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VETERANS HEALTH CARE
SYSTEM
Alexandria, Louisiana

Hernandez Consulting
ALBERT ARCHITECTURE

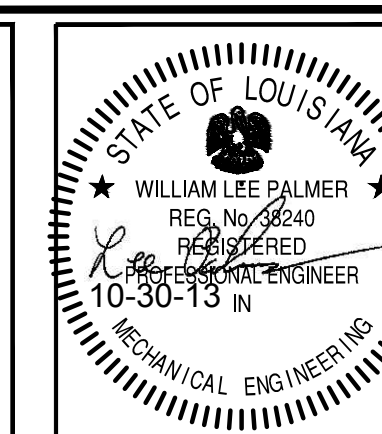
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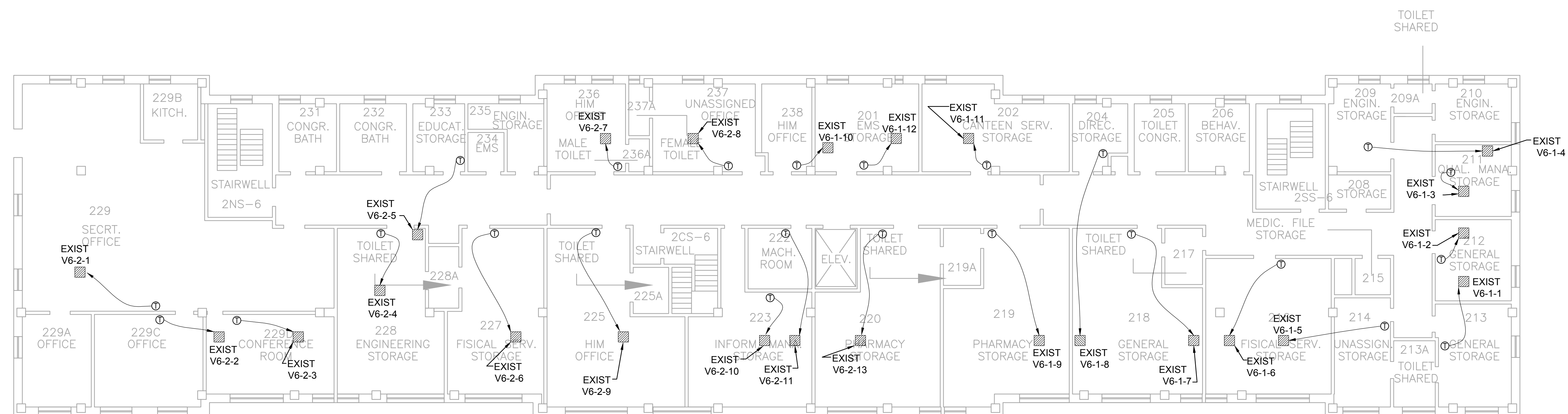
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<div> <div> </div> <div> </div> </div>	<div>Drawing Title:</div> <div>1ST FLOOR PLAN - MECHANICAL</div>
	<div>Approved: Service Engineer</div>
	<div>Approved: Service Director</div>

Project Title		
A&E Design - Upgrade Energy Management Control Systems		
Building Number	Checked	Drawn
6	WLP	NMT
Location		
Alexandria, LA		

Date	October 30, 2013
Project No.	VA256-12-C-0253
DRAWING NO.	M6-101
	Dwg. 1 Of 1





1 BUILDING 6 2ND FLOOR PLAN - MECHANICAL
SCALE: 1/8" = 1'-0"

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VETERANS HEALTH CARE
SYSTEM
Alexandria, Louisiana

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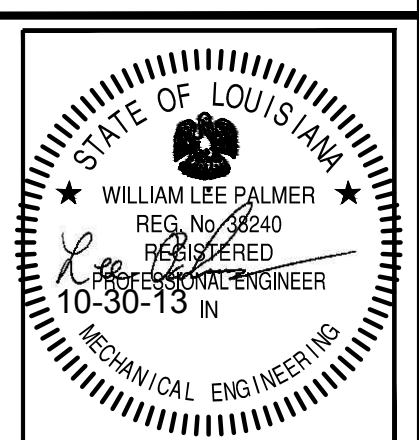
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	Drawing Title
	2ND FLOOR PLAN - MECHANICAL
	Approved: Service Engineer
	Approved: Service Director

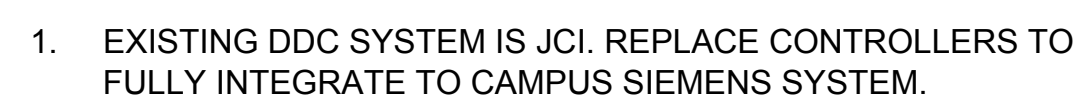
Project Title			
A&E Design - Upgrade Energy Management Control Systems			
Building Number	Checked	Drawn	
6	WLP	NMT	
Location			
Alexandria, LA			

Date	October 30, 2013
Project No.	VA256-12-C-0253
DRAWING NO.	M6-102
	Dwg. 1 Of 1





STATE OF LOUISIANA
 WILLIAM LEE PALMER
 REG. NO. 38240
 REGISTERED
 MECHANICAL ENGINEER
 10-30-13 IN



VETERANS HEALTH CARE SYSTEM

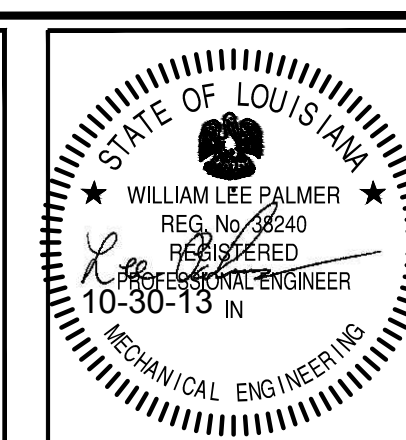
Alexandria, Louisiana

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Project Title		
A&E Design - Upgrade Energy Management Control Systems		
Building Number	Checked	Drawn
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Location		
Alexandria, LA		

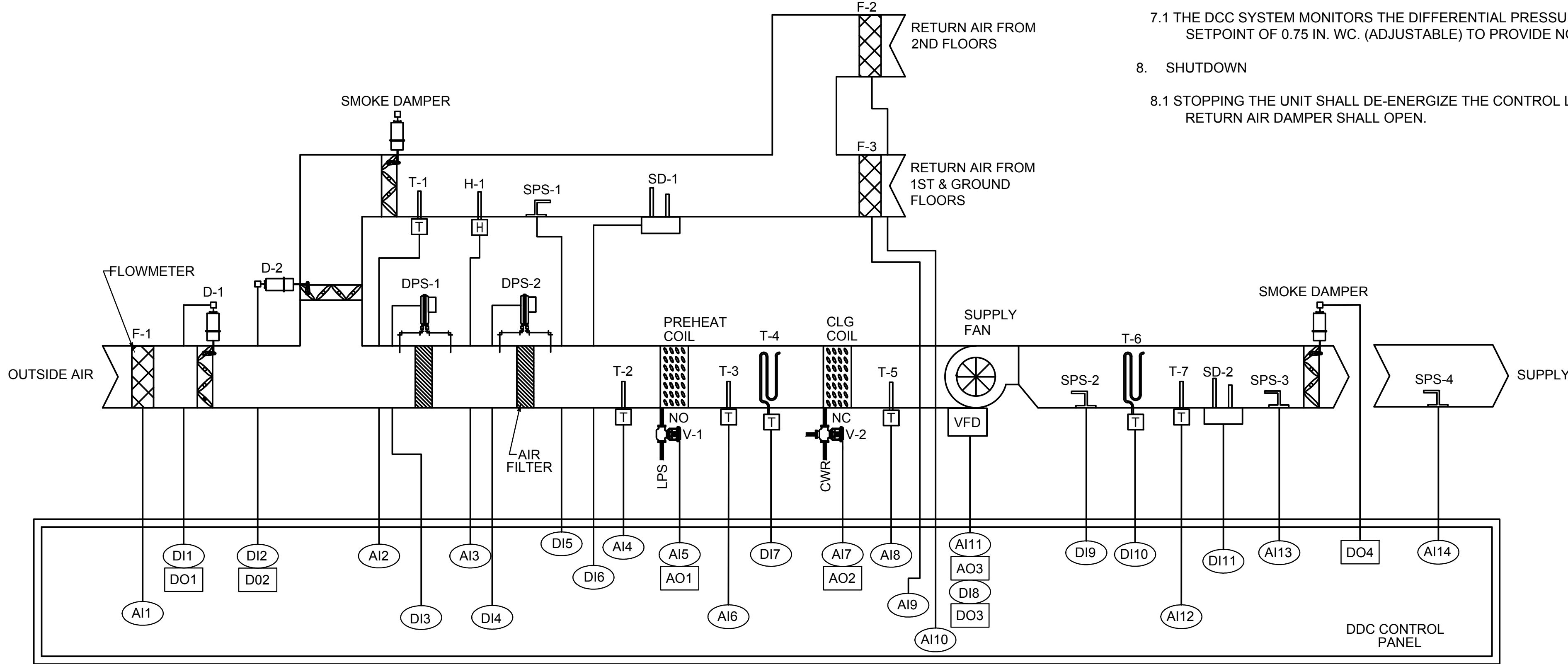
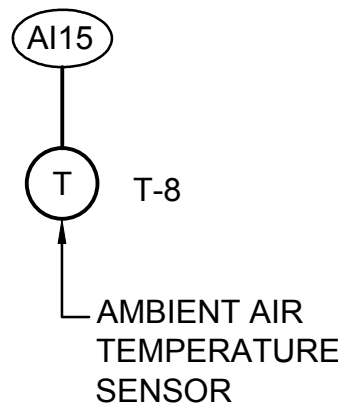


