Asli Mechanical Sdn. Bhd.

Airflow and Acoustic Research and Development Study of VAV Box

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1.0 INTRODUCTION

This report presents the results of acoustic and airflow development tests carried out on VAV Box supplied by ASLI Mechanical Sdn. Bhd., as described below.

This report is issued as a NATA certified report under the terms of Vipac's NATA accreditation No's 1163 and 1506.

2.0 UNITS UNDER TEST

Figure 1 below shows a schematic of the VAV Box, with detail of fundamental dimensions. All dimensions are detailed in Table 1 below.

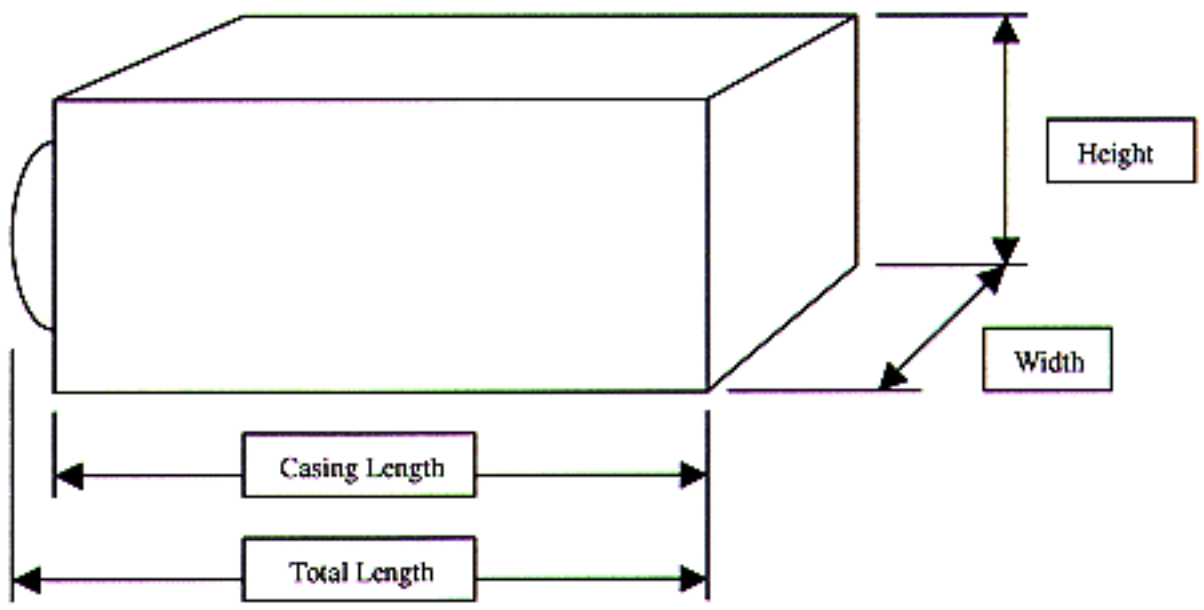

***Figure 1* : Schematic of the VAV Box**

Table 1 : Description of Units Under Test

Size	Inlet Diameter (mm)	Outlet Dimensions Width x Height (mm)	Casing Length (mm)	Total Length (mm)
A	250	360 x 320	395	405

Photographs of the test sample are shown in Figures 2 and 3.

Figure 4 shows the quadrant type mechanism used to fix the damper blade position, with graduations to enable measurement of damper blade angle (from horizontal) for each test condition.

Figure 5 shows the damper blade in the fully closed position (for the closed blade leakage test), and Figure 6 shows the blade partially open.

