CONTROLS SYMBOLS

- T — ROOM TEMPERATURE SENSOR
- SSP (H, L) — DUCT-MOUNTED STATIC PRESSURE TRANSMITTER (SUPPLY)
- SD — DUCT-MOUNTED SMOKE DETECTOR
- LLT, HLT — SAT — DUCT-MOUNTED TEMPERATURE TRANSMITTER (SUPPLY)
- HHL — SAH — DUCT-MOUNTED HUMIDITY TRANSMITTER (SUPPLY)
- SAF — DUCT-MOUNTED FLOW TRANSMITTER (SUPPLY)
- RAC02, C02 — DUCT-MOUNTED CARBON DIOXIDE SENSOR (RETURN)
- RAD-POS — ELECTRIC OPERATED CONTROL DAMPER (RETURN)
- HCV, NO — ELECTRIC OPERATED CONTROL VALVE (HEATING/NORMALLY OPEN)
- H, C — UNIT/DUCT-MOUNTED COIL (HEATING)
- UNIT-MOUNTED FILTER
- FAN

DUCTWORK SYMBOLS

- FC — FLEXIBLE CONNECTION, EQUIPMENT, VIBRATION (NOT TYPICALLY SHOWN AT UNIT CONNECTIONS)
- VANED ELBOW (PROVIDE ALL SQUARE OR RECTANGULAR ELBOWS WITH VANES EVEN IF SYMBOL IS MISSING)
- STANDARD RADIUS ELBOW (LONG RADIUS)
- 10"X8" — NEW DUCT (INSIDE DIMENSIONS: WIDTH x DEPTH)
- LOUVER (LOUVER SPECIFIED IN ARCHITECTURAL SECTION.)
- FLEXIBLE DUCTWORK (INSULATED)
- MD — MANUAL VOLUME DAMPER
- FD — FIRE DAMPER
- BACK-DRAFT DAMPER
- AUTOMATIC CONTROL DAMPER MODULATING
- AUTOMATIC CONTROL DAMPER TWO POSITION
- MANUAL SPLITTER DAMPER
- STANDARD BRANCH SUPPLY OR RETURN, NO SPLITTER (45° TAP)
- UP / DN — SUPPLY DUCT (UP & DOWN)
- UP / DN — EXHAUST DUCT (UP & DOWN)
- UP / DN — RETURN DUCT (UP & DOWN)
- SQUARE 4-WAY CEILING DIFFUSER
- EXHAUST OR RETURN CEILING REGISTER OR GRILLE
- VANED ELBOW & AIR SPLIT TYPE DUCT TAKE-OFF
- CONNECT NEW DUCT TO EXISTING DUCT
- UP — INCLINED RISE, IN DIRECTION OF AIR FLOW
- DN — INCLINED DROP, IN DIRECTION OF AIR FLOW
- LIMIT OF DEMOLITION

ABBREVIATIONS (NOT ALL ABBREVIATIONS WILL APPLY TO THIS WORK)

