

MEP ABBREVIATIONS

ABV.	ABOVE
AC	ALTERNATING CURRENT
A/C	AIR CONDITIONER
AFC	ABOVE FINISHED CEILING
AF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AG	ABOVE GRADE AND GFI
AHAP	AS HIGH AS POSSIBLE
AHU	AIR HANDLING UNIT
ALT.	ALTERNATE
AMB.	AMBIENT TEMPERATURE (F. DEGREE)
AMP	AMPERE
APPROX	APPROXIMATELY
ARCH.	ARCHITECTURAL
AVG.	AVERAGE
B	BOILER
B.G.	BELOW GRADE
BMS	BUILDING MANAGEMENT SYSTEM
BRD	BAROMETRIC RELIEF DAMPER
BTU	BRITISH THERMAL UNIT
CD	CONSTRUCTION DOCUMENTS
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CH	CHILLER
CHEM.	CHEMICAL
CHP	CHILLED WATER PUMP
CKT.	CIRCUIT
CLG.	CEILING
CMPR	COMPRESSOR
CT	COOLING TOWER
CWP	CONDENSER WATER PUMP
CU	CONDENSING UNIT
DB	DRY BULB
DEFL.	DEFLECTION
DEG. F	DEGREES FAHRENHEIT
DET.	DETAIL
DD	DESIGN DEVELOPMENT
DIA	DIAMETER
DISC	DISCONNECT SWITCH
DM	DIMENSION
EA	EXHAUST AIR
EDB	ENTERING DRY BULB
EF	EXHAUST FAN
ELEC.	ELECTRICAL
ELEV.	ELEVATION
EMCS	ENERGY MGMT. CONTROL SYSTEM
E.S.P.	EXTERNAL STATIC PRESS. (IN. W.G.)
EWB	ENTERING WET BULB
EWT	ENTERING WATER TEMPERATURE
EXH.	EXHAUST
EXIST.	EXISTING
F/A	FREE AREA OPENING (SQ. FT.)
FCU	FAN COIL UNIT
FHP	FRACTIONAL HORSE POWER
FLR.	FLOOR
FPI	COIL FINS PER INCH
FPM	FEET PER MINUTE
FPS	FEET PER SECOND
FT	FOOT OR FEET
GFI	GROUND FAULT INTERRUPTER
GPM	GALLONS PER MINUTE
HD	HEAD
HDA	HANDS/OFF/AUTO. MOTOR STARTER
HP	HORSE POWER
HPU	HEAT PUMP UNIT
HR	HOURS
HT	HEIGHT
HTG.	HEATING
HTR.	HEATER
HVAC	HEAT VENT AND AIR CONDITIONING
HWP	HOT WATER PUMP
HX	HEAT EXCHANGER
HZ	FREQUENCY (HERTZ)
ID	INSIDE DIAMETER OR DIMENSION
IN.	INCHES
KW	KILOWATT
KWH	KILOWATT HOUR
LAT	LEAVING AIR TEMPERATURE
LWT	LEAVING WATER TEMPERATURE
MAX	MAXIMUM
MCA	MINIMUM CURRENT AMPS
MOC	MAX. OVER CURRENT PROTECTION
MBH	1000 BTU PER HOUR
MECH.	MECHANICAL
MFR.	MANUFACTURER
MIN.	MINIMUM
MVD	MANUAL VOLUME DAMPER
N/A	NOT APPLICABLE
NC	NOISE CRITERIA
NIC	NOT IN CONSTRUCTION
NK	NECK DIMENSION
NO.	NUMBER
OA	OUTSIDE AIR
OAR	OWNERS AUTHORIZED REPRESENTATIVE
OB	OPPOSED BLADE DAMPER
OD	OUTSIDE DIAMETER
OF	OWNER FURNISHED CONTRACTOR INSTALLED
ORIG.	ORIGINAL
P.D.	PRESSURE DROP (FT)
PH.	PHASE
PMB	POWERED MIXING BOX
P.B.S.	PLUMBING
PNL	PANEL
PRESS.	PRESSURE
RA	RETURN AIR
RAG	RETURN AIR GRILLE
RD	RADIUS
RE.	REFERENCE
RPM	REVOLUTIONS PER MINUTE
RTU	ROOF TOP UNIT
S/S	SINGLE SPEED MOTOR
S/S/S	START/STOP/STATUS
SA	SUPPLY AIR
SAG	SUPPLY AIR GRILLE
SDC	STAND ALONE DIGITAL CONTROLLER
SEER	SEASON ENERGY EFFICIENCY RATIO
SENS.	SENSIBLE
SP	STATIC PRESSURE
SQ	SQUARE
STR.	MOTOR STARTER
TEMP.	TEMPERATURE
T.S.P.	TOTAL STATIC PRESSURE (IN. W.G.)
UH	UNIT HEATER
UNO	UNLESS NOTED OTHERWISE
V	VOLT
VAV	VARIABLE AIR VALVE
VEL	VELOCITY
W	WATT
W	WITH
WO	WITHOUT
W.G.	WATER GAUGE
WB	WET BULB
WP	WEATHERPROOF
WPD	WATER PRESSURE DROP
WPG	WEATHERPROOF GFI
XFMR	TRANSFORMER

DUCTWORK LEGEND

16x12	SHEET METAL DUCT	
→	DIRECTION OF FLOW	
=====	INTERNALLY INSULATED SHEET METAL DUCT	
-----	HIDDEN SHEET METAL DUCT	
	ROUND ELBOW DOWN (R/A SIMILAR)	
	ROUND ELBOW UP (R/A SIMILAR)	
	RADIUS ELBOW (R=1.5 MIN.)	
	45 DEGREE ELBOW (R=1.5 MIN.)	
	SIZE OR SHAPE TRANSITION	
	TURNING VANES (RECTANGULAR), SMOOTH RADIUS	
	FLEXIBLE DUCT CONN. WITH DAMPER	
	BRANCH TAKE-OFF	
	WYE JUNCTION	
	SUPPLY DUCT SECTION UP	
	SUPPLY DUCT SECTION DOWN	
	RETURN DUCT SECTION UP	
	RETURN DUCT SECTION DOWN	
	EXHAUST DUCT SECTION UP	
	90 DEGREE S/A ELBOW DOWN	
	90 DEGREE S/A ELBOW UP	
	90 DEGREE R/A ELBOW DOWN	
	EXHAUST DUCT SECTION DOWN	
	90 DEGREE R/A ELBOW UP	
	RADIUS ELBOW (R=1.5 MIN.)	
	SQUARE ELBOW WITH DOUBLE WALL TURNING VANES	
	BRANCH TAKE-OFF WITH VANED EXTRACTOR	
	SPIN-IN TAP WITH DAMPER	
	TEE WITH SQUARE ELBOWS, TURNING VANES & SPLITTER DAMPER	
	SIDEWALL SUPPLY GRILLE OR REGISTER WITH AIR EXTRACTOR	
	S/A GRILLE/REGISTER W/ ROUND NECK & FLEX CONNECTION, 4-WAY THROW (U.N.O.)	
	S/A GRILLE/REGISTER W/ SQUARE NECK, 4-WAY THROW (U.N.O.)	
	R/A GRILLE OR REGISTER	
	VOLUME DAMPER	
	COUNTER WEIGHTED BACKDRAFT DAMPER	
	FIRE DAMPER	
	FIRE/SMOKE DAMPER (WITH SM. DET.)	
	SMOKE DAMPER (WITH SM. DET.)	
	MOTORIZED DAMPER (WITH END SW.)	
	STATIC PRESSURE SENSOR	
	AIRFLOW MEASURE STATION	
	AIRFLOW IONIZER STATION	
	THERMOSTAT OR TEMP SENSOR/HUMIDISTAT/CARBON DIOXIDE SENSOR	
	ACCESS DOOR	
	DUCT MOUNTED SMOKE DETECTOR (TUBE SENSING TYPE)	
	ZONE DAMPER	

ALL SYMBOLS ON THIS LIST ARE NOT NECESSARILY USED ON THIS PROJECT.

DRAWING SHEET INDEX:		SCALE:
M0.0	LEGEND AND GENERAL NOTES - MECHANICAL	NTS
MS1.1	SPECIFICATIONS - MECHANICAL	NTS
M0.1	SCHEDULES/DETAILS - MECHANICAL	NTS
M2.1	FLOOR PLAN - DUCTWORK	1/8"

HVAC VALVE & FITTINGS SYMBOLS

	TEE
	TEE, UP
	TEE, DOWN
	SINGLE SWEEP TEE
	CROSS
	LATERAL
	45 DEGREE ELBOW
	90 DEGREE ELBOW
	90 DEGREE ELBOW UP
	90 DEGREE ELBOW DOWN
	CAP
	SINGLE W.F. LATERAL STUB
	DOUBLE W.F. LATERAL STUB
	SINGLE W.F. LAT. & TRAP
	DOUBLE W.F. LAT. & TRAP
	FLOOR DRAIN RISER W/TRAP
	FLOOR CLEAN OUT
	CLEAN OUT
	FLOOR DRAIN
	HUB DRAIN
	DOWN SPOUT
	FIRE HOSE CABINET
	VENT THRU ROOF
	OVERFLOW ROOF DRAIN
	ROOF DRAIN
	GAS PRESSURE REDUCING VALVE
	WATER PRESSURE REDUCING VALVE
	OS & Y VALVE
	GLOBE VALVE
	GATE VALVE
	BALANCING VALVE (WITH PETE'S PLUG EITHER SIDE)
	BUTTERFLY VALVE
	BALL VALVE
	SOLENOID VALVE
	PLUG VALVE
	CHECK VALVE
	PRESSURE RELIEF VALVE
	CONTROL 2 WAY VALVE
	CONTROL 3 WAY VALVE
	MOTORIZED ISOLATION VALVE (2-POSITION-24V)
	MOTORIZED CONTROL VALVE (MODULATING-24V)
	FLOOR CONTROL VALVE
	ANGLE GATE VALVE
	ANGLE GLOBE VALVE
	MANUALLY CALIBRATED BALANCING VALVE
	AUTOMATIC FLOW CONTROL VALVE
	STRAINER & BLOW OFF VALVE
	PRESSURE GAUGE & COCK
	UNION OR COMPANION FLANGES
	THERMOMETER
	PRESSURE & TEMPERATURE TAP (PETES PLUG)
	THERMOSTAT
	HUMIDISTAT
	FLOW METER
	ANCHOR (PIPE)
	EXPANSION JOINT
	PIPE GUIDE
	MANUAL AIR VENT
	AUTOMATIC AIR VENT
	HOSE END DRAIN
	HOSE BIBB
	THERMOMETER & WELL
	TEMPERATURE SENSOR
	FLOW SWITCH
	PRESSURE SENSOR
	COMPRESSED AIR TAP
	FLOAT AND THERM. TRAP
	BUCKET STEAM TRAP
	PIPE SIZE REDUCER (CONCENTRIC)
	PIPE SIZE REDUCER (ECCENTRIC)

ALL SYMBOLS ON THIS LIST ARE NOT NECESSARILY USED ON THIS JOB.

