



COLIN SHENTON

**65 PRINCESS STREET,
MANCHESTER**

NOISE ASSESSMENT FOR PLANNING PURPOSES

25 February 2020

AEC REPORT: P3980/R1c/RDC

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DOCUMENT STATUS

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Rev	Date	Document Details	Author	Checked
--	11/11/19	Original	RDC	PSK
a	13/11/19	Inclusion of rooftop plant manufacturer data.	RDC	PSK
b	10/12/19	Renaming of client details and glazing changes to para 2.9.	RDC	PSK
c	25/02/20	Calculations for plank breakout included	RDC	PSK

1.0 INTRODUCTION

- 1.1 Acoustic & Engineering Consultants Limited (AEC) has been instructed by Colin Shenton to undertake a noise assessment in relation to the proposed conversion of a former office block into a two-storey hotel development at 65 Princess Street, Manchester.
- 1.2 This report details the noise levels measured on site, presents the assessment criteria and discusses the implications on the site layout and building design to achieve acceptable noise levels in internal areas to meet the Local Authority requirements.
- 1.3 Acoustic terminology is discussed in brief in Appendix A.

2.0 BACKGROUND AND SITE DESCRIPTION

- 2.1 The proposed development is located at 65 Princess Street and is situated in a row of terraced commercial buildings in Manchester's city centre near St Peter's Square, Manchester. As identified on the attached Figure 1.
- 2.2 The front elevation of the site overlooks Princess Street and beyond to St Peter's Square.
- 2.3 There is a tram station on St Peter's Square and trams go past the site towards Victoria Station. It is understood that the last tram that travels through this section runs no later than 0100h, Monday – Sunday.
- 2.4 The rear elevation of the site faces onto an external courtyard area which is formed by the buildings that face Kennedy Street.
- 2.5 The building to the right of the development at 67 Princess Street is The Waterhouse public house. AEC understands that it has the following opening times:
 - Monday to Friday, 0800 – 0000h;
 - Saturday, Sunday, 0800 – 0100h.
- 2.6 In front of the public house on Princess Street, there is also a small external seating area, however, the operating times are unknown. It is understood that there is no external amplified music associated with the public house.
- 2.7 63 Princess Street is occupied by the Rozafa Greek restaurant. The operating times of the restaurant are unknown.
- 2.8 The proposed hotel will include 9 en-suite bedrooms with a ground floor reception area.
- 2.9 AEC understands that only the existing secondary glazing on the 1st floor will be retained at the request of the conservation officer.
- 2.10 The only mechanical services serving the hotel will be two rooftop external air conditioning units. Their operational times are understood to be 24 hours a day, 7 days a week. The location of the units is presented on the attached Figure 1.

3.0 BASIS OF ASSESSMENT

Determining of External Noise Levels

- 3.1 Chapters 6.2 to 6.7 of BS 8233:2014 '*Guidance on sound insulation and noise reduction for buildings*' (BS8233) describes how noise levels can be determined and assessed from different sources.
- 3.2 Chapter 6.5 of BS8233 provides guidance on how to assess noise from industrial and commercial sites. While this document does not mention how to assess noise from tram noise, therefore, long-term measurements were undertaken to measure a number of tram pass bys.
- 3.3 Paragraph 6.5.2 states that where industrial noise affects residential or mixed residential areas, the methods for rating noise in BS4142: 2014 '*Methods for rating and assessing industrial and commercial sound*', (BS4142) should be applied.

National Planning Policy Framework

- 3.4 The latest Planning Policies are included in the National Planning Policy Framework published by the Department for Communities and Local Government and dated March 2012 and revised in February 2019. However, any sections relating to 'Noise' were updated in July 2019.
- 3.5 This planning policies which relate specifically to noise are presented in paragraphs 170, 180 and 182 which are reproduced below:

170. Planning policies and decisions should contribute to and enhance the natural and local environment by:

(e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of noise.

180. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

(a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life ⁶⁰;

(b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

182. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of

use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.

- 3.6 Further to the above, the Governments ‘Planning Practice Guidance’ dated 6 March 2014 indicates:

‘Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. When preparing local or neighbourhood plans, or taking decisions about new development, there may also be opportunities to consider improvements to the acoustic environment.’

- 3.7 In addition, the guidance indicates that, whilst noise can override other planning concerns, it should not be considered in isolation from the economic, social and other environmental dimensions of any proposed development.

Local Authority Requirements

- 3.8 Manchester City Council has produced ‘Planning & Noise – Technical Guidance’ (2015) (PNTG) in relation to their requirements for noise assessments to accompany planning applications.
- 3.9 Section 3.6.1.1 of this document states “Manchester City Council has adopted the following internal limits for residential properties:
- Bedroom (night-time – 23.00 – 07.00) $30\text{dBL}_{\text{Aeq}}$ (individual noise events should not normally exceed $45\text{dBL}_{\text{Amax, F}}$ by more than 15 times);
 - Living Rooms (daytime – 07.00 – 23.00) $35\text{dBL}_{\text{Aeq}}$.
- 3.10 These levels are based on guidance presented in BS8233 and the World Health Organisation (WHO) document ‘Guidelines for Community Noise’ (1999).

