

SANDY BROWN

Consultants in Acoustics, Noise & Vibration

23224-R01-B

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Belgrove House

Planning Condition 3 (2020/3881/P) discharge report

London, Manchester, Edinburgh, Birmingham, Belfast, Leeds

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Version	Date	Comments	Author	Reviewer
A	23 Aug 23		Tom Stephenson	Matthew Robinson
B	18 Sep 23	Updated with generator flue	Kane Mitchell	Matthew Robinson

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Summary

Sandy Brown have been commissioned to provide acoustic design input relating to Belgrove House, which is a new build ten storey building with two basement levels, comprising predominantly Cat A office and laboratory space. An event space is proposed to the south of the ground floor, with an auditorium proposed lower ground level. Retail and exhibition space are also proposed to the ground floor.

This report sets out relevant information to discharge Planning Condition 3 (2020/3881/P) relating to external plant noise egress.

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1 Introduction

Sandy Brown have been commissioned to provide acoustic design input relating to Belgrove House, which is a new build ten storey building with two basement levels, comprising predominantly Cat A office and laboratory space. An event space is proposed to the south of the ground floor, with an auditorium proposed lower ground level. Retail and exhibition space are also proposed to the ground floor.

This report sets out relevant information to discharge Planning Condition 3 (2020/3881/P).

2 Planning condition

2.1 Condition 3 – Fixed Mechanical Plant Noise

Planning Condition 3 (2020/3881/P) states the following:

‘Prior to installation of the relevant plant/ machinery/ equipment, details shall be submitted to and approved in writing by the Council, of the external noise level emitted from that plant/machinery/equipment and mitigation measures as appropriate.

The mitigation measures shall ensure that the external noise level emitted from plant, machinery/ equipment will be lower than representative/typical existing background noise level by at least 10dBA, by 15dBA where the source is tonal, as assessed according to BS4142:2014 at the nearest and/or most affected noise sensitive premises, with all machinery operating together at maximum capacity.

The details shall be implemented as approved prior to occupation of the development and thereafter permanently retained and maintained in accordance with the manufacturers' recommendations.’

3 Basis of review

This report is based on the following information:

- Noise and vibration planning report as detailed in Sandy Brown report 19372-R03-C *Belgrove House Noise and vibration planning report*
- Stage 4 plant noise egress assessment as detailed in Sandy Brown report 19372-R06-A *Stage 4 acoustic design report* dated 24 November 2022
- Updated plant information package provided via email on 4 August 2023
- Revised plant noise egress assessment as detailed in Sandy Brown memo 23224-M008-A *Plant noise egress assessment* dated 17 August 2023.

4 Site location

4.1 The site and its surroundings

The site location in relation to its surroundings is shown in Figure 2. An excerpt of the proposed development plan is presented in Figure 1 for context.



Figure 1 Excerpt of the proposed development plan

The site is bounded by Euston Road to the north, Crestfield Street to the east, St Chad's Street to the south and Belgrave Street to the west.

