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HALIFAX, 65-67 BROAD STREET, READING

NOISE IMPACT ASSESSMENT

Report **16171-NIA-01**

Prepared on 24 September 2020

Issued For:

DL M&E Building Services Ltd

Kings House

James Street

Westhoughton, Bolton

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Executive Summary

This noise impact assessment has been undertaken in order to assess a proposed plant installation for commercial use at Halifax, 65-67 Broad Street, Reading RG1 2AF.

The proposed plant installation comprises 1 No. Daikin Condenser Unit.

A background noise survey has been undertaken as detailed in the report, in order to determine an appropriate noise emission criterion, in accordance with the requirements of Reading Borough Council.

Calculations were undertaken for the nearest identified receivers, identified in the attached site plan 16171-SP1. It should be noted that if there are closer receivers that Clement Acoustics is not aware of, a reassessment will be necessary, and this should therefore be confirmed by the Client.

It has been demonstrated that compliance with the established criterion is feasible, dependant on the following material considerations:

- The plant could be in use at any time.
- The noise emissions data for the proposed units as obtained from available manufacturer information
- Plant and receiver locations are as established in this report and marked on the attached site plan

If there is any deviation from the above, Clement Acoustics must be informed, in order to establish whether a reassessment is necessary.

Clement Acoustics has used all reasonable skill and professional judgement when preparing this report. The report relies on the information as provided to us at the time of writing and the assumptions as made in our assessment.

This report is designed to be suitable to discharge typical plant noise planning conditions, as per our original scope of work.

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16171-SP1	Indicative Site Plan
16171-TH1	Environmental Noise Time History
Appendix A	Glossary of Acoustic Terminology
Appendix B	Acoustic Calculations

Document Revision	Date of Revision	Reasons for Revision	Revision By
0	23/09/2020	First Issue	Daniel Hagan AMIOA

1.0 INTRODUCTION

Clement Acoustics has been commissioned by DL M&E Building Services Ltd to measure existing background noise levels at Halifax, 65-67 Broad Street, Reading RG1 2AF. Measured noise levels have been used to determine noise emissions criteria for a proposed plant installation in agreement with the planning requirements of Reading Borough Council.

This report presents the results of the environmental survey followed by noise impact calculations and outlines any necessary mitigation measures.

An acoustic terminology glossary is provided in Appendix A.

2.0 SITE DESCRIPTION

The site is located on a busy high street in the centre of Reading, with existing commercial units located either side and existing plant serving the premises.

Current proposals are to install one condenser unit within the rear courtyard, to be used by Halifax bank.

Two nearby windows (assumed to be residential dwellings) have been identified as the nearest affected receivers. These nearest noise sensitive receivers were identified through observations on-site. If there are any receivers closer to that identified within this report then a further assessment will need to be carried out. Therefore, the closest noise sensitive receiver should be confirmed by the client before the plant is installed or any noise mitigation measures are implemented.

Locations are shown in attached site plan 16171-SP1.

3.0 ENVIRONMENTAL NOISE SURVEY

3.1 Unattended Noise Survey Procedure

Measurements were undertaken at one position as shown on indicative site drawing 16171-SP1. The choice of this position was based both on accessibility and on collecting representative noise data in relation to the nearest affected receiver.

The surroundings and position used for the monitoring location are described in Table 3.1.

Position No.	Description
1	The microphone was mounted to a tripod on a 3 rd storey flat roof at the rear of the building ^[1]

Table 3.1: Description of unattended monitoring location

Note [1]: The position was considered to be free-field according to guidance found in BS 4142: 2014, and a correction for reflections has therefore not been applied.

Continuous automated monitoring was undertaken for the duration of the survey between 14:20 on 21 September 2020 and 12:00 on 22 September 2020.

The measurement procedure generally complied with BS 7445: 1991: '*Description and measurement of environmental noise, Part 2- Acquisition of data pertinent to land use*'.

The locations of the measurement position is shown on attached site plan 16171-SP1.

3.2 Weather Conditions

At the time of set-up and collection of the monitoring equipment the weather conditions were generally dry with light winds.

Weather conditions during the survey period have been obtained from the internet resource www.wunderground.com, which identified Farnborough as the nearest weather station. Wunderground.com indicates light to moderate wind speeds with no precipitation.

It is considered that the weather conditions did not significantly adversely affect the measurements and are therefore considered suitable for the measurement of environmental noise.

3.3 Equipment

The equipment calibration was verified, by means of a field verification check, before and after use and no abnormalities were observed.

The equipment used was as follows.

