

VIEW KEY	
NAME LEVEL NAME HEIGHT ABOVE PROJECT 0'-0" INDICATES DIRECTION OF TRUE NORTH PLAN OR DETAIL NUMBER PLAN OR DETAIL NAME PLAN OR DETAIL SCALE	INDICATES NOTE USED TO DESCRIBE ADDITIONAL INFORMATION ABOUT WORK REQUIRED, SPECIFIC TO THE SHEET AND/OR DETAIL.
LINE TYPE AND TAG KEY: NEW WORK BY THIS CONTRACTOR (WIDE LINE) NEW ----- EXISTING TO BE REMOVED (SHORT DASHED PATTERN) ----- NEW UNDERFLOOR OR UNDERGROUND (LONG DASHED PATTERN) EXISTING TO REMAIN OR WORK BY OTHERS (NARROW LINE) EXISTING ----- EXISTING TO BE REMOVED BY OTHERS (SHORT DASHED PATTERN) ----- EXISTING UNDERFLOOR OR UNDERGROUND (LONG DASHED PATTERN) HALFTONING DOES NOT MODIFY SCOPE. TAG-E TAGS WITH DASH 'E' INDICATES THE REFERENCED OBJECT IS EXISTING TAG-1 UNDERLINED TAG INDICATES OBJECT IS IN SCOPE. IF NEW, ADDITIONAL INFORMATION IS AVAILABLE IN A SCHEDULE, MATERIAL LIST, OR SYMBOL LIST INDICATES AN EXISTING SYSTEM'S POINT OF CONNECTION/REMOVAL	

FIRE / SMOKE BARRIER DESIGNATIONS	
THE LINE TYPES SHOWN ARE FOR THE CONVENIENCE OF THE CONTRACTOR. THE CONTRACTOR SHALL VERIFY RATINGS WITH THE LATEST SET OF ARCHITECTURAL PLANS AND FURNISH ALL MATERIALS REQUIRED TO COMPLY WITH THOSE RATINGS WHETHER SHOWN OR NOT.	
ALL FLOOR, FLOOR CEILING, AND ROOF CEILING ASSEMBLIES SHALL BE DESIGNATED AS 1, 2 HOUR FIRE BARRIER(S), UNLESS NOTED OTHERWISE ON THE PLANS. RATINGS WERE ACQUIRED FROM THE ARCHITECTURAL PLANS DATED 06.27.22.	
1 HOUR FIRE BARRIER	-----
2 HOUR FIRE BARRIER	-----

APPLICABLE CODES	
CONTRACTOR SHALL COMPLY WITH APPLICABLE CODES AND LOCAL AMENDMENTS.	
BUILDING CODE:	IBC 2015 EDITION
FIRE CODE:	IFC 2015 EDITION
PLUMBING CODE:	UPC 2021
MECHANICAL CODE:	IMC 2021 EDITION
ELECTRICAL CODE:	NFPA 70 (NEC) 2020 EDITION
LIFE SAFETY CODE:	NFPA 101 2012 EDITION
ENERGY CONSERVATION CODE:	IECC 2012
LOCAL BUILDING CODE:	CURRENT EDITION

CONTRACTOR ABBREVIATION KEY	
ABBR:	DESCRIPTION:
C.C.	CIVIL CONTRACTOR
C.M.	CONSTRUCTION MANAGER
E.C.	ELECTRICAL CONTRACTOR
G.C.	GENERAL CONTRACTOR
H.C.	HEATING CONTRACTOR
M.C.	MECHANICAL CONTRACTOR
P.C.	PLUMBING CONTRACTOR
T.C.	TECHNOLOGY CONTRACTOR
T.C.C.	TEMPERATURE CONTROLS CONTRACTOR
V.C.	VENTILATION CONTRACTOR

CONTACT PERSONS:	
DESCRIPTION:	PERSON:
PROJECT MANAGER	GAURAV SHARMA
MECHANICAL	MIKE TAUBE
ELECTRICAL	GAURAV SHARMA
TECHNOLOGY	ALAN SWANSON
STRUCTURAL	LISA POGUE
CIVIL	ALEX KRIST

CONTROL SYMBOL LIST			
NOT ALL SYMBOLS MAY APPLY.			
SYMBOL:	DESCRIPTION:		
	THERMOSTAT TEMPERATURE SENSOR (DUCT MOUNTED) PRESSURE SENSOR (DUCT MOUNTED)		
	ANALOG INPUT		DIGITAL INPUT
	ANALOG OUTPUT		DIGITAL OUTPUT
	DUCT SMOKE DETECTOR		HUMIDITY SENSOR (DUCT MOUNTED)
	DUCT FLOW METER		FILTER
	ELECTRIC BASEBOARD		ACTUATOR
	FAN		CURRENT SWITCH
	MOTOR		ZONE THERMOSTAT

TEMPERATURE CONTROLS ABBREVIATION KEY	
ABBR:	DESCRIPTION:
EA	EXHAUST/RELIEF AIR
N.C.	NORMALLY CLOSED
TYP	TYPICAL
RA	RETURN AIR
SA	SUPPLY AIR
EA	EXHAUST AIR

