NHBC FOUNDATION

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Debate

Maintaining quality in the design and construction of 1.5 million homes

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Roundtable participants

- Construction Products Association (CPA)
- Crest Nicholson
- Future Homes Hub (FHH)
- Hill Group
- Home Builders Federation (HBF)
- Homes England
- Institute of Clerk of Works and Construction Inspectorate (ICWCI)
- New Homes Quality Board (NHQB)
- NHBC
- Ottersbrook Consulting
- Places for People
- Vistry Group

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NHBC

Executive summary

NHBC commends the Labour Government's target of 1.5 million homes during this parliamentary term (2024-2029). This requires an increase in build volume from an average of ~200,000 to 300,000 new homes per year. The ambitious target of constructing 1.5 million homes within this parliamentary term presents significant opportunities and challenges for the construction industry. However, there is a historic trend between build volume and the quality of construction in newly built homes. As build volume increases, customer satisfaction decreases and the number of potential defects identified by NHBC rises. The increase in volume comes at a time of significant regulatory change, uptake of new technologies, skill and workforce shortages and the adoption of new, innovative construction systems.

As the industry prepares to increase housing output, the historic trend between increased build volume and a reduction in quality must be broken. In January 2025, the NHBC Foundation hosted a roundtable discussion to identify actions to achieve this. 16 industry stakeholders from 12 industry-leading companies and organisations participated. The objective of the discussion was to identify positive recommendations for government and industry to ensure quality is maintained in the design and construction of 1.5 million homes.

Topics of discussion included:

- how will the industry build 1.5 million quality homes
- diversity of builders and developers
- regulatory changes
- skills and workforce
- Modern Methods of Construction (MMC)
- quality assurance
- supply chains and materials
- consumer codes.

This report summarises the roundtable discussion, identifying key recommendations and findings. The recommendations are for multiple industry stakeholders, including, but not limited to, government, local authorities, house builders and training providers.

There is no set definition of 'quality' in construction, as quality is subjective and relevant to the lens through which it is viewed. For the roundtable discussion and this publication, quality in construction has been viewed as ***maintaining consistent high standards throughout the design and construction process, avoiding latent defects, meeting all regulatory requirements and complying with the relevant consumer codes***. By achieving this, NHBC's core purpose of raising standards and protecting homeowners can be met.

Summary of recommendations

Supporting SMEs and micro builders with technical assessments

- The Government should consider centralised resources for SMEs and micro builders to provide technical assessments at costs no greater than those a volume builder would be expected to pay.

Regulatory change

- The Government should consider providing additional support for training and upskilling the workforce in line with regulatory changes and increase the size of the workforce where changes in regulations result in additional duties.
- It would be beneficial to rewrite the Approved Documents in plain English, ensuring they are suitable for the intended audience.
- Aligning consultations, reviews and the introduction of regulatory changes may reduce the frequency of redesigning, upskilling and retraining, thus reducing delays and construction costs.
- Further research is needed into the benefits of longer transitional arrangements.

Development of skills and workforce

- Increase communication and incentives to attract more people to the construction industry.
- Advertise the diversity of roles and career opportunities within the construction industry and how they may suit different people.
- Further research is needed to identify support methods for businesses and individuals to ensure qualifications can be completed.
- Organisations need additional support and incentives to employ newly qualified individuals.
- The Government needs to provide certainty on long-term regulatory requirements to give the industry confidence to invest in training and growing the workforce.
- The research and guidance provided by the Future Homes Hub must continue to support the industry through regulatory changes.

MMC training requirements

- Additional training and resources may be required for skilled professionals and non-manual workers to transition to MMC.
- Training should be provided for those who are new to any build systems, particularly when transferring from masonry construction to MMC.
- Further work is needed to ensure adequate training facilities, programmes, incentives and support to attract people to careers in MMC and traditional construction.

Standardisation

- Local authorities, planning departments and developers should collaborate to fully appreciate the potential benefits of standardising design while accounting for local requirements.
- The industry must continue to innovate and adopt new forms of pre-manufactured systems and components across all MMC categories, ensuring that all components and systems meet the relevant standards, regulatory and testing requirements.

Supply chains and materials

- Clarity is needed from government on upcoming regulatory changes and material testing requirements to enable investment in the development of materials and systems.
- A minimum number of years between regulatory reviews should be agreed upon with a register of set review dates.
- Work must continue to ensure risks associated with the increased housing target and uptake in new technologies can be mitigated by government and the supply chain.

Quality assurance

- Create a national quality assurance standard specifically designed to manage quality through the design and construction process for various construction methods.

Culture

- The industry should use the results from the nine-month National New Homes Survey in conjunction with the eight-week National New Homes Survey to refocus culture and key performance indicators on long-term customer satisfaction.
- Create an industry-wide ambition of achieving defect-free homes.

Performance gap

- Reducing the performance gap must be made a priority to ensure all future homes perform as designed.
- The industry must be ready to start measuring the performance of new homes and to take responsibility for their performance.

Introduction

Housing targets

Labour came to power through the 2024 general election. As part of the Labour manifesto, an ambitious housing target of 1.5 million new homes – 300,000 per year – was set to help tackle the housing crisis. The annual housing target was further increased to 370,000 following changes to mandatory housing targets for councils and through the National Planning Policy Framework (NPPF) (MHCLG, 2024). This publication refers to annual targets of 300,000 homes based on the initial target of 1.5 million homes averaged over five years. However, the points raised are applicable to the increased annual target of 370,000 homes.

The previous Conservative Government set a target of delivering one million homes during its parliamentary term, with an annual target of 300,000 homes. However, the annual housing delivery averaged just over 200,000. Although the Covid-19 pandemic hindered the last parliament, the ambition of delivering 300,000 homes per year has not been achieved since the 1970s following the decline of new social housing. In fact, between 2010 and 2020, the average number of new homes built in England was ~170,400 (HM Government, 2024). Drastic changes are needed to meet the new housing target of 300,000 homes per annum and 1.5 million homes during this parliament.

The new Government has set to work on identifying and tackling the barriers to delivering new homes, such as reforming the National Planning Policy Framework (NPPF), introducing the concept of a Grey Belt and reassessing and setting new housing targets for local authorities. While these initial actions will contribute towards achieving the housing targets, further work is needed throughout the industry. The purpose of this publication is not to focus on what changes are required to deliver the housing target. Instead, this publication focuses on maintaining quality in designing and constructing 1.5 million homes.

