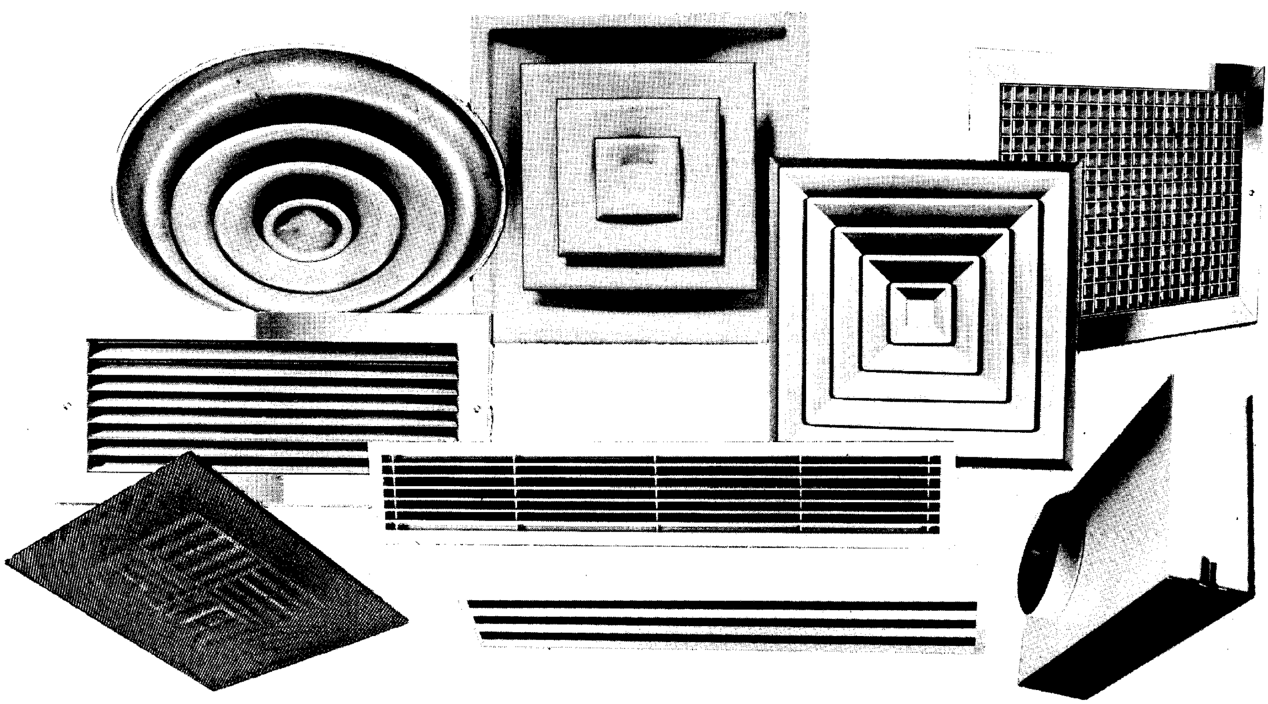
CARNES

TESTING AND BALANCING MANUAL



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INTRODUCTION

Regardless of size or design, an air distribution system seldom meets its intended goal without proper balancing of the specified outlets.

The degree of system balance often is the difference between a supply system that operates properly and one that doesn't.

In order to insure the engineers' design criteria and to satisfy the owners and occupants, proper system and component balancing is required. In today's technology it is not unreasonable to expect comfortable, quiet, and draftless system operation.

The purpose of this balancing manual is to aid the air balancing contractor in meeting this goal.

IMPORTANCE OF BALANCING SYSTEM

1. To assure comfort of the occupant. This is achieved by getting proper amounts of air in the designated spaces.
2. To pinpoint undesirable situations such as hot or cold rooms, drafty or stagnant areas, objectionable noise, or contaminated air.
3. Settings made during installation are approximate and must be fine tuned for proper system operation.
4. To meet area codes.

BENEFITS OF SYSTEMS BALANCING

1. Conserves energy.
2. Lower operating costs.
3. More comfort for occupants.
4. Healthier air.
5. The customer is more satisfied.

BASIC TESTING INSTRUMENTS

The instrument most commonly used to read air flow out of diffusers is a **Velometer.** Most K-factors in this balancing manual are for a Velometer. The "deflecting vane anemometer", as it is technically described, gives instantaneous velocity reading.

Four readings are usually taken on round or square ceiling diffusers and readings at one foot intervals are suggested on Linear diffuser outlets. The velocity readings are then averaged. The probe on the Velometer is positioned as described for each outlet device.

The other instrument most commonly used is the **Anemometer.** This device is technically described as a rotating vane anemometer. This instrument is used for reading velocities of registers and grilles. It is round, four inches in diameter, and has a vaned propeller wheel in the center. Timed readings must be taken with the anemometer as opposed to the Velometer which is an instantaneous one.

The anemometer is held at the face of the register or grille. A slow "S" shape sweeping motion is used covering the entire area of the grille to obtain a true average velocity.

DEFINITION OF TERMS

A_k	Area factor of an outlet or inlet which is also a flow factor determined from the discharge or intake velocity and the volume flow rate.
CFM	Volume flow rate; cubic feet per minute.
FPM	Velocity — feet per minute.
P_S	Static Pressure; expressed in inches H_2O.
P_T	Total Pressure; expressed in inches H_2O.
P_V	Velocity Pressure; expressed in inches H_2O.
T	Throw of an outlet in feet. The distance from the center of the outlet to a point in the airstream where the highest sustained velocity of the airstream has been reduced to a specified level.
t_a	Ambient temperature; expressed at C° or F°.
t	Temperature differential in C° or F° between the ambient room temperature and the supply air temperature.
V	Velocity of air flow; expressed in feet per minute (FPM).
V_k	Discharge or intake velocity of an outlet or inlet in FPM measured with calibrated Velometer at specified locations relative to the face of an inlet or outlet.
V_r	Room velocity in FPM; determined from velocity measurements in the occupied zone.
V_t	Terminal velocity from an outlet in FPM; the highest sustained velocity in the airstream arbitrarily specified and used to determine throw.

STAMPED STEEL LOUVERED DIFFUSERS

$$CFM = V_K \times A_K$$

AREA FACTOR (A_K) TABLES

Models SFEA & SFTA

Neck Size	NOMINAL LOUVERED AREA 12 x 12	18 x 18	24 x 24
	Horizontal Throw		
5	.12	—	—
6	.14	.22	.29
7	.17	.25	.28
8		.27	.28
10		.38	.42
12		.48	.50
14		—	.62

Previous Model SFA

Models SJEA & SJTA

Neck Size	NOMINAL LOUVERED AREA 12 x 12	18 x 18	24 x 24	12 x 12	18 x 18	24 x 24
	Horizontal Throw			Vertical Throw		
5	.09	—	—	.10	—	—
6	.12	.20	.35	.11	.21	.30
7	.15	.23	.31	.12	.23	.27
8	—	.26	.33	—	.24	.36
10	—	.29	.32	—	.23	.30
12	—	.38	.39	—	.30	.33
14	—	—	.60	—	—	.48

Previous Model SAA

Models SFTB 24 SFAB 24

Neck Size	24 x 24 Nominal Louvered Area
6	.18
8	.27
10	.37
12	.45
14	.52
16	.61

Model SJEB & SJTB

Neck Size	Face Size	AIR PATTERN Horizontal	Vertical
5	12x12	.095	.106
6	12x12	.119	.114
8	12x12	.170	.138
6	24x24	.350	.350
8	24x24	.320	.260
10	24x24	.360	.320
12	24x24	.510	.470
14	24x24	.620	.570

FIELD BALANCING

The actual volume of air being discharged from an outlet can be determined by measuring the outlet velocity in feet-per-minute (FPM) and multiplying by an area factor (A_K).

CFM = $V_K \times A_K$

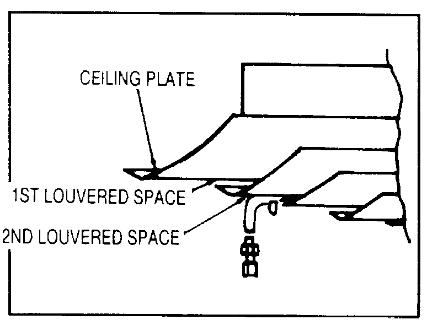
The Alnor velometer, with the 2220-A jet is the recommended equipment for balancing Carnes stamped diffusers.

The Alnor Model 6000P with 6070P probe can be used with the same A_K factors.

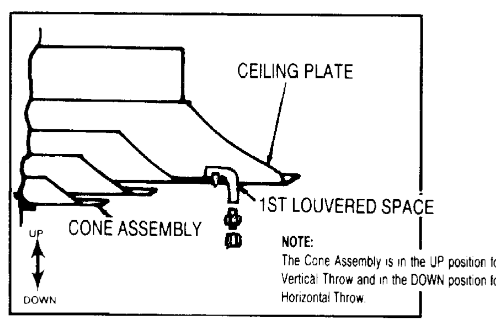
Place the Alnor jet into the correct louvered space as shown in the sketches below. Point the jet as directly as possible into the air stream and move the jet slowly along the lip of the cone to obtain the highest reading. Average the readings for all four sides to obtain V_K. Select the correct A_K from the tables and apply the formula to obtain the CFM.

ALNOR JET POSITION

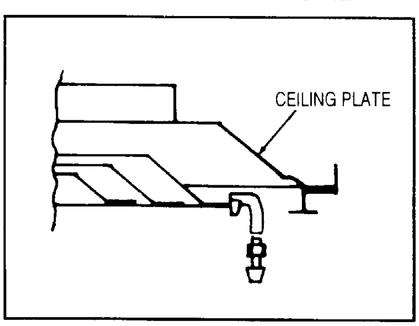
Models SFTA & SFTB



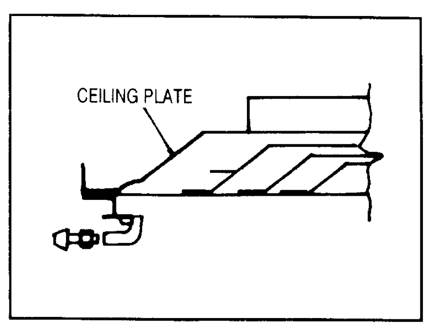
Model SJTA



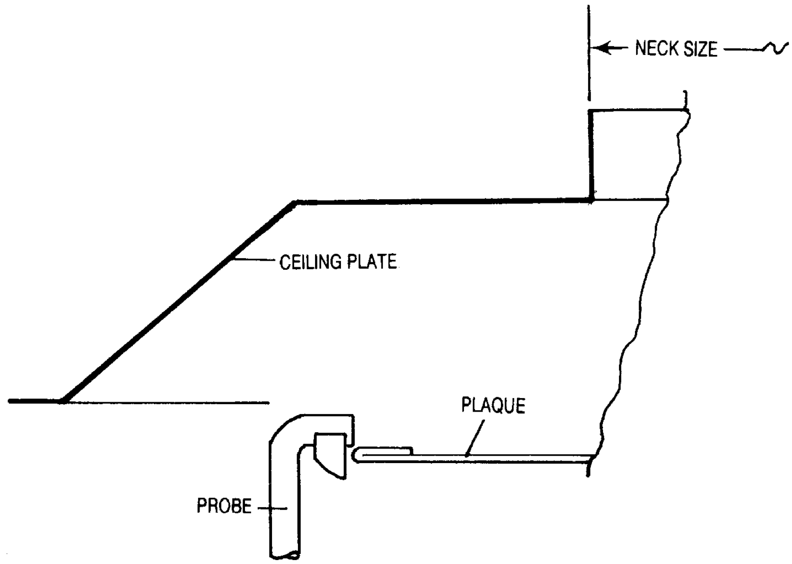
Model SJTB - Horizontal



Model SJTB - Vertical



STAMPED STEEL PLAQUE DIFFUSERS
MODEL SFPA



Model SFPA		
Face Size	Neck Size	A_k
12 x 12	05	.084
	06	.105
	08	.142
24 x 24	06	.180
	08	.220
	10	.290
	12	.360
	14	.430
	16	.480

FIELD BALANCING

The actual volume of air being discharged from an outlet can be determined by measuring the outlet velocity in feet-per-minute (FPM) and multiplying by an area factor (A_k).

$$\textbf{CFM} = V_k \times A_k$$

The Alnor velometer, with the 2220-A jet is the recommended equipment for balancing Carnes stamped diffusers.

The Alnor Model 6000P with 6070P probe can be used with the same A_k factors.

