9418.00 - HONEY CREEK RESORT BUILDING AUTOMATION SYSTEM IMPROVEMENTS

12633 Resort Dr, Moravia, IA 52571

Farnsworth GROUP

Design Firm Registration #184001856

100 Walnut Street, Suite 200 - Peoria, Illinois 61602 - Phone: (309) 689-9888 / info@f-w.com

HONEY CREEK LODGE - BAS

THE PORTION OF THIS TECHNICAL SUBMISSION DESCRIBED BELOW WAS PREPARED BY ME OR UNDER MY DIRECT PERSONAL SUPERVISION. I AM A DULY LICENSED ENGINEER UNDER THE LAWS OF THE STATE OF IOWA.

SIGNATURE:

NAME: Wade Ross

DATE: 9/20/2024

LICENSE RENEWAL DATE: 12/31/2025

PAGES OR DIVISIONS COVERED:

ALL

DESIGNER: **FARNSWORTH GROUP**

OWNER: **STATE OF IOWA**

DAS PROJECT NUMBER: **9418.00**

DAS PROJECT NAME: **DNR HCR Building Automation System Improvements**

SHEET NUMBER:

M0.00

SHEET of

09/20/2024

9/20/2024 9:29:42 AM

SYMBOLS LEGEND

NOTE: NOT ALL SYMBOLS ARE USED IN CONSTRUCTION DOCUMENTS

HYDRONIC

- 3-WAY CONTROL VALVE
- ANGLE GATE VALVE
- ANGLE GLOBE VALVE
- BALANCING/SHUTOFF VALVE
- BALL VALVE
- BUTTERFLY VALVE
- CALIBRATED BALANCING VALVE
- CHECK VALVE
- CONTROL VALVE
- EXPANSION VALVE
- GAS COCK
- GATE VALVE
- GLOBE VALVE
- PLUG VALVE
- PRESSURE REDUCING VALVE (WATER)
- PRESSURE REGULATOR (GAS)
- QUICK OPEN VALVE
- SAFETY RELIEF VALVE
- SOLENOID VALVE
- VACUUM RELIEF VALVE
- AUTOMATIC AIR VENT
- MANUAL AIR VENT
- FLOW SENSOR/SWITCH
- PRESSURE SENSOR/SWITCH
- TEMPERATURE SENSOR/SWITCH
- PRESSURE GAUGE
- THERMOMETER
- PIPE SLOPE ARROW
- PIPE ANCHOR
- PIPE GUIDES
- PIPE EXPANSION JOINT
- FLEXIBLE PIPE CONNECTOR
- PIPE UNION
- CONCENTRIC REDUCER
- ECCENTRIC REDUCER
- WYE STRAINER
- WYE STRAINER W/DRAIN VALVE
- DIRECTION OF FLOW
- STEAM BUCKET TRAP
- STEAM F&T TRAP
- BACKFLOW PREVENTER
- PRESSURE/TEMPERATURE PLUG
- PUMP
- METER
- PIPE TURNING UP
- PIPE TURNING DOWN
- TEE OFF TOP
- TEE OFF BOTTOM
- PIPE TEE
- PIPE CAP
- PLAN 90 DEGREE ELBOW
- PLAN 45 DEGREE ELBOW

PIPING SYSTEM (SOLID LINE)

BD	BOILER BLOW DOWN
CD	CONDENSATE DRAIN
CHS	CHILLED WATER SUPPLY
CWS	CONDENSER WATER SUPPLY
HCWS	DUAL TEMPERATURE SUPPLY
HPS	HIGH PRESSURE STEAM
HRS	HEAT RECOVERY SUPPLY
HTWS	HIGH TEMP WATER SUPPLY
HWS	HOT WATER SUPPLY
LPS	LOW PRESSURE STEAM
LS	LOOP SUPPLY
MPS	MEDIUM PRESSURE STEAM
PD	PUMP DISCHARGE
RHG	REFRIGERANT HOT GAS
RL	REFRIGERANT LIQUID
RS	REFRIGERANT SUCTION

PIPING SYSTEM (DASHED LINE)

CHR	CHILLED WATER RETURN
CWR	CONDENSER WATER RETURN
HCWR	DUAL TEMPERATURE RETURN
HPR	HIGH PRESSURE STEAM CONDENSATE RETURN
HRR	HEAT RECOVERY RETURN
HTWR	HIGH TEMP WATER RETURN
HWR	HOT WATER RETURN
LPR	LOW PRESSURE STEAM CONDENSATE RETURN
LR	LOOP RETURN
MPR	MEDIUM PRESSURE STEAM CONDENSATE RETURN

VENTILATION

- THERMOSTAT — AHU-1 — EQUIPMENT TO BE CONTROLLED; GUARD — LOCKABLE GUARD WHERE INDICATED
- TEMP, HUMID, CO, CO2 — SENSOR; ELEMENT TO BE MONITORED; GUARD — LOCKABLE GUARD WHERE INDICATED
- HUMIDISTAT
- WALL SWITCH
- TRANSFER AIR
- 12x8 — RECTANGULAR DUCT
- 12"ø — ROUND DUCT
- 12x8ø — FLAT OVAL DUCT
- SUPPLY DIFFUSER/REGISTER
- RETURN REGISTER/GRILLE
- EXHAUST REGISTER/GRILLE
- DIFFUSER AIRFLOW PATTERN IF OTHER THAN 4-WAY BLOW
- FLEXIBLE BRANCH RUNOUT TO SUPPLY DIFFUSER, 36" MAX LENGTH
- CEILING RETURN REGISTER WITH LINED DUCT FOR SOUND ATTENUATION OPEN TO CEILING PLENUM
- FLEXIBLE DUCT CONNECTION TO EQUIPMENT OR BETWEEN DUCTS
- VOLUME DAMPER
- MOTORIZED DAMPER
- FIRE DAMPER
- SMOKE DAMPER
- COMBINATION FIRE/SMOKE DAMPER
- SUPPLY AIR DUCT TOWARDS
- SUPPLY AIR DUCT AWAY
- RETURN/OUTDOOR AIR DUCT TOWARDS
- RETURN/OUTDOOR AIR DUCT AWAY
- EXHAUST AIR DUCT TOWARDS
- EXHAUST AIR DUCT AWAY

GENERAL

- AHU 1 — MECHANICAL EQUIPMENT TAG; EQUIPMENT TYPE; EQUIPMENT MARK
- S1 — AIR TERMINAL DESIGNATION
- 12x12 — THROAT SIZE
- 250 — AIRFLOW IN CFM
- ## — DETAIL OR SECTION MARK
- # — DETAIL #; SHEET #
- # — KEYNOTE
- POINT OF NEW CONNECTION
- CAP EXISTING PIPE OR DUCT
- NEW — BOLD TEXT INDICATES PROPOSED ITEM
- *EXISTING* — ITALIC TEXT INDICATES EXISTING ITEM
- LINE STYLE INDICATES DEMOLISHED ITEM

ABBREVIATIONS

AC	ABOVE CEILING/AIR CONDITIONER	GRH	GAS RADIANT HEATER
ACC	AIR COOLED CONDENSER	GS	GLYCOL SUPPLY
AF	AIR FILTER	GUH	GAS UNIT HEATER
AFF	ABOVE FINISHED FLOOR	HU	HUMIDIFIER
AHU	AIR HANDLING UNIT	HC	HEATING COIL
AL	ALUMINUM	HCWR	DUAL TEMPERATURE RETURN
AMS	AIR MEASURING STATION	HCWS	DUAL TEMPERATURE SUPPLY
AS	AIR SEPARATOR	HP	HEAT PUMP
AV	AUTOMATIC AIR VENT	HPR	HIGH PRESSURE STEAM RETURN
B	BOILER	HPS	HIGH PRESSURE STEAM SUPPLY
BAS	BUILDING AUTOMATION SYSTEM	HRC	HEAT RECOVERY COIL
BDD	BACKDRAFT DAMPER	HRV	HEAT RECOVERY VENTILATOR (SENSIBLE)
BFC	BELOW FINISHED CEILING	HS	HUMIDITY SENSOR
BFP	BACKFLOW PREVENTION DEVICE	HWP	HOT WATER PUMP
BJ	BETWEEN JOISTS	HWR	HOT WATER RETURN
BOD	BOTTOM OF DUCT	HWS	HOT WATER SUPPLY
BOP	BOTTOM OF PIPE	HX	HEAT EXCHANGER
BTUH	BRITISH THERMAL UNITS PER HOUR	ISP	INTERNAL STATIC PRESSURE
CA	COMPRESSED AIR	KH	KITCHEN HOOD - COMMERCIAL
CBS	COUNTER BALANCED SHUTTER	L	LOUVER
CC	COOLING COIL	LPR	LOW PRESSURE STEAM RETURN
CF	CEILING / CIRCULATING FAN	LPS	LOW PRESSURE STEAM SUPPLY
CFM	CUBIC FEET PER MINUTE	MA	MIXED AIR
CH	CHILLER	MAU	MAKEUP AIR UNIT
CHP	CHILLED WATER PUMP	MBH	THOUSANDS OF BTU PER HOUR
CHR	CHILLED WATER RETURN	MC	MECHANICAL CONTRACTOR
CHS	CHILLED WATER SUPPLY	MD	MOTORIZED DAMPER
CNV	CONVECTOR	MS	MOTORIZED SHUTTER
COND	CONDENSATE	NTS	NOT TO SCALE
CP	CONDENSATE PUMP	OA	OUTDOOR AIR
CRAC	COMPUTER ROOM AIR CONDITIONER	OBD	OPPOSED BLADE DAMPER
CT	COOLING TOWER	P	PUMP
CU	CONDENSING UNIT	PC	PLUMBING CONTRACTOR
CUH	CABINET UNIT HEATER	PBD	PARALLEL BLADE DAMPER
CV	CONTROL VALVE	PDH	POOL ROOM DEHUMIDIFIER
CW	DOMESTIC COLD WATER	PRV	PRESSURE RELIEF VALVE
CWP	CONDENSER WATER PUMP	PS	PRESSURE SWITCH
CWR	CONDENSER WATER RETURN	PSI	POUNDS PER SQUARE INCH
CWS	CONDENSER WATER SUPPLY	PTAC	PACKAGED TERMINAL AIR CONDITIONER
DAC	DOOR AIR CURTAIN	RA	RETURN AIR
DC	DRY COOLER	RF	RETURN AIR FAN
DH	DEHUMIDIFIER	RG	RETURN GRILLE (LESS DAMPER)
DN	DOWN	RH	ROOF HOOD
DOAS	DEDICATED OUTDOOR AIR SYSTEM	RHC	REHEAT COIL
DP	DIFFERENTIAL PRESSURE	RLFA	RELIEF AIR
DS	DUCT SILENCER	RP	RADIANT PANEL
DSU	DUCTLESS SPLIT UNIT	RPZ	REDUCED PRESSURE BFP
DX	DX COOLING COIL	RR	RETURN REGISTER (WITH DAMPER)
EA	EXHAUST AIR	RTU	ROOFTOP AIR HANDLING UNIT
EBB	ELECTRIC BASEBOARD HEATER	SA	SUPPLY AIR
EC	ELECTRICAL CONTRACTOR	SAS	SELF-ACTING SHUTTER
EF	EXHAUST FAN	SD	SUPPLY DIFFUSER/SMOKE DAMPER
EG	EXHAUST GRILLE (LESS DAMPER)	SF	SUPPLY FAN / SQUARE FOOT
EHC	ELECTRIC HEATING COIL	SFD	SMOKE/FIRE DAMPER
EL	ELEVATION	SG	SUPPLY GRILLE
ER	EXHAUST REGISTER	SR	SUPPLY REGISTER
ERP	ELECTRIC RADIANT PANEL	TCAC	TEMP. CONTROL AIR COMPRESSOR
ERV	ENERGY RECOVERY VENTILATOR	TCAD	TEMP. CONTROL AIR DRYER
ESP	EXTERNAL STATIC PRESSURE	TDV	TRIPLE DUTY VALVE
ET	EXPANSION TANK	TFA	TO FLOOR ABOVE
EUH	ELECTRIC UNIT HEATER	TFB	TO FLOOR BELOW
FA	FRESH AIR	TJ	THROUGH JOISTS
FCU	FAN COIL UNIT	TOD	TOP OF DUCT
FD	FIRE DAMPER	TOP	TOP OF PIPE
FDC	FLEXIBLE DUCT CONNECTION	TSP	TOTAL STATIC PRESSURE
FFA	FROM FLOOR ABOVE	UC	UNIT COOLER
FFB	FROM FLOOR BELOW	UFD	UNDERFLOOR DUCT
FPC	FLEXIBLE PIPE CONNECTION	UFT	UNDERFLOOR FAN TERMINAL
FPT	FAN POWERED AIR TERMINAL	UH	UNIT HEATER
FT	FINNED TUBE RADIATION	UV	UNIT VENTILATOR
GC	GENERAL CONTRACTOR	VAV	VARIABLE AIR VOLUME TERMINAL
GF	GAS FURNACE	VD	VOLUME DAMPER
GIH	GRAVITY INTAKE HOOD	VFD	VARIABLE FREQUENCY DRIVE
GPM	GALLONS PER MINUTE	VRP	VERTICAL RADIANT PANEL
GR	GLYCOL RETURN	WAC	WINDOW / WALL AIR CONDITIONER

GENERAL NOTES

MECHANICAL EQUIPMENT INSTALLATION

A. INSTALL EQUIPMENT TO ALLOW MAXIMUM POSSIBLE HEADROOM UNLESS SPECIFIC MOUNTING HEIGHTS ARE INDICATED

B. INSTALL EQUIPMENT LEVEL AND PLUMB, PARALLEL AND PERPENDICULAR TO OTHER BUILDING SYSTEMS AND COMPONENTS IN EXPOSED INTERIOR SPACES, UNLESS OTHERWISE INDICATED

C. INSTALL HVAC EQUIPMENT TO FACILITATE SERVICE, MAINTENANCE, AND REPAIR OR REPLACEMENT OF COMPONENTS. CONNECT EQUIPMENT FOR EASE OF REMOVAL, WITH MINIMUM INTERFERENCE TO OTHER INSTALLATIONS

D. THE INSTALLING CONTRACTOR ASSUMES FULL RESPONSIBILITY FOR ALL MECHANICAL EQUIPMENT PUT INTO OPERATION PRIOR TO THE INSTALLATION OF A WORKING CONTROL SYSTEM.

DEMOLITION

A. VERIFY EXACT SIZE AND LOCATION OF EXISTING UTILITIES PRIOR TO START OF DEMOLITION WORK

B. RELOCATE, REMOVE, AND ADJUST ALL MECHANICAL AND ELECTRICAL ITEMS AS REQUIRED TO ACCOMPLISH SCOPE OF NEW WORK

C. EXISTING MECHANICAL ITEMS ARE SHOWN IN SCHEMATIC FORM BASED UPON EXISTING CONSTRUCTION DOCUMENTS AND/OR FIELD INVESTIGATION

D. FIXTURES AND EQUIPMENT INDICATED TO BE REUSED OR SALVAGED SHALL REMAIN THE PROPERTY OF THE OWNER AND BE STORED IN A LOCATION AS DIRECTED BY OWNER'S REPRESENTATIVE

E. IN LOCATIONS WHERE EXISTING CONSTRUCTION IS REMOVED AND NO ADDITIONAL CONSTRUCTION IS INDICATED, PATCH EXISTING CONSTRUCTION TO MATCH ADJACENT SURFACES AND FINISHES

DDC CONTROLS

PROVIDE NEW FRONT END NETWORK MANAGER WITH WEB CABILITY. 1 YEAR SOFTWARE MAINTENANCE AGREEEMENT, NEW GRAPHICS, ALARMING CAPABILITY FROM REMOTE LOCATION THROUGH PHONE, TABLET, COMPUTER.

REPLACE EXISTING CONTROLLERS WITH NEW. PROVIDE NEW SENSORS WHERE INDICATED

THE PROJECT WILL BE COMMISSIONED. THE COMMISSIONING AGENT WILL BE HIRED BY THE OWNER. COORDINATE EFFORTS WITH THE COMMISSIONING AGENT AND SPECIFICATIONS.

