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Bristol Infill Sites

Small Scale Passivhaus

Tomas Gaertner – Gale & Snowden Architects

WHO ARE WE?

Since 2008 we have been involved with Passivhaus

Architects
Mechanical Engineers
Landscape Architects
Passivhaus Designer
Building Biologists

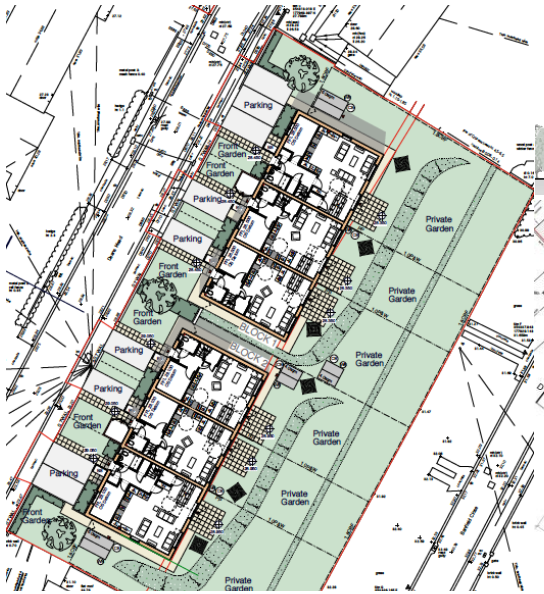
2010 completed the first multiresidential Passivhaus in the UK

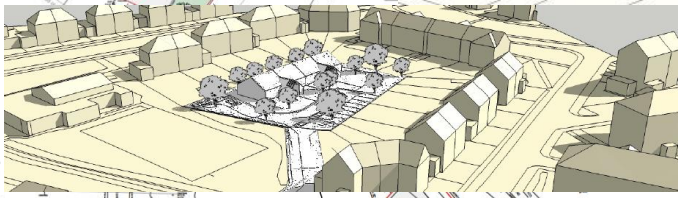
In 2014 became the first UK Building Biology consultancy accredited with IBN

Multidisciplinary
Integrated
Design lead team

Current Passivhaus work inlcudes residential, commercial, education and leisure projects

The Bristol Infill Sites





Project started in 2015

5 sites

23 homes

All sites within 1km

Former brownfield /garage sites

Mix of 1 and 2 bed bungalows and 2,3 and 4 bed houses

Completion in 2017

The Bristol Infill Sites

Why Passivhaus?

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As the 2015 European Green Capital, Bristol City Council decided to build exemplary housing projects on brownfield sites.

Originally tendered as CSH level 4, the development team changed the brief to Passivhaus when the Code was abolished in 2015

The project brief retained many of the original sustainability features like e.g. landscape integrated SUDs, waste credits, high daylighting and acoustic performance and on site renewable energy provision.

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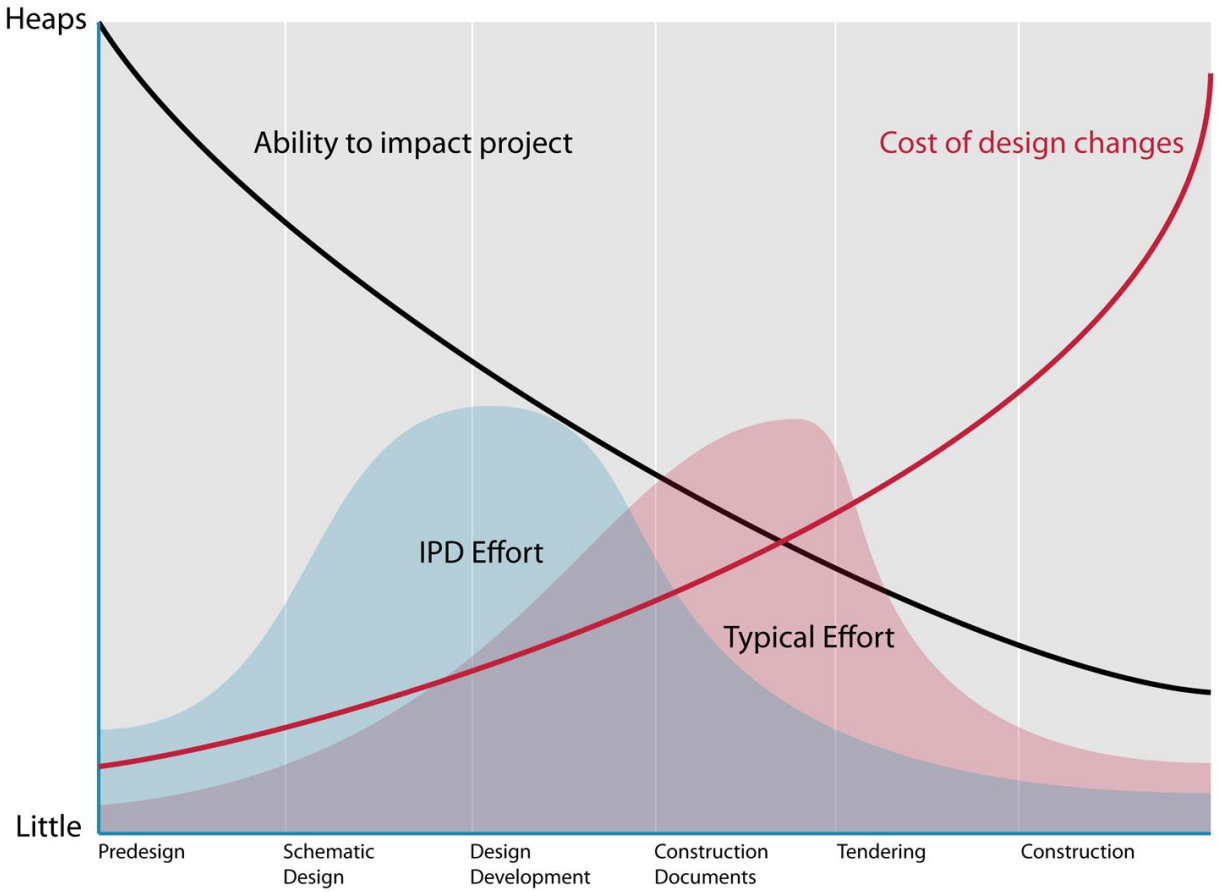
1 Planning Ahead

