2 BRITANNIA STREET, LONDON WC1X 9JE

BS4142 NOISE ASSESSMENT

29 November 2016

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Revision	Description	Issued by	Issue date
-	First Issue	Damien Hesnan	06/12/16
1	Revised Plant Location	Damien Hesnan	20/05/17

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1.0 INTRODUCTION

Aran Acoustics has been appointed to carry out a noise impact assessment for the proposed installation of an external condenser unit at 2 Britannia Street, London.

A noise survey and assessment has been requested by the Local Planning Authority to ensure that noise levels from the external condenser unit does not cause undue disturbance to nearby noise sensitive locations.

The purpose of this assessment is to determine the existing noise levels at the nearest noise sensitive location and establish the maximum permissible noise levels from proposed units.

Such to establish suitable plant noise levels an assessment has been carried out to BS 4142: 2014 '*Method for rating and assessing industrial and commercial sound*'. This assessment has been benchmarked against an environmental noise survey carried out on 29 November 2016.

This report therefore describes the noise survey and its results. Figure 4.1 contains a graphical representation of the noise measurements taken on site. Section 5.0 provides the maximum permissible noise levels for the proposed plant. Section 6.0 provides an assessment of plant noise levels.

2.0 SITE DESCRIPTION

The site is located at the junction of Britannia Street and Kings Cross Road in the London borough of Camden. The site is currently been developed for residential use. Proposals are to install an external air condenser unit on the fourth floor roof terrace of the building.

The nearest noise sensitive receptors to the proposed location of the air condenser unit is residential rooms at the rear of the adjacent building at 165 - 167 Kings Cross Road, top floor residential flats at 4 Britannia Street and Derby Lodge directly opposite the site.

The predominant noise sources in the area is road traffic on Kings Cross Road and Britannia Street to a lesser extent.

It was noted during the site visit that plant from a nearby building to the west of the site was both visible and audible within the courtyard area to the rear of 165 - 167 Kings Cross Road.

Figure 2.1 below shows a location map and aerial photo of the site and surrounding area.