SHEET LIST

Discipline	No.	Description
MECHANICAL	M0.00	COVER SHEET
MECHANICAL	M0.1	GENERAL INFORMATION
MECHANICAL	M1.1	LOWER LEVEL AREA A
MECHANICAL	M1.2	LOWER LEVEL AREA B
MECHANICAL	M1.3	FIRST FLOOR PLAN AREA A
MECHANICAL	M1.4	FIRST FLOOR PLAN AREA B
MECHANICAL	M1.5	FIRST FLOOR PLAN AREA C
MECHANICAL	M1.6	SECOND FLOOR PLAN AREA A
MECHANICAL	M1.7	SECOND FLOOR PLAN AREA B
MECHANICAL	M1.8	THIRD FLOOR PLAN AREA A
MECHANICAL	M1.9	THIRD FLOOR PLAN AREA B
MECHANICAL	M5.1	CONTROLS DIAGRAMS
MECHANICAL	M5.2	CONTROLS DIAGRAMS
MECHANICAL	M5.3	CONTROLS DIAGRAMS
MECHANICAL	M5.4	CONTROLS DIAGRAMS

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DRAWN:	LDE
REVIEWED:	WCR

SHEET TITLE:

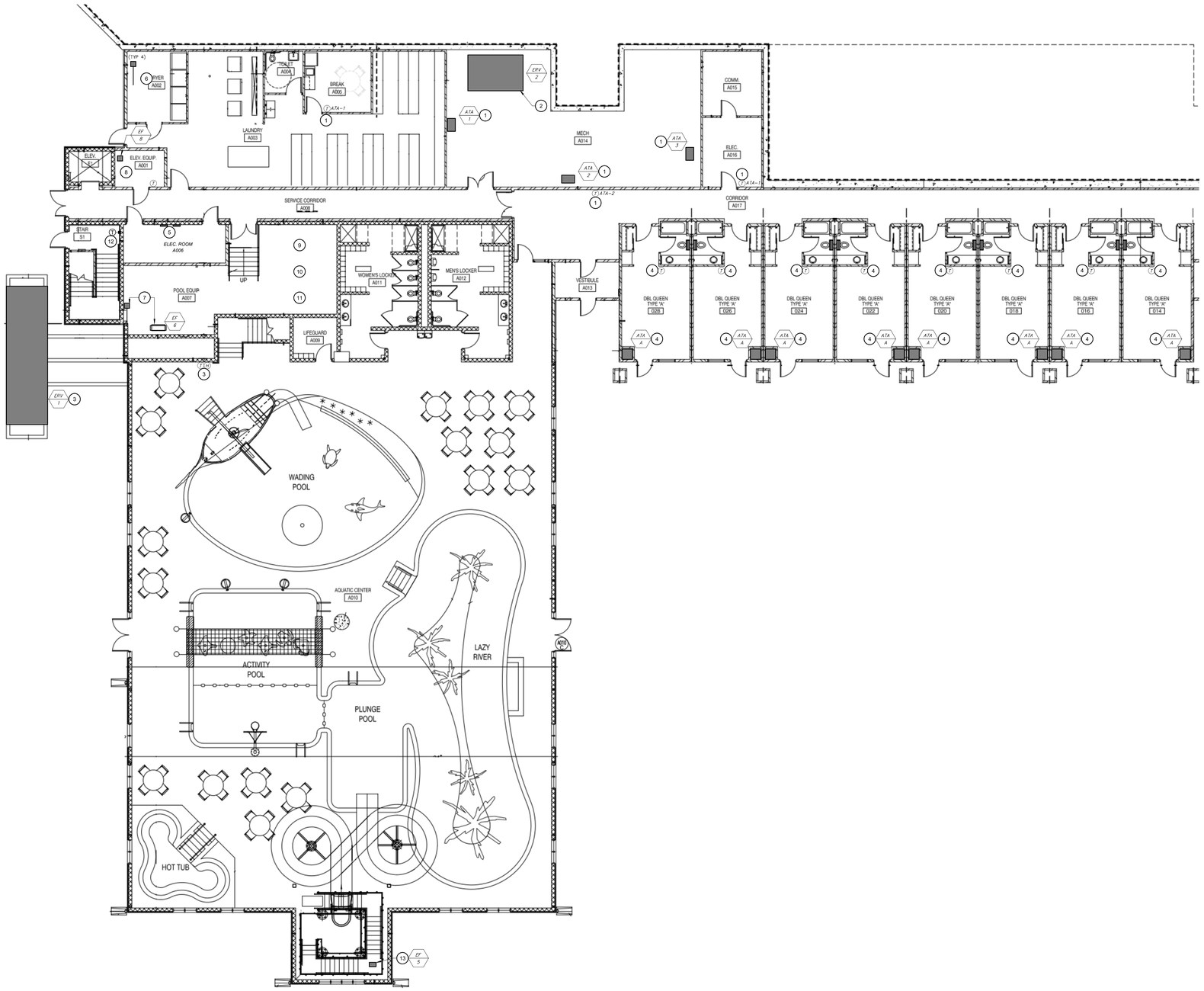
GENERAL INFORMATION

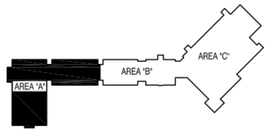
SHEET NUMBER:

M0.1

PROJECT NO.: 0241027.00

9/20/2024 9:28:40 AM





KEYNOTES

1. REPLACE EXISTING THERMOSTAT FOR EXISTING AIR TO AIR HEAT PUMP WITH PROGRAMABLE THERMOSTAT AND CONNECT TO EXISTING HEAT PUMP. PROVIDE NEW LEAVING AIR TEMPERATURE SENSOR AND FILTER DIFFERENTIAL PRESSURE SWITCH. REVISE SEQUENCE OF OPERATION.
2. REPLACE EXISTING CONTROLS FOR ERV-2. REVISE SEQUENCE OF OPERATIONS PER DETAIL 2 ON SHEET M5.2. RECOMMISSION AND REBALANCE UNIT.
3. EXISTING ERV SERVING THE POOL AREA. REPLACE EXISTING CONTROLS, THERMOSTAT AND HUMIDSTAT. REFER TO DETAIL 2 ON SHEET M5.4.
4. REPLACE EXISTING THERMOSTAT FOR EXISTING LODGE ROOM AIR TO AIR HEAT PUMP WITH PROGRAMMABLE THERMOSTAT AND CONNECT TO EXISTING HEAT PUMP REMOVE ALL WIRING. PROVIDE NEW LEAVING AIR TEMPERATURE SENSOR, WATER SENSOR AND FILTER DIFFERENTIAL PRESSURE SWITCH. PROVIDE NEW WIRING AND CONDUIT AS REQUIRED. REVISE SEQUENCE OF OPERATION, REFER TO DETAIL 1 ON SHEET M5.1.
5. REMOVE AND REPLACE EXISTING DDC CONTROLLERS. PROVIDE NEW WIRING TO EXISTING AND NEW CONTROLS.
6. FOUR EXISTING 24X32 MOTORIZED DAMPERS LOCATED IN EXISTING DUCTWORK. REPLACE THE EXISTIGN ACTUATORS AND PROVIDE NEW CONTROLS, REFER TO DETAIL 3 ON M5.2 FOR NEW SEQUENCE OF OPERATION.
7. POOL ROOM EXHAUST FAN AND MOTORIZED DAMPER. REPLACE THE EXISTING ACTUATOR. PROVIDE NEW CONTROLS. REFER TO DETAIL 1 ON SHEET M5.2 FOR NEW SEQUENCE OF OPERATION.
8. REPLACE EXISTING THERMOSTAT AND PROVIDE NEW CONTROLS AND SEQUENCE FOR ELEVATOR ROOM FAN CONTROLS. REFER TO DETAIL 3 ON SHEET M5.1 FOR NEW SEQUENCE OF OPERATION.
9. PROVIDE NEW CONTROLLER FOR WADING POOL CONTROLS, INCLUDING HEATER, FILTER DP, PUMP AND TEMPERATURE SENSORS. REFER TO DETAIL 6 ON SHEET M5.3 FOR NEW SEQUENCE OF OPERATION.
10. PROVIDE NEW CONTROLLER FOR PLUNGE POOL CONTROLS, INCLUDING HEATER, FILTER DP, PUMP AND TEMPERATURE SENSORS. REFER TO DETAIL 6 ON SHEET M5.3 FOR NEW SEQUENCE OF OPERATION.
11. PROVIDE NEW CONTROLLER FOR SPA POOL CONTROLS, INCLUDING HEATER, FILTER DP, PUMP AND TEMPERATURE SENSORS. REFER TO DETAIL 6 ON SHEET M5.3 FOR NEW SEQUENCE OF OPERATION.
12. PROVIDE NEW TEMPERATURE SENSOR. SENSOR TO MONITOR TEMPERATURE IN SPACE AND REPORT BACK TO FRONT END DDC SYSTEM.
13. POOL SLIDE FAN. PROVIDE NEW CONTROLS, INCLUDING NEW TEMPERATURE SENSOR. REFER TO DETAIL 3, SHEET M5.1.

GENERAL NOTES

A. CONTRACTOR TO PATCH AND PAINT WALLS WHERE SENSORS, CONTROLLERS OR OTHER EQUIPMENT IS REMOVED.

B. CONTRACTOR TO PROVIDE 48 HOURS NOTICE TO OWNER FOR ANY UTILITY OR EQUIPMENT SHUT DOWNS.

C. CONTRACTOR TO COORDINATE AFTER HOURS OR WEEKEND WORK WITH OWNER.

D. CONTRACTOR TO REMOVE AND REINSTALL CEILING TILES AS REQUIRED.

1 **FIRST FLOOR VENTILATION PLAN**

SCALE: 1/8" = 1'-0"

0 4 8 16

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#	DATE:	DESCRIPTION:
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PROJECT:

9418.00 - HONEY CREEK RESORT BUILDING AUTOMATION SYSTEM IMPROVEMENTS

12633 Resort Dr, Moravia, IA 52571

DATE:	09/20/2024
DESIGNED:	WCR
DRAWN:	LDE
REVIEWED:	WCR

SHEET TITLE:

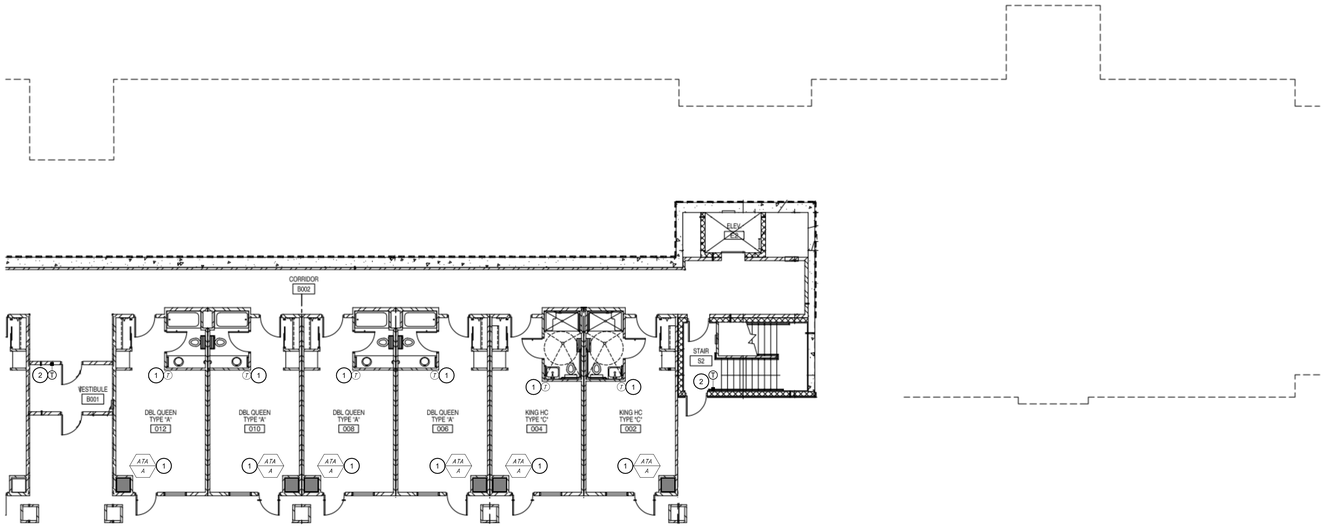
LOWER LEVEL AREA A

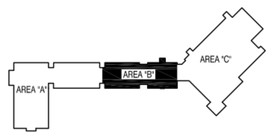
SHEET NUMBER:

M1.1

PROJECT NO.: 0241027.00

9/20/2024 5:24:41 AM





KEYNOTES

1. REPLACE EXISTING THERMOSTAT FOR EXISTING LODGE ROOM AIR TO AIR HEAT PUMP WITH PROGRAMMABLE THERMOSTAT AND CONNECT TO EXISTING HEAT PUMP. REMOVE ALL WIRING. PROVIDE NEW WIRING AND CONDUIT AS REQUIRED.PROVIDE NEW LEAVING AIR TEMPERATURE WATER SENSOR AND FILTER DIFFERENTIAL PRESSURE SWITCH. REVISE SEQUENCE OF OPERATION, REFER TO DETAIL 1 ON SHEET M5.1
2. PROVIDE NEW TEMPERATURE SENSOR. SENSOR TO MONITOR TEMPERATURE IN SPACE AND REPORT BACK TO FRONT END DDC SYSTEM.

GENERAL NOTES

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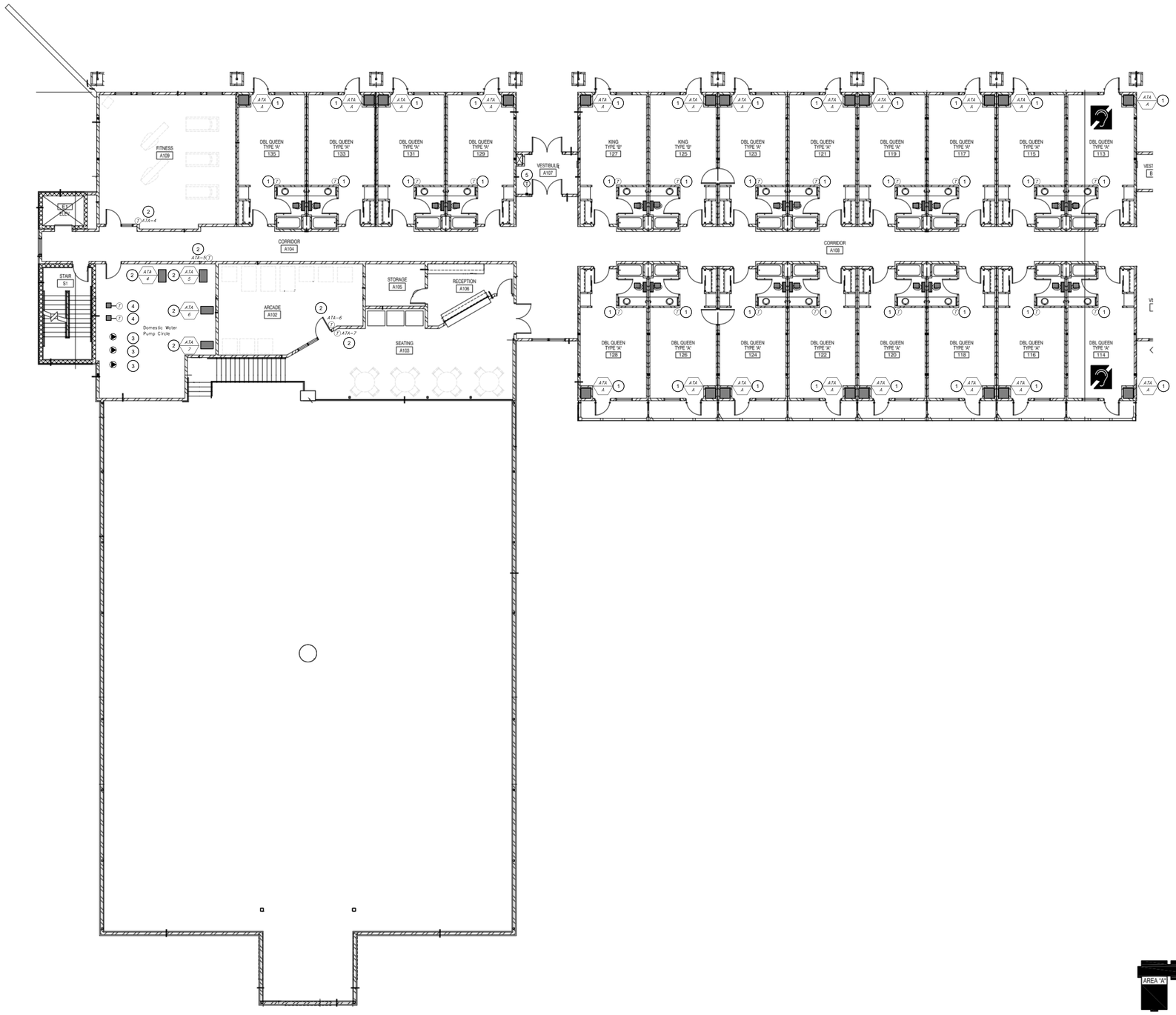
SHEET TITLE:

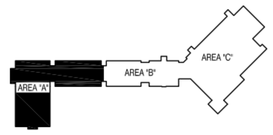
LOWER LEVEL AREA B

SHEET NUMBER:

M1.2

PROJECT NO.: 0241027.00





KEYNOTES (#)

1. REPLACE EXISTING THERMOSTAT FOR EXISTING LODGE ROOM AIR TO AIR HEAT PUMP WITH PROGRAMMABLE THERMOSTAT AND CONNECT TO EXISTING HEAT PUMP.REMOVE ALL WIRING. PROVIDE NEW WIRING AND CONDUIT AS REQUIRED. PROVIDE NEW LEAVING AIR TEMPERATURE SENSOR, WATER SENSOR SWITCH AND FILTER DIFFERENTIAL PRESSURE SWITCH. REVISE SEQUENCE OF OPERATION, REFER TO DETAIL 1 ON SHEET M5.1.
2. REPLACE EXISTING THERMOSTAT FOR EXISTING AIR TO AIR HEAT PUMP WITH PROGRAMMABLE THERMOSTAT AND CONNECT TO EXISTING HEAT PUMP. REMOVE ALL WIRING. PROVIDE NEW WIRING AND CONDUIT AS REQUIRED. PROVIDE NEW LEAVING AIR TEMPERATURE SENSOR AND FILTER DIFFERENTIAL PRESSURE SWITCH. REVISE SEQUENCE OF OPERATION, REFER TO DETAIL 1 ON SHEET M5.1.
3. PROVIDE NEW CONTROLS FOR DOMESTIC WATER RECIRCULATION PUMP. MONITOR PER DETAIL 3 ON SHEET M5.2.
4. PROVIDE NEW DOMESTIC LEAVING WATER TEMPERATURE SENSOR, MONITOR TEMPERATURE AND PROVIDE GRAPHICS. REFER TO DETAIL 5 ON SHEET M5.1.
5. PROVIDE NEW TEMPERATURE SENSOR. SENSOR TO MONITOR TEMPERATURE IN SPACE AND REPORT BACK TO FRONT END DDC SYSTEM.

