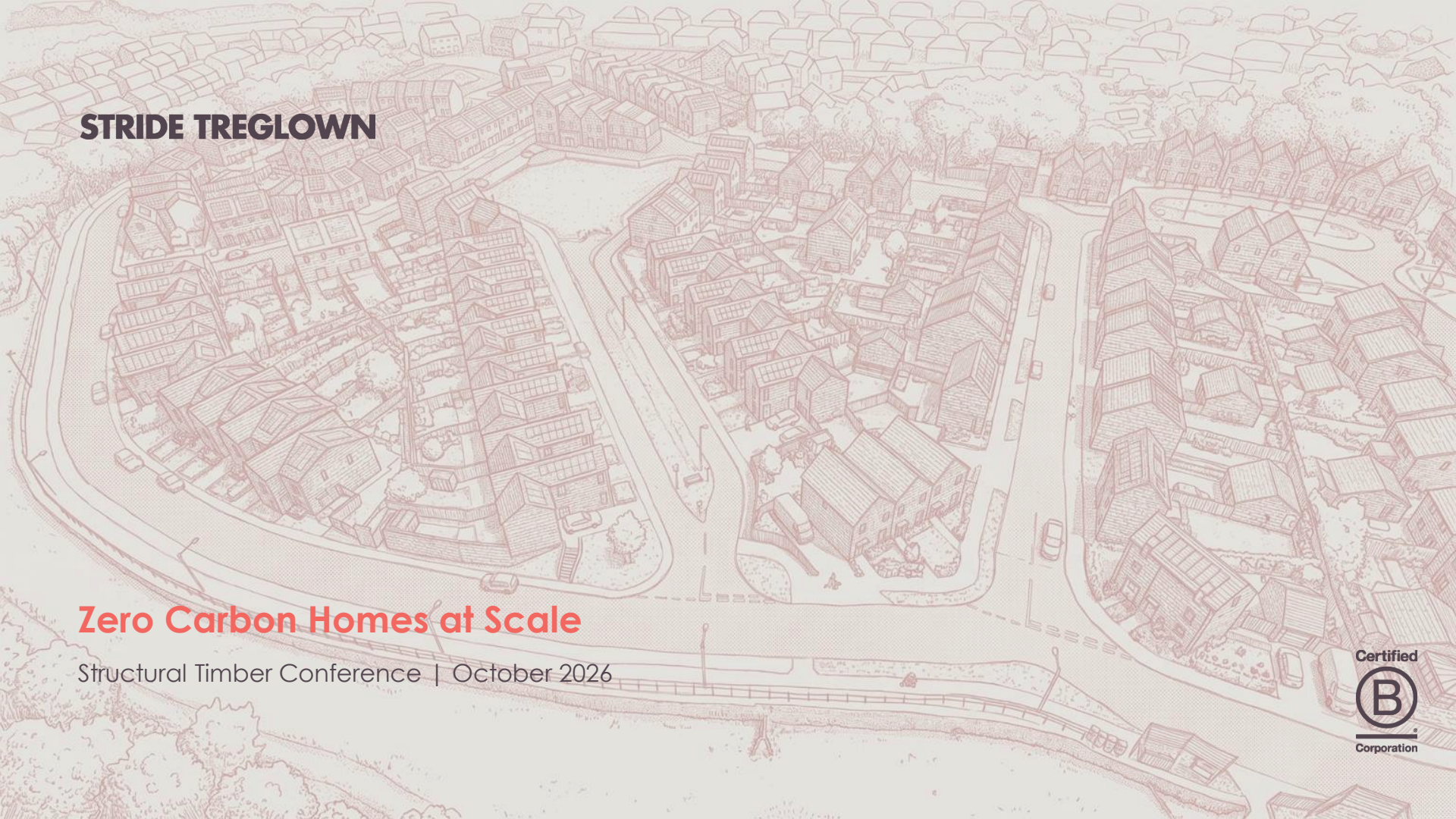
STRIDE TREGLOWN

Zero Carbon Homes at Scale

Structural Timber Conference | October 2026



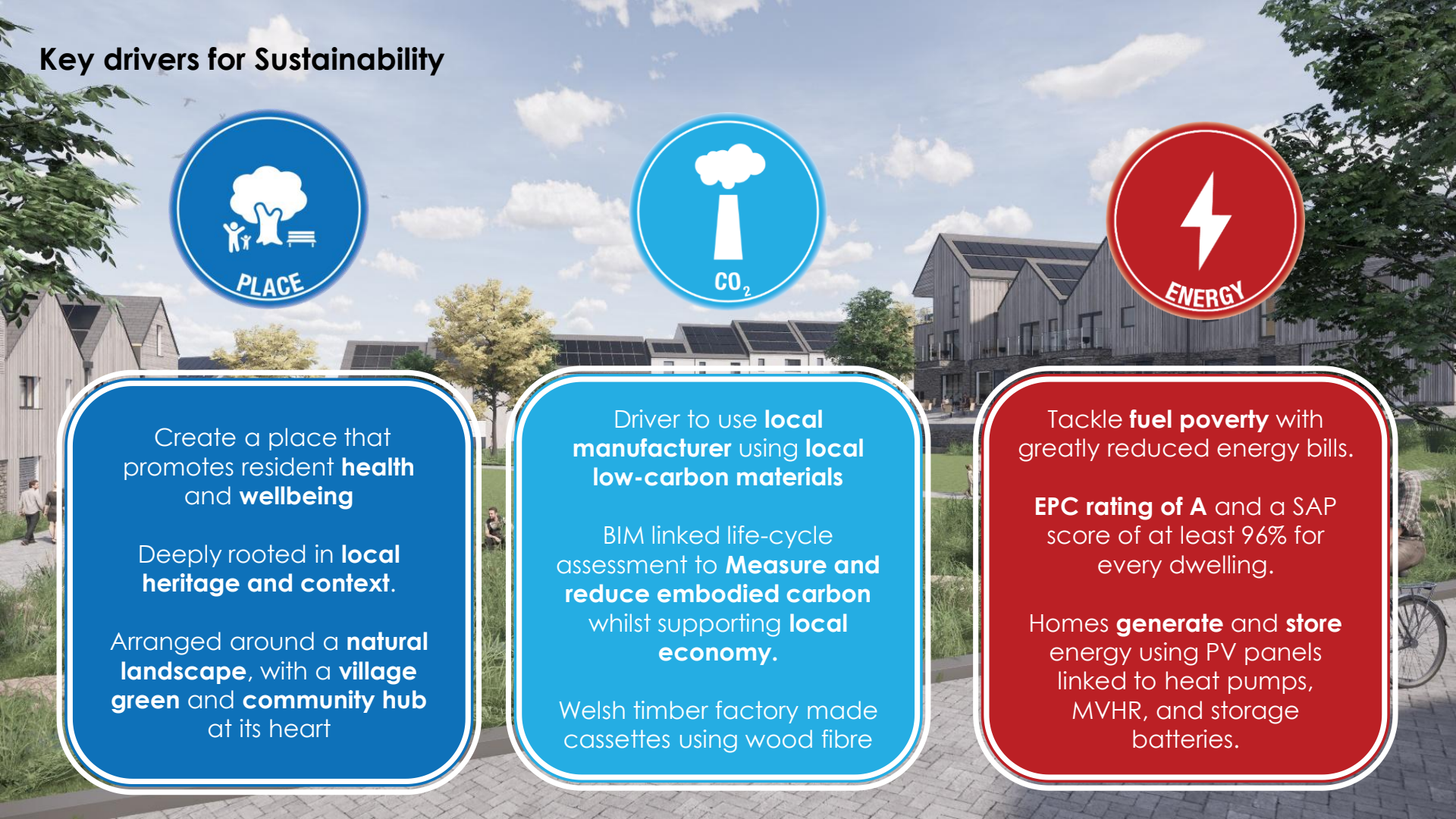
Certified B Corporation



Gwynfaen, Swansea 144 homes for Codi Group

STRIDE TREGLOWN

Key drivers for Sustainability



Create a place that promotes resident **health** and **wellbeing**

Deeply rooted in **local heritage and context**.

Arranged around a **natural landscape**, with a **village green** and **community hub** at its heart