Table 3.1 – Internal Noise Level Limits within Habitable Rooms

Activity	Location	Noise Limit, dB		
		Daytime 0700 – 2300h	Night-Time 2300 – 0700h	
		$\text{L}_{\text{Aeq, T}}$	$\text{L}_{\text{Aeq,}}$	$\text{L}_{\text{Amax,}}$
Resting	Living Room	35	-	-
Dining	Dining Room/Area	40	-	-
Sleeping (daytime resting)	Bedroom	35	30	45

- 3.11 In locations where the noise has a specific character such as the patron noise associated with the public house, AEC propose that the design aim should be to achieve internal noise levels at least 5dB below those presented in Table 3.1.

Ventilation

- 3.12 It is understood that ventilation is going to be provided in each room via mechanical services plant.
- 3.13 In order to meet MMC's internal noise level limits, building services plant should be controlled to achieve ambient noise levels no greater than NR25 L_{eq} when the systems are operating at their design duty.

Atmospheric Plant Noise Emissions

- 3.14 Based on guidance presented in MCC's document PNTG, the following is stated in relation to noise level limits for industrial sources at noise sensitive premises:

“Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location.”

4.0 NOISE MEASUREMENTS

- 4.1 An extended unattended noise level survey was undertaken by AEC on both the front (Location A, Princess Street) and rear (Location B, courtyard) over a weekend period. In both instances, the microphone was installed at 1st floor level, 1m from the façade of the existing building.
- 4.2 At Location A, noise levels were measured between 1700h on Friday 18 October, to 0700h on Monday 21 October. At Location B, noise levels were measured between 1715h on Friday 18 October, to 0645h on Sunday 20 October. Full logged data over 15-minute periods is held on file by AEC and is available on request.
- 4.3 All measurements were undertaken in general accordance with BS7445-1: 2003 '*Description and measurement of environmental noise. Guide to quantities and procedures*'.
- 4.4 A full measurement procedure is presented in Appendix B and the measured data is presented in Graphs B1 to B5 and a summary of the daytime and night-time noise levels are presented below.

Daytime

- 4.5 Daytime noise levels at both locations were due to road traffic, trams, patrons from The Waterhouse public house and nearby pedestrians.
- 4.6 The measured noise levels at both locations are summarised in Table 4.1, below. The noise levels are presented as a full 16-hour daytime ambient noise level between 0700 and 2300h on each day (unless where otherwise stated).
- 4.7 As shown in the graphs at the back of this report, the daytime noise levels remained relatively constant throughout each of the daytime measurement periods.

Table 4.1 – Measured Façade Daytime Ambient Noise Levels

Date	Noise Levels, dBL _{Aeq, T}	
	Location A (Princess Street)	Location B (Rear Courtyard)
Friday, 18/10/19	67 ¹	56 ¹
Saturday, 19/10/19	68	53
Sunday, 20/10/19	64	-

¹ – Not a full daytime period. Period of measurement was approximately 8 hours.

Night-time

- 4.8 During the night-time, noise levels at both locations were due to road traffic and pedestrians, trams, patrons from The Waterhouse public house and nearby pedestrians. However, the noise from the trams and patrons did reduce when the trams stopped and the public house closed.

- 4.9 Maximum noise levels at both locations were due to vehicles and pedestrians on Princess Street. These are presented in Table 4.2, below. In addition, in brackets next to the highest maximum, the tenth highest maximum noise level during each period is presented. This value is used in the assessment going forward as it ensures that sirens and other erroneous noise sources are removed from the assessment.
- 4.10 The measured noise levels at both locations are summarised in Table 4.2, below. In addition to the overall 8-hour night-time ambient noise levels, the ambient noise levels measured between 2300 and 0100h have also been provided, in order to present the influence on the noise levels when the public house closes at 0100h.
- 4.11 During each night-time period, no amplified music impacted the measurements.

Table 4.2 – Measured Facade Night-time Noise Levels

Date	Location A (Princess Street)			Location B (Rear Courtyard)		
	0700-2300h, Ambient, dBL _{Aeq, T}	2300-0100h, Ambient, dBL _{Aeq, T}	Highest Maximum, dBL _{AFmax}	0700-2300h, Ambient, dBL _{Aeq, T}	2300-0100h, Ambient, dBL _{Aeq, T}	Highest Maximum, dBL _{AFmax}
Friday, 18/10/19	65 ¹	66	95 (85)	49 ¹	51	70 (65)
Saturday, 19/10/19	62	65	93 (81)	48	50	72 (65)
Sunday, 20/10/19	63	63	87 (83)	-		-

¹ – Not a full daytime period. Period of measurement was approximately 8 hours.

- 4.12 As shown in Table 4.2, above, the ambient noise levels during the period 2300-0100h were marginally higher on the Friday night than any other night at both locations.

Background Noise Levels

- 4.13 In relation to complying with the requirements of the PNTG for noise level limits for industrial sources, the PNTG presents a method for calculating a 'typical' background sound level from a set of long-term noise measurement data.
- 4.14 The methodology for calculating this, fundamentally includes arithmetically averaging the measured background noise level during the same 15 minute period for each day (e.g., Friday, 1200-1215h, Saturday, 1200-1215h and Sunday, 1200-1215h).
- 4.15 Based on the above calculation method, the 'typical' background noise levels used in this assessment are presented in Table 4.3, below.
- 4.16 AEC understands that the air conditioning units are to be located on the rooftop directly above one of the bedrooms of the hotel that faces the rear courtyard. Therefore, this bedroom would be classed as the NNSR (around 5m away) and only the typical background noise levels for this location are presented, below.

