



Measurement of Environmental Noise

Report Reference Number: 7580-3

For: Nationwide Structures

Project/Site Address

Phoenix Works, Thurlstone, S36 9QU

Prepared by

John Ashe

Test Date

14th February 2018

Report Date

17th February 2018

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Measurement Survey
Undertaken By

John Ashe



Report Completed By

John Ashe

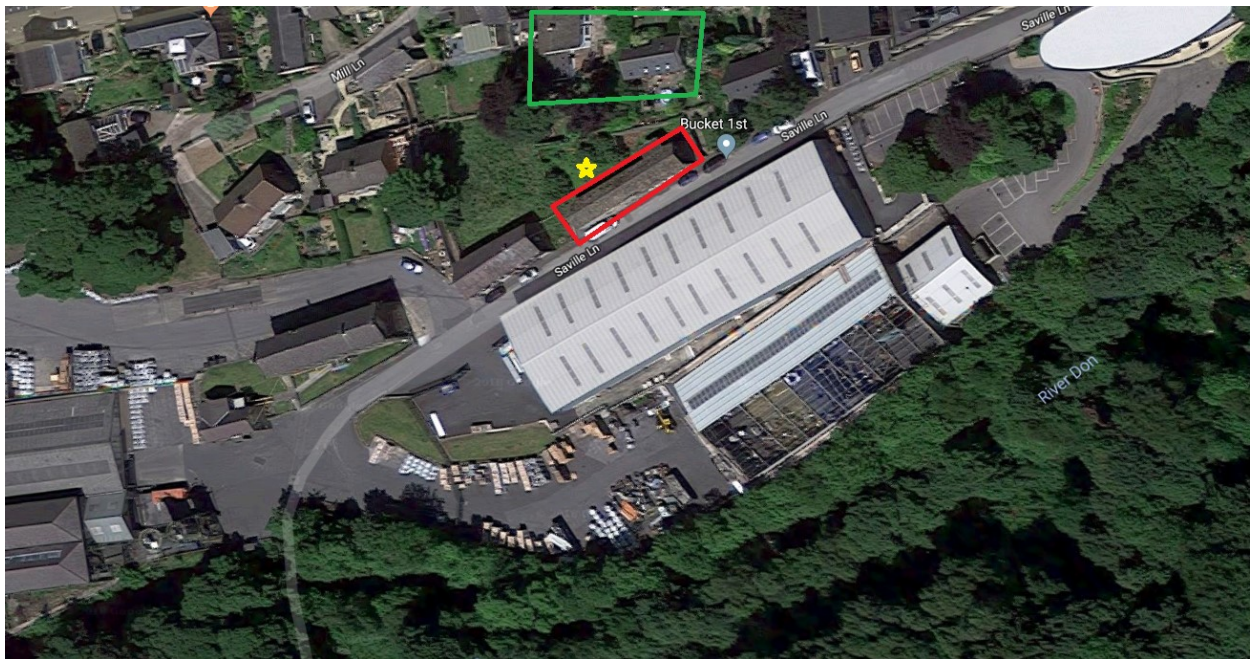


2.0 – Objectives

The purpose of the survey was to assess the proposed new building to be erected using a steel frame building to form a new metal fabrication workshop for the Phoenix Works company.

The report will be based from assumptions using general metal fabrication noise levels and by using generic façade resistance levels and improved façade resistance levels to create the proposed noise levels for the new building.

Below is the site plan of the existing site showing the existing building to be demolished highlighted in red. The nearest domestic dwellings highlighted in green and the microphone position highlighted in red.



3.0 – Site Description

The proposed development at Phoenix Works, Thurlstone, S36 9QU consists of a number of existing industrial units, old buildings containing workshops and a new office / administration building.

The old administration building on the edge of the site bordering the nearest dwellings is to be demolished and replaced with a new metal workshop building.

Pictures of the rear of the existing administration building are below showing the existing dwellings.





The main sources of noise on site are from the existing industrial units, road traffic noise from the main road at the top of the hill and site vehicles moving materials between buildings.

There is a hill directly to the rear of the building to be demolished meaning that the houses are at a higher level than the new proposed unit will be. As this is soft land, it will absorb some of the noise levels.

The opening hours for the business are as follows:

Monday – Friday – 0600 to 1700

Saturday – 0600 to 1200

4.0 – Microphone Position

The microphone was placed at the rear to the of the administration building as close as possible to the dwelling without being on the hill.

The microphone was placed 4m away from the façade of the existing administration building on soft land.

