HVAC LEGEND

SYMBOL	ABBREV	DESCRIPTION
A.M.D.	AMD	AIR MEASURING DEVICE
	SA	SUPPLY AIR DUCT (UP)
	SA	SUPPLY AIR DUCT (DOWN)
	RA	RETURN AIR DUCT (UP)
	RA	RETURN AIR DUCT (DOWN)
	EA	EXHAUST AIR DUCT (UP)
	EA	EXHAUST AIR DUCT (DOWN)
		ELBOW WITH TURNING VANES
F.D. AD	F.D.	FIRE DAMPER WITH ACCESS DOOR
S.D. AD	S.D.	SMOKE DAMPER WITH ACCESS DOOR
F.S.D. AD	F.S.D.	FIRE SMOKE DAMPER WITH ACCESS DOOR
	VD	VOLUME DAMPER
		FLAT OVAL
	FC	FLEXIBLE CONNECTION
		LINEAR DIFFUSER WITH FLEXIBLE DUCT AND SPIN-IN FITTING
S	SD	SMOKE DETECTOR
		SOUND ATTENUATOR
	SL	SOUND LINING
		STAINLESS STEEL DUCTWORK
		TRANSITION RECTANGULAR OR ROUND
		TRANSITION ROUND TO RECTANGULAR
		VARIABLE AIR VOLUME TERMINAL
		VARIABLE AIR VOLUME TERMINAL W/RHC
		DIFFUSER - ONE-WAY THROW
		DIFFUSER - TWO-WAY THROW
		DIFFUSER - THREE-WAY THROW
C	CFM	CUBIC FEET PER MINUTE
		CENTER LINE
	FTR	FINNED TUBE RADIATION
	F&T	FLOAT & THERMOSTATIC TRAP
	IB	INVERTED BUCKET
	TD	THERMODYNAMIC TRAP
	P/T	PRESSURE AND TEMPERATURE PLUG
DPS	DPS	DIFFERENTIAL PRESSURE SWITCH
	RA	RETURN AIR / OUTSIDE AIR / TRANSFER AIR
	SA	SUPPLY AIR
		THERMOMETER

SYMBOL (SINGLE LINE)	SYMBOL (DOUBLE LINE)	ABBREV	DESCRIPTION
		V-	TWO WAY AUTOMATIC CONTROL VALVE
		V-	THREE WAY AUTOMATIC CONTROL VALVE
			STRAINER WITH BLOWDOWN VALVE
		AAV	AUTOMATIC AIR VENT
		MAV	MANUAL AIR VENT
		GV	GATE VALVE
		GBV	GLOBE VALVE
		OSY	OS&Y VALVE
		CKV	CHECK VALVE
		BFP	BACKFLOW PREVENTER
		BV	BALANCING VALVE
			BALANCING VALVE W/FMF
TB		TBV	THERMOSTATIC BALANCING VALVE
			MANUAL BUTTERFLY VALVE
			MOTORIZED BUTTERFLY VALVE
			BALL VALVE
			GAS COCK
			PLUG VALVE
		FMF	FLOW METER FITTING (ANNUBAR TYPE)
		FMF	FLOW METER FITTING (VENTURI TYPE)
		FS	FLOW SWITCH
			CONCENTRIC REDUCER
			ECCENTRIC REDUCER
			FLANGED CONNECTION
			UNION
		HB	HOSE BIBB
		HED	HOSE END DRAIN
			PIPE ANCHOR
			PIPE GUIDE
			PIPE UP
			PIPE DOWN
			PIPE/DUCT CAPPED
			PIPE FLOW DIRECTION
			PRESSURE GAUGE
			PRESSURE GAUGE WITH COCK AND SNUBBER
		PRV	PRESSURE REDUCING VALVE
			PRESSURE RELIEF VALVE
		CX	POINT OF CONNECTION, NEW TO EXISTING
		DIA	DIAMETER

HVAC PIPE SYSTEM DESIGNATIONS

——— XX ———	SOLID LINE DENOTES SUPPLY
– – – XX – – –	HIDDEN LINE DENOTES RETURN
CD	CONDENSATE DRAIN
CHWS	CHILLED WATER SUPPLY
CHWR	CHILLED WATER RETURN
CHGS	CHILLED GLYCOL SUPPLY
CHGR	CHILLED GLYCOL RETURN
CWS	CONDENSER WATER SUPPLY
CWR	CONDENSER WATER RETURN
HS	HOT WATER HEATING SUPPLY
HR	HOT WATER HEATING RETURN
RHS	REHEAT HOT WATER HEATING SUPPLY
RHR	REHEAT HOT WATER HEATING RETURN
LPS	LOW PRESSURE STEAM SUPPLY (15 PSIG)
LPR	LOW PRESSURE CONDENSATE RETURN
HPS 70	HIGH PRESSURE STEAM SUPPLY (70 PSIG)
HPR 70	HIGH PRESSURE CONDENSATE RETURN (70 PSIG)
HPS 90	HIGH PRESSURE STEAM SUPPLY (90 PSIG)
HPR 90	HIGH PRESSURE CONDENSATE RETURN (90 PSIG)
PC	PUMPED CONDENSATE
RS	REFRIGERANT SUCTION
RL	REFRIGERANT LIQUID
HG	REFRIGERANT HOT GAS
FOS	FUEL OIL SUPPLY
FOR	FUEL OIL RETURN
FOV	FUEL OIL VENT
FOF	FUEL OIL FILL
FOG	FUEL OIL GAGE
GS	GLYCOL SUPPLY
GR	GLYCOL RETURN

OTHER PIPE DESIGNATIONS

——— XX ———	
G	NATURAL GAS
LPG	LOW PRESSURE GAS
D	DRAIN

MECHANICAL SHEET LIST

SHEET NUMBER	SHEET NAME	CURRENT REVISION
OBGYN		
M000	GENERAL INFORMATION - MECHANICAL	3
M001	SPECIFICATIONS - MECHANICAL	3
M002	SPECIFICATIONS - MECHANICAL	3
MD101	GROUND FLOOR DEMOLITION PLAN - AREA A HVAC	3
MD102	GROUND FLOOR DEMOLITION PLAN - AREA B HVAC	3
MD201	ROOF DEMOLITION PLAN - AREA A HVAC	3
MD202	ROOF DEMOLITION PLAN - AREA B HVAC	3
M101	GROUND FLOOR PLAN - AREA A HVAC	3
M102	GROUND FLOOR PLAN - AREA B HVAC	3
M201	ROOF PLAN - AREA A HVAC	3
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CONVENTIONS

A / MS — SECTION DESIGNATION
LETTER DENOTES SECTION IDENTIFICATION
INDICATES DRAWING NUMBER WHERE SECTION IS DRAWN

EXISTING DUCTWORK, PIPING, AND EQUIPMENT TO REMAIN (LIGHT, SOLID)

NEW DUCTWORK, PIPING, AND EQUIPMENT (HEAVY, SOLID)

EXISTING DUCTWORK, PIPING, AND EQUIPMENT TO BE REMOVED (HEAVY, DASHED)

1 100 — AIRFLOW (CFM)
AIR DEVICE DESIGNATION

1 — DENOTES REFERENCE TO DRAWING NOTES

1 — SUPPLY AIR TERMINAL UNIT DESIGNATION

1 — RETURN AIR TERMINAL UNIT DESIGNATION

1 — EXHAUST AIR TERMINAL UNIT DESIGNATION

00.00 — INVERT (ELEVATION)

H-_ — DENOTES REFERENCE TO HOSPITAL EQUIPMENT DESIGNATION.

ATC DIAGRAM LEGEND

SYMBOL	DEVICE	DESIGNATION
	AUTOMATIC CONTROL DAMPER (OPPOSED BLADE)	D-
	AUTOMATIC CONTROL DAMPER (PARALLEL BLADE)	D-
SD	SMOKE ISOLATION DAMPER	SD-
HTT	HUMIDITY/TEMPERATURE TRANSMITTER	HTT-
TT	TEMPERATURE TRANSMITTER	TT-
HT	HUMIDITY TRANSMITTER	HT-
FZ	FREEZE STAT (ELECTRIC)	FZ-
	AUTOMATIC CONTROL VALVE (TWO-WAY)	V-
	AUTOMATIC CONTROL VALVE (THREE-WAY)	V-
	AIR MEASURING DEVICE (DUCT MOUNTED)	AMD-
	SMOKE DETECTOR	SD-
	PUMP	P-
SPT	STATIC PRESSURE TRANSMITTER	SPT-
TT	TEMPERATURE TRANSMITTER (PNEUMATIC)	TT-
VFC	VARIABLE FREQUENCY CONTROLLER	VFC-
DPS	DIFFERENTIAL PRESSURE SWITCH	
T	SPACE TEMPERATURE SENSOR	T-
TT	SPACE THERMOSTAT (DIGITAL)	
H	SPACE HUMIDITY SENSOR	H-
HT	SPACE HUMIDITY TRANSMITTER	HT-
TN	NIGHT THERMOSTAT (PNEUMATIC)	TN-
FT	DIFFERENTIAL FLOW TRANSMITTER	FT-
	FLOW METER FITTING	FM-
AS	AQUASTAT	AS-
	FLOW SWITCH	FS-
	FAN (VANE AXIAL)	
	FAN (CENTRIFUGAL)	
TE	SPACE THERMOSTAT - ELECTRIC	TE-
HL	HUMIDITY HIGH LIMIT DIGITAL	HL-
ES	END SWITCH	ES-
	MOTORIZED BUTTERFLY VALVE	V-
	AIR MEASURING DEVICE (FAN INLET)	AMD-
	FILTER	
	COIL	
LL	TEMPERATURE LOW LIMIT	LL-
FM	INSERTION FLOW METER (TRANSMITTER)	FM-
MFM	MAGNETIC FLOW METER (TRANSMITTER)	MFM-
CS	CURRENT SWITCH	CS-
VPT	VELOCITY PRESSURE TRANSMITTER	VPT-
	SOLENOID VALVE	SV-
	PLENUM FAN	
	PRESSURE MONITOR	

ABBREVIATIONS

AABC	ASSOCIATED AIR BALANCE COUNCIL
AAP	MEDICAL GAS AREA ALARM PANEL.
ABBREV	ABBREVIATION
ABV	ABOVE
ACCU	AIR COOLED CONDENSING UNIT
ACU	AIR CONDITIONING UNIT
AD	ACCESS DOOR
AFF	ABOVE FINISHED FLOOR
AHU	AIR HANDLING UNIT
AP	ALARM PANEL
APD	AIR PRESSURE DROP
APPROX	APPROXIMATE, APPROXIMATELY
ARCH	ARCHITECT, ARCHITECTURAL
ARRG	ARRANGEMENT
ASHRAE	AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR CONDITIONING ENGINEERS
ASPE	AMERICAN SOCIETY OF PLUMBING ENGINEERS
ATC	AUTOMATIC TEMPERATURE CONTROLS
BHP	BRAKE HORSEPOWER
BLDG	BUILDING
BLW	BELOW
BNTH	BENEATH
BTUh	BTU PER HOUR
C.	COMMON
CC	COOLING COIL
CD	CEILING DIFFUSER
CLG	CEILING, COOLING
COMP.	COMPRESSOR
CONC	CONCRETE
CONN	CONNECTION, CONNECT
CONT	CONTINUATION, CONTINUED
CU	CONDENSING UNIT
CUH	CABINET UNIT HEATER
dB	DRY BULB
DBA	DECIBEL (REFERENCE "A" SCALE)
DESIG	DESIGNATION
DIFF	DIFFUSER
DISCH.	DISCHARGE
DN	DOWN
DOAS	DIRECT OUTDOOR AIR SUPPLY
DWG	DRAWING
(E)	EXISTING SCOPE
(ETR)	EXISTING SCOPE TO REMAIN
EA	EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE
EDR	EQUIVALENT DIRECT RADIATION
EER	ENERGY EFFICIENCY RATIO
EF	EXHAUST FAN
EFF	EFFICIENCY
EFT	ENTERING FLUID TEMPERATURE, EFFECTIVENESS
EG	EXHAUST GRILLE
ELEC	ELECTRICAL
ELEV	ELEVATION
ESP	EXTERNAL STATIC PRESSURE
ETR	EXISTING TO REMAIN
EWT	ENTERING WATER TEMPERATURE
EX.	EXISTING
EXP	EXPOSED
F	DEGREES FAHRENHEIT
FB	FILTER BANK
FCU	FAN COIL UNIT
FHC	FIRE HOSE CABINET
FLA	FULL LOAD AMPS
FLR	FLOOR
FO	FUEL OIL
FOB	FLAT ON BOTTOM
FOT	FLAT ON TOP
FPI	FINS PER INCH
FPM	FEET PER MINUTE
FPS	FEET PER SECOND
FT	FEET
GA	GAGE
GAL	GALLON
GALV	GALVANIZED
GPD	GALLONS PER DAY
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GR	GRILLE
H	HEIGHT
H.P.	HIGH PRESSURE
HD	HEAD
HORIZ	HORIZONTAL
HP	HORSEPOWER, HEAT PUMP
HVAC	HEATING, VENTILATING, AIR CONDITIONING
Hz	HERTZ
IMP	IMPELLER
IN.	W.G. INCHES OF PRESSURE, WATER GUAGE
kW	KILOWATT
L	LENGTH
L.P.	LOW PRESSURE
LAT	LEAVING AIR TEMPERATURE
LB.	POUNDS
LFT	LEAVING FLUID TEMPERATURE
LWT	LEAVING WATER TEMPERATURE
MAX	MAXIMUM
MBH	THOUSAND BTU PER HOUR
MCU	MODE CONTROL UNIT
MECH	MECHANICAL
MIN	MINIMUM
M.O.D.	MOTOR OPERATED DAMPER
MTD	MOUNTED
(N)	NEW SCOPE
N.C.	NORMALLY CLOSED
N.O.	NORMALLY OPEN
No.	NUMBER
NC	NOISE CRITERIA
NEBB	NATIONAL ENVIRONMENTAL BALANCING BUREAU
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
OA	OUTSIDE AIR
OED	OPEN END DUCT
OEP	OPEN END PIPE
OS&Y	OUTSIDE STEM AND YOKE
PH	PHASE
PLBG	PLUMBING
PPH	POUNDS PER HOUR (STEAM)
PPM	PARTS PER MILLION
PSIG	POUNDS PER SQUARE INCH (GAGE)
QTY	QUANTITY
RA	RETURN AIR
REG	REGISTER
REQ'D	REQUIRED
RG	RETURN GRILLE
RH	RELATIVE HUMIDITY
RHC	REHEAT COIL
RLFA	RELIEF AIR
RPM	REVOLUTIONS PER MINUTE
RWC	RAINWATER CONDUCTOR
RX.	REMOVE EXISTING
SA	SUPPLY AIR
SF	SQUARE FEET
SMACNA	SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION
SH	SENSIBLE HEAT
SPEC	SPECIFICATIONS
STRUCT	STRUCTURAL
SUCT.	SUCTION
TH	TOTAL HEAT
TSP	TOTAL STATIC PRESSURE
TYP	TYPICAL
V	VOLTS
V.B.	VACUUM BREAKER
VAV	VARIABLE AIR VOLUME
VEL	VELOCITY
VRF	VARIABLE REFRIGERANT FLOW
VRV	VARIABLE REFRIGERANT VOLUME
VTR	VENT THRU ROOF
W	WIDTH, WATTS
W/	WITH
W.G.	WATER GAGE
wB	WET BULB
WPD	WATER PRESSURE DROP
ZVB	MEDICAL GAS ZONE VALVE BOX

GENERAL NOTES:

1. REFER TO SHEET M001 - SPECIFICATIONS - MECHANICAL FOR MORE INFORMATION REGARDING PROJECT SCOPE, REQUIREMENTS, AND CONTRACTOR RESPONSIBILITIES.
2. ALL DUCT DIMENSIONS INDICATED WITHIN MECHANICAL DRAWINGS ARE INSIDE CLEAR DIMENSIONS. INTERIOR-LINED DUCTWORK SHALL BE UPSIZED TO ACCOUNT FOR THE THICKNESS OF THE INTERIOR INSULATION.
3. THE WORK OF THIS CONTRACTOR SHALL INCLUDE COORDINATION WITH THE WORK OF ALL OTHER CONTRACTORS AND ALL REQUIREMENTS OF THE SPECIFICATIONS AND THE DRAWINGS. PROVIDE A COORDINATION SHOP DRAWING INDICATING ALL EXISTING AND NEW MAJOR ELECTRICAL CONDUIT, FIRE PROTECTION PIPING, PLUMBING PIPING, AND PROVIDE FOR MECHANICAL DUCTWORK OFFSETS AT THESE TYPICAL LOCATIONS AS REQUIRED.
4. THE WORK SHALL INCLUDE ALL NECESSARY COMPONENTS SO AS TO PROVIDE A COMPLETE AND OPERATIONAL SYSTEM CAPABLE OF BEING READILY OPERATED AND MAINTAINED.
5. ALL MOTORS SERVED BY VARIABLE FREQUENCY DRIVES SHALL BE DESIGNED FOR INVERTER DUTY.
6. PROVIDE FIRE DAMPERS AND FIRE SMOKE DAMPERS IN ALL DUCTS PENETRATING FIRE RATED WALLS AND FLOOR SLABS AS INDICATED ON DRAWINGS.
7. PROVIDE VOLUME DAMPERS IN ALL BRANCH DUCTS AND OUTLETS.
8. PROVIDE PIPE ANCHORS AND GUIDES AS REQUIRED TO RELIEVE PIPE PRESSURE AS REQUIRED.
9. CONTRACTOR SHALL COORDINATE ANY PROPOSED SLAB PENETRATIONS, EXTERIOR WALL PENETRATIONS, OR SHAFT WALL PENETRATIONS WITH THE ARCHITECT AND MECHANICAL ENGINEER. THIS SHALL BE PRESENTED AS A SHOP DRAWING FOR OWNER, ARCHITECT, STRUCTURAL ENGINEER, AND MECHANICAL ENGINEER REVIEW.
10. PROVIDE VIBRATION ISOLATION FOR ALL HVAC EQUIPMENT, ROTATING MACHINES AS REQUIRED.
11. PROVIDE ACOUSTIC INSULATION AS PER DRAWINGS AND SPECIFICATIONS.
12. PROVIDE ACCESS DOORS IN DUCTWORK WHERE INDICATED OR REQUIRED FOR ACCESS TO SYSTEM COMPONENTS INCLUDING THE FOLLOWING:
    - 12.1. AUTOMATIC DAMPERS, FIRE DAMPERS, AND FIRE SMOKE DAMPERS
    - 12.2. SENSORS AND INSTRUMENTS
    - 12.3. VOLUME DAMPERS
13. PROVIDE ESCUTCHEONS AND SEALING OF ALL PENETRATIONS OF FIRE SEPARATIONS IN ACCORDANCE WITH THE APPLICABLE BUILDING CODES.
14. PROVIDE AND COORDINATE CONCRETE EQUIPMENT PADS FOR MECHANICAL EQUIPMENT AS REQUIRED.
15. DUCT DIMENSIONS AS SHOWN ON DRAWINGS REPRESENT CLEAR INSIDE DIMENSIONS AND DO NOT ACCOUNT FOR INTERNAL LINING NOR EXTERNAL INSULATION. IN THE EVENT THAT DUCT DIMENSIONS MUST BE MODIFIED DUE TO IN-FIELD CONDITIONS, MAINTAIN THE STATED CROSS SECTIONAL AREA OF EACH DUCT. REFER TO THE SPECIFICATIONS FOR THE LENGTH AND THICKNESS OF INSULATION AS REQUIRED BY MECHANICAL SYSTEM TYPE.
16. FABRICATE AND INSTALL ALL REFRIGERANT PIPING PER MANUFACTURER'S REQUIREMENTS.
17. PROVIDE AND INSTALL ALL DUCTWORK AND PIPING AS HIGH AS POSSIBLE WITHIN THE CEILING PLENUM.
18. "PROVIDE" SHALL BE THE EQUIVALENT OF "FURNISH AND INSTALL."
19. CONTRACTOR SHALL COVER AND PROTECT DUCTWORK FROM DUCT, DIRT, AND CONSTRUCTION DEBRIS. IT IS OF PARTICULAR IMPORTANCE TO AVOID CONTAMINATION OF DUCTWORK INTERIORS SO AS TO PREVENT THE ENTRAPMENT, CIRULCATION, AND TRANSFER OF CONSTRUCTION DUST TO OTHER AREAS, AS WELL AS THE PREMATURE LOADING OF HVAC EQUIPMENT FILTERS.
20. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO COORDINATE WITH THE BUILDING OWNER AND THE BUILDING FACILITIES MANAGEMENT ANY SHUT DOWN OF EXISTING SYSTEMS, REMOVAL OF EXISTING SYSTEMS, REMOVAL OF EXISTING MATERIALS, AND DELIVERY OF NEQ EQUIPMENT/MATERIALS.

DEMOLITION NOTES:

1. REFER TO SHEET M001 - SPECIFICATIONS - MECHANICAL FOR MORE INFORMATION REGARDING PROJECT SCOPE, REQUIREMENTS, AND CONTRACTOR RESPONSIBILITIES
2. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VISIT THE SITE PRIOR TO SUBMITTING THE BID TO BECOME THOROUGHLY FAMILIAR WITH THE SITE AND FULLY UNDERSTAND THE INTENT AND SCOPE OF WORK AS INDICATED BY THESE DOCUMENTS AND AS REQUIRED TO PERFORM THE WORK IN ACCORDANCE WITH THE PHASING SCHEDULE AS ISSUED BY THE CONSTRUCTION MANAGER AND / OR LANDLORD/OWNER.
3. CONTRACTOR SHALL PERFORM NO DEMOLITION WORK PRIOR TO OBTAINING SPECIFIC WRITTEN DIRECTION TO PROCEED FROM THE DESIGNATED REPRESENTATIVE OF THE OWNER. SPECIFIC WRITTEN APPROVAL MUST BE OBTAINED PRIOR TO CUTTING STEAM, CONDENSATE, OR WATER LINES, OR REMOVING CONTROL WIRING OR DEVICES, OR DEMOLISHING EQUIPMENT. SUBMIT A DEMOLITION SCHEDULE INDICATING REQUIRED APPROVALS. SUBMIT EACH APPROVAL REQUEST TO THE LANDLORD/OWNER AND BUILDING ENGINEERING A MINIMUM OF TWO WEEKS PRIOR TO THE INTENDED START OF WORK TO COORDINATE ALL REQUIRED SYSTEM SHUTDOWNS.
4. THE CONTRACTOR SHALL INCLUDE IN THE SCOPE OF WORK A THOROUGH INVESTIGATION OF THE EXISTING CONDITIONS. THE CONTRACTOR SHALL IDENTIFY TO THE LANDLORD/OWNER, AND TO THE ENGINEER, ANY PIPING, WIRING, EQUIPMENT, DEVICES, ETC. WHICH ARE NOT IDENTIFIED ON THE DEMOLITION DRAWINGS AS EITHER "TO REMAIN" OR "TO BE REMOVED". ANY UNIDENTIFIED CONDUIT, WIRING, DUCTWORK, PIPING OR EQUIPMENT THAT IS EXPOSED OR DISCOVERED DURING THE CONSTRUCTION PERIOD SHALL BE THOROUGHLY INVESTIGATED BY THE CONTRACTOR TO DETERMINE ITS SERVICE AND QUALITY OF CONSTRUCTION.
5. WHERE ANY EXISTING SERVICES, SYSTEMS, COMPONENTS, OR DEVICES INTERFERE WITH THE DEMOLITION OR REMOVAL PROCESS, THE CONTRACTOR SHALL NOTIFY THE ENGINEER, AND UPON WRITTEN APPROVAL FROM THE LANDLORD/OWNER'S APPROVED REPRESENTATIVE, SHALL ALTER OR RE-ROUTE AS NECESSARY AND AS APPROVED SUCH EXISTING CONDITIONS AS REQUIRED TO FACILITATE THE REMOVAL PROCESS.
6. WHERE ANY ASBESTOS CONTAINING MATERIALS (ACM) ARE IDENTIFIED IN THE FIELD AND INTERFERE WITH THE DEMOLITION OR REMOVAL PROCESS AND / OR INTERFERE WITH THE NEW INSTALLATION PROCESS, THE CONTRACTOR SHALL NOTIFY THE LANDLORD/OWNER AND THEIR APPROVED REPRESENTATIVE.
7. ANY UNAUTHORIZED ALTERATIONS TO THE EXISTING SYSTEMS SHALL BE CORRECTED BY THE CONTRACTOR TO THE SATISFACTION OF THE OWNER AT THE CONTRACTOR'S EXPENSE.

