



Noise Impact Assessment

Unit 3 The Stables, Manchester

Reference: 50-550-R1-1

Date: February 2022



NOISE IMPACT ASSESSMENT

Unit 3, The Stables
Manchester

Prepared for:

Emporium World UK Ltd

Report Ref: 50-550-R1-1
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EXECUTIVE SUMMARY

BACKGROUND

Site Address	Unit 3, The Stables, Manchester M20 5PA
National Grid Reference	E 385609 N 390432
Proposed Development	Installation of several external air conditioning units located on the rooftop of the site.
Report Objectives	The objectives of this report are to: Identify, measure and assess the potential impact of any proposed sound sources associated with the development upon existing receptors in the immediate vicinity of the Site. The report follows current and relevant British Standards to provide a robust assessment.

ASSESSMENT

Surveys Completed	E3P have been provided with sound power levels for each of the plant items that will be located on the rooftop of the site. Given that no residential receptors lie in the immediate vicinity, a background sound survey has not been completed.
Assessments	A 3D noise model has been constructed to assess potential commercial sound impact associated with the operation of the air-conditioning system upon the closest existing noise sensitive receptors.
Mitigation Requirements	The assessment determined that the predicted noise levels from the new plant items would not result in an adverse impact at the closest noise sensitive receptors.

CONCLUSIONS

This assessment has shown that no adverse impact is predicted at the closest receptors due to the proposed plant items.

As such, sufficient information has been provided in order to consider potential noise impact and found no adverse impact is expected.



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1. INTRODUCTION

1.1. BACKGROUND

E3P were commissioned by Emporium World UK Limited to undertake a Noise Impact Assessment for a planning application for the installation of several new air conditioning units at Unit 3, The Stables in Manchester, to be referred to hereafter as '*the Site*'.

This assessment looks to determine predict the fixed plant sound associated with the proposed development and to assess their impact, if any, upon existing residential receptors and to specify mitigation measures, where required.

1.2. PROPOSED DEVELOPMENT

The client is looking to install a several air condition units on the rooftop of the existing building. The Aircon conditioning units will be located in a recess between two pitched roofs.

The key sources of sound associated with the proposed development is the steady state sound from air conditioning units impacting upon existing receptors.

1.3. LIMITATIONS

Where a noise or vibration survey is required to inform an assessment, E3P will endeavour to ensure that all noise and vibration measurements taken are robust, representative and reliable in order to inform an accurate assessment at the time.

E3P will endeavour to capture all existing and proposed sources of sound and vibration at the time of the surveys and/or assessments. However, should new sources of sound be introduced, existing sources modified/changed, or characteristics of the sound be altered following completion of such, E3P cannot be held accountable for this.

Where mitigation measures are specified in this report, it should be noted that these measures are relative to a specific sound or vibration source, both in terms of the measured sound pressure and vibration level and the character of the sound source. Where either the sound pressure level or the character of the sound varies following completion of the sound survey, E3P cannot be held responsible for any subsequent variations in the proposed mitigation performance, for either absolute levels or frequency content.



2. ASSESSMENT METHODOLOGY

2.1. NATIONAL PLANNING POLICY FRAMEWORK

To prevent unacceptable risks from pollution, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be considered.

The national planning policy framework states that planning policies and decisions should aim to:

- ✿ Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development.
- ✿ Mitigate and reduce to a minimum, other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions.
- ✿ Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established.
- ✿ Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

2.2. NATIONAL PLANNING PRACTICE GUIDANCE

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.

Local planning authorities' plan-making and decision-making should take account of the acoustic environment and in doing so consider:

- ✿ Whether or not a significant adverse effect is occurring or is likely to occur.
- ✿ Whether or not an adverse effect is occurring or is likely to occur.
- ✿ Whether or not a good standard of amenity can be achieved.

In line with the explanatory note of the NPSE, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase, where applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.



The “observed effect levels” are as follows:

-  **Significant observed adverse effect level:** This is the level of noise exposure above which significant adverse effects on health and quality of life occur.
-  **Lowest observed adverse effect level:** This is the level of noise exposure above which adverse effects on health and quality of life can be detected.
-  **No observed effect level:** This is the level of noise exposure below which no effect at all on health or quality of life can be detected.

Table 2.1 summarises the noise exposure hierarchy, based on the likely average response.

