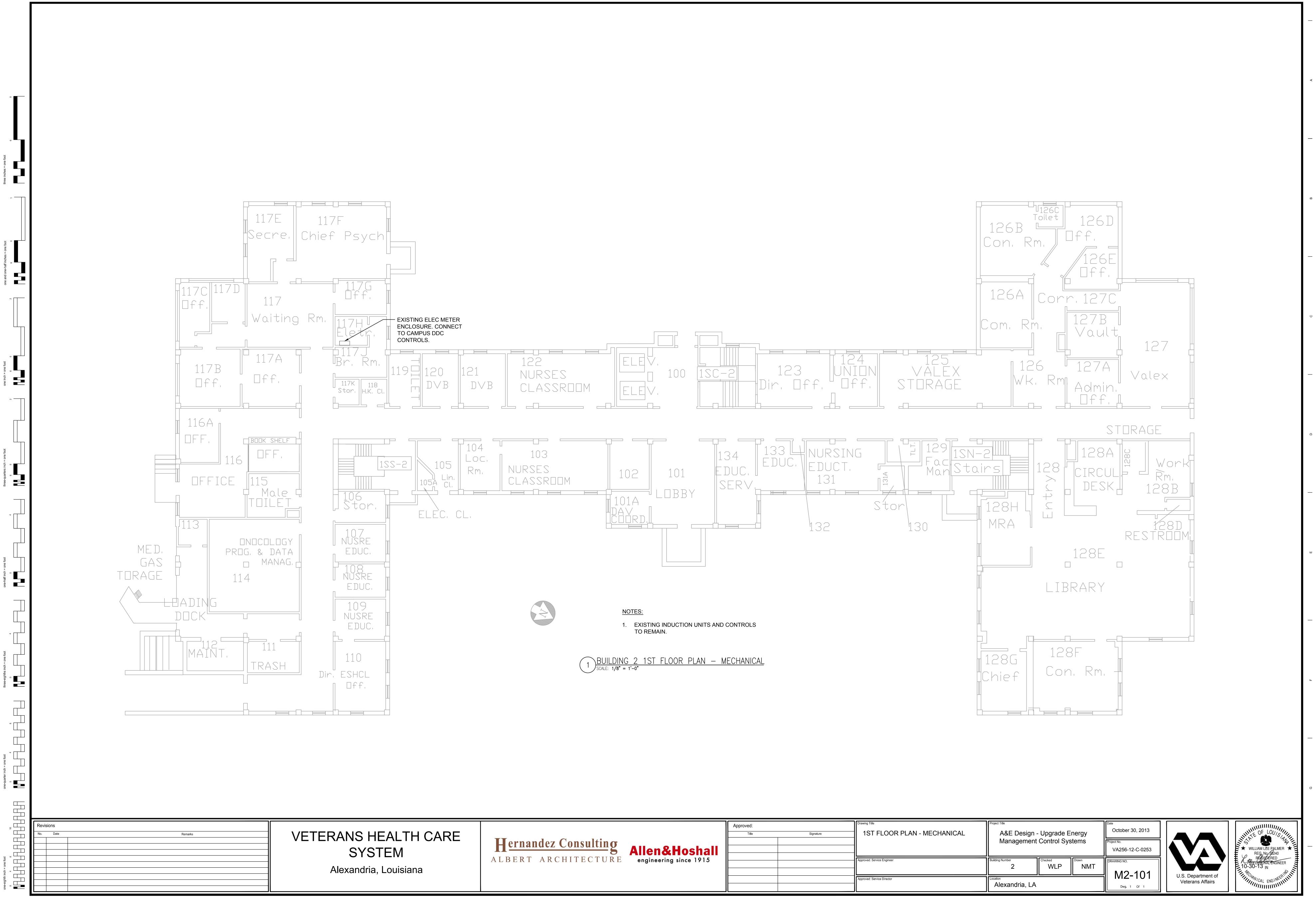
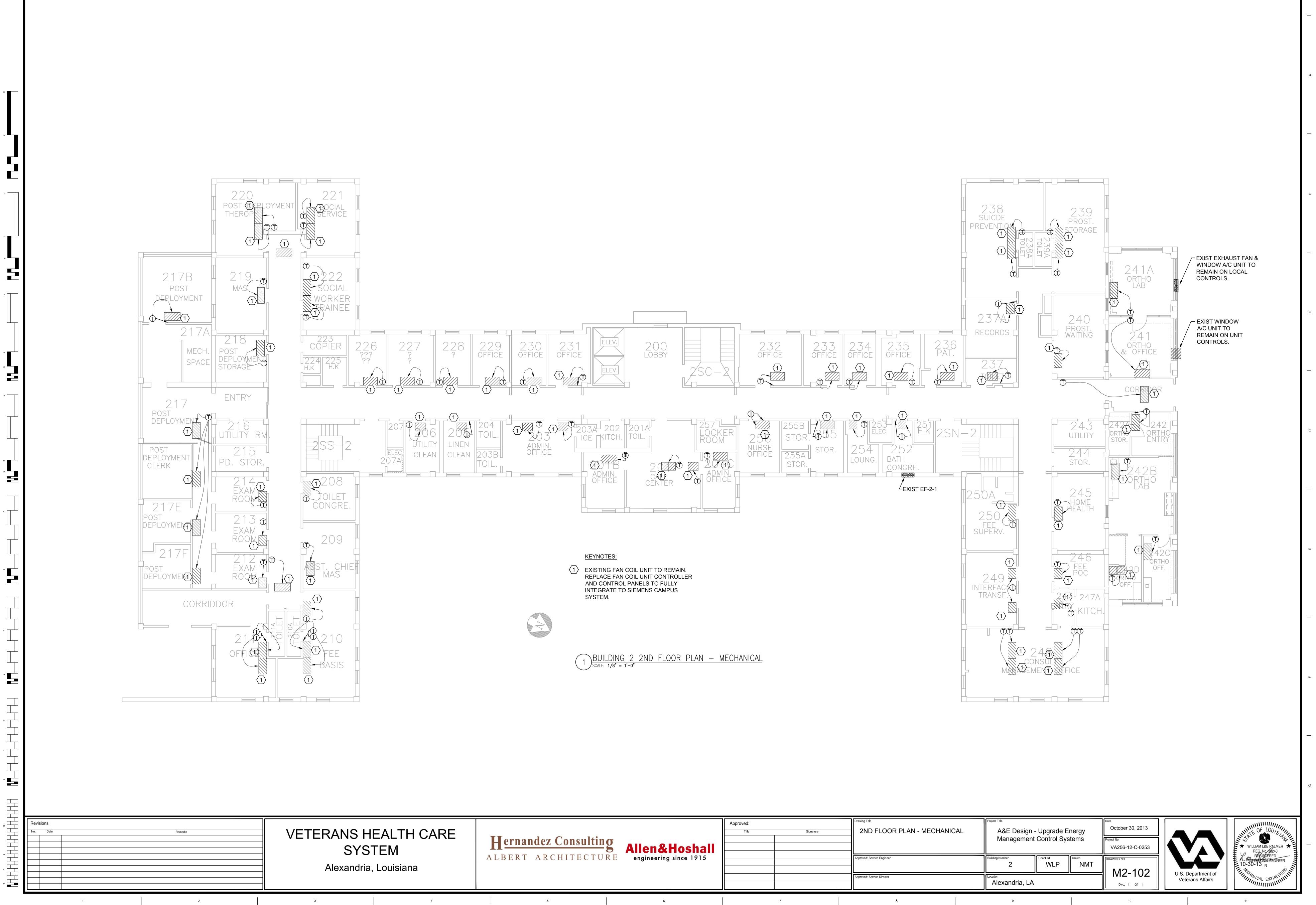


Signature	Drawing Title BASEMENT FLOOR PLAN - MECHANICAL	Project Title A&E Design - Upgrade Energy Management Control Systems	Date October 30, 2013 Project No. VA256-12-C-0253
	Approved: Service Engineer	Building Number 2 Checked WLP	DRAWING NO. M2-100
	Approved: Service Director	Alexandria, LA	Dwg. 1 Of 1
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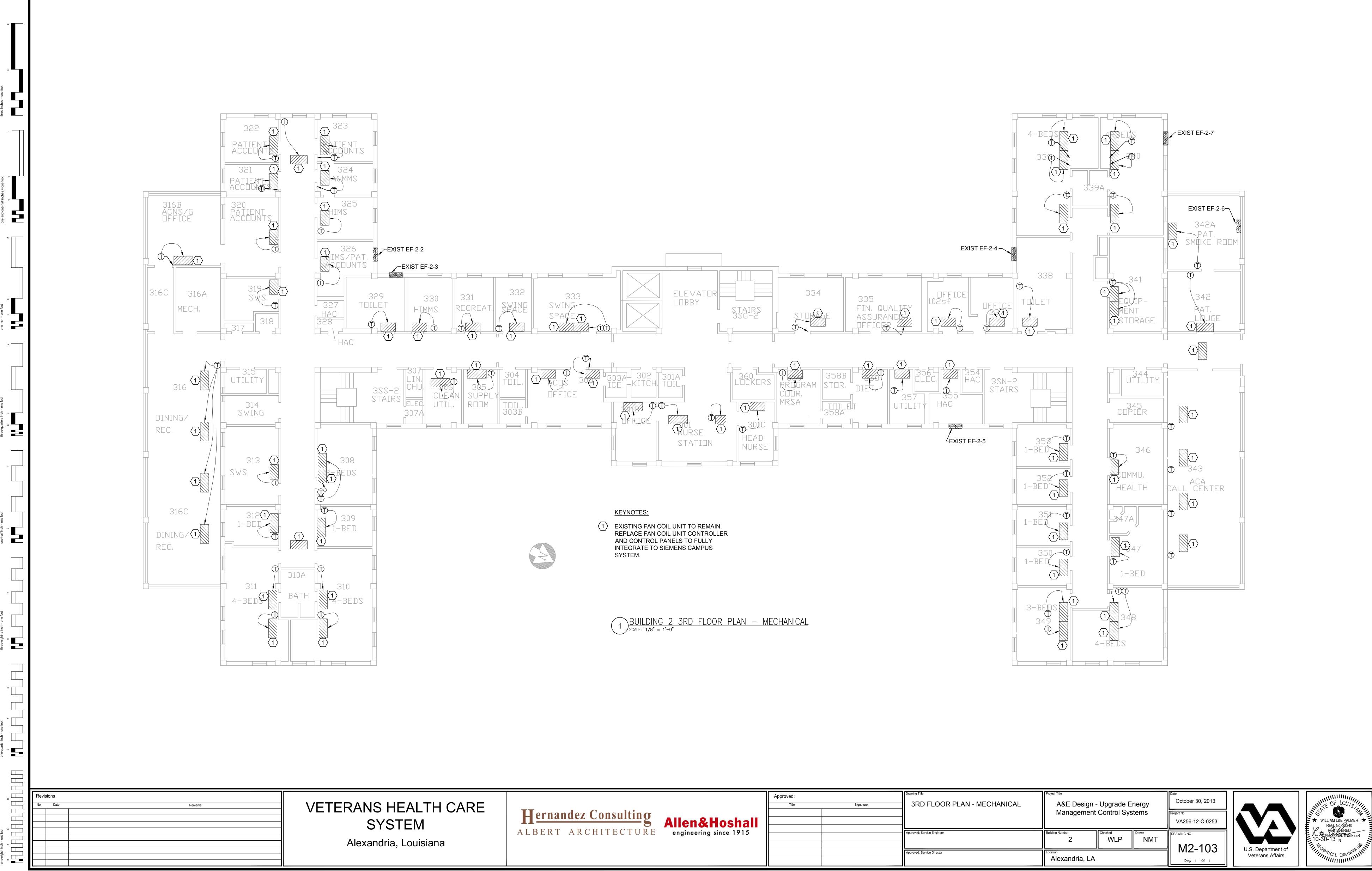
Signature	Drawing Title 1ST FLOOR PLAN - MECHANICAL	A&E Design - Management			Date October 30, 2013 Project No. VA256-12-C-0253	
	Approved: Service Engineer	Building Number 2	Checked WLP	Drawn NMT	DRAWING NO. M2-101	
	Approved: Service Director	Alexandria, LA			Dwg. 1 Of 1	U.S. Vet
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° ₽	No. Date	Remarks	VETERANS H
			SYS
*			Alexandria



