

ACOUSTICS CENTRAL



Footlocker, Reading

Planning Noise Report

2018011-0 R1

Footlocker, Reading

Planning Noise Report

2018011-0 R1

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Executive Summary

As part of granting planning permission for the development of the new Footlocker store in Reading, planning conditions regarding the control of noise from mechanical service plant installed as part of the works need to be addressed.

To facilitate this, Acoustics Central has been appointed to carry out an assessment of the noise generated by proposed plant items installed as part of the works. The purpose of the assessment, carried out in-line with current relevant standards, is to determine the impact on surrounding sensitivities.

Using noise data collected as part of a noise survey carried out at the site as a basis plant, noise limits have been established in accordance with the relevant planning condition.

An assessment of the predicted noise levels from the proposed plant has been undertaken to the nearest noise sensitive residential premises, and compared with the plant noise limits.

The noise assessment has demonstrated that the plant noise criteria are expected to be met. As such, the noise levels from the proposed plant are concluded to comply with the requirements of Planning Condition 4.

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Glossary of Acoustics Terms

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Document Naming and Version Control Policy

1 Introduction

- 1.1 As part of granting planning permission for the development of the new Footlocker store in Reading, planning conditions regarding the control of noise from mechanical service plant installed as part of the works need to be addressed.
- 1.2 To facilitate this, Acoustics Central has been appointed to carry out an assessment of the noise generated by proposed plant items installed as part of the works. The purpose of the assessment, carried out in-line with current relevant standards, is to determine the impact on surrounding sensitivities.
- 1.3 This report details a noise survey carried out at the site, the assessment carried out using the survey data as a basis, and the conclusions drawn from the assessment.
- 1.4 The report is necessarily technical in nature, however every effort has been made to make it as clear as possible. In this regard, the Glossary of Acoustics Terms attached as Appendix A gives further explanation on relevant acoustics terminology used within the report.

2 Site Layout

2.1 General

2.1.1 The site is 83 Broad Street Reading RG1 2AP, as indicated on the following Figure F1.



F1 Site Location – Imagery © 2018 Google

2.2 Noise Climate

2.2.1 The general ambient noise climate within the vicinity of the site comprises predominantly noise from existing plant and other activity taking place within the service areas south of the store.

2.3 Site Context

The buildings within the vicinity of the site are predominantly commercial in nature. There are however residences located on the upper storeys of various buildings within the vicinity (see Section 6).

3 Design Requirements

3.1 Planning Condition

3.1.1 Planning Condition 4 states the following:

"No mechanical plant shall be installed until a noise assessment of the proposed mechanical plant has been submitted and approved by this Council. The assessment shall be carried out for in accordance with BS4141:2014 methodology. The predicted rating level, L_{Ar,Tr} (specific sound level plus any adjustment for the characteristic features of the sound) as measured at a point 1 metre external to sensitive facades shall be at least 10dB below the existing background sound level, L_{A90,T} when all plant/equipment (or any part of it) is in operation. The plant shall thereafter only be installed in accordance with the assessment.

Reason: To safeguard the amenities of the adjoining premises and the area generally, in accordance with Policy CS34 of the Reading Borough Council Local Development Framework Core Strategy 2008 (altered 2015) and Policy DM4 of the Sites and Detailed Policies Document 2012 (altered 2015)."

3.2 BS 4142: 2014

- 3.2.1 When assessing the significance of noise from fixed mechanical services plant items on noise sensitive residential premises, British Standard 4142 contains relevant guidance.
- 3.2.2 BS 4142:2014 – "Methods for rating and assessing industrial and commercial sound" describes a method for assessing whether noise from factories, industrial premises, fixed installations, sources of industrial nature and commercial premises is likely to give rise to complaints.
- 3.2.3 Under the BS 4142 procedure, a noise rating level is calculated for the source at a receiver location (normally an existing residence or other sensitive premises). This rating level takes the predicted noise level at that location and adds various penalties for acoustic features expected to increase the significance of the source, such as tonality, impulsivity and intermittency.
- 3.2.4 The significance of the sound is then calculated by comparing the measured background sound level with the rating level, and observing the following principles:
- Typically, the greater this difference, the greater the magnitude of the impact.
 - A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
 - A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
- 3.2.5 The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

Terminology

- 3.2.6 BS 4142 contains specific terminology which it's helpful to summarise here. In addition, Appendix A presents a Glossary of Acoustics Terms.

