HVAC GENERAL NOTES

1. COMPLY WITH ALL APPLICABLE INTERNATIONAL BUILDING CODES FOR ALL WORK UNDER THIS CONTRACT.
2. THESE DOCUMENTS ARE DIAGRAMATIC IN NATURE AND ARE NOT TO BE SCALED. REFERENCE ARCHITECTURAL DRAWINGS FOR ALL DIMENSIONS.
3. ALL DETAILS AND SECTIONS SHOWN ON THE DRAWINGS ARE INTENDED TO BE TYPICAL AND SHALL BE CONSTRUCTED TO APPLY TO ANY SIMILAR SITUATION ELSEWHERE ON THE PROJECT, EXCEPT WHERE A DIFFERENT DETAIL IS SHOWN.
4. THE CONTRACTOR SHALL FURNISH ALL ADDITIONAL DATA AND DOCUMENTATION TO SECURE ALL REQUIRED PERMITS AND SHALL COORDINATE THIS DATA WITH THE CONSTRUCTION DOCUMENTS WHERE REQUIRED.
5. AS A MINIMUM, ALL WORK SHALL CONFORM TO THE APPLICABLE BUILDING CODE ADOPTED BY THE JURISDICTION OF THE SITE. WHERE MORE STRINGENT CODES ARE ADOPTED, THEY SHALL GOVERN THE WORK.
6. SIZE REFRIGERANT PIPING IN ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS BASED ON THE PROJECT SPECIFIC LAYOUT AND LENGTH OF REFRIGERANT PIPING. REFER TO SERIES DRAWINGS FOR ADDITIONAL INFORMATION.
7. FABRICATE ALL DUCTWORK IN ACCORDANCE WITH SMACNA STANDARDS. ALL DUCTWORK SHALL BE A MINIMUM OF 26 GAUGE.
8. PROVIDE MANUAL VOLUME DAMPERS AT EACH DUCT BRANCH LEADING TO AN OUTLET OPENING. INSTALL DAMPERS AS FAR AS POSSIBLE AWAY FROM THE DIFFUSER.
9. REFER TO AIR DEVICE SCHEDULE FOR INLET DUCT SIZES UNLESS OTHERWISE NOTED.
10. INSTALL EQUIPMENT SUCH THAT ALL MANUFACTURER'S RECOMMENDED CLEARANCES AND MAINTAINED. CONTRACTOR IS RESPONSIBLE FOR COORDINATING ALL EQUIPMENT LOCATIONS WITH OTHER TRADES.
11. WHERE MATERIALS REFERENCED ON DRAWINGS, OR NECESSARY TO COMPLETE THE WORK OF THIS CONTRACT ARE NOT SPECIFIED HEREIN, PROVIDE BEST QUALITY MATERIALS. WHERE MATERIALS ARE INTENDED TO MATCH EXISTING, PROVIDE CLOSEST POSSIBLE MATCH, SUBJECT TO OWNER'S APPROVAL. ALL ITEMS AND WORK ON DRAWINGS ARE NEW UNLESS INDICATED OTHERWISE. ALL WORK WHICH HAS BEEN DAMAGED SHALL BE REPAIRED OR REPLACED. WHERE ITEM CANNOT BE REPAIRED TO A "NEW CONDITION," OR WHERE THE STRUCTURAL INTEGRITY HAS BEEN AFFECTED, ITEM SHALL BE REPLACED.
12. COORDINATE ALL ROOF PENETRATION SIZES AND LOCATIONS WITH APPROVED EQUIPMENT SHOP DRAWINGS.
13. COORDINATE ALL MECHANICAL, PLUMBING AND ELECTRICAL WORK AND EQUIPMENT WITH STRUCTURAL MEMBERS, ELECTRICAL WORK, FIXTURES AND ALL OTHER TRADES.
14. PROVIDE VFD'S, STARTERS AND DISCONNECT SWITCHES FOR ALL MECHANICAL EQUIPMENT WHICH COMPLY WITH SPECIFICATIONS FOR MANUFACTURER QUALITY, CONFORMANCE AND OPTIONS.
15. COORDINATE FINAL THERMOSTAT LOCATIONS WITH INTERIOR FINISH AND FURNITURE EQUIPMENT DRAWINGS PRIOR TO INSTALLATION. MOUNT SENSORS 48" AFF TO THE TOP OF THE DEVICE.
16. THE CONTRACTOR SHALL PROVIDE A COMPLETE HVAC SYSTEM TO INCLUDE ALL LABOR, MATERIALS, TOOLS AND EQUIPMENT FOR A COMPLETE AND FUNCTIONAL SYSTEM INCLUDING ALL NECESSARY APPURTENCES CUSTOMARILY INCLUDED IF NOT SPECIFICALLY CALLED OUT.
17. DUCTWORK SIZES SHOWN ON DRAWINGS ARE INSIDE CLEAR DIMENSIONS.
18. REFER TO ELECTRICAL DRAWINGS FOR VOLTAGE AND PHASE REQUIREMENTS OF ALL EQUIPMENT REQUIRING AN ELECTRICAL CONNECTION. COORDINATE WITH ELECTRICAL AND NOTIFY ARCHITECT AND ENGINEER OF ANY EQUIPMENT DIFFERING IN VOLTAGE OR PHASE.
19. THE CONTRACTOR SHALL MAKE TESTS FOR ACCEPTANCE AND APPROVAL AS REQUIRED BY CODE AND THE REQUIREMENTS FOR APPLICABLE REGULATORY AGENCIES. REQUIRED TESTS SHALL BE PERFORMED IN THE PRESENCE OF THE DESIGNER AND/OR OWNER UNLESS OTHERWISE NOTED IN DRAWINGS AND SPECIFICATIONS. ALL TESTS SHALL BE COMPLETED PRIOR TO ANY MECHANICAL EQUIPMENT, PIPING OR DUCTWORK INSULATION BEING APPLIED.
20. PROVIDE VIBRATION ISOLATION FOR ALL MECHANIAL EQUIPMENT TO PREVENT TRANSMISSION OF VIBRATION TO BUILDING STRUCTURE.
21. ALL SWITCHES, OUTLETS, THERMOSTATS, CLOCKS, SPEAKERS OR OTHER WALL MOUNTED DEVICES OR CONTROLS SHALL BE INSTALLED IN LOCATIONS WHICH ARE UNOBSTRUCTED BY CABINETS, RACKS, FIXTURES, FURNISHINGS OR EQUIPMENT. ITEMS INTENDED FOR WALL MOUNTING SHALL BE INSTALLED ON THROUGH OR INTO ANY OTHER EQUIPMENT UNLESS SPECIFICALLY CALLED FOR. VERIFY MOUNTING HEIGHTS WITH ADA REQUIREMENTS.
22. ALL AREAS WHERE DUCTWORK IS EXPOSED TO VIEW, DUCTWORK AND ASSOCIATED DIFFUSERS AND GRILLES SHALL BE METALLIC COLOR.
23. SIDEWALL DIFFUSERS AND GRILLES COLOR TO BE DETERMINED BY ARCHITECT.
24. PROVIDE ESCUTCHEONS AT ALL LOCATIONS WHERE EITHER DUCTWORK OR PIPING EXPOSED TO VIEW PENETRATES WALLS OR SOFFITS. ESCUTCHEON COLOR TO MATCH DUCTWORK OR PIPING COLOR.
25. ALL INDOOR REFRIGERANT EQUIPMENT SHALL BE INSTALLED AS HIGH AS POSSIBLE TO CONCEAL CONDENSATE DRAIN AND ALLOW FOR DRAINAGE VIA GRAVITY.
26. LEAKAGE TEST: COMPLY WITH SMACNA'S "HVAC AIR DUCT LEAKAGE TEST MANUAL" SUBMIT TEST REPORT FOR DOAS SUPPLY DUCT. PRESSURE TEST DUCT AT 2" WG.
27. ALL EQUIPMENT WITH MOTORS SHALL BE PROVIDED WITH VIBRATION ISOLATION.

TEST AND BALANCE NOTES

1. TEST AND BALANCE SPECIALIST SHALL BE CERTIFIED BY AABC, NEBB OR TABB.
2. PERFORM TESTING AND BALANCING PROCEDURES ON EACH SYSTEM ACCORDING TO THE PROCEDURES CONTAINED IN AABC'S "NATIONAL STANDARDS FOR TOTAL SYSTEM BALANCE", ASHRAE 111, NEBB'S "PROCEDURAL STANDARDS FOR TESTING, ADJUSTING, AND BALANCING OF ENVIRONMENTAL SYSTEMS", SMACNA'S "HVAC SYSTEMS - TESTING, ADJUSTING, AND BALANCING" AND IN THIS SECTION.
3. CHECK DAMPERS FOR PROPER POSITION TO ACHIEVE DESIRED AIRFLOW PATH.
4. CHECK FOR AIRFLOW BLOCKAGES.
5. CHECK CONDENSATE DRAINS FOR PROPER CONNECTIONS AND FUNCTIONING.
6. CHECK FOR PROPER SEALING OF AIR-HANDLING-UNIT COMPONENTS.
7. VERIFY THAT AIR DUCT SYSTEM IS SEALED.
8. PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS:
   - A. ADJUST FANS TO DELIVER TOTAL INDICATED AIRFLOWS WITHIN THE MAXIMUM ALLOWABLE FAN SPEED LISTED BY FAN MANUFACTURER.
     - I. MEASURE TOTAL AIRFLOW.
       1. SET OUTSIDE-AIR, RETURN-AIR, AND RELIEF-AIR DAMPERS FOR PROPER POSITION THAT SIMULATES MINIMUM OUTDOOR-AIR CONDITIONS.
       2. WHERE DUCT CONDITIONS ALLOW, MEASURE AIRFLOW BY PITOT-TUBE TRAVERSE. IF NECESSARY, PERFORM MULTIPLE PITOT-TUBE TRAVERSES TO OBTAIN TOTAL AIRFLOW.
       3. WHERE DUCT CONDITIONS ARE NOT SUITABLE FOR PITOT-TUBE TRAVERSE MEASUREMENTS, A COIL TRAVERSE MAY BE ACCEPTABLE.
       4. IF A RELIABLE PITOT-TUBE TRAVERSE OR COIL TRAVERSE IS NOT POSSIBLE, MEASURE AIRFLOW AT TERMINALS AND CALCULATE THE TOTAL AIRFLOW.
     - II. MEASURE FAN STATIC PRESSURES AS FOLLOWS:
       1. MEASURE STATIC PRESSURE DIRECTLY AT THE FAN OUTLET OR THROUGH THE FLEXIBLE CONNECTION.
       2. MEASURE STATIC PRESSURE DIRECTLY AT THE FAN INLET OR THROUGH THE FLEXIBLE CONNECTION.
       3. MEASURE STATIC PRESSURE ACROSS EACH COMPONENT THAT MAKES UP THE AIR-HANDLING SYSTEM.
       4. REPORT ARTIFICIAL LOADING OF FILTERS AT THE TIME STATIC PRESSURES ARE MEASURED.
     - III. REVIEW RECORD DOCUMENTS TO DETERMINE VARIATIONS IN DESIGN STATIC PRESSURES VERSUS ACTUAL STATIC PRESSURES. CALCULATE ACTUAL SYSTEM-EFFECT FACTORS. RECOMMEND ADJUSTMENTS TO ACCOMMODATE ACTUAL CONDITIONS.
     - IV. OBTAIN APPROVAL FROM CONSTRUCTION MANAGER FOR ADJUSTMENT OF FAN SPEED HIGHER OR LOWER THAN INDICATED SPEED. COMPLY WITH REQUIREMENTS IN HVAC SECTIONS FOR AIR-HANDLING UNITS FOR ADJUSTMENT OF FANS, BELTS, AND PULLEY SIZES TO ACHIEVE INDICATED AIR-HANDLING-UNIT PERFORMANCE.
     - V. DO NOT MAKE FAN-SPEED ADJUSTMENTS THAT RESULT IN MOTOR OVERLOAD. CONSULT EQUIPMENT MANUFACTURERS ABOUT FAN-SPEED SAFETY FACTORS. MODULATE DAMPERS AND MEASURE FAN-MOTOR AMPERAGE TO ENSURE THAT NO OVERLOAD OCCURS. MEASURE AMPERAGE IN FULL-COOLING, FULL-HEATING, ECONOMIZER, AND ANY OTHER OPERATING MODE TO DETERMINE THE MAXIMUM REQUIRED BRAKE HORSEPOWER.
   - B. ADJUST VOLUME DAMPERS FOR MAIN DUCT, SUBMAIN DUCTS, AND MAJOR BRANCH DUCTS TO INDICATED AIRFLOWS.
     - I. MEASURE AIRFLOW OF SUBMAIN AND BRANCH DUCTS.
     - II. ADJUST SUBMAIN AND BRANCH DUCT VOLUME DAMPERS FOR SPECIFIED AIRFLOW.
     - III. RE-MEASURE EACH SUBMAIN AND BRANCH DUCT AFTER ALL HAVE BEEN ADJUSTED.
   - C. ADJUST AIR INLETS AND OUTLETS FOR EACH SPACE TO INDICATED AIRFLOWS.
     - I. SET AIRFLOW PATTERNS OF ADJUSTABLE OUTLETS FOR PROPER DISTRIBUTION WITHOUT DRAFTS.
     - II. MEASURE INLETS AND OUTLETS AIRFLOW.
     - III. ADJUST EACH INLET AND OUTLET FOR SPECIFIED AIRFLOW.
     - IV. RE-MEASURE EACH INLET AND OUTLET AFTER THEY HAVE BEEN ADJUSTED.
   - D. VERIFY FINAL SYSTEM CONDITIONS.
     - I. RE-MEASURE AND CONFIRM THAT MINIMUM OUTDOOR, RETURN, AND RELIEF AIRFLOWS ARE WITHIN DESIGN. READJUST TO DESIGN IF NECESSARY.
     - II. RE-MEASURE AND CONFIRM THAT TOTAL AIRFLOW IS WITHIN DESIGN.
     - III. RE-MEASURE ALL FINAL FAN OPERATING DATA, RPMS, VOLTS, AMPS, AND STATIC PROFILE.
     - IV. MARK ALL FINAL SETTINGS.
     - V. TEST SYSTEM IN ECONOMIZER MODE. VERIFY PROPER OPERATION AND ADJUST IF NECESSARY.
     - VI. MEASURE AND RECORD ALL OPERATING DATA.
     - VII. RECORD FINAL FAN-PERFORMANCE DATA.
9. ONCE ALL THE SYSTEM IS FINAL AND BALANCED AND APPROVED BY OWNER/ENGINEER. THE ROOM REGISTERS WITH INTEGRAL DAMPERS SHALL BE TACK WELDED TO NOT ALLOW FOR ADJUSTMENT.
10. PROCEDURES FOR HEAT-TRANSFER COILS:
    - A. MEASURE, ADJUST, AND RECORD THE FOLLOWING DATA FOR EACH ELECTRIC HEATING COIL:
      - I. NAMEPLATE DATA.
      - II. AIRFLOW.
      - III. ENTERING- AND LEAVING-AIR TEMPERATURE AT FULL LOAD.
      - IV. VOLTAGE AND AMPERAGE INPUT OF EACH PHASE AT FULL LOAD.
      - V. CALCULATED KILOWATT AT FULL LOAD.
      - VI. FUSE OR CIRCUIT-BREAKER RATING FOR OVERLOAD PROTECTION.
    - B. MEASURE, ADJUST, AND RECORD THE FOLLOWING DATA FOR EACH REFRIGERANT COIL:
      - I. DRY-BULB TEMPERATURE OF ENTERING AND LEAVING AIR.
      - II. WET-BULB TEMPERATURE OF ENTERING AND LEAVING AIR.
      - III. AIRFLOW.
11. TOLERANCES:
    - A. SET HVAC SYSTEMS AIRFLOW RATES WITHIN THE FOLLOWING TOLERANCES:
      - I. SUPPLY, RETURN, AND EXHAUST FANS AND EQUIPMENT WITH FANS: PLUS OR MINUS 5%.
      - II. AIR OUTLETS AND INLETS: PLUS OR MINUS 10%
    - B. THE BUILDING SHALL BE POSITIVELY PRESSURIZED ON ALL FLOORS TO MITIGATE INFILTRATION.

