ABBREVIATIONS

A	AMPERES
AV	AUTOMATIC AIR VENT
AC	AIR CONDITIONING
ACCU	AIR COOLED CONDENSING UNIT
AD	ACCESS DOOR
AFF	ABOVE FINISHED FLOOR
AHU	AIR HANDLING UNIT
AL	ACOUSTICAL LINING
AP	ACCESS PANEL
BDD	BACK DRAFT DAMPER
BHP	BRAKE HORSEPOWER
BMS	BUILDING MANAGEMENT SYSTEM
BTU	BRITISH THERMAL UNIT
BTUH	BTUH PER HOUR
CCW	COUNTER CLOCKWISE
CD	CEILING DIFFUSER
CFM	CUBIC FEET PER MINUTE
CG	CEILING GRILLE
CHWR	CHILLED WATER RETURN
CHWS	CHILLED WATER SUPPLY
CLG	CEILING
COND	CONDENSATE
CP	CONDENSATE PUMP
CR	CEILING REGISTER
CU FT	CU FT
CU IN	CU IN
CWR	CONDENSER WATER RETURN
CWS	CONDENSER WATER SUPPLY
DWG	DRAWING
CV	CONSTANT VOLUME
CW	CLOCKWISE
D	DROP
DB	DRY BULB
DX	DIRECT EXPANSION
DHW	DOMESTIC HOT WATER
DIAM	DIAMETER
DN	DOWN
(E)	EXISTING TO REMAIN
EAT	ENTERING AIR TEMPERATURE
EDB	ENTERING DRY BULB TEMPERATURE
EF	EXHAUST FAN
EG	EXHAUST GRILLE
EL	ELEVATION
ELEC	ELECTRIC
EQ	EQUAL
(ER)	EXISTING TO BE REMOVED
(ERR)	EXISTING TO REMOVED AND RELOCATED
EWB	ENTERING WET BULB
EWT	ENTERING WATER TEMPERATURE
EXH	EXHAUST
EXP	EXPANSION
EXIST	EXISTING
°F	DEGREES FAHRENHEIT
F&T	FLOAT AND THERMOSTATIC
FA	FREE AREA (SQ.FT.)
FC	FLEXIBLE CONNECTION
FD	FIRE DAMPER
FLA	FULL LOAD AMPERES
FPI	FINS PER INCH
FPM	FEET PER MINUTE
FPS	FEET PER SECOND

FT	FEET
FTR	FINNED TUBE RADIATION
G	GAUGE
GAL	GALLON
HC	HEATING COIL
HD	HEAD
HR	HOUR
HT	HEIGHT
HV	HEATING AND VENTILATING
HWR	HOT WATER RETURN
HWS	HOT WATER SUPPLY
HZ	FREQUENCY
IN	INCH OR INCHES
KW	KILOWATT
L	LENGTH
LAT	LEAVING AIR TEMPERATURE
LBS	POUNDS
LBD	LEAVING DRY BULB TEMPERATURE
LIN FT	LINEAR FEET
LPS	LOW PRESSURE SUPPLY
LPR	LOW PRESSURE RETURN
LRA	LOCKED ROTOR AMPS
LWB	LEAVING WET BULB TEMPERATURE
LWT	LEAVING WATER TEMPERATURE
MAV	MANUAL AIR VENT
MAX	MAXIMUM
MBH	THOUSAND BTUH PER HOUR
MER	MECHANICAL EQUIPMENT ROOM
MHP	MOTOR HORSEPOWER
MIN	MINIMUM
NO.	NUMBER
NTS	NOT TO SCALE
OA	OUTSIDE AIR
OAI	OUTSIDE AIR INTAKE
OED	OPEN ENDED DUCT
PD	PRESSURE DROP
PRV	PRESSURE REDUCING VALVE
PSI	POUNDS PER SQUARE INCH
PSIA	PSI ABSOLUTE
PSIG	PSI GAUGE
R	RISE
RA	RETURN AIR
RG	RETURN GRILLE
RLA	RUNNING LOAD AMPS
RM	ROOM
ROT	ROTATION
RPM	REVOLUTIONS PER MINUTE
(RRO)	EXISTING TO BE REMOVED AND RETURNED TO OWNER
RTU	ROOFTOP AIR-CONDITIONING UNIT
SA	SUPPLY AIR
SG	SUPPLY GRILLE
SP	STATIC PRESSURE
SPEC	SPECIFICATION
TEMP	TEMPERATURE
TR	TOP REGISTER
TRD	TRANSFER DUCT
TYP	TYPICAL
TX	TOILET EXHAUST
V	VOLTS
VA	VENTILATION AIR
WMS	WIRE MESH SCREEN

SYMBOL LIST

	SINGLE LINE DUCTWORK OR EQUIPMENT – NEW
	SINGLE LINE DUCTWORK OR EQUIPMENT – EXISTING
	DUCTWORK OR EQUIPMENT TO BE REMOVED
	DUCTWORK WITH ACOUSTICAL LINING
	DUCTWORK UNDER POSITIVE PRESSURE (SUPPLY AIR OR FAN DISCHARGE)
	DUCT UNDER NEGATIVE PRESSURE (RETURN,EXHAUST, OR OUTSIDE AIR)
VD	VOLUME DAMPER
FD/AD	FIRE DAMPER AND ACCESS DOOR
BDD	BACK DRAFT DAMPER
M	MOTORIZED DAMPER
M FSD/AD	COMBINATION SMOKE AND FIRE DAMPER (ELECTRIC) AND ACCESS DOOR
℄	CENTER LINE
CFM	CUBIC FEET PER MINUTE
⌀	DIAMETER
	AIRFLOW DIRECTION
	SQUARE FEET
L 1.0 Φ F.A.	LOUVER IN DOOR – MIN. 1.0 SF FREE AREA
UC	UNDERCUT DOOR
	POINT OF CONNECTION
	POINT OF DISCONNECTION
CD-A 400	TYPE A CEILING DIFFUSER (400 CFM SUPPLY AIR)
	RECTANGULAR DIFFUSER WITH BLANKING PLATE
	VANED ELBOW
	RADIUS ELBOW
	SEE DUCT DETAILS FOR TYPE OF BRANCH CONNECTION
	DUCT FLEXIBLE CONNECTION
	VERTICAL DUCT DROP (IN DIRECTION OF AIRFLOW)
	VERTICAL DUCT RISE (IN DIRECTION OF AIRFLOW)
T	THERMOSTAT
SD	DUCT SMOKE DETECTOR
	SECTION DESIGNATION SHEET NO. WHERE SECTION IS SHOWN
	NEW PIPE WITH DIRECTION OF FLOW
	EXISTING PIPING
	PIPING TO BE REMOVED
	PIPE DROP
	PIPE RISE

GENERAL NOTES

1. GENERAL NOTES, SYMBOL LIST AND DETAILS ARE APPLICABLE TO ALL HVAC/MECHANICAL DRAWINGS.
2. DRAWINGS ARE DIAGRAMMATIC. DETERMINE EXACT LOCATIONS OF SYSTEMS AND COMPONENTS IN FIELD. RELOCATE EXISTING WORK THAT INTERFERES WITH WORK OF THIS CONTRACT.
3. COORDINATE THIS WORK WITH THAT OF OTHER TRADES.
4. DIMENSIONS SHOWN ON PLAN ARE HORIZONTAL. DIMENSIONS SHOWN IN ELEVATION ARE VERTICAL EXCEPT IN WAY OF STRUCTURAL STEEL, DIMENSIONS ARE MEASURED PERPENDICULAR TO FLANGE.
5. PRODUCT INSTALLATION SHALL ADHERE TO MANUFACTURER'S REQUIREMENTS.
6. RUN DUCTS AND PIPING CONCEALED WITHIN WALLS, CEILINGS, OR SOFFITS, UNLESS OTHERWISE SPECIFIED AND CLEAR OF CEILING INSERTS. COORDINATE ROUTING WITH ARCHITECT AND CONSTRUCTION METHODS.
7. INSTALL THERMOSTATS 4'–6" ABOVE FINISHED FLOOR UNLESS OTHERWISE DIRECTED BY ARCHITECT.
8. SPECIFICATIONS ARE PART OF THESE DOCUMENTS AND SCOPE OF WORK.
9. REFER TO ARCHITECTURAL REFLECTED CEILING PLANS FOR EXACT LOCATIONS OF AIR DEVICES.
10. PROVIDE 36" CLEARANCE IN FRONT OF ALL ELECTRIC CONTROL PANELS PER N.E.C. AND MFG. REQUIREMENTS.

DEMOLITION NOTES

1. THE CONTRACTOR SHALL INCLUDE IN HIS PRICE ALL COSTS ASSOCIATED WITH REMOVALS AND RELOCATIONS OF HVAC WORK AS DESCRIBED ON THE DRAWINGS AND IN THE SPECIFICATIONS WITH ALLOWANCES FOR EXPECTED OR UNFORESEEN DIFFICULTIES WHEN CONCEALED WORK HAS BEEN OPENED. NO CLAIMS FOR ADDITIONAL WORK ASSOCIATED WITH DEMOLITION WILL BE ACCEPTED, EXCEPT IN CERTAIN CASES CONSIDERED JUSTIFIABLE BY THE OWNER/ENGINEER.
2. THE CONTRACTOR SHALL PERFORM DEMOLITION AND REMOVAL WORK WITH MINIMUM INTERFERENCE TO FUNCTIONING HVAC SYSTEMS. ALL AFFECTED SYSTEMS SHALL BE RECONNECTED AND RESTORED.
3. DEMOLITION AND REMOVAL WORK SHALL BE PERFORMED IN A NEAT AND WORKMANLIKE MANNER. THE CONTRACTOR SHALL PATCH, REPAIR OR OTHERWISE RESTORE ANY DAMAGED INTERIOR OR EXTERIOR BUILDING SURFACE TO ITS ORIGINAL CONDITION.
4. THE CONTRACTOR SHALL REMOVE ALL DUCT AND PIPING SUPPORTS, ETC. FROM PARTITIONS THAT ARE TO BE REMOVED. WHERE THE REMOVAL OF THESE ITEMS DISRUPTS EXISTING PIPING THAT IS TO REMAIN, THE CONTRACTOR SHALL INSTALL AND PROVIDE BYPASS CONNECTIONS AS NECESSARY.
5. PORTIONS OF PIPING AND DUCTWORK TO BE REMOVED OR ABANDONED AS A RESULT OF DEMOLITION WORK, BUT WHICH ARE REQUIRED TO REMAIN ACTIVE, SHALL BE CUT AT CONVENIENT LOCATIONS, REROUTED AND RECONNECTED.
6. THE CONTRACTOR SHALL NOTIFY THE CAMPUS, AT THE APPROPRIATE TIME, OF THE PROJECTED DEMOLITION AND PHASING SCHEDULE SO THAT REMOVAL OR RELOCATION OF AFFECTED MECHANICAL SERVICES MAY BE CARRIED OUT IN COORDINATION WITH THE PROJECT REQUIREMENTS.
7. ALL EXISTING MATERIAL AND EQUIPMENT IN USABLE CONDITION, WHICH IS TO BE REMOVED UNDER THIS CONTRACTOR, SHALL REMAIN THE PROPERTY OF THE OWNER OR SHALL BE DISPOSED OF BY THE HVAC CONTRACTOR, AS DIRECTED BY THE OWNER.
8. ARRANGE TO WORK CONTINUOUSLY, INCLUDING OVERTIME IF REQUIRED, TO ASSURE THAT SYSTEMS WILL BE SHUT DOWN ONLY DURING THE TIME ACTUALLY REQUIRED TO MAKE THE NECESSARY CONNECTIONS TO THE EXISTING SYSTEMS.
9. THE SHUTDOWN OF EXISTING BUILDING HVAC SERVICES SHALL BE COORDINATED WITH THE CAMPUS SERVICES. MAKE ARRANGEMENTS AT LEAST 5 BUSINESS DAYS PRIOR TO A SHUTDOWN.

AIR SYSTEMS

1. INTERNAL AIRFLOW DIMENSIONS ARE SHOWN FOR DUCTS. INCREASE DUCT SIZE AS NECESSARY TO MAINTAIN FREE FLOW AREA INDICATED.
2. PROVIDE VOLUME DAMPERS OR OTHER APPROVED BALANCING DEVICES AT DUCT BRANCHES AND RUN OUTS, AND AT REGISTER GRILLE AND DIFFUSER NECKS IN SUPPLY, RETURN AND EXHAUST DUCTWORK WHETHER SHOWN OR NOT.

MECHANICAL DRAWING LIST

SYMBOLS

Revisions

REVISION #	DATE	REVISION	APPROVED
–	7/8/21	FINAL REVIEW SET	
–	9/14/21	ISSUED FOR BID	

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PROJECT

Purchase College
Studio A
Renovations

DRAWING NAME

MECHANICAL SYMBOL LIST, NOTES & ABBREVIATONS

SEAL & SIGNATURE

SCALE NONE

DATE

CAD FILE#

DRAWING NUMBER

M-001.00

SHEET

01 of 09

HVAC SPECIFICATIONS

1. GENERAL

A. ALL APPLICABLE CODES, LAWS AND REGULATIONS GOVERNING OR RELATING TO ANY PORTION OF THIS WORK ARE HEREBY INCORPORATED INTO AND MADE A PART OF THESE SPECIFICATIONS, AND THEIR PROVISIONS SHALL BE CARRIED OUT BY THE CONTRACTOR WHO SHALL INFORM THE OWNER, PRIOR TO SUBMITTING A PROPOSAL, OF ANY WORK OR MATERIALS WHICH VIOLATE ANY OF THE ABOVE LAWS AND REGULATIONS. ANY WORK DONE BY THE CONTRACTOR CAUSING SUCH VIOLATION SHALL BE CORRECTED BY THE CONTRACTOR.

B. INVESTIGATE EACH SPACE THROUGH WITH EQUIPMENT MUST BE MOVED. WHERE NECESSARY, EQUIPMENT SHALL BE SHIPPED FROM MANUFACTURER IN SECTIONS OF SIZE SUITABLE FOR MOVING THROUGH AVAILABLE RESTRICTIVE SPACES. ASCERTAIN FROM BUILDING OWNER AT WHAT TIMES OF DAY EQUIPMENT MAY BE MOVED THROUGH ALL AREAS.

