ABBREVIATIONS

GENERAL	
AD	ACCESS DOOR
ADD'L	ADDITIONAL
AF	AIR FOIL
AFF	ABOVE FINISHED FLOOR
AFR	ABOVE FINISHED ROOF
ALT	ALTITUDE OR ALTERNATE
AMP	AMPERE
AP	ACCESS PANEL
APD	AIR PRESSURE DROP
ARCH	ARCHITECT
AS	AIR STREAM
ATC	AUTOMATIC TEMPERATURE CONTROL
ATM	ATMOSPHERE
AVE	AVERAGE
BHP	BRAKE HORSEPOWER
BI	BACKWARDS INCLINED
BLDG	BUILDING
BOD	BOTTOM OF DUCT
BTU	BRITISH THERMAL UNIT
BTUH	BTU PER HOUR
C TO C	CENTER TO CENTER
CENT	CENTRIFUGAL
CF	CUBIC FEET
CFM	CUBIC FEET PER MINUTE
CL	CENTERLINE
CLG	CEILING OR COOLING
CO	CARBON MONOXIDE
COL	COLUMN
CONC	CONCRETE
CONN	CONNECTION
CONTR	CONTRACTOR
D	DRAIN OR DEPTH
DB	DRY BULB TEMPERATURE
DEG	DEGREE
DDC	DIRECT DIGITAL CONTROL
DIA	DIAMETER
DIM	DIMENSION
DN	DOWN
DX	DIRECT EXPANSION
EA	EACH OR EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE
EFF	EFFICIENCY
ELEC	ELECTRICAL
ELEV	ELEVATION
EMER	EMERGENCY
EMS	ENERGY MANAGEMENT SYSTEM
ENT	ENTER
ESP	EXTERNAL STATIC PRESSURE
EXH	EXHAUST
EXIST	EXISTING
EXT	EXTERNAL
EXP	EXPANSION
F	FAHRENHEIT
FA	FREE AREA
FC	FLEXIBLE CONNECTION
FLA	FULL LOAD AMPS
FLEX	FLEXIBLE
FLRDR	FLOOR DRAIN
FPM	FEET PER MINUTE
FPS	FEET PER SECOND
FS	FLOW SWITCH
FT	FEET
G	GAS
GA	GAUGE
GAL	GALLONS
GALV	GALVANIZED
GC	GENERAL CONTRACTOR
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GRD	GRADE
GWB	GYPSUM WALL BOARD
HD	HEAD
HGT	HEIGHT
HP	HORSEPOWER OR HIGH POINT
HR	HOUR
HTG	HEATING
HZ	HERTZ (FREQUENCY, CYCLES PER SECOND)
ID	INSIDE DIAMETER
IN	INCHES
KW	KILOWATT
L	LENGTH
LAT	LEAVING AIR TEMPERATURE
LB	POUND
LF	LINEAR FEET
LP	LOW POINT
LRA	LOCKED ROTOR AMPS
LVDR	LOUVERED DOOR
LVG	LEAVING
MAX	MAXIMUM
MBH	THOUSAND BTUH
MCA	MINIMUM CIRCUIT AMPS
MECH	MECHANICAL
MFR	MANUFACTURER
MIN	MINIMUM
N/A	NOT APPLICABLE
NC	NORMALLY CLOSED OR NOISE CRITERIA
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
No	NUMBER
NOM	NOMINAL
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DIAMETER
ODP	OPEN DRIP PROOF
OV	OUTLET VELOCITY
PCF	POUNDS PER CUBIC FOOT
PD	PRESSURE DROP
PH	PHASE
PBG	PLUMBING
POS	PROVIDED BY OTHER SECTION
PVC	POLYVINYL CHLORIDE
QTY	QUANTITY
R	RADIUS
RET	RETURN
REQ'D	REQUIRED
RH	RELATIVE HUMIDITY
RLA	RUNNING LOAD AMPS
RLF	RELIEF
RM	ROOM
RPM	REVOLUTIONS PER MINUTE
SCH	SCHEDULE
SCR	SCREEN
SCT	SATURATED CONDENSING TEMPERATURE
SEN	SENSIBLE
SHC	SENSIBLE HEAT CAPACITY
SP	STATIC PRESSURE
SPECS	SPECIFICATIONS
SQ	SQUARE
SF	SQUARE FEET
STL	STEEL
SUP	SUPPLY
T	TEMPERATURE
TA	THROWAWAY
TEL	TELEPHONE
TEFC	TOTALLY ENCLOSED FAN COOLED
TEMP	TEMPERATURE
TSTAT	THERMOSTAT
TON	12,000 BTUH COOLING CAPACITY
TOT	TOTAL
TYP	TYPICAL
UC	UNDERCUT DOOR
V	VOLTS (ELECTRICAL)
VEL	VELOCITY
W	WIDTH OR WATT
W/	WITH
WB	WET BULB TEMPERATURE
WC	WATER COLUMN
WG	WATER GAUGE
W/O	WITHOUT
WPD	WATER PRESSURE DROP
WTD	WATER TEMPERATURE DIFFERENCE
X	EXISTING EQUIPMENT TO BE REMOVED
XM	EXISTING EQUIPMENT TO REMAIN
XN	NEW LOCATION OF RELOCATED EQUIPMENT
XR	EXISTING EQUIPMENT TO BE RELOCATED
DUCT	
ACD	AUTOMATIC CONTROL DAMPER
AFMS	AIR FLOW MEASURING STATION
AL	ACOUSTICAL DUCT LINER
BDD	BACKDRAFT DAMPER
BOD	BOTTOM OF DUCT
CD	CEILING DIFFUSER
DIFF	DIFFUSER
FBD	FLAT BOTTOM DUCT
LD	LINEAR DIFFUSER
OAI	OUTSIDE AIR INTAKE
OED	OPEN END DUCT
TOD	TOP OF DUCT
TSP	TOTAL STATIC PRESSURE (IN. WG)
TV	TURNING VANES
VD	VOLUME DAMPER
WMS	WIRE MESH SCREEN
DUCT SYSTEMS	
EA	EXHAUST AIR
OA	OUTSIDE AIR
RA	RETURN AIR
SA	SUPPLY AIR
EQUIPMENT	
AC	AIR CONDITIONING OR AIR CONDITIONING UNIT
ACCU	AIR COOLED CONDENSING UNIT
ACU	AIR CONDITIONING UNIT
AF	AIR FILTER OR AIR FOIL
AHU	AIR HANDLING UNIT
CC	COOLING COIL
CP	CONDENSATE DRAIN PUMP
DDC	DIRECT DIGITAL CONTROL
DX	DIRECT EXPANSION
EBB	ELECTRIC BASEBOARD HEATER
ECUH	ELECTRIC CABINET UNIT HEATER
EF	EXHAUST FAN
EHC	ELECTRICAL HEATING COIL
F	FAN
FTR	FINNED TUBE RADIATION
GRV	GRAVITY RELIEF VENT
HC	HEATING COIL
HP	HEAT PUMP
HX	HEAT EXCHANGER
P	PUMP
PHC	PREHEAT COIL
RTU	ROOF TOP UNIT
SF	SUPPLY FAN
TD	TRANSFER DUCT
UH	UNIT HEATER
UV	UNIT VENTILATOR
VAV	VARIABLE AIR VOLUME SUPPLY AIR TERMINAL
PIPING	
AAV	AUTOMATIC AIR VENT
ACV	AUTOMATIC CONTROL VALVE
AS	AIR SEPARATOR
ATV	ATMOSPHERIC VENT
BOP	BOTTOM OF PIPE
CO	CLEAN-OUT
DOV	DRAIN-OFF VALVE
FOB	FLAT ON BOTTOM REDUCER
FOT	FLAT ON TOP REDUCER
FCV	FLOW CONTROL VALVE
HB	HOSE BIBB CONN.
MAV	MANUAL AIR VENT
PRV	PRESSURE REDUCING VALVE
TAV	THERMOTSTATIC AIR VENT
TOP	TOP OF PIPE

GENERAL SYMBOLS

- EXISTING EQUIPMENT, DUCT, PIPING, ETC. (LIGHT LINE WEIGHT)
- NEW EQUIPMENT, DUCT, PIPING, ETC. (HEAVY LINE WEIGHT)
- DEMO EQUIPMENT, DUCT, PIPING, ETC. (SLASHED, HEAVY LINE WEIGHT)

PIPING SYMBOLS

- XX — SINGLE LINE SUPPLY PIPE (SOLID LINE), 'XX' TO DESIGNATE PIPE SYSTEM
- XX — SINGLE LINE RETURN PIPE (DASHED LINE), 'XX' TO DESIGNATE PIPE SYSTEM
- UNION
- BLIND FLANGE
- PIPE - CAPPED
- DIRECTION OF FLOW
- PIPE ANCHOR
- PIPE GUIDE
- PIPE CONNECTION - TOP
- PIPE CONNECTION - BOTTOM
- PIPE - DOWN
- PIPE - UP
- R — PITCH OF PIPE - (R) RISE OR (D) DROP
- CO — CLEANOUT FOR CONDENSATE DRAIN
- PIPE BREAK (SINGLE LINE)

PIPING ABBREVIATIONS

- D — DRAIN
- RL — REFRIGERANT LIQUID
- RS — REFRIGERANT SUCTION
- (NAME) — REMOVE EXISTING PIPING

DUCTWORK SYMBOLS

SINGLE LINE		DOUBLE LINE
WxD	RECTANGULAR DUCT W=WIDTH, D=DEPTH (INCHES UNLESS NOTED OTHERWISE) AS VIEWED	W, D, 10x6
DIA"Ø	ROUND DUCT (DIA=INSIDE DIAMETER)	DIA, 10"Ø
W/D	FLAT OVAL DUCT W=WIDTH, D=DEPTH	W, D, 10/6
	SUPPLY DUCT UP	
	SUPPLY DUCT DOWN	
	RETURN DUCT UP	
	RETURN DUCT DOWN	
	EXHAUST DUCT UP	
	EXHAUST DUCT DOWN	
10x6, 6"Ø, 10x6, 6"Ø	RECTANGULAR DUCT TO ROUND SUPPLY/RETURN/ EXHAUST	6"Ø, 10x6
	ACOUSTICALLY LINED DUCT	
	FLEXIBLE DUCT	
W	STANDARD RADIUS ELBOW (R = W) SUPPLY/RETURN/EXHAUST	R, W
W	FULL LENGTH SPLITTER VANES (R = W) SUPPLY/RETURN/ EXHAUST	R, W
	SPLIT TAKE-OFF	
	RECTANGULAR WYE SUPPLY	
R/D	CHANGE OF ELEVATION (R)RISE OR (D)DROP SUPPLY/RETURN/ EXHAUST	R/D
	45° TAP TAKE-OFF	
	90° TAP TAKE-OFF 45° TAKEOFF	
	90° TAP TAKE-OFF SQUARE TO ROUND CONNECTION	
	90° TAP TAKE-OFF BELLMOUTH CONNECTION	
	CONVERGE RETURN/EXHAUST W/45° TAKE-OFFS	
/VD	CEILING DUCT MOUNTED DIFFUSER/GRILLE	VD
/VD	TAKE-OFF TO DIFFUSER/GRILLE	HARD ELBOW, VD
VD	CEILING DUCT MOUNTED DIFFUSER/GRILLE	VD
	SUPPLY CEILING LINEAR DIFFUSER (W/ INSL. SHEETMETAL PLENUM)	
	SIDEWALL DUCT MOUNTED REGISTER/GRILLE	
	OPEN END DUCT W/ 1/2"x1/2" WMS	

DUCTWORK SYMBOLS (CONT.)

- ACD — AUTOMATIC CONTROL DAMPER W/ ACCESS DOOR
- VD — MANUAL VOLUME DAMPER
- STANDARD 4-WAY BLOW SUPPLY DIFFUSER
- 3-WAY BLOW SUPPLY DIFFUSER
- OR — 2-WAY BLOW SUPPLY DIFFUSER
- ONE-WAY BLOW SUPPLY DIFFUSER
- RETURN/EXHAUST GRILLE OR REGISTER
- LINEAR DIFFUSER
- LINEAR DIFFUSER W/ BLANK INACTIVE SECTIONS ADJACENT (INACTIVE SECTIONS SHALL HAVE SAME NUMBER OF SLOTS AND SLOT WIDTH AS ACTIVE LINEAR)
- UC 1/2" — UNDERCUT DOOR
- LVDR 1.5 SF — LOUVERED DOOR (FREE AREA)
- RETURN OR EXHAUST AIR FLOW
- SUPPLY AIR FLOW

CALLOUT SYMBOLS

- CONNECT NEW TO EXISTING
- REVISION NUMBER
- TEMPERATURE SENSOR OR THERMOSTAT
- REMOVE EXISTING ITEM
- SA(100) — S = SUPPLY, A = SCHEDULED DIFFUSER. (100) = CFM TO BALANCE TO
- RA(100) — R = RETURN, A = SCHEDULED GRILLE. (100) = CFM TO BALANCED TO
- EA(100) — E = EXHAUST, A = SCHEDULED GRILLE (100) = CFM TO BALANCED TO
- TA(100) — T = TRANSFER, A = SCHEDULED GRILLE (100) = CFM TO BALANCED TO

EQUIPMENT REQUIRING ELECTRICAL SERVICE, SEE SCHEDULE FOR PERFORMANCE REQUIREMENTS:

TAG / 1 / XX

- SCHEDULED EQUIPMENT UNIT NUMBER
- FIRST DIGIT(S) = UNIT IDENTIFICATION NUMBER (DUE TO EDITING NOT ALL NUMBERS MAY BE USED)
- EQUIPMENT REUSE

EQUIPMENT CONTROL SYMBOLS

- FILTER BANK
- H, C — HEATING COIL
- REHEAT COIL
- C, C — COOLING COIL
- CABINET HEATER
- STARTER, S/S, CT — STARTER
- CENTRIFUGAL FAN
- UPBLAST FAN
- OPPOSED BLADE DAMPER W/ TWO POSITION ACTUATOR
- OPPOSED BLADE DAMPER W/ MODULATING ACTUATOR
- PARALLEL BLADE DAMPER W/ TWO POSITION ACTUATOR
- PARALLEL BLADE DAMPER W/ MODULATING ACTUATOR

CONTROL POINT DESCRIPTOR LEGEND

- TAG — ATC CONTRACTOR PROVIDED DDC POINT AND HARDWARE
- TAG / ELEC PLBG — CONTROL DEVICE FURNISHED BY ELECTRICAL OR PLUMBING CONTRACTOR BUT INTERFACED TO DDC SYSTEM BY ATC CONTRACTOR
- TAG — ATC CONTRACTOR INTERFACE TO EQUIPMENT MANUFACTURER'S HARDWARE
- TAG — ATC CONTRACTOR PROVIDED LOCAL CONTROL POINT

CONTROL ABBREVIATIONS

ACD	AUTOMATIC CONTROL DAMPER
ALM	ALARM
ATC	AUTOMATIC TEMPERATURE CONTROL
DAT	DISCHARGE AIR TEMPERATURE SENSOR
DDC	DIRECT DIGITAL CONTROL
EAD	EXHAUST AIR DAMPER
ES	END SWITCH
FA	FAULT ALARM
FID	FAN ISOLATION DAMPER
FMT	FLOW METER/TRANSMITTER
FS	FLOW SWITCH
FZ	FREEZESTAT
HGB	HOT GAS BYPASS
HOA	HANDS-OFF AUTOMATIC SWITCH
HS	HAND SWITCH
LAT	LEAVING AIR TEMPERATURE SENSOR
LSPS	LOW STATIC PRESSURE SWITCH
LS	LEVEL SENSOR OR LIGHT SWITCH INTERFACE
MAT	MIXED AIR TEMPERATURE SENSOR
MD	MOTION DETECTOR
NC	NORMALLY CLOSED (ON LOSS OF POWER)
NO	NORMALLY OPEN (ON LOSS OF POWER)
OAD	OUTSIDE AIR DAMPER
OAT	OUTSIDE AIR TEMPERATURE SENSOR (DRY BULB)
RAD	RETURN AIR DAMPER
S	SWITCH
SAD	SUPPLY AIR DAMPER
SP	STATIC PRESSURE SENSOR
SPD	SPEED CONTROL
S/S	START/STOP
T	TEMPERATURE SENSOR/THERMOSTAT
TR	TEMPERATURE SENSOR/THERMOSTAT (ROOM)
WC	WATER COLUMN
X	REMOVE EXISTING ITEM

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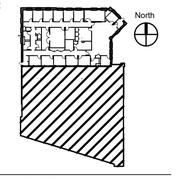
Number	Description	Date
	ISSUED FOR PERMIT & CONST.	23 JULY 2021

Key Plan:



Landlord Comments:

Project No.: Y021006

Drawing Sheet Title:
HVAC LEGEND, NOTES, AND ABBREVIATIONS

Drawing Sheet Number:
M-000

Owner's Branch No.:
532

HVAC GENERAL NOTES

1. GENERAL NOTES APPLY TO ALL DRAWINGS.
2. THIS PROJECT INVOLVES CONSTRUCTION INSIDE AN EXISTING STRUCTURE. CONTRACTORS, BY SUBMITTING A BID, ARE DEEMED TO BE COMPLETELY FAMILIAR WITH THE EXISTING CONDITION OF THE BUILDING AS IT INFLUENCES THE WORK DESCRIBED. ABSOLUTELY NO CLAIMS FOR EXTRA COMPENSATION WILL BE CONSIDERED FOR EXISTING CONDITIONS VISIBLE OR REASONABLY INFERABLE FROM A CAREFUL EXAMINATION OF THE EXISTING BUILDING.
3. THIS CONTRACTOR SHALL INSPECT THE EXISTING FIELD CONDITIONS AT THE SITE AND THE "AS-BUILT" BASE BUILDING CONTRACT DOCUMENTS PRIOR TO THE START OF ANY WORK TO DETERMINE WHAT EFFECT THE EXISTING CONDITIONS WILL HAVE ON HIS WORK. POTENTIAL PROBLEM AREAS SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT AND/OR ENGINEER IMMEDIATELY.
4. THIS CONTRACTOR SHALL CONNECT HIS WORK TO VARIOUS EXISTING PIPING, DUCTWORK, AND CONTROL SYSTEMS IN THE BASE BUILDING. THE NEW WORK SHALL BE COMPATIBLE WITH THE EXISTING SYSTEMS. LOCATION OF EQUIPMENT OR THE ROUTING OF THE VARIOUS SYSTEMS AS WELL AS OPENINGS IN FLOOR SLABS OR WALLS SHALL BE GOVERNED BY THE EXISTING CONDITIONS AS THEY APPEAR IN THE FIELD OR ON THE "AS-BUILT" DRAWINGS.
5. CARE SHALL BE TAKEN DURING THE INSTALLATION TO NOT DAMAGE OR INTERRUPT BUILDING SYSTEMS AND SERVICES THAT ARE ALREADY INSTALLED. DAMAGE TO SUCH SYSTEMS OR EQUIPMENT CAUSED BY THIS CONTRACTOR DURING INSTALLATION SHALL BE REPAIRED AND/OR REPLACED AT THIS CONTRACTOR'S EXPENSE TO THE COMPLETE SATISFACTION OF THE BUILDING OWNER.
6. SHUTDOWN OF EXISTING SYSTEMS FOR CONNECTION TO EXISTING SERVICES SHALL BE COORDINATED WITH THE CONSTRUCTION MANAGER OR GENERAL CONTRACTOR AND BUILDING OWNER. THIS CONTRACTOR SHALL SUBMIT REQUESTS, WHERE THEY AFFECT THE OPERATION OF THE BUILDING SYSTEMS, AT LEAST ONE WEEK IN ADVANCE OF ANY REQUIRED SHUTDOWN. THE ACTUAL SHUTDOWN PERIOD SHALL BE AS SHORT AS POSSIBLE AND AT A TIME MUTUALLY AGREEABLE TO THE BUILDING OWNER AND THE CONSTRUCTION MANAGER/GENERAL CONTRACTOR.
7. DRAWINGS ARE DIAGRAMMATIC, THEREFORE DETERMINE EXACT LOCATIONS OF SYSTEMS AND COMPONENTS IN FIELD.
8. ALL WORK SHALL BE COORDINATED WITH ALL TRADES INVOLVED. OFFSETS IN PIPING AND DUCTS (INCLUDING DIVIDED DUCTS) AND TRANSITIONS AROUND OBSTRUCTIONS SHALL BE PROVIDED AT NO ADDITIONAL COST TO THE OWNER.
9. VERIFY ALL EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS. VERIFY AND PROVIDE DUCT AND/OR PIPE TRANSITIONS TO FURNISHED EQUIPMENT. FIELD VERIFY AND COORDINATE ALL DIMENSIONS BEFORE FABRICATION.
10. REFER TO ARCHITECTURAL REFLECTED CEILING PLANS FOR EXACT LOCATIONS OF AIR TERMINAL DEVICES.
11. ALL MATERIALS AND EQUIPMENT UNLESS SPECIFICALLY INDICATED AS REUSED, SHALL BE NEW.
12. DUCTWORK SHALL NOT RUN ALONG FULL HEIGHT PARTITIONS.
13. ACCESS PANELS SHALL BE PROVIDED TO ALLOW FOR CLEANING OF COILS AND SERVICING OF DAMPERS, HEATERS, VALVES, AND ALL CONCEALED MECHANICAL EQUIPMENT.
14. THE INSIDE OF ALL DUCTWORK VISIBLE THROUGH A GRILLE OR DIFFUSER SHALL BE PAINTED FLAT BLACK.
15. EXISTING ROOM THERMOSTATS AND SENSORS SHALL BE PROTECTED DURING CONSTRUCTION AND RELOCATED AS INDICATED ON THE DRAWINGS. INSTALL NEW AND RELOCATED ROOM THERMOSTATS AND SENSORS 4 FEET AFF OR AS DIRECTED OTHERWISE BY ARCHITECT.
16. WHEN SECTION OF DUCTWORK IS NOT LABELED FOR SIZE, THE LARGER SIZE INDICATED ON THE CONNECTED DUCT SHALL PREVAIL. SIZE OF DUCT RUN-OUTS TO DIFFUSER SHALL EQUAL DIFFUSER NECK SIZE.
17. CONTRACTOR SHALL PROVIDE THE FOLLOWING SERVICES, AS APPLICABLE, ON ALL EXISTING HVAC EQUIPMENT INDICATED TO BE REUSED: 1) FILTER CHANGES, 2) BALANCING, 3) LUBRICATION. CONTRACTOR SHALL REPORT ANY EQUIPMENT DEFICIENCIES FOUND TO THE ARCHITECT AND/OR ENGINEER.
18. THE FIRE PROOFING OF THE BUILDING STRUCTURE IS NOT TO BE REMOVED FOR THE INSTALLATION OF HANGERS, SUPPORTS, DUCTWORK, ETC. IF FIRE PROOFING IS DAMAGED, IT SHALL BE REPAIRED AT THE EXPENSE OF THE TRADE.
19. CONTRACTOR SHALL TEST AND CALIBRATE ALL CONTROLS AND VERIFY ALL ARE FULLY FUNCTIONAL AND SUBMIT DOCUMENTATION. SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
20. CONTRACTOR SHALL PROVIDE AND SUBMIT DOCUMENTATION FOR TESTING AND BALANCING OF ALL AIR AND WATER SYSTEMS, DUCT AND PIPING PRESSURE AND LEAKAGE TESTS, OPERATING AND MAINTENANCE MANUALS, AND AS BUILT DRAWINGS. SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
21. REFER TO THE PROJECT SPECIFICATIONS FOR FURTHER REQUIREMENTS. SPECIAL ATTENTION IS DIRECTED TO THE PART 1 PROJECT SCOPE IN REGARDS TO THE DIV. 23 CONTRACTOR PROVIDING A "MAXIMUM SPACE SOUND PRESSURE LEVEL REPORT" AND COORDINATING THIS INFORMATION WITH ALL IMPACTED SUB-CONTRACTORS AND EQUIPMENT MANUFACTURERS PRIOR TO SUBMITTING SHOP DRAWINGS.
22. MANY EQUIPMENT SCHEDULES DO NOT LIST QUANTITIES. CONTRACTOR SHALL REFER TO ALL DRAWINGS AND PROVIDE THE REQUIRED QUANTITIES FOR ALL COMPONENTS.

