Innovate UK

Building Better Buildings
Hull

Rob Pannell
Zero Carbon Hub
THE PERFORMANCE GAP PROJECT

Closing the Gap Between Design & As Built
PURPOSE AND STRATEGIC OBJECTIVES

Facilitate the mainstream delivery of low and zero carbon homes working across boarders

- Provide leadership and create confidence
- Reduce risk
- Disseminate information
THE PERFORMANCE GAP
MOVING FORWARD

Government
Industry WG Structure

Core Work Groups
- WG0: Process
- WG1: Concept & Planning
- WG2a: Design
- WG2b: Tools
- WG3a: Materials & Procurement
- WG3b: Procurement
- WG4: Construction
- WG5a: Verification
- WG5b: Testing
- WG5c: CJDs

Steering Group

Industry Executive Committee

Delivery Approaches
- Design and Build
- Speculative Housebuilder

Assured Performance

Services

Further Research
Interim Report

The Problems!
Literature Review

- **State of the industry (aggregated data)**
  - NHBC, LABC, SAP software providers, professional institutions, house builders, manufacturers

- **Compliance processes**
  - As-built SAPs, ACD/ECD use, Air pressure tests, commissioning

- **Field trials**
  - TSB Building Performance Evaluation, EST Heat pump trials

- **Academic studies**
  - Stamford Brook, Elmtree Mews, Temple Avenue

- **“Secret” knowledge**
  - Manufacturers, Universities
Housebuilding Process Review

- 21 sites analysed
- Over 200 units
- Completely anonymous
- Identified many issues
Evidence Review

The truth behind the myths.
Prioritisation of issues

- 15 Priority for Action

AND cross-cutting themes

- KNOWLEDGE & SKILLS
- RESPONSIBILITY
- COMMUNICATION

Evidence Review Report
Inadequate Understanding & Knowledge within Design Team

Impact on:
- Buildability
- Compatibility of systems, materials and services
- Thermal detailing

Typical examples:
- Details into which insulation is impossible to fit
- No detail on support of screed at ground floor perimeters
- No consideration of thermal bridges for rooms over garages
- Etc....
Reality:

- Wall ties ✓
- Compressed edge seal ✗
- Insulation ✗

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IN  FULLY INSULATED PARTY WALL  IN

HOUSE 1  THERMAL BRIDGE  OUT  THERMAL BRIDGE  HOUSE 2
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Compressed edge seal and insulation difficult to install and omitted on site.
2. Concern over Competency of SAP Assessors

Problems with:

- Accuracy of inputs
- Following conventions
- Validating assumptions
- Evidencing assessments

Massive impact where they are giving design advice
How is the u-value calculated?

Can’t assume same thickness across entire roof

500mm roof Insulation specification on 18° roof pitch

Reduced space above joists makes Installation of full insulation thickness impossible despite this being assumed in SAP calculation
Lack of Site Team Energy Performance Related Knowledge and Skills and/or Care

Literature Review -

- “The lack of proper training of the workforce......resulted in significant construction faults, unplanned design solutions and wrong system commissioning”

  Oxford Brookes University, *Understanding the Gap between As Designed and As Built Performance*, 2013
Windows located in front of design positions

- Insufficient overlap with cavity closer
- **All** sites visited had the window in the wrong place
4. Product Substitution On Site

Literature Review -

- “The most striking observation about the application of materials and components were the number of occasions on which materials intended for one location were used in another”

Leeds Metropolitan University, Lessons from Stamford Brook, 2008
INDUSTRY RECOMMENDATIONS

Performance Assessment R&D

Skills and Knowledge Development

Construction Details Scheme

Continued Evidence Gathering
GOVERNMENT RECOMMENDATIONS
GOVERNMENT RECOMMENDATIONS

Signal Clear Direction

Stimulate Industry Investment

Strengthen Compliance Regime

Support Skills & Knowledge Development
ROUTE MAP TO 2020

The challenge ahead
How to address the Performance Gap?

- Provide a good practice guide in simple, clear format

- Use with on site toolbox talks, site manager training, builder’s merchants, building control, designer awareness, specifications, warranty providers.....disseminate lessons to the industry!
Site posters

ZERO CARBON HUB BUILDERS' BOOK

CAVITY WALL

4.0

PROBLEM TO AVOID

GAPS IN INSULATION

WHAT TO DO?

GOOD PRACTICE

1. Protect cavity and insulation from mortar droppings
2. Smooth mortar joints to allow insulation board tight against block
3. Install insulation tightly butted with no gaps
4. Cut insulation tight to cavity closers, trickle and cavity trays

MISSING INSULATION

WHAT TO DO?

GOOD PRACTICE

1. Install rigid insulation behind steel lacing, cavity trays, meter boxes and sulfactor vents or any other elements bridging cavity
2. Blown or injected insulation, ensure this reaches the whole wall with no gaps
3. Adjust drill pattern for tight spots, cavity trays and inject below DPC

Please print and use in your site office, for further information www.zercarbonhub.org
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
THE FUTURE
ZCH
OVERHEATING PROJECT
THANK YOU

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