C. DUCTWORK IS SHOWN DIAGRAMMATICALLY AND DOES NOT SHOW ALL OFFSETS, DROPS AND RISES OF RUNS. THE CONTRACTOR SHALL ALLOW IN HIS PRICE FOR ROUTING OF DUCTWORK TO AVOID OBSTRUCTIONS. EXACT LOCATIONS ARE SUBJECT TO APPROVAL OF ARCHITECT. COORDINATION WITH THE EXISTING SERVICES, INCLUDING THOSE OF OTHER TRADES IS REQUIRED.

D. SUPPORT ALL DUCTWORK AND PIPING FROM BUILDING STRUCTURE AND/OR FRAMING IN AN APPROVED MANNER. WHERE OVERHEAD CONSTRUCTION DOES NOT PERMIT FASTENING OR SUPPORTS FOR EQUIPMENT, FURNISH ADDITIONAL FRAMING. INSERTS SHALL BE STEEL, SLOTTED TYPE AND FACTORY PAINTED. SINGLE ROD SHALL BE SIMILAR TO GRINNELL FIG. 281. MULTI-ROD SHALL BE SIMILAR TO FEE & MASON SERIES 9000 WITH END CAPS AND CLOSURE STRIPS. MAXIMUM LOADING INCLUDING PIPES, DUCTWORK CONTENTS AND COVERING SHALL NOT EXCEED 75% OF RATED INSERT CAPABILITY. WHEN SUPPORTING FROM BUILDING USE BEAM CLAMPS IN APPROVED MANNER.

E. INSTALL WORK AS TO BE READILY ACCESSIBLE FOR OPERATION, MAINTENANCE AND REPAIR. MINOR DEVIATIONS FROM DRAWINGS MAY BE MADE TO ACCOMPLISH THIS, BUT CHANGES WHICH INVOLVE EXTRA COST SHALL NOT BE MADE WITHOUT APPROVAL.

F. REMOVAL AND RELOCATION OF CERTAIN EXISTING WORK WILL BE NECESSARY FOR THE PERFORMANCE OF THE GENERAL WORK. ALL EXISTING CONDITIONS CANNOT BE COMPLETELY DETAILED ON THE DRAWINGS. THE CONTRACTOR SHALL SURVEY THE SITE AND INCLUDE ALL CHANGES IN MAKING UP THE WORK PROPOSAL.

G. PLAN INSTALLATION OF NEW WORK AND CONNECTIONS TO EXISTING WORK TO INSURE MINIMUM INTERFERENCE WITH REGULAR OPERATION OF EXISTING FACILITIES. ALL SYSTEM SHUTDOWNS AFFECTING OTHER AREAS SHALL BE COORDINATED WITH BUILDING OWNER. INSTALL ISOLATION VALVES AT POINT OF CONNECTION TO THE EXISTING PIPING. PROVIDE TEMPORARY DUCT CAPS AND/OR CONNECTIONS TO MINIMIZE SHUTDOWN TIME.

H. CONNECT NEW WORK TO EXISTING WORK IN NEAT AND APPROVED MANNER. RESTORE EXISTING WORK DISTURBED WHILE INSTALLING NEW WORK TO ACCEPTABLE CONDITION AS DETERMINED BY ARCHITECT.

I. DISCONNECT, REMOVE AND/OR RELOCATE EXISTING MATERIAL, EQUIPMENT AND OTHER WORK AS NOTED OR REQUIRED FOR PROPER INSTALLATION OF NEW SYSTEM.

J. THE CONTRACTOR SHALL KEEP ALL EQUIPMENT AND MATERIALS, AND ALL PARTS OF THE BUILDING, EXTERIOR SPACES AND ADJACENT STREETS, SIDEWALKS AND PAVEMENTS, FREE FROM MATERIAL AND DEBRIS RESULTING FROM THE EXECUTION OF THIS WORK. EXCESS MATERIALS WILL NOT BE PERMITTED TO ACCUMULATE EITHER ON THE INTERIOR OR THE EXTERIOR.

K. SEAL OPENINGS AROUND DUCTS AND PIPING THROUGH PARTITIONS, WALLS AND FLOORS (NOT IN SHAFTS) WITH APPROVED FIRESTOPPING METHODS.

L. ALL PRESENT MATERIAL, EQUIPMENT AND CONSTRUCTION DEBRIS TO BE REMOVED UNDER THIS CONTRACT SHALL BECOME THE PROPERTY OF THE CONTRACTOR WITH THE EXCEPTION OF SPECIFIC EQUIPMENT AND APPARATUS REQUESTED BY THE BUILDING REPRESENTATIVE, ARCHITECT OR AS NOTED TO BE RELOCATED ON THE DRAWINGS SHALL BE PROPERLY DISPOSED OF BY THIS CONTRACTOR.

M. MATERIALS AND WORKMANSHIP, UNLESS OTHERWISE NOTED, SHALL BE IN ACCORDANCE WITH BUILDING STANDARDS.

N. THE WORK IN THE BUILDING SHALL BE DONE WHEN AND AS DIRECTED, AND IN A MANNER SATISFACTORY TO THE OWNER. THE WORK SHALL BE PERFORMED SO AS TO CAUSE THE LEAST POSSIBLE INCONVENIENCE AND DISTURBANCE TO THE PRESENT OCCUPANTS.

O. THE CONTRACTOR'S PROPOSAL FOR ALL WORK SHALL BE PREDICATED ON THE PERFORMANCE OF THE WORK DURING REGULAR WORKING HOURS. WHEN SO DIRECTED, HOWEVER, THE CONTRACTOR SHALL INSTALL WORK IN OVERTIME AND THE ADDITIONAL COST TO BE CHARGED THEREFORE SHALL BE ONLY THE "PREMIUM" PORTION OF THE WAGES PAID.

P. UNLESS OTHERWISE SPECIFICALLY SPECIFIED, INCLUDE ALL CUTTING AND PATCHING OF EXISTING FLOORS, WALLS, PARTITIONS AND OTHER MATERIALS IN THE EXISTING BUILDING. THE CONTRACTOR SHALL RESTORE THESE AREAS TO ORIGINAL CONDITION.

Q. REMOVABLE ACCESS TILE AND/OR ACCESS DOOR ARE REQUIRED IN HUNG CEILINGS, SHAFTS AND WALLS FOR ALL VOLUME AND FIRE DAMPERS, AUTOMATIC DAMPERS AND ALL OTHER MECHANICAL EQUIPMENT AND DEVICES. HVAC CONTRACTOR TO FURNISH ACCESS LOCATION REQUIREMENTS TO GENERAL CONTRACTOR. ACCESS TILE IDENTIFICATION: PROVIDE BUTTONS, TABS, AND MARKERS TO IDENTIFY LOCATION OF CONCEALED VALVES, DAMPERS AND EQUIPMENT.

R. ALL MATERIAL AND EQUIPMENT SHALL HAVE A UL, CSA, OR OTHER TESTING APPROVED AGENCY NUMBER. THIS INFORMATION MUST BE INCLUDED IN THE SUBMITTAL PACKAGE.

S. ALL MATERIAL AND EQUIPMENT TO BE NEW UNLESS OTHERWISE NOTED AND SHALL BE IN ACCORDANCE WITH BUILDING STANDARDS.

T. SUBMISSION OF A PROPOSAL SHALL BE CONSTRUED AS EVIDENCE THAT A CAREFUL EXAMINATION OF THE PORTIONS OF THE EXISTING BUILDING, EQUIPMENT, ETC., WHICH AFFECT THIS WORK, AND THE ACCESS TO SUCH SPACES, HAS BEEN MADE AND THAT THE CONTRACTOR IS FAMILIAR WITH EXISTING CONDITIONS AND DIFFICULTIES THAT WILL AFFECT THE EXECUTION OF THE WORK. LATER CLAIMS SHALL NOT BE MADE FOR LABOR, EQUIPMENT OR MATERIALS REQUIRED BECAUSE OF DIFFICULTIES ENCOUNTERED WHICH COULD HAVE BEEN FORESEEN DURING SUCH AN EXAMINATION. THE ON-SITE INSPECTION SHALL VERIFY EXISTING DUCTWORK, PIPING (SIZES, CLEARANCES, ETC) AND CONDITIONS.

U. INSURANCE: IN ACCORDANCE WITH BUILDING REQUIREMENTS AND SHALL INCLUDE A HOLD HARMLESS CLAUSE FOR OWNER AND ENGINEER.

V. THE FINAL ACCEPTANCE WILL BE MADE AFTER THE CONTRACTOR HAS ADJUSTED HIS EQUIPMENT, BALANCED THE VARIOUS SYSTEMS, DEMONSTRATED THAT IT FULFILLS THE REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS AND HAS FURNISHED ALL THE REQUIRED CERTIFICATES OF INSPECTION AND APPROVAL.

W. SPECIFICATIONS ARE OF SIMPLIFIED FORM AND INCLUDE INCOMPLETE SENTENCES. WORDS OR PHRASES SUCH AS "THE CONTRACTOR SHALL," "SHALL BE," "FURNISH," "PROVIDE," "A," "THE," AND "ALL" HAVE BEEN OMITTED FOR BREVITY.

X. DEFINITIONS:

1) "PROVIDE": TO SUPPLY, INSTALL AND CONNECT UP COMPLETE AND READY FOR SAFE AND REGULAR OPERATION THE PARTICULAR WORK REFERRED TO UNLESS SPECIFICALLY OTHERWISE NOTED.

2) "INSTALL": TO ERECT, MOUNT AND CONNECT COMPLETE WITH RELATED ACCESSORIES.

3) "FURNISH" OR "SUPPLY": TO PURCHASE, PROCURE, ACQUIRE AND DELIVER COMPLETE WITH RELATED ACCESSORIES.

4) "WORK": LABOR, MATERIALS, EQUIPMENT, APPARATUS, CONTROLS, ACCESSORIES AND OTHER ITEMS REQUIRED FOR PROPER AND COMPLETE INSTALLATION.

5) "CONCEALED": EMBEDDED IN MASONRY OR OTHER CONSTRUCTION, INSTALLED IN FURRED SPACES, WITHIN DOUBLE PARTITIONS OR HUNG CEILINGS, IN TRENCHES, IN CRAWL SPACES, OR IN ENCLOSURES.

6) "EXPOSED": NOT INSTALLED UNDERGROUND OR "CONCEALED" AS DEFINED ABOVE.

7) "SIMILAR" OR "EQUAL": EQUAL IN MATERIALS, WEIGHT, SIZE, DESIGN AND EFFICIENCY OF SPECIFIED PRODUCT.

2. SCOPE OF WORK

A. THE WORK UNDER CONTRACT INCLUDES ALL LABOR, MATERIALS AND APPLIANCES NECESSARY FOR THE FURNISHING, INSTALLING AND TESTING, COMPLETE AND READY FOR SAFE OPERATION OF THE SYSTEMS. WORK SHALL BE INSTALLED IN A NEAT, WORKMANLIKE MANNER.

B. THE CONTRACTOR SHALL GIVE NECESSARY NOTICE, FILE DRAWINGS AND SPECIFICATIONS WITH THE DEPARTMENT HAVING JURISDICTION, OBTAIN PERMITS OR LICENSES NECESSARY TO CARRY OUT THIS WORK AND PAY ALL FEES THEREFORE. THE CONTRACTOR SHALL ARRANGE FOR INSPECTION AND TESTS OF ANY OR ALL PARTS OF THE WORK IF SO REQUIRED BY AUTHORITIES AND PAY ALL CHARGES FOR SAME. THE CONTRACTOR SHALL PAY ALL COSTS FOR, AND FURNISH TO THE OWNER BEFORE FINAL BILLING, ALL CERTIFICATES NECESSARY AS EVIDENCE THAT THE WORK INSTALLED CONFORMS WITH ALL REGULATIONS WHERE THEY APPLY TO THIS WORK.

C. THE CONTRACTOR SHALL FURNISH A WRITTEN GUARANTEE TO REPLACE OR REPAIR PROMPTLY AND ASSUME RESPONSIBILITY FOR ALL EXPENSES INCURRED FOR ANY WORKMANSHIP AND EQUIPMENT IN WHICH DEFECTS DEVELOP WITHIN ONE YEAR FROM THE DATE OF FINAL CERTIFICATE FOR PAYMENT AND/OR FROM DATE OR ACTUAL USE OF EQUIPMENT OR OCCUPANCY OF SPACES, BY OWNER, INCLUDED UNDER THE VARIOUS PARTS OF THE WORK, WHICHEVER DATE IS EARLIER. THIS WORK SHALL BE DONE AS DIRECTED BY THE OWNER. THIS GUARANTEE SHALL ALSO PROVIDE THAT WHERE DEFECTS OCCUR, THE CONTRACTOR WILL ASSUME RESPONSIBILITY FOR ALL EXPENSES INCURRED IN REPAIRING AND REPLACING WORK OF OTHER TRADES AFFECTED BY DEFECTS, REPAIRS OR REPLACEMENTS IN EQUIPMENT SUPPLIED BY THE CONTRACTOR.

D. PROGRESS AND SPECIAL INSPECTIONS SHALL BE PERFORMED BY A LICENSED PROFESSIONAL ENGINEER TO BE HIRED BY THE OWNER.

E. PRIOR TO THE INSTALLATION OF ANY WORK AND PROCUREMENT OF EQUIPMENT PROVIDE COMPLETE SET OF COORDINATED SHOP DRAWINGS OF ALL NEW AND EXISTING EQUIPMENT, DUCTWORK, PIPING AND CONTROL SYSTEMS INDICATING CAPACITY DIMENSIONS AND SEQUENCE OF OPERATION FOR WRITTEN APPROVAL BY THE ARCHITECT AND ENGINEER.

3. SHOP DRAWINGS

A. INDICATE ON EACH SUBMISSION: PROJECT NAME AND LOCATION, ARCHITECT AND ENGINEER, ITEM IDENTIFICATION AND APPROVAL STAMP OF PRIME CONTRACTOR.

B. SUBMISSIONS:

1) SUBMISSIONS 11 IN. X 17 IN. OR SMALLER: IF THE SUBMISSION IS A CATALOG CUT, THEN THE CONTRACTOR SHALL SUBMIT ONE ORIGINAL AND TWO COPIES. OTHERWISE, HE SHALL SUBMIT THREE COPIES. THE ARCHITECT WILL FORWARD THE ORIGINAL AND ONE COPY (TWO COPIES WHEN NO ORIGINAL IS RECEIVED) TO THE ENGINEER. ALL CATALOG CUTS SHALL BE COMPLETE.

