



Construction  
Leadership  
Council

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# SMART CONSTRUCTION

## A GUIDE FOR HOUSING CLIENTS



# INTRODUCTION

## WHAT IS SMART CONSTRUCTION?

Smart construction is building design, construction and operation that through collaborative partnerships makes full use of digital technologies and industrialised manufacturing techniques to improve productivity, minimise whole life cost, improve sustainability and maximise user benefits.

This way of working can not only transform the housing industry, but also maximise the benefits of a home for the occupants and provide them with a better quality of life.

## WHY DO WE NEED SMART CONSTRUCTION?

We need to build more homes, more quickly. The Government aspires to a housing market that delivers 1.5 million homes by 2022, and 300,000 homes per year on average by the mid-2020s.

Meeting this growing demand will stretch the house building sector beyond its current capacity. This can be met by improving the productivity

of the sector, making more efficient use of the people and resources available through the use of smart construction. Productivity in the construction industry poses a huge challenge. While productivity in manufacturing has steadily grown over the last two decades, it's remained the same in construction – with a recent diagnosis suggesting a sector productivity gap of ~£15b against the average of other sectors.

### The construction industry:

accounts for

60%

of all materials used

creates

33%

of waste

generates

45%

of all CO2 emissions in the UK



## AND IT'S NOT JUST PRODUCTIVITY WE NEED TO BE CONCERNED ABOUT.

The construction industry has a major impact on the environment, both in terms of the resources it consumes and waste it produces.

We also need to think about what is arguably the most important part of our challenge – how do we help people? How do we help them by making housing affordable and cost effective to run? And how do we go further by helping them improve their lives, wellbeing and future opportunities?

The cost of running a home in the UK is almost half of the household's income, with the average annual cost of household bills and mortgages for homes with three bedrooms almost £20,000.

But it doesn't need to be this way. There is a solution. And smart construction is it.

## HOW CAN WE USE SMART CONSTRUCTION?

There are many different smart construction solutions on the market, here is an introduction to some of them.

### DIGITAL

Imagine if you didn't have to test, fail, learn from your mistakes and try again.

Imagine if you could get the design, calculations, techniques, and materials right the first time, every time.

Imagine if you could visualise and collaborate using live data to optimise the construction process.

Imagine how much time and money you would save.

With digital technologies and supporting processes you don't need to imagine. You can get the design, planning and execution right by carrying out a number of tests and generating predictions to help you optimise the build phase and use assets efficiently.

Digital software is already helping design and construction organisations to record the actual performance of projects and make smarter and more accurate decisions from the outset.

Examples of digital solutions include:



Building Information Modelling (BIM)

Digital design software  
(e.g. AutoCAD, AutoDesk Revit, ArchiCAD)



Digital information tools  
(e.g. SmartSite, data gathering, delivery tracking and management)

MANUFACTURING

New homes are currently constructed with a pre-manufactured value – that is, the proportion of components made off site – of approximately **40%**. Windows and roof structures are typical examples in traditional builds. But there are a range of technologies available that can deliver up to **70%** pre-manufactured value.

Increasing the proportion of pre-manufactured components radically improves the speed of delivery, with groundworks and construction occurring in parallel to the major build phase and main elements built in a quality-controlled environment.

Typical examples include:





- **PANELLISED:** Commonly pre-manufactured from timber in both open and closed panels, light-weight pre-galvanised steel, cross-laminated timber, hot rolled steel or pre-cast concrete as 2D elements and assembled on site.
- **STRUCTURAL INSULATED PANELS (SIPS):** Manufactured panels which are made from layers of different materials.
- **VOLUMETRIC CONSTRUCTION:** The offsite production of three-dimensional building sections, which are delivered to site and installed onto foundations. Sometimes external coverings such as a brick skin or roof tiles may be added onsite.
- **SUB-ASSEMBLIES AND COMPONENTS:** Such as wiring looms, bathroom pods, brick slips, flooring cassettes.

WHOLE LIFE PERFORMANCE

Advances in materials and building physics allow engineers to design high-performing homes that are comfortable to live in and low on energy use.