- **Specific sound:** sound from the source being assessed – in this case the extract plant. The specific sound level is measured and reported using the L_{Aeq} index.
- **Residual sound:** ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound. The residual sound level is also measured and reported using the L_{Aeq} index.
- **Ambient sound:** totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far. This includes the specific sound. The ambient sound level is also measured and reported using the L_{Aeq} index.
- **Background sound:** this is the sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval. It's used to indicate the underlying noise levels in the absence of more transient sources, and is measured and reported using the L_{A90} index.
- **Rating level:** The rating level is the specific sound once any adjustments for the characteristic features of the sound that result in an increased likelihood of disturbance (such as tonality, impulsivity, intermittency etc.) have been taken into account. It should be noted that these adjustments are as heard at the receiver, and not simply a consequence of the plant operating sound levels and conditions. As the adjustments increase the rating level, these can be thought of as penalties. As such, the rating level is the specific sound level with penalties applied.

4 Noise Survey and Plant Noise Limits

4.1 Survey Methodology

- 4.1.1 In order to quantify the background noise levels for comparison with the noise generated by the plant, an attended environmental noise survey was carried out at the site. This took place between 10h00 and 18h00 on Friday 26th January 2018.

4.2 Guidance and Standards

- 4.2.1 The survey instrumentation, methodology and reporting of results will be carried out following guidance contained within British Standard 7445-1:2003 - *'Description and measurement of environmental noise - Part 1: Guide to quantities and procedures'*,

4.3 Measurement Positions

- 4.3.1 Measurements were made at 2 positions as indicated on the following Figure F1. A description of each position is given below.



F2 Site Location Plan Indicating Noise Survey Measurement Positions– Imagery © 2018 Google

- MP1** The sound level meter was fixed to top of a tripod approximately 1.5m above ground level within the small access road leading to rear of store, approximately 1m from rear wall of neighbouring building.
- MP2** The sound level meter was fixed to top of a tripod approximately 1.5m above ground level approximately 1m from the wall perpendicular to the windows facing north to flats above the C.U.P. Cafe.

4.4 Noise Monitoring Equipment

4.4.1 All noise measurements were made with the equipment detailed in the following table.

Item	Manufacturer	Type
Sound Level Analyser	NTi	XL2-TA
Acoustic Calibrator	NTi	CAL200

T1 Equipment used during internal noise measurements

4.4.2 The sound level analyser presented in the above table conform to the Type 1 specification as given in BS EN 61672-1:2003 - *'Electroacoustics - Sound level meters - Part 1: Specifications'*. The calibrator presented in the above table conforms to the Class 1 specification as specified in IEC 60942:2003 - *'Electroacoustics - Sound calibrators'*.

Traceable Calibration

- 4.4.3 The measurement instrumentation, including sound level analyser, preamplifier and microphone have undergone traceable calibration by a competent laboratory within the last two years.
- 4.4.4 The associated acoustic calibrator has undergone traceable calibration by a competent laboratory within the last year.

On-Site Calibration

4.4.5 The noise measurement equipment was calibrated before and after the survey to ensure a consistent and acceptable level of accuracy is maintained. No significant drift (greater than 0.2dB) was noted to have occurred.

4.5 Data Recorded

- 4.5.1 Noise data was recorded in all relevant indices, including L_{Aeq} , L_{A90} , $L_{Amax,F}$ and $L_{Amax,S}$ ¹. See attached Appendix A for an explanation of noise units used.
- 4.5.2 Octave band data for each of the above indices was also recorded, the filters for which met the requirements of BS EN 61260:1996, Class 1.

