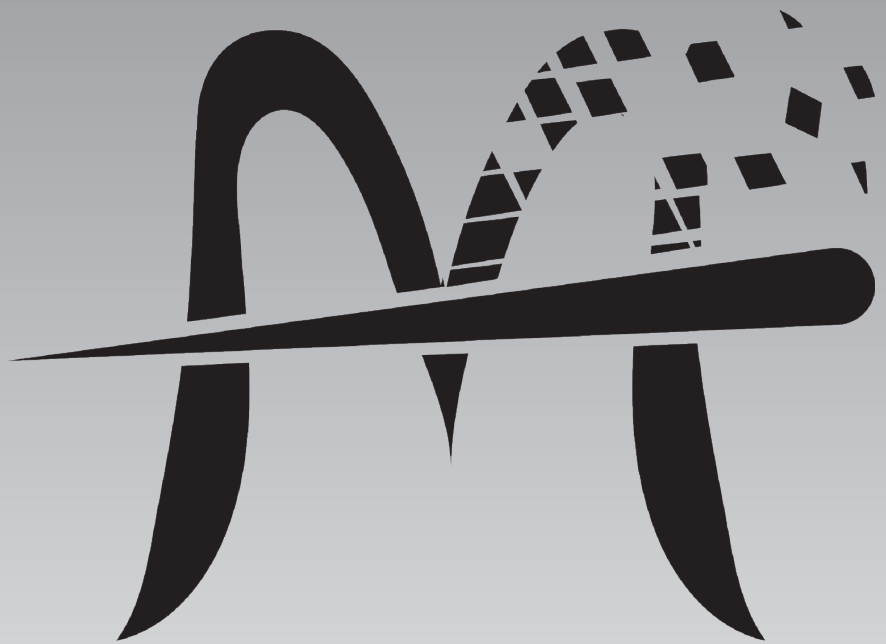
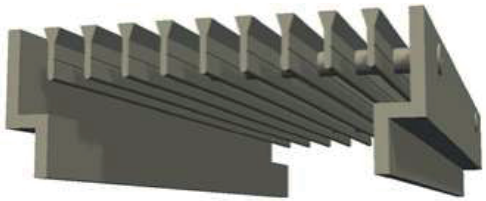


Makkah

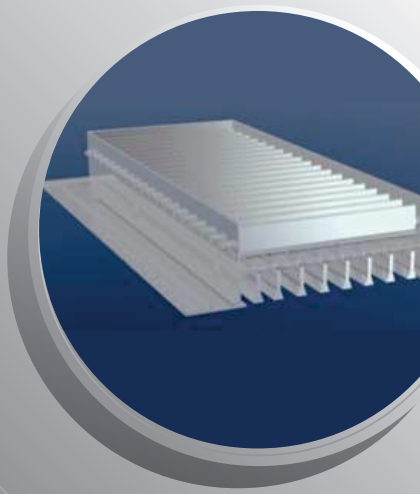
For Air Outlets



LINEAR BAR GRILLE (LBG)

Makkah LBG has standard finish of high quality, hard baked electrostatic powder coating for long life and easy cleaning. Standard color is white color RAL 9016, other colors available on request.

Makkah Customer support department technicians are available to take actual measurements on site on request.



Makkah extruded aluminum linear bar grille Model LBG is designed for use in wall, floor and ceiling applications to provide architectural excellence and outstanding performance flexibility.

PRODUCT DESCRIPTION

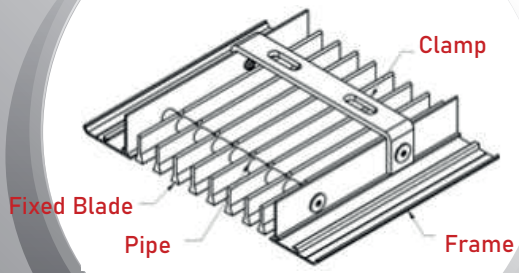
LBG comes in many models; supply (LBGS), return (LBGR), bar and blade (LBGB), bar and register (LBGG), core only (LBGC), frame without flange (LBGL) and floor grille (LBGF). These bar grilles are used in cooling, heating and other ventilation systems.

LBG is available in different core construction. Also LBG can be provided with unique curved designs as required

LINEAR BAR GRILLES RETURN

LBGR

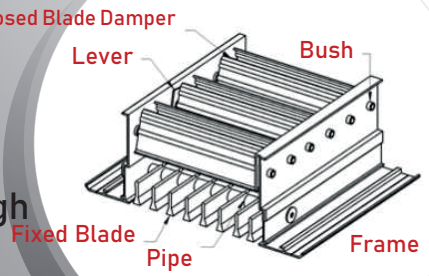
Is a linear bar grille composed of a set of fixed horizontal bars in the front face, used as a return grille.



LINEAR BAR GRILLES SUPPLY

LBGS

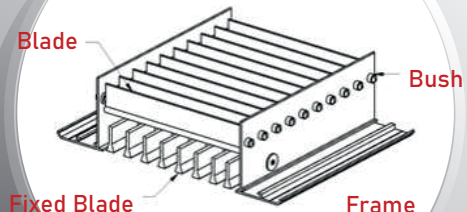
Is a linear bar grille composed of a set of fixed horizontal bars in the front face, with opposed bladedamper (OBD) supplied to achieve air flow control, lever operated through the face of the unit., used as a supply grille.



