



TRANSFORMING HOW WE BUILD HOMES

Work package 3/6:
Advanced Prototyping

April 2022



INTRODUCTION

As part of the AIMCH project, a number of advanced MMC prototyping trials were carried out and monitored on live developments from September 2019 – December 2021. More than 80 units were monitored across developments by London and Quadrant Housing (L&Q) and Stewart Milne Group (SMG) to gain data about resource and productivity.

A number of trials were carried out during the course of the project with varying levels of offsite construction. These include:

- Closed panel timber frame
- Factory fitted windows
- Chipboard decked floor cassettes
- Single leaf party wall
- Scaffoldless timber frame erect
- Felt and batten roof (on the ground)
- Fully tiled roof (on the ground)
- Offsite ground floor slabs
- GRP dormers
- Modular roof

Time, resource and waste were monitored over more than 30,000 operative hours, generating and collecting around one million data points.

SUMMARY

The data identified benefits in terms of productivity across all the advanced prototyping trials. It showed that roof construction on the slab is up to 22% quicker than building in-situ, and that modular roof installation is up to 51% quicker.

Employing scaffoldless timber frame erect increases the speed of follow on trades. Bricklaying in particular saw a speed improvement of about 20 operative hours. The scaffoldless timber frame does not impact the productivity of the timber frame erect process, however it alters the critical path of the build and has additional health and safety benefits.

The trials also showed that offsite ground floor systems are over 60% more efficient than traditional systems, and that single skin party walls have a positive impact for follow on trades and reduce first fix time by around 34%.

JOURNEY

Data from the trials was collected using BRE's CalIBRE system, a toolkit for measuring operative hours for the housebuilding process and determining operative efficiency. Dedicated site observers on each plot collected data on an iPad every 15 minutes on a plot specific basis and in the following areas:

- Plot
- Build stage
- Operative
- Work package (Build stage)
- Task
- Activity

At the same time, site observers collected SmartWASTE data three times a day. Waste collected at source using site mini skips and was measured in volume (m³) and weight (kg) using a weighing scale. The data generated can then be broken down to offer a deeper understanding of when, where and why the waste was generated

OUTCOMES

The project generated a number of key findings about efficiency, effectiveness, productivity, health and safety and costs.

Roof structures

It showed that building roof structures on the ground has both health and safety and productivity benefits, and that while costs increase as roof systems become more advanced, so do the health and safety, waste and productivity benefits.

In addition, it demonstrated that a significant percentage of the cost increase for advanced roofs comes from the additional material required in the structure to so the roof can be lifted safely. A reusable roof beam, which could be removed once installation is complete and reused on multiple plots, would make advanced roof systems significantly more viable.

Scaffoldless erect

Data showed that the scaffoldless timber frame erect system does not impact productivity in relation to the timber frame. It takes scaffolding off the critical path of timber frame construction, removing one of the key reasons for delay on timber frame developments.

If this system could be used in conjunction with an external, factory-fitted cladding system, it could potentially completely remove traditional scaffolding from the build, offering major cost and health and safety benefits.

Single skin party walls

Installation of single skin party wall systems happens at a similar pace to twin wall systems. The key benefits of the system are shown in the first fix. This was around 34% quicker due to specific tasks relating to the party wall, like insulation, being installed offsite.

Offsite ground floor system

Difficulties in the install of the offsite ground floor system resulted in a large portion of non-value and wasted time. With that said, it was still about 63% quicker than the traditional system. This could increase to circa 70% if non-value and waste can be brought into line with other analysis.

Timber frame construction

Timber frame is between 21-39% quicker than traditional masonry construction.



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