As the industry prepares to build a volume of homes that has not been achieved since the 1970s, it must also adapt to regulatory changes, take up new technologies and construction methods, and tackle a skills and workforce shortage. This publication looks at how these factors, along with other elements, may influence the quality of the design and construction of these new homes.

Definition of quality

It is well established that there is no set definition of 'quality' in construction, as quality is subjective and relevant to the lens through which it is being viewed. Quality for organisations such as the New Homes Quality Board (NHQB) relates to not only the standard of construction and the level of finish within homes but also the purchasing process, ensuring homes are complete before the completion of the sale (NHQB, 2022). While quality is in the name of the NHQB, it does not inspect the design or construction quality before or during the construction phase.

Industry reports, including the *Housebuilding Market Study* (CMA, 2024) and *More Homes Fewer Complaints* (APPG, 2016), identify a lack of unified definition of quality throughout the construction industry. The former views quality as 'the reasonable expectation a consumer might have of their new build home' 'this includes the structural integrity of the property, and the ability to use it and its features as reasonably intended' (CMA, 2024 p.41). The latter states that quality can relate to 'design, space standards, technical performance, compliance with building regulations and planning, energy and environmental performance.' (APPG, 2016).

In essence, there are different layers of quality in homes, including those below.

- **Perceived quality** – the quality of finishes, aesthetics and materials used.
- **In-built quality** – structural and technical details.
- **Design quality** – the overall design of a home and how well it functions.
- **Fundamental quality** – achieving compliance with minimum standards.
- **Transactional quality** – the service provided through the purchasing process.

This publication focuses on quality in the design and construction process. It shall be viewed as maintaining consistent high standards throughout the process, avoiding latent defects, meeting all regulatory requirements and complying with the relevant consumer codes. It is worth noting that this publication refers to England only. Requirements for other regions of the UK are outside the scope of this publication, yet some of the comments and recommendation may be applicable to multiple regions.

The points raised in this publication reflect the collaborative insights from the roundtable discussion, representing a range of perspectives beyond just those of NHBC.

Quality vs volume

Since 2004, NHBC has administered the National New Homes Survey, a customer satisfaction survey on behalf of the House Builders Federation (HBF). An initial survey is sent out for new homeowners to complete eight weeks after legal completion. A second survey is sent out nine months after legal completion. The questions within these surveys have evolved over the years to suit the needs of homeowners and the industry and track trends. The 2024 survey (October 2022 – September 2023) asked 10 questions about customer satisfaction. By asking various questions relating to customers' experience, it is possible to gain a holistic understanding of their satisfaction, accounting for multiple ways to define quality. One question explicitly mentions quality.

'Taking everything into account, overall, how satisfied or dissatisfied are you with the quality of your home?' (HBF, 2024).

The results of this question have historically been used to track trends in customer satisfaction with the quality of their new homes. When compared to trends in build volume, it is evident that one affects the other. As shown in Figure 1, as the number of new home completions increases, the percentage of customers satisfied with the quality of their new home decreases. This trend must be broken as the industry prepares to deliver an increased volume of new homes.

Figure 1 New home completions vs NNHS results (2008-2023)

Introduction to the roundtable

In January 2025, the NHBC Foundation hosted a roundtable discussion to identify actions to break the historic trend between quality and volume. 16 industry stakeholders participated from 12 companies and organisations, including representation from:

- **Construction Products Association (CPA)**
- **Crest Nicholson**
- **Future Homes Hub (FHH)**
- **Hill Group**
- **Home Builders Federation (HBF)**
- **Homes England**
- **Institute of Clerk of Works and Construction Inspectorate (ICWCI)**
- **New Homes Quality Board (NHQB)**
- **NHBC**
- **Ottersbrook Consulting**
- **Places for People**
- **Vistry Group**

The objective of the discussion was to identify positive recommendations for government and industry to ensure quality is maintained in the design and construction of 1.5 million homes. The discussion focused on key topics, including:

- how will the industry build 1.5 million quality homes
- diversity of builders and developers
- regulatory changes
- skills and workforce
- Modern Methods of Construction
- quality assurance
- supply chains and materials
- consumer codes.

This report summarises the roundtable discussion, identifying the key recommendations and findings. The recommendations are for multiple industry stakeholders, including but not limited to government, local authorities, housebuilders and training providers. While the discussion was structured around these topics, it was apparent that many of these factors overlapped. As such, the main findings from the discussion have been categorised accordingly and several of these topics have been merged.


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Findings from the roundtable discussion

Regulatory change

Supporting SMEs and micro builders with technical assessments

Building Regulations are becoming more rigorous in areas such as building safety, energy performance and reductions in CO_2 emissions. While these changes are essential to raising the standard of future homes, incremental changes and an increasing need for technical assessments impact the delivery of new homes. These changes have the most significant effect on SMEs and micro builders. The costs associated with staff training, changes to the design and a reliance on third-party technical professionals are higher than those of volume builders, which in turn contributes to the decline of SMEs and micro builders.

As regulations evolve, the number of technical assessments required for house building continues to increase. Volume builders may have access to resources and preferential rates and services over SMEs and micro builders; however, all homes must comply with the same regulatory requirements, which may put smaller developers at a financial disadvantage.

The cost of technical assessments, such as TM59 calculations for compliance with the requirements of overheating Building Regulations, varies from volume builders to SMEs and micro builders because volume builders benefit from economies of scale. It is recommended that financial and industry support for essential services, such as energy assessments and overheating calculations, be provided to micro builders.

Recommendation

- The Government should consider centralised resources for SMEs and micro builders to provide technical assessments at costs no greater than those a volume builder would be expected to pay.

Training following regulatory change

Continuous change in regulatory requirements is inevitable. Regulation changes without appropriate communications and follow-up training may lead to knowledge gaps in the workforce. Several reasons for knowledge gaps after regulatory changes are due to the lack of:

- awareness that a change has been implemented
- training on the impact of such changes
- communication and training on the reasons why changes have occurred
- unclear or inadequate guidance on how to comply with new regulations.

When asked how site teams stay updated with regulation changes, the discussion pointed towards a reactive mentality. There is a reliance on building inspectors and building control bodies to notify developers and sub-contractors when a change has occurred and what it means for the developer. However, this is not the responsibility of the Registered Building Control Approver, Local Authority Building Control or the Registered Building Inspector. It is the responsibility of the designers, principal designers, clients, contractors and principal contractors to maintain competency in their duties by staying informed of changes to regulations and to carry out their duties in line with the requirements under primary and secondary legislation, including the Building Act 1984, the Building Safety Act 2022 and the Building Regulations 2010.