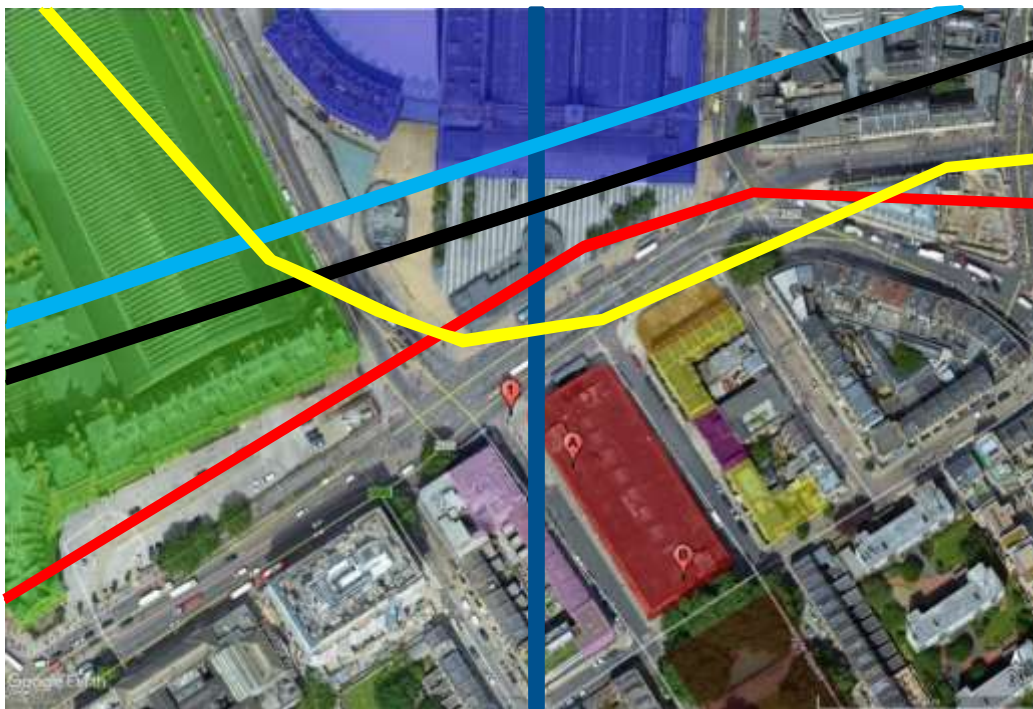


Figure 2 Aerial view of site (courtesy of Google Earth Pro)

The Northern line route is shown highlighted in black in Figure 2, the Victoria line route in light blue and Piccadilly line route in dark blue. In addition, the Metropolitan, Hammersmith & City and Circle lines are highlighted in red. The Thameslink train line is also shown highlighted in yellow.

4.2 Adjacent premises

Approximately 60 m to the north of the site is King's Cross train station, which is highlighted in blue within Figure 2 and highlighted in green is St Pancras International station which is also 60 m to the north.

15 m to the east of the site are a number of retail units which face Euston Road and are highlighted in orange.

Along Crestfield Street, also 15 m to the east, are a number of residential premises which are highlighted in yellow and the King's Cross Methodist church highlighted in purple.

15 m to the south of the site highlighted in brown is Argyle Garden which is a public park and sports area.

15 m to the west of the site are further residential premises which are situated along Belgrove Street and are highlighted in pink.

5 External noise limits

Plant noise egress limits for normally operating plant and emergency plant are provided in Section 10.2 of 19372-R06-A and are summarised below for reference. The limits are based on the results of the environmental noise survey presented in 19372-R03-C *Belgrove House Noise and vibration planning report*, guidance provided in BS 4142, and the requirements of BREEM Pol 05 and the *Camden Local Plan 2017*

5.1 Limits – Normally operating plant

The cumulative external noise egress limits for proposed normally operating plant items are set out in Table 1. The limits apply at 1 m from the worst affected windows and are presented as facade levels.

Table 1 Maximum external noise egress limits for normally operating plant

Location	Maximum sound pressure level at 1 m from noise sensitive premises, L_{Aeq} (dB) ^[1]	
	Daytime (07:00-23:00)	Night-time (23:00-07:00)
Euston Road, Belgrove Street, Crestfield Street	49	46
Argyle Square	43	41

^[1] If the plant noise contains audible tonal elements the limits should be reduced by 5 dB.

In addition to the above, plant noise egress on external terraces and external publicly accessible areas shall not exceed L_{Aeq} 55 dB.

5.2 Limits – Emergency plant

The cumulative external noise egress limits for proposed emergency and plant items are set out in Table 2. These are based on emergency and plant items only operating for short periods and are subject to agreement with LBC. The limits apply at 1 m from the worst affected windows and are presented as facade levels.

Table 2 Maximum external noise egress limits for emergency plant

Location	Maximum sound pressure level at 1 m from noise sensitive premises, L_{Aeq} (dB)	
	Daytime (07:00-23:00)	Night-time (23:00-07:00)
Euston Road, Belgrove Street, Crestfield Street	66	63
Argyle Square	60	58

6 Plant information

The proposed plant item locations and selections are presented below based on the latest information received.

