NOISE, VENTILATION & OVERHEATING

Jack Harvie-Clark, Apex Acoustics and ANC Acoustics, Ventilation & Overheating Group

New residential development

ANC ACOUSTICS & NOISE CONSULTANTS

Institute of Acoustics

Chartered Institute of Environmental Health

CURRENT ISSUES

Noise assessment – for Planning

Ventilation strategy – for Building Control

Overheating assessment – not statutory

Mechanical ventilation noise – not controlled

… design the accommodation so that it provides good standards of acoustics, ventilation and thermal comfort

STAGE 1: SITE NOISE RISK ASSESSMENT

NOISE RISK ASSESSMENT	POTENTIAL EFFECT WITHOUT NOISE MITIGATION	PRE-PLANNING APPLICATION ADVICE
Indicative Daytime Noise Levels $L_{Aeq,16hr}$ / Indicative Night-time Noise Levels $L_{Aeq,8hr}$ High 70 dB / 60 dB Medium 65 dB / 55 dB 60 dB / 50 dB Low 55 dB / 45 dB 50 dB / 40 dB Negligible	Increasing risk of adverse effect	High noise levels indicate that there is an increased risk that development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS. Applicants are strongly advised to seek expert advice. As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development. At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.
	No adverse effect	These noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds.

STAGE 2: FOUR KEY ELEMENTS

Element	Content
1	Good acoustic design
2	Internal noise level guidelines
3	External amenity area assessment
4	Other relevant issues

P.12, THE PLANNING APPLICATION MUST:

"Examine the effects of noise control measures on ventilation…"

P.13, NOTE 5 TO BS 8233 LEVELS

… internal target levels can be achieved with open windows in as many properties as possible demonstrates *good acoustic design*.

Where it is not possible … internal noise levels can be assessed with windows closed …

PARA 2.33

Opening windows for ventilation or cooling purposes reduces façade sound insulation.

Most residents value the ability to open windows at will…

LPAs should therefore normally request that designers principally aim, through the use of good acoustic design, to achieve the internal noise level guidelines in noise-sensitive rooms with windows open.

Justify in the ADS if assessed with windows closed.

PARA 2.34

Where … internal target noise levels can only be practically achieved with windows closed …

… special care must be taken to design the accommodation so that it provides good standards of acoustics, ventilation and thermal comfort …

… without unduly compromising other aspects of the living environment.

ANC ACOUSTICS & NOISE CONSULTANTS

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AVO GUIDE:

Interdependence of acoustics, ventilation, overheating

Ventilation & overheating for acousticians

Associate noise level guidelines with:

- ventilation conditions
- overheating mitigation

Guidance on pre-completion testing

Worked example, case study and design options

AVO GUIDE SCOPE

New residential development that will be exposed to:

airborne sound from transport sources

sound from domestic mechanical services

> **Para 2.38:** ***Where mechanical services are used .. the impact of noise .. on occupants should be assessed***