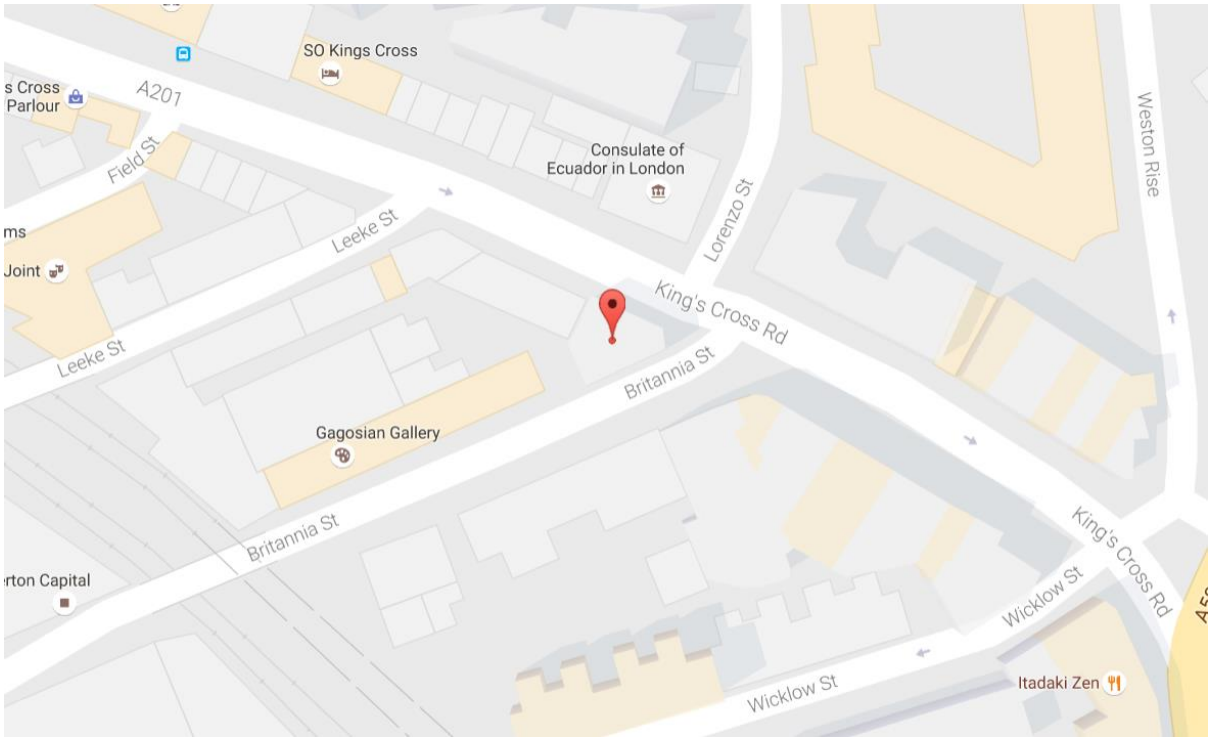


Figure 2.1 – Location map and aerial photo of the site

3.0 ENVIRONMENTAL NOISE SURVEY

A 24-hour environmental noise survey was carried out between Tuesday 29 and Wednesday 30 November 2016. A single noise monitor was placed on site and located at roof top level overlooking the rear courtyard.

The microphone was situated next to the boundary wall of the adjacent residential building at 165 – 167 Kings Cross Road. At this location, the microphone was considered to measure noise levels representative of the nearest noise sensitive receptor to the proposed location of the condenser unit with a direct line of sight.

Figure 3.1 below provides a site photo of the microphone position.

Figure 3.1 - Site photos indicating measurement position

3.1 Measurement Equipment

The following measurement equipment was used, which complies with the performance specifications for a Class 1 device in accordance with BS EN 61672-1, BS EN 61260 and BS EN 60942.

Name	Serial Number	Last Calibrated	Calibration Due
Norsonic Precision Sound Analyser Type 140	1403701	Oct 2016	Oct 2018
Norsonic Type 1209 Pre-amplifier	13278	Oct 2016	Oct 2018
Norsonic Type 1225 Microphone	106867	Oct 2016	Oct 2018
Norsonic Sound Calibrator Type 1251	32994	Oct 2016	Oct 2017

Table 3.1 – Measurement equipment used on site

The meter was calibrated before and after testing - no deviations were found. The meter was set to measure consecutive 'A' weighted 15-minute samples. This time period is in line with BS 4142 requirements.

3.2 Weather Conditions

The weather was mainly fine and dry for the duration of the survey. Wind speed remained below 5 m/s. The temperature varied between approximately 11 and 16 ^{o}C. The weather conditions were seen as suitable for the measurement of environmental noise in accordance with BS 7445-1:2003 '*Description and measurement of environmental noise'*.

4.0 SURVEY RESULTS

The noise levels measured during the 24-hour survey period are shown in Figure 4.1 below. The full set of acoustic data measured on site is available upon request.