No frequency analysis was carried out as the proposed unit is not yet constructed so the “problem” noise was not available to measure.

The following measurements were taken:

Measurement Time	Location	Duration	Reading Reference
14/02/2018 11:12 – 12:12	At Site	1 Hour	180214-0001S
13/04/2018 5:57 – 6:57	At Site	1 Hour	180413_0001
13/04/2018 6:58 – 7:58	At Site	1 Hour	180413_0003
13/04/2018 8:01 – 9:01	At Site	1 Hour	180413_0004
14/04/2018 8:41 – 9:41	At Site	1 Hour	180414_0001
14/04/2018 9:41 – 10:41	At Site	1 Hour	180414_0002
14/04/2018 10:42 – 11:42	At Site	1 Hour	180414_0003

The closest dwelling to the proposed new metal workshop unit is approximately 5m away.

5.0 – Uncertainties

The following has been done to minimise the uncertainty of the measurements:

1) A class one microphone has been used for the purpose of the survey. **Norsonic 140 SLM – serial number - 1405312**

2) Weather conditions – 100% Cloud cover

	Before Measurements	After Measurements
Wind speed:	5mph - East	5mph - East
Humidity:	64%	64%
Temperature:	8°C	8°C
Barometric pressure:	1022mb	1023mb

3) Noise on site was fairly constant with no sudden increases or decreases in noise levels.

4) All results seen in this report will be rounded. (0.5 will be rounded up).

5) It was not possible to get access to the dwellings. Instead the measurement was done on the soft land to the rear of the building to be demolished and replaced. The Microphone was placed over 3.5m away from the façade of the building 1.3m high. Care was taken to avoid being too close to the hill.

6.0 – Recommendations

As can be seen from the results section of this report if the building is insulated acoustically to a good standard and have a minimum R_w value of 48dB then the noise from the proposed unit will not have an adverse effect on the existing dwellings.

However, there is still a number of things than can be done to further improve the reduction of noise at the nearest dwellings as below:

1. Ensure that the façade of the building directly facing the dwellings has no openings, as this will provide a weakness in the structure allowing extra noise break-out from the unit.
2. Ensure that all and any doors to the unit are kept closed as much as reasonably practicably to avoid excess noise break-out
3. A Fence/more dense fence (than the existing) could be erected at the rear of the dwellings to provide a further barrier from the noise.
4. Ensure that any equipment is not directly connected to the façade of the building as this will cause vibration of the structure and could cause the structure to then become a noise source within itself.
5. The angle of the roof should not be too steep as to direct sound towards the first floor of the dwellings houses. The roof should be insulated to the same standards as the walls.

The calculations in the results section of this report, do not take into account the effect of the hill directly to the rear of the dwellings or the shrubbery / existing fences in place. These would normally be expected to reduce noise levels further.

7.0 – On Site Microphone Calibration

Microphone calibration: 114.0 dB 113.9dB = Drift of -0.1dB

(The drift value is within acceptable limits of +/-0.3dB)

8.0 – Results

Time	Reading – LAeq dB	L90
11:12 – 12:12	49.9dB ~ 50dB	45.9dB ~ 46dB
13/04/2018 05:57 – 06:57	49.3dB ~ 49dB	41.5dB ~ 42dB
13/04/2018 06:58 – 07:58	49.1dB ~ 49dB	43.7dB ~ 44dB
13/04/2018 08:01 – 09:01	49.6dB ~ 50dB	43.9dB ~ 44dB
14/04/2018 08:41 – 09:41	48.2dB ~ 48dB	42.8dB ~ 43dB
14/04/2018 09:41 – 10:41	49dB	42.3dB ~ 42dB
14/04/2018 10:42 – 11:42	47.7dB ~ 48dB	41.4dB ~ 41dB

The "problem" noise, in terms of LAeq - termed the "ambient" noise level. For the purpose of this report, an estimate of predicted noise levels for a metal fabrication workshop will be used.

Noise excluding the "problem" noise in terms of both LAeq and LA90; these measurements are termed the "residual" and "background" noise levels respectively.

It would be predicted that internal noise levels within the workshop (with it being metal fabrication) would be, at its highest levels 103dB LAeq (this level has been estimated from a number of sources and a equipment list from the client. See Technical Appendix).

