BURO HAPPOLD

UCL Bloomsbury BHP Due Diligence

Noise Impact Assessment

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0048835

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Glossary

Term	Definition
Ambient noise (as defined in BS 4142)	Totally encompassing noise in a given situation at a given time; it is usually composed of noise from many sources, near and far.
Background Noise (as defined in BS 4142)	A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90% of a given time interval, T, measured using time weighting, F, and quoted to the nearest whole number of decibels.
Decibel, dB	Commonly used unit used for the comparison of the powers of levels sound. Abbreviation dB. For sound pressure level (L_p) the reference quantity is $2x10^{-5}$ N/m^2. The sound pressure level existing when microphone measured pressure is $2x10^{-5}$ N/m^2 is 0 dB, the threshold of hearing.
Frequency	Number of cycles per second, measured in hertz (Hz), related to sound pitch.
L_{eq} (& L_{Aeq})- Equivalent continuous noise level of a time-varying noise	Equivalent continuous sound pressure level (A-weighted) over a period of time, T.
L_p - sound pressure level	Sound pressure level, in decibels, of a sound is 20 times the logarithm to the base of 10 of the ratio of the sound pressure to the reference pressure. The reference pressure shall be explicitly stated and is defined by standard.
$L_{90,T}$ ($L_{AF90,T}$)	Sound pressure level exceeded for 90% of the measurement period. Referred to as background noise level.
Statistical noise levels	Noise levels that vary greatly over time are usually expressed using statistical values of the level exceeded for a stated percentage of the time. These are denoted Lx, showing the level that is exceeded x% of the time. L_{A90} is considered to be the (A-weighted) background noise level with unusually loud events being excluded. L_{A10} is usually used for the measurement of traffic noise.
Weightings (as defined in IEC 61672:2003):	A-Weighting: Frequency weighting devised to attempt to take into account the fact that human response to sound is not equally sensitive to all frequencies; it consists of an electronic filter in a sound level meter, which attempts to build in this variability into the indicated noise level reading so that it will correlate, approximately, with human response.). C-Weighting: One of the frequency weightings corresponding to the 100-phon contour and the closest to the linear or un-weighted value.
$L_{Ar,T}$	Rating Noise Level (as defined in BS 4142:2014+A12019), the specific noise level plus any adjustment for the characteristic features of the noise.

1 Introduction

1.1 Overview

Buro Happold has been commissioned by University College London (UCL) to carry out a Noise Impact Assessment to support a Planning Application for the proposed addition of rooftop plant equipment to the Institute of Education (IoE) building, 20 Bedford Way, London, WC1H 0AL.

The development consists of several plant items, most notably an additional 16 Air Source Heat Pumps (ASHP) and 4 compressors, installed across Cores B & C of the IoE at rooftop level.

1.2 Content

This report covers the following elements, those being most relevant to planning:

- Background noise levels captured during the survey carried out by Buro Happold in June 2023 in the vicinity of the proposed site
- Maximum permissible noise impact levels for fixed mechanical plant, based on the Camden Local Planning Authority target compliance and results of the external noise survey
- Results from a 3D computer noise model (CadnaA) incorporating the proposed plant items to assess the likelihood of disturbance at the nearest Noise Sensitive Receptor (NSR).
- Recommendations for mitigation measures when required.

2 Acoustic Design Criteria

2.1 Reference Codes & Standards

This report is based on guidance from the following documents:

- National Planning Policy Framework, 2021
- Noise Policy Statement for England, 2010
- The London Plan *The Spatial development strategy for London consolidated with alterations since 2011*, 2016
- The London Plan, Policy D13 Agent of Change and D14 Noise, 2021
- Camden Planning Guidance – Amenity, 2019
- Camden Local Plan, 2017
- BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound

2.2 English Planning Policies on Noise Impacts

The National Planning Policy Framework (NPPF) is the overarching planning policy document for developments in England. The document contributes to sustainable development, aiming to protect or enhance the natural, built and historic environment, including minimising pollution and waste.

The NPPF document refers to the Noise Policy Statement for England (NPSE) specifically for noise impact. The NPSE provides guidance, which enables decisions to be made regarding the acceptable noise burden to place on society, using the three key phrases:

- No Observed Effect Level (NOEL)
- Lowest Observed Adverse Effect Level (LOAEL)
- Significant Observed Adverse Effect Level (SOAEL).

