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Malcolm Tungatt

Assessment of Noise Impact of a propose
ASHP at 10 Rake Fold, Ramsbottom, BL8 4ND

Prepared by :-

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(on behalf of the applicant)

CONTENTS

1.0 SUMMARY

2.0 INTRODUCTION

3.0 CALCULATION AND ASSESSMENT STANDARDS

3.1 MCS-020

3.2 ISO 9613-2

3.3 Other

4.0 BASIC APPROACH TO MODELLING

5.0 RESULTS AND DISCUSSIONS

5.1 MCS-020

5.2 Detailed Modelling

5.3 Mitigation

6.0 CONCLUSIONS/RECOMMENDATIONS

1.0 **SUMMARY**

An assessment using the simplified method of MCS-020 suggests that the predicted levels of the proposed new ASHP unit are 1 dB above the criterion for permitted development. However, this is a prediction method which we cannot endorse as its simplified approach err heavily on the cautious side and heavily over-predict the levels, particularly in this case.

A much more detailed assessment predicts levels which are likely to have negligible impact.



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P J Durell

2.0 INTRODUCTION

ADC was asked to carry out an independent assessment of the impact of a proposed new ASHP. The Local Authority has asked for the assessment in terms of MCS-020 which is simplified method aimed at the layperson, such as a prospective installer. We were also asked to do a more detailed assessment in terms of the main standards used in our normal work.

3.0 CALCULATION AND ASSESSMENT STANDARDS

3.1 MCS-020

The Microgeneration Installation Standard MC-020 is a document published by the Microgeneration Certification Scheme. It not something that we were previously familiar with and it is aimed at the layperson such as an MCS Contractor. It is a very simplified method of calculation, erring very heavily on the side of caution, particularly with respect to the effect of barriers.

It defines the assessment position as the centre of the nearest door or window of a habitable room of a neighbouring property – a neighbouring bedroom window for instance, or a neighbouring window or door onto a living room.

It provides a simplified calculation method for the propagation of the sound. The result is then added to a notional background level of 40 dB(A) to give an overall predicted level. If this less than or equal to 42 dB(A) then the proposal meets the criterion for permitted development.

3.2 ISO 9613-2

ISO 9613-2 : *Acoustics – Attenuation of sound during propagation outdoors* is the main profession standard for outdoor noise predictions. It includes a detail process of calculating the propagation, including geometric divergence, atmospheric absorption, ground effects, reflection from surfaces, screening by obstacles, and other guidance such as propagation through housing, foliage, etc. This is the method used by our CadnaA 3D modelling software, which is a very well established industry standard tool.

3.3 Other Standards

BS 4142 : *Methods for rating and assessing industrial and commercial sound* is a complicated document used to assess “*sound of an industrial and/or commercial nature*”. It is not explicitly intended for a domestic ASHP, but it is not explicitly excluded either.

Very briefly, it describes methods of comparing the proposed level (the ASHP noise at the assessment position) with the background level (the underlying level without the proposed unit, and drawing an initial estimate of impact based on this comparison. This is then considered in terms of context, and modified if appropriate, to arrive at the final impact.

BS 8233 is intended for new residential development but it is routinely used in all situations to set the overall levels into context. The criteria are based on WHO guidance and give the desirable criteria for indoor ambient noise levels for dwellings as follows:-

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,8hour}$	30 dB $L_{Aeq,8hour}$

Note that the standard accepts the widely used rule of thumb that, for a partly open window, the levels just outside will be 15dB higher than those just inside. This brings us to an external equivalent of the above table, as follows:-

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	50 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	55 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	50 dB $L_{Aeq,8hour}$	45 dB $L_{Aeq,8hour}$

4.0 **BASIC APPROACH TO MODELLING**

We followed the MCS-020 process exactly and this is presented in 5.1 below.

We have also used the well-established CadnaA modelling software which calculates noise propagation based on the processes of *ISO 9613 : Acoustics – Attenuation of sound during propagation outdoors*. Obviously, modelling software is reliant on the inputs and assumptions. The keys ones are:-

1. The ground is mainly reflective (coefficient of 0.2 assumed).
2. Calculations are based on two orders of reflections.
3. The buildings and the surrounding buildings are assumed to be mainly reflective (0.5 dB loss on reflection assumed).
4. The surrounding trees and vegetation will provide a small degree of absorption but this has been neglected.
5. Where acoustic fences are used, they are also assumed to be reflective the same as the buildings, unless specified otherwise.
6. The source data is based on manufacturers' literature. This is entered into the model as the sound power level. Where only overall dB(A) levels are provided, we used information from similar source to the spectrum shape (the noise levels across the frequency range).
7. All units are assumed to run continuously on full load.

