LSHTM PHASE 3D SOCIAL SPACES

PLANT NOISE EMISSIONS ASSESSMENT

Acoustics Report A1965 R02

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1 Introduction

Ion Acoustics is appointed by the London School of Hygiene and Tropical Medicine (LSHTM) to advise on acoustics relating to refurbishment and remodelling of the social spaces on the lower ground floor of their Keppel Street building. This is phase 3D of a current schedule of remodelling and refurbishment works. As part of the work, new building services plant are to be provided including a kitchen extract fan on the roof and two new condensers for the cold room and freezer. The noise of these is likely to need to be assessed as part of planning requirements. This report is provided to accompany the planning submission and sets noise limits to be achieved by the new plant and assesses the noise of the proposed plant.

2 Proposed Works and Site Layout

The proposed works for which planning permission is sought relate to a refurbishment of the existing lower ground floor dining rooms and kitchen, including extending these within the basement. The works also involve remodelling the south-west corner lightwell (former courtyard) to introduce a new social stair between ground and lower ground. These works make no fundamental difference to the exterior of the building and the uses remain essentially as currently.

Some of the existing air handling plant will be reused, but there is a requirement to introduce a new kitchen extract fan and two condenser units.

Figure 1 shows the location of the scheme, the new plant and the closest noise-sensitive receptors (residential locations) in plant view. Figure 2 shows the plant locations identified on a 3D aerial view.