A/E	ARCHITECT / ENGINEER	kg	KILOGRAM
AD	ACCESS DOOR	kg/HR	KILOGRAM PER HOUR
AF	AFTER FILTER	kPa	KILOPASCAL
AFF	ABOVE FINISHED FLOOR	kW	KILOWATT
AHU	AIR-HANDLING UNIT	kWh	KILOWATT HOUR
AMP	AMPERGE	L	LITER
APD	AIR PRESSURE DROP	L/s	LITERS PER SECOND (OR LITERS/SECOND)
ARI	AIR CONDITIONING AND REFRIGERATION INSTITUTE	LAT	LEAVING AIR TEMPERATURE
ASME	AMERICAN SOCIETY OF MECHANICAL ENGINEERS	LBS/HR	POUNDS PER HOUR
BHP	BRAKE HORSEPOWER	LF	LINEAR FOOT (FEET)
BTU	BRITISH THERMAL UNIT	LPS	LOW PRESSURE STEAM
BTUH	BRITISH THERMAL UNIT PER HOUR	LPSC	LOW PRESSURE STEAM (CLEAN)
C	CENTIGRADE (CELCIUS)	LSD	LINEAR SLOT DIFFUSER
CC	COOLING COIL	LWT	LEAVING WATER TEMPERATURE
CCD	COOLING COIL CONDENSATE DRAIN	M	METER, SI UNIT
CFM	CUBIC FEET PER MINUTE	M/s	METERS PER SECOND (OR METERS/SECOND)
CFT	CUBIC FEET	MAT	MIXED AIR TEMPERATURE
CM	CUBIC METER	MAX	MAXIMUM
CM/S	CUBIC METER PER SECOND	MB	MIXING BOX
COP	COEFFICIENT OF PERFORMANCE	MBH	1000 BTUH
CSG	CLEAN STEAM GENERATOR	MCA	MINIMUM BRANCH CIRCUIT AMPACITY
CU	CONDENSING UNIT	MERV	MINIMUM EFFICIENCY REPORTING VALUE
CAV	CONSTANT AIR VOLUME	MIN	MINIMUM
DB	DECIBELS	MM	MILLIMETER
Db	DRY-BULB TEMPERATURE	NA	NOT APPLICABLE
DDC	DIRECT DIGITAL CONTROLS	NC	NOISE CRITERIA
DEG	DEGREE	NTS	NOT TO SCALE
DIA, ø	DIAMETER	OA	OUTSIDE AIR
DH	DUCT-MOUNTED HUMIDIFIER	OAL	OUTSIDE AIR LOUVER
DP	DEW POINT TEMPERATURE	OD	OUTSIDE DIAMETER
DPA	DIFFERENTIAL PRESSURE ASSEMBLY	P	PUMP
DPS	DIFFERENTIAL PRESSURE SENSOR	PA	PASCAL
DSS	DUCTLESS SPLIT SYSTEM	PC	PUMPED CONDENSATE
DX	DIRECT EXPANSION	PCF	POUNDS PER CUBIC FOOT (FEET)
DXCC	DIRECT EXPANSION COOLING COIL	PD	PRESSURE DROP
EA	EXHAUST AIR	PF	PRE-FILTER
EAL	EXHAUST AIR LOUVER	PG	PRESSURE GAGE
EAR	EXHAUST AIR REGISTER	PHC	PREHEAT COIL
EAT	ENTERING AIR TEMPERATURE	PPM	PARTS PER MILLION
EC	ELECTRONIC CONTROLLER	PRV	PRESSURE REGULATING VALVE
ECC	ENGINEERING CONTROL CENTER	PSI	POUNDS PER SQUARE INCH
EER	ENERGY EFFICIENCY RATIO	PSIA	POUNDS PER SQUARE INCH ABSOLUTE
EF	EXHAUST FAN	PSIG	POUNDS PER SQUARE INCH GAGE
ESP	EXTERNAL STATIC PRESSURE	PSV	PRESSURE SAFETY VALVE
ET	EXPANSION TANK	RA	RETURN AIR
EWT	ENTERING WATER TEMPERATURE	RAR	RETURN AIR REGISTER
EXIST.	EXISTING	RAT	RETURN AIR TEMPERATURE
F	FAHRENHEIT	REA	RELIEF AIR
F&T	FLOAT AND THERMOSTATIC	RF	RETURN FAN
FD/SD	COMBINATION FIRE SMOKE DAMPER	RH	RELATIVE HUMIDITY
FD	FLOOR DRAIN	RHC	REHEAT COIL
FD	FIRE DAMPER	RLA	RUN LOAD AMPERE
FF	FINAL FILTER	RPM	REVOLUTIONS PER MINUTE
FPM	FEET PER MINUTE	RTU	ROOF TOP UNIT
FS	FLOW SWITCH	RV	RELIEF VALVE
FSTAT	FREEZESTAT	SA	SUPPLY AIR
FT	FEET	SAR	SUPPLY AIR REGISTER
FT-LB	FOOT-POUND	SAT	SUPPLY AIR TEMPERATURE
GA	GAUGE	SCFM	STANDARD CUBIC FEET PER MINUTE
GAL	GALLONS	SD	SMOKE DETECTOR
GPM	GALLONS PER MINUTE	SD	SMOKE DAMPER
H	HUMIDIFER	SF	SUPPLY FAN
HC	HEATING COIL	SH	STEAM HUMIDIFIER
HD	HEAD	SP	STATIC PRESSURE
HP	HORSEPOWER	TAG	TRANSFER AIR GRILLE
HTP	HEAT TRANSFER PACKAGE	TE	TEMPERATURE ENTERING
HW	HOT WATER	UH	UNIT-MOUNTED HUMIDIFIER
HWC	HOT WATER COIL	UL	UNDERWRITERS LABORATORY
HWHC	HOT WATER HEATING COIL	VAV	VARIABLE AIR VOLUME
HWR	HEATING HOT WATER RETURN	VFD	VARIABLE FREQUENCY DRIVE
HWS	HEATING HOT WATER SUPPLY	VHA	VETERANS HEALTH ADMINISTRATION
HZ	HERTZ	VR	VACUUM (STEAM CONDENSATE) RETURN
I/O	INPUT/OUTPUT	W	WATTS
IAQ	INDOOR AIR QUALITY	Wb	WET-BULB (TEMPERATURE)
ID	INSIDE DIAMETER	WF	WATER FILTER
IFB	INTEGRAL FACE AND BYPASS	WG	WATER GAGE
IN	INCHES	WPD	WATER SIDE PRESSURE DROP
IN HG	INCHES OF MERCURY		
IN WG	INCH WATER GAUGE		
IN-LB	INCH-POUND		

