MECHANICAL DESIGN MANUAL SUMMARY SHEET

SUBJECT: DIFFUSERS AND GRILLES

DESCRIPTION: Selection of diffusers and grilles.

APPLICATION: This information should be understood by all engineers and technicians who design duct systems.

SPECIFICATION SECTIONS AFFECTED: 15936

COST: $20 to $100 per outlet plus labor depending on type chosen.

DATE UPDATED: August 30, 1991

BY: Jeffrey G. Boldt, P.E.

DIFFUSERS AND GRILLES

SELECTION CRITERIA

The following criteria should be considered when selecting diffusers and grilles.

1. Drafts
2. Stagnant areas
3. Temperature variation
4. Noise
5. Lost space
6. Cost
7. Maintenance
8. Appearance

DEFINITIONS

Diffuser: A ceiling mounted supply outlet.

Drop: The distance that the air stream descends between the outlet and the end of its throw.

Entrainment: The movement of room air caused by the airstream discharged from the outlet. Also called **secondary air motion.**

Free Area: The total minimum area of the openings in the inlet or outlet through which air passes.

Primary Air: The air discharged from the outlet.

Register: An outlet which includes a damper.

Terminal Velocity: The maximum airstream velocity at the end of the throw.

Throw: The distance an airstream travels before the maximum airstream velocity is reduced to the specified terminal velocity (usually 50 or 100 fpm).

Ventilating Ceiling: A ceiling consisting of many air openings which discharge vertically.

SUPPLY OUTLET TYPES

Group A: Outlets mounted in or near the ceiling that discharge air horizontally. This group includes high sidewall grilles, sidewall diffusers, ceiling diffusers, and linear ceiling diffusers. See Figure 1.

Cooling: Temperature variations within the room are minimized, with hardly a stagnant region. Since the warmest air in the room is mixed immediately with the cool primary air far above the occupied zone, these outlets are capable of handling large

quantities of air at large temperature differentials. The cooling diagram for the high sidewall outlet shows an **overthrow** condition, causing the total air to drop along the opposite wall and flow across the floor. This should be avoided

Heating: Stratification can occur if flow rate is low. Most modern buildings have perimeter heat loss reduced enough to make Group A outlets satisfactory for heating at full flow, however, stratification often occurs in VAV systems which are at low flow when heat is needed. For optimum comfort flow rate should be higher when heating than when cooling. This is one of the reasons for the increased use of fan-powered VAV boxes in buildings with moderate heating needs.

Group B: Outlets mounted in or near the floor that discharge air vertically in a **nonspreading** jet. This group includes floor registers, baseboard units, low sidewall units, and linear grilles in the floor or windowsill. See Figure 2.

Cooling: The entire space is conditioned evenly if the throw is correct. If the throw is inadequate the area near the grille will be cooler than other areas. This can be a problem with VAV systems.

Heating: Temperature uniformity is better than for Group A outlets. This is because the warm primary air induces cold air at the floor instead of warmer air near the ceiling.

Group B outlets should be located to minimize wasted floor space and to avoid mud entering the outlets. Outlets mounted in the floor are subject to damage due to foot traffic and floor cleaning. They should be constructed of sturdy materials which are resistant to moisture.

Group C: Outlets mounted in or near the floor that discharge air in a vertical **spreading** jet. This group includes floor diffusers, sidewall diffusers, and linear diffusers installed in the floor or windowsill (e.g. residential floor registers). See Figure 3.

Performance is similar to that for Group B outlets except that the stagnant zone is larger during cooling and smaller during heating.

Group D: Outlets mounted in or near the floor that discharge air horizontally. This group includes baseboard and low sidewall registers. See Figure 4.

Cooling: Performance is very poor as cool supply air remains on the floor.

Heating: Temperature uniformity is good, except for areas directly in the air stream (which may be much of the room).

Group E: Outlets mounted in or near the ceiling that project air vertically. This group includes ceiling diffusers, linear grilles, and sidewall diffusers and grilles. See Figure 5.

Cooling: Primary air is projected to the floor and stays there resulting in poor temperature uniformity.

Heating: Primary air is projected to the floor and then rises toward the ceiling. Temperature uniformity is poor, particularly if the primary air does not reach the floor before turning up.

COMFORT CRITERIA

The standard measure of thermal comfort is the **effective draft temperature** which considers air temperature and velocity. See ASHRAE FUNDAMENTALS chapter 31 for a detailed description. Velocity in the occupied portions of the space should be below 50 fpm. There is no minimum velocity requirement.

Air Diffusion Performance Index (ADPI) is the percent of locations in the occupied space where the effective draft temperature is maintained within plus or minus 2.5 degrees of the average space temperature. ADPI values above 80 are acceptable. ADPI is a measure of cooling performance only. It is possible to meet this criteria with Group A, B and C outlets; however, only ceiling mounted diffusers provide a wide range of flow rates with acceptable ADPI values. ADPI is greater if many small outlets are used instead of a few large outlets.

COMMONLY USED OUTLETS

CD-1: The most frequently used outlet at KJWW is the CD-1 described in Figures 7 & 8. This is a louvered face ceiling diffuser. It has the following advantages.

1. It can distribute very large amounts of air per square foot without causing drafts.
2. The cost per diffuser and per cfm is low.
3. Appearance is good.

The following are disadvantages:

1. Ceiling return grilles can be hard to locate to prevent short-circuiting.
2. The pattern is fixed except that one or more quadrants can be **blanked-off**.
3. It is difficult to make and acceptable flexible connection to this type of diffuser.

This diffuser is also available from Tuttle & Bailey in a flush face version which is more attractive, has 10% longer throw, and creates 4 to 6 Db more noise. Krueger and Carnes do not have competitive models.

Some manufacturers make diffusers that look similar to these, but do not have the extended tapered inlet. These diffusers create much more noise and have much higher pressure drop.