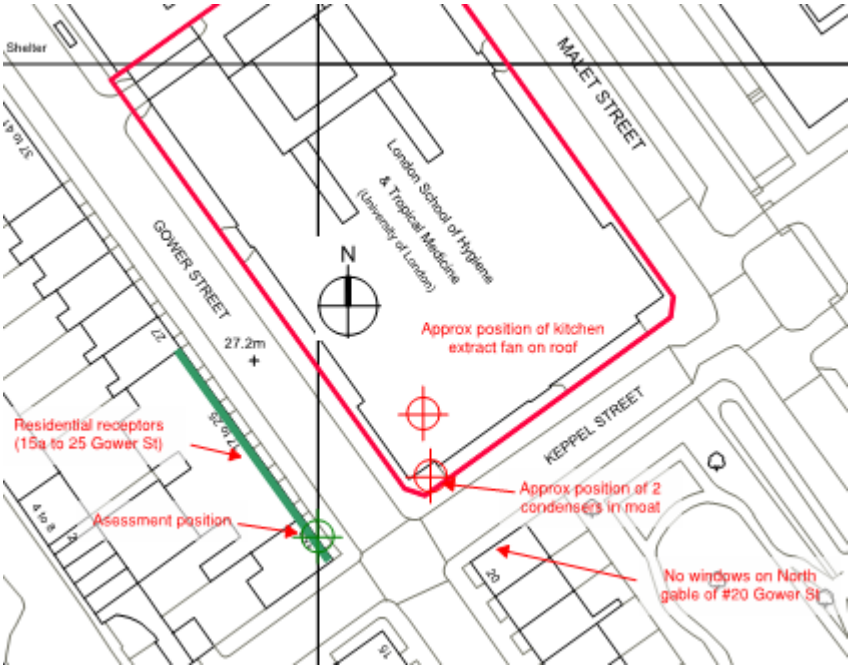

Figure 1 – Site Location Plan and New Plant Proposals

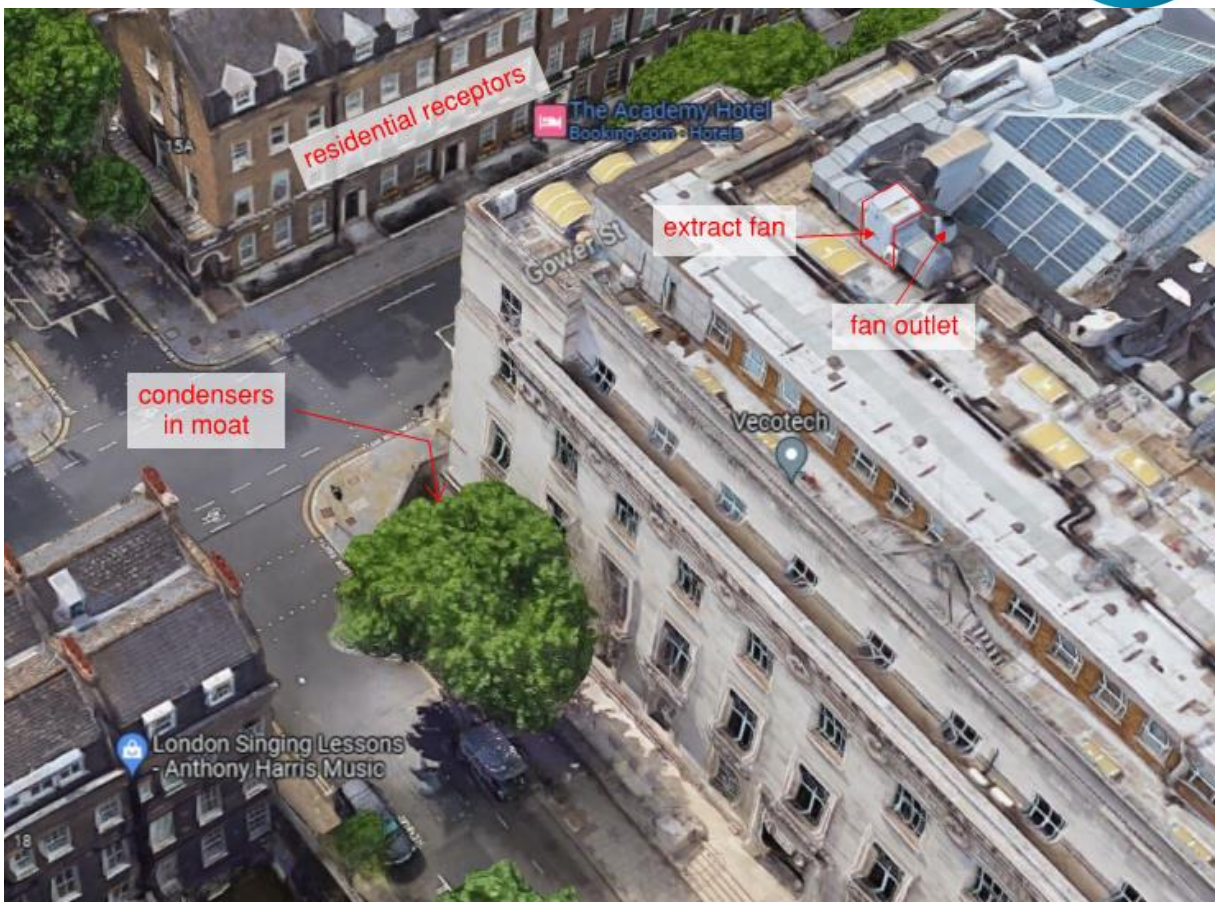

Figure 2: Location of Roof and Moat Plant (google maps image view from SE)

2.1 Noise Sensitive Receptors

The site is a mixed area with some residential, but mainly educational buildings nearby, including an extensive block of buildings for the University of London to the north-east beyond Malet Street.

The nearest noise-sensitive receptors are hotels on the south-western side of Gower Street. Other residential locations at Bonham Carter House (student residences) to the north and at 20 Keppel Street to the south were identified in a previous noise assessment for the Phase 2B project but these are further from the Phase 3D works and these will not be affected by the plant.

3 Planning Conditions and Noise Surveys

From our experience of similar projects at LSHTM, Camden Council would, if they impose a plant condition, be expected to implement a standard plant condition. For example a recent noise condition for a previous scheme 2B was imposed as below:

3.1 Noise Limit for Phase 2B (Application 2019/3391/P)

The planning application for the phase 2B works which included the new plant was consented with a noise limit as follows:

Noise levels at a point 1 metre external to sensitive facades shall be at least 5dB(A) less than the existing background measurement (LA90), expressed in dB(A) when all plant/equipment (or any part of it) is in operation unless the plant/equipment hereby permitted will have a noise that has a distinguishable, discrete continuous note (whine, hiss, screech, hum) and/or if there

are distinct impulses (bangs, clicks, clatters, thumps), then the noise levels from that piece of plant/equipment at any sensitive façade shall be at least 10dB(A) below the LA90, expressed in dB(A).