GENERAL SYMBOLS (NOT ALL SYMBOLS WILL APPLY TO THIS WORK)

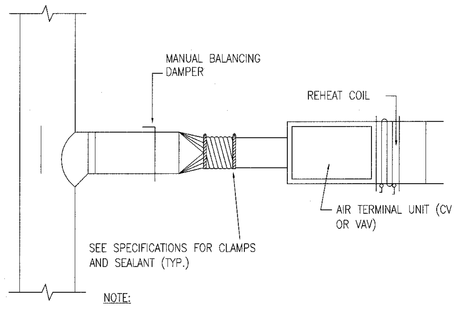
- DIRECTION OF FLOW
- ANCHOR
- REDUCER OR INCREASER
- TOP CONNECTION, 45° OR 90°
- BOTTOM CONNECTION, 45° OR 90°
- SIDE CONNECTION
- CAPPED OUTLET
- RISE OR DROP IN PIPE
- UNION
- PIPE UP
- PIPE DOWN
- INVERTED BUCKET TRAP SET INCLUDING PIPING ACCESSORIES
- FLOAT & THERMOSTATIC TRAP SET INCLUDING PIPING ACCESSORIES
- THERMOSTATIC TRAP SET INCLUDING PIPING ACCESSORIES
- THERMOMETER
- PRESSURE GAGE
- FLOW ELEMENT
- TEST PLUG (PRESSURE/TEMPERATURE)
- AV — AUTOMATIC AIR VENT
- MV — MANUAL AIR VENT
- POINT OF CONNECTION BETWEEN NEW AND EXISTING WORK
- PRIMARY ELEMENT FOR FLOW METERING
- INVERTED BUCKET STEAM TRAP ASSEMBLY (T)
- CLOSED-FLOAT-THERMOSTATIC STEAM TRAP ASSEMBLY (T)
- THERMOSTATIC STEAM TRAP (T)
- PRESSURE GAGE (WITH SIPHON ON STEAM SERVICE)