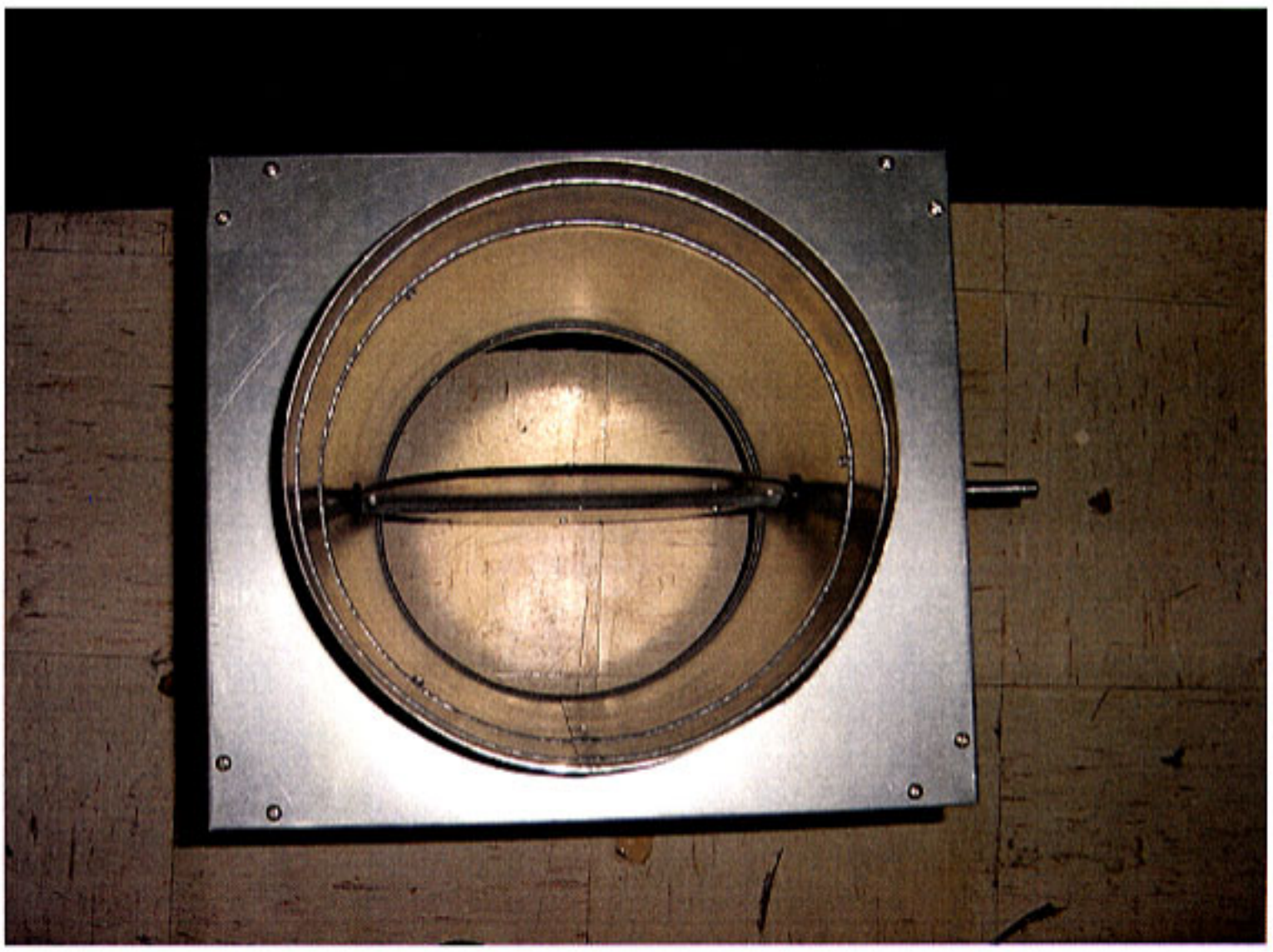

Figure 2: Test Sample, Inlet Side

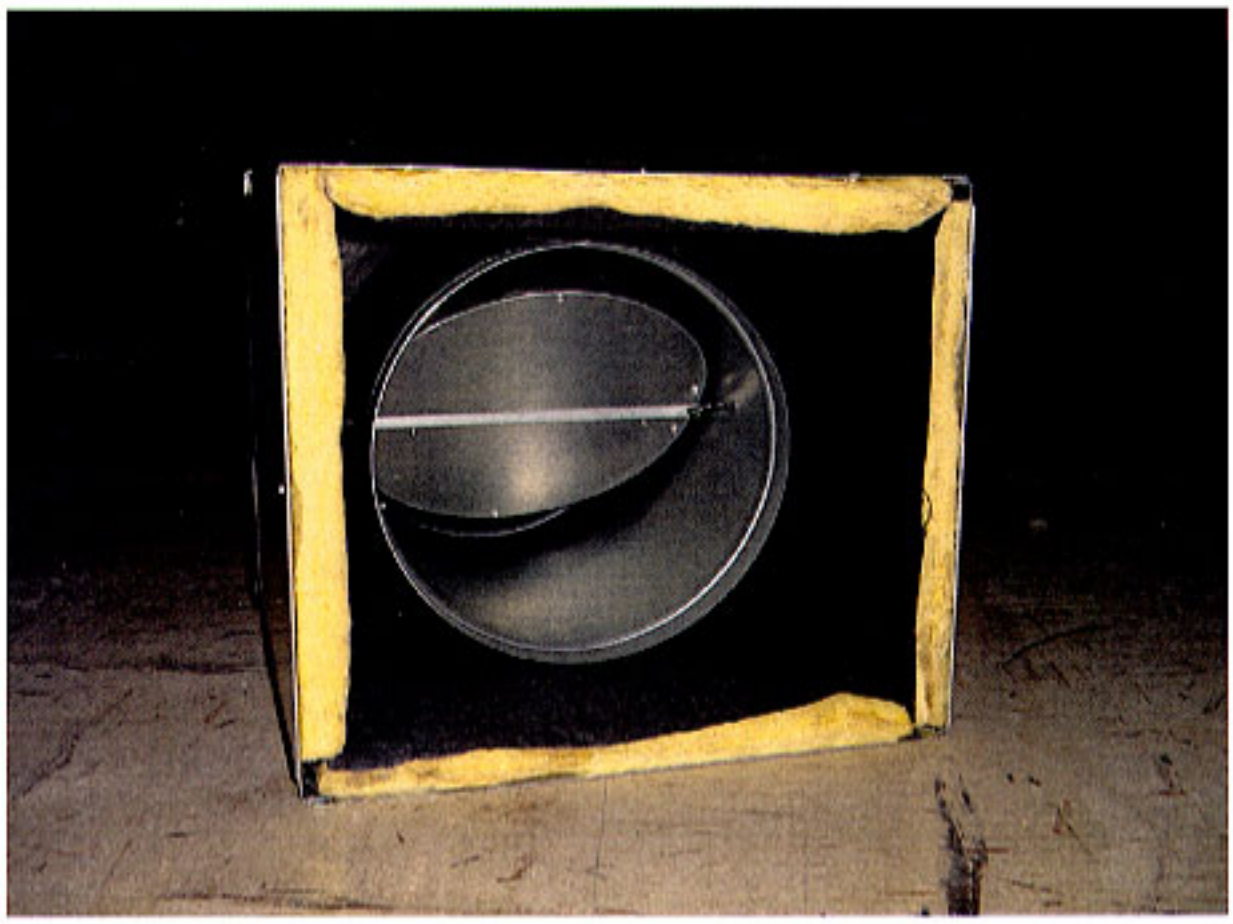

Figure 3: Test Sample, Outlet Side

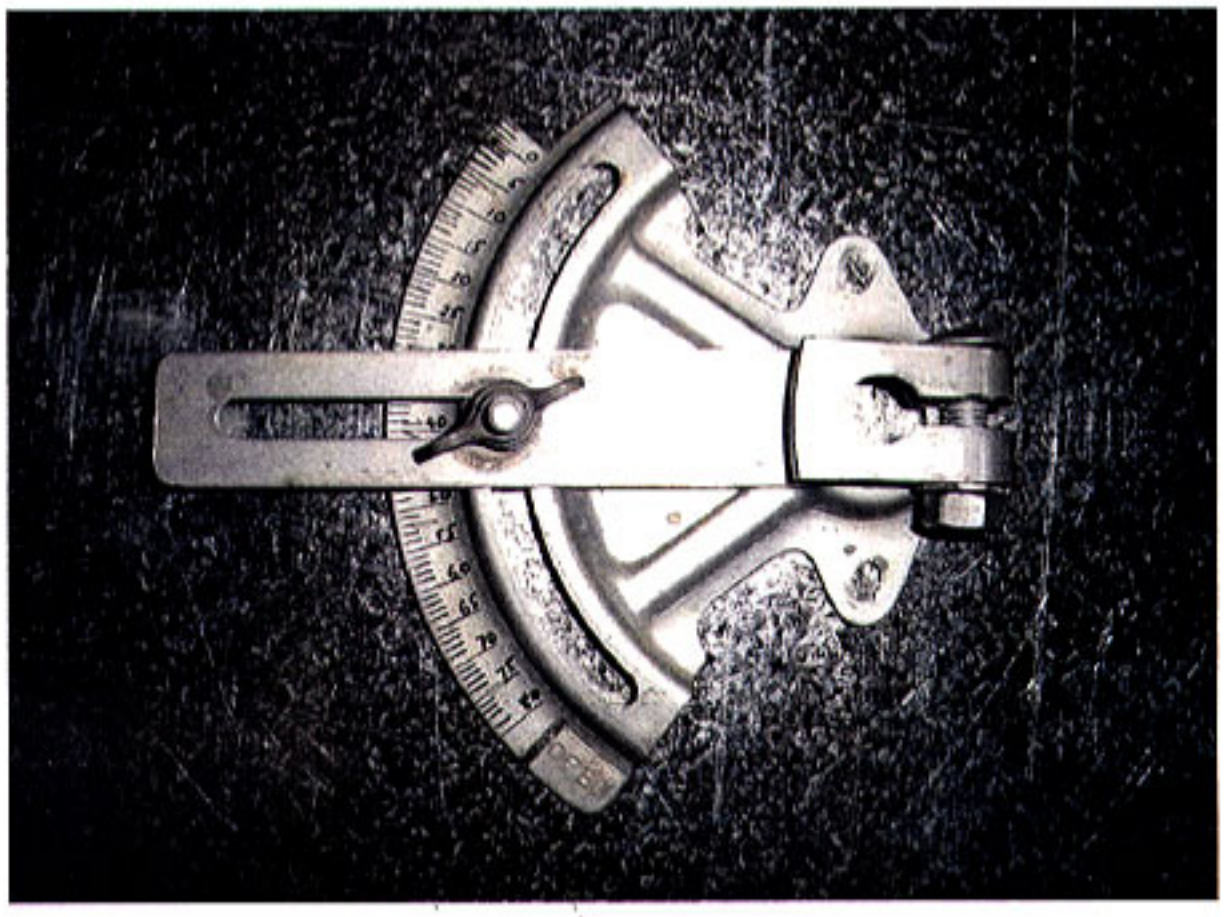

Figure 4: Damper Blade Mechanism

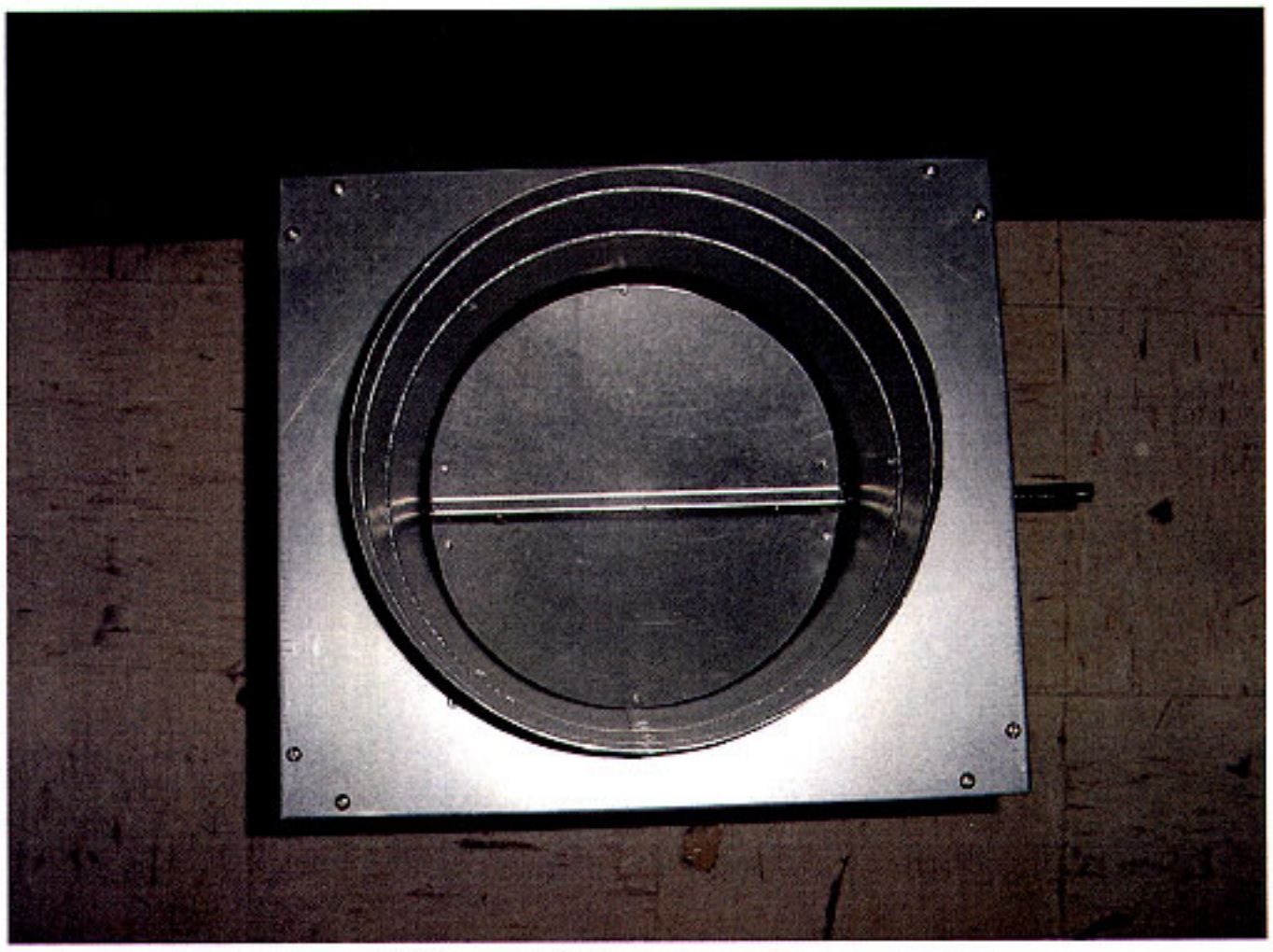

Figure 5: Damper Blade Fully Closed

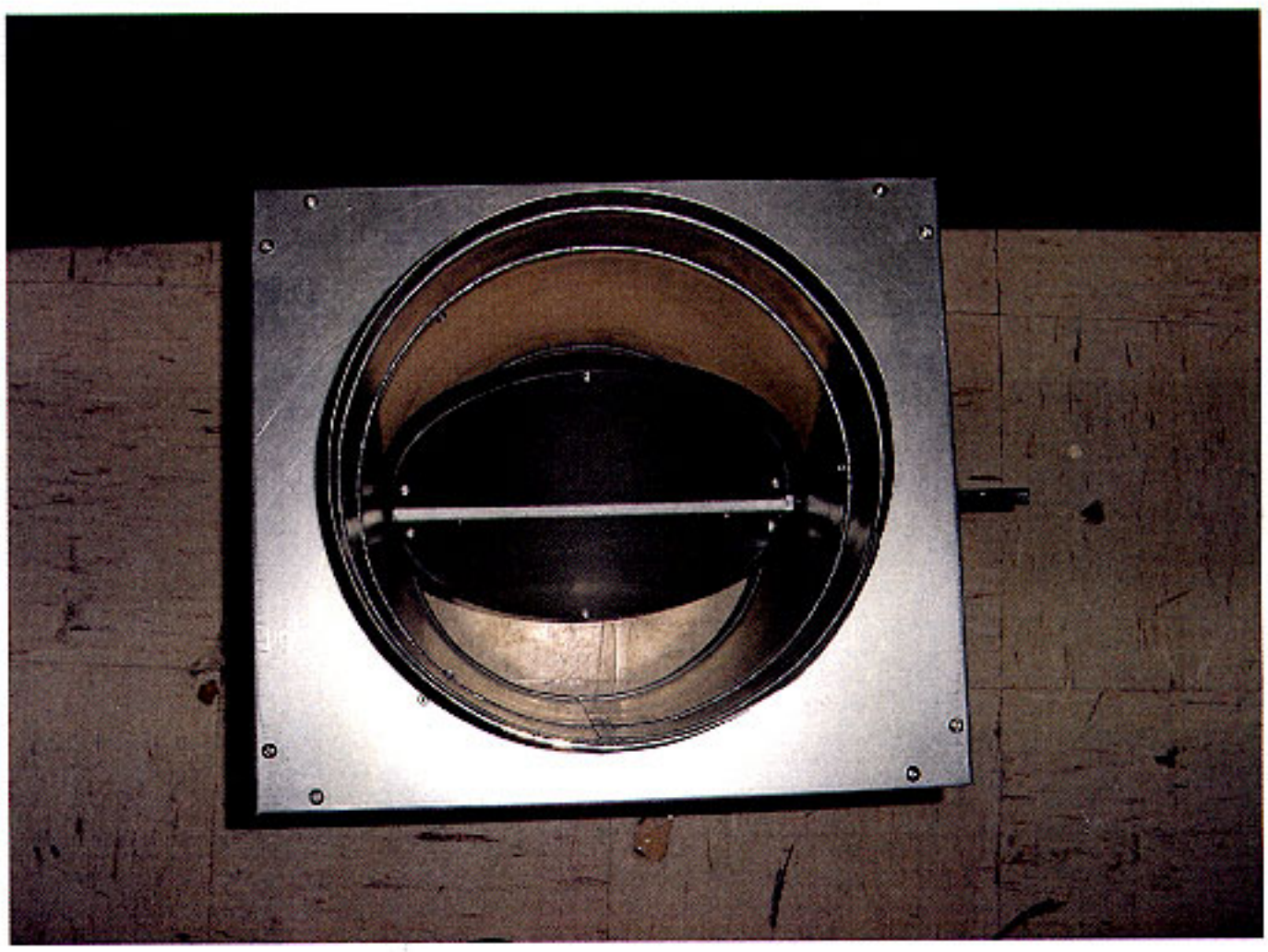

