVAL. NO FABRICATION OF STEEL SHALL COMMENCE WITHOUT APPROVED SHOP DRAWINGS.
10. SPECIAL INSPECTIONS IN ACCORDANCE WITH THE VUSBC SHALL BE PROVIDED IN ACCORDANCE WITH THE STATEMENT OF SPECIAL INSPECTIONS ON THIS SHEET
11. AHU LOADS WERE PROVIDED BY 2RW, SPECIFYING A 11'-0" x 28'-6" UNIT WEIGHING 16 TONS.
12. WALKABLE PLATFORMS ARE DESIGNED FOR A LIVE LOAD OF 45 PSF

**STATEMENT OF SPECIAL INSPECTIONS**

Material/Activity	Type of Inspection	Required (Y/N)	Continuous/Periodic	Extent	Reference
Structural Steel					
Quality Control	In-plant inspection of quality control procedures	Y	Periodic		IBC 1704.2
Bolts, Nuts, Washers	Material identification markings	Y	Periodic	Submittal & field review	AISC ASD A3.4
Bolts, Nuts, Washers	Review certification of compliance	Y	Periodic	Submittal & field review	IBC 1704.3, AISC ASD A3.4
Structural Steel	Material identification markings	Y	Periodic	Submittal & field review	IBC 1708.4, ASTM A6
Structural Steel	Review certification of compliance	Y	Periodic	Submittal & field review	IBC 1708.4, ASTM A6
Weld Filler Materials & Welder Certifications	Review certification of compliance	Y	Periodic	Submittal & field review	AISC ASD A3.6
Bolts, Nuts, Washers	Inspection of in-place high-strength bolts	Y	Periodic	Field review	IBC 1704.3.3C AISC SEC. A3.4, RCSC, SEC. 9
Welds	Inspection of welds	Y	Periodic	Field review	IBC 1704.3.1C AWS,D1.1
Structural Details	Inspection of structural details	Y	Periodic	Field review	IBC 1704.3.2
Masonry					
Epoxy Anchor	On site verification of anchor type, dimensions, adhesive identification and expiration date, anchor steel type, nominal anchor diameter and length. Installation description including verification of masonry compressive strength, anchor locations.	Y	Periodic	Submittal & field review	IBC 1704



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MONUMENT TERRACE BUILDING  
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sheet title  
GENERAL  
NOTES & PLAN  
VIEW

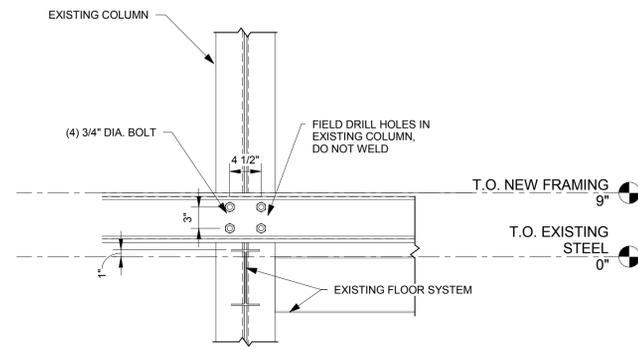
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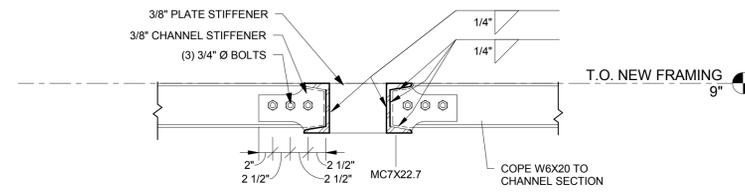
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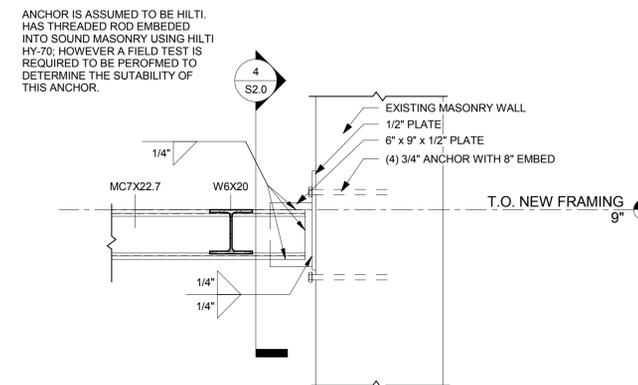
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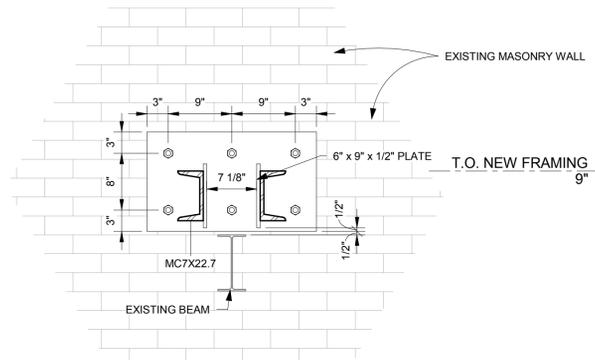
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TYPICAL BEAM TO COLUMN CONNECTION  
1" = 1'-0"



**2**  
TYPICAL WIDE FLANGE CONNECTION  
1" = 1'-0"

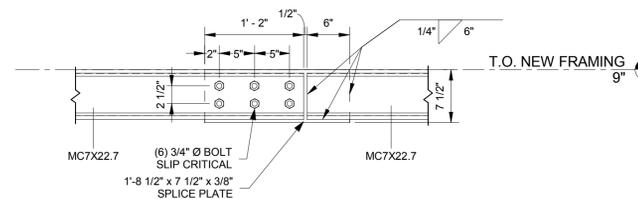


**3**  
SECTION  
1" = 1'-0"



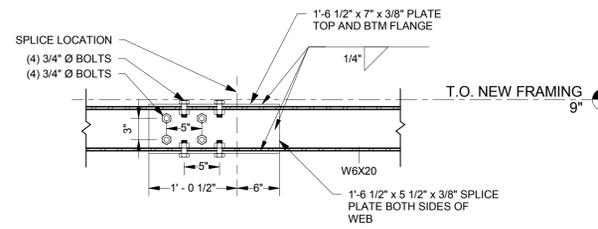
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SECTION  
1" = 1'-0"

SPLICE LOCATIONS TO BE DETERMINED BY THE CONTRATOR. CONTRATOR SHALL PROVIDE PROPOSED SPLICE LOCATION TO THE EOR FOR REVIEW. COORDINATE LOCATIONS WITH MEP REQUIREMENTS.



**5**  
TYPICAL MC-SECTION SPLICE DETAIL  
1" = 1'-0"

SPLICE LOCATIONS TO BE DETERMINED BY THE CONTRATOR. CONTRATOR SHALL PROVIDE PROPOSED SPLICE LOCATION TO THE EOR FOR REVIEW. COORDINATE LOCATIONS WITH MEP REQUIREMENTS.



**6**  
TYPICAL WIDE FLANGE SPLICE DETAIL  
1" = 1'-0"

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