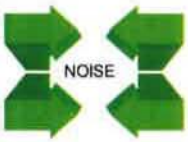
NIMSIRI CO. LTD.

Airflow and Acoustic Research and Development Study of various Air Outlets



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Vipac Engineers & Scientists Ltd
Melbourne, VIC
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Airflow and Acoustic Research and Development Study of various Air Outlets

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PREPARED FOR:
NIMSIRI Co Ltd
249 Moo9 Suksawad Rd
Bangpakok Radburana
BANGKOK Thailand 10140
Contact: Chotipat Yamchai-Anan
Phone: (+66) 2428 6334
Fax : (+66) 2428 6131

PREPARED BY:
Vipac Engineers & Scientists Ltd
279 Normanby Road
Port Melbourne VIC 3207
AUSTRALIA
Email: melbourne@vipac.com.au
Phone: 61 3 9647 9700
Fax : 61 3 9646 4370

AUTHOR:
Zarko Drinic
Senior Project Engineer
Date: 31/07/09

REVIEWED BY:
Michael Smith
N.A.T.A Signatory
Date: 31/7/09

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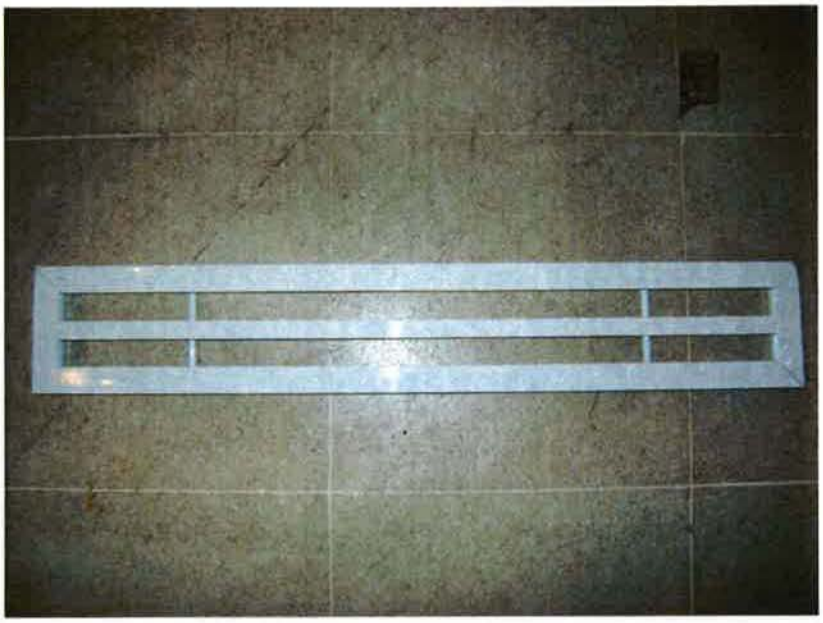

Figure 2: Test Unit No.2 – Linear Slot Diffuser

Figure 3: Test Unit No.3 – Linear Bar Grille

Figure 2: Test Unit No.4 – Square Ceiling Diffuser

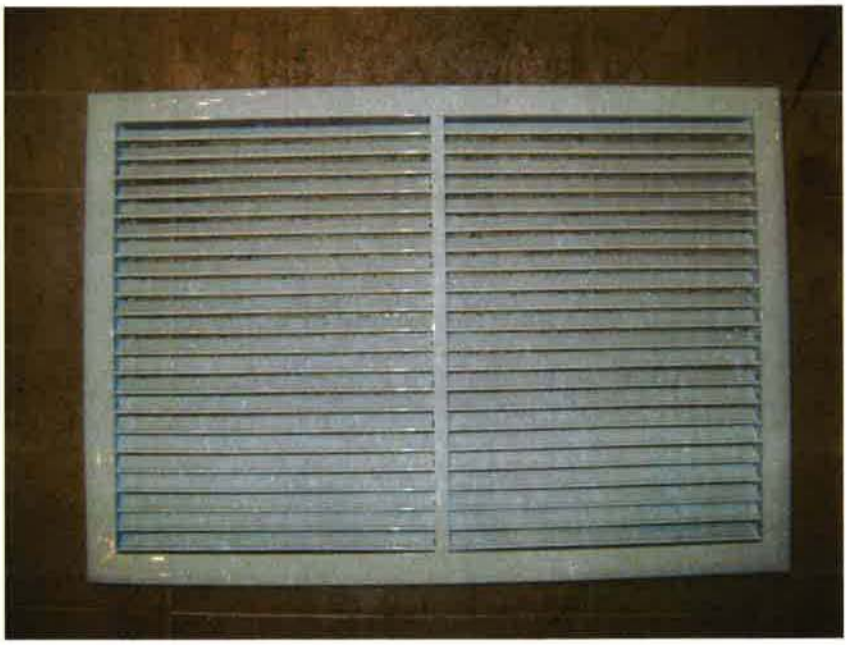

Figure 5: Test Unit No.5 – Return Air Grille

3. TEST CONDITIONS AND APPLICABLE STANDARDS

The unit was tested at a range of flow conditions, as shown on the Test Certificate.

