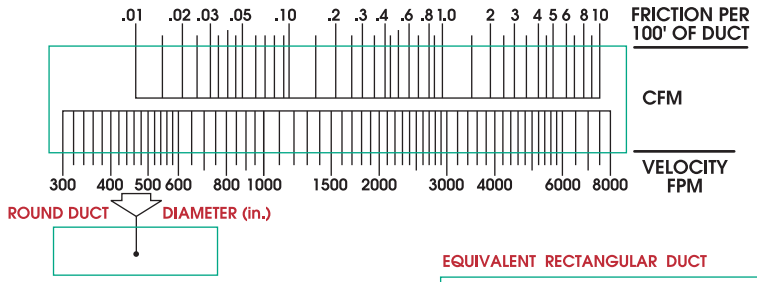
AIR DUCT CALCULATOR

Accomplish the following, all with one setting:

- Friction
- Velocity – F.P.M.
- Round Duct Size
- Weight Per Lin. Ft. Of Round Duct
- Surface Area In Sq. Ft. Per Lineal Foot Of Round Duct
- Rectangular Equivalents Of Round Duct Sizes

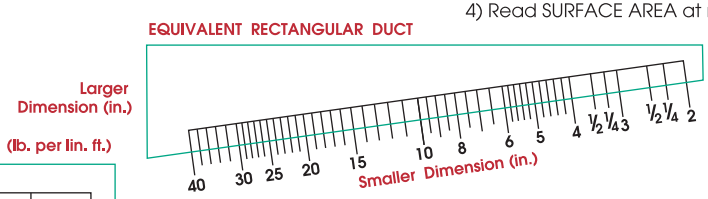
Also Gives:

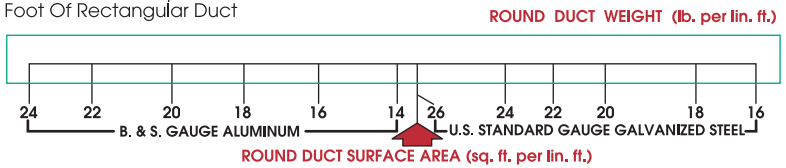
- Weight Per Lin. Ft. Of Rectangular Duct
- Surface Area In Sq. Ft. Per Lineal Foot Of Rectangular Duct



EQUAL-FRICTION METHOD

1) Set CFM under FRICTION and read VELOCITY below CFM.
2) Read ROUND DUCT DIAMETER at arrow.
3) Select EQUIVALENT RECTANGULAR DUCT and read ROUND DUCT WEIGHT opposite appropriate GAUGE.
4) Read SURFACE AREA at red arrow.



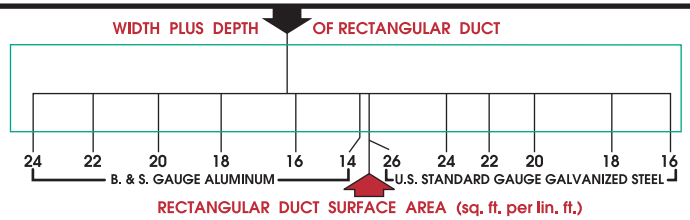


VELOCITY-REDUCTION METHOD

1) Set CFM at VELOCITY and read FRICTION above CFM.
2) Read other data as instructed under EQUAL-FRICTION.

WIDTH PLUS DEPTH

1) Set total of WIDTH PLUS DEPTH OF RECTANGULAR DUCT at black arrow.
2) Read RECTANGULAR DUCT WEIGHT opposite appropriate GAUGE.
3) Read SURFACE AREA at blue arrow.



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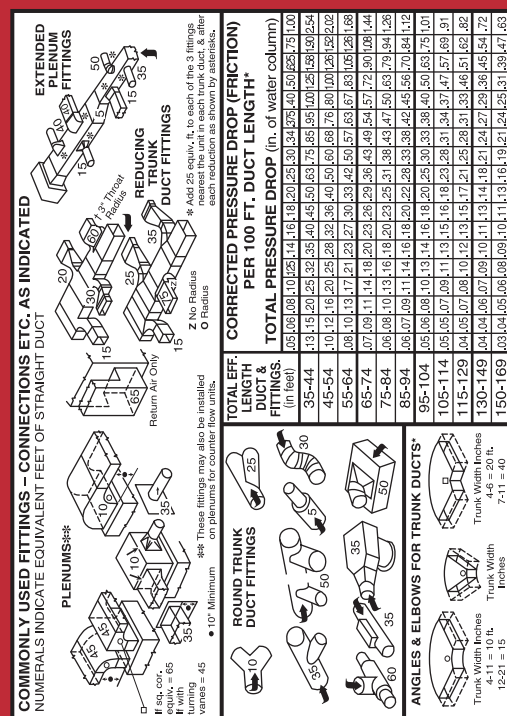
Amana-ADC