- TEMPERATURE CONTROL GENERAL NOTES:**
- REFER TO EQUIPMENT SCHEDULES TO CROSS REFERENCE WHICH CONTROL DIAGRAMS APPLY TO WHICH ITEMS OF EQUIPMENT.
 - EACH D.I., D.O., A.I. AND A.O. POINT SHOWN FOR ALL CONTROL DIAGRAMS SHALL BE DISCRETE FROM ALL OTHER POINTS EXCEPT AS SPECIFICALLY NOTED.
 - ALL WIRING, CONTROL COMPONENTS, DEVICES AND PROGRAMMING SHOWN ON THESE CONTROL DRAWINGS SHALL BE PROVIDED BY THE TCC UNLESS SPECIFICALLY NOTED OTHERWISE.
 - TEMPERATURE CONTROL CABLING, CONDUIT, BOXES, IDENTIFICATION: REFER TO THE SPECIFICATIONS FOR A COMPLETE LIST OF REQUIREMENTS. THE FOLLOWING SCHEDULE IS PROVIDED AS A CONVENIENCE. REFER TO SECTION 23 05 93 FOR ADDITIONAL DETAILED REQUIREMENTS.
 - A. CABLE/WIRE JACKET COLOR: BLUE
 - B. CONDUIT AND BOX COLOR: BLUE
 - C. CABLE/WIRE INSTALLATION: IN CONDUIT
 - ALL ACTUATORS SHALL BE OF THE ELECTRICAL TYPE FOR THIS PROJECT.
 - ALL MODULATING DAMPER AND VALVE ACTUATORS SHOWN WITH POSITION FEEDBACK SHALL HAVE THE VALVE POSITION DISPLAYED ON GRAPHICAL SCREEN ADJACENT TO THE DAMPER/VALVE COMMAND SIGNAL. DISPLAYED VALVE POSITION SHALL BE FROM THE FEEDBACK DEVICE/CIRCUIT (OUTPUT SIGNAL FROM THE FMCS TO THE ACTUATOR IS NOT ACCEPTABLE)
 - MODULATING SIGNALS SHALL BE DISPLAYED AS % OPEN (SIGNALS DISPLAYED AS % CLOSED ARE NOT ACCEPTABLE).
 - PRESSURE TRANSMITTERS WHOSE SIGNAL IS UTILIZED FOR MAINTAINING DUCT STATIC PRESSURE SHALL BE WIRED DIRECTLY TO THE CONTROLLER THAT MODULATES FAN SPEED. SIGNAL SHALL BE COMPLETELY INDEPENDENT OF THE FMCS NETWORK.
 - PRESSURE TRANSMITTERS WHOSE SIGNAL IS UTILIZED FOR MAINTAINING DIFFERENTIAL PRESSURE OF ANY PUMPED WATER SYSTEM (E.G. HEATING HOT WATER, CHILLED WATER AND THE LIKE) SHALL BE WIRED DIRECTLY TO THE CONTROLLER THAT MODULATES PUMP SPEED. SIGNAL SHALL BE COMPLETELY INDEPENDENT OF THE FMCS NETWORK.
 - ALL CONTROL COMPONENTS SUCH AS RELAYS, SWITCHES, DDC CONTROLLERS, ETC. SHALL BE MOUNTED IN STEEL ENCLOSURES WITH STEEL MOUNTING BACKPLATES PER SPECIFICATION 23 09 23.
 - EACH CONTROL PANEL SHALL HAVE A LAMINATED COPY OF THE APPLICABLE SEQUENCE OF OPERATION AND CONTROL DIAGRAM INDICATING THE POINTS, COMPONENTS AND OPERATION OF EQUIPMENT ASSOCIATED WITH EACH PANEL. REFER TO SECTION 23 09 23 FOR ADDITIONAL REQUIREMENTS.
 - TCC SHALL WIRE THE CONTROL SIGNAL FROM THE ASSOCIATED AIR HANDLING UNIT CONTROL PANEL TO CONTROL THE OPERATION OF SMOKE DAMPERS IN ACCORDANCE WITH SEQUENCE OF OPERATION. TCC SHALL PROVIDE ALL WIRING, CONDUIT, TRANSFORMERS, FUSING AND ALL OTHER ELECTRICAL COMPONENTS REQUIRED FOR COMPLETE INSTALLATION.
 - TCC SHALL EXTEND CONTROL SIGNAL FROM ADDRESSABLE RELAY DEVICE SERVING EACH AIR HANDLING UNIT. REFER TO ELECTRICAL DRAWINGS FOR LOCATIONS. TCC SHALL EXTEND AND TERMINATE WIRING AS REQUIRED FOR EQUIPMENT SHUTDOWN.
 - TCC SHALL EXTEND 24 VOLT POWER FROM CONTROL POWER JUNCTION BOX SHOWN ON FLOOR PLANS TO ALL OUTDOOR AIR BOX CONTROLLER JUNCTION BOXES. TCC SHALL PROVIDE ALL WIRING, SUPPORTS, FUSING SPACE, TOGGLE SWITCHES, AND ALL OTHER ELECTRICAL COMPONENTS REQUIRED FOR COMPLETE INSTALLATION.
 - TCC SHALL PROVIDE CONDUIT RUNS AS REQUIRED FOR OUTDOOR EQUIPMENT AND FOR EQUIPMENT INSTALLED REMOTELY FROM THE MAIN BUILDING THAT IS BEING MONITORED OR CONTROLLED BY THE FMCS.
 - TCC SHALL PROVIDE THERMOSTATS FOR AUTOMATIC CONTROL OF EQUIPMENT AS REQUIRED BY THESE CONTROL DRAWINGS. THERMOSTAT CONTACT AMP RATING SHALL BE MINIMUM 125% OF THE MAX. CURRENT DRAW FOR THE EQUIPMENT BEING SERVED. WHERE THERMOSTATS CONTROL THE STARTING OF MOTORS (I.E. FANS), THERMOSTATS SHALL BE RATED FOR MOTOR STARTING APPLICATIONS.
 - ELEMENT LENGTHS FOR BOTH MIXED AIR TEMP SENSORS AND LOW LIMIT TEMP SWITCHES SHALL BE MINIMUM 1 LINEAR FOOT PER SQUARE FOOT OF COIL SURFACE AREA. PROVIDE MULTIPLE SENSORS AND SWITCHES AS NEEDED TO ACHIEVE REQUIRED ELEMENT LENGTHS. LOCATE RESET SWITCHES MAX. 6'-0" ABOVE ADJACENT STANDING SURFACE (E.G. ROOF, PLATFORM OR FLOOR) SO THE RESET SWITCH CAN BE CYCLED WITHOUT THE NEED FOR A LADDER.
 - CONTROL DIAGRAMS ARE SCHEMATIC IN NATURE AND DO NOT SHOW ALL REQUIRED CONTROL DEVICES AND COMPONENTS. REFER TO FLOOR PLANS, FLOW DIAGRAMS AND DETAILS FOR ADDITIONAL CONTROL DEVICES, COMPONENTS AND REQUIREMENTS NOT SHOWN ON THESE CONTROL DRAWINGS.
 - TCC SHALL PROVIDE ALL CONTROL COMPONENTS AND ACCESSORIES AS REQUIRED FOR EQUIPMENT TO BE CONTROLLED AS DESCRIBED IN THE SEQUENCE OF OPERATION REGARDLESS OF WHETHER ALL CONTROL COMPONENTS OR POINTS ARE SHOWN IN THE ASSOCIATED CONTROL DIAGRAM.

TEMPERATURE CONTROL SHEET INDEX	
TC000	TEMPERATURE CONTROL COVERSHEET
TC501	PACKAGED ROOFTOP UNIT - MULTI-ZONE VAV- RTU-12
TC502	MISCELLANEOUS CONTROL DIAGRAMS
TC500	PACKAGED DOAS CONTROL DIAGRAM
GRAND TOTAL: 4	



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1	BID SET	07.13.22
NO.	DESCRIPTION	DATE

