REPORT

CLEAR
ACOUSTIC DESIGN

Supported Living, Cregg Na Ba

BS4142 Noise Impact Assessment

Date of Issue: 22/08/2024

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Revision: 1

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Table of Contents

1.0 Introduction

Clear Acoustic Design has been appointed to carry out a noise impact assessment in relation to the proposed refurbishment works at Cregg Na Ba, Chain Ln, Battle TN33 0HG. Proposals are for the installation of external air source heat pumps.

The local planning authority will likely request a noise impact assessment in order to safeguard the amenity of the surrounding receptors. The required noise impact assessment will be in line with BS 4142: 2014+ A1: 2019 *Methods for Rating and Assessing Industrial and Commercial Sound*. These criteria are seen to be appropriate in assessing and mitigating noise impact from this source.

2.0 Performance Standards

2.1 Local Authority Requirements

Specific requirements are unknown at this stage. The following is therefore assumed as a planning requirement.

A noise impact assessment is carried out by a suitably qualified acoustic consultant covering the current acoustic environment and how predicted noise from the proposed development, including all proposed plant and machinery, will affect nearby noise sensitive receptors.

Plant/Machinery to be attenuated:
All plant, machinery and equipment installed or operated should be so enclosed and/or attenuated that noise therefrom does not exceed, at any time, the existing background noise level when measured in accordance with BS4142:2014 at a point one metre external to the nearest residential or noise sensitive property.

2.2 BS 4142: 2014 + A1: 2019

BS 4142: 2014 + A1: 2019 *Methods for Rating and Assessing Industrial and Commercial Sound* has formed the basis of the assessment in this report. In this case, the rating level requirement for the proposed plant should not exceed the existing background noise level.

BS 4142 states that this indicates a "low" noise impact. This is therefore seen to equate to the *No Observed Adverse Effect Level* (NOAEL) under national planning policy.

3.0 Environmental Noise Survey

In order to assess the noise impact of the proposed mechanical plant installation, an environmental noise survey has been undertaken by Clear Acoustic Design at a location representative of the nearest noise sensitive receptor(s).

The closest receptor locations are taken to be the houses to the East and West of the site. The microphone was located on the West façade of the existing building to represent noise levels at these receptors.

Dominant noise sources are from road traffic noise from A271 and birdsong. The Microphone was located 1m from nearest facade, 1.5m above ground level.

The environmental noise survey has provided background noise levels, which will form the basis of the assessment in line with BS 4142:2014. Ambient and background noise levels were measured between 01/02/23 and 02/02/23 using a single fixed noise monitor (referred to as F1).

3.1 Measurement Equipment and Environmental Conditions

The weather was witnessed to be overcast and dry for the duration of the survey with light wind speeds. The following measurement equipment was used for the survey.

Equipment	Serial Number	Calibration Date
Casella CEL-633C Type 1 Sound Level Meter	2145374	18/02/22
Casella CEL-495 Preamplifier	002436	18/02/22
B&K 4189 Microphone	2529821	18/02/22
Casella CEL-120-1 Calibrator	113251	18/02/22

