WORKSHEET FOR RESIDENTIAL AIR SYSTEM DESIGN

RESET

Wallet card photocopy

Inspection Authority: _____
Signature: _____
Date: / /

Designer/Signature: _____
Phone: ( )_____Fax ( )_____
Date: / /

Submitted For: (Owner)

Name _____

Address _____

City_____ Prov ____

Postal code _____

Phone ( )_____Fax ( )_____

By: (Contractor)

Name _____

Address _____

City_____ Prov ____

Postal code _____

Phone ( )_____Fax ( )_____

Designed Equipment: (Heating)		**Designed Equipment: (Accessories)**	
Gas furnace		Electronic air cleaner	
Oil furnace		Pleated air cleaner	
Propane furnace		Electrostatic air filter	
Electric furnace		Dry media filter (thickness) //	
Heat pump		Merv____filter	
Water coil & blower		Water heating coil	
Designed Equipment: (Cooling)		Electric heating coil	
Indoor coil		Other	
Outdoor Unit		**Ventilation System (Integrated)**	
Air handler		System type :	
Other		Mixed air temperature °F	

Forms available from: HRAI * 2350 Matheson Blvd. East. * Suite 101 * Mississauga, Ontario * L4W 5G9

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PART A - DESIGN LOAD SPECIFICATIONS

A.1 Sub Total Heat Loss	Btuh.	A.3 Total Heat Loss (A.1 + A.2)	Btuh.
A.2 Ventilation Heat Loss	Btuh.		
A.4 Sub Total Heat Gain	Btuh.	A.6 Total Heat Gain (A.4 + A.5)	Btuh.
A.5 Ventilation Heat Gain	Btuh.		
A.7 Volume of House:	(Heated Area) X (Average Ceiling Height)		cu ft.
A.8 Ventilation Flow Rate:	As per Heat Loss/Gain Worksheet		cfm.

PART B – EQUIPMENT SELECTION

Heating Equipment:		Cooling Equipment:	
Make	Model	Make	Model (Outdoor Unit)
Fuel Type: ☐ Gas ☐ Oil ☐ Electricity ☐ Other		Make	Model (Indoor Unit)
B.1 Heating Output (Minimum 100% - of A.3)	Btuh.	Cooling Medium: ☐ DX ☐ Chilled Water ☐ Other	
B.2 Approved Temperature Rise/range	°F.	B.5 Cooling Output (80% - 125% of A.6) Btuh.	Tons
B.3 Equipment External Static Pressure	in. W.C.	B.6 Manufacturers Flow Rate/Ton	(cfm/ton)
B.4 Heating Air Flow Rate (blower specs)	cfm	B.7 Cooling Air Flow Rate. Target Air Flow rate = B.5 X B.6	cfm
		Actual Air Flow Rate (blower specs)	cfm
		B.8 Coil Pressure Drop, in. W.C. Dry:	Wet:
Speed setting:	Adjustment:	Speed Setting:	Adjustment:

PART C – AIR DISTRIBUTION & PRESSURE

C.1 Circulation Air Flow Rate (A.7 x 0.025)	cfm	C.5 Calculated Heating Temperature Rise [B.1 ÷ (B.4 x 1.08)]	°F
C.2 System Design Air Flow Rate (highest of B.4, B.7, C.1)	cfm	C.6 Filter Pressure Drop	in. W.C.
C.3 Cooling Airflow Proportioning Factor Calculate to 4 decimal places (B.7 ÷ A.4)	cfm/Btuh	C.7 Coil Pressure Drop (B.8)	in. W.C.
C.4 Heating Airflow Proportioning Factor Calculate to 4 decimal places		C.8 Total of Pressure Drop (C.6 + C.7)	in. W.C.
(C.2 ÷ A.1) ☐ or (B.4 ÷ A.1) ☐	cfm/Btuh	C.9 Available Design Pressure (B.3 – C.8) or Selected Design Pressure	in. W.C.

Note: When furnace standard filter is replaced, subtract its pressure drop from the replacement filter and record on line C.6

PART D - DETERMINING ROOM AND FLOOR DESIGN FLOW RATES								page 3
D.1 Floor								
D.2 Room								
D.3 Cooling load (Btuh)								
D.4 Room cooling flow rate (D.3 x C.3)								
D.5 Heating load (Btuh)								
D.6 Room heating flow rate (D.5 x C.4)								
D.7 Number of outlets per room								
D.8 Floor supply air flow rates (greatest airflow heating or cooling)								

PART D - CONTINUED											
D.1											
D.2											
D.3											
D.4											
D.5											
D.6											
D.7											
D.8											

PART E - INLET FLOW RATES					
Floor level (Location)	Basement (50% D.8 Max)	1st floor (Sum of D.8 Min)	2nd floor (Sum of D.8 Min)	3rd floor (Sum of D.8 Min)	Total = (C.2) (System cfm)
E.1 Floor return air flow rate					
E.2 Minimum number of openings					
E.3 Actual number of openings					
E.4 Actual cfm per opening (E.1 ÷ E.3)					

Note: After location of supply outlets and return inlets are determined, produce preliminary drawing.