LD-1: This slot diffuser is shown in Figures 9, 10 & 11. Some architects prefer the appearance of slot diffusers. There are many variations of length, number of slots and width of slots. It has the following advantages:

1. It can distribute nearly as many cfm per square foot without drafts as CD-1.
2. Appearance is preferred by many architects.
3. The air pattern is adjustable. Each of the slots can be field adjusted for right, left or vertical discharge. A frequent application is to aim two slots at the exterior wall and one toward the interior of a perimeter room.
4. Flexible ducts are easy to install correctly without bends near the diffuser inlet.
5. Ceiling return grilles are easier to locate to prevent short-circuiting.

The following are disadvantages:

1. Cost per diffuser is higher than for CD-1 ($55 vs. $33 for 10" inlet units plus installation).
2. The diffuser can tip over if not installed properly.
3. Throw can be very long preventing location near walls.

LD-2: See Figures 12 & 13. This is a decorative aluminum linear diffuser with fixed blades. It is commonly used in floors and "architectural" areas. It can be ordered with special reinforcement for floor applications and with Pencil Proof grilles for counter-top applications. Various finishes, grille deflections, dampers and mounting frames are available. This is an expensive product.

SG-1: This double-deflection grille is shown in Figures 14 & 15. Its performance is inferior to CD-1 and LD-1, however, many applications require wall mounted outlets. Cost of the grille is low, but installation is expensive as flexible duct is not used. Both vertical and horizontal deflector blades are furnished to provide control of the spread of the jet. The blades which the air passes through last have the greatest ability to control the jet. Normally a jet which spreads horizontally and not vertically is desired and the **face blades** are vertical. When specifying this type of grille it is important that the model listed identifies whether the face blades are horizontal or vertical. These grilles are available in aluminum also for use in shower rooms and other humid areas. Throw and NC values depend greatly on the setting of the blades. When blades are straight the throw is maximized and noise is minimized. One fast way to size supply grilles is to select the size for an inlet velocity of 500 fpm maximum. This

results in NC values around 20 with straight vanes and even inlet distribution.

Often grilles must be installed with the inlet duct perpendicular to the inlet. This results in uneven flow through the grille which increases noise and alters the direction of the flow. The best solution is to turn toward the grille with a full-size elbow with turning vanes. If the elbow can not be full-size then a note should be put on the drawing instructing that the turning vanes be individually positioned parallel to the airflow in an elbow which has a larger outlet than inlet.

RETURN AND EXHAUST GRILLES

Return grilles should be located to minimize short-circuiting of the supply air. This occurs when supply air enters the return grille without mixing with room air. Locating return grilles low in side walls is very effective, but it is expensive, adds pressure drop and limits furniture locations. Most systems use ceiling return grilles located as far from supply outlets as possible.

Return grilles have little effect on temperature uniformity and room airflow patterns, but can be used to "cool" areas with minor loads. If possible return grilles should be located to capture heat off of equipment. In tall spaces grilles can often be located to capture stratified high temperature air. Higher return temperatures reduce the supply cfm needed as the delta-T increases.

Return grilles are sized based on NC values and pressure drop. Pressure drop is often critical in return air systems as there are no VAV boxes to direct the air. Pressure drop must be particularly low for grilles which act as transfer grilles to minimize pressure differentials between rooms. "Normal" design criteria are NC30 or 0.05 inches pressure drop. These criteria result in face velocities of 400 fpm for single-deflection wall grilles handling less than 2000 cfm. Lower velocities are needed for larger grilles to control noise. Perforated ceiling return grilles can handle very large volumes of air. If they are ducted the size of the flexible duct is normally the limiting factor.

Plenum return grilles (**RG-P** See Figure 16) are often used in order to eliminate the expense of return ductwork. Because they are open to the plenum above they must be located away from VAV boxes and other noise sources. Sound transmission between rooms should also be considered when locating plenum return grilles.

When ducted return is desired **RG-1** which is a perforated face with a round duct collar is normally used. See Figure 17.

EG-1 is normally used for wall mounted return and exhaust grilles. The 40 degree deflection blades make the grille sight tight from most locations. See Figure 18.

Return air can be taken through light fixtures. Two types are available - those which take the air through the lamp cavity and those which take the air around the lamp cavity. Either of these designs can eliminate or reduce the number of return grilles. This saves money and is often desirable to the architect. The units which take return air through the lamp cavity remove much of the lamp heat before it reaches the occupied space. This reduces the supply flow rate needed. This also cools the lamps which causes their light output and energy consumption to decrease. Efficiency may go up or down. If you use light fixtures for return inlets, coordinate the types and locations with the electrical engineer. The inlets are generally knockouts and he must specify that they be opened.

Door grilles such as **DG-1** (Figure 19) are often used to transfer air between spaces which do not require acoustical privacy. Door grilles are generally sized for 100 fpm face velocity. Doors without gasketing will generally pass 40 cfm at 0.03" pressure drop through edge cracks. With a 3/4" undercut 100 cfm is possible at 0.03". Undercuts and door grilles must be coordinated with the architect.

CALCULATING THROW

Throw values are normally taken from manufacturer's literature. If you must extrapolate data the throw is proportional to cfm and inversely proportional to the terminal velocity selected. ASHRAE Fundamentals gives detailed calculations of the throw of isothermal jets.

The throw of exposed outlets is approximately 70% of the throw of outlets located at the ceiling.

The characteristic length of a space is the distance in plan view from the center of the outlet to the edge of the area which the diffuser must condition. Outlets should be selected so that the throw listed in Figure 6 is between 1 and 2 times the characteristic length for rooms with 8 foot ceilings.

If obstructions occur in the ceiling the supply air can be directed directly downward. This is the most common cause of dumping complaints.

SOUND DATA

All diffuser sound data should be based on 8dB room attenuation and referenced to 10EE-12 watts. Check catalogs carefully. Many use much higher room attenuation values. Uneven entrance conditions

can add 15 dB to the rated NC values. Volume dampers in outlets can cause very high noise levels when throttled and also increase noise greatly when open. Dampers should be located in the ductwork as far as possible from the outlets.

FIRE RATED CEILINGS

Diffusers which penetrate rated ceilings must have UL listed **ceiling dampers** installed. Ceiling dampers differ from fire dampers in that they contain insulation to prevent radiated heat from igniting the construction above. Special ceiling diffuser are manufactured by several companies.

1. Exterior walls are shown with heavy lines.
2. The primary air is shown by the clear envelopes.
3. The total air is shown by the diagonally lined envelopes.

