



## Ceiling Diffusers



**Directional Type WBD-4SDA**

# Ceiling Mounted Directional Diffuser

## Model : WBD-SDA

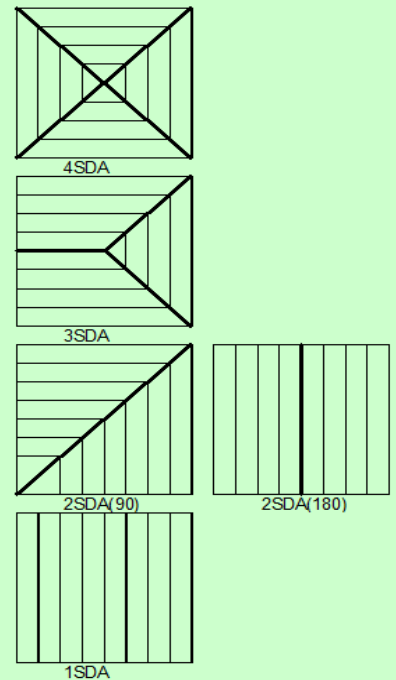


### To meet every conceivable design

Widely recommended for heating, cooling and ventilation applications, this range of diffusers defines versatility. Be it style size or air pattern, there is a WB air directional diffuser to meet that requirement. For effective distribution providing directed air diffusion, these diffusers can be selected in channeling the required amount of conditioned air into spaces where it's needed. Hence it is also available in 3, 2 and 1 way pattern - to meet every conceivable design.

The WBD - 4SDA is functionally designed for both surface mounting and lay-in installation. When equipped with an opposed blade damper, not only does it control the amount of air required, it also acts to maintain an even distribution of air throughout the entire face of the diffuser. In the event where flexible ducts or rigid round ducts are involved, a square to round adaptor can be installed (with or without the presence of the GDS).

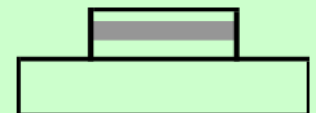
Though calibrated and tested for supply applications, the diffuser is as effective in return as well as transfer air applications.



### Accessories

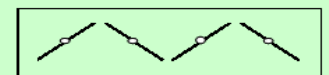
Radial fan damper - Model DF (Standard) (Electro Galvanised 0.5 mm thk)

This universal type control damper can be used with all WBD diffusers. It's designed to sit perfectly into the neck, hence minimising air leakage and thus enhancing performance and noise criteria. And most importantly reducing required head room.



Opposed blade damper - Model GDS (Electro Galvanised 0.5 mm thk) / Extruded Alum 1.0 mm thk

This universal type control damper can be used with all WBD diffusers. It's designed to sit perfectly into the neck or back of an ADR, hence minimising air leakage and thus enhancing performance and noise criteria. The opposed blade action also assists to maintain an even air distribution throughout the entire face of the diffuser. (refer to correction factors for performance)



Square to round adaptor - Model ADR (Electro Galvanised 0.5 mm thk)

This adaptor can be used with all WBD diffusers. It's designed to sit into the neck of the diffuser or into the GDS. It provides a quick and convenient transition for contractors where round or flexible ducts are used. (refer to correction factors for performance)



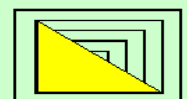
Different height available for different models & applications

Insulated Square to round adaptor - Model LB/D

Same function as the ADR but internally insulated with non-fibrous NBR Foam of 9 mm to further enhance the performance of the WBD-SDA. Glasswool insulation is possible but not advisable due to its fibrous content being a health hazard.

Blank Off Plate - Model BOP (Electro Galvanised 0.5 mm thk)

Used to blank off inactive sections of a diffuser where air is not required but the design requires a uniform layout of the same diffusers.



### Standard Sizes & Quick Reference Guide

Nominal Neck Size	Nominal Face Size	No of Blades (excl outer frame)	Opening Size	Maximum Collar Size Dia	Maximum CMH < 36 NC	Pressure Drop Pa	Horizontal Throw m
148 x 148	283 x 283	2	243 x 243	100	150	< 10	2
223 x 223	358 x 358	3	318 x 318	150	200	< 10	2.2
298 x 298	433 x 433	4	393 x 393	250	580	24.75	2.2
452 x 452	595 x 595	6	550 x 550	400	1500	19.5	3.2
487 x 487	605 x 605	6	560 x 560	400	1500	19.5	3.2

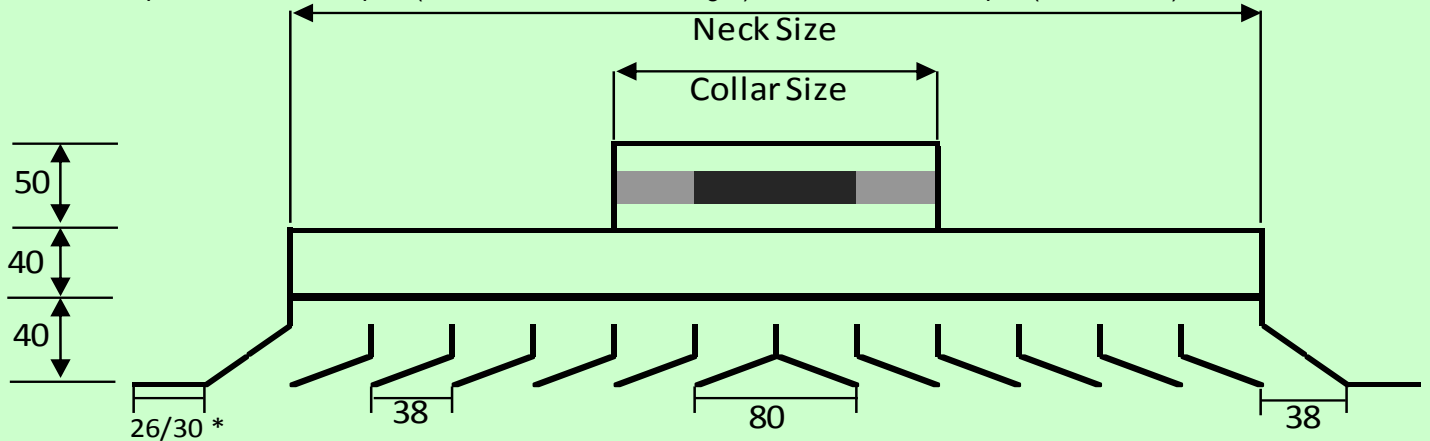
# Ceiling Mounted Directional Diffuser

## Model : WBD-SDA

### Constructions

#### 1) Model 1 : WBD-4SDA/ DF / ADR (Standard Construction)

Diffuser with square to round adaptor (model : ADR 50 mm height) and radial fan Damper (model : DF)

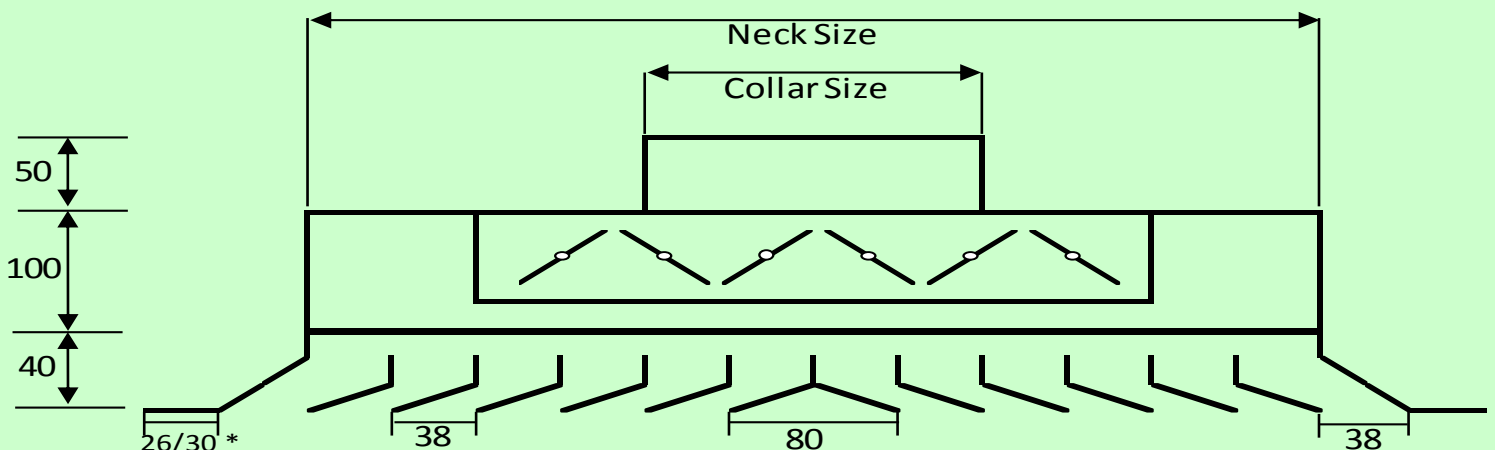


Note: Assembly Method for Configuration may differ for different Project.

