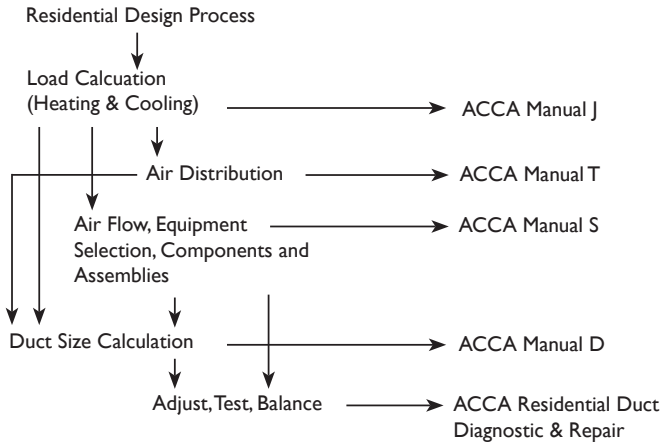




# AIR FLOW DYNAMICS & DUCT SIZING REFERENCE GUIDE

## PROCESS



## SUPPLY OR RETURN DUCT SIZE/CAPACITY

(.09 to .10 pressure drop per 100' EL)

CFM	Round (No. SL)	Rectangular (TD)		
50	5"	8 x 6		
75	5"	8 x 6		
100	6"	8 x 6	3½ x 10	(110)
125	6"	8 x 6	3½ x 12	(140)
150	7"	8 x 6	3½ x 14	(160)
175	7"	8 x 6		
200	7"	8 x 6		
250	8"	6 x 10	8 x 8	6 x 12
300	9"	6 x 10	8 x 8	6 x 12
350	9"	6 x 10	8 x 8	6 x 12
400	9"	8 x 10	8 x 8	6 x 12
500	10"	10 x 10	12 x 8	8 x 12
600	12"	10 x 10	12 x 8	8 x 12
700	12"	12 x 10	14 x 8	10 x 12
800	12"	12 x 10	16 x 8	10 x 12
900	14"	14 x 10	18 x 8	12 x 12
1,000	14"	14 x 10	18 x 8	12 x 12
1,200	14"	16 x 10	24 x 8	14 x 12
1,400	16"	18 x 10	24 x 8	16 x 12
1,600	16"	20 x 10	28 x 8	18 x 12
1,800	16"	24 x 10	30 x 8	20 x 12
2,000	18"	26 x 10	32 x 8	20 x 12
2,500	18"	30 x 10	20 x 14	24 x 12
3,000	20"	36 x 10	24 x 14	28 x 12
3,500	22"	40 x 10	28 x 14	32 x 12
4,000	24"	26 x 16	32 x 14	38 x 12

8" Joist - 375 CFM; 10" Joist - 525 CFM (return only)

### EQUIVALENT LENGTHS

#### PLENUM/DUCT FITTINGS

No. 23	Offset starting collar	10' EL
No. 20	Straight starting collar	35' EL
No. 120SC	Snap collar, round	35' EL

#### ROUND ELBOWS & ANGLES

	90° elbows	30' EL
	45° angles	10 - 20' EL

#### REGISTER BOOTS

No. 24R	90° register boot	30' EL
No. 27R	Straight register boot	5' EL
No. 28R	End register boot	50' EL

#### ROUND FITTINGS (TAKEOFFS)

No. 97	Round starting collar	35' EL
No. 63	Square to round straight	15' EL
No. 63A	Square to round elbow	40 - 45' EL
No. 62	Square to round elbow	40' EL
No. 55	Round to round (adjustable)	20 - 25' EL
No. 65	Round to round	20 - 25' EL