We have been provided with the following specification sheet from the manufacturer.

Unit Size

Daikin Altherma 3 High-Capacity Monobloc
 9kW, 11kW, 14kW & 16kW **Refer to Tables for output*

Dimensions

Width	1378mm
Depth	460mm
Height	870mm
Weight	149kg

Sound Power Level
 9kW, 11kW, 14kW & 16kW 62dBA

Max Height Difference ASHP to Cylinder $\leq 5\text{m}$
Max Distance ASHP to Cylinder $\leq 10\text{m}$

Note: Add an extra **150mm** to height with **Anti-Vibration Feet** on Hard surfaces.
 Add an extra **175mm** to height with **Soft Ground Pack** on Soft surfaces.



DAIKIN

British Gas ZER

5.0 RESULTS AND DISCUSSIONS

5.1 MCS-020

The following table shows the process in the standard.

MCS-020 Calculation

Step	Quantity/Process	Result
1	Sound Power Level	62 dB(A)
2	No. of reflective surfaces within 1m 3 Q Value	8
3	Heat Pump to Assessment Poisition Horizontal Distance 5.5 m Vertical dist Heat Pump to Ass Posn 2.8 m Overall distance	6.2 m
4	Overall Reduction	-17 dB
5	The ground floor kitchen breaks the line of sight but movements of up to 25 cm could bring part of the unit into view	-5 dB
6	Step 1 + Step 4 + Step 5	40 dB(A)
7	Notional Background Noise Level	40 dB(A)
8	Step 7 - Step 6	0 dB(A)
9	Adjustment figure 1 dB Final Result	43 dB(A)
10	Compare to permitted level	+1 dB

The outcome of this process is a predicted level 1 dB above the criterion for permitted development.

It is important to note, however, that we have no confidence in the above result.

For instance, the value at step 4 is actually -18 dB not -17 dB but there is no provision in the standard for values between 17 dB and 20 dB. That alone would give a result equal to the criterion, allowing permitted development..

Also, the directivity at step 2 relies on the assumption that all surfaces are 100% reflective and that they direct all their reflections towards the assessment position, this is clearly not the then case.

The big one, however, is the barrier calculation. There is nothing wrong with the simplification that something which just breaks the line of sight can provide a reduction of -5 dB and that something with more of a break can provide -10 dB. However, the requirements for judging the effect of the barrier or obstacle is whether the *top edge* of the unit has a line of sight to the assessment position. The vast majority of the unit's noise will come from the centre of the front of the unit. Even ignoring the fact that the source will direct the noise forwards, it leads to a substantial under-estimate of the screening effects in this case.

So, this process is what the Local Authority asked for, and we respect that it is a simple approach that errs heavily on the side of caution. But we cannot recommend it in favour of the more detailed approach in 5.2 below.

Note that the 1 dB excess is a tiny amount and we have offered a potential mitigation solution in 5.3 below to more than match it.

5.2 Detailed Modelling

Based on the unit operating continuously on full load¹, the predicted levels at the residential windows are as shown below:-

¹This is an extremely unlikely scenario, with most items rarely running beyond 70%, and less for daytime.



Note that:-

- The beige shapes are the buildings
- The blue cross is the centre of the ASHP, entered as a point source as a cautious assumption².
- The coloured numbers are the noise levels at the habitable rooms. Note that the software is set up to present the noisiest floor level.
- Note that the noise contours are shown for guidance as to how the noise propagates. The contours are at a height of 3.4 m, the height of the centre of the nearest bedroom window.

The following 3D view should help to visualise the model.



