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Project:

Jo Malone, 19 King Street Manchester

Title:

BS8233 Plant Assessment

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CONTENTS:

1	INTRODUCTION	1
2	SITE	1
3	GUIDANCE	2
4	BS8233 PLANT ASSESSMENT	3
5	CONCLUSIONS	5

APPENDIX A: Glossary of Technical Terms
APPENDIX B: Site Plan & Measurement Location
APPENDIX C: Planning Policy & Guidance

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1 INTRODUCTION

1.01 Environmental Equipment Corporation Limited has been commissioned by Andy Kerr Associates to undertake a desktop noise assessment of four new replacement condensing units to serve the retail premises of No 19 King Street Manchester.

1.02 This noise assessment has been conducted in accordance with relevant guidance documents and is based on a review of the existing plant that is to be replaced along as review of the resultant noise levels at the nearest windows.

1.03 This assessment includes the prediction of noise impacts at the worst affected noise sensitive receptors based on the proposed items of plant and their location.

1.04 This report is prepared solely for Andy Kerr Associates. Environmental Equipment Corporation Limited accepts no responsibility for its use by any third party. Note that the contents contained herein are produced for the purposes of review by relevant Planning Authority departments and do not constitute a detailed design or specification document to be used for the purposes of construction. Subsequent development of noise mitigation schemes shall engage EEC Ltd and Andy Kerr Associates so as to support the conclusions of this report.

1.05 Whilst every effort has been made to ensure that this report is easy to understand, it is necessarily technical in nature. To assist the reader, an explanation of the terminology used in this report is contained in Appendix A.

2 SITE

2.01 19 King Street is an existing five storey building, with retail units on the first and second storeys and office spaces expected to occupy the above floors. The site is located in a predominantly commercial area of Manchester.

2.02 The property is bound by the following:

- North – Retail and commercial demises of St Ann Street and Police Street;
- East – Adjoined neighbouring retail premises of Nos 21-23 King Street;
- South – King Street pedestrianised walkway with further retail and commercial units running parallel; and
- West – Adjoined neighbouring retail premises of No 17 King Street.

2.03 This application is for the installation of four Toshiba RAVGM1101 condensing units which are to replace four existing Fujitsu units wall mounted on the rear façade (northern elevation) of the building at first floor level, as presented in Appendix B.

2.04 From a review of the site, there are no Noise Sensitive Receivers that would meet the typical definition of being either dwellings, habitable spaces such as hotel bedrooms, libraries or places of worship within 25m of the plant installation. We are currently not aware of the strict definition the local authority classifies 'Noise Sensitive Receivers'.

2.05 Office spaces and retail units typically do not fall into the category of Noise Sensitive Receivers and as such are generally assessed against different guidance and assessment methods.

2.06 The closest receptors to the plant location are the first floor south-facing windows of St Anns House.

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2.07 All other noise sensitive receptors are at a greater distance from the proposed location of the units, or are protected by more screening by the intervening structures, and as such will be subject to lower levels of noise.

3 GUIDANCE

3.01 Guidance on acceptable noise levels for commercial spaces can be taken from British Standard 8233:2014 'Guidance on sound insulation and noise reduction for buildings'. Section 7 gives guidance on acoustic criteria and noise levels appropriate for various internal spaces that have different functions. Section 7.7.6 relates specifically to non-domestic buildings and offers guidance on appropriate internal ambient noise levels for internal spaces (when unoccupied) with specific consideration:

3.02 for communicating;

i. for study and/or work requiring concentration; and

ii. for acoustic privacy

iii. for listening rooms.

