

Technical note

To: Beverley Harrison, Danny Hine (BAM Construction)

From: Thomas Goose (GL Hearn Acoustics)

Subject: Camden & Islington MHU inpatient facility - emergency generator noise

Reference: GH/006037-01 M07

Date: 10 August 2021

Introduction

This memo discusses external plant noise associated with the emergency generator proposed near the Highgate Wing, for the Camden & Islington MHU inpatient facility. The generator is required to ensure that critical healthcare services remain running in the case of any loss to the mains power supply.

Guidance

British Standard 4142 'Methods for rating and assessing industrial and commercial sound' (BS 4142) describes a method for assessing noise from plant, including measuring representative background noise levels and determining a rating level for the plant noise. The following relations are made between the two values:

"NOTE 1 More than one assessment might be appropriate.

- 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.*

NOTE 2 Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.

Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following.

- 1) *The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.*

Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.

Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.

- 2) *The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound, to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it.*

NOTE 3 Consideration ought to be given to evidence on human response to sound and, in particular, industrial and/or commercial sound where it is available...

- 3) *The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:*
 - i) *facade insulation treatment;*
 - ii) *ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and*
 - iii) *acoustic screening."*

Further guidance specific to emergency plant and generators is included in Health Technical Memorandum 08-01: 'Acoustics' (HTM 08-01):

- "2.30 *An increase in internal and external noise levels of up to 10 dB(A) over the noise criteria is normally considered acceptable, provided regular testing only takes place during the daytime on a weekday."*
- "2.47 *Noise from healthcare premises can affect properties outside the site. This should be considered when stipulating environmental noise criteria for the project. These external criteria should be agreed with the local authority and should include any differences allowed for emergency equipment."*
- "2.49 *A relaxation of acoustic criteria for emergency situations and sporadic events (for example standby generators and helicopter flights) can be considered. This is subject to agreement by the local authority or other relevant body."*

Design and mitigation

Through the design process, and with the advice of GL Hearn Acoustics, BAM Construction have taken the following steps to reduce noise emissions from the proposed generator design, including liaising with specialist supplier Shenton Group.

- **Attenuation** and additional ducting of noisy parts is included in the proposals in the form of attenuators and exhaust gas silencers. Further attenuation is not expected to be effective.
- An acoustic **enclosure** is included in the proposals. It is understood that incorporating a larger enclosure would not be practical because of access requirements for emergency vehicles and parking necessary for staff.
- **Screening** to ground-floor flats will be provided by the existing boundary to the south of the site. Additional barriers are not considered to be feasible as they would need to fully screen the flats
- **Repositioning** the plant has been considered but no other positions are practical because of access requirements for emergency vehicles
- As the generator has inlets on each side, **rotating** it will not provide an acoustic benefit.
- The **selection** of alternative generator options has been considered, but we understand that no available models providing sufficient power in the space available are quieter than the option proposed.

In an e-mail of 30th June 2021, Shenton Group confirmed the following noise emission details for their proposed generator system including acoustic attenuators and a noise-reducing enclosure:

- 51 dB(A) from the attenuated inlets and outlets combined, measured at 10 metres under free-field conditions
- Approximately 64 dB(A) casing noise breakout from the primary chamber of the first exhaust gas silencer, measured at 1 metre from the silencer body mounted on the container roof, 3.25 metres high which is a small noise source and is not expected to commonly take place
- No more than 60 dB(A) from sources excluding casing noise breakout from the primary chamber of the first exhaust gas silencer, measured at 1 metre distance, 1.2 metres above ground level, at 90° to and out of air streams

A fuel tank and brick transformer building are also included which, on average, are not anticipated to generate significant noise levels relative to the generator.

The nearest noise-sensitive properties are understood to be flats on Lulot Gardens, approximately 10 metres to the south. As the hospital site includes audible existing plant, it is reasonable to assume that the character of noise from proposed plant will not be substantially different from the baseline context. Therefore, no penalty from BS 4142 will be applicable and the rating level ($L_{A,r,T,r}$) is equal to the specific sound level ($L_{Aeq,T}$).

Existing noise levels

Noise levels were measured at a position considered to be representative of the nearest noise-sensitive properties between 12:00 on Thursday 29 July and 14:00 on Tuesday 3 August 2021 at the position shown in Figure 1, approximately 1.5 metres above local ground level.

Figure 1: Noise survey measurement position



Information on survey equipment and calibration is available on request. A summary of the measured noise levels is provided in the Appendix to this technical note.

Expected noise levels

Based on the information provided by Shenton Group, expected noise levels at the position of the 'worst case' noise sensitive receptor during emergency use are summarised in Table 1.