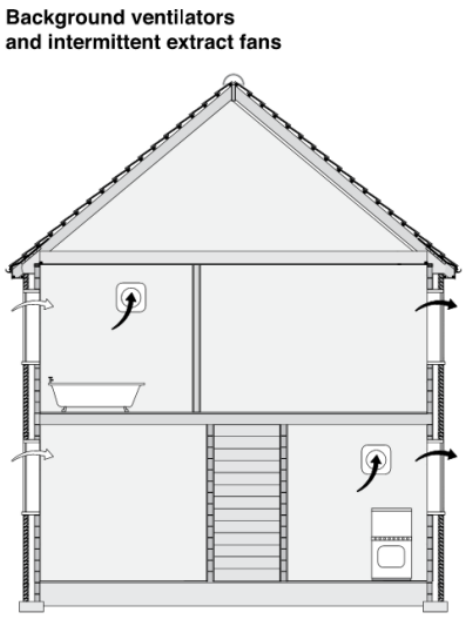
VENTILATION: PART F

Whole dwelling ventilation

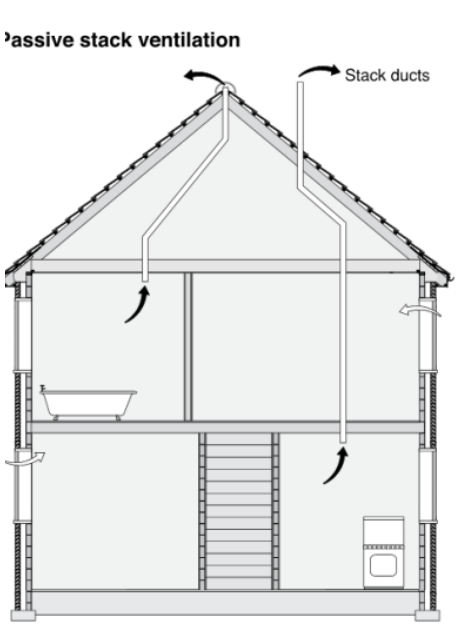
Mechanical extract

Purge ventilation

PART F TEMPLATE SYSTEMS



System 1



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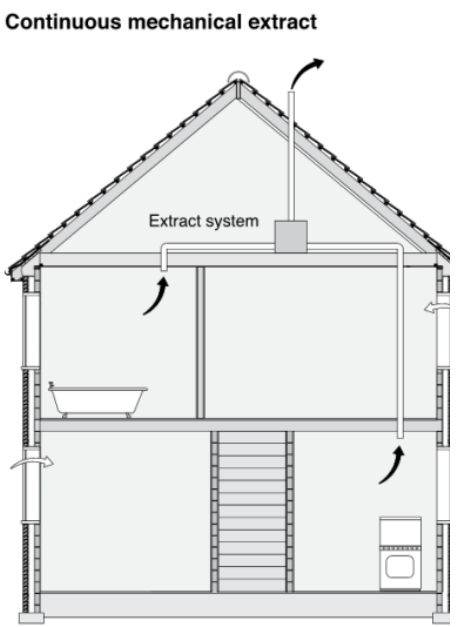
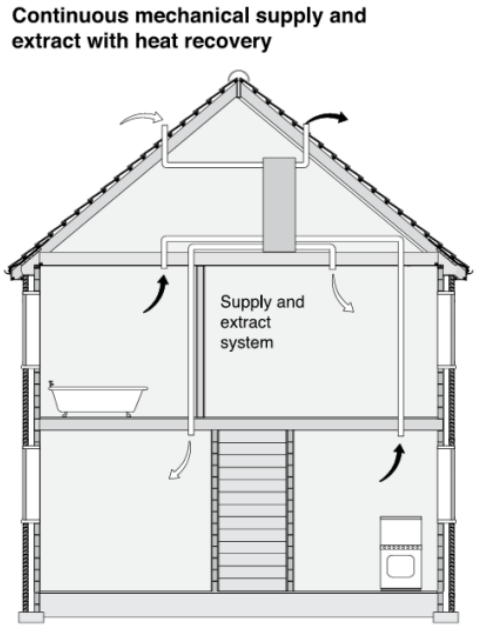
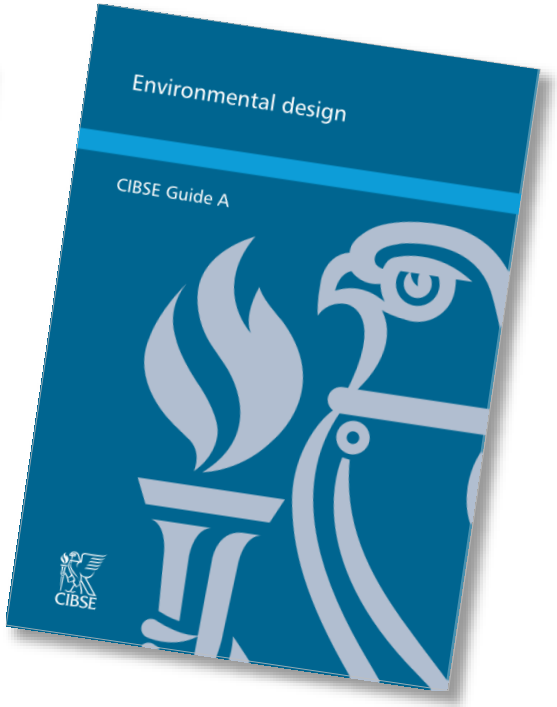


