



# TopHat

Confidential

# Who we are

## Technology enabled manufacturer of volumetric modular homes, established in 2016.

Based in a dedicated 125,000sqft advanced manufacturing facility in Foston, Derbyshire, the business currently employs 200 people.

TopHat's integrated technology platform drives industry leading design variation and customisation, manufacturing efficiency and quality.

The UK's first zero embodied carbon house builder TopHat has diversified routes to market through:

- ✓ Turnkey
- ✓ Partnerships
- ✓ Private sale

TopHat has invested more than £150m of private sector funds to date in the development of the company.



# Key accomplishments

- First true digital home manufacturer with scalable systems and process
- UK's first zero embodied carbon home builder
- 200 homes already in the ground featuring 12 different house types
- Catalogue of 22 semi-detached and detached homes and 7 apartment types, with an established 4 week DfMA process for a new production ready house type using TopHat standard details
- 5 year framework with Ikea/Skanska joint venture, Boklok, to deliver all their off-site homes in the UK
- Place on the Building Better Framework to deliver circa 500 homes per year



# Pipeline –strategic partnerships



## Boklok

5 year framework Agreement to deliver upwards of **1,500** homes.

**2022 – 210 homes**

**2023 – 500 homes**

**2024 – 500+ homes**

**2025 – 500+ homes**

This represents 70% of F1 capacity.

The Goldman Sachs logo, consisting of the words "Goldman" and "Sachs" stacked vertically in a white, serif font. The logo is centered on a light blue rectangular background.

## Goldman Sachs

Strategic Partnership with Goldman Sachs BTR fund to deliver several billion pounds of BTR product with the first 4 sites, **800** homes already identified.



## Building Better

A 5 year framework covering over 30 housing associations allowing the direct appointment of TopHat to deliver both houses and apartments. The framework, in the first 2 weeks, has generated close to **1,000** homes of enquiries.



# Delivered projects



# Kitchener Barracks, Chatham

NUMBER OF HOMES	CLIENT	SQUARE METRES
280	TopHat Developments	30.000



# Kitchener Barracks, Chatham

This project involves the construction of over 300 residential units on a former Ministry of Defence site in Chatham, Kent.

The homes are a mixture of 1 and 2-bedroom apartments and 2, 3, 4 and 5 bedroom houses. All houses are either delivered to national space standards or above and all significantly exceed the requirements of Part L.

The project is a development owned by TopHat and being delivered as a turnkey solution by TopHat Communities under a D&B JCT contract with the development SPV.

The site involves the delivery of over 600 modules, across each of the different house types and phases.

The site is very difficult, with a significant fall from the top to the bottom of the site. It has therefore been essential that the phasing and sequencing is cognisant of the site challenges. The project is being delivered in various phases, with Phases 1 and 2 now complete and Phase 3 due to commence in February 2021.

The site also includes a heritage building, which TopHat has also developed and completed. This demonstrates our ability to take on more complex sites than most offsite manufacturers.

All completed units have been sold by TopHat, with no issues occurring in sales from concerned mortgage lenders etc. In fact, the sales point of Kitchener Barracks has exceeded other local developments.

The houses have been delivered to an outstanding air tightness, with less than  $1\text{m}^3/\text{hr}/\text{m}^2@50\text{pa}$  being achieved in some of the homes. This has been achieved through the use of triple glazing and exceptionally high levels of insulation.

The homes have been delivered with a number of environmentally efficient technologies, including MVHR systems and wastewater heat recovery. This is in addition to the exceptional air tightness.

The completed units have therefore all received excellent EPC scores.

The final phase of the work commences in February 2021 and is used to offset any spare capacity in the factory.



# The Slivers, Rugby

NUMBER OF HOMES

38

CLIENT

Urban & Civic

SQUARE METRES

3500





# The Slivers, Rugby

This project involves the construction of 38 residential units for Urban & Civic in Rugby, Northamptonshire.

The homes are a mixture of 2, 3 and 4 bedrooms, terraced and semi-detached. In total, 76 modules are being used for the delivery of this project.

The project is a supply-only contract, delivered under a JCT D&B Contract, directly with the developer.

The site is very tight and known as the Slivers, with access from a single entrance, as shown in the below image.

TopHat has worked with the developer and the Local Authority to ensure the project obtained planning permission based on the standard TopHat designs.

The houses are being delivered across a phased, 6-month programme to suit the sales aspirations of the developer.



# White Road, Chatham

NUMBER OF HOMES

20

CLIENT

Medway Council

SQUARE METRES

1500



# White Road, Chatham

The design, supply and installation of 20 affordable homes at an infill site in White Road, Chatham.

The project was delivered under a D&B JCT contract. The project was constructed using 40 volumetric modules, with the top volume of the house having an integral roof structure.

The homes are all 2-bedroom, 4 person homes, delivered in accordance with national space standards and exceeding the requirements of Part L.

All homes have achieved an airtightness of less than  $3\text{m}^3/\text{hr}/\text{m}^2@50\text{pa}$ , a significant improvement on the  $5\text{m}^3/\text{hr}/\text{m}^2@50\text{pa}$  required by the client.

The homes have been delivered under a turnkey, design and build contract by TopHat, working with a local groundwork subcontractor preferred by the Local Authority.

The site is very tight, located behind an existing community centre and was essentially a waste ground. As can be seen from the plan above, there is a single, tight entrance onto the site.

TopHat secured the project in early 2020 and worked with the Local Authority to develop the design and obtain planning permission, based on the standard TopHat house designs.

TopHat commenced the works in the summer of 2020, clearing the site and installing infrastructure for the homes. The first modules were installed in October 2020 and completion was achieved in December 2020 to the high satisfaction of the client.