MECHANICAL SYMBOLS

EQUIPMENT DESIGNATIONS

SYMBOL	DESCRIPTION
AC-X	AIR COMPRESSOR DESIGNATION
ACC-X	AIR COOLED CHILLER DESIGNATION
ACCU-X	AIR COOLED CONDENSING UNIT DESIGNATION
ACU-X	AIR CONDITIONING UNIT DESIGNATION
AD-X	AIR DRYER DESIGNATION
AHU-X	AIR HANDLING UNIT DESIGNATION
AMD-X	AIRFLOW MONITORING DEVICE DESIGNATION
AS-X	AIR SEPARATOR DESIGNATION
B-X	BOILER DESIGNATION
CAD-X	COMPRESSED AIR DRYER DESIGNATION
CC-X	COOLING COIL DESIGNATION
CCP-X	COIL CIRCULATING PUMP DESIGNATION
CFP-X	CHEMICAL FEED PUMP DESIGNATION
CH-X	CHILLER DESIGNATION
CHP-X	CHILLED WATER PUMP DESIGNATION
CHX-X	CHILLED WATER HEAT EXHANGER DESIGNATION
CRU-X	CONDENSATE RETURN UNIT DESIGNATION
CUH-X	CABINET UNIT HEATER DESIGNATION
CWP-X	CONDENSER WATER PUMP DESIGNATION
CT-X	COMBUSTION TURBINE DESIGNATION
CT-X	COOLING TOWER DESIGNATION
DA-X	DEAERATOR DESIGNATION
DHC-X	DUCT HEATING COIL DESIGNATION
EDHC-X	ELECTRIC DUCT HEATING COIL DESIGNATION
EF-X	EXHAUST FAN DESIGNATION
ET-X	EXPANSION TANK DESIGNATION
EUH-X	ELECTRIC UNIT HEATER DESIGNATION
F-X	FILTER DESIGNATION
FCU-X	FAN COIL UNIT DESIGNATION
FOP-X	FUEL OIL PUMP DESIGNATION
FTR-X	FINNED TUBE RADIATION DESIGNATION
FWP-X	FEEDWATER PUMP DESIGNATION
G-X	GENERATOR DESIGNATION
GEF-X	GENERAL EXHAUST FAN DESIGNATION
H-X	HUMIDIFIER DESIGNATION
HRC-X	HEAT RECOVERY COIL DESIGNATION
HRSG-X	HEAT RECOVERY STEAM GENERATOR DESIGNATION
HRW-X	HEAT RECOVERY WHEEL DESIGNATION
HWP-X	HEATING WATER PUMP DESIGNATION
HX-X	HEAT EXCHANGER DESIGNATION
HV-X	HEATING AND VENTILATING UNIT DESIGNATION
LEF-X	LABORATORY EXHAUST FAN DESIGNATION
LGE-X	LOUVERED GRAVITY EXHAUST DESIGNATION
MAU-X	MAKEUP AIR UNIT DESIGNATION
PCHP-X	PRIMARY CHILLED WATER PUMP DESIGNATION
PCP-X	PUMP CONTROL PANEL DESIGNATION
PHWP-X	PRIMARY HEATING COIL DESIGNATION
PHP-X	PRIMARY HEATING WATER PUMP DESIGNATION
PHE-X	PLATE HEAT EXCHANGER DESIGNATION
RF-X	RETURN FAN DESIGNATION
RPU-X	REFRIGERANT PUMPOUT UNIT DESIGNATION
RTU-X	ROOFTOP AIR HANDLING UNIT DESIGNATION
SA-X	SOUND ATTENUATOR DESIGNATION
SC-X	SURFACE CONDENSER DESIGNATION
SCHP-X	SECONDARY CHILLED WATER PUMP DESIGNATION
SEF-X	SMOKE EXHAUST FAN DESIGNATION
SF-X	SUPPLY FAN DESIGNATION
SG-X	STEAM GENERATOR DESIGNATION
SHWP-X	SECONDARY HEATING WATER PUMP DESIGNATION
SPSS-X	STATIC PRESSURE SENSOR DESIGNATION
SS-X	SIDESTREAM SEPERATOR DESIGNATION
ST-X	STEAM TRAP DESIGNATION
TEF-X	TOILET EXHAUST FAN DESIGNATION
V-X	VALVE DESIGNATION
VF-X	VENTILATION FAN DESIGNATION

PIPING SYMBOLS

SYMBOL	DESCRIPTION
CD	CONDENSATE DRAIN
HPR	HIGH PRESSURE STEAM RETURN
HPS	HIGH PRESSURE STEAM SUPPLY
RL	REFRIGERANT LIQUID
RS	REFRIGERANT SUCTION

FIRE RATED PARTITION LINETYPES

SYMBOL	DESCRIPTION
	PARTITION THAT LIMITS SMOKE TRANSMISSION
	1/2 HOUR FIRE PARTITION
	1 HOUR FIRE PARTITION
	2 HOUR FIRE PARTITION
	3 HOUR FIRE PARTITION
	1 HOUR FIRE AND SMOKE BARRIER
	2 HOUR FIRE AND SMOKE BARRIER

PIPING COMPONENTS AND SPECIATIES

SYMBOL	DESCRIPTION
	PIPE GUIDE
	PIPE HANGER
S	PIPE SLIDE
	PIPE ANCHOR
	FLOAT AND THERMOSTATIC STEAM TRAP
	THERMODYNAMIC STEAM TRAP
	STEAM SEPARATOR
S B	SOOTBLOWER VALVE
	NEEDLE VALVE (NORMALLY OPEN)
	NEEDLE VALVE (NORMALLY CLOSED)
	NON-RETURN ANGLE VALVE
	NON-RETURN STRAIGHT VALVE
	VENTURI EDUCTOR VALVE
	VENTURI FLOW METER
	QUICK OPENING VALVE
	BASKET STRAINER
	BELLOWS EXPANSION JOINT
	COMPRESSION / EXPANSION JOINT
	ELECTRICAL HEAT TRACE
	EXHAUST HEAD WITH SLASH BLOCK
R	REFRIGERANT LEAK DETECTION STROBE/HORN ALARM
CS/CU	CORROSION COUPON
	DUPLEX STRAINER
	FLEXIBLE PIPE
FM	FLOW METER
M	FLOW METER (WITH POSITIVE DISPLACEMENT)
	FLOW METER (PROBE STYLE)
	GOOSENECK VENT
	ORIFICE FITTING
	POSITIVE DISPLACEMENT FLOW INDICATOR
	SUCTION DIFFUSER
	TURBINE
	PUMP

DUCTWORK SYMBOLS

SYMBOL	DESCRIPTION
H	HUMIDITY SENSOR
T	TEMPERATURE SENSOR
C	CARBON DIOXIDE SENSOR
	DUCT SMOKE DETECTOR
	SMOKE DETECTOR (IONIZATION)
	AIR FLOW
100 CFM	TRANSFER AIR FLOW (CFM INDICATED)
DL	DOOR LOUVER
UCD	UNDERCUT DOOR
	SUPPLY AIR DIFFUSER
	RETURN AIR GRILLE
	EXHAUST AIR GRILLE
	CIRCULAR AIR DIFFUSER
	AIRFLOW MONITORING DEVICE
	STATIC PRESSURE SENSING STATION
FD	FIRE DAMPER
FSD	COMBINATION FIRE / SMOKE DAMPER
VD	VOLUME DAMPER
BDD	BACK DRAFT DAMPER
	AUTOMATIC ISOLATION DAMPER
	AUTOMATIC GAS TIGHT ISOLATION DAMPER
	MANUAL GAS TIGHT ISOLATION DAMPER
SD	SMOKE DAMPER
SD	SMOKE DETECTOR
	FLEXIBLE CONNECTION
	DUCTWORK W/ SOUND LINING
	HORIZONTAL ACCESS DOOR
	VERTICAL ACCESS DOOR
	ELBOW W/ DOUBLE THICKNESS TURNING VANES
	RECTANGULAR BRANCH TAKE-OFF
	BELL MOUTH BRANCH TAKE-OFF
	ROUND BRANCH TAKE-OFF
	ROUND DUCT DROP OFF BOTTOM
	DUCT TRANSITION
	SQUARE TO ROUND TRANSITION
UP/DN	DUCTWORK CHANGE IN ELEVATION (UP OR DOWN)
	SUPPLY / OUTSIDE AIR DUCT RISER
	RETURN AIR DUCT RISER
	EXHAUST / RELIEF AIR DUCT RISER
	ROUND DUCT RISER
	ALL WELDED VEHICLE EXHAUST DUCT CONNECTION
X	SUPPLY AIR VOLUME TERMINAL UNIT IDENTIFIER
X	EXHAUST AIR TERMINAL UNIT IDENTIFIER
X AIR DEVICE TYPE XX CFM	AIR DEVICE IDENTIFIER

CONTROL AND INSTRUMENTATION LEGEND

CONTROLS SYMBOLS

SYMBOL	DESCRIPTION
T	SPACE THERMOSTAT
H	SPACE HUMIDISTAT
	DUCT OR PIPE THERMOMETER
TT-	TEMPERATURE TRANSMITTER
HT-	HUMIDITY TRANSMITTER
HLHT-	HIGH LIMIT HUMIDITY TRANSMITTER
PT-	PRESSURE TRANSMITTER
	PRESSURE GAGE WITH BALL VALVE
D-	CONTROL OR ISOLATION DAMPER
BDD	COUNTER BALANCE/GRAVITY BACKDRAFT DAMPER
FZ-	FREEZESTAT
AMS	AIR MONITORING STATION
CT	CURRENT TRANSDUCER
AMD	AIR MONITORING DEVICE WITH PRESSURE TRANSMITTER
DPT	DIFFERENTIAL PRESSURE TRANSMITTER
DPS	DIFFERENTIAL PRESSURE SWITCH OR SENSOR
PT	PRESSURE TRANSMITTER
VFD	VARIABLE FREQUENCY DRIVE
ES	END SWITCH
ATMD	AIRFLOW TEMPERATURE MEASURING DEVICE
M	MAGNAHELIC GAGE
M	METER
M	MOTOR
SD	SMOKE DETECTOR
SPS-	STATIC PRESSURE SENSING STATION
LPS	LOW PRESSURE SWITCH
S-	MANUAL SWITCH - START/STOP, FAN SPEED, OCCUPIED/UNOCCUPIED
BFM-	BUILDING FLOW METER
V-	TWO WAY CONTROL VALVE
V-	THREE WAY CONTROL VALVE
P-	COIL OR DOMESTIC WATER CIRCULATION PUMP
	IP68 22mm DIAMETER RED, YELLOW, OR GREEN LED STATUS INDICATORS
	IP68 22mm DIAMETER KEY SWITCHES, KEYED ALIKE. "ON" TO THE RIGHT
	ROOM PRESSURE SENSOR

SYMBOL	DESCRIPTION
	NORMALLY OPEN CONTACT
	INDICATION INPUT POINT
PI	PRESSURE INDICATOR
UPS	UNINTERUPTIBLE POWER SUPPLY (UPS)
DDCP	DIRECT DIGITAL CONTROL PANEL (DDCP)
	WORKSTATION/MONITOR
OS	OXYGEN DEPLETION SENSOR
RM	REFRIGERANT MONITOR
XX	DIGITAL PRESSURE, TEMPERATURE OR HUMIDITY INDICATION DEVICE
	VISIBLE OXYGEN DEPLETION ALARM
	AUDIBLE OXYGEN DEPLETION ALARM

DEVICE DESIGNATIONS

D-X-X	DAMPER DESIGNATION
V-X-X	VALVE DESIGNATION
SPS-X-X	STATIC PRESSURE SENSOR DESIGNATION
HT-X-X	HUMIDITY TRANSMITTER DESIGNATION
TT-X-X	TEMPERATURE TRANSMITTER DESIGNATION
CH-X	CHILLER DESIGNATION
CT-X	COOLING TOWER DESIGNATION
CHP-X	CHILLED WATER PUMP DESIGNATION
ST-X	STEAM TRAP DESIGNATION
SYSTEM TYPE (AI,BI,AO,BO) / POINT NUMBER	DDC POINT IDENTIFIER

ABBREVIATIONS

AI	ANALOG INPUT
AO	ANALOG OUTPUT
BI	BINARY INPUT
BO	BINARY OUTPUT
C	COMMON
MOD	MOTOR OPERATED DAMPER
NO	NORMALLY OPEN
NC	NORMALLY CLOSED
2 POS	TWO POSITION

DRAWING LIST

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ISSUE FOR
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ISSUE DATE
09.11.2018

REVISIONS

NO.	REASON	DATE

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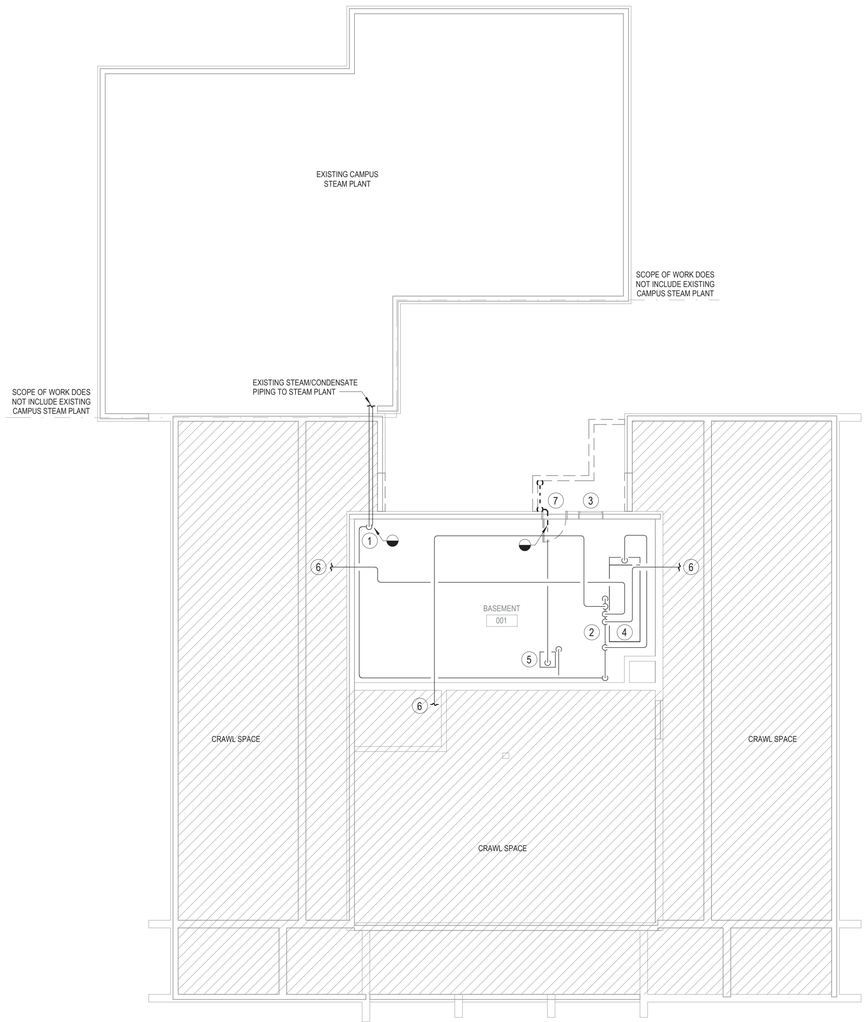
DESIGN TEAM
RMF