System 3



System 4

CURRENT GUIDANCE



Bedrooms	30 dBA	30 dBA / 55 dBC / NR 25	30 dBA
Living rooms	35 dBA	35 dBA / 60 dBC / NR 30	30 dBA

COST ACTION TU-0901

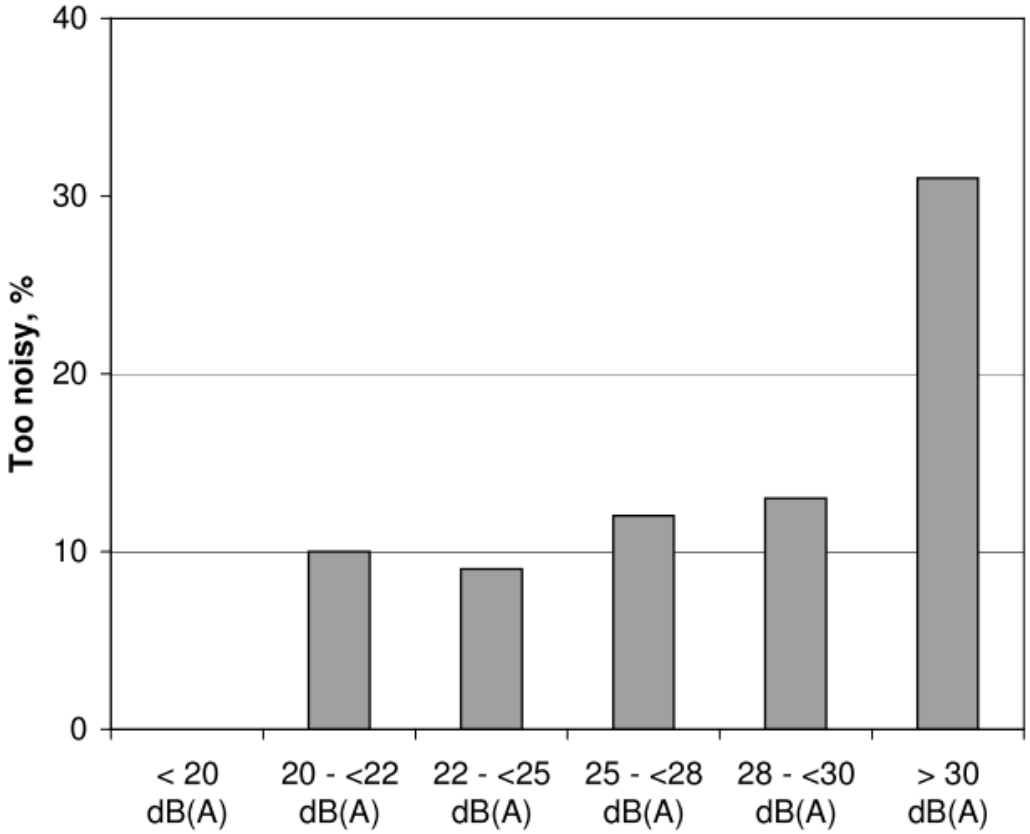
Acoustic Classification Scheme

Table 5.4. Sound levels in dwellings due to building service equipment. Class limits.[1]

Type of space and sources [2]	Class A L_{eq} or L_{maxF} (dB)	Class B L_{eq} or L_{maxF} (dB)	Class C L_{eq} or L_{maxF} (dB)	Class D L_{eq} or L_{maxF} (dB)	Class E L_{eq} or L_{maxF} (dB)	Class F L_{eq} or L_{maxF} (dB)
In dwellings due to ventilation / heating / cooling installation L_{eq}.	≤ 20	≤ 24	≤ 28	≤ 32	≤ 36	≤ 40

COST TU 0901, Building acoustics throughout Europe Volume 1: Towards a common framework in building acoustics throughout Europe, download here

STUDIES OF MECHANICAL NOISE



Kurnitski J, Eskola L, Palonen J, Seppanen O (2007). Use of mechanical ventilation in Finnish houses. Proceedings of 2nd European BlowerDoor-symposium, 2007, Kassel, Germany, 152–161.