ASHRAE CO ₂ DIFFERENTIAL	
	700 PPM — 15 CFM/PERSON
	500 PPM — 20 CFM/PERSON
	350 PPM — 30 CFM/PERSON

GENERAL HVAC NOTES:

- WITHOUT PRIOR APPROVAL FROM ENGINEER AND OWNER, ALL MECHANICAL EQUIPMENT SHALL NOT BE OPERATED DURING CONSTRUCTION OF THE BUILDING PER MANUFACTURER RECOMMENDATIONS. MECHANICAL CONTRACTOR IS RESPONSIBLE TO PROVIDE TEMPORARY HEATING OR COOLING AS NEEDED TO CLIMATE THE BUILDING.
- ALL PIPING AND DUCTS IN FINISHED ROOMS OR SPACES SHALL BE CONCEALED WITHIN FURRED CHASES OR ABOVE SUSPENDED CEILINGS.
- ALL DUCTWORK SIZES ARE PROVIDED IN CLEAR INSIDE AIRSTREAM DIMENSIONS. INCREASE DUCT SIZES TO ACCOMMODATE ANY INTERNAL INSULATION REQUIREMENTS (AS SPECIFIED). PROVIDE A MINIMUM OF 15 LINEAR FT. OF INTERNAL ACOUSTIC LINER ON SUPPLY AND RETURN AIR DUCTWORK FROM ANY FCU, AHU, AC, OR RTU (UNO). PROVIDE 8" INTERNAL LINER FOR MIXING OR VAV BOXES.
- PROVIDE FLEXIBLE CONNECTIONS ON AT THE INTAKE AND DISCHARGE OF ALL MOTOR DRIVEN EQUIPMENT.
- PROVIDE VIBRATION ISOLATORS FOR MOTOR-DRIVEN MECHANICAL EQUIPMENT.
- ALL FLEXIBLE DUCTWORK SHALL HAVE A MAXIMUM DEVELOPED LENGTH OF (5) FIVE FT.
- CONTRACTOR SHALL REFER TO THE ARCHITECTURAL REFLECTED CEILING PLANS FOR THE EXACT LOCATION OF ALL CEILING MOUNTED MEIP DEVICES INCLUDING BUT NOT LIMITED TO LIGHTS, DIFFUSERS, GRILLES ETC.
- AIR DEVICE DUCT SIZES SHALL BE THE SAME SIZE AS SHOWN ON THE DRAWINGS UNLESS NOTED OTHERWISE. REFER TO THE SCHEDULES FOR THE CFM RANGES. PROVIDE A TRANSITION FROM THE NECK SIZE TO THE REQUIRED DUCT SIZE SHOWN.
- CONTRACTOR SHALL VERIFY THE EQUIPMENT CLEARANCE REQUIREMENTS WITH THE MANUFACTURER'S RECOMMENDATIONS. EXACT LOCATION OF SELECTED EQUIPMENT SHALL BE COORDINATED WITH THE STRUCTURE TO PROVIDE RECOMMENDED CLEARANCES FOR MAINTENANCE.
- PROVIDE FIRE DAMPERS, FIRE/SMOKE DAMPERS AND FIRE STOP AS REQUIRED BY CODE AUTHORITIES FOR DUCT PENETRATIONS THROUGH FIRE OR SMOKE RATED WALL AND CEILINGS. REFER TO ARCHITECTURAL DRAWINGS FOR WALL TYPES.
- LOCATE ALL MECHANICAL EQUIPMENT FOR UNOBSTRUCTED MAINTENANCE ACCESS FOR ALL UNIT ACCESS PANELS, CONTROLS AND VALVING.
- FINISH ALL EXPOSED TO VIEW DUCTWORK AND WALL LOUVERS PER ARCHITECT'S RECOMMENDATIONS. ALL EXPOSED ROUND DUCT SHALL BE INTERNALLY SEALED AND MANUFACTURED FROM SPIRAL WOUND PAINT GRIP STEEL.
- ALL FLOOR BRANCHES OF PIPE RISERS SHALL BE PROVIDED WITH SHUT OFF VALVES AND DRAIN CONNECTION.
- UNLESS OTHERWISE SHOWN, LOCATE ALL ROOM THERMOSTATS, HUMIDISTAT AND CO2 SENSORS 4'-0" (CENTERLINE) ABOVE FINISHED FLOOR. NOTIFY THE ARCHITECT/ENGINEER OF ANY ROOMS WHERE THE ABOVE LOCATION CAN NOT BE MAINTAINED OR WHERE THERE IS A QUESTION ON PROPER LOCATION.
- DUCTWORK AND ITS CONSTRUCTION WILL BE GALVANIZED SHEET METAL AND CONSTRUCTED ACCORDING TO THE LATEST SMACNA STANDARDS.
- ALL DUCTWORK IS SHOWN IN SCHEMATIC FORM. DUCT RISES AND DROPS ARE NOT SHOWN. PROVIDE OFFSETS AS REQUIRED TO MEET SPACE REQUIREMENTS AND TO AVOID INTERFERENCE WITH OTHER TRADES. EACH TRADE SHALL BE RESPONSIBLE FOR COORDINATION WITH OTHER TRADES.
- ALL RADIUS TURNS SHALL BE SMOOTH WALL WITH A RADIUS OF R = 1.5D.

GENERAL PROJECT NOTES:

- PROVIDE ALL MATERIALS AND EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE AND OPERABLE MECHANICAL SYSTEM AS INDICATED ON THE DRAWINGS, AS SPECIFIED AND AS REQUIRED BY ALL NATIONAL, STATE AND LOCAL CODES.
- CONTRACT DRAWINGS FOR MECHANICAL WORK (HVAC, PLUMBING, AND FIRE PROTECTION) ARE DIAGRAMMATIC AND ARE INTENDED TO CONVEY SCOPE AND GENERAL ARRANGEMENT ONLY. IT IS THE CONTRACTORS RESPONSIBILITY FOR INSTALLING ALL MATERIALS PER SMACNA STANDARDS AND THE MANUFACTURER'S STANDARDS.
- ALL EXISTING SYSTEM INFORMATION AND/OR LOCATIONS ARE PROVIDED BY THE OWNER OR BY A 3RD PARTY. IT IS THE CONTRACTORS RESPONSIBILITY TO VERIFY ALL MEP SERVICES ARE LOCATED AS DESIGNED BEFORE BIDDING THE PROJECT. IN OCCURRENCES WHERE EXISTING DOES NOT MATCH DESIGNED, IT IS THE CONTRACTORS RESPONSIBILITY TO NOTIFY THE OWNER, ARCHITECT, & ENGINEER BEFORE PROCEEDING. IF ANY DISCREPANCIES ARE NOT IDENTIFIED AT BIDDING, THE COST SHALL BE ASSORBED BY THE CONTRACTOR AND NOT PASSED ONTO THE OWNER OR ENGINEER OF RECORD.
- COORDINATE CONSTRUCTION OF ALL MECHANICAL WORK WITH ARCHITECTURAL, STRUCTURAL, CIVIL, ELECTRICAL WORK, ETC., SHOWN ON THE OTHER CONTRACT DRAWINGS.
- WHEN TWO OR MORE ITEMS OF THE SAME TYPE OF EQUIPMENT ARE REQUIRED, THE PRODUCT OF ONE MANUFACTURE SHALL BE USED.
- ALL CONTROL WIRE AND CONDUIT SHALL COMPLY WITH THE LATEST EDITION NATIONAL ELECTRIC CODE AND DIVISION 23 OF THE SPECIFICATION.
- ALL MISCELLANEOUS STEEL REQUIRED TO ENSURE PROPER INSTALLATION AND AS SHOWN IN DETAILS FOR PIPING, DUCTWORK, AND EQUIPMENT (UNLESS OTHERWISE NOTED) SHALL BE FURNISHED AND INSTALLED BY THE MECHANICAL CONTRACTOR.
- MECHANICAL EQUIPMENT, DUCTWORK, AND PIPING SHALL NOT BE SUPPORTED FROM METAL DECK.
- LOCATION AND SIZES OF ALL FLOOR, WALL, AND ROOF OPENINGS SHALL BE COORDINATED WITH ALL OTHER TRADES.
- PROVIDE REMOTE BALANCING DAMPERS SIMILAR TO 'YOUNG CONCEALED REGULATORS' FOR ALL TAPS MADE ABOVE INACCESSIBLE CEILING OR WALLS. FINISH CONCEALMENT COVERS PER ARCHITECTS RECOMMENDATIONS.
- ALL AHU AND FCU FANS SHALL OPERATE CONTINUOUSLY DURING THE OCCUPIED MODE OF OPERATION WITH ASSOCIATED OUTSIDE AIR MOTORIZED DAMPERS IN THE FULL OPEN POSITION (UNLESS NOTED OTHERWISE OR DCV SYSTEM). DAMPER SHALL BE CLOSED WITH THE FANS OPERATIONAL IN THE MORNING WARM UP OR COOL DOWN MODES.
- ALL REMOTE MOUNTED DISCONNECT SWITCHES FOR MECHANICAL EQUIPMENT SHALL HAVE I.D. NAME PLATES.
- ALL DEMOLITION ACTIVITIES SHALL BE PERFORMED SO AS TO PROVIDE MINIMAL DISRUPTION TO THE NEIGHBORING TENANTS.
- ALL SAW CUTTING SHALL BE PERFORMED AFTER HOURS SO THAT OPERATION DOES NOT DISTURB NEIGHBORING TENANTS. THERE SHALL BE NO GAS POWERED EQUIPMENT IN TENANT AREAS.

DRAWING SYMBOLS

(ALL SYMBOLS MAY NOT APPEAR ON DRAWINGS)

SUBTITLE NUMBER DESCRIPTION
 XX DESCRIPTION
 X ← SCALE

DETAIL SYMBOL
 DETAIL #
 DRAWING NO. TO REFER TO

SECTION
 SECTION NUMBER
 DRAWING NUMBER WHERE SECTION IS LOCATED

AIR DISTRIBUTION DEVICE

 AIR QUANTITY
 ARROWS INDICATE THROW PATTERN
 G-R-D DESIGNATION

NOTE BY SYMBOL

ELEVATION/ RISER DIAGRAM SYMBOL

 ELEVATION/ RISER #
 DRAWING NUMBER
 POINTS TO ELEVATION/ RISER AREA

PIPING DESIGNATIONS
 (ALL DESIGNATIONS MAY NOT APPEAR ON DRAWINGS.)
 SYMBOL DESCRIPTION
 —X—X—X— EXISTING DUCT
 - - - - - EXISTING DUCT TO BE REMOVED
 CONNECT TO NEW OR EXISTING
 DEMO TO THIS POINT