Reason: To safeguard the amenities of the adjoining premises and the area generally in accordance with the requirements of policies A1 and A4 of the London Borough of Camden Local Plan 2017.

A noise report was prepared by Gillieron Scott Acoustic Design to accompany that planning application. This included the results of a noise survey carried out in 2019 to determine existing noise levels. The results of the noise survey were used to calibrate a noise model which was then used to provide results from other locations.

The results of the exercise are shown in Table 4 of the report which is labelled as "Summary of lowest background noise levels at nearby facades". There is some confusion over this as the preceding sentence describes this as "typical" (rather than the lowest) and the earlier data is also labelled as typical. Furthermore, the results derived from the model for the Gower Street façade are higher than the measured results. This may be because they have assumed a lower receptor position but it may also be due to adjustments made in fitting the noise model to all three positions. It would seem preferable to use the measured results however. The background data is shown below together with their modelled data. The measured data is assumed to represent typical values as required by BS 4142, but we would not typically use modelled L_{A90} values.

Table 1 – Gillieron Scott 2019 survey results and modelled predictions

	Typical Background Noise Level dB L_{A90}	
	Daytime (07.00-23.00)	**Night-time (23.00 – 07.00)**
Gower Street Façade Measured	53	49
Gower Street Façade (Modelled)	56	51
Bonham Carter House (Modelled)	56	54
Keppel Street (Modelled)	50	46

3.2 2021 Noise Survey

A more recent survey was carried out by Ion Acoustics in connection with a project to refurbish and remodel ground floor meeting rooms at LSHTM. The survey and results are described in Ion Acoustics Report A1726 R03 dated 23rd November 2021. A measurement was made of noise on the Gower Street façade at 1st floor level from the LSHTM building. This location is arguably more representative than that from the Gillerion report and is more recent, so is used for this current 3D scheme. The results of the survey are reported below together with the derived plant limit set 5dB below the measured typical background noise values.

It is assumed the new chillers installed as part of the Phase 2B works were operating at this time although since the measurement location was low down on the building any noise from these would have been well shielded and not significant. So the noise from those units would not need to be considered cumulatively. Road traffic noise dominated in this location.

Table 2 Measured Values and Noise Limits Gower Street Facade

Period	Typical Background Noise Level dB L_{A90}	Derived Plant Noise Limit dB L_{Ar}
Daytime (07.00-23.00)	56	51
Evening (19.00-23.00)	52	47
Night-time (23.00 – 07.00)	41	36

The limits apply to the cumulative level of all new Phase 3D plant and are set in terms of the BS 4142 rating level and therefore could include penalties for tonality impulsivity or intermittency as appropriate.

It is noted that the background values during the day are broadly similar to the Gillieron Scott values but the night-time values are much lower than the those modelled by Gillieron Scott. It is possible that their results which were measured on the roof tops or otherwise high up Gower Street façade were influenced by plant noise, some of which may have been removed following the installation of the new chillers. Therefore, using the later Ion Acoustics survey results is more appropriate and conservative.

4 Noise Levels for Phase 3D Social Spaces Plant

4.1 Proposed Plant

The proposed new plant comprises the following:

Roof-mounted Kitchen Extract Fan: VES TLine 120 TLL10/43-3
This will simply replace an existing fan in the same location and using the same ductwork and the same existing atmosphere-side attenuator. In principle this is a like for like replacement, but as the noise levels generated are not known, we have prepared a new assessment based on the proposed fan. The location is shown in Figure 2 on the roof. This fan would operate during the day and evening potentially, but not overnight.