It is proposed that noise emissions generated by the scheme achieve NOEL to LOAEL upon nearby NSRs.

2.3 The London Plan 2021

2.3.1 Policy D14 - Noise

Provides qualitative methods for the management of noise, stating:

- *"In order to reduce, manage and mitigate noise to improve health and quality of life, residential and other non-aviation development proposals should manage noise by:*
    1. *avoiding significant adverse noise impacts on health and quality of life*
    2. *reflecting the Agent of Change principle as set out in Policy D13 Agent of Change*
    3. *mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on existing noise-generating uses*
    4. *improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity)*
    5. *separating new noise-sensitive development from major noise sources (such as road, rail, air transport and some types of industrial use) through the use of distance, screening or internal layout – in preference to sole reliance on sound insulation*
    6. *where it is not possible to achieve separation of noise-sensitive development and noise sources without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through applying good acoustic design principles*
    7. *promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver.*
- Boroughs, and others with relevant responsibilities, should identify and nominate new Quiet Areas and protect existing Quiet Areas and protecting existing Quiet Areas in line with the procedure in Defra's Noise Action Plan for Agglomerations"

Response to The London Plan

Noise emissions from the proposed scheme are primarily from newly introduced fixed plant installations. The fixed plant noise target are based on Camden borough requirements (refer to the following section).

Calculations have been undertaken to assess the impact of the proposed plant and equipment on existing noise-sensitive receptors. Noise mitigation measures are proposed to meet the local authority's noise target.

2.4 British Standard 4142:2014+A1:2019 – Methods for rating and assessing industrial and commercial sound

BS 4142:2014+A1:2019 provides methods for rating and assessing sound of an industrial and/or commercial nature, which includes sound from industrial and manufacturing processes, fixed services plant, sound generated by the loading/unloading of goods and sound from mobile plant / vehicles associated with industrial / commercial premises (e.g. forklift trucks).

The standard utilises various descriptors to assess complaints, the impact of sound associated with proposed industrial / commercial activities on existing noise-sensitive receptors, or the impact and likely suitability of siting new noise-sensitive receptors in the vicinity of existing industrial / commercial noise sources.

The standard is specifically precluded from being used to determine likely internal sound levels arising from external noise, or from the assessment of various sound sources for which other (more relevant) guidance exists, including music/entertainment noise, person noise and construction noise.

The magnitude of impact is assessed by subtracting the measured background sound level at a location representative of the nearest noise-sensitive receptor, from the 'rating level' (the specific sound source to be introduced into the locality, corrected for acoustically distinguishing characteristics which may make it more subjectively prominent).

Typically, the greater the difference between the background and rating level, the greater the magnitude of impact, although BS 4142 emphasises that this is highly context-specific.

As a guideline, BS 4142 states that:

- *A difference (between the background and rating level) of around +10 dB or more is likely to be indicative of significant adverse impact, depending on context*
- *A difference (between the background and rating level) of around +5 dB or more is likely to be indicative of adverse impact, depending on context*
- *The lower the rating level relative to the background level, the less likely it is that the specific sound will have an adverse impact*
- *Where the rating level does not exceed the background level, this is an indication that the specific sound will have a low impact, depending on context.*

It should be noted that BS 4142:2014+A1:2019 draws a clear distinction between the detailed and flexible assessment methods contained within, and the more limited versions contained in the previous (1997) edition.

Above all, BS 4142:2014+A1:2019 requires qualified engineering consultants and technical planning professionals (e.g. Environmental Health Officers) to use a combination of quantitative assessment techniques and rational qualitative judgements to come to a reasoned conclusion.

2.4.1.1 Definitions

BS 4142 uses several specific terms to define the various levels used in assessments, as follows:

- **Specific sound** – the commercial / industrial noise source under consideration
- **Residual sound** – the sound level at the noise-sensitive receivers in the absence of the specific sound
- **Ambient sound** – the sound level at the noise-sensitive receivers in the presence of the specific sound (i.e. ambient = residual + specific)
- **Background level** - the sound pressure level which is exceeded by the residual sound for 90% of the measurement period
- **Rating level** – the specific sound, corrected for acoustically distinguishing characteristics.

Background level

BS 4142 emphasises that the background level ($L_{A90,T}$) is in fact a range of levels, not one absolute value. Whilst stating that the measurements of background sound should be normally not less than 15 mins, the focus is on obtaining a level for use in assessment that is representative of typical conditions at the noise-sensitive receivers.