Driver to use **local manufacturer** using **local low-carbon materials**

BIM linked life-cycle assessment to **Measure and reduce embodied carbon** whilst supporting **local economy.**

Welsh timber factory made cassettes using wood fibre

Tackle **fuel poverty** with greatly reduced energy bills.

EPC rating of A and a SAP score of at least 96% for every dwelling.

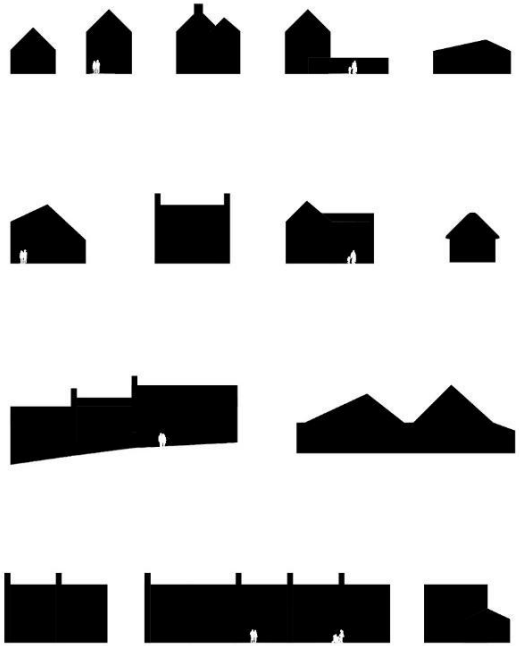
Homes **generate** and **store** energy using PV panels linked to heat pumps, MVHR, and storage batteries.

