Fareham Borough Council
Passivhaus Feasibility Study

Dr Sarah Price

Enhabit
Fareham BC have adopted a Passivhaus policy for Welbourne Garden City known as WEL 36

WEL36 (Part)

“Proposals for residential development shall incorporate 10% of dwellings built to Passivhaus Standard, unless it can be demonstrated to be unviable by means of a financial assessment which clearly demonstrates the maximum proportion of dwellings built to Passivhaus Standard which can be achieved.”
What questions did Fareham have about Passivhaus?

1) What are the advantages and disadvantages of Passivhaus?
2) What is equivalent to Passivhaus?
3) What is the residential sales and buy-to-let market demand for specialist Passivhaus house building?
What did we do to answer those questions?

Whole Life Cycle Costing Analysis for:

• Building regulations
• AECB Building Standard
• Passivhaus

Interviews:

University of Bath
Oxford University
Hastoe Housing Association
East Midlands Homes
Exeter Council
Norwich City Council
CLC International
Lendlease
Broadland District Council

University
University
Social Landlords
Social Landlords
Council/Social landlord
Council
Developers
Developers
Council/Developer
What did we do to answer those questions?

Interviews with

- Council members involved in the Sarisbury scheme
- Local and national estate agents

Viability modelling for a development of 100 houses with

- No Passivhaus dwellings
- 10% Passivhaus dwellings – all affordable rent
- 10% Passivhaus dwellings - proportion affordable and market sale
Tenants love Passivhaus

They report

very low energy bills
improvements in conditions such as eczema and asthma
lovely fresh air
happiness
controls can be a bit complicated/strange

No tenants were interviewed first hand as part of this study, these are all reports from our interviewees
Benefits of Passivhaus for landlords..

Higher standard of workmanship throughout the whole fabric of the building

Contractors can’t cut any corner. You get what you have designed and specified;

- **EXCELLENT**
- GOOD
- AVERAGE

*MIND THE GAP*
Benefits of Passivhaus for landlords..

More climate resilience and healthier homes; Lower risk of underheating and overheating

Reduction in antisocial behaviour; Fewer complaints from tenants, excellent ambassadors for their homes;
And what they hope to see in the future...

- Reduction in void times;
- Continued performance over the lifetime of the building;
Disadvantages of Passivhaus

- Cost premium
- Potentially higher maintenance costs
- Complicated controls/new environment for tenants

Social landlords would build Passivhaus every time… if they could afford it.
Passivhaus *can* work for private sale

There are only two completed private sale Passivhaus scheme that we know of:
- Remedial action costs money, get air tightness right in the first place
- Excellent site management is required
- Certification is a must
- They do cost more to build – between 0 and 25%...... average = 11%
- There is very little awareness of Passivhaus in the market – Agents were questioning if it were mortgageable!

So did they sell for more??

Yes.....but......
Carrowbreck scheme – 14 market sale Passivhaus units

- Didn’t achieve the uplift expected – but the market is more bouyant now
- It was tough to get Passivhaus across to the buyer and the selling agents
- Lots of data and feedback collected from this development – 85% of respondents would prefer to live in a Passivhaus or would only purchase a Passivhaus in the future
- Residents are applying for planning to make changes – are they sticking to Passivhaus principles?
There are more Passivhaus units coming up...

- Norwich City Council are developing Rayne Park in Norwich for both affordable housing and market sale
- 172 houses – 112 will be Passivhaus, some Code level 5
- Phase 1 Passivhaus homes are currently for sale – the show home opened in Jan 2018
- Initial feedback is that the Passivhaus homes are more desirable and have an edge on the market
What is equivalent to Passivhaus?

There is no equivalent = 11111
No idea = 1
Fareham Council = There has to be, because we’ve written it in our policy!

