MECHANICAL COVER SHEET

MECHANICAL ABBREVIATIONS

AC	AIR CONDITIONING UNIT
AD	ACCESS DOOR
AH	AIR HANDLING UNIT
ATC	AUTOMATIC TEMPERATURE CONTROL
B(500)	DIFFUSER TYPE – REFER TO SCHEDULE
BMS	BUILDING MANAGEMENT SYSTEM
BTU	BRITISH THERMAL UNIT
CC	COOLING COIL
CD	CONDENSATE DRAIN
CFM	CUBIC FEET PER MINUTE
CG	CEILING GRILLE
CP	CONDENSATE PUMP
CR	CEILING REGISTER
CUH	CABINET UNIT HEATER
CV	CONSTANT VOLUME
CW	DOMESTIC COLD WATER PIPING
DX	DIRECT EXPANSION
E	EXISTING
EAT	ENTERING AIR TEMPERATURE
EF	EXHAUST FAN
EG	EXHAUST GRILLE
EWT	ENTER WATER TEMPERATURE
FC	FAN COIL
FD	FIRE DAMPER WITH ACCESS DOOR
FLA	FULL LOAD AMPS
FPI	FIN PER INCH
FTR	FIN TUBE RADIATION
GPM	GALLONS PER MINUTE
GX	GENERAL EXHAUST
HWP	HOT WATER PUMP
HWS	HOT WATER SUPPLY
HWR	HOT WATER RETURN
HX	HEAT EXCHANGER
HZ	HERTZ
KW	KILOWATT
KX	KITCHEN EXHAUST
LAT	LEAVING AIR TEMPERATURE
MBH	THOUSAND BTU PER HOUR
MCA	MINIMUM CIRCUIT AMPS
MD	MOTORIZED DAMPER
NIC	NOT IN CONTRACT
NK	NECK SIZE
NTS	NOT TO SCALE
OAI	OUTSIDE AIR INTAKE
PC	PUMPED CONDENSATE
PD	PUMP DISCHARGE
PPH	POUNDS PER HOIUR
PH	PHASE
PSI	POUND PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH ABSOLUTE
PSIG	POUNDS PER SQUARE INCH GAUGE
RF	RETURN FAN
SD	SMOKE DETECTOR
TD	TRANSFER DUCT
TAO	TRANSFER AIR OPENING
TX	TOILET EXHAUST
V	VOLTS
VAV	VARIABLE AIR VOLUME
VD	VOLUME DAMPER
VFD	VARIABLE FREQUENCY DRIVE
WMS	WIRE MESH SCREEN

MECHANICAL DUCTWORK SYMBOL LIST

	NEW PIPING, DUCTWORK OR EQUIPMENT
	EXISTING PIPING, DUCTWORK OR EQUIPMENT TO REMAIN
	EXISTING PIPING, DUCTWORK OR EQUIPMENT TO BE REMOVED
	EXISTING EQUIPMENT TO BE REMOVED
18X12	DUCT SIZE (FIRST FIGURE INDICATES HORIZONTAL SIZE)
18ø	ROUND DUCT DIAMETER
	ACOUSTIC LINING IN DUCT
	TRANSITION FROM RECTANGULAR TO ROUND OR OVAL DUCT
AD	ACCESS DOOR IN DUCT
	FLEXIBLE CONNECTION
V.D.	VOLUME DAMPER
F.D.	FIRE DAMPER W/ DUCT ACCESS DOOR
M	MOTORIZED DAMPER W/DUCT ACCESS DOOR
F.S.D.	COMBINATION FIRE/SMOKE DAMPER W/DUCT ACCESS DOOR
	SUPPLY REGISTER
	RETURN OR EXHAUST REGISTER OR GRILLE
	SUPPLY CEILING DIFFUSER (4-WAY BLOW)
B(500)	DIFFUSER TYPE AND CFM (CUBIC FEET PER MINUTE). REFER TO SCHEDULE.
	RETURN CEILING GRILLE OR REGISTER
	SUPPLY LINEAR DIFFUSER W/ PLENUM
	RETURN LINEAR DIFFUSER W/ PLENUM
	SUPPLY DUCT UP
	SUPPLY DUCT DOWN
	RETURN OR EXHAUST DUCT UP
	RETURN OR EXHAUST DUCT DOWN
	ELBOW WITH TURNING VANES
	RADIUS ELBOW
	DUCT SPLIT OR BRANCH TAKEOFF
	CONTINUATION FOR DUCTWORK
VAV B(500)	TERMINAL BOX (CV, VAV). DESIGNATION INDICATES TYPE, BOX SIZE, AND CFM. QUANTITY (REFER TO SCHEDULES).
T	THERMOSTAT OR TEMPERATURE SENSOR TO BE WALL OR DUCT MOUNTED. REFER TO PLANS FOR LOCATION.
LD	LEAK DETECTION SENSOR
	THERMOSTAT / SENSOR WIRING FROM SENSING DEVICE TO CONTROLLED DEVICE
1	HEXAGON NOTE TAG
01	REVISION SYMBOL
SD	SMOKE DETECTOR
	POINT OF NEW CONNECTION TO EXISTING WORK
	REMOVE AND SAFE OFF EXISTING WORK FOR RECONNECTION

GENERAL NOTES

1. THESE DRAWINGS ARE GENERALLY DIAGRAMMATIC AND ARE INTENDED TO CONVEY THE SCOPE OF WORK AS WELL AS INDICATE GENERAL ARRANGEMENT OF EQUIPMENT, DUCTWORK AND PIPING. THE CONTRACTOR SHALL ADHERE TO THESE DRAWINGS AS CLOSELY AS POSSIBLE. HOWEVER, THE RIGHT IS RESERVED TO VARY THE RUNS OF DUCTWORK AND PIPING AND TO MAKE OFFSETS, WHERE NECESSARY, TO ACCOMMODATE CONDITIONS ARISING AT THE JOB SITE. THE CONTRACTOR SHALL PREPARE SHOP DRAWINGS TO BE SUBMITTED TO THE ENGINEER FOR APPROVAL. NO WORK SHALL BE PERFORMED PRIOR TO RECEIPT OF EQUIPMENT, DUCTWORK AND PIPING FABRICATION DRAWING APPROVAL.

2. ANY MATERIAL, WORK OR INCIDENTAL ACCESSORIES OR MINOR DETAILS NOT SHOWN BUT NECESSARY TO MAKE THE WORK COMPLETE IN ALL RESPECTS AND READY FOR OPERATION, EVEN IF NOT PARTICULARLY SHOWN ON THE DRAWINGS, SHALL BE PROVIDED BY THE CONTRACTOR WITHOUT ADDITIONAL EXPENSE TO THE OWNER.

3. DUCT SIZES SHOWN ON DRAWINGS ARE CLEAR INSIDE DIMENSIONS, WHERE ACOUSTICALLY LINED DUCT IS SPECIFIED. DUCT DIMENSIONS SHALL BE INCREASED TO ACCOMMODATE LINING.

4. WHERE WORK IS INDICATED TO BE BY OTHER CONTRACTORS, FOR EXAMPLE: "BY GENERAL CONSTRUCTION CONTRACTOR", THIS WORK IS NOT IN THE HVAC/MECHANICAL CONTRACT. EACH CONTRACTOR WILL BE RESPONSIBLE FOR CLOSE COORDINATION WITH OTHER CONTRACTORS WORK.

5. REFER TO APPROPRIATE SPECIFICATION SECTION FOR EQUIPMENT SELECTION PARAMETERS WHERE DRAWINGS DO NOT CONTAIN EQUIPMENT SCHEDULES.

6. ALL LOW PRESSURE TERMINAL BRANCH DUCTWORK (SUPPLY AND RETURN) SHALL BE PROVIDED WITH VOLUME CONTROL DAMPERS. ALL BRANCH DUCT VOLUME DAMPERS SERVING DIFFUSERS IN GYPSUM BOARD CEILINGS (OTHERWISE INACCESSIBLE) SHALL BE REMOTELY (CORD OR CABLE) OPERABLE THROUGH THE FACE OF THE DIFFUSER.

7. THERMOSTAT LOCATIONS SHALL BE COORDINATED WITH THE ARCHITECTURAL DRAWINGS. FINISHED PAINT COLOR TO BE SELECTED BY THE ARCHITECT. MANUFACTURER'S LOGO SHALL NOT BE EXPOSED.

8. AC UNITS SHOWN ON DRAWINGS ARE SCHEMATIC. SEE AC UNIT DETAIL ON DETAIL SHEET FOR ACTUAL TYPICAL ARRANGEMENT REQUIRED.

9. WHERE PIPING CONNECTIONS FOR EQUIPMENT SUCH AS AC UNITS, COIL, ETC. DIFFER FROM THE LINE SIZE PIPING. IT SHALL BE THE RESPONSIBILITY OF THE MECHANICAL CONTRACTOR TO FURNISH AND INSTALL THE NECESSARY REDUCER/EXPANDER FITTINGS TO ENABLE CONNECTION BETWEEN THE PIPING SYSTEM AND THE EQUIPMENT.

10. SOME PRESSURE AND TEMPERATURE GAUGES ARE SCHEMATICALLY SHOWN ON THE PLANS, REFER TO THE SPECIFICATIONS FOR EXACT TYPES AND LOCATIONS.

11. ALL FIRE DAMPERS SHALL BE 2 HOUR FIRE RATED PER U.L. 555.

12. PROVIDE FIRE SMOKE DAMPERS AND ACCESS DOORS IN ALL DUCTWORK PENETRATING FIRE RATED WALLS AND FLOORS. ALL ACCESS DOORS SHALL BE 18X18 (UON). ALL FIRE SMOKE DAMPERS SHALL BE PROVIDED WITH END SWITCH FOR STATUS SIGNAL TO THE BMS AND FIRE SMOKE CONTROL PANEL.

13. PROVIDE ONE THERMOSTAT FOR EACH ATTIC VENT AIR FAN UNIT, ENTRANCE HEATER AND AIR HANDLING UNIT. THERMOSTAT LOCATIONS SHALL BE AS SHOWN ON PLANS AND/OR WHERE DIRECTED AND APPROVED BY THE ARCHITECTS AND ENGINEERS.

14. ALL DUCTWORK AND PIPING REQUIRING FIRE RATING AND WHERE SHOWN ON PLANS SHALE BE PROVIDED WITH A 2-HOUR FIRE RATED ENCLOSURE (PROVIDED UNDER ANOTHER SECTION OF THE SPECIFICATIONS).

15. BORDER TYPES AND METHOD OF ATTACHMENT FOR ALL DIFFUSERS, GRILLES AND REGISTERS SHALL BE COORDINATED WITH THE ARCHITECTURAL CEILING DETAILS AND SPECIFICATIONS.

16. REFER TO SPECIFICATIONS FOR ACOUSTIC LINING REQUIREMENTS NOT SHOWN ON THE DRAWINGS.

17. PROVIDE ALL REQUIRED PIPE TAPPING FOR WATER TREATMENT SYSTEMS.

18. PROVIDE CABLE OPERATED DAMPER FOR ALL SUPPLY AND RETURN DIFFUSERS IN INACCESSIBLE CEILING. ADJUSTMENT OF VOLUME DAMPERS SHALL BE THROUGH THE DIFFUSER FACE.

MECHANICAL DRAWING LIST

M.0	MECHANICAL COVER SHEET
M.1	MECHANICAL MAIN LEVEL PLAN
M.2	MECHANICAL MEZZANINE LEVEL PLAN
M.3	MECHANICAL ROOF PLAN
M.4	MECHANICAL DETAILS
M.5	MECHANICAL SCHEDULES
M.6	MECHANICAL SPECIFICATIONS
M.7	MECHANICAL SPECIFICATIONS

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MECHANICAL COVER SHEET

M.0

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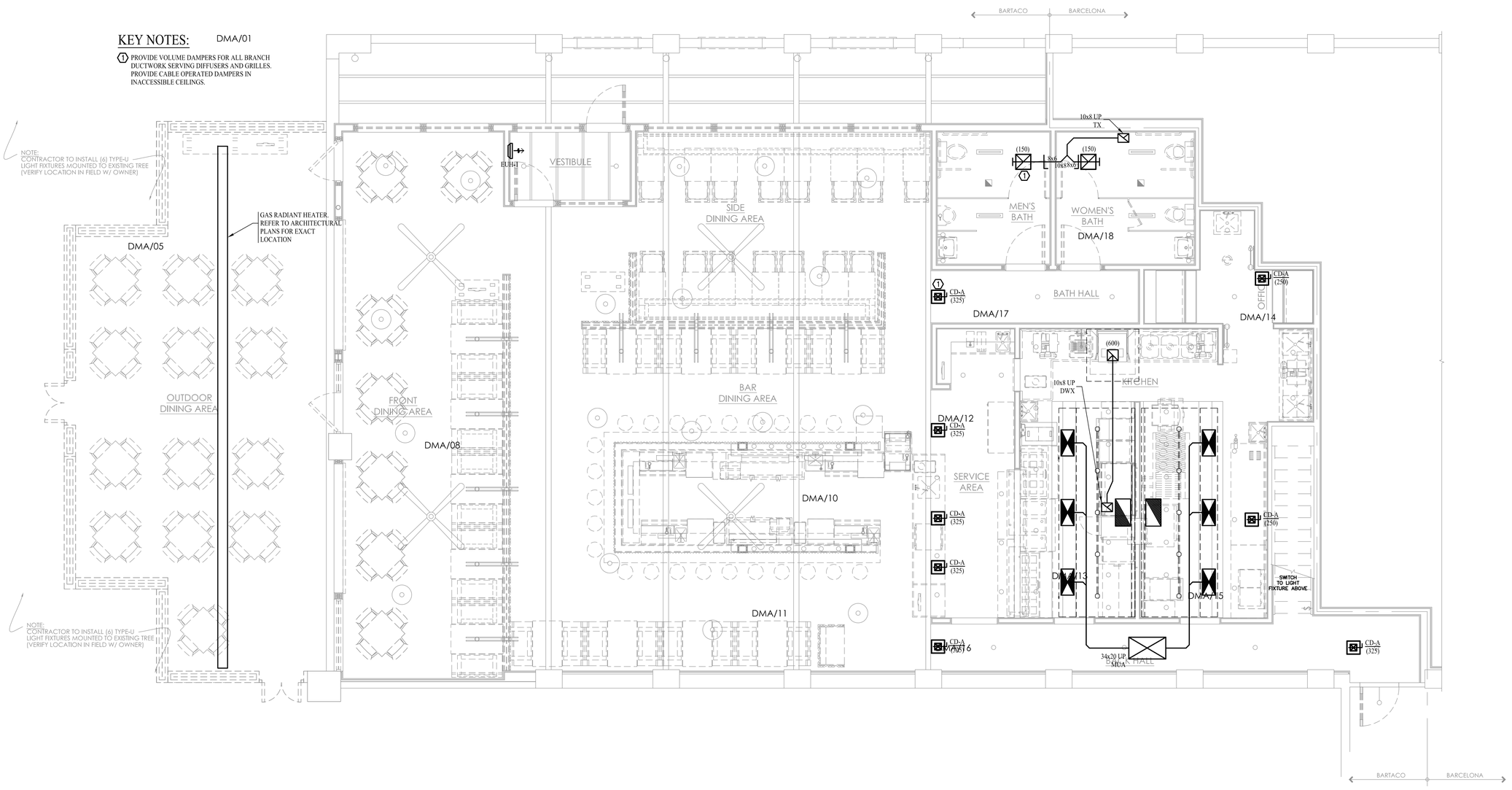
KEY NOTES: DMA/01

1. PROVIDE VOLUME DAMPERS FOR ALL BRANCH DUCTWORK SERVING DIFFUSERS AND GRILLES. PROVIDE CABLE OPERATED DAMPERS IN INACCESSIBLE CEILINGS.



MECHANICAL FIRST FLOOR PLAN

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

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MECHANICAL MAIN LEVEL PLAN

M.1

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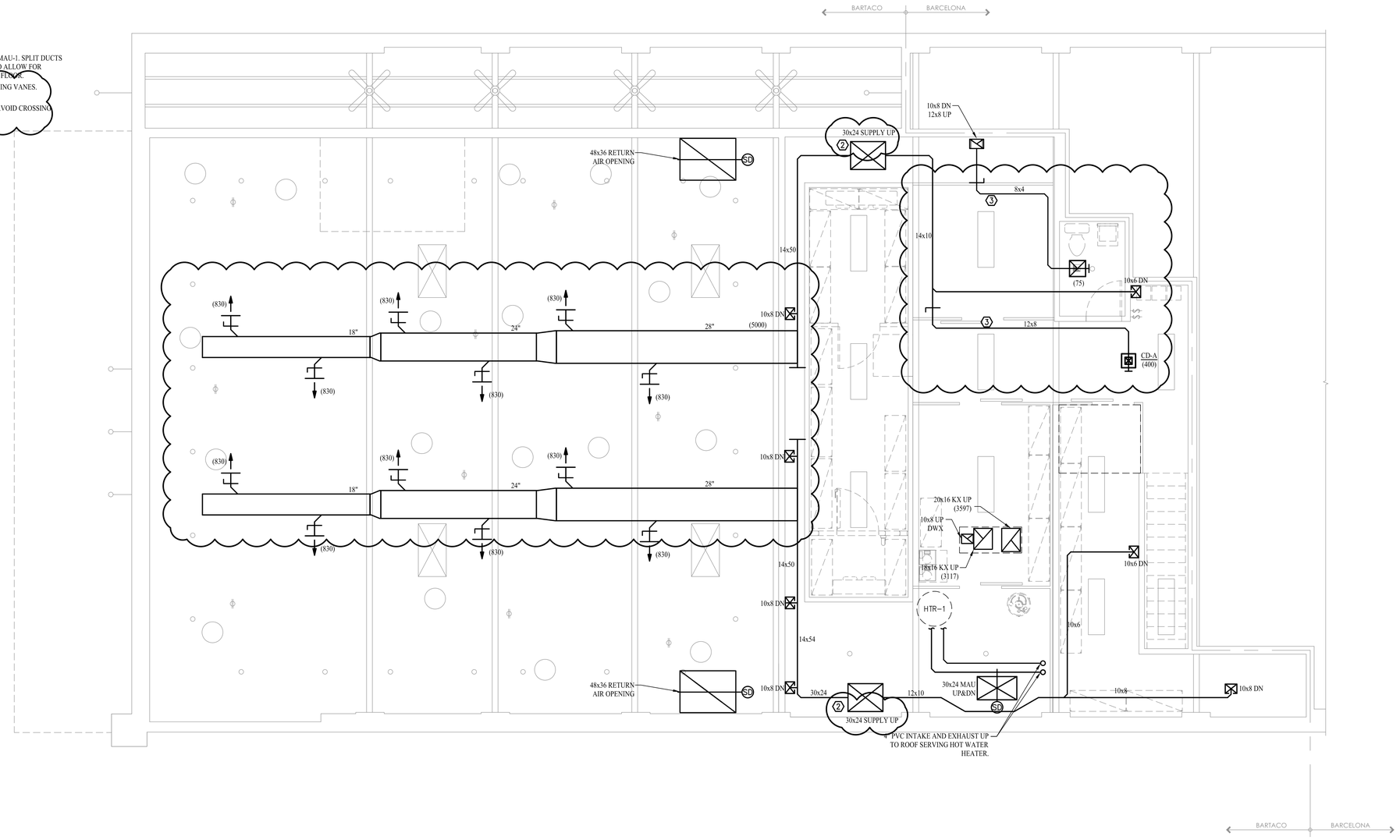
KEY NOTES:

1. PROVIDE A 28x18 UP TO MAU-1. SPLIT DUCTS INTO SPECIFIED SIZES TO ALLOW FOR DISTRIBUTION ON FIRST FLOOR.
2. PROVIDE SMACNA TURNING VANES.
3. ROUTE DUCTWORK TO AVOID CROSSING LIGHTING.