LINEAR BAR & BLADE GRILLES

LBGB

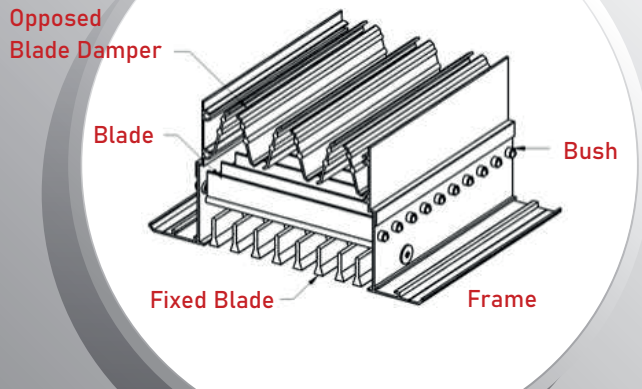
Is a linear bar grille composed of a set of fixed horizontal bars in the front face and individually adjustable vertical blades in the rear to control air flow pattern, used as a return grille.

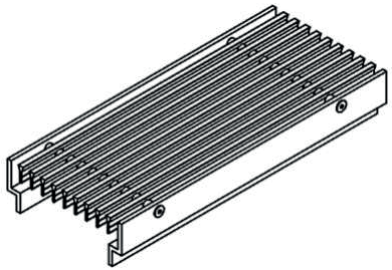


LINEAR BAR & BLADE REGISTER

LBGG

Is a linear bar grille composed of a set of fixed horizontal bars in the front face and individually adjustable vertical blades in the rear to control air flow pattern, used as a supply grille, opposed blade damper (OBD) supplied to achieve air flow control, lever operated through the face of the unit.

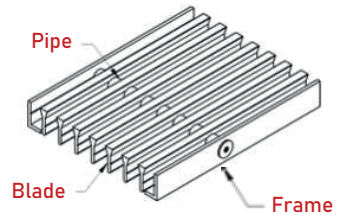




FLANGELESS BAR GRILLE

LBGL

Is a linear bar grille with flangeless frame used as a supply or return grille for recessed floor or ceiling air outlets. In recessed floor, it is not suitable for walk paths.



LINEAR FLOOR BAR GRILLE

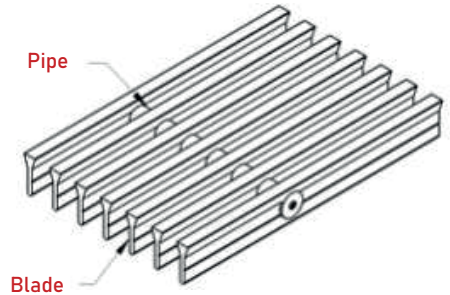
LBGF

Is a linear bar grille used as a supply or return grille for re-cessed floor air outlets. LBGF can stand up to1000 kg/m²load.

FRAMELESS BAR GRILLE

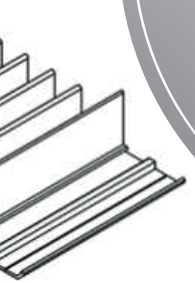
LBGC

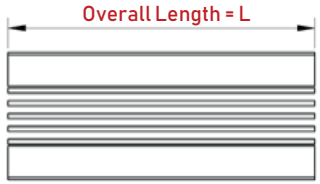
Is a linear bar grille core used as a supply or return grille for recessed floor or ceiling air outlets. In recessed floor, it is not suitable for walk paths.