Table 4.3 – Typical Façade Background Noise Levels

Elevation	Noise Level, dBL _{A90}	
	Day	Night
Rear Courtyard	45	42

5.0 ASSESSMENT OF PROPOSED DEVELOPMENT

External Noise levels

- 5.1 At both locations, the measurements were undertaken under façade conditions. Therefore, in accordance with guidance presented in BS7445-2: 'Description and measurement of environmental noise - Part 2: Guide to the acquisition of data pertinent to land use', a -3dB correction has been applied to the measured façade levels in order to obtain free-field noise levels which have been used in this assessment.
- 5.2 The typical daytime and night-time ambient and maximum noise levels affecting the two elevations proposed is presented in Table 5.1, below. This has been based on the measured noise levels at Locations A and B, respectively.
- 5.3 As identified in Section 3, the 2 hour night-time ambient noise levels between 2300-0100h were higher on the Friday night than on any other night. Therefore, these have been considered representative of the 'worst case' night-time noise level and are presented in Table 5.1, below.
- 5.4 The 10th highest maximum noise level has also been presented.

Table 5.1 – Free-field External Noise Levels Affecting Glazed Facades

Location	Daytime Ambient Noise Levels, dBL _{Aeq,16h}	Night-time Ambient Noise Levels, dBL _{Aeq,8h}	Night-time Maximum Noise Levels, dBL _{Amax, F}
Princess Street Elevation	≤ 65	≤ 62	≤ 82
Rear Courtyard Elevation	≤ 53	≤ 46	≤ 62

Internal Noise levels

- 5.5 AEC understands that the habitable rooms within the development are to be mechanically ventilated. As such, in order to meet the internal noise level limits required by MCC, the glazing on both elevations will be the weakest element.
- 5.6 In order to determine the acoustic requirements of the glazing to achieve appropriate internal noise levels, calculations have been undertaken based on typical room dimensions, the equivalent glazed area of around 40% in each room's façade, and full octave band centre frequency noise data.
- 5.7 The calculated sound insulation performance for the glazing is presented in Table 5.2, below, alongside example glazing build-ups to achieve the required glazing performance.

Table 5.2 – Outline Requirements to Achieve Internal Noise Level within Habitable Rooms

Elevation	Sound Insulation Performance	Example Glazing (TC – Thermal Cavity)
Princess Street	46dBR _w and 37dBR _w + C _{tr}	6mm Glass / 100mm Cavity / 4mm Glass
Rear Courtyard	31dBR _w and 25dBR _w + C _{tr}	4mm Glass / TC / 4mm Glass

- 5.8 Prior to any glazing being installed, octave band sound insulation performance data of the glazing build-ups and ventilators selected must be verified by AEC or others.
- 5.9 Windows can be openable for purge ventilation provided that they are effectively acoustically sealed when closed, and it is important that any frames and seals do not downgrade the sound insulation performance of the glazing.
- 5.10 It is anticipated that the external envelope and roof will achieve a sound insulation performance of at least 55dBR_w.

Plant Noise – Internal

- 5.11 The ventilation system will need to ensure that internal ambient noise levels in guest rooms/bedrooms, as presented in Table 3.1, are achieved.
- 5.12 To control airflow generated noise in ductwork systems to bedrooms, the maximum duct velocities are presented in Table 5.3, below.

Table 5.3 – Maximum Ductwork Airflow Velocities

Noise Level, dB(A)	Duct Velocity, m/s		
	Main Duct	Branch Duct	Final Runout
30 (NR25)	5.0	4.5	2.5