# Airport Road, Bristol

NUMBER OF HOMES

77

CLIENT

Boklok

SQUARE METRES

7100

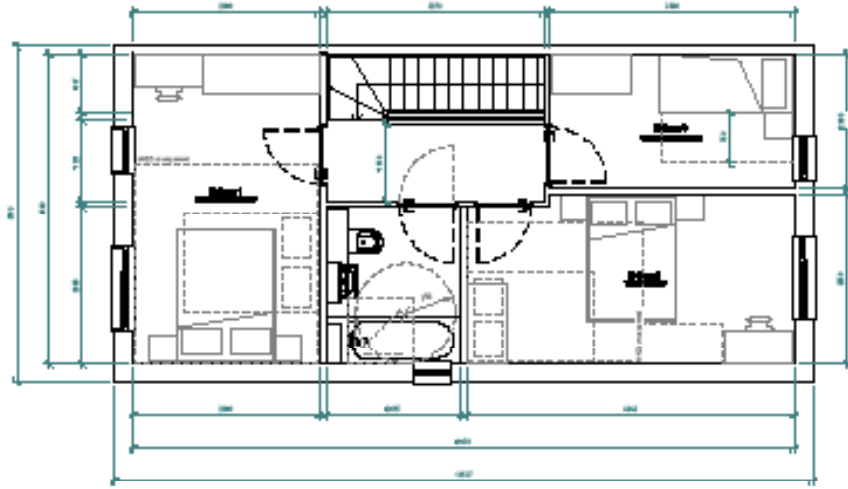


# Proposed house type

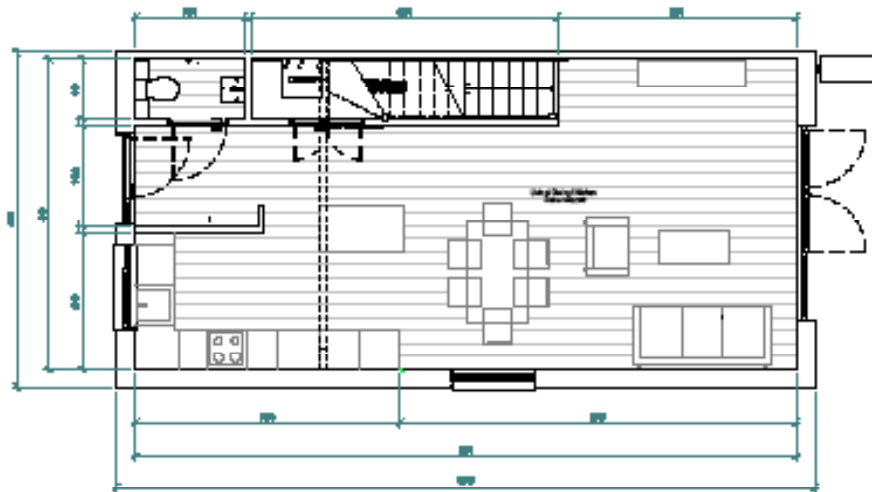


THC5\_93.4 sqm (1005.3 sqft)

## 3Bedroom\_5Person



First floor plan



Ground floor plan



### Tenure:

Market Sale and Affordable

### Standards:

- NDSS compliant as 3B\_5P (if en-suite variation selected NDSS compliant as 3B\_4P only)
- M4(2) compliant (porch upgrade required, not shown on the plan)
- Doors and windows are Secured by Design compliant
- Window positions shown on the plans above will vary depending on the elevation option selected
- Please refer to project specific specification for product's layout options, finishes and fittings

# Proposed apartment type



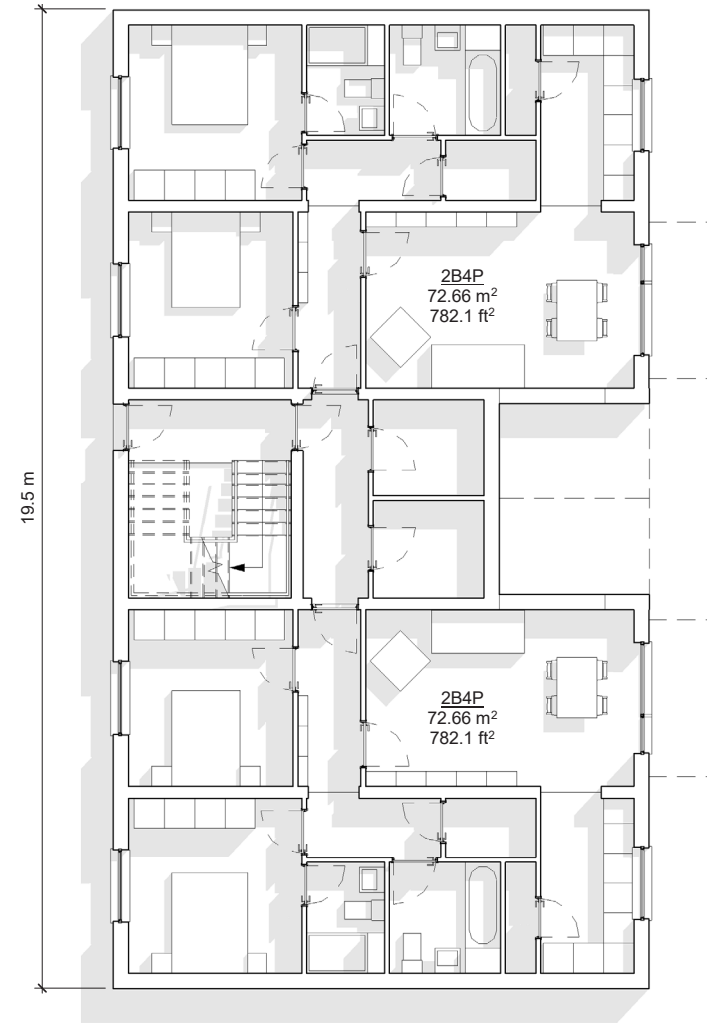
THGA 1\_50.6 sqm / 72.66 sqm

## 1Bedroom\_2Person 2Bedroom\_4Person



THGA 2\_72.66 sqm

## 2Bedroom\_4Person



Tenure:

PRS

Standards:

- NDSS compliant as 1B\_2P & 2B\_4P
- Doors and windows are Secured by Design compliant
- Window positions shown on the plans above will vary depending on the elevation option selected
- Please refer to project specific specification for product's layout options, finishes and fittings



\*Images for illustrative purposes only



# Cladding technology

A comprehensive range providing a total solution



Buff



Red - Multi



Charcoal



Red



Buff Roman Format



Slate Roman Format



Built examples

# TopHat specification

TopHat Specification item		Standard	Net Zero	PRS / Sale	Premium
1.0 Roof Form	1.1 Front to back pitch (F/B)	✓	✓	✓	✓
	1.2 Side to side pitch (S/S)				