¹ Maximum A-weighted sound pressure level using time-weighting "F" and "S". As stated in BS EN 61672-1:2003 Design-goal time constants are 0,125 s for time-weighting F (Fast) and 1 s for time weighting S (Slow).

- 4.5.3 Noise data was recorded for a period of at least 15 minutes within each of the survey hours, in which all indices and octave band spectra were recorded.

4.6 Meteorological Conditions

- 4.6.1 Weather conditions during the survey were dry and cold at around 5°C. No precipitation was recorded during the survey period. Wind speed was low and skies were overcast.

4.7 Results

- 4.7.1 Results of the noise survey are presented on the attached Schedule SCH1 in terms of L_{Aeq} , L_{Amax} , L_{A10} and L_{A90} .
- 4.7.2 The lowest background noise levels recorded during the survey were 48dB and 50 dB L_{A90} at positions MP1 and MP2 respectively.

4.8 Plant Noise Limits

- 4.8.1 As detailed in section 3.1, the mechanical services systems will need to be designed such that noise is 10dB below the lowest recorded L_{A90} in the relevant time period.
- 4.8.2 On this basis, the noise limits for non-tonal/intermittent plant to apply at 1m from the windows of the nearest affected noise sensitive premises within the vicinity of the plant locations are as shown in the following table.

Location	Noise Rating Limits, dB
	Plant Operating Hours <i>See Section 5.4</i>
Noise sensitivities close to rear of store	38
Noise sensitivities above C.U.P. Cafe	40

T2 Noise Limits for Mechanical Services Plant

- 4.8.3 As per methodology set out in BS 4142:2014, plant that is tonal, intermittent, or has other acoustic features that distinguish it from the existing noise climate as heard at the receptor location will need to be adequately penalized to determine the Rating Level.

5 Scheme

5.1 General

5.1.1 The following plant items are consideration as part of this assessment as these have the potential to give rise to significant atmospheric noise:

- 2no. Daikin RZQG140L9V1 Condensing Units (CU-01)
- 1no. Daikin RXS35L3 Condensing Unit (CU-02)
- 1no. Ecovent VES EVX549-3 Heat Recovery Unit (HRU-01)
- 1no. Daikin VAM1000FC Heat Recovery Unit (HRU-02)
- 1no. Systemair KVO160EC Extract Fan (EF-01)

5.2 Plant Arrangement

5.2.1 The condensing units and heat recovery unit HRU-01 are to be located on the flat roof area at the rear of the store. The second heat recovery unit HRU-02 and extract fan EF-01 are to be located in a small plant room at the rear of the site.

5.3 Data Used

5.3.1 Octave band sound power levels provided by the equipment manufacturers have been used as the basis for the assessment for plant items CU-01, CU-02, HRU-01 and HRU-02. For plant item EF-01 single figure sound pressure levels only are available. As such, an octave band spectrum for the item has been derived by using a typical fan spectral shape in order to be able to apply frequency dependent calculations.

5.3.2 The noise levels used are presented on the attached Plant Noise Schedule SCH2.

5.4 Hours of Operation

5.4.1 We are informed that plant will operate during the following hours.

- Monday 9:00 - 19:00
- Tuesday 9:00 - 19:00
- Wednesday 9:00 - 19:00
- Thursday 9:00 - 20:00
- Friday 9:00 - 19:00
- Saturday 9:00 - 19:00
- Sunday 11:00 - 17:00

5.4.2 As stated previously, the existing noise climate is predominantly controlled by noise from existing plant and other activity taking place within the service areas south of the store. As such, the survey data is expected to be sufficiently representative to quantify the existing noise climate during the intended hours of operation as detailed in Section 8 of BS 4142:2014.