2) SUBMISSIONS LARGER THAN 11 IN. X 17 IN.: SUBMIT TWO PRINTS AND ONE PAPER SEPIA TO THE ARCHITECT. THE ARCHITECT WILL FORWARD ONE PRINT AND THE PAPER SEPIA TO THE ENGINEER.

C. SUBMIT SHOP DRAWINGS FOR THE FOLLOWING:

1) DUCTWORK LAYOUT AND SHEET METAL DESIGNS.

2) ROOFTOP AIR-CONDITIONING UNIT

3) AIR OUTLETS AND INLETS.

4) AIR BALANCE REPORT.

5) OPERATING SEQUENCES.

6) VIBRATION ISOLATION.

7) AUTOMATIC CONTROL SYSTEMS AND DEVICES.

8) VAV BOXES.

9) DUCTWORK INSULATION AND LINER.

4. AS-BUILTS AND EQUIPMENT OPERATION INSTRUCTIONS

A. ON COMPLETION AND ACCEPTANCE OF WORK, THIS CONTRACTOR SHALL FURNISH WRITTEN INSTRUCTIONS, EQUIPMENT MANUALS AND DEMONSTRATE TO THE OWNER THE PROPER OPERATION AND MAINTENANCE OF ALL EQUIPMENT AND APPARATUS FURNISHED UNDER THIS CONTRACT.

B. THESE INSTRUCTIONS SHALL BE TYPED ON 8-1/2 IN. X 11 IN. PAPER AND BOUND IN THREE-RING BINDERS WITH CLEAR ACETATE COVERS. THE CONTRACTOR SHALL GIVE THREE COPIES OF THE INSTRUCTIONS TO THE OWNER AND ONE COPY TO THE ENGINEER.

C. THE INSTRUCTION BOOKLET SHALL BE ORGANIZED IN SECTIONS, WITH ONE SECTION PER SYSTEM. THE COVER OF THE INSTRUCTION BOOKLET SHALL BEAR THE NAME, ADDRESS AND PHONE NUMBER OF THE PROJECT, ARCHITECT, ENGINEER, MECHANICAL CONTRACTOR AND SUBCONTRACTORS.

D. REPRODUCIBLE "AS-BUILT" DRAWINGS INDICATING AS INSTALLED CONDITIONS SHALL BE PROVIDED TO THE ARCHITECT AFTER COMPLETION OF THE INSTALLATION.

5. SHEET METAL WORK

A. EXCEPT AS OTHERWISE SHOWN OR NOTED, ALL DUCTWORK AND OTHER SHEET METAL WORK SHALL BE RECTANGULAR GALVANIZED SHEET STEEL AND SHALL BE INSTALLED IN ACCORDANCE WITH THE LATEST EDITION OF SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION, INC. DUCT CONSTRUCTION STANDARDS, PRESSURE CLASSIFICATION 2 IN. W.G.

B. VOLUME DAMPERS: GALVANIZED STEEL, PER SMACNA "LOW VELOCITY MANUAL," EXCEPT PROVIDE BEARING AT ONE END OF DAMPER ROD AND QUADRANT, WITH LEVER AND LOCKSCREW AT OTHER END. FOR INSULATED DUCTS, QUADRANTS MOUNTED ON COLLAR TO CLEAR INSULATION. INSTALL WITH LEVERS ACCESSIBLE.

C. ACCESS DOORS: INSULATED OR UNINSULATED, SAME AS DUCT.

1) PROVIDE MINIMUM 12 IN. X 12 IN. ON MAIN DUCTS, AND 8 IN. X 8 IN. ON BRANCH DUCTS, UNLESS OTHERWISE APPROVED, AT FIRE DAMPERS, AND AT ALL DUCT ACCESSORIES SUCH AS DUCT SMOKE DETECTORS, AUTO DAMPERS, AND LOUVERS.

2) ALL ACCESS DOORS TO BE HINGED, WITH LATCH SIMILAR TO VENTLOCK NO. 100. REFER TO MECHANICAL DETAIL DRAWING FOR ADDITIONAL INFORMATION.

D. FLEXIBLE CONNECTIONS: NEOPRENE-COATED GLASS FABRIC, 30 OZ PER SQ YD WITH SEWED AND CEMENTED SEAMS, SIMILAR TO VENT FABRICS. PROVIDE WITH METAL COLLARS. ALLOW MINIMUM MOVEMENT OF 1 IN.

E. TURNING VANES: GALVANIZED STEEL SMALL DOUBLE-THICKNESS VANES WITH 2 IN. INSIDE RADIUS.

F. ALL DUCT DIMENSIONS INDICATED ON PLANS ARE INSIDE CLEAR DIMENSIONS.

G. WIRE MESH SCREEN (WMS): NO. 16 USSG, 3/4 SQUARE MESH, IN 1 IN. WIDE GALVANIZED STEEL ENCLOSING FRAME. FLANGED DUCT OPENING TO RECEIVE FRAME.

H. LOW PRESSURE FLEXIBLE DUCT: SHALL BE A FACTORY FABRICATED HIGH TEMPERATURE COPOLYMER IMPREGNATED GLASS FABRIC, LOCKED TO COLD ROLLED FLAT STEEL SPIRAL. SIMILAR TO WIREMOLD 57. MAXIMUM INSTALLED LENGTH SHALL NOT EXCEED 18 IN.

6. AIR OUTLETS

A. GENERAL:

1) MARGIN TYPES, COLORS, FINISH AND METHODS OF ATTACHMENT FOR ALL DIFFUSERS, GRILLES AND REGISTERS SHALL BE COORDINATED WITH ARCHITECTURAL CEILING AND WALL DETAILS AND SPECIFICATIONS.

2) FRAME TYPE SUITABLE FOR MOUNTING IN CEILING OR WALL CONSTRUCTION AS INDICATED ON ARCHITECTURAL PLANS.

3) EXACT LOCATION OF ALL AIR OUTLETS AS PER ARCHITECTURAL PLANS.

4) SUITABLE FOR OPERATION AT 20% EXCESS AND 20% LESS THAN NOTED CAPACITY FOR CONSTANT VOLUME SYSTEMS AND AT 20% EXCESS AND 60% LESS THAN NOTED CAPACITY FOR VARIABLE VOLUME SYSTEMS. MANUFACTURER RESPONSIBLE FOR EXAMINING APPLICATION OF EACH OUTLET AND GUARANTEE THAT EACH WILL PROVIDE REQUIRED NC LEVELS AND COMFORT SPACE CONDITIONS WITHOUT DRAFTS THROUGHOUT OPERATING RANGE.

5) ALL REGISTERS AND DIFFUSERS SHALL BE PROVIDED WITH OPPOSED BLADE VOLUME DAMPERS. DAMPER OPERATING LEVERS SHALL BE ACCESSIBLE AT THE FACE OF AIR OUTLETS.

B. REGISTERS AND GRILLES:

1) RETURN AND EXHAUST REGISTERS: STEEL CONSTRUCTION WITH VOLUME DAMPER. SIMILAR TO TITUS 300RL.

2) SUPPLY REGISTERS: ALUMINUM CONSTRUCTION, SINGLE DEFLECTION BAR GRILLE, WITH VOLUME DAMPER. SIMILAR TO TITUS CT-580.

3) TRANSFER GRILLES: STEEL CONSTRUCTION WITHOUT VOLUME DAMPER. SIMILAR TO TITUS 300RL.

7. NOISE CONTROL

A. ALL ROOM NC LEVELS SHALL BE 20 OR LESS.

B. PROVIDE SOUND LINING FOR THE FOLLOWING DUCTWORK:

1) ALL SUPPLY & RETURN DUCTWORK ON EACH SIDE OF ALL FANS AND AC UNITS.

2) AIR TRANSFER DUCTS.

3) ENTIRE DISTANCE DOWNSTREAM OF ALL VARIABLE AIR VOLUME BOXES.

4) ALSO WHERE NOTED ON A DRAWING.

C. SOUND LINING IN DUCTWORK: FIBROUS GLASS, MINIMUM 3 LB DENSITY, 2 IN. THICKNESS, MAXIMUM 0.25 K FACTOR AT 75 DEG F MEAN TEMPERATURE WITH ACRYLIC COATED FINISH FACTORY APPLIED EDGE COATING AND STENCILED IN ACCORDANCE WITH NFPA 90. FLAMESPREAD SHALL BE A MAXIMUM OF 25. LINING SHALL NOT SUPPORT MICROBIAL GROWTH AND SHALL BE TESTED IN ACCORDANCE WITH ASTM C 1071 AND ASTM G21/G22.

D. ALL SOUND LINING, ADHESIVES, FACES AND ACCESSORIES TO BE APPLIED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, EXCEPT AS OTHERWISE NOTED.

8. TESTING AND BALANCING

A. AIR BALANCING SHALL BE ACCOMPLISHED BY ADJUSTMENT OF FANS AND BRANCH DAMPERS FOR MAJOR ADJUSTMENTS. ADJUSTMENT OF TERMINAL DAMPERS AND DEVICES SHALL BE FOR TRIM OR MINOR ADJUSTMENT ONLY. THIS SHALL BE DONE TO PERMIT THE LEAST NOISE GENERATION IN THE TERMINAL AREAS AND UTILIZE MINIMUM FAN ENERGY.

B. UPON COMPLETION OF THE INSTALLATION, THE CONTRACTOR SHALL REBALANCE ANY EXISTING PORTIONS OF AIR DISTRIBUTION SYSTEM AND WATER DISTRIBUTION SYSTEM AFFECTED BY THE RENOVATION AND ALSO BALANCE ALL NEW WORK.

C. THE CONTRACTOR SHALL PROVIDE ALL LABOR, PRESSURE GAUGES, FLOW METERS, SHEAVES, AND BELTS REQUIRED TO BALANCE SYSTEMS.

D. FANS, AIR HANDLING UNITS, AND COILS SHALL BE BALANCED TO WITHIN +5% OF THEIR DESIGN CAPACITIES. ALL OTHER AIR QUANTITIES SHALL BE BALANCED TO WITHIN +10% OF THE DESIGN QUANTITIES.

E. BALANCING AND TESTING SHALL BE PERFORMED AND SUPERVISED BY ONE OF THE FOLLOWING INDEPENDENT FIRMS SPECIALIZING IN TESTING AND BALANCING:

1) PRECISION TESTING AND BALANCING, INC.

2) AIR CONDITIONING TEST AND BALANCING CORP.

3) CFM TESTING AND BALANCING CO.

F. THE PERFORMANCE AND CAPACITY OF ALL SYSTEMS AND EQUIPMENT TO BE DEMONSTRATED BY THE CONTRACTOR.

9. INSULATION - GENERAL REQUIREMENTS

A. ALL INSULATION MATERIALS, INCLUDING JACKETS, FACING, ADHESIVE, COATINGS, AND ACCESSORIES ARE TO BE FIRE HAZARD RATED AND LISTED BY UNDERWRITERS LABORATORIES, INC. USING STEINER TUNNEL TEST METHOD FOR FIRE HAZARD CLASSIFICATION OF BUILDING MATERIALS, STANDARD UL 723 (ASTM E-84), (ASA A2.5-1963). FLAMESPREAD: MAXIMUM 25. FUEL CONTRIBUTED AND SMOKE DEVELOPED: MAXIMUM 50. FLAMEPROOFING TREATMENTS SUBJECT TO DETERIORATION FROM MOISTURE OR HUMIDITY ARE NOT ACCEPTABLE.

B. DEFINITIONS:

1) EXPOSED: INDOOR DUCTS, PIPING OR EQUIPMENT LOCATED IN MECHANICAL EQUIPMENT ROOMS AND IN AREAS WHICH WILL BE VISIBLE WITHOUT REMOVING CEILINGS OR OPENING ACCESS PANELS.

2) CONCEALED: INDOOR DUCTS, PIPING OR EQUIPMENT WHICH IS NOT EXPOSED.

10. DUCTWORK INSULATION

A. INSULATE ALL DUCTWORK IN ACCORDANCE WITH INSULATION SCHEDULE EXCEPT AS OTHERWISE NOTED.

INSULATION SCHEDULE - DUCTWORK

SERVICE	LOCATION	THICKNESS	MATERIAL	FINISH
SUPPLY/RETURN	CONCEALED	1-1/2"	D-1	VAPORSEAL

B. REINSULATE ALL DUCTWORK AND PIPING WHICH IS EXISTING AND DAMAGED DURING CONSTRUCTION OR SHOWN OR REQUIRED TO BE RELOCATED. INSULATE WITH SAME MATERIAL AND THICKNESS.

C. NON-INSULATED DUCTWORK:

1) WHERE SOUND LINING IS OF MINIMUM THICKNESS SPECIFIED FOR INSULATION.

D. MATERIAL:

1) TYPE D-1: MINIMUM 1-LB DENSITY FIBERGLASS BLANKET, MAXIMUM 0.28 K-FACTOR AT 75 DEG F MEAN TEMPERATURE WITH FACTORY-APPLIED FOIL-SKRIM-KRAFT FACING SIMILAR TO MANVILLE MICROLITE.

2) TYPE D-2: 3 LB. FIBERGLASS BOARD. THE MAXIMUM K FACTOR SHALL BE 0.23 AT 75 DEG F MEAN TEMPERATURE WITH A MINIMUM DENSITY OF 3 LB. THE INSULATION SHALL BE PROVIDED WITH A FACTORY-APPLIED ALL PURPOSE OR ALL SERVICE FACING. THE INSULATION SHALL BE EQUAL TO MANVILLE TYPE 814 SPIN-GLASS AP.

3) TYPE D-3: MINIMUM 6 LB FIBERGLASS BOARD. MAXIMUM 0.22 K-FACTOR AT 75 DEG F MEAN TEMPERATURE WITH FACTORY APPLIED ALL PURPOSE OR ALL SERVICE FACING. SIMILAR TO MANVILLE 817 SPIN-GLASS AP.

E. INSTALLATION:

1) FIBERGLASS BLANKET: 2 IN. LAP STRIPS AT ALL SEAMS. SECURE BOTTOM OF ALL DUCTS OVER 24 IN. WIDE WITH MIN. 2 ROWS OF WELD PINS 12 IN. ON CENTER. SECURE ALL SEAMS WITH FOIL VAPOR BARRIER TAPE AND VAPORSEAL ADHESIVE.