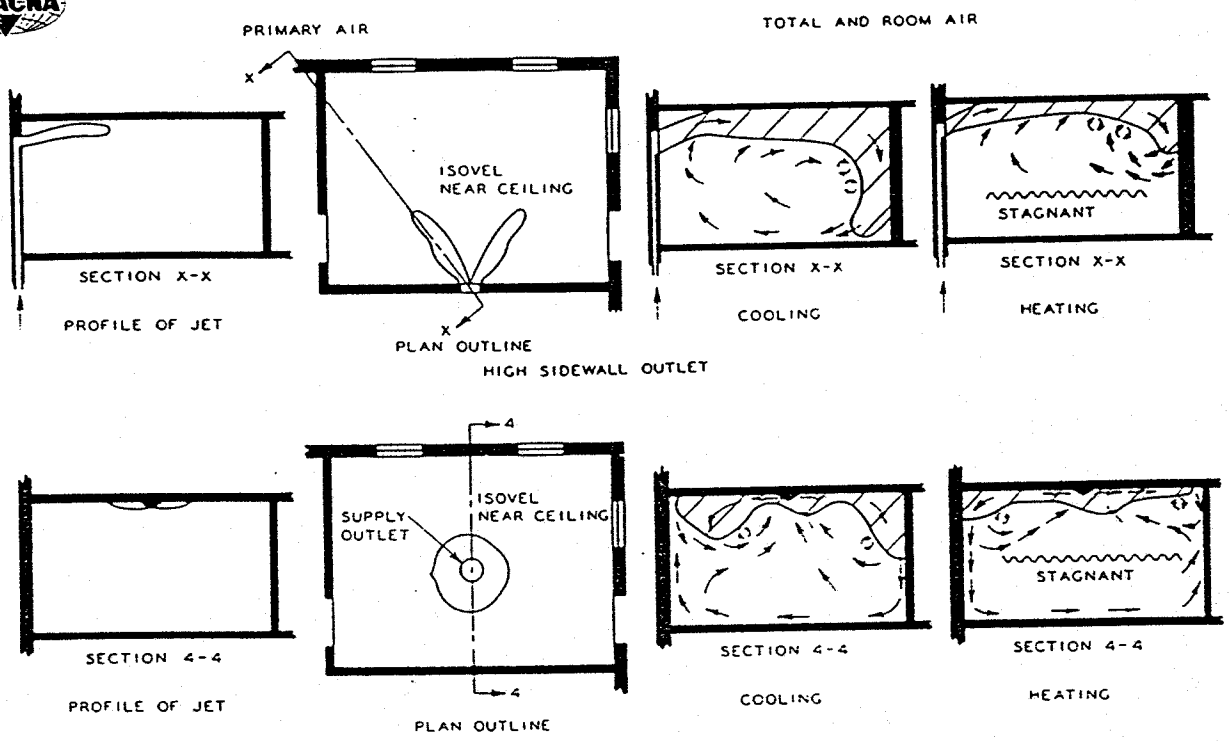

Figure 3-5 AIR MOTION CHARACTERISTICS OF GROUP A OUTLETS (2) Figure 1

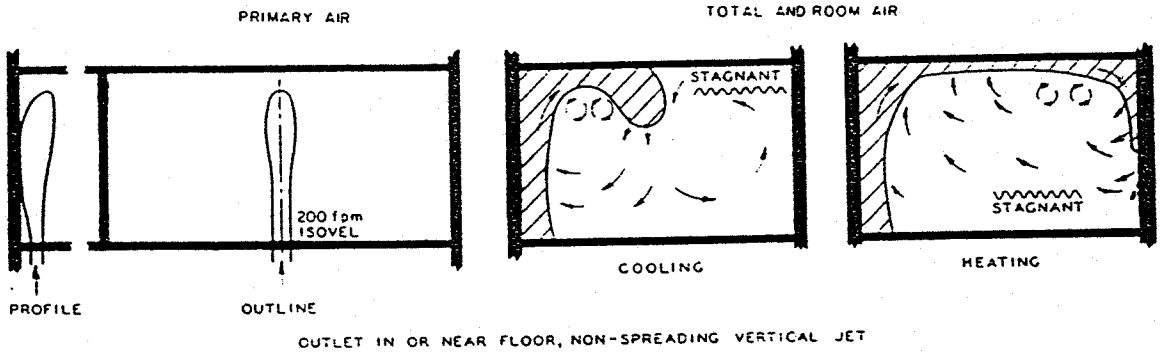

FIGURE 3-6 AIR MOTION CHARACTERISTICS OF GROUP B OUTLETS (2)

Figure 2

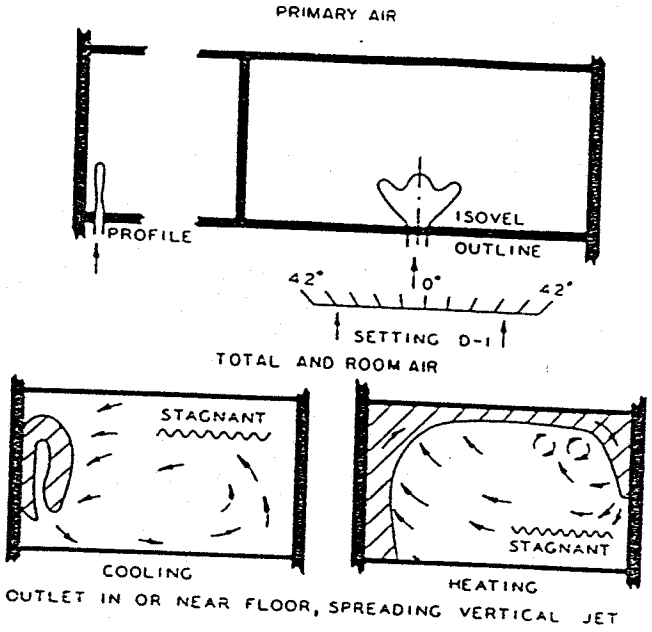

Figure 3-7 AIR MOTION CHARACTERISTICS OF GROUP C OUTLETS (2)

