CONSULTATION RESPONSE FORM

Consultation on Planning Standards for Permitted Development Installations of Air Source Heat Pumps

Thank you for taking the time to comment on this consultation. MCS values the input from all interested parties in the development of its Scheme as, without you, we would not be able to define and raise the quality of installations. We would be grateful if you could use this form for your response which helps with collation and consideration of responses.

Responses are welcome to all, or a selection of, the consultation questions included in this consultation document on the MCS website. General feedback is also welcome. Please submit responses by 26 January 2024 to consultations@mcscertified.com or The MCS Service Company Ltd, Violet 3, First Floor, Sci-Tech Daresbury, Keckwick Lane, Daresbury, Cheshire, WA4 4AB. Please state below whether you are responding as an individual or representing the views of an organisation and if you want the information that you provide to be treated as confidential.

Respondent Name:	Individual or organisation:	Organisation name:	Organisation type:	Date
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*The **Institute of Acoustics (IOA)** is the UK's professional body for those working in acoustics, noise and vibration. The IOA has some 3000 members from diverse backgrounds, with engineers, scientists, educators, lawyers, occupational hygienists, architects and environmental health officers among their number. This multidisciplinary culture provides a productive environment for cross-fertilisation of ideas and initiatives. The range of interests of members within the world of acoustics is equally wide, embracing such aspects as aerodynamics, architectural acoustics, building acoustics, electroacoustics, engineering dynamics, noise and vibration, hearing, speech, underwater acoustics, together with a variety of environmental aspects.*

Many members of the IOA regularly carry out noise impact assessments of heat pump installations that are not part of the MCS. In order to capture their professional experience to feed into the consultation, two consultation workshops were held: one at 17:00 on Monday 15th January and one at 12:00 on Friday the 19th January. 120 people attended in total and 101 submitted questionnaire responses, 94% of which were members of the IOA, comprising of consultants, academics and manufacturers, although the exact split was not known.

It was noticed that consultation questions listed in this document do not match those in the "Consultation Contents" document. The questions have been combined where this was noticed.

Acoustics is a complex subject, for which IOA members can provide professional assistance. It is recognised that the purpose of the MCS 020 was to simplify the assessment procedure to enable installers to complete a basic acoustic assessment without the costs of an acoustics specialist. There are risks associated with this simplification.

In general, the IOA has concerns that the existing permitted development noise limit (described as 42dB(A) at 1m from the nearest neighbouring habitable window) may be excessive, depending on the acoustic features of the ASHP sound and the background noise level. A research-backed 'permitted sound level' is encouraged, below which the risk of impact reduces below an observable adverse effect.

Consultation Questions

Current Clauses in MCS 020

1.1 Are there any circumstances (e.g. distance to nearest property) that could mean a noise assessment is not necessary to meet the conditions in Permitted Development Rights?

The IOA endorses a maximum distance at which the MCS 020 noise assessment procedure would need to be carried out, provided this didn't represent a relaxation of the MCS noise limit in real terms. There are situations where the nearest neighbouring property can be several hundred metres from an ASHP installed under the MCS; in such circumstances the MCS 020 noise assessment procedure would be a formality, requiring unnecessary time, effort, and paperwork of the MCS installer.

The three sound propagation variables included in the MCS 020 noise assessment procedure are: distance from the source to the assessment location, reflecting planes close to the source, and the presence of intervening barriers that provide useful acoustic screening.

The Energy Related Products (ERP) Regulations place sound power level limits on Air Source Heat Pumps (ASHPs) depending upon their rated heat output. Based on pessimistic sound propagation conditions, a maximum distance could be determined for each heat output category. Using the current MCS noise assessment procedure, pessimistic propagation conditions would be a single ASHP mounted on the ground, adjacent to two perpendicular walls facing the nearest neighbouring property, with no intervening solid barrier.