MECHANICAL
MEZZANINE LEVEL
PLAN

M.2

MECHANICAL MEZZANINE FLOOR PLAN

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

REVISED FOR CLARIFICATION - 2012/04/02

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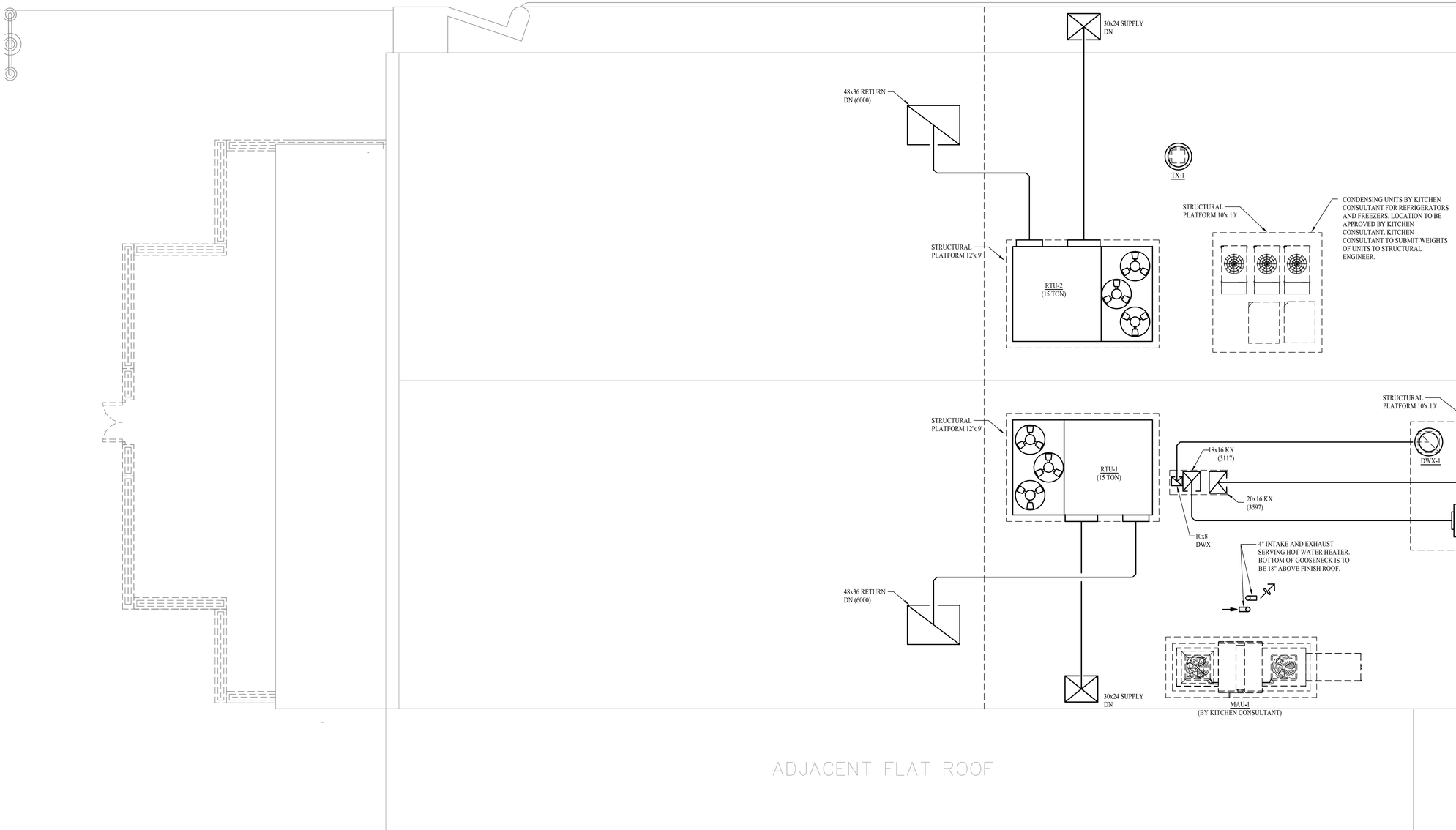

MECHANICAL ROOF PLAN

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

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MECHANICAL ROOF PLAN

M.3

MECHANICAL DETAILS

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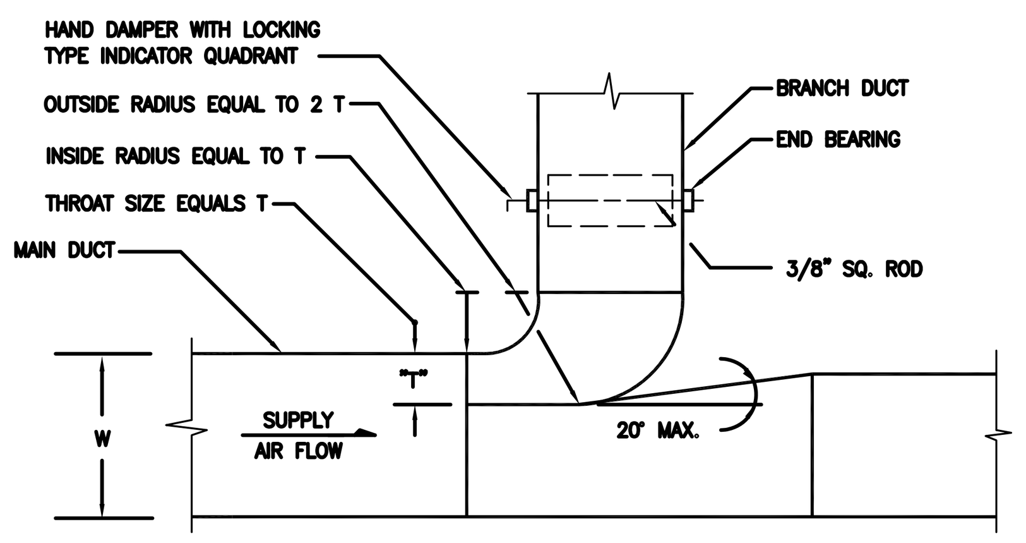
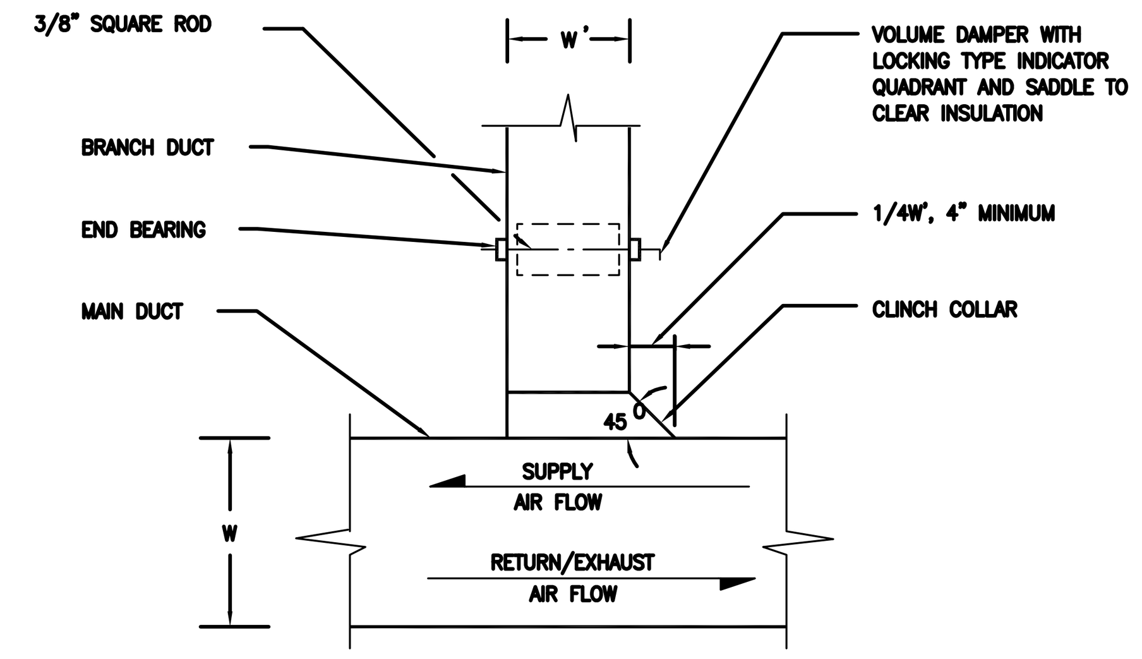


NOTES

1. FURNISH THIS TYPE CONNECTION WHERE NOTED & WHEN SINGLE LINE DUCTWORK IS INDICATED AS THIS ⊥ FOR LOW PRESSURE BRANCHES WITH MORE THAN 700 CFM & MEDIUM BRANCHES WITH MORE THAN 1000 CFM.
2. FURNISH THIS TYPE CONNECTION WITHOUT HAND DAMPER FOR ALL HIGH PRESSURE DUCTWORK BRANCHES.
3. MUST BE USED WHEN W ≥ 36".
4. MINIMUM T = 4".

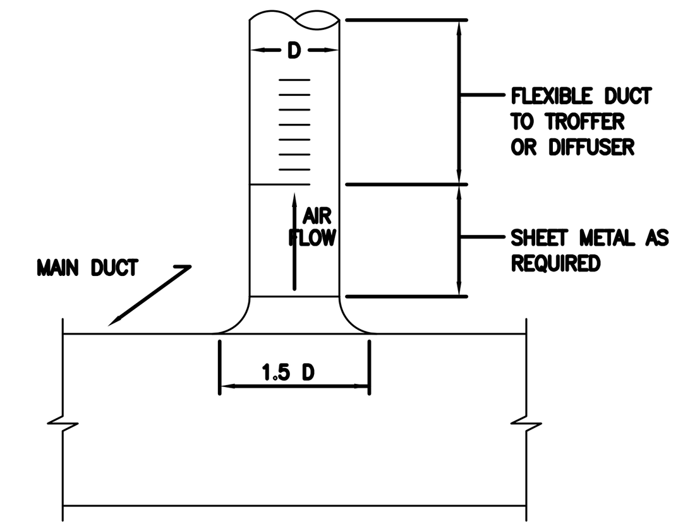
RECTANGULAR DUCT BRANCH WITH THROAT & VOLUME DAMPER
NOT TO SCALE



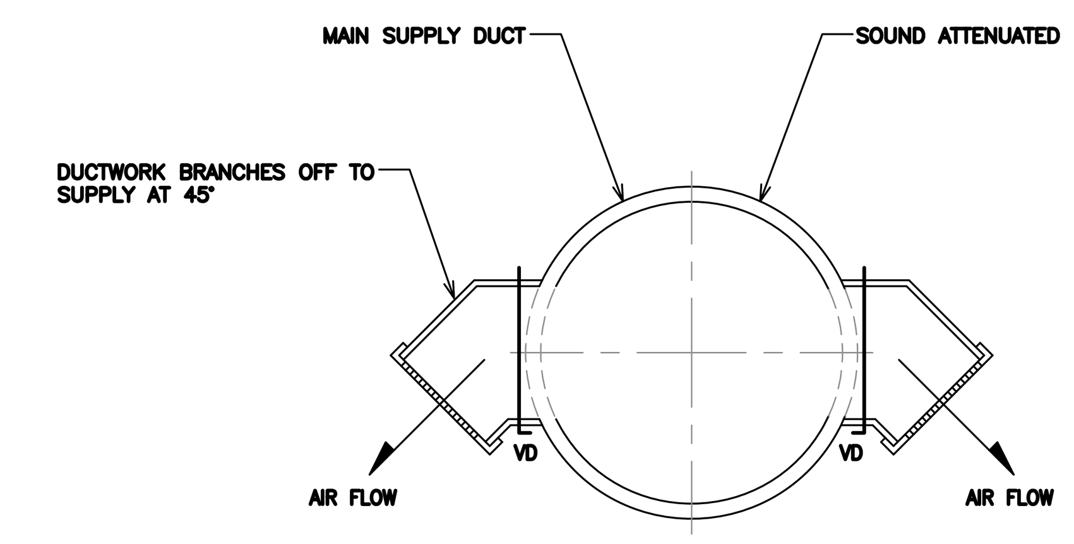
NOTES

1. FURNISH THIS TYPE CONNECTION WHEN SINGLE LINE DUCTWORK IS INDICATED AS THIS FOR LOW PRESSURE BRANCHES WITH LESS THAN 700 CFM AND MEDIUM PRESSURE BRANCHES WITH LESS THAN 1000 CFM.
2. NOT TO BE USED AS SUBSTITUTE FOR ELBOW

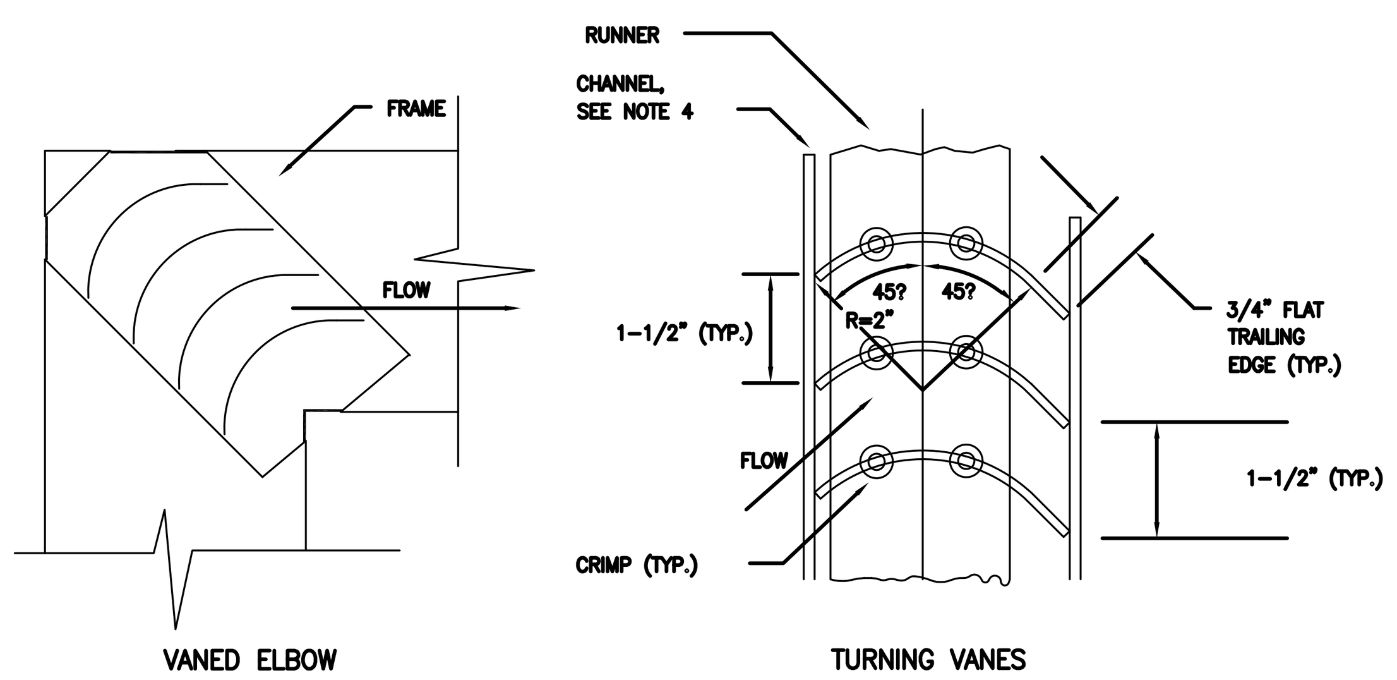
RECTANGULAR DUCT ANGULAR TAP WITH VOLUME DAMPER
NOT TO SCALE