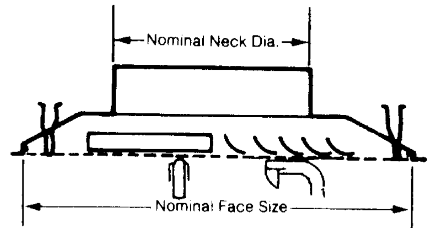
Place the Alnor jet into the correct position as shown. Point the jet as directly as possible into the air stream and move the jet slowly along the lip of the plaque to obtain the highest reading. Average the readings for all four sides to obtain V_k. Select the correct A_k from the tables and apply the formula to obtain the CFM.

ROUND & SQUARE NECK STAMPED PERFORATED DIFFUSERS — Supply

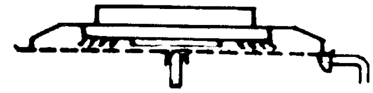
$$CFM = V_K \times A_K$$

Because of low face velocities, the most accurate CFM can be determined by use of a collector box and its respective A_K.

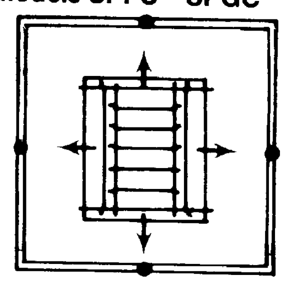
A_K factors for use with Alnor Series 6000P Velometer, probe 6070P.



Models SPAB - SPDB



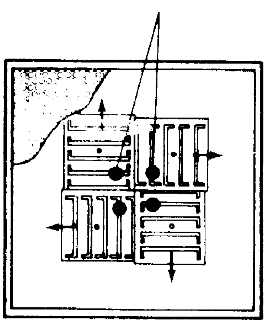
Models SPFC - SPGC



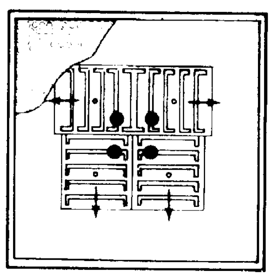
Black dots indicate the approximate position of the Alnor Jet. Move jet along deflector for highest reading - use the average of the readings for V_K.

Place Alnor Jet directly in the area shown on each deflector and flush against the face of the diffuser and read V_K.

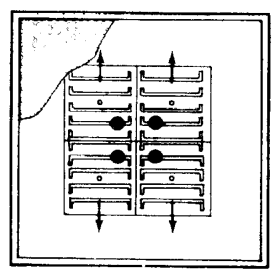
Models SPAB and SPDB



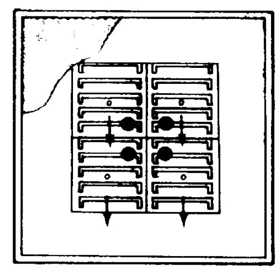
4-Way Blow



3-Way Blow



2-Way Blow



1-Way Blow

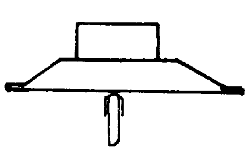
ROUND NECK

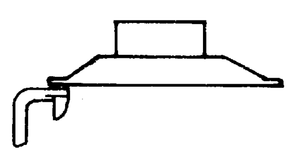
Nominal		A_K 1-Way		4-Way 3-Way 2-Way		Model SPFC 4-Way
Face Size	Neck Size	Face Flush	Face Drop	Face Flush	Face Drop	Flush Face
12 x 12	05	.09	.11	.09	.11	
	06	.11	.13	.12	.14	
	08	.17	.23	.18	.24	
24 x 24	06	.15	.15	.15	.15	.26
	08	.22	.24	.22	.25	.34
	10	.31	.33	.31	.34	.48
	12	.40	.44	.41	.45	.62
	14	.52	.58	.54	.59	.82
	16	.64	.71	.68	.73	1.15

SQUARE NECK

Nominal		A_K 1-Way		4-Way 3-Way 2-Way		Model SPGC 4-Way
Face Size	Neck Size	Face Flush	Face Drop	Face Flush	Face Drop	Flush Face
12 x 12	06 x 06	.16	.16	.16	.16	
	08 x 08	.24	.30	.25	.31	
24 x 24	06 x 06	.19	.20	.20	.20	.42
	08 x 08	.29	.32	.30	.33	.53
	10 x 10	.41	.44	.42	.45	.67
	12 x 12	.53	.57	.55	.59	.99
	14 x 14	.67	.73	.70	.77	.97
	16 x 16	.95	1.00	.93	1.03	1.57
	18 x 18	1.04	1.24	1.07	1.18	1.82

Model SPCB





Position probe as shown taking reading in the center of all four sides. Use the average of the readings for V_K.

Nominal Face Size	Nominal Neck Diameter	A_K* Factor
24 x 24	6	1.09
24 x 24	8	2.50
24 x 24	10	3.38
24 x 24	12	2.47
24 x 24	14	2.15
24 x 24	16	1.71

A_K for Anemotherm Velometer

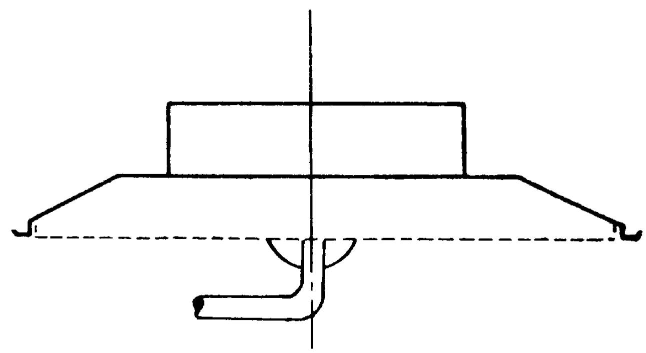
ROUND & SQUARE NECK STAMPED PERFORATED DIFFUSERS RETURN

SERIES SP

$$CFM = V_K \times A_K$$

RETURN UNITS

1. For measuring return air flow rates an Alnor Jet No. 2220A or 6070 is used. Transfer the Alnor tubing to the right side of the velometer.
2. Place the jet as shown in the sketch. Take a reading at the center of the duct to obtain V_K.
3. From the approximate Table select the A_K applicable to the diffuser size.
4. Calculate CFM = $V_K \times A_K$.



Model SPRB ROUND NECK			Model SPJB SQUARE NECK		
Face Size	Neck Size	A_K	Face Size	Neck Size	A_K
12 x 12	06	.20	12 x 12	06 x 06	.23
	08	.26		08 x 08	.32
				10 x 10	.40
24 x 24	06	.26	24 x 24	06 x 06	.30
	08	.31		08 x 08	.42
	10	.45		10 x 10	.55
	12	.56		12 x 12	.68
	14	.67		14 x 14	.87
	16	.83		16 x 16	1.01
				18 x 18	1.31
				22 x 22	1.61

Model SPHB	
Face Size	A_K
11¾ x 11¾	.52
11¾ x 23¾	1.04
11¾ x 47¾	2.08
23¾ x 23¾	2.08
47¾ x 23¾	4.16

PERFORATED AIR DIFFUSERS and RETURN AIR REGISTERS/GRILLES

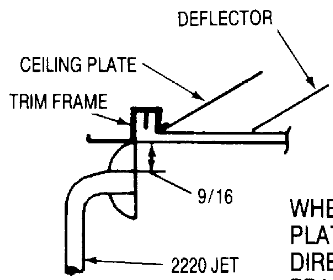
PERFORATED AIR DIFFUSERS — SP SERIES

FIELD BALANCING

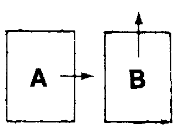
The actual volume of air being discharged from an outlet can be determined by measuring the outlet velocity in feet-per-minute (FPM) and multiplying by an area factor (A_K).

$$CFM = V_K \times A_K$$

Figure 1

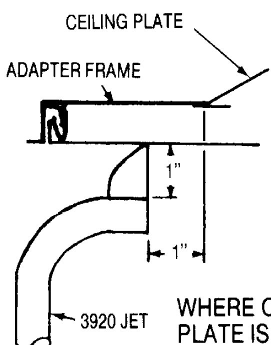


WHERE CEILING PLATE CONNECTS DIRECTLY TO TRIM FRAME



PATTERN ADJUSTMENT FOR RECTANGULAR UNITS

Figure 2



WHERE CEILING PLATE IS JOINED TO ADAPTER FRAME

NOTE: On all units where ceiling plate is joined to adapter frame, and all units with neck velocities of 400 FPM or less, laboratory testing has indicated more consistent field results can be obtained by using Alnor Jet No. 3920

RETURN UNITS

1. For measuring return air flow rates an Alnor Jet No. 2220A or 6070 is used. Transfer the Alnor tubing to the right side of the velometer.
2. Place the jet as shown in the sketch. Take a reading at the center of each side. Average the four readings to obtain V_K.
3. From Table 3 select the A_K applicable to the diffuser size.
4. Calculate **CFM** = $V_K \times A_K$.

***Models RSFA and RTFA Return Registers and Grilles A_K = 0.52**
A_K value is for one sq. ft. of face area. To measure return air rates use the same procedure as described for return units above.

**RETURN AIR REGISTERS/GRILLES — RSFA and RTFA*

SUPPLY DIFFUSERS

1. For measuring V_K an Alnor deflecting vane velometer with jet No. 2220 (or jet No. 2220A to which a 9/16" space has been fitted) is used.
2. Place the Alnor jet as shown in Figure 1 at the edge of the perforated face. Take a reading with the jet pointing directly into the center of the air stream from each deflector. Average all of the readings to obtain V_K.
3. From Table 1 select the A_K applicable to the diffuser size and the distribution pattern to which it has been adjusted.
4. Calculate **CFM** = $V_K \times A_K$.

TABLE 1 Models SPSA 2 and SPEA 2

Neck Size	A_K For 2220 or 6070 Jet Used as Supply — Pattern: Four Way	Three Way	2-Way Corner	Two Way	One Way
6 x 6	.26	.24	.24	.23	.20
8 x 8	.41	.43	.38	.38	.33
10 x 10	.62	. 63	.57	.58	.54
12 x12	.99	1.01	1.01	1.10	1.02
6 x 18 (A)	.68	.68	.69	.63	.61
6 x 18 (B)	—	.69	—	.70	.72
15 x 15	1.35	1.44	1.43	1.31	1.19
18 x 18	1.20	1.19	1.25	1.14	1.21

Previous Models 43002 and 43072

TABLE 2 Models SPSA 4 and SPEA 4

Neck Size	A_K For 3920 Jet Used as Supply — Pattern: Four Way	Three Way	2-Way Corner	Two Way	One Way
6 x 6	.40	.37	.32	.52	.35
8 x 8	.66	.58	.50	.55	.42
10 x 10	.57	. 53	.57	.54	.58
12 x12	1.11	1.05	.99	.98	.96
6 x 18 (A)	.83	.78	.92	.73	.83
6 x 18 (B)	—	1.09	—	.76	.81
15 x 15	1.51	1.41	1.39	1.45	1.34
18 x 18	1.88	1.86	1.74	1.90	1.47

Previous Models 43004 and 43074

Figure 3

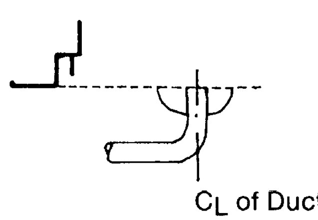


TABLE 3 Model SPPA

Neck Size	A_K
8 x 8	.25
10 x 10	.37
12 x 12	.52
14 x 14	.74
16 x 16	.88
18 x 18	1.10
22 x 22	1.60
10 x 22	.75

Previous Model 4350

ROUND AIR DIFFUSERS

$$CFM = V_K \times A_K$$

FIELD BALANCING

The following method describes the procedure to follow to find the volume of the air through the diffuser. Knowing the velocity from test and the effective area (A_K factor table) of the diffuser, the CFM of air from the diffuser can be calculated.

1. To determine CFM of Carnes diffusers, an Alnor Velometer equipped with a No. 6070 or 2220 Jet Nozzle is used.
2. Locate Velometer Nozzle slightly above outer periphery of No. 1 cone facing squarely into air stream as illustrated in diagram, (No. 1 cone is largest of the three center cones and closest to the ceiling plate). Determine air velocity at a minimum of at least six equally spaced points and find average value.
3. From Table select proper A_K factor size and model diffuser. Multiply the A_K factor by the average velocity to obtain volume of air (CFM) supplied through diffuser.

