



Construction
Leadership
Council

INNOVATION IN BUILDINGS WORKSTREAM

DEMAND CREATION, INVESTMENT AND VOLUME SURETY

Develop a compelling proposition for housing clients to increase demand for smart construction and provide volume surety to enable greater investment in industrialisation.

POSITION PAPER
NOVEMBER 2017

Foreword



I'm very pleased to introduce this report. It's the result of hard work and collaboration from a range of organisations from across the industry – all focused on how to address an important subject; how do we accelerate smart construction to deliver more housing, quicker, smarter and more efficiently?

The ever worsening deficit between housing supply and demand needs action and this report sets out to suggest clear and tangible actions that government can take in order to help address this topic with smart construction and housing industrialisation at the fore.

To gain real traction all parties need to work towards the same aim with both government and industry, in partnership, acting with clear goals in mind. This report, I hope, helps to develop concrete ideas and next steps, founded on knowledge, expertise, research and, most of all, collaboration and consensus.

Mike Chaldecott
Innovation in Buildings Workstream Leader, CLC
General Delegate and CEO Construction Products, Saint-Gobain UK & Ireland



It has been a pleasure to work collaboratively with people from across the housing and construction industry to present a collective view and recommendations as set out in this position paper. Our focus has been, from the outset, to focus on tangible actions to intelligently coordinate our housing demand and enable our supply chain to invest in Smart Construction.

The aim is to enable us to achieve our national housing needs, support our Industrial Strategy and Construction 2025, and put the UK at the forefront of housing industrialisation creating jobs, wealth and export potential. I would like to sincerely thank everybody who has contributed as part of our working group.

Adam Locke
Working Group Chair, CLC
Partnership and Innovation Leader, Laing O'Rourke



Executive Summary

The Construction Leadership Council's Innovation in Buildings workstream has set out, in collaboration with government, to recommend actions to unlock the supply and demand conundrum affecting the provision of additional housing adopting smart construction.

Definition of 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 costs, improve sustainability and maximise user benefits" [Source: CLC Measures, Sub Group]

Clients are seeking greater confidence in the capacity of the supply chain to deliver, but the supply chain requires greater transparency and surety of demand to be able to make the necessary investments in capacity and industrialised capability.

The proposed strategy seeks to focus on where additional capacity is most needed and is underserved through existing supply chains and where government has most influence to affect the adoption of smarter methods. This is through the housing programmes of city and regional administrations, the Homes and Communities Agency [HCA], and also the Private Rental Sector. [PRS]. The strategy has three key aspects:

- Aggregate demand within city regions and HCA programmes to provide visibility to the supply chain of future volume requirements.
 - Move to long term (three to five year plus) strategic partnerships and contracts to progressively improve performance and capacity managed collaboratively between client and supply chain stakeholders.
 - These longer term arrangements support initial investments in products, processes, and people that can be recouped over a longer period managing affordability for all stakeholders.
- Standardisation of requirements/specifications including space/pattern books - development of industry level guidance, and common standards supporting enhanced quality, and pre-manufactured value in delivery through-out the supply chain.
- Procurement – enabling achievement of this strategy through revised procurement guidance and model forms of contract, with appropriate measures to manage risk investment and reward collaboratively and transparently.

In summary this strategy aims to unlock private sector investment through coordination of public sector requirements. This will support our Industrial Strategy and Construction 2025, both meeting our national housing needs as well as putting the UK at the forefront of housing industrialisation creating jobs, wealth and export potential.



Introduction and Summary

The work of the Construction Leadership Council's Innovation in Buildings workstream (see Appendix I) is aligned with the government's vision set out in the Industrial Strategy and the Housing White Paper. The organisations involved are already playing a part in overcoming the UK housing shortage.

This paper gives proposals on how industry and government can enable confidence in housing innovation, to unlock the demand and supply conundrum and cost-effectively increase capacity to support the UK's need for an additional hundred thousand good quality homes per year.

The government wishes to ensure that housing supply in the UK grows significantly and to increase the productivity and capacity of the housing sector to meet this demand. It also wishes to provide the right conditions for companies to invest in creating capacity for the long term delivery of housing at scale. This group's ambition is to find practical mechanisms for government to use their buying power, at national and local level, to help stimulate demand for innovative housing delivery models, with minimal intervention in the market. The mechanisms should build confidence in the supply chain to encourage companies to invest in existing and **significant new additional capacity in the short-term, which can be scaled as demand grows.**

This additional capacity should demonstrate **significantly increased productivity through "smart construction"**.

This paper sets out our proposed approach and recommended plan to achieve this objective with a plan consisting of three key elements;

- "Clearing House" demand/supply matching mechanisms
- Standardisation of requirements/specifications including space/pattern books
- Procurement and value proposition challenges

It also includes proposals on how existing, or indeed new schemes like the Home Building Fund, Housing Infrastructure Fund, Affordable Housing Programme and Accelerated Construction can unlock private sector investment in existing and new capacity and stimulate smart construction.

The successful completion of our action plan will most importantly enable us to cost-effectively increase productivity and capacity in the housing sector for the long term, which will help us deliver more high quality, affordable homes.

This supports our Industrial Strategy and Construction 2025, both meeting our national housing needs as well as putting the UK at the forefront of housing industrialisation creating jobs, wealth and export potential. In summary the recommended actions for industry and government are as follows:

Industry

- Collaborate in supporting move to long term strategic partnerships and contracts, enabled through standards and aligned procurement processes.
- Use industry bodies and events to promote the opportunity and benefit for achieving capacity and performance enhancement through use of high pre-manufactured value smart construction and provide case studies and feedback on learning and performance improvement.
- Invest in capacity enhancement through product, processes, production plants and people enabled through government actions.