HVAC SPECIFICATIONS

PART 1 - GENERAL

1. GENERAL PROVISIONS: DRAWINGS ARE DIAGRAMMATIC AND INDICATE GENERAL ARRANGEMENT OF WORK IN CONTRACT.
2. SCOPE: PERFORM WORK AND PROVIDE NEW MATERIAL AND EQUIPMENT AS SHOWN ON DRAWINGS AND AS SPECIFIED IN THIS SECTION OF THE SPECIFICATIONS. PROVIDE ALL COMPONENTS AND MATERIALS, WHETHER SPECIFICALLY SHOWN OR NOT, THAT ARE NECESSARY TO MAKE THE SYSTEMS COMPLETE AND FULLY OPERATIONAL AS INTENDED IN THE CONSTRUCTION DOCUMENTS. WORK SHALL INCLUDE, BUT NOT BE LIMITED TO: 1) THE DESIGN INTENT AS ILLUSTRATED ON THESE DRAWINGS, AND 2) ALL TESTING, COMMISSIONING, AND CERTIFICATIONS NECESSARY FOR COMPLIANCE INCLUDING ANY REQUIRED REMEDIAL ACTIONS AND RETESTING DUE TO FAILURE.
3. SITE VISIT: VISIT AND CAREFULLY EXAMINE SITE TO IDENTIFY EXISTING CONDITIONS THAT MAY AFFECT WORK OF THIS SECTION BEFORE SUBMITTING BID. NO EXTRA PAYMENT WILL BE ALLOWED FOR ADDITIONAL WORK CAUSED BY UNFAMILIARITY WITH SITE CONDITIONS THAT ARE VISIBLE OR READILY DISCERNED BY AN EXPERIENCED OBSERVER.
4. RELATED WORK: THE FOLLOWING WORK IS NOT INCLUDED IN THIS SECTION AND WILL BE PROVIDED UNDER OTHER SECTIONS: 1) TEMPORARY HEAT FOR USE DURING CONSTRUCTION AND TESTING UNLESS SPECIFICALLY NOTED IN OTHER SPECIFICATION SECTIONS, 2) PAINTING, EXCEPT AS SPECIFIED, AND 3) ELECTRICAL POWER WIRING TO ALL EQUIPMENT OTHER THAN AUTOMATIC TEMPERATURE CONTROL PANELS AND COMPONENTS.
5. CODES, STANDARDS, AUTHORITIES AND PERMITS: CODES, LAWS AND ORDINANCES PROVIDE A BASIS FOR THE MINIMUM INSTALLATION CRITERIA. THESE DRAWINGS AND SPECIFICATIONS ILLUSTRATE THE SCOPE REQUIRED FOR THIS PROJECT, WHICH MAY EXCEED MINIMUM CODE, LAW AND STANDARDS CRITERIA. GIVE NOTICES, FILE PLANS, OBTAIN PERMITS AND LICENSES, PAY FEES AND BACKCHARGES AND OBTAIN NECESSARY APPROVALS FROM AUTHORITIES HAVING JURISDICTION AS REQUIRED FOR THE EXECUTION OF ALL WORK ASSOCIATED WITH THIS PROJECT. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE LATEST EDITIONS OF: 1) THE STATE BUILDING, ELECTRICAL, MECHANICAL, AND ENERGY CODES, 2) SMACNA, NFPA, ANSI/ASHRAE, ASME, UL, AND NEMA STANDARDS, 3) ALL OTHER APPLICABLE CODES, REGULATIONS, STANDARDS AND LAWS OF LOCAL, STATE AND FEDERAL GOVERNMENT AND OTHER AUTHORITIES HAVING JURISDICTION, AND 4) APPLICABLE BASE BUILDING STANDARDS AND SPECIFICATIONS.
6. INTERPRETATIONS OF DOCUMENTS: WHERE DRAWINGS OR SPECIFICATIONS DO NOT COINCIDE WITH MANUFACTURER'S RECOMMENDATIONS, OR ARE UNCLEAR AS TO INTENT, OR REQUIRED MATERIAL QUALITY, ADVISE THE ENGINEER IN WRITING BEFORE PROCEEDING WITH THE WORK. ALL COST FOR REWORK NECESSARY TO RESOLVE DISCREPANCIES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
7. REQUESTS FOR INFORMATION: ANY RFI FOR RESOLVING AN APPARENT CONFLICT OR UNCLARITY, OR A REQUEST FOR ADDITIONAL DETAIL, SHALL INCLUDE A SKETCH OR EQUIVALENT DESCRIPTION OF CONTRACTOR'S PROPOSED SOLUTION.
8. MAXIMUM SPACE SOUND POWER LEVEL REPORT:
   A. RESULTANT MAXIMUM SOUND LEVEL IN ALL SPACES (OTHER THAN MECHANICAL ROOMS, ELECTRICAL EQUIPMENT ROOMS, AND KITCHENS), AS INSTALLED, SHALL BE NO HIGHER THAN NC 40 IN COMPUTER ROOMS, NC 35 IN ANY OPEN GENERAL OFFICE TYPE SPACES, AND NC 30 IN ANY QUIET SPACES SUCH AS CONFERENCE ROOMS AND PRIVATE OFFICES. ANY SOUND REDUCTION CREDITS TAKEN SHALL BE AS APPLICABLE TO EACH SPACE SERVED, SUCH AS CEILING TYPE (IF ANY), NUMBER OF AIR OUTLETS AND INLETS INSTALLED AND THEIR NC LEVEL, ETC.
   B. THE DIVISION 23 CONTRACTOR SHALL ENGAGE A PROFESSIONAL ENGINEER SPECIALIZING IN ACOUSTICS TO PROVIDE AND SUBMIT A STAMPED AND SIGNED REPORT OF WHAT SOUND POWER LEVELS ARE REQUIRED BY ALL SOUND PRODUCING HVAC EQUIPMENT FROM THE AIR HANDLING EQUIPMENT TO EACH ROOM'S AIR OUTLET AND INLETS.
   C. PRIOR TO REQUESTING THEIR SHOP DRAWINGS, THE DIVISION 23 CONTRACTOR SHALL COORDINATE WITH ALL DIVISION 23 HVAC SUB-CONTRACTORS AND EQUIPMENT VENDORS TO SELECT AND SUBMIT ALL SOUND PRODUCING EQUIPMENT AND SOUND ATTENUATING DEVICES SO THAT THE INSTALLATION WILL MEET OR EXCEED THE ACOUSTIC REQUIREMENTS OF THE REPORT. THE REPORT REQUIREMENTS SHALL OVERRIDE ANY LESSOR REQUIREMENTS THAT MAY BE SHOWN ON THE DRAWINGS.
9. SUBMITTALS: PROVIDE SPECIFIED ITEMS AND EQUIPMENT UNLESS "EQUAL" OR "APPROVED EQUAL" IS EXPLICITLY INDICATED ON THE DRAWINGS. DEVIATIONS TO SPECIFIED ITEMS SHALL BE AT THE SOLE RISK OF THE CONTRACTOR, WHO SHALL BE RESPONSIBLE FOR ALL ASSOCIATED CHANGES TO THIS AND OTHER TRADES. REVIEW OF THE SHOP DRAWINGS BY THE ENGINEER SHALL NOT ABSOLVE THE CONTRACTOR FROM MEETING THE FULL DESIGN INTENT OF THE ASSOCIATED SYSTEM(S). SUBMITTALS SHALL INDICATE PRIOR REVIEW AND APPROVAL BY THE RESPONSIBLE CONTRACTOR. SUBMIT FOR REVIEW (6) SETS OF MANUFACTURER'S PRODUCT DATA FOR THE FOLLOWING ITEMS: 1) AIR DISTRIBUTION LAYOUT DRAWINGS AND DETAILS, 2) PIPING DISTRIBUTION LAYOUT DRAWINGS, COMPONENTS, AND DETAILS, 3) MAXIMUM SPACE SOUND PRESSURE LEVEL REPORT, 4) ALL EQUIPMENT, 5) CONTROL SCHEMATICS, COMPONENTS, AND SEQUENCES, INCLUDING TIE-IN TO THE EXISTING BUILDING CONTROL OR MANAGEMENT SYSTEM, 6) BALANCING REPORTS, 7) ALL TEST REPORTS, 8) COORDINATION DRAWINGS, 9) RECORD DRAWINGS, AND 10) ALL CERTIFICATES. ALLOW ENGINEER A MINIMUM OF 10 WORKING DAYS FOR PROCESSING AND REVIEW OF EACH SUBMISSION.
10. OPERATION AND MAINTENANCE DATA: SUBMIT (3) SETS OF OPERATING AND MAINTENANCE MANUALS PRIOR TO THE COMPLETION OF THE PROJECT. PROVIDE ON-SITE DEMONSTRATION OF ALL SYSTEMS TO OWNER AFTER SYSTEMS ARE FULLY OPERATIONAL. O&M MANUALS SHALL INCLUDE ALL COMPONENTS (DIFFUSERS, VALVES, ETC.) AS WELL AS SYSTEM DESCRIPTIONS OF ALL SYSTEMS WITH FLOW DIAGRAMS, WIRING DIAGRAMS, WRITTEN WARRANTEES, RECOMMENDED SPARE PARTS AND ROUTINE MAINTENANCE REQUIREMENTS WITH RECOMMENDED INTERVALS FOR ALL MOVING EQUIPMENT AND CONTROLS.
11. RECORD DRAWINGS: CAD RECORD DRAWING FILES SHALL BE SUBMITTED AT THE COMPLETION OF THE PROJECT SHOWING THE "AS-BUILT" CONDITION INCLUDING WORK INSTALLED AND ALL MODIFICATIONS OR ADDITIONS TO ORIGINAL DESIGN. OBTAIN THE AUTOCAD FILES FOR PREPARATION OF AS-BUILT DRAWINGS FROM THE ARCHITECT. THE ARCHITECT AND ENGINEER ARE NOT GRANTING ANY OWNERSHIP OR PROPERTY INTEREST IN THE CAD DRAWINGS BY THE DELIVERY OF THE CAD FILES. THE USE OF THE CAD FILES AND DRAWINGS ARE LIMITED FOR THE SOLE PURPOSE OF ASSISTING IN THE CONTRACTOR'S PERFORMANCE IN ITS CONTRACTUAL OBLIGATIONS WITH RESPECT TO THIS PROJECT. ANY REUSE AND/OR OTHER USE BY THE CONTRACTOR WILL BE AT THE CONTRACTOR'S SOLE RISK AND WITHOUT LIABILITY TO THE ARCHITECT AND ENGINEER.
12. WARRANTIES: WARRANTY INSTALLATION IN WRITING FOR ONE YEAR FROM DATE OF OWNER'S ACCEPTANCE OF CERTIFICATE OF SUBSTANTIAL COMPLETION. WHERE INDIVIDUAL EQUIPMENT SECTIONS SPECIFY LONGER WARRANTEES, PROVIDE THE LONGER WARRANTEE. REPAIR, REPLACE OR PROVIDE TEMPORARY ACCOMMODATIONS FOR DEFECTIVE MATERIALS, EQUIPMENT, WORKMANSHIP AND INSTALLATION THAT DEVELOP WITHIN 24 HOURS OF NOTIFICATION. WARRANTY SHALL INCLUDE A CONTACT PERSON (NAME AND 24 HOUR TELEPHONE NUMBER) FOR SERVICE REQUESTS. CORRECT DAMAGE CAUSED WHILE MAKING NECESSARY REPAIRS AND REPLACEMENTS UNDER WARRANTY PERIOD AT NO ADDITIONAL COST.
13. COORDINATION: CONFER WITH ALL OTHER TRADES RELATIVE TO LOCATION OF ALL APPARATUS AND EQUIPMENT TO BE INSTALLED AND SELECT LOCATIONS SO AS NOT TO CONFLICT WITH OR HINDER THE PROGRESS OF THE WORK OF OTHER SECTIONS. WORK INSTALLED THAT CREATES INTERFERENCE OR RESTRICTS ACCESS REQUIRED BY CODE (INCLUDING CLEARANCES TO ELECTRICAL COMPONENTS) OR TO CONDUCT MAINTENANCE AND/OR ADJUSTMENTS SHALL BE MODIFIED AT NO ADDITIONAL COST TO THE OWNER.
14. PROVIDE A SET OF COORDINATION DRAWINGS FOR USE IN VERIFYING REQUIRED CODE CLEARANCES (AS WELL AS CLEARANCES FOR OPERATION, REPAIR, REMOVAL, AND TESTING) OF ALL EQUIPMENT AND FOR USE IN COORDINATING INSTALLATION OF EQUIPMENT WITH OTHER TRADES. THE INTENT OF FABRICATION AND INSTALLATION OF ANY MEP TRADE. THE HVAC CONTRACTOR'S FLOOR PLANS SHALL BE THE BASIS FOR FLOOR PLAN COORDINATION. THE ELECTRICAL CONTRACTOR'S REFLECTED CEILING PLANS SHALL BE THE BASIS FOR REFLECTED CEILING PLAN COORDINATION.
15. SUPPORTS: INCLUDE ALL STRUCTURAL STEEL SUPPORTS, HANGER BRACKETS, ETC., REQUIRED FOR THE EXECUTION OF THE WORK OF THIS SECTION. THE WELDS AND EDGES OF ALL BRACKETS SHALL BE FILED OR GROUND SMOOTH FOR PAINTING. HANGERS SHALL BE STEEL ANGLE IRON, CHANNEL OR STEEL ROD USED WITH APPROVED CLAMPS, INSERTS, ETC. ALL HANGERS SHALL BE GALVANIZED OR PAINTED WITH TWO COATS OF RUSTOLEUM PAINT BEFORE INSTALLATION. APPLY TOUCH-UP PAINT (ZINC GALVANIZING FOR GALVANIZED STEEL) AFTER INSTALLATION. SUPPORTS INSTALLED IN EXTERIOR LOCATIONS SHALL BE PVC COATED STEEL, GALVANIZED STEEL, OR STAINLESS STEEL WITH STAINLESS STEEL HARDWARE.
16. CUTTING AND PATCHING: INCLUDE ALL CORING, CUTTING, PATCHING AND FIREPROOFING NECESSARY FOR THE EXECUTION OF THE WORK OF THIS SECTION. STRUCTURAL ELEMENTS SHALL NOT BE CUT WITHOUT WRITTEN APPROVAL OF THE ARCHITECT. THIS CONTRACTOR SHALL BE RESPONSIBLE FOR TAKING ALL PRECAUTIONS REQUIRED TO IDENTIFY HIDDEN PIPING, CONDUITS, ETC. BEFORE ANY CORE DRILLING AND/OR CUTTING OF SLABS COMMENCES, INCLUDING X-RAYING THE AFFECTED SLABS. REPAIR AND PATCH AROUND THE WORK SPECIFIED HEREIN TO MATCH THE EXISTING ADJACENT SURFACES TO THE SATISFACTION OF THE ARCHITECT. FILL AND PATCH ALL OPENINGS OR HOLES LEFT IN THE EXISTING STRUCTURES BY THE REMOVAL OF EXISTING EQUIPMENT THAT IS PART OF THIS SECTION OF THE SPECIFICATIONS. PATCH AND SEAL ALL EXISTING OPENINGS IN DUCTWORK AND PIPING NOT UTILIZED FOR NEW LAYOUT. PROVIDE FIRE STOPPING TO MAINTAIN THE FIRE RATING OF THE FIRE RESISTANCE-RATED ASSEMBLY. ALL PENETRATIONS AND ASSOCIATED FIRE STOPPING SHALL BE INSTALLED IN ACCORDANCE WITH THE FIRE STOPPING MANUFACTURER'S LISTED INSTALLATION DETAILS AND BE LISTED BY UL OR FM.
17. HOISTING, SCAFFOLDING AND PLANKING: INCLUDE THE FURNISHING, SET-UP AND MAINTENANCE OF ALL HOISTING MACHINERY, CRANES, SCAFFOLDS, STAGING AND PLANKING AS REQUIRED FOR THE EXECUTION OF WORK FOR THIS SECTION.
18. SAFETY PRECAUTIONS: LIFE SAFETY AND ACCIDENT PREVENTION SHALL BE A PRIMARY CONSIDERATION. COMPLY WITH ALL OF THE SAFETY REQUIREMENTS OF THE OWNER AND OSHA THROUGHOUT THE ENTIRE CONSTRUCTION PERIOD OF THE PROJECT. FURNISH, PLACE AND MAINTAIN PROPER GUARDS AND ANY OTHER NECESSARY CONSTRUCTION REQUIRED TO SECURE SAFETY OF LIFE AND PROPERTY.
19. ACCESSIBILITY: ALL WORK PROVIDED UNDER THIS SECTION OF THE SPECIFICATION SHALL BE INSTALLED SO THAT PARTS REQUIRING PERIODIC INSPECTION, MAINTENANCE AND REPAIR ARE READILY ACCESSIBLE. WORK OF THIS TRADE SHALL NOT INFRINGE UPON CLEARANCES REQUIRED BY EQUIPMENT OF OTHER TRADES.
20. PROTECTION OF WORK AND PROPERTY: THIS CONTRACTOR SHALL BE RESPONSIBLE FOR THE CARE AND PROTECTION OF ALL WORK INCLUDED UNDER THIS SECTION UNTIL THE COMPLETION AND FINAL ACCEPTANCE OF THIS PROJECT. PROTECT ALL EQUIPMENT AND MATERIALS FROM DAMAGE FROM ALL CAUSES INCLUDING, BUT NOT LIMITED TO, FIRE, VANDALISM AND THEFT. ALL MATERIALS AND EQUIPMENT DAMAGED OR STOLEN SHALL BE REPAIRED OR REPLACED WITH EQUAL MATERIAL OR EQUIPMENT AT NO ADDITIONAL COST TO THE OWNER. PROTECT ALL EQUIPMENT, OUTLETS AND OPENINGS, AND ROOF PENETRATIONS WITH TEMPORARY PLUGS, CAPS AND COVERS. PROTECT WORK AND MATERIALS OF OTHER TRADES FROM DAMAGE THAT MIGHT BE CAUSED BY WORK OR WORKMEN UNDER THIS SECTION AND MAKE GOOD DAMAGE THUS CAUSED. DAMAGED MATERIALS ARE TO BE REMOVED FROM THE SITE; NO SITE STORAGE OF DAMAGED MATERIALS WILL BE ALLOWED. ANY DAMAGE TO EXISTING SYSTEMS AND EQUIPMENT CAUSED BY THIS CONTRACTOR DURING INSTALLATION SHALL BE REPAIRED AND/OR REPLACED AT THIS CONTRACTOR'S EXPENSE TO THE COMPLETE SATISFACTION OF THE BUILDING OWNER.
21. SEISMIC RESTRAINT REQUIREMENTS: PROVIDE SEISMIC RESTRAINTS AS REQUIRED IN ACCORDANCE WITH THE STATE BUILDING CODE. A REGISTERED PROFESSIONAL STRUCTURAL ENGINEER, LICENSED IN THE APPLICABLE STATE FOR THE PROJECT LOCATION, SHALL PREPARE THE SEISMIC RESTRAINT DESIGN AND CERTIFY THAT THE DESIGN IS IN COMPLIANCE WITH THE STATE BUILDING CODE REQUIREMENTS.
22. COMMISSIONING: THE HVAC SYSTEMS SHALL BE PROVIDED WITH SYSTEM COMMISSIONING BY THE CONTRACTOR IN ACCORDANCE WITH 2018 INTERNATIONAL ENERGY CONSERVATION CODE. THE CONTRACTOR SHALL PROVIDE COMMISSIONING AND COMMISSIONING PLANS INCLUDING PRELIMINARY COMMISSIONING REPORTS DEVELOPED BY A REGISTERED DESIGN PROFESSIONAL OR AN APPROVED AGENCY IN ACCORDANCE WITH 2018 INTERNATIONAL ENERGY CONSERVATION CODE. THE SAME REGISTERED DESIGN PROFESSIONAL OR APPROVED AGENCY SHALL PROVIDE EVIDENCE OF MECHANICAL SYSTEMS COMMISSIONING AND COMPLETION TO THE PROFESSIONAL ENGINEER STAMPING THE HVAC DRAWINGS IN ACCORDANCE WITH THE PROVISIONS OF THE CODE SECTIONS.