An example methodology by which this typical value may be obtained is given in the document. In this example, monitoring of $L_{A90,15mins}$ is undertaken during periods which represent when the specific noise will be operational. After obtaining a sequence of representative contiguous or disaggregated results, it is then proposed that the modal value is representative of the 'typical' background level.

Specific sound

BS 4142 requires that the specific sound ($L_{Aeq,Tr}$) is obtained over a reference period of 1 hour (daytime) and 15 mins (at night). Ideally, measurements would be taken of the ambient sound and residual sound at the assessment location, with these measurements used to accurately calculate the specific sound (ambient – residual = specific).

Where the source (specific sound) is not yet operational, it is permissible to measure the specific sound elsewhere (or to use known manufacturers' or library data) and then model the impact of this against the known background level.

Rating level

Once the specific sound level has been determined, this must be corrected in terms of the need to consider the subjective prominence of the impact of the sound at noise-sensitive receivers, and the extent to which acoustically distinctive characteristics will attract attention.

BS 4142 states that this is normally possible to carry out a subjective assessment of characteristics, based on the following correction guidelines:

- **Tonality:** +2 dB for a 'just perceptible' tone, +4 dB for 'clearly perceptible', and rising to +6 dB for 'highly perceptible' tones
- **Impulsivity (rapidity of change and overall change in level):** +3 dB for 'just perceptible' impulsivity, +6 dB for 'clearly perceptible', rising to +9 dB for 'highly perceptible' impulsivity
- **Intermittency:** if the on/off-time of the specific sound is readily distinctive at the noise-sensitive receivers, +3 dB
- **Other sound characteristics:** (see page 14 or 20 in PDF file of 4142).

It should be noted that where one feature is clearly perceived as dominant, it may be applicable to correct for that feature only. Where multiple features are likely to affect perception and response, each should be added arithmetically.

2.5 Camden Borough Guidelines

Camden Planning Guidance – Amenity (2019) highlights how any development involving External Air extraction/conditioning equipment requires a formal acoustic assessment. It goes on to state that:

"developments proposing plant, ventilation, air extraction or conditioning equipment and flues will need to provide the system's technical specifications to the Council accompanying any acoustic report. 'BS4142 Method for rating Industrial and Commercial Sound' contains guidance and standards which should also be considered within the report."

The Camden Local Plan also asks for BS4142 to be used for cases relating to industrial and commercial noise sources and states that:

*"For such cases, a 'Rating Level' of **10 dB below background** (15 dB if tonal components are present) should be considered as the design criterion)."*

This information is summarised in Figure 2—1.

Industrial and Commercial Noise Sources

A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such cases a 'Rating Level' of 10 dB below background (15dB if tonal components are present) should be considered as the design criterion).

Table C: Noise levels applicable to proposed industrial and commercial developments (including plant and machinery)

Existing Noise sensitive receptor	Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAL (Red)
Dwellings**	Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade)	Day	'Rating level' 10dB* below background	'Rating level' between 9dB below and 5dB above background	'Rating level' greater than 5dB above background
Dwellings**	Outside bedroom window (façade)	Night	'Rating level' 10dB* below background and no events exceeding 57dBL_{Amax}	'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dB L_{Amax}	'Rating level' greater than 5dB above background and/or events exceeding 88dBL_{Amax}

Figure 2—1 Summary of Camden Borough guidance on industrial and commercial noise (Source: Camden Local Plan, Appendix 3)

3 Noise Survey

3.1 Introduction

Buro Happold Engineering conducted external noise surveys on Tuesday 27th and Wednesday 28th June 2023, within the vicinity of the development site.

This survey was undertaken to capture the existing background noise levels at nearby noise-sensitive receptors (NSR). This allows the specification of limiting noise levels for the proposed rooftop plant equipment, to see that the installation will not unduly increase existing noise levels in the vicinity of the site in line with pertinent criteria.

3.2 Site Overview

The site is located at 20 Bedford Way, London, WC1H 0AL. The local sound environment at the site consists primarily of vehicle movements on the local road network and existing plant items at the IoE and neighbouring academic buildings.

Figure 3—1 presents an aerial shot of the site, including the proposed location of new plant items (rooftops of the IoE cores of B & C).