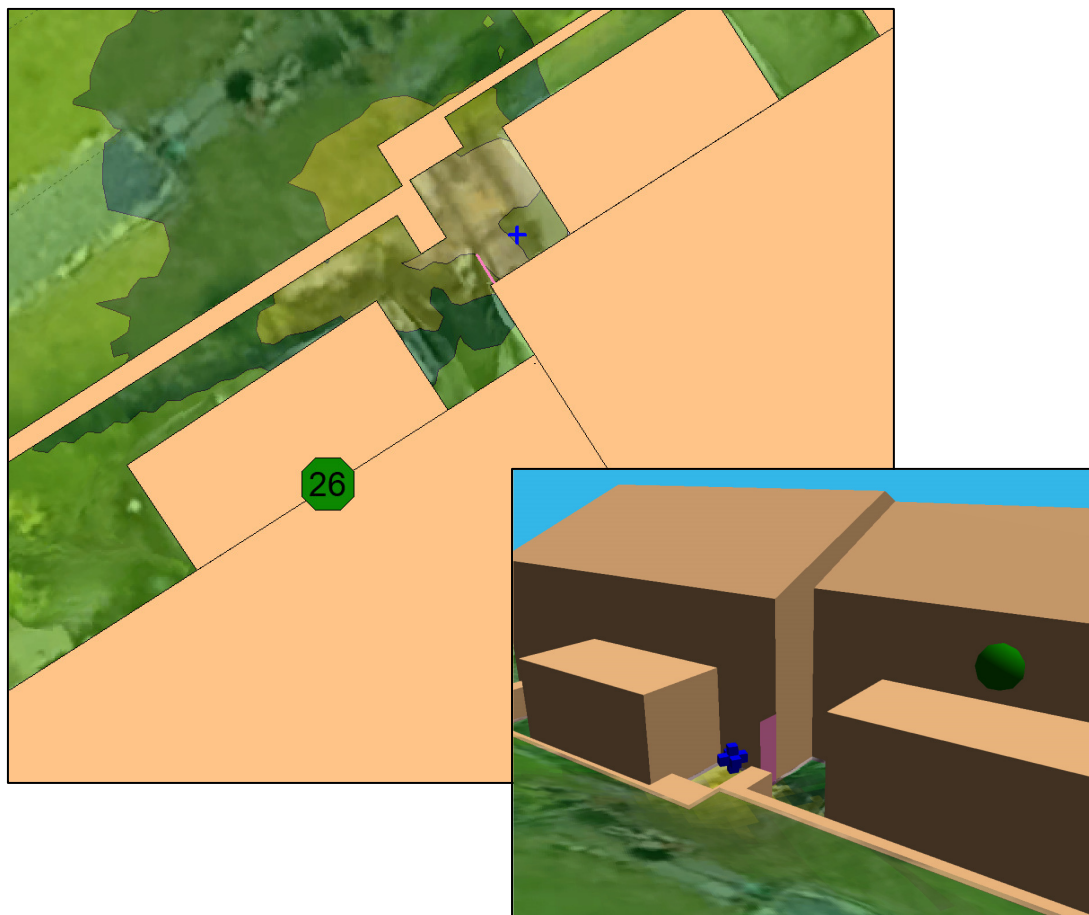
² It could be entered as a box with a vertical area source to the front, but this would give a lower noise level at the bedroom window due to the sound being directed forwards.

The predicted level of 29 dB(A) is very low and unlikely to be audible inside bedroom with the window open.

5.3 Mitigation

In our view there is no need for mitigation. The predicted levels using the detailed method are very low and substantially within the criterion suggested by MCS-020 and only 1 dB above it using the simplified method. Using both methods, the predicted levels are well below BS 8233 the external equivalent guidance for bedrooms at night. We cannot do a BS 4142 assessment without background noise levels, but even if they were very low (eg. less than 30 dB L_{A90}), the context section of BS 4142 would come into play as the predicted levels are so low.

However, if the 1 dB excess on the MCS-020 method proves to be a sticking point, a very simple 1.8 m high fence with a width of around 600 mm (more if you wish) would be more than enough to provide screening to increase the barrier attenuation of the MCS-020 method from -5 dB to -10 dB. See the magenta line in the images below.



Note that the fence is relied up to reduce the noise by up to only 5 dB and so any basic domestic fence will be adequate as long as there are no gaps. A simple overlapping featheredge type fence would be fine.

7.0 CONCLUSIONS/RECOMMENDATIONS

An assessment using the simplified method of MCS-020 suggests that the predicted levels of the proposed new ASHP unit are 1 dB above the criterion for permitted development. However, this is a prediction method which we cannot endorse as its simplified approach err heavily on the cautious side and heavily over-predict the levels, particularly in this case.

A much more detailed assessment predicts levels which are likely to have negligible impact.

We do not recommend any mitigation but, if necessary a simple fence or wall can be used to provide a small further reduction.

We recommend that you issue this report to planners and that Officers are encouraged to contact us directly with any queries.