CIRCULAR BRANCH CONNECTION TO SINGLE OUTLET
NOT TO SCALE



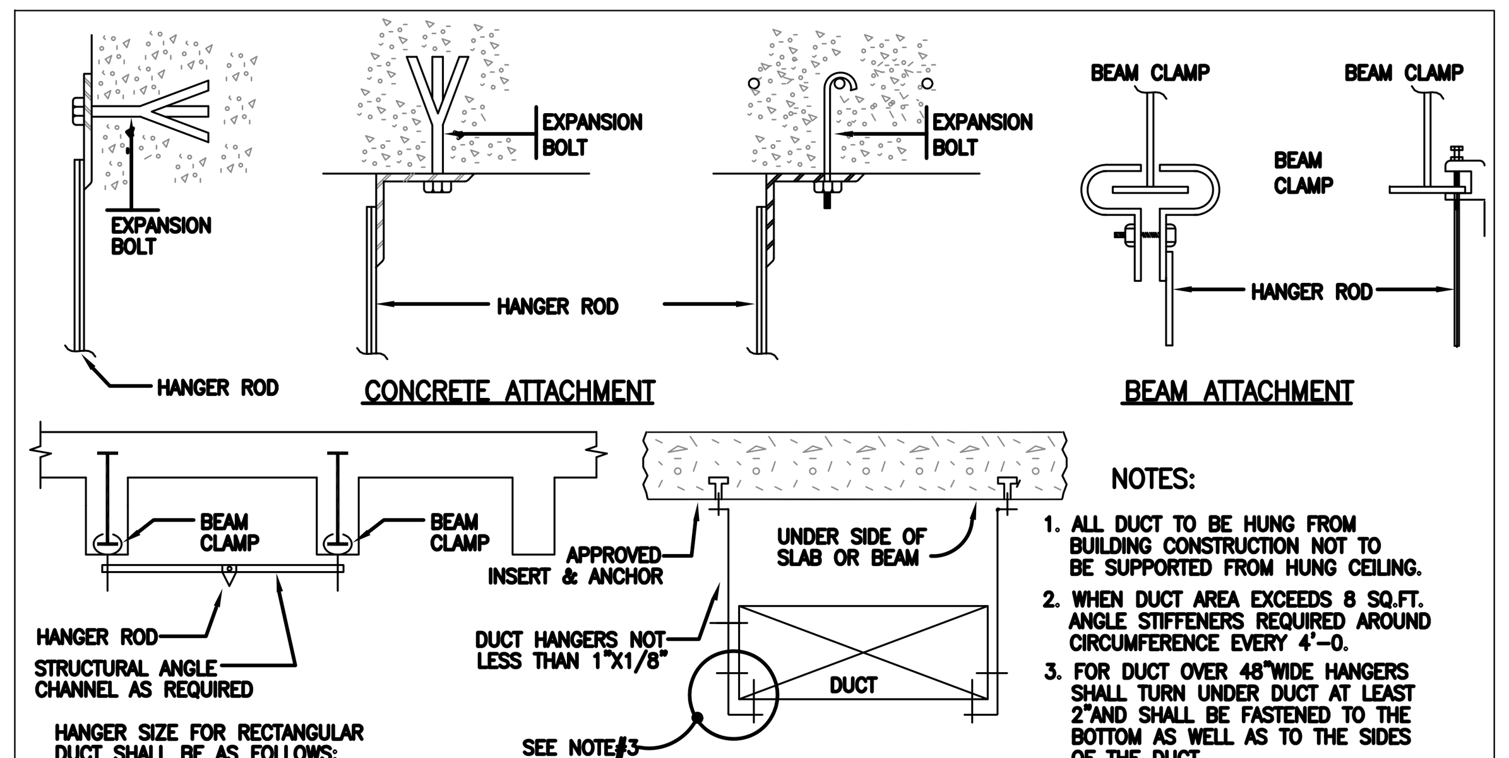
TYPICAL BRANCH DUCTWORK DESIGN
NOT TO SCALE



NOTES:

1. MAXIMUM UNSUPPORTED VANE LENGTH 36"
2. VANES AND FRAMES – 24 GAUGE
3. DUCT INLET AND OUTLET DIMENSIONS TO BE EQUAL
4. FOR HIGH VELOCITY APPLICATIONS PROVIDE 18 GAUGE CHANNEL AND TACK WELD VANE EDGES TO CHANNEL, TYPICAL BOTH ENDS
5. FRAMES AND CHANNELS – BOLTED OR TACK WELDED TO ELBOW

SINGLE-THICKNESS TURNING VANES FOR SQUARE ELBOW
NOT TO SCALE



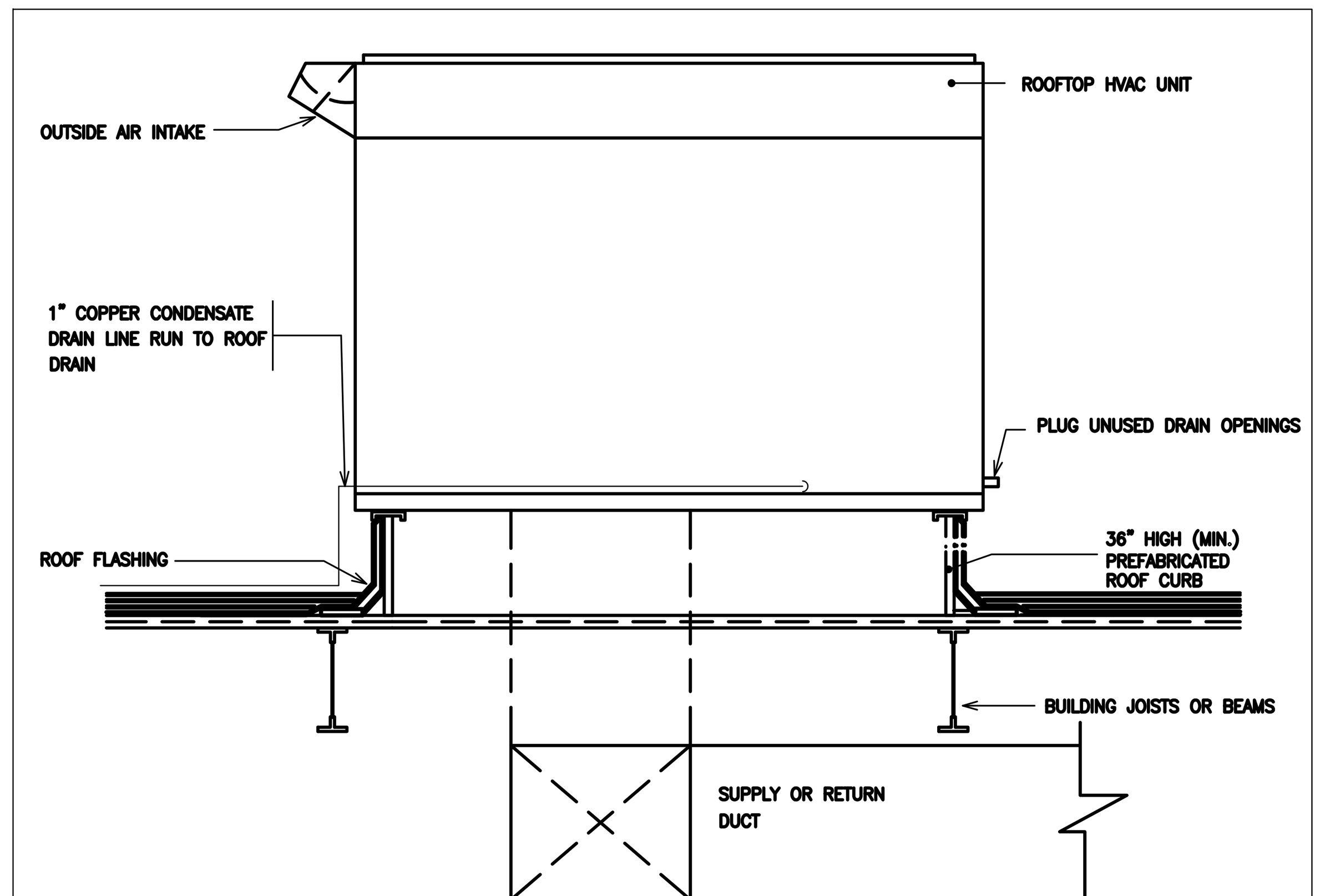
HANGER SIZE FOR RECTANGULAR DUCT SHALL BE AS FOLLOWS:

LONGEST DIMENSION OF DUCT	ROUND HANGERS	MAX SPACING SEE NOTE #4	STRAP HANGERS	TRAPEZE SHELF ANGLES
UP TO 18"	8"GA.WIRE	8'-0"	1"X1/8"	1"X1"X 1/8"
19" TO 30"	1/4" ROD	8'-0"	1"X1/8"	1"X1"X 1/8"
31" TO 42"	1/4" ROD	8'-0"	1"X1/8"GA.	1 1/2"X 1 1/2"X 1/8"
43" TO 60"	3/8" ROD	4'-0"	——	1 1/2"X 1 1/2"X 1/8"
61" TO 84"	3/8" ROD	4'-0"	——	2"X2"X1/8"
85" TO 96"	3/8" ROD	4'-0"	——	2"X2"X 3/16"
OVER 97"	3/8" ROD	4'-0"	——	2"X2"X 1/4"

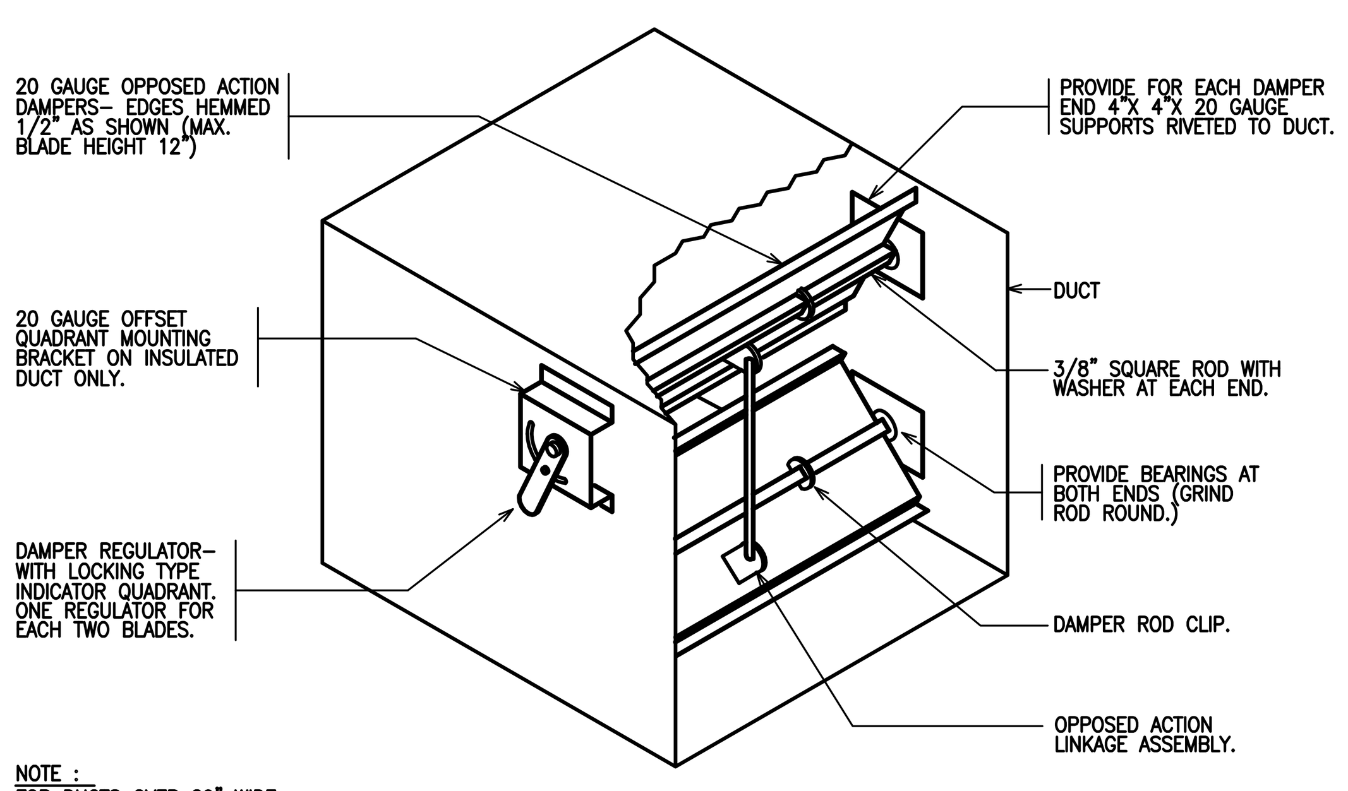
NOTES:

1. ALL DUCT TO BE HUNG FROM BUILDING CONSTRUCTION NOT TO BE SUPPORTED FROM HUNG CEILING.
2. WHEN DUCT AREA EXCEEDS 8 SQ.FT. ANGLE STIFFENERS REQUIRED AROUND CIRCUMFERENCE EVERY 4'-0.
3. FOR DUCT OVER 48"WIDE HANGERS SHALL TURN UNDER DUCT AT LEAST 2"AND SHALL BE FASTENED TO THE BOTTOM AS WELL AS TO THE SIDES OF THE DUCT.
4. FOR DUCTS WITH A CROSS SECTIONAL AREA OF 4 SQ.FT. OR LESS. HANGERS SHALL BE NO MORE THAN 8FT. APART. FOR DUCTS WITH A CROSS SECTIONAL AREA OF MORE THAN 4 SQ.FT. BUT NOT OVER 8 SQ.FT. HANGERS SHALL BE NOT MORE THAN 6 FT. A PART. AND FOR DUCTS WITH A CROSS SECTIONAL AREA OF MORE THAN 8 SQ.FT. HANGERS SHALL BE NOT MORE THAN 4 FT. A PART. THE DISTANCES BETWEEN SHALL BE MEASURED LINEARLY ALONG THE DUCT.

DUCT SUPPORT DETAIL
NOT TO SCALE



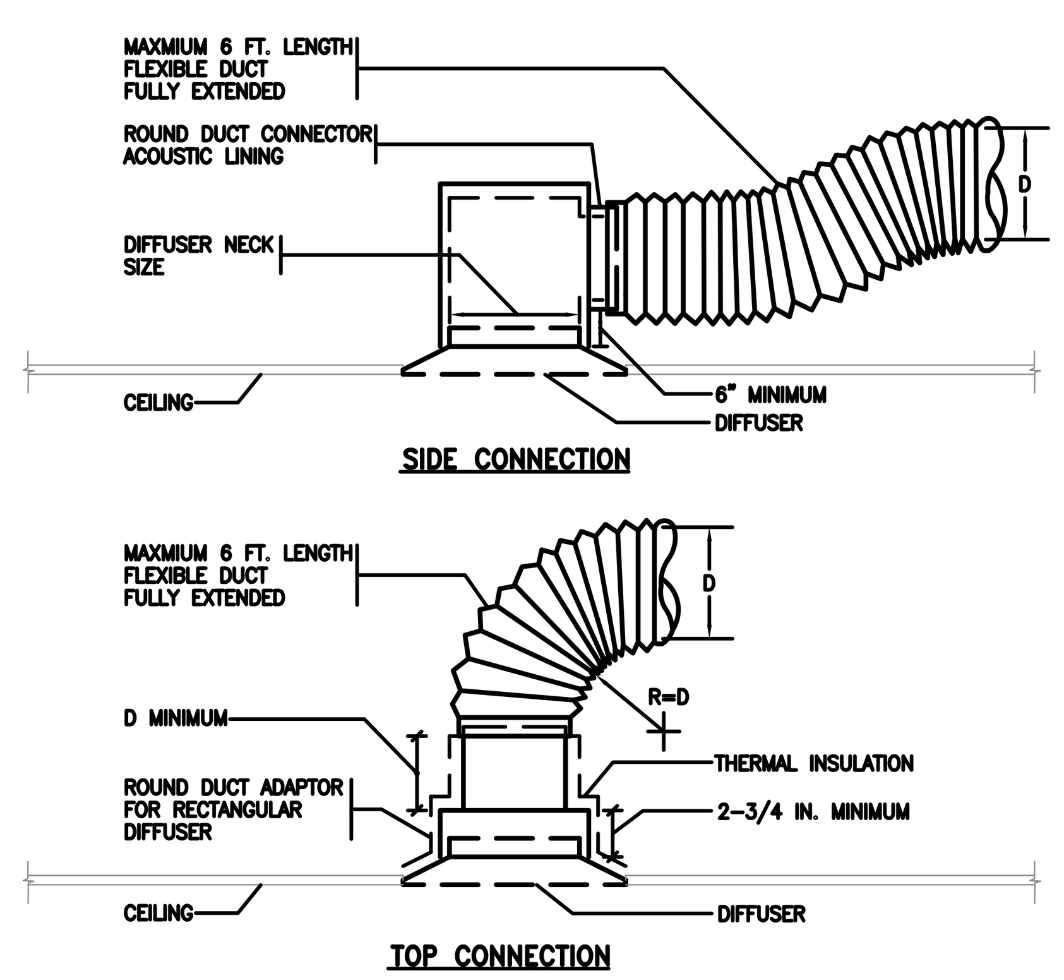
ROOFTOP A.C. UNIT INSTALLATION
NOT TO SCALE



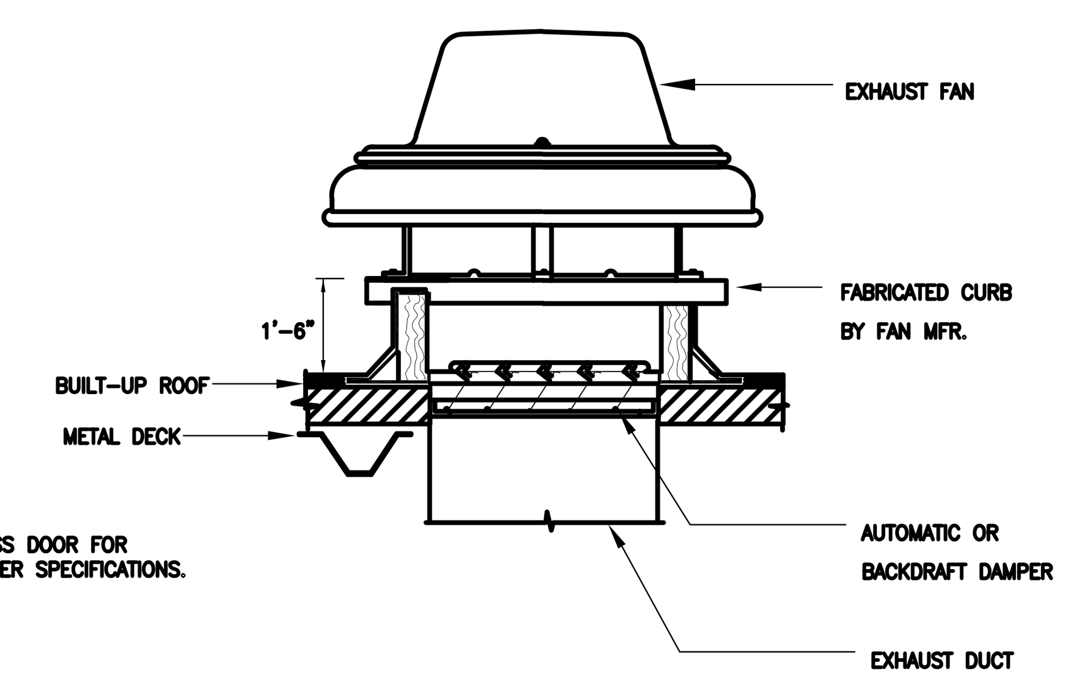
NOTE :
FOR DUCTS OVER 29" WIDE AND/OR OVER 12" HIGH.