Table 3.1 Measuring Equipment used for Survey

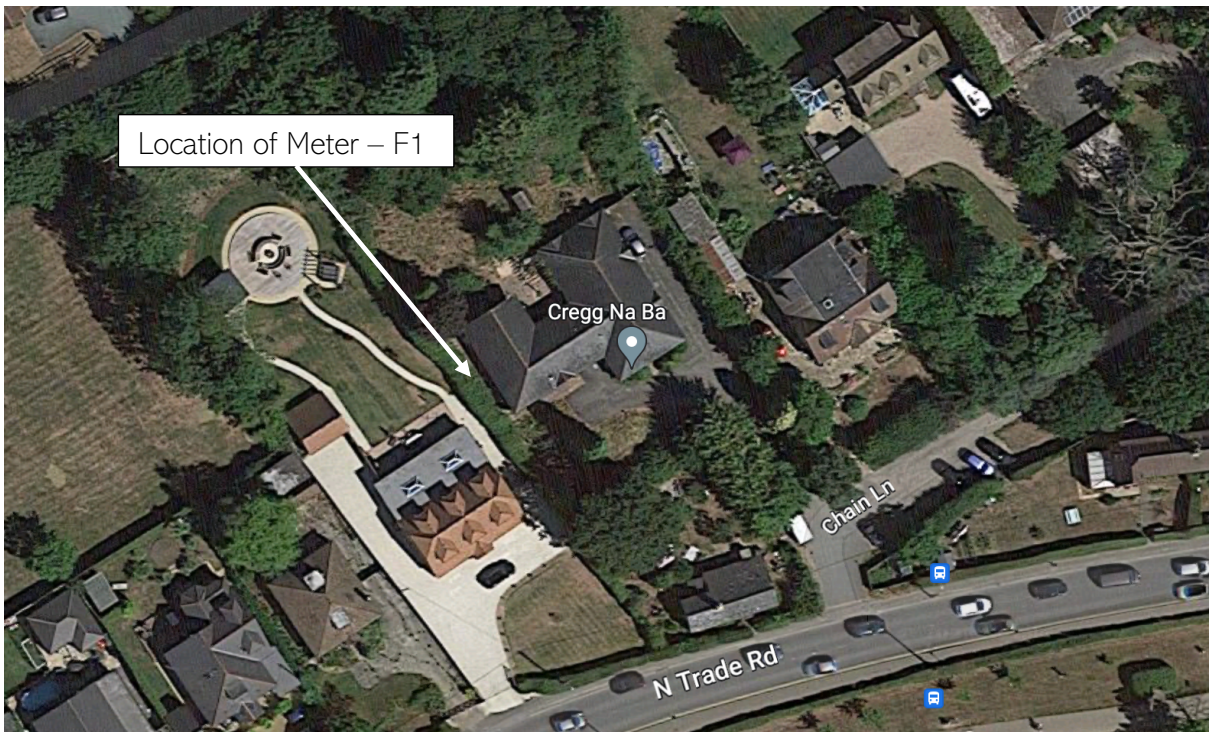

Figure 3.1 Site Location

3.2 Fixed Noise Monitoring Graph

Figure 3.2 below provides a graph of the measured noise levels at Location F1. The ambient (L_{Aeq}) and background (L_{A90}) noise levels are shown.