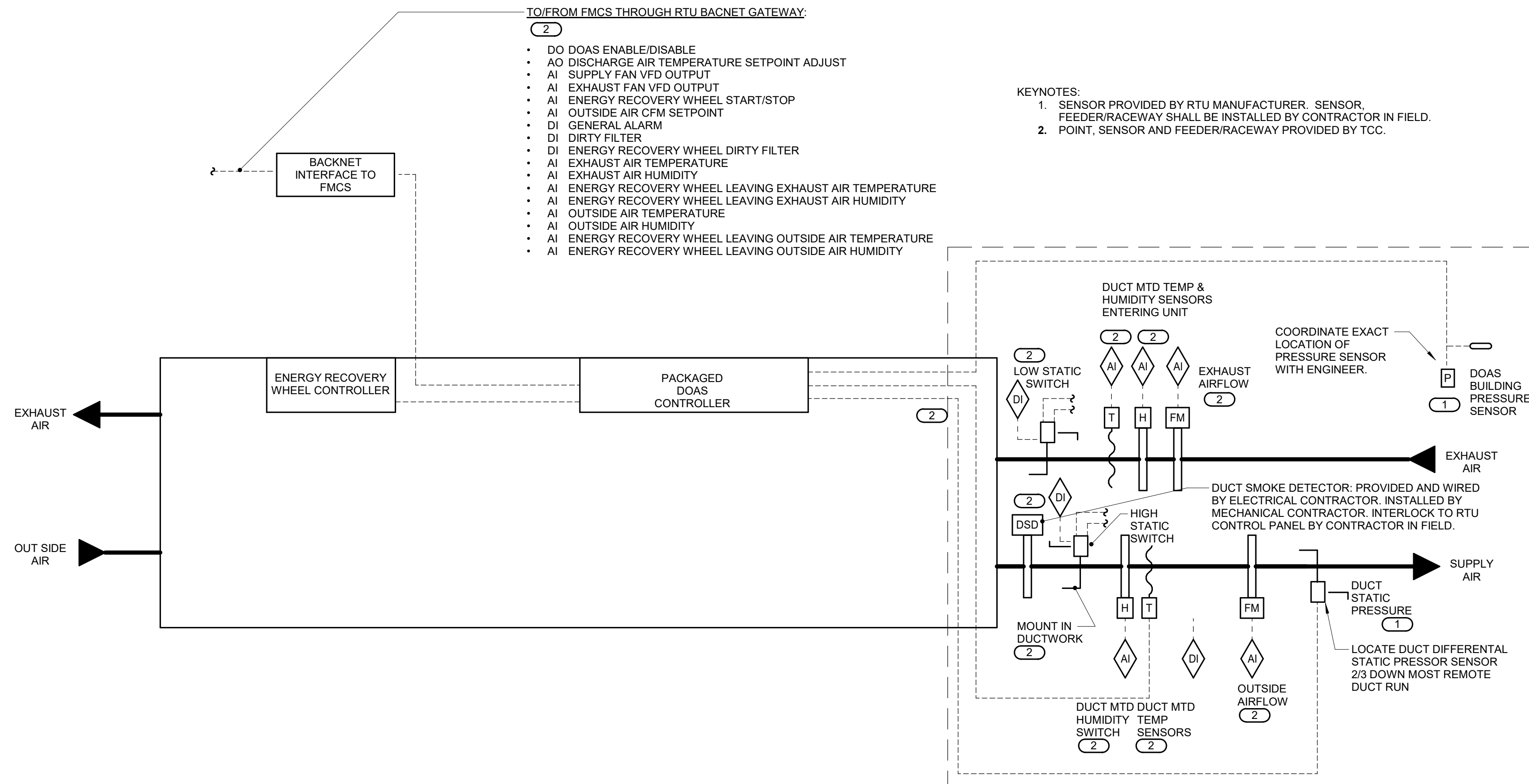
TEMPERATURE CONTROL COVERSHEET

PROJECT: 21002283.01

TC000

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 REFERENCE SCALE IN INCHES
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DOAS REPORT GENERATION:
DDC FMCS SHALL MONITOR THE FOLLOWING POINTS ON 10 MINUTE (ADJ.) INTERVALS WITHIN A SINGLE TREND. THE TREND SHALL RUN FOR A 365-DAY (ADJ.) DURATION AT WHICH POINT THE NEWEST VALUES SHALL AUTOMATICALLY OVERWRITE THE OLDEST VALUES:

PROVIDED BY PACKAGED MANUFACTURER THROUGH GATEWAY TO FMCS:	POINTS PROVIDED BY FMCS AND SYSTEM:
<ul style="list-style-type: none"> SUPPLY AIR TEMP SETPOINT [°F] SUPPLY AIR TEMP (SAT) [°F] SUPPLY AIR RELATIVE HUMIDITY [%] SUPPLY AIR DEWPOINT [°F] SUPPLY AIR DRYPOINT SETPOINT [°F] ENERGY RECOVERY WHEEL EXHAUST AIR LEAVING AIR TEMPERATURE [°F] ENERGY RECOVERY WHEEL EXHAUST AIR LEAVING RELATIVE HUMIDITY [%] EXHAUST FILTER LOADING (STATUS) SUPPLY FAN VFD OUTPUT [% FULL SPEED] EXHAUST FAN VFD OUTPUT [% FULL SPEED] ENERGY RECOVERY WHEEL VFD OUTPUT [% FULL SPEED] EXHAUST AIR DAMPER POSITION [% OPEN] EXHAUST AIR HUMIDITY OUTSIDE AIR DAMPER POSITION [% OPEN] SUPPLY FAN VFD OUTPUT EXHAUST FAN VFD OUTPUT GENERAL ALARM EXHAUST AIR TEMPERATURE EXHAUST AIR HUMIDITY OUTSIDE AIR TEMPERATURE OUTSIDE AIR HUMIDITY ENERGY RECOVERY WHEEL LEAVING OUTSIDE AIR TEMPERATURE ENERGY RECOVERY WHEEL LEAVING OUTSIDE AIR HUMIDITY 	<ul style="list-style-type: none"> DATE TIME GLOBAL OUTSIDE AIR TEMP [°F] GLOBAL OUTSIDE AIR HUMIDITY [%RH] EXHAUST AIRFLOW [CFM] EXHAUST AIR TEMP ENTERING UNIT (EAT) [°F] EXHAUST AIR RELATIVE HUMIDITY ENTERING UNIT [%] OUTSIDE AIRFLOW [CFM] DOAS ENABLE/DISABLE DISCHARGE AIR TEMPERATURE SETPOINT ADJUST OUTSIDE AIR CFM SETPOINT SUPPLY AIR HUMIDITY FIRE ALARM

THIS INFORMATION SHALL BE ACCESSIBLE TO VIEW IN GRAPHICAL FORM ON THE FMCS OPERATOR WORKSTATION.

ONCE PER MONTH, THE DDC FMCS SHALL RECORD THE LARGEST DOAS AIRFLOW WHICH OCCURED DURING THAT MONTH. THE DATE, TIME, OUTSIDE AIR TEMPERATURE (AND ALL OTHER VALUES LISTED ABOVE) THAT COINCIDED WITH THAT EVENT SHALL ALSO BE RECORDED. THIS INFORMATION SHALL BE STORED TO A MEMORY LOCATION ON THE FMCS OPERATOR WORKSTATION THAT IS MAINTAINED (NOT AUTOMATICALLY OVERWRITTEN).

