

MANAGING DIRECTORS
MATTHEW PALAVIDIS
VICTOR FATTORETTO
DIRECTOR
MATTHEW CARTER



LIGHTWEIGHT CONCRETE PANELS

ACOUSTIC PERFORMANCE REPORT

**System(s): Standard Panel(s) of Thickness 75mm, 100mm, 150
and 200mm**

DUBAI
A: PO Box 474025 DUBAI UAE
T: +97 15 53 476 738

SYDNEY MELBOURNE BRISBANE CANBERRA
KSA* LONDON DUBAI SINGAPORE ATHENS
{*Division of Matco}

www.acousticlogic.com.au

The information in this document is the property of Acoustic Logic Consultancy and shall be returned on demand. It is issued on the condition that, except with our written permission, it must not be reproduced, copied or communicated to any other party nor be used for any purpose other than that stated in particular enquiry, order or contract with which it is issued.

DOCUMENT CONTROL REGISTER

Project Number	20150028.5
Project Name	Al Maryah Central Mall, Abu Dhabi, U.A.E.
Document Title	Acoustic Test(s) Report
Document Reference	20160038/0623A/R01/AT
Issue Type	Email
Attention To	Louis Manzi Harwal Group

Revision	Date	Document Reference	Prepared By	Checked By	Approved By
0	23.06.2016	20160038/0623A/R0/AT	AT	MC	MC
1	27.06.2016	20160038/0623A/R1/AT	AT	MC	MC

TABLE OF CONTENTS

1	INTRODUCTION	4
2	TEST METHODOLOGY	4
2.1	MEASUREMENT EQUIPMENTS	5
2.2	TEST SIGNALS AND FREQUENCIES	6
3	TEST RESULTS	6
	<i>APPENDIX 1 - GLOSSARY OF ACOUSTIC TERMS</i>	9
	<i>APPENDIX 2 – CALIBRATION CERTIFICATES</i>	11

1 INTRODUCTION

This report presents the results of our acoustic performance testing of Standard Easy Walls lightweight concrete panels within the purpose built Airborne Transmission Loss Test facility at Harwal Group DIP. The test was undertaken by AL independently and has been commissioned by Technical Supplies and Service LTD.

The configuration of the subject Easy Walls panel tested is provided below;

- **Test#1:** Standard panel of thickness 75mm.
- **Test#2:** Standard panel of thickness 100mm.
- **Test#3:** Standard panel of thickness 150mm.
- **Test#4:** Standard panel of thickness 200mm.
- **Test#5:** Two Skins of Lightweight Concrete Acoustic Panel of thickness 75mm, separated with paper faced 50mm thick Glasswool insulation (18-24kg/m³ density) interlayer

The results of the measurements and acoustic weaknesses/ concerns as noted in the current installation have been presented below. The relevant standard adopted for the testing has also been stated below.

Based on the measured system results, AL has considered further wall configurations as intended for use on the Al Maryah Central project.

2 TEST METHODOLOGY

The following method was to establish the building element's (wall) airborne sound insulation. The test has been carried out generally in accordance with **BS EN ISO 140-3:1995 'Measurement of Sound Insulation in Building and of Building Elements Part 3-Laboratory Measurement of airborne sound Insulation of building elements'**.

1. Determine the acoustic panels to be tested.
2. Calibration of sound level meter with hand held calibrator to ensure for accuracy. Repeat calibration post measurements to qualify any drift in the measurement results. Use of speaker, noise generator and used burst of balloons to measured reverberation times.
3. In order to examine the Panel performance a source room is identified-location of the speaker. The adjacent room is the receiver room. Noise levels are taken in both rooms whilst the speaker is in operation. In addition background noise measurements and reverberation times are measured at the receiver room.

