

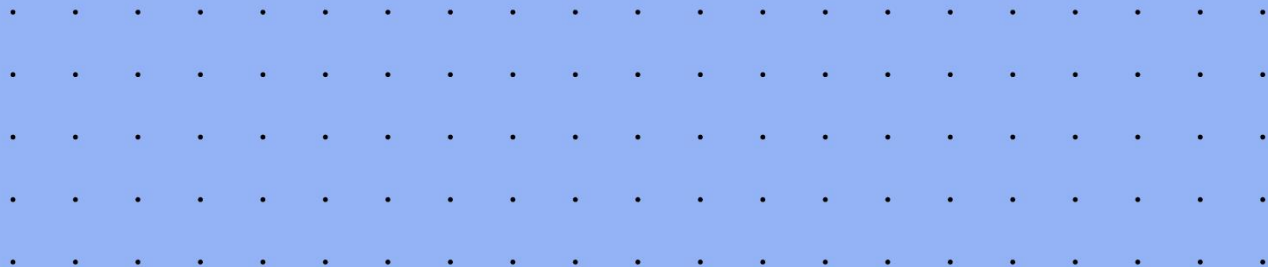
# Confidence in Innovative Construction

**HBF Conference**

**9<sup>th</sup> November 2021**

**Richard Lankshear**

**Senior Technical Services Manager**



# Innovative construction

## Modern methods of construction

Building on experience



Guide



NF

## Future: 2020s

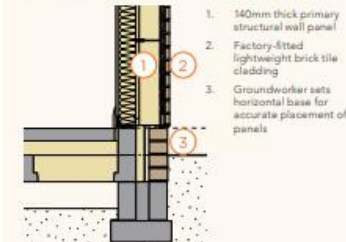


Light gauge steel frame open panels, lining materials installed on site



Project Etopia demonstration home, Watford, 2019, uses 'Hyper SIPS' high performing structural insulated panels, which include steel

### Light steel panelised construction: Ground floor



### In detail 2019

- ✓ Panels are delivered 'open' and internal finishes are then applied on site
- ✓ Traditional ground floor and substructure allow steel to be raised above damp proof course (DPC)
- ! Tighter tolerances for groundworks than conventional construction

### Light steel panelised construction: Technical observations

The substructure and suspended ground floor are constructed on site utilising a thermal ground floor, which is comprised of concrete beams with aerated insulating block infill above a ventilated underfloor void. The steel frame wall panel sits on a damp-proof course and is raised up 150mm above the external ground level, like a traditional house, allowing effective waterproofing and protecting the external cladding materials. Insulation continues below the wall panel to avoid a cold bridge at the base.

The steel frame panels are factory-fitted with lightweight brick tile external cladding. However, they are delivered 'open' on the internal face and internal finishes are installed on site.

# Innovative construction

## House building: a century of innovation

Technical advances in conventional construction



Guide



NHBC

### 1.5 Upper floors

Lightweight engineered timber joists incorporate voids for services, resist deflection and creaking and are sealed against draughts from the external walls.

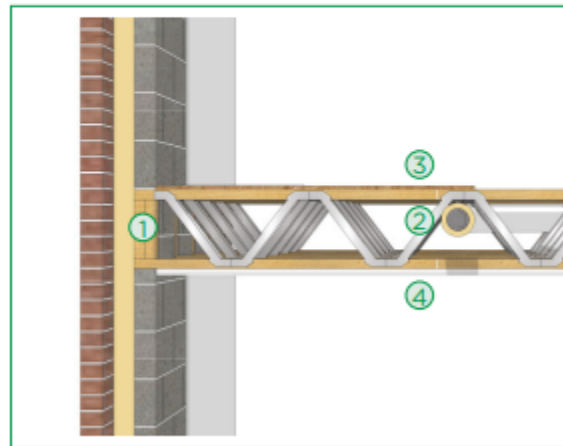


Figure 10 2019 typical upper floor

- 1 Engineered metal web timber floor joists built into and strapped to blockwork internal leaf
- 2 Floor void for services
- 3 Tongue and groove chipboard deck
- 4 Plasterboard ceiling screwed to joists

Energy efficiency

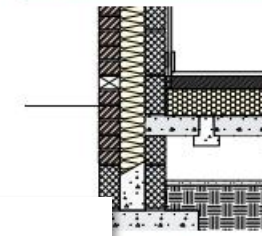


Figure 23 Thermally-efficient lintels

One-piece composite lintels (the horizontal supports across the top of a door or window) with pre-fitted insulation are designed to resist the passage of heat.