#### DUCT ELBOWS, RADIUS THROAT

No. 14	Up to 11"	10' EL
	12" to 21"	15' EL
	22" to 27"	20' EL
	28" to 33"	25' EL

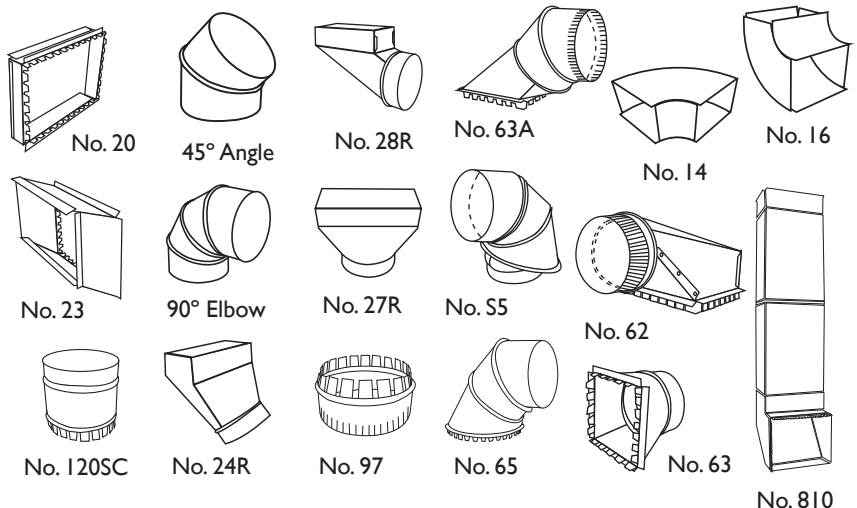
#### DUCT ELBOWS, SQUARE THROAT

No. 16	Up to 11"	40' EL
	12" to 15"	55' EL
	16" to 21"	75' EL
	22" to 27"	100' EL
	28" to 33"	125' EL

#### RETURN AIR SYSTEM

No. 810	Cold air boot, collar, duct	45- 65' EL
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## COMMON DUCT FITTINGS



## ADJUSTMENT OF DUCT DESIGN PRESSURE (RATE) FOR EQUIVALENT LENGTHS

Total Effective Length (Feet)	.05	.06	.08	.10	.125	.14	.16	.18	.20	.25	.30	.34	.375	.40	.50	.625	.75	1.00
35 - 44	.13	.15	.20	.25	.32	.35	.40	.45	.50	.63	.75	.85	.95	1.00	1.25	1.50	1.90	2.54
45 - 54	.10	.12	.16	.20	.25	.28	.32	.36	.40	.50	.60	.68	.76	.80	1.00	1.26	1.52	2.02
55 - 64	.08	.10	.13	.17	.21	.23	.27	.30	.33	.42	.50	.57	.63	.67	.83	1.05	1.26	1.68
65 - 74	.07	.09	.11	.14	.18	.20	.23	.26	.29	.36	.43	.49	.54	.57	.72	.90	1.08	1.44
75 - 84	.06	.08	.10	.13	.16	.18	.20	.23	.25	.31	.38	.43	.47	.50	.63	.79	.94	1.26
85 - 94	.06	.07	.09	.11	.14	.16	.18	.20	.22	.28	.33	.38	.42	.45	.56	.70	.84	1.12
95 - 104	.05	.06	.08	.10	.13	.14	.16	.18	.20	.25	.30	.33	.38	.40	.50	.63	.75	1.01
105 - 114	.05	.05	.07	.09	.11	.13	.15	.16	.18	.23	.28	.31	.34	.37	.47	.57	.69	.91
115 - 129	.04	.05	.07	.08	.10	.12	.13	.15	.17	.21	.25	.28	.31	.33	.46	.51	.62	.82
130 - 149	.04	.04	.06	.07	.09	.10	.11	.13	.14	.18	.21	.24	.27	.29	.36	.45	.54	.72
150 - 169	.03	.04	.05	.06	.08	.09	.10	.11	.13	.16	.19	.21	.24	.25	.31	.39	.47	.63
170 - 189	.03	.03	.04	.06	.07	.08	.09	.10	.11	.14	.17	.19	.21	.22	.28	.35	.42	.56
190 - 214	.03	.03	.04	.05	.06	.07	.08	.09	.10	.13	.15	.17	.19	.20	.25	.31	.37	.50
215 - 239	.02	.03	.04	.05	.05	.06	.07	.08	.09	.11	.13	.15	.17	.18	.22	.28	.33	.44
240 - 264	.02	.02	.03	.04	.05	.06	.06	.07	.08	.10	.12	.14	.15	.16	.20	.25	.30	.40
265 - 289	.02	.02	.03	.04	.04	.05	.06	.07	.07	.09	.11	.12	.14	.15	.18	.23	.27	.36
290 - 324	.02	.02	.03	.03	.04	.05	.05	.06	.07	.08	.10	.11	.12	.13	.17	.20	.24	.33
325 - 374	.02	.02	.02	.03	.04	.04	.05	.05	.06	.07	.09	.10	.11	.11	.14	.18	.21	.29
375 - 424	.01	.02	.02	.03	.03	.04	.04	.05	.05	.06	.08	.09	.09	.10	.13	.16	.19	.25
425 - 474	.01	.01	.02	.03	.03	.03	.04	.04	.05	.06	.07	.08	.08	.09	.11	.14	.17	.22
475 - 524	.01	.01	.02	.02	.03	.03	.03	.04	.04	.05	.06	.07	.08	.08	.10	.13	.15	.20
525 - 574	.01	.01	.02	.02	.02	.03	.03	.03	.04	.05	.06	.07	.07	.07	.09	.11	.14	.18
575 - 625	.01	.01	.01	.02	.02	.02	.03	.03	.03	.04	.05	.06	.06	.07	.08	.10	.13	.17