The site is neighboured by the following:

- North – the Royal National Hotel, which is identified as the closest NSR to the site
- East – residential, commercial, and other UCL academic buildings, with Russel Square further afield
- West – residential, commercial, and other UCL academic buildings, with Gordon Square further afield
- South – residential, commercial, and other UCL academic buildings.

Figure 3—1 Site Overview – measurement location & surrounding NSRs (Source: Google Earth)

3.3 Survey Methodology

3.3.1 Attendance

The following Buro Happold staff members visited the site to undertake the noise survey:

- Leonardo Fernandez MEng, Graduate Acoustic Engineer and associate member of the Institute of Acoustics (IOA)
- Rhiannon Hawkins BSc, Graduate Acoustic Engineer and student member of the IOA

3.3.2 Survey Equipment

A list of equipment used during the noise survey is presented in Table 3—1.

3.3.3 Measurement Location

A single measurement location was selected (Google Maps coordinates of (51.5235457, -0.1283269)), which consisted of a 24 hour automated measurement, sampling every 15 minutes, capturing noise data from 10:00 Tuesday 27th June to 11:00 Wednesday 28th June 2023.

This measurement location at rooftop level of the IoE Core B is shown in Figure 3—2.

The values measured on-site are averages of a background noise level descriptor during the relevant measurement period, $L_{A90,15min}$ (dB). This can be described as an A-weighted sound pressure level exceeded for 90% of the measurement period i.e. a level that would be perceived as a constant, background noise level. Typically, largely unaffected by local traffic pass-by or by transient events. More usually attributable to constantly-running building services plant or distant road traffic. What you would hear when there is no local traffic present (or other readily-identifiable noise sources).

Table 3—1 Environmental noise survey equipment

Name	Type	Serial Number
Sound Level Meter	Bruel & Kjaer 2250	2449831
Microphone	Bruel & Kjaer 4189	1837044
Pre-Amplifier	Bruel & Kjaer ZC 0032	02116
Acoustic Calibrator	Bruel & Kjaer 4231	1898067

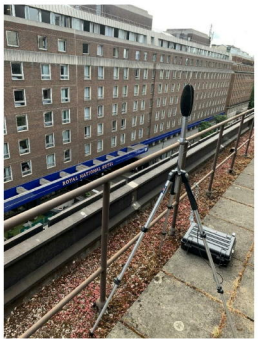


Figure 3—2 Noise measurement location at rooftop level of Core B

3.3.4 Noise Survey Results & Discussion

As previously described, the main objective of the noise survey is to obtain background noise levels representative of the nearest noise-sensitive receivers (NSR).

Data analysis has been performed on the measured background sound levels to determine the typical value required for a BS 4142 assessment.

As can be seen from Figure 3—3, the most frequent background level of $L_{A90,T}$ 55 dB was used to define typical day-time background sound levels at the measurement location.

As for night-time measurements shown in Figure 3—4, the lowest and most frequent background level of $L_{A90,T}$ 46 dB was used to define typical night-time background sound levels at the measurement location.

It was noted that road traffic along Bedford Way dominated the noise climate at the site location, with the ambient noise climate also comprising existing rooftop plant items

These typical background $L_{A90,T}$ noise levels will be used to set plant noise limits for the surrounding NSRs based on the Camden Borough guidance.

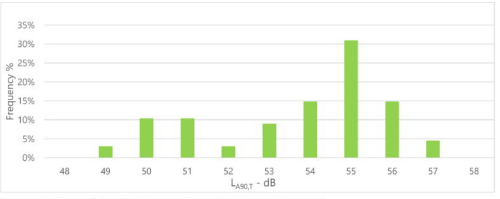


Figure 3—3 Modal analysis of daytime background levels captured during the noise survey

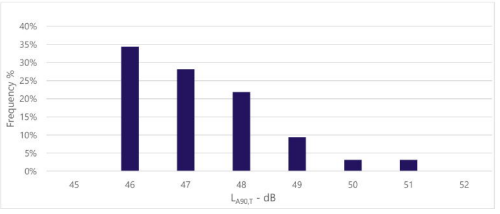


Figure 3—4 Modal analysis of night-time background levels at LT1

3.4 External Plant Noise Limits

For the purposes of this assessment, it is assumed that the plant will operate 24 h.

Based on the analysis above, a summary of the representative background sound levels and associated plant noise limits can be found in Table 3—2.

Plant noise targets are based on achieving a rating level that is 10 dB below the background sound level, which should see that the amenity of local NSRs is suitably protected.