MECHANICAL DUCTWORK DESIGN GUIDELINES

NOMINAL CFM RANGE	OPTIONAL, NET CLEAR INSIDE DUCT SIZE, SELECTIONS (SIZES IN INCHES)					NOMINAL DIAMETER
	NO. 1.	NO. 2.	NO. 3.	NO. 4.	NO. 5.	
UP TO 38	4 DIA.	4 x 3-1/2	4-1/2 x 3	---	---	4
39 TO 50	4-1/2 DIA.	5 x 3-1/2	6 x 3	---	---	5
51 TO 70	5 DIA.	5 x 4	5 x 3-1/2	7 x 3	---	5
71 TO 90	5-1/2 DIA.	5 x 5	6-1/2 x 4	9 x 3	---	6
91 TO 110	6 DIA.	6 x 5	7-1/2 x 4	11 x 3	---	6
111 TO 160	7 DIA.	7 x 6	8-1/2 x 5	11 x 4	13 x 3-1/2	7
161 TO 230	8 x 6-1/2	9 x 6	11 x 5	14 x 4	17 x 3-1/2	8
231 TO 320	9 x 7-1/2	10 x 7	12 x 6	14 x 5	20 x 4	10
321 TO 420	8-1/2 x 9	10 x 8-1/2	12 x 7	15 x 6	19 x 5	10
421 TO 540	10 x 10	11 x 9	13 x 8	15 x 7	18 x 6	12
541 TO 700	11 x 11	12 x 10	14 x 9	16 x 8	18-1/2 x 7	12
701 TO 850	12 x 12	13 x 11	14 x 10	16 x 9	19 x 8	14
851 TO 1000	14 x 12	15 x 11	16-1/2 x 10	19 x 9	22 x 8	14
1001 TO 1300	16 x 12	17 x 11	19 x 10	22 x 9	26 x 8	16
1301 TO 1500	18 x 12	20 x 11	23 x 10	25 x 9	30 x 8	16
1501 TO 1700	21 x 12	23 x 11	26 x 10	30 x 9	35 x 8	18
1701 TO 2000	19 x 14	22 x 13	24 x 12	26 x 11	28 x 10	20
2001 TO 2600	24 x 14	26 x 13	29 x 12	33 x 11	37 x 10	22
2601 TO 3500	25 x 16	30 x 14	33 x 13	36 x 12	40 x 11	24
3501 TO 4400	30 x 16	36 x 14	40 x 13	44 x 12	50 x 11	26
4401 TO 6000	32 x 18	38 x 16	43 x 14	47 x 13	54 x 12	28
6001 TO 7600	30 x 20	37 x 18	51 x 14	56 x 13	70 x 12	30
7601 TO 9000	30 x 25	35 x 22	38 x 20	43 x 18	60 x 14	32
9001 TO 11000	35 x 25					

SECTION 230500 COMMON WORK RESULTS

- 1. THE MECHANICAL HVAC SPECIFICATIONS ARE INTENDED TO BE USED TOGETHER AS CONSTRUCTION DOCUMENTS. THE ARE INTENDED TO DEFINE, NOT LIMIT, THE SCOPE OF WORK. THE CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIAL, TOOLS, MACHINERY, AND SERVICES NECESSARY TO COMPLETE THE WORK. THE WORK SHALL BE COORDINATED AS TO NOT IMPEDE THE PROGRESS OF THE PROJECT.
2. THESE DOCUMENTS ARE DIAGRAMATIC. THE CONTRACTOR SHALL COORDINATE ALL WORK SO THAT INTERFERENCES ARE AVOIDED.
3. THE MECHANICAL SYSTEM IS DESIGNED FOR A 100% SEALED ENVELOPE IN THE BUILDING FOR THE MECHANICAL SYSTEM TO FUNCTION AS DESIGNED AND TO ENSURE THERE IS NO HUMIDITY ISSUES CAUSED BY UNCONDITIONED AIR ENTERING THE BUILDING. THE GENERAL CONTRACTOR AND MECHANICAL CONTRACTOR ARE RESPONSIBLE TO COORDINATE THE VERIFICATION THAT THE BUILDING ENVELOPE IS SEALED. THE ENVELOPE IS THE AREA ON ANY EXTERIOR WALL OF THE SALON THAT COULD POTENTIALLY LEAK OUTSIDE AIR INTO THE SPACE. ALL AREAS ARE REQUIRED TO BE SEALED AND INSULATED TO PREVENT UNCONDITIONED OUTSIDE AIR IN THE BUILDING.

THIS INCLUDES...

- THE AREA WHERE THE ROOF MEETS THE OUTSIDE WALL.
-ANY EXTERIOR WALL THAT HAS GAPS OR OPENINGS IN THE WALL COVERING SHOWING INSULATION. THIS IS FROM FLOOR TO ROOF DECK AND EXTERIOR DOOR SEALS.

- A. IF THE BUILDING ENVELOPE IS LEAKING IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO INCLUDE AS A SEPARATE LINE ITEM ON THE PROPOSAL TO SEAL THE ENVELOPE.
B. IF THE ENVELOPE PASSES INSPECTION BEFORE BIDDING, THE GC IS TO PROVIDE A CERTIFICATION LETTER TO THE OWNER AND THE ENGINEER AT THE BID DATE.
C. IF THE ENVELOPE IS LEAKING AND AN ISSUE OCCURS WITHOUT NOTIFYING THE OWNER BEFORE THE BIDDING PROCESS, IT WILL BE AT THE GENERAL CONTRACTORS EXPENSE TO CORRECT THIS ISSUE. THE COST SHALL NOT BE PASSED ONTO THE OWNER.
D. THE GC IS RESPONSIBLE TO PROVIDE A REPORT TO THE MECHANICAL ENGINEER THAT THE LEAKING ENVELOPE ISSUE ISSUES ARE CORRECTED AND CERTIFIED. AT ANY TIME, POST CONSTRUCTION AT OCCUPANCY, THE OWNER FINDS THE ENVELOPE IS NOT SEALED, THE GC IS RESPONSIBLE TO CORRECT THE ISSUE AND ANY DAMAGES. THIS WILL BE AT THE COST TO THE GC AND NOT PASSED ONTO THE OWNER.

- 4. PROVIDE ALL EQUIPMENT, MATERIALS, LABOR, SUPERVISION, AND SERVICES NECESSARY FOR OR INCIDENTAL TO THE INSTALLATION OF A COMPLETE AND OPERATING REFRIGERATION AND AIR HANDLING SYSTEM AS INDICATED ON THE DRAWINGS AND AS SPECIFIED.

- 5. COORDINATE ALL WORK WITH ALL OTHER TRADES AND ANY EXISTING CONDITIONS TO PREVENT CONFLICTS. UNNECESSARY EXPENSE OR DELAYS IN THE INSTALLATION OF THE WORK, WHEN CONFLICTS ARISE, REMOVE AND RELOCATE ITEMS CAUSING SUCH CONFLICTS, AT NO ADDITIONAL COST TO THE OWNER. THE WORK SHALL BE ARRANGED IN A NEAT, WELL-ORGANIZED MANNER. LOCATE OPERATING AND CONTROL EQUIPMENT PROPERLY TO PROVIDE EASY ACCESS FOR OPERATION AND ACCESS FOR OPERATION AND MAINTENANCE.

- 6. SHOULD THERE BE ANY DOUBT TO THE INTENT OF THE CONTRACT DOCUMENTS (THESE DRAWINGS), OBTAIN AN INTERPRETATION FROM THE ARCHITECT.

- 7. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS, LICENSES, AND FEES TO COMPLETE THE WORK AT HIS/HER EXPENSE.

- 8. ANY FIRM OR INDIVIDUAL NOT HAVING THE NECESSARY EXPERIENCE AND EXPERTISE TO COMPLETE THE WORK SHALL NOT BE USED ON THIS PROJECT.

- 9. THE WORK SHALL CONFIRM TO THE LATEST EDITIONS OF THE FOLLOWING STANDARDS: APPLICABLE STATE AND LOCAL CODES, NFPA, AGA, ASME, ASHRAE, SBI, NSF, PDI, UL, NEC, NEMA, SMACNA, OSHA, AHRI, MSS, ANSI, FM, ADA.

- 10. THE CONTRACTOR SHALL ARRANGE AND COORDINATE WITH AUTHORITIES AND UTILITY COMPANIES FOR SERVICE CONNECTIONS IN ADDITION TO RESTORING ANY DEMOLITION REQUIRED FOR THE SAID CONNECTIONS.

- 11. WITHOUT THE PRIOR APPROVAL FROM THE ENGINEER AND OWNER, ALL MECHANICAL EQUIPMENT SHALL NOT BE OPERATED DURING CONSTRUCTION OF THE BUILDING PER MANUFACTURERS RECOMMENDATIONS. MECHANICAL CONTRACTOR IS RESPONSIBLE TO PROVIDE TEMPORARY HEATING OR COOLING AS NEEDED TO CLIMATIZE THE BUILDING.

- 12. PUNCH-LIST - DIVISION 23 SHALL SCHEDULE, THROUGH THE ARCHITECT WITH A MINIMUM OF 7-DAYS NOTICE, THE ENGINEER TO PERFORM THE FOLLOWING:

- A. PRE-PUNCH LIST: VERIFICATION OF MECHANICAL ITEMS SUCH AS, BUT NOT LIMITED TO, DUCTWORK SIZES, PIPING SIZES, LOCATIONS, METHODS OF ASSEMBLY / INSTALLATION, HANGING, BEFORE ITEMS ARE ENCLOSED BY CEILINGS, WALL, ETC.

- a. DIVISION 23 SHALL DELIVER TO BOTH THE ARCHITECT AND ENGINEER, A LETTER STATING THAT ALL ITEMS IN THE PRE-PUNCH LIST HAVE BEEN CORRECTED OR ADJUSTED ACCORDING TO THE GENERAL CONDITIONS OF THE CONTRACT BEFORE ANY CEILINGS, WALLS, ETC CAN BE INSTALLED TO ENCLOSE THE PLUMBING AND MECHANICAL ITEMS.

- B. FINAL PUNCH-LIST: VERIFICATION OF MECHANICAL ITEMS SUCH AS, BUT NOT LIMITED TO, UNIT OPERATION, SENSOR LOCATIONS, QUALITY OF INSTALLATION. ALL FINISHES AND COLORS SELECTED BY THE ARCHITECT.

- a. BEFORE PROCEEDING WITH THE FINAL PUNCH LIST, DIVISION 23 SHALL PROVIDE THE ENGINEER WITH A COMPLETE SIGNED AND SEALED TEST & BALANCE REPORT. THE ENGINEER SHALL NOT PERFORM A FINAL PUNCH LIST UNTIL A COMPLETE TEST & BALANCE REPORT IS RECEIVED.

- b. DIVISION 23 SHALL AT THE REQUEST OF THE ENGINEER, PROVIDE A LADDER AND ONE EMPLOYEE TO REMOVE AND REPLACE CEILING TILES, OPEN ACCESS DOORS, ETC. FOR THE INSPECTION OF MECHANICAL ITEMS. THE EMPLOYEE SHALL BE MADE IMMEDIATELY AVAILABLE TO REMOVE ITEMS REQUESTED BY THE ENGINEER. ANY CEILING TILES DAMAGED SHALL BE REPLACED WITH NEW (TO MATCH EXISTING) AT DIVISION 23'S EXPENSE.

- c. DIVISION 23 SHALL DELIVER TO BOTH THE ARCHITECT & ENGINEER A LETTER STATING THAT ALL ITEMS IN THE FINAL PUNCH LIST HAVE BEEN CORRECTED OR ADJUSTED ACCORDING TO THE GENERAL CONDITIONS OF THE CONTRACT.

- 13. DURING THE COURSE OF CONSTRUCTION, COLLECT AND COMPLETE THREE (3) SETS OF OPERATING INSTRUCTIONS, WIRING DIAGRAMS, CATALOG CUTS, PREVENTATIVE MAINTENANCE INSTRUCTIONS, PARTS LISTS, ETC FOR ALL THE EQUIPMENT FURNISHED UNDER THIS CONTRACT. ALL LITERATURE INCLUDING WARRANTIES SHALL BE INCLUDED IN THE OPERATION AND MAINTENANCE MANUALS.