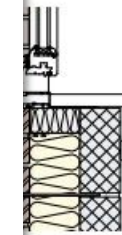


Figure 25 Energy-efficient windows

Double-glazed windows have two sheets of glass with a gap in between to create an insulating barrier that keeps heat in. Frames are designed to resist the passage of heat.

Figure 26 Advanced membranes

- 1 Waterproof roof underlay protects against external climatic conditions
- 2 Airtightness layer can reduce ventilation heat losses

NHBC Foundation House building: a century of innovation

16



2019  
Composite basalt fibre wall ties minimise heat crossing the insulated cavity



2003  
Stainless steel split wall ties allow for increased insulation in cavities up to 300 mm wide



2000  
Stainless steel wall ties with rounded safety ends for 75-100 mm wide insulated cavities



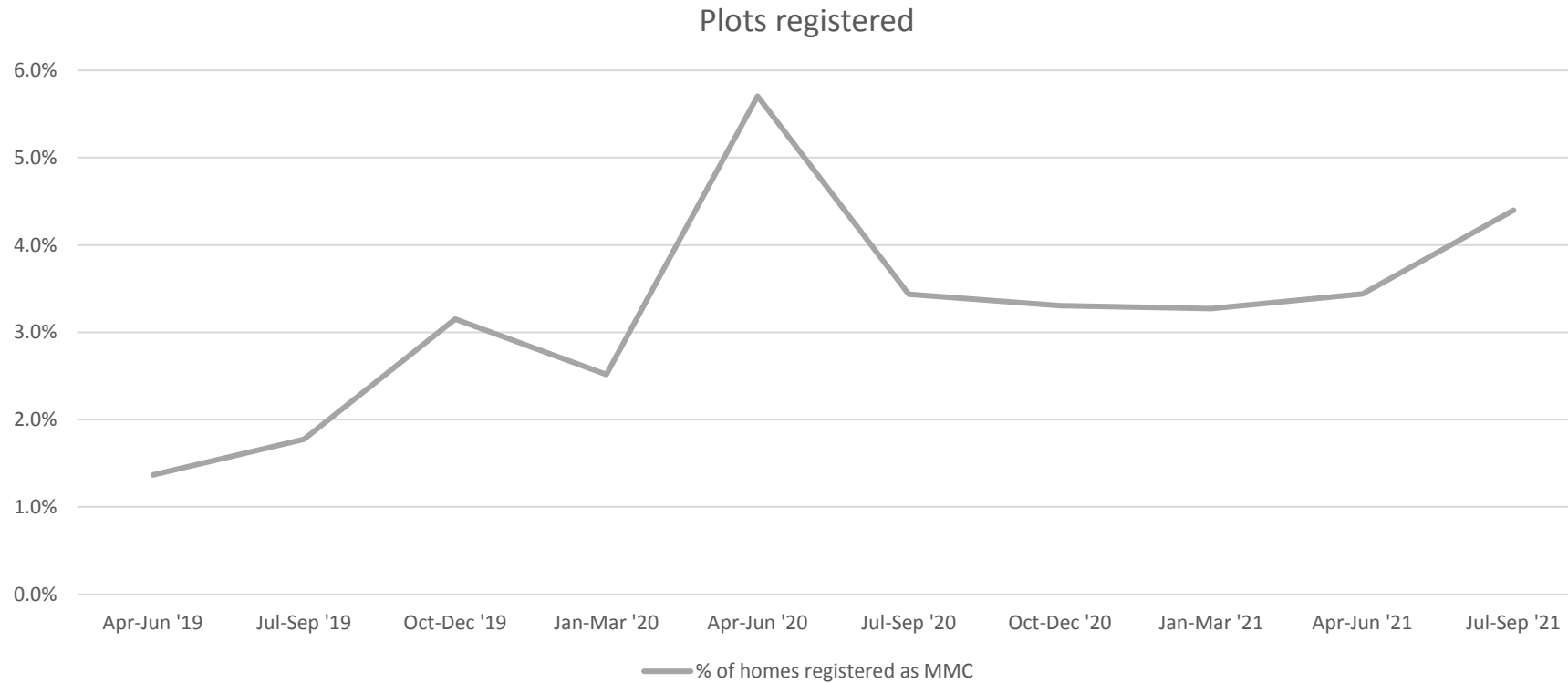
1984  
Galvanised wire butterfly wall ties for 50 mm wide cavities, prone to corrosion