TABLE 2.1 NOISE EXPOSURE HIERARCHY

PERCEPTION	EXAMPLES OF OUTCOMES	INCREASING EFFECT LEVEL	ACTION
Not Noticeable	No effect.	No observed effect	No specific measures required
Noticeable and Not Intrusive	Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No observed adverse effect	No specific measures required
Lowest Observed Adverse Effect Level			
Noticeable and Intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television, speaking more loudly, or having to close windows for some of the time because of the noise where there is no alternative ventilation. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed adverse effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Noticeable and Disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion, having to keep windows closed most of the time because of the noise where there is no alternative ventilation. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant observed effect	Avoid
Noticeable and Very Disruptive	Extensive and regular changes in behaviour and/or inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening, loss of appetite, significant/medically definable harm (auditory and non-auditory).	Unacceptable adverse effect	Prevent



The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any situation. These factors include the following:

-  The source and absolute level of the noise together with the time of day it occurs. Some types and level of noise will cause a greater adverse effect at night than if they occurred during the day. The adverse effect can also be greater simply because there is less background noise at night.
-  For non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise can be important.
-  The spectral content of the noise and the general character of the noise. The local topology and topography should also be considered along with the existing and, where appropriate, the planned character of the area.

More specific factors to consider when relevant:

-  Where applicable, the cumulative impacts of more than one source should be considered along with the extent to which the source of noise is intermittent and of limited duration.
-  Consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time. In both cases, a suitable alternative means of ventilation is likely to be necessary.
-  If external amenity spaces are an intrinsic part of the overall design, then the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.

2.3. BRITISH STANDARD BS 8233:2014+A1:2019 – GUIDANCE ON SOUND INSULATION AND NOISE REDUCTION FOR BUILDINGS

2.3.1. NOISE CRITERIA LIMITS

The scope of this standard is the provision of recommendations for the control of noise in and around buildings including residential dwellings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new buildings or refurbished buildings undergoing a change of use, rather than to assess the effect of changes in the external noise climate.

The standard suggests suitable internal noise levels within different types of buildings, including residential dwellings, as shown in Table 2.2.

TABLE 2.2 BS 8233:2014 RECOMMENDED INTERNAL NOISE LEVELS

CRITERION	TYPICAL SITUATION	DESIGN CRITERION, $L_{Aeq,T}$ (dB)
Suitable Resting and Sleeping Conditions	Living Room	35
	Bedroom	30

BS 8233 goes on to recommend noise levels for gardens:



It is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognised that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors might be warranted.

BS 8233 goes on to say:

In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited.

2.4. BS 4142: 2014+A1:2019 'METHODS FOR RATING AND ASSESSING INDUSTRIAL AND COMMERCIAL SOUND'

This standard describes methods for rating and assessing sound of an industrial or commercial nature which includes:

- ✳ Sound from industrial and manufacturing processes.
- ✳ Sound from fixed installations which comprise mechanical and electrical plant and equipment.
- ✳ Sound from the loading and unloading of goods and materials at industrial and / or commercial premises; and
- ✳ Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from processes or premises, such as that from forklift trucks, or that from train or ship movements on or around an industrial or commercial Site.

The procedure detailed in the standard compares the measured or predicted specific noise level from any of the above with the background sound level at a residential dwelling. The measured background sound level at a receptor should be reliable and should not necessarily ascertain a lowest measured background sound level, but rather to quantify what is typical.

The specific noise level also acknowledges the reference time intervals depending upon whether the noise source operates during daytime (1-hour) or night-time (15-minute) periods.

There are several 'penalties' which can be attributed to the specific sound level depending upon the 'acoustic features' of the sound level under investigation as follows:

Tonality

- ✳ +2 dB: where the tonality is just perceptible.
- ✳ +4 dB: where the tonality is clearly perceptible; and
- ✳ +6 dB: where the tonality is highly perceptible.

Impulsivity



-  +3 dB: where the impulsivity is just perceptible.
-  +6 dB: where the impulsivity is clearly perceptible; and
-  +9 dB: where the impulsivity is highly perceptible.

Intermittency

-  +3 dB: where the intermittency is readily distinctive against the acoustic environment.

In addition to the above, there is a penalty for 'other sound characteristics' of +3 dB where a sound exhibits characteristics that are neither tonal nor impulsive, though are readily distinctive against the acoustic environment. BS 4142 goes on to state that the rating level is equal to the specific sound level if there are no such features present or expected to be present.

Assessment of the rating level relative to the background sound level can yield the following commentary:

-  Typically, the greater this difference (between the rating level and the background sound level), the greater the magnitude of 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; and
-  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. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.



3. NOISE IMPACT ASSESSMENT

For the purposes of this assessment, E3P has used noise modelling software, CadnaA 2021 MR1, to determine the impact of noise from the proposed sound sources associated with the development, specifically, the proposed air conditioning units located on the rooftop.

