Acoustic Performance of Walls and Floors in Residential Buildings: A Simulation-Based Study Using ODEON

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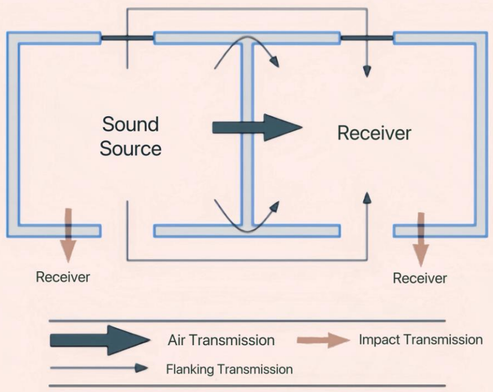
Aim of the Project

This dissertation explores how different **wall and floor materials** affect noise control in residential buildings.
Using **ODEON** simulation software, 18 material combinations were tested to estimate their performance in blocking airborne **(Rw)** and impact sound **(Ln,w).**
The goal is to find practical material setups that reduce noise and meet **ISO standards** for sound insulation.

Background

Noise between rooms and floors is a common problem in modern buildings, especially from upstairs neighbours or adjacent units.
Sound travels in three main ways:



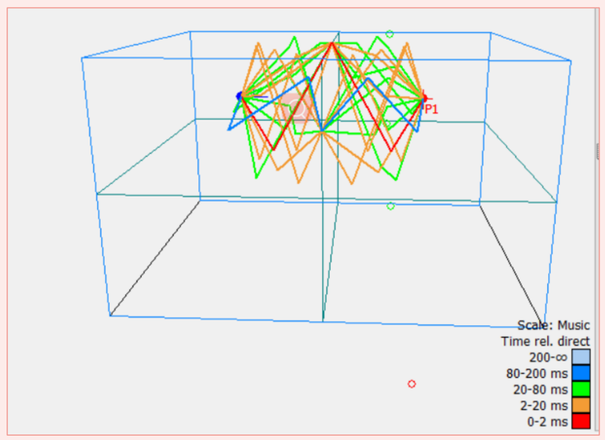
Methodology

Minitab

AUTODESK AutoCAD

Odeon Room Acoustics Software

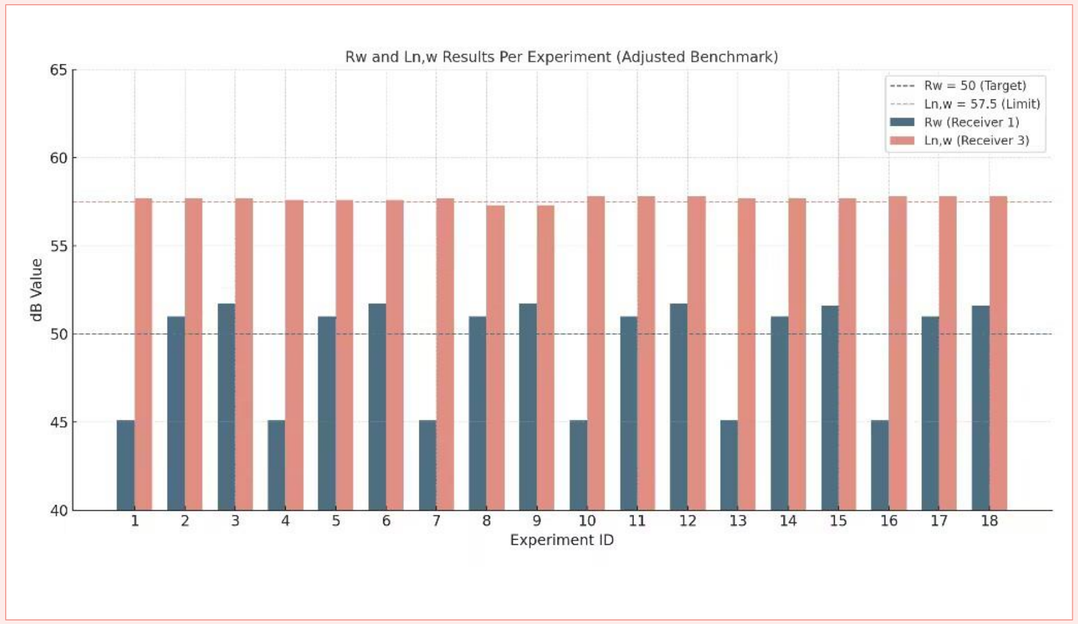
The following images **show the 3D sound path simulation** in ODEON.



This is one example of how sound travels from the source (P1) to the receivers through walls, floors, and flanking paths.
Different colours represent **delay times** for reflected sound energy.

Results & Conclusion

This study tested 18 material setups using a 3D house model in ODEON. Rw and Ln,w were calculated to check sound insulation performance. Only 2 combinations met the target (Rw ≥ 50, Ln,w ≤ 57.5 dB). **Brick and concrete worked best;** timber and plasterboard performed poorly. **RT60, C80,** and **D50** were also used to check speech clarity and comfort.



Brick and concrete materials showed **the best sound insulation**.
Lightweight setups like timber and plasterboard failed to meet ISO standards.
ODEON simulation helped evaluate direct and flanking sound paths.
These findings support better design choices for noise control in homes.

Future work could explore **more material types**, including eco-friendly options. It could also compare simulation results with **real building measurements** to improve accuracy.