



The Role of Off-Site Construction in Delivering New Homes

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Offsite construction for a smarter tomorrow
mcavoygroup.com

Inspiring
brighter
futures

CITA
Construction IT Alliance

About The McAvoy Group

- One of the UK's leading offsite specialists
- Independent, family-owned
- Established principal contractor
- **Delivering high quality buildings** for education, healthcare, residential, commercial and infrastructure
- **Harnessing digital technology** to streamline processes and further improve the quality and efficiency of buildings

Smart facts

**Winner of
RICS
Award for
Best Virtual
Reality BIM**

Smart facts

**BIM & VR – a
vital part of
our
business**

Smart facts

**1st offsite
specialist to
achieve BIM
Level 2
accreditation**

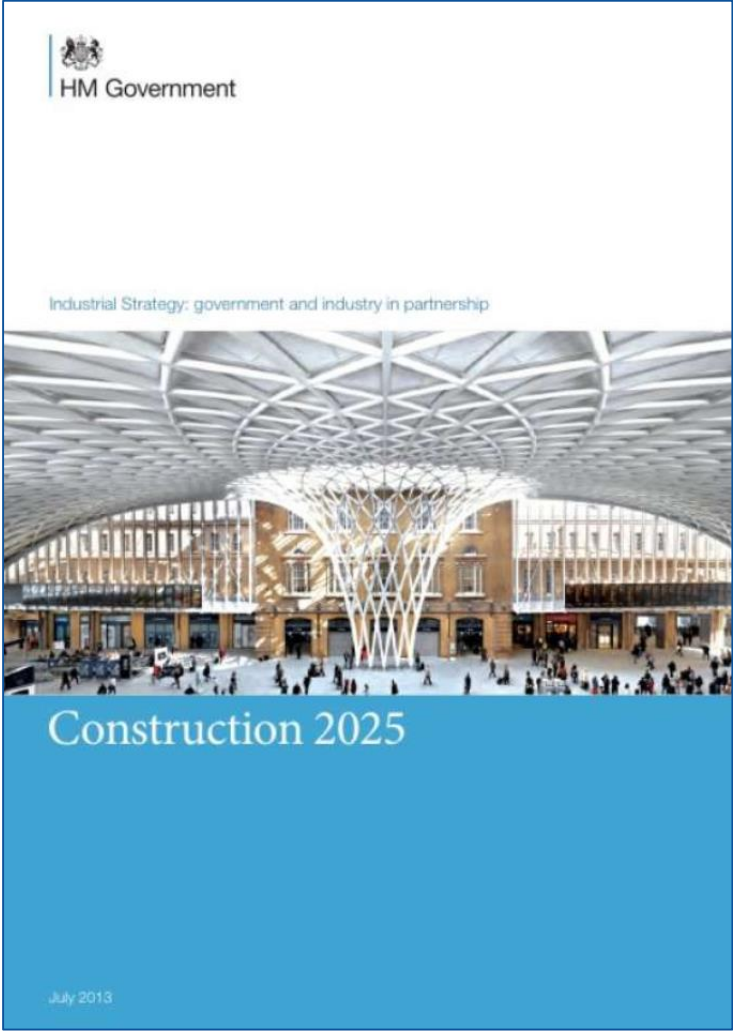
Smart facts

**Delivering
bespoke
offsite
solutions for
40+ years**

Smart facts

**2 purpose-built
offsite
manufacturing
centres
spanning
120,000sqft**

Why Offsite



Lower costs
33%

reduction in the initial cost of construction and the whole life cost of built assets

Lower emissions
50%

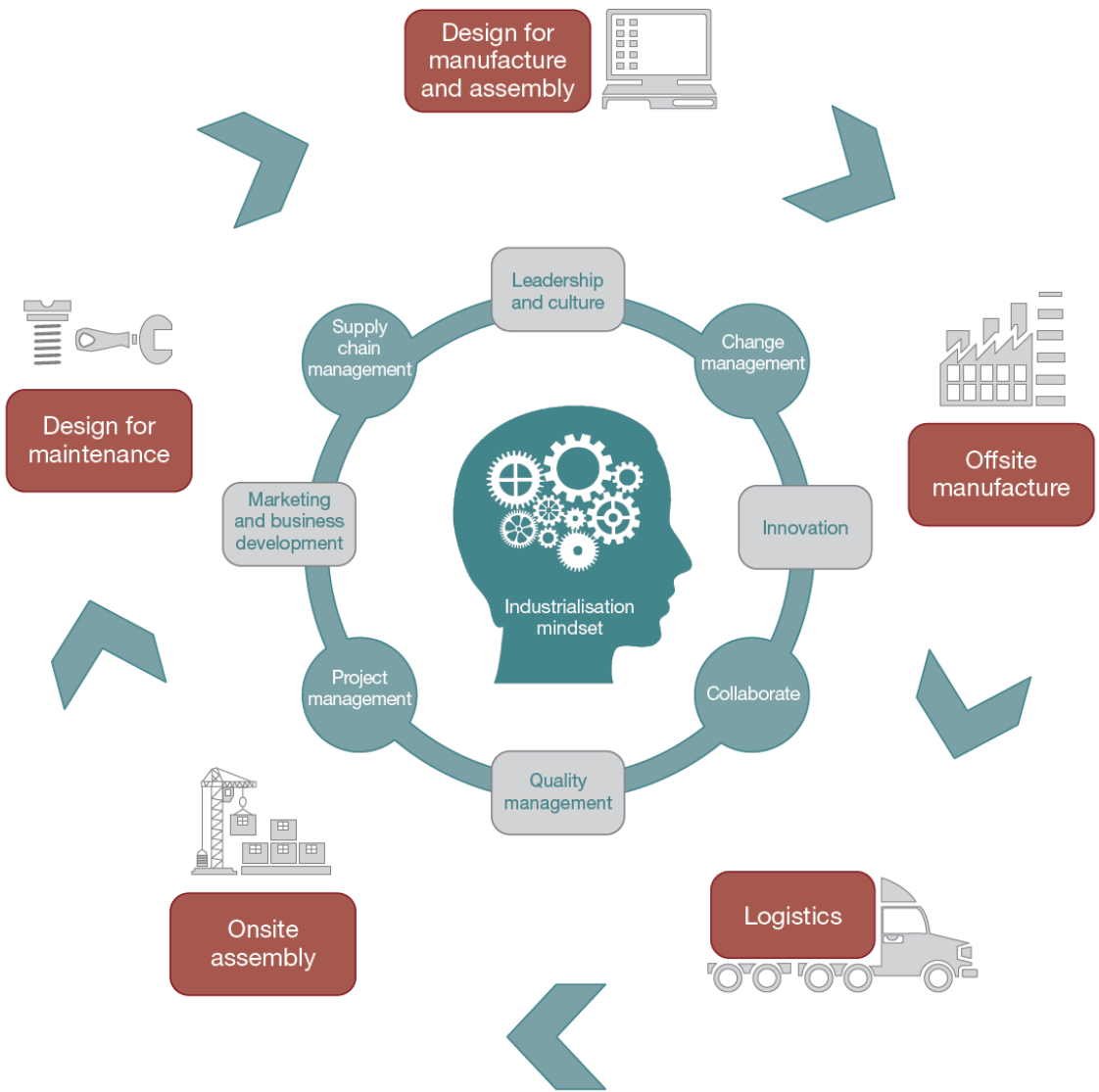
reduction in greenhouse gas emissions in the built environment