GENERAL NOTES

A. CONTRACTOR TO PATCH AND PAINT WALLS WHERE SENSORS, CONTROLLERS OR OTHER EQUIPMENT IS REMOVED.

B. CONTRACTOR TO PROVIDE 48 HOURS NOTICE TO OWNER FOR ANY UTILITY OR EQUIPMENT SHUT DOWNS.

C. CONTRACTOR TO COORDINATE AFTER HOURS OR WEEKEND WORK WITH OWNER.

D. CONTRACTOR TO REMOVE AND REINSTALL CEILING TILES AS REQUIRED.

1 **SECOND FLOOR VENTILATION PLAN**
SCALE: 1/8" = 1'-0"

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TRUE NORTH

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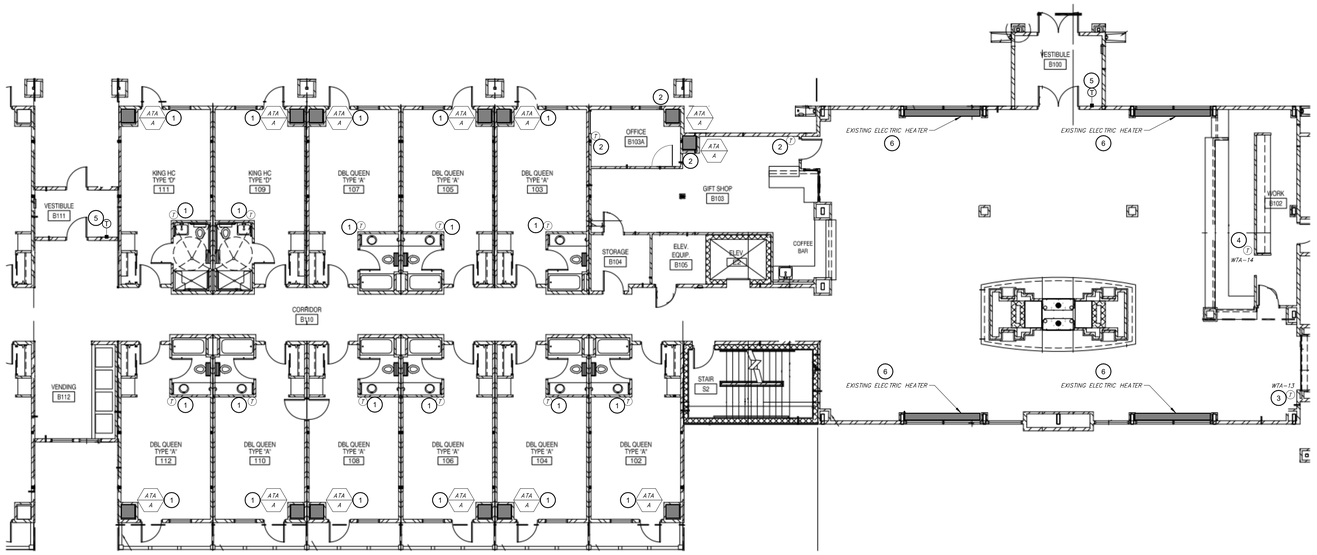
FIRST FLOOR PLAN AREA A

SHEET NUMBER:

M1.3

PROJECT NO.: 0241027.00



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0 4 8 16

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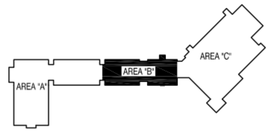

KEYNOTES (#)

1 REPLACE EXISTING THERMOSTAT FOR EXISTING LODGE ROOM AIR TO AIR HEAT PUMP WITH PRECOGRAMMABLE THERMOSTAT AND CONNECT TO EXISTING HEAT PUMP REVISE SEQUENCE OF OPERATION.REMOVE ALL WIRING. PROVIDE NEW WIRING AND CONDUIT AS REQUIRED. REFER TO DETAIL 1 ON SHEET M5.1.

2 REPLACE EXISTING THERMOSTAT FOR EXISTING AIR TO AIR HEAT PUMP WITH PROGRAMMABLE THERMOSTAT AND CONNECT TO EXISTING HEAT PUMP. REVISE SEQUENCE OF OPERATION. REMOVE ALL WIRING. PROVIDE NEW WIRING AND CONDUIT AS REQUIRED. REFER TO DETAIL 1 ON SHEET M5.1.

3 REPLACE THERMOSTAT AND CONTROLS FOR EXISTING WATER TO AIR HEAT PUMP. REFER TO DETAIL 1 ON SHEET M5.3. HEAT PUMP IS LOCATED ON SHEET M1.5.

4 REPLACE THERMOSTAT AND CONTROLS FOR EXISTING WATER TO AIR HEAT PUMP. REFER TO DETAIL 1 ON SHEET M5.3. HEAT PUMP IS LOCATED ON SHEET M1.5

5 PROVIDE NEW TEMPERATURE SENSOR. SENSOR TO MONITOR TEMPERATURE IN SPACE AND REPORT BACK TO FRONT END DDC SYSTEM.

6 EXISTING ELECTRIC HEATER. REFER TO DETAIL 3 ON M5.3.

GENERAL NOTES

A. CONTRACTOR TO PATCH AND PAINT WALLS WHERE SENSORS, CONTROLLERS OR OTHER EQUIPMENT IS REMOVED.

B. CONTRACTOR TO PROVIDE 48 HOURS NOTICE TO OWNER FOR ANY UTILITY OR EQUIPMENT SHUT DOWNS.

C. CONTRACTOR TO COORDINATE AFTER HOURS OR WEEKEND WORK WITH OWNER.

D. CONTRACTOR TO REMOVE AND REINSTALL CEILING TILES AS REQUIRED.

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PROJECT:

9418.00 - HONEY CREEK RESORT BUILDING AUTOMATION SYSTEM IMPROVEMENTS

12633 Resort Dr, Moravia, IA 52571

DATE:	09/20/2024
DESIGNED:	WCR
DRAWN:	LDE
REVIEWED:	WCR

SHEET TITLE:

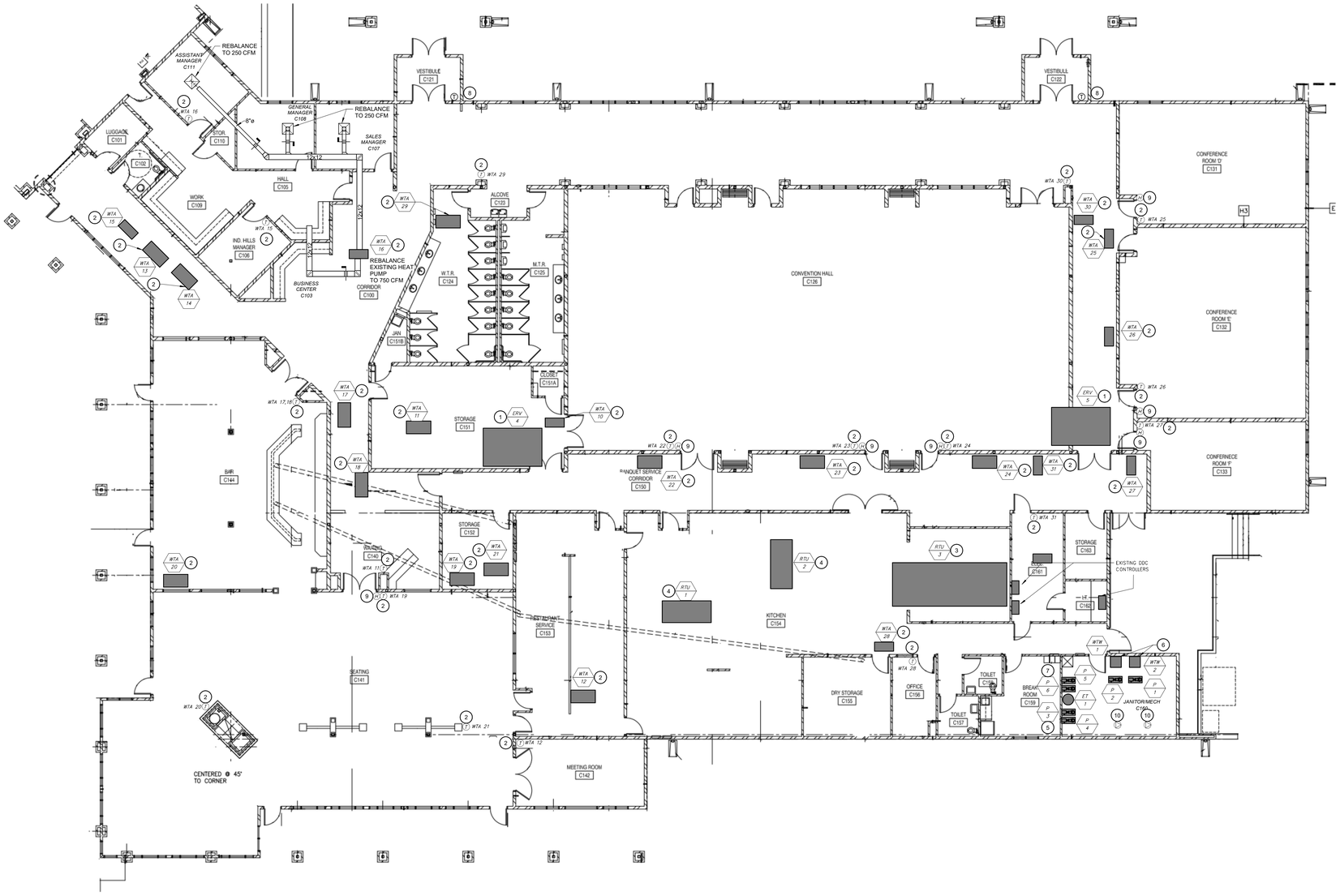
FIRST FLOOR PLAN AREA B

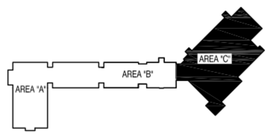
SHEET NUMBER:

M1.4

PROJECT NO.: 0241027.00

9/20/2024 9:29:41 AM





KEYNOTES (#)

1. REPLACE EXISTING CONTROLS FOR ERV-4 AND ERV-5. REVISE SEQUENCE OF OPERATIONS PER DETAIL 2 ON SHEET M5.2. RECOMMISSION AND REBALANCE UNIT. REVISE SEQUENCE OF OPERATION.
2. REPLACE EXISTING THERMOSTAT FOR EXISTING WATER TO AIR HEAT PUMP WITH PROGRAMMABLE THERMOSTAT AND CONNECT TO EXISTING HEAT PUMP.REMOVE ALL WIRING. PROVIDE NEW WIRING AND CONDUIT AS REQUIRED. HEAT PUMP IS LOCATED ABOVE CEILING. REVISE SEQUENCE OF OPERATION. REFER TO DETAIL 1 ON SHEET M5.3.
3. REPLACE EXISTING CONTROLS FOR ROOFTOP UNIT SERVING AS A MAKE UP AIR UNIT AND HVAC FOR THE KITCHEN AREA. UNIT HAS TO BACNET CONTROLLER, PULL IN ALL POINTS AND PROVIDE GRAPHICS FOR UNIT. REFER TO DETAIL 4 ON SHEET M5.2.
4. REPLACE EXISTING CONTROLS FOR ROOFTOP UNIT SERVING AS A MAKE UP AIR UNIT FOR THE KITCHEN HOODS. REVISE SEQUENCE OF OPERATION, REFER TO DETAIL 1 ON SHEET M5.4.
5. REVISE CONTROL SEQUENCE FOR GROUND LOOP PUMPS. REFER TO DETAIL 2 ON SHEET M5.1.
6. REVISE CONTROL SEQUENCE FOR WATER TO WATER HEAT PUMPS AND ASSOCIATED PUMPS, REFER TO DETAIL 5 ON SHEET M5.3.
7. REVISE CONTROL SEQUENCE FOR BUILDING LOOP PUMPS. REFER TO DETAIL 4 ON SHEET M5.1.
8. PROVIDE NEW TEMPERATURE SENSOR. SENSOR TO MONITOR TEMPERATURE IN SPACE AND REPORT BACK TO FRONT END DDC SYSTEM.
9. EXISTING HUMIDISTAT, MONITOR STATUS AND ALARM AT 800 PPM.
10. PROVIDE NEW CONTROLS FOR DOMESTIC WATER CIRC PUMP. MONITOR PER DETAIL 3 ON SHEET M5.2

GENERAL NOTES

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C. CONTRACTOR TO COORDINATE AFTER HOURS OR WEEKEND WORK WITH OWNER.

D. CONTRACTOR TO REMOVE AND REINSTALL CEILING TILES AS REQUIRED.

1 **SECOND FLOOR VENTILATION PLAN**
SCALE: 1/8" = 1'-0"

0 4 8 16 TRUE NORTH

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SHEET TITLE:

FIRST FLOOR PLAN AREA C

SHEET NUMBER:

M1.5

PROJECT NO.: 0241027.00

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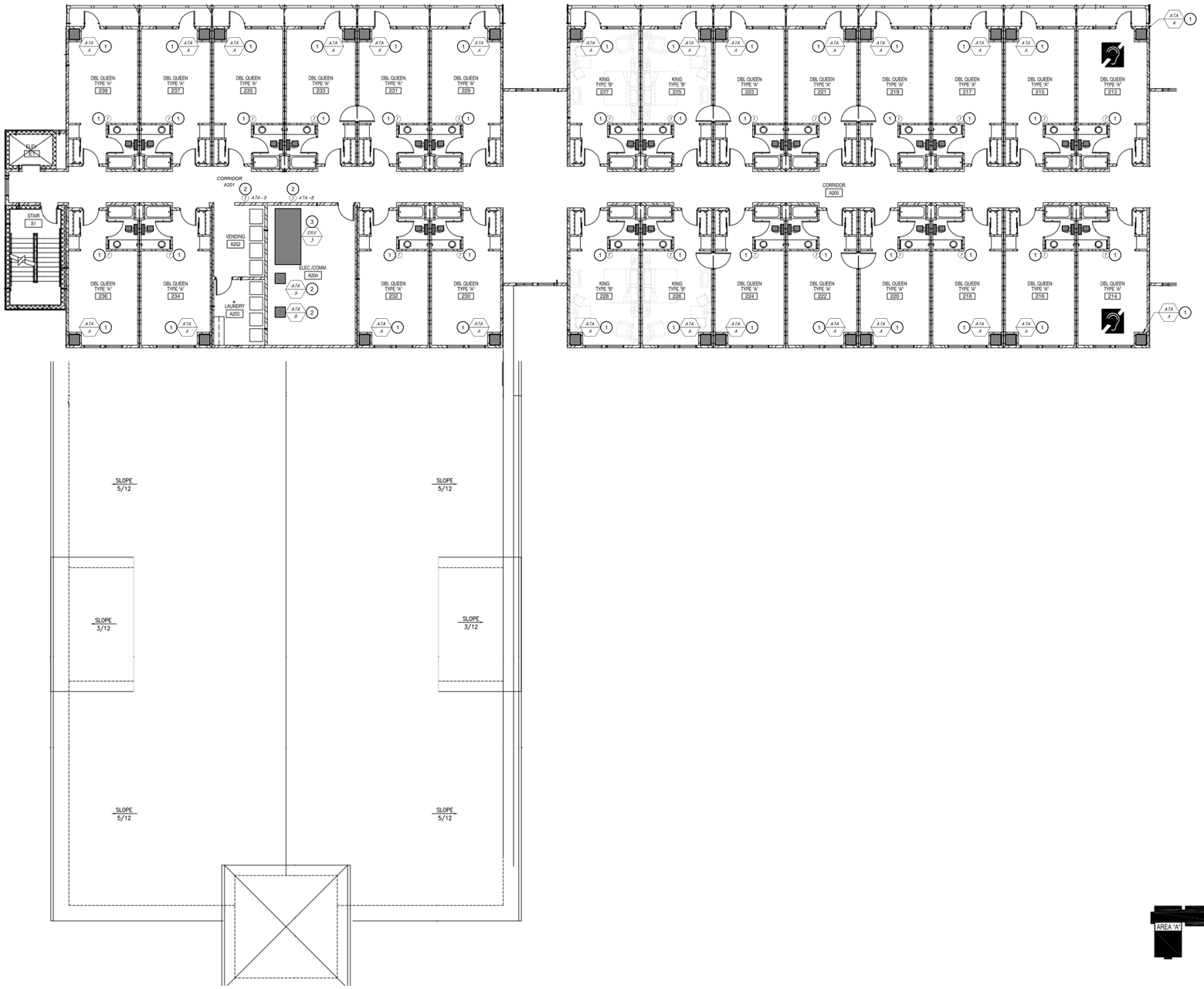

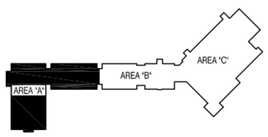

KEYNOTES (#)

1 REPLACE EXISTING THERMOSTAT FOR EXISTING LODGE ROOM AIR TO AIR HEAT PUMP WITH PROGRAMMABLE THERMOSTAT AND CONNECT TO EXISTING HEAT PUMP. PROVIDE NEW LEAVING AIR TEMPERATURE SENSOR, WATER SENSOR SWITCH AND FILTER DIFFERENTIAL PRESSURE SWITCH. REMOVE ALL WIRING. PROVIDE NEW WIRING AND CONDUIT AS REQUIRED. REVISE SEQUENCE OF OPERATION, REFER TO DETAIL1 ON SHEET M5.1.