For the four heat output categories currently specified in the ERP regulations, the maximum distance at which an MCS 020 noise assessment would need to be carried out would be as follows:

Rated heat output:	**≤ 6 kW**	**> 6 kW and ≤ 12 kW**	**> 12 kW and ≤ 30 kW**	**> 30 kW and ≤ 70 kW**
Maximum permitted sound power level outdoors:	65 dB(A) ref 1 pW	70 dB(A) ref 1 pW	78 dB(A) ref 1 pW	88 dB(A) ref 1 pW
Maximum distance at which a calculation is required:	19 m	33 m	82 m	259 m

This suggests that, for units up to 12 kW, a 33 m distance would be appropriate as a distance for typical domestic sized ASHP units. Where a higher rated heat output is required, an increased maximum distance would be needed. It should be noted that, because the data tables in the MCS 020 noise assessment procedure do not extend to distances greater than 30 m and are not in one metre steps, the inverse square law underpinning the data table in Note 4 has been used to calculate the decay of sound with distance from the source. This is as follows:

$$L_{pA} = L_{WA} + 10\log_{10}\left[\frac{Q}{4\pi r^2}\right] - A_B$$

- L_{pA} is the A-weighted sound pressure level referenced to 20 μPa.
- L_{WA} is the A-weighted sound power level of the ASHP referenced to 1 pW
- r is the distance in metres
- Q is the directivity factor (2, 4, or 8)
- A_B is the attenuation due to a barrier (0, 5 or 10 dB from the MCS 020 noise assessment procedure)

During the IOA consultation workshops, 63% of respondents agreed that this would be a suitable approach to take, with only 26% opposing the motion.

1.2 Contractors are required to obtain the A-weighted sound power level of the heat pump from manufacturer's data to calculate heat pump noise. To avoid confusion over which value for sound power level should be used, we propose having a single database to obtain the sound power level, for example the MCS Product Directory, instead of the manufacturer's data. Do you agree with this proposal, if so, where should the information be held?

During the consultation workshops, 89% of participants agreed that the sound power level data should be stored in the MCS Product Directory. However, 85% of participants thought that this information should be searchable by members of the public and that it should be accessible by an API to allow third-party applications to access data in the MCS Product directory. The use of this data by third parties is likely to result in innovative digital specification tools that will further drive the adoption of ASHPs in the UK.

Part of the confusion surrounding which sound power level figure to use is what operating conditions the ASHP is placed under during the test. Any database of sound power levels should clearly state the operating conditions under which the acoustic measurements were made.

The IOA recommends that the sound power level data be stored in the MCS Product Directory so that the correct information may be easily found by MCS installers; however, this data should also be openly accessible to the public, both on the MCS website and by Application Programming Interface (API). This data should also be accompanied by the operating conditions under which the ASHP sound power level was evaluated.

1.3 The methodology requires contractors to establish whether there is a solid barrier between the heat pump and the assessment position. We intend to clarify what can and cannot be considered a solid barrier. In this respect, what types of barriers (e.g. different types of fence panels, walls, hedges) are likely to be encountered when installing heat pumps on domestic properties?

79% of participants in the consultation workshops agreed that this information should include the following:

- the typical density of a barrier that would satisfy the definition of "solid";
- it should state that the barrier should have no cracks or gaps;
- examples of what would and would not constitute a solid barrier; and
- an example of upgrading a non-compliant fence to make it compliant.

The IOA recommends that the following definition be adopted:
"A solid barrier consists of an imperforate material, such as a pointed masonry wall or part of a building, through which there are no cracks or gaps. It should have a surface mass of at least 10 kg/m^2, or comprise timber boards at least 18 mm thick without any gaps. A timber sheet material may be mounted on a lighter weight garden fence to upgrade it to meet the specification of a solid barrier. A garden fence without an additional board would not usually constitute a solid barrier. Hedges, trees and shrubs would never be considered part of a solid barrier."

The IOA supports a clarification of the definition of a "solid barrier" in the MCS 020 noise assessment procedure.