Faster delivery
50%

reduction in the overall time, from inception to completion, for newbuild and refurbished assets

Improvement in exports
50%

reduction in the trade gap between total exports and total imports for construction products and materials



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Benefits of Offsite Construction

Build safer

Less waste

Build faster

Greater build quality

**Consistently on time
and budget**

Enhanced collaboration

Exceptional flexibility

Less disruption

**Reduced whole life
costs**

**Faster return on
investment**

The Farmer Review

- Identified and analysed the deep seated problems associated with the construction industry
- Identified the symptoms
- Diagnosed the root causes
- Established a treatment plan for recovery
- Keeping the industry under observation



The Farmer Review

Identified Issues

- Low Productivity
- Low Predictability
- Structural Fragmentation
- Leadership Fragmentation
- Low Margins, Adversarial Pricing Models & Financial Fragility
- Dysfunctional Training Funding & Delivery Model
- Workforce Size & Demographics
- Lack of Collaboration & Improvement Culture
- Lack of R&D & Investment in Innovation
- Poor Industry Image



The Farmer Review

Recommendations

- 'Industry, clients and government should work together to improve relationships and increase levels of investment in R&D and innovation in construction by changing commissioning trends from traditional to **pre-manufactured** approaches. The housing sector should be used as a scalable pilot programme for this integrated approach'



The Farmer Review

Recommendations

- Government should act to provide an 'initiation' stimulus to innovation in the housing sector by promoting the use of pre-manufactured solutions through policy measures'



House of Lords – Offsite Manufacture for Construction

- Growing labour & skills shortage in construction
- Offsite construction can lesson however different skills required for manufacturing
- Imperative skills needed for offsite do not displace traditional skills such as bricklaying
- Skills required for Offsite Construction
 - Site Implementation Skills
 - Technical Planning and Collaborative Skills
 - ‘Gatekeeper’ Skills
 - Procurement Skills
 - Digital Skills



House of Lords – Offsite Manufacture for Construction

‘ The Government has a presumption in favour of off-site manufacture and has affirmed its commitment to investing in off-site in the Construction Sector Deal; we strongly support this direction of travel’



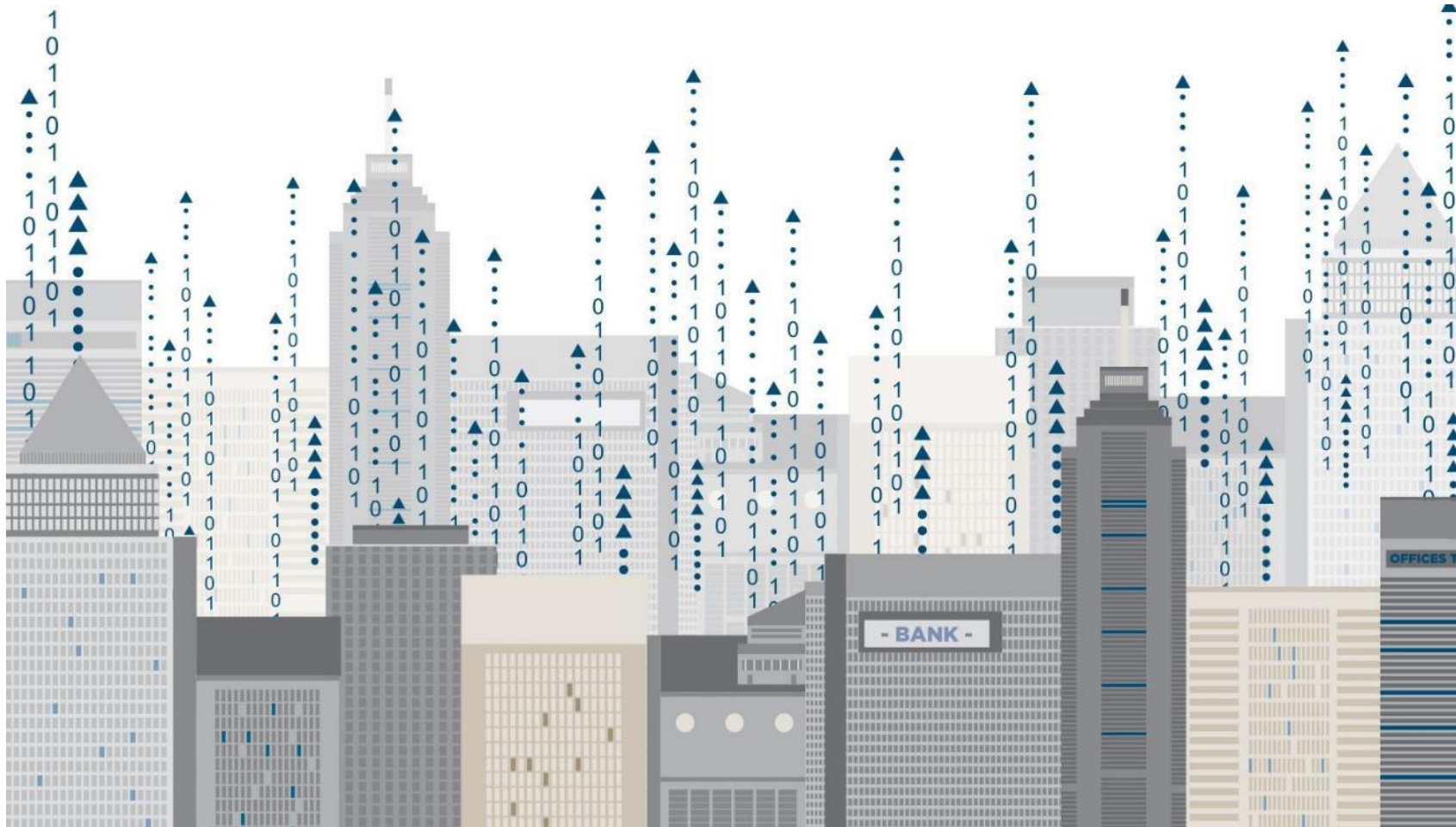
House of Lords – Offsite Manufacture for Construction

Government actions to overcome barriers

- Implementation of the Construction Sector Deal
- Government enforcement of the BIM Mandate for public contracts
- Presumption in favour of off-site construction
- Provision of a steady pipeline of projects
- Sharing intelligent client best practice across Public Sector
- Promote the adoption of recognised standards for of OSC
- Government funding for R&D and reinvestment of R&D tax credits into the off-site industry.