2.0 Energy	<b>2.1 Compliant with Part L</b>				
	2.1.1. Fabric air tightness 5m3/m2h @ 5Pa or better	✓		✓	
	2.1.2 Vaillant Eco-Tec or similar gas boiler				
	<b>2.2 35% reduction - ASHP</b>				
	2.2.1 Electric air-source heat pump with hot water tank	✓	✓	✓	
	2.2.2 Standard radiators baseline	✓	✓	✓	
	2.2.3 Flat panel radiators upgrade				
	<b>2.3 Net Zero Carbon</b>				
	2.3.1 3m3/m2h @ 50Pa or better		✓		
	2.3.2 Daikin or similar electric air-source heat pump with hot water tank				
	2.3.3 MVHR system		✓		
	2.3.4 Roof-mounted PV panels		✓		
	2.3.5 Roof-mounted PV panels with battery storage				

## 2.2.1 Air source heat pump (electric)

**Brand** Vaillant

**Model** Unitower and Aerotherm-plus

**Size** External unit (mm) 765 high x 450 deep x 1100 wide  
Internal unit (uniTOWER) 1866 high x 693 deep x 595 wide

**Performance** Excellent A+++ rated, SCOP of ~4.5

**Description** Monoblock Air Source Heat Pump with integrated high performance direct hot water cylinder

\* Unit manufacturer may vary from this dependant on supply



# TopHat specification

TopHat Specification item		Standard	Net Zero	PRS / Sale	Premium
3.0 External Finishes	<b>3.1 Roof</b>				
	3.1.1 Clay/ concrete tiles baseline	✓	✓	✓	✓
	3.1.2 Pressed metal				
	<b>3.2 Cladding</b>				
	3.2.1 Mauer printed brick system - A2 rated (see separate catalogue)	✓	✓	✓	
	3.2.2 Mauer brick slip system - A1 rated				
	<b>3.3 Windows</b>				
	3.3.1 PVCu Logik chamfered sash	✓	✓	✓	
	3.3.2 PVCu Logik flush sash				
	3.3.3 Alu/timber composite				✓
	3.3.4 Aluminium triple glazing				
	<b>3.4 External Doors</b>				
	3.4.1 GRP skinned solid door	✓	✓	✓	
	3.4.2 Alu/timber composite with fan light only				✓
	3.4.3 PVCu patio door 2035 x 2100	✓	✓	✓	
	3.4.4 Alu patio door 2035 x 2100				✓
	<b>3.5 Porch</b>				
	3.5.1 Canopy	✓	✓	✓	
	3.5.2 Surround				✓
	<b>3.6 Rainwater goods</b>				
	3.6.1 Plastic gutter down pipe	✓	✓	✓	
	3.6.2 Aluminium gutter and down pipe				✓

## 3.2.2 Standard radiator baseline

**Brand** Sterad or similar

**Model** K1 Classic Compact

**Size** Selection of radiator sizes based on room size and load requirements

**Colour** White

**Description** Standard profiled panel



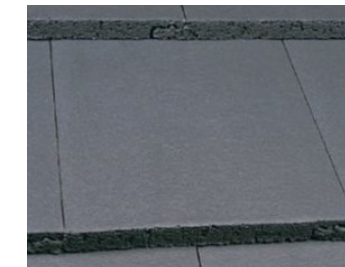
## 3.1.1 Clay/ Concrete tile baseline

**Brand** Marley or similar

**Model** Clay or Concrete

**Colour** Smooth grey or Mosborough red\*

**Size** 400x400mm



## 3.6.1 Plastic gutter & downpipe

**Brand** Floplast or similar

**Model** Square line

**Size** 114mm gutter and 63mm square downpipe

**Colour** Anthracite grey



# TopHat specification

TopHat Specification item		Standard	Net Zero	PRS / Sale	Premium
<b>4.0 Internal Finishes</b>	<b>4.1 Bathroom wall and floors</b>				
	4.1.1 Porcelain 300x600mm wall tile baseline	✓	✓	✓	
	4.1.2 Porcelain 600x600mm floor tile baseline	✓	✓	✓	
	4.1.3 Porcelain 300x600mm wall tile upgrade				✓
	4.1.4 Porcelain 600x600mm floor tile upgrade				✓
	4.1.5 Wood effect LVT tile baseline	✓	✓	✓	
	4.1.6 Multipanel single wall panel	✓	✓	✓	
	<b>4.2 Floor coverings</b>				
	4.2.1 Wood effect vinyl tiles (to all ground floor) baseline	✓	✓	✓	
	4.2.2 Engineered wooden flooring to all ground floor				✓
	4.2.3 Carpet (to stairs and FF landing and bedrooms) baseline			✓	✓
	4.2.4 Carpet (to stairs and FF landing and bedrooms) upgrade				

## 4.1.1 Ceramic tile

**Brand** Parkside or similar

**Model** Kirn

**Colour** Bianco White to family bathrooms  
Beige to en-suites "

**Size** 600 x 600mm floor tiles and 300 x 600mm wall tile

**Performance** Suitable for exterior and interior use in wet areas

**Description** Matte finish

"\*Includes full height tiling to walls around bath and shower and half height tiling to remaining walls apart from upstand behind the sink and toilet which is supplied as bathroom furniture (refer to 7.3 Bathroom Furniture)



# TopHat specification

TopHat Specification item		Standard	Net Zero	PRS / Sale	Premium
<b>5.0 Kitchen</b>	<b>5.1 Furniture</b>				
	5.1.1 Slab panel doors baseline	✓	✓	✓	✓
	5.1.2 Shaker doors upgrade				
	5.1.3 Carcass baseline	✓	✓	✓	
	5.1.4 Wooden carcass				✓
	5.1.5 Laminate top baseline	✓	✓	✓	
	5.1.6 Quartz top upgrade				✓
	5.1.7 Silestone top upgrade				
	5.1.8 Handles baseline	✓	✓	✓	
	5.1.9 Handles/ handleless upgrade				✓
	<b>5.2 Kitchen sink and tap</b>				
	5.2.1 Surface mounted sink	✓	✓	✓	
	5.2.2 Undermounted sink				✓
	5.2.3 Bristan or similar kitchen tap baseline	✓	✓	✓	✓
	5.2.4 Hansgrohe or similar kitchen tap upgrade				
	<b>5.3 Appliances*</b>				
	5.3.1 Hotpoint oven, hob & extract	✓	✓	✓	
	5.3.2 Bosch				✓
	5.3.3 Miele or similar				