2) FIBERGLASS BOARD: SEAL JOINTS AND BREAKS IN FACING WITH 3 IN. WIDE TAPE TO MATCH FACING AND ADHERE WITH VAPOR SEAL ADHESIVE. APPLY 5 IN. WIDE TAPE AT CORNERS, WELD PINS ON TOP, SIDES AND BOTTOM.

11. VIBRATION ISOLATION

A. GENERAL:

1) PROVIDE ISOLATION FOR EQUIPMENT, PIPING AND DUCTWORK.

2) INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

3) PROVIDE LEVELING DEVICES AND APPROVED RESILIENT RESTRAINING DEVICES AS REQUIRED TO LIMIT EQUIPMENT AND PIPING MOTION IN EXCESS OF 1/4 IN.

4) ACCEPTABLE MANUFACTURERS:

a. MASON INDUSTRIES, INC.

b. VIBRATION ELIMINATOR CO.

c. KORFUND DYNAMICS CORP.

12. MOTORS:

A. MOTORS (UNDER HVAC WORK): IN ACCORDANCE WITH NEMA, IEEE AND ANSI C50 STANDARDS:

1) STANDARD EFFICIENCY UNLESS OTHERWISE NOTED.

2) 1.15 SERVICE FACTOR.

13. EQUIPMENT

A. ROOFTOP AIR-CONDITIONING UNIT (RTU)

1) GENERAL: THE UNITS SHALL BE CONVERTIBLE AIRFLOW. THE OPERATING RANGE SHALL BE BETWEEN 115°F AND 0°F IN COOLING AS STANDARD FROM THE FACTORY FOR UNITS WITH MICROPROCESSOR CONTROLS. COOLING PERFORMANCE SHALL BE RATED IN ACCORDANCE WITH ARI TESTING PROCEDURES. ALL UNITS SHALL BE FACTORY ASSEMBLED, INTERNALLY WIRED, FULLY CHARGED WITH R-410A, AND 100 PERCENT RUN TESTED TO CHECK COOLING OPERATION, FAN AND BLOWER ROTATION, AND CONTROL SEQUENCE BEFORE LEAVING THE FACTORY. WIRING INTERNAL TO THE UNIT SHALL BE COLORED AND NUMBERED FOR SIMPLIFIED IDENTIFICATION. UNITS SHALL BE cULus LISTED AND LABELED, CLASSIFIED IN ACCORDANCE FOR CENTRAL COOLING AIR CONDITIONERS.

2) CASE: UNIT CASING SHALL BE CONSTRUCTED OF ZINC COATED, HEAVY GAUGE, AND GALVANIZED STEEL. EXTERIOR SURFACES SHALL BE CLEANED, PHOSPHATIZED, AND FINISHED WITH A WEATHER-RESISTANT BAKED ENAMEL FINISH. UNIT'S SURFACE SHALL BE TESTED 672 HOURS IN A SALT SPRAY TEST IN COMPLIANCE WITH ASTM B117. CABINET CONSTRUCTION SHALL ALLOW FOR ALL MAINTENANCE ON ONE SIDE OF THE UNIT. ALL EXPOSED VERTICAL PANELS AND TOP COVERS IN THE INDOOR AIR SECTION SHALL BE INSULATED WITH A CLEANABLE FOIL-FACED, FIRE-RETARDANT PERMANENT, ODORLESS GLASS FIBER MATERIAL. ALL INSULATION EDGES SHALL BE EITHER CAPTURED OR SEALED. THE UNIT'S BASE PAN SHALL HAVE NO PENETRATIONS WITHIN THE PERIMETER OF THE CURB OTHER THAN THE RAISED 1 1/8" HIGH DOWNFLOW SUPPLY/RETURN OPENINGS TO PROVIDE AN ADDED WATER INTEGRITY PRECAUTION, IF THE CONDENSATE DRAIN BACKS UP. THE BASE OF THE UNIT SHALL HAVE PROVISIONS FOR FORKLIFT AND CRANE LIFTING, WITH FORKLIFT CAPABILITIES ON THREE SIDES OF THE UNIT.

3) UNIT TOP: THE TOP COVER SHALL BE ONE PIECE CONSTRUCTION OR, WHERE SEAMS EXIST, IT SHALL BE DOUBLE-HEMMED AND GASKET-SEALED. THE RIBBED TOP ADDS EXTRA STRENGTH AND ENHANCES WATER REMOVAL FROM UNIT TOP.

4) COMPRESSORS: ALL UNITS SHALL HAVE DIRECT-DRIVE, HERMETIC, SCROLL TYPE COMPRESSORS WITH CENTRIFUGAL TYPE OIL PUMPS. MOTOR SHALL BE SUCTION GAS-COOLED AND SHALL HAVE A VOLTAGE UTILIZATION RANGE OF PLUS OR MINUS 10 PERCENT OF UNIT NAMEPLATE VOLTAGE. INTERNAL OVERLOADS SHALL BE PROVIDED WITH THE SCROLL COMPRESSORS.

5) REFRIGERANT CIRCUITS: SERVICE PRESSURE PORTS, AND REFRIGERANT LINE FILTER DRIERS ARE FACTORY-INSTALLED AS STANDARD. AN AREA SHALL BE PROVIDED FOR REPLACEMENT SUCTION LINE DRIERS.

6) EVAPORATOR AND CONDENSER COILS: INTERNALLY FINNED, 5/16" COPPER TUBES MECHANICALLY BONDED TO A CONFIGURED ALUMINUM PLATE FIN SHALL BE STANDARD. COILS SHALL BE LEAK TESTED AT THE FACTORY TO ENSURE THE PRESSURE INTEGRITY. THE EVAPORATOR COIL AND CONDENSER COIL SHALL BE LEAK TESTED TO 650 PSIG AND PRESSURE TESTED TO 450 PSIG. THE CONDENSER COIL SHALL HAVE A PATENT PENDING 1+1+1 HYBRID COIL DESIGNED WITH SLIGHT GAPS FOR EASE OF CLEANING. A REMOVABLE, REVERSIBLE, DOUBLE-SLOPED CONDENSATE DRAIN PAN WITH THROUGH THE BASE CONDENSATE DRAIN IS STANDARD.

7) FANS: THE OUTDOOR FAN SHALL BE DIRECT-DRIVE, STATICALLY AND DYNAMICALLY BALANCED, DRAW-THROUGH IN THE VERTICAL DISCHARGE POSITION. THE FAN MOTOR SHALL BE PERMANENTLY LUBRICATED AND SHALL HAVE BUILT-IN THERMAL OVERLOAD PROTECTION.

8) HINGED ACCESS DOORS: SHEET METAL HINGES ARE AVAILABLE ON THE FILTER/EVAPORATOR, SUPPLY FAN/HEAT, AND THE COMPRESSOR/CONTROL ACCESS DOORS.

9) LOW LEAK ECONOMIZER: THIS ACCESSORY MEETS LOW LEAK REQUIREMENTS FOR ASHRAE 90.1, IECC, AND CA TITLE 24 STANDARDS (3 CFM/SQ.FT. AT 1" WG EXTERIOR AIR, 4 CFM/SQ.FT. AT 1" WG RETURN AIR). THIS OPTION ALLOWS 100% OUTDOOR AIR SUPPLY FROM 0-100% MODULATING DAMPERS AND IS STANDARD WITH BAROMETRIC RELIEF. IT CAN BE PAIRED WITH POWERED EXHAUST FOR ADDITIONAL BUILDING PRESSURE RELIEF. AVAILABLE ON DOWNFLOW UNITS ONLY.

SYMBOLS

Revisions

REVISION #	DATE	REVISION	APPROVED
-	7/8/21	FINAL REVIEW SET	
-	9/14/21	ISSUED FOR BID	

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PROJECT

Purchase College
Studio A
Renovations

DRAWING NAME

MECHANICAL SPECIFICATIONS
(SHEET 1)

SEAL & SIGNATURE

SCALE NONE
DATE
CAD FILE#

DRAWING NUMBER
M-002.00

SHEET
02 of 09

10) PHASE MONITOR: PHASE MONITOR SHALL PROVIDE 100% PROTECTION FOR MOTORS AND COMPRESSORS AGAINST PROBLEMS CAUSED BY PHASE LOSS, PHASE IMBALANCE, AND PHASE REVERSAL. PHASE MONITOR IS EQUIPPED WITH AN LED THAT PROVIDES AN ON OR FAULT INDICATOR. THERE ARE NO FIELD ADJUSTMENTS. THE MODULE WILL AUTOMATICALLY RESET FROM A FAULT CONDITION.

11) FILTERS: ALL UNIT FILTERS SHALL BE MIN. 4" THICK MERV-13 RATED.

12) CONTROLS: UNIT SHALL BE COMPLETELY FACTORY-WIRED WITH NECESSARY CONTROLS AND CONTACTOR PRESSURE LUGS OR TERMINAL BLOCK FOR POWER WIRING. UNIT SHALL PROVIDE AN EXTERNAL LOCATION FOR MOUNTING A FUSED DISCONNECT DEVICE. A CHOICE OF MICROPROCESSOR OR ELECTROMECHANICAL CONTROLS SHALL BE AVAILABLE. MICROPROCESSOR CONTROLS PROVIDE FOR VOLT CONTROL FUNCTIONS. THE RESIDENT CONTROL ALGORITHMS SHALL MAKE ALL HEATING, COOLING, AND/OR VENTILATING DECISIONS IN RESPONSE TO ELECTRONIC SIGNALS FROM SENSORS MEASURING INDOOR AND OUTDOOR TEMPERATURES. THE CONTROL ALGORITHM MAINTAINS ACCURATE TEMPERATURE CONTROL, MINIMIZES DRIFT FROM SET POINT, AND PROVIDES BETTER BUILDING COMFORT. A CENTRALIZED MICROPROCESSOR SHALL PROVIDE ANTI-SHORT CYCLE TIMING AND TIME DELAY BETWEEN COMPRESSORS TO PROVIDE A HIGHER LEVEL OF MACHINE PROTECTION.

B. VAV BOXES

1) FURNISH AND INSTALL TITUS MODEL DESV SINGLE DUCT, VARIABLE AIR VOLUME TERMINALS OF THE SIZES AND CAPACITIES SHOWN IN THE PLANS.

2) TERMINALS SHALL BE CERTIFIED UNDER THE ARI STANDARD 880 CERTIFICATION PROGRAM AND CARRY THE ARI SEAL. NONCERTIFIED TERMINALS MAY BE SUBMITTED AFTER TESTING AT AN INDEPENDENT TESTING LABORATORY UNDER CONDITIONS SELECTED BY THE ENGINEERING CONSULTANT IN FULL COMPLIANCE WITH ARI STANDARD 880. THESE TESTS MUST BE WITNESSED BY THE ENGINEERING CONSULTANT WITH ALL COSTS TO BE BORNE BY THE TERMINAL MANUFACTURER. TESTING DOES NOT ENSURE ACCEPTANCE.

3) THE TERMINAL CASING SHALL BE MINIMUM 22-GAUGE GALVANIZED STEEL, INTERNALLY LINED WITH ½-INCH DUAL DENSITY INSULATION WHICH COMPLIES WITH UL 181 AND NFPA 90A. ALL EXPOSED INSULATION EDGES SHALL BE COATED WITH NFPA 90A APPROVED SEALANT TO PREVENT ENTRAINMENT OF FIBERS IN THE AIRSTREAM. THE DISCHARGE CONNECTION SHALL BE SLIP AND DRIVE CONSTRUCTION FOR ATTACHMENT TO METAL DUCTWORK. THE CASING SHALL BE CONSTRUCTED TO HOLD LEAKAGE TO THE MAXIMUM VALUES SHOWN IN THE CASING LEAKAGE TABLE.

4) THE DAMPER SHALL BE HEAVY GAUGE STEEL WITH SHAFT ROTATING IN DELRIN® SELF-LUBRICATING BEARINGS. NYLON BEARINGS ARE NOT ACCEPTABLE. SHAFT SHALL BE CLEARLY MARKED ON THE END TO INDICATE DAMPER POSITION. STICKERS OR OTHER REMOVABLE MARKINGS ARE NOT ACCEPTABLE. THE DAMPER SHALL INCORPORATE A MECHANICAL STOP TO PREVENT OVER STROKING AND A SYNTHETIC SEAL TO LIMIT CLOSE-OFF LEAKAGE TO THE MAXIMUM VALUES SHOWN IN THE DAMPER LEAKAGE TABLE.

5) ACTUATORS SHALL BE CAPABLE OF SUPPLYING AT LEAST 35-INCH LBS. OF TORQUE TO THE DAMPER SHAFT AND SHALL BE MOUNTED EXTERNALLY FOR SERVICE ACCESS. TERMINALS WITH INTERNAL ACTUATOR MOUNTING OR LINKAGE CONNECTION MUST INCLUDE GASKETED ACCESS PANEL, REMOVABLE WITHOUT DISTURBING DUCTWORK. CASING WITH ACCESS PANEL SHALL BE CONSTRUCTED TO HOLD LEAKAGE TO THE MAXIMUM VALUES SHOWN IN THE CASING LEAKAGE TABLE.

6) AT AN INLET VELOCITY OF 2000 FPM, THE MINIMUM STATIC PRESSURE REQUIRED TO OPERATE ANY TERMINAL SIZE SHALL NOT EXCEED 0.13-INCH WG FOR THE BASIC TERMINAL.

7) SOUND RATINGS FOR THE TERMINAL SHALL NOT EXCEED 25 NC AT 0.25 STATIC PRESSURE. SOUND PERFORMANCE SHALL BE ARI CERTIFIED.

