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FINANCE & ADMINISTRATION BUILDING



NJ DOT F&A BUILDING (AS-BUILTS)

ENERGY SAVINGS IMPROVEMENT PROJECT

BUILDING AUTOMATION SYSTEM

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1	TITLE PAGE	
2	TABLE OF CONTENTS	
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5	HWS C-1 WIRING SCHEMATIC	
6	MER HWS + CHWS BOOSTER PUMPS FLOW DIAGRAM	
7	MER HWS + CHWS BOOSTER PUMPS C-1 WIRING SCHEMATIC	
8	MER HWS + CHWS BOOSTER PUMPS C-2 WIRING SCHEMATIC	
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18	VAV BOXES FLOW DIAGRAM, WIRING SCHEMATIC, & FTR SCHEDULE	
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20	HWS, FTR, AHU, & VAV BOXES VALVE SCHEDULE	

LEGEND & SYMBOLS

GENERAL NOTES

1. ALL POWER WIRING 120 VAC AND ABOVE BY ELECTRICAL CONTRACTOR.

TEMPERATURE CONTROL LEGEND:

 MOUNTED ON PANEL FACE

 MOUNTED INSIDE PANEL

 CONTROL TUBE #3

 PNEUMATIC TUBING

 - WIRING

 TERMINAL BLOCK #6

 SOLENOID VALVE

 CONTROL VALVE, 2-WAY

 CONTROL VALVE, 3-WAY

 PARALLEL BLADED DAMPER

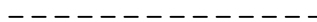
 OPPOSED BLADED DAMPER

 SIGNAL LINE INSIDE PANEL

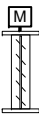
ABBREVIATIONS:

AFMS- AIR FLOW MEASURING STATION	OA -OUTSIDE AIR
C- COMMON PORT	OL'S- MOTOR STARTER OVERLOADS
CCP- CENTRAL CONTROL PANEL	PC- PRESSURE CONTROLLER
CR- CONTROL RELAY	PE- PRESSURE TOGGLE SWITCH
CS- CURRENT SWITCH	PI- PRESSURE INDICATOR
DA-DAMPER ACTUATOR	PL- PILOT LIGHT
DPRO- DAMPER OUTPUT	PR- PNEUMATIC RELAY
DPRS- DAMPER STATUS	PT- PRESSURE TRANSMITTER
DPS- DIFFERENTIAL PRESSURE SWITCH	RC- RECEIVER CONTROLLER
DPT- DIFFERENTIAL PRESSURE TRANS	RR- REVERSING RELAY
EA- EXHAUST AIR	RT- ROOM THERMOSTAT
ES- END SWITCH, POSITION SWITCH	S- SWITCH
FS- FLOW SWITCH	SD- SMOKE DETECTOR
FSD- FIRE & SMOKE DAMPER	S/W- SUMMER/ WINTER SIGNAL
H- HUMIDISTAT	T- THERMOSTAT
HC- MOTOR STARTER HOLDING COIL	TS- TEMPERATURE SENSOR
HI- HUMIDITY INDICATOR	TC- TIME CLOCK
HL- HIGH LIMIT HUMIDISTAT	TDR- TIME DELAY RELAY
HS- HIGH SIGNAL SELECTOR	THL- TEMPERATURE HIGH LIMIT THERMOSTAT
HT- HUMIDITY TRANSMITTER	TI- TEMPERATURE INDICATOR
LCP- LOCAL CONTROL PANEL	TLL- TEMPERATURE LOW LIMIT THERMOSTAT
LS- LOW SIGNAL SELECTOR	TR- TRANSDUCER
MA- MIXED AIR	TT- TEMPERATURE TRANSMITTER
MOD-MOTER OPERATED DAMPER	TX- TRANSFORMER
NC- NORMALLY CLOSED	V- VALVE
NCP- NETWORK CONTROL PANEL	WB- WET BULB
NO- NORMALLY OPEN	WU- WARM-UP SIGNAL

WIRING LEGEND

	Low Voltage, 18 AWG, Copper Wire
	Low Voltage Communication Wiring 22/2 AWG, CL2P, Shielded Copper Wire, Low Capacitance
	Line Voltage, THHN Field Wiring

HVAC SYSTEM LEGEND:

 MOTOR OPERATED DAMPER

 PREHEAT COIL

 COOLING COIL

 REHEAT COIL

 HEATING COIL

 DIRECT EXPANSION COIL

 FAN

 MANUAL VALVE

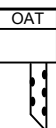
 ZONE CO2 SENSOR

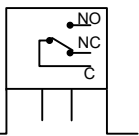
 WATER FLOW METER

 AVERAGING TYPE TEMPERATURE SENSOR

 FILTER

 FIRE & SMOKE DAMPER (BY OTHERS)

 OUTSIDE AIR TEMPERATURE SENSOR

 LEAK DETECTOR

 FREEZESTAT (D.P. CONTACT)

 DUCT MOUNTED TEMPERATURE SENSOR

 IMMERSION TYPE TEMPERATURE SENSOR

 DUCT MOUNTED SMOKE DETECTOR

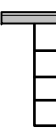
 STATIC PRESSURE TRANSMITTER

 STEAM PRESSURE SENSOR

 DUCT MOUNTED HUMIDITY SENSOR

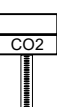
 SPACE TEMPERATURE

 OUTSIDE AIR CO2 SENSOR

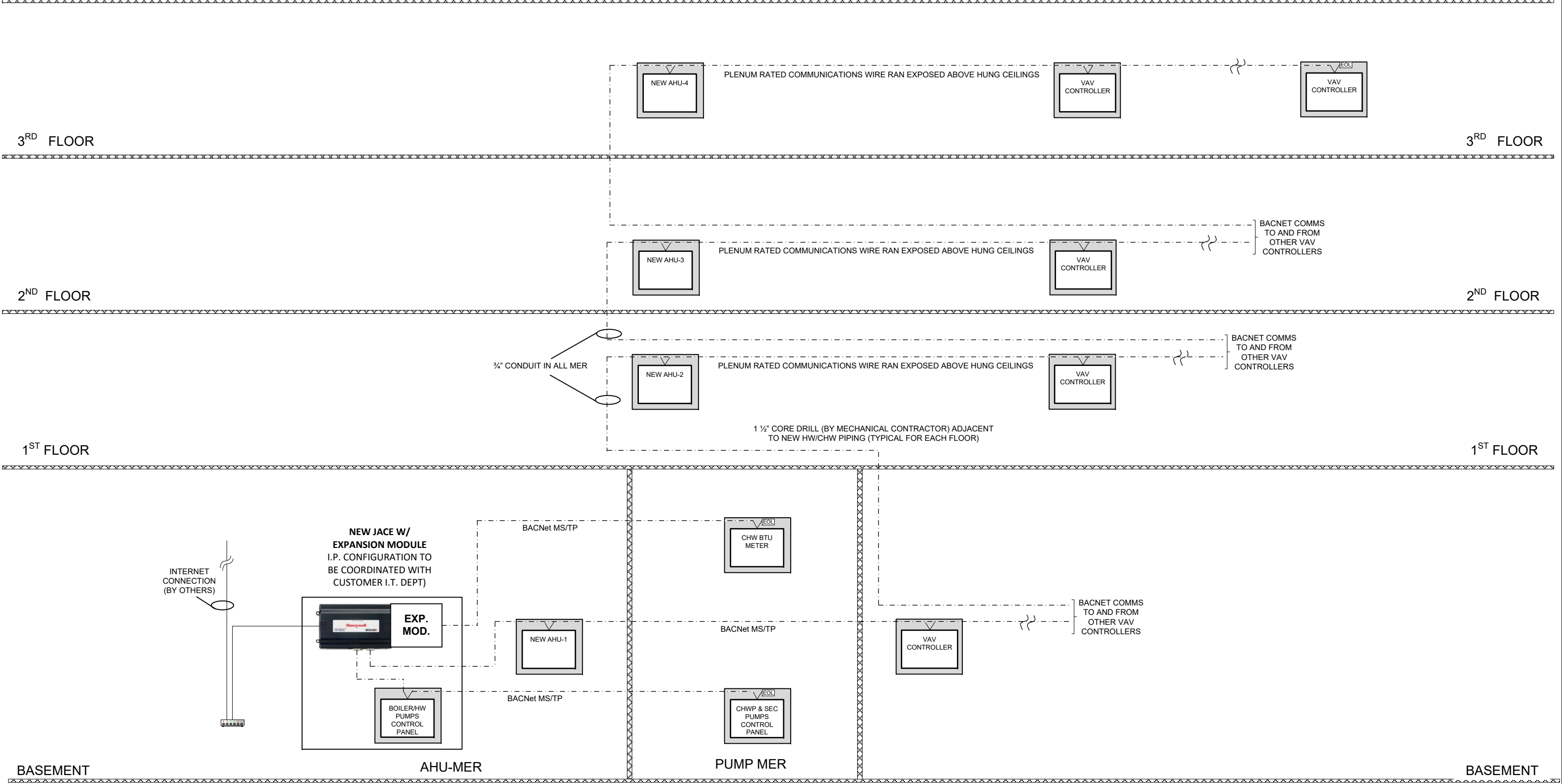
 AIR FLOW MEASURING STATION

 CONTROL RELAY

 CURRENT SENSOR

 CO2 SENSOR

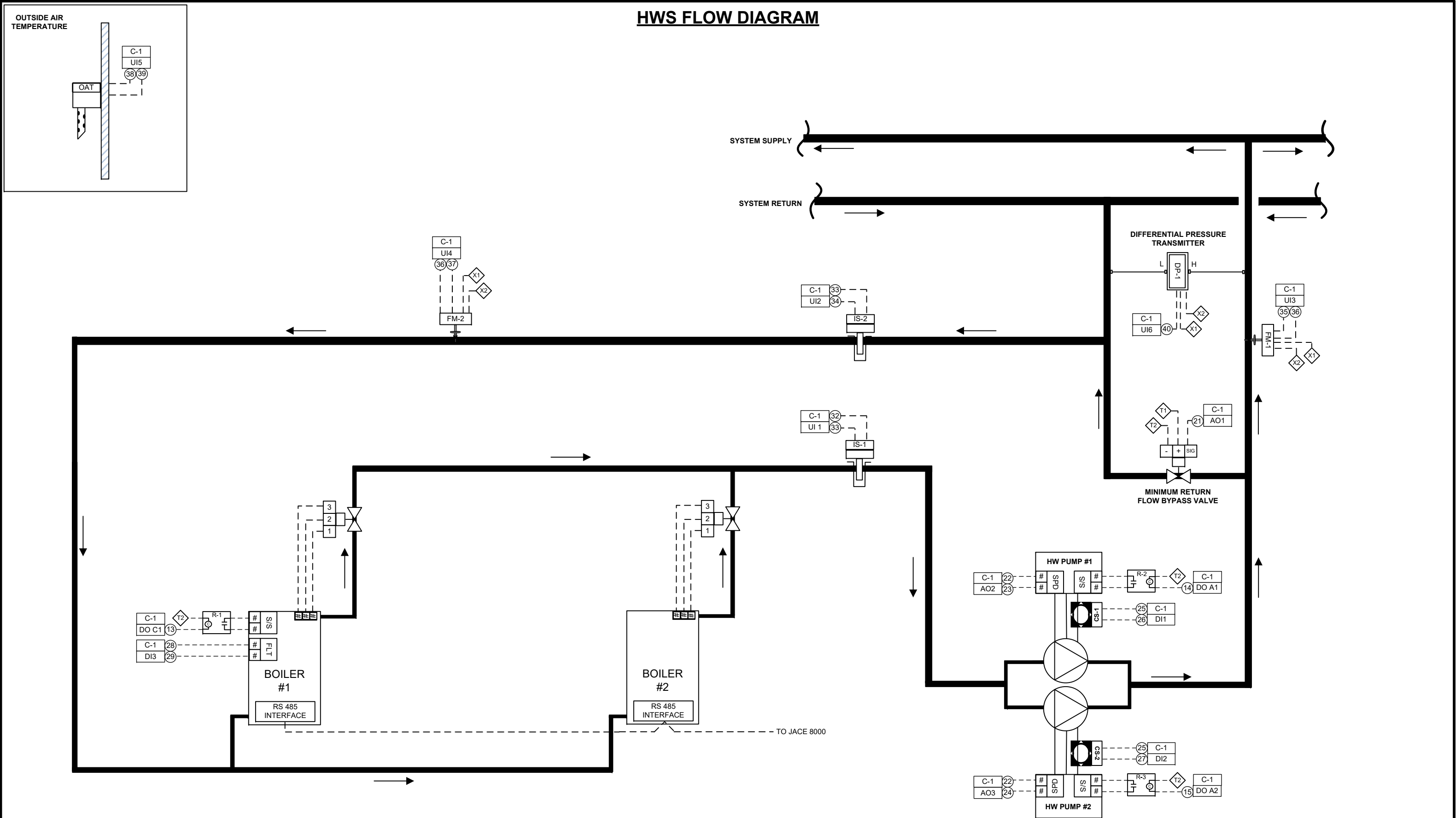
NETWORK RISER



NOTE: 1) 120VAC POWER TO ALL CONTROL PANELS BY OTHERS

FACILITY	NJ DOT F&A BUILDING						Project: NJ DOT F&A BUILDING	
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	1	12-21-2017	AS-BUILTS			NETWORK RISER	
ARCHITECTS	.	0	06-16-2017	SUBMITTAL	A.V.		Job No. #17-04260	
		NO.	DATE	REVISION	BY		Page 3 of 20	

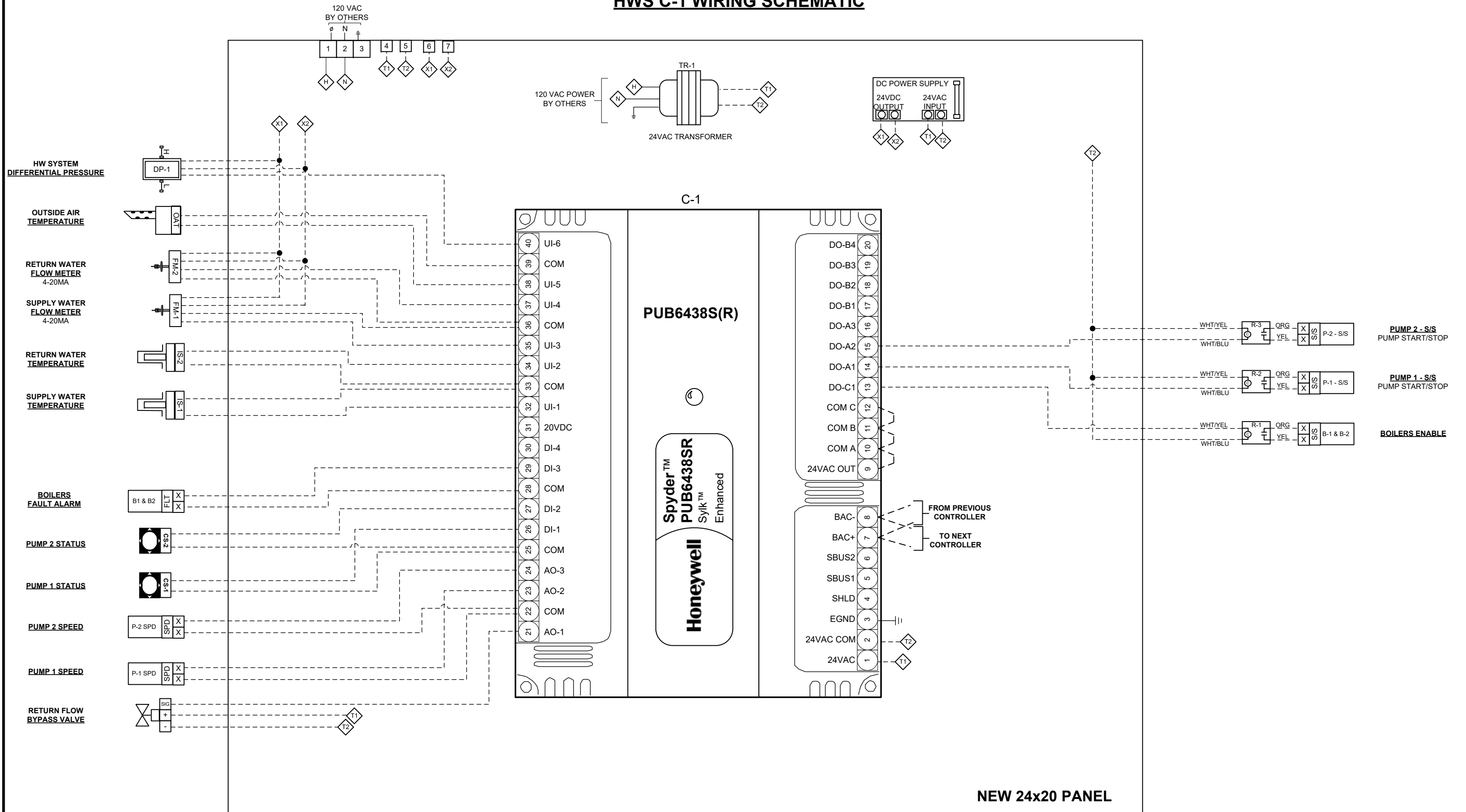
HWS FLOW DIAGRAM



NOTES: ALL DEVICES ARE NEW UNLESS OTHERWISE NOTED

FACILITY	NJ DOT F&A BUILDING						Project: NJ DOT F&A BUILDING	
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	1	12-21-2017	AS-BUILTS			HWS FLOW DIAGRAM	
		0	06-16-2017	SUBMITTAL	A.V.			
ARCHITECTS	.	NO.	DATE	REVISION	BY		Job No. #17-04260 Page 4 of 20	

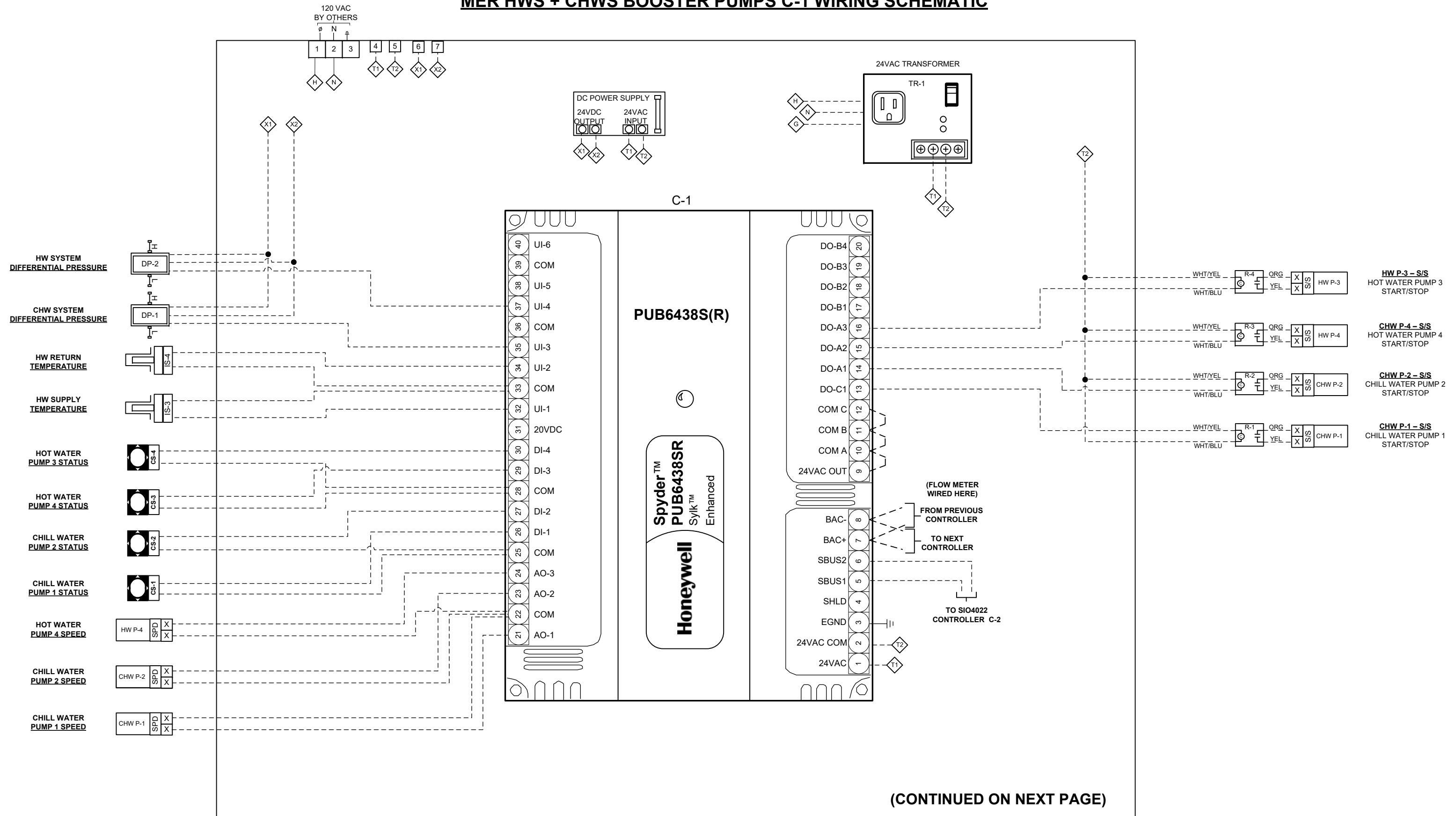
HWS C-1 WIRING SCHEMATIC



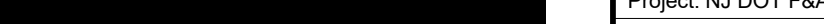
NOTES:

[illegible]

MER HWS + CHWS BOOSTER PUMPS C-1 WIRING SCHEMATIC

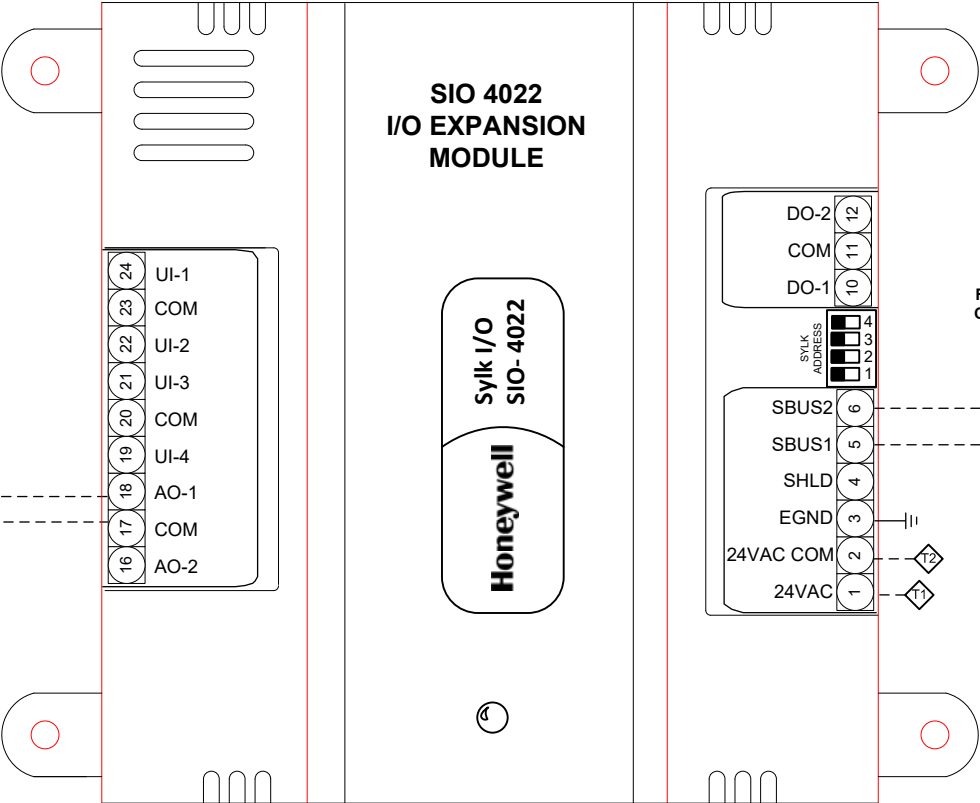
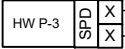


NOTES:

FACILITY	NJ DOT F&A BUILDING						Project: NJ DOT F&A BUILDING				
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	1	12-21-2017	AS-BUILTS				MER HWS + CHWS BOOSTER PUMPS C-1			
		0	06-16-2017	SUBMITTAL	A.V.			WIRING SCHEMATIC			
ARCHITECTS	.	NO.	DATE	REVISION	BY						
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MER HWS + CHWS BOOSTER PUMPS C-2 WIRING SCHEMATIC

HOT WATER
PUMP 3 SPEED



FROM PUB6438SR
CONTROLLER C-1

NEW 24x20 PANEL
(FROM PREVIOUS PAGE)

NOTES: ALL DEVICES ARE NEW NLESS OTHERWISE NOTED

FACILITY	NJ DOT F&A BUILDING				
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		NO.	DATE	REVISION	BY



Project: NJ DOT F&A BUILDING	
MER HWS + CHWS BOOSTER PUMPS C-2 WIRING SCHEMATIC	
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HW SYS SEQUENCE OF OPERATIONS

Sequence of Operations

- A. When the outside air temperature is below the hot water system enable setpoint of 60 deg F. (Adj.), the Honeywell BMS shall start the lead hot water system pump.
- B. If the lead hot water pump fails to start, then the Honeywell BMS shall command the lag hot water pump to start.
- C. After pump status has been proven on the Honeywell BMS shall enable the hot water system via the Aerco Boiler Control System. The Aerco Boiler Controller shall select the lead boiler and open the lead boiler’s isolation valve through its own interlocking controls.
- D. The boiler system shall operate to maintain a hot water supply temperature setpoint based on the following outside air reset schedule.
- At 60°F (adj.) outside air temperature, the hot water supply temperature setpoint shall be 120°F (adj.)
- At 20°F (adj.) outside air temperature, the hot water supply temperature setpoint shall be 180°F (adj.)
- E. A differential pressure sensor, at the end of the hot water piping loop, shall monitor the hot water system differential pressure. As the differential pressure drops below the differential pressure setpoint, the pump speed shall increase to maintain the differential pressure setpoint. As the differential pressure rises above the differential pressure setpoint, the pump speed shall decrease to maintain the differential pressure setpoint.
- F. A minimum return water flow setpoint shall be calculated based on the number of boilers running and the return water flow bypass valve, between the return and supply header, shall modulate open to maintain a minimum return water flow through each operating boiler. A flow sensor on the return header shall monitor the minimum amount of flow based on Boiler MFG’s requirements.
- G. When the buildings are in the Unoccupied Mode:
1. Set the VFD output to 50% for the pump output. 2. Set the MAX Temp to 140 degrees. F.

The following points will be shown on a graphic:
Example of available points from Boiler Control Panel Open Protocol Interface to be on graphic.

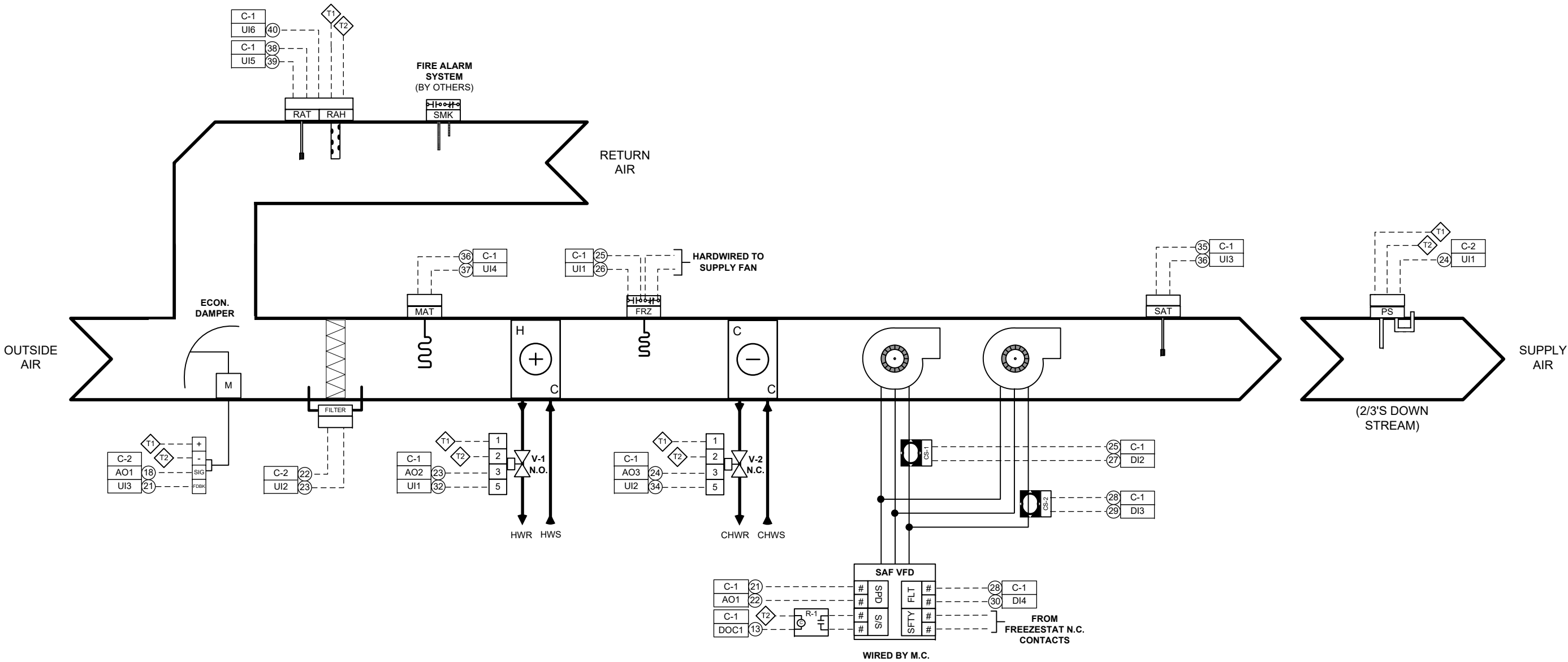
1.Outside Air Temperature, Header Temperature, Header Setpoint, Percent of Load (%), Boiler # Status

- Example of points provided by the BMS controller (either hardwired or via Communication Interface)
2. Outside air (OA) Temperature
3. Heating Hot Water System Supply Water Temperature
4. Heating Hot Water Supply Temperature Setpoint
5. Heating Hot Water System Return Water Temperature
6. Pump VFD Start/Stop
7. Pump VFD Status
8. Pump VFD Speed
9. Pump VFD Alarm
10. Pump VFD kW
11. System Differential Pressure
12. System Differential Pressure Setpoint
13. Boiler System Supply Water Temperature
14. Boiler System Return Temperature
15. Hot Water System Flow
16. Hot Water System Bypass Valve Position
17. Firing rate
18. Fault Code(s)
19. Operational Status (Standby, Remote, Off, On, Manual Override)
20. BMS will animate the boiler graphic when the boiler(s) are firing

- H. The BMS will annunciate the following alarms
1. Alarms from the Boiler Control Interface
2. High Supply Water Temperature
3. Low Supply Water Temperature
4. Pump VFD Failure
5. Low/High System Differential Pressure

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ARCHITECTS	.	0	06-16-2017	SUBMITTAL	A.V.		Job No.	#17-04260
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AHU-1 (BASEMENT MER) FLOW DIAGRAM



NOTES: ALL DEVICES ARE NEW NLESS OTHERWISE NOTED

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ARCHITECTS	.	0	06-16-2017	SUBMITTAL	A.V.
		NO.	DATE	REVISION	BY

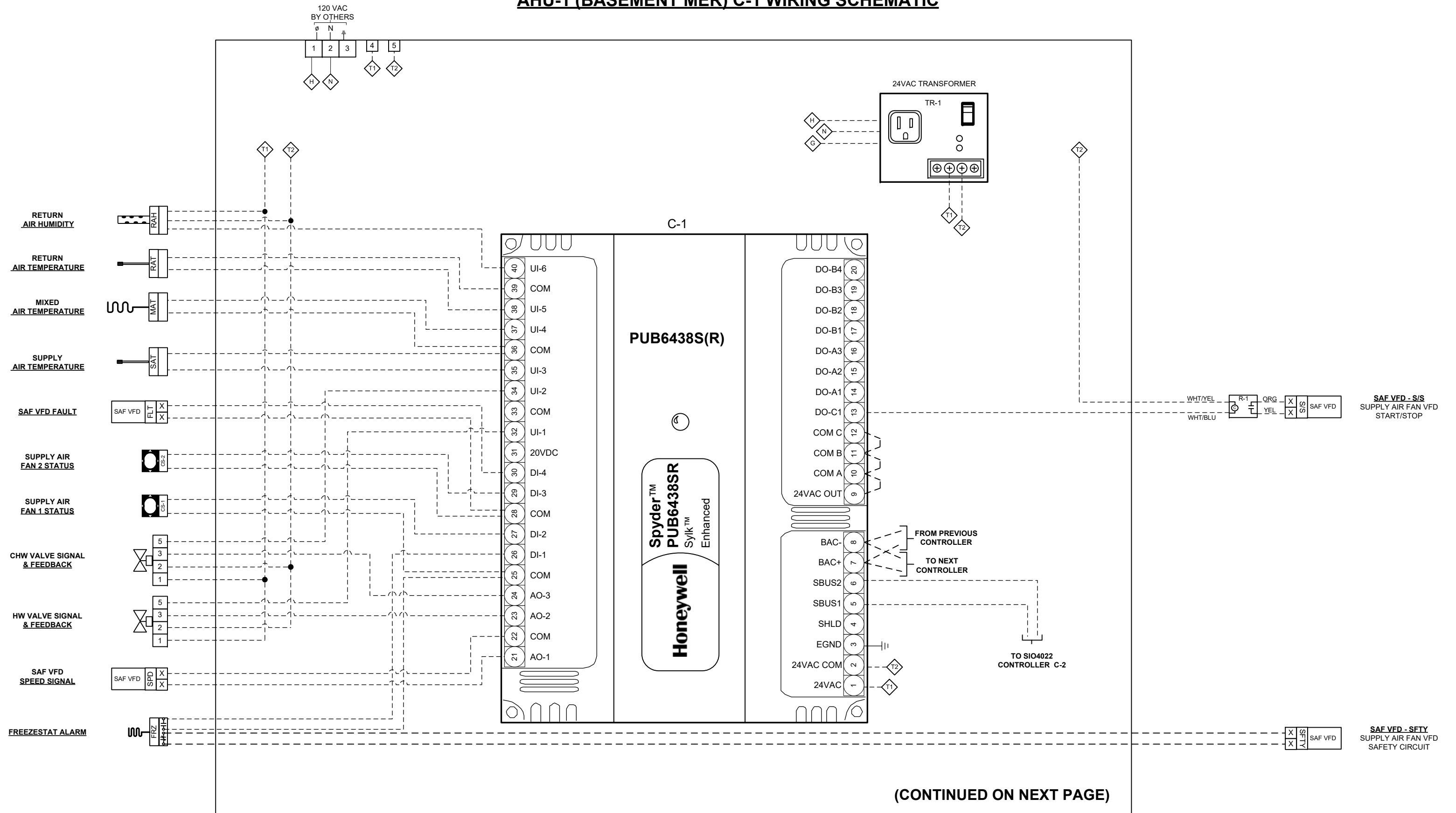
Project: NJ DOT F&A BUILDING

AHU-1 (BASEMENT MER) FLOW DIAGRAM

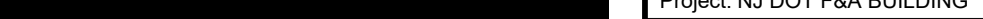
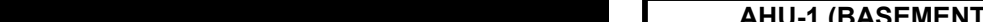
Job No. #17-04260

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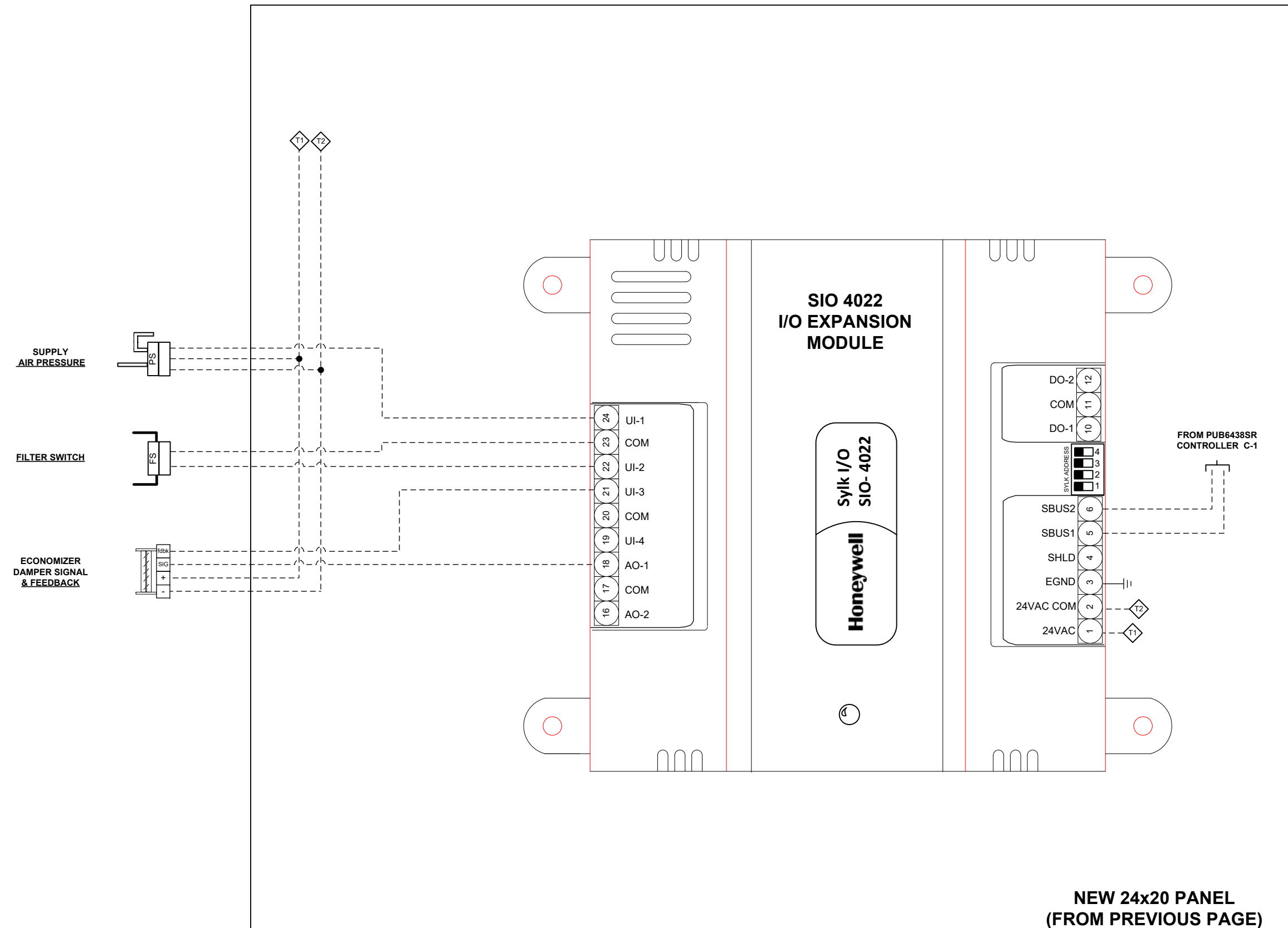
AHU-1 (BASEMENT MER) C-1 WIRING SCHEMATIC



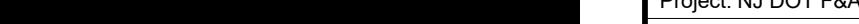
NOTES: ALL DEVICES ARE NEW UNLESS OTHERWISE NOTED

FACILITY	NJ DOT F&A BUILDING					Project: NJ DOT F&A BUILDING			
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	1	12-21-2017	AS-BUILTS			AHU-1 (BASEMENT MER) C-1 WIRING SCHEMATIC		
		0	06-16-2017	SUBMITTAL					
ARCHITECTS	.	NO.	DATE	REVISION				BY	
							Job No.	#17-04260	Page

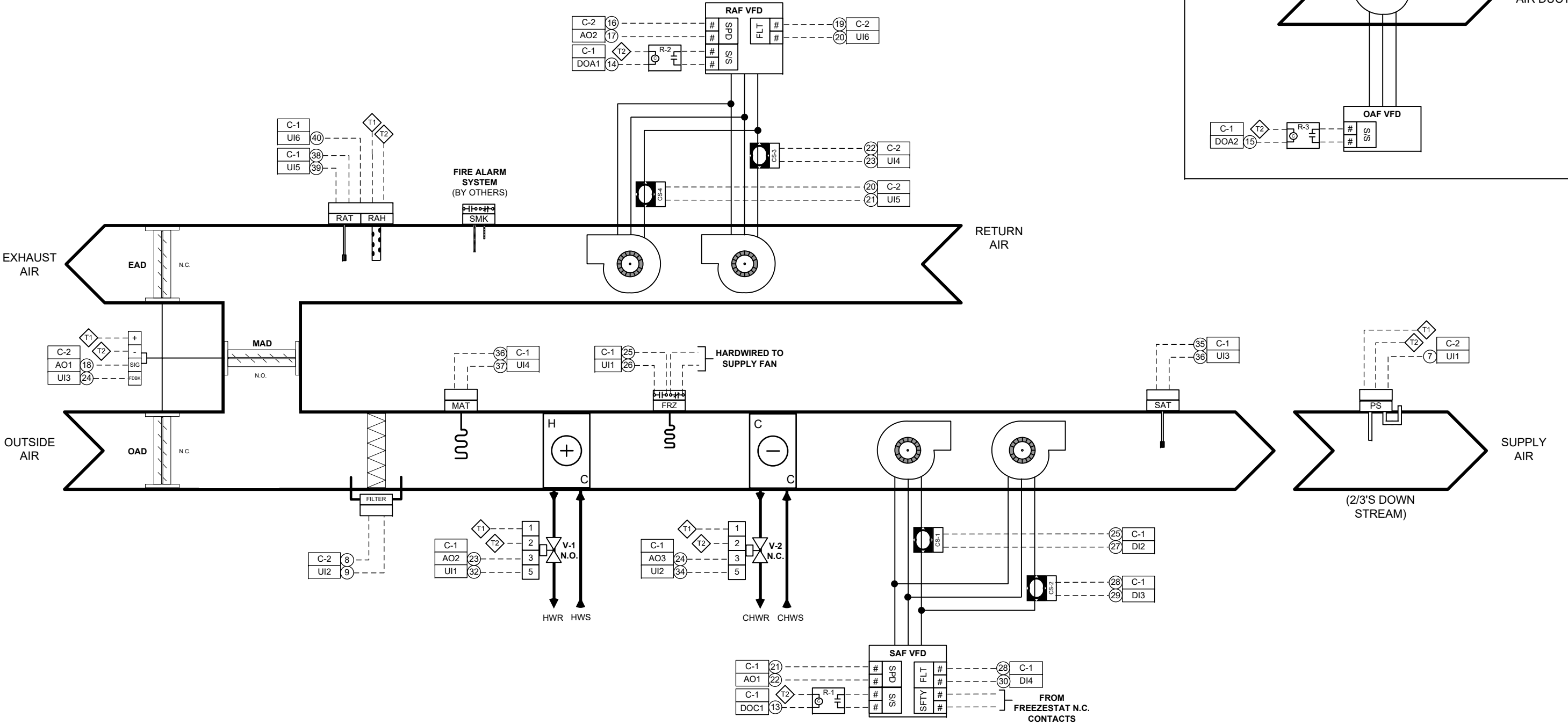
AHU-1 (BASEMENT MER) C-2 WIRING SCHEMATIC



NOTES: ALL DEVICES ARE NEW UNLESS OTHERWISE NOTED

FACILITY	NJ DOT F&A BUILDING					Project: NJ DOT F&A BUILDING				
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		0	06-16-2017	SUBMITTAL			A.V.			
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AHU-2, 3, & 4 (1ST, 2ND, & 3RD FLOORS) FLOW DIAGRAM
(TYPICAL OF 3 EXCEPT AS NOTED)



NOTES: ALL DEVICES ARE NEW NLESS OTHERWISE NOTED

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Project: NJ DOT F&A BUILDING	
AHU-2, 3, & 4 (1ST, 2ND, & 3RD FLOORS) FLOW DIAGRAM	
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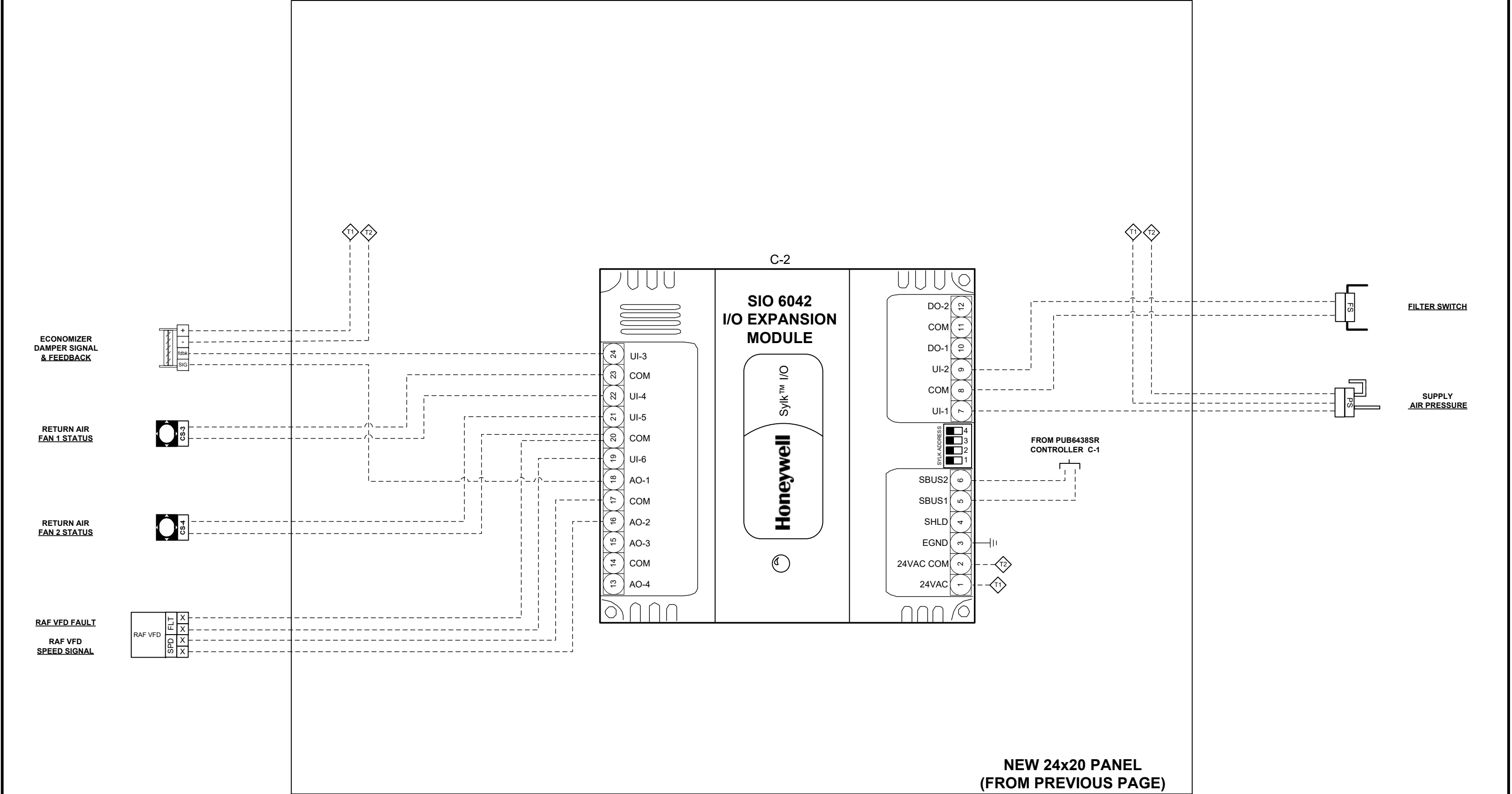
(TYPICAL OF 3 EXCEPT AS NOTED)



Project: NJ DOT F&A BUILDING
AHU-2, 3, & 4 (1ST, 2ND, & 3RD FLOORS) C-1 WIRING SCHEMATIC

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AHU-2, 3, & 4 (1ST, 2ND, & 3RD FLOORS) C-2 WIRING SCHEMATIC
(TYPICAL OF 3)



FACILITY	NJ DOT F&A BUILDING					Project: NJ DOT F&A BUILDING			
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		0	06-16-2017	SUBMITTAL	A.V.				
ARCHITECTS	.	NO.	DATE	REVISION	BY	Job No. #17-04260 Page 15 of 20			

AHU SEQUENCE OF OPERATIONS

Scope

- 1. Existing AHUs will be retrofitted with new open protocol controllers and DDC End Devices to execute the sequence of operations & points list. Existing end devices can be re-used if they are functional.
- 2. New Pressure Independent Hot Water Coil & Chilled Water Coil Control Valves will be provided

AHU Sequence of Operations

- 1. All air handling units shall be placed into its respective modes via the Building Management System (BMS). If communication is lost with the BMS, the controller(s) will operate using its local schedule and set points.
- 2. All Set Points and Time Schedules shall be User adjustable via the BMS.

Optimal Start & Morning Warm-Up Mode:

- 1 – Prior to a transition from the building’s unoccupied night set back mode to occupied mode, if a specific AHU’s zone average space temperature is more than 5°F below the occupied heating set point, a morning warm-up mode will be activated. The BMS will determine the Optimal Start Time for the Morning Warm-Up Sequence, but not to exceed 1 hour prior to the initiation of the normal scheduled occupied mode.
- 2 – During morning warm up, the OA Dampers controlled by the BMS will be closed, supply and return fans will be initiated, and the respective air handling unit’s heat will be enabled to 100% until the respective zone has achieved the occupied heating set point.
- 3 – Once the AHU’s average zone space temperature has reached the zone’s occupied heating set point, the Morning Warm-Up Sequence will be disabled and the AHU shall revert to its normal scheduled mode.

Optimal Start & Morning Cool Down Sequence (for spaces with cooling controlled by the BMS)

- 1 – Prior to a transition from the building’s unoccupied night set back mode to occupied mode, if a specific AHU’s zone average space temperature is more than 5°F above the occupied cooling set point, a morning cool down mode will be activated. The BMS will determine the Optimal Start Time for the Morning Cool-Down Sequence, but not to exceed 1 hour prior to the initiation of the normal scheduled occupied mode.
- 2 – During morning cool down, the OA Dampers controlled by the BMS will be closed, supply and return fans will be initiated, and the respective air handling unit’s cooling will be enabled to 100% until the respective zone has achieved the occupied cooling set point.
- 3 – Once the AHU’s average zone space temperature has reached the zone’s occupied cooling set point, the Morning Cool-Down Sequence will be disabled and the AHU shall revert to its normal scheduled mode.

OCCUPIED MODE:

- 1 – All air handling units shall be indexed into the occupied mode via the BMS schedule.
- 2- Upon initial startup, the Outside and Return Air Damper shall open to their Minimum Outside Air setting and the supply fan and return (s) shall start.
- 3- If the supply fan fails to start as sensed by its current sensor, an alarm shall be generated and the outside air damper shall close.
- 4 – Once the supply fan has proven on, the AHU will slowly ramp up and modulate the supply fan VFD to maintain a duct static pressure set point of 1.5 inches W.C (adj), and the return fan VFD shall track at 90% the supply fan speed.
- 5 - The supply duct static pressure sensor will also act as a high duct static pressure safety and will shut down the AHU in the event that the duct static pressure rises above 3.0 inches W.C. (adj).
- 6 - If the duct static pressure sensor fails, the VFD will limit its speed to 50% and an alarm will be annunciated.
- 7 – The AHU will enable cooling or heating to maintain discharge air temperature set point (adj). The discharge air temperature set point, adjustable (55°F-75°F), will be reset based on the zone’s average space temperature of 74 Degr F. (adj).
- 8 - When a zone’s average space temperature is 2 Degr F. or more below the average space temperature setpoint of 74 Degr F. (adj), the discharge air set-point shall be 75 Degr F. When a zone’s average space temperature is 2 Degr F. or more above the average space temperature setpoint of 74 Degr F. (adj), the discharge air set-point shall be 55 Deg F.
- 9- If the space temperature is 2 Degr F. above the space temperature set-point (74 Degr F. adj.) and the outside air temperature is above 60 Degr F., the AHU will enter it’s cooling mode.
- 10- Upon a call for cooling, the Outside Air Damper shall remain at its minimum position, the hot water valve shall remain closed and the chilled water valve shall modulate open to maintain the discharge air set point.
- 11 - If the discharge temperature rises above the discharge high limit of 95 Degr F. (adj), the discharge sensor will act as a high discharge temperature limit and a high temperature alarm will be annunciated.
- 12 - If the space temperature is 2 Degr F. above the space temperature set-point (74 Degr F. adj.) and the outside air temperature is above 51 Degr F., but below 59 Degr F., the AHU shall enter its economizer mode.
- 13 - Upon a call for economizer cooling, the Outside Air Damper shall modulate open to maintain the discharge air set-point.
- 14 – If the outside air damper is fully open and still cannot maintain the discharge air setpoint, then the chilled water valve shall modulate open to help maintain the discharge air set point.
- 15 – If both the outside air damper and chilled water valve are fully open and still cannot maintain the discharge air set point, then the AHU will disable the economizer mode and enter its normal cooling mode.
- 16 - If the space temperature is 2 Degr F. below the space temperature set-point (74 Degr F. adj.) and the outside air temperature is below 50 Degr F., the Unit Ventilator will enter it’s heating mode.
- 17 - Upon a call for heating, the Outside Air Damper shall remain at its minimum position, the chilled water valve shall remain closed and the hot water valve shall begin to modulate to maintain the discharge air set-point.
- 18- If the discharge air temperature falls below 45 Degr F., the discharge air temperature sensor will act as a low discharge temperature limit, a low temperature alarm will be annunciated, and the outside air damper shall close.

FACILITY	NJ DOT F&A BUILDING						Project: NJ DOT F&A BUILDING	
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	1	12-21-2017	AS-BUILTS				
ARCHITECTS	.	0	06-16-2017	SUBMITTAL	A.V.			
		NO.	DATE	REVISION	BY			
		Job No.		#17-04260	Page	16 of 20		

AHU SEQUENCE OF OPERATIONS CONT.

UNOCCUPIED MODE:

- 1 – The AHU fans shall be off, the Outside Air Damper shall be closed, and the Return Air Damper shall be open.
- 2 – When the Outside Air Temperature is below 40 Degs F., the Hot Water Valve shall fully open.
- 4 – When any zone’s average space temperature is below the Unoccupied Heating Set-point of 60 deg. F. (adj), the respective AHU’s Supply Air Fan shall start. The outside air damper shall remain closed and the hot water coil shall be modulated open to maintain a Discharge Air Set-point of 80 Degs F.
- 5 – When the Space Temperature rises above the Unoccupied Heating Set-point of 68 Degs F. (adj), the AHU’s Supply Air and Return Air Fans shall stop and the unit shall return to its normal unoccupied mode.

AIR FILTER MONITORING:

- 1 – A differential pressure switch will monitor the differential pressure across the filter when the fans are running. If the switch closes for 2 minutes after a request for fan operation a dirty filter alarm will be annunciated.

FREEZE PROTECTION (HW COILS ONLY):

- 1 – If Low Temperature Limit Switch senses a coil below a setting of 38 deg. F, the Return Air Damper shall be commanded open, the Outside Air Damper shall be commanded fully closed, the Hot Water Valve shall be commanded fully open. The supply and return fans shall shutdown and an alarm shall be generated.

SENSOR ALARMING:

- 1 – If the Space Temperature is above 85 deg. F or below 50 deg. F an alarm shall be generated.
- 2 – If the Discharge Air Temperature is above 95 deg. F or below 45 deg. F an alarm shall be generated.
- 3- Supply Fan Failure

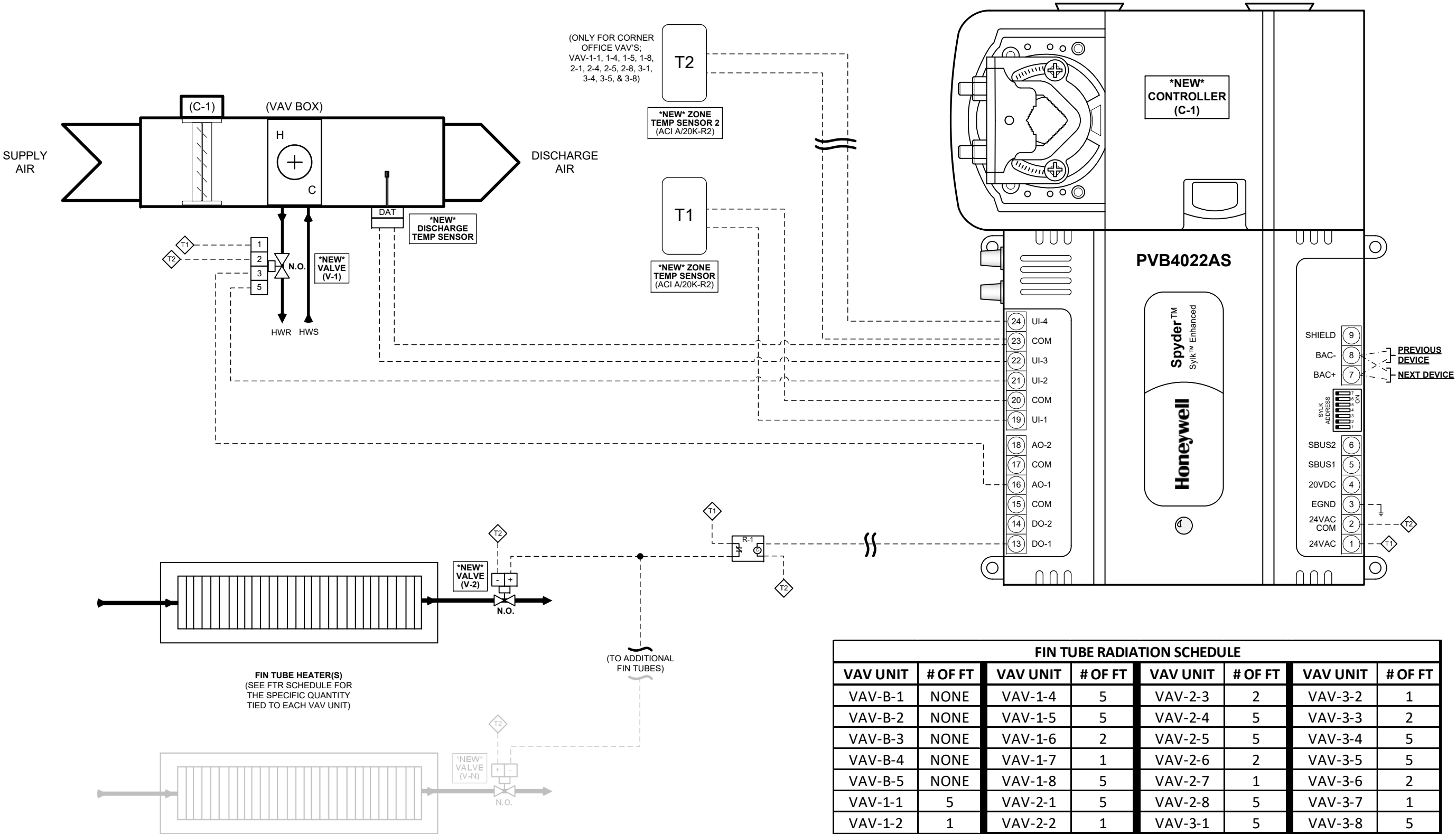
The following points will be shown on a graphic for each unit:

1. Supply Air Temperature and Set Point
2. Average Zone Temperature and Set Point
3. Fan VFD Status
4. Fan VFD Speed
5. OA Damper Position
6. RA Damper Position
7. Hot Water Coil Control Valve Position
8. Chilled Water Valve Position
9. OA Temperature (Global)
10. Return Air Temperature and Return Air Humidity
11. Mixed Air Temperature
12. Low Limit Thermostat Status
13. Filter Status

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MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	1	12-21-2017	AS-BUILTS			AHU SEQUENCE OF OPERATIONS CONT.	
ARCHITECTS	.	0	06-16-2017	SUBMITTAL	A.V.		Job No.	#17-04260
		NO.	DATE	REVISION	BY		Page	17 of 20

VAV BOXES FLOW DIAGRAM, WIRING SCHEMATIC, & FTR SCHEDULE

(TYPICAL OF 29 EXCEPT AS NOTED)



NOTES: ALL DEVICES ARE NEW NLESS OTHERWISE NOTED

FACILITY	NJ DOT F&A BUILDING						Project: NJ DOT F&A BUILDING
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	1	12-21-2017	AS-BUILTS			VAV BOXES FLOW DIAGRAM, WIRING SCHEMATIC, & FTR SCHEDULE
ARCHITECTS		0	06-16-2017	SUBMITTAL	A.V.		Job No. #17-04260
		NO.	DATE	REVISION	BY		Page 18 of 20

VAV SEQUENCE OF OPERATIONS

Scope

1.Existing VAVs will be field retrofitted with new VAV DDC Controls to execute the sequence of operations & points list. Existing end devices can be re-used if they are functional.

VAV Sequence of Operations

- 1.All VAV units shall be placed into its respective modes via the Building Management System (BMS). If communication is lost with the BMS, the occupied mode shall be the default mode of the VAV.
- 2.All Set Points and Time Schedules shall be User adjustable via the BMS.

OCCUPIED MODE:

- 1 – The VAV controller shall use the measured space temperature and compare the active cooling and heating set points in order to determine the requested cooling or heating needs of the space.
- 2- When the VAV unit is in cooling mode, the VAV shall maintain the space temperature by modulating the airflow between the active cooling minimum airflow set point to the maximum cooling airflow set point.
- 3-When the VAV unit is in heating mode, the VAV shall maintain the space temperature by modulating closed to heating minimum airflow set point and then by modulating the Reheat Coil Valve.
- 4 – If the Reheat Coil Valve is fully open and the VAV’s space temperature still remains below the space temperature set point, then the zone radiation valves associated with that VAV will open and heat the space.

ALARMS

The BMS will annunciate the following alarms

- 1. Controller Communication Failure
- 2. High Space Temperature
- 3. Low Space Temperature
- 4. High Discharge Air Temperature
- 5. Space Sensor Failure

The following points will be shown on a graphic for each unit:

- 1. Space Temperature
- 2. Heating and Cooling Space Temperature Set points
- 3. VAV Damper Position
- 4. Hot Water Coil Control Valve Position
- 5. CFM Airflow Reading

FACILITY	NJ DOT F&A BUILDING						Project: NJ DOT F&A BUILDING		
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	1	12-21-2017	AS-BUILTS					
ARCHITECTS	.	0	06-16-2017	SUBMITTAL	A.V.		VAV SEQUENCE OF OPERATIONS		
		NO.	DATE	REVISION	BY				
						Job No.	#17-04260	Page	19 of 20

HWS, FTR, AHU, & VAV VALVE SCHEDULE

Label	Associated EQUIPMENT	QTY	Pattern	Equip. GPM	Style	Valve Size	Valve CV	Fail Postion	Act Control	Valve Assembly P/N
VAV B-1	AHU-1	1	2-WAY	5.20	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2AHPX5000
VAV B-2	AHU-1	1	2-WAY	2.30	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2AEPX5000
VAV B-3	AHU-1	1	2-WAY	4.00	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2AGPX5000
VAV B-4	AHU-1	1	2-WAY	3.60	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2AFPX5000
VAV B-5	AHU-1	1	2-WAY	4.80	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2AGPX5000
VAV 1-1	AHU-2	1	2-WAY	5.20	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2AHPX5000
VAV 1-2	AHU-2	1	2-WAY	2.80	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2AEPX5000
VAV 1-3	AHU-2	1	2-WAY	3.30	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2AFPX5000
VAV 1-4	AHU-2	1	2-WAY	5.20	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2AHPX5000
VAV 1-5	AHU-2	1	2-WAY	6.50	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2AJPX5000
VAV 1-6	AHU-2	1	2-WAY	2.20	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2AEPX5000
VAV 1-7	AHU-2	1	2-WAY	1.50	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2ADPX5000
VAV 1-8	AHU-2	1	2-WAY	4.70	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2AGPX5000
VAV 2-1	AHU-3	1	2-WAY	5.20	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2AHPX5000
VAV 2-2	AHU-3	1	2-WAY	2.80	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2AEPX5000
VAV 2-3	AHU-3	1	2-WAY	3.30	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2AFPX5000
VAV 2-4	AHU-3	1	2-WAY	5.20	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2AHPX5000
VAV 2-5	AHU-3	1	2-WAY	5.60	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2AHPX5000
VAV 2-6	AHU-3	1	2-WAY	2.50	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2AEPX5000
VAV 2-7	AHU-3	1	2-WAY	2.10	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2AEPX5000
VAV 2-8	AHU-3	1	2-WAY	4.70	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2AGPX5000
VAV 3-1	AHU-4	1	2-WAY	5.20	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2AHPX5000
VAV 3-2	AHU-4	1	2-WAY	2.60	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2AEPX5000
VAV 3-3	AHU-4	1	2-WAY	3.20	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2AFPX5000
VAV 3-4	AHU-4	1	2-WAY	5.20	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2AHPX5000
VAV 3-5	AHU-4	1	2-WAY	5.60	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2AHPX5000
VAV 3-6	AHU-4	1	2-WAY	2.50	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2AEPX5000
VAV 3-7	AHU-4	1	2-WAY	1.90	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2ADPX5000
VAV 3-8	AHU-4	1	2-WAY	4.30	PRESSURE INDEPENDENT	0.50	N/A	IN PLACE	2 POSITION	VRN2AGPX5000
AHU-1	CHW	1	2-WAY	92.80	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATI	VRN2E9PX5000
AHU-1	HW	1	2-WAY	20.80	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATI	VRN2DQPX6100
AHU-2	CHW	1	2-WAY	147.40	PRESSURE INDEPENDENT	3.00	N/A	IN PLACE	MODULATI	VRW2JW45MB
AHU-2	HW	1	2-WAY	31.90	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATI	VRN2DSPX6200
AHU-3	CHW	1	2-WAY	147.40	PRESSURE INDEPENDENT	3.00	N/A	IN PLACE	MODULATI	VRW2JW45MB
AHU-3	HW	1	2-WAY	31.90	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATI	VRN2DSPX6200
AHU-4	CHW	1	2-WAY	142.80	PRESSURE INDEPENDENT	3.00	N/A	IN PLACE	MODULATI	VRW2JW45MB
AHU-4	HW	1	2-WAY	31.90	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATI	VRN2DSPX6200
FTR	HW	78	2-WAY	.23 - .29	ZONE TIGHT BALL VALVE	0.75	ADJUSTABLE	OPEN	2 POSITION	Z2075Q-K+CQKB2
BOILER MIN FLOW		1	2-WAY	50.00	CHARACTERIZED BALL VAI	2.00	71	IN PLACE	MODULATI	VRN2FRPX5000

PROJECT: DOT F&A BUILDING**JOB: #17-04260****DWG. TOTAL: Page 1 of 1**

PAGE	QTY	PRODUCT #	MAN.	DESCRIPTION
PG 4 HWS	2	A/20K-I-2.5"	ACI	Immersion + ½ Well 20K temperature sensor
PG 4 HWS	2	C-2200	Senva	Current Transducer
PG 4 HWS	1	A/20K-O	ACI	20K Outside Air Temp sensor
PG 4 HWS	1	PW20G	Senva	30ft. 0-10V Differential Pressure Transmitter
PG 4 HWS	2	PFT-IAN-B111-S	Dwyer	4 - 20 mA Paddlewheel Flow Sensor
PG 4 HWS	1	VBN2FRPX5000	Honeywell	2", Cv = 71, Min-flow-rate bypass valve
PG 5 HWS	1	PUB6438SR	Honeywell	Spyder BACnet Controller (6UI 4DI 3AO 8DO)
PG 5 HWS	1	PSH75A	FD, Inc.	75VS Transformer with outlet and switch
PG 5 HWS	1	BPS-015	Dwyer	1.5A VDC Transfomer
PG 5 HWS	3	782-2C-24A	Auto.Direct	24VAC CUBE Relay
PG 5 HWS	4	782-2C-SKT	Auto.Direct	Relay mounting socket
PG 5 HWS	1	SCE-24EL2006LP	Saginaw	24" x 20" x 6" Enviroline Control Panel
PG 5 HWS	1	SCE-24P20	Saginaw	24" x 20" Subpanel
PG 6 MER	2	A/20K-I-2.5"	ACI	Immersion + ½ Well 20K temperature sensor
PG 6 MER	4	C-2200	Senva	Current Transducer
PG 6 MER	4	PW20G	Senva	30ft. 0-10V Differential Pressure Transmitter
PG 6 MER	1	305011	Badger	3050 series BTU Meter and Flow Monitor
PG 7 MER	1	PUB6438SR	Honeywell	Spyder BACnet Controller (6UI 4DI 3AO 8DO)
PG 7 MER	1	PSH75A	FD, Inc.	75VS Transformer with outlet and switch
PG 7 MER	1	BPS-015	Dwyer	1.5A VDC Transfomer
PG 7 MER	4	782-2C-24A	Auto.Direct	24VAC CUBE Relay
PG 7 MER	4	782-2C-SKT	Auto.Direct	Relay mounting socket
PG 8 MER	1	SIO4022	Honeywell	SYLKBus Controller Expansion (4UI 2AO 2DO)
PG 8 MER	1	SCE-24EL2006LP	Saginaw	24" x 20" x 6" Enviroline Control Panel
PG 8 MER	1	SCE-24P20	Saginaw	24" x 20" Subpanel
PG 10 AHU-1	1	A/RH5-20K-D	ACI	20K Air Temp & Humidity Sensor
PG 10 AHU-1	1	ADPS-04-2-N	Dwyer	Differential pressure sensor for filter status
PG 10 AHU-1	1	A/20K-AF	ACI	20K Rigid Copper Mixed Air Temp Sensor
PG 10 AHU-1	1	TE-DFN-F088-00	Dwyer	Temperature 8 inch probe
PG 10 AHU-1	1	MS-312-LCD	Dwyer	2/3's Differential pressure transmitter
PG 10 AHU-1	1	L482A	Honeywell	Low-limit temperature control switch
PG 10 AHU-1	1	C-2200	Senva	Current Transducer
PG 11 AHU-1	1	PUB6438SR	Honeywell	Spyder BACnet Controller (6UI 4DI 3AO 8DO)
PG 11 AHU-1	1	TR75VA001	FD, Inc.	120VAC/24VAC Transformer
PG 11 AHU-1	1	PSH75A	FD, Inc.	Outlet power supply with switch
PG 11 AHU-1	1	782-2C-24A	Auto.Direct	24VAC CUBE Relay
PG 11 AHU-1	1	782-2C-SKT	Auto.Direct	Relay mounting socket
PG 12 AHU-1	1	SIO4022	Honeywell	SylkBUS Controller Expansion (4UI 2AO 2DO)

PAGE	QTY	PRODUCT #	MAN.	DESCRIPTION
PG 12 AHU-1	1	SCE-24EL2006LP	Saginaw	24" x 20" x 6" Enviroline Control Panel
PG 12 AHU-1	1	SCE-24P20	Saginaw	24" x 20" Subpanel
PG 13 AHU	3	A/RH5-20K-D	ACI	20K Air Temp & Humidity Sensor
PG 13 AHU	3	ADPS-04-2-N	Dwyer	Differential pressure sensor for filter status
PG 13 AHU	3	A/20K-AF	ACI	20K Rigid Copper Mixed Air Temp Sensor
PG 13 AHU	3	TE-DFN-F088-00	Dwyer	Temperature 8 inch probe
PG 13 AHU	3	MS-312-LCD	Dwyer	2/3's Differential pressure transmitter
PG 13 AHU	3	L482A	Honeywell	Low-limit temperature control switch
PG 13 AHU	12	C-2200	Senva	Current Transducer
PG 14 AHU	3	PUB6438SR	Honeywell	Spyder BACnet Controller (6UI 4DI 3AO 8DO)
PG 14 AHU	3	PSH75A	FD, Inc.	75VS Transformer with outlet and switch
PG 14 AHU	3	PSH75A	FD, Inc.	Outlet power supply with switch
PG 14 AHU	9	782-2C-24A	Auto.Direct	24VAC CUBE Relay
PG 14 AHU	9	782-2C-SKT	Auto.Direct	Relay mounting socket
PG 15 AHU	3	SIO6042	Honeywell	SylkBUS Controller Expansion (6UI 4AO 2DO)
PG 15 AHU	3	SCE-24EL2006LP	Saginaw	24" x 20" x 6" Enviroline Control Panel
PG 15 AHU	3	SCE-24P20	Saginaw	24" x 20" Subpanel
PG 18 VAVS	29	PVB4022AS	Honeywell	Spider BACnet VAV Controller (4UI 2AO 2DO)
PG 18 VAVS	41	A/20K-R2	ACI	Zone Temperature Sensor
PG 18 VAVS	29	TE-DFN-F088-00	Dwyer	Temperature 8 inch probe
PG 18 VAVS	24	RIBU1C	FD, Inc. (RIB)	Relay SPDT

NOTE: HWS, CHWS, AHU, FTR, AND VAV VALVE PARTS ARE LISTED ON VALVE SCHEDULE

MAIN OFFICE BUILDING



NJ DOT M.O.B. (AS-BUILTS)
ENERGY SAVINGS IMPROVEMENT PROJECT
BUILDING AUTOMATION SYSTEM

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3	NETWORK RISER	
4	HWS FLOW DIAGRAM	
5	HWS AERCO CONTROLLER WIRING SCHEMATIC	
6	HWS C-1 WIRING SCHEMATIC	
7	HWS SEQUENCE OF OPERATIONS	
8	CHILL WATER BTU-METER FLOW DIAGRAM	
9	AHU-1 TO 11 (1ST - 3RD FLOORS) FLOW DIAGRAM	
10	AHU-1 TO 11 (1ST - 3RD FLOORS) C-1 WIRING SCHEMATIC	
11	AHU-1 TO 11 (1ST - 3RD FLOORS) C-2 WIRING SCHEMATIC	
12	AHU-12 (1ST FLOOR SW) FLOW DIAGRAM	

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14	AHU-12 (1ST FLOOR SW) C-1 WIRING SCHEMATIC	
15	AHU-12 (1ST FLOOR SW) C-2 WIRING SCHEMATIC	
16	AIR HANDLING UNIT & VALVE SCHEDULE	
17	AHU SQUENCE OF OPERATIONS	
18	AHU SEQUENCE OF OPERATIONS CONT.	
19	VAV BOX FLOW & WIRING DIAGRAM	
20	VAV BOX & ASSOCIATED FT SCHEDULE	
21	VAV SEQUENCE OF OPERATIONS	
22	UNIT HEATER FLOW & WIRING DIAGRAM	
23	FIN TUBE RADIATOR FLOW & WIRING DIAGRAM	

LEGEND & SYMBOLS

GENERAL NOTES

1. ALL POWER WIRING 120 VAC AND ABOVE BY ELECTRICAL CONTRACTOR.

TEMPERATURE CONTROL LEGEND:

MOUNTED ON PANEL FACE

MOUNTED INSIDE PANEL

CONTROL TUBE #3

PNEUMATIC TUBING

WIRING

TERMINAL BLOCK #6

SOLENOID VALVE

CONTROL VALVE, 2-WAY

CONTROL VALVE, 3-WAY

PARALLEL BLADED DAMPER

OPPOSED BLADED DAMPER

SIGNAL LINE INSIDE PANEL

ABBREVIATIONS:

AFMS- AIR FLOW MEASURING STATION

C- COMMON PORT

CCP- CENTRAL CONTROL PANEL

CR- CONTROL RELAY

CS- CURRENT SWITCH

DA-DAMPER ACTUATOR

DPRO- DAMPER OUTPUT

DPRS- DAMPER STATUS

DPS- DIFFERENTIAL PRESSURE SWITCH

DPT- DIFFERENTIAL PRESSURE TRANS

EA- EXHAUST AIR

ES- END SWITCH, POSITION SWITCH

FS- FLOW SWITCH

FSD- FIRE & SMOKE DAMPER

H- HUMIDISTAT

HC- MOTOR STARTER HOLDING COIL

HI- HUMIDITY INDICATOR

HL- HIGH LIMIT HUMIDISTAT

HS- HIGH SIGNAL SELECTOR

HT- HUMIDITY TRANSMITTER

LCP- LOCAL CONTROL PANEL

LS- LOW SIGNAL SELECTOR

MA- MIXED AIR

MOD-MOTER OPERATED DAMPER

NC- NORMALLY CLOSED

NCP- NETWORK CONTROL PANEL

NO- NORMALLY OPEN

OA -OUTSIDE AIR

OL'S- MOTOR STARTER OVERLOADS

PC- PRESSURE CONTROLLER

PE- PRESSURE TOGGLE SWITCH

PI- PRESSURE INDICATOR

PL- PILOT LIGHT

PR- PNEUMATIC RELAY

PT- PRESSURE TRANSMITTER

RC- RECEIVER CONTROLLER

RR- REVERSING RELAY

RT- ROOM THERMOSTAT

S- SWITCH

SD- SMOKE DETECTOR

S/W- SUMMER/ WINTER SIGNAL

T- THERMOSTAT

TS- TEMPERATURE SENSOR

TC- TIME CLOCK

TDR- TIME DELAY RELAY

THL- TEMPERATURE HIGH LIMIT THERMOSTAT

TI- TEMPERATURE INDICATOR

TLL- TEMPERATURE LOW LIMIT THERMOSTAT

TR- TRANSDUCER

TT- TEMPERATURE TRANSMITTER

TX- TRANSFORMER

V- VALVE

WB- WET BULB

WU- WARM-UP SIGNAL

WIRING LEGEND

Low Voltage, 18 AWG, Copper Wire

Low Voltage Communication Wiring 22/2 AWG, CL2P, Shielded Copper Wire, Low Capacitance

Line Voltage, THHN Field Wiring

HVAC SYSTEM LEGEND:

MOTOR OPERATED DAMPER

PREHEAT COIL

COOLING COIL

REHEAT COIL

HEATING COIL

DIRECT EXPANSION COIL

FAN

MANUAL VALVE

ZONE CO2 SENSOR

WATER FLOW METER

AVERAGING TYPE TEMPERATURE SENSOR

FILTER

FIRE & SMOKE DAMPER (BY OTHERS)

OUTSIDE AIR TEMPERATURE SENSOR

LEAK DETECTOR

FREEZESTAT (D.P. CONTACT)

DUCT MOUNTED TEMPERATURE SENSOR

IMMERSION TYPE TEMPERATURE SENSOR

DUCT MOUNTED SMOKE DETECTOR

STATIC PRESSURE TRANSMITTER

STEAM PRESSURE SENSOR

DUCT MOUNTED HUMIDITY SENSOR

SPACE TEMPERATURE

OUTSIDE AIR CO2 SENSOR

AIR FLOW MEASURING STATION

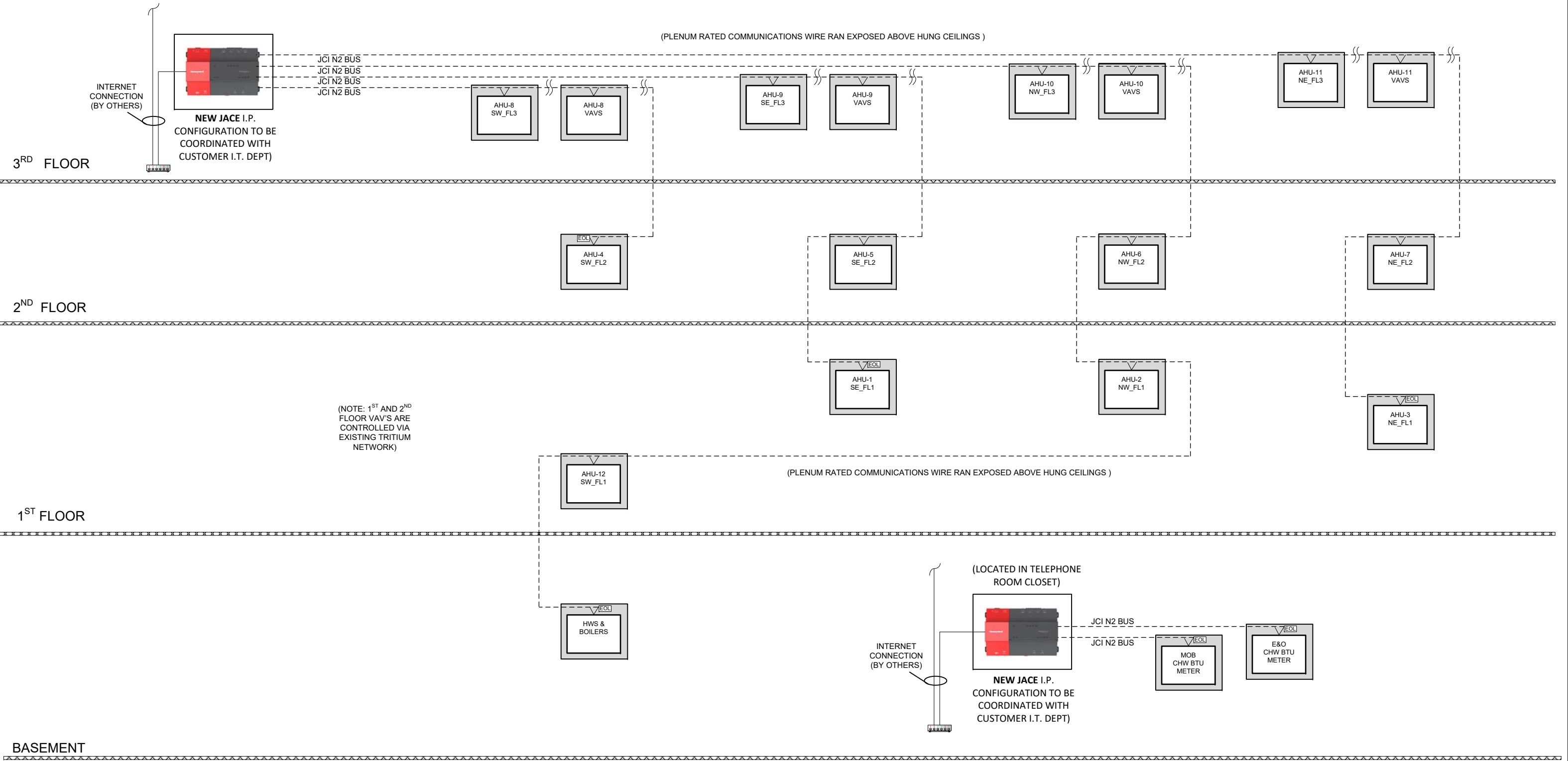
CONTROL RELAY

CURRENT SENSOR

CO2 SENSOR

FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618						Project: NJ DOT M.O.B. BUILDING
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	01-02-2018	AS-BUILTS			
		1	11-03-2017	ADDED RISER, HWS, & REVISED AHU SEQ.			
ARCHITECTS		0	06-13-2017	SUBMITTAL	A.V.		
		NO.	DATE	REVISION	BY		
							LEGEND & SYMBOLS
							Job No. #17-04260Page 2 of 23

NETWORK RISER



FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618								Project: NJ DOT M.O.B. BUILDING
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	01-02-2018	AS-BUILTS					
		1	11-03-2017	ADDED RISER, HWS, & REVISED AHU SEQ.					
ARCHITECTS		0	06-13-2017	SUBMITTAL	A.V.				
		NO.	DATE	REVISION	BY				

NETWORK RISER

HWS FLOW DIAGRAM

The diagram illustrates the Heating Water System (HWS) layout, showing the flow of water between three boilers (Boiler #1, #2, #3) and two pumps (Pump #1, #2). The system is controlled by an AERCO CONTROLLER (PROTONODE) and a JACE 8000 system.

