ACOUSTIC DESIGN TECHNOLOGY
Noise and Vibration Consultants

ADT 2550

11 April 2017

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THE MANCHESTER COLLEGE, HARPURHEY CAMPUS

ENVIRONMENTAL NOISE IMPACT ASSESSMENT

ACOUSTIC CONSULTANCY REPORT ADT 2550/ENIA

Revision	Date	Issued By	Revision Notes
-	11 April 2017	Chris Middleton	first issue

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1.0 SUMMARY

An environmental noise impact assessment has been undertaken of the plant to be relocated at the Manchester College Harpurhey Campus, in accordance with the requirements set out in Section 3.6.1.5.1 of the Manchester City Council document 'Planning and Noise : Technical Guidance' (December 2015) .

BS 4142:2014 rating levels have been determined at the nearest noise sensitive areas and are 13 dB below the otherwise prevailing background noise levels, comfortably within the Manchester City Council normal requirement to achieve rating levels at least 5 dB below the background level.

On that basis the environmental noise impact of the proposals is compliant with the Manchester City Council requirements.

2.0 BASIS OF ASSESSMENT

2.1 Site Location

The site is located on the Harpurhey Campus of The Manchester College, on the A664 Rochdale Road, Manchester. There are teaching buildings to the north and south, with an overhead walkway over the proposed plant area.

On the opposite side of Rochdale Road to the west is a three storey apartment block, and there are two storey houses on Hemsley Street South to the east.

Rochdale Road continues south to Manchester City Centre, about 4km away, and north to the M60 some 2 ½ km away.

2.2 Proposed Development

The proposal is to relocate the air conditioning units a few metres to the east, below the overhead walkway, and to surround them with a security cage, all as shown on the planning application drawings.

2.3 Assessment Criteria

Section 3.6.1.5.1 of the Manchester City Council document 'Planning and Noise : Technical Guidance' (December 2015) requires the BS 4142:2014 rating level of fixed plant installations to be controlled to at least 5 dB below the otherwise prevailing background (L_{A90}) level.

2.4 Nearest Noise Sensitive Properties

The noise sensitive properties in the surrounding area have been grouped into two noise sensitive areas as described below and as indicated on the attached site plan 2550/SP1.

NSA	Location	Direction	Approximate distance from proposed plant location (metres)
NSA1	Rochdale Road apartments	west	45
NSA2	Hemsley Street South houses	east	48

The above NSA represent the closest noise sensitive properties, with others located further from the site and in some cases screened by the intervening buildings. A satisfactory noise impact at the defined NSA should therefore ensure a satisfactory noise impact at other noise sensitive areas.

2.5 Strategy for Noise Impact Assessment

Based on the information in Sections 2.1 to 2.4 above, the strategy for the noise impact assessment has been broken down into the following stages:

i. undertake an environmental noise survey to obtain baseline noise data, as described in Section 3.0 below

ii. calculate noise emissions from the proposed plant and assess the environmental noise impact, as described in Section 4.0 below.

3.0 ENVIRONMENTAL NOISE SURVEY

3.1 Introduction

An environmental noise survey was undertaken by Chris Middleton between 11:30 hours and 12:30 hours on Thursday 6 April 2017, that being a period when the plant would normally be operating at full capacity, but outside of the morning and evening rush hour traffic periods when background levels would be higher.

The intention was to measure the noise emissions from the installed and operating plant, although in the event it proved impossible to obtain meaningful data due to the influence of road traffic noise. The manufacturer's published noise data for the plant has therefore been used.

3.2 Instrumentation

The instrumentation used, along with the field calibration values before and after the survey are detailed in Appendix A of this report.