WALL RATINGS

——— XX ———	
S	SMOKE PARTITION
SB	SMOKE BARRIER
FP	FIRE PARTITION
FB	FIRE BARRIER
1H	1 HOUR FIRE RESISTANCE RATED WALL ASSEMBLY
2H	2 HOUR FIRE RESISTANCE RATED WALL ASSEMBLY
3H	3 HOUR FIRE RESISTANCE RATED WALL ASSEMBLY

NOTE NOT ALL SYMBOLS AND ABBREVIATIONS MAY APPLY TO THIS PROJECT

TEVEBAUGH ARCHITECTURE

PROJECT
PMMG WEST CHESTER OB/GYN RENOVATION

1055 Andrew Dr.
West Chester, PA 19380

OWNER
Clinical Care Associates of the University of Pennsylvania Health System

1500 Market St Fl 10
Philadelphia, PA 19102

ARCHITECT
TEVEBAUGH ARCHITECTURE
TWO MILL ROAD, SUITE 210
WILMINGTON, DE 19806
302.984.1400

MEP ENGINEER
WSP
1700 MARKET STREET, SUITE 1050
PHILADELPHIA, PA 19113
215.209.1200

STRUCTURAL ENGINEER
DCI ENGINEERS
2 MILL ROAD, SUITE 100
WILMINGTON, DE 19806
302.252.9200

Project Status
FOR CONSTRUCTION SET

COMMONWEALTH OF PENNSYLVANIA — REGISTERED PROFESSIONAL — DONALD PROCZ — ENGINEER No. PE043575

ISSUANCES

NO:	DATE	DESCRIPTION
1	05/31/2024	CONSTRUCTION DOCUMENTS
2	07/12/2024	CDS - ADDENDUM 01
3	07/26/2024	FOR CONSTRUCTION SET

N

Date	07/26/2024
Scale	1/8" = 1'-0"
Drawn	WSP
Checked	WSP
Approved	WSP
Project	24021
	PMMG: 22.261

Sheet Name
GENERAL INFORMATION - MECHANICAL

Sheet
M000

MECHANICAL SPECIFICATIONS

1. SCOPE OF WORK:
   A. THE PROJECT WORK AND BID SHALL INCLUDE ALL LABOR, MATERIALS, SUPERVISION, EQUIPMENT, TOOLS AND SERVICES NECESSARY OR INCIDENTAL TO THE COMPLETE CONSTRUCTION OF THE WORK FOR THE PROJECT AS SHOWN ON THE CONTRACT DOCUMENTS AND AS REQUIRED TO PROVIDE A COMPLETE AND FULLY OPERATIONAL INSTALLATION. THE AIA GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, AIA DOCUMENT A201, LATEST VERSION IS HEREBY INCORPORATED BY REFERENCE AND THE SAME IS APPLICABLE TO THE WORK ON THIS PROJECT AS THOUGH IT IS INCLUDED IN FULL HEREWITH. THE WORK SHALL INCLUDE BUT NOT BE LIMITED TO:
      1. DEMOLITION OF EXISTING SYSTEMS AND EQUIPMENT AS REQUIRED TO ACCOMMODATE THE NEW WORK.
      2. PACKAGED ROOFTOP AIR CONDITIONING UNITS
      3. VARIABLE VOLUME TERMINAL UNITS WITH ELECTRIC REHEAT
      4. EXHAUST FANS
      5. SPLIT SYSTEM AIR CONDITIONING UNIT
      6. SUPPLY, RETURN, EXHAUST AND TRANSFER AIR DISTRIBUTION SYSTEM
      7. DIRECT DIGITAL CONTROL SYSTEM.
      8. STARTUP, TESTING AND BALANCING, TRAINING AND PROJECT CLOSEOUT.
2. DEFINITIONS:
   A. "OWNER" AND "OWNER'S" SHALL MEAN CLINICAL CARE ASSOCIATES OF THE UNIVERSITY OF PENNSYLVANIA HEALTH SYSTEM,1500 MARKET STREET, FL 10, PHILADELPHIA, PA 19102 OR THEIR ASSIGNED REPRESENTATIVE.
   B. "ARCHITECT" SHALL MEAN TEVEBAUGH ARCHITECTURE, TWO MILL ROAD, SUITE 210, WILMINGTON, DE 19806, 302.984.1400.
   C. "ENGINEER" SHALL MEAN WSP USA, 1700 MARKET STREET, SUITE 1050, PHILADELPHIA, PA, 19103.
   D. "FURNISH" SHALL MEAN DELIVER TO SITE FOR INSTALLATION BY OTHERS.
   E. "INSTALL" SHALL MEAN FIX IN POSITION AND CONNECT FOR USE.
   F. "PROVIDE" SHALL MEAN FURNISH AND INSTALL.
   G. "FIRESTOPPING", "FIRESTOP" OR "FIRESAFING" IN ANY FORM SHALL MEAN A SEALING OR STUFFING MATERIAL OR ASSEMBLY PLACED IN SPACES BETWEEN BUILDING MATERIALS TO ARREST THE MOVEMENT OF SMOKE, HEAT, GASES OR FIRE THROUGH WALL OR FLOOR OPENINGS.
3. REGULATIONS: ALL WORK SHALL COMPLY WITH ALL GOVERNING CODES, ORDINANCES, OWNER STANDARDS AND AUTHORITIES HAVING JURISDICTION.
4. PERMITS: CONTRACTOR SHALL OBTAIN AND PAY FOR ALL PERMITS.
5. GUARANTEE: THE CONTRACTOR GUARANTEES BY HIS ACCEPTANCE OF THE CONTRACT THAT ALL WORK PROVIDED SHALL BE FREE FROM DEFECTS IN WORKMANSHIP AND MATERIALS FOR A PERIOD OF ONE YEAR AFTER DATE OF CERTIFICATE OF COMPLETION AND ACCEPTANCE OF WORK BY THE OWNER, BUT NOT MORE THAN EIGHTEEN MONTHS FROM DELIVERY. ANY DEFECTS IN WORKMANSHIP, MATERIALS OR PERFORMANCE WHICH APPEAR WITHIN THE GUARANTEE PERIOD SHALL BE CORRECTED BY THE CONTRACTOR WITHOUT ADDITIONAL COST.
6. OBLIGATION OF BIDDERS: AT THE TIME OF THE OPENING OF BIDS EACH BIDDER WILL BE PRESUMED TO HAVE INSPECTED THE SITE AND TO HAVE READ AND TO BE THOROUGHLY FAMILIAR WITH THE DRAWINGS AND OTHER CONTRACT DOCUMENTS, INCLUDING ALL ADDENDA. THE FAILURE OR NEGLECT OF ANY BIDDER TO RECEIVE OR EXAMINE ANY FORM, INSTRUMENT OR DOCUMENT OR INSPECT THE SITE SHALL IN NO WAY RELIEVE THE BIDDER FROM ANY OBLIGATION IN RESPECT TO HIS BID OR ENTITLE HIM TO EXTRA COMPENSATION.
7. DRAWINGS: THE DRAWINGS ARE DIAGRAMMATIC AND DO NOT INDICATE EACH AND EVERY OFFSET OR ACCESSORY REQUIRED. ALL DIMENSIONS ARE APPROXIMATE AND THE CONTRACTOR IS REQUIRED TO FIELD VERIFY ALL SIZES PRIOR TO CONSTRUCTION.
8. SPECIAL CONDITIONS:
   A. THE PROJECT IS PLANNED FOR A CONSTRUCTION SEQUENCE WHEREBY THE CONSTRUCTION WORK TO BE PERFORMED MAY BE COMPLETED WHILE OTHERS OCCUPY THE BUILDING AND CONSTRUCTION AREA. CONTRACTORS WORKING ON THIS PROJECT MUST COMPLETE ALL THE REQUIRED WORK FOR A GIVEN SYSTEM DURING THE OWNER DESIGNATED PHASING PERIOD. THE CONTRACTOR SHALL PROVIDE TEMPORARY PROTECTION WALLS AND DUST BARRIERS AROUND THE CONSTRUCTION AREAS OF WORK.
   B. CONTRACTORS SHALL PROVIDE COSTS BASED ON WORKING DURING NORMAL HOURS MONDAY THROUGH FRIDAY AND PROVIDE AN ADD ALTERNATE TO PROVIDE WORK ON NIGHTS AND/OR WEEKENDS.
   C. PHASING: THE CONTRACTOR SHALL SCHEDULE PHASING TO MINIMIZE THE DISRUPTION OF EXISTING SERVICES. PHASING SHALL INCLUDE ASSURANCE FOR CLEAN TO DIRTY AIRFLOW, EMERGENCY PROCEDURES, CRITERIA FOR INTERRUPTION OF PROTECTION, CONSTRUCTION OF ROOF SURFACES, WRITTEN NOTIFICATION OF INTERRUPTIONS, AND COMMUNICATION AUTHORITY. PROCEDURES MUST BE DEVELOPED FOR NOISE AND VIBRATION THAT WILL AFFECT OCCUPIED BUILDING AREAS AND PLANNED ACCORDINGLY. THE RENOVATION AREAS SHALL BE ISOLATED FROM THE OCCUPIED AREAS.
   D. THE CONTRACTOR'S PERSONNEL, INCLUDING ALL SUBCONTRACTOR'S, SHALL ADHERE TO AND ABIDE BY THE OSHA STANDARDS AND THE OWNER'S PROCEDURES FOR SAFETY AND DRESS, INCLUDING RELATED ESTABLISHED SITE-REQUIRED PROCEDURES FOR ENTERING THE WORK AREAS OF THE BUILDING, THE MORE STRINGENT STANDARDS SHALL APPLY. CONTRACTORS' EMPLOYEES MUST HAVE BEEN OSHA SAFETY TRAINED PRIOR TO WORKING ON THE CONSTRUCTION SITE.
   E. ALL CONTRACTORS PERFORMING SERVICES FOR THE OWNER UNDER THIS CONTRACT ARE REQUIRED TO PROVIDE INSURANCE WITH INSURANCE COMPANIES LICENSED WITHIN THE MUNICIPALITY OF THE WORK SITE PRIOR TO THE PERFORMANCE OF THE WORK. INSURANCE REQUIREMENTS AND MINIMUM COVERAGE SHALL BE IN ACCORDANCE WITH THE OWNER'S REQUIREMENTS. CONTRACTOR(S) SHALL DELIVER ALL REQUIRED INSURANCE CERTIFICATES TO OWNER NOT LATER THAN FIVE (5) DAYS AFTER RECEIPT OF NOTIFICATION TO PROCEED.
   F. PLEASE NOTE THAT THE OWNER RESERVES THE RIGHT TO HALT ANY CONSTRUCTION ACTIVITIES DURING EXECUTION OF THE WORK THAT MAY IN THE OWNER'S OPINION BE DISRUPTIVE, INCONVENIENT, DANGEROUS, ETC. AT THAT TIME, AT NO COST TO OWNER. THIS WORK SHALL BE RESCHEDULED WITH CONTRACTOR WITHIN 24 HOURS.
9. EVERY EFFORT MUST BE MADE TO MAINTAIN A CLEAN AREA DURING CONSTRUCTION. ALL CONTRACTORS SHALL BE REQUIRED AS PART OF THIS PROPOSAL TO PROVIDE CLEAN UP OF THEIR OWN WORK ON A DAILY BASIS. THIS INCLUDES BROOM CLEANING AND REMOVAL OF DEBRIS. THE CONTRACTOR FOR THIS PROJECT SHALL PROVIDE A DUMPSTER ON SITE FOR DISCARDING DEBRIS. IF THE CONTRACTOR OR SUBCONTRACTOR FAILS TO MAINTAIN A CLEAN AREA IN THE OPINION OF THE OWNER, AND AFTER FAIR WARNING, THEN THE OWNER RESERVES THE RIGHT TO EMPLOY THE NECESSARY PERSONNEL AND BACK-CHARGE THE CONTRACTORS FOR CLEANUP.
10. CONTRACTOR SHALL PROTECT THE OWNER'S BUILDING AND EXISTING EQUIPMENT SHALL IN AND AROUND THE WORK AREAS. CORRECT ALL DAMAGE TO THE SATISFACTION OF THE OWNER.
11. MAINTAIN REQUIRED CLEARANCES FOR EQUIPMENT AND ITEMS INDICATED ON PROJECT. INSTALL PIPING TO AVOID EXISTING HANGERS, PIPING, OBSTRUCTIONS, ETC., AND ADJUST PIPING, SUPPORTS AND HANGERS AS NECESSARY FOR INSTALLATION TO MAINTAIN CLEARANCE. PROVIDE NEW PIPE SUPPORTS AND SUSPEND FROM BUILDING STRUCTURE(S) OR FROM ADDITIONAL FRAMEWORK SUPPORTED OFF BLDG. STRUCTURES. DO NOT SUPPORT PIPING OFF DUCTWORK, OTHER PIPING, CONDUITS, METAL DECK, ETC.
12. THE CONTRACTOR SHALL COORDINATE SHUTDOWN OF OPERATING SYSTEMS WITH THE OWNER IN WRITING WITH A MINIMUM OF THREE DAYS NOTICE. OTHERWISE, ALL OPERATING SYSTEMS SHALL REMAIN IN SERVICE THROUGHOUT THE CONSTRUCTION PROCESS.
13. CONTRACTOR SHALL WORK WITH OWNER FOR CREATION AND COMPLIANCE WITH INFECTION CONTROL RISK ASSESSMENT IN ACCORDANCE WITH OWNER'S STANDARDS AND ASHE ICRA 2.0.
14. SUBMITTALS AND SHOP DRAWINGS:
   A. COLLECT PRODUCT DATA INTO A SINGLE SUBMITTAL FOR EACH ELEMENT OF CONSTRUCTION OR SYSTEM. PRODUCT DATA INCLUDES PRINTED INFORMATION, SUCH AS MANUFACTURER'S INSTALLATION INSTRUCTIONS, CATALOG CUTS, DIMENSIONS, STANDARD COLOR CHARTS, ROUGHING-IN DIAGRAMS AND TEMPLATES, STANDARD WIRING DIAGRAMS, CAPACITY DATA AND PERFORMANCE CURVES.
   B. SHOP DRAWINGS: SUBMIT NEWLY PREPARED INFORMATION DRAWN ACCURATELY TO SCALE. HIGHLIGHT, ENCIRCLE, OR OTHERWISE INDICATE DEVIATIONS FROM THE CONTRACT DOCUMENTS. DO NOT REPRODUCE CONTRACT DOCUMENTS OR COPY STANDARD INFORMATION AS THE BASIS OF SHOP DRAWINGS.
   C. SHOP DRAWINGS INCLUDE FABRICATION AND INSTALLATION DRAWINGS, SETTING DIAGRAMS, SCHEDULES, PATTERNS, ROUTING OF EQUIPMENT, TEMPLATES AND SIMILAR DRAWINGS. INCLUDE THE FOLLOWING INFORMATION: DIMENSIONS, LAYOUTS, DETAILS, IDENTIFICATION OF PRODUCTS AND MATERIALS INCLUDED BY SHEET AND DETAIL NUMBER
   D. DISTRIBUTION: THE CONTRACTOR SHALL FURNISH PRELIMINARY SUBMITTAL AND SHOP DRAWING REVIEW COPIES TO THE OWNER AND THE ENGINEER FOR REVIEW AND APPROVAL. FURNISH COPIES OF FINAL SUBMITTAL TO INSTALLERS, SUBCONTRACTORS, SUPPLIERS, MANUFACTURERS, FABRICATORS, AND OTHERS REQUIRED FOR PERFORMANCE OF CONSTRUCTION ACTIVITIES. SHOW DISTRIBUTION ON TRANSMITTAL FORMS.
   E. COORDINATION DRAWINGS: PREPARE COORDINATION DRAWINGS WHERE CAREFUL COORDINATION IS NEEDED FOR INSTALLATION OF PRODUCTS AND MATERIALS FABRICATED BY SEPARATE ENTITIES. PREPARE COORDINATION DRAWINGS WHERE LIMITED SPACE AVAILABILITY NECESSITATES MAXIMUM UTILIZATION OF SPACE FOR EFFICIENT INSTALLATION OF DIFFERENT COMPONENTS. SHOW THE RELATIONSHIP OF COMPONENTS SHOWN ON SEPARATE SHOP DRAWINGS. INDICATE REQUIRED INSTALLATION SEQUENCES. PREPARATION OF COORDINATION DRAWINGS IS THE RESPONSIBILITY OF THE SUBCONTRACTOR PRINCIPALLY INVOLVED, WHERE INVOLVEMENT BY OTHER CONTRACTORS IS MINOR.
   F. AS A MINIMUM PROVIDE ELECTRONIC SUBMITTALS WITH CONTRACTOR'S APPROVAL STAMP FOR THE FOLLOWING MATERIALS AND EQUIPMENT:
      1. ROOFTOP AIR CONDITIONING UNITS
      2. VAV TERMINALS
      3. CONTROLS
      4. DATA ROOM COOLING SYSTEM
      5. CONDENSATE PUMPS
      6. EXHAUST FANS
      7. DUCTWORK SHOP DRAWINGS AND DUCT MATERIALS
      8. PIPING AND ACCESSORIES
      9. ROOF CURBS AND EQUIPMENT SUPPORTS
      10. DUCT AND PIPE INSULATION AND LINER
      11. VIBRATION ISOLATION
      12. HANGERS AND SUPPORTS
      13. FIRESTOPPING ASSEMBLIES AND MATERIALS
      14. LABELS AND IDENTIFICATION
15. DEMOLITION AND ALTERATIONS:
      1. PROVIDE REMOVALS, RELOCATIONS AND ALTERATIONS TO EXISTING SYSTEMS, EQUIPMENT AND MATERIALS. PERFORM THE WORK IN NEAT AND WORKMANLIKE MANNER. UNLESS OTHERWISE NOTED, REMOVE ALL HANGERS, FOUNDATIONS AND STRUCTURAL SUPPORTS FOR SAID EQUIPMENT AND MATERIALS.
      2. UNLESS SHOWN OR SPECIFIED OTHERWISE, NO EXISTING EQUIPMENT OR MATERIAL SHALL BE REUSED WITHOUT SPECIFIC APPROVAL OF THE OWNER.
      3. EQUIPMENT AND MATERIALS TO BE REMOVED, AND NOT DESIRED BY THE OWNER, SHALL BECOME PROPERTY OF THE CONTRACTOR, BE REMOVED FROM SITE PROMPTLY AND BE PROPERLY DISPOSED OF IN ACCORDANCE WITH GOVERNING REGULATIONS.
      4. EQUIPMENT AND MATERIAL TO BE REMOVED AND DESIRED BY THE OWNER SHALL BE RIGGED TO ON-SITE STORAGE LOCATION AS DIRECTED BY THE OWNER. SHOULD EQUIPMENT PLANNED FOR REUSED BECOME LOST OR DAMAGED IN THE COURSE OF THE PROJECT WORK, THE CONTRACTOR SHALL REPLACE THEM WITH NEW UNITS OF THE SAME MANUFACTURE AND MODEL AT HIS COST. NOT ALL EXISTING SERVICES HAVE BEEN SHOWN. DO NOT REMOVE OR ABANDON ANY SERVICES UNLESS SPECIFICALLY NOTED.