6 Plant Noise Assessment

6.1 In order to demonstrate compliance with the external noise level requirements, an atmospheric plant noise assessment has been carried out to the following locations:

- AP1 Residence on upper storey of 79 Broad Street
- AP2 Residence on upper storey of 59 St. Mary's Butts
- AP3 Residences on upper storeys of 53 St. Mary's Butts

6.2 The above assessment positions are illustrated on the following figure F3.



F3 Site Plan Indicating Noise Assessment Positions – Imagery © 2018 Google

6.3 Our calculations take into account the effects of distance and, where relevant, screening from roof and wall edges where these obscure the plant from direct view.

6.4 As per methodology set out in BS 4142:2014, plant that is tonal, intermittent, or has other acoustic features that distinguish it from the existing noise climate as heard at the receptor location need to be adequately penalized to determine the Rating Level. In this instance, the highest noise generating plant item at any receptor is at least 18 dBA below the ambient noise

level, which is largely controlled by sources with the same character. As such, penalties to account for acoustic features are not expected to be warranted.

- 6.5 A large number of calculations are undertaken to determine the resultant noise levels at each receptor. As such, a sample of the calculations undertaken as part of the atmospheric noise assessment is given as attached calculation sheets CS1-CS3. Full calculation sheets can be issued on request.
- 6.6 By utilising the methodology set out above we calculate noise levels at the aforementioned assessment positions as presented in the following table. The noise limits are also reproduced for ease of comparison.

Location	Noise Limits, dB	Predicted Levels, dB
	Operating Hours	Operating Hours
AP1		
Residence on upper storey of 79 Broad Street	38	34
AP2		
Residence on upper storey of 59 St. Mary's Butts	40	29
AP3		
Residences on upper storeys of 53 St. Mary's Butts	40	25

T3 Noise limits and calculated levels for proposed plant items

- 6.7 As the above table shows, the noise levels arising as a result of the proposed plant are expected to be at least 4 dB lower than the plant noise limits.

7 Conclusions

- 7.1 Using noise data collected as part of a noise survey carried out at the site as a basis plant, noise limits have been established in accordance with the relevant planning condition.
- 7.2 An assessment of the predicted noise levels from the proposed plant has been undertaken to the nearest noise sensitive residential premises, and compared with the plant noise limits.
- 7.3 The noise assessment has demonstrated that the plant noise criteria are expected to be met. As such, the noise levels from the proposed plant are concluded to comply with the requirements of Planning Condition 4.

SCH1

Noise Survey Results

Time	L_{Aeq} (dB)	$L_{Amax,F}$ (dB)	L_{A10} (dB)	L_{A90} (dB)
MP1				
10h00	52.4	88.1	58.2	47.6
11h00	53.9	70.2	54.6	51.1
12h00	54.4	84.6	54	50.9
13h00	54.7	76.5	56.6	51.6
14h00	54.8	66.7	56.6	51.1
15h00	53.4	74.3	57.5	51
16h00	53.4	64	55.9	51
17h00	55.9	74.5	58.2	51.7
MP2				
10h00	57.2	68.4	55.4	50.4
11h00	53.9	78.5	55.3	52.1
12h00	55.6	70.8	57	51.3
13h00	55.5	70.8	56.7	51.9
14h00	55.8	74	55.1	54.7
15h00	56.7	73.7	53.7	55.2
16h00	55.7	68.1	54.5	55
17h00	57.8	77.7	58	55.9

Plant Noise Schedule

Reference	Description	Unit Details	Data Source	Noise Level Type	dB(A)	Noise Levels (dB)							
						63	125	250	500	1k	2k	4k	8k
CU-01	Condensing Unit	Daikin RZQG140L9V1	Man	Sound Pressure, Lp @ 1m		60.0	54.0	52.0	48.0	47.0	45.0	43.0	32.0
CU-02	Condensing Unit	Daikin RXS35L3	Man	Sound Pressure, Lp @ 1m		40.0	45.0	43.0	41.0	37.0	32.0	27.0	19.0
HRU-01	Main Heat Recovery Unit - 60% Duty	Ecovent VES EVX549-3	Man	Sound Power, Lw		67.0	65.0	61.0	60.0	57.0	55.0	51.0	40.0
HRU-02	Secondary Heat Recovery Unit	Daikin VAM1000FC	Man	Sound Power, Lw		56.0	54.0	47.0	43.0	40.0	32.0	26.0	22.0
EF-01	Extract Fan	Systemair KVO160EC	Man	Sound Pressure, Lp @ 3m	48.7								