Applied at scale, smart construction will reduce running costs, while improving delivered quality, performance and durability of the home.

This helps to reduce the overall whole life cost of the building – a considerable benefit to both investors and occupants.

	By using <b>advanced materials and techniques</b> , we can improve the performance of a building.
	By improving the <b>energy efficiency</b> of a home, we can reduce the running costs.
	By improving the <b>durability of a home</b> , we can reduce maintenance costs.
	By improving <b>indoor air quality, visual, thermal and acoustic comfort</b> – alongside <b>boosting energy performance</b> – we can enhance the overall wellbeing of the occupants.





## BENEFITS

### RAISE QUALITY

Smart construction techniques involve building under controlled conditions, increasing precision and quality and process control, while minimising waste.

Pre-delivery inspections, factory-controlled installation conditions, traceability of components for maintenance or later modification, and properly planned interfaces reduce defects in the final building.

### WHOLE LIFE BUILDING COST

This helps to reduce the overall whole life cost of the building — a considerable benefit to both investors and occupants.

Smart construction helps to reduce on-site costs and minimise waste, while achieving a 'right first time' delivery.

By simplifying processes, reducing the risk of error and streamlining the decision making process, we also see productivity and efficiency benefits in the procurement and construction phases.

Smart construction places greater emphasis on work carried out away from the site.

This allows stakeholders and partners across the design, manufacturing and construction stages to plan, organise and work together to improve efficiency.

We can generate greater predictability of performance and outcomes, and significantly increase the speed of build on site and greater certainty of project performance, costs and completion deadlines.

### DESIGN FOR WELLBEING

Smart construction helps us to design better homes that meet higher standards of indoor air quality, visual, acoustic and thermal comfort, along with low energy use.

We spend up to 90% of our time indoors, with as much as 65% of our time at home, so it needs to be a place where we feel comfortable, safe and benefits our health and wellbeing.

Smart construction helps us to make sure the design, specification, manufacturing and construction of homes can achieve a higher level of control and comfort.

Homes that are high quality and built with the occupant in mind are less likely to suffer from issues around under-performance.

This not only enhances the quality of life and living conditions for the owner or tenant, but it has wider social, economic and environmental benefits. High performing homes can help to create happier, healthier communities, with lower energy costs and minimal impact on the environment.

## BOOST FLEXIBILITY

Using smart construction allows those involved with design and planning to fully explore ideas, concepts, processes and materials while maintaining a degree of flexibility.

From early refinement of the design parameters to the materials used and the final construction details, digital technologies can make the whole design, planning and implementation process more accurate and efficient.

Smart construction isn't limited to a certain style of property or trend.

Although one of the benefits of using smart construction is the ability to repeat and repurpose designs, that doesn't mean all homes have to look the same.

A variety of finishes and configurations are usually available, and with specialist suppliers offering solutions to different parts of the market, all types of residential buildings can take advantage of smart construction – whether high-rise, mid-rise or low-rise homes for private sale, rental or social markets.

## DELIVER ENVIRONMENTAL PERFORMANCE

Smart construction integrates the design and fabrication process more than traditional construction methods, meaning minimal recycling and the elimination of waste.

On top of this, techniques such as modular construction mean structures can be disassembled, reassembled and reconfigured – opening up more opportunities for homes and buildings to be used again in a different location and/or for a different purpose.

By addressing the use of materials in construction, as well as the transport used for the project, the industry is already achieving significant reduction in operational and embodied carbon.

## HEALTH AND SAFETY

In the design phase, smart construction software allows organisations to review the design and make sure operations in the factory and on site are planned and optimised in a way to guarantee the best health, welfare and safety outcomes.

We can minimise, if not completely remove, any risks or negative impact on operations at all stages and from all perspectives.

For example, during the construction phase, smart construction methods reduce the overall impact of noise and dust pollution, as well as the number of operatives on site and vehicle movements, which limits the impact on local neighbours, as well as reduces the risk of accidents.