- 1 No. Svantek Type 977 Class 1 Sound Level Meter
- Rion Type NC-74 Class 1 Calibrator

4.0 RESULTS

4.1 Unattended Noise Survey Results

The $L_{Aeq:5min}$, $L_{Amax:5min}$, $L_{A10:5min}$ and $L_{A90:5min}$ acoustic parameters were measured at the location shown in site drawing 16171-SP1.

Measured noise levels are shown as a time history in Figure 16171-TH1, with average ambient and minimum background noise levels summarised in Table 4.1.

Time Period	Average ambient noise level	Minimum background noise level
	$L_{eq:T}$	$L_{90:5min}$
Daytime (07:00 - 23:00)	57 dB(A)	47 dB(A)
Night-time (23:00 - 07:00)	60 dB(A)	59 dB(A)*

Table 4.1: Average ambient and minimum background noise levels

*** It should be noted that the predominant noise source during night-time hours is existing plant emissions. To provide a more robust assessment the lower minimum background noise level found during the daytime will be used as the criterion.**

5.0 NOISE CRITERIA

The Reading Borough Council criteria for noise emissions are as follows:

“Where noise generating equipment is proposed, the noise source specific level (plant noise level) should be at least 10dBA below the existing background level as measured at the nearest noise sensitive receptor.”

It is understood that the proposed plant unit will be for commercial use, however to provide a more robust assessment it will be assumed the plant could be operational at any time.

Based on the results of the environmental noise survey and requirements of Reading Borough Council, Table 5.1 presents the proposed plant noise emission criteria:

Period	Plant Noise Emission Limit $L_{eq,T}$
Daytime (07:00 - 23:00)	37 dB(A)
Night-time (23:00 - 07:00)	49 dB(A)

Table 5.1: Plant noise emission limits

6.0 PLANT NOISE IMPACT ASSESSMENT

6.1 Proposed Installation

The proposed plant installation comprises the following:

- 1 No. Daikin RXM42N9 condenser unit

Noise emissions for the proposed plant unit, as provided by the manufacturer, are shown in Table 6.1. Loudest modes of operation have been used in order to present a robust worst-case assessment.

Plant Unit	Sound Pressure Levels (at 1 meter, dB) in each Frequency Band								dB(A)
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
RXM42N9	48	51	50	47	43	36	30	23	48

Table 6.1: Manufacturer provided noise emissions levels

6.2 Noise Impact Assessment

The closest receivers have been identified as follows:

- Receiver 1: The window on the rear façade of the adjacent building, which is a minimum of 19 m from the proposed plant location.
- Receiver 2: The window on the rear façade of 17-18 West Street, which is a minimum of 20 m from the proposed plant location.

Screening of the nearest noise sensitive receptors is provided by both the building envelope and the courtyard boundary wall.

Taking into account all necessary acoustic corrections, the resulting noise level at the identified residential windows would be as shown in Table 6.2. Detailed calculations are shown in Appendix B.

Receiver	Plant Noise Criterion	Noise Level at Receiver (due to proposed plant)
Receiver 1	37dB(A)	15 dB(A)
Receiver 2		16 dB(A)

Table 6.2: Noise levels and criterion at noise sensitive receivers

As presented in Table 6.2 and Appendix B, the proposed plant installation would be expected to meet the requirements of the proposed criteria.

6.3 British Standard Requirements

Further calculations have been undertaken to assess whether the noise emissions from the proposed plant unit would be expected to meet recognised British Standard recommendations, in order to further ensure the amenity of nearby noise sensitive receivers.

British Standard 8233: 2014 '*Guidance on sound insulation and noise reduction for buildings*' gives recommendations for acceptable internal noise levels in residential properties. Assuming worst case conditions, of the closest window being for a bedroom, BS 8233: 2014 recommends 30 dB(A) as being acceptable internal resting conditions during daytime.

With loudest external levels of 16 dB(A), acceptable internal conditions would be met without taking the attenuation of the window itself into consideration. According to BS 8233: 2014, a typical building facade with a partially open window offers 15 dB attenuation.

It can therefore be predicted that, in addition to meeting the requirements of the set criteria, the emissions from the proposed plant would be expected to meet the most stringent recommendations of the relevant British Standard, with neighbouring windows partially open. Predicted levels are shown in Table 6.5.

Receiver	Recommended Target – <i>For sleeping conditions in a bedroom, in BS 8233: 2014</i>	Noise Level at Receiver (due to plant installation)
Receiver 1	30 dB(A)	< 10 dB(A)
Receiver 2		

Table 6.5: Noise levels and criteria inside nearest residential space

7.0 CONCLUSION

An environmental noise survey has been undertaken at Halifax, 65-67 Broad Street, Reading RG1 2AF. The results of the survey have enabled criteria to be set for noise emissions from the proposed plant in accordance with the requirements of the Reading Borough Council.