Digital Construction



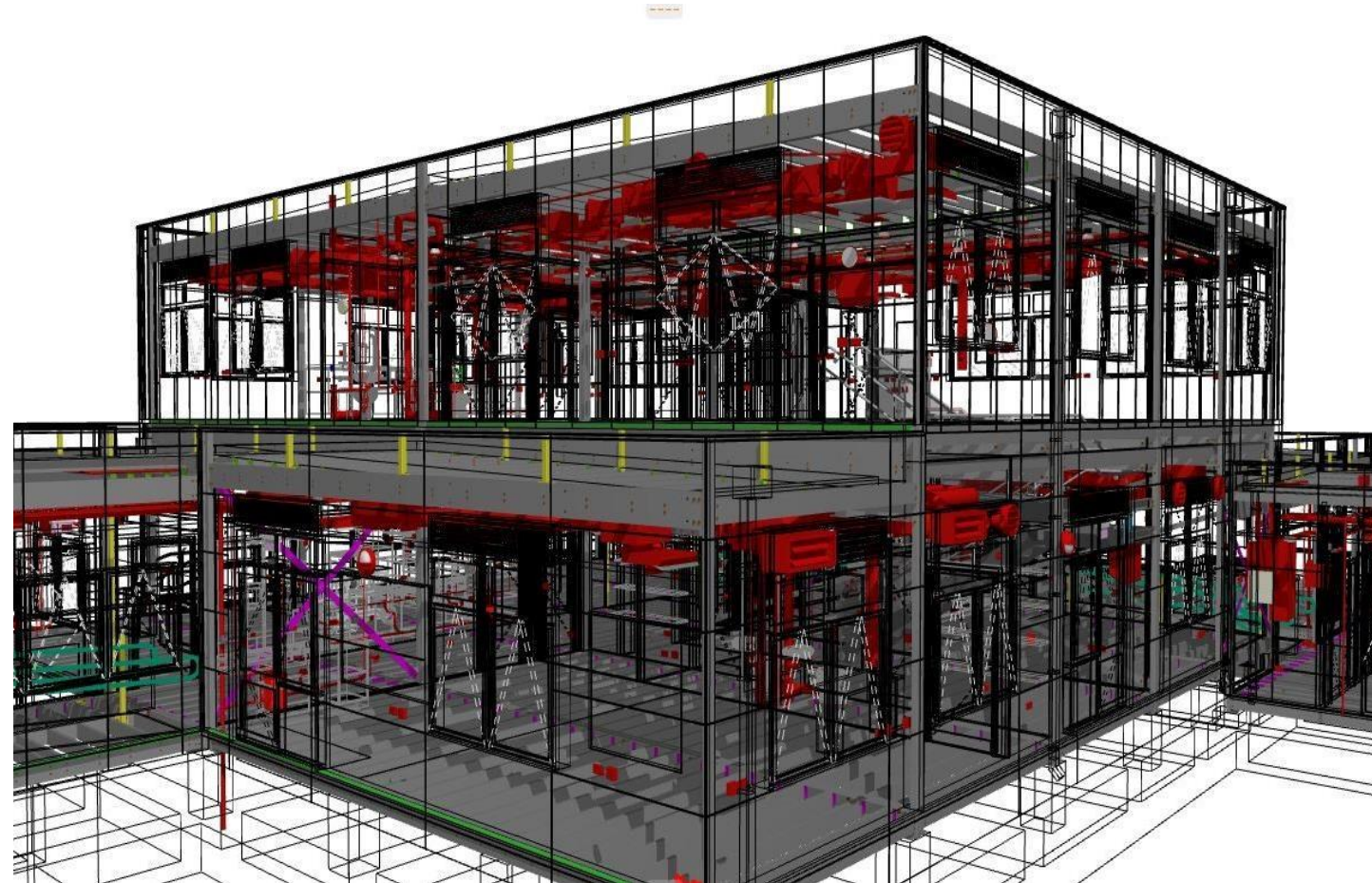
Smart Construction,
from virtual
to reality

Offsite construction for a smarter tomorrow

BIM and Digital Construction – Early engagement & collaboration

- More effective collaboration
- Shorter design periods – critical for offsite
- Streamlining of processes
- Better quality, and early decisions
- Improved client engagement

Smart Construction,
from virtual
to reality



Virtual Reality – early client engagement

- Easy transition to VR from the CAD authoring package
- ‘One click’ VR
- Bi-directional link between VR session and the CAD authoring package



Live Design



How We Use Virtual Reality

- Provide a collaborative experience
- Remote sessions can be hosted
- Ability to tour guide any user around our design models, irrespective of their location



Multi-User



How We Use Virtual Reality

- Deliver H&S training
- Develop specific VR experiences to train factory / site operatives on repeatable tasks



Staff Training



Augmented Reality – The Next Development

- Allows projection of CAD data onto the world around us (mixed)
- Allows you to superimpose the building on a site
- An excellent planning tool
- New level of client engagement
- Could allow delivery of 3D data to manufacturing – huge potential for offsite



DAQRI SMART HELMET



MICROSOFT HOLOLENS



TABLET OR MOBILE DEVICE

Ireland's Housing Crisis

Homelessness

- 9,874 homeless people in Ireland in June 2018
- In increase of 2,858 since December 2014
- 110 rough sleepers counted in Dublin in Spring 2018
- 2,637 people living in hotels in June 2018 costing DCC €46.9m
- Rents have increased by more than 90% in Central Dublin since 2010
- 480,000 new homes are needed in Ireland by 2031
- An average of 34,000 new units required annually with more than 50% of these needed in Dublin
- Fewer than 10,000 new units were delivered nationwide in 2017

Source: Irish Times & Initiative Ireland



McAvoy Offsite Housing - Status

1. **Baseline Designs completed**
2. **'Prototype' build completed**
3. **BOPAS accredited as of June 2018**
4. **Joymount scheme - 40 no. houses and apartments**



*build*offsite



Fully Integrated Design Team from RIBA Stage 0

Architects

Structural
Engineers

M&E
Consultants

Acoustic
Engineers

Fire
Consultants

Landscape
Architects

Daylight
Assessment

BREEAM
Assessment

Site Surveys

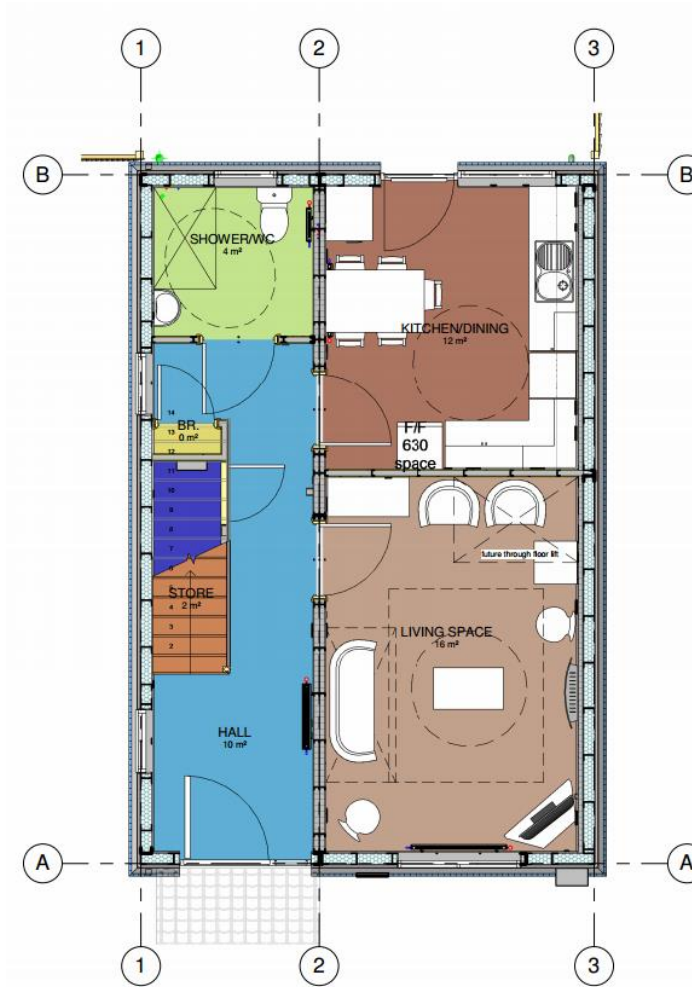
Planning
Consultants

Transport
Consultants

ICT
Consultants

Baseline Design

- Detached / Semi or terrace
- 95 m² floor area
- 3 Bedroom, 5 person
- 6 Modular units / assemblies