U.S. Department of
Veterans Affairs



VAV AIR HANDLING UNIT	
LOCAL DDC CONTROLLER	
INPUTS	
ANALOG	(AI1) OUTSIDE AIR FLOWMETER (F-1)
	(AI2) RETURN AIR TEMPERATURE SENSOR (T-1)
	(AI3) RETURN AIR HUMIDITY SENSOR (H-1)
	(AI4) MIXED AIR TEMPERATURE SENSOR (T-2)
	(AI5) PREHEAT STEAM CONTROL VALVE (V-1)
	(AI6) PREHEAT COIL DISCHARGE AIR TEMPERATURE SENSOR (T-3)
	(AI7) CHILLED WATER CONTROL VALVE (V-2)
	(AI8) COOLING COIL DISCHARGE AIR TEMPERATURE SENSOR (T-5)
	(AI9) RETURN AIR GROUND & 1ST FLOORS FLOWMETER (F-3)
	(AI10) RETURN AIR 2ND & 3RD FLOORS FLOWMETER (F-2)
	(AI11) SUPPLY FAN VFD STATUS
	(AI12) SUPPLY AIR TEMPERATURE SENSOR (T-7)
	(AI13) SUPPLY AIR STATIC PRESSURE SENSOR (SPS-3)
	(AI14) DISCHARGE AIR STATIC PRESSURE SENSOR (SPS-4)
	(AI15) AMBIENT AIR TEMPERATURE SENSOR (T-8)
DIGITAL	(DI1) OUTSIDE AIR DAMPER (D-1) STATUS
	(DI2) RETURN AIR DAMPER (D-2) STATUS
	(DI3) FILTER STATUS (DPS-1)
	(DI4) FILTER STATUS (DPS-2)
	(DI5) RETURN AIR STATIC PRESSURE SENSOR (SPS-1) STATUS
	(DI6) RETURN AIR SMOKE DETECTOR (SD-1) STATUS
	(DI7) LOW LIMIT TEMPERATURE SENSOR (T-4) STATUS
	(DI8) SUPPLY FAN STATUS
	(DI9) DISCHARGE AIR HIGH STATIC PRESSURE SWITCH (SPS-2) STATUS
	(DI10) HIGH LIMIT TEMPERATURE SENSOR (T-6) STATUS
	(DI11) SUPPLY AIR SMOKE DETECTOR (SD-2) STATUS

VAV AIR HANDLING UNIT	
LOCAL DDC CONTROLLER	
OUTPUTS	
ANALOG	(AO1) PREHEAT STEAM CONTROL VALVE (V-1)
	(AO2) CHILLED WATER CONTROL VALVE (V-2)
	(AO3) SUPPLY FAN VFD SPEED
DIGITAL	(DO1) OUTSIDE AIR DAMPER (D-1)
	(DO2) RETURN AIR DAMPER (D-2)
	(DO3) SUPPLY FAN START/STOP
	(DO4) SMOKE DAMPER OPEN/CLOSE



1 BUILDING 6 AHU#6-1 & AHU#6-2 CONTROL SCHEMATIC & SEQUENCE
SCALE: NOT TO SCALE

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 SHALL 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. AIR FLOW

2.1 OUTSIDE AIR IS METERED BY FLOWMETER, F-1, TO MONITOR AND MAINTAIN A CONSTANT MIN. OUTSIDE AIR FLOW BY MODULATING THE RETURN DAMPER, D-2, AND OUTSIDE AIR DAMPER, D-1, UP TO THE MAX. FLOW SETPOINT OF 5000 CFM (ADJUSTABLE).

3. TEMPERATURE CONTROL

3.1 TEMPERATURE SENSOR, T-3, IN THE PREHEAT COIL DISCHARGE SHALL TRANSMIT TEMPERATURE CHANGES TO THE DDC. THE DDC SYSTEM SHALL MODULATE THE 2-WAY STEAM PREHEAT CONTROL VALVE, V-1, TO MAINTAIN PREHEAT TEMPERATURE SETPOINT (ADJUSTABLE).

3.2 TEMPERATURE SENSOR, T-7, IN THE DISCHARGE AIR DUCT TRANSMITS TEMPERATURE CHANGES TO THE DDC. THE DDC MODULATES THE 2-WAY COOLING CONTROL VALVE, V-2, TO MAINTAIN DISCHARGE AIR TEMPERATURE SETPOINT OF 55°F (ADJUSTABLE).

4. STATIC PRESSURE AND SUPPLY FAN SPEED CONTROL

4.1 THE VFD SHALL MODULATE THE SPEED OF THE SUPPLY FAN TO MAINTAIN DISCHARGE AIR STATIC PRESSURE TO ITS SETPOINT OF 1.0 IN. WC. (ADJUSTABLE) AS SENSED BY THE DUCT STATIC PRESSURE SENSOR, SPS-4, LOCATED ¾ OF THE WAY DOWN THE LONGEST DUCT MAIN.

4.2 THE SUPPLY FAN SPEED SHALL DECREASE TOWARDS ITS MIN. FREQUENCY. AS THE DISCHARGE AIR STATIC PRESSURE DECREASES, THE SUPPLY FAN SPEED SHALL INCREASE.

4.3 THE STATIC PRESSURE IS RESET BASED ON ACTUAL BUILDING LOAD BY POLLING ALL VAV TERMINAL UNITS.

5. DEHUMIDIFICATION CONTROL

5.1 A DUCT HUMIDITY SENSOR, H-1, SHALL MEASURE THE RETURN AIR HUMIDITY AT THE AHU. THE DDC WILL AVERAGE THE POSITION OF THE VAV BOX AIR VALVES AND SHALL ADJUST THE AIR TEMPERATURE UP OR DOWN TO PROVIDE THE MOST EFFICIENT SUPPLY AIR TEMPERATURE TO SATISFY VAV BOX DURING OCCUPIED OPERATION.

5.2 IF THE RETURN AIR HUMIDITY RISES ABOVE SETPOINT OF 60% (ADJUSTABLE) THE SUPPLY AIR TEMPERATURE OF THE AHU SHALL BE LOWERED TO KEEP THE RETURN AIR HUMIDITY BELOW SETPOINT.

6. ALARMS

6.1 THE UNIT SHALL STOP UPON ANY OF THE SAFETIES BEING TRIPPED REGARDLESS OF THE MODE OF OPERATION (AUTOMATIC, HAND OR BYPASS).

6.2 THE AIR HANDLER RETURN AIR SMOKE DETECTOR, SD-1, AND THE DISCHARGE AIR SMOKE DETECTOR, SD-2, SHALL STOP THE UNIT AND CLOSE THE SMOKE DAMPERS UPON SENSING COMBUSTION PRODUCTS IN THE SYSTEM. SMOKE DETECTORS MUST BE MANUALLY REST AFTER AN ALARM CONDITION IN ORDER FOR THE FAN TO RESTART AND THE SMOKE DAMPERS TO OPEN.

6.3 A MIXED AIR TEMPERATURE SENSOR, T-2, UPSTREAM OF THE COOLING COIL SIGNALS THE DDC UPON A DROP IN TEMPERATURE BELOW 45°F, WHICH SHALL GENERATE AN ALARM TO THE ECC.

6.4 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 (40°F ADJUSTABLE). THE LOW LIMIT SWITCHES MUST BE MANUALLY RESET AFTER AN ALARM CONDITION.

6.5 A TEMPERATURE HIGH LIMIT, T-6, SHALL 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.

6.6 A DISCHARGE AIR HIGH STATIC PRESSURE SAFETY SWITCH, SPS-2, LOCATED AT THE SUPPLY FAN DISCHARGE SHALL STOP THE UNIT UPON SENSING HIGH DISCHARGE DUCT STATIC ABOVE 3 IN. STATIC PRESSURE (ADJUSTABLE) TO PREVENT OVER PRESSURIZING THE DUCTWORK. STATIC PRESSURE SWITCH IS HARDWIRED TO THE VFD AND UNIT IS SHUTDOWN IN HAND, AUTO, OR BYPASS MODE. THE HIGH STATIC PRESSURE SAFETIES MUST BE MANUALLY RESET AFTER AN ALARM CONDITION.

6.7 UPON FAILURE OF THE VFD, THE SUPPLY FAN SHALL BE CONTROLLED MANUALLY AT THE DDC PANEL OR THE ECC THROUGH THE BYPASS STARTER. FAN SHALL BE OPERATED AT CONSTANT SPEED.

7. MONITORING

7.1 THE DCC SYSTEM MONITORS THE DIFFERENTIAL PRESSURE ACROSS EACH 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.

8. SHUTDOWN

8.1 STOPPING THE UNIT SHALL DE-ENERGIZE THE CONTROL LOOPS AND SEND THE CONTROL VALVES TO THE CLOSED POSITION. THE OUTSIDE AIR DAMPER WILL CLOSE AND THE RETURN AIR DAMPER SHALL OPEN.

NOTES:

1. ALL CONTROL DEVICES ARE EXISTING DDC. SENSOR, VALVES, ETC CAN BE REUSED IF FUNCTIONAL AND COMPATIBLE.
2. DDC CONTROLLER TO BE REPLACED. CONNECT NEW CONTROLLER TO EXISTING ELECTRICAL SERVICE.