The following noise level data has been provided by the client:

- ✳ X2 Samsung Outdoor Unit (AC052RXADKG/EU) – 62 Lw dB.
- ✳ X3 Samsung Outdoor Unit (AC071RXADKG/EU) – 65 Lw dB; and
- ✳ X2 Samsung Outdoor Unit (AR12TXHZAWKXEU) – 63 Lw dB

The above sound power levels have been input into the noise model as point sources with appropriate directivity applied.

As the plant items are associated with an office space it is thought that the operational periods for the plant are to run during the daytime periods only. The night-time period has not been assessed as it is assumed the office will be closed and the plant items not operational.

The following inputs have been included in the model:

- ✳ Ground elevations have been taken as existing by way of a 2 m grid Digital Terrain Model (DTM) which contains public sector information licensed under the Open Government License v3.0.
- ✳ Existing buildings have been included in the model and assumed to have a structured façade.
- ✳ A reflection order of 2 has been used in all calculations.
- ✳ Noise levels generated using ISO 9613-1 and ISO 9613-2 "*Acoustics – Attenuation of sound during propagation outdoors*" as incorporated into CadnaA software.
- ✳ Approximate fixed plant item locations have been taken from the 'Proposed A/C Rooftop Layout Plan – Drg 2967AC01 Rev – Dated 04/01/2022.
- ✳ The roof of the building where the proposed plant is located has been modelled as a flat roof. In reality the roof is pitched with the plant items located in the recess between the two pitched roofs. A flat roof, as modelled, can be considered worst case with no screening provided by the roof.

Given that the plant items to be installed will be steady state in nature, a BS 4142 assessment has not been undertaken. Instead, consideration to the absolute noise levels is given with the aim to be below internal noise level criteria set out in BS 8233:2014.



3.1. INTERNAL NOISE LEVEL ASSESSMENT

The highest predicted noise level during daytime periods, at the closest noise sensitive receptors are detailed in Table 3.1. Internal noise levels are predicted using a 13 dB reduction for an open window. The internal noise level criterion during the daytime period is 35 dB. The criterion for garden areas is 50 dB as outlined in BS 8233:2014.

TABLE 3.1 PREDICTED INTERNAL NOISE LEVELS AT CLOSEST RECEPTORS

Receptor	Highest Predicted Noise level at façade / garden area (dB)	Highest Predicted Internal Noise level with open window (dB)	Exceedance of Criteria +/- (dB)
Travelodge	33	20	-15
Eastern Receptor	20	7	-28
Eastern Receptor – Gardens	25	-	-25

Figures 1 & 2 are the resultant noise maps for both the Travelodge and Eastern Receptors. It should be noted that the grid height has been set to 10 m when assessing the sound at the Travelodge receptors, this is to allow for a worst-case level at rooms that overlook the top of the Unit 3, The stables roof, with line of site to the plant. Grid heights of 1.5 meters was set when assessing the eastern residential receptors.

In addition to this the pitch roof has been modelled as a flat roof and as such actual levels on site have potential to be lower than those predicted in the above table due to screen effects. Furthermore, noise levels generated by the fixed plant items would still not exceed the more stringent criteria of 30 dB during the night-time period. This is a positive indication of no adverse impact will be caused at the surrounding receptors.

Consideration must also be given to the office spaces situated within the existing building that the air conditioning units are located on. Figure 3 details the external noise levels at the first-floor windows of the offices. As can be seen in Figure 3 the highest external noise levels at the office windows will be 30 dB. This would result in internal noise levels of 17 dB with widows open, this is 18 dB below the criterion of 35 dB set out in BS8233:2014.

Considering the above assessments, no adverse impact is predicted associated with the new plant.



4. CONCLUSION AND RECOMMENDATIONS

E3P were commissioned by Emporium World UK Limited to undertake a Noise Impact Assessment for proposed rooftop air conditioning units at the Unit 3, the Stables in Manchester.

E3P have been provided with sound power levels for each of the plant items that will be located on the rooftop of the site.

A 3D noise model has been constructed to assess potential commercial sound impact associated with the operation of the air-conditioning system.

The assessment determined that the predicted internal noise levels at the closest noise sensitive receptors would fall 15 and 28 dB below the internal noise level criteria set out in BS 8233:2014. Noise levels within the eastern receptor's garden also fall 25 dB below the relevant criteria.

Consideration has also been given to internal noise levels within the office spaces below the air conditioner units in the existing building. Internal noise levels to the worst affected first floor offices would be 18 dB below the relevant criteria.