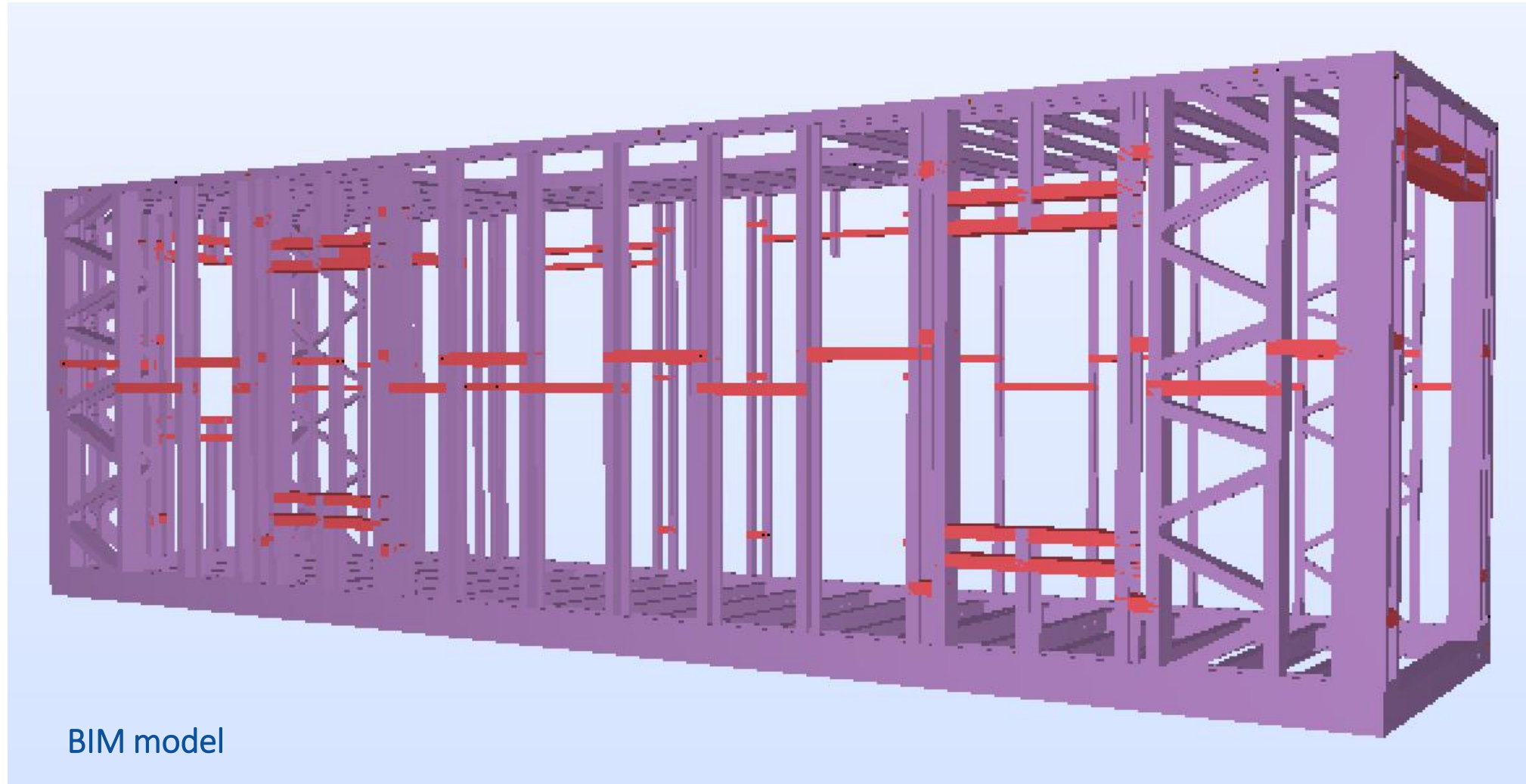
1 Ground Floor
Plan
1 : 50



2 1st Floor Plan
1 : 50

LGSF Structure

(Line Loaded)



BIM model

Pre-fabricated panels



LGSF modules



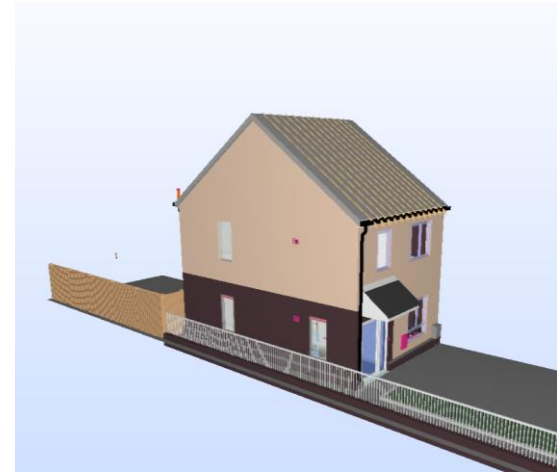
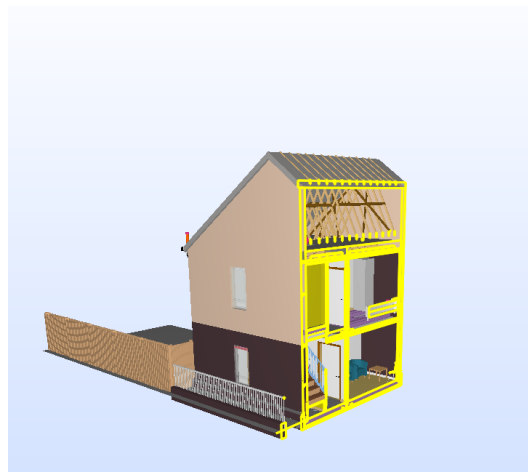
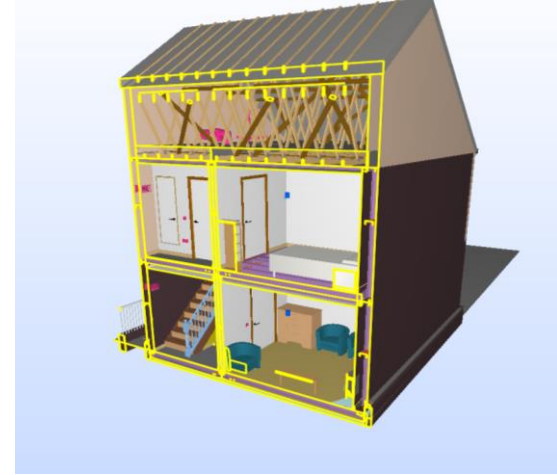
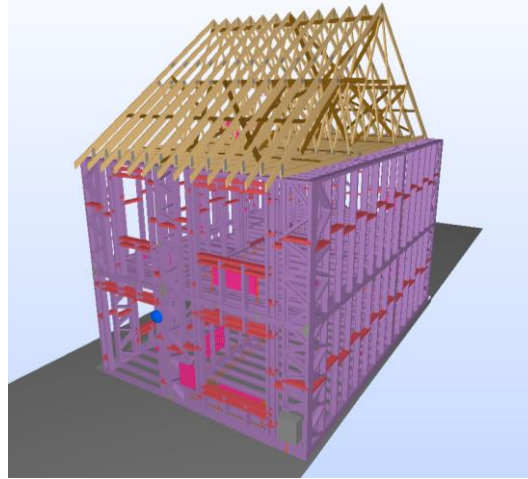
House Prototype