DOAS REPORT GENERATION
TYPICAL FOR DOAS-1 & DOAS-2

DOAS EXHAUST FAN AIRFLOW SCHEDULE			
SYSTEM	SUPPLY CFM	POSITIVE PRESSURIZATION CFM	REMARKS
DOAS-1	2300	500	NOTES 1,2
DOAS-2	4725	500	NOTES 1,2

- NOTES:
- DOAS EXHAUST FAN AIRFLOW SETPOINT AND THE SUPPLY FAN AIRFLOW (AS MEASURED BY THE AFMS)
 - EXHAUST FAN AIRFLOWS SHALL NOT BE THE CFM INDICATED ON THE FAN SCHEDULE, BUT SHALL BE THE AIRFLOW INDICATED IN THE FINAL TAB REPORT.

DOAS FAN INTERLOCK SCHEDULE		
SYSTEM	INTERLOCKED EXHAUST FANS	REMARKS
DOAS-1	EF-1 AND EXISTING EXHAUST FAN TO REMAIN	NOTE 1
DOAS-2	NONE	

- NOTES:
- INTERLOCK EXHAUST FAN OPERATION THROUGH THE FMCS WITH RESPECTIVE DOAS IN ACCORDANCE WITH DOAS SEQUENCE OF OPERATION.
 - TCC SHALL PROVIDE NEW RELAYS AND/OR CONNECTIONS TO EXISTING MOTOR STARTERS AND MOTOR STARTERS REQUIRED TO PROVIDE INTERLOCK WITH EXISTING FANS TO REMAIN.

CONTROLS PROVIDED BY CONTRACTOR IN THE FIELD:
THE TCC SHALL EXTEND THE FMCS NETWORK TO THE RTU UNITARY CONTROLLER PER THE PROTOCOL SPECIFIED IN SECTION 23 09 00.

WHEN DOAS IS INDEXED TO RUN, THE FOLLOWING SHALL OCCUR:

- COMBINATION FIRE/SMOKE DAMPERS SHALL OPEN.
- AFTER A 30 SECOND DELAY TO ALLOW FOR OPENING OF COMBINATION FIRE/SMOKE DAMPERS, THE FMCS SHALL SEND A SIGNAL TO INDEX THE DOAS TO START.
- WHEN THE DOAS SUPPLY FAN HAS STARTED THE INTERLOCKED EXHAUST FANS SHALL START AS SHOWN IN THE FAN INTERLOCK SCHEDULE.

BUILDING OCCUPANCY SCHEDULING:
ENABLE RTU TO RUN BASED ON THE FOLLOWING OCCUPANCY SCHEDULE (COORDINATE OCCUPANCY SCHEDULE WITH EICC):

- MORNING START-UP MODE: MONDAY THROUGH FRIDAY 5:00AM-6:00AM (ADJ.)
SATURDAY THROUGH SUNDAY 7:00AM-8:00AM (ADJ.)
- OCCUPIED MODE: MONDAY THROUGH FRIDAY 6:00AM-5:00PM (ADJ.)
SATURDAY THROUGH SUNDAY 8:00AM-5:00PM (ADJ.)
- UNOCCUPIED MODE: MONDAY THROUGH FRIDAY 9:00PM-5:00AM (ADJ.)
SATURDAY THROUGH SUNDAY 6:00PM-7:00AM (ADJ.)

CONTRACTOR SHALL FIELD INSTALL THE FOLLOWING MANUFACTURER PROVIDED EXTERNAL SENSORS AND WIRE BACK TO RTU CONTROLLER:

- DUCT STATIC PRESSURE SENSOR IN SUPPLY DUCT.
- BUILDING PRESSURE SENSOR.
- SUPPLY AIR TEMPERATURE IN SUPPLY DUCT.

EXTERNAL CONTROLS PROVIDED BY AND/OR WIRED BY TCC:

- SUPPLY AND EXHAUST TEMPERATURE SENSOR
- SUPPLY AND EXHAUST HUMIDITY SENSOR
- DUCT SMOKE DETECTOR
- AIR FLOW MEASURING STATION
- ALL REQUIRED POINTS FROM DOAS CONTROLLER TO FMCS
- ALL REQUIRED POINTS FROM FMCS TO DOAS CONTROLLER

ALARMS, INTERLOCKS AND SAFETIES:
WHEN FIRE ALARM CONTROL PANEL INDICATES AN ALARM CONDITION, FMCS SHALL SEND A SIGNAL TO DOAS TO SHUTDOWN UNIT.

THE FOLLOWING SAFETIES SHALL BE INSTALLED AND WIRED IN THE FIELD AND SHALL DISABLE DOAS.

- HIGH STATIC SWITCH (WIRED TO UNIT/DISABLE TO TURN FANS OFF)
- LOW STATIC SWITCH (WIRED TO UNIT/DISABLE TO TURN FANS OFF)
- FIRE ALARM RELAY (WIRED TO UNIT/DISABLE TO TURN FANS OFF)

WHENEVER DOAS IS SHUTDOWN THE FMCS SHALL COMMAND THE FOLLOWING TO OCCUR:

- ALL COMBINATION FIRE/SMOKE DAMPERS SHALL FULLY CLOSE.
- INTERLOCKED EXHAUST FANS SHALL BE DE-ENERGIZED.

CONTROLS PROVIDED BY PACKED EQUIPMENT MANUFACTURER:

PACKAGE ROOFTOP UNIT SYSTEM DESCRIPTION:
REFER TO SECTION 23 74 11 FOR A DESCRIPTION OF THE RTU AND THE CONTROLS PROVIDED BY THE RTU MANUFACTURER.

DOAS CONTROL PANEL SEQUENCE OF OPERATION:
THE FMCS SHALL SEND A SIGNAL TO START THE DOAS.

SUPPLY FAN CONTROL:
RTU CONTROLLER SHALL MODULATE SIGNAL TO SUPPLY FAN VFD AS REQUIRED TO MAINTAIN SCHEDULED OUTSIDE AIR CFM AS MEASURED BY THE STATIC PRESSURE TRANSMITTER.

SUPPLY FAN CONTROL:
RESET SUPPLY DUCT STATIC PRESSURE SETPOINT AS REQUIRED TO MAINTAIN SCHEDULED AIRFLOW AT THE MOST REMOTE OUTLET TO RESET THE SUPPLY DUCT DIFFERENTIAL STATIC PRESSURE.

SUPPLY FAN OPERATION:
DOAS CONTROL PANEL SHALL MODULATE SIGNAL TO SUPPLY FAN VFD AS REQUIRED TO MAINTAIN SCHEDULED OUTSIDE AIR CFM AS MEASURED BY AIRFLOW MEASURING STATION.

EXHAUST FAN OPERATION:
EXHAUST FAN SHALL BE INDEXED TO RUN WHENEVER THE SUPPLY FAN IS INDEXED TO RUN. DOAS CONTROL PANEL SHALL MODULATE SIGNAL TO EXHAUST FAN VFD AS REQUIRED TO MAINTAIN THE AIRFLOW OFFSET AS INDICATED IN THE EXHAUST FAN AIRFLOW SCHEDULE.

VENTILATION CONTROL:
WHENEVER THE UNIT IS IN OCCUPIED MODE THE OUTSIDE AIR DAMPER SHALL BE FULLY OPEN.