79% participants agreed that there should also be an option for manufacturers to offer packaged systems, comprising an ASHP with an attenuating enclosure. These elements should be tested together for acoustic and thermal performance and listed on the MID as a single unit.

1.4 The current background noise assumption used in the methodology is 40dB. We are proposing to maintain this assumption for urban areas but decrease the background noise assumption to 35dB for rural areas. To determine whether an area is rural or urban, we propose using this postcode lookup tool. Do you agree with this method? Are there other considerations we should make in determining whether a domestic property is in an urban or rural area?

Under the proposals outlined in question 1.4, the following would be the case:

	Urban Areas	**Rural Areas**
Background Noise Level, L_{BG}:	40 dB(A)	35 dB(A)
Current Noise Limit L_{Lim}:	42 dB(A)	
Absolute noise level limit of ASHP noise alone, L_{ASHP}:	$L_{Lim} = 10\log_{10}\left[10^{(L_{ASHP}/10)} + 10^{(L_{BG}/10)}\right]$	
	37.8 dB(A)*	41.0 dB(A)
*Using the data table from Note 7, this number would be 37 dB(A) because the difference between the ASHP noise level and the background noise level must be in whole (integer) dB.		

The proposed reduction in background noise level of 5 dB(A) will increase the permitted level of ASHP noise by 3.2 dB at the nearest neighbouring property. Rural areas are more likely to be quieter, which means they are already likely to be more adversely impacted by ASHPs installed under the MCS. Allowing a higher level of ASHP noise at the nearest neighbouring property is likely to increase this adverse impact further.

With reference to the current UK Government policy on noise, this proposal is not likely to avoid significant adverse impacts on health and quality of life, nor does it mitigate and minimise adverse impacts on health and quality of life. The Noise Policy Statement for England (NPSE) requires that policy be *"developed and implemented on the basis of strong scientific evidence".* To allow a greater level of noise impact in rural areas does not apply current scientific knowledge on noise impact and soundscape, nor does it coincide with local planning policies, which usually require the presence of a new specific source of environmental sound (such as a heat pump) not to exceed the existing background sound level.

91% of participants at the consultation workshop did not agree with the proposed rural/urban background noise method. ***The IOA* strongly opposes the *reduction of the stated background noise level in rural areas with the way the assessment is currently carried out, as this would effectively result in higher permitted levels in rural areas than in urban ones.***

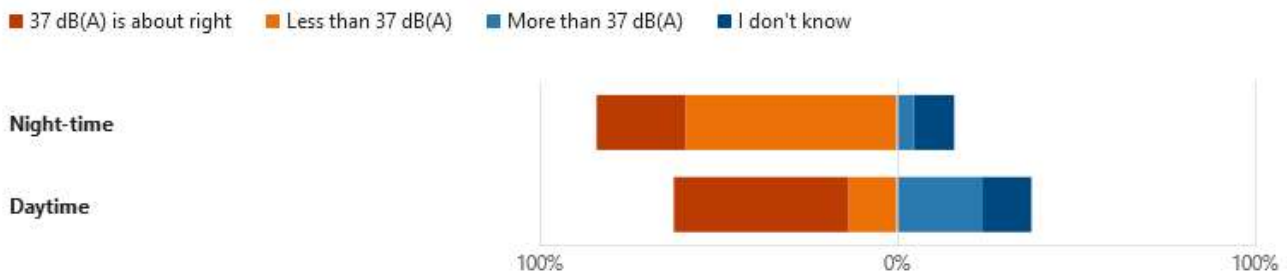
Please also see the answer to question 1.5, which continues the discussion about having two noise limits after describing a useful simplification of the MCS noise assessment procedure.

1.5 We want to ensure the assessment methodology is straightforward for installers on-site to accurately follow. Are there ways to make the assessment simpler and more streamlined?