3.3 Procedure

Two measurement positions were selected as described below and indicated on the attached site plan 2550/SP1:

i. in front of the Rochdale Road apartments
ii. on Hemsley Street South, near the junction with Radford Drive

At positions 1 and 2 the microphone was mounted on a tripod approximately 1.2 metres above the ground and least 3.5 metres from any other acoustically reflective surface. For each measurement the sound level meter was set to store the octave band and A-weighted 100ms short-term L_{eq} levels over sample periods of up to 10 minutes for subsequent post processing.

3.4 Results

The logged data has been post processed to determine $L_{Aeq,T}$ $L_{A90,T}$ and L_{Amax} levels for each 10 minute period, as follows:

Position	Plant operating	$L_{Aeq,\ 10mins}$ dB	L_{Amax} dB	L_{A90} dB
1	no	62	74	54
2	no	64	78	53

Please refer to Appendix B for explanation of the noise units and the A-weighting term used in this report.

3.5 Weather Conditions

For the duration of the survey the weather was dry with no more than a light breeze, with limited effect on the measured levels.

3.6 Description of Existing Acoustic Environment

The noise levels at measurement position 1 on Rochdale Road were entirely controlled by traffic on Rochdale Road, including regular buses and lorries.

At position 2 the $L_{eq,T}$ and L_{max} were controlled by regular vehicles passing on Hemsley Street South, while the background L_{90} was controlled by traffic on Moston Lane to the south, as well as some noise from the Rochdale Road traffic radiating through the gap between the College buildings. Noise from roof mounted plant on the College was also audible.

4.0 NOISE IMPACT ASSESSMENT

4.1 Basis of Assessment

As already mentioned in Section 2.3 above, the Manchester City Council requirement is to achieve a BS 4142:2014 rating level at least 5 dB below the otherwise prevailing background noise level.

4.2 Specific Sound Level

4.2.1 Source Sound Levels

Manufacturer's noise data for the plant (a Mitsubishi PURY-P400YLM-A1 air conditioning condenser and a Mitsubishi PURY-P450YLM-A1 unit) is provided in Appendix C. These are sound pressure levels at 1 metre distance, tested in hemispherical free field conditions.

4.2.2 Predicted Specific Sound Levels

With the plant installed in the new location under the walkway, there will be sufficient reflections that the sound effectively radiates approximately quarter-spherically towards both NSA.

The corrections to the source sound level are therefore as follows:

	NSA1 Rochdale Road	NSA2 Hemsley Street South
Distance correction -20 log (d/1)	- 33	-34
Correction for hemispherical to quarter spherical free field conditions	+ 3	+ 3
Total correction to source sound level	- 30	- 31

Specific noise levels at the two NSA are therefore as follows:

Location	Predicted $L_{eq,T}$ (dB) at octave band centre frequency (Hz)								$L_{Aeq,T}$ dB
	63	125	250	500	1k	2k	4k	8k	
NSA1 Rochdale Rd.	46	42	38	34	29	22	18	13	36
NSA2 Hemsley S/S	45	41	37	33	28	21	17	12	35

The calculation details are provided in Appendix D.

4.3 Background Sound Level

The background levels at the two NSA were as follows:

Location	L_{A90} dB
NSA1 Rochdale Road	54
NSA2 Hemsley Street South	53

4.4 Rating Level

To convert the specific sound levels into rating levels, corrections have to be applied for impulsivity, intermittency, tonality and other sound characteristics where such features are present. The appropriate corrections are set out in the following sections, following the principles set out in Section 9.2 of BS 4142.

4.4.1 Tonality

The octave band specific sound levels in Section 4.2 do not indicate tonality, as no octave band is particularly prominent above the adjoining octave bands, although some just perceptible tonality was subjectively noticeable during observations of the units operating. On that basis a + 2 dB penalty should be applied for tonality 'just perceptible at the noise receptor'.

4.4.2 Impulsivity

Noise emissions from air conditioning units of the type under assessment do not operate in an impulsive way, and no correction for impulsivity is therefore required.

4.4.3 Intermittency

The plant operates intermittently in response to demand from the teaching rooms that they serve, and a + 3 dB penalty for intermittency is therefore appropriate.