The test set up was in general accordance with Air Diffusion Council (USA) Equipment Test Code 1062: GRD-84. Measurements were taken in general accordance with the following standards:

ACOUSTICS
Australian Standard 1217.2-1985. "Acoustic - Determination of Sound Power Levels of Noise Sources Part 2 - Precision Methods for Broad-Band Sources in Reverberation Rooms".

AIRFLOW
Air Diffusion Council (USA) Equipment Test Code 1062: GRD-84.

THROW & STATIC PRESSURE DROP
Air Diffusion Council (USA) Equipment Test Code 1062: GRD-84.

4. TEST SET UP AND PROCEDURE

Vipac's Reverberation Test Room has a volume of 170m^3 has been qualified in accordance with the procedures in AS 1217.2 - 1985 for determination of sound power in octave bands with Centre Frequencies from 125 Hz to 8000 Hz.

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

The unit was supplied with ambient temperature air at the specified airflow. The environmental test conditions in the reverberation chamber varied within the following ranges:

Test Air Temperature	16 degrees C	± 2.0 degree C
Room Air Temperature	18 degrees C	± 2.0 degree C
Barometric Pressure	1050 millibar	± 5 millibar
Relative Humidity	55	± 10%

Following calibration checks, sound pressure levels were measured and converted to sound power levels using the comparison method of AS1217.2 - 1985 (ie. using a reference sound source of known Sound Power to determine room correction).

Airflow rates were measured using Ø 150 mm orifice plate. Static pressure drop was recorded using a (Static Pressure) probe and an inclined manometer. Throw was measured using a hotwire type anemometer. Figure 6 shows the test set up (Ceiling Installation). Figure 7 shows the test set up (Wall Installation).

