Post-occupancy evaluation of housing
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What is POE?

POE answers the following broad questions:

• How is a building working?
• Is this what was intended?
• How can it be improved?

(Leaman, Building Use Studies Ltd)
What does POE involve?

POE = Systematic collection and evaluation of information about the performance of a building in use

Data collected:

- measured information - energy consumption, temperatures, lighting levels, acoustic performance, maintenance etc.,
- survey data – designers intentions, occupant comfort + satisfaction, management, etc.

Identifying ways to improve building design, performance and fitness for purpose.
Some quick definitions...

- *Satisfaction survey* = are people happy in the building?
- *Monitoring* = did it measure up physically?
- *Post completion evaluation* = how did the construction process go?
- *Post occupancy evaluation* = are people happy and did the building measure up?
- *Soft Landings* = how do we build all this into the brief?
Current drivers for housing POE

• minimum performance standards on all new housing and on existing housing when subject to material alterations
• all existing public housing stock to be evaluated

Building Regulations:
• recommendation to include POE in future

Good Homes Alliance:
• private developers committed to 2 years monitoring of all new developments (www.gha.co.uk)
What are the benefits of POE for housing?

- Reduces client’s future costs
- Reduces whole-life environmental impact
- Maximises value of property portfolios
- Reduces future liability of clients
- Minimises maintenance costs
- Increases occupants satisfaction
- Increases design know-how
Which POE strategy should I use?

Effective POE is fundamentally multi-modal in its approach - portfolio of methods available including:

- pre-visit questionnaires
- gather technical data to establish construction, systems etc.
- semi-structured interviews with key actors (client, designer, contractor, occupant, manager)
- field observations during walk-through visits + audit
- predicted and actual resource costs identified where possible
- physical monitoring where necessary including thermal imaging

- avoids “bean counting” and highlights things not working
Open ended interviewing adds value

- Brings out hidden factors and tacit knowledge not revealed by specific questions
- Avoids wasting time and energy - interview adapts itself to each situation
- Is more revealing where the same actor is re-interviewed after time
- Reveals problems that would not have been revealed by a standard questionnaire
Typical POE methods used in 4 recent case studies

<table>
<thead>
<tr>
<th>Project/shared POE indicators</th>
<th>Thermal monitoring</th>
<th>Energy use</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>2.</td>
<td>x</td>
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<tr>
<td>3.</td>
<td>x</td>
<td>x</td>
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<tr>
<td>4.</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project/other POE indicators</th>
<th>Humidity</th>
<th>User survey</th>
<th>Thermographic imaging</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td>x</td>
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<td>2.</td>
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<td>3.</td>
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<tr>
<td>4.</td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>

**Bathroom (19 No 03 to 19 Nov 04) 20 day moving average**

- Int Air
- Brick/Intl
- Sheathing
- Ext Air

![Bathroom Graph](image)

![House Image](image)
Case study 1:
Innovative housing in Aberdeenshire

key findings:

50% of households experienced overheating—no thermal mass + poor cross-ventilation

80% of households complained about acoustics

Technical issues included flanking noise via attic
Case study 2: Innovative materials performance in POE

key findings:
Good thermal time lag helps to prevent overheating/underheating
Poor energy performance due to occupants opening windows all the time
Excellent passive conditioning for humidity: 40-60% all year round

unfired clay brick
Case study 3: Innovative low-energy measures in housing

key findings:

13 case studies evaluated over 7 year period
Passive systems generally performed better than active ones
Conservatories don’t work
Poor commissioning and user induction
Case study 3: features used

<table>
<thead>
<tr>
<th>low energy feature/ nos. of cases</th>
<th>initial cases 1999</th>
<th>additional cases 2006</th>
<th>Total</th>
<th>% of all</th>
</tr>
</thead>
<tbody>
<tr>
<td>high insulation</td>
<td>9</td>
<td>9</td>
<td>18</td>
<td>78</td>
</tr>
<tr>
<td>passive ventilation</td>
<td>5</td>
<td>5</td>
<td>10</td>
<td>43</td>
</tr>
<tr>
<td>breathing wall</td>
<td>4</td>
<td>4</td>
<td>8</td>
<td>35</td>
</tr>
<tr>
<td>sunspaces</td>
<td>6</td>
<td>2</td>
<td>8</td>
<td>35</td>
</tr>
<tr>
<td>communal heating</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>30</td>
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<tr>
<td>thermal mass</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>solar panels (water)</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>ground source heat pumps</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>dynamic insulation</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>biomass energy/Combined Heat and Power (CHP)</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Mechanical Heat and Ventilation Recovery (MVHR)</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>
Case study 3: overall acceptance of features over time

<table>
<thead>
<tr>
<th>Feature</th>
<th>Would provider use feature again?</th>
<th>% providers who would use again</th>
</tr>
</thead>
<tbody>
<tr>
<td>high insulation</td>
<td>yes, if affordable</td>
<td>100</td>
</tr>
<tr>
<td>passive ventilation</td>
<td>yes</td>
<td>100</td>
</tr>
<tr>
<td>breathing wall</td>
<td>yes</td>
<td>100</td>
</tr>
<tr>
<td>sunspaces</td>
<td>yes, amenity only</td>
<td>66</td>
</tr>
<tr>
<td>communal heating</td>
<td>yes</td>
<td>66</td>
</tr>
<tr>
<td>solar panels (water)</td>
<td>yes, if affordable</td>
<td>100</td>
</tr>
<tr>
<td>ground source heat pumps MVHR</td>
<td>yes</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td>0</td>
</tr>
</tbody>
</table>
Future directions: Private sector housing

key issues:

Developing housing products that meet the Code for Sustainable Homes
Training design and construction teams to deliver the products
Utilising formal POE feedback including monitoring and surveys
Demonstrating “green credentials” with sound evidence
POE barriers and opportunities....

- Organisations more focussed on the next development than evaluating the one just completed
- Uneconomic to undertake expensive and comprehensive POEs particularly if physical monitoring is required
- Use of POEs which aim to identify only what is abnormal, rather than monitoring normality continuously, can significantly reduce cost of POE
- ‘Snapshot’ POE as a quinquennial maintenance item can quickly recoup costs through problem-identification – can save up to 25% energy costs with no-cost remedial measures.
Dealing with emerging issues

Emergent problems due to:

- lack of precedent
- change in use and management
- changing technology
- poor information management
- design failure
- climate change

Solution = embedding POE in housing procurement
Longitudinal post-occupancy evaluation

- Benchmarks building performance over time
- Allows an organisation to reflect on the cultural changes that have taken place over time
- Helps build capacity of organisations to deal with technological and social change and identifies training requirements
- Articulates the tacit knowledge that tends to get lost in housing organisations due to personnel changes
Thank you for listening to this.....

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