



Placement Impact on
Heat Pump Acoustics

IEA HPT

Annex **63**

BUILDING ACOUSTICS IMPACT OF HEAT PUMPS

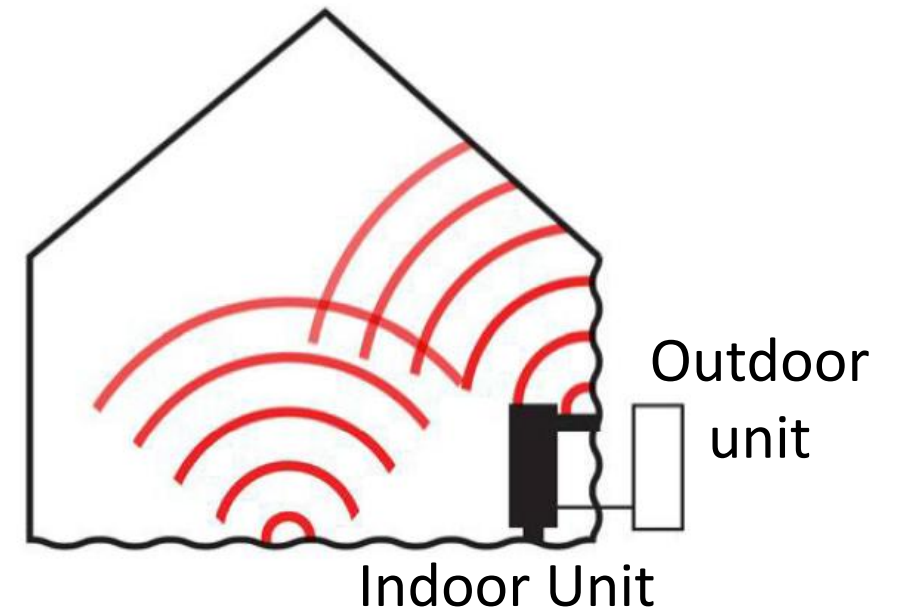
Building Acoustics Impact of Heat Pumps

- Subject of Annex63 Task 1:
 - Impacting the “owner”
 - Structure borne noise & vibrations
 - Refinement of numerical and measurement methods.
 - Assessment of frost free operating points in comparison to maximum power level.
 - Time-correlated flow-acoustic-vibration measurements.
 - ...

Focus of today's workshop: How is the owner effected by the noise of a heat pump?

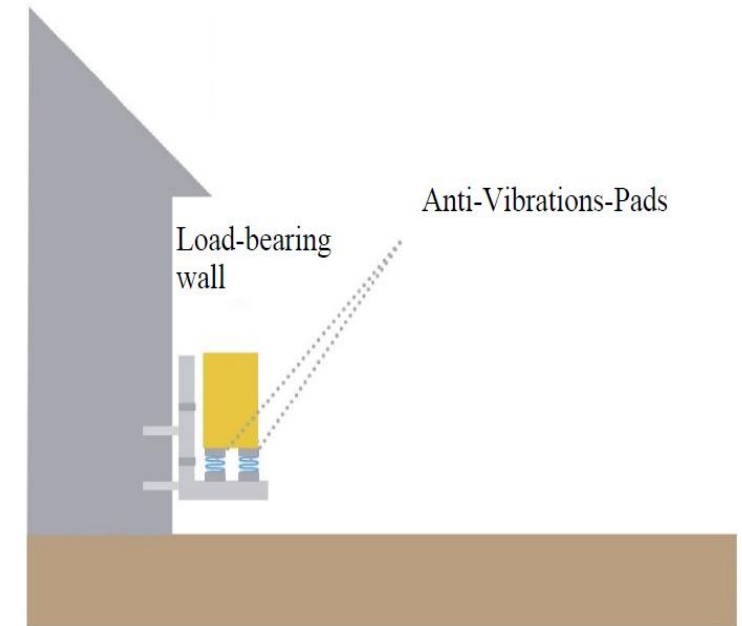
Throwback – Annex51

- Main causes for indoor noise:
 - Compressor (low-frequency)
 - Fan
 - Circulation pumps
- Primary transfer path:
 - Structure-borne via build-structure
 - Vibration input to a structure through the installation's suspension (Outdoor and indoor unit).
 - Floor/Walls: Emit noise by transferred vibrations & Transfer of vibrations.



