

# UK HOUSE BUILDING MANUFACTURING AFFORDABLE QUALITY HOMES

Institution of  
**MECHANICAL ENGINEERS**

**As the recent report 'Building The Homes We Need'<sup>[4]</sup> points out, the UK has "a housing supply system that consistently delivers too few homes, of variable quality, at very high costs". The UK's housing supply market is widely recognised as being broken, and fixing it will require bold long-term leadership from Government to incentivise innovation, set challenging standards and put the householder at the heart of the build process. This Policy Statement looks at the role of off-site construction technologies in speeding up the house building system, strengthening UK manufacturing, driving skills development and engineering innovation and, most importantly, making our new homes affordable and truly sustainable.**

The Institution of Mechanical Engineers recommends that:

- 1. Government should support investment in the UK supply chain for off-site construction technologies.** The current off-site industry needs support for innovation and expansion and needs the people and facilities to compete against imports, if it is to meet the demand for its products that will come from clients focused on long-term quality and value. Government should help develop the skills and infrastructure required to grow this sector, which will create jobs and deliver economic benefit for the nation.
- 2. Government must reverse policies that are working against improvements in quality and standards.** Building Regulations and planning policies should prioritise long-term sustainability and affordability by setting progressive and challenging standards for energy and resource efficiency, through life-cycle assessment. Instead of 'winding down' the Code for Sustainable Homes, Government should be championing its further development, and fully integrating its principles into Building Regulations.
- 3. Government should work much harder to diversify the UK housing supply market, by opening up much greater opportunities for self-builders, local authorities and housing associations.** By 2020, there should be at least as many houses built by these players as are constructed by the traditional commercial building companies. Government should recognise that the step change in ambition required, needs far more commitment and imagination than the welcome, but inadequate, £30m for self-build schemes announced in 2011. There is the need for fundamental restructuring of supply and there is an opportunity for New Garden Cities to lead the way.

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## SUPPLY, QUALITY AND AFFORDABILITY

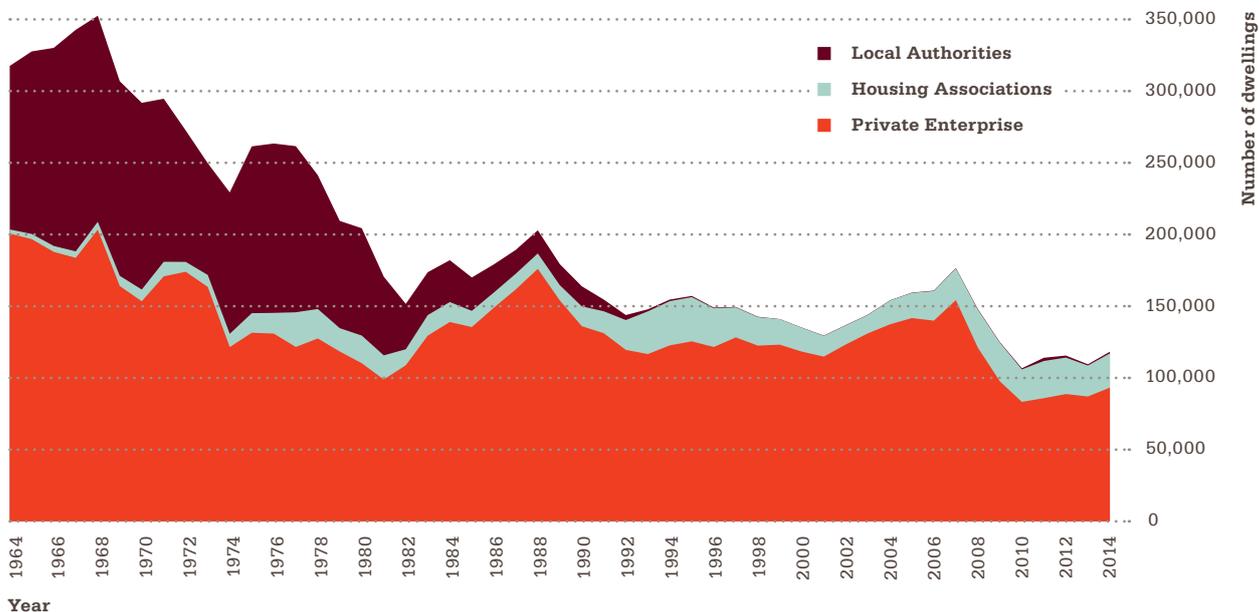
There is widespread consensus that for the UK's housing infrastructure to keep pace with the nation's growing population and the demand for additional homes, a minimum of 250,000 new dwellings a year will need to be built in England alone for at least the next two decades. In the year to June 2014, fewer than 115,000 were actually completed. **Figure 1** shows that at no time over the last two decades has the annual figure ever exceeded 180,000 and, on average, the number has been just over 140,000 a year<sup>[1]</sup>. There is therefore an urgent and pressing need to substantially increase the number of new homes being built on an annual basis. However, not only does the number of new dwellings need to increase, so does the quality of their construction.