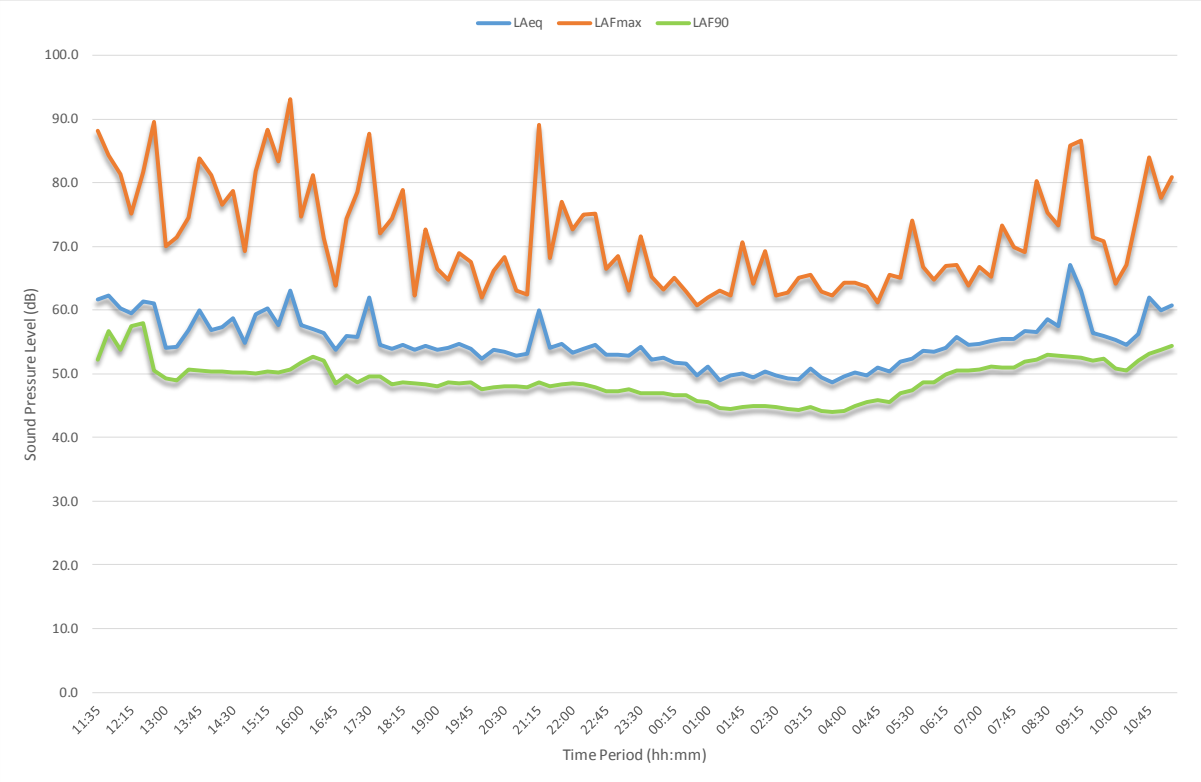


Figure 4.1 - Noise levels measured on site

The table below provides a summary of the noise levels measured on site at the fixed microphone position during the survey period including the representative background; L_{A90}.

Noise Descriptor	Daytime 07:00 – 23:00 hours	Night time 23:00 – 07:00 hours
Average Noise Level, L_{Aeq}	58.2	51.7
Representative Background, L_{A90}	48.5	47.0

Table 4.1 - Summary of measured noise levels

5.0 BS4142 ASSESSMENT CRITERIA

BS 4142:2014 describes a method of determining the level of noise of an industrial nature, together with the procedures for assessing whether the noise in question is likely to give rise to complaints from persons living in the vicinity. As such, an assessment to BS 4142 is typically called for within planning conditions.

The likelihood of complaints in response to a specific noise depends on various factors. BS 4142 assesses the likelihood of complaints by considering the margin by which the noise in question exceeds the background noise level. BS 4142 states that:

a) Typically, the greater this difference, the greater the magnitude of the impact.
b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
d) 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 or a significant 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, depending on the context.

This standard also allows for an appropriate correction for the acoustic features present in the noise using a number of methods. A correction should be applied if one or more of the following features (see the list below), are present within the noise sources in question.

- The noise is of a tonal nature, i.e. it contains a distinguishable, discreet, continuous note such as whine, hiss, screech, hum;
- The noise is impulsive, i.e. it contains distinct impulses such as bangs, clicks, clatters, or thumps;
- The noise contains other characteristics that are neither tonal nor impulsive but is irregular enough to attract attention.

5.1 Target Plant Noise Levels

It is understood that the air condenser unit will operate intermittently throughout the day and night time periods therefore Aran Acoustics propose that noise levels from plant should not exceed -10 dB below the background noise level when measured at the nearest noise sensitive location. This target has been imposed upon similar developments and is seen as a suitable design target where complaints are deemed unlikely.

It is considered that fans associated with typical air condenser units produce a broadband noise with no tonal features. These types of units are also inverter driven, meaning that the unit will gradually increase or decrease its operating capacity depending on the level of duty required. This gives a positive indication that the noise produced is not immediate or distinguishable which may attract attention therefore no correction is applied to the results.

Based on the lowest measured background noise level during the proposed operating period and the suggested design targets including any tolerance or correction factors, the following table shows the maximum permissible noise level from the condenser unit when measured at the window of the nearest residential receptor.