Throwback – Annex51

- Takeaways from Annex51
 - Outdoor units on walls/roof can excite building structure and be heard indoors.
 - Sensitive spaces indoors are bedrooms and living rooms.
 - Precautions: Prefer ground installation on a heavy, stiff, building-decoupled base and avoid light walls/roofs.



→ [Annex51: theoretical considerations and summary of knowledge](#)

Annex63 – What's new?

- One focus of Annex63 Task 1 is to obtain measurements that provide information on the following topics:
 - On-site measurements
 - Measurements of vibrations, outdoor and indoor sound
 - Consider psychoacoustic evaluation
- Investigate effect of air-borne and structure borne sound to the sound perceived by the owner.
- Case Study of two On-site measurements
 - Contributed by Peutz (NL) and University of Salford (UK)
 - Featured in a contribution for the heat pump conference 2026 in Vienna



Case Study – Peutz

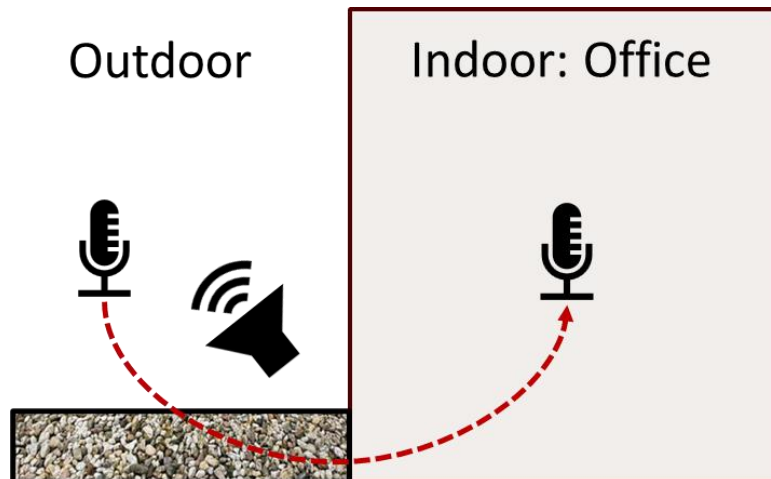


- Heat pump mounted to the side façade of a dwelling.
- Noise complaints in the past lead to changes in the mounting.
- Sound measurements outdoors and indoors.
- Vibration measurements at heat pump and mounting structure.