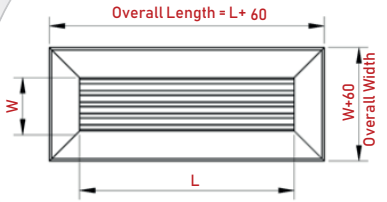
END CAP ARRANGEMENTS

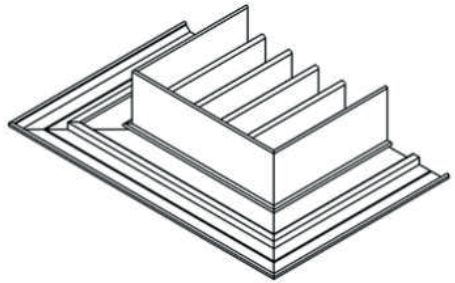
WITHOUT END CAP
Option W



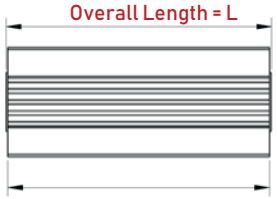


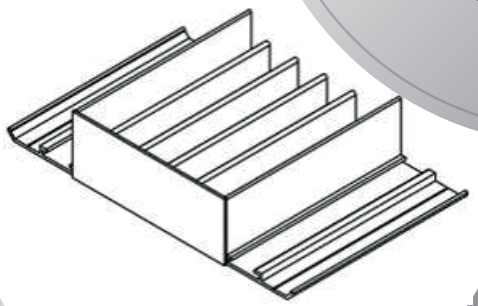
MITERED END CAP (STANDARD)
Option M





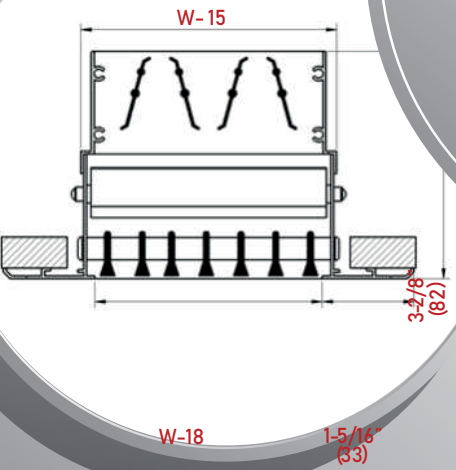
FLAT END CAP
Option C



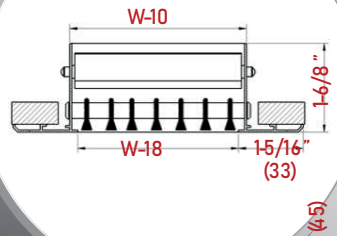


DIMENSIONAL DATA

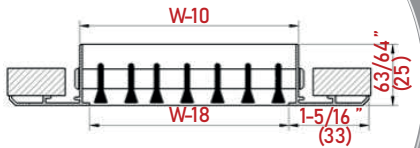
W = Ceiling or wall opening (width)



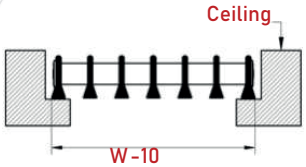
Linear Bar & Blade Register
LBGG



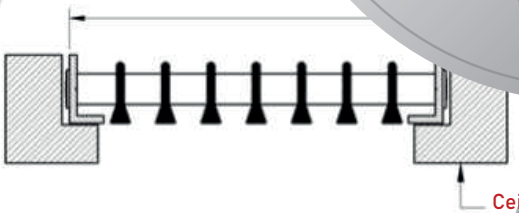
Linear Bar & Blade Grille
LBGB



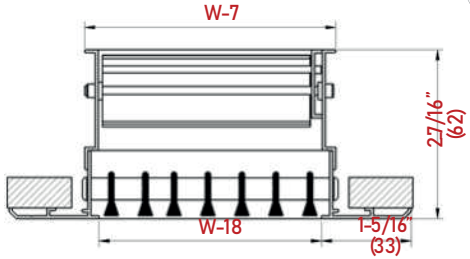
Linear Bar Grill Return
LBGR



Frameless Bar Grille
LBGL



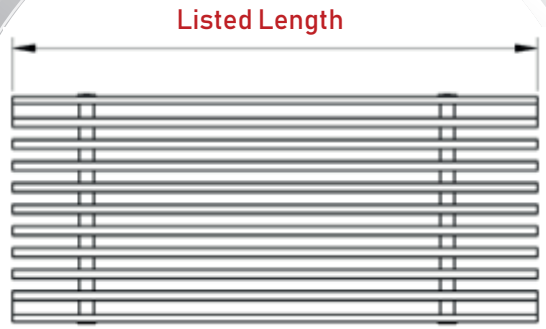
Frameless Bar Grille
LBGC

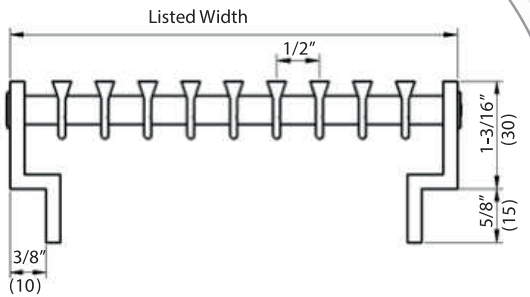


Linear Bar Grill Supply
LBGS

Listed Widths W(inches)

2	2½	3	3½	4	5	6	8	10

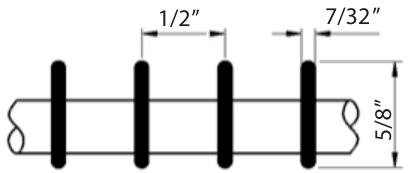




Floor Linear Bar Grille
LBGF

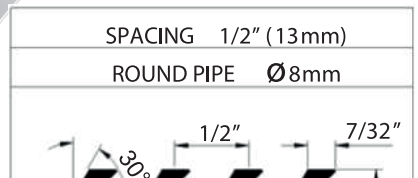
Blade Types

SPACING 1/2" (13mm)
ROUND PIPE Ø8mm



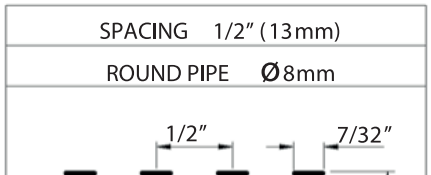
O° DEFLECTION FLAT

SPACING 1/2" (13mm)
ROUND PIPE Ø8mm



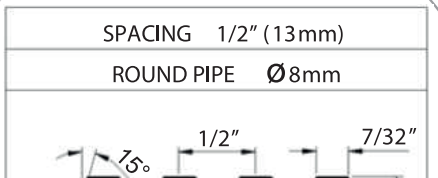
30° DEFLECTION

SPACING 1/2" (13mm)
ROUND PIPE Ø8mm



O° DEFLECTION "T"