All dimensions to nearest mm and are nominal. Details correct at print (09/16)

#### 2) Model 2 : WBD-4SDA / D / ADR

Diffuser with square to round adaptor (model : ADR 100 mm height) and opposed blade damper (model: GDS)

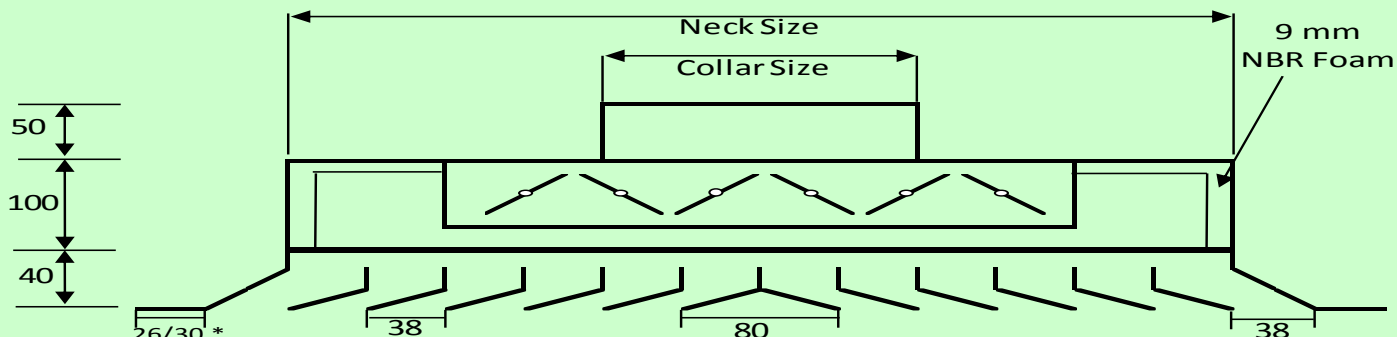


# Ceiling Mounted Directional Diffuser

## Model : WBD-SDA

### 3) Model 3 : WBD-4SDA / LB / D

Diffuser with insulated square to round adaptor (model : LB/D 100 mm height) and opposed blade damper (model: GDS)



\* For F/S 595 x 595 & 605 x 605, the blade is 30 mm. For the rest of the available size, the blade is 26 mm.

## PERFORMANCE DATA

Neck Vel	1.5	2.0	2.5	3.0	3.5	4.0	4.5
P Drop	9.0	16.2	24.6	35.8	48.8	63.7	80.6

### F/S: 283 x 283 N/S: 148 X148

4SDA	CMH	125.0			165.0			210.0			250.0			295.0			335.0			380.0		
	NC	<10			14.0			21.0			27.0			31.0			35.0			39.0		
	Throw	1.8	2.7	4.9	2.4	3.7	5.5	3.0	4.6	6.4	3.7	4.9	7.0	4.3	5.2	7.3	4.6	5.5	7.9	4.9	6.1	8.5
	3SDA Throw	2.1	3.4	5.5	3.0	4.6	6.4	3.7	4.9	7.0	4.6	5.5	7.6	4.9	5.8	8.2	5.2	6.4	8.8	5.5	6.7	9.4
	2SDA Throw	2.4	4.0	5.8	3.4	4.9	6.7	4.3	5.5	7.6	4.9	5.8	8.5	5.2	6.4	9.1	5.5	6.7	9.8	5.8	7.3	10.4

1SDA	Throw	3.7	5.2	7.3	4.9	5.8	8.2	5.5	6.7	9.4	5.8	7.3	10.4	6.4	7.9	11.0	6.7	8.2	11.9	7.3	8.8	12.5
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### F/S: 358 X358 N/S: 223 X223

4SDA	CMH	210.0			280.0			350.0			420.0			490.0			560.0			630.0		
	NC	<10			17.0			24.0			30.0			34.0			38.0			42.0		
	Throw	2.4	3.7	5.8	3.4	4.6	6.7	4.0	5.2	7.3	4.6	5.8	8.2	5.2	6.1	8.8	5.5	6.7	9.4	5.8	7.0	10.1
	3SDA Throw	3.0	4.6	6.4	4.0	5.2	7.3	4.9	5.8	8.2	5.2	6.4	9.1	5.8	7.0	9.8	6.1	7.3	10.7	6.4	7.9	11.3
	2SDA Throw	3.4	4.9	7.0	4.6	5.8	7.9	5.2	6.4	9.1	5.8	7.0	9.8	6.1	7.6	10.7	6.7	7.9	11.3	7.0	8.5	12.2

1SDA	Throw	4.9	6.1	8.5	5.8	7.0	9.8	6.4	7.9	11.0	7.0	8.5	12.2	7.6	9.1	13.1	7.9	9.8	14.0	8.5	10.4	14.6
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### F/S: 433 X433 N/S: 298 X298

4SDA	CMH	325.0			435.0			545.0			650.0			760.0			875.0			980.0		
	NC	10.0			19.0			26.0			32.0			35.0			40.0			44.0		
	Throw	3.0	4.6	6.4	4.0	5.2	7.6	4.9	6.1	8.5	5.2	6.4	9.1	5.8	7.0	10.1	6.1	7.6	10.7	6.4	7.9	11.3
	3SDA Throw	3.7	5.2	7.3	4.9	6.1	8.5	5.5	6.7	9.4	6.1	7.3	10.4	6.4	7.9	11.3	7.0	8.5	11.9	7.3	8.8	12.8
	2SDA Throw	4.3	5.5	7.9	5.2	6.4	9.1	5.8	7.3	10.4	6.4	7.9	11.3	7.0	8.5	12.2	7.6	9.1	13.1	7.9	9.8	13.7

1SDA	Throw	5.5	6.7	9.8	6.4	7.9	11.3	7.3	8.8	12.5	7.9	9.8	13.7	8.5	10.4	14.6	9.1	11.3	15.8	9.8	11.9	16.8
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# Ceiling Mounted Directional Diffuser

## Model : WBD-SDA

### PERFORMANCE DATA

Neck Vel	1.5	2.0	2.5	3.0	3.5	4.0	4.5
P Drop	9.0	16.2	24.6	35.8	48.8	63.7	80.6

#### F/S: 595 x 595 N/S: 452 X452

4SDA	CMH	470.0			630.0			785.0			900.0			1050.0			1250.0			1400.0		
	NC	12.0			21.0			28.0			34.0			38.0			42.0			46.0		
	Throw	3.7	5.2	7.3	4.9	5.8	8.2	5.5	6.7	9.4	5.8	7.3	10.4	6.4	7.9	11.0	6.7	8.2	11.9	7.3	8.8	9.4
	Throw	4.6	5.8	8.2	5.5	6.7	9.4	6.1	7.3	10.4	6.7	8.2	11.6	7.0	8.8	12.5	7.6	9.4	13.1	8.2	10.1	14.0
	Throw	5.2	6.1	8.8	5.8	7.3	10.1	6.7	7.9	11.3	7.3	8.8	12.5	7.6	9.4	13.4	8.2	10.1	14.3	8.8	10.7	15.2
1SDA	Throw	6.1	7.6	10.7	7.0	8.8	12.5	7.9	9.8	13.7	8.8	10.7	15.2	9.4	11.6	16.5	10.1	12.5	17.7	10.7	13.1	18.6

#### F/S: 600 X360 N/S: 482 X250

4SDA	CMH	335.0			450.0			560.0			675.0			785.0			900.0			1000.0		
	NC	<10			18.0			25.0			31.0			35.0			39.0			43.0		
3SDA	Throw L	3.0	4.6	6.7	4.3	5.5	7.6	4.9	6.1	8.5	5.5	6.7	9.4	5.8	7.3	10.4	6.4	7.6	11.0	6.7	8.2	11.6
	Throw S	1.8	2.7	4.9	2.4	3.7	5.8	3.0	4.6	6.4	3.7	4.9	7.0	4.3	5.2	7.6	4.6	5.8	7.9	4.9	6.1	8.5
2SDA(18)	Throw L	3.4	4.9	7.0	4.6	5.8	7.9	5.2	6.4	8.8	5.8	7.0	9.8	6.1	7.6	10.7	6.7	7.9	11.3	7.0	8.5	12.2
	Throw S	1.8	2.7	4.9	2.4	3.7	5.8	3.0	4.6	6.4	3.7	4.9	7.0	4.3	5.2	7.6	4.6	5.8	7.9	4.9	6.1	8.5
2SDA(9)	Throw L	3.7	5.2	7.3	4.9	5.8	8.2	5.5	6.7	9.4	5.8	7.3	10.4	6.4	7.9	11.0	6.7	8.2	11.9	7.3	8.8	12.5
1SDA	Throw L	4.6	5.8	8.2	5.5	6.7	9.4	6.1	7.3	10.4	6.7	8.2	11.6	7.0	8.8	12.5	7.6	9.4	13.1	8.2	10.1	14.0
	Throw S	2.4	4.0	5.8	3.4	4.9	6.7	4.3	5.5	7.6	4.9	5.8	8.5	5.2	6.4	9.1	5.5	6.7	9.8	5.8	7.3	10.4
	Throw L	5.2	6.1	8.8	5.8	7.3	10.1	6.7	7.9	11.3	7.3	8.8	12.5	7.6	9.4	13.4	8.2	10.1	14.3	8.8	10.7	15.2

#### Return Correction Factors

NECK SIZE	-Neg SP	NC
148 x 148	0.73 TP	Listed + 0
223 x 223	0.87 TP	Listed + 2
298 x 298	0.93 TP	Listed + 4
452 x 452	1.47 TP	Listed + 6
487 x 487	1.47 TP	Listed + 6
482 x 250	1.47 TP	Listed + 3

Dia	Recommended CMH
150	100 to 200
200	201 to 400
250	401 to 600
300	601 to 850
350	851 to 1100
400	1101 to 1500

#### Notes

All units tested in accordance to ADC (USA) equipment test code 1062:GRD-84

Acoustics AS 1217.2

All pressures in pascal

Throw are listed in meters and to a terminal velocity of 0.75,0.5 & 0.25 m/s

Throw data is based on supply air and room air being at isothermal conditions.