COMMONLY USED FITTINGS – CONNECTIONS ETC. AS INDICATED

NUMERALS INDICATE EQUIVALENT FEET OF STRAIGHT DUCT



TOTAL EFF. LENGTH DUCT & FITTINGS. (in feet)	CORRECTED PRESSURE DROP (FRICTION) PER 100 FT. DUCT LENGTH* TOTAL PRESSURE DROP (in. of water column)																							
	.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	1.58	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

NOTE: Scale on front of chart is for 100 ft. of duct. For greater or lesser equivalent lengths, use friction indicated in above table.

* Formula for Friction Loss (if not found in above table): Friction Loss = System design pressure x 100 / Total equivalent length of duct

BASIC AIR CONDITIONING FORMULAS

(For legend see bottom of slide)

COOLING

$H_S = CFM_T \times 1.08 \times (T_1 - T_2)$

$H_L = CFM_T \times .68 \times (W_1 - W_2)$

$H_T = CFM_T \times 4.5 \times (h_1 - h_2)$

$T_1 = t_1 + \frac{CFM_O}{CFM_T} \times (t_2 - t_1)$ ❶

❶ If duct heat gain is a factor, add to T_1: $\frac{\text{Duct Heat Gain (Btuh)}}{CFM_T \times 1.08}$

$T_2 = T_1 - \frac{H_S}{CFM_T \times 1.08}$

$CFM_T = \frac{H_S \text{ (total)}}{1.08 \times (T_1 - T_2)}$ OR $CFM_T = \frac{H_S \text{ (internal)}}{1.08 \times (t_1 - T_2)}$ ❸

HEATING and/or HUMIDIFYING

$H_S = CFM_T \times 1.08 \times (T_2 - T_1)$

$H_L = CFM_T \times .68 \times (W_2 - W_1)$

$H_T = CFM_T \times 4.5 \times (h_2 - h_1)$

$T_1 = t_1 + \frac{CFM_O}{CFM_T} \times (t_1 - t_2)$ ❷

❷ If duct heat loss is a factor, subtract Duct Heat Loss (Btuh) from T_1: $\frac{\text{Duct Heat Loss (Btuh)}}{CFM_T \times 1.08}$

$T_2 = T_1 + \frac{H_S}{CFM_T \times 1.08}$

$CFM_T = \frac{H_S}{1.08 \times (T_2 - T_1)}$

❸ Sensible load of outside air not included.

$h_2 = h_1 - \frac{H_T}{CFM_T \times 4.5}$ [1] $h_2 = h_1 + \frac{H_T}{CFM_T \times 4.5}$ [2]

Leaving Air W.B. Temperature: Refer to Enthalpy Table and read W.B. temperature corresponding to enthalpy of leaving air (h_2).

For Cooling see [1] For Heating see [2]

Friction Loss = System design pres. x 100 / Total equiv. length of duct per 100 ft.

THESE FORMULAS APPLY FOR EITHER COOLING OR HEATING and/or HUMIDIFYING

$CFM_T = \frac{N_T V}{60 \text{ min/hr}}$ $N_T = \frac{CFM_T \text{ (60 min/hr)}}{V}$

$CFM_O = \frac{N_O V}{60 \text{ min/hr}}$ $N_O = \frac{CFM_O \text{ (60 min/hr)}}{V}$

BASIC FAN LAWS

a = NEW
b = OLD

$SP_a = SP_b \times \left(\frac{RPM_a}{RPM_b}\right)^2$

$HP_a = HP_b \times \left(\frac{RPM_a}{RPM_b}\right)^3$

$CFM_a = CFM_b \times \frac{RPM_a}{RPM_b}$

$RPM_a = RPM_b \times \frac{CFM_a}{CFM_b}$

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