GENERAL NOTES

1. ALL PIPING AND DUCTS IN FINISHED ROOMS OR SPACES SHALL BE CONCEALED IN A FURRED CHASE OR ABOVE THE SUSPENDED CEILING.
2. THE FIRST FIGURE OF DUCT SIZE INDICATES DIMENSION OF FACE SHOWN OR INDICATED. DUCT SIZES ARE NET INSIDE DIMENSIONS.
3. TOTAL STATIC PRESSURE NOTED IN THE SCHEDULES INCLUDES DUCT SYSTEM, TERMINAL UNITS, FILTERS, COILS, ETC.
4. FOR TYPICAL WATER PIPING CONNECTIONS TO EQUIPMENT, SEE STANDARD EQUIPMENT DETAILS.
5. DIFFUSER, REGISTER AND GRILLE SIZES SHOWN ON FLOOR PLANS ARE NECK SIZES.
6. WATER PIPE CONNECTIONS TO AIR HEATING AND COOLING COILS SHALL BE MADE TO PROVIDE COUNTER FLOW BETWEEN WATER AND AIR.

PIPING SYMBOLS

- HWS — HWS — HWS — HOT WATER HEATING SUPPLY
- HWR — HWR — HWR — HOT WATER HEATING RETURN
- D — D — D — DRAIN LINE
- V — V — V — VENT LINE



NOTE:

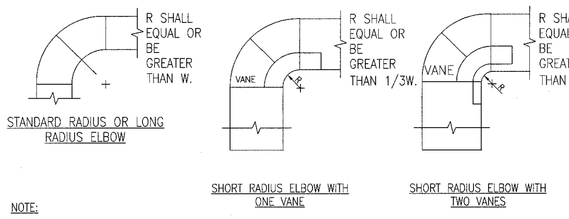
1. RIGID STRAIGHT TERMINAL UNIT INLET LENGTH SHALL BE A MINIMUM OF 2 TIMES THE DIAMETER OF INLET BEFORE THE SENSOR, OR THE MANUFACTURER'S RECOMMENDED DISTANCE, WHICHEVER IS GREATER.
2. A FLEXIBLE AIR DUCT CONNECTOR IS NOT MANDATORY FOR INLET TO THIS BOX, BUT ALLOWED TO ACCOMMODATE MINOR OFFSETS. MAXIMUM LENGTH 1'-0" [900mm].
3. A BRANCH DUCT SERVING AN INDIVIDUAL BOX MAY BE THE SAME SIZE AS THE BOX INLET, PROVIDED THE EQUIVALENT LENGTH OF THE BRANCH DUCT, AS SHOWN, DOES NOT EXCEED 10 FEET (3 METERS). FOR LONGER LENGTHS, INCREASE THE DUCT SIZE AND PROVIDE A DUCT TRANSITION TO MAINTAIN THE DUCT STATIC PRESSURE DROP AT OR BELOW 0.08"/100' [1.64Pa/m].

   COMPONENT ARRANGEMENT MAY VARY BY MANUFACTURER. PROVIDE INSULATION W/VAPOR BARRIER FOR CONNECTING DUCT SECTIONS.
4.

DUCT CONNECTIONS - AIR TERMINAL UNITS

1 / 1-H9

NTS



STANDARD RADIUS OR LONG RADIUS ELBOW

SHORT RADIUS ELBOW WITH ONE VANE

SHORT RADIUS ELBOW WITH TWO VANES

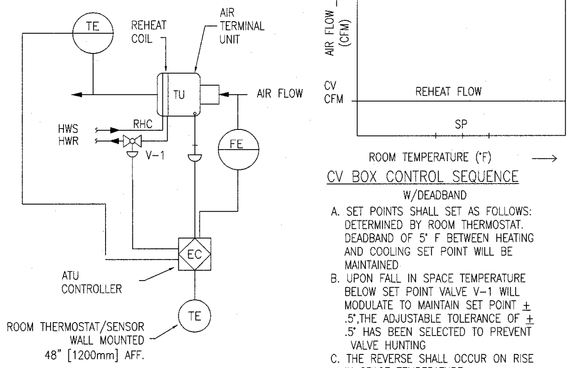
NOTE:

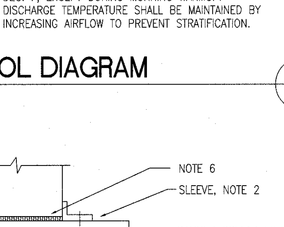
1. THE INTERIOR SURFACE OF ALL RADIUS ELBOWS SHALL BE MADE ROUND.
2. ALL STANDARD RADIUS ELBOWS CAN BE SUBSTITUTED WITH SHORT RADIUS ELBOWS. ALL SHORT RADIUS ELBOWS SHALL HAVE VANES. VANES SHALL BE CONSTRUCTED, SUPPORTED AND FASTENED AS RECOMMENDED BY SMACNA.

