Team Katsura
Wind-driven thermal comfort

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Hypothesis

• Comfort is better in rooms:
  • with openings
  • on the upper floor
  • on the windward side

• How do we define Comfort?
  • Subjective surveys of the 5 team members
  • ASHRAE Thermal Sensation scale
  • Assume -1 to +1 = comfort
Methods – Rooms

• Characterize rooms based on:
  • Windward vs. leeward side of building
  • 1st vs. 2nd floor
  • Openings (windows/doors)
  • Degree of openings (ranked)
Methods – data collection

Physical
• Exterior:
  o Wind direction, windward vs. leeward → observation of trees blowing
• Interior
  o Temperature → measurement, Kestrel
  o Air Velocity → observation (consensus)
    ➢ Scale 1-5 (still to breezy)
  o Thermal Sensation → observation (individual)
    ➢ Scale -3 to +3 (cold-neutral-not)
  o Comfort → assume TS of -1 to +1 = comfortable

Personal
• Clothing value
  o Estimated (individual) → 0.4 to 0.8 clo
Results– Rooms & Average Thermal Sensation
## Results

<table>
<thead>
<tr>
<th>2nd floor</th>
<th>1st floor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Open</strong></td>
<td><strong>Open</strong></td>
</tr>
<tr>
<td><img src="image1.png" alt="Graph A" /></td>
<td><img src="image2.png" alt="Graph D" /></td>
</tr>
<tr>
<td><strong>Closed</strong></td>
<td><strong>Partially open / closed</strong></td>
</tr>
<tr>
<td><img src="image3.png" alt="Graph C" /></td>
<td><img src="image4.png" alt="Graph E" /></td>
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</tbody>
</table>

*WINDWARD*
Conclusions

• Comfort was affected less by orientation (windward vs. leeward)
• Comfort was more affected by degree of openness (windows vs. doors, extent open, etc.)
• Windward ventilation was more readily accessible (but on this cold day, there was a little too much)
• Clo value had less of an impact because individual differences and thermal sensitivities were more significant