Figure 6: Damper Blade Partially Open

3.0 APPLICABLE STANDARDS

The test unit was tested for both radiated and discharge noise at a range of flow conditions, as shown on the Test Certificate.

The test set up was in accordance with ANSI/ASHRAE 130-1996 ("Methods of Testing for Rating Ducted Air Terminals Units") for radiated and discharge sound power determination.

The test set up was in accordance with ISO 7244 ("Air Distribution and Air Diffusion – Aerodynamics Testing of Dampers and Valves") for casing leakage and closed blade leakage determination.

Acoustic measurements were performed in accordance with 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".

4.0 TEST SET UP AND PROCEDURE

The Unit under test was set up in the Vipac Air Distribution Test Chambers (Reverberation Rooms 1 and 2) and connected to a quiet air supply.

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

Test Air Temperature	17 degrees C ± 2.0 degree C
Room Air Temperature	19 degrees C ± 2.0 degree C
Barometric Pressure	1055 millibar ± 5 millibar
Relative Humidity	60 ± 10%

Air flow rates were measured using orifice plate located upstream of the fan under test. Static pressure drop was recorded using 4 manifolded pressure tappings located upstream of the VAV Box under test. Figure 7 shows an indicative schematic of the laboratory set up.

Radiated noise was measured in Reverberation Room 1 and Discharge noise was measured in Reverberation Room 2.