Signature	Drawing Title 2ND FLOOR PLAN - MEC	A&E Design - Management		•••	Date October 30, 2013 Project No. VA256-12-C-0253	
	 Approved: Service Engineer	Building Number 2	Checked WLP	Drawn NMT		
	Approved: Service Director	Alexandria, LA			M2-102 Dwg. 1 Of 1	U.S. Vet
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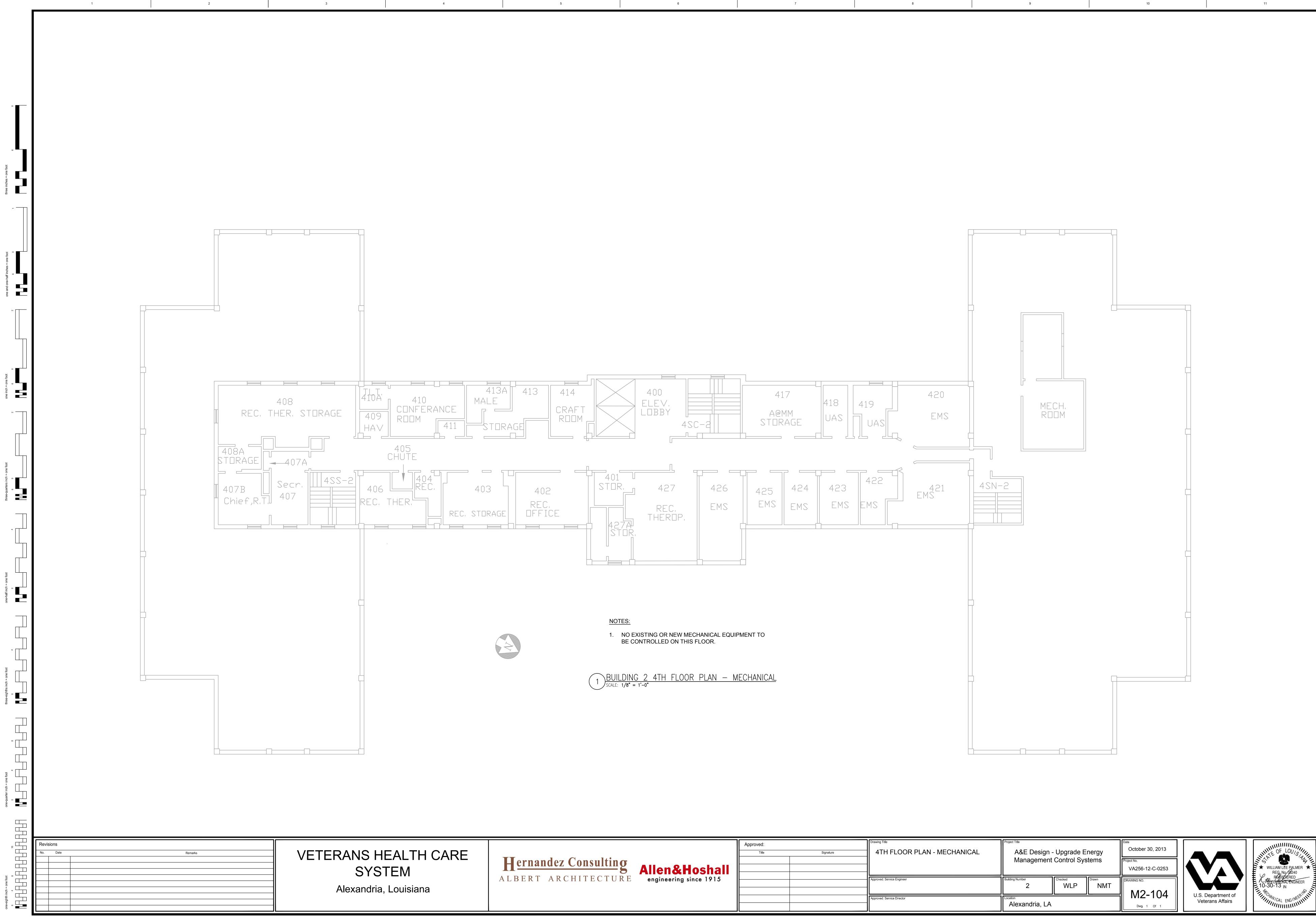


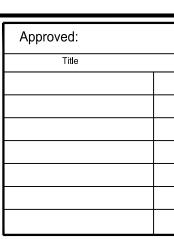


Signature	3RD FLOOR PLAN - MECHANICAL	A&E Design - Upgrade E Management Control Sys		Date October 30, 2013	
			SIGHIS	Project No. VA256-12-C-0253	
	Approved: Service Engineer	Building Number 2 Checked WLP	Drawn NMT		
	Approved: Service Director	Location Alexandria, LA		M2-103	U.S. Vet
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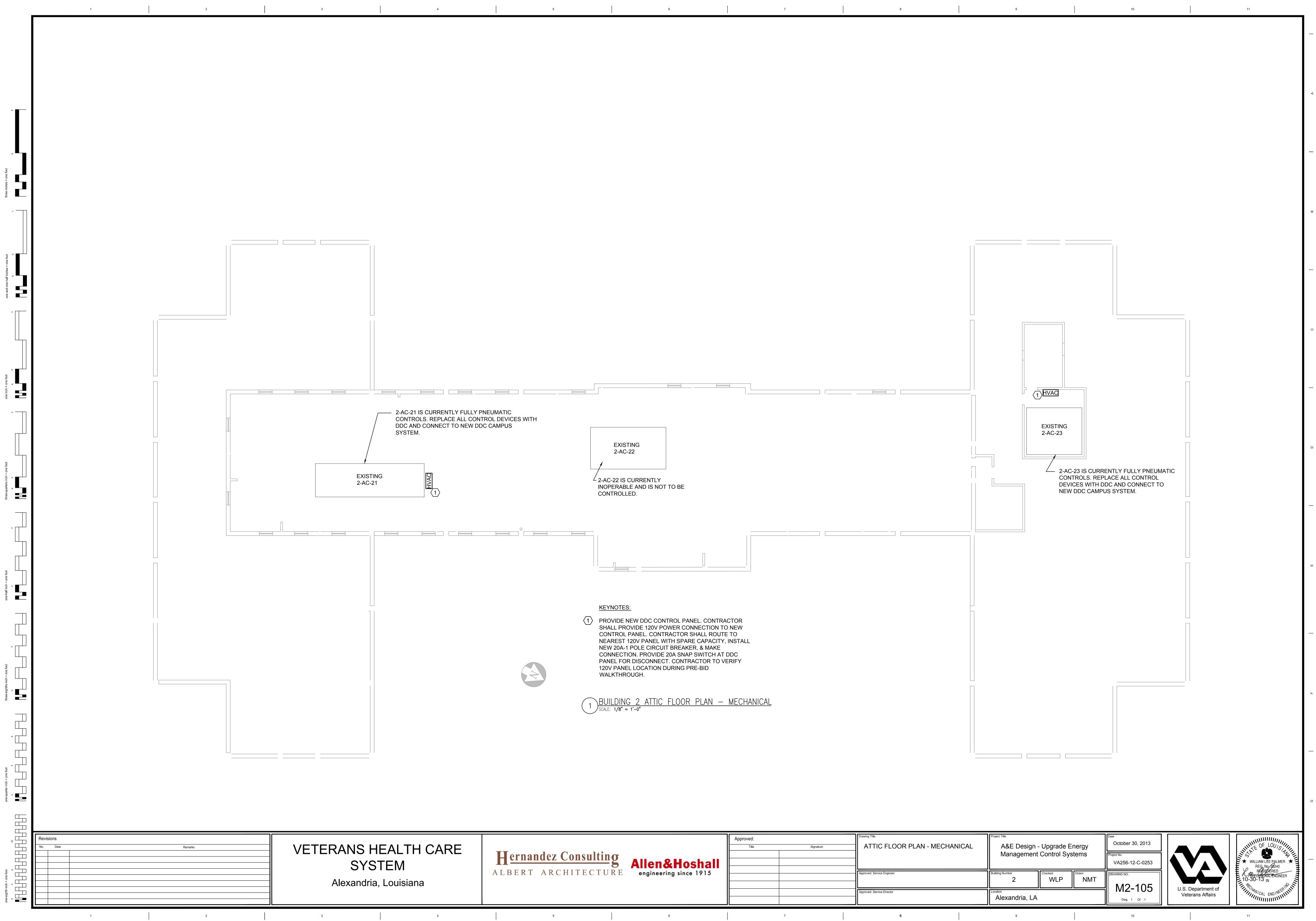