LOW PRESSURE BALANCING DAMPER
NOT TO SCALE

H01-001



DIFFUSER CONNECTION DETAIL
NOT TO SCALE



NOTE:
PROVIDE ACCESS DOOR FOR DAMPERS AS PER SPECIFICATIONS.

ROOF EXHAUST FAN DETAIL
NOT TO SCALE

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MECHANICAL DETAILS

M.4

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NOTE TO PROCESSOR: TAKE RTU DATA FROM THE SUBMITTAL. THERE'S ALSO A HOOD SUBMITTAL

ROOFTOP AIR CONDITIONING UNIT SCHEDULE

UNIT NO.	SERVICE	NOMINAL TONS	TOTAL CFM	O.A. CFM	SUPPLY FAN DATA				COOLING COIL DATA											GAS HTG SEC.						RETURN FAN DATA				FILTERS (CHARCOAL AND PREFILTER)		ELECTRICAL DATA					WEIGHT (LBS)	MANUFACTURER/MODEL
					RPM	MOTOR BHP	MOTOR HP	TOTAL E.S.P. IN WG	ENT AIR TEMP		LVG AIR TEMP		DIRECT EXPANSION COIL					TOT MBH	SENS MBH	EAT	LAT	HEAT INPUT (MBH)	HEAT OUTPUT (MBH)	TEMP. RISE (°F)	MIN. GAS PRESS. (IN)	RPM	MOTOR BHP	MOTOR HP	TOTAL E.S.P. IN WG	%EFF.	DEPTH	VOLTS	PHASE	HZ	MCA	MOCP		
									DB	WB	DB	WB	ROWS	FPI	REFRIG.	SUCT. (F)	LIQ. (F)			DB	DB															
RTU-1,2	DINNING	15	6000	–	1725	–	–	1.5	80	67	55	54	2	17	R-410A	–	–	192	172	50	98	310	–	–	–	1745	–	–	0.75	–	–	208	3	60	82.8	100	–	CARRIER 48HCEE17D

NOTES:
1. PROVIDE RTU WITH 2" CHARCOAL FILTERS.
2. PROVIDE RTU WITH NEW CURBS.
3. UNITS TO BE SELECTED FOR 105 DEGREE AMBIENT TEMPERATURE.
4. PROVIDE RTU WITH DISCONNECTS.
5. PROVIDE HOT GAS BYPASS FOR EACH RTU.
6. PROVIDE POWER EXHAUSTERS WITH RTU.
7. PROVIDE RTU WITH VFD.

100% OA MAKE-UP SUPPLY AIR UNIT SCHEDULE

DESIGNATION	SERVICE	LOCATION	SUPPLY FAN DATA						NATURAL GAS RE-HEAT DATA						ELECTRIC DATA		FILTERS			WEIGHT	SIZE (L X W X H) IN X IN X IN	MANUFACTURER	MODEL NO.	REMARKS
			TOTAL	MIN. OUTDOOR AIR	EXT. STATIC PRESS	MOTOR DATA			TOTAL CAP.	TOTAL CAP.	HEAT TYPE	EDB	LDB	MIN INLET PRESS			PRE FILTER	TYPE	EFF.					
						BRAKE HORSE POWER	SUPPLY FAN MOTOR HP	SPEED							V/PH/HZ	FLA				LBS.				
			CFM	CFM	IN.H2O			RPM	INPUT MBH	OUTPUT MBH		F	F	IN. H2O					%					NOTES: 1. PROVIDE 24 INCH HIGH ROOF CURB WITH INTEGRAL VIBRATION ISOLATION FOR MAU-1. 2. PROVIDE STARTER AND DISCONNECT SWITCH (UN-FUSED).
MAU-1	KITCHEN	ROOF	5372	5372	0.75	–	3	752	342	315	NAT. GAS	0	55	7-14	208/3/60	9.5	2"	12"	30	932	–	–	–	

BY KITCHEN CONSULTANT

DIFFUSER, REGISTER, & GRILLE SCHEDULE

UNIT TAG	APPLICATION	FACE/SLOTS WxL (IN.)	NECK/INLET (IN.)	CFM/LF RANGE	T.S.P. (IN. W.G.)	NC	MANUFACTURER	MODEL	REMARKS
CD-A	SUPPLY	12x12	6"	0-125	0.06	10	TITUS	OMIN	SEE NOTES
–	SUPPLY	12x12	8"	126-250	0.07	12	TITUS	OMNI	SEE NOTES
–	SUPPLY	12x12	10"	251-425	0.08	20	TITUS	OMNI	SEE NOTES
SR-A	SUPPLY	18x10	–	440-475	0.08	28	TITUS	25RL	SEE NOTES
EG-A	EXHAUST	8x8	–	0-175	0.05	–	TITUS	350RL	SEE NOTES
CG-A	RETURN	46x46	–	0-5600	.08	38	TITUS	23RL	SEE NOTES

NOTES:
1. COORDINATE BORDER, FRAME AND FINISH OF AIR OUTLETS WITH ARCHITECT.
2. PROVIDE CORD OPERATED DAMPERS FOR DIFFUSERS IN INACCESIBLE CEILINGS.
3. PROVIDE INSULATED PLENUMS FOR LINEAR SUPPLY AND RETURN DIFFUSERS..
4. PROVIDE RELEIF RINGS, CONTROL POWER AND T-STATS FOR VARIABLE AIR FLOW DIFFUSERS.

FAN SCHEDULE

DESIGNATION	TYPE	CFM	MOTOR (RPM)	MOTOR HP	ELECTRICAL SERVICE V/ø/PH	FLA	STATIC PRESSURE (INCHES)	MANUFACTURER/ MODEL NO.	SERVICE	REMARKS
TX-1	UPBLAST	375	1725	1/4	120/1/60	5.8	0.5	GREENHECK GB-091-4	BATHROOM	–
KX-1	UTILITY	3597	1725	2.0	208/3/60	7.5	1.25	GREENHECK SWB-215-20	KITCHEN HOOD	–
KX-2	UTILITY	3117	1725	2.0	208/3/60	7.5	1.25	GREENHECK SWB-215-20	KITCHEN HOOD	–
DWX-1	ROOF MNTD.	600	1725	1/4	115/1/60	5.8	1.25	GREENHECK USGF-140HP-4	DISHWASHER	

NOTES:
1. SEE DETAIL FOR TYPICAL/EXHAUST FAN INSTALLATION.
2. ALL CONTROL WIRING-INTERLOCK-RELAYS AND MISCELLANEOUS DEVICES SHALL BE DONE BY MECHANICAL CONTRACTOR.
3. PROVIDE HANGERS AND SPRING VIBRATION ISOLATORS FOR ALL FANS WITH A MINIMUM OF 1" STATIC DEFLECTION.
4. ALL FANS INCLUDE A DISCONNECT SWITCH PROVIDED BY THE MECHANICAL CONTRACTOR AND INSTALLED BY ELECTRICAL CONTRACTOR.
5. KX-1,2 SHALL BE UL 762 RATED.

ELECTRIC HEATERS

DESIGNATION	TYPE	LOCATION	CFM	KW HIGH/LOW	AMP	ELECTRICAL SERVICE V/ø/PH	LENGTH (INCHES)	APPROX. WEIGHT (LBS)	MANUFACTURER/ MODEL NO.	REMARKS
EUH-1	RECESSED WALL	VESTIBULE	70	1.5/.75	6.7	208/1/60	–	14	INDEECO – EWI 935U01500V	

NOTES:
1. ARCHITECT TO VERIFY COLOR AND FINISH FOR ELECTRIC HEATERS.
2. PROVIDE HEATER TYPE T FOR TWO-STAGE THERMOSTAT FOR OPERATION BETWEEN 750 AND 1500 WATTS.

L'ARC ARCHITECTS, LLC

OWNER:
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ARCHITECT:
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971 FARMINGTON, LLC
971 FARMINGTON AVENUE
WEST HARTFORD

SD:	
DD:	
CD:	
BID:	
PERMIT:	12-23-11
CONTRACT:	
CONST:	
REVISION 1	01-27-12
CONSTRUCTION 2	03-09-12

MECHANICAL SCHEDULES

M.5

MECHANICAL SPECIFICATIONS

Edwards & Zuck
CONSULTING ENGINEERS
30 OAK STREET
STAMFORD,
CT. 06905
Tel. 203-352-1717
Fax 203-352-1718

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

A. INSTALL ALL NEW WORK IN A NEAT WORKMANLIKE MANNER READILY ACCESSIBLE FOR OPERATION, MAINTENANCE AND REPAIR.

B. CODES, PERMITS AND INSPECTIONS:

1. ALL WORK SHALL COMPLY WITH REQUIREMENTS OF STATE/LOCAL BUILDING CODE, STATE/LOCAL BUILDING DEPARTMENT, BUILDING MANAGEMENT, AND ALL AUTHORITIES HAVING JURISDICTION AND APPLICABLE NATIONAL, LAWS AND REGULATIONS GOVERNING OR RELATING TO ANY PORTION OF THIS WORK SHALL BE INCORPORATED INTO AND MADE A PART OF THESE SPECIFICATIONS. CONTRACTOR IS TO INFORM ENGINEER OF ANY EXISTING WORK OR MATERIALS, WHICH VIOLATE ANY OF THE ABOVE LAWS AND REGULATIONS. ANY WORK DONE BY THE CONTRACTOR CAUSING SUCH VIOLATION SHALL BE CORRECTED AT THE CONTRACTOR'S EXPENSE BY THIS CONTRACTOR AND AT NO EXPENSE TO THE OWNER.
2. THIS CONTRACTOR SHALL PERFORM ALL CONTROLLED INSPECTIONS, IF REQUIRED, AND OBTAIN ALL EQUIPMENT USE PERMITS AS REQUIRED BY STATE AND LOCAL AUTHORITIES. PERMITS SHALL BE TURNED OVER TO OWNER AT JOB COMPLETION.
3. ALL APPLICABLE EQUIPMENT SHALL HAVE AN M.E.A. OR B.S.A. NUMBER.

C. SITE VERIFICATION:

1. PRIOR TO SUBMISSION OF THE BID, THIS CONTRACTOR SHALL VISIT THE JOB SITE TO ASCERTAIN THE ACTUAL FIELD CONDITIONS AS THEY RELATE TO THE WORK INDICATED ON THE DRAWINGS AND DESCRIBED HEREIN. DISCREPANCIES, IF ANY, SHALL BE BROUGHT TO THE ENGINEER'S ATTENTION PRIOR TO SUBMISSION OF THE BID, AND IF NOT RESOLVED TO SATISFACTION, SHALL BE SUBMITTED AS A WRITTEN QUALIFICATION OF THE BID. SUBMISSION OF A BID SHALL BE EVIDENCE THAT SITE VERIFICATION HAS BEEN PERFORMED AS DESCRIBED ABOVE.

D. CONTRACT DOCUMENTS:

1. PRIOR TO SUBMISSION OF A FORMAL BID, THIS CONTRACTOR SHALL REVIEW ALL DRAWINGS OF THE ENTIRE PROJECT INCLUDING GENERAL CONSTRUCTION, DEMOLITION, ARCHITECTURAL, MECHANICAL, ELECTRICAL, PLUMBING AND SPRINKLER AND SHALL INCLUDE ANY WORK REQUIRED IN THE BID WHICH IS INDICATED OR IMPLIED TO BE PERFORMED BY THIS TRADE IN OTHER SECTIONS OF THE WORK.
2. DRAWINGS ARE DIAGRAMMATIC AND INDICATE GENERAL ARRANGEMENT OF WORK AND APPROXIMATE LOCATION OF EQUIPMENT. REFER TO ARCHITECTURAL DRAWINGS FOR ALL DIMENSIONS AND COORDINATE FINAL LOCATIONS OF DIFFUSERS, GRILLES, REGISTERS, THERMOSTATS, SENSORS, SWITCHES AND ANY WALL-MOUNTED DEVICES. ALL WORK SHALL BE COORDINATED WITH OTHER TRADES TO AVOID CONFLICT.
3. IF A CONFLICT OCCURS IN THE SPECIFICATIONS AND/OR ON THE DRAWINGS, THE MORE STRINGENT SITUATION SHALL APPLY.

E. GUARANTEE:

1. ALL MATERIALS AND WORKMANSHIP SHALL BE GUARANTEED FOR A PERIOD OF ONE YEAR FROM DATE OF FINAL ACCEPTANCE OF THIS WORK. FINAL ACCEPTANCE SHALL BE DEFINED AS THE TIME AT WHICH THE MECHANICAL WORK IS TAKEN OVER AND ACCEPTED BY THE OWNER, AND IS UNDER CARE, CUSTODY, AND CONTROL OF THE OWNER. ENGAGE THE SERVICES OF VARIOUS MANUFACTURERS SUPPLYING THE EQUIPMENT FOR THE PROPER STARTUP AND OPERATION OF ALL SYSTEMS INSTALLED. INSTRUCT THE OWNER'S PERSONNEL IN THE PROPER OPERATION AND SERVICING OF THE SYSTEM.
2. THE CONTRACTOR SHALL GUARANTEE TO REPLACE OR REPAIR PROMPTLY AND ASSUME RESPONSIBILITY FOR ALL EXPENSES INCURRED FOR ANY WORKMANSHIP AND EQUIPMENT IN WHICH DEFECTS DEVELOP WITHIN THE GUARANTEE PERIOD. THIS WORK SHALL BE DONE AS DIRECTED BY THE OWNER. THIS GUARANTEE SHALL INCLUDE RESPONSIBILITY FOR ALL EXPENSES INCURRED IN REPAIRING AND REPLACING WORK OF OTHER TRADES AFFECTED BY DEFECTS, REPAIRS OR REPLACEMENTS IN EQUIPMENT SUPPLIED BY THIS CONTRACTOR.
3. THIS CONTRACTOR IS RESPONSIBLE FOR THE MAINTENANCE AND OPERATION OF ALL SYSTEMS UNTIL THE FINAL ACCEPTANCE OF THE WORK.
4. ALL AIR CONDITIONING UNIT COMPRESSORS AND REFRIGERATION COMPONENTS SHALL HAVE A 5-YEAR WARRANTY.

F. THE GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION AIA DOCUMENT A201, LATEST EDITION, OR AS REQUIRED BY THE ARCHITECT'S DOCUMENTS, AND/OR THE STRUCTURAL ENGINEER'S DOCUMENTS, AS APPLICABLE, ARE PART OF THIS CONTRACT.

G. DEFINITIONS:

1. MECHANICAL CONTRACTOR, THIS CONTRACTOR – THE PARTY OR PARTIES HAVE BEEN DULY AWARDED THE CONTRACT FOR AND ARE THEREBY MADE RESPONSIBLE FOR THE MECHANICAL WORK AS DESCRIBED HEREIN.
2. THIS CONTRACT, THE CONTRACT – THE AGREEMENT COVERING THE WORK TO BE PERFORMED BY THIS CONTRACTOR.
3. APPROVED, EQUAL, SATISFACTORY, ACCEPTED, ACCEPTABLE, EQUIVALENT – SUITABLE FOR USE ON THE PROJECT, AS DETERMINED BY THE ENGINEER BASED ON DOCUMENTS PRESENTED FOR SUCH DETERMINATION.
4. THESE SPECIFICATIONS, THIS SECTION, PART, DIVISION (OF THE SPECIFICATION) – THE DOCUMENT SPECIFYING THE WORK TO BE PERFORMED BY THIS CONTRACTOR.
5. THE MECHANICAL WORK, THIS WORK – ALL LABOR MATERIALS, EQUIPMENT, APPARATUS, CONTROLS, ACCESSORIES, AND OTHER ITEMS REQUIRED FOR A PROPER AND COMPLETE INSTALLATION BY THE MECHANICAL CONTRACTOR.
6. ARCHITECT, ENGINEER, OWNER'S REPRESENTATIVE – THE PARTY OR PARTIES RESPONSIBLE FOR INTERPRETING, ACCEPTING AND OTHERWISE RULING ON THE PERFORMANCE UNDER THIS CONTRACT.
7. FURNISH – PURCHASE AND DELIVER TO THE PROJECT SITE COMPLETE WITH EVERY NECESSARY APPURTENANCE AND SUPPORT, ALL AS PART OF THE MECHANICAL WORK.
8. INSTALL – UNLOAD AT THE DELIVERY POINT AT THE SITE AND PERFORM EVERY OPERATION NECESSARY TO ESTABLISH SECURE MOUNTING INSTALLATION AND CORRECT OPERATION AT THE PROPER LOCATION IN THE PROJECT, ALL AS PART OF THE MECHANICAL WORK.
9. PROVIDE – FURNISH AND INSTALL.
10. NEW – MANUFACTURED WITHIN THE PAST TWO YEARS AND NEVER BEFORE USED.
11. RELOCATE – MOVE EXISTING EQUIPMENT AND ALL ACCESSORIES AS REQUIRED.
12. REMOVE – DISMANTLE AND CART AWAY FROM SITE INCLUDING ALL RELATED ACCESSORIES. ALL ITEMS SHALL BE LEGALLY DISPOSED OF. ALL OTHER EQUIPMENT AND OPERATIONS IN ANY WAY EFFECTED BY THE REMOVAL IS TO REMAIN IN FULL OPERATION. PROVIDE ALL NECESSARY COMPONENTS TO MAINTAIN SUCH OPERATION.