Boilers and Pumps:

- Boiler #1, #2, #3:** Each boiler has an RS 485 INTERFACE connected to the AERCO CONTROLLER. They are connected to the SYSTEM RETURN line via three-way valves.
- Pump #1, #2:** Each pump has an RS 485 INTERFACE connected to the AERCO CONTROLLER. They are connected to the SYSTEM SUPPLY line via three-way valves.

Flow and Control:

- SYSTEM SUPPLY:** The main supply line for the system.
- SYSTEM RETURN:** The main return line for the system.
- Differential Pressure Transmitter (DPT-1):** Monitors the pressure difference between the supply and return lines.
- Minimum Return Flow Bypass Valve:** Ensures a minimum flow rate in the return line.
- Temperature and Pressure Sensors:** Various sensors (T1, T2, T3, P1, P2, P3) are installed throughout the system for monitoring and control.
- Control Valves (C-1):** Used to regulate flow and pressure at various points.
- Flow Meters (FM-1, FM-2):** Measure the flow rate in different sections of the system.

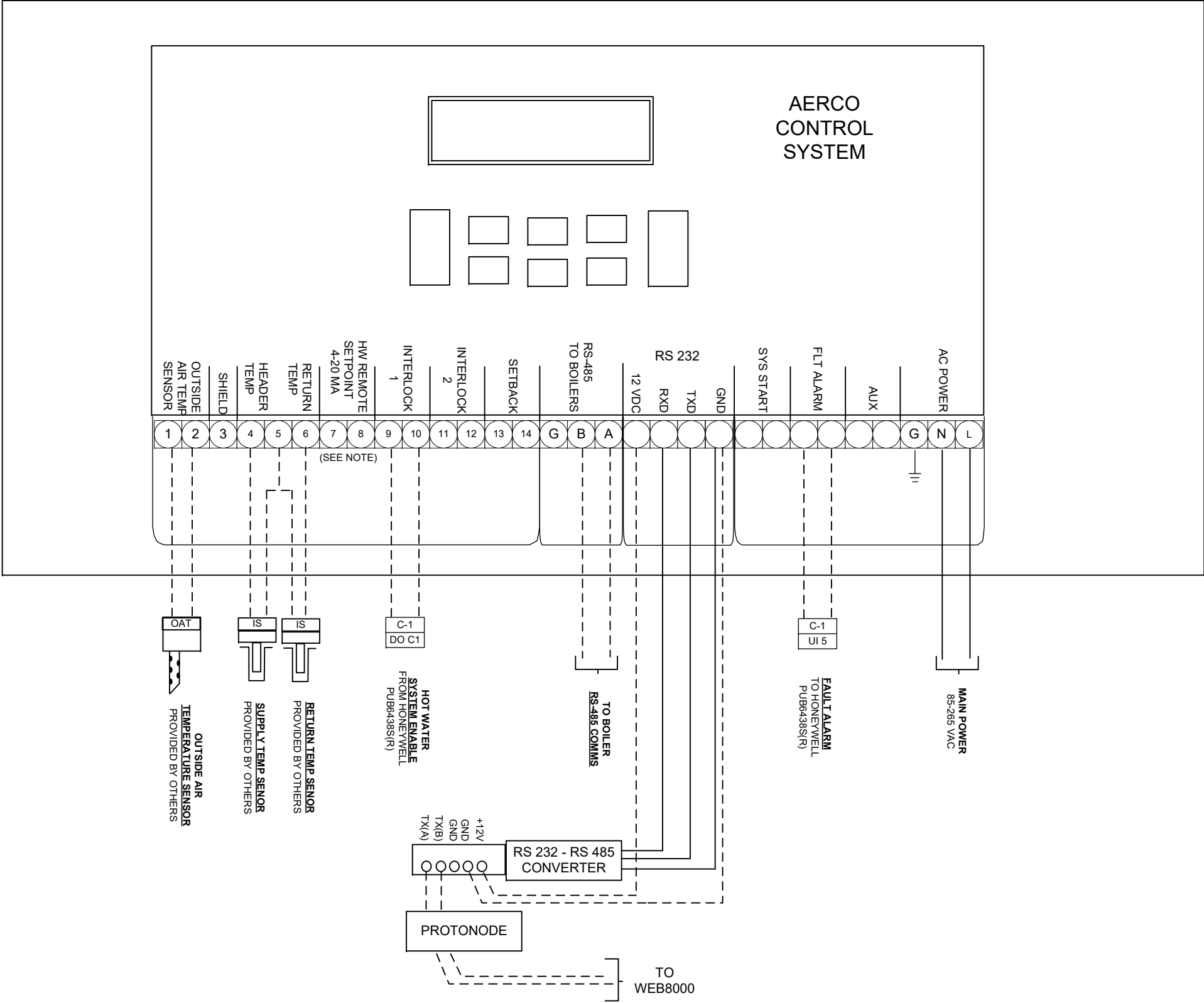
Control System:

- AERCO CONTROLLER (PROTONODE):** The central control unit for the system.
- JACE 8000:** An external control system connected to the AERCO CONTROLLER.
- RS 485 Interfaces:** Connect the boilers and pumps to the AERCO CONTROLLER.

FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618							Project: NJ DOT M.O.B. BUILDING		
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	01-02-2018	AS-BUILTS				HWS FLOW DIAGRAM		
		1	11-03-2017	ADDED RISER, HWS, & REVISED AHU SEQ.						
ARCHITECTS		0	06-13-2017	SUBMITTAL	A.V.			Job No. #17-04260 Page 4 of 23		
		NO.	DATE	REVISION	BY					

HWS AERCO CONTROLLER WIRING SCHEMATIC

PROVIDED M.C.

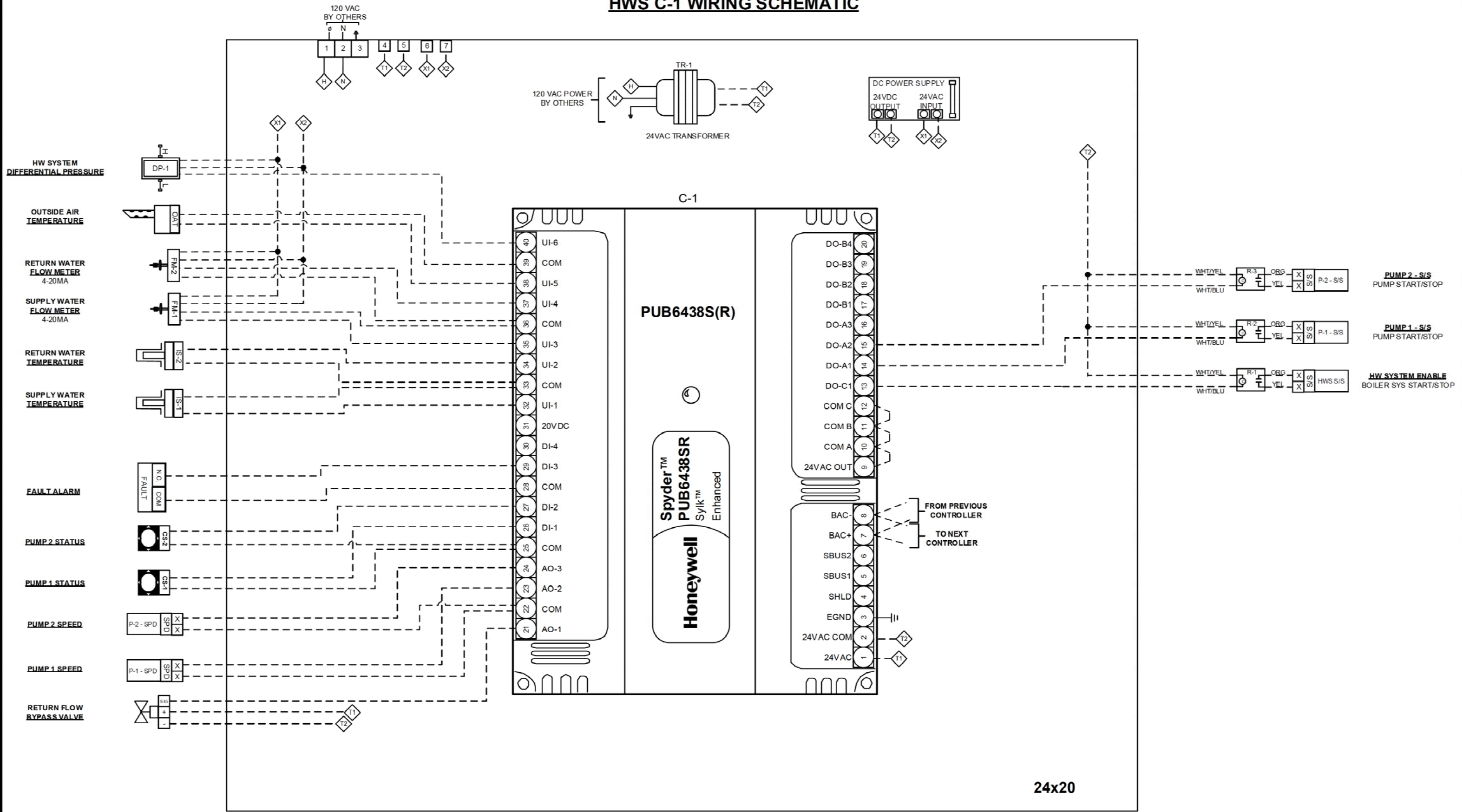


NOTES: HOT WATER REMOTE SETPOINT OBTAINED VIA BACNET

FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618				
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	01-02-2018	AS-BUILTS	
		1	11-03-2017	ADDED RISER, HWS, & REVISED AHU SEQ.	
ARCHITECTS		0	06-13-2017	SUBMITTAL	A.V.
		NO.	DATE	REVISION	BY

Project: NJ DOT M.O.B. BUILDING	
HWS AERCO CONTROLLER WIRING SCHEMATIC	
Job No. #17-04260	Page 5 of 23

HWS C-1 WIRING SCHEMATIC



NOTES:

FACILITY	NJ DEPARTMENT OF TRANSPORTATION, PAVING TOWNSHIP, NJ 08512				Project: NJ DOT MOB	
MECHANICAL	DOD ENERGY, LLC, 5425 HARDING HIGHWAY, MAY'S LANDING, NJ 08330				HWS C-1 WIRING SCHEMATIC	
ARCHITECTS		0	06-09-2017	Hot Water System Submission	L.C.	
		NO.	DATE	REVISION	BY	
						Job No. #17-04260 Page 5 of 6

HW SYS SEQUENCE OF OPERATIONS

Sequence of Operations

- A. When the outside air temperature is below the hot water system enable setpoint of 60 deg F. (Adj.), the Honeywell BMS shall start the lead hot water system pump.
- B. If the lead hot water pump fails to start, then the Honeywell BMS shall command the lag hot water pump to start.
- C. After pump status has been proven on the Honeywell BMS shall enable the hot water system via the Aerco Boiler Control System. The Aerco Boiler Controller shall select the lead boiler and open the lead boiler’s isolation valve through its own interlocking controls.
- D. The boiler system shall operate to maintain a hot water supply temperature setpoint based on the following outside air reset schedule.
- At 60°F (adj.) outside air temperature, the hot water supply temperature setpoint shall be 120°F (adj.)
- At 20°F (adj.) outside air temperature, the hot water supply temperature setpoint shall be 180°F (adj.)
- E. A differential pressure sensor, at the end of the hot water piping loop, shall monitor the hot water system differential pressure. As the differential pressure drops below the differential pressure setpoint, the pump speed shall increase to maintain the differential pressure setpoint. As the differential pressure rises above the differential pressure setpoint, the pump speed shall decrease to maintain the differential pressure setpoint.
- F. A minimum return water flow setpoint shall be calculated based on the number of boilers running and the return water flow bypass valve, between the return and supply header, shall modulate open to maintain a minimum return water flow through each operating boiler. A flow sensor on the return header shall monitor the minimum amount of flow based on Boiler MFG’s requirements.
- G. When the buildings are in the Unoccupied Mode:
1. Set the VFD output to 50% for the pump output. 2. Set the MAX Temp to 140 degrees. F.

The following points will be shown on a graphic:

Example of available points from Boiler Control Panel Open Protocol Interface to be on graphic.

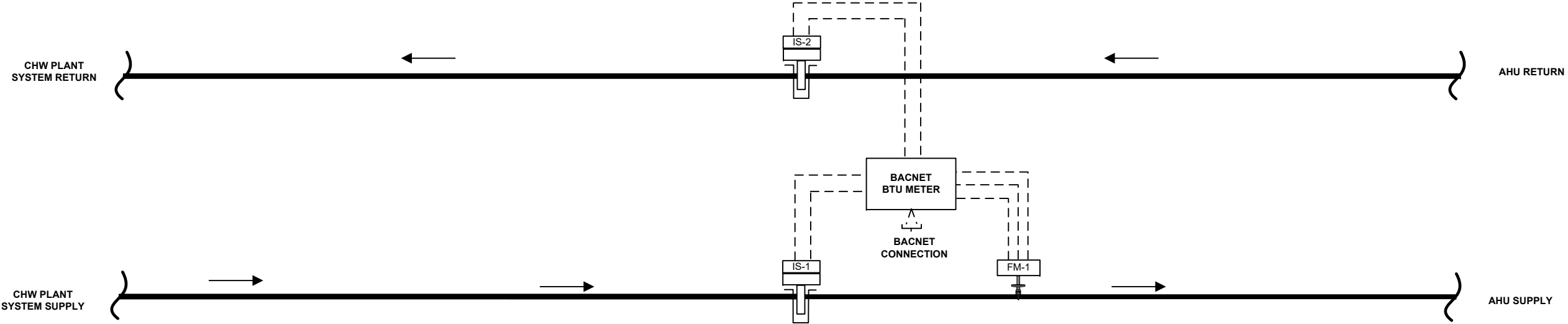
1.Outside Air Temperature, Header Temperature, Header Setpoint, Percent of Load (%), Boiler # Status

- Example of points provided by the BMS controller (either hardwired or via Communication Interface)
2. Outside air (OA) Temperature
3. Heating Hot Water System Supply Water Temperature
4. Heating Hot Water Supply Temperature Setpoint
5. Heating Hot Water System Return Water Temperature
6. Pump VFD Start/Stop
7. Pump VFD Status
8. Pump VFD Speed
9. Pump VFD Alarm
10. Pump VFD kW
11. System Differential Pressure
12. System Differential Pressure Setpoint
13. Boiler System Supply Water Temperature
14. Boiler System Return Temperature
15. Hot Water System Flow
16. Hot Water System Bypass Valve Position
17. Firing rate
18. Fault Code(s)
19. Operational Status (Standby, Remote, Off, On, Manual Override)
20. BMS will animate the boiler graphic when the boiler(s) are firing

- H. The BMS will annunciate the following alarms
1. Alarms from the Boiler Control Interface
2. High Supply Water Temperature
3. Low Supply Water Temperature
4. Pump VFD Failure
5. Low/High System Differential Pressure

FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618						Project: NJ DOT M.O.B. BUILDING	
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	01-02-2018	AS-BUILTS			HW SYS SEQUENCE OF OPERATIONS	
		1	11-03-2017	ADDED RISER, HWS, & REVISED AHU SEQ.				
ARCHITECTS		0	06-13-2017	SUBMITTAL	A.V.		Job No.	#17-04260
		NO.	DATE	REVISION	BY	Page 7 of 23		

CHILL WATER BTU-METER FLOW DIAGRAM



FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618								Project: NJ DOT M.O.B. BUILDING
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	01-02-2018	AS-BUILTS					CHILL WATER BTU-METER FLOW DIAGRAM
		1	11-03-2017	ADDED RISER, HWS, & REVISED AHU SEQ.					
ARCHITECTS		0	06-13-2017	SUBMITTAL	A.V.				
		NO.	DATE	REVISION	BY				Job No. #17-04260Page 8 of 23

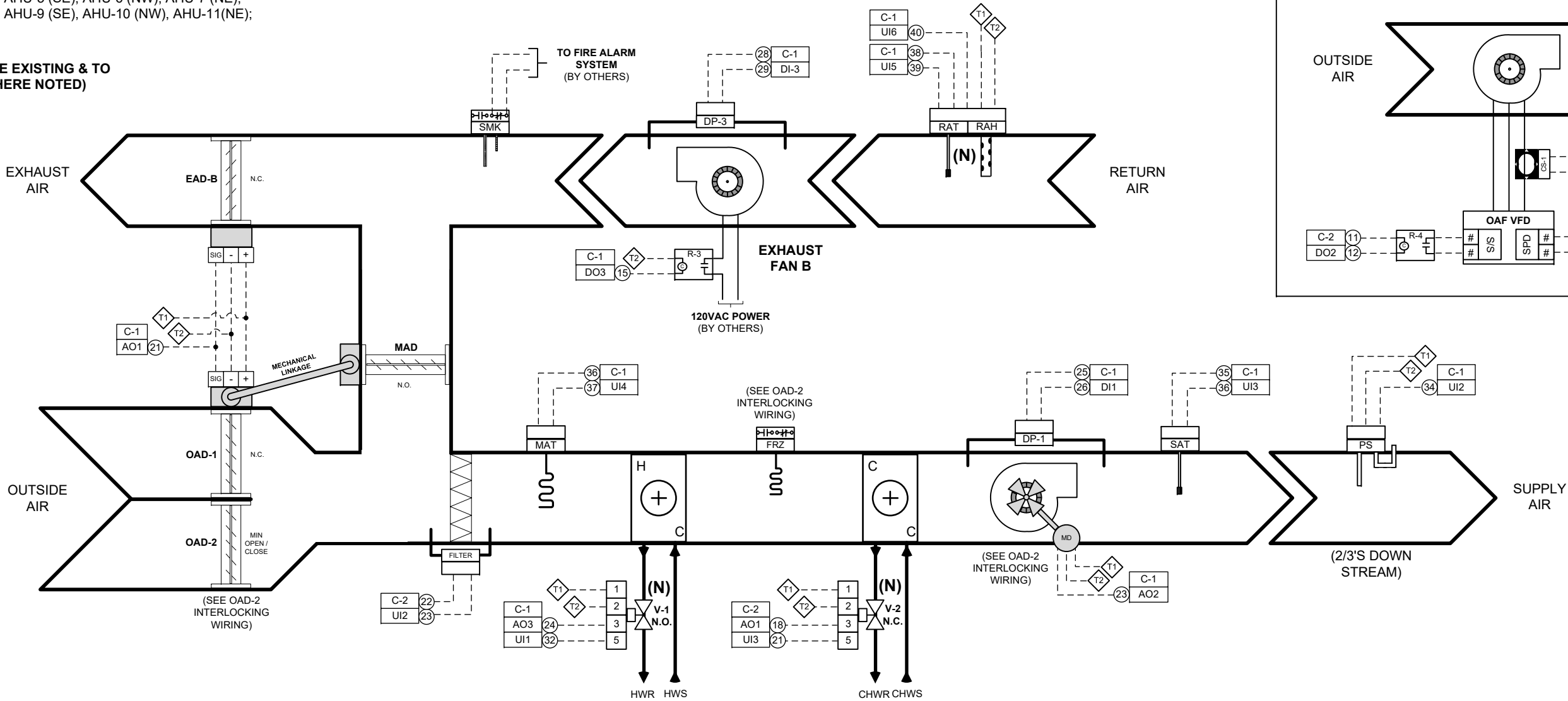
AHU LOCATIONS:

1ST FLOOR – AHU-1 (SE), AHU-2 (NW), AHU-3 (NE);
2ND FLOOR – AHU-4 (SW), AHU-5 (SE), AHU-6 (NW), AHU-7 (NE);
3RD FLOOR – AHU-8 (SW), AHU-9 (SE), AHU-10 (NW), AHU-11(NE);

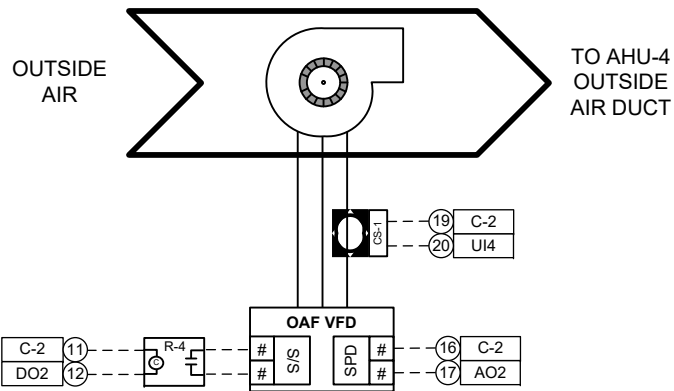
(NOTE: ALL DEVICES ARE EXISTING & TO BE RE-USED EXCPET WHERE NOTED)

AHU-1 TO 11 (1ST - 3RD FLOORS) FLOW DIAGRAM

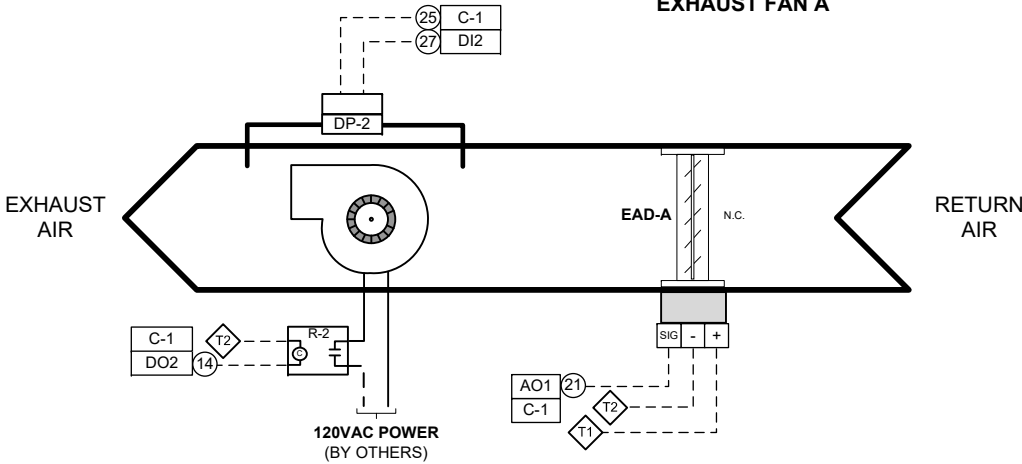
(TYPICAL OF 11 EXCEPT AS NOTED)



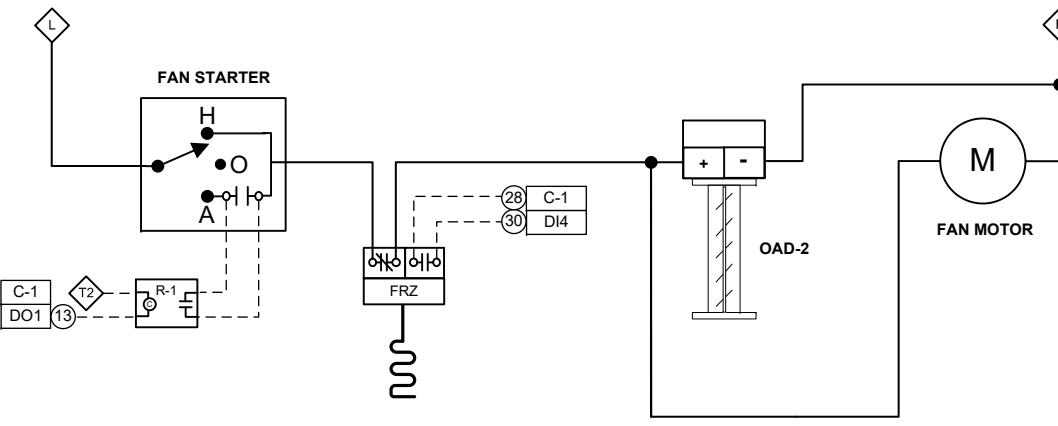
AHU-8, 9, 10, & 11 OUTSIDE AIR FAN DIAGRAM



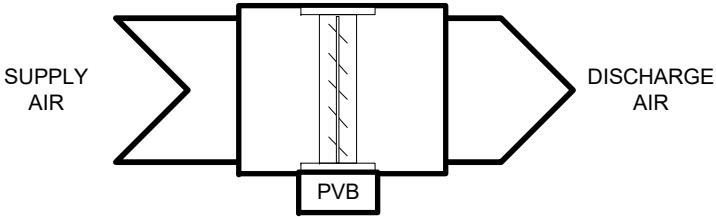
EXHAUST FAN A



OUTSIDE AIR DAMPER 2 & STARTER INTERLOCKING WIRING



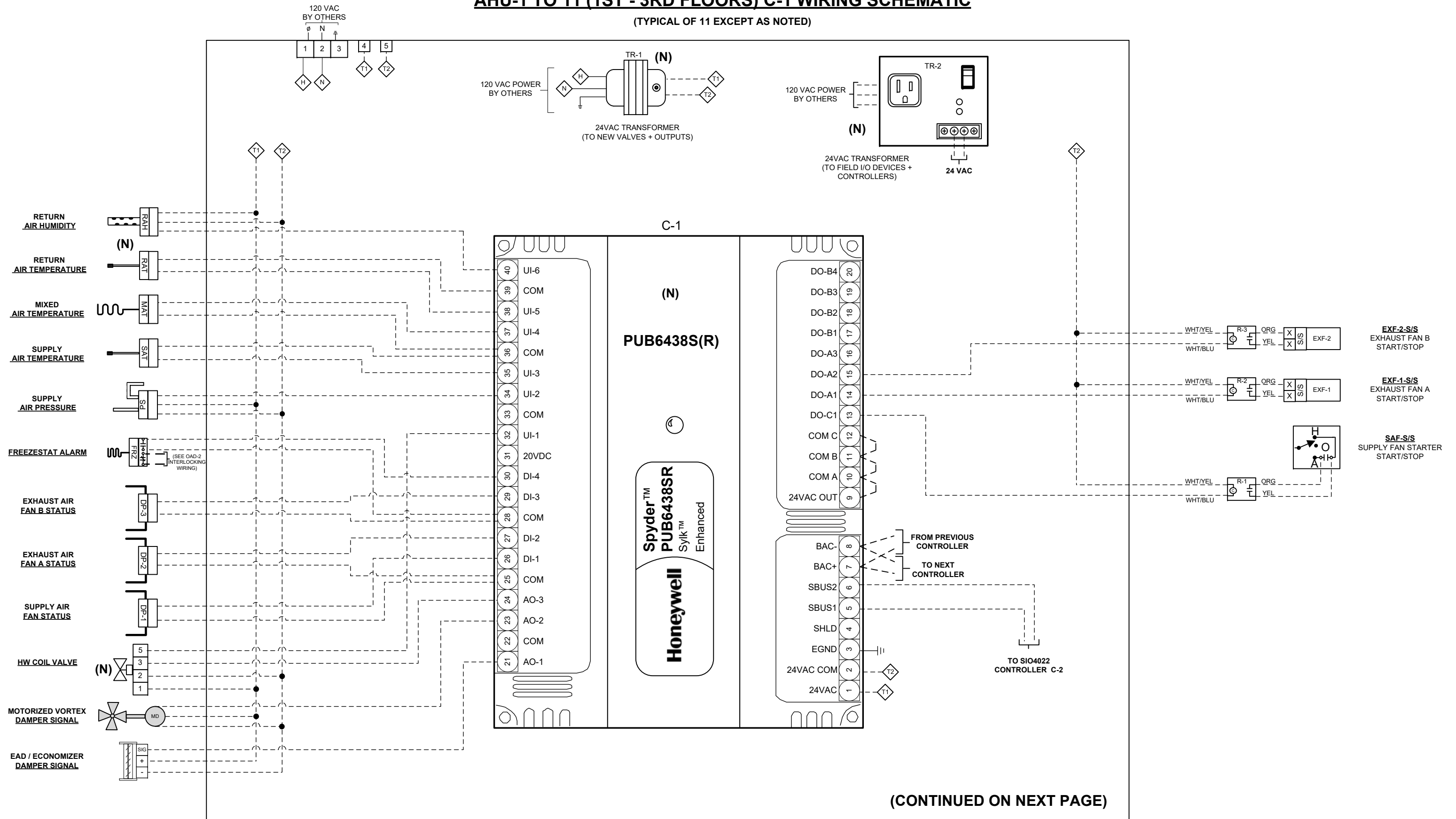
VAV BOX(ES)
(TYPICAL OF 84)
(SEE VAV PAGE SCHEDULE)



FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618						Project: NJ DOT M.O.B. BUILDING			
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	01-02-2018	AS-BUILTS			AHU-1 TO 11 (1ST - 3RD FLOORS) FLOW DIAGRAM			
		1	11-03-2017	ADDED RISER, HWS, & REVISED AHU SEQ.						
		0	06-13-2017	SUBMITTAL	A.V.					
ARCHITECTS		NO.	DATE	REVISION	BY		Job No.	#17-04260	Page	9 of 23

AHU-1 TO 11 (1ST - 3RD FLOORS) C-1 WIRING SCHEMATIC

(TYPICAL OF 11 EXCEPT AS NOTED)



(NOTE: ALL DEVICES ARE EXISTING & TO BE RE-USED SECPET WHERE NOTED)

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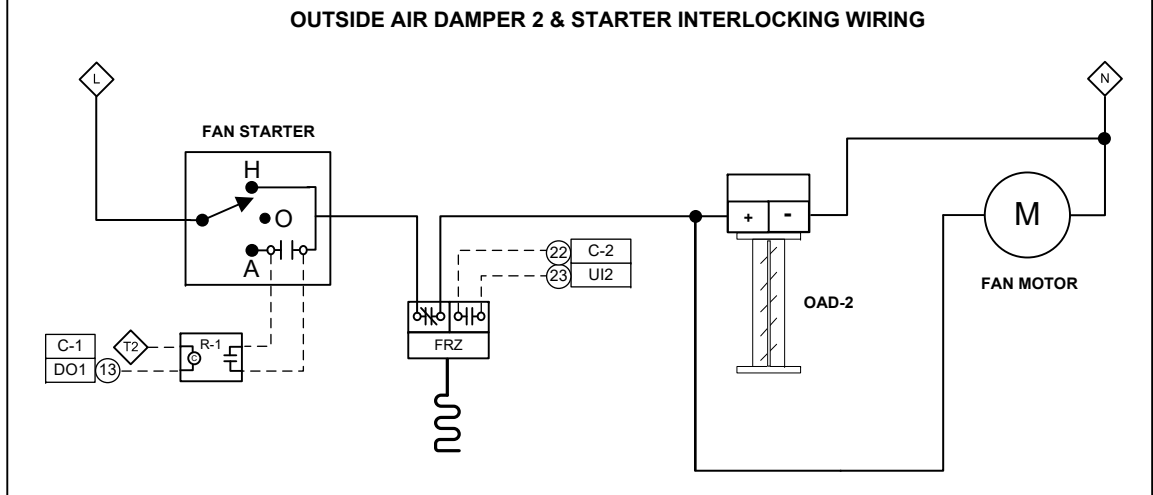
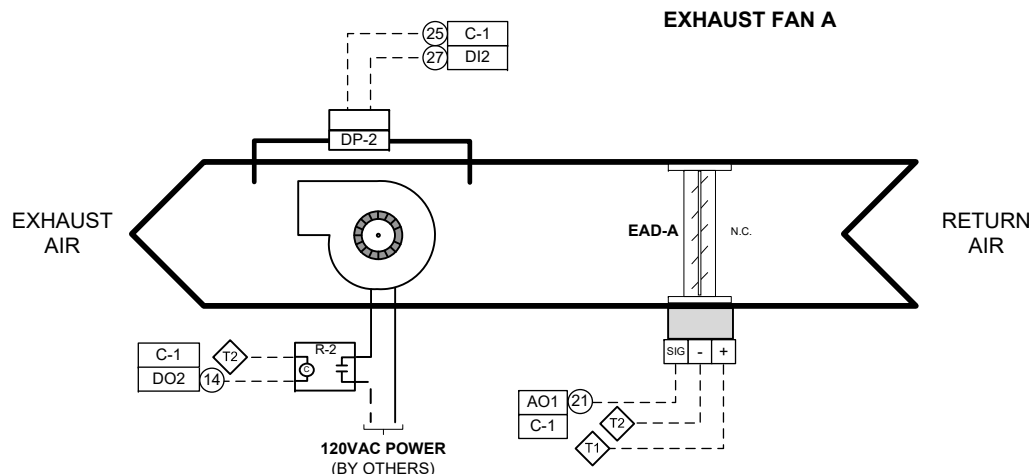
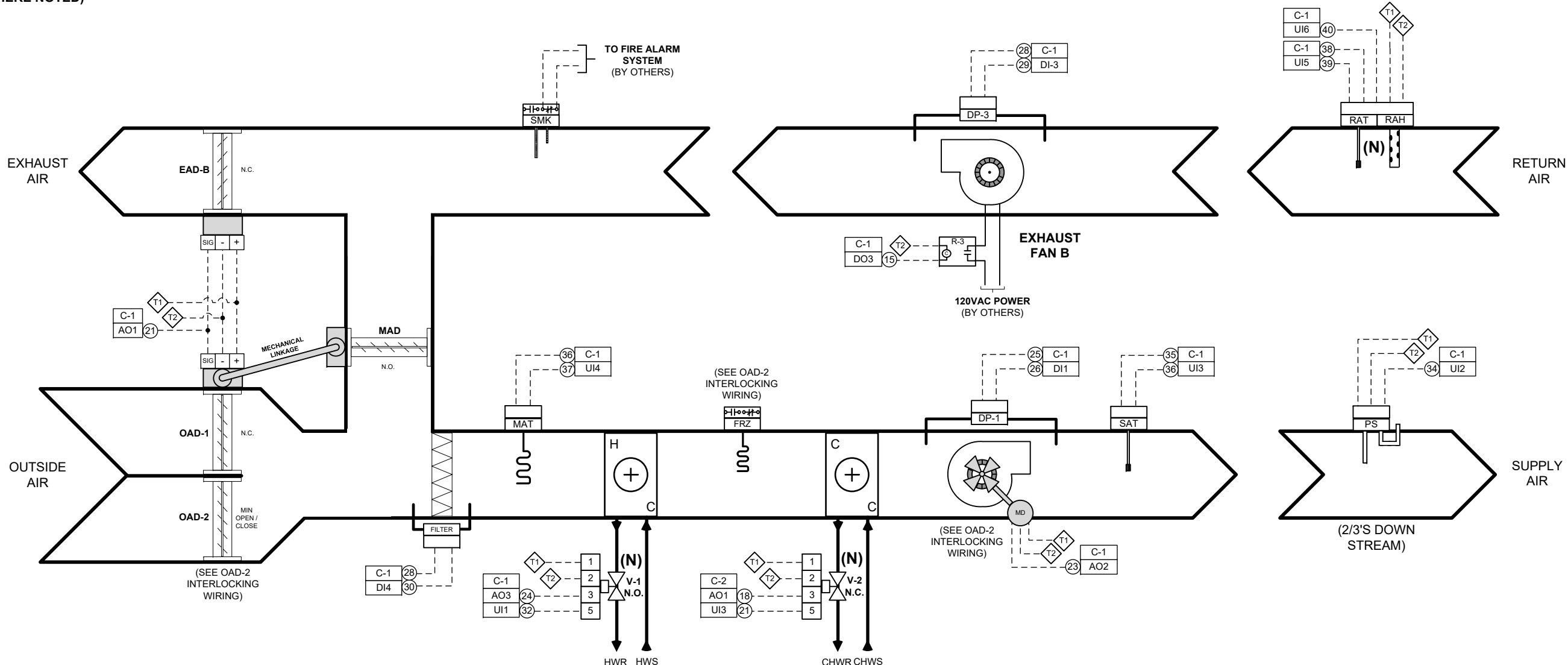
(TYPICAL OF 11 EXCEPT AS NOTED)



FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618			
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	01-02-2018	AS-BUILTS
		1	11-03-2017	ADDED RISER, HWS, & REVISED AHU SEQ.
		0	06-13-2017	SUBMITTAL A.V.
ARCHITECTS		NO.	DATE	REVISION BY

AHU-12 (1ST FLOOR SW) FLOW DIAGRAM

(NOTE: ALL DEVICES ARE EXISTING & TO BE RE-USED EXCEPT WHERE NOTED)



FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618				
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	01-02-2018	AS-BUILTS	
		1	11-03-2017	ADDED RISER, HWS, & REVISED AHU SEQ.	
		0	06-13-2017	SUBMITTAL	
ARCHITECTS		NO.	DATE	REVISION	A.V. BY

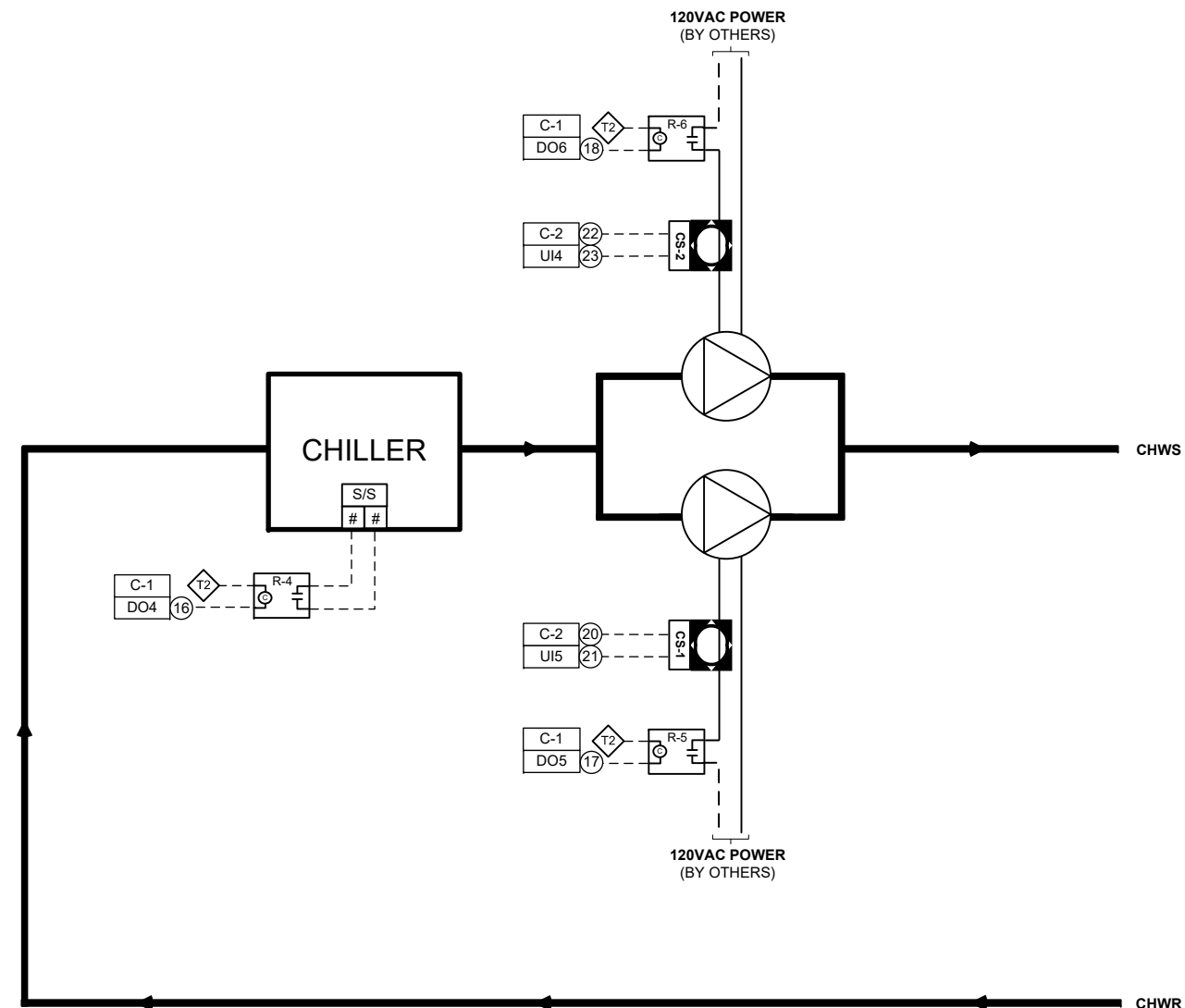
Project: NJ DOT M.O.B. BUILDING

AHU-12 (1ST FLOOR SW) FLOW DIAGRAM

Job No. #17-04260

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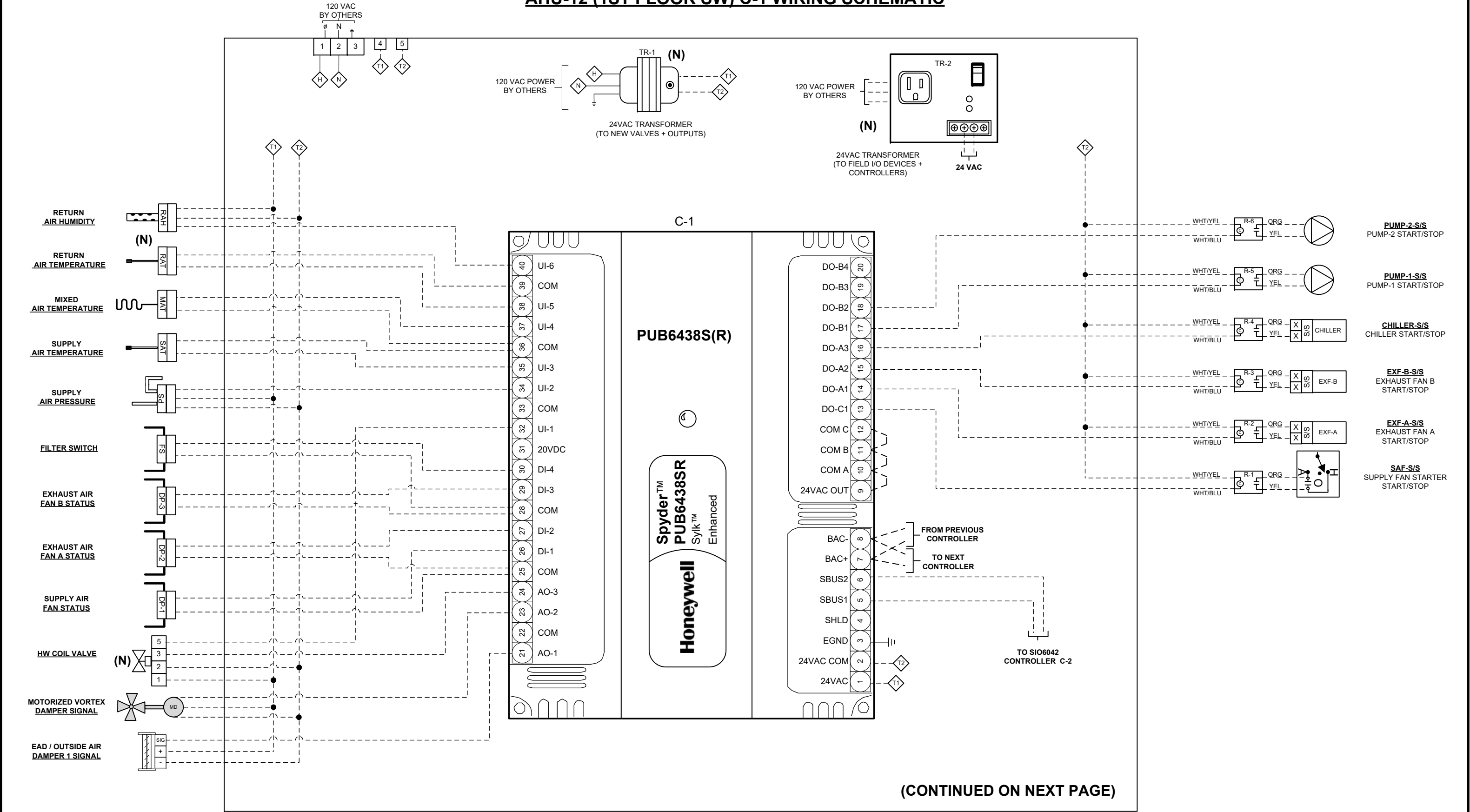
AHU-12 (1ST FLOOR SW) CHWS FLOW DIAGRAM



(NOTE: ALL DEVICES ARE EXISTING & TO BE RE-USED SECPET WHERE NOTED)

FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618								Project: NJ DOT M.O.B. BUILDING	
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	01-02-2018	AS-BUILTS					AHU-12 (1ST FLOOR SW) CHWS FLOW DIAGRAM	
		1	11-03-2017	ADDED RISER, HWS, & REVISED AHU SEQ.						
		0	06-13-2017	SUBMITTAL	A.V.					
ARCHITECTS		NO.	DATE	REVISION	BY				Job No.	#17-04260

AHU-12 (1ST FLOOR SW) C-1 WIRING SCHEMATIC

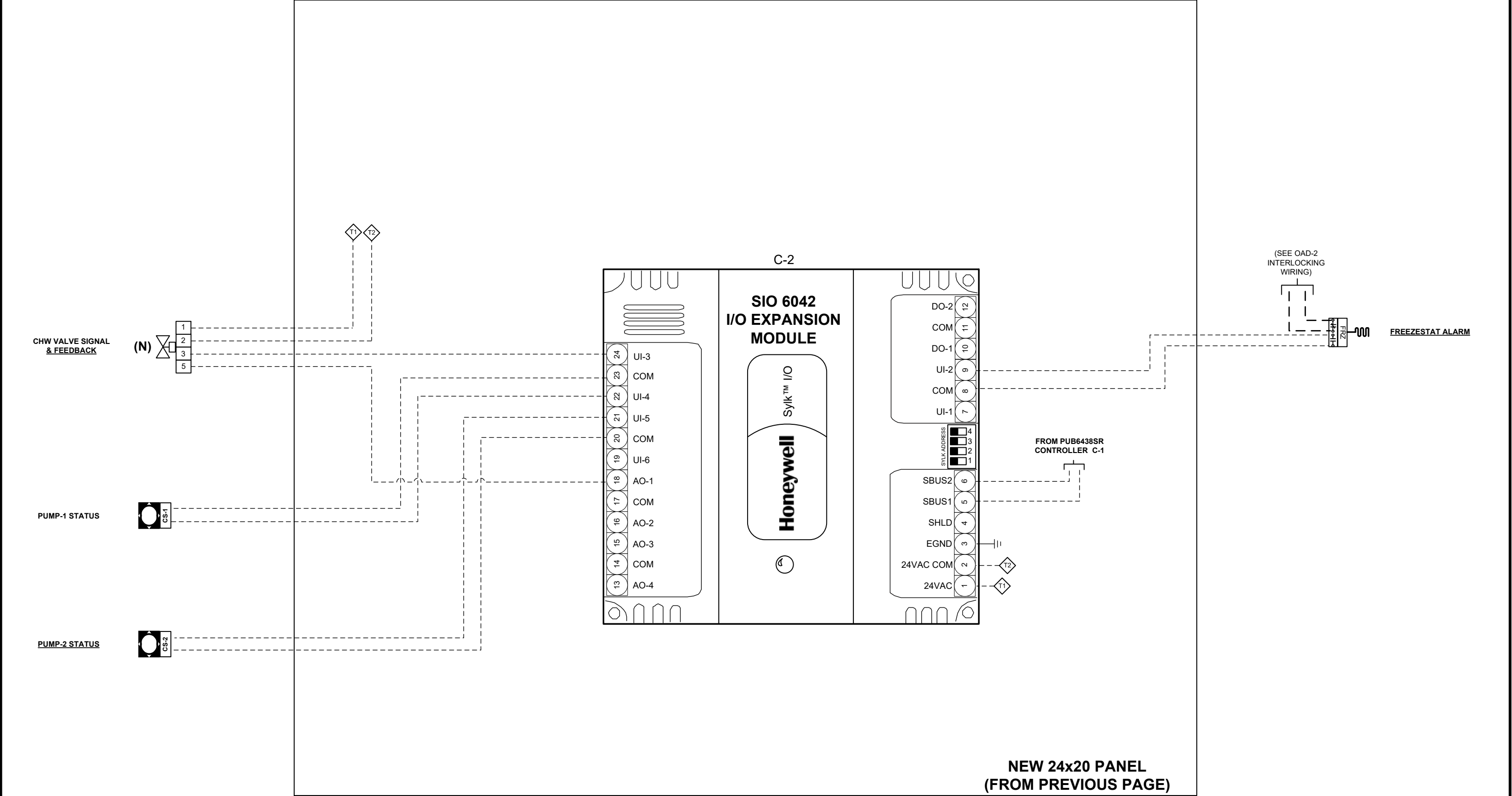


(CONTINUED ON NEXT PAGE)

(NOTE: ALL DEVICES ARE EXISTING & TO BE RE-USED SECPET WHERE NOTED)

FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618							Project: NJ DOT M.O.B. BUILDING
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	01-02-2018	AS-BUILTS				AHU-12 (1ST FLOOR SW) C-1 WIRING SCHEMATIC
		1	11-03-2017	ADDED RISER, HWS, & REVISED AHU SEQ.				
ARCHITECTS		0	06-13-2017	SUBMITTAL		A.V.		
		NO.	DATE	REVISION		BY		Job No. #17-04260 Page 14 of 23

AHU-12 (1ST FLOOR SW) C-2 WIRING SCHEMATIC



(NOTE: ALL DEVICES ARE EXISTING & TO BE RE-USED SECPET WHERE NOTED)

FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618								Project: NJ DOT M.O.B. BUILDING
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	01-02-2018	AS-BUILTS					AHU-12 (1ST FLOOR SW) C-2 WIRING SCHEMATIC
		1	11-03-2017	ADDED RISER, HWS, & REVISED AHU SEQ.					
ARCHITECTS		0	06-13-2017	SUBMITTAL		A.V.			
		NO.	DATE	REVISION		BY			Job No. #17-04260 Page 15 of 23

AIR HANDLING UNIT & VALVE SCHEDULE

NJ DOT MOB Building										
Label	Associated EQUIPMENT	QTY	Pattern	Equip. GPM	Style	Valve Size	Valve CV	Fail Postion	Act Control	Valve Assembly P/N
HC-COIL	AHU-1	1	2-WAY	16.0	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DPPX6100
CC-COIL	AHU-1	1	2-WAY	56.4	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATING	VRN2E3PX5000
HC-COIL	AHU-2	1	2-WAY	10.6	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DNPX6100
CC-COIL	AHU-2	1	2-WAY	42.7	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATING	VRN2EUPX5000
HC-COIL	AHU-3	1	2-WAY	13.1	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DNPX6100
CC-COIL	AHU-3	1	2-WAY	52.6	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATING	VRN2E2PX5000
HC-COIL	AHU-4	1	2-WAY	13.8	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DNPX6100
CC-COIL	AHU-4	1	2-WAY	59.2	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATING	VRN2E3PX5000
HC-COIL	AHU-5	1	2-WAY	13.3	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DNPX6100
CC-COIL	AHU-5	1	2-WAY	46.8	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATING	VRN2E1PX5000
HC-COIL	AHU-6	1	2-WAY	12.0	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DNPX6100
CC-COIL	AHU-6	1	2-WAY	47.0	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATING	VRN2E1PX5000
HC-COIL	AHU-7	1	2-WAY	14.6	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DNPX6100
CC-COIL	AHU-7	1	2-WAY	57.7	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATING	VRN2E3PX5000
HC-COIL	AHU-8	1	2-WAY	14.6	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DNPX6100
CC-COIL	AHU-8	1	2-WAY	66.6	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATING	VRN2E5PX5000
HC-COIL	AHU-9	1	2-WAY	15.8	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DPPX6100
CC-COIL	AHU-9	1	2-WAY	66.6	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATING	VRN2E5PX5000
HC-COIL	AHU-10	1	2-WAY	13.8	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DNPX6100
CC-COIL	AHU-10	1	2-WAY	59.8	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATING	VRN2E3PX5000
HC-COIL	AHU-11	1	2-WAY	15.2	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DPPX6100
CC-COIL	AHU-11	1	2-WAY	65.4	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATING	VRN2E5PX5000
HC-COIL	AHU-12	1	2-WAY	15.5	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DPPX6100
CC-COIL	AHU-12	1	2-WAY	65.2	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATING	VRN2E5PX5000
RADIATION	3rd FLOOR SW	13	2-WAY	TBD	ZONE TIGHT BALL VALVE	0.75	ADJUSTABLE	OPEN	2-POSITION	Z2075Q-K+CQKB24-LL
RADIATION	3rd FLOOR SE	13	2-WAY	TBD	ZONE TIGHT BALL VALVE	0.75	ADJUSTABLE	OPEN	2-POSITION	Z2075Q-K+CQKB24-LL
RADIATION	3rd FLOOR NW	13	2-WAY	TBD	ZONE TIGHT BALL VALVE	0.75	ADJUSTABLE	OPEN	2-POSITION	Z2075Q-K+CQKB24-LL
RADIATION	3rd FLOOR NE	13	2-WAY	TBD	ZONE TIGHT BALL VALVE	0.75	ADJUSTABLE	OPEN	2-POSITION	Z2075Q-K+CQKB24-LL
BOILER MIN FLOW		1	2-WAY	75.0	CHARACTERIZED BALL	2.00	108	IN PLACE	MODULATING	VBN2FTPX5000

AHU#	MAX CFM
AHU-1	8860
AHU-2	6970
AHU-3	9650
AHU-4	10480
AHU-5	7720
AHU-6	7440
AHU-7	10610
AHU-8	11730
AHU-9	11730
AHU-10	10800
AHU-11	11700
AHU-12	9800

AHU SEQUENCE OF OPERATIONS

A. BUILDING AUTOMATION SYSTEM INTERFACE:

1. The Building Management System (BMS) will send the controller Occupied, Unoccupied, Optimal Start, and Timed Override commands. The BMS may also send a space temperature and/or space temperature set point. If a BMS is not present, or communication is lost with the BMS, the controller will operate using its local schedule and set points.

B. UNOCCUPIED MODE:

1. General Unit Control:
 - a. In the unoccupied mode the unit will cycle as required to maintain the adjustable (adj.) unoccupied space heating and cooling set points. The variable frequency drive (VFD) will operate as necessary to maintain duct static pressure set point (adj.) during morning warm up or cool down modes. The outside air damper will remain closed, and the return air damper will remain open during unoccupied mode.
2. Unoccupied Heating Night Set Back:
 - a. The BMS will dynamically adjust the Heating Night Set Back Temperature Set Point downwards such that the Morning Warm-Up Sequence Duration will not exceed 2 hours. Dynamically adjusted night set back will not drop below 50 degrees.
 - i. Morning Warm Up Duration is defined as the amount of time it takes for the average building temperatures to go from Unoccupied Night Set Back Set Point to Occupied Set Point.
 - b. BMS will provide the Operator with the ability to manually set and override the Unoccupied Heating Night Set Back Temperature Set Point.
3. Unoccupied Cooling Night Set Back (Applies Only To Spaces With Mechanical Cooling Controlled By The BMS):
 - a. The BMS will dynamically adjust the Cooling Night Set Back Temperature Set Point upwards such that the Morning Cool-Down Sequence will not exceed 2 hours. Dynamically adjusted night set back will not exceed 80 degrees.
 - i. Morning Warm Up Duration is defined as the amount of time it takes for the average building temperatures to go from Unoccupied Night Set Back Set Point to Occupied Set Point.
 - b. BMS will provide the Operator with the ability to manually set and override the Unoccupied Cooling Night Set Back Temperature Set Point.

C. MORNING WARM-UP MODE:

1. On a transition from the unoccupied mode to occupied mode, if the zone average temperature is 3°F below the occupied set point a morning warm-up routine mode will be activated. When morning warm-up is initiated the AHU will enable the unit's heat and supply fan. The outside air damper will remain closed. When the zone average temperature reaches set point (adj.), the AHU will transition to the occupied mode.
2. The BMS will determine the Optimal Start Time for the Morning Warm-Up Sequence not to exceed 2 hours prior to the initiation of occupied mode.

D. COOL-DOWN MODE:

1. On a transition from the unoccupied mode to occupied mode, if the zone average temperature is 3°F above the occupied set point a morning cool-down mode will be activated. When morning cool-down is initiated the AHU will enable the fan and cooling or economizer. The outside air damper will remain closed. When the zone average temperature reaches set point (adj.), the AHU will transition to the occupied mode.
2. The BMS will determine the Optimal Start Time for the Morning Cool-Down Sequence not to exceed 2 hours prior to the initiation of occupied mode.

E. OCCUPIED MODE:

1. The AHU will enable cooling or heating to maintain discharge air temperature set point (adj.). The AHU will control the supply fan VFD to maintain duct static pressure set point (adj.). The outdoor air damper will open to the minimum set point.

F. DISCHARGE AIR TEMPERATURE RESET CONTROL:

1. The discharge air temperature set point, adjustable (55°F-65°F), will be reset based on either the outside air temperature or zone average temperature. The minimum discharge air set point will be set at 55°F (adj.). The discharge temperature sensor will prevent the discharge air temperature from falling below the minimum discharge air set point (adj.). If the discharge air temperature continues to fall, the discharge temperature sensor will act as a low discharge temperature limit, a low temperature alarm will be annunciated, and the unit will shut down. If the discharge temperature rises above the high limit set point the sensor will act as a high discharge temperature limit and will keep the unit running, a high temperature alarm will be annunciated.

G. OUTDOOR AIR TEMPERATURE RESET:

1. The discharge air temperature set point will be adjusted based on the outside air temperature and the cooling load of the building.

H. ZONE TEMPERATURE RESET:

1. The discharge air temperature set point will be adjusted based on the temperature of the critical zone(s).

I. DISCHARGE DUCT STATIC PRESSURE CONTROL:

1. The AHU will modulate the output to the VFD as required to maintain the duct static pressure set point of 1.5 inches W.C (adj.). If the duct static pressure falls below 1.3 inches W.C (adj.) the RTU will increase the output to the VFD to maintain set point. If the duct static pressure rises above 1.7 inches W.C (adj.) the AHU will decrease the output to the VFD to maintain set point. The supply duct static pressure sensor will also act as a high duct static pressure safety and will shut down the AHU in the event that the duct static pressure reaches 3.0 inches W.C. (adj.). A reset will be required to reset the AHU. When the AHU is in the unoccupied mode the AHU will modulate the speed of the VFD to 50%. If the duct static pressure sensor fails, the VFD will modulate its speed to 50%, an alarm will be annunciated.

J. SUPPLY FAN OPERATION:

1. The supply fan will be enabled while in the occupied mode and cycled on during the unoccupied mode. A differential pressure switch will monitor the differential pressure across the fan. If the switch does not open within 40 seconds after a request for fan operation a fan failure alarm will be annunciated, the unit will stop, requiring a manual reset.

K. TIMED OVERRIDE (TOV):

1. Area control monitors the status of the “on” and “cancel” buttons of the zone temperature sensors associated with the area. When a timed override request from a Trane zone temperature sensor, is sensed, the area will change from its current state to occupied.

L. FILTER STATUS:

1. A differential pressure switch will monitor the differential pressure across the filter when the fan is running. If the switch closes for 2 minutes after a request for fan operation a dirty filter alarm will be annunciated.

FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618					Project: NJ DOT M.O.B. BUILDING	
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	01-02-2018	AS-BUILTS			
		1	11-03-2017	ADDED RISER, HWS, & REVISED AHU SEQ.			
		0	06-13-2017	SUBMITTAL			A.V.
ARCHITECTS		NO.	DATE	REVISION			BY
						Job No. #17-04260Page 17 of 23	

AHU SEQUENCE OF OPERATIONS CONT.

UNOCCUPIED MODE:

1 – The AHU fans shall be off, the Outside Air Damper shall be closed, and the Return Air Damper shall be open.

2 – When the Outside Air Temperature is below 40 Degr F., the Hot Water Valve shall fully open.

4 – When any zone's average space temperature is below the Unoccupied Heating Set-point of 60 deg. F. (adj), the respective AHU's Supply Air Fan shall start. The outside air damper shall remain closed and the hot water coil shall be modulated open to maintain a Discharge Air Set-point of 80 Degr F.

5 – When the Space Temperature rises above the Unoccupied Heating Set-point of 68 Degr. F. (adj), the AHU's Supply Air Fan shall stop and the unit shall return to its normal unoccupied mode.

AIR FILTER MONITORING:

1 – A differential pressure switch will monitor the differential pressure across the filter when the fan is running. If the switch closes for 2 minutes after a request for fan operation a dirty filter alarm will be annunciated.

FREEZE PROTECTION (HW COILS ONLY):

1 – If Low Temperature Limit Switch senses a coil below a setting of 38 deg. F, the Return Air Damper shall be commanded open, the Outside Air Damper shall be commanded fully closed, the Hot Water Valve shall be commanded fully open. The supply fan shall shutdown and an alarm shall be generated.

SENSOR ALARMING:

1 – If the Space Temperature is above 85 deg. F or below 50 deg. F an alarm shall be generated.

2 – If the Discharge Air Temperature is above 95 deg. F or below 45 deg. F an alarm shall be generated.

3- Supply Fan Failure

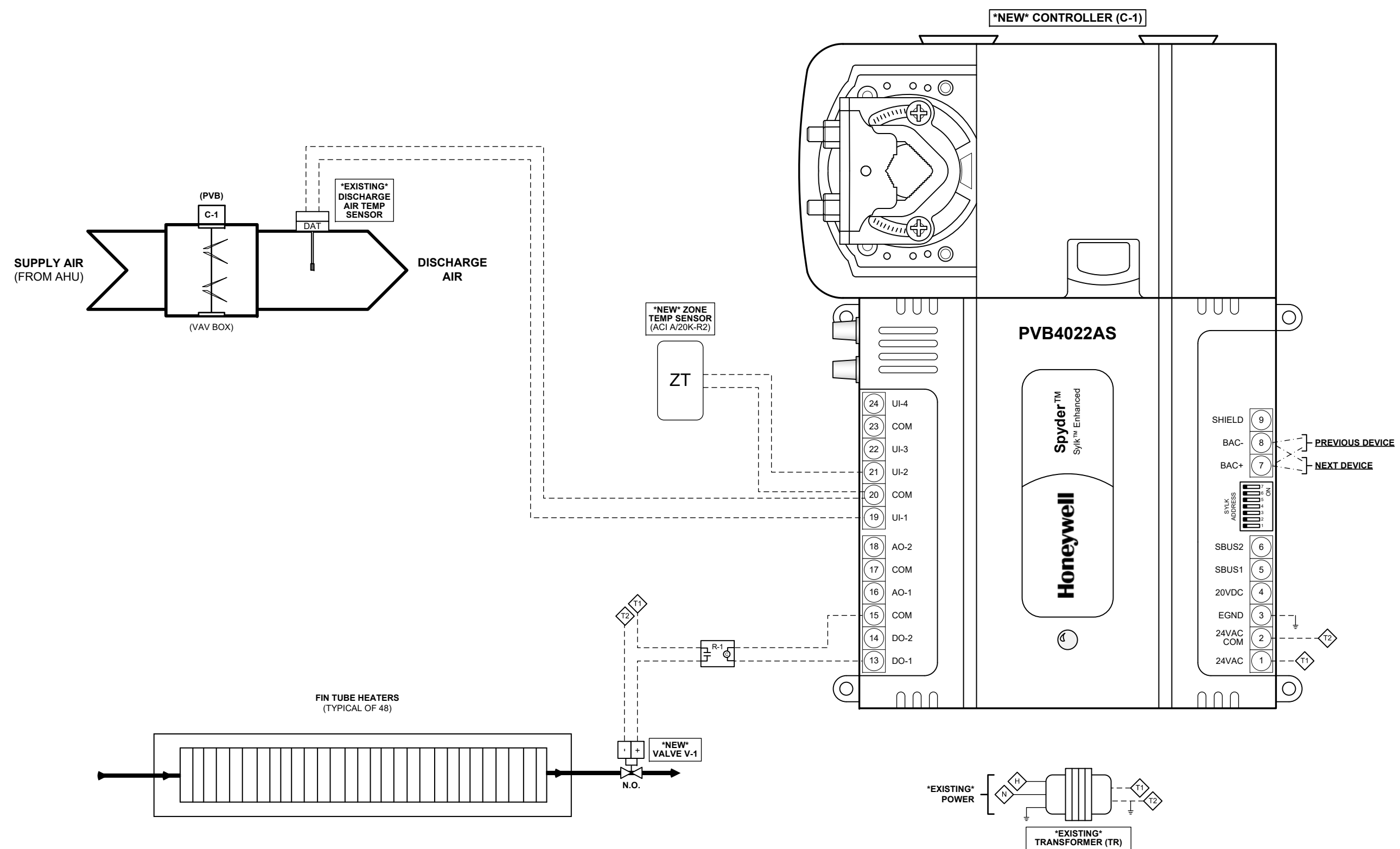
The following points will be shown on a graphic for each unit:

1. Supply Air Temperature and Set Point
2. Average Zone Temperature and Set Point
3. Fan VFD Status
4. Fan VFD Speed
5. OA Damper Position
6. RA Damper Position
7. Hot Water Coil Control Valve Position
8. Chilled Water Valve Position
9. OA Temperature (Global)
10. Return Air Temperature and Return Air Humidity
11. Mixed Air Temperature
12. Low Limit Thermostat Status
13. Filter Status

[illegible]

VAV BOX FLOW & WIRING DIAGRAM

(TYPICAL OF 84)



FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618								Project: NJ DOT M.O.B. BUILDING
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	01-02-2018	AS-BUILTS					VAV BOX FLOW & WIRING DIAGRAM
		1	11-03-2017	ADDED RISER, HWS, & REVISED AHU SEQ.					
ARCHITECTS		0	06-13-2017	SUBMITTAL	A.V.				
		NO.	DATE	REVISION	BY				Job No. #17-04260 Page 19 of 23

VAV BOX & ASSOCIATED FIN TUBE SCHEDULE

VAV#	AHU-8	AHU-9	AHU-10	AHU-11	TOTAL	MAX CFM	MIN CFM
(TOTAL)	17	25	21	21	84	---	---
VAV-1	---	1	---	---	1	390	100
VAV-2	---	1	---	---	1	440	110
VAV-3	---	1	---	---	1	400	100
VAV-4	---	1	1	---	2	280	70
VAV-5	1	---	---	---	1	1520	380
VAV-6	3	1	---	---	4	430	110
VAV-7	3	5	4	4	16	480	120
VAV-8	---	1	1	---	2	290	80
VAV-9	---	2	---	2	4	1460	370
VAV-10	1	---	---	1	2	290	80
VAV-11	1	---	---	---	1	410	110
VAV-12	1	---	---	---	1	690	180
VAV-13	2	---	---	---	2	1800	450
VAV-14	---	1	---	---	1	1120	280
VAV-15	---	---	1	---	1	200	50
VAV-16	1	---	---	4	5	530	140
VAV-17	1	---	---	---	1	800	200
VAV-18	1	---	---	---	1	1400	350
VAV-19	---	1	1	---	2	360	90
VAV-20	---	2	---	---	2	320	80
VAV-21	---	4	---	---	4	520	130
VAV-22	---	1	---	---	1	1040	260
VAV-23	---	---	1	---	1	680	170
VAV-24	---	---	1	---	1	1020	260
VAV-25	---	---	---	1	1	330	90
VAV-26	1	---	---	2	3	280	70
VAV-27	---	---	---	1	1	1060	270
VAV-28	---	---	---	1	1	550	140
VAV-29	---	---	---	1	1	530	140
VAV-30	1	1	1	1	4	230	60
VAV-31	---	---	---	2	2	610	160
VAV-32	---	---	---	1	1	640	160
VAV-33	---	---	1	---	1	470	120
VAV-34	---	---	1	---	1	600	150
VAV-35	---	---	1	---	1	550	140
VAV-36	---	---	2	---	2	1160	290
VAV-37	---	---	1	---	1	430	110
VAV-38	---	---	2	---	2	480	120
VAV-39	---	---	1	---	1	510	130
VAV-40	---	1	1	---	2	230	60
VAV-41	---	1	---	---	1	240	60

FT#	VALVE DATA
FT-1	SEE VALVE SCHEDULE
FT-2	SEE VALVE SCHEDULE
FT-3	SEE VALVE SCHEDULE
FT-4	SEE VALVE SCHEDULE
FT-5	SEE VALVE SCHEDULE
FT-6	SEE VALVE SCHEDULE
FT-7	SEE VALVE SCHEDULE
FT-8	SEE VALVE SCHEDULE
FT-9	SEE VALVE SCHEDULE
FT-10	SEE VALVE SCHEDULE

VAV SEQUENCE OF OPERATIONS

Scope

1.Existing VAVs will be field retrofitted with new VAV DDC Controls to execute the sequence of operations & points list. Existing end devices can be re-used if they are functional.

VAV Sequence of Operations

1.All VAV units shall be placed into its respective modes via the Building Management System (BMS). If communication is lost with the BMS, the occupied mode shall be the default mode of the VAV.

2.All Set Points and Time Schedules shall be User adjustable via the BMS.

OCCUPIED MODE:

1 – The VAV controller shall use the measured space temperature and compare the active cooling and heating set points in order to determine the requested cooling or heating needs of the space.

2- When the VAV unit is in cooling mode, the VAV shall maintain the space temperature by modulating the airflow between the active cooling minimum airflow set point to the maximum cooling airflow set point.

3-When the VAV unit is in heating mode, the VAV shall maintain the space temperature by modulating closed to heating minimum airflow set point.

4 – If the VAV's space temperature still remains below the space temperature set point, then the zone radiation valves associated with that VAV will open and heat the space.