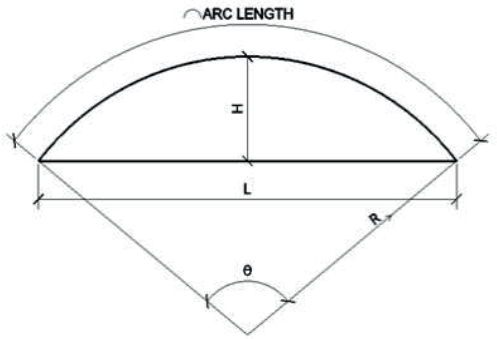
SPACING 1/2" (13mm)
ROUND PIPE Ø8mm



15° DEFLECTION

Dimensional Data —Curves

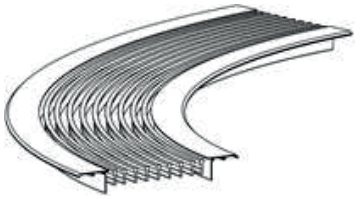
GRILLE SEGMENTS



θ =Angle
R=Radius
H=Segment height.
= R × (1-COS(θ /2))
L=Segment Length.
=2× R × (SIN (θ /2))
AL=Arc length
=θ × (p / 180) × R

CURVED LINEAR BAR GRILL FOR CEILING

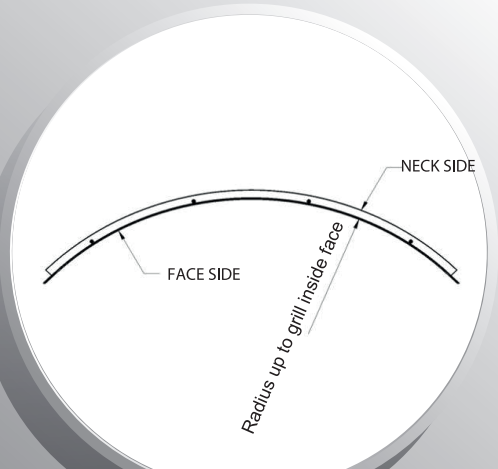
-Minimum radius for any curve or circular 1 meter.
-Curved section are supplied without OBD
-Minimum two dimensions are required for curves or please bring forma (a cut to actual carton).



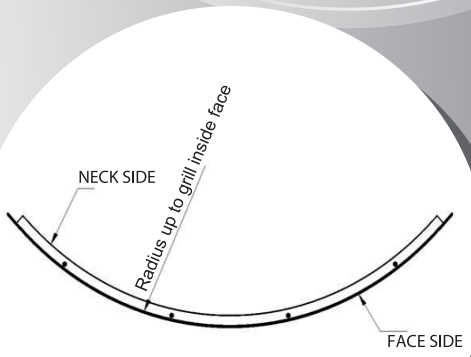
Dimensional Data —Curves

CURVED LINEAR BAR GRILL FOR WALL

INSIDE WALL



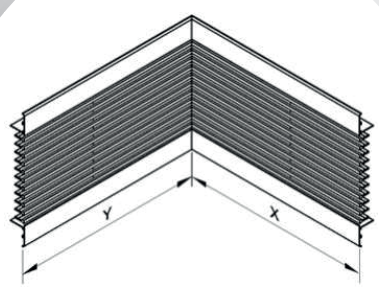
OUT SIDE WALL



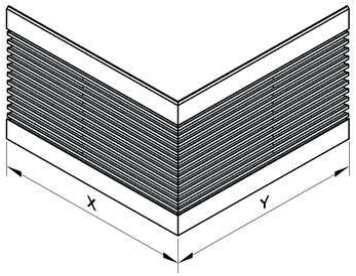
-Minimum radius for any curve or circular 1 meter.
-Curved section are supplied without OBD
-Minimum two dimensions are required for curves or please bring forma (a cut to actual carton).

Corner Pieces

SIDE WALL - INSIDE CORNER

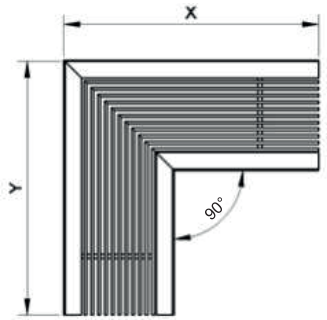


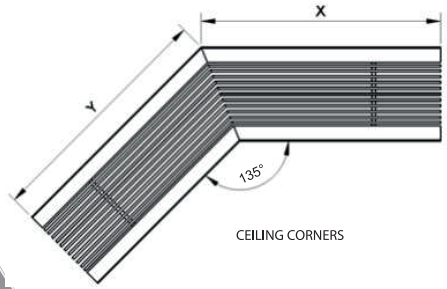
SIDE WALL - OUTSIDE CORNER



CORNER PIECES

X & Y = 16" (Minimum) Face to face.
Available standard angles 90° and 135°.





CEILING CORNERS

Performance Data

QUICK SELECTION TABLE

NOMINAL WIDTH	CFM/FOOT
2"	00- 20
3"	30-175
4"	50-225
5"	70-300
6"	90-350
8"	110 -400
10"	130 -450

SELECTION EXAMPLE

Required:

Linear bar grille on side wall to throw 1.5m³/s into the room (0°de-flection, "T" shape blades). The opening length shall be 2 meters. The required throw shall be 4meters and NC shall not exceed 35.
. What shall be the width?