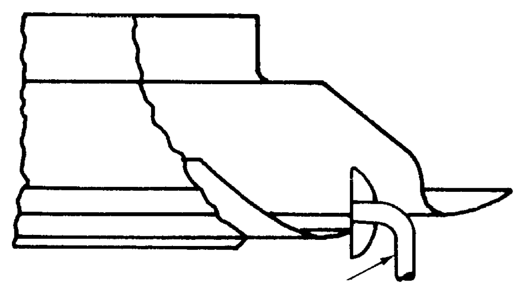


TABLE of A_K FACTORS

MODEL		SIZES														
		4	5	6	8	10	12	14	16	18	20	24	28	32	36	38
SSEA		.063	.12	.13	.22	.25	.38	.50	.59	.76	.96	1.44	2.37	3.77	3.85	
SSAA and SSMA	Horizontal		.19	.14	.25	.41	.56	.81	.95	1.35	1.68	2.25	3.25	4.18	4.80	5.14
	Vertical		.16	.11	.21	.32	.48	.64	.84	1.02	1.34	1.92	2.56	3.30	3.90	4.13
SSHA				.07	.12	.20	.28	.40	.52	.67	.84					

Model SSEA *Previous Model DE4*
Model SSAA *Previous Model DA5*
Model SSMA *Previous Model DM6*
Model SSHA *Previous Model DH8*

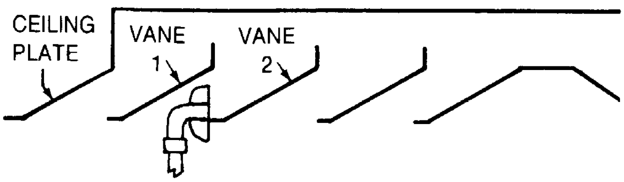
DIFFUSERS — STEEL SQUARE and RECTANGULAR

SK Series

$$CFM = V_k \times A_k$$

FIELD BALANCING

The following method describes the procedure to follow to find the velocity of the air through the diffuser. Knowing the velocity from test and the effective area (A_k factor table) of the diffuser, the CFM of air from the diffuser can be calculated.



1. To determine CFM of the above Carnes diffusers, an Alnor Velometer equipped with a No. 2220* Jet Nozzle is used.
2. Locate Velometer Nozzle slightly above outer periphery of second vane, and facing squarely into air stream as illustrated in diagram. Measure air velocity at a minimum of two points along each active side of the diffuser to within 1½ inches of vane end, and find average value.
3. From Table select proper A_k factor size and model diffuser. Multiply the A_k factor by the average velocity to obtain volume of air (CFM) supplied through diffuser.

**NOZZLE MAY HAVE TO BE ROTATED SO GUIDE VANES DO NOT INTERFERE.*

**6070 Jet Nozzle may be substituted for the 2220 Jet.*

SQUARE NECK A_k FACTOR TABLE

Size	1-Way	2-Way	2-Way Corner	3-Way	4-Way
6 x 6	.086	.085	.097	.097	.098
9 x 9	.20	.19	.22	.21	.21
12 x 12	.36	.31	.34	.34	.35
15 x 15	.53	.50	.56	.55	.54
18 x 18	.79	.72	.81	.79	.78
21 x 21	1.00	.94	1.07	1.05	1.00
24 x 24	1.26	1.17	1.36	1.38	1.33

RECTANGULAR NECK A_k FACTOR TABLE

Neck Size	A_k Factor	Neck Size	A_k Factor	Neck Size	A_k Factor
6 x 9	.16	9 x 15	.34	12 x 24	.72
6 x 12	.21	9 x 18	.42	12 x 30	.90
6 x 15	.25	9 x 21	.49	12 x 36	1.07
6 x 18	.29	9 x 24	.55	12 x 42	1.24
6 x 21	.34	9 x 30	.68	12 x 48	1.41
6 x 24	.38	9 x 36	.81	15 x 18	.68
6 x 30	.47	9 x 42	.94	15 x 21	.79
6 x 36	.55	9 x 48	1.07	15 x 24	.90
6 x 42	.64	12 x 15	.47	18 x 21	.94
6 x 48	.72	12 x 18	.55	18 x 24	1.07
9 x 12	.29	12 x 21	.64	21 x 24	1.24

Previous Models KS, KF, KT, KE

SQUARE NECK ADJUSTABLE 4-WAY

A_k FACTOR		NECK SIZE IN INCHES
Horiz.	Vertical	Y and Z
.127	.095	6 x 6 Area .25 Sq. Ft.
.27	.20	9 x 9 Area .56 Sq. Ft.
.47	.34	12 x 12 Area 1.00 Sq. Ft.
.72	.52	15 x 15 Area 1.56 Sq. Ft.
1.02	.75	18 x 18 Area 2.25 Sq. Ft.
1.37	1.00	21 x 21 Area 3.06 Sq. Ft.
1.77	1.30	24 x 24 Area 4.0 Sq. Ft.

Previous Model KSA 40

ROUND NECK ADJUSTABLE 4-WAY

A_k FACTOR		NECK SIZE IN INCHES
Horiz.	Vertical	Y and Z
.115	.092	5" Dia. Area .136 Sq. Ft.
.272	.203	6" Dia. Area .916 Sq. Ft.
.292	.192	8" Dia. Area .35 Sq. Ft.
.474	.322	10" Dia. Area .545 Sq. Ft.
.647	.555	12" Dia. Area .785 Sq. Ft.
.657	.541	14" Dia. Area 1.07 Sq. Ft.
1.023	.869	16" Dia. Area 1.395 Sq. Ft.
1.342	1.129	18" Dia. Area 1.77 Sq. Ft.
1.278	1.101	20" Dia. Area 2.18 Sq. Ft.

Previous Model RKSA 40

ROUND NECK SIZES

DUCT DIA.	A A	A_k FACTOR
5	6 x 6	.18
6	9 x 9	.20
8	9 x 9	.25
10	12 x 12	.32
12	15 x 15	.40
14	15 x 15	.50
16	18 x 18	.62
18	21 x 21	.74
20	21 x 21	.89

Previous RK Series

CARNES FIELD BALANCING DATA

EXTRUDED ALUMINUM SQUARE DIFFUSERS

SA SERIES

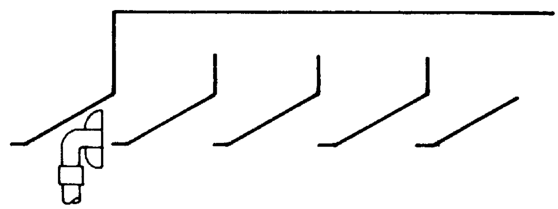
$$CFM = V_k \times A_k$$

FIELD BALANCING

The following method describes the procedure to determine the quantity of the air through the diffuser. Knowing the velocity from test and the effective area (air from the performance table) or the diffuser, the CFM of air can be calculated.

SUPPLY DIFFUSERS

1. To determine CFM of the diffuser, an Alnor Velometer equipped with a No. 2220 Jet, No. 2220 A Jet, or No. 6070 Jet is used.
2. Locate Velometer Nozzle slightly above outer periphery of first vane, and facing squarely into air stream as illustrated in diagram. Measure air velocity at a minimum of two points along each active side of the diffuser to within 1½ inches of vane end, and find average value.
3. From the performance Table select proper A_k factor for the size of diffuser tested. Multiply the A_k factor by the average velocity to obtain volume of air (CFM) supplied through the diffuser.



RETURN DIFFUSER

The same three steps are followed except the opposite Velometer tube connection is used to secure air velocity.

Size	A_k FACTORS													
	Blow 10	Blow 11	Blow 12	Blow 20	Blow 21	Blow 22	Blow 25	Blow 26	Blow 27	Blow 30	Blow 31	Blow 32	Blow 40	Blow 41
6 x 6	.107			.097			.097			.097			.114	
6 x 9		.142	.142		.142	.142		.146	.146		.146	.146		.160
6 x 12		.193	.193		.190	.190		.197	.197		.197	.197		.212
6 x 15		.223	.223		.220	.220		.228	.228		.228	.228		.245
6 x 18		.291	.291		.288	.288		.299	.299		.299	.299		.320
6 x 21		.341	.341		.338	.338		.348	.348		.348	.348		.375
6 x 24		.390	.390		.388	.388		.398	.398		.398	.398		.429
9 x 9	.219			.210			.221			.221			.239	
9 x 12		.291	.291		.288	.288		.299	.299		.299	.299		.320
9 x 15		.368	.368		.360	.360		.372	.372		.372	.372		.400
9 x 18		.440	.440		.434	.434		.449	.449		.449	.449		.483
9 x 21		.513	.513		.508	.508		.522	.522		.522	.522		.563
9 x 24		.589	.589		.580	.580		.600	.600		.600	.600		.648
12 x 12	.388			.391			.399			.399			.412	
12 x 15		.490	.490		.482	.482		.499	.499		.499	.499		.539
12 x 18		.590	.590		.580	.580		.600	.600		.600	.600		.648
12 x 21		.689	.689		.679	.679		.700	.700		.700	.700		.759
12 x 24		.788	.788		.774	.774		.800	.800		.800	.800		.866
15 x 15	.612			.605			.623			.623			.673	
15 x 18		.738	.738		.727	.727		.751	.751		.751	.751		.811
15 x 21		.862	.862		.850	.850		.878	.878		.878	.878		.949
15 x 24		.988	.988		.970	.970		1.010	1.010		1.010	1.010		1.086
18 x 18	.891			.892			.901			.901			.964	
18 x 21		1.034	1.034		1.018	1.018		1.050	1.050		1.050	1.050		1.139
18 x 24		1.186	1.186		1.167	1.167		1.203	1.203		1.203	1.203		1.304
21 x 21	1.210			1.189			1.229			1.229			1.330	
21 x 24		1.382	1.382		1.361	1.361		1.408	1.408		1.408	1.408		1.522
24 x 24	1.590			1.550			1.660			1.660			1.750	

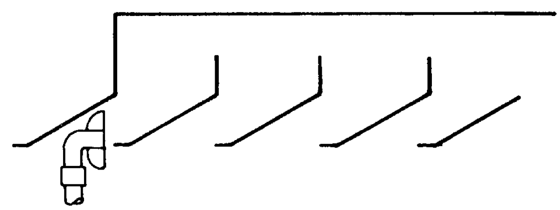
Previous 4700 Series

Model SARA
EXTRUDED ALUMINUM SQUARE and RECTANGULAR SUPPLY and RETURN DIFFUSERS

$$CFM = V_K \times A_K$$

FIELD BALANCING

The following method describes the procedure to determine the quantity of the air through the diffuser. Knowing the velocity from test and the effective area (from the performance table) of the diffuser, the CFM of air can be calculated.



SUPPLY DIFFUSERS

1. To determine CFM of the diffuser, an Alnor Velometer equipped with a No. 2220 Jet, No. 2220A Jet, or No. 6070 Jet is used.
2. Locate Velometer Nozzle slightly above outer periphery of first vane, and facing squarely into air stream as illustrated in diagram. Measure air velocity at a minimum of two points along each active side of the diffuser to within 1½ inches of vane end, and find average value.
3. From the performance table select proper A_K factor for the size of diffuser tested. Multiply the A_K factor by the average velocity to obtain volume of air (CFM) supplied through the diffuser.

SQUARE NECK SIZES

Supply Size	Return Size	Supply A_K Factor
21 x 21	12 x 12	.72
24 x 24	15 x 15	.84
27 x 27	18 x 18	.99
30 x 30	21 x 21	1.12
33 x 33	21 x 21	1.58
36 x 36	24 x 24	1.76
39 x 39	27 x 27	1.95
42 x 42	27 x 27	2.55
45 x 45	30 x 30	2.86
48 x 48	33 x 33	3.14
51 x 51	36 x 36	3.43
54 x 54	36 x 36	4.55
57 x 57	39 x 39	4.90
60 x 60	42 x 42	5.22

RECTANGULAR NECK SIZES

Supply Size	Return Size	Supply A_K Factor	Supply Size	Return Size	Supply A_K Factor
21 x 36	12 x 27	1.05	33 x 48	21 x 36	2.04
21 x 48	12 x 39	1.31	33 x 60	21 x 48	2.43
21 x 60	12 x 51	1.57	36 x 48	24 x 36	2.13
24 x 36	15 x 27	1.14	36 x 60	24 x 48	2.53
24 x 48	15 x 39	1.39	39 x 48	27 x 36	2.23
24 x 60	15 x 51	1.66	39 x 60	37 x 48	2.83
27 x 36	18 x 27	1.20	42 x 48	27 x 33	2.87
27 x 48	18 x 39	1.46	42 x 60	27 x 45	3.44
27 x 60	18 x 51	1.72	45 x 48	30 x 33	3.01
30 x 36	21 x 27	1.26	45 x 60	30 x 45	3.59
30 x 48	21 x 39	1.52	48 x 60	33 x 45	3.75
30 x 60	21 x 51	1.79	51 x 60	36 x 45	3.90
33 x 36	21 x 24	1.67	54 x 60	36 x 42	4.90
33 x 42	21 x 30	1.85	57 x 60	39 x 42	5.06

Previous Model 4750

CHANNELAIRE EXTRUDED ALUMINUM ADJUSTABLE LINEAR AIR DIFFUSER

$$CFM = V_K \times A_K$$

FIELD BALANCING

1. Place Alnor Jet *2220A as per sketch, and take velocity readings at frequent intervals along one slot of a group of slots having the same vane settings.