\* Appliances included are hob, oven and extract

\* Client requested alternative specification items will be considered

\* Unticked items are client cost options

## 5.1.1 Doors

**Manufacturer** Woodlands, Symphony or Benchmark

**Model** Slab door - Egger laminate wrapped

**Colour** Cashmere grey in matt finish

**Size** Base units - Standard height and widths

**Highlevel units** Standard tall units in standard widths

\*Door and plinth to be provided to allow purchasers to fit integrated dishwasher and washer dryer



# TopHat specification

TopHat Specification item		Standard	Net Zero	PRS / Sale	Premium
<b>6.0 WCs and bathrooms</b>	<b>6.1 W.C and family bathroom sanitaryware</b>				
	6.1.1 Ideal Standard or similar WC sink baseline	✓	✓	✓	
	6.1.2 Ideal Standard or similar family bathroom sink baseline	✓	✓	✓	
	6.1.3 Ideal Standard or similar toilet baseline	✓	✓	✓	
	6.1.4 Ideal Standard or similar bath baseline	✓	✓	✓	
	6.1.5 Roca or similar WC sink upgrade				✓
	6.1.6 Roca or similar Family bathroom sink upgrade				✓
	6.1.7 Roca or similar Toilet upgrade				✓
	6.1.8 Bath pole and curtain baseline	✓	✓		
	6.1.9 Bath screen glass upgrade			✓	✓
	<b>6.2 Brassware</b>				
	6.2.1 Bristan or similar basin tap baseline	✓	✓	✓	
	6.2.2 Hansgrohe or similar basin tap upgrade				✓
	6.2.3 Bristan or similar bath filler baseline	✓	✓	✓	
	6.2.4 Hansgrohe or similar basin bath filler upgrade				✓
	6.2.5 Bristan or similar shower mixer baseline	✓	✓	✓	
	6.2.6 Hansgrohe or similar shower mixer upgrade				✓
	6.2.7 Waterworks or similar upgrade throughout				
	6.2.8 Toilet holder + door clothes hooks baseline	✓	✓	✓	✓
	6.2.9 M4(3) grab rail pack				
	<b>6.3 Vanity Furniture</b>				
	6.3.1 No vanity furniture and mirror baseline	✓	✓		
	6.3.2 Vanity furniture, concealed cistern and mirror cabinet unit			✓	✓

## 6.1.4 Bath

**Manufacturer** Ideal Standard or similar

**Model** Tesi

**Colour** White

**Size** 700(W) x1700(L)

**Description** Acrylic bath with waste overflow in chrome. White acrylic side panel front to allow maintenance access  
\*lower overflow version required if 110 l/per person per day required



## 6.2.1 Basin tap baseline

**Manufacturer** Bristan or similar

**Model** Orta tap

**Colour** Chrome

\*to WCs only



## 6.2.3 Bath and shower mixer upgrade

**Manufacturer** Bristan or similar

**Model** Clio Bath filler

**Colour** Chrome

\*to family bathrooms



# TopHat specification

TopHat Specification item		Standard	Net Zero	PRS / Sale	Premium
<b>7.0 Electrical fixtures and fittings</b>	<b>7.1 Lighting</b>				
	7.1.1 Pendant baseline	✓	✓	✓	
	7.1.2 Pendant upgrade				✓
	7.1.3 Recessed downlight baseline	✓	✓	✓	✓
	7.1.4 External porch light baseline	✓	✓	✓	
	7.1.5 External porch light upgrade				✓
	7.1.6 External patio light baseline	✓	✓	✓	
	7.1.7 External patio light upgrade				✓
	<b>7.2 Sockets and switches</b>				
	7.2.1 White PVC baseline	✓	✓	✓	
	7.2.2 White PVC USB sockets upgrade				✓
	7.2.3 Brush aluminium upgrade				
	7.2.4 Brush bronze or brass upgrade				
	7.2.5 Shaver socket in master bedroom ensuite	✓	✓	✓	✓
	<b>7.3 Media</b>				
	7.3.1 TV and Wifi media plate	✓	✓	✓	✓
	7.3.2 Sky+ connection in living room and master bedroom				
	<b>7.4 Heating and H&amp;S</b>				
	7.4.1 Standard central thermostat	✓	✓	✓	✓
	7.4.2 Hive or similar thermostat				
	7.4.3 Heat and smoke detector	✓	✓	✓	✓

- \* Appliances included are hob, oven and extract
- \* Client requested alternative specification items will be considered
- \* Unticked items are client cost options

## 7.1.1 Pendant baseline

**Manufacturer** Hager or similar

**Model** 624SEL212/9

**Colour** White

**Size** 700(W) x1700(L)

**Description** Safety pendant set 9" - short skirt



## 7.1.3 Recessed downlight baseline

**Manufacturer** Ovia or similar

**Model** Nano 5

**Colour** White

**Diameter** 90mm



## 7.1.4 External porch light baseline

**Manufacturer** Aurora or similar

**Model** EN-WL5BLK

**Colour** Satin chrome or Matt black

**Description** 240V GU10 IP44 aluminium fixed up/down wall light black(white)



# TopHat specification

TopHat Specification item		Standard	Net Zero	PRS / Sale	Premium
<b>8.0 Internal joinery</b>	<b>8.1 Internal doors</b>				
	8.1.1 Plain flush door	✓	✓	✓	✓
	8.1.2 Thirsk grained door				
	8.1.3 Ironmongery baseline (zoo)	✓	✓	✓	✓
	8.1.4 Oversized internal doors				
	<b>8.2 Skirtings and architraves</b>				
	8.2.1 baseline	✓	✓	✓	✓
	8.2.2 upgrade				
	<b>8.3 Stairs</b>				
	8.3.1 Baseline (painted handrail, mdf treads)	✓	✓	✓	
	8.3.2 Upgrade (timber handrail, mdf treads)				✓
	8.3.3 Upgrade (softwood handrail and stair)				