This is in the situation where plant selections do not have acoustically distinguishable features as defined in BS 4142:2014+A1:2019.

Note: these are rating levels in accordance with BS 4142:2014+A1:2019, which requires that penalty corrections are made to the noise source for acoustically distinguishable features. Therefore, if the selections include plant with tonal, impulsive, or intermittent noise features, these targets would reduce accordingly. They are cumulative levels that apply to all plant items operating simultaneously – individual items may need to be attenuated to less than these values such that the cumulative level is achieved.

Table 3—2 Representative background sound levels and associated plant noise target

Period	Representative background $L_{A90,T}$ sound levels	Camden Borough guidance	$L_{Ar,Tr}$ (dB) Rating Level – limiting noise level for fixed plant @ 1 m from NSR façade
Day (07:00-23:00)	55	-10 dB	45
Night (23:00-07:00)	46	-10 dB	36

4 Plant Noise Break-out Assessment

4.1 Plant Proposals

It is understood that 4 no. AWB 250 compressors and 16 no. Air Source Heat Pump (ASHP) fans and are proposed to be installed at rooftop level across Cores B & C of the IoE building.

This corresponds to a ratio of 4 flatbeds (housing 8 fans each) for every 1 compressor, as shown in Figure 4—1.

The proposed location of the compressor and fan units is presented in Figure 4—2 as **orange** and **yellow** rectangles respectively, with the proposed screens highlighted in **blue**.

It is understood that the sound pressure level at 10 metres from the AWB 250 compressor should be assumed to be **54.3 dB**, as shown in Figure 4—3.

No octave band frequency sound pressure or sound power level was available for both the compressor and fan units. As such, octave band sound pressure levels have been used for similar units. The spectra used for this assessment are presented in Table 4—1.

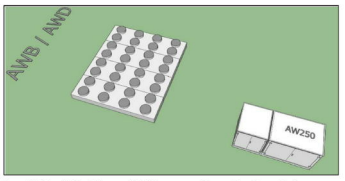


Figure 4—1 Four flatbeds for every AW250 compressor (Source: Pure Renewables)

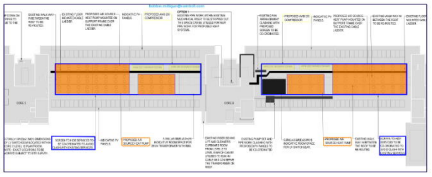


Figure 4—2 Rooftop plan showing the proposed location of screens & plant items (Source: Buro Happold, Drg. No. "0048835-SK-02-03")

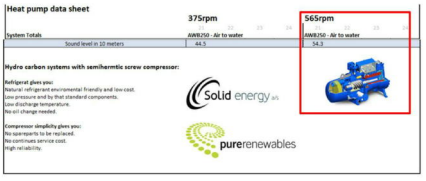


Figure 4—3 Data provided for the AWB 250 Compressor (Source: Solid Energy / Pure Renewables)

Table 4—1 Spectra adopted for noise modelling assessment, based on similar items of equipment

Plant Item	Frequency (Hz)						
	63	125	250	500	1000	2000	4000
ASHP Fan	50	54	59	62	63	63	63
Compressor	79	68	71	77	80	76	71

4.2 Noise Modelling Exercise

To assess the noise propagation of these compressor and fan units towards the surroundings of the IoE, a noise model has been produced using CadnaA v2023 acoustic modelling software. The noise model has been constructed based on detailed Google Earth mapping data and plant equipment datasheets for similar compressor or ASHP units which quote frequency specific noise emission data.

The model predicts and maps the noise impact of the units on nearby noise-sensitive receivers, considering factors such as distance attenuation, natural and barrier attenuation, reflections, and source directivity. The calculated levels will be compared to the plant noise targets set out in Table 3—2.

4.2.1 Methodology

CadnaA® is a three-dimensional noise modelling software package that predicts noise levels based on the appropriate input data e.g. location and orientation of equipment and sound power data. The software package can consider a variety of information about the site including topography, buildings, and potential noise sources.

The proposed compressor units have been included as point sources, denoted as " **+** " within the model, and the fan units have been included as area sources, denoted by **dark blue** rectangles within the model, as shown in Figure 4—4.