Sound data NC values are based on a room absorption of -10dB, re 10-12 watts

Data is tabulated for supply applications and are tested for maximum ceiling effect.

For no ceiling application, the horizontal throw will be reduce by about 25%, producing more downward projection





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**WB Air Techniques Pte Ltd**

7 Toa Payoh Industrial Park

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tel : 65 6252-6707

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[www.wbair.sg](http://www.wbair.sg)

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## **Round Ceiling Diffusers**

**Model : WB-RDC**



# ROUND DIFFUSERS

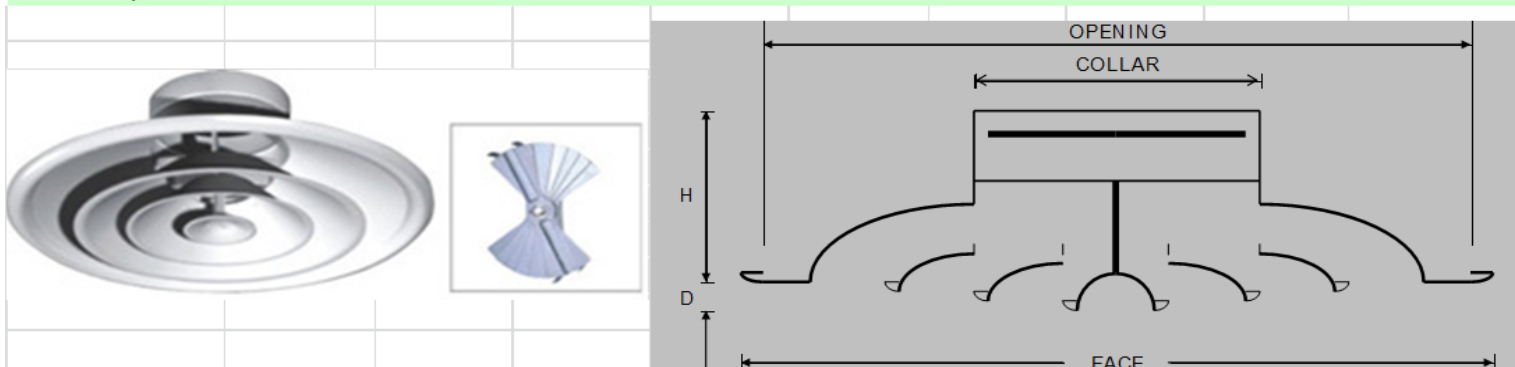
Model : WB - RDC



## INTRODUCTION

Model **WB-RDC** is used for the supply and exhaust of cooled and heated air in facilities such as offices, malls, open spaces and schools with ceiling to floor height between 2.4m to 12m . The diffuser can be installed in both ceiling or exposed duct installations.

Diffuser is constructed of aluminum in standard white epoxy powder coating while collar and slide damper is matt black steel.



## DIMENSIONAL DETAILS

## QUICK SELECTION CHART

Collar Dia	Face Dia	Opening dia	Height	D	CMH Range	NC
150	340	315	125	6	195-390	< 36
200	440	415	135	8	350-700	< 36
250	520	495	145	12	550-1095	< 36
300	610	585	155	14	790-1580	< 36
350	710	685	165	16	800-1800	< 36
403	914	813	253	117	951-2378	< 36
454	1028	915	269	127	1200-3000	< 36
504	1143	1016	285	137	1486-3347	< 36
606	1143	1016	285	137	2140-4808	< 36

Sizes 150-350 are cone adjustable to 2 levels, cone in for full vertical and cone out for full horizontal.

Sizes 403-606 are cone screw fully adjustable, cone in for full vertical and cone out for full horizontal.

Sizes from 406 onwards are non stock items & may take about 6-8 weeks.

Height includes damper of 100mm standard, other heights are available.

D = cone drop in down position for full horizontal pattern.

## PERFORMANCE DATA

Velocity m/s		2.00	2.50	3.00	3.50	4.00	4.50	5.00	6.00
Face Dia 340	Q (cmh)	135.92	169.90	203.88	237.86	271.84	305.82	339.80	399.27
Neck Dia 150	SP(pa)	4.50	7.00	10.00	13.50	17.50	22.00	27.50	40.00
	NC (dBA)			15.00	20.00	24.00	27.00	31.00	36.00
	Radius of diffusion @0.25m/s	0.81	1.22	1.42	1.63	1.83	2.03	2.24	2.44
	Radius of diffusion @0.5m/s	0.61	0.91	1.07	1.22	1.37	1.52	1.68	1.83
	Drop @ 0.17m/s	1.50	2.10	2.55	3.30	3.75	4.35	4.80	5.40
Face Dia 440	Q (cmh)	237.86	297.33	356.79	416.26	475.72	535.19	594.65	713.58
Neck Dia 200	SP(pa)	4.50	7.00	10.00	13.50	17.50	22.00	27.50	40.00
	NC (dBA)			16.00	21.00	26.00	29.00	32.00	38.00
	Radius of diffusion @0.25m/s	1.22	1.38	1.54	2.03	2.24	2.44	2.84	3.66
	Radius of diffusion @0.5m/s	0.91	1.04	1.16	1.52	1.68	1.83	2.13	2.74
	Drop @ 0.17m/s	1.55	2.12	2.63	3.40	3.87	4.74	5.19	5.98
Face Dia 520	Q (cmh)	373.78	458.73	560.67	645.62	739.07	832.51	925.96	1112.85
Neck Dia 250	SP(pa)	4.50	7.00	10.00	13.50	17.50	22.00	27.50	40.00
	NC (dBA)			17.00	22.00	27.00	30.00	33.00	39.00
	Radius of diffusion @0.25m/s	1.22	1.63	2.03	2.44	2.84	3.25	3.58	4.06
	Radius of diffusion @0.5m/s	0.91	1.22	1.52	1.83	2.13	2.44	2.68	3.05
	Drop @ 0.17m/s	1.56	2.15	2.71	3.51	4.37	5.17	5.42	6.74



# ROUND DIFFUSERS

Model : WB - RDC



## PERFORMANCE DATA

Velocity m/s		2.00	2.50	3.00	3.50	4.00	4.50	5.00	6.00
Face Dia 610	Q (cmh)	535.19	662.61	798.53	934.45	1070.37	1197.80	1333.72	1597.06
Neck Dia 300	SP(pa)	4.50	7.00	10.00	13.50	17.50	22.00	27.50	40.00
	NC (dBA)			18.00	23.00	27.00	31.00	34.00	40.00
Radius of diffusion @0.25m/s		1.63	2.03	2.44	2.84	3.25	3.66	4.06	4.88
Radius of diffusion @0.5m/s		1.22	1.52	1.83	2.13	2.44	2.74	3.05	3.66
Drop @ 0.17m/s		1.58	2.18	3.00	3.90	5.10	5.85	6.60	7.80
Face Dia 710	Q (cmh)	722.08	900.47	1078.87	1265.76	1444.15	1622.55	1800.94	2157.73
Neck Dia 350	SP(pa)	4.50	7.00	10.00	13.50	17.50	22.00	27.50	40.00
	NC (dBA)		13.00	19.00	24.00	28.00	32.00	35.00	41.00
Radius of diffusion @0.25m/s		2.03	2.44	2.84	3.25	3.66	4.47	4.88	5.69
Radius of diffusion @0.5m/s		1.52	1.83	2.13	2.44	2.74	3.35	3.66	4.27
Drop @ 0.17m/s		1.55	2.19	3.10	4.00	5.45	6.15	7.00	8.40
Face Dia 914	Q (cmh)	951.44	1189.30	1427.16	1665.02	1902.88	2140.74	2378.60	2854.32
Neck Dia 403	SP(pa)	4.50	7.00	10.00	13.50	17.50	22.00	27.50	40.00
	NC (dBA)		14.00	19.00	25.00	29.00	32.00	36.00	41.00
Radius of diffusion @0.25m/s		2.03	2.84	3.25	3.66	4.47	4.88	5.69	6.50
Radius of diffusion @0.5m/s		1.52	2.13	2.44	2.74	3.35	3.66	4.27	4.88
Drop @ 0.17m/s		1.55	2.19	3.15	4.05	5.60	6.45	7.40	9.00
Face Dia 1028	Q (cmh)	1206.29	1503.62	1800.94	2106.76	2412.58	2701.41	3007.23	3601.88
Neck Dia 454	SP(pa)	4.50	7.00	10.00	13.50	17.50	22.00	27.50	40.00
	NC (dBA)		15.00	20.00	25.00	30.00	33.00	36.00	42.00
Radius of diffusion @0.25m/s		2.44	3.25	3.66	4.47	4.88	5.69	6.10	7.32
Radius of diffusion @0.5m/s		1.83	2.44	2.74	3.35	3.66	4.27	4.57	5.49
Drop @ 0.17m/s		1.60	2.20	3.20	4.10	5.72	6.75	7.80	9.60
Face Dia 1143	Q (cmh)	1486.63	1868.90	2225.69	2599.47	2973.25	3347.03	3720.81	4434.39
Neck Dia 504	SP(pa)	4.50	7.00	10.00	13.50	17.50	22.00	27.50	40.00
	NC (dBA)		15.00	21.00	26.00	30.00	34.00	37.00	43.00
Radius of diffusion @0.25m/s		2.84	3.66	4.06	4.88	5.69	6.10	6.91	7.72
Radius of diffusion @0.5m/s		2.13	2.74	3.05	3.66	4.27	4.57	5.18	5.79
Drop @ 0.17m/s		1.70	2.22	3.25	4.15	5.85	7.05	8.20	10.20
Face Dia 1143	Q (cmh)	2140.74	2667.43	3194.12	3737.80	4264.49	4808.17	5334.86	6405.23
Neck Dia 606	SP(pa)	4.50	7.00	10.00	13.50	17.50	22.00	27.50	40.00
	NC (dBA)		16.00	22.00	27.00	31.00	35.00	38.00	44.00
Radius of diffusion @0.25m/s		3.25	4.06	4.88	5.69	6.50	7.32	8.13	9.75
Radius of diffusion @0.5m/s		2.44	3.05	3.66	4.27	4.88	5.49	6.10	7.32
Drop @ 0.17m/s		1.80	2.25	3.30	4.20	6.00	7.20	8.70	10.80

### Notes

Units are tested in accordance to Air Diffusion Council ADC Code 1062: GRD-84 and ASHRAE 70-72 .