The MCS 020 Noise Assessment Procedure combines a fixed notional background noise level (currently 40 dB(A)) with the calculated ASHP noise level at the assessment location. This is an entirely unnecessary calculation step and does not enhance the evaluation or assessment of the noise from the air source heat pump in any way.

The IOA recommends removing the background noise level from the MCS 020 noise calculation procedure entirely and relying on an absolute limit for the ASHP noise level alone. Using the current MCS noise assessment procedure and data tables this would be 37 dB(A). This would simplify the noise assessment procedure and remove a number of the calculation steps.

91% of the consultation workshop participants agreed that a split between rural and urban areas is not a good way to target quieter and noisier areas; however 80% did support the adoption of the right conservative absolute limit for the ASHP noise level alone. Participants were asked: *What are the appropriate noise limits for the daytime and night-time periods?* With the responses illustrated below:



The responses show that the majority were happy with the current 37 dB(A) limit on ASHP noise during the daytime but they generally supported a reduction at night. 82% would support the adoption of a level appropriate for the night-time if only one limit could be adopted; this is partly a result of acoustic features, such as tonality, intermittency and impulsivity, that are not currently being accounted for in the MCS noise assessment. A 37 dB(A) absolute ASHP noise limit may be appropriate during the night-time for an ASHP with good sound quality; however, for an ASHP with high tonality it could be too high, especially at night.

It is acknowledged that lowering the limit for ASHP noise itself would potentially restrict the rollout of ASHPs in the UK; 80% of participants at the workshop agreed that a more conservative limit would be appropriate if there were some allowance for a survey component to be included in the noise assessment procedure for areas believed to have higher background noise levels. For example: an installer may find that they could not provide a quiet enough ASHP to meet the MCS noise limit using the MCS noise procedure; but, because they believed the installation site to be in a noisier location where the impact of the ASHP noise were likely to be lower, a low-cost certified noise survey could be carried out to determine the real background noise level in the area and a greater budget for the ASHP noise level could be apportioned.

The IOA recommends further consideration of the MCS noise limit. This includes adopting both an absolute limit for the ASHP noise level alone and adopting a lower threshold for the night-time.

Additional Noise Clauses in MIS 3005-I

2.1 What steps could be considered appropriate to strengthen the requirements in the Heat Pump Installation Standard to ensure the acoustic impact of heat pumps on domestic properties is minimised? For example, should we consider tonality, orientation, location, avoiding reflective surfaces, the use of anti-vibration mats or other steps, and how?

97% of participants would like the MCS to publish guidance with information about how the orientation, location, avoiding reflective surfaces and possible use of antivibration mounts could be used to mitigate and minimise noise both at neighbouring properties but also in areas used by the owners of the ASHP. 89% of participants would like the MCS to publish guidance for members of the public and giving them an indication of the type of sound that owners and their neighbours might hear from a correctly installed ASHP.

The IOA has already published separate briefing notes for members of the public and acoustics or environmental health professionals seeking to assess the noise from them:

- Professional advice note: https://www.ioa.org.uk/sites/default/files/briefing_note_-_heat_pumps_-_professional_advice_note_-_publication_8.pdf
- Briefing note for members of the public: https://www.ioa.org.uk/sites/default/files/briefing_note_-_heat_pumps_-_publication_12.pdf

The IOA supports the publication of additional guidance for installers on how the orientation, location, avoidance of reflective surfaces, and possible use of anti-vibration mounts may help to reduce the ASHP noise at the nearest neighbouring property. It also supports the publication of guidance for members of the public, illustrating what owners of ASHPs and their neighbours might expect to hear from a correctly specified and installed ASHP. If the MCS were to publish guidance, the IOA, together with partner organisation such as the Chartered Institute of Environmental Health (CIEH), would be willing and able to provide expertise to help prepare it.