   Take readings at approximately 6 inches from end and at 1 foot intervals, being careful to avoid readings direclty below spacer bars which are at 18 inch intervals. Take at least four readings on unit under 4 feet long.
2. Determine L as the length in feet of the section.
3. Calculate CFM.
   a. For **PARALLEL** discharge

      Measure V_K on the side of slot as shown

      Take A_K from Table 1 Column A

      Total CFM = $A_K \times V_K \times L$

   b. For **DAMPERING** of **PARALLEL DISCHARGE**

   If control vanes are in dampering position, apply the following multipliers to the A_K factor from Table No. 1.

Slot Opening	Multiplier
3/8"	1.0
5/16"	0.8
1/4	0.7
3/16	0.5
1/8	0.4
1/16	0.2

   Total CFM = $A_K \times V_K \times L \times$ Multiplier

**6070 Jet Probe may be substituted for the 2220A.*

   c. For **PERPENDICULAR** discharge

      Measure V_K on one side of slot

      Take A_K from Table 1 Column B

      Total CFM = $A_K \times V_K \times L$

RETURN AIR TESTING

Transfer the No. 2220A Jet tubing connection to the right side of the velometer

Measure V_K in the open side of the slot as shown.

Take A_K from Table 1C

Total CFM = $A_K \times V_K \times L$

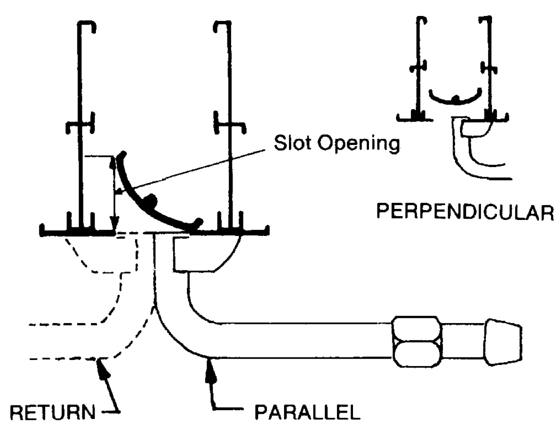


TABLE NO. 1 - A_K FACTORS FOR FIELD TESTING

Slot Width	Number of Slots	A Parallel Discharge	B Perpendicular Discharge	C Return
		A_K/FOOT LENGTH		
1/2"	1	.032	.038	.045
	2	.066	.079	.091
	3	.102	.119	.137
	4	.135	.158	.185
3/4"	1	.039	.046	.055
	2	.080	.095	.110
	3	.123	.143	.165
	4	.162	.19	.222
1"	1	.043	.047	
	2	.083	.094	
	3	.128	.146	
	4	.160	.198	

Model DASB, DAMB, DARB — ADJUSTABLE SLOT DIFFUSER

$CFM = V_K \times A_K$

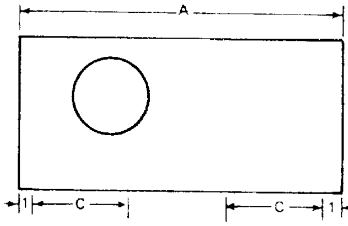
FIELD BALANCING

When a new air system is put into operation, the system must be adjusted to distribute the air quantities in accordance with the plans.

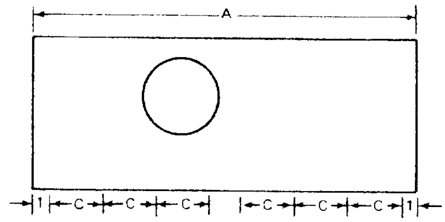
The actual volume of air being discharged from an outlet can be determined by measuring the outlet velocity in feet-per-minute (FPM) and multiplying by an area factor (A_K). $CFM = V_K \times A_K$.

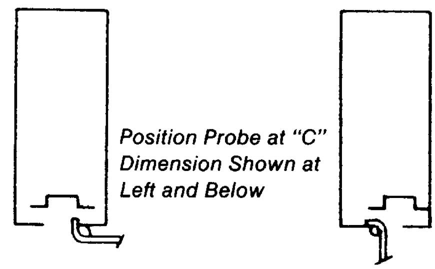
For measuring V_K use an Alnor deflecting velometer with Jet No. 6070P, calculate $CFM = V_K \times A_K$.

SIZES 24", 30" and 36



SIZES 48" and 60"



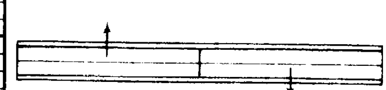


VERTICAL **HORIZONTAL**

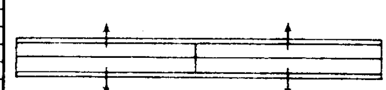
6070P JET POSITION

DIMENSIONS LISTED IN INCHES

Diffuser Length	B Inlet	Nominal Length	Slot Width	Slot Quantity	Blow Pattern	A	C Inches	Horizontal A_k	Vertical A_k
24	6 8 or 10	24	3/4	1	1-Way	23¾	7	.044	.062
		24	1	1	1-Way	23¾	7	.059	.086
		24	1½	1	1-Way	23¾	7	.091	.144
		24	3/4	2	1-Way	23¾	7	.091	.144
		24	3/4	2	2-Way	23¾	7	.091	
		24	1	2	1-Way	23¾	7	.125	.195
		24	1	2	2-Way	23¾	7	.125	
		24	1½	2	1-Way	23¾	7	.184	.303
		24	1½	2	2-Way	23¾	7	.184	
30	6 8 or 10	30	3/4	1	1-Way	29¾	9	.057	.079
		30	1	1	1-Way	29¾	9	.076	.113
		30	1½	1	1-Way	29¾	9	.117	.180
		30	3/4	2	1-Way	29¾	9	.117	.180
		30	3/4	2	2-Way	29¾	9	.117	
		30	1	2	1-Way	29¾	9	.157	.252
		30	1	2	2-Way	29¾	9	.157	
		30	1½	2	1-Way	29¾	9	.240	.400
		30	1½	2	2-Way	29¾	9	.240	
36	6 8 or 10	36	3/4	1	1-Way	35¾	9	.067	.099
		36	1	1	1-Way	35¾	9	.091	.144
		36	1½	1	1-Way	35¾	9	.142	.224
		36	3/4	2	1-Way	35¾	9	.142	.224
		36	3/4	2	2-Way	35¾	9	.142	
		36	1	2	1-Way	35¾	9	.184	.303
		36	1	2	2-Way	35¾	9	.184	
		36	1½	2	1-Way	35¾	9	.287	.485
		36	1½	2	2-Way	35¾	9	.287	
48	6 8 or 10	48	3/4	1	1-Way	47¾	7½	.091	.144
		48	3/4	1	2-Way	47¾	7½	.044	
		48	1	1	1-Way	47¾	7½	.125	.195
		48	1	1	2-Way	47¾	7½	.099	
		48	1½	1	1-Way	47¾	7½	.184	.303
		48	1½	1	2-Way	47¾	7½	.091	
		48	3/4	2	1-Way	47¾	7½	.184	.303
		48	3/4	2	2-SW	47¾	7½	.184	
		48	3/4	2	2-SL	47¾	7½	.091	
		48	1	2	1-Way	47¾	7½	.254	.426
		48	1	2	2-SW	47¾	7½	.254	
		48	1	2	2-SL	47¾	7½	.125	
		48	1½	2	1-Way	47¾	7½	.380	.678
		48	1½	2	2-SW	47¾	7½	.380	
		48	1½	2	2-SL	47¾	7½	.184	
60	6 8 or 10	60	3/4	1	1-Way	59¾	9	.117	.180
		60	3/4	1	2-Way	59¾	9	.057	
		60	1	1	1-Way	59¾	9	.157	.252
		60	1	1	2-Way	59¾	9	.076	
		60	1½	1	1-Way	59¾	9	.240	.400
		60	1½	1	2-Way	59¾	9	.117	
		60	3/4	2	1-Way	59¾	9	.240	.400
		60	3/4	2	2-SW	59¾	9	.240	
		60	3/4	2	2-SL	59¾	9	.117	
		60	1	2	1-Way	59¾	9	.320	.555
		60	1	2	2-SW	59¾	9	.320	
		60	1	2	2-SL	59¾	9	.157	
		60	1½	2	1-Way	59¾	9	.482	.878
		60	1½	2	2-SW	59¾	9	.482	
		60	1½	2	2-SL	59¾	9	.240	



SL — Blow Pattern Split in Length



SW — Blow Pattern Split in Width

Model DAFA — FIRE DAMPER SLOT DIFFUSER

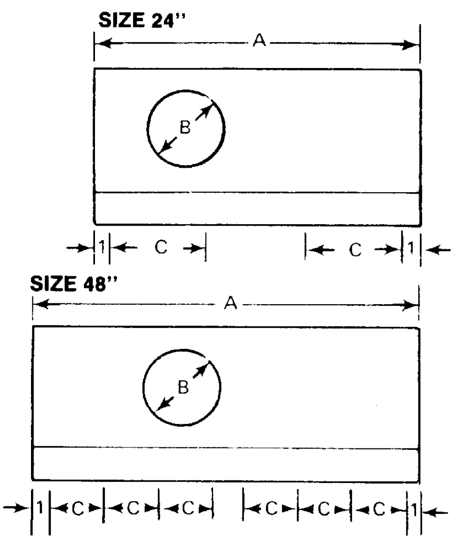
$$CFM = V_K \times A_K$$

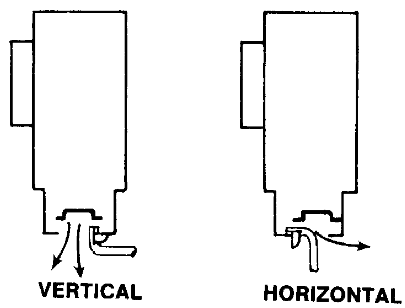
FIELD BALANCING

When a new air system is put into operation, the system must be adjusted to distribute the air quantities in accordance with the plans.

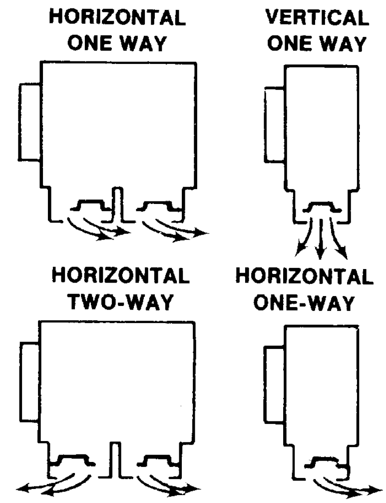
The actual volume of air being discharged from an outlet can be determined by measuring the outlet velocity in feet-per-minute (FPM) and multiplying by an area factor (A_K). CFM = $V_K \times A_K$.

For measuring V_K use an Alnor deflecting velometer with Jet No. 6070P, calculate CFM = $V_K \times A_K$.