VENTILATION STUDIES

Hasselaar, 2008, Netherlands: 500 homes

Noise limits occupiers' use of fan settings

Hady et al, 2008, Denmark, 100 homes

Set point too noisy, operated lower with health effects

Balvers et al, Netherlands 2012, 300 homes

>30 dB(A) at set point in 86 % of homes

Brown & Gorgolewski, 2015, Canada, 165 homes

HVAC noise causes dissatisfaction and switching off of fans

ZERO CARBON HUB, 2016

The end result was that nearly all of the 13 occupants interviewed by the team across the sites had turned off their ventilation systems, finding them too noisy, especially at night.

If systems are turned off, they are not doing their job. The air quality in the property will be compromised, with potentially serious consequences for the health of occupants.

APEX PROPOSALS

Highest limit:

Combined external noise + mech services ≤ 30 dB(A)

Optimal limit:

Mech services noise ≤ 24 dB(A) in bedrooms

Further research with Salford University

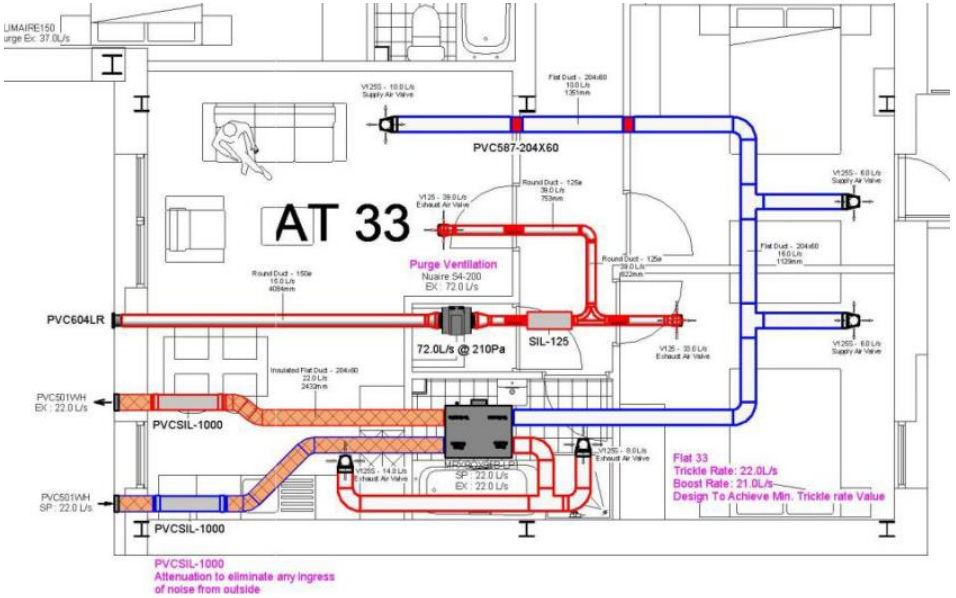
How loud is too loud? Noise from domestic mechanical ventilation systems,
38th AIVC - 6th TightVent & 4th Venticool Conference
Ventilating healthy low-energy buildings, September 2017, Nottingham, UK

PURGE VENTILATION – 4 ACH

Para 2.35: … ***noise level guidelines .. not applicable under "purge ventilation"***

Passive

Mechanical



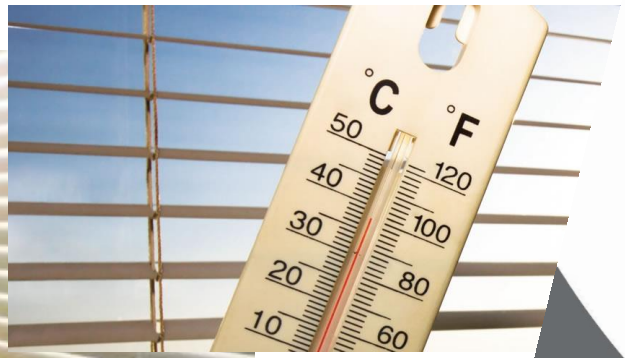
OVERHEATING

Para. 2.36: .. ***consider the potential noise impact during the overheating condition***