Revisions		
No.	Date	Remarks

VETERANS HEALTH CARE
SYSTEM
Alexandria, Louisiana

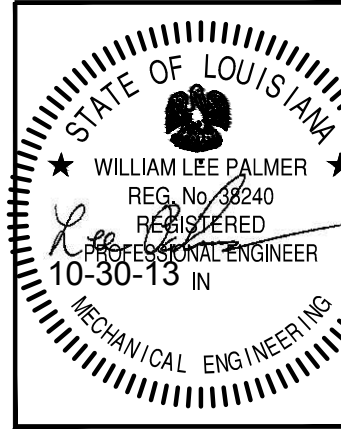
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Approved:	
Title	Signature

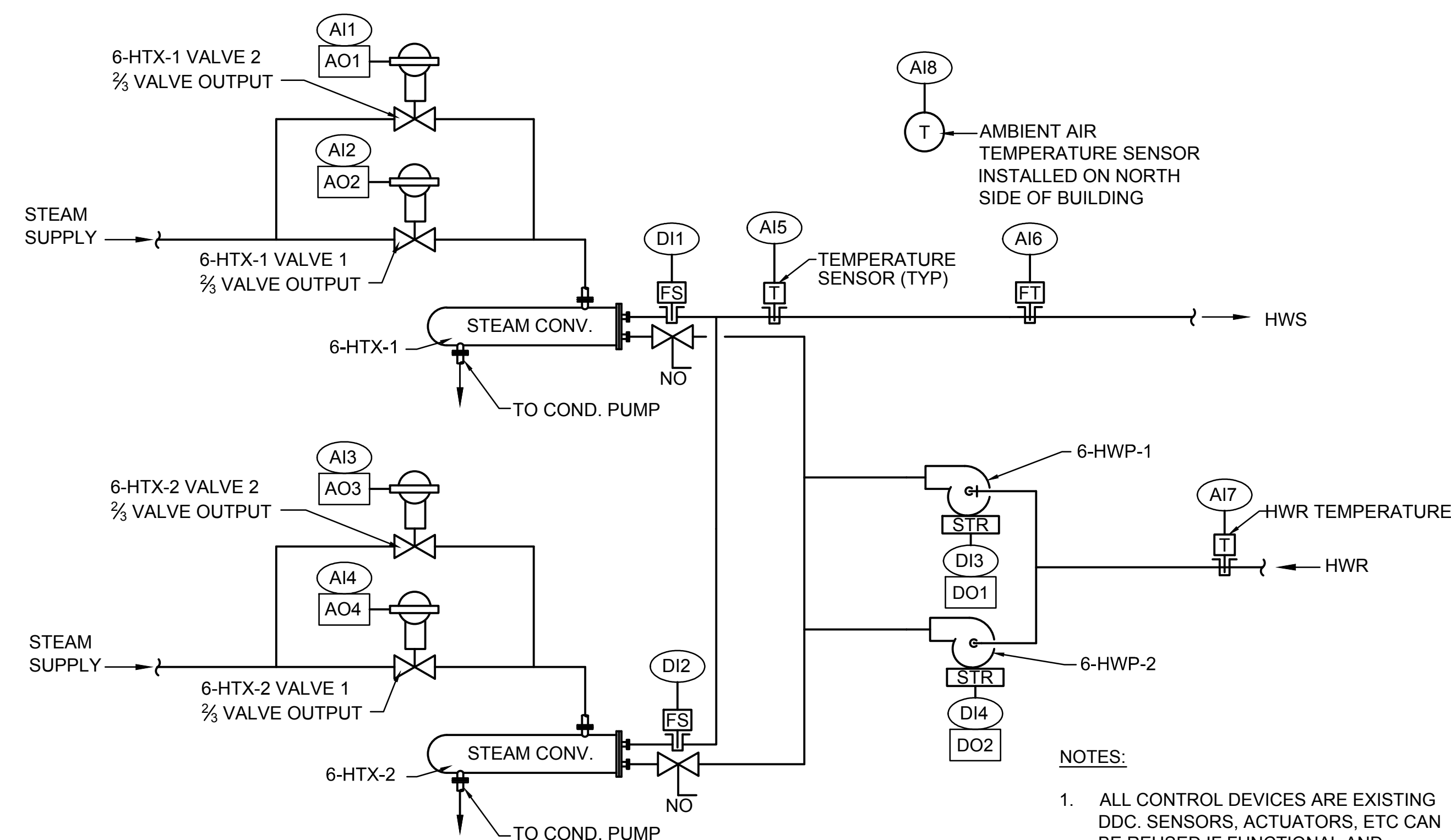
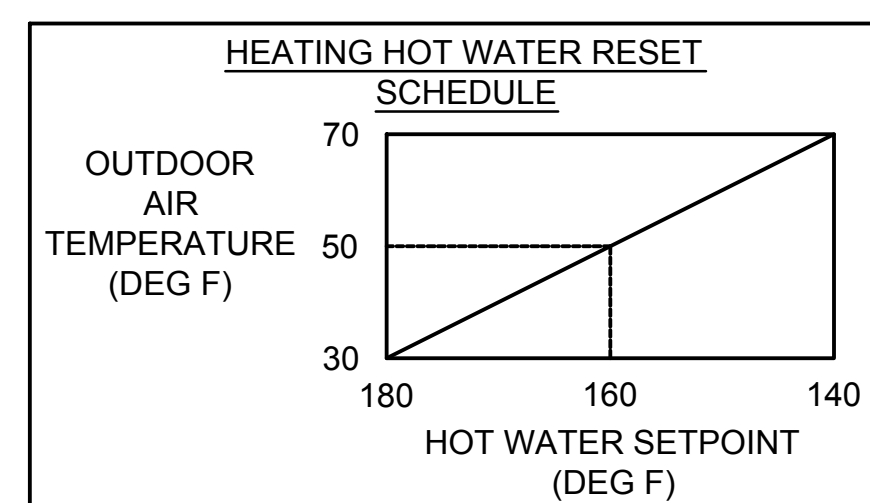
Drawing Title	
AHU#6-1 & AHU#6-2 CONTROL SCHEMATIC & SEQUENCE	
Approved: Service Engineer	
Approved: Service Director	

Project Title	
A&E Design - Upgrade Energy Management Control Systems	
Building Number	6
Checked	WLP
Drawn	NMT
Location	Alexandria, LA

Date	
October 30, 2013	
Project No.	VA256-12-C-0253
Drawing No.	M6-200
Dwg. 1 of 1	



HEATING HOT WATER SYSTEM		
LOCAL DDC CONTROLLER		
INPUTS		
ANALOG	AI1	STEAM CONVERTER (6-HTX-1) VALVE 2 STATUS
	AI2	STEAM CONVERTER (6-HTX-1) VALVE 1 STATUS
	AI3	STEAM CONVERTER (6-HTX-2) VALVE 2 STATUS
	AI4	STEAM CONVERTER (6-HTX-2) VALVE 1 STATUS
	AI5	HOT WATER SUPPLY TEMPERATURE SENSOR
	AI6	HOT WATER SUPPLY FLOWMETER
	AI7	HOT WATER RETURN TEMPERATURE SENSOR
	AI8	AMBIENT AIR TEMPERATURE SENSOR
DIGITAL	DI1	STEAM CONVERTER (6-HTX-1) FLOW SWITCH STATUS
	DI2	STEAM CONVERTER (6-HTX-2) FLOW SWITCH STATUS
	DI3	HOT WATER PUMP (6-HWP-1) STATUS
	DI4	HOT WATER PUMP (6-HWP-2) STATUS
OUTPUTS		
ANALOG	AO1	STEAM CONVERTER (6-HTX-1) VALVE 2 CONTROLLER
	AO2	STEAM CONVERTER (6-HTX-1) VALVE 1 CONTROLLER
	AO3	STEAM CONVERTER (6-HTX-2) VALVE 2 CONTROLLER
	AO4	STEAM CONVERTER (6-HTX-2) VALVE 1 CONTROLLER
DIGITAL	DO1	HOT WATER PUMP (6-HWP-1) START/STOP
	DO2	HOT WATER PUMP (6-HWP-2) START/STOP



- NOTES:**
1. ALL CONTROL DEVICES ARE EXISTING DDC. SENSORS, ACTUATORS, ETC CAN BE REUSED IF FUNCTIONAL AND COMPATIBLE.
 2. DDC CONTROLLER TO BE REPLACED. CONNECT NEW CONTROLLER TO EXISTING ELECTRICAL SERVICE.

1 BUILDING 6 HEATING HOT WATER SYSTEM CONTROL SCHEMATIC & SEQUENCE
SCALE: NOT TO SCALE

SEQUENCE OF OPERATION

1. OCCUPIED MODE
 - 1.1. STEAM CONTROL VALVES SHALL MODULATE TO MAINTAIN THE HOT WATER SUPPLY TEMPERATURE AT SETPOINT.
 - 1.2. THE HOT WATER SUPPLY TEMPERATURE RESETS INVERSELY WITH THE OUTDOOR TEMPERATURE AS SCHEDULED: AT 30°F OA - HWS AT 180°F, AT 70°F OA - HWS AT 140°F.
 - 1.3. STEAM HOT WATER CONVERTERS, 6-HTX-1 & 6-HTX-2, ARE 100% REDUNDANT AND ONLY ONE UNIT AT A TIME WILL OPERATE.
 - 1.4. HOT WATER PUMPS ARE CONTROLLED BY THE DDC SYSTEM. THE PUMPS ARE 100% REDUNDANT REQUIRING ONLY ONE PUMP AT A TIME TO OPERATE. THE LEAD/LAG WATER PUMPS AND HEAT EXCHANGERS ARE SEQUENCED BY THE DDC SYSTEM TO CHANGE EVERY 7 DAYS. IN THE EVENT A PUMP FAILS TO START IN 30 SECONDS OR NO FLOW CONDITION AT THE HEAT EXCHANGER, AN ALARM IS GENERATED, AND THE SECOND PUMP/EXCHANGER STARTS AUTOMATICALLY.
2. UNOCCUPIED MODE
 - 2.1. IF THE OUTSIDE AIR TEMPERATURE IS BELOW 40°F (ADJUSTABLE) THE DDC SYSTEM WILL PLACE THE HWS IN OCCUPIED MODE TO START PUMPS AND ACTUATE STEAM VALVES TO MAINTAIN SETPOINT AS NEEDED BY THE RESET SCHEDULE.
3. VALVE SEQUENCE FOR LEAD HEAT EXCHANGER
 - 3.1. AFTER THE FLOW THROUGH THE HEAT EXCHANGER HAS BEEN CONFIRMED VIA THE FLOW SWITCH (F-S-X), THE DDC CONTROLLER WILL RECEIVE AN INPUT AND THE 24VAC POWER WILL BE APPLIED TO THE STEAM VALVE ACTUATORS. THE STEAM VALVES SHALL OPERATE IN THREE MODES OF CONTROL.
 - 3.2. FIRST MODE: THE ½ CAPACITY STEAM VALVE MODULATES TO MAINTAIN THE ACTIVE SETPOINT. AFTER THE ½ VALVE HAS REACHED 100% CAPACITY FOR 5 MINUTES, THE SECOND MODE WILL BE ENABLED.
 - 3.3. SECOND MODE: THE ½ VALVE IS COMMANDED TO CLOSE AND THE ½ CAPACITY STEAM VALVE MODULATES TO MAINTAIN SETPOINT. AFTER THE ½ VALVE HAS REACHED 100% CAPACITY FOR 5 MINUTES, THE THIRD MODE WILL BE ENABLED.
 - 3.4. THIRD MODE: THE ½ VALVE WILL BE RE-ENABLED, AND BOTH STEAM VALVES MODULATE TOGETHER TO MAINTAIN SETPOINT.
 - 3.5. AS DEMAND REDUCES, THE MODES WILL BE DISABLED AT 40% COMMANDED VALVE (DIFFERENTIAL OF 60%), AND A 5 MINUTE DELAY WILL BE ACTIVATED BETWEEN MODES. UPON A LOSS OF FLOW THE STEAM VALVES WILL BE CLOSED (HARDWIRED AND SOFTWARE INTERLOCKS).