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Design Stage

Use of BIM processes and models allowed us to engage with our client and make changes to layout quickly and simply



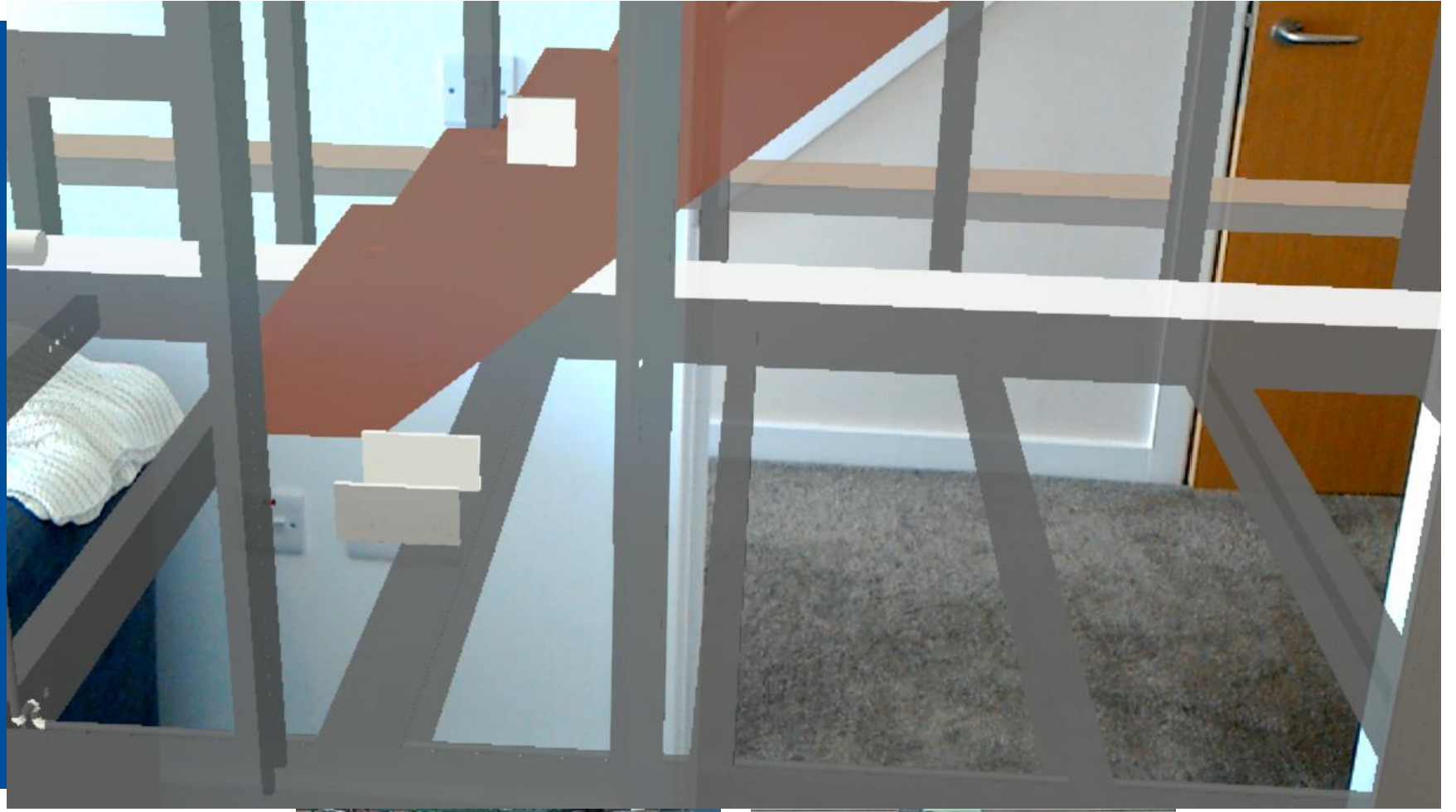
Prototype Stage

Physical prototype enabled further changes to layout before committing to production on scale



Post Installation Stage

Layered VR models allow maintenance inspection to be easily performed



The Joymount Scheme – our first residential project

Early Engagement
Partnering
Collaboration



Joymount – The First Offsite Housing Scheme in Northern Ireland



Offsite construction for a smarter tomorrow

The Joymount Scheme

Location : Carrickfergus
Duration on site : 40 weeks
Scope : 12 Houses, 3 Bungalows, 25 apartments



