



TRANSFORMING HOW WE BUILD HOMES

year two summary report february 2021



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Prototyping at L&Q's flagship housing development at Saxon Reach, Milton Keynes

introduction

Advanced Industrialised Methods for the Construction of Homes (AIMCH) is a three year housing innovation project set up by a consortium of major private, public and academic partners, which aims to tackle the challenges in the housing sector, to provide additional homes across the UK.

This innovative project is a collaboration between Stewart Milne Group, Barratt Developments PLC, L&Q, the Manufacturing Technology Centre (MTC), the Construction Scotland Innovation Centre (CSIC) and Forster Group; the project is managed by Limberger Associates.

The consortium aims to industrialise how the construction industry builds homes, by identifying and developing advanced offsite solutions needed to meet current and future housebuilding demands. The innovative solutions will be trialled on live housing projects across the UK, with successful new methods then commercialised and brought to market on a large scale. It is expected that AIMCH will result in new digital design tools, manufacturing advancements, improved near-to-market offsite systems and lean site processes.

The ultimate goal of the project is to support the housing sector to deliver the UK Government's additional new homes targets, whilst reducing costs and maintaining quality, enabling homes to be built more quickly and with minimal defects. Over the three year period, the project has potential to impact 35,000 homes each year that are being delivered by AIMCH partners across the UK.

This report summarises the achievements of the project in its **second year**. Despite the challenges faced by the global pandemic the project has gained significant momentum with the completion of several outputs, the addition of two new workstreams and continued activity across all twelve parts of the project. The pandemic impact has only accelerated the need to transform how homes are constructed. AIMCH is a real opportunity to innovate out of recovery, recalibrate and exploit outputs post pandemic.



Prime Minister Boris Johnson visited Barratt Homes' Stretton development Kings Quarter

summary of achievements in year two

- Monitoring has taken place on 42 plots (23 Barratt and 19 L&Q), with over 100,000 operative observations recorded and 500,000 pieces of data collected and used to evaluate masonry, timber frame and advanced closed panel MMC methods
- Barratt completed all advanced closed panel timber frame units, including pre-tiled roof systems and scaffoldless erect MMC construction, to achieve a weather tight, insulated and secure superstructure in a day
- L&Q completed 7 of the 9 site MMC initiatives being trialled onsite, including innovative closed wall, flooring and modular roof systems, for housing and apartment designs
- Embarked on a study to measure and profile Embodied Carbon (EC) and Whole Life Costing (WLC) in the use of MMC systems, across 4 housing typologies to current and near zero carbon/energy standards
- Produced a Guide to Creating a BIM Housing Manual, providing a framework for developers to transition to 3D digital working
- Developed a methodology and carried out detailed housing standardisation studies, to determine a range of standardisation opportunities, suitable for housing



- Created a suite of common standard product families and concept recommendations, ready for engagement with supply chain and use in future industrialised housing pattern books
- Completed requirements mapping, analysis and vendor engagement for the development of a Digital Business Enterprise Resource Planning (ERP) System, suitable for OSM
- Created a Design for Manufacturing and Assembly (DFMA) Guide for Timber Panelised MMC Systems, to optimise housing designs suitable for panelised MMC systems
- Developed an advanced factory modelling tool (mathematical, 2D & 3D) to configure differing solutions for future MMC factory investments, including simulation and 3D visualisation
- Completed proof of concept trials and progressed design solutions for advanced MMC robotic manufacturing work centres for panelised sheathing, insulation and window fitting, suitable for factory applications
- Analysed regional build costs for all construction methods across all areas of England and established full monetary values, £ per square feet and percentage differences
- Captured detailed requirements and evaluated solutions for a proof of concept Augmented Reality (AR) as part of an advanced roof tiling solution. This will assist in the correct selection, orientation and installation of roof coverings and Solar PV panels
- Developed innovation challenges and supplier sandpit selection process, ready for engagement with the supply chain sector, via Construction Product Association networks, to identify promising solutions for advanced MMC, standardisation and zero carbon technologies of the future

- Developed a strategy for a proof of concept, near zero carbon home trial, with Barratt Developments, in conjunction with the AIMCH project
- Presented at several high profile dissemination events, including the Financial Times Future of Building Event, to disseminate on-going learning and progress emerging from the project
- Updated the AIMCH website and promoted shared learning, through press and social media channels, as part of wider industry benefits and awareness
- Maintained good progress, steering the project through the difficulties, arising from the global pandemic
- Mark Farmer appointed as AIMCH Chair in December 2020

onsite monitoring

Background

In addition to reviewing how productivity is measured, AIMCH partners Barratt Developments and L&Q aim to benchmark conventional build methods, compare and identify improvements offered by panelised MMC systems in reducing site labour, increasing productivity and reducing onsite waste, sharing findings with partners and industry.