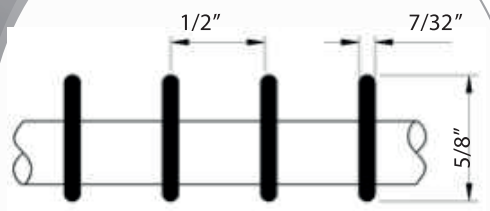
Solution:

-First we should calculate the flow per foot:
0.75m³/s = 1,589.2CFM AND 2m = 6.6ft Then:
Flow per foot = 1,589.2/6.6=240.8CFM/ft
-Throw = 4m = 13.1ft
-Then from performance table on page 12 we can see that 5'wide LBG can be suitable and will have noise rating of NC 34 and throw much larger than required. Whereas 10'wide LBG can be a better choice for more laminar flow as the throw shall be just slightly bigger than required throw.
-After consulting with the architect, you select any width between 5' and 10'.

SELECTION PROCEDURE

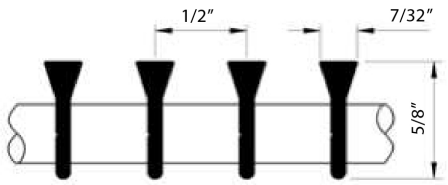
1. Determine air volume flow rate per outlet.
2. Calculate flow rate per foot.
3. For supply air grille application, establish required throw.
4. Establish required maximum noise and pressure values.
5. From the following performance tables select the most suitable width that meets the required throw (or more) at the calculated flow rate per foot, and meet required (or better) NC, and pressure values.

LINEAR BAR GRILL SUPPLY (performance data)
1/2"SPACING,0° DEFLECTION (flat bar)



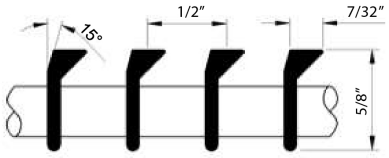
NOMINAL WIDTH (Inches)	AREA Sq. Ft. (Effective free area/ Linear foot)	VELOCITY (FPM)		400	600	800	1000	1200	1400	1600	1800	2000
		TOTAL PRESSURE (in. W.G.)		0.009	0.020	0.036	0.057	0.080	0.109	0.143	0.182	0.225
2	.055	Flow, CFM / Foot		22	33	44	55	66	77	88	99	110
		Throw, Feet	Sill or floor	1-1	4-4	7-7	9-10	11-12	14-16	16-18	17-20	19-21
			Sidewall	5-7	8-12	11-16	14-20	17-23	19-26	21-28	23-30	25-33
		NC		<20	<20	<20	<20	23	27	31	34	37
2½	.074	Flow, CFM / Foot		30	44	59	74	89	104	118	133	148
		Throw, Feet	Sill or floor	1-1	5-5	9-9	11-12	14-15	16-17	19-20	21-23	24-25
			Sidewall	6-8	9-13	13-17	16-21	18-24	21-28	24-31	27-35	31-39
		NC		<20	<20	<20	<20	22	26	30	33	36
3	.096	Flow, CFM / Foot		38	58	77	96	115	134	154	173	192
		Throw, Feet	Sill or floor	2-2	7-7	10-11	13-14	16-17	19-20	21-23	24-25	25-26
			Sidewall	7-10	10-14	14-19	17-23	20-26	24-30	27-34	30-38	33-41
		NC		<20	<20	<20	<20	22	26	30	33	36
3½	.116	Flow, CFM / Foot		46	69	93	116	139	162	186	209	232
		Throw, Feet	Sill or floor	3-3	8-8	12-12	15-16	19-20	21-23	24-25	26-27	29-29
			Sidewall	7-10	12-16	16-20	20-25	23-28	26-32	29-36	32-40	36-44
		NC		<20	<20	<20	<20	22	26	30	33	36
4	.139	Flow, CFM / Foot		56	83	111	139	167	195	222	250	278
		Throw, Feet	Sill or floor	3-3	9-9	13-13	16-17	20-21	23-24	25-26	27-27	30-30
			Sidewall	8-11	13-17	17-21	20-25	25-30	28-34	30-37	35-42	38-45
		NC		<20	<20	<20	<20	23	27	31	34	37
5	.179	Flow, CFM / Foot		72	107	143	179	215	250	286	322	358
		Throw, Feet	Sill or floor	4-4	10-10	14-14	18-18	22-23	24-24	27-28	30-31	32-32
			Sidewall	10-13	14-18	19-23	22-27	27-32	30-36	33-40	37-44	41-48
		NC		<20	<20	<20	<20	23	27	31	34	37
6	.221	Flow, CFM / Foot		88	133	177	221	265	310	354	398	442
		Throw, Feet	Sill or floor	5-5	10-10	15-15	18-18	23-23	25-25	28-28	31-31	32-32
			Sidewall	12-15	16-20	20-24	24-29	29-34	33-39	35-41	40-46	44-50
		NC		<20	<20	<20	<20	24	28	32	35	38
8	.272	Flow, CFM / Foot		109	163	218	272	326	381	435	490	544
		Throw, Feet	Sill or floor	6-6	11-11	16-16	19-19	24-24	26-26	29-29	32-32	33-33
			Sidewall	14-17	17-21	21-25	26-31	31-36	35-41	37-42	42-48	47-52
		NC		<20	<20	<20	20	25	29	33	36	39
10	.336	Flow, CFM / Foot		134	202	268	336	403	470	536	605	672
		Throw, Feet	Sill or floor	7-7	11-11	17-17	19-19	25-25	27-27	30-31	33-33	34-34
			Sidewall	16-19	18-22	22-26	28-33	33-38	37-445	39-43	44-50	51-54
		NC		<20	<20	<20	20	26	30	34	37	40

