CLC’s Purpose

Works with industry and government to identify and deliver actions supporting UK construction in building greater efficiency, skills and growth

Website: www.constructionleadershipcouncil.co.uk

- Lead the delivery of the Construction Sector Deal
- Bring the industry together to work towards improved performance
- Maintain progress towards the 2025 Strategy Goals
- Support key industry initiatives
Skills for the Future
Mark Reynolds
Mace

Innovation in Buildings
Mike Chaldecott
Saint-Gobain

Procuring for Value
Ann Bentley
Rider Levett Bucknall

Fair Practice
Andy Mitchell
Thames Tideway
Fergus Harradence
BEIS

Transforming Construction
Sam Stacey

Network Plus
Jacqui Glass

Green Construction (Sustainability), Exports & Trade, etc
33% Lower Costs
50% Faster Delivery
50% Lower Emissions
50% Growth in Exports

Construction Leadership Council Board

Construction Leadership Council Advisory Board

CLC Structure
The Construction Leadership Council’s Innovation in Buildings Workstream

- Embedding innovative construction techniques
- Initially focusing on Homes and schools
- Increase take up of Smart Construction

‘Smart Construction’

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.
Industry Roadmapping

• Involving over 40 industry experts

• Identifying barriers and solutions to the take up and the commercialisation of ‘Smart Construction’

• The reports can be found at: http://www.constructionleadershipcouncil.co.uk/workstream/innovation/
Who is involved?

Working Groups

Mike Chaldecott
Saint-Gobain
CLC Innovation in Buildings

Centres of Excellence & Collaboration
Shelagh Grant
The Housing Forum

Demonstrator Projects, Measures & Business Case
Simon Cross
BRE

Demand Creation, Investment & Volume Surety
Adam Locke
Laing O'Rourke

Risk-averse Culture, Lending, Valuation & Insurance
Mark Farmer
Cast

Schools
Tim Carey
Willmott Dixon

and many more...
Centres of Excellence Signposted

11 physical centres

4 knowledge networks

http://www.constructionleadershipcouncil.co.uk/centres-of-excellence-in-the-uk/
Dashboard of Metrics
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 aims to a housing market that delivers 1.5 million homes by 2025, 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 diagnostic suggesting a sector productivity gap of £135 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
SIMPLE METRICS GUIDE FOR SMART CONSTRUCTION

Smart construction is still a relatively new way of working in the industry, but we’re already seeing the advantages of it thanks to a number of key projects.

We’ve selected several case studies, which illustrate the key features and benefits of smart construction.

By choosing a range of parameters, we’ve set a number of quantitative measures to show how smart construction performs against traditional methods.

There are some areas such as risk, wellbeing design and circular economy where there are currently no quantitative measures in place and as a result are looked at on a qualitative level.

And because these projects are still fairly new – these figures and results are just the beginning.

As time progresses, attitudes and behaviours change, and the industry realises the benefits of smart construction, we hope to encourage more organisations to use these measures and come forward with their own examples of innovative projects that show just how beneficial smart construction is.