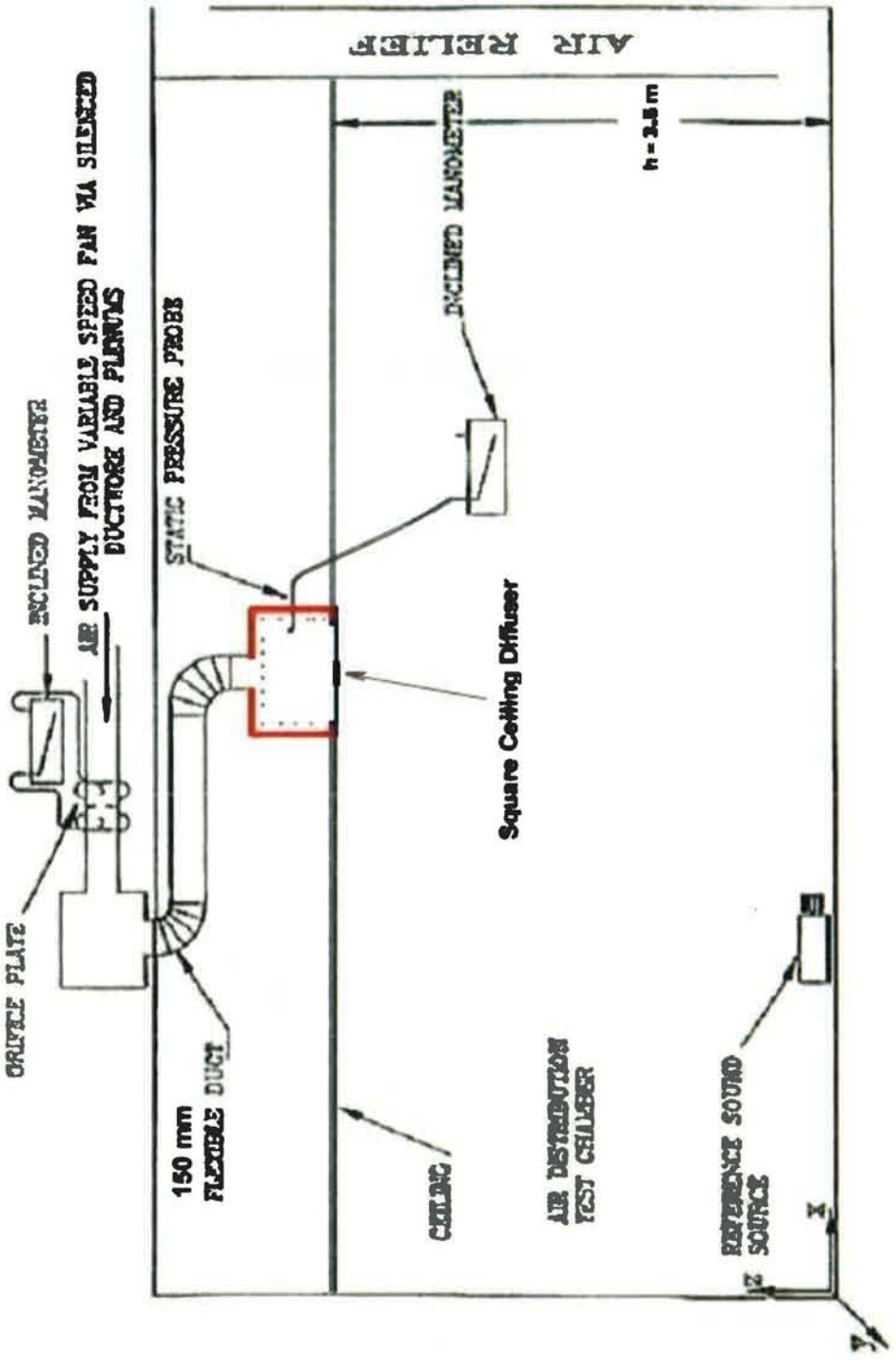

Figure 6: Test Set-up (Ceiling Installation)

