WORKSHEET FOR RESIDENTIAL AIR SYSTEM DESIGN page 1

HRAI SkillTech ACADEMY
Setting the Standard for Performance

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		Hepa 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 * 5045 Orbitor Drive * Building 11 * Suite 300 Mississauga, Ontario * L4W 4Y4 E. & E.O.
(Sept 98)

PART A - DESIGN LOAD SPECIFICATIONS

A.1 Sub Total Heat Loss _____Btuh.

A.2 Ventilation Heat Loss _____ Btuh.

A.3 Total Heat Loss _____ Btuh.. (A.1 + A.2)

A.4 Sub Total Heat Gain _____ Btuh.

A.5 Ventilation Heat Gain _____ Btuh.

A.6 Total Heat Gain _____ Btuh. (A.4 + A.5)

A.7 Volume of House _____ cu ft.

A.8 Ventilation Flow Rate _____ cfm.

PART B - EQUIPMENT SELECTION

Heating Equipment:

Make _____ Model _____

Fuel Type: ☐ Gas ☐ Oil ☐ Electricity ☐ Other _____

B.1 Heating Output _____ Btuh.
(100% -140% of A.3)

B.2 Approved Temperature rise/ range _____ °F

B.3 Equipment External Static Pressure _____ in. W.C.

B.4 Heating Air Flow Rate. _____ cfm.
(when selected) _____ RPM/Speed.
(or when single temp rise) cfm = [B.1 ÷ (1.08 x B.2)]

Cooling Equipment:

Make _____ Model _____ (indoor coil)

Cooling Medium: ☐ DX ☐ Chilled water ☐ Other _____

B.5 Cooling output _____ (Btuh) _____ Tons.
(80% - 125% of A.6)

B.6 Manufacturers Flow Rate/Ton _____ (cfm/ton)

B.7 Coil Pressure Drop _____ in. W.C.

B.8 Cooling Air Flow Rate. _____ cfm.
(when selected) _____RPM/Speed.
(or when calculated) cfm = B.5 (tons) x B.6

PART C - AIR DISTRIBUTION & PRESSURE

C.1 Circulation Air Flow Rate. _____ cfm.
(A.7 x .025)

C.2 System Design Air Flow Rate. _____ cfm.
(highest of B.4, B.8, C.1)

C.3 Cooling Air Flow Proportioning Factor (B.8 ÷ A.4)
(calculate to 4 decimal places) _____ cfm/Btuh.

C.4 Heating Air Flow Proportioning Factor (C.2 ÷ A.1)
(calculate to 4 decimal places) _____ cfm/Btuh.

C.5 Calculated Heating Temperature Rise _____ °F.
[B.1 ÷ (B.4 x 1.08)]

C.6 Filter Pressure Drop _____ in. W.C.

C.7 Coil Pressure Drop (B.7) _____ in. W.C.

C.8 Total of Pressure Drop (C.6 + C.7) _____ in. W.C.

C.9 Available Design Pressure (B.3 - C.8) _____ 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								

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)	Outside air (100% of A.8)	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)										
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.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]										

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