Government

- Configure government programmes including Accelerated Construction and the Home Building Fund, or new programmes to aggregate demand into long term framework contracts linked to improved performance.
- Use these contracts to support the development of planning and design standards, and procurement processes aligned to deliver capacity and performance objectives.
- Commission the HCA together with City Mayors to aggregate and coordinate demand and procurement to intelligently catalyse the supply chain investment and capacity.

Market Analysis

We have undertaken an analysis of the housing market, housing providers, future growth forecasts and the alignment of benefits arising from smart construction. The conclusion of this analysis is that in order to achieve the delivery of additional homes in a short timeframe there are some housing providers and market sectors that are more likely to adopt smart construction methods such as offsite than others. This is not to say that there are no advantages for other housing providers in taking a smart construction approach. There are advantages for all stakeholders in the housing market but we should target our immediate efforts towards those whose business model and objectives are closely aligned with the benefits of smart construction and where we are likely to achieve the greatest benefits in the shortest space of time.

The housing providers we should concentrate on are **government, public bodies, local authorities, housing associations and the build-to-rent sector**. There is a substantial pipeline of development amongst these providers [estimated at approximately 50,000-70,000 homes per annum], which if it were nudged towards smart construction, would create a volume and certainty of demand to sustain investment and significant growth in productivity and capacity.

There are a number of reasons why those providers are the best candidates:

- They are not driven by the rate of sales.
- They tend to take a long-term view of the benefits from development, benefiting directly from a low lifecycle cost and local employment.
- They reap the rewards of development over an extended period of time.
- In some cases they have a legal obligation to provide new homes, for example through local plans, and associated financial targets. They have a direct long term interest in operational cost effectiveness.
- They have a clearer and more direct social value agenda, giving stronger links with employability, skills, build quality, total cost of ownership and mitigating climate change emissions.
- They are more likely to be adversely impacted by the skills shortage.
- They are more likely to experience higher build costs than volume developers.

A visible pipeline of demand is the primary missing piece of the business case needed to attract investment into manufacturing for smart construction. By aggregating a substantial pipeline of work for these providers into national or regional frameworks or contracts, sufficient demand and order book can be created thus enabling manufacturers to invest in production facilities and systems, product development, workforce and skills.



Value Chain Challenges (a selection not necessarily a comprehensive list)

Building owner (social housing in this case, but applicable to other groups)

- Attracted by improved specification, speed and quality of smart construction.
- Reluctance of advisors (many architects and developers) to endorse alternative build methods.
Concerns of:
 - Unproven systems and technology
 - Undercapitalised manufacturers who may not have longevity as suppliers
 - Incompatibility with current cost models
- Higher one-off build cost and a belief that there is insufficient volume to get to cost parity with traditional methods.
- Lack of suitable land with commercially viable development potential.
- Single source supplier risk due to lack of standardisation and sufficient suppliers.

Developer / contractor

- Smart construction does not fit their existing organisational and business model (site management, supply chain, cash flow) – where housing completions are typically slowed to match the rates to maintain desired sales prices. Higher demand supports better prices and profits.
- Adopting innovative construction methods is seen as introducing additional, unnecessary risk.
- There is little appetite or capacity to invest in the short-term for a potential longer term gain. Without external requirements to provide higher building performance there is little incentive to invest.
- Constructors recognise that the growing skills shortage will impact both capacity and costs, so smart construction offers a potential method of addressing this issue.

Manufacturers and supply chain

- Solutions have been developed but there is no visibility and continuity of demand or pipeline of projects/orders.
- Established procurement frameworks require resource investment to participate, but come with no certainty of orders being placed or future work at any point.
- When orders are confirmed; demand is often unstable causing capacity fluctuations and increased cost and response times.
- Developer / contractor ethos may be to try and change solution specification to what suits them, rather than the smart solution selected by the client and design team.
- Traditional construction procurement contracts and behaviour adds unnecessary cost and risk to manufacturers which is unrecoverable, or passed on to the client – undermining the value of the Smart construction.

Government is directly commissioning new housing through the Accelerated Construction initiative. For this to have an impact on the market it needs to set demands and standards that help to meet performance levels and influence capacity requirements that enable more provision supported through smart construction. There is an opportunity to use these projects as exemplars driving wider learning in the industry.

Local Authorities are already reinvesting in housing programmes and many of them are starting development, entering into joint ventures or creating housing companies. This is a good opportunity for them to engage with a type of procurement enabling higher pre-manufactured value rather than traditional procurement which will put them into competition with the traditional housing market at a point where there is limited capacity to deliver.

As they ramp up their housing businesses, it would be better if they started with this in mind and designed for manufacture, rather than designing for traditional construction. Key to this will be to look at the demand as a programme rather than as multiple single one-off procured projects and use this demand to stimulate smart construction of housing to support the required additional capacity. The HCA can have a key role in shaping the approach of this sector of the market.

Build-to-rent companies are starting to invest in new homes, professionalising a sector that currently largely consists of individuals letting out a second home. Institutionally backed private rental is a long-term sustainable housing model for those who are not ready to buy or who prefer to remain mobile. Developments are typically 200-300 housing units with repetition in the design

and layouts, ideal applications for industrial production. These companies will need to be convinced that there is sufficient, capable and reliable capacity in the market to meet their needs.

Innovation is expensive, and until volumes increase offsite manufacturing is unlikely to be the cheapest delivery method for new homes in the short term. It is recognised that moving to a new delivery model requires investment in all parts of the supply chain such as training, skills, investing in culture and practice, and developing client technical teams. Other costs derive from capital outlay to invest in capacity. However, particularly as volumes climb, economies of scale will give unit costs that represent better value because a high pre-manufactured value solution delivers better performing buildings more quickly, and better, more cost effective outcomes for occupants and building owners.