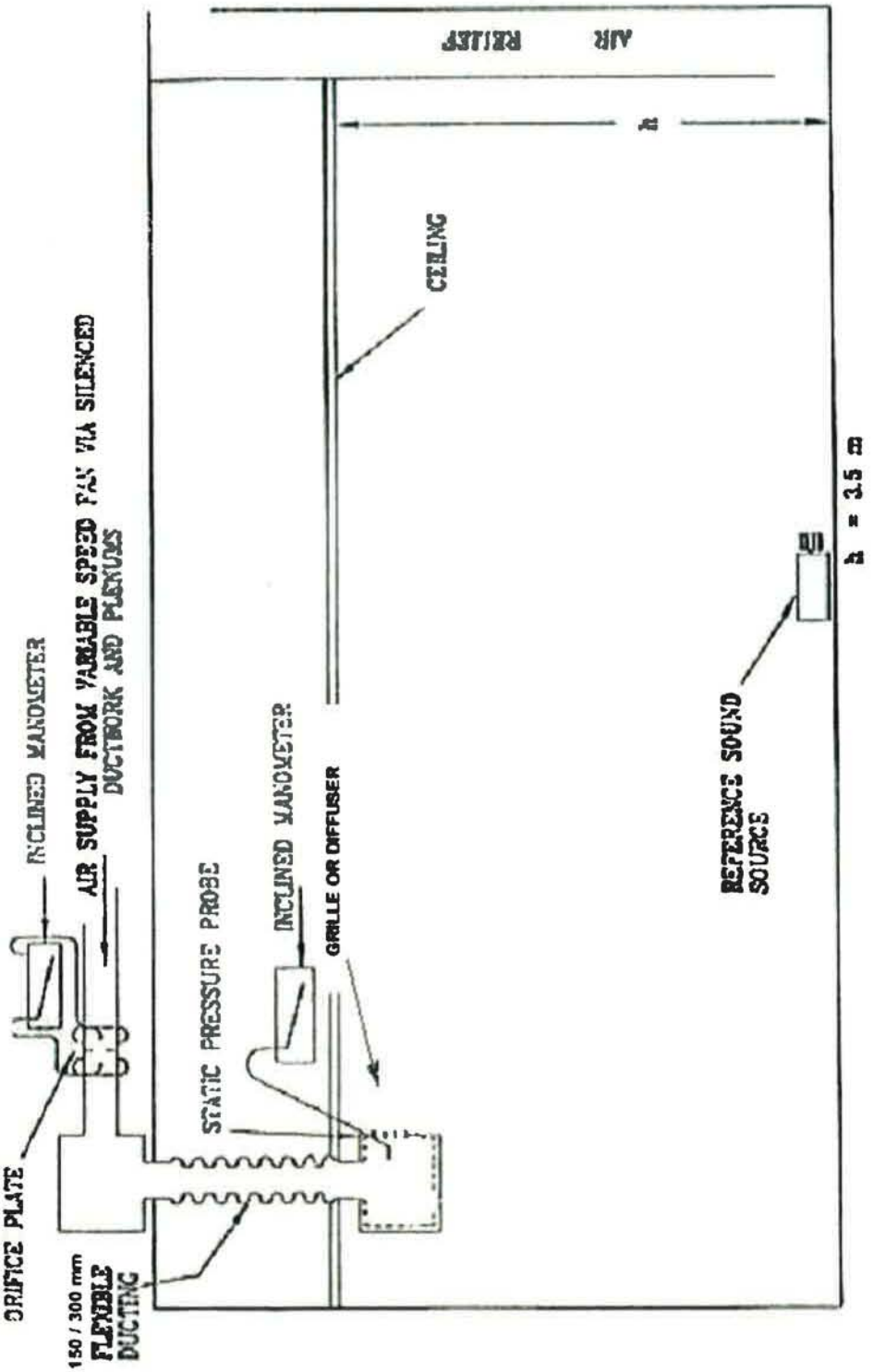

Figure 7: Test Set-up (Wall Installation)

5. INSTRUMENTATION

INSTRUMENT	MAKE & MODEL	CALIBRATION		SERIAL NO.
		BY	DATE	
Sound Level Meter	ONO SOKKI LA-5570	Vipac	09/09/2008	47958 / 20627
Microphone	MI-3310	Vipac	09/09/2008	21367
Acoustic Calibrator	B&K 4230	Vipac	30/01/2008	860700
Manometers (2)	Incline Manometer	Australian Pressure Lab	28/07/2008	PM6 - 168
	EMA 200		09/09/08	KH320630
Orifice Plates	Vipac	Vipac	May 2001	-
Hotwire Anemometer	TSI 9545-A	TSI	01/04/2008	9545A0813010

6. ORDERS OF ACCURACY

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

Pressure Drop: ± 5% or 0.5 Pa whichever is greater

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

7. RESULTS

The results obtained are shown in the attached Test Certificates.

Report Prepared by:
VIPAC ENGINEERS AND SCIENTISTS LTD.

.....
ZARKO DRINIC
SENIOR PROJECT ENGINEER

.....
MICHAEL SMITH
N.A.T.A. SIGNATORY

TEST CERTIFICATE No.1

ACOUSTIC AND AIRFLOW PERFORMANCE TESTS OF VARIOUS OUTLETS

SUPPLIED BY: NIMSIRI CO LTD
TESTED BY: VIPAC ENGINEERS & SCIENTISTS LTD
TEST DATE: MARCH 2009
CLIENT: NIMSIRI CO LTD
UNIT: Double Deflection Grille
SIZE: 600 mm x 150 mm

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
234	11	12.6*	22	<46.6	41.9	33.0	26.4	21.2	<15.4	<11.0
264	14	13.5*	25	48.1	43.9	36.7	30.0	24.5	17.3	<11.9
320	21	15.0*	31	50.2	47.8	41.9	36.1	30.9	23.8	15.1
362	28	15.6*	34	52.9	50.7	44.9	39.7	34.7	28.5	18.6
402	35	16.2*	38	58.7	54.1	48.7	43.6	39.2	33.6	24.8

LEGEND
Qs - Primary Air Flow Rate (L/s)
Ps - Supply Static Pressure (Pa)
< - 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
T - Horizontal Throw in meters at terminal velocity of 0.25m/s
* - Extrapolated values (excluded from NATA accreditation)

Zarko Drinic
SENOIR PROJECT ENGINEER

Michael Smith
N.A.T.A. SIGNATORY

NATA Accredited Laboratory Numbers: 1163 & 1506

This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO / IEC 17025. The results of the tests, calibrations and/or measurements included in this document are traceable to Australian / national standards.

TEST CERTIFICATE No.2

ACOUSTIC AND AIRFLOW PERFORMANCE TESTS OF VARIOUS OUTLETS

SUPPLIED BY: NIMSIRI CO LTD
TESTED BY: VIPAC ENGINEERS & SCIENTISTS LTD
TEST DATE: MARCH 2009
CLIENT: NIMSIRI CO LTD
UNIT: Linear Slot Diffuser
SIZE: 800 mm x 100 mm

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
195	8	11.0*	21	<47.8	41.7	31.6	23.4	17.8	<12.7	<10.6
220	11	12.2*	26	48.6	43.4	37.5	26.3	21.7	15.0	<10.7
252	15	13.3*	30	50.4	46.5	41.6	32.1	29.4	23.2	<11.1
287	21	13.9*	32	52.0	49.6	43.2	35.2	34.4	29.5	13.2
345	33	15.3*	38	58.1	54.7	48.7	42.6	42.5	39.5	22.6