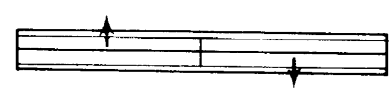
6070P JET POSITION
Position Probe at "C" Dimension Shown at Left and Below



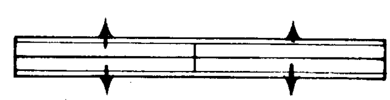
DIMENSIONS LISTED IN INCHES

Model DAFA	B Inlet	Nominal Length	Slot Width	Slot Quantity	Blow Pattern	A	C Inches	Horizontal A_K	Vertical A_K
	6	24	3/4	1	1-Way	23¾	7	.058	.068
	6	24	1	1	1-Way	23¾	7	.073	.095
	6	24	1¼	1	1-Way	23¾	7	.089	.098
	8	24	3/4	2	1-Way	23¾	7	.131	.170
24	8	24	3/4	2	2-Way	23¾	7	.153	
	8	24	1	2	2-Way	23¾	7	.132	.185
	8	24	1	2	2-Way	23¾	7	.157	
	8	24	1¼	2	1-Way	23¾	7	.165	.207
	8	24	1¼	2	2-Way	23¾	7	.172	
	8	48	3/4	1	1-Way	47¾	7	.111	.145
	8	48	3/4	1	2-Way	47¾	7	.111	
	8	48	1	1	1-Way	47¾	7	.136	.177
	8	48	1	1	2-Way	47¾	7	.131	
	8	48	1¼	1	1-Way	47¾	7	.160	.196
	8	48	1¼	1	2-Way	47¾	7	.161	
	10	48	3/4	2	1-Way	47¾	7	.254	.357
48	10	48	3/4	2	2-SW	47¾	7	.323	
	10	48	3/4	2	2-SL	47¾	7	.263	
	10	48	1	2	1-Way	47¾	7	.279	.382
	10	48	1	2	2-SW	47¾	7	.348	
	10	48	1	2	2-SL	47¾	7	.288	
	10	48	1¼	2	1-Way	47¾	7	.315	.432
	10	48	1¼	2	2-SW	47¾	7	.360	
	10	48	1¼	2	2-SL	47¾	7	.331	

HORIZONTAL — 2 SL or 2SW



2 SL — Blow Pattern Split in Length



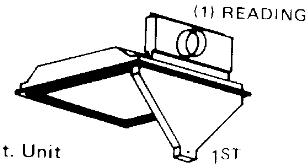
2 SW — Blow Pattern Split in Width

UNDERWRITERS' LABORATORIES, INC.®
CLASSIFIED
AIR TERMINAL UNITS
FIRE RESISTANCE CLASSIFICATION
DESIGN NOS. — SEE PRODUCT CATEGORY
IN UL FIRE RESISTANCE DIRECTORY
CONTROL NO. 241Y

SINGLE/DOUBLE TROFFER DIFFUSERS

$$CFM = V_K \times A_K$$

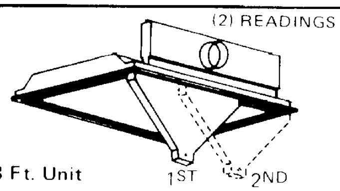
SINGLE TROFFER DIFFUSERS



2 Ft. Unit

$A_K = .14$

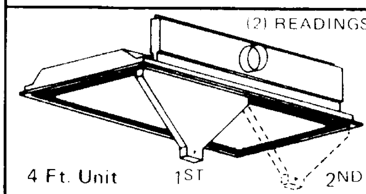
$CFM = 1st\,(FPM) \times .14$



3 Ft. Unit

$A_K = .18$

$$CFM = \frac{1st\,(FPM) + 2nd\,(FPM) \times .18}{2}$$

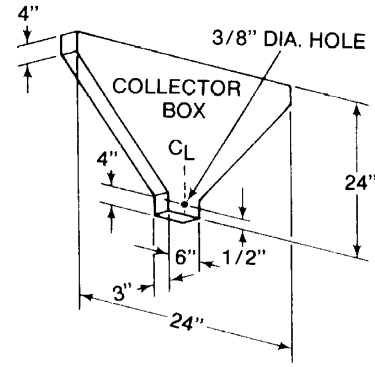


4 Ft. Unit

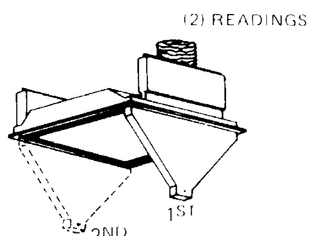
$A_K = .25$

$$CFM = \frac{1st\,(FPM) + 2nd\,(FPM) \times .25}{2}$$

COLLECTORS BOX — DIMENSIONS



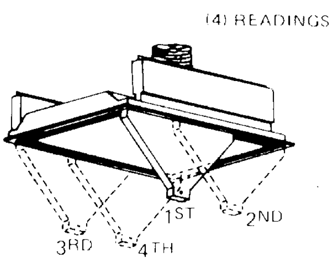
DOUBLE TROFFER DIFFUSERS



2 Ft. Unit

$A_K = .28$

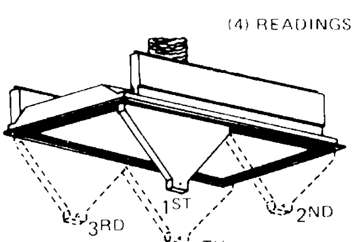
$$CFM = \frac{1st\,(FPM) + 2nd\,(FPM) \times .28}{2}$$



3 Ft. Unit

$A_K = .36$

$$CFM = \frac{1st\,(FPM) + 2nd\,(FPM) \times .36 + 3rd\,(FPM) + 4th\,(FPM)}{4}$$

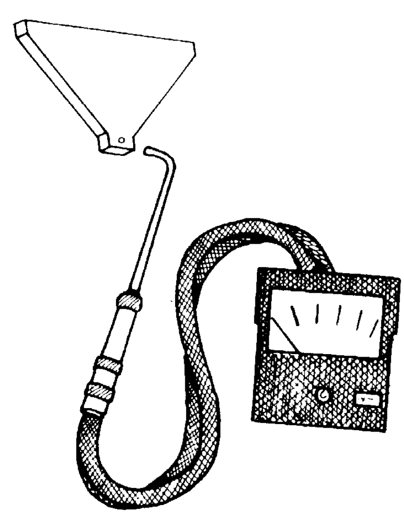


4 Ft. Unit

$A_K = .50$

$$CFM = \frac{1st\,(FPM) + 2nd\,(FPM) \times .50 + 3rd\,(FPM) + 4th\,(FPM)}{4}$$

WHEN AN ALNOR VELOMETER IS USED, PLACE THE 2220 JET (For Higher FPM) OR 3920 JET (For Lower FPM) DIRECTLY INTO THE AIR STREAM AND ROTATE SLIGHTLY TO OBTAIN THE HIGHEST (FPM) READING.



CARNES FIELD BALANCING DATA

PLENUM SLOT DIFFUSERS — SUPPLY and RETURN

SERIES DF

$$CFM = V_k \times A_k$$

FIELD BALANCING

The actual volume of air being discharged from an outlet can be determined by measuring the outlet velocity in feet-per-minute (FPM) and multiplying by an area factor (A_k).

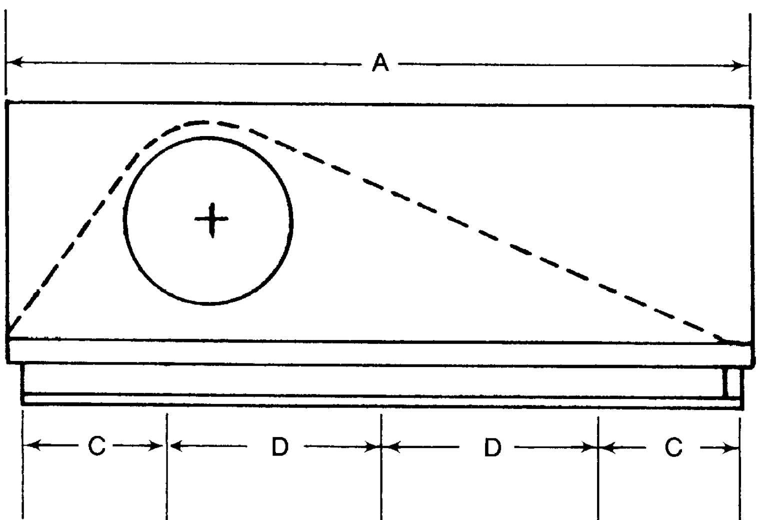
$$CFM = V_k \times A_k$$

SUPPLY AND RETURN UNITS

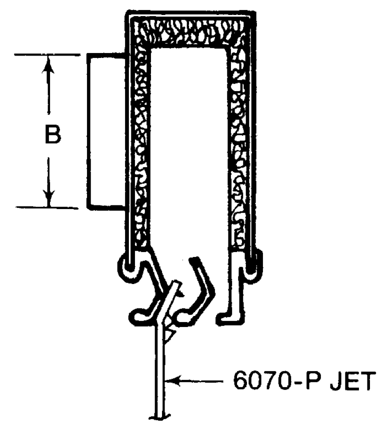
For measuring V_k an Alnor deflecting vane velometer with Jet No. 6070P, calculate:

$$CFM = V_k \times A_k$$

DFSA — Supply Diffuser — *Previous Model A VSA*
DFRA — Return Diffuser — *Previous Model A VAA*



6070P JET POSITIONS



TWO SLOT 1-WAY

DIMENSIONS LISTED IN INCHES

MODEL	NOMINAL LENGTH (Inches)	NUMBER SLOTS	NOMINAL CFM	A (Inches)	B (Inches)	C (Inches)	D (Inches)	*A_k FACTOR	
								DFSA	DFRA
2411	24	1	100	$23^{13}/_{16}$	6	$2^{1}/_{2}$	6	.08	.05
2421	24	2	200	$23^{13}/_{16}$	6	$2^{1}/_{2}$	6	.14	.10
2422	24	2	200	$23^{13}/_{16}$	6	$2^{1}/_{2}$	6	.17	.11
2431	24	3	300	$23^{13}/_{16}$	6	$2^{1}/_{2}$	6	.24	.14
2432	24	3	300	$23^{13}/_{16}$	8	$2^{1}/_{2}$	6	.24	.17
2442	24	4	400	$23^{13}/_{16}$	8	$2^{1}/_{2}$	6	.31	.22
3011	30	1	125	$29^{13}/_{16}$	6	$3^{1}/_{2}$	$7^{1}/_{2}$	.08	.06
3021	30	2	250	$29^{13}/_{16}$	6	$3^{1}/_{2}$	$7^{1}/_{2}$	.18	.13
3022	30	2	250	$29^{13}/_{16}$	6	$3^{1}/_{2}$	$7^{1}/_{2}$	.19	.14
3031	30	3	400	$29^{13}/_{16}$	8	$3^{1}/_{2}$	$7^{1}/_{2}$	.29	.18
3032	30	3	400	$29^{13}/_{16}$	8	$3^{1}/_{2}$	$7^{1}/_{2}$	.29	.21
3042	30	4	500	$29^{13}/_{16}$	8	$3^{1}/_{2}$	$7^{1}/_{2}$	.36	.28
4811	48	1	200	$47^{13}/_{16}$	6	$5^{1}/_{2}$	12	.115	.10
4821	48	2	400	$47^{13}/_{16}$	8	$5^{1}/_{2}$	12	.25	.24
4822	48	2	400	$47^{13}/_{16}$	8	$5^{1}/_{2}$	12	.22	.22
4831	48	3	600	$47^{13}/_{16}$	10 Oval	$3^{1}/_{2}$	12	.41	.38
4832	48	3	600	$47^{13}/_{16}$	10 Oval	$3^{1}/_{2}$	12	.43	.35
4842	48	4	800	$47^{13}/_{16}$	10 Oval	$3^{1}/_{2}$	12	.50	.49
6011	60	1	250	$59^{13}/_{16}$	8	7	15	.18	.13
6021	60	2	400	$59^{13}/_{16}$	8	7	15	.34	.30
6022	60	2	500	$59^{13}/_{16}$	8	7	15	.32	.28
6031	60	3	600	$59^{13}/_{16}$	10 Oval	7	15	.48	.48
6032	60	3	600	$59^{13}/_{16}$	10 Oval	7	15	.50	.44
6042	60	4	800	$59^{13}/_{16}$	10 Oval	7	15	.85	.61

**Total Diffuser A_k (NOT A_k per foot)*

STEEL, STAINLESS STEEL, ALUMINUM REGISTERS and GRILLES

$$CFM = V_K \times A_K$$

FIELD BALANCING

Supply Air Application

When a new air system is put into operation, the system will have to be adjusted to distribute the amount of air in accordance with the plans and specifications. To determine the actual CFM being delivered, the field man must use this formula:

[$CFM = V_K \times A_K$]

CFM = Cubic Feet per Minute
V_K = Average Outlet Velocity FPM
A_K = Area Factor

This Alnor Velometer, equipped with a 2220-A or 6070 jet will be used for all supply air determinations. It will be positioned between blades with the shank of the jet parallel to the face and across the grille blades.

Air delivery to the grille may not be uniform across the face and because of this, care should be taken to determine the average face velocity. The drawing in Figure 2 shows a possible face velocity variation. A good technique calls for enough measurements to establish the variation. The average reading in this example is 800 FPM. Six points were checked to establish the trend to higher velocities. The outlet velocity (800 FPM) is then multiplied by the A_K, selected from the table for the unit. From Table 1 the A_K for a 24" x 12" grille at 0° blade deflection is 1.30.