2 REPLACE EXISTING THERMOSTAT FOR EXISTING AIR TO AIR HEAT PUMP WITH PROGRAMMABLE THERMOSTAT AND CONNECT TO EXISTING HEAT PUMP. PROVIDE NEW LEAVING AIR TEMPERATURE SENSOR, WATER SENSOR SWITCH AND FILTER DIFFERENTIAL PRESSURE SWITCH. REMOVE ALL WIRING. PROVIDE NEW WIRING AND CONDUIT AS REQUIRED. REVISE SEQUENCE OF OPERATION, REFER TO DETAIL 1 ON SHEET M5.1.

3 REPLACE EXISTING CONTROLS FOR ERV-2. REVISE SEQUENCE OF OPERATIONS PER DETAIL 2 ON SHEET M5.2. RECOMMISSION AND REBALANCE UNIT. REVISE SEQUENCE OF OPERATION.

GENERAL NOTES

A. CONTRACTOR TO PATCH AND PAINT WALLS WHERE SENSORS, CONTROLLERS OR OTHER EQUIPMENT IS REMOVED.

B. CONTRACTOR TO PROVIDE 48 HOURS NOTICE TO OWNER FOR ANY UTILITY OR EQUIPMENT SHUT DOWNS.

C. CONTRACTOR TO COORDINATE AFTER HOURS OR WEEKEND WORK WITH OWNER.

D. CONTRACTOR TO REMOVE AND REINSTALL CEILING TILES AS REQUIRED.

1 **THIRD FLOOR VENTILATION PLAN**
SCALE: 1/8" = 1'-0"

0 4 8 16

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9418.00 - HONEY CREEK RESORT BUILDING AUTOMATION SYSTEM IMPROVEMENTS

12633 Resort Dr, Moravia, IA 52571

DATE:	09/20/2024
DESIGNED:	WCR
DRAWN:	LDE
REVIEWED:	WCR

SHEET TITLE:

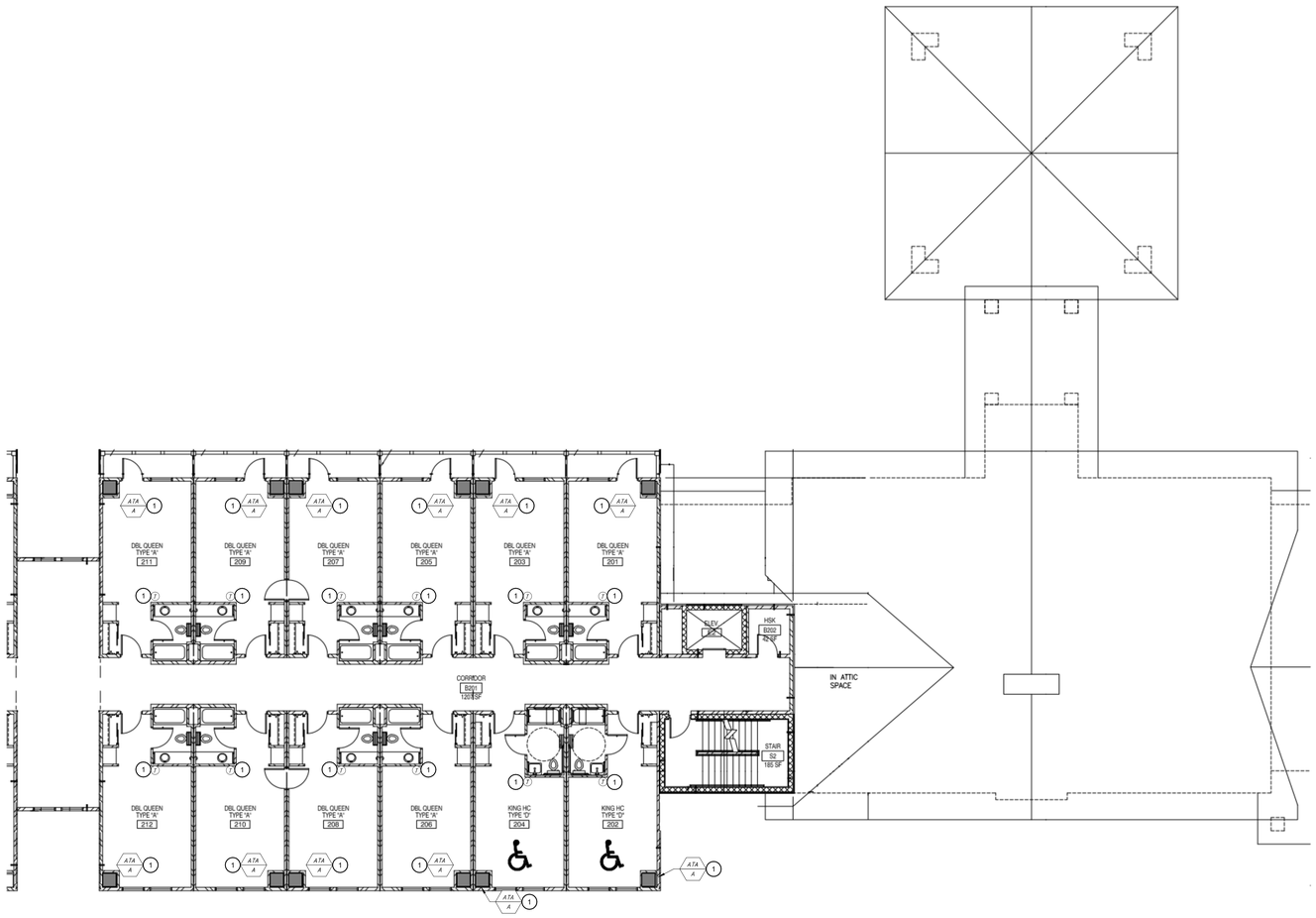
SECOND FLOOR PLAN AREA A

SHEET NUMBER:

M1.6

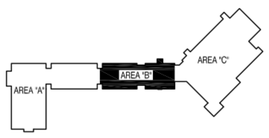
PROJECT NO.: 0241027.00

9/20/2024 2:28:41 AM



1 THIRD FLOOR VENTILATION PLAN

SCALE: 1/8" = 1'-0"



KEYNOTES (#)

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DATE:	09/20/2024
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SHEET TITLE:

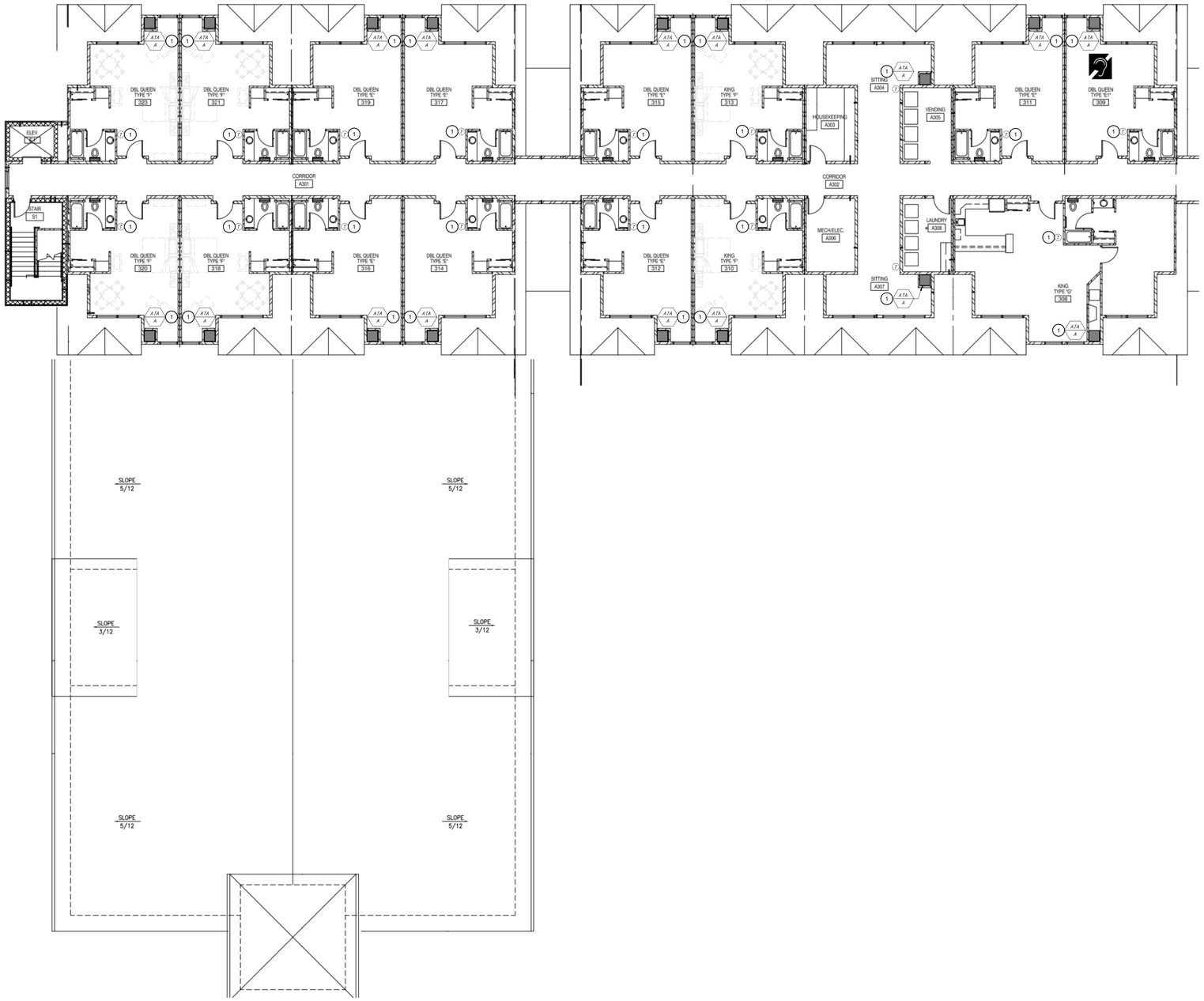
SECOND FLOOR PLAN AREA B

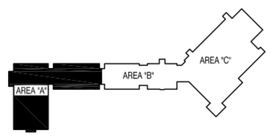
SHEET NUMBER:

M1.7

PROJECT NO.: 0241027.00

9/20/2024 9:28:41 AM





KEYNOTES

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1 **THIRD FLOOR PLAN A**

SCALE: 1/8" = 1'-0"

0 4 8 16

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THIRD FLOOR PLAN AREA A

SHEET NUMBER:

M1.8

PROJECT NO.: 0241027.00

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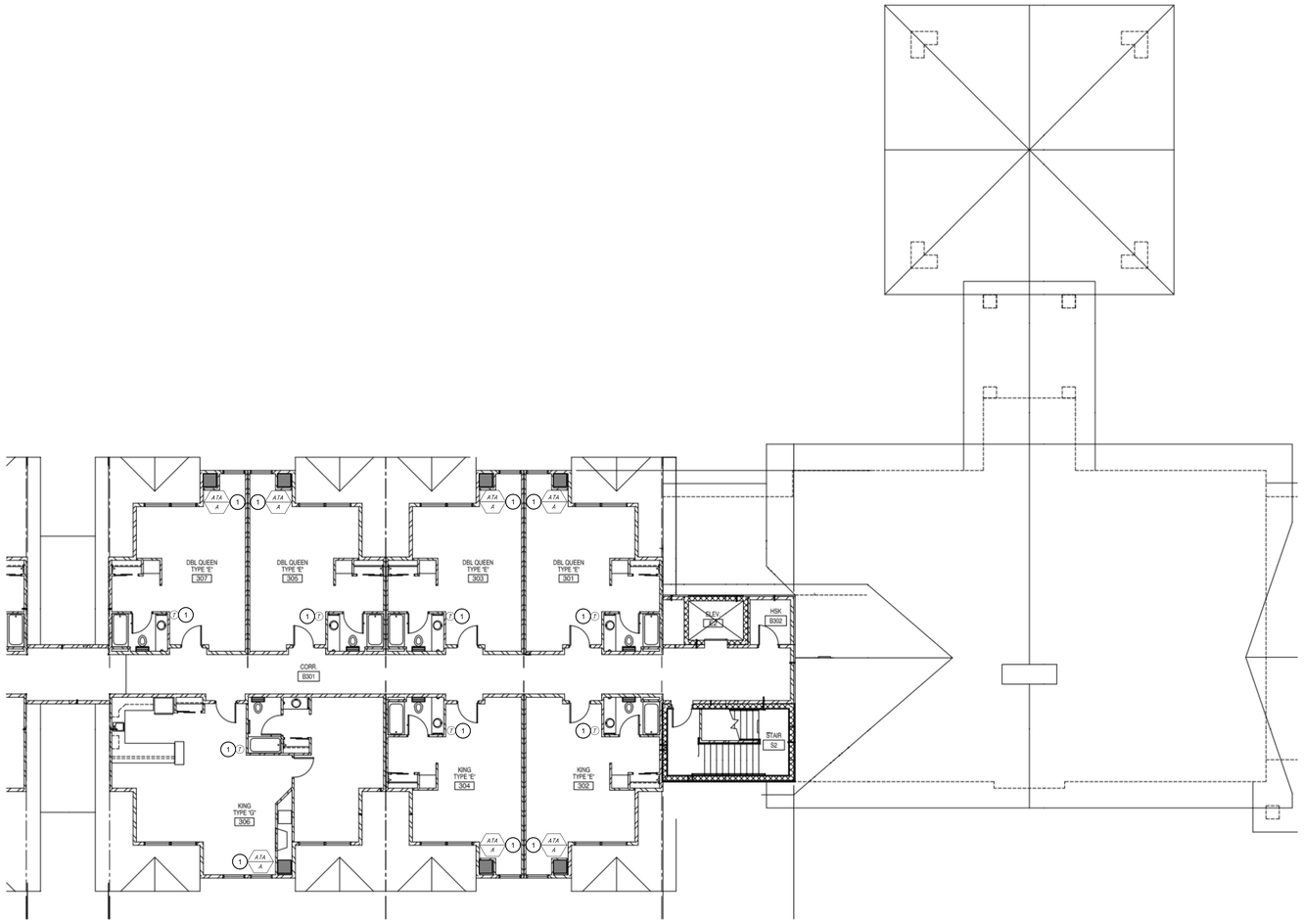

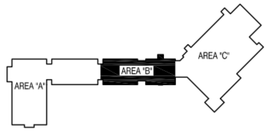

1 THIRD FLOOR PLAN B

SCALE: 1/8" = 1'-0"

0 4 8 16

TRUE NORTH

KEYNOTES (#)

1 1. REPLACE EXISTING THERMOSTAT FOR EXISTING LODGE ROOM AIR TO AIR HEAT PUMP WITH PROGRAMMABLE THERMOSTAT AND CONNECT TO EXISTING HEAT PUMP. PROVIDE NEW LEAVING AIR TEMPERATURE SENSOR, WATER SENSOR SWITCH AND FILTER DIFFERENTIAL PRESSURE SWITCH. REVISE SEQUENCE OF OPERATION, REFER TO DETAIL 1 ON SHEET M5.1.

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SHEET TITLE:

THIRD FLOOR PLAN AREA B

SHEET NUMBER:

M1.9

PROJECT NO.: 0241027.00

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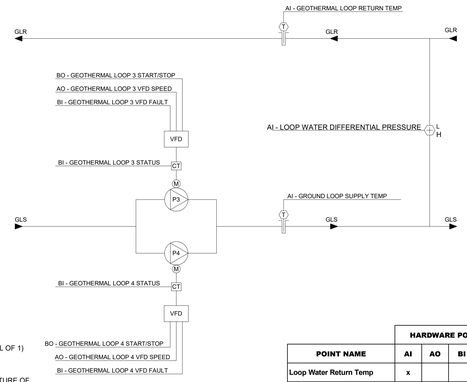


SEQUENCE OF OPERATION - GEOTHERMAL LOOP PUMPS (TYPICAL OF 1)

GEOTHERMAL LOOP PUMP SYSTEM - RUN CONDITIONS:
THE GEOTHERMAL LOOP PUMPS SHALL BE ENABLED WHENEVER:
- THE GEOTHERMAL LOOP PUMPS ILL RUN WHEN THE TEMPERATURE OF THE BUILDING LOOP RETURN WATER TEMPERATURE EXCEEDS 60F OR DROPS BELOW 45F FOR 15 MINUTES OR MORE.
- IF THE BUILDING LOOP TEMPERATURE IS BETWEEN 45F AND 60F THE PUMPS WILL BE OFF.

TO PREVENT SHORT CYCLING, THE GEOTHERMAL LOOP PUMP SYSTEM SHALL RUN FOR AND BE OFF FOR MINIMUM ADJUSTABLE TIMES (BOTH USER DEFINABLE).

