CONTROL SYSTEM GENERAL NOTES

PROVIDE A COMPLETE ANDOVER CONTROL SYSTEM TO ACCOMPLISH THE SEQUENCE OF OPERATION. PROVIDE A BID ALTERNATE TO PROVIDED CONNECTIVITY TO THE EXISTING MIDWESTERN STATE UNIVERSITY ANDOVER DIRECT DIGITAL CONTROL (DDC) SYSTEM WITH THE MAIN CONTROL PANEL IN THE CENTRAL PLANT BUILDING.

THE CONTROL SYSTEMS SHALL BE COMPLETE WITH ALL WIRING, CONDUIT, POWER SUPPLIES AND ALL OTHER ITEMS REQUIRED FOR A COMPLETE AND OPERATIONAL SYSTEM THAT WILL ACCOMPLISH THE SEQUENCE OF OPERATIONS.

IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE ALL ASPECTS OF THE DDC CONTROL SYSTEM TO ENSURE THAT THE SYSTEM OPERATE AS REQUIRED BY THESE DOCUMENTS AND NATIONAL AND LOCAL CODES.

ENTECH SALES AND SERVICE, FARMERS BRANCH OFFICE, PROVIDES AND SERVICES ALL MIDWESTERN STATE UNIVERSITY ANDOVER CONTROLS. ENTECH SHALL BE THE SOLE COMPANY ABLE TO BID THE ANDOVER CONTROLS FOR THIS PROJECT.

THE EXISTING CONTROLS FOR ALL FOUR EXISTING SYSTEMS SHALL BE REMOVED AND THE WALLS PATCHED AND PAINTED.

SYMBOL LIST

SYMBOL	DESCRIPTION
	OPPOSED BLADE DAMPER
	HEATING OR COOLING COIL
	AUTOMATIC 2-WAY VALVE
	AUTOMATIC 3-WAY VALVE
	FAN OR PUMP MOTOR
P	DIFFERENTIAL PRESSURE SENSOR
P	PRESSURE TRANSMITTER
CSR	CURRENT SENSING RELAY
FS	WATER FLOW MONITORING
S	SMOKE DETECTOR
T	TEMPERATURE SENSOR
T	THERMOSTAT OR TEMP SENSOR
H	HUMIDISTAT OR HUMIDITY SENSOR
TCU	TERMINAL CONTROL UNIT
VFD	VARIABLE FREQUENCY DRIVE
VS	VIBRATION SENSOR
	VAV DAMPER W/FLOW MONITOR
DI	DDC DIGITAL INPUT POINT
DO	DDC DIGITAL OUTPUT POINT
AI	DDC ANALOG INPUT POINT
AO	DDC ANALOG OUTPUT POINT
OPB	OPEN PROTOCOL BUS
M	MOTOR
MS	MOTOR STARTER
ES	ENTHALPY SENSOR
HPL	HIGH PRESSURE LIMIT SWITCH
CO_2	CARBON DIOXIDE DETECTOR
F	AIRFLOW MONITORING STATION
HLH	HIGH LIMIT HUMIDITY
AVA	ADJUSTABLE VALVE ACTUATION
AF	AIR FLOW INDICATOR

SEQUENCE OF OPERATION, RTU-1, 2 & 3

THIS SEQUENCE OF OPERATION APPLIES TO THE FOLLOWING ROOF MOUNTED DX UNITS: RTU-1, 2 & 3.

1. RTU OFF: THE SUPPLY FAN IS OFF, THE OUTDOOR AIR DAMPER IS CLOSED, THE RETURN DAMPER IS OPEN, THE ELECTRIC DUCT HEATER IS OFF AND THE HUMIDIFIER IS OFF.
2. OCCUPIED MODE: THE SUPPLY FAN RUNS CONTINUOUSLY DURING THE OCCUPIED MODE. THE ROOFTOP UNIT DX COOLING COIL OR GAS FURNACE MODULATE TO MAINTAIN THE SPACE TEMPERATURE SETPOINT, AS DESCRIBED BELOW. THE OUTDOOR AIR AND RETURN AIR DAMPERS ARE OPEN TO ALLOW THE SCHEDULED CFM OF OUTDOOR AIR INTO THE UNIT.
3. VENTILATION DELAY AND PRE-COOLING MODE OF OPERATION: DURING THE VENTILATION-DELAY MODE THE OUTDOOR AIR DAMPER IS CLOSED, THE RETURN DAMPER IS OPEN, SUPPLY FAN RUNS CONTINUOUSLY WITH THE DX COOLING COIL OR NATURAL GAS FURNACE MODULATING TO ACHIEVE DESIGN SPACE TEMPERATURES. UNTIL THE VENTILATION DELAY OR PRE-COOLING MODE ENDS, RETURN AIR IS CIRCULATED TO BRING THE BUILDING TO COMFORT CONDITIONS USING A MINIMUM OF ENERGY.
4. HUMIDITY CONTROL: THE HUMIDITY SENSORS ARE SHOWN ON THE DRAWINGS. TEMPERATURE AND HUMIDIFIER SENSORS SHALL BE LOCATED AT THE TOP OF THE ART ZONE OR A MAXIMUM OF 90" ABOVE FINISHED FLOOR.