PART 2 - PRODUCTS

1. DUCTWORK: MATERIAL, CONSTRUCTION, AND INSTALLATION SHALL MEET REQUIREMENTS OF MOST RECENT EDITIONS OF SMACNA HVAC DUCT CONSTRUCTION STANDARDS, EXCEPT FOR MORE STRINGENT REQUIREMENTS SPECIFIED OR SHOWN ON DRAWINGS. SEE DUCTWORK PRESSURE CLASS AND SEAL CLASS DETAIL FOR CONSTRUCTION REQUIREMENTS. PROVIDE FLEXIBLE CONNECTION ON ALL DUCTS CONNECTING TO FANS AND ROTATING EQUIPMENT. ALL DUCTS SHALL BE GROUNDED ACROSS FLEXIBLE CONNECTION WITH FLEXIBLE COPPER GROUNDING STRAPS. MAXIMUM LENGTH OF FLEXIBLE RUN-OUT TO DIFFUSERS SHALL BE 6 FEET. FOR LONGER RUN-OUTS, ADD RIGID DUCT. DUCTS SHALL BE CONSTRUCTED OF HOT DIPPED GALVANIZED STEEL UNLESS OTHERWISE NOTED.
2. DAMPERS: PROVIDE MANUAL ADJUSTABLE VOLUME DAMPERS, WITH EXTENDED MOUNT, INDICATING AND LOCKING QUADRANTS ON EACH TAKE-OFF TO REGISTER, GRILLE, OR DIFFUSER (NOT ALL MAY BE SHOWN ON DRAWINGS). BACK-DRAFT DAMPERS SHALL HAVE CLASS 1 LEAKAGE RATING AND HAVE ADJUSTABLE COUNTERWEIGHTS OR SPRINGS TO LOWER THE PRESSURE DROP.
3. DIFFUSERS, REGISTERS, AND GRILLES: PROVIDE DIFFUSERS, REGISTERS AND GRILLES FOR SUPPLY, RETURN, AND EXHAUST OUTLETS, OF SIZE, TYPE, AND DESIGN SHOWN ON DRAWINGS. DIFFUSER SIZES SHOWN ARE NECK SIZES; REGISTER AND GRILLE SIZE ARE NOMINAL. ACCEPTABLE MANUFACTURERS: TITUS, ANEMOSTAT, KRUEGER, TUTTLE & BAILEY, PRICE, OR METALAIRE. SOUND PRESSURE LEVELS ARE NOT TO EXCEED NC 30.
4. ACOUSTICAL SOUND LINING: MATERIALS AND INSTALLATION SHALL MEET THE FOLLOWING STANDARDS, AS APPLICABLE: NFPA-90A, UL723, NFPA-255; SMACNA DUCT LINER APPLICATIONS STANDARD; SMACNA MECHANICAL FASTENERS STANDARD; ADHESIVE AND SEALANT COUNCIL: ADHESIVES STANDARD FOR DUCT LINER - ASC-A-7001A; ASTM E-84 FIRE HAZARD CLASSIFICATIONS OF 25 FLAME SPREAD, 50 SMOKE DEVELOPED, AND 50 FUEL CONTRIBUTED. INSULATION SHALL HAVE A NOMINAL R-VALUE OF 4.0 AT 1" THICKNESS AND SHALL PASS UL 181 TESTS FOR MOLD GROWTH AND AIR EROSION. INTERNAL AIRFLOW DIMENSIONS ARE SHOWN FOR DUCTS, CONTRACTOR SHALL INCREASE DUCT SIZE FOR LINING. PROVIDE MINIMUM 1" THICK ACOUSTICAL LINING. SEAL ALL JOINTS WITH MANUFACTURER APPROVED MASTIC. USE SHEET METAL NOSING AT ALL RAW EDGES. SEE INSULATION TABLE ON DRAWING FOR SCOPE OF ACOUSTIC DUCT LINING. FACTORY FABRICATED DOUBLE-WALL INTERNALLY INSULATED DUCT WITH PERFORATED PANEL MAY BE USED IN PLACE OF LINING. FIBER GLASS LINING SHALL BE JOHN MANVILLE PERMACOTE LINACOUSTIC OR EQUAL BY CERTAIN-TEED, KNAUF, OR OWENS CORNING.
5. DUCT INSULATION (EXTERNAL): INSULATION SHALL BE CERTAIN-TEED, KNAUF, MANVILLE, OR OWENS CORNING. MATERIALS SHALL MEET REQUIREMENTS OF ADHESIVE AND SEALANT COUNCIL STANDARDS AND SMACNA. MINIMUM DUCTWORK INSULATION THICKNESS SHALL BE AS REQUIRED TO MEET THE R-VALUES LISTED IN THE "DUCT INSULATION R-VALUES" DETAIL. FOR CONCEALED INSULATION, USE FIBROUS GLASS DUCT WRAP, WITH FOIL-KRAFT FLAME RESISTANT VAPOR BARRIER. EXPOSED INSULATION SHALL BE RIGID FIBERGLASS INSULATION WITH ALUMINUM VAPOR BARRIER.
6. WATER PIPING AND VALVES: CONDENSATE DRAIN PIPING SHALL BE COPPER. PROVIDE DIELECTRIC FITTINGS EQUAL TO PPP CLEARFLOW TO CONNECT DISSIMILAR PIPING MATERIALS.
7. REFRIGERANT PIPING: REFRIGERANT PIPING SHALL BE BRAZED ACR COPPER TUBING WITH WROUGHT COPPER FITTINGS. PROVIDE ALL REQUIRED ACCESSORIES PER MANUFACTURER'S BEST RECOMMENDATIONS. PIPE SIZES SHOWN ARE APPROXIMATE, CONFIRM AND PROVIDE ALL PIPE SIZING (BASED ON ACTUAL FIELD ROUTING), INCLUDING ANY REQUIRED DOUBLE SUCTION RISERS AND ALL VALVES AND APPURTENANCES, AS RECOMMENDED BY UNIT MANUFACTURER. SUBMIT SIZING CALCULATIONS IF ANY MANUFACTURER'S RECOMMENDATION DIFFERS FROM WHAT IS SHOWN ON THE DRAWINGS.
8. PIPE INSULATION: WATER PIPING INSULATION SHALL BE FIBROUS GLASS INSULATION WITH FACTORY-APPLIED FIRE RETARDANT VAPOR BARRIER JACKET WITH K FACTOR OF AT LEAST 0.23 AT 75 DEG. F MEAN TEMPERATURE BY OWENS CORNING, CERTAIN-TEED, MANVILLE, OR KNAUF. REFRIGERANT SUCTION LINES, HOT GAS BYPASS LINES, CONDENSATE DRAIN LINES, AND OUTDOOR LIQUID LINES SHALL BE INSULATED WITH RIGID CLOSED CELL FOAM INSULATION, EQUAL TO ARMACELL AP/ARMAFLEX OR HALSTEAD/NOMACO (INSULTUBE). ASTM E-84 FIRE HAZARD RATINGS SHALL BE 25 FLAME SPREAD, 50 SMOKE DEVELOPED AND 50 FUEL CONTRIBUTED. INSULATION THICKNESS SHALL BE AS LISTED IN THE "PIPE INSULATION" DETAIL. ALL OUTDOOR PIPING SHALL BE COVERED WITH WEATHERPROOFED ALUMINUM JACKET.
9. PIPE HANGERS AND SUPPORTS: PROVIDE PIPE STANDS, SUPPORTS, HANGERS, AND OTHER SUPPORTING APPLIANCES AS NECESSARY TO SUPPORT WORK REQUIRED BY CONTRACT DOCUMENTS. SPACING OF HANGERS SHALL BE INSTRUCTED IN ACCORDANCE WITH APPLICABLE BUILDING AND MECHANICAL CODES. SIZE OF HANGERS SHALL INCLUDE THE PIPE INSULATION WITH SHIELD. WHERE HANGERS ARE USED OUTDOORS, THEY SHALL BE STAINLESS STEEL OR PVC COATED GALVANIZED STEEL.
10. FANS: ALL FANS SHALL HAVE THEIR AIR PERFORMANCE RATED IN ACCORDANCE WITH AMCA AND SHALL BE LICENSED TO BEAR THE AMCA SEAL. ALL MOTORS UNDER 1 HP SHALL BE ECM TYPE. BACK-DRAFT DAMPERS SHALL HAVE CLASS 1 LEAKAGE RATING AND HAVE ADJUSTABLE COUNTERWEIGHTS OR SPRINGS TO LOWER THE PRESSURE DROP. ACCEPTABLE MANUFACTURERS OF ROOF EXHAUSTERS, TRANSFER FANS, AND CEILING EXHAUST FANS SHALL BE: PENN, GREENHECK, OR COOK.
11. VIBRATION ISOLATION: PROVIDE VIBRATION ISOLATION FOR EACH PIECE OF ROTATING OR PISTON DRIVEN HVAC EQUIPMENT SHOWN ON THE DRAWINGS. ISOLATION MAY BE INTERNAL OR EXTERNAL TO THE EQUIPMENT AND SHALL PROVIDE AT LEAST 90% ISOLATION EFFICIENCY. INSTALLATION PRACTICES SHALL BE IN STRICT ACCORDANCE WITH THE RECOMMENDATIONS OF THE VIBRATION ISOLATION MANUFACTURER.
12. ELECTRIC BASEBOARD RADIATION: PROVIDE ELECTRIC BASEBOARD RADIATION BY INDECCO, Q-MARK, OR BRASCH OF CAPACITIES SHOWN ON THE SCHEDULES. UNITS SHALL BE UL LISTED AND BE PROVIDED WITH REQUIRED THERMAL CUTOUTS, DISCONNECTS AND ALL OTHER REQUIRED SAFETY AND OPERATING CONTROLS. PROVIDE INTEGRAL THERMOSTAT AS SHOWN ON THE DRAWINGS.
13. CONDENSATE DRAIN PUMPS: PROVIDE, WHERE INDICATED ON DRAWINGS, CONDENSATE PUMPS WITH TANK AND LEVEL CONTROL BY HARTELL, LITTLE GIANT, LIBERTY, ZOELLER, OR APPROVED EQUAL. PROVIDE EACH PUMP WITH A CHECK VALVE. PUMPS LOCATED ABOVE SUSPENDED OR DROPPED CEILINGS SHALL BE HARDWIRED. PUMPS LOCATED IN RETURN AIR PLENUMS SHALL BE CONSTRUCTED OF MATERIALS THAT ARE NON-COMBUSTIBLE (METAL) OR LIMITED COMBUSTIBLE WITH A MAXIMUM SMOKE DEVELOPED INDEX OF 50. THESE PUMPS SHALL BE EQUAL TO HARTELL MODEL A2-X-1965.
14. AUTOMATIC TEMPERATURE CONTROLS: PROVIDE AUTOMATIC TEMPERATURE CONTROLS CAPABLE OF PERFORMING ALL SEQUENCES OF OPERATION SHOWN ON THE DRAWINGS OR DESCRIBED IN THESE SPECIFICATIONS. INDIVIDUAL CONTROL COMPONENTS MAY NOT BE SHOWN ON CONTRACT DOCUMENTS, BUT ATC CONTRACTOR SHALL SUPPLY ALL COMPONENTS, AND CONTROL WIRING (INCLUDING POWER WIRING TO ALL PANELS, CONTROLLERS, TRANSFORMERS, ACTUATORS, ETC.) NECESSARY FOR A COMPLETE OPERABLE SYSTEM. COORDINATE WITH ELECTRICAL CONTRACTOR FOR LOCATION OF LINE VOLTAGE JUNCTION BOX IN EACH MECHANICAL AREA. ATC CONTRACTOR SHALL EXTEND WIRING FROM THESE BOX(ES) TO ALL CONTROL COMPONENTS AND SHALL BE RESPONSIBLE FOR ALL SYSTEM COMPONENTS, WHETHER HE SUBCONTRACTS ELECTRICAL AND OTHER WORK OR NOT. WIRING BETWEEN FIRE ALARM SYSTEM AND TEMPERATURE CONTROL SYSTEM, EXCEPT FOR DUCT MOUNTED SMOKE DETECTORS (FURNISHED BY THE ELECTRICAL CONTRACTOR), SHALL BE BY THE ATC CONTRACTOR.
15. AUTOMATIC TEMPERATURE CONTROL WIRING, CONDUITS AND CABLE
   A. ALL WIRING SHALL BE COPPER AND MEET THE REQUIREMENTS OF THE NEC
   B. RACEWAYS AND CONDUIT: RIGID GALVANIZED STEEL CONDUIT (RGSC) SHALL BE UTILIZED FOR ALL EXTERIOR LOCATIONS WITH THREADED FITTINGS. ELECTRICAL METALLIC TUBING (EMT) SHALL BE UTILIZED INDOORS WITH SET SCREW TYPE FITTINGS. PROVIDE CONDUIT EXPANSION FITTINGS WITH EXTERNAL BONDING JUMPERS EQUAL TO OZ GEDNEY TYPE EX FOR RGSC AND TYPE TX FOR EMT WHEN CROSSING EXPANSION JOINTS. UL LISTED LIQUID TIGHT FLEXIBLE METAL CONDUIT (LFMC) AND FLEXIBLE METAL CONDUIT (FMC) SHALL BE USED FOR FINAL CONNECTIONS TO EQUIPMENT WHERE FLEXIBILITY OR VIBRATION ISOLATION ARE REQUIRED. LFMC SHALL BE UV RESISTANT WHEN INSTALLED IN AN EXTERIOR LOCATION. ALL RACEWAYS, WHICH PASS THROUGH BUILDING EXPANSION JOINTS, SHALL BE EQUIPPED WITH EXPANSION FITTINGS. ALL CONDUITS SHALL BE SUPPORTED IN AN APPROVED MANNER TO THE BUILDING STRUCTURE. SUPPORT FROM CONDUITS, DUCTWORK, PIPING, ETC. WILL NOT BE PERMITTED.
   B.1. CONDUIT IN FINISHED AREAS SHALL BE CONCEALED IN CEILING CAVITY SPACES, PLENUMS, FURRED SPACES AND WALL CONSTRUCTION. EXCEPTION; METALLIC SURFACE RACEWAY MAY BE USED IN FINISHED AREAS ON MASONRY WALLS. ALL SURFACE RACEWAY IN FINISHED AREAS MUST BE COLOR MATCHED TO THE EXISTING FINISH WITHIN THE LIMITATIONS OF STANDARD MANUFACTURED COLORS.
   B.2. CONDUIT, IN NON-FINISHED AREAS WHERE POSSIBLE, SHALL BE CONCEALED IN CEILING CAVITY PACES, PLENUMS, FURRED SPACES, AND WALL CONSTRUCTION. EXPOSED CONDUIT WILL RUN PARALLEL TO OR AT RIGHT ANGLES TO THE BUILDING STRUCTURE.
   C. ALL EXPOSED RACEWAY THAT IS EXPOSED TO MOISTURE OR LOCATED OUTDOORS SHALL BE INSTALLED IN RIGID METAL CONDUIT WITH FLEXIBLE CONNECTIONS TO ALL MECHANICAL EQUIPMENT UTILIZING LIQUID TIGHT FLEXIBLE METAL CONDUIT NOT TO EXCEED 18". ALL PENETRATIONS OF WEATHER TIGHT BOXES SHALL UTILIZE WEATHERPROOF HUBS. ALL CONDUIT SUPPORTS SHALL BE HOT DIPPED GALVANIZED. EXPOSED HORIZONTAL RUNS SHALL BE MINIMIZED. ALL FASTENERS, MISCELLANEOUS SUPPORTS (UNISTRUT OR EQUAL) AND HARDWARE UTILIZED FOR THE WIRING INSTALLATION SHALL BE STAINLESS STEEL. ALL ROOF PENETRATIONS SHALL BE IN ACCORDANCE WITH THE ROOFING MANUFACTURER'S INSTRUCTIONS TO MAINTAIN THE INTEGRITY AND ANY REMAINING WARRANTEE ON THE ROOFING SYSTEM.
   D. FLEXIBLE METALLIC CONDUIT (MAX. 3 FEET) SHALL BE USED FOR CONNECTIONS TO ACTUATOR MOTORS, CONTROLLERS, AND SENSORS MOUNTED ON VIBRATION PRODUCING EQUIPMENT. LIQUID-TIGHT FLEXIBLE CONDUIT SHALL BE USE IN EXTERIOR LOCATIONS AND INTERIOR LOCATIONS SUBJECT TO MOISTURE.
   E. JUNCTION BOXES SHALL BE PROVIDED AT ALL CABLE SPLICES, EQUIPMENT TERMINATION, AND TRANSITIONS FROM EMT TO FLEXIBLE CONDUIT. INTERIOR DRY LOCATION J-BOXES SHALL BE GALVANIZED PRESSED STEEL, NOMINAL FOUR-INCH SQUARE WITH BLANK COVER. EXTERIOR LOCATION JH-BOXES SHALL BE CAST ALLOY FS BOXES WITH THREADED HUBS AND GASKETED COVERS.
   F. WHERE THE SPACE ABOVE THE CEILING IS A SUPPLY OR RETURN AIR PLENUM, THE WIRING SHALL BE PLENUM RATED. TEFLON WIRING CAN BE RUN WITHOUT CONDUIT ABOVE SUSPENDED CEILINGS. EXCEPTION: ANY WIRE RUN IN SUSPENDED CEILINGS THAT IS USED TO CONTROL OUTSIDE AIR DAMPERS OR TO CONNECT THE SYSTEM TO THE FIRE MANAGEMENT OR SMOKE CONTROL SYSTEMS SHALL BE IN CONDUIT.
   G. COAXIAL CABLE SHALL CONFORM TO RG62 OR RG59 RATING. PROVIDE PLENUM RATED COAXIAL CABLE WHEN RUNNING IN RETURN AIR PLENUMS.
   H. ETHERNET 10/100 BASE -T NETWORK WIRING SHALL BE EQUIVALENT TO OWNER'S PREMISE WIRING OR, AS A MINIMUM, CATEGORY 5E OR 6 CABLING UP TO 300' MAXIMUM RUN.
   I. FIBER OPTIC CABLE SHALL BE USED FOR RUNS OVER 300' AND SHALL INCLUDE THE FOLLOWING SIZES; 50/125, 62.5/125 OR 100/140. ONLY GLASS FIBER IS ACCEPTABLE, NO PLASTIC. FIBER OPTIC CABLE SHALL ONLY BE INSTALLED AND TERMINATED BY AN EXPERIENCED CONTRACTOR. THE BAS CONTRACTOR SHALL SUBMIT TO THE ENGINEER THE NAME OF THE INTENDED CONTRACTOR OF THE FIBER OPTIC CABLE WITH HIS SUBMITTAL DOCUMENTS.
   J. CABLES SHALL BE ATTACHED TO THE BUILDING PROPER AT REGULAR INTERVALS SUCH THAT THERE IS NO DROOP GREATER THAN 2 INCHES BETWEEN SUPPORTS. CABLES SHALL NOT TO BE AFFIXED TO OR SUPPORTED BY PIPES, CONDUITS (UNLESS SPECIFICALLY ALLOWED BY THE NEC), DUCTS, ETC. WIRES SHALL BE KEPT A MINIMUM OF THREE (3) INCHES FROM ALL PIPING.
   K. WHERE SENSOR WIRES LEAVE THE CONDUIT SYSTEM, THEY ARE TO BE PROTECTED BY A NON-METALIC BUSHING.
   L. WIRING SHALL NOT BE ALLOWED TO RUN THROUGH ELEVATOR, TELEPHONE EQUIPMENT, AND ELECTRIC ROOMS.
16. DUCTLESS SPLIT AC UNITS: PROVIDE UNITS OF CAPACITIES AND TYPE AS SHOWN ON DRAWINGS BY MITSUBISHI, SANYO, TOSHIBA, FUJITSU, DAIKIN, CARRIER OR SAMSUNG. UNITS SHALL HAVE WIRED MICROPROCESSOR CONTROLS WITH PROGRAMMABLE TIMER AND TEMPERATURES. INDOOR UNITS SHALL HAVE CLEANABLE FILTERS AND ADJUSTABLE FAN SPEEDS AND LOUVERS. OUTDOOR UNITS SHALL BE LOW NOISE. INSTALL WITH PRECHARGED INSULATED REFRIGERANT LINES SIZED FOR THE INSTALLATION CONDITIONS BY THE MANUFACTURER.
17. SPLIT SYSTEM DIRECT EXPANSION AIR CONDITIONING: PROVIDE COMPLETE DX SYSTEM FOR CENTRAL STATION AIR CONDITIONING UNITS OF TYPES, SIZES, AND CAPACITIES SHOWN ON SCHEDULES. SYSTEM SHALL CONSIST OF MATCHING AIR COOLED CONDENSING UNITS, COMPRESSORS, INSULATED PIPING (SIZED BY THE MANUFACTURER FOR THE INSTALLATION CONDITIONS - INCLUDING DOUBLE SUCTION RISERS WHERE NEEDED), CONTROLS PER THE SEQUENCES ON THE DRAWINGS, WIRING, AND OTHER ACCESSORIES AND APPURTENANCES NECESSARY TO PROVIDE FULLY AUTOMATICALLY FUNCTIONING SYSTEM. PROVIDE TIME DELAY RELAY FOR TIMED BYPASS OF THE LOW PRESSURE SWITCH OR OTHER MEANS TO START CONDENSING UNIT AT 0 DEG. F WITHOUT NUISANCE SAFETY TRIP UNITS. UNITS SHALL HAVE THE SCHEDULED NUMBER OF STAGES (AT LEAST ONE PER COMPRESSOR) OF COOLING. PROVIDE INSULATED REFRIGERANT PIPING BETWEEN AIR-COOLED CONDENSING UNIT AND AIR HANDLING UNIT. PROVIDE ALL NECESSARY AUXILIARIES AND APPURTENANCES.
18. PACKAGED DX ROOFTOP UNIT: PROVIDE PACKAGED DX ROOFTOP UNIT BY CARRIER, TRANE, YORK, MAMMOTH, OR DAIKIN. UNIT SHALL HAVE COOLING AND HEATING AS SCHEDULED AND MICROPROCESSOR BASED DISCHARGE AIR, VARIABLE AIR VOLUME CONTROLS (FOR VAV UNITS), AND ALL COMPONENTS REQUIRED TO MEET THE SEQUENCES SHOWN ON THE DRAWINGS (AND INTERFACE WITH THE BUILDINGS' CONTROL SYSTEM FOR GRAPHICS, ALARMS, SCHEDULING AND SETPOINT ADJUSTMENT). FANS SHALL BE STATICALLY AND DYNAMICALLY BALANCED AND RATED IN ACCORDANCE WITH THE LATEST EDITION OF ARI STANDARD 430. PROVIDE PREMIUM EFFICIENCY, VFD COMPATIBLE MOTORS, SIZED TO BE NON-OVERLOADING THROUGHOUT FAN CURVE. COILS SHALL BE RATED IN ACCORDANCE WITH ARI STANDARD 410. ALL STEAM COILS SHALL BE NON-FREEZE TYPE, ELECTRIC COILS SHALL BE RATED BY UL AND NEC. PROVIDE ALL NECESSARY FILTERS AND ACCESSORIES. PROVIDE PREFABRICATED VIBRATION ISOLATION TYPE (UNLESS ALL ROTATING EQUIPMENT HAS INTERNAL VIBRATION ISOLATORS) ROOF CURBS. PROVIDE ALL NECESSARY SAFETY CONTROLS FOR FURNACE OR ELECTRIC COILS. PROVIDE THE SCHEDULED NUMBER OF STAGES (AT LEAST ONE PER COMPRESSOR) OF CAPACITY CONTROL (PLUS, FOR VAV UNITS, HOT GAS BYPASS FOR EACH REFRIGERANT CIRCUIT). PROVIDE THE FOLLOWING ACCESSORIES: 1) FULL ECONOMIZER CONTROL, 2) RETURN/EXHAUST FAN, 3) SINGLE POINT ELECTRICAL CONNECTION STARTERS/VFD'S AND DISCONNECT SWITCH.

PART 3 - EXECUTION

1. DEMOLITION: THE EXISTING FACILITY WILL CONTINUE TO OPERATE DURING ALL PHASES OF THE DEMOLITION WORK AND SUBSEQUENT CONSTRUCTION. NO INTERRUPTION OF THE SYSTEMS WILL BE PERMITTED WITHOUT PRIOR APPROVAL OF THE OWNER'S REPRESENTATIVE. SUBMIT PROPOSED METHODS AND SEQUENCE OF OPERATIONS FOR THE SELECTIVE DEMOLITION WORK TO THE OWNER'S REPRESENTATIVE FOR REVIEW PRIOR TO THE START OF THE WORK. ANY DEMOLITION SHALL BE COORDINATED WITH OWNER, ARCHITECT, CM/GC, AND ENGINEER. PERFORM ALL DEMOLITION WHILE ENSURING MINIMUM INTERFERENCE WITH ADJACENT OCCUPIED AREAS.
2. INSTALLATION OF EQUIPMENT: INSTALL ALL ITEMS SPECIFIED UNDER PART 2 - PRODUCTS, ACCORDING TO THE MANUFACTURER'S REQUIREMENTS, SHOP DRAWINGS, AND DETAILS AS SHOWN ON THE DRAWINGS AND AS SPECIFIED. INSTALL ALL WORK SO THAT PARTS REQUIRING INSPECTION, REPLACEMENT, MAINTENANCE AND REPAIR SHALL BE READILY ACCESSIBLE. MINOR DEVIATIONS FROM THE DRAWINGS MAY BE MADE TO ACCOMPLISH THIS, BUT ANY SUBSTANTIAL CHANGE SHALL NOT BE MADE WITHOUT PRIOR WRITTEN OWNER APPROVAL.
3. IDENTIFICATION: ALL EQUIPMENT, PIPING, AND DUCTWORK PROVIDED UNDER THIS SECTION OF THE SPECIFICATIONS SHALL BE MARKED FOR EASE OF IDENTIFICATION PER OWNER'S OR INDUSTRY STANDARDS.
4. CLEANING: DUCTS SHALL BE THOROUGHLY CLEANED SO THAT NO DIRT OR DUST SHALL BE DISCHARGED FROM DIFFUSERS, REGISTERS, OR GRILLES, WHEN SYSTEM IS OPERATED. AFTER COMPLETION OF PROJECT, CLEAN EXTERIOR SURFACES OF ALL EQUIPMENT INCLUDED IN THIS SECTION, INCLUDING REMOVAL OF CONCRETE RESIDUE. AFTER COMPLETION OF PROJECT, REMOVE ALL CONSTRUCTION DEBRIS, TEMPORARY FACILITIES AND EQUIPMENT FROM WORK AREA. CLEAN WORK AREA TO PERMIT OCCUPATION.
5. TESTING AND INSPECTION: PROVIDE QUALIFIED PERSONNEL, EQUIPMENT, APPARATUS, AND SERVICES FOR TESTING AND INSPECTION OF MECHANICAL SYSTEMS. DO NOT COVER OR CONCEAL WORK BEFORE TESTING AND INSPECTION AND OBTAINING APPROVAL. AFTER ALL COMPONENTS OF THE REFRIGERANT SYSTEMS HAVE BEEN INSTALLED AND THE PIPING CONNECTED, THE SYSTEM SHALL BE SUBJECTED TO A REFRIGERANT LEAKAGE TEST. THE REFRIGERANT LEAKAGE TEST SHALL BE DONE BEFORE ANY REFRIGERANT PIPE IS INSULATED OR COVERED. HIGH AND LOW SIDE OF THE REFRIGERANT SYSTEM SHALL BE TESTED FOR THE MINIMUM REFRIGERANT LEAKAGE TEST PRESSURE SPECIFIED IN ASHRAE 15, FOR THE REFRIGERANT USED. SYSTEM SHALL BE PROVED TIGHT AND FREE OF LEAKS BY ALLOWING THE REFRIGERANT LEAKAGE TEST PRESSURE TO REMAIN ON THE SYSTEM FOR 24 HOURS WITH NO DROP IN PRESSURE. LEAKS, DAMAGE, AND DEFECTS DISCOVERED OR RESULTING FROM TESTING SHALL BE REPAIRED OR REPLACED TO LIKE-NEW CONDITION WITH ACCEPTABLE MATERIALS. TESTS SHALL BE CONTINUED UNTIL SYSTEMS OPERATE WITHOUT LEAKS OR REPAIRS. REPORT ON INDUSTRY STANDARD REPORTING FORMS, SUBMITTED FOR APPROVAL IN ADVANCE. SUBMIT SIX COPIES OF TESTING REPORTS FOR APPROVAL. CONTRACTOR SHALL FURNISH ALL TEST MEDIUMS AND DISPOSE OF ALL TEST MEDIUMS AT AN APPROVED OFF SITE LOCATION AFTER TESTING IS COMPLETE.
6. CONTROLS START UP AND TESTING: EACH POINT IN THE CONTROL SYSTEM SHALL BE TESTED FOR BOTH HARDWARE AND SOFTWARE FUNCTIONALITY (INCLUDING ALARMS AND GRAPHICS) AND SHALL BE TESTED AGAINST THE APPROPRIATE SEQUENCE OF OPERATION. A WRITTEN REPORT SHALL BE SUBMITTED TO THE OWNER INDICATING THAT THE INSTALLED SYSTEM FUNCTIONS IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS.
7. START UP AND BALANCING: PROVIDE NEBB, AABC, TABB OR NBC CERTIFIED PERSONNEL, EQUIPMENT, APPARATUS, AND SERVICES FOR START-UP AND BALANCING OF MECHANICAL SYSTEMS TO PERFORMANCE DATA SHOWN IN SCHEDULES AND ON DRAWINGS, AS SPECIFIED, AND AS REQUIRED BY CODES, STANDARDS, REGULATIONS, AND AUTHORITIES HAVING JURISDICTION INCLUDING CITY INSPECTORS. AIR FLOWS SHALL BE BALANCED TO +/- 10% OF DESIGN. LEAKS, DAMAGE, AND DEFECTS DISCOVERED OR RESULTING FROM START-UP AND BALANCING SHALL BE REPAIRED OR REPLACED TO LIKE-NEW CONDITION WITH ACCEPTABLE MATERIALS. TESTS SHALL BE CONTINUED UNTIL SYSTEM OPERATES WITHOUT ADJUSTMENTS OR REPAIRS. REPORT DATA ON INDUSTRY STANDARD NEBB, AABC, OR NBC REPORTING FORMS. SUBMIT SIX COPIES OF START-UP AND BALANCING REPORTS TO ARCHITECT FOR APPROVAL.