GEOTHERMAL LOOP PUMP LEAD/LAG OPERATION:
THE TWO VARIABLE SPEED GEOTHERMAL LOOP PUMPS SHALL OPERATE IN A LEAD/LAG FASHION.
- THE LEAD PUMP SHALL RUN FIRST.
- ON FAILURE OF THE LEAD PUMP, THE LAG PUMP SHALL RUN AND THE LEAD PUMP SHALL TURN OFF.

THE DESIGNATED LEAD PUMP SHALL ROTATE UPON ONE OF THE FOLLOWING CONDITIONS (USER SELECTABLE):
- MANUALLY THROUGH A SOFTWARE SWITCH
- IF PUMP RUNTIME (ADJ.) IS EXCEEDED
- DAILY
- WEEKLY
- MONTHLY

GEOTHERMAL LOOP PROVIDED AS FOLLOWS:
- GEOTHERMAL LOOP PUMP 1
- FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
- RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
- RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.
- VFD FAULT.

- GEOTHERMAL LOOP PUMP 2
- FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
- RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
- RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.
- VFD FAULT.

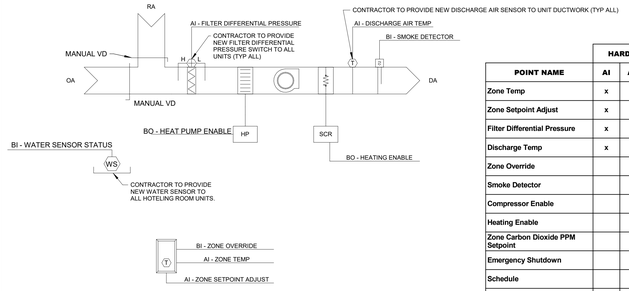
ALARMS SHALL BE PROVIDED AS FOLLOWS:
- HIGH GEOTHERMAL LOOP DIFFERENTIAL PRESSURE: IF THE GEOTHERMAL LOOP DIFFERENTIAL PRESSURE IS 25% (ADJ.) GREATER THAN SETPOINT.
- LOW GEOTHERMAL LOOP DIFFERENTIAL PRESSURE: IF THE GEOTHERMAL LOOP DIFFERENTIAL PRESSURE IS 25% (ADJ.) LESS THAN SETPOINT.

GEOTHERMAL LOOP TEMPERATURE MONITORING:
THE FOLLOWING TEMPERATURES SHALL BE MONITORED:
- GEOTHERMAL LOOP SUPPLY.
- GEOTHERMAL LOOP RETURN.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- HIGH GEOTHERMAL LOOP SUPPLY TEMP: IF THE GEOTHERMAL LOOP SUPPLY TEMPERATURE IS GREATER THAN 55°F (ADJ.).
- LOW GEOTHERMAL LOOP SUPPLY TEMP: IF THE GEOTHERMAL LOOP SUPPLY TEMPERATURE IS LESS THAN 38°F (ADJ.).

	HARDWARE POINTS				SOFTWARE POINTS						
POINT NAME	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show on Graphic
Loop Water Return Temp	x								x		x
Loop Water Supply Temp	x								x		x
Loop Water Differential Pressure	x								x		x
Loop Water Pump 3 VFD Speed		x							x		x
Loop Water Pump 4 VFD Speed		x							x		x
Loop Water Pump 3 VFD Fault			x							x	x
Loop Water Pump 4 VFD Fault			x							x	x
Loop Water Pump 3 Status			x						x		x
Loop Water Pump 4 Status			x						x		x
Loop Water Pump 3 Start/Stop				x							x
Loop Water Pump 4 Start/stop				x							x
Outside Air Temp					x						x
Loop Water Differential Pressure Setpoint					x						x
High Loop Water Supply Temp Shutdown										x	
Low Loop Water Supply Temp Shutdown										x	
High Loop Water Supply Temp										x	
Loww Loop Water Supply Temp										x	
High Loop Water Differential Pressure										x	
Low Loop Water Differential Pressure										x	
Loop Water Pump 3 Failure										x	
Loop Water Pump 3 Running in Hand										x	
Loop Water Pump 3 Runtime Exceeded										x	
Loop Water Pump 4 Failure										x	
Loop Water Pump 4 Running in Hand										x	
Loop Water Pump 4 Runtime Exceeded										x	

2 GEOTHERMAL LOOP PUMP CONTROLS
SCALE: No Scale



	HARDWARE POINTS				SOFTWARE POINTS						
POINT NAME	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show on Graphic
Zone Temp	x								x		x
Zone Setpoint Adjust	x								x		x
Filter Differential Pressure	x								x		x
Discharge Temp	x								x		x
Zone Override			x						x		x
Smoke Detector			x						x	x	x
Compressor Enable				x					x		x
Heating Enable				x					x		x
Zone Carbon Dioxide PPM Setpoint					x				x		x
Emergency Shutdown						x			x	x	x
Schedule								x			
Heating Setpoint									x		x
Cooling Setpoint									x		x
High Zone Temp										x	
Low Zone Temp										x	
Filter Change Required										x	
High Discharge Air Temp										x	
Low Discharge Air Temp										x	

SEQUENCE OF OPERATION - AIR SOURCE HEAT PUMP (TYPICAL OF 114)

RUN CONDITIONS - SCHEDULED:
THE UNIT SHALL RUN ACCORDING TO A USER DEFINABLE TIME SCHEDULE IN THE FOLLOWING MODES:
- OCCUPIED MODE: THE UNIT SHALL MAINTAIN
- A 74°F (ADJ.) COOLING SETPOINT
- A 70°F (ADJ.) HEATING SETPOINT

- UNOCCUPIED MODE (NIGHT SETBACK): THE UNIT SHALL MAINTAIN
- A 85°F (ADJ.) COOLING SETPOINT.
- A 55°F (ADJ.) HEATING SETPOINT.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- HIGH ZONE TEMP: IF THE ZONE TEMPERATURE IS GREATER THAN THE COOLING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).
- LOW ZONE TEMP: IF THE ZONE TEMPERATURE IS LESS THAN THE HEATING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).
- THE EXISTING AIR TO AIR HEAT PUMPS ARE CURRENTLY NOT ON THE EXISTING BAS.
- PROVIDE A NEW CONTROLLER FOR EACH OF THE 8 DUCTED AIR TO AIR HEAT PUMPS WITH OCCUPIED AND UNOCCUPIED MODES. THE SUPPLY FAN SHALL RUN CONTINUOUSLY IN OCCUPIED MODE. THE HEAT PUMP SHALL RUN ON ITS OWN CONTROLS TO MAINTAIN SPACE TEMPERATURE.
- FURNISH NEW LEAVING AIR TEMPERATURE SENSOR AND FILTER DIFFERENTIAL PRESSURE SENSOR.
- PROVIDE NEW WIRING AND CONTROLS FOR EXISTING UNITS. PROVIDE NEW GRAPHICS WITH THE NOTED CONTROL POINTS.

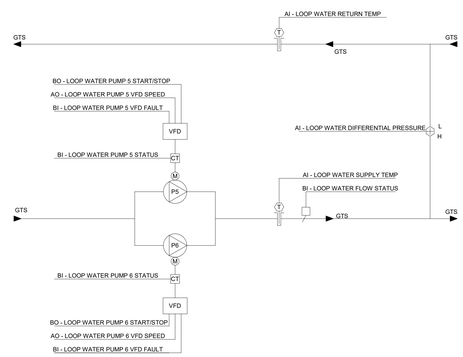
FILTER DIFFERENTIAL PRESSURE MONITOR:
THE CONTROLLER SHALL MONITOR THE DIFFERENTIAL PRESSURE ACROSS THE FILTER.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- FILTER CHANGE REQUIRED: FILTER DIFFERENTIAL PRESSURE EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

DISCHARGE AIR TEMPERATURE:
THE CONTROLLER SHALL MONITOR THE DISCHARGE AIR TEMPERATURE.

- WATER IS DETECTED AT WATER SENSOR SWITCH
- HIGH DISCHARGE AIR TEMP: IF THE DISCHARGE AIR TEMPERATURE IS GREATER THAN 120°F (ADJ.).
- LOW DISCHARGE AIR TEMP: IF THE DISCHARGE AIR TEMPERATURE IS LESS THAN 40°F (ADJ.).

1 AIR SOURCE HEAT PUMP CONTROLS
SCALE: No Scale



SEQUENCE OF OPERATION - LOOP MONITOR AND PUMPS (TYPICAL OF 2)

WATER SOURCE HEAT PUMP LOOP MONITOR - RUN CONDITIONS:
THE LOOP MONITOR SHALL RUN WHENEVER :
- ANY ZONE IS OCCUPIED.
- OR A DEFINABLE NUMBER OF UNOCCUPIED ZONES NEED HEATING OR COOLING.

THE FOLLOWING LOOP WATER CONDITIONS SHALL BE MONITORED:
- FLOW STATUS.
- SUPPLY TEMPERATURE.
- RETURN TEMPERATURE.

ALARMS AND A HEAT PUMP SHUTDOWN SIGNAL SHALL BE GENERATED UPON ANY OF THE FOLLOWING LOOP WATER CONDITIONS:
- NO LOOP FLOW.
- HIGH LOOP WATER SUPPLY TEMP SHUTDOWN: IF THE LOOP WATER SUPPLY TEMPERATURE IS GREATER THAN 92°F (ADJ.).
- LOW LOOP WATER SUPPLY TEMP SHUTDOWN: IF THE LOOP WATER SUPPLY TEMPERATURE IS LESS THAN 58°F (ADJ.).

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- HIGH LOOP WATER SUPPLY TEMP: IF THE LOOP WATER SUPPLY TEMPERATURE IS GREATER THAN 90°F (ADJ.).
- LOW LOOP WATER SUPPLY TEMP: IF THE LOOP WATER SUPPLY TEMPERATURE IS LESS THAN 60°F (ADJ.).

LOOP WATER PUMP LEAD/LAG OPERATION:
THE TWO LOOP WATER PUMPS SHALL OPERATE IN A LEAD/LAG FASHION.
- THE LEAD PUMP SHALL RUN FIRST.
- ON FAILURE OF THE LEAD PUMP, THE LAG PUMP SHALL RUN AND THE LEAD PUMP SHALL TURN OFF.
- THE VFD WILL CONTROL THE MINIMUM FLOW TO BE 40% OF THE MAXIMUM FLOW

THE DESIGNATED LEAD PUMP SHALL ROTATE UPON ONE OF THE FOLLOWING CONDITIONS (USER SELECTABLE):
- MANUALLY THROUGH A SOFTWARE SWITCH
- IF PUMP RUNTIME (ADJ.) IS EXCEEDED
- DAILY
- WEEKLY
- MONTHLY

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- LOOP WATER PUMP 1
- FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
- RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
- RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.
- VFD FAULT.

- LOOP WATER PUMP 2
- FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
- RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
- RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.
- VFD FAULT.

LOOP WATER DIFFERENTIAL PRESSURE CONTROL:
THE CONTROLLER SHALL MEASURE LOOP WATER DIFFERENTIAL PRESSURE AND MODULATE THE LOOP WATER PUMP VFDS IN SEQUENCE TO MAINTAIN ITS LOOP WATER DIFFERENTIAL PRESSURE SETPOINT. THE FOLLOWING SETPOINTS ARE RECOMMENDED VALUES. ALL SETPOINTS SHALL BE FIELD ADJUSTED DURING THE COMMISSIONING PERIOD TO MEET THE REQUIREMENTS OF ACTUAL FIELD CONDITIONS.

THE CONTROLLER SHALL MODULATE LOOP WATER PUMP SPEEDS TO MAINTAIN A LOOP WATER DIFFERENTIAL PRESSURE OF 12LBF/IN2 (ADJ.). THE VFD MINIMUM SPEED SHALL NOT DROP BELOW 40% FLOW (ADJ.).

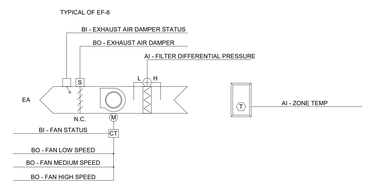
ON DROPPING LOOP WATER DIFFERENTIAL PRESSURE, THE VFDS SHALL STAGE ON AND RUN TO MAINTAIN SETPOINT AS FOLLOWS:
- THE CONTROLLER SHALL MODULATE THE LEAD VFD TO MAINTAIN SETPOINT.
- IF THE LEAD VFD SPEED IS GREATER THAN A SETPOINT OF 90% (ADJ.), THE LAG VFD SHALL STAGE ON.
- THE LAG VFD SHALL RAMP UP TO MATCH THE LEAD VFD SPEED AND THEN RUN IN UNISON WITH THE LEAD VFD TO MAINTAIN SETPOINT.

ON RISING LOOP WATER DIFFERENTIAL PRESSURE, THE VFDS SHALL STAGE OFF AS FOLLOWS:
- IF THE VFD SPEEDS THEN DROPS BACK TO 60% (ADJ.) BELOW SETPOINT, THE LAG VFD SHALL STAGE OFF.
- THE LEAD VFD SHALL CONTINUE TO RUN TO MAINTAIN SETPOINT.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- HIGH LOOP WATER DIFFERENTIAL PRESSURE: IF THE LOOP WATER DIFFERENTIAL PRESSURE IS 25% (ADJ.) GREATER THAN SETPOINT.
- LOW LOOP WATER DIFFERENTIAL PRESSURE: IF THE LOOP WATER DIFFERENTIAL PRESSURE IS 25% (ADJ.) LESS THAN SETPOINT.

	HARDWARE POINTS				SOFTWARE POINTS						
POINT NAME	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show on Graphic
Loop Water Return Temp	x								x		x
Loop Water Supply Temp	x								x		x
Loop Water Differential Pressure	x								x		x
Loop Water Pump 4 VFD Speed		x							x		x
Loop Water Pump 5 VFD Speed		x							x		x
Loop Water Flow Status			x								x
Loop Water Pump 4 VFD Fault			x							x	x
Loop Water Pump 5 VFD Fault			x							x	x
Loop Water Pump 4 Status			x						x		x
Loop Water Pump 5 Status			x						x		x
Loop Water Pump 4 Start/Stop				x							x
Loop Water Pump 5 Start/stop				x							x
Outside Air Temp					x						x
Loop Water Differential Pressure Setpoint					x						x
No Loop Flow										x	
High Loop Water Supply Temp Shutdown										x	
Low Loop Water Supply Temp Shutdown										x	
High Loop Water Supply Temp										x	
Loww Loop Water Supply Temp										x	
High Loop Water Differential Pressure										x	
Low Loop Water Differential Pressure										x	
Loop Water Pump 4 Failure										x	
Loop Water Pump 4 Running in Hand										x	
Loop Water Pump 4 Runtime Exceeded										x	
Loop Water Pump 5 Failure										x	
Loop Water Pump 5 Running in Hand										x	
Loop Water Pump 5 Runtime Exceeded										x	

4 BUILDING LOOP PUMP CONTROLS
SCALE: No Scale



SEQUENCE OF OPERATION - EXHAUST FAN - COOLING (TYPICAL OF 2)

RUN CONDITIONS - SCHEDULED:
THE UNIT SHALL BE ENABLED ACCORDING TO A USER DEFINABLE TIME SCHEDULE IN THE FOLLOWING MODES:
- OCCUPIED MODE: THE UNIT SHALL MAINTAIN A ZONE TEMPERATURE COOLING SETPOINT OF 78°F (ADJ.).
- UNOCCUPIED MODE (NIGHT SETBACK): THE UNIT SHALL MAINTAIN A ZONE TEMPERATURE COOLING SETPOINT OF 85°F (ADJ.).

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- HIGH ZONE TEMP: IF THE ZONE TEMPERATURE IS GREATER THAN THE COOLING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).

FAN:
THE FAN SHALL RUN ANYTIME THE ZONE TEMPERATURE RISES BELOW COOLING SETPOINT. UNLESS SHUTDOWN ON SAFETIES. THE FAN SPEEDS SHALL BE INDEXED AS FOLLOWS:
- LOW SPEED SHALL RUN ANYTIME THE ZONE TEMPERATURE RISES ABOVE SETPOINT.
- MEDIUM SPEED SHALL RUN ANYTIME THE ZONE TEMPERATURE RISES FURTHER ABOVE SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).
- HIGH SPEED SHALL RUN ANYTIME THE ZONE TEMPERATURE RISES EVEN FURTHER ABOVE SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).

EXHAUST AIR DAMPER:
THE EXHAUST AIR DAMPER SHALL OPEN ANYTIME THE UNIT RUNS AND SHALL CLOSE ANYTIME THE UNIT STOPS. THE EXHAUST AIR DAMPER SHALL CLOSE 30 SEC (ADJ.) AFTER THE FAN STOPS.

FILTER DIFFERENTIAL PRESSURE MONITOR:
THE CONTROLLER SHALL MONITOR THE DIFFERENTIAL PRESSURE ACROSS THE FILTER.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- FILTER CHANGE REQUIRED: FILTER DIFFERENTIAL PRESSURE EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

DAMPER STATUS:
THE FAN SHALL BE ENABLED AFTER THE DAMPER STATUS HAS PROVEN.

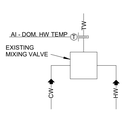
ALARMS SHALL BE PROVIDED AS FOLLOWS:
- DAMPER FAILURE: COMMANDED OPEN, BUT THE STATUS IS CLOSED.
- DAMPER IN HAND: COMMANDED CLOSED, BUT THE STATUS IS OPEN.