The following noise mapping assumptions have been made when producing the noise models for the proposed development:

- The model has been calibrated under the worst-case assumption that four flatbeds (housing 16 fans) generate the same amount of noise as a single compressor, i.e. 54.3 dB at 10 metres.
- Compressor units have been assigned a height of 1.4 metres and fan flatbeds with a height of 3.1 metres.
- Two models have been run, one without any noise mitigation measures and one with the proposed screens have been placed at the locations shown in blue in Figure 4—2. The screens are assumed to be solid/reflective and 3 m in height relative to the local ground level.
- Plant is assumed to be operating at reduced load during the night-time (23:00-07:00) period, corresponding to an approximate 5 dB decrease in sound pressure level at 10 metres for all plant items.
- Buildings around the proposed development were input based on Open Street Map geodata
- A worst-case ground absorption coefficient of 0 has been modelled (assuming hard reflective ground), and building absorption coefficient of 0.01 (assuming reflective facades). These represent worst-case assessment conditions.
- Air temperature and relative humidity have been assumed to be at typical CadnaA input levels of 10°C and 70%. CadnaA software calculates air absorption according to ISO 9613-1:1993

4.2.2 Limitations

The assessment has been based on the results produced through a noise modelling exercise, which provides predictions on the likely future noise levels. Typically, an uncertainty within a range of approximately +/- 3 dB could be expected from computer noise modelling software.

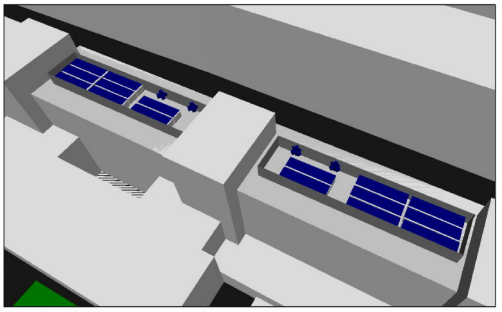


Figure 4—4 Fan flatbeds represented as area sources and compressors represented as point '+' sources

4.2.1 Modelling Results

Figure 4—5 Calculated plant noise impact during the daytime period (07:00-23:00) – NO screens

Figure 4—6 Calculated plant noise impact during the night-time period (23:00-07:00) – NO screens

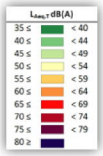


Figure 4—7 Calculated noise impact during the daytime period (07:00-23:00) – inclusion of a 3 metre tall smooth / reflective barrier

Figure 4—8 Calculated noise impact during the night-time period (23:00-07:00) – inclusion of a 3 metre tall smooth / reflective barrier

4.2.2 Noise Modelling Discussion

Figure 4—5 through to Figure 4—8 highlight that the worst-affected NSR is the Royal National Hotel to the north of the site. This is likely because it is of a comparable height to the IoE and the closest of all surrounding NSRs.

Table 4—2 presents the level difference between the plant noise limits and the greatest incident façade noise levels at the Royal National Hotel, **omitting any acoustic screen**. These façade noise levels have been extracted from Figure 4—5 and Figure 4—6.

Table 4—3 presents the level difference between the plant noise limits and the greatest incident façade noise levels at the Royal National Hotel when a **3 m tall solid & reflective barrier surrounding the plant items is included**. These façade noise levels have been extracted from Figure 4—7 and Figure 4—8.

As can be seen in Table 4—2 and Table 4—3, an acoustic barrier is needed to comply with the plant noise limits outlined in Section 3.4.

The recommended properties for these screens are outlined in Section 4.3.1.

4.2.3 Acoustic characteristics

Air source heat pumps typically do not contain acoustic characteristics such as tonality, impulsivity and intermittency. Although the compressors can impulsively turn on, it's not expected to be frequent to the point where a penalty should be applied. Therefore, the 5 dB penalty has not been included in this assessment.

Table 4—2 Predicted incident façade noise levels at the closest NSRs versus to the plant noise limits – NO SCREEN

Period	Highest predicted incident façade noise levels at the closest NSRs (Royal National Hotel)	$L_{Ar,Tr}$ (dB) Rating Level – limiting noise level for fixed plant @ 1 m from NSR façade	Difference
Day (07:00-23:00)	46	45	+1 dB exceedance
Night (23:00-07:00)	41	36	+5 dB exceedance

Table 4—3 Predicted incident façade noise levels at the closest NSRs versus to the plant noise limits – 3 m tall barrier

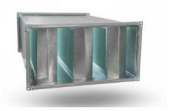
Period	Highest predicted incident façade noise levels at the closest NSRs (Royal National Hotel)	$L_{Ar,Tr}$ (dB) Rating Level – limiting noise level for fixed plant @ 1 m from NSR façade	Difference
Day (07:00-23:00)	46	39	6 dB below noise limits (Compliant)
Night (23:00-07:00)	34	36	2 dB below noise limits (Compliant)

4.3 Outline Plant Mitigation Proposals

In addition to selecting low-noise plant items, other noise mitigation measures may be necessary to meet the proposed noise targets.