PART 4 - PROJECT CLOSEOUT

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ITEMS ASSOCIATED WITH PROJECT CLOSEOUT. ALLOW SUFFICIENT TIME IN THE CONSTRUCTION SCHEDULE TO ENSURE THAT THE INSTALLATION IS SUBSTANTIALLY COMPLETE AND ALL REQUIRED TESTING AND ACCURATELY COMPLETED DOCUMENTATION IS DELIVERED TO THE ENGINEER AT LEAST TWO WEEKS PRIOR TO ENGINEER'S SUBSTANTIAL COMPLETION SITE VISIT. FAILURE TO ADEQUATELY PLAN OR SUBMISSION OF INCOMPLETE/INCORRECT DOCUMENTATION WILL RESULT IN BACK CHARGES OF ALL COSTS ASSOCIATED WITH ADDED WORK PERFORMED BY NV5.
2. PROVIDE CERTIFICATES OF INSPECTIONS FROM EQUIPMENT MANUFACTURERS FOR ALL COMPRESSORIZED AND GAS FIRED EQUIPMENT STATING THAT THE AUTHORIZED FACTORY REPRESENTATIVES HAVE INSPECTED AND TESTED THE OPERATION OF THEIR RESPECTIVE EQUIPMENT AND FOUND THE EQUIPMENT TO BE IN SATISFACTORY OPERATING CONDITION AND INSTALLED PER THE MANUFACTURERS INSTALLATION INSTRUCTIONS AND REQUIREMENTS.
3. PROVIDE BACKUP DOCUMENTATION TO VERIFY THAT ALL SEQUENCES OF OPERATIONS AND CONTROLS HAVE BEEN INCORPORATED AND ALL SYSTEMS AND EQUIPMENT ARE WORKING PER THE SPECIFIED SEQUENCES OF OPERATIONS.
4. PROVIDE BACKUP DOCUMENTATION THAT ALL PIPE LEAKAGE AND PRESSURE TESTS HAVE BEEN CONDUCTED AND THAT ALL SYSTEMS HAVE PASSED. PROVIDE START-UP AND BALANCING REPORTS FOR ALL AIR SYSTEMS. AIR BALANCING REPORT SHALL VERIFY THE DESIGN OUTDOOR AIR IS BEING SUPPLIED TO THE BUILDING.
5. THE CONTRACTOR SHALL SUBMIT COMMISSIONING AND COMMISSIONING PLANS INCLUDING PRELIMINARY COMMISSIONING REPORTS DEVELOPED BY A REGISTERED DESIGN PROFESSIONAL OR AN APPROVED AGENCY IN ACCORDANCE WITH 2018 INTERNATIONAL ENERGY CONSERVATION CODE. THE SAME REGISTERED DESIGN PROFESSIONAL OR APPROVED AGENCY SHALL PROVIDE EVIDENCE OF MECHANICAL SYSTEMS COMMISSIONING AND COMPLETION TO THE PROFESSIONAL ENGINEER STAMPING THE HVAC DRAWINGS IN ACCORDANCE WITH THE PROVISIONS OF THE CODE SECTIONS.
6. SUBSTANTIAL COMPLETION SITE VISIT BY THE ENGINEER SHALL BE CONDUCTED AFTER RECEIPT AND REVIEW OF THE CONTRACTOR'S CERTIFICATE OF COMPLETION AND ALL CODE MANDATED TEST REPORTS AND SUBMISSIONS LISTED ABOVE. SUBSTANTIAL COMPLETION SITE VISITS SHALL NOT BE REQUESTED UNTIL THE PROJECT IS SUBSTANTIALLY COMPLETE.
7. PREMATURE REQUESTS THAT REQUIRE ADDITIONAL/FOLLOW UP SITE VISITS BY THE ENGINEER OF DEFICIENT ITEMS (AREAS INCOMPLETE, SYSTEMS NOT OPERATIONAL, ETC.) WILL RESULT IN BACK CHARGES OF THE COSTS ASSOCIATED WITH ANY ADDED VISITS.

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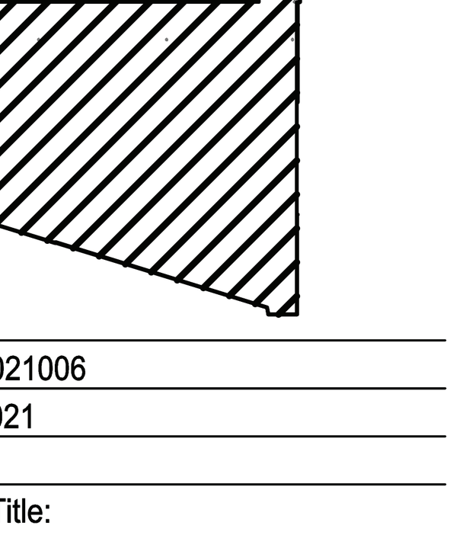
10954

Number	Description	Date
	ISSUED FOR PERMIT & CONST.	23 JULY 2021

Key Plan:



Project No.: Y021006
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Drawing Sheet Title:
HVAC SPECIFICATIONS

Drawing Sheet Number:
M-001

Owner's Branch No.:
532

DEMOLITION SHEET NOTES:

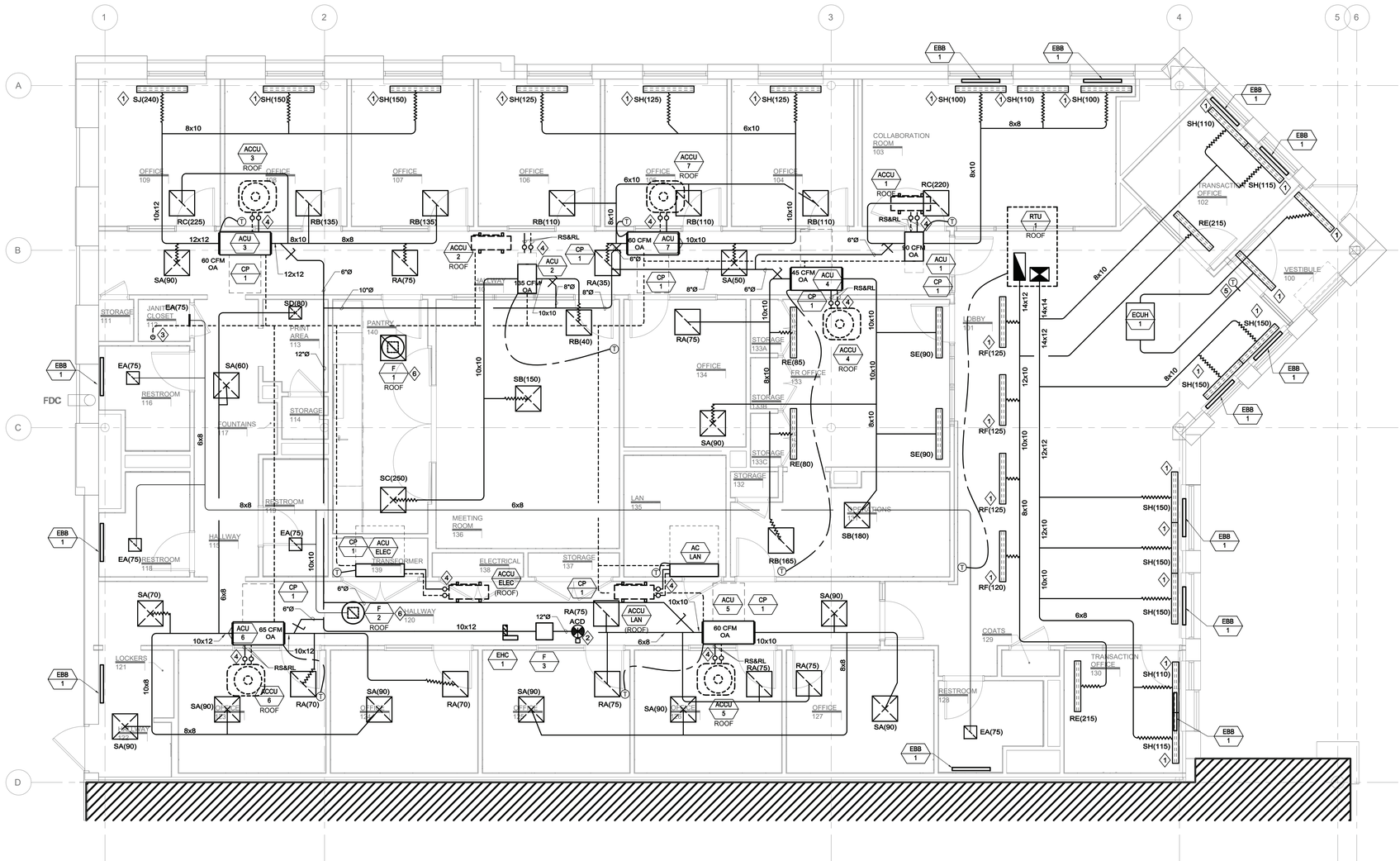
1. REFER TO SHEET H-000 FOR HVAC LEGEND, SYMBOLS AND ABBREVIATIONS.
2. THE EXISTING FACILITY WILL CONTINUE TO OPERATE DURING ALL PHASES OF THE DEMOLITION WORK AND SUBSEQUENT CONSTRUCTION. NO INTERRUPTION OF THE SYSTEMS WILL BE PERMITTED WITHOUT PRIOR APPROVAL OF THE OWNER'S REPRESENTATIVE.
3. PERFORM ALL DEMOLITION WHILE ENSURING MINIMUM INTERFERENCE WITH ADJACENT OCCUPIED AREAS.
4. PRIOR TO THE START OF DEMOLITION, CONTRACTOR SHALL FIELD VERIFY ALL EXISTING HVAC DUCTWORK, EQUIPMENT, DIFFUSERS AND SYSTEM LOCATIONS.
5. EXISTING DUCTWORK AND PIPING TO BE REUSED SHALL BE CLEANED, SEALED AND INSULATED PER LOCAL BUILDING CODE AND PER SPECIFICATIONS. GENERALLY THE CONTRACTOR IS TO ENSURE THAT THE CONDITION OF THE DUCTWORK IS ACCEPTABLE FOR REUSE.
6.
7. DEMOLITION SCOPE INCLUDES THE DEMOLITION OF ALL HVAC EQUIPMENT SERVING THE SPACE EXCEPT WHERE CALLED FOR REUSE. THE DEMOLITION SCOPE INCLUDES ALL AIR HANDLERS, HEAT PUMPS, DUCTWORK, DIFFUSERS/GRILLES, AIR CONDITIONING UNITS, PIPING, HANGERS, AND CONTROLS.

SHEET NOTES:

1. REFER TO SHEET H-000 FOR HVAC LEGEND, SYMBOLS AND ABBREVIATIONS.
2. CONTRACTOR TO COORDINATE ALL BUILDING SHUTDOWNS WITH BUILDING MANAGEMENT.
3. ALL EXISTING DUCTWORK AND PIPING WHICH IS TO BE REUSED SHALL BE CLEANED, REINFORCED, INSULATED, LINED, SEALED AND BRAGED AS PER SPECIFICATIONS.
4. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING DUCT AND PIPE SIZES AND LOCATIONS PRIOR TO THE START OF CONSTRUCTION. CONTRACTOR SHALL INFORM ENGINEER OF ANY DISCREPANCIES ON DRAWINGS.
5. CONTRACTOR SHALL ENSURE ALL EXISTING EQUIPMENT IS OPERATING PROPERLY PRIOR TO REUSE AND SHALL REPAIR/REPLACE EQUIPMENT NOT OPERATING PROPERLY.
6. PROVIDE FIRE DAMPERS AT ALL FIRE RATED WALLS.
7. PROVIDE VOLUME DAMPERS AT EACH DIFFUSER, REGISTER AND GRILLE (AIR DEVICE). ALL VOLUME DAMPERS SHALL BE ACCESSIBLE. VOLUME DAMPERS LOCATED IN INACCESSIBLE LOCATIONS SHALL BE PROVIDED WITH REMOTELY ADJUSTABLE BALANCING DAMPER.
8. THERMOSTATS SHALL BE MOUNTED 4'-0" ABOVE FINISHED FLOOR, COORDINATE EXACT LOCATION WITH THE ARCHITECT. THERMOSTATS MOUNTED ON PERIMETER WALLS SHALL BE PROVIDED WITH AN INSULATED BACK PLATE.
9. CONTRACTOR TO ENSURE A RETURN AIR PATH IS AVAILABLE FROM ALL ROOMS AND SPACES BACK TO THE MAIN RETURN AIR DUCT INLETS. CONTRACTOR SHALL PROVIDE TRANSFER DUCTS AT ALL FULL HEIGHT PARTITIONS. ALL TRANSFER DUCTS SHALL BE LINED AND CONSTRUCTED ACCORDING TO DETAIL. TRANSFER DUCTS SHALL BE SIZED AT A MAXIMUM VELOCITY OF 300 FPM.
10. PROVIDE CLEANOUTS AT ALL CHANGES IN DIRECTION FOR ALL CONDENSATE DRAIN PIPING.
11. PROVIDE RAWAL APR CONTROL DEVICE, AS MANUFACTURED BY RAWAL DEVICES INC., FOR ALL SPLIT SYSTEMS/ROOF TOP UNITS OF 2.5 TON CAPACITY AND LARGER. APR CONTROL SHALL BE INSTALLED ON THE CONDENSING SECTION OF THE SYSTEM IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
12. HVAC CONTRACTOR SHALL INCLUDE AS PART OF PROJECT SCOPE (1) 8 HOUR DAY FOR HVAC TECHNICIAN, BALANCING CONTRACTOR AND CONTROLS CONTRACTOR TO INTERFACE WITH THE HVAC DESIGN ENGINEER AFTER THE REQUIRED START UP AND BALANCING HAS BEEN COMPLETED TO VERIFY PROPER OPERATION OF ALL MECHANICAL SYSTEMS BEFORE THE SPACE IS TURNED OVER TO FIDELITY INVESTMENTS. DURING THIS MEETING, THE CONTRACTORS SHALL HAVE WITH THEM ALL NECESSARY EQUIPMENT TO VERIFY OPERATION OF EQUIPMENT AND TO VERIFY AIRFLOWS (DIFFUSER AND TRAVERSE). ANY DEFICIENCIES FOUND DURING THIS WALK THROUGH SHALL BE CORRECTED AT NO ADDITIONAL EXPENSE TO THE OWNER.
13. ALL DUCT RUNOUTS TO DIFFUSERS SHALL MATCH SCHEDULED DIFFUSER NECK SIZE, UNLESS OTHERWISE NOTED.
14. ALL DUCT RUNOUTS TO TERMINAL EQUIPMENT SHALL MATCH SCHEDULED INLET SIZE, UNLESS OTHERWISE NOTED.

KEYNOTES:

1. PROVIDE WITH REMOTELY ADJUSTABLE VOLUME DAMPER PER DETAIL.
2. 12"Ø EXHAUST AIR DUCT UP THROUGH ROOF. TERMINATE WITH GOOSENECK PER DETAIL.
3. 3/4" CONDENSATE DRAIN PIPING DOWN TO JANITORS CLOSET SINK.
4. MANUFACTURER TO SIZE REFRIGERANT LINES. CONTRACTOR SHALL CONFIRM FINAL ROUTING AND SIZING WITH MANUFACTURER'S RECOMMENDATIONS.
5. REMOTE DUCT MOUNTED TWO STAGE T-STAT.
6. PROVIDE WITH ACD.



1 HVAC PLAN
M-201 SCALE: 1/4" = 1'-0"

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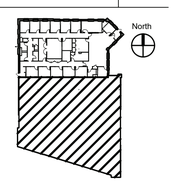

Landlord Comments:

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Drawing Sheet Title:
HVAC 1ST FLOOR PLAN

Drawing Sheet Number:
M-201

Owner's Branch No.:
532

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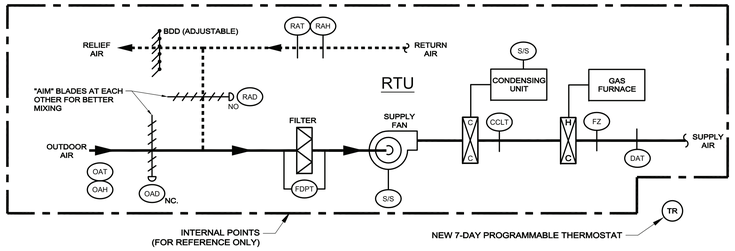


UNIT CONTROLS:

GENERAL

1. UNIT SHALL BE STARTED AND STOPPED VIA SPACE MOUNTED PROGRAMMABLE THERMOSTAT. ALL SETPOINTS SHALL BE ADJUSTABLE. ALL ACTUATORS SHALL BE ELECTRONIC.
2. ALL TEMPERATURES LISTED ARE FAHRENHEIT.
3. PROVIDE APPROPRIATE ANTI-RECYCLE TIME DELAYS ON COMPRESSOR.
4. OCCUPIED TIMES SHALL BE 7:00 AM TO 7:00 PM, MONDAY THROUGH FRIDAY.
5. OCCUPIED COOLING SETPOINT SHALL BE 73°F (ADJ.) AND HEATING SETPOINT SHALL BE 68°F (ADJ.). UNOCCUPIED COOLING SETPOINT SHALL BE 85°F (ADJ.) AND HEATING SETPOINT SHALL BE 55°F (ADJ.).

FAN CONTROL

1. WHILE IN THE OFF MODE (OR ON SAFETY OR MANUAL DISCONNECT) RTU SHALL BE OFF WITH THE OUTSIDE AIR DAMPER (OAD) CLOSED, THE CONDENSING UNIT OFF, AND THE RETURN AIR DAMPER (RAD) OPEN.
2. WHEN STARTED IN OCCUPIED MODE, THE OAD SHALL OPEN TO THE MINIMUM OUTDOOR AIR POSITION, AS SET DURING BALANCING AND THE UNIT SUPPLY FAN SHALL START AND RUN CONTINUOUSLY.

OCCUPIED HEATING CONTROL

1. UPON A DROP IN ROOM TEMPERATURE BELOW THE ROOM HEATING SETPOINT OF 68°F, THE ROOFTOP UNIT SHALL STAGE ON IN THE HEATING MODE AS REQUIRED TO MAINTAIN THE SPACE TEMPERATURE SETPOINT. THE REVERSE SHALL OCCUR ON A RISE IN SPACE TEMPERATURE.

OCCUPIED COOLING CONTROL

1. UPON A RISE IN ROOM TEMPERATURE ABOVE THE ROOM COOLING SETPOINT OF 73°F, THE COOLING CYCLE SHALL BE ACTIVATED.
2. THE FIRST MEANS OF COOLING SHALL BE ACTIVATION OF THE ECONOMIZER. IF THE OUTSIDE AIR ENTHALPY IS BELOW THE RETURN AIR ENTHALPY, THE OUTSIDE AND RETURN AIR DAMPERS SHALL BE PROPORTIONALLY MODULATED UP TO 100% OUTDOOR AIR TO MAINTAIN SPACE TEMPERATURE SETPOINT. DAT SHALL OVERRIDE, IF REQUIRED, TO LIMIT SUPPLY AIR TEMPERATURE TO 55°F MINIMUM DURING ECONOMIZER COOLING (LIMIT SHALL NOT RESULT IN REDUCTION OF THE MINIMUM OUTDOOR AIRFLOW). IF ADDITIONAL COOLING IS REQUIRED, THE CONDENSING UNIT'S COMPRESSORS SHALL BE STAGED ON AS REQUIRED. FOR LOW LOAD OPERATION, RAWAL APR CONTROL DEVICE SHALL BE USED. THE REVERSE SHALL OCCUR ON A DROP IN SPACE TEMPERATURE BELOW COOLING SETPOINT.
3. IF THE OUTSIDE AIR ENTHALPY RISES ABOVE THE RETURN AIR ENTHALPY THE ECONOMIZER SHALL BE POSITIONED TO PROVIDE MINIMUM OUTDOOR AIRFLOW AND THE UNIT STAGED TO MAINTAIN ROOM COOLING SETPOINT TEMPERATURE. DAT SHALL LIMIT SUPPLY AIR TO 55°F MINIMUM, DURING MECHANICAL COOLING.

UNOCCUPIED MODE

1. UNIT'S OUTSIDE AIR DAMPER WILL BE CLOSED. IF SPACE TEMPERATURE FALLS BELOW 55°F (ADJ) FOR A PERIOD OF FIVE MINUTES, RETURN AIR DAMPER WILL BE FULL OPEN, FAN SHALL START AND THE UNIT SHALL OPERATE IN HEATING MODE. WHEN ROOM TEMPERATURE RISES ABOVE 60°F, THE UNIT SHALL SHUT DOWN.
2. UNIT'S OUTSIDE AIR DAMPER WILL BE CLOSED. IF SPACE TEMPERATURE RISES ABOVE 85°F (ADJ) FOR A PERIOD OF FIVE MINUTES, RETURN AIR DAMPER WILL BE FULL OPEN, FAN SHALL START AND UNIT SHALL GO INTO COOLING MODE TO SATISFY THERMOSTAT (TR).

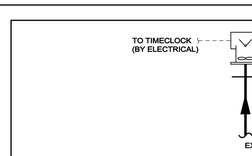
WARM-UP CONTROL

1. PROGRAMMABLE THERMOSTAT SHALL PROVIDE OPTIMUM START CAPABILITY. WARM-UP SHALL BE DONE WITH RAD OPEN AND OAD CLOSED. WHEN ROOM TEMPERATURE RISES ABOVE 68°F, OCCUPIED MODE SHALL START.

SAFETIES

1. THE FOLLOWING SAFETIES EACH WITH ITS OWN MANUAL RESET BUTTON, SHALL SHUT DOWN THE UNIT VIA HARDWIRE BEFORE H-O-A.
   a. ANY FREEZESTAT (FZ) SHALL SHUTDOWN THE UNIT WHENEVER THE TEMPERATURE IS LESS THAN 35°F.

NV5 | ROOFTOP UNIT CONTROL SEQUENCE | HC02



F1 & F-2

EXHAUST FAN:

1. OCCUPIED MODE: THE TIME CLOCK (PROVIDED BY ELECTRICAL) LOCATED IN THE ELECTRICAL CLOSET SHALL SEND A SIGNAL TO THE THE EXHAUST FAN TO START. OCCUPIED TIMES SHALL BE 7:00AM - 7:00PM. UPON ACTIVATION THE AUTOMATIC CONTROL DAMPER (ACD) SHALL OPEN AND THE FAN IS ENABLED.
2. UNOCCUPIED MODE: THE TIME CLOCK LOCATED IN THE ELECTRICAL CLOSET SHALL SEND A SIGNAL TO THE EXHAUST FAN TO DE-ENERGIZE. UPON DEACTIVATION THE FAN SHALL SHUT DOWN AND THE AUTOMATIC CONTROL DAMPER SHALL CLOSE.

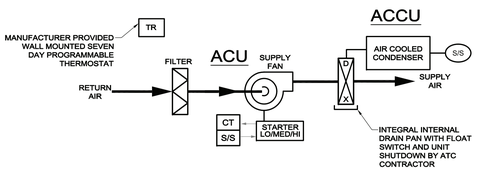
NV5 | F-1 & F-2 ROOF EXHAUST FAN CONTROL SEQUENCE | HC04

HVAC EQUIPMENT HOURS OF OPERATION SCHEDULE

SYSTEM	OCCUPIED HOURS OF OPERATION	THERMOSTAT SET-POINT				FAN SPEED		REMARKS
		OCCUPIED		UNOCCUPIED				
		COOLING (°F)	HEATING (°F)	COOLING (°F)	HEATING (°F)	OCCUPIED	UNOCCUPIED	
ROOFTOP UNIT	7 A.M. - 7 P.M.	73	68	85	55	ON	AUTO	SEE NOTES
SPLIT HEAT PUMPS (ACU/ACCU)	7 A.M. - 7 P.M.	73	68	85	55	ON	AUTO	SEE NOTES
OUTDOOR AIR FAN	7 A.M. - 7 P.M.	-	-	-	-	ON	OFF	SEE NOTES
TOILET/JANITORS EXHAUST FAN	7 A.M. - 7 P.M.	-	-	-	-	ON	OFF	SEE NOTES
LAN AND ELEC ROOM AC UNITS	24 / 7	75	55	-	-	AUTO	-	SEE NOTES

NOTES:

1. COORDINATE FINAL HOURS OF OPERATION WITH LANDLORD.
2. REFER TO CONTROL SEQUENCES FOR ADDITIONAL INFORMATION.
3. HOURS OF OPERATION ARE SPECIFIED FOR WEEKDAYS MONDAY THROUGH FRIDAY AND EXCLUDES HOLIDAYS AS DETERMINED BY LANDLORD (UNLESS OTHERWISE NOTED).



DUCTLESS SPLIT AIR CONDITIONING UNIT CONTROL SEQUENCE:

GENERAL

1. THIS SEQUENCE APPLIES TO THE DUCTLESS SPLIT AIR CONDITIONING UNITS SERVING THE LAN AND ELECTRICAL ROOMS.
2. UNIT SHALL BE STARTED AND STOPPED VIA A WALL MOUNTED SEVEN DAY PROGRAMMABLE THERMOSTAT. CONTROL SHALL BE BY MANUFACTURER SUPPLIED MICROPROCESSOR CONTROLLER.
3. ALL TEMPERATURES LISTED ARE FAHRENHEIT.
4. OCCUPIED COOLING SETPOINT SHALL BE 75°F (ADJ.). OCCUPIED HEATING SETPOINT SHALL BE 55°F (ADJ.).
5. PROVIDE APPROPRIATE ANTI-RECYCLE TIME DELAYS ON COMPRESSOR.
6. UNIT SHALL BE IN OCCUPIED MODE AT ALL TIMES.

FAN CONTROL

1. THE FAN OPERATION AND SPEED SHALL BE CONTROLLED BY UNIT CONTROLLER TO MAINTAIN FAN AT OPTIMUM SPEED WHILE THE UNIT IS IN OCCUPIED MODE AS SPACE CONDITIONS REQUIRE.

COOLING CONTROL

1. UPON AN INCREASE IN SPACE TEMPERATURE ABOVE 75°F (ADJ.), AS SENSED BY THE SPACE MOUNTED SEVEN DAY PROGRAMMABLE THERMOSTAT, THE UNIT SHALL ENERGIZE IN COOLING MODE IN ORDER TO MAINTAIN SPACE TEMPERATURE.
2. THE REVERSE SHALL OCCUR UPON A DROP IN SPACE TEMPERATURE.

HEATING CONTROL

1. UPON A DROP IN SPACE TEMPERATURE BELOW 55°F (ADJ.), AS SENSED BY THE SPACE TEMPERATURE SENSOR, THE ASSOCIATED AC UNIT SHALL OPERATE IN THE HEATING MODE AS REQUIRED TO MAINTAIN SPACE TEMPERATURE.
2. THE REVERSE SHALL OCCUR UPON A RISE IN SPACE TEMPERATURE.