Signature	Drawing Title 4TH FLOOR PLAN - MECHANICAL	A&E Design - Management		nergy	Date October 30, 2013 Project No. VA256-12-C-0253	
	Approved: Service Engineer	Building Number 2	Checked WLP	Drawn NMT	M2-104	
	Approved: Service Director	Alexandria, LA			IVIZ-104 Dwg. 1 Of 1	U.S. Vet
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Signature	Drawing Title ATTIC FLOOR PLAN - MECHANICA	A&E Design - Management			Date October 30, 2013 Project No. VA256-12-C-0253	
	Approved: Service Engineer	Building Number 2	Checked WLP	Drawn NMT		
	Approved: Service Director	Alexandria, LA			M2-105	U.S V
7	8	9			10	

		VAV AIR HANDLING UNIT		١	VAV AIR HANDLING UNIT
		LOCAL DDC CONTROLLER			LOCAL DDC CONTROLLER
INP	UTS		00	TPUTS	
	Al1	OUTSIDE AIR DAMPER (D-1) STATUS		AO1	OUTSIDE AIR DAMPER (D-1)
	AI2	RETURN AIR DAMPER (D-2) STATUS	u	AO2	RETURN AIR DAMPER (D-2)
	(Al1)	MIXED AIR TEMPERATURE SENSOR (T-1)	ANALOG	AO3	STEAM PREHEAT CONTROL VALVE (V-1)
ŋ	Al4	RETURN AIR TEMPERATURE SENSOR (T-2)	A I	AO4	CHILLED WATER CONTROL VALVE (V-2)
ANALOG	AI5	RETURN AIR HUMIDITY SENSOR (H-1)		AO5	STEAM REHEAT CONTROL VALVE (V-3)
A	Al6	STEAM PREHEAT CONTROL VALVE (V-1)		DO3	SUPPLY FAN START/STOP
	AI7	PREHEAT COIL DISCHARGE AIR TEMPERATURE SENSOR (T-3)			
	AI8	CHILLED WATER CONTROL VALVE (V-2)			
	Al9	COOLING COIL DISCHARGE AIR TEMPERATURE SENSOR (T-5)			
	AI10	STEAM REHEAT CONTROL VALVE (V-3)			
	(AI11)	AHU DISCHARGE TEMPERATURE SENSOR (T-7)			
	AI12	OUTSIDE AIR TEMPERATURE SENSOR (T-8)			
	AI13	OUTSIDE AIR HUMIDITY SENSOR (H-2)			
	DI1	FILTER STATUS (DPS-1)			
	DI2	RETURN AIR SMOKE DETECTOR (SD-1) STATUS			
Ļ	DI3	LOW LIMIT TEMPERATURE SENSOR (T-4) STATUS			
DIGITAL	DI4	SUPPLY FAN STATUS			
	DI5	HIGH LIMIT TEMPERATURE SENSOR (T-6) STATUS			
	DI6	SUPPLY AIR SMOKE DETECTOR (SD-2) STATUS			
	DI7	SUPPLY AIR HIGH STATIC PRESSURE SWITCH (SPS-1) STATUS			

5

NOTES:

1. ALL CONTROL DEVICES ARE EXISTING PNEUMATIC AND ARE TO BE REPLACED WITH APPROPIATE DDC DEVICES.

 PROVIDE NEW DDC CONTROLLER. CONNECT NEW CONTROLLER TO EXISTING 120V ELECTRICAL SERVICE.
 TEST AND BALANCE ALL AIR FLOWS TO AHU, FCU, VAV BOXES (MAX. AND MIN.), ETC PRIOR TO STARTING WORK. PROVIDE REPORT TO VA. BALANCE ALL AIR FLOWS TO

PRE-CONSTRUCTION VALUES.

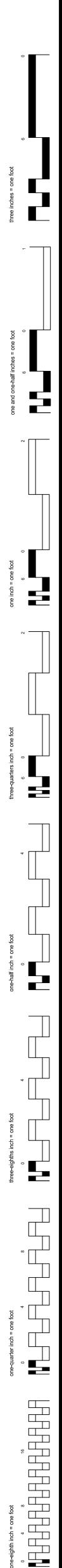
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OUTSIDE AIR

	ns	Revisions	
VETERANS H	Date Remarks	No. Date	
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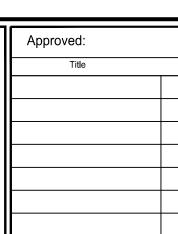
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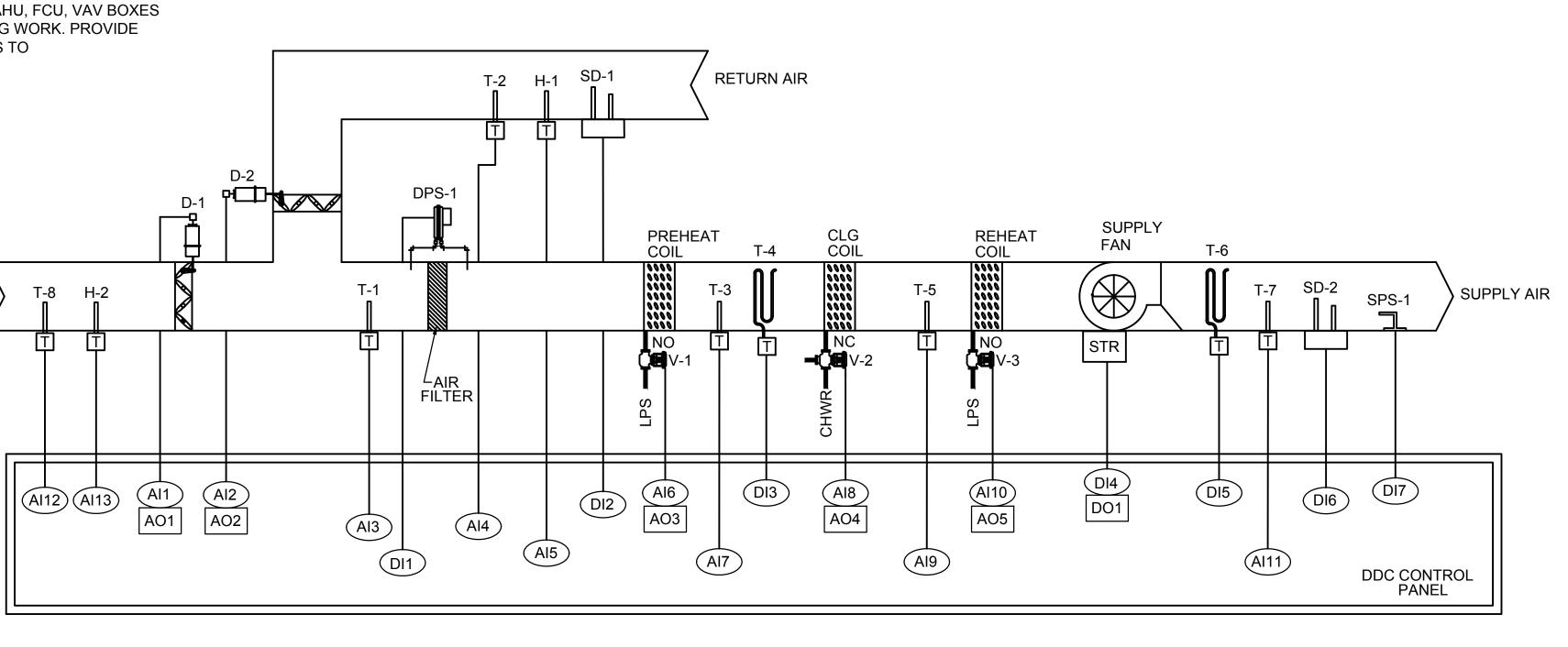