   DEHUMIDIFICATION: WHEN THE USER DEFINABLE RELATIVE HUMIDITY (RH) IS EXCEEDED BY 3% THE ASSOCIATED ROOFTOP UNIT SHALL ENTER THE DEHUMIDIFICATION MODE. IN THIS MODE THE DX COOLING COIL SHALL ENTER FULL COOLING MODE TO LOWER THE TEMPERATURE LEAVING THE COOLING COIL TO BE 55° F. THE ELECTRIC REHEAT COIL, LOCATED DOWNSTREAM OF THE COOLING COIL, SHALL MODULATE VIA THE SCR CONTROL, TO REHEAT THE AIR TO THE UNIT SUPPLY AIR TEMPERATURE SETPOINT.

   HUMIDIFICATION: WHEN THE USER DEFINABLE RELATIVE HUMIDITY (RH) DROPS BELOW THAT VALUE BY 4% THE ROOFTOP UNIT SHALL ENTER THE HUMIDIFICATION MODE. IN THIS MODE THE ROOFTOP SUPPLY FAN IS ON, THE EXISTING HUMIDIFICATION STEAM DISTRIBUTION GRID, VIA THE STEAM GENERATOR, SHALL INJECT STEAM INTO THE SUPPLY DUCTWORK FOR 5 MINUTES TO ALLOW THE SPACE HUMIDITY TO NORMALIZE. IF, AT THAT TIME, THE RH IS STILL BELOW THE SETPOINT THE HUMIDIFIER SHALL CONTINUE TO OPERATE UNTIL THE SPACE RELATIVE HUMIDITY (RH) IS 3% ABOVE THE SETPOINT.
5. SAFETY SHUTDOWN OF THE FAN. THE CONTROL SYSTEM SHUTS DOWN THE ROOFTOP UNIT SUPPLY FAN IF SMOKE IS DETECTED OR HIGH HUMIDITY LEVELS ARE DETECTED. ALL OF THESE ALARM DEVICES SHALL HAVE AN OUTPUT DIRECTLY TO THE ROOTOP UNIT SHUTDOWN TERMINALS THAT WILL TURN THE ROOFTOP UNIT OFF UPON AN ALARM CONDITION.

a. SMOKE DETECTION. SMOKE DETECTORS SHALL SHUTDOWN THE ROOFTOP UNIT WHENEVER THE PRESENCE OF SMOKE IS DETECTED. TO RESTART THE UNIT, THE SMOKE DETECTOR MUST BE MANUALLY RESET.

b. HIGH HUMIDITY DETECTION. ON A RISE IN SPACE RH ABOVE THE HIGH LIMIT SETPOINT (USER ADJUSTABLE) THE ROOFTOP UNIT SHALL SHUTDOWN. TO RESTART THE UNIT, THE CONTROL PANEL MUST BE MANUALLY RESET.

SEQUENCE OF OPERATION, RTU- 4

THIS SEQUENCE OF OPERATION APPLIES TO THE FOLLOWING ROOF MOUNTED DX UNITS: RTU-4.