LINEAR BAR GRILL SUPPLY (performance data)
1/2"SPACING,0° DEFLECTION (T bar)



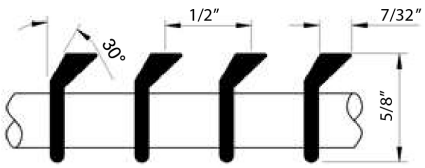
NOMINAL WIDTH (Inches)	AREA Sq. Ft. (Effective free area/ Linear foot)	VELOCITY (FPM)		400	600	800	1000	1200	1400	1600	1800	2000
		TOTAL PRESSURE (in. W.G.)		0.010	0.022	0.040	0.063	0.089	0.121	0.159	0.202	0.250
2	.045	Flow, CFM / Foot		18	27	36	45	54	63	72	81	90
		Throw, Feet	Sill or floor	1-1	4-4	7-7	9-10	11-13	14-16	16-18	17-20	19-21
			Sidewall	5-7	9-12	11-16	14-20	16-23	19-26	21-28	22-30	25-33
		NC		<20	<20	<20	<20	23	28	32	35	38
2½	.066	Flow, CFM / Foot		26	40	53	66	79	92	106	119	132
		Throw, Feet	Sill or floor	2-2	6-6	8-9	12-13	14-16	17-19	20-22	22-23	23-24
			Sidewall	6-9	9-12	12-17	16-22	19-25	21-28	25-32	28-36	30-39
		NC		<20	<20	<20	20	25	30	34	37	40
3	.088	Flow, CFM / Foot		35	53	70	88	106	123	141	158	176
		Throw, Feet	Sill or floor	2-2	7-7	10-11	13-15	16-18	19-21	22-24	24-25	26-27
			Sidewall	7-10	11-15	14-19	17-23	21-27	24-31	27-34	31-39	34-42
		NC		<20	<20	<20	21	26	31	35	38	41
3½	.110	Flow, CFM / Foot		44	66	88	110	132	154	176	198	220
		Throw, Feet	Sill or floor	3-3	8-8	12-12	15-16	19-20	21-22	24-25	26-27	29-29
			Sidewall	7-10	12-16	16-20	20-25	23-28	26-32	29-36	32-40	36-44
		NC		<20	<20	<20	22	27	32	36	39	42
4	.133	Flow, CFM / Foot		53	80	106	133	160	186	213	239	266
		Throw, Feet	Sill or floor	3-3	9-9	13-13	16-17	20-21	23-24	25-26	28-28	31-31
			Sidewall	8-11	13-17	17-21	21-26	25-30	28-34	30-37	35-42	38-46
		NC		<20	<20	<20	23	28	33	37	40	43
5	.177	Flow, CFM / Foot		71	106	142	177	212	248	283	318	354
		Throw, Feet	Sill or floor	4-4	10-10	15-15	18-18	22-23	25-25	27-28	30-30	34-34
			Sidewall	10-13	14-18	19-23	22-27	27-32	31-37	33-40	37-44	41-48
		NC		<20	<20	<20	24	29	34	38	41	44
6	.222	Flow, CFM / Foot		89	133	178	222	266	310	355	440	444
		Throw, Feet	Sill or floor	5-5	10-10	15-15	19-19	23-23	25-25	29-29	31-31	36-36
			Sidewall	11-14	16-20	20-24	24-29	29-34	33-39	35-41	40-46	44-50
		NC		<20	<20	<20	25	30	35	39	42	45
8	.274	Flow, CFM / Foot		110	164	219	274	329	384	438	493	548
		Throw, Feet	Sill or floor	6-6	11-11	16-16	20-20	24-24	26-26	30-30	32-32	37-37
			Sidewall	12-15	17-21	21-25	25-30	30-35	34-40	36-42	41-47	45-51
		NC		<20	<20	20	26	31	36	40	43	46
10	.338	Flow, CFM / Foot		135	203	270	338	406	473	541	608	676
		Throw, Feet	Sill or floor	6-6	11-11	16-16	21-21	25-25	26-26	32-32	33-33	38-38
			Sidewall	13-16	19-23	22-26	27-32	32-37	36-42	38-43	43-49	48-53
		NC		<20	<20	21	27	32	37	41	44	47