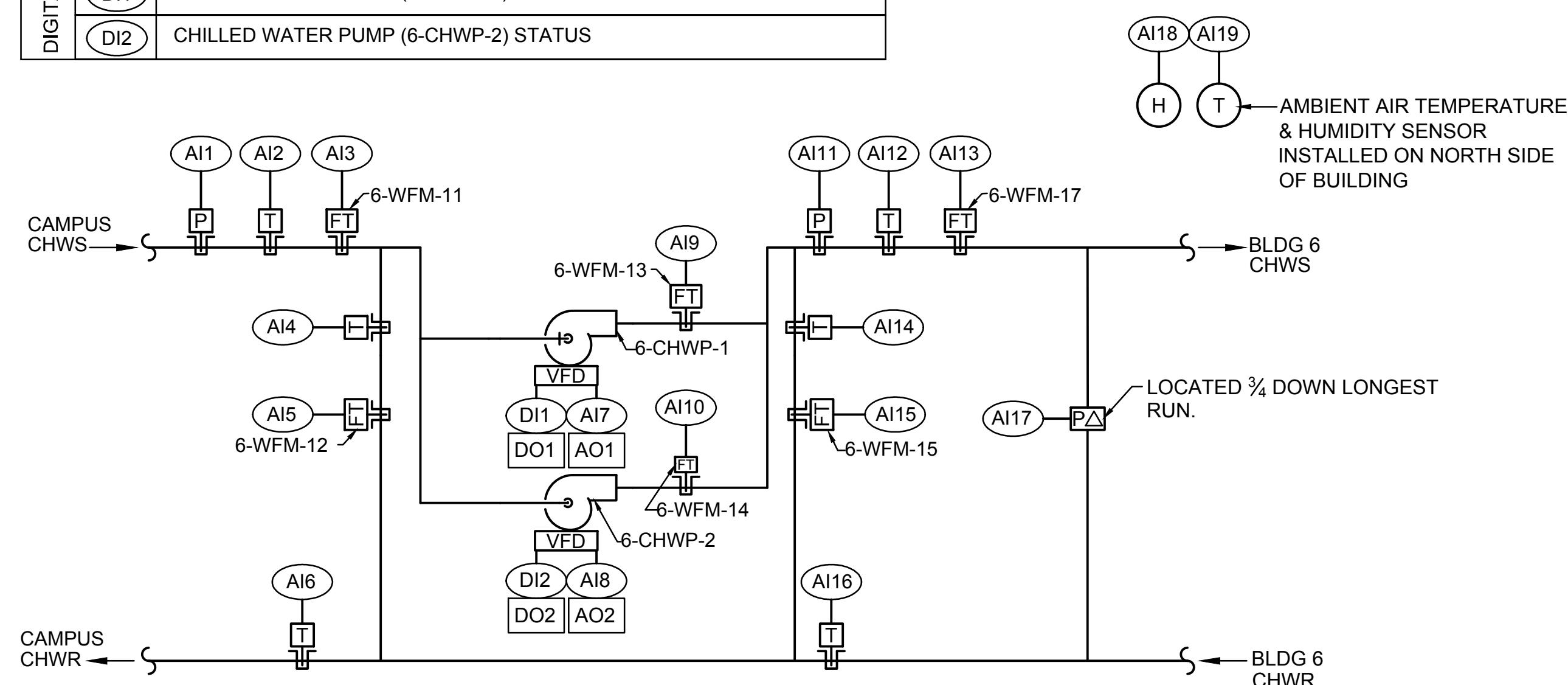
SEQUENCE OF OPERATION

1. GENERAL
 - 1.1. THE EXISTING CHILLED WATER SUPPLY FROM THE CENTRAL COOLING PLANT PROVIDES CHILLED WATER TO THE VFD SECONDARY PUMPING SYSTEM AT BUILDING 6. THE SECONDARY PUMPS ARE 100% REDUNDANT REQUIRING ONLY ONE PUMP AT A TIME TO OPERATE.
 - 1.2. UPON A CALL FOR COOLING FROM ANY AIR HANDLER, FAN COIL, OR BLOWER COIL, THE LEAD CHILLED WATER PUMP SHALL ENERGIZE AND THE RESPECTIVE VFD SHALL MODULATE THE PUMP TO MAINTAIN THE PRESSURIZATION SETPOINT (ADJUSTABLE) AT THE DIFFERENTIAL PRESSURE SENSOR LOCATED $\frac{3}{4}$ OF THE WAY DOWN THE LONGEST PIPING RUN. THE VFD WILL MODULATE AS REQUIRED TO MAINTAIN THE SYSTEM PRESSURE SETPOINT.
 - 1.3. A HYDRONIC BRIDGE CIRCUIT DOWNSTREAM OF THE CHILLED WATER PUMPS WITH A FLOWMETER, TEMPERATURE SENSOR AND MANUAL BALANCING VALVE SHALL BE UTILIZED TO BYPASS SECONDARY CHILLED WATER FLOW BACK TO THE PRIMARY LOOP AT MIN. VFD SETPOINT, WHILE COOLING COIL 2-WAY VALVES FLOW SHUT OFF AS COOLING LOAD DICTATES. MANUAL BALANCING VALVES SHALL BE SET AS A PRESSURE DROP TO MATCH REMAINDER OF BUILDING PIPING CIRCUIT AT MIN. FLOW. CHILLED WATER FLOWS WILL BE MEASURED AND TOTALIZED BY HIGH ACCURACY FLOWMETERS AT EACH PUMP DISCHARGE, HYDRONIC BRIDGE BYPASS, AND COMMON SECONDARY CHW SUPPLY.
2. LEAD/STANDBY PUMP CONTROL
 - 2.1. IF THE LEAD BUILDING SECONDARY CHILLED WATER PUMP FAILS TO OPERATE, THE STANDBY PUMP SHALL BE AUTOMATICALLY STARTED, AND THE SYSTEM SHALL RESUME NORMAL OPERATION. AN ALARM WILL BE GENERATED AT THE DDC PANEL TO NOTIFY OF PUMP FAILURE.
 - 2.2. THE LEAD/STANDBY STATUS OF THE PUMPS SHALL BE ROTATED EVERY 7 DAYS FOR EVEN RUNTIME.

SECONDARY CHILLED WATER SYSTEM		
LOCAL DDC CONTROLLER		
INPUTS		
ANALOG	(AI1)	CAMPUS CHILLED WATER SUPPLY PRESSURE SENSOR
	(AI2)	CAMPUS CHILLED WATER SUPPLY TEMPERATURE SENSOR
	(AI3)	CAMPUS CHILLED WATER SUPPLY FLOWMETER (6-WFM-11)
	(AI4)	EMERGENCY BYPASS TEMPERATURE SENSOR
	(AI5)	EMERGENCY BYPASS FLOWMETER (6-WFM-12)
	(AI6)	CAMPUS CHILLED WATER RETURN TEMPERATURE
	(AI7)	CHILLED WATER PUMP (6-CHWP-1) VFD STATUS
	(AI8)	CHILLED WATER PUMP (6-CHWP-2) VFD STATUS
	(AI9)	6-CHWP-1 DISCHARGE FLOWMETER (6-FWM-13)
	(AI10)	6-CHWP-1 DISCHARGE FLOWMETER (6-FWM-14)
	(AI11)	BUILDING 6 CHILLED WATER SUPPLY PRESSURE SENSOR
	(AI12)	BUILDING 6 CHILLED WATER SUPPLY TEMPERATURE SENSOR
	(AI13)	BUILDING 6 CHILLED WATER SUPPLY FLOWMETER (6-WFM-17)
	(AI14)	HYDRONIC BYPASS BRIDGE TEMPERATURE SENSOR
	(AI15)	HYDRONIC BYPASS BRIDGE FLOWMETER (6-WFM-15)
	(AI16)	BUILDING 6 CHILLED WATER RETURN TEMPERATURE SENSOR
	(AI17)	DIFFERENTIAL PRESSURE SENSOR
	(AI18)	AMBIENT AIR HUMIDITY SENSOR
	(AI19)	AMBIENT AIR TEMPERATURE SENSOR
DIGITAL	(DI1)	CHILLED WATER PUMP (6-CHWP-1) STATUS
	(DI2)	CHILLED WATER PUMP (6-CHWP-2) STATUS

SECONDARY CHILLED WATER SYSTEM		
LOCAL DDC CONTROLLER		
OUTPUTS		
DIGITAL ANALOG	AO1	CHILLED WATER PUMP (6-CHWP-1) VFD SPEED
	AO2	CHILLED WATER PUMP (6-CHWP-2) VFD SPEED
	DO1	CHILLED WATER PUMP (6-CHWP-1) START/STOP
	DO2	CHILLED WATER PUMP (6-CHWP-2) START/STOP

- NOTES:**
1. ALL CONTROL DEVICES ARE EXISTING DDC. SENSORS, ACTUATORS, ETC CAN BE REUSED IF FUNCTIONAL AND COMPATIBLE.
 2. DDC CONTROLLER TO BE REPLACED. CONNECT NEW CONTROLLER TO EXISTING ELECTRICAL SERVICE.



