

## The Future Homes Standard

### 2019 Consultation on changes to Part L (conservation of fuel and power) and Part F (ventilation) of the Building Regulations for new dwellings

## Response from the Institute of Acoustics

### Introduction

The Institute of Acoustics is the professional body for those working in the field of acoustics and noise management. Our members include consultants, academics and regulators. Our activities include working for the building industry, developers and local authorities in all matters associated with sound and noise management in the built environment. This response has been compiled by members of the Institute and endorsed by its Governing body.

### Approved Document F (ADF) – Ventilation.

The proposed ADF wording regarding noise is reproduced below for ease of reference.

#### **“Performance**

*In the Secretary of State’s view, requirement F1(1) will be met if the dwelling is provided with a means of ventilation which:*

*[...]*

- d. *minimises the ingress of external air pollutants [...]*
- e. *provides all of the following as far as reasonably practicable:*
  - *Low levels of noise, by following guidance in paragraphs 1.5 to 1.7*
  - *[...]*

Paragraphs 1.5 – 1.7 state;

#### **Noise**

1.5 *Mechanical ventilation systems, including both continuous and intermittent mechanical ventilation should be designed and installed to minimise noise. This includes all of the following:*

- *sizing and jointing ducts correctly*
- *ensuring that equipment is appropriately and securely fixed*
- *selecting appropriate equipment, including following paragraph 1.6.*

1.6 *For mechanical ventilation systems, fan units should be appropriately sized so that fans operating in normal background ventilation mode are not unduly noisy. This might require fans to be sized so that they do not operate near the maximum capacity of the fan when operating in normal background ventilation mode.*

1.7 *Account should be taken of outside noise when considering the suitability of opening windows for purge ventilation.”*

**Noise from mechanical ventilation and extract fans.**

The IOA supports the sentiment that noise from ventilation systems needs to be considered as part of the design. Unfortunately, the proposed wording “*not being unduly noisy*” does not provide sufficient guidance. The requirement is vague, and, as written, will leave the detailed implementation of these regulations open to interpretation. Consequently, it is likely that the optimum outcome will not be achieved in all residential developments.

This revision is in contrast to the current version of ADF which does define noise levels. The IOA recognises that in specifying values, there is a risk that these might become regarded as fixed thresholds which have to be met at all times regardless of circumstances. Government policy requires that significant observed adverse effects from noise are avoided and reasonable steps are taken to mitigate and minimise adverse effects within the context of Government policy on sustainable development.

It would be helpful if ADF could provide an indication of the noise exposure at which adverse effects might be expected to occur. This would assist with the implementation of noise management policy in this situation.

The Association of Noise Consultants (ANC) and Institute of Acoustics recently published document: *Acoustics, Ventilation and Overheating Residential Design Guide (AVO)* provides relevant information which might be used. Values are provided on desirable internal ambient noise levels in dwellings from building services based on the types of ventilation mentioned in ADF and on recent research. These are reproduced in Table 1.

Table 1 Recommended noise levels from mechanical ventilation systems in dwellings

Ventilation condition	Possible system / design solution	Desirable internal ambient noise levels from mechanical services, $L_{Aeq}$ (dB)		
		Bedrooms	Living rooms	Bathrooms / WCs / kitchens
Whole dwelling ventilation	Continuous MEV <sup>1</sup> at minimum low ventilation rates	≤ 26 or 30*	≤ 30	-
	Continuous MVHR <sup>2</sup> at minimum low ventilation rates			
Extract ventilation	Intermittent extract fans	≤ 26 or 30 <sup>3</sup>	≤ 35	≤ 45
	Continuous MEV at high ventilation rates			
	Continuous MVHR at high ventilation rates			

<sup>1</sup> MEV – Mechanical extract ventilation

<sup>2</sup> MVHR – Mechanical ventilation with heat recovery

<sup>3</sup> Recent research suggests that a noise level in the region of 24 – 26 dB(A) in bedrooms may be required to prevent adverse reaction to noise from this type of source from most occupants while trying to fall asleep. (Harvie-Clark, Conlan, Wei, & Siddall, 2019)

The IOA believe that there is a case for using these values as design targets in the new version of ADF to provide clearer guidance.

Compliance with the above criteria could be enforced through pre-completion testing of internal noise levels from ventilation systems in a sample of dwellings. If this requirement was adopted, the measurements should be undertaken following the guidance provided in BS EN ISO 16032:2004 *Acoustics. Measurement of sound pressure level from service equipment in buildings. Engineering method* and ought to be carried out at the same time as ventilation airflow measurements.