A noise impact assessment has then been undertaken using manufacturer noise data to predict the noise levels, due to the proposed plant, at the nearby noise sensitive receivers.

Calculations show that noise emissions from the proposed units should meet the requirements of the Reading Borough Council.

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24 September 2020

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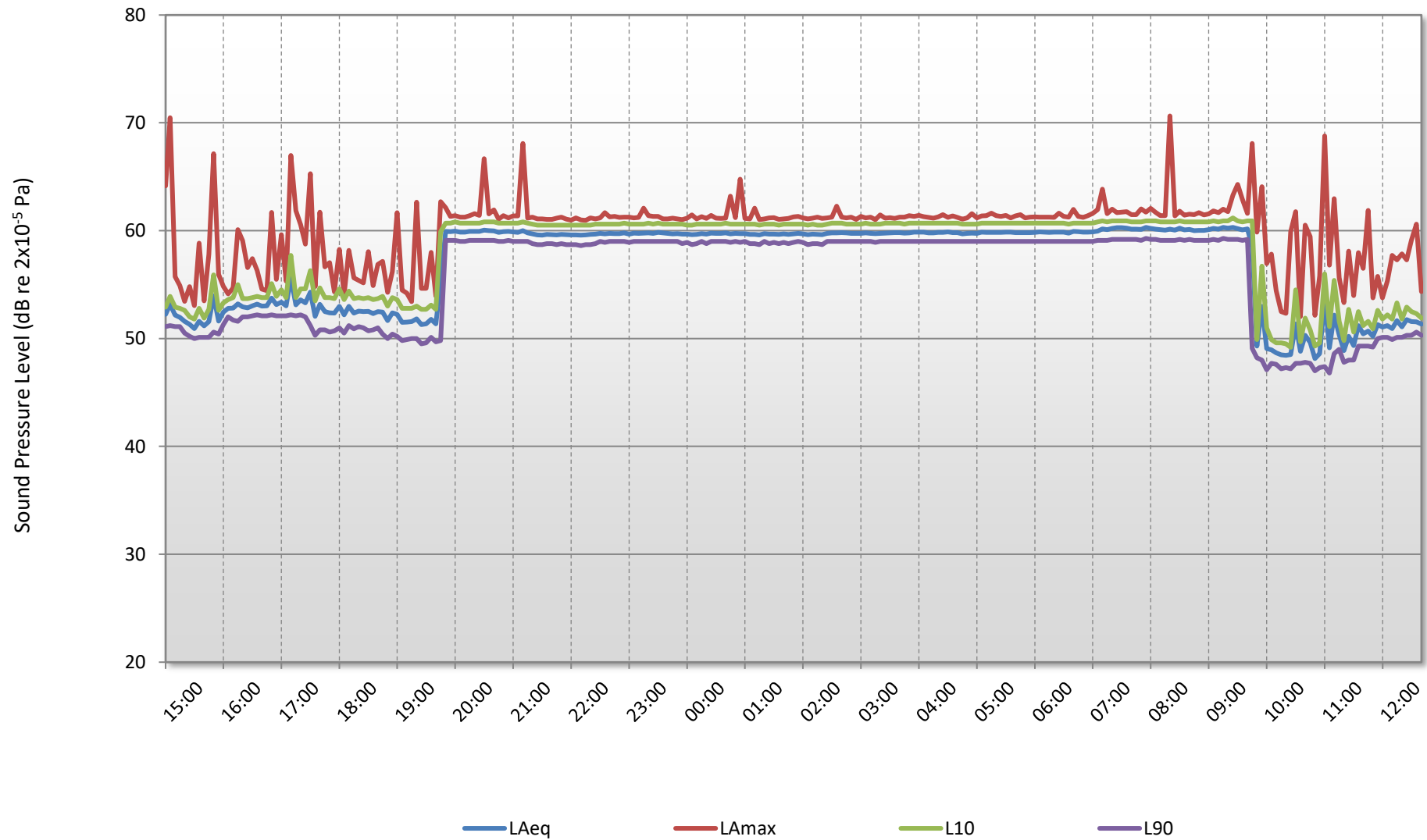
24 September 2020



-  Noise Survey Position
-  Noise Sensitive Receiver

Halifax, 65-67 Broad Street, Reading

Environmental Noise Time History
21 September 2020 to 22 September 2020



GLOSSARY OF ACOUSTIC TERMINOLOGY

dB(A)

The human ear is less sensitive to low (below 125Hz) and high (above 16kHz) frequency sounds. A sound level meter duplicates the ear's variable sensitivity to sound of different frequencies. This is achieved by building a filter into the instrument with a similar frequency response to that of the ear. This is called an A-weighting filter. Measurements of sound made with this filter are called A-weighted sound level measurements and the unit is dB(A).