1. RTU OFF: THE SUPPLY FAN IS OFF, THE OUTDOOR AIR DAMPER IS CLOSED AND THE RETURN DAMPER IS OPEN.
2. OCCUPIED MODE: THE SUPPLY FAN RUNS CONTINUOUSLY DURING THE OCCUPIED MODE. THE ROOFTOP UNIT DX COOLING COIL OR GAS FURNACE MODULATE TO MAINTAIN THE SPACE TEMPERATURE SETPOINT, AS DESCRIBED BELOW. THE OUTDOOR AIR AND RETURN AIR DAMPERS ARE OPEN TO ALLOW THE SCHEDULED CFM OF OUTDOOR AIR INTO THE UNIT.
3. VENTILATION DELAY AND PRE-COOLING MODE OF OPERATION: DURING THE VENTILATION-DELAY MODE THE OUTDOOR AIR DAMPER IS CLOSED, THE RETURN DAMPER IS OPEN, SUPPLY FAN RUNS CONTINUOUSLY WITH THE DX COOLING COIL OR NATURAL GAS FURNACE MODULATING TO ACHIEVE DESIGN SPACE TEMPERATURES. UNTIL THE VENTILATION DELAY OR PRE-COOLING MODE ENDS, RETURN AIR IS CIRCULATED TO BRING THE BUILDING TO COMFORT CONDITIONS USING A MINIMUM OF ENERGY.
4. SAFETY SHUTDOWN OF THE FAN. THE CONTROL SYSTEM SHUTS DOWN THE ROOFTOP UNIT SUPPLY FAN IF SMOKE IS DETECTED OR HIGH HUMIDITY LEVELS ARE DETECTED. ALL OF THESE ALARM DEVICES SHALL HAVE AN OUTPUT DIRECTLY TO THE ROOTOP UNIT SHUTDOWN TERMINALS THAT WILL TURN THE ROOFTOP UNIT OFF UPON AN ALARM CONDITION.

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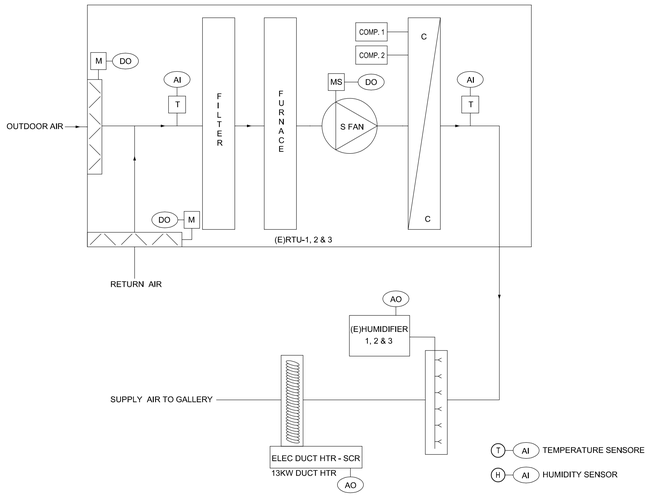
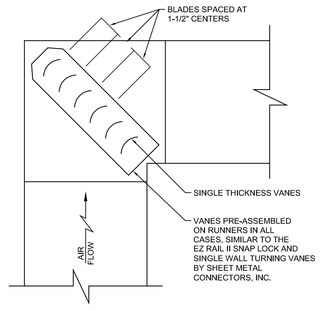
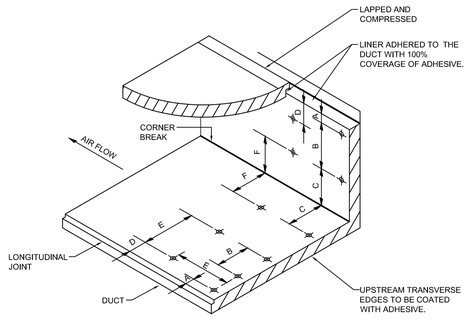


1 RTU-1, 2 & 3 CONTROL DIAGARM
NO SCALE



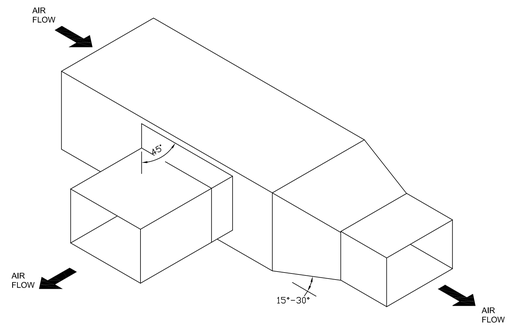
2 TYPICAL SQUARE ELBOW
SCALE: NO SCALE



MAXIMUM SPACING FOR FASTENERS
USED WITH FLEXIBLE DUCT LINER.

VELOCITY	UPSTREAM EDGE			MID-SECTION		
	A	B	C	D	E	F
0-2000 F.P.M.	3"	12"	12"	6"	18"	12"