- A. AT COMPLETION OF WORK, AND PRIOR TO REQUEST FOR FINAL INSPECTION, SUBMIT THE MANUALS TO THE ARCHITECT IN ACCORDANCE WITH DIVISION 1 AND SPECIFIED HEREIN. MANUALS SHALL BE BOUND IN HEAVY DUTY, THREE-RING, VINYL COVERED, HARD-BACKED BINDERS, WITH CLEAR PLASTIC POCKET ON THE SPINE. THE SPINE OF EACH BINDER SHALL HAVE THE FOLLOWING TYPEWRITTEN LETTERING INSERTED...

OPERATION AND MAINTENANCE MANUAL MECHANICAL SYSTEMS OF (NAME OF PROJECT)

B. MANUALS SHALL INCLUDE THE FOLLOWING:

- a. A MASTER INDEX AT THE BEGINNING OF MANUAL SHOWING ITEMS INCLUDED. USE PLASTIC TAB INDEXES FOR EACH SECTION OF THE MANUAL.
b. THE FIRST SECTION SHALL CONSIST OF THE NAME, ADDRESS AND PHONE NUMBER OF THE ARCHITECT, MECHANICAL AND ELECTRICAL ENGINEERS, AND ALL CONTRACTORS & SUB-CONTRACTORS. ALSO INCLUDE A COMPLETE LIST OF EQUIPMENT INSTALLED WITH NAME, ADDRESS, AND PHONE NUMBERS OF SUPPLIERS.

- c. COPY OF ALL ENGINEERS APPROVED SUBMITTAL FORM FOR ALL REQUIRED SUBMITTALS.

- d. A SECTION FOR EACH PIECE OF EQUIPMENT WHICH SHALL INCLUDE THE FOLLOWING: MANUFACTURERS CATALOG DATA INCLUDING CAPACITY, SIZE ETC. BY HIGHLIGHTING THE APPLICABLE DATA; MANUFACTURERS INSTALLATION & MAINTENANCE MANUALS; PERFORMANCE CURVES FOR PUMPS, FANS ETC; RECOMMENDED LIST OF SPARE PARTS TO BE STACKED FOR PREVENTATIVE MAINTENANCE; EQUIPMENT PARTS IDENTIFICATION LIST FOR REPAIR AND REPLACEMENT PURPOSES; WIRING DIAGRAMS FOR THE SPECIFIC PIECE OF EQUIPMENT. GENERALIZED DOCUMENTS ARE NOT ACCEPTABLE.

- e. TEMPERATURE CONTROL DIAGRAMS, IDENTIFYING INDIVIDUAL COMPONENTS AND THEIR LOCATION. SEQUENCE OF OPERATION SHALL BE INCLUDED WITH THE DIAGRAM. IDENTIFY MODEL AND SERIAL NUMBER AT EACH LOCATION.

- f. COPY OF TEST & BALANCE REPORT.

- g. COPY OF EACH SHOP DRAWING/RED-LINE DRAWING.

- h. COPY OF MANUFACTURERS START-UP REPORT.

- i. ENGINEERS OBSERVATION REPORTS.

- j. COPY OF ALL INSPECTION TAGS/REPORTS.

- k. EXISTING ACTIVE SERVICES: WATER, SEWER, ELECTRICAL, TELEPHONE, ETC. WHEN ENCOUNTERED, SHALL BE PROTECTED AGAINST DAMAGE. DO NOT INTERRUPT OR DISTURB OPERATION OF ACTIVE SERVICES WHICH ARE TO REMAIN. IF ACTIVE SERVICES ARE ENCOUNTERED WHICH REQUIRE RELOCATION, RELOCATION SHALL BE IN CONFORMANCE WITH THE REQUIREMENTS OF THE UTILITY OR MUNICIPALITY WITH JURISDICTION, WHERE EXISTING SERVICES ARE TO BE ABANDONED, THEY SHALL BE TERMINATED IN CONFORMANCE WITH REQUIREMENTS OF THE UTILITY OR MUNICIPALITY WITH JURISDICTION.

- 14. ALL MATERIALS AND EQUIPMENT FURNISHED BY THIS CONTRACTOR SHALL OPERATE AND PERFORM AS DESIGNED WITH RESPECT TO EFFICIENCIES, CAPACITIES, AND QUIETNESS FOR ONE YEAR FROM SUBSTANTIAL COMPLETION. PROVIDE ALL SERVICES REQUIRED TO IMMEDIATELY REPAIR OR REPLACE, AT NO ADDITIONAL COST TO THE OWNER, ANY DEFECTIVE PART OF THE INSTALLATION RESULTING FROM THE SUPPLY OF FAULTY WORKMANSHIP OF MATERIAL, LACK OF MAINTENANCE, ACCIDENTS, OR CARELESSNESS ON THE PART OF THE OWNER SHALL NOT BE INCLUDED IN THIS WARRANTY.

- 15. CLEAN EQUIPMENT AND FIXTURES AT TIME OF COMPLETION USING MANUFACTURERS RECOMMENDED CLEANING METHODS AND MATERIALS.

- 16. UPON REQUEST, THE ENGINEER CAN PROVIDE CONSTRUCTION DOCUMENTS IN AUTOCAD 2000 SERIES FORMAT. UPON WRITTEN REQUEST, COMPLETION OF A RELEASE FORM, AND PAYMENT OF THE ENGINEERS STANDARD FEE OF \$200 SET-UP CHARGE AND \$50 PER DRAWING, ENGINEER WILL PROVIDE ELECTRONIC FILES ON DVD OR EMAIL. IF REQUESTED, ENGINEER WILL ALSO PROVIDE A LIST OF DRAWING LAYERS AND NAMES THAT WILL BE MAINTAINED.

END OF SECTION

SECTION 230593 TESTING, ADJUSTING AND BALANCING

- 1. UTILIZE AN AABC CERTIFIED AGENT TO TEST, ADJUST, AND BALANCE ALL HVAC SYSTEMS. SUBMIT CERTIFICATIONS FOR APPROVAL.

- 2. THE TEST AND BALANCE COMPANY SHALL BE AN INDEPENDENT FIRM SEPARATE AND DISTINCT FROM AND NOT BE ASSOCIATED WITH OR BE A SUBSIDIARY OF A FIRM PERFORMING WORK UNDER DIVISION 22 OR 23 AND SHALL BE UNDER DIRECT CONTRACT TO THE GENERAL CONTRACTOR.

- 3. THE CONTRACTOR SHALL PROVIDE THE T&B FIRM WITH COPIES OF ALL DRAWINGS, SPECIFICATIONS, SHOP DRAWINGS, SUBMITTAL DATA, REVISIONS, CHANGE ORDERS, AND OTHER DATA REQUIRED FOR PLANNING FOR T&B WORK.

- A. THE MECHANICAL CONTRACTOR SHALL INSTALL ALL DAMPERS IN AN ACCESSIBLE AREA AND FLAG ALL DAMPERS FOR EASE OF IDENTIFYING LOCATION.

- B. THE CONTRACTOR SHALL CORRECT ANY DEFICIENCIES NOTED DURING THE T&B INCLUDING CONTROLS CALIBRATION, INSTALLATION OF BALANCING DEVICES, SHEAVE REPLACEMENTS, AND MOTOR REPLACEMENTS AT NOT ADDITIONAL COST TO THE OWNER.

- C. THE CONTRACTOR IS RESPONSIBLE TO NOTIFY THE T&B COMPANY IN WRITING WHEN ALL DEFICIENCY REPAIRS ARE COMPLETE.

- D. SHOULD THE SYSTEM NOT BE READY FOR RETESTING IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO COMPENSATE THE T&B COMPANY FOR LOST TIME.

- 4. AFTER SYSTEMS HAVE BEEN TESTED, BALANCED (WITHIN 5% OF DESIGN), AND PLACED IN PROPER WORKING ORDER, BUT BEFORE FINAL ACCEPTANCE OF THE MECHANICAL SYSTEMS, DEMONSTRATE THE SYSTEMS TO THE OWNER.

- A. THE T&B FIRM SHALL LOCK AND MARK LOCATIONS OF ALL DAMPERS AFTER FINAL SETTING.

- 5. SUBMIT REPORT WITH CERTIFIED SIGNATURE AND SEAL TO ENGINEER FOR REVIEW AND COMMENTS. ALL FEATURES AND FUNCTIONS OF ALL SYSTEMS SHALL BE EXPLAINED AND THE OWNER SHALL BE INSTRUCTED IN PROPER OPERATION AND MAINTENANCE OF THE EQUIPMENT AND SYSTEMS.

- A. THE REPORT SHALL INCLUDE FOR EACH PIECE OF EQUIPMENT AND SYSTEM THE FOLLOWING INFORMATION.

- 6. RECORD MANUFACTURER, MODEL, SERIAL, MOTOR NAMEPLATE AND ALL MANUFACTURER DATA RELATED INFORMATION.

- 7. TOTAL ACTUAL CFM BY TRAVERSE.

- 8. ALL READINGS OF SUPPLY, RETURN, OUTSIDE AIR AND EXHAUST REGISTERS.

- 9. MEASURE AND RECORD MOTOR FULL LOAD APMS, RPM'S AND HORSE POWER.

- 10. TEST SUPPLY, RETURN, EXHAUST, AND OSA FANS. ADJUST BLOWERS SPEEDS TO ACHIEVE SPECIFIED CFM.

- 11. FAN AND MOTOR SHEAVE SIZES AND CENTER DISTANCE. INCLUDE ALL BELT SIZES.

- 12. PILOT TUBE TRANSVERSE AT MIN OF 5 POINTS ON EACH DUCT SYSTEM

- 13. MEASURE AND RECORD SPACE TEMPERATURE.

- 14. OSA TEMPERATURE (DB / WB)

- 15. WET BULB AND DRY BULB AIR TEMPERATURES ON THE ENTERING AND LEAVING SIDES OF ALL EQUIPMENT.

- 16. TEST AND RECORD STATIC PRESSURES, INCLUDING ENTERING AND LEAVING STATIC PRESSURES OF EACH FAN, COIL, AND FILTER SECTION

- 17. CALIBRATION CERTIFICATIONS OF ALL EQUIPMENT BEING UTILIZED.

- 18. ALL DEFICIENCIES OF NONCONFORMANCE WITH THE DESIGN DOCUMENTS SHALL BE NOTATED.

- B. ALL DEFICIENCIES SHALL BE REPORTED TO THE ARCHITECT / ENGINEER AND SHALL BE REPAIRED BY THE MECHANICAL CONTRACTOR.

- C. AFTER ALL DEFICIENCIES ARE REPAIRED THE SYSTEM SHALL BE VERIFIED AND ADJUSTED AS NEEDED BY THE T&B CONTRACTOR.

- 19. TESTING AND BALANCING PROCEDURES SHALL BE PERFORMED WITH

EQUIPMENT CLEANED AND CLEAN FILTER MEDIA.

- 20. INSTRUCT OWNER IN THE MAINTENANCE PROCEDURES TO DRAIN AND PROTECT WATER SYSTEMS FROM FREEZING DURING WINTER CONDITIONS.