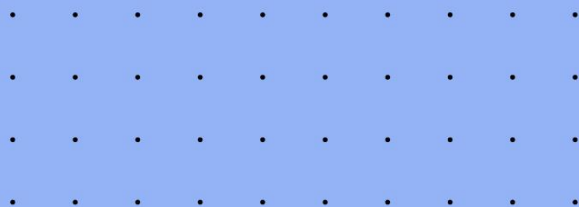
1920s-1978  
Galvanised mild steel wall ties used to join the two leaves of a wall together, prone to corrosion



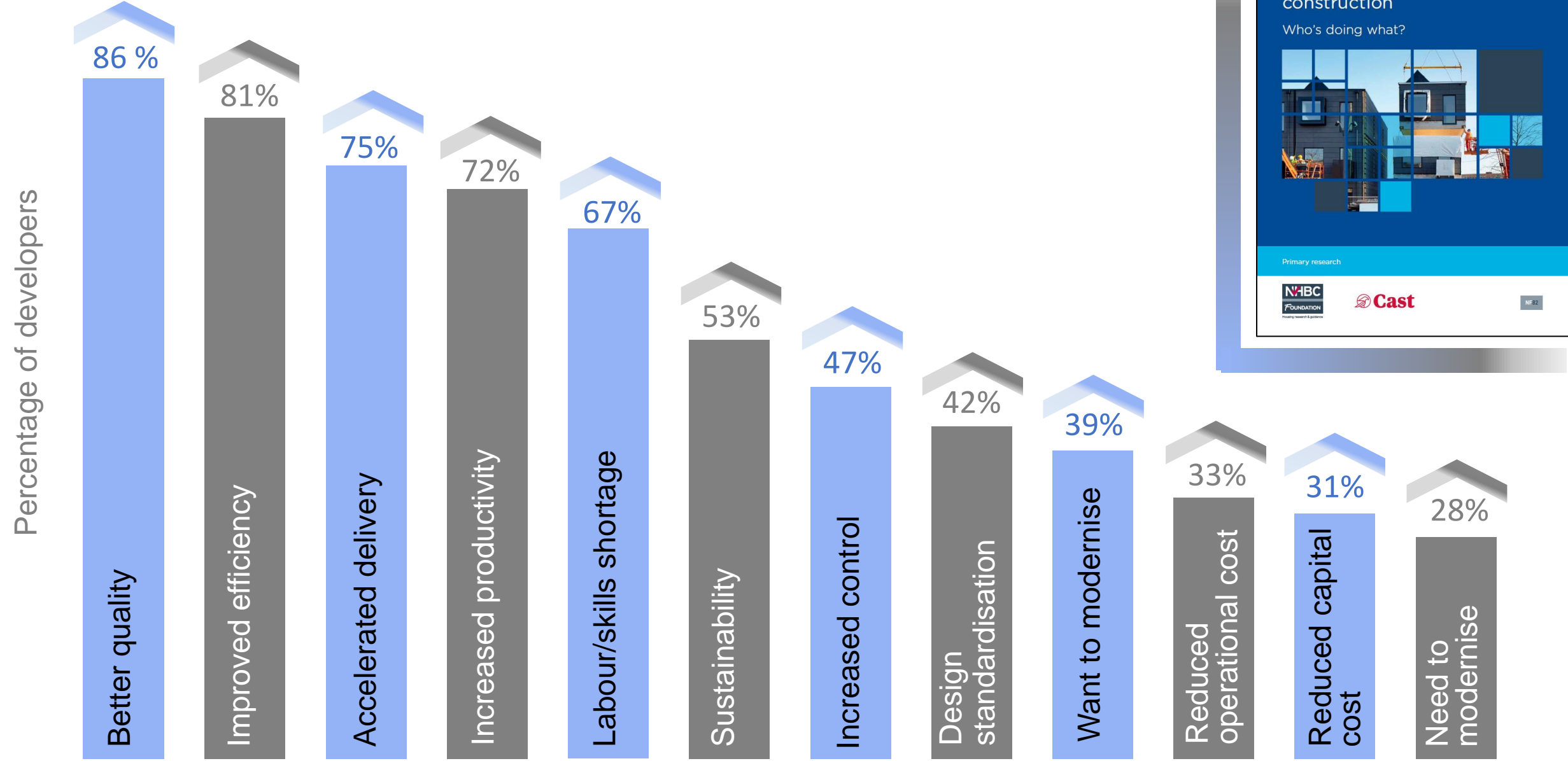
# MMC in NHBC Registered sites



Closed panel and  
volumetric systems only

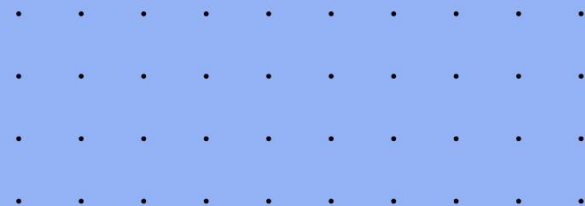


# Factors driving the uptake of MMC





# Quality



# Risks peculiar to offsite construction

- 1) Systemic defects built into multiple homes
- 2) New materials or combinations of materials
- 3) Consideration of on-site interfaces
- 4) Lack of clarity of ownership of overall design
- 5) Substitution of materials or amended design
- 6) Inadequate or incomplete design
- 7) Poor quality of manufacture
- 8) Storage, transportation and erection
- 9) Inspection of critical details (fire stopping, connections, weather protection)

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# Quality of design



## Technical Extra

November 2018 | Issue 24



### NHBC Standards

- NHBC Standards 2019
- Magnesium oxide building boards
- NHBC Standards Chapter 6.10 'Light steel frame'
- BS 5534:2014+A2:2018, Slating and tiling for pitched roofs and vertical cladding - Code of practice
- BS 8612:2018 - Dry fixed ridge, hip, and verge systems for slating and tiling - specification



### Regulation and compliance

- Unprotected areas between buildings
- Structural systems for bay windows
- Changes to landfill legislation



### Guidance and good practice

- CPVC pipe in fire sprinkler systems
- NHBC Foundation
- Foundation Depth Calculator Plus App
- Tying up Robust Details cavity masonry walls
- Stair installation guide



### Information and support

- Information and support
- Technical News

NHBC Standards

## Magnesium oxide (MgO) building boards



**Who should read this:** Architects, designers, manufacturers, technical managers and site managers.

### Introduction

NHBC has become aware of a relatively new type of building board being used in the UK, commonly known as MgO board. Some of the products we have come across do not have suitable verification of performance and we understand that similar products are known to have failed overseas.

This article is a reminder that products with a critical function should have suitable verification of their performance in order to comply with the NHBC Standards.

### Guidance

NHBC has received reports from Denmark and other countries of defects in walls built using MgO building boards, typically as either sheathing or to withstand the exact cause of the failures.

To achieve satisfactory long-term performance across a range of critical functions, building boards must be suitably durable and able to withstand the environmental conditions that they are likely to be exposed to, including humidity. We understand there are variances in the types, quality and manufacturing process of MgO boards, which may have a significant effect on how they perform in practice when exposed to humid conditions.

As a reminder, where products with a critical function are used on NHBC registered sites, they should hold suitable verification of their performance. Typically this can be achieved through compliance with a British Standard or via satisfactory assessment undertaken by a technical approval authority (independent third party certification) acceptable to NHBC, such as the BBA or KIWA.

As there is no British Standard for MgO boards, the process for these products to be accepted for use on NHBC registered sites must be via independent certification.