**Throw** in meters with cone in down position for full **horizontal** distribution; cooling temperature differential of 20 deg F and at a terminal velocity of 0.5m/s & 0.25m/s for spread and 0.17m/s for vertical drop .

For full **vertical** down projection values with cones in up position, take radial value multiply 0.8. Simultaneously, radial values shall be reduced by a factor of 0.733

Throw correction factor for exposed duct installation is X 0.766 .

NC values based on room absorption of 10dB re10 to power 12 watts as per ISO 3741 comparison method.

For return applications, add 4 to NC and multiply 0.8 for neg static pressure.

Damper throttling NC correction factors ; at 80% add 4dB, at 68% add 8dB, at 50% add 16dB



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**WB Air Techniques Pte Ltd**

7 Toa Payoh Industrial Park

#01-1245

Singapore 319059

tel : 65 6252-6707

fax : 65 6253-4435

email [wbsales@singnet.com.sg](mailto:wbsales@singnet.com.sg)

[www.wbair.sg](http://www.wbair.sg)

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The purchase should independently determine the suitability of the product for intended application. Thank you for choosing WB Air for your air distribution needs.



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Vipac Engineers & Scientists Ltd.

279 Normanby Rd, Port Melbourne, VIC 3207, Australia

Private Bag 16, Port Melbourne, VIC 3207

w. [www.vipac.com.au](http://www.vipac.com.au) | A.B.N. 33 005 453 627 | A.C.N. 005 453 627

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Wong Brothers Pte Ltd

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# Airflow and Acoustic Research and Development Study of Various Outlets

Report No. 30U-17-0126-TRP-633861-00

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Vipac Engineers & Scientists Ltd  
Melbourne, Australia  
October 2017





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Page 1 of 15

## DOCUMENT CONTROL FORM

<b>Airflow and Acoustic Research and Development Study of Various Outlets</b>	
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<b>PREPARED FOR:</b>	<b>PREPARED BY:</b>
<b>Wong Brothers Pte Ltd</b> Block 7 Toa Payoh Industrial Park #01-1245 Singapore 319059  Contact Person: Mr. Ng Kok Hui Phone: (65) 6252 6707 Fax: (65) 6253 4435	Vipac Engineers & Scientists Ltd., Victorian Technology Centre, 275 Normanby Road, Port Melbourne VIC. 3207 AUSTRALIA  Phone: (613) 9647-9755 Fax: (613) 9646-4370

<b>PREPARED AND AUTHORISED BY:</b>	 ..... Zarko Drinic                      Date: 20 <sup>th</sup> October 2017 Authorised Signatory	
<b>REVIEWED BY:</b>	 ..... Xun Li                              Date: 20 <sup>th</sup> October 2017 Acoustic Consultant	
<b>REVISION HISTORY:</b>		
<b>Issue No.</b> 0	<b>Date Issued</b> October 2017	<b>Reason/Comments</b> Original Data
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<b>KEY WORDS:</b>	Air Flow Rate, Pressure, Noise	

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## 1.0 INTRODUCTION

This report presents the results of airflow and acoustic tests carried out on various outlets, supplied by “Wong Brothers Pte Ltd”, as described below.

## 2.0 TEST SPECIMEN

The units under tests are detailed in Table 1 below.

**Table 1: Units under tests**

#	Product Name	Dimensions (mm)
1	4-way Ceiling Diffuser (Horizontal Throw)	600 x 600
2	Linear Bar Grille (Horizontal Throw)	1000 x 100
3	Linear Slot Diffuser (Horizontal Throw 1-way)	1200 x 2-slots
4	Linear Slot Diffuser (Horizontal Throw 1-way)	1200 x 3-slots

Photographs of the Test Units are shown in Figure 1 below.



Figure 1: Test Items (4-way Diffuser/ Bar Grille / 2-slot Diffuser / 3-slot Diffuser)

## 3.0 TEST CONDITIONS AND APPLICABLE STANDARDS

### 3.1 TEST CONDITIONS

The units under (acoustic) tests were supplied with ambient temperature air at the following conditions:

Air Temperature	19 °C	± 3 °C
Barometric Pressure	101 kPa	± 2 kPa
Relative Humidity	50	± 10 %

### 3.2 APPLICABLE STANDARDS

The units were tested at a range of flow conditions, as shown on the Test Certificates.

The test set ups were in general accordance with ANSI/ASHRAE 70-2006 Standard. Measurements were taken in general accordance with the following standards:

#### **ACOUSTICS**

AS 1217.2-1985 Acoustics – Determination of sound power levels of noise sources Part 2: Precision methods for broad-band sources in reverberation rooms.

ISO 3741-1999 Acoustics – Determination of sound power levels of noise sources using sound pressure. Precision methods for reverberation rooms.

#### **AIRFLOW**

ANSI/ASHRAE 70-2006 – Method of Testing the performance of Air Outlets and Air Inlets

#### **THROW & STATIC PRESSURE DROP**

ANSI/ASHRAE 70-2006 – Method of Testing the performance of Air Outlets and Air Inlets

## 4.0 TEST SET UP AND SPECIFICATION

Vipac's Reverberation Test Room with a volume of 170m<sup>3</sup> has been qualified in accordance with the procedures in AS 1217.2-1985 (ISO 3741-1999) for determination of sound power in octave bands with Centre Frequencies from 125 Hz to 8000 Hz.

The units under test were set up in the Air Distribution (Reverberation) Test Chamber and connected to a quiet air supply.

Following calibration checks, sound pressure levels were measured and converted to sound power levels using the comparison method of AS 1217.2 - 1985 (ie. using a reference sound source of known Sound Power to determine room correction).

Airflow rates were measured using Ø150mm orifice plate. Static pressure drops were recorded using a (Static Pressure) probe and a digital manometer. Throw was measured using a hotwire type anemometer. Figures 2, 3 and 4 show the test setups.

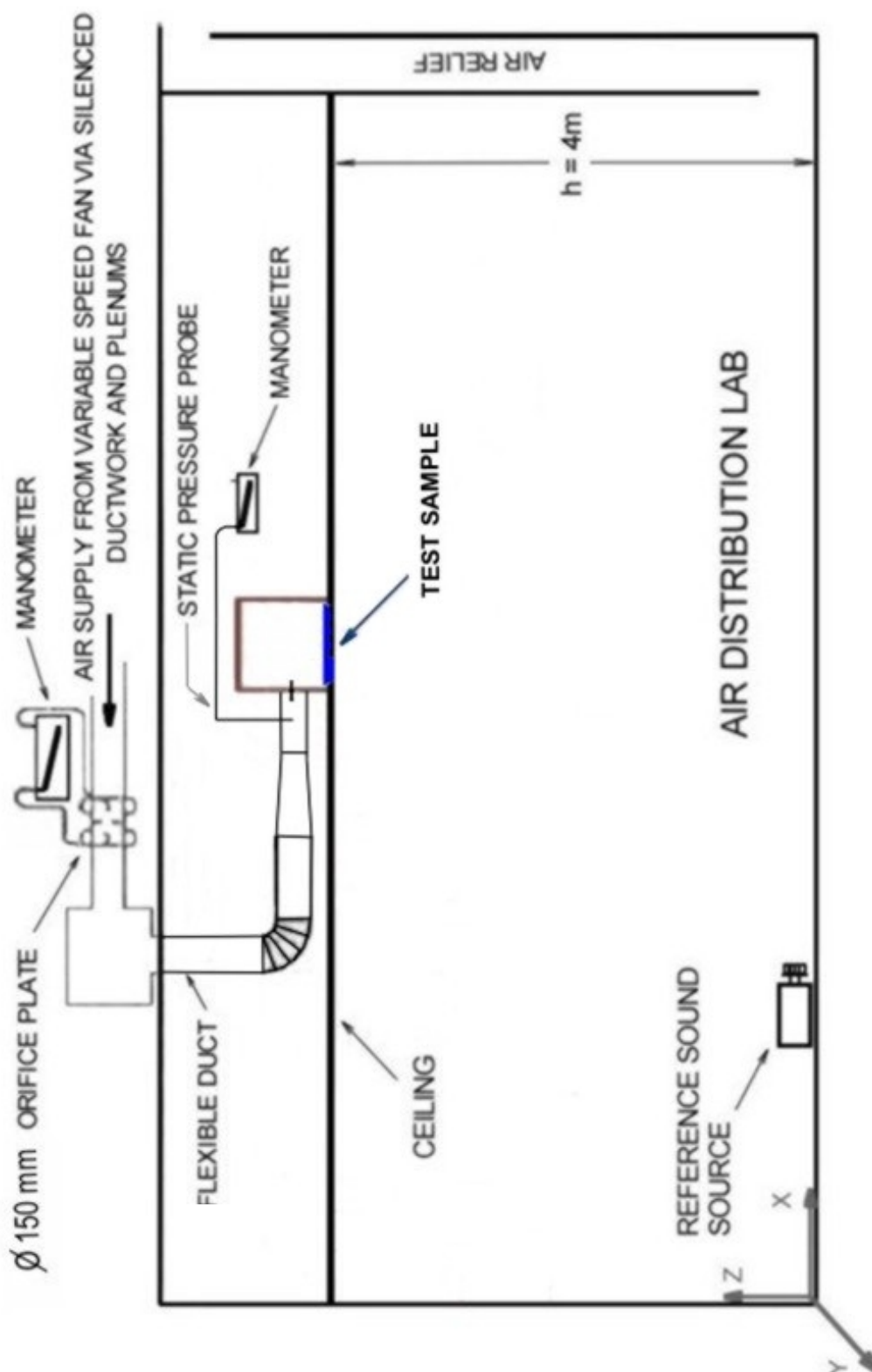


Figure 2: Test Set-up: 4-way Ceiling Diffuser (Air Distribution Laboratory)