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

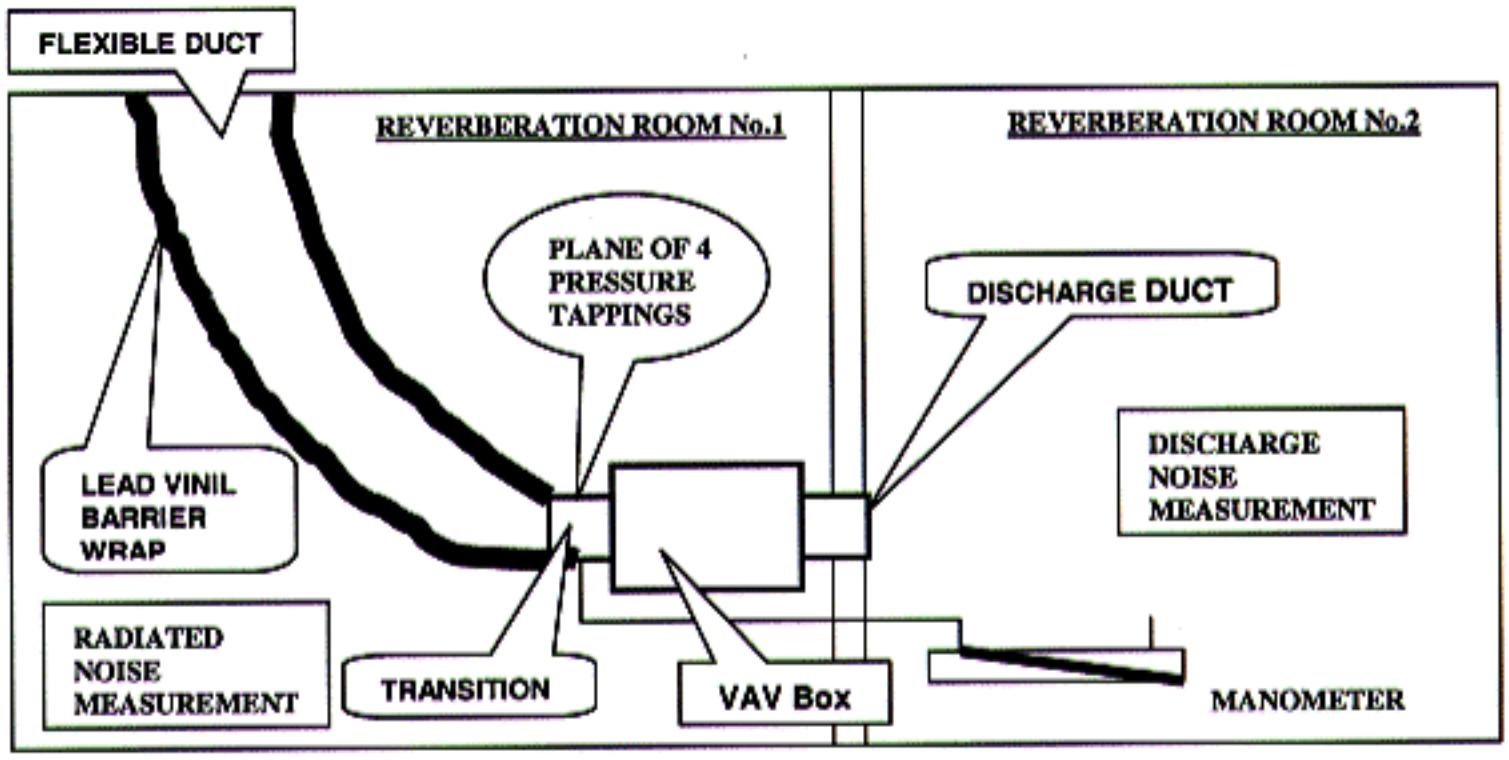

Figure 7: Schematic of Laboratory Set Up

5.0 INSTRUMENTATION

INSTRUMENT	MAKE & MODEL	CALIBRATION		SERIAL NO.
		BY	DATE	
Sound Level Meter	LD2900	Vipac	May 2001	A0316
Microphone	B&K 4145	Vipac	May 2001	25415619
Acoustic Calibrator	LD CA250	Vipac	August 2001	860700
Sound Power Reference Source	Pope	Vipac	May 2001	3172
Manometers (2)	Airflow Developments Type 504	Gas Technology Services	June 2001	36862 PM6-168
Orifice Plates	Vipac	Vipac	May 2001	-
Thermometer	Digital T200KC	-	-	-

6.0 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

7.0 RESULTS

The results obtained are shown in the attached Test Certificates.

The leakage test results are shown in Appendix A.

Report Prepared by:

VIPAC ENGINEERS AND SCIENTISTS LTD.

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ZARKO DRINIC
PROJECT ENGINEER

.....