ALARMS

The BMS will annunciate the following alarms

1. Controller Communication Failure
2. High Space Temperature
3. Low Space Temperature
4. High Discharge Air Temperature
5. Space Sensor Failure

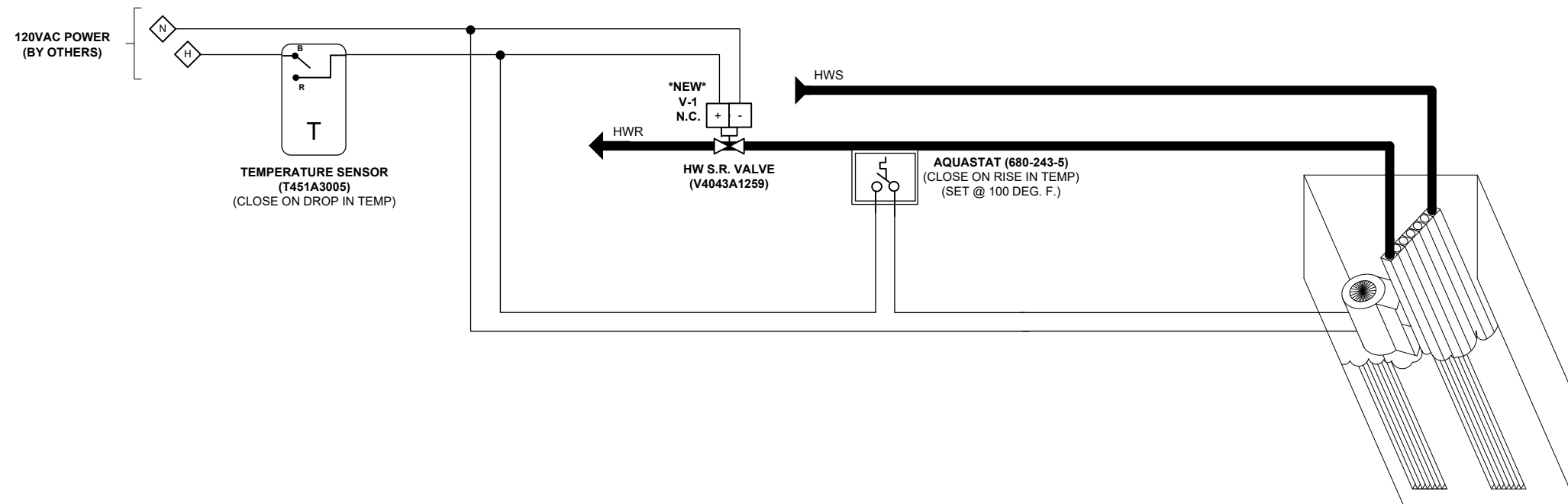
The following points will be shown on a graphic for each unit:

1. Space Temperature
2. Heating and Cooling Space Temperature Set points
3. VAV Damper Position
4. Hot Water Coil Control Valve Position
5. CFM Airflow Reading

[illegible]

UNIT HEATER FLOW & WIRING DIAGRAM

(TYPICAL OF 35)



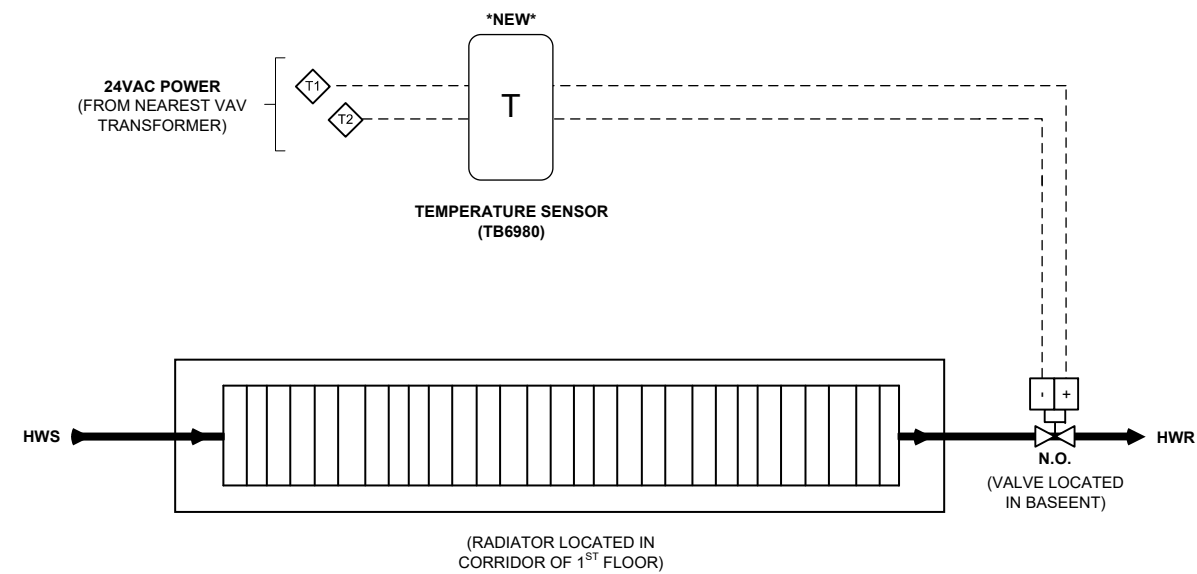
CABINET UNIT HEATER & VALVE SCHEDULE

NO.	VALVE SIZE	P/N	NO.	VALVE SIZE	P/N	NO.	VALVE SIZE	P/N
UH-1	3/4"	V4043A1259	UH-13	3/4"	V4043A1259	UH-25	3/4"	V4043A1259
UH-2	3/4"	V4043A1260	UH-14	3/4"	V4043A1260	UH-26	3/4"	V4043A1260
UH-3	3/4"	V4043A1261	UH-15	3/4"	V4043A1261	UH-27	3/4"	V4043A1261
UH-4	3/4"	V4043A1262	UH-16	3/4"	V4043A1262	UH-28	3/4"	V4043A1262
UH-5	3/4"	V4043A1263	UH-17	3/4"	V4043A1263	UH-29	3/4"	V4043A1263
UH-6	3/4"	V4043A1264	UH-18	3/4"	V4043A1264	UH-30	3/4"	V4043A1264
UH-7	3/4"	V4043A1265	UH-19	3/4"	V4043A1265	UH-31	3/4"	V4043A1265
UH-8	3/4"	V4043A1266	UH-20	3/4"	V4043A1266	UH-32	3/4"	V4043A1266
UH-9	3/4"	V4043A1267	UH-21	3/4"	V4043A1267	UH-33	3/4"	V4043A1267
UH-10	3/4"	V4043A1268	UH-22	3/4"	V4043A1268	UH-34	3/4"	V4043A1268
UH-11	3/4"	V4043A1269	UH-23	3/4"	V4043A1269	UH-35	3/4"	V4043A1269
UH-12	3/4"	V4043A1270	UH-24	3/4"	V4043A1270			

**NOTE: SYSTEM IS SELF-CONTAINED
AND NOT TIED INTO THE BMS**

[illegible]

FIN TUBE RADIATOR FLOW & WIRING DIAGRAM



**NOTE: SYSTEM IS SELF-CONTAINED
AND NOT TIED INTO THE BMS**

[illegible]

PROJECT: NJDOT MOB Building

ID NUMBER: #17-04260

PAGE 1 OF 1

PAGE	QTY	PRODUCT #	MFGR.	DESCRIPTION
PG 3 HWS	2	A/20K-I	ACI	Immersion + ½ Well 20K temperature sensor
PG 3 HWS	2	C-2200	Senva	Current Transducer
PG 3 HWS	1	A/20K-O	ACI	20K Outside Air Temp sensor
PG 3 HWS	1	PW20G	Senva	30ft. 0-10V Differential Pressure Transmitter
PG 3 HWS	2	PFT-1AN-B111-S	Dwyer	4 - 20 mA Paddlewheel Flow Sensor
PG 5 HWS	1	SCE-24EL2008LP	Saginaw	24" x 20" x 8" Enviroline Control Panel
PG 5 HWS	1	SCE-24P20	Saginaw	24" x 20" Subpanel
PG 5 HWS	1	TR75VA001	FD, Inc.	75 VA 120VAC/24VAC Transformer
PG 5 HWS	1	BPS-015	Dwyer	1.5A VDC Transfomer
PG 5 HWS	1	PUB6438SR	Honeywell	Spyder BACnet Controller (6UI 4DI 3AO 8DO)
PG 5 HWS	1	RIBU1C	FD, Inc.	Relay SPDT
PG 5 HWS	2	782-2C-24A	Auto.Direct	24VAC CUBE Relay
PG 5 HWS	2	782-2C-SKT	Auto.Direct	Relay mounting socket
PG 8 CHW	1	Series 3050	Badger	BTU Monitor for Hydronic Systems
PG 9 AHU	11	A/RH5-20K-D	ACI	20K Air Temp & Humidity Sensor
PG 10 AHU	11	SCE-24EL2006LP	Saginaw	24" x 20" x 6" Enviroline Control Panel
PG 10 AHU	11	SCE-24P20	Saginaw	24" x 20" Subpanel
PG 10 AHU	11	PUB6438SR	Honeywell	Spyder BACnet Controller (6UI 4DI 3AO 8DO)
PG 10 AHU	11	PSH75A	FD, Inc.	Outlet power supply with switch
PG 10 AHU	11	TR75VA001	FD, Inc.	120VAC/24VAC Transformer
PG 11 AHU	11	SIO4022	Honeywell	SylkBUS Controller Expansion (4UI 2AO 2DO)
PG 12 AHU	1	A/RH5-20K-D	ACI	20K Air Temp & Humidity Sensor
PG 14 AHU	1	SCE-24EL2006LP	Saginaw	24" x 20" x 6" Enviroline Control Panel
PG 14 AHU	1	SCE-24P20	Saginaw	24" x 20" Subpanel
PG 14 AHU	1	PUB6438SR	Honeywell	Spyder BACnet Controller (6UI 4DI 3AO 8DO)
PG 14 AHU	1	PSH75A	FD, Inc.	Outlet power supply with switch
PG 14 AHU	1	TR75VA001	FD, Inc.	120VAC/24VAC Transformer
PG 15 AHU	1	SIO6042	Honeywell	SylkBUS Controller Expansion (6UI 4AO 2DO)
PG 19 VAVS	84	PVB4022AS	Honeywell	Spider BACnet VAV Controller (4UI 2AO 2DO)
PG 19 VAVS	84	A/20K-R2	ACI	Zone Temperature Sensor

NOTE: FT, AHU HW, AND AHU CHW VALVE PARTS ARE LISTED ON VALVE SCHEDULE

ENGINEERING & OPERATIONS BUILDING



NJ DOT E&O BUILDING EMS (AS-BUILTS)

ENERGY SAVINGS IMPROVEMENT PROJECT

BUILDING AUTOMATION SYSTEM

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3	NETWORK RISER	
4	HOT WATER SYSTEM FLOW DIAGRAM	
5	HOT WATER SYSTEM AERCO CONTROLLER WIRING SCHEMATIC	
6	HOT WATER SYSTEM C-1 WIRING SCHEMATIC	
7	HOT WATER SYSTEM SEQUENCE OF OPERATIONS	
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9	AIR HANDLING UNIT (AHU-#A&B) FLOW DIAGRAM	
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11	AIR HANDLING UNIT (AHU-#C) FLOW DIAGRAM	
12	AIR HANDLING UNIT (AHU-#A,B,&C) C-1 WIRING SCHEMATIC	
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17	AIR HANDLING UNIT (AHU-2-3) C-1 WIRING SCHEMATIC	

SHEET #	CONTENTS	REV.
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19	AIR HANDLING UNIT (AHU-2-4) FLOW DIAGRAM	
20	AIR HANDLING UNIT (AHU-2-4) C-1 WIRING SCHEMATIC	
21	AIR HANDLING UNIT (AHU-2-4) C-2 WIRING SCHEMATIC	
22	AIR HANDLING UNIT SEQUENCE OF OPERATIONS	
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24	AIR HANDLING UNIT CHW VALVE SCHEDULE	
25	REHEAT COIL FLOW & WIRING DIAGRAM & SEQUENCE OF OPERATIONS	
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27	REHEAT COIL VALVE SCHEDULE PAGE 2	
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31	HEATING & VENTILATING UNIT (HV-2-1) FLOW DIAGRAM	
32	HEATING & VENTILATING UNIT (HV-2-1) WIRING SCHEMATIC	
33	HEATING & VENTILATING UNIT SEQUENCE OF OPERATIONS	

LEGEND & SYMBOLS

GENERAL NOTES

1. ALL POWER WIRING 120 VAC AND ABOVE BY ELECTRICAL CONTRACTOR.

TEMPERATURE CONTROL LEGEND:

 MOUNTED ON PANEL FACE

 MOUNTED INSIDE PANEL

 CONTROL TUBE #3

 PNEUMATIC TUBING

 WIRING

 TERMINAL BLOCK #6

 SOLENOID VALVE

 CONTROL VALVE, 2-WAY

 CONTROL VALVE, 3-WAY

 PARALLEL BLADED DAMPER

 OPPOSED BLADED DAMPER

 SIGNAL LINE INSIDE PANEL

ABBREVIATIONS:

AFMS- AIR FLOW MEASURING STATION

C- COMMON PORT

CCP- CENTRAL CONTROL PANEL

CR- CONTROL RELAY

CS- CURRENT SWITCH

DA-DAMPER ACTUATOR

DPRO- DAMPER OUTPUT

DPRS- DAMPER STATUS

DPS- DIFFERENTIAL PRESSURE SWITCH

DPT- DIFFERENTIAL PRESSURE TRANS

EA- EXHAUST AIR

ES- END SWITCH, POSITION SWITCH

FS- FLOW SWITCH

FSD- FIRE & SMOKE DAMPER

H- HUMIDISTAT

HC- MOTOR STARTER HOLDING COIL

HI- HUMIDITY INDICATOR

HL- HIGH LIMIT HUMIDISTAT

HS- HIGH SIGNAL SELECTOR

HT- HUMIDITY TRANSMITTER

LCP- LOCAL CONTROL PANEL

LS- LOW SIGNAL SELECTOR

MA- MIXED AIR

MOD-MOTER OPERATED DAMPER

NC- NORMALLY CLOSED

NCP- NETWORK CONTROL PANEL

NO- NORMALLY OPEN

OA -OUTSIDE AIR

OL'S- MOTOR STARTER OVERLOADS

PC- PRESSURE CONTROLLER

PE- PRESSURE TOGGLE SWITCH

PI- PRESSURE INDICATOR

PL- PILOT LIGHT

PR- PNEUMATIC RELAY

PT- PRESSURE TRANSMITTER

RC- RECEIVER CONTROLLER

RR- REVERSING RELAY

RT- ROOM THERMOSTAT

S- SWITCH

SD- SMOKE DETECTOR

S/W- SUMMER/ WINTER SIGNAL

T- THERMOSTAT

TS- TEMPERATURE SENSOR

TC- TIME CLOCK

TDR- TIME DELAY RELAY

THL- TEMPERATURE HIGH LIMIT THERMOSTAT

TI- TEMPERATURE INDICATOR

TLL- TEMPERATURE LOW LIMIT THERMOSTAT

TR- TRANSDUCER

TT- TEMPERATURE TRANSMITTER

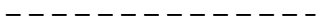
TX- TRANSFORMER

V- VALVE

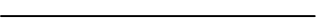
WB- WET BULB

WU- WARM-UP SIGNAL

WIRING LEGEND

 Low Voltage, 18 AWG, Copper Wire

 Low Voltage Communication Wiring 22/2 AWG, CL2P, Shielded Copper Wire, Low Capacitance

 Line Voltage, THHN Field Wiring

HVAC SYSTEM LEGEND:

 MOTOR OPERATED DAMPER

 PREHEAT COIL

 COOLING COIL

 REHEAT COIL

 HEATING COIL

 DIRECT EXPANSION COIL

 FAN

 MANUAL VALVE

 ZONE CO2 SENSOR

 WATER FLOW METER

 AVERAGING TYPE TEMPERATURE SENSOR

 FILTER

 FIRE & SMOKE DAMPER (BY OTHERS)

 OUTSIDE AIR TEMPERATURE SENSOR

 FREEZESTAT (D.P. CONTACT)

 DUCT MOUNTED TEMPERATURE SENSOR

 IMMERSION TYPE TEMPERATURE SENSOR

 DUCT MOUNTED SMOKE DETECTOR

 STATIC PRESSURE TRANSMITTER

 STEAM PRESSURE SENSOR

 DUCT MOUNTED HUMIDITY SENSOR

 SPACE TEMPERATURE

 OUTSIDE AIR CO2 SENSOR

 AIR FLOW MEASURING STATION

 CONTROL RELAY

 CURRENT SENSOR

 CO2 SENSOR

FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618	3	01-03-2018	AS-BUILTS		Project: NJ DOT E&O BUILDING EMS
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	11-03-2017	ADDED BTU-M AND REVISED AHU SEQ.		
		1	07-21-2017	ADDED AHUS, RHCS, AND SCHEDULES		
ARCHITECTS		0	05-22-2017	BACNET COMMUNICATIONS RISER	A.V.	
		NO.	DATE	REVISION	BY	LEGEND & SYMBOLS
		Job No. #17-04260		Page 2 of 33		

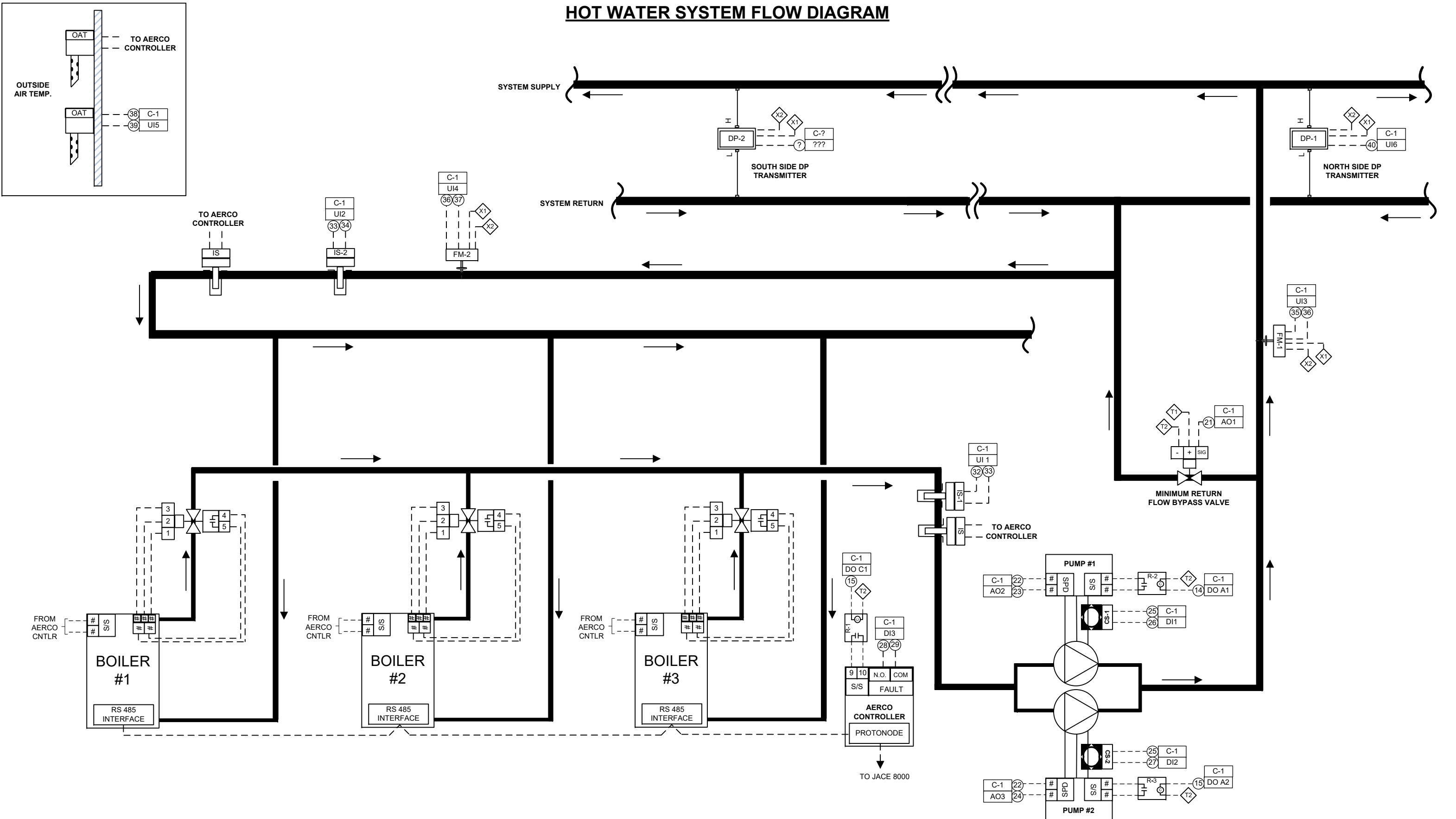
SOUTH SIDE



**NOTE: 1) 120VAC POWER TO ALL CONTROL PANELS BY OTHERS
2) ALL FINAL CONTROL PANEL LOCATIONS TO BE FIELD VERIFIED**

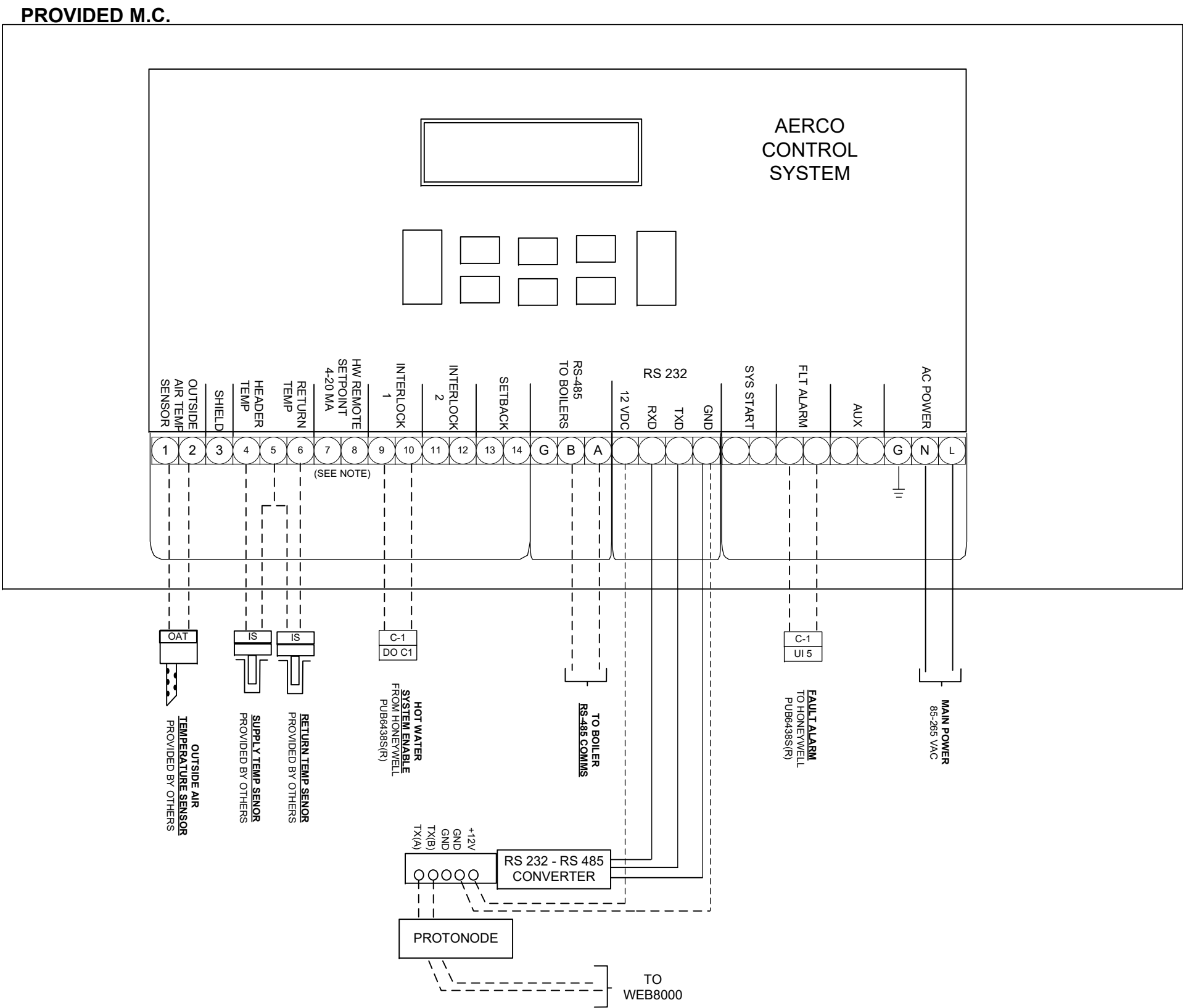
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HOT WATER SYSTEM FLOW DIAGRAM



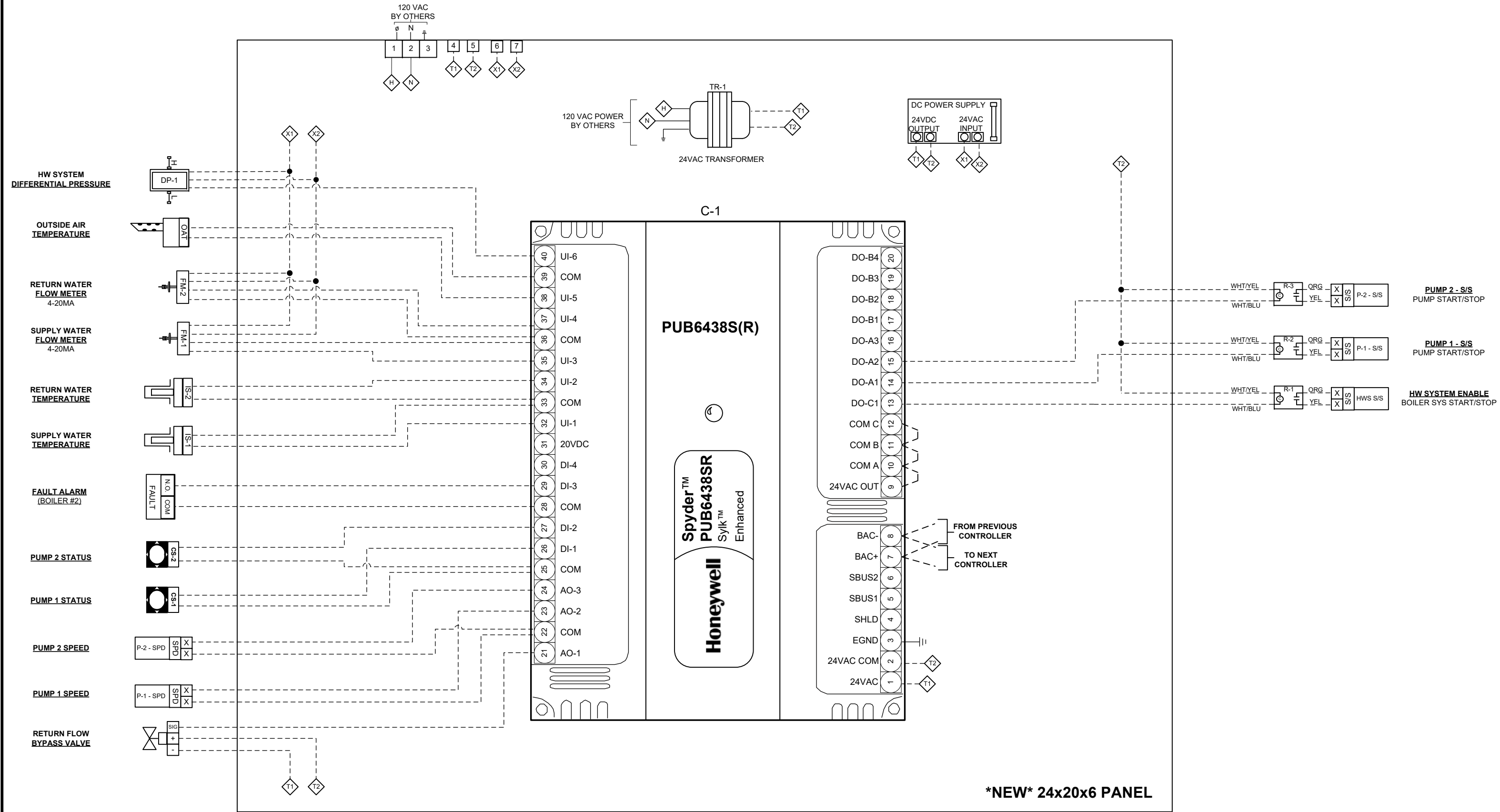
FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618	3	01-03-2018	AS-BUILTS		Project: NJ DOT E&O BUILDING EMS	
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	11-03-2017	ADDED BTU-M AND REVISED AHU SEQ.			HOT WATER SYSTEM FLOW DIAGRAM
		1	07-21-2017	ADDED AHUS, RHCS, AND SCHEDULES			
		0	05-22-2017	BACNET COMMUNICATIONS RISER	A.V.		
ARCHITECTS		NO.	DATE	REVISION	BY		

HOT WATER SYSTEM AERCO CONTROLLER WIRING SCHEMATIC



FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618	3	01-03-2018	AS-BUILTS			Project: NJ DOT E&O BUILDING EMS	
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	11-03-2017	ADDED BTU-M AND REVISED AHU SEQ.			HOT WATER SYSTEM AERCO CONTROLLER WIRING SCHEMATIC	
		1	07-21-2017	ADDED AHUS, RHCS, AND SCHEDULES				
		0	05-22-2017	BACNET COMMUNICATIONS RISER	A.V.			
ARCHITECTS		NO.	DATE	REVISION	BY		Job No.	#17-04260
							Page	5 of 33

HOT WATER SYSTEM C-1 WIRING SCHEMATIC



NOTES:

FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618	3	01-03-2018	AS-BUILTS	
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	11-03-2017	ADDED BTU-M AND REVISED AHU SEQ.	
		1	07-21-2017	ADDED AHUS, RHCS, AND SCHEDULES	
ARCHITECTS		0	05-22-2017	BACNET COMMUNICATIONS RISER	A.V.
		NO.	DATE	REVISION	BY

Project: NJ DOT E&O BUILDING EMS	
HOT WATER SYSTEM C-1 WIRING SCHEMATIC	
Job No. #17-04260	Page 6 of 33

HOT WATER SYSTEM SEQUENCE OF OPERATIONS

Sequence of Operations

- A. When the outside air temperature is below the hot water system enable setpoint of 60 deg F. (Adj.), the Honeywell BMS shall start the lead hot water system pump.
- B. If the lead hot water pump fails to start, then the Honeywell BMS shall command the lag hot water pump to start.
- C. After pump status has been proven on the Honeywell BMS shall enable the hot water system via the Aerco Boiler Control System. The Aerco Boiler Controller shall select the lead boiler and open the lead boiler’s isolation valve through its own interlocking controls.
- D. The boiler system shall operate to maintain a hot water supply temperature setpoint based on the following outside air reset schedule.
At 60°F (adj.) outside air temperature, the hot water supply temperature setpoint shall be 120°F (adj.)
At 20°F (adj.) outside air temperature, the hot water supply temperature setpoint shall be 180°F (adj.)
- E. A differential pressure sensor, at the end of the hot water piping loop, shall monitor the hot water system differential pressure. As the differential pressure drops below the differential pressure setpoint, the pump speed shall increase to maintain the differential pressure setpoint. As the differential pressure rises above the differential pressure setpoint, the pump speed shall decrease to maintain the differential pressure setpoint.
- F. A minimum return water flow setpoint shall be calculated based on the number of boilers running and the return water flow bypass valve, between the return and supply header, shall modulate open to maintain a minimum return water flow through each operating boiler. A flow sensor on the return header shall monitor the minimum amount of flow based on Boiler MFG’s requirements.
- G. When the buildings are in the Unoccupied Mode:
1. Set the VFD output to 50% for the pump output. 2. Set the MAX Temp to 140 degrees. F.

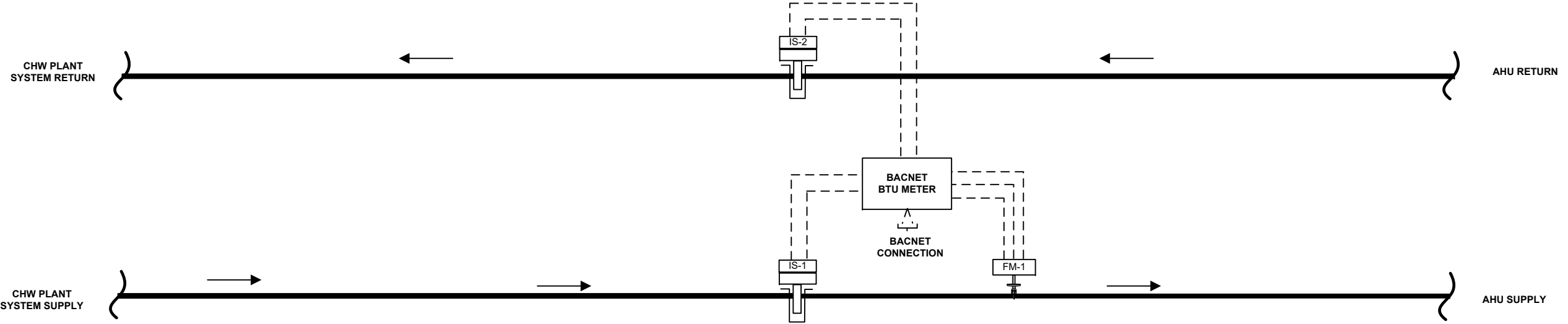
The following points will be shown on a graphic:
Example of available points from Boiler Control Panel Open Protocol Interface to be on graphic.
1.Outside Air Temperature, Header Temperature, Header Setpoint, Percent of Load (%), Boiler # Status

- Example of points provided by the BMS controller (either hardwired or via Communication Interface)
- 2. Outside air (OA) Temperature
 - 3. Heating Hot Water System Supply Water Temperature
 - 4. Heating Hot Water Supply Temperature Setpoint
 - 5. Heating Hot Water System Return Water Temperature
 - 6. Pump VFD Start/Stop
 - 7. Pump VFD Status
 - 8. Pump VFD Speed
 - 9. Pump VFD Alarm
 - 10. Pump VFD kW
 - 11. System Differential Pressure
 - 12. System Differential Pressure Setpoint
 - 13. Boiler System Supply Water Temperature
 - 14. Boiler System Return Temperature
 - 15. Hot Water System Flow
 - 16. Hot Water System Bypass Valve Position
 - 17. Firing rate
 - 18. Fault Code(s)
 - 19. Operational Status (Standby, Remote, Off, On, Manual Override)
 - 20. BMS will animate the boiler graphic when the boiler(s) are firing

- H. The BMS will annunciate the following alarms
- 1. Alarms from the Boiler Control Interface
 - 2. High Supply Water Temperature
 - 3. Low Supply Water Temperature
 - 4. Pump VFD Failure
 - 5. Low/High System Differential Pressure

FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618	3	01-03-2018	AS-BUILTS				Project: NJ DOT E&O BUILDING EMS	
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	11-03-2017	ADDED BTU-M AND REVISED AHU SEQ.				HOT WATER SYSTEM SEQUENCE OF OPERATIONS	
		1	07-21-2017	ADDED AHUS, RHCS, AND SCHEDULES					
ARCHITECTS		0	05-22-2017	BACNET COMMUNICATIONS RISER	A.V.				
		NO.	DATE	REVISION	BY			Job No.	#17-04260
						Page		7 of 33	

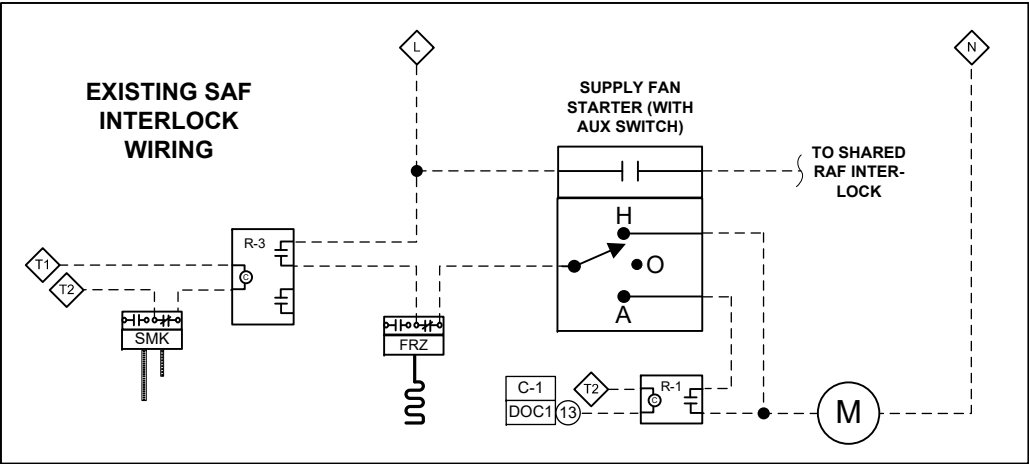
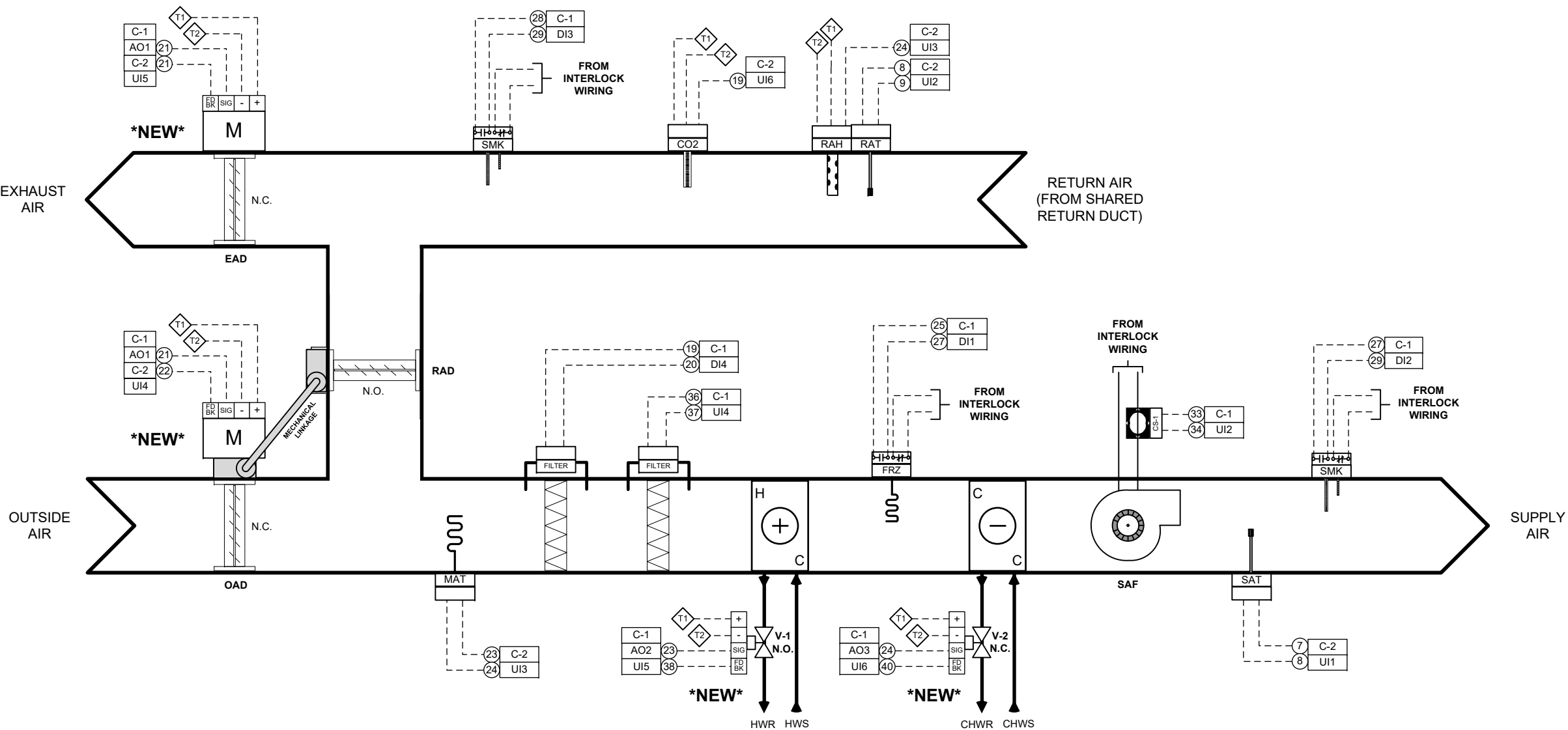
CHILL WATER BTU-METER FLOW DIAGRAM



FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618	3	01-03-2018	AS-BUILTS			Project: NJ DOT E&O BUILDING EMS	
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	11-03-2017	ADDED BTU-M AND REVISED AHU SEQ.			CHILL WATER BTU-METER FLOW DIAGRAM	
		1	07-21-2017	ADDED AHUS, RHCS, AND SCHEDULES				
ARCHITECTS		0	05-22-2017	BACNET COMMUNICATIONS RISER	A.V.		Job No. #17-04260	Page 8 of 33
		NO.	DATE	REVISION	BY			

AIR HANDLING UNIT (AHU-#A&B) FLOW DIAGRAM

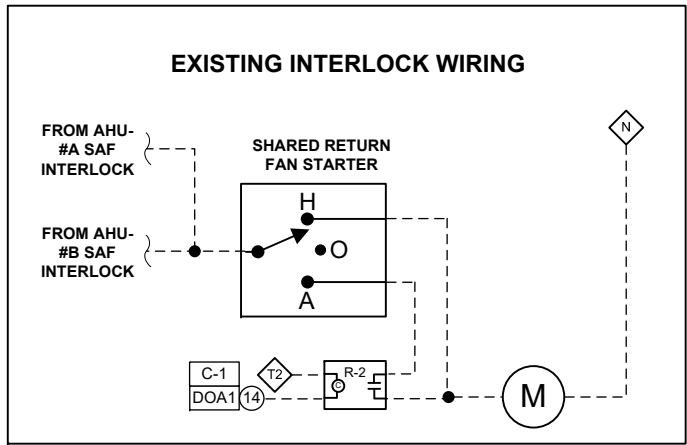
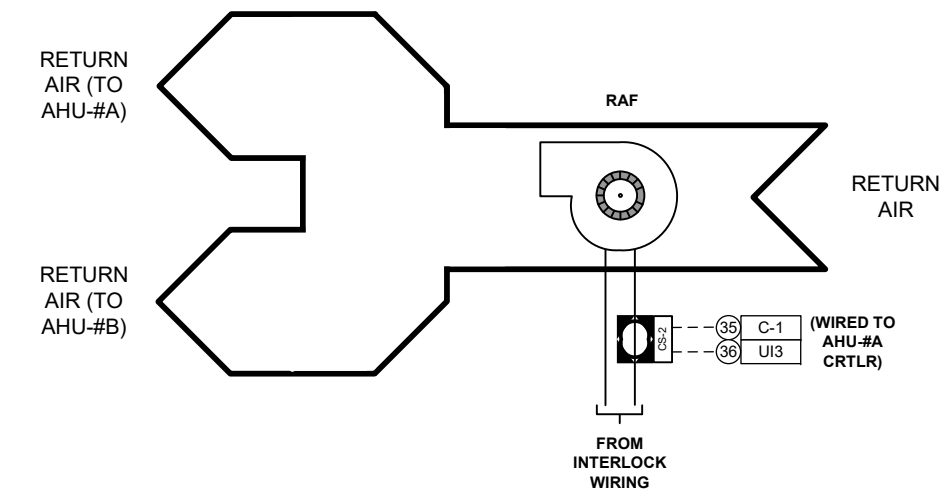
(TYPICAL OF 14)



NOTES:
- REUSE EXISTING DEVICES IF POSSIBLE EXCEPT WHERE NOTED

FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618	3	01-03-2018	AS-BUILTS		Project: NJ DOT E&O BUILDING EMS	
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	11-03-2017	ADDED BTU-M AND REVISED AHU SEQ.			
		1	07-21-2017	ADDED AHUS, RHCS, AND SCHEDULES			
		0	05-22-2017	BACNET COMMUNICATIONS RISER	A.V.		
ARCHITECTS		NO.	DATE	REVISION	BY		Job No. #17-04260

AIR HANDLING UNIT (AHU-#A&B) RAF FLOW DIAGRAM
(TYPICAL OF 14)

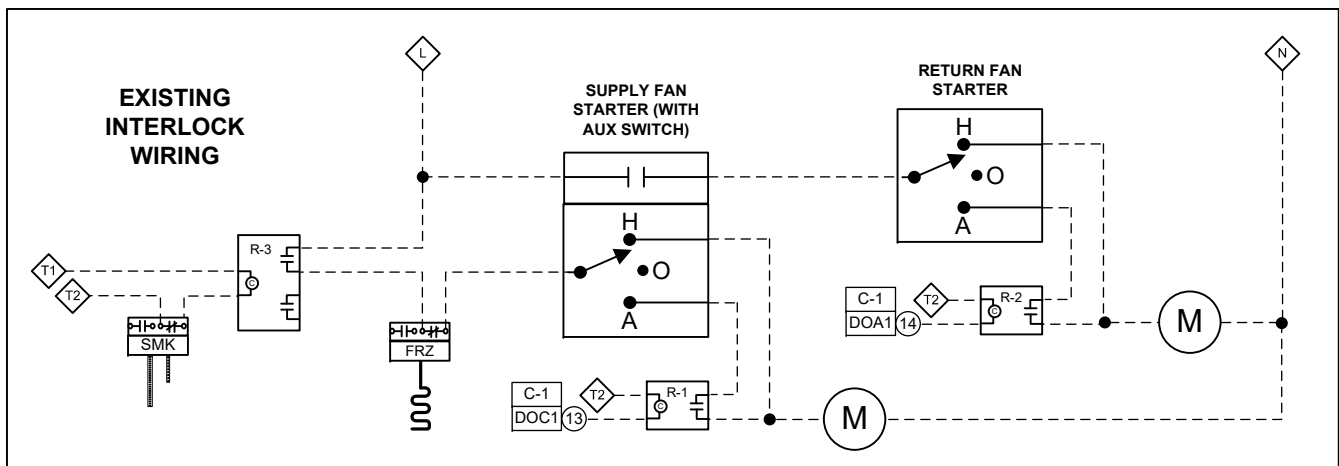


NOTES:

– REUSE EXISTING DEVICES IF POSSIBLE EXCEPT WHERE NOTED

FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618	3	01-03-2018	AS-BUILTS			Project: NJ DOT E&O BUILDING EMS
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	11-03-2017	ADDED BTU-M AND REVISED AHU SEQ.			
		1	07-21-2017	ADDED AHUS, RHCS, AND SCHEDULES			
ARCHITECTS		0	05-22-2017	BACNET COMMUNICATIONS RISER	A.V.		
		NO.	DATE	REVISION	BY		
		Job No.		#17-04260	Page	10 of 33	

(TYPICAL OF 5)

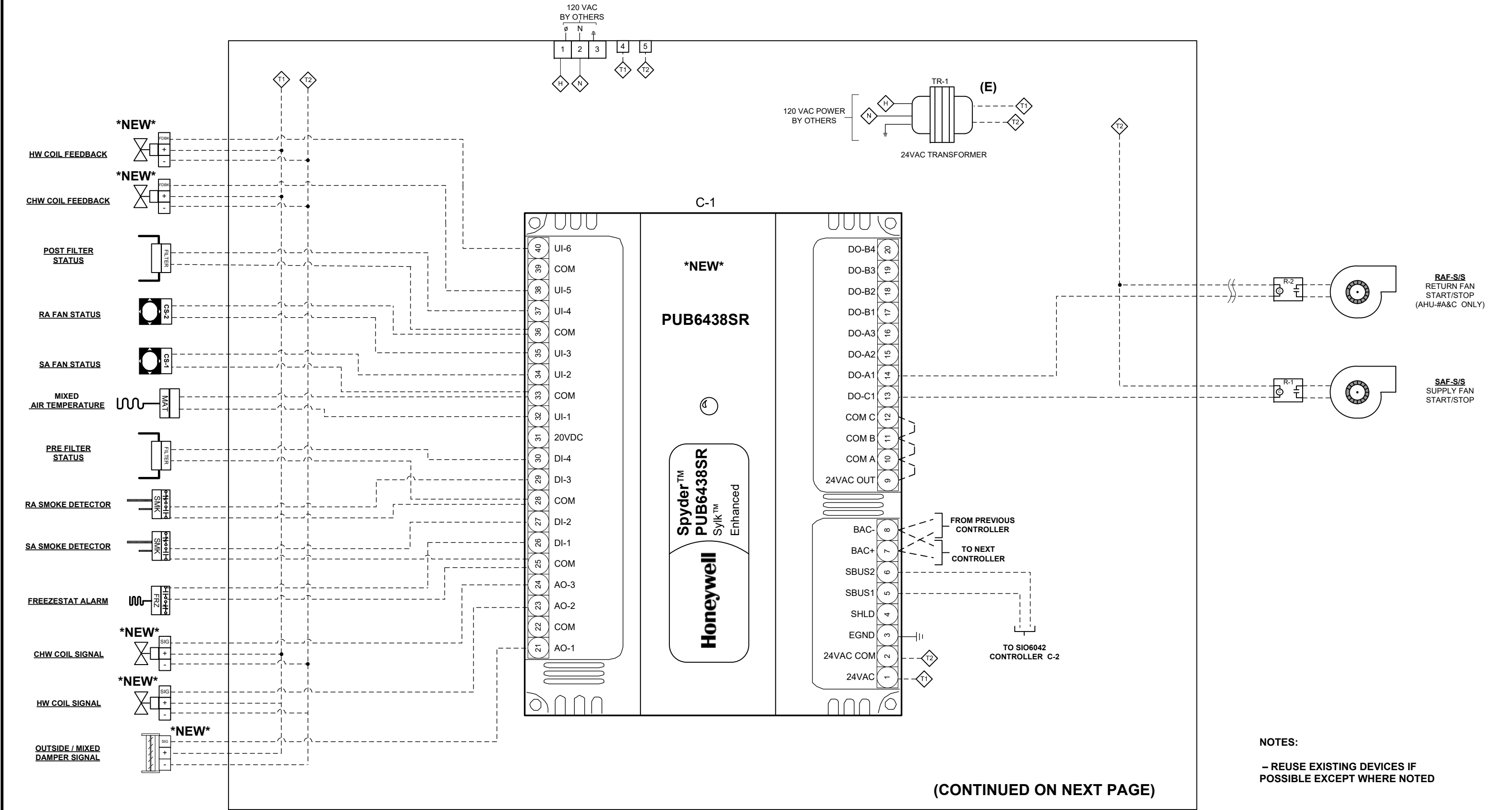


- REUSE EXISTING DEVICES IF POSSIBLE EXCEPT WHERE NOTED

FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618	3	01-03-2018	AS-BUILTS			Project: NJ DOT E&O BUILDING EMS			
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	11-03-2017	ADDED BTU-M AND REVISED AHU SEQ.			AIR HANDLING UNIT (AHU-#C) FLOW DIAGRAM			
		1	07-21-2017	ADDED AHUS, RHCS, AND SCHEDULES						
		0	05-22-2017	BACNET COMMUNICATIONS RISER	A.V.					
ARCHITECTS		NO.	DATE	REVISION	BY			Job No.	#17-04260	Page

AIR HANDLING UNIT (AHU-#A,B,&C) C-1 WIRING SCHEMATIC

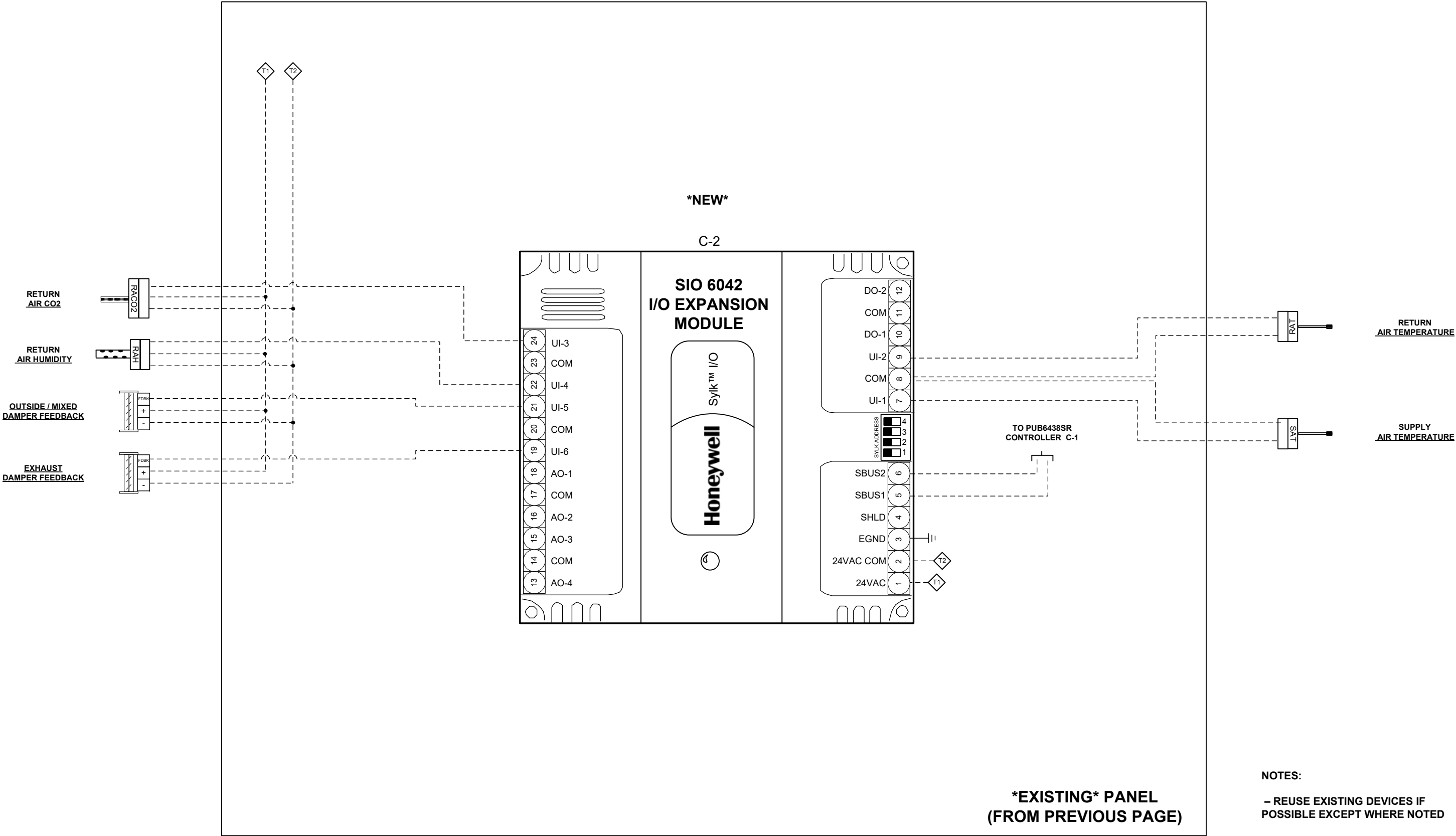
(TYPICAL OF 19)



FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618	3	01-03-2018	AS-BUILTS			Project: NJ DOT E&O BUILDING EMS
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	11-03-2017	ADDED BTU-M AND REVISED AHU SEQ.			AIR HANDLING UNIT (AHU-#A,B,&C) C-1 WIRING SCHEMATIC
		1	07-21-2017	ADDED AHUS, RHCS, AND SCHEDULES			
ARCHITECTS		0	05-22-2017	BACNET COMMUNICATIONS RISER	A.V.		Job No. #17-04260 Page 12 of 33
		NO.	DATE	REVISION	BY		

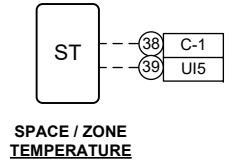
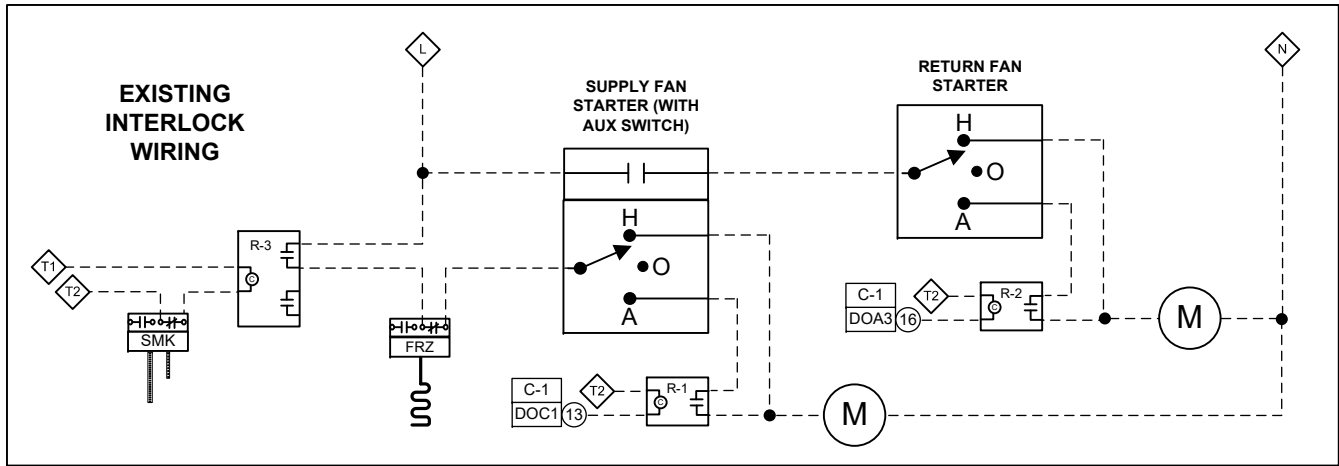
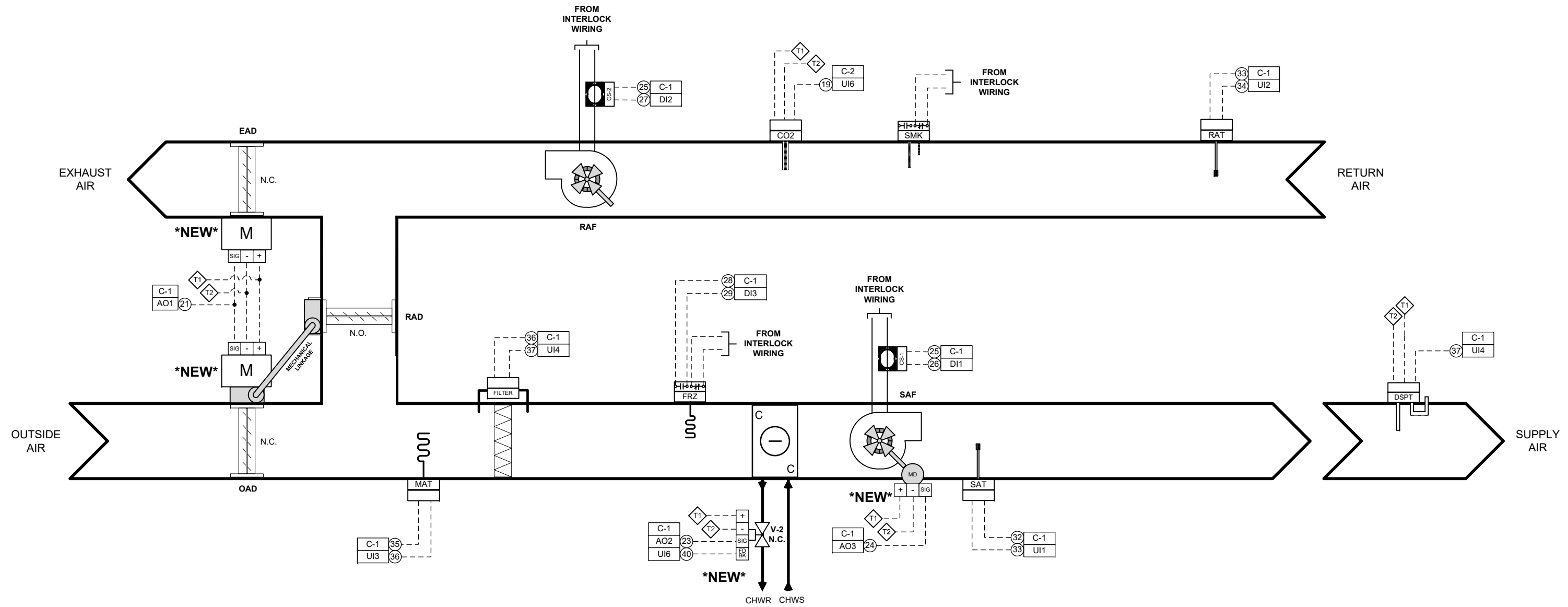
AIR HANDLING UNIT (AHU-#A,B,&C) C-2 WIRING SCHEMATIC

(TYPICAL OF 19)



FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618	3	01-03-2018	AS-BUILTS		Project: NJ DOT E&O BUILDING EMS AIR HANDLING UNIT (AHU-#A,B,&C) C-2 WIRING SCHEMATIC Job No. #17-04260Page 13 of 33
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	11-03-2017	ADDED BTU-M AND REVISED AHU SEQ.		
		1	07-21-2017	ADDED AHUS, RHCS, AND SCHEDULES		
ARCHITECTS		0	05-22-2017	BACNET COMMUNICATIONS RISER	A.V.	
		NO.	DATE	REVISION	BY	

AIR HANDLING UNIT (AHU-2-2) FLOW DIAGRAM

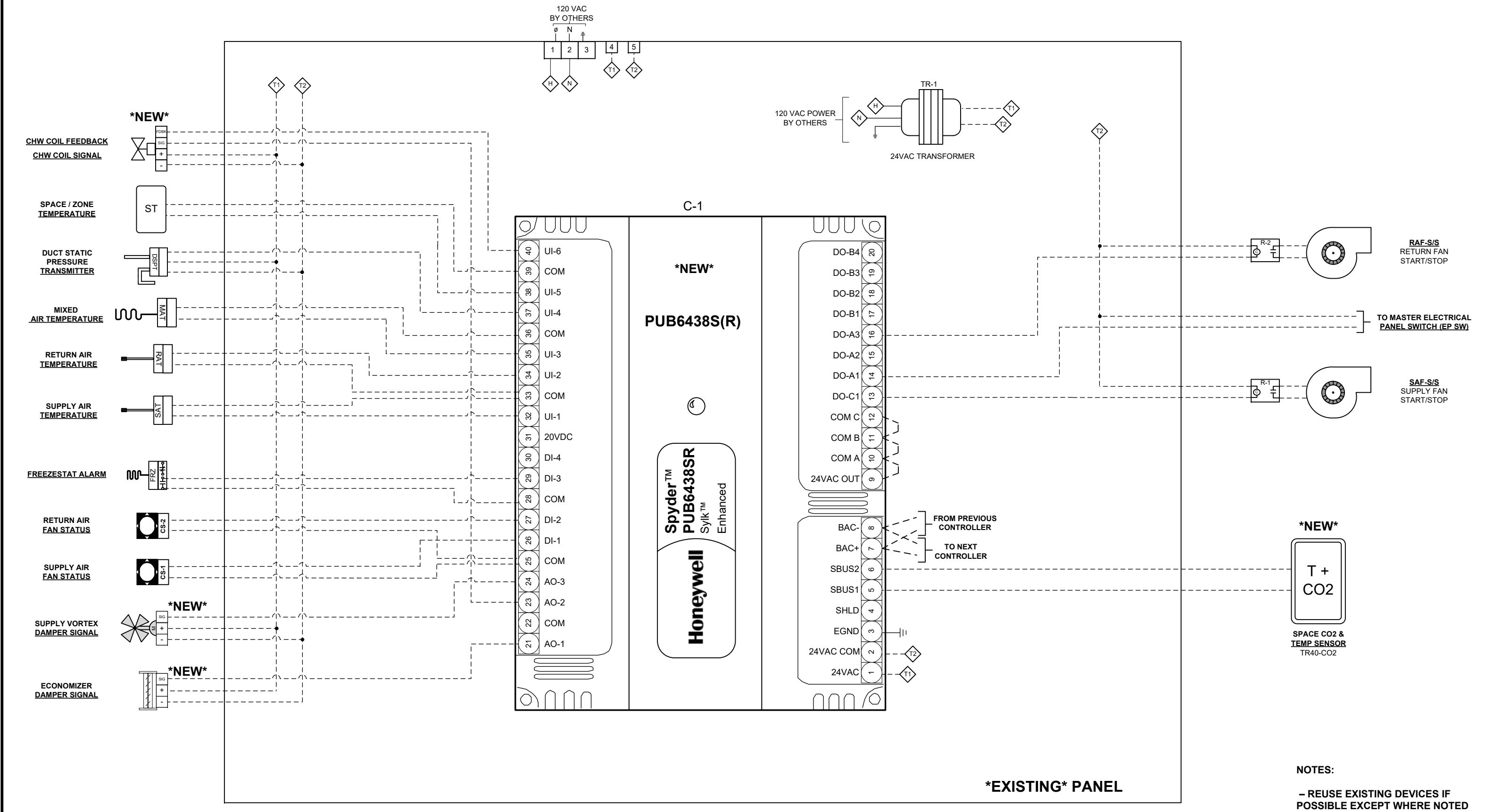


NOTES:
- REUSE EXISTING DEVICES IF POSSIBLE EXCEPT WHERE NOTED

FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618	3	01-03-2018	AS-BUILTS	
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	11-03-2017	ADDED BTU-M AND REVISED AHU SEQ.	
		1	07-21-2017	ADDED AHUS, RHCS, AND SCHEDULES	
ARCHITECTS		0	05-22-2017	BACNET COMMUNICATIONS RISER	A.V.
		NO.	DATE	REVISION	BY

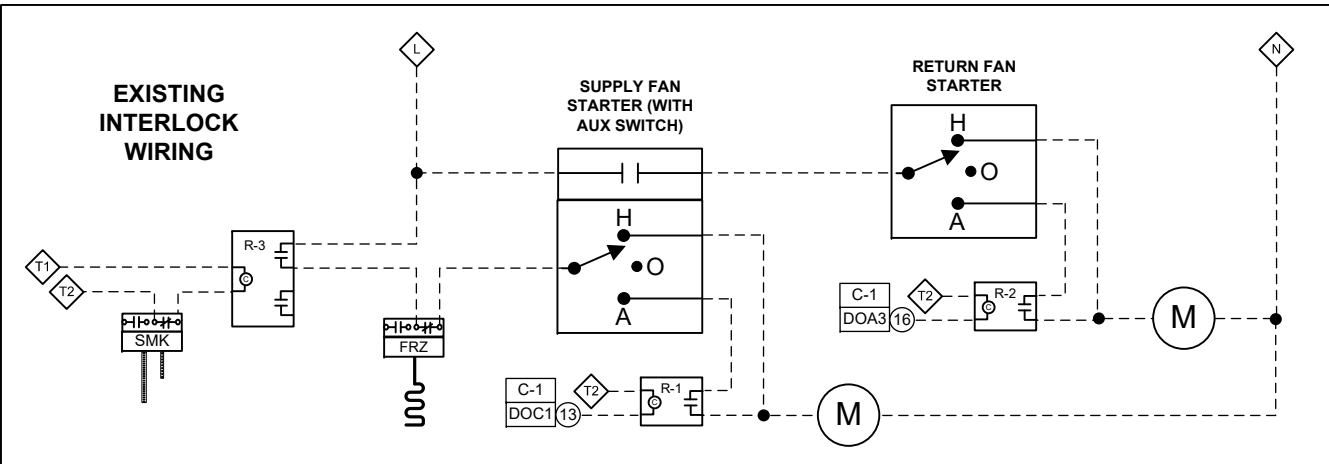
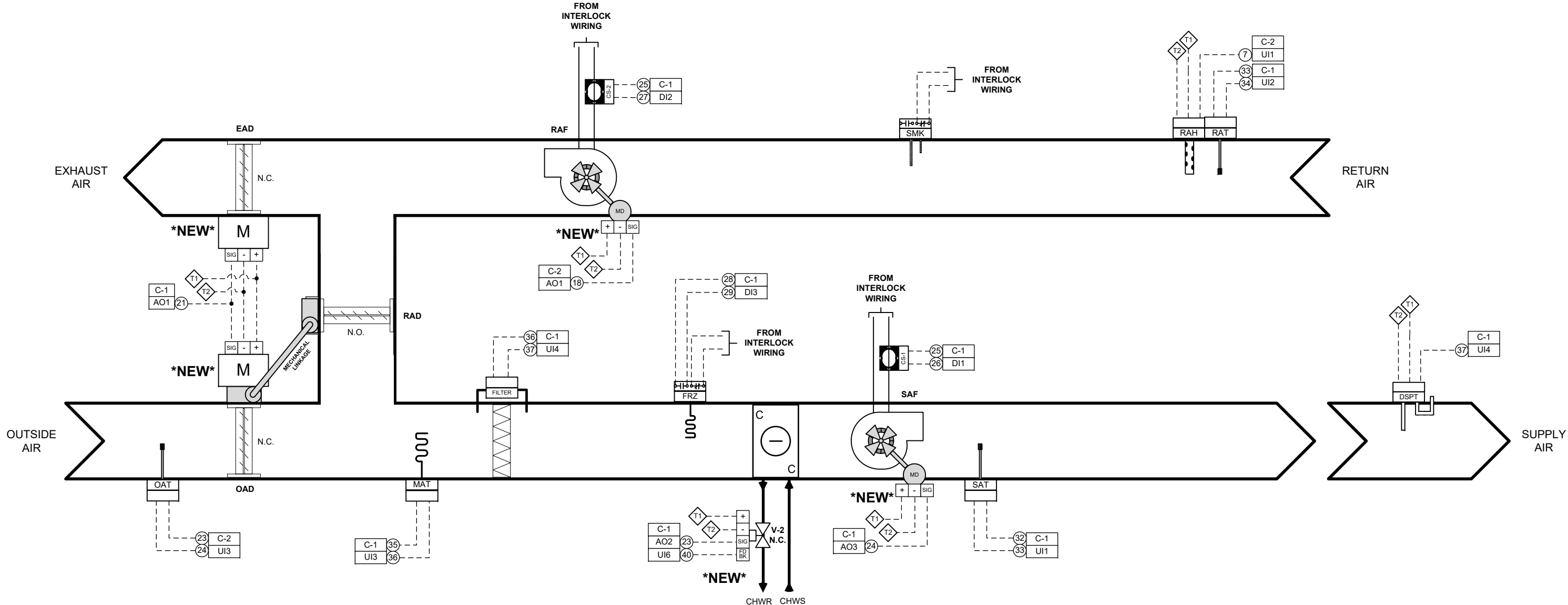
Project: NJ DOT E&O BUILDING EMS	
AIR HANDLING UNIT (AHU-2-2) FLOW DIAGRAM	
Job No. #17-04260	Page 14 of 33

AIR HANDLING UNIT (AHU-2-2) WIRING SCHEMATIC



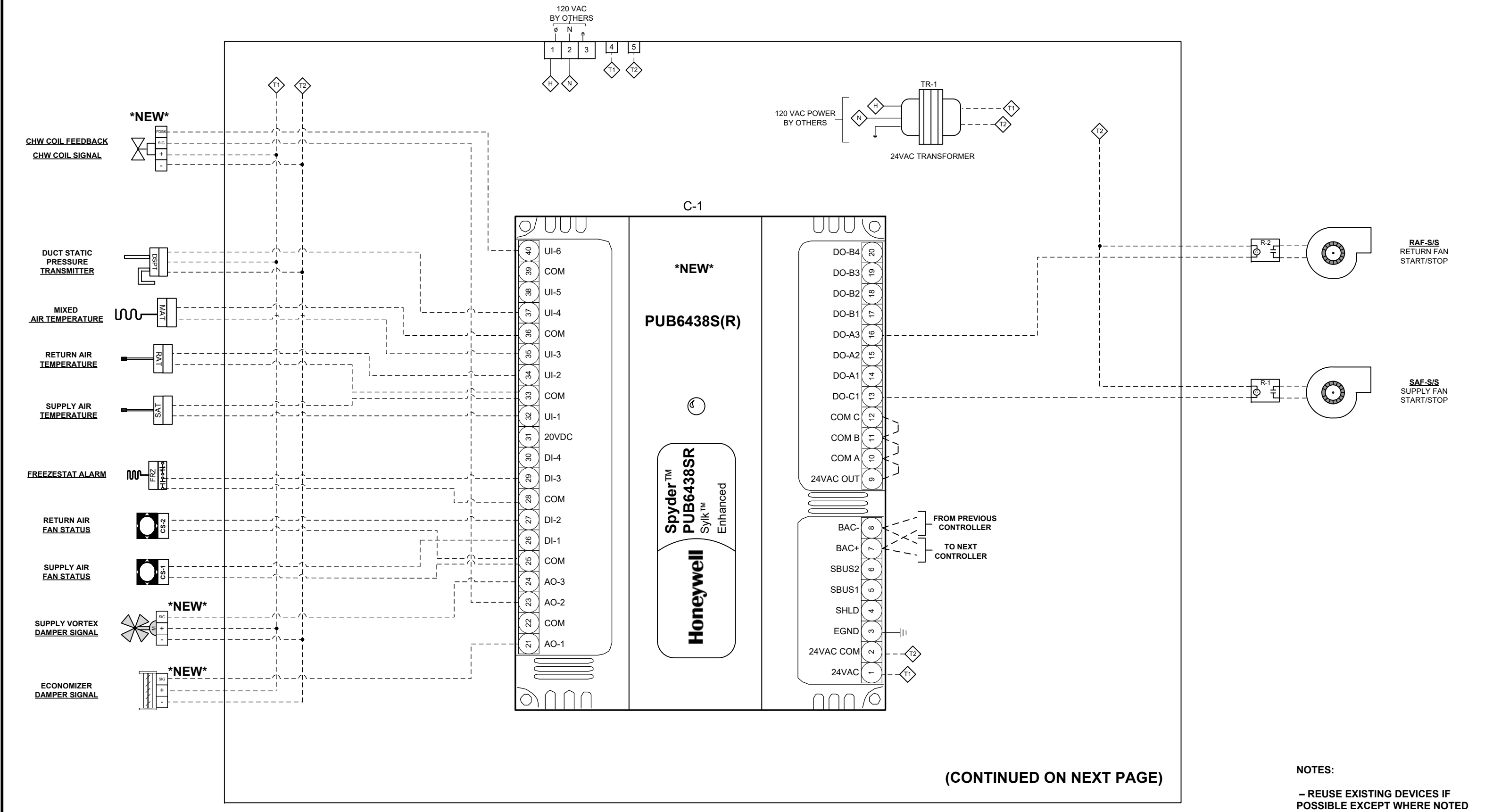
FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618	3	01-03-2018	AS-BUILTS			Project: NJ DOT E&O BUILDING EMS
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	11-03-2017	ADDED BTU-M AND REVISED AHU SEQ.			AIR HANDLING UNIT (AHU-2-2) WIRING SCHEMATIC
		1	07-21-2017	ADDED AHUS, RHCS, AND SCHEDULES			
ARCHITECTS		0	05-22-2017	BACNET COMMUNICATIONS RISER	A.V.		Job No. #17-04260Page 15 of 33
		NO.	DATE	REVISION	BY		

AIR HANDLING UNIT (AHU-2-3) FLOW DIAGRAM



FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618	3	01-03-2018	AS-BUILTS			Project: NJ DOT E&O BUILDING EMS			
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	11-03-2017	ADDED BTU-M AND REVISED AHU SEQ.			AIR HANDLING UNIT (AHU-2-3) FLOW DIAGRAM			
		1	07-21-2017	ADDED AHUS, RHCS, AND SCHEDULES						
		0	05-22-2017	BACNET COMMUNICATIONS RISER	A.V.					
ARCHITECTS		NO.	DATE	REVISION	BY			Job No.	#17-04260	Page

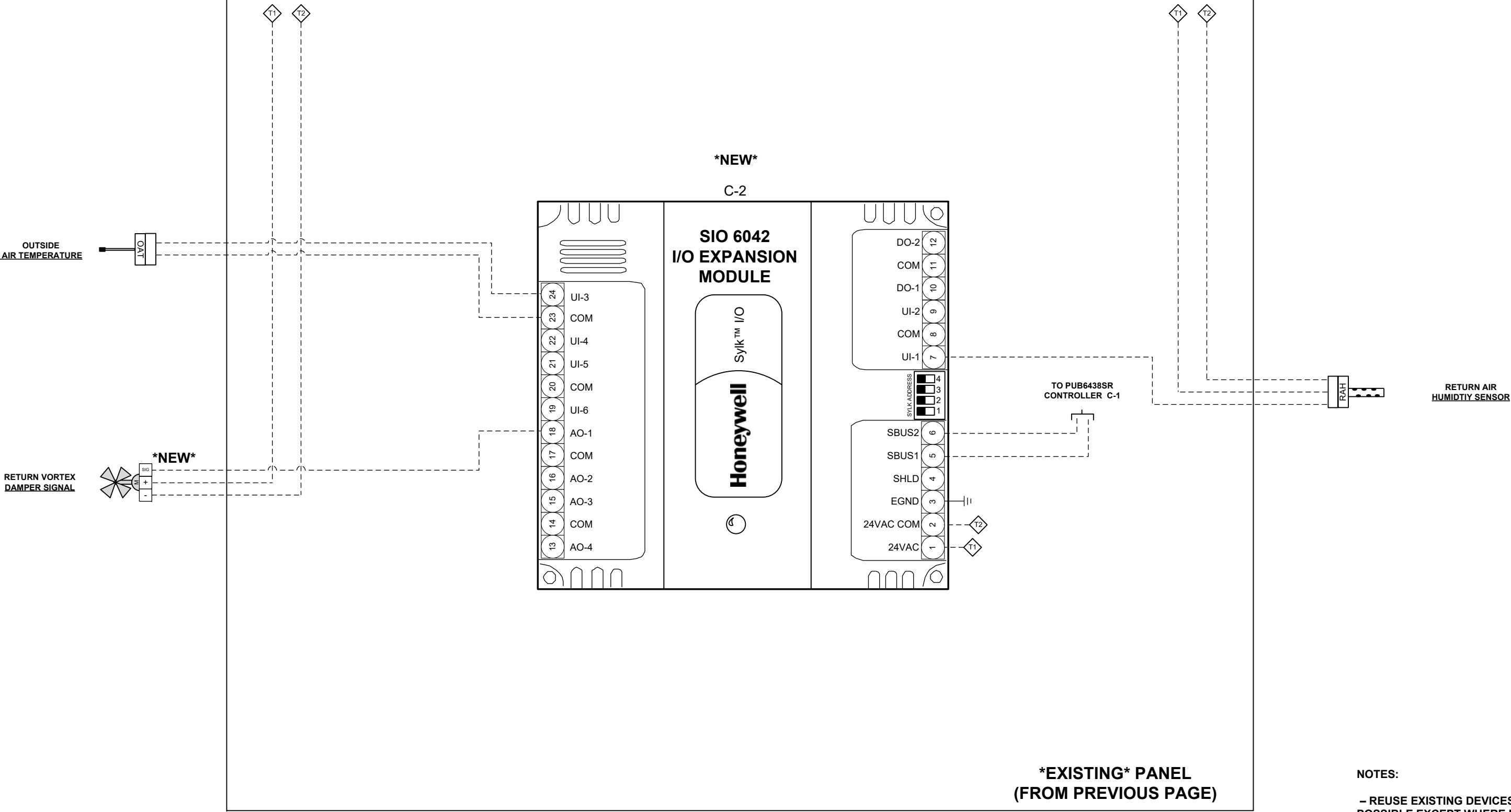
AIR HANDLING UNIT (AHU-2-3) C-1 WIRING SCHEMATIC