LINEAR BAR GRILL SUPPLY (performance data)
1/2"SPACING, 15° DEFLECTION



NOMINAL WIDTH (Inches)	AREA Sq. Ft. (Effective free area/ Linear foot)	VELOCITY (FPM)		400	600	800	1000	1200	1400	1600	1800	2000
		TOTAL PRESSURE (in. W.G.)		0.009	0.020	0.036	0.057	0.080	0.109	0.143	0.182	0.225
2	.056	Flow, CFM / Foot		22	34	45	56	67	78	90	101	112
		Throw, Feet	Sill or floor	1-1	4-4	7-7	9-10	12-13	14-16	16-18	17-20	19-21
			Sidewall	5-7	8-12	11-16	14-20	17-23	18-25	20-27	22-30	26-34
		NC		<20	<20	<20	25	30	35	39	43	46
2½	.075	Flow, CFM / Foot		30	45	60	75	90	105	120	135	150
		Throw, Feet	Sill or floor	1-1	5-5	8-9	11-12	14-15	16-18	19-21	21-22	22-23
			Sidewall	6-8	9-13	12-17	16-21	19-25	21-27	24-31	27-35	30-38
		NC		<20	<20	<20	24	29	34	38	42	45
3	.093	Flow, CFM / Foot		37	56	74	93	112	130	149	167	186
		Throw, Feet	Sill or floor	2-2	6-6	10-10	12-13	16-17	19-20	21-23	23-24	25-25
			Sidewall	6-9	10-14	13-18	17-22	20-26	24-30	26-33	30-37	32-40
		NC		<20	<20	<20	23	28	33	37	41	44
3½	.113	Flow, CFM / Foot		45	68	90	113	136	158	181	203	226
		Throw, Feet	Sill or floor	2-2	7-7	12-12	14-15	18-19	21-22	23-24	25-26	27-27
			Sidewall	7-10	11-15	16-20	18-23	22-27	25-32	28-35	32-39	34-42
		NC		<20	<20	<20	23	28	33	37	41	44
4	.133	Flow, CFM / Foot		53	80	106	133	160	186	212	239	266
		Throw, Feet	Sill or floor	3-3	8-9	13-13	15-16	19-20	22-23	24-25	26-27	30-30
			Sidewall	8-11	12-16	17-21	19-24	24-29	27-33	30-36	33-40	37-44
		NC		<20	<20	<20	24	29	34	38	42	45
5	.173	Flow, CFM / Foot		69	104	138	173	208	242	277	312	346
		Throw, Feet	Sill or floor	4-4	9-9	14-14	17-17	21-22	24-24	26-27	29-29	32-32
			Sidewall	10-13	14-18	19-23	21-26	25-31	29-35	33-38	35-42	39-46
		NC		<20	<20	<20	24	29	34	38	42	45
6	.212	Flow, CFM / Foot		85	127	170	212	254	296	339	382	424
		Throw, Feet	Sill or floor	5-5	10-10	15-15	18-18	23-23	25-25	28-28	30-30	34-34
			Sidewall	11-14	16-20	20-24	24-28	27-32	30-36	33-39	37-43	41-47
		NC		<20	<20	<20	24	29	34	38	42	45
8	.262	Flow, CFM / Foot		105	157	210	262	314	367	419	472	524
		Throw, Feet	Sill or floor	6-6	11-10	16-16	19-19	25-25	26-26	30-30	31-32	34-34
			Sidewall	12-15	18-22	21-25	27-30	29-33	31-37	34-40	39-44	44-48
		NC		<20	<20	<20	25	30	35	39	43	46
10	.323	Flow, CFM / Foot		129	194	258	323	388	452	517	581	646
		Throw, Feet	Sill or floor	7-7	12-11	17-17	20-20	27-27	28-28	32-32	33-33	35-35
			Sidewall	13-15	20-24	21-25	30-32	31-34	32-38	34-40	40-45	45-50
		NC		<20	<20	20	26	30	36	40	44	47

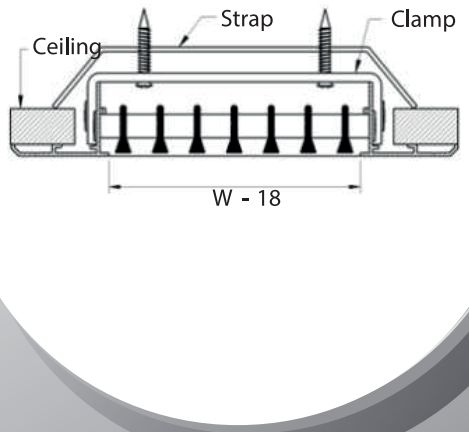
LINEAR BAR GRILL SUPPLY (performance data)
1/2"SPACING, 30° DEFLECTION