Developers are looking for construction solutions that give them certainty of supply and a defined cost in a market where traditional contracting can give them neither. This provides an obvious opportunity for high pre-manufactured value offerings to startup; and by using the South-East market to create enough of a pipeline of demand to draw in from existing suppliers and new factories to be set up and to begin to supply. After a relatively short period the costs will come down to a point where pre-manufactured construction systems will be viable for production and development throughout the UK.

In order to catalyse this change we have identified three recommendations for action aimed to enable supply chains to have bankable confidence to invest through having better visibility and security of the demand. This investment will give project owners greater confidence in committing volume to the supply chain.

- Clearing house and demand/supply matching mechanisms
- Standardisation of requirements/specifications including space/pattern books
- Procurement/value propositions including long term contracting

In addition the Government has three key mechanisms announced to support additional housing:

- The Home Building Fund (HBF)
- Accelerated Construction (AC)
- Delivery Partner Panel 3 of the HCA (DPP3)

This paper also considers how these mechanisms could be further developed to enable the demand and supply side objectives to be met through coordinated action by industry and government.



“Clearing House” Demand/Supply Matching Mechanisms

To unlock investment in supply chain facilities greater visibility of demand and commitments to forward volume is necessary. The current market is typified by lack of visibility on both the demand and supply sides. The strategic housing providers we have identified have long term or large scale development plans but there is no mechanism to engage the smart construction industry on more than an ad-hoc basis. Mechanisms to broker greater awareness of the potential benefits of smart construction to clients are required. We have received a number of requests for this form of engagement from local authorities, housing associations and private developers.

Commitments to forward volume through long-term strategic partnerships and contracts will support the ability of the supply chain to further invest in the products, people, processes and plants this in turn will help to create greater quality, productivity and capacity. Long-term commitments and increased scale of demand from housing providers and landowners will spread the design stage costs across greater volumes with potential unit costs falling through replication. We have seen a number of partnerships of this form emerging, where demand is being aggregated across major regional developments and across similar clients but to date there is little opportunity to communicate and formalise the potential partnership opportunities and their benefits to industry and clients.

Creating opportunities to match developable UK land to UK supply chains to meet UK housing demand is essential if we want to see investment lead to significant long-term productivity and capacity increases in the domestic market. Government and the CLC acting as a convener for this activity will help to create a neutral environment where commercial conflicts of interests can be overcome.

We would like government to work with us to ensure effective use of public procurement driving the adoption of innovations in the smart construction of buildings and catalyse the market and support private sector clients to do the same. Preference should be given to where this innovation improves land use, revenue generation, energy efficiency, performance, quality and sustainability of the building, which will in turn improve affordability for the occupant.

We would like government to use their buying power and convening capabilities, at national and local level, to aggregate public and private demand for housing. Providing better visibility and commitment to forward contracts will give confidence of companies wishing to invest to support **new additional capacity coming online quickly** and **increased productivity through “smart construction”**. The HCA can play a significant role in this arena and could be commissioned by government to take a greater lead.

The following mechanisms are proposed:

- Match making events to link interested parties on the demand and supply sides and related open days/events at manufacturing facilities or live sites to increase customer knowledge and understanding of the benefits of Off-site manufacturing in a controlled environment
- Support for the creation of long term strategic relationships and contracts between industry partners and housing providers and landowners

Match making events /data exchange

This would be a series of events held throughout the country with representation from strategic clients such as local authorities, housing associations, institutional investors and other private developers on the demand side and smart construction providers on the supply side.

Develop a coordinated programme of national and regional match-making events for housing providers, landowners and smart construction suppliers. This could be promoted through existing industry networks such as ULI, Buildoffsite, CIH, National Housing Federation and the Housing Forum and make use of existing client engagement events. It is proposed that this opportunity is made available to anyone in the supply chain to encourage as much collaboration as possible but that this is coordinated in a way that targets strategic housing providers effectively and enables them to understand the benefits clearly. Industry (CLC and as above) and Government (BEIS, CLG, HCA, LGA, GLA) should give their support to this approach, with a resourced programmed coordinator.

It is suggested that a brokerage event would include a request for information from participants summarised below. This could support and augment information collated within existing public framework systems, with a format based on for example HCA information structure. HCA could act as a leader to pilot such an approach linked to Accelerated Construction or other programmes, thus providing both an early pathfinder as well as an incentive for participation by stakeholders.

Key parameters of interest are indicated below.

Demand	Supply side
Pipeline units/year	Product type
Location	Target capacity/year
Scale-by project/location (number of units)	Target locations
Building typology (e.g houses, low or medium rise)	Performance/standards
Performance requirements	Benchmark cost data
Land-use requirements	

Key considerations for success

- Protection and reliability of data
- Motivation/incentives to support participation
- Resourcing and costs to support event coordination

Actions/ next steps

- Identify coordination team and resources
- Develop pilot event – development to be led by industry, but potentially hosted and supported by GLA, or by HCA linked to programmes
- Follow on with CIH June 2018 event and target HBF event in September 2018
- Identify regional or sector “natural” clusters for follow on events e.g. North-East/Northwest
- Consider formalising into “Housing Hubs” or similar (see below)
- Clarify HCA expectations; grant recipients and that potential future applicants will attend match making events