The presence of acoustic features, such as tonality, impulsivity, and intermittency, may make the sound from ASHPs more noticeable against other background noise. This may be despite the ASHP having a low overall sound power level. Many participants at the consultation workshop believed that a penalty should be applied to ASHPs that have strong acoustic features, for example: the noise limit could be set 5 dB lower where this is the case, which would follow British Standard methods usually employed in the assessment of noise from mechanical and electrical services affecting residential receptors. The technical problem that remains with this approach is that there is currently no way for ASHP manufacturers to demonstrate that their products have good sound quality, meaning that they would all suffer this penalty. 90% of the participants agreed that further research was required to identify methods for evaluating acoustic features associated with ASHP operation, and that, until then, a precautionary approach should be taken.

The IOA recommends that research be commissioned to investigate ways that acoustic features could be determined in laboratory conditions. A way to advantage manufacturers producing ASHPs with good sound quality would encourage innovation and development in the industry, which would result in greater uptake of ASHPs across the UK whilst minimising the risk of annoyance and complaints.

Multiple Heat Pumps in the Curtilage of a Property

3.1 Are there any circumstances where it would not be appropriate to install multiple cascaded heat pumps on the same property? For example, due to the heat load or system design to the property, or the location of the property?

The IOA supports the installation of multiple cascaded heat pumps within the curtilage of the same property if the combined ASHP noise level at the assessment location were not to exceed 'the limit' for a single unit. *87%* of participants at the consultation workshop agreed with this statement.

3.2 The proposed methodology would likely be based on a spreadsheet in order to make calculations simpler for installers on-site, but is there additional benefits to making a paper-based methodology available too?

90% of participants at the consultation workshop agreed that a digital calculation tool should be implemented to improve the robustness of the MCS installers' noise assessments. Most of the respondents (84) wanted to see this as a web form, with other support for both a spreadsheet and a smartphone app. 81% of respondents agreed that the method should still be published in full to allow installers to carry out the procedure in other ways, which may be paper based, but are also likely to be innovative new tools from third parties, which will increase the uptake of ASHPs in the UK.

The current paper-based exercise uses data tables, which prevent the calculation of a more precise ASHP noise level because the tabulated distance steps are up to 5m. 69% of participants agreed that the MCS noise assessment procedure should use the analytical equation for sound propagation to calculate the level at the assessment location. Currently, there are ASHP installations that may be prevented from going ahead because the data tables add an additional penalty to the sound over and above the intended limit.

The IOA supports the implementation of the noise assessment procedure as a digital calculation tool, preferably as either a webform or a smartphone app. The calculations should be based on the analytical equations to allow a more precise calculations to be carried out. Publishing the method in full would allow for a paper-based calculation to be carried out but would also allow third parties to create innovative tools that may increase the uptake of ASHPs in the UK.

Multiple Heat Pumps in a Neighbourhood

4.1 What methods could be used to determine the number and relative positioning (both distance and angles) of heat pumps already installed or likely to be installed in a neighbourhood?

4.2 What precautions should be taken to avoid raising background noise above agreed levels when multiple heat pumps are being installed in a given area?

The participants of the consultation workshop were split on how to handle the noise from multiple ASHPs installed under the MCS at different properties within a neighbourhood. Many participants were concerned about the potential for cumulative noise impacts and a steady increase in noise if all the residential properties in a neighbourhood were to install ASHPs. There is a perceived risk of this so-called 'noise creep', depending on the background sound environment.

There was also concern with the potential for multiple air source heat pumps to 'beat' with one another. This effect results from two tonal sound sources with frequencies close to, but not the same as, one another. The result is a tone that fades in and out with a period equal to the difference between the two separate tone frequencies. This makes the sound from both units far more noticeable, without a significant increase in the overall sound pressure level.

The IOA recommends that further research be carried out to identify what the effect of numerous domestic ASHPs is likely to have within a residential neighbourhood. It should be noted that the innovation charity NESTA has appointed Apex Acoustics to carry out modelling exercises to investigate this. For more information, please contact Jack Harvie-Clark, whose contact details are listed on the first page.