Improving communication and understanding

The example of thermal bridging details was discussed. There are several ways to comply with Part L of the Building Regulations in relation to thermal bridging details. Clause 4.18 of Approved Document L Volume 1: Dwellings (2021) states:

4.18 Thermal bridges should be assessed in a new dwelling using one of the following methods.

a. Use construction joint details calculated by a suitably competent person following the guidance in the Building Research Establishment's BR 497 and the temperature factors set out in the Building Research Establishment's Information Paper 1/06.

b. Use junction details from a reputable non-government database containing independently assessed thermal junction details, such as Local Authority Building Control's Construction Details library.

c. Use the values in the Standard Assessment Procedure, Table K1. A mixture of known and default values may be used.

d. Use a default y-value of 0.20W/(m^2.K).

Note: A mix of approaches may be used for different elements on the same dwelling. When using the approach in (a) or (b) above, an appropriate system of site inspection should be in place.

However, evidence suggests that the thermal bridging details used for the SAP assessments are not always clearly communicated to site teams. This can lead to homes being built following the default methods that the trades are familiar with. This disparity in design versus as-built can contribute to underperformance in energy efficiency and an increased risk of cold spots, leading to an increased risk of condensation and mould growth.

The example of thermal bridging details is just one area that requires additional support. The Future Homes Hub is currently developing guides to assist developers in further understanding this specific issue. However, industry support for all regulatory changes affecting the built environment is needed beyond this.

Recommendations

- The Government should consider providing additional support for training and upskilling the workforce in line with regulatory changes and increase the size of the workforce where changes in regulations result in additional duties.
- It would be beneficial to rewrite the Approved Documents in plain English, ensuring they are suitable for the intended audience.

Alignment of regulatory changes

Building Safety Regulator and Approved Documents

The Building Safety Regulatory (BSR), created under the Building Safety Act 2022, is part of the Health and Safety Executive (HSE). The purpose of the BSR is to regulate higher-risk buildings (HRBs), raise safety standards for all buildings and help professionals in design, construction and building control improve their competence.

The Approved Documents are a series of documents that provide guidance on how to meet the requirements of the Building Regulations 2010. The BSR is responsible for reviewing and updating the Approved Documents. Document reviews are carried out with input from working groups within the Building Advisory Committee (BAC), whose role is to 'provide advice and information to the BSR on new and emerging issues across the built environment' (HSE, 2023).

As stated in document *CLG00019304/1 Annex B – Simplifying statutory guidance in the approved documents and reviewing technical requirements* (Grenfell Tower Inquiry, 2022), reviews of the Approved Documents are carried out in three-year cycles, with no Approved Document due to be reviewed more frequently than every six years, except for Approved Document L.

Within *CLG00019304/1 Annex B – Simplifying statutory guidance in the approved documents and reviewing technical requirements* it is acknowledged that the Approved Documents are in need of comprehensive review. The document goes on to suggest that the predecessor to BSR did not have sufficient capacity to review all the Approved Documents simultaneously within the previous parliament. As such, reviews have been carried out in a phased approach, often leading to staggered changes in regulations (Grenfell Tower Inquiry, 2022).

Impact of regulatory changes

Changes to regulations may directly impact the design of new homes, including standard house types and those that have previously received planning approval. Amendments to designs to comply with ongoing changes can result in changes to material requirements, plot and site layout alternations and potential alterations to planning consent. These changes may result in increased build costs and delays in construction. While changes to regulations are essential for continual improvements to the built environment, the process in which they are applied could be streamlined to minimise their impact.

Recommendation

- Aligning consultations, reviews and the introduction of regulatory changes may reduce the frequency of redesigning, upskilling and retraining thus reducing delays and construction costs.

Transitional arrangements

Changes in regulations come into effect following transitional arrangements. Details of the transitional arrangements, including timeframes and details of the buildings they apply to, are announced at the time of draft publication following a consultation period. There is a historic culture of house builders trying to get ahead of changes in regulation by commencing the build of dwellings sufficiently enough to qualify for the older set of regulations. Properties are then left dormant until a later date. This industry rush can adversely affect construction quality, material availability and the workforce's competence in carrying out the initial work.

In 2023, there was a significant increase in Initial Notices submitted due to the new regulatory changes to Approved Documents (AD) F and L, as well as the introduction of AD O and S. These amended and new documents came into effect on 15 June 2022. AD F, L and O did not apply to work subject to a building notice, full plans application or Initial Notice submitted before 15 June 2022, provided that the building work commenced before 15 June 2023. In many cases, applications were for multiple buildings on a site, for example multiple houses. In such instances, only those individual buildings where work had commenced could take advantage of the transitional provisions. After this date, any dwelling that had not commenced was subject to the updated regulations. AD S followed the same principle and dates but applied the requirements based on the start of the site rather than individual buildings.

In the lead-up to 15 June 2023 the number of dwelling starts was in excess of the usual build volume for that time period, as shown in the Indicators of New Supply statistics from MHCLG, see Figure 2 (MHCLG, 2025). This increase in starts for the purpose of meeting the transitional arrangements resulted in an increase in material and labour demand for a short period and delays in the take up of new regulations.

According to Energy Performance Certificate (EPC) data, only 40% of new homes completed in England during December 2024, 18 months after the June 2023 transitional arrangements, were built to the 2021 regulations. This trend has continued into early 2025. It is predicted that a sudden rise in the percentage of new homes built to the 2021 regulations will be seen towards the end of 2025, continuing to rise in 2026. Changes in regulations will see more homes built with technology previously not used at a mass scale, such as air source heat pumps and photovoltaics (solar PV). The high concentration of delayed uptake may result in industry bottlenecks, and the associated risks include:

- lack of competent persons
- insufficient systems and material supply
- substitute systems and materials
- delays in construction
- increase in build costs incurred from high demand for material and labour.

All these factors impact the quality of the homes being constructed.