Figure 3

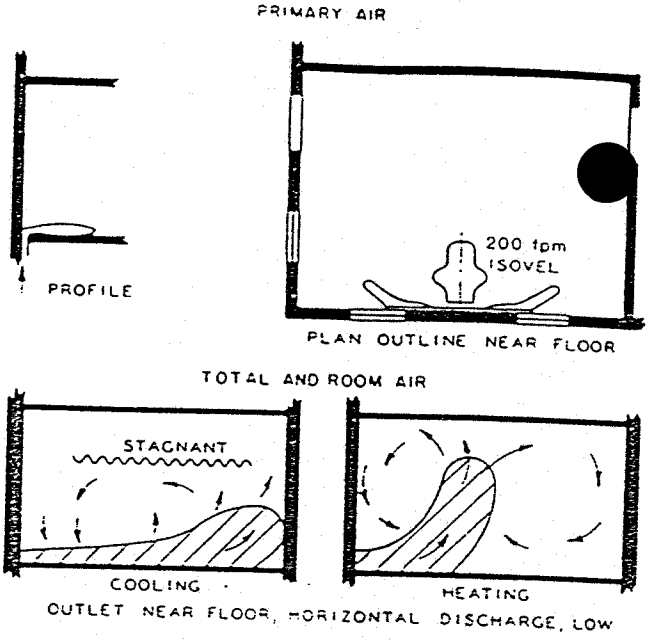

Figure 3-8 AIR MOTION CHARACTERISTICS OF GROUP D OUTLETS (2)

Figure 4

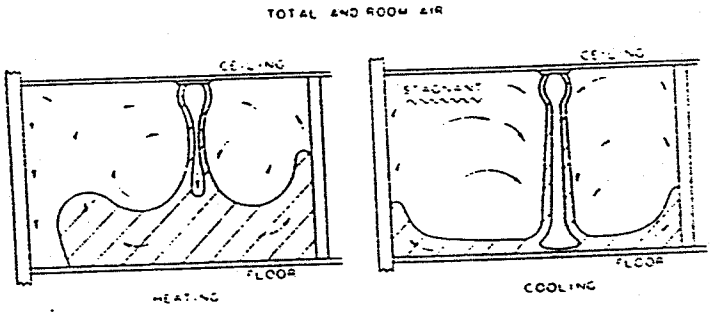

Figure 3-9 AIR MOTION CHARACTERISTICS OF GROUP E OUTLETS (2)

Figure 5

1. Exterior walls are shown with heavy lines.
2. The primary air is shown by the clear envelopes.
3. The total air is shown by the diagonally lined envelopes.

GRILLES REGISTERS & DIFFUSERS SCHEDULE NOTE 2

MBOL	MAT'L.	TYPE	MARGIN	INLET SIZE	FACE SIZE	FINISH	MANUFACTURER	MODEL	REMARKS	ALTERNATE MANUFACTURERS AND MODELS	MAX. CFM NOTE 10	TOTAL PRESSURE ΔP_T DROP (11)	NOTE 7 T_{50}
CD-1	STEEL	LAY-IN	–	6"ø	24X24	WHITE	TUTTLE & BAILEY	DM 2406	NOTES 5, 8, & 10	KRUEGER 1400 CARNES SFTA 2406	140	0.05	8
CD-1				8"ø				DM 2408		KRUEGER 1400 CARNES SFTA 2408	220	0.09	11
CD-1				10"ø				DM 2410		KRUEGER 1400 CARNES SFTA 2410	380	0.06	14
CD-1				12"ø				DM 2412		KRUEGER 1400 CARNES SFTA 2412	500	0.05	14
LD-1	STEEL	SLOT	–	8"ø	48X4 1/2	WHITE	KRUEGER	PTBSI 50 3 SLOT	NOTES 1, 3, & 11	TUTTLE & BAILEY PCD-H2	200	0.13	20
LD-1				10"ø	48X5 1/4			PTBSI 75 3 SLOT	NOTES 1, 3, 4, & 11		300	0.15	27
LD-1				12"ø	48X6			PTBSI 150 3 SLOT			400	0.16	32
LD-2	ALUM.	SLOT	1"	SEE DRAWINGS	–	–	TUTTLE & BAILEY	4100-E0	NOTE 9			NOTE 9	NOTE 9
SG-1	STEEL	DOUBLE DEFLECTION	1 1/4"	SEE DRAWINGS	–		TUTTLE & BAILEY	T64	NOTE 9	KRUEGER 880V CARNES RSDAV	500 FPM	NOTE 9	NOTE 9
=													
RG-P	STEEL	PERFORATED	–	24X24	24X24	WHITE	KRUEGER	1196-A	NOTES 5 & 6	TUTTLE & BAILEY CTPVL4 CARNES SPHB 22400	1000	0.027	–
RG-1	STEEL	PERFORATED	–	8"ø	24X24		CARNES	SPRB 22408	NOTES 5		250	0.063	–
RG-1			–	10"ø	24X24		CARNES	SPRB 22410			400	0.067	–
RG-1			–	12"ø	24X24		CARNES	SPRB 22412			550	0.07	–
RG-2	STEEL	PERFORATED	–	22X22	24X24		KRUGER	1196	NOTES 5	TUTTLE & BAILEY CTRL4 CARNES SPIB 22422	1000	0.027	–
DG-1	ALUM.	SIGHT-TIGHT	1"	SEE DRAWINGS	–	NOTE 12	TUTTLE & BAILEY	A980WF			100 fpm	0.020	—
EG-1	STEEL	40° DEFLECTION	1 1/4"	SEE DRAWINGS	–		TUTTLE & BAILEY	T70D	NOTE 9	KRUEGER S80H	3-500 FPM	NOTE 9	NOTE 9

TES:

WITH 1/4" INTERNAL INSULATION. PATTERN ADJUSTABLE RIGHT, LEFT AND DOWN FOR EACH SLOT. BLACK INTERIOR. WHITE CENTER TEES FURNISHED. SIDE TEES BY G.C. FOR T-BAR CEILING.

NO GRILLE OR DIFFUSER SHALL HAVE A VOLUME DAMPER INCLUDED UNLESS SPECIFICALLY NOTED ON THE PLANS OR IN THIS SCHEDULE.