2 BUILDING 6 SECONDARY CHILLED WATER SYSTEM CONTROL SCHEMATIC & SEQUENCE
SCALE: NOT TO SCALE

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VETERANS HEALTH CARE
SYSTEM
Alexandria, Louisiana

Hernandez Consulting
ALBERT ARCHITECTURE

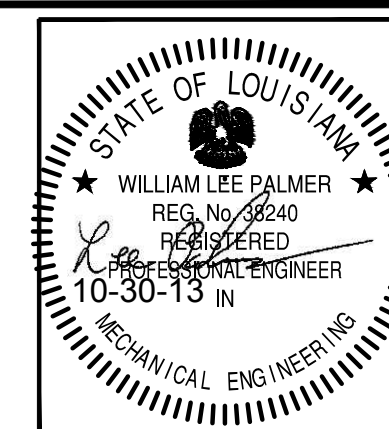
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engineering since 1915

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	Drawing Title
	HEATING HOT WATER & SCHW SYSTEMS CONTROL SCHEMATICS & SEQUENCES
	Approved: Service Engineer
	Approved: Service Director

Project Title			
A&E Design - Upgrade Energy Management Control Systems			
Building Number	Checked	Drawn	
6	WLP	NMT	
Location			
Alexandria, LA			

Date	October 30, 2013
Project No.	VA256-12-C-0253
DRAWING NO.	M6-202
	Dwg. 1 Of 1



SEQUENCE OF OPERATION

1. OCCUPIED MODE

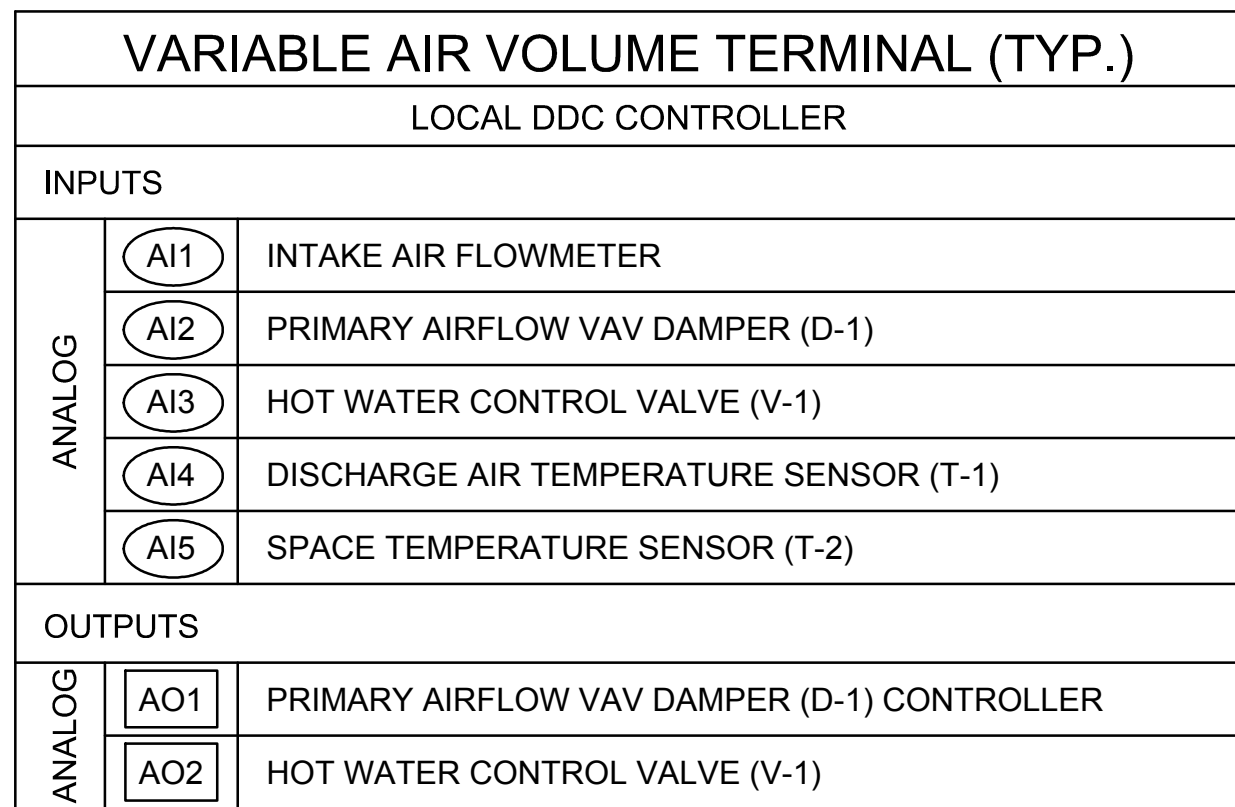
- THE ZONE TEMPERATURE SENSOR, T-2, TRANSMITS READINGS TO THE VAV CONTROLLER WHICH IN TURN MODULATES THE PRIMARY AIRFLOW VAV DAMPER, D-1, AND REHEAT CONTROL VALVE, V-1, TO MAINTAIN SPACE TEMPERATURE SETPOINTS (ADJUSTABLE).
- UPON A RISE IN ZONE TEMPERATURE ABOVE SETPOINT, THE VAV BOX CONTROLLER MODULATES THE PRIMARY AIRFLOW VAV DAMPER TO MAX. CFM SETPOINT.
- A DROP IN SPACE TEMPERATURE SETPOINT SIGNALS THE VAV TO MODULATE THE PRIMARY AIRFLOW VAV DAMPER TO THE MIN. CFM SETPOINT. A FURTHER DROP IN ZONE TEMPERATURE SIGNALS THE VMA TO MODULATE THE VAV BOX REHEAT CONTROL VALVE OPEN TO HEAT THE ZONE TO WITHIN +/- 0.5°F OF SETPOINT.

2. UNOCCUPIED MODE

- WHEN THE SYSTEM IS INDEXED TO UNOCCUPIED MODE, THE AIR HANDLER STOPS, THE PRIMARY AIRFLOW VAV DAMPER AND THE REHEAT CONTROL VALVE CLOSES.
- IF THE ZONE TEMPERATURE FALLS BELOW THE NIGHT SETBACK SETPOINT (ADJUSTABLE), THE AIR HANDLING UNIT WILL START, THE VAV BOX DAMPER OPEN, AND THE REHEAT CONTROL VALVE WILL MODULATE OPEN TO MAINTAIN THE UNOCCUPIED ZONE TEMPERATURE AT SETPOINT.
- IF THE ZONE TEMPERATURE RISES ABOVE THE NIGHT CYCLE SETPOINT, THE AIR HANDLING UNIT WILL START AND THE VAV BOX DAMPER WILL MODULATE OPEN TO COOL THE ZONE TO THE UNOCCUPIED COOLING SETPOINT TEMPERATURE.
- T-2 CONTAINS A PUSH BUTTON OVERRIDE TO ALLOW OCCUPANTS TO INDEX THE SYSTEM TO OCCUPIED MODE FOR AFTER HOURS USE. THE VMA CONTROLLER WILL FUNCTION PER THE OCCUPIED MODE OF OPERATION UNTIL THE TEMPORARY OCCUPANCY TIMER EXPIRES, AT WHICH TIME THE VAV CONTROLLER WILL REVERT TO UNOCCUPIED MODE OF OPERATION DEPENDING ON TIME OF DAY SCHEDULING.