Promote Long term strategic relationships

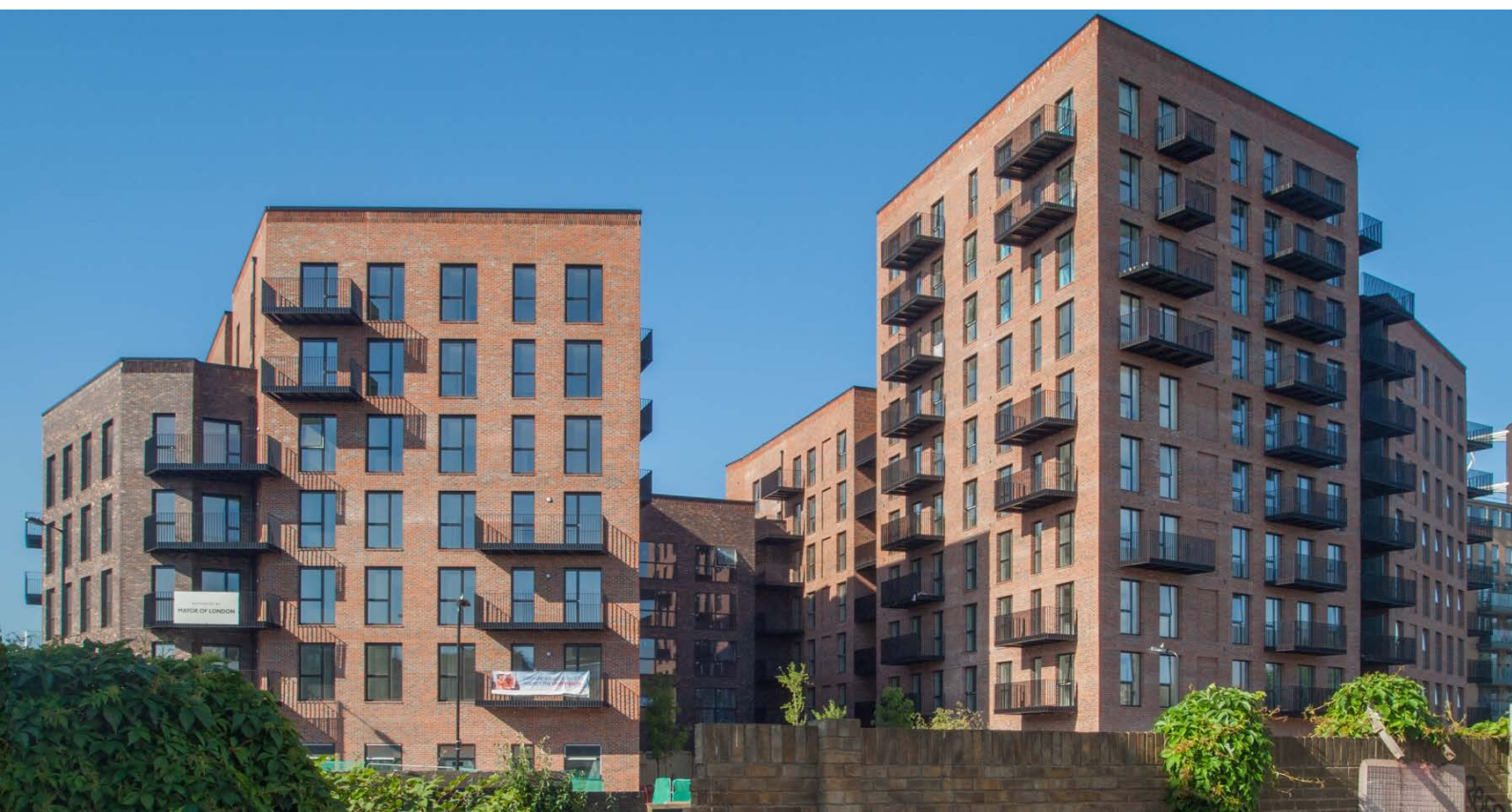
Current industry practice is generally that each project is procured development by project late in the process. Although demand is anticipated it is rarely contracted in advance. This makes it difficult for those investing in supply chain capacity to gain desirable levels of confidence in future pipelines that are “bankable”. Even in framework arrangements there is often limited visibility of forward volumes or any contracted volume beyond individual schemes to give surety of orders to secure investment.

Longer term arrangements do exist in other industries for example automotive and aerospace. Here the requirement to continually perform and innovate to improve is typically built into contractual arrangements. These are driven by value and sets of KPIs/SLA which create the correct behaviours, relationships and working environment to deliver innovation, invest in capacity, improve quality and reduce cost.

In the construction industry Alliance contracts have been used, for example in long-term (large) infrastructure projects, with incentives to progressively improve performance and encourage innovation. Similar approaches are proposed to support the development of higher pre-manufactured value in housing.

Mechanisms to support greater acceptance and development of long term strategic relationships include:

- Increase awareness via CLC and other related industry forums.
- Description of operating models for long term strategic relations.
- Model agreements - such as the NEC contract which can be tuned to the specific supplier including:
 - KPIs, SLA and incentive based contracts.
 - Collaboration agreements around behaviours and culture.
 - Transition plans – from initial engagement through to fully itemised outputs.
- Model Letters of Intent - examples of which may be in use in other sectors.
- Aspiration and ramp up profile for capacity and quality targets.
- Examples and descriptions of benefits and methods through Case studies Build in approach through HCA/Other public sector procurement (potential for initial subset pilot programme within wider programme of HBF/Accelerated Construction/ DPP3 – this would include a commitment to a level of capacity over a three-five year timescale to support higher pre-manufactured value and performance.



Actions

- Identify team with responsibility and resourcing to progress actions.
- Identify and launch team to create model forms of strategic relationships to support long term visibility and “bankable” demand. This would need to include input from investor community ideally to support “bankability”. The outputs would consider both private and public sector procurement:
 - Model letter of intent.
 - Model forward contract (including KPIs, SLAs, collaboration agreements, and transition plans).
- Compile example case studies of long-term relationships.
- Consider Housing Hubs for more structured discussion between LA/HAs/supply chains
 - Identify exemplar long terms relationships /contracts opportunity and pilot approach through a sub-set of HCA or coalition of the willing e.g. Local Authorities within London area.