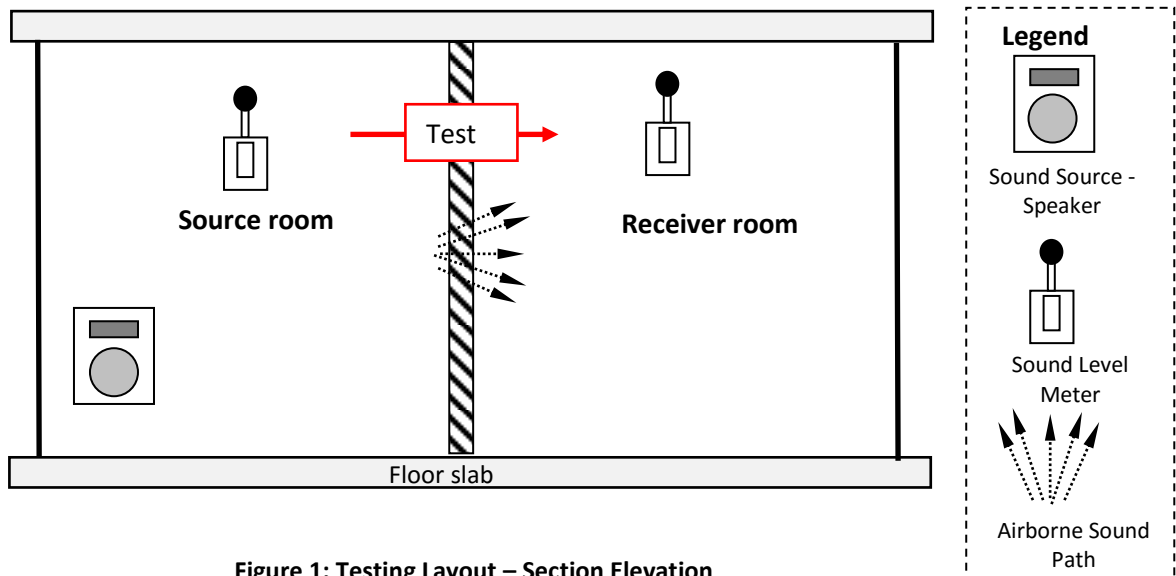


Figure 1: Testing Layout – Section Elevation

2.1 MEASUREMENT EQUIPMENTS

The instruments used during the test are listed below.

1. Norsonic Type 140 Class 1 Sound Level Analyzer-SN: 1402803.
2. Norsonic Calibrator 1251-SN: 32343.
3. LAX TH308A amplified speaker.
4. NTI – Minirator Signal PRO Noise Generator.

Noise measurements were undertaken using a Norsonic 140 – Type 1 Sound Level Analyser [SN: 1402803], set on fast response. The sound level meter was calibrated before and after the measurements using a Norsonic Sound Calibrator type 1251 [SN: 32343]. No significant drift was recorded. Current calibration certificates have been attached in the **Appendix 2** of this report.



Figure 2: Excerpt images - Nor140 Sound Level Analyser & Type 1251 Calibrator

An LAX TH308A speaker fitted with NTi Minirator MR-PRO signal generator was used as the noise source. Refer speaker excerpt image of the speaker and noise generator below for reference.



Figure 3: Excerpt image - LAX TH308A amplified speaker and NTI Minirator Signal PRO Noise Generator

2.2 TEST SIGNALS AND FREQUENCIES

Random pink noise was used during the test procedure. Testing conducted in $1/3^{\text{rd}}$ octave bands between the ranges of 100 Hz to 3150 Hz for the acoustic performance ratings. The noise was generated within the Source room and recorded within the Receiver locations to determine the panel acoustic performance in line with the abovementioned standard.

3 TEST RESULTS

This section presents the results of our measurements. The subject panels was tested in two orientations with one room as a Source and adjacent room as a Receiver to determine the sound insulation performance of the standards panels. Refer indicative [NTS] section details below highlighting the test orientations.