PROJECT NAME
CAMPBELL UNIVERSITY
DAY HALL RENOVATIONS

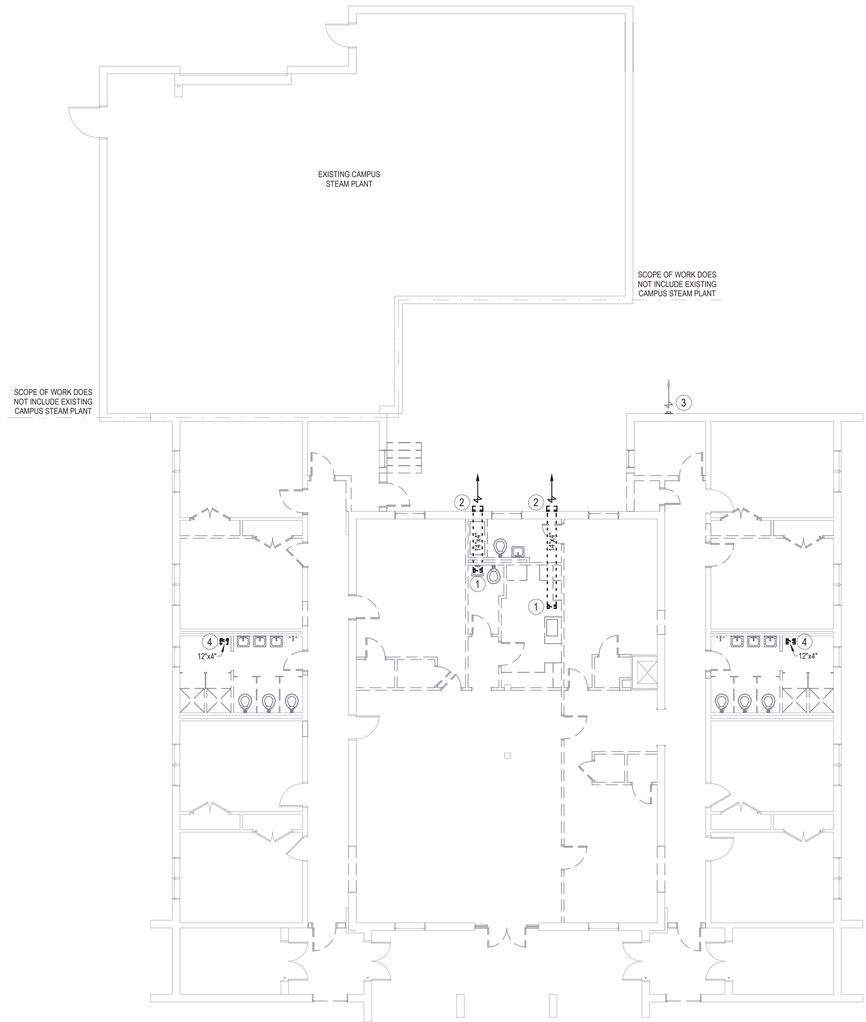
PROJECT NO.
513.9660.00

SHEET TITLE
MECHANICAL NOTES, SYMBOLS AND ABBREVIATIONS

SHEET NUMBER
M001



1 M101 — **LEVEL 0 - MECHANICAL DEMOLITION**
SCALE: 1/8" = 1'-0"



2 M101 — **LEVEL 1 - MECHANICAL DEMOLITION**
SCALE: 1/8" = 1'-0"

GENERAL NOTES

1. ALL PIPING ON THIS LEVEL NOT WITHIN EXISTING MECHANICAL ROOM LOCATED WITHIN MECHANICAL CRAWL SPACE.

SHEET NOTES

1. EXISTING STEAM AND STEAM CONDENSATE RETURN PIPING FROM CENTRAL CAMPUS STEAM PLANT. EXISTING STEAM PRESSURE REDUCING STATION ABANDONED IN PLACE. SHUT OFF STEAM TO THE BUILDING IN STEAM PLANT ISOLATING DAY HALL. NO LIVE STEAM TO BE LEFT IN DAY HALL. CUT STEAM PIPING DOWNSTREAM OF SHUT-OFF VALVE AND CAP BOTH ENDS. PROVIDE LABEL ON SHUTOFF VALVE STATING "STEAM SUPPLY PIPING ABANDONED IN PLACE", WITH DATE. DRAIN STEAM SYSTEM ONCE COOL AND ABANDON IN PLACE.
2. EXISTING STEAM PRESSURE REDUCING STATION, STEAM RELIEF VENT AND LOW PRESSURE STEAM MANIFOLD TO BE ABANDONED IN PLACE.
3. DEMOLISH EXISTING VENTILATION FAN AND LOUVER. SEE ARCHITECTURAL DRAWINGS FOR PATCHING.
4. EXISTING STEAM TO HOT WATER HEAT EXCHANGER FOR DOMESTIC WATER PRODUCTION TO REMAIN - ABANDON IN PLACE.
5. EXISTING STEAM CONDENSATE RECEIVER PUMP TO REMAIN - ABANDON IN PLACE.
6. EXISTING STEAM AND CONDENSTATE PIPING TO STEAM RADIATORS ON FLOORS 1 THROUGH 3. CUT AND CAP STEAM/CONDENSATE PIPING 6" BELOW FIRST FLOOR LEVEL. ABANDON ALL STEAM AND CONDENSATE PIPING ON BASEMENT LEVEL.
7. EXISTING STEAM CONDENSATE PUMP VENT TERMINATING IN MECHANICAL BASEMENT ENTRANCE. DEMOLISH PIPING AS NECESSARY FOR NEW WALL CONSTRUCTION.

GENERAL NOTES

1. ALL MECHANICAL STEAM AND CONDENSATE PIPING ON THIS LEVEL TO BE DEMOLISHED UNLESS NOTED OTHERWISE.
2. ALL STEAM RADIATORS TO BE DEMOLISHED. STEAM/CONDENSATE PIPING CAPPED IN BASEMENT LEVEL. ALL PIPING ON THIS FLOOR TO BE DEMOLISHED.

SHEET NOTES

1. DEMOLISH EXISTING CEILING EXHAUST FANS AND DUCTWORK.
2. DEMOLISH EXISTING EXHAUST LOUVERS ON EXTERIOR OF BUILDING. SEE ARCHITECTURAL DRAWINGS FOR WALL PATCHING.
3. EXISTING DRYER VENT TO REMAIN. DEMOLISH ANY DUCT CONNECTIONS AND PROVIDE SHEET METAL BLANK-OFF PANEL. CAP AND INSULATE.
4. DEMOLISH EXISTING EXHAUST DUCTWORK, SUPPORTS, AND AIR DEVICES.

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NORTH CAROLINA PROFESSIONAL SEAL 041471 ENGINEER BLAKE A. SMITH

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ISSUE FOR
PERMIT SET

ISSUE DATE
09.11.2018

REVISIONS

NO.	REASON	DATE

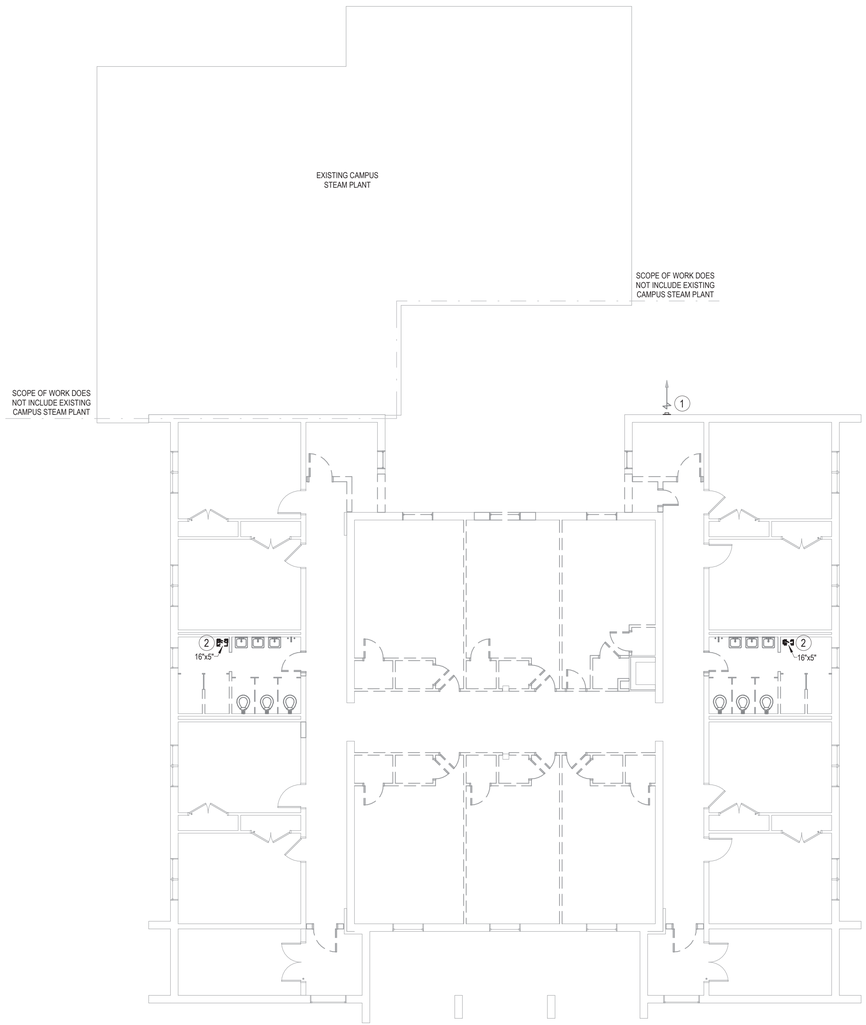
PROJECT TEAM
PRINCIPAL IN CHARGE
ALAN CAVE, P.E.
PROJECT MANAGER
BLAKE SMITH, P.E.
DESIGN TEAM
RMF

PROJECT NAME
CAMPBELL UNIVERSITY
DAY HALL RENOVATIONS

PROJECT NO.
513.9660.00

SHEET TITLE
MECHANICAL
DEMOLITION FLOOR
PLANS - LEVELS 0 AND 1

SHEET NUMBER
M101



1 - M102

LEVEL 2 - MECHANICAL DEMOLITION

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

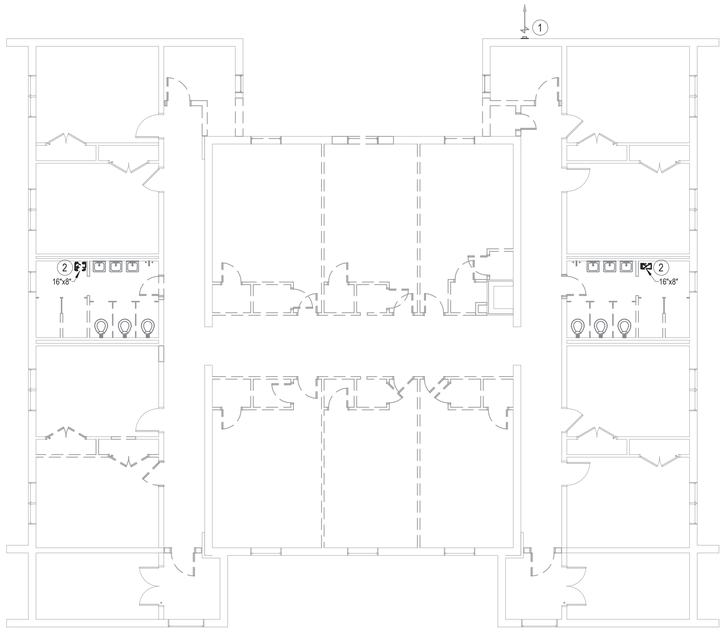
GENERAL NOTES

1. ALL MECHANICAL STEAM AND CONDENSATE PIPING ON THIS LEVEL TO BE DEMOLISHED UNLESS NOTED OTHERWISE.
2. ALL STEAM RADIATORS TO BE DEMOLISHED. STEAM/CONDENSATE PIPING CAPPED IN BASEMENT LEVEL. ALL PIPING ON THIS FLOOR TO BE DEMOLISHED.

SHEET NOTES

(1) EXISTING DRYER VENT TO REMAIN. DEMOISH ANY DUCT CONNECTIONS AND PROVIDE SHEET METAL BLANK-OFF PANEL. CAP AND INSULATE.

(2) DEMOLISH EXISTING EXHAUST DUCTWORK, SUPPORTS, AND AIR DEVICES.



2 - M102

LEVEL 3 - MECHANICAL DEMOLITION

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

GENERAL NOTES

1. ALL MECHANICAL STEAM AND CONDENSATE PIPING THROUGHOUT THE BUILDING TO BE DEMOLISHED UNLESS NOTED OTHERWISE.
2. ALL STEAM RADIATORS TO BE DEMOLISHED. STEAM/CONDENSATE PIPING CAPPED IN BASEMENT LEVEL. ALL PIPING ON THE FLOOR TO BE DEMOLISHED.

SHEET NOTES

(1) EXISTING DRYER VENT TO REMAIN. DEMOISH ANY DUCT CONNECTIONS AND PROVIDE SHEET METAL BLANK-OFF PANEL. CAP AND INSULATE.

(2) DEMOLISH EXISTING EXHAUST DUCTWORK, SUPPORTS, AND AIR DEVICES.

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MECHANICAL
DEMOLITION FLOOR
PLANS - LEVELS 2 AND 3

SHEET NUMBER
M102

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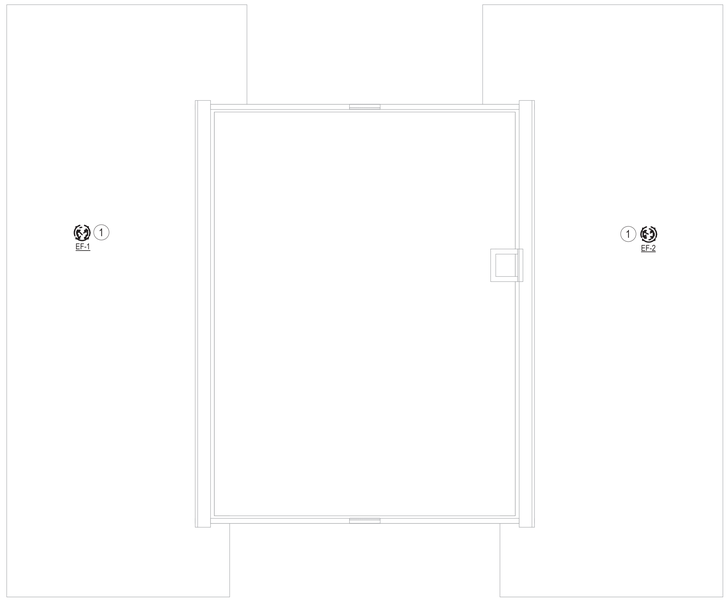

1 / - / M103 **ROOF LEVEL - HVAC DEMOLITION**
SCALE: 1/8" = 1'-0"

GENERAL NOTES

1. NOT USED.

SHEET NOTES

(1) DEMOLISH EXISTING EXHAUST FAN AND ASSOCIATED DUCTWORK. PROVIDE CAP FOR EXISTING EXISTING CURB. NEW EXHAUST FAN SHALL HAVE NEW ROOF CURB.