In the first year of the project, the project team implemented a range of monitoring techniques such as Calibre and SMART Waste studies, as established construction monitoring tools and processes, used within the housing sector.

The project is undertaking an early stage proof of concept study to develop radio-frequency identification (RFID) and Bluetooth technology BLE labour tracking system. Data is being captured on-site for both current construction methods and future operations where MMC is utilised. This will be used to identify where productivity can be increased.

The team has also introduced a data collection tool to develop apprentice learning and upskill the workforce. A number of measures have already been implemented, where there were productivity improvements identified.

Monitoring on site will continue for both project partners, with Barratt completing monitoring of conventional masonry site during 2021. This part of the project is due to be completed in Sept 2021.

Year 2 activity & outputs

- Monitoring has continued both the Barratt and L&Q sites utilising the established Calibre and SMART Waste productivity measurement tools
- The prototyping of the BLE system will continue as part of an early stage proof of concept trial, for future development, improvement and scaling up
- Barratt are in the process of completing a selection of open panel timber units and masonry homes for benchmarking purposes
- Barratt completed all advanced closed panel timber frame units, including pre-tiled roof systems and scaffold less erect MMC construction, to achieve a weather tight, insulated and secure superstructure in a day
- L&Q completed 7 of the 9 site MMC initiatives being trialled onsite, including innovative closed wall, flooring and modular roof systems, for housing and apartment designs

Learnings for industry

The collection of this site monitoring data will allow the project partners and industry to truly understand construction site productivity and other key related metrics when comparing current and future build methodologies. Key findings will be made available to industry later in 2021.



digital business enterprise system

Background

AIMCH aims to produce a single seamless digital system (an Enterprise Resource Planning or ERP system) that will allow businesses to process offsite manufacturing from concept design to completion.

This will demonstrate an increase in efficiency, quality and a reduction in lead-time, downtime and processing time associated with the manufacturing and installation of MMC systems. Once the ERP system is implemented this will form the foundations to streamline the business through one source of real time data, implement new automation and robotic technology and provide agility in terms of adopting new ways of working, improving standards and productivity.

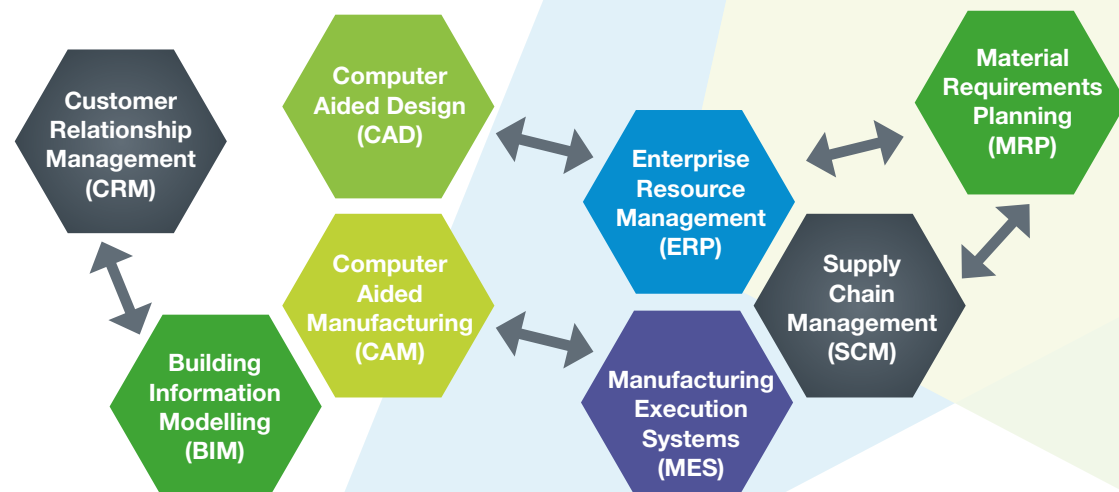
To enable this part of the project, initially MTC worked with Stewart Milne Timber Systems to develop a digital roadmap which enabled opportunities for digital development to be identified. Custom data captured in the first year of the project was critical in the development and integration of an ERP down selection proposal.

Year 2 activity & outputs

Detailed process mapping and research formed the basis of a ERP requirement schedule and down selection process. Through further analysis and vendor engagement over the second year of the project, an ERP solution has been sourced and a business benefits case developed for future investment. Covid-19 and the complex mix of requirements affected the vendor engagement process. However, after adjustment, two solutions have been found and further exploration into these has been carried out.