6.1 Basement plant locations

The basement plant arrangement comprises the following items:

- AHUs (Highlighted in green in Figure 3) which intake from FAI plenum that is connected to the atmosphere at the Level 5 terrace.
- AHUs which exhaust into the basement plant room and passively exhaust via two louvres (Highlighted in purple in Figure 3) terminating onto Belgrove St.
- 1 x smoke extract fan (Highlighted in red in Figure 3) exhausting to a plenum which is connected to the atmosphere at the Level 5 terrace. This is an emergency plant item.
- A generator (highlighted in blue in Figure 3) is also proposed to the basement plant room. It has been confirmed that the proposed generator will not only provide power during emergency scenarios but will also provide back-up power during power outages to allow the building to maintain normal operation. For this reason, the generator is considered to be a normally operating item of plant, rather than an emergency operating item of plant.

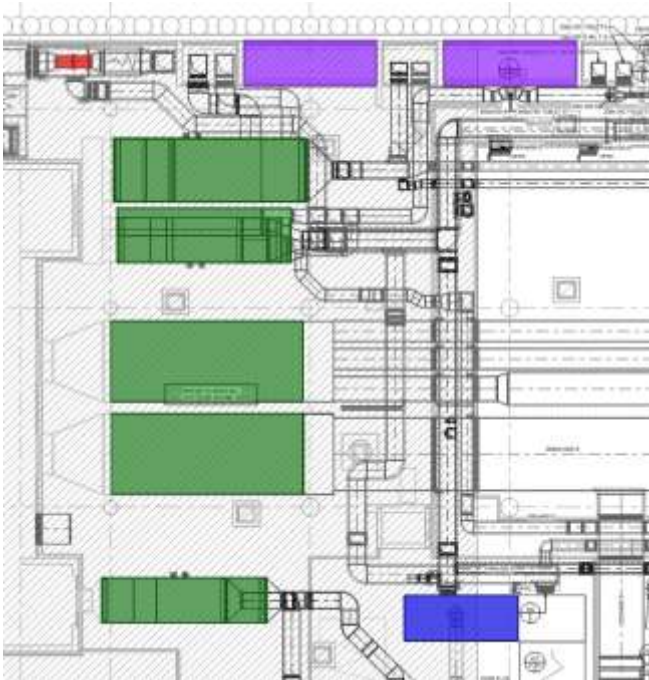


Figure 3 Basement level - Noise transfer to exterior of building via louvres

6.2 Level 00 plant locations

The location of the L00 smoke extract fan is shown in red in Figure 4, which connects to the atmosphere at the Crestfield Street facade. This is an emergency plant item.

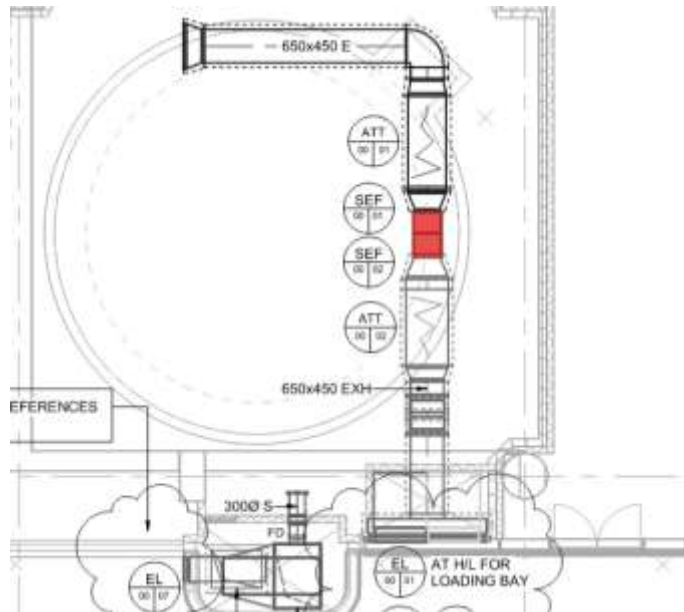


Figure 4 Level 00 smoke extract fan

6.3 Level 10 plant locations

The locations of the L10 plant items remain unchanged from the previous assessment and are shown in Figure 5 with:

- 1 x air handling unit highlighted in green
- Strobic fans highlighted in yellow
- 1 x smoke extract fan highlighted in purple. This is an emergency plant item.