NOTES:
- REUSE EXISTING DEVICES IF POSSIBLE EXCEPT WHERE NOTED

FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618	3	01-03-2018	AS-BUILTS			Project: NJ DOT E&O BUILDING EMS
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	11-03-2017	ADDED BTU-M AND REVISED AHU SEQ.			AIR HANDLING UNIT (AHU-2-3) C-1 WIRING SCHEMATIC
		1	07-21-2017	ADDED AHUS, RHCS, AND SCHEDULES			
ARCHITECTS		0	05-22-2017	BACNET COMMUNICATIONS RISER	A.V.		Job No. #17-04260Page 17 of 33
		NO.	DATE	REVISION	BY		

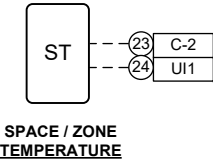
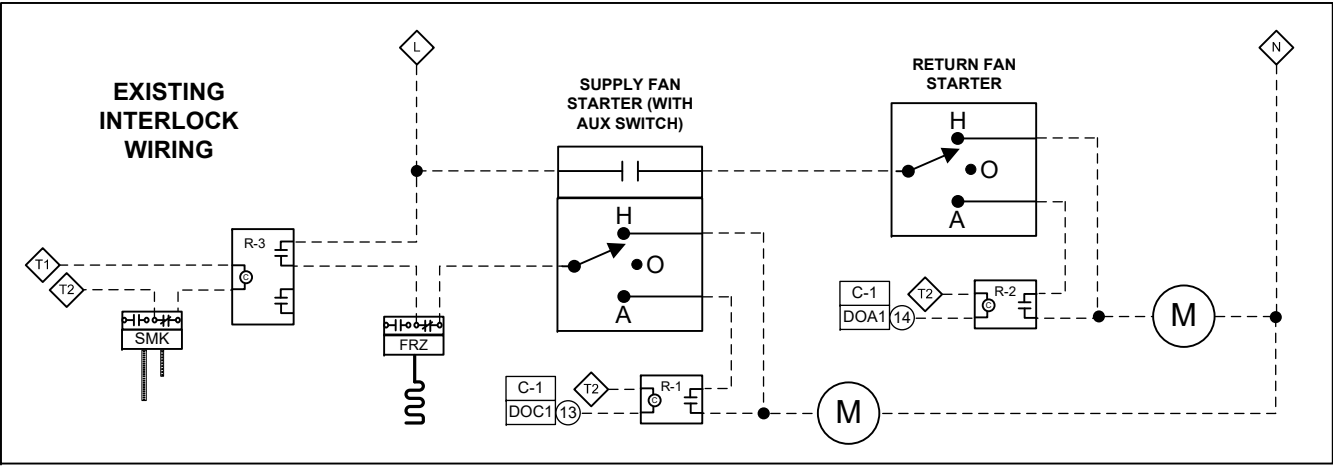
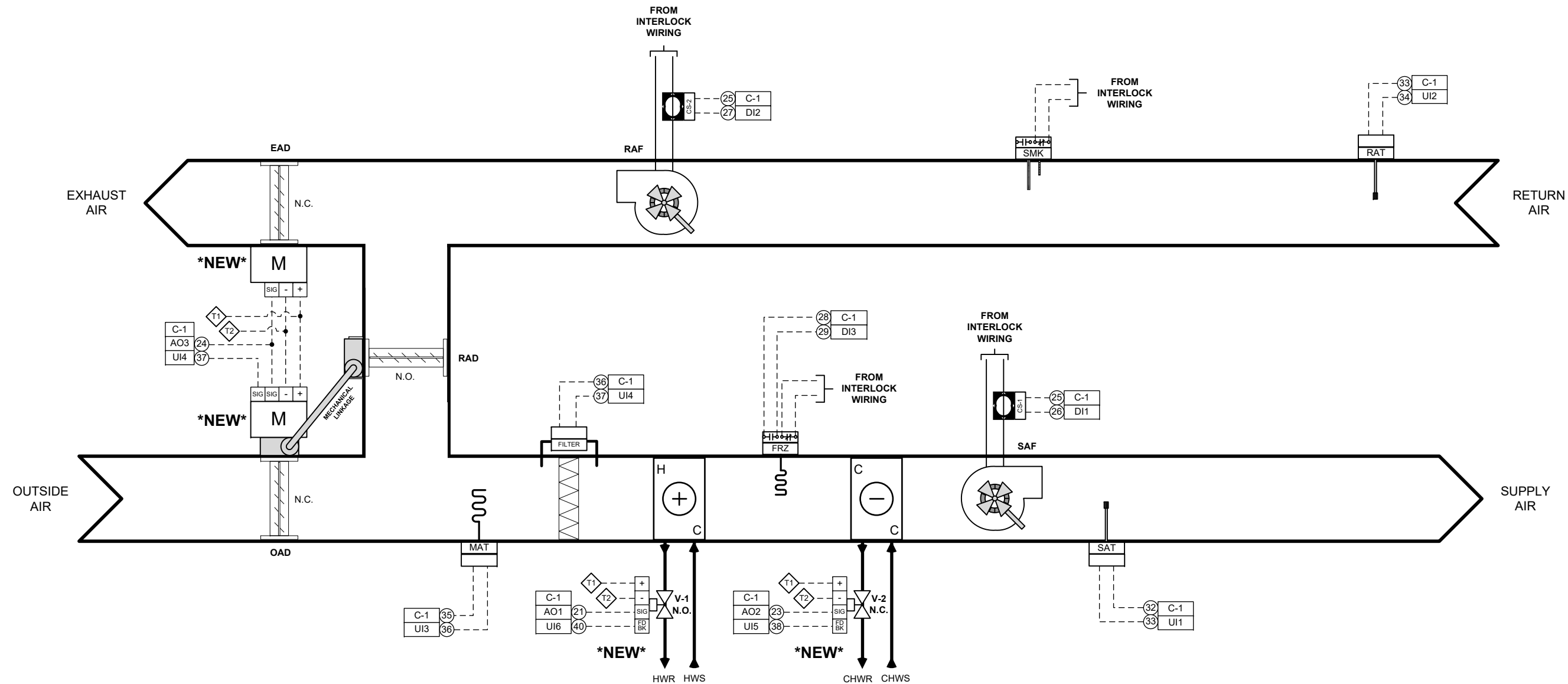
AIR HANDLING UNIT (AHU-2-3) C-2 WIRING SCHEMATIC



NOTES:
- REUSE EXISTING DEVICES IF POSSIBLE EXCEPT WHERE NOTED

FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618	3	01-03-2018	AS-BUILTS			Project: NJ DOT E&O BUILDING EMS
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	11-03-2017	ADDED BTU-M AND REVISED AHU SEQ.			
		1	07-21-2017	ADDED AHUS, RHCS, AND SCHEDULES			
ARCHITECTS		0	05-22-2017	BACNET COMMUNICATIONS RISER	A.V.		
		NO.	DATE	REVISION	BY		
		Job No.		#17-04260	Page	18 of 33	

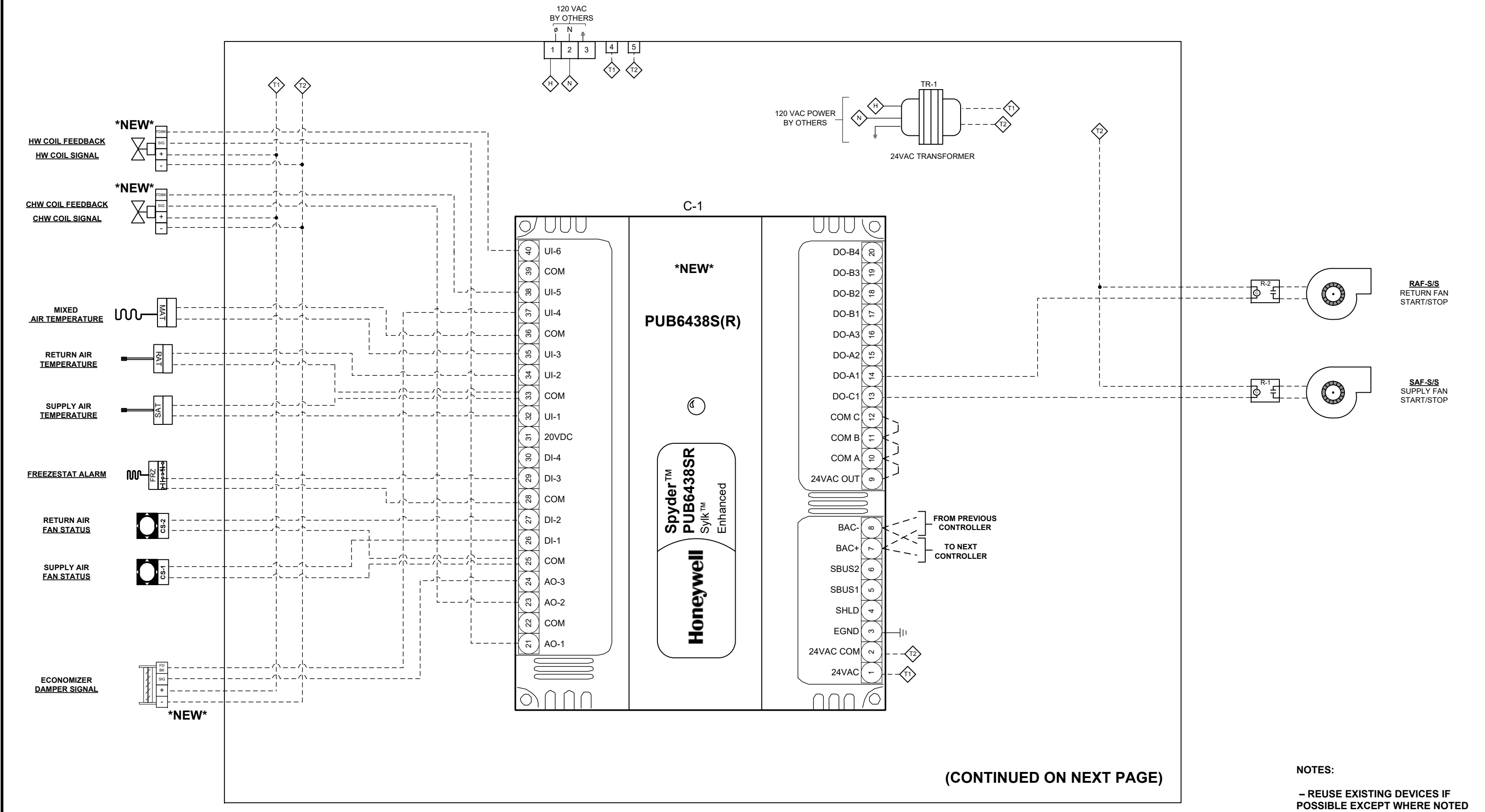
AIR HANDLING UNIT (AHU-2-4) FLOW DIAGRAM



FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618	3	01-03-2018	AS-BUILTS		Project: NJ DOT E&O BUILDING EMS
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	11-03-2017	ADDED BTU-M AND REVISED AHU SEQ.		
ARCHITECTS		1	07-21-2017	ADDED AHUS, RHCS, AND SCHEDULES		
		0	05-22-2017	BACNET COMMUNICATIONS RISER	A.V.	
		NO.	DATE	REVISION	BY	

AIR HANDLING UNIT (AHU-2-4) FLOW DIAGRAM

AIR HANDLING UNIT (AHU-2-4) C-1 WIRING SCHEMATIC

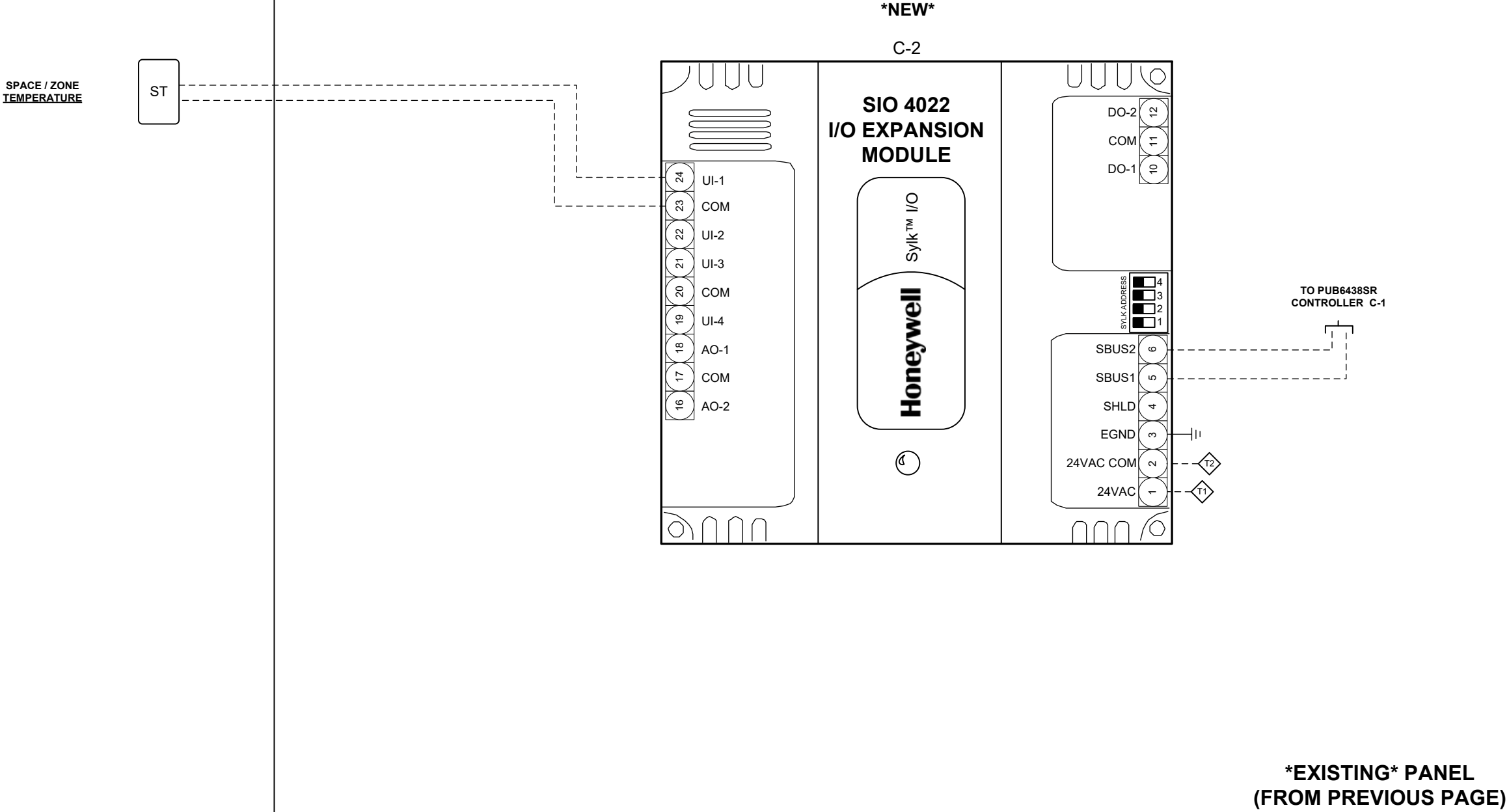


(CONTINUED ON NEXT PAGE)

NOTES:
- REUSE EXISTING DEVICES IF POSSIBLE EXCEPT WHERE NOTED

FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618	3	01-03-2018	AS-BUILTS					Project: NJ DOT E&O BUILDING EMS
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	11-03-2017	ADDED BTU-M AND REVISED AHU SEQ.					AIR HANDLING UNIT (AHU-2-4) C-1 WIRING SCHEMATIC
		1	07-21-2017	ADDED AHUS, RHCS, AND SCHEDULES					
ARCHITECTS		0	05-22-2017	BACNET COMMUNICATIONS RISER	A.V.				Job No. #17-04260 Page 20 of 33
		NO.	DATE	REVISION	BY				

AIR HANDLING UNIT (AHU-2-4) C-2 WIRING SCHEMATIC



NOTES:
- REUSE EXISTING DEVICES IF POSSIBLE EXCEPT WHERE NOTED

FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618	3	01-03-2018	AS-BUILTS				Project: NJ DOT E&O BUILDING EMS
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	11-03-2017	ADDED BTU-M AND REVISED AHU SEQ.				AIR HANDLING UNIT (AHU-2-4) C-2 WIRING SCHEMATIC
		1	07-21-2017	ADDED AHUS, RHCS, AND SCHEDULES				
ARCHITECTS		0	05-22-2017	BACNET COMMUNICATIONS RISER	A.V.			Job No. #17-04260Page 21 of 33
		NO.	DATE	REVISION	BY			

AIR HANDLING UNIT HW VALVE SCHEDULE

NJ DOT EO Building HW Coils

Label	Associated EQUIPMENT	QTY	Pattern	Equip. GPM	Style	Valve Size	Valve CV	Fail Postion	Act Control	Valve Assembly P/N
HW Coil	HWC-1A	1	2-WAY	20.0	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DPPX6100
HW Coil	HWC-1B	1	2-WAY	27.0	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DRPX6100
HW Coil	HWC-2A	1	2-WAY	29.0	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DRPX6100
HW Coil	HWC-2B	1	2-WAY	28.0	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DRPX6100
HW Coil	HWC-2-1	1	2-WAY	48.0	PRESSURE INDEPENDENT	1.50	N/A	OPEN	MODULATING	VRN2E1PX6100
HW Coil	HWC-2-4	1	2-WAY	26.0	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DRPX6100
HW Coil	HWC-3A	1	2-WAY	30.0	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DRPX6100
HW Coil	HWC-3B	1	2-WAY	39.0	PRESSURE INDEPENDENT	1.50	N/A	OPEN	MODULATING	VRN2ETPX6100
HW Coil	HWC-3C	1	2-WAY	21.0	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DQPX6100
HW Coil	HWC-4A	1	2-WAY	27.0	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DRPX6100
HW Coil	HWC-4B	1	2-WAY	37.0	PRESSURE INDEPENDENT	1.50	N/A	OPEN	MODULATING	VRN2ETPX6100
HW Coil	HWC-4C	1	2-WAY	21.0	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DQPX6100
HW Coil	HWC-5A	1	2-WAY	25.0	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DQPX6100
HW Coil	HWC-5B	1	2-WAY	32.0	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DSPX6100
HW Coil	HWC-5C	1	2-WAY	21.0	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DQPX6100
HW Coil	HWC-6A	1	2-WAY	25.0	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DQPX6100
HW Coil	HWC-6B	1	2-WAY	31.0	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DSPX6100
HW Coil	HWC-6C	1	2-WAY	21.0	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DQPX6100
HW Coil	HWC-7A	1	2-WAY	25.0	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DQPX6100
HW Coil	HWC-7B	1	2-WAY	31.0	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DSPX6100
HW Coil	HWC-7C	1	2-WAY	22.0	PRESSURE INDEPENDENT	1.25	N/A	OPEN	MODULATING	VRN2DQPX6100
BOILER MIN FLOW		1	2-WAY	225.0	CHARACTERIZED BALL	2.50	202	IN PLACE	MODULATING	VBN3G1PX5000

FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618	3	01-03-2018	AS-BUILTS				Project: NJ DOT E&O BUILDING EMS	
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	11-03-2017	ADDED BTU-M AND REVISED AHU SEQ.					AIR HANDLING UNIT HW VALVE SCHEDULE
		1	07-21-2017	ADDED AHUS, RHCS, AND SCHEDULES					
		0	05-22-2017	BACNET COMMUNICATIONS RISER	A.V.				
ARCHITECTS		NO.	DATE	REVISION	BY				

AIR HANDLING UNIT CHW VALVE SCHEDULE

NJ DOT EO Building CHW Coils										
Label	Associated EQUIPMENT	QTY	Pattern	Equip. GPM	Style	Valve Size	Valve CV	Fail Postion	Act Control	Valve Assembly P/N
CHW Coil	AHU-1A	1	2-WAY	40.0	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATING	VRN2ETPX5000
CHW Coil	AHU-1B	1	2-WAY	61.0	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATING	VRN2E4PX5000
CHW Coil	AHU-2-2	1	2-WAY	148.0	PRESSURE INDEPENDENT	3.00	N/A	IN PLACE	MODULATING	VRW2JW4SMB
CHW Coil	AHU-2-3	1	2-WAY	57.0	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATING	VRN2E3PX5000
CHW Coil	AHU-2-4	1	2-WAY	33.0	PRESSURE INDEPENDENT	1.25	N/A	IN PLACE	MODULATING	VRN2DSPX5000
CHW Coil	AHU-2A	1	2-WAY	58.0	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATING	VRN2E3PX5000
CHW Coil	AHU-2B	1	2-WAY	67.0	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATING	VRN2E5PX5000
CHW Coil	AHU-3A	1	2-WAY	61.0	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATING	VRN2E4PX5000
CHW Coil	AHU-3B	1	2-WAY	99.0	PRESSURE INDEPENDENT	2.50	N/A	IN PLACE	MODULATING	VRW2JV4SMB
CHW Coil	AHU-3C	1	2-WAY	37.0	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATING	VRN2ETPX5000
CHW Coil	AHU-4A	1	2-WAY	51.0	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATING	VRN2E2PX5000
CHW Coil	AHU-4B	1	2-WAY	86.0	PRESSURE INDEPENDENT	2.50	N/A	IN PLACE	MODULATING	VRN2G9PX5000
CHW Coil	AHU-4C	1	2-WAY	39.0	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATING	VRN2ETPX5000
CHW Coil	AHU-5A	1	2-WAY	46.0	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATING	VRN2E1PX5000
CHW Coil	AHU-5B	1	2-WAY	77.0	PRESSURE INDEPENDENT	2.50	N/A	IN PLACE	MODULATING	VRN2G7PX5000
CHW Coil	AHU-5C	1	2-WAY	37.0	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATING	VRN2ETPX5000
CHW Coil	AHU-6A	1	2-WAY	44.0	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATING	VRN2EUPX5000
CHW Coil	AHU-6B	1	2-WAY	68.0	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATING	VRN2E5PX5000
CHW Coil	AHU-6C	1	2-WAY	41.0	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATING	VRN2EUPX5000
CHW Coil	AHU-7A	1	2-WAY	47.0	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATING	VRN2E1PX5000
CHW Coil	AHU-7B	1	2-WAY	82.0	PRESSURE INDEPENDENT	2.50	N/A	IN PLACE	MODULATING	VRN2G9PX5000
CHW Coil	AHU-7C	1	2-WAY	41.0	PRESSURE INDEPENDENT	1.50	N/A	IN PLACE	MODULATING	VRN2EUPX5000

AIR HANDLING UNIT SEQUENCE OF OPERATIONS

A. BUILDING AUTOMATION SYSTEM INTERFACE:

- 1. The Energy Management System (BMS) will send the controller Occupied, Unoccupied, Optimal Start, and Timed Override commands. The BMS may also send a space temperature and/or space temperature set point. If the BMS is not present, or communication is lost with the BMS, the controller will operate using its local schedule and set points.

B. OCCUPIED (TEMPERATURE CONTROL):

- 1. During Occupied periods the supply fan and return fan will run continuously and the chilled water valve and/or the hydronic heating valve will modulate to maintain the supply air temperature set point. If the supply air temperature sensor fails during normal operation, all valves will close and an alarm will be annunciated.

C. OCCUPANCY BASED OA DAMPER CONTROL:

- 1. Space CO2 Sensor will be installed in the occupied space(s) served by each AHU.
- 2. On a rise above space CO2 set point (adj.), the OA Damper will open.
- 3. When the space CO2 level (PPM) is at or below set point, the OA Damper Will Close

D. UNOCCUPIED (NIGHT SETBACK):

- 1. When the space temperature is below the Unoccupied heating set point (60°F adj.), the supply and return fan will start, the outside air damper will remain closed, and the hot water valve will open. When the space temperature rises above the Unoccupied heating set point (60°F adj.) plus the Unoccupied differential (4°F adj.), the supply and return fan will stop and the hot water valve will close.
- 2. When the space temperature is above the Unoccupied cooling set point 85°F (adj.), the supply and return fan will start, the outside air damper will remain closed, and the chilled water valve will open. When the space temperature falls below the Unoccupied cooling set point (85°F adj.) minus the Unoccupied differential (4°F adj.), the supply and return fan will stop and the chilled water valve will close.

E. MORNING WARM-UP:

- 1. During optimal start, if the space temperature is below the Occupied heating set point, a morning warm-up sequence will be activated. The supply fan will start, the hot water valve will open and the outside air damper will remain closed. Mode will terminate when the space temperature reaches the Occupied heating set point or the occupied time period has started.

F. MORNING COOL-DOWN:

- 1. During Optimal Start, if the space temperature is above the Occupied cooling set point, a morning cool-down sequence will be activated. The supply fan will start, the chilled water valve will open, and the outside air damper will remain closed. Mode will terminate when the space temperature reaches the Occupied cooling set point or the occupied time period has started.

G. FREEZE PROTECTION:

- 1. The initial damper opening rate will be limited to 2% per minute until the damper has reached its minimum ventilation position. The outside air damper will modulate to a position less than the minimum damper position if the mixed air temperature drops below 50°F (adj.). If the mixed air temperature sensor fails the outside air damper will close and an alarm will be annunciated.
- 2. A hardwired, low limit temperature switch is electrically interlocked with the motor starter. If the low limit temperature switch is tripped (38°F adj.), the outside air damper will close, all valves will open to 100% (adjust per climate), and an alarm will be annunciated. A manual reset of the low limit temperature switch will be required to restart the fan.

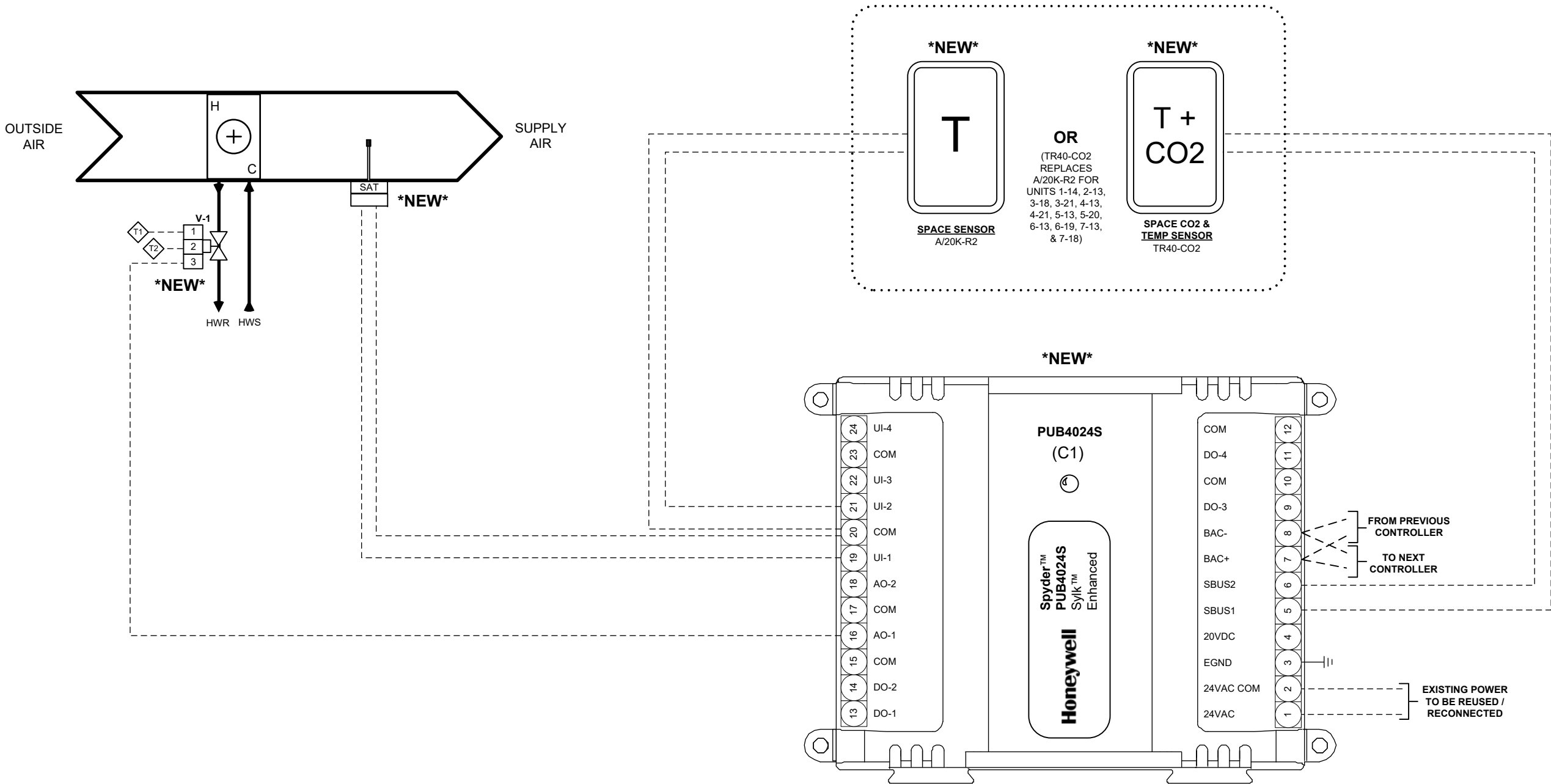
H. FILTER STATUS:

- 1. A differential pressure switch will monitor the differential pressure across the filter when the fan is running. If the switch closes during normal operation a dirty filter alarm will be annunciated.

FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618	3	01-03-2018	AS-BUILTS			Project: NJ DOT E&O BUILDING EMS	
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	11-03-2017	ADDED BTU-M AND REVISED AHU SEQ.			AIR HANDLING UNIT SEQUENCE OF OPERATIONS	
		1	07-21-2017	ADDED AHUS, RHCS, AND SCHEDULES			Job No.	#17-04260
ARCHITECTS		0	05-22-2017	BACNET COMMUNICATIONS RISER	A.V.		Page	24 of 33
		NO.	DATE	REVISION	BY			

REHEAT COIL FLOW & WIRING DIAGRAM & SEQUENCE OF OPERATIONS

(TYPICAL OF 184)



SEQUENCE OF OPERATIONS:

- 1 – The Re-heat Coils shall be indexed into the Operational Mode when their associated AHU is enabled.
- 2 – The Discharge Temperature Set-point shall be reset based on the Space Temperature. When the space temperature is 67 Degs F. or below, the discharge air set-point shall be 85 Degs F. When the space temperature is 77 Degs F. or above, the discharge air set-point shall be 55 Deg F.
- 3 – When enabled and the Discharge Temperature is more than 2 deg. F. below the Discharge Temperature Set-point, the Reheat Coil will modulate the HWC Valve to maintain the Discharge Temperature Set-point.

FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618	3	01-03-2018	AS-BUILTS		Project: NJ DOT E&O BUILDING EMS	
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	11-03-2017	ADDED BTU-M AND REVISED AHU SEQ.			REHEAT COIL FLOW & WIRING DIAGRAM & SEQUENCE OF OPERATIONS
		1	07-21-2017	ADDED AHUS, RHCS, AND SCHEDULES			
ARCHITECTS		0	05-22-2017	BACNET COMMUNICATIONS RISER	A.V.		Page 25 of 33
		NO.	DATE	REVISION	BY		

NJ DOT EO Building Reheat Coils										
Label	Associated EQUIPMENT	QTY	Pattern	Equip. GPM	Style	Valve Size	Valve CV Position	Fail Postion	Act Control	Valve Assembly P/N
HC-1-1	AHU-1-B	1	2-WAY	1.2	ZONE TIGHT	0.50	0.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-1-2	AHU-1-B	1	2-WAY	1.7	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-1-3	AHU-1-A	1	2-WAY	0.5	ZONE TIGHT	0.5	0.5	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-1-4	AHU-1-A	1	2-WAY	1.9	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-1-5	AHU-1-A	1	2-WAY	1.2	ZONE TIGHT	0.5	0.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-1-6	AHU-1-A	1	2-WAY	1.3	ZONE TIGHT	0.5	0.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-1-7	AHU-1-A	1	2-WAY	1.3	ZONE TIGHT	0.5	0.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-1-8	AHU-1-A	1	2-WAY	1.1	ZONE TIGHT	0.5	0.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-1-9	AHU-1-A	1	2-WAY	1.2	ZONE TIGHT	0.5	0.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-1-10	AHU-1-A	1	2-WAY	1.8	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-1-11	AHU-1-B	1	2-WAY	2.1	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-1-12	AHU-1-B	1	2-WAY	2.3	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-1-13	AHU-1-B	1	2-WAY	3.6	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-1-14	AHU-1-B	1	2-WAY	4.2	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-1-15	AHU-1-B	1	2-WAY	2.3	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-1-16	AHU-1-B	1	2-WAY	3.1	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-1-17	AHU-1-B	1	2-WAY	4.2	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-1-18	AHU-1-B	1	2-WAY	4.2	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-1-19	AHU-1-B	1	2-WAY	3.9	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-1-20	AHU-1-B	1	2-WAY	2.0	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-1-21	AHU-2-2	1	2-WAY	4.1	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-1-25	AHU-2-2	1	2-WAY	4.1	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-1-26	AHU-2-2	1	2-WAY	7.9	ZONE TIGHT	0.5	4.8	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-1-27	AHU-2-2	1	2-WAY	3.2	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-1-28	AHU-2-2	1	2-WAY	0.8	ZONE TIGHT	0.5	0.5	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-2-1	AHU-2-B	1	2-WAY	1.9	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-2-2	AHU-2-B	1	2-WAY	2.7	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-2-3	AHU-2-A	1	2-WAY	0.7	ZONE TIGHT	0.5	0.5	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-2-4	AHU-2-A	1	2-WAY	2.1	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-2-5	AHU-2-A	1	2-WAY	1.0	ZONE TIGHT	0.5	0.5	OPEN	MODULATING	Z2050Q-J+CQKB24-RL

REHEAT COIL VALVE SCHEDULE PAGE 2

HC-2-6	AHU-2-A	1	2-WAY	1.4	ZONE TIGHT	0.5	0.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-2-7	AHU-2-A	1	2-WAY	1.7	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-2-8	AHU-2-A	1	2-WAY	1.5	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-2-9	AHU-2-A	1	2-WAY	1.4	ZONE TIGHT	0.5	0.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-2-10	AHU-2-B	1	2-WAY	4.5	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-2-11	AHU-2-B	1	2-WAY	3.8	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-2-12	AHU-2-B	1	2-WAY	4.9	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-2-13	AHU-2-B	1	2-WAY	3.7	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-2-14	AHU-2-B	1	2-WAY	3.2	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-2-15	AHU-2-B	1	2-WAY	4.2	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-2-16	AHU-2-B	1	2-WAY	3.7	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-2-17	AHU-2-B	1	2-WAY	4.0	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-2-18	AHU-2-B	1	2-WAY	0.7	ZONE TIGHT	0.5	0.5	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-2-19	AHU-2-B	1	2-WAY	3.8	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-2-20	AHU-2-A	1	2-WAY	3.9	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-2-21	AHU-2-B	1	2-WAY	1.8	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-2-22	AHU-2-B	1	2-WAY	0.8	ZONE TIGHT	0.5	0.5	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-1	AHU-3-B	1	2-WAY	1.3	ZONE TIGHT	0.5	0.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-2	AHU-3-B	1	2-WAY	3.2	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-3	AHU-3-A	1	2-WAY	0.7	ZONE TIGHT	0.5	0.5	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-4	AHU-3-A	1	2-WAY	1.6	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-5	AHU-3-A	1	2-WAY	1.1	ZONE TIGHT	0.5	0.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-6	AHU-3-A	1	2-WAY	2.9	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-7	AHU-3-A	1	2-WAY	1.4	ZONE TIGHT	0.5	0.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-8	AHU-3-A	1	2-WAY	0.9	ZONE TIGHT	0.5	0.5	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-9	AHU-3-A	1	2-WAY	1.9	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-10	AHU-3-A	1	2-WAY	1.9	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-11	AHU-3-B	1	2-WAY	4.8	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-12	AHU-3-B	1	2-WAY	4.9	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-13	AHU-3-B	1	2-WAY	5.3	ZONE TIGHT	0.5	3.0	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-14	AHU-3-B	1	2-WAY	4.0	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-15	AHU-3-B	1	2-WAY	4.3	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-16	AHU-3-B	1	2-WAY	4.3	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-17	AHU-3-B	1	2-WAY	4.0	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-18	AHU-3-B	1	2-WAY	3.3	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-19	AHU-3-B	1	2-WAY	4.0	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-20	AHU-3-B	1	2-WAY	3.0	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-21	AHU-3-C	1	2-WAY	3.5	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-22	AHU-3-C	1	2-WAY	2.9	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL

FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618	3	01-03-2018	AS-BUILTS						Project: NJ DOT E&O BUILDING EMS
		2	11-03-2017	ADDED BTU-M AND REVISED AHU SEQ.						
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	1	07-21-2017	ADDED AHUS, RHCS, AND SCHEDULES						
		0	05-22-2017	BACNET COMMUNICATIONS RISER	A.V.					
ARCHITECTS		NO.	DATE	REVISION	BY					
										Job No. #17-04260 Page 27 of 33

REHEAT COIL VALVE SCHEDULE PAGE 3

HC-3-23	AHU-3-C	1	2-WAY	4.2	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-24	AHU-3-C	1	2-WAY	5.5	ZONE TIGHT	0.5	3.0	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-25	AHU-3-C	1	2-WAY	4.9	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-26	AHU-3-C	1	2-WAY	2.3	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-27	AHU-3-C	1	2-WAY	2.2	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-28	AHU-3-C	1	2-WAY	1.0	ZONE TIGHT	0.5	0.5	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-29	AHU-3-C	1	2-WAY	3.1	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-3-30	AHU-3-C	1	2-WAY	1.4	ZONE TIGHT	0.5	0.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-4-1	AHU-4-B	1	2-WAY	1.3	ZONE TIGHT	0.5	0.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-4-2	AHU-4-B	1	2-WAY	3.4	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-4-3	AHU-4-A	1	2-WAY	0.7	ZONE TIGHT	0.5	0.5	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-4-4	AHU-4-A	1	2-WAY	1.8	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-4-5	AHU-4-A	1	2-WAY	2.7	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-4-6	AHU-4-A	1	2-WAY	2.1	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-4-7	AHU-4-A	1	2-WAY	1.4	ZONE TIGHT	0.5	0.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-4-8	AHU-4-B	1	2-WAY	4.8	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-4-9	AHU-4-B	1	2-WAY	4.9	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-4-10	AHU-4-B	1	2-WAY	5.2	ZONE TIGHT	0.5	3.0	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-4-11	AHU-4-B	1	2-WAY	3.2	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-4-12	AHU-4-B	1	2-WAY	3.2	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-4-13	AHU-4-B	1	2-WAY	3.0	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-4-14	AHU-4-B	1	2-WAY	2.8	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-4-15	AHU-4-B	1	2-WAY	4.5	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-4-16	AHU-4-B	1	2-WAY	1.9	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-4-17	AHU-4-B	1	2-WAY	3.6	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-4-18	AHU-4-B	1	2-WAY	2.8	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-4-19	AHU-4-B	1	2-WAY	3.6	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-4-20	AHU-4-C	1	2-WAY	5.7	ZONE TIGHT	0.5	3.0	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-4-21	AHU-4-C	1	2-WAY	4.9	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-4-22	AHU-4-C	1	2-WAY	2.3	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-4-23	AHU-4-C	1	2-WAY	1.0	ZONE TIGHT	0.5	0.5	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-4-24	AHU-4-C	1	2-WAY	2.5	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-4-25	AHU-4-C	1	2-WAY	2.7	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-4-26	AHU-4-C	1	2-WAY	2.5	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-4-27	AHU-4-C	1	2-WAY	1.3	ZONE TIGHT	0.5	0.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-5-1	AHU-5-B	1	2-WAY	1.3	ZONE TIGHT	0.5	0.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-5-2	AHU-5-B	1	2-WAY	3.9	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL

REHEAT COIL VALVE SCHEDULE PAGE 4

HC-5-3	AHU-5-A	1	2-WAY	0.7	ZONE TIGHT	0.5	0.5	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-5-4	AHU-5-A	1	2-WAY	0.5	ZONE TIGHT	0.5	0.5	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-5-5	AHU-5-A	1	2-WAY	1.8	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-5-6	AHU-5-A	1	2-WAY	1.8	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-5-7	AHU-5-A	1	2-WAY	1.2	ZONE TIGHT	0.5	0.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-5-8	AHU-5-A	1	2-WAY	1.0	ZONE TIGHT	0.5	0.5	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-5-9	AHU-5-A	1	2-WAY	1.3	ZONE TIGHT	0.5	0.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-5-10	AHU-5-B	1	2-WAY	4.8	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-5-11	AHU-5-B	1	2-WAY	4.9	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-5-12	AHU-5-B	1	2-WAY	4.8	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-5-13	AHU-5-B	1	2-WAY	4.2	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-5-14	AHU-5-B	1	2-WAY	1.9	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-5-15	AHU-5-B	1	2-WAY	3.8	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-5-16	AHU-5-B	1	2-WAY	4.2	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-5-17	AHU-5-B	1	2-WAY	3.0	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-5-18	AHU-5-C	1	2-WAY	3.1	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-5-19	AHU-5-C	1	2-WAY	1.9	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-5-20	AHU-5-C	1	2-WAY	2.9	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-5-21	AHU-5-C	1	2-WAY	4.2	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-5-22	AHU-5-C	1	2-WAY	5.7	ZONE TIGHT	0.5	3.0	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-5-23	AHU-5-C	1	2-WAY	4.9	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-5-24	AHU-5-C	1	2-WAY	2.3	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-5-25	AHU-5-C	1	2-WAY	3.5	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-5-26	AHU-5-C	1	2-WAY	1.0	ZONE TIGHT	0.5	0.5	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-5-27	AHU-5-C	1	2-WAY	2.5	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-5-28	AHU-5-C	1	2-WAY	1.3	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-6-1	AHU-6-B	1	2-WAY	1.4	ZONE TIGHT	0.5	0.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-6-2	AHU-6-B	1	2-WAY	4.7	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-6-3	AHU-6-A	1	2-WAY	0.7	ZONE TIGHT	0.5	0.5	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-6-4	AHU-6-A	1	2-WAY	1.0	ZONE TIGHT	0.5	0.5	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-6-5	AHU-6-A	1	2-WAY	1.6	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-6-6	AHU-6-A	1	2-WAY	1.5	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-6-7	AHU-6-A	1	2-WAY	0.8	ZONE TIGHT	0.5	0.5	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-6-8	AHU-6-A	1	2-WAY	1.3	ZONE TIGHT	0.5	0.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-6-9	AHU-6-B	1	2-WAY	4.5	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-6-10	AHU-6-B	1	2-WAY	4.9	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-6-11	AHU-6-B	1	2-WAY	4.8	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-6-12	AHU-6-B	1	2-WAY	4.1	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-6-13	AHU-6-B	1	2-WAY	4.1	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL

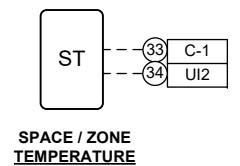
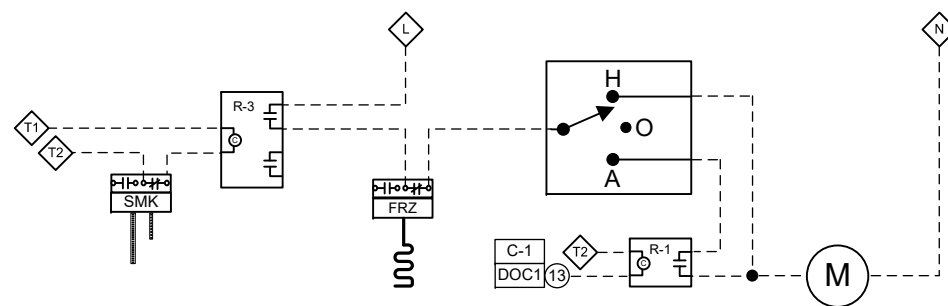
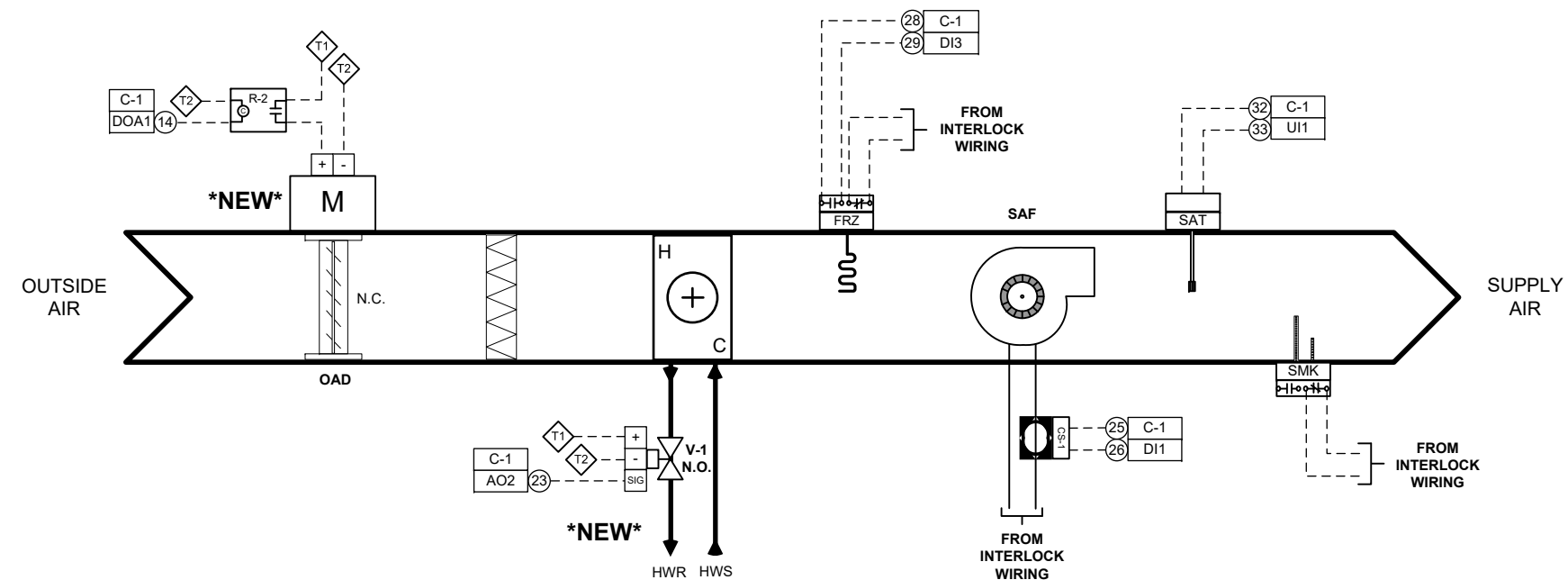
FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618	3	01-03-2018	AS-BUILTS						Project: NJ DOT E&O BUILDING EMS
		2	11-03-2017	ADDED BTU-M AND REVISED AHU SEQ.						
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	1	07-21-2017	ADDED AHUS, RHCS, AND SCHEDULES						
		0	05-22-2017	BACNET COMMUNICATIONS RISER	A.V.					
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REHEAT COIL VALVE SCHEDULE PAGE 5

HC-6-14	AHU-6-B	1	2-WAY	3.4	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-6-15	AHU-6-B	1	2-WAY	3.4	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-6-16	AHU-6-B	1	2-WAY	1.9	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-6-17	AHU-6-C	1	2-WAY	3.7	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-6-18	AHU-6-C	1	2-WAY	3.0	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-6-19	AHU-6-C	1	2-WAY	4.3	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-6-20	AHU-6-C	1	2-WAY	6.8	ZONE TIGHT	0.5	4.8	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-6-21	AHU-6-C	1	2-WAY	5.9	ZONE TIGHT	0.5	3.0	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-6-22	AHU-6-C	1	2-WAY	2.8	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-6-23	AHU-6-C	1	2-WAY	2.7	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-6-24	AHU-6-C	1	2-WAY	1.2	ZONE TIGHT	0.5	0.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-6-25	AHU-6-C	1	2-WAY	3.7	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-6-26	AHU-6-C	1	2-WAY	1.4	ZONE TIGHT	0.5	0.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-7-1	AHU-7-B	1	2-WAY	1.4	ZONE TIGHT	0.5	0.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-7-2	AHU-7-B	1	2-WAY	4.7	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-7-3	AHU-7-A	1	2-WAY	0.8	ZONE TIGHT	0.5	0.5	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-7-4	AHU-7-A	1	2-WAY	0.8	ZONE TIGHT	0.5	0.5	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-7-5	AHU-7-A	1	2-WAY	1.7	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-7-6	AHU-7-A	1	2-WAY	1.7	ZONE TIGHT	0.5	1.2	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-7-7	AHU-7-A	1	2-WAY	0.8	ZONE TIGHT	0.5	0.5	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-7-8	AHU-7-A	1	2-WAY	1.3	ZONE TIGHT	0.5	0.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-7-9	AHU-7-B	1	2-WAY	4.9	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-7-10	AHU-7-B	1	2-WAY	4.9	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-7-11	AHU-7-B	1	2-WAY	5.1	ZONE TIGHT	0.5	3.0	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-7-12	AHU-7-B	1	2-WAY	4.4	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-7-13	AHU-7-B	1	2-WAY	4.4	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-7-14	AHU-7-B	1	2-WAY	3.7	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-7-15	AHU-7-B	1	2-WAY	3.1	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-7-16	AHU-7-C	1	2-WAY	4.5	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-7-17	AHU-7-C	1	2-WAY	3.2	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-7-18	AHU-7-C	1	2-WAY	4.8	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-7-19	AHU-7-C	1	2-WAY	6.9	ZONE TIGHT	0.5	4.8	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-7-20	AHU-7-C	1	2-WAY	6.0	ZONE TIGHT	0.5	3.0	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-7-21	AHU-7-C	1	2-WAY	2.8	ZONE TIGHT	0.5	1.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-7-22	AHU-7-C	1	2-WAY	4.0	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-7-23	AHU-7-C	1	2-WAY	1.3	ZONE TIGHT	0.5	0.7	OPEN	MODULATING	Z2050Q-J+CQKB24-RL
HC-7-24	AHU-7-C	1	2-WAY	3.7	ZONE TIGHT	0.5	2.4	OPEN	MODULATING	Z2050Q-J+CQKB24-RL

FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618	3	01-03-2018	AS-BUILTS						Project: NJ DOT E&O BUILDING EMS
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	11-03-2017	ADDED BTU-M AND REVISED AHU SEQ.						REHEAT COIL VALVE SCHEDULE PAGE 5
		1	07-21-2017	ADDED AHUS, RHCS, AND SCHEDULES						
ARCHITECTS		0	05-22-2017	BACNET COMMUNICATIONS RISER	A.V.					Job No. #17-04260 Page 30 of 33
		NO.	DATE	REVISION	BY					

HEATING & VENTILATING UNIT (HV-2-1) FLOW DIAGRAM

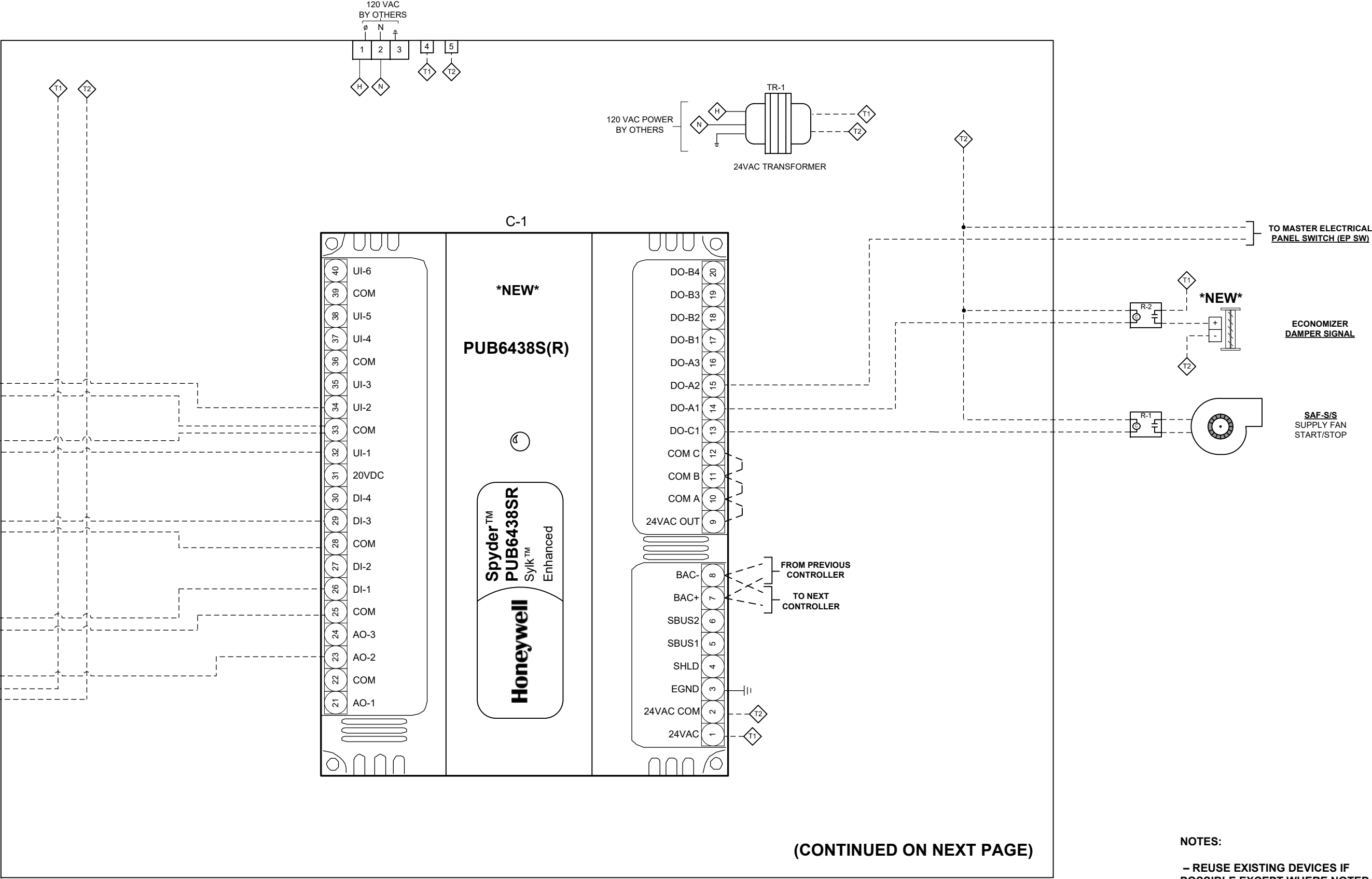


NOTES:

- REUSE EXISTING DEVICES IF POSSIBLE EXCEPT WHERE NOTED

FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618	3	01-03-2018	AS-BUILTS			Project: NJ DOT E&O BUILDING EMS			
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	11-03-2017	ADDED BTU-M AND REVISED AHU SEQ.				HEATING & VENTILATING UNIT (HV-2-1) FLOW DIAGRAM		
		1	07-21-2017	ADDED AHUS, RHCS, AND SCHEDULES						
		0	05-22-2017	BACNET COMMUNICATIONS RISER	A.V.					
ARCHITECTS		NO.	DATE	REVISION	BY					
							Job No.	#17-04260	Page	31 of 33

HEATING & VENTILATION UNIT (HV-2-1) WIRING SCHEMATIC



FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618	3	01-03-2018	AS-BUILTS			Project: NJ DOT E&O BUILDING EMS
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	11-03-2017	ADDED BTU-M AND REVISED AHU SEQ.			HEATING & VENTILATION UNIT (HV-2-1) WIRING SCHEMATIC
		1	07-21-2017	ADDED AHUS, RHCS, AND SCHEDULES			Job No. #17-04260
ARCHITECTS		0	05-22-2017	BACNET COMMUNICATIONS RISER	A.V.		Page 32 of 33
		NO.	DATE	REVISION	BY		

HEATING & VENTILATING UNIT SEQUENCE OF OPERATIONS

A. BUILDING AUTOMATION SYSTEM INTERFACE:

1. The Energy Management System (BMS) will send the controller Occupied, Unoccupied, Optimal Start, and Timed Override commands. The BMS may also send a space temperature and/or space temperature set point. If the BMS is not present, or communication is lost with the BMS, the controller will operate using its local schedule and set points.

B. OCCUPIED (TEMPERATURE CONTROL):

1. During Occupied periods the Outdoor Air Damper shall open, the supply fan and return fan will run continuously, and the hydronic heating valve will modulate to maintain the supply air temperature set point. The supply air temperature set point shall be reset based on the space temperature.

C. MORNING WARM-UP:

1. During optimal start, if the space temperature is below the Occupied heating set point, a morning warm-up sequence will be activated. The supply fan will start, the hot water valve will open and the outside air damper will remain closed. Mode will terminate when the space temperature reaches the Occupied heating set point or the occupied time period has started.

D. FREEZE PROTECTION:

1. A hardwired, low limit temperature switch is electrically interlocked with the motor starter. If the low limit temperature switch is tripped (38°F adj.), the outside air damper will close, all valves will open to 100% (adjust per climate), and an alarm will be annunciated. A manual reset of the low limit temperature switch will be required to restart the fan.

FACILITY	NJ DEPARTMENT OF TRANSPORTATION, EWING TOWNSHIP, NJ 08618	3	01-03-2018	AS-BUILTS				Project: NJ DOT E&O BUILDING EMS	
MECHANICAL	DCO ENERGY, LLC, 5429 HARDING HIGHWAY, MAYS LANDING, NJ 08330	2	11-03-2017	ADDED BTU-M AND REVISED AHU SEQ.				HEATING & VENTILATING UNIT SEQUENCE OF OPERATIONS	
		1	07-21-2017	ADDED AHUS, RHCS, AND SCHEDULES					
ARCHITECTS		0	05-22-2017	BACNET COMMUNICATIONS RISER	A.V.				
		NO.	DATE	REVISION	BY			Job No.	#17-04260
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PG	QTY	PRODUCT #	MFGR.	DESCRIPTION
PG 3 RISER	2	WEB-8000-CSE	Honeywell	Web Controller / JACE
PG 3 RISER	4	NPB-8000-2X-485	Honeywell	RS-485 Expansion Module for Web-8000
PG 3 RISER	2	DEVICE-___	Honeywell	JACE License Up to ___ Devices
PG 4 HWS	1	A/20K-O	ACI	Outside Air Temp Sensor
PG 4 HWS	2	A/20K-I	ACI	Immersion + ½ Well 20K sensor
PG 4 HWS	2	PW20G	Senva	Differential Pressure Transmitter
PG 4 HWS	2	PFT-IAN-B111-S	Dwyer	Paddlewheel Flow Sensor (4-20MA)
PG 4 HWS	2	C-2200	Senva	Current Transducer
PG 4 HWS	1	VBN3G1PX5000	Honeywell	3-way Brass Ball Valve + Actuator
PG 6 HWS	1	PUB6438SR	Honeywell	Spyder BACnet Prog. Controller
PG 6 HWS	1	TR75VA001	FD, Inc. (RIB)	120VAC/24VAC Transformer
PG 6 HWS	1	BPS-015	Dwyer	24VDC Power Supply, 24VAC Input
PG 6 HWS	3	RIBU1C	FD, Inc. (RIB)	Relay SPDT
PG 6 HWS	1	SCE-24N2006LP	Saginaw	Enviroline Series Control Panel
PG 6 HWS	1	SCE-24N20MP	Saginaw	Subpanel
PG 8 BTUM	1	Series 3050	Badger	BTU Monitor for Hydronic Systems
PG 9to13 AHU	38	MS7510A2008	Honeywell	Damper Actuator
PG 9to13 AHU	1	VRN2DPPX6100	Honeywell	Pressure Independent Valve + Actuator
PG 9to13 AHU	8	VRN2DQPX6100	Honeywell	Pressure Independent Valve + Actuator
PG 9to13 AHU	5	VRN2DRPX6100	Honeywell	Pressure Independent Valve + Actuator
PG 9to13 AHU	3	VRN2DSPX6100	Honeywell	Pressure Independent Valve + Actuator
PG 9to13 AHU	2	VRN2ETPX6100	Honeywell	Pressure Independent Valve + Actuator
PG 9to13 AHU	4	VRN2ETPX5000	Honeywell	Pressure Independent Valve + Actuator
PG 9to13 AHU	3	VRN2EUPX5000	Honeywell	Pressure Independent Valve + Actuator
PG 9to13 AHU	2	VRN2E1PX5000	Honeywell	Pressure Independent Valve + Actuator
PG 9to13 AHU	1	VRN2E2PX5000	Honeywell	Pressure Independent Valve + Actuator
PG 9to13 AHU	1	VRN2E3PX5000	Honeywell	Pressure Independent Valve + Actuator
PG 9to13 AHU	2	VRN2E4PX5000	Honeywell	Pressure Independent Valve + Actuator
PG 9to13 AHU	2	VRN2E5PX5000	Honeywell	Pressure Independent Valve + Actuator
PG 9to13 AHU	1	VRN2G7PX5000	Honeywell	Pressure Independent Valve + Actuator
PG 9to13 AHU	2	VRN2G9PX5000	Honeywell	Pressure Independent Valve + Actuator
PG 9to13 AHU	1	VRN2JV4SMB	Honeywell	Pressure Independent Valve + Actuator
PG 9to13 AHU	38	PUB6438SR	Honeywell	Spyder BACnet Prog. Controller

PROJECT: NJDOT - E&O BLDG

ID NUMBER: 17-04260

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PG	QTY	PRODUCT #	MFGR.	DESCRIPTION
PG 9to13 AHU	38	SIO6042	Honeywell	Sylk I/O Controller Expansion
PG 14to21 AHU	6	MS7510A2008	Honeywell	Damper Actuator
PG 14to21 AHU	1	VRN2DRPX6100	Honeywell	Pressure Independent Valve + Actuator
PG 14to21 AHU	1	VRN2DSPX5000	Honeywell	Pressure Independent Valve + Actuator
PG 14to21 AHU	1	VRN2E3PX5000	Honeywell	Pressure Independent Valve + Actuator
PG 14to21 AHU	1	VRN2JW4SMB	Honeywell	Pressure Independent Valve + Actuator
PG 14to21 AHU	3	PUB6438SR	Honeywell	Spyder BACnet Prog. Controller
PG 14to21 AHU	2	SIO6042	Honeywell	Sylk I/O Controller Expansion
PG 25 RHC	184	A/20K-R2	Honeywell	Space Temperature Sensor
PG 25 RHC	184	A/20K-D-6"-PB	Honeywell	Discharge Temperature Sensor
PG 25 RHC	184	Z2050Q-J + CQKB24-RL	Honeywell	Zone Tight Valve + Actuator
PG 25 RHC	184	PUB4024S	Honeywell	Spyder BACnet Prog. Controller
PG 31 HV	1	MS8110A1008	Honeywell	Damper Actuator
PG 31 HV	1	VRN2E1PX6100	Honeywell	Pressure Independent Valve + Actuator
PG 32 HV	1	PUB6438SR	Honeywell	Sylk I/O Controller Expansion



THIOKOL COMPLEX



NJDOT THIOKOL COMPLEX BUILDINGS (AS-BUILTS)

ENERGY SAVINGS IMPROVEMENT PROJECT

BUILDING AUTOMATION SYSTEM

SHEET #	CONTENTS	REVISION
1	TITLE PAGE	
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4	HOT WATER SYSTEM FLOW DIAGRAM	
5	HOT WATER SYSTEM C-1 WIRING SCHEMATIC	
6	HOT WATER SYSTEM C-2 WIRING SCHEMATIC	
7	HOT WATER SYSTEM C-3 WIRING SCHEMATIC	
8	HOT WATER SYSTEM SEQUENCE OF OPERATIONS	
9	POWER AND GAS MONITORING FLOW DIAGRAM	

LEGEND & SYMBOLS

GENERAL NOTES

1. ALL POWER WIRING 120 VAC AND ABOVE BY ELECTRICAL CONTRACTOR.

TEMPERATURE CONTROL LEGEND:

	MOUNTED ON PANEL FACE		CONTROL VALVE, 2-WAY
	MOUNTED INSIDE PANEL		CONTROL VALVE, 3-WAY
	CONTROL TUBE #3		PARALLEL BLADED DAMPER
	PNEUMATIC TUBING		OPPOSED BLADED DAMPER
	WIRING		SIGNAL LINE INSIDE PANEL
	TERMINAL BLOCK #6		
	SOLENOID VALVE		

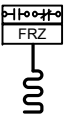
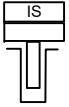
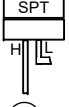
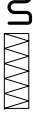
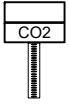
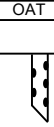
ABBREVIATIONS:

AFMS- AIR FLOW MEASURING STATION	OA -OUTSIDE AIR
C- COMMON PORT	OL'S- MOTOR STARTER OVERLOADS
CCP- CENTRAL CONTROL PANEL	PC- PRESSURE CONTROLLER
CR- CONTROL RELAY	PE- PRESSURE TOGGLE SWITCH
CS- CURRENT SWITCH	PI- PRESSURE INDICATOR
DA-DAMPER ACTUATOR	PL- PILOT LIGHT
DPRO- DAMPER OUTPUT	PR- PNEUMATIC RELAY
DPRS- DAMPER STATUS	PT- PRESSURE TRANSMITTER
DPS- DIFFERENTIAL PRESSURE SWITCH	RC- RECEIVER CONTROLLER
DPT- DIFFERENTIAL PRESSURE TRANS	RR- REVERSING RELAY
EA- EXHAUST AIR	RT- ROOM THERMOSTAT
ES- END SWITCH, POSITION SWITCH	S- SWITCH
FS- FLOW SWITCH	SD- SMOKE DETECTOR
FSD- FIRE & SMOKE DAMPER	S/W- SUMMER/ WINTER SIGNAL
H- HUMIDISTAT	T- THERMOSTAT
HC- MOTOR STARTER HOLDING COIL	TS- TEMPERATURE SENSOR
HI- HUMIDITY INDICATOR	TC- TIME CLOCK
HL- HIGH LIMIT HUMIDISTAT	TDR- TIME DELAY RELAY
HS- HIGH SIGNAL SELECTOR	THL- TEMPERATURE HIGH LIMIT THERMOSTAT
HT- HUMIDITY TRANSMITTER	TI- TEMPERATURE INDICATOR
LCP- LOCAL CONTROL PANEL	TLL- TEMPERATURE LOW LIMIT THERMOSTAT
LS- LOW SIGNAL SELECTOR	TR- TRANSDUCER
MA- MIXED AIR	TT- TEMPERATURE TRANSMITTER
MOD-MOTER OPERATED DAMPER	TX- TRANSFORMER
NC- NORMALLY CLOSED	V- VALVE
NCP- NETWORK CONTROL PANEL	WB- WET BULB
NO- NORMALLY OPEN	WU- WARM-UP SIGNAL

WIRING LEGEND

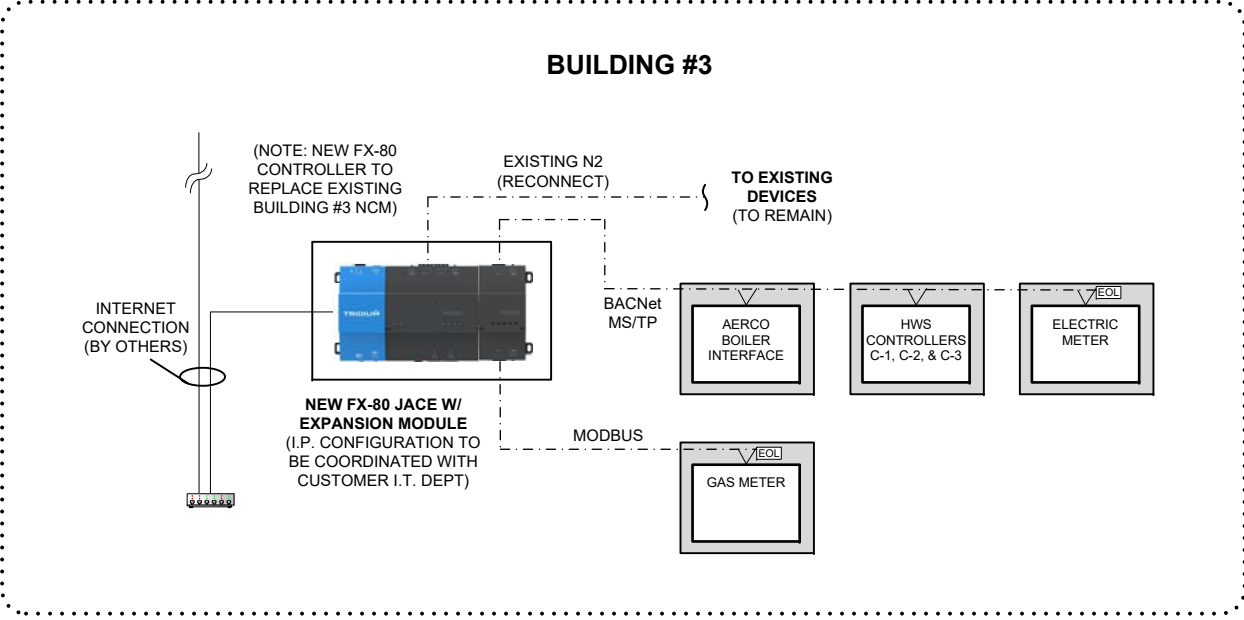
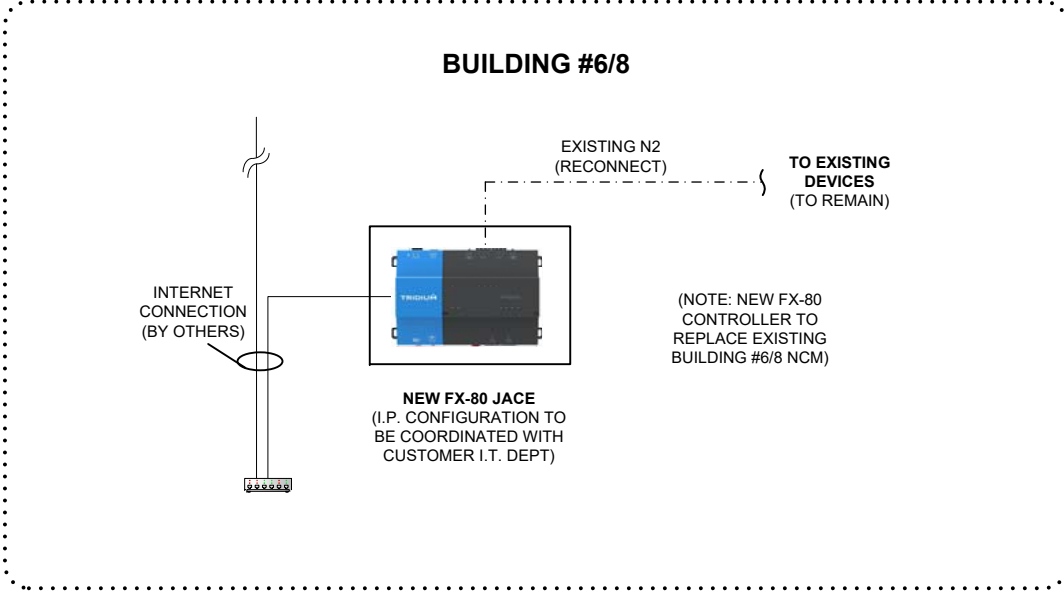
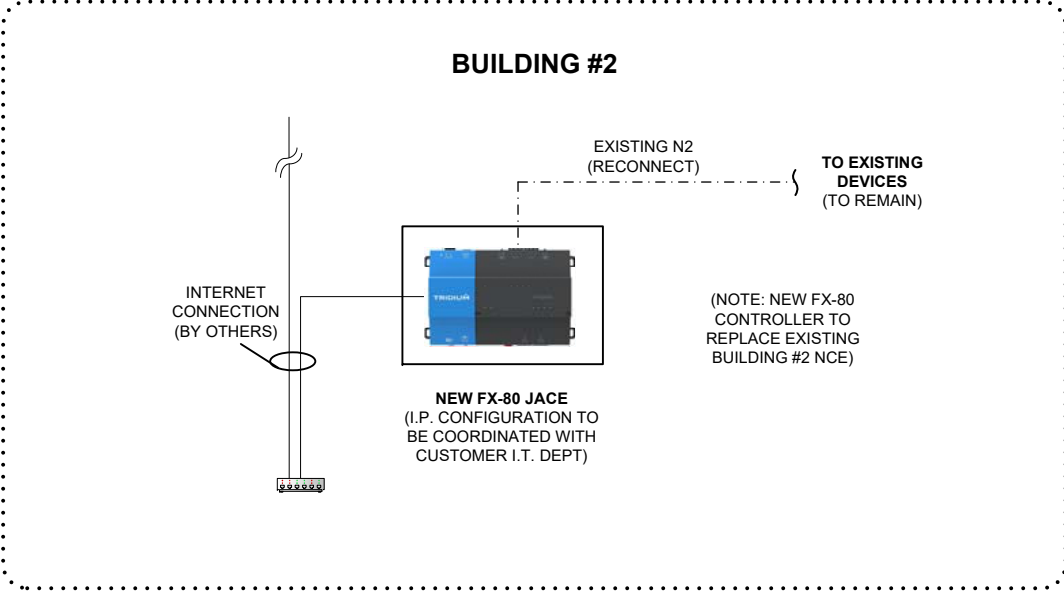
	Low Voltage, 18 AWG, Copper Wire
	Low Voltage Communication Wiring 22/2 AWG, CL2P, Shielded Copper Wire, Low Capacitance
	Line Voltage, THHN Field Wiring

HVAC SYSTEM LEGEND:

	MOTOR OPERATED DAMPER		FREEZESTAT (D.P. CONTACT)
	PREHEAT COIL		DUCT MOUNTED TEMPERATURE SENSOR
	COOLING COIL		IMMERSION TYPE TEMPERATURE SENSOR
	REHEAT COIL		DUCT MOUNTED SMOKE DETECTOR
	HEATING COIL		STATIC PRESSURE TRANSMITTER
	DIRECT EXPANSION COIL		STEAM PRESSURE SENSOR
	FAN		DUCT MOUNTED HUMIDITY SENSOR
	MANUAL VALVE		SPACE TEMPERATURE
	ZONE CO2 SENSOR		OUTSIDE AIR CO2 SENSOR
	WATER FLOW METER		AIR FLOW MEASURING STATION
	AVERAGING TYPE TEMPERATURE SENSOR		CONTROL RELAY
	FILTER		CURRENT SENSOR
	FIRE & SMOKE DAMPER (BY OTHERS)		CO2 SENSOR
	OUTSIDE AIR TEMPERATURE SENSOR		

FACILITY	NJDOT Thiokol Complex Buildings 1035 Parkway Ave, Ewing, NJ 08625	4	12-26-2017	AS-BUILTS	A.V.	[REDACTED]	[REDACTED]	Project: NJ DOT THIOKOL COMPLEX BUILDINGS	
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	3	09-12-2017	INCLUDED HW SYSTEM DIAGRAMS	A.V.			LEGEND & SYMBOLS	
		2	06-28-2017	COMBINED BLDGS 2,3,4, & 9	A.V.				
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	05-22-2017	BACNET COMMUNICATIONS RISER				Job No. #17-04260	
		NO.	DATE	REVISION	BY			Page 2 of 9	

