

# Design for Manufacture Assembly



## Design for Manufacture

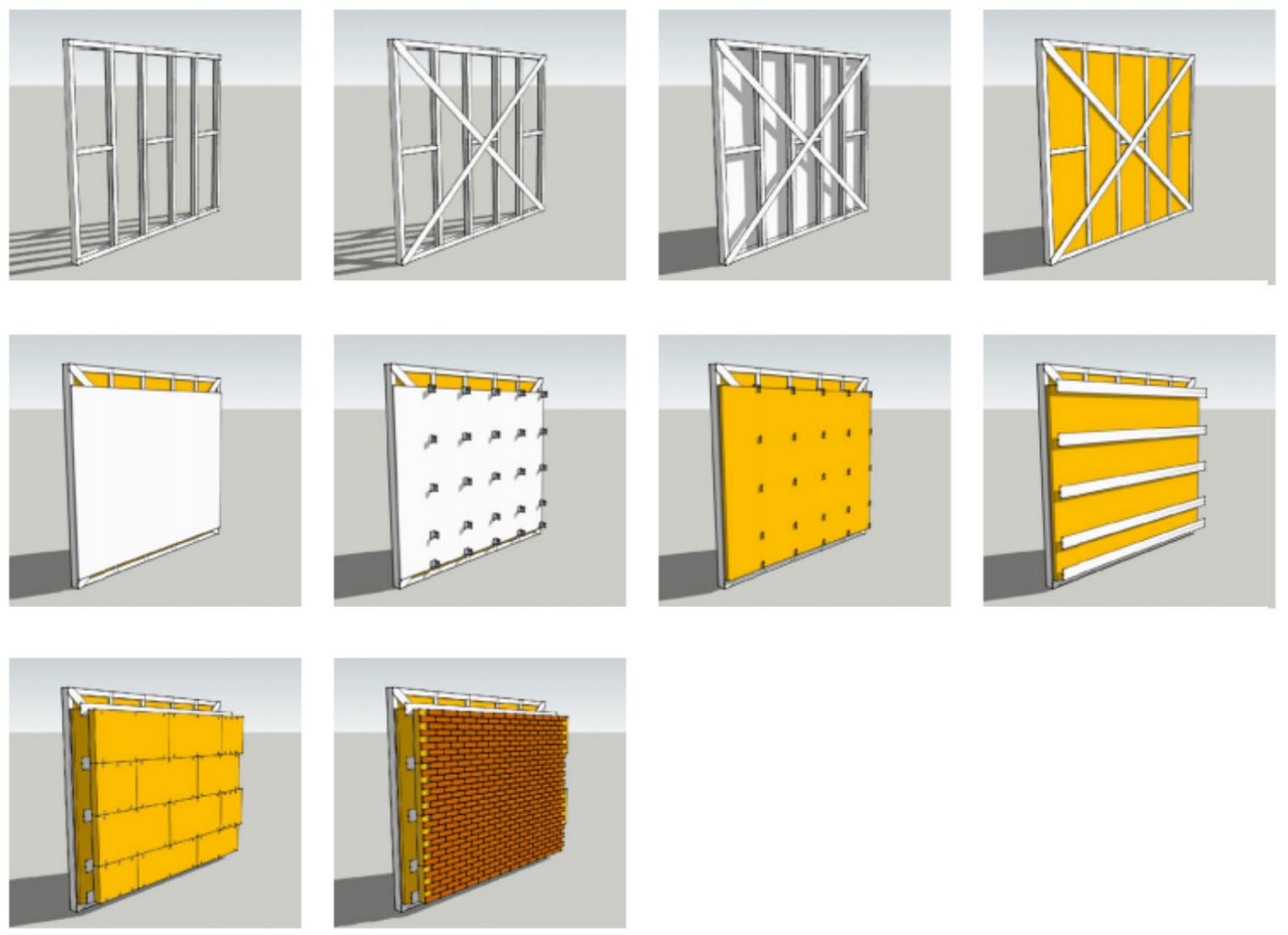
**Frame Standardisation** – The standardisation of the frame design is essential in order to take full advantage of the opportunities afforded by the assembly of the HOME in factory conditions. The number of different 'types' of frames required to construct the pod units and the panel units should, where possible, be distilled down to the fewest number of types. The reduced number of 'types' of frames will lead to reduced costs and manufacture times, therefore boosting efficiencies.