### Next steps

As of 1 January 2019, NHBC will only accept MgO boards on the following conditions:

1. The boards hold independent third party certification, which includes specific reference to compliance with NHBC Standards.
2. The certification should be awarded to the board as an individual building component or specifically assessed for durability when it is a component of a certified rendering system.
3. Boards are fixed with suitable stainless steel fixings as specified by the board supplier.
4. The boards are not to be used below DPC level.
5. Where used as sheathing, the boards are protected from precipitation during construction by the use of a breathable membrane.

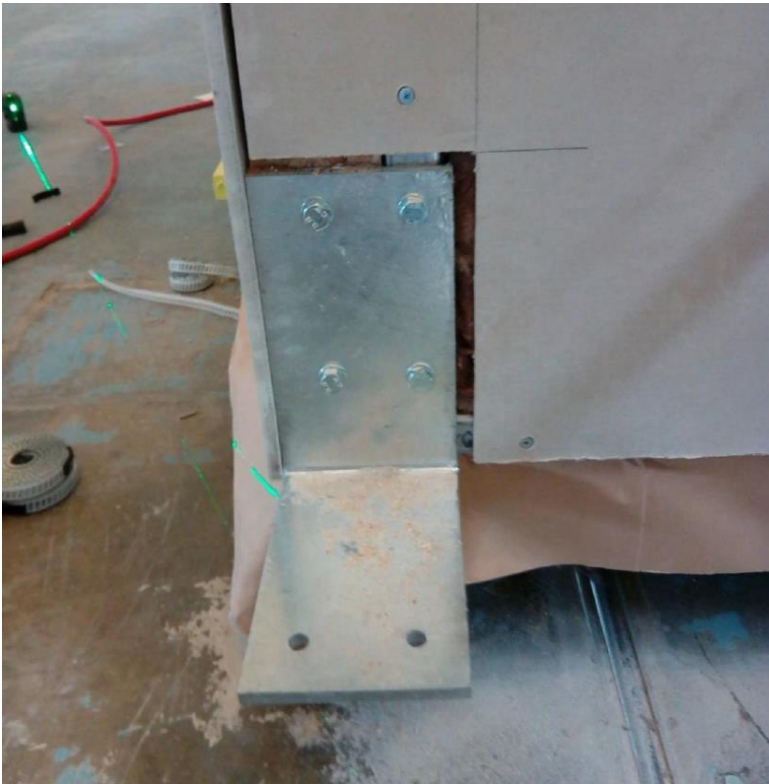
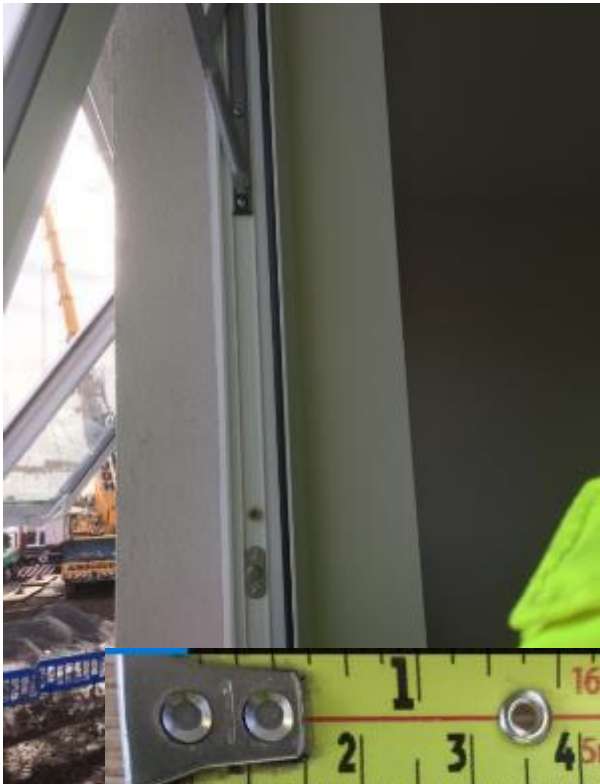
We have been in discussions with the certification bodies and a number of MgO board manufacturers who are working to provide us with assurances that the boards available in the UK are fit for purpose. As such, we have set up a website to list the MgO boards currently acceptable to NHBC, which we will update as the situation progresses. Please visit [www.nhbc.co.uk/magnesium-oxide-building-boards](http://www.nhbc.co.uk/magnesium-oxide-building-boards).