NETWORK RISER

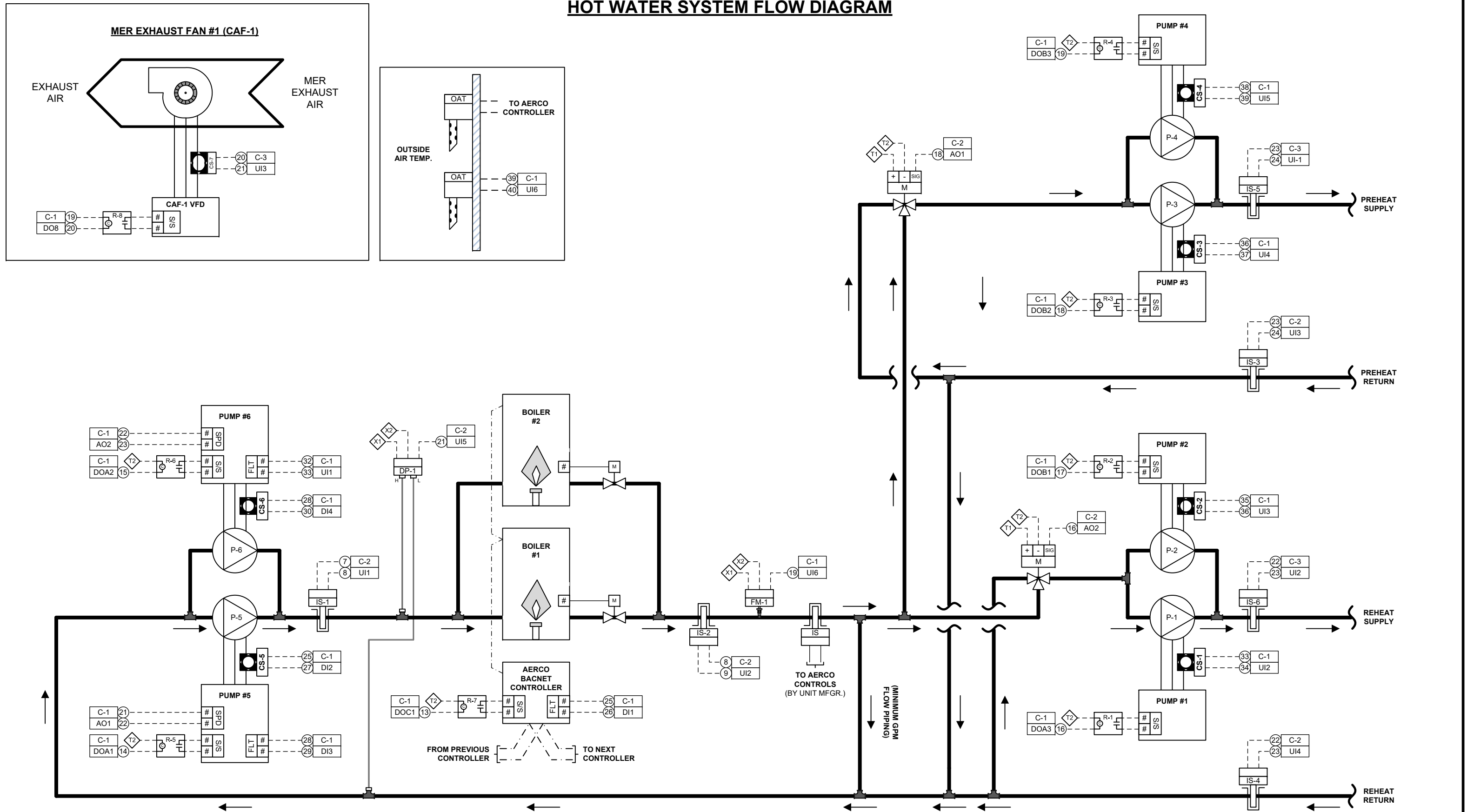


NOTE: 1) 120VAC POWER TO ALL CONTROL PANELS BY OTHERS

FACILITY	NJDOT Thiokol Complex Buildings 1035 Parkway Ave, Ewing, NJ 08625	4	12-26-2017	AS-BUILTS	A.V.
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	3	09-12-2017	INCLUDED HW SYSTEM DIAGRAMS	A.V.
		2	06-28-2017	COMBINED BLDGS 2,3,4, & 9	A.V.
		0	05-22-2017	BACNET COMMUNICATIONS RISER	
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	NO.	DATE	REVISION	BY

	Project: NJ DOT THIOKOL COMPLEX BUILDINGS	
	NETWORK RISER	
	Job No. #17-04260	Page 3 of 9

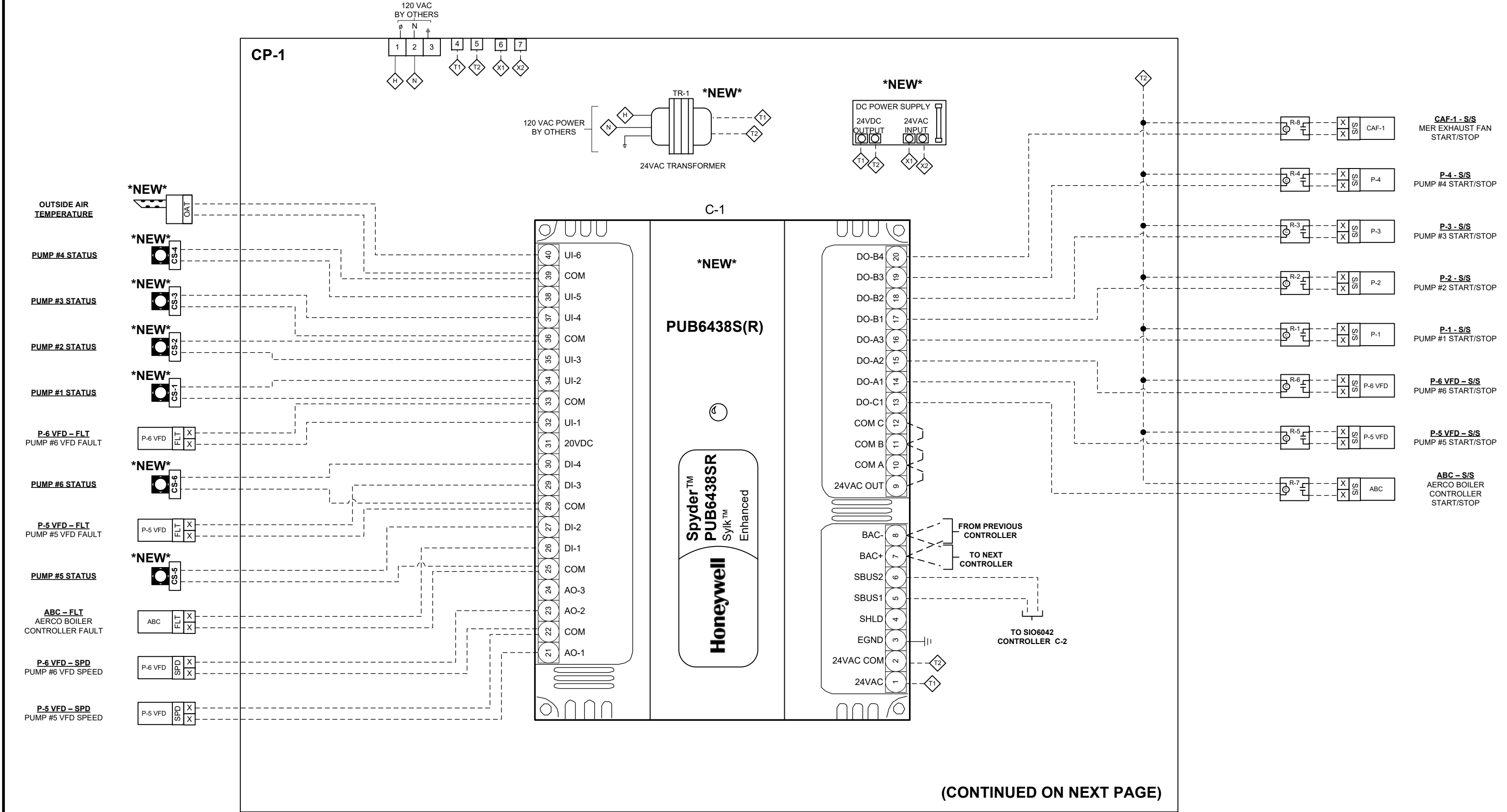
HOT WATER SYSTEM FLOW DIAGRAM



NOTES: SEE VALVE SCHEDULE FOR VALVE DATA

FACILITY	NJDOT Thiokol Complex Buildings 1035 Parkway Ave, Ewing, NJ 08625	4	12-26-2017	AS-BUILTS	A.V.				Project: NJ DOT THIOKOL COMPLEX BUILDINGS	
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	3	09-12-2017	INCLUDED HW SYSTEM DIAGRAMS	A.V.				HOT WATER SYSTEM FLOW DIAGRAM	
		2	06-28-2017	COMBINED BLDGS 2,3,4, & 9	A.V.					
		0	05-22-2017	BACNET COMMUNICATIONS RISER						
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	NO.	DATE	REVISION	BY				Job No.	#17-04260

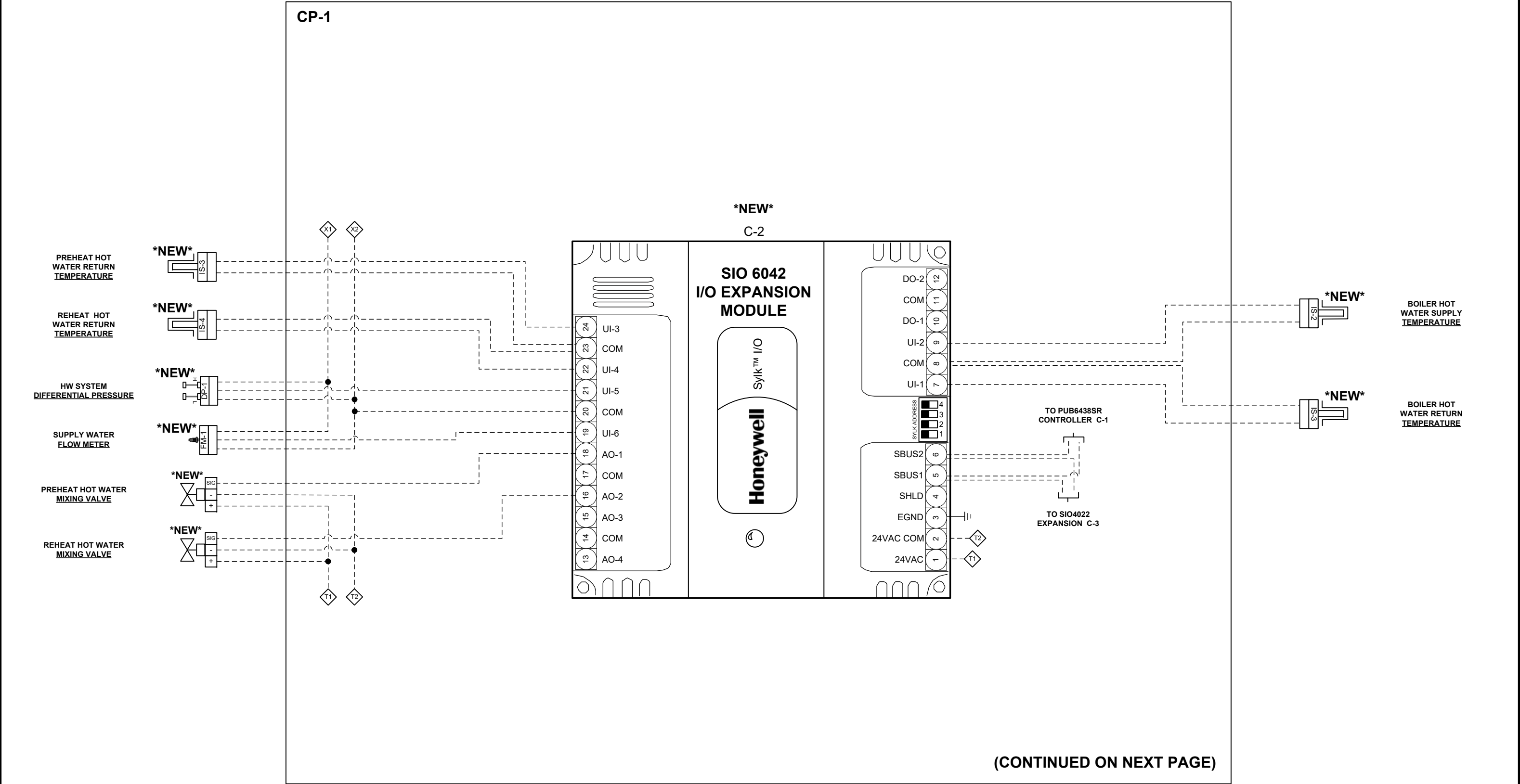
HOT WATER SYSTEM C-1 WIRING SCHEMATIC



NOTES: SEE VALVE SCHEDULE FOR VALVE DATA

FACILITY	NJDOT Thiokol Complex Buildings 1035 Parkway Ave, Ewing, NJ 08625	4	12-26-2017	AS-BUILTS	A.V.		Project: NJ DOT THIOKOL COMPLEX BUILDINGS	
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	3	09-12-2017	INCLUDED HW SYSTEM DIAGRAMS	A.V.			
		2	06-28-2017	COMBINED BLDGS 2,3,4, & 9	A.V.			
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	05-22-2017	BACNET COMMUNICATIONS RISER				
		NO.	DATE	REVISION	BY	Job No. #17-04260		
						Page 5 of 9		

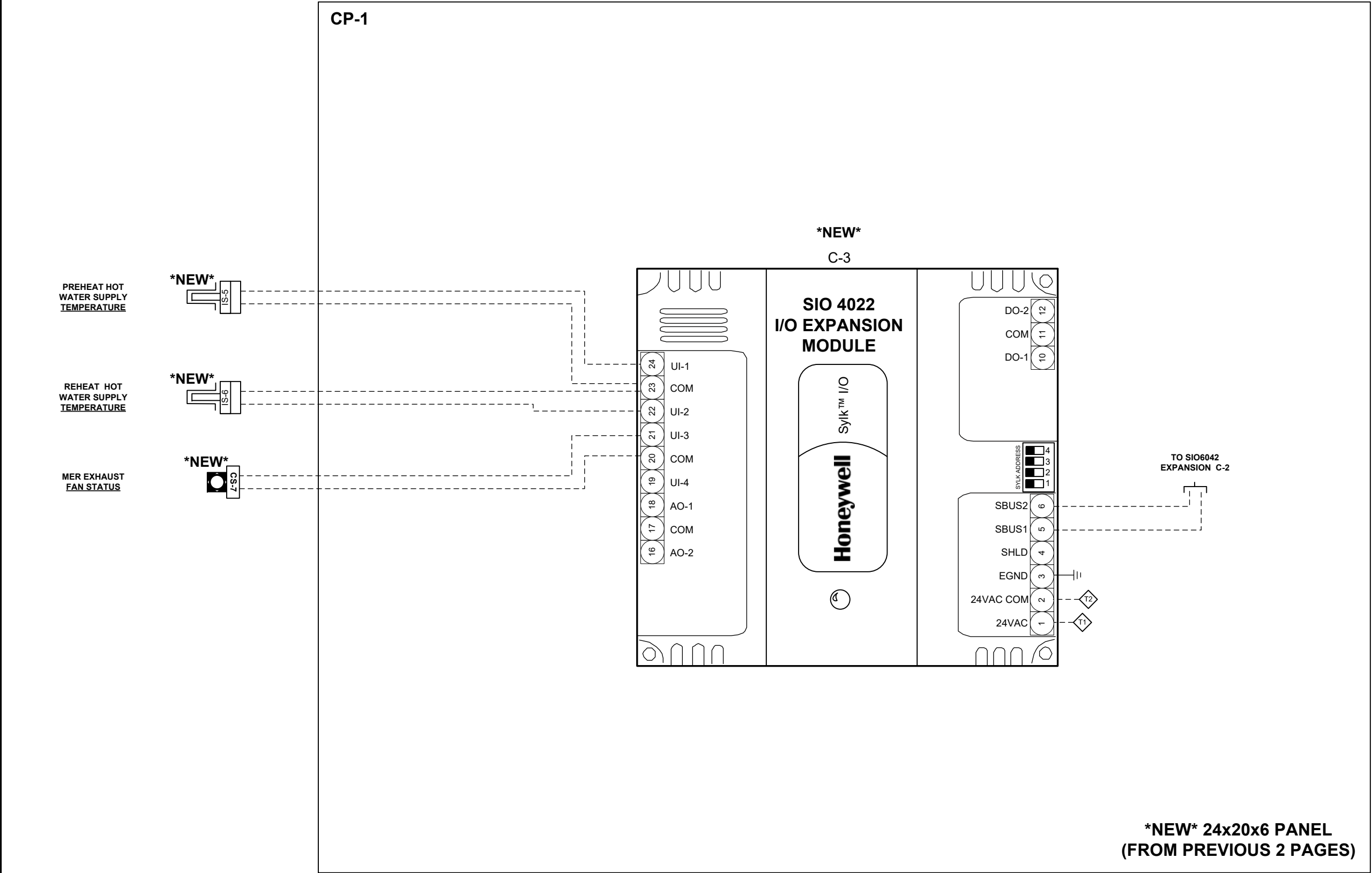
HOT WATER SYSTEM C-2 WIRING SCHEMATIC



NOTES:

FACILITY	NJDOT Thiokol Complex Buildings 1035 Parkway Ave, Ewing, NJ 08625	4	12-26-2017	AS-BUILTS	A.V.	[Redacted]	[Redacted]	Project: NJ DOT THIOKOL COMPLEX BUILDINGS	
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	3	09-12-2017	INCLUDED HW SYSTEM DIAGRAMS	A.V.			HOT WATER SYSTEM C-2 WIRING SCHEMATIC	
		2	06-28-2017	COMBINED BLDGS 2,3,4, & 9	A.V.				
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	05-22-2017	BACNET COMMUNICATIONS RISER				Job No. #17-04260	Page 6 of 9
		NO.	DATE	REVISION	BY				

HOT WATER SYSTEM C-3 WIRING SCHEMATIC



NOTES:

FACILITY	NJDOT Thiokol Complex Buildings 1035 Parkway Ave, Ewing, NJ 08625	4	12-26-2017	AS-BUILTS	A.V.				Project: NJ DOT THIOKOL COMPLEX BUILDINGS	
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	3	09-12-2017	INCLUDED HW SYSTEM DIAGRAMS	A.V.				HOT WATER SYSTEM C-3 WIRING SCHEMATIC	
		2	06-28-2017	COMBINED BLDGS 2,3,4, & 9	A.V.					
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	05-22-2017	BACNET COMMUNICATIONS RISER					Job No. #17-04260Page 7 of 9	
		NO.	DATE	REVISION	BY					

HOT WATER SYSTEM SEQUENCE OF OPERATIONS

HW SYSTEM ENABLE:

- 1 – The hot water system shall be enabled whenever the outside air temperature is below 58 Deg F. (adj.)
- 2 - The hot water system shall be disabled whenever the outside air temperature is above 59 Deg F. (adj.)

OUTSIDE AIR TEMP/HW SUPPLY SETPOINT RESET:

- 1 – When the outside air temperature is 60 Deg F. or above the hot water supply set-point shall be 120 Deg F.
- 2 - When the outside air temperature is 30 Deg F. or below the hot water supply set-point shall be 180 Deg F.

INITIAL START-UP: HOT WATER PUMPS

- 1 – When the hot water system is enabled by the BMS, the lead hot water pump for each riser shall start.
- 2 – If the lead pump fails to start after 30 seconds as sensed by its respective current sensor then an alarm shall be generated.
- 3 – If the lead pump is in alarm then the lag pump shall start.
- 4 – The main system pump shall slowly ramp up to maintain the hot water system differential pressure set-point of 20 PSID
- 5 – Once hot water flow has been established, enable the boilers.

BOILER SEQUENCE:

- 1 – The boilers shall sequence themselves via their own factory provided controls and stage themselves accordingly in order to maintain the hot water set-point.
- 2 – The BMS shall reset the hot water supply set-point based on outside air temperature and monitor the boiler status and alarm conditions.

PUMP SEQUENCE:

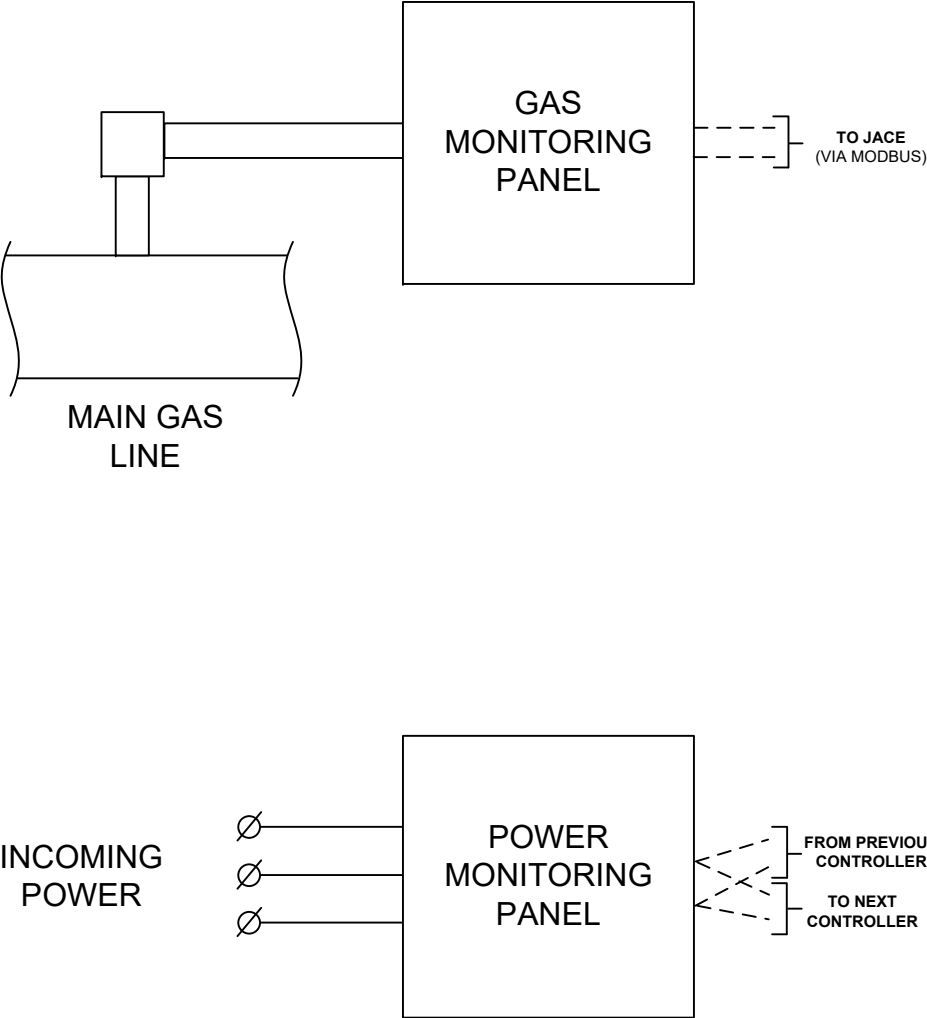
- 1 – The pump VFD’s shall speed up and down it’s associated hot water pump as needed in order to maintain the hot water system differential pressure set-point for each pump set’s respective riser.

LEAD/LAG EQUIPMENT ROTATION:

- 1 – The BMS will rotate the equipment lead/lag schedule on a weekly basis in order to equalize equipment runtime.

FACILITY	NJDOT Thiokol Complex Buildings 1035 Parkway Ave, Ewing, NJ 08625	4	12-26-2017	AS-BUILTS	A.V.			Project: NJ DOT THIOKOL COMPLEX BUILDINGS	
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	3	09-12-2017	INCLUDED HW SYSTEM DIAGRAMS	A.V.			HOT WATER SYSTEM SEQUENCE OF OPERATIONS	
		2	06-28-2017	COMBINED BLDGS 2,3,4, & 9	A.V.				
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	05-22-2017	BACNET COMMUNICATIONS RISER				Job No.	#17-04260
		NO.	DATE	REVISION	BY				
						Page		8 of 9	

POWER AND GAS MONITORING FLOW DIAGRAM



FACILITY	NJDOT Thiokol Complex Buildings 1035 Parkway Ave, Ewing, NJ 08625	4	12-26-2017	AS-BUILTS	A.V.		Project: NJ DOT THIOKOL COMPLEX BUILDINGS	
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	3	09-12-2017	INCLUDED HW SYSTEM DIAGRAMS	A.V.		POWER AND GAS MONITORING FLOW DIAGRAM	
		2	06-28-2017	COMBINED BLDGS 2,3,4, & 9	A.V.			
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	05-22-2017	BACNET COMMUNICATIONS RISER			Job No. #17-04260	Page 9 of 9
		NO.	DATE	REVISION	BY			

PROJECT: NJDOT - THIOKOL BUILDINGS

JOB ID NUMBER: 17-04260

PAGE 1 OF 1

PAGE	SHIP	QTY	PRODUCT #	MFGR.	DESCRIPTION
PG 3 RISER		3	FX-SC8BASE-0	J.C.I.	FX-80 Web Controller / JACE
PG 3 RISER		1	FX-SC8XD485-0	J.C.I.	Dual Port RS-485 Expansion Module
PG 4+5 HWS		1	A/20K-O	ACI	Outside Air Temp Sensor
PG 4+6+7 HWS		6	A/20K-I	ACI	Immersion + ½ Well 20K sensor
PG 4+6 HWS		1	PW20G	Senva	Differential Pressure Transmitter
PG 4+6 HWS		1	PFT-IAN-B111-S	Dwyer	Paddlewheel Flow Sensor (4-20MA)
PG 4+5+7 HWS		7	C-2200	Senva	Current Transducer
PG 4+5 HWS		8	RIBU1C	FD, Inc. (RIB)	120 Vac / 10-30 Vac/dc Relay SPDT
PG 4+6 HWS		1	VBF3L41S0B + MN7234A2008	Honeywell	6" Cv=346 3-way Valve + Modulating Actuator
PG 4+6 HWS		1	VBF3JU1S0B + MN7510A2001	Honeywell	4" Cv=152 3-way Valve + Modulating Actuator
PG 5 HWS		1	PUB6438SR	Honeywell	Spyder BACnet Programmable Controller
PG 5 HWS		1	TR75VA001	FD, Inc. (RIB)	120VAC/24VAC Transformer
PG 5 HWS		1	BPS-015	Dwyer	24VDC Power Supply, 24VAC Input
PG 6 HWS		1	SIO6042	Honeywell	Sylk I/O Controller Expansion Module
PG 7 HWS		1	SIO4022	Honeywell	Sylk I/O Controller Expansion Module
PG 5-7 HWS		1	SCE-24N2006LP	Saginaw	Enviroline Series Control Panel
PG 5-7 HWS		1	SCE-24N20MP	Saginaw	Subpanel for Enviroline Panel
PG 9 GAS/PWR		1	PS3037-S-N	Dent Inst.	1-pt. Rev. Grade Power Meter
PG 9 GAS/PWR		1	CT-R16-A4-U	Dent Inst.	Flexible Current Transformer
PG 9 GAS/PWR		1	620S-BT-L06-M1- EN2-V4-NR-9-MB	Sierra Inst.	BoilerTrak Immersible Thermal Gas Mass Flow Meter



FERNWOOD COMPLEX



NJ DOT FERNWOOD GARAGE BUILDINGS 1&1A (AS-BUILTS)

ENERGY SAVINGS IMPROVEMENT PROJECT

BUILDING AUTOMATION SYSTEM

SHEET NUMBER	CONTENTS	REVISION
1	TITLE PAGE	
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3	NETWORK RISER	
4	MAKE-UP AIR UNIT (MAU-1,2,3,&1A) FLOW DIARAM	
5	MAKE-UP AIR UNIT (MAU-1,2,3,&1A) WIRING SCHEMATIC	
6	EXHAUST FAN CONTROLLER (1&1A) WIRING SCHEMATIC	
7	MAU & EXHAUST FAN SEQUENCE OF OPERATIONS	
8	AIR HANDLING UNIT (AHU-1 & CU-1) FLOW DIAGRAM	
9	AIR HANDLING UNIT (AHU-1 & CU-1) WIRING SCHEMATIC	
10	AIR HANDLING UNIT SEQUENCE OF OPERATIONS	
11	GAS UNIT HEATER FLOW & WIRING DIAGRAM	
12	POWER AND GAS MONITORING FLOW DIAGRAM	

LEGEND & SYMBOLS

GENERAL NOTES

1. ALL POWER WIRING 120 VAC AND ABOVE BY ELECTRICAL CONTRACTOR.

TEMPERATURE CONTROL LEGEND:

 MOUNTED ON PANEL FACE

 MOUNTED INSIDE PANEL

 CONTROL TUBE #3

 PNEUMATIC TUBING

 WIRING

 TERMINAL BLOCK #6

 SOLENOID VALVE

 CONTROL VALVE, 2-WAY

 CONTROL VALVE, 3-WAY

 PARALLEL BLADED DAMPER

 OPPOSED BLADED DAMPER

 SIGNAL LINE INSIDE PANEL

ABBREVIATIONS:

AFMS- AIR FLOW MEASURING STATION

C- COMMON PORT

CCP- CENTRAL CONTROL PANEL

CR- CONTROL RELAY

CS- CURRENT SWITCH

DA-DAMPER ACTUATOR

DPRO- DAMPER OUTPUT

DPRS- DAMPER STATUS

DPS- DIFFERENTIAL PRESSURE SWITCH

DPT- DIFFERENTIAL PRESSURE TRANS

EA- EXHAUST AIR

ES- END SWITCH, POSITION SWITCH

FS- FLOW SWITCH

FSD- FIRE & SMOKE DAMPER

H- HUMIDISTAT

HC- MOTOR STARTER HOLDING COIL

HI- HUMIDITY INDICATOR

HL- HIGH LIMIT HUMIDISTAT

HS- HIGH SIGNAL SELECTOR

HT- HUMIDITY TRANSMITTER

LCP- LOCAL CONTROL PANEL

LS- LOW SIGNAL SELECTOR

MA- MIXED AIR

MOD-MOTER OPERATED DAMPER

NC- NORMALLY CLOSED

NCP- NETWORK CONTROL PANEL

NO- NORMALLY OPEN

OA -OUTSIDE AIR

OL'S- MOTOR STARTER OVERLOADS

PC- PRESSURE CONTROLLER

PE- PRESSURE TOGGLE SWITCH

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S- SWITCH

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S/W- SUMMER/ WINTER SIGNAL

T- THERMOSTAT

TS- TEMPERATURE SENSOR

TC- TIME CLOCK

TDR- TIME DELAY RELAY

THL- TEMPERATURE HIGH LIMIT THERMOSTAT

TI- TEMPERATURE INDICATOR

TLL- TEMPERATURE LOW LIMIT THERMOSTAT

TR- TRANSDUCER

TT- TEMPERATURE TRANSMITTER

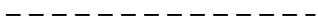
TX- TRANSFORMER

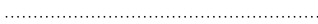
V- VALVE

WB- WET BULB

WU- WARM-UP SIGNAL

WIRING LEGEND

 Low Voltage, 18 AWG, Copper Wire

 Low Voltage Communication Wiring 22/2 AWG, CL2P, Shielded Copper Wire, Low Capacitance

 Line Voltage, THHN Field Wiring

HVAC SYSTEM LEGEND:

 MOTOR OPERATED DAMPER

 PREHEAT COIL

 COOLING COIL

 REHEAT COIL

 HEATING COIL

 DIRECT EXPANSION COIL

 FAN

 MANUAL VALVE

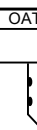
 ZONE CO2 SENSOR

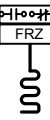
 WATER FLOW METER

 AVERAGING TYPE TEMPERATURE SENSOR

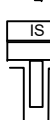
 FILTER

 FIRE & SMOKE DAMPER (BY OTHERS)

 OUTSIDE AIR TEMPERATURE SENSOR

 FREEZESTAT (D.P. CONTACT)

 DUCT MOUNTED TEMPERATURE SENSOR

 IMMERSION TYPE TEMPERATURE SENSOR

 DUCT MOUNTED SMOKE DETECTOR

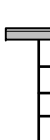
 STATIC PRESSURE TRANSMITTER

 STEAM PRESSURE SENSOR

 DUCT MOUNTED HUMIDITY SENSOR

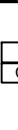
 SPACE TEMPERATURE

 OUTSIDE AIR CO2 SENSOR

 AIR FLOW MEASURING STATION

 CONTROL RELAY

 CURRENT SENSOR

 CO2 SENSOR

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625	3	01-05-2018	AS-BUILTS		Project: NJ DOT FERNWOOD GARAGE BUILDINGS 1&1A	
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	11-02-2017	ADDED DOOR SWITCHES			
		1	09-13-2017	SEPARATED EXHAUST FANS			
		0	08-08-2017	SUBMITTAL	A.V.		
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	NO.	DATE	REVISION	BY		
LEGEND & SYMBOLS						Job No. #17-03253	Page 2 of 12

NETWORK RISER

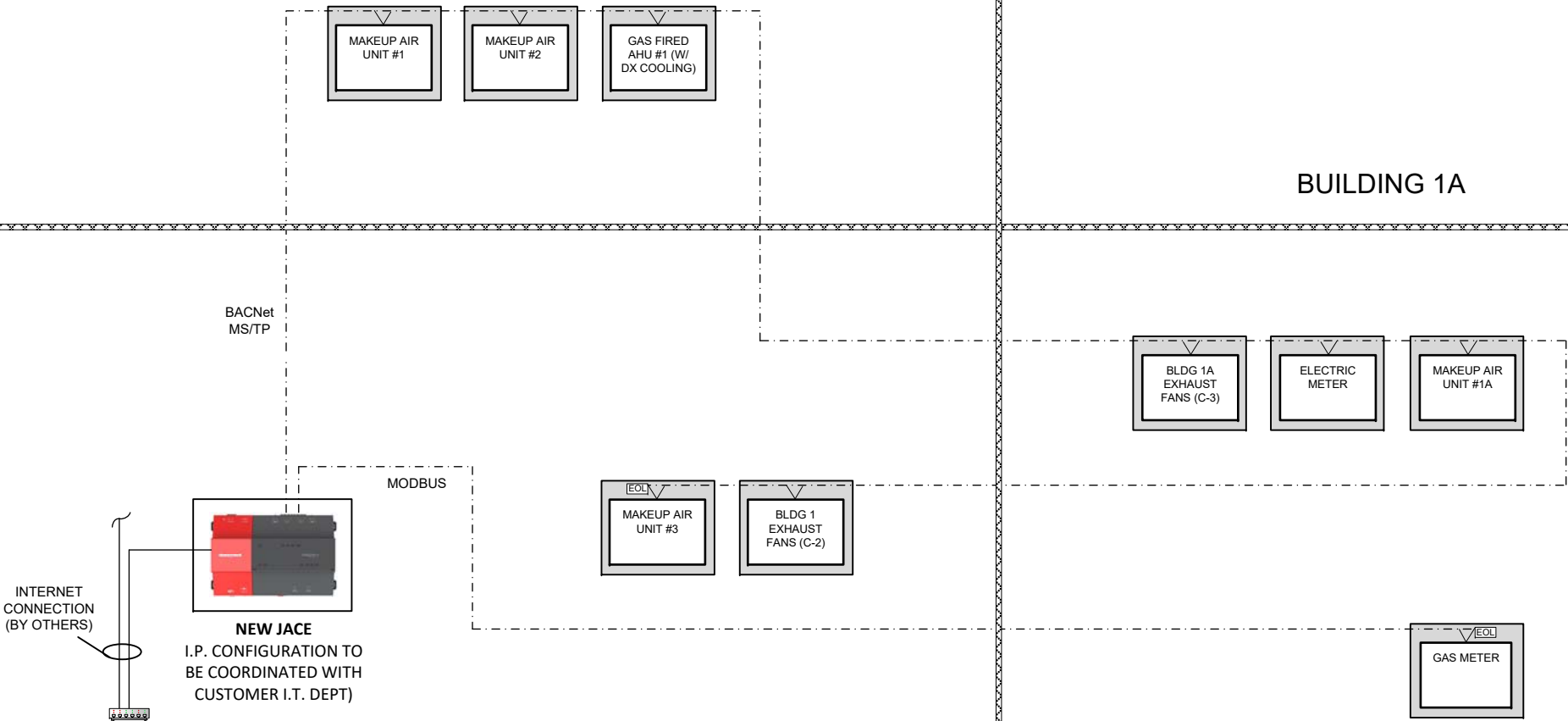
BUILDING 1

MEZZANINE

BUILDING 1A

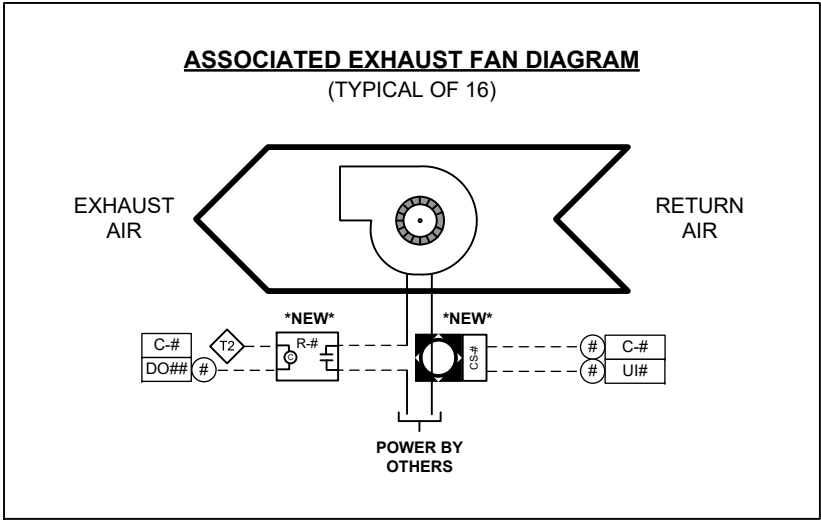
1ST FLOOR

1ST FLOOR

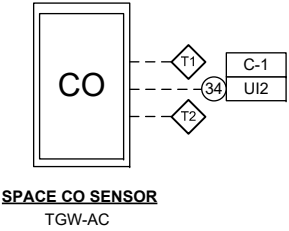
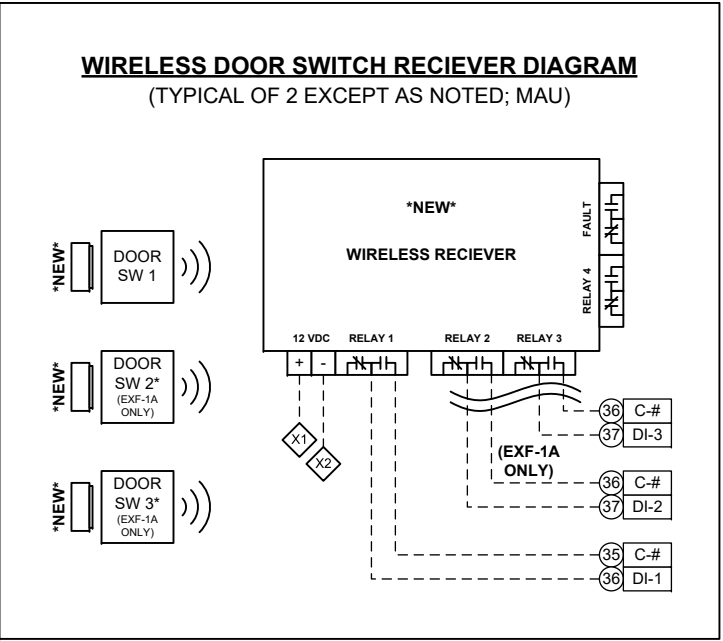
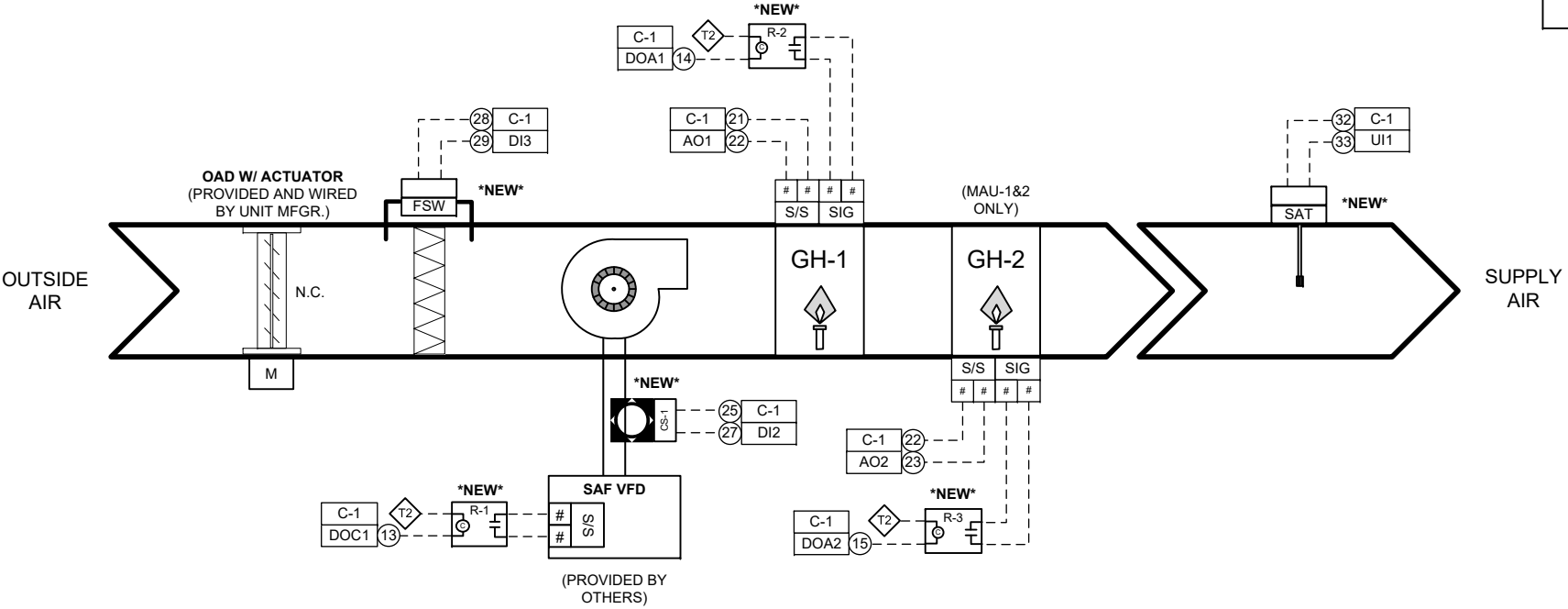


NOTE: 1) 120VAC POWER TO ALL CONTROL PANELS BY OTHERS

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625	3	01-05-2018	AS-BUILTS		Project: NJ DOT FERNWOOD GARAGE BUILDINGS 1&1A	
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	11-02-2017	ADDED DOOR SWITCHES			
		1	09-13-2017	SEPARATED EXHAUST FANS			
		0	08-08-2017	SUBMITTAL	A.V.		
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	NO.	DATE	REVISION	BY		
NETWORK RISER						Job No. #17-03253	Page 3 of 12



MAKE-UP AIR UNIT (MAU-1,2,3,&1A) FLOW DIAGRAM
(TYPICAL OF 4 EXCEPT AS NOTED)



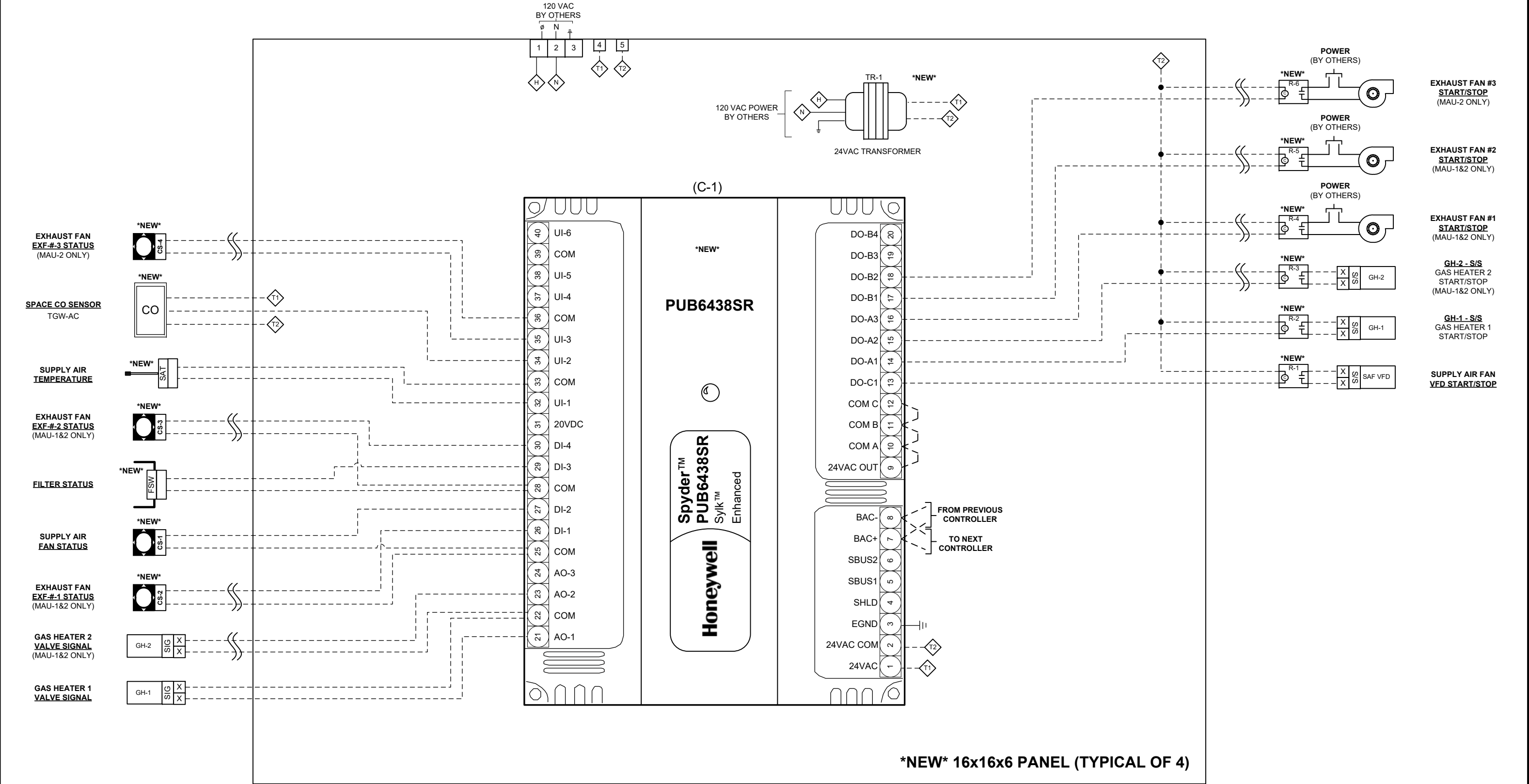
MAU UNIT ASSOCIATED EXF SCHEDULE

MAU UNIT	# OF EXF	LOCATION SERVED	EXF CONTROLLER
MAU-1	2	GARAGE (EAST)	MAU-1 (C-1)
MAU-2	3	GARAGE (EAST) & BATHROOMS	MAU-2 (C-1)
MAU-3	6	GARAGE WEST)	EXF-1 (C-2)
MAU-1A	5	GARAGE (1A)	EXF-1A (C-2)

NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625	3	01-05-2018	AS-BUILTS		Project: NJ DOT FERNWOOD GARAGE BUILDINGS 1&1A	
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	11-02-2017	ADDED DOOR SWITCHES			MAKE-UP AIR UNIT (MAU-1,2,3,&1A) FLOW DIAGRAM
		1	09-13-2017	SEPARATED EXHAUST FANS			
		0	08-08-2017	SUBMITTAL	A.V.		
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	NO.	DATE	REVISION	BY		Job No. #17-03253

MAKE-UP AIR UNIT (MAU-1,2,3.&1A) WIRING SCHEMATIC
(TYPICAL OF 4 EXCEPT AS NOTED)



NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

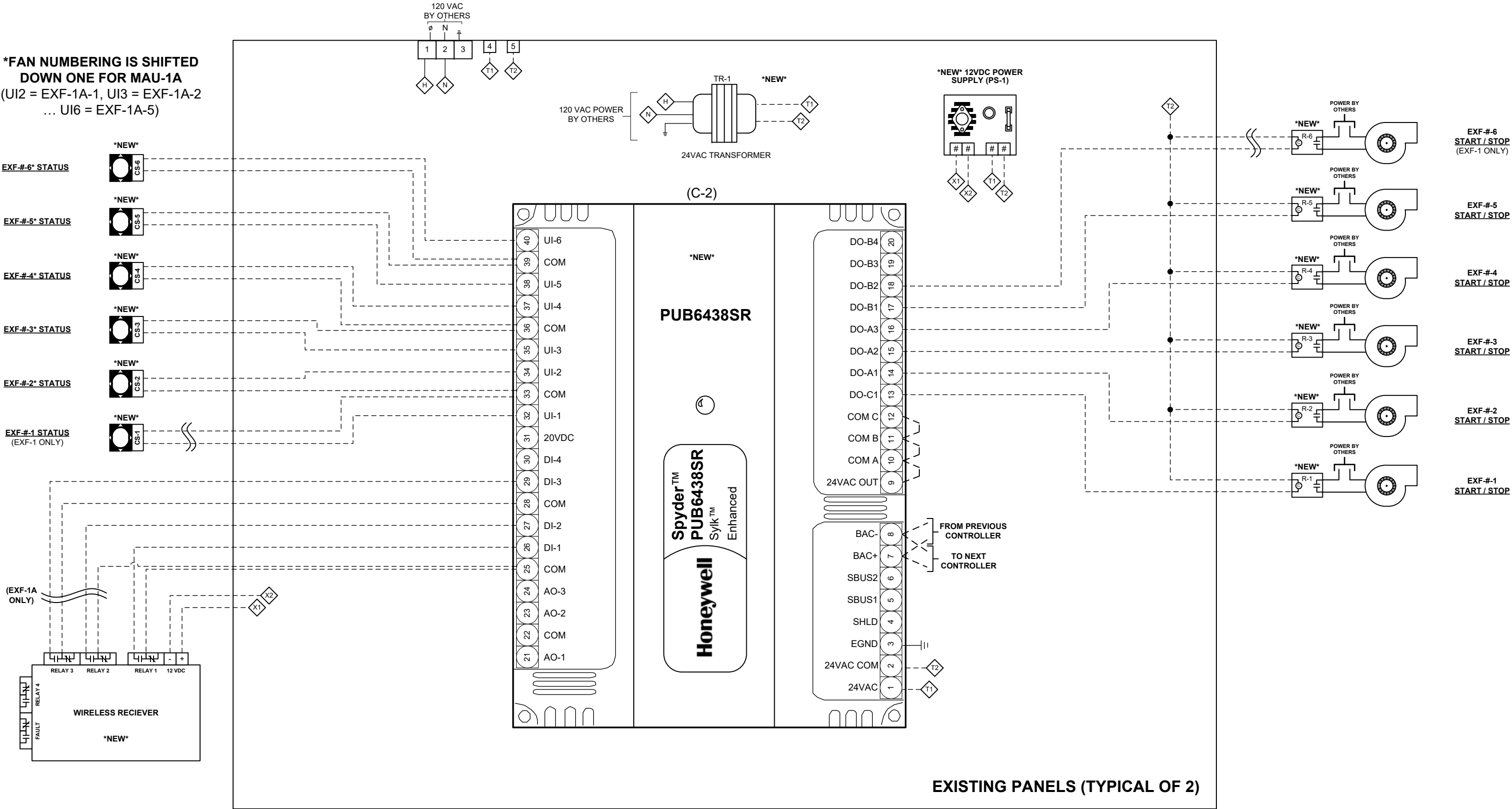
FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625	3	01-05-2018	AS-BUILTS					
		2	11-02-2017	ADDED DOOR SWITCHES					
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	1	09-13-2017	SEPARATED EXHAUST FANS					
		0	08-08-2017	SUBMITTAL					A.V.
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	NO.	DATE	REVISION	BY				

Project: NJ DOT FERNWOOD GARAGE BUILDINGS 1&1A
MAKE-UP AIR UNIT (MAU-1,2,3.&1A) WIRING SCHEMATIC
Job No. #17-03253Page 5 of 12

EXHAUST FAN CONTROLLER (1&1A) WIRING SCHEMATIC

(TYPICAL OF 2 EXCEPT AS NOTED)

*FAN NUMBERING IS SHIFTED
DOWN ONE FOR MAU-1A
(UI2 = EXF-1A-1, UI3 = EXF-1A-2
... UI6 = EXF-1A-5)



FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625	3	01-05-2018	AS-BUILTS		Project: NJ DOT FERNWOOD GARAGE BUILDINGS 1&1A EXHAUST FAN CONTROLLER (1&1A) WIRING SCHEMATIC Job No. #17-03253Page 6 of 12
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	11-02-2017	ADDED DOOR SWITCHES		
		1	09-13-2017	SEPARATED EXHAUST FANS		
		0	08-08-2017	SUBMITTAL	A.V.	
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	NO.	DATE	REVISION	BY	

MAU & EXHAUST FAN SEQUENCE OF OPERATIONS

ENABLED MODE:

- 1 – The Make-up Air Unit and its associated Exhaust Fans shall be indexed into the Enabled Mode as per the BMS schedule, or whenever CO levels exceed 10 ppm (adj.).
- 2 – Upon initial startup, the Outside Air Damper shall open.
- 3 – Once the Outside Air Damper has proved open via the End Switch, the Supply Air Fan and all associated Exhaust Fans shall start.
- 4 – If the Supply Air Fan fails to start as sensed by its current sensor, an alarm shall be generated, the Outside Air Damper shall close, and all associated Exhaust Fans shall stop.
- 5 – Once the Supply Air Fan has proved on, the Make-up Air Unit shall calculate its mode of operation.
- 6 – If the Outside Air Temperature is below 50 deg. F. (adj.), the Make-up Air Unit will enter its heating mode.
- 7 – Upon a call for heating, the (first) Gas Heating Stage shall be enabled and the GH-1 Valve Signal shall modulate to maintain a Discharge Air Set-point of 60 deg. F..
- 8 – DUAL STAGE GH UNITS ONLY: If the GH-1 Valve Signal reaches 100% and the Discharge Air Set-point isn't met, GH Stage 2 shall be enabled and have its valve signal modulated to maintain DASP until no longer needed.

AIR FILTER MONITORING:

- 1 – The DDC controller shall monitor the filter switch and generate an alarm when it is tripped at the manufacturers dirty filter rating.

SENSOR ALARMING:

- 1 – If the Space Temperature is above 95 deg. F or below 45 deg. F an alarm shall be generated.
- 2 – If the Discharge Air Temperature is above 120 deg. F or below 35 deg. F an alarm shall be generated.
- 3 – If the Discharge Air Temperature remains within 4 deg. F below of the Heating Set-point and the Heating Signal is more than 10% for longer than 10 minutes, an alarm shall be generated.
- 4 – All set-points shall be user adjustable from the graphical user interface.
- 5 – If a Door Switch has been open and the MAU's heating has been operational for longer than 15 minutes, a critical alarm will be enunciated in the BMS.

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MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	11-02-2017	ADDED DOOR SWITCHES	
		1	09-13-2017	SEPARATED EXHAUST FANS	
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-08-2017	SUBMITTAL	A.V.
		NO.	DATE	REVISION	BY

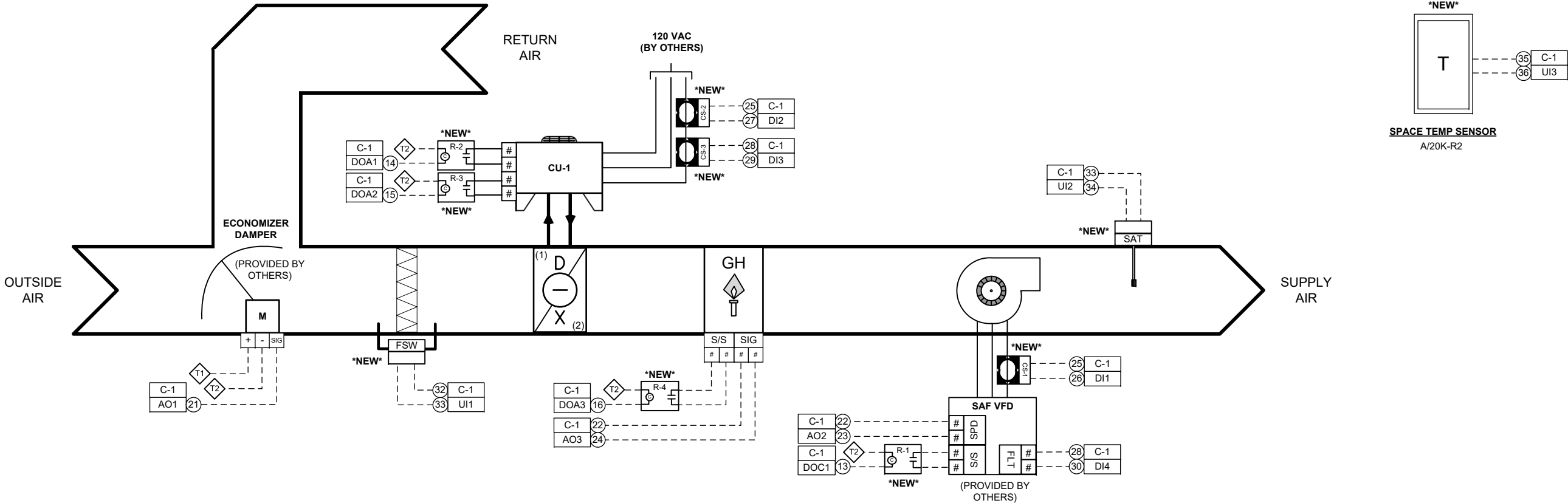
Project: NJ DOT FERNWOOD GARAGE BUILDINGS 1&1A

MAU & EXHAUST FAN SEQUENCE OF OPERATIONS

Job No. #17-03253

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AIR HANDLING UNIT (AHU-1 & CU-1) FLOW DIAGRAM & SCHEDULE



NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625	3	01-05-2018	AS-BUILTS	
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	11-02-2017	ADDED DOOR SWITCHES	
		1	09-13-2017	SEPARATED EXHAUST FANS	
		0	08-08-2017	SUBMITTAL	A.V.
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	NO.	DATE	REVISION	BY

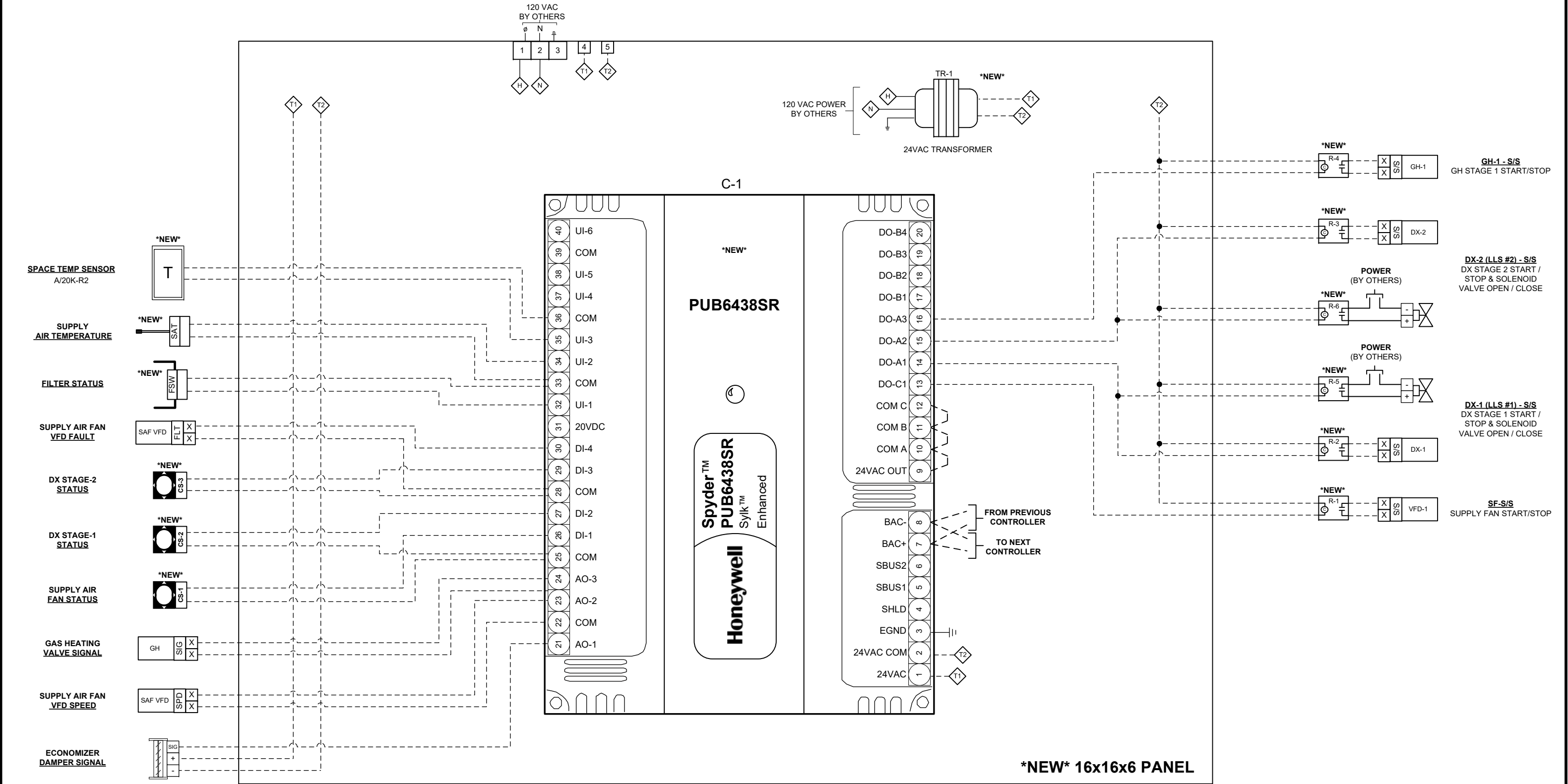
Project: NJ DOT FERNWOOD GARAGE BUILDINGS 1&1A

AIR HANDLING UNIT (AHU-1 & CU-1) FLOW DIAGRAM & SCHEDULE

Job No. #17-03253

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AIR HANDLING UNIT (AHU-1 & CU-1) WIRING SCHEMATIC



NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625	3	01-05-2018	AS-BUILTS		Project: NJ DOT FERNWOOD GARAGE BUILDINGS 1&1A AIR HANDLING UNIT (AHU-1 & CU-1) WIRING SCHEMATIC Job No. #17-03253Page 9 of 12
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	11-02-2017	ADDED DOOR SWITCHES		
		1	09-13-2017	SEPARATED EXHAUST FANS		
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-08-2017	SUBMITTAL	A.V.	
		NO.	DATE	REVISION	BY	

AIR HANDLING UNIT SEQUENCE OF OPERATIONS

MODE SELECTION:

- 1 – The Air Handler Unit shall be indexed into the Occupied and Unoccupied Modes via the BMS schedule (modes may be overridden by the Emergency Management System).
- 2 – The Air Handler Unit shall operate in Warm-up Mode instead of Unoccupied Mode whenever there is less than an hour left until the start of the next scheduled Occupied Mode.
- 3 – Should the controller lose communication with the BMS, an alarm shall be generated and the Air Handler Unit shall follow its local schedule until communication is restored.
- 4 – Should the Supply Air Fan fail whenever its called for, an alarm shall be generated and the unit (and all end-devices) shall remain inoperative until the alarm is cleared.

SET-POINT SELECTION:

- 1 – All set-points shall be user adjustable from the graphical user interface and Emergency Management System.
- 2 – The Occupied Space Temperature Set-point shall default to 72 deg. F. and be limited between 70 deg. F. and 74 deg. F.

OPERATIONAL MODES:

UNOCCUPIED MODE:

- 1 – The Gas Heating, Supply Air Fan, and any DX Cooling shall be off (by default), and the Outside Air Damper shall be closed.
- 2 – The Supply Air Fan and Gas Heating shall be enabled whenever the Space Temperature Sensor is below an Unoccupied Heating Set-point of 60 deg. F. The Gas Heating Signal shall modulate to maintain the Discharge Air Temp. Set-point.
- 3 – DX COOLING UNITS ONLY: The Supply Air Fan and DX Cooling shall be enabled whenever the Space Temperature Sensor is below an Unoccupied Cooling Set-point of 85 deg. F.

WARM-UP MODE:

- 1 – The Air Handler Unit shall operate identically as when in the Unoccupied Mode, however the Space Temperature Heating and Cooling Set-points shall be set to 68 deg. F. and 76 deg. F., respectively.

OCCUPIED MODE:

- 1 – The Outside Air Damper shall be opened to its Minimum Outside Air setting and the Supply Air Fan shall be enabled.
- 2 – The Gas Heating shall be enabled whenever the Space Temperature is 2 deg. F. or more below the Space Temperature Set-point (72 deg. F. adj.). The Gas Heating Signal shall modulate to maintain the Discharge Air Temp. Set-point.
- 3 – DX COOLING UNITS ONLY: the DX Cooling shall be enabled whenever the Space Temperature is 2 deg. F. or more above the Space Temperature Set-point.

ADDITIONAL ALARMS:

AIR FILTER MONITORING:

- 1 – When the filter exceeds the manufacturer’s rating for a dirty filter, an alarm shall be generated.

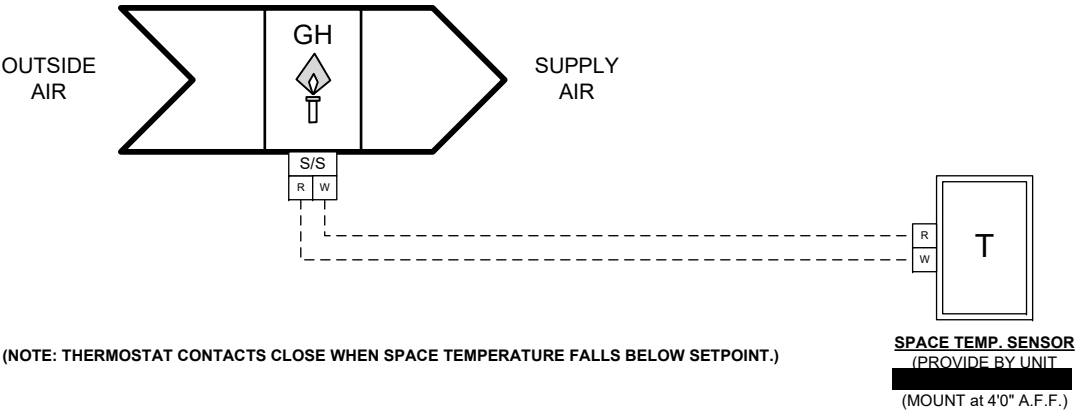
TEMPERATURE ALARMING:

- 1 – If the Space Temperature is above 90 deg. F. or below 55 deg. F. an alarm shall be generated.
- 2 – If the Discharge Air Temperature is above 120 deg. F or below 45 deg. F an alarm shall be generated.

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625	3	01-05-2018	AS-BUILTS		Project: NJ DOT FERNWOOD GARAGE BUILDINGS 1&1A
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	11-02-2017	ADDED DOOR SWITCHES		
		1	09-13-2017	SEPARATED EXHAUST FANS		
		0	08-08-2017	SUBMITTAL	A.V.	
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	NO.	DATE	REVISION	BY	Job No. #17-03253
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GAS UNIT HEATER FLOW & WIRING DIAGRAM

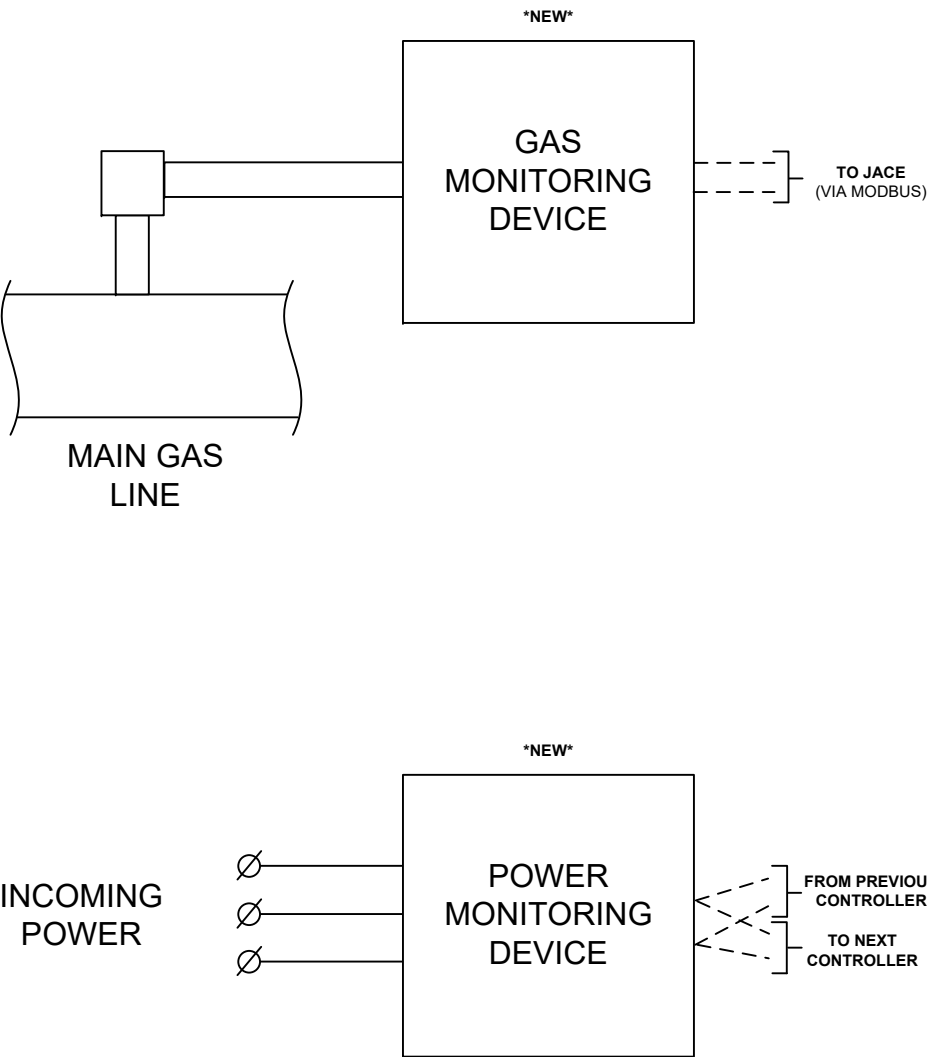
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NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625	3	01-05-2018	AS-BUILTS				Project: NJ DOT FERNWOOD GARAGE BUILDINGS 1&1A	
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	11-02-2017	ADDED DOOR SWITCHES				GAS UNIT HEATER FLOW & WIRING DIAGRAM	
		1	09-13-2017	SEPARATED EXHAUST FANS				Job No.	#17-03253
		0	08-08-2017	SUBMITTAL	A.V.			Page	11 of 12
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POWER AND GAS MONITORING FLOW DIAGRAM



FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625	3	01-05-2018	AS-BUILTS			Project: NJ DOT FERNWOOD GARAGE BUILDINGS 1&1A	
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	11-02-2017	ADDED DOOR SWITCHES			POWER AND GAS MONITORING FLOW DIAGRAM	
		1	09-13-2017	SEPARATED EXHAUST FANS				
		0	08-08-2017	SUBMITTAL	A.V.			
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	NO.	DATE	REVISION	BY		Job No.	#17-03253
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PAGE	QTY	PRODUCT #	MFGR.	DESCRIPTION
PG 3 RISER	1	WEB-8000-CSE	Honeywell	JACE Web Controller
PG 3 RISER	1		Honeywell	JACE License Up to ____ Devices
PG 4&5 MAU	4	TGW-AC	Senva	Space Carbon Monoxide Sensor
PG 4&5 MAU	4	A/20K-D-8"	ACI	8-inch Duct Temperature Probe
PG 4&5 MAU	4	ADPS-04-2-N	Dwyer	Differential Pressure Filter Switch
PG 4to6 MAU/EXF	20	C-2200	Senva	On/Off Status Current Transducer
PG 4to6 MAU/EXF	26	RIBU1C	FD, Inc. (RIB)	120 Vac / 10-30 Vac/dc Relay SPDT
PG 4&6 MAU/EXF	2	EN4202R	Inovonics	Wireless Reciever w/ 4 Relays
PG 4&6 MAU/EXF	4	EN1210W	Inovonics	Wireless Magnetic Door Switch
PG 5&6 MAU/EXF	6	PUB6438SR	Honeywell	Spyder BACnet Prog. Controller
PG 5&6 MAU/EXF	6	TR75VA001	FD, Inc. (RIB)	120VAC/24VAC Transformer
PG 5 MAU	4	SCE-16N1606LP	Saginaw	Enviroline Series Control Panel
PG 5 MAU	4	SCE-16N16MP	Saginaw	16x16 Subpanel
PG 6 EXF	2	DCP-1.5-W-12VDC	Kele	24VAC/12VDC Power Supply
PG 8&9 AHU	1	A/20K-R2	ACI	Space Temperature Sensor
PG 8&9 AHU	1	A/20K-D-8"	ACI	8-inch Duct Temperature Probe
PG 8&9 AHU	1	ADPS-04-2-N	Dwyer	Differential Pressure Filter Switch
PG 8&9 AHU	3	C-2200	Senva	On/Off Status Current Transducer
PG 8&9 AHU	4	RIBU1C	FD, Inc. (RIB)	120 Vac / 10-30 Vac/dc Relay SPDT
PG 9 AHU	1	PUB6438SR	Honeywell	Spyder BACnet Prog. Controller
PG 9 AHU	1	TR75VA001	FD, Inc. (RIB)	120VAC/24VAC Transformer
PG 9 AHU	1	SCE-16N1606LP	Saginaw	Enviroline Series Control Panel
PG 9 AHU	1	SCE-16N16MP	Saginaw	16x16 Subpanel
PG 12 GAS/PWR	1	PS3037-S-N	Dent Inst.	1-pt. Rev. Grade Power Meter
PG 12 GAS/PWR	1	CT-R16-A4-U	Dent Inst.	Flexible Current Transformer
PG 12 GAS/PWR	1	620S-BT-L06-M1-EN2-V4-NR-9-MB	Sierra Inst.	BoilerTrak Immersible Thermal Gas Mass Flow Meter

NJ DOT FERNWOOD GARAGE BUILDING 4 (AS-BUILTS)

ENERGY SAVINGS IMPROVEMENT PROJECT BUILDING AUTOMATION SYSTEM

SHEET NUMBER	CONTENTS	REVISION
1	TITLE PAGE	
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7	GAS UNIT HEATER FLOW & WIRING DIAGRAM	
8	POWER AND GAS MONITORING FLOW DIAGRAM	

LEGEND & SYMBOLS

GENERAL NOTES

1. ALL POWER WIRING 120 VAC AND ABOVE BY ELECTRICAL CONTRACTOR.

TEMPERATURE CONTROL LEGEND:

 MOUNTED ON PANEL FACE

 MOUNTED INSIDE PANEL

 CONTROL TUBE #3

 PNEUMATIC TUBING

 WIRING

 TERMINAL BLOCK #6

 SOLENOID VALVE

 CONTROL VALVE, 2-WAY

 CONTROL VALVE, 3-WAY

 PARALLEL BLADED DAMPER

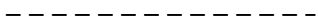
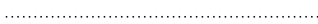
 OPPOSED BLADED DAMPER

 SIGNAL LINE INSIDE PANEL

ABBREVIATIONS:

AFMS- AIR FLOW MEASURING STATION	OA -OUTSIDE AIR
C- COMMON PORT	OL'S- MOTOR STARTER OVERLOADS
CCP- CENTRAL CONTROL PANEL	PC- PRESSURE CONTROLLER
CR- CONTROL RELAY	PE- PRESSURE TOGGLE SWITCH
CS- CURRENT SWITCH	PI- PRESSURE INDICATOR
DA-DAMPER ACTUATOR	PL- PILOT LIGHT
DPRO- DAMPER OUTPUT	PR- PNEUMATIC RELAY
DPRS- DAMPER STATUS	PT- PRESSURE TRANSMITTER
DPS- DIFFERENTIAL PRESSURE SWITCH	RC- RECEIVER CONTROLLER
DPT- DIFFERENTIAL PRESSURE TRANS	RR- REVERSING RELAY
EA- EXHAUST AIR	RT- ROOM THERMOSTAT
ES- END SWITCH, POSITION SWITCH	S- SWITCH
FS- FLOW SWITCH	SD- SMOKE DETECTOR
FSD- FIRE & SMOKE DAMPER	S/W- SUMMER/ WINTER SIGNAL
H- HUMIDISTAT	T- THERMOSTAT
HC- MOTOR STARTER HOLDING COIL	TS- TEMPERATURE SENSOR
HI- HUMIDITY INDICATOR	TC- TIME CLOCK
HL- HIGH LIMIT HUMIDISTAT	TDR- TIME DELAY RELAY
HS- HIGH SIGNAL SELECTOR	THL- TEMPERATURE HIGH LIMIT THERMOSTAT
HT- HUMIDITY TRANSMITTER	TI- TEMPERATURE INDICATOR
LCP- LOCAL CONTROL PANEL	TLL- TEMPERATURE LOW LIMIT THERMOSTAT
LS- LOW SIGNAL SELECTOR	TR- TRANSDUCER
MA- MIXED AIR	TT- TEMPERATURE TRANSMITTER
MOD-MOTER OPERATED DAMPER	TX- TRANSFORMER
NC- NORMALLY CLOSED	V- VALVE
NCP- NETWORK CONTROL PANEL	WB- WET BULB
NO- NORMALLY OPEN	WU- WARM-UP SIGNAL

WIRING LEGEND

	Low Voltage, 18 AWG, Copper Wire
	Low Voltage Communication Wiring 22/2 AWG, CL2P, Shielded Copper Wire, Low Capacitance
	Line Voltage, THHN Field Wiring

HVAC SYSTEM LEGEND:

 MOTOR OPERATED DAMPER

 PREHEAT COIL

 COOLING COIL

 REHEAT COIL

 HEATING COIL

 DIRECT EXPANSION COIL

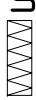
 FAN

 MANUAL VALVE

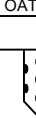
 ZONE CO2 SENSOR

 WATER FLOW METER

 AVERAGING TYPE TEMPERATURE SENSOR

 FILTER

 FIRE & SMOKE DAMPER (BY OTHERS)

 OUTSIDE AIR TEMPERATURE SENSOR

 FREEZESTAT (D.P. CONTACT)

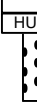
 DUCT MOUNTED TEMPERATURE SENSOR

 IMMERSION TYPE TEMPERATURE SENSOR

 DUCT MOUNTED SMOKE DETECTOR

 STATIC PRESSURE TRANSMITTER

 STEAM PRESSURE SENSOR

 DUCT MOUNTED HUMIDITY SENSOR

 SPACE TEMPERATURE

 OUTSIDE AIR CO2 SENSOR

 AIR FLOW MEASURING STATION

 CONTROL RELAY

 CURRENT SENSOR

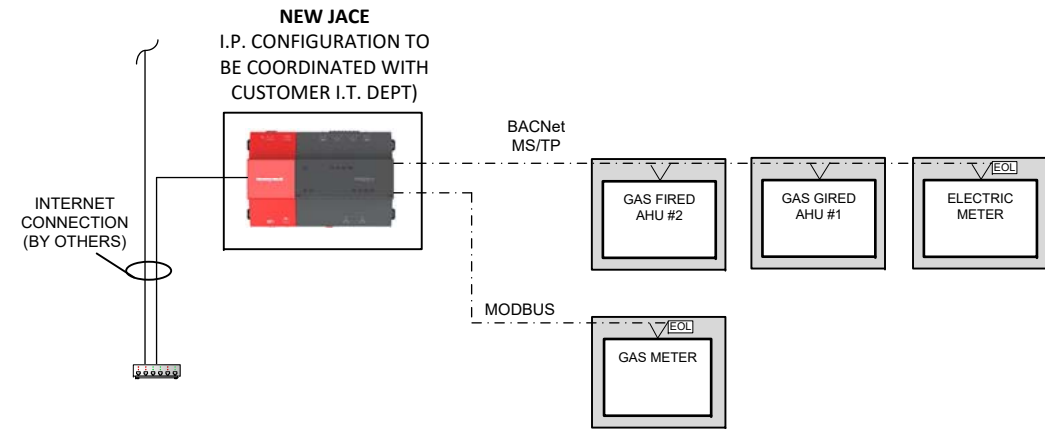
 CO2 SENSOR

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625				
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	1	01-05-2018	AS-BUILTS	
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-11-2017	SUBMITTAL	A.V.
		NO.	DATE	REVISION	BY

Project: NJ DOT FERNWOOD GARAGE BUILDING 4

LEGEND & SYMBOLS

NETWORK RISER

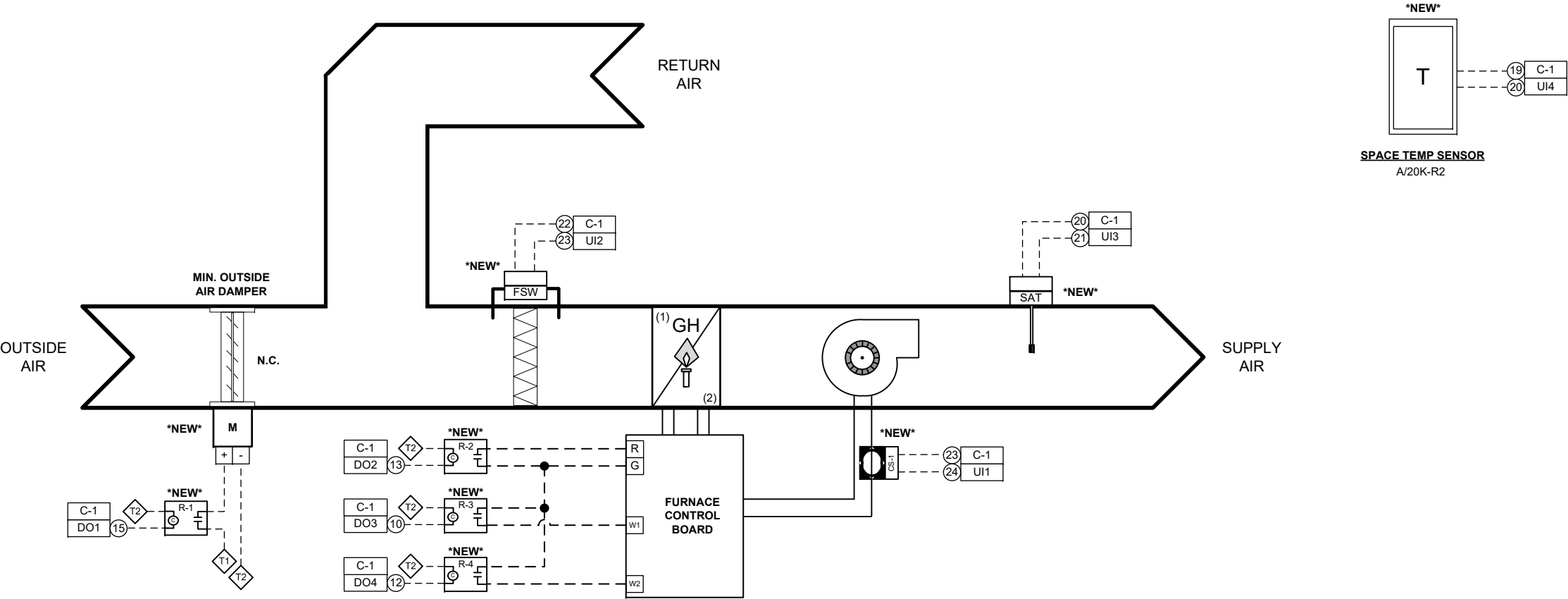


NOTE: 1) 120VAC POWER TO ALL CONTROL PANELS BY OTHERS

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625						Project: NJ DOT FERNWOOD GARAGE BUILDING 4	
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	1	01-05-2018	AS-BUILTS			NETWORK RISER	
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-11-2017	SUBMITTAL	A.V.		Job No.	#17-03253
		NO.	DATE	REVISION	BY		Page	3 of 8

AIR HANDLING UNIT (AHU-1&2) FLOW DIAGRAM

(TYPICAL OF 2)



NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625							Project: NJ DOT FERNWOOD GARAGE BUILDING 4
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	1	01-05-2018	AS-BUILTS				AIR HANDLING UNIT (AHU-1&2) FLOW DIAGRAM
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-11-2017	SUBMITTAL		A.V.		Job No. #17-03253
		NO.	DATE	REVISION	BY	Page 4 of 8		

(TYPICAL OF 2)



FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625						Project: NJ DOT FERNWOOD GARAGE BUILDING 4	
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	1	01-05-2018	AS-BUILTS			AIR HANDLING UNIT (AHU-1&2) WIRING SCHEMATIC	
		0	08-11-2017	SUBMITTAL				
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	NO.	DATE	REVISION			BY	Job No. #17-03253

AIR HANDLING UNIT SEQUENCE OF OPERATIONS

WARM-UP MODE:

- 1 – One hour prior to the occupied mode, the Air Handler Unit shall be placed in Warm-up Mode when that Space Temperature is more than 10 Degs F. below the Space Heating Set-point.
- 2 – The Outside Air Dampers shall be closed and the Return Air Damper shall be opened, the stage 1 gas heating signal shall be enabled.
- 3 – The Air Handler Unit shall be released from Warm-up Mode when the Space Temperature is less than 3 Degs F. below the Space Heating Set-point or when the unit enters its scheduled occupied mode.
- 4 – When the Air Handler Unit is released from warm-up mode the Outside and Return Air Dampers and the Hot Water Valve shall revert to their scheduled modes.