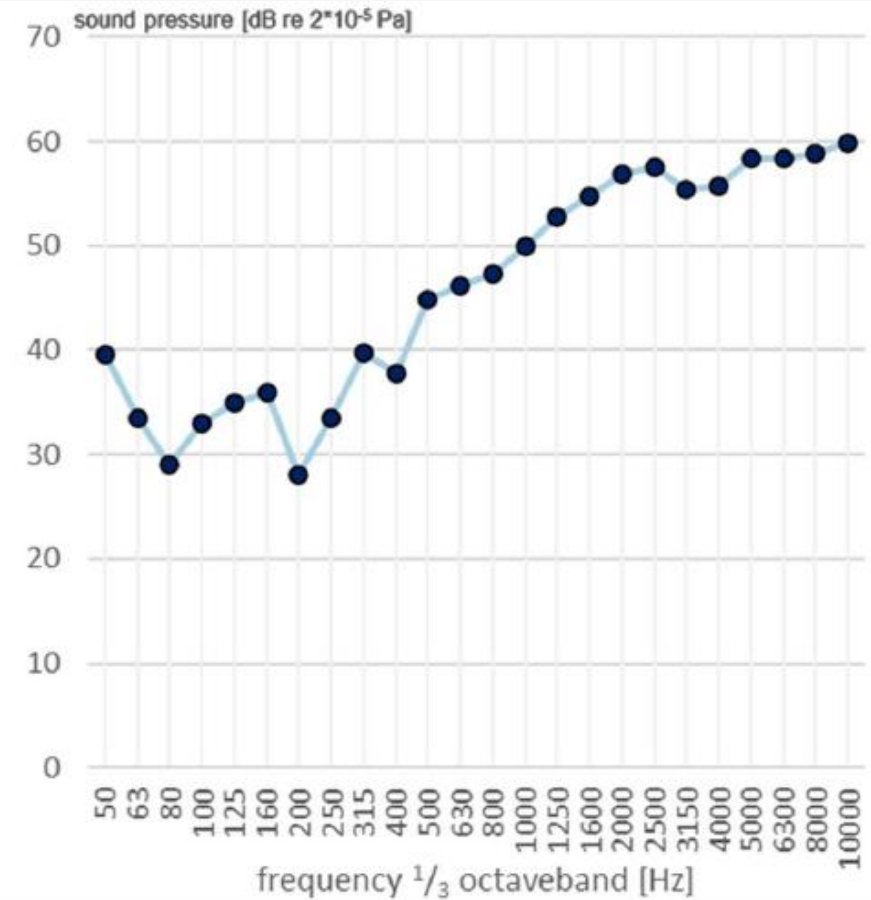
Case Study – Peutz



- Estimation of air-borne sound transmission
 - Source: Speaker placed outside (air-borne sound)
 - Transfer: Outdoor to indoor microphone
 - Used to calculate the expected air-borne noise contribution indoors from heat pump operation.



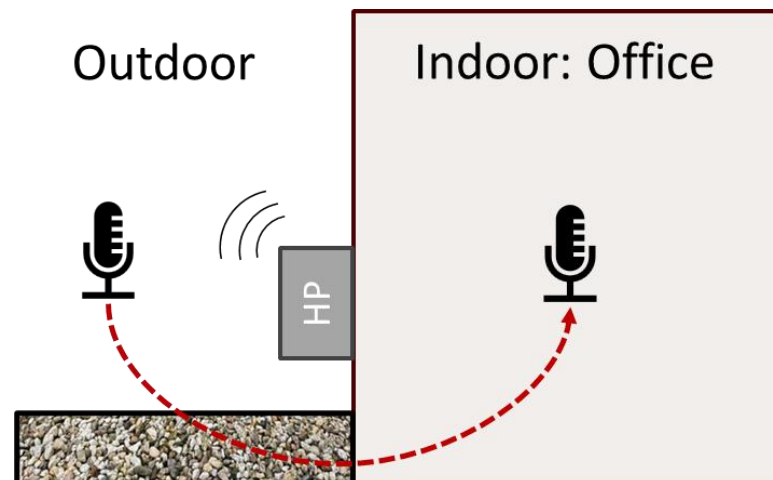
Reduction air-borne sound outside to office



Case Study – Peutz



- Contributions to perceived indoor sound
 - Source: Heat pump (air- & structure-borne sound)
 - Sound measurements outdoors & indoors
 - Estimated indoor sound caused by air-borne sound outside.



Sound pressure levels:

Outdoor: **55 dB(A) @ 1m**

Indoor: **27 dB(A)**
(air- & structure-borne sound)

Indoor estimated: **20 dB(A)**
(air-borne contribution)

