Plan No. _____
Date _____
Calculated by _____

WORKSHEET FOR MANUAL D
DUCT DESIGN FOR RESIDENTIAL AIR CONDITIONING

For: Name _____
Address _____
City and State or Province _____
By: Contractor _____
Address _____
City _____

System Information

Heating Summary
Manual J Heating Load = _____ Btuh
Ventilation CFM = _____ Winter Design Temperature Difference = _____ °F

Cooling Summary
Manual J Sensible Cooling Load = _____ Btuh _____
Total Cooling Load _____ Btuh Ventilation CFM = _____

Number of Zones _____ Number of Returns _____
Type of System _____ Location _____
Supply-Side Materials. . . Trunk _____ Branch _____
Return-Side Materials. . . Trunk _____ Branch _____
Location of Duct Runs. . . Supply _____ Return _____
R-Value of Duct Wall. . . Supply _____ Return _____

Equipment Summary

Heating Make _____ Model _____ Type _____
Heating Input (Btuh) _____ Heating Output (Btuh) _____ Temp Rise Range _____
Blower Heating CFM _____ Avail. External Stat Press (ESP) _____ IWC
Temperature Rise = $\frac{\text{Furnace output Btuh}}{1.1 \times \text{Blower CFM}}$ = _____ BTUH = _____ °F TR
1.1 x _____ CFM
Cooling Make _____ Model _____ Type _____
Sensible Cooling (Btuh) _____ Latent Cooling (Btuh) _____ Total (Btuh) _____
Blower Cooling CFM _____ Coil Pressure Loss (DPL) _____ IWC
Space Thermostat Heat ( ) Cool ( ) Heat/Cool ( ) Night Setback ( )

Recommended Velocity (FPM)

	Supply Side				Return Side			
	Recommended		Maximum		Recommended		Maximum	
	Rigid	Flex	Rigid	Flex	Rigid	Flex	Rigid	Flex
Trunk Ducts	700	600	900	700	600	600	700	700
Branch Ducts	600	600	900	700	400	400	700	700
Supply Outlet Face Velocity	Size for Throw		700		--		--	
Return Grille Face Velocity	--		--		--		500	
Filter Grille Face Velocity	--		--		--		300	

- Use *Manual J* to calculate the room heating and cooling loads.
- If two or more supply outlets are used for a room, split the room heating load and room cooling load into parts.
- Enter the heating and cooling loads for all supply outlets on the worksheet (correlate with outlet identification numbers).
- Multiply the heating loads by the heating factor to find heating Cfms and enter these values on the worksheet.
- Multiply the cooling loads by the cooling factor to find cooling Cfms and enter these values on the worksheet.
- For each supply outlet, select the larger of the heating Cfm value or cooling Cfm value and enter the design Cfm values on the worksheet.
- Use a duct slide rule or friction chart to find the round duct runout size (the sizing tool must be for the actual airway material), and enter the preliminary sizes on the worksheet.
- Use a duct slide rule or friction chart to check airway velocity and enter the velocity values on the worksheet.
- If one or more velocities are too high, resize the duct for an acceptable velocity, and enter the final sizes on the worksheet.
- Correlate trunk sections with downstream branch sections and calculate heating and cooling Cfm for each unique section of trunk duct, then enter these values on the worksheet (see Sections 6-12 through 6-16).
- Use the heating and cooling factors to determine heating and cooling Cfm and the design Cfm (larger of the two values).
- Use a duct slide rule or friction chart to find the round duct runout size (the sizing tool must be for the actual airway material), and enter the preliminary sizes on the worksheet.
- Use a duct slide rule or friction chart to check airway velocity and enter the velocity values on the worksheet.
- If one or more velocities are too high, resize the duct for an acceptable velocity, and enter the final sizes on the worksheet.
- Assign Cfm values to each return grille and repeat the process for the return-side of the system.