### Control of overheating.

It is recognised that ADF is intended to establish minimum requirements for ventilation to dwellings. However, as mechanical systems are often used to control overheating in dwellings, it would be appropriate for the new ADF to incorporate guidance on suitable internal noise levels from such systems. Consideration might be given to the AVO guide, which includes recommendations for indoor ambient noise levels from mechanical services when operating to control overheating. These are reproduced in Table 2.

It is worth noting that the extent to which the relaxation in the levels set out below can be used is dependent on the specific local situation.

Table 2 Recommended noise levels from mechanical ventilation systems in dwellings to control overheating

Possible system / design solution	Desirable upper internal ambient noise levels from mechanical services, $L_{Aeq}$ (dB)		
	Bedrooms	Living rooms	Bathrooms / WCs / kitchens
Ventilative cooling (increased air flow)	30 ( $\pm$ 5)	35 ( $\pm$ 5)	-
Comfort cooling (fan coil units, etc.)			

### External sound break-in.

The proposed ADF states that, for requirement F1(1) to be met the means of ventilation for a dwelling need to minimise the ingress of external air pollutants. Although not overtly stated, external noise from environmental sources (such as road traffic, etc.) constitutes a pollutant and as such should be included in the future revision of the document.

### Sound break-in through open windows and ventilation openings.

Managing the amount of sound from external sources breaking into residential dwellings needs to follow Government policy. Some criteria can be found in BS 8233:2014 which sets out values for desirable and reasonable internal levels as a result of noise from external sources. These values take into account sound break-in through windows, doors, solid portions of the façade and any ventilation openings.

As such, it would be helpful if the new ADF includes a statement along the lines of that shown below to ensure external sound break-in through open windows and ventilation openings is properly assessed and managed:

*“Good acoustic design should be applied to any development in terms of both the overall layout and internal layout. Guidance on this aspect can be found in the Professional Practice Guidance on Planning and Noise, as referenced in the Government’s Planning Practice Guidance on Noise. With regard to the dwelling façade, external sound break-in through ventilation openings must be considered as part of the overall design process. Such openings should be designed so that Government noise management policy is met. Relevant guidance can be found in BS 8233:2014.”*

### **Purge ventilation.**

Paragraph 1.7 of the proposed ADF states that external noise should be taken into account when considering the suitability of opening windows to provide purge ventilation. As purge ventilation is required in situations where increased air flow rates are needed for short periods of time, such as to rapidly dilute pollutants and / or water vapour, there is no policy requirement to include specific mitigation given that occupants would experience any increased levels of noise for only short periods.

### **Vibration from mechanical ventilation systems.**

Paragraph 1.5 of the new ADF states that mechanical ventilation systems should be appropriately and securely fixed. However, securely fixing the mechanical services may result in excessive vibration transfer and re-radiated noise due to the operation of the systems.

As such, it would be prudent to rephrase paragraph 1.5 to mention that the mechanical ventilation systems should be installed such that:

- The level of vibration from these systems do not exceed the *low probability of adverse comment* range recommended in BS 6472-1:2008;
- The total noise level in the various rooms from induct noise, unit case breakout and re-radiated noise from mechanical ventilation systems should not exceed the levels given in Table 1 and Table 2 (above).

To achieve those criteria, it might be necessary to require anti-vibration mounts to be provided to systems such as MVHR and MEV units.

### **Approved Document L – Conservation of fuel and power.**

While no specific reference to noise is made within the new proposed ADL, it does include guidance on a number of items that can impact on the acoustic performance of a development. These are discussed below.

### **Air source heat pumps.**

One of the elements of the proposed Future Homes Standard is the expectation that all homes would have a heat pump. Whilst the advantages of heat pumps in terms of reducing carbon emissions are clear, what does not appear to have been considered is the potential noise impact from these devices.

Any mechanical system that includes a fan has the potential to generate noise. As these pumps are attached to the exterior of a dwelling, the noise from them has the potential to impact on those living nearby.

Currently, such pumps can be installed using permitted development rights. At the time this legislation was implemented, the potential noise impact issue was recognised. Consequently, the requirements of the Microgeneration Certification Scheme have to be followed by the installer in order to manage the potential noise impact from these devices on those living nearby.

If the Future Homes Standard is to include heat pumps, it is essential that managing the noise from these units is included as an intrinsic part of this process in order to mitigate and minimise the potential adverse effects.

### **Limiting the effects of solar gains in summer.**

One of the measures ADL recommends to help limit the effects of solar gains in summer, is to provide exposed thermal mass. However, this could have implications on the sound insulation strategy between dwellings and on the internal noise levels from ventilation systems.

It is advised that reference is made to Approved Document E (ADE) regarding sound insulation between dwellings and the approach necessary to achieve its requirements, and to the recommendations for inclusion in the new version of ADF discussed in the previous sections with regard to internal noise levels from ventilation systems.

Institute of Acoustics

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