Scenario#1 – Room 1 to Room 2

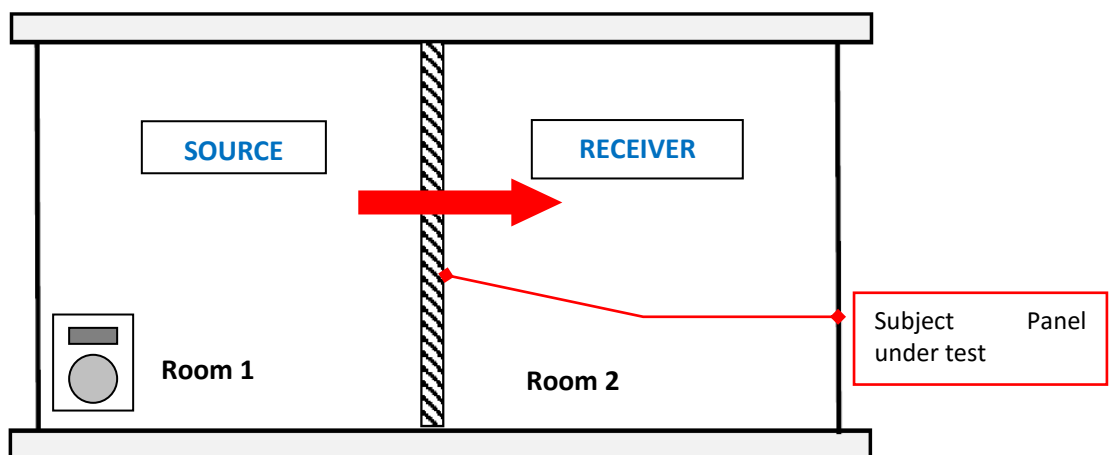


Figure 4: Scenario#1 - Room 2 to Room 1

Scenario#2- Room 2 to Room 1

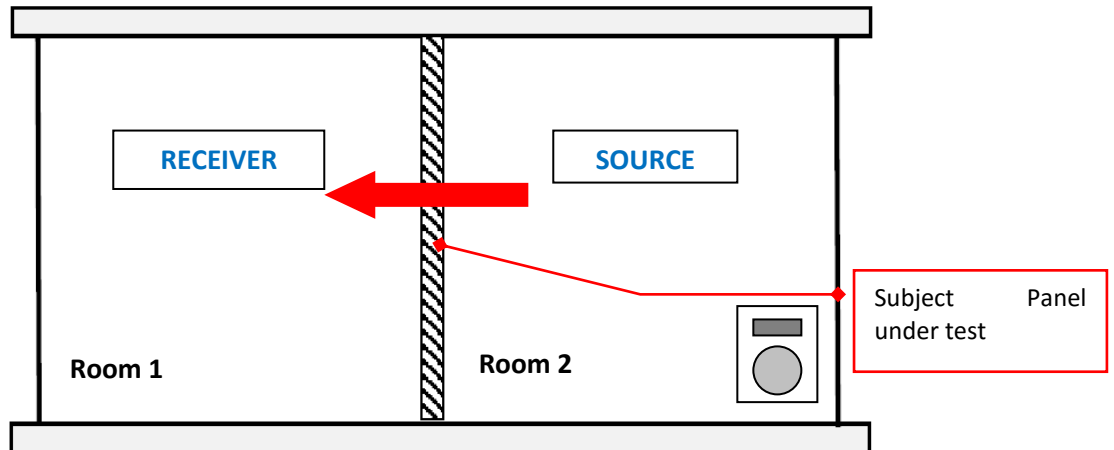


Figure 5: Scenario#2 Room 1 to Room 2

The measured test results of the subject panels have been tabulated below:

Table 1: Lightweight Concrete Panel Airborne Performance Test Results

Easy Wall Panels	Test Date	R _w dB	Report Reference#
Test# 1 -75mm standard panel	15 th August,2015	Scenario# 1 - 40	20150028.14/0815A/R00/AT
		Scenario# 2 - 41	
Test# 2 -100mm standard panel	16 th July,2015	Scenario# 1 - 45	20150028.12/0720A/R00/HP
		Scenario# 2 - 45	
Test# 3 -150mm standard panel	26 th March, 2015	Scenario# 1 - 48	20150028.10/0602A/R02/HP
		Scenario# 2 - 49	
Test# 4 -200mm standard panel	09 th June, 2015	Scenario# 1 - 52	20150028.11/0611A/R1/HP
		Scenario# 2 - 51	
Test#5 - Two Skins of Lightweight Concrete Acoustic Panel of thickness 75mm, separated with paper faced 50mm thick Glasswool insulation (18-24kg/m ³ density) interlayer {200mm overall partition footprint}	16 th April, 2016	58	20150028.8/0419B/R3/HP