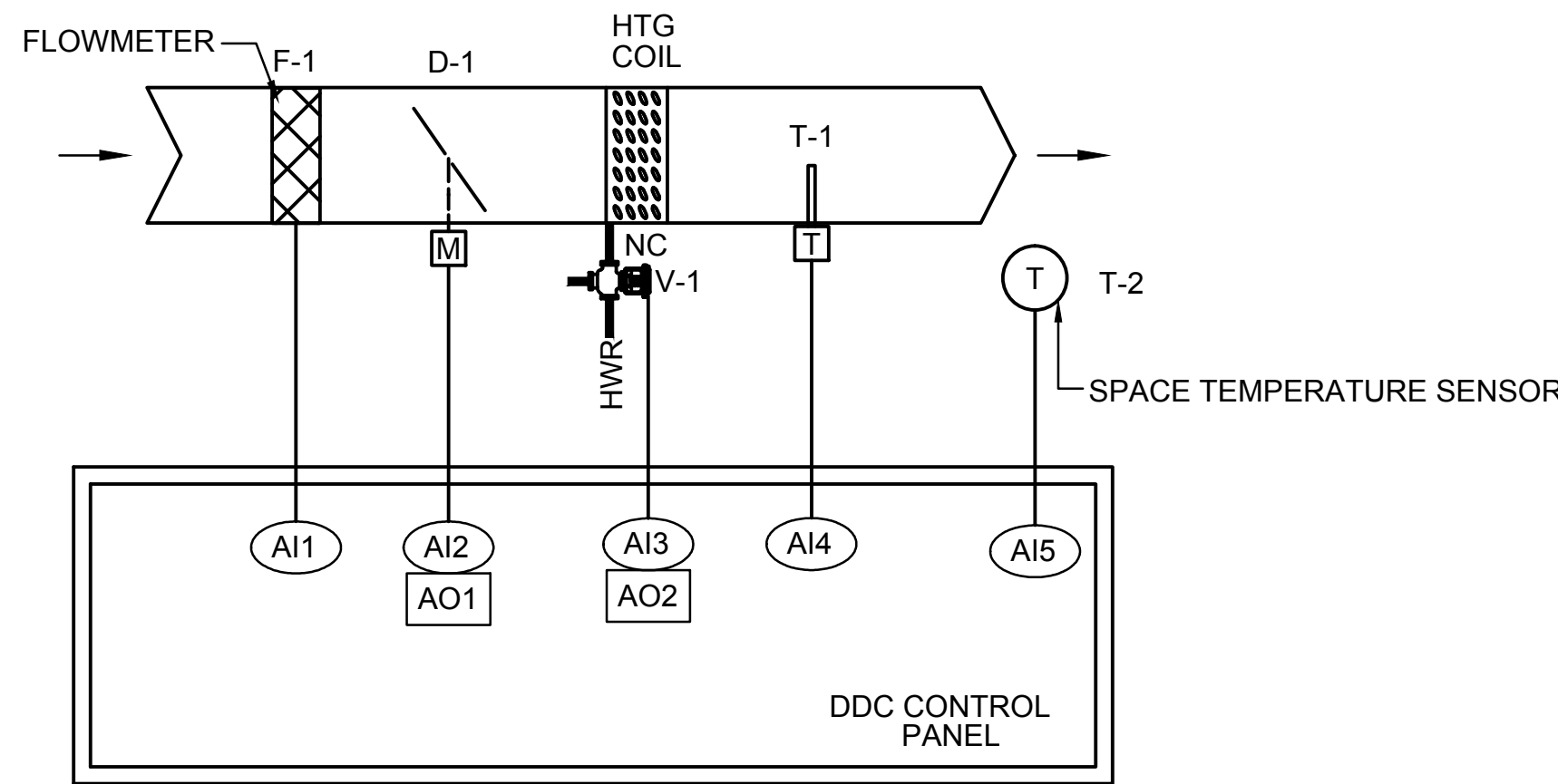
3. MORNING WARM-UP MODE

- WHEN INDEXED TO THE MORNING WARM-UP MODE OF OPERATION, THE DDC SYSTEM WILL SET THE SPACE SENSOR TO ITS OCCUPIED HEATING TEMPERATURE SETPOINT (ADJUSTABLE). THE VMA CONTROLLER WILL INDEX THE PRIMARY AIRFLOW VAV DAMPER TO 100% OPEN. THE REHEAT CONTROL VALVE WILL OPEN AND ALLOW THE PRIMARY AIRFLOW TO HEAT THE ZONE WHEN THE RESPECTIVE AIR HANDLER IS CYCLED TO MORNING WARM-UP MODE.
- WHEN THE ZONE TEMPERATURE REACHES ITS OCCUPIED SETPOINT, THE PRIMARY AIRFLOW VAV DAMPER AND THE REHEAT CONTROL VALVE WILL CLOSE AND THE AIR HANDLER IS STILL IN WARM-UP MODE. AS THE AIR HANDLER IS INDEXED TO OCCUPIED MODE OF OPERATION, THE VAV BOX WILL INDEX TO OCCUPIED MODE AS WELL.



NOTES:

- ALL CONTROL DEVICES ARE EXISTING DDC. SENSORS & ACTUATORS CAN BE REUSED IF FUNCTIONAL AND COMPATIBLE.
- CONTROLLER AND SPACE TEMPERATURE SENSOR TO BE REPLACED.



1 BUILDING 6 VARIABLE AIR VOLUME TERMINAL (TYP.) CONTROL SCHEMATIC & SEQUENCE
SCALE: NOT TO SCALE

SEQUENCE OF OPERATION

1. START/STOP CONTROL

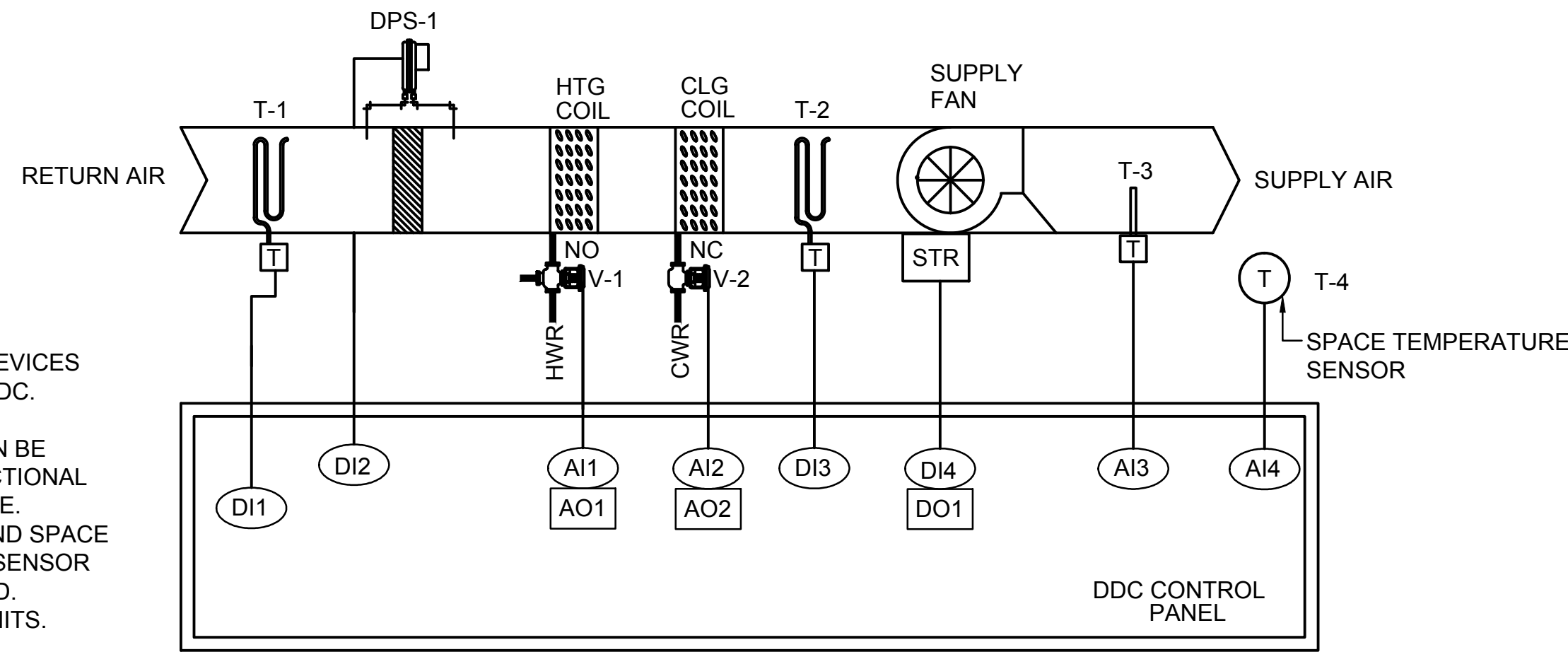
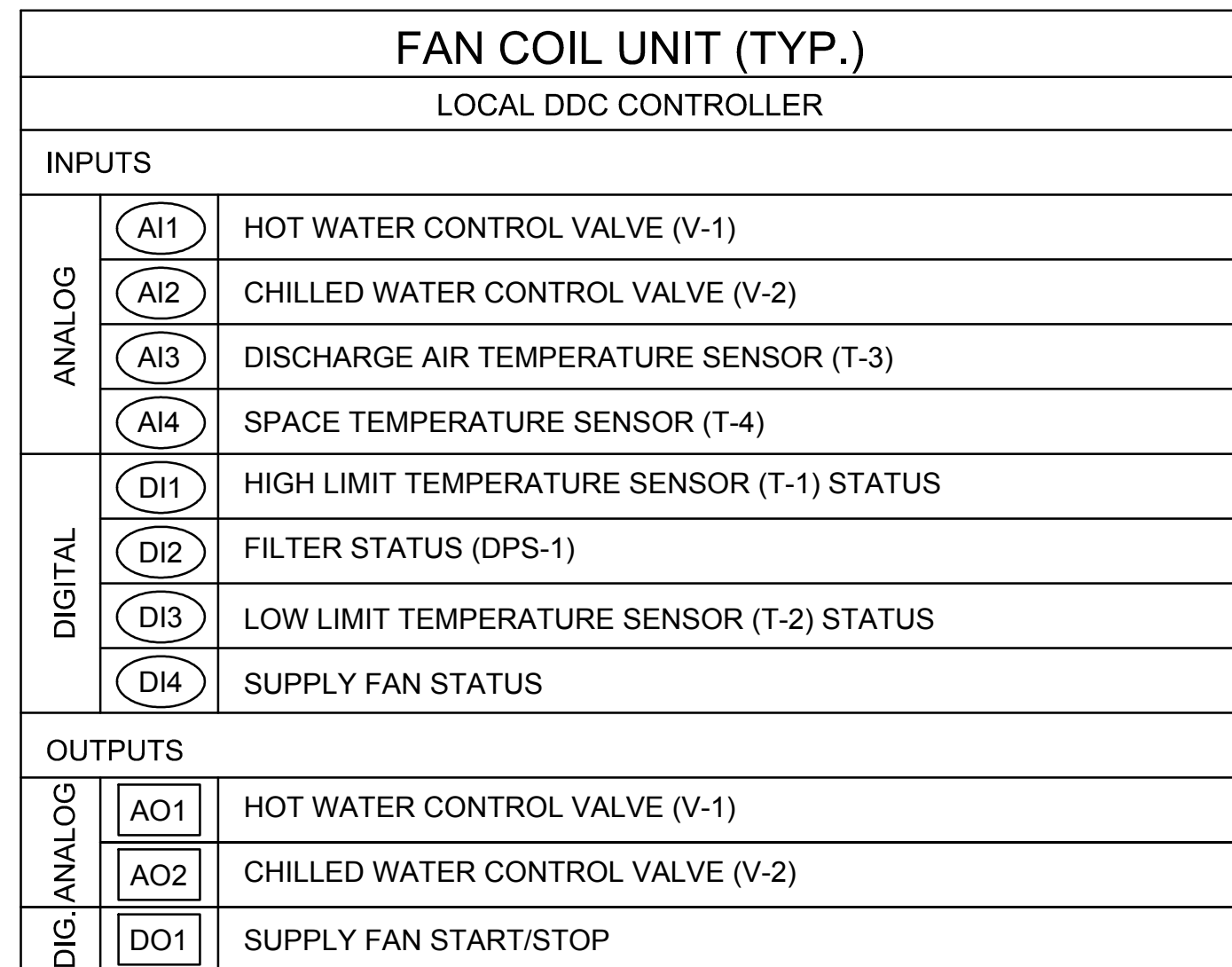
- THE BLOWER COIL WILL OPERATE ON A SCHEDULE AS SET BY THE ECC. THE UNIT FAN WILL BE STARTED AND STOPPED BY THE DDC SYSTEM THROUGH THE ECC. THE CONTROL LOOPS ARE ENERGIZED WHEN FAN RUN STATUS IS PROVEN BY THE CURRENT SENSING RELAY. STOPPING THE UNIT WILL DE-ENERGIZE THE CONTROL LOOPS AND SEND THE HOT WATER AND CHILLED WATER CONTROL VALVES TO THE CLOSED POSITION.