OCCUPIED MODE:

- 1 – The Air Handler Unit shall be indexed into the occupied mode via the BMS schedule.
- 2 - Upon initial startup, the Outside and Return Air Damper shall open to their Minimum Outside Air setting.
- 3 - The supply fan shall start and slowly ramp up to its preset speed as determined by the balancing contractor.
- 4 - If the supply fan fails to start, an alarm shall be generated and the outside air damper shall close.
- 5 – Once the supply fan has proven on, the Air Handler Unit shall calculate its mode of operation.
- 6 - If the space temperature is 2 Degs F. below the space temperature set-point (72 Degs F. adj.) and the outside air temperature is below 55 Degs F., the Air Handler Unit will enter it’s heating mode.
- 7 - Upon a call for heating, the Outside Air Damper shall remain at its minimum position and the stage 1 gas heating signal shall be enabled.
- 8 – When the Space Temperature is below 45 Degs F., both gas heating stages shall be enabled.
- 9 – If the space temperature is 2 Degs F. above the space temperature set-point (72 Degs F. adj.) and the outside air temperature is above 51 Degs F., but below 62 Degs F., the Air Handler Unit will enter its economizer mode.
- 10 - Upon a call for economizer cooling, the Outside Air Damper shall modulate open to maintain the discharge air set-point.
- 11- If the discharge air temperature goes below 45 Degs F., the economizer mode shall be overridden and the outside air damper shall modulate back to its minimum position.
- 12 – If the space temperature is 2 Degs F. above the space temperature set-point (72 Degs F. adj.) and the outside air temperature is above 65 Degs F., the Air Handler Unit will enter it’s cooling mode.
- 13 - Upon a call for cooling, the Outside Air Damper shall remain at its minimum position, the DX coils and the ACCU’s shall be toggled on, and the heating signals shall remain off.

UNOCCUPIED MODE:

- 1 – The Air Handler Unit’s Supply Air Fan shall be off, the Outside Air Damper shall be closed, and the Return Air Damper shall be open.
- 2 – When any Space Temperature Sensor is below an Unoccupied Heating Set-point of 60 deg. F, the Air Handler Unit’s Supply Air Fan shall start. The outside air damper shall remain closed and the gas heating stage 1 shall be enabled.
- 3 – When the Space Temperature rises above the Unoccupied Heating Set-point, the Air Handler Unit’s Supply Air Fan shall stop.

AIR FILTER MONITORING:

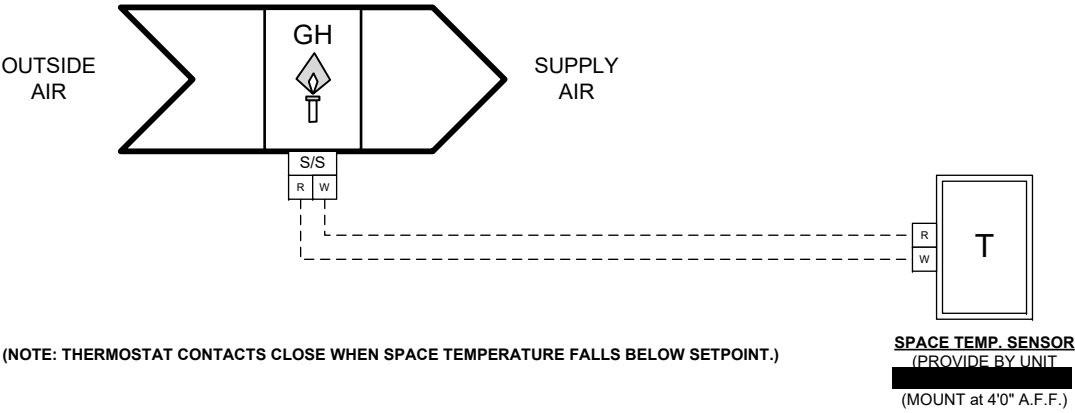
- 1 – When the filter exceeds the manufacturer’s rating for a dirty filter, an alarm shall be generated.

SENSOR ALARMING:

- 1 – If the Space Temperature is above 85 deg. F or below 55 deg. F an alarm shall be generated.
- 2 – If the Discharge Air Temperature is above 120 deg. F or below 45 deg. F an alarm shall be generated.
- 3 - All set-points shall be user adjustable from the graphical user interface. Occupied space temperature set-points shall be limited between 70 Degs F. and 74 Degs F.

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625							Project: NJ DOT FERNWOOD GARAGE BUILDING 4	
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	1	01-05-2018	AS-BUILTS				AIR HANDLING UNIT SEQUENCE OF OPERATIONS	
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-11-2017	SUBMITTAL	A.V.				
		NO.	DATE	REVISION	BY			Job No.	#17-03253

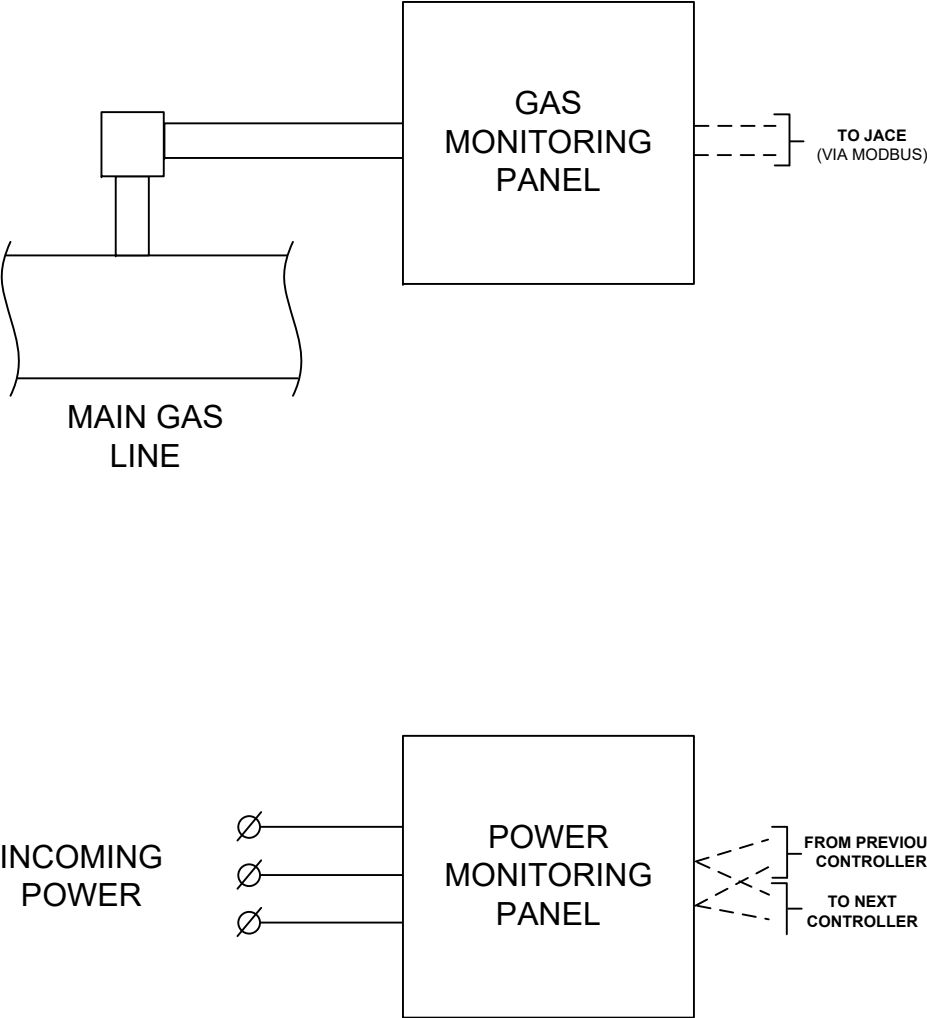
GAS UNIT HEATER FLOW & WIRING DIAGRAM



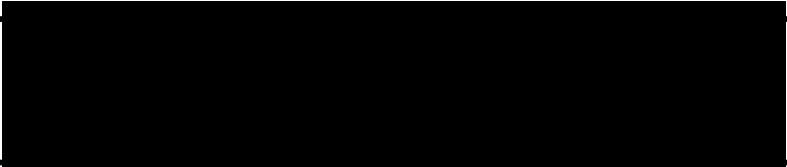
NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625								Project: NJ DOT FERNWOOD GARAGE BUILDING 4
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	1	01-05-2018	AS-BUILTS					GAS UNIT HEATER FLOW & WIRING DIAGRAM
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-11-2017	SUBMITTAL	A.V.				Job No. #17-03253
		NO.	DATE	REVISION	BY				Page 7 of 8

POWER AND GAS MONITORING FLOW DIAGRAM



FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625				
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	1	01-05-2018	AS-BUILTS	
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-11-2017	SUBMITTAL	A.V.
		NO.	DATE	REVISION	BY



PROJECT: NJDOT ESIP - FERNWOOD 4

JOB ID NUMBER: 17-04260

PAGE 1 OF 1

PAGE	QTY	PRODUCT #	MFGR.	DESCRIPTION
PG 3 RISER	1	WEB-8000-CSE	Honeywell	JACE Web Controller
PG 3 RISER	1		Honeywell	JACE License Up to ____ Devices
PG 4 & 5 AHU	2	A/20K-R2	ACI	Space Temperature Sensor
PG 4 & 5 AHU	2	A/20K-D-8"	ACI	8-inch Duct Temperature Probe
PG 4 & 5 AHU	2	ADPS-04-2-N	Dwyer	Differential Pressure Filter Switch
PG 4 & 5 AHU	2	C-2200	Senva	On/Off Status Current Transducer
PG 4 & 5 AHU	8	RIBU1C	FD, Inc. (RIB)	120 Vac / 10-30 Vac/dc Relay SPDT
PG 4 & 5 AHU	2	MS8105A1030	Honeywell	24Vac On/Off 44lb-in Actuator
PG 5 AHU	2	PUB4024S	Honeywell	Spyder BACnet Prog. Controller
PG 5 AHU	2	TR75VA001	FD, Inc. (RIB)	120VAC/24VAC Transformer
PG 5 AHU	2	SCE-16N1606LP	Saginaw	Enviroline Series Control Panel
PG 5 AHU	2	SCE-16N16MP	Saginaw	16x16 Subpanel
PG 8 GAS/PWR	1	PS3037-S-N	Dent Inst.	1-pt. Rev. Grade Power Meter
PG 8 GAS/PWR	1	CT-R16-A4-U	Dent Inst.	Flexible Current Transformer
PG 8 GAS/PWR	1	620S-BT-L06-M1-EN2-V4-NR-9-MB	Sierra Inst.	BoilerTrak Immersible Thermal Gas Mass Flow Meter

TITLE PAGE

NJ DOT FERNWOOD GARAGE BUILDING 7 (AS-BUILTS)

ENERGY SAVINGS IMPROVEMENT PROJECT

BUILDING AUTOMATION SYSTEM

SHEET NUMBER	CONTENTS	REVISION
1	TITLE PAGE	
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4	MAKE-UP AIR UNIT (MAU-1) FLOW DIARAM	
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7	AIR HANDLING UNIT (AHU-1) FLOW DIAGRAM	
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9	AIR HANDLING UNIT SEQUENCE OF OPERATIONS	
10	GAS UNIT HEATER FLOW & WIRING DIAGRAM	
11	RADIANT CEILING PANEL FLOW & WIRING DIAGRAM	
12	POWER AND GAS MONITORING FLOW DIAGRAM	

[illegible]

LEGEND & SYMBOLS

GENERAL NOTES

1. ALL POWER WIRING 120 VAC AND ABOVE BY ELECTRICAL CONTRACTOR.

TEMPERATURE CONTROL LEGEND:

 MOUNTED ON PANEL FACE

 MOUNTED INSIDE PANEL

 CONTROL TUBE #3

 PNEUMATIC TUBING

 WIRING

 TERMINAL BLOCK #6

 SOLENOID VALVE

 CONTROL VALVE, 2-WAY

 CONTROL VALVE, 3-WAY

 PARALLEL BLADED DAMPER

 OPPOSED BLADED DAMPER

 SIGNAL LINE INSIDE PANEL

ABBREVIATIONS:

AFMS- AIR FLOW MEASURING STATION

C- COMMON PORT

CCP- CENTRAL CONTROL PANEL

CR- CONTROL RELAY

CS- CURRENT SWITCH

DA-DAMPER ACTUATOR

DPRO- DAMPER OUTPUT

DPRS- DAMPER STATUS

DPS- DIFFERENTIAL PRESSURE SWITCH

DPT- DIFFERENTIAL PRESSURE TRANS

EA- EXHAUST AIR

ES- END SWITCH, POSITION SWITCH

FS- FLOW SWITCH

FSD- FIRE & SMOKE DAMPER

H- HUMIDISTAT

HC- MOTOR STARTER HOLDING COIL

HI- HUMIDITY INDICATOR

HL- HIGH LIMIT HUMIDISTAT

HS- HIGH SIGNAL SELECTOR

HT- HUMIDITY TRANSMITTER

LCP- LOCAL CONTROL PANEL

LS- LOW SIGNAL SELECTOR

MA- MIXED AIR

MOD-MOTER OPERATED DAMPER

NC- NORMALLY CLOSED

NCP- NETWORK CONTROL PANEL

NO- NORMALLY OPEN

OA -OUTSIDE AIR

OL'S- MOTOR STARTER OVERLOADS

PC- PRESSURE CONTROLLER

PE- PRESSURE TOGGLE SWITCH

PI- PRESSURE INDICATOR

PL- PILOT LIGHT

PR- PNEUMATIC RELAY

PT- PRESSURE TRANSMITTER

RC- RECEIVER CONTROLLER

RR- REVERSING RELAY

RT- ROOM THERMOSTAT

S- SWITCH

SD- SMOKE DETECTOR

S/W- SUMMER/ WINTER SIGNAL

T- THERMOSTAT

TS- TEMPERATURE SENSOR

TC- TIME CLOCK

TDR- TIME DELAY RELAY

THL- TEMPERATURE HIGH LIMIT THERMOSTAT

TI- TEMPERATURE INDICATOR

TLL- TEMPERATURE LOW LIMIT THERMOSTAT

TR- TRANSDUCER

TT- TEMPERATURE TRANSMITTER

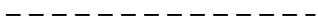
TX- TRANSFORMER

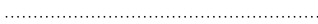
V- VALVE

WB- WET BULB

WU- WARM-UP SIGNAL

WIRING LEGEND

 Low Voltage, 18 AWG, Copper Wire

 Low Voltage Communication Wiring 22/2 AWG, CL2P, Shielded Copper Wire, Low Capacitance

 Line Voltage, THHN Field Wiring

HVAC SYSTEM LEGEND:

 MOTOR OPERATED DAMPER

 PREHEAT COIL

 COOLING COIL

 REHEAT COIL

 HEATING COIL

 DIRECT EXPANSION COIL

 FAN

 MANUAL VALVE

 ZONE CO2 SENSOR

 WATER FLOW METER

 AVERAGING TYPE TEMPERATURE SENSOR

 FILTER

 FIRE & SMOKE DAMPER (BY OTHERS)

 OUTSIDE AIR TEMPERATURE SENSOR

 FREEZESTAT (D.P. CONTACT)

 DUCT MOUNTED TEMPERATURE SENSOR

 IMMERSION TYPE TEMPERATURE SENSOR

 DUCT MOUNTED SMOKE DETECTOR

 STATIC PRESSURE TRANSMITTER

 STEAM PRESSURE SENSOR

 DUCT MOUNTED HUMIDITY SENSOR

 SPACE TEMPERATURE

 OUTSIDE AIR CO2 SENSOR

 AIR FLOW MEASURING STATION

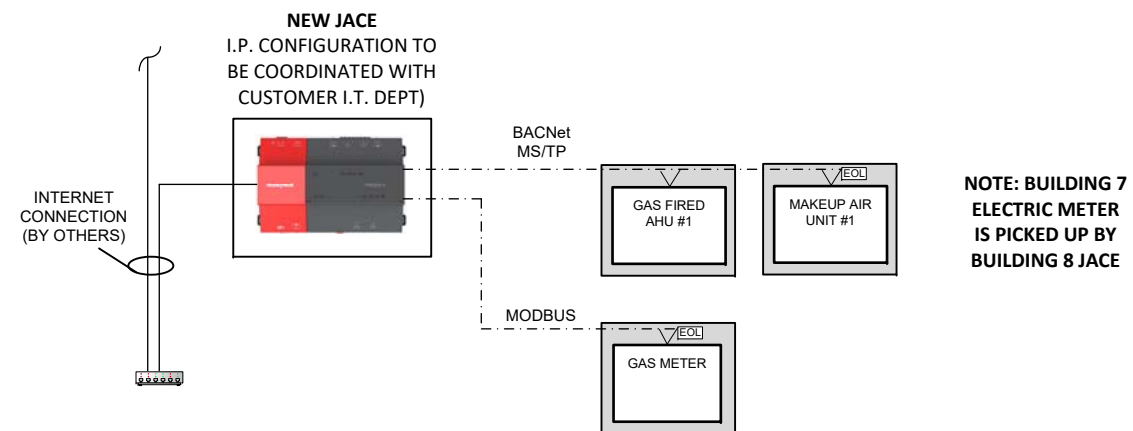
 CONTROL RELAY

 CURRENT SENSOR

 CO2 SENSOR

FACILITY	NJDOT Fernwood Building 7, 1035 Parkway Ave, Ewing, NJ 08625						Project: NJ DOT FERNWOOD GARAGE BUILDING 7	
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS			LEGEND & SYMBOLS	
		1	11-02-2017	ADDED DOOR SWITCHES				
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-11-2017	SUBMITTAL	A.V.			
		NO.	DATE	REVISION	BY		Job No. #17-03253	Page 2 of 12

NETWORK RISER

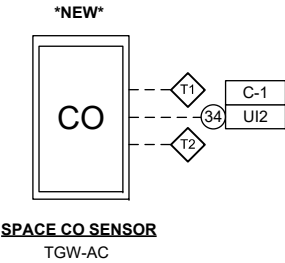
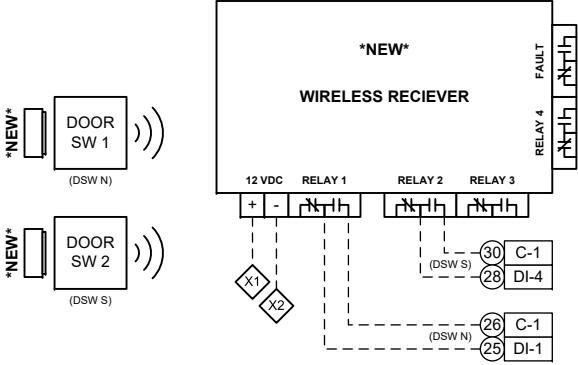
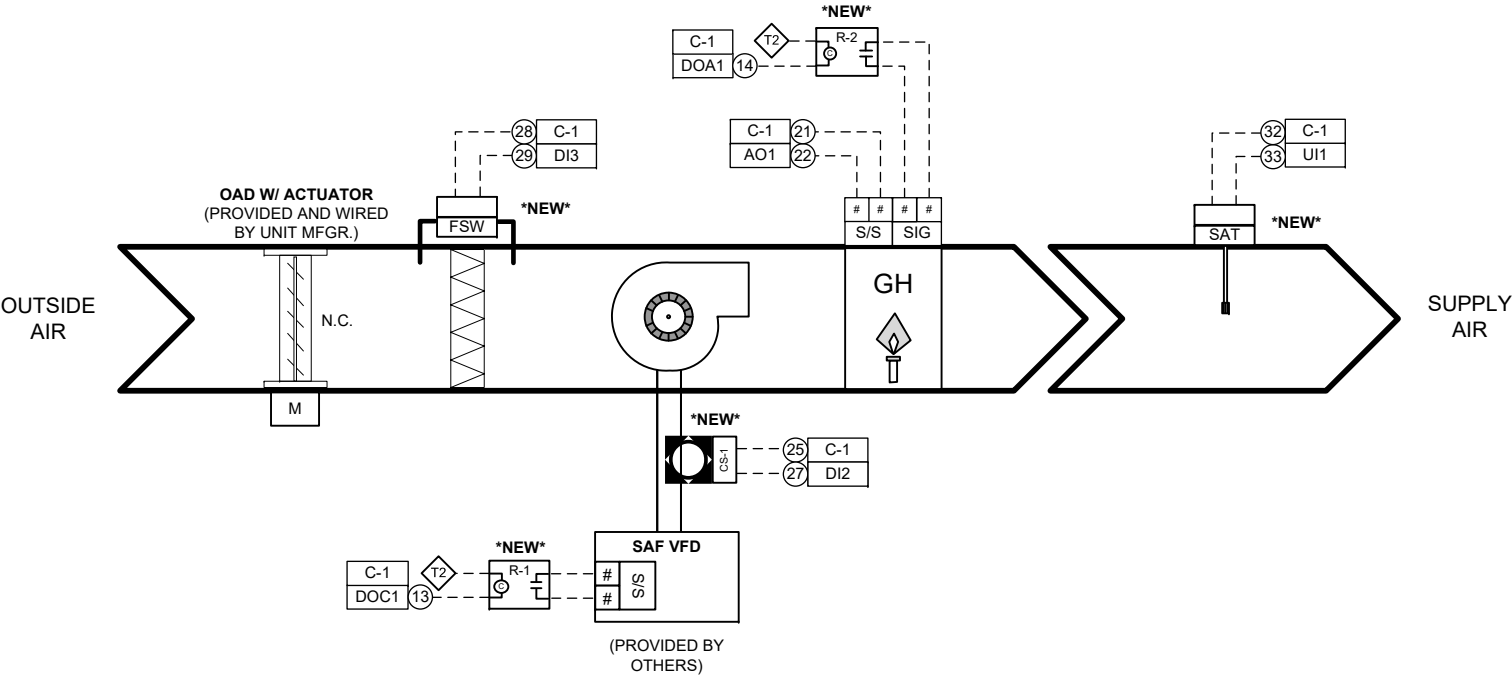


NOTE: 1) 120VAC POWER TO ALL CONTROL PANELS BY OTHERS

[illegible]

MAKE-UP AIR UNIT (MAU-1) FLOW DIAGRAM

WIRELESS DOOR SWITCH RECIEVER DIAGRAM



NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

FACILITY	NJDOT Fernwood Building 7, 1035 Parkway Ave, Ewing, NJ 08625					
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS		
		1	11-02-2017	ADDED DOOR SWITCHES		
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-11-2017	SUBMITTAL	A.V.	
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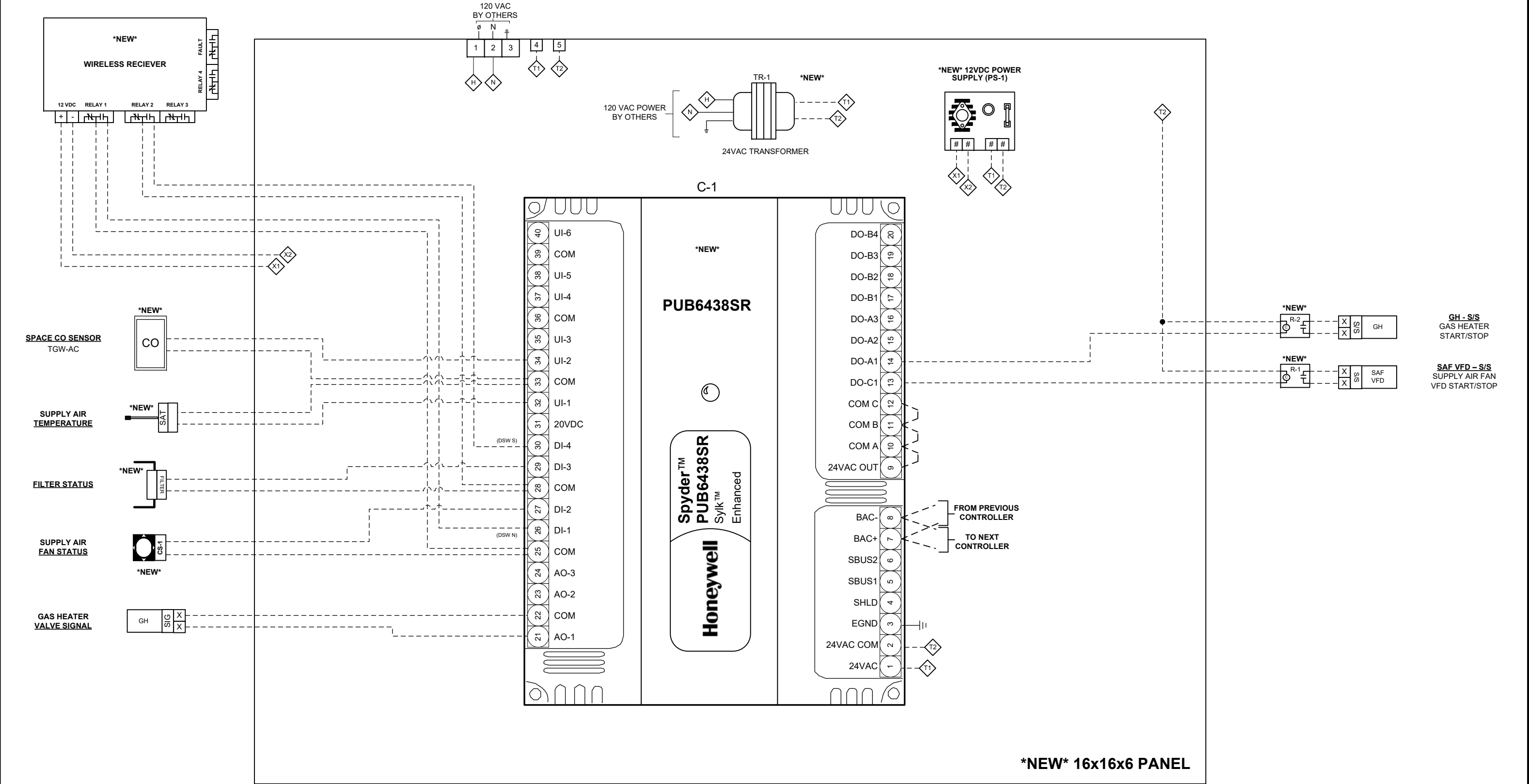
Project: NJ DOT FERNWOOD GARAGE BUILDING 7

MAKE-UP AIR UNIT (MAU-1) FLOW DIAGRAM

Job No. #17-03253

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MAKE-UP AIR UNIT (MAU-1) WIRING SCHEMATIC



NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

FACILITY	NJDOT Fernwood Building 7, 1035 Parkway Ave, Ewing, NJ 08625						Project: NJ DOT FERNWOOD GARAGE BUILDING 7
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS			MAKE-UP AIR UNIT (MAU-1) WIRING SCHEMATIC
		1	11-02-2017	ADDED DOOR SWITCHES			
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-11-2017	SUBMITTAL	A.V.		
		NO.	DATE	REVISION	BY		Job No. #17-03253 Page 5 of 12

MAU SEQUENCE OF OPERATIONS

ENABLED MODE:

- 1 – The Make-up Air Unit and its associated Exhaust Fans shall be indexed into the Enabled Mode as per the BMS schedule, or whenever CO levels exceed 10 ppm (adj.).
- 2 – Upon initial startup, the Outside Air Damper shall open.
- 3 – Once the Outside Air Damper has proved open via the End Switch, the Supply Air Fan shall start.
- 4 – If the Supply Air Fan fails to start as sensed by its current sensor, an alarm shall be generated and the Outside Air Damper shall close.
- 5 – Once the Supply Air Fan has proved on, the Make-up Air Unit shall calculate its mode of operation.
- 6 – If the Outside Air Temperature is below 50 deg. F. (adj.), the Make-up Air Unit will enter it’s heating mode.
- 7 – Upon a call for heating, the Gas Heating Signal shall begin to modulate to maintain a Discharge Air Set-point of 60 deg. F..

AIR FILTER MONITORING:

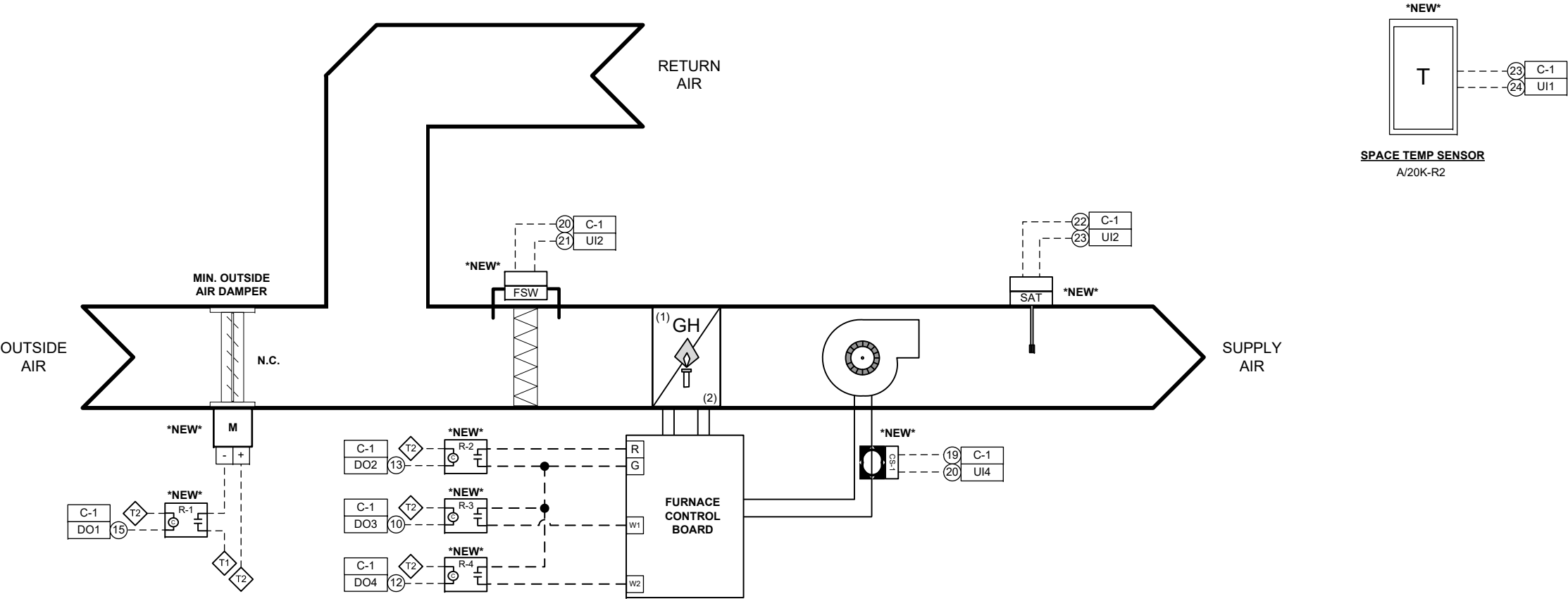
- 1 – The DDC controller shall monitor the filter switch and generate an alarm when it is tripped at the manufacturers dirty filter rating.

SENSOR ALARMING:

- 1 – If the Space Temperature is above 95 deg. F or below 45 deg. F an alarm shall be generated.
- 2 – If the Discharge Air Temperature is above 120 deg. F or below 35 deg. F an alarm shall be generated.
- 3 – If the Discharge Air Temperature remains within 4 deg. F below of the Heating Set-point and the Heating Signal is more than 10% for longer than 10 minutes, an alarm shall be generated.
- 4 – All set-points shall be user adjustable from the graphical user interface.
- 5 – If a door switch has been open and the MAU’ heating has been operational for longer than 15 minutes, a critical alarm will be enunciated in the BMS.

FACILITY	NJDOT Fernwood Building 7, 1035 Parkway Ave, Ewing, NJ 08625								Project: NJ DOT FERNWOOD GARAGE BUILDING 7
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS					
		1	11-02-2017	ADDED DOOR SWITCHES					
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-11-2017	SUBMITTAL	A.V.				
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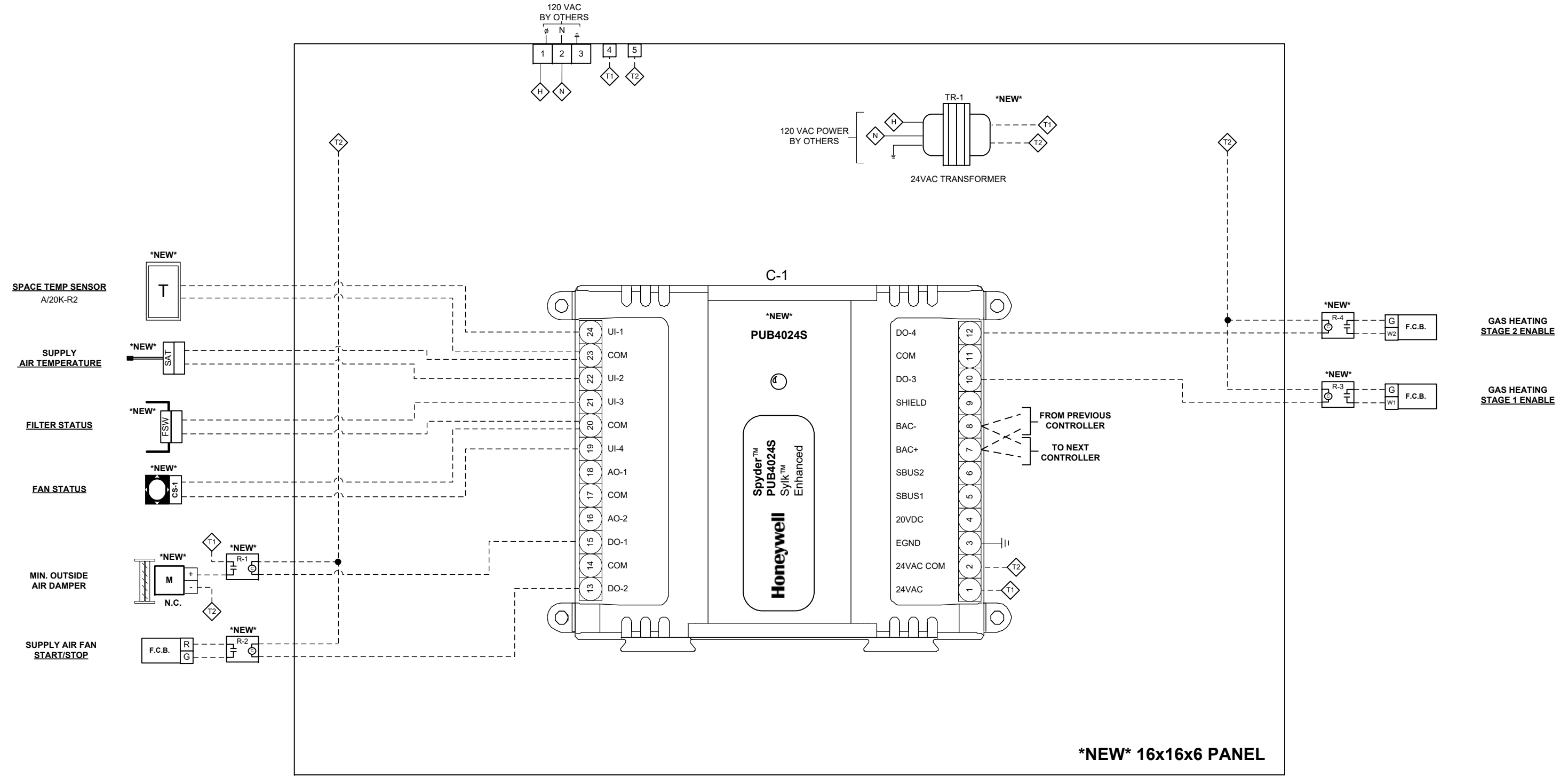
AIR HANDLING UNIT (AHU-1) FLOW DIAGRAM



NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

FACILITY	NJDOT Fernwood Building 7, 1035 Parkway Ave, Ewing, NJ 08625								Project: NJ DOT FERNWOOD GARAGE BUILDING 7
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS					AIR HANDLING UNIT (AHU-1) FLOW DIAGRAM
		1	11-02-2017	ADDED DOOR SWITCHES					
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-11-2017	SUBMITTAL	A.V.				
		NO.	DATE	REVISION	BY				Job No. #17-03253 Page 7 of 12

AIR HANDLING UNIT (AHU-1) WIRING SCHEMATIC

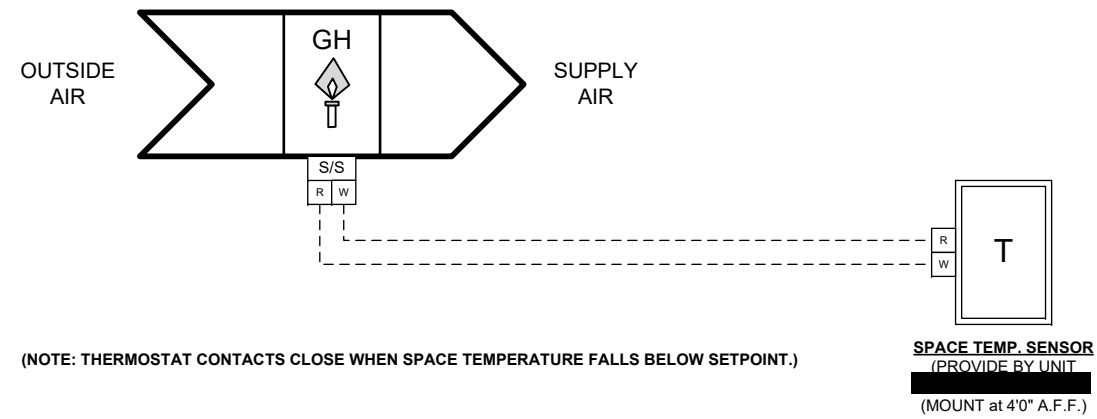


NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

FACILITY	NJDOT Fernwood Building 7, 1035 Parkway Ave, Ewing, NJ 08625						Project: NJ DOT FERNWOOD GARAGE BUILDING 7
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS			AIR HANDLING UNIT (AHU-1) WIRING SCHEMATIC
		1	11-02-2017	ADDED DOOR SWITCHES			
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-11-2017	SUBMITTAL	A.V.		
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GAS UNIT HEATER FLOW & WIRING DIAGRAM

(TYPICAL OF 2)



NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

FACILITY	NJDOT Fernwood Building 7, 1035 Parkway Ave, Ewing, NJ 08625					Project: NJ DOT FERNWOOD GARAGE BUILDING 7		
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS			GAS UNIT HEATER FLOW & WIRING DIAGRAM	
		1	11-02-2017	ADDED DOOR SWITCHES				
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-11-2017	SUBMITTAL		A.V.	Job No. #17-03253 Page 10 of 12	
		NO.	DATE	REVISION	BY			

RADIANT CEILING PANEL FLOW & WIRING DIAGRAM

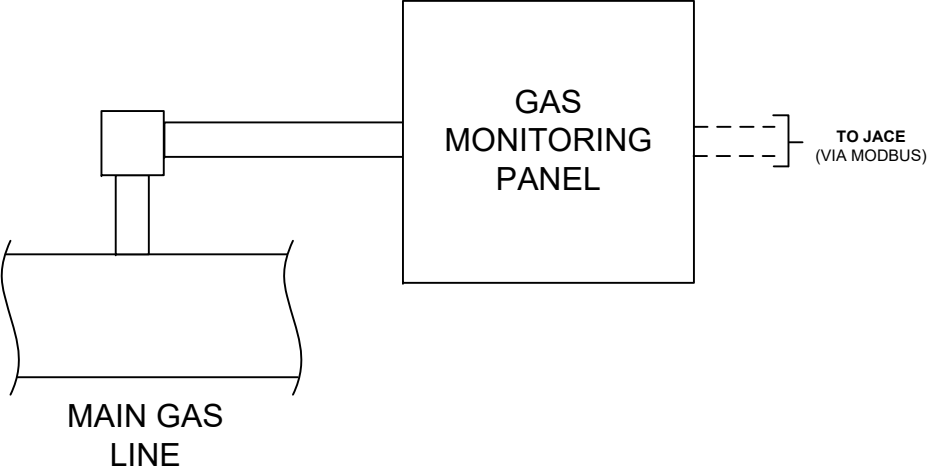
(TYPICAL OF 8)



NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

FACILITY	NJDOT Fernwood Building 7, 1035 Parkway Ave, Ewing, NJ 08625							Project: NJ DOT FERNWOOD GARAGE BUILDING 7
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS				
		1	11-02-2017	ADDED DOOR SWITCHES				
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-11-2017	SUBMITTAL	A.V.			
		NO.	DATE	REVISION	BY			
								RADIANT CEILING PANEL FLOW & WIRING DIAGRAM
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POWER AND GAS MONITORING FLOW DIAGRAM



FACILITY	NJDOT Fernwood Building 7, 1035 Parkway Ave, Ewing, NJ 08625								Project: NJ DOT FERNWOOD GARAGE BUILDING 7
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS					POWER AND GAS MONITORING FLOW DIAGRAM
		1	11-02-2017	ADDED DOOR SWITCHES					
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-11-2017	SUBMITTAL	A.V.				
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PROJECT: NJDOT ESIP - FERNWOOD 7

JOB ID NUMBER: 17-04260

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PAGE	QTY	PRODUCT #	MFGR.	DESCRIPTION
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PG 3 RISER	1		Honeywell	JACE License Up to ____ Devices
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PG 4 & 5 MAU	1	ADPS-04-2-N	Dwyer	Differential Pressure Filter Switch
PG 4 & 5 MAU	1	C-2200	Senva	On/Off Status Current Transducer
PG 4 & 5 MAU	2	RIBU1C	FD, Inc. (RIB)	120 Vac / 10-30 Vac/dc Relay SPDT
PG 4 & 5 MAU	1	EN4202R	Inovonics	Wireless Reciever w/ 4 Relays
PG 4 & 5 MAU	2	EN1210W	Inovonics	Wireless Magnetic Door Switch
PG 5 MAU	1	PUB6438SR	Honeywell	Spyder BACnet Prog. Controller
PG 5 MAU	1	TR75VA001	FD, Inc. (RIB)	120VAC/24VAC Transformer
PG 5 MAU	1	DCP-1.5-W-12VDC	Kele	24VAC/12VDC Power Supply
PG 5 MAU	1	SCE-16N1606LP	Saginaw	Enviroline Series Control Panel
PG 5 MAU	1	SCE-16N16MP	Saginaw	16x16 Subpanel
PG 7 & 8 AHU	1	A/20K-R2	ACI	Space Temperature Sensor
PG 7 & 8 AHU	1	A/20K-D-8"	ACI	8-inch Duct Temperature Probe
PG 7 & 8 AHU	1	ADPS-04-2-N	Dwyer	Differential Pressure Filter Switch
PG 7 & 8 AHU	1	C-2200	Senva	On/Off Status Current Transducer
PG 7 & 8 AHU	4	RIBU1C	FD, Inc. (RIB)	120 Vac / 10-30 Vac/dc Relay SPDT
PG 7 & 8 AHU	1	MS8105A1030	Honeywell	24Vac On/Off 44lb-in Actuator
PG 8 AHU	1	PUB4024S	Honeywell	Spyder BACnet Prog. Controller
PG 8 AHU	1	TR75VA001	FD, Inc. (RIB)	120VAC/24VAC Transformer
PG 8 AHU	1	SCE-16N1606LP	Saginaw	Enviroline Series Control Panel
PG 8 AHU	1	SCE-16N16MP	Saginaw	16x16 Subpanel
PG 12 GAS/PWR	1	620S-BT-L06-M1-EN2-V4-NR-9-MB	Sierra Inst.	BoilerTrak Immersible Thermal Gas Mass Flow Meter

NJ DOT FERNWOOD GARAGE BUILDING 8 (AS-BUILTS)

ENERGY SAVINGS IMPROVEMENT PROJECT

BUILDING AUTOMATION SYSTEM

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3	NETWORK RISER	
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5	MAKE-UP AIR UNIT (MAU-1) WIRING SCHEMATIC	
6	MAU SEQUENCE OF OPERATIONS	
7	AIR HANDLING UNIT (AHU-1&3) FLOW DIAGRAM	
8	AIR HANDLING UNIT (AHU-1&3) WIRING SCHEMATIC	
9	AIR HANDLING UNIT (AHU-2&4) FLOW DIAGRAM	
10	AIR HANDLING UNIT (AHU-2&4) WIRING SCHEMATIC	
11	AIR HANDLING UNIT SEQUENCE OF OPERATIONS	
12	GAS UNIT HEATER FLOW & WIRING DIAGRAM	
13	RADIANT CEILING PANEL FLOW & WIRING DIAGRAM	
14	POWER AND GAS MONITORING FLOW DIAGRAM	

LEGEND & SYMBOLS

GENERAL NOTES

1. ALL POWER WIRING 120 VAC AND ABOVE BY ELECTRICAL CONTRACTOR.

TEMPERATURE CONTROL LEGEND:

 MOUNTED ON PANEL FACE

 MOUNTED INSIDE PANEL

 CONTROL TUBE #3

 PNEUMATIC TUBING

 WIRING

 TERMINAL BLOCK #6

 SOLENOID VALVE

 CONTROL VALVE, 2-WAY

 CONTROL VALVE, 3-WAY

 PARALLEL BLADED DAMPER

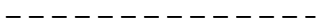
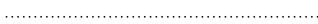
 OPPOSED BLADED DAMPER

 SIGNAL LINE INSIDE PANEL

ABBREVIATIONS:

AFMS- AIR FLOW MEASURING STATION	OA -OUTSIDE AIR
C- COMMON PORT	OL'S- MOTOR STARTER OVERLOADS
CCP- CENTRAL CONTROL PANEL	PC- PRESSURE CONTROLLER
CR- CONTROL RELAY	PE- PRESSURE TOGGLE SWITCH
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MA- MIXED AIR	TT- TEMPERATURE TRANSMITTER
MOD-MOTER OPERATED DAMPER	TX- TRANSFORMER
NC- NORMALLY CLOSED	V- VALVE
NCP- NETWORK CONTROL PANEL	WB- WET BULB
NO- NORMALLY OPEN	WU- WARM-UP SIGNAL

WIRING LEGEND

	Low Voltage, 18 AWG, Copper Wire
	Low Voltage Communication Wiring 22/2 AWG, CL2P, Shielded Copper Wire, Low Capacitance
	Line Voltage, THHN Field Wiring

HVAC SYSTEM LEGEND:

 MOTOR OPERATED DAMPER

 PREHEAT COIL

 COOLING COIL

 REHEAT COIL

 HEATING COIL

 DIRECT EXPANSION COIL

 FAN

 MANUAL VALVE

 ZONE CO2 SENSOR

 WATER FLOW METER

 AVERAGING TYPE TEMPERATURE SENSOR

 FILTER

 FIRE & SMOKE DAMPER (BY OTHERS)

 OUTSIDE AIR TEMPERATURE SENSOR

 FREEZESTAT (D.P. CONTACT)

 DUCT MOUNTED TEMPERATURE SENSOR

 IMMERSION TYPE TEMPERATURE SENSOR

 DUCT MOUNTED SMOKE DETECTOR

 STATIC PRESSURE TRANSMITTER

 STEAM PRESSURE SENSOR

 DUCT MOUNTED HUMIDITY SENSOR

 SPACE TEMPERATURE

 OUTSIDE AIR CO2 SENSOR

 AIR FLOW MEASURING STATION

 CONTROL RELAY

 CURRENT SENSOR

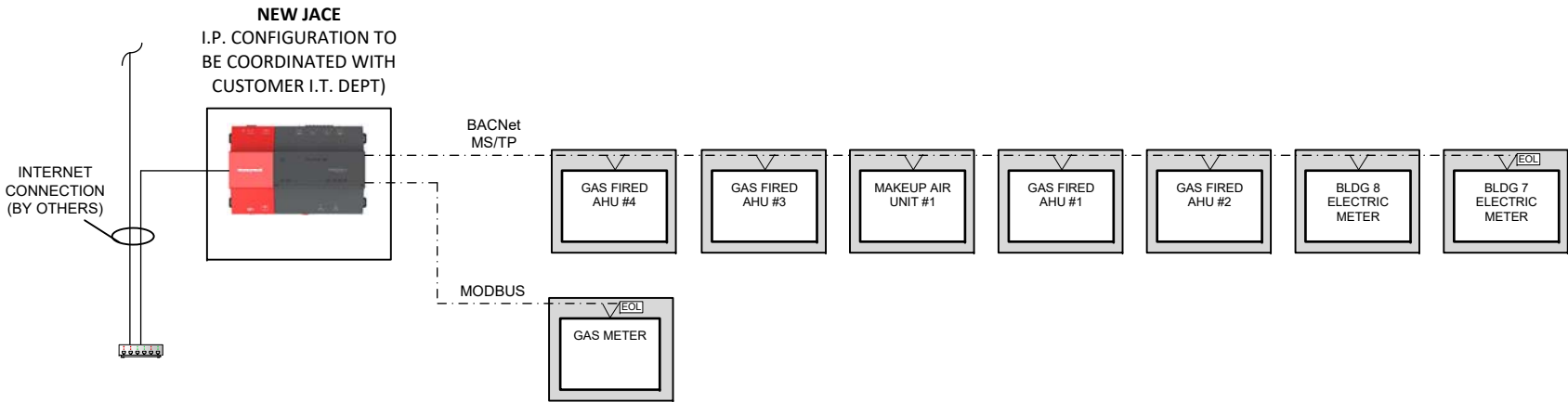
 CO2 SENSOR

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625				
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS	
		1	11-02-2017	ADDED DOOR SWITCHES	
		0	08-11-2017	SUBMITTAL	A.V.
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	NO.	DATE	REVISION	BY

Project: NJ DOT FERNWOOD GARAGE BUILDING 8

LEGEND & SYMBOLS

NETWORK RISER



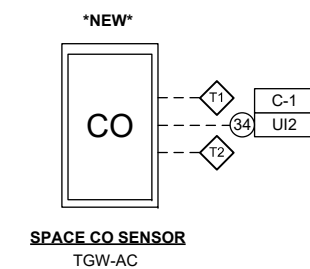
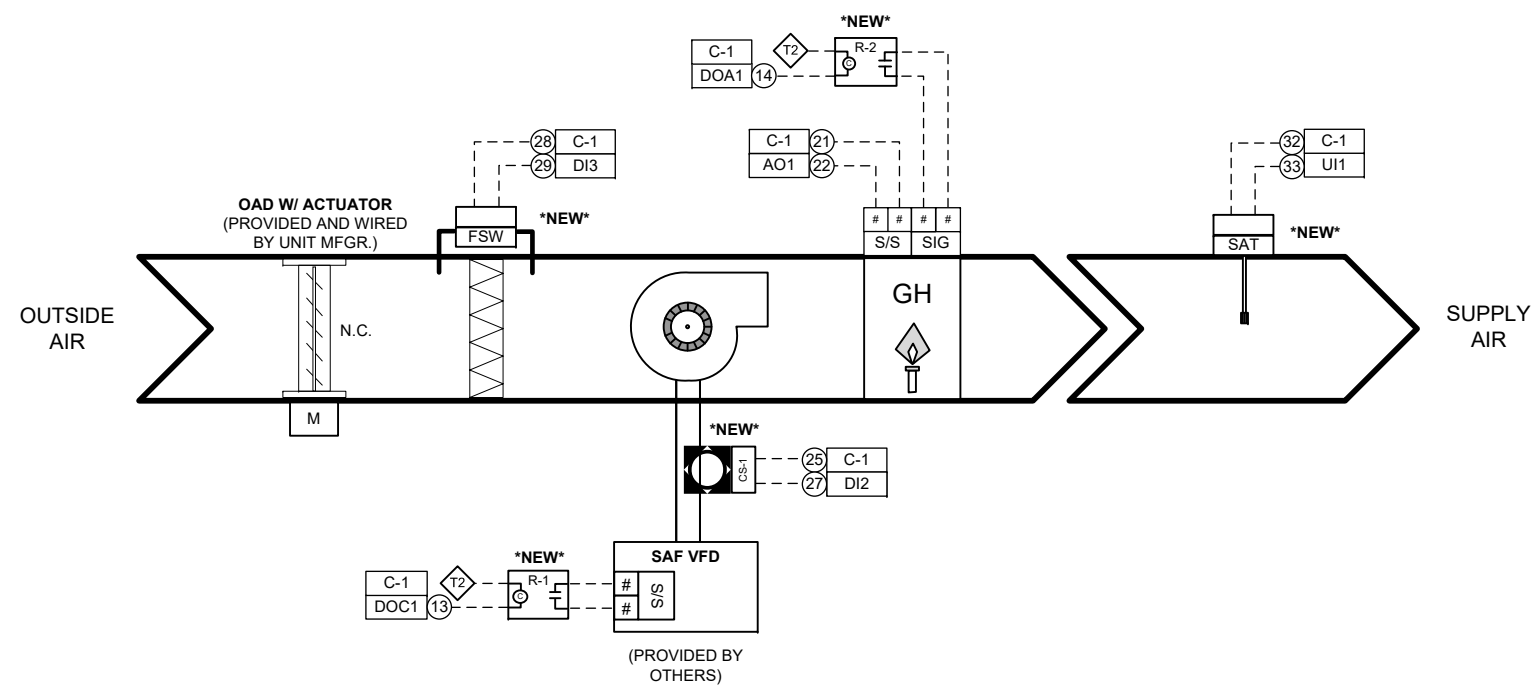
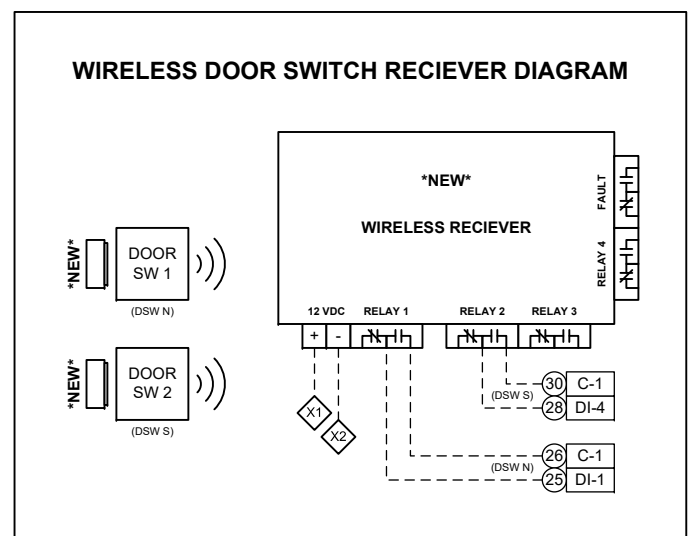
NOTE: 1) 120VAC POWER TO ALL CONTROL PANELS BY OTHERS

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625				
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS	
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Project: NJ DOT FERNWOOD GARAGE BUILDING 8

NETWORK RISER

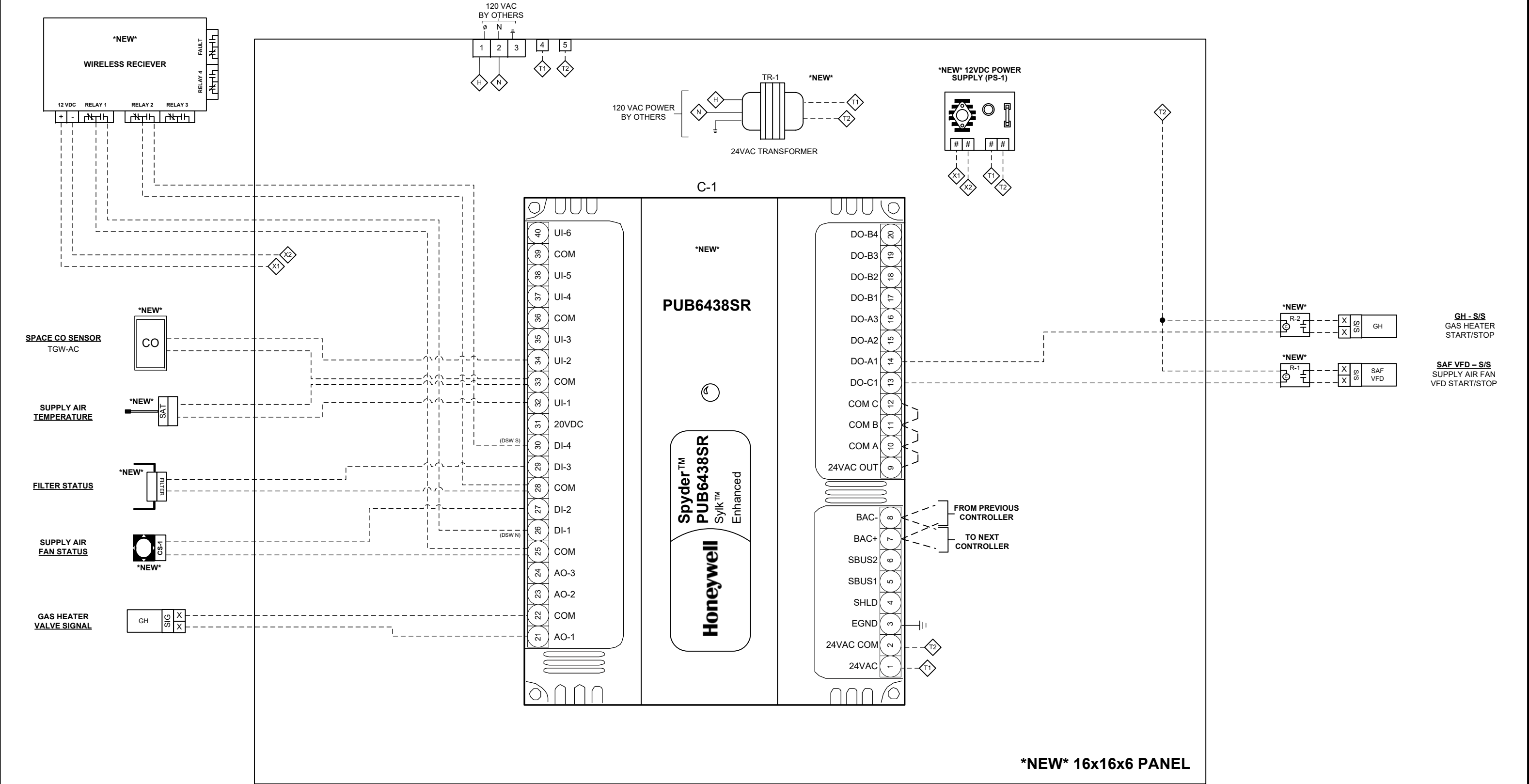
MAKE-UP AIR UNIT (MAU-1) FLOW DIAGRAM



NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

[illegible]

MAKE-UP AIR UNIT (MAU-1) WIRING SCHEMATIC



NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625						Project: NJ DOT FERNWOOD GARAGE BUILDING 8
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS			MAKE-UP AIR UNIT (MAU-1) WIRING SCHEMATIC
		1	11-02-2017	ADDED DOOR SWITCHES			
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-11-2017	SUBMITTAL	A.V.		
		NO.	DATE	REVISION	BY		Job No. #17-03253 Page 5 of 14

MAU SEQUENCE OF OPERATIONS

ENABLED MODE:

- 1 – The Make-up Air Unit and its associated Exhaust Fans shall be indexed into the Enabled Mode as per the BMS schedule, or whenever CO levels exceed 10 ppm (adj.).
- 2 – Upon initial startup, the Outside Air Damper shall open.
- 3 – Once the Outside Air Damper has proved open via the End Switch, the Supply Air Fan shall start.
- 4 – If the Supply Air Fan fails to start as sensed by its current sensor, an alarm shall be generated and the Outside Air Damper shall close.
- 5 – Once the Supply Air Fan has proved on, the Make-up Air Unit shall calculate its mode of operation.
- 6 – If the Outside Air Temperature is below 50 deg. F. (adj.), the Make-up Air Unit will enter it's heating mode.
- 7 – Upon a call for heating, the Gas Heating Signal shall begin to modulate to maintain a Discharge Air Set-point of 60 deg. F..

AIR FILTER MONITORING:

- 1 – The DDC controller shall monitor the filter switch and generate an alarm when it is tripped at the manufacturers dirty filter rating.

SENSOR ALARMING:

- 1 – If the Space Temperature is above 95 deg. F or below 45 deg. F an alarm shall be generated.
- 2 – If the Discharge Air Temperature is above 120 deg. F or below 35 deg. F an alarm shall be generated.
- 3 – If the Discharge Air Temperature remains within 4 deg. F below of the Heating Set-point and the Heating Signal is more than 10% for longer than 10 minutes, an alarm shall be generated.
- 4 – All set-points shall be user adjustable from the graphical user interface.
- 5 – If a door switch has been open and the MAU' heating has been operational for longer than 15 minutes, a critical alarm will be enunciated in the BMS.

[illegible]

(TYPICAL OF 2)



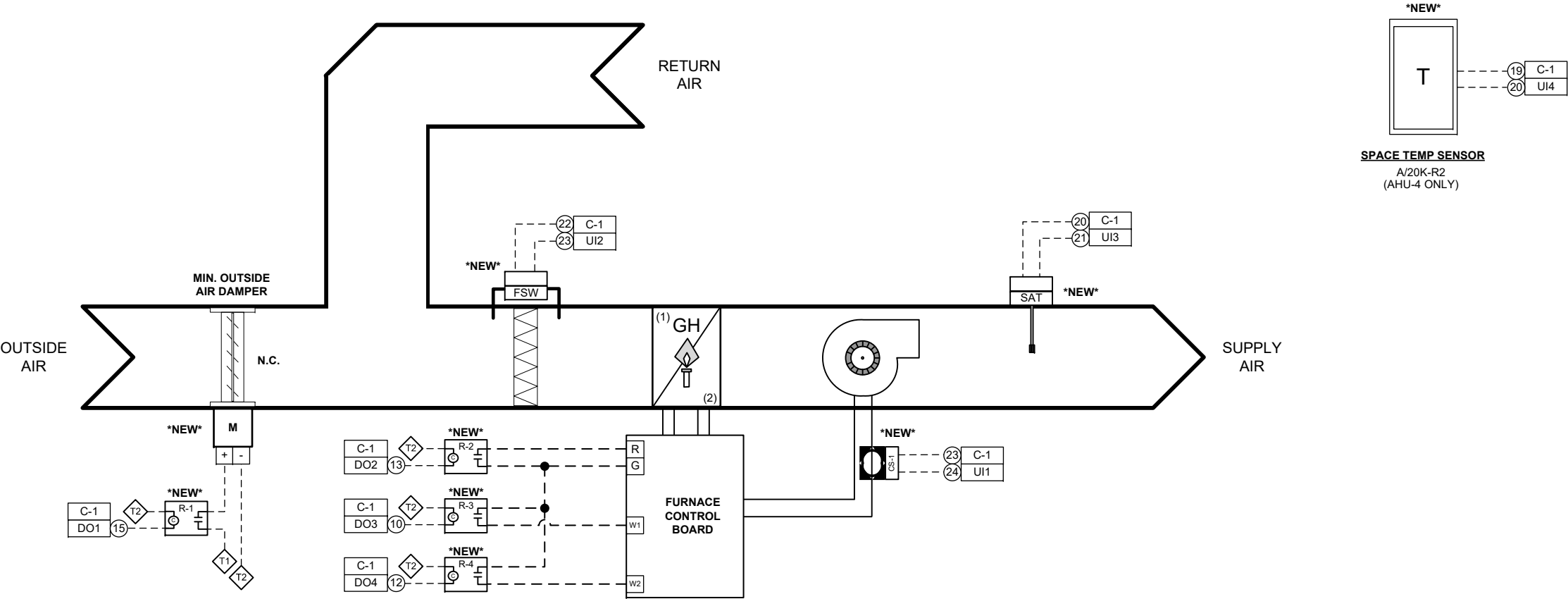
FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625					Project: NJ DOT FERNWOOD GARAGE BUILDING 8		
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS			AIR HANDLING UNIT (AHU-1&3) FLOW DIAGRAM	
		1	11-02-2017	ADDED DOOR SWITCHES				
		0	08-11-2017	SUBMITTAL		A.V.		
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	NO.	DATE	REVISION		BY	Job No. #17-03253 Page 7 of 14	

(TYPICAL OF 2)



FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625					Project: NJ DOT FERNWOOD GARAGE BUILDING 8		
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS			AIR HANDLING UNIT (AHU-1&3) WIRING SCHEMATIC	
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ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	NO.	DATE	REVISION		BY	Job No. #17-03253 Page 8 of 14	

AIR HANDLING UNIT (AHU-2&4) FLOW DIAGRAM
(TYPICAL OF 2 EXCEPT AS NOTED)



NOTE:
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FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625							Project: NJ DOT FERNWOOD GARAGE BUILDING 8
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS				AIR HANDLING UNIT (AHU-2&4) FLOW DIAGRAM
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		NO.	DATE	REVISION	BY			Job No. #17-03253 Page 9 of 14

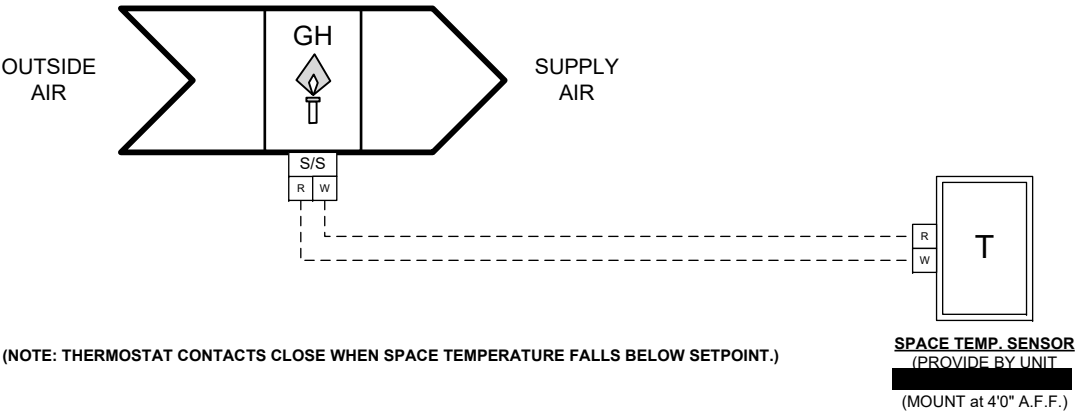
(TYPICAL OF 2 EXCEPT AS NOTED)



FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625					Project: NJ DOT FERNWOOD GARAGE BUILDING 8 AIR HANDLING UNIT (AHU-2&4) WIRING SCHEMATIC Job No. #17-03253 Page 10 of 14
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS		
		1	11-02-2017	ADDED DOOR SWITCHES		
		0	08-11-2017	SUBMITTAL	A.V.	
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	NO.	DATE	REVISION	BY	

GAS UNIT HEATER FLOW & WIRING DIAGRAM

(TYPICAL OF 6)



NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625								Project: NJ DOT FERNWOOD GARAGE BUILDING 8
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS					GAS UNIT HEATER FLOW & WIRING DIAGRAM
		1	11-02-2017	ADDED DOOR SWITCHES					
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-11-2017	SUBMITTAL	A.V.				
		NO.	DATE	REVISION	BY				Job No. #17-03253Page 12 of 14

RADIANT CEILING PANEL FLOW & WIRING DIAGRAM

(TYPICAL OF 3)



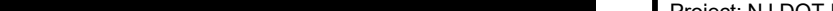
NOTE:
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FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625					Project: NJ DOT FERNWOOD GARAGE BUILDING 8	
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS			RADIANT CEILING PANEL FLOW & WIRING DIAGRAM
		1	11-02-2017	ADDED DOOR SWITCHES			
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-11-2017	SUBMITTAL	A.V.		Job No. #17-03253Page 13 of 14
		NO.	DATE	REVISION	BY		

Diagram illustrating the connection of the Gas Monitoring Panel to the Main Gas Line and the JACE system.

- The **MAIN GAS LINE** is connected to the **GAS MONITORING PANEL** via a vertical pipe and a horizontal pipe.
- The **GAS MONITORING PANEL** is connected to the **TO JACE (VIA MODBUS)** output via a dashed line.