Sustainability standards

- Code for Sustainable Homes
- Home Quality Mark
- Energy Efficiency Standards
  - AECB Building Standard
  - Passivhaus standards
- Carbon Reduction Standards
  - Part L - Building Regulations
  - Zero Carbon Homes

ukpassivhausconference2018
Modelled AECB Building standard and Passivhaus

<table>
<thead>
<tr>
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<th>Passivhaus</th>
<th>Passivhaus Institute Low Energy Building</th>
<th>AECB Building Standard</th>
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<td>Space heating demand (kWh/m² annum)</td>
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<td>30</td>
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<tr>
<td>Primary Energy (kWh/m² annum)</td>
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<td>135</td>
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<td>Air tightness (ach⁻¹)</td>
<td>0.6</td>
<td>1.0</td>
<td>1.5</td>
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- Modelled four archetypes in PHPP to meet AECB & Passivhaus targets
- Limit AECB U-values to building regs maximum in some cases
- Model four archetypes in SAP using PHPP inputs
- Examine AECB & Passivhaus performance in UK Building regs
AECB and Passivhaus vs UK Building regulations

- AECB standard did not meet building regulations in 3 out of 4 cases in South of England without solar PV.
- When modelled in any other UK climate zone, they would have passed with fabric alone.

PHPP results for AECB Building standard

- Detached = 40 kWh/m²annum
- Semi = 38 kWh/m²annum
- Mid-terrace = 30 kWh/m²annum
- Mid-floor flat = 20 kWh/m²annum
Whole life costing analysis – 5 cases

CASE 1
- Building regulations compliant Part L1a
- Gas boiler for space heating
- Gas boiler for hot water
- Natural ventilation
- Masonry cavity wall construction

CASE 2
- Passivhaus
- Electric space heating
- Air source heat pump (ASHP) for hot water
- Mechanical ventilation with heat recovery (MVHR)
- Timber frame construction

CASE 3
- Passivhaus
- Gas boiler for space heating
- Gas boiler for hot water
- Mechanical ventilation with heat recovery (MVHR)
- Timber frame construction

CASE 4
- Passivhaus
- Gas boiler for space heating
- Gas boiler for hot water
- Mechanical ventilation with heat recovery (MVHR)
- Masonry cavity wall construction

CASE 5
- AECB Building Standard
- Gas boiler for space heating
- Gas boiler for hot water
- Mechanical ventilation with heat recovery (MVHR)
- Masonry cavity wall construction
Whole life costing comparison

All figures are quote at their Net Present Value. Discount rate has been modelled at an average of 3% over the 100 year period. Cost inflation has been modelled at 2%.

CASE 2
Passivhaus - Timber frame, Electric space heating, AHSP hot water, MVHR

CASE 3
Passivhaus - Timber frame, Gas heating & hot water, MVHR

CASE 4
Passivhaus - Masonry cavity walls, Gas heating & hot water, MVHR

CASE 5 AECB
Building standard - Masonry cavity wall, Gas heating & hot water, MVHR

DECC Central  Central + 0.54%  DECC High  High + 1.9%
Energy consumption comparison

Total energy bills for year 1

CASE 5 AECB Building standard, Gas heating & hot water, MVHR
CASE 3 & 4 Passivhaus - Gas boiler for space heating & DHW, MVHR
CASE 2 Passivhaus - Electric space heating, AHSP DHW, MVHR
CASE 1 Part L, Gas boiler for space heating & DHW, Nat Vent

- Space heating costs
- Hot water costs
- Other costs (auxiliary and unregulated)
Capital costs comparison

Construction costs - Percentage uplift on Building Regulations

CASE 2 Passivhaus
- Timber frame, Electric space heating, AHSP hot water, MVHR

CASE 3 Passivhaus
- Timber frame, Gas heating & hot water, walls, MVHR

CASE 4 Passivhaus
- Masonry cavity heating & hot water, MVHR

CASE 5 AECB Building standard
- Masonry cavity wall, Gas heating & hot water, MVHR
Findings and recommendations

- 10% Passivhaus has **limited impact on the financial viability** of the Welsborne development
- Increase number of Passivhaus units in each development phase
- Only use the **PHI Low energy building standard** for an alternative to Passivhaus in terraces, semis and detached properties
- There should be **no alternative** for high rise and apartment blocks
- **Sustainability standards are not equivalent to Passivhaus** as they do not guarantee the quality in workmanship
- Zero carbon homes are more likely to result in a **technologically complex** design as opposed to a fabric first approach
- All Passivhaus or PHI Low energy buildings **must be certified**
- The majority of Passivhaus dwellings should be **affordable housing** with a small proportion market sale
- **Training for contractors and developers** agents may be required
- Ensure Passivhaus dwellings have **clear non-technical guidance**
- There is value in **monitoring the performance** and use of new Passivhaus housing
Thank you...

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