Building Better Buildings

BPE Case Study – Dungannon Passivhaus
• Choice Housing Ireland Ltd
• Lisnahull Terrace, Dungannon
• Building Performance Evaluation
• The Performance Gap
• Lessons for industry
Choice Housing Ireland Ltd

- Largest Housing Association in Ireland
- Manage around 10,000 homes
- We plan to build 500 homes/year for 5 years
- Experience of developing sustainable homes!
Lisnahull Terrace, Dungannon

The first social housing scheme in Ireland certified to the Passivhaus Standard
Lisnahull Terrace, Dungannon
Passivhaus Standard

Passivhaus is a building design standard, with the following requirements:

- Specific Heating Demand < 15 kWh/m2.yr
- Specific Cooling Demand < 15 kWh/m2.yr
- Specific Heating Load < 10 W/m2
- Specific Primary Energy Demand < 120 kWh/m2.yr
- Air Changes Per Hour < 0.6 @ n50
Lisnahull Terrace, Dungannon
Passivhaus Standard
Lisnahull Terrace, Dungannon
Passivhaus Standard

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Lisnahull Terrace, Dungannon

Some Challenges!

What’s different about Passivhaus for social housing?
- Not a private development (most passive homes are!)
- Tenants aren’t involved in development or design
- Tenants are selected at short notice before handover

Specific Challenges for Lisnahull Terrace
- First of its kind in Ireland
- Lack of consultant and contractor experience
- Steep learning curve
- Tenant language barrier

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Lisnahull Terrace, Dungannon

Mechanical & Electrical Approach

- Thermal Store installed (constant hot water)
- Solar thermal panels installed for hot water and heating
- LPG boiler for remaining heating demand
- MVHR system required to provide controlled ventilation
- Heating provided via ventilation system and radiators
- Tenants decide on heating times and set points

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Building Performance Evaluation

- Building fabric
- Review of systems
- Review of handover
- Post occupancy design review
- Feedback from occupants
- Remote monitoring of heat, electricity, water & environment (every 5 minutes for 2 years)
Performance Gap

- Average energy costs in first few years:
  - 3 bed homes - £900-£1,100
  - 4 bed homes – Approx £1,700

- Higher energy costs than expected, based on design software:
  - 10-15% more energy used in one home, 60-65% more energy used in the other!
  - One home used around 50% more LPG than the other, whilst the other home used around 50% more electricity than the other!
Performance Gap

- Some reasons include:
  - Raw energy costs within SAP
  - Choice of heating type (LPG)
  - Higher room temperatures (23c vs 20c)
  - Unnecessary energy use by occupants e.g. lighting/opening windows
  - White goods and equipment
  - Homes typically more heavily occupied
  - Some issues with systems installed e.g. solar thermal/MVHR
  - Building fabric tested poorer than design expectation (air tightness & insulation)
Lessons for Industry

General Lessons

- Do you need to certify a passivhaus project?
- Future contractors (or DIY)!
- Future occupants!
- Longevity of airtightness measures
- Industry training (and client training!)
- Communication
- Support for occupants
Lessons for Industry

Expectations?

- What design tool are you using e.g. SAP / PHPP?
- What factors are assumed energy costs based on?
- Beware of general “claims” e.g. Passivhaus doesn’t require a heating system.
- Passivhaus focuses more on heat than electricity
- What about how homes are used? Occupancy?
- Expectations of designers / funders / builders / occupants?
Lessons for Industry
Occupancy & Lifestyle!

“..houses are for people to live in... Occupants are not so easily engineered...”

- Difference between social housing and self-build
- Engage with occupants as early as possible
- Should you have to learn how to live in a passivhaus?
- Training/support for occupants e.g. room temperatures & opening windows.
- How are systems integrated – automatic?
- Are controls easy to understand and use?
- Language barrier

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Lessons for Industry

M&E

- Low energy homes can make choosing a heating system more difficult (payback on renewables)
- Specification of equipment (some may not be sourced locally)
- Integrating systems
- Communication is vital between designers / contractors / sub contractors / client / occupant e.g. setpoints
- Maintenance e.g. MVHR filters
- Simplicity of controls
- Issues with most M&E systems at this scheme – would we have known without BPE?

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Lessons for Industry
Specific Lessons - MVHR

- Must be designed, specified, installed and commissioned correctly!
- Occupants should understand importance of keeping the system running.
- Balancing the system by floor?
- Alerts for changing filters

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Lessons for Industry
Specific Lessons – Secondary Systems

- What happens if a “secondary system” fails:
  - Solar Thermal
  - Solar PV
  - Rainwater harvesting
  - MVHR
Lessons for Industry
Specific Lessons – Rainwater Harvesting

- A “Sustainable” technology?
- No metered water charges in NI (yet)
- Cost of running the system
- Are they left running or switched off?
- Maintenance implications
- Increased risk?
- CO2 saving on water vs CO2 cost of pump?

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Lessons for Industry
Specific Lessons – Thermal Stores

- Can be a great piece of equipment for a home!
- Is it appropriate for a very low energy home?
- How are multiple heat sources controlled to ensure lowest cost and constant hot water etc?
- What are the settings?
- Heat losses into the home!
Lessons for Industry

Killynure Green, Carryduff

First scheme in NI designed to Level 5 of The Code for Sustainable Homes

- Lessons taken from our BPE project!
- Increased training/support for occupants
- M&E Redesign
  - Removed thermal store
  - Change to Gas Combi boiler
  - Removed solar thermal
  - Increased Solar PV
  - Removed heat recovery from showers/baths
  - Changed from UFH to Rads

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Lessons for Industry

Killynure Green, Carryduff

First scheme in NI designed to Level 5 of The Code for Sustainable Homes

- Outcome!
  - Capital saving of over £50,000
  - Increased revenue from ROCs
  - Fewer systems to integrate (simplified for consultants, contractors, sub-contractors, client & Occupants!
  - Expected reduced running costs for occupants
  - Expected reduced environmental impact
  - Reduced maintenance for Choice

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Lessons for Industry
Building Performance Evaluation

- Significant problems with monitoring which industry needs to address
- Monitoring still expensive
- Don’t under-estimate time commitment!
- It has proven very beneficial for Choice!
- Consider what BPE information do you need?
- Temporary/mobile option for monitoring?
Thank you.

Questions?

- Energy Independence
- Preserve Rainforests
- Sustainability
- Green Jobs
- Livable Cities
- Renewables
- Clean Water, Air
- Healthy Children
- Etc. Etc.