1.02 SCOPE OF WORK

A. PROVIDE ALL LABOR, MATERIALS, EQUIPMENT, AND CONTRACTOR'S SERVICES NECESSARY FOR COMPLETE, SAFE INSTALLATION OF ALL MECHANICAL WORK. THE SCOPE OF WORK SHALL INCLUDE BUT NOT BE LIMITED TO THE FOLLOWING:

1. DEMOLITION AND REMOVAL OF ITEMS AS REQUIRED.
2. DUCTWORK AND DUCTWORK ACCESSORIES.
3. AIR DISTRIBUTION SYSTEM (AIR OUTLETS, VAV BOXES, FAN POWERED BOXES, ETC.).
4. PIPING AND PIPING ACCESSORIES INCLUDING ALL VALVING.
5. EQUIPMENT (PUMPS, AIR CONDITIONING UNITS, FANS, VARIABLE FREQUENCY DRIVES, ETC.).
6. INSULATION OF PIPING, EQUIPMENT AND DUCTWORK.
7. SOUND ATTENUATORS AND SOUND LINING.
8. AUTOMATIC TEMPERATURE CONTROLS.
   TESTING AND BALANCING.
9. CUTTING AND PATCHING.
10. SHOP DRAWINGS.
11. AS-BUILT DRAWINGS.
12. OPERATING AND MAINTENANCE MANUALS.
13. FULL COORDINATION WITH OTHER TRADES.
14. WARRANTY AND GUARANTY.
15. PHASING AS REQUIRED BY OWNER, CONSTRUCTION MANAGER, GENERAL CONTRACTOR OR BUILDING MANAGEMENT.
16. PREMIUM TIME FOR WORK TO BE PERFORMED AFTER-HOURS AS REQUIRED BY BUILDING MANAGEMENT AND/OR OWNER.
17. FILING, PERMITS, CONTROLLED INSPECTIONS.
18. FULL TESTING AND STARTUP OF ALL SYSTEMS.

1.03 SHOP DRAWINGS

A. SUBMIT SHOP DRAWINGS CERTIFIED BY ALL TRADES THAT COORDINATION HAS BEEN COMPLETED. SUBMIT ALL CERTIFIED EQUIPMENT CUTS WITH CONSTRUCTION WIRING DIAGRAMS AND AUTOMATIC TEMPERATURE CONTROL REQUIREMENTS. SHOP DRAWINGS SUBMISSION SHALL INCLUDE, BUT NOT BE LIMITED TO, THE FOLLOWING:

1. DUCTWORK – PROVIDE DUCT SHOP STANDARDS AND LEAKAGE TEST CERTIFICATION, AS REQUIRED, AND 3/8 SCALE DUCT LAYOUT.
2. INSULATION FOR DUCTWORK, PIPING AND EQUIPMENT.
3. CERTIFIED AIR BALANCING REPORT.
4. EQUIPMENT CATALOG CUTS FOR ALL ITEMS TO BE UTILIZED ON PROJECT (RTUs, PUMPS, AC UNITS, VARIABLE FREQUENCY DRIVES, ETC.).
5. AIR OUTLETS (DIFFUSERS, REGISTERS, GRILLES, ETC.).
6. AUTOMATIC TEMPERATURE CONTROL DIAGRAMS, DEVICES AND SEQUENCE OF OPERATION.
7. AS-BUILT DRAWINGS AT PROJECT COMPLETION OF THE INSTALLED CONDITION OF WORK.

B. THE QUANTITY OF SHOP DRAWINGS SHALL AS A MINIMUM BE FOUR (4) COPIES OF 8-1/2" X 11" SUBMISSIONS AND ONE (1) REPRODUCIBLE AND ONE (1) PRINT OF ALL DRAWINGS. SPECIFIC JOB REQUIREMENTS MAY BE MORE STRINGENT AND CONTRACTOR IS RESPONSIBLE TO OBTAIN REQUIREMENTS FROM CONSTRUCTION MANAGER, GENERAL CONTRACTOR OR ARCHITECT.

1.04 MAINTENANCE MANUALS

A. SUBMIT FOUR (4) LOOSE-LEAF BOUND OPERATING AND MAINTENANCE MANUALS WITH INDEX AND INDEX TABS TO INCLUDE THE FOLLOWING:

1. OPERATING AND MAINTENANCE INSTRUCTIONS ON ALL SYSTEMS.
2. MANUFACTURERS CATALOG CUTS ON ALL EQUIPMENT.
3 AUTOMATIC TEMPERATURE CONTROL SYSTEMS WITH SEQUENCE OF OPERATIONS, CATALOG CUTS OF ALL DEVICES AND POINT-TO-POINT WIRING DIAGRAMS.
4. CERTIFIED FINAL AIR AND WATER BALANCING REPORT.
5. DUCT AND PIPING AS-BUILT DRAWINGS WITH VALVE CHART AND KEY PLAN DRAWINGS INSERTED IN BINDER.
6. ALL ITEMS SUBMITTED FOR REVIEW IN SHOP DRAWING SECTION.

1.05 AS-BUILT DRAWINGS

A. CONTRACTOR SHALL MAINTAIN RECORD DRAWING PRINTS ON JOB SITE AND RECORD, AT TIME OF OCCURRENCE, DEVIATIONS FROM CONTRACT DOCUMENTS DUE TO FIELD COORDINATION, BULLETINS, OR ADDENDA.

B. CONTRACTOR SHALL REVISE SHOP DRAWINGS TO CONFORM TO RECORD DRAWINGS AND SUBMIT AN AS-BUILT CONDITION (PIPING AND DUCTWORK) DRAWINGS UPON COMPLETION OF THE PROJECT. FINAL SUBMISSION OF REPRODUCIBLE AS-BUILT DRAWINGS ARE TO BE SIGNED AND CERTIFIED BY THE INSTALLING CONTRACTOR THAT THIS IS THE AS-BUILT CONDITION OF THE WORK.

1.06 SERVICE AND WARRANTY (MAINTENANCE CONTRACT)

A. THIS CONTRACTOR SHALL PROVIDE AS AN ADD ALTERNATE PRICE, A FULL ONE YEAR SERVICE AND WARRANTY OF ALL MECHANICAL COMPONENTS AND SYSTEMS, WITH PRICES FOR YEARS 2, 3 AND 4 FOLLOWING THIS FIRST YEAR. AT THE TIME OF ACCEPTANCE OF PROJECT, THE TENANT OR OWNER=S REPRESENTATIVE WILL DECIDE TO ACCEPT WHICH ALTERNATE, IF ANY.

1.07 SUBSTITUTIONS

A. NO SUBSTITUTE MATERIAL OR MANUFACTURER OF EQUIPMENT SHALL BE PERMITTED WITHOUT A FORMAL WRITTEN SUBMITTAL TO THE ENGINEER WHICH INCLUDES ALL DIMENSIONAL, PERFORMANCE AND MATERIAL SPECIFICATIONS. ANY CHANGES IN LAYOUT, ELECTRICAL CHARACTERISTICS, STRUCTURAL REQUIREMENTS, OR DESIGN DUE TO THE USE OF A SUBSTITUTION SHALL BE SUBMITTED TO THE ENGINEER AS PART OF THIS PROPOSAL. THE CONTRACTOR TAKES FULL RESPONSIBILITY FOR THE SUBSTITUTION AND ALL CHANGES RESULTING FROM SUBSTITUTION. ALL ITEMS SHALL BE SUBSTITUTED FOR REVIEW IN CONJUNCTION WITH THE SUBMITTAL OF THE SUBSTITUTION. ANY SUBSTITUTION MUST BE SUBMITTED WITH AN EXPLANATION AS TO WHY A SUBSTITUTION IS BEING UTILIZED. IF THE SUBSTITUTED ITEM DEVIATES FROM THE SPECIFIED ITEM, THOSE DEVIATIONS ARE TO BE IDENTIFIED ON A LINE-BY-LINE BASIS. IF THE SUBSTITUTE IS BEING UTILIZED FOR FINANCIAL REASONS, THE ASSOCIATED CREDIT MUST BE SIMULTANEOUSLY SUBMITTED.

B. ALL SUBSTITUTED EQUIPMENT SHALL CONFORM TO SPACE REQUIREMENTS AND PERFORMANCE REQUIREMENTS SHOWN ON CONTRACT DOCUMENTS. CONTRACTOR SHALL REPLACE ANY EQUIPMENT THAT DOES NOT MEET THESE REQUIREMENTS AT HIS OWN EXPENSE. ANY MODIFICATIONS TO ASSOCIATED SYSTEMS OR ADDITIONAL COSTS ATTRIBUTED TO THIS SUBSTITUTION SHALL BE AT THIS CONTRACTOR'S EXPENSE.

C. CONTRACTOR SHALL SUBMIT BID BASED ON SPECIFIED ITEMS AND SHALL SUPPLY AS AN ALTERNATE PRICE ANY SUBSTITUTIONS.

1.08 ACCESS DOORS IN GENERAL CONSTRUCTION

A. THIS CONTRACTOR SHALL SUBMIT TO THE ARCHITECT FOR APPROVAL A PLAN INDICATING THE SIZE AND LOCATION OF ALL ACCESS DOORS REQUIRED FOR OPERATION AND MAINTENANCE OF ALL CONCEALED EQUIPMENT, DEVICES, VALVES, DAMPERS AND CONTROLS. CONTRACTOR SHALL ARRANGE FOR FURNISHING AND INSTALLATION OF ALL ACCESS DOORS IN FINISHED CONSTRUCTION AND INCLUDE COSTS IN THE BID. ACCESS DOORS SHALL BE OF ADEQUATE SIZE TO PROVIDE ACCESS TO CONCEALED ITEMS FOR OPERATION AND MAINTENANCE, WITH A MINIMUM SIZE OF 18" X 18".

2.01 DUCTWORK AND ACCESSORIES

A. ALL DUCTWORK SHALL BE FABRICATED AND INSTALLED IN ACCORDANCE WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS – METAL AND FLEXIBLE, 1995 OR LATEST EDITION, SMACNA HVAC AIR DUCT LEAKAGE TEST MANUAL, 1991 OR LATEST EDITION, NFPA 90A LATEST EDITION, AND THE STATE/LOCAL BUILDING CODE. THE MORE STRINGENT REQUIREMENT OF ANY CODES SHALL APPLY.

B. PROVIDE ALL SUPPORTING AND HANGING DEVICES IN ACCORDANCE WITH STATE/LOCAL BUILDING CODE AND SMACNA.

C. DUCTWORK LAYOUT AND ROUTING IS SCHEMATIC AND THE MECHANICAL CONTRACTOR IS RESPONSIBLE FOR ALL DUCT SIZE CHANGES AND RELOCATIONS TO ACCOMMODATE SPACE AND STRUCTURAL CONDITIONS. OFFSETS AND TRANSFORMATIONS SHALL PRESERVE THE FULL INSIDE CROSS-SECTIONAL AREA OF DUCTWORK SHOWN ON THE DRAWINGS.

D. DUCTWORK (NEW AND EXISTING TO BE REUSED) SHALL HAVE PRESSURE CLASSIFICATION, SEALING REQUIREMENTS AND LEAKAGE TESTING IN ACCORDANCE WITH SMACNA AND AS LISTED BELOW UNLESS OTHERWISE SPECIFIED OR SHOWN ON THE DRAWINGS.

1. 4" CLASS: ALL SUPPLY DUCTWORK FROM DISCHARGE OF AIR UNITS TO INLETS OF TERMINAL BOXES. SEAL CLASS AA@, LEAKAGE CLASS 6 (RECTANGULAR) OR CLASS 3 (ROUND).
2. 3" CLASS: ALL SUCTION AND DISCHARGE OF KITCHEN HOOD, AND SMOKE EXHAUST DUCTWORK. SEAL CLASS AB@, LEAKAGE CLASS 12 (RECTANGULAR) OR CLASS 6 (ROUND).
3. 2" CLASS: ALL OTHER LOW PRESSURE DUCTWORK. SEAL CLASS AC@, LEAKAGE CLASS 24 (RECTANGULAR) OR CLASS 12 (ROUND).
4. LEAKAGE TESTING:

   ALL TESTING SHALL BE DONE IN THE PRESENCE OF THE ENGINEER OR OWNER'S REPRESENTATIVE. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL COLLARS, CAPS, ELECTRIC POWER, ETC. NECESSARY TO PERFORM THE TESTS. THE CONTRACTOR IS ALSO RESPONSIBLE FOR SCHEDULING THE TEST NO LESS THAN THREE (3) BUSINESS DAYS PRIOR TO ITS INTENDED OCCURRENCE. LOW PRESSURE DUCTWORK (2" CLASS) SHALL BE TESTED ON AN AS-NEEDED BASIS AT THE ENGINEER'S DIRECTION. LEAKAGE TEST PROCEDURES SHALL FOLLOW THE OUTLINES AND CLASSIFICATIONS IN THE SMACNA HVAC DUCT LEAKAGE TEST MANUAL. IF SPECIMEN FAILS TO MEET ALLOTTED LEAKAGE LEVEL, THE CONTRACTOR SHALL MODIFY TO BRING IT INTO COMPLIANCE AND SHALL RETEST IT UNTIL ACCEPTABLE LEAKAGE IS DEMONSTRATED. TESTS AND NECESSARY REPAIR SHALL BE COMPLETED PRIOR TO CONCEALMENT OF DUCTS.

E. MATERIALS:

1. SHEETMETAL: UNLESS OTHERWISE SPECIFIED OR INDICATED, DUCTS SHALL BE CONSTRUCTED OF HOT-DIPPED GALVANIZED SHEETMETAL WITH 60 COMMERCIAL COATING ACCORDING TO ASTM 653 AND A924.
2. STAINLESS STEEL: PROVIDE DUCTWORK OF STAINLESS STEEL CONSTRUCTION, WHERE INDICATED. DUCTWORK SHALL BE 316/NO. 4 FINISH FOR EXPOSED DUCT. 304/NO. 1 FINISH FOR CONCEALED DUCTS. PROVIDE FOR ALL CORROSIVE EXHAUST SYSTEMS INCLUDING FUME HOODS FOR DISHWASHING SYSTEM.
3. ALUMINUM: PROVIDE DUCTWORK OF ALUMINUM CONSTRUCTION, WHERE INDICATED. DUCTWORK SHALL BE ALLOY 3003-H14, OF THICKNESS REQUIRED BY THE SMACNA DUCT CONSTRUCTION STANDARDS. PROVIDE FOR ALL DUCTWORK EXPOSED TO WEATHER AND MOISTURE INCLUDING OUTSIDE AIR DUCTS WITHIN 10 FEET OF LOUVERS AND DISHWASHER EXHAUST.
4. BLACK IRON (CARBON STEEL): PROVIDE DUCTWORK OF BLACK IRON (CARBON STEEL), WHERE INDICATED. DUCTWORK SHALL BE BLACK IRON (CARBON STEEL) SHEET COMPLYING WITH ANSI/ASTM 415. PROVIDE FOR ALL KITCHEN EXHAUST AND KITCHEN HOOD SYSTEMS.
5. IN WELDED CASES FOR ALL METAL DUCTWORK, THE FILLER ROD MATERIAL SHALL EQUAL OR EXCEED THE BASE METAL PROPERTIES.
6. WELDED DUCTWORK SHALL BE SEALED AIR, WATER AND GAS TIGHT.
7. FLEXIBLE CONNECTIONS AT FANS SHALL BE NEOPRENE COATED, FLAME RETARDANT GLASS FABRIC (COMPLYING WITH NFPA 90 AND 96), 30 OZ./SQ. YD. WITH SEWED AND CEMENT SEAMS.
8. FLEXIBLE DUCTWORK SHALL NOT BE USED ON THIS PROJECT.

F. FABRICATION:

1. CONFORM TO SMACNA REQUIREMENTS FOR METAL THICKNESS, REINFORCING, JOINTS, AND SEALING FOR MAXIMUM STATIC PRESSURES INVOLVED. ALL SEAMS AND JOINTS SHALL BE SEALED AND TAPED.
2. ELBOWS SHALL CONFORM TO SMACNA REQUIREMENTS AND THE FOLLOWING:
   A) PROVIDE LONG RADIUS TYPE WITH CENTERLINE RADIUS MINIMUM 1.5 TIMES DUCT WIDTH. PROVIDE SHORT RADIUS OR SQUARE ELBOWS WHERE INDICATED OR WHERE REQUIRED TO FIT RESTRICTED SPACES. PROVIDE DOUBLE THICKNESS TURNING VANES ON ALL SHORT RADIUS AND MITERED ELBOWS. CONFORM TO SMACNA FOR THE NUMBER OF VANES FOR FITTINGS.
3. BRANCH CONNECTIONS: PROVIDE 45 DEGREE ENTRY OR CONICAL TAPS. PROVIDE RADIUS TYPE FITTINGS FOR DIVIDED FLOW BRANCHES.

G. VOLUME DAMPERS:

1. GALVANIZED STEEL OR SAME AS DUCT CONSTRUCTION. CONFORM TO SMACNA HVAC DUCT CONSTRUCTION STANDARDS, 1995 OR LATEST EDITION, OPPOSED BLADE TYPE. PROVIDE BEARING AT BOTH ENDS OF DAMPER ROD AND QUADRANT, WITH LEVER AND LOCK SCREW, AT ONE END. INSTALL WITH LEVERS ACCESSIBLE THROUGH INSULATION. SPLITTER DAMPER OR AIR EXTRACTORS SHALL NOT BE USED ON THIS PROJECT.
2. PROVIDE MANUAL BALANCING VOLUME DAMPERS AS REQUIRED TO PROPERLY BALANCE THE AIR DISTRIBUTION SYSTEM. IF THE LOCATION OF BALANCING DAMPERS IS NOT DEFINED ON THE DRAWINGS, THE FOLLOWING MINIMUM STANDARDS SHALL GOVERN:
   A) LOW PRESSURE: ALL SUPPLY AIR MAIN BRANCHES FROM TRUNK, EACH SPLIT, AND ALL SUB-BRANCHES FROM MAINS SHALL BE PROVIDED WITH BALANCING DAMPERS.
   B) LOW PRESSURE: ALL EXHAUST AND RETURN BRANCHES FROM TRUNK, EACH SPLIT AND ALL SUB-BRANCHES FROM MAINS SHALL BE PROVIDED WITH BALANCING DAMPERS.
   C) AS NOTED ON PLANS.

H. DUCT ACCESS DOORS:

1. CONFORM TO SMACNA WITH PIANO HINGES, TWO SASH LOCKS AND DOOR GASKETS. SCREWED ACCESS PANELS ARE NOT PERMITTED. PROVIDE REMOVABLE ACCESS DOORS WHERE DOOR SWING CANNOT BE ACCOMMODATED.