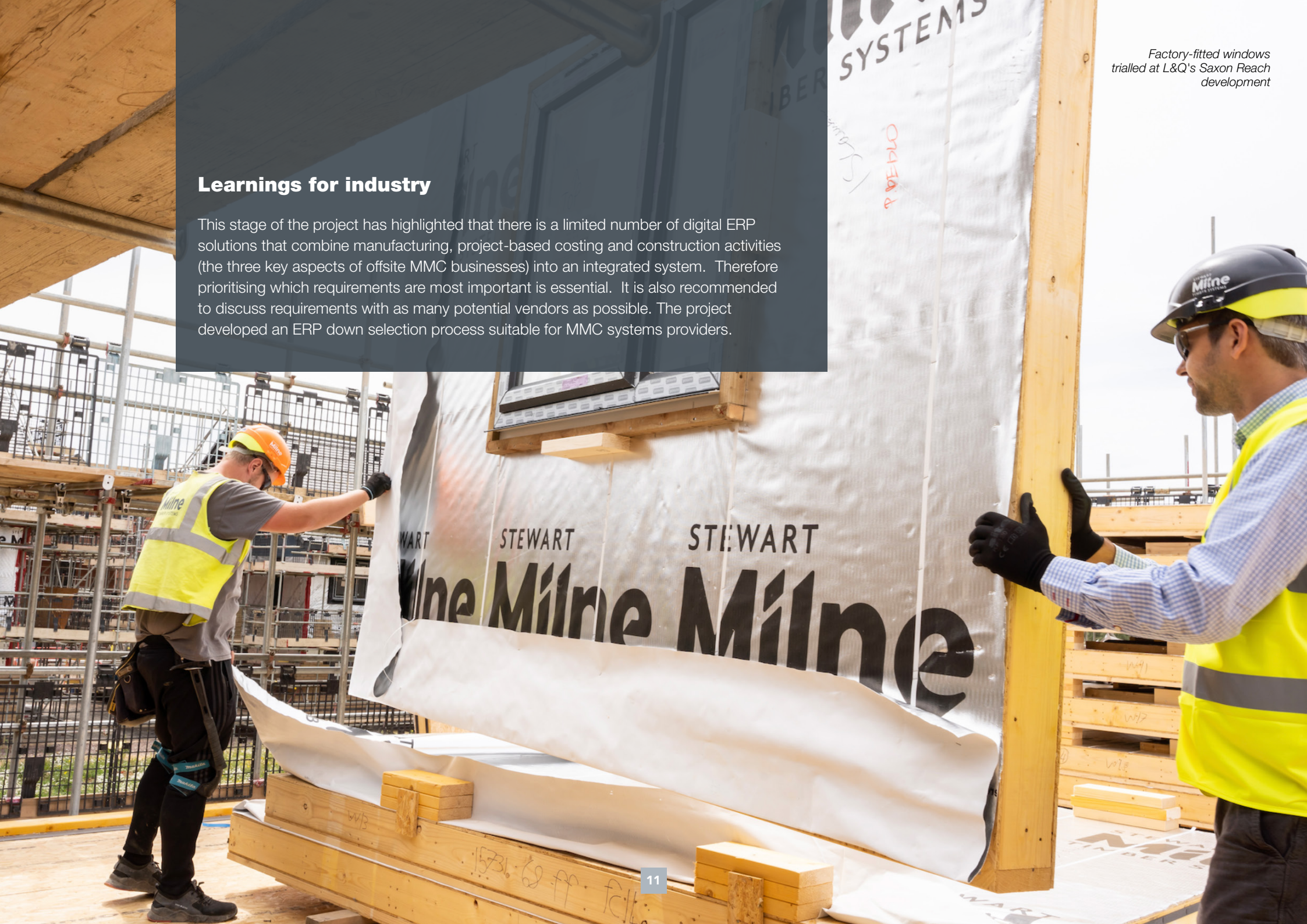
A report detailing the ERP down selection journey and learnings, as used by Stewart Milne Timber Systems, has been completed and will be available to industry in February 2021. Process mapping for a smaller starter ERP system for Forster Group will complete in Spring 2021 to allow their down selection journey to begin, suitable for an SME manufacturer.

A series of interconnected technologies and solutions that facilitate the business processes



Learnings for industry

This stage of the project has highlighted that there is a limited number of digital ERP solutions that combine manufacturing, project-based costing and construction activities (the three key aspects of offsite MMC businesses) into an integrated system. Therefore prioritising which requirements are most important is essential. It is also recommended to discuss requirements with as many potential vendors as possible. The project developed an ERP down selection process suitable for MMC systems providers.



design standardisation and product families

Background

Standardisation is critical to an effective industrialised housing approach. The automotive industry has shown how standardisation can be leveraged to derive significant business benefits, such as lowering costs, increasing productivity and improving quality, whilst providing a framework of flexibility, that is valued by car purchasers.

Through the creation and exploitation of future industrialised housing design, that embrace standardisation and MMC, yet deliver high quality, functional and appealing homes, AIMCH aims to fuel a path to delivering more homes, at an affordable cost.

Within this part of the project, led by the AIMCH developer partners, the team have undertaken studies of existing housing portfolios to better understand the level of existing standardisation. They analysed how best to design solutions that yield greater future standardisation by developing common components/sub-assemblies or design parameters, that maximise design standardisation, whilst retaining high quality designs within their current and future housing solutions.