Figure 1

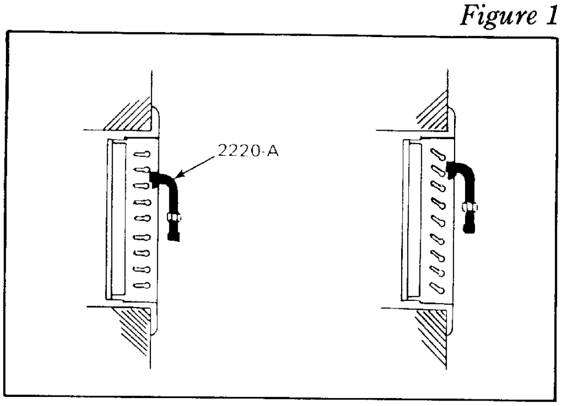
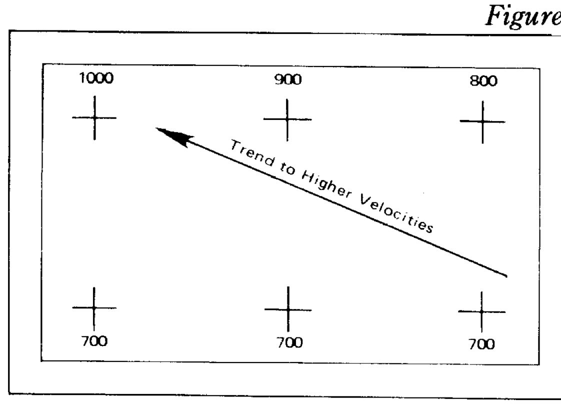
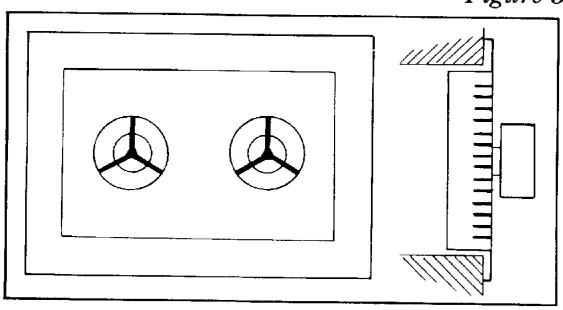


Figure 2



Return Air Application

Figure 3



To determine the face velocity V_K, hold the anemometer so that the dial faces the front of return air grille. Take several one minute readings over the face and obtain an average velocity reading. Use the instrument correction curve to determine the true V_K. Look up the A_K (Area Factor) on the chart for the particular blade angle and model number. Then the CFM can be obtained by this formula.

$$CFM = V_K \times A_K$$

MODEL			MODEL			MODEL			MODEL		
New	*Old*	**Table**	**New**	*Old*	**Table**	**New**	*Old*	**Table**	**New**	*Old*	**Table**
RTSA	*100*	1	RWEAF	*6190*	7	RWFA	*6520*	3	RWDA	*6820*	2
RSSA	*150*	1	RAEAF	*6195*	6	RNFA	*6521*	3	RNDA	*6821*	2
RTDA	*200*	1	RAEAF	*6195*	7	RAFA	*6525*	3	RADA	*6825*	2
RSDA	*250*	1	RWPAF	*6290*	6	RWJA	*6540*	8	RWLA	*6830*	9
RTRA	*500 0°*	4	RWPAF	*6290*	7	RAJA	*6545*	8	RNLA	*6831*	9
RTAA	*500 15°*	5	RAPAF	*6295*	6	RWHA	*6590*	8	RALA	*6835*	9
RSRA	*550 0°*	4	RAPAF	*6295*	7	RAHA	*6595*	8	RWAA	*6840*	8
RSAA	*550 45°*	5	RWBA	*6510*	3	RWSA	*6810*	2	RAAA	*6845*	8
RTLA	*600*	5	RNBA	*6511*	3	RNSA	*6811*	2	RWRA	*6890*	8
RSLA	*650*	5	RABA	*6515*	3	RASA	*6815*	2	RARA	*6895*	8
RWEAF	*6190*	6									

CARNES FIELD BALANCING DATA

CFM = $V_K \times A_K$

Steel and Stainless Steel — Supply Air Applications/Using Jet 2220-A — Front and Rear Blades 0° Deflection —Damper Wide Open

Models RTSA, RSSA, RTDA, RSDA, RMSA, RLSA, RMDA and RLDA

TABLE 1

	WIDTH																
HEIGHT	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36
4		.10	.13	.17	.20	.24	.28	.31	.34	.39	.42	.45	.49	.52	.56	.59	.63
6		.15	.20	.26	.31	.36	.42	.47	.52	.58	.63	.69	.74	.80	.84	.89	.96
8			.28	.35	.42	.49	.56	.62	.70	.76	.83	.92	.99	1.05	1.15	1.25	1.30
10				.43	.54	.61	.70	.79	.89	.96	1.07	1.17	1.27	1.36	1.44	1.54	1.65
12					.62	.74	.83	.96	1.07	1.18	1.30	1.41	1.51	1.65	1.75	1.85	1.97
14						.87	.99	1.13	1.26	1.39	1.51	1.65	1.77	1.93	2.05	2.19	2.31
16							1.14	1.30	1.44	1.61	1.75	1.92	2.13	2.18	2.33	2.48	2.65
18								1.48	1.65	1.80	1.97	2.15	2.31	2.49	2.65	2.82	2.98
20									1.83	2.02	2.20	2.39	2.57	2.75	2.95	3.13	3.32
22										2.22	2.40	2.61	2.84	3.01	3.22	3.45	3.65
24											2.66	2.87	3.09	3.32	3.57	3.78	4.02
26												3.10	3.33	3.61	3.85	4.10	4.35
28													3.62	3.90	4.18	4.44	4.70
30														4.15	4.45	4.71	5.00
32															4.72	5.05	5.38
34																5.39	5.70
36																	6.10

Extruded Aluminum Supply Air Application/Using Jet 2220-A — Front and Rear Blades 0° Deflection — Damper Wide Open — 3/4" Blade Spacing

Models RWSA, RNSA, RASA, RWDA, RNDA and RADA

TABLE 2

	WIDTH																
HEIGHT	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36
4		.10	.13	.17	.20	.24	.28	.31	.36	.40	.43	.48	.51	.54	.58	.63	.66
6		.15	.20	.26	.32	.37	.43	.49	.54	.61	.66	.72	.77	.84	.88	.95	1.03
8			.28	.36	.43	.51	.59	.66	.73	.81	.88	.99	1.06	1.15	1.22	1.32	1.38
10				.44	.54	.64	.74	.84	.94	1.03	1.15	1.25	1.35	1.45	1.55	1.65	1.76
12					.66	.77	.88	1.03	1.15	1.25	1.38	1.50	1.61	1.76	1.87	2.00	2.14
14						.91	1.06	1.20	1.35	1.49	1.61	1.77	1.92	2.06	2.22	2.36	2.52
16							1.22	1.38	1.55	1.73	1.87	2.05	2.22	2.37	2.55	2.73	2.90
18								1.57	1.76	1.95	2.14	2.33	2.52	2.70	2.90	3.10	3.30
20									1.97	2.17	2.37	2.60	2.80	3.00	3.25	3.45	3.66
22										2.40	2.64	2.87	3.10	3.35	3.59	3.83	4.05
24											2.90	3.15	3.40	3.65	3.91	4.15	4.45
26												3.40	3.70	4.00	4.30	4.70	4.85
28													4.02	4.40	4.61	4.95	5.25
30														4.65	4.95	5.30	5.65
32															5.30	5.66	6.08
34																6.05	6.45
36																	6.90

Extruded Aluminum Supply Air Application/Using Jet 2220-A — Front and Rear Blades 0° Deflection — Damper Wide Open — 1/2" Blade Spacing

Models RWBA, RNBA, RABA, RWFA, RNFA and RAFA

TABLE 3

	WIDTH																
HEIGHT	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36
4			.11	.14	.17	.21	.24	.27	.30	.33	.36	.39	.43	.46	.50	.53	.56
6		.13	.17	.22	.27	.31	.36	.41	.46	.51	.56	.61	.66	.71	.74	.80	.86
8			.24	.30	.37	.43	.50	.56	.62	.68	.75	.83	.90	.96	1.04	1.10	1.17
10				.38	.46	.54	.62	.71	.79	.87	.96	1.05	1.14	1.23	1.30	1.39	1.47
12					.56	.65	.75	.86	.96	1.05	1.17	1.26	1.36	1.47	1.58	1.68	1.79
14						.77	.89	1.02	1.14	1.26	1.38	1.50	1.62	1.74	1.86	1.98	2.12
16							1.04	1.17	1.30	1.45	1.58	1.72	1.87	2.00	2.14	2.28	2.43
18								1.33	1.47	1.64	1.80	1.95	2.12	2.27	2.44	2.58	2.75
20									1.66	1.83	1.99	2.19	2.35	2.53	2.70	2.88	3.04
22										2.01	2.20	2.40	2.60	2.80	3.00	3.20	3.40
24											2.44	2.64	2.85	3.04	3.28	3.45	3.72
26												2.86	3.10	3.35	3.55	3.80	4.05
28													3.37	3.61	3.88	4.13	4.89
30														3.87	4.18	4.40	4.70
32															4.41	4.70	5.05
34																5.06	5.35
36																	5.75

CARNES FIELD BALANCING DATA

Steel and Stainless Steel — Return Applications/Using 4" Turning Vane — 0° Deflection — Damper Wide Open

Models RTRA, RSRA, RMRA and RLRA

TABLE 4

HEIGHT \ WIDTH	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36
4		.11	.14	.18	.22	.25	.30	.34	.38	.41	.46	.49	.54	.57	.62	.66	.70
6		.16	.22	.28	.34	.39	.46	.51	.57	.64	.70	.76	.82	.88	.93	1.00	1.06
8			.30	.37	.46	.54	.61	.70	.77	.85	.93	1.03	1.11	1.18	1.27	1.35	1.44
10				.47	.57	.67	.77	.88	.98	1.08	1.18	1.29	1.40	1.50	1.59	1.70	1.83
12					.70	.81	.93	1.06	1.18	1.28	1.44	1.56	1.67	1.82	1.95	2.06	2.20
14						.96	1.12	1.25	1.40	1.54	1.67	1.84	1.97	2.14	2.37	2.45	2.60
16							1.27	1.44	1.59	1.78	1.95	2.11	2.37	2.46	2.61	2.77	2.98
18								1.63	1.82	2.01	2.21	2.39	2.60	2.77	2.98	3.18	3.35
20									2.04	2.25	2.45	2.67	2.88	3.09	3.32	3.55	3.75
22										2.47	2.70	2.94	3.19	3.44	3.65	3.90	4.15
24											2.98	3.23	3.49	3.75	4.00	4.25	4.55
26												3.48	3.80	4.07	4.33	4.75	4.95
28													4.10	4.40	4.71	5.03	5.35
30														4.95	5.10	5.45	5.75
32															5.42	5.76	6.15
34																6.19	6.58
36																	6.95

Steel and Stainless Steel — Return Applications/Using 4" Turning Vane — 45° Deflection — Damper Wide Open

Models RTAA, RSAA, RMAA, RLAA, RTLA and RSLA

TABLE 5

HEIGHT \ WIDTH	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36
4		.10	.13	.17	.20	.23	.26	.29	.32	.35	.38	.41	.44	.46	.49	.53	.55
6		.15	.19	.24	.29	.33	.37	.42	.46	.51	.55	.59	.62	.68	.71	.75	.80
8			.26	.32	.38	.44	.49	.55	.60	.65	.71	.78	.83	.88	.95	.99	1.05
10				.39	.46	.54	.60	.68	.75	.82	.89	.96	1.03	1.10	1.16	1.23	1.30
12					.55	.63	.71	.80	.89	.96	1.05	1.14	1.20	1.30	1.38	1.45	1.54
14						.73	.83	.93	1.03	1.13	1.22	1.31	1.40	1.50	1.57	1.68	1.78
16							.95	1.05	1.16	1.27	1.37	1.48	1.59	1.69	1.80	1.95	2.03
18								1.17	1.30	1.43	1.54	1.65	1.78	1.90	2.03	2.13	2.25
20									1.43	1.56	1.69	1.83	1.95	2.07	2.23	2.35	2.48
22										1.70	1.85	1.99	2.14	2.29	2.41	2.56	2.70
24											2.03	2.17	2.32	2.48	2.63	2.76	2.93
26												2.33	2.49	2.68	2.83	3.00	3.15
28													2.68	2.80	3.10	3.40	3.80
30														3.05	3.12	3.47	3.60
32															3.43	3.61	3.85
34																3.85	4.05
36																	4.30

Extruded Aluminum Eggcrate Return Application/Using 4" Turning Vane or Alnor 3930 — Damper Wide Open

Models RWEA, RNEA, RAEA, RWPA, RNPA and RAPA

TABLE 6

HEIGHT \ WIDTH	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36
4			.12	.16	.19	.23	.27	.30	.34	.37	.41	.45	.49	.52	.57	.61	.65
6		.14	.19	.25	.30	.35	.41	.47	.52	.59	.65	.70	.76	.82	.88	.94	1.01
8			.27	.34	.41	.49	.57	.65	.72	.79	.86	.97	1.05	1.13	1.22	1.30	1.38
10				.43	.52	.62	.72	.82	.92	1.02	1.13	1.24	1.35	1.45	1.54	1.65	1.76
12					.65	.76	.88	1.01	1.13	1.25	1.38	1.50	1.63	1.73	1.87	2.01	2.15
14						.90	1.05	1.20	1.35	1.48	1.63	1.78	1.92	2.09	2.24	2.40	2.57
16							1.22	1.38	1.54	1.77	1.90	2.07	2.24	2.43	2.59	2.83	2.95
18								1.55	1.76	1.95	2.15	2.34	2.57	2.75	2.95	3.12	3.35
20									1.98	2.20	2.40	2.64	2.73	3.09	3.30	3.52	3.78
22										2.43	2.65	2.92	3.18	3.41	3.68	3.85	4.20
24											2.95	3.21	3.56	3.78	4.01	4.30	4.60
26												3.58	3.80	4.10	4.40	4.67	5.00
28													4.15	4.43	4.93	5.15	5.45
30														4.82	5.19	5.50	5.85
32															5.55	5.90	6.30
34																6.32	6.75
36																	7.20