I. SIZE: MINIMUM 20"X14" EXCEPT DUCTS LESS THAN 16", ONE DIMENSION 20" AND THE OTHER DIMENSION, 2" LESS THAN THE DUCT WIDTH.

1. PROVIDE ACCESS DOORS: AT ENTERING AND LEAVING SIDES OF COILS IN DUCTS; AUTOMATIC DAMPERS ON LINKAGE SIDE, MANUAL VOLUME DAMPERS 2 SQ. FT. AND LARGER, FIRE DAMPERS, SMOKE DAMPERS, COMBINATION FIRE/SMOKE DAMPERS, SMOKE DETECTION HEADS, FAN BEARINGS ENCLOSED IN DUCTS, SUCTION AND DISCHARGE SIDES OF CEILING MOUNTED FANS, FILTERS, REHEAT COILS, AT ALL EQUIPMENT REQUIRING ACCESS AND AS INDICATED ON DRAWINGS.

J. COMBINATION FIRE/SMOKE DAMPERS:

1. COMBINATION FIRE/SMOKE DAMPERS SHALL BE INSTALLED AS INDICATED ON DRAWING AND AS REQUIRED BY STATE/LOCAL BUILDING CODE. DAMPERS TO BE UL 555S LATEST EDITION LISTED AND LABELED AND IN CONFORMANCE WITH NFPA.
2. COMBINATION FIRE/SMOKE DAMPERS SHALL BE CLASS 1 (ONE), DUAL OVERRIDE REMOTE RESETTABLE, OPPOSED MULTIBLADE TYPE WITH FUSIBLE MECHANICAL HEAT RESPONSIVE DEVICE, 120-VOLT OR PNEUMATIC ACTUATOR AS REQUIRED MOUNTED OUT OF THE AIR STREAM, WITH DAMPER OPERATOR AND BLADE POSITION INDICATOR SWITCHES. PROVIDE MOTOR MOUNT BRACKET STRENGTHENER FOR DAMPERS OVER 10" IN HEIGHT. PROVIDE A 10 GAUGE WELDED VERTICAL STIFFENER AT EACH CORNER TO PREVENT DAMPER MISALIGNMENT.
3. THE HVAC CONTRACTOR SHALL PROVIDE ALL DEVICES, RELAYS, END SWITCHES, E/P SWITCHES, CONTROL COMPONENTS, AIR PIPING, POWER WIRING, CONTROL WIRING AND INTERLOCK WIRING, AS REQUIRED TO ACCOMPLISH THE SEQUENCE OF OPERATION FOR THESE DAMPERS.
4. DAMPERS SHALL BE MANUFACTURED BY IMPERIAL MODEL #770 OR APPROVED EQUAL.

K. EXISTING DUCTWORK TO BE REUSED:

1. THIS CONTRACTOR SHALL INSPECT, SEAL PER SMACNA REQUIREMENTS, LEAK TEST, AND INSULATE ALL EXISTING DUCTWORK TO BE REUSED. EXISTING DUCTWORK TO BE REUSED SHALL CONFORM TO SPECIFICATIONS FOR NEW DUCTWORK LISTED HEREIN. ALL REQUIRED WORK SHALL BE PART OF BID.

L. AUTOMATIC CONTROL DAMPERS:

1. PROVIDE DAMPERS WITH PARALLEL BLADES FOR 2-POSITION CONTROL, OR OPPOSED BLADES FOR MODULATING CONTROL OF CONSTANT OR VARIABLE VOLUME SYSTEM.
2. AUTOMATIC DAMPERS TO BE VERY LOW LEAKING TYPE WITH JAMB AND BLADE SEALS RATED FOR SMOKE DAMPER APPLICATION. CONSTRUCT BLADES OF 16 GAUGE GALVANIZED STEEL. PROVIDE HEAVY-DUTY MOLDED SELF-LUBRICATING NYLON BEARINGS, 1/2" DIAMETER STEEL AXLES SPACED ON 9" CENTERS, BLADES TO BE MAXIMUM 10" HIGH. FRAME SHALL BE CONSTRUCTED OF 16 GAUGE X 4-3/8" GALVANIZED HAT SHAPED STEEL PROPERLY BRACED WITH GALVANIZED STEEL FINISH AND ALUMINUM TOUCH-UP.
3. DAMPERS INSTALLED IN ALUMINUM DUCTS SHALL BE ALUMINUM WITH WEATHERPROOF COMPONENTS.
4. DAMPERS TO BE MANUFACTURED BY IMPERIAL OR APPROVED EQUAL.

M. EXPOSED DUCTWORK:

1. WHERE DUCTWORK IS INDICATED TO BE EXPOSED TO VIEW IN OCCUPIED SPACES, PROVIDE MATERIALS, WHICH ARE FREE FROM VISUAL IMPERFECTIONS, INCLUDING PITTINGS, SEAM MARKS, STAINS, DISCOLORATIONS, AND OTHER IMPERFECTIONS. PROVIDE FINISHES, WHICH WILL ALLOW PAINTING. PROVIDE FLAT TYPE SEAMS AND JOINTS FOR ALL EXPOSED DUCT CONSTRUCTION.

N. COMMERCIAL COOKING KITCHEN EXHAUST DUCTWORK AND LOW TEMPERATURE CHIMNEYS (FIELD FABRICATED):

1. CONSTRUCT DUCTWORK OF CARBON STEEL (BLACK IRON) WITH ALL JOINTS CONTINUOUSLY WELDED, AIR, GAS, AND WATERTIGHT.

   A) INTERIOR EXHAUST DUCTWORK OR CHIMNEYS:

   CARBON STEEL (BLACK IRON) SHALL BE NO. 16US GAUGE FOR AREAS UP TO 155 SQ. INCHES, 14US GAUGE UP TO 200 SQ. INCHES, 12US GAUGE UP TO 255 SQ. INCHES AND NO. 10 U.S. GAUGE FOR GREATER AREAS.

   B) EXTERIOR EXHAUST DUCTWORK:

   CARBON STEEL (BLACK IRON) SHALL BE 1/8" THICK FOR AREAS UP TO 7 SQUARE FEET, 3/16" FOR AREAS UP TO 12.5 SQUARE FEET, 1/4" FOR LARGER AREAS. EXTERIOR CHIMNEYS SHALL BE GALVANIZED OR WEATHERPROOFED AS REQUIRED.
2. PROVIDE 18"X18" (OR LARGEST FEASIBLE) AIR, WATER AND GAS TIGHT ACCESS DOORS; MOUNTED ON THE SIDE OF THE DUCT, AT 20 FOOT INTERVALS FOR THE ENTIRE LENGTH OF HORIZONTAL DUCT AND AT EACH CHANGE IN DIRECTION. PROVIDE ACCESS DOOR AT BASE OF RISER IN SIDE OF DUCT.
3. FLEXIBLE CONNECTIONS FOR KITCHEN EXHAUST DUCTS TO FANS SHALL BE MANUFACTURED OF A NON-COMBUSTIBLE MINERAL BASE MATERIAL THAT CANNOT BE PENETRATED BY GREASE.

2.02 INSULATION

A. ALL INSULATION SHALL MEET THE REQUIREMENTS OF ASTM, NFPA, STATE/LOCAL ENERGY CODE AND ALL AUTHORITIES HAVING JURISDICTION. ALL MECHANICAL INSULATION (JACKETING, COVERINGS, ADHESIVES, MASTICS, FACINGS, TAPES, ETC.), SHALL HAVE RATINGS NOT EXCEEDING A AFLAME SPREAD@ OF 25 OR LESS AND A SMOKE DEVELOPED@ INDEX OF 50 OR LESS.

B. BEFORE APPLYING INSULATION, ALL PRESSURE AND LEAK TESTS SHALL BE COMPLETED AND APPROVED. FURNISH AND INSTALL AS PER MANUFACTURER'S REQUIREMENTS.

D. DUCT INSULATION:

1. GENERAL
   A) INSULATION SHALL BE APPLIED WITH MASTICS, ADHESIVES, COATINGS, WITH COVERS, WEATHER-PROTECTION AND OTHER WORK AS REQUIRED BY MANUFACTURER'S RECOMMENDATIONS. DO NOT INSULATE SOUND LINED DUCTWORK. MATERIALS SHALL MEET REQUIREMENTS OF ADHESIVE AND SEALANT COUNCIL STANDARDS AND SMACNA.
2. CONCEALED DUCTWORK
   A) INSULATE SUPPLY AND FRESH AIR DUCTS AND PLENUMS IN CONCEALED SPACES AND RETURN DUCT NOT IN CEILING PLENUM WITH AT LEAST 1-1/2" THICK FIBROUS GLASS DUCT WRAP, WITH FOIL-KRAFT FLAME RESISTANT VAPOR BARRIER.
3. EXPOSED DUCTWORK
   A) INSULATE EXPOSED SUPPLY, RETURN AND FRESH AIR DUCTS AND EXPOSED PLENUM WITH 1" THICK, SEMI-RIGID FIBROUS GLASS BOARDS WITH FACTORY APPLIED FIRE RETARDANT FOIL REINFORCED KRAFT VAPOR BARRIER FACING. PROVIDE WELD PINS AND VAPOR SEAL ALL JOINTS WITH TAPE.
4. OUTDOOR DUCTWORK
   A) FOR OUTDOOR DUCTWORK OR DUCTWORK EXPOSED TO THE ELEMENTS IN ADDITION TO INSULATION AND FINISHES SPECIFIED FOR INDOOR DUCTWORK, APPLY TWO (2) COATS OF WEATHERPROOF MASTIC AND EMBED INTO WET COAT TWO (2) LAYERS OF GLASS CLOTH OVER INSULATION JACKET. SMOOTH MEMBRANE TO AVOID WRINKLES AND OVERLAP ALL SEAMS AT LEAST 3". APPLY A SECOND COAT OF THE SAME COATING TO THE ENTIRE SURFACE. TOP CENTER OF RECTANGULAR DUCT SHALL PITCH TO EACH SIDE TO AVOID TRAPPING OF WATER IN THE CENTER.
5. KITCHEN EXHAUST
   A) KITCHEN EXHAUST DUCTWORK SHALL HAVE A MINIMUM INSULATION COVERING OF TWO INCHES OF CALCIUM SILICATE BLOCK, ATTACHED WITH 1" HIGH RIB COPPER STEEL LATH FINISHED WITH TWO COATS OF CEMENT. INSURE THAT THE INSULATION EXTENDS THROUGH ALL WALL PENETRATIONS TO SEPARATE THE DUCTS FROM THE BUILDING CONSTRUCTION.

2.03 ELECTRICAL WORK

A. GENERAL

1. ELECTRICAL POWER WIRING SHALL BE PROVIDED BY THE ELECTRICAL CONTRACT; CONTROL WIRING SHALL BE BY THE HVAC CONTRACT. CONTROL WIRING SHALL BE DEFINED AS ANY 12V, 24V, OR 120V WIRING INSTALLED FOR PURPOSES OTHER THAN PROVIDING PRIMARY ELECTRICAL POWER TO EQUIPMENT.
2. MOTOR STARTERS AND VARIABLE FREQUENCY DRIVES (VFD) SHALL BE FURNISHED BY THE HVAC CONTRACTOR AND INSTALLED BY THE ELECTRICAL CONTRACTOR. REFER TO THE EQUIPMENT SECTION FOR VARIABLE FREQUENCY DRIVE SPECIFICATIONS.
3. DUCT MOUNTED SMOKE DETECTORS, WHERE REQUIRED, SHALL BE PROVIDED BY AD WIRED BY THE ELECTRICAL CONTRACTOR, AND MOUNTED BY THE HVAC CONTRACTOR.
4. ALL ELECTRICAL CONTROL WIRING SHALL COMPLY WITH LOCAL ELECTRICAL CODE, ALL AUTHORITIES HAVING JURISDICTION AND THE PROJECT ELECTRICAL SPECIFICATIONS.
5. MECHANICAL CONTRACTOR TO OBTAIN QUANTITY OF CONTROLLERS REQUIRED AND COORDINATE WITH THE ELECTRICAL CONTRACTOR FOR ALL OPERATING REQUIREMENTS, INTERLOCKS AND CONNECTIONS FOR STARTERS.
6. THE MECHANICAL CONTRACTOR SHALL PREPARE AND SUBMIT FOR APPROVAL POINT-TO-POINT, COMPLETELY COORDINATED WIRING DIAGRAMS AND INDICATE ALL SOURCE POWER REQUIREMENTS AND ALL FIELD WIRING TO BE PERFORMED BY THE ELECTRICAL CONTRACTOR.
7. WHERE EXISTING STARTERS ARE TO BE REUSED, THIS CONTRACTOR SHALL MAINTAIN ALL EXISTING CONTROL CONNECTIONS. WHERE NEW STARTERS ARE TO BE PROVIDED TO REPLACE EXISTING, THIS CONTRACTOR SHALL SURVEY THE EXISTING CONTROL CONNECTIONS AND PREPARE AN EXISTING CONTROL WIRING DIAGRAM PRIOR TO DEMOLITION FOR SUBMITTAL TO THE ENGINEER. THE NEW STARTERS SHALL BE PROVIDED WITH THE NECESSARY CONTACTS AND RELAYS REQUIRED TO RECONNECT THE EXISTING CONTROLS. PROVIDE ALL REQUIRED CONTACTS FOR UNIT START/STOP AND FIRE ALARM.

B. MOTORS:

1. MOTORS SHALL HAVE THE ELECTRICAL CHARACTERISTICS AS LISTED ON THE DRAWINGS. COORDINATE ALL REQUIREMENTS WITH THE ELECTRICAL CONTRACTOR. ALL MOTORS SHALL COMPLY WITH NEMA MG-1 STANDARD AND SHALL BE OF THE HIGH EFFICIENCY TYPE AND MEET THE 1992 EPA ENERGY EFFICIENCY ACT AND UTILITY COMPANY REBATE REQUIREMENTS.
2. MOTORS FOR VARIABLE FREQUENCY DRIVES (VFD) SHALL BE SUITABLE FOR USE WITH VARIABLE FREQUENCY DRIVES AND COMPLY WITH NEMA MG-1 PART 31.40.4.2. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING ALL REQUIREMENTS OF THE MOTOR AND VFD MANUFACTURER.
3. IF CONTRACTOR ELECTS TO SUBSTITUTE OR INCREASE MOTOR HORSEPOWER OVER THAT WHICH IS SPECIFIED, THE COST OF MOTOR AND ELECTRICAL CHANGES SHALL BE BORNE BY THIS CONTRACTOR.

C. STARTERS:

1. EACH MOTOR EXCEPT AS NOTED, SHALL BE PROVIDED WITH A COMBINATION FUSED DISCONNECT AND ACROSS-THE-LINE MAGNETIC STARTER WITH PUSHBUTTON STATIONS MOUNTED ON THE COVER. COORDINATE REQUIREMENTS WITH THE ELECTRICAL CONTRACTOR. FOR AUTOMATICALLY OR REMOTELY CONTROLLED MOTORS, FURNISH HAND OFF AUTO (HOA) SELECTOR SWITCHES IN PLACE OF THE PUSH BUTTONS.
2. FURNISH MANUALLY OPERATED MOTOR STARTERS OF THE PROPER SIZE FOR ALL MOTORS LESS THAN 2 HP WHICH ARE NOT AUTOMATICALLY CONTROLLED. STARTERS FOR MOTORS 175 WATTS OR LESS SHALL CONSIST OF A SNAP SWITCH WITH THERMAL OVERLOAD PROTECTION WHERE SUCH PROTECTION IS NOT AN INTEGRAL PART OF THE MOTOR.
3. COMBINATION MAGNETIC STARTERS FOR ALL MOTORS SHALL HAVE THERMAL OVERLOAD, PILOT LIGHT, LOW VOLTAGE PROTECTION IN ALL THREE PHASES. INCLUDE A CONTROL TRANSFORMER FOR EACH MAGNETIC STARTER TO PROVIDE 120-VOLT CONTROL POWER WITH THREE (3) SETS OF SPARE NORMALLY CLOSED OR NORMALLY OPEN CONTACTS.
4. ALL STARTERS SHALL BE ASSEMBLED AND INTERNALLY WIRED WITH ALL DEVICES IN CONFORMANCE WITH NEMA STANDARDS.
5. STARTERS FOR MOTORS 75 HP AND ABOVE SHALL BE SOLID STATE ELECTRONIC SOFT START TYPE STARTERS.
6. DISCONNECT SWITCHES ARE PROVIDED BY THE ELECTRICAL CONTRACTOR IF NOT INTEGRAL WITH EQUIPMENT.

D. ENCLOSURES:

1. PROVIDE ENCLOSURES FOR STARTERS AND VFD'S SUITABLE FOR OPERATING ENVIRONMENT. ENCLOSURES SHALL BE NEMA 1 VENTILATED SHEET METAL FOR INDOOR APPLICATION, NEMA 3R WITH ADDITIONAL GASKETING WEATHERPROOF RAIN TIGHT ENCLOSURE OR EXPOSED OUTDOOR SERVICE OR INDOOR SERVICE EXPOSED TO MOISTURE. PROVIDE DISCONNECT SWITCH ON ENCLOSURE AS REQUIRED FOR SERVICE.

2.04 VIBRATION ISOLATION PRODUCTS

A. FURNISH AND INSTALL ALL NECESSARY VIBRATION ISOLATORS, VIBRATION HANGERS, MOUNTING PADS, RAILS, ETC., TO ISOLATE VIBRATION AND SOUND FROM BEING TRANSMITTED TO THE BUILDING CONSTRUCTION. ALL VIBRATION ISOLATION PRODUCTS SHALL BE SPECIFICALLY DESIGNED FOR THEIR INTENDED USE.

B. MANUFACTURER OF VIBRATION ISOLATION EQUIPMENT SHALL HAVE THE FOLLOWING RESPONSIBILITIES:

1. DETERMINE VIBRATION ISOLATOR SIZES AND LOCATIONS.
2. PROVIDE SUITABLE PIPING AND EQUIPMENT VIBRATION ISOLATION SYSTEMS.
3. GUARANTEE SPECIFIED ISOLATION SYSTEM ATTENUATION AND DEFLECTION.
4. PROVIDE INSTALLATION INSTRUCTIONS, DRAWINGS AND FIELD SUPERVISION TO ASSURE PROPER INSTALLATION AND PERFORMANCE. STARTERS SHALL BE SELECTED TO SUIT MOTOR RUNNING AND STARTING CHARACTERISTICS.