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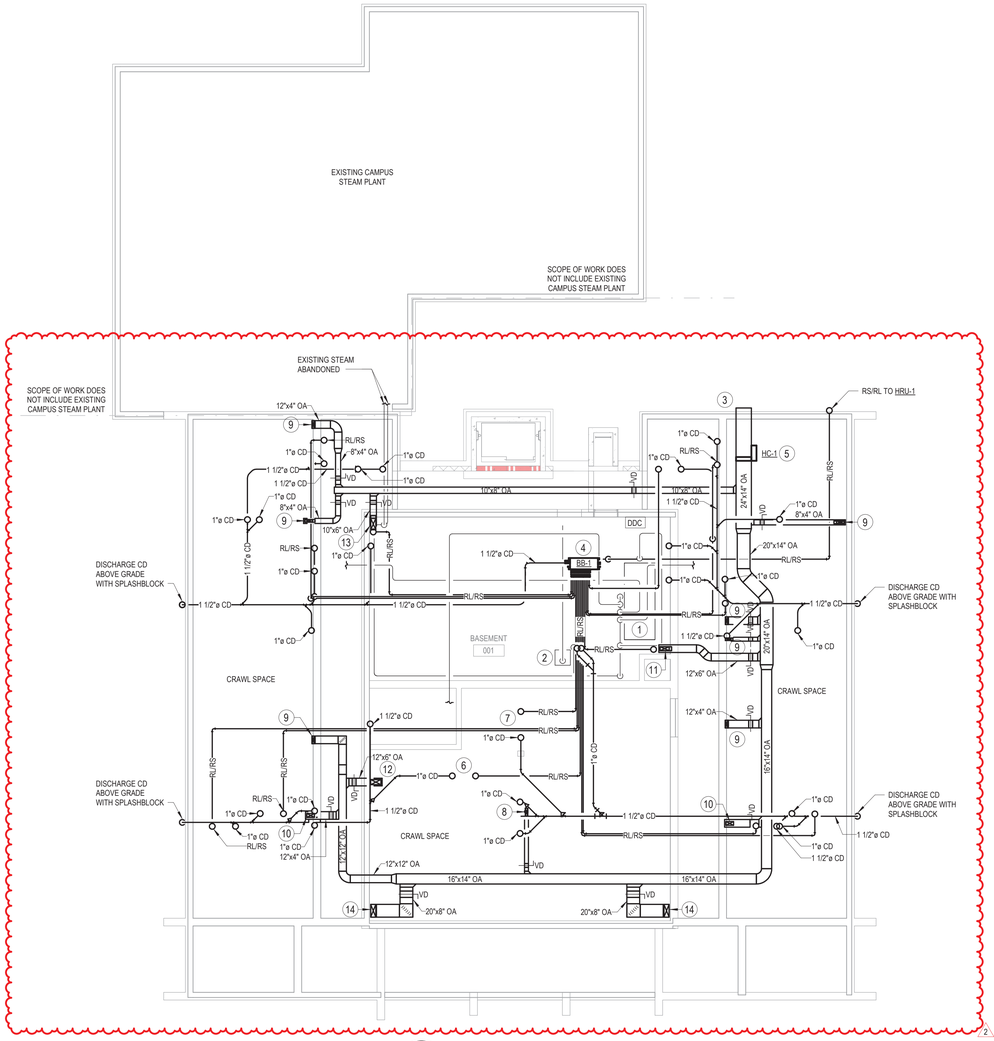
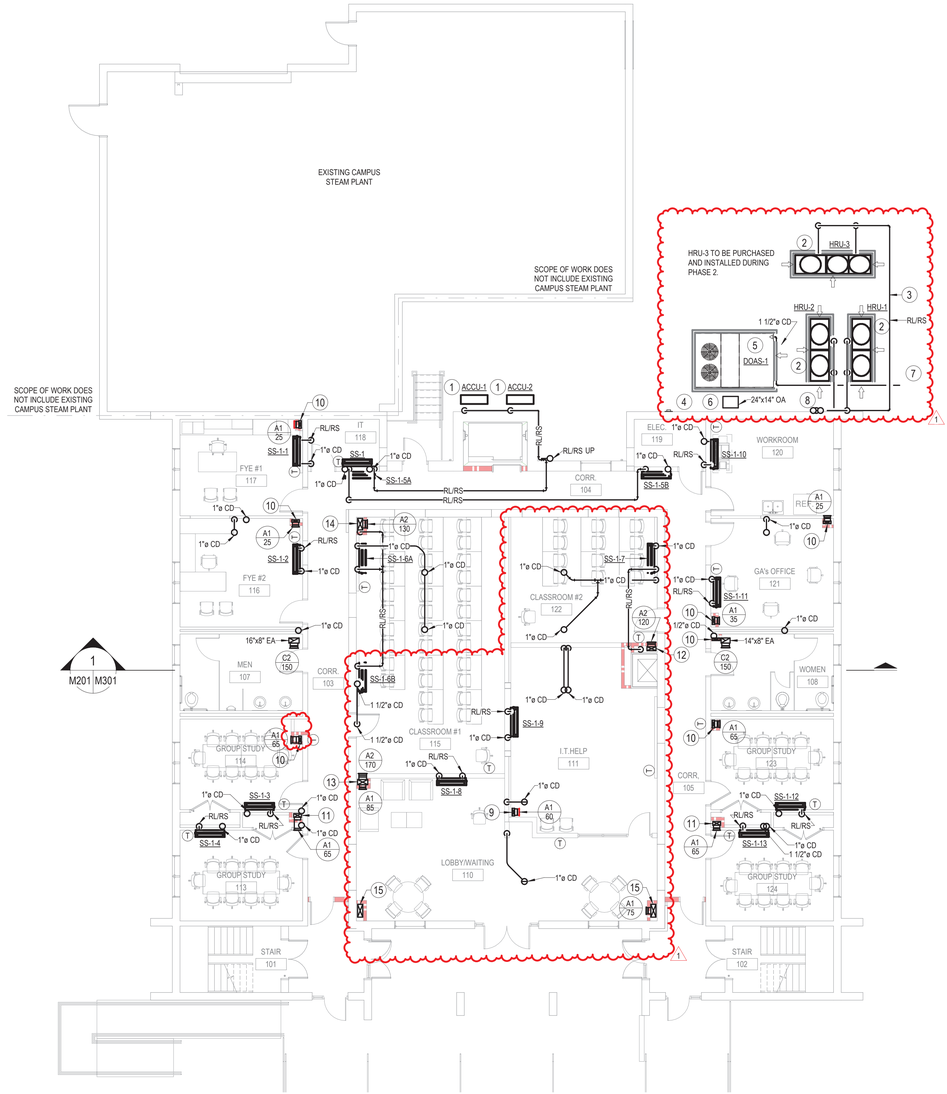
SHEET TITLE
MECHANICAL
DEMOLITION PLANS -
ROOF LEVEL

SHEET NUMBER
M103



1 - M201 **LEVEL 0 - NEW HVAC PLAN**

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



2 - M201 **LEVEL 1 - NEW HVAC PLAN**

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

GENERAL NOTES

1. ALL CONDENSATE DRAINS INTENDED TO GRAVITY DRAIN.
2. SEE COVER SHEET GENERAL NOTES.
3. DUCT MANUAL VOLUME DAMPERS SHALL BE OPPOSED BLADE.
4. ALL EXTERIOR REFRIGERANT INSULATION SHALL HAVE ALUMINUM JACKETS WITH ORANGE PEEL FINISH.

SHEET NOTES

1. EXISTING STEAM TO HOT WATER, DOMESTIC HOT WATER HEAT EXCHANGER - ABANDONED IN PLACE.
2. EXISTING STEAM CONDENSATE PUMP - ABANDONED IN PLACE.
3. OUTSIDE AIR DUCT FROM DOAS-1. SEE VIEW 2/M201 FOR CONTINUATION.
4. NEW VRF SYSTEM HRU-1 BRANCH BOX SUSPENDED FROM STRUCTURE TO SERVE INDOOR UNITS ON FIRST FLOOR. EACH REFRIGERANT OUTLET FROM BRANCH BOX TO BE INDIVIDUALLY VALVED FOR ISOLATION. INSTALL BRANCH BOX AS HIGH AS POSSIBLE TO ALLOW GRAVITY DRAIN OF CONDENSATE.
5. NEW ELECTRIC HEATING COIL FOR DEDICATED OUTDOOR AIR UNIT.
6. RL/RS UP THROUGH WALL TO SS-1-8.
7. RL/RS UP THROUGH WALL TO SS-1-9.
8. 12"x4" OUTSIDE AIR DUCT RISER FROM BASEMENT CRAWL SPACE TO FIRST FLOOR.
9. 12"x4" OUTSIDE AIR DUCT RISER FROM BASEMENT CRAWL SPACE TO SECOND FLOOR.
10. 12"x6" OUTSIDE AIR DUCT RISER FROM BASEMENT CRAWL SPACE TO SECOND FLOOR.
11. 14"x6" OUTSIDE AIR DUCT RISER FROM BASEMENT CRAWL SPACE TO SECOND FLOOR.
12. 16"x8" OUTSIDE AIR DUCT RISER FROM BASEMENT CRAWL SPACE TO FIRST FLOOR.
13. 18"x8" OUTSIDE AIR DUCT RISER FROM BASEMENT CRAWL SPACE TO SECOND FLOOR.
14. 20"x8" OUTSIDE AIR DUCT RISER FROM BASEMENT CRAWL SPACE TO SECOND FLOOR. 2

SHEET NOTES

1. NEW DUCTLESS SPLIT SYSTEM OUTDOOR UNIT INSTALLED ON CONCRETE PAD. PROVIDE PVC INSULATION JACKET TO ALL REFRIGERANT PIPING INSTALLED OUTDOORS. ROUTE REFRIGERANT PIPING ALONG BUILDING EXTERIOR WALL AND PENETRATE ABOVE FIRST FLOOR CEILING. SEAL ALL EXTERIOR WALL PIPING PENETRATIONS. SIZE ALL REFRIGERANT PIPING PER MANUFACTURER'S RECOMMENDATIONS.
2. NEW HEAT RECOVERY VRF OUTDOOR UNIT INSTALLED ON 6" CONCRETE PAD SO THAT TOP OF UNITS ARE LEVEL WITH MASONRY SCREEN WALL. INSTALL ON 6" TALL CONCRETE PAD, WHERE PAD IS 3" LARGER THAN EQUIPMENT FOOTPRINT. SHALL REST ON NEOPRENE VIBRATION ISOLATORS. 1
3. INSTALL VRF REFRIGERANT PIPING ALONG MASONRY SCREEN WALL. PROVIDE PVC INSULATION JACKET TO ALL REFRIGERANT PIPING INSTALLED OUTDOORS. ROUTE REFRIGERANT PIPING FROM EACH VRF SYSTEM TO FLOOR LEVELS WITH PIPING PENETRATIONS TO RESPECTIVE ABOVE CEILING SPACES. SEAL ALL EXTERIOR WALL PIPING PENETRATIONS. SIZE ALL REFRIGERANT PIPING PER MANUFACTURER'S RECOMMENDATIONS.
4. MAINTAIN EXISTING CRAWL SPACE ACCESS DOOR WHEN INSTALLING DEDICATED OUTDOOR AIR UNIT.
5. DEDICATED OUTDOOR AIR UNIT DOAS-1 INSTALLED ON 6" CONCRETE HOUSEKEEPING PAD.
6. OUTSIDE AIR DUCT FROM DOAS-1 TO PENETRATE EXTERIOR WALL ABOVE GRADE THROUGH LEVEL 0 CRAWL SPACE. SEE VIEW 1/M201 FOR DUCTWORK CONTINUATION. PROVIDE METAL SHIELDING TO PROTECT EXTERIOR DUCTWORK FROM ELEMENTS.
7. ROUTE OUTDOOR AIR UNIT CONDENSATE DRAIN UNDER VRF CONDENSING UNITS AND THROUGH MECHANICAL YARD MASONARY SCREEN WALL. TERMINATE DRAIN WITH OPEN 90 DEGREE ELBOW OVER LANDSCAPING.
8. REFRIGERANT PIPING ASSOCIATED WITH HRU-1 DOWN AND INTO BASEMENT CRAWL SPACE. REFRIGERANT PIPING ASSOCIATED WITH HRU-2 UP AND INTO SECOND FLOOR CEILING SPACE. REFRIGERANT PIPING ASSOCIATED WITH HRU-3 UP AND INTO THIRD FLOOR CEILING SPACE.

SHEET NOTES

9. 12"x4" OUTSIDE AIR DUCT RISER FROM BASEMENT CRAWL SPACE TO FIRST FLOOR.
10. 12"x4" OUTSIDE AIR DUCT RISER FROM BASEMENT CRAWL SPACE TO SECOND FLOOR.
11. 12"x6" OUTSIDE AIR DUCT RISER FROM BASEMENT CRAWL SPACE TO SECOND FLOOR.
12. 14"x6" OUTSIDE AIR DUCT RISER FROM BASEMENT CRAWL SPACE TO SECOND FLOOR.
13. 16"x8" OUTSIDE AIR DUCT RISER FROM BASEMENT CRAWL SPACE TO FIRST FLOOR.
14. 18"x8" OUTSIDE AIR DUCT RISER FROM BASEMENT CRAWL SPACE TO SECOND FLOOR.
15. 20"x8" OUTSIDE AIR DUCT RISER FROM BASEMENT CRAWL SPACE TO SECOND FLOOR. 2

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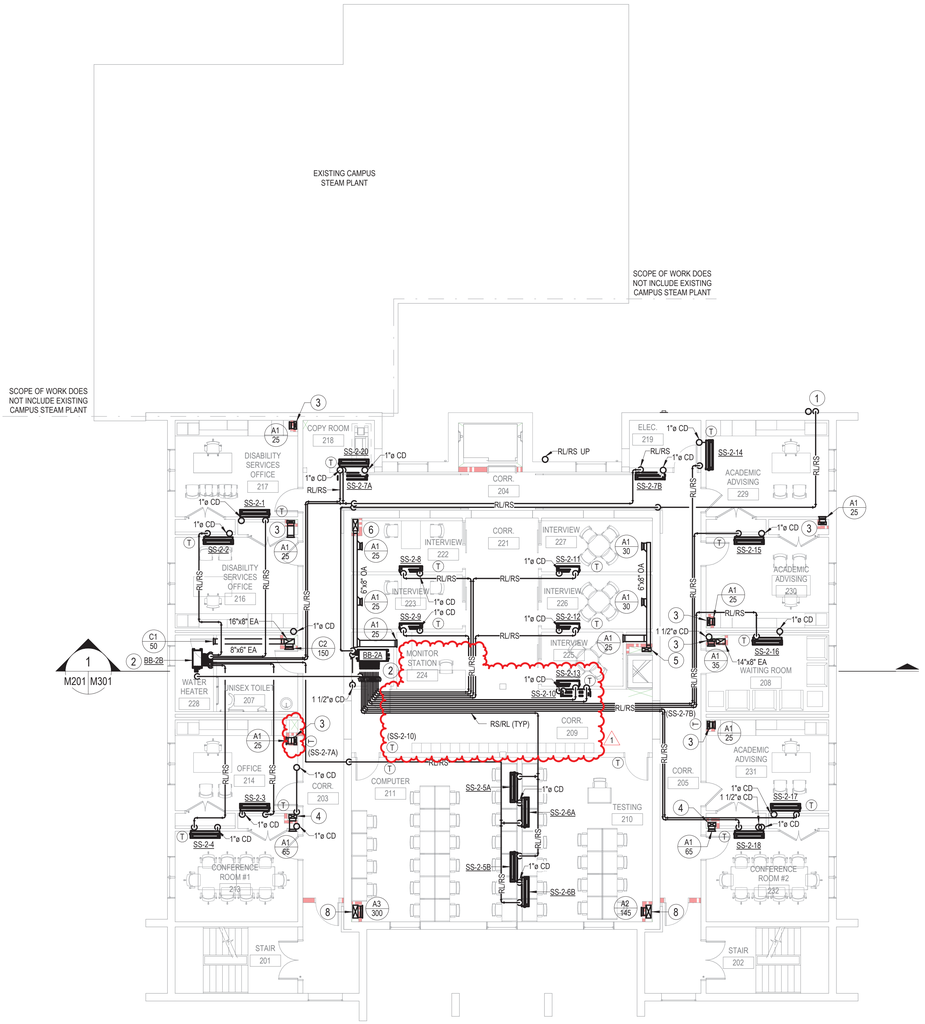
DAY HALL RENOVATIONS

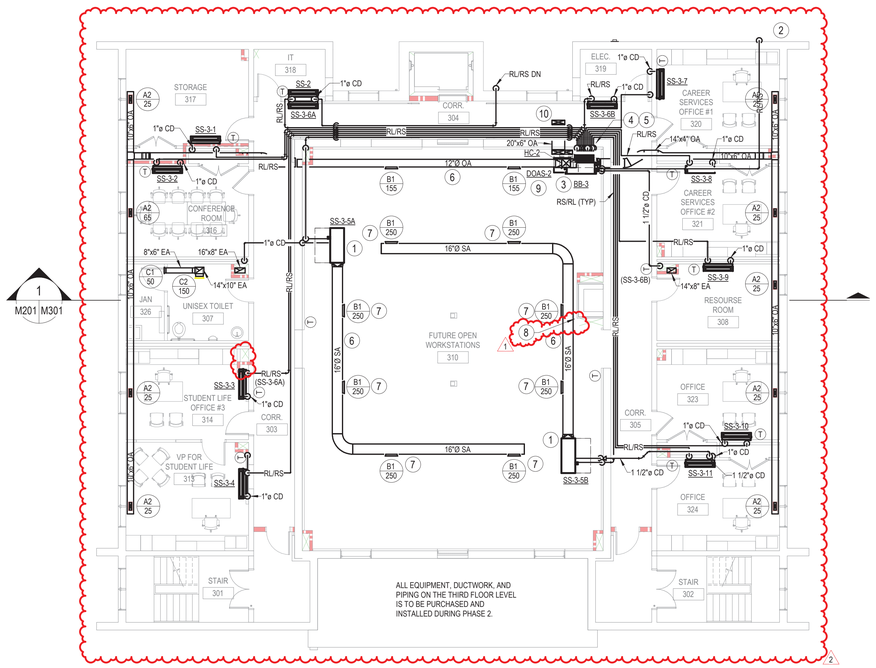
PROJECT NO.
513.9660.00

SHEET TITLE
MECHANICAL FLOOR PLANS - LEVELS 0 AND 1

SHEET NUMBER
M201



1 - M202 **LEVEL 2 - NEW HVAC PLAN**
SCALE: 1/8" = 1'-0"



2 - M202 **LEVEL 3 - NEW HVAC PLAN**
SCALE: 1/8" = 1'-0"