Effective Length Worksheet

Element	Supply Run ID Number				Element	Return Run ID Number			
Trunk Length					Trunk Length				
Trunk Length					Trunk Length				
Trunk Length					Trunk Length				
Runout Length					Runout Length				
Group 1					Group 5				
Group 2					Group 6				
Group 3					Group 7				
Group 4					Group 8				
Group 8					Group 10				
Group 9					Group 11				
Group 11					Group 12				
Group 12					Group 13				
Group 13					Other				
Other					Other				
Total Length					Total Length				

Friction Rate Worksheet

Step 1) Manufacturer's Blower Data

External static pressure (ESP) = _____ IWC Cfm = _____

Step 2) Component Pressure Losses (CPL)

Direct expansion refrigerant coil	_____
Electric resistance heating coil	_____
Hot water coil	_____
Heat exchanger	_____
Low efficiency filter	_____
High or mid-efficiency filter	_____
Electronic filter	_____
Humidifier	_____
Supply outlet	_____
Return grille	_____
Balancing damper	_____
UV lights or other component	_____
Total component losses (CPL)	_____ IWC

Step 3) Available Static Pressure (ASP)

ASP = (ESP - CPL) = (_____ - _____) = _____ IWC

Step 4) Total Effective Length (TEL)

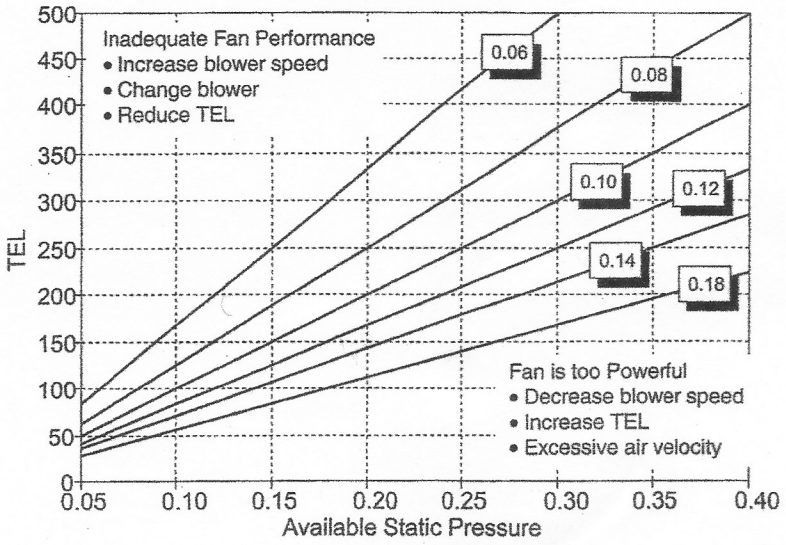
Supply-side TEL + Return-side TEL = (_____ + _____) = _____ Feet

Step 5) Friction Rate Design Value (FR)

FR value from friction rate chart = _____ IWC/100

$$FR = \frac{ASP \times 100}{TEL}$$

Friction Rate Chart



Duct Sizing Worksheet

HF = Blower Cfm / Manual J Heat Loss = ( ) / ( ) =

CF = Blower Cfm / Manual J Sensible Heat Gain = ( ) / ( ) =

FR Value

Supply-Side Runouts

Run - Trunk	H-Btuh	C-Btuh	H-Cfm	C-Cfm	Dsn Cfm	Round Size	Velocity	Final Size
1 —								
2 —								
3 —								
4 —								
5 —								
6 —								
7 —								
8 —								
9 —								
10 —								
11 —								
12 —								

Supply-Side Trunks

	Trunk						
	Trunk						
	Trunk						
	Trunk						

Return-Side Runouts

Run - Trunk	Associated Supply Runs	H-Cfm	C-Cfm	Dsn Cfm	Round Size	Velocity	Final Size
1 —							
2 —							
3 —							
4 —							
5 —							
6 —							
7 —							
8 —							
9 —							
10 —							

Return-Side Trunks

	Trunk						
	Trunk						
	Trunk						
	Trunk						

1) Room H-Btuh and C-Btuh obtained from the standard ***Manual J*** load calculation procedure (Eighth Edition, Version 2.00, or later).
2) H-Cfm = HF x H-Btuh and C-Cfm = CF x C-Btuh
3) Design Cfm = Larger of the H-Cfm or C-Cfm values (runout ducts) . . . or . . . Total downstream Cfm (trunk ducts)
4) Round size is based on FR value. Final size is based on FR value if air velocity is acceptable, or the maximum allowable velocity value.