early adoption and integrated design

Influencing Costs

MacLeamy Curve (2004)



2 Design

Take the ‘free’ Energy Savings

Maximise ‘free’ energy savings

Orientation

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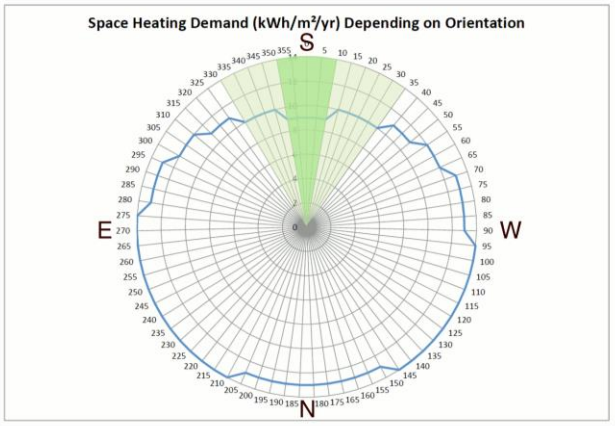
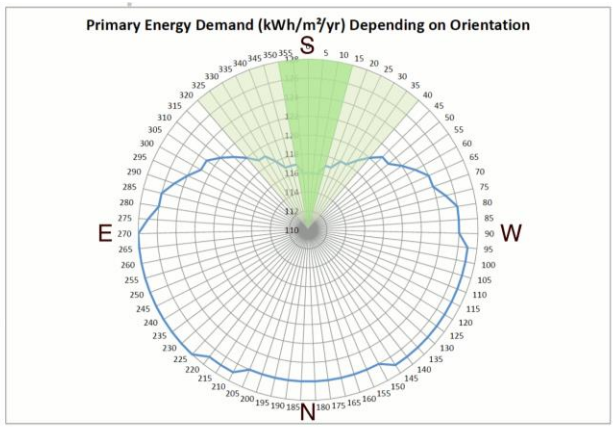
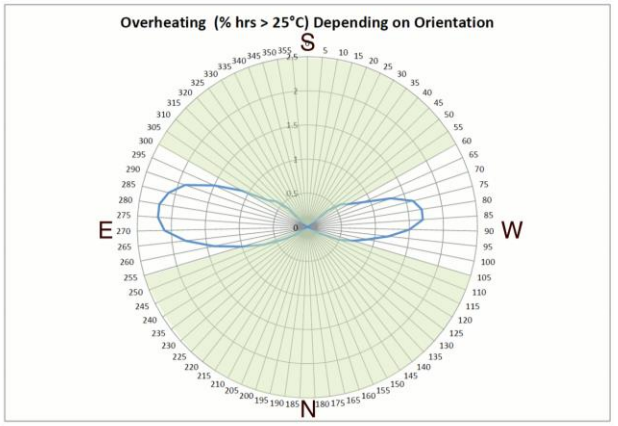