Applying the corrections for tonality and intermittency to the specific sound level results in the following rating levels at the NSA:

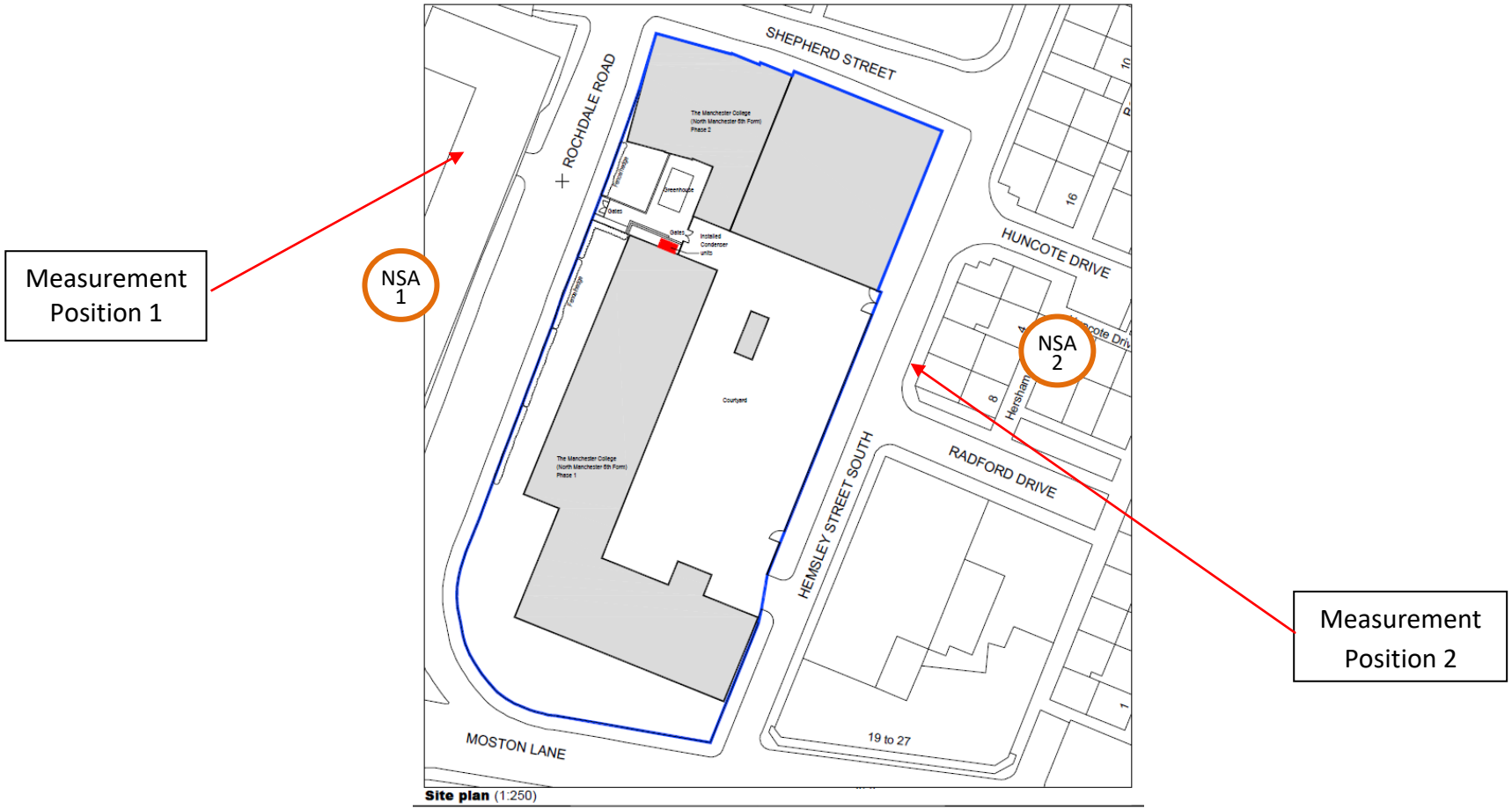
Location	$L_{Ar,\ 1\ hour}$ dB
NSA1 Rochdale Road	41
NSA2 Hemsley Street South	40

