

Lean Passivhaus: Affordable Performance

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1 Energy performance can be reached, but at what cost?

Numerous certification systems have been created in response to sustainable demands. Case studies of “green” certified buildings however revealed a large gap between planned and measured energy performance [Bell 2011; Usable Buildings Trust 2012]. Passivhaus however seems to stand out as an exception [Bordass 2009; Feist 2005].

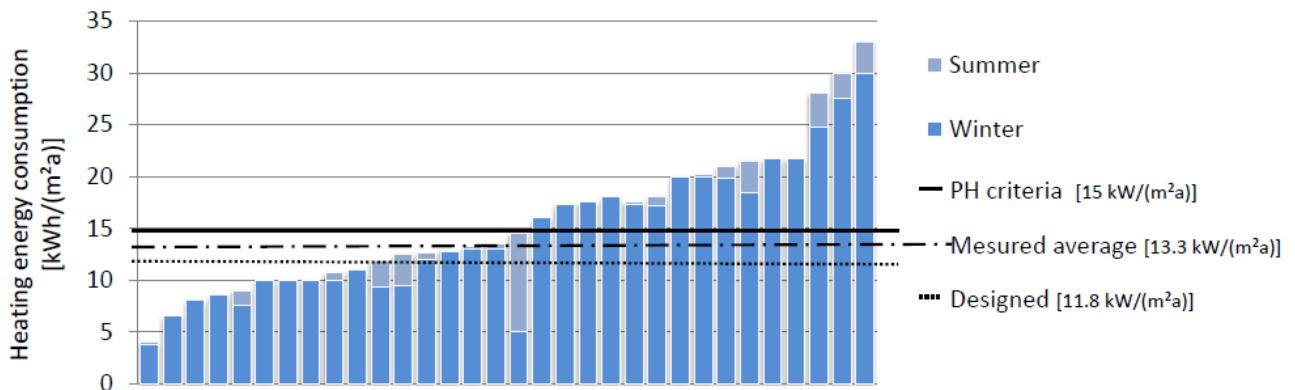


Figure 1: Predicted vs. measured heat loss for 32 Passivhaus dwellings [based upon Feist 2005]

Whilst performing as planned, Passivhaus buildings have been estimated to have a 10-15% higher capital cost than buildings built at the Building Regulations standard [Newman and Whidborne 2011]. Lean is a practice aiming for higher value at low cost by fulfilling the client’s wish directly, reducing waste to a minimum. Ohno [1988] defines 7 forms of waste: overproduction, waiting time, unnecessary movements, administration, incorrect inventory, movement disruption through excess of resources and defective products. Minimising these could reduce capital cost, allowing for affordable performance.

2 Case Studies on the real cost of Passivhaus

6 new-built educational buildings in the UK, all certified BREEAM very good, have been studied to compare the cost impact of Passivhaus with or without Lean principles. Qualitative interviews on the use of such principles have been conducted without mentioning the word “Lean” to prevent the influence of the participant.

Passivhaus: cheaper than average once it’s Lean?

The overall capital cost, divided per m², has revealed a repartition of Passivhaus through the cost range in spite of smaller project sizes. Lean seems to uphold the aim of cost

reduction, the more principles being used the cheaper the projects were, both projects using those principles having the lowest cost per m². Lean has been implemented amongst others through flat hierarchies facilitating communication or planning the site for the most effective construction process in transport and time.

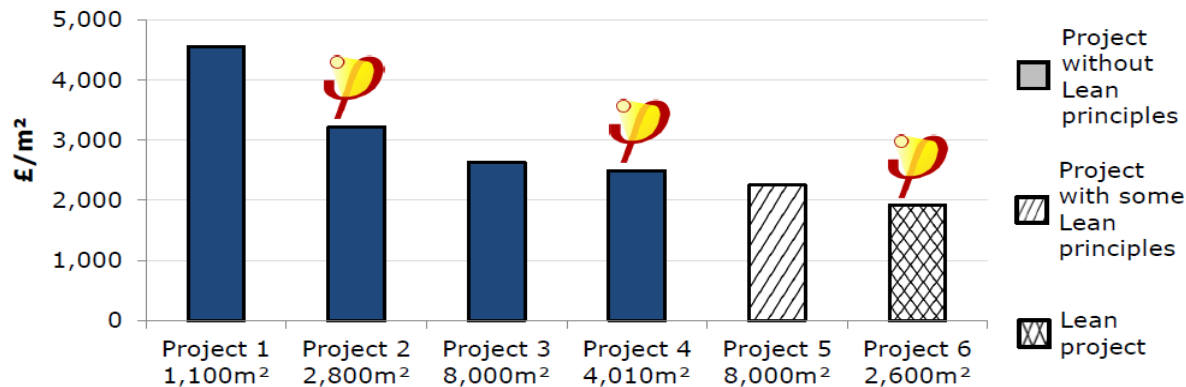


Figure 2: Project cost per m², with indications on Passivhaus certification and Lean implementation

3 Conclusion: performance can be cheap

Passivhaus, as one of few models providing energy performance as planned, is estimated to have higher capital costs. Using lean principles to optimise the process, waste is reduced as cost reduced, allowing for projects with capital costs below average in spite of certification and construction processes deemed expensive.

References

- [Bell, 2011] Bell, Malcolm, Low carbon housing: Lessons from Elm Tree Mews (2011)
- [Bordass 2011] Bordass, Bill, Building services: avoiding unnecessary energy demand and use through careful design and operation (2009)
- [Feist, 2005] Feist, Wolfgang, Climate Neutral Passive House Estate in Hannover-Kronsberg (2005)
- [Newman and Whidborne 2011] Newman, Nick and Whidborne, R What does Passivhaus cost? Sourcing and supply chain, UK Passivhaus Conference (2011)
- [Ohno 1998] Ohno, Taiichi, Toyota production system: beyond large-scale production (1988)
- [Usable Building Trust 2012] Usable Building Trust, Probe, available at: <http://www.usablebuildings.co.uk/> (2012)

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