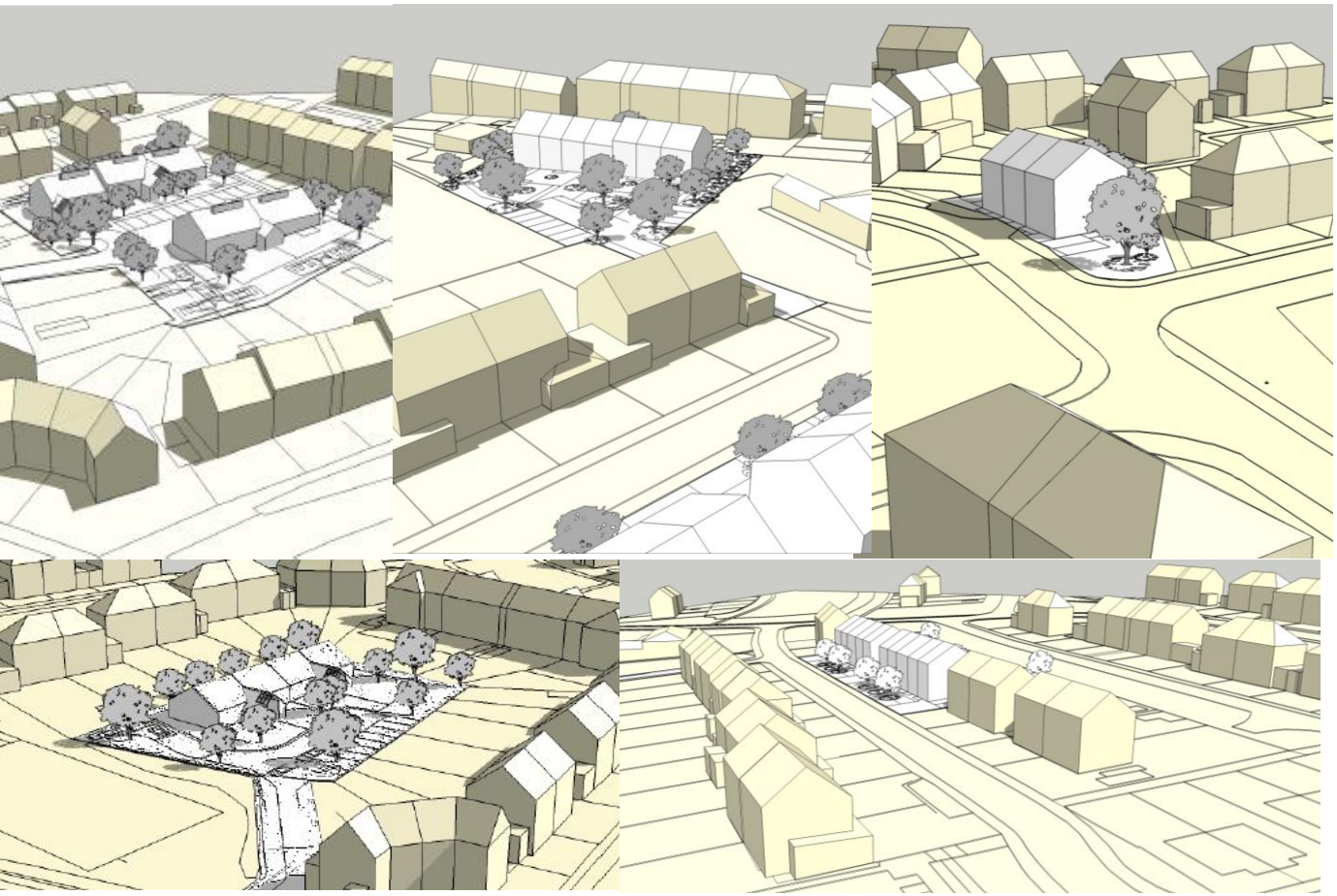
Maximise ‘free’ energy savings

Orientation

Working for a ‘political client’ required compromises on site layouts and design to accommodate stakeholders views.