Homes that are predominantly mechanically ventilated because they have either no opportunity or extremely limited opportunities for opening windows (e.g. due to noise levels) …

NOISE AND OVERHEATING

“Excessive” noise outside: what is acceptable inside?



https://www.london.gov.uk/what-we-do/planning/london-plan/current-london-plan/london-plan-chapter-five-londons-response/poli-8

AVO GUIDE

The acceptability of higher internal ambient noise levels considered in terms of effects such as:

Daytime annoyance, interference with activities

Night-time sleep disturbance

RISK-BASED APPROACH

Describe the:

- noise levels
- frequency
- duration

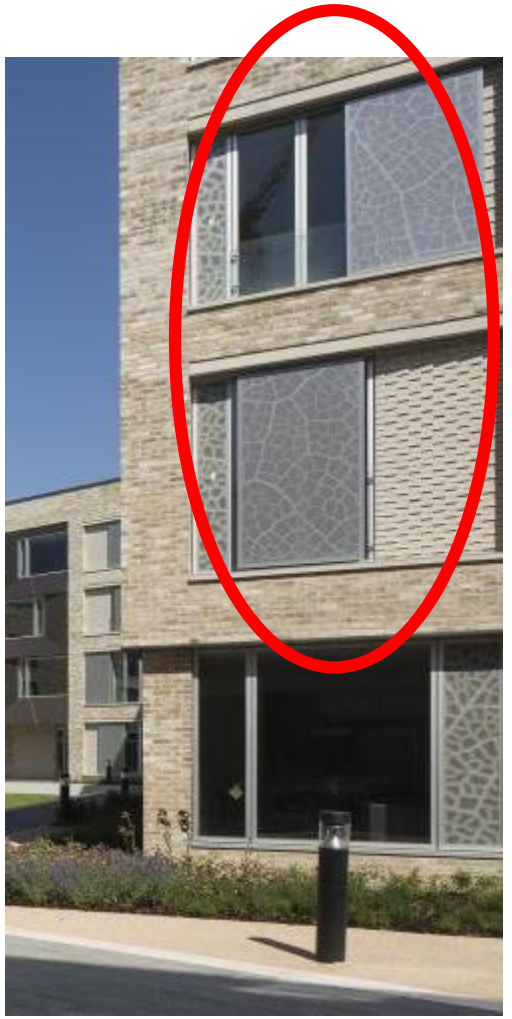
Consider the effect of individual noise events

Assess the likely impact on occupants

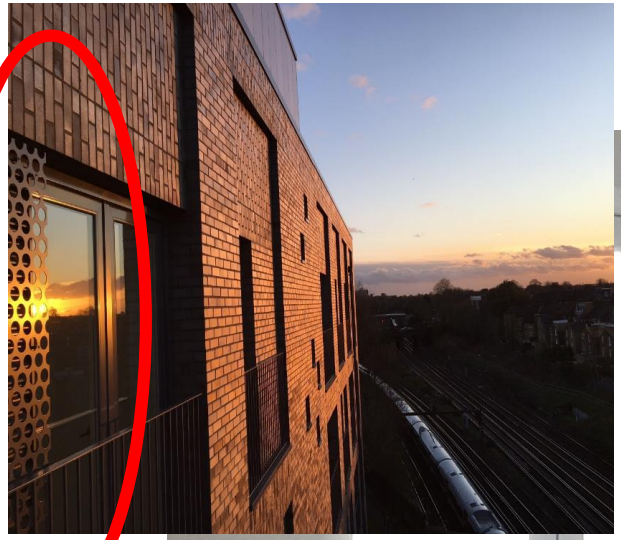
ADS, PARA. 2.72 E)