CARNES FIELD BALANCING DATA

Extruded Aluminum Eggcrate Return Application/Using Alnor 2220-2220-A - Damper Wide Open

Models RWEA, RNEA, RAEA, RWPA, RNPA and RAPA

TABLE 7

HEIGHT	WIDTH 4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36
4				.12	.15	.18	.21	.23	.26	.30	.32	.35	.38	.41	.44	.47	.50
6		.11	.15	.19	.23	.27	.32	.36	.41	.46	.50	.55	.59	.64	.68	.74	.78
8			.21	.26	.32	.38	.44	.50	.56	.62	.68	.75	.82	.88	.94	1.00	1.08
10				.33	.41	.48	.56	.64	.72	.80	.88	.96	1.05	1.13	1.20	1.30	1.39
12					.50	.59	.68	.78	.88	.97	1.08	1.18	1.27	1.39	1.48	1.57	1.69
14						.70	.81	.93	1.05	1.17	1.27	1.40	1.51	1.64	1.76	1.89	2.00
16							.94	1.08	1.20	1.35	1.48	1.61	1.76	1.90	2.03	2.15	2.33
18								1.23	1.39	1.54	1.69	1.83	2.00	2.15	2.33	2.48	2.65
20									1.55	1.72	1.88	2.07	2.25	2.40	2.62	2.77	2.98
22										1.92	2.09	2.28	2.48	2.69	2.87	3.10	3.30
24											2.33	2.53	2.73	2.98	3.19	3.39	3.62
26												2.75	3.00	3.25	3.42	3.70	3.95
28													3.29	3.50	3.76	4.05	4.30
30														3.95	4.05	4.31	4.62
32															4.31	4.65	5.00
34																5.03	5.30
36																	5.65

Extruded Aluminum Return Registers and Grilles — 4" Anemometer held directly against Face — Damper Wide Open

Models RWJA, RNJA, RAJA, RWHA, RNHA, RAHA, RWAA, RNAA, RAAA, RNRA and RARA

TABLE 8

HEIGHT	WIDTH 4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36
4		.11	.15	.19	.23	.27	.31	.35	.39	.43	.47	.51	.56	.59	.63	.68	.72
6		.17	.23	.29	.35	.41	.47	.53	.59	.66	.72	.79	.85	.91	.96	1.03	1.10
8			.31	.39	.47	.56	.63	.72	.79	.87	.95	1.07	1.15	1.22	1.32	1.41	1.49
10				.49	.59	.69	.79	.91	1.02	1.12	1.23	1.34	1.45	1.56	1.66	1.77	1.87
12					.72	.85	.96	1.10	1.22	1.34	1.49	1.62	1.74	1.87	2.02	2.13	2.27
14						.99	1.15	1.30	1.45	1.60	1.74	1.88	2.04	2.20	2.36	2.53	2.67
16							1.32	1.49	1.66	1.84	2.01	2.19	2.36	2.53	2.70	2.89	3.08
18								1.68	1.87	2.08	2.27	2.47	2.67	2.88	3.08	3.27	3.47
20									2.10	2.33	2.54	2.77	2.98	3.10	3.43	3.66	3.87
22										2.55	2.79	3.05	3.29	3.55	3.90	4.13	4.29
24											3.08	3.33	3.60	3.87	4.12	4.40	4.67
26												3.61	3.92	4.22	4.50	4.76	5.09
28													4.23	4.55	4.83	5.19	5.50
30														4.85	5.21	5.55	5.90
32															5.56	5.93	6.30
34																6.32	6.70
36																	7.19

Extruded Aluminum Return Register and Grilles — 4" Anemometer held directly against Face — Damper Wide Open

Models RWLA, RNLA and RALA

TABLE 9

HEIGHT	WIDTH 4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36
4		.11	.14	.18	.21	.25	.29	.32	.36	.40	.44	.47	.52	.55	.59	.63	.67
6		.17	.21	.27	.32	.38	.44	.49	.55	.61	.67	.72	.78	.83	.87	.95	1.01
8			.29	.36	.44	.52	.59	.67	.73	.80	.87	.97	1.07	1.13	1.21	1.28	1.35
10				.45	.55	.64	.73	.83	.94	1.02	1.13	1.22	1.33	1.42	1.51	1.61	1.72
12					.67	.78	.87	1.01	1.13	1.23	1.35	1.42	1.57	1.72	1.83	1.94	2.07
14						.91	1.07	1.18	1.33	1.45	1.57	1.72	1.85	1.98	2.13	2.28	2.42
16							1.21	1.35	1.51	1.67	1.83	1.98	2.13	2.28	2.45	2.62	2.77
18								1.53	1.72	1.88	2.07	2.23	2.42	2.58	2.77	2.95	3.13
20									1.93	2.10	2.29	2.49	2.69	2.88	3.09	3.29	3.50
22										2.31	2.53	2.73	2.97	3.19	3.41	3.64	3.85
24											2.77	3.00	3.23	3.50	3.74	3.97	4.20
26												3.25	3.52	3.79	4.03	4.31	4.54
28													3.80	4.09	4.38	4.67	4.95
30														4.42	4.73	5.00	5.30
32															5.01	5.30	5.55
34																5.68	6.00
36																	6.40

CARNES FIELD BALANCING DATA

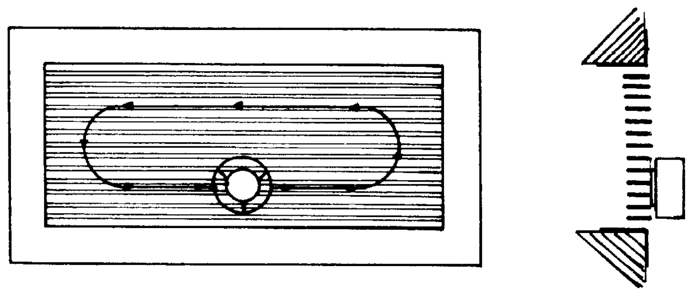
STURDICORE HEAVY DUTY STEEL RETURN AIR REGISTERS and GRILLES

$$CFM = V_K \times A_K$$

FIELD BALANCING

To determine air velocity, V_K, hold the anemometer so that the dial faces the Sturdicore and just touches the blades. Take several 1 minute readings, moving the instrument as shown below. Correct the average V_K using the instrument correction curve. Select the A_K from the table of common sizes or the graph and multiply the corrected V_K by the A_K.

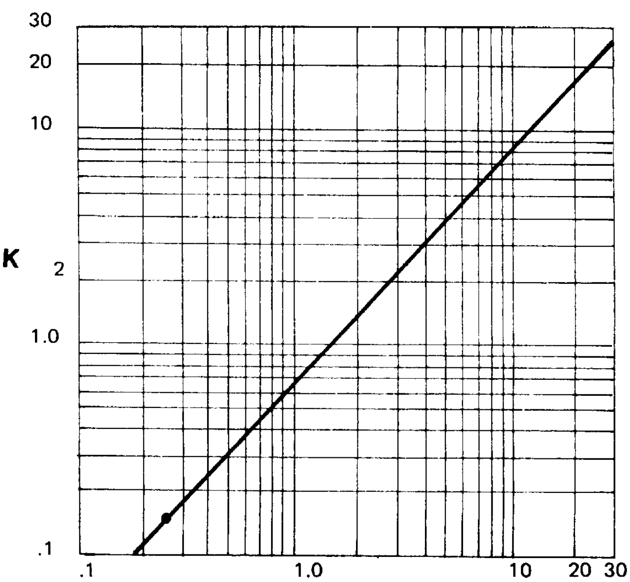
ANEMOMETER POSITION



MODELS RSHA, RSEA, RTHA and RTEA

NOMINAL SIZE (Inch.)	DUCT AREA (Ft.)	AREA FACTOR (Av.) 0° and 40° Defelection
10 x 6	.42	.27
12 x 6	.50	.32
10 x 8	.56	.36
12 x 8	.67	.44
18 x 6	.75	.50
12 x 12	1.00	.68
18 x 12	1.50	1.03
24 x 12	2.00	1.40
18 x 18	2.25	1.57
30 x 12	2.50	1.79
24 x 18	3.00	2.15
30 x 18	3.75	2.73
24 x 24	4.00	2.90
36 x 18	4.50	3.29
30 x 24	5.00	3.69
36 x 24	6.00	4.45
36 x 30	7.50	5.65
48 x 24	8.00	6.00
48 x 30	10.00	7.62
48 x 36	12.00	9.25
48 x 42	14.00	10.07
48 x 48	16.00	12.50
54 x 24	9.00	6.83
54 x 36	13.50	10.04
54 x 48	18.00	14.10
60 x 24	10.00	7.62
60 x 36	15.00	11.60
60 x 48	20.00	15.80
66 x 24	11.00	8.43
66 x 36	16.50	12.80
66 x 48	22.00	17.50
72 x 24	12.00	9.25
72 x 36	18.00	14.10
72 x 48	24.00	19.20

AREA FACTORS



Example: 24" x 24": **CFM** $= A_K (V_K)$
A_K $= 2.90$ $V_K = 1000$ FPM
CFM $= 2.90 (1000)$
CFM $= 2900$

VARICORE REVERSIBLE CORE REGISTERS and GRILLES

$CFM = V_k \times A_k$

FIELD BALANCING

Supply Air Application

The actual volume of air discharging from an outlet is determined by measuring the outlet velocity in FPM and multiplying by an Area Factor (A_k).

$CFM = V_k \times A_k$

The Alnor velometer with a 2220-A jet is the recommended equipment for balancing Varicore Registers and Grilles with jet positioning as shown in the sketches. For 0° rear blade setting, a sampling of measurements from several positions on the grille face is ideal. When wide spread angels are required, take measurements only at the 0° blade settings in the grille center. This technique allows sampling the highest velocities and provides more consistent results. 5° or 15° deflections have no measureable effect on the 2220-A jet and position over blade or gap is not critical. Avoid positioning the jet in line with a rear blade however.

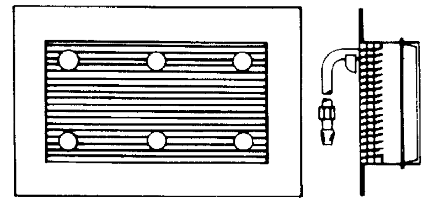
The Alnor Model 6000P with 6070P probe can also be used with the same A_k factors.

Return Air Applications

Alnor jet positions are the same as supply positions. The fitting on the instrument case must be reversed however, to obtain normal readings. The A_k is selected from the return table.

The Alnor Model 6000P with 6070P probe can also be used with the same A_k factors.