An early part of the work was to manage the differing developer attitudes, approaches, ideas,

supply chains and brand characteristics relating to standardisation. MTC provided an independent facilitation role, leveraging their expertise in delivering collaborative standardisation solutions, within the automotive sector transferring skills and approaches, which were then used by the AIMCH developer partners.

The work delivered a standardisation methodology and ranking system, leading to detailed studies of key areas of standardisation interest, by each

of the AIMCH developer partners, including suggested standardised components or sub-assemblies, known as **product families**. These product families can be developed further through collaborative engagement with supply chains and creation of industrialised kit of parts suitable for use within future housing designs and in the creation of **Industrialised Housing Pattern Books** which is one of the final outputs of this project.



Year 2 activity & outputs

- Housing standardisation down selection methodology
 - o Selection methodology
 - o Ranking and scoring matrix
 - o Identified 15 standardisation opportunities and short listed these
 - o Completed final report
- Detailed standardisations studies, for a selection of housing standardisation opportunities
 - o Windows & doors
 - o Stairs
 - o Wet rooms
 - o Service cupboards
- Created a suite of common standard product families and concept recommendations for:
 - o Windows & doors
 - o Stairs
 - o Wet rooms
 - o Service cupboards
- Completed a final report, pulling all aspects into a one overview document, suitable for shared learning and generic use across the industry

Learnings for industry

The findings from the standardisation studies, thought to be the first of their kind, confirmed the lack of standardisation that currently exists across the AIMCH developers' housing portfolios. This presents a great opportunity to review new approaches and thinking on how best to embrace standardisation, focused on areas of opportunity identified through the down selection process.

The studies analysed in detail the influences, drivers, and reasons that block standardisation. Detailed mapping exercises were undertaken of the current state variability, and where coalescence to common sizes and approaches, can facilitate standardisation. The work concludes by presenting standard product family recommendations that can be used by the AIMCH developers to review current and future housing portfolios.

Standardisation of sub-assemblies and the creation of product families, within housing design, as a mainstream industrialised process, is a significant shift for the AIMCH developers and wider industry. This will take many years to embrace, embed and deliver to the scale, capability and benefits shown by the automotive sector. However, these innovative collaborative studies, believed to be the first of their kind, show real promise in the potential to embrace standardisation as a positive attribute rather than negative.

AIMCH partners are already seeing business opportunities where this work can be exploited within their businesses. In the case of Stewart Milne Homes, the recommendations have been utilised in the creation on a new housing range for deployment within the business in the next 12-36 months.

Similarly, L&Q have adopted the information for their housing library where there is strong potential for a standardised range of components including bathrooms, service cupboards, fenestration and external housing features, which enable commercial viability for MMC at scale and are beneficial to construction on site.



Single skin party wall trials

bim housing manual

Building Information Modelling (BIM) is a process which can bring benefits to any housing development. It brings new challenges to the way we work. In housebuilding it requires developers to adopt new design standards, approaches and processes.

BIM brings many new terms and vocabulary into the working environment and navigating through them can be daunting. There are many forums and guides to help, however they do not fully reflect the house building industries processes, from land identification through to customer care.

The housing industry is well suited to BIM adoption, where the benefits of a standardised designs, collaborative procurement and repeatable processes are inherently built into the housebuilding delivery process.

AIMCH has created a Guide to Creating a BIM Housing Manual, providing a framework for those developers, housebuilders and stakeholders, keen to adopt BIM. The guide allows housebuilders to consider and tailor their BIM transition approach, to suit their specific business drivers, needs and systems

The AIMCH Guide to Creating a BIM Housing Manual was developed by the AIMCH developer partners. The key objectives were:

- To provide a framework that helps housebuilders create their own specific BIM Housing Manual
- To set out the expected standards that should be applied to the creation of a Project Information Model (PIM) created using 3D modelling software to ensure alignment with BS EN ISO 19650
- To address the need for a collective and consistent approach across all housing design work streams and developments
- To enable digital working, ensuring data capture for key tasks and processes to engender efficiencies
- To be a source of information for staff to adopt a consistent approach to BIM model and information production



AIMCH utilised the experiences for the developer partners, Stewart Milne Group, Barratt Developments and L&Q, whom are all at varying stages of BIM adoption, to develop a common framework with assistance from Keppie Architects BIM consultants.