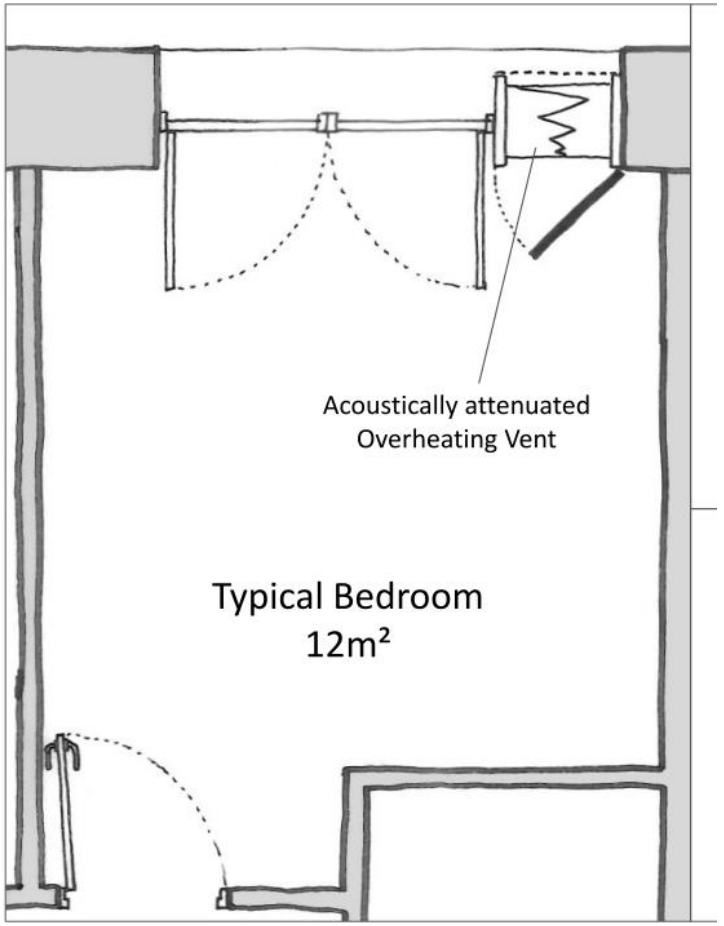
Where .. windows need to be closed .. to meet the internal noise guidelines then full details of the proposed ventilation and thermal comfort arrangements must be provided.