Moat: External Lower Ground Cool Room and Freezer Condenser: WILH-1A2 and 1A3
These two small condenser units will be located at lower ground level in the existing moat. Each unit has a noise level of 36dBA at 10m.

All of the plant will be fully visually shielded from the residential receptors by virtue of the roof height/parapet effect for the kitchen extract and the location in the moat for the condensers. The condensers are assessed by assuming shielding, although we have included for increased reflections from within the moat.

4.2 Plant Noise Levels

Manufacturer's noise data has been provided by TBandA and CRH for the fan and condensers respectively. Noise emissions calculations have been prepared for a nominal worst affected window of the hotel on Gower Street. The full calculation is given in Appendix B. The noise levels predicted are:

Kitchen extract fan duct outlet:	11dBA
Kitchen extract fan casing breakout:	26.6dBA
Condensers (both units operating):	31.6dBA

The overall day and evening level would therefore be 32.8dBA from all the plant. The extract fan would not need to run at night, and the only plant which may from time to time need to run at hight are the freezer or chiller condensers if required to maintain temperatures. The night noise level is therefore 31.6dBA. These units are not expected to exhibit any of the characteristics set out in the previous Camden planning permission and therefore no correction is required. The margin of compliance with the noise limits is given in Table 3.

Table 3 Measured Values and Noise Limits Gower Street Facade

Period	Plant Noise Limit dB	Plant noise level	Margin of compliance
Daytime (07.00-23.00)	51	32.8	18.2 dB
Evening (19.00-23.00)	47	32.8	14.2 dB
Night-time (23.00 – 07.00)	36	31.6	4.4 dB

Therefore, the noise limits are met comfortably with the proposed plant.

It is further noted that the hotel and residences on 15a to 25 Gower Street are exposed to high noise level from road noise on Gower Street and all have secondary glazing and windows do no need to be opened for ventilation, which provides higher levels of acoustic protection such that it is not in fact necessary to reduce noise levels so low to protect their amenity.

Therefore, the proposed new plant does not have any significant noise impact and would be acceptable in terms of residential amenity and compliance with Camden and national guidance.

5 Summary

This report sets out a plant noise assessment for new plant proposed for the Phase 3D works at the London School of Hygiene and Tropical Medicine for the lower ground floor social spaces. In particular, there is a small amount of new plant being provided as part of the scheme, and it is likely that the local authority, London Borough of Camden, may require a noise assessment for that plant.

An assessment has been made in line with previous planning requirements for the same building. Background noise levels have been taken from a baseline noise survey carried out by Ion Acoustics in 2020 representing the closest sensitive receptors, a hotel on Gower Street. These have been used to determine plant noise limits.

The new plant, a replacement kitchen extract fan and two small condenser units, have been assessed and calculations of their noise levels made to the sensitive receptors. This finds that the noise levels would be within the likely noise limits during day evening and night. It also finds that the noise levels predicted would be very low compared to road noise levels affecting the housing and would not be significant within the hotel.

The proposed plant scheme is therefore acceptable in terms of potential planning requirements and in respect of protecting amenity at the nearest residential receptors.

Appendix A - **Glossary of Acoustic Terms**

Decibel dB Unit used to describe quantify sound pressure levels or noise levels. 0 dB is the approximate threshold of hearing and 120 – 140 dB is the threshold of pain. A decibel is a logarithmic quantity and for sound pressure is calculated relative to a reference sound pressure level of 20 µPa. A change of 1 dB is just detectable under carefully controlled listening conditions.

A weighted decibel dB(A) The dB(A) unit used to describe a sound pressure level with the frequency spectrum weighted to account for the sensitivity of human hearing at different frequencies. Human hearing is less sensitive at low and high frequencies and most sensitive at speech frequencies, typically 500 Hz to 2kHz. The dB(A) weighting better describes the subjective effect. A change of 3 dB(A) is typically the minimum noticeable difference for noises with a similar character. A change of 10 dB(A) is equivalent to a subjective doubling or halving of loudness. A-weighted noise levels are denoted by a suffix 'A' as in L_{Aeq}, L_{Amax} etc.