GENERAL NOTES

1. SEE COVER SHEET GENERAL NOTES.

SHEET NOTES

1. REFRIGERANT PIPING THROUGH EXTERIOR WALL AND DOWN TO HRU-2 IN MECHANICAL SERVICE YARD.
2. NEW VRF SYSTEM HRU-2 BRANCH BOX SUSPENDED FROM STRUCTURE TO SERVE INDOOR UNITS ON THIRD FLOOR. EACH REFRIGERANT OUTLET FROM BRANCH BOX TO BE INDIVIDUALLY VALVED FOR ISOLATION.
3. 12"x4" OUTSIDE AIR DUCT RISER FROM BASEMENT CRAWL SPACE TO SECOND FLOOR.
4. 12"x6" OUTSIDE AIR DUCT RISER FROM BASEMENT CRAWL SPACE TO SECOND FLOOR.
5. 14"x6" OUTSIDE AIR DUCT RISER FROM BASEMENT CRAWL SPACE TO SECOND FLOOR.
6. 18"x8" OUTSIDE AIR DUCT RISER FROM BASEMENT CRAWL SPACE TO SECOND FLOOR.
7. 20"x8" OUTSIDE AIR DUCT RISER FROM BASEMENT CRAWL SPACE TO SECOND FLOOR. 2

GENERAL NOTES

1. SEE COVER SHEET GENERAL NOTES.

SHEET NOTES

1. HORIZONTAL SPLIT SYSTEM UNIT SUPPORTED FROM STRUCTURE. PROVIDE UNITS WITH VIBRATION ISOLATION PER MANUFACTURER'S RECOMMENDATIONS. DO NOT ROUTE INSTALL DUCTWORK DIRECTLY OVER OR UNDER LIGHTING FIXTURES. SEE LIGHTING PLANS FOR LOCATIONS. 1
2. REFRIGERANT PIPING THROUGH EXTERIOR WALL AND DOWN TO HRU-3 IN MECHANICAL SERVICE YARD.
3. NEW VRF SYSTEM HRU-3 BRANCH BOX SUSPENDED FROM STRUCTURE TO SERVE INDOOR UNITS ON THIRD FLOOR. EACH REFRIGERANT OUTLET FROM BRANCH BOX TO BE INDIVIDUALLY VALVED FOR ISOLATION.
4. SUPPORT EXPOSED PARALLEL INSULATED REFRIGERANT PIPES FROM A SINGLE TRAPEZE HANGER. MOUNT DEPENDENT LIQUID AND SUCTION LINES ADJACENT TO EACH OTHER. EXPOSED REFRIGERANT PIPING SHALL HAVE WHITE PVC JACKETS.
5. DROP EXPOSED INSULATED REFRIGERANT PIPES DOWN WALL TO LOWER CORRIDOR CEILING SPACE. PIPING ABOVE CORRIDOR CEILING CAN BE SUPPORTED INDENDENTLY AND TO RUN THROUGH STRUCTURAL JOIST WEBBING.
6. EXPOSED DUCTWORK SHALL HAVE 2" LINER EQUAL TO JOHNS MANVILLE SPIRACOUSTIC PLUS. ALL INTERNALLY LINED DUCTWORK SIZES SHOWN ON PLANS ARE THE INTERNAL CLEAR DIAMETERS.
7. SUPPLY DIFFUSER SHALL BE INSTALLED AT 30° DOWN FROM HORIZONTAL ON ROUND DUCT.
8. INSTALL DUCT AS CLOSE AS POSSIBLE TO EXISTING FURRED CHIMNEY WALL. 1
9. VERTICAL INDOOR SPLIT SYSTEM UNIT. SEE DETAIL FOR INSTALLATION REQUIREMENTS. INSTALL ELECTRIC DUCT HEATER HC-2 AFTER HOT GAS REHEAT COIL.
10. OUTSIDE AIR DUCTWORK UP THROUGH ROOF. 2

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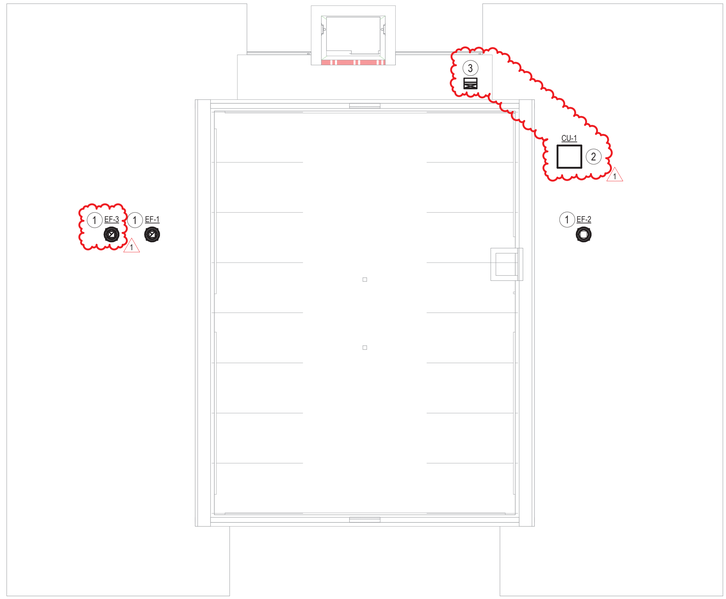
MECHANICAL FLOOR PLANS - LEVELS 2 AND 3

SHEET NUMBER
M202



1 / - / M203 **ROOF LEVEL - HVAC NEW WORK**
SCALE: 1/8" = 1'-0"

GENERAL NOTES

1. INSTALL ALL ROOFTOP MECHANICAL EQUIPMENT AT LEAST 10'-0" FROM THE ROOF EDGE.

SHEET NOTES

1. NEW DOWNBLAST GENERAL EXHAUST FAN MOUNTED ON ROOF CURB. SEE DETAIL FOR FLASHING AND INSTALLATION.
2. CONDENSING UNIT FOR INDOOR SPLIT SYSTEM OUTDOOR AIR UNIT DOAS-2.
3. PROVIDE GOOSENECK - COVER OPENING WITH BIRDSCREEN.

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MECHANICAL FLOOR PLANS - ROOF LEVEL

SHEET NUMBER
M203

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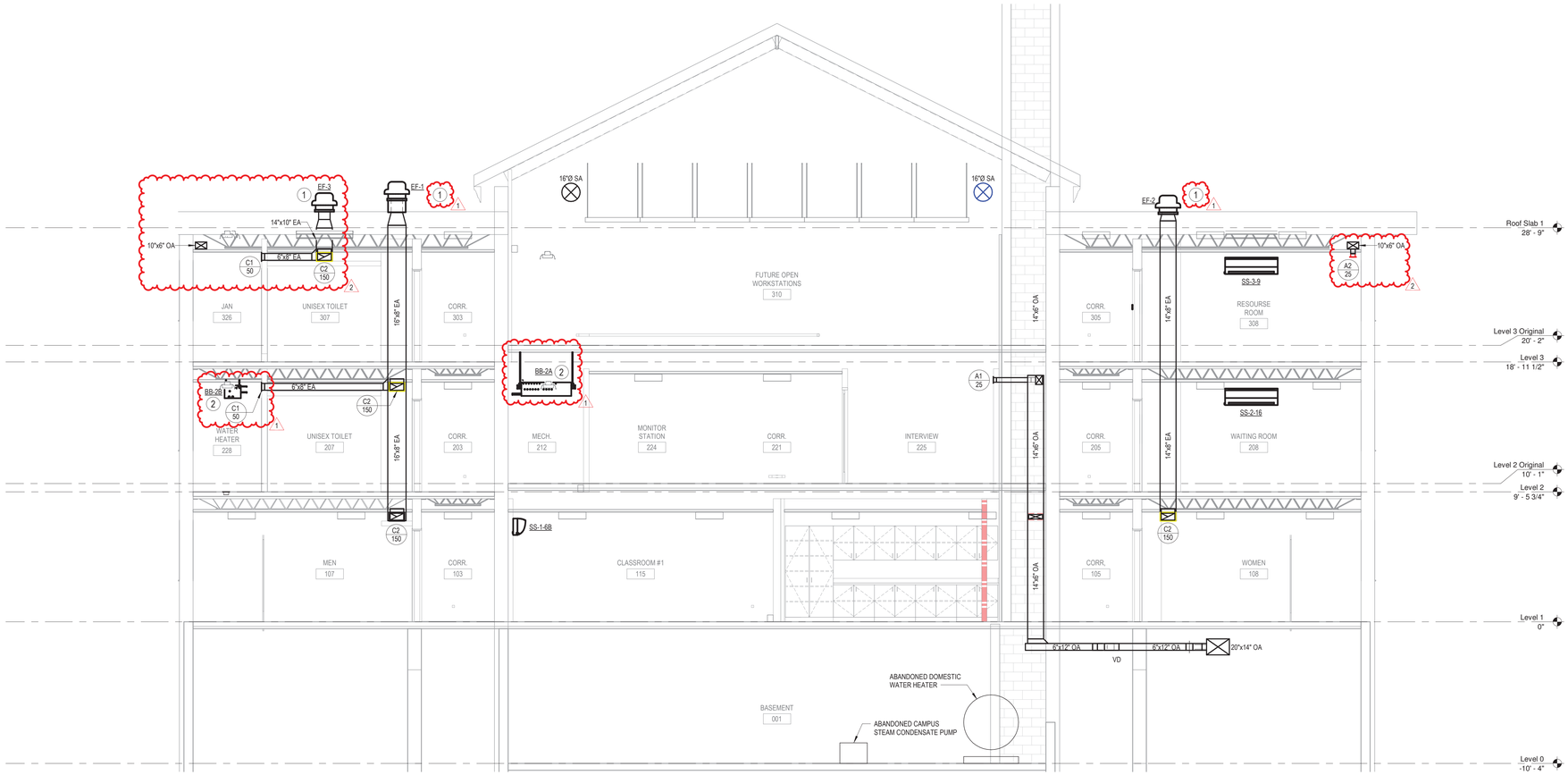

1 M201 | M301 **BUILDING SECTION**
SCALE: 1/4" = 1'-0"

SHEET NOTES

1. NEW DOWNBLAST GENERAL EXHAUST FAN MOUNTED ON ROOF CURB. SEE DETAIL FOR FLASHING AND INSTALLATION.
2. INSTALL REFRIGERANT BRANCH BOXES AS TIGHT TO CEILINGS OR STRUCTURE AS POSSIBLE.

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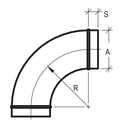
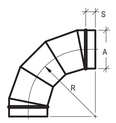
SHEET TITLE
MECHANICAL SECTIONS

SHEET NUMBER
M301



DIMENSIONS:
A = 3" THROUGH 8"
QR = 1.5A
S = 2"

DIE-STAMPED 45° AND 90°

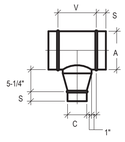


DIMENSIONS:
A = 23" AND LARGER
QR = 1.5A
S = 2"

0-35° = 2 PIECE
36-71° = 3 PIECE
72-90° = 5 PIECE

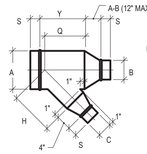
ADD ONE PIECE FOR
EACH ADDITIONAL 18°
OR FRACTION THEREOF

FABRICATED-OVER 22"



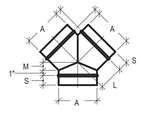
DIMENSIONS:
S = 2"
TC = ONE TAP
V = C+4"
• TC2 = TWO TAPS
V = C+D+8"

CONICAL TEE



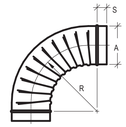
DIMENSIONS:
S = 2"
LCR = ONE TAP
Y = 1.414C+4.83
• LC2R = TWO TAPS
Y = 1.414(C+D)+9.66
Q = A/2+.707C+2.414
H = .707A+.5C+2"

REDUCING CONICAL LATERAL



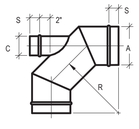
DIMENSIONS:
S = 2"
L = A/2+1"
M = .207A

Y-BRANCH 90°



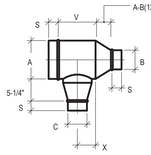
DIMENSIONS:
90°A = 4-12",14"
60°A = 4-12",14",16"
45°A = 4-12",14",16"
QR = 1.5A
S = 2"

PLEATED



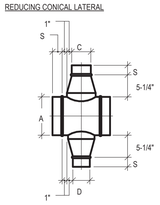
DIMENSIONS:
ALL SIZES
QR = 1.5A
S = 2"

HEEL TAPPED 90"



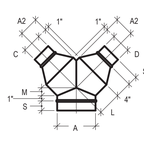
DIMENSIONS:
S = 2"
• TCR = ONE TAP
V = C+4"
TC2R = TWO TAPS
V = C+D+8"

REDUCING CONICAL TEE



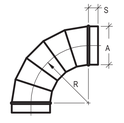
DIMENSIONS:
S = 2"
V = LARGER TAP + 4"

CONICAL CROSS 90°



DIMENSIONS:
S = 2"
L = A/2+1"
M = .207A

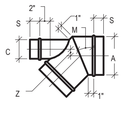
REDUCING Y-BRANCH 90°



DIMENSIONS:
A = 3" THROUGH 22"
QR = 1.5A
S = 2"

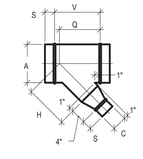
0-35° = 2 PIECE
36-71° = 3 PIECE
72-90° = 5 PIECE

FABRICATED-9" THROUGH 22"



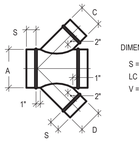
DIMENSIONS:
ALL SIZES
QR = VARIES
S = 2"
Z = A-C/2-.707
M = 22.5°
R = DOES NOT
EQUAL 1.5A

HEEL TAPPED 45°



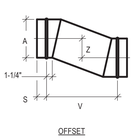
DIMENSIONS:
S = 2"
LC = ONE TAP
V = 1.414C+4.83
• LC2 = TWO TAPS
V = 1.414(C+D)+9.66
Q = A/2+.707C+2.414
H = .707A+.5C+2"

CONICAL LATERAL



DIMENSIONS:
S = 2"
LC = ONE TAP
V = 1.414 (LARGER TAP)+2"

LATERAL CROSS



DIMENSIONS:
S = 2"
V = 2A UNLESS SPECIFIED
Z = SPECIFY OFFSET

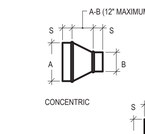
OFFSET

NOTES:

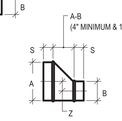
• IF TWO TAPS, BOTH TAPS ARE IN LINE ON ONE SIDE AND THE TAPS ARE SEPARATED BY 2 INCHES

DIAMETER	NUMBER OF VANES
3-5"	1
6-9"	2
10-14"	3
15-19"	4
20-60"	5
OVER 60"	12° CTR'S

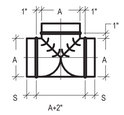
1 - M501 **ROUND DUCTWORK FITTINGS DETAIL**
SCALE:N.T.S.