- 21. FURNISH THE NECESSARY TRAINED PERSONNEL TO PERFORM THE DEMONSTRATIONS AND INSTRUCTIONS. THE MANUFACTURER'S REPRESENTATIVES FOR THE EQUIPMENT SHALL BE PRESENT TO ASSIST WITH THE DEMONSTRATIONS.

END OF SECTION

SECTION 233113 AIR DISTRIBUTION

- 1. THE SHEET METAL DUCTWORK SHALL BE CONSTRUCTED TO SMACNA PRESSURE CLASS AND STANDARDS. PROVIDE FIRE AND / OR COMBINATION FIRE/SMOKE DAMPERS AT ALL FIRE RATED WALLS AND AREA SEPARATIONS PER ALL CODE REQUIREMENTS.

- 2. RECTANGULAR ELBOWS, UNLESS INDICATED OTHERWISE, SHALL BE CONSTRUCTED WITH CENTERLINE RADIUS OF NOT LESS THAN 1.5 DUCT WIDTH OR SQUARE ELBOW WITH DOUBLE WALL STREAMLINE VANES.

- 3. RETURN AIR ACOUSTICAL ELBOWS SHALL BE A SQUARE ELBOW WITH NO TURNING VANES.

- 4. SLOPES FOR TRANSITIONS OR OTHER CHANGES IN DIMENSIONS SHALL BE MINIMUM 1 TO 3.

- 5. TRANSVERSE JOINTS (WITH A SIDE WALL LARGER THAN 14") SHALL BE DUCTMATE, TDC, OR TYPES FABRICATED ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS."

- 6. ROUND STEEL DUCT SHALL BE SPIRAL DUCT CONSTRUCTION IN ALL COMMERCIAL APPLICATIONS. SNAP LOCK ROUND DUCT IS ACCEPTABLE IN RESIDENTIAL CONSTRUCTION ONLY.

- 7. AT EACH MAJOR BRANCH FROM A PRIMARY RECTANGULAR OR SQUARE TRUNK DUCT, AND WHERE SHOWN ON THE DRAWINGS, INSTALL A SPLITTER DAMPER OR MULTIBLADE ADJUSTABLE AIR PICKUP. SPLITTER DAMPER SHALL HAVE END BEARINGS AND CONSIST OF A BLADE CONSTRUCTED OF 20 GAUGE-GALVANIZED STEEL SECURELY RIVETED OR WELDED TO A SQUARE OPERATING ROD.

- 8. EXPOSED DUCT SHALL BE CONSTRUCTED WITH PAINT GRIP SHEET METAL AND PAINTED WITH 2 COATS OF PAINT, COLOR TO BE CHOSEN BY ARCHITECT/OWNER.

- A. EXPOSED DUCT IS NOT TO BE EXTERNALLY SEALED. GASKETED FITTINGS ARE REQUIRED OR THE DUCT SHALL BE INTERNALLY SEALED.

- 9. ALL DUCTWORK SHALL BE SEALED WITH A HEAVY MASTIC TYPE SEALANT IN ACCORDANCE WITH "HVAC DUCT CONSTRUCTION STANDARDS," LATEST EDITION, SEAL CLASS A.

- 10. FLEXIBLE DUCTWORK SHALL BE PRE-INSULATED CPE LINER BONDED TO A COATED SPRING STEEL HELIX. JOINTS TO BE SEALED PER MANUFACTURER'S UL APPROVED RECOMMENDATIONS. INSULATION SHALL HAVE A "C" FACTOR OF 23 AT 60 DEGREES F WITH AN OUTER FIBERGLASS REINFORCED METALIZED FILM MOISTURE BARRIER. MAXIMUM 6" WC POSITIVE PRESSURE, 25 FLAME SPREAD, 50 SMOKE RATING PER NFPA. UL 181 CLASS 1 DUCT. TECHNIFLEX SERIES WK. MAXIMUM LENGTH FOR ANY FLEXIBLE DUCT SHALL NOT EXCEED 5'-0" EXTENDED LENGTH.

- 11. PROVIDE MANUFACTURERS STANDARD DIFFUSERS, REGISTERS, AND GRILLES OF SIZE, SHAPE, CAPACITY, AND TYPE INDICATED ON THE DRAWINGS. CONSTRUCTED OF MATERIALS AND COMPONENTS AS INDICATED, AND REQUIRED FOR A COMPLETE INSTALLATION. UNDER NO CIRCUMSTANCES SHALL OBD'S OR BUTTERFLY DAMPERS BE USED ON ANY REGISTERS. IN ACCESSIBLE AREAS MANUAL DAMPERS SHALL BE USED. IN HARD LID CEILING AREAS, REMOTE CABLE DAMPERS SHALL BE USED. ACCESS PANELS SHALL NOT BE USED TO ACCESS ANY DAMPER IN A HARD LID CEILING.

- 12. DIFFUSERS, REGISTERS, AND GRILLES SHALL HAVE AS A MINIMUM, TEMPERATURE AND VELOCITY TRAVERSES, THROW AND DROP, AND NOISE CRITERIA RATINGS FOR EACH SIZE DEVICE AS LISTED IN MANUFACTURERS CURRENT DATA.

- 13. ASSEMBLE AND INSTALL DUCTWORK IN ACCORDANCE WITH RECOGNIZED INDUSTRY PRACTICES WHICH WILL ACHIEVE AIR-TIGHT SYSTEMS (MAXIMUM 5% LEAKAGE), WITH NO OBJECTIONABLE NOISE, AND CAPABLE OF PERFORMING INDICATED SERVICE. INSTALL EACH RUN WITH MINIMUM NUMBER OF JOINTS. ALIGN DUCTWORK ACCURATELY WITH INTERNAL SURFACES SMOOTH. SUPPORT DUCTS RIGIDLY WITH SUITABLE STRAPS, BRACES, HANGERS AND ANCHORS IN ACCORDANCE WITH THE LATEST SMACNA "HVAC DUCT CONSTRUCTION STANDARDS" LATEST EDITION. DUCT HANGERS SHALL BE OF THE TYPE WHICH WILL HOLD DUCTS TRUE-TO-SHAPE AND TO PREVENT BUCKLING.

- 14. PROVIDE AUXILIARY STEEL AS REQUIRED TO ADEQUATELY SUPPORT DUCTWORK.

- 15. CLEAN DUCTWORK INTERNALLY, UNIT BY UNIT AS IT IS INSTALLED, OF DUST AND DEBRIS. CLEAN EXTERNAL SURFACES OF FOREIGN SUBSTANCES WHICH MIGHT CAUSE CORROSIVE DETERIORATION OF METAL OR WHERE DUCT IS TO BE PAINTED AT ENDS OF DUCTS WHICH ARE NOT CONNECTED TO EQUIPMENT OR AIR DISTRIBUTION DEVICES AT TIME OF DUCTWORK INSTALLATION, PROVIDE TEMPORARY CLOSURE OF POLYETHYLENE FILM OR OTHER COVERING WHICH WILL PREVENT ENTRANCE OF DUST AND DEBRIS UNTIL CONNECTIONS ARE TO BE COMPLETED.

- 16. AT ENDS OF DUCTS WHICH ARE NOT CONNECTED TO EQUIPMENT OR AIR DISTRIBUTION DEVICES AT TIME OF DUCTWORK INSTALLATION, PROVIDE TEMPORARY CLOSURE OF POLYETHYLENE FILM OR OTHER COVERING WHICH WILL PREVENT ENTRANCE OF DUST AND DEBRIS UNTIL CONNECTIONS ARE TO BE COMPLETED.

- 17. PROVIDE COMBINATION FIRE AND SMOKE DAMPERS WHERE SHOWN ON THE DRAWINGS. DAMPERS SHALL MEET ALL REQUIREMENTS OF FIRE DAMPERS AND ADDITIONALLY SHALL INCLUDE AN OPERATING SHAFT, WHICH, WHEN ROTATED 90 DEG., CAUSES THE DAMPER TO OPERATE BETWEEN CLOSED AND OPEN. ALL DAMPERS SHALL COMPLY WITH THE REQUIREMENTS OF UL-555, 350°F TEMPERATURE RATING AND WITH PRESSURE AND VELOCITY LEVELS AS REQUIRED BY THE INSTALLATION. PROVIDE BREAKAWAY DUCT CONNECTS AS REQUIRED BY UL.

- A. EACH DAMPER SHALL BE PROVIDED WITH AN END SWITCH.

- B. EACH DAMPER SHALL HAVE A DUCT DOOR WITH-IN 6" OF THE OUTLET OF EACH DAMPER. THE MINIMAL SIZE DUCT DOOR SHALL BE NO LESS THAN 8X8.

- C. EACH DAMPER SHALL BE FURNISHED COMPLETE WITH 18 GAUGE GALVANIZED FACTORY SLEEVE AND DAMPER OPERATOR (PNEUMATIC OR ELECTRIC TO CONFORM TO CONTROL SYSTEM) FACTORY INSTALLED ON EXTERIOR OF SLEEVE AND PROPERLY LINKED TO DAMPER OPERATING SHAFT. OPERATORS SHALL BE UL LISTED AND LABELED AS FIRE DAMPER OPERATORS.

- D. EACH DAMPER SHALL BE ACTIVATED BY A DUCT SMOKE DETECTOR PROVIDED BY DIVISION 26.

- 18. STEEL ACCESS DOORS AND FRAMES SHALL BE FACTORY-FABRICATED AND ASSEMBLED UNITS, COMPLETE WITH ATTACHMENT DEVICES AND FASTENERS READY FOR INSTALLATION. JOINTS AND SEAMS SHALL BE CONTINUOUSLY WELDED STEEL, WITH WELDS GROUND SMOOTH AND FLUSH WITH ADJACENT SURFACES. FRAMES SHALL BE 18-GAGE STEEL, WITH SUITABLE MEANS OF ANCHORING FRAME TO WALL CONSTRUCTION.

- A. PROVIDE A 1-INCH-WIDE EXPOSED PERIMETER FLANGE FOR UNITS INSTALLED IN UNIT MASONRY, PRE-CAST, CAST-IN-PLACE CONCRETE, CERAMIC TILE, OR WOOD PANELING.

- B. UNITS SHALL BE PROVIDED WITH PERFORATED FLANGES WITH DRY-WALL IN WALLBOARD BEAD FOR INSTALLATION IN GYPSUM WALL BOARD OR PLASTER. DOORS SHALL HAVE FLUSH PANEL, 14-GAGE SHEET STEEL, WITH CONCEALED SPRING HINGES OR CONCEALED CONTINUOUS PIANO HINGE

END OF SECTION

SECTION 233610 AIR TERMINAL UNITS

- 1. CONSTANT/VARIABLE AIR VOLUME BOXES

- A. CASING SHALL BE CONSTRUCTED OF ZINC-COATED STEEL, MECHANICALLY ASSEMBLED AND SEALED TO FORM AN AIR-TIGHT CONSTRUCTION; MAXIMUM CASING AIR LEAKAGE OF TWO (2) PERCENT AT 3" W.C. SPOT WELDED CASINGS ARE NOT ACCEPTABLE.