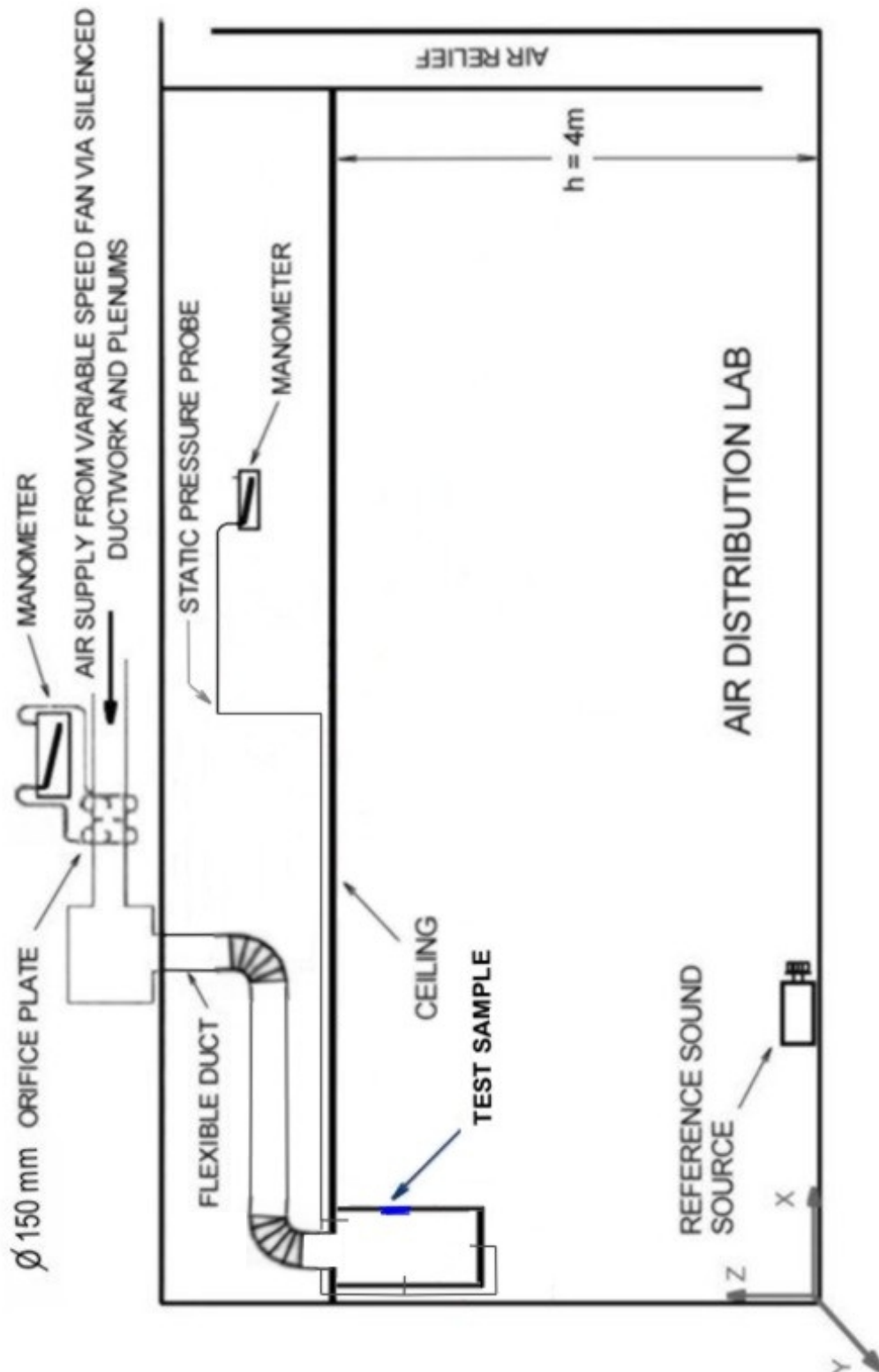


Figure 3: Test Set-up: Linear Bar Grille (Air Distribution Laboratory)



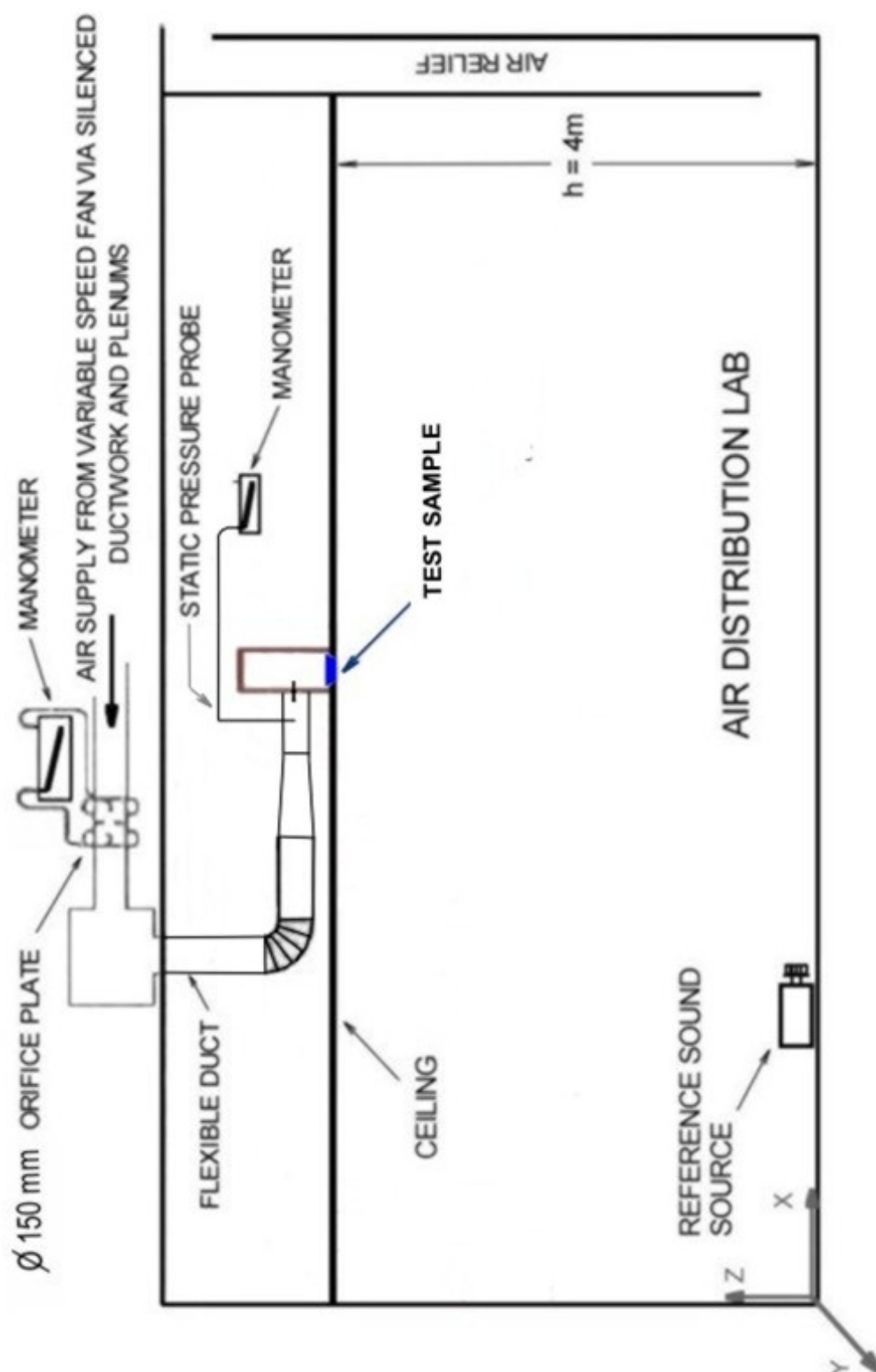


Figure 4: Test Set-up: Linear Slot Diffusers (Air Distribution Laboratory)

## 5.0 INSTRUMENTATION

INSTRUMENT	MAKE & MODEL	CALIBRATION		SERIAL NO. (Bar Code)
		BY	DATE	
Sound Level Meter Acoustic Calibrator	ONO SOKKI LA-3570 Larson Davis CA250	Vipac	March 2016	26500546
		Vipac	January 2017	3172
Manometers (2)	TSI (PVM 610) TSI (DP-CALC)	GTS	September 2017	PVM610718009
		GTS	September 2017	000010147
Orifice Plates	Ø150mm	Vipac	May 2013	-
Airflow Anemometer	TSI 465P	UKAS	January 2017	TA4651210002

## 6.0 ORDERS OF ACCURACY

<u>Sound Pressure Level:</u>	Octave Band Centre Frequency (Hz)	Standard Deviation <sup>(1)</sup> (dB)
	125	± 3.0
	250	± 2.0
	500 to 4000	± 1.5
	8000	± 3.0

Pressure Drop: ± 5% or 1 Pa whichever is greater

Airflow: ± 5% or 10 L/s whichever is greater

(1) Uncertainty in determining sound power levels of broadband sources in reverberation rooms (AS1217.2 / Table 1.1 / Page 6)

## 7.0 RESULTS

The results obtained are shown in the attached Test Certificates.