## 8.1.1 Internal doors plain baseline

**Manufacturer** Ian Firth, Vicaima or similar

**Model** IFV.10 Paint grade plus

**Colour** White primed

**Size** Imperial Door Sizes, Thickness 35mm

**Description** Semi solid core, supplied and fitted with quicksemble hinges in a chrome finish



## 8.1.3 Door furniture baseline

**Manufacturer** Zoo or similar

**Model** ZCS050SS

**Colour** Satin stainless

**Size** 125mm x 19mm dia oval section handle

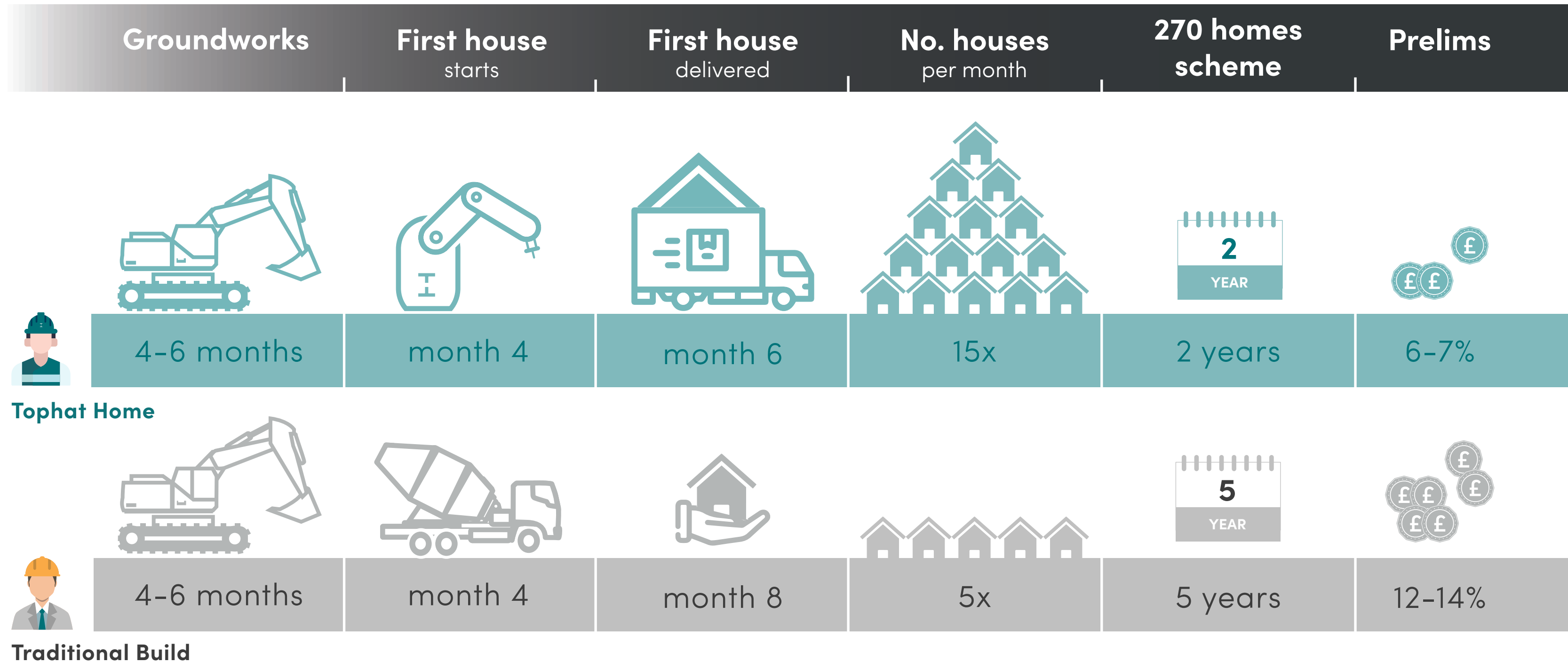
**Description** Associated hardware to match





# Timescales

Methods of construction timescale comparison.



# Sustainability

**Our approach to delivering homes is highly sustainable. Not only in operation, but in delivery too.**

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**A TopHat home has 82% less embodied carbon than a traditional home, as we use low carbon impact materials, such as timber, and reduce waste through precision manufacturing. TopHat homes are also significantly better to run, with our standard homes achieving over a 50% reduction in carbon emissions over a 60 year period. Our standard homes also exceed all current environmental legislation and performance requirements.**

The homes we deliver have the environment and sustainability at their core, through both intelligent decision and smart manufacturing processes. In practical terms, we design so that all homes we manufacture use less energy and can be zero carbon.

We don't stop at the end user experience. Through every stage of design and manufacture we are seeking to build in high levels of environmental and sustainability performance. This is achieved through less waste in the construction process and a significant reduction in transportation to and from sites.

Through the reduction of drafts and heat leakage, to the addition of features such as solar panels and the use of proprietary cladding systems, the costs of heating and running a TopHat home are reduced. Our homes minimise their the day-to-day impact on the environment.

Our choice of materials and where we source them also improves sustainability as we've in-creased the life expectancy of our homes, ensuring that they perform for the long term.



# Impeccable environmental and social standards

Ultra low embodied carbon, lower energy in use, affordable homes at scale, and jobs created where they are needed.

The greenest new homes being built at scale in the UK today:

Ultra low embodied carbon	Future Homes Standard ready	Lower carbon in-use	Lower lifetime energy costs
<ul style="list-style-type: none"> <li>✓ Timber frame all sustainably sourced</li> <li>✓ Low carbon cladding</li> <li>✓ 82% less embodied carbon than the average new build home</li> <li>✓ Already 65% lower than the RIBA 2030 target for whole life embodied carbon</li> </ul>	<ul style="list-style-type: none"> <li>✓ Structure designed ready to take enhanced levels of insulation</li> <li>✓ All TopHat homes have air source heat pumps as standard</li> </ul>	<ul style="list-style-type: none"> <li>✓ A TopHat home will save a significant amount of the CO<sub>2</sub> compared to a traditional house</li> <li>✓ 50% reduction in carbon in use compared to a traditional house</li> <li>✓ Air source heat pumps as standard can deliver net zero carbon with the use of PVs</li> <li>✓ TopHat will deliver net zero carbon as the grid becomes green</li> </ul>	<ul style="list-style-type: none"> <li>✓ Substantially less energy consumption than the average home in England (~30% lower than a traditional house<sup>1</sup>)</li> <li>✓ Zero bill option can be delivered, with potential to leverage the offering between zero bills for customers (100% capital contribution) and no capital contribution, but 100% revenue opportunity for TopHat (which could be securitised)</li> </ul>

Addressing the significant shortage of affordable social housing and creating jobs where they are needed:



Sources: Statista, WSP Analysis (1) Refers to a 3 bed house which is not a new build.