- B. INSULATION SHALL LINE THE INTERIOR CASING WALL AND SHALL NOT BE LESS THAN 1/2" THICK DUAL DENSITY FIBERGLASS WITH 4 PPF SKIN OUTER LAYER. THE MATERIAL MUST COMPLY WITH UL181 AND NFPA 90A WITH NO RAW EDGES EXPOSED TO THE AIRSTREAM. ALL INSULATION SHALL BE ADHERED TO THE UNIT CASING BY TWO MEANS I.E., AN NFPA 90A APPROVED ADHESIVE AND A MECHANICAL FASTENER WELDED TO THE UNIT CASING WALL (CLENCH NAIL). RAW INSULATION EDGES ON THE DISCHARGE OF THE UNIT MUST BE COVERED WITH METAL LINER TO ELIMINATE FLAKING OF INSULATION DURING FIELD DUCT CONNECTIONS. OPTIONAL: PROVIDE FOIL FACE LINING WITH NYLON SCRIM BACKING WHICH MEETS IAQ STANDARDS.

- C. VALVE ASSEMBLY SHALL BE MANUFACTURED OF A 22 GAUGE AIR VALVE BODY TO HANDLE HIGH PRESSURE AND A 16 GAUGE COMPOSITE DAMPER BLADE, (KEY ATTACHED TO A SOLID SHAFT.) THE SHAFT SHALL HAVE A POSITION INDICATOR MARKED ON THE END FOR VERIFICATION OF DAMPER POSITION. TWO GALVANIZED DAMPER BLADES SHALL "SANDWICH" CLOSED CELL FOAM GASKET MATERIAL PROVIDING FOR MINIMUM VALVE LEAKAGE DAMPER LEAKAGE SHALL NOT EXCEED TWO (2) PERCENT OF UNITS MAXIMUM RATED CAPACITY WITH INLET PRESSURE UP TO 6" WG. THE VALVE ASSEMBLY SHALL HAVE BUILT-IN MAXIMUM AND MINIMUM HEAVY GAUGE MECHANICAL STOPS TO PREVENT OVER-STROKING OF THE DAMPER.

- D. AIRFLOW SENSOR MUST BE EQUIPPED WITH A CENTER AVERAGING CHAMBER AND HAVE MULTI-AXIS SAMPLING TUBES. PRESSURE MEASURING TAPS SHALL BE PROVIDED EXTERNAL TO THE UNIT WITH AN AIRFLOW CURVE FOR EASE OF AIR BALANCING. THE TERMINAL UNIT INLET SENSOR SHALL AMPLIFY THE DUCT VELOCITY PRESSURE BY A FACTOR OF 2.5 AND SHALL MAINTAIN CONTROL ACCURACY THROUGHOUT THE ENTIRE OPERATING RANGE OF THE UNIT IN ANY INLET CONFIGURATION.

- E. ALL PERFORMANCE SHALL BE CERTIFIED BY AHRI.

- F. BOXES SHALL BE JCI, ENVIRO-TECH, KRUEGER OR TITUS.

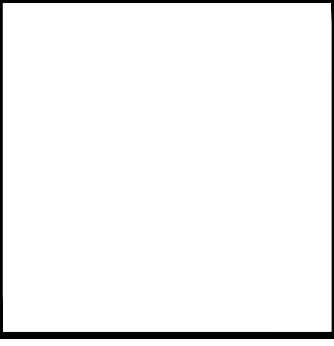
- G. DDC CONTROLS

- a. THE BOX MANUFACTURER SHALL MOUNT AND WIRE THE DDC CONTROLLER AND ACTUATOR PROVIDED BY THE TEMPERATURE CONTROL SUBCONTRACTOR UNDER SECTION 230900.

- b. THE BOX MANUFACTURER WILL FURNISH AIR INLET AIRFLOW SENSOR AS DESCRIBED PREVIOUSLY, A LOW VOLTAGE TRANSFORMER, AND A CONTROL ENCLOSURE. INCLUDE "A FAN RELAY" FOR DDC CONTROLS ON FAN POWERED BOXES. ALL THESE ITEMS TO BE FACTORY MOUNTED AND WIRED.

- c. CALIBRATION OF THE DDC CONTROLS IS TO BE PERFORMED BY THE TEMPERATURE CONTROL SUBCONTRACTOR.

END OF SECTION



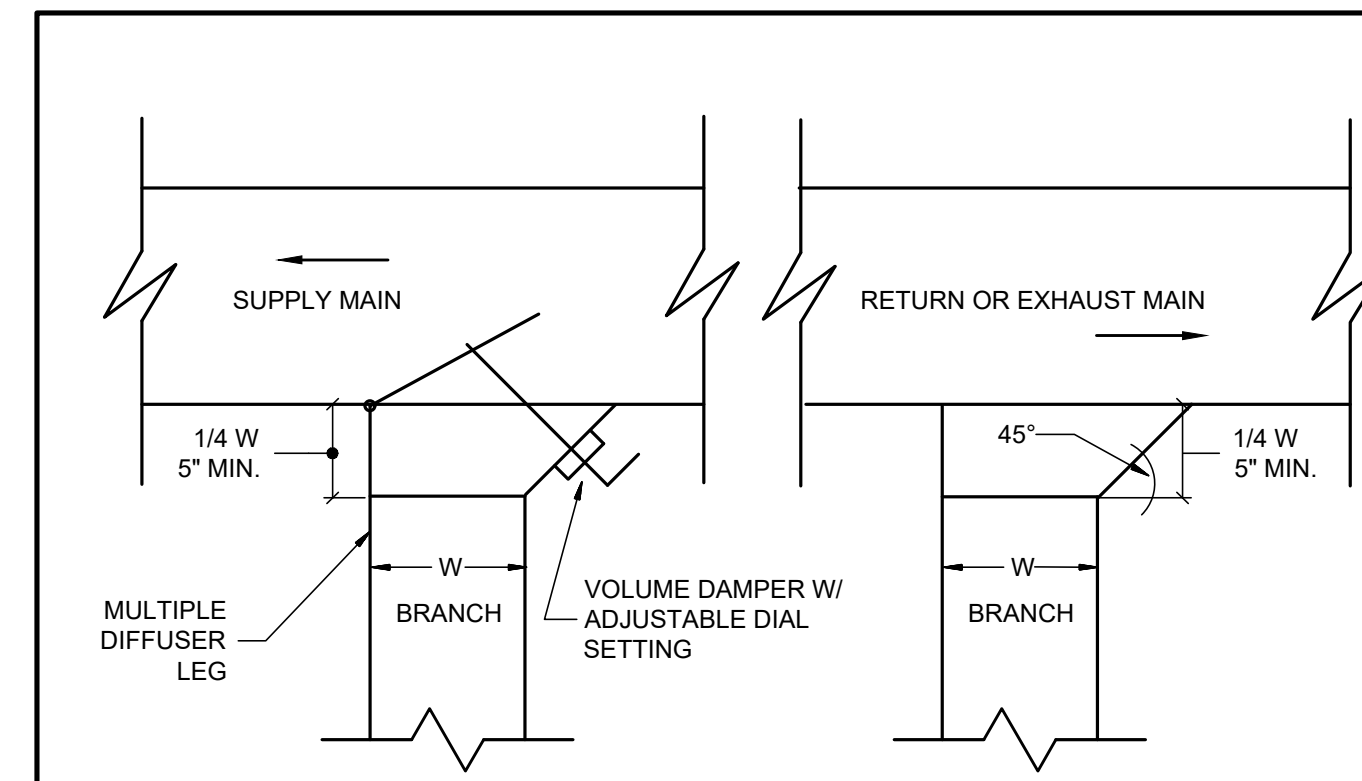
ARCHITECT ARCHITERIOS 611 ALEXANDRITE DRIVE, OAK POINT, TX, 75068 ENGINEER MD ENGINEERING

COMPUTACENTER PLANO TENANT IMPROVEMENT COMPUTACENTER 6111 W. PLANO, PKWY., SUITE 3100 PLANO, TX, 75093

REVISIONS table with columns for date and description

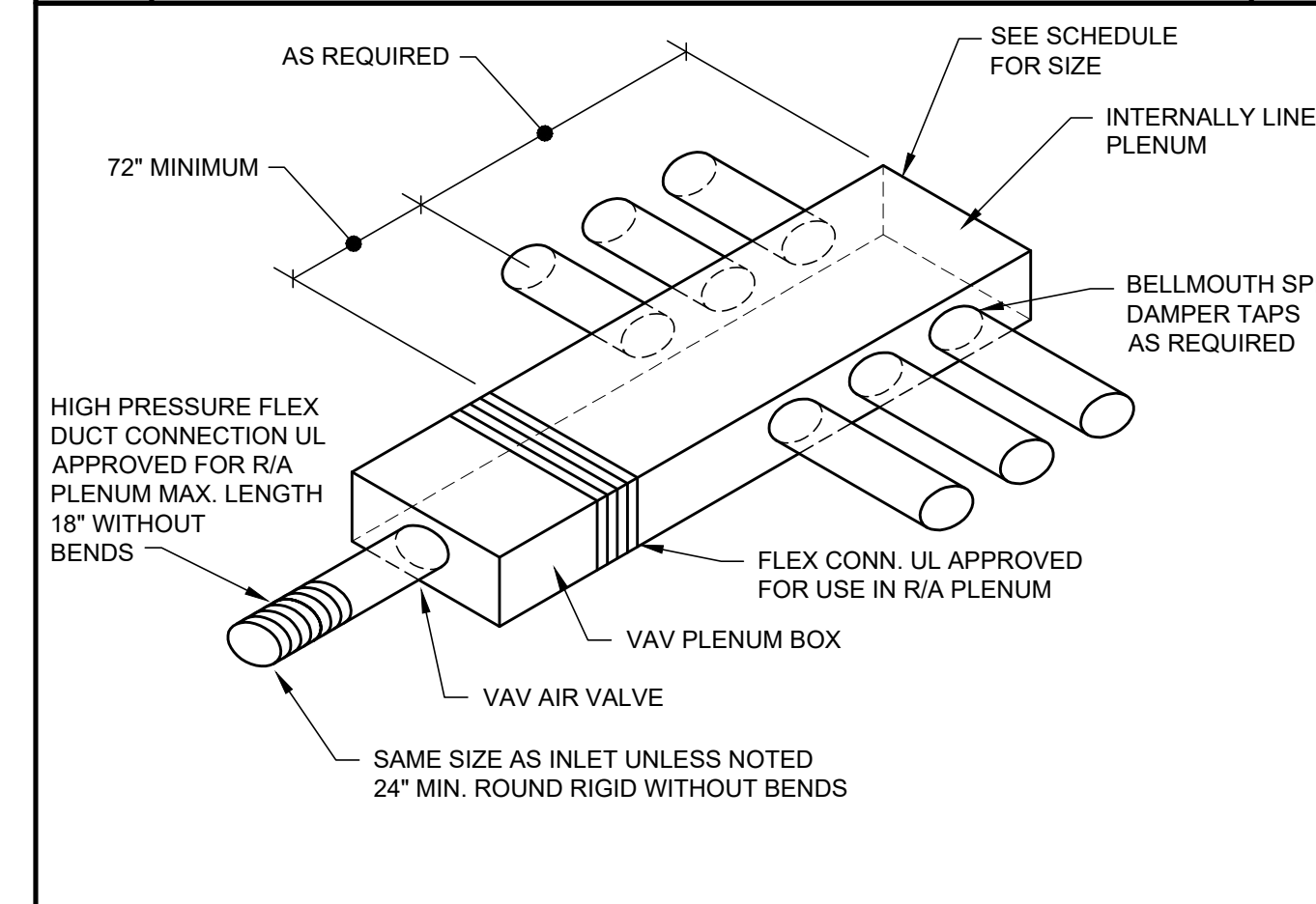
PREPARED BY: 152.0233.00 DATE: 02/24/23 CHECKED BY: JS