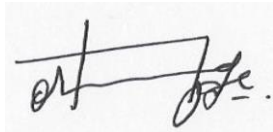
Based on the measured system results, AL has considered further wall configurations as intended for use on the Al Maryah Central project.

Table 2: Lightweight Concrete Panel Predicted Results – Al Maryah Central

Proposed Easy Wall Panels	Required Acoustic Rating R_w dB	AL Predicted R_w dB	Compliance
Two skins of 75mm standards panels {150mm overall partition footprint}	45	50	✓
Two skins of 100mm standards panels {200mm overall partition footprint}	55	55	✓
Two skins of 100mm standards panels + 4.5mm FC sheet on both sides {209mm overall partition footprint}	55	56	✓
100mm standard panel	45	45	✓
200mm standard panel +4.5mm FC sheet on both sides	55	55	✓
Two Skins of Lightweight Concrete Acoustic Panel of thickness 75mm, separated with 50mm thick PIR insulation (35kg/m ³ density) interlayer {200mm overall partition footprint}	55	56	✓

We trust this information is satisfactory. Please contact us should you have any further queries.

Yours faithfully,



ACOUSTIC LOGIC
Mohammed Afaque
Project Engineer

APPENDIX 1 - GLOSSARY OF ACOUSTIC TERMS

Sound

Sound is a cyclic change in air pressure.

The rate at which the air pressure cycles occur determines whether the sound is high pitched (eg crickets) or low pitched (eg fog horn). The rate at which the air pressure cycles, or the “frequency” is measured in cycles/per second or Hertz.

The amount the air pressure fluctuates determines the loudness of the sound.

Sound Pressure Level (SPL)

The sound pressure level closely corresponds to human hearing, converted into a logarithmic scale with units of decibel, or dB as follows:

$$\text{Sound Pressure Level (SPL)} = 20 \times \text{Log}_{10} (P/\text{Pref})$$

Where:

P = pressure in Pa

Pref = reference pressure which roughly corresponds to the threshold of human hearing (2×10^{-5} Pa)

Sound Power Level (SWL)

The sound power level is the energy emitted by a noise source. It is also a logarithmic scale and is defined as:

$$\text{SWL} = 10 \times \text{Log} (W/W_{\text{ref}})$$

Where:

P = sound power in Watts (W)

Pref = reference sound power (10-12W)

Sound Power is the sound energy that is emitted whereas sound pressure is the result of this as perceived by the ear or meter. The ear and microphones measure sound pressure, not sound power.

Room Correction factor

Room Correction factor is an indicative in absorption of sound level in dB when inclusion of typical furnishings as per a subject area is taken into consideration. The inclusions generally results in improvement in absorption within the room, thereby reducing the resultant noise level for accurate measurements.

Correction Terms (dB)

"C" is a correction for incident sound typical of living activities (talking, music, radio and TV), it is typically represented in frequency bands 50-3150, 50-5000 or 100-5000 Hz.

"Ctr" is a low frequency correction term for transportation, disco music etc

Decibel (dB)

One-tenth of a Bel. A Bel is the unit of level of a quantity proportional to power when the base of the logarithm is 10. Also, the unit of level of a field quantity when the base of the logarithm is the square root of 10.

dB (A)

Specific measuring scale achieved by a weighting network fitted in a sound level meter. Gives a single-figure rating to a broad-band sound. dB (A) is approximately equivalent to the human ear frequency response.

Field Sound Transmission co-efficient (FSTC)

A single-number index which characterizes the frequency dependent airborne sound insulation performance of partitions. FSTC values for partitions relate to insitu "field" performance. Similarly R'W relates to insitu "field" performance.