Standardisation

Smart construction is a collection of different innovative methodologies which range from a supply chain of pre-manufactured components being assembled on site to complete solutions such as fully manufactured homes. The primary construction materials include timber, steel, concrete and combinations of these. The proliferation of different solutions creates great opportunities but also bring challenges with interoperability of components and limited supply chain capacity. Developers have raised concerns about the limitation in capacity coupled to risks associated with using unique products and single source suppliers.

The benefits of increased certainty, speed, quality and reduced cost that can come from a design and manufacturing approach are reliant on repeatability and scale. Within each construction method the cost of developing new designs from scratch is significant and repeated every time a new client specifies the requirements of the housing they wish to procure.

Standardisation within the smart construction sector could help the market to scale up, reduce costs of design and production, reduce risks to purchasers of only having one point of purchase, grow confidence in prefabrication, and develop common approaches and methods.

Bringing in even low levels of standardisation will have a dramatic impact on quality and costs, as manufacturers improve the efficiency of what they produce, as the scale they operate at grows to meet new demand. Design quality will rise as designers concentrate on the spatial and visible aspects of construction and less time reinventing the wheel. Construction quality will rise as installation teams become more effective at implementing the same solution many times rather than many solutions every time. Construction and manufacturing costs will fall as repeatable solutions are used more often.

Proposed standardisation guidance:

- Standardised approaches to the different housing market sectors.
- Common performance metrics.
- Some standard typologies to enable costing and planning.
- Some common approaches to design, layout and servicing.
- Some common rules for logistics between authorities.
- Some commonality between regulatory regimes: NHBC/BOPAS/LANTAC, LABC etc.
- Some common design principles – e.g definitions of floor to floor heights, setting out, openings
- Some commonality in component interfaces

This can be captured in a pattern-book approach covering both key typology/layout and component dimensions and interfaces.

Note that where possible existing and developing standards can be incorporated to the above approach. Examples or relevant developments include:

- British Standards Institute: proposed update to BS 5606 Guide to accuracy in buildings – through ISO/TC 56 – in particular “Modular Coordination”
- BRE : BPS 7014 – BRE Product Standard – Standard for Modular Systems for Dwellings
- Housing Hub – Design for Standardisation for Design for Manufacture and Assembly [DfMA]

Developing the necessary guidance will require specific funding resourcing and engagement with the industry. Such guidance and standardisation approaches have been developed in other sectors for example in education, the Education and Skills Funding Agency [ESFA] has taken a lead, and this approach flows through to its procurement approach. In the housing sector, Crest Nicholson is working with multiple manufacturer to develop common specifications that each can work to. Linking such activity to the specific application (and importantly the supply contracts) aligns incentives and resources.

However wider industry guidance will help all parts of the sector develop. It is proposed that initial design standardisation guidance is let either as part of HCA procurement processes, or as a separate contract (for example under Innovate UK Small Business Research Initiative [IUK SBRI])

mechanism) which may be then used by HCA in its procurement and delivery processes but also can form the basis of wider industry guidance, and could be supported and endorsed through CLC and related bodies. In the short term the standardisation would form design guidance for clients, consultants, designers and contractors.

Clients would use a programme like Accelerated Construction to procure standardised approaches using definitions created by design standardisation guidance group. These definitions would cover all the types of offsite construction in outline, with enough detail to enable designers to use them as a template. This does not mean that the results will all look the same; the principles of mass customisation used in most manufacturing industries would focus on standardisation of core construction elements and interface details, and less to appearance which will remain mostly a customer choice, brand and planning matter. Different type definitions could go into more detail, for example a hotel bathroom for 3* hotels could be defined completely, whereas a build-to-rent bathroom may be the same size as other types but the finishes would be left to the individual client to specify. In the long term the implementation of standardisation could be managed as part of certification via BOPAS or NHBC or LA type approval LANTAC.

There is some degree of standardisation of practice within currently housing construction, the aim to support this further through standardisation aligned to high manufactured value systems.

The type specification would operate in a series of levels numbering one - five

- Level 1: Platform/type – the structural dimensions needed to plan the unit.
- Level 2: Adding M&E service definitions.
- Level 3: Sizes of openings.
- Level 4: Materials.
- Level 5: Finishes.

Collaboration between bodies such as the CLC, BOPAS, investors, government, NACSBA, BRE, BSI, manufacturers, designers and sector specific bodies to achieve type definitions and a pattern book with core components identified that can then be used by clients and designers to fulfil their requirements.

Key Actions

Set up activity early in 2017 and produce a first set of guidance in 2017:

- Create the group and develop a business plan, demonstrating the value of the approach including showcasing examples
- Identify the types of housing guidance to be defined first, (the ones offering the greatest benefit to the offsite industry), potentially linked to specific procurement requirements
- Engage with the different housing market sectors
- Secure funding from the sectors to produce guidance
- Develop a priority list and create a first set of sector guidance and standards (this could be apartments for rent built using modular volumetric for example, or linked to HCA procurement frameworks)
- Disseminate and showcase demonstrators
- Obtain and respond to feedback
- Develop a second set of sector guidance and standards (e.g terraced housing for urban sites)
- Continue to produce guidance for affordable housing, student accommodation, extra care, retirement, custom build, etc., dependant on sector demand.

The work would be relevant to the UK initially but would establish IP and capability that would be relevant to a range of overseas housing providers and designers/manufacturers in future years giving UK designers, contractors and manufacturers an export opportunity.