2. TEMPERATURE CONTROL

- A ZONE TEMPERATURE SENSOR SENDS TEMPERATURE INFORMATION TO THE DDC SYSTEM. THE DDC SYSTEM THEN MODULATES THE CHILLED WATER AND HOT WATER CONTROL VALVES, V-2 AND V-1 RESPECTIVELY, IN SEQUENCE TO MAINTAIN ZONE TEMPERATURE SETPOINT.
- UPON A RISE IN ZONE TEMPERATURE, THE CHILLED WATER VALVE WILL MODULATE OPEN TO MAINTAIN ZONE TEMPERATURE SETPOINT OF 75°F (ADJUSTABLE).
- IF THE ZONE TEMPERATURE FALLS BELOW 70°F SETPOINT (ADJUSTABLE), THE HOT WATER VALVE WILL MODULATE OPEN TO MAINTAIN ZONE SETPOINT.
- IF THE UNIT FAILS TO OPERATE BETWEEN THE RANGE OF 70-75°F (ADJUSTABLE), AN ALARM MESSAGE WILL BE SENT TO THE ECC, AND BOTH CHILLED AND HOT WATER CONTROL VALVES WILL CLOSE.

3. SYSTEM SAFETIES

- HIGH LIMIT THERMOSTAT, T-1, IN THE RETURN AIR PATH WILL STOP THE UNIT UPON DETECTION OF TEMPERATURE ABOVE ITS SETPOINT OF 125°F.
- LOW LIMIT THERMOSTAT, T-2, LOCATED BEFORE THE CHILLED WATER COILS WILL STOP THE UNIT UPON DETECTION OF AIR TEMPERATURE BELOW ITS SETPOINT OF 35°F.
- FILTER STATUS WILL BE MONITORED BY A DIFFERENTIAL PRESSURE SENSOR, DPS-1, AT THE FILTER BANK.



NOTES:

- ALL CONTROL DEVICES ARE EXISTING DDC. SENSORS, AND ACTUATORS CAN BE REUSED IF FUNCTIONAL AND COMPATIBLE.
- CONTROLLER AND SPACE TEMPERATURE SENSOR TO BE REPLACED.
- TYPICAL OF 3 UNITS.

2 BUILDING 6 FAN COIL UNIT (TYP.) CONTROL SCHEMATIC & SEQUENCE
SCALE: NOT TO SCALE

Revisions		
No.	Date	Remarks

**VETERANS HEALTH CARE
SYSTEM**
Alexandria, Louisiana

Hernandez Consulting
ALBERT ARCHITECTURE

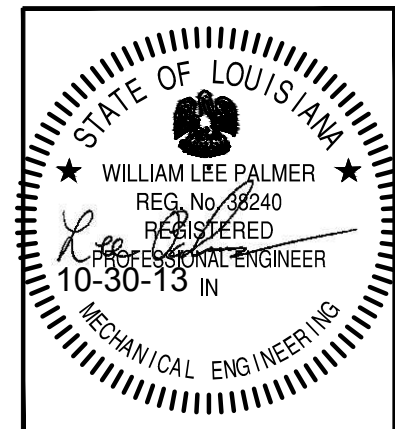
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Approved:	Signature

Drawing Title
VAV TERMINAL (TYP.) & FCU (TYP.) CONTROL SCHEMATICS & SEQUENCES
Approved: Service Engineer
Approved: Service Director

Project Title
A&E Design - Upgrade Energy Management Control Systems
Building Number
6
Checked
WLP
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NMT
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Alexandria, LA

Date
October 30, 2013
Project No.
VA256-12-C-0253
Drawing No.
M6-203
Dwg. 1 of 1



SHUT-OFF VARIABLE AIR VOLUME BOX WITH HOT WATER REHEAT					
LABEL	AREA SERVED	AHU SERVED	CFM		HEATING COIL GPM
			MAX.	MIN.	
V6-1-1	213, 2C1	AHU#6-1	650	450	1.75
V6-1-2	212	AHU#6-1	370	230	1.0
V6-1-3	211	AHU#6-1	330	225	1.0
V6-1-4	208, 209, 209A, 210	AHU#6-1	880	550	2.50
V6-1-5	213A, 214, 215	AHU#6-1	680	400	1.75
V6-1-6	216	AHU#6-1	1000	450	2.0
V6-1-7	217, 218	AHU#6-1	1100	500	2.25
V6-1-8	204, 205, 206, 2C2	AHU#6-1	960	525	2.50
V6-1-9	219, 219A	AHU#6-1	1100	450	2.0
V6-1-10	238, 2C3	AHU#6-1	360	230	1.0
V6-1-11	202	AHU#6-1	640	400	1.75
V6-1-12	201	AHU#6-1	400	200	0.90
V6-1-13	220	AHU#6-1	930	430	1.75
V6-1-14	113, 113A	AHU#6-1	630	325	1.50
V6-1-15	112	AHU#6-1	330	170	0.75
V6-1-16	111, 1C1	AHU#6-1	510	230	1.0
V6-1-17	108, 109, 110, 110A	AHU#6-1	750	500	2.25
V6-1-18	114	AHU#6-1	420	230	1.0
V6-1-19	116	AHU#6-1	1000	400	1.75
V6-1-20	117, 118, 1C2	AHU#6-1	1160	450	1.75
V6-1-21	104, 105, 106	AHU#6-1	650	500	2.50
V6-1-22	119, 119A	AHU#6-1	1150	450	1.75
V6-1-23	101, 1C3	AHU#6-1	870	550	2.25
V6-1-24	120	AHU#6-1	900	450	1.75
V6-1-25	122	AHU#6-1	300	170	0.75
V6-1-26	123	AHU#6-1	400	250	1.0
V6-1-27	14	AHU#6-1	370	370	2.0
V6-1-28	015, 016	AHU#6-1	350	230	1.0
V6-1-29	17	AHU#6-1	870	600	3.0
V6-1-30	18	AHU#6-1	930	550	2.5
V6-1-31	011, 012	AHU#6-1	220	220	1.25
V6-1-32	0C3, 008, 009, 010	AHU#6-1	1140	850	3.75
V6-1-33	020A	AHU#6-1	460	340	1.50
V6-1-34	020B	AHU#6-1	350	250	1.25
V6-1-35	020C	AHU#6-1	220	170	0.75
V6-2-1	229, 229B	AHU#6-2	2510	1350	6
V6-2-2	229A, 229C	AHU#6-2	1080	500	2.25
V6-2-3	229D	AHU#6-2	780	380	1.75
V6-2-4	228	AHU#6-2	950	390	1.75
V6-2-5	231, 232, 233, 234, 235	AHU#6-2	910	630	3
V6-2-6	227, 228A, 2C4	AHU#6-2	1110	500	2
V6-2-7	236	AHU#6-2	330	160	0.75
V6-2-8	237, 237A	AHU#6-2	450	275	1.25
V6-2-9	225, 225A, 2C3	AHU#6-2	1310	475	2
V6-2-10	223	AHU#6-2	640	350	1.5
V6-2-11	222	AHU#6-2	430	150	0.5
V6-2-12	129, 129B	AHU#6-2	2100	1160	4.5
V6-2-13	129A, 129C	AHU#6-2	1020	450	2
V6-2-14	129D	AHU#6-2	430	220	1
V6-2-15	129E	AHU#6-2	300	170	0.75
V6-2-16	128	AHU#6-2	830	350	1.5
V6-2-17	126, 127, 1C5	AHU#6-2	1090	500	2
V6-2-18	131, 132, 133, 134, 135	AHU#6-2	800	550	2.5
V6-2-19	125, 125A, 1C3	AHU#6-2	1150	460	1.75
V6-2-20	136	AHU#6-2	340	225	1
V6-2-21	137, 137A	AHU#6-2	430	210	1
V6-2-22	124	AHU#6-2	820	300	1.25
V6-2-23	004	AHU#6-2	380	310	1.5
V6-2-24	001	AHU#6-2	2100	1300	5.5
V6-2-25	005, 006, 0C3	AHU#6-2	940	700	3.25
V6-2-26	007	AHU#6-2	700	580	2.75
V6-2-27	001A	AHU#6-2	300	210	1
V6-3-1	303	AHU#6-3	400	325	1.50
V6-3-2	304	AHU#6-3	400	325	1.50
V6-3-3	305	AHU#6-3	820	700	3.25
V6-3-4	309, 3C3	AHU#6-3	600	475	2.25
V6-3-5	310	AHU#6-3	300	250	1.10
V6-3-6	311	AHU#6-3	550	450	2.25
V6-3-7	300, 3C3	AHU#6-3	550	450	2.25
V6-3-8	301	AHU#6-3	500	400	2.0
V6-3-9	302	AHU#6-3	430	320	1.50
V6-3-10	306, 308	AHU#6-3	700	700	3.50