C. ISOLATION SYSTEMS SHALL BE MANUFACTURED BY MASON INDUSTRIES OR APPROVED EQUAL BY THE ENGINEER.

D. MOUNTING TYPES:

1. STATIC DEFLECTION OF ISOLATORS SHALL BE A MINIMUM OF 90% EFFICIENCY. PROVIDE CORROSION PROTECTION FOR EQUIPMENT MOUNTED OUTDOORS.
2. FLOOR MOUNTING OF CENTRIFUGAL FANS (3 HP AND LESS) SPRING ISOLATORS (TYPE SLF).
3. FLOOR AND ROOF MOUNTING OF FACTORY ASSEMBLED AIR HANDLING UNITS, AIR CONDITIONING UNITS, HEAT EXCHANGERS AND CONDENSING UNITS – SPRING ISOLATORS (ROOF EQUIPMENT TYPE SLR), OR (INDOOR EQUIPMENT TYPE SLF).
4. FLOOR MOUNTING OF CENTRIFUGAL FANS (5 HP AND ABOVE) – SPRING ISOLATOR WITH INERTIA BASE – (TYPE KSL).

MOTOR HP	REQUIRED MINIMUM CONCRETE INERTIA BASE THICKNESS	MINIMUM ISOLATION DEFLECTION
UP TO 30 HP	6"	3/4"
40 TO 75 HP	8"	3/4"
100 HP AND GREATER	12"	3/4"

5. MOUNTING OF CEILING-SUPPORTED FANS, IN-LINE PUMPS, HEAT EXCHANGERS, AND AIR HANDLING UNITS – SPRING ISOLATORS – (TYPE DNHS).
6. FLOOR MOUNTING OF PACKAGED AIR CONDITIONING UNIT WITH INTERNAL ISOLATION FOR COMPRESSORS – NEOPRENE IN SHEAR – TYPE SUPER W.
7. ROOFTOP AC UNITS – SPRING ROOF CURB – TYPE RSC.
8. PROVIDE FLEXIBLE CONNECTIONS BETWEEN ALL FANS AND DUCTWORK (REFER TO DUCTWORK SECTION FOR SPECIFICATIONS).

2.05 SEISMIC RESTRAINTS

A. ALL EQUIPMENT, PIPING AND DUCTWORK SHALL BE ADEQUATELY RESTRAINED TO RESIST SEISMIC FORCES. THIS SPECIFICATION IS IN ADDITION TO THE SPECIFIED VIBRATION ISOLATION FOR THIS PROJECT. RESTRAINT DEVICES SHALL BE DESIGNED AND SELECTED TO MEET SEISMIC REQUIREMENTS AS DEFINED IN THE LATEST ISSUE OF THE STATE AND LOCAL CODE HAVING JURISDICTION AND UNIFORM BUILDING CODE (UBC).

MINIMUM AG@ FORCES LISTED SHALL MEET OR EXCEED BUILDING CODE LISTED.

SEISMIC ZONE/ BUILDING CODE	AG@ FORCES FOR ALL PIPE, DUCT & CONDUIT HORIZ.	VERT.	AG@ FORCES FOR RIGIDLY MOUNTED EQUIPMENT HORIZ.	VERT.	AG@ FORCES FOR SAFETY AG@ FORCES FOR FLEXIBLY MOUNTED EQUIPMENT HORIZ.	VERT.	EQUIPMENT EITHER RIGIDLY OR FLEXIBILITY MOUNTED HORIZ.	VERT.
ZONE 2A UBC-94	0.15	0.05	0.15	0.05	0.30	0.10	0.5	0.15

B. ANCHOR BOLT CALCULATIONS, SIGNED AND STAMPED BY A REGISTERED PROFESSIONAL ENGINEER, SHALL BE SUBMITTED SHOWING ADEQUACY OF THE BOLT SIZING AND TYPE. CALCULATIONS SHALL INCLUDE ANCHOR EMBEDMENT, MINIMUM EDGE DISTANCE AND MINIMUM CENTER DISTANCE. THE DESIGN LATERAL FORCES SHALL BE DISTRIBUTED IN PROPORTION TO THE MASS DISTRIBUTION OF THE EQUIPMENT. CALCULATIONS SHALL BE FURNISHED FOR ANCHORS OR RESTRAINT DEVICES, CABLES, ISOLATORS AND ON RIGIDLY MOUNTED EQUIPMENT. THE SEISMIC DESIGNER MUST PERFORM FINAL JOBSITE INSPECTION TO VERIFY ANCHOR INSTALLATION.

C. RESTRAINT OF RIGIDLY MOUNTED PIPING AND DUCTWORK MAY CONFORM TO ANATIONAL UNIFORM SEISMIC INSTALLATION GUIDELINES@, OR AGUIDELINES FOR SEISMIC RESTRAINTS OF MECHANICAL SYSTEMS AND PLUMBING PIPING SYSTEMS,@ SMACNA.

D. CONTRACTOR SHALL SUPPLY ALL SUPPLEMENTAL STEEL REQUIRED FOR ALL EQUIPMENT, DUCTWORK AND PIPING INCLUDING ROOF MOUNTED EQUIPMENT.

E. ALL ISOLATORS AND EQUIPMENT SHALL MEET OSHPD REQUIREMENTS AND CONTAIN APPROVAL FROM OSHPD.

F. MANUFACTURER TO BE MASON INDUSTRIES, OR APPROVED EQUAL BY THE ENGINEER.

G. ISOLATED EQUIPMENT:

1. FLOOR MOUNTED ISOLATED EQUIPMENT SHALL BE PROTECTED, AS REQUIRED, WITH ISOLATORS AND RESTRAINTS. FOR EQUIPMENT WITH HIGH CENTER OF GRAVITY, ADDITIONAL CABLE RESTRAINTS SHALL BE FURNISHED, AS REQUIRED TO LIMIT FORCES AND MOTION CAUSED BY ROCKING.
2. ALL SUSPENDED ISOLATED EQUIPMENT AND VESSELS SHALL BE PROTECTED WITH CABLE RESTRAINTS. CABLES SHALL BE INSTALLED TO PREVENT EXCESSIVE SEISMIC MOTION AND SO ARRANGED THAT THEY DO NOT ENGAGE DURING NORMAL OPERATION, STARTING OR STOPPING.
3. ALL SEISMIC RESTRAINTS FOR ISOLATED EQUIPMENT SHALL BE DESIGNED AND FURNISHED BY THE ISOLATION MANUFACTURER OR SUPPLIER.

H. ISOLATED DUCTWORK

1. ISOLATED DUCTWORK 4 SQ. FT. AND LARGER IN CROSS-SECTIONAL AREA OR 26" DIAMETER AND LARGER SHALL BE PROTECTED IN ALL PLANES BY CABLE RESTRAINTS. THE DUCTWORK SHALL BE REINFORCED AT ALL RESTRAINT LOCATIONS AS PER SMACNA. LOCATIONS SHALL BE DETERMINED BY THE ISOLATOR SUPPLIER AND SHALL INCLUDE BUT NOT BE LIMITED TO:
   A) AT ALL EQUIPMENT CONNECTIONS.
   E) AT ALL DUCT RUNS AND DUCT RUN ENDS (TRANSVERSE BRACING).
   F) AT HORIZONTAL RUNS.
2. ISOLATED DUCTWORK UNDER 4 SQ. FT. IN CROSS-SECTIONAL AREA OR UNDER 26" DIAMETER, NEED NOT BE ADDITIONALLY RESTRAINED.

I. RIGIDLY MOUNTED EQUIPMENT

1. FLOOR MOUNTED AND SUSPENDED EQUIPMENT AND VESSELS WHICH WEIGH OVER 200 POUNDS AND ALL SUSPENDED OR WALL MOUNTED EQUIPMENT SHALL BE PROTECTED BY PROPERLY SIZED ANCHOR BOLTS OR HANGERS, RODS AND BRACING AND, IF REQUIRED, BY ADDITIONAL SEISMIC RESTRAINTS AS DESCRIBED ABOVE FOR ISOLATED EQUIPMENT. THE NEED FOR ADDITIONAL RESTRAINTS SHALL BE DETERMINED BY AND, IF REQUIRED, FURNISHED BY THE SUPPLIER OF THE SEISMIC RESTRAINTS FOR THE ISOLATED EQUIPMENT.

J. RIGIDLY MOUNTED DUCTWORK

1. ALL DUCTWORK SHALL BE PROTECTED THE SAME AS RIGIDLY MOUNTED PIPING.

K. DIFFUSERS

1. AIR DIFFUSERS THAT WEIGHT NOT MORE THAN 10 KG (20 POUNDS) AND THAT RECEIVE NO TRIBUTARY LOADING FROM THE DUCTWORK, MAY BE POSITIVELY ATTACHED TO AND SUPPORTED BY THE CEILING RUNNERS.

L. INSTALLATION

1. ALL SEISMIC RESTRAINTS ARE TO BE SECURELY ANCHORED OR FASTENED TO THE EQUIPMENT AND SUPPORTING STRUCTURE IN ACCORDANCE WITH THE APPROVED SUBMITTAL DATA.
2. OPERATING CLEARANCES ARE TO BE ADJUSTED SO THAT RESTRAINTS DO NOT INTERFERE DURING NORMAL OPERATION OF THE EQUIPMENT.
3. UPON COMPLETION OF THE INSTALLATION, THE SUPPLIER OF THE SEISMIC RESTRAINTS SHALL INSPECT AND CERTIFY IN WRITING TO THE ARCHITECT THAT RESTRAINTS HAVE BEEN INSTALLED PROPERLY AND IN ACCORDANCE WITH HIS RECOMMENDATIONS.
4. SUBMITTALS
5. THE SEISMIC AND VIBRATION CONTROL MANUFACTURER SHALL DETERMINE THE NUMBER, SIZE, AND TYPE OF ANCHOR BOLTS, CABLE RESTRAINTS, SEISMIC SNUBBERS, ETC., FOR EACH PIECE OF EQUIPMENT AND GROUPS OF PIPES AND DUCTS.

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CONSTRUCTION △2	03-09-12

MECHANICAL SPECIFICATIONS

M.6

MECHANICAL SPECIFICATIONS

6. COMPLETE ENGINEERING CALCULATIONS AND DRAWINGS FOR ALL VIBRATION AND SEISMIC REQUIREMENTS FOR ALL EQUIPMENT, PIPING AND DUCTWORK.

7. THE STATE PROFESSIONAL ENGINEERING STAMP OF THE ENGINEER WHO IS RESPONSIBLE FOR THE DESIGN, CALCULATIONS AND OPERATION OF THE VARIATION AND SEISMIC SYSTEM.

8. THE TYPE, SIZE AND DEFLECTION OF EACH ISOLATOR PROPOSED FOR ITEMS IN THIS SPECIFICATION AND ON THE DRAWINGS.

9. DETAILS FOR ALL THE ISOLATORS AND SEISMIC BRACING WITH SNUBBERS PROPOSED FOR ITEMS IN THE SPECIFICATION AND ON THE DRAWINGS.

10. DETAILS FOR STEEL FRAMES AND CONCRETE INERTIA BASES TO BE USED IN CONJUNCTION WITH THE ISOLATION AND SEISMIC RESTRAINT OF THE ITEMS IN THIS SPECIFICATION AND DRAWINGS.

11. CLEARLY OUTLINED PROCEDURES FOR INSTALLING AND ADJUSTING THE ISOLATIONS, SEISMIC BRACING AND SNUBBER.

2.06 TESTING AND BALANCING

A. GENERAL:

1. TESTING AND BALANCING WORK SHALL BE PERFORMED BY AN INDEPENDENT COMPANY (NOT ASSOCIATED WITH THE HVAC CONTRACTOR), AABC CERTIFIED OR AS APPROVED BY THE ENGINEER BEFORE COMMENCEMENT OF WORK. APPROVED COMPANIES INCLUDE MERENDINO ASSOCIATES, R.H. MCDERMOTT, INTERNATIONAL TESTING AND BALANCING OR AS APPROVED BY THE ENGINEER AND BUILDING MANAGEMENT.

2. AFTER ALL PROJECT HVAC WORK IS COMPLETE, TESTED, AND IN FULL WORKING ORDER, THE AGENCY SHALL PERFORM THE BALANCING AND TESTING OF THE PROJECT HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS.

3. UPON THE COMPLETION OF THE AIR CONDITIONING SYSTEM, THE BALANCING AGENCY SHALL PERFORM TESTING AND BALANCING AND COMPILE ALL TEST DATA IN A CERTIFIED REPORT AND SUBMIT FOUR (4) COPIES FOR REVIEW AND APPROVAL TO THE ENGINEER.

4. THE REPORT SHALL INCLUDE DESIGN AND ACTUAL READINGS FOR ALL EQUIPMENT AND LOCATION PLAN INDICATING WHERE ALL WORK HAS BEEN PERFORMED, AND METHODS OF BALANCING AND DETAILS OF INSTRUMENTS USED.

5. IF DISCREPANCIES EXIST IN THE REPORT THAT REQUIRE FIELD VERIFICATION, THE TESTING AND BALANCING COMPANY IN THE PRESENCE OF THE ENGINEER SHALL VISIT THE JOBSITE FOR FIELD VERIFICATION OF THE REPORT.

6. AFTER SUBMISSION OF THE FIELD VERIFIED BALANCING REPORT, THE AIR BALANCING COMPANY SHALL RETURN TO THE JOB SITE TO PERFORM TWO (2) OCCUPANT COMFORT BALANCES AS DIRECTED BY THE OWNER OR ENGINEER.

7. THE FINAL REPORT AFTER THE COMFORT BALANCE IS TO BE INCLUDED IN PROJECT OPERATING AND MAINTENANCE MANUAL.

8. THE TESTING AND BALANCING AGENCY SHALL INCLUDE AS PART OF THEIR WORK AN EXTENDED WARRANTY OF 90 DAYS AFTER COMPLETION OF TEST AND BALANCE WORK. THE ENGINEER AT HIS DISCRETION DURING THE WARRANTY PERIOD MAY REQUEST A RECHECK OR RESETTING OF ANY EQUIPMENT. THE MECHANICAL CONTRACTOR AND THE BALANCING CONTRACTOR SHALL PROVIDE THE NECESSARY TECHNICIANS TO FACILITATE THIS WORK.

9. THE BALANCING AGENCY SHALL PERMANENTLY MARK ALL ADJUSTMENT DEVICES (VALVES, DAMPERS, ETC.) TO ENABLE THE SETTING TO BE RESTORED.

B. AIR BALANCING

1. HVAC CONTRACTOR SHALL ENSURE THAT A FIRST SET OF AIR FILTERS ARE IN PLACE, WHENEVER FANS ARE RUNNING AND REPLACED WITH A NEW CLEAN SET OF FILTERS BEFORE TESTING IS COMMENCED.

2. TEST, ADJUST, REPLACE SHEAVES, AND BALANCE ALL EQUIPMENT AND AIR DISTRIBUTION SYSTEMS TO PROVIDE AIR QUANTITIES INDICATED ON PLANS WITHIN PLUS OR MINUS 5 PERCENT.

3. TEST REPORT SHALL INCLUDE, BUT NOT BE LIMITED TO THE FOLLOWING:

A) FLOW, LEAKAGE CLASS, TEMPERATURE, STATIC PRESSURE OF AIR AT ALL TRUNK DUCTS SERVING AREAS OF WORK.

B) TEMPERATURE OF AIR LEAVING OUTLETS AT TWO (2) TYPICAL AIR OUTLETS.

C) QUANTITY OF AIR AT EACH AIR INLET AND OUTLET AFTER BALANCING.

D) PROVIDE FOR ALL FANS, FAN MOTOR HP, AMPS, VOLTS, FAN RPM, CFM, INLET AND DISCHARGE STATIC PRESSURE, SHEAVE POSITION.

E) PROVIDE FOR ALL AIR CONDITIONING UNITS, SUPPLY CFM, OUTSIDE AIR CFM, RETURN AIR CFM, MIXED AIR CFM. PROVIDE OUTSIDE AIR, MIXED AIR AND SUPPLY AIR TEMPERATURES (DRY BULB – COOLING AND HEATING, WET–BULB–COOLING). INDICATE UNIT OPERATING MODE DURING TEST.

F) LISTING OF DESIGN AND ACTUAL READINGS AS WELL AS ALL MANUFACTURERS DATA FOR EQUIPMENT.

2.07 EQUIPMENT

A. PROVIDE ALL EQUIPMENT AND ACCESSORIES OF THE SIZES AND CAPACITIES AS SCHEDULED AND AS INDICATED ON THE DRAWINGS.

B. INSTALL EQUIPMENT IN ACCORDANCE WITH APPROVED SHOP DRAWINGS, MANUFAC–TURER'S RECOMMENDATIONS, INSTRUCTIONS, AND ALL AUTHORITIES HAVING JURISDICTION.

C. PROVIDE EQUIPMENT SUPPORTS AND/OR MOUNTINGS AS INDICATED ON THE DRAWING, IN VIBRATION SPECIFICATION AND AS FOLLOWS:

1. FLOOR MOUNTED EQUIPMENT – PROVIDE DIMENSIONS FOR A 4" CONCRETE HOUSEKEEPING PAD WITH ALL REQUIRED WATERPROOFING TO THE CONSTRUCTION MANAGER.

2. EQUIPMENT ON FLOOR STANDS – PROVIDE FLOOR STAND OF STRUCTURAL STEEL OR STEEL PIPES AND FITTINGS AND BOLT TO FLOOR.

3. ROOF MOUNTED EQUIPMENT – PROVIDE PRE–FABRICATED ISOLATED ROOF CURB WITH INTEGRAL VIBRATION ISOLATORS.

4. CEILING MOUNTED EQUIPMENT – PROVIDE SUPPORTS WITH APPROVED SUITABLE ANCHORS SUSPENDED DIRECTLY FROM BUILDING STEEL STRUCTURE.

5. PROVIDE SUPPLEMENTAL STEEL AS REQUIRED TO ADEQUATELY SUPPORT THE EQUIPMENT LOAD.

D. EQUIPMENT SHALL BE INSTALLED WITH VIBRATION ISOLATION, REFER TO VIBRATION ISOLATION SECTION.

G. DIFFUSERS, GRILLES AND REGISTERS

1. GENERAL

A) GRILLES, REGISTERS AND DIFFUSERS SHALL BE TESTED IN ACCORDANCE WITH ASHRAE STANDARD 70–1991 OR LATEST EDITION. THE MANUFACTURER SHALL PROVIDE PUBLISHED PERFORMANCE DATA FOR ALL AIR INLETS AND OUTLETS TO BE USED ON PROJECT AS PART OF THE SUBMISSION.