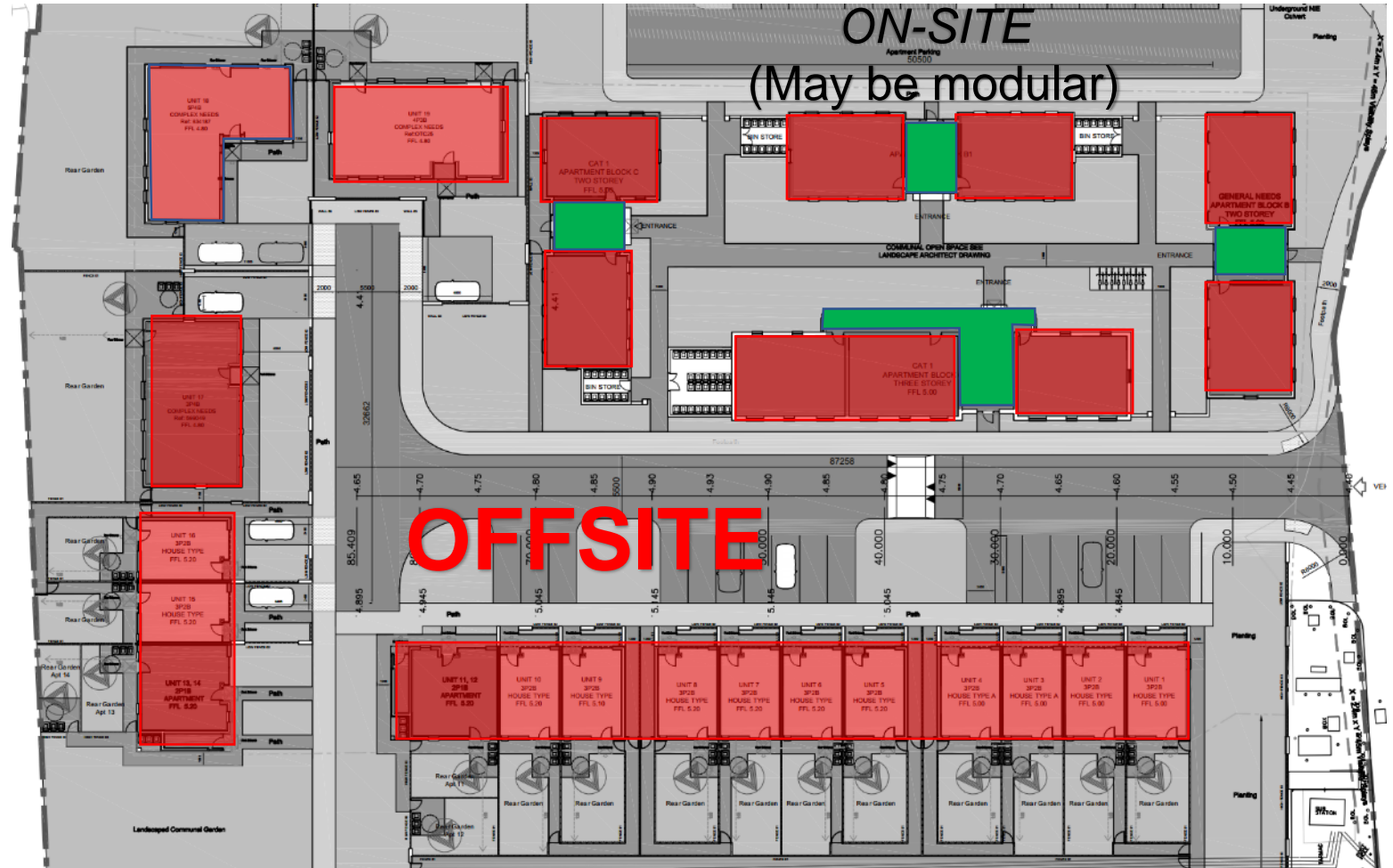
- Houses
- Bungalows
- Apartments

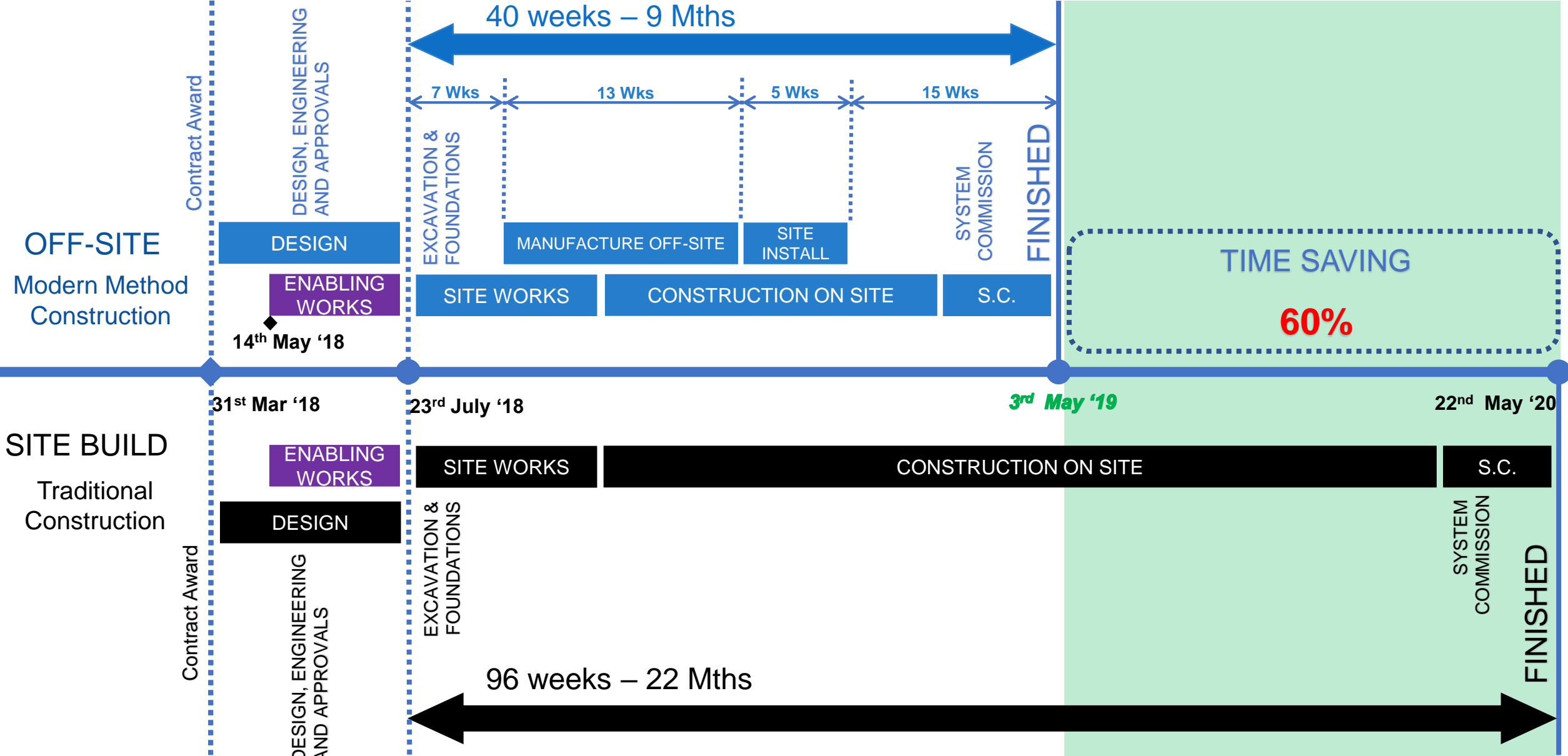


The Joymount Scheme - Scope

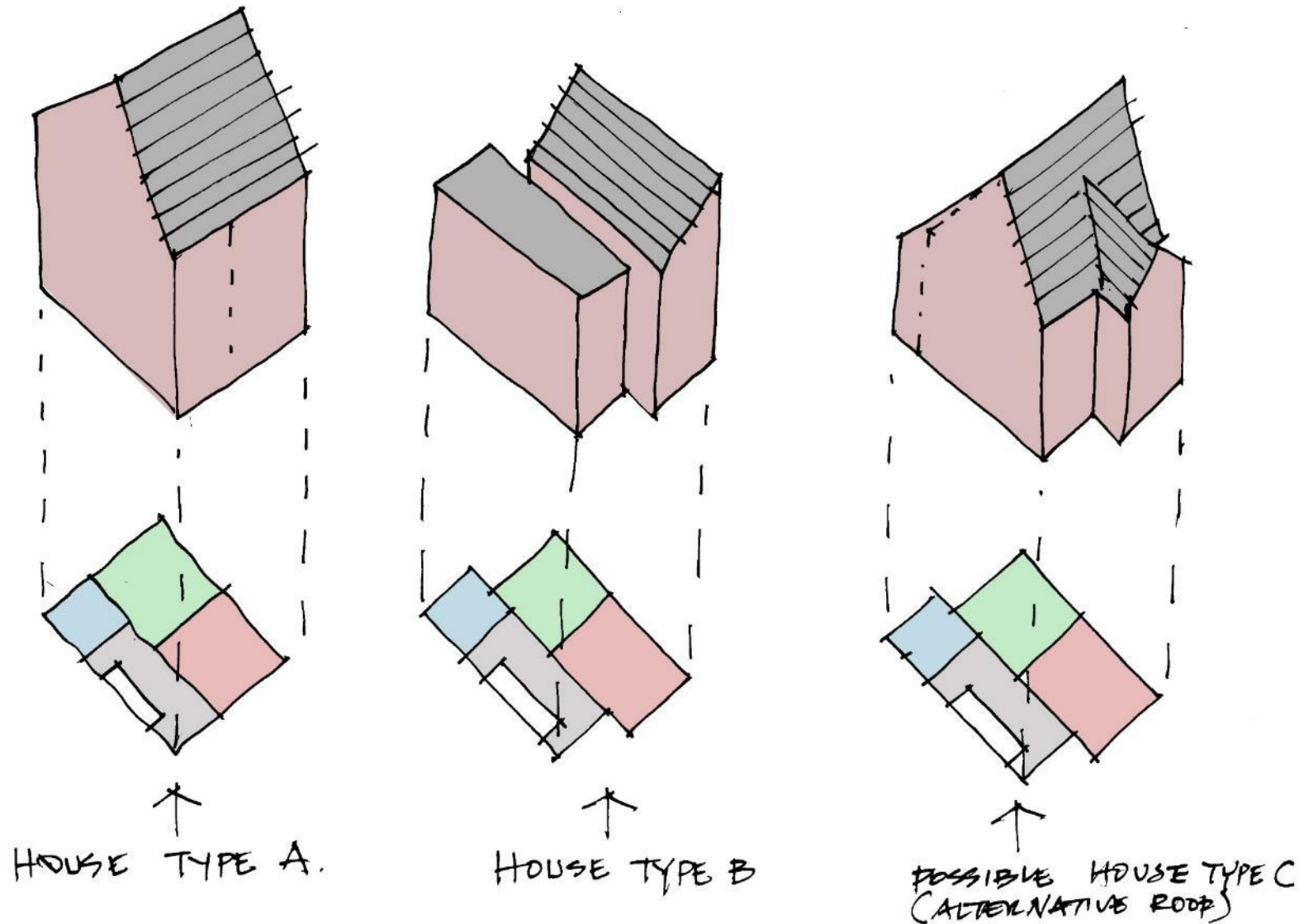
A development designed for traditional construction.....