Maximise ‘free’ energy savings

Orientation



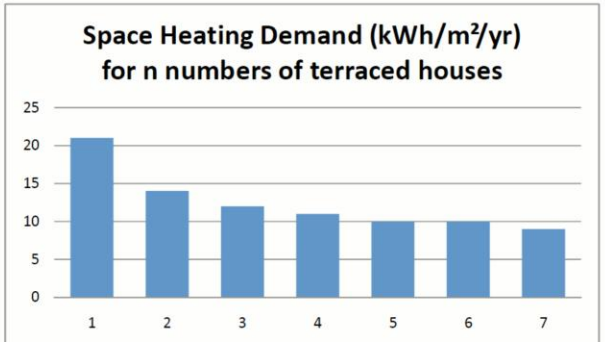
Tight sites

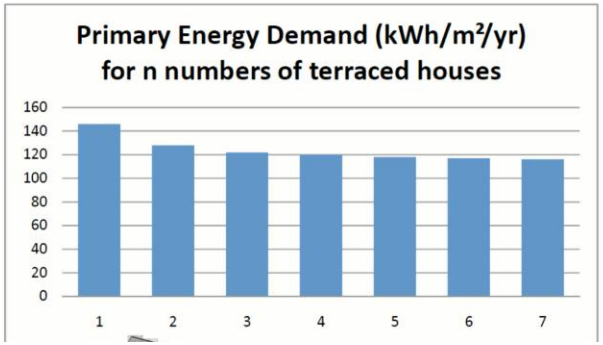
Overlooking and privacy issues limited chances to optimise solar gains

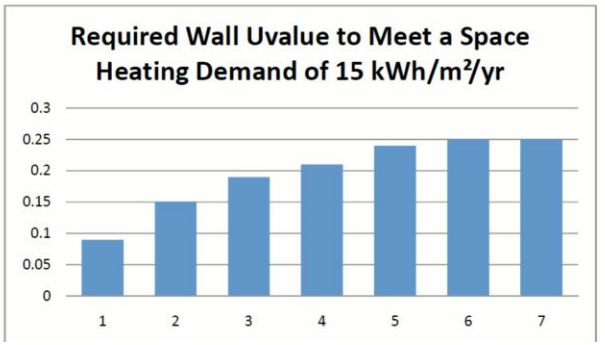
Inner city sites overshaded from adjacent properties

Maximise ‘free’ energy savings

Form/Massing







Optimised form and orientation allows for greater flexibility in fabric performance

Maximise ‘free’ energy savings

Form/Massing

Bristol City’s policy was to provide housing that *‘fills the gaps’* - housing that private developers would not usually provide.

As a result the client’s brief changed to 1/2bed bungalows and 1 bed houses.