FAN STATUS:
THE CONTROLLER SHALL MONITOR THE FAN STATUS.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
- FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
- FAN RUNTIME EXCEEDED: FAN STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

	HARDWARE POINTS				SOFTWARE POINTS						
POINT NAME	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show on Graphic
Zone Temp	x								x		x
Filter Differential Pressure	x								x		x
Exhaust Air Damper Status			x						x		x
Fan Status			x						x		x
Fan Medium Speed				x					x		x
Fan High Speed				x					x		x
Fan Low Speed				x					x		x
Exhaust Air Damper				x					x		x
Cooling Setpoint					x				x		x
Schedule								x			
High Zone Temp										x	
Filter Change Required										x	
Exhaust Air Damper Failure										x	
Exhaust Air Damper in Hand										x	
Fan Failure										x	
Fan in Hand										x	
Fan Runtime Exceeded										x	

3 EXHAUST FAN - COOLING CONTROLS
SCALE: No Scale



SEQUENCE OF OPERATION - TYPICAL 1

PROVIDE NEW TEMPERATURE SENSOR ON THE TEMPERED WATER DOWNSTREAM OF THE MIXING VALVE. MONITOR TEMPERATURE.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- HIGH WATER TEMPERATURE: IF WATER TEMPERATURE IS ABOVE 125 DEG.
- LOW WATER TEMPERATURE: IF WATER TEMPERATURE IS BELOW 100 DEG.

	HARDWARE POINTS				SOFTWARE POINTS						
POINT NAME	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show on Graphic
Domestic HW Temp	x								x		x
Domestic HW High Temp										x	
Domestic HW Low Temp										x	

5 DOMESTIC WATER TEMPERATURE CONTROLS
SCALE: No Scale

Farnsworth GROUP
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Engineers | Architects | Surveyors | Scientists

ISSUE:

#	DATE:	DESCRIPTION:
1	09/20/24	Permit Set

PERMIT SET

PROJECT:

9418.00 - HONEY CREEK RESORT BUILDING AUTOMATION SYSTEM IMPROVEMENTS

12633 Resort Dr, Moravia, IA 52571

DATE:	09/20/2024
DESIGNED:	WCR
DRAWN:	LDE
REVIEWED:	WCR

SHEET TITLE:

CONTROLS DIAGRAMS

SHEET NUMBER:

M5.1

PROJECT NO.: 0241027.00

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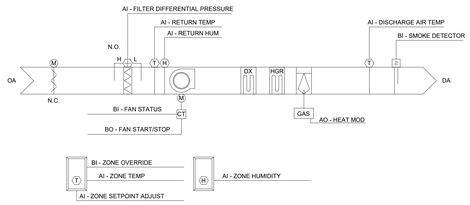


POINT NAME	HARDWARE POINTS AI	AO	BI	BO	SOFTWARE POINTS AV	BV	Loop	Sched	Trend	Alarm	Show on Graphic
Zone Temp	x								x		x
Zone Setpoint Adjust	x										x
Filter Differential Pressure	x								x		x
Discharge Air Temp	x								x		x
Zone Humidity	x								x		x
Return Temp	x								x		x
Return Humidity	x								x		x
Heating Output		x							x		x
Zone Override			x						x		x
Smoke Detector			x						x	x	x
Fan Status			x								x
Fan Start/Stop				x					x		x
Emergency Shutdown						x			x		x
Schedule								x			
Heating Setpoint									x		x
Cooling Setpoint									x		x
High Zone Temp										x	
Low Zone Temp										x	
Filter Change Required										x	
High Discharge Air Temp										x	
Low Discharge Air Temp										x	
Fan Failure										x	
High Zone Humidity										x	

SEQUENCE OF OPERATION - RTU-1 (TYPICAL OF 1)

RUN CONDITIONS - SCHEDULED:
THE UNIT SHALL RUN ACCORDING TO A USER DEFINABLE TIME SCHEDULE IN THE FOLLOWING MODES:
- OCCUPIED MODE: THE UNIT SHALL MAINTAIN
- A 74°F (ADJ.) COOLING SETPOINT
- A 70°F (ADJ.) HEATING SETPOINT.

- UNOCCUPIED MODE (NIGHT SETBACK): THE UNIT SHALL MAINTAIN
- A 85°F (ADJ.) COOLING SETPOINT.
- A 55°F (ADJ.) HEATING SETPOINT.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- HIGH ZONE TEMP: IF THE ZONE TEMPERATURE IS GREATER THAN THE COOLING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).
- LOW ZONE TEMP: IF THE ZONE TEMPERATURE IS LESS THAN THE HEATING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).

DEMAND LIMITING - ZONE SETPOINT OPTIMIZATION:
TO LOWER POWER CONSUMPTION, THE ZONE SETPOINTS SHALL AUTOMATICALLY RELAX WHEN THE FACILITY POWER CONSUMPTION EXCEEDS DEFINABLE THRESHOLDS. THE AMOUNT OF RELAXATION SHALL BE INDIVIDUALLY CONFIGURABLE FOR EACH ZONE. THE ZONE SETPOINTS SHALL AUTOMATICALLY RETURN TO THEIR PREVIOUS SETTINGS WHEN THE FACILITY POWER CONSUMPTION DROPS BELOW THE THRESHOLDS.

ZONE SETPOINT ADJUST:
THE OCCUPANT SHALL BE ABLE TO ADJUST THE ZONE TEMPERATURE HEATING AND COOLING SETPOINTS AT THE ZONE SENSOR.

ZONE OPTIMAL START:
THE UNIT SHALL USE AN OPTIMAL START ALGORITHM FOR MORNING START-UP. THIS ALGORITHM SHALL MINIMIZE THE UNOCCUPIED WARM-UP OR COOL-DOWN PERIOD WHILE STILL ACHIEVING COMFORT CONDITIONS BY THE START OF SCHEDULED OCCUPIED PERIOD.

ZONE UNOCCUPIED OVERRIDE:
A TIMED LOCAL OVERRIDE CONTROL SHALL ALLOW AN OCCUPANT TO OVERRIDE THE SCHEDULE AND PLACE THE UNIT INTO AN OCCUPIED MODE FOR AN ADJUSTABLE PERIOD OF TIME. AT THE EXPIRATION OF THIS TIME, CONTROL OF THE UNIT SHALL AUTOMATICALLY RETURN TO THE SCHEDULE.

EMERGENCY SHUTDOWN:
THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING AN EMERGENCY SHUTDOWN SIGNAL.

SMOKE DETECTION:
THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING A SMOKE DETECTOR STATUS.

FAN:
THE FAN SHALL RUN ANYTIME THE UNIT IS COMMANDED TO RUN, UNLESS SHUTDOWN ON SAFETIES.

THE COOLING SHALL BE ENABLED WHENEVER:
- OUTSIDE AIR TEMPERATURE IS GREATER THAN 60°F (ADJ.).
- AND THE ZONE TEMPERATURE IS ABOVE COOLING SETPOINT.
- AND THE FAN IS ON.

COOLING AND DEHUMIDIFICATION
- THE UNIT WILL RUN ON ITS OWN CONTROLS TO MAINTAIN TEMPERATURE AND HUMIDITY THROUGH THE DX COIL AND HGR COIL.

THE COOLING COIL VALVE SHALL OPEN WHENEVER THE FREEZESTAT (IF PRESENT) IS ON.

HEATING COIL VALVE:
THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND MODULATE THE HEATING COIL VALVE TO MAINTAIN ITS HEATING SETPOINT.

THE HEATING SHALL BE ENABLED WHENEVER:
- OUTSIDE AIR TEMPERATURE IS LESS THAN 65°F (ADJ.).
- AND THE ZONE TEMPERATURE IS BELOW HEATING SETPOINT.
- AND THE FAN IS ON.

THE HEATING COIL VALVE SHALL OPEN WHENEVER THE FREEZESTAT (IF PRESENT) IS ON.

HEATING - HIGH DISCHARGE AIR TEMPERATURE LIMIT:
THE CONTROLLER SHALL MEASURE THE DISCHARGE AIR TEMPERATURE AND, ON RISING TEMPERATURE, LIMIT THE HEATING AS FOLLOWS:
- AS THE DISCHARGE AIR TEMPERATURE RISES FROM 90°F TO 120°F (ADJ.),
- THE CONTROLLER SHALL LIMIT THE HEATING OUTPUT FROM 100% TO 0% (ADJ.).

THE OUTSIDE AIR DAMPERS SHALL CLOSE WHEN THE UNIT IS OFF.

FILTER DIFFERENTIAL PRESSURE MONITOR:
THE CONTROLLER SHALL MONITOR THE DIFFERENTIAL PRESSURE ACROSS THE FILTER.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- FILTER CHANGE REQUIRED: FILTER DIFFERENTIAL PRESSURE EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

DISCHARGE AIR TEMPERATURE:
THE CONTROLLER SHALL MONITOR THE DISCHARGE AIR TEMPERATURE.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- HIGH DISCHARGE AIR TEMP: IF THE DISCHARGE AIR TEMPERATURE IS GREATER THAN 120°F (ADJ.).
- LOW DISCHARGE AIR TEMP: IF THE DISCHARGE AIR TEMPERATURE IS LESS THAN 40°F (ADJ.).

FAN STATUS:
THE CONTROLLER SHALL MONITOR THE FAN STATUS.

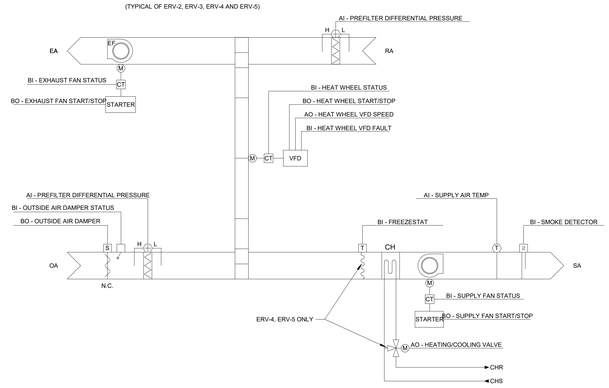
ALARMS SHALL BE PROVIDED AS FOLLOWS:
- FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
- FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
- FAN RUNTIME EXCEEDED: FAN STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

ZONE HUMIDITY:
THE CONTROLLER SHALL MONITOR THE ZONE HUMIDITY.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- HIGH ZONE HUMIDITY: IF THE ZONE HUMIDITY IS GREATER THAN 70% (ADJ.).
- LOW ZONE HUMIDITY: IF THE ZONE HUMIDITY IS LESS THAN 35% (ADJ.).

4 MC_RTU CONTROLS
SCALE: No Scale

(TYPICAL OF ERV-2, ERV-3, ERV-4 AND ERV-5)



POINT NAME	HARDWARE POINTS AI	AO	BI	BO	SOFTWARE POINTS AV	BV	Loop	Sched	Trend	Alarm	Show on Graphic
Outside Air Temp	x								x		x
Exhaust Air Temp	x								x		x
Heat Wheel Discharge Air Temp	x								x		x
Return Air Temp	x								x		x
Prefilter Differential Pressure	x								x		
Final Filter Differential Pressure	x								x		
Supply Air Temp	x								x		x
Heat Wheel VFD Speed		x							x		x
Freezestat			x						x	x	x
Smoke Detector			x						x	x	x
Outside Air Damper Status			x						x		x
Heat Wheel Status			x						x		x
Heat Wheel VFD Fault			x						x	x	x
Supply Fan Status			x						x		x
Exhaust Fan Status			x						x		x
Outside Air Damper				x					x		x
Heat Wheel Start/Stop				x					x		x
Supply Fan Start/Stop				x					x		x
Exhaust Fan Start/Stop				x					x		x
Coil Valve Position	x								x		x
Supply Air Temp Setpoint					x				x		x
Outside Air Temp					x						x
Emergency Shutdown						x			x	x	x
Schedule								x			
Outside Air Damper Failure										x	
Outside Air Damper in Hand										x	
Heat Wheel Rotation Failure										x	
Heat Wheel in Hand										x	
Heat Wheel Runtime Exceeded										x	
Supply Fan Failure										x	
Supply Fan in Hand										x	
Supply Fan Runtime Exceeded										x	
Exhaust Fan Failure										x	
Exhaust Fan in Hand										x	
Exhaust Fan Runtime Exceeded										x	
Compressor Runtime Exceeded										x	
Prefilter Change Required										x	x
High Supply Air Temp										x	
Low Supply Air Temp										x	

SEQUENCE OF OPERATION - MAKEUP AIR UNIT - SUPPLY AIR TEMP - HYDRONIC HEATING/COOLING (TYPICAL OF 4)

RUN CONDITIONS - SCHEDULED:
THE UNIT SHALL RUN BASED UPON AN OPERATOR ADJUSTABLE SCHEDULE.

EMERGENCY SHUTDOWN:
THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING AN EMERGENCY SHUTDOWN SIGNAL.

FREEZE PROTECTION:
THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING A FREEZESTAT STATUS.

SMOKE DETECTION:
THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING A SMOKE DETECTOR STATUS.

DEMAND LIMITING - SETPOINT ADJUST:
TO LOWER POWER CONSUMPTION, THE SUPPLY AIR TEMPERATURE SETPOINT SHALL AUTOMATICALLY RELAX (RAISED FOR COOLING; LOWERED FOR HEATING) WHEN THE FACILITY POWER CONSUMPTION EXCEEDS DEFINABLE THRESHOLDS. THE AMOUNT OF RELAXATION SHALL BE ACCOMPLISHED BY ONE OF THE FOLLOWING METHODS:
- THE SUPPLY AIR TEMPERATURE SETPOINT SHALL RELAX BY 2°F (ADJ.) FOR EACH DEMAND THRESHOLD EXCEEDED.
- THE SETPOINTS IN THE ZONES SUPPLIED BY THIS UNIT SHALL BE RELAXED AS SPECIFIED IN THE SEQUENCE OF OPERATIONS FOR THE ZONES. THIS SHALL IN TURN RELAX THE UNIT'S SUPPLY AIR TEMPERATURE SETPOINT BY A USER DEFINABLE AMOUNT.

ALL SETPOINTS SHALL AUTOMATICALLY RETURN TO THEIR PREVIOUS SETTINGS WHEN THE FACILITY POWER CONSUMPTION DROPS BELOW THE THRESHOLDS.

OUTSIDE AIR DAMPER:
THE OUTSIDE AIR DAMPER SHALL OPEN ANYTIME THE UNIT RUNS AND SHALL CLOSE ANYTIME THE UNIT STOPS. THE SUPPLY FAN SHALL START ONLY AFTER THE DAMPER STATUS HAS PROVEN THE DAMPER IS OPEN. THE OUTSIDE AIR DAMPER SHALL CLOSE 4SEC (ADJ.) AFTER THE SUPPLY FAN STOPS.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- OUTSIDE AIR DAMPER FAILURE: COMMANDED OPEN, BUT THE STATUS IS CLOSED.
- OUTSIDE AIR DAMPER IN HAND: COMMANDED CLOSED, BUT THE STATUS IS OPEN.

HEAT RECOVERY WHEEL - VARIABLE SPEED:
THE CONTROLLER SHALL MODULATE THE HEAT WHEEL FOR ENERGY RECOVERY AS FOLLOWS.

COOLING RECOVERY MODE:
THE CONTROLLER SHALL MEASURE THE HEAT WHEEL DISCHARGE AIR TEMPERATURE AND MODULATE THE HEAT WHEEL SPEED TO MAINTAIN A SETPOINT 2°F (ADJ.) LESS THAN THE UNIT SUPPLY AIR TEMPERATURE SETPOINT. THE HEAT WHEEL SHALL RUN FOR COOL RECOVERY WHENEVER:
- UNIT RETURN AIR TEMPERATURE IS 5°F (ADJ.) OR MORE BELOW THE OUTSIDE AIR TEMPERATURE.
- AND THE UNIT IS IN A COOLING MODE.
- AND THE SUPPLY FAN IS ON.

HEATING RECOVERY MODE:
THE CONTROLLER SHALL MEASURE THE HEAT WHEEL DISCHARGE AIR TEMPERATURE AND MODULATE THE HEAT WHEEL SPEED TO MAINTAIN A SETPOINT 2°F (ADJ.) GREATER THAN THE UNIT SUPPLY AIR TEMPERATURE SETPOINT. THE HEAT WHEEL SHALL RUN FOR HEAT RECOVERY WHENEVER:
- UNIT RETURN AIR TEMPERATURE IS 5°F (ADJ.) OR MORE ABOVE THE OUTSIDE AIR TEMPERATURE.
- AND THE UNIT IS IN A HEATING MODE.
- AND THE SUPPLY FAN IS ON.

THE HEAT WHEEL SHALL RUN IN FROST PROTECTION:
- OUTSIDE AIR TEMPERATURE DROPS BELOW 15°F (ADJ.)
- OR WHENEVER EXHAUST AIR TEMPERATURE DROPS BELOW 20°F (ADJ.).