Background: **17 dB(A)**

Case Study – Peutz



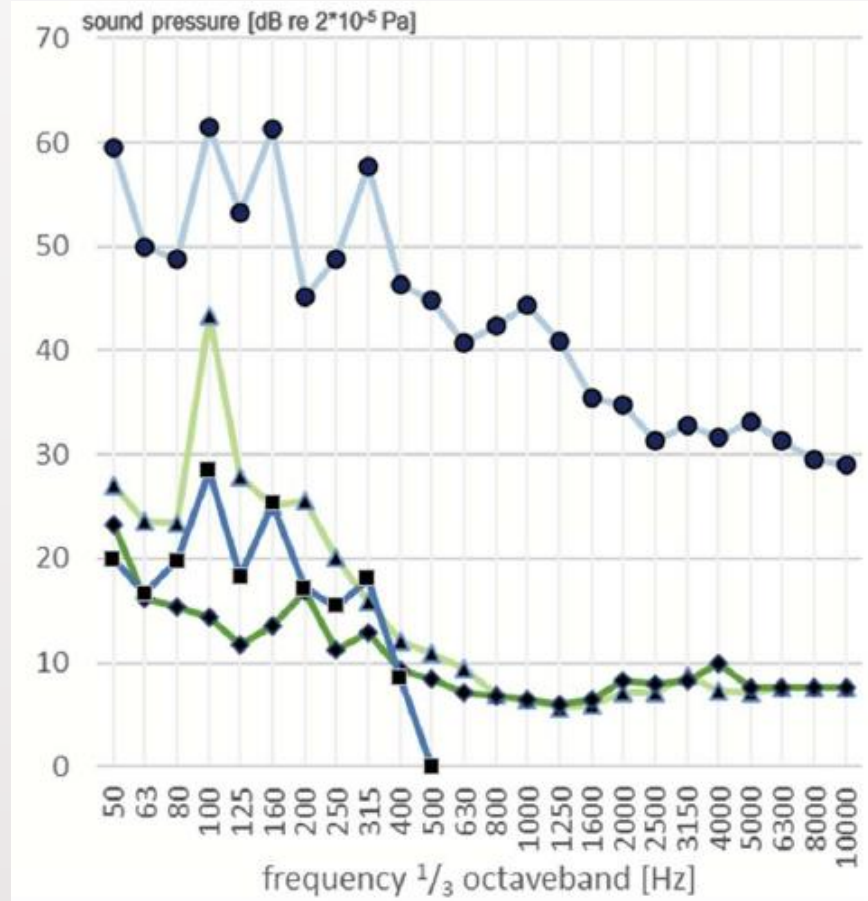
- 1/3-Octave spectrum of heat pump sound:
 - Relevant frequency spectrum indoor : < 500 Hz
 - Dominant Peak @100 Hz cannot be explained by air-borne sound transmission.
- Indoor sound is primarily caused by structure-borne sound transmission.
- Low A-weighted SPL can be misleading, due to attunation of low frequencies in A-weighting.
- Low frequency tonal components have the potential to disturb the owner.

Outdoor sound: 55 dB(A) @ 1m

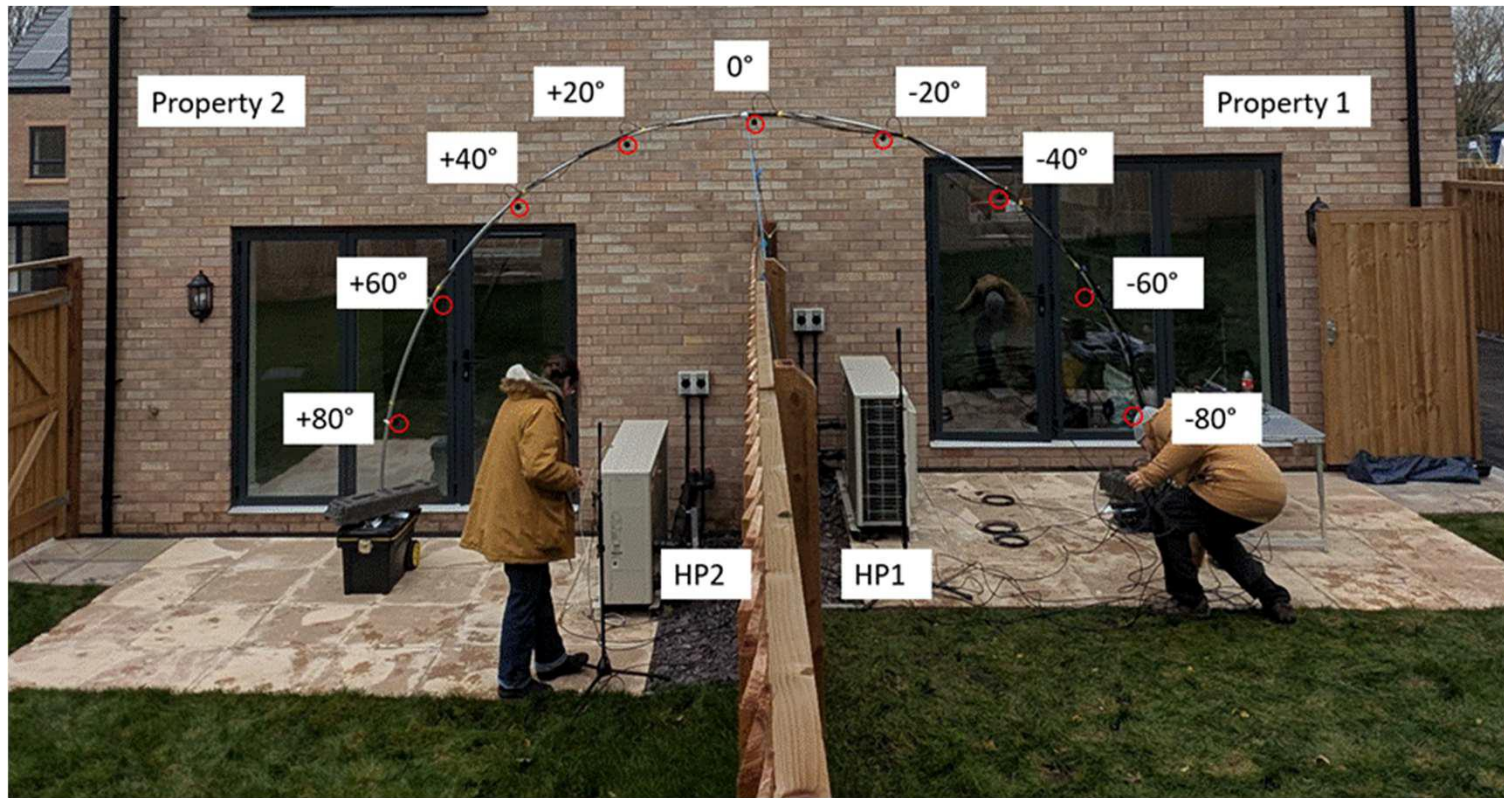
Indoor sound: 27 dB(A)