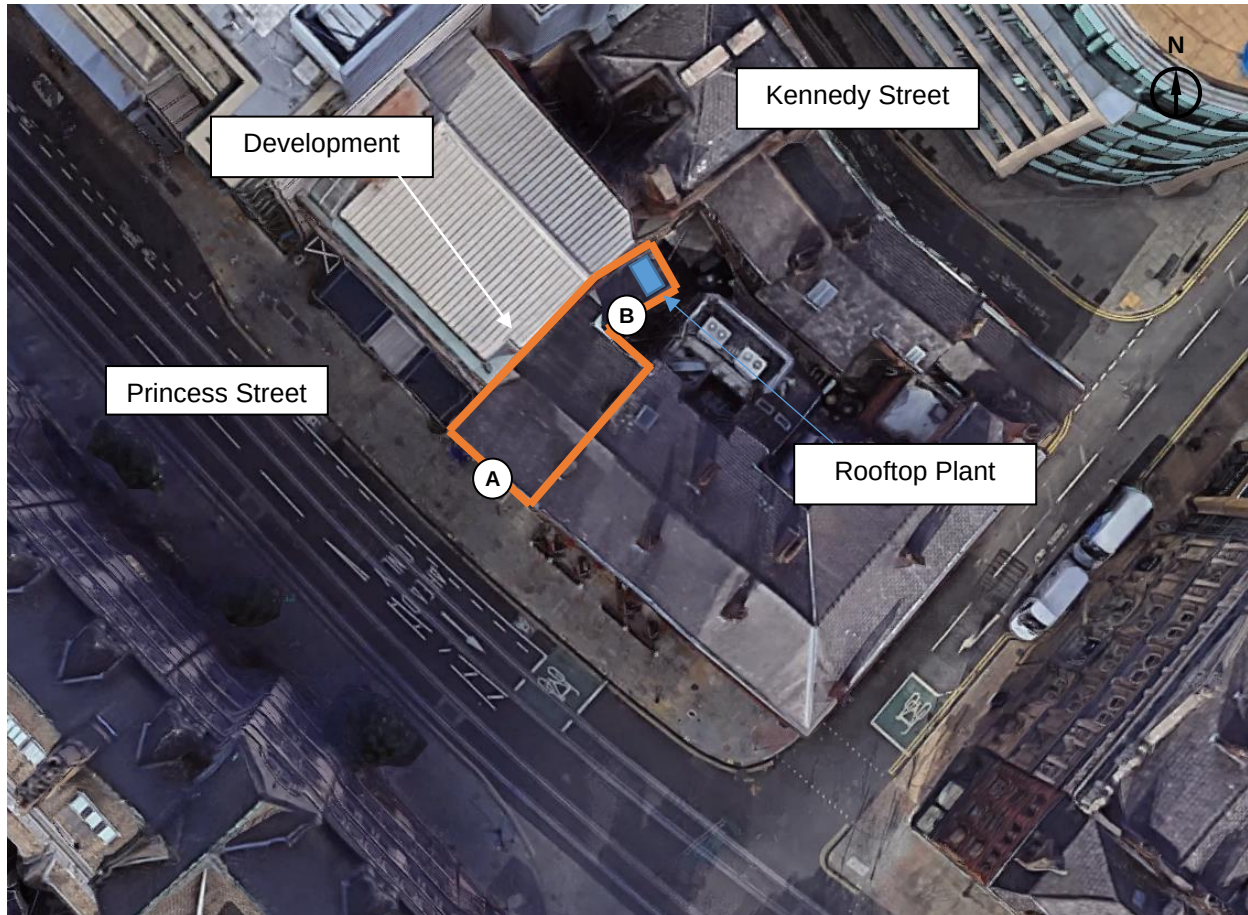
Plant Noise – External

- 5.13 It is understood that the proposed items of plant are Diekin VRV IV Condensing Units (model number: RXYSCQ5TV1).
- 5.14 It is understood that the plant will operate at the same duty throughout the night-time and daytime periods. Based on this, in order to achieve the requirements of PNTG, the rating noise level must not exceed 5dB below the 'typical' background noise level of 42dBL_{A90, T}.
- 5.15 Based on provided manufacturers tests data, a single unit emits a sound pressure level of around 53dB(A) at 1m.
- 5.16 The noise level external to the NNSR has been calculated as 24dBL_{Aeq, T}. This has been based on both units operating simultaneously, distance correction (5m) and screening from the proposed parapet.
- 5.17 External noise levels external to the NNSR, based on two of these units operating at the same time, appropriate distance attenuation to the NNSR (5m), and screening provided by the roof, would be 24dB(A).
- 5.18 As the calculated noise level is around 13dB below the noise level limit, it would be virtually inaudible at the receptor and, therefore, no character correction needs to be applied.
- 5.19 Based on the above, the requirements of the PNTG would be achieved. A calculation detailing the above is presented in Appendix C at the back of this report.

6.0 SUMMARY AND CONCLUSIONS

- 6.1 Acoustic and Engineering Consultants Limited (AEC) has been appointed by Colin Shenton to undertake a noise assessment relating to a proposed converted hotel development at 65 Princess Street, Manchester. This noise assessment is required to accompany the associated planning application for the development.
- 6.2 This assessment considers the noise levels measured on-site and provides outline guidance on the required sound insulation performance of the external envelope, including the glazing, to meet the Local Authority's internal noise level limits.
- 6.3 Manchester City Council require that the development should be designed in order to achieve the desired internal noise level limits as stated in their document '*Planning and Noise Technical Guidance*', dated December 2015.
- 6.4 It is understood that the development will be mechanically ventilated.
- 6.5 The noise level measurements undertaken by AEC were unattended, with logging noise level meters installed on two facades of the building; one facing Princess Street, and one facing the rear courtyard.
- 6.6 At both locations, the noise sources around the site were road traffic and tram noise on Princess Street, as well as patron noise from The Waterhouse Public House and local pedestrians.
- 6.7 A summary of the measured noise levels is presented in Section 4, with the full measurement data presented in Appendix B. These noise levels have been assessed against the design criteria in Section 5.
- 6.8 Based on the noise assessment, AEC has proposed appropriate glazing that is necessary to control internal noise levels to meet the levels presented in PNTG in all habitable rooms during both the daytime and night-time periods. These are presented in Section 5, above.
- 6.9 Based on provided test data for the proposed external rooftop plant, the requirements of the PNTG will be achieved.
- 6.10 This assessment demonstrates that appropriate planning conditions can be applied to the proposed development to ensure that internal noise levels will comply with the requirements of Manchester City Council.
- 6.11 Therefore, based on the above, noise should not be considered a determining factor in relation to any planning permission being sought.