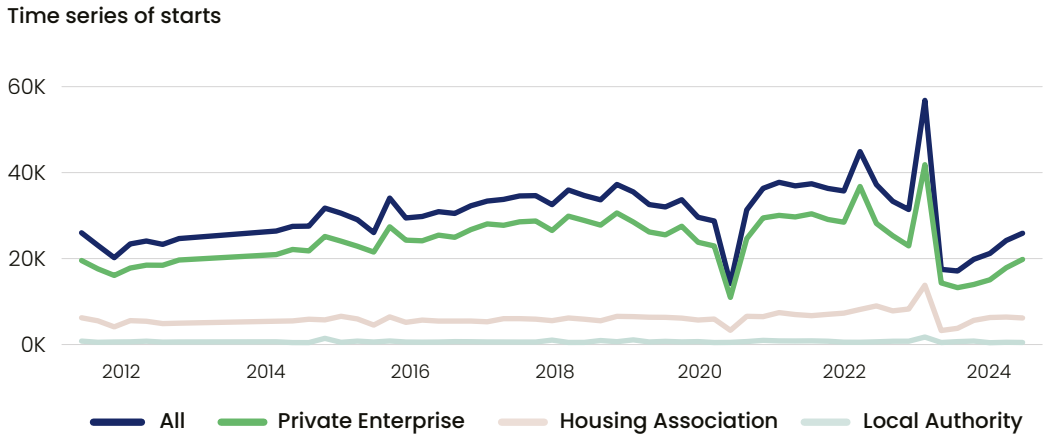


Figure 2 Indicators of new housing supply, image source: (MHCLG, no date)

In 2023, the definition of commencement within Regulation 46A of The Building Regulations 2010 was inserted by The Building Regulations etc. (Amendment) (England) Regulations 2023. In England, under the previous definitions of commencement, the start of work was generally regarded as the point at which the project requires building control input and without such input would be deemed a case for enforcement.

For instance, previous definitions have used the terms:

- excavation for strip or trench foundations or for pad footings
- digging out and preparation of ground for raft foundations
- vibroflotation (stone columns) piling, boring for piles or pile driving.

With a further definition of what was not considered the start of work:

- removal of vegetation
- removal of topsoil
- removal or treatment of contaminated soil
- excavation of trial holes
- dynamic compaction
- general site servicing works (eg roadways and drainage).

The updated definition requires the completion of the lowest floor for complex buildings. If the building is not defined as complex, then the work is regarded as commenced when the sub-surface structure of the building including all foundations, basement levels (if any) and the structure of ground floor level is completed. There are also different provisions if the work is the result of change of use of an existing building. This could potentially also be relevant if new homes created as a result of a change of use are included in the 1.5 million new homes.

The definition of commencement relates to the validity of plots within an Initial Notice. However, the updated definition of commencement may be used in future transitional arrangements of Approved Documents. The use of this definition may deter house builders from excessively building beyond their needs to meet transitional arrangements due to the additional costs and resources associated with these works. However, transitional arrangements and whether an Approved Document applies to individual plots or a whole site varies throughout the Approved Document library.

Recommendation

- Further research is needed into the benefits of longer transitional arrangements and the impact of the definition of commencement.

Skill and workforce requirements

Background

To deliver 1.5 million quality homes, we must ensure an adequate number of competent professionals across every aspect of the industry. These individuals and organisations will need to adapt their skills and knowledge in line with changes in regulations. The adoption of new build systems and technology will grow to meet the demands of increased build volume, build rate and regulatory requirements. As such, the number of professionals in these newly emerging fields will also need to increase.

Reduction in numbers

In addition to requirements for professionals in new systems and technologies, there is an ever-growing shortage of traditional trades. The UK construction workforce has been decreasing in size following the Covid-19 pandemic and the UK's departure from the EU. In Q1 2024, the number of employees in the UK construction industry hit the lowest number since Q1 2000 (ONS, 2024). CITB reported that during 2023 there was a deficit of over 10,000 workers leaving construction versus those newly recruited (CITB, 2024b). Furthermore, there is an additional risk of losing heritage skills and experience as a large portion (35%) of the remaining workforce are nearing retirement age over the next 10-15 years (Capital Economics, 2024). CITB estimates that England's home-building workforce will need to increase by 30% (an additional 152,000 people) to achieve the Government's target of 1.5 million homes (CITB, 2024a), with 219,000 additional people needed over the next 10 years (Capital Economics, 2024).

Some of the reasons for people leaving UK construction industry in recent years include:

- right to work/visa requirements (including consequences of the UK's departure from the EU)
- insolvency
- personal reasons
- retirement
- change of career.

Building control capacity

Following the introduction of the Building Safety Regulator, changes were introduced mandating the registration of all building inspectors. As part of the registration, building inspectors must prove their competency to work on particular building types and within specific registration classes. Following successful assessments, building inspectors become Registered Building Inspectors (RBIs), with ongoing requirements to maintain competency.

While the introduction of the registration contributes to a safer built environment, the requirements have led to a shortage of building inspectors within England. It is worth noting that RBIs are in high demand with the current build volume. To meet the housing targets, significant resources must be invested in training future RBIs to meet the upcoming needs.

Apprenticeships and businesses

Government work is underway to support more construction apprentices. Following the roundtable discussion, it was announced on 11 February 2025 that the minimum duration of apprenticeships would be reduced from 12 months to eight months. Changes have also been introduced to allow businesses to decide whether adult learners over 19 need to complete a Level 2 English and maths qualification. As an alternative, apprentices over the age of 19 can now be assessed in English and maths requirements core to their jobs. These changes are reported to unlock an additional 10,000 apprentices annually by allowing them to focus on their paid work (DfE, 2025). On 23 March 2025, the Government announced a further £600 million investment in training for construction workers over the next four years. While these actions will contribute to reducing the workforce deficit, further action may be needed.

An apprenticeship is often the preferred way to enter the construction industry. However, it is not the only route. The capacity of businesses and training facilities usually limits the number of available apprenticeships. Alternative training routes must be considered to meet the industry demand for a new workforce, such as formal learning through T-Levels, colleges, technical colleges and universities or training through employment and independent specialist training providers.

Getting enough people to start training through apprenticeships or other routes is only part of the challenge. People starting and not completing qualifications or not being hired at the end of their qualification is also problematic. Understanding why this happens and supporting individuals and companies in breaking this trend is essential. Further research is needed to fully understand what support businesses and individuals need.

Training for new technologies

As the industry transitions towards net zero new homes there will be a shift in the technology. It is well established that technology such as air source heat pumps (ASHPs) will play a key role in this transition. While the industry is aware that systems such as ASHPs will be core to future homes, there is a delay in uptake due to regulatory uncertainty.