The framework is focused on four key areas:

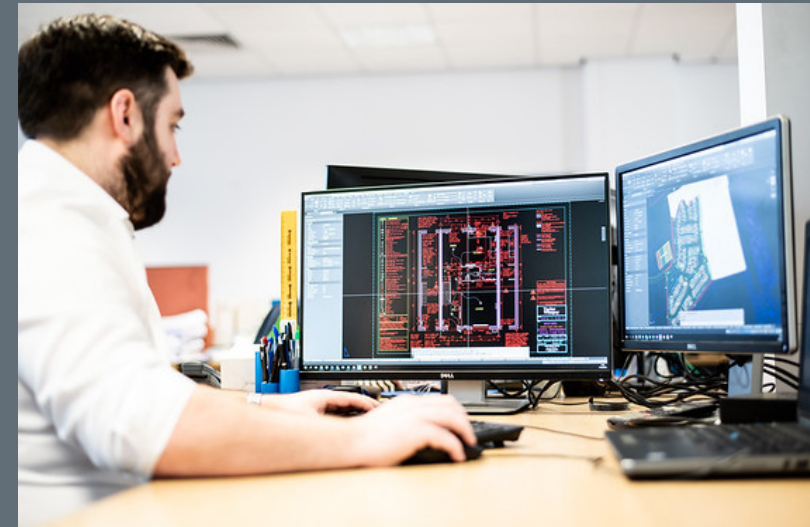
- **Technical** - relating BIM standards, 3D Model set up, Model management, modelling configuration, BIM processes and information governance
- **People** - relating to building capability, training, competency, role profiling and knowledge levels
- **Culture** - relating to the need for collaborative working, management of support mechanisms and cultural values
- **Leadership** - relating to business sponsors, communications, commitment and BIM champions

Learnings for industry

Through the creation of the Guide to Creating a BIM Housing Manual, the AIMCH project delivered the following BIM Housing Guide industry outcomes:

- A framework guide that helps housebuilders create their own specific BIM Housing Manual.
- Recommendations on the technical, people, cultural and leadership requirements needed to support BIM digital working
- Templates to assist housebuilders create delivery plans for upskilling, competency and knowledge levels
- Guidance to allow housebuilders to consider cultural development, management of change and organisational capability.
- The guide provides a structure and content to assist users navigate their way through BIM adoption and implementation.

The transition to 3D BIM enabled digital working with the housebuilding industry is already underway. Over time this way of working will



become the new norm, as was the case when drawing board were replaced with 2D CAD drawing systems. By adopting BIM enabled digital working, housebuilding will be industrialised and transform how homes are designed, procured, manufactured and constructed. BIM digital working can lead to reduced costs, increased output, fewer defects and high quality homes, the sector can be proud of.

advanced prototyping

Background

Developing and trialling advanced panelised MMC systems on live developments aims to demonstrate the effectiveness of new scalable MMC solutions, through reducing the amount of labour resource and material waste onsite while improving productivity, quality and build speed in a cost effective way.

In the first year of the project Barratt Developments developed and erected six advanced closed panel timber frame units on a live development near Warrington, a Homes England site, and last year L&Q began trials on one of their live developments in Milton Keynes.

These systems, in particular the single skin party wall, factory fitted windows, scaffold-less erect and pre-tiled roofs, have created a great deal of interest, not only within Barratt and AIMCH partners, but also across the construction industry, and in October 2021 Prime Minister Boris Johnson saw a prototype first-hand on a visit to the Barratt site.

The trials have included varying levels of advanced systems for Barratt and L&Q including pre-insulated external wall panels, pre-fitted windows, chipboard decked floor cassettes, ground erect roof systems, factory fitted fire protection and single skin party walls. Units have also been erected without any

scaffold, as well as the roof being pre-tiled on the ground before being lifted into place and completed as prefabricated fully tiled modular roof system, delivered to site.

Ongoing productivity monitoring has provided the project with detailed data to analyse the differences between the advanced systems in terms of time,

resource, quality and material waste, compared to conventional masonry or open panel timber frame systems.

Forster Group have also been working closely with MTC to develop an innovative roof tiling system, with advanced prototyping developing over the past year.

Fully tiled roof system installed at L&Q's Saxon Reach development





Roof rig built for Forster Group by MTC

Year 2 activity & outputs

Despite the impact of site closures in 2020 due to Covid-19 construction trialling and monitoring restarted successfully and work continues to progress well.

Over the past year Barratt have completed the construction of their advanced MMC systems with the first occupants now living in prototyped AIMCH homes. Early analysis of these homes has identified benefits of the new systems.

Barratt is continuing to build and monitor open panel timber frame and masonry units using the CaliBRE and SMARTWaste tools, to gather vital benchmarking data to compare.

In 2020 L&Q began trialling advanced systems on a live development in Milton Keynes. Six out of the nine initiatives have been completed on site so far: Prefabricated concrete ground floors, factory fitted French doors, modular roof, factory fitted fire protection to apartment walls, single party wall panel and GRP dormers.