FIGURE 1 – Existing Site Showing Monitoring Locations



Map data @2019 Google United Kingdom

APPENDIX A – Acoustic Terminology in Brief

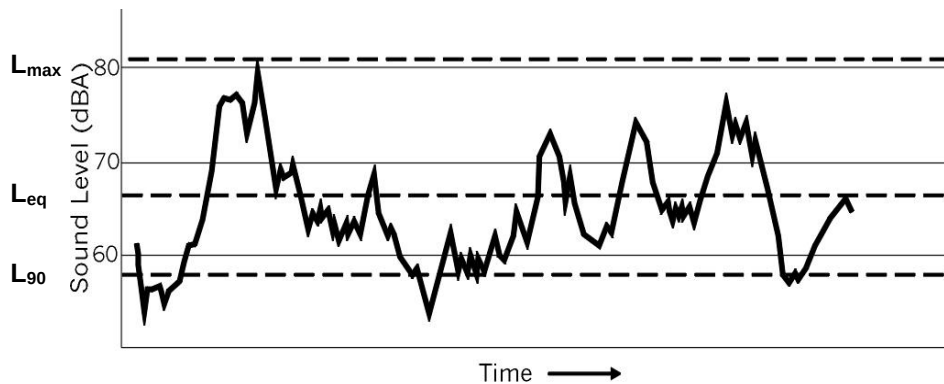
Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air. The rate at which the pressure fluctuations occur determines the pitch or *frequency* of the sound. The frequency is expressed in Hertz (*Hz*), that is, cycles per second. The human ear is sensitive to sounds from about 20 Hertz to 20,000 Hertz. Although sound can be of one discrete frequency - a 'pure tone' - most sound is made up of many different frequencies.

The human ear is more sensitive to some frequencies than others, and modern instruments can measure sound in the same subjective way. This is the basis of the A-weighted sound pressure level *dBA*, normally used to assess the effect of noise on people. The *dBA* weighting emphasises or reduces the importance of certain frequencies within the audible range.

Sound Units

In order to assess environmental noise, measurements are carried out by sampling over specific periods of time, such as fifteen minutes or one hour, the statistically determined results being used to quantify various aspects of the sound.

The figure below shows an example of sound level varying with time. Because of this time variation the same period of sound can be described by several different levels. The most common of these are described below. It should be noted that in many instances in the main body of text, the unit will be preceded by a *dB* descriptor in the report e.g. $L_{Aeq,T}$ could be written $dB L_{Aeq,T}$



Example of Sound Level Varying With Time

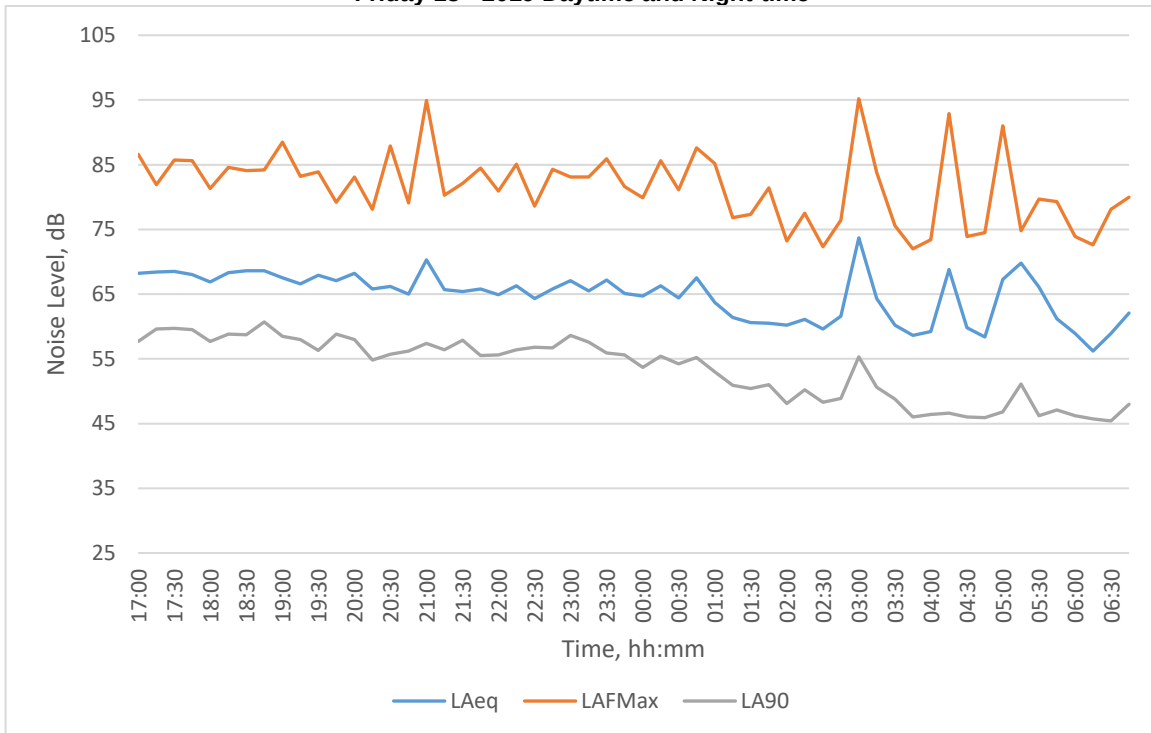
$L_{Aeq,T}$	The equivalent continuous (A-weighted) sound level. It may be thought of as the "average" sound level over a given time, <i>T</i> . It is used for assessing noise from various sources: industrial and commercial premises, construction sites, railways and other intermittent noises and can be considered as the "ambient" noise level.
$L_{A90,T}$	The (A-weighted) sound level exceeded for 90% of a measurement period. It is the value often used to describe background noise.
L_{Amax}	The maximum (A-weighted) sound level measured during a given time. 'Fast' or 'Slow' meter response should be cited.