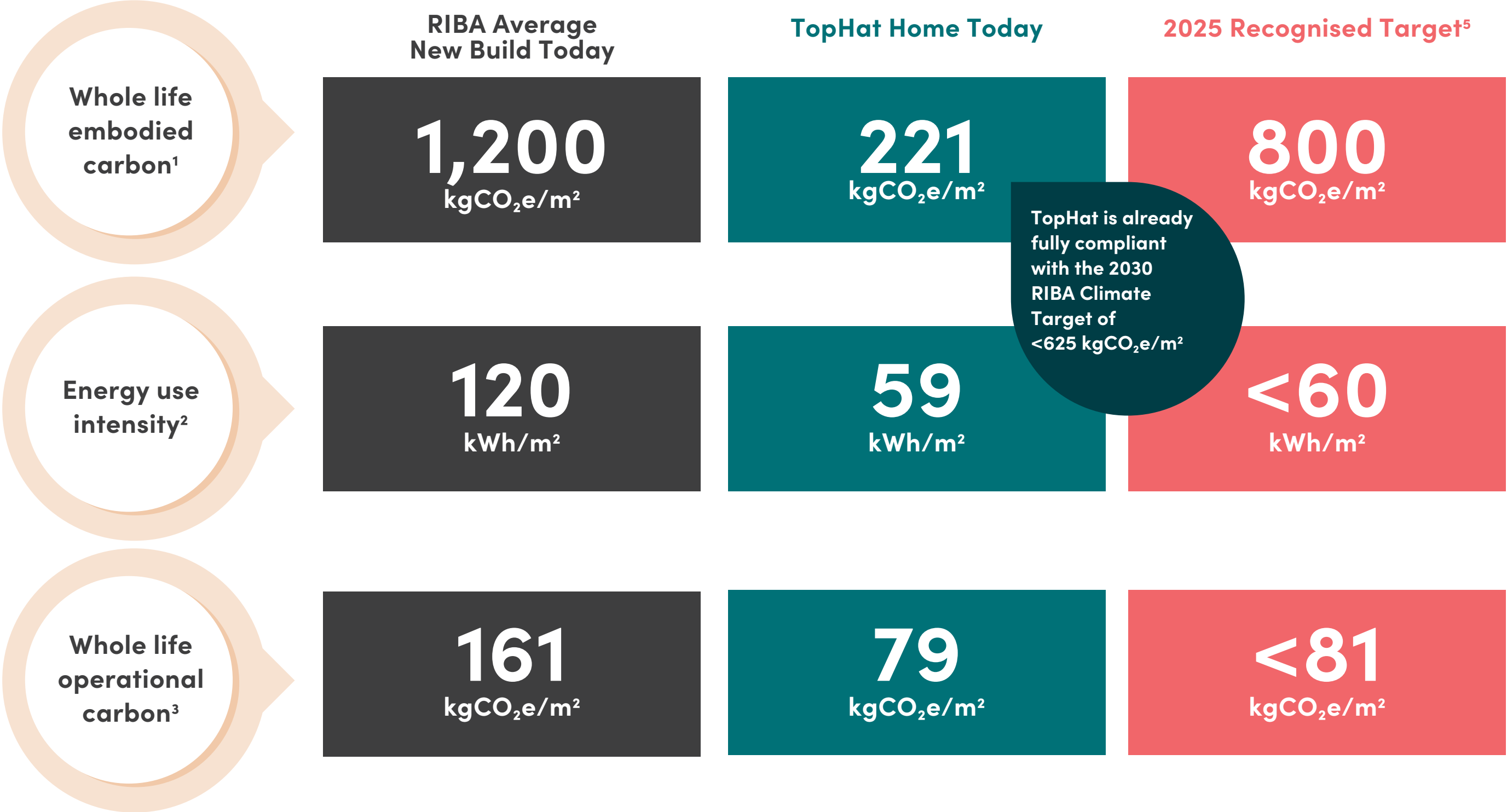
# EU taxonomy

To meet Article 9 standards, TopHat needs to make a contribution to at least one environmental objective while doing no significant harm to any other environmental objectives, as well as comply with social safeguards and technical screening.

Specified environmental objectives	TopHat's contribution
Climate change mitigation	<p>Instead of using heavily polluting materials, such as concrete and bricks, TopHat uses materials that have a significantly reduced impact on the environment</p> <p>The use of sustainable timber for TopHat homes has a long term positive impact, as additional trees are planted, which over time will sequester CO<sub>2</sub> out of the environment. Based on Class A1 A3 embodied carbon, when factoring in carbon sequestration, the TopHat product actually results in a reduction in CO<sub>2</sub></p> <p>The TopHat home already has significantly less whole life embodied carbon than the 2030 target set by RIBA (RIBA 625kgCO<sub>2</sub>e/m<sup>2</sup> v TopHat 221kgCO<sub>2</sub>e/m<sup>2</sup>)</p> <p>TopHat uses air source heat pumps to provide heat, which are all electric, eliminating the use of gas and reducing TopHat's environmental impact climate change adaption</p>
Climate change adaption	<p>TopHat's homes are designed to meet the UK Government's Future Homes Standard, which will come into force in 2025. This requires homes to be ready for future environmental changes, with better building performance</p> <p>TopHat homes are also all electric, meaning that as the grid continues to decarbonise, TopHat homes become lower carbon overtime</p> <p>TopHat homes are factory built, using automation driven from a 3D model, which means each home has a digital twin, enabling future adaptation and change much more easily than a traditionally built home</p>
Sustainable use and protection of water and marine resources	<p>TopHat's homes use no water in their manufacture, as opposed to traditionally built homes, which according to the NHBC use about 8,000 litres of water on average</p> <p>The elimination of water reduces the risk of contamination to existing water courses, whilst also reducing consumption pressures</p>
Transition to a circular economy	<p>TopHat's homes can be de constructed, and reused or rebuilt</p> <p>If a particular site became unviable or uninhabitable, it is feasible for a resident to move their home to another location</p> <p>The TopHat digital twin allows for adaptation in the future as well and changes can be made much more easily than a traditionally built home</p> <p>Pollution prevention and control</p>
Pollution prevention and control	<p>By building homes in a controlled, factory environment, we are reducing the risk of pollution into the environment</p>
Protection and restoration of biodiversity and ecosystems	<p>Does no significant harm</p>

# Embodied carbon lifecycle assessment

At present, TopHat meets and exceeds RIBA targets set for 2025.