The Remaining advanced systems will be trialled during the start of 2021 including:

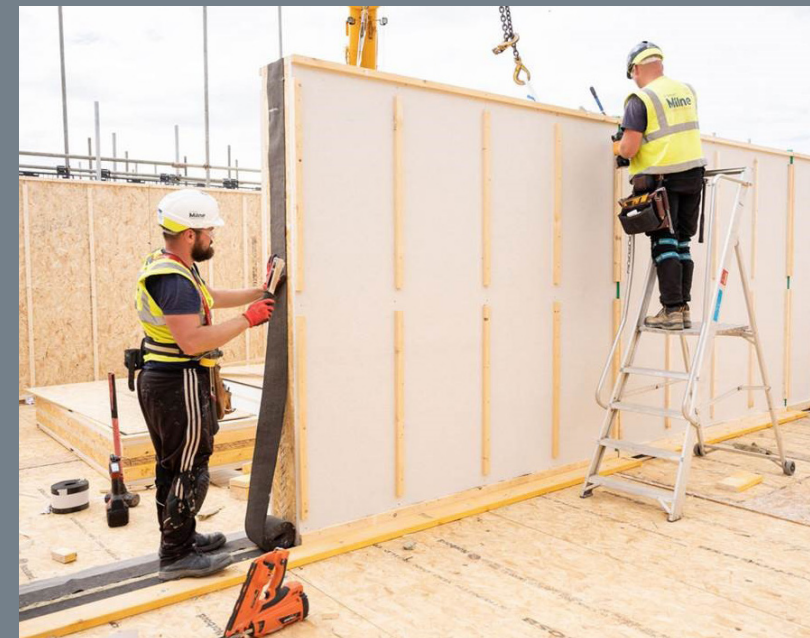
- Spray plaster to walls and ceilings vs tape and joint finish to walls and ceilings
- Pre-tiled roof vs felt and batten roof
- High Strength Gypsum Board vs Ply Pattress panels fitted on site

Forster Group, in partnership with MTC, have started developing their advanced roof tiling solution. Workshops have been carried out to develop the methodology for the prototyping and a roof rig was built in the workshop at MTC by Stewart Milne Group to enable the proof of concept trials to be carried out in a safe and controlled environment during Covid-19. The first roofing trial was carried out and monitored and is under review. Of interest was the development of solutions to digitally scan the roof to derive outputs that can be used in their future manufacturing process. Learnings will be taken to develop the system further for on-going proof of concept trials.

Learnings for industry

All advanced Panelised MMC systems and lean construction solutions trialled so far have been completed successfully and early analysis is recognising the benefits of these advanced panelised MMC systems with the hard data to back it up. The trialling and monitoring not only allows the benefits of the advanced panelised MMC systems to be recognised in relation to resource and waste, but also highlights areas of opportunity where systems and operations could be improved further.

Installation of single skin party wall system, Stewart Milne Group



advanced manufacturing - future mmc factory & robotics

Background

The aim of this part of the project, led by Stewart Milne Group and MTC, is to utilise modern manufacturing technology, used in other sectors, to help reduce planning and analysis timescales for creating new MMC factories and quickly generate a factory model and specification for business case submission. The work involved three steps utilising mathematical modelling, simulation and 3D visualisation to deliver a factory blueprint, business case and ROI, for future Offsite Manufacturing (OSM) factory investment.

It involves research and mathematical modelling on the current and predicted future state of timber offsite panelised MMC manufacturing systems to identify gaps and make recommendations for the adoption of simulation technology, and the development of new automated and robotic manufacturing methods.

The past year of the project has seen the completion of Future Factory Simulation. This work has paved the way for Offsite Manufacturing (OSM) companies to make more agile decisions about increasing

capacity to the market by using modelling and simulation tools to support and control digital factory planning activities.

Stewart Milne Group and MTC have worked together for several months in a highly innovative collaboration. Discovery processes, advanced modelling and simulation techniques were used to explore a multitude of scenarios and variables to create a model that would be easy to use yet extremely valuable, flexible but relevant.

In partnership with Forster Group, the team has also been working on an innovative manufacturing solution for their roof tiling system being developed, with work carried out to identify and test concept designs ready for selection.

Stewart Milne Group have progressed detailed design solutions for three specific manufacturing areas of interest, for robotic manufacturing of timber based MMC components. Proof of concept trials have been completed and pre-production designs developed with their technology partners.