EXAMPLE 1: NW CAMBRIDGE

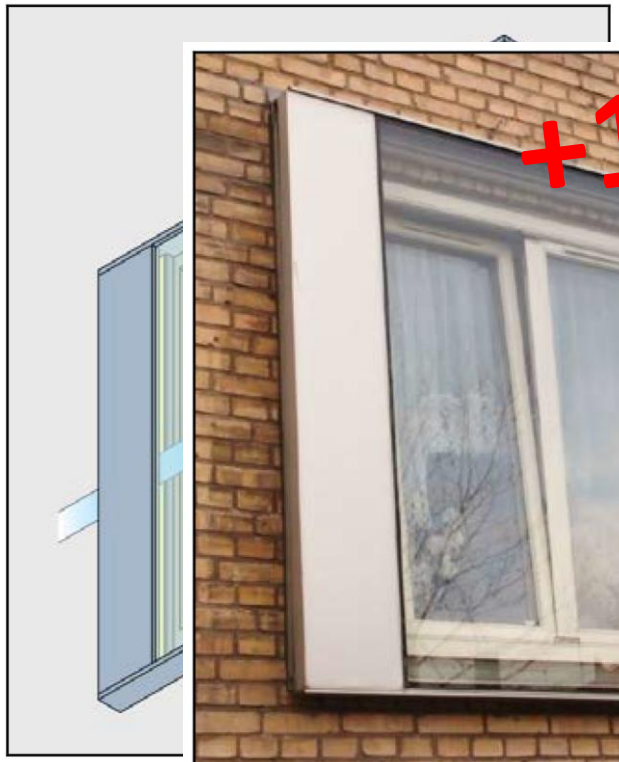


EXAMPLE 2: ST JOHN'S HILL, CLAPHAM





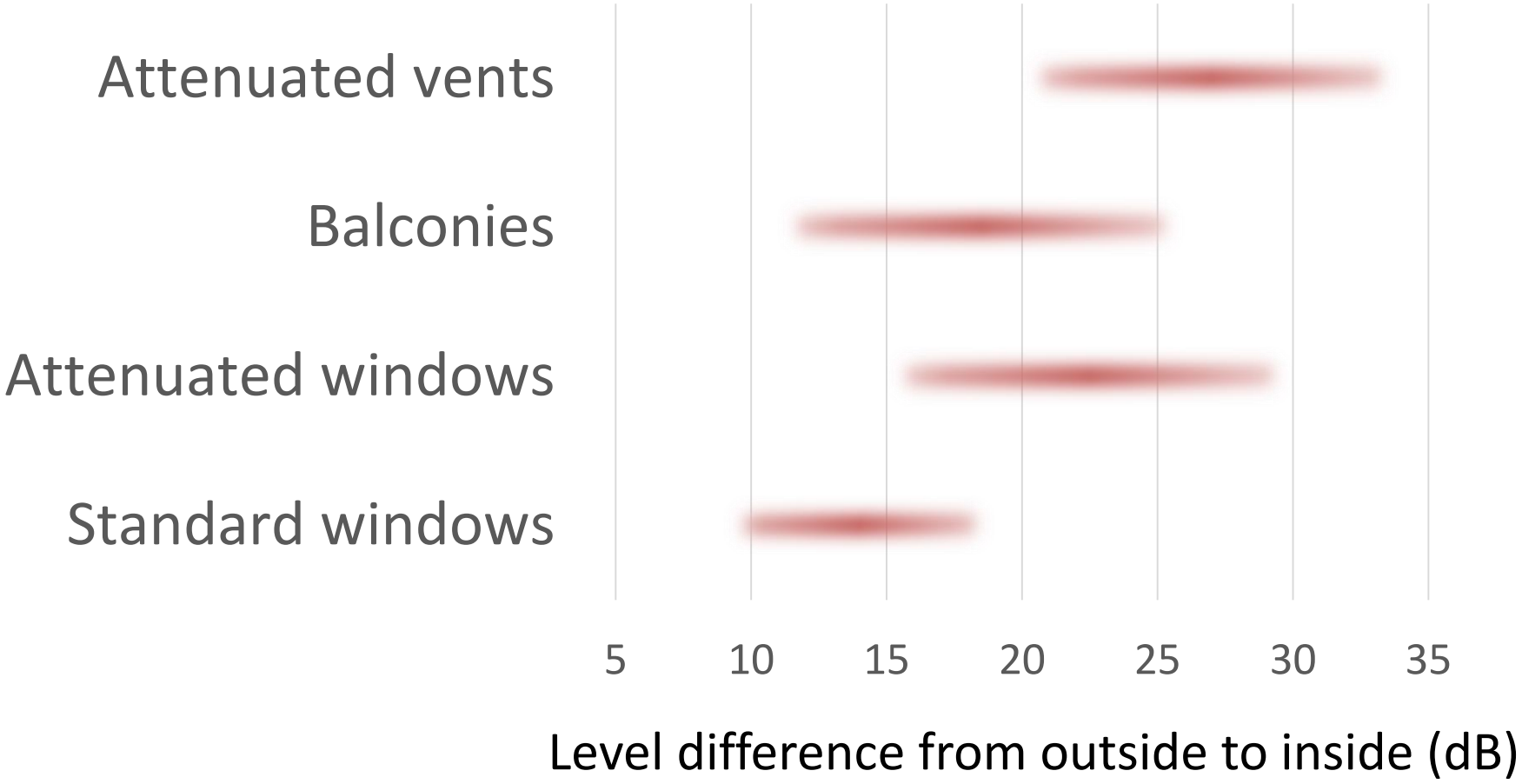
DANISH RESEARCH



+10 dB $R_w + C_{tr}$

http://www2.mst.dk/Udgiv/publikationer/2017/05/978-87-93529-98-4.pdf

OPTIONS


Attenuated vents
Balconies
Attenuated windows
Standard windows
5
10
15
20
25
30
35
Level difference from outside to inside (dB)

SUMMARY

Para. 2.72 g) … design the accommodation so that it provides good living conditions (in respect of acoustics, ventilation and thermal comfort)

ProPG has:

- Linked noise with other IEQ factors

The ANC Guide will:

- Provide detail
- Offer quantitative guidance
- Examples and case study

Further research:

- Appropriate mech vent noise levels
- Noise tolerance with overheating

THANK YOU

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www.apexacoustics.co.uk/noise-and-ventilation-in-dwellings
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