4.5 Assesment

A comparison of the BS 4142:2014 rating levels in Section 4.4 above with the otherwise prevailing background levels in Section 4.3 above reveals that the rating levels are 13 dB below the background level at each NSA.

On that basis the Manchester City Council requirement to achieve a rating level at least 5 dB below the background level has been fulfilled.

FOR ACOUSTIC DESIGN TECHNOLOGY



Notes

Description
Site Plan Showing Noise Monitoring Locations

Project
The Manchester College, Harpurhey Campus

Date
11 April 2017

Drawing No.
2550/SP1

ADT
Acoustic Design Technology
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APPENDIX A - INSTRUMENTATION

Manufacturer	Type and / or Model	Serial Number	Last Laboratory Calibration	Calibrator Output (dB)	Free Field Correction (dB)	Initial reading (dB)	Final reading (dB)
	(Black) Solo Class 1 Sound Level Meter	65201	September 2015	114.23	-0.1	113.9	113.9
01 dB	PRE 21 S Pre-Amplifier	15619	September 2015				
	MCE 212 ½ inch Microphone	101204	September 2015				
Norsonic	Nor1251 Calibrator (Cal 5)	34220	January 2017	114.23			

APPENDIX B

The annoyance produced by noise is dependent upon many complex interrelated factors such as 'loudness', its frequency (or pitch) and any variations in its level. In order to have some objective measure of the annoyance, scales have been derived to allow for these subjective factors.

dB(A) The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average person. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level.

When the noise being measured has a variable amplitude, it is necessary to qualify the basic dB(A) unit. This may be done using a statistical index L_n dB(A), where n is an integer between 1 and 99, and is the percentage of the sample time for which the stated dB(A) level is exceeded. In defining the use of the index, both the value of n and the length of the sample period must be stated.

L_1 L_1, being the dB(A) level exceeded for 1% of the time, is used in Building Bulletin 93 as a measure of individual noisy events.

L_{90} L_{90} is the dB(A) level exceeded for 90% of the time, and is used as a measure of background noise level, as it excludes the effects of occasional transient levels, such as individual passing cars or aircraft.

In addition to the statistical noise indices defined above, the following noise units are also used to define variable amplitude noise sources:

L_{eq} The L_{eq} is defined as the notional steady sound pressure level which, over a stated period of time, would contain the same amount of acoustical energy as the actual fluctuating sound measured over the same period - i.e.: it is a measure of the "average" noise level

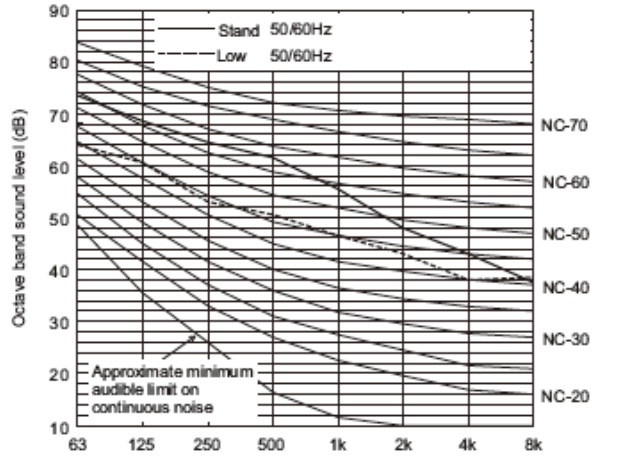
L_{max} The L_{max} is the maximum sound pressure level recorded over the measurement period.