Flanking transmission

Transmission of sound from a source room to an adjacent receiving room but not via the common partition.

Insertion loss

The reduction of noise level by the introduction of a noise control device: established by the substitution method of test.

Noise reduction

Used to define the performance of a noise barrier. Established by measuring the difference in sound pressure levels adjacent to each surface. (See also Sound Reduction Index)

Sound Transmission co-efficient (STC)

A single-number index which characterizes the frequency dependent airborne sound insulation performance of partitions. STC values for partitions relate to laboratory performance. Units for testing and calculation in dB. Similarly R_w is the 'weighted sound reduction index' and derived using similar criterion to the STC and in turn represented as a single value. The R_w and STC are generally of similar magnitude.

Transmission Loss (TL)

The accumulated decrease in acoustic intensity as an acoustic pressure wave propagates outwards from source. The intensity of the signal is reduced with increasing range due to spreading and attenuation.

APPENDIX 2 – CALIBRATION CERTIFICATES



Calibration Certificate

CERTIFICATE NO. 42145 / 2015

Issued on : May 02, 2015

Customer: - **ACOUSTIC LOGIC**

P.O. BOX NO : 474025

DUBAI, U.A.E.

TEL : +971 4 4508061

Instrument Details: -

TYPE	: SOUND CALIBRATOR		
MAKE	: NORSONIC	SL. NO.	: 32343
MODEL	: 1251	RANGE	: 114.0 db

Calibrating Instrument:-

Instrument	: MULTIFUNCTION CALIBRATOR		
Serial No.:	: 1249G13	Measuring	: 0.01ppm
Certificate No.	: UKAS-0356422	Uncertainty	

The uncertainty limits quoted refer to measured values only with no account being taken of the instrument's ability to maintain its calibration. We hereby confirm that the above mentioned instrument was calibrated according to our WI No.26 under observation of ISO/IEC 17025 certified Quality Assurance System.

Calibration Results:-

Sl.No	Calibrator Value in dB	Master Reading in dB	Error in dB
1.	114.0 dB	114.02 dB	-0.02
2.	114.0 dB	114.01 dB	-0.01
3.	114.0 dB	114.02 dB	-0.02

Calibration Conditions : Temperature 20 +/- 2 °C Relative Humidity: 50 +/- 10% RH

Calibration Details:-

Calibration date : 02-05-2015

Calibration due : 01-05-2016

Calibrated by :

Verified by



OMCL-35





Calibration Certificate

CERTIFICATE NO. 42146 / 2015

Issued on May 02, 2015

Customer: - **ACOUSTIC LOGIC**

P.O.BOX NO : 474025

DUBAI, U.A.E.

TEL : +971 4 4508061

Instrument Details: -

TYPE	: SOUND LEVEL METER		
MAKE	: NORSONIC	SL. NO.	: 1402803
MODEL	: 140	RANGE	: 30-130 db

Calibrating Instrument:-

Instrument	: MULTIFUNCTION CALIBRATOR		
Serial No.:	: 1249G13	Measuring	: 0.01ppm
Certificate No.	: UKAS-0356422	Uncertainty	

The uncertainty limits quoted refer to measured values only with no account being taken of the instrument's ability to maintain its calibration. We hereby confirm that the above mentioned instrument was calibrated according to our WI No.26 under observation of ISO/IEC 17025 certified Quality Assurance System.

Calibration Results:-


Sl.No	Reference Value in dB	Instrument Reading in dB	Error in dB
1.	35.0	35.0	0.0
2.	50.0	49.8	-0.2
3.	60.0	60.2	0.2
4.	70.0	70.1	0.1
5.	80.0	80.2	0.2
6.	90.0	90.3	0.3
7.	100.0	100.3	0.3
8.	110.0	110.4	0.4
9.	120.0	119.6	-0.4
10.	130.0	129.6	-0.4

Calibration Conditions : Temperature 20 +/- 2 °C Relative Humidity: 50 +/- 10% RH