Uncertainty around the timeline and scope of regulatory changes including the Future Homes Standard, Approved Document G and other legislation is preventing investment in skills and technology. We need to ensure there are enough trained individuals and organisations ready to deliver and install these new systems prior to the regulatory requirements. For this to happen, the industry needs clarity and certainty from government.

A study by the Heat Pump Association identified that the number of individuals completing recognised heat pump qualifications is increasing. However, 39% of those who qualify do not go on to work in heat pump installations. The report indicates that the uncertainty within the industry is delaying individuals and organisations from fully committing to the transition to these systems (HPA, 2024). Government needs to provide certainty on long-term regulatory requirements to give the industry confidence to invest in the training and workforce for future needs.

Future Homes Hub (FHH)

Research is currently being carried out by the FHH to understand the readiness of the industry for various workstreams, including workforce development. The research carried out by the FHH will inform government and industry as to where the gaps are and help provide support and guidance through regulatory changes. Continuation of the FHH's work will be vital in supporting the industry through the upcoming years.

Recommendations

- Increase communication and incentives to attract more people to the construction industry.
- Increase investment in training additional Registered Building Inspectors to ensure adequate capacity for increasing housing supply.
- Advertise the diversity of roles and career opportunities within the construction industry and how they may suit different people.
- Further research is needed to identify support methods for businesses and individuals to ensure qualifications can be completed.
- Organisations need additional support and incentives to employ newly qualified individuals.
- The Government needs to provide certainty on long-term regulatory requirements to give the industry confidence to invest in training and growing the workforce.
- The research and guidance provided by the Future Homes Hub must continue to support the industry through regulatory changes.

Can Modern Methods of Construction (MMC) reduce the workforce deficit?

A 2019 report by CITB examined how increasing panelised and volumetric construction instead of masonry construction can reduce labour requirements. It was stated that a 40% increase in workforce (195,000 additional people) was required to achieve the then-target of 300,000 houses by the mid-2020s using cavity masonry construction. Through modelling different scenarios, the report identified that the additional workforce requirement may be reduced from 195,000 to 158,000 by increasing the mix of MMC. The figure of 158,000 was projected using a scenario of 15% panelised, 35% volumetric and 50% cavity masonry. The baseline scenario, accountable for the 195,000, was modelled on 100% cavity masonry construction (CITB, 2019). The difference in additional people in the two scenarios shows MMC's potential role in reducing the workforce deficit; however, further work is needed to achieve the level of MMC modelled in the study
(CITB, 2019).

The roundtable discussion identified that while MMC has the potential to reduce the workforce deficit, training must be provided for existing skills, trades, manual workers and professional non-manual workers to enable the move to MMC and ensure that quality is maintained.

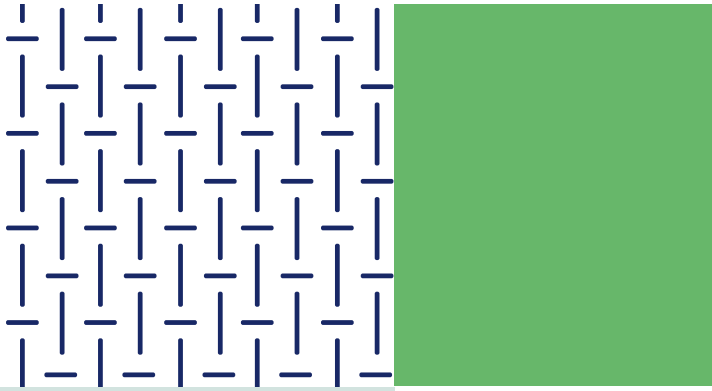
Diversity of workforce

Careers in MMC production can appeal to audiences beyond those based on traditional building sites. An increase in MMC production can help to reduce the skills and labour gap by offering an alternative career path to traditional site-based construction. The alternative working conditions may appeal to those discouraged from a career on a construction site, but who still wish to work in the manufacturing side of the construction industry.

The skill requirements for design for manufacture and assembly (DfMA) can also differ from traditional construction. Where construction sites require operatives to meet specific training requirements, DfMA can be more accessible for those entering the industry, eg a closed panel timber frame factory in which there is one skilled carpenter overseeing the works of multi-skilled operatives, rather than each individual needing to be a skilled carpenter. The uptake in and development of new technology may also appeal to a different cohort, where skills such as computer coding, 3D computer modelling, 3D printing and automated design can play a key role.

Vertical integration and diversifying construction types

The growing trend of developers purchasing (primarily timber frame) MMC facilities allows for vertical integration of design, manufacture and construction of their own homes. This change has led to developers manufacturing systems, such as roof trusses, floor cassettes and engineered floor joists, directly for their projects. Such materials would have previously been purchased through a specialist supplier. The move to in-house manufacturing is driven by the need to secure the supply chain of materials, reducing bottlenecks associated with reliance on limited suppliers and allowing for rapid response to changes in design and material requirements. These changes allow for in-house quality assurance processes and help to reduce fluctuations in quality as the pressures of increased build volume are applied. Vertical integration could play a key role in maintaining quality in the delivery of 1.5 million homes.



Recommendations

- Additional training and resources may be required for skilled professionals and non-manual workers to transition to MMC.
- Training should be provided for those who are new to any build systems, particularly when transferring from masonry construction to MMC.
- Further work is needed to ensure adequate training facilities, programmes, incentives and support to attract people to careers in MMC and traditional construction.

Standardisation

National voluntary building standard

Standardisation of design can be beneficial for build speed, maintaining quality and consistency, cost management and securing the supply of materials. It is worth noting that standardisation of design does not mean that all homes are built to look the same; instead, the core details of the design can be replicated with the aesthetic finishes tailored to customer preferences and fit with the local vernacular. Variations of design are essential to ensure homes meet the local needs, such as regional materials and aesthetics, overheating prevention, wind-driven rain exposure, wind loadings, flooding and risks associated with coastal regions.

Local housing design standards and codes are commonplace among local authorities. They are built on principles set out in the *National Design Guide and National Model Design Guide* (MHCLG, 2021a and b) and tailored to regional priorities. These design standards and codes ensure that proposed developments comply with local requirements, often exceeding minimum regulatory requirements.

The roundtable discussion highlighted instances where standardised designs encounter resistance from planning and local authorities. It was identified that further support is needed from local authorities and planning departments to work with standardisation of design as various local standards can discourage the use of MMC and off-site construction by requiring bespoke local design. There is an opportunity for local authorities and MMC/off-site construction manufacturers to collaborate on the design and development of future housing projects to meet the needs of both parties and to realise the benefits of these construction methods.