      5. EXISTING PIPING AND DUCTS NO LONGER REQUIRED TO REMAIN IN SERVICE SHALL BE DISCONNECTED AND REMOVED BACK TO SERVICE MAINS AND TRUNK DUCTS, INCLUDING EXISTING PIPING HANGERS, SUPPORTS, AND AIR DEVICES. EXISTING PIPE AND DUCTS INDICATED OR REQUIRED TO REMAIN IN SERVICE SHALL BE CAPPED
      6. EXISTING PIPING THAT REMAINS CONCEALED, BURIED, OR OTHERWISE CONTAINED IN OR BELOW THE REMAINING SLABS AND WALLS SHALL BE CAPPED, PLUGGED, OR OTHERWISE SEALED. ALL PIPES SHALL BE CUT SO THAT THEIR CAPPED OR PLUGGED ENDS WILL BE FAR ENOUGH BEHIND FINISHED SURFACES TO ALLOW FOR THE INSTALLATION OF THE NORMAL THICKNESS OF FINISHED MATERIAL.
      7. WHEN EXISTING MECHANICAL WORK IS REMOVED, ALL RELATED PIPES, VALVES, DUCTS, AND MATERIALS SHALL ALSO BE REMOVED.
16. CUTTING AND PATCHING:
   A. CUTTING AND PATCHING ASSOCIATED WITH BOTH NEW AND EXISTING WORK SHALL BE PERFORMED IN A NEAT AND WORKMANLIKE MANNER. EXISTING SURFACES WHICH ARE DAMAGED BY THE CONTRACTOR SHALL BE REPAIRED OR PROVIDED WITH NEW MATERIALS. STRUCTURAL MEMBERS SHALL NOT BE CUT OR PENETRATED UNLESS APPROVED BY THE ENGINEER. ALL PATCHING SHALL BE DONE WITH MATERIALS AND METHODS SIMILAR TO EXISTING ADJACENT WORK, SUBJECT TO APPROVAL OF THE OWNER AND DECISION SHALL BE FINAL.
   B. WHEN THE WORK SPECIFIED HEREIN CONNECTS TO EXISTING PIPING OR DUCTWORK, THE CONTRACTOR SHALL PERFORM ALL NECESSARY ALTERATIONS, CUTTING, OR FITTING OF THE EXISTING WORK AS MAY BE NECESSARY OR REQUIRED TO MAKE SATISFACTORY CONNECTIONS BETWEEN THE NEW AND EXISTING WORK AND TO LEAVE THE COMPLETED WORK IN A FINISHED AND WORKMANLIKE CONDITION, TO THE ENTIRE SATISFACTION OF THE OWNER.
   C. WHEN THE WORK SPECIFIED HEREIN OR UNDER OTHER DIVISIONS OF THE CONTRACT NECESSITATES RELOCATION OF EXISTING MECHANICAL EQUIPMENT, PIPING OR DUCTWORK, THE CONTRACTOR SHALL PERFORM ALL WORK AND MAKE ALL NECESSARY CHANGES TO EXISTING WORK AS MAY BE REQUIRED TO LEAVE THE COMPLETED WORK IN A FINISHED AND WORKMANLIKE CONDITION, TO THE ENTIRE SATISFACTION OF THE OWNER AT NO ADDITIONAL COST.
   D. EXISTING MECHANICAL EQUIPMENT, PIPING AND DUCTWORK AFFECTED BY REMOVAL OR NEW WORK INSTALLATION AND REQUIRED TO REMAIN IN SERVICE SHALL BE REINSTALLED OR SUPPORTED AS REQUIRED IN ACCORDANCE WITH NEW WORK SPECIFICATION. ALL WORK SHALL BE COMPLETED TO THE ARCHITECT'S SATISFACTION AND AT NO ADDITIONAL COST TO THE OWNER.
   E. VALVE OFF OR DISCONNECT LIVE SERVICES AS REQUIRED FOR REMOVAL WORK.
17. FIRESTOPPING:
   A. PENETRATIONS THROUGH FIRE RATED WALLS, PARTITIONS, FLOORS, AND OTHER BUILDING CONSTRUCTION SHALL BE FIRE STOPPED.
   B. REFERENCES: ASTM E84, ASTM E119, ASTM E814, FACTORY MUTUAL – FIRE HAZARD CLASSIFICATIONS, UL – FIRE HAZARD CLASSIFICATIONS, UL 263, UL 723, UL 1479, WARNOCK HERSEY – CERTIFICATION LISTINGS.
   C. REGULATORY REQUIREMENTS: CONFORM TO APPLICABLE CODE FOR FIRE RESISTANCE RATINGS AND SURFACE BURNING CHARACTERISTICS. PROVIDE CERTIFICATE OF COMPLIANCE FROM AUTHORITY HAVING JURISDICTION INDICATING APPROVAL OF MATERIALS USED.
   D. APPLY ALL MATERIALS IN ACCORDANCE WITH MATERIAL MANUFACTURER'S REQUIREMENTS AND RECOMMENDATIONS, REGULATORY REQUIREMENTS AND LISTING AGENCY REQUIREMENTS FOR ASSEMBLED INSTALLATIONS.
   E. FIRESTOPPING MATERIALS SHALL BE MANUFACTURED BY: 3M FIRE PROTECTION PRODUCTS, ST. PAUL, MN; FLAME STOP INC., FORT WORTH, TEXAS; OR BIO FIRESHIELD, INC., HOUSTON, TEXAS
   F. FIRESTOPPING MATERIAL: CAULKS AND PUTTIES, COMPOSITE SHEETS, MORTARS, PLASTIC PIPE DEVICES, PROTECTIVE WRAPS, SILICONE SEALANTS AND FOAMS, SPRAYS, TAPES, WRAPS AND STRIPS.
18. DUCT ROOF CURBS SHALL BE WELDED GALVANIZED STEEL, INSULATED MOUNTING CURB WITHOUT CANT STRIP AND WITH TREATED WOOD NAILER WITH MINIMUM 1-1/2 INCHES THICK FIBERGLASS INSULATION. CURB HEIGHT SHALL BE MINIMUM 14 INCHES OR GREATER AS REQUIRED. PROVIDE FLASHING AND COUNTER FLASHING TO MAINTAIN LEAK PROOF ROOF SYSTEM. CURBS SHALL BE EQUAL TO PENN BARRY "UNIBEAM".
19. EQUIPMENT SUPPORTS SHALL BE 18 GAUGE GALVANIZED STEEL, UNITIZED CONSTRUCTION, STRAIGHT BASE SECTION WITHOUT CANT STRIP AND INTEGRAL BASE PLATE, ALL WELDED CONSTRUCTION, PRESSURE TREATED WOOD NAILER, COUNTER FLASHING WITH LAG SCREWS AND INTERNAL REINFORCEMENT. UNLESS OTHERWISE INDICATED, OVERALL, HEIGHT AS RECOMMENDED BY SMACNA FIGURE 5-4 TO PROVIDE CLEARANCE FOR ROOF MAINTENANCE. ROOF EQUIPMENT SUPPORTS TO BE PATE TYPE ES-2, THYCURB TYPE TEMS-3, RPS TYPE ER-2A. PROVIDE FLASHING AND COUNTER FLASHING TO MAINTAIN LEAK PROOF ROOF SYSTEM.
20. CONTRACTOR SHALL ENGAGE A ROOFING CONTRACTOR LICENSED TO INSTALL THE OWNER'S ROOFING SYSTEM. ROOFING WORK WILL COMPLY WITH AND MAINTAIN OWNER'S ROOFING WARRANTEE.
21. IDENTIFICATION:
   A. ALL PIPING AND DUCT SYSTEMS SHALL BE LABELED AND IDENTIFICATION SHALL COMPLY WITH OSHA AND ANSI AL3.1, LATEST EDITION, STANDARDS FOR THE IDENTIFICATION OF SYSTEMS, OPERATING PRESSURE AND FLOW.
   B. ALL EQUIPMENT SHALL BEAR A STAINLESS STEEL, PLATED STEEL, BRASS OR PHENOLIC NAMEPLATES LISTING MANUFACTURER, MODEL NO., SERIAL NO., ELECTRICAL DATA AND PERFORMANCE DATA RIVETED TO THE CABINET. ALL EQUIPMENT SHALL BEAR A PHENOLIC PLATE LISTING THE OWNER'S EQUIPMENT NUMBER AFFIXED WITH PERMANENT ADHESIVE OR TWO-SIDED MOUNTING FOAM ADHESIVE TAPE.
   C. CONTRACTOR SHALL OBTAIN THE OWNER AND CLIENT'S STANDARDS FOR IDENTIFICATION NAMES, ABBREVIATIONS AND CONVENTIONS AND SHALL INCORPORATE THEM WITHIN THIS PROJECT.
22. DUCT INSULATION:
   A. SUPPLY AIR DUCTWORK EXTERNAL INSULATION
      1. MINERAL-FIBER BLANKET THERMAL INSULATION: GLASS FIBERS BONDED WITH A THERMOSETTING RESIN.
      2. COMPLY WITH ASTM C 553 TYPE II, WITHOUT FACING AND WITH ALL-SERVICE JACKET MANUFACTURED FROM KRAFT PAPER, REINFORCING SCRIM, ALUMINUM FOIL, AND VINYL FILM.
      3. INSULATION THICKNESS SHALL BE 2".
      4. INSULATION SHALL BE OWENS CORNING ALL SERVICE DUCT WRAP OR EQUAL BY CERTAINTEED OR KNAUF.
   B. DUCT LINER SHALL BE MADE FROM GLASS FIBERS BONDED WITH A THERMOSETTING RESIN. DUCTWORK SHALL BE LINED 10 FEET UPSTREAM OF ROOFTOP EXHAUST FANS AND 10 FEET DOWNSTREAM OF INLINE TRANSFER/EXHAUST FANS. LINER SHALL BE 1" THICK.
      1. "K" ('KSI') VALUE PER ASTM C518, 0.24 AT 75°F (0.036 AT 24°C) BASED ON 1" MATERIAL THICKNESS.
      2. NOISE REDUCTION COEFFICIENT OF 0.70 MINIMUM WHEN TESTED IN ACCORDANCE WITH ASTM C423 WHEN USING A TYPE "A" MOUNTING AT 1" THICKNESS.
      3. MAXIMUM RATED VELOCITY OF 6000 FPM (30.5 METERS/SECOND).
      4. THE AIR STREAM SURFACE SHALL HAVE A 100% COVERAGE COATING OF ACRYLIC POLYMER FORMULATED WITH AN IMMOBILIZED EPA REGISTERED ANTI-MICROBIAL AGENT PROVEN RESISTANT TO MICROBIAL GROWTH AS DETERMINED BY ASTM G21.
      5. MINIMUM WATER REPELLENCY OF 6 ON AIR STREAM SIDE COATING PER INDA IST 80.6
      6. DUCT LINER SHALL HAVE A FHC OF 25/50 AND BE CLASSIFIED AS MEETING THE REQUIREMENTS OF LIMITED COMBUSTIBILITY.
      7. MATERIAL SHALL BE CERTIFIED BY PER GREENGUARD.
      8. SHALL NOT CONTAIN ASBESTOS, LEAD, MERCURY, OR MERCURY COMPOUNDS.
      9. LINER SHALL BE JOHNS MANVILLE LINACOUSTIC RC OR EQUIVALENT BY OWENS CORNING OR KNAUF
23. REFRIGERANT PIPING INSULATION:
   A. FLEXIBLE ELASTOMERIC THERMAL INSULATION: CLOSED-CELL, SPONGE- OR EXPANDED-RUBBER MATERIALS. COMPLY WITH ASTM C 534, TYPE I FOR TUBULAR MATERIALS AND TYPE II FOR SHEET MATERIALS.
   B. ADHESIVE: AS RECOMMENDED BY INSULATION MATERIAL MANUFACTURER.
   C. EXTERIOR INSULATION SHALL INCLUDE ULTRAVIOLET-PROTECTIVE COATING AS RECOMMENDED BY INSULATION MANUFACTURER.
   D. INSULATION THICKNESS SHALL BE 1" ON PIPING 1" AND SMALLER. INSULATION THICKNESS SHALL BE 1-1/2" ON PIPING 1-1/4"AND LARGER
   E. INSULATION SHALL BE EQUIVALENT TO ARMSTRONG AP ARMAFLEX.
24. COIL CONDENSATE PIPING: COIL CONDENSATE PIPING SHALL BE TYPE L COPPER TUBING WITH SOLDERED JOINTS. PIPING SHALL BE INSULATED WITH 1 INCH THICK FIBERGLASS PIPE INSULATION WITH ALL SERVICE JACKET, OWENS CORNING SSL II WITH ASJ.
25. DUCTWORK:
   A. FABRICATE, FURNISH AND INSTALL ALL DUCTWORK IN ACCORDANCE WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS-METAL AND FLEXIBLE" LATEST EDITION.
   B. RECTANGULAR SUPPLY AND RETURN AIR DUCTWORK SHALL BE FABRICATED FROM GALVANIZED CARBON STEEL MATERIAL COMPLYING WITH ASTM A 653/A 653M, WITH G90 (S275) GALVANIZED COATING. STATIC PRESSURE CLASSIFICATIONS SHALL BE +/-3" WG. USE "DUCTMATE" OR "TDC" FLANGED TRANSVERSE JOINT CONNECTIONS FOR DUCT SECTIONS. SEAL FLANGED JOINTS PER MANUFACTURERS RECOMMENDED MATERIAL SPECIFICATIONS AND INSTALLATION METHODS. SEAL RECTANGULAR AND ROUND DUCTWORK TO COMPLY WITH SMACNA CLASS A.
   C. GENERAL EXHAUST DUCT SHALL BE SAME AS ABOVE WITH PRESSURE CLASSIFICATION OF NEGATIVE 3 INCHES WG.
   D. HANG DUCTS FROM BUILDING STRUCTURE WITH GALVANIZED STEEL HANGER MATERIALS AND METHODS COMPLYING WITH SMACNA. DUCT SUPPORTS SHALL NOT BE FASTENED TO METAL ROOF DECK.
   E. PROVIDE FIBERGLASS REINFORCED NEOPRENE FLEXIBLE CONNECTIONS BETWEEN FANS AND/OR EQUIPMENT AND DUCTS TO PREVENT TRANSMISSION OF VIBRATIONS THROUGH THE DUCTWORK.
   F. PROVIDE STANDARD VOLUME DAMPERS AT ALL BRANCH TAKE-OFFS ON THE LOW PRESSURE SIDE OF ALL AIR TERMINAL UNITS. DAMPERS SERVING DUCTS IN EXCESS OF 12 INCHES IN HEIGHT SHALL BE PROVIDED WITH MULTIPLE OPPOSED-BLADES. LINKAGE SHALL BE OUTSIDE AIR STREAM AND SUITABLE FOR HORIZONTAL OR VERTICAL APPLICATIONS. DAMPERS SHALL BE MANUFACTURED FROM GALVANIZED STEEL AND INCLUDE ZINC-PLATED, DIE-CAST CORE WITH DIAL AND HANDLE MADE OF 3/32-INCH- (2.4-MM-) THICK ZINC-PLATED STEEL, AND A 3/4-INCH (19-MM) HEXAGON LOCKING NUT. INCLUDE CENTER HOLE TO SUIT DAMPER OPERATING-ROD SIZE. INCLUDE ELEVATED PLATFORM FOR INSULATED DUCT MOUNTING.
   G. FABRICATE TURNING VANES TO COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS-METAL AND FLEXIBLE" LATEST EDITION.
   H. DUCT ACCESS DOORS - PROVIDE FACTORY FABRICATED HINGED ACCESS DOORS MADE FROM GALVANIZED STEEL IN ACCORDANCE WITH SMACNA STANDARDS. ACCESS DOORS SERVING INSULATED DUCTWORK SHALL BE DOUBLE WALL WITH 1" FIBERGLASS INSULATION. ACCESS DOORS AND PANELS SHALL BE AIRTIGHT, INCLUDE GASKET AND BE SUITABLE FOR DUCT PRESSURE CLASS. ACCESS DOORS ARE REQUIRED ON EACH SIDE OF DUCT COILS AND WHEREVER ELSE INDICATED ON THE DRAWINGS AND REQUIRED BY SPECIFICATIONS. ACCESS DOOR SIZE SHALL BE MINIMUM 16" X 12" OR ONE INCH SMALLER THAN DUCT WIDTH.
   I. ALL DUCT ELBOWS AND OFFSETS SHALL BE LONG RADIUS TYPE (1.5 TIMES OF THE NOMINAL SIZE)
   J. USE LONG RADIUS 90 DEGREE METAL ELBOW OR 12" LONG STRAIGHT METAL DUCT SPOOL PIECE AT DIFFUSER INLET FOR CONNECTION TO FLEXIBLE DUCT.
   K. FLEXIBLE DUCTWORK SHALL BE ROUND DUCT OF FULLY ANNEALED ALUMINUM, CORRUGATED FOR STRENGTH AND FLEXIBILITY AND SUITABLE FOR POSITIVE AND NEGATIVE 10" W.G. WORKING PRESSURE AT 200 DEGREES F. DUCT SHALL INCLUDE L" THICK FIBERGLASS EXTERNAL INSULATION HAVING MAXIMUM THERMAL CONDUCTIVITY OF 0.23 AT 75 DEG. F MEAN TEMPERATURE AND BE ENCLOSED IN POLYETHYLENE VAPOR BARRIER JACKET. DUCTWORK SHALL COMPLY WITH NFPA 90A AND BE UNDERWRITERS LABORATORIES, INC. (UL) LISTED CLASS 1 AIR DUCT, UL STANDARD 181. SPIN-IN GALVANIZED STEEL SHEET METAL COLLARS FOR INSTALLING FLEXIBLE DUCT SHALL BE OF SAME MANUFACTURER. COLLARS SHALL BE WITH OR WITHOUT EXTRACTORS AND VOLUME DAMPERS AS SHOWN ON THE DRAWINGS. DUCTWORK SHALL BE CLEVAFLEX, INC. TYPE SFV OR EQUIVALENT BY FLEXMASTER USA, INC., OR MANVILLE. LENGTH HALL NOT EXCEED 4 FEET.
   L. FLEX CONNECTORS:
      1. PROVIDE VIBRATION DAMPENING FLEXIBLE COMMERCIAL GRADE DUCT CONNECTORS BETWEEN DUCTWORK, FANS, DOAS UNITS, DUCTED FAN COIL UNITS AND AT SIMILAR DUCTED EQUIPMENT CONNECTIONS.
      2. CONNECTORS SHALL CONSIST OF VINYL/POLYESTER 20 OZ FABRIC MECHANICALLY DOUBLE FOLDED TO 24 GA G60 GALVANIZED STEEL. FABRIC SHALL BE MILDEW RESISTANT PER ASTM G-21 AND MEET NFPA 701. CONNECTOR SHALL BE EQUAL TO DUCTMATE PROFLEX WITH POWER LOCK
26. DUCT ACCESSORIES:
   A. FIRE, SMOKE AND COMBINATION FIRE/SMOKE DAMPERS: PROVIDE NEW UL LISTED FIRE, SMOKE AND COMBINATION FIRE/SMOKE DAMPERS WITH ACCESS DOORS AS INDICATED ON THE DRAWINGS CONFORMING TO THE REQUIREMENTS OF THE PARTITIONS WITHIN WHICH THEY ARE INSTALLED AND AS NOTED ON THE CONTRACT DOCUMENTS. INSTALL IN ACCORDANCE WITH CONDITIONS OF MANUFACTURER'S UL LISTING. FIRE DAMPERS SHALL BE OF THE TYPE WITH BLADES INSTALLED COMPLETELY OUT OF THE AIR STREAM. PROVIDE SLEEVES, 16-GAUGE FOR DAMPERS LARGER THAN 24 INCHES AND 14-GAUGE FOR LARGER DAMPERS. CONNECT TO ADJOINING DUCTWORK WITH BREAKAWAY CONNECTIONS AS DETAILED IN UL 555.
27. EQUIPMENT:
   A. REFER TO SCHEDULES ON THESE CONTRACT DOCUMENTS FOR EQUIPMENT REQUIREMENTS.
28. MOTORS:
   A. PROVIDE MOTORS OF A SIZE ADEQUATE TO DRIVE THE EQUIPMENT BUT IN NO CASE LESS THAN THE SIZE SHOWN OR SPECIFIED. IF A MOTOR LARGER THAN THAT SPECIFIED IS REQUIRED, THE CONTRACTOR SHALL BEAR THE EXPENSE OF CHANGES IN FOUNDATIONS, SUPPORT, WIRE AND CONDUIT CONNECTIONS, CIRCUIT PROTECTIVE DEVICES, VARIABLE FREQUENCY DRIVES, OR OTHER AFFECTED ELEMENTS OF THE SYSTEM. EACH MOTOR SHALL HAVE SUFFICIENT CAPACITY TO START AND OPERATE THE MACHINE IT DRIVES WITHOUT EXCEEDING THE MOTOR NAMEPLATE RATING AT THE SPEED SPECIFIED OR AT THE LOAD WHICH MAY BE OBTAINED BY THE DRIVE ACTUALLY PROVIDED. RATE MOTOR FOR CONTINUOUS DUTY AT 115 PERCENT OF RATED CAPACITY; BASE TEMPERATURE RISE ON AN AMBIENT TEMPERATURE OF 104 DEGREES FAHRENHEIT.
   B. MOTORS FOR USE WITH VARIABLE FREQUENCY CONTROLLERS SHALL BE DESIGNED TO WITHSTAND A RISE TIME OF 0.10 MICROSECONDS AND A PEAK VOLTAGE OF 1600 PER NEMA MG1 SECTION 31.40.42.
   C. MOTORS 1/2-HP AND LARGER SHALL BE 3 PHASE, CLASS B, GENERAL PURPOSE, SQUIRREL CAGE, OPEN TYPE, HIGH EFFICIENCY, INDUCTION MOTORS, AND WOUND FOR 208 OR 480 VOLTS, 60 HERTZ, ALTERNATING CURRENT. MOTORS SMALLER THAN 1/2-HP SHALL BE SINGLE PHASE, OPEN CAPACITOR TYPE IN ACCORDANCE WITH NEMA STANDARDS WOUND FOR 115 VOLTS, 60 HERTZ, ALTERNATING CURRENT. MOTORS 1/6 HP AND UNDER MAY BE SPLIT PHASE TYPE. THE RATED NOMINAL FULL LOAD EFFICIENCY SHALL COMPLY WITH THE UNITED STATES ENERGY AND INDEPENDENCE AND SECURITY ACT (EISA) OF 2007 AND NEMA STANDARD MG1 TABLE 12-2.
   D. UNLESS OTHERWISE INDICATED EACH MOTOR (5 HP OR LARGER) OR MOTOR DRIVEN EQUIPMENT (5 HP OR LARGER) SHALL HAVE A COMPOSITE POWER FACTOR (PF) RATING OF A MINIMUM OF 90% WHEN THE MOTOR IS OPERATING AT THE DESIGN DUTY DEFINED ON THE DRAWINGS. POWER FACTOR CORRECTION DEVICES SHALL BE PROVIDED TO MEET THE STATED CRITERIA.
   E. DEVICES (SUCH AS: CAPACITORS) OR EQUIPMENT (SUCH AS: SOLID STATE POWER FACTOR CONTROLLERS) WHEN REQUIRED FOR POWER FACTOR CORRECTION SHALL BE PROVIDED WITH THE MOTORS OR ITEM OR MOTOR DRIVEN EQUIPMENT. THE DEVICE SHALL BE MOUNTED AND WIRED TO THE MOTOR BY THE PROJECT ELECTRICAL CONTRACTOR.
   F. FOR A MOTOR OR MOTOR DRIVEN EQUIPMENT REQUIRING OTHER THAN ACROSS-THE-LINE STARTING PF CORRECTING CAPACITORS (OR OTHER EQUIPMENT) SHALL BE CONNECTED TO MOTOR TERMINALS VIA A CONTRACTOR (CONTROLLER) WITH A 120 VAC COIL. THE 120 VAC COIL SHALL BE ENERGIZED VIA AN AUXILIARY CONTACT ON THE CONTRACTOR (CONTROLLER) USED TO ESTABLISH THE "RUN" OPERATING MODE FOR THE MOTOR OR MOTOR DRIVEN EQUIPMENT.
   G. ALL MOTORS FOR USE WITH VARIABLE FREQUENCY CONTROLLERS SHALL INCLUDE A MAINTENANCE FREE, CIRCUMFERENTIAL, CONDUCTIVE MICRO FIBER BEARING PROTECTION RING TO DISCHARGE SHAFT CURRENTS TO GROUND. BEARING PROTECTION RINGS SHALL BE AEGIS, MODEL SGR, OR APPROVED EQUAL. BEARING PROTECTION SHALL BE INSTALLED AND TESTED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
29. PACKAGED ROOFTOP AIR CONDITIONING UNITS
   A. GENERAL:
      1. UNITS SHALL BE FACTORY ASSEMBLED DIRECT EXPANSION COOLING WITH INDIRECT FIRED NATURAL GAS HEAT AND INCLUDE FACTORY INSTALLED CONTROLS. UNITS SHALL INCLUDE INSULATED WEATHER-TIGHT CASING WITH COMPRESSORS, AIR-COOLED CONDENSER COIL, CONDENSER FANS, EVAPORATOR COIL, RETURN-AIR FILTERS, SUPPLY MOTORS AND UNIT CONTROLS UNITS SHALL BE UL LISTED.
      2. COOLING CAPACITY RATINGS SHALL BE BASED ON AHRI STANDARD.
      3. HEATING CAPACITIES, AND EFFICIENCIES SHALL BE AHRI CERTIFIED WITHIN SCOPE OF AHRI STANDARD 340-360 FOR 12.5 TO 20 TONS, AND ANSIZ21.47 AND 10 CFR PART 431 PERTAINING TO COMMERCIAL WARM AIR FURNACES (ALL GAS HEATING UNITS).
      4. UNITS SHALL BE 100% FACTORY RUN TESTED AND FULLY CHARGED WITH R-410A.
      5. UNITS SHALL INCLUDE COMPLETE REFRIGERATION SYSTEM AND FULL CHARGE OF R410A REFRIGERANT.
      6. MANUFACTURER SHALL PROVIDE ROOF CURBS OR CURB ADAPTORS AS INDICATED ON THE DOCUMENTS.
      7. REFER TO SCHEDULE FOR REQUIRED HEATING AND COOLING CAPACITIES, TOTAL AND OUTDOOR AIRFLOW, ELECTRICAL VOLTAGE, PHASES, FULL LOAD AMPS AND MAXIMUM OVERCURRENT PROTECTIVE DEVICE AMPS.
   B. WARRANTY
      1. PROVIDE PARTS AND LABOR WARRANTY FOR ONE YEAR FROM START-UP BUT NOT MORE THAN 18 MONTHS FROM SHIPMENT.
      2. PROVIDE FIVE-YEAR EXTENDED PARTS WARRANTY FOR COMPRESSORS.
      3. PROVIDE TEN-YEAR HEAT EXCHANGER PARTS WARRANTY.
   C. REGULATORY REQUIREMENTS: UNIT SHALL CONFORM TO ANSI Z21.47/UL1995 FOR CONSTRUCTION OF PACKAGED AIR CONDITIONER.
   D. UNIT CASING
      1. CABINET: GALVANIZED STEEL, PHOSPHATIZED, AND FINISHED WITH AN AIR-DRY PAINT COATING WITH REMOVABLE ACCESS PANELS. STRUCTURAL MEMBERS SHALL BE ZINC COATED, HEAVY GAUGE WITH ACCESS DOORS AND REMOVABLE PANELS OF MINIMUM 20 GAUGE.
      2. CABINET SURFACE SHALL BE TESTED 672 HOURS IN SALT SPRAY TEST IN COMPLIANCE WITH ASTM B117.
      3. CABINET CONSTRUCTION SHALL ALLOW FOR ALL SERVICE AND MAINTENANCE FROM ONE SIDE OF THE UNIT.
      4. CABINET TOP COVER SHALL BE ONE PIECE CONSTRUCTION OR WHERE SEAMS EXITS, IT SHALL BE DOUBLE-HEMMED AND GASKET-SEALED.
      5. ACCESS PANELS: WATER- AND AIR-TIGHT PANELS WITH HANDLES SHALL PROVIDE ACCESS TO FILTERS, HEATING SECTION, RETURN AIR FAN SECTION, SUPPLY AIR FAN SECTION, EVAPORATOR COIL SECTION, AND UNIT CONTROL SECTION.
      6. UNIT BASE PAN SHALL HAVE A RAISED 1 1/8 INCH HIGH LIP AROUND THE SUPPLY AND RETURN OPENINGS FOR WATER INTEGRITY.
      7. INSULATION: PROVIDE 1/2 INCH THICK FIBERGLASS INSULATION WITH FOIL FACE ON ALL EXTERIOR PANELS IN CONTACT WITH THE RETURN AND CONDITIONED AIR STREAM. ALL EDGES MUST BE CAPTURED SO THAT THERE IS NO INSULATION EXPOSED IN THE AIR STREAM.
      8. PROVIDE 115-VOLT CONVENIENCE OUTLET, FACTORY-INSTALLED AND POWERED PER NEC REQUIREMENTS.
      9. PROVIDE OPENINGS EITHER ON SIDE OF UNIT OR THROUGH THE BASE FOR POWER, CONTROL, CONDENSATE, AND GAS CONNECTIONS.
   E. AIR FILTERS
      1. AIR FILTERS: FACTORY INSTALLED FILTERS SHALL MOUNT INTEGRAL WITHIN THE UNIT AND SHALL BE ACCESSIBLE THROUGH ACCESS PANELS. TWO-INCH THICK GLASS FIBER DISPOSABLE MEDIA FILTERS SHALL BE PROVIDED.
      2. 2" PLEATED FILTERS - UNIT SHALL BE PROVIDED WITH TWO INCH MERV 8 FILTERS WITH FILTER REMOVAL TOOL AS STANDARD ON ALL PRODUCTS.
   F. FANS
      1. PROVIDE UNITS WITH DIRECT DRIVE, DYNAMICALLY BALANCED SUPPLY FANS OR BELT DRIVEN SUPPLY FANS WITH ADJUSTABLE MOTOR SHEAVES.
      2. OUTDOOR AND INDOOR FAN SHALL BE PERMANENTLY LUBRICATED AND HAVE INTERNAL THERMAL OVERLOAD PROTECTION.
      3. OUTDOOR FANS SHALL BE DIRECT DRIVE, STATICALLY AND DYNAMICALLY BALANCED, DRAW THROUGH IN THE VERTICAL DISCHARGE POSITION.
      4. PROVIDE SHAFTS CONSTRUCTED OF SOLID HOT ROLLED STEEL, GROUND AND POLISHED, WITH KEY-WAY, AND PROTECTIVELY COATED WITH LUBRICATING OIL.
   G. MOTORS AND DRIVES
      1. UNIT SHALL BE PROVIDED WITH AN ECM (ELECTRONICALLY COMMUTATED MOTOR) OR VFD (VARIABLE FREQUENCY DRIVE) ON INDOOR FAN MOTOR. THE ECM OR VFD SHALL CHANGE FAN SPEED ACCORDING TO MODE OF OPERATION. THE ECM OR VFD SHALL RECEIVE A 0-10 VDC SIGNAL FROM THE UNIT CONTROLS BASED UPON SUPPLY STATIC PRESSURE AND SHALL CAUSE THE DRIVE TO ACCELERATE OR DECELERATE AS REQUIRED TO MAINTAIN THE SUPPLY STATIC PRESSURE SETPOINT.
      2. UNIT WITH VFDS SHALL BE PROVIDED WITH GROUNDING RINGS FOR ELECTRICAL PROTECTION. SHAFT GROUNDING RINGS PROVIDE LONG TERM MOTOR/VFD BEARING RELIABILITY.
   H. GAS FIRED HEATING SECTION
      1. COMPLETELY ASSEMBLED AND FACTORY INSTALLED HEATING SYSTEM SHALL BE INTEGRAL TO UNIT, UL OR CSA APPROVED SPECIFICALLY FOR OUTDOOR APPLICATIONS FOR USE DOWNSTREAM FROM REFRIGERANT COOLING COILS. THREADED CONNECTION WITH PLUG OR CAP PROVIDED. PROVIDE CAPABILITY FOR GAS PIPING THROUGH THE SIDE OF THE UNIT.
      2. HEATING SECTION SHALL BE FACTORY RUN TESTED PRIOR TO SHIPMENT.
      3. HEATING SECTION SHALL INCLUDE MODULATING GAS CONTROL VALVE AND ACCOMPLISH MINIMUM 10 TO 1 CAPACITY TURNDOWN.
      4. INDUCED DRAFT COMBUSTION TYPE WITH DIRECT SPARK IGNITION SYSTEM, REDUNDANT MAIN GAS VALVE, AND 2-STAGED OR MODULATING HEAT.
      5. GAS BURNER SAFETY CONTROLS: PROVIDE SAFETY CONTROLS FOR THE PROVING OF COMBUSTION AIR PRIOR TO IGNITION, AND CONTINUOUS FLAME SUPERVISION. PROVIDE FLAME ROLLOUT SWITCHES. UPON A FAILURE TO IGNITE, THREE ATTEMPTS OF IGNITION WILL OCCUR BEFORE LOCKOUT OF THE IGNITION SYSTEM.
      6. INDUCED DRAFT BLOWER SHALL HAVE COMBUSTION AIR PROVING SWITCHES AND BUILT-IN THERMAL OVERLOAD PROTECTION ON FAN MOTOR.
      7. HEAT EXCHANGER: PROVIDE TUBULAR SECTION TYPE HEAT EXCHANGER CONSTRUCTED FROM 18-GAUGE STAINLESS STEEL.
      8. BURNERS: BURNERS SHALL BE OF THE IN-SHOT TYPE CONSTRUCTED OF STAINLESS STEEL.
      9. LIMIT CONTROLS: HIGH TEMPERATURE LIMIT CONTROLS WILL SHUT OFF GAS FLOW IN THE EVENT OF EXCESSIVE TEMPERATURES RESULTING FROM RESTRICTED INDOOR AIRFLOW OR LOSS OF INDOOR AIRFLOW.
   I. EVAPORATOR COIL
      1. COILS SHALL BE ALL ALUMINUM OR COPPER TUBE WITH MECHANICALLY FASTENED ALUMINUM FINS.
      2. PROVIDE AN INDEPENDENT EXPANSION DEVICE FOR EACH REFRIGERATION CIRCUIT. FACTORY PRESSURE TEST AT 450 PSIG AND LEAK TEST AT 200 PSIG.
      3. PROVIDE DRAIN PAN FOR BASE OF EVAPORATOR COIL CONSTRUCTED OF STAINLESS STEEL NON-CORROSIVE MATERIAL AS FACTORY INSTALLED.
   J. CONDENSER SECTION
      1. COILS SHALL BE ALL ALUMINUM OR COPPER TUBE WITH MECHANICALLY FASTENED ALUMINUM FIN AND FACTORY PRESSURE TEST TO 450 PSIG.
      2. PROVIDE VERTICAL DISCHARGE, DIRECT DRIVE FANS WITH ALUMINUM BLADES. FANS SHALL BE STATICALLY BALANCED. MOTORS SHALL BE PERMANENTLY LUBRICATED, WITH INTEGRAL THERMAL OVERLOAD PROTECTION IN A WEATHER TIGHT CASING.
   K. REFRIGERATION SYSTEM
      1. COMPRESSORS: PROVIDE SCROLL COMPRESSOR WITH DIRECT DRIVE OPERATING AT 3600 RPM. INTEGRAL CENTRIFUGAL OIL PUMP. PROVIDE SUCTION GAS COOLED MOTOR WITH WINDING TEMPERATURE LIMITS AND COMPRESSOR OVERLOADS.
      2. COMPRESSORS SHALL BE VARIABLE SPEED CAPABLE OF SPEED MODULATION FROM 15HZ TO A MAXIMUM OF 60 HZ. THE MINIMUM UNIT CAPACITY SHALL BE 25% OF FULL LOAD OR LESS (3-10 TON) OR 27% OF FULL LOAD OR LESS (12.5 TON). THE COMPRESSOR MOTOR SHALL BE PERMANENT MAGNET TYPE. EACH VARIABLE SPEED COMPRESSOR SHALL BE MATCHED WITH A SPECIFICALLY DESIGNED, REFRIGERANT COOLED, VARIABLE FREQUENCY DRIVE WHICH MODULATES THE SPEED OF THE COMPRESSOR MOTOR AND PROVIDES SEVERAL COMPRESSOR PROTECTION FUNCTIONS. CONTROL OF THE VARIABLE SPEED COMPRESSOR AND INVERTER CONTROL, AS WELL AS TANDEM DIRECT DRIVER, SCROLL TYPE COMPRESSORS SHALL BE INTEGRATED WITH THE UNIT CONTROLLER. EACH COMPRESSOR SHALL HAVE A CRANKCASE HEATER AS STANDARD.
      3. ALL ROOFTOP UNITS MUST USE VARIABLE SPEED COMPRESSOR FOR FIRST STAGE CAPACITY. UNITS WITH MULTIPLE COMPRESSORS MAY UTILIZES SINGLE SPEED UNITS FOR SECOND STAGE.
      4. UNITS SHALL HAVE COOLING CAPABILITIES DOWN TO 0 DEGREE F. FOR FIELD-INSTALLED LOW AMBIENT ACCESSORY, THE MANUFACTURER SHALL PROVIDE A FACTORY-AUTHORIZED SERVICE TECHNICIAN THAT WILL ASSURE PROPER INSTALLATION AND OPERATION.
      5. PROVIDE EACH UNIT WITH ONE OR TWO REFRIGERANT CIRCUITS FACTORY-SUPPLIED COMPLETELY PIPED WITH LIQUID LINE FILTER-DRIER, SUCTION AND LIQUID LINE PRESSURE PORTS.
   L. OUTDOOR AIR SECTION
      1. PROVIDE A FULLY INTEGRATED 100% MODULATING COMPARATIVE ENTHALPY OUTSIDE AIR ECONOMIZER WITH UNIT RETURN, MINIMUM POSITION SETTING, PRESET LINKAGE, WIRING HARNESS WITH PLUG. UNIT OPERATION IS THROUGH PRIMARY TEMPERATURE CONTROLS THAT AUTOMATICALLY MODULATE DAMPERS TO MAINTAIN SPACE TEMPERATURE CONDITIONS.
      2. PROVIDE ADJUSTABLE MINIMUM POSITION CONTROL LOCATED IN THE ECONOMIZER SECTION OF THE UNIT.
      3. PROVIDE SPRING RETURN MOTOR FOR OUTSIDE AIR DAMPER CLOSURE DURING UNIT SHUTDOWN OR POWER INTERRUPTION.
      4. PROVIDE DUCT MOUNTED CO2 SENSOR TO MONITOR SPACE OCCUPANCY LEVELS WITHIN THE BUILDING BY MEASURING THE PARTS PER MILLION OF CO2 (CARBON DIOXIDE) IN THE AIR. AS CO2 LEVELS INCREASE, THE ECONOMIZER FRESH AIR DAMPER SHALL MODULATE TO MEET THE CO2 SPACE VENTILATION REQUIREMENTS.
   M. PROVIDE THE FOLLOWING MANUFACTURER OPTIONS
      1. HOT GAS REHEAT COIL.
      2. DISCONNECT.
      3. RETURN DUCT MOUNTED CO2 SENSOR.

