BS 2019 2-4 SEPT ROME 16th IBPSA INTERNATIONAL CONFERENCE AND EXHIBITION

INTERNATIONAL BUILDING PERFORMANCE SIMULATION ASSOCIATION

Application Of A Method Of 1-D Equivalent Wall To Multidimensional Geometries : Impact On Building Energy Performance

Speaker:

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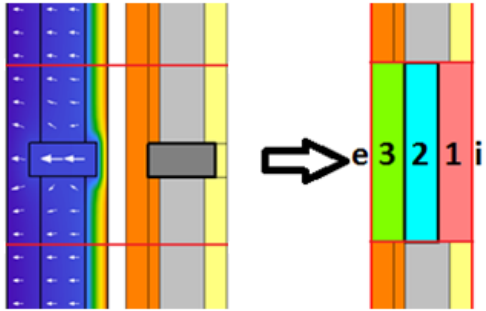
Context

- Use of energy simulation tools
  - Building energy performance : evaluate, predict, optimise
  - Hypotheses → inaccuracies
- Focus on thermal bridges (2/3-D geometries)
  - 4-40% of building heat losses
  - Most of building energy software : 1-D heat flux
    - ✓Steady-state additional heat flux considered (classic evaluation)
    - ! Dynamic effects not considered → wrong sizing of systems
- → Method : accurate, easy to integrate, low resources

Equivalent wall method

- 2-D/3-D geometry is replaced by a 1-D equivalent wall
  - Same thermal behaviour → three-layer
  - R_j, C_j → e_j, k_j, c_j, ρ_j → building simulation

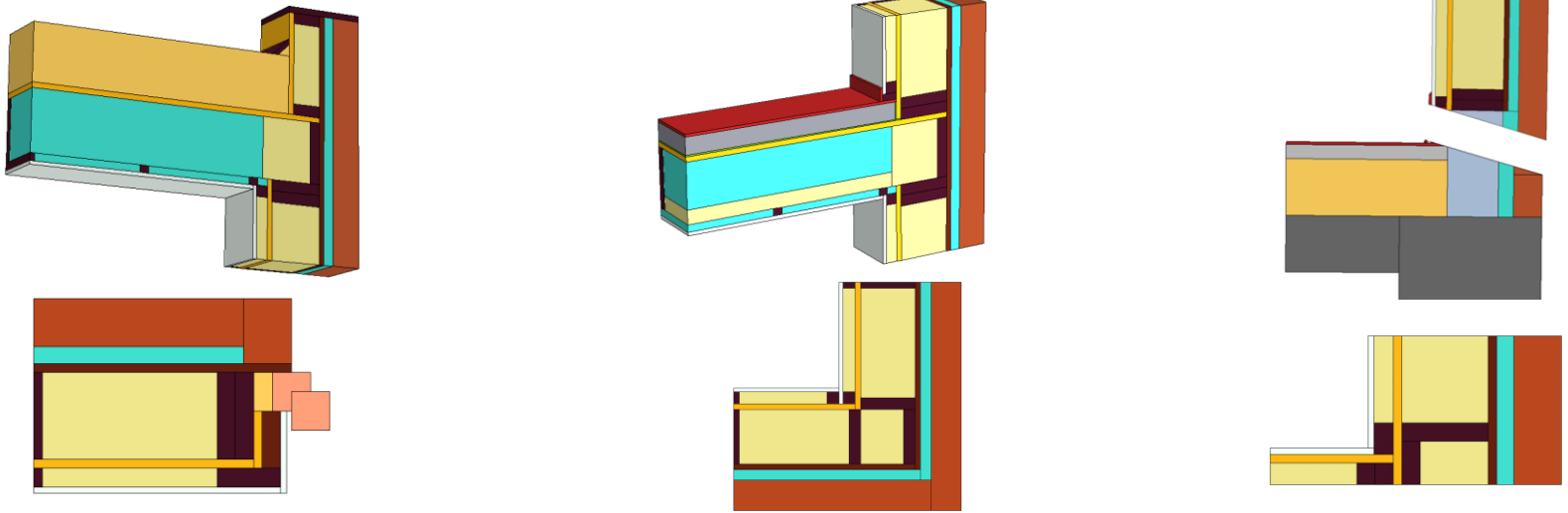


    - Same values of …
      - Resistance R, Heat Capacity C, Structure factors (ϕ_{ii}, ϕ_{ie}, ϕ_{ee})
      - Infinity of possibilities
    - Minimise an objective function F
      - Heat flux $q_i(t)$ through inner surface over time in harmonic conditions

$$F = \sqrt{\sum_{t=400h}^{t=2000h} (q_i(t)^2 - q_i'(t)^2)}$$

Study

- Six thermal bridges of a wooden-structure dwelling
  - → validation of equivalent walls ?
  - → impact on building energy needs ?



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Questions and Comments

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