In apartment buildings aluminium facades are not applied very often in the Netherlands. In a case study [1] is explained how, based on laboratory experiments and predictions the airborne and impact sound insulation between apartments were expected to fulfill comfort class demands. In the lab experiments a substitute facade was used in front of the concrete floor between the apartments. After the completion of the apartment building sound insulation measurements have been done in situ. In this paper the measurement results are given and discussed in relation to the prediction. The airborne sound insulation just fulfils the demands in the same way as the results of the lab experiments and predictions.

Introduction

Aluminium facades are mainly applied in office buildings. Applying these types of facades in high-rise apartment buildings with higher acoustical demands, flanking transmission along the facade may become important and maybe even dominant, especially when the facade is situated in front of the (concrete) floor between the apartments and when a higher comfort class is aimed at, i.e. \( R_{w} \geq 57 \text{ dB} \) and \( L_{nT, tw} \leq 61 \text{ dB} \).

The demands for impact sound insulation will probably be met rather easily using a heavy floating floor construction.

A prediction of the airborne sound insulation was made based on the proposed building elements.

Questions about the accuracy of the prediction arose, so tests have been done in the laboratory on the T-junction of floor and facade to determine the overall sound insulation as well as the vibration transmission indices \( K_{v} \) across the junction. By using these results in a new prediction we tried to confirm the first prediction results. Only a substitute facade had to be used in the test because the real facade was not under construction at that moment. Just the direct sound transmission through the concrete floor and flanking transmission via the facade have been taken into account in the laboratory tests. This could be predicted rather well.

1. The junctions

The T-junction of floor and facade consists of a 220 mm concrete floor with a 70 mm floating floor resting on 20 mm of rockwool and an aluminium facade containing two types of double glazing: 8-15-6 mm normal thermal insulating glass and PVB-laminated safety glass 8-12-44.2 mm.

The relevant part of the facade consists of three elements: on each concrete floor an aluminium facade element almost entirely consisting of glazing is mounted hanging; in front of each concrete floor a coupling element is mounted between two facade elements. This coupling element is made of aluminium with plywood and filled with rockwool. It is connected to the upper and lower facade elements by means of flexible rubber profiles.

As the experiments have been done on a substitute façade, both junctions, the proposed and the substitute are given in detail below.

1.1. The proposed junction details

Junction details are shown in figs. 1a and 1b.

Figure 1a Vertical section of the proposed junction
1.2. **The substitute junction**

Junctions are shown in figs 2a and 2b.

As can be seen the proposed and substitute façade do not differ much in weight or bending stiffness. Experiments have been done without a floating floor.

In practice 4 airborne sound insulation measurements have been carried out in vertical direction between 2 apartments on the 5th and 6th floor:
- Between the living rooms in 2 directions
- Between 2 type of bedrooms in vertical direction

Impact sound insulation measurements were done three times:
- From living room on the 6th floor to the living room on the 5th floor
- Similarly between 2 type of bedrooms

Measurement results are summarized in table 1 and 2. In figures 3 and 4 the airborne and impact sound insulation is shown as a function of frequency respectively.

### Table 1 Results of airborne sound insulation measurements

<table>
<thead>
<tr>
<th>source room</th>
<th>receiving room</th>
<th>$R_w$ (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Living 6th fl.</td>
<td>Living 5th fl.</td>
<td>56</td>
</tr>
<tr>
<td>Living 5th fl.</td>
<td>Living 6th fl.</td>
<td>57</td>
</tr>
<tr>
<td>Bedroom 1 6th fl.</td>
<td>Bedroom 1 5th fl.</td>
<td>61</td>
</tr>
<tr>
<td>Bedroom 2 6th fl.</td>
<td>Bedroom 2 5th fl.</td>
<td>59</td>
</tr>
</tbody>
</table>

### Table 2 Results of impact sound insulation measurements

<table>
<thead>
<tr>
<th>source room</th>
<th>receiving room</th>
<th>$L_{N,T}$ (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Living 6th fl.</td>
<td>Living 5th fl.</td>
<td>44</td>
</tr>
<tr>
<td>Bedroom 1 6th fl.</td>
<td>Bedroom 1 5th fl.</td>
<td>44</td>
</tr>
<tr>
<td>Bedroom 2 6th fl.</td>
<td>Bedroom 2 5th fl.</td>
<td>48</td>
</tr>
</tbody>
</table>
Figure 3 Results of airborne sound insulation measurements in practice

Figure 4 Results of impact sound insulation measurements in practice
3. Conclusions

- Prediction of the airborne sound insulation of the lab test set-up with the measured values of $K_{ij}$ agreed with the measurement results.
- In this situation without floating floor prediction showed that the sound transmission via the floor was dominant.
- Prediction of the airborne sound insulation in practice, so with a floating floor, using the measured values of $K_{ij}$ as input data did not agree with the measurement results.
- Prediction results for the apartment building were about 7 dB higher.
- Prediction results for the apartment building showed a dominant sound transmission via the facade.

4. References