Free-field Level	This refers to the sound level measured outside, away from reflecting surfaces.
Façade Level	This refers to the sound level measured outside, at 1m from a hard reflecting surface, typically 3dB greater than the free-field level.
R_w	Single number rating used to describe the <u>laboratory</u> airborne sound insulation properties of a material or building element over a range of frequencies, typically 100-3150Hz.
D_{nT,w} + C_{tr}	As above only the resultant figure is adjusted by a spectrum adaptation term in relation to the low frequency sound insulation performance.
D_{n,e,w}	Weighted element-normalised level difference. Single number rating used to describe the sound insulation performance.

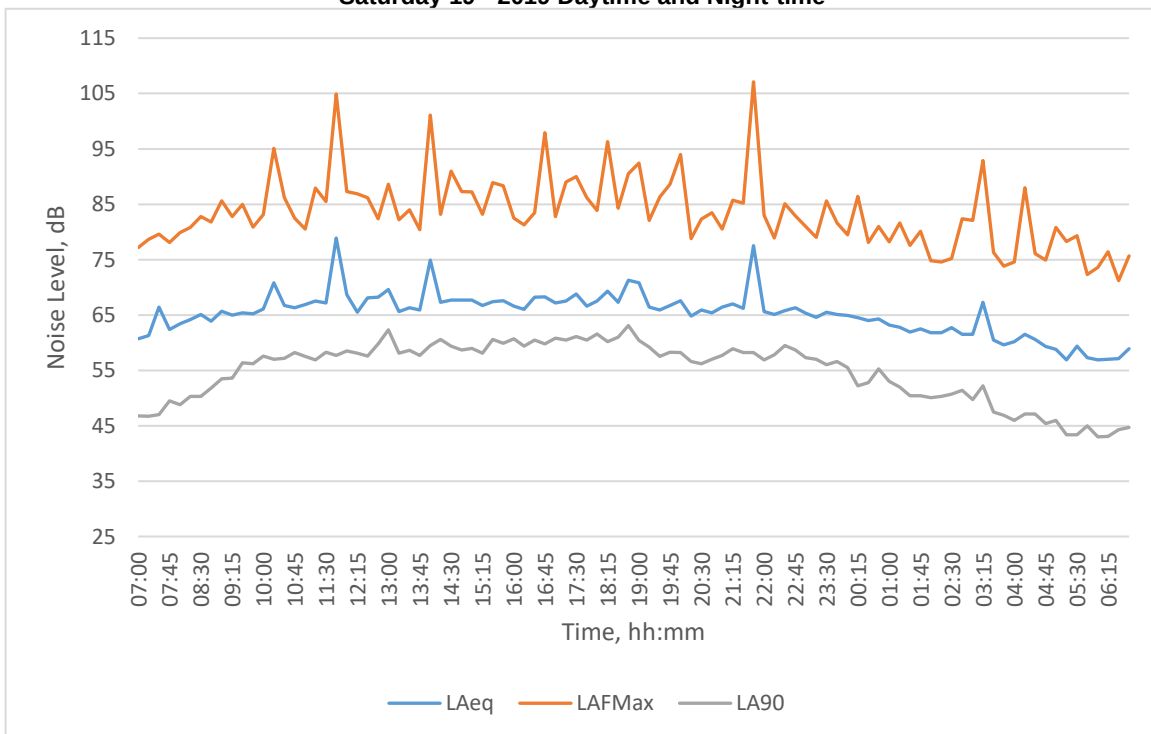
APPENDIX B – Noise Survey Details

Date & Time of Survey:	Friday 18 October 2019, 1700h to Monday 21 October 2019, 0830h					
Personnel:	Ross Chamberlain (AEC).					
Equipment Used:	Cirrus CR:171B Real Time Analyser (AEC Kit 3) Cirrus CR:171B Real Time Analyser (AEC Kit 5)					
Calibration:	The sound level analysers, which conforms to BS EN 61672-1: 2003 ' <i>Electro acoustics – sound level meters - Part 1 Specifications</i> ' for Class 1 Type Z meters, was in calibration and check calibrated before and after the measurement periods using a Brüel & Kjær type 4231 (94dB) calibrator. There was no significant drift of calibration. Calibration certificates are available on request.					
Weather Conditions:	Date	Period	Wet/Dry	Temp°C	Wind Speed & Direction	Cloud Cover
	18/10/19	Day	Dry	High 12°C, Low 9°C	6mph north	60%
	18/10/19 – 19/10/19	Night	Dry	High 9°C, Low 8°C	6mph north	55%
	19/10/19	Day	Dry	High 12°C, Low 7°C	6mph east	25%
	19/10/19 – 20/10/19	Night	Dry	High 8°C, Low 7°C	3mph east	35%
	20/10/19	Day	Dry	High 11°C, Low 6°C	10mph south	35%
	20/10/19 – 21/10/19	Night	Dry	High 10°C, Low 9°C	9mph south	60%
Measurement Locations:	Two microphones were connected via individual extension cables and fixed externally at a location 1m any façade via a pole. The first microphone was installed on the Princess Street elevation on the 1 st floor level, which is identified as A on Figure 1. The second microphone was installed on the courtyard elevation on the 1 st floor level, which is identified as B on Figure 1.					
Measurement Details:	Measurements were logged continuously over 1s for post processing and assessment. This location was selected to represent the worst-case affected façade of the development that would be affected by road, tram and patron noise.					
Façade / Free-Field:	All measurements were façade level. The measured daytime and night-time periods for the unattended survey is presented on Graphs B1 to B5.					
Measured Data:	Full 1/3 rd octave band centre frequency data was obtained for all measurements.					