Maximise ‘free’ energy savings

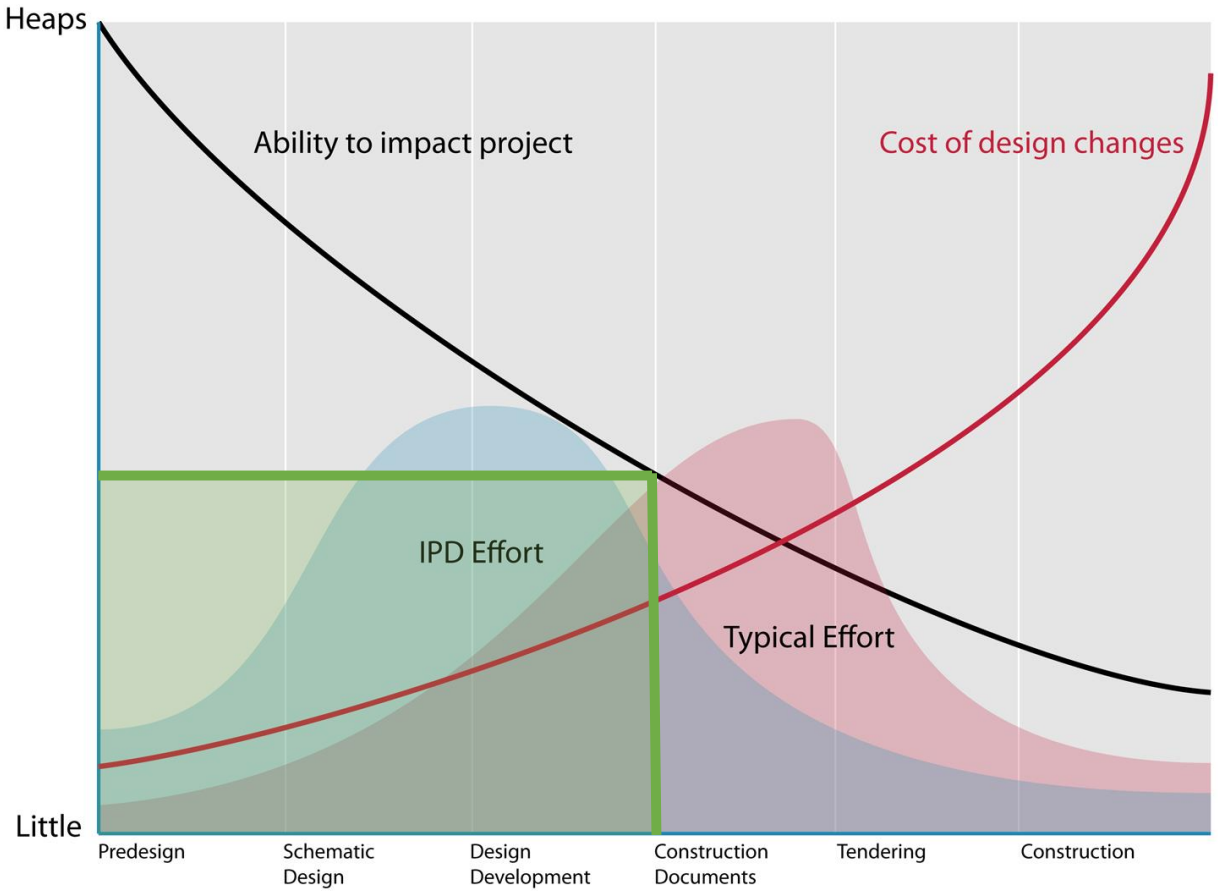
Form factor

Client’s brief and planning restrictions resulted in small scale developments generally consisting of 2-5 bungalows and 1 bed houses.

For most blocks the ‘form factor’ was in the region of 3.5 – 4.

Influencing Costs

MacLeamy Curve (2004)



Influencing Costs

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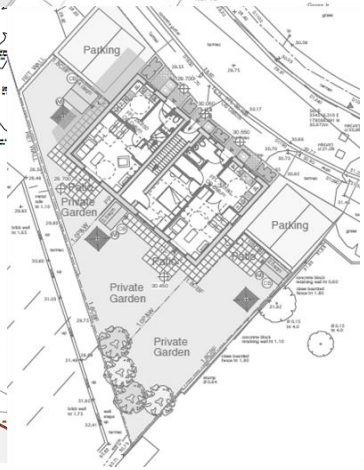

Passivhaus Brief

All sites were to be developed by a single contractor to the same specs and details

G&S recommended to the client to develop the two best performing sites to Passivhaus standard and accept higher heat demand on all others due to massing and orientation.

The biggest challenge – Costly site constraints

- Changes in level and existing rights of way significantly reduced usability and dictated site layout

- Depending on the site 28-36% of budget was spent on highway access, retaining structures, boundaries and site utilities

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3 Specification

Detailing + Construction

Cost effective Passivhaus – 5 Strategies

Minimise layers/trades in key fabric elements

Rationalise fabric performance by focusing on elements that are easy/cheaper to install

Efficient use of openings to optimise solar gains eg max glazed area, reduce external reveals, avoid shading devices

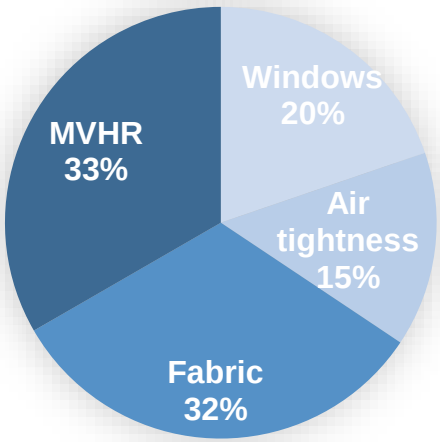
Robust air tightness strategy, appropriate for the size of project and expected supervision (avoid tapes etc.)

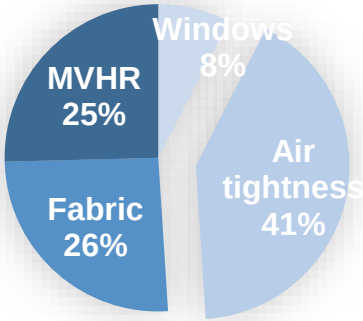
Dry or quick drying construction to ensure adequate environment for good quality installation

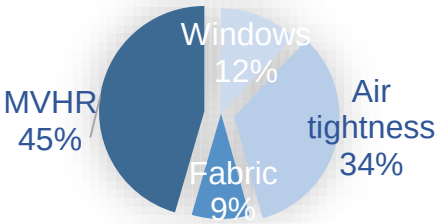
2010

2012 /2013

2014/2015







Cost effective Passivhaus

This is a bike.

Vanmool printed a flatscreen television on the side of their boxes shipping damage dropped by 70–80%.