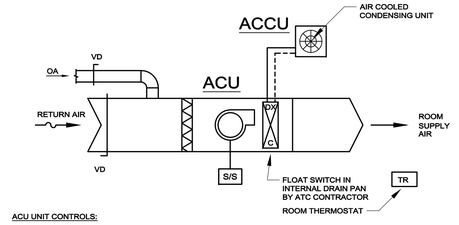
ALARMS/SAFETIES

1. IF THE AC UNIT FAILS, ROOM TEMPERATURE IS ABOVE 80°F (ADJ), ROOM TEMPERATURE IS BELOW 50°F (ADJ.), OR ANY SAFETY IS TRIPPED, THE CONTROLLER SHALL SHALL GENERATE AN AUDIBLE ALARM WITHIN THE SPACE.
2. UPON ACTIVATION OF THE FLOAT SWITCH, UNIT SHALL TURN OFF.

NOTES

1. CONDUIT FOR INTERCONNECTING CONTROL WIRING BETWEEN INDOOR AND OUTDOOR UNITS TO BE PROVIDED BY ELECTRICAL CONTRACTOR.

NV5 | DUCTLESS SPLIT AC UNIT | HC04



ACU UNIT CONTROLS:

GENERAL

1. THE UNIT SHALL BE STARTED AND STOPPED VIA A 7-DAY PROGRAMMABLE THERMOSTAT WITH MICROPROCESSOR CONTROLS CAPABLE OF CONTROLLING THE ACU .
2. PROVIDE APPROPRIATE ANTI-CYCLE TIME DELAYS ON COMPRESSOR.
3. OCCUPIED TIMES SHALL BE 7:00AM TO 7:00PM.
4. OCCUPIED COOLING SETPOINT SHALL BE 73°F (ADJ.) AND THE HEATING SETPOINT SHALL BE 68°F (ADJ.).
5. UNOCCUPIED COOLING SETPOINT SHALL BE 85°F (ADJ.) AND THE HEATING SETPOINT SHALL BE 55°F (ADJ.).

FAN CONTROL

1. DURING OCCUPIED HOURS, THE FAN SHALL RUN CONTINUOUSLY.
2. DURING UNOCCUPIED HOURS, THE FAN SHALL RUN UPON A CALL FOR HEATING OR COOLING.

COOLING CONTROL

1. DURING OCCUPIED COOLING THE UNIT SHALL OPERATE AS REQUIRED TO MAINTAIN A SPACE TEMPERATURE OF 73°F (ADJ.), AS SENSED BY THE ROOM THERMOSTAT.
2. DURING UNOCCUPIED COOLING THE UNIT SHALL OPERATE AS REQUIRED TO MAINTAIN A SPACE TEMPERATURE OF 85°F (ADJ.), AS SENSED BY THE ROOM THERMOSTAT.

HEATING CONTROL

1. DURING OCCUPIED HEATING THE UNIT SHALL OPERATE AS REQUIRED TO MAINTAIN A SPACE TEMPERATURE OF 68°F (ADJ.), AS SENSED BY THE ROOM THERMOSTAT.
2. DURING UNOCCUPIED HEATING THE UNIT SHALL OPERATE AS REQUIRED TO MAINTAIN A SPACE TEMPERATURE OF 55°F (ADJ.), AS SENSED BY THE ROOM THERMOSTAT.

WARM-UP CONTROL

1. PROGRAMMABLE THERMOSTAT SHALL PROVIDE OPTIMUM START CAPABILITY. WARM-UP SHALL BE DONE WITH ACD OPEN. WHEN ROOM TEMPERATURE RISES ABOVE 68°F, OCCUPIED MODE SHALL START.

ALARMS

1. UPON ACTIVATION OF THE FLOAT SWITCH, UNIT SHALL TURN OFF.

NV5 | ACU/ACCU CONTROL SEQUENCE | HC03

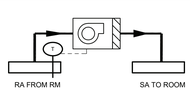
EBB

ELECTRIC BASEBOARD

1. THIS SEQUENCE APPLIES TO ELECTRIC BASEBOARD HEATER.
2. THE ELECTRIC BASEBOARD SHALL BE CONTROLLED BY AN INTEGRAL THERMOSTAT. THE ELECTRIC BASEBAORD HEATER SHALL BE OFF DURING UNOCCUPIED HOURS.
3. UPON A CALL FOR HEAT FROM THE THERMOSTAT, ELECTRIC BASEBOARD SHALL BE ENERGIZED AS REQUIRED TO MAINTAIN THE SPACE TEMPERATURE SETPOINT, 68°F (ADJUSTABLE). THE REVERSE SHALL OCCUR UPON A RISE IN SPACE TEMPERATURE.

NV5 | ELECTRIC BASEBOARD HEATER | HC02

ECUH



VESTIBULE CEILING MOUNTED ELECTRIC CABINET UNIT HEATER:

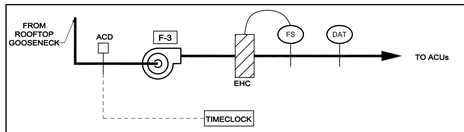
GENERAL

1. THE FAN AND ELECTRIC HEATING COIL SHALL BE CONTROLLED BY THE THERMOSTAT MOUNTED IN RETURN GRILLE.

CONTROL SEQUENCE

1. WHEN THE SENSOR LOCATED IN THE ASSOCIATED RETURN GRILLE SENSES A DROP IN SPACE TEMPERATURE BELOW SETPOINT (68°F ADJ) THE FAN SHALL ENERGIZE AND THE ELECTRIC COIL SHALL STAGE ON/OFF AS REQUIRED.

NV5 | CEILING MOUNTED CABINET UNIT HEATER CONTROL SEQUENCE | HC05



OUTDOOR AIR FANS AND ELECTRIC HEATING COILS

1. THIS SEQUENCE APPLIES TO THE OUTDOOR AIR FANS AND ELECTRIC HEATING COILS.
2. OCCUPIED MODE: DURING OCCUPIED HOURS.
   2.1. A TIMECLOCK SHALL SEND A SIGNAL TO OPEN THE DAMPER (ACD) FOR F-1 TO START. AFTER ENDSWITCH (ES) PROVES ACD OPEN, THE FAN SHALL START. OCCUPIED TIMES SHALL BE 9:00AM - 5:00PM (ADJ.) AND SHALL BE CONFIRMED BY OWNER. THE FAN SHALL RUN CONTINUOUSLY DURING OCCUPIED HOURS.
   2.2. FAN F-1 SHALL BE CONSTANT VOLUME.
   2.3. UPON PROOF OF AIRFLOW, AT FLOW SWITCH (FS), ELECTRIC HEATING COIL (EHC) SHALL ENERGIZE AS REQUIRED TO MAIN A DISCHARGE TEMPERATURE (DAT) OF 60°F (ADJ.)
3. UNOCCUPIED MODE: THE TIMECLOCK SHALL SEND A SIGNAL FOR THE ELECTRIC HEATING COIL TO DE-ENERGIZE, FANS TO STOP, AND DAMPER (ACD) TO CLOSE.
4. COORDINATE LOCATION OF TIMECLOCK WITH GENERAL CONTRACTOR.
5. TIMECLOCK SHALL BE PROVIDED BY MECHANICAL CONTRACTOR. ATC CONTRACTOR SHALL PROVIDE ALL CONTROL WIRING.
6. FAN SHALL SHUT DOWN IF ASSOCIATED SMOKE FIRE DAMPER CLOSES.

NV5 | OUTDOOR AIR FAN AND ELECTRIC HEATING COIL CONTROL SEQUENCE | HC04

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Fidelity Investor Center
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Nanuet, NY
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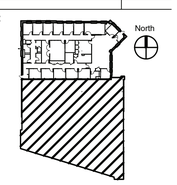
Number	Description	Date
	ISSUED FOR PERMIT & CONST.	23 JULY 2021

Key Plan:



Project No.: Y021006
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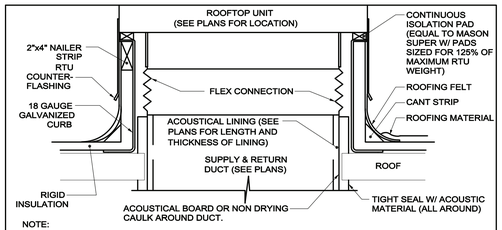
Drawing Sheet Title:
HVAC CONTROLS

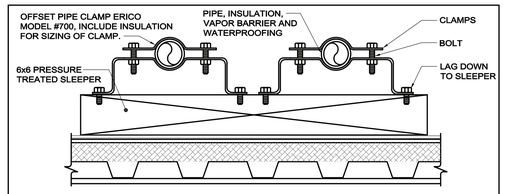
Drawing Sheet Number:
H-600

Owner's Branch No.:
532



NOTE:
1. LINE THE TOP OF THE ROOF UNDER CURB AND SIDES OF CURB W/ 4" THICK (TWO 2" LAYERS) ACOUSTICAL BOARD.

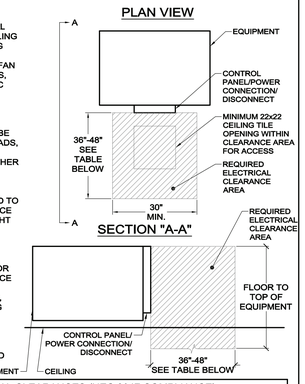
NV5 ROOFTOP UNIT MOUNTING W/ CURB — H907



NOTES:
1. FOR DISTANCE BETWEEN SUPPORTS REFER TO SPECIFICATIONS.
2. THE SUPPORTS SHALL BE SUBMITTED AS SHOP DRAWINGS AND SHALL BE REVIEWED BY THE REGISTERED STRUCTURAL ENGINEER.
3. PROVIDE DOUBLE LAYER SLIP SHEET (ROOF MEMBRANE) BETWEEN ROOF & SLEEPER.

NV5 ROOF SURFACE MOUNTED PIPING SUPPORT (UP TO 3") — H007

NOTES:
1. DETAIL APPLIES TO ALL MECHANICAL EQUIPMENT LOCATED ABOVE A CEILING THAT REQUIRES POWER, INCLUDING CONTROL POWER. EQUIPMENT INCLUDES, BUT IS NOT LIMITED TO, FAN POWERED BOXES, VAV BOXES, FANS, FAN COIL UNITS, HEAT PUMPS, CRAC UNITS, DX SPLIT SYSTEMS, DUCT HEATERS, ETC.
2. ELECTRICAL CLEARANCE AREA (INCLUDING WITHIN CEILING) MUST BE FREE FROM LIGHTS, SPRINKLER HEADS, FIRE ALARM DEVICES, SPEAKERS, PIPING, DUCTWORK, BEAMS AND OTHER OBSTRUCTIONS.
3. THE HEIGHT OF THE ELECTRICAL CLEARANCE SHALL BE AS REQUIRED TO INSTALL AND PERFORM MAINTENANCE ON THE EQUIPMENT. MINIMUM HEIGHT SHALL BE FROM FLOOR TO TOP OF EQUIPMENT.
4. REFER TO SPECIFIC MANUFACTURER PRODUCT DATA FOR ADDITIONAL ACCESS AND CLEARANCE REQUIREMENTS FOR FANS, COMPRESSORS, VALVES, DAMPERS, FILTERS, ETC. COORDINATE CEILING MOUNTED DEVICE LOCATIONS AS REQUIRED
5. COORDINATE WITH ALL TRADES TO PROVIDE THESE MINIMUM REQUIRED CLEARANCES.

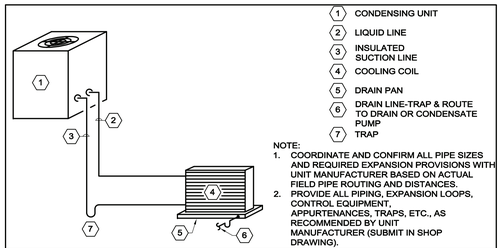


MINIMUM ELECTRICAL CLEARANCES (NEC 2017 COMPLIANCE)

VOLTAGE TO GROUND (SINGLE PHASE VOLTAGE)	CONDITION 1	CONDITION 2	CONDITION 3
0-150	36"	36"	36"
151-600	36"	42"	48"

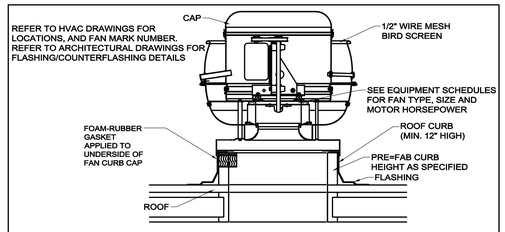
CONDITION 1 - EXPOSED LIVE PARTS ON ONE SIDE OF THE WORKING SPACE AND NO LIVE OR GROUNDED PARTS ON THE OTHER SIDE OF THE WORKING SPACE, OR EXPOSED LIVE PARTS ON BOTH SIDES OF THE WORKING SPACE THAT ARE EFFECTIVELY GUARDED BY INSULATING MATERIALS.
CONDITION 2 - EXPOSED LIVE PARTS ON ONE SIDE OF THE WORKING SPACE AND GROUNDED PARTS ON THE OTHER SIDE OF THE WORKING SPACE. CONCRETE, BRICK, OR TILE WALLS SHALL BE CONSIDERED AS GROUNDED
CONDITION 3 - EXPOSED LIVE PARTS ON BOTH SIDES OF THE WORKING SPACE
NOTE: CLEARANCE WIDTH SHALL BE 30" OR THE WIDTH OF THE CONTROL PANEL/POWER CONNECTION, WHICHEVER IS GREATER

NV5 ELECTRICAL CLEARANCE MECHANICAL EQUIPMENT ATC CEILING — H103

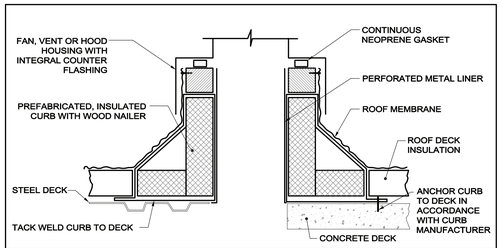


NOTE:
1. COORDINATE AND CONFIRM ALL PIPE SIZES AND REQUIRED EXPANSION PROVISIONS WITH UNIT MANUFACTURER BASED ON ACTUAL FIELD PIPE ROUTING AND DISTANCES.
2. PROVIDE ALL PIPING, EXPANSION LOOPS, CONTROL EQUIPMENT, APPURTENANCES, TRAPS, ETC., AS RECOMMENDED BY UNIT MANUFACTURER (SUBMIT IN SHOP DRAWING).

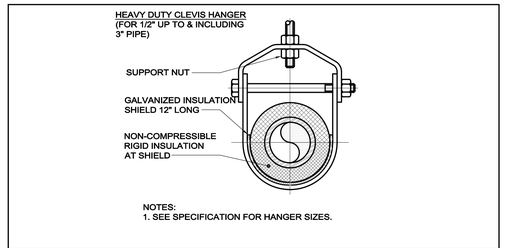
NV5 REFRIGERANT PIPING COMPONENT SCHEMATIC — H1306



NV5 ROOF MOUNTED EXHAUST FAN — H411

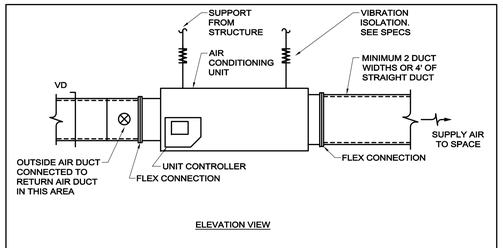


NV5 ROOF CURB — H906



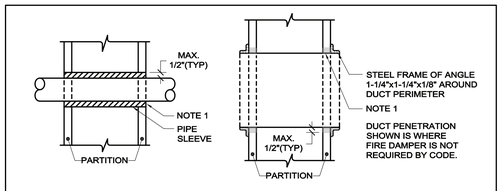
NOTES:
1. SEE SPECIFICATION FOR HANGER SIZES.

NV5 PIPE HANGER SUPPORT — H001



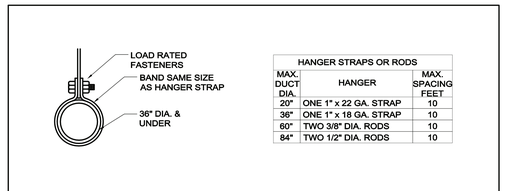
NOTES:
1. SENSOR SHALL BE ORIENTED IN SAME PLANE AS ELBOW AND BE WITHIN 10° OF HORIZONTAL OR PER MANUFACTURER'S RECOMMENDATION.
2. IF STRAIGHT RUN CANNOT BE MADE PROVIDE FLOW STRAIGHTENER AT BOX INLET.
3. BOX ORIENTATION FOR SUPPLY AND RET/EXH IS DIFFERENT. VELOCITY SENSOR MUST BE IN CORRECT ORIENTATION.

NV5 AIR CONDITIONING UNIT CONNECTIONS (DUCTED RETURN) — H236



NOTES:
1. AT FIRE RATED PARTITIONS ADD ADDITIONAL LAYER OF FIRE SAFING INSULATION AROUND PENETRATIONS SO AS TO FILL CAVITY.
2. DUCT AND PIPE PENETRATIONS THROUGH CORRIDOR WALLS ABOVE THE CEILING ARE TO BE FIRE STOPPED AROUND THE PENETRATION.

NV5 DUCT & PIPE PENETRATIONS — H901

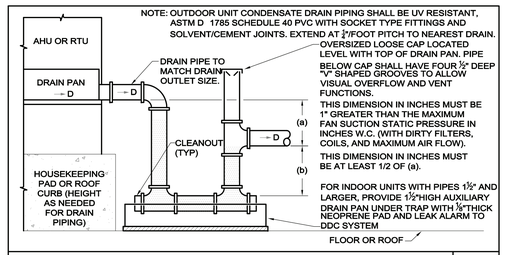


HANGER STRAPS OR RODS

MAX. DUCT DIA.	HANGER	MAX. SPACING FEET
20"	ONE 1" x 22 GA. STRAP	10
36"	ONE 1" x 18 GA. STRAP	10
60"	TWO 3/8" DIA. RODS	10
84"	TWO 1/2" DIA. RODS	10

NOTES:
1. ALL SUPPORTS SHALL BE GALVANIZED STEEL FOR STEEL DUCT, STAINLESS STEEL FOR STAINLESS STEEL DUCT, OR ALUMINUM FOR ALUMINUM DUCT.
2. HANGERS MUST NOT DEFORM DUCT SHAPE.
3. ATTACHMENTS TO STRUCTURE SHALL BE PER SMACNA.

NV5 ROUND METAL DUCT HANGERS — H008



NV5 DRAW THRU UNIT CONDENSATE TRAP — H1110

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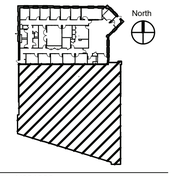
Number	Description	Date
	ISSUED FOR PERMIT & CONST.	23 JULY 2021

Key Plan:


Project No.: Y021006
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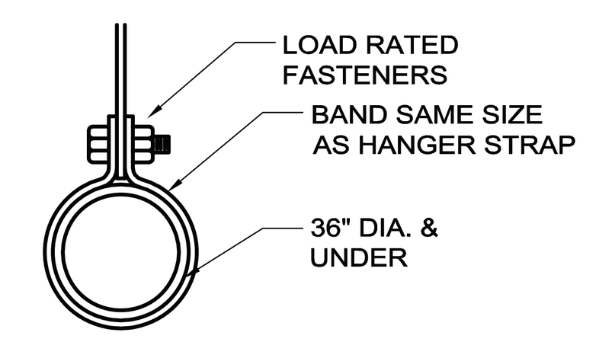
Drawing Sheet Title:
HVAC DETAILS

Drawing Sheet Number:
M-700

Owner's Branch No.:
532



HANGER STRAPS OR RODS		
MAX. DUCT DIA.	HANGER	MAX. SPACING FEET
20"	ONE 1" x 22 GA. STRAP	10
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84"	TWO 1/2" DIA. RODS	10

NOTES:
1. ALL SUPPORTS SHALL BE GALVANIZED STEEL FOR STEEL DUCT, STAINLESS STEEL FOR STAINLESS STEEL DUCT, OR ALUMINUM FOR ALUMINUM DUCT.
2. HANGERS MUST NOT DEFORM DUCT SHAPE.
3. ATTACHMENTS TO STRUCTURE SHALL BE PER SMACNA.

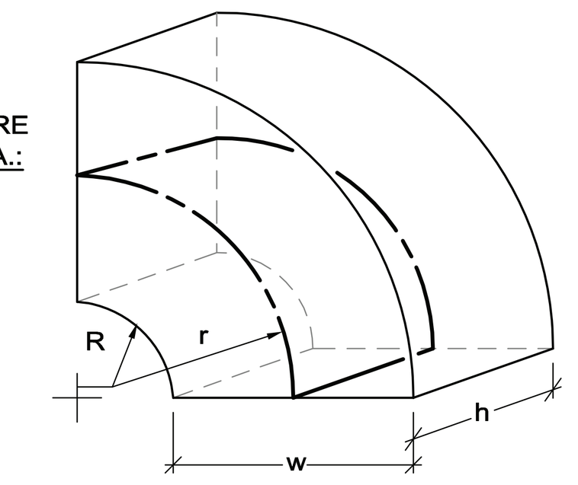
NV5 — ROUND METAL DUCT HANGERS — H008

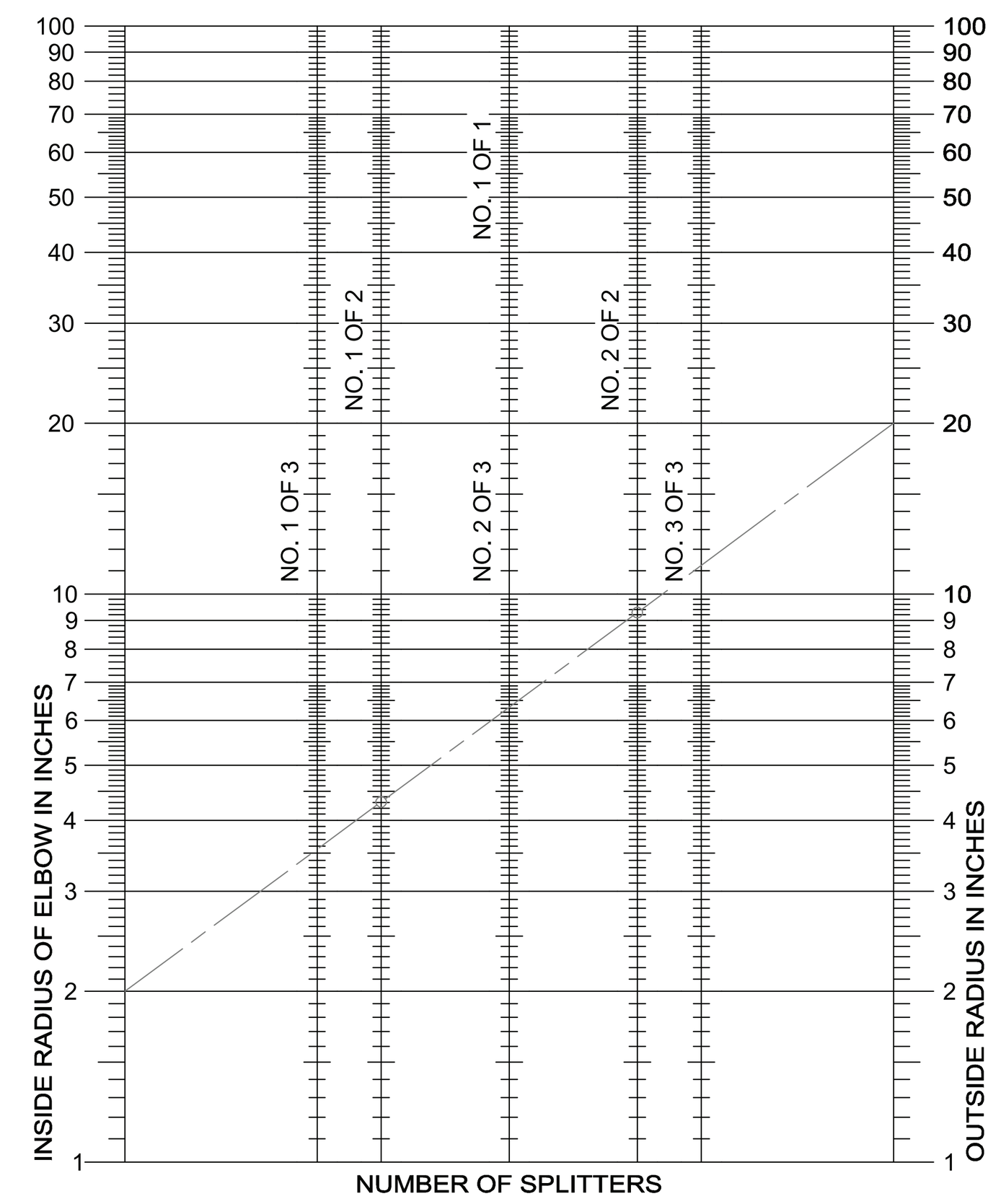
RADIUS ELBOW AND SPLITTER VANE REQUIREMENTS

r/w RATIO:	NO. OF VANES FOR 1 ELBOW:	NO. OF VANES WHEN 2 ELBOWS ARE WITHIN 2 EQUIV. DIA.:
r/w >= 1.50	0	1
1.5 > r/w >= 0.70	1	2
0.7 > r/w >= 0.60	2	3
0.6 > r/w >= 0.55	3	3

EQUIVALENT DIAMETER = (w+h)/2

NOTE: r/w = 0.5 IS A SQUARE THROAT ELBOW! HOWEVER, MINIMUM INSIDE RADIUS R SHOULD BE 2".