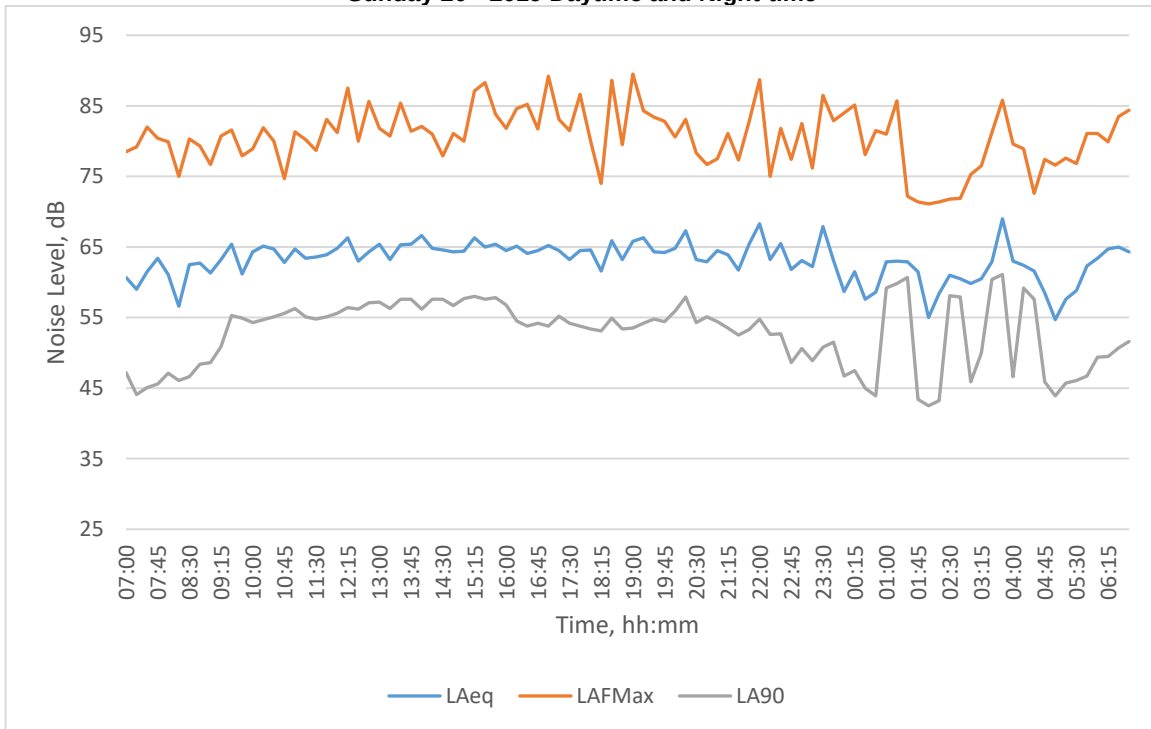
**GRAPH B1 – Measured Façade Noise Levels – Princess Street Elevation
Friday 18th 2019 Daytime and Night-time**



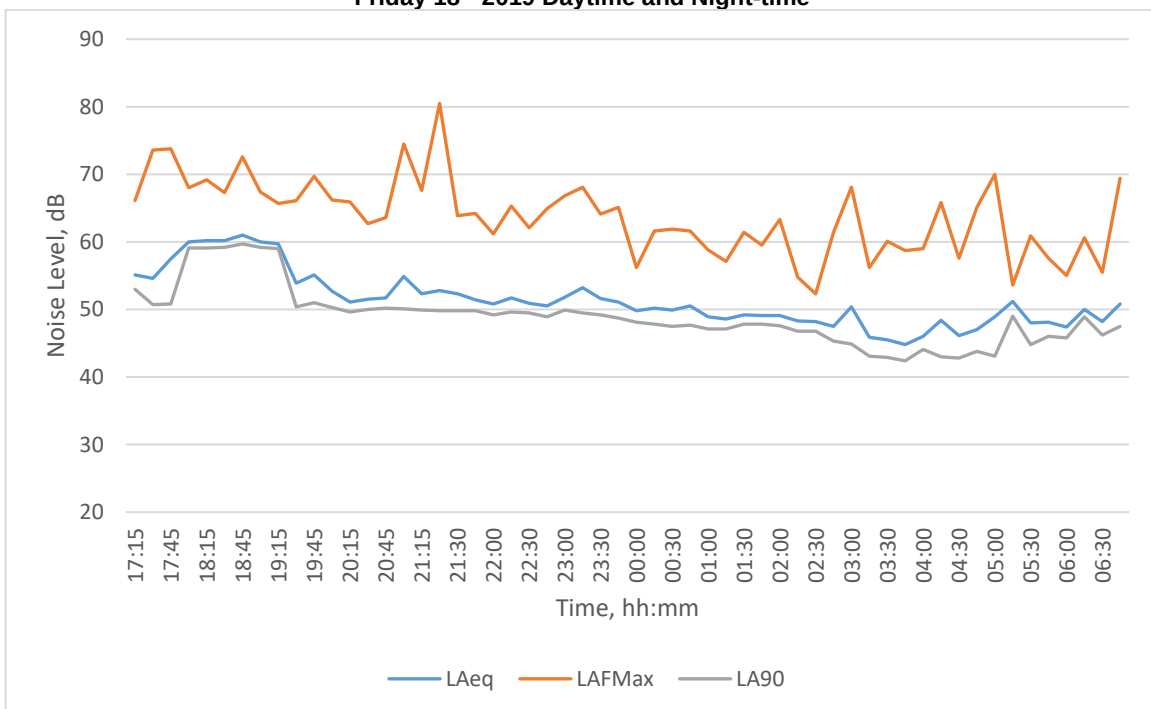
**GRAPH B2 – Measured Façade Noise Levels – Princess Street Elevation
Saturday 19th 2019 Daytime and Night-time**