L_{eq}

The sound from noise sources often fluctuates widely during a given period of time. An average value can be measured, the equivalent sound pressure level L_{eq} . The L_{eq} is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period.

L_{10}

This is the level exceeded for not more than 10% of the time. This parameter is often used as a "not to exceed" criterion for noise

L_{90}

This is the level exceeded for not more than 90% of the time. This parameter is often used as a descriptor of "background noise" for environmental impact studies.

L_{max}

This is the maximum sound pressure level that has been measured over a period.

Octave Bands

In order to completely determine the composition of a sound it is necessary to determine the sound level at each frequency individually. Usually, values are stated in octave bands. The audible frequency region is divided into 10 such octave bands whose centre frequencies are defined in accordance with international standards.

Addition of noise from several sources

Noise from different sound sources combines to produce a sound level higher than that from any individual source. Two equally intense sound sources operating together produce a sound level which is 3dB higher than one alone and 10 sources produce a 10 dB higher sound level.

Attenuation by distance

Sound which propagates from a point source in free air attenuates by 6dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3dB for each doubling of distance.

Subjective impression of noise

Sound intensity is not perceived directly at the ear; rather it is transferred by the complex hearing mechanism to the brain where acoustic sensations can be interpreted as loudness. This makes hearing perception highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a reasonable guide to help explain increases or decreases in sound levels for many acoustic scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud
20	About 4 times as loud

Barriers

Outdoor barriers can be used to reduce environmental noises, such as traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and its construction.

Reverberation control

When sound falls on the surfaces of a room, part of its energy is absorbed and part is reflected back into the room. The amount of reflected sound defines the reverberation of a room, a characteristic that is critical for spaces of different uses as it can affect the quality of audio signals such as speech or music. Excess reverberation in a room can be controlled by the effective use of sound-absorbing treatment on the surfaces, such as fibrous ceiling boards, curtains and carpets.

APPENDIX B1

16171

Halifax, 65-67 Broad Street, Reading

EXTERNAL PLANT NOISE EMISSIONS CALCULATION

Receiver: Receiver 1 (See 16171-SP1)

Source: Proposed plant installation

	Frequency, Hz								
	63	125	250	500	1k	2k	4k	8k	dB(A)
Manufacturer provided sound pressure level at 1 metre Daikin RXM42N9	48	51	50	47	43	36	30	23	48
Correction for reflections, dB	6	6	6	6	6	6	6	6	
Distance correction to receiver, dB (19 m) ^[1]	-26	-26	-26	-26	-26	-26	-26	-26	
Barrier Correction due to Building Envelope, dB	-5	-7	-12	-15	-18	-18	-18	-18	
Sound pressure level at receiver	23	24	18	12	5	0	0	0	15

[1] Distance loss calculated assuming Point Source attenuation (typically used where distance is more than 3x the largest source dimension)

Design Criterion	37
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BS 8233 ASSESSMENT CALCULATION

Receiver: Inside Nearest Residential Window

Source: Proposed plant installation

	Frequency, Hz								
	63	125	250	500	1k	2k	4k	8k	dB(A)
Sound pressure level outside window	23	24	18	12	5	0	0	0	15
Minimum attenuation from partially open window, dB	-15	-15	-15	-15	-15	-15	-15	-15	
Sound pressure level inside nearest noise sensitive premises	8	9	3	0	0	0	0	0	7

Design Criterion	30
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APPENDIX B2

16171

Halifax, 65-67 Broad Street, Reading

EXTERNAL PLANT NOISE EMISSIONS CALCULATION

Receiver: Receiver 2 (See 16171-SP1)

Source: Proposed plant installation

	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Manufacturer provided sound pressure level at 1 metre Daikin RXM42N9	48	51	50	47	43	36	30	23	48
Correction for reflections, dB	6	6	6	6	6	6	6	6	
Distance correction to receiver, dB (20 m) ^[1]	-26	-26	-26	-26	-26	-26	-26	-26	
Barrier Correction due to Courtyard Boundary, dB	-5	-7	-10	-14	-15	-18	-18	-18	
Sound pressure level at receiver	23	24	20	13	8	0	0	0	16

[1] Distance loss calculated assuming Point Source attenuation (typically used where distance is more than 3x the largest source dimension)

Design Criterion	37
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BS 8233 ASSESSMENT CALCULATION

Receiver: Inside Nearest Residential Window

Source: Proposed plant installation

	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Sound pressure level outside window	23	24	20	13	8	0	0	0	16
Minimum attenuation from partially open window, dB	-15	-15	-15	-15	-15	-15	-15	-15	
Sound pressure level inside nearest noise sensitive premises	8	9	5	0	0	0	0	0	7

Design Criterion	30
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