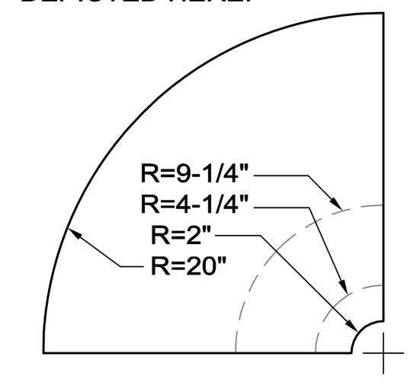
r = CENTERLINE RADIUS
R = INSIDE RADIUS
w = DUCT WIDTH
h = DUCT HEIGHT

TERMINOLOGY:

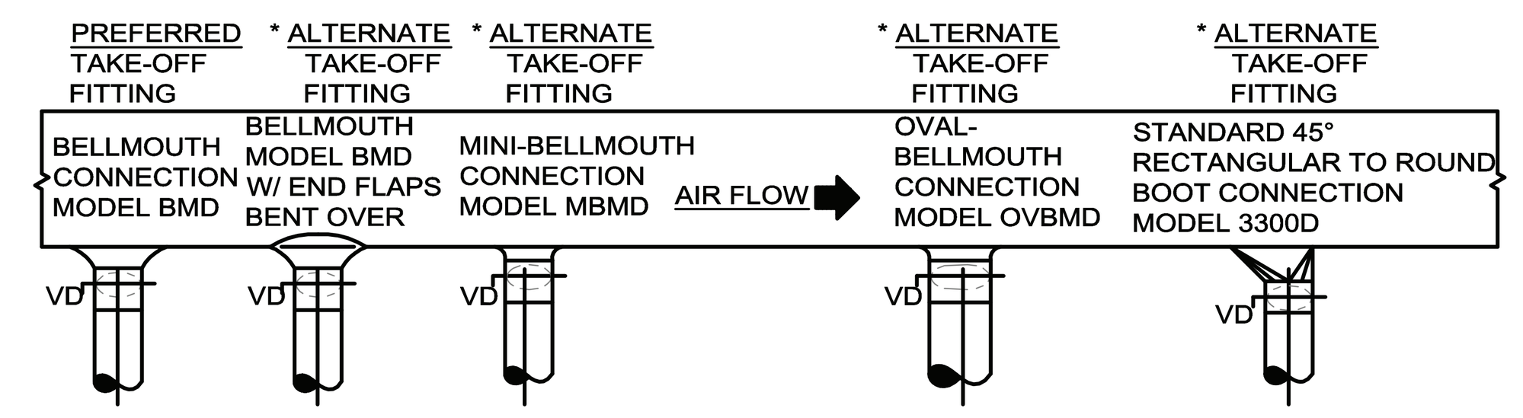
"NO. 1 OF 3" = NO. 1 VANE OF A TOTAL OF 3 VANES.

"NO. 2 OF 3" = NO. 2 VANE OF A TOTAL OF 3 VANES.

EXAMPLE AT LEFT IS DEPICTED HERE:



NV5 — NUMBERING & SPACING OF DUCT SPLITTER VANES — H1520

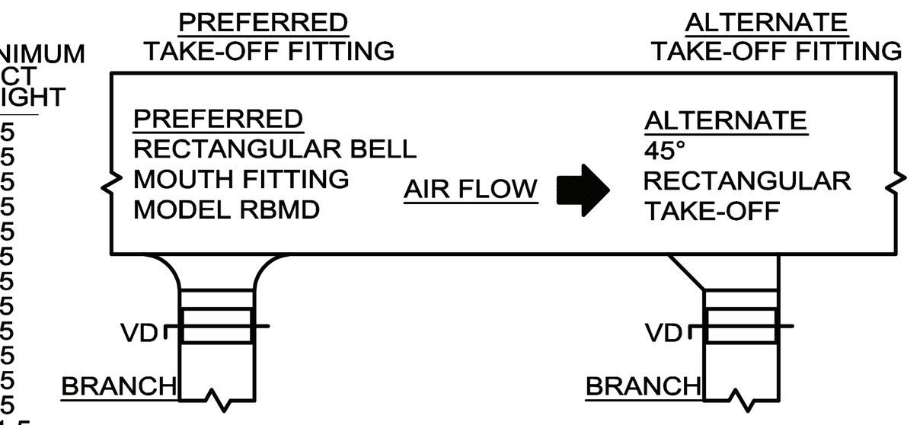


DUCT SIZE	HOLE SIZE	MINIMUM DUCT HEIGHT	DUCT SIZE	HOLE SIZE	MINIMUM DUCT HEIGHT	DUCT SIZE	HOLE SIZE	MINIMUM DUCT HEIGHT	DUCT SIZE	HOLE SIZE	MINIMUM DUCT HEIGHT
5"	8"	9"	5"	—	—	5"	—	—	5"	5" x 10"	7"
6"	9"	10"	6"	7"	9"	6"	—	—	6"	6" x 12"	8"
7"	10"	11"	7"	—	—	7"	9"x 10-9/16"	10"	7"	6" x 12"	8"
8"	11"	12"	8"	9"	11"	8"	9"x 12-1/8"	10"	8"	6-1/2" x 12"	8-1/2"
9"	12"	13"	9"	—	—	9"	9"x 13-11/16"	10"	9"	6-1/2" x 14"	8-1/2"
10"	13"	14"	10"	11"	13"	10"	9"x 15-1/4"	10"	10"	6-1/2" x 16"	8-1/2"
12"	15"	16"	12"	—	—	12"	9"x 18-3/8"	10"	12"	8-1/2" x 18"	10-1/2"
14"	17"	18"	14"	—	—	14"	9"x 21-1/2"	10"	14"	10" x 20"	12"
16"	19"	20"	16"	—	—	16"	9"x 24-5/8"	10"	16"	—	—

ALTERNATE ROUND BRANCH DUCT TAKE-OFFS

* ALTERNATE FITTING'S TO BE USED WHEN DUCT HEIGHT DOES NOT PERMIT THE USE OF THE FULL SIZE BELLMOUTH

DUCT SIZE	HOLE SIZE	MINIMUM DUCT HEIGHT
6 x 4	7.5 x 5.5	7.5
10 x 4	11.5 x 5.5	7.5
16 x 4	17.5 x 5.5	7.5
24 x 4	25.5 x 5.5	7.5
6 x 5	7.5 x 6.5	8.5
10 x 5	11.5 x 6.5	8.5
16 x 5	17.5 x 6.5	8.5
24 x 5	25.5 x 6.5	8.5
6 x 6	7.5 x 7.5	9.5
10 x 6	11.5 x 7.5	9.5
16 x 6	17.5 x 7.5	9.5
24 x 6	25.5 x 7.5	9.5
8 x 8	9.5 x 9.5	11.5
16 x 8	17.5 x 9.5	11.5
24 x 8	25.5 x 9.5	11.5
10 x 10	11.5 x 11.5	13.5
16 x 10	17.5 x 11.5	13.5
24 x 10	25.5 x 11.5	13.5

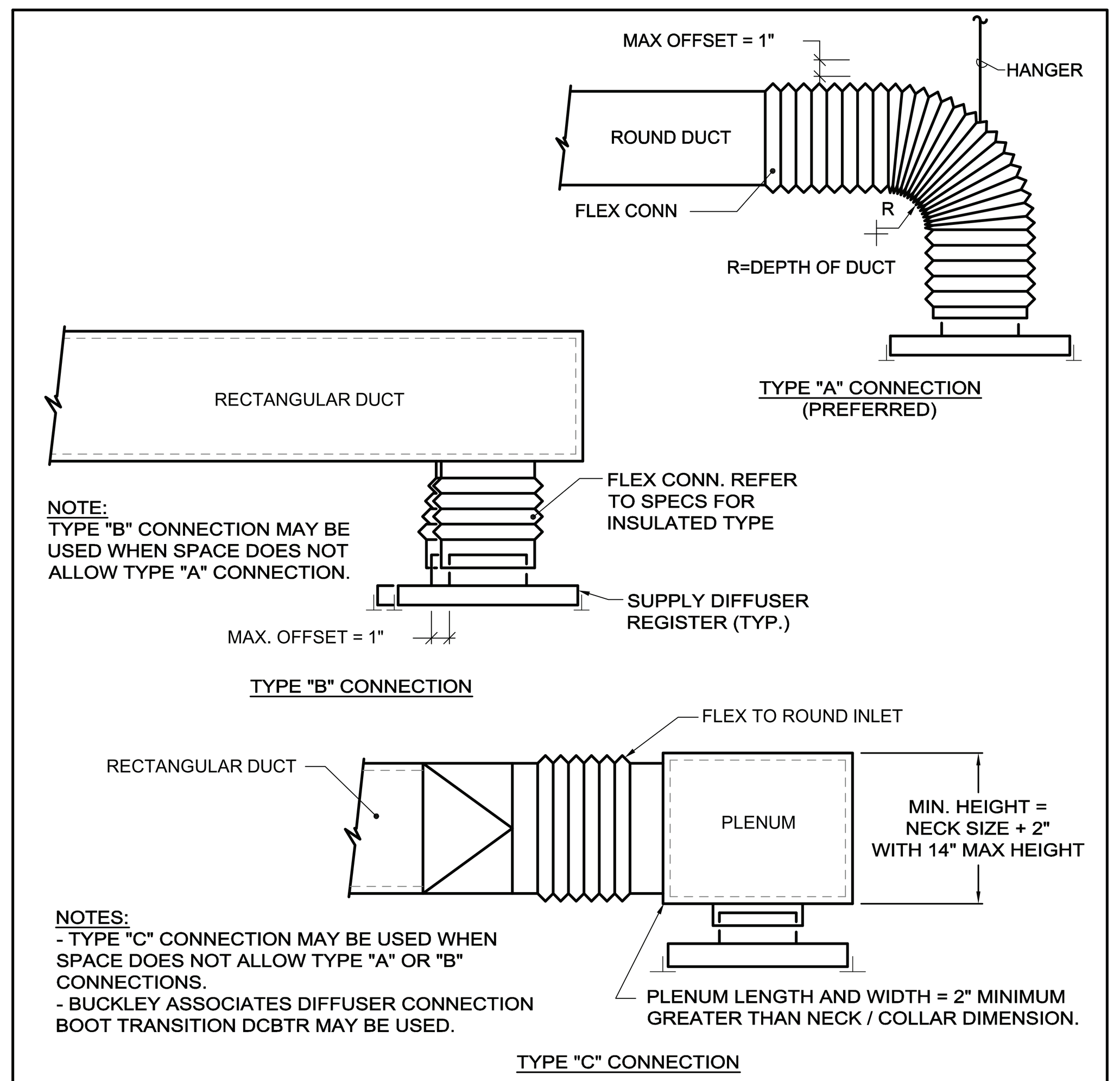


ALTERNATE RECTANGULAR BRANCH DUCT TAKE-OFF

NOTES:
ALL ROUND AND RECTANGULAR BELLMOUTH FITTINGS SHALL BE INCLUDED WITH THE FOLLOWING STANDARD FEATURES:

1. NEOPRENE GASKET TO MINIMIZE AIR LEAKAGE.
2. PRE-DRILLED HOLES FOR QUICK MOUNTING.
3. CONSTRUCTED OF HEAVY GALVANIZED STEEL.
4. 26 GAUGE GALV. QUADRANT VOLUME DAMPER W/ TIGHT FITTING GASKETING TO MINIMIZE LEAKAGE AT DAMPER PIVOT POINTS. (FOR LOW PRESSURE DUCTWORK)

NV5 — TYPICAL DUCT TAKE-OFF — H1521

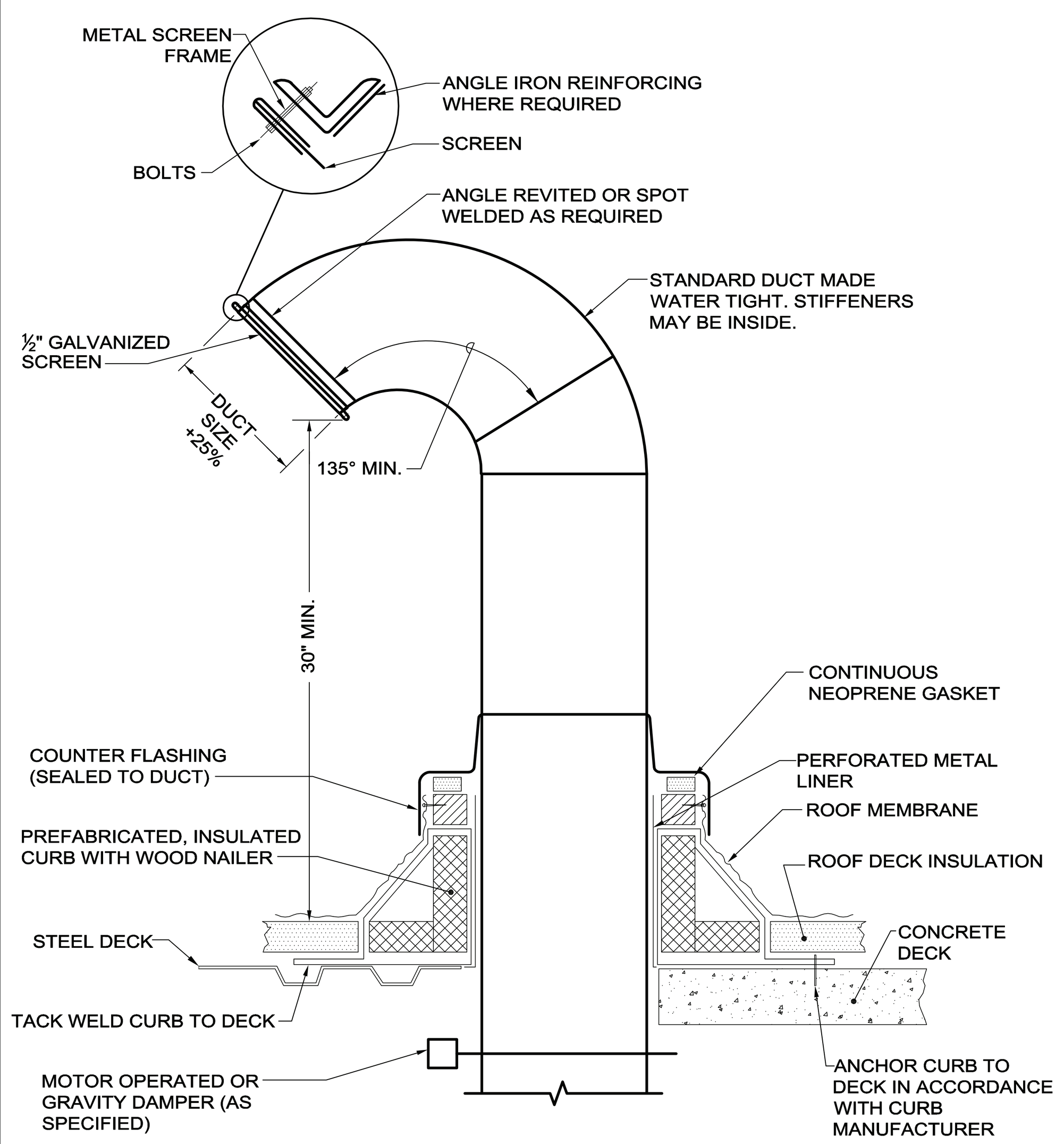


NOTE:
TYPE "B" CONNECTION MAY BE USED WHEN SPACE DOES NOT ALLOW TYPE "A" CONNECTION.

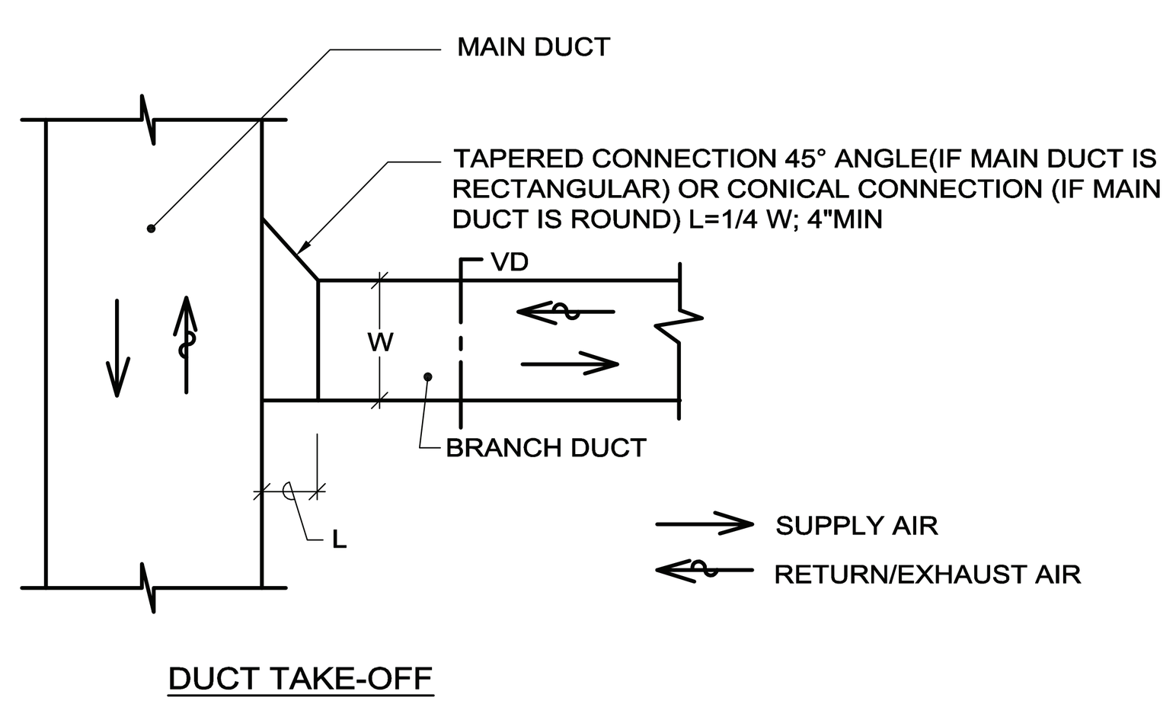
NOTES:
- TYPE "C" CONNECTION MAY BE USED WHEN SPACE DOES NOT ALLOW TYPE "A" OR "B" CONNECTIONS.
- BUCKLEY ASSOCIATES DIFFUSER CONNECTION BOOT TRANSITION DCBTR MAY BE USED.

NOTES:
1. THESE DETAILS ALLOW DUCTWORK TO BE PROVIDED BEFORE CEILING GRID IS INSTALLED THEN DIFFUSER/REGISTER CAN BE POSITIONED INTO GRID.
2. PROVIDE INSULATED TRANSITION ROUND TO SQUARE IF REQUIRED AT DIFFUSER.
3. PROVIDE NYLON TY-WRAP TOOL OR REUSABLE SS DRAW BAND PER SPECS.
4. FLEX DUCT SHALL NOT HAVE MORE THAN 1/2" SAG PER FOOT.
5. LENGTH OF FLEX DUCT SHALL NOT EXCEED 6'-0".
6. PROVIDE DUCT MOUNTED VOLUME DAMPER WHENEVER POSSIBLE. TRY TO AVOID NECK DAMPERS.

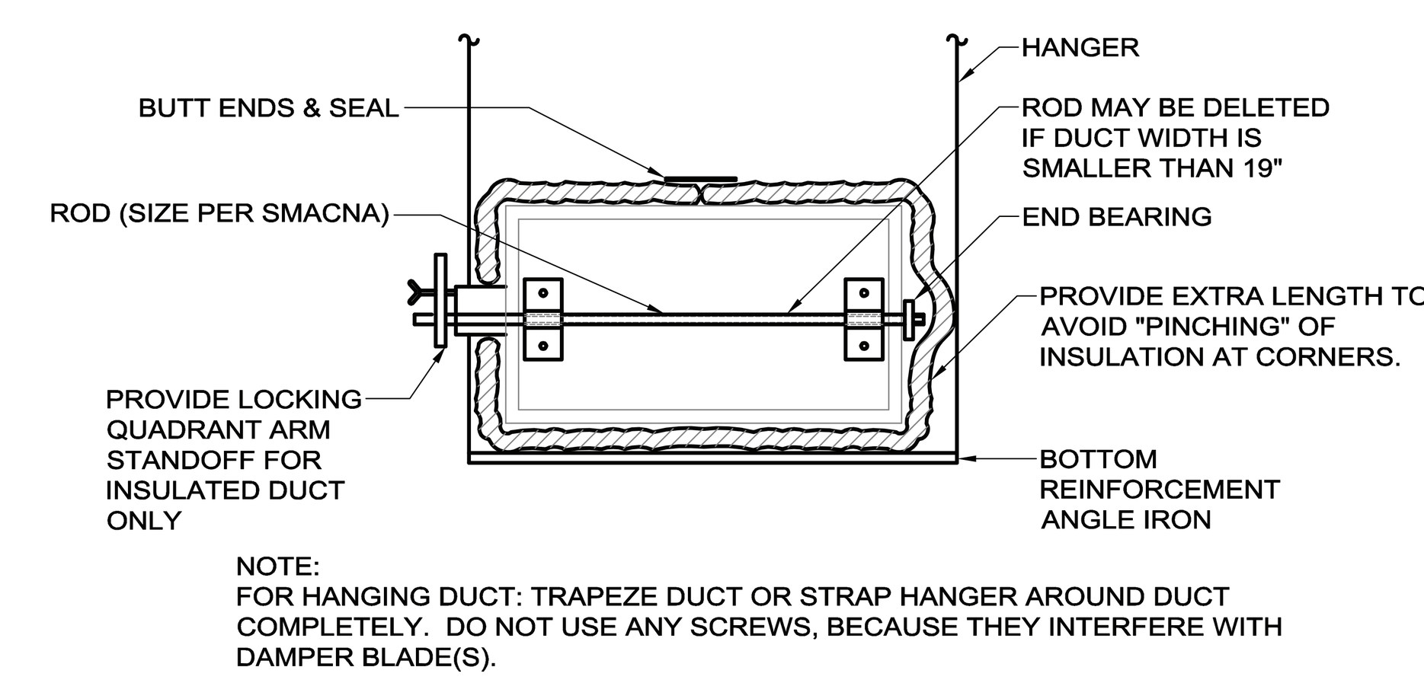
NV5 — TYPICAL SUPPLY DIFFUSER/ REGISTER DUCTWORK & CONNECTION — H1517



NV5 — GOOSENECK DETAIL — H1523

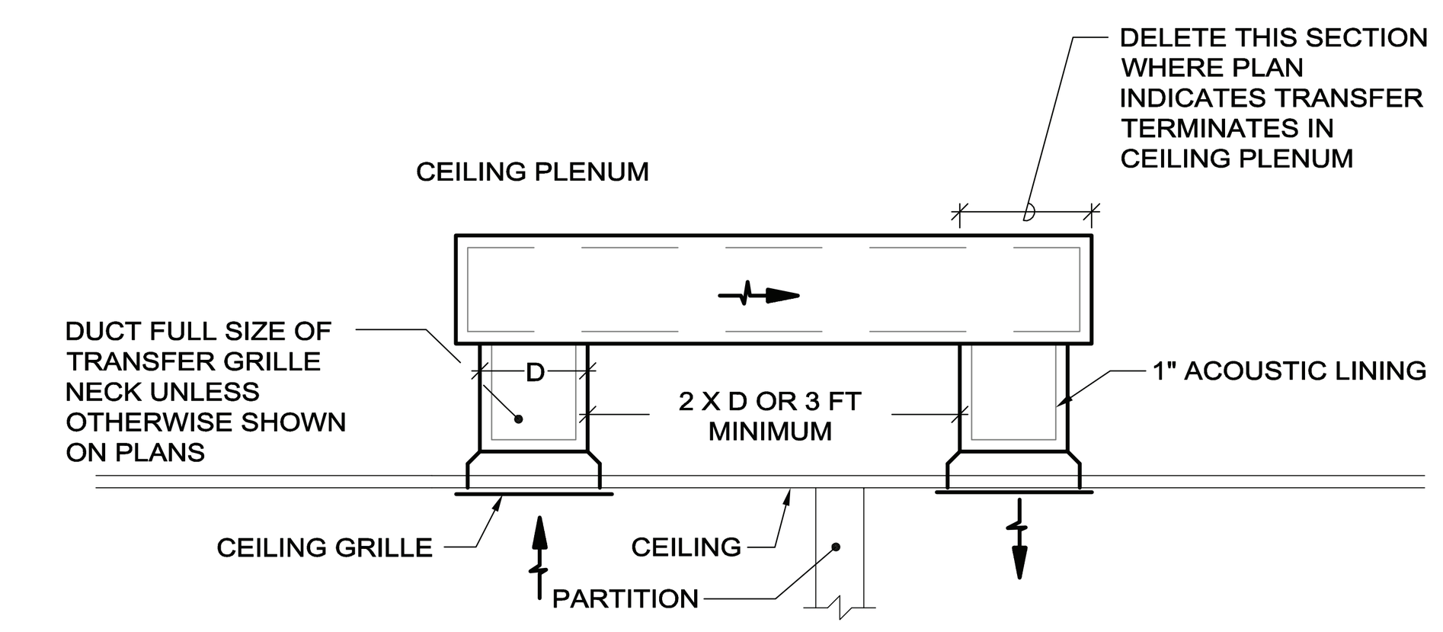


NV5 — BRANCH TAKE-OFFS — H1501

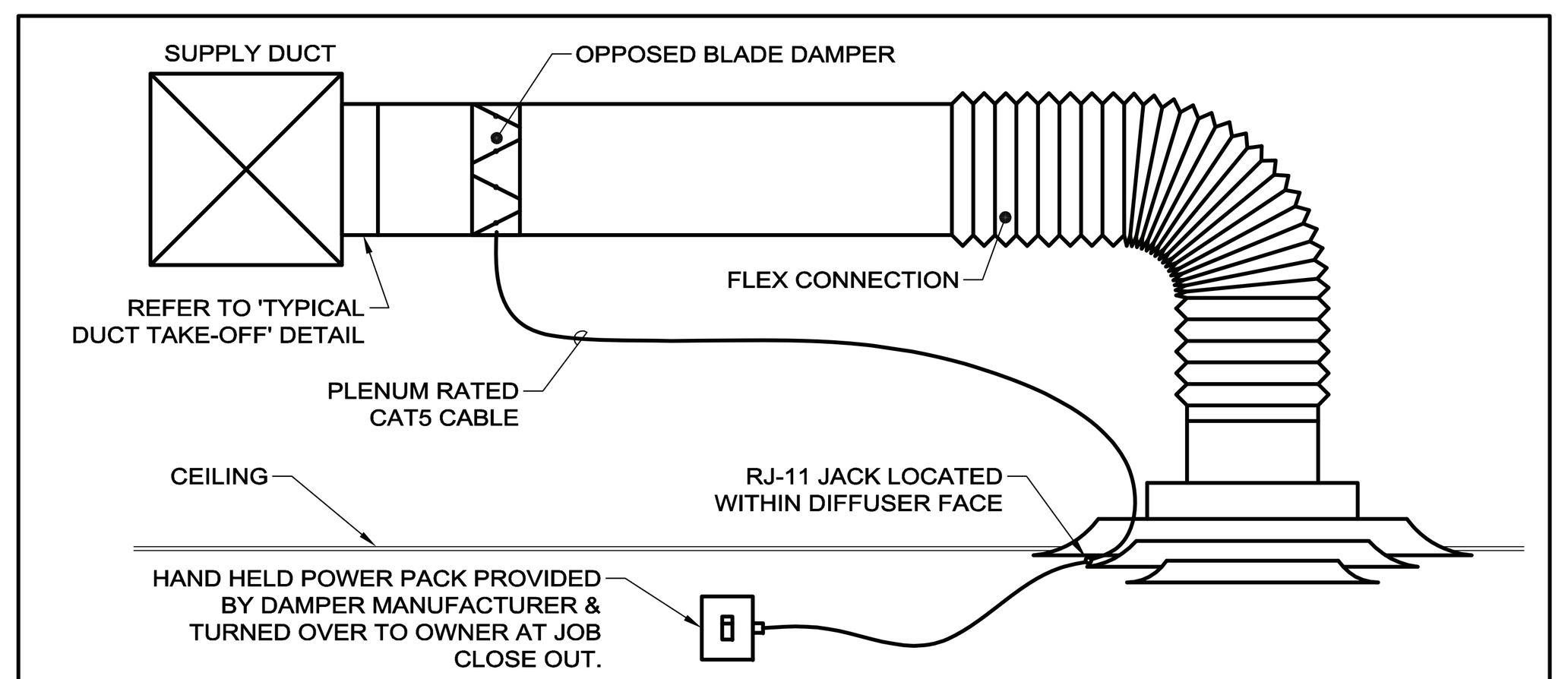


NOTE:
FOR HANGING DUCT: TRAPEZE DUCT OR STRAP HANGER AROUND DUCT COMPLETELY. DO NOT USE ANY SCREWS, BECAUSE THEY INTERFERE WITH DAMPER BLADE(S).