# Hernandez Consulting

Allen&Hoshall engineering since 1915





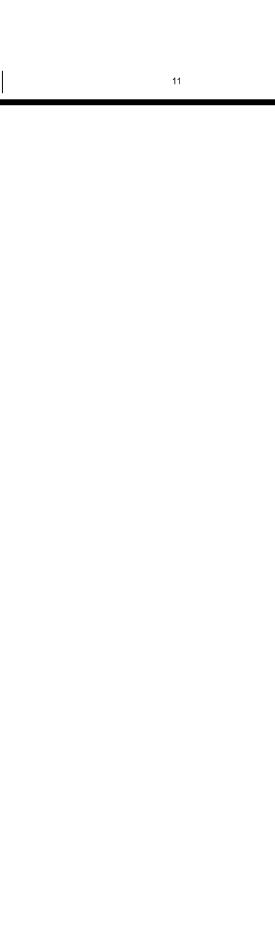
### SEQUENCE OF OPERATION

1. GENERAL

- 1.1 THE AIR HANDLING UNIT SHALL BE STARTED AND STOPPED AUTOMATICALLY AT THE ECC. THE HOA SWITCH SHALL BE KEPT IN THE AUTO POSITION. HAND AND OFF POSITIONS SHALL BE USED FOR MAINTENANCE ONLY. UPON RECEIVING A START COMMAND THE SUPPLY FAN WILL START ONLY AFTER ALL INTERNAL SAFETIES ARE PROVEN. ONCE FAN RUN STATUS IS PROVEN BY A CURRENT SENSING RELAY, THE CONTROLS SHALL OPERATE ACCORDING TO THE SEQUENCES AS DESCRIBED BELOW.
- 2. DAMPER CONTROL
- 3.1 DURING OCCUPIED MODE, OA DAMPER SHALL BE FULLY OPEN AND RA DAMPERS SHALL BE FULLY CLOSED.
- 3.2 DURING UNOCCUPIED MODE, IF THE UNIT IS RUNNING THE OA DAMPER SHALL BE FULLY CLOSED AND THE RA DAMPER SHALL BE FULLY OPEN.
- 3. TEMPERATURE CONTROL
- 3.1 THE PREHEAT COIL VALVE (V-1) SHALL MODULATE TO MAINTAIN A PREHEAT DISCHARGE TEMPERATURE AS SENSED BY (T-3) OF 45°F.
- 3.2 WHEN OA DEWPOINT IS ABOVE 55°F THE CHILLED WATER COIL VALVE (V-2) SHALL MODULATE TO MAINTAIN A UNIT DISCHARGE TEMPERATURE AS SENSED BY (T-7) OF 57°F. WHEN THE OA DEWPOINT IS BELOW 55°F THE CHILLED WATER COIL VALVE (V-2) SHALL MODULATE TO MAINTAIN A UNIT DISCHARGE TEMPERATURE AS SENSED BY (T-7) OF 75°F.
- 3.3 WHEN ALL ZONES ARE CALLING FOR HEATING PREHEAT VALVE (V-1) AND REHEAT VALVE (V-3) SHALL MODULATE TO MAINTAIN A DISCHARGE AIR TEMPERATURE OF 90°F AS SENSED BY (T-7).
- 4. ALARMS
- 4.1 THE UNIT SHALL STOP UPON ANY OF THE SAFETIES BEING TRIPPED REGARDLESS OF THE MODE OF OPERATION (AUTOMATIC, HAND OR BYPASS).
- 4.2 THE RETURN AIR SMOKE DETECTOR, SD-1, OR THE SUPPLY AIR SMOKE DETECTOR, SD-2, SHALL STOP THE UNIT UPON SENSING COMBUSTION PRODUCTS IN THE SYSTEM. SMOKE DETECTORS MUST BE MANUALLY REST AFTER AN ALARM CONDITION IN ORDER FOR THE FAN TO RESTART.
- 4.3 A TEMPERATURE LOW LIMIT SWITCH, T-4, SHALL STOP THE UNIT, CLOSE THE OUTSIDE AIR DAMPER, OPEN THE PREHEAT VALVE, AND SEND A CRITICAL ALARM TO THE ECC UPON SENSING A FALL IN TEMPERATURE BELOW SETPOINT (35°F ADJUSTABLE). THE LOW LIMIT SWITCHES MUST BE MANUALLY RESET AFTER AN ALARM CONDITION.
- 4.4 A TEMPERATURE HIGH LIMIT, T-6, WILL SHUTDOWN THE FAN AND SEND AN ALARM TO THE ECC UPON A RISE IN DISCHARGE AIR ABOVE 125°F. THE HIGH LIMIT SWITCH MUST BE MANUALLY RESET AFTER AN ALARM.
- 4.5 A DISCHARGE AIR HIGH STATIC PRESSURE SAFETY SWITCH, SPS-1, LOCATED AT THE SUPPLY FAN DISCHARGE WILL STOP THE UNIT UPON SENSING HIGH SUPPLY DUCT STATIC ABOVE 3 IN. STATIC PRESSURE (ADJUSTABLE) TO PREVENT OVER PRESSURIZING THE DUCTWORK.
- 5. MONITORING
- 5.1 THE DCC SYSTEM MONITORS THE DIFFERENTIAL PRESSURE ACROSS THE FILTER AND GENERATES AN ALARM IF THE DIFFERENTIAL PRESSURE INCREASES ABOVE THE SETPOINT OF 0.75 IN. WC. (ADJUSTABLE) TO PROVIDE NOTIFICATION OF A DIRTY FILTER.
- 6. SHUTDOWN
- 6.1 STOPPING THE UNIT SHALL DE-ENERGIZE THE CONTROL LOOPS AND SEND THE CONTROL VALVES AND OUTSIDE AIR DAMPER TO THE CLOSED POSITION.

1 BUILDING 2 2-AC-21 & 2-AC-23 CONTROL SCHEMATIC & SEQUENCE SCALE: NOT TO SCALE

Signature	 Drawing Title 2-AC-21 & 2-AC-23 CON SCHEMATIC & SEQUEN	A&E Design - Management			Date October 30, 2013 Project No.	
	Approved: Service Engineer	Building Number 2	Checked WLP	Drawn NMT	VA256-12-C-0253	
	Approved: Service Director	Alexandria, LA			IVIZ-ZUU Dwg. 1 Of 1	U.S. Ve
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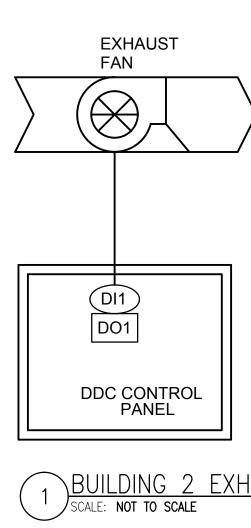


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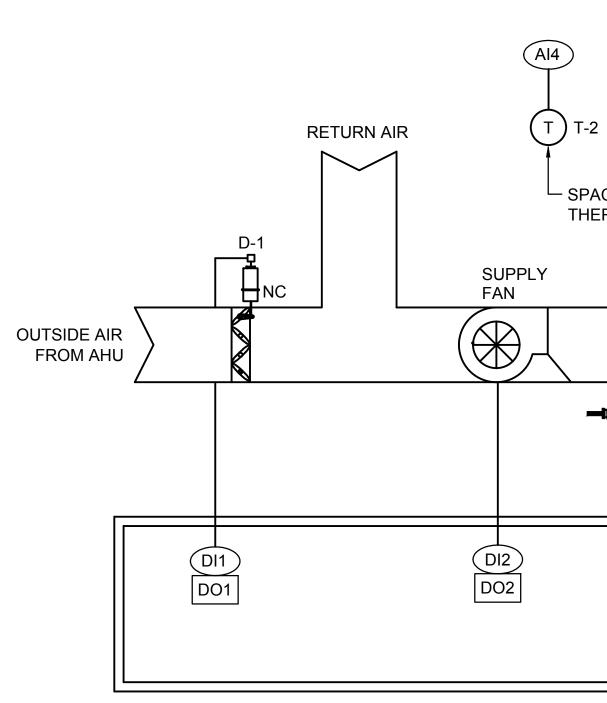




2. ALARM

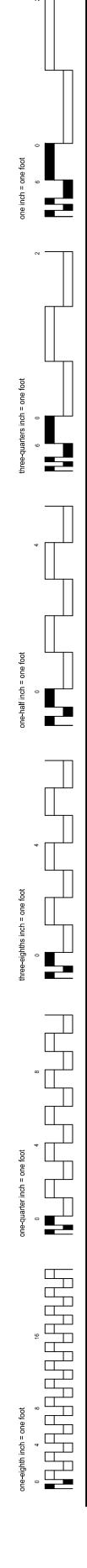


		FAN COIL UNIT (TYP.)					
	LOCAL DDC CONTROLLER						
INP	UTS						
	Al1	CHILLED WATER CONTROL VALVE (V-1)					
LOG	Al2	HOT WATER CONTROL VALVE (V-2)					
ANALOG	Al3	DISCHARGE AIR TEMPERATURE SENSOR (T-1)					
	Al4	ZONE TEMPERATURE SENSOR (T-2)					
TAL	DI1	OUTSIDE AIR DAMPER (D-1) STATUS					
DIGITAL	DI2	SUPPLY FAN STATUS					
Ουτ	PUTS						
LOG	AO1	CHILLED WATER CONTROL VALVE (V-1)					
ANALOG	AO2	HOT WATER CONTROL VALVE (V-2)					
DIGITAL	DO1	OUTSIDE AIR DAMPER (D-1)					
DIG	DO2	SUPPLY FAN START/STOP					



1 BUILDING 2 FAN COIL UNIT (TYP.) CONTROL SCHEMATIC & SEQUENCE SCALE: NOT TO SCALE

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SEQUENCE OF OPERATION: EXHAUST FAN (TYP.)

4

1.1. FAN TO BE STARTED AND STOPPED BY A TIME SCHEDULE OF 24 HOURS A DAY (ADJ.).

2.1. ALARM SHALL BE GENERATED WHEN STATUS DOES NOT MATCH COMMAND.

	EXHAUST FAN (TYP.)
	LOCAL DDC CONTROLLER
INPUTS	
D.	I1 EXHAUST FAN STATUS
OUTPUT	S
	D1 EXHAUST FAN (7-EF#4) START/STOP

NOTES:

- 1. PROVIDE NEW DDC CONTROLLER. CONNECT NEW CONTROLLER TO EXISTING 120V ELECTRICAL SERVICE.
- 2. TYPICAL FOR EF-2-1, EF-2-2, EF-2-3, EF-2-4, EF-2-5, EF-2-6, & EF-2-7.

1 BUILDING 2 EXHAUST FAN (TYP.) CONTROL SCHEMATIC & SEQUENCE SCALE: NOT TO SCALE

SEQUENCE OF OPERATION: FAN COIL UNIT (TYP.)

- 1. SUPPLY FAN CONTROL
- 1.1. WHEN THE THERMOSTAT FAN MODE IS SET TO "ON", THE SUPPLY FAN SHALL RUN CONTINUOUSLY.
- 1.2. WHEN THE THERMOSTAT FAN MODE IS SET TO "AUTO", THE SUPPLY FAN SHALL RUN ANYTIME THERE IS A CALL FOR HEATING OR COOLING.
- 2. TEMPERATURE CONTROL
- 2.1. THE UNIT SHALL CONTROL TO MAINTAIN THE ZONE TEMPERATURE SETPOIINT AS SENSED BY THE ZONE TEMPERATURE SENSOR, T-2.
- 3. OCCUPIED MODE
- 3.1. THE OCCUPANCY MODE SHALL BE CONTROLLED VIA A NETWORK INPUT.
- 4. OUTSIDE AIR DAMPER
- 4.1. OUTSIDE AIR DAMPER SHALL BE OPEN WHEN RESPECTIVE AHU IS ON.