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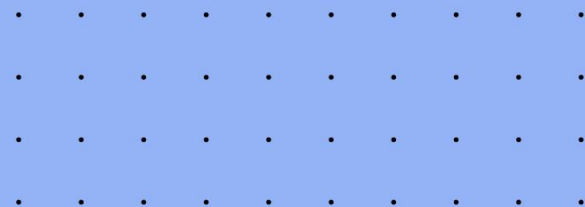


# DfMA / Advanced manufacture



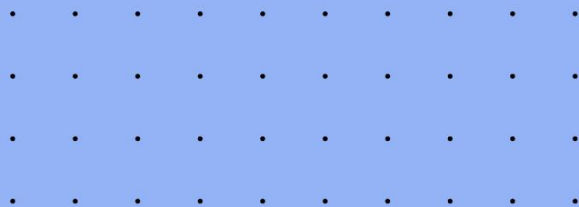
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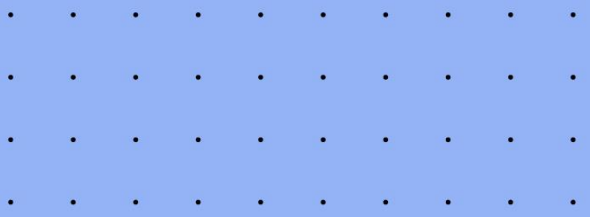
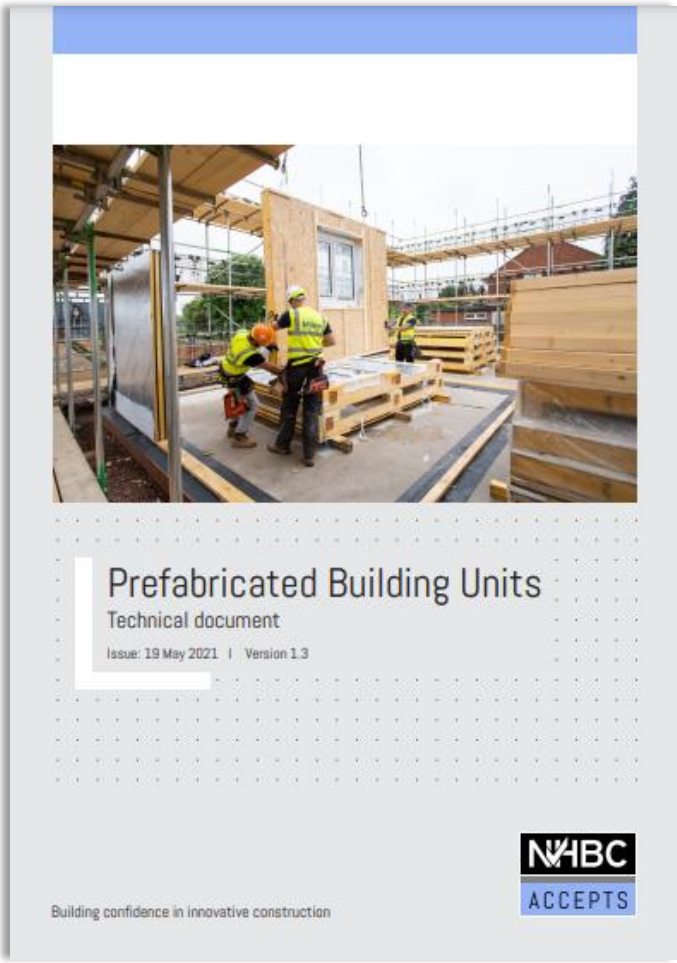
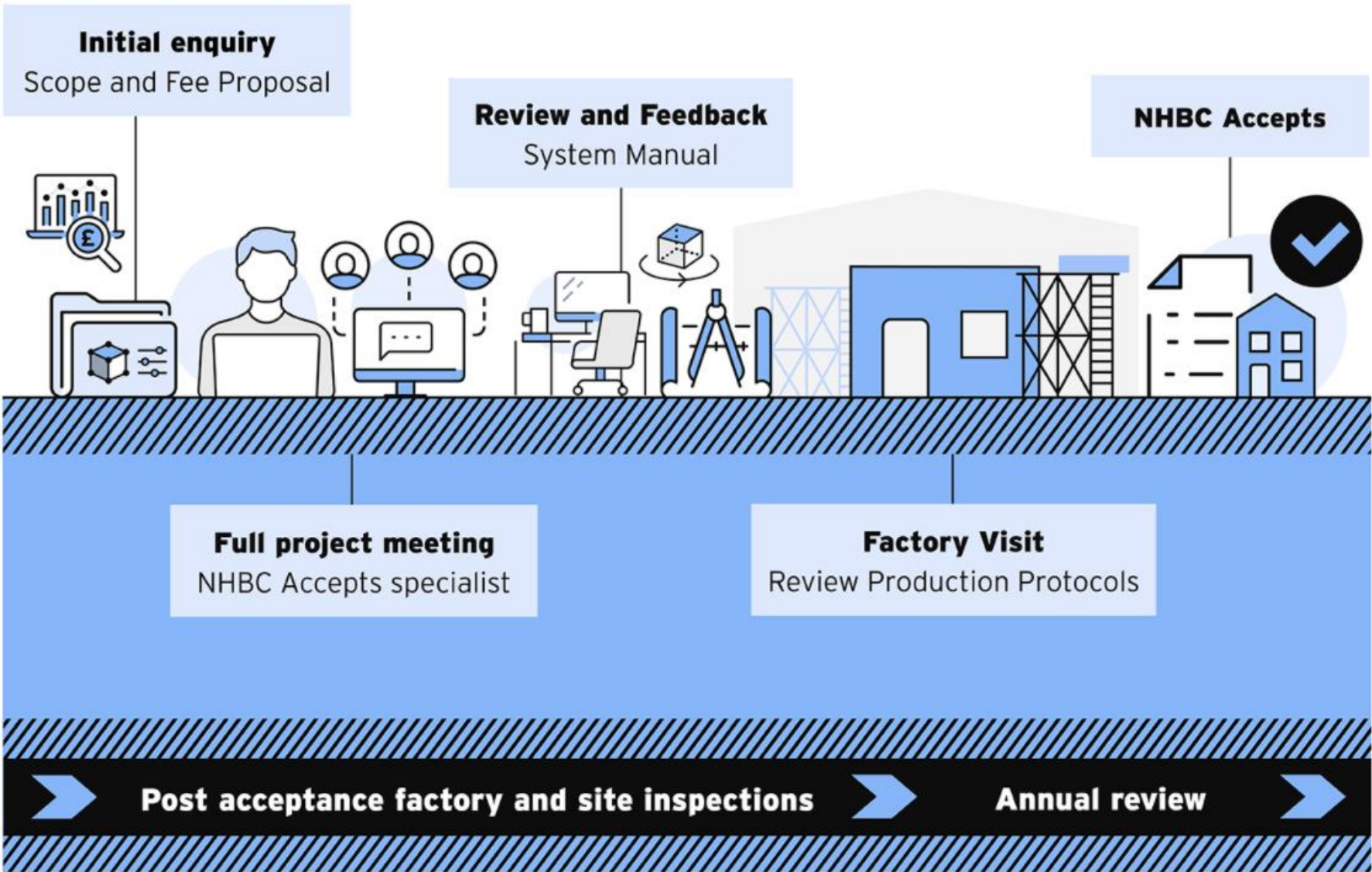
# Quality assurance protocols