Optimised details - Monolithic construction

Optimised details - Monolithic construction

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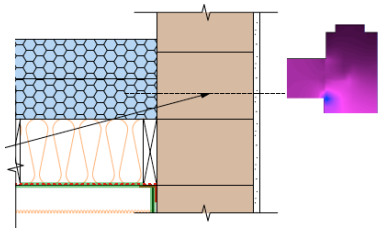
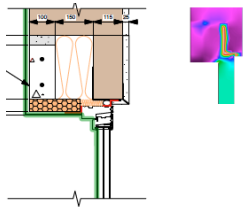
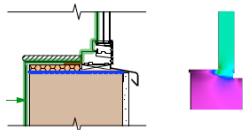
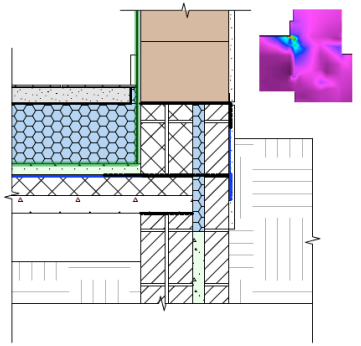
Monolithic wall construction using porous clay blocks (Poroton)









- Less trades involved
- Simplified sequencing
- Speed of construction
- Low moisture content
- Robust airtightness strategy
- Reduced construction waste

Optimised details - Monolithic construction

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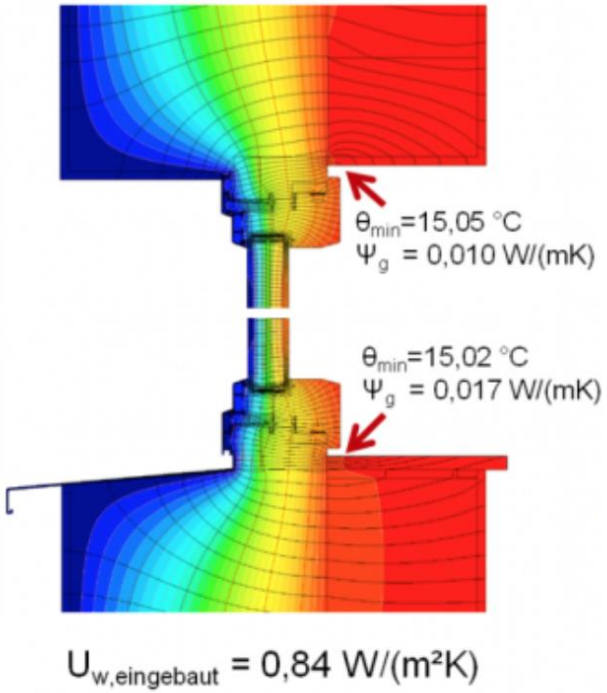
Standard PH installation



15% more solar gains

15% less solar gains

Healthy Design – Why bother?

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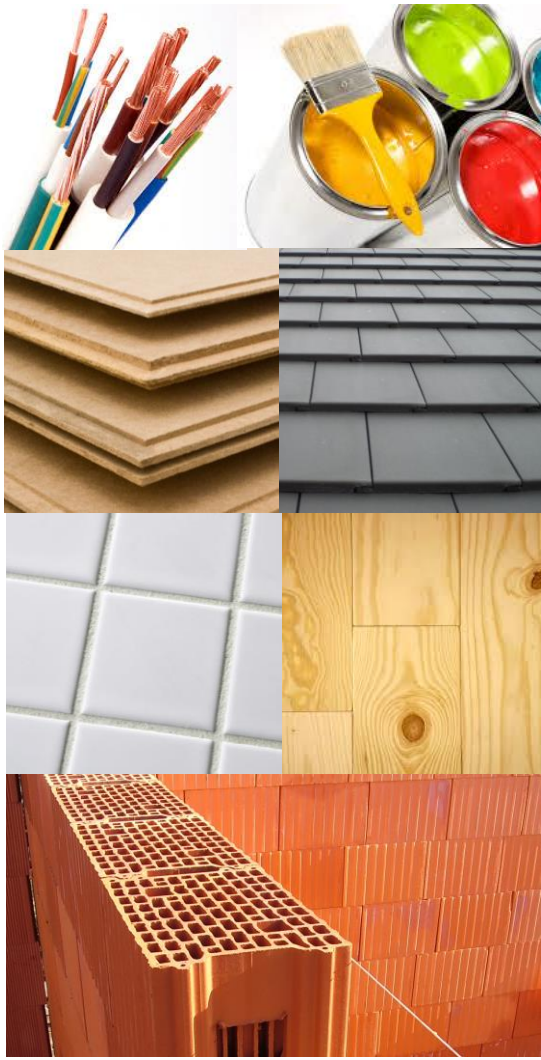
Additional health benefits

- Hygroscopic and highly permeable surfaces throughout help regulate internal humidity
- Optimum humidity levels 40-60% reduce spillage of dust and improve air quality
- Thermal mass helps reduce frequency of overheating
- Purely mineral material from supplier that provides full content declarations for their products
- No VOC mineral product
- mineral, unprocessed material that creates no wastage on site
- can be crushed and used for aggregate etc.
- No future maintenance liability from hidden chemicals (HBCD etc.)