   A. OPERATING CONTROLS
      1. PROVIDE MICROPROCESSOR UNIT-MOUNTED DDC CONTROL WHICH WHEN USED WITH AN ELECTRONIC ZONE SENSOR PROVIDES PROPORTIONAL INTEGRAL ROOM CONTROL. THIS UCM SHALL PERFORM ALL UNIT FUNCTIONS BY MAKING ALL HEATING, COOLING, AND VENTILATING DECISIONS THROUGH RESIDENT SOFTWARE LOGIC.
      2. PROVIDE FACTORY-INSTALLED INDOOR EVAPORATOR DEFROST CONTROL TO PREVENT COMPRESSOR SLUGGING BY INTERRUPTING COMPRESSOR OPERATION.
      3. PROVIDE AN ANTI-CYCLE TIMING AND MINIMUM ON/OFF BETWEEN STAGES TIMING IN THE MICROPROCESSOR.
      4. COMPRESSOR OPERATION SHALL BE INTEGRATED WITH ECONOMIZER CYCLE TO ALLOW MECHANICAL COOLING WHEN ECONOMIZER IS NOT ADEQUATE TO SATISFY ZONE REQUIREMENTS. COMPRESSORS ARE ENABLED IF SPACE TEMPERATURE IS RECOVERING TO COOLING SETPOINT AT A RATE OF LESS THAN 0.2 DEGREES PER MINUTE. COMPRESSOR LOW AMBIENT LOCKOUT SHALL OVERRIDE THIS FUNCTION.
      5. ROOFTOP UNIT MANUFACTURER SHALL PROVIDE A BACNET INTERFACE TO ENERGY MANAGEMENT SYSTEM. THROUGH THIS INTERFACE ALL ENERGY MANAGEMENT FUNCTIONS SHALL BE PERFORMED. THE INTERFACE WITH NECESSARY CONTROLS AND SENSORS SHALL ALL BE FACTORY MOUNTED (NOT FIELD MOUNTED).
      6. CONTROL FUNCTIONS: INCLUDE UNIT SCHEDULING, OCCUPIED/UNOCCUPIED MODE, START-UP AND COAST-DOWN MODES, NIGHTTIME FREE-COOL PURGE MODE, DEMAND LIMITING, NIGHT SETBACK, DISCHARGE AIR SET POINT ADJUSTMENT, TIMED OVERRIDE AND ALARM SHUTDOWN.
   B. ROOF CURB OR CURB ADAPTOR: PROVIDE FACTORY SUPPLIED ROOF CURB OR CURB ADAPTOR AS REQUIRED BY SITE CONDITIONS THAT SHALL INCLUDE 16 GAUGE PERIMETER MADE OF ZINC COATED STEEL WITH SUPPLY AND RETURN AIR GASKETING AND WOOD NAILER STRIPS. SHIP KNOCKED DOWN AND PROVIDED WITH INSTRUCTIONS FOR EASY ASSEMBLY. CURB SHALL BE MANUFACTURED IN ACCORDANCE WITH THE NATIONAL ROOFING CONTRACTORS ASSOCIATION GUIDELINES.
   C. MANUFACTURER:
      1. BASIS OF DESIGN: TRANE PRECEDENT PACKAGED ROOFTOP AIR CONDITIONING UNIT
      2. EQUIVALENT UNITS BY CARRIER, DAIKIN AND YORK/JCI MAY BE SUBMITTED FOR APPROVAL.
30. VARIABLE VOLUME TERMINAL UNITS: TERMINAL UNITS SHALL BE SINGLE DUCT WITH MODULATING ELECTRIC HEAT, DISSIPATIVE SILENCER AND MANUFACTURER PROVIDED BACNET MS/TP COMPATIBLE DIRECT DIGITAL CONTROLLER.
   A. UNIT CASING SHALL BE 22 GA. GALVANIZED STEEL WITH ROUND, FLAT OVAL OR RECTANGULAR INLETS WITH 5 1⁄2" (140) DEEP INLET DUCT COLLAR FOR FIELD CONNECTION. OUTLETS SHALL BE RECTANGULAR AND CONFIGURED FOR FLANGED CONNECTIONS. CASING LEAKAGE DOWNSTREAM OF THE DAMPER SHALL NOT EXCEED 1% @ 1" W.G. HIGH SIDE CASING LEAKAGE SHALL NOT EXCEED 2% @ 3" W.G.
   B. DAMPER ASSEMBLIES OF 16 GA. (1.63) GALVANIZED STEEL SHALL BE MULTIPLE OPPOSED BLADE CONSTRUCTION. DAMPER BLADES SHALL BE FITTED WITH FLEXIBLE SEALS FOR TIGHT CLOSURE AND MINIMIZED SOUND GENERATION. DAMPER BLADES SHALL BE SCREWED THROUGH THE SHAFT TO INSURE THAT NO SLIPPAGE OCCURS. BLADE SHAFTS SHALL PIVOT IN CORROSION FREE SELF-LUBRICATING BRONZE OILITE BEARINGS. IN THE FULLY CLOSED POSITION, AIR LEAKAGE PAST THE CLOSED DAMPER SHALL NOT EXCEED 2% OF THE NOMINAL CATALOG RATING AT 3" W.G. INLET STATIC PRESSURE AS RATED BY ASHRAE STANDARD 130.
   C. THE TERMINAL UNITS SHALL BE CAPABLE OF OPERATION AS DESCRIBED HEREIN WITH A MINIMUM INLET STATIC PRESSURE THAT SHALL NOT EXCEED 0.30" W.G. @ 2000 FPM INLET VELOCITY.
   D. EACH UNIT SHALL BE CONSTRUCTED WITH SINGLE POINT ELECTRICAL CONNECTIONS. ALL ELECTRICAL COMPONENTS SHALL BE ETL OR UL LISTED OR RECOGNIZED AND INSTALLED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE. ALL ELECTRICAL COMPONENTS SHALL BE INSTALLED IN A CONTROL BOX. THE ENTIRE ASSEMBLY SHALL BE ETL LISTED AND SO LABELED.
   E. EACH UNIT SHALL BE FULLY LINED WITH NON-POROUS, SEALED LINER WHICH COMPLIES WITH NFPA 90A & 90B, ASTM E84, UL 723, UL 181 AND ASTM G21 & G22. INSTALLATION SHALL BE 1/2" (13) MINIMUM THICKNESS, 4 LB./CU. FT. (64 KG/M3) DENSITY WITH REINFORCED ALUMINUM FOIL-SCRIM-KRAFT (FSK) FACING. ALL CUT EDGES SHALL BE SECURED WITH STEEL ANGLES OR END CAPS TO ENCAPSULATE EDGES AND PREVENT EROSION.
   F. ALL SOUND DATA SHALL BE COMPILED IN AN INDEPENDENT LABORATORY AND IN ACCORDANCE WITH THE LATEST VERSION OF AHRI STANDARD 880 AND ANSI/ASHRAE STANDARD 130.
   G. DISSIPATIVE SILENCERS SHALL CONTAIN A UNIT CASING CONSTRUCTED OF 22 GA. GALVANIZED STEEL. INLET AND DISCHARGE SHALL BE RECTANGULAR AND CONFIGURED FOR FLANGED CONNECTIONS. EACH SILENCER SHALL BE LINED WITH FIBERGLASS INSULATION, PLACED INSIDE THE TOP AND BOTTOM SIDES OF THE SILENCER, THEREBY ELIMINATING THE REQUIREMENT FOR FIELD WRAPPING WITH THERMAL INSULATION. THE SILENCER BAFFLES SHALL BE FILLED WITH FIBERGLASS ABSORPTION MEDIA AND ENCAPSULATED BY 22 GA. PERFORATED COATED STEEL BAFFLES. THE PERFORATED METAL BAFFLES SHALL BE RIGIDLY FASTENED TO THE CASING OF THE SILENCER. UNITS SHALL MEET NFPA 90A AND UL 181 STANDARDS.
   H. SINGLE DUCT TERMINAL UNIT PROPORTIONAL ELECTRIC HEATING COILS WITH DISCHARGE TEMPERATURE CONTROL:
      1. ELECTRIC HEATING COILS SHALL CONSIST OF OPEN COILS OF HIGH GRADE NICKEL AND CHROMIUM RESISTANCE WIRE OR NICHROME ELEMENTS AND INSULATED WITH CERAMIC INSULATORS IN GALVANIZED STEEL BRACKETS, SUPPORTED IN HEAVY GAUGE GALVANIZED STEEL FRAMES. EACH UNIT EMPLOYING AN ELECTRIC HEATING COIL SHALL BE CONSTRUCTED AND INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF THE LOCAL AUTHORITIES AND SHALL BE UL OR ETL LISTED SPECIFICALLY WITH THE HEATER AS A COMPONENT OF THE TERMINAL UNIT DEVICE.
      2. TERMINAL BOLTS, NUTS AND WASHERS SHALL BE OF CORROSION RESISTANT MATERIALS. COILS SHALL BE CONSTRUCTED SO THE INSTALLATION MAY BE ACCOMPLISHED IN ACCORDANCE WITH THE PROVISIONS OF THE NATIONAL ELECTRICAL CODE, FOR ZERO CLEARANCE. COILS SHALL BE GIVEN A 2000 VOLT DIELECTRIC TEST AT THE FACTORY.
      3. AUTOMATIC RESET THERMAL CUTOUTS SHALL BE FURNISHED FOR PRIMARY PROTECTION WITH MANUALLY RESETTABLE LIMIT SWITCHES IN POWER CIRCUITS FOR SECONDARY PROTECTION. BOTH DEVICES SHALL BE SERVICEABLE THROUGH TERMINAL BOX WITHOUT REMOVING HEATING ELEMENT FROM THE TERMINAL DEVICE. THE AIR PRESSURE SAFETY CUTOUT PICKUP PROBE SHALL BE REMOTELY MOUNTED NEAR THE VOLUME CONTROL DAMPER FOR MAXIMUM FIDELITY.
      4. HEATING COILS SHALL HAVE A TERMINAL BOX AND COVER, WITH PROPORTIONAL HEAT CONTROL FOR THE SINGLE CIRCUIT, BRANCH CIRCUIT FUSING ON HEATERS OVER 45 AMPS PER THE NEC AND AN AIR FLOW SAFETY INTERLOCK SWITCH FOR INSTALLATION IN THE HEATER CONTROL ENCLOSURE. PROVIDE A 120 OR 24 VAC CONTROL POWER TRANSFORMER WITH AN INTEGRAL OR SEPARATELY MOUNTED PRIMARY AND/OR SECONDARY OVERCURRENT PROTECTION DEVICE IN ACCORDANCE WITH NEC REQUIREMENTS.
      5. AN ELECTRIC HEATER SHALL BE FACTORY MOUNTED AND PRE-WIRED AS AN INTEGRAL PACKAGE WITH THE SINGLE DUCT VARIABLE VOLUME TERMINAL UNIT. HEATERS SHALL BE SIZED AS SHOWN ON THE DRAWINGS. THE ENTIRE ASSEMBLY INCLUDING THE ELECTRIC HEATER SHALL BE ETL LISTED FOR ZERO CLEARANCE AND SO LABELED AND SHALL MEET ALL REQUIREMENTS OF THE LATEST NATIONAL ELECTRICAL CODE, (CSA C22.2 NO.236). THE UNIT SHALL HAVE A SINGLE POINT ELECTRICAL CONNECTION (DUAL POINT ELECTRICAL ON 600V). HEATER CASING AND PANEL SHALL BE A MINIMUM OF 20 GA. GALVANIZED STEEL. EACH HEATER SHALL BE COMPLETE WITH AUTOMATIC RESET HIGH LIMIT THERMAL CUT-OUTS, CONTROL VOLTAGE TRANSFORMER AS REQUIRED, GROUND TERMINAL AND HIGH GRADE NICKEL CHROME ALLOY WIRE.
      6. ELEMENT WIRES SHALL BE SUPPORTED BY CERAMIC ISOLATORS. EACH HEATER SHALL BE SUPPLIED WITH FACTORY SUPPLIED AND PRE-WIRED BRANCH CIRCUIT FUSING AS REQUIRED BY NEC AND UL. CIRCUITING AND FUSING SHALL ALSO BE IN ACCORDANCE WITH THE CIRCUITING REQUIREMENTS AS SHOWN ON THE PLANS.
      7. ADDITIONAL ACCESSORIES SHALL INCLUDE (CONTROL TRANSFORMER, CIRCUIT FUSING, DISCONNECT SWITCH, PNEUMATIC ELECTRIC SWITCHES) FOR HEATER CONTROL.
      8. HEATER SHALL BE CAPABLE OF PROVIDING PROPORTIONAL CONTROL OF HEATER CAPACITY FROM AN INPUT SIGNAL OF 4 – 20 MA, 2 – 10 VDC OR 0 – 10 VDC. THE SCR CONTROLLER SHALL PROVIDE A 1 – 24 VDC PULSED OUTPUT TO SSR(S) [SOLID STATE RELAY(S)] IN PROPORTION TO ZONE HEATING DEMAND. THE SSR'S SHALL SWITCH WITH ZERO CROSS OVER TO REDUCE SYSTEM NOISE AND THERMAL SHOCK ON HEATER COILS.
      9. THE SCR CONTROLLER SHALL CONTAIN A DISCHARGE TEMPERATURE SENSOR CAPABLE OF LIMITING LEAVING AIR TEMPERATURE TO A USER DEFINED SETPOINT. THE SCR CONTROLLER SHALL PULSE THE COIL TO MAINTAIN ZONE DEMAND WHILE PROVIDING THE SET MAXIMUM DISCHARGE AIR TEMPERATURE. UPON MEASURING A DISCHARGE AIR TEMPERATURE ABOVE THE USER DEFINED SETPOINT, THE CONTROLLER SHALL REDUCE HEATER CAPACITY TO MAINTAIN MAXIMUM ALLOWABLE DISCHARGE AIR TEMPERATURE. THE DISCHARGE AIR TEMPERATURE SETPOINT SHALL BE ADJUSTABLE FROM 80 – 120°F (27 – 49°C) BY USE OF A CONTROLLER MOUNTED POTENTIOMETER.
      10. ALL WIRING OF BUILT-IN DEVICES SHALL BE BROUGHT TO CLEARLY MARKED TERMINAL STRIPS. A COMPLETE WIRING DIAGRAM SHALL BE PERMANENTLY ATTACHED TO THE HEATING COIL PANEL COVER.
      11. ELECTRIC HEATING COILS SHALL BE DESIGNED FOR OPERATION WITH THE DDC CONTROLLER AND CONTROL SYSTEM.
      12. ELECTRIC HEATING COILS AND THE ASSOCIATED CONTROL PANELS SHALL BE CONSTRUCTED AS A COMPONENT OF THE ENTIRE TERMINAL UNIT AND MOUNTED IN THE DISCHARGE ATTENUATOR DOWNSTREAM OF THE TERMINAL UNIT.
      13. THE MANUFACTURER SHALL PROVE ADEQUATE EVEN AIRFLOW OVER THE ELECTRIC HEATING COIL UNDER THE FULL RANGE OF AIRFLOW SCHEDULED (MINIMUM TO MAXIMUM) TO PREVENT UNEVEN HEATING OF THE ELECTRIC COILS. THE TERMINAL DEVICE SHALL BE LISTED IN ACCORDANCE WITH UL 1995 AS A COMPOSITE ASSEMBLY CONSISTING OF THE VAV TERMINAL DEVICE AND THE ELECTRIC HEATING DEVICE.
   B. VAV BACNET CONTROLLERS
      1. TERMINAL MANUFACTURER SHALL PROVIDE VAV TERMINAL CONTROLLERS. CONTROLLERS SHALL INCLUDE FULLY ADJUSTABLE ANALOG OUTPUTS AND DIGITAL OUTPUTS AS REQUIRED UTILIZING A PROPORTIONAL PLUS INTEGRAL CONTROL LOOP TO CONTROL DAMPER, ELECTRIC HEAT COILS FOR THE PURPOSE OF MAINTAINING USER SETPOINTS. EACH CONTROLLER SHALL BE CLASSIFIED AS A NATIVE BACNET DEVICE, CONFORMING TO THE BACNET ADVANCED SPECIFIC CONTROLLERS (B-ASC) PROFILE, ANSI/ASHRAE BACNET STANDARD 135.
      2. THE VAV CONTROLLER SHALL BE AVAILABLE WITH INTEGRATED APPLICATIONS FOR SINGLE DUCT TERMINALS, COOLING/HEATING WITH CHANGEOVER AND MORNING WARM UP.
      3. THE CONTROLLER SHALL BE FULLY CONFIGURABLE VIA THE DIGITAL DISPLAY SENSOR, INCLUDING COMMUNICATION PARAMETERS (INSTANCE, MAC, BAUD) AND APPLICATION SETTINGS (K-FACTOR, FLOW LIMITS, BOX CONFIGURATION, REHEAT, DEFAULT USER SETPOINTS, ETC.), WITHOUT ANY SPECIFIC PC-BASED SOFTWARE.
      4. THE VAV CONTROLLER SHALL BE CAPABLE OF BEING BALANCED FROM THE DIGITAL ROOM SENSOR WITHOUT ANY SPECIFIC PC-BASED SOFTWARE.
      5. THE CONTROLLER SHALL HAVE INTEGRATED MS/TP COMMUNICATIONS. THE COMMUNICATION PORT SHALL HAVE NETWORK PROTECTION BULBS AND INTEGRATED END-OF-LINE TERMINATIONS.
      6. THE CONTROLLER SHALL HAVE AN INTEGRATED ACTUATOR RATED AT 40 IN-LBS. CONNECTION TO THE DAMPER SHALL BE WITH A V-BOLT CLAMP, ACCEPTING 3/8" TO 5/8" DAMPER SHAFT SIZES. THE ACTUATOR SHALL TRAVEL 0 TO 95 DEGREES WITH ADJUSTABLE END STOPS AT 45 AND 60 DEGREES OF ROTATION. THE ACTUATOR SHALL HAVE AN INTEGRATED GEAR DISENGAGEMENT MECHANISM.
      7. THE CONTROLLER SHALL HAVE AN INTEGRATED TRANSDUCER PRESSURE SENSOR FOR AIRFLOW MEASUREMENT. THE SENSOR SHALL HAVE A RANGE OR 0-2"WC, CONSUMING AND ACCURATE TO 4.5% OF READING OR 0.0008"WC, WHICHEVER IS GREATER.
      8. THE CONTROLLER SHALL HAVE A DEDICATED ROOM SENSOR PORT FOR DIRECT INTERFACE TO A DIGITAL DISPLAY ROOM SENSOR OR DISCRETE ROOM SENSOR. THE CONTROLLER SHALL HAVE THE ABILITY OF DETECTING IF A SENSOR HAS BEEN CONNECTED TO THE PORT AND IDENTIFY ITS TYPE, EITHER DIGITAL DISPLAY OR DISCRETE. SENSORS SHALL BE HOT-SWAPPABLE WITHOUT POWERING DOWN THE CONTROLLER. SENSOR INFORMATION VIA THE PORTS SHALL NOT CONSUME ANY OF THE DEVICES TERMINATED INPUT CAPACITY.
      9. THE CONTROLLER SHALL HAVE SCREW TERMINAL BLOCKS THAT CAN ACCOMMODATE WIRE SIZES 14-22 AWG. TERMINALS SHALL BE COLOR CODED: BLACK TERMINALS FOR POWER, GREEN TERMINALS FOR INPUT AND OUTPUTS, AND GREY TERMINALS FOR TWISTED-SHIELDED-PAIR COMMUNICATION.
      10. THE POWER SUPPLY FOR THE CONTROLLER SHALL BE 24 VOLTS AC (-15%, +20%) POWER. VOLTAGE BELOW THE OPERATING RANGE OF THE SYSTEM SHALL BE CONSIDERED AN OUTAGE.
   C. DIGITAL ROOM SENSOR
      1. THE DIGITAL DISPLAY ROOM SENSOR SHALL PROVIDE SPACE CONDITION MEASUREMENTS AND INDICATIONS, INCLUDING TEMPERATURE AND LOCAL MOTION/OCCUPANCY (OPTIONAL), AND USER SETPOINT ADJUSTMENTS.
      2. THE DIGITAL ROOM SENSOR SHALL CONNECT DIRECTLY TO THE CONTROLLER AND SHALL NOT UTILIZE ANY OF THE HARDWARE I/O POINTS OF THE CONTROLLER. THE DIGITAL DISPLAY ROOM SENSOR SHALL BE ABLE TO BE LOCATED UP TO 75' FROM THE CONTROLLER.
      3. THE DIGITAL DISPLAY ROOM SENSOR SHALL PROVIDE A TEMPORARY NETWORK INTERFACE JACK, FIELD ACCESSIBLE WITHOUT UNINSTALLING THE SENSOR, FOR CONNECTION TO THE BACNET MS/TP COMMUNICATION TRUNK TO WHICH THE DEVICES CONNECTED. THE DIGITAL DISPLAY ROOM SENSOR, THE CONNECTED CONTROLLER, AND ALL OTHER DEVICES ON THE BACNET NETWORK SHALL BE ACCESSIBLE THROUGH THE TEMPORARY COMMUNICATION JACK. MICROPROCESSOR BASED SENSORS WHOSE PORT ONLY ALLOWS COMMUNICATION WITH THE CONTROLLER TO WHICH IT IS CONNECTED SHALL NOT BE ACCEPTABLE.
      4. THE DIGITAL DISPLAY ROOM SENSOR SHALL HAVE AN INTEGRATED SENSOR FOR TEMPERATURE MEASUREMENT AS STANDARD
      5. USER/OCCUPANT SETPOINTS MAY BE ADJUSTED VIA THE DIGITAL DISPLAY ROOM SENSOR.
      6. THE DIGITAL DISPLAY ROOM SENSOR SHALL HAVE PRE-CONFIGURED MENUS FOR ALL CONTROL SEQUENCES ALLOWING ACCESS TO COMMUNICATION AND APPLICATION PARAMETERS.
      7. THE DIGITAL DISPLAY ROOM SENSOR SHALL HAVE TWO LEVELS OF PASSWORD PROTECTION: ONE LEVEL TO PROTECT USER SETPOINT ADJUSTMENT, AND ONE LEVEL TO PROTECT CONFIGURATION MENU PARAMETERS. PASSWORDS SHALL BE AT LEAST 4 DIGITS IN LENGTH.
   D. MANUFACTURER: TERMINALS SHALL BE NAILOR 3000Q SERIES SINGLE DUCT VARIABLE VOLUME QUIET TERMINAL UNITS OR EQUIVALENT BY TRANE, TITUS, TUTTLE AND BAILEY, DAIKIN, ENVIROTEC OR GREENHECK.
31. DRIVES FOR MACHINERY:
   A. EQUIP EACH MOTOR DRIVEN MACHINE WITH A V-BELT DRIVE EXCEPT THOSE WHICH ARE DIRECTLY CONNECTED. WHERE FACTORY DESIGNED AND ASSEMBLED BELT DRIVES WHICH DO NOT CONFORM TO THE FOLLOWING ARE PROPOSED TO BE FURNISHED, SUCH NON-CONFORMITY MUST BE NOTED ON THE SUBMITTALS AND SUCH NON-CONFORMITY MAY BE CAUSE FOR REJECTION OF THE ITEM.
   B. V-BELT DRIVES SHALL INCLUDE A MINIMUM OF TWO BELTS.
   C. SELECT EACH DRIVE ACCORDING TO THE RATING AND RECOMMENDATION OF THE MANUFACTURER FOR THE SERVICE WITH WHICH USED, GIVING PROPER ALLOWANCE FOR SHEAVE DIAMETER, CENTER DISTANCE, AND ARC OF CONTACT LESS THAN 180 DEGREES. SIZE MOTORS DRIVING CENTRIFUGAL FANS SO THEY HAVE A NAMEPLATE RATING OF NOT LESS THAN 5 PERCENT ABOVE THE TOTAL OF ACTUAL FAN BRAKE HORSEPOWER AND DRIVE LOSS AT SPECIFIED CAPACITY IF THE WHEEL IS OF OTHER THAN THE FORWARD CURVED BLADE TYPE, AND NOT LESS THAN 50 PERCENT ABOVE THE TOTAL OF ACTUAL FAN BRAKE HORSEPOWER AND DRIVE LOSS AT SPECIFIED CAPACITY IF THE WHEEL IS OF THE FORWARD CURVE BLADE TYPE.
   D. BELTS SHALL BE CONSTRUCTED OF ENDLESS REINFORCED CORDS OF LONG STAPLE ARAMIT, NYLON, RAYON, OR OTHER SUITABLE TEXTILE FIBERS IMBEDDED IN RUBBER. USE BELT WITH CORRECT CROSS SECTION TO FIT PROPERLY IN THE SHEAVE GROOVES. CAREFULLY MATCH BELTS FOR EACH DRIVE.
   E. MOTOR SHEAVES LESS THAN 20 HP SHALL BE ADJUSTABLE PITCH TYPE SO SELECTED THAT THE REQUIRED FAN ROTATION SPEED WILL BE OBTAINED WITH THE MOTOR SHEAVE SET APPROXIMATELY IN MID-POSITION AND HAVE THE SPECIFIED PITCH DIAMETER IN THAT POSITION. MOTORS ABOVE 20 HP SHALL BE PROVIDED WITH FIXED SHEAVES TO ACHIEVE THE RATED CAPACITY OF THE FAN. DURING THE COMMISSIONING PHASE, IF REQUIRED TO MEET THE ACTUAL SYSTEM REQUIREMENTS, A SECOND SET OF SHEAVES AND BELTS SHALL BE PROVIDED AND INSTALLED.
   F. SELECT THE MOTOR OF A CAPACITY NEEDED TO OPERATE THE EQUIPMENT AT THE SPECIFIED MID-POSITION OPERATING CONDITION. WHERE NON-OVERLOADING MOTORS ARE SPECIFIED, SELECT THE MOTOR SHEAVE. IN NO CASE SHALL MOTORS BE A SMALLER SIZE THAN THOSE SHOWN.
   G. DO NOT SELECT FAN SHEAVE SMALLER IN DIAMETER THAN 30 PERCENT OF THE FAN WHEEL DIAMETER.
   H. CONSTRUCT SHEAVE OF CAST IRON OR STEEL, BORED TO FIT PROPERLY ON THE SHAFTS AND SECURED WITH KEY WAYS (NOT SET SCREWS) OR PROPER SIZE, EXCEPT KEY WAYS MAY BE OMITTED FOR SHEAVES HAVING 1/2-INCH OR SMALLER BORES WHERE SET SCREWS MAY BE USED.
   I. PROVIDE OSHA APPROVED GUARDS FOR ALL BELT DRIVES, CONSTRUCTED IN ACCORDANCE WITH SMACNA STANDARDS. SUBMIT SHOP DRAWINGS FOR APPROVAL.
32. FAN:
   A. ALL FAN MOTORS SHALL BE VARIABLE SPEED BLDC TYPE.
   B. ALL FAN MOTORS SHALL HAVE INHERENT PROTECTION, THERMAL PROTECTION, AND HAVE PERMANENTLY LUBRICATED BEARINGS, AND BE COMPLETELY VARIABLE SPEED.
   C. ALL FAN MOTORS SHALL BE MOUNTED FOR QUIET OPERATION.
   D. ALL FANS SHALL BE PROVIDED WITH A RAISED GUARD TO PREVENT CONTACT WITH MOVING PARTS.
   E. THE HEAT RECOVERY OUTDOOR UNIT SHALL HAVE VERTICAL DISCHARGE AIRFLOW.
   F. THE HEAT RECOVERY OUTDOOR UNITS SHALL NOT REQUIRE ANY FIELD INSTALLED COMPONENTS OR COMPONENT MODIFICATION TO ALLOW DUCTING OF DISCHARGE AIR. OUTDOOR UNIT CAPACITIES 6 – 14 TONS (NOMINAL) SHALL HAVE THE CAPABILITY FOR DUCTING OF DISCHARGE AIR UP TO 0.43" WC STATIC PRESSURE WITH FACTORY PROVIDED DIMENSIONAL DESIGN DRAWINGS. OUTDOOR UNIT CAPACITIES 16 – 20 TONS (NOMINAL) SHALL HAVE THE CAPABILITY FOR DUCTING OF DISCHARGE AIR UP TO 0.32" WC STATIC PRESSURE WITH FACTORY PROVIDED DIMENSIONAL DESIGN DRAWINGS.
33. COIL:
   A. THE OUTDOOR COIL SHALL BE OF NONFERROUS CONSTRUCTION WITH LANCED OR CORRUGATED PLATE FINS ON COPPER TUBING.
   B. THE HEAT RECOVERY CONDENSING UNIT SALT SPRAY TEST METHOD: ASTM B117-18 - THE HEAT EXCHANGER SHOWED NO UNUSUAL RUST OR CORROSION DEVELOPMENT TO 2,280 HOURS.
   C. THE COIL SHALL BE PROTECTED WITH AN INTEGRAL METAL GUARD.
   D. THE HEAT EXCHANGER SHALL CONSIST OF TWO SEPARATE CIRCUITS TO ENHANCE THE HEAT PUMP DEFROST CYCLE. THE UNIT SHALL USE THE ENTIRE COIL INITIALLY FOR THE DEFROST CYCLE. TO RESUME HEATING FASTER IN EXTREME CONDITIONS, THE UPPER SECTION SHALL RETURN TO HEATING OPERATION WHILE THE LOWER SECTION CONTINUES TO DEFROST.
34. IDF ROOM COOLING SYSTEM:
   A. THE DATA ROOM COOLING SHALL BE AN STAND ALONE AIR COOLED COOLING ONLY SPLIT SYSTEM WITH LOW AMBIENT CONTROLS TO 0 DEG F.
   B. OUTDOOR CONDENSING UNIT SHALL INCLUDE:
      1. GALVANIZED STEEL CABINET WITH BAKED ON POWDER COATED FINISH AND FAN GUARD
      2. HERMETICALLY SEALED INVERTER CONTROLLED ROTARY COMPRESSOR
      3. COMPLETE REFRIGERANT CIRCUIT WITH ELECTRONIC EXPANSION VALVE REFRIGERANT FLOW CONTROL
      4. COPPER TUBE ALUMINUM FIN CONDENSER COIL
      5. AXIAL FLOW PROP FAN WITH BRUSHLESS DIRECT CURRENT MOTOR
      6. BASE PAN HEATER
      7. OPTIONAL FRONT WIND BAFFLES / GUARD
      8. ELECTRICAL: UNIT SHALL INCLUDE COMPLETE ELECTRICAL PACKAGE WITH TERMINAL BLOCK, CONTROL UNIT AND SINGLE POINT POWER CONNECTION. MATCHED INDOOR EVAPORATOR SHALL BE POWERED FROM THE OUTDOOR CONDENSING UNIT.
   C. INDOOR EVAPORATOR UNIT SHALL INCLUDE:
      1. UL 94 FLAME RESISTANT PLASTIC ENCLOSURE
      2. GALVANIZED STEEL MOUNTING PLATE
      3. COPPER TUBE ALUMINUM FIN EVAPORATOR COIL
      4. WITH BRUSHLESS DIRECT CURRENT MOTOR
      5. BOTTOM ACCESS PANEL
      6. CROSS FLOW FORWARD CURVE FAN WHEEL WITH THREE SPEED BRUSHLESS DIRECT CURRENT MOTOR
      7. ELECTRO-STATIC WASHABLE PERMANENT FILTER
      8. ELECTRICAL CONNECTION FOR CONDENSATE PUMP
   D. UNIT CONTROLS SHALL BE BY UNIT MANUFACTURER AND INCLUDE:
      1. WALL MOUNTED WIRED CONTROLLER
      2. BUILT-IN WIFI ADAPTER FOR SMART PHONE ACCESS
      3. OVERFLOW DETECTION
      4. AUTO RESTART FUNCTION AFTER POWER INTERRUPTION
      5. SYSTEM SHALL BE SAMSUNG MAX HEAT 2.0 SERIES AR**TSFABWKNCV OR EQUIVALENT BY MITSUBISHI ELECTRIC, FUJITSU OR DAIKIN.
35. CONDENSATE PUMPS:
   A. PUMPS SHALL BE BLUE DIAMOND CONDENSATE REMOVAL PUMPS MODEL SELECTED AS REQUIRED FOR THE UNIT SERVED
   B. PUMPS SHALL BE CONFIGURED TO BE POWERED FROM THE SERVED COOLING UNIT
36. ROOFTOP EXHAUST FANS
   A. DESCRIPTION - FAN SHALL BE A SPUN ALUMINUM, ROOF MOUNTED, BELT DRIVEN, DOWN BLAST CENTRIFUGAL EXHAUST VENTILATOR.
   B. CERTIFICATIONS - FAN SHALL BE MANUFACTURED AT AN ISO 9001 CERTIFIED FACILITY. FAN SHALL BE LISTED BY UNDERWRITERS LABORATORIES (UL 705) AND UL LISTED FOR CANADA (CUL 705). FAN SHALL BEAR THE AMCA CERTIFIED RATINGS SEAL FOR SOUND AND AIR PERFORMANCE.
   C. CONSTRUCTION - FAN SHALL BE OF BOLTED AND WELDED CONSTRUCTION UTILIZING CORROSION RESISTANT FASTENERS. THE SPUN ALUMINUM STRUCTURAL COMPONENTS SHALL BE CONSTRUCTED OF MINIMUM 16 GAUGE MARINE ALLOY ALUMINUM, BOLTED TO A RIGID ALUMINUM SUPPORT STRUCTURE. THE ALUMINUM BASE SHALL HAVE CONTINUOUSLY WELDED CURB CAP CORNERS FOR MAXIMUM LEAK PROTECTION. THE DISCHARGE BAFFLE SHALL HAVE A ROLLED BEAD FOR ADDED STRENGTH. A TWO PIECE TOP CAP SHALL HAVE STAINLESS STEEL QUICK RELEASE LATCHES TO PROVIDE ACCESS INTO THE MOTOR COMPARTMENT WITHOUT THE USE OF TOOLS. AN INTEGRAL CONDUIT CHASE SHALL BE PROVIDED THROUGH THE CURB CAP AND INTO THE MOTOR COMPARTMENT TO FACILITATE WIRING CONNECTIONS. THE MOTOR, BEARINGS AND DRIVES SHALL BE MOUNTED ON A MINIMUM 14 GAUGE STEEL POWER ASSEMBLY, ISOLATED FROM THE UNIT STRUCTURE WITH RUBBER VIBRATION ISOLATORS. THESE COMPONENTS SHALL BE ENCLOSED IN A WEATHER-TIGHT COMPARTMENT, SEPARATED FROM THE EXHAUST AIRSTREAM. LIFTING LUGS SHALL BE PROVIDED TO HELP PREVENT DAMAGE FROM IMPROPER LIFTING. UNIT SHALL BEAR AN ENGRAVED ALUMINUM NAMEPLATE. NAMEPLATE SHALL INDICATE DESIGN CFM, STATIC PRESSURE AND MAXIMUM FAN RPM. UNIT SHALL BE SHIPPED IN ISTA CERTIFIED TRANSIT TESTED PACKAGING.
   D. WHEEL - WHEEL SHALL BE CENTRIFUGAL BACKWARD INCLINED, CONSTRUCTED OF 100 PERCENT ALUMINUM, INCLUDING A PRECISION MACHINED CAST ALUMINUM HUB. WHEEL INLET SHALL OVERLAP AN AERODYNAMIC ALUMINUM INLET CONE TO PROVIDE MAXIMUM PERFORMANCE AND EFFICIENCY. WHEEL SHALL BE BALANCED IN ACCORDANCE WITH AMCA STANDARD 204-05, BALANCE QUALITY AND VIBRATION LEVELS FOR FANS.
   E. MOTOR - MOTOR SHALL BE NEMA DESIGN B WITH CLASS B INSULATION RATED FOR CONTINUOUS DUTY AND FURNISHED AT THE SPECIFIED VOLTAGE, PHASE AND ENCLOSURE.
   F. BEARINGS - BEARINGS SHALL BE DESIGNED AND INDIVIDUALLY TESTED SPECIFICALLY FOR USE IN AIR HANDLING APPLICATIONS. CONSTRUCTION SHALL BE HEAVY DUTY REGREASABLE BALL TYPE IN A CAST IRON PILLOWBLOCK HOUSING SELECTED FOR A MINIMUM L50 LIFE IN EXCESS OF 200,000 HOURS AT MAXIMUM CATALOGED OPERATING SPEED.
   G. BELTS AND DRIVES - BELTS SHALL BE OIL AND HEAT RESISTANT, STATIC CONDUCTING. DRIVES SHALL BE PRECISION MACHINED CAST IRON TYPE, KEYED AND SECURELY ATTACHED TO THE WHEEL AND MOTOR SHAFTS. DRIVES SHALL BE SIZED FOR 150 PERCENT OF THE INSTALLED MOTOR HORSEPOWER. THE VARIABLE PITCH MOTOR DRIVE MUST BE FACTORY SET TO THE SPECIFIED FAN RPM.
   H. DISCONNECT – FAN SHALL INCLUDE MANUFACTURERS NEMA 3R ACCESSORY ELECTRICAL DISCONNECT.
   I. CONTROLS: FAN SHALL START AND RUN CONTINUOUSLY AND SHUTDOWN IN COORDINATION WITH THE RELATED VRF HVAC SYSTEM.
   J. PRODUCT - FAN SHALL BE MODEL ACEB AS MANUFACTURED BY LOREN COOK COMPANY OF SPRINGFIELD, MISSOURI OR EQUIVALENT BY PENNBARRY OR GREENHECK.
37. SYSTEM START UP:
   A. CONTRACTOR SHALL OBTAIN INITIAL LUBRICATION REPORTS FROM MANUFACTURER OR PERFORM AND DOCUMENT INITIAL LUBRICATION AS PER MANUFACTURER'S REQUIREMENTS PRIOR TO OPERATION FOR ALL EQUIPMENT.
   B. CONTRACTOR SHALL INSURE ALL ISOLATED EQUIPMENT IS FREE TO MOVE ON VIBRATION ISOLATORS AND ALL TEMPORARY RESTRAINTS USED FOR SHIPPING ARE REMOVED PRIOR TO OPERATION.
   C. CONTRACTOR SHALL VERIFY WIRING OF ALL MOTORS AND PACKAGED EQUIPMENT, "BUMP" MOTORS AND CONNECTED ROTATING EQUIPMENT TO VERIFY PROPER ROTATION AND CORRECT ANY DEFICIENCIES.
   D. CONTRACTOR SHALL INSTALL FILTERS WITHIN PROJECT SCOPE.
   E. CONTRACTOR SHALL TEST ALL CONTROL LOOPS AND SMOKE DETECTOR WIRING TO VERIFY CONTINUITY AND CONFIGURATION.
   F. CONTRACTOR SHALL VERIFY PROPER OPERATION OF CONTROLS AND SMOKE DETECTORS.
   G. CONTRACTOR SHALL INSTALL 30% FILTER MEDIA OR SIMILAR FILTERING DEVICE ON ALL AIR OUTLETS CONNECTED TO EXISTING DUCTWORK WITHIN THE PROJECT SCOPE PRIOR TO STARTING SYSTEMS TO PREVENT DEBRIS DISTURBED DURING THE CONSTRUCTION PROCESS FROM DISBURSING THROUGH THE FINISHED SPACES.
   H. CONTRACTOR SHALL SUBMIT A REPORT TO THE OWNER AND ENGINEER REFLECTING COMPLETION OF THE ABOVE ITEMS.
38. CONTROLS - GENERAL
   A. CONTRACTOR SHALL PROVIDE ALL SOFTWARE, HARDWARE AND LICENSES REQUIRED TO OPERATE, MAINTAIN AND MODIFY THE SYSTEM CONTROLS AND THE UNIVERSITY OF PENNSYLVANIA (UPENN) SHALL BE SPECIFIED AS THE OWNER.
   B. CONTRACTOR SHALL PROVIDE COMPLETE SOFTWARE SUBSCRIPTION SERVICE FOR A MINIMUM ONE YEAR AFTER SYSTEM ACCEPTANCE BY UPENN WHICH SHALL ALL CORRECTIONS, MANUFACTURER UPDATES AND PROGRAM CHANGES AS REQUESTED BY UPENN.
      1. IN ADDITION TO THE OPERATING THE SYSTEMS, ALL PROGRAMS PERTINENT TO THE OPERATION, INTERFACE, TRENDING AND BACKUP WITH BE PROVIDED ON SEPARATE MEDIA IN A FORMAT AS DIRECTED BY UPENN.
   C. CONTROLS SHALL COMPLY WITH UPENN DESIGN STANDARDS DIVISION 25.55.00 INSTRUMENTATION AND INTEGRATED CONTROLS UNLESS OTHERWISE NOTED.
      1. CONTROLS SHALL NOT BE INTEGRATED WITH THE UNIVERSITY SUPERVISORY CONTROL AND DATA ACQUISITIONS (SCADA) SYSTEM.
39. OPERATOR WORKSTATION: PROVIDE A PC-BASED LAPTOP MICROCOMPUTER WITH BUILDING AUTOMATION SOFTWARE BY MANUFACTURER OF CENTRAL SYSTEM CONTROLLER, MINIMUM CONFIGURATION AS FOLLOWS:
   A. PROCESSOR: INTEL I5 MULTI CORE OR GREATER, 2.0 GHZ. OR GREATER
   B. OPERATING SYSTEM: WINDOWS 11 PRO OR AS REQUESTED BY CLIENT.
   C. RANDOM-ACCESS MEMORY: MINIMUM 4 GB.
   D. INTERNAL GRAPHICS CARD: CAPABLE OF 3840 x 2160 RESOLUTION (4K).
   E. SCREEN: MINIMUM 14 INCH, LCD COLOR, MINIMUM 1920X1080 RESOLUTION OR AS DESIRED BY THE CLIENT.
   F. HARD DRIVE: SOLID STATE TYPE MINIMUM 512 GB STORAGE.
   G. ETHERNET 1000BASE-T, WIRELESS 802.11AC, BLUETOOTH.
   H. ALL CONTROLS SHALL BE ELECTRONIC.
   I. COMMUNICATION WIRING:
      1. ALL CABLING SHALL BE RATED FOR CEILING PLENUM INSTALLATION COMPLY WITH THE GOVERNING EDITION OF THE NATIONAL ELECTRICAL CODE AND INSTALLED IN A NEAT AND WORKMANLIKE MANNER. FOLLOW MANUFACTURER'S INSTALLATION RECOMMENDATIONS FOR ALL COMMUNICATION CABLING.
      2. CONTRACTOR SHALL VERIFY THE INTEGRITY OF THE ENTIRE NETWORK FOLLOWING CABLE INSTALLATION. USE APPROPRIATE TEST MEASURES FOR EACH PARTICULAR CABLE.
      3. WHEN A, A PROVIDE LIGHTING ARRESTOR BETWEEN THE LINE AND GROUND WHERE CABLE ENTERS OR EXITS A BUILDING.
      4. ALL RUNS OF COMMUNICATION WIRING SHALL BE UNSPLICED LENGTH WHEN THE LENGTH IS COMMERCIALLY AVAILABLE.
      5. ALL COMMUNICATION WIRING SHALL BE LABELED TO INDICATE ORIGIN AND DESTINATION.
40. CENTRAL SYSTEM CONTROLLER
   A. CENTRAL SYSTEM CONTROLLER SHALL BE A MICROPROCESSOR BASED BACNET ROUTER DEVICE THAT SERVES AS THE CENTRAL COORDINATOR WHICH INTEGRATES USER INTERFACE, COMMUNICATIONS BETWEEN SYSTEM EQUIPMENT, TERMINAL UNITS AND SPACE THERMOSTATS, SOFTWARE, OPERATING MODES AND SEQUENCES.
   B. AS A MINIMUM CONTROL SHALL INCLUDE:
      1. 32 BIT PROCESSOR
      2. 512 MB RAM
      3. 8 GB FLASH MEMORY
      4. 20 MB DATABASE SPACE
   C. COMMUNICATIONS: AS A MINIMUM, CONTROLLER SHALL INCLUDE AND INTEGRATE THE FOLLOWING COMMUNICATIONS PROTOCOLS:
      1. BACNET IP OVER ETHERNET
      2. BACNET/IP
      3. BACNET MS/TP (76,800 BPS)
      4. BACNET/SC
      5. BLUETOOTH LOW ENERGY TECHNOLOGY
      6. INTERNET BASED CONNECTION FOR ALARMS AND NOTIFICATIONS VIA EMAIL AND TEXT (ACCESSORY MODULE PERMITTED FOR THIS FUNCTION)
   D. CONTROLLER SHALL INCLUDE THE FOLLOWING MINIMUM CONNECTIONS:
      1. TWO ETHERNET (10/100-BASE T)
      2. THREE RS-485 WITH INTERNAL OR EXPANSION MODULES CAPABLE OF CAPTURING ALL ASSIGNED SYSTEM DEVICES PLUS 10 SPARE DEVICES
      3. TWO USB
      4. 11 UNIVERSAL 16 BIT INPUTS (0-5 VDC, 0-10 VDC, 4-20 MA, THERMISTOR)
      5. BLUETOOTH (BLE5.0)
   E. CONTROLLER SHALL INCLUDE DATABASE BACKUP ON POWER FAIL VIA SUPER CAPACITOR OR BATTERY
   F. CONTROLLERS LOCATED INDOORS SHALL BE WITHIN NEMA 1 ENCLOSURES. CONTROLLERS LOCATED OUTDOORS SHALL BE WITHIN NEMA 3R ENCLOSURES.
41. PRESSURE MONITOR: DIFFERENTIAL ROOM PRESSURE IS TO BE MONITORED BY A SETRA SYSTEMS, INC. – SETRA LITE (DEVICE), WITH FUNCTIONS THAT SHALL INCLUDE AN INTEGRAL PRESSURE SENSOR AND LED LIGHT RING WITH VISUAL RED, GREEN, AND YELLOW ALARMING AND AUDIBLE ALARMING. CONTRACTOR SHALL COORDINATE OPTIONS AND MODEL VERSIONS AS NEEDED TO SUIT PROJECT CONDITIONS. COLOR AND FINISH SHALL BE MANUFACTURER'S STANDARD AS SELECTED BY ARCHITECT.
   A. MONITOR SHALL BE CONFIGURED FOR +/-0.25 IN WC RANGE AND HAVE +/-0.5% FULL SCALE ACCURACY.
   B. MONITOR SHALL BE POWERED FROM 24 VOLT CONTROL SYSTEM AND INCLUDE FIELD CONFIGURABLE OUTPUT, 0-5 VOLT, 0-10 VOLT, 4-20 MA
   C. MONITOR SHALL INCLUDE INTEGRAL PRESSURE PORT.
   D. PRESSURE PORT: MONITOR SHALL INCLUDE MANUFACTURERS REMOTE SINTERED METAL SINGLE GANG FILTERED PRESSURE PORT WITH WALL PLATE. PROVIDE TUBING BETWEEN MONITOR AND PRESSURE PORT. 2