<table>
<thead>
<tr>
<th>METRIC</th>
<th>DESCRIPTION</th>
<th>2020 TARGET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital cost</td>
<td>The costs associated with the construction of the building per metre square of gross internal floor space £ / m²</td>
<td>£1480</td>
</tr>
<tr>
<td>Speed</td>
<td>The elapsed time at which the building was built from the first day the first man hour on site was registered to HSE to the last day, captured as days / m²</td>
<td>0.14</td>
</tr>
<tr>
<td>Productivity</td>
<td>The efficiency at which a building is being constructed by looking at the ratio of capital cost to man hours recorded on site reflected as £ / man hour</td>
<td>£31</td>
</tr>
<tr>
<td>Pre-manufactured value</td>
<td>Calculated by the gross capital cost of the project take away the prelims and site labour costs. The result of this is then divided by the capital cost and is reflected as a %</td>
<td>50%</td>
</tr>
<tr>
<td>Quality</td>
<td>This is calculated by 1 minus the cost of post-completion defects as set out by NRC over the total build cost reflected as a %</td>
<td>99.5</td>
</tr>
<tr>
<td>Health and safety</td>
<td>The number of people injured over a year for each million hours worked by a group of employees or workers</td>
<td>1.79 injuries per million hours worked</td>
</tr>
<tr>
<td>Embodied carbon</td>
<td>This refers to the amount of embodied carbon associated with the production and transport of materials used in the construction of homes per metre square of gross internal floor space reflected as kgCO₂e / m²</td>
<td>700 kgCO₂e/m²</td>
</tr>
<tr>
<td>In-use energy</td>
<td>This refers to the in use energy efficiency performance and its environmental impact, identified through EPC ratings</td>
<td>EPC Rating A</td>
</tr>
<tr>
<td>Waste generated</td>
<td>This is the ratio of volume of construction phase waste that has been generated represented for every £100K of the capital cost. Volume (m³) construction waste/£100k project value</td>
<td>8.2</td>
</tr>
</tbody>
</table>
Suite of Case Studies
Guidance Document for Metrics

Status: Soon to be published

SMART CONSTRUCTION

Housing Industry Metrics

<table>
<thead>
<tr>
<th>Definition</th>
<th>Information Required</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Gross Capital Cost (GCC)</td>
<td>Cost associated with construction of building per net square gross internal floor area (GIFA)</td>
<td>GCC = Cost associated with construction of the building, excluding demolition and site clearance, and non-construction costs such as marketing etc. (see ACC cost of building the site)</td>
</tr>
<tr>
<td>2. Embodied Carbon (nGCO 2e/MH)</td>
<td>amount of embodied carbon associated with the production and transport of materials used in the construction of the house per net square gross internal floor space</td>
<td>(nGCO 2e) = embodied carbon in the green space per meter squared (GIFA) emissions that arise from the energy and industrial processes used in the manufacturing, transport and delivery of the materials and components required to construct a building (see ACC, methodology to calculate embodied carbon)</td>
</tr>
<tr>
<td>3. Time on site (days)</td>
<td>required on site to complete</td>
<td>From the first day the house becomes site-registered until the last house is completed and the builder's warranty is in place</td>
</tr>
<tr>
<td>4. No. of completed units</td>
<td>Number of houses (building) / (month)</td>
<td>(Number of houses completed per year)</td>
</tr>
<tr>
<td>5. Productivity (hourly)</td>
<td>Hourly = Gross Capital Cost (GCC) / (infrastructure + administration) + (costs of workforce + (hourly)</td>
<td>Hourly = Gross Capital Cost (GCC) / (infrastructure + administration) + (costs of workforce + (hourly)</td>
</tr>
<tr>
<td>6. Pre-empted waste</td>
<td>No. of waste bins per site</td>
<td>Pre-empted waste is an issue that arises with the construction of housing, where the contractor is encouraged to reduce waste and increase recycling.</td>
</tr>
</tbody>
</table>

CLC Innovation in Buildings Workstream

CLC: Construction Leadership Council

GIFA: Gross Internal Floor Area

GCC: Gross Capital Cost

ACC: Additional Costs

CLC: Construction Leadership Council

nGCO 2e: Net Greenhouse Gas Equivalent

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Demand Report

“Unlock the supply and demand conundrum affecting the provision of additional housing adopting Smart Construction”

- Aggregation of Demand
- Standardisation
- Procurement
Procurement

- Developing a “model contract” for SMART Construction
- Trial of strawman contract with housing clients
- Work with King’s College London
MMC Definitions

http://www.cast-consultancy.com

Category
DEFINITIONS

The term 'pre-manufacturing' encompasses processes executed away from final workface, including in remote factories, near site or on-site 'pop up' factories. The pass test is the application of a manufactured or fabrication or consolidation process in controlled conditions prior to final assembly / install. On-site 'workface factories' are included in Category 7.