Recommendation

- Local authorities, planning departments and developers should collaborate to fully appreciate the potential benefits of standardising design while accounting for local requirements.

Standardisation through DfMA and MMC

MMC and the design for manufacturing and assembly methodology (DfMA) epitomise standardisation through the construction process. Throughout the discussion, MMC was deemed essential for the delivery of the housing target and as a way of maintaining quality within these new homes. To define what is classed as MMC, the *MMC Definition Framework* was created by a working group led by Mark Farmer of Cast Consultancy, supported by representatives of Buildoffsite, Homes England, NHBC and the Royal Institute of Chartered Surveyors (RICS) (MHCLG, 2019). *The MMC Definition Framework* identifies seven MMC categories (Cast Consultancy, 2019):

Category 1
Pre-manufacturing – 3D primary structural systems

Category 2
Pre-manufacturing – 2D primary structural systems

Category 3
Pre-manufacturing – Non-systemised structural components

Category 4
Pre-manufacturing – Additive manufacturing

Category 5
Pre-manufacturing – Non-structural assemblies and sub-assemblies

Category 6
Traditional building product-led site labour reduction/ productivity improvements

Category 7
Site process-led labour reduction/productivity improvements

Most new English homes are built from cavity masonry construction. Category 2 closed panelised assemblies are the most common form of MMC in England's homes, with Category 1 volumetric systems gradually increasing in volume. It is predicted that the percentage of MMC used is going to increase over the coming years. This relates to multiple categories and system types (Formston and Buckle, 2023; House of Lords, 2022, NHF, 2024).

The increased use of MMC from each category can be beneficial for construction efficiency and maintaining quality. Factory-build components have the benefit of undergoing rigorous quality assurance checks, ensuring consistency and quality throughout the manufacturing process. Increasing the use of MMC systems and components has the potential to bring consistent quality through the construction process. Benefits in time and materials efficiencies can also be gained through using the same factory-produced off-the-shelf components. Such benefits have been seen through the years with the adoption of off-site components such as engineered floor joints, roof trusses, staircases, floor systems, door sets, etc. The industry must continue to innovate and adopt new forms of pre-manufactured systems and components across all MMC categories, ensuring all components and systems meet the relevant standards, regulatory and testing requirements.

Recommendation

- The industry must continue to innovate and adopt new forms of premanufactured systems and components across all MMC categories, ensuring that all components and systems meet the relevant standards, regulatory and testing requirements.

It is worth noting that the full subject of MMC's barriers, opportunities, limitations (including capacity) and reasons for system and business failures is complex and outside the scope of this report. Numerous reports have been written on these topics and further reports will be released in due course from industry bodies and the NHBC Foundation.

Supply chains and materials

The increase in housing volume from an average of 200,000 to 300,000 homes annually will be reliant on the supply of materials. Historically, the UK construction industry has encountered issues with maintaining an adequate supply of the core materials such as concrete blocks, bricks, specific insulations and aggregates. This is largely due to the fluctuations in the housing demand and build rates. Similar trends will likely be seen in new technologies that are yet to experience the fluctuations on high volume home building.

As demand increases beyond the supply capacity, developers are faced with:

- delays to construction
- use of substitute materials
- seeking alternative suppliers
- increased costs
- having to accept substandard quality materials
- manufacturers encouraged to take on additional design and construction responsibilities.

These factors directly impact the quality of new homes and homeowner satisfaction.

The supply chain is affected by macro-economics, such as the limitations to global resources, international trade agreements, geopolitical situations and trends in national and international economies. Micro-economics also play their part, such as changes in regulations, manufacturing issues and builders' mid-year and year-end targets. In this report we are focused on the factors that can be influenced by industry and government.

The role of social housing

The annual target of 300,000 homes has not been achieved since the 1970s, following the decline in the construction of new social housing as shown in Figure 3. The shortage of social housing is well documented and requires urgent action from the construction industry and government (MHCLG, 2024). To achieve the annual target of 300,000 homes the number of social homes being built must increase. This report focuses on key areas relating to maintaining quality. The details of how social housing can increase and the necessary support and changes to achieve this should be addressed separately.

An increase in social housing regardless of micro and macro-economic situations would play a vital role in creating a level of consistent supply and demand through the industry. This would provide certainty for both the supply chain and the workforce and could improve the security of the supply chain which has previously been impacted by the fluctuations of housing volumes seen in the past.