NOTES:

- 1. ALL CONTROL DEVICES ARE EXISTING DDC. 2. FAN COIL UNIT CONTROLLER TO BE REPLACED.
- 3. SPACE THERMOSTAT TO BE REPLACED.
- 4. UNIT TEMP SENSORS AND ACTUATORS CAN BE REUSED IF FUNCTIONAL AND COMPATIBLE WITH

THERMOSTAT

NEW CONTROLS. 5. TYPICAL OF 110 UNITS.

CLG COIL HTG COIL 0000 0000 0000 0000 0000 T-1 SUPPLY AIR **---**V-2 Al2 AO2 Al1 AO1 AI3

DDC CONTROL PANEL

Remarks	VETERANS HEALTH CARE SYSTEM	Hernandez Consulting Allen&Hoshall	Approved: Title Signature	Drawing Title FAN COIL UNIT (TYP.) & EXHAUST FAN (TYP.) CONTROL SCHEMATICS, SEQUENCES & BALANCE SCHEDULES	A&E Design - Upgra Management Contro		Date October 30, 2013 Project No. VA256-12-C-0253	
	Alexandria, Louisiana	ALBERT ARCHITECTURE engineering since 1915		Approved: Service Engineer	Building Number Checked	P NMT		
				Approved: Service Director	Alexandria, LA		M2-201	U.S. De Vetera
1 2	3 4	5 6	7	8	9		10	

QTY. FCU		SUPPLIED BY	TOTAL		GPI	Μ
PER ROOM	AREA SERVED	AHU	CFM	OA CFM	COOLING	HEATIN
2	201	2-AC-21	220	30	1.50	1.0
1	201C	2-AC-21	420	45	2.25	1.0
1	201B	2-AC-21	450	45	2.50	1.0
1	203	2-AC-21	200	30	1.50	1.0
1	203	2-AC-21	400	40	2.25	1.0
1	205	2-AC-21	150	20	0.75	0.75
1	206	2-AC-21	280	30	1.25	1.0
1	208	2-AC-21	240	30	1.25	0.75
1	209	2-AC-21	450	45	2.50	1.0
2	210	2-AC-21	570	40	3.50	1.0
2	210	2-AC-21	320	40	2.25	1.0
1	210	2-AC-21	250	40	1.25	1.0
1	212	2-AC-21	150	30	1.0	0.75
1	213	2-AC-21	150	30	1.0	0.75
1	214	2-AC-21	150	30	1.0	0.75
1	217	2-AC-21	560	90	4.0	1.0
1	217B	2-AC-21	840	90	5.75	0.75
1	217E	2-AC-21	560	90	4.0	1.0
1	217E	2-AC-21 2-AC-21	560	90	4.0	1.0
1	POST DEPLOYMENT CLERK	2-AC-21 2-AC-21	560	90	4.0	1.0
1	218	2-AC-21	80	20	0.75	0.50
1	210	2-AC-21	190	30	1.25	0.75
2	213	2-AC-21 2-AC-21	450	50	3.25	1.0
2	220	2-AC-21 2-AC-21	350	40	2.0	1.0
2	211	2-AC-21 2-AC-21	250	40	1.25	1.0
1	222	-				
	220	2-AC-21	570	45	3.0	1.0
1		2-AC-21	350	40		1.0
1	228	2-AC-21	320	40	1.75	1.0
1	229	2-AC-21	270	40	1.25	1.0
1	230	2-AC-21	320	40	1.75	1.0
1	231	2-AC-21	340	40	1.75	1.0
1	232	2-AC-23	330	30	1.75	1.0
1	233	2-AC-23	325	30	1.75	1.0
1	234	2-AC-23	200	20	1.00	0.75
1	235	2-AC-23	300	40	1.50	1.0
1	236	2-AC-23	400	50	2.0	1.0
1	237	2-AC-23	80	20	0.75	0.50
1	237A	2-AC-23	200	30	1.25	1.0
2	238	2-AC-23	530	40	2.75	1.0
2	239	2-AC-23	530	40	2.75	1.0
1	240	2-AC-23	210	45	1.50	1.0
1	241A	2-AC-23	620	65	3.50	0.75
1	241	2-AC-23	840	120	6.70	1.0
1	242	2-AC-23	630	60	3.00	0.75
1	242B	2-AC-23	840	80	5.75	0.75
1	242C	2-AC-23	760	50	3.50	0.75
1	242D	2-AC-23	250	30	1.25	1.0
1	245	2-AC-23	90	30	0.75	0.50
1	246	2-AC-23	80	20	0.75	0.50
1	247	2-AC-23	80	20	1.25	0.50
4	248	2-AC-23	530	55	3.50	1.0
2	249	2-AC-23	270	40	1.50	1.0
1	250	2-AC-23	430	45	2.50	1.0
1	252	2-AC-21	200	20	1.25	0.75
1	254	2-AC-21	250	30	1.25	1.0
1	255	2-AC-21	170	25	1.0	0.75
1	256	2-AC-21	450	45	2.50	1.0
1	2ND FLOOR SOUTHEAST	2-AC-21	830	90	3.50	0.75
I		2-70-21	000	30	0.00	0.75
1	2ND FLOOR SOUTHWEST CORRIDOR	2-AC-21	830	90	3.75	0.75
		1		1		

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QTY. FCU		SUPPLIED BY	TOTAL		GPM	
PER ROOM	AREA SERVED	AHU	CFM	OA CFM	COOLING	HEATING
2	301	2-AC-21	300	40	2.25	1.0
1	301C	2-AC-21	450	45	2.50	1.0
1	301B	2-AC-21	540	60	2.50	1.0
2	303	2-AC-21	430	60	3.50	1.0
1	305	2-AC-21	150	20	0.75	0.75
1	306	2-AC-21	150	20	0.75	0.75
2	308	2-AC-21	280	35	1.50	1.0
1	309	2-AC-21	270	45	1.75	1.0
2	310	2-AC-21	550	50	3.0	1.0
2	311	2-AC-21	430	50	2.75	1.0
1	312	2-AC-21	130	45	0.75	0.75
1	313	2-AC-21	240	65	1.25	1.0
4	316	2-AC-21	750	90	5.25	0.75
1	316B	2-AC-21	840	90	6.70	0.75
1	319	2-AC-21	80	20	0.75	0.5
1	320	2-AC-21	240	65	1.25	1.0
1	321	2-AC-21	270	45	1.25	1.0
1	322	2-AC-21	460	45	2.75	1.0
1	323	2-AC-21	460	45	2.50	1.0
1	324	2-AC-21	270	45	1.25	1.0
1	325	2-AC-21	270	45	1.25	1.0
1	326	2-AC-21 2-AC-21	230	30	1.25	1.0
1	329	2-AC-21 2-AC-21	230	30	1.25	1.0
	329		230	45	1.25	1.0
1		2-AC-21				
1	331	2-AC-21	200	30	1.25	1.0
1	332	2-AC-21	270	30	1.0	1.0
2	333	2-AC-21	250	25	1.25	1.0
1	334	2-AC-23	750	60	3.50	0.75
1	335	2-AC-23	840	90	5.80	0.75
1	336	2-AC-23	300	30	1.50	1.0
1	337	2-AC-23	350	30	2.0	1.0
1	338	2-AC-23	310	30	1.0	1.0
3	339	2-AC-23	400	35	2.50	1.0
3	340	2-AC-23	320	35	2.0	1.0
2	341	2-AC-23	120	35	1.0	0.50
1	342	2-AC-23	550	50	2.50	1.0
1	342A	2-AC-23	840	240	6.70	0.75
4	343	2-AC-23	630	70	4.50	1.0
1	346	2-AC-23	150	20	0.75	0.5
1	347	2-AC-23	200	45	1.25	0.5
2	348	2-AC-23	450	50	3.0	1.0
2	349	2-AC-23	330	25	2.0	1.0
1	350	2-AC-23	280	45	1.25	0.75
1	351	2-AC-23	280	45	1.25	0.75
1	352	2-AC-23	280	45	1.25	0.75
1	353	2-AC-23	300	45	1.25	0.75
1	355	2-AC-23	220	30	1.0	0.75
1	357	2-AC-23	220	40	1.25	0.75
1	358	2-AC-23	180	20	1.0	0.50
1	359	2-AC-23	400	40	2.25	1.0
1	3RD FLOOR SOUTHEAST CORRIDOR	2-AC-21	1000	80	6.70	0.75
1	3RD FLOOR SOUTHWEST CORRIDOR	2-AC-21	1000	80	6.70	0.75
1	3RD FLOOR NORTH CORRIDOR	2-AC-23	1100	80	6.70	0.75