Representative Background, L_{A90}	Tolerance Factor	Correction Factor	Max Noise Level at Residential
47 dBA	-10 dB	-0 dB	**37 dBA**

Table 5.1 - Plant Noise Level Target

Based upon the measurement results in Section 4.0 and noise level criteria provided within this section, it can be seen that noise levels from the proposed external condenser unit should not exceed 37 dBA when measured at the nearest noise sensitive receptor.

Note that noise levels have been rounded to the nearest whole number for assessment purposes in accordance with BS4142:2014.

6.0 PLANT NOISE LEVEL ASSESSMENT

The external condenser unit is to be located on the 4th floor terrace of the building as indicated on the site plans in Appendix A. Proposal include an enclosure to be placed over the unit.

Based on manufacturers data, the unit produces a sound pressure level of 53 dBA when measured at 1m. The following table provided the manufacturers sound pressure level data for the unit. Manufacturers technical data sheets are contained in Appendix B.

	Octave Band Centre Frequency, Hz, dB							
Description	**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1.0 K Hz**	**2.0 K Hz**	**4.0 K Hz**	**dBA**
Daikin Condenser RXYSQ-P68V1	61.5	55	54	52	48	42	35	**53**

Table 6.1 - Octave Band Data for typical Condenser Unit

Using the noise level data in Table 6.1, further calculations were carried out to determine the noise levels from the unit at the nearest noise sensitive receptors.

At distance, noise levels from the unit can be considered a point source and sound will decay at a rate of 6dB per doubling of distance.

The following table provides the calculated noise level from the unit of plant at each noise sensitive receptor. Calculation sheets are provided in Appendix C.

The external wall directly opposite at 4 Britannia St contains glazing which it is understood provides light to a staircore and lift lobby. We have included a noise break-in calculation to this area within our assessment, indicated as *4 Britannia St (Internal)* in the Table 5.1.

Noise Sensitive Receptor	Calculated Noise Level at Receptor (dBA)	Target Noise Level (dBA)	Level Difference (dB)
165 – 167 Kings Cross Road (External)	36	37	**-1**
4 Britannia St (External)	26	37	**-11**
4 Britannia St (Internal)	22	30	**-8**
Derby Lodge (External)	29	37	**-8**

Table 5.1 - Plant Noise Level Target

Note our calculations include a barrier correction where appropriate and assumes the enclosure will provide a 50% reduction in open area therefore a 3 dB reduction in noise levels. The enclosure should be of solid construction with a minimum mass of 4 kg/m^3.

Calculations show that the noise level from the condenser unit including attenuation losses meet with the target ratings at each noise sensitive receptor therefore no further mitigation is required at this stage.

7.0 SUMMARY AND CONCLUSION

A noise survey was carried out at the proposed location of an air condenser unit at 2 Britannia Street, London 29 November 2016.