TEVEBAUGH ARCHITECTURE

PROJECT
PMMG WEST CHESTER OB/GYN RENOVATION
1055 Andrew Dr.
West Chester, PA 19380

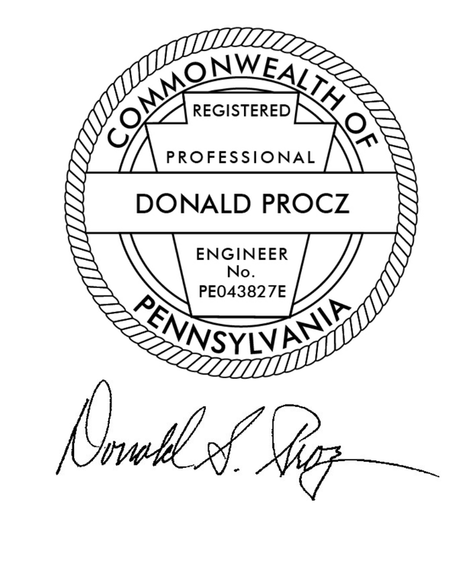
OWNER
Clinical Care Associates of the University of Pennsylvania Health System
1500 Market St Fl 10
Philadelphia, PA 19102

ARCHITECT
TEVEBAUGH ARCHITECTURE
TWO MILL ROAD, SUITE 210
WILMINGTON, DE 19806
302.984.1400

MEP ENGINEER
WSP
1700 MARKET STREET, SUITE 1050
PHILADELPHIA, PA 19113
215.209.1200

STRUCTURAL ENGINEER
DCI ENGINEERS
2 MILL ROAD, SUITE 100
WILMINGTON, DE 19806
302.252.9200

Project Status
FOR CONSTRUCTION SET



ISSUANCES

NO.	DATE	DESCRIPTION
1	06/21/2024	CONSTRUCTION DOCUMENTS
2	07/12/2024	CDS - ADDENDUM 01
3	07/26/2024	FOR CONSTRUCTION SET

Date	07/26/2024
Scale	3/32" = 1'-0"
Drawn	WSP
Checked	WSP
Approved	WSP
Project	24021
	PMMG: 22.261