LEGEND
Qs - Primary Air Flow Rate (L/s)
Ps - Supply Static Pressure (Pa)
< - 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
T - Horizontal Throw in meters at terminal velocity of 0.25m/s
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Zarko Drinic
SENOIR PROJECT ENGINEER

Michael Smith
N.A.T.A. SIGNATORY

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TEST CERTIFICATE No.3

ACOUSTIC AND AIRFLOW PERFORMANCE TESTS OF VARIOUS OUTLETS

SUPPLIED BY: NIMSIRI CO LTD
TESTED BY: VIPAC ENGINEERS & SCIENTISTS LTD
TEST DATE: MARCH 2009
CLIENT: NIMSIRI CO LTD
UNIT: Linear Bar Grille
SIZE: 600 mm x 150 mm

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
211	9	11.4*	21	<46.6	41.4	32.1	24.8	<20.1	<14.7	<10.9
248	12	13.2*	25	<47.1	42.6	36.5	28.2	22.8	15.9	<11.0
299	18	14.4*	30	48.6	46.1	41.2	35.0	29.4	20.8	<12.1
357	25	15.6*	36	54.4	52.2	46.7	42.3	36.5	29.9	19.3
413	34	16.8*	41	59.8	55.8	49.9	46.8	41.9	36.2	26.4

LEGEND
Qs - Primary Air Flow Rate (L/s)
Ps - Supply Static Pressure (Pa)
< - 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
T - Horizontal Throw in meters at terminal velocity of 0.25m/s
* - Extrapolated values (excluded from NATA accreditation)

Zarko Drinic
SENOIR PROJECT ENGINEER

Michael Smith
N.A.T.A. SIGNATORY

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TEST CERTIFICATE No.4

ACOUSTIC AND AIRFLOW PERFORMANCE TESTS OF VARIOUS OUTLETS

SUPPLIED BY: NIMSIRI CO LTD
TESTED BY: VIPAC ENGINEERS & SCIENTISTS LTD
TEST DATE: MARCH 2009
CLIENT: NIMSIRI CO LTD
UNIT: Square Ceiling Diffuser
SIZE: 300 mm x 300 mm

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
193	8	10.4*	22	<47.3	42.5	33.8	25.0	<19.0	<13.1	<10.5
222	11	10.8*	26	<47.5	43.3	37.5	28.3	23.2	17.1	<10.8
280	19	12.2*	31	49.1	45.9	42.2	36.0	28.7	20.3	<11.6
337	27	13.5*	36	52.1	50.7	46.8	42.3	36.1	29.0	17.0
390	38	14.4*	40	56.8	54.8	50.2	46.5	41.8	35.8	24.9

LEGEND
Qs - Primary Air Flow Rate (L/s)
Ps - Supply Static Pressure (Pa)
< - 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
T - Horizontal Throw in meters at terminal velocity of 0.25m/s
* - Extrapolated values (excluded from NATA accreditation)

Zarko Drinic
SENOIR PROJECT ENGINEER

Michael Smith
N.A.T.A. SIGNATORY

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TEST CERTIFICATE No.5

ACOUSTIC AND AIRFLOW PERFORMANCE TESTS OF VARIOUS OUTLETS

SUPPLIED BY: NIMSIRI CO LTD
TESTED BY: VIPAC ENGINEERS & SCIENTISTS LTD
TEST DATE: MARCH 2009
CLIENT: NIMSIRI CO LTD
UNIT: Return Air Grille
SIZE: 600 mm x 400 mm

TEST CONDITIONS			SOUND POWER LEVEL, dB re 1E-12 W OCTAVE BAND CENTRE FREQUENCY (Hz)						
Qs (L/s)	Ps (Pa)	NC	125	250	500	1000	2000	4000	8000
206	3	19	<45.9	39.9	29.4	22.7	18.5	<15.7	<15.4
268	5	23	47.7	42.8	34.2	28.5	24.0	17.9	<15.9
358	7	30	53.7	48.7	41.1	35.3	32.0	25.7	19.1
413	10	35	57.9	52.3	45.7	40.1	36.7	31.2	25.6
476	13	39	61.4	56.4	49.6	43.8	40.7	35.2	28.9

LEGEND
Qs - Primary Air Flow Rate (L/s)
Ps - Supply Static Pressure (Pa)
< - Insufficient margin above background noise to allow accurate determination
NC - Noise Criterion based upon room absorption of 10 dB

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Michael Smith
N.A.T.A. SIGNATORY

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