The location of the generator flue is shown in Figure 6 in red.

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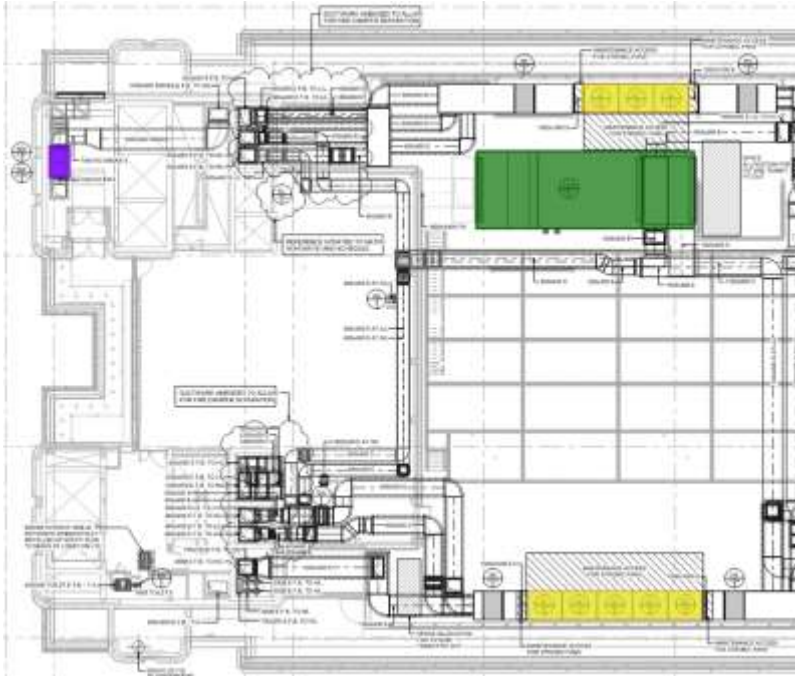


Figure 5 L10 plant – AHU, strobic fans and smoke extract fan

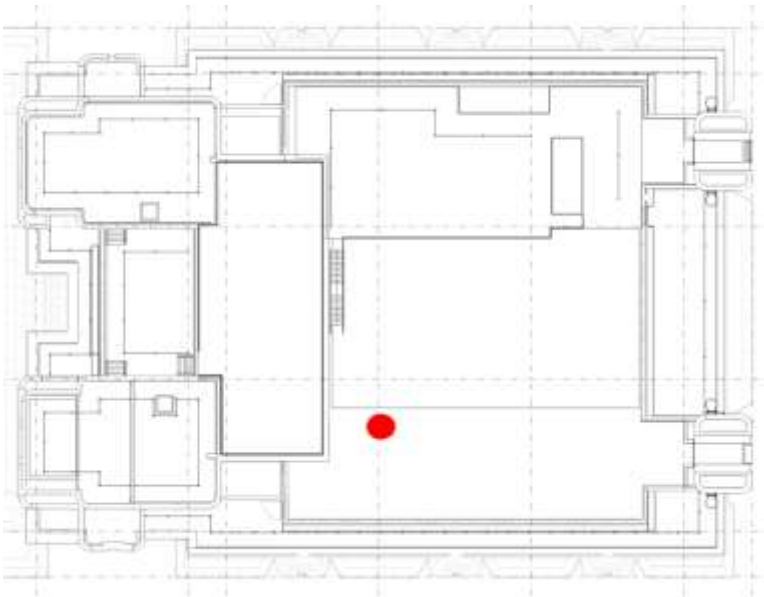


Figure 6 L10 plant – Generator flue location

6.4 Rooftop plant items

It is understood that the following items are proposed to the roof:

- 4 x air source heat pumps
- 1 x air handling unit
- 1 x smoke extract fan. This is an emergency plant item.