Alnor Position



2220-A JET POSITION

USE CENTER POSITION ONLY FOR SPREAD ANGLE SETTINGS

A_k Supply Registers and Grilles

WIDTH (columns) × HEIGHT (rows)

	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	40	44	48	56	60	64	72	78	84	90	96	102	108	114	120	126	132	138	144	
4	.11	.14	.16	.19	.22	.25	.28	.31	.34	.36	.39	.42	.45	.48	.51	.57																			4
5	.14	.17	.21	.24	.28	.31	.35	.39	.42	.46	.50	.53	.57	.60	.64	.72	.79	.87																	5
6	.16	.21	.25	.29	.34	.38	.42	.47	.51	.55	.60	.64	.69	.73	.78	.86	.95	1.04	1.23	1.32															6
8	.22	.28	.34	.39	.45	.51	.57	.63	.69	.75	.81	.87	.93	.98	1.04	1.16	1.29	1.41	1.65	1.77	1.89	2.14	2.32												8
10		.35	.42	.50	.57	.64	.72	.79	.87	.94	1.01	1.09	1.17	1.24	1.32	.147	1.62	1.77	2.08	2.23	2.39	2.69	2.93	3.16	3.39	3.63									10
12			.51	.60	.69	.78	.87	.95	1.04	1.13	1.23	1.32	1.41	1.50	1.59	1.77	1.95	2.14	2.51	2.69	2.88	3.25	3.53	3.81	4.10	4.38	4.66	4.95	5.23	5.52					12
14				.70	.81	.91	1.01	1.12	1.23	1.33	1.44	1.54	1.65	1.76	1.86	2.08	2.29	2.51	2.94	3.16	3.38	3.81	4.14	4.47	4.80	5.14	5.47	5.80	6.13	6.47	6.80	7.14	7.47		14
16					.93	1.04	1.17	1.29	1.41	1.53	1.65	1.77	1.89	2.02	2.14	2.39	2.63	2.88	3.38	3.63	3.88	4.38	4.76	5.14	5.52	5.90	6.28	6.66	7.04	7.43	7.81	8.20	8.58	8.97	16
18						1.18	1.32	1.45	1.59	1.73	1.86	2.00	2.14	2.28	2.42	2.69	2.97	3.25	3.81	4.10	4.38	4.95	5.37	5.80	6.23	6.66	7.09	7.52	7.96	8.39	8.82	9.26	9.69	10.13	18
20							1.47	1.62	1.77	1.92	2.08	2.23	2.39	2.54	2.69	3.00	3.32	3.63	4.25	4.57	4.88	5.52	5.99	6.47	6.95	7.43	7.91	8.39							20
22								1.79	1.95	2.12	2.29	2.46	2.63	2.80	2.97	3.31	3.66	4.00	4.69	5.04	5.39	6.09	6.61	7.14	7.67	8.20	8.73	9.26							22
24									2.14	2.32	2.51	2.69	2.88	3.07	3.25	3.63	4.00	4.38	5.14	5.52	5.90	6.66	7.23	7.81	8.39	8.97	9.55	10.13							24
26										2.52	2.72	2.93	3.13	3.30	3.53	3.94	4.35	4.76	5.58	5.99	6.41	7.23													26
28											2.94	3.16	3.38	3.60	3.81	4.25	4.69	5.14	6.02	6.47	6.92	7.81													28
30												3.39	3.63	3.86	4.10	4.57	5.04	5.52	6.47	6.95	7.43	8.39													30
32													3.88	4.13	4.38	4.88	5.39	5.90	6.92	7.43	7.94	8.97													32
34														4.40	4.66	5.20	5.74	6.28	7.36	7.91	8.45	9.55													34
36															4.95	5.51	6.09	6.66	7.81	8.39	8.97	10.13													36
40																6.15	6.79	7.43																	40
44																6.79	7.49	8.20																	44
48																7.42	8.20	8.97																	48
54																8.39	9.26	10.13																	54
	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	40	44	48	56	60	64	72	78	84	90	96	102	108	114	120	126	132	138	144	

A_k Return Registers and Grilles

WIDTH (columns) × HEIGHT (rows)

	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	40	44	48	56	60	64	72	78	84	90	96	102	108	114	120	126	132	138	144	
4	.09	.11	.14	.17	.19	.22	.24	.27	.30	.32	.35	.37	.40	.42	.45	.50																			4
5	.12	.15	.19	.22	.26	.30	.33	.37	.40	.44	.47	.51	.54	.58	.61	.68	.75	.82																	5
6	.15	.20	.24	.28	.33	.37	.42	.46	.51	.55	.59	.64	.68	.73	.77	.86	.95	1.04	1.21	1.30															6
8	.21	.28	.34	.40	.46	.53	.59	.65	.72	.78	.84	.90	.97	1.03	1.09	1.20	1.34	1.47	1.72	1.84	1.97	2.22	2.41												8
10		.36	.44	.52	.60	.68	.76	.84	.93	1.01	1.09	1.17	1.25	1.33	1.41	1.57	1.74	1.90	2.22	2.38	2.55	2.87	3.11	3.36	3.60	3.84									10
12			.54	.64	.74	.83	.94	1.04	1.14	1.23	1.33	1.43	1.53	1.63	1.73	1.93	2.13	2.33	2.73	2.93	3.13	3.52	3.82	4.12	4.42	4.72	5.02	5.31	5.61	5.91					12
14				.75	.87	.99	1.11	1.23	1.34	1.46	1.58	1.70	1.82	1.93	2.05	2.29	2.52	2.76	3.23	3.47	3.70	4.12	4.53	4.88	5.24	5.59	5.94	6.30	6.65	7.00	7.36	7.71	8.07		14
16					1.01	1.14	1.28	1.42	1.55	1.69	1.83	1.96	2.10	2.24	2.37	2.65	2.92	3.19	3.74	4.01	4.28	4.83	5.23	5.64	6.05	6.46	6.87	7.28	7.69	8.10	8.51	8.92	9.32	9.73	16
18						1.30	1.46	1.61	1.76	1.92	2.07	2.23	2.38	2.54	2.69	3.00	3.31	3.62	4.24	4.55	4.86	5.48	5.94	6.41	6.87	7.33	7.80	8.26	8.73	9.19	9.65	10.12	10.58	11.05	18
20							1.63	1.80	1.97	2.15	2.32	2.49	2.67	2.84	3.01	3.36	3.71	4.05	4.74	5.09	5.44	6.13	6.65	7.17	7.69	8.21	8.73	9.24							20
22								2.00	2.18	2.38	2.57	2.76	2.95	3.14	3.33	3.72	4.10	4.48	5.25	5.63	6.01	6.78	7.36	7.93	8.50	9.08	9.65	10.23							22
24									2.40	2.60	2.81	3.02	3.23	3.44	3.65	4.07	4.49	4.91	5.75	6.17	6.59	7.43	8.06	8.69	9.32	9.95	10.58	11.21							24
26										2.83	3.05	3.29	3.52	3.75	3.97	4.43	4.89	5.34	6.26	6.71	7.17	8.08													26
28											3.31	3.55	3.80	4.05	4.29	4.79	5.28	5.77	6.76	7.25	7.75	8.74													28
30												3.81	4.08	4.35	4.61	5.14	5.68	6.21	7.26	7.80	8.33	9.39													30
32													4.36	4.65	4.94	5.50	6.07	6.64	7.77	8.34	8.90	10.04													32
34														4.95	5.26	5.86	6.46	7.07	8.27	8.88	9.48	10.69													34
36															5.57	6.22	6.86	7.50	8.78	9.42	10.06	11.34													36
40																6.93	7.64	8.36																	40
44																7.64	8.43	9.22																	44
48																8.36	9.22	10.08																	48
54																9.43	10.40	11.37																	54
	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	40	44	48	56	60	64	72	78	84	90	96	102	108	114	120	126	132	138	144	

TRIMAIRE & CURTAINAIRE EXTRUDED ALUMINUM LINEAR GRILLES

$CFM = V_k \times A_k$

FIELD BALANCING

The actual volume of air discharging from an outlet is determined by measuring the outlet velocity (V_k) in FPM and multiplying by an Area Factor (A_k).

$CFM = V_k \times A_k \times \text{Length in Feet}$

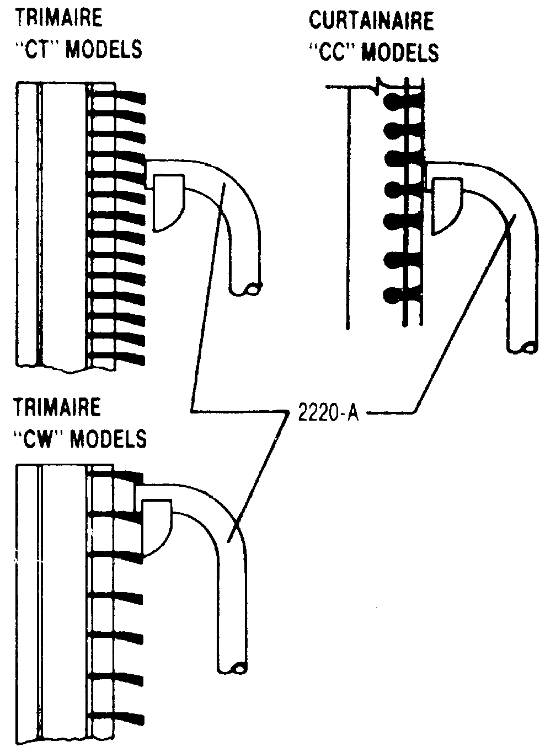
The Alnor velometer equipped with a 6070 jet should be used for all supply air determinations. The sketch shows the jet position on the face. The jet position is identical for 0° or 15° blade deflection.

Jet position on the face of Trimaire "CT" models is *not* critical and may be over any combination of blade or space. The jet will fit the blade gap on "CW" models. Jet position on the face of Curtainaire *is* critical and should be centered over a space.

Air delivery to the grille face may not be uniform, resulting in uneven outlet velocities (V_k). Care should be taken to determine the average velocity when this situation is encountered. In severe cases, a minimum of one reading per foot may be required.

A good approximation to return air volume may be made using a 4" turning vane Anemometer. Take several one minute readings at the face and average them. Multiply the average value by the grille face area in square feet to determine CFM.

2220A Jet Probe may be substitued for 6070.



CURTAINAIRE			TRIMAIRE					
CC SERIES A_k Per Foot of Length			CT SERIES A_k Per Foot of Length			CW SERIES A_k Per Foot of Length		
Listed Size	0° Blade	15° Blade	Listed Size	0° Blade	15° Blade	Listed Size	0° Blade	15° Blade
2"	.038	.034	2"	.040	.038	2"	.048	.046
2½"	.063	.058	2½"	.067	.065	2½"	.082	.078
3"	.089	.081	3"	.094	.090	3"	.113	.110
3½"	.114	.103	3½"	.120	.116	3½"	.145	.140
4"	.139	.125	4"	.145	.141	4"	.177	.171
4½"	.164	.147	4½"	.171	.167	4½"	.209	.201
5"	.189	.167	5"	.197	.191	5"	.240	.232
6"	.238	.208	6"	.245	.240	6"	.297	.293
8"	.322	.282	8"	.341	.331	8"	.408	.406
10"	.401	.355	10"	.423	.410	10"	.523	.519
12"	.471	.476	12"	.493	.481	12"	.603	.627

DECIMAL EQUIVALENT OF FRACTIONS

Decimal	Fraction
.015625	——————1/64
.03125	———1/32
.046875	——————3/64
.0625	———1/16
.078125	——————5/64
.09375	———3/32
.109375	——————7/64
.125	1/8
.140625	——————9/64
.15625	———5/32
.17185	——————11/64
.1875	———3/16
.203125	——————13/64
.21875	———7/32
.234375	——————15/64
.25	1/4
.265625	——————17/64
.28125	———9/32
.296875	——————19/64
.3125	———5/16
.328125	——————21/64
.34375	———11/32
.359375	——————23/64
.375	3/8
.390625	——————25/64
.40625	———13/32
.421875	——————27/64
.4375	———7/16
.453125	——————29/64
.46875	———15/32
.484375	——————31/64
.50	1/2

Decimal	Fraction
.515625	——————33/64
.53125	———17/32
.546875	——————35/64
.5625	———9/16
.578125	——————37/64
.59375	———19/32
.609375	——————39/64
.625	5/8
.640625	——————41/64
.65625	———21/32
.671875	——————43/64
.6875	———11/16
.703125	——————45/64
.71875	———23/32
.734375	——————47/64
.75	3/4
.765625	——————49/64
.78125	———25/32
.796875	——————51/64
.8125	———13/16
.828125	——————53/64
.84375	———27/32
.859375	——————55/64
.875	7/8
.890625	——————57/64
.90625	———29/32
.921875	——————59/64
.9375	———15/16
.953125	——————61/64
.96875	———31/32
.984375	——————63/64

ROUND DUCT AREA AND CIRCUMFERENCE

Dia. In Inches	Area Sq. Ft.	Circum. Inches
1	.00545	3.142
2	.0218	6.283
3	.0491	9.425
4	.0873	12.57
5	.1364	15.71
6	.1964	18.85
7	.2673	21.99
8	.3491	25.13
9	.4418	28.27
10	.5454	31.42
11	.6600	34.56
12	.7854	37.70
13	.9218	40.84
14	1.069	43.98
15	1.227	47.12
16	1.396	50.27
17	1.576	53.41
18	1.767	56.55
19	1.969	56.69
20	2.182	62.83
21	2.405	65.97
22	2.64	69.12
23	2.885	72.26
24	3.142	75.40
25	3.409	78.54

Dia. In Inches	Area Sq. Ft.	Circum. Inches
26	3.687	81.68
27	3.976	84.82
28	4.276	87.97
29	4.587	91.11
30	4.909	94.25
31	5.241	97.39
32	5.585	100.5
33	5.940	103.7
34	6.305	106.8
35	6.681	109.9
36	7.069	113.1
37	7.467	116.2
38	7.876	119.4
39	8.296	122.5
40	8.727	125.6
41	9.168	128.8
42	9.621	131.9
43	10.08	135.1
44	10.56	138.2
45	11.04	141.4
46	11.54	144.5
47	12.05	147.7
48	12.51	150.8
49	13.09	153.9
50	13.64	157.1