Calculation Sheet

CU-01 to AP1

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
<i>Noise Source</i>									
Noise Source - CU-01									
Sound Pressure Levels @ 1m		60.0	54.0	52.0	48.0	47.0	45.0	43.0	32.0 52.5 dBA
<i>+10 log (N)</i>									
N	2.0								
		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
<i>Point Source Distance Loss</i>									
Start Distance (m)	1.0								
End Distance (m)	17.0								
		-24.6	-24.6	-24.6	-24.6	-24.6	-24.6	-24.6	-24.6
<i>Maekawa Screening Loss</i>									
Path Difference (m)	0.1								
		-5.7	-6.5	-7.7	-9.5	-11.7	-14.2	-17.0	-19.8
<i>External Receiver</i>									
External Receiver - AP1									
Sound Pressure, Lp		32.7	25.9	22.7	16.9	13.7	9.2	4.4	-9.4 20.1 dBA

Calculation Sheet

HRU-01 FAI to AP1

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
<i>HRU-01 FAI</i>									
HRU-01 FAI - HRU-01									
Sound Power Levels		67.0	65.0	61.0	60.0	57.0	55.0	51.0	40.0 62.6 dBA
<i>Point Source Radiation Loss</i>									
Radiation - Hemispherical									
		-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0
<i>External Grille Directivity</i>									
Width (m)	0.7								
Height (m)	0.6								
Angle (°)	170.0								
		-7.1	-14.5	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0
<i>Point Source Distance Loss</i>									
Start Distance (m)	1.0								
End Distance (m)	17.0								
		-24.6	-24.6	-24.6	-24.6	-24.6	-24.6	-24.6	-24.6
<i>Maekawa Screening Loss</i>									
Path Difference (m)	0.1								
		-5.7	-6.5	-7.7	-9.5	-11.7	-14.2	-17.0	-19.8
<i>External Receiver</i>									
External Receiver - AP1									
Sound Pressure, Lp		21.6	11.4	5.7	2.9	-2.3	-6.8	-13.5	-27.4 4.9 dBA

Calculation Sheet

HRU-01 EXH to AP1

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
<i>HRU-01 EXH</i>									
HRU-01 EXH - HRU-01									
Sound Power Levels		67.0	65.0	61.0	60.0	57.0	55.0	51.0	40.0 62.6 dBA
<i>Point Source Radiation Loss</i>									
Radiation - Hemispherical									
		-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0
<i>External Grille Directivity</i>									
Width (m)	0.7								
Height (m)	0.6								
Angle (°)	50.0								
		0.6	0.6	0.4	0.4	0.4	0.3	0.3	0.3
<i>Point Source Distance Loss</i>									
Start Distance (m)	1.0								
End Distance (m)	17.0								
		-24.6	-24.6	-24.6	-24.6	-24.6	-24.6	-24.6	-24.6
<i>Maekawa Screening Loss</i>									
Path Difference (m)	0.1								
		-5.7	-6.5	-7.7	-9.5	-11.7	-14.2	-17.0	-19.8
<i>External Receiver</i>									
External Receiver - AP1									
Sound Pressure, Lp		29.3	26.5	21.1	18.3	13.1	8.5	1.7	-12.1 19.8 dBA

2018011-0 R1 Appendix A

Glossary of Acoustics Terms – Noise Levels

Single Figures and Spectra

Generally speaking, the human ear is capable of hearing noise within the frequency range 20Hz to 20kHz. To make handling of data more meaningful and manageable, the range is often divided into 'bands', each of which covers a specific part.