8) ACCESSORIES

a. THE PROPORTIONAL ELECTRONIC AIRFLOW SENSOR SHALL BE TOTALLY INDEPENDENT OF THE DUCT STATIC PRESSURE AND SHALL ADJUST THE HEATER CAPACITY ACCORDING TO THE AVAILABLE AIRFLOW. THE HEATERS SHALL DELIVER MAXIMUM HEATING WHEN NEEDED WITH NORMAL MINIMUM AIRFLOW, REDUCE HEATING WITH LOWER THAN MINIMUM AIRFLOW AND STOP HEATING WITH NO AIRFLOW. UNIT SHALL INCLUDE AN INTEGRAL DOOR INTERLOCK TYPE DISCONNECT SWITCH WHICH WILL NOT ALLOW THE ACCESS DOOR TO BE OPENED WHILE POWER IS ON. NON-INTERLOCKING TYPE DISCONNECTS ARE NOT ACCEPTABLE. ALL INDIVIDUAL COMPONENTS SHALL BE UL LISTED OR RECOGNIZED.

b. FACTORY INTEGRAL SOUND ATTENUATOR

c. ULTRALOC LINER:
THE TERMINAL CASING SHALL BE MINIMUM 22-GAUGE GALVANIZED STEEL. THE UNITS SHALL BE LINED WITH 1-INCH THICK MATTE FACED INSULATION, MEETING UL 181 AND NFPA 90A, ENCLOSED BETWEEN THE UNIT CASING AND A NON-PERFORATED INTERNAL 22-GAUGE SHEET METAL COVER EXTENDING OVER THE FIBERGLASS INSULATION, AS WELL AS COVERING THE LINER CUT EDGES. THE DISCHARGE CONNECTION SHALL BE SLIP AND DRIVE CONSTRUCTION FOR ATTACHMENT TO METAL DUCTWORK. THE CASING SHALL BE CONSTRUCTED TO HOLD LEAKAGE TO THE MAXIMUM VALUES SHOWN IN THE CASING LEAKAGE TABLE.

14. AUTOMATIC CONTROLS – GENERAL REQUIREMENTS

A. FURNISH AND INSTALL A COMPLETE ELECTRIC OR ELECTRONIC CONTROL SYSTEM TO PROVIDE TEMPERATURE CONTROL AS SPECIFIED UNDER DESCRIPTION OF OPERATION.

B. WORK SHALL INCLUDE ALL WIRING, CONTROL EQUIPMENT, AND ACCESSORIES NECESSARY TO MAKE THIS SYSTEM COMPLETE. ALL WIRING SHALL BE 24 VOLT. COORDINATE WITH MANUFACTURER FOR INTERCONNECTION WITH CONTROLS INCLUDED IN EQUIPMENT. ALL CONTROL WORK SHALL BE INSTALLED BY HVAC CONTRACTOR.

C. THE CONTROLS CONTRACTOR SHALL FURNISH AND INSTALL ALL REQUIRED HARDWARE, SUCH AS CONTROLLERS, TRANSMITTERS, SENSORS, AND CONTROL WIRING TO ENABLE THE INDICATED SEQUENCES OF OPERATION. THE BUILDING CONTROLS SHALL BE LOCAL/ STANDALONE TYPE CONSISTING OF DIRECT DIGITAL CONTROL (DDC) OR ELECTRONIC DEVICES, UNLESS INDICATED OTHERWISE.

D. ACCEPTABLE MANUFACTURERS:

1) JOHNSON SERVICE CO.

2) HONEYWELL, INC.

3) OR APPROVED EQUAL

E. SEQUENCE OF OPERATIONS:

1) ROOFTOP AIR-CONDITIONING UNIT (RTU-1)

a. UNIT SHALL BE PROVIDED WITH A PACKAGED MICROPROCESSOR CONTROLLER. THIS CONTRACTOR SHALL FURNISH, MOUNT AND WIRE ANY ADDITIONAL COMPONENTS NOT PROVIDED BY THE UNIT MANUFACTURER TO ACHIEVE A COMPLETELY OPERATIONAL SYSTEM.

b. OCCUPIED MODE:

a) EACH VAV TERMINAL SHALL USE PRESSURE-INDEPENDENT CONTROL, WITH AIRFLOW MEASUREMENT, TO VARY PRIMARY AIRFLOW TO MAINTAIN ZONE TEMPERATURE AT ITS OCCUPIED SETPOINT. THE RTU SHALL MODULATE THE SUPPLY FAN TO MAINTAIN DUCT STATIC PRESSURE AT SETPOINT AND MODULATE (OR CYCLE) COMPRESSORS, MODULATE (OR STAGE) HEAT, AND/OR ENABLE AIRSIDE ECONOMIZING TO MAINTAIN DISCHARGE AIR TEMPERATURE AT SETPOINT. THE OA DAMPER SHALL MODULATE, IN PROPORTION TO CHANGING SUPPLY FAN SPEED, TO BRING IN THE REQUIRED AMOUNT OF VENTILATION.

c. MORNING WARM-UP/PRE-COOL:

a) EACH VAV TERMINAL UNIT SHALL VARY PRIMARY AIRFLOW TO RAISE/LOWER ZONE TEMPERATURE TO ITS OCCUPIED SETPOINT. THE RTU SHALL MODULATE THE SUPPLY FAN TO MAINTAIN DUCT STATIC PRESSURE AT SETPOINT AND MODULATE (OR CYCLE) COMPRESSORS OR MODULATE (OR STAGE) HEAT TO MAINTAIN DISCHARGE AIR TEMPERATURE AT SETPOINT. THE OA DAMPER SHALL REMAIN CLOSED, UNLESS ECONOMIZING.

c. FAN-PRESSURE OPTIMIZATION:

a) THE SYSTEM CONTROLLER SHALL MONITOR ALL VAV DAMPER POSITIONS AND RESET THE RTU'S DUCT STATIC PRESSURE SETPOINT BASED ON THE POSITION OF THE FURTHEST-OPEN DAMPER.

d. DISCHARGE AIR TEMPERATURE RESET:

a) THE SYSTEM CONTROLLER SHALL RESET THE RTU'S DISCHARGE AIR TEMPERATURE SETPOINT BASED ON CURRENT ZONE COOLING/HEATING DEMANDS.

e. COOLING/HEATING CHANGEOVER LOGIC:

a) THE SYSTEM CONTROLLER SHALL DETERMINE THE OVERALL SYSTEM COOLING/HEATING MODE BASED ON "VOTING" FROM EACH ZONE. WHEN THE MAJORITY OF ZONES REQUIRE COOLING, THE RTU SHALL OPERATE IN COOLING MODE AND ANY ZONE THAT REQUIRES HEATING SHALL REDUCE PRIMARY AIRFLOW TO MINIMUM. WHEN THE MAJORITY OF ZONES REQUIRE HEATING, THE RTU SHALL OPERATE IN HEATING MODE AND ANY ZONE THAT REQUIRES COOLING SHALL REDUCE PRIMARY AIRFLOW TO MINIMUM.

f. SMOKE DETECTOR (FURNISHED BY ELECTRICAL CONTRACTOR AND INSTALLED BY MECHANICAL CONTRACTOR) LOCATED IN THE SUPPLY AIR DUCTWORK SHALL AUTOMATICALLY SHUTDOWN FANS UPON THE DETECTION OF SMOKE. ELECTRICAL CONTRACTOR SHALL INTERLOCK ALARM SIGNAL WITH BASE BUILDING FIRE ALARM SYSTEM.

2) VARIABLE AIR VOLUME BOXES (VAV BOXES)

a. COORDINATE FACTORY MOUNTING AND WIRING OF SECONDARY CONTROL PANEL, ACTUATOR AND TRANSFORMER WITH THE VAV BOX MANUFACTURER. THE BMS CONTRACTOR SHALL BE RESPONSIBLE FOR FURNISHING, INSTALLING AND WIRING OF CONTROLS NOT FURNISHED, INSTALLED OR WIRED BY OTHERS THAT ARE REQUIRED FOR AN OPERATIONAL SYSTEM.

b. OCCUPIED MODE

a) IF THE VAV BOX ENTERING TEMPERATURE IS LESS THAN 70°F, THE VAV BOX SHALL OPERATE IN COOLING MODE. UPON A FALL IN SPACE TEMPERATURE BELOW SETPOINT, THE BOX DAMPER SHALL MODULATE CLOSED TO THE MINIMUM CFM SETPOINT. UPON A RISE IN SPACE TEMPERATURE, THE BOX DAMPER SHALL MODULATE FROM THE MINIMUM TO THE MAXIMUM CFM SETTING AS NECESSARY TO MAINTAIN THE CFM SETPOINT AS RESET BY THE SPACE TEMPERATURE. THE MINIMUM AND MAXIMUM CFM SETTINGS SHALL BE THOSE SCHEDULED ON THE MECHANICAL DRAWINGS.

b) IF THE VAV BOX ENTERING TEMPERATURE IS GREATER THAN 70°F PLUS A DIFFERENTIAL, THE VAV BOX SHALL OPERATE IN HEATING MODE. UPON A RISE IN SPACE TEMPERATURE ABOVE SETPOINT, THE BOX DAMPER SHALL MODULATE CLOSED TO THE MINIMUM CFM SETPOINT. UPON A FALL IN SPACE TEMPERATURE, THE BOX DAMPER SHALL MODULATE FROM THE MINIMUM TO THE MAXIMUM CFM SETTING AS NECESSARY TO MAINTAIN THE CFM SETPOINT AS RESET BY THE SPACE TEMPERATURE. THE MINIMUM AND MAXIMUM CFM SETTINGS SHALL BE THOSE SCHEDULED ON THE MECHANICAL DRAWINGS.

c. UNOCCUPIED MODE

a) WHEN THE PRIMARY FAN SYSTEM SERVING THE VAV BOX IS NOT RUNNING, THE VAV BOX DAMPER SHALL CLOSE.

b) IF THE SPACE TEMPERATURE FALLS BELOW THE UNOCCUPIED SETBACK TEMPERATURE SETPOINT OF 60°F (ADJ.) OR RISES ABOVE THE UNOCCUPIED SETUP TEMPERATURE SETPOINT OF 80°F (ADJ.), THE FAN SYSTEM SERVING THE VAV BOX SHALL BE ENABLED AND THE VAV BOX SHALL BE INDEXED TO THE MAXIMUM CFM SETTING. THE FAN SYSTEM SHALL RUN FOR A MINIMUM OF 1/2 HOUR (ADJ.).

c) THE VAV DDC CONTROLLER SHALL BE PROGRAMMED FOR OCCUPANCY OVERRIDE. BY DEPRESSING THE OCCUPANCY OVERRIDE BUTTON LOCATED ON THE SPACE TEMPERATURE SENSOR, THE VAV BOX AND THE FAN SYSTEM SERVING THE VAV BOX SHALL BE RESTORED TO THE OCCUPIED MODE.

c. THE VAV BOX SHALL NOT OPEN BEYOND THE MAXIMUM CFM SETTING. PROVIDE ONE (1) DDC CONTROLLER AND ONE (1) WALL-MOUNTED TEMPERATURE SENSOR FOR EACH VAV BOX.

3) EXHAUST FAN (EF-1):

a. FAN SHALL ENERGIZE WHENEVER THE SPACE TEMPERATURE RISES ABOVE THE TEMPERATURE SETPOINT OF 80°F (ADJUSTABLE). FAN SHALL BE DE-ENERGIZED WHEN SPACE TEMPERATURE IS AT OR BELOW SETPOINT.

15. EXECUTION

A. PROVIDE AND INSTALL ALL EQUIPMENT AND ACCESSORIES OF THE SIZES AND CAPACITIES AS SCHEDULED AND AS INDICATED ON THE DRAWINGS AND IN ACCORDANCE WITH APPROVED SHOP DRAWINGS AND MANUFACTURERS RECOMMENDATIONS. PROVIDE ALL MOTOR STARTERS AS REQUIRED; MOTOR STARTERS WILL BE INSTALLED BY THIS CONTRACTOR AND WIRED BY ELECTRICAL TRADE.

B. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING ALL REQUIRED CLEARANCES FOR SERVICING AND MAINTENANCE. COORDINATE REQUIREMENTS WITH ALL TRADES.

C. IDENTIFICATION OF EQUIPMENT AND CONTROLS

1) ALL EQUIPMENT SHALL BE STENCILED OR LABELED WITH LAMACOID PLATES SCREWED THEREON WHICH SHALL INDICATE SYSTEMS SERVICE.

16. EQUIPMENT START-UP AND TESTING

A. UPON COMPLETION OF THE INSTALLATION, THIS CONTRACTOR SHALL ENSURE THAT ALL EQUIPMENT AND SYSTEMS ARE TESTING AND BALANCED UNDER FIELD OPERATING CONDITIONS TO DEMONSTRATE ITS COMPLIANCE WITH SPECIFICATION REQUIREMENTS.

B. SHOULD ANY PART OF THE EQUIPMENT OR SYSTEM FAIL TO MEET THE CONTRACT REQUIREMENTS, THIS CONTRACTOR SHALL ADJUST, REPAIR OR REPLACE ALL DEFECTIVE OR INOPERATIVE PARTS AND AGAIN CONDUCT THE COMPLETE START-UP TEST.

17 SYSTEM TESTING AND BALANCING (AIR BALANCING)

A. AIR SYSTEM BALANCING SHALL BE PERFORMED BY AN APPROVED INDEPENDENT CERTIFIED TESTING AND BALANCING FIRM. THE TESTING AND BALANCING FIRM SHALL BE AABC, NEBB, TABB CERTIFIED OR DIRECTLY SUPERVISED BY A STAFFED LICENCED PROFESSIONAL ENGINEER WITH A MINIMUM OF FIVE YEARS EXPERIENCE. AIR SYSTEM BALANCING SHALL BE PERFORMED IN THE PRESENCE OF A BUILDING REPRESENTATIVE.

B. SUBMIT A DIGITAL COPY OF AIR BALANCING REPORT FOR REVIEW CONSISTING OF DESIGN AND ACTUAL READINGS OF ALL EQUIPMENT/DEVICES, LOCATION PLANS OF ALL EQUIPMENT/ DEVICES BALANCED, BALANCING EQUIPMENT USED AND METHODS OF BALANCING.

C. CONTRACTOR SHALL SUBMIT AIR BALANCE DATA SHEETS AND REPORTS WHICH TABULATE TEST DATA FROM FINAL ADJUSTED SYSTEM CONDITIONS WITHIN 10% OF DESIGN QUANTITIES FOR SYSTEM COMPONENTS AIR OUTLETS, RETURNS AND TERMINAL UNITS INDICATING CFM AND PRESSURE DROP; PERFORMANCE CHARACTERISTICS FOR ALL FANS AND AIR CONDITIONING EQUIPMENT INDICATING RPM, CFM, PRESSURE DROP ACROSS EACH COMPONENT (FILTERS, COILS, DAMPERS, ETC), AMPS, SUCTION AND DISCHARGE STATIC PRESSURE, OUTSIDE AIR CFM, BHP AND HP AT DESIGN CONDITIONS; AIR OUTLET DISCHARGE TEMPERATURE AND CFM; TERMINAL BOX INLET SP, MINIMUM AND MAXIMUM AIR SETTINGS.