MICHAEL SMITH
N.A.T.A. SIGNATORY

TEST CERTIFICATE – No.1

ACOUSTIC AND AIRFLOW PERFORMANCE TEST OF AIR TERMINALS

SUPPLIED BY: ASLI MECHANICAL SDN. BHD.
TESTED BY: VIPAC ENGINEERS & SCIENTISTS LTD
TEST ENGINEER: ZARKO DRINIC
TEST DATE: 14 / 03 / 2002
CLIENT: ASLI MECHANICAL SDN. BHD.
UNIT: Single Duct Air Terminal
Size A, Φ250 mm inlet

RADIATED SOUND POWER LEVELS

TEST CONDITIONS		SOUND POWER LEVEL, dB re 1E-12 W OCTAVE BAND CENTRE FREQUENCY (Hz)						
Qs(l/s)	% of Rated Flow	125	250	500	1000	2000	4000	8000
125Pa PRESSURE DROP								
318	25%	54.3	52.3	43.2	39.3	30.8	<22.5	<19.7
448	50%	57.5	53.3	48.9	45.5	37.8	31.5	<21.6
542	75%	60.6	56.8	53.3	50.5	43.7	37.2	25.0
637	100%	61.5	57.8	56.6	54.0	48.4	42.6	31.7
375Pa PRESSURE DROP								
318	25%	58.7	57.3	54.3	46.2	39.2	33.0	<23.0
448	50%	63.3	61.2	56.5	49.8	42.5	35.9	25.1
542	75%	65.5	63.5	58.8	52.8	46.5	40.5	29.0
637	100%	66.7	64.5	60.5	56.6	50.0	44.0	33.2
750Pa PRESSURE DROP								
318	25%	59.5	59.2	56.1	51.6	47.6	40.0	32.1
448	50%	65.0	63.9	59.8	54.2	49.8	42.6	33.5
542	75%	68.1	66.8	60.7	56.3	52.2	44.6	35.1
637	100%	69.9	68.2	62.3	58.0	54.2	47.4	41.8

LEGEND

Qs - Air Flow Rate (l/s)
< - Insufficient margin above background noise to allow accurate determination

Zarko Drinic
PROJECT ENGINEER

Michael Smith
N.A.T.A. SIGNATORY

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TEST CERTIFICATE – No.2

ACOUSTIC AND AIRFLOW PERFORMANCE TEST OF AIR TERMINALS

SUPPLIED BY:	**ASLI MECHANICAL SDN. BHD.**
TESTED BY:	**VIPAC ENGINEERS & SCIENTISTS LTD**
TEST ENGINEER:	**ZARKO DRINIC**
TEST DATE:	**14 / 03 / 2002**
CLIENT:	**ASLI MECHANICAL SDN. BHD.**
UNIT:	**Single Duct Air Terminal**
	Size A, Φ250 mm inlet

DISCHARGE SOUND POWER LEVELS

TEST CONDITIONS		SOUND POWER LEVEL, dB re 1E-12 W OCTAVE BAND CENTRE FREQUENCY (Hz)						
Qs(l/s)	% of Rated Flow	125	250	500	1000	2000	4000	8000
125Pa PRESSURE DROP								
318	25%	57.7	56.8	51.2	48.3	46.7	42.0	35.5
448	50%	58.9	59.1	53.9	52.3	49.1	44.9	37.8
542	75%	61.0	61.4	55.2	53.4	50.2	45.6	38.6
637	100%	65.0	66.3	61.0	57.6	54.3	52.7	44.5
375Pa PRESSURE DROP								
318	25%	64.1	67.3	63.3	60.5	57.0	56.5	49.5
448	50%	65.0	69.1	63.9	61.0	57.6	57.1	50.5
542	75%	66.7	70.4	64.8	62.1	59.3	58.0	51.4
637	100%	67.7	72.0	65.9	63.6	60.1	58.9	52.1
700Pa PRESSURE DROP								
318	25%	67.5	71.1	66.1	68.0	65.6	63.9	59.6
448	50%	70.0	73.3	67.6	68.6	66.9	65.7	60.0
542	75%	72.5	74.6	69.0	69.4	67.3	66.5	60.7
637	100%	77.4	75.4	71.7	72.2	69.8	68.0	62.8

LEGEND

Qs - Air Flow Rate (l/s)

< - Insufficient margin above background noise to allow accurate determination

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APPENDIX A

LEAKAGE TEST RESULTS

CLOSED BLADE LEAKAGE

Size	Inlet Diameter (mm)	Pressure Drop (Pa)	Leakage (l/s)
A	Ø250	125	4
		375	9
		750	13

CASING LEAKAGE

Size	Inlet Diameter (mm)	Pressure Drop (Pa)	Leakage (l/s)
A	Ø250	125	4
		375	9
		750	12