3 FLEXIBLE DUCT LINER INSTALLATION DETAIL
SCALE: NO SCALE



4 DIVERGING TEE, 45° EXIT DETAIL
SCALE: NO SCALE

GENERAL NOTES

1. PERFORM ALL WORK IN ACCORDANCE WITH ALL APPLICABLE CODES AND AUTHORITIES HAVING JURISDICTION. PROVIDE ALL PERMITS, INSPECTIONS, LICENSES AND FEES. FURNISH ALL LABOR, EQUIPMENT, SUPPLIES, AND MATERIALS NECESSARY TO PROVIDE COMPLETE AND OPERATIONAL SYSTEMS.
2. THE DRAWINGS AND SPECIFICATIONS INDICATE THE GENERAL DESIGN AND ARRANGEMENT OF PIPES, FIXTURES, EQUIPMENT, SYSTEMS, ETC. INFORMATION SHOWN IS DIAGRAMMATIC IN CHARACTER AND DOES NOT NECESSARILY INDICATE EVERY REQUIRED OFFSET, FITTING, ETC. DO NOT SCALE THE DRAWINGS FOR DIMENSIONS. TAKE ALL DIMENSIONS, MEASUREMENTS, EQUIPMENT LOCATIONS, LEVELS, ETC. FROM THE ARCHITECTURAL DRAWINGS, FIELD MEASUREMENTS, AND FROM THE EQUIPMENT TO BE FURNISHED. PIPING MAY BE RELOCATED OR OFFSET FOR PROPER CLEARANCES OR TO AVOID CONFLICTS WITH OTHER TRADES. THE DESIGN INTENT (I.E. PITCHES, VELOCITIES, PRESSURE DROPS, VOLTAGE DROPS, ETC.) CANNOT BE GREATLY ALTERED WITHOUT THE APPROVAL OF THE ARCHITECT. THE COST OF THESE DEVIATIONS TO AVOID INTERFERENCE'S SHALL BE PART OF THE ORIGINAL CONTRACT BID.
3. CONFER AND COOPERATE WITH ALL OTHER TRADES TO COORDINATE THEIR WORK. COORDINATION SHALL INCLUDE, BUT SHALL NOT BE LIMITED TO, MATERIALS AND EQUIPMENT ROUTED IN CEILING AND WALL CAVITIES, EQUIPMENT ARRANGEMENT IN MECHANICAL SPACES, INCLUDING EQUIPMENT CLEARANCE REQUIREMENTS, ELEVATIONS AND DIMENSIONS OF STRUCTURAL MEMBERS AND OPENINGS, ETC. NOTIFY THE ARCHITECT OF ANY CONFLICTS.
4. BASE FINAL INSTALLATION OF MATERIALS AND EQUIPMENT ON ACTUAL DIMENSIONS AND CONDITIONS AT THE PROJECT SITE. FIELD MEASURE FOR MATERIALS AND EQUIPMENT REQUIRING EXACT FIT. NO EXTRAS WILL BE GIVEN FOR THE CONTRACTOR'S FAILURE TO FIELD COORDINATE.
5. THE OWNER OR ENGINEER ARE NOT RESPONSIBLE FOR THE CONTRACTOR'S SAFETY PRECAUTIONS OR FOR MEANS, METHODS, TECHNIQUES, CONSTRUCTION SEQUENCES, OR PROCEDURES REQUIRED TO PERFORM THE WORK.
6. LOCATE ALL EQUIPMENT THAT MUST BE SERVICED, OPERATED, OR MAINTAINED IN FULLY ACCESSIBLE POSITIONS. EQUIPMENT SHALL INCLUDE, BUT NOT BE LIMITED TO, VALVES, MOTORS, CONTROLLERS, SWITCHGEAR, AND DRAIN POINTS IF REQUIRED FOR BETTER ACCESSIBILITY. FURNISH ACCESS DOORS FOR THIS PURPOSE. MINOR DEVIATIONS FROM THE DRAWINGS MAY BE ALLOWED TO PROVIDE FOR BETTER ACCESSIBILITY. ANY CHANGES SHALL BE APPROVED BY THE ARCHITECT AND CONSTRUCTION MANAGER/GENERAL CONTRACTOR PRIOR TO MAKING THE CHANGE.
7. COORDINATE ELECTRICAL REQUIREMENTS OF APPROVED MECHANICAL EQUIPMENT WITH THE ELECTRICAL SUB-CONTRACTOR PRIOR TO THE PURCHASE AND INSTALLATION OF ANY ELECTRICAL EQUIPMENT, DEVICES, WIRING, OR CONDUIT.
8. ALL EQUIPMENT LISTED TO UL508A OR UL1995 SHALL HAVE A SHORT CIRCUIT CURRENT RATING (SCCR) OF THE ASSEMBLY MEETING OR EXCEEDING THE RATING OF THE PANEL FROM WHICH IT IS POWERED. SCCR RATINGS MAY BE REDUCED BASED ON ACTUAL CALCULATIONS BASED ON ACTUAL CONSTRUCTION AND IN ACCORDANCE WITH NEC. RATING SHALL BE STAMPPED ON EQUIPMENT AT THE FACTORY. REFER TO ELECTRICAL FOR ADDITIONAL INSTRUCTIONS.
9. ALL RECTANGULAR DUCTWORK SHALL HAVE 1.5" THICK DUCT LINER, ALL ROUND DUCTWORK SHALL HAVE 2" THICK DUCT WRAP INSULATION WITH VAPOR BARRIER. INSTALL INSULATION PER THE MANUFACTURER'S INSTRUCTIONS.
10. ALL ROOFTOP UNITS (TOTAL OF 4) SHALL BE ADJUSTED TO SUPPLY THE CFM SHOWN ON THE DRAWING. THE GALLERY 4 ROOFTOP UNIT SHALL BE TESTED PRIOR TO START OF WORK TO DETERMINE THE CURRENT CFM BEING SUPPLIED TO ALL OF THE SYSTEM AIR DIFFUSERS THAT ARE OUTSIDE THE GALLERY 4 AREA. WHEN THE WORK IS COMPLETE THE GALLERY 4 SPACE WILL BE BALANCED AS SHOWN ON THE DRAWINGS AND THE OTHER SYSTEM DIFFUSERS WILL BE BALANCED TO THE ORIGINAL CFM VALUES.
11. ALL DUCTWORK SHALL BE SHEET METAL, PAINT GRIP. FABRICATED TO SMACNA STANDARDS FOR +/-1" WG PRESSURE CLASS. SEAL ALL JOINTS TO SEAL CLASS "A".
12. ALL NEW DUCTWORK AND RETURN BULKHEADS SHALL BE PAINTED TO MATCH THE EXISTING COLOR OF THE STRUCTURE.