**Number of profiles** – In an effort to simplify supply streams and storage of raw materials, the design of our frames limits the number of different steel profiles required to build the frames, reducing waste.

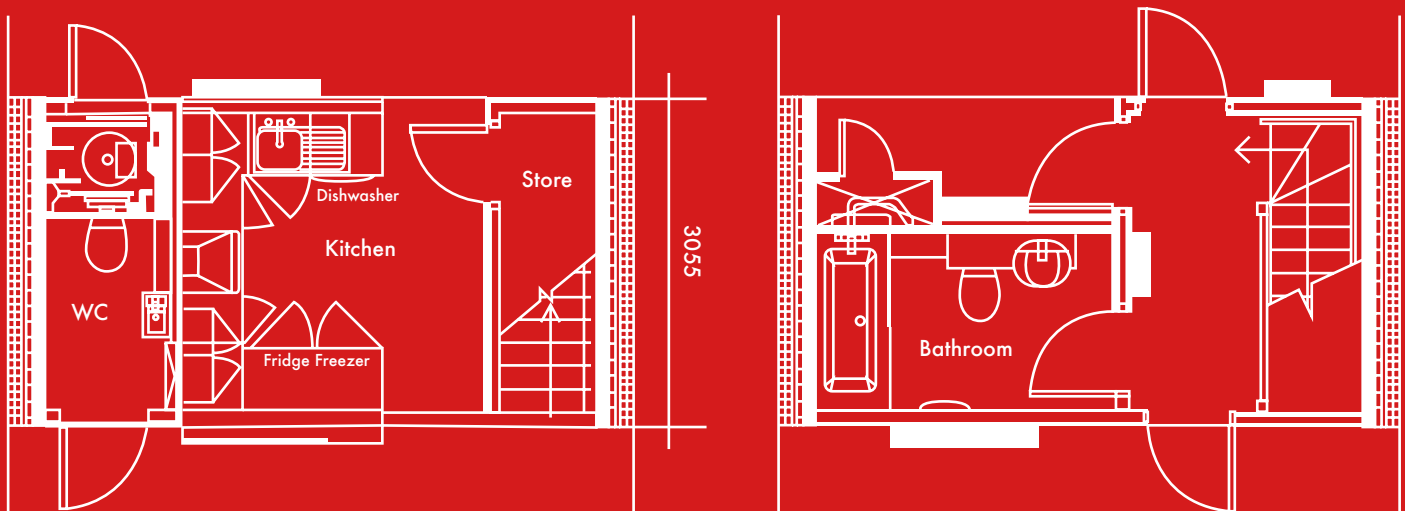
## Wall Panel Units Standardisation

– As HOME is not designed for a specific site or arrangement (detached, semi, detached, etc.) HOME must be able to perform well and meet all statutory requirements regardless of location, orientation and arrangement. Therefore, all panelled units, including any windows and doors within it must be able to meet all requirements in the most extreme climate conditions. This position leads to a situation where all panels must be standardised, which is beneficial to the process of manufacturing the panel units in our factory.





**Central Pod Unit Integration** - The central pod units are required to integrate M&E and fixed furniture items, such as kitchens, bathroom furniture and final finishes. The installation needs to be carried out within factory conditions. The pod units should be designed in such a way that a selection of different fixed furniture options can be installed, but within limitations on choice to prevent over engineering.



**HOME Economy of scope and scale** - The HOME itself is designed in such a way to ensure that all the efficiencies afforded by Hadley Offsite are gained. To meet these requirements the HOME should be constructed from a kit of parts which is made up from a limited number of unique elements and, where possible, maximise the number of repeated elements and manufacturing processes. This philosophy is strived for at every level of manufacture, from the frame to the whole house.

**Flexibility** - The different house typologies (2 bed, 3 bed) are designed so that the differences in layouts between each of the typologies are as limited as possible whilst also being compliant to national described space standards (NDSS). The house is also designed to easily be arranged in different house groupings (terrace, semi-detached, detached) without having to rearrange the internal layouts.