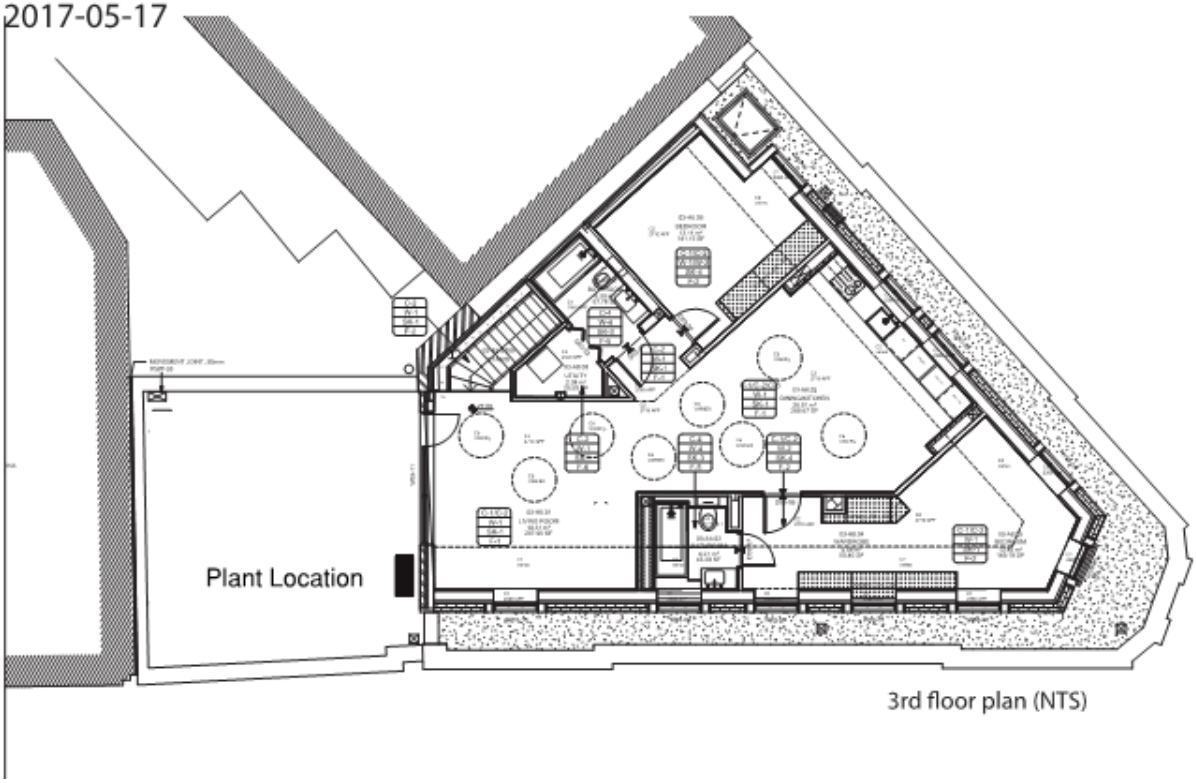
From this survey the minimum representative background noise level at the nearest sensitive property was found to be 47 dB L_{A90} during the proposed operational hours.

Using guidance in BS 4142, noise levels from the proposed external plant associated with the development should not exceed -10 dBA below the background noise level at the window of the nearest residential dwelling.

Based on manufacturer's noise level data for the proposed plant, calculations show that noise levels at the nearest noise sensitive receptors will not exceed the maximum permissible noise level target of 37 dBA therefore complaints are deemed unlikely.

APPENDIX A – SITE LAYOUT DRAWINGS

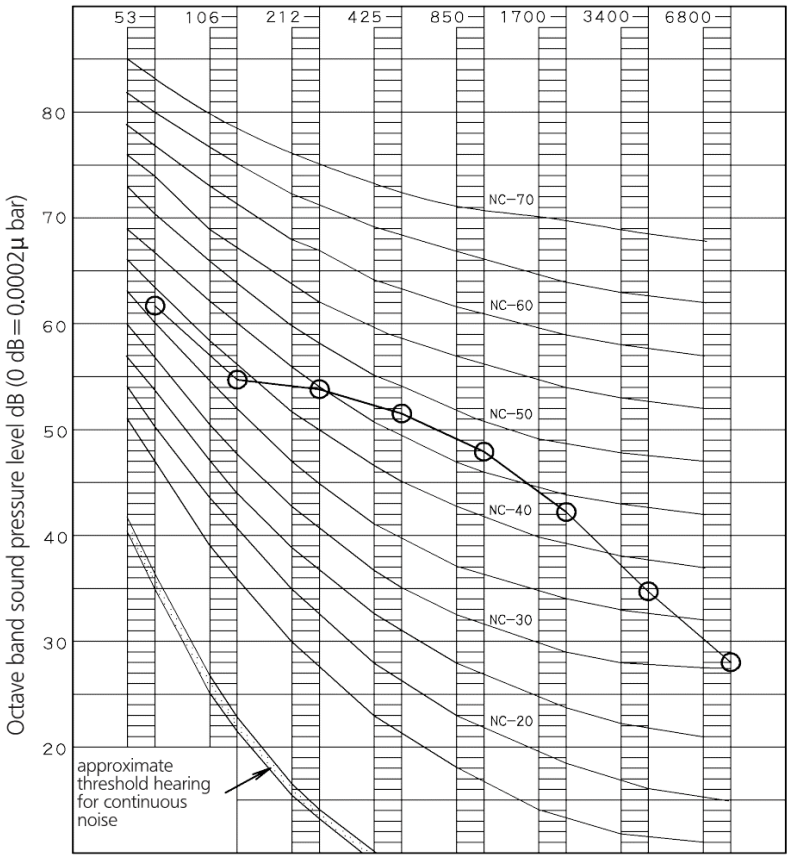
AC unit on Flat 8 terrace - Alt option 02
Issued for discussion
2017-05-17