DUCTWORK RADIUS ELBOWS

2 / 1-H9

NTS





CV BOX CONTROL SEQUENCE

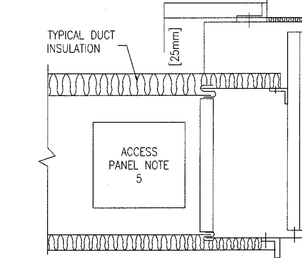
W/DEADBAND

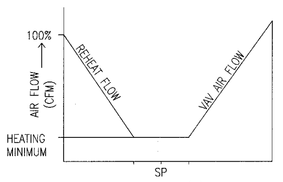
A. SET POINTS SHALL SET AS FOLLOWS: DETERMINED BY ROOM THERMOSTAT. DEADBAND OF 5° F BETWEEN HEATING AND COOLING SET POINT WILL BE MAINTAINED
B. UPON FALL IN SPACE TEMPERATURE BELOW SET POINT VALVE V-1 WILL MODULATE TO MAINTAIN SET POINT ± .5°.THE ADJUSTABLE TOLERANCE OF ± .5° HAS BEEN SELECTED TO PREVENT VALVE HUNTING
C. THE REVERSE SHALL OCCUR ON RISE IN SPACE TEMPERATURE.

CAV AIR TERMINAL UNIT CONTROL DIAGRAM

3 / 1-H9

NTS





VAV BOX CONTROL SEQUENCE

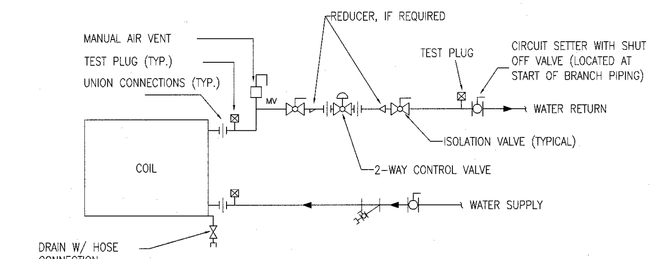
W/DEADBAND

A. SET POINTS SHALL BE SET AS FOLLOWS: COOLING 75°F (ADJ) HEATING 70°F(ADJ) DEADBAND OF 5° F BETWEEN HEATING AND COOLING SET POINTS WILL BE MAINTAINED.
B. UPON FALL IN SPACE TEMPERATURE THE VAV DAMPER WILL MODULATE TO MINIMUM POSITION.
C. UPON FURTHER DROP IN SPACE TEMPERATURE VALVE V-1 WILL MODULATE TO MAINTAIN SET POINT ± .5° F. THE ADJUSTABLE TOLERANCE OF ± .5° F HAS BEEN SELECTED TO PREVENT VALVE HUNTING
D. THE REVERSE SHALL OCCUR ON THE RISE IN SPACE TEMPERATURE.
E. MAXIMUM AIR DISCHARGE TEMPERATURE SHALL BE 90 DEG. F, EXCEPT DURING MORNING WARM-UP. DISCHARGE TEMPERATURE SHALL BE MAINTAINED BY INCREASING AIRFLOW TO PREVENT STRATIFICATION.