Indoor sound estimated: 20 dB(A)

Background noise inside: 17 dB(A)



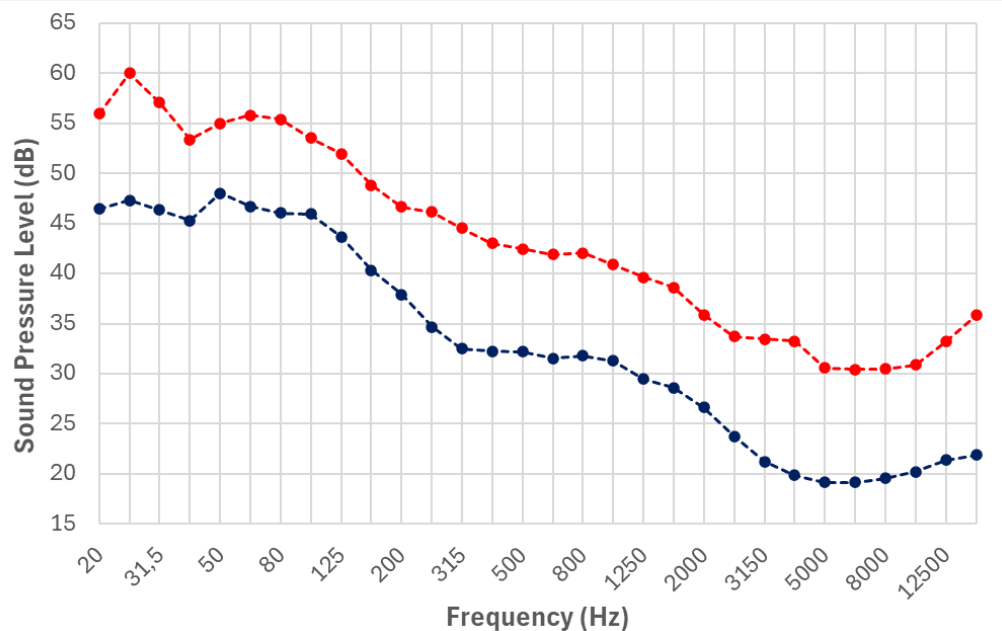
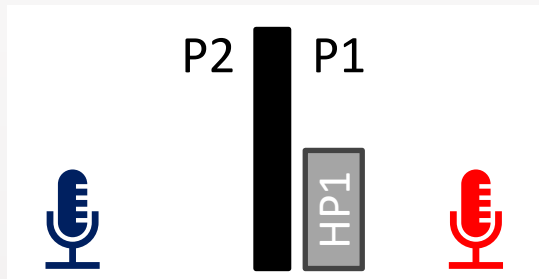
Case Study – University of Salford