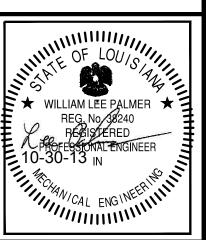
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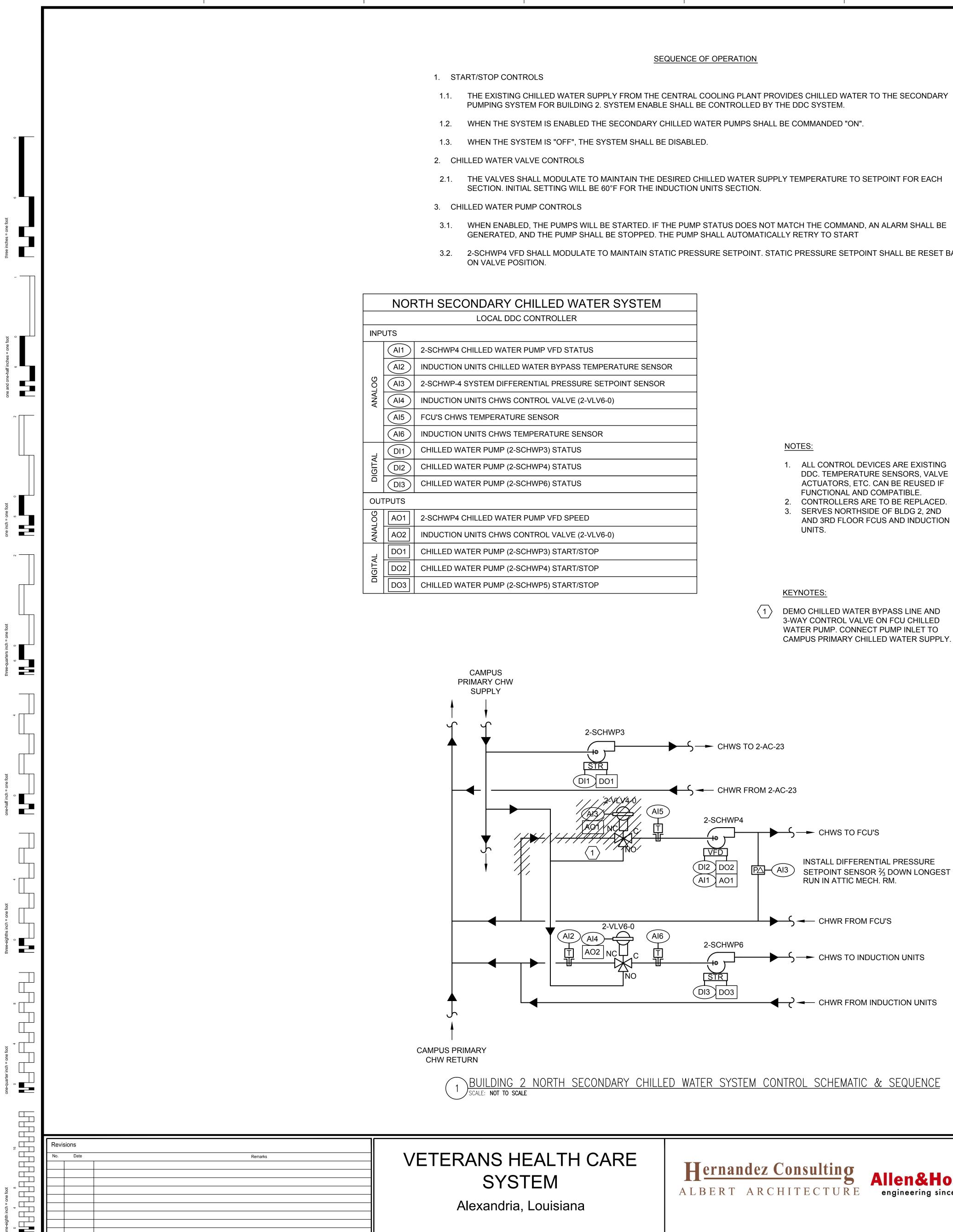
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Alexandria, Lo

SEQUENCE OF OPERATION	1. ST
OLS	1.1.
HILLED WATER SUPPLY FROM THE CENTRAL COOLING PLANT PROVIDES CHILLED WATER TO THE SECONDARY M FOR BUILDING 2. SYSTEM ENABLE SHALL BE CONTROLLED BY THE DDC SYSTEM.	1.2.
EM IS ENABLED THE SECONDARY CHILLED WATER PUMPS SHALL BE COMMANDED "ON".	1.3.
EM IS "OFF", THE SYSTEM SHALL BE DISABLED.	2. CH
VE CONTROLS	2.1.
ALL MODULATE TO MAINTAIN THE DESIRED CHILLED WATER SUPPLY TEMPERATURE TO SETPOINT FOR EACH . SETTING WILL BE 60°F FOR THE INDUCTION UNITS SECTION.	3. CH
IP CONTROLS	3.1.
, THE PUMPS WILL BE STARTED. IF THE PUMP STATUS DOES NOT MATCH THE COMMAND, AN ALARM SHALL BE D THE PUMP SHALL BE STOPPED. THE PUMP SHALL AUTOMATICALLY RETRY TO START	3.2.
SHALL MODULATE TO MAINTAIN STATIC PRESSURE SETPOINT. STATIC PRESSURE SETPOINT SHALL BE RESET BASED TION.	

5

HILLED WATER SYSTEM
CONTROLLER
PUMP VFD STATUS
WATER BYPASS TEMPERATURE SENSOR
ENTIAL PRESSURE SETPOINT SENSOR
NTROL VALVE (2-VLV6-0)
ESENSOR
MPERATURE SENSOR
CHWP3) STATUS
CHWP4) STATUS
CHWP6) STATUS
PUMP VFD SPEED
NTROL VALVE (2-VLV6-0)
CHWP3) START/STOP
CHWP4) START/STOP
CHWP5) START/STOP

ALTH CARE EM	Hernandez Consulting	Allen&Hoshall	Approved: Title	Signature	Drawing Title NORTH & SOUTH SCHWS CONTROL SCHEMATICS & SEQUENCES	A&E Design Management			Date October 30, 2013 Project No. VA256-12-C-0253	
ouisiana	ALBERT ARCHITECTURE	engineering since 1915			Approved: Service Engineer	Building Number 2	Checked WLP	Drawn NMT	M2-202	
					Approved: Service Director	Alexandria, LA			<b>IVIZ-ZUZ</b> Dwg. 1 Of 1	U.: \
4	5	6		7	8	9			10	

## SEQUENCE OF OPERATION

START/STOP CONTROLS

THE EXISTING CHILLED WATER SUPPLY FROM THE CENTRAL COOLING PLANT PROVIDES CHILLED WATER TO THE SECONDARY PUMPING SYSTEM FOR BUILDING 2. SYSTEM ENABLE SHALL BE CONTROLLED BY THE DDC SYSTEM.

WHEN THE SYSTEM IS ENABLED THE SECONDARY CHILLED WATER PUMPS SHALL BE COMMANDED "ON".

WHEN THE SYSTEM IS "OFF", THE SYSTEM SHALL BE DISABLED.

CHILLED WATER VALVE CONTROLS

THE VALVES SHALL MODULATE TO MAINTAIN THE DESIRED CHILLED WATER SUPPLY TEMPERATURE TO SETPOINT FOR EACH SECTION. INITIAL SETTING WILL BE 60°F FOR THE INDUCTION UNITS SECTION.

CHILLED WATER PUMP CONTROLS

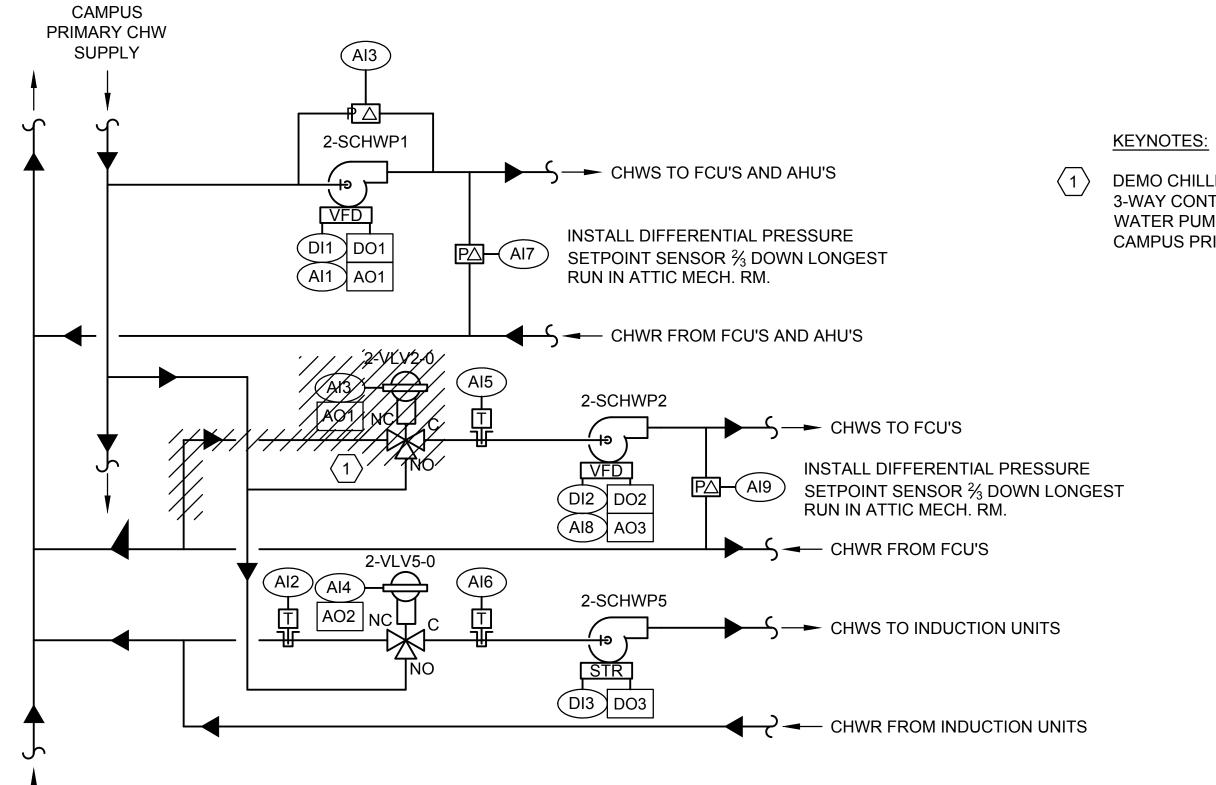
WHEN ENABLED, THE PUMPS WILL BE STARTED. IF THE PUMP STATUS DOES NOT MATCH THE COMMAND, AN ALARM SHALL BE GENERATED, AND THE PUMP SHALL BE STOPPED. THE PUMP SHALL AUTOMATICALLY RETRY TO START.

2-SCHWP1 & 2-SCHWP2 VFD SHALL MODULATE TO MAINTAIN STATIC PRESSURE SETPOINT. STATIC PRESSURE SETPOINT SHALL BE RESET BASED ON VALVE POSITION.