DIMENSIONS:
S = 2"

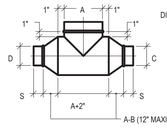


REDUCERS



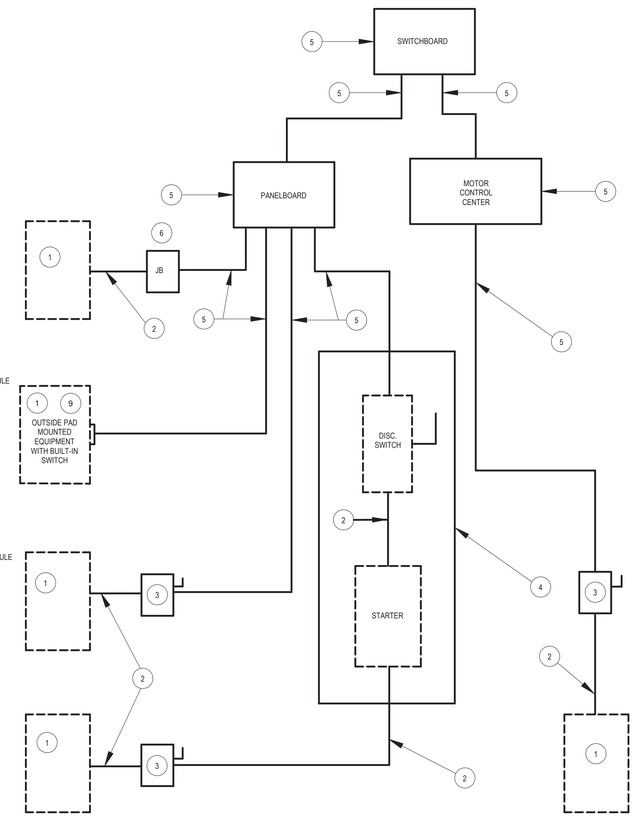
DIMENSIONS:
S = 2"
SEE SCHEDULE
BELOW

BULLHEAD TEE



DIMENSIONS:
S = 2"
SEE SCHEDULE
BELOW

REDUCING BULLHEAD TEE



ELECTRICAL NOTES

1. EQUIPMENT PROVIDED BY TRADES OTHER THAN ELECTRICAL.
2. CONDUIT & WIRING BY MECHANICAL, PLUMBING CONTRACTOR OR OTHER TRADES OTHER THAN ELECTRICAL.
3. IF AN ADDITIONAL DISCONNECT IS REQUIRED BY NEC, IT SHALL BE PROVIDED AND INSTALLED BY THE CONTRACTOR PROVIDING THE EQUIPMENT.
4. A COMBINATION STARTER OR VFD MAY BE USED IN LIEU OF A SEPARATE DISCONNECT SWITCH AND STARTER. LOCATE ADJACENT TO EQUIPMENT. DISCONNECT SWITCH, VFD AND/OR STARTER SHALL BE PROVIDED BY THE CONTRACTOR PROVIDING THE EQUIPMENT.
5. SWITCHBOARD, PANELBOARD, FEEDER CIRCUIT WIRING AND CONDUIT PROVIDED BY ELECTRICAL TRADE AS SHOWN ON THE ELECTRICAL DRAWINGS. SEE PANELBOARD SCHEDULES FOR WIRE AND BREAKER SIZES.
6. JUNCTION BOX MAY BE SHOWN ON ELECTRICAL PLANS FOR SOME EQUIPMENT. IF NO STARTER OR DISCONNECT IS SUPPLIED, A JUNCTION BOX SHALL BE INSTALLED ADJACENT TO EQUIPMENT. THE ELECTRICAL CONTRACTOR SHALL PROVIDE LINE SIDE WIRING TO THE JUNCTION BOX. LOAD SIDE WIRING WILL BE PROVIDED BY MECHANICAL, PLUMBING CONTRACTOR OR OTHER TRADES OTHER THAN ELECTRICAL.
7. FOR PROJECTS UTILIZING AN MCC, THE STARTER, CB, AND/OR THE VFD LOCATED IN THE MCC SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR.
8. IN ALL CASES THE CONTRACTOR SUPPLYING THE EQUIPMENT SHALL MAKE THE FINAL ELECTRICAL TERMINATIONS, START UP, AND TEST THE EQUIPMENT.
9. IF THE ROOF TOP EQUIPMENT IS NOT PROVIDED WITH BUILT IN DISCONNECT SWITCH, THE ELECTRICAL CONTRACTOR SHALL PROVIDE A DISCONNECT SWITCH.

3 - M501 **DIVISION OF RESPONSIBILITIES DETAIL**
SCALE:N.T.S.

FULL RADIUS ELBOWS
WHERE POSSIBLE
(R = W)

MITERED ELBOWS

DUCT OFFSETS

(BRANCH FLOW LESS THAN
25% OF MAIN FLOW)

(BRANCH FLOW GREATER THAN
25% OF MAIN FLOW)

BRANCH TAKE-OFFS

RADIUS ELBOW

RECTANGULAR ELBOW

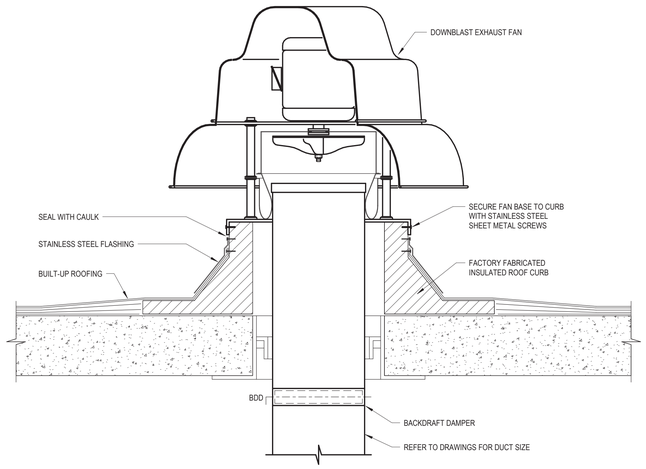
LOW VELOCITY ELBOWS

DIVERGING FLOW

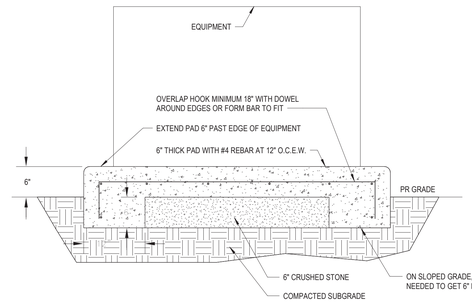
CONVERGING FLOW

RECTANGULAR TO RECTANGULAR TRANSITIONS

2 - M501 **RECTANGULAR DUCTWORK FITTINGS DETAIL**
SCALE:N.T.S.



4 - M501 **DOWNBLAST EXHAUST FAN DETAIL**
SCALE:N.T.S.



NOTES:

1. FOR TRANSFORMER, GENERATOR, AND ATS, COORDINATE KNOCKOUTS FOR CONDUIT TURN UPS WITH EQUIPMENT. PROVIDE RIGID ELBOWS ON CONDUITS WHERE TURNING UP INTO THE PAD.
2. COORDINATE FINAL PAD LOCATION WITH OWNER ACCESS REQUIREMENTS FOR MAINTENANCE.

5 - M501 **EQUIPMENT PAD DETAIL**
SCALE:N.T.S.

LITTLE
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NORTH CAROLINA PROFESSIONAL SEAL 041471 ENGINEER BLAKE A. SMITH

Sep 11 2018 3:45 PM

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ISSUE FOR
PERMIT SET

ISSUE DATE
09.11.2018

REVISIONS

NO.	REASON	DATE

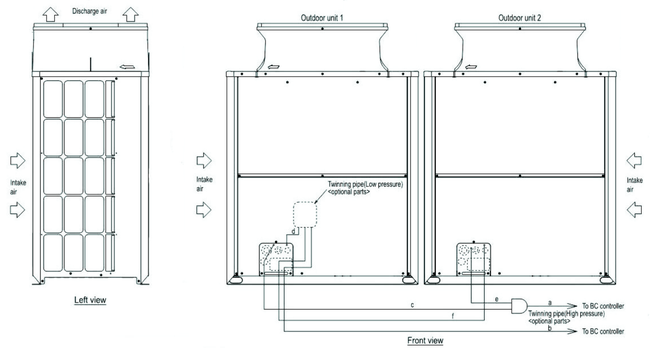
PROJECT TEAM
PRINCIPAL IN CHARGE
ALAN CAVE, P.E.
PROJECT MANAGER
BLAKE SMITH, P.E.
DESIGN TEAM
RMF

PROJECT NAME
CAMPBELL UNIVERSITY
DAY HALL RENOVATIONS

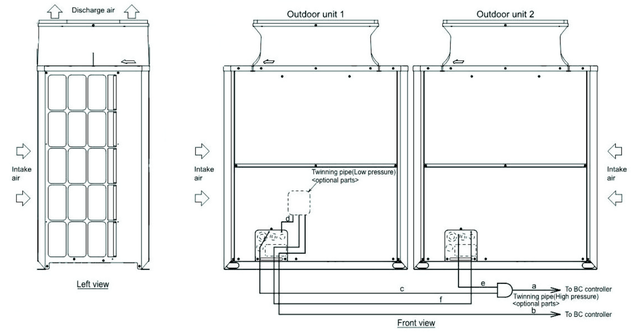
PROJECT NO.
513.9660.00

SHEET TITLE
MECHANICAL DETAILS

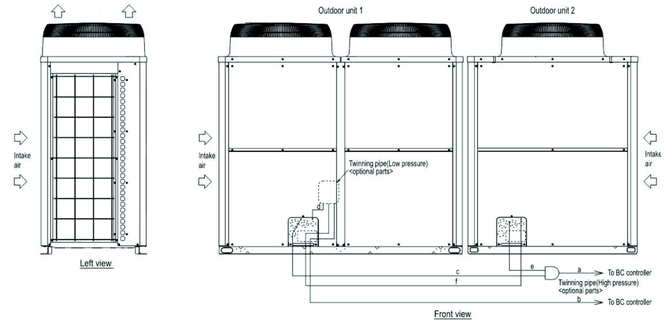
SHEET NUMBER
M501



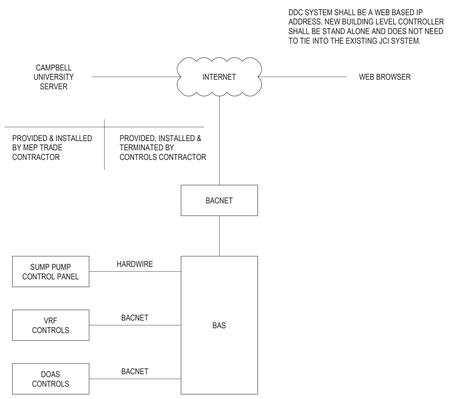
1 · M502 **PURY-P168TSKMU-A OUTDOOR AIR DETAIL**
SCALE:N.T.S.



2 · M502 **PURY-HP144TSKMU-A-H OUTDOOR AIR DETAIL**
SCALE:N.T.S.



3 · M502 **PURY-P216TSKMU-A OUTDOOR AIR DETAIL**
SCALE:N.T.S.



4 · M502 **BUILDING CONTROLS SCHEMATIC**
SCALE:N.T.S.

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NORTH CAROLINA PROFESSIONAL SEAL 041471 ENGINEER BLAKE A. SMITH

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ISSUE FOR
PERMIT SET

ISSUE DATE
09.11.2018

REVISIONS

NO.	REASON	DATE

PROJECT TEAM
PRINCIPAL IN CHARGE
ALAN CAVE, P.E.
PROJECT MANAGER
BLAKE SMITH, P.E.
DESIGN TEAM
RMF

PROJECT NAME
CAMPBELL UNIVERSITY
DAY HALL RENOVATIONS

PROJECT NO.
513.9660.00

SHEET TITLE
MECHANICAL DETAILS

SHEET NUMBER
M502

VRF SYSTEM INDOOR UNIT SCHEDULE

DESIGNATION	SERVICE	AIRFLOW (CFM)	ESP (IN WG)	COOLING		HEATING	ELECTRICAL	BASIS OF DESIGN	REMARKS
				TOTAL (MBH)	SENSIBLE (MBH)	TOTAL (MBH)			
SS-1-1	FYE #1 117	370	0.00	6.85	6.50	5.99	208/1/60	TRANE MITSUBISHI PKFY-P08NHMU-E2	1
SS-1-2	FYE #2 116	370	0.00	6.85	6.50	5.99	208/1/60	TRANE MITSUBISHI PKFY-P08NHMU-E2	1
SS-1-3	GROUP STUDY 114	370	0.00	10.27	8.39	8.99	208/1/60	TRANE MITSUBISHI PKFY-P12NHMU-E2	1
SS-1-4	GROUP STUDY 113	370	0.00	10.27	8.39	8.99	208/1/60	TRANE MITSUBISHI PKFY-P12NHMU-E2	1
SS-1-5A	CORRIDOR 104	370	0.00	10.27	8.39	8.99	208/1/60	TRANE MITSUBISHI PKFY-P12NHMU-E2	1
SS-1-5B	CORRIDOR 104	370	0.00	10.27	8.39	8.99	208/1/60	TRANE MITSUBISHI PKFY-P12NHMU-E2	1
SS-1-6A	CLASSROOM #1 115	370	0.00	10.27	8.39	8.99	208/1/60	TRANE MITSUBISHI PKFY-P12NHMU-E2	1
SS-1-6B	CLASSROOM #1 115	370	0.00	10.27	8.39	8.99	208/1/60	TRANE MITSUBISHI PKFY-P12NHMU-E2	1
SS-1-7A	CLASSROOM #2 122	370	0.00	10.27	8.39	8.99	208/1/60	TRANE MITSUBISHI PKFY-P12NHMU-E2	1
SS-1-7B	CLASSROOM #2 122	370	0.00	10.27	8.39	8.99	208/1/60	TRANE MITSUBISHI PKFY-P12NHMU-E2	1
SS-1-8	IT HELP 111	180	0.00	5.14	4.04	4.46	208/1/60	TRANE MITSUBISHI PKFY-P06NBMU-E2R1	1
SS-1-9	LOBBY/WAITING 110	370	0.00	12.09	9.68	12.32	208/1/60	TRANE MITSUBISHI PKFY-P15NHMU-E2	1
SS-1-10	WORKROOM 120	370	0.00	10.27	8.39	8.99	208/1/60	TRANE MITSUBISHI PKFY-P12NHMU-E2	1
SS-1-11	GA'S OFFICE 121	370	0.00	10.27	8.39	8.99	208/1/60	TRANE MITSUBISHI PKFY-P12NHMU-E2	1
SS-1-12	GROUP STUDY 123	370	0.00	10.27	8.39	8.99	208/1/60	TRANE MITSUBISHI PKFY-P12NHMU-E2	1
SS-1-13	GROUP STUDY 124	370	0.00	10.27	8.39	8.99	208/1/60	TRANE MITSUBISHI PKFY-P12NHMU-E2	1
SS-2-1	DISABILITY SERVICES 217	370	0.00	7.19	6.64	6.34	208/1/60	TRANE MITSUBISHI PKFY-P08NHMU-E2	1
SS-2-2	DISABILITY SERVICES 216	370	0.00	7.19	6.64	6.34	208/1/60	TRANE MITSUBISHI PKFY-P08NHMU-E2	1
SS-2-3	OFFICE 214	370	0.00	7.18	6.64	6.34	208/1/60	TRANE MITSUBISHI PKFY-P08NHMU-E2	1
SS-2-4	CONFERENCE ROOM #1 213	370	0.00	10.78	8.61	9.51	208/1/60	TRANE MITSUBISHI PKFY-P12NHMU-E2	1
SS-2-5A	COMPUTER 211	370	0.00	13.48	10.28	11.97	208/1/60	TRANE MITSUBISHI PKFY-P15NHMU-E2	1
SS-2-5B	COMPUTER 211	370	0.00	13.48	10.28	11.97	208/1/60	TRANE MITSUBISHI PKFY-P15NHMU-E2	1
SS-2-6A	TESTING 210	370	0.00	7.19	6.64	6.34	208/1/60	TRANE MITSUBISHI PKFY-P08NHMU-E2	1
SS-2-6B	TESTING 210	370	0.00	7.19	6.64	6.34	208/1/60	TRANE MITSUBISHI PKFY-P08NHMU-E2	1
SS-2-7A	CORRIDOR 204	370	0.00	7.19	6.64	6.34	208/1/60	TRANE MITSUBISHI PKFY-P08NHMU-E2	1
SS-2-7B	CORRIDOR 204	370	0.00	7.19	6.64	6.34	208/1/60	TRANE MITSUBISHI PKFY-P08NHMU-E2	1
SS-2-8	INTERVIEW 222	180	0.00	5.39	4.15	4.72	208/1/60	TRANE MITSUBISHI PKFY-P06NBMU-E2R1	1
SS-2-9	INTERVIEW 223	180	0.00	5.39	4.15	4.72	208/1/60	TRANE MITSUBISHI PKFY-P06NBMU-E2R1	1
SS-2-10	MONITOR STATION 224	180	0.00	5.39	4.15	4.72	208/1/60	TRANE MITSUBISHI PKFY-P06NBMU-E2R1	1
SS-2-11	INTERVIEW 227	180	0.00	5.39	4.15	4.72	208/1/60	TRANE MITSUBISHI PKFY-P06NBMU-E2R1	1
SS-2-12	INTERVIEW 226	180	0.00	5.39	4.15	4.72	208/1/60	TRANE MITSUBISHI PKFY-P06NBMU-E2R1	1
SS-2-13	INTERVIEW 225	180	0.00	5.39	4.15	4.72	208/1/60	TRANE MITSUBISHI PKFY-P06NBMU-E2R1	1
SS-2-14	ACADEMIC ADVISING 229	370	0.00	7.19	6.64	6.34	208/1/60	TRANE MITSUBISHI PKFY-P08NHMU-E2	1
SS-2-15	ACADEMIC ADVISING 230	370	0.00	7.19	6.64	6.34	208/1/60	TRANE MITSUBISHI PKFY-P08NHMU-E2	1
SS-2-16	WAITING ROOM 208	370	0.00	7.19	6.64	6.34	208/1/60	TRANE MITSUBISHI PKFY-P08NHMU-E2	1
SS-2-17	ACADEMIC ADVISING 231	370	0.00	7.19	6.64	6.34	208/1/60	TRANE MITSUBISHI PKFY-P08NHMU-E2	1
SS-2-18	CONFERENCE ROOM #2 232	370	0.00	10.78	8.61	9.51	208/1/60	TRANE MITSUBISHI PKFY-P12NHMU-E2	1
SS-2-19	CORRIDOR 209	180	0.00	5.39	4.15	4.72	208/1/60	TRANE MITSUBISHI PKFY-P06NBMU-E2R1	1
SS-2-20	COPY ROOM 218	370	0.00	10.78	8.61	9.51	208/1/60	TRANE MITSUBISHI PKFY-P12NHMU-E2	1
SS-3-1	STORAGE 317	370	0.00	13.10	10.12	10.86	208/1/60	TRANE MITSUBISHI PKFY-P15NHMU-E2	1, 2
SS-3-2	CONFERENCE ROOM 316	370	0.00	13.10	10.12	10.86	208/1/60	TRANE MITSUBISHI PKFY-P15NHMU-E2	1, 2
SS-3-3	STUDENT LIFE OFFICE #3 314	370	0.00	13.10	10.12	10.86	208/1/60	TRANE MITSUBISHI PKFY-P15NHMU-E2	1, 2
SS-3-4	VP FOR STUDENT LIFE 313	370	0.00	15.72	11.47	12.77	208/1/60	TRANE MITSUBISHI PKFY-P18NHMU-E2	1, 2
SS-3-5A	FUTURE OFFICES 310	930	0.00	31.44	22.94	25.54	208/1/60	TRANE MITSUBISHI PVFY-P36NAMU-E	1, 2
SS-3-5B	FUTURE OFFICES 310	930	0.00	31.44	22.94	25.54	208/1/60	TRANE MITSUBISHI PVFY-P36NAMU-E	1, 2
SS-3-6A	CORRIDOR 304	570	0.00	20.97	18.88	17.24	208/1/60	TRANE MITSUBISHI PKFY-P24NKMU-E2.TH	1, 2
SS-3-6B	CORRIDOR 304	570	0.00	20.97	18.88	17.24	208/1/60	TRANE MITSUBISHI PKFY-P24NKMU-E2.TH	1, 2
SS-3-7	CAREER SERVICES OFFICE #1 320	370	0.00	13.10	10.12	10.86	208/1/60	TRANE MITSUBISHI PKFY-P15NHMU-E2	1, 2
SS-3-8	CAREER SERVICES OFFICE #2 321	370	0.00	10.48	8.48	8.62	208/1/60	TRANE MITSUBISHI PKFY-P12NHMU-E2	1, 2
SS-3-9	RESOURCE ROOM 308	370	0.00	10.48	8.48	8.62	208/1/60	TRANE MITSUBISHI PKFY-P12NHMU-E2	1, 2
SS-3-10	OFFICE 323	370	0.00	10.48	8.48	8.62	208/1/60	TRANE MITSUBISHI PKFY-P12NHMU-E2	1, 2
SS-3-11	OFFICE 324	370	0.00	10.48	8.48	8.62	208/1/60	TRANE MITSUBISHI PKFY-P12NHMU-E2	1, 2
.	.	.	.	.	.	.	.	.	. 2