SHEET SPECIFICATIONS - MECHANICAL MS1.1



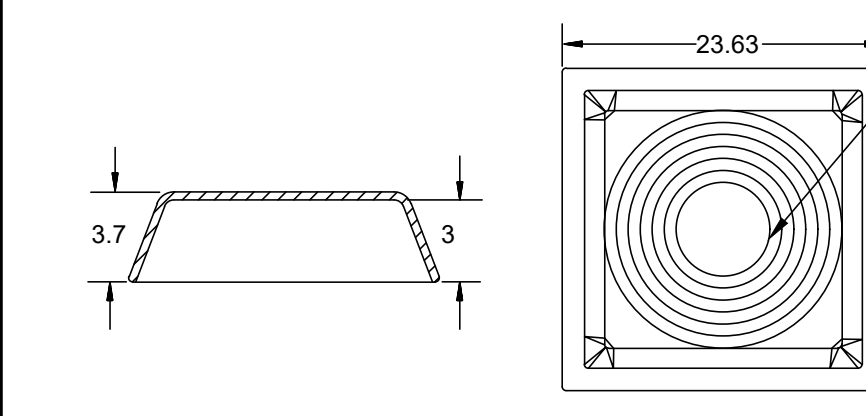
02 LOW PRESSURE BRANCH TAKE OFF

SCALE: NTS

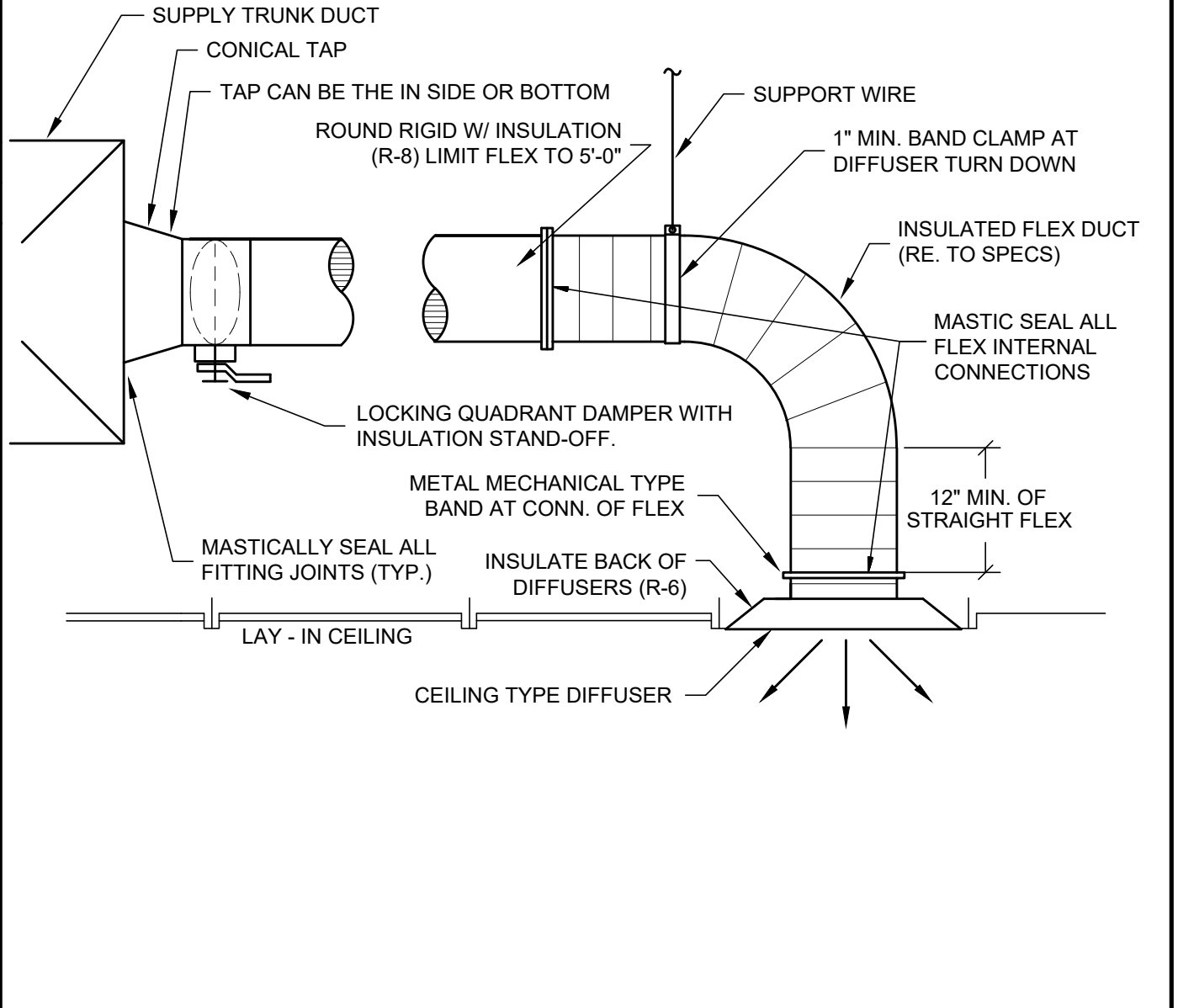


03 VARIABLE AIR VOLUME BOX

SCALE: NTS



- NOTES:
1. APPLICATION FOR SUPPLY AND RETURN DIFFUSERS.
 2. INSULATION SHALL FIT TIGHT AGAINST DIFFUSER.
 3. SEAL ALL (4) SIDES OF THE INSULATION TO THE GRILLE.
 4. R-6 INSULATION.



01 TYPICAL CEILING SUPPLY DIFFUSER

SCALE: NTS

EXISTING AIR DEVICE SCHEDULE

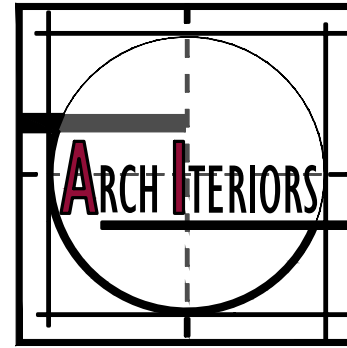
DESIG.	MFG.	DESCRIPTION	NECK SIZE INCHES	MATERIAL	OBD	MODEL NUMBER	NOTES
A	PRICE	24"X4" SUPPLY SLOT DIFFUSER	AS NOTED	ALUM.	N	TBD 3	1,2,3
B	PRICE	48"X4" SUPPLY SLOT DIFFUSER	AS NOTED	ALUM.	N	TBD 3	1,2,3
C	PRICE	24"X24" SQUARE CONE SUPPLY DIFFUSER	AS NOTED	ALUM.	N	SCD	1,2,3
D	PRICE	24"X24" PERFORATED RETURN DIFFUSER	AS NOTED	ALUM.	N	PRF	1,2,3

- NOTES:
1. MATCH FRAME OR AIR DEVICE WITH CEILING. REFERENCE ARCHITECTURAL REFLECTIVE CEILING PLANS AND ROOM FINISH SCHEDULE.
 2. REFER TO HVAC DRAWINGS FOR ANY NECK SIZES OTHER THAN THOSE SHOWN ABOVE.

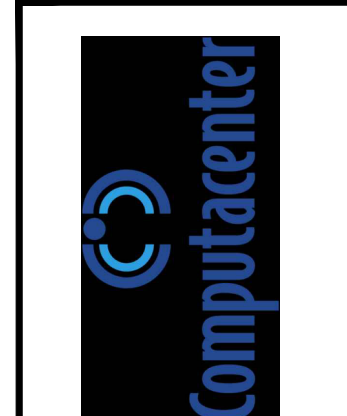
VAV TERMINAL UNIT SCHEDULE

MARK	INLET SIZE	PRIMARY AIR CFM RANGE	MIN. INLET S.P. (WG)	MANUFACTURER	MODEL NO.	NOTES
VAV-01	8" DIA	105-900	0.5	TRANE	VCC	SEE NOTES

- NOTES:
1. BOXES SHALL HAVE ROUND INLETS WITH MULTI-POINT, SELF-CALIBRATING CROSSFLOW INLET PROBES
 2. BOXES SHALL BE AHRI CERTIFIED.
 3. DIRECT DIGITAL CONTROLS AND PRESSURE INDEPENDENT OPERATION, FACTORY MOUNTED OR FIELD INSTALLED AT CONTRACTORS OPTION.
 4. RADIATED AND DISCHARGE SOUND POWER LEVELS SHALL NOT EXCEED MAXIMUMS STATED WITHIN SPECIFICATIONS.



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 ENGINEER **MD ENGINEERING**
 10000 Registered Firm No. 07-489
 P.O. Box 10000, Dallas, Texas 75215 - 469-467-0200
 Project Number: 231501



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 TENANT IMPROVEMENT
 COMPUTACENTER
 6111 W. PLANO, PKWY., SUITE 3100
 PLANO, TX, 75093

REVISIONS:

PROJECT NO: 152.0233.00
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 DATE: 02/24/23
 CHECKED BY: JS
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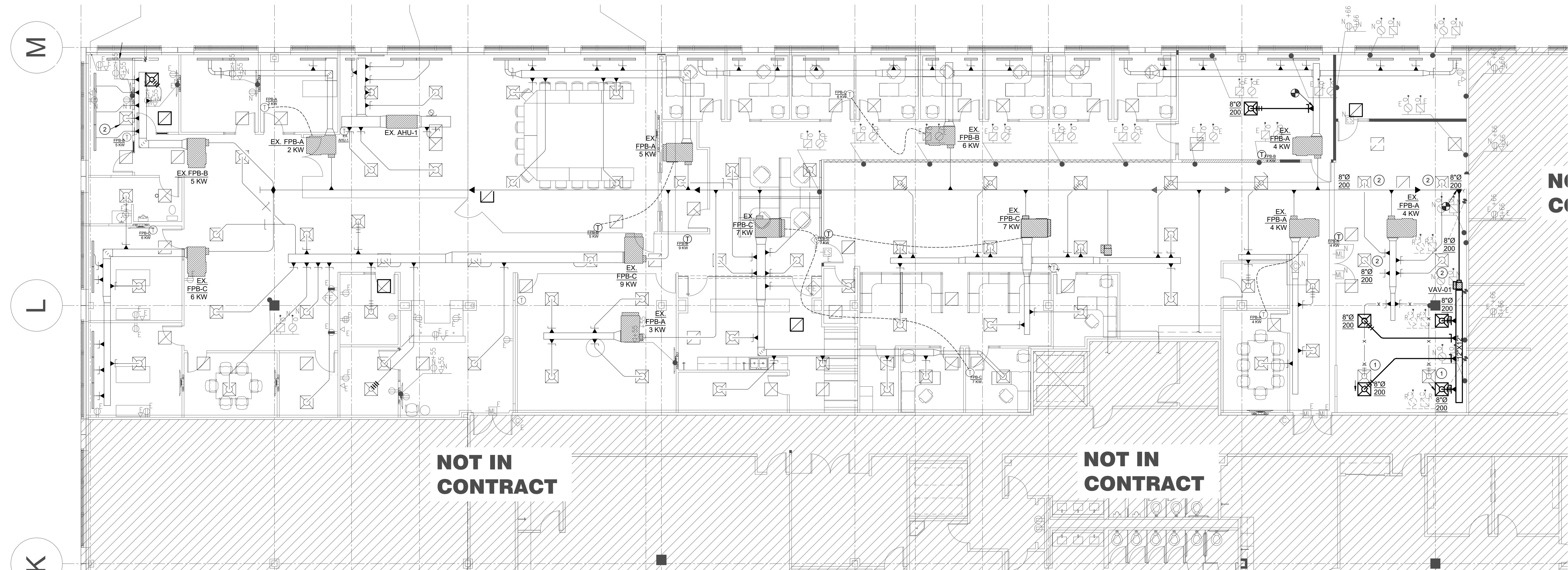
SHEET
 SCHEDULES/
 DETAILS -
 MECHANICAL
M0.1