Optimised details - Monolithic construction

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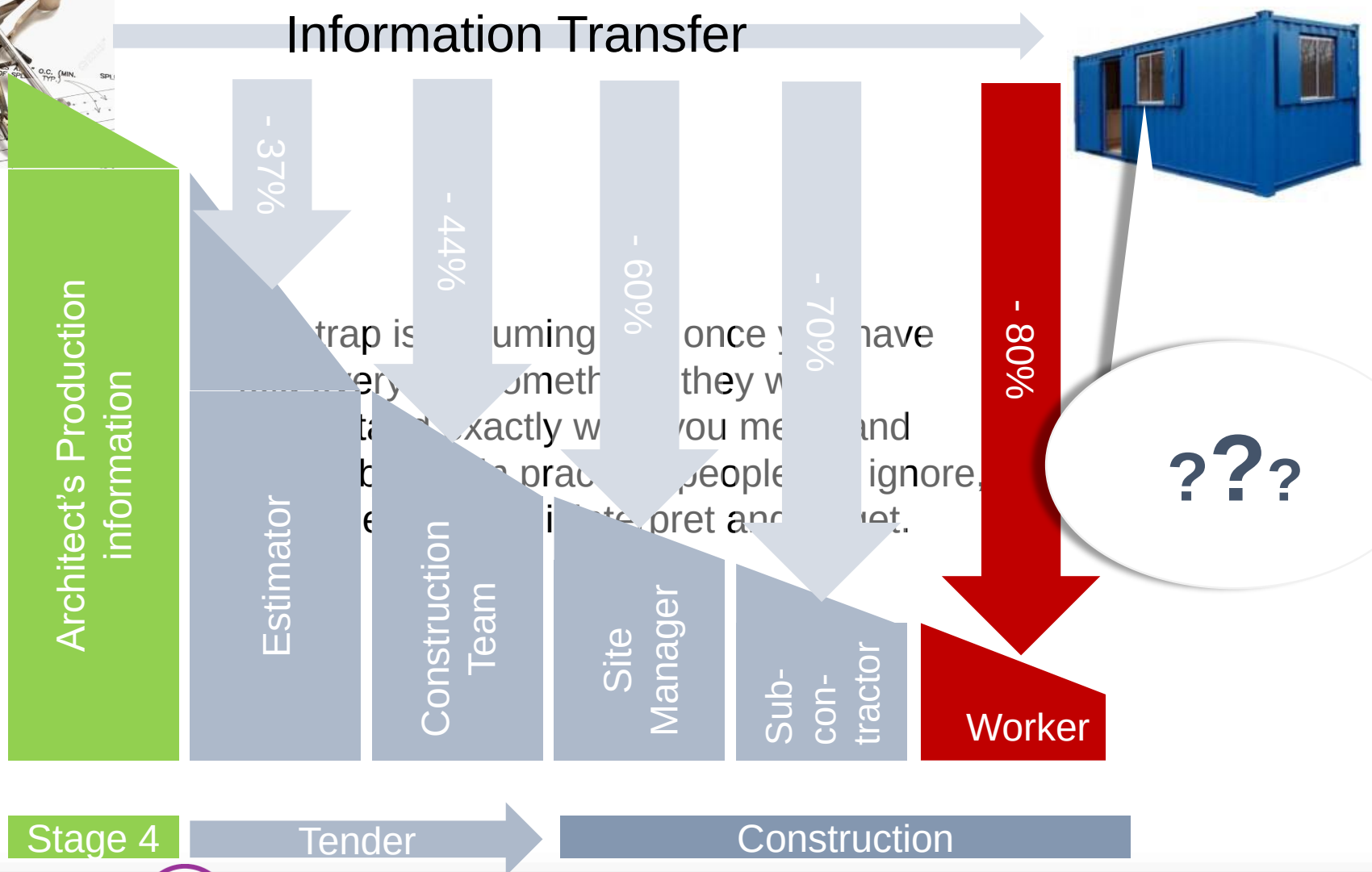
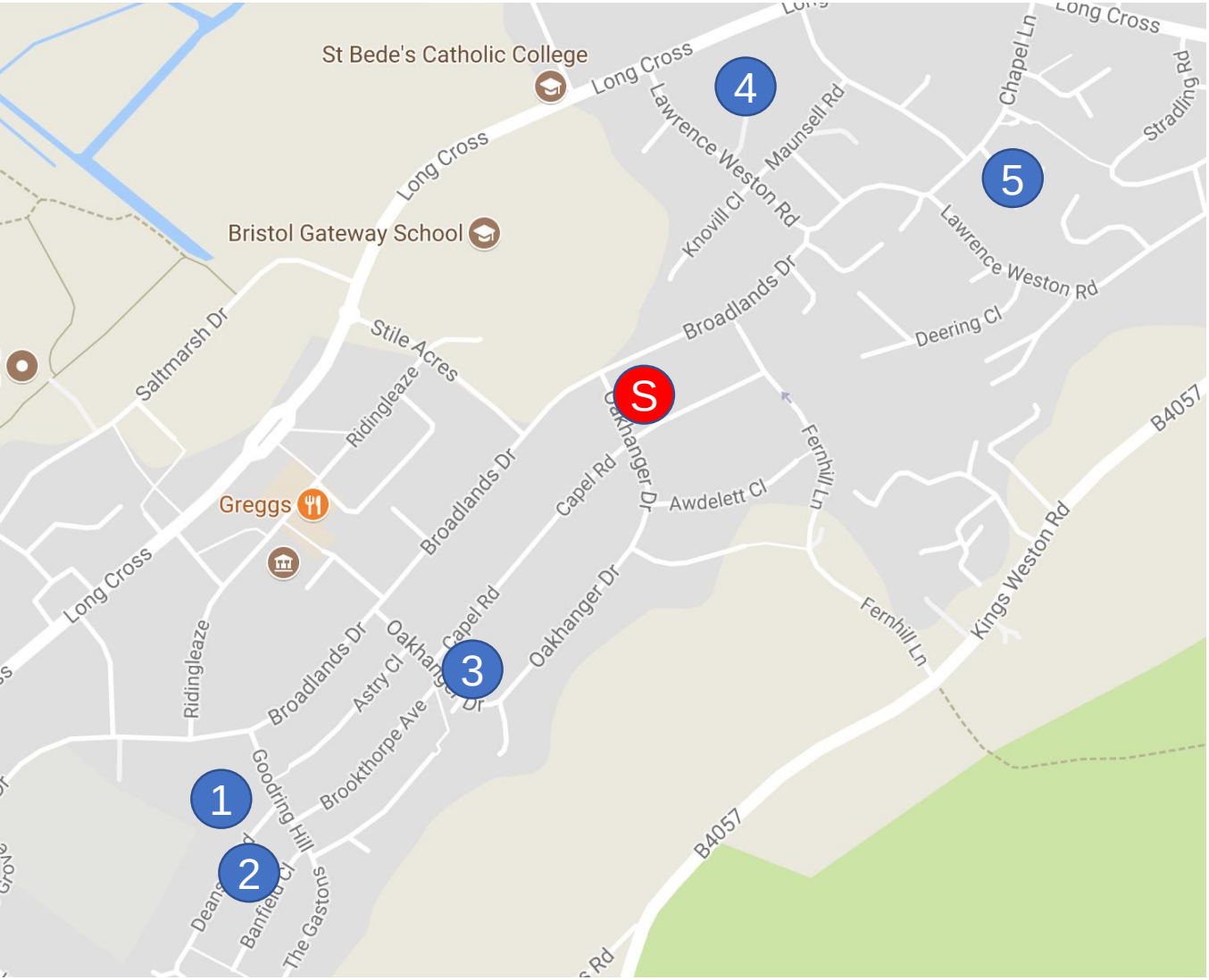
4 communication

’THE Industry standard’

Cascaded Downward Communication



Cascaded Downward Communication



To provide a competitive price the contractor allowed for a single, central site compound and site managers office.

This resulted in reduced site supervision and affected the build quality on all sites.

3 Key Learnings

- Although it is tempting to choose small scale developments as ‘Passivhaus trials’ to reduce risk, exaggerated site abnormals distort the perceived on-costs
- Local authorities still ‘benchmark’ sustainability credentials againstthe Code. For this project planners used SAP to assess the energy benefit of Passivhaus. LABC’s system of assessing materials is still behind and compromises the use of innovative technologies.
- Early engagement with contractors is key, ideally before or during tender to minimise communication losses and adequate resourcing.

Avoid the pitfalls

- Life cycle costs: PH components are more expensive to replace – just because something is PH certified does not mean it will necessarily last longer
- High performance insulants: expensive and often contain hazardous chemicals
- Local climate: don't just copy what works abroad
- Keep it simple and avoid 'belt and bracers'

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