Sheet Name
SPECIFICATIONS - MECHANICAL

Sheet
M001

42. BUILDING MANAGEMENT SYSTEM (BMS) SOFTWARE:
    A. PROVIDE BMS SOFTWARE HOSTED ON ABOVE OPERATOR WORKSTATION.
    B. SOFTWARE SHALL ACQUIRE, TRANSFER, AND STORE CONTROL SYSTEM DATA AND ISSUE ALARMS AND NOTICES FOR CONNECTED EQUIPMENT AND SYSTEM VIA AUTOMATED EMAIL AND TEXT CORRESPONDENCE.
    C. SOFTWARE SHALL FACILITATE REMOTE SYSTEM MONITORING, OPERATION AND CONTROL USING COMPUTER OR SMART PHONE WEB BASED APPLICATIONS.
    D. CONTRACTOR SHALL CONFIGURE INTERNET CONNECTION AND AN SMTP SERVER (EMAIL ACCOUNT) THROUGH CLIENT'S LOCAL ETHERNET OR WIFI.
43. CONTROLS SOFTWARE:
    A. SOFTWARE SHALL BE RESIDENT ON THE CENTRAL SYSTEM CONTROLLER.
    B. SOFTWARE SHALL INCLUDE APPLICATIONS TO INTERFACE, MODIFY, TREND, UPDATE AND MANAGE THE CONTROL SYSTEM.
        1. SOFTWARE SHALL BE COMPATIBLE WITH CURRENT EDITIONS OF WINDOWS, MACOS, IOS AND ANDROID.
        2. SYSTEM ACCESS SHALL BE FACILITATED THROUGH THE USE OF BASIC WEB BROWSER SOFTWARE BY BOTH PERSONAL COMPUTER AND MOBILE DEVICES INCLUDING WINDOWS EDGE, GOOGLE CHROME, APPLE SAFARI
        3. SOFTWARE SHALL BE CONFIGURED TO ISSUE ALARMS AND NOTIFICATIONS THROUGH EMAIL AND TEXT NOTIFICATIONS.
    C. SOFTWARE SHALL INCLUDE:
        1. COMPLETE GRAPHIC INTERFACE INDICATED EACH PIECE OF OPERATING EQUIPMENT, TERMINAL UNIT, THERMOSTATS, HUMIDISTATS, SMOKE DETECTORS, CARBON MONOXIDE SENSORS AND STAND ALONE SENSORS ALONG WITH LISTING OF ALL POINTS, ALARMS AND SET POINTS.
        2. MANUFACTURER'S STANDARD PLATFORM CUSTOMIZED TO INTEGRATE WITH ALL SYSTEM DEVICES AND EXECUTE SPECIFIED SEQUENCE OF CONTROLS, ALARMS AND SAFETIES.
        3. TRENDING FOR ALL INPUTS, MONITORED VALUES, ALARMS AND EVENTS. TRENDING DATA SHALL BE MAINTAINED FOR 12 MONTHS.
        4. INTERFACE WITH CLIENT NETWORK TO
    D. OPERATOR INTERFACE SOFTWARE SHALL INCLUDE:
        1. ENGLISH LANGUAGE.
        2. MANUAL OPERATOR SIGN-OFF AND PROGRAMMABLE AUTOMATIC SIGN-OFF PERIOD.
        3. RECORDED AND TRENDED OPERATOR SIGN-ON AND SIGN-OFF ACTIVITY.
        4. SECURITY ACCESS.
        5. DATA SEGREGATION.
        6. OPERATORS COMMANDS:
    E. CENTRAL SYSTEM CONTROLLER ACCEPTABLE MANUFACTURERS: TRANE TRACER SC+, DELTA CONTROLS (REDS PLUS), JOHNSON CONTROLS INC., SIEMENS, SCHNEIDER ELECTRIC
44. SEQUENCE OF OPERATION
    A. UNOCCUPIED, MORNING WARM-UP AND OCCUPIED MODES SHALL BE CONFIGURED AND SCHEDULED THROUGH THE CENTRAL SYSTEM CONTROLLER.
    B. SET POINTS SHALL BE CONFIGURED, SCHEDULED AND ADJUSTED THROUGH THE CENTRAL SYSTEM CONTROLLER. INITIAL SETPOINTS ARE AS FOLLOWS:
        1. UNOCCUPIED TEMPERATURE: 60 DEG F, 5 DEG DEADBAND.
        2. OCCUPIED TEMPERATURE: 74 DEGREE F, 2 DEGREE DEADBAND
        3. VAV HIGH LIMIT DISCHARGE TEMPERATURE: 105 DEG F
        4. ROOFTOP UNIT UNOCCUPIED AND MORNING WARM UP SUPPLY AIR TEMPERATURE: 100 DEG F
        5. ROOFTOP UNIT OCCUPIED SUPPLY AIR TEMPERATURE: 55 DEG F, -2 DEG DEADBAND
        6. ROOFTOP UNIT SUPPLY DUCT STATIC PRESSURE: 0.75 IN WG, 0.2 IN WG DEADBAND.
        7. ROOFTOP UNIT LOW LIMIT DISCHARGE TEMPERATURE: 45 DEG F
        8. OCCUPIED CO2: 1,200 PPM
        9. IDF ROOM HIGH LIMIT: 85 DEG F
        10. ROOM PRESSURE DIFFERENTIAL: 0.05 IN WG, -0.02 IN WG DEADBAND AND ONE MINUTE ALARM DELAY.
    C. ALARMS: IN ADDITION TO THAT NOTED HEREIN, ALARMS SHALL BE ISSUED IN RESPONSE TO CONFLICT BETWEEN:
        1. SET POINTS AND RELATED SENSED VALUES
        2. COMMANDED ACTION AND SYSTEM STATUS.
        3. EQUIPMENT FAILURE
        4. FIRE PROTECTION SYSTEM NOTIFICATION
    D. ROOFTOP UNITS
        1. OPERATING MODES, SCHEDULES, SET POINTS, ALARMS AND SCHEDULES SHALL BE CONFIGURED THROUGH THE CENTRAL SYSTEM CONTROLLER.
        2. UNOCCUPIED HEATING MODE: UPON SPACE TEMPERATURE FALLING BELOW SET POINT DEADBAND, BASED ON DESIGNATED ZONE TEMPERATURE SENSOR, ROOFTOP UNIT SHALL START, DELIVER SCHEDULED MAXIMUM AIRFLOW AND MAINTAIN UNOCCUPIED SUPPLY AIR TEMPERATURE. OUTSIDE/RETURN AIR DAMPER SHALL BE CLOSED TO OUTSIDE AIR. UPON SPACE TEMPERATURE RISING ABOVE SET POINT DEADBAND, UNIT SHALL STOP.
        3. MORNING WORM UP AND COOL DOWN MODE: CENTRAL SYSTEM CONTROLLER SHALL TREND SPACE TEMPERATURE TO DETERMINE OPTIMAL START TIME TO ACHIEVE OCCUPIED TEMPERATURE SET POINT. AS COMMANDED BY CENTRAL SYSTEM CONTROLLER, UNIT SHALL START AND RUN CONTINUOUSLY. UNIT SHALL MAINTAIN MAXIMUM SCHEDULED SUPPLY AIRFLOW AND MORNING WARM UP OR OCCUPIED SUPPLY AIR TEMPERATURE SET POINT AS APPLICABLE. UPON ACHIEVING SPACE TEMPERATURE SET POINT BASED ON DESIGNATED ZONE TEMPERATURE SENSOR, ROOFTOP UNIT SHALL REVERT TO OCCUPIED MODE.
        4. OCCUPIED MODE: ROOFTOP AIR HANDLING UNIT SHALL MAINTAIN OCCUPIED SUPPLY AIR SETPOINT THROUGH MODULATION OF COOLING AND HEATING CAPACITY. UNIT SHALL MODULATE OUTDOOR AIR DAMPER TO MAINTAIN OCCUPIED CO2 SETPOINT. UNIT SHALL MODULATE SUPPLY AIRFLOW TO MAINTAIN DUCT STATIC PRESSURE SETPOINT.
        5. SAFETIES AND ALARMS:
            A. UPON SIGNAL FROM FIRE ALARM SYSTEM OR ASSOCIATED DUCT SMOKE DETECTOR, UNIT SHALL DE-ENERGIZE AND CLOSE OUTSIDE AIR DAMPER.
            B. UPON SUPPLY AIR TEMPERATURE FALLING OUTSIDE OF SET POINT DEADBAND, ISSUE ALARM.
            C. UPON SUPPLY AIR DUCT STATIC FALLING OUTSIDE OF DEADBAND, ISSUE ALARM. 2
            D. UPON LOSS OF AIRFLOW, UNIT SHALL SHUT DOWN, AND CLOSE OUTSIDE AIR DAMPER AND ISSUE ALARM.
            E. UPON SUPPLY AIR FALLING BELOW LOW LIMIT SET POINT, OUTDOOR AIR DAMPER SHALL CLOSE AND ISSUE ALARM. UPON CONTINUED SUPPLY AIR BELOW LOW LIMIT SET POINT, UNIT SHALL SHUTDOWN AND ISSUE ALARM.
            F. UNIT SHALL ISSUE ALARM UPON FAILURE.
    E. VARIABLE AIR VOLUME TERMINALS:
        1. OPERATING MODES, SET POINTS, ALARMS AND SCHEDULES SHALL BE CONFIGURED THROUGH THE CENTRAL SYSTEM CONTROLLER.
        2. UNOCCUPIED AND MORNING WARM UP MODE: TERMINAL DAMPER SHALL MODULATE TO THE FULLY OPEN POSITION. TERMINALS SERVING SPACES CONFIGURED WITH PRESSURE MONITORING SHALL MODULATE TO
        3. OCCUPIED MODE:
            A. SUPPLY AIR TERMINAL UNIT DAMPER SHALL BE MODULATED OPEN TO MINIMUM
            B. ON A RISE IN SPACE TEMPERATURE ABOVE SET POINT AS SENSED BY RESPECTIVE SPACE TEMPERATURE SENSOR, SUPPLY AIR ELECTRIC REHEAT SHALL BE MODULATED OFF THROUGH ITS SCR CONTROLS, THEN SUPPLY AIR TERMINAL UNIT DAMPER SHALL BE MODULATED BETWEEN MINIMUM AND MAXIMUM AIRFLOW SET POINTS TO MAINTAIN SPACE TEMPERATURE SET POINT AS SENSED BY SPACE THERMOSTAT.
            C. ON A FALL IN SPACE TEMPERATURE BELOW SET POINT WITH SUPPLY AIR TERMINAL UNIT DAMPER MODULATED TO MINIMUM SUPPLY AIRFLOW, SCR CONTROLLED ELECTRIC REHEAT COIL SHALL MODULATE CAPACITY TO MAINTAIN SPACE TEMPERATURE SETPOINT.
        4. ALARMS AND SAFETIES:
            A. UPON REACHING TERMINAL SUPPLY AIR TEMPERATURE HIGH LIMIT SET POINT AS SENSED BY THE TERMINAL DISCHARGE AIR SENSOR, SCR CONTROLLED ELECTRIC COIL SHALL MODULATE TO MAINTAIN MAXIMUM SET POINT AND ALARM SHALL BE ISSUED. UPON CONTINUED SUPPLY AIR TEMPERATURE EXCEEDING HIGH LIMIT SETPOINT, REHEAT COIL SHALL BE DE-ENERGIZED AND ALARM SHALL BE ISSUED.
            B. UPON TERMINAL FAILURE, AN ALARM SHALL BE ISSUED.
            C. UPON SPACE TEMPERATURE RISING OR FALLING OUTSIDE OF SET POINT DEADBAND DURING OCCUPIED HOURS, AN ALARM SHALL BE ISSUED.
    F. EXHAUST FANS
        1. EXHAUST FANS SHALL BE OPERATED IN ACCORDANCE WITH FACILITY OCCUPIED SCHEDULE.
        2. EXHAUST FANS SERVING SPACES WITH PRESSURE MONITORING SHALL OPERATE CONTINUOUSLY
        3. ALARMS AND SAFETIES: UPON FAN FAILURE, AN ALARM SHALL BE ISSUED.
    G. IDF ROOM:
        1. THE CENTRAL SYSTEM CONTROLLER SHALL MONITOR IDF ROOM SPACE TEMPERATURE
        2. ALARMS AND SAFETIES: UPON IDF ROOM TEMPERATURE RISING ABOVE HIGH LIMIT SET POINT, AN ALARM SHALL BE ISSUED.
    H. ROOMS WITH PRESSURE MONITORING:
        1. THE CENTRAL SYSTEM CONTROLLER SHALL MONITOR ROOM PRESSURE SENSORS.
        2. ALARMS AND SAFETIES: UPON SPACE FALLING BELOW PRESSURE SET POINT DEADBAND FOR DURATION BEYOND ALARM DELAY, AN ALARM SHALL BE ISSUED.
        3. THE CLEAN SUPPLY AND CLEAN WORKROOM WILL NOT BE ALARMED DURING UNOCCUPIED HOURS UNLESS OTHERWISE DIRECTED.
45. SEQUENCE OF OPERATION
    A. RTU
    B. VAV
    C. IDF COOLING UNIT
    D. EXHAUST FANS
46. TESTING, ADJUSTING AND BALANCING: WORK SHALL INCLUDE BUT IS NOT LIMITED TO THE FOLLOWING REQUIREMENTS.
    A. THE CONTRACTOR SHALL EMPLOY A TESTING AND BALANCING AGENCY SPECIALIZING IN TOTAL SYSTEM AIR AND HYDRONIC BALANCING, TESTING AND COMMISSIONING TO TEST AND ADJUST THE SYSTEMS AS INDICATED IN THE DESIGN DOCUMENTS. AGENCY A SHALL BE A CERTIFIED MEMBER OF THE NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB). THE AGENCY SHALL PROVIDE ALL LABOR, ENGINEERING AND TEST EQUIPMENT REQUIRED TO ADJUST AND BALANCE ALL HEATING, VENTILATING AND AIR CONDITIONING AND EXHAUST SYSTEMS AS NOTED ON THE DOCUMENTS AND IN ACCORDANCE WITH NEBB REQUIREMENTS AND RECOMMENDATIONS. ALL PERSONNEL INVOLVED IN THE EXECUTION OF THE WORK UNDER THE AGENCY SHALL BE EXPERIENCED AND FACTORY TRAINED SPECIFICALLY IN THE TOTAL BALANCING OF MECHANICAL SYSTEMS AS WELL AS BEING REGULAR EMPLOYEES OF THE AGENCY.
    B. TESTING AND BALANCING SHALL BEGIN AFTER THE COMPLETION OF CONSTRUCTION WORK, AFTER RECEIPT OF CONTRACTOR'S START-UP REPORT AND AFTER REPLACEMENT OF FILTERS AS NOTED ABOVE.
    C. OBTAIN 1 SET OF DRAWINGS, SPECIFICATIONS, BULLETINS AND ADDENDA FROM THE MECHANICAL CONTRACTOR. OBTAIN CONTRACTORS START UP REPORT. REVIEW DATA AND BECOME FAMILIAR WITH REQUIREMENTS OF THE CONTRACT DOCUMENTS INCLUDING DESIGN AND PERFORMANCE PARAMETERS DEFINED THEREIN.
    D. TEST AND ADJUST FAN SPEEDS TO DELIVER THE REQUIRED AIR VOLUME AND RECORD RPM AND FULL LOAD AMPERES.
    E. TEST AND ADJUST SYSTEMS FOR DESIGN OUTSIDE AIR, SUPPLY AIR, RETURN AIR AND EXHAUST AIR QUANTITIES.
    F. TEST AND ADJUST EACH TERMINAL UNIT AND AIR TERMINAL DEVICE FOR PROPER OPERATION AND TO ACHIEVE AIR FLOW VOLUMES WITHIN 10% OF DESIGN REQUIREMENTS.
    G. MAKE PITOT-TUBE TRAVERSE OF MAIN SUPPLY DUCTS TO VERIFY DESIGN AIR VOLUME AND SEAL DUCT ACCESS HOLES WITH RUBBER OR METAL SNAP-IN-PLUGS. MAKE ADJUSTMENTS AS REQUIRED TO ACHIEVE DIFFERENTIAL AIR FLOW RELATIONSHIPS AS INDICATED ON THE CONTRACT DOCUMENTS.
    H. VERIFY THAT ALL RUNNING EQUIPMENT IS OPERATING PROPERLY AND PERFORMING THE INTENDED DUTY.
    I. VERIFY PROPER OPERATION OF ALL CONTROLS. DOCUMENT RESULTS AND NOTIFY OWNER OF DISCREPANCIES IN WRITING.
    J. THE AGENCY SHALL PREPARE AND SUBMIT FOR REVIEW A TEST REPORT USING NEBB STANDARD DATA SHEETS. THE REPORT SHALL INCLUDE BUT NOT BE LIMITED TO THE FOLLOWING BALANCING DATA:
        1. AMBIENT CONDITIONS: DRY BULB AND WET BULB TEMPERATURES
        2. MOTORS: MANUFACTURER; MODEL; SERIAL NUMBER; RATED AND MEASURED AMPERAGE, VOLTAGE, HORSEPOWER AND RPM; CORRECTED FULL LOAD AMPERAGE; CALCULATED BHP; AND SHEAVE SIZE, TYPE AND MANUFACTURER.
        3. RTU: MODEL AND SERIAL NUMBERS; RATED CAPACITY; DESIGN AND MEASURED SUPPLY AIR QUANTITY AND FAN STATIC PRESSURE; DESIGN AND MEASURED AMBIENT AIR AND SUPPLY AIR DRY BULB AND WET BULB TEMPERATURES AT TIME OF TEST; RATED AND MEASURED COMPRESSOR RUNNING LOAD AMPERAGE AND VOLTAGE; AND VERIFICATION OF PROPER OPERATION.
        4. FANS: INTENDED DUTY; MANUFACTURER; MODEL AND SERIAL NUMBERS; RATED AIR VOLUME, RPM AND PRESSURE; MEASURED AIR VOLUME, RPM AND PRESSURE; PULLEY SIZE, TYPE AND MANUFACTURER; BELT SIZE AND QUANTITY; AND VERIFICATION OF PROPER OPERATION.
        5. AIR TERMINAL UNITS: MANUFACTURER; MODEL; LOCATION; MAXIMUM AND MINIMUM AIR VOLUME, STATIC PRESSURE LOSS AT MAXIMUM AIR VOLUME, SATISFACTORY OPERATION OF ELECTRIC RE-HEAT COILS.
        6. AIR TERMINAL DEVICE: NUMBER; MANUFACTURER; LOCATION; DESIGN VELOCITY AND AIR VOLUME; EFFECTIVE AREA FACTOR AND SIZE; AND MEASURED VELOCITY AND AIR VOLUME; A SCALED PLAN LOCATING EACH AIR TERMINAL DEVICE.
        7. IDF ROOM COOLING SYSTEM: LOCATION, MODEL AND SERIAL NUMBERS; RATED CAPACITY; RATED AND MEASURED SUPPLY AIR QUANTITY; REQUIRED AND MEASURED CONDENSER WATER FLOW; AND VERIFICATION OF PROPER OPERATION.
        8. FAN COIL UNITS: TEXT
47. PROJECT CLOSEOUT REQUIREMENTS:
    A. CONTRACTOR SHALL PROVIDE ELECTRONIC OPERATION AND MAINTENANCE MANUALS.
    B. CONTRACTOR SHALL PROVIDE ELECTRONIC AS BUILT DRAWINGS.
    C. CONTRACTOR SHALL PROVIDE INSTRUCTION TRAINING TO OWNER'S STAFF TO INSURE PROPER OPERATIONS OF SYSTEMS. CONTRACTOR SHALL PROVIDE A MINIMUM OF EIGHT (8) HOURS OF INSTRUCTION IN TWO SESSIONS.

END OF MECHANICAL SPECIFICATIONS

TEVEBAUGH
ARCHITECTURE

PROJECT
PMMG WEST CHESTER OB/GYN RENOVATION

1055 Andrew Dr.
West Chester, PA 19380

OWNER
Clinical Care Associates of the University of Pennsylvania Health System

1500 Market St Fl 10
Philadelphia, PA 19102

ARCHITECT
TEVEBAUGH ARCHITECTURE
TWO MILL ROAD, SUITE 210
WILMINGTON, DE 19806
302.984.1400

MEP ENGINEER
WSP
1700 MARKET STREET, SUITE 1050
PHILADELPHIA, PA 19113
215.209.1200

STRUCTURAL ENGINEER
DCI ENGINEERS
2 MILL ROAD, SUITE 100
WILMINGTON, DE 19806
302.252.9200

Project Status
FOR CONSTRUCTION SET

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
DONALD PROCZ
ENGINEER
No. PE043827E

ISSUANCES

NO.	DATE	DESCRIPTION
1	06/21/2024	CONSTRUCTION DOCUMENTS
2	07/12/2024	CDS - ADDENDUM 01
3	07/26/2024	FOR CONSTRUCTION SET

Date	07/26/2024
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	PMMG: 22.261

Sheet Name
SPECIFICATIONS - MECHANICAL

Sheet
M002

GENERAL NOTES

A. REFER TO DRAWING M000 FOR SYMBOLS AND ABBREVIATIONS.

B. REFER TO DRAWING M001 FOR MECHANICAL SPECIFICATIONS.

C. EXISTING ROOFTOP UNITS MAY REMAIN IN SERVICE DURING CONSTRUCTION. VERIFY CONSTRUCTION PHASING SCHEDULE WITH OWNER AND CM.

DEMO NOTES

A. DEMO SCOPE OF WORK HATCH

B. NEIGHBORING TENANT AREA - NIC HATCH

1 MD101 **GROUND FLOOR DEMOLITION PLAN - AREA A HVAC**
Scale : 1/4" = 1'-0"

TEVEBAUGH ARCHITECTURE

PROJECT
PMMG WEST CHESTER OB/GYN RENOVATION

1055 Andrew Dr.
West Chester, PA 19380

OWNER
Clinical Care Associates of the University of Pennsylvania Health System
1500 Market St Fl 10
Philadelphia, PA 19102

ARCHITECT
TEVEBAUGH ARCHITECTURE
TWO MILL ROAD, SUITE 210
WILMINGTON, DE 19806
302.984.1400

MEP ENGINEER
WSP
1700 MARKET STREET, SUITE 1050
PHILADELPHIA, PA 19113
215.209.1200

STRUCTURAL ENGINEER
DCI ENGINEERS
2 MILL ROAD, SUITE 100
WILMINGTON, DE 19806
302.252.9200

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Sheet Name
GROUND FLOOR DEMOLITION PLAN - AREA A HVAC

Sheet
MD101

GENERAL NOTES

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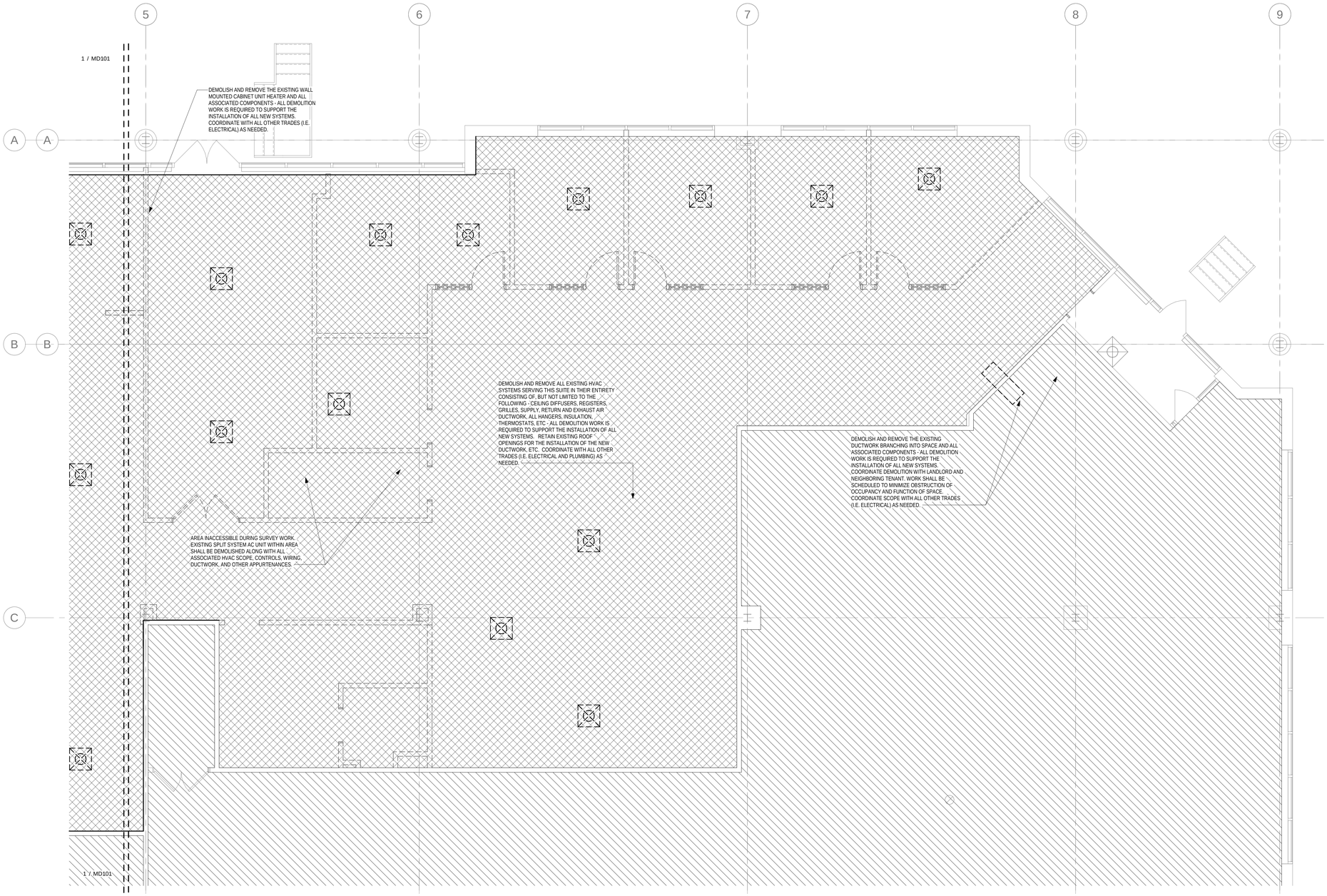
B. NEIGHBORING TENANT AREA - NIC HATCH



1 MD102 **GROUND FLOOR DEMOLITION PLAN - AREA B HVAC**
Scale : 1/4" = 1'-0"

TEVEBAUGH ARCHITECTURE

PROJECT
PMMG WEST CHESTER OB/GYN RENOVATION

1055 Andrew Dr.
West Chester, PA 19380

OWNER
Clinical Care Associates of the University of Pennsylvania Health System
1500 Market St Fl 10
Philadelphia, PA 19102

ARCHITECT
TEVEBAUGH ARCHITECTURE
TWO MILL ROAD, SUITE 210
WILMINGTON, DE 19806
302.984.1400

MEP ENGINEER
WSP
1700 MARKET STREET, SUITE 1050
PHILADELPHIA, PA 19113
215.209.1200

STRUCTURAL ENGINEER
DCI ENGINEERS
2 MILL ROAD, SUITE 100
WILMINGTON, DE 19806
302.252.9200

Project Status
FOR CONSTRUCTION SET

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL
DONALD PROCZ
ENGINEER No. PE043807E

ISSUANCES

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Sheet Name
GROUND FLOOR DEMOLITION PLAN - AREA B HVAC

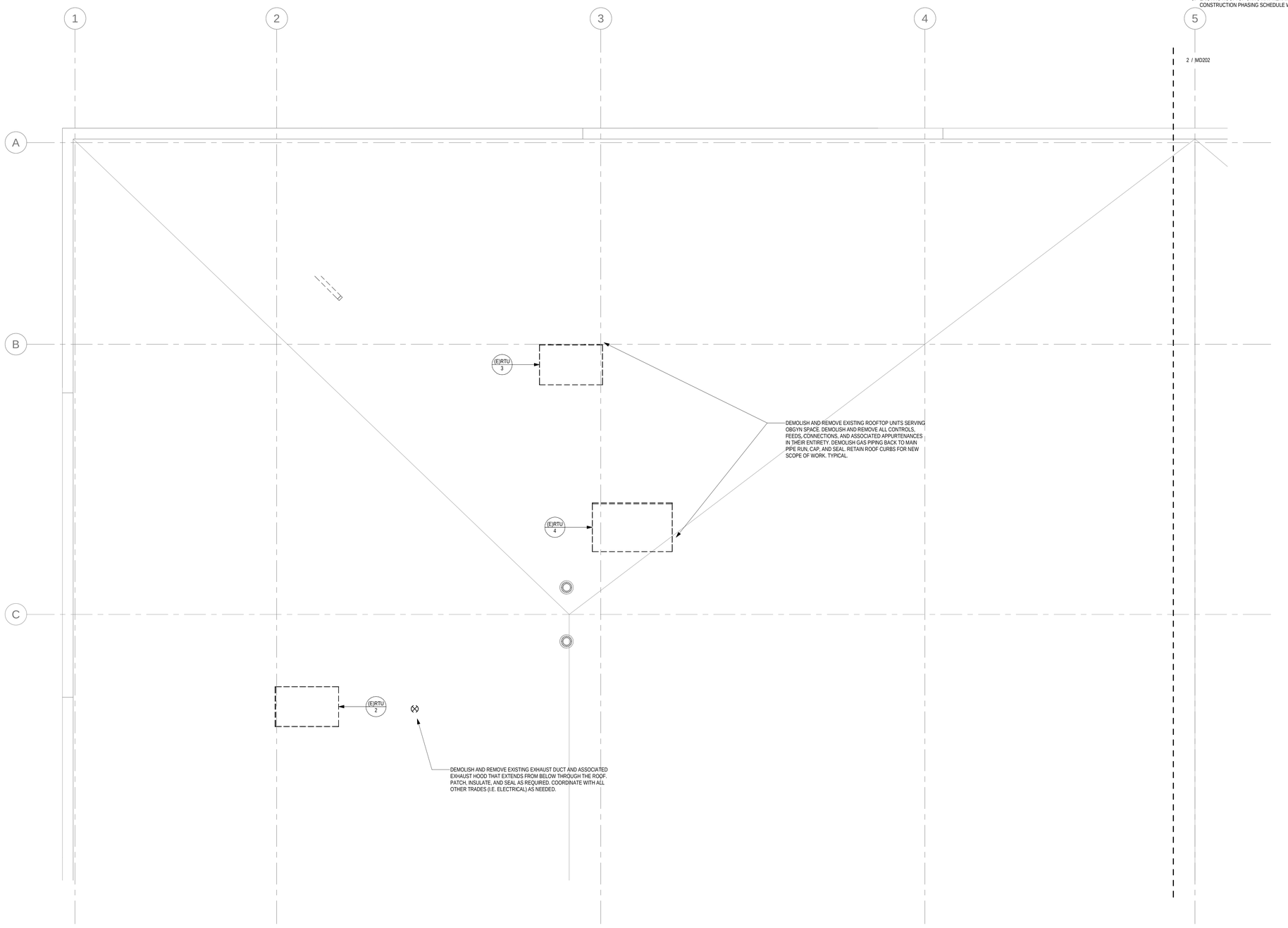
Sheet
MD102

GENERAL NOTES

A. REFER TO DRAWING M000 FOR SYMBOLS AND ABBREVIATIONS.

B. REFER TO DRAWING M001 FOR MECHANICAL SPECIFICATIONS.

C. EXISTING ROOFTOP UNITS MAY REMAIN IN SERVICE DURING CONSTRUCTION. VERIFY CONSTRUCTION PHASING SCHEDULE WITH OWNER AND CM.