APPENDIX C

5. SOUND LEVELS

DATA G11

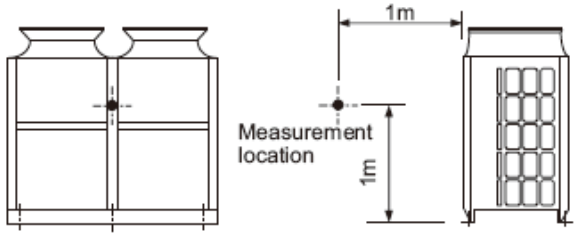
Sound level of PURY-P400YLM-A1(-BS)



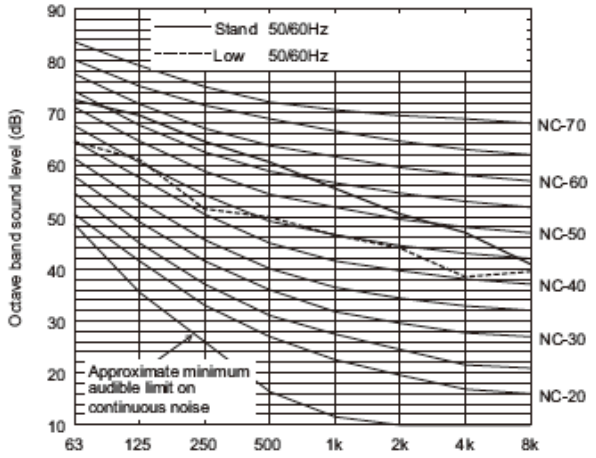
		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard	50/60Hz	73.5	68.5	64.5	61.5	55.5	48.0	43.0	37.5	62.5
Low noise mode	50/60Hz	64.0	60.5	53.0	50.5	46.5	43.0	38.0	38.5	53.0

When Low noise mode is set,the A/C system's capacity is limited. The system could return to normal operation from Low noise mode automatically in the case that the operation condition is severe.

Measurement condition
PURY-P450, 500YLM-A1(-BS)



Sound level of PURY-P450YLM-A1(-BS)



		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard	50/60Hz	72.5	69.5	64.5	60.5	55.5	50.5	47.0	41.0	62.5
Low noise mode	50/60Hz	64.5	61.0	51.5	50.0	46.5	44.0	38.5	39.5	53.0

When Low noise mode is set,the A/C system's capacity is limited. The system could return to normal operation from Low noise mode automatically in the case that the operation condition is severe.

Sound level of PURY-P500YLM-A1(-BS)

APPENDIX D

CALCULATION DETAILS

NSA1	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	A-wt
Lp at 1m PURY-P400YLM-A1	73.5	68.5	64.5	61.5	55.5	48	43	37.5	62
Lp at 1m PURY-P450YLM-A1	72.5	69.5	64.5	60.5	55.5	50.5	47	41	62
Total Lp at 1m both units	76	72	68	64	59	52	48	43	66
Distance correction	-33	-33	-33	-33	-33	-33	-33	-33	
Hemispherical to quarter spherical radiation	+ 3	+ 3	+ 3	+ 3	+ 3	+ 3	+ 3	+ 3	
Specific sound level	46	42	38	34	29	22	18	13	36
NSA2									
Lp at 1m PURY-P400YLM-A1	73.5	68.5	64.5	61.5	55.5	48	43	37.5	62
Lp at 1m PURY-P450YLM-A1	72.5	69.5	64.5	60.5	55.5	50.5	47	41	62
Total Lp at 1m both units	76	72	68	64	59	52	48	43	66
Distance correction	-34	-34	-34	-34	-34	-34	-34	-34	
Hemispherical to quarter spherical radiation	+ 3	+ 3	+ 3	+ 3	+ 3	+ 3	+ 3	+ 3	
Specific sound level	45	41	37	33	28	21	17	12	35