## **Design for Assembly**

Hadley HOME have a solution to use a combination of pods as well as wall panel units if required to construct the house and can offer a hybrid solution when being used for small or difficult sites to access, such as disused garage sites.

The central pod units and the wall panel units that make up the HOME are designed in such a way that they are easily transported to site on Hadley's own transport and then assembled on site. The wall panel units can be dispatched to site when the site is prepared and ready for the HOME to be assembled. This 'just in time' delivery method should negate the requirement for the wall panels and pod units to be stored on site, which will reduce the opportunity for damage or theft to occur prior to assembly.

The wall panels and pod units are weather protected during their transportation to site to ensure that internal finishes and any other fabrics are not damaged by weather prior to assembly. The wall panel units will be supplied with lifting cleats so that they can be craned into position easily and then fixed together using standard fixing details. Sacrificial panels have been designed where there are openings within the pod to maintain structural integrity of the pod units during the lifting process both onto the truck for transportation and off the truck for assembly. Once the pod units have been lifted into place the sacrificial panels can be removed.

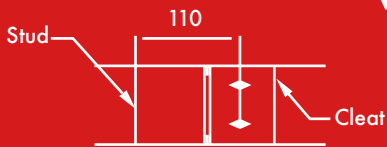
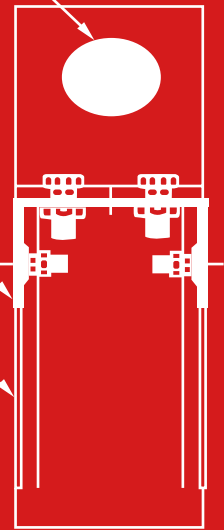
Hadley supplied lifting cleat fixed to panel head type with 2 nos. m12 xox bolts

Panels lifted on site using Hadley supplied lifting cleats. Panel lifted at max 2m points using 2 nos. Lifting cleats to suit panel weight/ center of gravity