The Callcutt Review<sup>[2]</sup> of 2007 concluded that *"in the current house building market, there are insufficient incentives for quality. The returns to house builders for investing in quality barely justify the effort"*. This was a damning indictment of traditional house building techniques and, just as importantly, of the ways building standards had been developed and enforced up to that time. This finding was further supported in industry surveys which, using customer satisfaction as a proxy for build quality, suggested that only about 35–45% of buyers were 'very

satisfied' with the quality of their new home. A more recent 2014 survey by the Home Builders Federation shows only a moderate improvement to 52%<sup>[3]</sup>. The challenge is that the existing housing market, and a lack of proper regulatory enforcement of standards, discourage quality and can often lead to builders feeling compelled to build small homes with poor thermal efficiency in order to maximise short-term shareholder value.

With demand far exceeding supply for the past few decades, UK house prices have tended to increase at rates far outstripping retail inflation and wage growth, leading to a long-term reduction in housing affordability. While rising house prices are popular with some, they have various detrimental effects on many more, including on social mobility, the labour market, debt burdens, homelessness, welfare expenditure and pension provisions. In parallel, high land prices, and a problematic planning regime, ensure that the current house building market provides high returns for land owners, marginal returns for builders, and almost completely ignores the long-term needs of the homes' ultimate owners and occupiers. In this regard a recent report by KPMG and Shelter<sup>[4]</sup> sets out a range of potential interventions; in particular, the report highlights the barriers facing small builders and self-builders, alongside a general lack of competition and widespread innovation in house building.

**Figure 1:** House building in England, 1964–2014.  
Source: DCLG



## CONVENTIONAL HOUSE BUILDING

UK house building is a mature industry which has delivered a good level of profits for its investors, and in recent decades the sector has become increasingly dominated by commercial players (**Figure 1**) that have consolidated into a few large companies. Firms producing over 500 houses a year increased their market share from 56% to 68% between 2008 and 2012, while the numbers of firms building fewer than 500 units a year halved over the same period<sup>[5]</sup>. This lack of diversity is even more acute in areas such as London.

**Figure 1** shows that today local authorities and housing associations play a small part in the overall provision of new homes. What is not discernable from **Figure 1** however, is an almost complete absence of a self-build sector in the UK; the Callcutt Review estimated that self-build made up approximately 15,000–18,000 units a year, or just 10% of total UK production in the mid-2000s. This is lower than in other European countries, and far below that in Austria, Germany, France and Ireland, for example, where self-build is estimated to account for about 60–80% of all homes. The Callcutt Review noted that “*self-build developments characteristically achieve higher quality of specification and better cost-in-use. They are more likely to be innovative, not least in sustainability*”. They put the prospective home-owner at the centre of the build process, and also provide opportunities for engagement of smaller local builders.

The dominant house building business model in the UK consists of land acquisition, development and outright sale. Profit is the margin between the sale price and the combined acquisition and development costs; the developer retains no long-term interest in the property and when competition for scarce land is high, along with its costs, margins are maintained by minimising the development costs and/or by restricting supply to ensure high sale prices.

Traditional on-site masonry construction, in which houses are built from scratch in situ with bricks and mortar and then fitted with a myriad of services assembled from individual small-scale components (plumbing, electrics etc), is the construction method of choice for most new homes in the UK. This labour-intensive process can be very slow, particularly in bad weather, and if attention to detail is not maintained, quality can be seriously compromised and the designed-for standards not realised.

## OFF-SITE SOLUTIONS

As a recent report by the Construction Industry Council (CIC) notes, a number of factory-assembled components are already widely used within the traditional house building industry; for example, manufactured truss-rafters for the construction of pitched roofs and factory-finished windows and doors. While some of these assemblies have been around a long time, others are emerging that are more ‘high tech’ in basis, particularly in their use of modern manufacturing technologies to take much of the overall build process off-site. Structural insulated panels (SIPs), volumetric construction (of modular units) and hybrid combinations of the two provide good examples. Modern Methods of Construction (MMC) is a catch-all descriptor for a range of these new, not-so-new and innovative techniques.