GENERAL NOTES

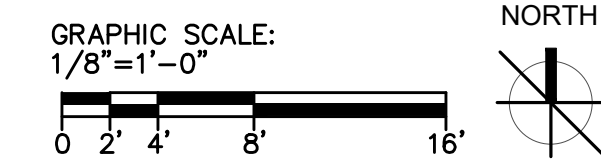
- SEE PLAN SHEET M0.0 FOR NOTES, SYMBOLS, AND ABBREVIATIONS. REFER TO SPECIFICATIONS FOR ADDITIONAL PROJECT REQUIREMENTS.
- PROVIDE ACOUSTIC SEAL AT RETURN AIR TRANSFER, SUPPLY OR OUTSIDE AIR DUCTWORK FOR ALL ACOUSTIC WALLS TO DECK.
- CONTRACT DRAWINGS ARE DIAGRAMMATIC. CONTRACTOR SHALL INSTALL ALL MECHANICAL MATERIAL PER SMACNA STANDARDS.
- ALL EXPOSED DUCTS THAT ARE TO BE PAINTED SHALL BE CONSTRUCTED FROM PAINT GRIP SHEET METAL. FINISHES PER ARCHITECTURAL RECOMMENDATIONS.
- ALL EXPOSED DUCTS ARE TO BE INTERNALLY LINED & INTERNALLY SEALED (OR GASKETED FITTINGS SHALL BE USED).
- COORDINATE WITH ALL TRADES BEFORE INSTALLING ANY EQUIPMENT OR DUCTWORK.
- ALL SHEET METAL DUCTWORK PENETRATING FIRE RATED WALLS SHALL BE MINIMUM OF 26 GAUGE. ALL OTHER DUCT SHALL BE CONSTRUCTED AS SPECIFIED IN ACCORDANCE WITH THE LATEST EDITION OF SMACNA "HVAC DUCT CONSTRUCTION STANDARDS."
- PROVIDE RADIUS FITTINGS FOR ALL DUCTWORK, WHERE NOT POSSIBLE SINGLE WALL TURNING VANES IN 30 - 45 DEG. TURNS IN DUCTWORK. TURNS GREATER THAN 45 DEG. SHALL BE DOUBLE WALL.
- REFER TO AIR DEVICE SCHEDULE FOR RUNOUT DUCT SIZED TO DIFFUSERS.
- ALL RUNOUTS TO AIR DEVICES SHALL INCLUDE BALANCING DAMPERS IN ALL SUPPLY AIR, RETURN AIR, AND EXHAUST AIR TAPS AND BRANCH DUCTWORK UNLESS OTHERWISE NOTED. PROVIDE REMOTE BALANCING DAMPERS FOR ALL TAPS MADE ABOVE INACCESSIBLE CEILINGS.

NOTES BY SYMBOL "O"

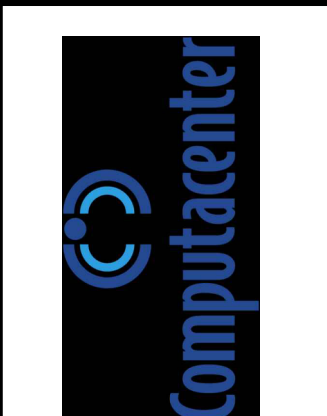
- DISCONNECT DIFFUSER FROM FPB-A AND TIE INTO VAV-01. RELOCATE DIFFUSER AS SHOWN.
- RE-BALANCE DIFFUSER TO 200 CFM.



01 FLOOR PLAN - DUCTWORK
SCALE: 1/8"=1'-0"



ARCHITECT **ARCHITERS** 611 ALEXANDRITE DRIVE, OAK POINT, TX, 75068
 ENGINEER **MD ENGINEERING**
 License Registered Firm No. 7-7489
 State of Texas License No. 429-467-0200
 Project Number: 231501



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REVISIONS:

PREPARED BY: 152.0233.00
 CHECKED BY: ET
 DATE: 02/24/23
 DESIGNED BY: JS
 REVIEWED FOR: BID/PERMIT

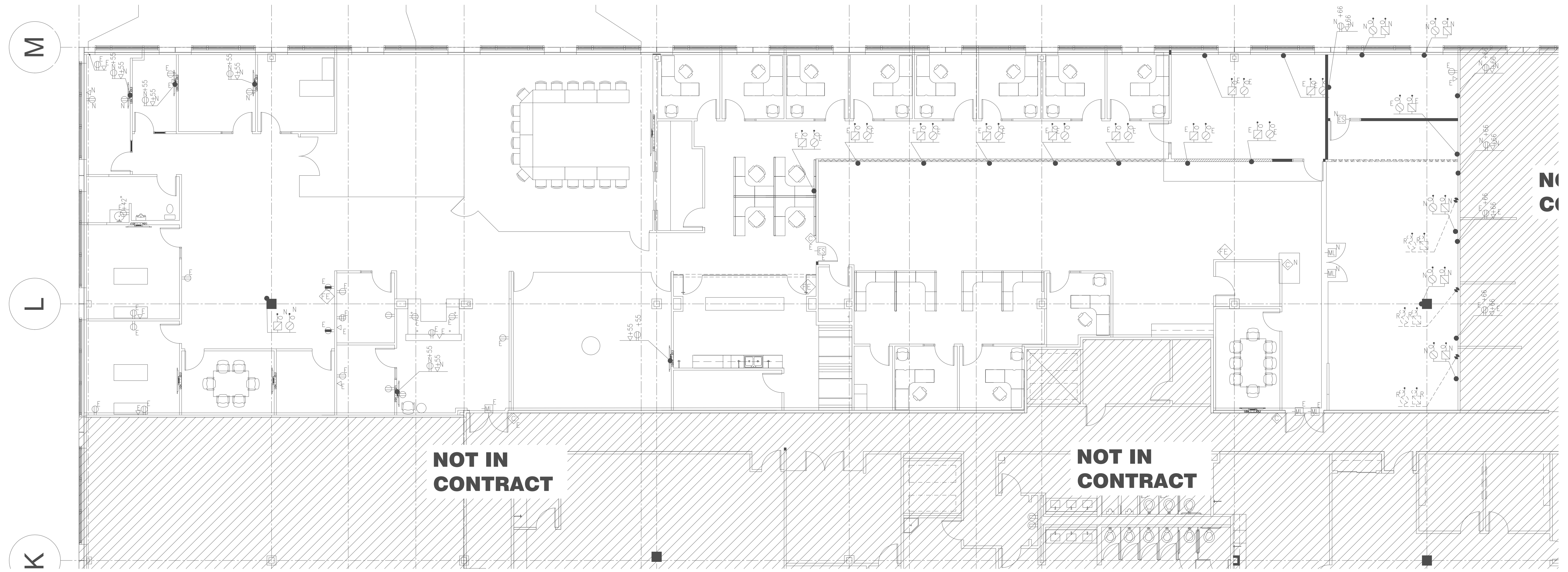
SHEET
 FLOOR PLAN - DUCTWORK
M2.1

GENERAL NOTES

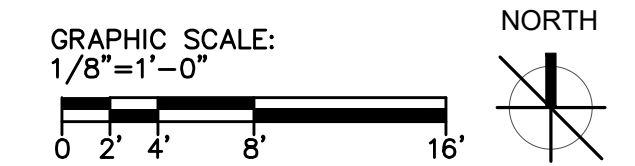
1. SEE PLAN SHEET M0.0 FOR NOTES, SYMBOLS, AND ABBREVIATIONS. REFER TO SPECIFICATIONS FOR ADDITIONAL PROJECT REQUIREMENTS.
2. SIZE REFRIGERANT LINES PER MANUFACTURERS RECOMMENDATIONS.
3. INSTALL REFRIGERATION PIPING PER "PIPING HANDBOOK" AND MANUFACTURER SPECIFICATIONS.
4. CALCULATE FOR EXPANSION AND CONTRACTION, INSTALL EXPANSION JOINTS IF NEEDED IN REFRIGERATION PIPING.
5. PENETRATIONS THROUGH THE STORM SHELTER ENVELOPE LARGER THAN 3-1/2" SQUARE INCHES IN AREA FOR RECTANGULAR OPENINGS OR 2-1/16" IN DIAMETER SHALL BE CONSIDERED OPENING AND SHALL BE PROVIDED WITH AN OPENING PROTECTIVE DEVICE. REFERENCE STRUCTURAL DRAWINGS.

NOTES BY SYMBOL "○"

1. ROUTE FULLY INSULATED DX LINES WITHIN WALL DOWN TO WALL PENETRATION AT 2 BRICK COURSES ABOVE FINISH SLAB. PROVIDE A SLEEVE AND WEATHER TIGHT SEAL OF DX LINES AT WALL PENETRATION. DO NOT SEGMENT PIPE INSULATION AT PENETRATION POINT. PROVIDE 0.016 ALUMINUM JACKET WITH PROPER CLOSURE SYSTEM ON ALL EXTERIOR PIPE INSULATION. —OR—
1. ROUTE FULLY INSULATED DX LINES UP TO ROOF PENETRATION REFER TO DETAIL. PROVIDE WEATHER TIGHT SEAL OF DX LINES AT ROOF PENETRATION. DO NOT SEGMENT PIPE INSULATION AT PENETRATION POINT. PROVIDE 0.016 ALUMINUM JACKET WITH PROPER CLOSURE SYSTEM ON ALL EXTERIOR PIPE INSULATION.
2. FULLY INSULATED CONDENSATE DRAIN LINE DOWN WITHIN WALL TO CONNECTION AT SINK TAILPIECE OR MOP SINK. REFER TO DETAIL.
3. PROVIDE TOP OF PIPE CONNECTION POINT TO VENTED / SLOPED DRAIN LINE FOR PUMPED CONDENSATE TERMINATION POINT.
4. 4" CONCRETE HOUSEKEEPING PAD. PROVIDE A MINIMUM OF 24" EQUIPMENT CLEARANCE BETWEEN AND OUT FROM UNDER ANY EAVE.



01 FLOOR PLAN - MECH PIPING
SCALE: 1/8"=1'-0"



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SHEET
 FLOOR PLAN - MECH PIPING
M3.1