THROW BASED ON 2 SLOTS IN ONE DIRECTION.

TALLER THAN STANDARD CONSTRUCTION TO ALLOW ROUND INLET. OVAL INLET IS NOT ACCEPTABLE.

WITH FRAME FOR T-BAR CEILING.

FOR RETURN AIR PLENUM. NO DUCT CONNECTION.

THROW BASED ON ISOTHERMAL AIR WITH 50 FPM TERMINAL VELOCITY PER ADC STANDARD 1062-GRD-84.

STAMPED CONSTRUCTION, 4-WAY PATTERN, REMOVABLE INNER CORE.

MUST BE SPECIFIED ON AN INDIVIDUAL BASIS, BECAUSE OF THE VARIABILITY IN SIZE.

MAXIMUM CFM BASED ON 700 FPM INLET VELOCITY OR NC32 WHICHEVER IS LESS. NC BASED ON 8dB ROOM EFFECT RE:10^{-12} WATTS.

. MAXIMUM CFM BASED ON 600 FPM INLET VELOCITY OR NC32 WHICHEVER IS LESS. NC BASED ON 8dB ROOM EFFECT RE:10^{-12} WATTS.

2. WHITE OR GRAY FINISH SUITABLE FOR FIELD PAINTING BY GC.

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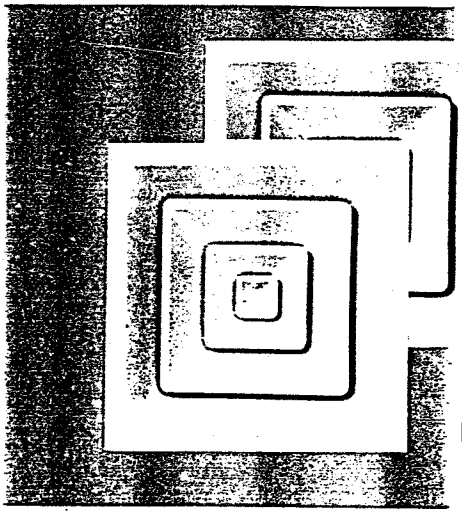
Figure 6

SQUARE DIFFUSERS W/FIXED PATTERN STEP DOWN CORE
DM

CD-1

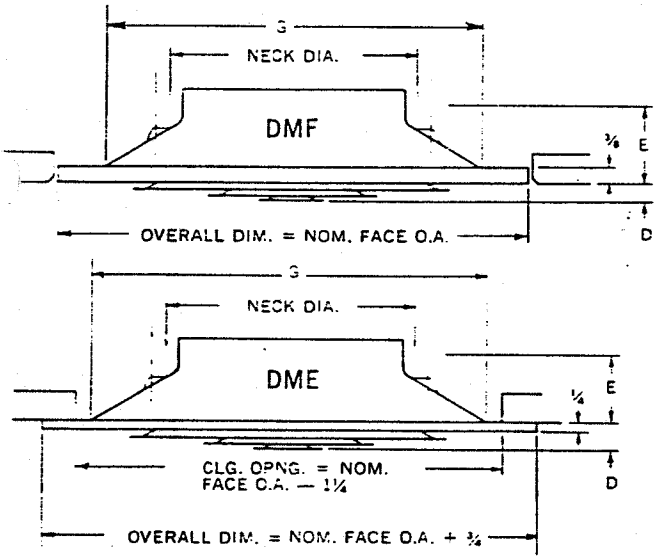
Tuttle & Bailey

STEEL



DMF Diffuser

DME Diffuser



DIMENSIONS

Listed Size	Neck Dia.	Nominal Face Overall	D		E ± 1/8		G
			DME	DMF	DME	DMF	
1206	6	12 x 12	1	¾	1 1/16	1 5/16	10¼
1208	8	12 x 12	1	¾	1 1/16	1 7/16	10¼
1608	8	16 x 16	1	—	2 1/16	—	14½
2010	10	20 x 20	1 1/16	—	3 1/16	—	18⅛
2406	6	24 x 24	1	⅞	1 1/16	1 5/16	10¼
2408	8	24 x 24	1	⅞	1 1/16	1 7/16	10¼
2410	10	24 x 24	1 1/16	15/16	3 1/16	3⅛	18⅛
2412	12	24 x 24	1 1/16	15/16	3 1/16	4 1/16	22¼
2415	15	24 x 24	1 1/16	15/16	3 1/16	3⅛	22¼

All Dimensions in Inches

ACCESSORIES

Dampers
Control Grids
Duct Rings

For Ceiling or Exposed Duct Installation

DM Supply Diffusers with integral round necks are recommended for heating, ventilating and cooling, and are equipped with moderately stepped down cores for moderate increase of performance range. Round-neck-to-square-face construction results in a 360° air diffusion pattern similar to a full round diffuser. High diffusion induction rates result in rapid temperature and velocity equalization of the mixed air mass well above the zone of occupancy. Horizontal performance assures confident use of cooling temperature differentials of 30°F and greater, at predicted low air motion (35 fpm) in the zone of occupancy. DM Supply Diffusers perform efficiency with air loadings of 6 to 24 air changes per hour (based on 10-ft. ceiling height), and sound level range of NC 25 to 35.

FEATURES

- Removable center core affords access to accessories. All accessory adjustments easily made without disturbing ceiling.
- Cores are interchangeable with DF diffusers in the field. Changeover cores without disturbing ceiling.
- DME diffusers are equipped with overlap margins designed to cover ceiling opening and minimize dirt development on ceiling.
- DMF diffusers are styled to fit flush tile ceilings; overall diffuser dimensions match standard tile size.
- Duct straps for mounting furnished as standard on overlap and flush tile ceiling mountings. Diffuser duct strap fastens directly to duct with concealed fasteners; margins fit tight to ceiling for optimum ceiling appearance.
- DM diffusers can be equipped with margins and leveling clips for installation on lay-in T-Bar ceilings (DML4, DML2, DMLS); concealed spline (DMSP); snap-in metal pan (DMST); Simplex metal pan (DMSX); radiant metal pan (DMBM); other ceiling system coordinations available. Contact factory for margin submittals. When specified as DML4, DML2, DMLS or DMSP, the diffuser neck is a collar which fits rigid or flexible connecting ducting. (See page 14 for panel sizes.)
- Diffusers and accessories are constructed of steel.
- Baked White enamel finish.