3.03 The guidance applies to external noise as it affects the internal acoustic environment from sources without a specific character. Table 6 of section 7.7.6 recommends the following internal noise limits based on the presence of steady, external noise sources:

Table 6 **Typical noise levels in non-domestic buildings**

Activity	Location	Design range dB $L_{Aeq,\ T}$
Speech or telephone communications	Department store Cafeteria, canteen, kitchen	50 – 55
	Concourse Corridor, circulation space	45 – 55
Study and work requiring concentration	Library, gallery, museum	40 – 50
	Staff/meeting room, training room	35 – 45
	Executive office	35 – 40
Listening	Place of worship, counselling, meditation, relaxation	30 – 35

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4 BS8233 PLANT ASSESSMENT

4.01 This application is for the installation of four condensing units to be located on the northern elevation of the building, mounted to the wall at first floor level.

4.02 From a review of the local area via Street Maps and Aerial imaging, the area surrounding the plant installation is already heavily populated with additional third party plant, most of which does not have any noise control hardware, that serves the nearby retail/commercial properties. It can therefore reasonable be expected that the existing noise climate external to the identified closest windows will be predominantly controlled by plant noise. The existing plant is either similar or larger than the proposed new replacement plant.

4.03 Tables 7.1 and 7.2 compares the manufacturers published noise levels for the proposed new plant against the existing plant that is to be replaced.

Item	Published Sound Pressure Level at 1m- dBA
Toshiba RAVGP 1101	50 dB
Toshiba RAVGP 1101	50 dB
Toshiba RAVGP 1101	50 dB
Toshiba RAVGP 1101	50 dB
Cumulative SPL	**56 dBA**

Table 7.1: Published Sound Pressure Levels for the Proposed New Units

Item	Published Sound Pressure Level - dBA
Fujitsu 036 Unit	54 dB
Fujitsu 036 Unit	54 dB
Fujitsu 036 Unit	54 dB
Fujitsu 024 Unit	52 dB
Cumulative SPL	**60 dBA**

Table 7.2: Published Sound Pressure Levels for Currently Installed Units

4.04 It can clearly be seen that based on all 4 No. units operating the proposed new plant will be at least 4dB quieter than the plant it is replacing. This would be a perceptible reduction in noise in this immediate location.

4.05 A further review of the potential noise impact has been undertaken below based on current British Standard guidance for noise within commercial office spaces. In accordance with guidance given in BS8233 and a worst case assumption that the nearest window will be for a cellular office space rather than an open plan office space it would be recommended that the proposed new plant does not exceed a range of 35-40 dB(A), 1m inside of the closest windows.

4.06 Predicted noise levels have been calculated at the closest windows to the plant installation, the south-facing first-floor windows of St Ann's Place. These windows are observed to be non-opening and double glazed, in which a reduction of 25dB has been accounted for, for a closed, non-opening window. As all offices appear to be served by existing condenser/heat pump plant it is expected that most offices will keep their windows closed. Based on the existing plant that is in the immediate vicinity it would be expected that any occupant adversely affected by noise would already be closing their window based on the existing noise levels.

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4.07 Tables 7.3 – 7.4 present the results of worst-case plant noise predictions at the worst-case locations.

Item	Noise Level	Notes
Four New Toshiba Units	56 dB(A)	Cumulative sound pressure level at 1m
Reflections	+ 6 dB	Additional reflections – Facades of side walls
Barrier Effect	0 dB	Line of sight to proposed plant location
Point source area Losses over 2 metres	- 6 dB	Distance to closest window
Loss for a closed window	- 25 dB	Allowance for a closed window
Resultant Noise Level	31 dB(A)	St Ann's House South Facing Windows

Table 7.3: St Ann's House Plant Noise Calculation (New Plant)

Property	Predicted $L_{Aeq,T}$	Proposed Noise Limit – dBA	Exceedance of noise limit
St Ann's Place (New Plant)	31 dB	35-40 dB	- 4 to -9dB

Table 7.4: Assessment of Predicted Noise Levels Based on Proposed Noise Limit, Free-field dB(A)

4.08 As presented in Table 7.4 above, it can be seen that noise targets with regards to BS8233 are met at the closest windows to the replacement plant.