Report Prepared by:  
***VIPAC ENGINEERS AND SCIENTISTS LTD.***



.....  
**XUN LI**  
**ACOUSTIC CONSULTANT**



.....  
**ZARKO DRINIC**  
**AUTHORISED SIGNATORY**

# TEST CERTIFICATE No.1 (J/N: 30U-17-0126)

## ACOUSTIC AND AIRFLOW PERFORMANCE TESTS

**SUPPLIED BY:** WONG BROTHERS PTE LTD  
**TESTED BY:** VIPAC ENGINEERS & SCIENTISTS LTD  
**TEST DATE:** October 2017  
**CLIENT:** WONG BROTHERS PTE LTD  
**UNIT:** 4-way Ceiling Diffuser  
**SIZE:** 600 mm x 600 mm

Ceiling Installation - HORIZONTAL THROW

TEST CONDITIONS				SOUND POWER LEVEL, dB re 1E-12 W OCTAVE BAND CENTRE FREQUENCY (Hz)						
Qs (L/s)	Ps (Pa)	T (m)	NC	125	250	500	1000	2000	4000	8000
235	10	4.1	22	46.5	44.6	32.9	27.3	22.0	-	-
261	12	4.8	27	48.2	47.9	37.4	32.4	28.0	-	-
322	19	6.2	33	54.2	53.3	44.2	41.1	37.8	28.9	-
387	28	>7	39	58.8	58.6	49.5	47.3	45.2	35.9	25.7
459	40	>7	44	63.8	63.1	54.3	52.8	51.2	42.5	32.3

### LEGEND

Qs - Primary Air Flow Rate (L/s)  
Ps - Supply Static Pressure (Pa)  
T - Horizontal Throw in meters to a terminal velocity of 0.25 m/s (m)  
- - Insufficient margin above background noise to allow accurate determination  
> - Length of throw greater than that able to be measured  
NC - Noise Criterion based upon room absorption of 10 dB



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ACOUSTIC CONSULTANT



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AUTHORISED SIGNATORY

## TEST CERTIFICATE No.2 (J/N: 30U-17-0126)

### ACOUSTIC AND AIRFLOW PERFORMANCE TESTS

<b>SUPPLIED BY:</b>	<b>WONG BROTHERS PTE LTD</b>
<b>TESTED BY:</b>	<b>VIPAC ENGINEERS &amp; SCIENTISTS LTD</b>
<b>TEST DATE:</b>	<b>October 2017</b>
<b>CLIENT:</b>	<b>WONG BROTHERS PTE LTD</b>
<b>UNIT:</b>	<b>Linear Bar Grille</b>
<b>SIZE:</b>	<b>1000 mm x 100 mm</b>

**Wall Installation - HORIZONTAL THROW**

TEST CONDITIONS				SOUND POWER LEVEL, dB re 1E-12 W OCTAVE BAND CENTRE FREQUENCY (Hz)						
Qs (L/s)	Ps (Pa)	T (m)	NC	125	250	500	1000	2000	4000	8000
267	18	>7	22	46.5	43.8	35.4	30.3	23.5	-	-
333	29	>7	28	52.6	49.3	41.7	37.6	32.6	26.6	-
370	36	>7	32	54.8	52.6	44.3	40.3	35.8	29.7	22.2
431	51	>7	37	58.8	56.6	49.0	45.1	41.5	36.1	28.5
493	67	>7	42	61.7	61.0	53.5	49.6	46.6	41.9	34.7

#### LEGEND

Qs - Primary Air Flow Rate (L/s)  
 Ps - Supply Static Pressure (Pa)  
 T - Horizontal Throw in meters to a terminal velocity of 0.25 m/s (m)  
 - - Insufficient margin above background noise to allow accurate determination  
 > - Length of throw greater than that able to be measured  
 NC - Noise Criterion based upon room absorption of 10 dB



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## TEST CERTIFICATE No.3 (J/N: 30U-17-0126)

### ACOUSTIC AND AIRFLOW PERFORMANCE TESTS

<b>SUPPLIED BY:</b>	<b>WONG BROTHERS PTE LTD</b>
<b>TESTED BY:</b>	<b>VIPAC ENGINEERS &amp; SCIENTISTS LTD</b>
<b>TEST DATE:</b>	<b>October 2017</b>
<b>CLIENT:</b>	<b>WONG BROTHERS PTE LTD</b>
<b>UNIT:</b>	<b>Linear Slot Diffuser (2-slots)</b>
<b>SIZE:</b>	<b>1200 mm x 2-slots</b>

**Ceiling Installation - HORIZONTAL THROW (1-way)**

TEST CONDITIONS				SOUND POWER LEVEL, dB re 1E-12 W OCTAVE BAND CENTRE FREQUENCY (Hz)						
Qs (L/s)	Ps (Pa)	T (m)	NC	125	250	500	1000	2000	4000	8000
105	23	4.8	23	-	44.0	38.8	30.2	24.5	-	-
125	32	6.0	28	47.6	48.5	43.7	36.5	32.6	22.2	-
146	44	>7	33	51.6	51.7	47.7	40.9	38.6	29.3	-
179	66	>7	38	55.7	56.7	52.7	46.6	46.9	39.4	24.5
207	89	>7	43	58.4	60.3	56.1	50.1	51.9	45.6	32.1

#### LEGEND

Qs - Primary Air Flow Rate (L/s)  
 Ps - Supply Static Pressure (Pa)  
 T - Horizontal Throw in meters to a terminal velocity of 0.25 m/s (m)  
 - - Insufficient margin above background noise to allow accurate determination  
 > - Length of throw greater than that able to be measured  
 NC - Noise Criterion based upon room absorption of 10 dB



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# TEST CERTIFICATE No.4 (J/N: 30U-17-0126)

## ACOUSTIC AND AIRFLOW PERFORMANCE TESTS

**SUPPLIED BY:** WONG BROTHERS PTE LTD  
**TESTED BY:** VIPAC ENGINEERS & SCIENTISTS LTD  
**TEST DATE:** October 2017  
**CLIENT:** WONG BROTHERS PTE LTD  
**UNIT:** Linear Slot Diffuser (3-slots)  
**SIZE:** 1200 mm x 3-slots

Ceiling Installation - HORIZONTAL THROW (1-way)

TEST CONDITIONS				SOUND POWER LEVEL, dB re 1E-12 W OCTAVE BAND CENTRE FREQUENCY (Hz)						
Qs (L/s)	Ps (Pa)	T (m)	NC	125	250	500	1000	2000	4000	8000
131	19	5.0	22	-	44.6	37.3	27.6	20.4	20.0	-
150	24	6.0	27	-	48.5	41.1	32.8	26.6	21.1	-
187	38	>7	33	48.6	52.9	47.6	40.4	37.4	27.9	-
227	56	>7	38	53.7	57.7	52.7	46.2	45.3	36.9	22.8
282	89	>7	44	58.9	62.9	57.9	51.6	52.6	46.2	33.5

### LEGEND

Qs - Primary Air Flow Rate (L/s)  
Ps - Supply Static Pressure (Pa)  
T - Horizontal Throw in meters to a terminal velocity of 0.25 m/s (m)  
- - Insufficient margin above background noise to allow accurate determination  
> - Length of throw greater than that able to be measured  
NC - Noise Criterion based upon room absorption of 10 dB