HOW TO SPECIFY

Listed size, W finish.

Notes:

1. See Engineering Section for diffuser application data.
2. See Accessory Section, page 41.

Figure 7

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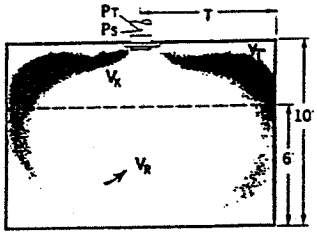
CD-1

ENGINEERING PERFORMANCE DATA

Listed Size Outlet Area		FACE VELOCITY 400	500	600	700	800	1000	1200	1400	1600	1800
1206	CFM	55	70	85	100	110	140	170	195	225	250
2406	P_s	<.01	.01	.015	.02	.025	.04	.06	.08	.10	.13
	Throw	1.5	2	2.5	3	3.5	4	5	5.5	6.5	7.5
A_K .14	NC	X	X	X	X	X	X	X	X	20	23
1208	CFM	70	90	110	125	145	180	215	250	290	325
2408	P_s	<.01	.01	.017	.02	.03	.045	.064	.086	.11	.14
	Throw	2	2.5	3	3.5	4	4.5	5.5	6.5	7.5	8.5
A_K .18	NC	X	X	X	X	X	X	X	20	22	28
1608	CFM	100	125	150	175	200	250	300	350	400	450
	P_s	<.01	.012	.02	.025	.033	.05	.072	.10	.13	.17
A_K .25	Throw	2.5	3	3.5	4	4.5	5.5	6.5	7.5	9	10
	NC	X	X	X	X	X	X	X	22	27	32
2010	CFM	155	195	235	275	310	390	470	545	625	700
2410	P_s	.01	.015	.022	.03	.04	.06	.09	.12	.15	.20
	Throw	2.5	3.5	4	5	5.5	7	8.5	9.5	11	12.5
A_K .39	NC	X	X	X	X	X	20	24	30	34	39
2412	CFM	235	295	355	415	470	590	710	825	945	1060
	P_s	.01	.018	.025	.035	.045	.07	.10	.14	.18	.24
A_K .59	Throw	3.5	4	5	6	6.5	8.5	10	12	13.5	15
	NC	X	X	X	X	X	20	24	28	33	36
2415	CFM	300	375	450	525	600	750	900	1050	1200	1350
	P_s	.013	.02	.03	.038	.05	.075	.11	.16	.24	.34
A_K .75	Throw	4	5	5.5	6.5	7.5	9.5	11.5	13.5	15	17
	NC	X	X	X	X	X	20	25	30	34	38

Terminal velocity 100 FPM.
X indicates < NC 20.



Listed Size	1206	1208	1608	2010	2406	2408	2410	2412	2415
V. Outlet Velocity	500	600	700	800	900	1000	1200	1400	1600
P_T w/#4 Damper	.02	.03	.04	.05	.06	.08	.11	.16	.20
P_S w/#4 Damper	.01	.02	.02	.03	.04	.05	.07	.09	.12
P_T w/o #4 Damper	.02	.02	.03	.04	.05	.06	.09	.12	.16
P_S w/o #4 Damper	.01	.01	.02	.02	.03	.03	.04	.06	.08

NOTES:

- Pressure Accuracy ± .01" or 10% whichever is greater.
- When Diffusers are used on exposed duct, multiply the throw (T) by .7.
- Terminal velocity 100 FPM.

SYMBOLS **Ps** Static Pressure Inches H_2O
NC Re 8db Room Attenuation

Add 10 to NC values

Figure 8

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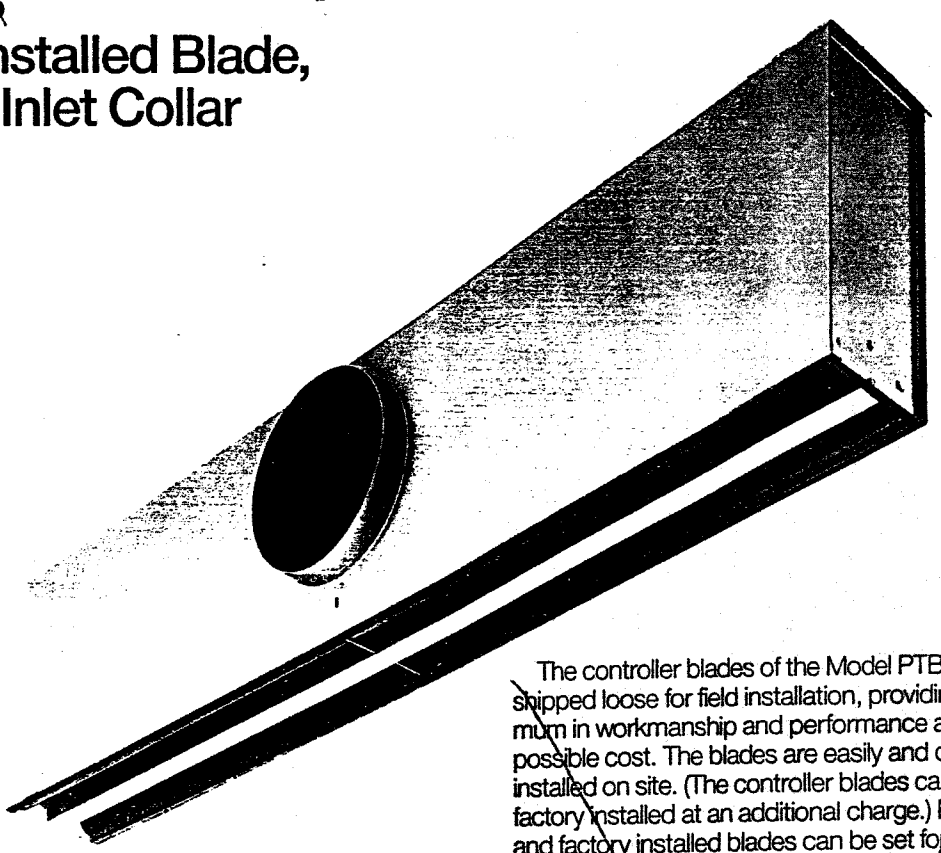
LD-1

PTBSS
Field-Installed Blade, Drawn Inlet Collar



The controller blades of the Model PTBSS are shipped loose for field installation, providing the optimum in workmanship and performance at the lowest possible cost. The blades are easily and quickly installed on site. (The controller blades can also be factory installed at an additional charge.) Both loose and factory installed blades can be set for left, right or vertical airflow after the diffuser is installed.