Hertz, Hz Unit used to describe frequency of noise equivalent to the number of cycles per second. Human hearing is normally taken to extend from 20 Hz to 20,000 Hz but with reduced sensitivity at lower and higher frequencies (see dB(A) above). The 'Noise Spectrum' is the distribution of the noise across different frequency bands.

L_{eq}– This is a quasi-average noise level which includes all the sound energy during the measurement period averaged out across the period. It is typically used to describe the ambient noise level. The A weighted value is the L_{Aeq}.

L_{90} – This is the level exceeded for 90% of the measurement period and indicates the steady underlying background noise level. The A weighted Level is the L_{A90}.

L_{01} – This is the level exceeded for 1% of the measurement time. This is used to indicate more typical maxima. The L_{max} is the highest level during a measurement period, but can often be a very short-term single event (and is not always representative of the typical maxima.

NR - The Noise Rating, NR, is used to describe steady noise levels such as mechanical services noise. A family of curves is defined in octave frequency bands and the NR rating for a particular noise is the lowest NR curve which is entirely above the spectrum of the noise under consideration.

24/05/23				Octave Band Centre Frequency, Hz								
LSHTM 3D Social Spaces: Plant noise				63	125	250	500	1000	2000	4000	dBA	
Noise to hotel on Gower St												
kitchen extract fan exhaust				24.6	22.6	13.6	9.6	-15.4	-19.4	-23.4	11.0	
kitchen extract fan breakout											26.6	
condensers (x2)											31.6	
day level (all plant)											32.8	
day/evening limit											47.0	
margin of compliance											14.2	
night level (condensers only)											31.6	
night limit											36.0	
margin of compliance											4.4	
Kitchen Extract Fan - VES Tline 120 TLL710/43-3												
duct SWL				77.0	80.0	84.0	83.0	79.0	74.0	70.0		
breakout	SPI at 1m										60.0	
horiz distnace	27	m										
vertical distance	12	m										
slant distance	29.55	m										
Extract outlet SWL				77.0	80.0	84.0	83.0	79.0	74.0	70.0		
mitred bend, 500mm				0.0	0.0	6.0	8.0	4.0	3.0	3.0		
generic attenuator, 600mm, 45% free area				2.0	4.0	8.0	10.0	10.0	10.0	10.0		
mitred bend, 1000mm				1.0	6.0	8.0	4.0	3.0	3.0	3.0		
end reflection, 1000mm, 1000mm				4.0	1.0	0.0	0.0	0.0	0.0	0.0		
			Lw	70.0	69.0	62.0	61.0	62.0	58.0	54.0		
Atmosphere		distance	29.5m	40.4	40.4	40.4	40.4	40.4	40.4	40.4		
	directivity : 90°,90°, 1000mm, 1000mm			2.0	1.0	-1.0	-4.0	-30.0	-30.0	-30.0		
			Lp	31.6	29.6	20.6	16.6	-8.4	-12.4	-16.4	18.0	dB(A)
shielding from lightwell	-10			21.6	19.6	10.6	6.6	-18.4	-22.4	-26.4	8.0	dB(A)
reflections from facad	3			24.6	22.6	13.6	9.6	-15.4	-19.4	-23.4	11.0	dB(A)
kitchen extract fan casing breakout												
Lp rec = Lpr ref - 20 log (d/dref) - shielding + reflections												
Lp ref	60.0		60	dBA								
d			29.55	m								
dref			1	m								
20 log r			-29.41	dB								
DI			3	dB								
shielding			-10	dB								
façade reflections			3	dB								
Lp at hotel windows (condensers)			26.59	dBA								
Condensers:												
chiller	WILH-1A2		36	dBA								
freezer	WILH-1A3		36	dBA								
total			39	dBA								
Lp rec = Lpr ref - 20 log (d/dref) - shielding + reflections												
d			21	m								
dref			10	m								
20 log r			-6.444	dB								
DI			6	dB								
shielding			-10	dB								
façade reflections			3	dB								
Lp at hotel windows (condensers)			31.56	dBA								