The client has confirm the following will be installed into the new workshop:

These measurements have been taken at operator position as a LAeq reading over a representative period for that equipment

Welders – (Assumed MIG) – 102dB (<http://www.hse.gov.uk/welding/noise-vibration.htm>)

Grinding on a pedestal grinder 90 dB(A) - 95 dB(A) –
(<http://www.hse.gov.uk/engineering/noise.htm>)

Lathe – 81dB

(http://www.howardleight.com/assets/attachments/374/Howard_Leight_NoiseThermometer_1_.pdf?1398722435)

Milling machine – 65dB – (<http://esatjournals.net/ijret/2014v03/i23/IJRET20140323054.pdf>)

Pillar Drills – Not Significant

The total output of noise within the workshop will be as follows:

$$10\log(10^{10.2} + 10^{9.5} + 10^{8.1} + 10^{6.5}) = 102.81 \sim 103\text{dB}$$

The above is assuming that all equipment will be running at the same time. This is highly unlikely as from information given from the client, only 3 people will be working inside the unit.

A cladding Rw value for metal cladding insulated with Rockwool Acoustic insulation is 48dB+Ctr <http://www.rockwool.co.uk/technical-support/tools/acoustic-calculator/> (based on using a system similar to the document below in the technical appendix) leaving the external noise (at the façade of the building) as 55dB (assuming no openings on the façade.).

$$103\text{dB} - (53\text{dB} + 5\text{dB Ctr})$$

Once this is calculated over the distance to the nearest property the problem noise level will be:

$$20\log(5\text{m} / 1\text{m}) = 14\text{dB Reduction over 4m}$$

$$55\text{dB} - 14\text{dB} = 41\text{dB}$$

Since noise transmission from the roof is also a possible path of transmission, this figure needs to be added to its self to obtain a more accurate figure:

$$10\log(10^{4.1} + 10^{4.1}) = 44\text{dB}$$

Since the noise from the proposed unit due to being metal fabrication, and assuming the use of equipment that may produce impulsive noises which will be more dominant than potential tonal noises, a 6dB penalty should be applied.

The background noise levels (L90) are then compared to the rating level. For the purpose of this survey the “rating” level should not exceed 10dB that of the background level (L90).

$$\text{“Rating” Level} = 44\text{dB}$$

$$\text{Daytime Background Noise Level} = 46\text{dB}$$

$$\text{Early Morning Background noise level} = 10\log((10^{4.3} + 10^{4.2} + 10^{4.1}) / 3) = 43.4\text{dB} \sim 43\text{dB}$$

$$\text{Saturday Morning Background noise level} =$$

$$10\log((10^{4.2} + 10^{4.4} + 10^{4.4}) / 3) = 42\text{dB}$$

As can be seen the noise level will not be 5dB more than existing back ground noise levels

9.0 – Technical Appendix

Class 1 Microphone: Norsonic 140 SLM
Calibrator: Norsonic 1251

SITE DATA:

Please see attached sheets sent with this document.

NOISE DATA:

https://www.gla.ac.uk/media/media_142352_en.pdf - Page 2 - Figure 1 – Punch Press

<http://journal.unaab.edu.ng/index.php/theses/thesis/view/3962> - Olusegun Rotimi Gabriel - Hammering on Metal objects (118dB Laeq) from Metal Fabrication Company

http://www.hse.gov.uk/foi/internalops/sims/manuf/3_01_14.htm -

Cutting - 110dB(A)

Abrasive Blasting – 95dB(A) – 135dB(A)

These measurements have been taken at operator position as a Laeq reading over a representative period.

<http://www.hse.gov.uk/engineering/noise.htm> -

Power Presses – 95dB(A) – 115dB(A)

CNC Punch – 95dB(A) – 100dB(A)

Metal Cutting Saws – 90dB(A) – 95dB(A)

Grinding on a pedestal grinder 90 dB(A) - 95 dB(A)

Discharging metal objects into metal bins 85 dB(A) -95 dB(A)

General noise level in fabrication shop 85 dB(A) - 95 dB(A)

Hammering steel 95 dB(A) - 100 dB(A)

Guillotining 95 dB(A) - 100 dB(A)

Multi-spindle automatic turning 95 dB(A) - 105 dB(A)

Circular sawing metal 95 dB(A) - 105 dB(A)

Pressing - blanking 95 dB(A) - 110 dB(A)

punch pressing 110 dB(A) - 120 dB(A)

Riveting 100 dB(A) - 110 dB(A)

These measurements have been taken at operator position

http://www.mcrma.co.uk/pdf/mcrma_t08.pdf - Page 2 - Sheet Metal Shop Near Grinder – 110dB

<http://www.rockwool.co.uk/technical-support/tools/acoustic-calculator/>

Sound Insulation Prediction (v8.0.1)