	SOUTH SECONDARY CHILLED WATER SYSTEM						
	LOCAL DDC CONTROLLER						
INP	INPUTS						
	Al1	2-SCHWP1 CHILLED WATER PUMP VFD STATUS					
	Al2	INDUCTION UNITS CHILLED WATER BYPASS TEMPERATURE SENSOR					
	AI3	2-SCHWP1 CHILLED WATER PUMP DIFFERENTIAL PRESSURE SENSOR					
U U	Al4	INDUCTION UNITS CHWS CONTROL VALVE (2-VLV5-0)					
ANALOG	AI5	FCU'S CHWS TEMPERATURE SENSOR					
AN	(Al6)	INDUCTION UNITS CHWS TEMPERATURE SENSOR					
	(AI7)	2-SCHWP-1 SYSTEM DIFFERENTIAL PRESSURE SETPOINT SENSOR					
	AI8	2-SCHWP-2 CHILLED WATER PUMP VFD STATUS					
	(AI9)	2-SCHWP-2 SYSTEM DIFFERENTIAL PRESSURE SETPOINT SENSOR					
Ļ	DI1	CHILLED WATER PUMP (2-SCHWP1) STATUS					
DIGITAL	DI2	CHILLED WATER PUMP (2-SCHWP2) STATUS					
	DI3	CHILLED WATER PUMP (2-SCHWP5) STATUS					
OU	TPUTS						
LOG	AO1	2-SCHWP1 CHILLED WATER PUMP VFD SPEED					
ANALOG	AO2	INDUCTION UNITS CHWS CONTROL VALVE (2-VLV5-0)					
	AO3	2-SCHWP2 CHILLED WATER PUMP VFD SPEED					
Ļ	DO1	CHILLED WATER PUMP (2-SCHWP1) START/STOP					
DIGITAL	DO2	CHILLED WATER PUMP (2-SCHWP2) START/STOP					
	DO3	CHILLED WATER PUMP (2-SCHWP5) START/STOP					

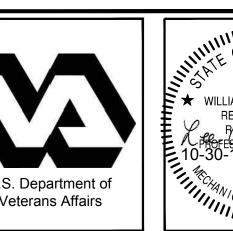
NOTES:

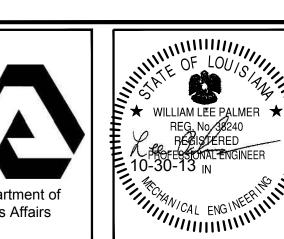
- FCUS AND INDUCTION UNITS.



CAMPUS PRIMARY CHW RETURN

2 BUILDING 2 SOUTH SECONDARY CHILLED WATER SYSTEM CONTROL SCHEMATIC & SEQUENCE SCALE: NOT TO SCALE





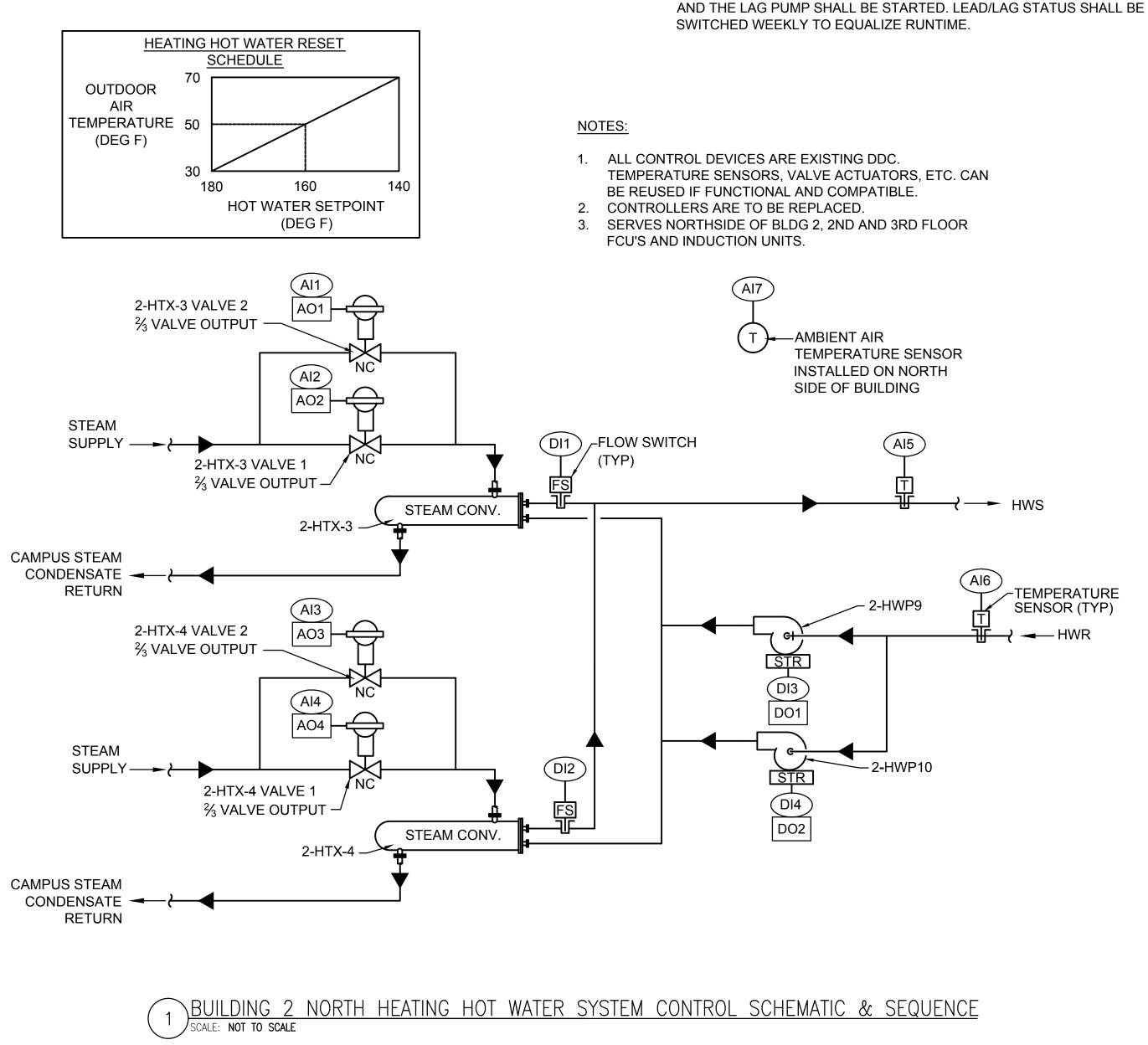
DEMO CHILLED WATER BYPASS LINE AND 3-WAY CONTROL VALVE ON FCU CHILLED WATER PUMP. CONNECT PUMP INLET TO CAMPUS PRIMARY CHILLED WATER SUPPLY.

TEMPERATURE SENSORS, VALVE ACTUATORS, ETC. CAN BE REUSED IF FUNCTIONAL AND COMPATIBLE. 2. CONTROLLERS ARE TO BE REPLACED. CONNECT NEW CONTROLLERS TO EXISTING ELECTRICAL SERVICE. 3. SERVES SOUTHSIDE OF BLDG 2, 2ND AND 3RD FLOOR

1. ALL CONTROL DEVICES ARE EXISTING DDC.

G

	NORTH HEATING HOT WATER SYSTEM	SEQUENCE OF OPERATION
	LOCAL DDC CONTROLLER	1. START/STOP CONTROLS
INP	PUTS	1.1. THE HEATING SYSTEM SHALL AUTOMATICALLY START WHEN THE
	AI1 STEAM CONVERTER (2-HTX-3) VALVE 2 STATUS	OUTSIDE AIR TEMPERATURE FALLS BELOW THE SYSTEM ENABLE SETPOINT.
	AI2 STEAM CONVERTER (2-HTX-3) VALVE 1 STATUS	1.2. WHEN THE SYSTEM IS "ON":
U U	AI3 STEAM CONVERTER (2-HTX-4) VALVE 2 STATUS	1.2.1. STEAM CONTROL VALVES SHALL MODULATE TO MAINTAIN THE
ANALOG	AI4 STEAM CONVERTER (2-HTX-4) VALVE 1 STATUS	HOT WATER SUPPLY TEMPERATURE AT SETPOINT.
A	AI5 HOT WATER SUPPLY TEMPERATURE SENSOR	1.2.2.       THE HOT WATER SUPPLY TEMPERATURE RESETS INVERSELY         WITH THE OUTDOOR TEMPERATURE AS SCHEDULED: AT 30°F OA,
	AI6 HOT WATER RETURN TEMPERATURE SENSOR	HWS TEMPERATURE AT 180°F, AT 70°F OA, HWS TEMPERATURE AT 140°F.
	AI7 AMBIENT AIR TEMPERATURE SENSOR	
	DI1 STEAM CONVERTER (2-HTX-3) FLOW SWITCH STATUS	1.2.3.       STEAM HOT WATER CONVERTERS, 2-HTX-3 & 2-HTX-4, ARE 100%         REDUNDANT AND ONLY ONE UNIT AT A TIME SHALL OPERATE.
DIGITAL	DI2 STEAM CONVERTER (2-HTX-4) FLOW SWITCH STATUS	1.2.4. HOT WATER PUMPS ARE CONTROLLED BY THE DDC SYSTEM. THE
DIG	DI3 HOT WATER PUMP (2-HWP9) STATUS	PUMPS ARE 100% REDUNDANT REQUIRING ONLY ONE PUMP AT A TIME TO OPERATE.
	DI4 HOT WATER PUMP (2-HWP10) STATUS	1.3. WHEN THE OUTSIDE AIR TEMPERATURE RISES ABOVE THE SYSTEM
00	ITPUTS	ENABLE SETPOINT OR THE SYSTEM IS "OFF", THE HEATING SHALL BE DISABLED.
	AO1 STEAM CONVERTER (2-HTX-3) VALVE 2 CONTROLLER	2. HEAT EXCHANGER CONTROL
ANALOG	AO2 STEAM CONVERTER (2-HTX-3) VALVE 1 CONTROLLER	2.1. THIS SYSTEM CONSISTS OF TWO STEAM HEAT EXCHANGERS WITH $\frac{1}{3}$ -
ANA	AO3 STEAM CONVERTER (2-HTX-4) VALVE 2 CONTROLLER	<sup>2</sup> / <sub>3</sub> STEAM VALVES. AFTER THE FLOW THROUGH THE HEAT EXCHANGER HAS BEEN CONFIRMED VIA THE FLOW SWITCH, THE
	AO4 STEAM CONVERTER (2-HTX-4) VALVE 1 CONTROLLER	24VAC POWER SHALL BE APPLIED TO THE STEAM VALVE ACTUATORS.
DIGITAL	DO1 HOT WATER PUMP (2-HWP9) START/STOP	THE TWO STEAM INLET VALVES WILL MODULATE IN SEQUENCE TO MAINTAIN THE DESIRED HOT WATER SUPPLY TEMPERATURE TO
DIG	DO2 HOT WATER PUMP (2-HWP10) START/STOP	SETPOINT AS RESET BY THE OUTDOOR AIR TEMPERATURE.
		3. HOT WATER PUMP CONTROL
		3.1. WHEN ENABLED, A PUMP SHALL BE STARTED. IF THE PUMP STATUS DOES NOT MATCH THE COMMAND, AN ALARM SHALL BE GENERATED