NOTES:

1. PROVIDE SIMPLE WALL MOUNTED WIRED CONTROLLER FOR EACH UNIT (PAC-YT53CRAU).
2. EQUIPMENT TO BE PROVIDED IN PHASE 2 UNLESS NOTED OTHERWISE. 2

VRF SYSTEM BRANCH BOX CONTROLLER SCHEDULE

DESIGNATION	TOTAL BRANCHES	WEIGHT (LBS)	ELECTRICAL	MCA	BASIS OF DESIGN	REMARKS
BB-1	13	150	208/1/60	1.08	MITSUBISHI CMP-P1013NU-GA1	1, 2
BB-2A	13	150	208/1/60	1.08	MITSUBISHI CMP-P1013NU-GA1	1, 2
BB-2B	8	85	208/1/60	0.64	MITSUBISHI CMP-P108NU-GB1	1, 2
BB-3	13	150	208/1/60	1.08	MITSUBISHI CMP-P1013NU-GA1	1, 2, 3
.	.	.	.	.	.	. 2

NOTES:

1. PROVIDE WITH DRAIN PAN.
2. PROVIDE ISOLATION VALVES ON EACH BRANCH WITH JOINT ADAPTORS.
3. EQUIPMENT TO BE PROVIDED IN PHASE 2 UNLESS NOTED OTHERWISE. 2

OUTDOOR AIR SUMMARY

DESIGNATION	SYSTEM TYPE	CONDITION ANALYZED	SYSTEM FLOOR AREA (SF)	SYSTEM POPULATION	OUTDOOR AIR REQUIRED (CFM)	OUTDOOR AIR PROVIDED (CFM)	AIR DISTRIBUTION EFFECTIVENESS
DOAS-1	100% OUTDOOR AIR	COOLING	8,892	204	1,862	1,930	1.00
DOAS-2	100% OUTDOOR AIR	COOLING	4,600	43	504	575	1.00
-	-	-	-	-	-	-	-

1

DUCT MOUNTED ELECTRIC HEATING COIL

DESIGNATION	LOCATION	AIRFLOW (CFM)	APPROXIMATE SIZE (IN x IN)	VELOCITY (FPM)	EAT (°F)	LAT (°F)	CAPACITY (kW)	NO. OF STEPS	ELECTRICAL	BASIS OF DESIGN	REMARKS
HC-1	DOAS-1 SA DUCT (CRAWL SPACE)	2,000	24x14	850	20	70	35.0	SCR	208/3/60	INDEECO QUZ	1
HC-2	DOAS-2 SA DUCT (THIRD FLOOR)	600	.	.	20	70	10.0	SCR	208/3/60	INDEECO QUZ	1, 2
-	-	-	-	-	-	-	-	-	-	-	-

NOTES:

1. PROVIDE WITH SCR CONTROLS THAT WILL BE CONNECTED AND CONTROLLED BY DOAS UNIT.
2. EQUIPMENT TO BE PROVIDED IN PHASE 2 UNLESS NOTED OTHERWISE.

DEDICATED OUTDOOR AIR UNIT SCHEDULE

DESIGNATION	LOCATION	AIRFLOW (CFM)	SUPPLY FAN				COOLING DATA								FILTERS		MCA	MOCP	ELECTRICAL	BASIS OF DESIGN	REMARKS
			QUANTITY	AIRFLOW (CFM)	ESP (IN WG)	MOTOR BHP	EAT (°F)		LAT (°F)		TOTAL MBH	SENSIBLE MBH	FACE VELOCITY	MAX AIR PD (IN WG)	ROWS	TYPE	MERV RATING				
							DB	WB	DB	WB											
DOAS-1	MECHANICAL YARD	2,000	1	2,000	1.0	7.5	97.1	76.3	53.0	51.4	165.4	92.3	150	0.5	4	2" PLEATED	8	68	90	208/3/60	MORGANIZER	1, 3, 5, 6, 7, 8, 9,10, 11 ,12
DOAS-2	THIRD FLOOR	600	1	600	0.6	0.75	97.1	76.3	55.3	53.5	46.6	27.9	150	0.5	4	2" PLEATED	8	3	15	208/3/60	MORGANIZER	2, 4, 5, 6, 7, 9,10, 12, 13
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

NOTES:

1. HORIZONTAL AIR HANDLER WITH SIDE DISCHARGE. TRANE MORGANIZER HOT GAS REHEAT COIL WITH MODULATING FACE/BYPASS DAMPER.
2. VERTICAL AIR HANDLER WITH TOP DISCHARGE. TRANE MORGANIZER HOT GAS REHEAT COIL WITH MODULATING FACE/BYPASS DAMPER.
3. ELECTRIC DUCT HEATER HC-1 MOUNTED DOWNSTREAM OF THE HOT GAS REHEAT COIL.
4. ELECTRIC DUCT HEATER HC-2 MOUNTED DOWNSTREAM OF THE HOT GAS REHEAT COIL.
5. PROVIDE WITH ELECTRONIC APR VALVE FOR PART LOAD CAPACITY CONTROL ON FIRST ON/LAST OFF REFRIGERANT CIRCUIT.
6. PROVIDE 7" COLOR TOUCHSCREEN USER INTERFACE FOR DIAGNOSTICS, SCHEDULING, AND SETPOINT ADJUSTMENTS.
7. PROVIDE FACTORY START-UP BY TRANE AND 1 YEAR WARRANTY ON LABOR.
8. MOUNT ON 8" TALL CONCRETE EQUIPMENT PAD.
9. PROVIDE FACTORY MOUNTED SUPPLY AIR SMOKE DETECTOR.
10. PROVIDE FACTORY START-UP.
11. STAINLESS STEEL DRAIN PAN.
12. PROVIDE WITH BACNET CORD TO TIE INTO MAIN DDC FOR CAMPUS CONTROL.
13. EQUIPMENT TO BE PROVIDED IN PHASE 2 UNLESS NOTED OTHERWISE.

2

GENERAL EXHAUST FAN SCHEDULE

DESIGNATION	SERVICE	AIRFLOW (CFM)	ESP (IN WG)	FAN SPEED (RPM)	MOTOR HORSEPOWER (BHP)	MOTOR SIZE (HP)	DRIVE TYPE	ELECTRICAL	APPROXIMATE WEIGHT (LBS)	INLET SONES	BASIS OF DESIGN	REMARKS
EF-1	CENTRIFUGAL DOWNBLAST	400	0.25	1600	0.07	1/10	DIRECT	120/1/60	50	8	GREENHECK G-085-VG	1, 2, 3, 4
EF-2	CENTRIFUGAL DOWNBLAST	200	0.25	1300	0.03	1/10	DIRECT	120/1/60	50	6	GREENHECK G-080-VG	1, 2 ,3 ,4
EF-3	CENTRIFUGAL DOWNBLAST	250	0.15	1250	0.03	1/10	DIRECT	120/1/60	50	6	GREENHECK G-080-VG	1, 2 ,3 ,4 ,5

2

NOTES:

1. PROVIDE FANS WITH INTEGRAL OVERCURRENT PROTECTION AND DISCONNECT SWITCH.
2. PROVIDE FANS WITH NEMA 3R DISCONNECT SWITCH.
3. PROVIDE WITH BACKDRAFT DAMPER.
4. COORDINATE FOOR OPENING AND ROOF CURBS WITH GENERAL CONTRACTOR.
5. EQUIPMENT TO BE PROVIDED IN PHASE 2 UNLESS NOTED OTHERWISE. 2

VRF SYSTEM OUTDOOR UNIT SCHEDULE

DESIGNATION	COOLING (MBH)	HEATING (MBH)	REFRIGERANT	WEIGHT (LBS)	ELECTRICAL	MCA	MOCP	BASIS OF DESIGN	REMARKS
HRU-1	166.02	145.33	R-410A	1,050	.	.	.	TRANE MITSUBISHI PURY-P168TSKMU-A	1, 4, 5, 6, 7, 8, 9, 10, 11, 13
HRU-1A	.	.	R-410A	500	208/3/60	23	30	TRANE MITSUBISHI PURY-P72TKMU-A	-
HRU-1B	.	.	R-410A	550	208/3/60	34	40	TRANE MITSUBISHI PURY-P96TKMU-A	-
HRU-2	165.38	139.98	R-410A	1,050		.	.	TRANE MITSUBISHI PURY-P168TSKMU-A	2, 4, 5, 6, 7, 8, 9, 10, 11, 13
HRU-2A	.	.	R-410A	500	208/3/60	23	30	TRANE MITSUBISHI PURY-P72TKMU-A	-
HRU-2B	.	.	R-410A	500	208/3/60	34	40	TRANE MITSUBISHI PURY-P96TKMU-A	-
HRU-3	215.91	176.28	R-410A	1,275	.	.	.	TRANE MITSUBISHI PURY-P216TSKMU-A	3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14
HRU-3A	.	.	R-410A	550	208/3/60	34	57	TRANE MITSUBISHI PURY-P96TKMU-A	2
HRU-3B	.	.	R-410A	725	208/3/60	45	74	TRANE MITSUBISHI PURY-P120TKMU-A	-
.	.	.	.	.	.	.	.	.	.

NOTES:

1. HRU-1 SYSTEM IS MADE UP OF HRU-1A & HRU-1B.
2. HRU-2 SYSTEM IS MADE UP OF HRU-2A & HRU-2B.
3. HRU-3 SYSTEM IS MADE UP OF HRU-3A & HRU-3B.
4. PROVIDE UNITS WITH OUTDOOR TWINNING KIT SPECIFIC FOR UNIT BEING PROVIDED.
5. REQUIRES ELECTRICAL CONNECTION FOR EACH UNIT.
6. INSTALL ON NEOPRENE VIBRATION ISOLATION PADS.
7. PROVIDE ALL ACCESSORIES FOR COMPLETE WORKING UNIT.
8. PROVIDE WITH HAIL GUARD KIT.
9. PROVIDE MODEL AE-200A CENTRAL TOUCH-SCREEN CONTROLLER TO MONITOR ALARMS AND SCHEDULE INDOOR UNIT SETPOINTS. INCLUDE EXPANSION MODULES AS NECESSARY TO MONITOR ALL INDOOR AND OUTDOOR UNITS. PROVIDE WITH BACNET CORD TO TIE INTO MAIN DDC FOR CAMPUS CONTROL.
10. ALL REFRIGERANT PIPING MUST BE INDEPENDENTLY INSULATED.
11. REFERENCE PIPING AND WIRING DIAGRAMS ON MECHANICAL SHEET M701.
12. REFERENCE PIPING AND WIRING DIAGRAMS ON MECHANICAL SHEET M702.
13. PROVIDE TWO PIPE HEAT RECOVERY VRF SYSTEM. BASIS OF DESIGN: TRANE MITSUBISHI CITY MULTI VRF.
14. EQUIPMENT TO BE PROVIDED IN PHASE 2 UNLESS NOTED OTHERWISE. 2

SPLIT SYSTEM UNIT SCHEDULE

DESIGNATION	SERVICE	TYPE	INDOOR UNIT		OUTDOOR UNIT					ELECTRICAL	BASIS OF DESIGN	REMARKS
			MOUNTING	AIRFLOW (CFM)	TOTAL MBH	SEER	AMBIENT TEMP RATING °F	MCA	MOCP			
SS-1 / ACCU-1	IT 118	COOLING	WALL	370	12	20.8	95	11	28	208/1/60	MITSUBISHI PKA-A12HA7 & PUY-A12NKA7	1, 2, 3, 4, 5, 6
SS-2 / ACCU-2	IT 318	COOLING	WALL	370	12	20.8	95	11	28	208/1/60	MITSUBISHI PKA-A12HA7 & PUY-A12NKA7	1, 2, 3, 4, 5, 6
-	-	-	-	-	-	-	-	-	-	-	-	-

NOTES:

1. R-410A REFRIGERANT.
2. PROVIDE CONTROLS AND THERMOSTATS INCLUDING OPERATION MODES, BACKLIT DISPLAY, FAN SPEED, AIRFLOW AND DIRECTION SETTINGS AND 7 DAY/24 HOUR SCHEDULE CAPABILITIES.
3. PROVIDE EQUIPMENT PAD FOR OUTDOOR UNITS.
4. POWER FOR INDOOR UNIT PROVIDED BY OUTDOOR UNIT.
5. PROVIDE NEMA-3R DISCONNECT SWITCH.
6. PROVIDE LOW AMBIENT KIT.

AIR DEVICE SCHEDULE

DESIGNATION	DUTY	CFM		FACE/MODULE SIZE (IN)	NOMINAL DUCT SIZE (IN)	THROW PATTERN	MAX TOTAL AIR PD (IN WG)	MAX NOISE CRITERIA (NC)	BASIS OF DESIGN		REMARKS
		MIN	MAX						MANUFACTURER	MODEL	
A1	OUTSIDE AIR	0	120	12x6	10x4	-	0.1	15	TITUS	300FL	1, 3
A2	OUTSIDE AIR	121	150	14x6	12x4	-	0.1	15	TITUS	300FL	1, 3
A3	OUTSIDE AIR	151	350	20x10	18x8	-	0.1	15	TITUS	300FL	1, 3
B1	SUPPLY	0	400	20x12	18x10	-	0.1	15	TITUS	300FL	1, 3
C1	EXHAUST	0	100	10x8	8x6	-	0.1	15	TITUS	300FL	1, 3
C2	EXHAUST	101	200	14x8	12x6	-	0.1	15	TITUS	300FL	1, 3
											1

NOTES:

1. PROVIDE OPPOSED BLADE DAMPER WITH SCREW DRIVER BALANCING. TAC WELD DAMPER IN POSITION AFTER TEST AND BALANCE IS COMPLETED.
2. PROVIDE MANUAL BALANCING DAMPER IN DUCTWORK TAKE-OFF FITTING.
3. PROVIDE 22.5° BLADE ANGLE. 1

OUTDOOR CONDENSING UNIT SCHEDULE

DESIGNATION	LOCATION	REFRIGERANT	COMPRESSOR		WEIGHT (LBS)	MCA	MOCP	ELECTRICAL	BASIS OF DESIGN	REMARKS
			QUANTITY	CAPACITY (TONS)						
CU-2	ROOF	R-410A	1	4	400	18	30	208/3/60	TRANE 4TTA	1, 2, 3, 4 ,5
-	-	-	-	-	-	-	-	-	-	-

NOTES:

1. OUTDOOR CONDENSING UNIT PARIED WITH DOAS-2.
2. PROVIDE WITH FACTORY INSTALLED ELECTRONIC APR VALVE.
3. PROVIDE HOT GAS REHEAT.
4. LOW AMBIENT TO 0F.
5. PROVIDE 1 YEAR WARRANTY ON PARTS AND ACCESSORIES.