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- HEAT WHEEL ROTATION FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
- HEAT WHEEL IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
- HEAT WHEEL RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).
- HEAT WHEEL VFD IN FAULT

SUPPLY FAN:
THE SUPPLY FAN SHALL RUN ANYTIME THE UNIT IS COMMANDED TO RUN. TO PREVENT SHORT CYCLING, THE SUPPLY FAN SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME, UNLESS SHUTDOWN ON SAFETIES.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- SUPPLY FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
- SUPPLY FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
- SUPPLY FAN RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

EXHAUST FAN:
THE EXHAUST FAN SHALL RUN WHENEVER THE SUPPLY FAN RUNS, UNLESS SHUTDOWN ON SAFETIES.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- EXHAUST FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
- EXHAUST FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
- EXHAUST FAN RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

(PROVIDE FOR ERV-4 AMD ERV-5 ONLY)
SUPPLY AIR TEMPERATURE SETPOINT - OUTSIDE AIR RESET:
THE CONTROLLER SHALL MONITOR THE SUPPLY AIR TEMPERATURE AND SHALL MAINTAIN SUPPLY AIR TEMPERATURE SETPOINT. THE SUPPLY AIR TEMPERATURE SETPOINT SHALL RESET FOR COOLING AS FOLLOWS:

AS OUTSIDE AIR TEMPERATURE DROPS FROM 85°F (ADJ.) TO 20°F (ADJ.)
THE SUPPLY AIR TEMPERATURE SETPOINT SHALL RESET UPWARDS FROM 55°F (ADJ.) TO 65°F (ADJ.).

COOLING STAGES:
THE CONTROLLER SHALL MEASURE THE SUPPLY AIR TEMPERATURE AND MODULATE THE COIL CONTROL VALVE COOLING TO MAINTAIN ITS COOLING SETPOINT. TO PREVENT SHORT CYCLING, THERE SHALL BE A USER DEFINABLE (ADJ.) DELAY BETWEEN STAGES, AND EACH STAGE SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME.

THE COIL SHALL BE ENABLED WHENEVER:
- AND THE SUPPLY AIR TEMPERATURE IS ABOVE COOLING SETPOINT OR BELOW ITS HEATING SETPOINT.
- AND THE FAN STATUS IS ON.

PREFILTER DIFFERENTIAL PRESSURE MONITOR:
THE CONTROLLER SHALL MONITOR THE DIFFERENTIAL PRESSURE ACROSS THE PREFILTER. PROVIDE TWO NEW SENSORS.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- PREFILTER CHANGE REQUIRED: PREFILTER DIFFERENTIAL PRESSURE EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- FINAL FILTER CHANGE REQUIRED: FINAL FILTER DIFFERENTIAL PRESSURE EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

2 MAKEUP AIR UNIT - SUPPLY AIR TEMP - DX CONTROLS
SCALE: No Scale

MISCELLANEOUS CONTROL SEQUENCES AND POINTS

THE FOLLOWING ARE CONTROL SEQUENCES TO COMMISSION IN THE FIELD, WITHOUT BAS MONITORING. REPORT TO THE ENGINEER IF ANY SEQUENCE CANNOT BE PERFORMED DUE TO INOPERABLE EQUIPMENT OR SENSORS:

DOMESTIC WATER CIRCULATING PUMPS (TYPICAL OF 1):

AN EXISTING STRAP ON THERMOSTAT ENERGIZES THE PUMP WHEN THE RETURN WATER TEMPERATURE IS BELOW SETPOINT.

LAUNDRY DRYER (TYPICAL OF 4):

WHEN THE DRYER OPERATES, ITS RESPECTIVE OUTSIDE AIR DAMPER OPENS.

ELEVATOR HOISTWAY DAMPER (TYPICAL OF 1):

WHEN THE FIRE ALARM SMOKE DETECTOR IN THE ELEVATOR HOISTWAY OR THE ELEVATOR LOBBY IS ACTIVED, THE ELEVATOR HOISTWAY DAMPER WILL OPEN

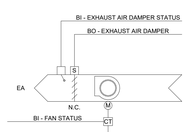
THE FOLLOWING ARE CONTROL SEQUENCES TO COMMISSION IN THE FIELD AND NEED BAS MONITORING:

SUMP PUMPS (TYPICAL OF 2)

MONITOR THE EXISTING HIGH LEVEL ALARM CONTACT PROVIDED. PROVIDE ALARM WHEN THE HIGH LEVEL ALARM STATE IS INDICATED.

POINT NAME	HARDWARE POINTS AI	AO	BI	BO	SOFTWARE POINTS AV	BV	Loop	Sched	Trend	Alarm	Show on Graphic
Sump Pump Alarm										x	

3 MISCELLANEOUS
SCALE: No Scale



TYPICAL OF EF-6

POINT NAME	HARDWARE POINTS AI	AO	BI	BO	SOFTWARE POINTS AV	BV	Loop	Sched	Trend	Alarm	Show on Graphic
Filter Differential Pressure	x								x		x
Exhaust Air Damper Status			x						x		x
Fan Status			x						x		x
Fan Start/Stop				x					x		x
Exhaust Air Damper				x					x		x
Schedule								x			
Filter Change Required										x	
Exhaust Air Damper Failure										x	
Exhaust Air Damper in Hand										x	
Fan Failure										x	
Fan in Hand										x	
Fan Runtime Exceeded										x	

SEQUENCE OF OPERATION - EXHAUST FAN - ON/OFF (TYPICAL OF 1)

RUN CONDITIONS - SCHEDULED:
THE FAN SHALL RUN ACCORDING TO A USER DEFINABLE SCHEDULE.

FAN:
THE FAN SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME.

EXHAUST AIR DAMPER:
THE EXHAUST AIR DAMPER SHALL OPEN ANYTIME THE UNIT RUNS AND SHALL CLOSE ANYTIME THE UNIT STOPS. THE EXHAUST AIR DAMPER SHALL CLOSE 30 SEC (ADJ.) AFTER THE FAN STOPS.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- DAMPER FAILURE: COMMANDED OPEN, BUT THE STATUS IS CLOSED.
- DAMPER IN HAND: COMMANDED CLOSED, BUT THE STATUS IS OPEN.

DAMPER STATUS:
THE FAN SHALL BE ENABLED AFTER THE DAMPER STATUS HAS PROVEN.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- DAMPER FAILURE: COMMANDED OPEN, BUT THE STATUS IS CLOSED.
- DAMPER IN HAND: COMMANDED CLOSED, BUT THE STATUS IS OPEN.

FAN STATUS:
THE CONTROLLER SHALL MONITOR THE FAN STATUS.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
- FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
- FAN RUNTIME EXCEEDED: FAN STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

1 EXHAUST FAN - ON/OFF CONTROLS
SCALE: No Scale

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ISSUE:

#	DATE:	DESCRIPTION:
1	09/20/24	Permit Set

PERMIT SET

PROJECT:

9418.00 - HONEY CREEK RESORT BUILDING AUTOMATION SYSTEM IMPROVEMENTS

12633 Resort Dr, Moravia, IA 52571

DATE:	09/20/2024
DESIGNED:	WCR
DRAWN:	LDE
REVIEWED:	WCR

SHEET TITLE:

CONTROLS DIAGRAMS

SHEET NUMBER:

M5.2

PROJECT NO.: 0241027.00

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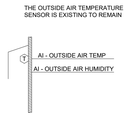


SEQUENCE OF OPERATION - OUTSIDE AIR CONDITIONS (TYPICAL OF 1)

OUTSIDE AIR CONDITIONS:
THE CONTROLLER SHALL MONITOR THE OUTSIDE AIR TEMPERATURE AND HUMIDITY AND CALCULATE THE OUTSIDE AIR ENTHALPY ON A CONTINUAL BASIS. THESE VALUES SHALL BE MADE AVAILABLE TO THE SYSTEM AT ALL TIMES.

ALARM SHALL BE GENERATED AS FOLLOWS:
- SENSOR FAILURE: SENSOR READING INDICATES SHORTED OR DISCONNECTED SENSOR. IN THE EVENT OF A SENSOR FAILURE, AN ALTERNATE OUTSIDE AIR CONDITIONS SENSOR SHALL BE MADE AVAILABLE TO THE SYSTEM WITHOUT INTERRUPTION IN SENSOR READINGS.

IF AN OA TEMP SENSOR CANNOT BE READ, A DEFAULT VALUE OF 65°F WILL BE USED.

IF AN OA HUMIDITY SENSOR CANNOT BE READ, A DEFAULT VALUE OF 50 % WILL BE USED.

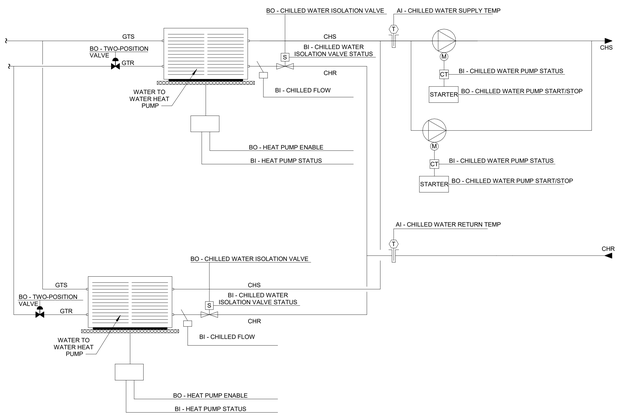
OUTSIDE AIR TEMPERATURE HISTORY:
THE CONTROLLER SHALL MONITOR AND RECORD THE HIGH AND LOW TEMPERATURE READINGS FOR THE OUTSIDE AIR. THESE READINGS SHALL BE RECORDED ON A DAILY, MONTH-TO-DATE, AND YEAR-TO-DATE BASIS.

COOLING DEGREE DAY:
THE CONTROLLER SHALL PROVIDE A DEGREE DAY HISTORY INDEX THAT REFLECTS THE ENERGY CONSUMPTION FOR THE FACILITIES COOLING DEMAND. COMPUTATIONS SHALL USE A MEAN DAILY TEMPERATURE OF 65° F (ADJ.). THE DEGREE DAY PEAK VALUE READINGS SHALL BE RECORDED ON A DAILY, MONTH-TO-DATE, AND YEAR-TO-DATE BASIS.

HEATING DEGREE DAY:
THE CONTROLLER SHALL PROVIDE A DEGREE DAY HISTORY INDEX THAT REFLECTS THE ENERGY CONSUMPTION FOR THE FACILITIES HEATING DEMAND. COMPUTATIONS SHALL USE A MEAN DAILY TEMPERATURE OF 65° F (ADJ.). THE DEGREE DAY PEAK VALUE READINGS SHALL BE RECORDED ON A DAILY, MONTH-TO-DATE, AND YEAR-TO-DATE BASIS.

	HARDWARE POINTS				SOFTWARE POINTS						
POINT NAME	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show on Graphic
Outside Air Temp	x								x		x
Outside Air Humidity	x								x		x
Outside Air Enthalpy					x				x		x
High Temp Today									x		x
High Temp Month-to-Date									x		x
High Temp Year-to-Date									x		x
Low Temp Today									x		x
Low Temp Month-to-Date									x		x
Low Temp Year-to-Date									x		x
Sensor Failure										x	

4 OUTSIDE AIR CONDITIONS CONTROLS
SCALE: No Scale



SEQUENCE OF OPERATION - WATER TO WATER HEAT PUMP (TYPICAL OF 4)

HEAT PUMP RUN CONDITIONS:
WATER TO WATER HEAT PUMPS WILL BE INDEXED TO RUN WHEN EITHER OF THE ASSOCIATED ERVS ARE INDEXED TO RUN.

TO PREVENT SHORT CYCLING, THE HEAT PUMP SHALL RUN FOR AND BE OFF FOR MINIMUM ADJUSTABLE TIMES (BOTH USER DEFINABLE), UNLESS SHUTDOWN ON SAFETIES OR OUTSIDE AIR CONDITIONS.

THE HEAT PUMP SHALL RUN SUBJECT TO ITS OWN INTERNAL SAFETIES AND CONTROLS.

CHILLED WATER ISOLATION VALVE:
THE VALVE SHALL OPEN ANYTIME THE HEAT PUMP IS CALLED TO RUN.

THE VALVE SHALL OPEN PRIOR TO THE HEAT PUMP BEING ENABLED AND SHALL CLOSE ONLY AFTER THE HEAT PUMP IS DISABLED. THE VALVE SHALL THEREFORE HAVE:
- A USER ADJUSTABLE DELAY ON START.
- AND A USER ADJUSTABLE DELAY ON STOP.

THE DELAY TIMES SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY CHILLED WATER SYSTEM START-UP, SHUTDOWN AND SEQUENCING.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- FAILURE: VALVE COMMANDED OPEN BUT THE STATUS INDICATES CLOSED.
- OPEN IN HAND: VALVE COMMANDED CLOSED BUT THE STATUS INDICATES OPEN.
- RUNTIME EXCEEDED: VALVE STATUS RUNTIME EXCEEDS A USER-DEFINABLE LIMIT.

CHILLED WATER PUMP:
THE LEAD CHILLED WATER PUMP SHALL RUN ANYTIME THE HEAT PUMP IS CALLED TO RUN.
- THE LEAD PUMP WILL RUN CONTINUOUSLY. IF THE LEAD PUMP FAILS, THE LAG PUMP WILL START AFTER A 30 SECOND DELAY. THE LEAD PUMP WILL BE ROTATED WEEKLY.

THE CHILLED WATER PUMP SHALL START PRIOR TO THE HEAT PUMP BEING ENABLED AND SHALL STOP ONLY AFTER THE HEAT PUMP IS DISABLED. THE CHILLED WATER PUMP SHALL THEREFORE HAVE:
- A USER ADJUSTABLE DELAY ON START.
- AND A USER ADJUSTABLE DELAY ON STOP.

THE DELAY TIMES SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY CHILLED WATER SYSTEM START-UP, SHUTDOWN AND SEQUENCING.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- CHILLED WATER PUMP FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
- CHILLED WATER PUMP RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
- CHILLED WATER PUMP RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.

HEAT PUMP:
THE HEAT PUMP SHALL BE ENABLED A USER ADJUSTABLE TIME AFTER PUMP STATUSES ARE PROVEN ON. THE HEAT PUMP SHALL THEREFORE HAVE A USER ADJUSTABLE DELAY ON START.

THE DELAY TIME SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY CHILLED WATER SYSTEM START-UP, SHUTDOWN AND SEQUENCING.

THE HEAT PUMP SHALL RUN SUBJECT TO ITS OWN INTERNAL SAFETIES AND CONTROLS.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- HEAT PUMP FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
- HEAT PUMP RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
- HEAT PUMP RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.

CHILLED WATER SUPPLY TEMPERATURE - SETPOINT RESET:
WHEN THE OUTSIDE AIR TEMPERATURE IS BELOW 45F THE HEAT PUMPS WILL BE INDEXED TO HEATING. WHEN THE OUTSIDE AIR TEMPERATURE IS ABOVE 60F THE HEAT PUMPS WILL BE INDEXED TO COOLING. LWT FOR COOLING SHALL BE 45F (ADJ). LWT FOR HEATING SHALL BE 120F (ADJ). START THE SECOND HEAT PUMP AND

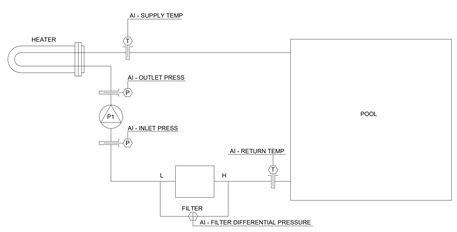
CHILLED WATER TEMPERATURE MONITORING:
THE FOLLOWING TEMPERATURES SHALL BE MONITORED:
- CHILLED WATER SUPPLY.
- CHILLED WATER RETURN.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- HIGH CHILLED WATER SUPPLY TEMP: IF THE CHILLED WATER SUPPLY TEMPERATURE IS GREATER THAN 55°F (ADJ.) HIGHER THAN SETPOINT.

- LOW CHILLED WATER SUPPLY TEMP: IF THE CHILLED WATER SUPPLY TEMPERATURE IS LESS THAN 38°F (ADJ.) LOWER THAN SETPOINT.

	HARDWARE POINTS				SOFTWARE POINTS						
POINT NAME	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show on Graphic
Chilled Water Return Temp	x								x		x
Chilled Water Supply Temp	x								x		x
Chilled Water Flow			x						x		x
Glyco 2-Pos Valve				x					x	x	x
Regrigerant Leak Shutdown			x						x	x	x
Chilled Water Isolation Valve Status			x						x		x
Chilled Water Pump Status			x						x		x
Heat Pump Status			x						x		x
Chilled Water Isolation Valve				x							x
Chilled Water Pump Start/Stop				x							x
Heat Pump Enable				x							x
Outside Air Temp					x						x
Chilled Water Isolation Valve Failure										x	
Chilled Water Pump Failure										x	
Chiller Failure										x	
Heat Pump Running in Hand										x	
High Chilled Water Supply Temp										x	
Low Chilled Water Supply Temp										x	

5 WATER TO WATER HEAT PUMP CONTROLS
SCALE: No Scale



SEQUENCE OF OPERATION – POOL CONTROLS (TYPICAL OF 3 – SPA, WADING, PLUNGE)

CONNECT TO THE EXISTING PRESSURE SENSORS IN THE INLET AND OUTLET OF EACH PUMP. MONITOR EACH PRESSURE.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- IF THE PRESSURE IS OUTSIDE THE LIMITS GIVEN FOR THE PUMPS.

CONNECT TO THE EXISTING TEMPERATURE SENSORS ON THE INLET AND OUTLET OF EACH POOL. MONITOR EACH PRESSURE.