NV5 — TYPICAL DUCT INSTALLATION & SUPPORT NEAR VOLUME DAMPERS — H1509

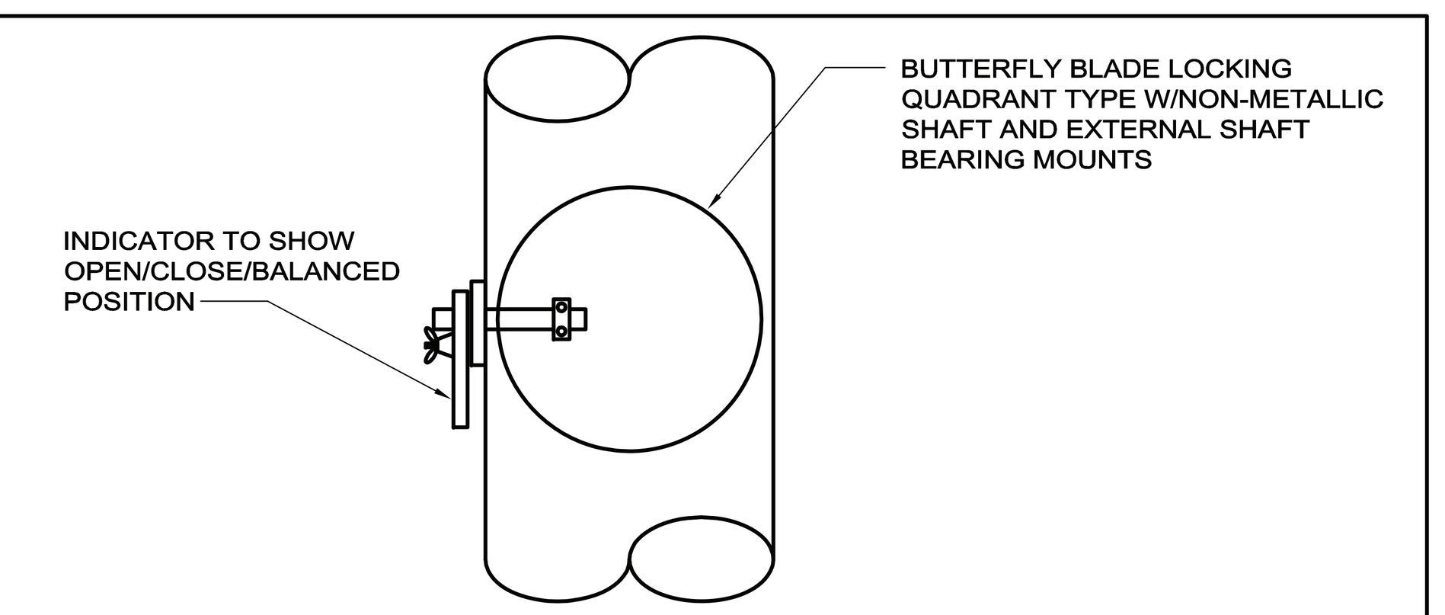


NV5 — TRANSFER BOOT W/ GRILLES — H1505



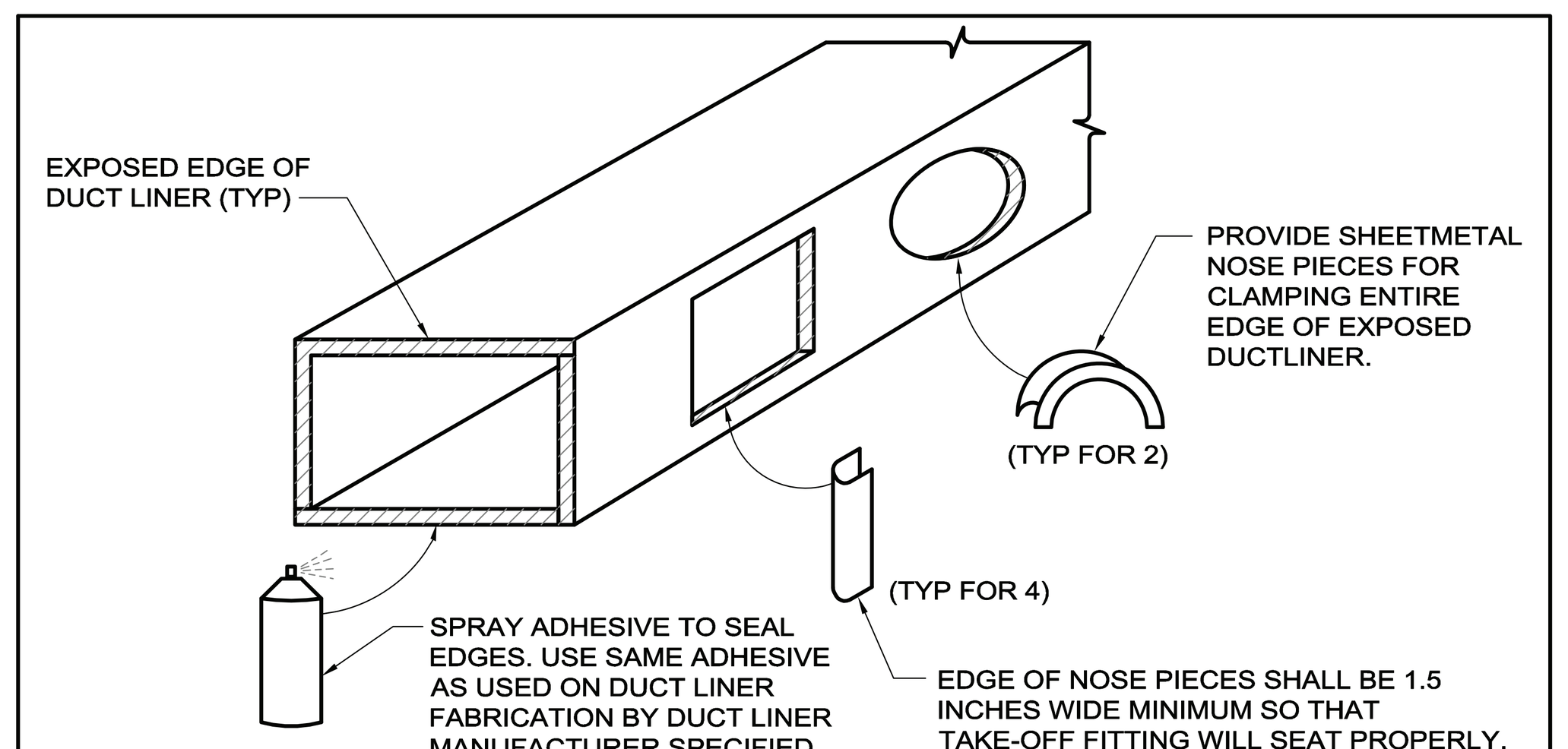
NOTE:
1. PROVIDE RJ-11 CONNECTION WITHIN THE DIFFUSER FACE.

NV5 — REMOTELY ADJUSTABLE BALANCING DAMPER — H1511A



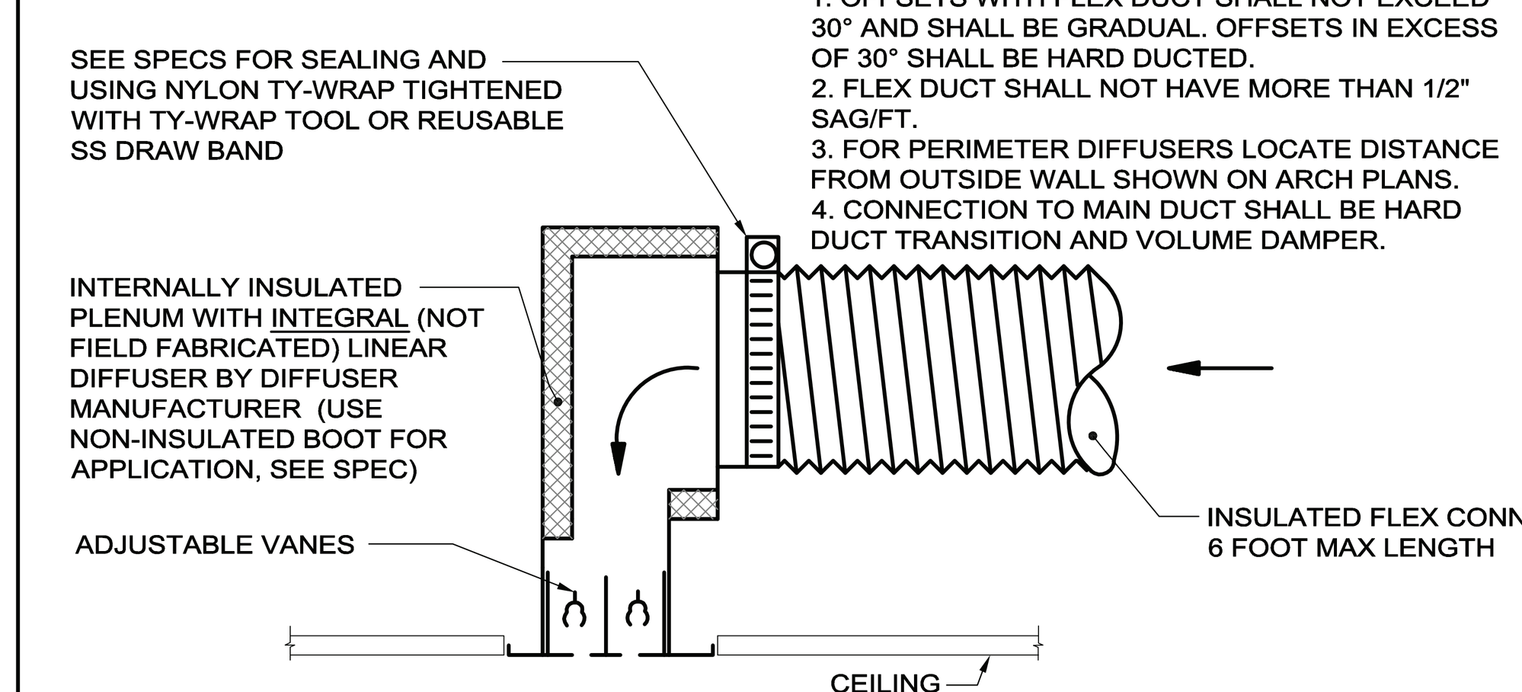
NOTES:
1. DAMPER SHALL BE MFR. OF SAME MATERIAL AS DUCTWORK
2. GAUGE OF DAMPER TO BE (2) GAUGES HEAVIER THAN DUCTWORK
3. PROVIDE 2" STANDOFF FOR DAMPER HANDLES ON INSULATED DUCTS.

NV5 — ROUND VOLUME DAMPER UP TO 14"Ø - LOW PRESSURE — H1514

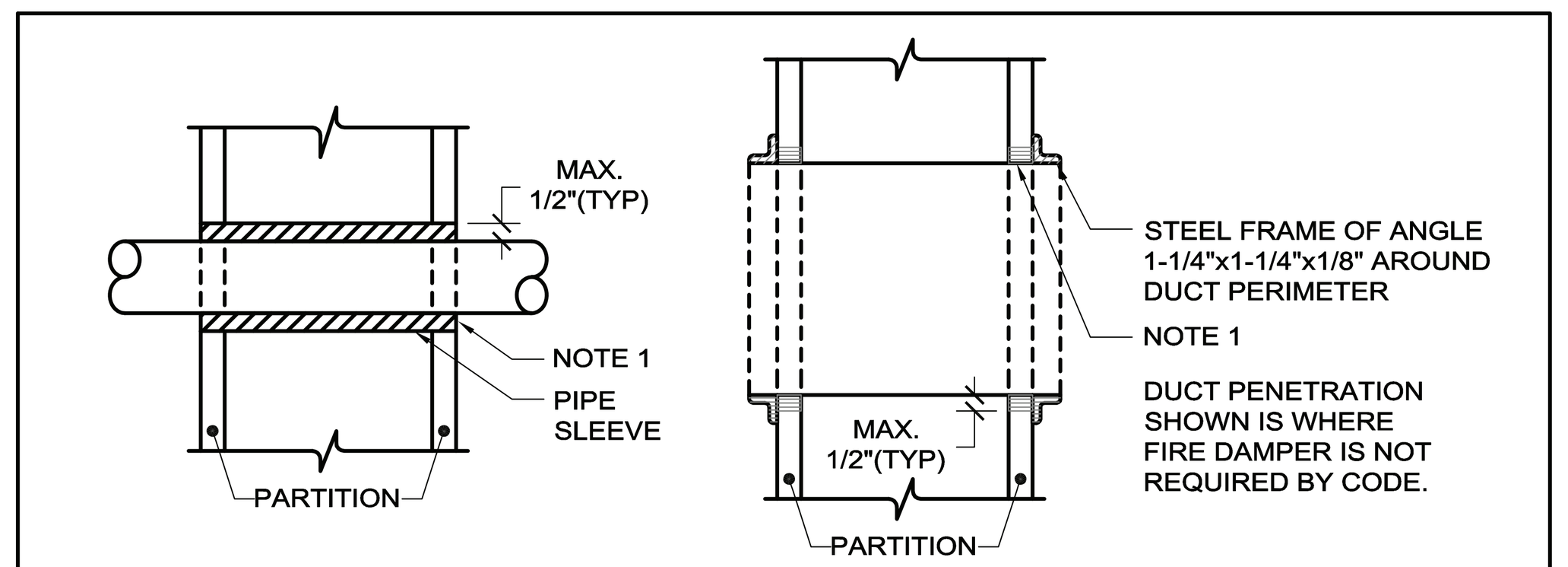


NV5 — SEALING & SECURING EXPOSED DUCTLINER — H1503

NOTES:
1. OFFSETS WITH FLEX DUCT SHALL NOT EXCEED 30° AND SHALL BE GRADUAL. OFFSETS IN EXCESS OF 30° SHALL BE HARD DUCTED.
2. FLEX DUCT SHALL NOT HAVE MORE THAN 1/2" SAG/FT.
3. FOR PERIMETER DIFFUSERS LOCATE DISTANCE FROM OUTSIDE WALL SHOWN ON ARCH PLANS.
4. CONNECTION TO MAIN DUCT SHALL BE HARD DUCT TRANSITION AND VOLUME DAMPER.

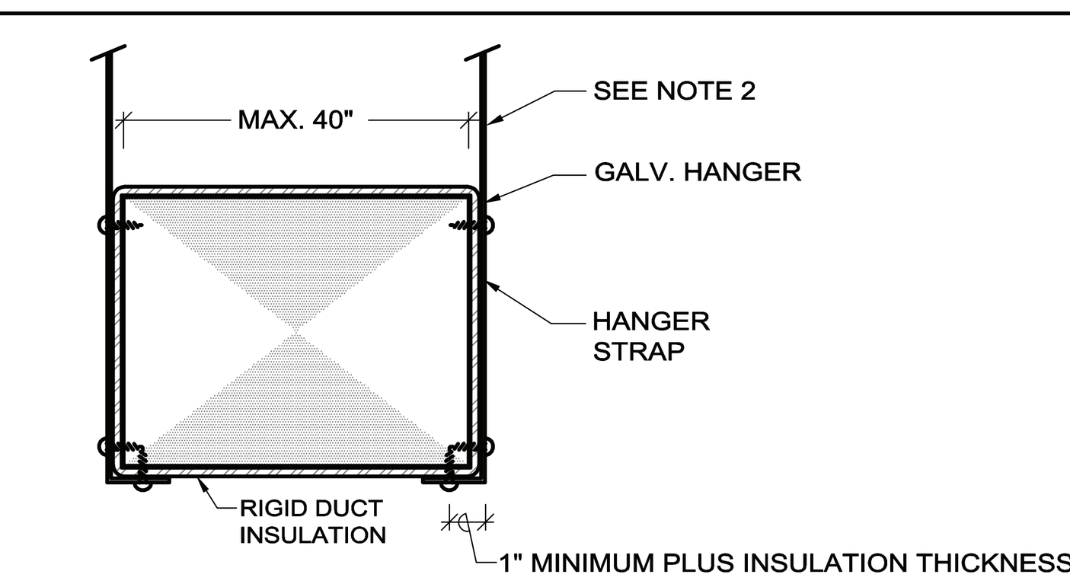


NV5 — LINEAR DIFFUSER CONNECTION — H1516



NOTES:
1. AT FIRE RATED PARTITIONS ADD ADDITIONAL LAYER OF FIRE SAFING INSULATION AROUND PENETRATIONS SO AS TO FILL CAVITY.
2. DUCT AND PIPE PENETRATIONS THROUGH CORRIDOR WALLS ABOVE THE CEILING ARE TO BE FIRE STOPPED AROUND THE PENETRATION.

NV5 — DUCT & PIPE PENETRATIONS — H901



NOTES:
1. CUTTING AND PATCHING SHALL BE LIMITED TO A MINIMUM AS REQUIRED FOR PROPER INSTALLATION.
2. SUPPORTS SHALL BE SPACED AND SIZED AS PER SMACNA.

NV5 — DUCT HANGER SUPPORT — H1508A

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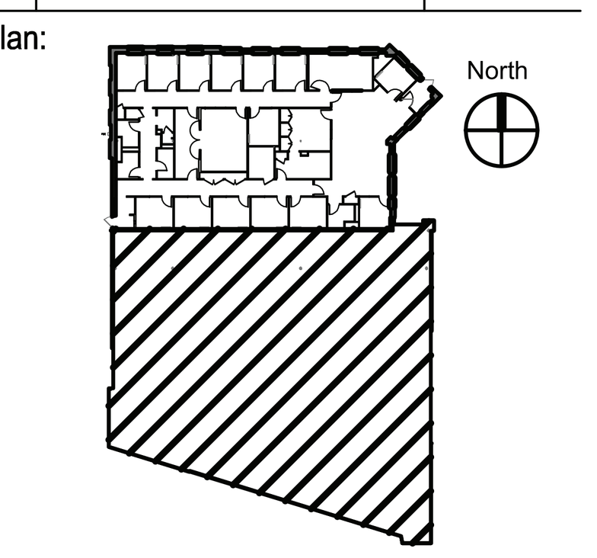
Number	Description	Date
	ISSUED FOR PERMIT & CONST.	23 JULY 2021

Key Plan:



Project No.: Y021006
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Drawing Sheet Title:
HVAC DETAILS

Drawing Sheet Number:
M-701

Owner's Branch No.:
532

PACKAGED DX ROOFTOP AIR HANDLING UNIT SCHEDULE

TAG	LOCATION	OPERATING WEIGHT (LBS)	REFRIGERANT TYPE	SUPPLY FAN CFM TOTAL	SUPPLY FAN CFM MIN. O.A.	SUPPLY FAN EXT STATIC PRESS. (IN.WG)	SUPPLY FAN MOTOR (BHP)	UNIT COOLING COIL CAPACITY (MBH) TONS	CAPACITY (MBH) TOTAL	CAPACITY (MBH) SENS.	EAT (F°) DB	EAT (F°) WB	LAT (°F) DB	LAT (°F) WB	UNIT HEATING (GAS) CAPACITY (MBH) INPUT	CAPACITY (MBH) OUTPUT	PRESSURE (IN. WG) MIN/MAX	STAGES	EAT (°F) DB	LAT (°F) DB	ELECTRICAL TOTAL UNIT V	PH	HZ	MCA	MOCP	COMPRESSOR RLA	COMPRESSOR LRA	INDOOR FAN FLA	CONDENSER FAN FLA	COOLING EFF.	HEATING THERMAL EFF. (%)	MANUFACTURER AND MODEL NUMBER (AS STANDARD)	REMARKS
RTU-1	ROOF	513	R-410A	1120	120	1.2	0.75	3	29.2	23.5	80	65	60	57	67/110	54/88	4/13	2	65	109	480	3	60	12	15	5.7	73	2.4	2.4	16.0 SEER	81	CARRIER 48GCDM04	SEE NOTES

NOTES:

1. REFER TO SPECIFICATIONS, DETAILS, AND CONTROL DRAWINGS FOR ADDITIONAL INFORMATION.
2. PROVIDE MANUFACTURER'S 7-DAY PROGRAMMABLE THERMOSTAT.
3. PROVIDE WITH ENTHALPY ECONOMIZER, THREE SETS OF FILTERS, CONVENIENCE OUTLET, AND INSULATED CABINET.
4. PROVIDE ALL RTUs WITH RAWAL APR CONTROL DEVICE.

SPLIT SYSTEM AIR CONDITIONING UNIT SCHEDULE

TAG	LOCATION	INDOOR: MANUFACTURER AND MODEL NUMBER (AS STANDARD)	CFM TOTAL	CFM O.A.	MOTOR (HP)	ESP (IN. WG.)	UNIT COOLING CAPACITY TOTAL	CAPACITY SENSIBLE	EAT(°F) DB	EAT(°F) WB	LAT(°F) DB	LAT(°F) WB	UNIT HEATING CAPACITY kw	EAT (°F) DB	LAT (°F) DB	ELECTRIC DATA V	PH	HZ	MCA	MOCP	REFRIGERANT TYPE	OUTDOOR TAG	LOCATION	DESIGN AMBIENT TEMP (°F)	MINIMUM AMBIENT TEMP (°F)	MANUFACTURER AND MODEL NUMBER (AS STANDARD)	TOTAL UNIT V	PH	HZ	MCA	MOCP	COMPRESSOR RLA	COMPRESSOR LRA	CONDENSER FAN FLA	EFFICIENCY (SEER)	REMARKS
ACU-1	ABOVE CEILING	CARRIER 40MBDQ12	310	90	.18	0.5	18	-	75	62	58	53	2	68	88	208	1	60	.2	-	R-410A	ACCU-1	ROOF	110	32	CARRIER 38MAQB12R	208	1	60	15	20	5.7	-	-	21.5	SEE NOTES
ACU-2	ABOVE CEILING	CARRIER 40MBDQ18	400	135	.27	0.5	14.7	-	75	62	58	53	2.5	68	88	208	1	60	.2	-	R-410A	ACCU-2	ROOF	110	32	CARRIER 38MAQB18R	208	1	60	13	20	7.3	-	-	18.5	SEE NOTES
ACU-3	ABOVE CEILING	CARRIER FV4C	630	60	1/3	0.5	18	11.6	75	62	58	53	4	68	88	208	1	60	5.4	15	R-410A	ACCU-3	ROOF	110	32	CARRIER 25HHA424	208	1	60	16.5	25	12.8	58.3	0.5	14	SEE NOTES
ACU-4	ABOVE CEILING	CARRIER FV4C	450	45	1/3	0.5	18	11.6	75	62	58	53	2.5	68	88	208	1	60	5.4	15	R-410A	ACCU-4	ROOF	110	32	CARRIER 25HHA418	208	1	60	11.8	20	9.0	48.0	0.5	14	SEE NOTES
ACU-5	ABOVE CEILING	CARRIER FV4C	360	60	1/3	0.5	18	11.6	75	62	58	53	2.5	68	88	208	1	60	5.4	15	R-410A	ACCU-5	ROOF	110	32	CARRIER 25HHA418	208	1	60	11.8	20	9.0	48.0	0.5	14	SEE NOTES
ACU-6	ABOVE CEILING	CARRIER FV4C	480	65	1/3	0.5	18	11.6	75	62	58	53	3	68	88	208	1	60	5.4	15	R-410A	ACCU-6	ROOF	110	32	CARRIER 25HHA424	208	1	60	16.5	25	12.8	58.3	0.5	14	SEE NOTES
ACU-7	ABOVE CEILING	CARRIER FV4C	425	60	1/3	0.5	18	11.6	75	62	58	53	2.5	68	88	208	1	60	5.4	15	R-410A	ACCU-7	ROOF	110	32	CARRIER 25HHA418	208	1	60	11.8	20	9.0	48.0	0.5	14	SEE NOTES

NOTES:

1. REFER TO SPECIFICATIONS, DETAILS, AND CONTROL DRAWINGS FOR ADDITIONAL INFORMATION.
2. INDOOR UNIT - PROVIDE WITH 3 SETS OF FILTERS, VIBRATION ISOLATION PER SPECIFICATIONS, AND 7-DAY PROGRAMMABLE THERMOSTAT.
3. DISCONNECTS PROVIDED BY ELECTRICAL CONTRACTOR.