DISCHARGE AIR TEMPERATURE CONTROL:
DISCHARGE AIR TEMPERATURE SHALL BE 55°F (ADJ.) AT FULL HEATING THE ENERGY RECOVERY WHEEL SHALL BE ROTATING AT FULL SPEED AND THE GAS BURNER MODULATING TO MAINTAIN SETPOINT. WHENEVER THE DISCHARGE AIR TEMPERATURE IS ABOVE SETPOINT THE FOLLOWING SHALL OCCUR:

- MODULATE GAS BURNER OFF.
- MODULATE ENERGY RECOVERY WHEEL SPEED TO MAINTAIN SETPOINT.
- THE ENERGY RECOVERY WHEEL SHALL BE DISABLED.
- MODULATE COMPRESSORS.
- THE ENERGY RECOVERY WHEEL SHALL TURN ON TO FULL SPEED.
- THE DOAS COMPRESSORS SHALL BE ENABLED AND MFR SHALL MODULATE COMPRESSOR CAPACITY REQUIRED TO MAINTAIN SETPOINT.

AT FULL COOLING THE ENERGY RECOVERY WHEEL SHALL BE ROTATING AT FULL SPEED CLOSED AND THE DOAS COMPRESSORS MODULATING TO MAINTAIN SETPOINT. WHENEVER THE DISCHARGE AIR TEMPERATURE IS BELOW SETPOINT THE FOLLOWING SHALL OCCUR:

- MODULATE COMPRESSORS TO MAINTAIN SETPOINT.
- DISABLE THE ENERGY RECOVERY WHEEL WHEN THE TEMPERATURE DIFFERENCE FROM THE RETURN AIR AND OUTSIDE AIR IS 5°F (ADJ.) OR LESS.
- THE ENERGY RECOVERY WHEEL SHALL BE ENABLED.
- THE ENERGY RECOVERY WHEEL SHALL MODULATE SPEED OF WHEEL TO MAINTAIN SETPOINT.
- ONCE THE ENERGY RECOVERY WHEEL IS AT FULL SPEED THE GAS FIRED BURNER SHALL MODULATE OPEN.

ENERGY RECOVERY WHEEL CONTROL:
THE MANUFACTURER SHALL CONTROL PREHEAT AND WHEEL SPEED TO PREVENT FROST FROM ON THE WHEEL.

ALARMS, INTERLOCKS AND SAFETIES:
SEND AN ALARM TO THE CONTROLLER INTERFACE (FMCS) FOR THE FOLLOWING:

- SUPPLY FAN FAULT (AIRFLOW, CURRENT OR VFD)
- EXHAUST FAN FAULT (AIRFLOW, CURRENT OR VFD)
- DIFFERENTIAL PRESSURE SWITCH ACROSS ANY FILTER (30%) BANK EXCEEDS 0.6 INCHES W.G. (ADJ.)
- IF DISCHARGE AIR TEMPERATURE IS MORE THAN 10°F (ADJ.) ABOVE OR BELOW SETPOINT.
- EMERGENCY STOP
- DIRTY FILTERS (WHEN FILTER PRESSURE DROP EXCEEDS 0.6" W.C. (ADJ.))

WHENEVER DOAS IS SHUTDOWN THE RTU CONTROLLER SHALL COMMAND THE FOLLOWING TO OCCUR:

- SUPPLY FAN AND EXHAUST FAN VFDs SHALL BE DE-ENERGIZED.
- OUTSIDE AIR AND RELIEF AIR DAMPERS SHALL FULLY CLOSE. THE RETURN AIR DAMPER SHALL FULLY OPEN.
- HEATING AND COOLING SHALL BE DISABLED.
- THE ENERGY RECOVERY WHEEL SHALL STOP.

UNOCCUPIED MODE:
FMCS SHALL PROVIDE TIME OF DAY SCHEDULE TO ALLOW DOAS TO ENTER UNOCCUPIED MODE PER SCHEDULE.

- THE SUPPLY AND EXHAUST FANS SHALL TURN OFF.
- THE OUTSIDE AIR AND EXHAUST AIR DAMPERS SHALL CLOSE.

1 PACKAGED DOAS UNIT WITH ENERGY RECOVERY WHEEL CONTROL - DOAS-1 & DOAS-2
12" = 1'-0"

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1	BID SET	07.13.22
NO.	DESCRIPTION	DATE

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REFERENCE SCALE IN INCHES
0 1 2 3