# Onsite coordination



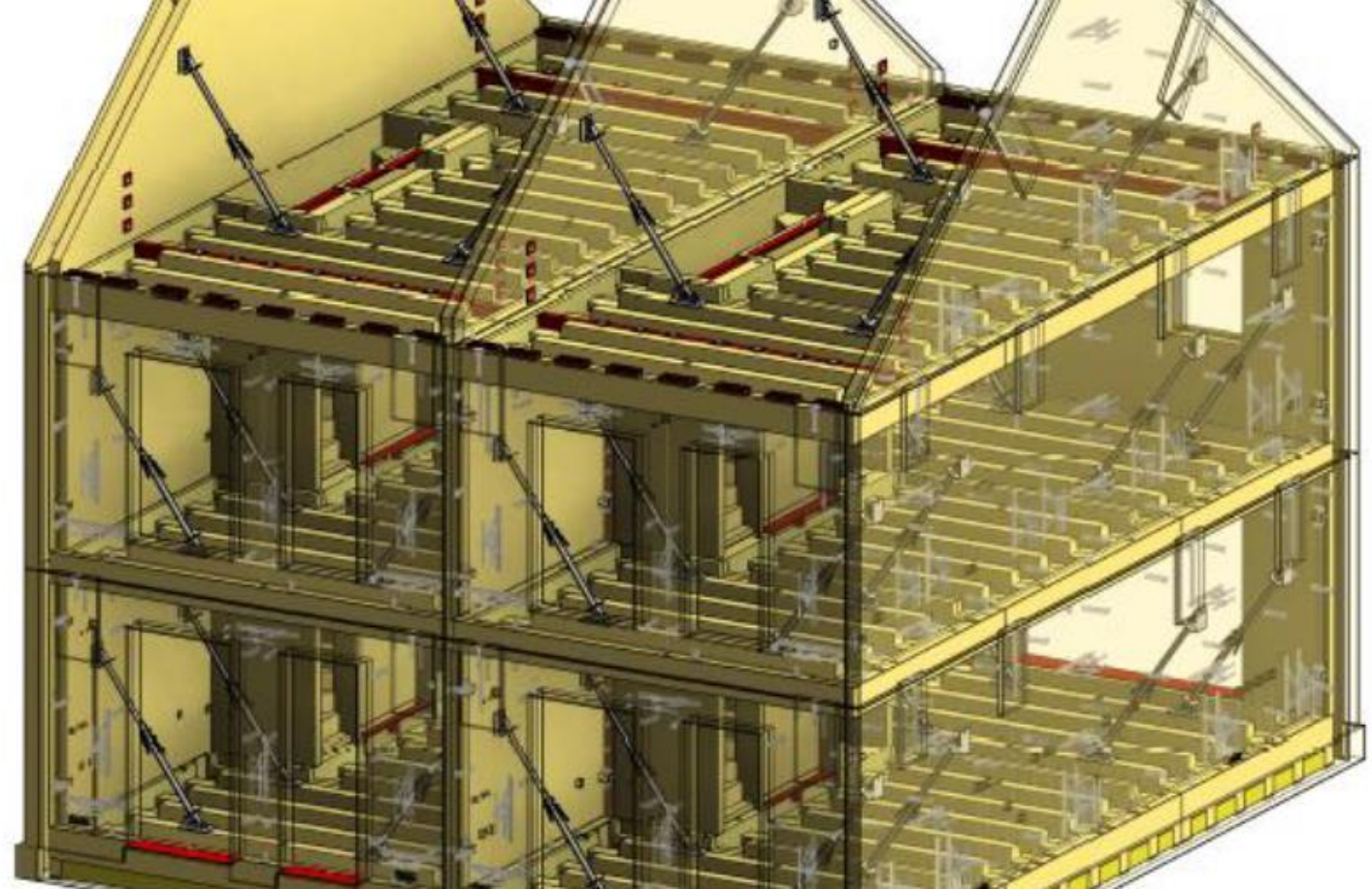






Some accepted  
Volumetric systems





Panelised systems





Innovative products



# Some important lessons

- **Offsite does not always mean better quality.** Third party audited QMS is required, with interrogation of factory production controls
- Extra caution for small, emerging manufacturers. **R&D requires time.**
- **Ongoing and frequent assessment of quality** required since change of design, process or materials often occurs.
- **Do not underestimate the level of detail required for DfMA.** Early design freeze is essential allowing translation for all assembly processes.
- “Those who cannot remember the past are condemned to repeat it”. Design should be based on good practice.

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# Thank you