(1) New build, compliance approach. (2) The amount of carbon emitted during the making of a building. (2) Indicator of the energy efficiency of a building’s design and/or operations. (3) The amount of carbon emitted during the operational or in use phase of a building. (4) Business as usual, standard house, from RIBA. (5) Based on RIBA 2025 target; RIBA 2025 target assumes a highly decarbonised grid, which will benefit TopHat too, as an all electric provider.

# Zero carbon houses specification

TopHat can deliver Zero Carbon Houses based on our standard modular fabric. We define these as having net zero CO<sub>2</sub> emissions over the course of a year resulting from regulated energy use. The below is based on energy use and CO<sub>2</sub> emission calculations performed in SAP 9.92 as required by ADL1A 2013 (amended 2016).

Roof	Modular timber frame ceiling cassette fully filled with mineral fibre insulation. A conventional trussed rafter roof is constructed on site following the placement of modules. A further layer of mineral fibre insulation is installed in the roof space. U value of 0.11 W/m <sup>2</sup> .K
Walls	140mm structural timber frame, fully filled with mineral fibre insulation. An additional layer of mineral fibre insulation is applied to the outside of the structural frame. Finished externally with a highly realistic brick effect ventilated façade system, U value of 0.17 W/m <sup>2</sup> .K
Floors	Suspended timber ground floor cassette fully filled with mineral fibre insulation, U value of 0.13W/m <sup>2</sup> .KW/m <sup>2</sup> .K
Windows	PVCu double glazed windows achieving a whole unit U value of 1.2 W/m <sup>2</sup> .K Possible triple glazing dependant on location.
Air Permeability	Between 3 and 5 m <sup>3</sup> /m <sup>2</sup> /hour @ 50Pa
Heat generator	Air Source Heat Pump (ASHP), currently Vaillant AroTHERM
Heat emitter	55°C radiators
Water heating	From main ASHP system via 190 litre domestic hot water cylinder with immersion heater boost and disinfection function, currently Vaillant UniTOWER
Ventilation	MEV (centralised continuous extract ventilation) from wet rooms and kitchen, trickle vents to provide fresh air
Electrical installation	Conventional twin and earth system, with first floor distribution board to aid modularisation
Lighting	100% LED
Renewable energy	Solar photovoltaic system (PV). Minimum system capacity of approximately 3kWp, for example a THC 1 house type in ZCH guide would require 2.88kWp single south facing array. An example system from Viridian Solar, based on the Clearline Fusion product would comprise 9 portrait format PV panels 320W resulting in an array is 5.4m high and 3.3m wide
EV charging	Optional provision for 7kW EV charging point to front or side façade of house

This specification requires that a sufficient area of suitably orientated roof be available for PV installation. This is generally possible but does depend on the orientation and roof form, both of which should be considered at planning stage to ensure the cost of ZCH houses is minimised. Please see Impact of Orientation and Roof form on ZCH - RD Briefing Note for further explanation of specification and cost implications.

## 1 NO POVERTY



TopHat delivers energy efficient homes, which the poorest in society will be able to afford to heat, assisting in the reduction of fuel poverty

TopHat creates increased capacity in the housing market, enabling more people to access affordable, high-quality homes.

TopHat creates well paid jobs within areas of higher unemployment and away from areas of saturated employment. As a living wage employer, we create higher value jobs, in areas with more affordable housing.

## 3 GOOD HEALTH AND WELL-BEING



We use modern manufacturing techniques to reduce manual lifting, working at height and other dangerous activities typically associated with construction. The outcome is a lower risk of injury and poor health.

## 4 QUALITY EDUCATION



TopHat supports its employees by providing access to further education, supporting people through apprenticeships and degrees.

TopHat works with those who have had limited educational opportunity, creates a supportive working environment and creates learning opportunities through apprenticeships.

All employees in TopHat have access to continued education and training, via a range of different means to suit their aspirations, aims and intentions.

## 5 GENDER EQUALITY



TopHat does not accept any form of discrimination and will publish its paygap on an annual basis. We will enable women to have a full and effective engagement in our decision making.

We use technology, intelligent work practices and modern manufacturing techniques to create greater access for women to the workforce.

TopHat will adopt policies that actively promote gender equality throughout the TopHat business.

## 6 CLEAN WATER AND SANITATION



TopHat will develop manufacturing processes that eliminate the use of water to manufacture the homes in our advanced manufacturing facility.

We will design homes that minimise water usage, putting less pressure on a limited supply.

## 7 AFFORDABLE AND CLEAN ENERGY



TopHat does not build homes that consume fossil fuels at the point of ownership, with all homes powered by electric alone. This eliminates the use of fossil fuels by the owner, whilst also eliminating CO2 emissions on the development.

All TopHat houses will achieve a minimum EPC score of B - demonstrating the delivery of new homes that exceed minimum targets.

All TopHat homes will be adaptable to ensure PVs and other green and new technologies can be easily added to the home.

## 8 DECENT WORK AND ECONOMIC GROWTH



TopHat will achieve higher productivity, through technological upgrades and innovation. We will create new jobs in highly-sustainable, low-carbon industry.

We will focus on growing our business, without environmental degradation, through the use of renewable, sustainable and alternative materials, wherever possible.

Create high value work opportunities for young people and people with disabilities, whilst ensuring equal pay for equal work.

## 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



TopHat promotes inclusive and sustainable industrialisation, by creating sustainable homes, in areas less economically well-off.

TopHat invests and promotes innovation through a dedicated research and development team, who develop, test and assess new, sustainable technologies and products.

TopHat develops a product that increases affordability of homes, by increasing

## 10 REDUCED INEQUALITIES

TopHat's homes are used in the regeneration of regions, where new, affordable and sustainable homes are needed.

TopHat delivers homes that cater for the needs of a wide range of people, providing accessible homes, that are affordable and safe places to live.