1 ROOF DEMOLITION PLAN - AREA A HVAC
1/4" = 1'-0"

TEVEBAUGH ARCHITECTURE

PROJECT
PMMG WEST CHESTER OB/GYN RENOVATION

1055 Andrew Dr.
West Chester, PA 19380

OWNER
Clinical Care Associates of the University of Pennsylvania Health System

1500 Market St Fl 10
Philadelphia, PA 19102

ARCHITECT
TEVEBAUGH ARCHITECTURE

TWO MILL ROAD, SUITE 210
WILMINGTON, DE 19806
302.984.1400

MEP ENGINEER
WSP

1700 MARKET STREET, SUITE 1050
PHILADELPHIA, PA 19113
215.209.1200

STRUCTURAL ENGINEER
DCI ENGINEERS

2 MILL ROAD, SUITE 100
WILMINGTON, DE 19806
302.252.9200

Project Status
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COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
DONALD PROCZ
ENGINEER
PE042807E

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Sheet Name
ROOF DEMOLITION PLAN - AREA A HVAC

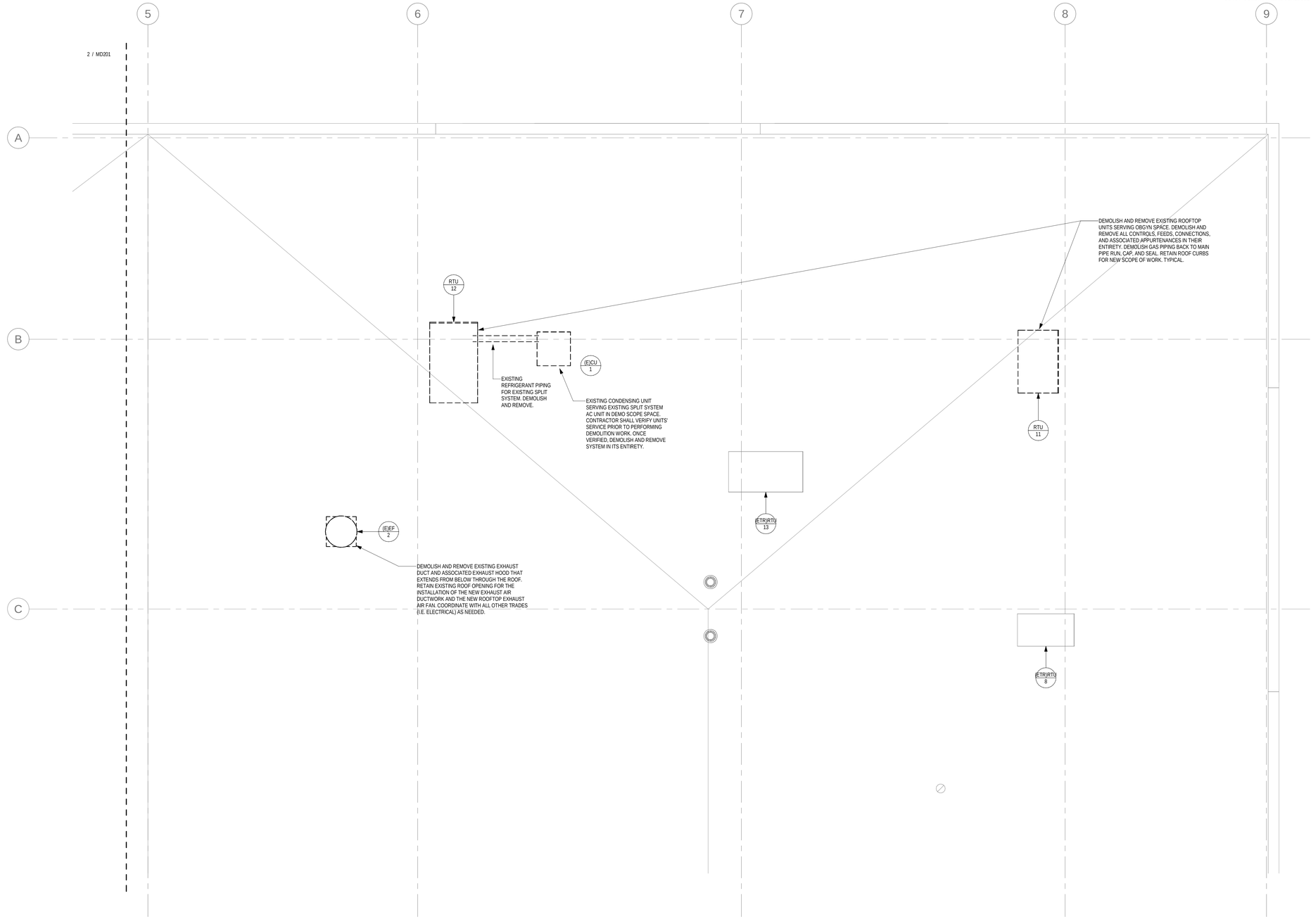
Sheet
MD201

GENERAL NOTES

A. REFER TO DRAWING M000 FOR SYMBOLS AND ABBREVIATIONS.

B. REFER TO DRAWING M001 FOR MECHANICAL SPECIFICATIONS.

C. EXISTING ROOFTOP UNITS MAY REMAIN IN SERVICE DURING CONSTRUCTION. VERIFY CONSTRUCTION PHASING SCHEDULE WITH OWNER AND CM.



1 ROOF DEMOLITION PLAN - AREA B HVAC
1/4" = 1'-0"

TEVEBAUGH ARCHITECTURE

PROJECT
PMMG WEST CHESTER OB/GYN RENOVATION

1055 Andrew Dr.
West Chester, PA 19380

OWNER
Clinical Care Associates of the University of Pennsylvania Health System

1500 Market St Fl 10
Philadelphia, PA 19102

ARCHITECT
TEVEBAUGH ARCHITECTURE

TWO MILL ROAD, SUITE 210
WILMINGTON, DE 19806
302.984.1400

MEP ENGINEER
WSP

1700 MARKET STREET, SUITE 1050
PHILADELPHIA, PA 19113
215.209.1200

STRUCTURAL ENGINEER
DCI ENGINEERS

2 MILL ROAD, SUITE 100
WILMINGTON, DE 19806
302.252.9200

Project Status
FOR CONSTRUCTION SET

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
DONALD PROCZ
ENGINEER No. PE043878

ISSUANCES

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Project	24021
	PMMG: 22.261

Sheet Name
ROOF DEMOLITION PLAN - AREA B HVAC

Sheet
MD202

GENERAL NOTES

A. REFER TO DRAWING M000 FOR SYMBOLS AND ABBREVIATIONS.

B. REFER TO DRAWING M001 FOR MECHANICAL SPECIFICATIONS.

C. ROOFTOP UNIT RETURN AND TRANSFER AIR DUCTWORK SHALL INCLUDE ACOUSTIC DUCT LINING. REFER TO SPECIFICATIONS FOR MORE INFORMATION.

SHEET NOTES

1. ROOM PRESSURE SENSOR INSTALLED IN WALL, MIN 48" ABOVE FINISHED FLOOR. BASIS OF DESIGN - SETRALITE ROOM PRESSURE PORT. REFER TO DETAIL DRAWING M701 AND SPECIFICATION DRAWING M001
2. DUCT SMOKE DETECTOR.
3. ROOFTOP UNIT RETURN DUCTWORK AND TRANSFER AIR DUCTWORK SHALL INCLUDE ACOUSTIC DUCT LINING. REFER TO SPECIFICATIONS FOR MORE INFORMATION.
4. PROVIDE DOOR SWEEP, 1" LOOPED NEOPRENE INSERT WITH ANODIZED ALUMINUM 3/4" FLANGE BY NATIONAL GUARD PRODUCTS, INC OR EQUAL.
5. BALANCE AIR TO MAINTAIN 0.05" W.G. DIFFERENTIAL

PRIVATE TOUCHDOWN 116
COOR. OFFICE 106
VESTIBULE 100
SURGERY SCHED. 105
CORRIDOR 002
WORKROOM 107
OB COOR. 104
CHECK-IN 107A
WAITING ROOM 101
TOILET 102
CONSULT 103
ELEC 001E
STAFF TOUCHDOWN A 115
CORRIDOR 004
STAFF TOUCHDOWN B 117
CORRIDOR 006
STAFF TOUCHDOWN C 125
EXAM 3 114
EXAM 1 113
EXAM 4 118
EXAM 15 124
EXAM 2 119
EXAM 13 123
EXAM 16 126
EXAM 18 134
EXAM 14 127
EXAM 17 133
TOILET 108
TOILET 120
TOILET 121
TOILET 122
CORRIDOR 001
EXAM 5 109
EXAM 6 112
EXAM 9 128
CORRIDOR 005
EXAM 10 131
EXAM 7 110
STOR - A 003A
EXAM 8 111
EXAM 11 129
STOR - B 005A
EXAM 12 130
CLEAN SUPPLY 132

PROVIDE TRANSITION TO 48"x17" FOR RETURN DUCT OPENING. PROVIDE WIRE MESH SCREEN AT INLET.
34" X 18" SA & RA DUCT UP TO RTU-2
PROVIDE TRANSITION TO 48"x17" FOR RETURN DUCT OPENING. PROVIDE SMOKE DETECTOR IN RETURN AIR DUCTWORK. PROVIDE WIRE MESH SCREEN AT INLET.
34" X 18" SA & RA DUCT UP TO RTU-4. CONNECT SA INTO 34" X 14" PLENUM.
PROVIDE TRANSITION TO 48"x17" FOR RETURN DUCT OPENING. PROVIDE WIRE MESH SCREEN AT INLET.
34" X 18" SA & RA DUCT UP TO RTU-1
10x10 EA DUCT UP TO EF-1
BALANCER TO BALANCE RETURN TO PROVIDE POSITIVE PRESSURE RELATION

2 / M102

2 / M101 **GROUND FLOOR PLAN - AREA A HVAC**
Scale : 1/4" = 1'-0"

TEVEBAUGH ARCHITECTURE

PROJECT
PMMG WEST CHESTER OB/GYN RENOVATION
1055 Andrew Dr.
West Chester, PA 19380

OWNER
Clinical Care Associates of the University of Pennsylvania Health System
1500 Market St Fl 10
Philadelphia, PA 19102

ARCHITECT
TEVEBAUGH ARCHITECTURE
TWO MILL ROAD, SUITE 210
WILMINGTON, DE 19806
302.984.1400

MEP ENGINEER
WSP
1700 MARKET STREET, SUITE 1050
PHILADELPHIA, PA 19113
215.209.1200

STRUCTURAL ENGINEER
DCI ENGINEERS
2 MILL ROAD, SUITE 100
WILMINGTON, DE 19806
302.252.9200

Project Status
FOR CONSTRUCTION SET

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL
DONALD PROCZ
ENGINEER No. PE043878

ISSUANCES

NO.	DATE	DESCRIPTION
1	06/21/2024	CONSTRUCTION DOCUMENTS
2	07/12/2024	CDS - ADDENDUM 01
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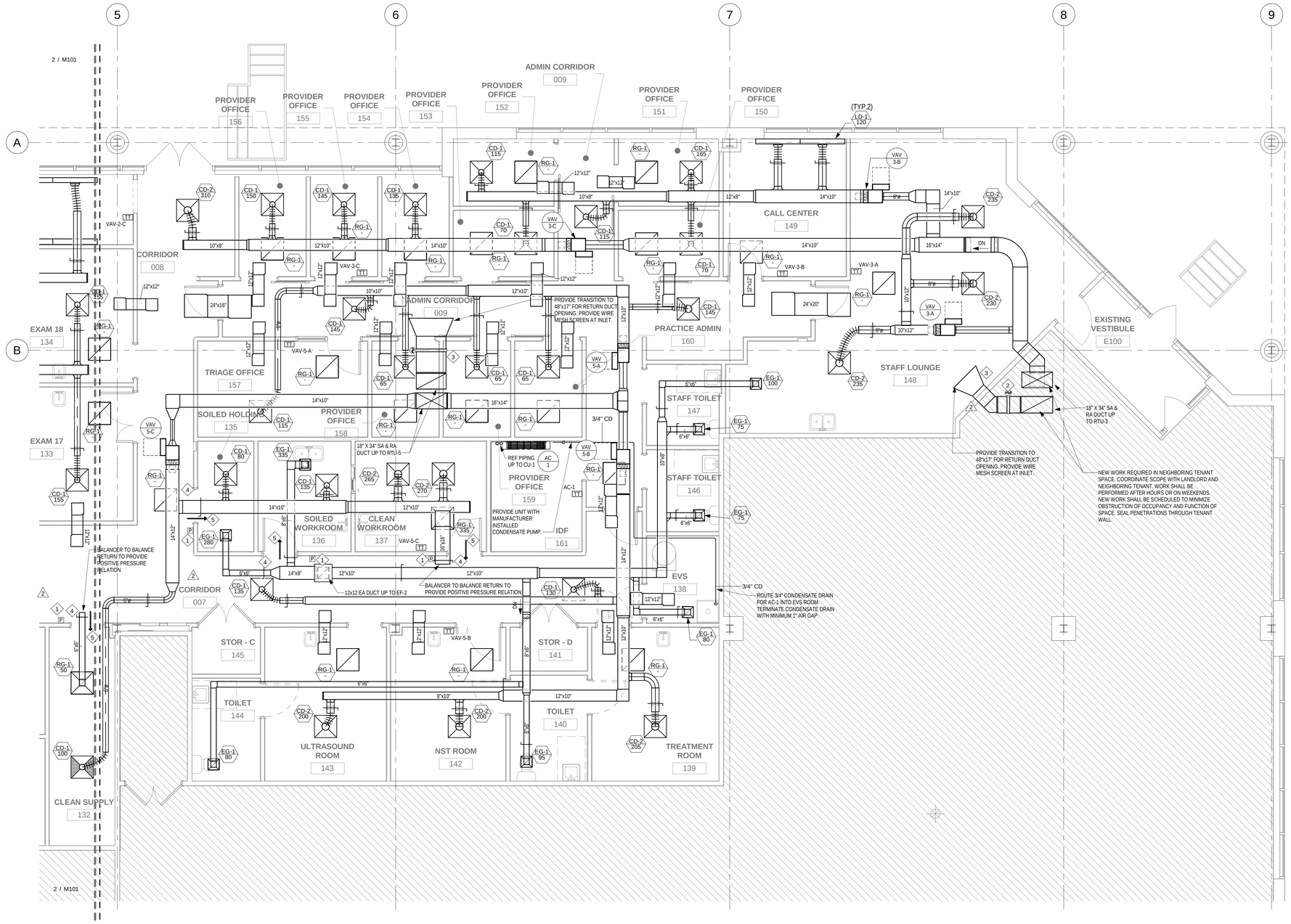
Project	24021
	PMMG: 22.261

Sheet Name
GROUND FLOOR PLAN - AREA A HVAC

Sheet
M101



2 M102 **GROUND FLOOR PLAN - AREA B HVAC**
Scale : 1/4" = 1'-0"

GENERAL NOTES (2)

A. REFER TO DRAWING M000 FOR SYMBOLS AND ABBREVIATIONS.

B. REFER TO DRAWING M001 FOR MECHANICAL SPECIFICATIONS.

C. ROOFTOP UNIT RETURN AND TRANSFER AIR DUCTWORK SHALL INCLUDE ACOUSTIC DUCT LINING. REFER TO SPECIFICATIONS FOR MORE INFORMATION.

SHEET NOTES

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5. BALANCE AIR TO MAINTAIN 0.05" W.G. DIFFERENTIAL

TEVEBAUGH ARCHITECTURE

PROJECT
PMMG WEST CHESTER OB/GYN RENOVATION

1055 Andrew Dr.
West Chester, PA 19380

OWNER
Clinical Care Associates of the University of Pennsylvania Health System

1500 Market St Fl 10
Philadelphia, PA 19102

ARCHITECT
TEVEBAUGH ARCHITECTURE

TWO MILL ROAD, SUITE 210
WILMINGTON, DE 19806
302.984.1400

MEP ENGINEER
WSP

1700 MARKET STREET, SUITE 1050
PHILADELPHIA, PA 19113
215.209.1200

STRUCTURAL ENGINEER
DCI ENGINEERS

2 MILL ROAD, SUITE 100
WILMINGTON, DE 19806
302.252.9200

Project Status

FOR CONSTRUCTION SET

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL DONALD PROCZ ENGINEER No. PE043878

ISSUANCES

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Date	07/26/2024
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Project	24021
	PMMG: 22.261

Sheet Name

GROUND FLOOR PLAN - AREA B HVAC

Sheet

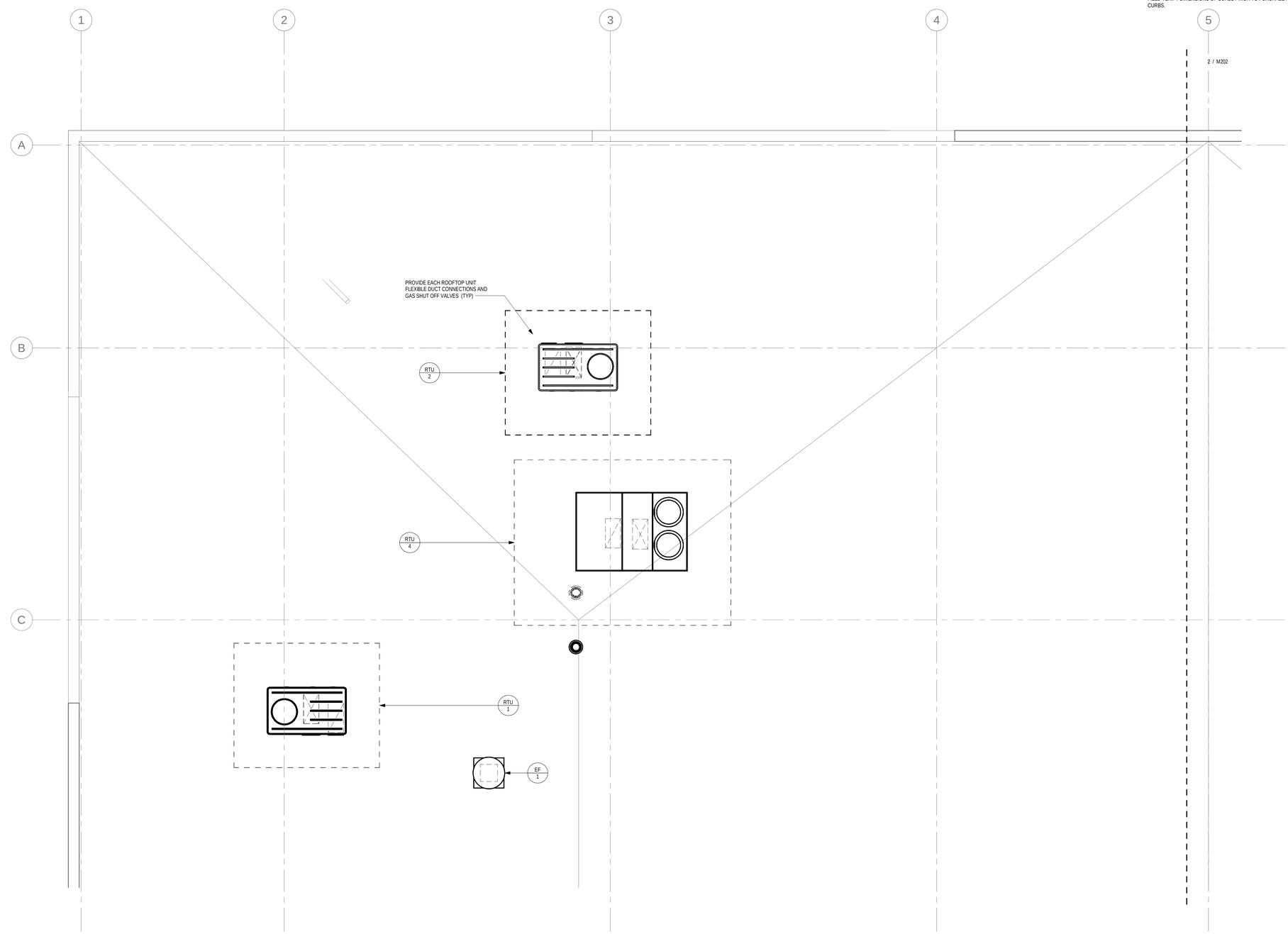
M102

GENERAL NOTES

A. REFER TO DRAWING M000 FOR SYMBOLS AND ABBREVIATIONS.

B. REFER TO DRAWING M001 FOR MECHANICAL SPECIFICATIONS.

C. WHERE ROOFTOP UNITS SHALL BE MOUNTED ON EXISTING CURBS. CONTRACTOR SHALL FIELD VERIFY DIMENSIONS OF CURBS PRIOR TO PURCHASE AND ORDER OF UNIT ADAPTER CURBS.



1 ROOF PLAN - AREA A HVAC
1/4" = 1'-0"

TEVEBAUGH ARCHITECTURE

PROJECT
PMMG WEST CHESTER OB/GYN RENOVATION

1055 Andrew Dr.
West Chester, PA 19380

OWNER
Clinical Care Associates of the University of Pennsylvania Health System

1500 Market St Fl 10
Philadelphia, PA 19102

ARCHITECT
TEVEBAUGH ARCHITECTURE

TWO MILL ROAD, SUITE 210
WILMINGTON, DE 19806
302.984.1400

MEP ENGINEER
WSP

1700 MARKET STREET, SUITE 1050
PHILADELPHIA, PA 19113
215.209.1200

STRUCTURAL ENGINEER
DCI ENGINEERS

2 MILL ROAD, SUITE 100
WILMINGTON, DE 19806
302.252.9200

Project Status

FOR CONSTRUCTION SET

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
DONALD PROCZ
ENGINEER No. PE043807S

ISSUANCES

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Sheet Name

ROOF PLAN - AREA A HVAC

Sheet

M201

GENERAL NOTES

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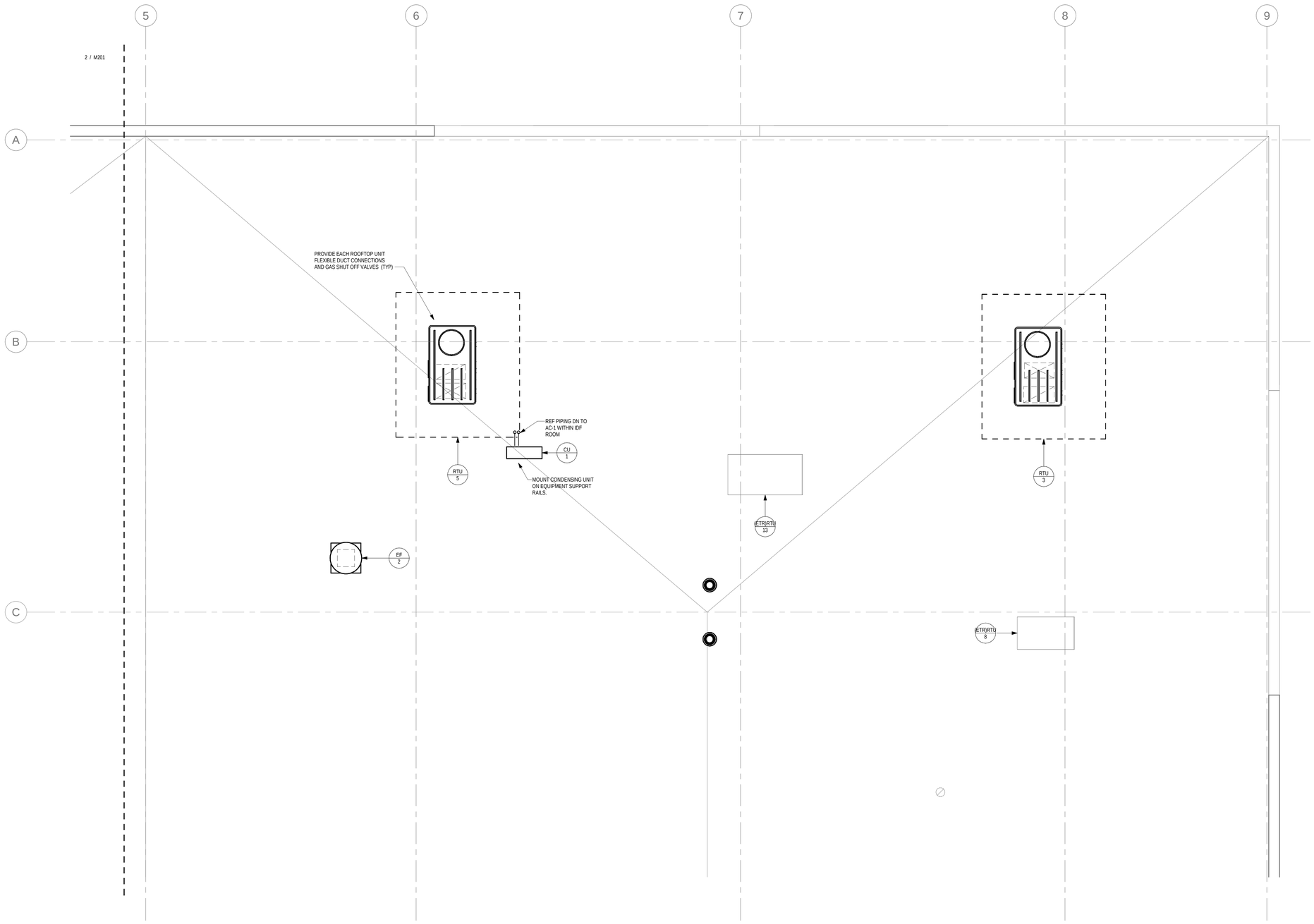
B. REFER TO DRAWING M001 FOR MECHANICAL SPECIFICATIONS.

C. WHERE ROOFTOP UNITS SHALL BE MOUNTED ON EXISTING CURBS, CONTRACTOR SHALL FIELD VERIFY DIMENSIONS OF CURBS PRIOR TO PURCHASE AND ORDER OF UNIT ADAPTER CURBS.



1 ROOF PLAN - AREA B HVAC
1/4" = 1'-0"

TEVEBAUGH ARCHITECTURE

PROJECT
PMMG WEST CHESTER OB/GYN RENOVATION

1055 Andrew Dr.
West Chester, PA 19380

OWNER
Clinical Care Associates of the University of Pennsylvania Health System

1500 Market St Fl 10
Philadelphia, PA 19102

ARCHITECT
TEVEBAUGH ARCHITECTURE

TWO MILL ROAD, SUITE 210
WILMINGTON, DE 19806
302.984.1400

MEP ENGINEER
WSP

1700 MARKET STREET, SUITE 1050
PHILADELPHIA, PA 19113
215.209.1200

STRUCTURAL ENGINEER
DCI ENGINEERS

2 MILL ROAD, SUITE 100
WILMINGTON, DE 19806
302.252.9200

Project Status

FOR CONSTRUCTION SET

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
DONALD PROCZ
ENGINEER No. PE043807S

ISSUANCES

NO.	DATE	DESCRIPTION
1	06/21/2024	CONSTRUCTION DOCUMENTS
3	07/26/2024	FOR CONSTRUCTION SET

Date	07/26/2024
Scale	As indicated
Drawn	WSP
Checked	WSP
Approved	WSP
Project	24021
	PMMG: 22.261

Sheet Name

ROOF PLAN - AREA B HVAC

Sheet

M202

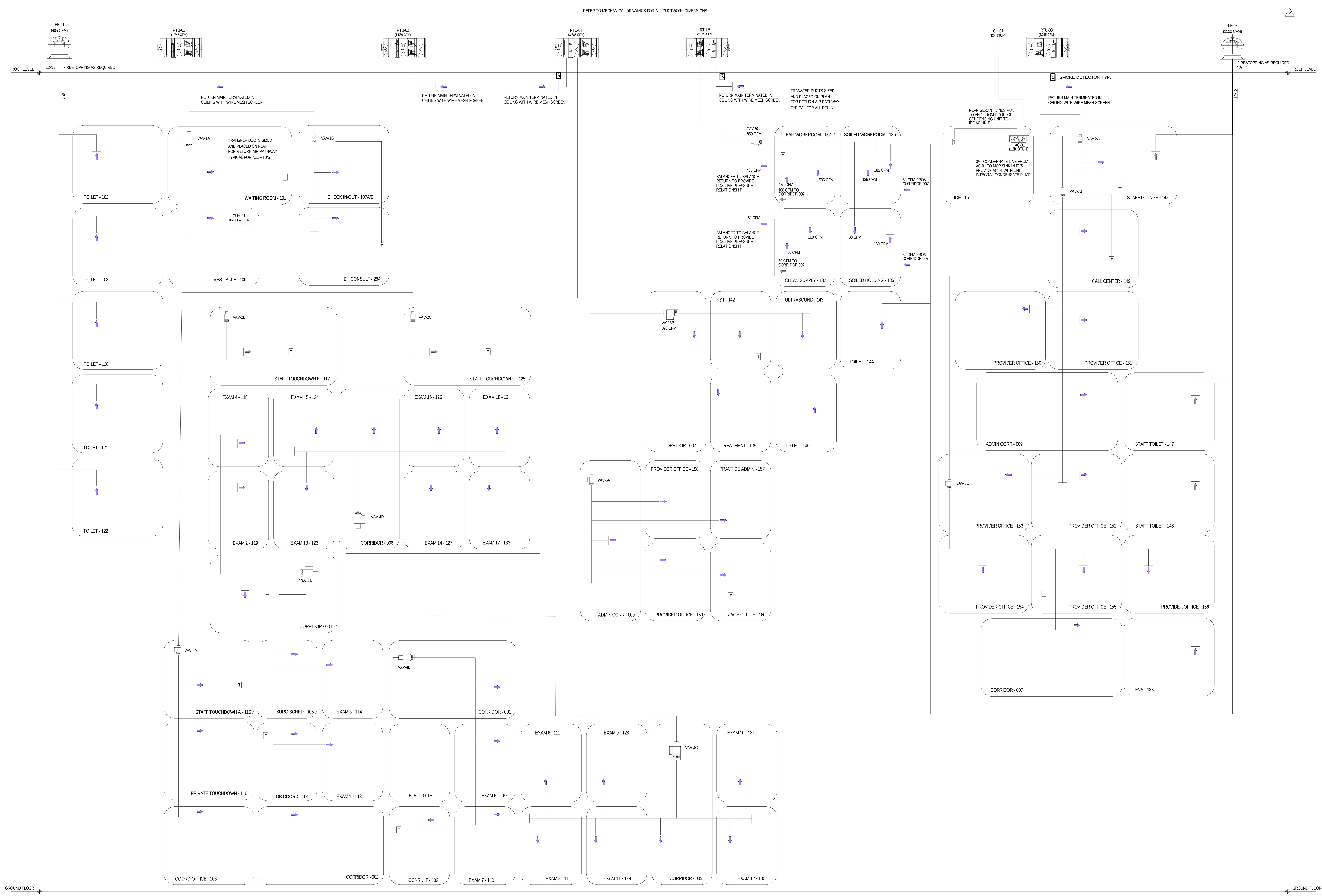
E

D

C

B

A



1 2 3 4 5 6

TEVEBAUGH ARCHITECTURE

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Clinical Care Associates of the University of Pennsylvania Health System