The PTBSS also features an inlet collar that is drawn from the diffuser plenum wall, eliminating the leakage that can occur at a mechanically fastened collar. A generous 1⅛" or greater depth of collar makes duct connections easy.

A high capacity slot diffuser, the PTBSS can handle a large volume of air at low pressure drops and noise levels. The PTBSS is well suited for variable air volume operation. With its aerodynamically curved blade design, the diffuser projects a tight blanket of air across the ceiling, from minimum to maximum flow.

Features

- Inlet collar drawn from diffuser plenum wall, eliminating leakage
- Steel curved blade
- Economical—blades shipped loose for field installation
- Double metal thickness at slot face for rigidity and straightness
- Choice of one or two slots
- Slot width selections: 1" (PTBS100S) and 1½" (PTBS150S)
- Available lengths: 24", 30", 36", 48" and 60"
- Standard finish: black face, deflectors and factory installed center tee; white optional T-bars

Additional Models

- PTBSSI insulated
- PTBSS-FB factory installed blades
- PTBSSI-FB factory installed blades with insulation

Figure 9

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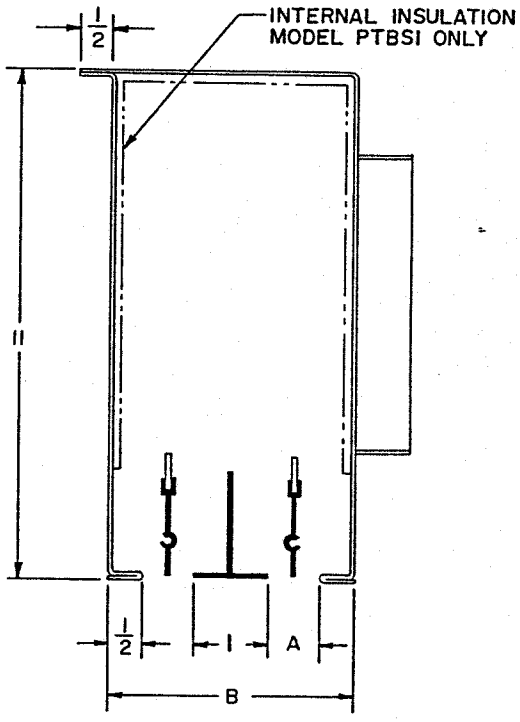
LD-1

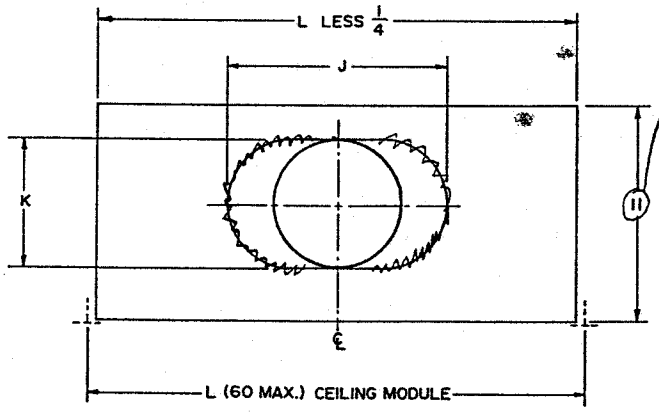
4 # Specification Drawings

PTBS50, 75, 100, 125, 150
PTBSI50, 75, 100, 125, 150
One, Two, Three and Four Slot

"I" Indicates Insulated Unit



Model	A	B			
		1 Slot	2 Slot	3 Slot	4 Slot
PTBS-PTBSI50	½	1½	3	4½	6
PTBS-PTBSI75	¾	1¾	3½	5¼	7
PTBS-PTBSI100	1	2	4	6	8
PTBS-PTBSI125	1¼	2¼	4½	6¾	9
PTBS-PTBSI150	1½	2½	5	7½	10



Inlet Size	J	K	L
~~5 Round~~	~~4⅞~~		~~24, 30, 36~~
6 Round	5⅞	–	24, 30, 36, 48, 60
~~7 Round~~	~~6⅞~~	–	~~24, 30, 36, 48, 60~~
8 Round	7⅞	–	24, 30, 36, 48, 60
~~9 Oval~~	~~9⅞~~	~~7⅞~~	~~24, 30, 36, 48, 60~~
10 ~~Oval~~ Round	~~X~~10	~~7⅞~~	24, 30, 36, 48, 60
12 ~~Oval~~ Round	~~11⅞~~ 12	~~7⅞~~	48, 60