B) THE MECHANICAL CONTRACTOR TO COORDINATE THE LOCATION OF DIFFUSERS, GRILLES AND REGISTERS WITH OTHER TRADES AND WITH CEILING AND WALL CONSTRUCTION. THE MECHANICAL CONTRACTOR IS TO VERIFY THAT ALL DIFFUSERS, GRILLES AND REGISTERS ARE COMPATIBLE WITH CEILING CONSTRUCTION TO WHICH THEY ARE TO BE INSTALLED.

C) COORDINATE ALL WORK WITH THE GENERAL CONTRACTOR AND REFER TO THE ARCHITECTURAL DRAWINGS FOR THE EXACT LOCATION, LENGTHS AND FOR FRAMING AND MITERING ARRANGEMENTS THAT MAY DIFFER FROM THOSE SHOWN ON HVAC DRAWINGS. PROVIDE ALL REQUIRED GENERAL CONSTRUCTION, FRAMING, BLOCKING, PLASTERING AND SUPPORTS TO MATCH CEILING, SOFFIT OR WALL CONSTRUCTION AS PART OF THE PROJECT.

D) INLETS AND OUTLETS SHALL HANDLE AIR QUANTITIES INDICATED AT OPERATING VELOCITIES WITH SOUND PRESSURE LEVEL NOT TO EXCEED NC–30, UNLESS NOTED OTHERWISE.

E) DIFFUSERS, GRILLES AND REGISTERS SHALL BE INSTALLED WITH FACES SET LEVEL AND PLUM AND MOUNTED TIGHTLY AGAINST MOUNTING SERVICE.

F) ALL AIR INLETS AND OUTLETS TO BE STEEL OR ALUMINUM IF EXPOSED TO MOISTURE UNLESS OTHERWISE INDICATED. FINISHES TO BE SELECTED BY THE ARCHITECT.

G) DIFFUSERS, GRILLES AND REGISTERS SHALL BE MANUFACTURED BY TITUS OR ANEMOSTAT.

H) SUBMIT FOR APPROVAL A COMPLETE SCHEDULE OF ALL AIR INLETS AND OUTLETS TO BE USED ON PROJECT INCLUDING MANUFACTURER'S MODELS, SIZES, PERFORMANCES, ACCESSORIES, ACOUSTIC INFORMATION, FINISHES, ETC., BEFORE RELEASE FOR FABRICATION. NOTE ANY DEVIATIONS FROM SPECIFICATIONS AND SCHEDULES SHALL BE INDICATED ON SUBMITTAL.

2. AIR INLET AND OUTLET DEVICES:

A) PROVIDE DIFFUSERS, GRILLES AND REGISTERS FOR SUPPLY, RETURN AND EXHAUST INLETS AND OUTLETS, OF THE SIZE, TYPE AND DESIGN INDICATED ON DRAWINGS.

B) ALL SUPPLY RETURN AND EXHAUST AIR INLETS AND OUTLETS SHALL BE PROVIDED WITH AN OPPOSED BLADE DAMPER AND GRID (ADJUSTABLE THROUGH THE FACE) FOR TRIM BALANCING.

C) SUPPLY REGISTERS SHALL HAVE TWO SETS OF DIRECTIONAL CONTROL BLADES.

D) ONLY 4–WAY DIFFUSERS SHALL BE USED. PROVIDE BLANK–OFF SHEETMETAL BAFFLE FOR ALL 1–WAY, 2–WAY AND 3–WAY DIFFUSERS.

E) ALL LINEAR DIFFUSERS SHALL BE PROVIDED WITH CABLE OPERATED OPPOSED BLADE DAMPER ADJUSTABLE THROUGH THE FACE OF THE DIFFUSER. DAMPERS AND PLENUM TAPS SHALL BE SPACED AT A MAXIMUM OF 4 FEET ON CENTER. PROVIDE DIFFUSERS WITH ADJUSTABLE AIR PATTERN CONTROL VALVES.

2.08 AUTOMATIC TEMPERATURE CONTROLS

A. GENERAL:

1. FURNISH AND INSTALL AS HEREIN SPECIFIED, A COMPLETE AUTOMATIC TEMPERATURE CONTROL SYSTEM OF THE (ELECTRIC) AS REQUIRED.

2. OR APPROVED EQUAL BY THE ENGINEER. MANUFACTURER SHALL BE APPROVED BY ENGINEER BEFORE COMMENCING WORK.

3. ALL TEMPERATURE CONTROL SYSTEMS AND COMPONENTS UNDER THIS SUBCONTRACT ARE TO BE FULLY MODULATING TYPE, EXCEPT WHERE NOTED OTHERWISE. THE SYSTEM SHALL BE COMPLETE IN ALL RESPECTS INCLUDING ALL ASSOCIATED CONTROL EQUIPMENT, THERMOSTATS, CONTROL VALVES, VALVE ACTUATORS, DAMPER OPERATORS, RELAYS, PILOT POSITIONERS, CONTROL WIRING, CONTROL AIR PIPING, SWITCHES, INTERLOCK WIRING, ELECTRICAL OR PNEUMATIC CONTROL COMPONENTS AND ASSOCIATED PIPING OR WIRING, APPURTENANCES, ETC., TO PROVIDE THE FUNCTIONS DESCRIBED IN THESE SPECIFICATIONS AND PLANS, REGARDLESS OF WHETHER OR NOT SAID DEVICE RELAY, ETC. IS SPECIFICALLY MENTIONED HEREAFTER.

4. THE SYSTEM SHALL BE SUPERVISED AND CHECKED OUT COMPLETELY IN ALL RESPECTS BY COMPETENT MECHANICS, REGULARLY EMPLOYED BY THE MANUFACTURER.

5. THE CONTROL SYSTEMS SHALL BE IN ACCORDANCE WITH THE FOLLOWING DESCRIPTION OF SYSTEM OPERATIONS AND/OR DETAIL INFORMATION SHOWN ON THE PLANS AND AS DESCRIBED HEREIN.

A) THE MANUFACTURER OF THE AUTOMATIC CONTROL EQUIPMENT SHALL SUBMIT THE FOLLOWING FOR APPROVAL: A SCHEMATIC DIAGRAM OF EACH CONTROL SYSTEM WHICH SHALL INDICATE THE PROPER SEQUENCE OF OPERATION AND RANGE OF THE CONTROLS FOR ALL CYCLES. A COMPLETE DESCRIPTION OF THE AUTOMATIC OPERATION OF EACH SYSTEM. THE DESCRIPTION SHOULD INCLUDE THE DUTY OF EACH THERMOSTAT, VALVE, SWITCH, ETC., INCORPORATED IN THE CONTROL SYSTEM WITH A SCHEDULE AND ILLUSTRATION OF ALL CONTROL INSTRUMENTS AND EQUIPMENT INCLUDING CONTROL PANELS AND DEVICES FOR EACH SYSTEM.

B. ELECTRIC WIRING:

1. ALL ELECTRICAL WORK (EXCEPT FOR MOTOR FEEDERS, WIRING BETWEEN MOTORS, MOTOR CONTROLLERS, FEEDER PANELS, FUSES, CIRCUIT BREAKERS AND BUS BARS) REQUIRED FOR THE AUTOMATIC TEMPERATURE CONTROL SYSTEM SHALL BE PROVIDED BY THIS CONTRACTOR. WORK SHALL INCLUDE BUT NOT BE LIMITED TO TIME SWITCHES, DAMPER MOTORS, DAMPER SWITCHES, ELECTRIC THERMOSTATS, ELECTRIC RELAYS, E/P SWITCHES, INTERLOCKING WIRING, WIRE, CONDUIT, ETC.

2. ALL 115 VOLT POWER REQUIRED FOR CONTROL PURPOSES SHALL BE PROVIDED BY THE CONTROL CONTRACTOR FROM A SOURCE ESTABLISHED BY THE ELECTRICAL CONTRACTOR.

3. THE CONTROL MANUFACTURER SHALL INCLUDE WIRING DIAGRAMS IN HIS SHOP DRAWINGS SUBMITTALS FULLY COORDINATED WITH THE ELECTRICAL CONTRACTOR'S WORK. IT SHALL BE THE AUTOMATIC TEMPERATURE CONTROL CONTRACTOR'S RESPONSIBILITY TO PROVIDE ALL WIRING AND CONDUIT AS REQUIRED TO ACHIEVE THE FUNCTION CALLED FOR IN THESE SPECIFICATIONS, CONFORMING WITH LOCAL CODES FOR MATERIAL AND INSTALLATION. THE ELECTRICAL SPECIFICATION FOR THE PROJECT'S ELECTRICAL WORK IS TO BE FOLLOWED.

4. FURNISH A CERTIFICATE INDICATING THE METHOD OF WIRING COMPLIANCE WITH LOCAL CODES AS PART OF THE FIRST SHOP DRAWING SUBMITTAL.

C. ROOM THERMOSTAT AND SWITCH LOCATIONS:

1. ALL ROOM THERMOSTATS AND SWITCH LOCATIONS (WHETHER SHOWN ON PLANS OR NOT) SHALL BE SELECTED AND SUBMITTED BY THE TEMPERATURE CONTROL MANUFACTURER FOR APPROVAL BY THE ARCHITECT AND ENGINEER PRIOR TO ACTUAL INSTALLATION.

D. AUTOMATIC DAMPERS:

1. PROVIDE CONTROLS FOR ALL THE AUTOMATIC DAMPERS, AS SPECIFIED IN THE DUCTWORK SECTION, AND SHOWN ON THE DRAWINGS.

2. CONTROL MOTORS OR ACTUATORS SHALL BE OF THE ELECTRONIC OR PNEUMATIC TYPE, UNLESS OTHERWISE NOTED, OR APPROPRIATE SIZE AND QUANTITIES TO PROVIDE TWO–POSITION OR PROPORTIONING CONTROL ACTION AS SPECIFIED. PROPORTIONING TYPE SHALL BE EQUIPPED WITH PILOT TYPE POSITIONERS. PILOT POSITIONERS SHALL BE SELECTED FOR VARIED SPRING RANGES AND ADJUSTABLE WITHOUT DISMANTLING POSITIONER AND CONTROL MOTOR.

3. AUTOMATIC DAMPERS EXPOSED TO THE ELEMENTS SHALL HAVE ELECTRIC ACTUATORS WITH ALL REQUIRED ACCESSORIES.

E. SEQUENCE OF OPERATIONS: (RTU–1, RTU–2, MAU–1, KX–1, KX–2, DWX–1, AND TX–1)

1. INTERLOCK – ALL UNIT(S) RTU–1, RTU–2, MAU–1, KX–1, KX–2, DWX–1, AND TX–1 SHALL BE INTERLOCKED WITH ALL ASSOCIATED AUTOMATIC DAMPERS. MASTER CONTROL PANEL SHALL EITHER ENERGIZE OR DE–ENERGIZE ALL OF THE RESPECTIVE INTERLOCKED SYSTEMS.

2. SYSTEM OFF (OCCUPIED) – WHEN MASTER CONTROL PANEL IS SET TO THE OFF POSITION, ALL UNIT(S) SHALL BE DE–ENERGIZED AND ALL DAMPERS SHALL BE IN CLOSED POSITION.

3. SYSTEM ON (OCCUPIED) – WHEN MASTER CONTROL PANEL IS ENERGIZED. THE RESPECTIVE AUTOMATIC DAMPER SHALL BE OPENED AND ALL UNITS SHALL THAN BE ENERGIZED. SPACE THERMOSTATS SHALL MAINTAIN SPACE SET POINT(S) BY CYCLING COMPRESSORS AND/OR MODULATING GAS–FIRED HEATERS IN RTU–1, RTU–2, AND MAU–1.

4. SYSTEM OFF (UN–OCCUPIED) – MASTER CONTROL PANEL SHALL BE ABLE TO ONLY OPERATE RTU–1 AND RTU–2 TO MAINTAIN MINIMUM TEMPERATURE SET POINTS DURING THE UN–OCCUPIED MODE. RTU–1 AND RTU–2 SHALL BE PLACED IN TOTAL RE–CIRCULATION MODE.

PART 3 – EXECUTION

3.01 DEMOLITION, REMOVAL AND RELOCATION

A. REMOVAL, TEMPORARY CONNECTIONS AND RELOCATION OF CERTAIN EXISTING WORK WILL BE NECESSARY FOR THE INSTALLATION OF THE NEW SYSTEMS. ALL EXISTING CONDITIONS ARE NOT TO BE COMPLETELY DETAILED ON THE DRAWINGS. THE CON–TRACTOR SHALL SURVEY THE SITE AND MAKE ALL NECESSARY CHANGES REQUIRED BASED ON EXISTING CONDITIONS FOR PROPER INSTALLATION OF NEW WORK.

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

C. EQUIPMENT REQUIRED TO BE TEMPORARILY DISCONNECTED AND RELOCATED SHALL BE CAREFULLY REMOVED, STORED, CLEANED, REINSTALLED, RECONNECTED, AND MADE OPERATIONAL.

D. ALL EXISTING WORK NOT INDICATED FOR DEMOLITION SHALL BE PROTECTED FROM DAMAGE. WHERE EXISTING WORK TO REMAIN IS DAMAGED OR DISTURBED, THE CONTRACTOR SHALL REPAIR OR REPLACE TO OWNER'S AND BUILDING MANAGER'S SATISFACTION AT NO COST TO THE OWNER OR BUILDING MANAGEMENT.

E. GENERAL CONTRACTOR REMOVE ALL CEILING IN AREAS WHERE NEW DUCTWORK OR PIPING IS TO BE INSTALLED OR EXISTING IS ALTERED, AS PER ARCHITECT'S INSTRUCTIONS.

F. ALL NECESSARY CUTTING AND PATCHING TO ACCOMMODATE THE NEW HVAC WORK SHALL BE PERFORMED BY THIS CONTRACTOR AND COORDINATED WITH BUILDING MANAGEMENT SO AS TO MINIMIZE DISRUPTION OF EXISTING TENANTS AND SERVICES. RESTORE ALL ITEMS TO MATCH EXISTING CONDITIONS.

G. ALL EXISTING MATERIAL AND EQUIPMENT TO BE REMOVED UNDER THIS CONTRACT WILL REMAIN THE PROPERTY OF THE OWNER OR SHALL BE LEGALLY DISPOSED OF BY THIS CONTRACTOR AS DIRECTED BY THE ARCHITECT OR OWNER. REFRIGERATION CONTAINED IN EXISTING EQUIPMENT TO BE REMOVED SHALL BE RECLAIMED OR LEGALLY DISPOSED OF IN ACCORDANCE WITH EPA REQUIREMENTS AND ASHRAE.

H. PROVIDE FOR LEGAL REMOVAL AND DISPOSAL OF ALL RUBBISH AND DEBRIS FROM THE BUILDING AND SITE. COORDINATE ALL DEMOLITION AND REMOVALS WITH BUILDING MANAGEMENT.

3.02 CONNECTION TO EXISTING WORK

A. PLAN INSTALLATION OF NEW WORK AND CONNECTIONS TO EXISTING WORK TO INSURE MINIMUM INTERFERENCE WITH REGULAR OPERATION OF EXISTING FACILITIES. ALL SYSTEM SHUTDOWNS AFFECTING OTHER AREAS SHALL BE COORDINATED WITH BUILDING MANAGEMENT. INSTALL ISOLATION VALVES AT POINT OF CONNECTION TO THE EXISTING PIPING. INSTALL ISOLATION DAMPERS AT CONNECTION TO EXISTING DUCTWORK. PROVIDE TEMPORARY DUCTWORK AND PIPING CONNECTIONS AS REQUIRED TO MINIMIZE SHUTDOWN TIME.

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

C. MAINTAIN CONTINUOUS OPERATION OF EXISTING FACILITIES.

3.03 CHASING, CHOPPING OR CORE DRILLING

A. PRIOR TO ANY CHASING, CHOPPING, OR CORE DRILLING BEING PERFORMED, THIS CONTRACTOR SHALL FIELD INVESTIGATE EXISTING CONDITIONS AND COORDINATE WITH ALL APPROPRIATE TRADES AND BUILDING MANAGEMENT TO ENSURE THAT WORK WILL BE IN HARMONY WITH OTHER WORK AND NOT AFFECT ANY EXISTING BUILDING SYSTEMS. THIS WORK MUST BE APPROVED BY BUILDING MANAGEMENT PRIOR TO PROCEEDING.

3.03 SYSTEM COMMISSIONING

A. PRIOR TO FULL OPERATION, A COMPLETE DEMONSTRATION AND TESTING OF THE SYSTEM OPERATING FUNCTIONS AND ALARMS SHALL BE PERFORMED BY THIS CONTRACTOR IN THE PRESENCE OF THE OWNER'S REPRESENTATIVE AND ENGINEER. THIS TESTING SHALL TAKE PLACE AFTER HAVING SATISFACTORILY MET THE REQUIREMENTS OF SHOP DRAWING ACCEPTANCE. COMMISSIONING OF THE SYSTEM SHALL BE SCHEDULED BEFORE THE SPACE IS OCCUPIED LEAVING ENOUGH TIME TO CORRECT THE SYSTEM'S DEFICIENCIES AND AFTER SHOP DRAWING ACCEPTANCE. UPON SUCCESSFUL COMPLETION OF SYSTEM OPERATION, THE CONTRACTOR SHALL SUBMIT A STATEMENT STATING THAT THE FULL OPERATION OF ALL SYSTEMS, FUNCTIONS AND ALARMS HAS BEEN DEMONSTRATED AND ARE OPERATIONAL AS WELL AS A LISTING OF ALL SYSTEMS, ALARMS AND FUNCTIONS THAT HAVE BEEN COMMISSIONED. ALL ITEMS SHALL BE SUBMITTED FOR REVIEW AND ACCEPTANCE TO THE OWNER, OWNER'S REPRESENTATIVE AND ENGINEER BEFORE FINAL ACCEPTANCE CAN TAKE PLACE.

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MECHANICAL SPECIFICATIONS

M.7