1500 Market St Fl 10
Philadelphia, PA 19102

ARCHITECT
TEVEBAUGH ARCHITECTURE
TWO MILL ROAD, SUITE 210
WILMINGTON, DE 19806
302.984.1400

MEP ENGINEER
WSP
1700 MARKET STREET, SUITE 1050
PHILADELPHIA, PA 19113
215.209.1200

STRUCTURAL ENGINEER
DCI ENGINEERS
2 MILL ROAD, SUITE 100
WILMINGTON, DE 19806
302.252.9200

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DONALD PROCZ
ENGINEER
No.
PE043827E

[illegible]

ISSUANCES

NO.	DATE	DESCRIPTION
1	06/21/2024	CONSTRUCTION DOCUMENTS
2	07/12/2024	CDS - ADDENDUM 01
3	07/26/2024	FOR CONSTRUCTION SET

N

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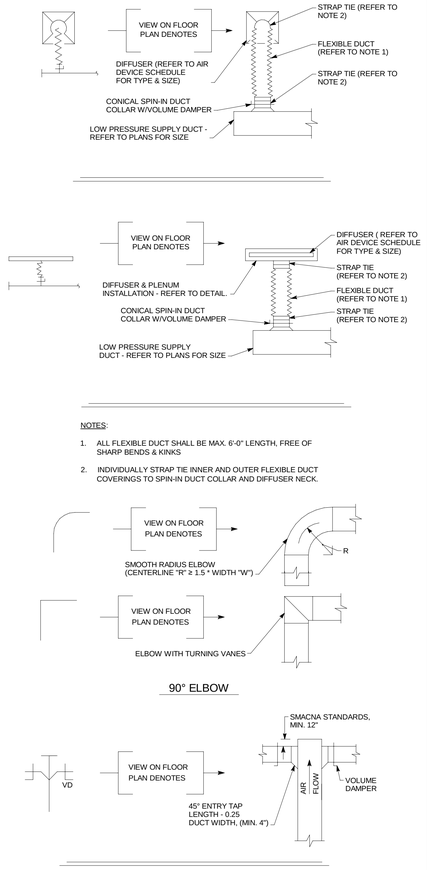
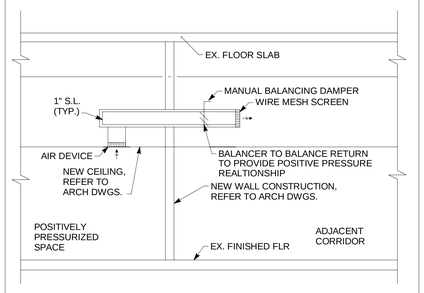
Approved	WSP
Project	24021
	PMMG: 22.261

Sheet Name
AIR FLOW DIAGRAM - MECHANICAL

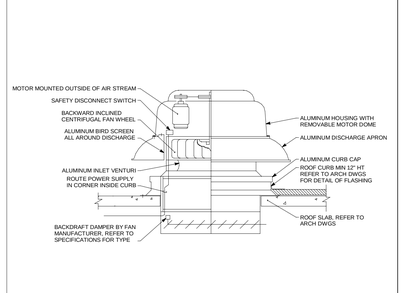
Sheet
M601



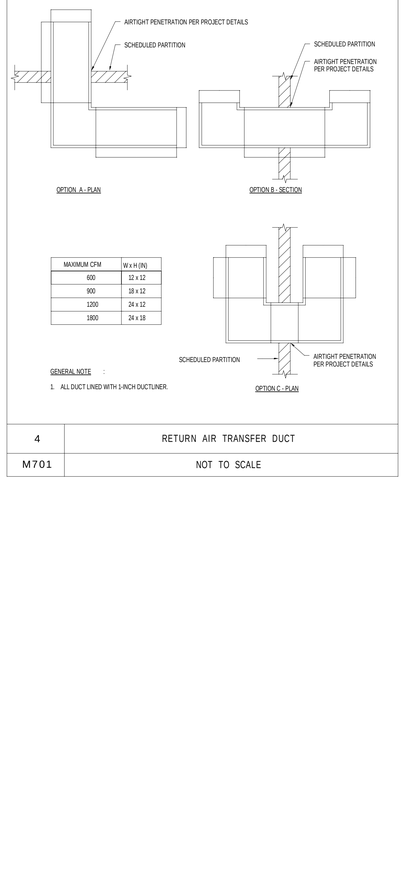
1	DUCTWORK DETAILS
M701	NOT TO SCALE



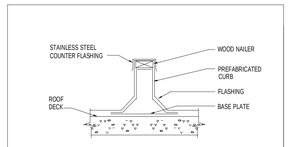
2	RETURN DUCT INSTALLATION - PRESSURIZED SPACES
M701	NOT TO SCALE



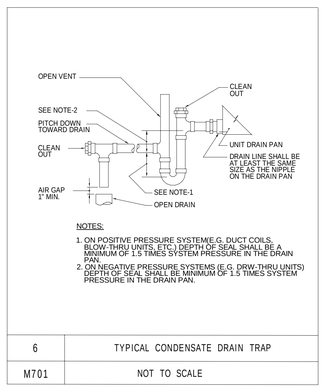
3	DOME CENTRIFUGAL ROOF EXHAUST FAN
M701	NOT TO SCALE



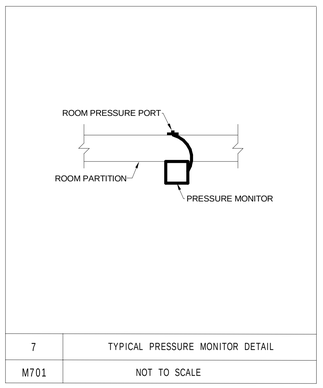
4	RETURN AIR TRANSFER DUCT
M701	NOT TO SCALE



5	ROOF EQUIPMENT CURB
M7 - 01	NOT TO SCALE



6	TYPICAL CONDENSATE DRAIN TRAP
M701	NOT TO SCALE



7	TYPICAL PRESSURE MONITOR DETAIL
M701	NOT TO SCALE

TEVEBAUGH ARCHITECTURE

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1500 Market St Fl 10
Philadelphia, PA 19102

ARCHITECT
TEVEBAUGH ARCHITECTURE
TWO MILL ROAD, SUITE 210
WILMINGTON, DE 19806
302.984.1400

MEP ENGINEER
WSP
1700 MARKET STREET, SUITE 1050
PHILADELPHIA, PA 19113
215.209.1200

STRUCTURAL ENGINEER
DCI ENGINEERS
2 MILL ROAD, SUITE 100
WILMINGTON, DE 19806
302.252.9200

Project Status
FOR CONSTRUCTION SET

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL
DONALD PROCZ
ENGINEER No. PE043837E

ISSUANCES

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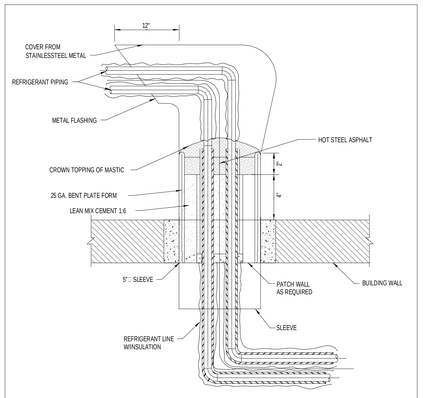
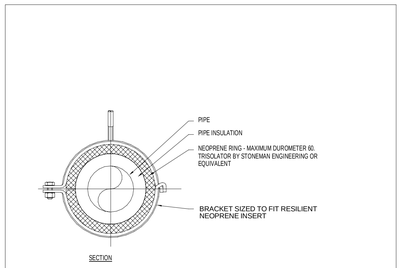
Sheet Name
DETAILS - MECHANICAL

Sheet
M701



1	WALL PENETRATIONS DETAIL FOR REFRIGERANT PIPING
M702	NOT TO SCALE

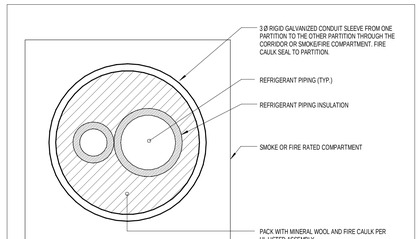


SECTION

GENERAL NOTES :

1. PURPOSE: TO CONTROL NOISE AND VIBRATION FROM BUILDING SERVICES.
2. A MINIMUM OF 1 INCH CLEARANCE TO BE ALLOWED FOR BETWEEN HANGERS AND ANY STRUCTURE.
3. THICKNESS OF RESILIENT SHOULD BE AT LEAST 10% OF PIPE DIAMETER.

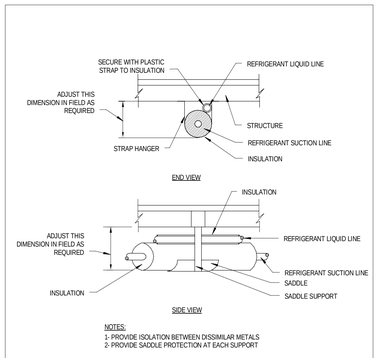
2	NEOPRENE PIPE CLAMPS
M702	NOT TO SCALE



NOTES:

PER ASHRAE STANDARD 15, THE REFRIGERANT LINES CROSSING A FIRE OR SMOKE RATED PARTITION OR CORRIDOR SHALL BE SEPERATED FROM THE OTHER SPACES. PROVIDE A RIGID GALVANIZED CONDUIT TO PROVIDE THE SEPERATION

3	REFRIGERANT PIPING SEPARATION DETAIL
M702	NOT TO SCALE

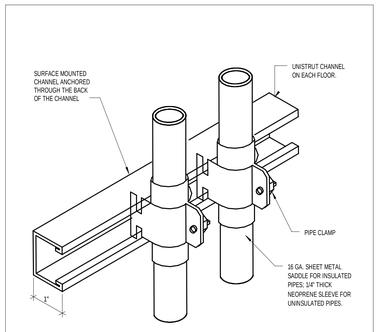


END VIEW

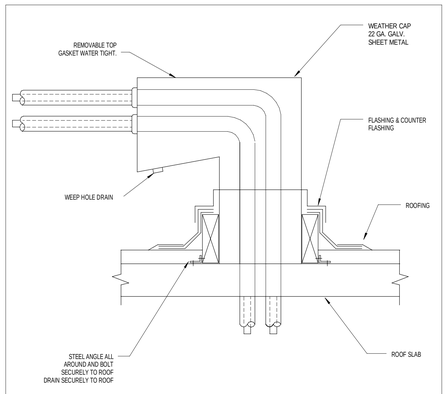
SIDE VIEW

NOTES:
1- PROVIDE ISOLATION BETWEEN DISSIMILAR METALS
2- PROVIDE SADDLE PROTECTION AT EACH SUPPORT

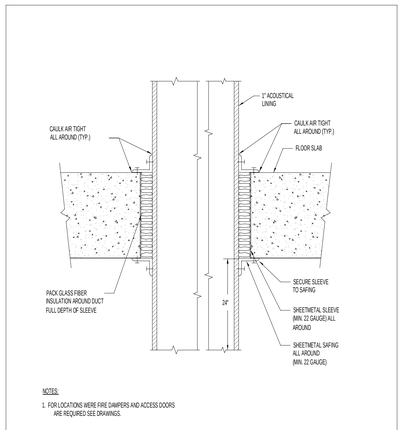
4	REFRIGERANT HANGING DETAIL
M702	NOT TO SCALE



5	REFRIGERANT PIPE RISER SUPPORT DETAIL
M702	NOT TO SCALE



6	REFRIGERANT PIPING ROOF PENETRATION
M702	NOT TO SCALE



NOTES:

1. FOR LOCATIONS WERE FIRE DAMPERS AND ACCESS DOORS ARE REQUIRED SEE DRAWINGS.

7	DUCT PENETRATING ROOF
M702	NOT TO SCALE

TEVEBAUGH ARCHITECTURE

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ARCHITECT
TEVEBAUGH ARCHITECTURE

TWO MILL ROAD, SUITE 210
WILMINGTON, DE 19806
302.984.1400

MEP ENGINEER
WSP

1700 MARKET STREET, SUITE 1050
PHILADELPHIA, PA 19113
215.209.1200

STRUCTURAL ENGINEER
DCI ENGINEERS

2 MILL ROAD, SUITE 100
WILMINGTON, DE 19806
302.252.9200

Project Status

FOR CONSTRUCTION SET

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL
DONALD PROCZ
ENGINEER No. PE043827E

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Sheet Name

DETAILS - MECHANICAL

Sheet

M702

PACKAGED NATURAL GAS FIRED DX COOLING ROOFTOP AIR HANDLING UNIT

GENERAL						SUPPLY FAN						COOLING COIL				CONDENSER SECTION				HOT GAS REHEAT COIL			NATURAL GAS HEATING COIL				ELECTRICAL					
			TOTAL CFM																												
DESIG	LOCATION	SERVICE	MAX	MIN	MIN OA (CFM)	QTY	AIRFLOW (CFM)	MOTOR HP	EXTERNAL STATIC PRESS. (IN. W.G.)	FAN RPM	MERV RATING	MIN TOTAL / SENS. CAP (MBH)	EAT (dB / wB) (°F)	LAT (dB / wB) (°F)	REFRIG.	EER	IEER	COMP. QTY	COMP. RLA (EACH)	COND. FAN QTY	COND. FAN RLA (EACH)	TOTAL CAP. (MBH)	EAT (°F)	LAT (°F)	INPUT CAPACITY (MBH)	CFM	EAT (°F)	LAT (°F)	VOLTS / PHASE / Hz	SYSTEM MCA	SYSTEM MOP	WEIGHT (LBS)	SIZE IN (LxWxH)	BASIS OF DESIGN	REMARKS
RTU-1	ROOFTOP	OBGYN	1745	600	675	1	1745	2.75	1.5	1170	8	70.6 / 52.9	81 / 66.9	56.7 / 56.6	R410A	12.8	23.2	1	20.8	1	5.7	--	--	--	120	1745	47.2	106	208-230/3/60	39	50	1188	89x53x47	TRANE - YZC	ALL
RTU-2	ROOFTOP	OBGYN	1580	800	560	1	1575	1	1.3	1137	8	60.3 / 45.1	81 / 66.9	56.5 / 56.5	R410A	12.9	19.6	1	16.0	1	2.4	--	--	--	100	1575	47.2	107.6	208-230/3/60	26	40	1133	89x53x41	TRANE - YZC	ALL
RTU-3	ROOFTOP	OBGYN	2215	600	695	1	2160	2.75	1.5	1182	8	70.7 / 53.4	81 / 66.9	56.8 / 56.4	R410A	12.8	23.2	1	20.8	1	3.3	--	--	--	120	2160	47.2	105.4	208-230/3/60	39	50	1188	89x53x47	TRANE - YHJ	ALL
RTU-4	ROOFTOP	OBGYN	3885	1000	1400	2	3900	4.6	1.5	1196	8	151.2 / 109.4	81 / 66.9	55.3 / 55.1	R410A	14.3	26.1	2	35.6	1	9.4	93.2	51.7	73.5	250	3900	51.4	98.5	208-230/3/60	78	110	2371	123x87x66	TRANE - YZJ	ALL
RTU-5	ROOFTOP	OBGYN	2320	600	700	1	2320	2.75	1.5	1599	8	70.7 / 53.4	81 / 66.9	57.9 / 56.9	R410A	12.8	23.2	1	25.8	1	2.8	--	--	--	120	2320	47.2	93.4	208-230/3/60	39	50	1188	89x53x47	TRANE - YZC	ALL

NOTES:

1. SELECTION BASIS OF DESIGN MANUFACTURER: TRANE
2. ALL EQUIPMENT SHALL BE SECURELY MOUNTED AS DETAILED IN THE MANUFACTURER'S PUBLISHED INSTALLATION MANUAL.
3. STATIC PRESSURE INDICATED IS EXTERNAL STATIC PRESSURE EXCLUDING FILTER PRESSURE DROP.
4. AIRFLOW IS BASED ON STANDARD EXTERNAL PRESSURE.
5. UNIT SHALL BE CAPABLE OF SUPPLY AIR TEMPERATURE CONTROL. PROVIDE UNIT WITH SUPPLY AIR TEMPERATURE SENSOR.
6. PROVIDE UNIT DISCONNECT SWITCH.
7. PROVIDE UNIT WITH CONDENSATE DRAIN AND TAP PER DETAIL #7, SHEET M701.
8. FIELD VERIFY UNIT DIMENSIONS AND EXISTING CURB DIMENSIONS. PROVIDE UNIT WITH ROOF CURB ADAPTER AS REQUIRED FOR UNIT INSTALLATION.

SUPPLY AIR TERMINAL SCHEDULE

				AIRFLOW (CFM)			MAX APD (NOTE 3)	HEATING COIL (NOTE 2)			MAX SOUND (NOTE 1)	
AHU DESIG	DESIG	TYPE	UNIT SIZE	MAX COOLING	MIN	MAX HEATING		MIN CAP (MBH)	KW	LAT (°F)		REMARKS
RTU-1	VAV-1-A	VSD	14	1485	520	520	0.5	29.7	9.0	95	55	ALL
RTU-1	VAV-1-B	VSD	5	260	95	95	0.5	3.1	1.0	80	55	ALL
RTU-2	VAV-2-A	VSD	8	650	230	230	0.5	13.0	4.0	95	55	ALL
RTU-2	VAV-2-B	VSD	6	510	150	150	0.5	10.2	3.0	95	55	ALL
RTU-2	VAV-2-C	VSD	5	420	145	145	0.5	8.4	2.5	95	55	ALL
RTU-3	VAV-3-A	VSD	8	700	165	165	0.5	13.9	4.0	95	55	ALL
RTU-3	VAV-3-B	VSD	9	720	275	275	0.5	14.3	4.0	95	55	ALL
RTU-3	VAV-3-C	VSD	9	740	260	260	0.5	14.7	4.5	95	55	ALL
RTU-4	VAV-4-A	VSD	12	1030	760	760	0.5	13.0	4.0	80	55	ALL
RTU-4	VAV-4-B	VSD	8	630	605	605	0.5	8.1	2.5	80	55	ALL
RTU-4	VAV-4-C	VSD	12	1160	100	0	0.5	14.7	4.5	80	55	ALL
RTU-4	VAV-4-D	VSD	12	1065	100	0	0.5	13.5	4.0	80	55	ALL
RTU-5	VAV-5-A	VSD	8	580	205	205	0.5	7.0	2.0	80	55	ALL
RTU-5	VAV-5-B	VSD	9	950	335	335	0.5	10.1	3.0	80	55	ALL
RTU-5	VAV-5-C	CAV	9	850	850	850	0.5	9.9	3.0	80	55	ALL

NOTES:

1. MAXIMUM SOUND POWER SCHEDULED IS END DISCHARGE SOUND POWER LEVEL, IN dB, BASED ON MAXIMUM SCHEDULED AIRFLOW AT 1.0 IN W.G. INLET PRESSURE AT 500 HZ OCTAVE BAND.
2. HEATING COIL DUTY RATED AT MAXIMUM HEATING AIRFLOW.
3. MAXIMUM AIR PRESSURE DROP IS AT MAXIMUM SCHEDULED COOLING AIRFLOW WITH REHEAT COIL.
4. UNITS SHALL BE CAPABLE OF SCR HEATING.
5. PROVIDE UNITS WITH HEATING COIL COVER ELEMENTS.

AIR TERMINAL SCHEDULE

DESIGNATION	MAX AIR FLOW	FACE DIMEN (LxW)	CONNECTION	MODEL	MANUFACTURER	REMARKS
CD-1	175 CFM	24x24	6	OMNI	TITUS	ALL
CD-2	275 CFM	24x24	8	OMNI	TITUS	ALL
EG-1	185 CFM	12x12	SEE DWGS	PAR	TITUS	ALL
LD-1	200 CFM	48x6, (1) 1" SLOT	8	FL-10-S	TITUS	ALL
LD-2	290 CFM	48x6, (1) 1" SLOT	10	FL-10-S	TITUS	ALL
LD-3	245 CFM	48x6, (1) 1.5" SLOT	8	FL-10-S	TITUS	ALL
LR-1	--	48x6, (1) 1" SLOT	--	FL-10-R	TITUS	ALL
RG-1	--	24x24	--	PAR	TITUS	ALL

NOTES:

1. SELECTION BASIS OF DESIGN MANUFACTURER: TITUS
2. FINAL FINISHES SHALL BE SELECTED BY ARCHITECT.
3. BASIS OF DESIGN INCLUDES ROUND CONNECTIONS TO SUPPLY DIFFUSERS, SQUARE CONNECTIONS TO EXHAUST GRILLES, AND SQUARE OPENINGS FOR RETURN GRILLES.

DX SPLIT SYSTEM AIR CONDITIONING UNIT SCHEDULE

				EVAPORATOR FAN DATA		ELECTRICAL DATA									
DESIGNATION	LOCATION	REFRIGERANT	CONDENSING UNIT	AIR FLOW (CFM)	DX COOLING CAPACITY TOTAL(BTU/H)	MAX OVER CURRENT PROTECTION (MOP)	MIN CIRCUIT AMPACITY(A)	FULL LOAD AMPS(A)	VOLTAGE(V)	PHASE(PH)	HERTZ(HZ)	SOUND DATA (dBA)	MODEL	MANUFACTURER	WEIGHT (LBS)	REMARKS
AC-1	IDF 161	R410A	CU-1	375	12000	30.0	20.00	0.35	208	1	60	39	RNS	SAMSUNG	24	ALL

NOTES:

1. SELECTION BASIS OF DESIGN MANUFACTURER: SAMSUNG
2. ALL EQUIPMENT SHALL BE SECURELY MOUNTED AS DETAILED IN THE MANUFACTURER'S PUBLISHED INSTALLATION MANUAL. BASIS OF DESIGN IS WALL-MOUNTED UNIT, 102" MIN ABOVE FINISHED FLOOR. VERIFY INSTALLATION IN FIELD.
3. MECHANICAL CONTRACTOR SHALL SIZE ALL REFRIGERANT LINES AND CONNECTIONS IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS BASED ON IN-FIELD CONDITIONS AND INSTALLED REFRIGERANT LENGTHS.
4. AIRFLOW IS BASED ON STANDARD EXTERNAL PRESSURE.

FAN SCHEDULE

	AIRFLOW (CFM)							MOTOR				
DESIG	MAX	MIN	S.P. (IN. W.G.)	WHEEL DIA. (IN.)	BLADE TYPE	FAN CLASS	FAN RPM	BHP	RPM	VOLTS / PHASE / Hz	BASIS OF DESIGN	REMARKS
EF-1	405	405	0.75	24	BACKWARD INCLINED	I	1725	0.25	1725	208 / 1 / 60	PENNBARRY DX13	1,2,3
EF-2	1120	1120	0.75	24	BACKWARD INCLINED	I	1550	0.33	1550	208 / 1 / 60	PENNBARRY DX16	1,2,4

NOTES:

1. PROVIDE UNIT WITH BIRDSCREEN, DISCONNECT SWITCH, AND BACKDRAFT DAMPER.
2. PROVIDE UNIT WITH DISCONNECT SWITCH.
3. COORDINATE FAN TO EXISTING ROOF CURB. NEW FAN SHALL UTILIZE EXISTING FAN CURBS.
4. PROVIDE CURB ADAPTER AND MONT ON EXISTING ROOF CURB.

ELECTRIC UNIT HEATER SCHEDULE

			MIN. CAPACITY (KW)	AIRFLOW (CFM)	ELECTRICAL					
DESIG	SERVICE	CONFIGURATION			MOTOR HP	MCA	VOLTS / PHASE / Hz	WEIGHT (LBS)	BASIS OF DESIGN	REMARKS
CUH	VESTIBULE	CEILING MOUNTED	4	250	1/8	20	208 / 1 / 60	120	BERKO - CUH935	ALL

NOTES:

1. PROVIDE UNIT WITH DISCONNECT SWITCH.
2. PROVIDE UNIT WITH INTEGRAL THERMOSTAT AND MANUFACTURER'S CONTROLS.
3. PROVIDE CEILING-MOUNTED, RECESSED OPTION.
4. FINAL FINISHES SHALL BE SELECTED BY THE ARCHITECT.

SPLIT SYSTEM CONDENSER UNIT SCHEDULE

			RATED PERFORMANCE	ELECTRICAL DATA									
DESIGNATION	SERVICE	LOCATION	DX CAPACITY TOTAL (MBH)	VOLT (V)	PHASE (Ph)	H(Hz)	MOCP	MCA	MODEL	MANUFACTURER	WEIGHT (LBS)	SOUND DATA (dBA)	REMARKS
CU-1	IDF COOLING	IDF 161	12.0	208	1	60	30	20	RXS	SAMSUNG	71	46	ALL

NOTES:

1. ALL EQUIPMENT SHALL BE SECURELY MOUNTED AS DETAILED IN THE MANUFACTURER'S PUBLISHED INSTALLATION MANUAL AND WITHIN THESE CONTRACT DOCUMENTS. IF CONFLICT EXISTS, BRING TO THE ATTENTION OF THE ENGINEER PRIOR TO COMMENCING WORK.
2. MECHANICAL CONTRACTOR SHALL SIZE ALL REFRIGERANT LINES, CONNECTIONS, COMPONENTS, SPECIALTIES, FITTINGS, AND DEVICES IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS BASED ON IN-FIELD CONDITIONS AND INSTALLED REFRIGERANT LENGTHS.
3. PROVIDE UNIT WITH DISCONNECT SWITCH.

TEVEBAUGH ARCHITECTURE

PROJECT
PMMG WEST CHESTER OB/GYN RENOVATION

1055 Andrew Dr.
West Chester, PA 19380

OWNER
Clinical Care Associates of the University of Pennsylvania Health System

1500 Market St Fl 10
Philadelphia, PA 19102

ARCHITECT
TEVEBAUGH ARCHITECTURE

TWO MILL ROAD, SUITE 210
WILMINGTON, DE 19806
302.984.1400

MEP ENGINEER
WSP

1700 MARKET STREET, SUITE 1050
PHILADELPHIA, PA 19113
215.209.1200

STRUCTURAL ENGINEER
DCI ENGINEERS

2 MILL ROAD, SUITE 100
WILMINGTON, DE 19806
302.252.9200

Project Status

FOR CONSTRUCTION SET

COMMONWEALTH OF PENNSYLVANIA — REGISTERED PROFESSIONAL — DONALD PROCZ — ENGINEER No. PE043827E

ISSUANCES

NO.	DATE	DESCRIPTION
1	06/21/2024	CONSTRUCTION DOCUMENTS
2	07/12/2024	CDS - ADDENDUM 01
3	07/26/2024	FOR CONSTRUCTION SET

Date	07/26/2024
Scale	NOT TO SCALE
Drawn	WSP
Checked	WSP
Approved	WSP
Project	24021
	PMMG: 22.261

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SCHEDULES - MECHANICAL

Sheet

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