3D future factory simulation - Stewart Milne Group

Year 2 activity & outputs

Stewart Milne Group - Robotics & Automation

- Detailed reviews of robotic work centre activity and cycle times were carried out to inform work centre design
- Completed preproduction design of a robotic work centre for timber frame wall panels
- Developed concepts and design solutions for high speed installation of insulation
- Completed proof of concept trials for the robotic fitting of window elements with CSIC, for commercialisation within AIMCH
- Working with technology partners to investigate developments that will reduce cycle times and increase efficiency as part of a fully automated wall and floor manufacturing solution

Stewart Milne Group - Future Factory Simulation

- Mathematical modelling was used to demonstrate the capability of using modelling tools to support the creation of a new factory specification and layout, in terms of the shop floor system capacity, layout, flow and cost
- MTC Produced an Excel user interface to enable wider use of specialist Discrete Event Simulation (DES)
- Developed 3D architectural models, using both DES outputs and virtual reality animation software to explore different methods of visualising future factory designs
- The tool set and methodology developed provides the capability to build and evaluate many different production scenarios so that investment decisions can be made with deeper insight.
- A report detailing this part of the project can be found on aimch.co.uk/outputs

Forster Group

- A tool to help cost potential manufacturing approaches, including automation to produce roofing solutions was developed by MTC and used to evaluate potential options

- Workshops were completed to review the manufacturing operations and factory design to suit differing concept design options
- Proof of concept trials are progressing with MTC, which will provide the base data for the development of the manufacturing system, with the first trials now complete and further scheduled

Learnings for industry

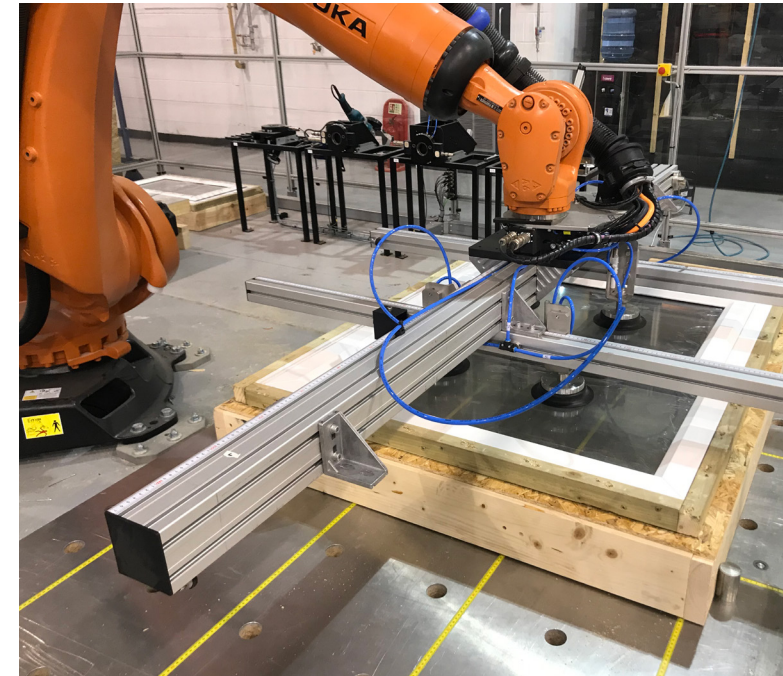
The project has provided several agile and accessible tools that have been used immediately. This helped to model (and remodel) scenarios quickly and without external consultant support. The wider OSM supply chain and the construction industry can benefit from adopting modelling methods and technologies to improve agile, scenario-based decision making.

It highlighted, especially with the DES tools, that a certain degree of experience and understanding is required to maximise the benefits of the tools. Close collaboration demonstrated that modelling and simulation can be simplified and become more accessible than previously thought.

Simulation can add value when re-planning existing production activities and facilities, as well as informing larger investment and expansion projects. There is potential to expand the use of modelling from factory systems to further areas of application such as supply chain, resource management and material/product management.



Offsite production & robotics trials by Stewart Milne Group



commercial viability

Background

An aim of AIMCH is to ensure that any of the proposed solutions are commercially viable and scalable across a range of house types and tenures, benchmarked against current construction methods.

During the first year, the team examined a variety of build costs (around 50 in total), for a number of house types across the UK, and used the data to collate information on costs relating to traditional masonry construction, open panel timber frame construction and closed panel timber frame construction, with allowances for the regional variations.

The data was analysed and summaries produced which outline costs for a number of different areas of the project (including both value and by square foot) with details for labour, materials and subcontractor costs.

It was confirmed that every region currently has a significantly different cost benchmark due to variations in the cost of labour, materials and subcontractors.

In the second year of the project, these benchmarks were developed to incorporate actual onsite costs and provide a true benchmark for analysis between the current standard house construction and MMC solutions.

The project now has an overview of specific regional costs, which have been amended to compare and contrast masonry construction with standard and advanced closed panel timber frame. Also, open panel timber frame construction with standard and advanced closed panel timber frame construction. This has generated both monetary and square foot cost differences for the building structure.

To these building structure cost differences, a separate comparison for site overheads/preliminaries/waste has been undertaken in order to ascertain the actual cost differential relating to different types of construction.



These site overhead/preliminary/waste adjustments have been added to the building structure cost in order to ascertain the true cost difference for analysis, in monetary terms, square foot terms and percentage terms. This is now the true base information for specific regions of England.

This will be continually updated and revised throughout the project as and when new technologies and enhanced MMC are developed, in order to ascertain future cost benefits.