VAV AIR TERMINAL UNIT CONTROL DIAGRAM

5 / 1-H9

NTS

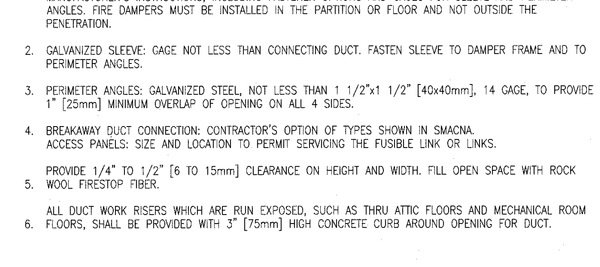


*** UNION FITTINGS SHALL BE PROVIDED ON ALL SIDES OF THE 2-WAY VALVE. 3-WIRE FLOATING POINT CONTROL IS NOT ACCEPTABLE

TERMINAL UNIT WATER COILS - PIPING CONNECTIONS

4 / 1-H9

NTS



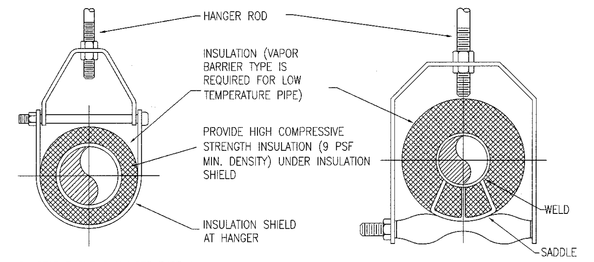
NOTE:

1. A VERTICAL DAMPER IS SHOWN. HORIZONTAL DAMPER INSTALLATION, IS SIMILAR. FOLLOW DAMPER MANUFACTURER'S INSTRUCTIONS, INCLUDING FASTENER OPTIONS AND GAGES FOR SLEEVE AND PERIMETER ANGLES. FIRE DAMPERS MUST BE INSTALLED IN THE PARTITION OR FLOOR AND NOT OUTSIDE THE PENETRATION.
2. GALVANIZED SLEEVE: GAGE NOT LESS THAN CONNECTING DUCT. FASTEN SLEEVE TO DAMPER FRAME AND TO PERIMETER ANGLES.
3. PERIMETER ANGLES: GALVANIZED STEEL, NOT LESS THAN 1 1/2"x1 1/2" [40x40mm], 14 GAGE, TO PROVIDE 1" [25mm] MINIMUM OVERLAP OF OPENING ON ALL 4 SIDES.
4. BREAKAWAY DUCT CONNECTION: CONTRACTOR'S OPTION OF TYPES SHOWN IN SMACNA. ACCESS PANELS: SIZE AND LOCATION TO PERMIT SERVICING THE FUSIBLE LINK OR LINKS.
5. PROVIDE 1/4" TO 1/2" [6 TO 15mm] CLEARANCE ON HEIGHT AND WIDTH. FILL OPEN SPACE WITH ROCK WOOL FIRESTOP FIBER.
6. ALL DUCT WORK RISERS WHICH ARE RUN EXPOSED, SUCH AS THRU ATTIC FLOORS AND MECHANICAL ROOM FLOORS, SHALL BE PROVIDED WITH 3" [75mm] HIGH CONCRETE CURB AROUND OPENING FOR DUCT.