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MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS				POWER AND GAS MONITORING FLOW DIAGRAM		
		1	11-02-2017	ADDED DOOR SWITCHES				A.V.		
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-11-2017	SUBMITTAL						
		NO.	DATE	REVISION	BY		Job No.	#17-03253	Page	14 of 14

PAGE	QTY	PRODUCT #	MFGR.	DESCRIPTION
PG 3 RISER	1	WEB-8000-CSE	Honeywell	JACE Web Controller
PG 3 RISER	1		Honeywell	JACE License Up to ____ Devices
PG 4 & 5 MAU	1	TGW-AC	Senva	Space Carbon Monoxide Sensor
PG 4 & 5 MAU	1	A/20K-D-8"	ACI	8-inch Duct Temperature Probe
PG 4 & 5 MAU	1	ADPS-04-2-N	Dwyer	Differential Pressure Filter Switch
PG 4 & 5 MAU	1	C-2200	Senva	On/Off Status Current Transducer
PG 4 & 5 MAU	1	RIBU1C	FD, Inc. (RIB)	120 Vac / 10-30 Vac/dc Relay SPDT
PG 4 & 5 MAU	1	EN4202R	Inovonics	Wireless Reciever w/ 4 Relays
PG 4 & 5 MAU	2	EN1210W	Inovonics	Wireless Magnetic Door Switch
PG 5 MAU	1	PUB6438SR	Honeywell	Spyder BACnet Prog. Controller
PG 5 MAU	1	TR75VA001	FD, Inc. (RIB)	120VAC/24VAC Transformer
PG 5 MAU	1	DCP-1.5-W-12VDC	Kele	24VAC/12VDC Power Supply
PG 5 MAU	1	SCE-16N1606LP	Saginaw	Enviroline Series Control Panel
PG 5 MAU	1	SCE-16N16MP	Saginaw	16x16 Subpanel
PG 7-10 AHU	3	A/20K-R2	ACI	Space Temperature Sensor
PG 7-10 AHU	4	A/20K-D-8"	ACI	8-inch Duct Temperature Probe
PG 7-10 AHU	4	ADPS-04-2-N	Dwyer	Differential Pressure Filter Switch
PG 7-10 AHU	6	C-2200	Senva	On/Off Status Current Transducer
PG 7-10 AHU	18	RIBU1C	FD, Inc. (RIB)	120 Vac / 10-30 Vac/dc Relay SPDT
PG 7-10 AHU	4	MS8105A1030	Honeywell	24Vac On/Off 44lb-in Actuator
PG 8 AHU	2	PUB6438SR	Honeywell	Spyder BACnet Prog. Controller
PG 10 AHU	2	PUB4024S	Honeywell	Spyder BACnet Prog. Controller
PG 8 & 10 AHU	4	TR75VA001	FD, Inc. (RIB)	120VAC/24VAC Transformer
PG 8 & 10 AHU	4	SCE-16N1606LP	Saginaw	Enviroline Series Control Panel
PG 8 & 10 AHU	4	SCE-16N16MP	Saginaw	16x16 Subpanel
PG 14 GAS/PWR	2	PS3037-S-N	Dent Inst.	1-pt. Rev. Grade Power Meter
PG 14 GAS/PWR	2	CT-R16-A4-U	Dent Inst.	Flexible Current Transformer
PG 14 GAS/PWR	1	620S-BT-L06-M1-EN2-V4-NR-9-MB	Sierra Inst.	BoilerTrak Immersible Thermal Gas Mass Flow Meter

TITLE PAGE

NJ DOT FERNWOOD GARAGE BUILDING 11 (AS-BUILTS)

ENERGY SAVINGS IMPROVEMENT PROJECT

BUILDING AUTOMATION SYSTEM

SHEET NUMBER	CONTENTS	REVISION
1	TITLE PAGE	
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[illegible]

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 MOUNTED ON PANEL FACE

 MOUNTED INSIDE PANEL

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 PNEUMATIC TUBING

 WIRING

 TERMINAL BLOCK #6

 SOLENOID VALVE

 CONTROL VALVE, 2-WAY

 CONTROL VALVE, 3-WAY

 PARALLEL BLADED DAMPER

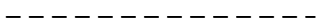
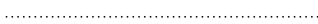
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 OUTSIDE AIR CO2 SENSOR

 AIR FLOW MEASURING STATION

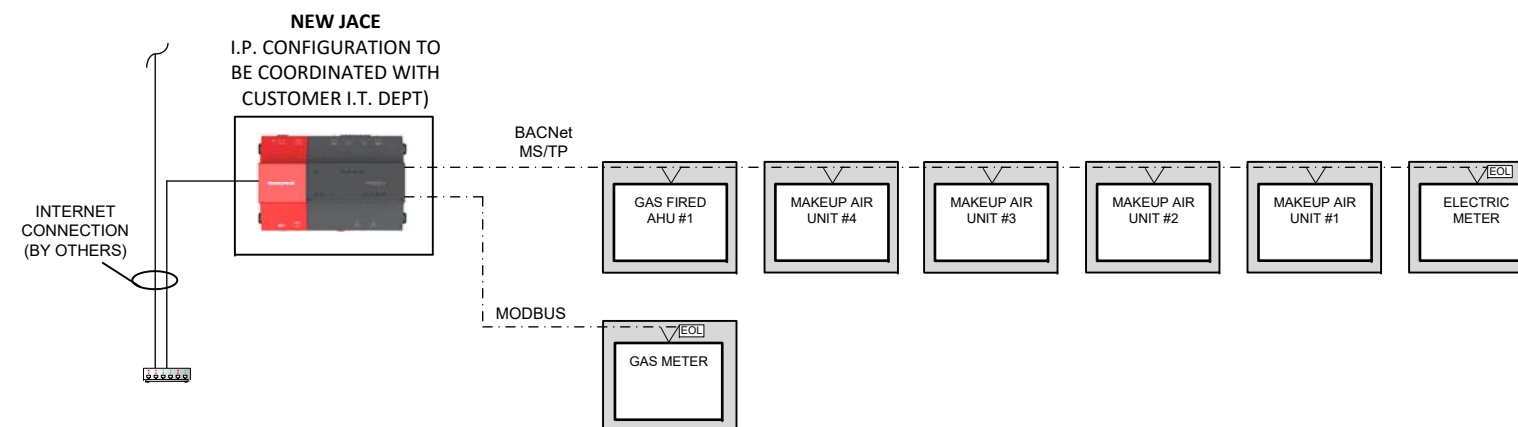
 CONTROL RELAY

 CURRENT SENSOR

 CO2 SENSOR

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625								Project: NJ DOT FERNWOOD GARAGE BUILDING 11
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		1	11-02-2017	ADDED DOOR SWITCHES					
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-14-2017	SUBMITTAL		A.V.			
		NO.	DATE	REVISION		BY			Job No. #17-04260Page 2 of 11

NETWORK RISER

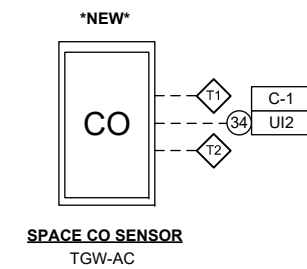
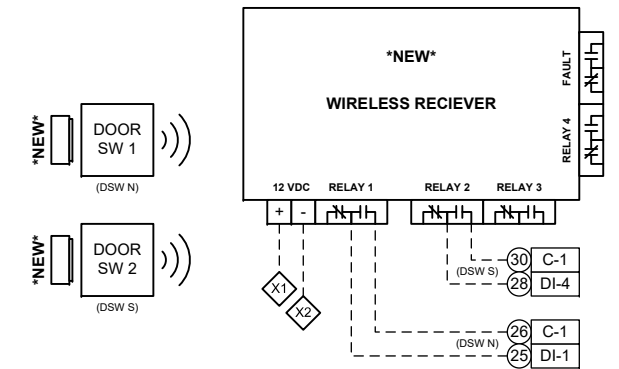
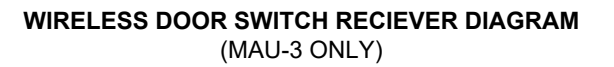
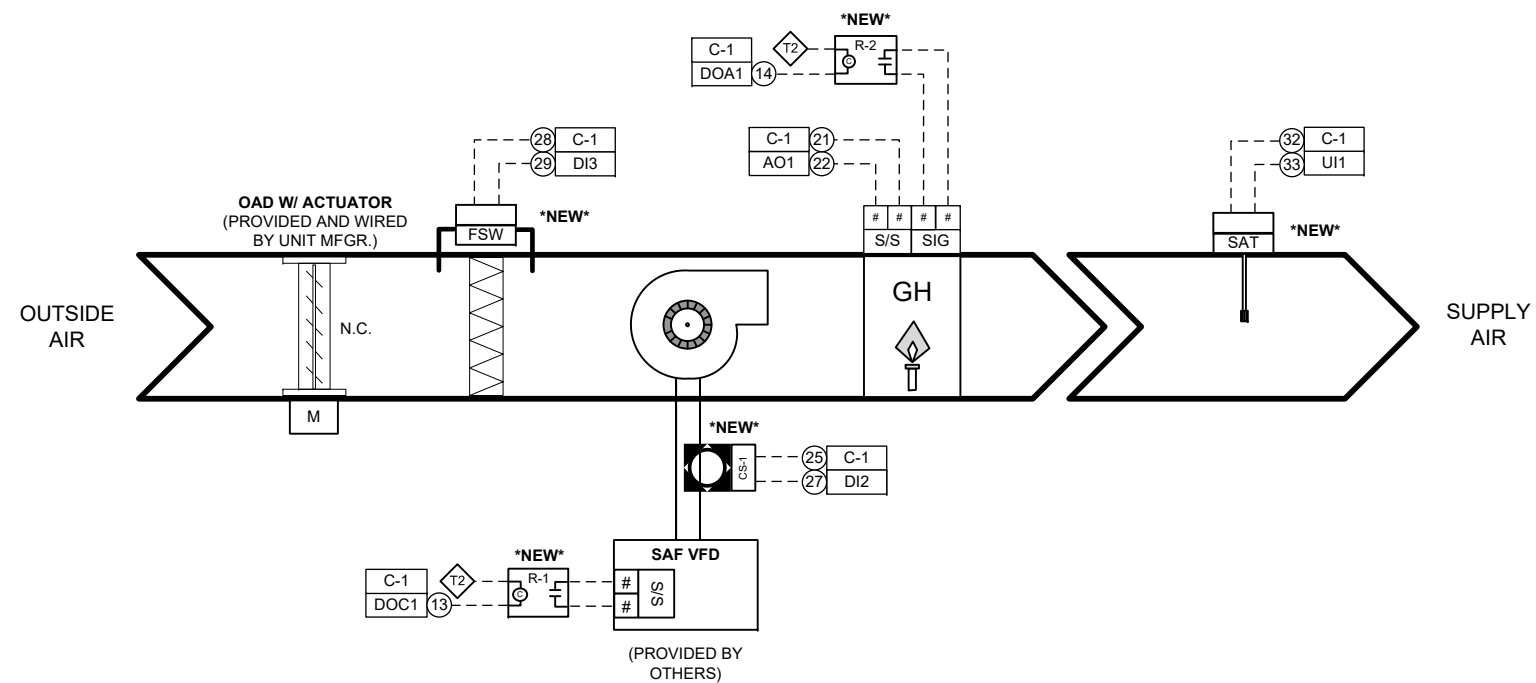


NOTE: 1) 120VAC POWER TO ALL CONTROL PANELS BY OTHERS

[illegible]

MAKE-UP AIR UNIT (MAU-1,2,3,&4) FLOW DIAGRAM

(TYPICAL OF 4 EXCEPT AS NOTED)



NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625					Project: NJ DOT FERNWOOD GARAGE BUILDING 11		
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ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	NO.	DATE	REVISION		BY	Job No. #17-04260 Page 4 of 11	

(TYPICAL OF 4 EXCEPT AS NOTED)



FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625					Project: NJ DOT FERNWOOD GARAGE BUILDING 11 MAKE-UP AIR UNIT (MAU-1,2,3,&4) WIRING SCHEMATIC Job No. #17-04260 Page 5 of 11
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS		
		1	11-02-2017	ADDED DOOR SWITCHES		
		0	08-14-2017	SUBMITTAL	A.V.	
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	NO.	DATE	REVISION	BY	

MAU SEQUENCE OF OPERATIONS

ENABLED MODE:

- 1 – The Make-up Air Unit and its associated Exhaust Fans shall be indexed into the Enabled Mode as per the BMS schedule, or whenever CO levels exceed 10 ppm (adj.).
- 2 – Upon initial startup, the Outside Air Damper shall open.
- 3 – Once the Outside Air Damper has proved open via the End Switch, the Supply Air Fan shall start.
- 4 – If the Supply Air Fan fails to start as sensed by its current sensor, an alarm shall be generated and the Outside Air Damper shall close.
- 5 – Once the Supply Air Fan has proved on, the Make-up Air Unit shall calculate its mode of operation.
- 6 – If the Outside Air Temperature is below 50 deg. F. (adj.), the Make-up Air Unit will enter it's heating mode.
- 7 – Upon a call for heating, the Gas Heating Signal shall begin to modulate to maintain a Discharge Air Set-point of 60 deg. F..

AIR FILTER MONITORING:

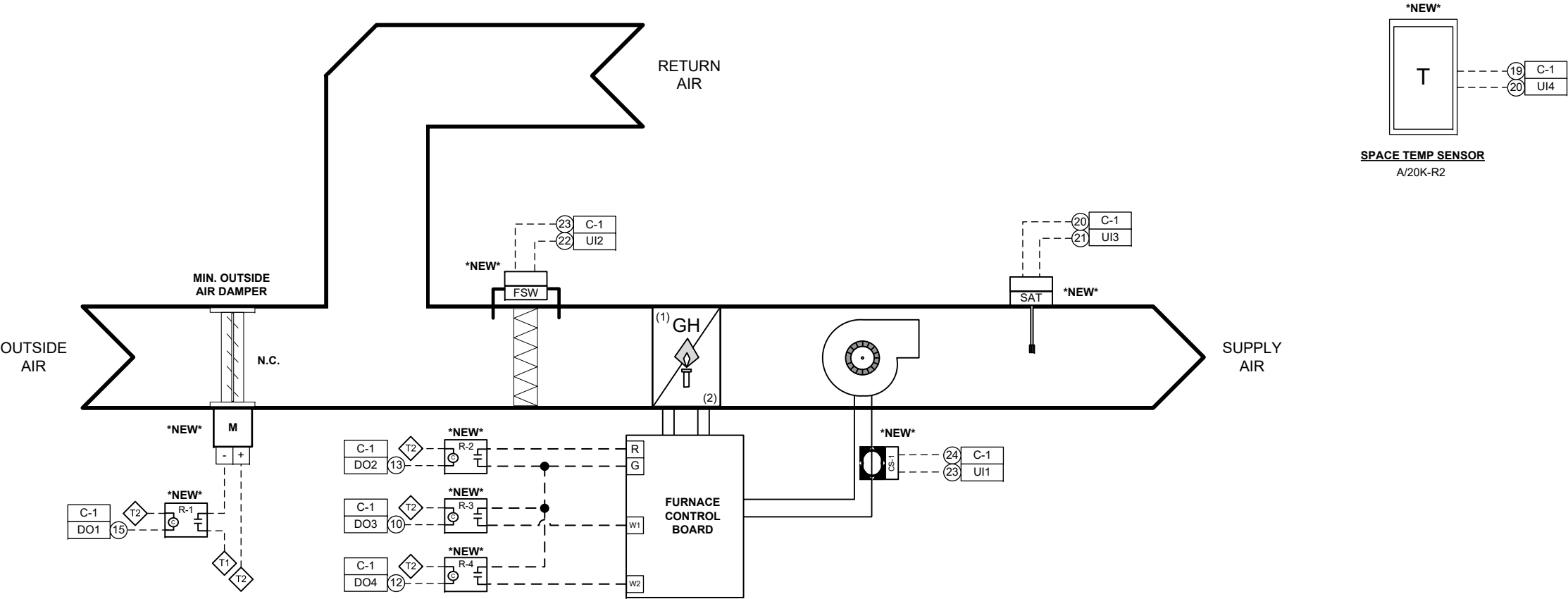
- 1 – The DDC controller shall monitor the filter switch and generate an alarm when it is tripped at the manufacturers dirty filter rating

SENSOR ALARMING:

- 1 – If the Space Temperature is above 95 deg. F or below 45 deg. F an alarm shall be generated.
- 2 – If the Discharge Air Temperature is above 120 deg. F or below 35 deg. F an alarm shall be generated.
- 3 – If the Discharge Air Temperature remains within 4 deg. F below of the Heating Set-point and the Heating Signal is more than 10% for longer than 10 minutes, an alarm shall be generated.
- 4 – All set-points shall be user adjustable from the graphical user interface.
- 5 – If a door switch has been open and the MAU' heating has been operational for longer than 15 minutes, a critical alarm will be enunciated in the BMS.

[illegible]

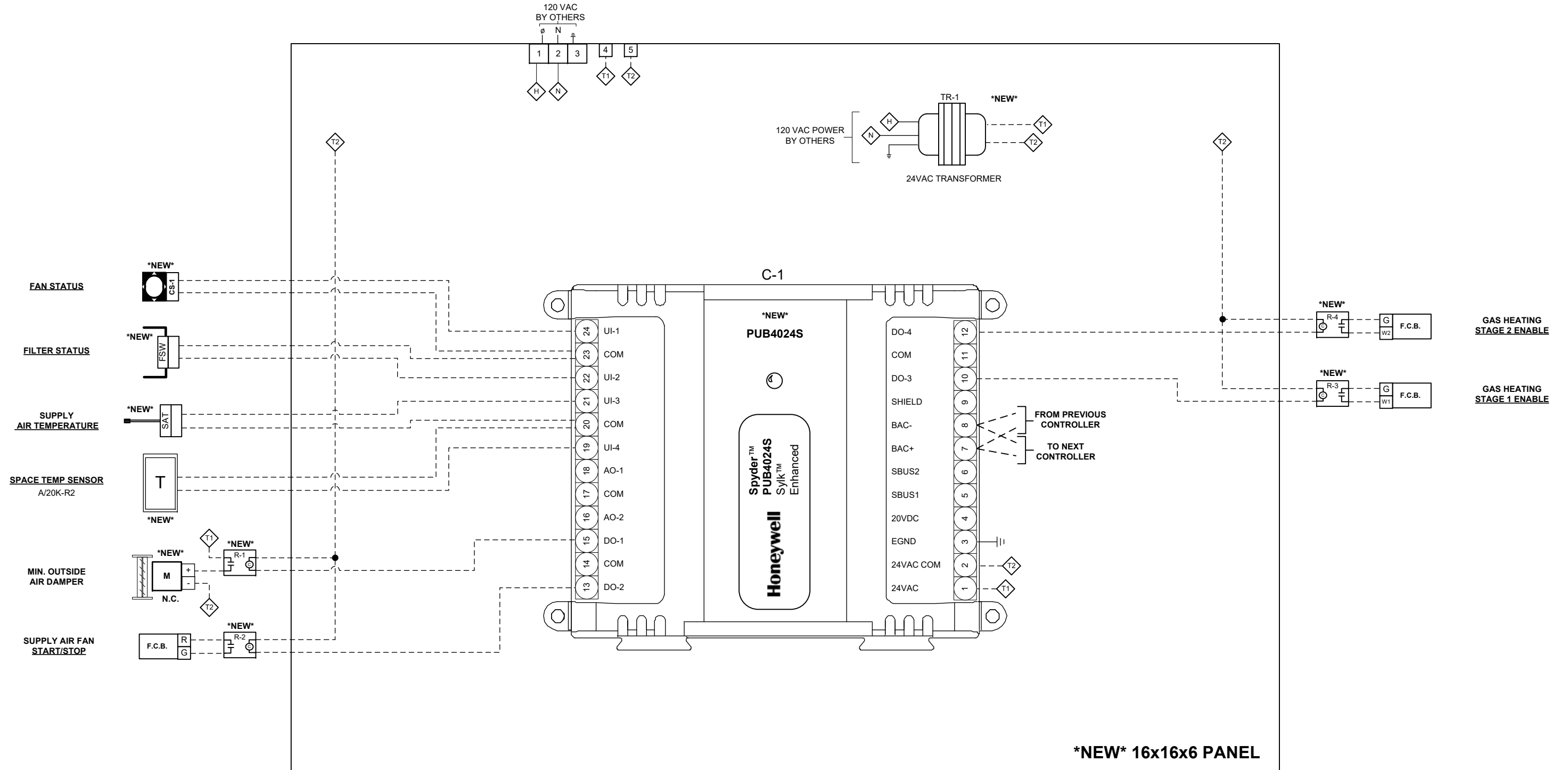
AIR HANDLING UNIT (AHU-1) FLOW DIAGRAM



NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625						Project: NJ DOT FERNWOOD GARAGE BUILDING 11
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS			
		1	11-02-2017	ADDED DOOR SWITCHES			
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-14-2017	SUBMITTAL	A.V.		
		NO.	DATE	REVISION	BY		

AIR HANDLING UNIT (AHU-1) WIRING SCHEMATIC



NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625							Project: NJ DOT FERNWOOD GARAGE BUILDING 11	
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS				AIR HANDLING UNIT (AHU-1) WIRING SCHEMATIC	
		1	11-02-2017	ADDED DOOR SWITCHES					
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-14-2017	SUBMITTAL	A.V.			Job No. #17-04260 Page 8 of 11	
		NO.	DATE	REVISION	BY				

AIR HANDLING UNIT SEQUENCE OF OPERATIONS

WARM-UP MODE:

- 1 – One hour prior to the occupied mode, the Air Handler Unit shall be placed in Warm-up Mode when that Space Temperature is more than 10 Degs F. below the Space Heating Set-point.
- 2 – The Outside Air Dampers shall be closed and the Return Air Damper shall be opened, the stage 1 gas heating signal shall be enabled.
- 3 – The Air Handler Unit shall be released from Warm-up Mode when the Space Temperature is less than 3 Degs F. below the Space Heating Set-point or when the unit enters its scheduled occupied mode.
- 4 – When the Air Handler Unit is released from warm-up mode the Outside and Return Air Dampers and the Hot Water Valve shall revert to their scheduled modes.

OCCUPIED MODE:

- 1 – The Air Handler Unit shall be indexed into the occupied mode via the BMS schedule.
- 2 - Upon initial startup, the Outside and Return Air Damper shall open to their Minimum Outside Air setting.
- 3 - The supply fan shall start and slowly ramp up to its preset speed as determined by the balancing contractor.
- 4 - If the supply fan fails to start, an alarm shall be generated and the outside air damper shall close.
- 5 – Once the supply fan has proven on, the Air Handler Unit shall calculate its mode of operation.
- 6 - If the space temperature is 2 Degs F. below the space temperature set-point (72 Degs F. adj.) and the outside air temperature is below 55 Degs F., the Air Handler Unit will enter it’s heating mode.
- 7 - Upon a call for heating, the Outside Air Damper shall remain at its minimum position and the stage 1 gas heating signal shall be enabled.
- 8 – When the Space Temperature is below 45 Degs F., both gas heating stages shall be enabled.
- 9 – If the space temperature is 2 Degs F. above the space temperature set-point (72 Degs F. adj.) and the outside air temperature is above 51 Degs F., but below 62 Degs F., the Air Handler Unit will enter its economizer mode.
- 10 - Upon a call for economizer cooling, the Outside Air Damper shall modulate open to maintain the discharge air set-point.
- 11- If the discharge air temperature goes below 45 Degs F., the economizer mode shall be overridden and the outside air damper shall modulate back to its minimum position.
- 12 – If the space temperature is 2 Degs F. above the space temperature set-point (72 Degs F. adj.) and the outside air temperature is above 65 Degs F., the Air Handler Unit will enter it’s cooling mode.
- 13 - Upon a call for cooling, the Outside Air Damper shall remain at its minimum position, the DX coils and the ACCU’s shall be toggled on, and the heating signals shall remain off.

UNOCCUPIED MODE:

- 1 – The Air Handler Unit’s Supply Air Fan shall be off, the Outside Air Damper shall be closed, and the Return Air Damper shall be open.
- 2 – When any Space Temperature Sensor is below an Unoccupied Heating Set-point of 60 deg. F, the Air Handler Unit’s Supply Air Fan shall start. The outside air damper shall remain closed and the gas heating stage 1 shall be enabled.
- 3 – When the Space Temperature rises above the Unoccupied Heating Set-point, the Air Handler Unit’s Supply Air Fan shall stop.

AIR FILTER MONITORING:

- 1 – When the filter exceeds the manufacturer’s rating for a dirty filter, an alarm shall be generated.

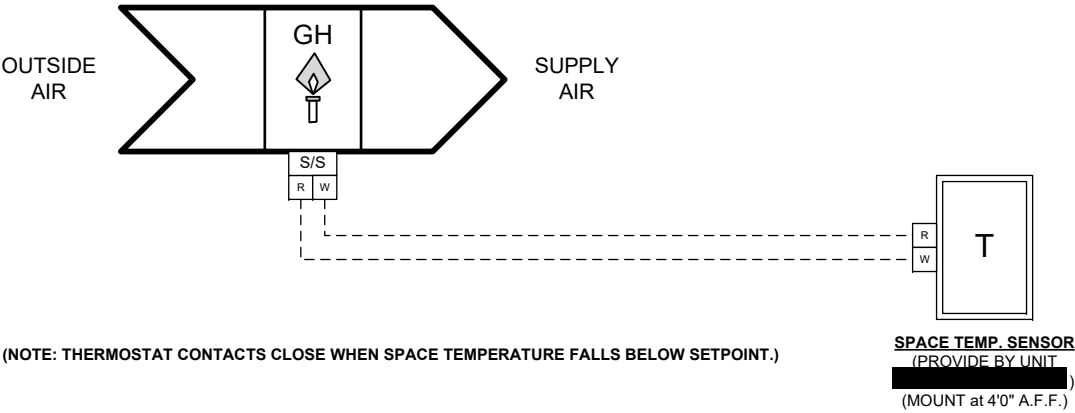
SENSOR ALARMING:

- 1 – If the Space Temperature is above 85 deg. F or below 55 deg. F an alarm shall be generated.
- 2 – If the Discharge Air Temperature is above 120 deg. F or below 45 deg. F an alarm shall be generated.
- 3 - All set-points shall be user adjustable from the graphical user interface. Occupied space temperature set-points shall be limited between 70 Degs F. and 74 Degs F.

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625						Project: NJ DOT FERNWOOD GARAGE BUILDING 11	
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS			AIR HANDLING UNIT SEQUENCE OF OPERATIONS	
		1	11-02-2017	ADDED DOOR SWITCHES				
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-14-2017	SUBMITTAL	A.V.			
		NO.	DATE	REVISION	BY		Job No.	#17-04260
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GAS UNIT HEATER FLOW & WIRING DIAGRAM

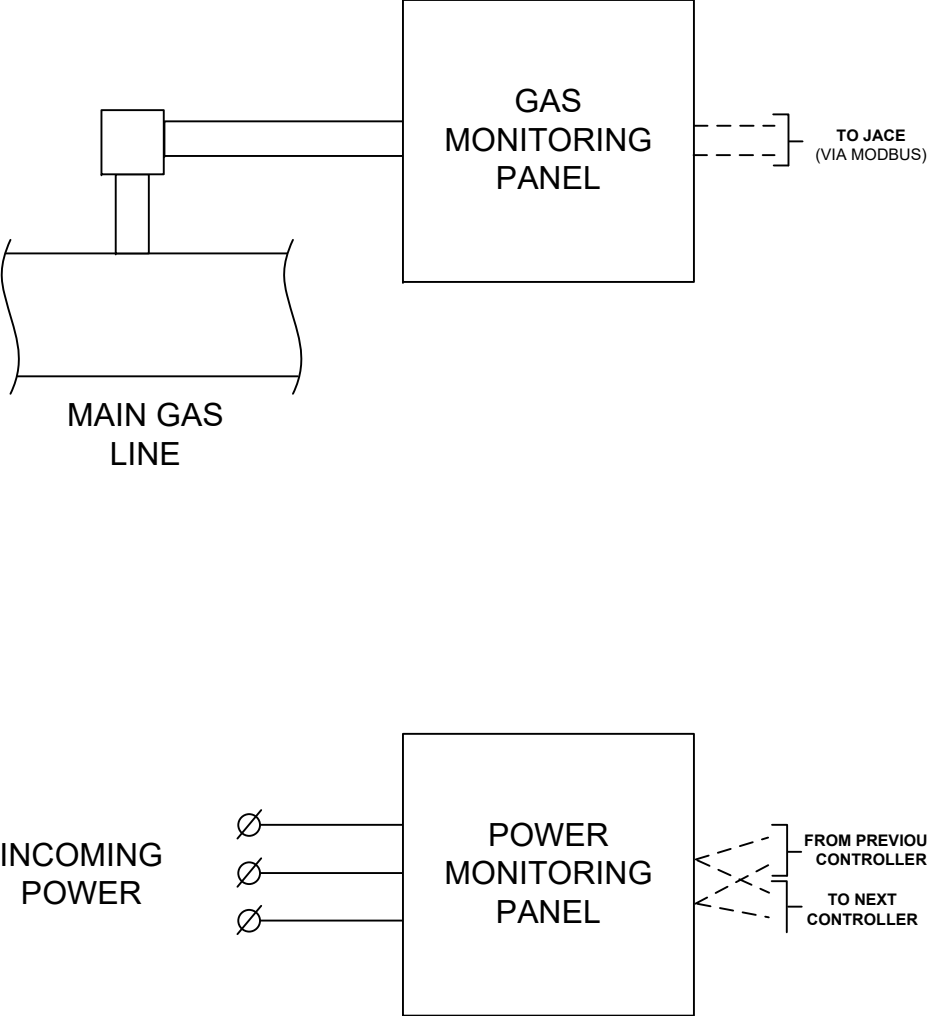
(TYPICAL OF 9)



NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625						Project: NJ DOT FERNWOOD GARAGE BUILDING 11	
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS			GAS UNIT HEATER FLOW & WIRING DIAGRAM	
		1	11-02-2017	ADDED DOOR SWITCHES				
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-14-2017	SUBMITTAL	A.V.			
		NO.	DATE	REVISION	BY		Job No.	#17-04260
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POWER AND GAS MONITORING FLOW DIAGRAM



FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625								Project: NJ DOT FERNWOOD GARAGE BUILDING 11
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS					POWER AND GAS MONITORING FLOW DIAGRAM
		1	11-02-2017	ADDED DOOR SWITCHES					
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-14-2017	SUBMITTAL	A.V.				
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PAGE	QTY	PRODUCT #	MFGR.	DESCRIPTION
PG 3 RISER	1	WEB-8000-CSE	Honeywell	JACE Web Controller
PG 3 RISER	1		Honeywell	JACE License Up to ____ Devices
PG 4 & 5 MAU	4	TGW-AC	Senva	Space Carbon Monoxide Sensor
PG 4 & 5 MAU	4	A/20K-D-8"	ACI	8-inch Duct Temperature Probe
PG 4 & 5 MAU	4	ADPS-04-2-N	Dwyer	Differential Pressure Filter Switch
PG 4 & 5 MAU	4	C-2200	Senva	On/Off Status Current Transducer
PG 4 & 5 MAU	4	RIBU1C	FD, Inc. (RIB)	120 Vac / 10-30 Vac/dc Relay SPDT
PG 4 & 5 MAU	1	EN4202R	Inovonics	Wireless Reciever w/ 4 Relays
PG 4 & 5 MAU	2	EN1210W	Inovonics	Wireless Magnetic Door Switch
PG 5 MAU	4	PUB6438SR	Honeywell	Spyder BACnet Prog. Controller
PG 5 MAU	4	TR75VA001	FD, Inc. (RIB)	120VAC/24VAC Transformer
PG 5 MAU	1	DCP-1.5-W-12VDC	Kele	24VAC/12VDC Power Supply
PG 5 MAU	4	SCE-16N1606LP	Saginaw	Enviroline Series Control Panel
PG 5 MAU	4	SCE-16N16MP	Saginaw	16x16 Subpanel
PG 7 & 8 AHU	1	A/20K-R2	ACI	Space Temperature Sensor
PG 7 & 8 AHU	1	A/20K-D-8"	ACI	8-inch Duct Temperature Probe
PG 7 & 8 AHU	1	ADPS-04-2-N	Dwyer	Differential Pressure Filter Switch
PG 7 & 8 AHU	1	C-2200	Senva	On/Off Status Current Transducer
PG 7 & 8 AHU	4	RIBU1C	FD, Inc. (RIB)	120 Vac / 10-30 Vac/dc Relay SPDT
PG 7 & 8 AHU	1	MS8105A1030	Honeywell	24Vac On/Off 44lb-in Actuator
PG 8 AHU	1	PUB4024S	Honeywell	Spyder BACnet Prog. Controller
PG 8 AHU	1	TR75VA001	FD, Inc. (RIB)	120VAC/24VAC Transformer
PG 8 AHU	1	SCE-16N1606LP	Saginaw	Enviroline Series Control Panel
PG 8 AHU	1	SCE-16N16MP	Saginaw	16x16 Subpanel
PG 11 GAS/PWR	1	PS3037-S-N	Dent Inst.	1-pt. Rev. Grade Power Meter
PG 11 GAS/PWR	1	CT-R16-A4-U	Dent Inst.	Flexible Current Transformer
PG 11 GAS/PWR	1	620S-BT-L06-M1-EN2-V4-NR-9-MB	Sierra Inst.	BoilerTrak Immersible Thermal Gas Mass Flow Meter

NJ DOT FERNWOOD GARAGE BUILDING 16 (AS-BUILTS)

ENERGY SAVINGS IMPROVEMENT PROJECT BUILDING AUTOMATION SYSTEM

SHEET NUMBER	CONTENTS	REVISION
1	TITLE PAGE	
2	LEGEND & SYMBOLS	
3	NETWORK RISER	
4	AIR HANDLING UNIT (AHU-1) FLOW DIAGRAM	
5	AIR HANDLING UNIT (AHU-1) WIRING SCHEMATIC	
6	AIR HANDLING UNIT SEQUENCE OF OPERATIONS	
7	GAS UNIT HEATER FLOW & WIRING DIAGRAM	
8	POWER AND GAS MONITORING FLOW DIAGRAM	

LEGEND & SYMBOLS

GENERAL NOTES

1. ALL POWER WIRING 120 VAC AND ABOVE BY ELECTRICAL CONTRACTOR.

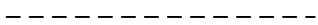
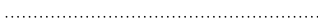
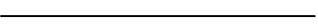
TEMPERATURE CONTROL LEGEND:

	MOUNTED ON PANEL FACE		CONTROL VALVE, 2-WAY
	MOUNTED INSIDE PANEL		CONTROL VALVE, 3-WAY
	CONTROL TUBE #3		PARALLEL BLADED DAMPER
	PNEUMATIC TUBING		OPPOSED BLADED DAMPER
	WIRING		SIGNAL LINE INSIDE PANEL
	TERMINAL BLOCK #6		
	SOLENOID VALVE		

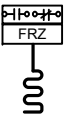
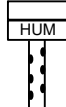
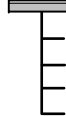
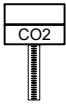
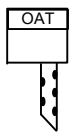
ABBREVIATIONS:

AFMS- AIR FLOW MEASURING STATION	OA -OUTSIDE AIR
C- COMMON PORT	OL'S- MOTOR STARTER OVERLOADS
CCP- CENTRAL CONTROL PANEL	PC- PRESSURE CONTROLLER
CR- CONTROL RELAY	PE- PRESSURE TOGGLE SWITCH
CS- CURRENT SWITCH	PI- PRESSURE INDICATOR
DA-DAMPER ACTUATOR	PL- PILOT LIGHT
DPRO- DAMPER OUTPUT	PR- PNEUMATIC RELAY
DPRS- DAMPER STATUS	PT- PRESSURE TRANSMITTER
DPS- DIFFERENTIAL PRESSURE SWITCH	RC- RECEIVER CONTROLLER
DPT- DIFFERENTIAL PRESSURE TRANS	RR- REVERSING RELAY
EA- EXHAUST AIR	RT- ROOM THERMOSTAT
ES- END SWITCH, POSITION SWITCH	S- SWITCH
FS- FLOW SWITCH	SD- SMOKE DETECTOR
FSD- FIRE & SMOKE DAMPER	S/W- SUMMER/ WINTER SIGNAL
H- HUMIDISTAT	T- THERMOSTAT
HC- MOTOR STARTER HOLDING COIL	TS- TEMPERATURE SENSOR
HI- HUMIDITY INDICATOR	TC- TIME CLOCK
HL- HIGH LIMIT HUMIDISTAT	TDR- TIME DELAY RELAY
HS- HIGH SIGNAL SELECTOR	THL- TEMPERATURE HIGH LIMIT THERMOSTAT
HT- HUMIDITY TRANSMITTER	TI- TEMPERATURE INDICATOR
LCP- LOCAL CONTROL PANEL	TLL- TEMPERATURE LOW LIMIT THERMOSTAT
LS- LOW SIGNAL SELECTOR	TR- TRANSDUCER
MA- MIXED AIR	TT- TEMPERATURE TRANSMITTER
MOD-MOTER OPERATED DAMPER	TX- TRANSFORMER
NC- NORMALLY CLOSED	V- VALVE
NCP- NETWORK CONTROL PANEL	WB- WET BULB
NO- NORMALLY OPEN	WU- WARM-UP SIGNAL

WIRING LEGEND

	Low Voltage, 18 AWG, Copper Wire
	Low Voltage Communication Wiring 22/2 AWG, CL2P, Shielded Copper Wire, Low Capacitance
	Line Voltage, THHN Field Wiring

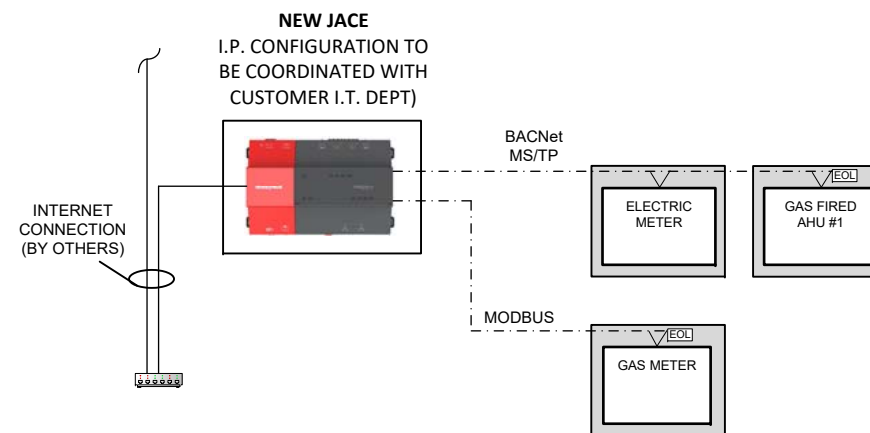
HVAC SYSTEM LEGEND:

	MOTOR OPERATED DAMPER		FREEZESTAT (D.P. CONTACT)
	PREHEAT COIL		DUCT MOUNTED TEMPERATURE SENSOR
	COOLING COIL		IMMERSION TYPE TEMPERATURE SENSOR
	REHEAT COIL		DUCT MOUNTED SMOKE DETECTOR
	HEATING COIL		STATIC PRESSURE TRANSMITTER
	DIRECT EXPANSION COIL		STEAM PRESSURE SENSOR
	FAN		DUCT MOUNTED HUMIDITY SENSOR
	MANUAL VALVE		SPACE TEMPERATURE
	ZONE CO2 SENSOR		OUTSIDE AIR CO2 SENSOR
	WATER FLOW METER		AIR FLOW MEASURING STATION
	AVERAGING TYPE TEMPERATURE SENSOR		CONTROL RELAY
	FILTER		CURRENT SENSOR
	FIRE & SMOKE DAMPER (BY OTHERS)		CO2 SENSOR
	OUTSIDE AIR TEMPERATURE SENSOR		

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ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-14-2017	SUBMITTAL	A.V.		
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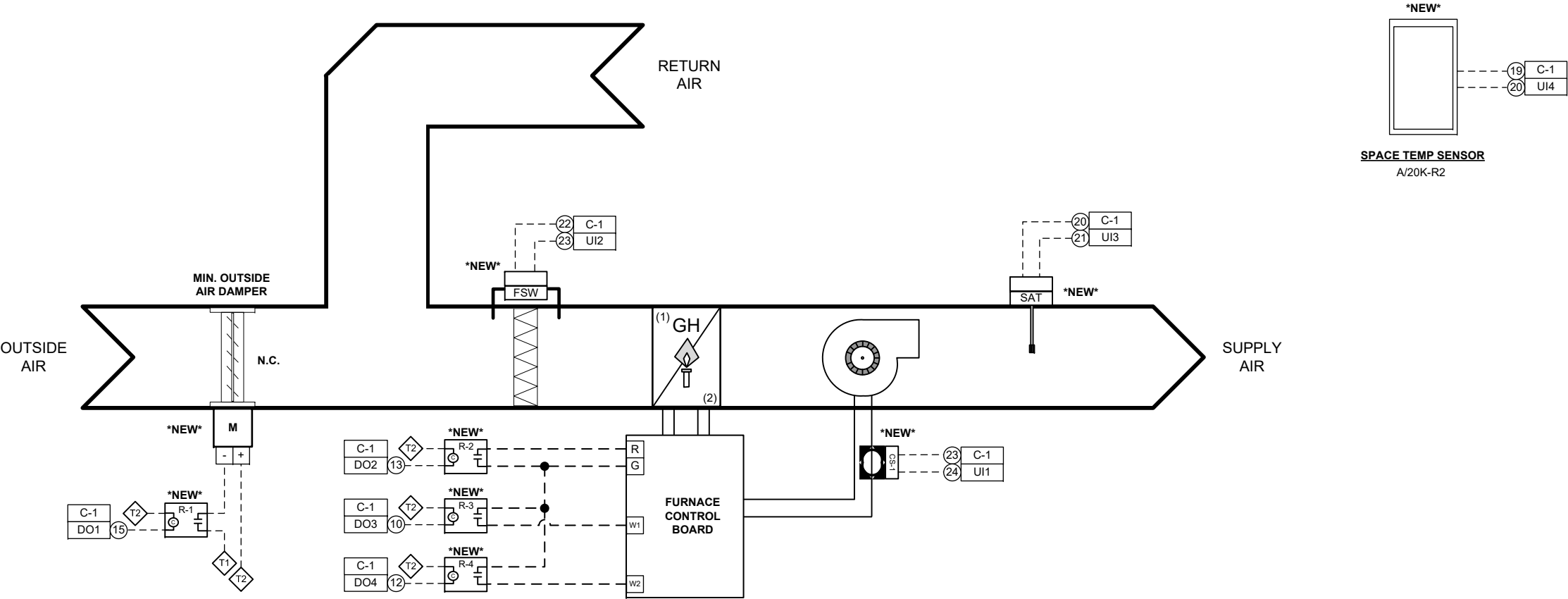
NETWORKRISER



NOTE: 1) 120VAC POWER TO ALL CONTROL PANELS BY OTHERS

[illegible]

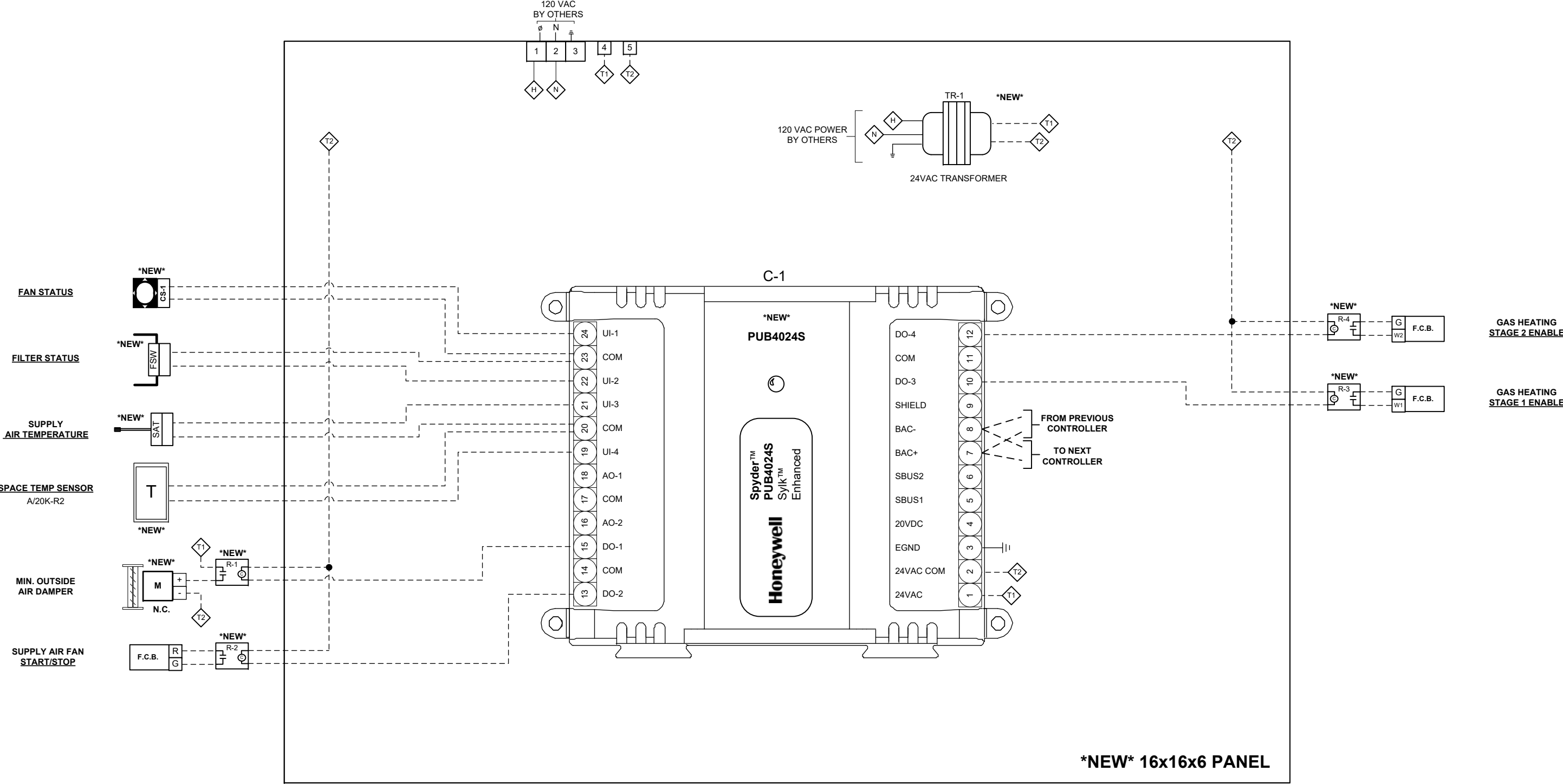
AIR HANDLING UNIT (AHU-1) FLOW DIAGRAM



NOTE:
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FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625						Project: NJ DOT FERNWOOD GARAGE BUILDING 16
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330		01-05-2018	AS-BUILTS1			AIR HANDLING UNIT (AHU-1) FLOW DIAGRAM
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-14-2017	SUBMITTAL	A.V.		Job No. #17-04260
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AIR HANDLING UNIT (AHU-1) WIRING SCHEMATIC



NOTE:
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MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330		01-05-2018	AS-BUILTS1			AIR HANDLING UNIT (AHU-1) WIRING SCHEMATIC
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-14-2017	SUBMITTAL	A.V.		Job No. #17-04260
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AIR HANDLING UNIT SEQUENCE OF OPERATIONS

WARM-UP MODE:

- 1 – One hour prior to the occupied mode, the Air Handler Unit shall be placed in Warm-up Mode when that Space Temperature is more than 10 Degr F. below the Space Heating Set-point.
- 2 – The Outside Air Dampers shall be closed and the Return Air Damper shall be opened, the stage 1 gas heating signal shall be enabled.
- 3 – The Air Handler Unit shall be released from Warm-up Mode when the Space Temperature is less than 3 Degr F. below the Space Heating Set-point or when the unit enters its scheduled occupied mode.
- 4 – When the Air Handler Unit is released from warm-up mode the Outside and Return Air Dampers and the Hot Water Valve shall revert to their scheduled modes.

OCCUPIED MODE:

- 1 – The Air Handler Unit shall be indexed into the occupied mode via the BMS schedule.
- 2 - Upon initial startup, the Outside and Return Air Damper shall open to their Minimum Outside Air setting.
- 3 - The supply fan shall start and slowly ramp up to its preset speed as determined by the balancing contractor.
- 4 - If the supply fan fails to start, an alarm shall be generated and the outside air damper shall close.
- 5 – Once the supply fan has proven on, the Air Handler Unit shall calculate its mode of operation.
- 6 - If the space temperature is 2 Degr F. below the space temperature set-point (72 Degr F. adj.) and the outside air temperature is below 55 Degr F., the Air Handler Unit will enter it's heating mode.
- 7 - Upon a call for heating, the Outside Air Damper shall remain at its minimum position and the stage 1 gas heating signal shall be enabled.
- 8 – When the Space Temperature is below 45 Degr F., both gas heating stages shall be enabled.
- 9 – If the space temperature is 2 Degr F. above the space temperature set-point (72 Degr F. adj.) and the outside air temperature is above 51 Degr F., but below 62 Degr F., the Air Handler Unit will enter its economizer mode.
- 10 - Upon a call for economizer cooling, the Outside Air Damper shall modulate open to maintain the discharge air set-point.
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- 12 – If the space temperature is 2 Degr F. above the space temperature set-point (72 Degr F. adj.) and the outside air temperature is above 65 Degr F., the Air Handler Unit will enter it's cooling mode.
- 13 - Upon a call for cooling, the Outside Air Damper shall remain at its minimum position, the DX coils and the ACCU's shall be toggled on, and the heating signals shall remain off.

UNOCCUPIED MODE:

- 1 – The Air Handler Unit's Supply Air Fan shall be off, the Outside Air Damper shall be closed, and the Return Air Damper shall be open.
- 2 – When any Space Temperature Sensor is below an Unoccupied Heating Set-point of 60 deg. F, the Air Handler Unit's Supply Air Fan shall start. The outside air damper shall remain closed and the gas heating stage 1 shall be enabled.
- 3 – When the Space Temperature rises above the Unoccupied Heating Set-point, the Air Handler Unit's Supply Air Fan shall stop.

AIR FILTER MONITORING:

- 1 – When the filter exceeds the manufacturer's rating for a dirty filter, an alarm shall be generated.

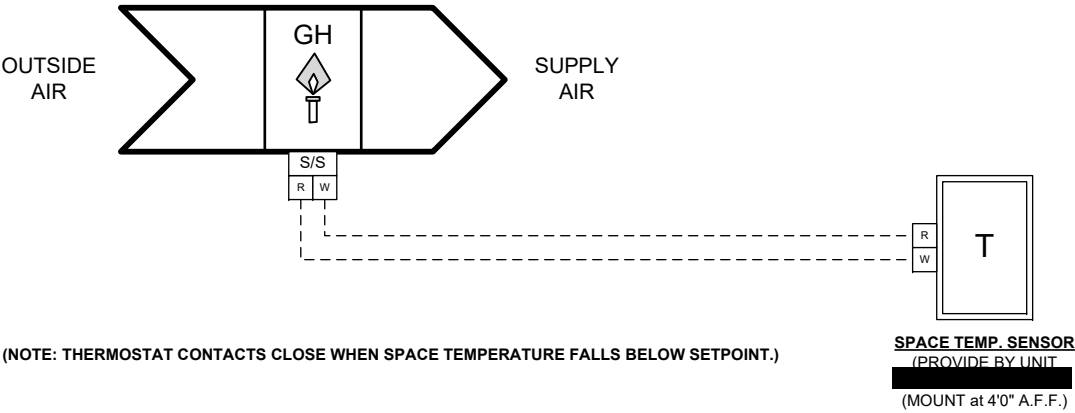
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- 1 – If the Space Temperature is above 85 deg. F or below 55 deg. F an alarm shall be generated.
- 2 – If the Discharge Air Temperature is above 120 deg. F or below 45 deg. F an alarm shall be generated.
- 3 - All set-points shall be user adjustable from the graphical user interface. Occupied space temperature set-points shall be limited between 70 Degr. F. and 74 Degr. F.

[illegible]

GAS UNIT HEATER FLOW & WIRING DIAGRAM

(TYPICAL OF 2)

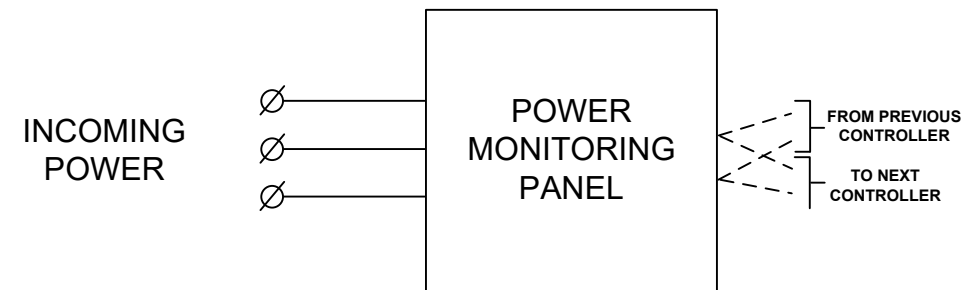


NOTE:
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MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330		01-05-2018	AS-BUILTS1					GAS UNIT HEATER FLOW & WIRING DIAGRAM
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-14-2017	SUBMITTAL		A.V.			Job No. #17-04260
		NO.	DATE	REVISION		BY			Page 7 of 8

Diagram illustrating the connection of the Gas Monitoring Panel to the Main Gas Line and the JACE system.

- The **MAIN GAS LINE** is connected to the **GAS MONITORING PANEL**.
- The **GAS MONITORING PANEL** is connected to the **JACE** system via **MODBUS** communication.



FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625									Project: NJ DOT FERNWOOD GARAGE BUILDING 16			
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330									POWER AND GAS MONITORING FLOW DIAGRAM			
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	01-05-2018 08-14-2017	AS-BUILTS1 SUBMITTAL	A.V.					Job No. #17-04260 Page 8 of 8			
		NO.	DATE	REVISION	BY								

PROJECT: NJDOT ESIP - FERNWOOD 16

JOB ID NUMBER: 17-04260

PAGE 1 OF 1

PAGE	QTY	PRODUCT #	MFGR.	DESCRIPTION
PG 3 RISER	1	WEB-8000-CSE	Honeywell	JACE Web Controller
PG 3 RISER	1		Honeywell	JACE License Up to ____ Devices
PG 4 & 5 AHU	1	A/20K-R2	ACI	Space Temperature Sensor
PG 4 & 5 AHU	1	A/20K-D-8"	ACI	8-inch Duct Temperature Probe
PG 4 & 5 AHU	1	ADPS-04-2-N	Dwyer	Differential Pressure Filter Switch
PG 4 & 5 AHU	1	C-2200	Senva	On/Off Status Current Transducer
PG 4 & 5 AHU	4	RIBU1C	FD, Inc. (RIB)	120 Vac / 10-30 Vac/dc Relay SPDT
PG 4 & 5 AHU	1	MS8105A1030	Honeywell	24Vac On/Off 44lb-in Actuator
PG 5 AHU	1	PUB4024S	Honeywell	Spyder BACnet Prog. Controller
PG 5 AHU	1	TR75VA001	FD, Inc. (RIB)	120VAC/24VAC Transformer
PG 5 AHU	1	SCE-16N1606LP	Saginaw	Enviroline Series Control Panel
PG 5 AHU	1	SCE-16N16MP	Saginaw	16x16 Subpanel
PG 8 GAS/PWR	1	PS3037-S-N	Dent Inst.	1-pt. Rev. Grade Power Meter
PG 8 GAS/PWR	1	CT-R16-A4-U	Dent Inst.	Flexible Current Transformer
PG 8 GAS/PWR	1	620S-BT-L06-M1-EN2-V4-NR-9-MB	Sierra Inst.	BoilerTrak Immersible Thermal Gas Mass Flow Meter

NJ DOT FERNWOOD GARAGE BUILDING 17 (AS-BUILTS)

ENERGY SAVINGS IMPROVEMENT PROJECT BUILDING AUTOMATION SYSTEM

SHEET NUMBER	CONTENTS	REVISION
1	TITLE PAGE	
2	LEGEND & SYMBOLS	
3	NETWORK RISER	
4	MAKE-UP AIR UNIT (MAU-1,2,3,&4) FLOW DIARAM	
5	MAKE-UP AIR UNIT (MAU-1,2,3,&4) WIRING SCHEMATIC	
6	MAU SEQUENCE OF OPERATIONS	
7	AIR HANDLING UNIT (AHU-1) FLOW DIAGRAM	
8	AIR HANDLING UNIT (AHU-1) WIRING SCHEMATIC	
9	AIR HANDLING UNIT SEQUENCE OF OPERATIONS	
10	GAS UNIT HEATER FLOW & WIRING DIAGRAM	
11	POWER AND GAS MONITORING FLOW DIAGRAM	

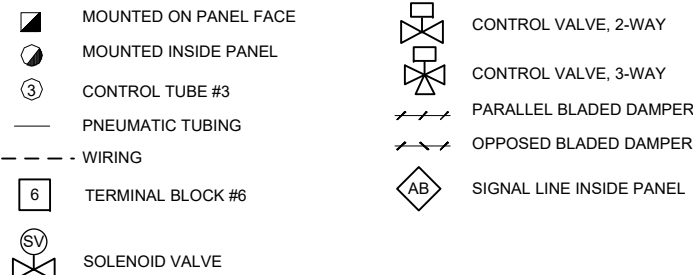
FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625								Project: NJ DOT FERNWOOD GARAGE BUILDING 17
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS					TITLE PAGE
		1	11-03-2017	ADDED DOOR SWITCHES					
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-11-2017	SUBMITTAL	A.V.				
		NO.	DATE	REVISION	BY				Job No. #17-03253Page 1 of 11

LEGEND & SYMBOLS

GENERAL NOTES

1. ALL POWER WIRING 120 VAC AND ABOVE BY ELECTRICAL CONTRACTOR

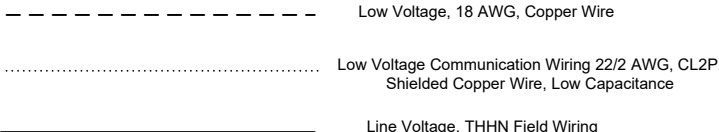
TEMPERATURE CONTROL LEGEND:



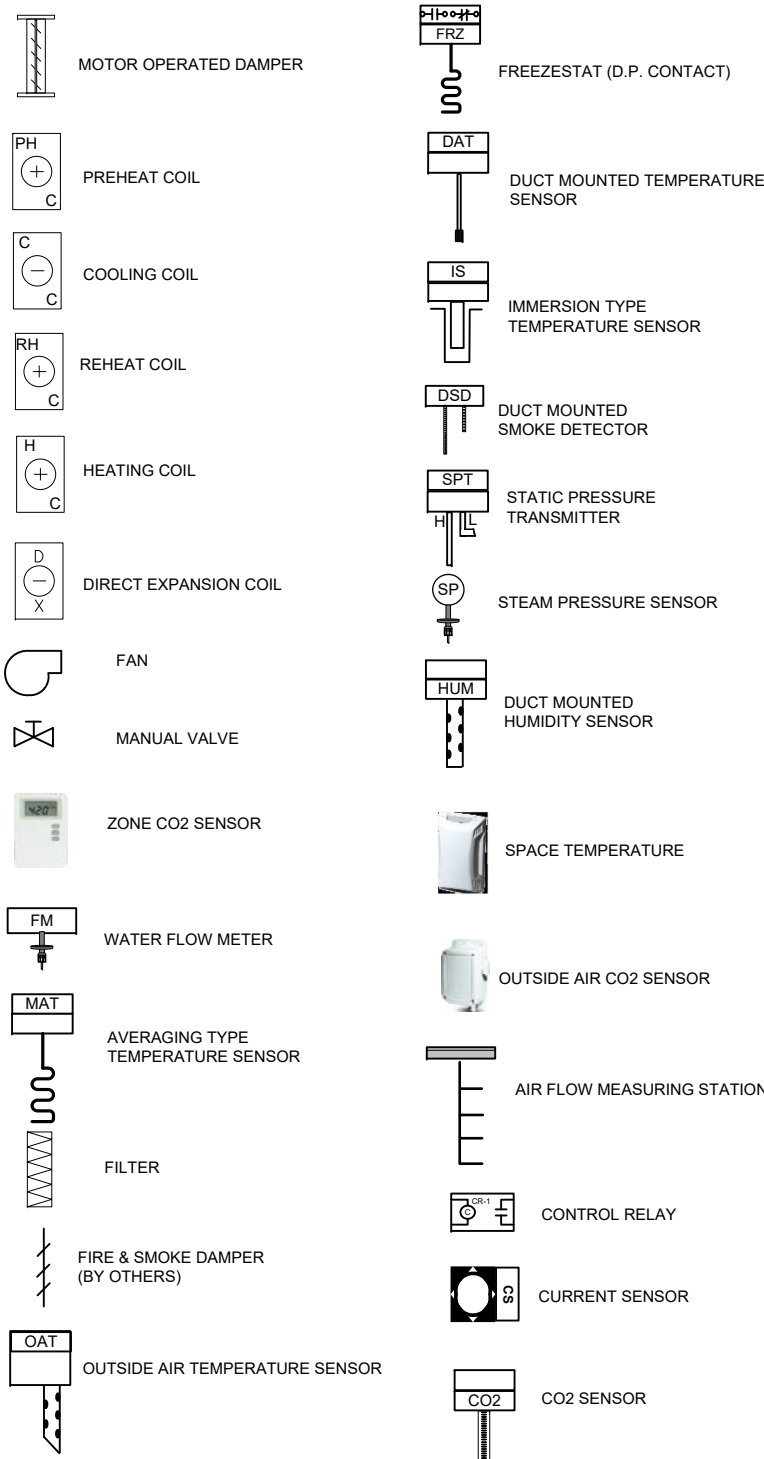
ABBREVIATIONS:

AFMS- AIR FLOW MEASURING STATION	OA -OUTSIDE AIR
C- COMMON PORT	OL'S- MOTOR STARTER OVERLOADS
CCP- CENTRAL CONTROL PANEL	PC- PRESSURE CONTROLLER
CR- CONTROL RELAY	PE- PRESSURE TOGGLE SWITCH
CS- CURRENT SWITCH	PI- PRESSURE INDICATOR
DA-DAMPER ACTUATOR	PL- PILOT LIGHT
DPRO- DAMPER OUTPUT	PR- PNEUMATIC RELAY
DPRS- DAMPER STATUS	PT- PRESSURE TRANSMITTER
DPS- DIFFERENTIAL PRESSURE SWITCH	RC- RECEIVER CONTROLLER
DPT- DIFFERENTIAL PRESSURE TRANS	RR- REVERSING RELAY
EA- EXHAUST AIR	RT- ROOM THERMOSTAT
ES- END SWITCH, POSITION SWITCH	S- SWITCH
FS- FLOW SWITCH	SD- SMOKE DETECTOR
FSD- FIRE & SMOKE DAMPER	S/W- SUMMER/ WINTER SIGNAL
H- HUMIDISTAT	T- THERMOSTAT
HC- MOTOR STARTER HOLDING COIL	TS- TEMPERATURE SENSOR
HI- HUMIDITY INDICATOR	TC- TIME CLOCK
HL- HIGH LIMIT HUMIDISTAT	TDR- TIME DELAY RELAY
HS- HIGH SIGNAL SELECTOR	THL- TEMPERATURE HIGH LIMIT THERMOSTAT
HT- HUMIDITY TRANSMITTER	TI- TEMPERATURE INDICATOR
LCP- LOCAL CONTROL PANEL	TLL- TEMPERATURE LOW LIMIT THERMOSTAT
LS- LOW SIGNAL SELECTOR	TR- TRANSDUCER
MA- MIXED AIR	TT- TEMPERATURE TRANSMITTER
MOD-MOTER OPERATED DAMPER	TX- TRANSFORMER
NC- NORMALLY CLOSED	V- VALVE
NCP- NETWORK CONTROL PANEL	WB- WET BULB
NO- NORMALLY OPEN	WU- WARM-UP SIGNAL

WIRING LEGEND

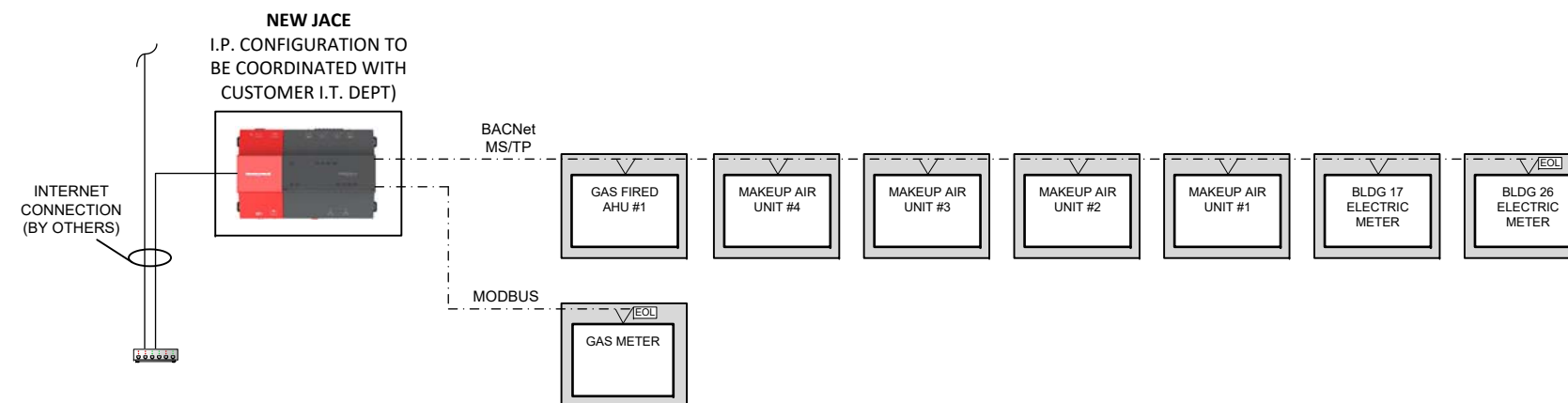


HVAC SYSTEM LEGEND:



FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625								Project: NJ DOT FERNWOOD GARAGE BUILDING 17			
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS					LEGEND & SYMBOLS			
		1	11-03-2017	ADDED DOOR SWITCHES								
		0	08-11-2017	SUBMITTAL	A.V.							
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	NO.	DATE	REVISION	BY				Job No. #17-03253		Page 2 of 11	

NETWORK RISER

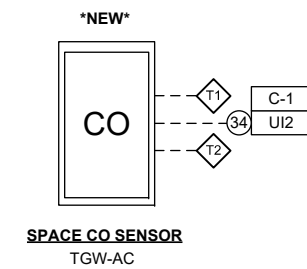
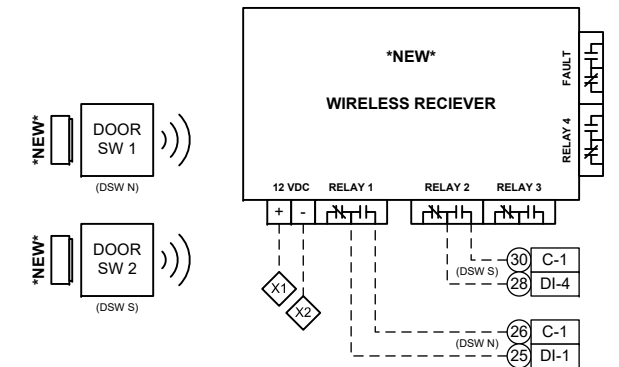
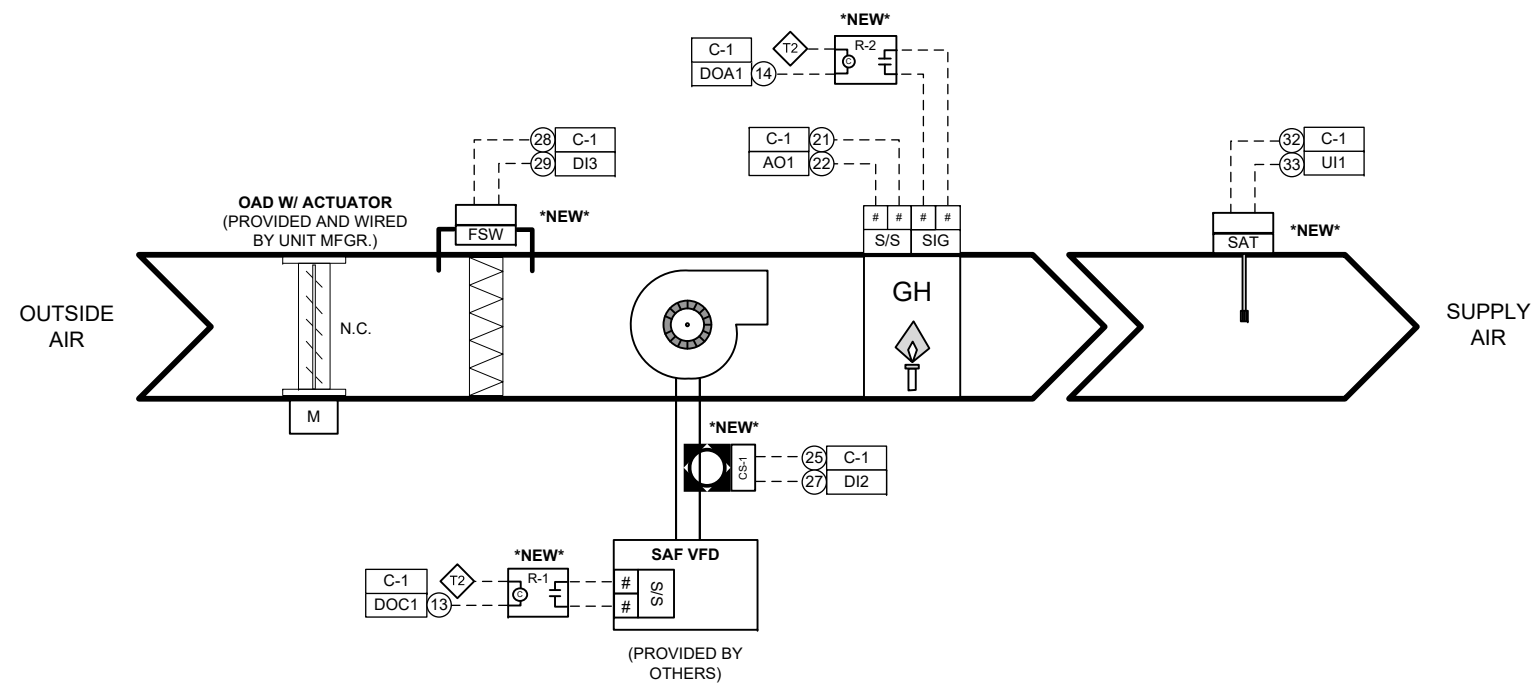


NOTE: 1) 120VAC POWER TO ALL CONTROL PANELS BY OTHERS

[illegible]

MAKE-UP AIR UNIT (MAU-1 - MAU-4) FLOW DIAGRAM

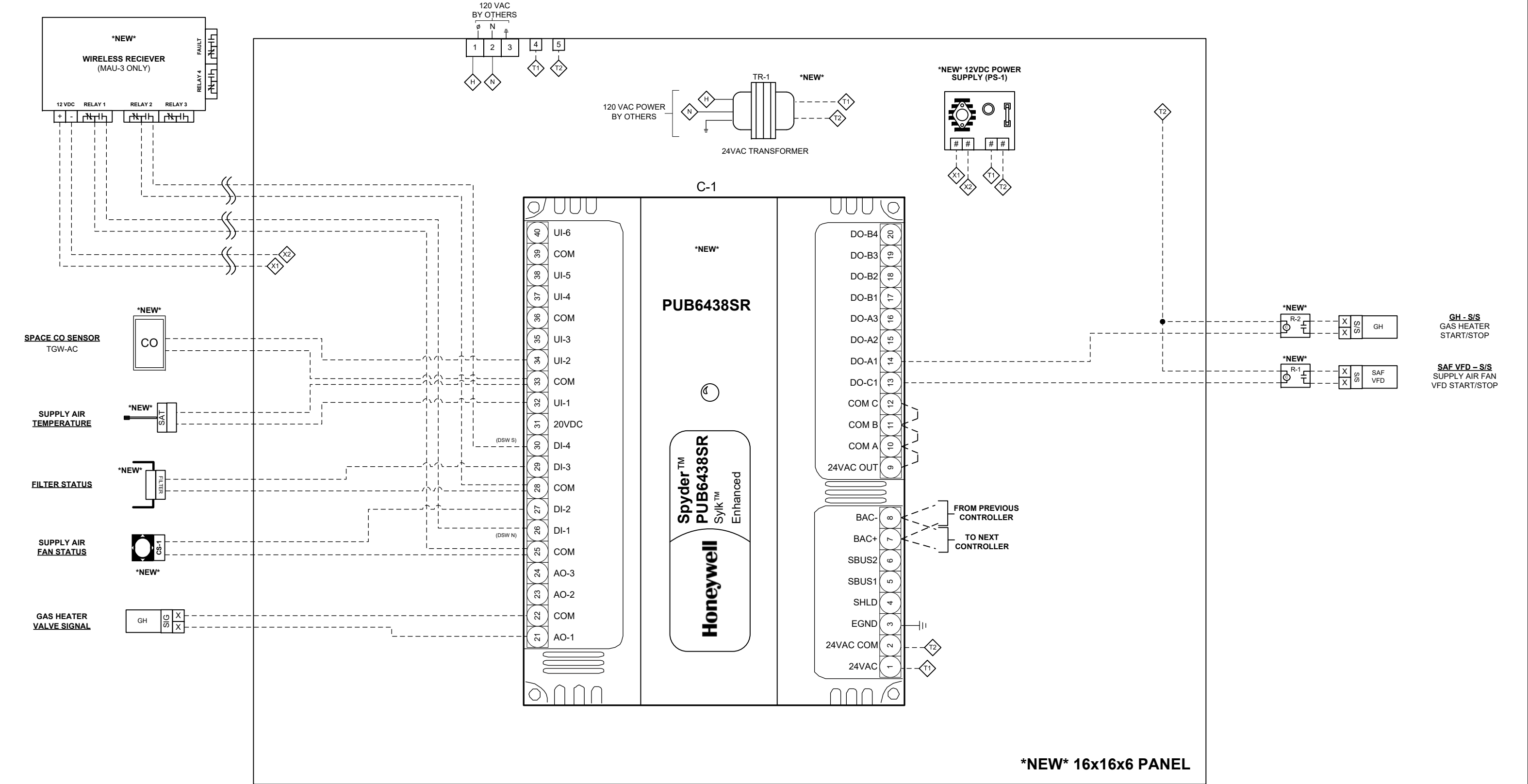
(TYPICAL OF 4 EXCEPT AS NOTED)



NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625					Project: NJ DOT FERNWOOD GARAGE BUILDING 17	
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS			
		1	11-03-2017	ADDED DOOR SWITCHES			
		0	08-11-2017	SUBMITTAL			A.V.
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	NO.	DATE	REVISION			BY

MAKE-UP AIR UNIT (MAU-1 - MAU-4) WIRING SCHEMATIC
(TYPICAL OF 4 EXCEPT AS NOTED)



NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625								Project: NJ DOT FERNWOOD GARAGE BUILDING 17
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS					MAKE-UP AIR UNIT (MAU-1 - MAU-4) WIRING SCHEMATIC
		1	11-03-2017	ADDED DOOR SWITCHES					
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-11-2017	SUBMITTAL		A.V.			
		NO.	DATE	REVISION		BY			Job No. #17-03253 Page 5 of 11

MAU SEQUENCE OF OPERATIONS

ENABLED MODE:

- 1 – The Make-up Air Unit and its associated Exhaust Fans shall be indexed into the Enabled Mode as per the BMS schedule, or whenever CO levels exceed 10 ppm (adj.).
- 2 – Upon initial startup, the Outside Air Damper shall open.
- 3 – Once the Outside Air Damper has proved open via the End Switch, the Supply Air Fan shall start.
- 4 – If the Supply Air Fan fails to start as sensed by its current sensor, an alarm shall be generated and the Outside Air Damper shall close.
- 5 – Once the Supply Air Fan has proved on, the Make-up Air Unit shall calculate its mode of operation.
- 6 – If the Outside Air Temperature is below 50 deg. F. (adj.), the Make-up Air Unit will enter it’s heating mode.
- 7 – Upon a call for heating, the Gas Heating Signal shall begin to modulate to maintain a Discharge Air Set-point of 60 deg. F..

AIR FILTER MONITORING:

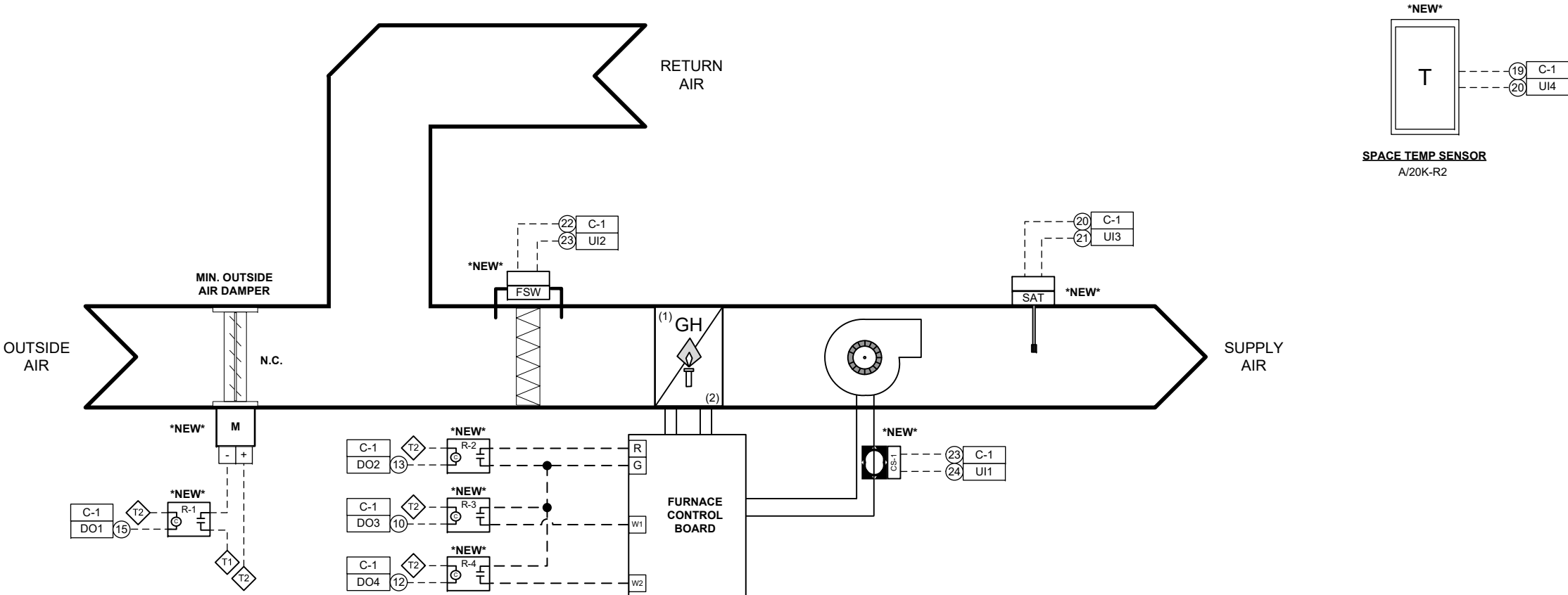
- 1 – The DDC controller shall monitor the filter switch and generate an alarm when it is tripped at the manufacturers dirty filter rating.

SENSOR ALARMING:

- 1 – If the Space Temperature is above 95 deg. F or below 45 deg. F an alarm shall be generated.
- 2 – If the Discharge Air Temperature is above 120 deg. F or below 35 deg. F an alarm shall be generated.
- 3 – If the Discharge Air Temperature remains within 4 deg. F below of the Heating Set-point and the Heating Signal is more than 10% for longer than 10 minutes, an alarm shall be generated.
- 4 – All set-points shall be user adjustable from the graphical user interface.
- 5 – If a door switch has been open and the MAU’ heating has been operational for longer than 15 minutes, a critical alarm will be enunciated in the BMS.