There is a risk that the implementation becomes too bureaucratic and isn't implemented, or that it is implemented and it stifles innovation. Some housing providers who want to be different in their approach may see this as potentially diluting their brand or conflicting with their design aspirations. Repeating work already being done elsewhere in ISO standard development can be avoided by having representation in both efforts.

What does Industry need to do?

Get behind the initiative and support it with effort and advice, work more closely with clients and contractors to further develop their systems to meet market demands, trial systems and solutions, publish and promote best practice/benefits

What will the impact be?

The industry will come to an initial view of what is meant by designing housing using different offsite systems that can be commented on, used for procurement and design, shared and adapted over time. This will enable manufacturers to invest in systems that can build to the required standards, or improve upon them, and will enable them to compete against each other on a level playing field. Clients will be able to determine how far to take their ambitions to use offsite systems in a way that can be communicated to manufacturers, and when it comes to procurement they will have choices of manufacturer to buy from.

What does government need to do?

Support the initiative through the CLC, HCA and other mechanisms to provide a resourced secretariat and team and use the definitions of standard approaches in direct procurement to pilot the approach with the market. Provide funding for work to publish, market and disseminate the type definitions.



Procurement and Value Proposition Challenges

Across the housebuilding value chain there are barriers to the adoption of new models and technologies including offsite solutions. Current procurement practices are often a barrier to the use of smart construction methods and incentivise against innovation by rewarding lowest capital cost bids rather than by measuring the outcomes and their value, such as improved energy performance or whole life cost.

Opportunities

Funding to stimulate housebuilding

- DCLG Home Building Fund
- HCA Accelerated Construction
- GLA Innovation Fund - Investment Loan
- Shared Ownership & Affordable Homes
- HCA / Homes England DPP3 Frameworks

This funding may stimulate housebuilding but will not necessarily accelerate the development of smart construction or any form of innovation. This may be particularly true if the funding is directed at developers or projects whose business model is based on traditional construction.

The outline approach which follows, seeks to address the obstacles to innovation for all parties and sets out a framework which is intended to:

- Encourage development and testing of new solutions /smart construction
- Provide a more stable pipeline of demand to refine and scale products processes
- Encourage new entrants to housebuilding (manufacturers, developers, investors)
- Enable benchmarking of new and traditional solutions without over subsidising any approach.

The Funding Allocation Model

The proposal is to subdivide a funding round 'pot' into allocations by project stage:

- Land and planning.
- Utilities and infrastructure.
- Construction and supply chain.

The funding is designed to stimulate supply, by leveraging the best outcomes and value for the end client and HM Government funding. These outcomes should be specified as measurable performance requirements:

- Specification: e.g. thermal performance, warranty, aesthetic, occupier appeal.
- Speed: e.g. time to plan, procure, construct and handover.
- Dependability: e.g. conformance to programme, levels of snagging and quality defects.
- Flexibility: e.g. ability to adapt building solutions pre- and post- construction.
- Cost: Both construction cost and whole life cost.
- Added Value e.g. UK job creation, market development including for example the level of pre-manufactured value, sector shift and up skilling.

These performance criteria are set with a minimum or maximum level as appropriate, and would form the basis of a balanced scorecard for procurement

Long term contracts or specific grant funding, through the HCA, is allocated to projects or supply contracts based on a commitment to achieve, or exceed the output criteria effectively creating a smart construction market for suppliers to enter, engage and secure work. To ensure a range of solutions is tested, funding may be allocated by applicable building types (e.g detached/terraced houses, low/mid/high rise apartment buildings) or solution technology or material I (e.g. timber SIPS, thin-joint masonry block, volumetric steel frame).

Consortia (housing providers, developer and supply chain) may bid for the funding, but need to convince assessors that they can meet or exceed each of the performance requirements.

Alternatively, suppliers can bid to be evaluated for first tier access to the smart construction marketplace.

Suggested criteria are as follows:

- All those achieving the performance requirements will earn a follow-on contract to at least (say) 50% of their previous funding (likely to be based on peer reviewed design performance). Remaining funding will be allocated pro-rata to those projects which have over-performed against the criteria.
- The performance criteria will then be raised to the mid-point between the original and the best performing solution.

The key priority is to establish a valuable set of performance criteria, which offer a level playing-field assessment between solutions, can be measured without developers 'gaming' the system and have a clear trajectory and agreed goals to encourage medium to long term innovation/market development /investment by the supply chain.

The ambition is to create a virtuous cycle of funding for innovation, testing in real projects, accurate benchmarking between technologies, developers and regions.

Challenges will include:

- Aligning the metrics across the diversity of national geography, green versus brownfield sites.
- Establishing a meaningful and accepted weighting between the multiple criteria through a balanced scorecard system.
- Developing approaches to assess performance of funded projects (within the development cycles rather than post-completion) to avoid the demand lag for the supply chain.
- Creating and allocating contracts that could change over time.
- Rewarding housing providers, suppliers, contractors with more orders in return for delivering defined outputs, whilst continually raising the bar.

These challenges are seen as worthy of investment to establish a housing innovation culture which is not predicated on subsidy and subjective assessment.

Next steps

- Develop the outline procurement model and assessment criteria and tools.
- Encourage adoption by the HCA/Homes England in procurement programmes.
- Support the promotion and adoption of the model by priority clients.
- Monitor and report on and audit progress towards targets.

Links to other activity

- Information from the measures working group to inform the development of the procurement tool.
- Creating a feedback mechanism in the procurement tool to inform further iterations will be necessary, perhaps an activity for the identified centres of excellence.
- Promoting the model through match-making events.