PART F - SUMMARY OF TOTAL EFFECTIVE LENGTHS FOR RETURN DUCTS										page 4
Inlet No	Equipment Connection (Group 1)	Trunk To Drop Connection (Group 1)	Trunk Transitions (Group 2)	Trunk Fittings (Group 2)	Duct To Joist (Group 3)	Turbulence Effect	Stud To Joist (Group 4)	Grille Opening To Stud (Group 4)	Measured Length (ft)	Branch Effective Length (ft)

PART G - DUCT DESIGN PRESSURE
G.1 (Return Branch Longest Effective Length_____ft).
G.2 **R/A Plenum Pressure:** Available Design Pressure (Line C.9) x Return Air Apportioning Factor (Appendix C (C3)) ( ) x ( ) = _____in. W.C. (Record Line H.8)
G.3 **S/A Plenum Pressure:** Available Design pressure (Line C.9) - R/A Plenum Pressure ( ) - ( ) =_____in. W.C. (Record Line J.7)

PART H - SIZING OF RETURN GRILLES, BRANCHES AND MAIN TRUNK DUCTS										page 5
H.1 Trunk Letter/No										
H.2 Inlet Location (Room)										
H.3 Inlet No (R)										
H.4 Inlet flow rate (cfm) (Line E.4 adjusted)										
H.5 Minimum required inlet free area (sq. in.) (Appendix C8)										
H.6 Inlet size (Appendix A)										
H.7 Inlet Pressure Loss (in. W.C.)										
H.8 R/A Plenum pressure (in. W.C.) (Line G.2)										
H.9 Adjusted duct design pressure (H.8 - H.7)										
H.10 Branch effective length (ft) (Part F)										
H.11 Loss/100 ft. of effective length [(H.9 x 100) ÷ H.10]										
H.12 Branch duct size (round) (H.4, H.11) (Appendix C4,5)										
H.13 Branch rectangular equivalent (Appendix C6)										
H.14 Joist to trunk opening size (2 x area H.13)										
H.15 Trunk flow rate (cfm) accumulation of H.4										
H.16 Lowest loss/100 ft encountered from duct end.										
H.17 Trunk duct size (round) (H.15, H.16) (Append C4,5)										
H.18 Trunk rectangular equivalent (Appendix C6)										
H.19 Installed Trunk size (Transitions)										
H.20 Trunk velocity (fpm) fpm = [(cfm x 144) ÷ area]										

PART I - SUMMARY OF TOTAL EFFECTIVE LENGTHS FOR SUPPLY DUCTS

Outlet No	Plenum Fitting (Group 5)	Trunk Transition (Group 6)	Trunk Fittings (Group 6)	Trunk To Branch Take offs (Group 7)	Aspiration Effect	Duct Flex Length (ft)	Branch Elbows (Group 8)	Boot Fitting (Group 8)	Measured Length (ft)	Branch Effective Length (ft)

PART J - SIZING OF SUPPLY DIFFUSERS, BRANCHES AND MAIN TRUNK DUCTS										page 7
J.1 Trunk Letter/No										
J.2 Outlet location (Room)										
J.3 Outlet No (S)										
J.4 Outlet flow rate (cfm) (Line D.6 ÷ D.7) (Heating)										
J.4b Outlet flow rate (cfm) (Line D.4 ÷ D.7) (Cooling)										
J.5 Outlet size										
J.6 Outlet pressure loss (in. W.C.)										
J.7 S/A Plenum pressure (in. W.C.) (Line G.3)										
J.8 Adjusted duct design pressure (J.7 - J.6)										
J.9 Branch effective length (ft) (Part I)										
J.10 Loss/100 ft of effective length [(J.8 x 100) ÷ J.9]										
J.11 Branch duct size (round) (J.4, J.10) (Appendix C4,5)										
J.12 Branch rectangular equivalent (Appendix C6)										
J.13 Trunk flow rate (cfm) accumulation of J.4										
J.13bTrunk flow rate (cfm) accumulation of J.4b										
J.14 Lowest loss/100 ft encountered from duct end.										
J.15 Trunk duct size (round) (J.13, J.14) (Appendix C4,5)										
J.16 Trunk rectangular equivalent (Appendix C6)										
J.17 Installed Trunk size (Transitions)										
J.18 Trunk velocity (fpm) fpm = [(cfm x 144) ÷ area]										

PART J - CONTINUED														page 8
J.1														
J.2														
J.3														
J.4														
J.4b														
J.5														
J.6														
J.7														
J.8														
J.9														
J.10														
J.11														
J.12														
J.13														
J.13b														
J.14														
J.15														
J.16														
J.17														
J.18														