PACKAGED DOAS CONTROL DIAGRAM

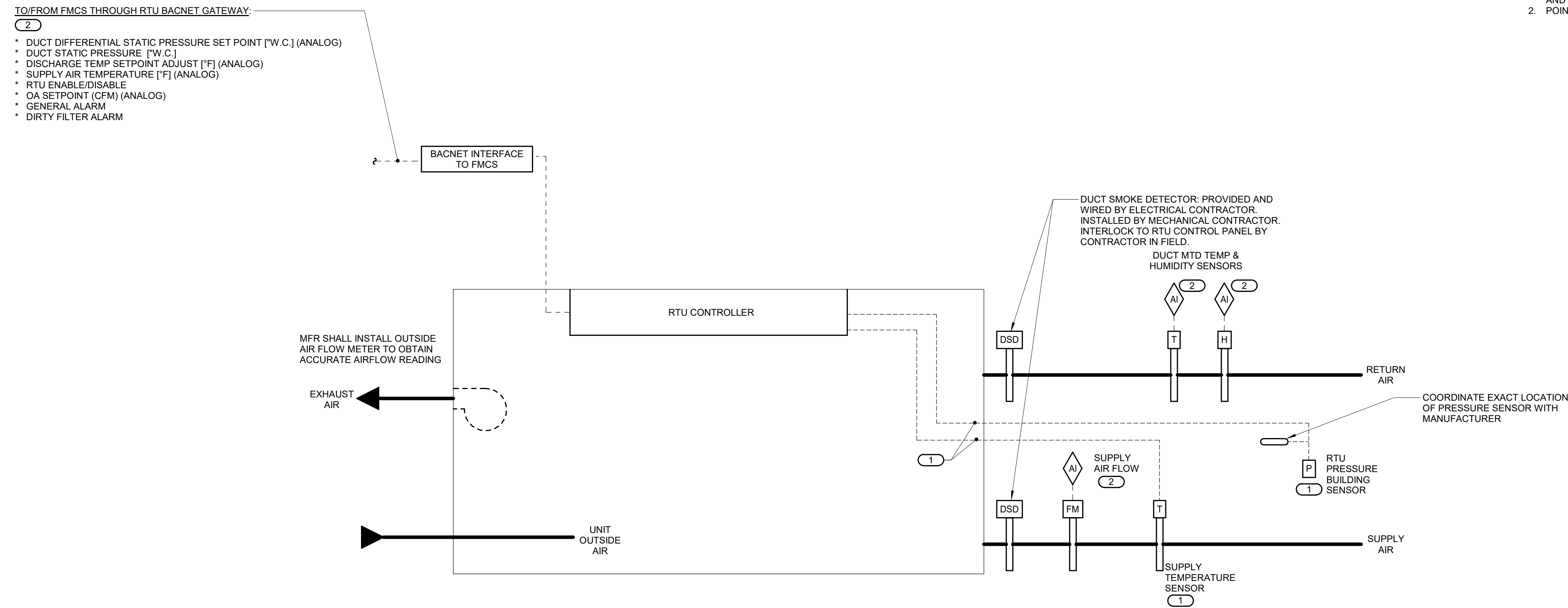
PROJECT: 2100283.01

TC500

AHU REPORT GENERATION: DDC FMCS SHALL MONITOR THE FOLLOWING POINTS ON 10 MINUTE (ADJ.) INTERVALS WITHIN A SINGLE TREND. THE TREND SHALL RUN FOR 365 DAY (ADJ.) DURATION AT WHICH POINT THE NEWEST VALUES SHALL AUTOMATICALLY OVERWRITE THE OLDEST VALUES.	
PROVIDED BY PACKAGED MANUFACTURER THROUGH GATEWAY TO FMCS:	POINTS PROVIDED BY FMCS AND SYSTEM:
<ul style="list-style-type: none"> SUPPLY AIR TEMP (SAT) [°F] OUTSIDE AIRFLOW [CFM] FILTER SWITCH SUPPLY FAN VFD OUTPUT [% FULL SPEED] OUTSIDE AIR DAMPER POSITION [% OPEN] 	<ul style="list-style-type: none"> DATE TIME GLOBAL OUTSIDE AIR TEMP [°F] GLOBAL OUTSIDE AIR DWP [°F] GLOBAL OUTSIDE AIR HUMIDITY [%RH] SUPPLY AIR RELATIVE HUMIDITY [%] ROOM AIR TEMP SETPOINT [°F] RETURN AIR TEMP (RAT) [°F] RETURN AIR RELATIVE HUMIDITY [%] SUPPLY AIRFLOW [CFM]
THIS INFORMATION SHALL BE ACCESSIBLE TO VIEW IN EITHER TABULAR OR GRAPHICAL FORM ON THE FMCS OPERATOR WORKSTATION	

EXTERNAL CONTROLS PROVIDED BY CONTROLS CONTRACTOR AND WIRED TO FMCS:
<ul style="list-style-type: none"> RETURN HUMIDITY SENSOR RETURN TEMPERATURE SENSOR HUMIDITY SENSOR DUCT SMOKE DETECTOR DUCT SMOKE DETECTOR INTERLOCK SUPPLY FAN AIRFLOW

- KEYNOTES:**
- SENSOR PROVIDED BY RTU MANUFACTURER. SENSOR FEEDER/RACEWAY AND CONNECTION SHALL BE INSTALLED BY CONTRACTOR IN THE FIELD.
 - POINT, SENSOR AND FEEDER/RACEWAY PROVIDED BY TCC.



CONTROLS SEQUENCE PROVIDED BY CONTRACTOR IN FIELD:	
SEQUENCE OF OPERATION: THE TCC SHALL EXTEND THE FMCS NETWORK TO THE RTU BACNET INTERFACE PER THE PROTOCOL SPECIFIED IN SECTION 23 09 00.	
WHEN RTU IS INDEXED TO RUN, THE FOLLOWING SHALL OCCUR:	
<ul style="list-style-type: none"> AFTER A 30 SECOND DELAY TO ALLOW FOR OPENING OF COMBINATION FIRE/SMOKE DAMPERS, SUPPLY FAN SHALL BE ENABLED TO RUN. 	
BUILDING OCCUPANCY SCHEDULING: ENABLE RTU TO RUN BASED ON THE FOLLOWING OCCUPANCY SCHEDULE:(COORDINATE OCCUPANCY SCHEDULE WITH OWNER)	
<ul style="list-style-type: none"> MORNING START-UP MODE: MONDAY THROUGH FRIDAY 5:00AM-6:00AM (ADJ.) SATURDAY THROUGH SUNDAY 7:00AM-8:00AM (ADJ.) OCCUPIED MODE: MONDAY THROUGH FRIDAY 6:00AM-9:00PM (ADJ.) SATURDAY THROUGH SUNDAY 8:00AM-6:00PM (ADJ.) UNOCCUPIED MODE: MONDAY THROUGH FRIDAY 9:00PM-5:00AM (ADJ.) SATURDAY THROUGH SUNDAY 6:00PM-7:00AM (ADJ.) 	
CONTRACTOR SHALL FIELD INSTALL THE FOLLOWING MANUFACTURER PROVIDED EXTERNAL SENSORS AND WIRE BACK TO RTU CONTROLLER:	
<ul style="list-style-type: none"> DUCT STATIC PRESSURE SENSOR IN SUPPLY DUCT. SUPPLY AIR TEMPERATURE IN SUPPLY DUCT. 	
ALARMS, INTERLOCKS AND SAFETIES: THE FOLLOWING SAFETIES SHALL BE INSTALLED AND WIRED IN THE FIELD.	
<ul style="list-style-type: none"> FIRE ALARM RELAY (WIRED TO UNIT ENABLE/DISABLE TO TURN FANS OFF) 	

CONTROLS PROVIDED BY PACKED EQUIPMENT MANUFACTURER:	
PACKAGE ROOFTOP UNIT SYSTEM DESCRIPTION: REFER TO SECTION 23 74 11 FOR A DESCRIPTION OF THE RTU AND THE CONTROLS PROVIDED BY THE RTU MANUFACTURER.	
SUPPLY FAN CONTROL: RTU CONTROLLER SHALL MODULATE SIGNAL TO SUPPLY FAN VFD AS REQUIRED TO MAINTAIN SPACE TEMPERATURE AS REQUIRED BY THE SPACE TEMPERATURE SENSOR.	
EXHAUST FAN CONTROL: RTU CONTROLLER SHALL MONITOR BUILDING PRESSURE SIGNAL AND OPERATE EXHAUST FAN AS REQUIRED TO MAINTAIN +0.05" (ADJ.) W.C.	
VENTILATION CONTROL: WHENEVER THE UNIT IS IN OCCUPIED MODE THE OUTSIDE AIR DAMPER SHALL BE AT THE BALANCED MINIMUM POSITION BASED ON THE VENTILATION SCHEDULE.	
SUPPLY AIR TEMPERATURE CONTROL: DISCHARGE AIR TEMPERATURE SHALL BE 55°F (ADJ.) AND 95°F (ADJ.) TO MEET SPACE TEMPERATURE SETPOINT.	
DEHUMIDIFICATION CONTROL: WHENEVER HUMIDITY REACHES 60% RH, DEHUMIDIFICATION SEQUENCE SHALL BE ENABLED.	
WHENEVER RTU IS SHUTDOWN THE RTU CONTROLLER SHALL COMMAND THE FOLLOWING TO OCCUR:	
<ul style="list-style-type: none"> SUPPLY FAN AND EXHAUST FAN SHALL STOP. OUTSIDE AIR AND EXHAUST AIR DAMPERS SHALL FULLY CLOSE. THE RETURN AIR DAMPER SHALL FULLY OPEN. HEATING AND COOLING SHALL BE DISABLED. OUTSIDE AIR AND RELIEF AIR DAMPER SHALL REMAIN CLOSED. RETURN AIR DAMPER SHALL BE 100% OPEN 	
UN-OCCUPIED MODE OPERATION: OUTSIDE AIR AND RELIEF AIR DAMPER SHALL REMAIN CLOSED. RETURN AIR DAMPER SHALL BE 100% OPEN.	