DUCTWORK PRESSURE CLASS AND SEAL CLASS

PRESSURE CLASS	STATIC PRESSURE CLASS	SMACNA SEAL CLASS	SMACNA LEAKAGE CLASS RECTANGULAR	SMACNA LEAKAGE CLASS ROUND	DESIGN VELOCITY LIMITS
2"	2" POS. OR NEG.	A	6	3	2000 FPM OR LESS

UNLESS OTHERWISE SPECIFIED OR SHOWN ON THE DRAWINGS, USE THE FOLLOWING PRESSURE CLASSIFICATIONS FOR THE TYPES OF DUCTWORK LISTED BELOW

2" CLASS:	ALL DUCTWORK.

NOTES:

1. REFER TO SPECIFICATIONS AND DETAILS FOR ADDITIONAL INFORMATION.

DUCTLESS SPLIT AIR-CONDITIONING UNIT SCHEDULE

INDOOR TAG	LOCATION	MANUFACTURER AND MODEL NUMBER (AS STANDARD)	COOLING CAPACITY (BTU) TOTAL	COOLING CAPACITY (BTU) SENSIBLE	HEATING CAPACITY (BTU) TOTAL	FAN DATA (CFM) TOTAL	REFRIGERANT TYPE	OUTDOOR TAG	LOCATION	WEIGHT (LBS)	SOUND PRESSURE DB(A)	DESIGN AMBIENT TEMP (°F) SUMMER	DESIGN AMBIENT TEMP (°F) WINTER	MANUFACTURER AND MODEL NUMBER (AS STANDARD)	ELECTRICAL DATA V	PH	HZ	MOCP	EFFICIENCY SEER	EFFICIENCY HSPF	REMARKS
ACU-LAN	LAN ROOM	MITSUBISHI PKA-A24KA	24,000	18,000	23,000	775	R410A	ACCU-LAN	ROOF	163	48	95	0	MITSUBISHI PUZ-A24NHA	208	1	60	30	21	11	SEE NOTES
ACU-ELE	ELE ROOM	MITSUBISHI PKA-A12HA	12,000	9,700	11,100	425	R410A	ACCU-ELE	ROOF	163	48	95	0	MITSUBISHI PUZ-A12NKA	208	1	60	15	20	10.2	SEE NOTES

NOTES:

1. REFER TO SPECIFICATIONS, DETAILS, AND CONTROL DRAWINGS FOR ADDITIONAL INFORMATION.
2. DISCONNECT SWITCH BY ELECTRICAL CONTRACTOR.
3. INDOOR UNIT IS POWERED FROM OUTDOOR UNIT.
4. INDOOR UNIT - PROVIDE WALL MOUNTED THERMOSTAT THERMOSTAT AND MANUFACTURERS INTEGRAL CONDENSATE PUMP.
5. REFRIGERANT PIPE SIZES AND REQUIRED ACCESSORIES SHALL BE PER MANUFACTURERS RECOMMENDATIONS.
6. LOCATE AIR COOLED CONDENSING UNIT ON ROOF.

MINIMUM DUCT INSULATION R-VALUES (IECC - 2018 AND ASHRAE 90.1-2016 COMPLIANCE)

LOCATION	SUPPLY	RETURN	RAW OUTDOOR AIR	EXHAUST WITH ENERGY RECOVERY	EXHAUST WITHOUT ENERGY RECOVERY
OUTDOORS	R-12	R-12	-0-	R-12	-0-
UNCONDITIONED SPACE (SHAFT OR CEILING WITH DUCTED RETURN AIR)	R-6	R-6	R-6	R-6	-0-

DUCT LINING SCOPE: ACOUSTIC DUCT LINING OF THE TYPE AND THICKNESS SPECIFIED SHALL BE INSTALLED ON ALL SUPPLY, RETURN, AND EXHAUST DUCTWORK WITHIN 20 FEET OF ALL TYPES OF AIR HANDLING UNITS (INCLUDING RTU, ERU, FCU, MUA, ETC., AND ALL BRANCHES WITHIN 20') ALL FANS (INCLUDING BRANCHES), ALL LOW PRESSURE DUCTWORK DOWNSTREAM OF ALL TYPES OF SUPPLY VOLUME BOXES (CV, VAV, FPVAV, ETC.), AND WHERE DETAILED OR SHOWN ON DRAWINGS.

NOTES: (SEE SPECIFICATIONS FOR R-VALUES OF VARIOUS DUCT INSULATION AND LINERS).

1. R-VALUES SHOWN MAY BE OBTAINED BY ADDING THE R-VALUES OF BOTH THE LINING (WHERE SHOWN OR USED) AND EXTERNAL DUCT INSULATION.
2. R-VALUES SHOWN ARE AS INSTALLED. USE R-VALUES FOR 25% COMPRESSION FOR NON-RIGID INSULATION.
3. REFER TO SPECIFICATIONS AND DETAILS FOR ADDITIONAL INFORMATION.

FAN SCHEDULE

TAG	SERVICE	LOCATION	CFM	FAN TYPE	E.S.P. (IN.WG)	WHEEL TYPE	WHEEL DRIVE	OUTLET VELOCITY (FPM)	MOTOR RPM	BHP	HP	V	PH	FLA	MANUFACTURER AND MODEL NUMBER (AS STANDARD)	REMARKS
F-1	PANTRY EXHAUST	ROOF	250	ROOF	.25	CENTRIFUGAL BI	DIRECT	357	1014	0.02	1/6	208	1	1.5	GREENHECK G-090-VG	SEE NOTES
F-2	TOILET/JAN EXHAUST	ROOF	375	ROOF	.75	CENTRIFUGAL BI	DIRECT	323	1642	0.12	1/6	208	1	2.6	GREENHECK G-095-VG	SEE NOTES
F-3	OUTDOOR AIR	ABOVE CEILING	515	INLINE	.75	CENTRIFUGAL FC	DIRECT	583	1406	0.25	1/3	208	1	2.4	GREENHECK CSP-A700-VG	SEE NOTES

NOTES:

1. REFER TO SPECIFICATIONS, DETAILS, AND CONTROL DRAWINGS FOR ADDITIONAL INFORMATION.
2. PROVIDE WITH EC MOTOR, VIBRATION ISOLATION, 120V ACTUATED DAMPER WITH ENDSWITCH, WIRING PIGTAIL, HOOD HASPS, BIRDSCREEN, AND HINGED BASE.
3. UNIT MOUNTED DISCONNECT SWITCH PROVIDED BY ELECTRICAL CONTRACTOR.

PIPE INSULATION (2018 AND ASHRAE 90.1 - 2016 COMPLIANCE)

MINIMUM INSULATION THICKNESS IN INCHES FOR INDOOR PIPE SIZES (SEE NOTES BELOW)

PIPING SYSTEM TYPES	FLUID TEMP. RANGE (°F)	< 1"	1" & 1¼"	1½" - 3"	4" - 6"	8" & UP	K-FACTOR (BTU-INCH/°F-HR-SF) AT AVE. TEMP. (°F)
REFRIGERANT OR COOLING COIL CONDENSATE DRAIN	≤ 60	0.5	1	1	1	1.5	0.20-0.27 @ 75°F

NOTES:

1. FOR MINIMUM THICKNESS OF ALTERNATIVE INSULATION TYPES OUTSIDE THE STATED CONDUCTIVITY RANGE, SEE TEST METHOD FOR STEADY STATE HEAT TRANSFER PROPERTIES OF HORIZONTAL PIPE INSULATIONS, ASTM C 335-95, AND THE STATE ENERGY CODE.

2. REFER TO SPECIFICATIONS AND DETAILS FOR ADDITIONAL INFORMATION.

DIFFUSER, GRILLE & REGISTER SCHEDULE

TAG	SELECTION RANGE (CFM)	NECK SIZE (IN.)	OVERALL SIZE (IN.)	SERVICE	MOUNTING	ACCESSORIES	MANUFACTURER AND MODEL NUMBER (AS STANDARD)	MAX NC	REMARKS
SA	0-100	6Ø	24x24	SUPPLY	LAY-IN	-	TITUS OMNI	30	SEE NOTES
SB	105-210	8Ø	24x24	SUPPLY	LAY-IN	-	TITUS OMNI	30	SEE NOTES
SC	215-360	10Ø	24x24	SUPPLY	LAY-IN	-	TITUS OMNI	30	SEE NOTES
SD	0-100	6Ø	12x12	SUPPLY	SURFACE	-	TITUS OMNI	30	SEE NOTES
SE	0-210	8Ø	48" x (1) 1" SLOT	SUPPLY	LAY-IN	INS. PLENUM	TITUS FL10-HT	30	SEE NOTES
SF	215-230	10Ø	48" x (1) 1" SLOT	SUPPLY	LAY-IN	INS. PLENUM	TITUS FL10-HT	30	SEE NOTES
SG	235-260	12Ø	48" x (1) 1.5" SLOT	SUPPLY	LAY-IN	INS. PLENUM	TITUS FL15-HT	30	SEE NOTES
SH	0-210	8Ø	48" x (1) 1" SLOT	SUPPLY	BORDER 22	INS. PLENUM	TITUS FL10-HT	30	SEE NOTES
SI	215-230	10Ø	48" x (1) 1" SLOT	SUPPLY	BORDER 22	INS. PLENUM	TITUS FL10-HT	30	SEE NOTES
SJ	235-300	12Ø	48" x (1) 2" SLOT	SUPPLY	BORDER 22	INS. PLENUM	TITUS FL10-HT	30	SEE NOTES
RA	0-100	8Ø	24x24	SUPPLY	LAY-IN	-	TITUS OMNI	30	SEE NOTES
RB	105-210	10Ø	24x24	SUPPLY	LAY-IN	-	TITUS OMNI	30	SEE NOTES
RC	215-400	12Ø	24x24	SUPPLY	LAY-IN	-	TITUS OMNI	30	SEE NOTES
RD	400-600	14Ø	24x24	SUPPLY	LAY-IN	-	TITUS OMNI	30	SEE NOTES
RE	0-210	10Ø	48" x (1) 1" SLOT	RETURN	LAY-IN	INS. PLENUM	TITUS FL10-HT	30	SEE NOTES
RF	0-210	10Ø	48" x (1) 1" SLOT	RETURN	BORDER 22	INS. PLENUM	TITUS FL10-HT	30	SEE NOTES
RG	215-230	12Ø	48" x (1) 1" SLOT	RETURN	BORDER 22	INS. PLENUM	TITUS FL10-HT	30	SEE NOTES
RH	235-300	14Ø	48" x (1) 2" SLOT	RETURN	BORDER 22	INS. PLENUM	TITUS FL10-HT	30	SEE NOTES
EA	0-100	6Ø	12x12	EXHAUST	SURFACE	-	TITUS OMNI	30	SEE NOTES
EB	0-210	8Ø	12x12	EXHAUST	SURFACE	-	TITUS OMNI	30	SEE NOTES
EC	0-250	10Ø	24x24	EXHAUST	LAY-IN	-	TITUS OMNI	30	SEE NOTES
ED	0-30	6x6	8x8	EXHAUST	SIDE WALL	-	TITUS 350 RL	30	SEE NOTES

NOTES:

1. REFER TO SPECIFICATIONS AND DETAILS FOR ADDITIONAL INFORMATION.
2. SEE PLANS FOR LOCATIONS AND QUANTITIES FOR EACH AIR DEVICE.
3. SEE PLANS FOR BLOW PATTERNS FOR EACH AIR DEVICE.
4. AIR DEVICE FINISHES SHALL BE WHITE.
5. BORDER TYPES SHALL BE COMPATIBLE WITH THE REFLECTED CEILING PLANS.

ELECTRIC HEATING COIL SCHEDULE

TAG	SERVICE	LOCATION	CFM	TYPE	CAPACITY KW	CAPACITY BTUH	AIR TEMP (°F) ENT	AIR TEMP (°F) LVG	DUCT SIZE W (IN.)	DUCT SIZE H (IN.)	VELOCITY (FPM)	NO. OF STEPS	ELECTRIC SERVICE V	PH	HZ	MANUFACTURER AND MODEL NUMBER (AS STANDARD)	REMARKS
EHC-1	OA	DUCT	630	OC	5	17.1	30	55	12	12	696	SCR	480	3	60	INDEECO QUZ	SEE NOTES

NOTES:

1. PROVIDE WITH THERMAL CUTOUTS, DOOR DISCONNECT SWITCH, AIRFLOW SWITCH, CONTROL TRANSFORMER, FUSES AND MANUFACTURERS SAFETIES.
2. ELECTRIC COIL SHALL BE FLANGED TYPE.

ELECTRIC CABINET UNIT HEATER SCHEDULE

TAG	LOCATION	TYPE	MOUNTING	WEIGHT (LBS)	INPUT (kW)	OUTPUT (MBH)	AIR CFM	AIR EAT (°F)	AIR LAT (°F)	ELECTRIC SERVICE V	PH	HZ	TOTAL AMPS	MANUFACTURER AND MODEL NUMBER (AS STANDARD)	REMARKS
ECUH-1	VESTIBULE	HORIZ	HUNG	120	3.0	10.2	250	60	98	480	3	60	3.6	QMARK CU935	SEE NOTES

NOTES:

1. REFER TO SPECIFICATIONS, DETAILS, AND CONTROL DRAWINGS FOR ADDITIONAL INFORMATION.
2. PROVIDE WITH CONCEALED CABINET, CASING WITH FRONT & BACK DUCT COLLARS, AND REMOTE DUCT MOUNTED TWO STAGE T-STAT.
3. UNIT MOUNTED DISCONNECT SWITCH PROVIDED BY ELECTRICAL CONTRACTOR.
4. PROVIDE WITH TEMPERATURE SENSOR IN THE RETURN GRILLE.

CONDENSATE PUMP SCHEDULE

TAG	SERVICE	LOCATION	REC. CAP. GAL.	FLUID TEMP. (°F)	DISCHARGE PRESS (FT)	PUMP CAP. (GPM)	ELECTRICAL HP	V	PH	AMPS	MANUFACTURER AND MODEL NUMBER (AS STANDARD)	REMARKS
CP-1	ACU-1	PLENUM	1	55	12	4	1/10	120	1	3.1	HARTELL A2X-1965	SEE NOTES

NOTES:

1. REFER TO SPECIFICATIONS, DETAILS, AND CONTROL DRAWINGS FOR ADDITIONAL INFORMATION.
2. CONDENSATE PUMP SHALL BE HARD WIRED AND PLENUM RATED

ELECTRIC BASEBOARD SCHEDULE

TAG	LENGTH	WATTS PER FOOT	TOTAL WATTS	OUTPUT (MBH)	ELECTRIC SERVICE AMPS	V	PH	MANUFACTURER AND MODEL NUMBER (AS STANDARD)	REMARKS
EBB-1	3'-0"	250	750	2.6	2.7	277	1	QMARK CPH05A3250	SEE NOTES

NOTES:

1. REFER TO SPECIFICATIONS AND CONTROL DIAGRAMS FOR ADDITIONAL INFORMATION
2. PROVIDE WITH INTEGRAL CONCEALED DISCONNECT PREWIRED TO THE UNIT. DISCONNECTING MEANS SHALL BE NEMA RATED AND SUITABLE FOR LOCKING IN THE OFF POSITION.
3. CONFIRM EQUIPMENT FINISH WITH THE ARCHITECT.
4. PROVIDE WITH INTEGRAL THERMOSTAT AND PEDESTAL KIT.

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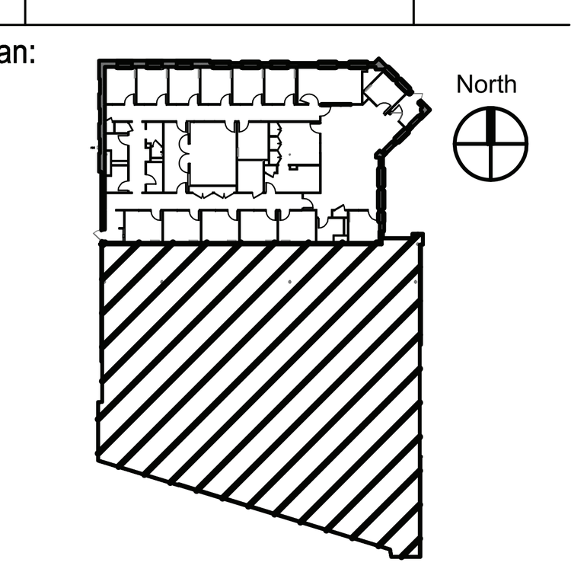
Number	Description	Date
	ISSUED FOR PERMIT & CONST.	23 JULY 2021

Key Plan:



Project No.: Y021006

Drawing Sheet Title:
HVAC SCHEDULES

Drawing Sheet Number:
M-800

Owner's Branch No.:
532

OUTDOOR AIR CALCULATIONS

FPB#/ROOM NAME	ZONE POP. (PEOPLE)	PEOPLE OUTDOOR AIR RATE (CFM/PERSON)	ROOM FLOOR AREA (SF)	AREA OUTDOOR AIR RATE (CFM/SF)	PEOPLE OUTDOOR AIRFLOW (CFM)	AREA OUTDOOR AIRFLOW (CFM)	BREATHING ZONE OUTDOOR AIRFLOW (CFM)	AIR DISTRIBUTION EFFECTIVENES	ZONE OUTDOOR AIRFLOW (CFM) MIN	ROOM SUPPLY AIRFLOW (CFM)	EXHAUST AIRFLOW (CFM)	RETURN AIR BALANCE	DESIGN OA	DESIGN RA
	Pz	Rp	Az	Ra	Rp*Az	Ra*Az	Vbz	Ez		Vpz				
	(Input)	(Input)	(Input)	(Input)	(Output)	(Output)	(Output)	(Input)	(Output)	(Input)	(Input)	(Output)	(Input)	(Input)
COLLAB 103	11.60	5	232	0.06	58.00	14	72	0.8	90	310	0	220	90	220
ACU-1 TOTALS:	11.60		232		58.00	14	72	0.8	90	310	0	220	90	220
PANTRY 138	0	7.5	166	0.12	0	20	20	0.8	25	250	250	0	25	0
MEETING 136	14.10	5	282	0.06	70.50	17	87	0.8	109	150	0	41	110	40
ACU-2 TOTALS:	14.10		448		71	37	107	0.8	134	400	250	41	135	260
OFFICE 107	0.56	5	111	0.06	2.78	7	9	0.8	12	150	0	138	15	135
OFFICE 108	0.56	5	111	0.06	2.78	7	9	0.8	12	150	0	138	15	135
OFFICE 109	0.56	5	111	0.06	2.78	7	9	0.8	12	240	0	228	15	225
HALLWAY 110 W	0	0	168	0.06	0	10	10	0.8	13	90	0	77	15	75
ACU-3 TOTALS:	1.67		501		8.33	30	38	0.8	48	630	0	582	60	570
OPERATIONS 131	0.71	5	142	0.06	3.55	9	12	0.8	15	180	0	165	15	165
FR OFFICE 133	1.03	5	206	0.06	5.15	7	12	0.8	15	180	0	165	15	165
OFFICE 134	0.56	5	111	0.06	2.78	7	9	0.8	12	90	0	78	15	75
ACU-4 TOTALS:	2.30		459		11.48	22	33	0.8	42	450	0	408	45	405
OFFICE 125	0.56	5	111	0.06	2.78	7	9	0.8	12	90	0	78	15	75
OFFICE 126	0.56	5	111	0.06	2.78	7	9	0.8	12	90	0	78	15	75
OFFICE 127	0.56	5	111	0.06	2.78	7	9	0.8	12	90	0	78	15	75
HALLWAY 120 E	0	0	154	0.06	0	9	9	0.8	12	90	0	78	15	75
ACU-5 TOTALS:	1.67		487		8.33	29	38	0.8	47	360	0	313	60	300
OFFICE 123	0.56	5	111	0.06	2.78	7	9	0.8	12	90	0	78	20	70
OFFICE 124	0.56	5	111	0.06	2.78	7	9	0.8	12	90	0	78	20	70
HALLWAY 115	0	0	115	0.06	0	7	7	0.8	9	60	0	0	10	0
HALLWAY 120 W	0	0	60	0.06	0	4	4	0.8	5	70	0	0	5	0
JAN 112	0	0	10	0.06	0	1	1	0.8	1	0	75	0	0	0
RESTROOM 116	0	0	52	0.06	0	3	3	0.8	4	0	75	0	0	0
RESTROOM 118	0	0	52	0.06	0	3	3	0.8	4	0	75	0	0	0
RESTROOM 119	0	0	52	0.06	0	3	3	0.8	4	0	75	0	0	0
PRINTER 113	0	0	37	0.06	0	2	2	0.8	3	80	0	0	5	0
LOCKERS 122	0	0	60	0.06	0	4	4	0.8	5	90	0	0	5	0
ACU-6 TOTALS:	1.11		660		5.55	40	45	0.8	56	480	300	156	65	140
OFFICE 104	0.56	5	111	0.06	2.78	7	9	0.8	12	125	0	113	15	110
OFFICE 105	0.56	5	111	0.06	2.78	7	9	0.8	12	125	0	113	15	110
OFFICE 106	0.56	5	111	0.06	2.78	7	9	0.8	12	125	0	113	15	110
HALLWAY 110 E	0	0	168	0.06	0	10	10	0.8	13	50	0	37	15	35
ACU-7 TOTALS:	1.67		501		8.33	30	38	0.8	48	425	0	377	60	365
TOTALS:	34.10		3288		171	202	372	0.8	465	3055	550	2098	515	2260

RTU-1 OUTDOOR AIR CALCULATIONS

FPB#/ROOM NAME	ZONE POP. (PEOPLE)	PEOPLE OUTDOOR AIR RATE (CFM/PERSON)	ROOM FLOOR AREA (SF)	AREA OUTDOOR AIR RATE (CFM/SF)	PEOPLE OUTDOOR AIRFLOW (CFM)	AREA OUTDOOR AIRFLOW (CFM)	BREATHING ZONE OUTDOOR AIRFLOW (CFM)	AIR DISTRIBUTION EFFECTIVENES	ZONE OUTDOOR AIRFLOW (CFM) MIN	ROOM SUPPLY AIRFLOW (CFM)	EXHAUST AIRFLOW (CFM)	RETURN AIR BALANCE	DESIGN OA	DESIGN RA
	Pz	Rp	Az	Ra	Rp*Az	Ra*Az	Vbz	Ez		Vpz				
	(Input)	(Input)	(Input)	(Input)	(Output)	(Output)	(Output)	(Input)	(Output)	(Input)	(Input)	(Output)	(Input)	(Input)
LOBBY 101	6.94	5	694	0.06	34.70	42	76	0.8	95	670	0	575	100	495
7-TR OFFICE 102	0.46	5	92	0.06	2.30	6	8	0.8	10	225	0	215	10	215
7-TR OFFICE 130	0.46	5	92	0.06	2.30	6	8	0.8	10	225	0	215	10	215
RESTROOM 128	0	0	56	0.06	0	3	3	0.8	4	0	75	0	0	0
RTU-1 TOTALS:	7.86		934		39.30	56	95	0.8	119	1120	75	1005	120	925

Landlord Comments:

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Seals:

General Notes:

Project Title:

Fidelity INVESTMENTS

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245 Summer Street
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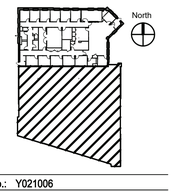
Fidelity Investor Center

2142 Fashion Drive
Nanuet, NY
10954

Number	Description	Date
	ISSUED FOR PERMIT & CONST.	23 JULY 2021

Key Plan:



Project No.: Y021006

Drawing Sheet Title:

HVAC SCHEDULES

Drawing Sheet Number:

M-801

Owner's Branch No.:

532