FAN COIL UNITS BALANCING SCHEDULE						
LABEL	AREA SERVED	AHU SERVED	FAN CFM	OA CFM	GPM	
					COOLING	HEATING
FCU#6-1	BSMT SOUTH REAR ENTRY	-	650	0	2.4	1.75
FCU#6-2	BSMT NORTH REAR ENTRY	-	650	0	2.4	1.75
FCU#6-3	022 MECH SPACE	-	650	0	2.4	1.75

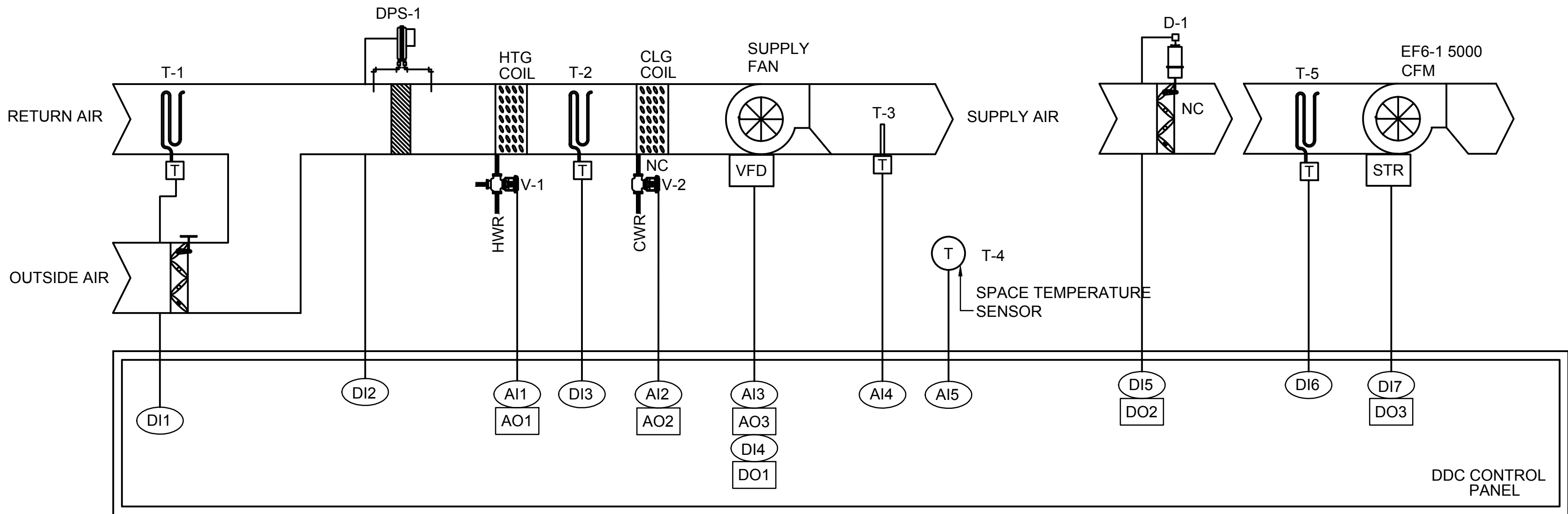
AIR HANDLING UNITS BALANCING SCHEDULE					
LABEL	AREA SERVED	SUPPLY CFM	OA CFM	COOLING COIL GPM	PREHEAT COIL LBS/HR
AHU#6-1	SOUTH SIDE OF BASEMENT, 1ST FLOOR, & 2ND FLOOR	24500	5000	148	570
AHU#6-2	NORTH SIDE OF BASEMENT, 1ST FLOOR, & 2ND FLOOR	24500	5000	148	570
AHU#6-3	3RD FLOOR	5250	790	30	-

SEQUENCE OF OPERATION

- START/STOP CONTROL
 - THE BLOWER COIL WILL OPERATE ON A SCHEDULE AS SET BY THE ECC. THE UNIT FAN WILL BE STARTED AND STOPPED BY THE DDC SYSTEM THROUGH THE ECC. THE CONTROL LOOPS ARE ENERGIZED WHEN FAN RUN STATUS IS PROVEN BY THE CURRENT SENSING RELAY. STOPPING THE UNIT WILL DE-ENERGIZE THE CONTROL LOOPS AND SEND THE HOT WATER AND CHILLED WATER CONTROL VALVES TO THE CLOSED POSITION.
 - EF6-1 OPERATES ONLY WHEN THE BCU IS OFF AND THE WALL MOUNTED THERMOSTAT, T-6, IS ABOVE ZONE TEMPERATURE SETPOINT 86°F (ADJUSTABLE). WHEN EF6-1 TURNS ON, THE EXHAUST AIR DAMPER WILL OPEN. EF6-1 IS COMMANDED OFF WHEN THE ZONE TEMPERATURE REACHES SETPOINT OR WHEN THE BCU TURNS ON. WHEN EF6-1 IS COMMANDED OFF, THE EXHAUST AIR DAMPER WILL CLOSE.
- TEMPERATURE CONTROL
 - A ZONE TEMPERATURE SENSOR SENDS TEMPERATURE INFORMATION TO THE DDC SYSTEM. THE DDC SYSTEM THEN MODULATES THE CHILLED WATER AND HOT WATER CONTROL VALVES, V-2 AND V-1 RESPECTIVELY, IN SEQUENCE TO MAINTAIN ZONE TEMPERATURE SETPOINT.
 - UPON A RISE IN ZONE TEMPERATURE, THE CHILLED WATER VALVE WILL MODULATE OPEN TO MAINTAIN ZONE TEMPERATURE SETPOINT OF 75°F (ADJUSTABLE).
 - IF THE ZONE TEMPERATURE FALLS BELOW 70°F SETPOINT (ADJUSTABLE), THE HOT WATER VALVE WILL MODULATE OPEN TO MAINTAIN ZONE SETPOINT.
 - IF THE UNIT FAILS TO OPERATE BETWEEN THE RANGE OF 70-75°F (ADJUSTABLE), AN ALARM MESSAGE WILL BE SENT TO THE ECC, AND BOTH CHILLED AND HOT WATER CONTROL VALVES WILL CLOSE.
- SYSTEM SAFETIES
 - HIGH LIMIT THERMOSTAT, T-1, IN THE RETURN AIR PATH WILL STOP THE UNIT UPON DETECTION OF TEMPERATURE ABOVE ITS SETPOINT OF 125°F.
 - LOW LIMIT THERMOSTAT, T-2, LOCATED BEFORE THE CHILLED WATER COILS WILL STOP THE UNIT UPON DETECTION OF AIR TEMPERATURE BELOW ITS SETPOINT OF 35°F.
 - FILTER STATUS WILL BE MONITORED BY A DIFFERENTIAL PRESSURE SENSOR, DPS-1, AT THE FILTER BANK.

NOTES:

- ALL CONTROL DEVICES ARE EXISTING DDC. SENSORS, ACTUATORS, ETC CAN BE REUSED IF FUNCTIONAL AND COMPATIBLE.
- CONTROLLER AND SPACE TEMPERATURE SENSOR TO BE REPLACED.
- EXHAUST FAN INTERLOCKED WITH BOILER COIL UNIT.



1 BUILDING 6 BLOWER COIL UNIT CONTROL SCHEMATIC & SEQUENCE
SCALE: NOT TO SCALE

BLOWER COIL UNIT		
LOCAL DDC CONTROLLER		
INPUTS		
ANALOG	AI1	HOT WATER CONTROL VALVE (V-1)
	AI2	CHILLED WATER CONTROL VALVE (V-2)
	AI3	SUPPLY FAN VFD STATUS
	AI4	DISCHARGE AIR TEMPERATURE SENSOR (T-3)
	AI5	SPACE TEMPERATURE SENSOR (T-4)
DIGITAL	DI1	RETURN AIR HIGH LIMIT TEMPERATURE SENSOR (T-1) STATUS
	DI2	FILTER STATUS (DPS-1)
	DI3	LOW LIMIT TEMPERATURE SENSOR (T-2) STATUS
	DI4	SUPPLY FAN STATUS
	DI5	EXHAUST AIR DAMPER (D-1) STATUS
	DI6	HIGH LIMIT TEMPERATURE SENSOR (T-5) STATUS
	DI7	EXHAUST FAN (EF6-1) STATUS
OUTPUTS		
ANALOG	AO1	HOT WATER CONTROL VALVE (V-1)
	AO2	CHILLED WATER CONTROL VALVE (V-2)
	AO3	SUPPLY FAN VFD SPEED
DIGITAL	DO1	SUPPLY FAN START/STOP
	DO2	EXHAUST AIR DAMPER (D-1) CONTROLLER
	DO3	EXHAUST FAN (EF6-1) START/STOP

VETERANS HEALTH CARE
SYSTEM
Alexandria, Louisiana

Hernandez Consulting
ALBERT ARCHITECTURE

Allen&Hoshall
engineering since 1915

Approved:	
Title	Signature

Drawing Title	BCU & EXHAUST FAN (TYP.) CONTROL SCHEMATICS & SEQUENCES & BALANCE SCHEDULES
Approved: Service Engineer	
Approved: Service Director	

Project Title	A&E Design - Upgrade Energy Management Control Systems		
Building Number	6	Checked	WLP
Drawn	NMT		
Location	Alexandria, LA		

Date	October 30, 2013
Project No.	VA256-12-C-0253
DRAWING NO.	M6-204
Dwg. 1	Of 1