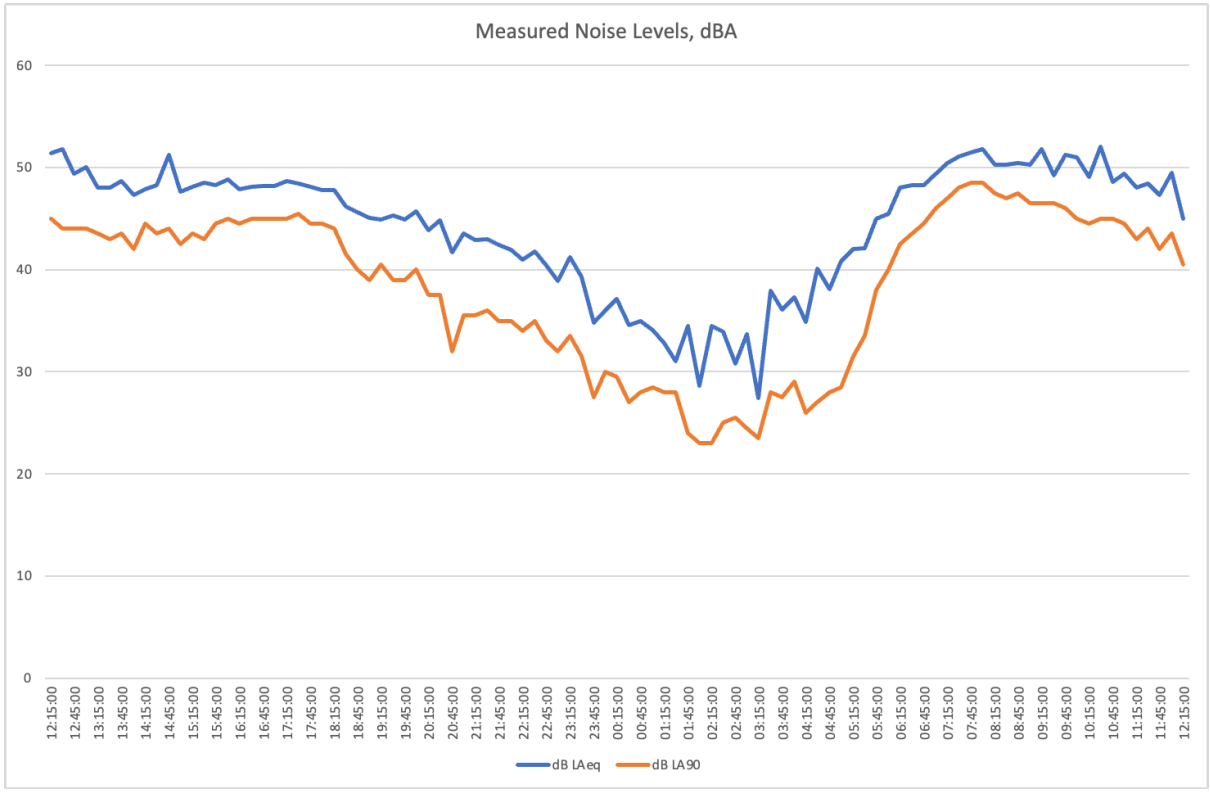

Figure 3.2 Long Term Measurement Graph – F1

3.2.1 Assessment Background Noise Level

In order to conduct an assessment in line with BS 4142: 2014, it is necessary to extrapolate representative background noise levels from the long-term survey data.

The proposed ASHPs will operate during the night, and therefore the background noise levels during this time will be applicable.

As stated in BS4142:2014, the representative background noise level should not necessarily be the minimum sample value measured and should suitably represent the full assessment dataset. The published example in BS4142:2014 uses the modal value. In this instance Clear Acoustic Design have also used the modal value.

The background noise level which will form the basis of the assessment is presented in Table 3.2 below.

Time period	Assessment Background Noise Level, L_{A90} dB
Day (0700-2300)	43
Night (2300-0700)	27

Table 3.2: Assessment Background Noise Level

4.0 Noise Impact Assessment

4.1 Noise Sources

The proposals for this site are for 2 external air source heat pumps. The proposed location of these units is shown below.