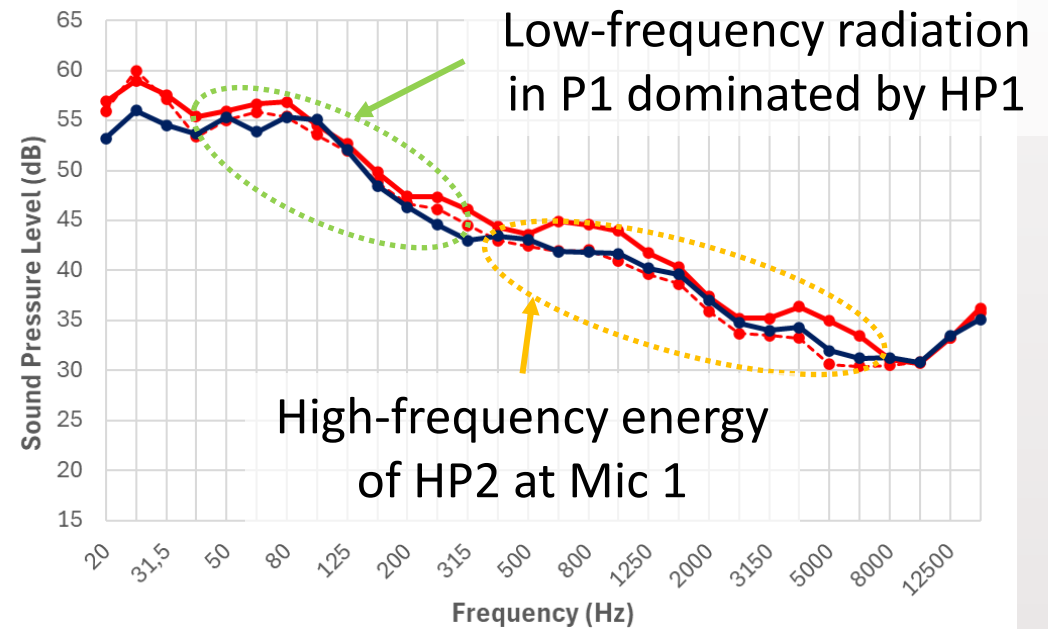
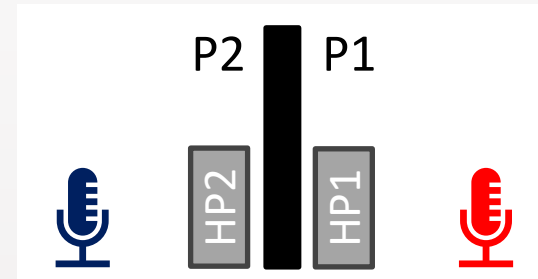
- Two heat pumps separated by a wooden fence installed in close proximity.
- Outdoor sound measurements conducted with a microphone arc. (9 Microphones)
- Discussion of interaction effects & psychoacoustic analysis

Case Study – University of Salford

One heat pump operational

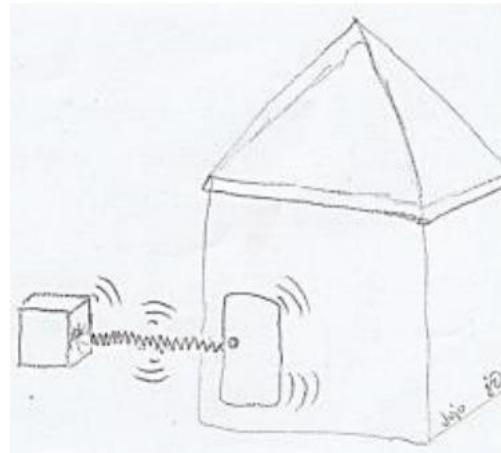


Two heat pumps operational



Conclusion

- Topic of Task 1: Building Acoustics impact of heat pumps.
- Special focus on heat pump noise effecting the owner.
- Contributing a paper with two case studies to the heat pump conference 2026 in Vienna.



Thank you!



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