Figure 10

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LD-1

PTBS • ¾" Slot

3 Slot

		CFM	75	112	150	187	225	262	300
		NC	12	20	26	31	35	38	41
		Throw	5-8-16	8-12-20	11-16-24	13-19-27	16-20-29	18-22-32	19-24-34
24" Long	Total Press. at Inlet Size	5	.06	.14	.25	.40	.58	.79	1.03
		6	.04	.10	.17	.28	.40	.54	.71
		7	.03	.07	.13	.20	.29	.40	.52
		8	.02	.05	.09	.15	.22	.30	.39
		9	.02	.05	.09	.14	.20	.27	.36
		10	.02	.05	.09	.14	.20	.27	.36
		CFM	93	140	187	234	281	328	375
		NC	12	20	26	31	35	38	41
		Throw	6-9-18	9-13-23	12-18-27	15-21-30	18-23-33	20-25-35	22-27-38
30" Long	Total Press. at Inlet Size	5	.08	.18	.32	.50	.73	.99	1.29
		6	.05	.12	.22	.35	.50	.68	.89
		7	.04	.09	.16	.25	.36	.50	.65
		8	.03	.07	.12	.19	.28	.38	.49
		9	.02	.06	.10	.16	.24	.32	.42
		10	.02	.05	.09	.14	.20	.27	.36
		CFM	112	168	225	281	337	393	450
		NC	12	20	26	31	35	38	41
		Throw	6-10-20	10-15-25	13-20-29	16-23-33	20-25-36	22-27-39	24-29-41
36" Long	Total Press. at Inlet Size	5	.09	.21	.38	.60	.87	1.19	1.55
		6	.06	.15	.26	.42	.60	.82	1.07
		7	.04	.11	.19	.30	.44	.60	.78
		8	.03	.08	.14	.23	.33	.45	.59
		9	.03	.07	.12	.20	.28	.39	.51
		10	.02	.06	.11	.17	.25	.34	.45
		CFM	150	225	300	375	450	525	600
		NC	12	20	26	31	35	38	41
		Throw	7-11-23	11-17-29	15-23-34	19-27-38	23-29-41	26-32-45	27-34-48
48" Long	Total Press. at Inlet Size	6	.08	.20	.35	.56	.80	1.09	1.43
		7	.06	.14	.26	.40	.58	.80	1.04
		8	.04	.11	.19	.31	.44	.61	.79
		9	.04	.09	.17	.26	.38	.52	.68
		10	.03	.08	.15	.23	.33	.46	.60
		12	.03	.06	.12	.18	.27	.37	.48
		CFM	187	281	375	468	562	656	750
		NC	12	20	26	31	35	38	41
		Throw	8-13-26	13-19-33	17-26-38	21-30-42	26-33-46	29-35-50	31-38-54
60" Long	Total Press. at Inlet Size	6	.11	.25	.44	.70	1.00	1.37	1.79
		7	.08	.18	.32	.51	.73	1.00	1.30
		8	.06	.14	.24	.39	.56	.76	.99
		9	.05	.12	.21	.33	.48	.65	.85
		10	.04	.10	.18	.29	.42	.57	.75
		12	.03	.08	.15	.23	.34	.46	.60

4 Slot

		CFM	100	150	200	250	300	350	400
		NC	12	20	26	31	35	38	41
		Throw	6-9-19	9-14-24	12-19-27	16-22-31	19-24-34	21-26-37	22-27-39
24" Long	Total Press. at Inlet Size	5	.08	.19	.34	.54	.77	1.06	1.38
		6	.05	.13	.23	.37	.53	.73	.95
		7	.04	.09	.17	.27	.39	.53	.69
		8	.03	.07	.13	.20	.29	.40	.53
		9	.02	.06	.11	.17	.25	.35	.45
		10	.02	.05	.10	.15	.22	.30	.40
		CFM	125	187	250	312	375	437	500
		NC	12	20	26	31	35	38	41
		Throw	7-10-21	10-16-27	14-21-31	17-24-34	21-27-38	23-29-41	25-32-44
30" Long	Total Press. at Inlet Size	5	.10	.24	.43	.67	.97	1.32	1.73
		6	.07	.16	.29	.46	.67	.91	1.19
		7	.05	.12	.21	.34	.49	.66	.87
		8	.04	.09	.16	.26	.37	.50	.66
		9	.03	.08	.14	.22	.32	.43	.57
		10	.03	.07	.12	.19	.28	.38	.50
		CFM	150	225	300	375	450	525	600
		NC	12	20	26	31	35	38	41
		Throw	7-11-23	11-17-29	15-23-34	19-27-38	23-29-41	26-32-45	27-34-48
36" Long	Total Press. at Inlet Size	5	.12	.29	.51	.81	1.16	1.59	2.07
		6	.08	.20	.35	.56	.80	1.09	1.43
		7	.06	.14	.26	.40	.58	.80	1.04
		8	.04	.11	.19	.31	.44	.61	.79
		9	.04	.09	.17	.26	.38	.52	.68
		10	.03	.08	.15	.23	.33	.46	.60
		CFM	200	300	400	500	600	700	800
		NC	12	20	26	31	35	38	41
		Throw	9-13-27	13-20-34	18-27-39	22-31-44	27-34-48	30-37-52	32-39-55
48" Long	Total Press. at Inlet Size	6	.11	.26	.47	.74	1.07	1.46	1.91
		7	.08	.19	.34	.54	.78	1.06	1.39
		8	.06	.14	.26	.41	.59	.81	1.06
		9	.05	.12	.22	.35	.51	.70	.91
		10	.05	.11	.20	.31	.45	.61	.80
		12	.04	.09	.16	.25	.36	.49	.64
		CFM	250	375	500	625	750	875	1000
		NC	12	20	26	31	35	38	41
		Throw	10-15-30	15-22-38	20-30-44	25-34-49	30-38-54	33-41-58	36-44-62
60" Long	Total Press. at Inlet Size	6	.14	.33	.59	.93	1.34	1.85	2.39
		7	.10	.24	.43	.68	.98	1.33	1.74
		8	.08	.18	.33	.52	.74	1.01	1.33
		9	.07	.16	.28	.44	.64	.87	1.14
		10	.06	.14	.25	.39	.56	.76	1.00
		12	.05	.11	.20	.31	.45	.61	.80

Notes

1. Total pressures are in inches of water.
2. Data were obtained from tests conducted in accordance with ISO Standard 5279, ISO Standard 3741 and ADC Test Code 1062 GRD84.
3. Throw values are given for terminal velocities of 150, 100 and 50 FPM.
4. Throws listed for multi-slot diffusers are one-way. For divided airflow, select the throw in each direction according to the number of slots aimed in that direction, with the total airflow apportioned between slots. For example, a three-slot PTBS with ¾" slots 48" long handles a total of 375 CFM. Two slots blow left, the other blows right. From the table for two slots at 250 CFM, the throw is 16-22-31. From the table for one slot at 125 CFM, the throw is 11-15-22.
5. NC values are based on a room absorption of 10 dB, re 10^{-12} watts and an uninsulated diffuser.

NC ratings do not include the inlets

Figure 11

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