DELIVERING REAL ENERGY EFFICIENCY OPPORTUNITIES & RISKS

Low Energy Know How
15th October 2015

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Zero Carbon Hub
An interesting time for new build homes....

**NZEB System Schematic**

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**EPBD Article 2, NZEB definition:**

[...] ‘nearly zero-energy building’ means a building that has a very high energy performance [...]. The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby.[...]

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nZEB – Cost Optimal Review

- Reviewed every 5 years
- Next cycle is 2017

### Reference Home - Semi

<table>
<thead>
<tr>
<th></th>
<th>Spec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall</td>
<td>0.18 W/m²K</td>
</tr>
<tr>
<td>Roof</td>
<td>0.13 W/m²K</td>
</tr>
<tr>
<td>Window</td>
<td>1.4 W/m²K</td>
</tr>
<tr>
<td>Floor</td>
<td>0.15 W/m²K</td>
</tr>
<tr>
<td>Heating System</td>
<td>Gas 90%, weather comp., zone control, interlock</td>
</tr>
<tr>
<td>Air tightness</td>
<td>6.1 m³/m²h</td>
</tr>
<tr>
<td>Thermal Bridging</td>
<td>0.09 W/m²K</td>
</tr>
</tbody>
</table>

**Primary Energy**

117 kWh/m²/year

Reference Building – May 2013 report
Some context for the challenge

**Part L 2013**

- Opening area: Same as actual up to 25% of floor area
- Ext. walls (W/m²K): 0.18
- Party walls (W/m²K): 0
- Floor (W/m²K): 0.13
- Roof (W/m²K): 0.13
- Windows (W/m²K): 1.4 (g=0.63)
- Air tightness (m³/hr.m²): 5.0
- Thermal bridging (W/m²K): Calculated using the lengths of junctions in the actual dwelling and the psi values provided in Appendix R
- Ventilation type: Natural (with extract fans)
- Gas boiler: 89.5% (SEDBUK)

~ 117 – 120 kWh/m²/yr

**The old days.....**

**END TERRACE MODEL SPECIFICATION**

- Total Floor Area: 76.32 m²
- Number of stories: 2
- Floor U-value: 0.13 W/m²K
- External Wall U-value: 0.18 W/m²K
- Party wall U-value: 0.00 W/m²K
- Roof U-value: 0.13 W/m²K
- Windows U-value: 1.4 W/m²K
- Door U-value: 1.0 W/m²K
- Design air permeability: 5.0 m³/hr.m²
- Condensing Gas Boiler: 1998 or later
- PV: 1.6 kWp
- PV orientation: South East
- Overshading: <20%
- y value: 0.051 W/m²K

**PREDICTED PERFORMANCE**

- Fabric Energy Efficiency: 46 kWh/m²/year
- Carbon Compliance*: 11 kgCO₂/m²/yr
- Primary Energy**: 43.6 kWh/m²/year

~ 45 kWh/m²/yr
Opportunities and risks

- **Performance gap** – moving to solutions
- **Ventilation** – encouraging best practice
- **Overheating** – understanding the issues
Performance gap - First step to solutions

Common themes on site
Site Posters - Fabric and Services

Fabric
1. Groundworks
2. Beam and Block Floor
3. Door Threshold
4. Cavity Wall – partial fill
5. Cavity wall – full fill
6. Floor Joists
7. Separating wall
8. Lintels
9. Windows
10. Bay windows
11. Projecting windows
12. Eaves
13. Roof
14. Dryline
15. Ventilation
16. Heating / hotwater
17. Finals
**Window Installation**

**Problem to Avoid:** Windows installed forward of design position

*Coldspot*

- No overlap of window and cavity

**What to Do?**

- Close the cavity with tightly packed insulation (1)
- Insulation to window reveal (2)
- Window fitter to provide non standard large cill (3)
- Overlap frames with cavity as much as possible - minimum 30mm
- Check trickle vent sizes as design
- Leave at least 10mm tolerance around window frames and structural opening

**Good Practice:** A large overlap with cavity will improve thermal performance. For improved airtightness, use air barrier tapes between the window/door and structure.

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**Eaves**

**Problem to Avoid:** No insulation at eaves

*Squashed Insulation*

- No space for insulation
- Reduced space above joists makes installation of full insulation impossible

**What to Do?**

- Install rigid insulation to top of the wall plate (1)
- Truss design to accommodate space for insulation at eaves (2)
- Lay mineral wool insulation into eaves (3)
- Cut insulation around eaves tinsels

**Good Practice:** Install insulation before eaves are inaccessible.
Ventilation – delivery improvements
Ventilation Field Study

- Focus on MEV and MVHR
- Site walkthrough investigations
- Interviews with key people:
  - Installers
  - Site management
  - Designers
  - Manufacturers
  - Residents
Targeted technical review

Tasks include:

- Volumetric air flow measurements
- Air exchange rates using tracer gas
- Review of commissioning
- Assessment of air inlet provision
  - Trickle ventilators and cross flow
- Overall compliance with Part F
Overheating – a few numbers

- 20%
- 1 in 3
- 9°C
- £100,000
- 2,000
- 7,000
- 100
The issue with definitions

“We’re finding increasingly that the local environmental health officers have a view and they’re potentially at odds with their building control colleagues.”

HOUSING ASSOCIATION
Are Housing Providers looking out for risk factors?

Services design

Thermal mass / purge

Secure ventilation

Shading
Are the tools supporting proper checks?
The 7 Brothers; Guiding SME’s

1. Builders’ Book - Masonry
2. SAP Untangled
3. Thermal Bridging Guide
4. Design Guide
5. Cost Efficiency Handbook
6. Services Simplified
7. Builders’ Book - Timber Frames
Stay in touch:
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Thank you