Calibration Details:-

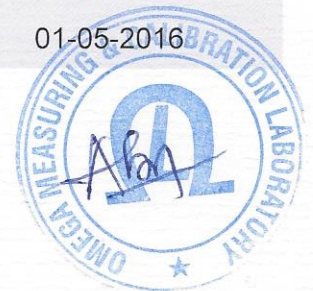
Calibration date : 02-05-2015

Calibration due : 01-05-2016

Calibrated by : 

Verified by : 

OMCL-35



P.O.Box : 125349, Dubai - U.A.E., Tel.: 04 - 341 3680, Fax : 04 - 341 369

E-mail : omcl@emirates.net.ae / sbem@emirates.net.ae

www.sanbookomega.com



Calibration Certificate

CERTIFICATE NO. 32077 / 2014

Issued on April 30, 2014

Customer: - **ACAUSTIC LOGIC**

P.O.BOX NO : 474025

DUBAI, U.A.E.

TEL : +971 4 4508061

Instrument Details: -

TYPE	: SOUND LEVEL METER		
MAKE	: NORSONIC	SL. NO.	: 1402803
MODEL	: 140	RANGE	: 30-130 db

Calibration Gases:-

Instrument	: MULTIFUNCTION CALIBRATOR		
Serial No.:	: 1249G13	Measuring	: 0.01ppm
Certificate No.	: UKAS-0356422	Uncertainty	

The uncertainty limits quoted refer to measured values only with no account being taken of the instrument's ability to maintain its calibration. We hereby confirm that the above mentioned instrument was calibrated according to our WI No.26 under observation of ISO/IEC 17025 certified Quality Assurance System.

Calibration Results:-

Sl.No	Reference Value in dB	Instrument Reading in dB	Error in dB
1.	35.0	35.0	0.0
2.	50.0	49.8	-0.2
3.	60.0	60.2	0.2
4.	70.0	70.1	0.1
5.	80.0	80.1	0.1
6.	90.0	90.3	0.3
7.	100.0	99.7	-0.3
8.	110.0	110.3	0.3
9.	120.0	119.7	-0.3
10	130.0	130.0	0.0

Calibration Conditions : Temperature 20 +/- 2 °C Humidity: 50 +/- 10% RH

Calibration Details:-

Calibration date : 30-04-2014

Calibration due : 29-04-2015

Calibrated by :

Verified by :



OMCL-35*



P.O.Box : 125349, Dubai - U.A.E., Tel.: 04 - 341 3680, Fax : 04 - 341 3690

E-mail : omcl@emirates.net.ae / sbem@emirates.net.ae

www.sanbookomega.com



Calibration Certificate

CERTIFICATE NO. 32078 / 2014

Issued on : April 30, 2014

Customer: - **ACAUSTIC LOGIC**
P.O.BOX NO : 474025
DUBAI , U.A.E.
TEL : +971 4 4508061

Instrument Details: -

TYPE	: SOUND CALIBRATOR		
MAKE	: NORSONIC	SL. NO.	: 32343
MODEL	: 1251	RANGE	: 114.0 db

Calibration Gases:-

Instrument	: MULTIFUNCTION CALIBRATOR		
Serial No.:	: 1249G13	Measuring	: 0.01ppm
Certificate No.	: UKAS-0356422	Uncertainty	

The uncertainty limits quoted refer to measured values only with no account being taken of the instrument's ability to maintain its calibration. We hereby confirm that the above mentioned instrument was calibrated according to our WI No.26 under observation of ISO/IEC 17025 certified Quality Assurance System.

Calibration Results:-

Sl.No	Calibrator Value in dB	Master Reading in dB	Error in dB
1.	114.0 dB	114.01 dB	-0.01
2.	114.0 dB	114.02 dB	-0.02
3.	114.0 dB	114.03 dB	-0.03

Calibration Conditions : Temperature 20 +/- 2 °C Humidity: 50 +/- 10% RH

Calibration Details:-

Calibration date : 30-04-2014 Calibration due : 29-04-2015

Calibrated by :

Verified by



OMCL-33