1. Pre-manufacturing (BD primary structural systems)
2. Pre-manufacturing (BD primary structural systems)
3. Pre-manufacturing components (non-systemised primary structure)
4. Additive manufacturing (structural and non-structural)
5. Pre-manufacturing (non-structural assemblies & sub-assemblies)
6. Traditional building product led site labour reduction / productivity improvements
7. Site process led site labour reduction / productivity / assurance improvements

CLC Innovation in Buildings Workstream
Quality Assurance

**Status:** Soon to be developed

Develop a unified quality assurance ‘scheme’ for assessing MMC technologies. This would then act as a gateway to acceptance of the final homes for warranty, mortgage and building insurance offers.
**Status:** Soon to be published

Barriers and solutions to the adoption of innovation and smart construction in school building?

Workshop on 9 December to agree 2020 activity
Contact Details

Construction.enquiries@beis.gov.uk
Construction Sector Deal
Transforming Construction Programme

Offsite Construction Show 2019
Transforming Construction: Why?

We account for 9% of GDP

We employ 2.6 million people

We create turnover in excess of £100bn
A 25% increase in productivity could almost double the UK average profit margin of construction companies.
Construction Sector Deal

Industrial Strategy
Construction Sector Deal

Lower costs
33%
reduction in the initial cost of construction and the whole life cost of built assets

Faster delivery
50%
reduction in the overall time, from inception to completion, for newbuild and refurbished assets

Lower emissions
50%
reduction in greenhouse gas emissions in the built environment

Improvement in exports
50%
reduction in the trade gap between total exports and total imports for construction products and materials
Transforming Construction Programme

- £170m Government funding
- £250m Matched industry funding
- 4 years of funding
- Sustainable long-term model

- £72m Total funding
  - £59m Construction Innovation Hub
  - £36m Active Building Centre
  - £59m R&D Projects
Transforming Construction Programme

Objective: to develop a platform design and delivery concept that can:

- Reduce cost, delivery time and lifetime carbon emissions
- Integrate active renewable energy systems
- Boost productivity and increase whole life value

Demonstrating innovative technologies which: address the
- environmental carbon challenge
- enable cost effective energy harvesting to reduce fuel poverty
- Deliver positive social, economic and environmental impact
A new construction eco-system

- Digital design using BIM
- Draws on digital versions of platform components
- Components manufactured offsite, assembled onsite
- Supply chains build up around components and systems
R&D Projects: First Competition

Information
- Data interoperability
- Digital integration platform
- From BIM to machine control
- AR for efficiency
- IoT for site plant
- IoT and concrete curing
- IoT and thermal performance
- LIDAR for cranes

Machine learning
- AI and logistics
- AI for programme prediction
- AI and BIM
- AI and component tracking
- AI for site safety
- AI and progress monitoring
- AI for quality
- Alexa for sites

Product and process
- Panelised housing
- DfMA for housing
- Modular Homes
- Industrialised homes
- Energy active prefab
- Smart piles
- Frame optimisation
- Modular steel
- Non-prismatic concrete

Exploration of the Benefits of R&D Projects in Construction...
**R&D and Demonstration Projects: Second Competition**

**£36m total R&D funding available**

Two competitions will run in parallel:

- £26m Demonstration fund
- £10m Collaborative R&D fund

**Spending Profile:**

- £27m in FY20/21
- £8m in FY21/22

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**£26m Demonstration**

- Opens 28th August 2019
- Closes 6th November 2019
- Projects start 1st April 2020

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**£10m CR&D**

- Opens 28 August 2019
- Closes 30th October 2019
- Projects start 1st April 2020
Sector Deal: Driving the Transition to Offsite

- **Presumption in favour of offsite** – 5 Departments will procure offsite solutions where this delivers VFM

- **National Digital Twin** – Digital Frameworks Task Group developing a set of principles and the framework for built environment data, which will guide the development of digital twins, support the development of BIM standards and ensure the NDT delivers public good in perpetuity

- **Project 13** – support the adoption of Project 13 approaches within the construction sector – to drive a more collaborative and efficient business model.
Discussion