Achieving a minimum of
88% Offsite Construction

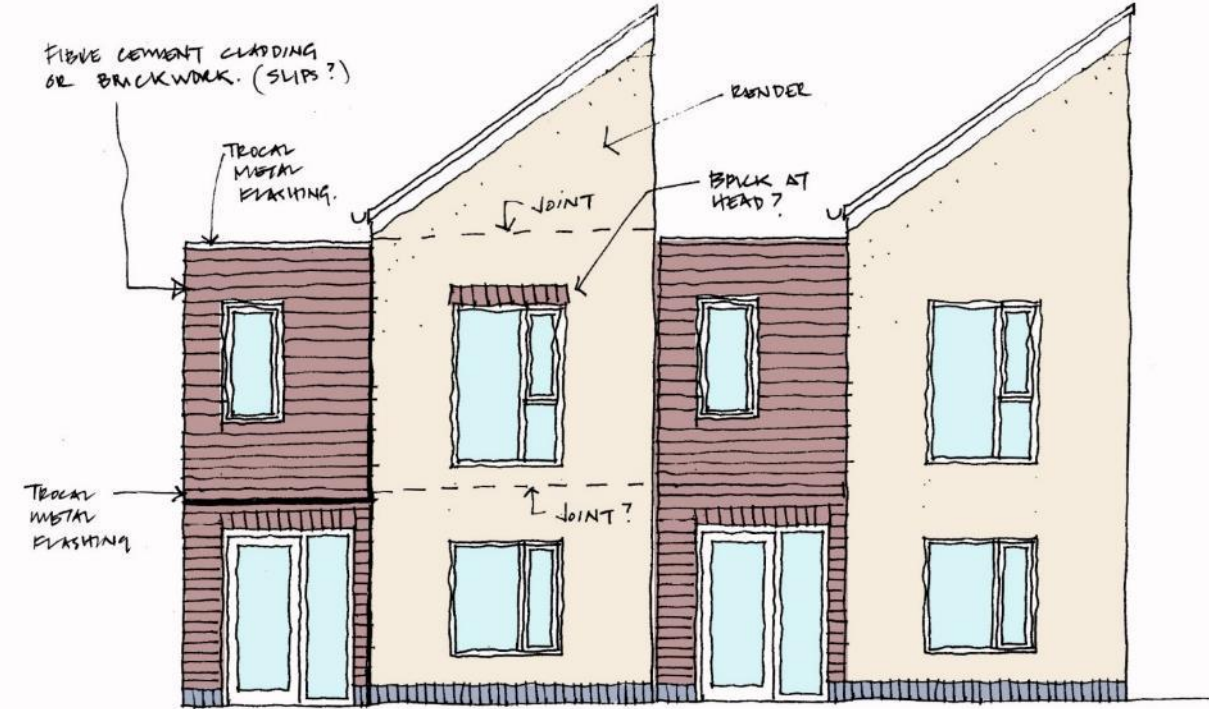
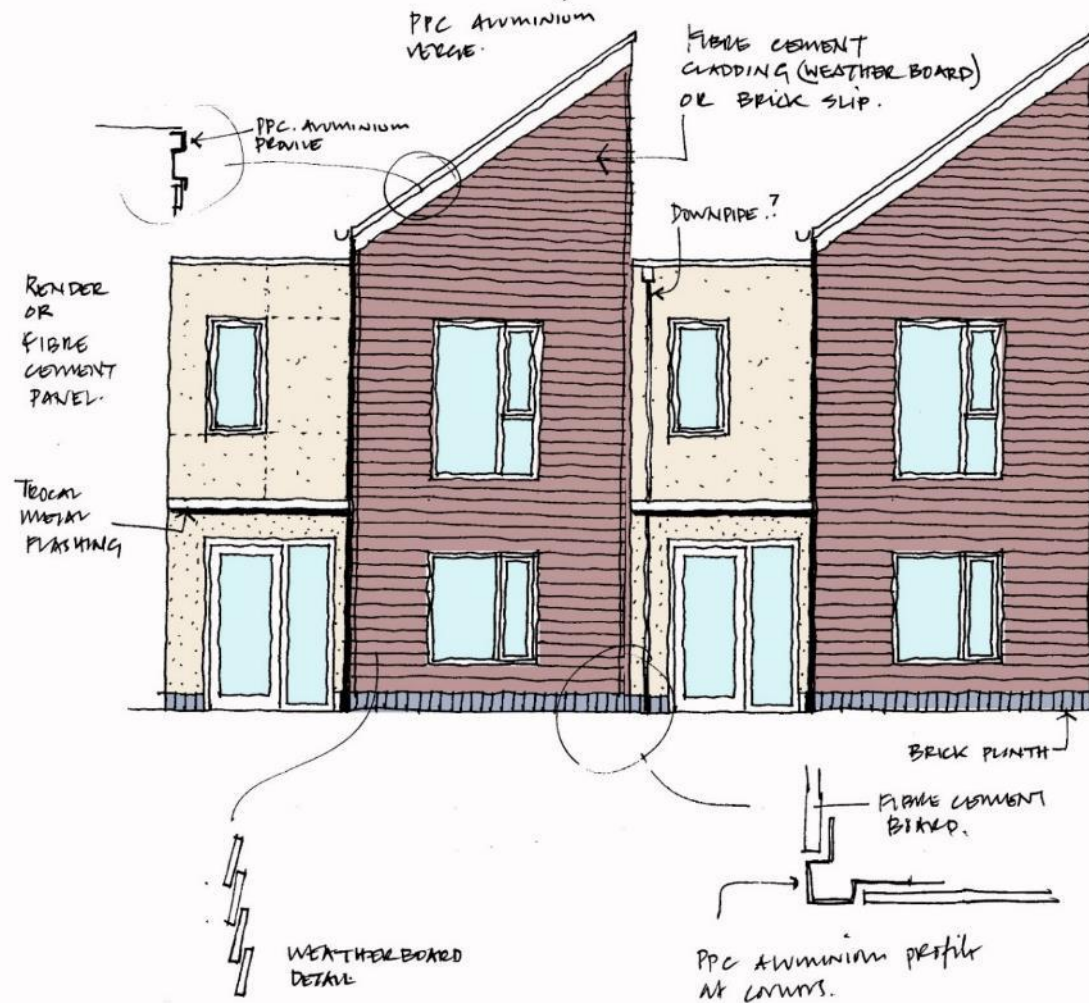