D. CONTRACTOR SHALL INCLUDE IN THEIR BID ONE (1) JOB SITE COMFORT BALANCE UPON ACCEPTANCE OF THE FINAL BALANCING REPORT.

18. ELECTRICAL WORK

A. ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR POWER WIRING UNDER A SEPARATE DIVISION OF CONTRACT WORK. AUTOMATIC TEMPERATURE, SAFETY AND INTERLOCKING CONTROLS FOR MOTORS, MOTOR STARTERS AND OTHER ELECTRICAL APPARATUS AND DEVICES SHALL BE PROVIDED BY THE HVAC CONTRACTOR. CONTROL WIRING SHALL INCLUDE BUT NOT LIMITED TO ALL 12, 24, AND 120 VOLT WIRING.

B. THE MECHANICAL CONTRACTOR SHALL PREPARE AND SUBMIT FOR APPROVAL TERMINAL POINT TO TERMINAL POINT, COMPLETELY COORDINATED AND INTEGRATED WIRING DIAGRAMS FOR ALL WIRING REQUIRING FIELD INSTALLATION BY THE ELECTRICAL CONTRACTOR.

C. SPECIFIC WIRING DIAGRAMS OF FACTORY INSTALLED EQUIPMENT WIRING SHALL ALSO BE SUBMITTED FOR APPROVAL AND FURNISHED TO THE ELECTRICAL CONTRACTOR FOR HIS INSTALLATION REQUIREMENTS AND OTHER USES.

D. HVAC CONTRACTOR SHALL COORDINATE WITH THE ELECTRICAL CONTRACTOR FOR THE INSTALLATION OF DUCT DETECTORS. DUCT DETECTOR SHALL BE FURNISHED AND WIRED BY THE ELECTRICAL CONTRACTOR AND MOUNTED BY THE HVAC CONTRACTOR.

SYMBOLS

Revisions

REVISION #	DATE	REVISION	APPROVED
-	7/8/21	FINAL REVIEW SET	
-	9/14/21	ISSUED FOR BID	

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PROJECT

Purchase College
Studio A
Renovations

DRAWING NAME

MECHANICAL SPECIFICATIONS
(SHEET 2)

SEAL & SIGNATURE

SCALE NONE

DATE

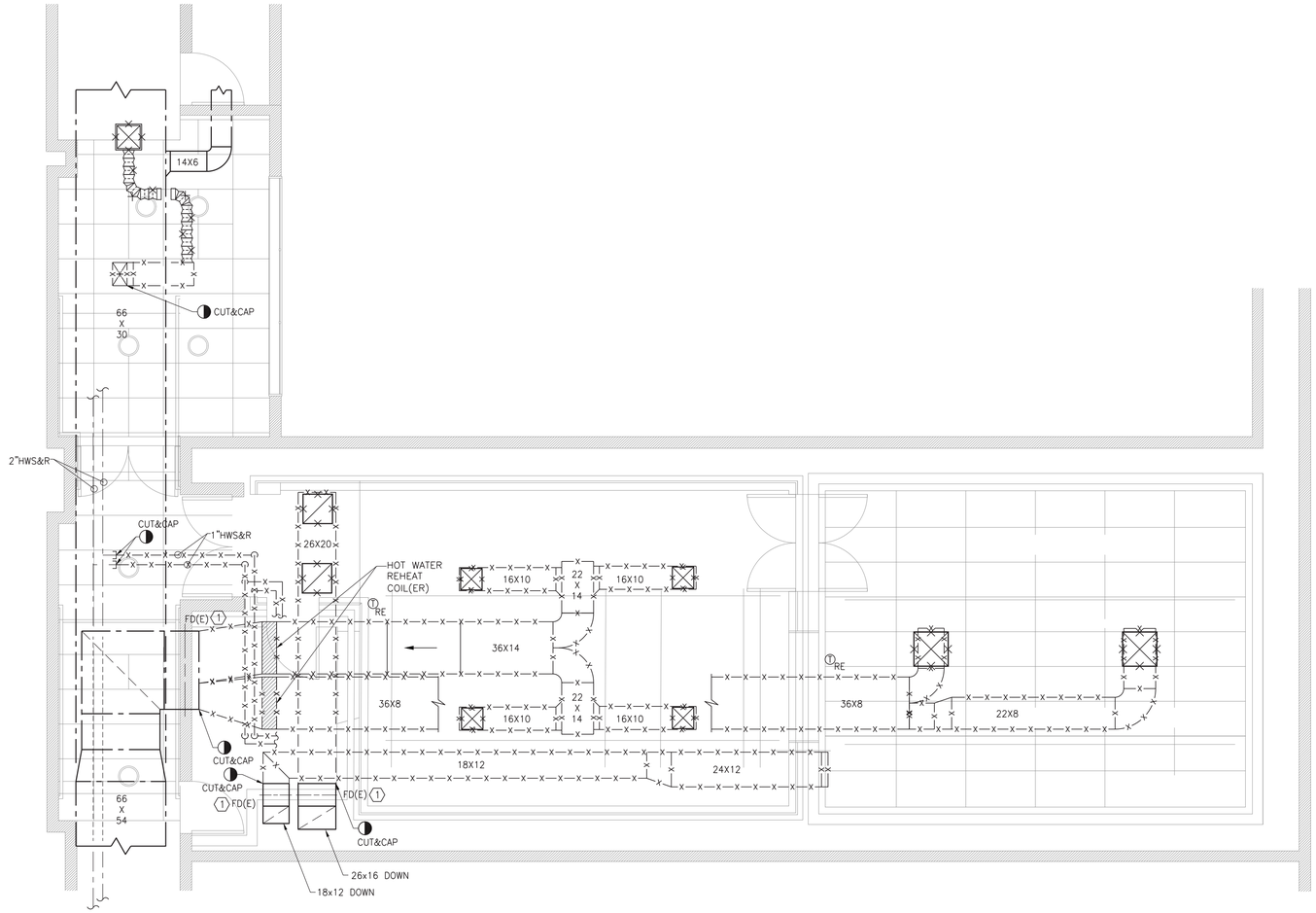
CAD FILE#

DRAWING NUMBER

M-003.00

SHEET

03 of 09



DRAWING NOTES:

1. ALL EXISTING SUPPLY AND RETURN DUCTWORK WITH ASSOCIATED DIFFUSERS/GRILLES SHALL BE REMOVED IN ITS ENTIRETY BACK TO SHAFT/CORRIDOR WALL AS INDICATED.
2. REMOVE ALL EXISTING THERMOSTATS AND PNEUMATIC CONTROLS IN ITS ENTIRETY.
3. ALL EXISTING HOT WATER PIPING, HOT WATER COILS AND ASSOCIATED CONTROLS SHALL BE REMOVED IN ITS ENTIRETY. HOT WATER BRANCH LINES SHALL BE CAPPED OFF AT THE MAIN IN THE CORRIDOR.
4. CONTRACTOR SHALL REPAIR/RESTORE FIRE-RATING OF ALL EXISTING WALLS AFFECTED BY DEMOLITION WORK. COORDINATE ALL REPAIR WORK WITH ARCHITECT.

KEY NOTES:

(1) EXISTING FIRE DAMPER TO REMAIN, REMOVE FUSIBLE LINK AND CLOSE DAMPER CURTAIN.

SYMBOLS

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MECHANICAL
DEMOLITION PLAN

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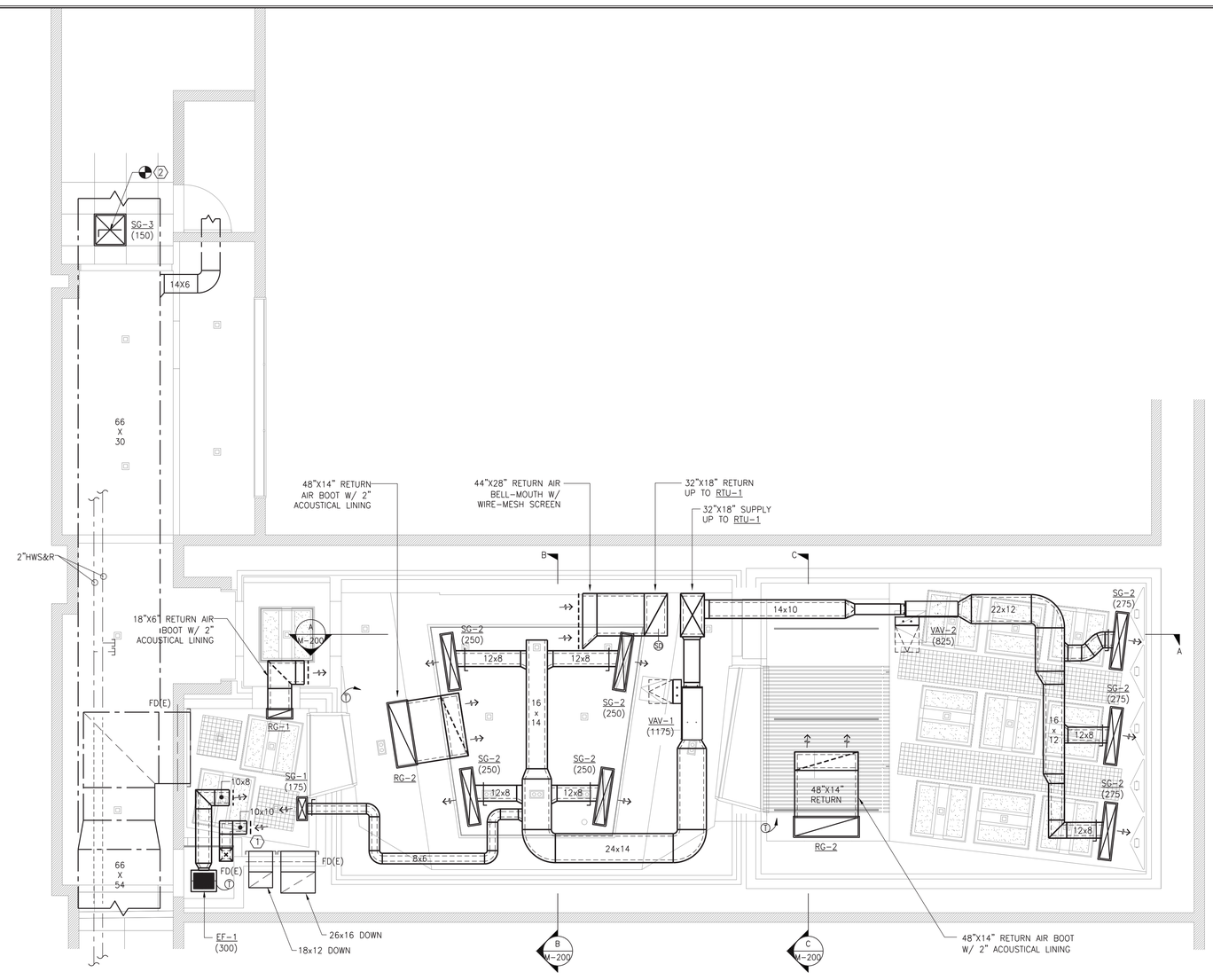

DRAWING NOTES:

1. CONTRACTOR SHALL INSTALL ALL HVAC EQUIPMENT AS REQUIRED TO ALLOW FOR PROPER SERVICE ACCESS.
2. ALL DUCTWORK DIMENSIONS, AS SHOWN ON THE DRAWINGS, ARE INTERNAL CLEAR DIMENSIONS AND DUCT SIZE SHALL BE INCREASED TO COMPENSATE FOR DUCT LINING THICKNESS. ALL SUPPLY, RETURN AND EXHAUST DUCTWORK SHALL BE PROVIDED WITH MIN. 2" THICK INTERNAL ACOUSTICAL LINING, UNLESS OTHERWISE NOTED.
3. COORDINATE DIFFUSER, REGISTER, AND GRILLE LOCATIONS WITH ARCHITECTURAL REFLECTED CEILING PLANS, LIGHTING, AND OTHER CEILING ITEMS.
4. PROVIDE FLEXIBLE CONNECTIONS IN ALL DUCTWORK SYSTEMS CONNECTED TO RTU AND FANS. FLEXIBLE CONNECTIONS SHALL BE PROVIDED AT THE POINT OF CONNECTION TO THE EQUIPMENT UNLESS OTHERWISE INDICATED. PROVIDE FLEXIBLE CONNECTORS AT ALL DUCTWORK CONNECTIONS PENETRATING ACOUSTICAL CEILING.
5. ALL DUCTWORK SHALL BE INSTALLED AT MAXIMUM HEIGHTS ALLOWABLE OR AS REQUIRED TO CLEAR NEW CEILING. DUCTWORK SHALL BE OFFSET AS REQUIRED TO AVOID CONFLICTS EVEN IF NOT SPECIFICALLY INDICATED ON PLAN.
6. PROVIDE ALL REQUIRED BRANCH SUPPLY DUCTWORK TO SERVE NEW AIR OUTLETS IN LOCATIONS INDICATED. ALL AIR OUTLETS SUPPLY DUCT BRANCH CONNECTIONS SHALL BE PROVIDED WITH CABLE OPERATED DAMPERS.
7. TERMINAL AIR BOX LOCATIONS SHOWN ARE DIAGRAMMATIC. CONTRACTOR TO COORDINATE EXACT BOX LOCATIONS TO AVOID CONFLICTS WITH CEILING CONSTRUCTION AND OTHER TRADES.
8. EXACT LOCATIONS OF ALL THERMOSTATS SHALL BE AS PER ARCHITECT/ENGINEER. TYPICALLY THEY ARE LOCATED NEAR NEW LIGHT SWITCHES. REFER TO ARCHITECTURAL DWGS FOR THERMOSTAT MOUNTING HEIGHT. MECHANICAL CONTRACTOR SHALL SUBMIT THERMOSTAT LOCATIONS TO ENGINEER FOR REVIEW PRIOR TO INSTALLATION.
9. ALL OPENINGS IN FIRE WALLS/ROOF DUE TO DUCTWORK, CONDUITS, ETC. SHALL BE FIRE-STOPPED WITH A PRODUCT SIMILAR TO 3M OR APPROVED EQUAL AS SPECIFIED IN THE ARCHITECTURAL CONTRACT DRAWINGS.
10. ALL OPEN-ENDED DUCTWORK SHALL BE PROVIDED WITH WIRE-MESH SCREEN.
11. PROVIDE VIBRATION ISOLATION FOR ALL MECHANICAL EQUIPMENT AS REQUIRED TO PREVENT TRANSMISSION OF VIBRATION TO BUILDING STRUCTURE.