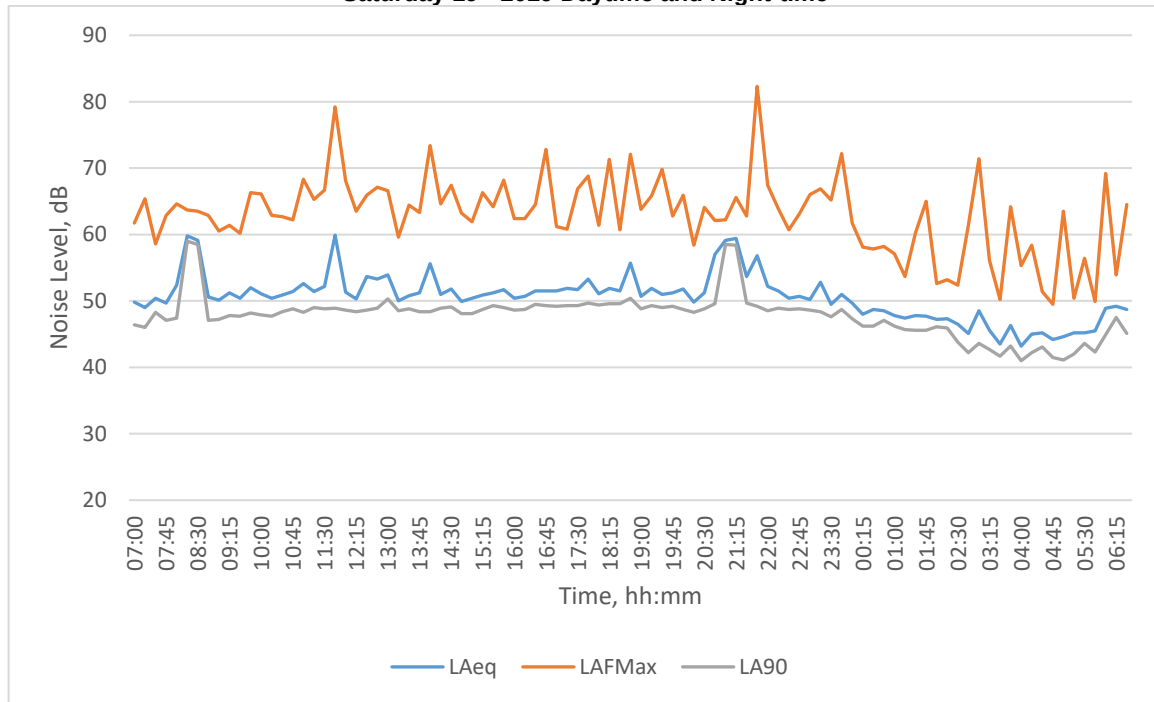
**GRAPH B3 – Measured Façade Noise Levels – Princess Street Elevation
Sunday 20th 2019 Daytime and Night-time**



**GRAPH B4 – Measured Façade Noise Levels – Courtyard Elevation
Friday 18th 2019 Daytime and Night-time**



GRAPH B5 – Measured Façade Noise Levels – Courtyard Elevation
Saturday 19th 2019 Daytime and Night-time



APPENDIX C – Rating Noise Level – External Plant

Details	Level	Commentary
Measured Ambient Sound Level, $L_{Aeq,T}$	$L_{Aeq} = 50$ dB	Specific sound source not operating.
Measured Background Sound Level, L_{A90}	$L_{A90 (1h)} = 42$ dB	Specific sound source not operating
Specific Sound Level	$L_{Aeq (1h)} = 53$ dB	Manufacturer test data (sound pressure level @ 1m)
Acoustic Feature Correction	+0 dB	
Distance Attenuation	-14 dB	$=20 \cdot \log(1 / 5)$, where 5m = distance from source to receiver.
Barrier Attenuation	-15 dB	Provided by the parapet, and 0% angle of view to the plant from the glazing.
Rating Level, $L_{Ar,Tr}$	$(53 - 14 - 15)$ dB = 24 dB	
Background Sound Level	$L_{A90 (1 h)} = 42$ dB	
Excess of rating over background sound level	$(24 - 41)$ dB = -17 dB	
Assessment indicates that the source will have a low impact depending on context		
Uncertainty of the assessment	Not significant	