6.5 Acoustic data for normally operating proposed plant items

The received noise data for the proposed AHUs is provided in Table 3.

Table 3 AHU sound power data

Item	Sound power level, L_w (dB)							
	Octave-band centre frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
AHUs 01-04 Intake	95	92	102	97	97	95	90	86
AHU 05 Intake	85	82	92	87	87	85	80	76
AHU 05 Exhaust	85	82	92	87	87	85	80	76
AHU 06 Intake	85	85	97	91	91	88	85	78
AHU 06 Exhaust	88	87	94	91	91	94	85	84
AHU 07 Intake	88	85	95	90	90	88	83	79
AHU 07 Exhaust	87	84	94	89	89	87	82	78
AHU 08 Intake	82	84	87	84	84	83	76	74
AHU 08 Exhaust	84	86	84	84	86	81	75	69
AHU 09 Intake	85	84	91	88	88	91	82	81
AHU 09 Exhaust	84	83	90	87	87	90	81	80
AHU 11 Intake	80	77	87	82	82	80	75	71
AHU 11 Exhaust	79	78	85	82	82	85	76	75

The insertion losses for the AHU attenuators are set out in the received datasheets and presented in Table 4. Regenerated noise via the attenuators will need to be suitably controlled such that the plant noise egress criteria are not exceeded.

Table 4 AHU in-duct attenuator insertion losses

Item	Attenuator insertion loss, D_i (dB)							
	Octave-band centre frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
AHU inlet attenuator	8	13	27	39	45	45	35	24
AHU outlet attenuator	8	13	27	39	45	45	35	24

The received noise data for the strobic fans operating with attenuators is provided in Table 5.

Table 5 Strobic fan sound power data (with attenuators)

Item	Sound power level, L_w (dB)							
	Octave-band centre frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
2x strobic fans with attenuation, Corrected outlet sound power levels (L10 to the north of AHU10)	92	95	91	86	84	82	84	79
4x strobic fans with attenuation, Corrected outlet sound power levels (L10 to the south of the ASHPs)	95	98	94	89	87	85	87	82

The received sound power data for the proposed ASHPs is provided in Table 6.

Table 6 ASHPs sound power data

Item	Sound power level, L_w (dB)							
	Octave-band centre frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
ASHPs	89	89	89	88	88	86	74	70

Noise data has been provided for the generator inlet, outlet and casing breakout noise.

The sound pressure data received for the generator is provided in Table 7.

Table 7 Generator noise data

Generator noise source	Sound pressure level at 1 m, L_{eq} (dB)							
	Octave-band centre frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
Inlet	86	76	58	51	46	45	40	38
Outlet	86	76	58	51	46	45	40	38

Noise data is not available for the generator flue, and so a noise limit of L_{Aeq} 63 dB at 1 m from the termination has been set. This noise limit assumes the same spectrum as per the generator outlet.

6.6 Acoustic data for emergency proposed plant items

The received sound power data for the emergency smoke extract fan is provided in Table 8.

Table 8 SEF sound power data

Item	Sound power level, L_w (dB)							
	Octave-band centre frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
SEF-B1-03, SEF-B1-04 inlet	107	102	101	99	92	91	87	84
SEF-00-01, SEF-00-02 inlet	95	90	94	93	92	91	87	84
SEF 10-01, SEF 10-02, SEF-RF-01, SEF-RF-02 inlet	91	93	89	92	93	92	89	87
All SEF outlets	94	93	89	90	91	92	88	86

7 Assessment

A 3D environmental noise model has been created using CadnaA by Datakustik to assess noise egress from the proposed items of plant. This model considers screening from surrounding buildings, reflections, and distance attenuation. A screenshot from this model is provided in Figure 7.