104mm non lipped head track section

Stud section

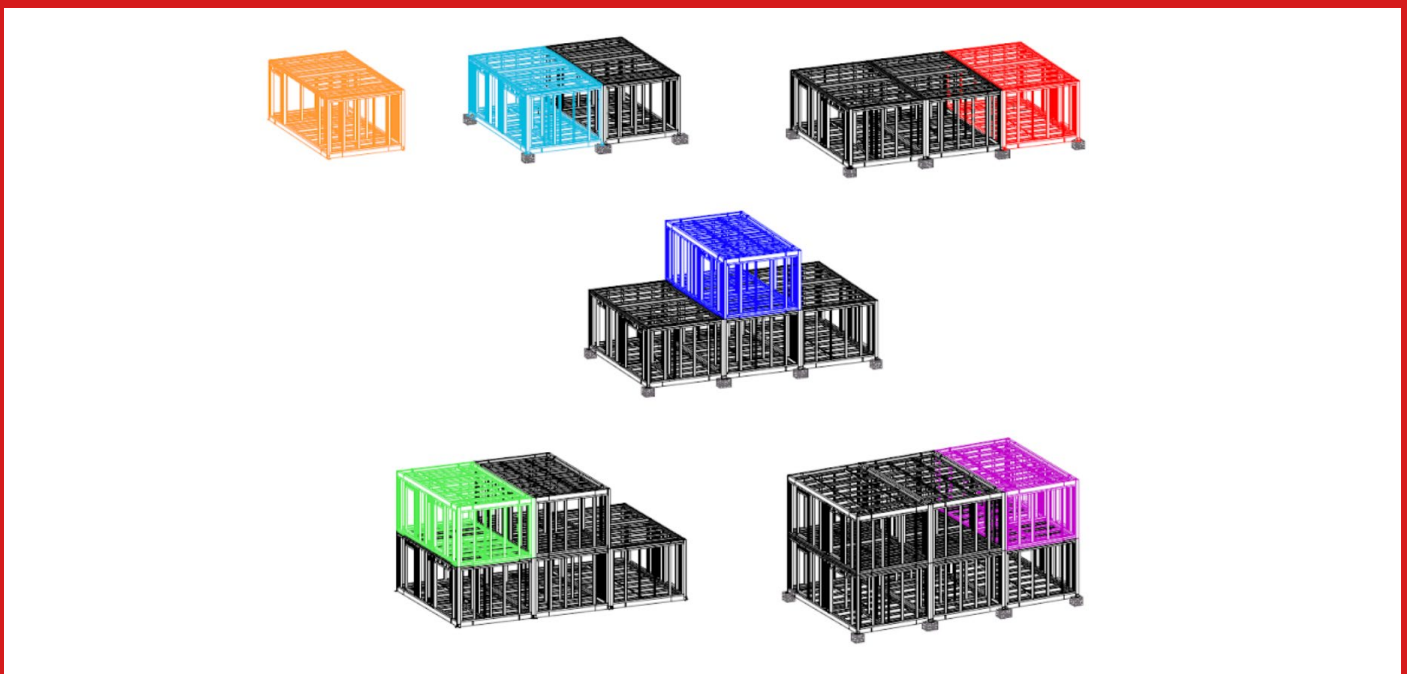


Panels are to be lifted individually into location only. Pre drilled holes in the panel head members dictate lifting locations

### Cleat Location

### Panel Head Lifting Detail

Where pod units are the core of the house where the utility type rooms are located (kitchen, WC and bathroom), with the stair core being incorporated in the ground floor pod. The pod units itself are split into two sections; the ground floor and the first floor, this is so the pod units are easier to store and that they can be transported to site with ease. Both sections will be supplied with lifting cleats so that the ground floor section can be lifted onto a pre-prepared foundation solution and then the first floor section lifted on top of the ground floor section.



The pods contain rooms which were heavily M&E dependent and contained fixed furniture which need to be manufactured and finished at Hadley's Offsite facility.

All incoming services pop up through the floor of the utility cupboard, so careful coordination is required through design and installing on site. Once the HOME is assembled then all the preinstalled pipework and electrical services are connected.



## **Design for High Performance and Low Impact**

Renewable adoption - The Hadley Offsite HOME is designed in a holistic way to ensure that it is low impact and high performing to assist in the reduction of fuel poverty and energy usage. This is achieved through the utilisation of active technologies, renewable resources, the betterment of Building Regulations and NHBC standards whilst also considering ease of maintenance.

Target U-values for building elements - The HOME is made up from building elements that were possible are lower than Notional Dwelling Specification as set out in Approved Document L1A Conservation of fuel and power.

Hadley and its stakeholders have worked collaboratively utilising BIM best practices throughout the design stage. The process of sharing relevant Revit models has enabled studies to be carried out on the HOME design highlighting any possible issues, such as clash detection. This has allowed for an iterative design to take place where results from test data can be fed back into the design and where possible solutions to mitigate any issues have been explored and the revolutionised new design retested up until the point where issues arising from the test data have been resolved.

Where possible active technologies have been considered and the impact of their inclusion in the HOME. The house will also have a remote monitoring system, items such as lighting systems and potentially where technologies such as air source heat pumps can all be connected back to a central router within the home then transferred to a cloud space for access.

There have been a number of renewable technologies and market leading products tested on the prototype house that enable us to make informative decisions on product selection. For various products refer to 'Package Levels'.



## **Design for Life Cycle Value and Wider Benefits**

The Hadley Offsite HOME is designed to maximise the life cycle value of the house as well as other wider benefits. These include minimising the cost of design, production and assembly whilst also improving quality control, energy performance and reducing CO2 emissions both in construction and use. Reducing running costs is a central consideration in an effort to reduce fuel poverty.

The target for the house for life cycle cost and CO2 emissions reduction. Hadley worked with key stakeholders in order to understand the model that Housing Providers adopt with managing their existing stock and new stock. HOME designs consider the way in which it assembles the various parts of the house to ensure ease of maintenance for years to come.

The cost of design has been minimised by creating a single flexible but robust design that can easily be modified to suit a number of requirements. The ground floor also has flexibility to have an open plan aspect or to divide the various living spaces. The HOME has been designed in such a way that it can be constructed either as a detached house, semi-detached houses or as terraced housing to meet the needs of a site. The façade of the HOME can utilise a number of façade treatments and can be changed to meet Local Authority requirements. The lightweight steel frame system used in the HOME can be constructed up to 10 storeys using Hadley Steel Framing, therefore, the system has the potential to be used for low rise apartment buildings.