## 11 SUSTAINABLE CITIES AND COMMUNITIES

TopHat provides access to safe and affordable homes for the majority.

TopHat delivers new homes that don't cost the earth and can, in fact, be used to reduce carbon emissions.

TopHat delivers homes that support positive economic, social and environmental links between urban areas where we deliver homes, and more rural areas where we build them.

## 12 RESPONSIBLE CONSUMPTION AND PRODUCTION

TopHat will deliver homes that sustainably consume materials, resulting in no net increase of CO2 emissions from our activities.

TopHat develops new materials and products to reduce our environmental impact where existing materials are highly impactful.

TopHat generates no waste from the production of our homes.

## 13 CLIMATE ACTION

TopHat designs and delivers homes that are fit for future climate change.

TopHat uses principles, such as biophilic design, to make our homes more resilient to climate action.

## 15 LIFE ON LAND

TopHat actively purchases sustainable timber that results in reforestation.

TopHat actively develops homes that improve local biodiversity and encourage native tree planting.

## 16 PEACE, JUSTICE AND STRONG

TopHat will act in an accountable and transparent manner at all levels.

TopHat will act in a non-discriminatory manner at all times, positively enforcing behaviours that encourage the same.

## 17 PARTNERSHIPS FOR THE GOALS

TopHat is committed to working in public-private and public partnerships to ensure better outcomes for the widest cross section of society.

We will continue to monitor our activities and provide data to our partners.



# Commerical and contract structure

## Payment structure

For elements of work associated with traditional site activities, such as groundworks and infrastructure, TopHat works on the basis of a monthly application process and 21-day payment terms.

For the module elements, TopHat has a slightly different process as follows (each percentage is off just the module value and payable within 21-days):

- 10% design fee on signing the contract
- 10% on the commencement of manufacture
- 50% on the completion of the modules and vesting of ownership in the customer. (In practice, this means the customer pays for the modules after they are installed on site, due to 21-day terms.)
- 20% upon completion of the module install
- 10% upon practical completion.

The payments are typically broken down into phases when looking at larger schemes.

The payment profile means that the customer typically has the benefit of the modules on their site, before 80% of the payment is made, significantly altering the risk profile.

This is only possible due to the financial backing enjoyed by TopHat.

This favourable funding structure means that customers are not having to pay large sums of money for modules that are not in their ownership, greatly assisting in the financing of schemes.

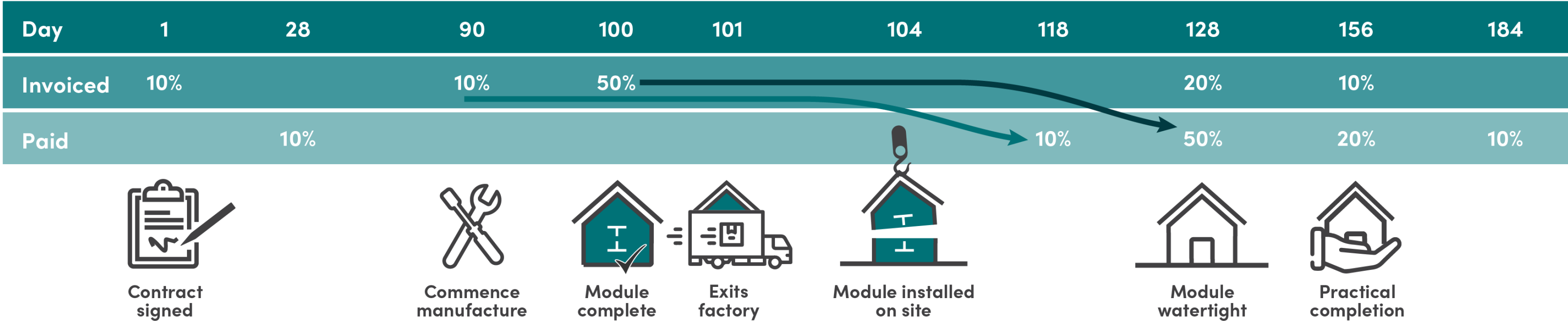
## Different forms of contract

TopHat has experience of working with a wide range of different types of contract. The two most commonly used are the NEC and JCT.

Our strong preference is for a JCT design & build contract as it is typically best understood by the market and suppliers.

The NEC is a good contract for larger, complex projects. However, it requires a significant amount of managerial time, which would put costs up, for limited benefit in this environment.

TopHat have also used more bespoke contracts, such as the High Value D&B contract used by the Department for Education, which is easily adaptable. This is also a good, clear contract.



# Accreditations, certifications and awards

Through repeated processes and designs, we are able to ensure quality much more easily than a traditional construction approach. Aligned with high-tech manufacturing, where quality is inspected several times prior to a home leaving the factory, the outcome is a better home, time after time.



# Mortgage providers on Kitchener Barracks



# Insurances and warranties

**All TopHat homes are Lloyds Register certified and BOPAS assured for a 75-year design life.**

Our R&D team are currently working through the NHBC Accepts process to get an accredited version of our system. The time frame for this is clearly not a fixed one, but our aim is to have it done for Summer 2022. We are assuming c. May / June for having an approved product.

We have identified technical solutions to the challenges placed by NHBC and are working through a testing and approvals process as part of our TRL and MRL process.

We have various hold points within our manufacturing process and invite external parties including building control to participate in regular inspections.

We have used BLP, Checkmate and Buildzone to provide 12 year warranties on our Kitchener Barracks site as part of our proof of concept process and are typically using Checkmate and Buildzone on other projects.

## Standard TopHat approach

All TopHat homes are made from a timber frame and come with a 3D printed brick façade as standard. The advantage of this approach is that our homes have a very low embedded carbon, typically 1/27th of a traditional masonry house (within appendices).

Standard performance includes the following:

- ASHP for hot water and heating that ensures compliance with Part L 2024.
- Airtightness of 5m<sup>3</sup>/hr/m<sup>2</sup>@50PA, although in practice this is typically c.3 m<sup>3</sup>/hr/m<sup>2</sup>@50PA.
- Wall u-value of 0.23.
- Window u-value of 1.4.

**Enhanced options are available and have been delivered on various projects in the past, including airtightness of 1m<sup>3</sup>/hr/m<sup>2</sup>@50PA.**