Figure 7 Screenshot of 3D environmental noise model

7.1 Normally operating plant items

Based on the acoustic noise data and proposed attenuation for the normally operating items of plant including the generator, the highest predicted levels of plant noise egress are set out below:

- Along Crestfield Street – L_{Aeq} 46 dB
- Along Belgrove Street – L_{Aeq} 46 dB
- South of St Chads Street – L_{Aeq} 41 dB.

The above predicted levels of plant noise egress comply with the daytime (07:00-23:00) and night-time (23:00-07:00) normally operating plant noise egress criteria as per Table 1.

The assessment does not consider any attenuation/mitigation from the plant deck screening, and so this is not relied on from an acoustic perspective.

7.2 Emergency plant items

Based on the acoustic noise data for the emergency operating items of plant, the highest predicted levels of plant noise egress are set out below:

- Along Crestfield Street – L_{Aeq} 62 dB
- Along Belgrove Street – L_{Aeq} 57 dB
- South of St Chads Street – L_{Aeq} 57 dB.

The above predicted levels of plant noise egress comply with the daytime (07:00-23:00) and night-time (23:00-07:00) emergency plant noise egress criteria as per Table 2.

7.3 Attention catching characteristics

Regarding intermittency, the specific sound level of each plant item is predicted to be at least 10 dB below the representative background sound level and as such, any intermittency is not expected to be readily distinctive against the residual acoustic environment. Therefore, no corrections for intermittency are considered to be appropriate.

Regarding tonality, only octave band noise data has been provided so it is difficult to accurately assess any tonal characteristics. The available data provided does not indicate that any highly perceptible tones are likely and as the specific sound level for each plant item is at least 10 dB below the representative background sound level, tonal characteristics are not expected to be highly perceptible at the receptor. As such no corrections for tonality are considered to be appropriate.

Appendix A

Glossary of acoustic terminology

General terms

Airborne sound	Sound propagating through the air.
Density	Mass per unit volume, expressed in kilograms per cubic metre (kg/m^3).
Frequency	The number of cycles per second. The unit of frequency is the Hertz (Hz). Frequency gives a sound its distinctive tone.
Frequency band	A continuous range of frequencies between stated upper and lower limits (see also 'Octave band' and 'One-third octave band').
Sound pressure level	A logarithmic measure of the effective sound pressure of a sound relative to a reference value, measured in decibels, dB. Sound pressure levels are dependent on the conditions under which they are measured.
Sound power level	A logarithmic measure of the sound power in comparison to specified reference level, measured in decibels, dB. Unlike sound pressure, sound power is not room or distance dependent.
Spectrum	The composition of a particular sound in terms of separate frequency bands.
Acoustic parameters	
'A' weighting	Frequency weighting based on the frequency response of the human ear which has been found to correlate well with the subjective response to sound.
Decibel (dB)	A logarithmic unit used for many acoustic values to indicate the level with respect to a reference level
Hz	Hertz (Hz) is the unit of frequency (see also 'Frequency')
$L_{A90,T}$	The A-weighted sound pressure level exceeded 90% of the measurement period (T) over which a noise is measured (ie, the quietest 10% of the period). When not weighted it is denoted $L_{90,T}$. This parameter is generally considered to be representative of a constant noise source, or background noise level.
$L_{Aeq,T}$	Equivalent A-weighted sound pressure level of a steady noise that has the same acoustic energy as a fluctuating noise over the measurement period (T). When not weighted it is denoted $L_{eq,T}$.

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$L_{Amax,T}$	The highest A-weighted sound pressure level measured in the period (T) with either fast (L_{AFmax}) or slow (L_{ASmax}) time weightings. When not weighted it is denoted L_{Fmax} or L_{ASmax} .
Octave band	A frequency band in which the upper limit of the band is twice the frequency of the lower limit.
One-third octave band	A frequency band in which the upper limit of the band is the cube root of two times the lower limit of the band or more simply one third of an octave band.