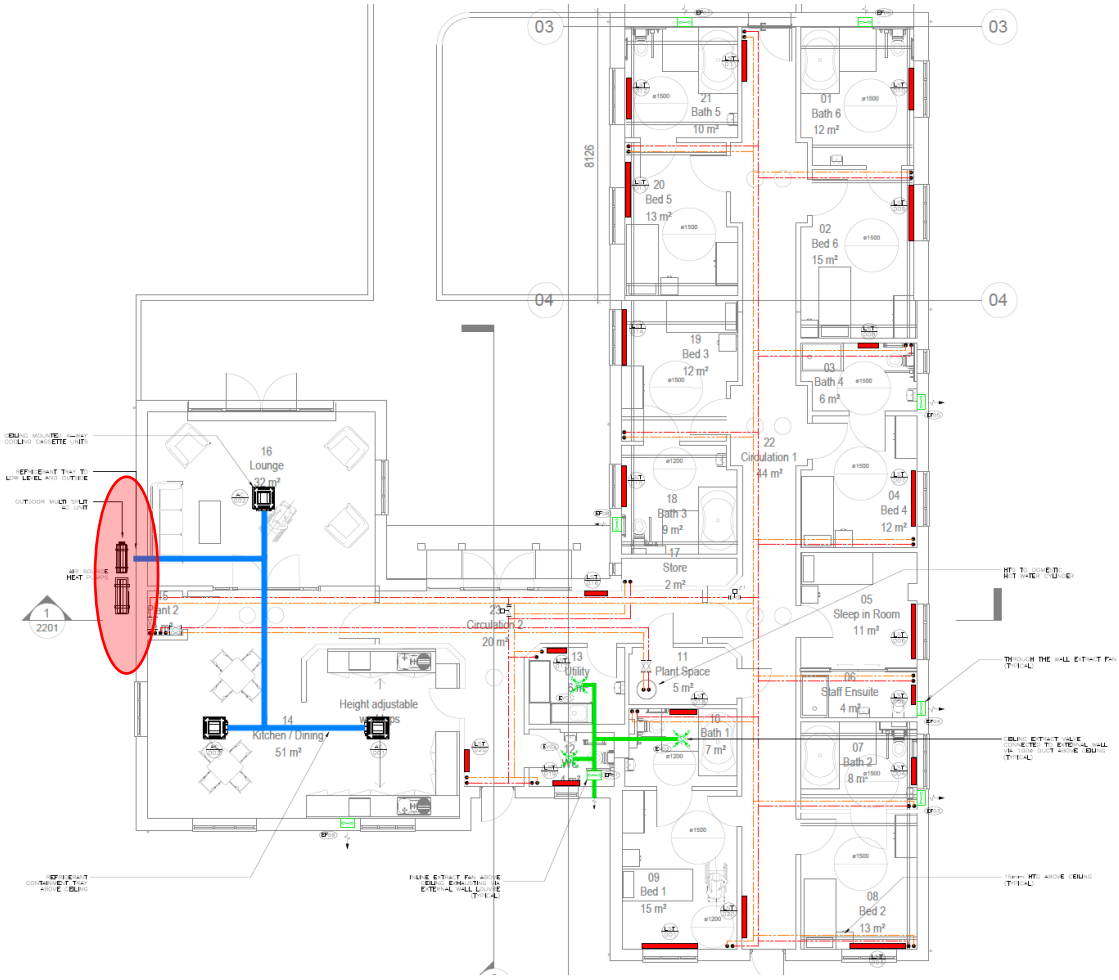

Figure 4.1: Location of proposed ASHPs

The currently proposed ASHP's are from Mitsubishi Electric. The sound pressure levels which have formed the basis of the assessment are presented in Table 4.1 below and are based on the manufacturer datasheets.

The proposed units are not seen to be tonal nor impulsive in nature. Noise emissions are also deemed unlikely to be distinctive against the residual acoustic environment. As such no feature corrections will be applied when forming the cumulative rating level of this source, in line with BS 4142: 2014.

Type	No of Units	Sound pressure level at 1m, dB L_{Aeq}
PUZ-HWM140VHA(-BS)	1	53 dBA (Heating)
MXZ--2F53VF3	1	51 dBA (Heating)

Table 4.1: Noise Sources, Sound Pressure Levels, dBA

Figure 4.2: Location of proposed ASHPs and receptors

4.2 Assessment Outcome

In order to demonstrate compliance with likely local authority rating level requirements, Table 4.2 below provides an assessment in line with BS 4142: 2014 + A1: 2019.

As can be seen, the rating noise level exceeds the background noise level by a margin of +13dBA during the night without considering any noise barriers or attenuation. This would be seen to indicate a significant adverse impact at this closest receptor.

Time Period	Combined Sound pressure level at 1 metre	Source Directivity Correction	Distance to receptor	Distance/Barrier attenuation	Rating Noise Level at receptor, L_{Aeq} dBA	Assessment Outcome Against Background Noise
Day	55 dBA	+3dB	8m	18dB	40dBA	**-3 dB**
Night	55 dBA	+3dB	8m	18dB	40dBA	**+13 dB**
Night	55 dBA	+3dB	8m	18dB + 10dB barrier attenuation	30 dBA	**+3dB**

Table 4.2: BS 4142 Assessment – Outcome

4.3 Noise Mitigation

Based on the above calculations, plant location, and currently assumed noise targets, it will be necessary to introduce further noise mitigation to comply with the noise requirements during the night.

If there is solid boundary fencing to the West of the site, and the line of sight of the proposed units is fully blocked at the windows of the nearest residential receptor, then a minimum noise barrier attenuation of approximately 10dBA can be expected. If this is the case, then noise levels will be reduced to approximately 3dB above background noise at the receptor, a marginal exceedance, but at an absolute noise level of 30dBA.

It should be noted that 30dBA in a very low noise level in terms of the absolute level and it is not normally recommended to design the night-time rating noise to a level lower than this, other than in special circumstances.