These could include, but are not limited to, atmosphere-side attenuators, duct lagging and mass barrier screens, examples of these are shown in Figure 4—9.

The above can be controlled through the use of an appropriately worded Planning Condition.



Rectangular Attenuator

Circular attenuator

Duct lagging

Noise barrier with acoustic lining

Figure 4—9 Outline plant noise mitigation proposals

4.3.1 Noise Barrier Properties

Barriers could be used as effective mitigation means to control noise from plant items as identified in Figure 4—9 and as presented in the results of the modelling exercise in Section 4.2.2.

The acoustic performance of barriers is generally considered to be limited by the factors highlighted in Figure 4—10.

It is key to consider all of the factors when designing an effective barrier.

For a barrier to be effective and limit the noise transmission paths to the factors identified in Figure 4—10, it should be;

- Constructed from a material with a minimum mass per unit area of 15 kg/m^2
- Of sufficient height i.e. tall enough to obstruct line of sight between source and receiver
- Well-sealed to the ground
- Have no gaps.

An example product that should provide sufficient levels of noise attenuation is the Caice® SS300 Acoustic Louvre, shown in Figure 4—11.

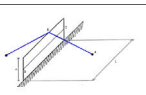
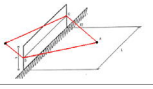
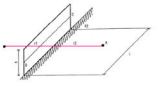
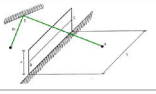
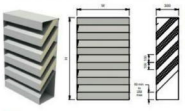
Diffraction over the top of the barrier.	
Diffraction around the sides of the barrier: this occurs where the distance between the source and the screen edge is less than 5 times the height of the barrier.	
Passing through the barrier	
Reflections where materials overhang the barrier in close proximity.	

Figure 4—10 Factors limiting barrier performance

SS300 Acoustic Louvre
Technical Data

caice

Single Bank Acoustic Louvre, Standard Performance Profile, 300mm Deep



Typical weight 40kg/m²

Generally louvres above 50kg will be supplied in modules for assembly on site. Joining brackets and fixings will be provided for assembly.

Installation services, support steelwork, flashings, fixings to the structure and mastic will not be provided unless stated.

Refer to the Acoustic Louvre Schedule and Product Code Definitions for the size and specification of each Acoustic Louvre.

A minimum of 10mm clearance should be allowed between the structure and the Acoustic Louvre sizes shown.

Performance

Acoustic Data	dB in each Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Sound reduction index	6	6	9	13	21	20	16	13
Weighted sound reduction index (Rw)				17				
Static insertion loss	5	6	9	14	20	20	20	20
Regenerated sound power level at 1m/s face velocity	48	41	34	30	25	20	13	12
Regenerated sound power level at 2m/s face velocity	66	58	51	47	40	43	39	39

Figure 4—11 Example breathable noise barrier (Source: Caice)

5 Conclusion

A plant noise break-out assessment has been undertaken for the proposed air source heat pump chillers and compressors at the UCL IoE building at 20 Bedford Way, London, WC1H 0AL.

External noise level criteria are proposed to reduce the risk of an adverse impact upon existing noise-sensitive receptors (associated with building services plant noise).

Where plant items do not have acoustically distinguishable features:

- $L_{Aeq,Tr}$ 45 dB during daytime periods (07:00 – 23:00 hours)
- $L_{Aeq,Tr}$ 36 dB during night-time periods (23:00 – 07:00 hours)

By designing to these Rating level targets, suitable acoustic conditions (LOAEL) can be maintained at the surrounding noise-sensitive developments, particularly the Royal National Hotel to the north of the site.

It is recommended that the proposed plant items on Cores B & C rooftops be enclosed by an **3 m higher solid acoustic barrier** to comply with the plant noise targets set in line with local planning guidance.

Based on the inclusion of the noise mitigation outlined above, noise is not considered to form a barrier to development.

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