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5 CONCLUSIONS

5.01 Andy Kerr Associates has appointed Environmental Equipment Corporation Limited to undertake a noise assessment for four new condensing units to replace four existing units as a like-for-like replacement.

5.02 The assessment has been carried out in accordance with relevant guidance documents to review the noise emissions of the four new units in comparison to the existing four units.

5.03 Predictions have shown that the new like-for-like replacement will see a 4dB improvement in cumulative noise emissions in comparison to that of the currently installed plant items which is a perceptible improvement to noise from this plant area. There are a number of other plant installation in the immediate vicinity such that the noise climate is expected to be largely plant controlled already.

5.04 It has been demonstrated via calculation that the resultant noise levels within the closest spaces to the plant, those of St Ann's House, will satisfy the strictest guideline values for cellular office spaces specified within BS8233 based on the windows being closed. Whilst these guideline values are typically for anonymous noise sources as the new plant would be below these guideline values the plant this can be considered sufficient additional mitigation for the fact the noise climate could be plant controlled. As all the surrounding buildings appear to be served by existing condenser/heat pump plant it is reasonable to expect the office will be served by HVAC plant that will be of a similar character to any break in noise.

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APPENDIX A

GLOSSARY OF TECHNICAL TERMS

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ACOUSTIC TERMINOLOGY

Absorption Classes	The sound absorption of a material is rated from Class A to Class E, where Class A materials provide the highest level of sound absorption.
Ambient Noise Levels	Noise levels measured in the absence of noise requiring control, frequently measured to determine the situation prior to the additional of a new noise source.
dB	Decibel. The logarithmic unit of sound level.
dB(A)	A-weighted decibel. The A-weighting approximates the response of the human ear.
$D_{nT,w}$	Weighted standardized level difference. A single number quantity of the sound level difference between two rooms. $D_{nT,w}$ is typically used to measure the on-site sound insulation performance of a building element such as a wall, floor or ceiling. Measured in accordance with BS EN ISO 16283-1 and weighted in accordance with BS EN ISO 717-1.
$D_{n,e,w}$	The weighted element-normalized level difference. A single number rating of the sound reduction provided by a sound passing through an individual element. $D_{n,e,w}$ is typically used to define the sound insulation provided by ventilators. Measured in accordance with BS EN ISO 10140-2:2010 and rated in accordance with BS EN ISO 717-1.
Flanking	Transmission of sound energy through paths adjacent to the building element being considered. For example, sound may be transmitted around a wall by travelling up into the ceiling space and then down into the adjacent room.
Frequency	Sound can occur over a range of frequencies extending from the very low, such as the rumble of thunder, up to the very high such as the crash of cymbals. Sound is generally described over the frequency range from 63Hz to 4kHz, roughly equal to the range of frequencies on a piano.
Impact Sound	Sound produced by an object impacting directly on a building structure, such as footfall noise or chairs scrapping on a floor.
$L_{Aeq,t}$	The equivalent continuous sound level measured in dBA. This is commonly referred to as the average noise level. 't' is the interval time for the measurement. Typically 't' of 16hrs and 8hrs is used for day and night time ambient noise respectively or 't' is defined by the period of interest in BS4142 assessments.
$L_{A90,t}$	The noise level exceeded for 90% of the measurement period, measured in dBA. This is commonly referred to as the background noise level.
$L'_{nT,w}$	Weighted, standardized impact sound pressure level. A single number rating of the impact sound insulation of a floor/ceiling when impacted on by a standard "tapper" machine. The lower the $L'_{nT,w}$, the better the acoustic performance. Measured in accordance with BBS EN ISO 140-7 and rated in accordance with BS EN ISO 717-2.
NR	Noise Rating. A single number rating which is based on the sound level in the octave bands 31.5Hz – 8kHz inclusive, generally used to assess noise from mechanical services in buildings.
Octave Band	Frequencies are often grouped together into octaves for analysis. Octave bands are labelled by their centre frequency which are: 63Hz, 125Hz, 250Hz, 500Hz, 1kHz, 2kHz and 4kHz.
Reverberation Time (T_{mf})	Reverberation time is used for assessing the acoustic qualities of a space. It is defined as the time it takes for an impulse to decay by 60dB. T_{mf} is the arithmetic average of the reverberation time in the mid frequency bands (500Hz, 1kHz and 2kHz).
R_w	Weighted sound reduction index. A single number rating of the sound insulation performance of a specific building element. R_w is measured in a laboratory. R_w is commonly used by manufacturers to describe the sound insulation performance of building elements such as plasterboard and concrete. Measured in accordance with BS EN ISO 10140-2:2010 and rated in accordance with BS EN ISO 717-1.
Sound Absorption	When sound hits a surface, some of the sound energy is absorbed by the surface material. Sound absorption refers to the ability of a material to absorb sound, rated from 0, complete reflection, to 1, complete absorption.
Sound Insulation	When sound hits a surface, some of the sound energy travels through the material. 'Sound insulation' refers to the ability of a material to prevent the travel of sound.
Structure-borne transmission	Transmission of sound energy as vibrations via the structure of a building.