Table 1: Expected plant noise egress levels at nearby noise-sensitive properties

Time Period		Existing measured noise levels <i>(expected plant noise egress levels relative to measurement)</i>		
		Representative background, dB L _{A90,T} *	Average ambient, dB L _{Aeq,T}	Maximum ambient, dB L _{Aeq,T} *
Weekday (Mon - Fri)	Daytime (07:00 – 23:00)	42 (+9)	50 (+1)	56 (-5)
	Night-time (23:00 – 07:00)	37 (+14)	43 (+8)	51 (+0)

Time Period		Existing measured noise levels (<i>expected plant noise egress levels relative to measurement</i>)		
		Representative background, dB L _{A90,T} *	Average ambient, dB L _{Aeq,T}	Maximum ambient, dB L _{Aeq,T} *
Weekend (Sat - Sun)	Daytime (07:00 – 23:00)	40 (+11)	46 (+5)	50 (+1)
	Night-time (23:00 – 07:00)	37 (+14)	42 (+9)	53 (-2)
*For the representative background noise level and maximum ambient noise level, T = 1 hour for daytime and 15 minutes for night-time in accordance with the recommendations of BS 4142.				

Expected frequency of occurrence

According to facilities management at Camden & Islington, in the last 18 months, there have been two incidents when the existing generators activated to provide emergency power. For each incident, the generators operated for less than 30 minutes (including the rundown time for the generators).

The maintenance regime is understood to be a recommendation of 2 services a year, and a 10-minute operational test once a week or month. The maintenance and tests will take place during weekday daytime hours only.

Assessment

Although noise criteria have been agreed for plant associated with the main MHU inpatient facility under normal usage, specific noise criteria for the emergency generator at the Highgate Wing have not been specified by the local planning authority for this generator.

Following the guidance documents BS 4142 for typical plant, an excess of 14 dB over the background noise level is likely to be an indication of a significant adverse impact in the worst case, at night. However, the methodology in BS 4142 recognises that adjustments should be made according to the context. As the equipment is for emergency use only, HTM 08-01 indicates that an increase of 10 dB relative to typical noise criteria is normally appropriate. Using this adjustment, an adverse impact would be expected rather than a significant adverse impact.

Additionally, the measured noise levels demonstrate that noise levels comparable to those expected from the generator were already present in the area during the survey period of less than a week, with 14 daytime 1-hour periods of and 1 night-time period exceeding 51 dB L_{Aeq,T}.

Given the expected low frequency of occurrences of emergency use, and established maintenance and testing regime in accordance with the advice of HTM 08-01, noise emissions from the proposed generator are expected to be comparable to noise levels that are already experienced over short periods in the area.

Conclusion

A design process to reduce noise emissions as far as practicable has been followed.

Based on the information provided and existing noise levels measured, noise emissions from the proposed generator are expected to be comparable to noise levels that are already experienced over short periods in the area, but above representative background noise levels, particularly at night.

With appropriate adjustments made in the context of emergency usage only, the guidance in BS 4142 indicates that this is a likely indication of an adverse impact when the emergency generator is operating, which is expected to only be required once or twice a year. Regular testing will only take place during the daytime on a weekday.

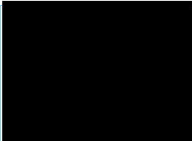
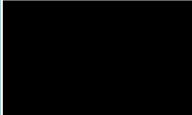
If you have any queries please do not hesitate to contact me.

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Appendix

Figure 2: Measured background noise level histograms

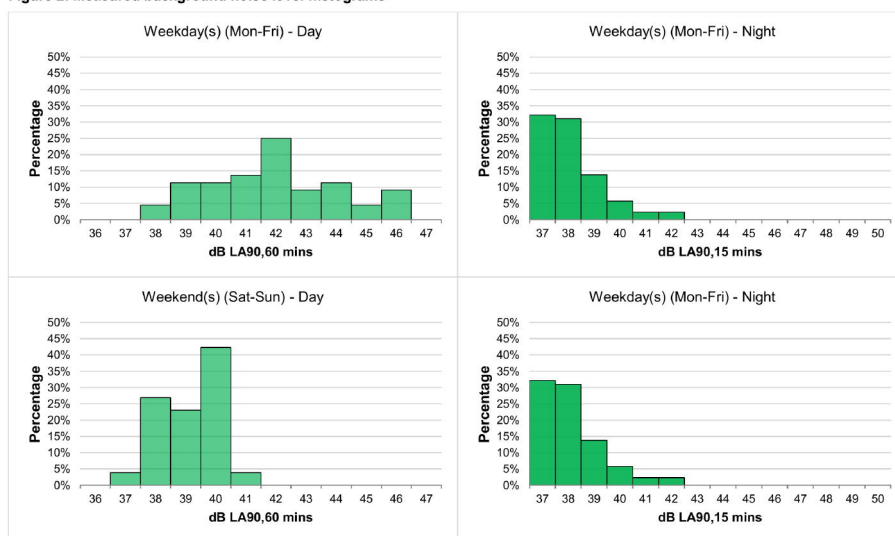


Figure 3: Measured noise level time history

