REVERSE SEA TO PREDICT FLANKING TRANSMISSION IN TIMBER FRAMED CONSTRUCTIONS

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Content

• Industrial need at the design stage
• Prediction of flanking transmission
• Measurement
• Use of EN12354 Model
• Use of reverse SEA
• Field transmission loss prediction
Building system: CLT
Building system: CLT

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Building system: CLT
Industrial need

- Design the structure, meet all criteria need and all regulations
- Master all design fields
- Compose a structure that don’t over estimate acoustic need
- Use as much as possible simple products for assembly
- Create an acoustic design tool
- Agree with control body on the accuracy
- Validate performance at the design stage
Design process

- **Building elements**
  - Walls, floors, windows, ...

- **Construction Build-ups**
  - Building elements + Junctions

- **Calculation method is based on SEA, EN12354**
Design process

• **Need of inputs**
  - Measurements only,
  - walls, floors,
  - Junctions

\[
2D, R, Ln \\
3D, Dv,ij Kij \\
CLF and DLF
\]

• **Calculation method is based on SEA, EN12354**
Measurement Strategy

- Measure $D_{vij}$ or $K_{ij}$ on core structure
  - Using mapping of vibration reduction

- Measure CLF and DLF
  - Using Reverse SEA
Measurement Strategy

- Measure Dvij or Kij on final structure
  - Using mapping of vibration reduction

- Measure CLF and DLF
  - Using Reverse SEA
Measurement

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Measurement
Reverse SEA Methodology

\[
\begin{pmatrix}
- (\eta_{1d} + \eta_{12} + \cdots + \eta_{1n}) \\
\eta_{12} \\
. \\
. \\
\eta_{1n}
\end{pmatrix}
\begin{pmatrix}
\eta_{21} \\
- (\eta_{2d} + \eta_{21} + \cdots + \eta_{2n}) \\
. \\
. \\
- (\eta_{nd} + \cdots + \eta_{nn})
\end{pmatrix}
\begin{pmatrix}
E_1 \\
E_2 \\
. \\
. \\
E_n
\end{pmatrix}
= \begin{pmatrix}
- W_{inj,1} \\
\omega_0 \\
- W_{inj,2} \\
\omega_0 \\
. \\
. \\
- W_{inj,n} \\
\omega_0
\end{pmatrix}
\]
Measurement reduction
Measurement reduction
Measurement reduction

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Measurement reduction

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Measurement reduction
Measurement reduction

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Measurement reduction
Measurement reduction
Measurement reduction
Field transmission loss prediction

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Insulation Calculation

- Combination of all paths

$$R' = -10\log \left[ 10^{-\frac{R}{10}} + \sum_{ij} 10^{-\frac{R_{ij}}{10}} \right]$$

$$D_{nT} = R' - 10\log \frac{0.16 V}{T_0 S_s}$$
Insulation Calculation $R_{ij}, D_{n,TA}$

$D_nTA = 64 (-2 ; -4)$ dB

$R_{dd}$, Direct sound transmission loss
$R_{w} = 70 (-2 ; -8)$ dB red line

$R_{ff}$, flanking sound transmission loss
$R_{fd}$
$R_{df}$

Global sound transmission direct and flanking

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Conclusion

- Flanking transmission prediction with two strategies for measurement is undergoing
- A prediction model will be set using specific junction characteristics
- Using reverse SEA will help in predicting $D_{v,ij}$
- With the prediction tool and the growing expertise the designer will be more precise for a more competitive use of products
Thank you for your attention