KEY NOTES:

(1) TERMINATE TRANSFER DUCT IN RACK CLOSET MINIMUM 12" ABOVE FINISHED FLOOR.

(2) BOTTOM TAP EXISTING SUPPLY AIR MAIN IN CORRIDOR TO NEW CEILING DIFFUSER, PROVIDE MANUAL VOLUME DAMPER AS REQUIRED.

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Studio A
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DRAWING NAME

MECHANICAL
CONSTRUCTION PLAN

SEAL & SIGNATURE

SCALE 1/4"=1'-0"

DATE

CAD FILE#

DRAWING NUMBER

M-101.00

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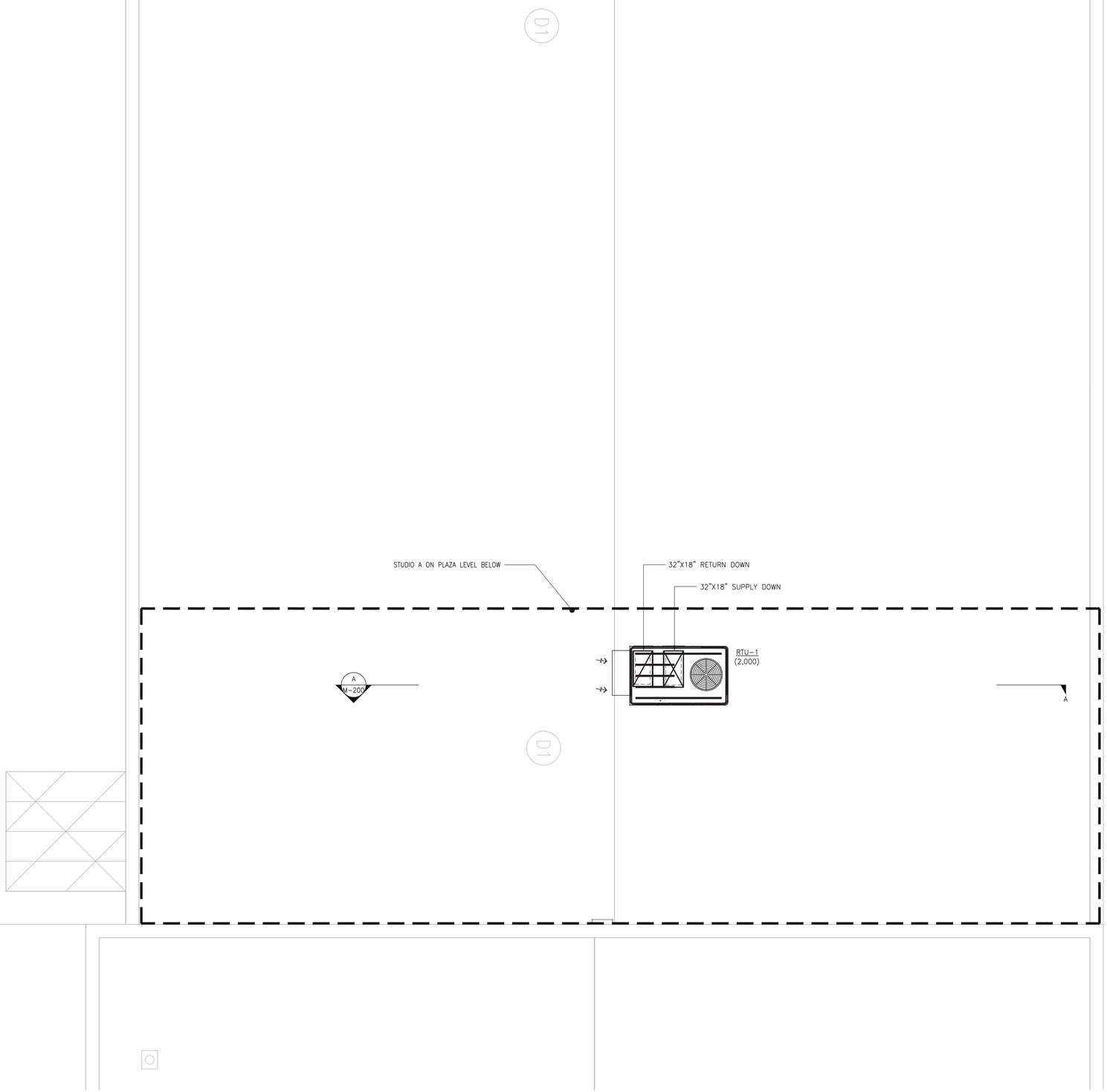

DRAWING NOTES:

1. CONTRACTOR SHALL FURNISH AND INSTALL NEW ROOFTOP HVAC EQUIPMENT AS PER MANUFACTURERS RECOMMENDATIONS AND REQUIRED SERVICE CLEARANCES.
2. CONDENSATE DRAIN LINE FROM RTU SHALL BE PIPED FULL SIZE OF UNIT DRAIN OUTLET, WITH "P" TRAP, AND PIPED TO NEAREST ROOF DRAIN.
3. CONTRACTOR SHALL COORDINATE AND RETAIN THE CAMPUS APPROVED ROOFING CONTRACTOR TO PERFORM ALL FLASHING WORK FOR NEW ROOF CURB INSTALLATION. REFER TO ROOF CURB INSTALLATION DETAIL ON DWG. M-300.
4. ROOF DUCT OPENINGS TO BE PROVIDED BY OTHERS. CONTRACTOR SHALL COORDINATE LOCATIONS OF ALL ROOF OPENINGS WITH STRUCTURAL ENGINEER & ARCHITECT, PROVIDE STRUCTURAL FRAMING REINFORCEMENT AS REQUIRED.

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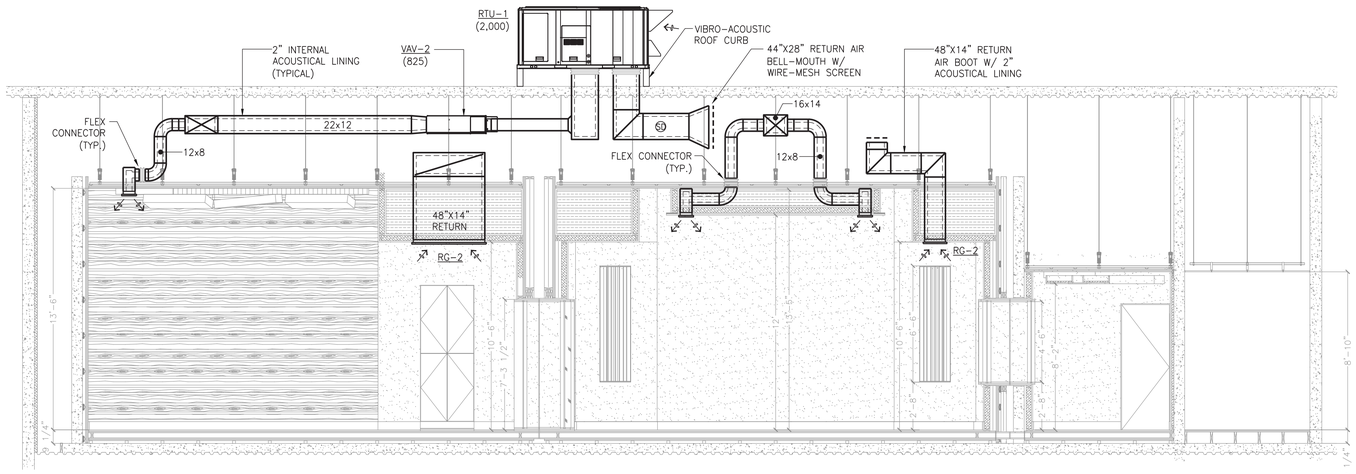
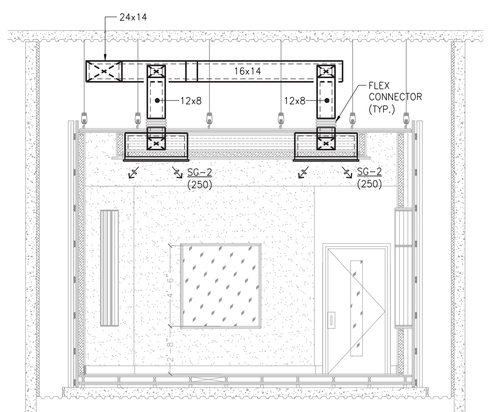


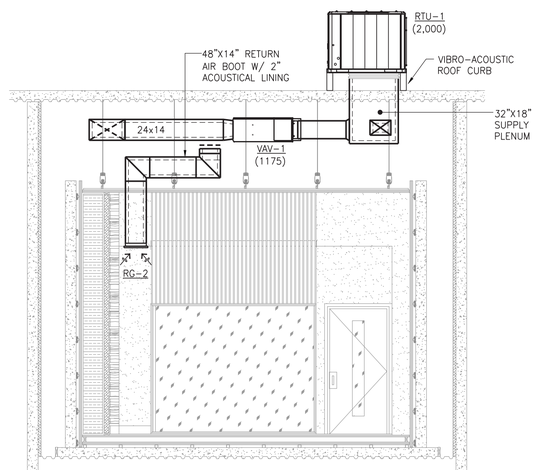
A MECHANICAL ELEVATION – SOUTH

SCALE: 1/4" = 1'-0"



B MECHANICAL ELEVATION – CONTROL ROOM

SCALE: 1/4" = 1'-0"



C MECHANICAL ELEVATION – LIVE ROOM

SCALE: 1/4" = 1'-0"

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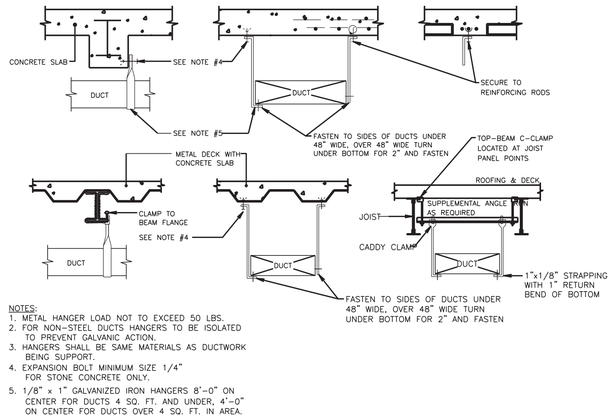
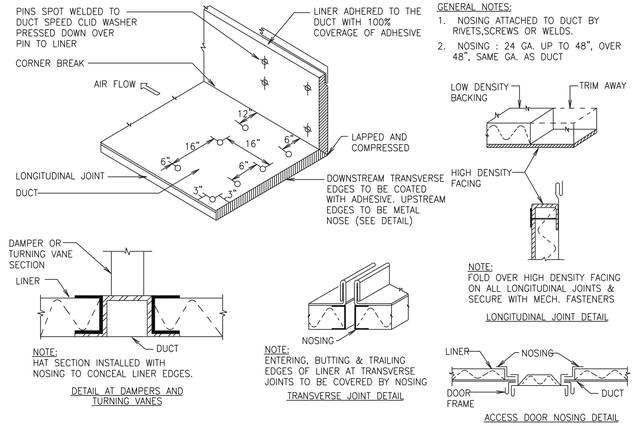


NOTES:
1. METAL HANGER LOAD NOT TO EXCEED 50 LBS.
2. FOR NON-STEEL DUCTS HANGERS TO BE ISOLATED TO PREVENT GALVANIC ACTION.
3. HANGERS SHALL BE SAME MATERIALS AS DUCTWORK BEING SUPPORT.
4. EXPANSION BOLT MINIMUM SIZE 1/4" FOR STONE CONCRETE ONLY.
5. 1/8" x 1" GALVANIZED IRON HANGERS 8'-0" ON CENTER FOR DUCTS 4 SQ. FT. AND UNDER, 4'-0" ON CENTER FOR DUCTS OVER 4 SQ. FT. IN AREA.

TYPICAL DUCT HANGING DETAILS



GENERAL NOTES:
1. NOSING ATTACHED TO DUCT BY RIVETS,SCREWS OR WELDS.
2. NOSING : 24 GA. UP TO 48", OVER 48", SAME GA. AS DUCT

NOTE:
HAT SECTION INSTALLED WITH NOSING TO CONCEAL LINER EDGES.