Revisions		
No. Date	Remarks	VETERANS HE
		SYST
		Alexandria,

5



	SOUTH HEATING HOT WATER SYSTEM							
	LOCAL DDC CONTROLLER							
INP	INPUTS							
	(Al1)	STEAM CONVERTER (2-HTX-1) VALVE 2 STATUS						
	Al2	STEAM CONVERTER (2-HTX-1) VALVE 1 STATUS						
ŋ	Al3	STEAM CONVERTER (2-HTX-2) VALVE 2 STATUS						
ANALOG	Al4	STEAM CONVERTER (2-HTX-2) VALVE 1 STATUS						
A	AI5	HOT WATER SUPPLY TEMPERATURE SENSOR						
	Al6	HOT WATER RETURN TEMPERATURE SENSOR						
	AI7	AMBIENT AIR TEMPERATURE SENSOR						
	DI1	STEAM CONVERTER (2-HTX-1) FLOW SWITCH STATUS						
DIGITAL	DI2	STEAM CONVERTER (2-HTX-2) FLOW SWITCH STATUS						
DIG	DI3	HOT WATER PUMP (2-HWP7) STATUS						
	DI4	HOT WATER PUMP (2-HWP8) STATUS						
OUTPUTS								
	AO1	STEAM CONVERTER (2-HTX-1) VALVE 2 CONTROLLER						
LOG	AO2	STEAM CONVERTER (2-HTX-1) VALVE 1 CONTROLLER						
ANALOG	AO3	STEAM CONVERTER (2-HTX-2) VALVE 2 CONTROLLER						
	AO4	STEAM CONVERTER (2-HTX-2) VALVE 1 CONTROLLER						
TAL	DO1	HOT WATER PUMP (2-HWP7) START/STOP						
DIGITAL	DO2	HOT WATER PUMP (2-HWP8) START/STOP						

HEATING HOT WATER RESET

<u>SCHEDULE</u>

180

160

HOT WATER SETPOINT

(DEG F)

140

OUTDOOR

AIR

(DEG F)

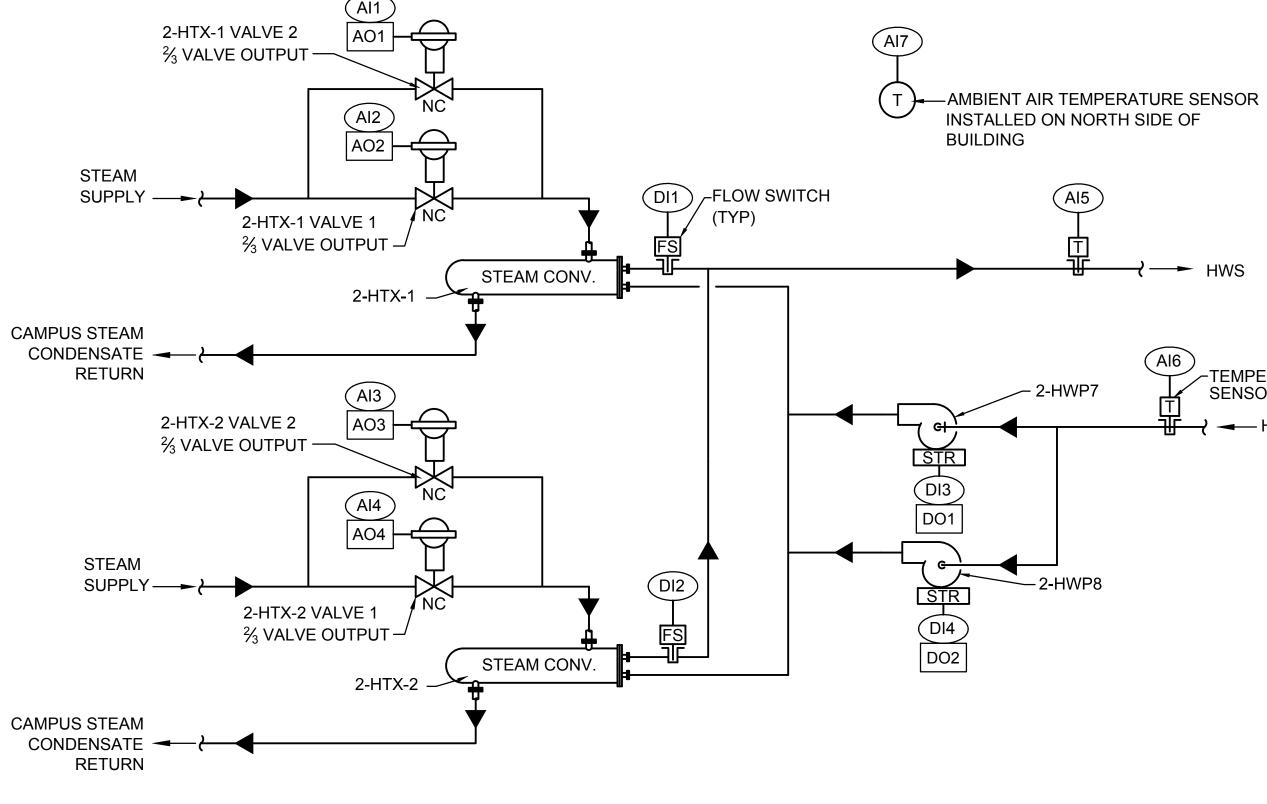
TEMPERATURE 50

## SEQUENCE OF OPERATION

- 1. START/STOP CONTROLS
- 1.1. THE HEATING SYSTEM SHALL AUTOMATICALLY START WHEN THE OUTSIDE AIR TEMPERATURE FALLS BELOW THE SYSTEM ENABLE SETPOINT.
- 1.2. WHEN THE SYSTEM IS "ON":
- 1.2.1. STEAM CONTROL VALVES SHALL MODULATE TO MAINTAIN THE HOT WATER SUPPLY TEMPERATURE AT SETPOINT.
- 1.2.2. THE HOT WATER SUPPLY TEMPERATURE RESETS INVERSELY WITH THE OUTDOOR TEMPERATURE AS SCHEDULED: AT 30°F OA, HWS TEMPERATURE AT 180°F, AT 70°F OA, HWS TEMPERATURE AT 140°F.
- STEAM HOT WATER CONVERTERS, 2-HTX-1 & 2-HTX-2, ARE 100% 1.2.3. REDUNDANT AND ONLY ONE UNIT AT A TIME SHALL OPERATE.
- 1.2.4. HOT WATER PUMPS ARE CONTROLLED BY THE DDC SYSTEM. THE PUMPS ARE 100% REDUNDANT REQUIRING ONLY ONE PUMP AT A TIME TO OPERATE.
- 1.3. WHEN THE OUTSIDE AIR TEMPERATURE RISES ABOVE THE SYSTEM ENABLE SETPOINT OR THE SYSTEM IS "OFF", THE HEATING SHALL BE DISABLED.
- 2. HEAT EXCHANGER CONTROL
- 2.1. THIS SYSTEM CONSISTS OF TWO STEAM HEAT EXCHANGERS WITH  $\frac{1}{3}$  -<sup>2</sup>/<sub>3</sub> STEAM VALVES. AFTER THE FLOW THROUGH THE HEAT EXCHANGER HAS BEEN CONFIRMED VIA THE FLOW SWITCH (FS-X), THE 24VAC POWER SHALL BE APPLIED TO THE STEAM VALVE ACTUATORS. THE TWO STEAM INLET VALVES WILL MODULATE IN SEQUENCE TO MAINTAIN THE DESIRED HOT WATER SUPPLY TEMPERATURE TO SETPOINT AS RESET BY THE OUTDOOR AIR TEMPERATURE.
- 3. HOT WATER PUMP CONTROL
- 3.1. WHEN ENABLED, A PUMP SHALL BE STARTED. IF THE PUMP STATUS DOES NOT MATCH THE COMMAND, AN ALARM SHALL BE GENERATED AND THE LAG PUMP SHALL BE STARTED. LEAD/LAG STATUS SHALL BE SWITCHED WEEKLY TO EQUALIZE RUNTIME.

## NOTES:

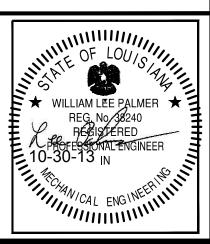
- 1. ALL CONTROL DEVICES ARE EXISTING DDC. TEMPERATURE SENSORS, VALVE ACTUATORS, ETC. CAN BE REUSED IF FUNCTIONAL AND COMPATIBLE.
- CONTROLLERS ARE TO BE REPLACED.
- SERVES SOUTHSIDE OF BLDG 2, 2ND AND 3RD FLOOR FCU'S AND INDUCTION UNITS.



BUILDING 2 SOUTH HEATING HOT WATER SYSTEM CONTROL SCHEMATIC & SEQUENCE

	Approved: Service Engineer Approved: Service Director	Building Number 2	Checked WLP	Drawn NMT	DRAWING NO. M2-203	U.S.
	SCHEMATICS & SEQUENCES	Building Number			VA256-12-C-0253	
Signature	NORTH & SOUTH HEATING HOT WATER SYSTEMS CONTROL	Project Title A&E Design - Upgrade Energy Management Control Systems			October 30, 2013	





TEMPERATURE SENSOR (TYP) HWR