3rd floor plan (NTS)

APPENDIX B – TECHNICAL DATA SHEETS

RXYSQ6P8V1B - Cooling

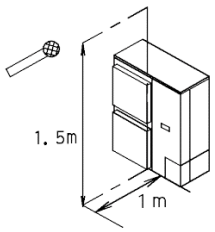


NOTES

1 Overall (dB)

Scale A	53.0
Scale B	64.5

(B,G,N is already rectified)



2 Operating conditions:
Power source 220-240V 50Hz/220V 60Hz
Cooling:
Return air temperature: 27°CDB, 19.0 CWB
Outdoor temperature: 35°CDB, 24°CWB

3 Measuring place: Measure in anechoic room

4 The operating sound is measured in anechoic chamber, if it is measured under the actual installation conditions, it is normally over the set value due to enviromental noise and sound reflection.

5 Location of microphone:

4D052716J

APPENDIX C – PLANT NOISE CALCULATION SHEETS

2 Britannia Street London

Plant Noise Calculation

Barrier Attenuation

$A_b = 10 \log_{10} (3 + G \ \delta / \lambda)$ dB

Distance Attenuation

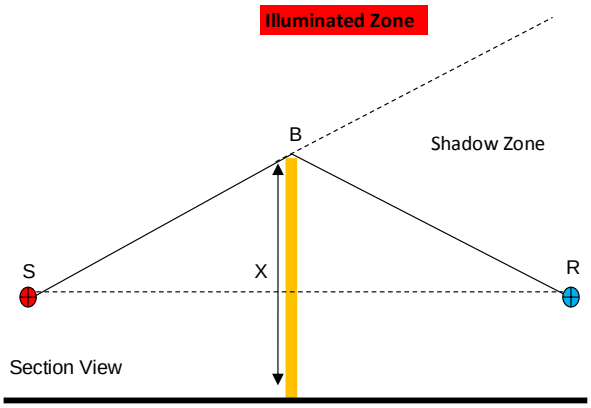
$A_d = 20 \log_{10} (D + \delta)$ dB

Geometry of Field

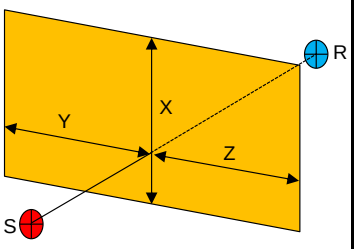
S: Source Noise

B: Barrier

R: Receiver



Dimensions	Path 1	Path 2	Path 2
Distance between Source and Receiver	6.9	7.9	14.8
Distance between Source and Barrier	3.6	5.9	1.8
Barrier Dimensions X, Y, Z	0.5	1.8	0.5
Source Dimension	0.7	0	0.7
Reciever Height	1.5	1.8	1.5
Radiation Factor (Q)	2	2	2
Path Difference δ	-0.108	0.066	-0.028
Use this Source	TRUE	TRUE	TRUE