Offsite Housing Concept Design – Alternative module / roof options



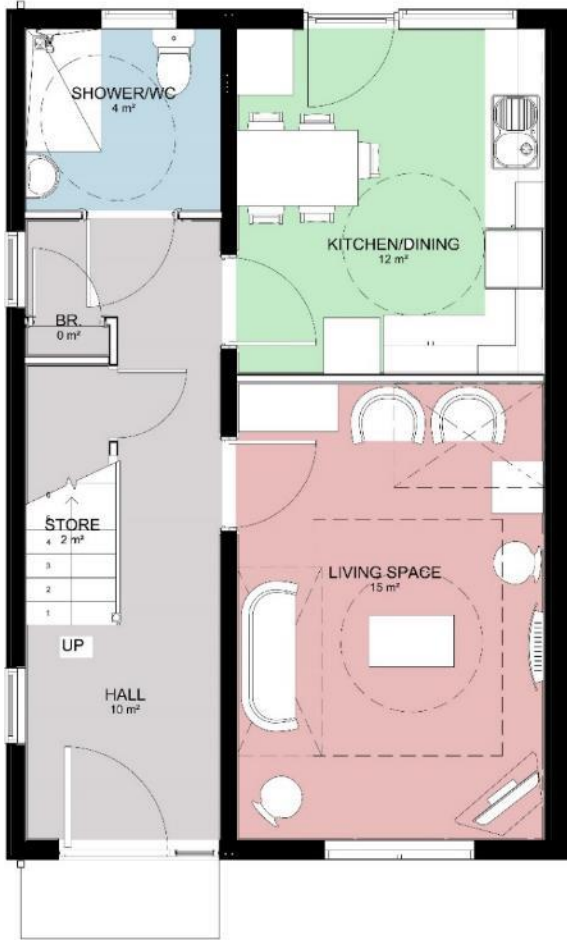
Offsite Housing Concept Design – Alternative Cladding



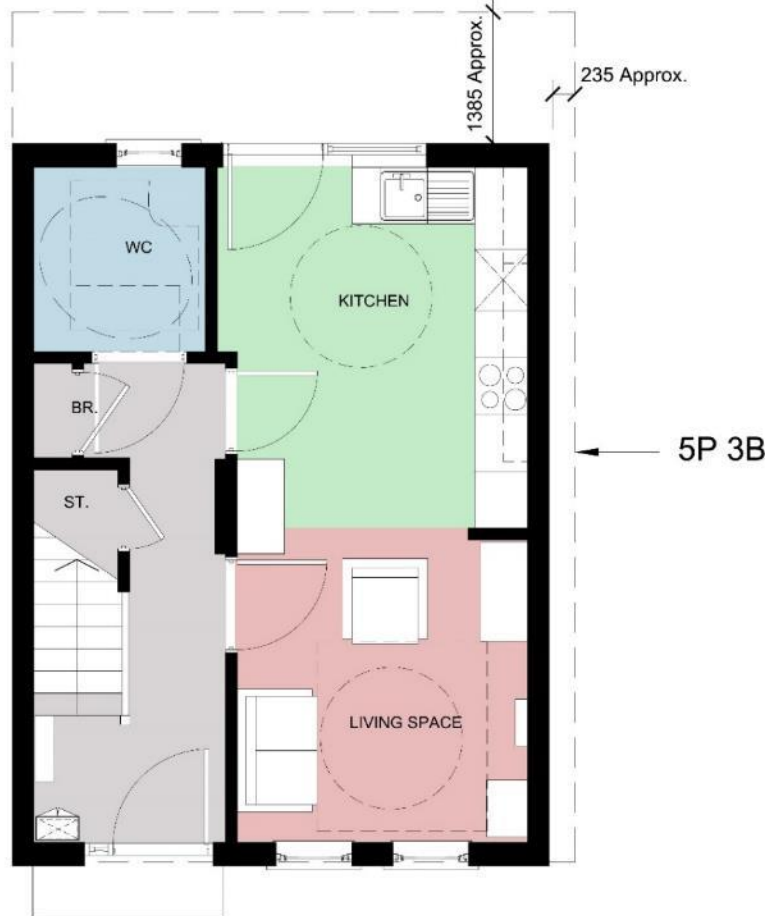
Offsite Housing Concept Design – Alternative Cladding



Three bed & two bed ground floor plans



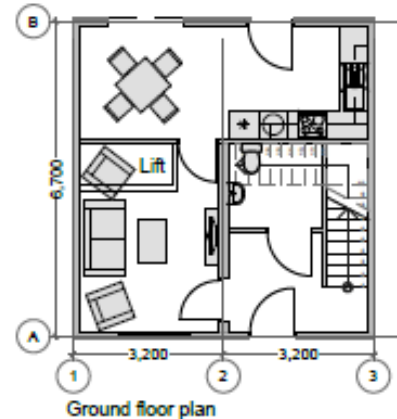
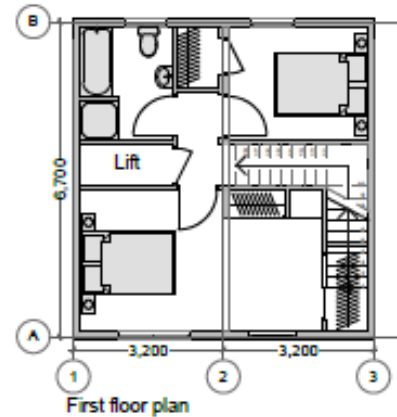
Standard Ground Floor (5P 3B)



Ground Floor (3P 2B Option)

Alternative 2 Bed 4 Person House type

- Line Loaded System
- Maximises factory work
- 3.2m wide modules to maximise transport efficiency
- NDSS and LHDG layout
- Lifetime Homes
- PFC beams to create open-plan area
- Factory fitted cladding



Lifetime House
2 Bed / 4 module
(Detached, Semi or Terrace)



Mid Rise Apartments

- Line Loaded System
- Maximises factory work
- 3.8m wide modules to maximise transport efficiency
- Modular core
- NDSS and LHDG layout
- Flexible balconies
- Service risers in corridor
- PFC beams to create open-plan area



Apartment floorplans

- Line Loaded System
- Maximises factory work
- 3.8m wide modules to maximise transport efficiency
- Modular core
- NDSS and LHDG layout
- Flexible balconies
- Service risers in corridor
- PFC beams to create open-plan area





Benefits of an Off-Site Solution:

- ✓ Increased collaboration
- ✓ Standardisation
- ✓ Less dependent upon on-site skills
- ✓ Improved quality
- ✓ Health & safety benefits
- ✓ Improved logistics, less deliveries
- ✓ Improved cost certainty
- ✓ Certainty of delivery
- ✓ Reduced program (Faster)
- ✓ Quicker return on investment

**Build Smart.
Build Offsite.
Build McAvoy**