This is a positive indication that no adverse impact will be caused at the surrounding receptors. Therefore, no mitigation measures are required.

As such, sufficient information has been provided in order to consider potential noise impact and found no adverse impact is expected.

END OF REPORT



APPENDIX I

GLOSSARY OF ACOUSTIC TERMINOLOGY

NOISE

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source. The most widely used weighting mechanism that best corresponds to the response of the human ear is the "A"-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq} , L_{A90} etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective but, as a general guide, a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions. An indication of the range of sound levels commonly found in the environment is given in the following table.

TABLE A1 TYPICAL SOUND PRESSURE LEVELS

SOUND PRESSURE LEVEL	LOCATION/EXAMPLE
0	Threshold of hearing
20–30	Quiet bedroom at night
30–40	Living room during the day
40–50	Typical office
50–60	Inside a car
60–70	Typical high street
70–90	Inside a factory
100–110	Burglar alarm at 1 m away
110–130	Jet aircraft on take off
140	Threshold of pain



ACOUSTIC TERMINOLOGY

TABLE A2 TERMINOLOGY

DESCRIPTOR	EXPLANATION
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2E-05 Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. "A" weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
L_{Aeq, T}	L _{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.
L_{Amax}	L _{Amax} is the maximum A-weighted sound pressure level recorded over the period stated. L _{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L _{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the "fast" sound level meter response.
L₁₀ and L₉₀	If a non-steady noise is to be described, it is necessary to know both its level and the degree of fluctuation. The L _n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L ₁₀ is the level exceeded for 10% of the time and as such can be regarded as the "average maximum level". Similarly, L ₉₀ is the "average minimum level" and is often used to describe the background noise. It is common practice to use the L ₁₀ index to describe traffic noise.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally, as measured outside and away from buildings.
Fast	A time weighting used in the root-mean-square section of a sound level meter with a 125-millisecond time constant.
Slow	A time weighting used in the root-mean-square section of a sound level meter with a 1000-millisecond time constant.



APPENDIX II

FIGURES

Figure 1 - Daytime Grid Noise Map - Calculation at 1.5 m above ground level



Project:
Unit 3, The Stables, Manchester

Project-No:
50-550

Client:
Emporium World UK Ltd

**Daytime Noise Level,
LAeq,16hr (dB)**

...	<= 38
	38 < ... <= 40
	40 < ... <= 43
	43 < ... <= 45
	45 < ... <= 48
	48 < ... <= 50
	50 < ... <= 53
	53 < ... <= 55
	55 < ...

Noise Map Objects

+	Point Source
	Road
	Building
	Calculation Area



Project Engineer: Scott Boughton
Date: 22/02/2022

Figure 2 - Daytime Grid Noise Map - Calculation at 10 m above ground level



Project:
Unit 3, The Stables, Manchester

Project-No:
50-550

Client:
Emporium World UK Ltd

**Daytime Noise Level,
LAeq,16hr (dB)**

...	<= 38
38 < ...	<= 40
40 < ...	<= 43
43 < ...	<= 45
45 < ...	<= 48
48 < ...	<= 50
50 < ...	<= 53
53 < ...	<= 55
55 < ...	

Noise Map Objects

+	Point Source
—	Road
□	Building
□	Calculation Area



Project Engineer: Scott Boughton
Date: 22/02/2022

This topographic map shows a hillside with contour lines indicating elevation. The map is oriented with North at the top. The elevation scale ranges from 390405 to 390450 meters. The map includes a grid of coordinates (Easting: 385585 to 385640; Northing: 390405 to 390450). A large white polygon represents a specific area of interest, likely a field or a cleared area. Within this area, there are several small black crosses (+) and a label '27.2'. To the right of this area, there is a label '29.8'. The map also shows a road or path running horizontally across the middle, and a stream or ditch running vertically on the left side. The background is a greenish-brown color, representing vegetation and terrain. The text 'Geoinformation Group' and 'Getmapping plc, Infoterra Ltd' are visible on the map.

Client:
Emporium World UK Ltd

	$\dots \leq 38$
	$38 < \dots \leq 40$
	$40 < \dots \leq 43$
	$43 < \dots \leq 45$
	$45 < \dots \leq 48$
	$48 < \dots \leq 50$
	$50 < \dots \leq 53$
	$53 < \dots \leq 55$
	$55 < \dots$

- + Point Source
-  Road
-  Building
-  Calculation Area



Project Engineer: Scott Boughton
Date: 22/02/2022