2

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ISSUE FOR
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ISSUE DATE
09.11.2018

REVISIONS

NO.	REASON	DATE
1	AV Revisions by Owner and Quality Control	08.20.18
2	Revisions by Owner	09.11.18

PROJECT TEAM
PRINCIPAL IN CHARGE
ALAN CAVE, P.E.
PROJECT MANAGER
BLAKE SMITH, P.E.
DESIGN TEAM
RMF

PROJECT NAME
CAMPBELL UNIVERSITY
DAY HALL RENOVATIONS

PROJECT NO.
513.9660.00

SHEET TITLE
MECHANICAL SCHEDULES

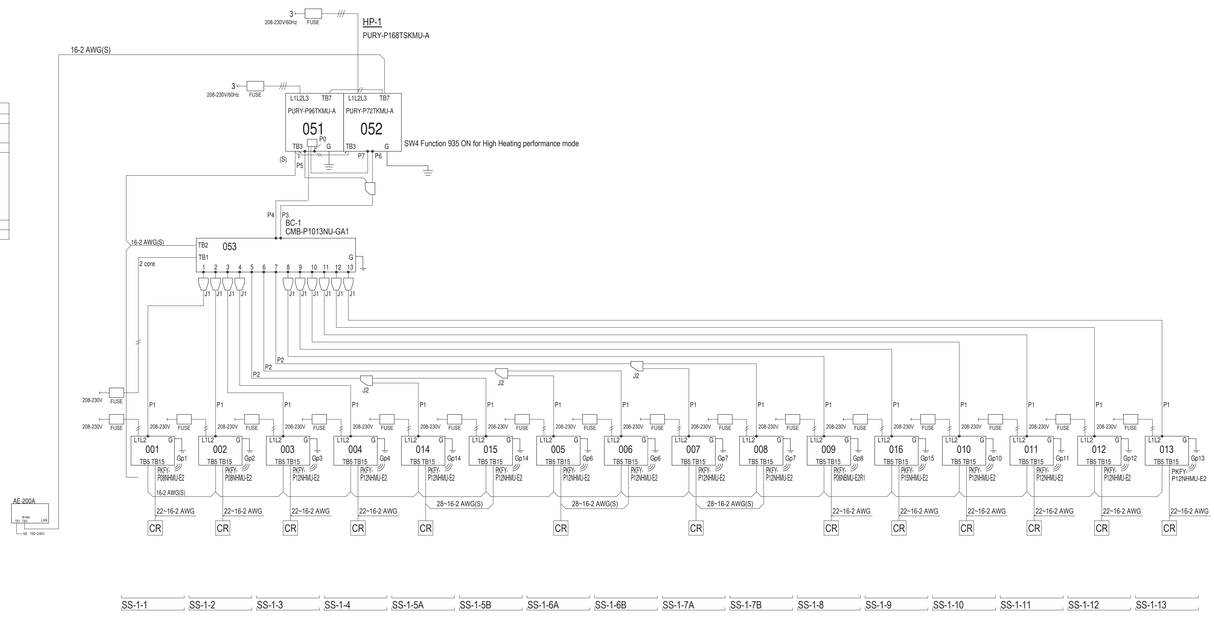
SHEET NUMBER
M601

GENERAL NOTES

1. THIS SHEET IS FOR INFORMATIONAL PURPOSES ONLY. CONTRACTOR SHALL VERIFY EXACT LENGTHS OF PIPE AND ADJUST AS NECESSARY. SHOP DRAWING SHALL BE ADJUSTED AS NECESSARY.

CITY MULTI
SYSTEM SCHEMATIC DWG.

PIPING AND CONTROLS	
SYMBOL	BRANCH PIPE MODEL NAME
J1	Reducer
J2	CMY-Y102SS-G2
SYMBOL	LIQUID PIPE/GAS PIPE SIZE
P1	1/4 / 1/2
P2	3/8 / 5/8
P3	7/8 /
P4	/ 1-1/8
P5	3/4 /
P6	5/8 /
P7	/ 3/4
SYMBOL	MODEL NUMBER
CR	PAC-YT53CRAU-J

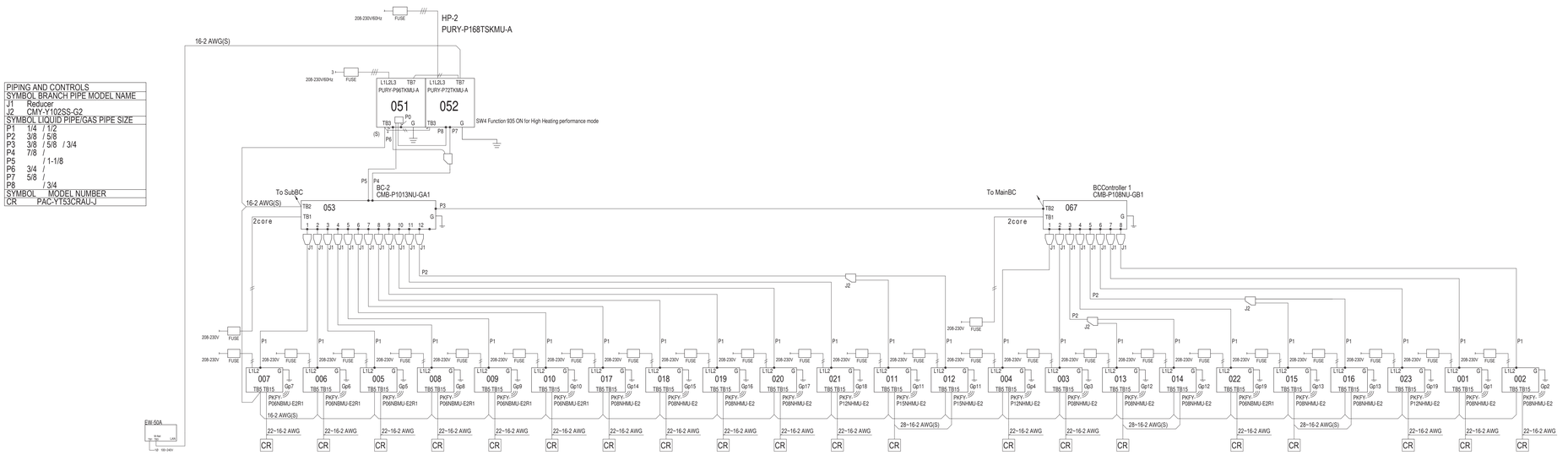


SS-1-1 SS-1-2 SS-1-3 SS-1-4 SS-1-5A SS-1-5B SS-1-6A SS-1-6B SS-1-7A SS-1-7B SS-1-8 SS-1-9 SS-1-10 SS-1-11 SS-1-12 SS-1-13

1 M701 **VRF SYSTEM 1 RISER**
SCALE:N.T.S.

CITY MULTI
SYSTEM SCHEMATIC DWG.

PIPING AND CONTROLS	
SYMBOL	BRANCH PIPE MODEL NAME
J1	Reducer
J2	CMY-Y102SS-G2
SYMBOL	LIQUID PIPE/GAS PIPE SIZE
P1	1/4 / 1/2
P2	3/8 / 5/8
P3	3/8 / 5/8 / 3/4
P4	7/8 /
P5	/ 1-1/8
P6	3/4 /
P7	5/8 /
P8	/ 3/4
SYMBOL	MODEL NUMBER
CR	PAC-YT53CRAU-J



SS-2-10 SS-2-9 SS-2-8 SS-2-11 SS-2-12 SS-2-13 SS-2-14 SS-2-15 SS-2-16 SS-2-17 SS-2-18 SS-2-5A SS-2-5B SS-2-4 SS-2-3 SS-2-6A SS-2-6B SS-2-19 SS-2-7A SS-2-7B SS-2-20 SS-2-1 SS-2-2

2 M701 **VRF SYSTEM 2 RISER**
SCALE:N.T.S.

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PROJECT MANAGER
BLAKE SMITH, P.E.
DESIGN TEAM
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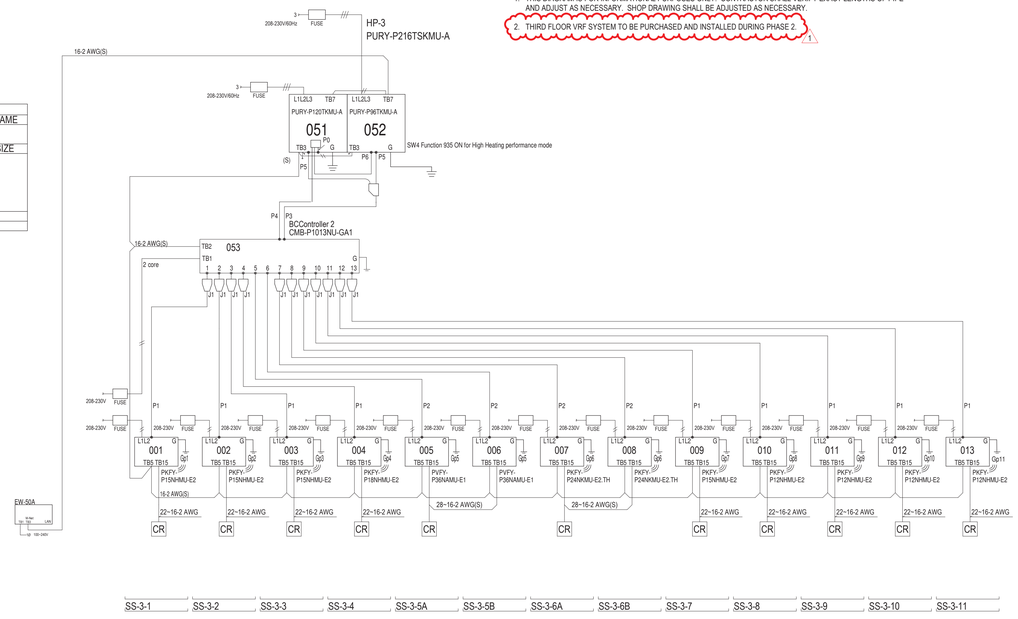
MECHANICAL CONTROLS

SHEET NUMBER
M701

CITY MULTI
SYSTEM SCHEMATIC DWG.

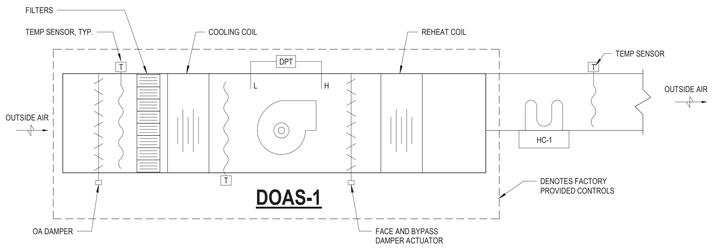
PIPING AND CONTROLS	
SYMBOL	BRANCH PIPE MODEL NAME
J1	Reducer
J2	CMY-Y102SS-G2
SYMBOL	LIQUID PIPE/GAS PIPE SIZE
P1	1/4 / 1/2
P2	3/8 / 5/8
P3	1-1/8 /
P4	/ 1-1/8
P5	3/4 /
P6	/ 7/8
SYMBOL	MODEL NUMBER
CR	PAC-YT53CRAU-J



GENERAL NOTES

1. THIS DIAGRAM IS FOR INFORMATIONAL PURPOSES ONLY. CONTRACTOR SHALL VERIFY EXACT LENGTHS OF PIPE AND ADJUST AS NECESSARY. SHOP DRAWING SHALL BE ADJUSTED AS NECESSARY.
2. THIRD FLOOR VRF SYSTEM TO BE PURCHASED AND INSTALLED DURING PHASE 2. 1

1 M702 **VRF SYSTEM 3 RISER**
SCALE:N.T.S.



SEQUENCE OF OPERATION

HOT GAS REHEAT PACKAGE ROOFTOP UNIT:

A. DISCHARGE AIR OCCUPIED CONTROL:

Control of the Trane Hot Gas Reheat DX rooftop unit is accomplished through a dedicated standalone Control module. One CONTROL MODULE will be installed on each rooftop unit (RTU). This controller utilizes five temperature sensors. The function of this controller is to maintain a programmed discharge air temperature.

The first temperature sensor (DXSUPPLY) is mounted after the DX evaporator coil. This temperature sensor will be used by the control module to control the compressors to maintain a 55 degree (programmable) dry bulb temperature setpoint. On multiple compressor applications the first compressor is energized at 51 degree and the second 55. The second compressor is shut off at 49 degrees and the first 44. These settings are adjustable.

The next temperature sensor (FBSUPPLY) is field mounted in the duct after the hot gas reheat coil and will be used by the CONTROL MODULE to output an analog signal to the face & bypass damper actuator (FBDAMPER) to maintain the discharge temperature to a 74 (programmable) setpoint.

Two strap-on temperature sensors (STS-1 & 2) will be used in the system. Strap-on temperature sensor #1 (STS-1) will be located in the suction line of circuit #1. This temperature sensor will disable both cooling circuits when the temperature goes below 28 degrees and enable them above 38. Strap-on temperature sensor #2 (STS-2) will be located in liquid line of compressor #1. This temperature sensor will enable control of condenser fan #2 by the CONTROL MODULE when the liquid line temperature exceeds 90 degrees. Under 85 degrees the fan is disabled. On single condenser fan units a variable speed controller modulates the speed of the fan.

The last temperature sensor (OASUPPLY) is mounted in the condenser section and monitors the outdoor air intake temperature. The CONTROL MODULE is programmed to lock the unit cooling out if the outside air intake is 63 degrees dry bulb temperature or lower.

The heat will be enabled when the outside air intake temperature is below 60 degrees (programmable). When heating is called for (based on the FBSUPPLY temperature), the CONTROL MODULE will go into heating mode and the heat will be controlled as required to maintain the FBSUPPLY heating setpoint (programmable). The SCR is controlled by an analog signal (AO3) from the CONTROL MODULE. The SCR controller modulates the electric heater based on the heating setpoint. On a multiple stage heater the SCR controls the first stage. Once the SCR ramps up to 100% a binary output (BO5) closes to energize the next stage of heat at 100% and the SCR starts modulating the 1st stage.

The CONTROL MODULE is programmed to maintain discharge air setpoint (for heating and cooling). The CONTROL MODULE has all of these functions pre-programmed, however since it is fully programmable, the setpoints and sequence can be modified if required.

B. FAN PROVING DEVICE:

A contact closure into the CONTROL MODULE IN-8 will indicate to the CONTROL MODULE proof of airflow from a differential pressure switch allowing either cooling or heating to operate.

C. OCCUPIED/UNOCCUPIED CONTROL:

A contact closure into the CONTROL MODULE IN-7 will indicate to the CONTROL MODULE an occupied mode of operation (the CONTROL MODULE will operate in the unoccupied mode while the contacts into IN-7 are open). The dry contact input will be wired from either a time clock or the building energy management system.

D. UNOCCUPIED MODE:

When the CONTROL MODULE is indexed to the unoccupied mode, the supply fan will be OFF and the cooling and heating stages will be OFF.

E. RTU SHUTDOWN CONTROL:

A dry contact opening across terminals 16 and 17 on the LTB board in the RTU will put the RTU in a fire shutdown mode of operation (contact by others).

2 M702 **OUTDOOR AIR UNIT DETAIL**
SCALE:N.T.S.

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RMF

PROJECT NAME
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DAY HALL RENOVATIONS

PROJECT NO.
513.9660.00

SHEET TITLE
MECHANICAL CONTROLS

SHEET NUMBER
M702