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# PROJECT REFERENCES

## AIR DISTRIBUTION PRODUCTS



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	PROJECT TITLE	DATE	CONTRACTOR	Remarks	CONSULTANT / ARCHITECT
1	Orchard View Condo @ Anguilla	2010	Sanyo Engineering	Grilles & Dampers	
2	78 Shenton Major A&A	2010	Kurihara Kogyo Co., Ltd	Grilles & Dampers/Actuator	
3	Inter Roller @ Boon Lay	2010	Sing Wah Enterprise	Grilles & Dampers/Actuator	
4	Nestoil	2010	APP Engineering	Grilles & Dampers/Actuator	
5	Creates @University Town	2010	Dai Dan CO., Ltd	Grilles & Dampers/Actuator	
6	Heritage Museum	2010	Kurihara Kogyo Co., Ltd	Grilles & Dampers/Actuator	
7	Changi Cove Hotel	2010	Great Resources	Grilles & Dampers/Actuator	
8	United World College @ Tampines	2010	Great Resources	Grilles & Dampers/Actuator	
9	IBP Changi Phase 3	2010	Powen Electrical	Grilles & Dampers/Actuator	
10	DrillQuip Factory @ Tuas	2010	Powen Electrical	Grilles & Dampers/Actuator	
11	Canadian International Sch	2010	Chester Technologies	Grilles & Dampers/Actuator	
12	SRC @ Jurong Island	2011	Kurihara Kogyo Co., Ltd	Grilles & Dampers/Actuator	
13	Heraeus @ Tuas Ave 5	2011	Kurihara Kogyo Co., Ltd	Grilles & Dampers/Actuator	
14	No 8 Claymore Hill Condo	2011	V3 Construction P/L	Grilles & Dampers/Actuator	
15	HSBC @ Mapletree	2011	BWH Engrg P/L	Grilles & Dampers/Actuator	
16	Jln Tepong	2011	BWH Engrg P/L	Grilles & Dampers/Actuator	
17	S.T @ Chin Bee Rd	2011	BWH Engrg P/L	Grilles & Dampers/Actuator	
18	NJC	2011	Double Mechanical Pte Ltd	Grilles & Dampers/Actuator	
19	Jurong Ville Sec Sch	2011	Double Mechanical Pte Ltd	Grilles & Dampers	
20	LV @ MBS	2011	BWH Engrg P/L	Grilles & Dampers	
21	Woh Hup HQ	2011	Powen Electrical	Grilles & Dampers/Actuator	
22	Jotun @ Tuas	2011	Technical Frigecon	Grilles & Dampers/Actuator	
23	Gombak Camp major A & A	2011	TKK Facility Management	Grilles & Dampers/Actuator	
24	Unilever Asia P/L @ Mapletree biz	2011	Hoong Fung Engrg Works	Grilles & Dampers/Actuator	
25	ITE HQ @ AMK	2011	Great Resources	Aluminum Flexible Duct	
26	Seacare Hotel @ Chin Swee Rd	2011	Shan Ming	Aluminum Flexible Duct	
27	Dorsett Hotel	2011	Bintai Kindenko P/L	Grilles & Dampers/Actuator	
28	Sage @ Nassim Hill	2011	Sanyo Engrg	Grilles & Dampers	
29	St Thomas Walk	2011	Powen Electrical	Grilles & Dampers/Actuator	
30	PLB @ Changi T2	2011	Natural Cool A/C & Engrg P/L	Grilles & Dampers	
31	Quayside Isle	2012	Bintai Kindenko P/L	Grilles & Dampers/Actuator	
32	The Pinnacle Collection @ Sentosa	2012	Powen Electrical	Grilles & Dampers/Actuator	

# PROJECT REFERENCES

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	PROJECT TITLE	DATE	CONTRACTOR	Remarks	CONSULTANT / ARCHITECT
33	Korean Church	2012	Bintai Kindenko P/L	Grilles & Dampers/Actuator	
34	Centennia Suites @ Kim Seng	2012	Powen Electrical	Grilles & Dampers	
35	Metropolis @ Buona Vista	2012	Powen Electrical	Aluminum Flexible Duct	
36	Metropolis @ Buona Vista	2012	Quantum Automation P/L	VAV Box	
37	LucasFilm @ Fusionopolis	2012	Kurihara Kogyo Co.,Ltd	Grilles & Dampers/Actuator	
38	Anguillia Park Condo	2012	Natural Cool A/C & Engrg P/L	Grilles & Dampers/Actuator	
39	Singapore Turf Club-Contract 3	2012	Luova Engrg P/L	Grilles & Dampers/Actuator	
40	2M2P	2012	Sing Wah Enterprise P/L	Grilles & Dampers/Actuator	
41	Soundstage @ Mediapolis	2012	Evergreen Engrg & Contrt P/L	Grilles & Dampers/Actuator	
42	Super Coffee Factory @ Tuas West	2013	Natural Cool A/C & Engrg P/L	Grilles & Dampers/Actuator	
43	Westgate @ Boon Lay Way	2013	Bintai Kindenko P/L	Grilles & Dampers/Actuator	
44	Holiday Inn Express @ Clemenceau	2013	Guthrie Engrg(S) P/L	Grilles & Dampers/Actuator	
45	Nucleos @ Biopolis 5	2013	Powen Electrical	Grilles & Dampers/Actuator	
46	One KM @ Tanjong Katong	2013	Great Resources	Grilles & Dampers/Actuator	
47	Pixel Red @ Tai Seng	2013	Powen Electrical	Grilles & Dampers/Actuator	
48	Hillier Condo @ Hillview Ave	2013	Great Resources	Grilles & Dampers/Actuator	
49	Palms @ Sixth Ave	2013	Natural Cool A/C & Engrg P/L	Grilles & Dampers	
50	Singapore Turf Club-Contract 4	2013	Natural Cool A/C & Engrg P/L	Aluminum Flexible Duct	
51	Changi Civil Services Club	2014	Powen Electrical	Grilles & Dampers/Actuator	
52	Fusionopolis Way Tower A/B	2014	Kurihara Kogyo Co.,Ltd	Grilles & Dampers/Actuator	
53	Ngee Ann Poly	2014	Luova Engrg P/L	Grilles & Dampers/Actuator	
54	Ripple Bay @ Pasir Ris Dr4	2014	Powen Electrical	Grilles & Dampers/Actuator	Square Mech
55	Marina Sq A&A	2014	Powen Electrical	Grilles & Dampers/Actuator	Meinhardt
56	Essec @ Nepal Park	2014	Kurihara Kogyo Co.,Ltd	Grilles & Dampers/Actuator	
57	DBS A&A	2014	Dai-Dan Co;Ltd	Aluminum Flexible Duct	KTPI
58	Changi Prison	2014	Great Resources	Grilles & Dampers/Actuator	CPG
59	Genting Hotel @ Juring Town Hall Rd	2014	Bintai Kindenko P/L	Grilles & Dampers/Actuator	
60	Carlton Hotel A&A	2014	Powen Electrical	Grilles & Dampers/Actuator	Beca
61	Sky Green Condo @ Macphenson	2014	Powen Electrical	Grilles & Dampers/Actuator	
62	Woodsville Condo @ 18 Woodsville Close	2014	Natural Cool A/C & Engrg P/L	Grilles & Dampers	CPG
63	Keppel Shipyard @ 51 Pioneer Sector 1	2014	Natural Cool A/C & Engrg P/L	Grilles & Dampers/Actuator	
64	Sennett Condo @ Pheng Geck Ave	2014	Natural Cool A/C & Engrg P/L	Grilles & Dampers	T.Y.Lin

# PROJECT REFERENCES

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	PROJECT TITLE	DATE	CONTRACTOR	Remarks	CONSULTANT / ARCHITECT
65	PLB @ T1/T2	2014	Natural Cool A/C & Engrg P/L	Grilles & Dampers	CPG
66	Greenwood Mews Condo	2014	Natural Cool A/C & Engrg P/L	Grilles & Dampers/Actuator	Rankine & Hill
67	Kong Meng San @ 88 Brighthill Road	2014	Koyo M&E P/L	Grilles & Dampers/Actuator	
68	Crown Plaza Hotel Extension @ T3	2015	Powen Engrg P/L	Grilles & Dampers/Actuator	Surbana
69	OUE Tower 1 @ 6 Shenton Way	2015	Powen Engrg P/L	Grilles & Dampers/Actuator	KTPI
70	Downtown Line 3 (16 Station)	2015	Bintai Kindenko P/L	Grille/Alum Flex Duct	P.B
71	Mixed Development @ 15 Cairnhill Rd	2015	Powen Engrg P/L	G&D/Alum Flex Duct	Beca
72	Changi T1/T2 Gangway	2015	Trans Equatorial Engrg P/L	WPC Bargrille	
73	Katong Hotel @ 86 East Coast Rd	2015	Great Resources	Grilles & Dampers/Actuator	UPC
74	Lee Kong Chian(Yunnan)@ NTU	2015	Bintai Kindenko P/L	VAV Box	Meinhardt
75	Lee Kong Chian(Novena)@ Mandalay Rd	2015	Bintai Kindenko P/L	VAV Box	Meinhardt
76	Duo @ Rochor/Beach Rd/Ophir Rd	2015	Kurihara Kogyo Co.Ltd	Grilles & Dampers/Actuator	Beca
77	Amore @ Punggol Central	2015	Natural Cool A/C & Engrg P/L	Grilles & Dampers/Actuator	United Project
78	PLB @ T4	2015	Natural Cool A/C & Engrg P/L	Grilles & Dampers	CPG
79	Thomson Three Condo @ Brighthill Drive	2015	Kembla A/C P/L	Grilles & Dampers/Actuator	
80	Link Hotel @ Tiong Bahru	2015	Supersonic A/C Elect.Engrg P/L	Grilles & Dampers/Actuator	
81	The Scotts Tower @ 38 Scotts Rd	2015	Co-AI Engrg Intergrated Services	Grilles & Dampers	
82	The Glade @ Bedok Rise	2016	Powen Engrg P/L	Grilles & Dampers/Actuator	Beca
83	Goodwood Grand @ 28 Balmoral Rd	2016	Natural Cool A/C & Engrg P/L	Grilles & Dampers	Meinhardt
84	DSO @ 12 Science Park Drive	2016	Shan Ming A/C	Aluminum Flex Duct	
85	Bedok Integrated Complex	2016	Bintai Kindenko P/L	VAV Box/Grille & Dampers/Actuator	Rankine & Hill
86	Downtown East @ Pasir Ris Close	2016	Natural Cool A/C & Engrg P/L	Grilles & Dampers/Actuator	Beca
87	Mapletree @ Tai Seng	2016	Powen Engrg P/L	VAV Box/Grille & Dampers/Actuator	Bescon
88	GSK HQ @ Vista Exchange Green	2016	Powen Engrg P/L	VAV Box/Grille & Dampers/Actuator	Squire Mech
89	Kampung Admiralty@Woodlands Close	2016	Powen Engrg P/L	VAV Box/Grille & Dampers/Actuator	Aecom
90	Jurong Town Hall	2016	Sing Wah Enterprise P/L	Grilles & Dampers/Actuator	Parson
91	Pioneer Polyclinic @Jurong West St61	2016	Bintai Kindenko P/L	Grilles & Dampers/Actuator	Mott Mac
92	St Joseph Nursing Home@Jurong West	2016	Natural Cool A/C & Engrg P/L	Grilles & Dampers/Actuator	Bescon
93	NorthPoint Shopping@Yishun Ave 2	2016	Bintai Kindenko P/L	Grilles & Dampers/Actuator	Squire Mech
94	The Gallery Hotel@Nanson Rd	2016	General Thermal Engrg P/L	Grilles & Dampers/Actuator	JRP
95	Coco Palms Condo	2016	SAS M&E P/L	Grilles & Dampers/Actuator	Meinhardt
96	Clifford Center	2016	Powen Engrg P/L	Grilles & Dampers/Actuator	JRP