Conclusions and Recommendations

The government wishes to ensure that public procurement drives innovative new products and services and we would like them to work with us to ensure they also drive the use of innovations in the smart construction of buildings thus acting as a catalyst for the market. We would like government to promote development using smart construction where the investment in innovation leads to improvement in: efficient land use, energy efficiency, performance, quality and sustainability of the building. This will, in turn, improve affordability for the occupant, as well as improving capacity and productivity of the house building industry, and creating export potential.

The government also wishes to provide the right conditions for companies to invest in the long term. This is going to be critical in the housing sector if the government wishes to reach an additional 100,000 homes per year. For example, 50,000 modular homes per year equates to 10 to 20 factories (each providing 2,500-5,000 homes/year), underpinned by a supply chain delivering quality component parts that consider DfMA requirements.

As part of this process we would like government to use their buying power, at national and local level, to help aggregate demand for housing to provide visibility and commitment to forward contracts and therefore confidence to companies wishing to invest to support **significant additional and new capacity coming online quickly** and **significantly increased productivity through “smart construction”**.

We are already assessing how this could be done, for example by holding regional networking events to facilitate engagement between construction companies, manufacturers, the supply chain and potential clients (paying particular attention to the Private Rented Sector) and creating long-term supply contracts to help give bankable confidence to invest.

In order to support this change we have identified three areas of action. These aim to help the supply chain to invest through having better visibility/security of demand and project owners to have greater confidence in committing volume to the supply chain.

- ‘Clearing House’ and demand/supply matching mechanisms
- Standardisation of requirements and specifications including space/pattern books
- Procurement/value propositions including long term contracting

In addition the government has three key mechanisms announced to support addition housing:

- The home building Fund (HBF).
- Accelerated Construction (AC).
- Delivery Partner Panel 3 of the HCA (DPP3).

This paper also considers how these mechanisms could be further developed to enable the demand and supply creation objectives. In summary the recommended actions for industry and government are as follows:

Industry:

- Collaborate in supporting move to long terms strategic partnerships and contracts, enabled through standards and aligned procurement processes.
- Use industry bodies/events to promote the opportunity for achieving capacity and performance enhancement through use of high pre-manufactured value smart construction and provide case studies and feedback on learning and performance improvement.
- Invest in capacity enhancement through product, processes, production plants and people enabled through government actions.

Government:

- Set-up government programmes to aggregate demand into long term framework contracts linked to improved performance.
- Use these contracts to support the development of planning and design standards, and procurement processes aligned to deliver the capacity and performance objectives.
- Commission the HCA together with City Mayors to aggregate and coordinate demand and procurement to intelligently catalyse the supply chain investment and capacity.

Appendix I - Background

The Construction Leadership Council's **Innovation in buildings** workstream is embedding innovative construction techniques to improve productivity and capacity in the construction industry, and the quality and whole-life performance of buildings. The workstream is initially focussing on homes, but with a view to expanding to all building types later, taking action to overcome some of the key barriers to the take up and the commercialisation of 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".

A roadmapping event was held on the 7th April 2016, facilitated by Cambridge University's Institute for Manufacturing, with over 40 experts from across industry. The aim of the workshop was to help develop a strategic roadmap of barriers to the take-up and commercialisation of smart construction. An executive summary and the full report from the day can be found [here](#).

11 major barriers were identified in the roadmapping workshop and are listed below in priority order:

1. Lack of collaboration.
2. Lack of demand.
3. Investment in suppliers who can support Smart Construction.
4. Lending, valuation & insurance.
5. Immature supply chain.
6. Risk-averse culture in construction.
7. Procurement models.
8. Business case for change.
9. Requires economies of scale.
10. Lack of performance data.
11. Skills shortage.

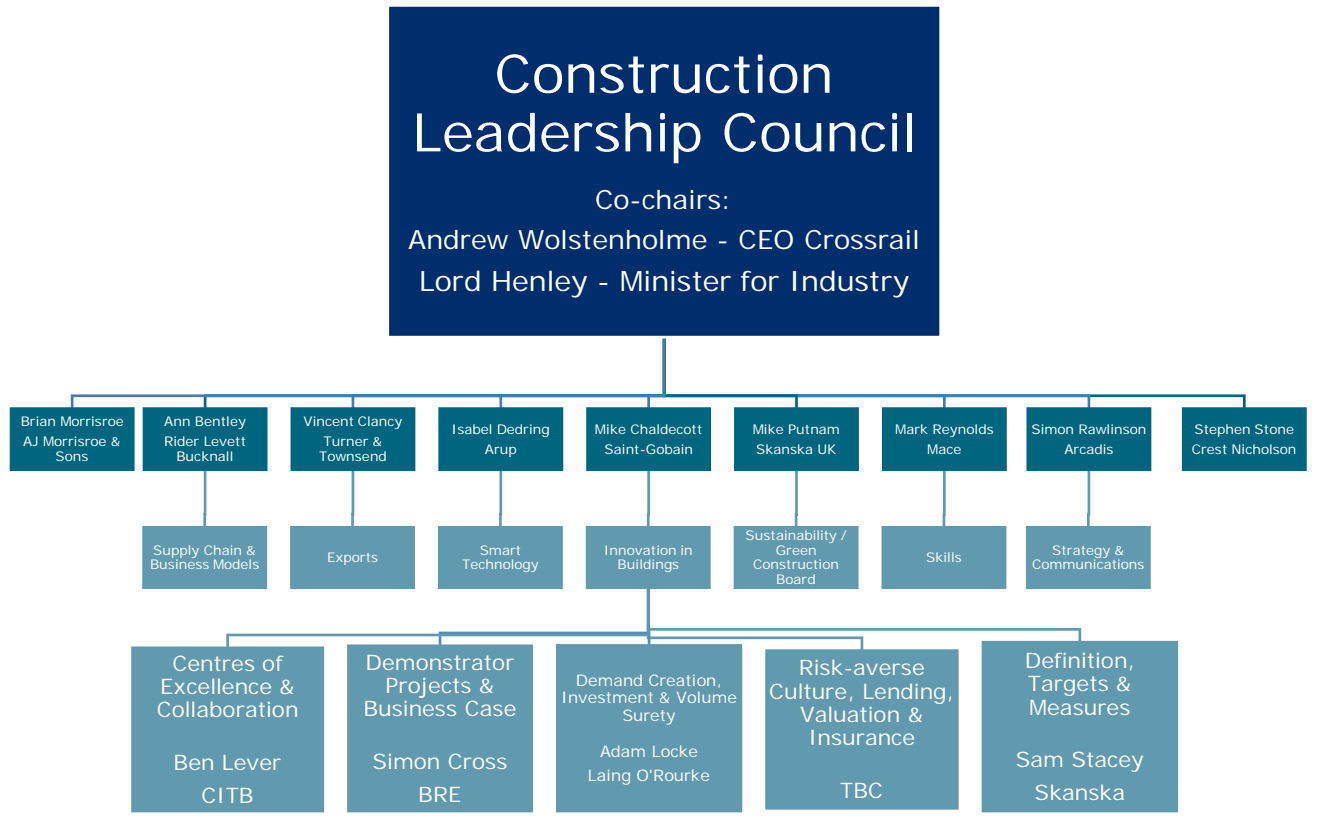
The key barriers, along with all the innovation workstream activities, have been developed into an action plan and formal working groups have been established to deliver and continue the work started on the day. The organisations and individuals involved can be seen in the organisation chart in the appendix which include academics, architects, construction companies, finance institutions, government departments, Local Authorities, manufacturers, trade associations, etc.