Program copyright Marshall Day Acoustics 2014

Rockwool International A/S - Key No. 2586

Margin of error is generally within $R_w \pm 3$ dB

Job Name: AC05

Job No.: 0065

Page No.:

Date: 14 Apr 16

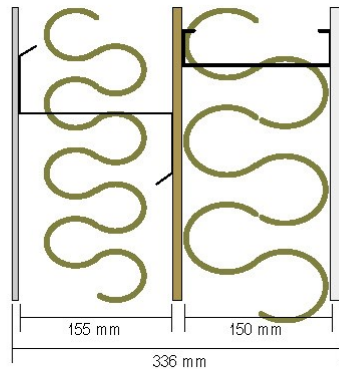
Initials:

File Name: A05.kl



Notes:

Modelled as a sealed system.



R_w	53 dB	
C	-1 dB	
C_{tr}	-5 dB	
D_{nTw}	55 dB	[V:50m3] [A:11m2]

System description

Panel 1: 1 x 8.0 mm ROCKPANEL Rockclad (ρ :1050 kg/m³, E:4GPa, η :0.01)

Cavity: Z Girt, Stud spacing 600 mm, Infill ROCKWOOL Rainscreen Duo Slab Thickness 105 mm (ρ :48 kg/m³, Rf:19400 Pa.s/m²)

Panel 2: 1 x 10.0 mm Cement Particle Board (ρ :1250 kg/m³, E:4.2GPa, η :0.01)

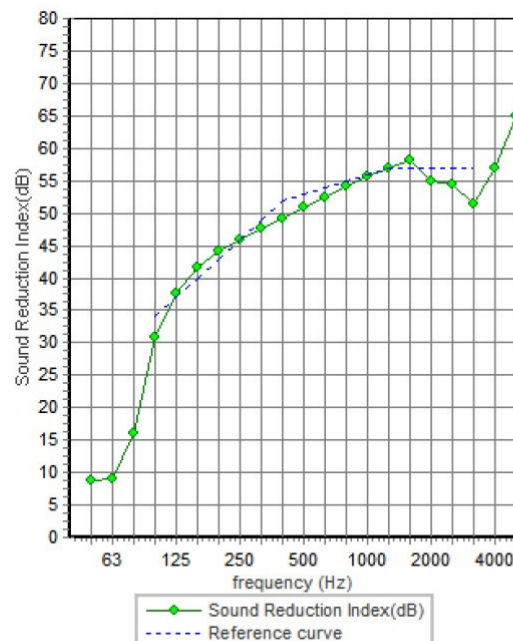
Cavity: Steel stud (1.0-1.6 mm) @ 600 mm, Infill ROCKWOOL Flexi (45 kg/m³) Thickness 140 mm

Panel 3: 1 x 12.5 mm Gyproc Wallboard 12.5mm (ρ :640 kg/m³, E:1.6GPa, η :0.01)

Mass-air-mass resonant frequency =54 Hz, 82 Hz

Panel Size 2.7x4 m

frequency (Hz)	R(dB)	R(dB)
50	9	
63	9	10
80	16	
100	31	
125	38	34
160	42	
200	44	
250	46	46
315	48	
400	49	
500	51	51
630	52	
800	54	
1000	56	55
1250	57	
1600	58	
2000	55	56
2500	54	
3150	51	
4000	57	55
5000	65	



Campbell Associates Ltd
 5b Chelmsford Road Industrial Estate
 GREAT DUNMOW, CM6 1HD, England
www.campbell-associates.co.uk
info@campbell-associates.co.uk
 Phone 01371 871030 Facsimile 01371879106



CALIBRATION



0789

Certificate number: U25732

Certificate of Calibration and Conformance

Test object: Sound Calibrator
Manufacturer: Norsonic
Type: 1251
Serial no: 33547

Customer: E2 Specialist Consultants Ltd
Address: 3B South Park Way, Wakefield Junction 41 Business Park,
 Wakefield. WF2 0XJ.
Contact Person: John Ashe.

Measurement Results:	Level	Level Stability	Frequency	Frequency Stability	Distortion
1:	114.01 dB	0.01 dB	1000.42 Hz	0.00 %	<0.3 %
2:	114.00 dB	0.01 dB	1000.42 Hz	0.00 %	<0.3 %
3:	114.01 dB	0.06 dB	1000.42 Hz	0.00 %	<0.3 %
Result (Average):	114.01 dB	0.03 dB	1000.42 Hz	0.00 %	<0.3 %
Expanded Uncertainty:	0.10 dB	0.06 dB	1.00 Hz	0.01 %	0.10 %
Degree of Freedom:	>100	4	>100	>100	>100
Coverage Factor:	2.00	3.31	2.00	2.00	2.00

The stated level is relative to 20µPa. The level is traceable to National Standards.