1	BID SET	07.13.22
NO.	DESCRIPTION	DATE

1 PACKAGED ROOFTOP UNIT CONTROL (SINGLE-ZONE VAV) WITH EXHAUST FAN - RTU-14
12" = 1'-0"

**PACKAGED ROOFTOP
UNIT - MULTI-ZONE
VAV- RTU-12**

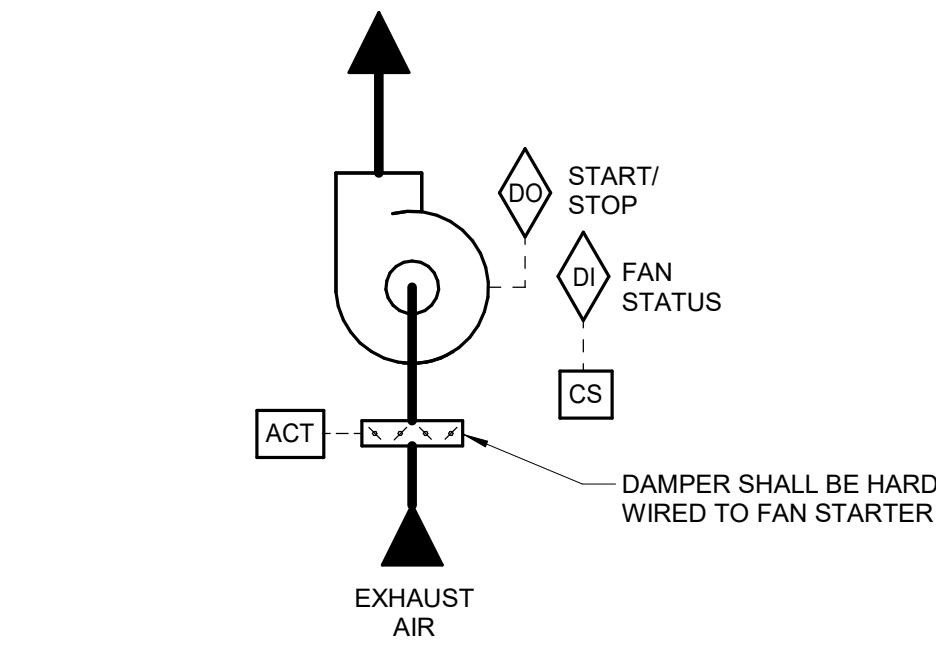
IMEG
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PROJECT # 2100283.10

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REFERENCE SCALE IN INCHES
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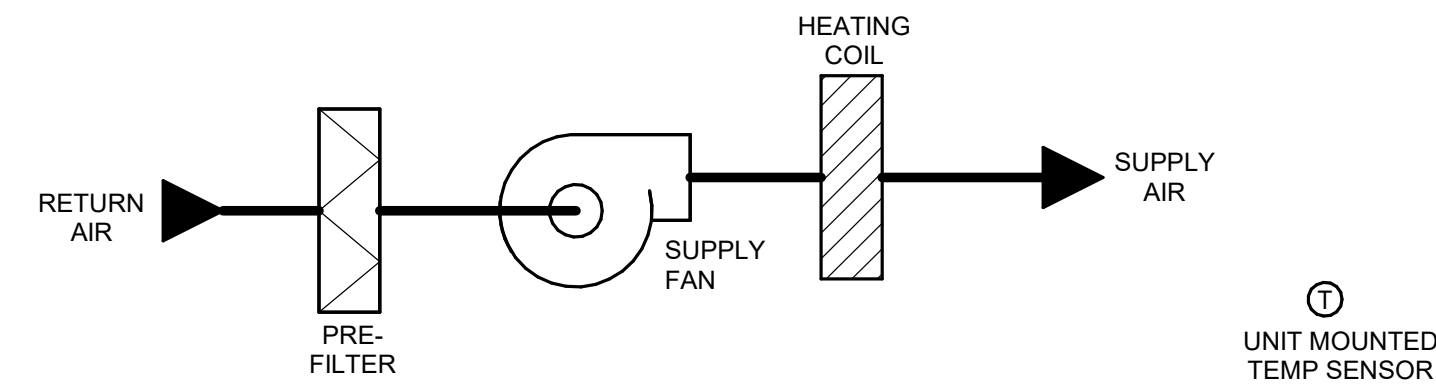
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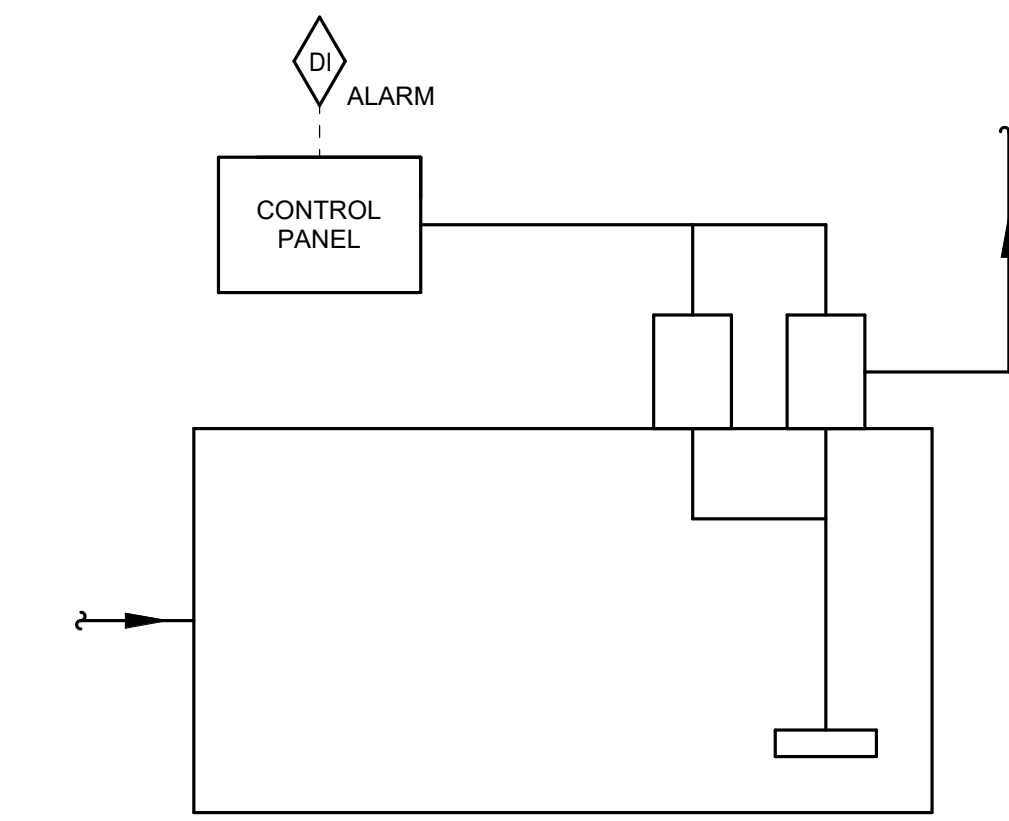
SEQUENCE OF OPERATION:
EXHAUST FAN START SHALL RUN CONTINUOUSLY DURING
AHU-1RTU-1 OCCUPIED MODE. WHEN EACH IS IN UNOCCUPIED MODE,
EXHAUST FAN SHALL BE OFF.
M.C. SHALL INTERLOCK WITH REST ROOM OCCUPANCY SENSOR FOR
FIRST FLOOR.
2-POSITION DAMPER SHALL FULLY OPEN WHEN FAN IS ENERGIZED.
WHEN FAN IS DE-ENERGIZED, 2-POSITION DAMPER SHALL FULLY
CLOSE

