Manual D

Breakdown Series for Manual J, S, & D

New Mexico's Energy Codes Support

Manual D is the third step in the HVAC design process. Now that we have selected the properly sized appliances, we can now size the ductwork.

J. Available Static Pressure

	Heating (in H2O)	Cooling (in H2O)	
External Static Pressure:	0.70	0.70	Total external static pressure shown in inches of water column. This is a designer choice and may change during the design process.
Coil:	0.25	0.25	We now are reducing our available static pressure by items that we put within the airstream. This is the indoor coil. The static pressure loss can be found in the manufacturers performance data. Some designers may use a wet coil for the cooling static loss which would be higher than a dry coil. Many designers in New Mexico will use the same static loss for heating and cooling as the coils are generally dry.
Heat exchanger:	0	0	This would be the static loss for the heat exchanger. In this design the heat exchanger was part of the furnace and was included In the manufacturers fan performance table.
Supply diffusers:	0.03	0.03	Static loss for the supply diffusers. This can be found in the manufacturers performance data. Manual T is another ACCA document that provides the procedure for the design of the supply registers and return grilles. This is not a code requirement. Using 0.03 is an acceptable static loss.

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	Heating (in H2O)	Cooling (in H2O)	
Return grilles:	0.03	0.03	Static loss for the return grills. Same explanation as the supply diffusers.
Filter:	0.10	0.10	Static loss for the filter. Many manufacturers do include a "cost effective" filter in their fan performance table. Many designers will add a static loss for a filter.
Humidifier:	0	0	Static loss for a humidifier can be found in the manufacturers performance data. This design does not include a humidifier
Balancing damper:	0	0	Static loss for the balancing dampers can be found in the manufacturers performance data. Here a 0.03 would also be acceptable.
Other device:	0	0	Any other devices that might produce a static loss.
Available static pressure:	0.29	0.29	This is the available static pressure for the ductwork design. Total external static pressure less all pressure losses.

K. Total Effective Length

	Supply (ft)	Return (ft)	
Measured length of run-out:	12	4	This would be the length of the supply or return air duct from the trunk line to the diffuser.
Measured length of trunk:	28	6	This would be the length of the trunk line from the furnace to the connection of a supply or return air duct to the trunk line.
Equivalent length of fittings:	150	105	As you can see equivalent length of fittings add significant length to the system. One fitting can add as much as 100 feet to a duct system.
Total length:	190	115	Simply adds the runout length of trunk and fitting lengths
Total effective length:	305		This is the sum of the longest supply air path and the longest return air path. Although the system might not be physically this long the air thinks it is this long. Air is not particularly smart and likes to be guided on a relatively smooth path. Sharp turns and rough (not smooth on the inside) duct work cause turbulence inside the duct.

L. **Friction Rate**

	Heating (in/100ft)	Cooling (in/100ft)		
Supply ducts:	0.095	0.095	OK	The friction rate is the relationship between the blower and the duct work. This is the friction rate formula: ASP x 100/TEL Where: ASP = Available static pressure 100 = The friction rate is per 100' of duct length TEL = Total Equivalent Length of ductwork .29 x 100 /305 = .095
Return ducts	0.095	0.095	OK	The OK indicates that the friction rate is between a 0.06 and a 0.18. If the friction rate is outside this range, it is very likely the duct system will not perform as expected. The design friction rate should be within this range.

M. **Fitting Equivalent Length Details**

Supply 4AD=60, 2J1=60, 12O1=10, 1P=20: Total EL=150
Return 6C3=50, 6M=20, 6CB=25, 5K=10: Total EL=105

These are the fittings that the designer used in the duct design. Many of you will look at this an ask yourself what does fitting AD or 2JI look like. Pictures of all fitting types are available in Manual D. It is recommended that a picture of fittings used into design is available for the field inspector at the time of inspection.

Static Pressure and Friction Rate
Entire House
ACME Design

Job: 1006
Date:
By:

Project Information

For: New House, Good Builder

Available Static Pressure

J

	Heating (in H2O)	Cooling (in H2O)
External static pressure	0.70	0.70
Pressure losses		
Coil	0.25	0.25
Heat exchanger	0	0
Supply diffusers	0.03	0.03
Return grilles	0.03	0.03
Filter	0.10	0.10
Humidifier	0	0
Balancing damper	0	0
Other device	0	0
Available static pressure	0.29	0.29

Total Effective Length

K

	Supply (ft)	Return (ft)
Measured length of run-out	12	4
Measured length of trunk	28	6
Equivalent length of fittings	150	105
Total length	190	115
Total effective length		305

Friction Rate

L

	Heating (in/100ft)		Cooling (in/100ft)	
Supply Ducts	0.095	OK	0.095	OK
Return Ducts	0.095	OK	0.095	OK

Fitting Equivalent Length Details

Supply	4AD=60, 2J1=60, 12O1=10, 1P=20: TotalEL=150
Return	6C3=50, 6M=20, 6CB=25, 5K=10: TotalEL=105

M