PASSIVHAUS TO ZERO CARBON HOMES
ALLAN THOMPSON – TOLENT LIVING
• The Government has committed to reducing all carbon emissions to be reduced by 80% by 2050 and UK housing is estimated to account for c. 30% of all carbon emissions

• The Government did want UK new build housing to be zero carbon by 2016 (plans abandoned in 2015)

• Fuel costs in the UK continue to rise – annual electricity and gas bills up by 80% since 2003

• Europe has been building environmentally friendly housing far longer than the UK and so has much more knowledge and experience in this area
DEFINITION OF PASSIVHAUS

The term “PassivHaus” refers to a specific construction standard for buildings with good comfort conditions during summer and winter, without the need for a traditional heating system. (Data: Passive House Platform)

Design concept developed in Germany

- Space heating 15 kWh/m²/year
- Primary energy 120 kWh/m²/year
- Airtightness 0.60 times its volume per hour at a pressure of 50 pascals
**PROJECT OVERVIEW**

**Name:** Racecourse Estate Bungalows  
**Type:** 28 No. affordable bungalows for the elderly with 25 No. Passivhaus accredited:  
- 25 x 2Bed/3Person  
- 2 x 2Bed/3Person wheelchair  
- 1 x 2Bed/4Person wheelchair  

**Build type:** Timber frame faced with brickwork and render  
**Location:** Houghton le Spring, Sunderland  
**Occupancy:** Occupied since January 2012  
**Budget:** £3.4M
PROJECT OVERVIEW CONTD.
SUMMARY – CONTRACTOR CHALLENGES

Every opening/junction/joint in the building had been specifically designed

Air tightness is so stringent that even letterboxes were not permitted

It was vital the new homes were built exactly as shown on the drawings

Stage by stage tests determined whether the required quality of construction was being achieved and if it was not where the home was failing and therefore where responsibility lay

The build quality was unique and very real challenge for everyone involved in the project
Air-tightness requirements of PassivHaus

No. of units

Airtightness - standard deviation graph

based on test results at Stamford Brooke
SUMMARY – CONTRACTING APPROACH

- Site induction video produced
- Dedicated quality manager appointed
- Air tightness 'culture' instilled on site
- Site based workshops/toolbox talks
- 3 detached plots as a 'test bed'
- All detail drawings have a comprehensive inspection checklist
- Interim air testing by site team
In context, the measured and predicted whole house heat loss for both dwellings represent the two best performing dwellings out of a sample of 21 other new build coheating tests undertaken by Centre of the Built Environment at Leeds Met over the last decade.

Technology Strategy Board
Building Performance Evaluation Report
25th March 2013
“These bungalows are beautiful, we haven’t had our heating on yet! My husband was always cold before we came here.”

“It’s great in the cold weather my new home is cosy and warm and I don’t have to worry about heating costs any more as I rarely use it.” I really like living here the bungalows are brilliant!”

“The passiv bungalows are fantastic, I absolutely love my home and have settled in well here”
PASSIVHAUS TO ZERO CARBON

RACECOURSE ESTATE – HOUGHTON LE SPRING

ESTON ECO VILLAGE – SOUTHBANK MIDDLESBROUGH
Airtightness – 0.60m³/hr/m² (5m³/hr/m²)

U values – ground floor 0.10 (0.17), ext wall 0.10 (0.24), roof 0.09 (0.10), windows 0.90 (1.30), ext doors 0.90 (1.20)

Solar thermal – 4.2m² (4.2m²)

PV – 4.70 kWp (none)

MVHR (none)

Passivhaus principles but not formal PH accreditation
ESTON ECO VILLAGE – SOUTHBANK MIDDLESBROUGH

New build homes with
4 No. zero carbon
2B/4P = 6 = 78 M2
3B/5P = 9 = 96 M2

Retrofits on Queen Street
2B/3P = 11 no. = 75m2
ESTON ECO VILLAGE – SOUTHBANK MIDDLESBROUGH
Roof – o/a target U value 0.09

- Insulated pre-formed cavity closer for 300mm cavity
- 2 layers of 100mm Kooltherm K7 insulation
- 18mm bitroc boarding with joints taped for airtightness
- Airtight tape at junctions
- 50mm services void with mineral wool insulation
**Ext walls** – o/a target U value 0.10

- Airtight tape between window & plaster finish
- Preformed insulated cavity closer
- Triple glazed windows U value 0.90
- 425mm basalt resin wall ties
Ground floor – o/a target U value 0.10

- 300mm cavity filled with injected EPS beads & basalt resin wall ties
- Airtight tape at junctions
- Wet plaster wall finish
- 378mm EPS blocks fitted between pcc beams
- EPS boarding below cavity tray
LESSONS LEARNT/OBSERVATIONS

- The same site team have built Zero Carbon homes using PassivHaus principles but not PassivHaus certified products

- Our Zero Carbon homes have been traditionally constructed – no Modern Methods of Construction

- Using PassivHaus principles of high levels of air tightness and insulation is an easily understood tangibly beneficial approach

- We found the traditional masonry construction of the Zero Carbon homes much easier to design, procure and build, being much more familiar territory for us as a house builder

- Passivhaus approach gives best correlation between design and as built performance
WHERE ARE WE NOW?

• 2006 UK Gov. all new build homes zero carbon by 2016
  Abandoned in 2015

• 2008 Zero Carbon Hub set up to oversee the road to zero carbon
  Closed in March 2016

• Department of Business, Energy & Industrial Strategy
  Department of Energy & Climate Change dissolved in July 2016

• June 2016 UK Gov. targets 57% reduction in CO2 emissions by 2030
  Emissions Reduction Plan ???

• June 2016 now looking at 6th UK Housing Minister since 2010
WHAT DO WE NEED NOW?

• Clarity & certainty about future policy direction
• Strong Public Sector Leadership
• Policies which cover new build and more importantly existing housing
THE TEAM

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