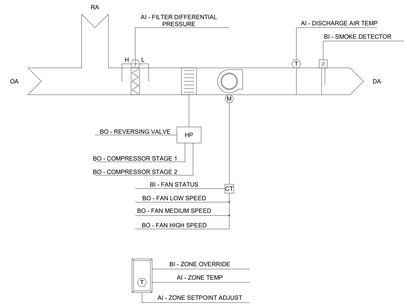
ALARMS SHALL BE PROVIDED AS FOLLOWS:
- IF THE TEMPERATURE IS OUTSIDE THE LIMITS GIVEN FOR THE POOL TEMPERATURES.

CONNECT TO THE EXISTING DIFFERENTIAL PRESSURE ACROSS EACH POOL FILTER. MONITOR THE DIFFERENTIAL PRESSURE.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- IF THE DIFFERENTIAL PRESSURE RISES ABOVE THE DIRTY FILTER PRESSURE.

	HARDWARE POINTS				SOFTWARE POINTS						
POINT NAME	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show on Graphic
Supply Temp	x								x		x
Return Temp	x								x		x
Outlet Pressurre	x								x		x
Inlet Pressure	x								x		x
Filter DP	x								x		x
Filter DP Alarm										x	
Supply Temp - High Alarm										x	
Supply Temp - Low Alarm										x	

6 POOL CONTROLS
SCALE: No Scale



SEQUENCE OF OPERATION - WATER SOURCE HEAT PUMP (TYPICAL OF 31)

RUN CONDITIONS - SCHEDULED:
THE UNIT SHALL RUN ACCORDING TO A USER DEFINABLE TIME SCHEDULE IN THE FOLLOWING MODES:
- OCCUPIED MODE: THE UNIT SHALL MAINTAIN
- A 74°F (ADJ.) COOLING SETPOINT
A 70°F (ADJ.) HEATING SETPOINT

- UNOCCUPIED MODE (NIGHT SETBACK): THE UNIT SHALL MAINTAIN
- A 85°F (ADJ.) COOLING SETPOINT.
- A 55°F (ADJ.) HEATING SETPOINT.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- HIGH ZONE TEMP: IF THE ZONE TEMPERATURE IS GREATER THAN THE COOLING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).
- LOW ZONE TEMP: IF THE ZONE TEMPERATURE IS LESS THAN THE HEATING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).

ZONE SETPOINT ADJUST:
THE OCCUPANT SHALL BE ABLE TO ADJUST THE ZONE TEMPERATURE HEATING AND COOLING SETPOINTS AT THE ZONE SENSOR.

ZONE OPTIMAL START:
THE UNIT SHALL USE AN OPTIMAL START ALGORITHM FOR MORNING START-UP. THIS ALGORITHM SHALL MINIMIZE THE UNOCCUPIED WARM-UP OR COOL-DOWN PERIOD WHILE STILL ACHIEVING COMFORT CONDITIONS BY THE START OF SCHEDULED OCCUPIED PERIOD.

ZONE UNOCCUPIED OVERRIDE:
A TIMED LOCAL OVERRIDE CONTROL SHALL ALLOW AN OCCUPANT TO OVERRIDE THE SCHEDULE AND PLACE THE UNIT INTO AN OCCUPIED MODE FOR AN ADJUSTABLE PERIOD OF TIME. AT THE EXPIRATION OF THIS TIME, CONTROL OF THE UNIT SHALL AUTOMATICALLY RETURN TO THE SCHEDULE.

EMERGENCY SHUTDOWN
THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING AN EMERGENCY SHUTDOWN SIGNAL.

SMOKE DETECTION:
THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING A SMOKE DETECTOR STATUS.

FAN:
THE FAN SHALL RUN ANYTIME THE UNIT IS COMMANDED TO RUN, UNLESS SHUTDOWN ON SAFETIES. THE FAN SPEEDS SHALL BE INDEXED AS FOLLOWS:
- LOW SPEED SHALL RUN ANYTIME THE ZONE TEMPERATURE IS WITHIN SETPOINTS.
- MEDIUM SPEED SHALL RUN ANYTIME THE ZONE TEMPERATURE IS OUTSIDE OF SETPOINTS.
- HIGH SPEED SHALL RUN ANYTIME THE ZONE TEMPERATURE IS OUTSIDE OF SETPOINTS BY A USER DEFINABLE AMOUNT (ADJ.).

HEATING AND COOLING - 2 COMPRESSOR STAGES:
THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND STAGE THE COMPRESSORS TO MAINTAIN ITS SETPOINT. TO PREVENT SHORT CYCLING, THERE SHALL BE A USER DEFINABLE (ADJ.) DELAY BETWEEN STAGES, AND EACH STAGE SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME. THE COMPRESSOR SHALL RUN SUBJECT TO ITS OWN INTERNAL SAFETIES AND CONTROLS.

THE HEATING SHALL BE ENABLED WHENEVER:
- OUTSIDE AIR TEMPERATURE IS LESS THAN 65°F (ADJ.).
- AND THE FAN STATUS IS ON.
- AND THE REVERSING VALVE IS IN HEAT MODE.

THE COOLING SHALL BE ENABLED WHENEVER:
- OUTSIDE AIR TEMPERATURE IS GREATER THAN 60°F (ADJ.).
- AND THE FAN STATUS IS ON.
- AND THE REVERSING VALVE IS IN COOL MODE.

ON MODE CHANGE, THE COMPRESSOR SHALL BE DISABLED AND REMAIN OFF UNTIL AFTER THE REVERSING VALVE HAS CHANGED POSITION.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- COMPRESSOR 1 RUNTIME EXCEEDED: COMPRESSOR 1 RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).
- COMPRESSOR 2 RUNTIME EXCEEDED: COMPRESSOR 2 RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

SUPPLEMENTAL HEATING - HIGH DISCHARGE AIR TEMPERATURE LIMIT:
THE CONTROLLER SHALL MEASURE THE DISCHARGE AIR TEMPERATURE AND, ON RISING TEMPERATURE, LIMIT THE SUPPLEMENTAL HEATING AS FOLLOWS:
- AS THE DISCHARGE AIR TEMPERATURE RISES FROM 90°F TO 120°F (ADJ.),
- THE CONTROLLER SHALL LIMIT THE HEATING OUTPUT FROM 100% TO 0% (ADJ.).

FILTER DIFFERENTIAL PRESSURE MONITOR:
THE CONTROLLER SHALL MONITOR THE DIFFERENTIAL PRESSURE ACROSS THE FILTER.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- FILTER CHANGE REQUIRED: FILTER DIFFERENTIAL PRESSURE EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

DISCHARGE AIR TEMPERATURE:
THE CONTROLLER SHALL MONITOR THE DISCHARGE AIR TEMPERATURE.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- HIGH DISCHARGE AIR TEMP: IF THE DISCHARGE AIR TEMPERATURE IS GREATER THAN 120°F (ADJ.).
- LOW DISCHARGE AIR TEMP: IF THE DISCHARGE AIR TEMPERATURE IS LESS THAN 40°F (ADJ.).

FAN STATUS:
THE CONTROLLER SHALL MONITOR THE FAN STATUS.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
- FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
- FAN RUNTIME EXCEEDED: FAN STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

	HARDWARE POINTS				SOFTWARE POINTS						
POINT NAME	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show on Graphic
Zone Temp	x								x		x
Zone Setpoint Adjust	x								x		x
Filter Differential Pressure	x								x		x
Discharge Temp	x								x		x
Heating Output		x							x		x
Zone Override			x						x		x
Smoke Detector			x						x	x	x
Fan Status			x						x		x
Fan Low Speed				x					x		x
Fan Medium Speed				x					x		x
Fan High Speed				x					x		x
Reversing Valve				x					x		x
Compressor Stage 1				x					x		x
Compressor Stage 2				x					x		x
Heating Enable				x					x		x
Emergency Shutdown						x			x	x	x
Schedule								x			
Heating Setpoint									x		x
Cooling Setpoint									x		x
High Zone Temp										x	
Low Zone Temp										x	
Compressor 1 Runtime Exceeded										x	
Compressor 2 Runtime Exceeded										x	
Filter Change Required										x	
High Discharge Air Temp										x	
Low Discharge Air Temp										x	
Fan Failure										x	
Fan in Hand										x	
Fan Runtime Exceeded										x	

1 WATER SOURCE HEAT PUMP CONTROLS
SCALE: No Scale

SEQUENCE OF OPERATION - CARBON DIOXIDE SENSOR (TYPICAL OF 7)

CARBON DIOXIDE SENSOR:
MONITOR THE EXISTING CARBON DIOXIDE LEVELS IN THE 6 CONFERENCE ROOMS AND RESTAURANT AREA

ALARM SHALL BE GENERATED AS FOLLOWS:
- IF THE CARBON DIOXIDE LEVEL IN ANY SPACE IS GREATER THAN 800 PPM

	HARDWARE POINTS				SOFTWARE POINTS						
POINT NAME	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show on Graphic
Zone CO2	x								x		x
Zone CO2 - High										x	

2 CARBON DIOXIDE SENSORS
SCALE: No Scale

SEQUENCE OF OPERATION - CONVECTIVE / FIN TUBE HEATER - ELECTRIC (TYPICAL OF 1)

RUN CONDITIONS - SCHEDULED:
THE ELECTRIC HEAT IN THE GREAT ROOM WILL WORK IN CONJUNCTION WITH THE ASSOCIATED HEAT PUMP TO MAINTAIN SPACE TEMPERATURE.

DISABLE WHEN THE OUTDOOR AIR TEMPERATURE IS ABOVE 55 DEGREES

	HARDWARE POINTS				SOFTWARE POINTS						
POINT NAME	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show on Graphic
Zone Temp	x								x		x
Heating Stage 1				x					x		x
Heating Stage 2				x					x		x
Schedule								x			
Heating Setpoint									x		x
Low Zone Temp										x	

3 CONVECTIVE / FIN TUBE HEATER - ELECTRIC CONTROLS
SCALE: No Scale

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ISSUE

#	DATE:	DESCRIPTION:
1	09/20/24	Permit Set

PERMIT SET

PROJECT:

9418.00 - HONEY CREEK RESORT BUILDING AUTOMATION SYSTEM IMPROVEMENTS

12633 Resort Dr, Moravia, IA 52571

DATE:	09/20/2024
DESIGNED:	WCR
DRAWN:	LDE
REVIEWED:	WCR

SHEET TITLE:

CONTROLS DIAGRAMS

SHEET NUMBER:

M5.3

PROJECT NO.: 0241027.00

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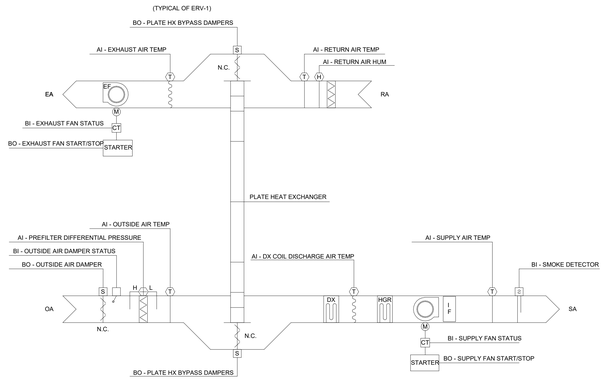
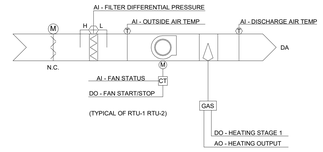


SEQUENCE OF OPERATION - MAKEUP AIR UNIT - SUPPLY AIR TEMP (TYPICAL OF 1)

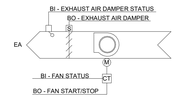
MAKE UP AIR UNIT MAU-1 SHALL RUN ON A TIME SCHEDULE. THE UNIT HAS A BACNET CONTROLLER AND WILL RUN ON ITS OWN CONTROLS. PROVIDE GRAPHICS, POINTS AND ALARMS PER THE POINTS LIST AND CONTROL SCHEMATIC.

	HARDWARE POINTS				SOFTWARE POINTS						
POINT NAME	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show on Graphic
Outside Air Temp	x								x		x
Exhaust Air Temp	x								x		x
DX Coil Discharge Air Temp	x								x		x
Return Air Humidity	x								x		x
Prefilter Differential Pressure	x								x		
Supply Air Temp	x								x		x
Smoke Detector			x						x	x	x
Outside Air Damper Status			x						x		x
Supply Fan Status			x						x		x
Exhaust Fan Status			x						x		x
Outside Air Damper				x					x		x
Supply Air Temp Setpoint					x				x		x
Outside Air Temp					x						x
Emergency Shutdown						x			x	x	x
Schedule								x			
Outside Air Damper Failure										x	
Supply Fan Failure										x	
Supply Fan in Hand										x	
Supply Fan Runtime Exceeded										x	
Exhaust Fan Failure										x	
Prefilter Change Required										x	x
Final Filter Change Required										x	x
High Supply Air Temp										x	
Low Supply Air Temp										x	

2 **MAKEUP AIR UNIT - SUPPLY AIR TEMP CONTROLS**
SCALE: No Scale



(TYPICAL OF RTU-1 RTU-2)



(TYPICAL OF EF-1, EF-2, EF-3)

SEQUENCE OF OPERATION - MAKEUP AIR UNIT (TYPICAL OF 2)

RUN CONDITIONS - DEMAND:
THE UNIT SHALL BE INTERLOCKED WITH AN ASSOCIATED HOOD EXHAUST FAN TO RUN WHENEVER EXHAUST FAN RUNS.

EMERGENCY SHUTDOWN:
THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING AN EMERGENCY SHUTDOWN SIGNAL.

FAN:
THE FAN SHALL RUN ANYTIME THE UNIT IS COMMANDED TO RUN, UNLESS SHUTDOWN ON SAFETIES.

GAS HEATING STAGES:
THE CONTROLLER SHALL MEASURE THE DISCHARGE AIR TEMPERATURE AND STAGE THE HEATING TO MAINTAIN ITS HEATING SETPOINT. TO PREVENT SHORT CYCLING, THERE SHALL BE A USER DEFINABLE (ADJ.) DELAY BETWEEN STAGES, AND EACH STAGE SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME.

THE HEATING SHALL BE ENABLED WHENEVER:
- OUTSIDE AIR TEMPERATURE IS LESS THE 65°F (ADJ.).
- AND THE ZONE TEMPERATURE IS BELOW HEATING SETPOINT.
- AND THE FAN IS ON.

HEATING - HIGH DISCHARGE AIR TEMPERATURE LIMIT:
THE CONTROLLER SHALL MEASURE THE DISCHARGE AIR TEMPERATURE AND, ON RISING TEMPERATURE, LIMIT THE HEATING AS FOLLOWS.
- AS THE DISCHARGE AIR TEMPERATURE RISES FROM 90°F TO 120°F (ADJ.).
- THE CONTROLLER SHALL LIMIT THE HEATING OUTPUT FROM 100% TO 0% (ADJ.).

OUTSIDE AIR DAMPER:
THE OUTSIDE AIR DAMPERS SHALL OPEN WHEN THE UNIT IS ON CLOSE WHEN THE UNIT IS OFF.

FILTER DIFFERENTIAL PRESSURE MONITOR:
THE CONTROLLER SHALL MONITOR THE DIFFERENTIAL PRESSURE EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- FILTER CHANGE REQUIRED: FILTER DIFFERENTIAL PRESSURE EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

DISCHARGE AIR TEMPERATURE:
THE CONTROLLER SHALL MONITOR THE DISCHARGE AIR TEMPERATURE.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- HIGH DISCHARGE AIR TEMP. IF THE DISCHARGE AIR TEMPERATURE IS GREATER THAN 120°F (ADJ.).
- LOW DISCHARGE AIR TEMP. IF THE DISCHARGE AIR TEMPERATURE IS LESS THAN 40°F (ADJ.).

FAN STATUS:
THE CONTROLLER SHALL MONITOR THE FAN STATUS.

ALARMS SHALL BE PROVIDED AS FOLLOWS.
- FAN FAILURE: COMMAND ON, BUT STATUS IS OFF
- FAN IN HAND: COMMAND OFF. BUT STATION IS ON.
DEFINABLE LIMIT (ADJ.).

	HARDWARE POINTS				SOFTWARE POINTS						
POINT NAME	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show on Graphic
Outside Air Temp	x								x		x
Prefilter Differential Pressure	x								x		
Supply Air Temp	x								x		x
Supply Fan Status			x						x		x
Exhaust Fan Status			x						x		x
Outside Air Damper				x					x		x
Supply Fan Start/Stop				x					x		x
Exhaust Fan Start/Stop				x					x		x
Heating Stage 1				x					x		x
Supply Air Temp Setpoint					x				x		x
Emergency Shutdown						x			x	x	x
Supply Fan Failure										x	
Supply Fan in Hand										x	
Exhaust Fan Failure										x	
Prefilter Change Required										x	x
High Supply Air Temp										x	
Low Supply Air Temp										x	

1 **MAKEUP AIR UNIT - GAS CONTROLS**
SCALE: No Scale

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ISSUE:

#	DATE:	DESCRIPTION:
1	09/20/24	Permit Set

PERMIT SET

PROJECT:

9418.00 - HONEY CREEK RESORT BUILDING AUTOMATION SYSTEM IMPROVEMENTS

12633 Resort Dr, Moravia, IA 52571

DATE:	09/20/2024
DESIGNED:	WCR
DRAWN:	LDE
REVIEWED:	WCR

SHEET TITLE:

CONTROLS DIAGRAMS

SHEET NUMBER:

M5.4

PROJECT NO.: 0241027.00

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