The five working groups are:

- **Centres of excellence and collaboration** - supporting and creating centres of excellence for skills and knowledge to share best practice, inspire collaboration and showcase new opportunities. Also to address the lack of collaboration, and a need for strategic partnerships within the supply chain.
- **Demonstrator projects and business case** - supporting and promoting demonstrator projects to raise awareness with consumers, aid industry learning and demonstrate the benefits of smart construction. Also to prove the business case for change, and the ability to demonstrate benefits through in-use performance data.
- **Demand creation, investment and volume surety** - influence housing clients to increase demand for smart construction and provide volume surety amidst volatile demand to address the lack of investment.
- **Risk-averse culture, lending, valuation and insurance** - work with the finance sector to improve availability and affordability of finance and insurance products for homes built using smart construction, considering concerns over product durability and equity retention, to address the risk-averse culture in construction.
- **Definition, targets and measures** - ongoing measurement and reporting of progress against to be identified targets.

The lack of construction skills, especially for smart construction, was highlighted as a major issue within the construction value-chain which should be addressed, but due to there being another Construction Leadership Council workstream for skills, it was felt that this work would be better placed there.

Appendix II – Organisation Chart



Appendix III – Demand Creation Working Group

Isobel Wade	DCLG	
Gavin Fraser	BEIS	
Adam Morton	National Housing Federation	
Adam Locke	Chair/Laing O'Rourke	A
Trudie McCormick	Keepmoat	
Stewart Delgarno	Stewart Milne Group	C
Rory Bergin	HTA Design	B
Adrian Campbell	ARUP	
Joshua Southern	KPMG	
Tim Hall	Total Flow	C
Jessica Moore	BEIS	
John Slaughter	HBF	A
Jason Powell	Accord Group	A
Paul McGivern	HCA	C
Kieran White	Vision Modular	
Wayne Yeomans	B&K Structures	C
Rod Davensac	Legal and General	
Dennis Seal	Buildoffsite	B
Matt Cooper	ARUP	B
Maja Jorgensen	GLA	A
Jamie Ratcliff	GLA	
Ellen Storrar	GLA	A
James Lidgate	Legal and General	
John Bedford	Accord Group	
Tom Jarman	Your Homes Newcastle	B
Jade Lewis	Saint-Gobain	

Key: participation in sub-group

A – 'Clearing House' and demand/supply matching mechanisms

B - Standardisation of requirements/specifications including space/pattern books

C - Procurement/value propositions including long term contracting



Appendix IV – Glossary of Terms

AC	Accelerated Construction
BEIS	Department for Energy and Industrial Strategy
BOPAS	Build-off site Property Assurance Scheme
BRE	Building Research Establishment
BSI	British Standards Institute
CIH	Chartered Institute of Housing
CLC	Construction Leadership Council
CLG/DCLG	Department for Communities and Local Government
DfMA	Design for Manufacture and Assembly
DPP3	Delivery Partner Panel 3 of the HCA (DPP3)
ESFA	Education and Skills Funding Agency
GLA	Greater London Authority
HA	Housing Association
HBF	The home building Fund or Home Builders Federation
HCA	Homes and Communities Agency
IUK SBRI	Innovate UK Small Business Research Initiative
KPI	Key Performance Indicator
LA	Local Authority
LABC	Local Authority Building Control
LANTAC	Local Authority National Type Approval Confederation
LGA	Local Government Association
NEC	New Engineering Contract
NHBC	National House Builders Confederation
OSM	Offsite Manufacturing
SLA	Service Level Agreement
ULI	Urban Land Institute
UK	United Kingdom



Construction
Leadership
Council

www.constructionleadershipcouncil.co.uk

C/O Department for Business, Energy & Industrial Strategy
1 Victoria Street, London, SW1H 0ET Tel: 020 7215 6476
E-Mail: construction.enquiries@beis.gsi.gov.uk