House building by type of developer, England and Wales, 1946-2024

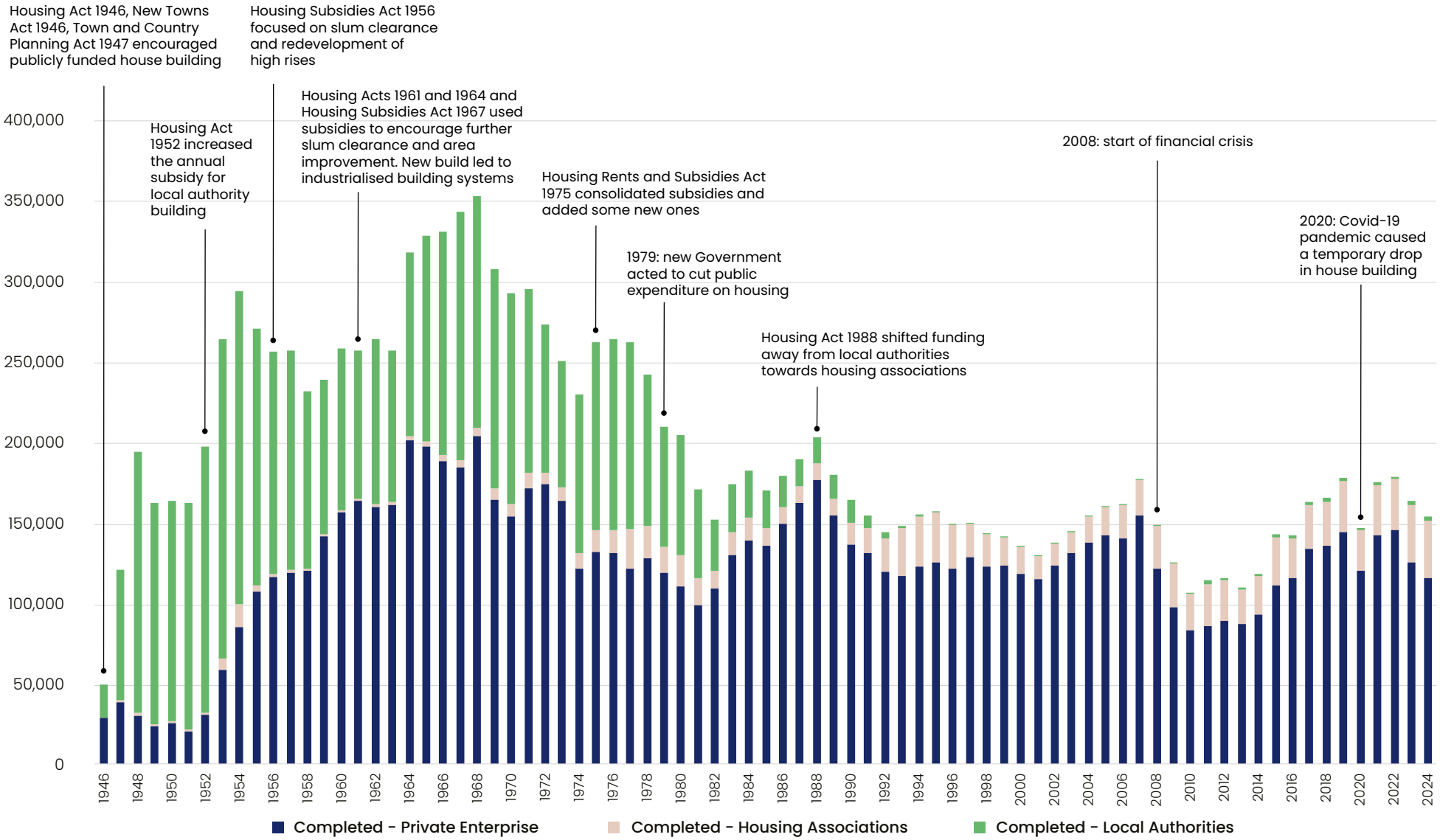


Figure 3 Source: (Wilson and Barton, 2023)

Diversity of suppliers

The industry is reliant on a small number of suppliers and manufacturers for core materials. This has previously resulted in material shortages when issues occur with these manufacturers or their supply chains. To make the industry less vulnerable to single points of failure, the diversity of materials and suppliers needs to increase and reassurances need to be put in place to help support suppliers through downturns in production. To increase supply chain diversity and resilience, further work is required between industry, government, (new) suppliers and manufacturers to identify solutions. In addition to this, the benefits of vertical integration and additional control processes previously discussed may play a key role in supply chain security.

Ensuring robust supply of materials

The quality and consistency of materials fluctuates in line with supply and demand. When demand increases beyond the supply capacity, the quality of materials available has been seen to decline. Materials such as bricks, concrete block and timber are some of the most essential materials for the construction of new homes, yet these are often the most vulnerable to shortages and deviation in quality beyond acceptable tolerances. Materials supplied outside of acceptable tolerances result in a reduction in the quality of new homes, a higher wastage rate, increased costs and delays to construction time. To build 1.5 million quality homes, a robust supply of quality materials must be established, along with improved control over the DfMA process.

Alternative construction methods will play a role in reducing the demand on materials. The industry has widely accepted engineered solutions such as timber I-beams and metal web joists which require fewer materials than traditional methods. Further advances can be made to reduce the amount of virgin materials needed to build homes. MMC, timber frame, material re-use and engineered materials will all be vital to ensure there are adequate materials for the construction of future homes. Each material and system will need to comply with the required testing standards and regulatory requirements. Further testing standards may be required as the industry evolves towards solutions such as material re-use. The industry, government and supply chains must work together to further develop these alternative solutions and testing standards to achieve a robust supply chain of new and existing materials.

Substitute materials and certification

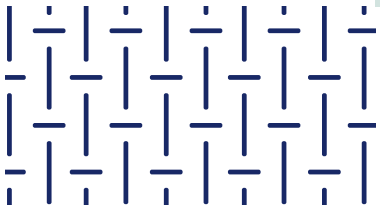
At times of supply shortages, substitute materials and technologies are often used. The substitution of materials and technologies can be detrimental to the performance of a building. The design and performance of buildings is complex and relies on each component to perform as designed. Often the substitution of one element will have a knock-on impact to the overall performance of the building. Substitute materials should therefore be avoided. Where this is not possible, thorough checks must be carried out to understand the performance of the substitute and how it impacts the overall building performance. This may result in changes to design to comply with fire performance, thermal efficiency, structural integrity and material lifespan. Substitutes must be approved by the relevant bodies, ensuring all criteria are met prior to proceeding.

Regulation clarity and certainty from government

The development of innovation and material manufacturing relies on market certainty. There are sectors of industry suppliers currently holding back from innovation and expansion of manufacturing while waiting for government decisions on future legislation. For the industry to invest, long-term certainty and clarity on requirements must be provided. Working on a 10-year plan rather than over parliamentary terms would help to provide certainty. Setting specific review dates for regulations and Approved Documents would also help. It was suggested within the discussion that a minimum number of years between reviews should be agreed between government and industry.

Recommendations

- Clarity is needed from government on upcoming regulatory changes and material testing requirements to enable investment in the development of materials and systems.
- A minimum number of years between regulatory reviews should be agreed with a register of set review dates.
- The supply capacity should be identified. Risks associated with the increased housing target and uptake in new technologies should be addressed by government and the supply chain.



Quality assurance

Quality management and assurance frameworks are essential for maintaining quality, consistency and compliance across industries. However, there is no nationally accepted quality assurance standard for construction in the UK new-build housing sector. ISO 9001 is one of the most recognised international quality management standards; it is used in various industries and is acknowledged in Approved Document 7. However, due to its generic nature, ISO 9001 does not provide sufficient detail to ensure consistent quality assurance systems are implemented during the design and construction of new-build houses. Developing a specific framework or standard for quality assurance when designing and constructing new homes would be beneficial.

The contents and structure of a national construction quality assurance framework or standard should be developed through a collaborative process involving a range of industry stakeholders. Participants should include SMEs and volume builders that have experience in a range of construction methods and specialists in quality and quality insurance, such as the Chartered Quality Institute, NHBC, New Homes Quality Board, Institute of Clerk of Works and Construction Inspectorate, The Buildoffsite Property Assurance Scheme, Lloyd's Register and The British Standards Institution (BSI).