## FORMULAS

### Sensible Heat Formula

$$\text{BTU/Hour} = \text{CFM} \times \text{TD} \times 1.08$$

$$\text{CFM} = \frac{\text{BTU/Hour}}{1.08 \times \text{TD} \times \text{ACF}}$$

1.08 is a conversion factor

TD is the Temperature Difference created by the appliance

ACF is the Altitude Correction Factor (see above table)

Altitude Correction Factor (ACF)			
0 ft	1.0	5000 ft	.826
500 ft	.981	6000 ft	.801
1000 ft	.962	7000 ft	.772
2000 ft	.926	8000 ft	.749
3000 ft	.891	9000 ft	.715
4000 ft	.858	10000 ft	.687

$$\text{Sensible Heat Ratio} = \frac{\text{Sensible Load}}{\text{Sensible Load} + \text{Latent Load}}$$

SHR below .80 = 21° TD

SHR .80 to .85 = 19° TD

SHR above .85 = 17° TD

High humidity = 350 CFM/ton

Ave. humidity = 400 CFM/ton

Low humidity = 450 CFM/ton

$$\text{CFM} = \frac{\text{Sensible Load}}{1.08 \times \text{TD} \times \text{ACF}}$$

### Total Heat Equation

$$\text{CFM} = \frac{\text{BTU/Hr}}{4.5 \times \text{H} \times \text{ACF}}$$

4.5 is a conversion factor  
H is the BTU per lb. of air removed

### Friction Rate

*\*used in duct calculators*

$$\text{Friction Rate} = \frac{\text{Pressure Drop} \times 100}{\text{TEL}}$$

Pressure Drop is the available static pressure (ASP) allocated to the duct work.

ASP = Blower Static Pressure - Component Pressure Drops

TEL is the Total Effective Length of the longest supply run and the longest return run.

### CFM Calculations

$$\text{Room CFM} = \frac{\text{Blower CFM} \times \text{Room Load}}{\text{Equipment Sizing Load}}$$

$$\text{Flow Factor} = \frac{\text{Blower CFM}}{\text{Equipment Sizing Load}}$$

$$\text{Room CFM} = \text{Flow Factor} \times \text{Room Load}$$