SYMBOLS

SYMBOL	DESCRIPTION
20/20	ACOUSTICAL DUCT LINING (FIGURES SHOWN ARE INSIDE DUCT DIMENSIONS)
20/20	SUPPLY AIR DUCT UP (POSITIVE PRESSURE)
20/20	RETURN AIR DUCT UP (NEGATIVE PRESSURE)
20/20	EXHAUST AIR DUCT UP (NEGATIVE PRESSURE)
20/20	SUPPLY AIR DUCT DN (POSITIVE PRESSURE)
20/20	RETURN AIR DUCT DN (NEGATIVE PRESSURE)
20/20	EXHAUST AIR DUCT DN (NEGATIVE PRESSURE)
18"Ø	ROUND SUPPLY AIR DUCT UP (POSITIVE PRESSURE)
18"Ø	ROUND RETURN AIR DUCT UP (NEGATIVE PRESSURE)
18"Ø	ROUND EXHAUST AIR DUCT UP (NEGATIVE PRESSURE)
18"Ø	ROUND SUPPLY AIR DUCT DN (POSITIVE PRESSURE)
18"Ø	ROUND RETURN AIR DUCT DN (NEGATIVE PRESSURE)
18"Ø	ROUND EXHAUST AIR DUCT DN (NEGATIVE PRESSURE)
	RECTANGULAR DUCT SQUARE ELBOW WITH TURNING VANES
W, R=3W/2	RECTANGULAR DUCT RADIUS ELBOW
D, R=3D/2	ROUND DUCT RADIUS ELBOW
20/20 16/20	TRANSITION CONCENTRIC UNLESS TOP LEVEL (TOP LVL) OR BOTTOM LEVEL (BOT LVL) IS NOTED
20/20 16"Ø	TRANSITION, RECTANGULAR TO ROUND CONCENTRIC UNLESS TOP LEVEL (TOP LVL) OR BOTTOM LEVEL (BOT LVL) IS NOTED
	FLEXIBLE DUCT CONNECTION
	SOUND ATTENUATOR
	SQUARE CEILING DIFFUSER (SUPPLY) (4-WAY UNLESS OTHERWISE INDICATED)
	SQUARE CEILING GRILLE (RETURN)
	SQUARE CEILING GRILLE (EXHAUST)
T TS	THERMOSTAT (OR) TEMP SENSOR
	DUCT SPLITTER WITH DAMPER
M	MOTORIZED DAMPER
OR	MANUAL VOLUME DAMPER
FD	FIRE DAMPER
FSD	FIRE SMOKE DAMPER

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BRIAN D. RICHARDS
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LICENSED
PROFESSIONAL ENGINEER
12/06/2021

Midwestern State University
Wichita Falls Museum of Art
HVAC System Modificaitons

2 Eureka Cir.
Wichita Falls, TX 76308

DATE ISSUED:
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ISSUED FOR CONST.	12-06-2021

REVISIONS:

SHEET CONTENTS:
GENERAL NOTES
AND DETAILS

SHEET NUMBER:
M0.1

N
TRUE