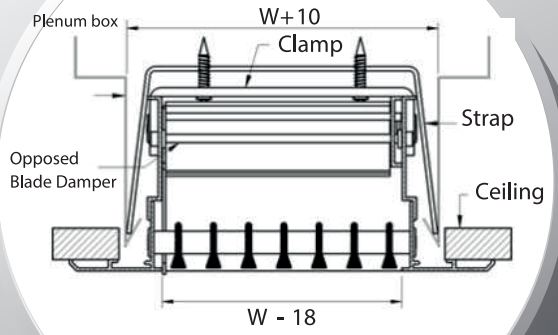
NOMINAL WIDTH (Inches)	AREA Sq. Ft. (Effective free area/ Linear foot)	VELOCITY (FPM)		400	600	800	1000	1200	1400	1600	1800	2000
		TOTAL PRESSURE (in. W.G.)		0.009	0.020	0.036	0.057	0.080	0.109	0.143	0.182	0.225
2	.056	Flow, CFM / Foot		22	34	45	56	67	78	90	101	112
		Throw, Feet	Sill or floor	1-1	4-4	7-7	9-10	12-13	14-16	16-18	17-20	19-21
			Sidewall	5-7	8-12	11-16	14-20	17-23	18-25	20-27	22-30	26-34
		NC		<20	<20	<20	25	30	35	39	43	46
2½	.073	Flow, CFM / Foot		29	44	58	73	88	102	117	131	146
		Throw, Feet	Sill or floor	1-1	5-5	8-9	11-12	14-15	16-18	19-21	21-22	22-23
			Sidewall	6-8	9-13	12-17	16-21	19-25	21-27	24-31	27-35	30-38
		NC		<20	<20	<20	24	29	34	38	42	45
3	.090	Flow, CFM / Foot		36	54	72	90	108	126	144	162	180
		Throw, Feet	Sill or floor	2-2	6-6	10-10	12-13	16-17	19-20	21-23	23-24	25-25
			Sidewall	6-9	10-14	13-18	17-22	20-26	24-30	26-33	30-37	32-40
		NC		<20	<20	<20	23	28	33	37	41	44
3½	.110	Flow, CFM / Foot		44	66	88	110	132	154	176	198	220
		Throw, Feet	Sill or floor	2-2	7-7	12-12	14-15	18-19	21-22	23-24	25-26	27-27
			Sidewall	7-10	11-15	16-20	18-23	22-27	25-31	28-35	32-39	34-42
		NC		<20	<20	<20	23	28	33	37	41	444
4	.128	Flow, CFM / Foot		51	77	102	128	154	179	205	230	256
		Throw, Feet	Sill or floor	3-3	8-9	13-13	15-16	19-20	22-23	24-25	26-27	30-30
			Sidewall	8-11	12-16	17-21	19-24	24-29	27-33	30-36	33-40	37-44
		NC		<20	<20	<20	24	29	34	38	42	45
5	.168	Flow, CFM / Foot		67	101	134	168	202	235	269	302	336
		Throw, Feet	Sill or floor	4-4	9-9	14-14	17-17	21-22	24-24	26-27	29-29	32-32
			Sidewall	10-13	14-18	19-23	21-26	25-31	29-35	33-38	35-42	39-46
		NC		<20	<20	<20	24	29	34	38	42	45
6	.197	Flow, CFM / Foot		79	118	158	197	236	276	315	355	394
		Throw, Feet	Sill or floor	5-5	10-10	15-15	18-18	23-23	25-25	28-28	30-30	34-34
			Sidewall	11-14	16-20	20-24	24-28	27-32	30-36	33-39	37-43	41-47
		NC		<20	<20	<20	24	29	34	38	42	45
8	.240	Flow, CFM / Foot		96	144	192	240	288	336	384	432	480
		Throw, Feet	Sill or floor	6-6	11-10	16-16	19-19	25-25	26-26	30-30	31-32	34-34
			Sidewall	12-15	18-22	21-25	27-30	29-33	31-37	34-40	39-44	44-48
		NC		<20	<20	<20	25	30	35	39	43	46
10	.296	Flow, CFM / Foot		118	178	237	296	355	414	474	533	592
		Throw, Feet	Sill or floor	7-7	12-11	17-17	20-20	27-27	28-28	32-32	33-33	35-35
			Sidewall	13-16	20-24	21-25	30-32	31-34	32-38	34-40	40-45	45-50
		NC		<20	<20	20	26	30	36	40	44	47

Installation

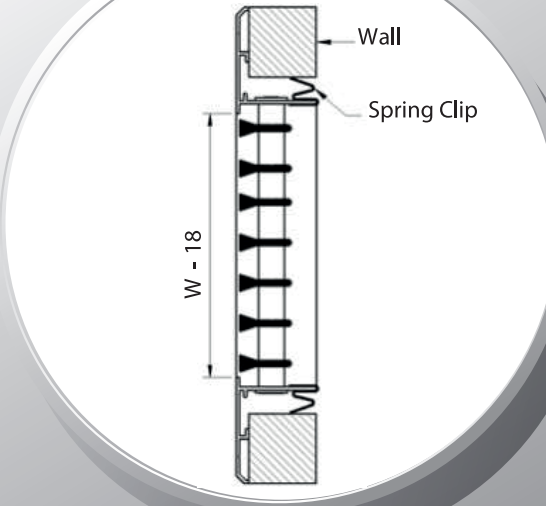
Option C: By Clamp and Strap (Ceiling)



Option P: By Clamp and Strap (Plenum)

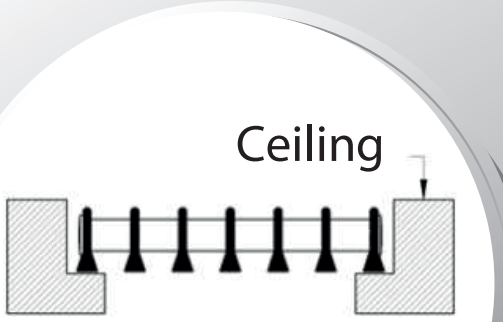


Option R: By Spring Clip (Wall)

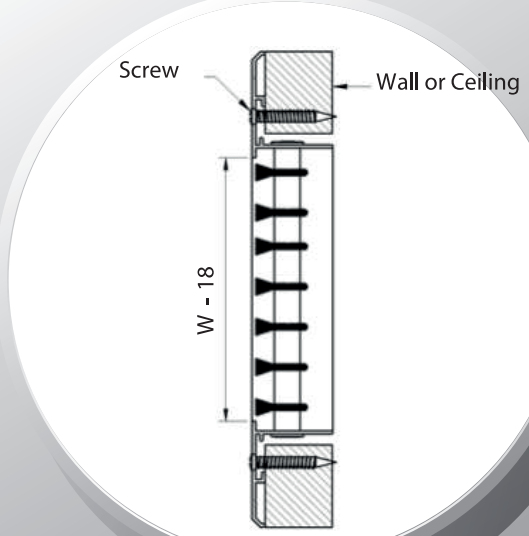


Installation

Option X: On recessed ceiling or floor (LBGC, LBGL or LBGF)



Option S: By Screw (Wall or Ceiling)



ALIGNMENT STRIPS