Recommendation

- Create a national quality assurance standard specifically designed to manage quality through the design and construction process for various construction methods.

Culture

Key performance indicators and defect-free homes

Key performance indicators (KPIs) drive the new home construction industry. Some of the KPIs for site teams may relate to construction quality, such as:

- the number of potential defects identified by inspectors (reportable items)
- the results of NHBC Construction Quality Reviews (CQRs) which review the quality of construction, including design details
- NHBC Quality Common Scoring, the metric NHBC uses to express the quality of the inspected construction stage.

However, further work is needed to go beyond the areas covered by these NHBC services to their registered builders, especially for builders and developers who do not receive these services.

In addition to KPIs focusing on the design and construction process, it is common for builders and developers to use the results of the eight-week National New Homes Survey (NNHS). The eight-week NNHS has been administered by NHBC on behalf of the HBF since 2004 and the results are published annually. The survey questions have been adapted to meet the industry and customer needs. The 2024 survey (October 2022 – September 2023) asked 10 questions about customer satisfaction variables. By asking various questions relating to customers' experience, it is possible to gain a holistic understanding of their satisfaction, accounting for multiple ways to define quality.

In addition to the eight-week survey, a nine-month National New Homes Survey is also sent out. The eight-week and nine-month periods follow the date of legal completion. As noted in the CMA *Housebuilding Market Study* (CMA, 2024), customer satisfaction declines between the two surveys. The decreased level of satisfaction relates to the number of snags found within homes over time and the time builders take to rectify snags. The CMA identified a particular trend: the more snags identified, the longer it would take for a builder to fix them.

Recommendation

- The industry should use the results from the nine-month National New Homes Survey in conjunction with the eight-week National New Homes Survey to refocus culture and key performance indicators on long-term customer satisfaction.

It is worth noting that the CMA report and the NNHS do not differentiate between defects and snags. While both terms are used interchangeably there is a difference in severity between the two. The term snag relates to minor issues generally relating to aesthetics or items that may require minor adjustments, whereas NHBC classes defects as a breach of NHBC technical requirements. The NHBC technical requirements are:

R1 Statutory requirements. Work shall comply with all relevant Building Regulations and other statutory requirements relating to the completed construction work.

R2 Design requirement. Design and specification shall provide satisfactory performance.

R3 Materials requirement. All materials, products and building systems shall be suitable for their intended purpose.

R4 Workmanship requirement. All work shall be carried out in a proper, neat and workmanlike manner.

R5 Structural design requirement. Structural design shall be carried out by suitably qualified persons in accordance with British Standards and Codes of Practice.

Further guidance on how to meet these requirements is provided within the NHBC Standards.

While the NNHS and CMA Housebuilding Market Study primarily use the term snag, it was the view of the roundtable discussion that focus should be given to defect prevention.

To further drive the focus towards reducing defects, the aspiration of achieving zero-defect homes should become part of the industry's culture. While this suggestion was raised and discussed, it is mirrored within existing literature, such as the *More Homes Fewer Complaints* report (APPG, 2016). The benefits of building zero-defect homes include reduced cost and construction time, as the remediation work would be reduced.

Recommendation

- Create an industry-wide ambition of achieving defect-free homes.

Transparency of building performance

There is significant evidence that the energy performance of new homes is worse than designed. The difference between the designed and actual performance is known as the performance gap and has been well-researched and documented. The Future Homes Standard (FHS) consultation stated that there are four leading causes of the performance gap in new homes (DLUHC, 2024).

1. **Buildings are not being built as they were designed, for example because of poor build quality or materials being substituted.**
2. **Fixed building services, such as ventilation and heating systems, are not correctly installed and commissioned.**
3. **Occupants use buildings in different ways than those assumed at the design stage.**
4. **Inaccuracies within the models that are used to calculate the energy performance of buildings.**

Point four relates to quality in the design of homes when including the quality of the models and assumptions used. However, item four was not discussed within the roundtable discussion and is therefore not explored within this report.

The 2021 changes to Approved Document L aimed to strengthen evidence of compliance. This includes the Building Regulations England Part L (BREL) report and photos of specific elements during construction, both of which are provided to the homeowner alongside operating and maintenance instructions which should include a home user guide detailing how the home can be run in a healthy and energy-efficient manner.

Building Performance Evaluations (BPE), including Smart Meter Enabled Thermal Efficiency Rating (SMETER), heat transfer co-efficient tests (HTCs) and Post Occupancy Evaluations (POE) have been previously proposed as a way to reduce the performance gap and should be explored further, as discussed in *Design & As-Built Performance* (Zero Carbon Hub, 2014). While these may have a role to play in reducing the performance gap, it is important to consider the following points in relation to post-occupancy evaluation.

- What are the ramifications of identifying the underperformance of a home?
- Is it possible to identify the specific reason why a home isn't performing as designed?
- What are the next steps if a building is found to not perform as designed?

While BPE/POE are not currently a requirement within the Building Regulations, they are required within the planning requirements of some regions. It is likely that the use of BPE/POE will increase over the coming years. The construction industry must be ready to start measuring the performance of new homes and to take responsibility for their performance.

Recommendations

- Reducing the performance gap must be made a priority to ensure all future homes perform as designed.
- The industry must be ready to start measuring the performance of new homes and to take responsibility for their performance.

Conclusion

The ambitious target of constructing 1.5 million homes within this parliamentary term presents significant opportunities and challenges for the construction industry. This report highlights that maintaining quality while increasing build volume is crucial. The roundtable discussion hosted by the NHBC Foundation has provided valuable insights and recommendations to ensure quality is not compromised.

Key recommendations include supporting SMEs and micro builders with technical assessments, aligning regulatory changes to minimise disruptions and investing in workforce development. Emphasising the importance of Modern Methods of Construction (MMC) and standardisation can help address the workforce deficit and improve efficiency. Additionally, ensuring a robust supply chain and clear regulatory guidance from the government will be essential in meeting the housing targets.

The industry must adopt a culture of continuous improvement, aiming for defect-free homes and transparency in building performance. Implementing these recommendations will help maintain the quality of design and construction in 1.5 million homes. However, these recommendations alone are not an extensive list of what is needed from the Government and industry. The NHBC Foundation will continue to work with the construction industry in the coming years to further understand trends and changes and identify where support may be required to ensure the successful delivery of the Government's housing target.

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