The stated level is valid at reference conditions. The following correction factors have been applied during the measurement: Pressure: 0.0005 dB/kPa Temperature: 0.003 dB/°C Relative humidity: 0.000 dB/%RH Load volume : 0.0003 dB/mm³

The reported expanded uncertainty of measurements is based on a standard uncertainty multiplied by the coverage factor of k=2, providing a level of confidence of approximately 95%. Where the degrees of freedom are insufficient to maintain this confidence level, the coverage factor is increased to maintain this confidence level. The uncertainty has been determined in accordance with UKAS requirements.

Records: K:\C A\Calibration\Nor-1504\Nor-1018 CalCal\2017\NOR1251_33547_M1.nmf

Environmental conditions:	Pressure:	Temperature:	Relative humidity:
Reference conditions:	101.325 kPa	23.0 °C	50 %RH
Measurement conditions:	100.206 ± 0.045 kPa	22.3 ± 0.1 °C	47.8 ± 0.8 %RH

Date received for calibration: 24/05/2017
 Date of calibration: 05/06/2017
 Date of issue: 05/06/2017
 Engineer

Supervisor

Michael Tickner

Darren Batten TechIOA

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to recognised national standards, and to the units of measurement realised at an accredited national physical laboratory or other recognised standards laboratories. This certificate may not be reproduced other than in full without the prior written approval of the issuing laboratory.

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CALIBRATION



Certificate of Calibration and Conformance

Certificate No.: U25734

Test object: Sound Level Meter, BS EN IEC 61672-1:2003 Class 1 (Precision) and associated Frequency Analyser BS EN IEC 61260, Class 1
Manufacturer: Norsonic
Type: 140
Serial no: 1405312
Customer: E2 Specialist Consultants Ltd
Address: 3B South Park Way, Wakefield Junction 41 Business Park, Wakefield. WF2 0XJ.
Contact Person: John Ashe.

Method :

Calibration has been performed as set out in CA Technical Procedures TP01 & 02 as appropriate. These are based on the procedures for periodic verification of sound level meters as set out in BS EN IEC 61672-3:2006 and for electrical testing of frequency filters as set out in BS EN IEC 61260. Results and conformance statement are overleaf and detailed results are in the attached Test Report.

	Producer:	Type:	Serial No:	Certificate number
Microphone	Norsonic	1225	168187	25733
Calibrator*	Norsonic	1251	33547	U25732
Preamplifier	Norsonic	1209	15370	Included

Additional items that also have been submitted for verification

Wind shield	Norsonic	Nor1451
Attenuator	None	
Extension cable	None	

These items have been taken into account wherever appropriate.

Environmental conditions:	Pressure:	Temperature:	Relative humidity:
Reference conditions:	101.325 kPa	23.0 °C	50.0 %RH
Measurement conditions:	99.95 ±0.01kPa	22.4 ±0.2°C	48.5 ±2%RH

Date received : 24/05/2017
Date of calibration: 05/06/2017
Date of issue: 05/06/2017

Engineer

Michael Tickner

Supervisor

Darren Batten TechIOA

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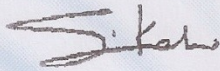
Page 1 of 2

Certificate of Competence in Environmental Noise Measurement

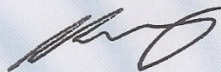
This is to certify that

John William Matthew Ashe

*has completed a course of instruction approved by the
Institute of Acoustics and designed to enable the candidate
to undertake environmental noise measurements in a
competent manner and has achieved a satisfactory
performance in the written and practical examinations
thereof and that this fact has been recorded in a
Register kept by the Institute for this purpose.*



Education Committee Chairman



Institute Secretary

Date 16 May 2014

Centre Leeds Metropolitan University

Reference Number EK161

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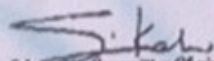
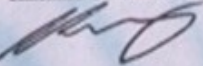


Certificate of Competence in Environmental Noise Measurement

This is to certify that

Luke Edward Murphy

*has completed a course of instruction approved by the
Institute of Acoustics and designed to enable the candidate
to undertake environmental noise measurements in a
competent manner and has achieved a satisfactory
performance in the written and practical examinations
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Institute Secretary

Date 10 October 2014

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