SECTION THRU FIRE DAMPER INSTALLATION

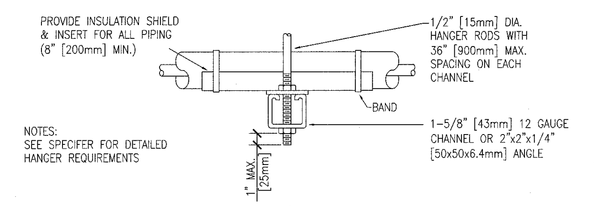
6 / 1-H9

NTS



ADJUSTABLE CLEVIS HANGER TYPE 1 - SEE SPECIFICATIONS

ADJUSTABLE CLEVIS HANGER TYPE 43 - SEE SPECIFICATIONS



NOTES:
SEE SPECIFER FOR DETAILED HANGER REQUIREMENTS

SIDE VIEW TRAPEZE HANGER FOR UP TO 1000 LB. [453KG] UNIFORM LOAD

MAXIMUM PIPE/TUBING SUPPORT SPACING

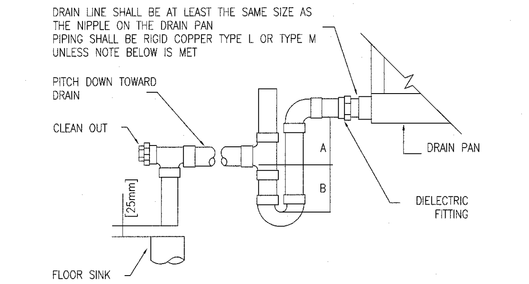
NOM. SIZE	IN. [mm]	THRU 3/4" [20]	1 [25]	1 1/4|1 1/2 [32] [40]	2 [50]	2 1/2 [65]	3 [75]	4 [100]	5 [125]	6 [150]	8 [200]	10 [250]
PIPE	FT. [mm]	7 [2100]	7 [2100]	7 [2100]	9 [2700]	10 [3000]	11 [3400]	12 [3700]	14 [4100]	16 [4900]	17 [5200]	19 [5800]	22 [6700]
TUBING	FT. [mm]	5 FT [1500]	6 [1800]	7 [2100]	8 [2400]	8 [2400]	9 [2700]	10 [3000]	12 [3700]	13 [4000]	14 [4100]	16 [4900]	– –

NOTE: FOR TRAPEZE HANGER TAKE SPACING OF SMALLEST SIZE ON TRAPEZE.

PIPE HANGERS

7 / 1-H9

NTS



NOTE: 1. CPVC PIPE MAY BE USED ONLY IF APPROVED BY LOCAL VA AND IS INDOORS AND DOES NOT PASS THROUGH RATED BARRIERS.
2. DIELECTRIC FITTING TO BE USED WHEN TWO DISSIMILAR METALS ARE TO BE CONNECTED.

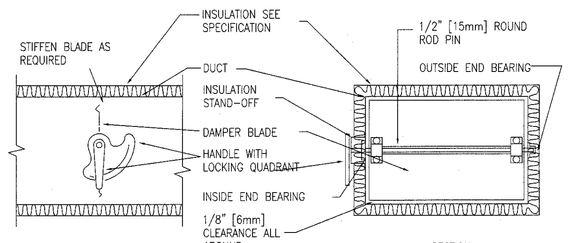
UNIT TYPE	A	B
DRAW THRU	2" [50mm] PLUS X	X
BLOW THRU	1" [25mm] MINIMUM	2X

WHERE X = STATIC PRESSURE IN PAN

AIR HANDLING UNIT DRAIN TRAP DETAIL

8 / 1-H9

NTS



NOTE:

1. DELETE INSULATION STAND-OFF ON DUCTWORK WITHOUT EXTERIOR INSULATION.
2. DETAIL SHOWS SINGLE BLADE DAMPER. DAMPER INSTALLATION SHALL BE SIMILAR FOR MULTI-BLADE DAMPERS & ROUND DAMPERS.
3. DAMPERS LOCATED IN INACCESSIBLE SPACES (DUE TO EQUIPMENT LOCATION, HARD CEILINGS, OR OTHERWISE) SHALL BE PROVIDED WITH REMOTE DAMPER ACTUATORS. COORDINATE INSTALLATION WITH ELECTRICAL AND CONTROLS CONTRACTORS.

VOLUME DAMPER DETAIL

9 / 1-H9

NTS

FULLY SPRINKLERED BUILDING
BID DOCUMENTS

Revisions:	Date

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Drawing Title:	MECHANICAL DETAILS
Approved: Project Director	
Project Title:	SURGICAL SUPPORT AND LOCKERS
Location:	IOWA CITY VAMC, 601 HIGHWAY 6 WEST, IOWA CITY, IOWA 52246-2208
Date:	07-13-12
Checked:	KLP
Drawn:	JEM
Project Number:	636A8-11-011
Building Number:	1
Drawing Number:	1-H9

Office of Construction and Facilities Management
Department of Veterans Affairs

VA FORM 08-6231