There will likely not be any significant benefit in reducing noise levels any further than this, regardless of the relative difference to the background noise level. As this exceedance only occurs during the night, the external noise levels in the gardens are not relevant, and the noise levels inside the building are more of the concern. With a partially open window at night this would relate to an internal noise level of between 15-20 dBA, well below the BS8233:2014 internal noise requirement of 30 dBA for a bedroom at night. The noise should therefore not be audible inside the neighbouring dwellings even with open window ventilation.

It should also be noted that an increase of 3dB is barely perceptible to the human ear and therefore any further mitigation to lower noise will have very minimal subjective benefit.

Based on the units not being visible at the receptor due to a solid fence or screen, and the context of the rating noise level, it is deemed that the noise impact would be sufficiently low in accordance with BS4142:2014.

4.3.1 Noise Barrier Specification

It is advised that any noise barrier has a mass in the region of 6 kg/m^2. This surface mass will ensure that the noise barrier is efficient across the full frequency range. This mass requirement therefore represents the acoustic requirement for the fence.

A 6kg/m^2 softboard closeboard fence, will provide the following SRI acoustic performance in terms of sound transfer through the structure.

63	125	250	500	1k	2k	4k
7	11	16	20	23	24	36

Rw 23 dB
C -1
Ctr -3
Rw+Ctr 20 dB
100-3150 Hz

By applying the above sound reduction to a broadband noise source, the dBA loss would be in the region of 23 dBA.

ASHP's are typically broadband noise sources, without any tonality, and therefore a figure close to 20 dBA would be expected in terms of a dBA loss through the fence.

Real-world manufacturers noise data for an example air source heat pump are shown below.

Type	63	125	250	500	1k	2k	4k	Sound pressure level at 1m, dB L_{Aeq}
Manufacturer Noise Data for ASHP at 1m	56	56	53	50	48	43	40	53 dBA

Using the data above, transfer though the 6kg/m^2 fence would be as follows.

Type	63	125	250	500	1k	2k	4k	Sound pressure level at 1m, dB L_{Aeq}
SRI	7	11	16	20	23	24	36	53 dBA
Noise level after fence mass attenuation	49	45	37	30	25	19	4	34 dBA
							Total Loss	19 dBA

The example above sing real world ASHP data, shows a relatively high dBA loss of 19dBA using a 6 kg/m^2 fence. This considers the full frequency range of the ASHP and the spectral acoustic performance of the fencing material.

This type of closeboard would therefore be suitable for this site and would comply with the requirements discussed in the previous section.

The noise barrier should also be high and wide enough such that the line of sigh to the nearest receptors is fully blocked. This will ensure that a noise reduction of at least 10dBA is provided by the barrier. There should be no gaps underneath the fence or at any abutments with other structures.

It has been calculated that an average mass of 6kg/m^2 can be easily achieved with a standard close-board fence that is cut from 22mm boards, with approximately 25mm overlapping boards. The boards on these closeboard fence types typically taper from around 15mm to 6mm in thickness. As there is an overlap, the thinnest part of the boards are never exposed, and are covered by the thicker part of the overlapping board.

With 100mm wide boards, and a 25mm overlap, the average thickness of the boards is approximately 15mm, with a surface mass of approximately 7.5 kg/m^2.

5.0 Conclusion

Clear Acoustic Design has been appointed to carry out a noise impact assessment in relation to the proposed mechanical plant installation at Cregg Na Ba.

The noise impact assessment is in line with BS 4142: 2014 + A1: 2019 *Methods for Rating and Assessing Industrial and Commercial Sound*. These criteria are seen to be appropriate in assessing and mitigating noise impact from this source. A noise level target of equal to background noise at night has been assumed at this stage.

As can be seen in Table 4.2 above, the noise level of the mechanical plant installation will be marginally above the assumed noise requirements, providing a suitable solid barrier fence blocks the line of sight from the units to the receptor.

BS4142:2014 states that the context of a noise source and assessment must be considered, not just the predicted relative noise level, which includes the absolute noise level. The predicted absolute noise level with a noise barrier of 30 dB L_{Aeq}, which is a very low external noise level, would result in a bedroom internal noise level, with an open window, of approximately 15-20 dBA. This demonstrates that the likely noise impact of the proposed installation is low.

It should also be noted that an increase of 3dB is barely perceptible to the human ear and therefore any further mitigation to lower noise to the design target will have very minimal subjective benefit.