DETAIL AT DAMPERS AND TURNING VANES

NOTE:
ENTERING, BUTTING & TRAILING EDGES OF LINER AT TRANSVERSE JOINTS TO BE COVERED BY NOSING

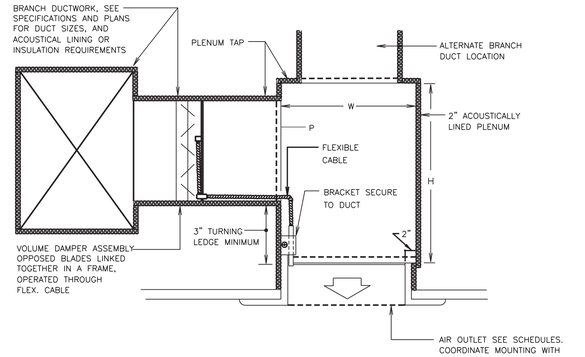
TRANSVERSE JOINT DETAIL

NOTE:
FOLD OVER HIGH DENSITY FACING ON ALL LONGITUDINAL JOINTS & SECURE WITH MECH. FASTENERS

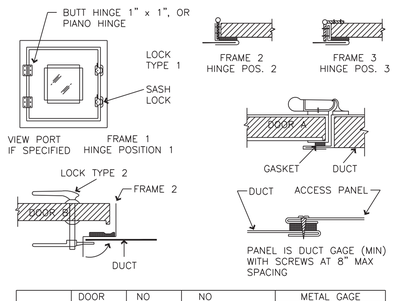
LONGITUDINAL JOINT DETAIL

ACCESS DOOR NOSING DETAIL

ACOUSTICAL DUCT LINER DETAIL



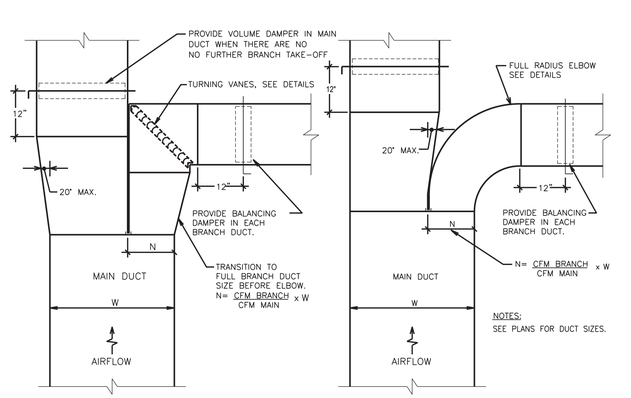
PLENUM BOX INSTALLATION DETAIL



	DOOR SIZE	NO HINGES	NO LOCKS	METAL GAGE FRAME	DOOR	BACK
2" W.G. STATIC & LESS	12"X12"	2	1-S	24	26	26
	16"X20"	2	2-S	22	24	26
	24"X24"	3	2-S	22	22	26
3" W.G. STATIC	12"X12"	2	1-S	22	22	26
	16"X20"	2	1-S,1-T,1-B	20	20	26
	24"X24"	3	2-S,1-T,1-B	20	20	24
4" W.G. TO 10" W.G.	12"X12"	2	1-S,1-T,1-B	20	20	26
	16"X20"	3	2-S,1-T,1-B	20	18	24
	24"X24"	3	2-S,2-T,2-B	18	18	24

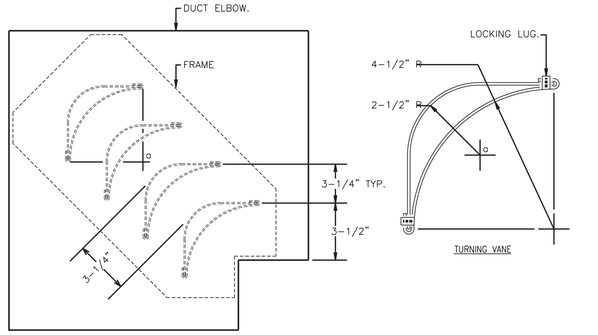
S=SIDE OPPOSITE HINGES, T=TOP, B=BOTTOM

DUCT ACCESS DOORS DETAIL



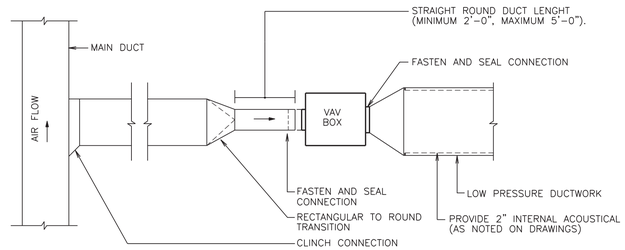
NOTES:
SEE PLANS FOR DUCT SIZES.

SUPPLY AIR DUCT NECK CONNECTIONS



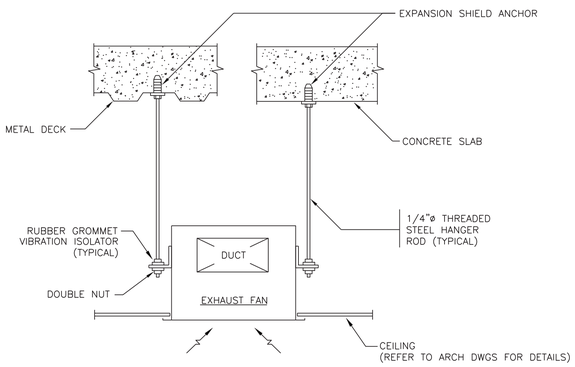
NOTES
1. FRAME AND VANES TO BE SAME MATERIAL AS DUCTWORK.
2. LOCKING LUGS TO BE INTEGRAL WITH THE TURNING VANE.
3. MAXIMUM UNSUPPORTED FRAME LENGTH TO BE 48".
4. FRAMES TO BE BOLTED OR RIVETED TO THE ELBOW.
5. VANES AND FRAMES TO BE SAME GAUGE AS THE ELBOW. (MINIMUM 20 GAUGE)
6. SQUARE ELBOWS ARE TO BE USED ONLY WHEN SPECIFICALLY INDICATED ON THE DESIGN DRAWINGS.

MITERED ELBOWS WITH DOUBLE THICKNESS TURNING VANES

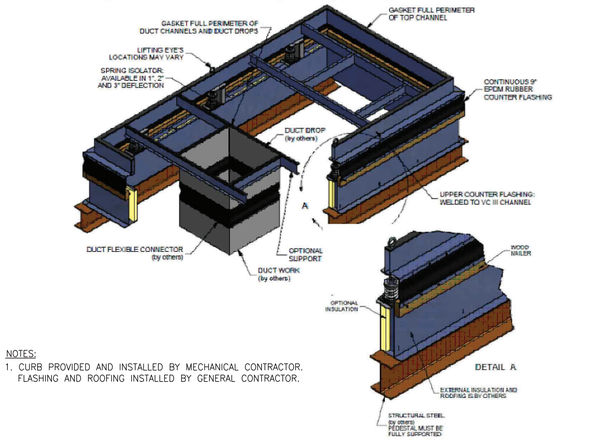


NOTES:
1. THE OPERATION OF VARIABLE VOLUME TERMINAL UNITS ARE AFFECTED BY EXCESSIVE TURBULENCE ON THE ENTERING SIDE OF EACH TERMINAL UNIT THEREFORE, TERMINAL UNITS MUST NOT BE INSTALLED TOO CLOSE TO MAIN DUCTS, ELBOWS AND FITTINGS.
2. WHEN MINIMUM UPSTREAM STRAIGHT DUCT CONNECTION TO TERMINALS AS INDICATED ABOVE CANNOT BE MAINTAINED, PROVIDE ORIFICE PLATE, STRAIGHTENING VANES OR OTHER DEVICE AS RECOMMENDED BY TERMINAL UNIT MANUFACTURER AND SUBMIT TO ENGINEER FOR REVIEW PRIOR TO INSTALLATION.
3. MANUFACTURER OF TERMINAL UNIT SHALL PROVIDE CONTROLS ON LEFT OR RIGHT SIDE AS REQUIRED BY FIELD CONDITIONS.
4. ARRANGE ACCESS TO PERMIT EASY FIELD BALANCE AND MAINTENANCE OF TERMINAL UNIT. MAINTAIN MIN. 12" CLEARANCE ALL AROUND VAV BOX.

VAV TERMINAL UNIT INSTALLATION DETAIL



CEILING EXHAUST FAN HANGING DETAIL



NOTES:
1. CURB PROVIDED AND INSTALLED BY MECHANICAL CONTRACTOR. FLASHING AND ROOFING INSTALLED BY GENERAL CONTRACTOR.

VIBRATION ISOLATION ROOF CURB DETAIL

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ROOF TOP AIR CONDITIONING UNIT SCHEDULE

TAG	LOCATION	SERVICE	MIN. OUTSIDE AIR (CFM)	SUPPLY FAN DATA					COOLING PERFORMANCE							HEATING PERFORMANCE						ELECTRICAL DATA				EFFICIENCY		WEIGHT (LBS.)	UNIT DIMENSIONS	MANUFACTURER / MODEL	NOTES
				CFM	FAN QTY.	ESP (IN. W.C.)	RPM	BHP	COIL SIZE		EAT (°F)		LAT (°F)		TOTAL CAPACITY (MBH)	SENSIBLE CAPACITY (MBH)	HEATING TYPE	OUTDOOR AMBIENT TEMP (°F)	EAT (°F)		LAT (°F)		TOTAL CAPACITY (MBH)	V/PH/HZ	FLA	MCA	MOP	EER	IEER/SEER				
									ROWS	FPI	DB	WB	DB	WB					DB	WB	DB	WB										
RTU-1	ROOF	SEE PLANS	300	2,000	1	0.75	–	–	–	–	80.0	67.0	57.2	57.1	58.9	46.9	ELECTRIC	13.0	60.0	–	85.0	–	30.5	208/3/60	–	27.0	40.0	13.0	16.4	1,100	89"L X 53"W X 41"H	TRANE / WHC060H3R0A	1-9

NOTES:

1. CONTRACTOR TO COORDINATE UNIT CONFIGURATIONS WITH FIELD CONDITIONS. MAINTAIN ALL SERVICE CLEARANCES AS REQUIRED.
2. UNIT SHALL BE CONFIGURED WITH BOTTOM SUPPLY, BOTTOM RETURN CONNECTIONS.
3. PROVIDE FACTORY CONTROLS WITH VAV DISCHARGE AIR CONTROL, STATIC PRESSURE CONTROL, VARIABLE SPEED DRIVE AND ENTHALPY ECONOMIZER CONTROL.
4. PROVIDE WITH FACTORY DISCONNECT SWITCH AND GFI CONVENIENCE OUTLET TO BE FIELD WIRED.
5. PROVIDE WITH VIBRO-ACOUSTIC ROOF CURB, SIMILAR TO THYBAR MODEL 'VIBRO-CURB III', WITH MIN. 2" DEFLECTION.
6. PROVIDE SINGLE-POINT ELECTRICAL CONNECTION TO UNIT.
7. PROVIDE WITH AIR FILTERS RATED FOR 4" THICK, MERV-13.
8. PROVIDE WEATHER-HOOD ON INTAKE/RELIEF OPENINGS.
9. PROVIDE BAROMETRIC RELIEF HOOD.
10. PROVIDE BMS COMMUNICATION CARD.

Acoustics

Sound Path	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Ducted Discharge	80 dB	84 dB	71 dB	68 dB	65 dB	62 dB	63 dB	55 dB
Ducted Inlet	75 dB	73 dB	62 dB	59 dB	57 dB	53 dB	51 dB	44 dB
Outdoor Noise	90 dB	90 dB	85 dB	85 dB	83 dB	79 dB	74 dB	68 dB

DIFFUSER, GRILLE & REGISTER SCHEDULE

TAG	SERVICE	CEILING TYPE	CFM RANGE	NO. OF SLOTS	NECK SIZE (IN.)	FACE OVERALL DIMENSIONS WXL (IN.)	MATERIAL	MAX P.D	NOISE CRITERIA (NC)	MANUFACTURER / MODEL	NOTES
SG-1	SUPPLY	SEE RCP	0-175	–	16"X6"	18"X8"	ALUMINUM	0.01	<20	TITUS / CT-580	1-4
SG-2	SUPPLY	SEE RCP	0-700	–	42"X8"	44"X10"	ALUMINUM	0.01	<20	TITUS / CT-580	1-4
SG-3	SUPPLY	SEE RCP	0-300	–	22"X22"	24"X24"	ALUMINUM	0.03	<20	TITUS / 250-AA	1-4
RG-1	RETURN	SEE RCP	0-200	–	16"X6"	18"X8"	STEEL	0.02	<20	TITUS / 300RL	1-4
RG-2	RETURN	SEE RCP	0-1500	–	48"X14"	50"X16"	STEEL	0.01	<20	TITUS / 300RL	1-4

NOTES:

1. DIFFUSERS SHALL BE SUITABLE FOR THE TYPE OF CEILING CONSTRUCTION BEING INSTALLED IN.
2. COORDINATE BORDER TYPES WITH CEILING/WALL CONSTRUCTION.
3. PROVIDE CABLE-OPERATED DAMPERS FOR DIFFUSERS IN INACCESSIBLE CEILINGS.
4. COORDINATE COLOR AND FINISH WITH ARCHITECT.

EXHAUST FAN SCHEDULE

TAG	LOCATION	AREA SERVED	CFM	ESP (IN. WC)	FAN RPM	TYPE	ELECTRICAL DATA				INLET dBA (dB)	WEIGHT	MANUFACTURER / MODEL	NOTES
							VOLTAGE	PHASE	WATTS	FLA (A)				
EF-1	RACK CLOSET	RACK CLOSET	300	0.3	935	CEILING-MOUNTED	115	1	43.0	3.4	47	32	GREENHECK / SP-A510-VG	CONTROLLED VIA WALL-MOUNTED THERMOSTAT

NOTES:

1. PROVIDE EC MOTOR WITH MOUNTED POTENTIOMETER DIAL.
2. PROVIDE FACTORY DISCONNECT SWITCH.
3. PROVIDE VIBRATION ISOLATION KIT AND MOUNTING ACCESSORIES.

VARIABLE AIR VOLUME (VAV) BOX SCHEDULE

TAG	SIZE	CAPACITY RANGE CFM	MIN CFM	MAX CFM	MINIMUM INLET PRESSURE	CONTROLLER	SOUND ATTENUATOR	RADIANT SOUND PRESSURE (NC)	DISCHARGE SOUND PRESSURE (NC)	MANUFACTURER AND MODEL	NOTES
VAV-1	12"ø	300-1175	170	2,000	1" W.C.	DDC	YES	20	24	TITUS / DESV	1-8
VAV-2	10"ø	210-825	130	1,400	1" W.C.	DDC	YES	22	25	TITUS / DESV	1-8

NOTES:

1. REFER TO PLANS FOR ACTUAL DESIGN AIRFLOW VALUES.
2. ALL TERMINAL BOXES TO BE DDC.
3. CONTRACTOR TO COORDINATE UNIT CONFIGURATIONS WITH FIELD CONDITIONS. MAINTAIN ALL SERVICE CLEARANCES AS REQUIRED.
4. PROVIDE WALL-MOUNTED TEMPERATURE CONTROLLER FOR EACH VAV BOX.
5. PROVIDE 1" ULTRALOC LINER FOR ALL VAV'S.
6. PROVIDE FACTORY MOUNTED CONTROLS.
7. PROVIDE TOGGLE DISCONNECT SWITCH.
8. PROVIDE MULTI-POINT CENTER AVERAGING INLET VELOCITY SENSOR.

SYMBOLS

Revisions

REVISION #	DATE	REVISION	APPROVED
–	7/8/21	FINAL REVIEW SET	
–	9/14/21	ISSUED FOR BID	

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PROJECT

Purchase College
Studio A
Renovations

DRAWING NAME

MECHANICAL SCHEDULES

SEAL & SIGNATURE

SCALE NONE

DATE

CAD FILE#

DRAWING NUMBER

M-400.00

SHEET

09 of 09