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625								Project: NJ DOT FERNWOOD GARAGE BUILDING 17
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS					
		1	11-03-2017	ADDED DOOR SWITCHES					
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-11-2017	SUBMITTAL	A.V.				
		NO.	DATE	REVISION	BY				
									MAU SEQUENCE OF OPERATIONS
									Job No. #17-03253Page 6 of 11

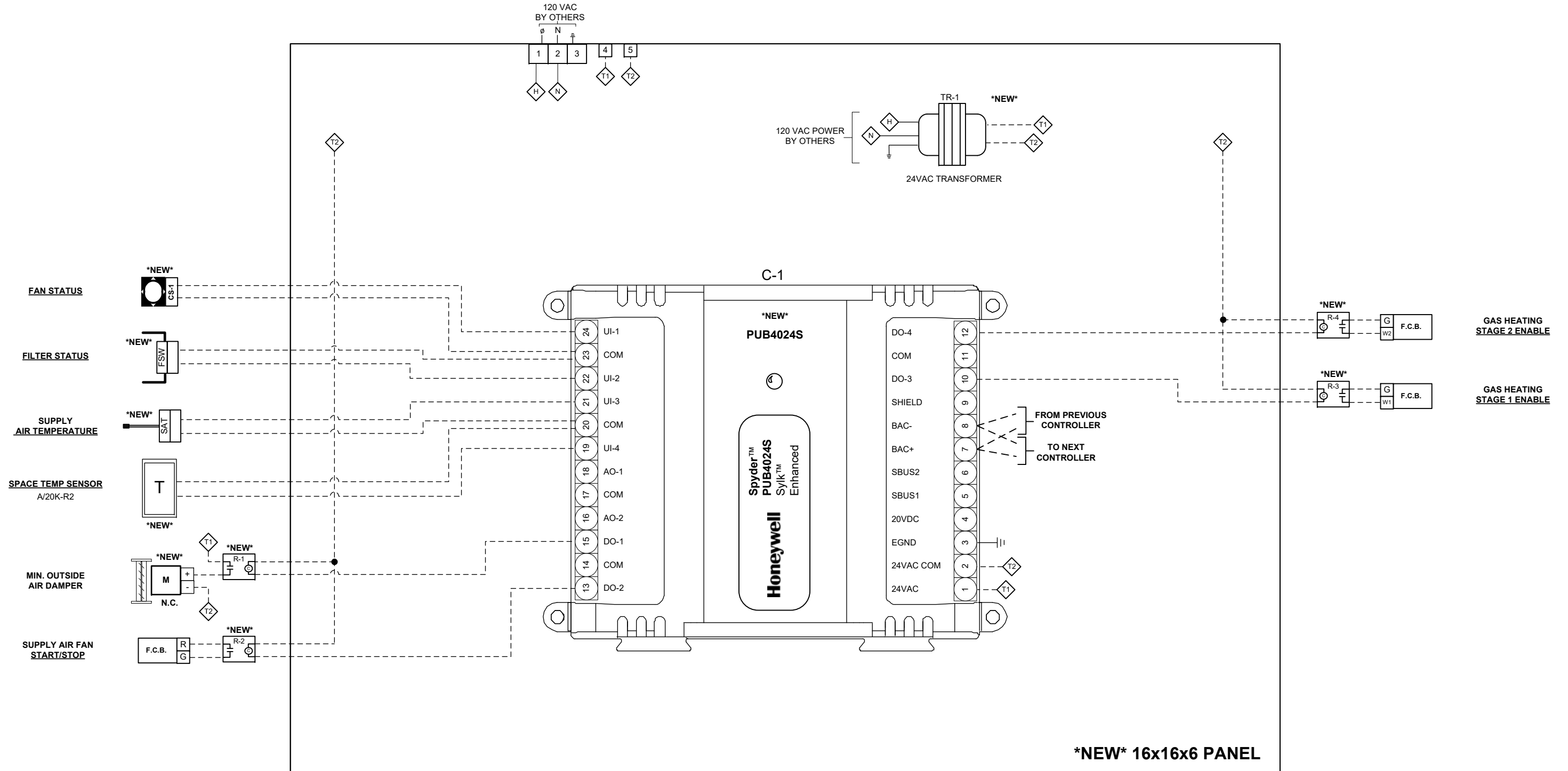
AIR HANDLING UNIT (AHU-1) FLOW DIAGRAM



NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625					Project: NJ DOT FERNWOOD GARAGE BUILDING 17 AIR HANDLING UNIT (AHU-1) FLOW DIAGRAM Job No. #17-03253 Page 7 of 11
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS		
		1	11-03-2017	ADDED DOOR SWITCHES		
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-11-2017	SUBMITTAL	A.V.	
		NO.	DATE	REVISION	BY	

AIR HANDLING UNIT (AHU-1) WIRING SCHEMATIC

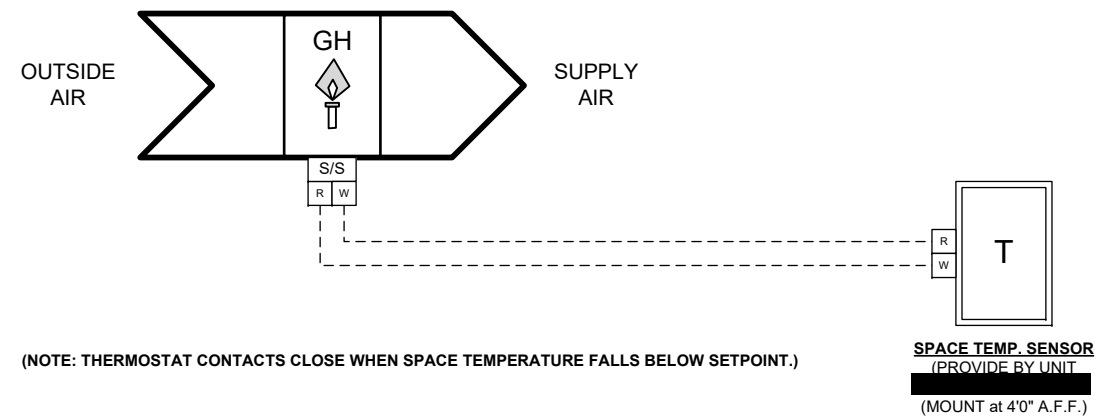


NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

[illegible]

GAS UNIT HEATER FLOW & WIRING DIAGRAM

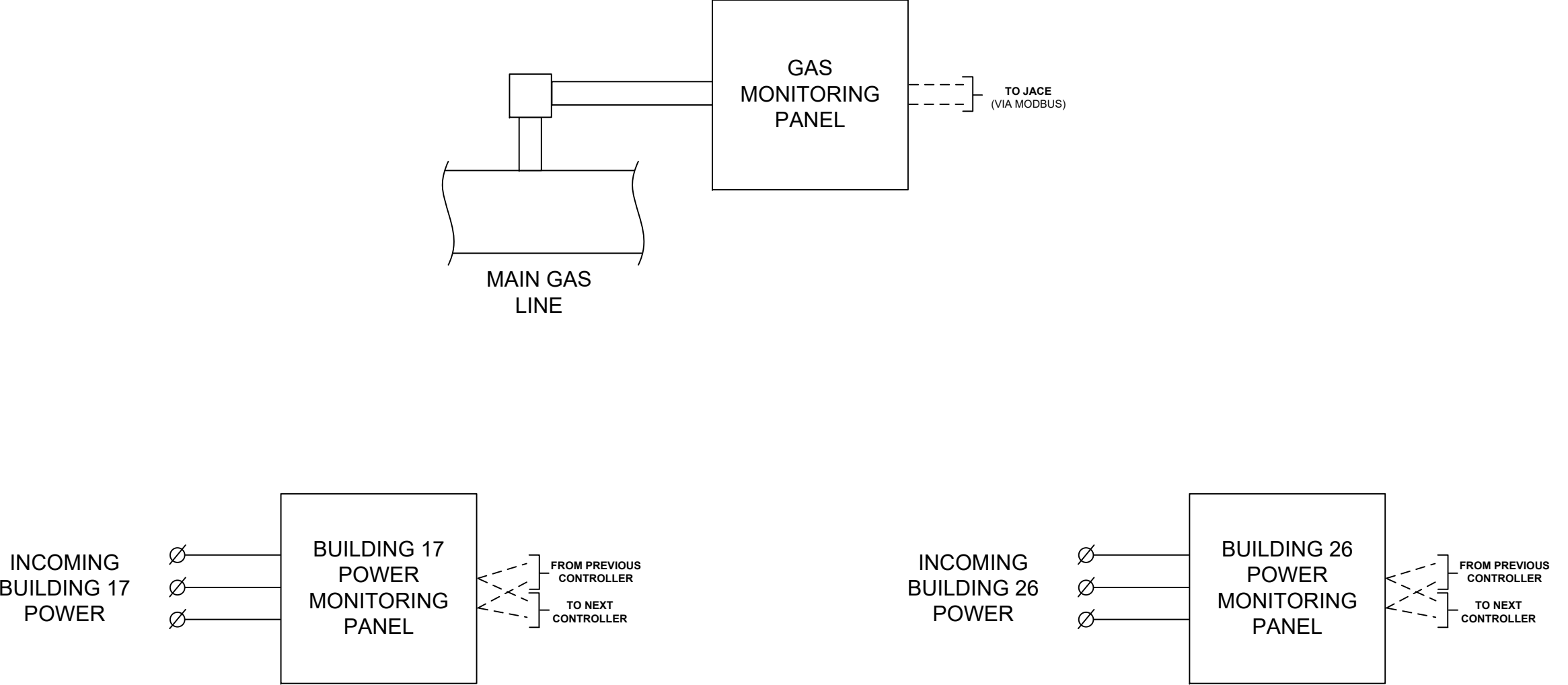
(TYPICAL OF 8)



NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625					Project: NJ DOT FERNWOOD GARAGE BUILDING 17		
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS			GAS UNIT HEATER FLOW & WIRING DIAGRAM	
		1	11-03-2017	ADDED DOOR SWITCHES				
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-11-2017	SUBMITTAL		A.V.	Job No. #17-03253	
		NO.	DATE	REVISION	BY	Page 10 of 11		

POWER AND GAS MONITORING FLOW DIAGRAM



FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625						Project: NJ DOT FERNWOOD GARAGE BUILDING 17	
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS			POWER AND GAS MONITORING FLOW DIAGRAM	
		1	11-03-2017	ADDED DOOR SWITCHES				
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-11-2017	SUBMITTAL	A.V.		Job No. #17-03253Page 11 of 11	
		NO.	DATE	REVISION	BY			

PAGE	QTY	PRODUCT #	MFGR.	DESCRIPTION
PG 3 RISER	1	WEB-8000-CSE	Honeywell	JACE Web Controller
PG 3 RISER	1		Honeywell	JACE License Up to ____ Devices
PG 4 & 5 MAU	4	TGW-AC	Senva	Space Carbon Monoxide Sensor
PG 4 & 5 MAU	4	A/20K-D-8"	ACI	8-inch Duct Temperature Probe
PG 4 & 5 MAU	4	ADPS-04-2-N	Dwyer	Differential Pressure Filter Switch
PG 4 & 5 MAU	4	C-2200	Senva	On/Off Status Current Transducer
PG 4 & 5 MAU	4	RIBU1C	FD, Inc. (RIB)	120 Vac / 10-30 Vac/dc Relay SPDT
PG 4 & 5 MAU	1	EN4202R	Inovonics	Wireless Reciever w/ 4 Relays
PG 4 & 5 MAU	2	EN1210W	Inovonics	Wireless Magnetic Door Switch
PG 5 MAU	4	PUB6438SR	Honeywell	Spyder BACnet Prog. Controller
PG 5 MAU	4	TR75VA001	FD, Inc. (RIB)	120VAC/24VAC Transformer
PG 5 MAU	1	DCP-1.5-W-12VDC	Kele	24VAC/12VDC Power Supply
PG 5 MAU	4	SCE-16N1606LP	Saginaw	Enviroline Series Control Panel
PG 5 MAU	4	SCE-16N16MP	Saginaw	16x16 Subpanel
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PG 7 & 8 AHU	1	A/20K-D-8"	ACI	8-inch Duct Temperature Probe
PG 7 & 8 AHU	1	ADPS-04-2-N	Dwyer	Differential Pressure Filter Switch
PG 7 & 8 AHU	1	C-2200	Senva	On/Off Status Current Transducer
PG 7 & 8 AHU	4	RIBU1C	FD, Inc. (RIB)	120 Vac / 10-30 Vac/dc Relay SPDT
PG 7 & 8 AHU	1	MS8105A1030	Honeywell	24Vac On/Off 44lb-in Actuator
PG 8 AHU	1	PUB6438SR	Honeywell	Spyder BACnet Prog. Controller
PG 8 AHU	1	TR75VA001	FD, Inc. (RIB)	120VAC/24VAC Transformer
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PG 8 AHU	1	SCE-16N16MP	Saginaw	16x16 Subpanel
PG 11 GAS/PWR	2	PS3037-S-N	Dent Inst.	1-pt. Rev. Grade Power Meter
PG 11 GAS/PWR	2	CT-R16-A4-U	Dent Inst.	Flexible Current Transformer
PG 11 GAS/PWR	1	620S-BT-L06-M1-EN2-V4-NR-9-MB	Sierra Inst.	BoilerTrak Immersible Thermal Gas Mass Flow Meter

NJ DOT FERNWOOD GARAGE BUILDING 19 (AS-BUILTS)

ENERGY SAVINGS IMPROVEMENT PROJECT BUILDING AUTOMATION SYSTEM

SHEET NUMBER	CONTENTS	REVISION
1	TITLE PAGE	
2	LEGEND & SYMBOLS	
3	NETWORK RISER	
4	AIR HANDLING UNIT (AHU-1) FLOW DIAGRAM	
5	AIR HANDLING UNIT (AHU-1) WIRING SCHEMATIC	
6	AIR HANDLING UNIT SEQUENCE OF OPERATIONS	
7	POWER AND GAS MONITORING FLOW DIAGRAM	

LEGEND & SYMBOLS

GENERAL NOTES

1. ALL POWER WIRING 120 VAC AND ABOVE BY ELECTRICAL CONTRACTOR.

TEMPERATURE CONTROL LEGEND:

 MOUNTED ON PANEL FACE

 MOUNTED INSIDE PANEL

 CONTROL TUBE #3

 PNEUMATIC TUBING

 WIRING

 TERMINAL BLOCK #6

 SOLENOID VALVE

 CONTROL VALVE, 2-WAY

 CONTROL VALVE, 3-WAY

 PARALLEL BLADED DAMPER

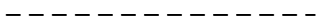
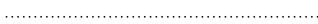
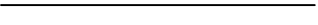
 OPPOSED BLADED DAMPER

 SIGNAL LINE INSIDE PANEL

ABBREVIATIONS:

AFMS- AIR FLOW MEASURING STATION	OA -OUTSIDE AIR
C- COMMON PORT	OL'S- MOTOR STARTER OVERLOADS
CCP- CENTRAL CONTROL PANEL	PC- PRESSURE CONTROLLER
CR- CONTROL RELAY	PE- PRESSURE TOGGLE SWITCH
CS- CURRENT SWITCH	PI- PRESSURE INDICATOR
DA-DAMPER ACTUATOR	PL- PILOT LIGHT
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LCP- LOCAL CONTROL PANEL	TLL- TEMPERATURE LOW LIMIT THERMOSTAT
LS- LOW SIGNAL SELECTOR	TR- TRANSDUCER
MA- MIXED AIR	TT- TEMPERATURE TRANSMITTER
MOD-MOTER OPERATED DAMPER	TX- TRANSFORMER
NC- NORMALLY CLOSED	V- VALVE
NCP- NETWORK CONTROL PANEL	WB- WET BULB
NO- NORMALLY OPEN	WU- WARM-UP SIGNAL

WIRING LEGEND

	Low Voltage, 18 AWG, Copper Wire
	Low Voltage Communication Wiring 22/2 AWG, CL2P, Shielded Copper Wire, Low Capacitance
	Line Voltage, THHN Field Wiring

HVAC SYSTEM LEGEND:

 MOTOR OPERATED DAMPER

 PREHEAT COIL

 COOLING COIL

 REHEAT COIL

 HEATING COIL

 DIRECT EXPANSION COIL

 FAN

 MANUAL VALVE

 ZONE CO2 SENSOR

 WATER FLOW METER

 AVERAGING TYPE TEMPERATURE SENSOR

 FILTER

 FIRE & SMOKE DAMPER (BY OTHERS)

 OUTSIDE AIR TEMPERATURE SENSOR

 FREEZESTAT (D.P. CONTACT)

 DUCT MOUNTED TEMPERATURE SENSOR

 IMMERSION TYPE TEMPERATURE SENSOR

 DUCT MOUNTED SMOKE DETECTOR

 STATIC PRESSURE TRANSMITTER

 STEAM PRESSURE SENSOR

 DUCT MOUNTED HUMIDITY SENSOR

 SPACE TEMPERATURE

 OUTSIDE AIR CO2 SENSOR

 AIR FLOW MEASURING STATION

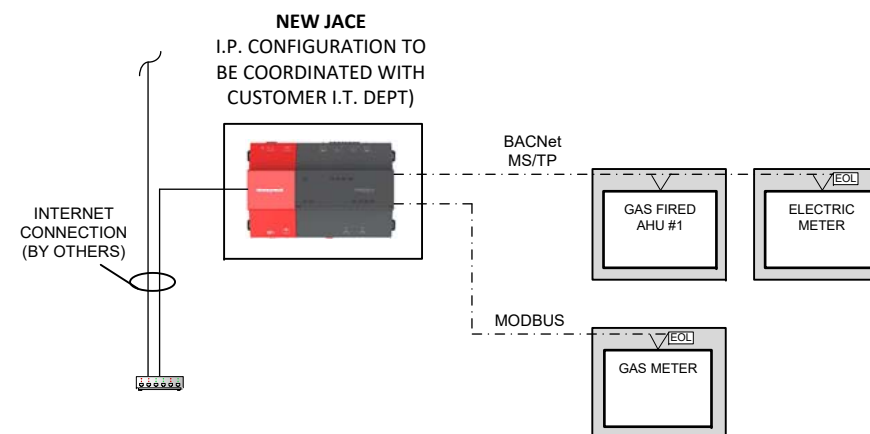
 CONTROL RELAY

 CURRENT SENSOR

 CO2 SENSOR

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625					[REDACTED]	[REDACTED]	Project: NJ DOT FERNWOOD GARAGE BUILDING 19	
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	1	01-05-2018	AS-BUILTS				LEGEND & SYMBOLS	
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-14-2017	SUBMITTAL	A.V.			Job No. #17-04260	
		NO.	DATE	REVISION	BY			Page 2 of 7	

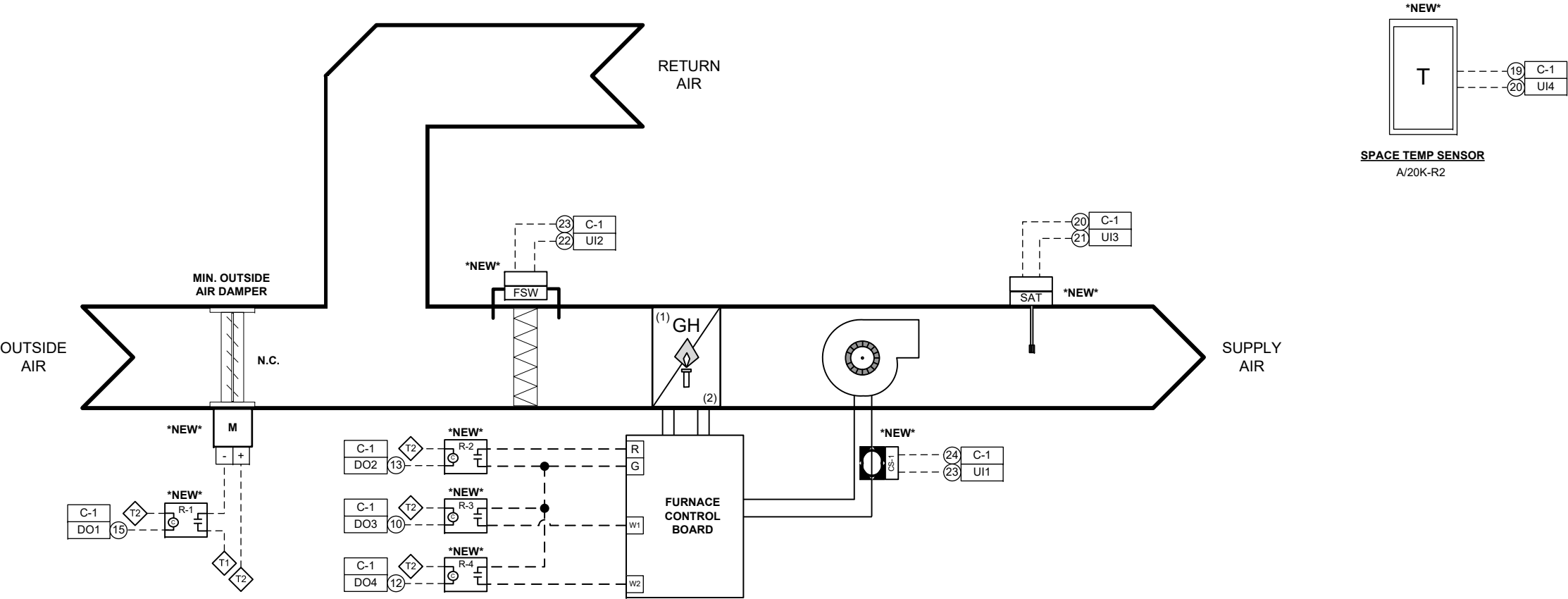
NETWORK RISER



NOTE: 1) 120VAC POWER TO ALL CONTROL PANELS BY OTHERS

[illegible]

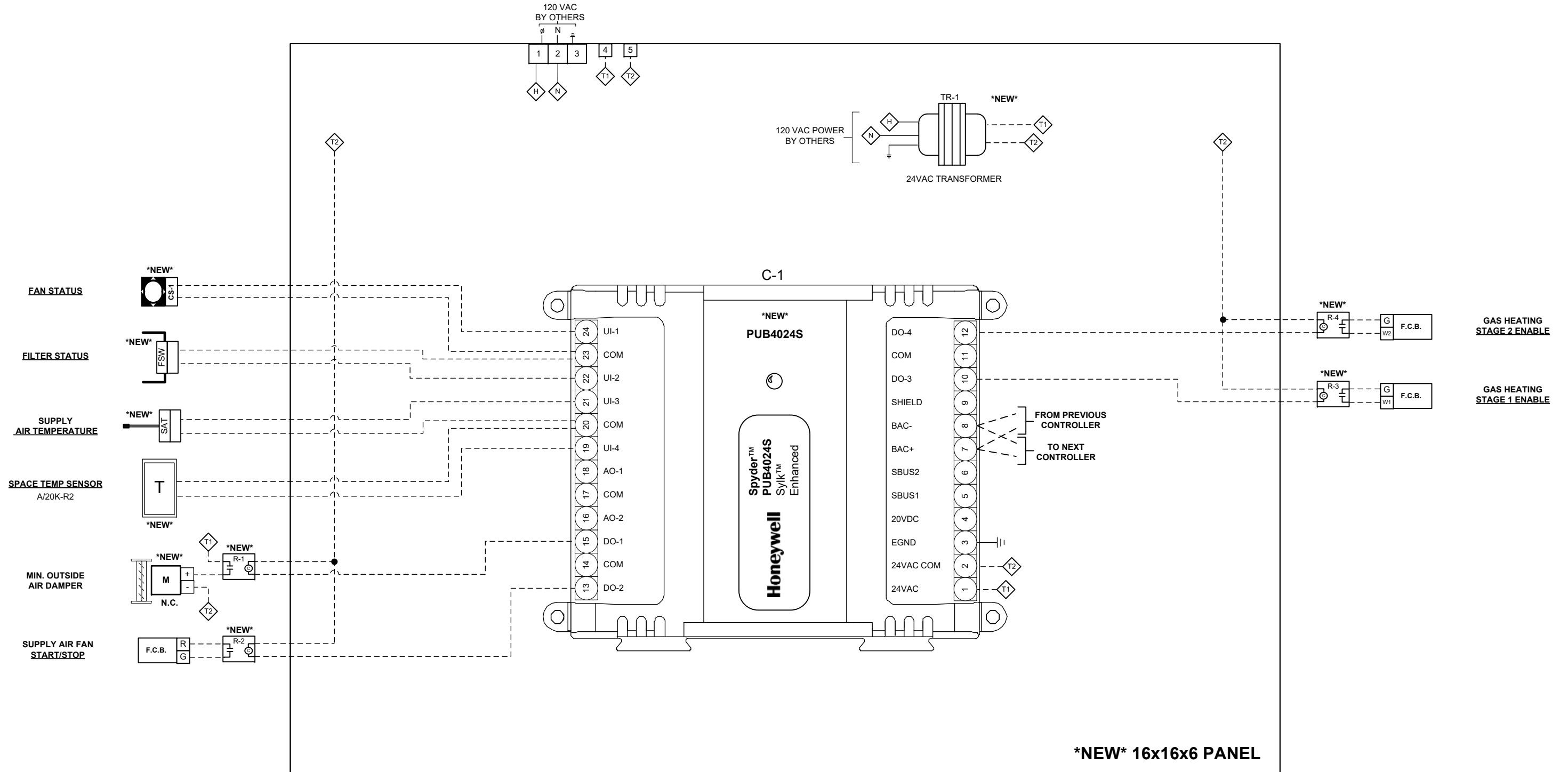
AIR HANDLING UNIT (AHU-1) FLOW DIAGRAM



NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625						Project: NJ DOT FERNWOOD GARAGE BUILDING 19
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	1	01-05-2018	AS-BUILTS			AIR HANDLING UNIT (AHU-1) FLOW DIAGRAM
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-14-2017	SUBMITTAL	A.V.		Job No. #17-04260
		NO.	DATE	REVISION	BY		Page 4 of 7

AIR HANDLING UNIT (AHU-1) WIRING SCHEMATIC



NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

[illegible]

AIR HANDLING UNIT SEQUENCE OF OPERATIONS

WARM-UP MODE:

- 1 – One hour prior to the occupied mode, the Air Handler Unit shall be placed in Warm-up Mode when that Space Temperature is more than 10 Degr F. below the Space Heating Set-point.
- 2 – The Outside Air Dampers shall be closed and the Return Air Damper shall be opened, the stage 1 gas heating signal shall be enabled.
- 3 – The Air Handler Unit shall be released from Warm-up Mode when the Space Temperature is less than 3 Degr F. below the Space Heating Set-point or when the unit enters its scheduled occupied mode.
- 4 – When the Air Handler Unit is released from warm-up mode the Outside and Return Air Dampers and the Hot Water Valve shall revert to their scheduled modes.

OCCUPIED MODE:

- 1 – The Air Handler Unit shall be indexed into the occupied mode via the BMS schedule.
- 2 - Upon initial startup, the Outside and Return Air Damper shall open to their Minimum Outside Air setting.
- 3 - The supply fan shall start and slowly ramp up to its preset speed as determined by the balancing contractor.
- 4 - If the supply fan fails to start, an alarm shall be generated and the outside air damper shall close.
- 5 – Once the supply fan has proven on, the Air Handler Unit shall calculate its mode of operation.
- 6 - If the space temperature is 2 Degr F. below the space temperature set-point (72 Degr F. adj.) and the outside air temperature is below 55 Degr F., the Air Handler Unit will enter it's heating mode.
- 7 - Upon a call for heating, the Outside Air Damper shall remain at its minimum position and the stage 1 gas heating signal shall be enabled.
- 8 – When the Space Temperature is below 45 Degr F., both gas heating stages shall be enabled.
- 9 – If the space temperature is 2 Degr F. above the space temperature set-point (72 Degr F. adj.) and the outside air temperature is above 51 Degr F., but below 62 Degr F., the Air Handler Unit will enter its economizer mode.
- 10 - Upon a call for economizer cooling, the Outside Air Damper shall modulate open to maintain the discharge air set-point.
- 11- If the discharge air temperature goes below 45 Degr F., the economizer mode shall be overridden and the outside air damper shall modulate back to its minimum position.
- 12 – If the space temperature is 2 Degr F. above the space temperature set-point (72 Degr F. adj.) and the outside air temperature is above 65 Degr F., the Air Handler Unit will enter it's cooling mode.
- 13 - Upon a call for cooling, the Outside Air Damper shall remain at its minimum position, the DX coils and the ACCU's shall be toggled on, and the heating signals shall remain off.

UNOCCUPIED MODE:

- 1 – The Air Handler Unit's Supply Air Fan shall be off, the Outside Air Damper shall be closed, and the Return Air Damper shall be open.
- 2 – When any Space Temperature Sensor is below an Unoccupied Heating Set-point of 60 deg. F, the Air Handler Unit's Supply Air Fan shall start. The outside air damper shall remain closed and the gas heating stage 1 shall be enabled.
- 3 – When the Space Temperature rises above the Unoccupied Heating Set-point, the Air Handler Unit's Supply Air Fan shall stop.

AIR FILTER MONITORING:

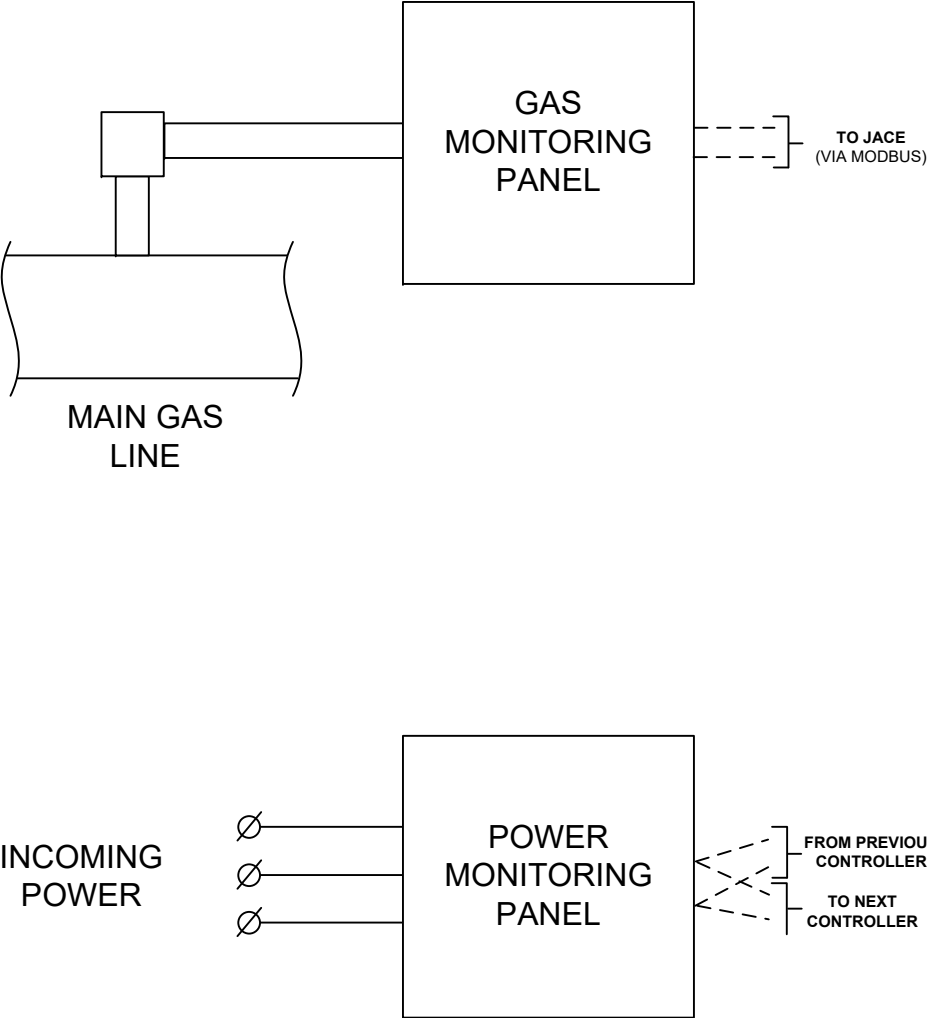
- 1 – When the filter exceeds the manufacturer's rating for a dirty filter, an alarm shall be generated.

SENSOR ALARMING:

- 1 – If the Space Temperature is above 85 deg. F or below 55 deg. F an alarm shall be generated.
- 2 – If the Discharge Air Temperature is above 120 deg. F or below 45 deg. F an alarm shall be generated.
- 3 - All set-points shall be user adjustable from the graphical user interface. Occupied space temperature set-points shall be limited between 70 Degr. F. and 74 Degr. F.

[illegible]

POWER AND GAS MONITORING FLOW DIAGRAM



FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625								Project: NJ DOT FERNWOOD GARAGE BUILDING 19
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	1	01-05-2018	AS-BUILTS					POWER AND GAS MONITORING FLOW DIAGRAM
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-14-2017	SUBMITTAL	A.V.				Job No. #17-04260
		NO.	DATE	REVISION	BY				Page 7 of 7

PROJECT: NJDOT ESIP - FERNWOOD 19

JOB ID NUMBER: 17-04260

PAGE 1 OF 1

PAGE	QTY	PRODUCT #	MFGR.	DESCRIPTION
PG 3 RISER	1	WEB-8000-CSE	Honeywell	JACE Web Controller
PG 4 & 5 AHU	1	A/20K-R2	ACI	Space Temperature Sensor
PG 4 & 5 AHU	1	A/20K-D-8"	ACI	8-inch Duct Temperature Probe
PG 4 & 5 AHU	1	ADPS-04-2-N	Dwyer	Differential Pressure Filter Switch
PG 4 & 5 AHU	1	C-2200	Senva	On/Off Status Current Transducer
PG 4 & 5 AHU	4	RIBU1C	FD, Inc. (RIB)	120 Vac / 10-30 Vac/dc Relay SPDT
PG 4 & 5 AHU	1	MS8105A1030	Honeywell	24Vac On/Off 44lb-in Actuator
PG 5 AHU	1	PUB4024S	Honeywell	Spyder BACnet Prog. Controller
PG 5 AHU	1	TR75VA001	FD, Inc. (RIB)	120VAC/24VAC Transformer
PG 5 AHU	1	SCE-16N1606LP	Saginaw	Enviroline Series Control Panel
PG 5 AHU	1	SCE-16N16MP	Saginaw	16x16 Subpanel
PG 7 GAS/PWR	1	PS3037-S-N	Dent Inst.	1-pt. Rev. Grade Power Meter
PG 7 GAS/PWR	1	CT-R16-A4-U	Dent Inst.	Flexible Current Transformer
PG 7 GAS/PWR	1	620S-BT-L06-M1-EN2-V4-NR-9-MB	Sierra Inst.	BoilerTrak Immersible Thermal Gas Mass Flow Meter

TITLE PAGE

NJ DOT FERNWOOD GARAGE BUILDING 21 (AS-BUILTS)

ENERGY SAVINGS IMPROVEMENT PROJECT

BUILDING AUTOMATION SYSTEM

SHEET NUMBER	CONTENTS	REVISION
1	TITLE PAGE	
2	LEGEND & SYMBOLS	
3	NETWORK RISER	
4	MAKE-UP AIR UNIT (MAU-1 TO 5) FLOW DIARAM	
5	MAKE-UP AIR UNIT (MAU-1 TO 5) WIRING SCHEMATIC	
6	MAU SEQUENCE OF OPERATIONS	
7	AIR HANDLING UNIT (AHU-1&2) FLOW DIAGRAM	
8	AIR HANDLING UNIT (AHU-1&2) WIRING SCHEMATIC	
9	AIR HANDLING UNIT SEQUENCE OF OPERATIONS	
10	GAS UNIT HEATER FLOW & WIRING DIAGRAM	
11	POWER AND GAS MONITORING FLOW DIAGRAM	

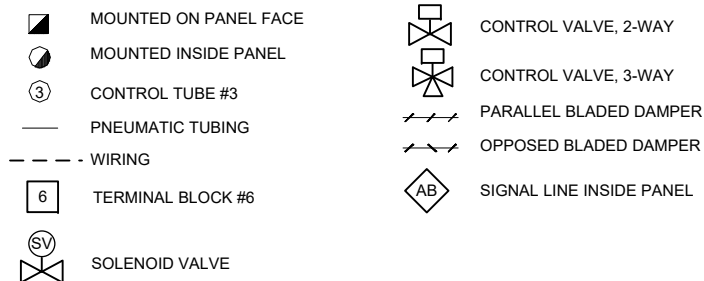
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LEGEND & SYMBOLS

GENERAL NOTES

1. ALL POWER WIRING 120 VAC AND ABOVE BY ELECTRICAL CONTRACTOR.

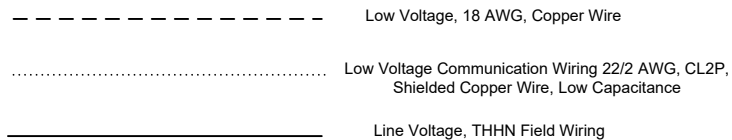
TEMPERATURE CONTROL LEGEND:



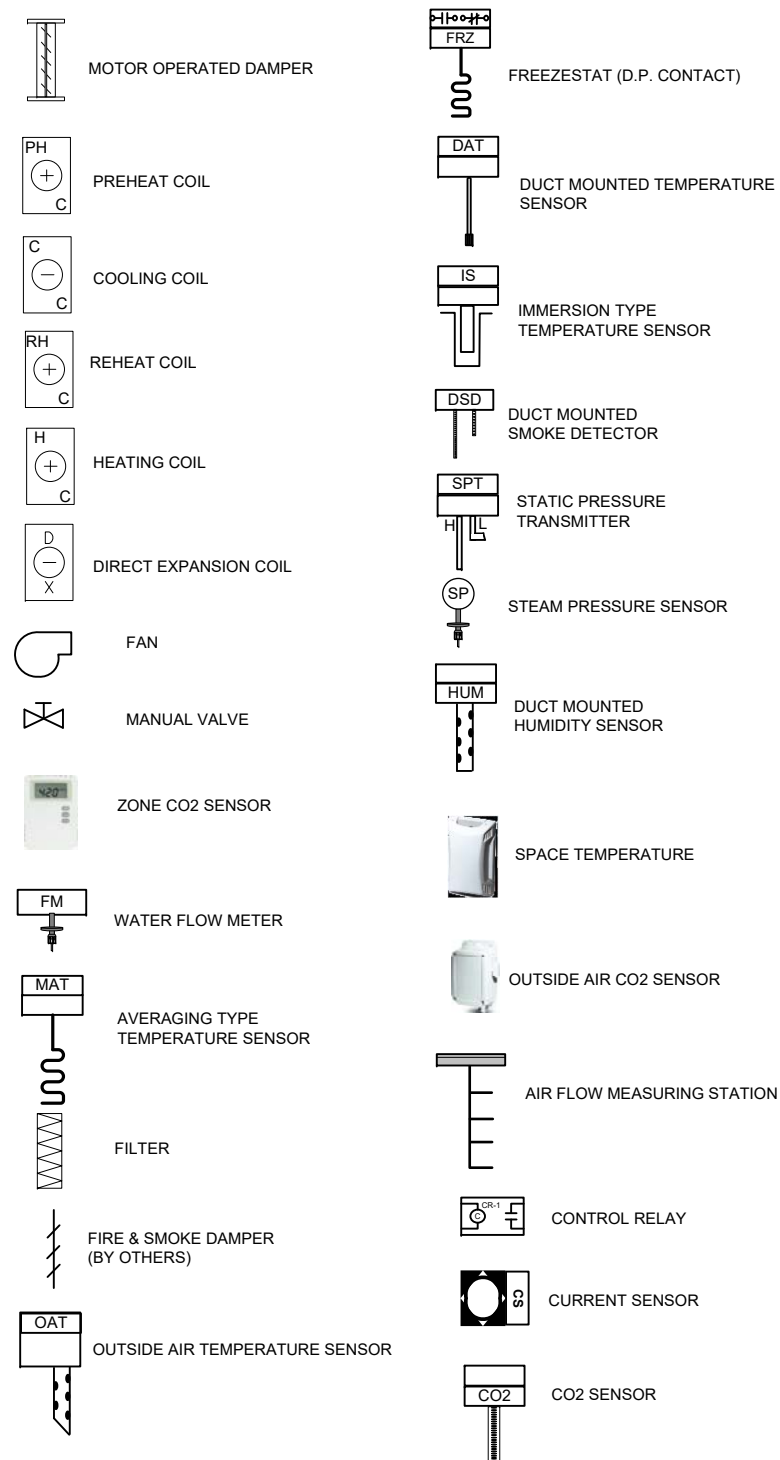
ABBREVIATIONS:

AFMS- AIR FLOW MEASURING STATION	OA- OUTSIDE AIR
C- COMMON PORT	OL'S- MOTOR STARTER OVERLOADS
CCP- CENTRAL CONTROL PANEL	PC- PRESSURE CONTROLLER
CR- CONTROL RELAY	PE- PRESSURE TOGGLE SWITCH
CS- CURRENT SWITCH	PI- PRESSURE INDICATOR
DA-DAMPER ACTUATOR	PL- PILOT LIGHT
DPRO- DAMPER OUTPUT	PR- PNEUMATIC RELAY
DPRS- DAMPER STATUS	PT- PRESSURE TRANSMITTER
DPS- DIFFERENTIAL PRESSURE SWITCH	RC- RECEIVER CONTROLLER
DPT- DIFFERENTIAL PRESSURE TRANS	RR- REVERSING RELAY
EA- EXHAUST AIR	RT- ROOM THERMOSTAT
ES- END SWITCH, POSITION SWITCH	S- SWITCH
FS- FLOW SWITCH	SD- SMOKE DETECTOR
FSD- FIRE & SMOKE DAMPER	S/W- SUMMER/ WINTER SIGNAL
H- HUMIDISTAT	T- THERMOSTAT
HC- MOTOR STARTER HOLDING COIL	TS- TEMPERATURE SENSOR
HI- HUMIDITY INDICATOR	TC- TIME CLOCK
HL- HIGH LIMIT HUMIDISTAT	TDR- TIME DELAY RELAY
HS- HIGH SIGNAL SELECTOR	THL- TEMPERATURE HIGH LIMIT THERMOSTAT
HT- HUMIDITY TRANSMITTER	TI- TEMPERATURE INDICATOR
LCP- LOCAL CONTROL PANEL	TLL- TEMPERATURE LOW LIMIT THERMOSTAT
LS- LOW SIGNAL SELECTOR	TR- TRANSDUCER
MA- MIXED AIR	TT- TEMPERATURE TRANSMITTER
MOD-MOTER OPERATED DAMPER	TX- TRANSFORMER
NC- NORMALLY CLOSED	V- VALVE
NCP- NETWORK CONTROL PANEL	WB- WET BULB
NO- NORMALLY OPEN	WU- WARM-UP SIGNAL

WIRING LEGEND

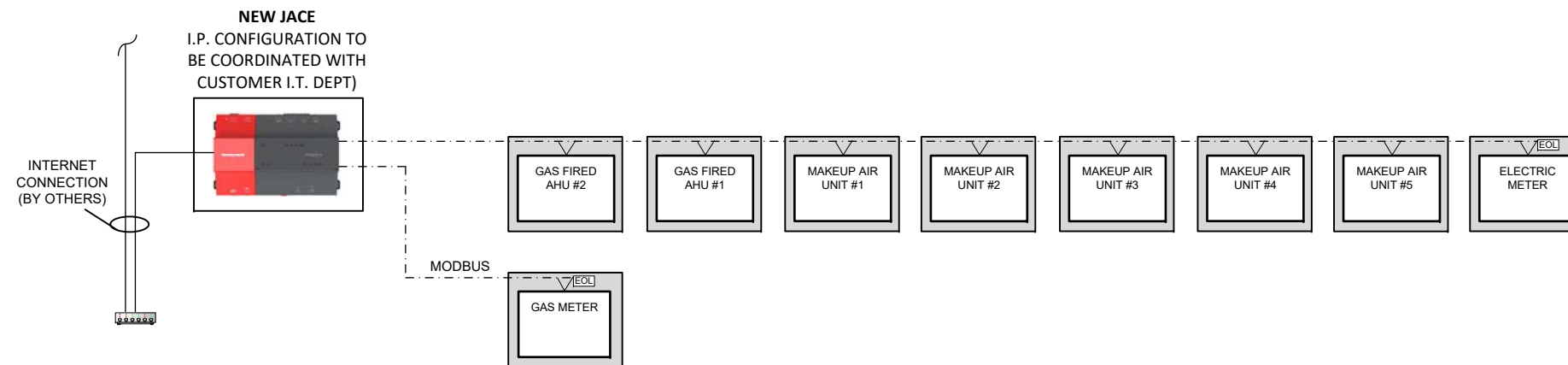


HVAC SYSTEM LEGEND:

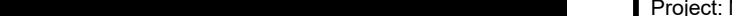


FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625					Project: NJ DOT FERNWOOD GARAGE BUILDING 21	
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS			
		1	11-03-2017	ADDED DOOR SWITCHES			
		0	08-14-2017	SUBMITTAL			A.V.
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	NO.	DATE	REVISION			BY
						LEGEND & SYMBOLS	
					Job No. #17-04260	Page 2 of 11	

NETWORK RISER

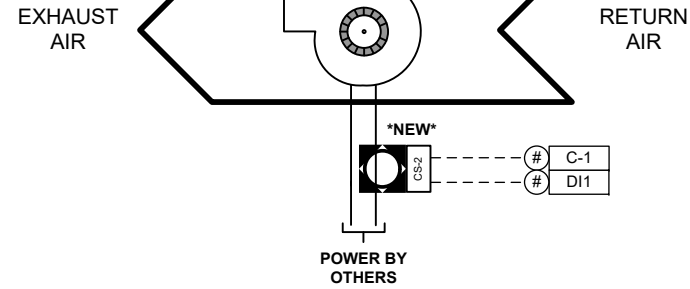


NOTE: 1) 120VAC POWER TO ALL CONTROL PANELS BY OTHERS

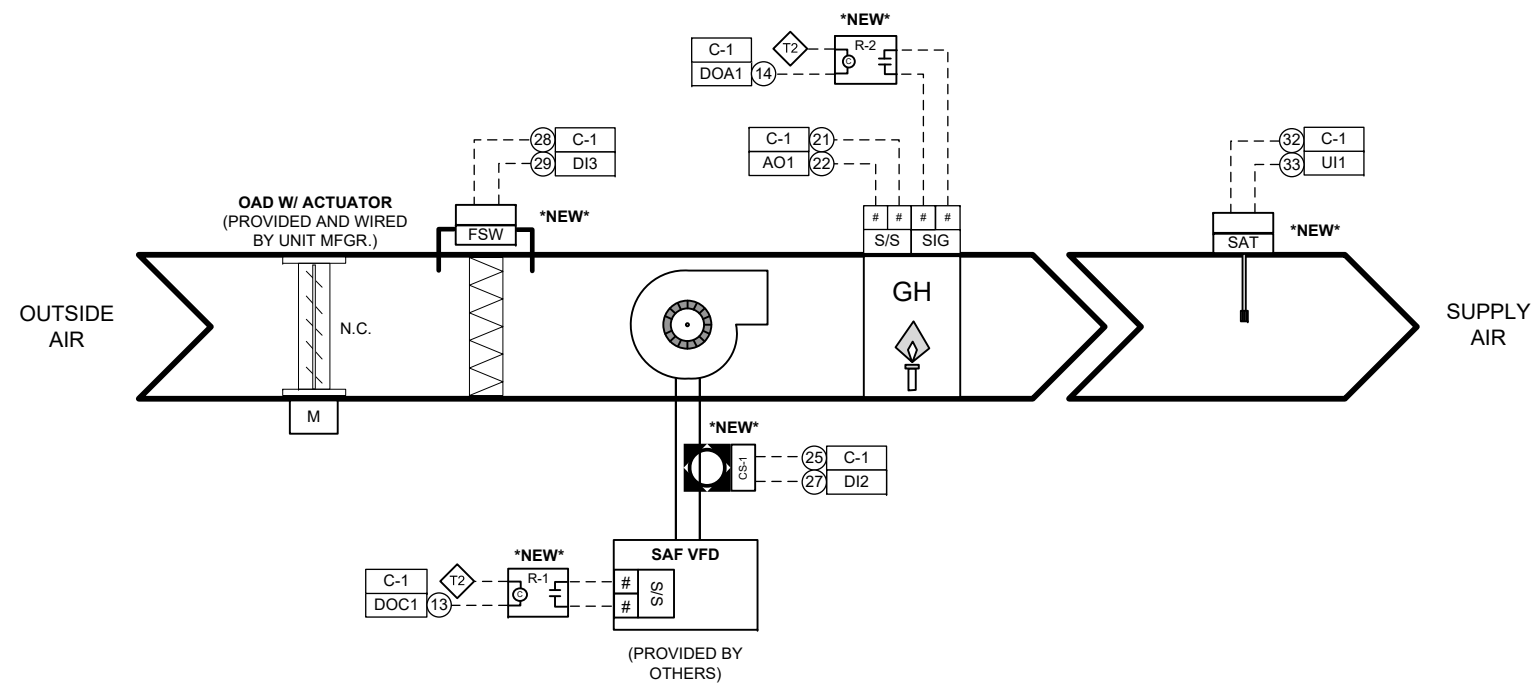
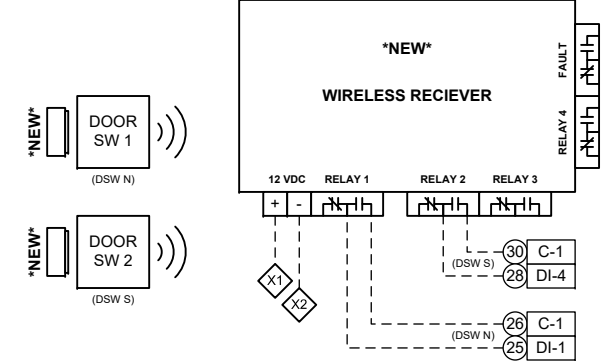
FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625						Project: NJ DOT FERNWOOD GARAGE BUILDING 21		
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS				NETWORK RISER	
		1	11-03-2017	ADDED DOOR SWITCHES					
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-14-2017	SUBMITTAL	A.V.				
		NO.	DATE	REVISION	BY				

(TYPICAL OF 5 EXCEPT AS NOTED)

(TYPICAL OF 3; MAU1,2,&3)



(MAU-4 ONLY)



NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625					Project: NJ DOT FERNWOOD GARAGE BUILDING 21				
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS			MAKE-UP AIR UNIT (MAU-1 TO 5) FLOW DIAGRAM			
		1	11-03-2017	ADDED DOOR SWITCHES						
		0	08-14-2017	SUBMITTAL		A.V.				
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	NO.	DATE	REVISION		BY	Job No.	#17-04260	Page	4 of 11

(TYPICAL OF 5 EXCEPT AS NOTED)

[illegible]

MAU SEQUENCE OF OPERATIONS

ENABLED MODE:

- 1 – The Make-up Air Unit and its associated Exhaust Fan shall be indexed into the Enabled Mode as per the BMS schedule, or whenever its associated Exhaust Fan is running (MAU-4 also runs when MAU-3's EXF is running).
- 2 – Upon initial startup, the Outside Air Damper shall open.
- 3 – Once the Outside Air Damper has proved open via the End Switch, the Supply Air Fan shall start.
- 4 – If the Supply Air Fan fails to start as sensed by its current sensor, an alarm shall be generated and the Outside Air Damper shall close.
- 5 – Once the Supply Air Fan has proved on, the Make-up Air Unit shall calculate its mode of operation.
- 6 – If the Outside Air Temperature is below 50 deg. F. (adj.), the Make-up Air Unit will enter it's heating mode.
- 7 – Upon a call for heating, the Gas Heating Signal shall begin to modulate to maintain a Discharge Air Set-point of 60 deg. F..

AIR FILTER MONITORING:

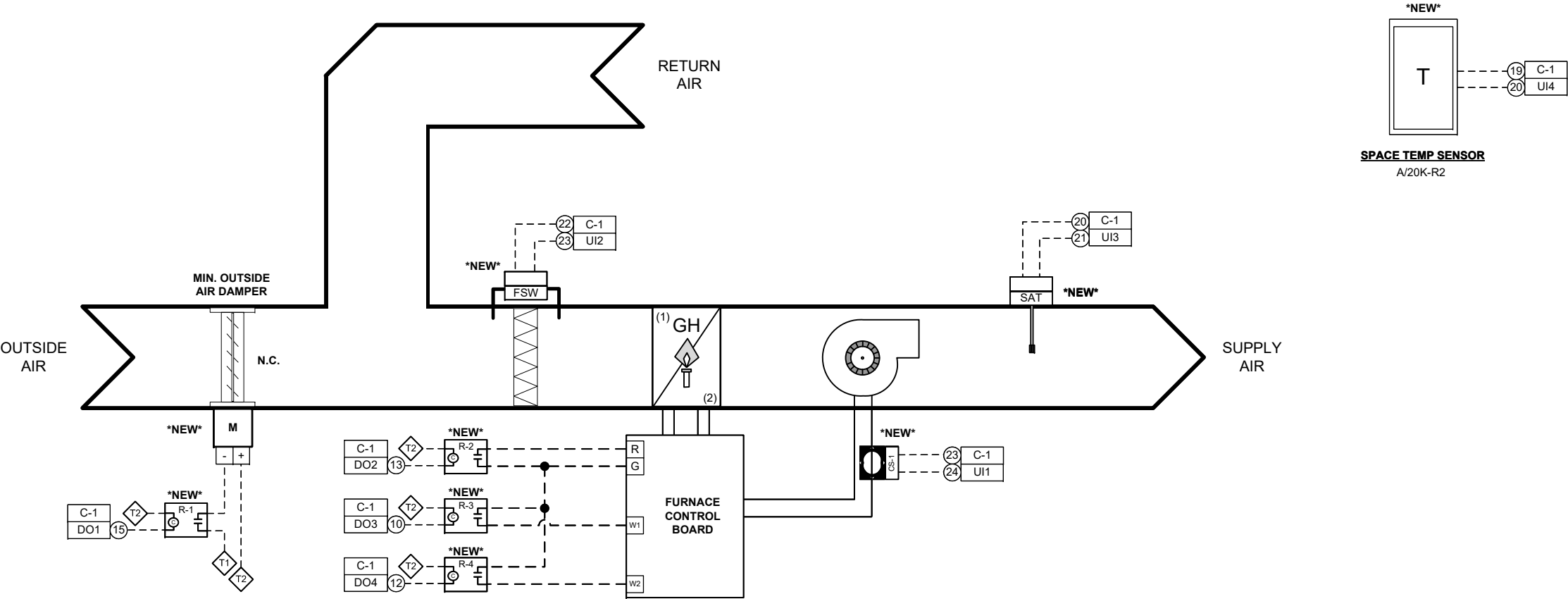
- 1 – The DDC controller shall monitor the filter switch and generate an alarm when it is tripped at the manufacturers dirty filter rating.

SENSOR ALARMING:

- 1 – If the Space Temperature is above 95 deg. F or below 45 deg. F an alarm shall be generated.
- 2 – If the Discharge Air Temperature is above 120 deg. F or below 35 deg. F an alarm shall be generated.
- 3 – If the Discharge Air Temperature remains within 4 deg. F below of the Heating Set-point and the Heating Signal is more than 10% for longer than 10 minutes, an alarm shall be generated.
- 4 – All set-points shall be user adjustable from the graphical user interface.
- 5 – If a door switch has been open and the MAU' heating has been operational for longer than 15 minutes, a critical alarm will be enunciated in the BMS.

[illegible]

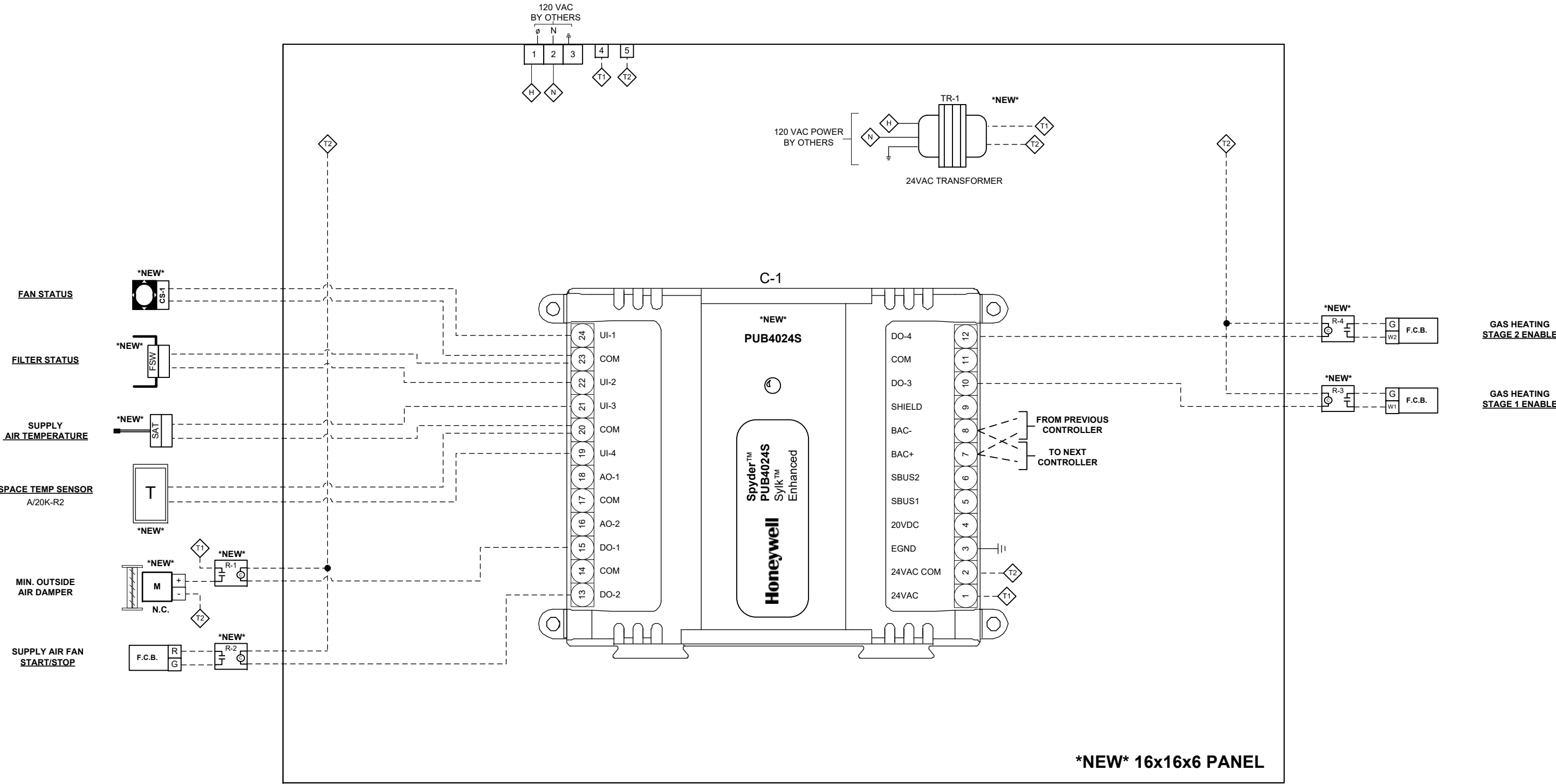
AIR HANDLER UNIT (AHU-1&2) FLOW DIAGRAM
(TYPICAL OF 2)



NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625								Project: NJ DOT FERNWOOD GARAGE BUILDING 21
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS					AIR HANDLER UNIT (AHU-1&2) FLOW DIAGRAM
		1	11-03-2017	ADDED DOOR SWITCHES					
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-14-2017	SUBMITTAL	A.V.				
		NO.	DATE	REVISION	BY				Job No. #17-04260 Page 7 of 11

AIR HANDLER UNIT (AHU-1&2) WIRING SCHEMATIC
(TYPICAL OF 2)



NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625						Project: NJ DOT FERNWOOD GARAGE BUILDING 21
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS			AIR HANDLER UNIT (AHU-1&2) WIRING SCHEMATIC
		1	11-03-2017	ADDED DOOR SWITCHES			
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-14-2017	SUBMITTAL	A.V.		
		NO.	DATE	REVISION	BY		Job No. #17-04260 Page 8 of 11

AIR HANDLER UNIT SEQUENCE OF OPERATIONS

WARM-UP MODE:

- 1 – One hour prior to the occupied mode, the Air Handler Unit shall be placed in Warm-up Mode when that Space Temperature is more than 10 Degs F. below the Space Heating Set-point.
- 2 – The Outside Air Dampers shall be closed and the Return Air Damper shall be opened, the stage 1 gas heating signal shall be enabled.
- 3 – The Air Handler Unit shall be released from Warm-up Mode when the Space Temperature is less than 3 Degs F. below the Space Heating Set-point or when the unit enters its scheduled occupied mode.
- 4 – When the Air Handler Unit is released from warm-up mode the Outside and Return Air Dampers and the Hot Water Valve shall revert to their scheduled modes.

OCCUPIED MODE:

- 1 - The Air Handler Unit shall be indexed into the occupied mode via the BMS schedule.
- 2 - Upon initial startup, the Outside and Return Air Damper shall open to their Minimum Outside Air setting.
- 3 - The supply fan shall start and slowly ramp up to its preset speed as determined by the balancing contractor.
- 4 - If the supply fan fails to start, an alarm shall be generated and the outside air damper shall close.
- 5 - Once the supply fan has proven on, the Air Handler Unit shall calculate its mode of operation.
- 6 - If the space temperature is 2 Degr F. below the space temperature set-point (72 Degr F. adj.) and the outside air temperature is below 55 Degr F., the Air Handler Unit will enter it's heating mode.
- 7 - Upon a call for heating, the Outside Air Damper shall remain at its minimum position and the stage 1 gas heating signal shall be enabled.
- 8 - When the Space Temperature is below 45 Degr F., both gas heating stages shall be enabled.
- 9 - If the space temperature is 2 Degr F. above the space temperature set-point (72 Degr F. adj.) and the outside air temperature is above 51 Degr F., but below 62 Degr F., the Air Handler Unit will enter its economizer mode.
- 10 - Upon a call for economizer cooling, the Outside Air Damper shall modulate open to maintain the discharge air set-point.
- 11 - If the discharge air temperature goes below 45 Degr F., the economizer mode shall be overridden and the outside air damper shall modulate back to its minimum position.
- 12 - If the space temperature is 2 Degr F. above the space temperature set-point (72 Degr F. adj.) and the outside air temperature is above 65 Degr F., the Air Handler Unit will enter it's cooling mode.
- 13 - Upon a call for cooling, the Outside Air Damper shall remain at its minimum position, the DX coils and the ACCU's shall be toggled on, and the heating signals shall remain off.

UNOCCUPIED MODE:

- 1 – The Air Handler Unit's Supply Air Fan shall be off, the Outside Air Damper shall be closed, and the Return Air Damper shall be open.
- 2 – When any Space Temperature Sensor is below an Unoccupied Heating Set-point of 60 deg. F, the Air Handler Unit's Supply Air Fan shall start. The outside air damper shall remain closed and the gas heating stage 1 shall be enabled.
- 3 – When the Space Temperature rises above the Unoccupied Heating Set-point, the Air Handler Unit's Supply Air Fan shall stop.

AIR FILTER MONITORING:

- 1 – When the filter exceeds the manufacturer's rating for a dirty filter, an alarm shall be generated.

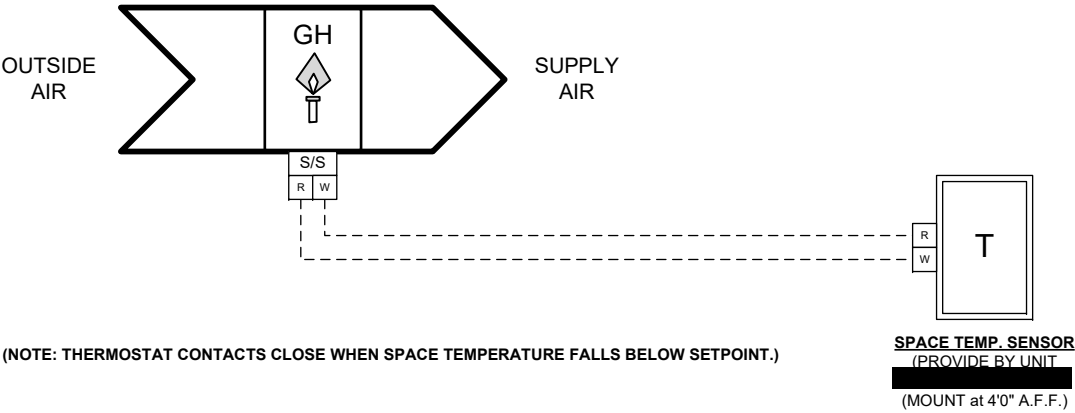
SENSOR ALARMING:

- 1 – If the Space Temperature is above 85 deg. F or below 55 deg. F an alarm shall be generated.
- 2 – If the Discharge Air Temperature is above 120 deg. F or below 45 deg. F an alarm shall be generated.
- 3 - All set-points shall be user adjustable from the graphical user interface. Occupied space temperature set-points shall be limited between 70 Degr F. and 74 Degr F.

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625				
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS	
		1	11-03-2017	ADDED DOOR SWITCHES	
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-14-2017	SUBMITTAL	A.V.
		NO.	DATE	REVISION	BY

GAS UNIT HEATER FLOW & WIRING DIAGRAM

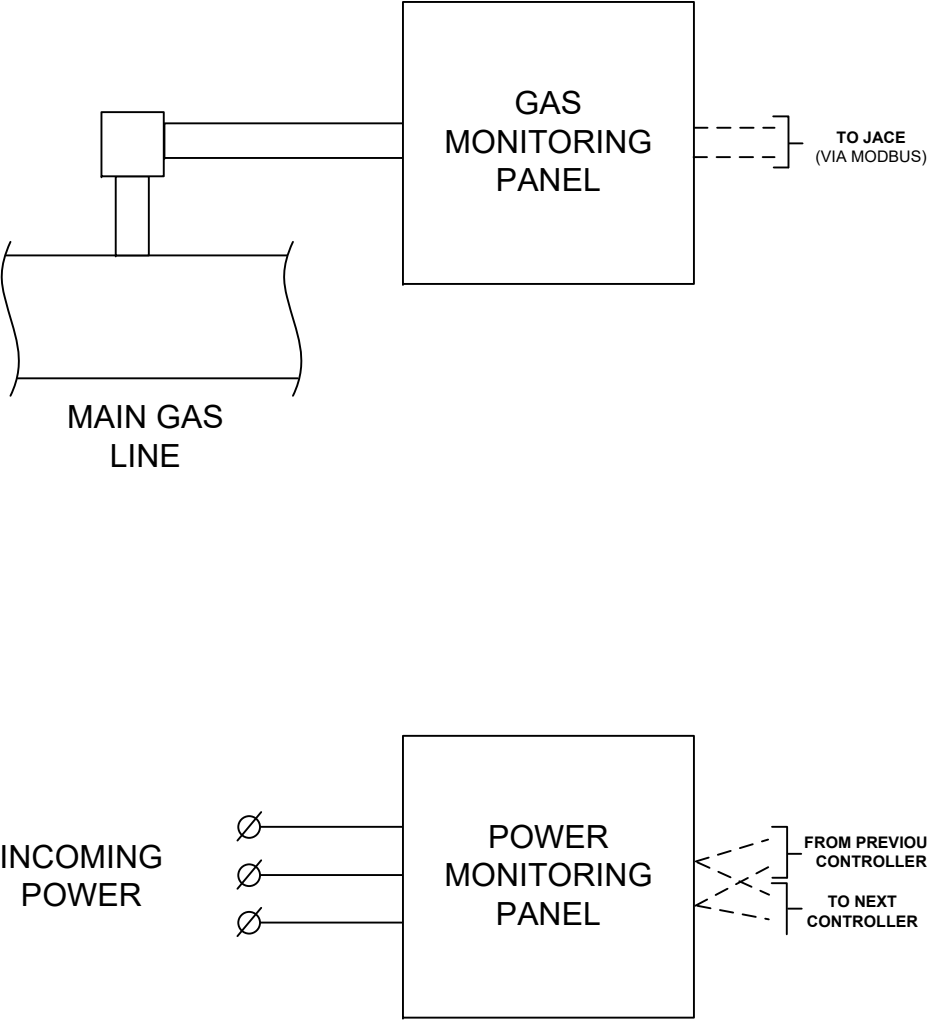
(TYPICAL OF 11)



NOTE:
PLEASE SEE MECHANICAL PLANS FOR UNIT SCHEDULE

FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625								Project: NJ DOT FERNWOOD GARAGE BUILDING 21
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS					GAS UNIT HEATER FLOW & WIRING DIAGRAM
		1	11-03-2017	ADDED DOOR SWITCHES					
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-14-2017	SUBMITTAL	A.V.				
		NO.	DATE	REVISION	BY				Job No. #17-04260Page 10 of 11

POWER AND GAS MONITORING FLOW DIAGRAM



FACILITY	NJDOT Fernwood Building 1, 1035 Parkway Ave, Ewing, NJ 08625								Project: NJ DOT FERNWOOD GARAGE BUILDING 21
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS					POWER AND GAS MONITORING FLOW DIAGRAM
		1	11-03-2017	ADDED DOOR SWITCHES					
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	08-14-2017	SUBMITTAL	A.V.				
		NO.	DATE	REVISION	BY				Job No. #17-04260Page 11 of 11

PAGE	QTY	PRODUCT #	MFGR.	DESCRIPTION
PG 3 RISER	1	WEB-8000-CSE	Honeywell	JACE Web Controller
PG 3 RISER	1	NC-8025	Honeywell	JACE License Up to 25 Devices
PG 4 & 5 MAU	5	A/20K-D-8"	ACI	8-inch Duct Temperature Probe
PG 4 & 5 MAU	5	ADPS-04-2-N	Dwyer	Differential Pressure Filter Switch
PG 4 & 5 MAU	8	C-2200	Senva	On/Off Status Current Transducer
PG 4 & 5 MAU	5	RIBU1C	FD, Inc. (RIB)	120 Vac / 10-30 Vac/dc Relay SPDT
PG 4 & 5 MAU	1	EN4202R	Inovonics	Wireless Reciever w/ 4 Relays
PG 4 & 5 MAU	2	EN1210W	Inovonics	Wireless Magnetic Door Switch
PG 5 MAU	5	PUB6438SR	Honeywell	Spyder BACnet Prog. Controller
PG 5 MAU	5	TR75VA001	FD, Inc. (RIB)	120VAC/24VAC Transformer
PG 5 MAU	1	DCP-1.5-W-12VDC	Kele	24VAC/12VDC Power Supply
PG 5 MAU	5	SCE-16N1606LP	Saginaw	Enviroline Series Control Panel
PG 5 MAU	5	SCE-16N16MP	Saginaw	16x16 Subpanel
PG 7 & 8 AHU	2	A/20K-R2	ACI	Space Temperature Sensor
PG 7 & 8 AHU	2	A/20K-D-8"	ACI	8-inch Duct Temperature Probe
PG 7 & 8 AHU	2	ADPS-04-2-N	Dwyer	Differential Pressure Filter Switch
PG 7 & 8 AHU	2	C-2200	Senva	On/Off Status Current Transducer
PG 7 & 8 AHU	8	RIBU1C	FD, Inc. (RIB)	120 Vac / 10-30 Vac/dc Relay SPDT
PG 7 & 8 AHU	2	MS8105A1030	Honeywell	24Vac On/Off 44lb-in Actuator
PG 8 AHU	2	PUB4024S	Honeywell	Spyder BACnet Prog. Controller
PG 8 AHU	2	TR75VA001	FD, Inc. (RIB)	120VAC/24VAC Transformer
PG 8 AHU	2	SCE-16N1606LP	Saginaw	Enviroline Series Control Panel
PG 8 AHU	2	SCE-16N16MP	Saginaw	16x16 Subpanel
PG 11 GAS/PWR	1	PS3037-S-N	Dent Inst.	1-pt. Rev. Grade Power Meter
PG 11 GAS/PWR	1	CT-R16-A4-U	Dent Inst.	Flexible Current Transformer
PG 11 GAS/PWR	1	620S-BT-L06-M1-EN2-V4-NR-9-MB	Sierra Inst.	BoilerTrak Immersible Thermal Gas Mass Flow Meter

TITLE PAGE

NJ DOT FERNWOOD GARAGE BUILDING 23 (AS-BUILTS)

ENERGY SAVINGS IMPROVEMENT PROJECT

BUILDING AUTOMATION SYSTEM

SHEET NUMBER	CONTENTS	REVISION
1	TITLE PAGE	
2	LEGEND & SYMBOLS	
3	NETWORK RISER	
4	MAKE-UP AIR UNIT (MAU-1) FLOW DIARAM	
5	MAKE-UP AIR UNIT (MAU-1) WIRING SCHEMATIC	
6	MAU SEQUENCE OF OPERATIONS	
7	AIR HANDLING UNIT (AHU-1) FLOW DIAGRAM	
8	AIR HANDLING UNIT (AHU-1) WIRING SCHEMATIC	
9	AIR HANDLING UNIT SEQUENCE OF OPERATIONS	
10	GAS UNIT HEATER (UH-1 TO 8) FLOW & WIRING DIAGRAM	
11	POWER AND GAS MONITORING FLOW DIAGRAM	

[illegible]

LEGEND & SYMBOLS

GENERAL NOTES

1. ALL POWER WIRING 120 VAC AND ABOVE BY ELECTRICAL CONTRACTOR.

TEMPERATURE CONTROL LEGEND:

 MOUNTED ON PANEL FACE

 MOUNTED INSIDE PANEL

 CONTROL TUBE #3

 PNEUMATIC TUBING

 WIRING

 TERMINAL BLOCK #6

 SOLENOID VALVE

 CONTROL VALVE, 2-WAY

 CONTROL VALVE, 3-WAY

 PARALLEL BLADED DAMPER

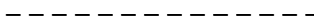
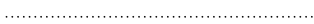
 OPPOSED BLADED DAMPER

 SIGNAL LINE INSIDE PANEL

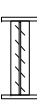
ABBREVIATIONS:

AFMS- AIR FLOW MEASURING STATION	OA -OUTSIDE AIR
C- COMMON PORT	OL'S- MOTOR STARTER OVERLOADS
CCP- CENTRAL CONTROL PANEL	PC- PRESSURE CONTROLLER
CR- CONTROL RELAY	PE- PRESSURE TOGGLE SWITCH
CS- CURRENT SWITCH	PI- PRESSURE INDICATOR
DA-DAMPER ACTUATOR	PL- PILOT LIGHT
DPRO- DAMPER OUTPUT	PR- PNEUMATIC RELAY
DPRS- DAMPER STATUS	PT- PRESSURE TRANSMITTER
DPS- DIFFERENTIAL PRESSURE SWITCH	RC- RECEIVER CONTROLLER
DPT- DIFFERENTIAL PRESSURE TRANS	RR- REVERSING RELAY
EA- EXHAUST AIR	RT- ROOM THERMOSTAT
ES- END SWITCH, POSITION SWITCH	S- SWITCH
FS- FLOW SWITCH	SD- SMOKE DETECTOR
FSD- FIRE & SMOKE DAMPER	S/W- SUMMER/ WINTER SIGNAL
H- HUMIDISTAT	T- THERMOSTAT
HC- MOTOR STARTER HOLDING COIL	TS- TEMPERATURE SENSOR
HI- HUMIDITY INDICATOR	TC- TIME CLOCK
HL- HIGH LIMIT HUMIDISTAT	TDR- TIME DELAY RELAY
HS- HIGH SIGNAL SELECTOR	THL- TEMPERATURE HIGH LIMIT THERMOSTAT
HT- HUMIDITY TRANSMITTER	TI- TEMPERATURE INDICATOR
LCP- LOCAL CONTROL PANEL	TLL- TEMPERATURE LOW LIMIT THERMOSTAT
LS- LOW SIGNAL SELECTOR	TR- TRANSDUCER
MA- MIXED AIR	TT- TEMPERATURE TRANSMITTER
MOD-MOTER OPERATED DAMPER	TX- TRANSFORMER
NC- NORMALLY CLOSED	V- VALVE
NCP- NETWORK CONTROL PANEL	WB- WET BULB
NO- NORMALLY OPEN	WU- WARM-UP SIGNAL

WIRING LEGEND

	Low Voltage, 18 AWG, Copper Wire
	Low Voltage Communication Wiring 22/2 AWG, CL2P, Shielded Copper Wire, Low Capacitance
	Line Voltage, THHN Field Wiring

HVAC SYSTEM LEGEND:

 MOTOR OPERATED DAMPER

 PREHEAT COIL

 COOLING COIL

 REHEAT COIL

 HEATING COIL

 DIRECT EXPANSION COIL

 FAN

 MANUAL VALVE

 ZONE CO2 SENSOR

 WATER FLOW METER

 AVERAGING TYPE TEMPERATURE SENSOR

 FILTER

 FIRE & SMOKE DAMPER (BY OTHERS)

 OUTSIDE AIR TEMPERATURE SENSOR

 FREEZESTAT (D.P. CONTACT)

 DUCT MOUNTED TEMPERATURE SENSOR

 IMMERSION TYPE TEMPERATURE SENSOR

 DUCT MOUNTED SMOKE DETECTOR

 STATIC PRESSURE TRANSMITTER

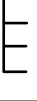
 STEAM PRESSURE SENSOR

 DUCT MOUNTED HUMIDITY SENSOR

 SPACE TEMPERATURE

 OUTSIDE AIR CO2 SENSOR

 AIR FLOW MEASURING STATION

 CONTROL RELAY

 CURRENT SENSOR

 CO2 SENSOR

FACILITY	NJDOT Fernwood Building 23, 1035 Parkway Ave, Ewing, NJ 08625								Project: NJ DOT FERNWOOD GARAGE BUILDING 23
MECHANICAL	DCO Energy, 5429 Harding Highway Building 500, Mays Landing, NJ 08330	2	01-05-2018	AS-BUILTS					LEGEND & SYMBOLS
		1	11-03-2017	ADDED DOOR SWITCHES					
ARCHITECTS	Concord Engineering, 520 South Burnt Mill Road, Voorhees, New Jersey 08043	0	09-13-2017	SUBMITTAL		A.V.			
		NO.	DATE	REVISION		BY			Job No. #17-03253Page 2 of 11