When using SIPs, excavation and foundation installation takes place as with traditional masonry construction, although, due to the lighter structural frame, it is possible to have a lower foundation specification. Prefabricated SIPs manufactured in accordance with the house design are delivered to site and erected, interlocking to form a continuous layer of insulation and so forming the inner skin of the house. This is the structural load-bearing element of the dwelling and supports the floors, the roof and internal loads. Roof construction can be traditional roof trusses, or can be constructed using additional SIPs which leave an open, usable and fully insulated space<sup>[6]</sup>.

Volumetric construction (ie modular construction) involves the production of three-dimensional units in controlled factory conditions, prior to transportation to site. Modules can be delivered in various forms ready for on-site assembly, from a basic empty shell awaiting on-site finishing, to completely fitted-out units with all the internal/external finishes and services. Most volumetric construction in the UK has been in hotels, student accommodation, offices and hospitals, but family-sized modular dwellings are becoming more popular.

Off-site construction technologies offer a wide range of advantages over conventional forms<sup>[7]</sup>. These include:

- **Shorter build times**, typically less than half the time it takes to build a conventional, masonry house.
- **Superior quality**, through factory-based quality control, precision engineering and design standardisation.
- **More energy-efficient**, achieving superior thermal insulation, with in-use energy savings of at least 20% over conventional methods.
- **Less waste**, through efficient use of materials, up to 90% less waste than conventional construction sites.
- **Lower ownership costs**, through lower bills and reduced maintenance.
- **Upskilling and strengthening UK manufacturing**, through high-technology manufacturing and opening up of new supply chain opportunities as well as export potential.
- **Reduced impact on transport systems, pollution and infrastructure**, where off-site construction will reduce the amount of raw materials needed to be transported to the site.

## POLICY ISSUES

Historically, the only previous large-scale deployment of off-site techniques for houses (as opposed to flats or commercial properties) in the UK was the programme of prefabricated (prefab) building immediately after the Second World War. These units were designed as a temporary solution to an acute housing need in an era of severe construction material and labour shortages. As the CIC rightly points out, in today's context the most significant support for the increased use of off-site construction methods rests with the Government's ambition to raise the requirements for the thermal performance of new homes, as well as meet the as-yet unsatisfied and increasing demand for more dwellings. Done properly, such ambitions can make off-site techniques cost-competitive for volume house builders and speed up the supply side of the equation.

The Coalition Government stated in 2011 that it was reviewing Building Regulations to further improve energy efficiency and carbon emissions standards for new buildings. The Code for Sustainable Homes provided a clear, long-term roadmap for industry to see how construction standards, the thermal efficiency, energy usage and other sustainability impacts of new homes would evolve. Real progress had been made in delivering homes to Code requirements, and the occupants of such buildings were reported as being very happy with their homes, which they found to be warm and comfortable.

The Department of Communities and Local Government's (DCLG) own 2013 publication stated "*few seem to disagree that the Code for Sustainable Homes has played a vital role in driving sustainability issues up the agenda within house building*". Yet in 2013, DCLG published a housing standards review consultation which proposed to "*wind down the role of the Code*". In 2014, the Prime Minister announced a new Starter Homes initiative that would cut purchase costs by exempting houses built under the scheme from zero carbon standards. So cheaper to buy remains the priority over more affordable and warm to live in. Rather than a clear regulatory framework, in which house builders can work, innovate and plan effectively, the industry now has a confusing, stalled policy environment, likely to lead to reduced quality as well as create uncertainty and delay to the detriment of housing provision.

However, beyond these regulatory issues it is important to note that policies to encourage a major expansion of the self-build sector are also required in order to fully realise the potential of off-site technologies. Most new-build homes are for individual private purchasers, but those ultimate purchasers have little to no influence over the quality, size or design of their home, other than through deciding whether or not to buy it. This disconnect simply does not exist in other sectors, but, crucially, does not apply to self-builders. The Institution of Mechanical Engineers believes the UK Government should, as part of a comprehensive housing market reform programme, aim to grow the self-build sector, supported by UK-based off-site manufacturers, to supply at least 50% of the market need (125,000 homes a year in England) by 2030.

## RECOMMENDATIONS

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## REFERENCES

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- <sup>6</sup> [www.the-self-build-guide.co.uk/structural-insulated-panels.html](http://www.the-self-build-guide.co.uk/structural-insulated-panels.html)
- <sup>7</sup> Offsite Housing Review, Construction Industry Council, February 2013

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