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APPENDIX B

SITE PLAN
&
MEASUREMENT LOCATION

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St Ann's House
Closest Windows of St Ann's House
MAYO STREET
MAYO STREET
Plant Location
Existing 4 No & location for 4 No like for like replacement units
No 19 King Street

Location of Plant backing onto Mayo Street Alleway

APPENDIX C

PLANNING POLICY AND GUIDANCE

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National Planning Policy Framework and the Noise Policy Statement for England

The Department for Communities and Local Government published the National Planning Policy Framework (NPPF) on 27th March 2012 (as amended on 20th December 2023) and upon its publication, the majority of planning policy statements and guidance notes were withdrawn, including Planning Policy Guidance 24 Planning and Noise, which previously presented the government's overarching planning policy on noise.

Paragraph 180 in Section 15 of the NPPF , entitled Conserving and enhancing the natural environment, states that:

> *"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 soil, air, water or noise pollution or land instability…"*

Paragraph 191 in Section 15 also states that:

> *"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;*
>
> *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…"*

The Department for Environment Food and Rural Affairs published the Noise Policy Statement for England (NPSE) in March 2010. The explanatory note of NPSE defines the following terms used in the NPPF:

> *"NOEL – No Observed Effect Level*
>
> *This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.*
>
> *LOAEL – Lowest Observed Adverse Effect Level*
>
> *This is the level above which adverse effects on health and quality of life can be detected.*
>
> *2.21 Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.*
>
> *SOAEL – Significant Observed Adverse Effect Level*
>
> *This is the level above which significant adverse effects on health and quality of life occur."*

The NPSE does not define any of the above effect levels numerically.

The NPSE presents the Noise Policy Aims as:

> *"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy and sustainable development:*
>
> *avoid significant adverse impacts on health and quality of life;*

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mitigate and minimise adverse impacts on health and quality of life; and

where possible, contribute to the improvement of health and quality of life."

It can be seen that the first two bullet points are similar to Section 11 of the NPPF, with a third aim that seeks to improve health and quality of life. The NPSE later expands on the Noise Policy Aims, stating:

> *2.23 The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided while also taking into account the guiding principles of sustainable development (paragraph 1.8).*
>
> *2.24 The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such adverse effects cannot occur.*
>
> *2.25 This aim* (the third aim)*, seeks where possible, positively to improve health and quality of life through the pro-active management of noise while also taking into account the guiding principles of sustainable development (paragraph 1.8), recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim."*

It is clear that noise described in the NPSE as SOAEL that would lead to significant adverse effects should be avoided, although there is no definition as to what constitutes a significant adverse effect. Similarly, noise should be mitigated where it is high enough to lead to adverse effects, termed the LOAEL, but not so high that it leads to significant adverse effects.

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