Frequency (Hz)	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dBA
Condenser Unit (Lp)	61.5	55	54	52	48	42	35	28	53
Barrier Attenuation	-3	-1	0	0	0	0	0	0	-
Distance Attenuation	-17	-17	-17	-17	-17	-17	-17	-17	-
Q Factor	3	3	3	3	3	3	3	3	-
Enclosure Attenuation	-3	-3	-3	-3	-3	-3	-3	-3	
Noise Level at 165 - 167 Kings Cross Rd	41.5	37.0	37.4	34.9	31.4	25.4	18.4	11.4	36
Condenser Unit (Lp)	61.5	55	54	52	48	42	35	28	53
Barrier Attenuation	-5	-6	-7	-8	-10	-13	-15	-18	-
Distance Attenuation	-18	-18	-18	-18	-18	-18	-18	-18	-
Q Factor	3	3	3	3	3	3	3	3	-
Enclosure Attenuation	-3	-3	-3	-3	-3	-3	-3	-3	
Noise Level at 4 Britannia St	38.0	31.0	29.0	25.0	19.6	11.2	1.5	-8.3	26
Condenser Unit (Lp)	61.5	55	54	52	48	42	35	28	53
Barrier Attenuation	-4	-4	-3	-1	0	0	0	0	-
Distance Attenuation	-23	-23	-23	-23	-23	-23	-23	-23	-
Q Factor	3	3	3	3	3	3	3	3	-
Enclosure Attenuation	-3	-3	-3	-3	-3	-3	-3	-3	
Noise Level at 1 - 24 Britannia St	33.7	27.5	27.3	26.9	24.6	18.6	11.6	4.6	29

Combined Noise Level at Receiver	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	#VALUE!

Minimum Mass of Barrier ≥	4 kg/m³

Z:\Projects\Residential Projects\150112 - Britannia St, London\Plant Calcs\[BS8233 Facade Calc - Britannia St.xlsm]Staircore

4 Britannia St: Staircore — Room Ref:

BS8233 Facade Noise Break In Calculation			125	250	500	1000	2000	4000	dBA
External Noise Level - L_{eq}			55.0	54.0	51.5	48.0	42.0	35.0	53.0
Safety Tolerance	0 dB		0.0	0.0	0.0	0.0	0.0	0.0	
Correction Factors									
Distance Correction L2 = L1 - 10*log(D1/D2)	-15 dB		-14.8	-14.8	-14.8	-14.8	-14.8	-14.8	
Barrier Correction Ab = 10 log10 (D + d) dB			0.0	0.0	0.0	0.0	0.0	0.0	
Angle of View Correction Av = 10 log(θ/180)	180		0.0	0.0	0.0	0.0	0.0	0.0	
Noise Level at Façade			40.2	39.2	36.7	33.2	27.2	20.2	38.2
Calculation of environmental noise break-in to residential rooms									
L2 = L1 - R + 10*log(S/A) + 3dB (Freefield version)									
Room Volume =	19.4 m3								
Reverberation Time =	1.2 s		1.2	1.2	1.2	1.2	1.2	1.2	
10*log(S/A)			5.8	5.8	5.8	5.8	5.8	5.8	
FAÇADE Elements									
Total Façade Area 1	9.9 m2								
Glazing Area, Sg - Façade 1	3.8 m2								
4mm Glass / 12mm Air Cavity / 4mm Glass		SRI	23	18	26	38	44	38	
		Sg/Sf	-27	-22	-30	-42	-48	-42	
Predicted noise level in building from glazing 1			21.8	25.8	15.3	-0.2	-12.2	-13.2	18.7
Solid Area, Sw - Façade 1	6.1 m2								
Timber Clad Panel		SRI	14	31	40	43	50	49	
		Sw/Sf	-16	-33	-42	-45	-52	-51	
Predicted noise level through solid façade 1			32.8	14.8	3.3	-3.2	-16.2	-22.2	17.2
Roof/Floor Area, Sc - Façade 1	0.0 m2								
No Roof		SRI	0	0	0	0	0	0	
		Sc/Sf	0	0	0	0	0	0	
Predicted noise level through solid façade 3 / Roof			0.0	0.0	0.0	0.0	0.0	0.0	0.0
Trickle Vent(s) - Façade 1	1 Vent								
No Trickle Vent		Dne	0	0	0	0	0	0	
		Ao/S	0	0	0	0	0	0	
Predicted noise level through trickle vents ` Lff-Dne+10log(A0/A)+K			0.0	0.0	0.0	0.0	0.0	0.0	0.0
Combined Internal Noise Level			**33.2**	**26.2**	**16.2**	**8.7**	**7.8**	**7.8**	**22**
Target Internal Noise Level (dBA)									30
									Pass