For most acoustics applications, either octave or third-octave bands are used. Each band has a specific centre frequency which is used to identify it. When reported, the band centre frequency is given, along with the associated noise level, e.g. 63dB L_{eq} at 500Hz.

Noise levels can also be reported as single figure values where all energy contained within the measured frequency range is summed to provide a single figure. However, as the human ear does not hear noise at different frequencies with equal loudness, a weighting curve is often applied to levels before summing to account for this fact.

The most common curve is the A-weighting curve, and its use is denoted by including the letter 'A' with either the index e.g. 63dB L_{Aeq} , or with the decibel suffix (if the index is described elsewhere), e.g. 63dBA. 'B' and 'C' weighting curves may also be applied, depending on the application. A 'Z' is used to indicate a single figure where no weighting has been applied, e.g. 63dB L_{Zeq} .

Noise Level Indices

Noise level measurements can be made and reported in a variety of indices. The index is reported using the letter L to indicate Level, followed by, for example, abbreviations to represent the specifics of the index, and time intervals where applicable. The most commonly used are given below.

$L_{eq,T}$ (dB) - Equivalent Continuous Sound Pressure Level

The $L_{eq,T}$ value is the sound pressure level in decibels of a continuous steady sound that within a specified time interval, T , has the same mean-squared sound pressure as a sound that varies with time. It is often used as a descriptor of the **ambient noise climate**, and commonly seen as a single A-weighted figure $L_{Aeq,T}$.

L_{max} (dB) - Maximum Sound Pressure Level

The L_{max} value is the highest recorded sound pressure level in decibels averaged across a specified time constant during a noise measurement of certain duration. Two time constants are used, Fast and Slow, where the time constants are 0.125s and 1s respectively. The time constant is denoted in the index, $L_{max,F}$ for Fast and $L_{max,S}$ for Slow. It is often used to identify transient events that have a high-level relative to the ambient noise climate, and commonly seen as a single A-weighted figure L_{Amax} .

$L_{10,T}$ (dB) - Equivalent Continuous Sound Pressure Level

The $L_{10,T}$ value is the sound pressure level in decibels that is exceeded for 10% of a given time interval, T. It is often used as a measurement of noise from transportation sources such as road and rail. It is commonly seen as a single A-weighted figure $L_{A10,T}$.

$L_{90,T}$ (dB) - Equivalent Continuous Sound Pressure Level

The $L_{90,T}$ value is the sound pressure level in decibels that is exceeded for 90% of a given time interval, T. It is often used as a descriptor of the **background noise climate**, and commonly seen as a single A-weighted figure $L_{A90,T}$.

2018011-0 R1 Appendix B

Document Naming and Version Control Policy

All documents are issued with a unique number which comprises the principle 7-digit project and 1-digit subsection numbers, for example 2015123-0, and a reference indicating iteration of document type, for example R1 for Report 1, M2 for Memorandum 2 etc.

All documents employ version control through the use of a unique version number. The version numbers employ two levels of hierarchy, and use the format illustrated below:

V 1 . 2

Major Minor

Major

A major revision occurs when the report is revised to reflect significant changes in design strategy. For example, wide scale changes to building footprint or general arrangements, changes to principle construction type (e.g. masonry to lightweight), reselection of mechanical services plant etc. A change in strategy that takes place within the same RIBA work stage for example will prompt a major revision to a document.

Minor

A minor revision occurs when the report is revised to reflect minor changes to the design implementation. For example a change in the type of natural vent, extract fan, surface finish etc. to be used, on the project. Minor revisions will also occur when there is a change in wording of the report text.

Reporting

The Document History and Version Control table on the second page of each report identifies the versions through which the document has moved, along with the date, author that produced the version, and a description of its purpose or change. Prior to issue, the document will be signed (physically or electronically) by the most recent author and reviewer.

Electronic File Naming

Reports issued electronically use the following format:

2015xxx	-	x	Rx	Noise Assessment Report	v1.0	15.02.12	.pdf
Project Number		Subsection Report Number		Report Name	Version	Date	File Extension

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