# PROJECT REFERENCES

## AIR DISTRIBUTION PRODUCTS

Its not about superficial aesthetics, it's about a perfect unison of form function & reliability



	PROJECT TITLE	DATE	CONTRACTOR	Remarks	CONSULTANT / ARCHITECT
97	Singapore Tourism Board	2016	Siew Engineering P/L	VAV Box	
98	NTU SPC L5	2016	Siew Engineering P/L	VAV Box/Grille & Dampers/Actuator	
99	NTU EMB L7	2016	Siew Engineering P/L	VAV Box/Grille & Dampers/Actuator	
100	HDB Punggol NC1	2016	Great Resources	Grille & Dampers/Actuator	Bescon
101	AMK THK Hospital	2017	Quantum Automation P/L	VAV Box	
102	Bayview Hotel@Bencoolen Street	2017	Accon Engrg P/L	Grille & Dampers/Actuator	EWC
103	Farrer Park Hotel	2017	General Thermal Engrg P/L	Grille & Dampers	JRP
104	Raffles Hospital Extension	2017	Powen Engrg P/L	VAV Box/Grille & Dampers/Actuator	JRP
105	ST Omega @ AMK Electronics Park Rd	2017	Powen Engrg P/L	Grille & Dampers/Actuator	BELMAC
106	JTC Space @ 14 Tuas Ave 1	2017	Bintai Kindenko P/L	Grille & Dampers/Actuator	Aecom
107	The Creek Condo@Toh Tuck Road	2017	Great Resources M&E	Grille & Dampers	KTP
108	Shaw Center/Shaw House	2017	Natural Cool A/C & Engrg P/L	Grille & Dampers/Actuator	Bescon
109	Data Centre @ 27 Tampines St 92	2017	Amcool P/L	Grille & Dampers/Actuator	Plan One Engrg Services
110	Data Centre @ 21 Defu Ave 1	2017	Amcool P/L	Grille & Dampers/Actuator	Plan One Engrg Services
111	Data Centre @ 20 Tampines St 92	2017	Amcool P/L	Grille & Dampers/Actuator	CPG
112	German European Sch@Dairy Farm Rd	2017	Great Resources M&E	Grille & Dampers/Actuator	Beca
113	Changi Airport PLB T1E	2017	Natural Cool A/C & Engrg P/L	Grille & Dampers	J.Roger Preston
114	Bus Depot@Seletar RD299	2017	Natural Cool A/C & Engrg P/L	Grille & Dampers/Actuator	Rankine & Hill
115	1&3 Kallang Junction	2017	Accon Engrg P/L	Grille & Dampers/Actuator	Gims & Associate P/L
116	Proxima@Gambas	2017	Accon Engrg P/L	Grille & Dampers/Actuator	PDC Consultant Engrg
117	Bus Depot@Ulu Pandan RD300	2017	Natural Cool A/C & Engrg P/L	Grille & Dampers/Actuator	Rankine & Hill
118	Housing Development@Canberra Link	2017	Natural Cool A/C & Engrg P/L	Grille & Dampers/Actuator	Bescon
119	Maamunagau Maldives	2018	A Venture Engineering Pte Ltd	Grille & Dampers/Actuator	Ace-Tech Design Pte Ltd
120	National Archives Of Spore	2018	BMS Engrg & Trading P/L	VAV Box	Squire Mech
121	Warehouse @ Bulim Ave	2018	Kurihara Kogyo Co;Ltd	Grille & Dampers/Actuator	Squire Mech
122	Stars Of Kovan Condo	2018	Powen Engrg P/L	Grille & Dampers	T.Y.Lin International P/L
123	68 Residence (Myanmar)	2018	Bintai Kindenko P/L	Grille & Dampers/Actuator	
124	Alps Residence	2018	Great Resources M&E	Grille & Dampers/Actuator	UPC Consultant
125	JTC Furniture Hub	2018	Great Resources M&E	VAV Box/Grille & Dampers/Actuator	Arup Spore P/L
126	Boys Complex	2018	Great Resources M&E	Grille & Dampers/Actuator	CPG
127	No1 Gul St5	2018	Powen Engrg P/L	Grille & Dampers/Actuator	Neam Solution/Vincent Han A
128	45 Leng Kee Rd	2018	Natural Cool A/C & Engrg P/L	Grille & Dampers/Actuator	Tritont Consultant LLP

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	PROJECT TITLE	DATE	CONTRACTOR	Remarks	CONSULTANT / ARCHITECT
129	Data Centre @ 15 Defu Ave 1	2018	Amcool P/L	Grille & Dampers/Actuator	Plan-One Building Services
130	Paterson Services Apt	2018	D.I.S A/C & Elect P/L	WPC Bargrille/Grille	JRP
131	YTC office @ Peninsula Plaza	2018	Accon Engrg P/L	WPC Bargrille/Grille	CMP Consultants P/L
132	Bollore Blue Hub @ Sunview Rd	2018	Sing Wah Enterprise P/L	Bspot/Grille & Dampers/Actuator	
133	Marina East Desailination Plant	2018	Bintai Kindenko P/L	Grille & Dampers/Actuator	Mott Macdonald Consultant
134	Outram Community Hospital	2018	Bintai Kindenko P/L	Dampers/PIR Duct	Surbana Jurong Consultant P/L
135	SMU	2019	Quantun Automation P/L	VAV Box	
136	Toa Payoh West CC	2019	Narural Cool A/C&Engrg P/L	Grille & Dampers	HT M&E Consultant
137	The Verge@2 Serangoon Road	2019	Powen Engrg P/L	Grille & Dampers/Actuator	KTPI
138	Spore Exam & Accessment Board	2019	BMS Engrg & Trading P/L	VAV Box	
139	Woodland Regional Bus Interchange	2019	Kin Xin Engrg P/L	Grille & Dampers/Actuator	Elead Associate P/L
140	Madrasah Education Institute@toa payoh	2019	Luova Engrg P/L	Grille & Dampers	
141	Huamin Pri Sch	2019	Luova Engrg P/L	Grille & Dampers	Squire Mech P/L
142	Naval Base Pri Sch	2019	Luova Engrg P/L	Grille & Dampers	Squire Mech P/L
143	Orchid Park Sec Sch	2019	Luova Engrg P/L	Grille & Dampers	Squire Mech P/L
144	Tampines Pri Sch	2019	Luova Engrg P/L	Grille & Dampers	Squire Mech P/L
145	PSA @ 34 Harbour Drive	2019	Powen Engrg P/L	VAV Box/Grille & Damper	Surbana Jurong Consultant
146	Temasek Poly	2019	Kin Xin Engrg P/L	VAV Box	
147	Punggol Pri Sch	2019	Natural Cool A/C & Engrg P/L	Grille & Dampers	Arup Spore P/L
148	Chin Cheng Polyclinics	2020	M&C Engrg&Trading P/L	VAV Box	
149	JTC Logistic Hub@Gul Circle	2020	Kimly Construction P/L	Grille & Dampers	Meinhardt
150	Changi T2	2020	A&L Engrg P/L	VAV Box	CAG
151	SJSM @ 30 Dover Ave	2021	Natural Cool A/C & Engrg P/L	Grille & Dampers	Squire Mech P/L
152	Senja Nursing Home	2021	Yitac(S) P/L	VAV Box/Grille & Dampers	Surbana Jurong Consultant
153	JTC-WNC @ Woodland Ave 4&9	2021	Powen Engrg P/L	Grille & Dampers	WSP Consultancy P/L
154	Sembawang Sports Hub	2021	Great Resources M&E	VAV Box/Grille & Dampers	Aecom
155	Tee Yih Jia	2021	Great Resources M&E	Grille & Dampers	Surbana Jurong Consultant
156	Fixed Gangway@ T1/T2/T3	2022	PBT Engrg	WPC Bar Grille	JRP
157	Condo @ 21 Stirling Road	2022	Great Resources M&E	Grille & Dampers	Rankine & Hill
158	JTC-MSRF	2022	Sing Wah Enterprise P/L	Grille & Dampers	JRP
159					
160					

# PROJECT REFERENCES

## Highlights

It's not about superficial aesthetics, it's about a perfect unison of form function & reliability

## AIR DISTRIBUTION PRODUCTS

WB Air

Over the past decades, we have corrected, enhanced and are still constantly re-engineering our products, services & operations to meet with the ever demanding and changing economy.

This has led us through numerous projects of different fields & functions. From small cafes to skyscrapers, bomb shelters to sewage plants, showrooms to outdoor atriums & Integrated Resorts.

Our Products have been put to test and have humbly met **form, function & reliability**.