Year 2 activity & outputs

- Obtaining regional build costs for all construction methods across all areas of England
- Ascertaining true site overhead/preliminary costs for all types of construction
- Calculating full monetary values, £ per square feet and percentage differences, for all types of construction across all areas of England (build and site overhead costs)

Lessons for industry

As traditional resources of labour and materials become more expensive and limited and with the journey towards greater energy efficiency and carbon neutrality, it is now more important than ever to achieve cost certainty, better quality, speedier build and reduction in carbon footprint.

augmented reality (ar) proof of concept for roof coverings

Background

This part of the project, added to its scope at the start of year two, aims to create an augmented reality (AR) proof of concept to execute detailed augmented instructions for installing roof coverings for new build housing.

The proposed solution will develop:

- An application that will author the build order for installation of roof coverings linked to the relative sequence of barcodes
- An application to run on an augmented/ mixed reality device with functionality to read barcodes/label, execute augmented instructions for installing roof coverings in the correct orientation and steps
- A solution to identify a point of reference to overlay the augmented instructions either by using a fiducial marker or other appropriate means

So far this part of the project has captured detailed requirements and validated them with test cases. The team have carried out a down selection of potential devices and software available on the market.

The next step in this part of the project is procure the hardware and software and develop the application. This will be followed by a live demonstration of the technology in action.

Year 2 activity & outputs

- Completed a hardware down selection review
- Carried out comparisons and testing between a variety of off the shelf AR devices based on risk to wearer location, working at height, display capability, durability for outdoor use and cost
- A handheld device was selected over a headset device to advance to next stage of this workstream, more specifically i-pad pro and i-phone 12, both now having integrated LIDAR technology
- Work commenced on developing the application

Learnings for industry

The technology is available but very rarely used in the construction industry. This proof-of-concept work will shine a light on this approach and the benefits to subcontractors onsite.

Information sharing between offices and site-based teams has always been a challenge for subcontractors and this technology can go a long way in bridging that gap.



embodied carbon & whole life costing

Background

Verco and Whole Life Consultants were brought into the project to carry out embodied carbon and whole life cost analysis as a new element of the AIMCH project. The aim of this workstream is to evaluate the long term environmental impacts of the use of MMC systems and assess capital cost versus whole life costing (WLC).

The project will assess four AIMCH house designs, built using masonry, large format block, open and closed panel timber frame, and light gauge steel MMC systems, for embodied carbon and whole life costs.

Data will be gathered and analysed on the benefits and impact on the procurement of housing comparing WLC cost in the context of MMC panelised construction systems, compared to conventional build methods, assessing procuring for value against procuring on cost.

Specifically for Stewart Milne Group the embodied carbon profiling of timber based

MMC systems was completed, as part of cradle to gate assessment.

The output will be a case study on the benefits, impacts and issues arising from detailed embodied carbon and whole life costing assessments, in the context of comparing MMC panelised construction systems compared to conventional build methods, in the future scaling up of AIMCH homes.

In year two of the project the scope of work was agreed and analysis began on four house types across four build methods. The next phase of this activity is to complete data collection and beginning modelling of the house types and build methods.

Learnings for industry

Taking into consideration the future needs of the industry, additional investment by both project partners and Innovate UK in this additional element to the project highlights the importance of carbon and whole life costs of the construction process. Engaging the expertise of Verco and Whole Life Consultants has been key.

engaging industry

A major aim of AIMCH is to ensure industry can benefit from its work through its dissemination. Thousands across industry have engaged with AIMCH in the project's second year.

- Appointment of Mark Farmer, Founding Director & CEO Cast Real Estate & Construction Consultancy, and Government champion on MMC, as Chair in December 2020
- AIMCH project halfway industry webinar
- Sharing of findings with key stakeholders
- Keynote at Innovate UK's Future of Building Week with the Financial Times plus five other industry events
- Creation of new video and animation to highlight specific project outputs on the project's website and social media channels
- 21 pieces of coverage in the construction press

The AIMCH team is happy to share the project's findings at industry events or meetings, therefore please contact hmaguire@cs-ic.org with any speaking requests.



Mark Farmer was appointed as new AIMCH Chair



End Note

Many outputs will be completed throughout 2021 to the end of the project in March 2022, so to keep up-to-date with these and to find out more about the project visit aimch.co.uk and follow us on [LinkedIn](#) and [Twitter](#).

project partners



Stewart Milne Group

Lead Industry Partner – Housing and OSM Supply Chain



Barratt Developments PLC

Industry Partner – Private Housing



Forster Group

Industry Partner – SME Sub Contractor



L&Q

Industry Partner – Social Housing



Manufacturing Technology Centre (MTC)

Lead Research Partner



Construction Scotland Innovation Centre (CSIC)

Research and Dissemination Partner



Limberger Associates

Project Managers

project supporters





TRANSFORMING
HOW WE BUILD HOMES



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