1 EXHAUST FAN CONTROL - CONTINUOUS OPERATION - EF-1
NO SCALE



SEQUENCE OF OPERATION:
THE CABINET HEATER SHALL BE FURNISHED WITH A UNIT MOUNTED FAN SPEED SELECTOR SWITCH (OFF-
HIGH-MED-LOW). THE UNIT SHALL MAINTAIN A SPACE TEMPERATURE OF NO MORE THAN 60 DEGREES F.

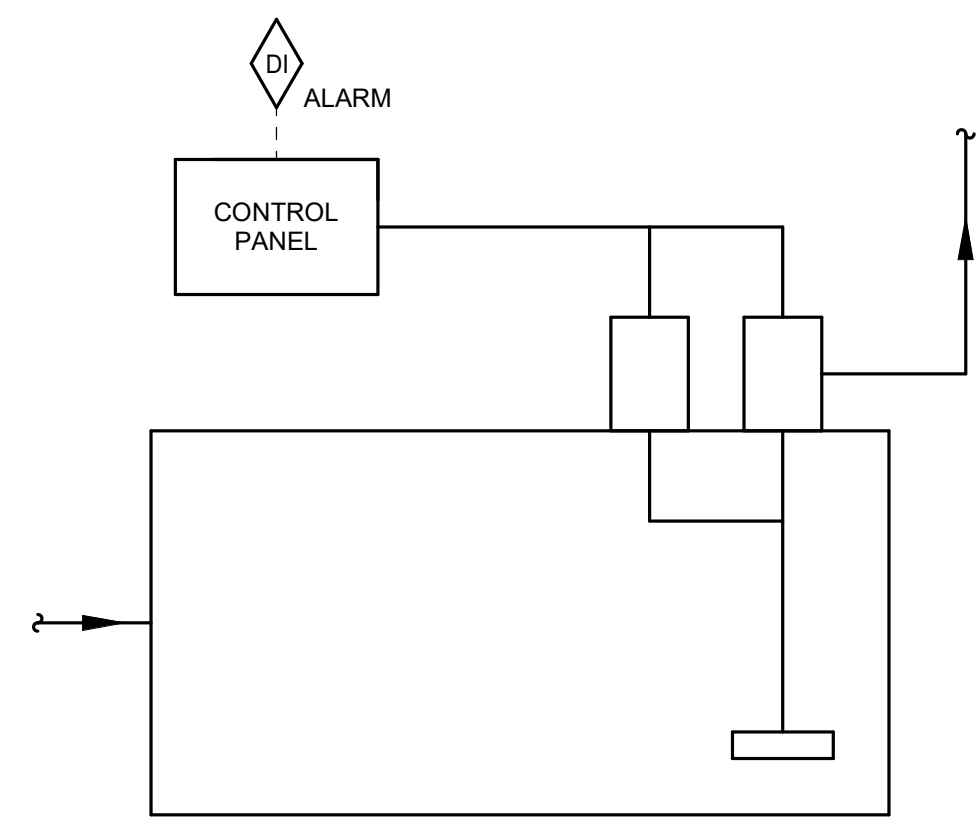
2 CABINET HEATER CONTROL - HYDRONIC
NO SCALE



ALARMS, INTERLOCKS & SAFETIES:
FMCS SHALL INDICATE AN ALARM TO THE FMCS OPERATOR WORKSTATION IN THE EVENT
THE FOLLOWING OCCUR:
* UPON LOSS OF POWER TO EJECTOR CONTROL PANEL OR IF AN ALARM CONTACT OPENS
* ANY PUMP INDICATES AN ALARM CONDITION.
* THE CONTROLLER INDICATE AN ALARM CONDITION.

3 SEWAGE PUMP MONITORING
NO SCALE

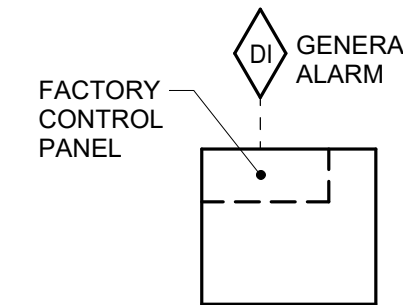
NOTES:
1. PROVIDE CONTROL PANEL CAPABLE OF TWO ALARM POINTS FOR EACH PUMP.



ALARMS, INTERLOCKS & SAFETIES:
FMCS SHALL INDICATE AN ALARM TO THE FMCS OPERATOR WORKSTATION IN THE EVENT
THE FOLLOWING OCCUR:
* ANY PUMP INDICATES AN ALARM CONDITION.
* THE CONTROLLER INDICATE AN ALARM CONDITION.

4 SUMP PIT ALARM
NO SCALE

NOTES:
1. PROVIDE CONTROL PANEL CAPABLE OF TWO ALARM
POINTS FOR EACH PUMP



SEQUENCE OF OPERATION:
* THE VACUUM PUMP CONTROLLER SHALL OPERATE THE SYSTEM TO MAINTAIN THE
SPECIFIED PRESSURE.
ALARMS, INTERLOCKS & SAFETIES:
* SEND AN ALARM TO THE FMCS OPERATOR INTERFACE IF THE VACUUM PUMP
CONTROLLER INDICATES AN ALARM.

5 VACUUM PUMP CONTROL DIAGRAM
NO SCALE

NOTES:
1. VACUUM PUMP PROVIDED BY DENTAL EQUIPMENT VENDOR, COORDINATE CONNECTION WITH
SELECTED VENDOR