Place

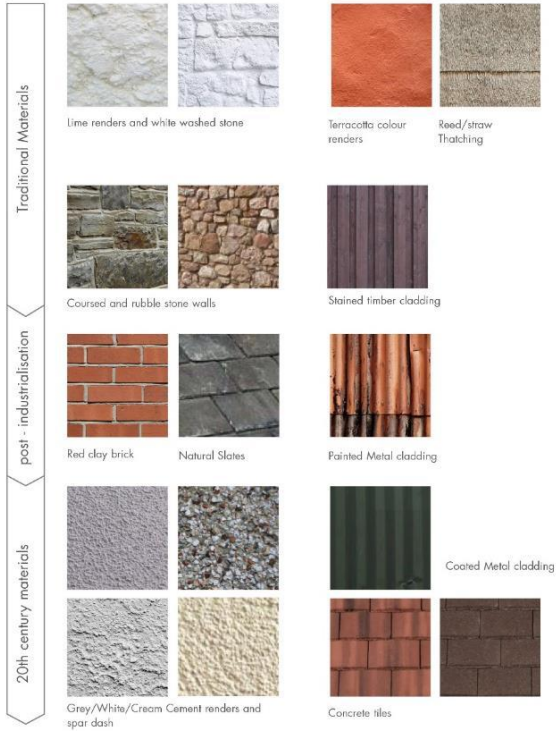


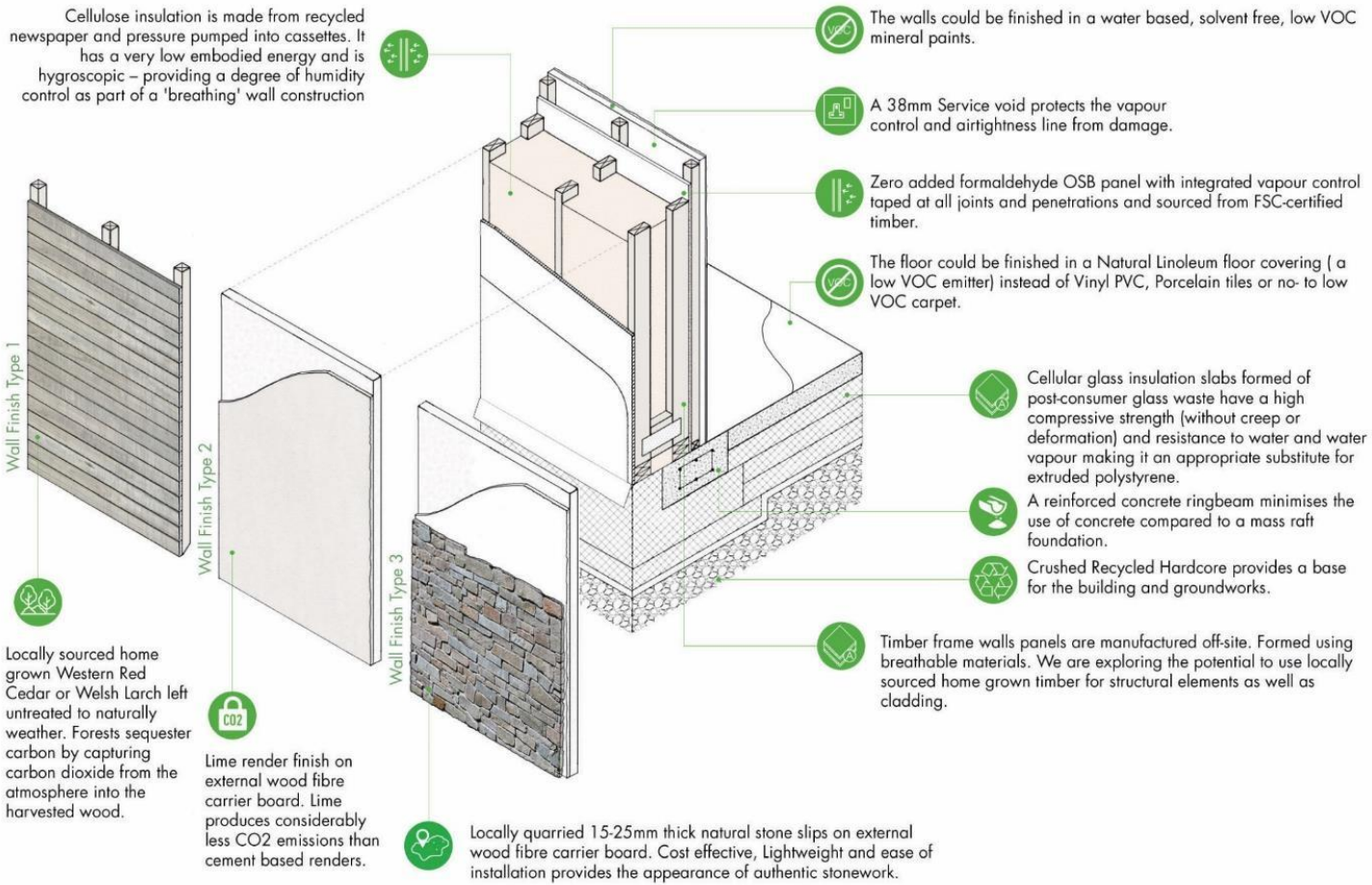
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Vernacular Forms



Vernacular Materials

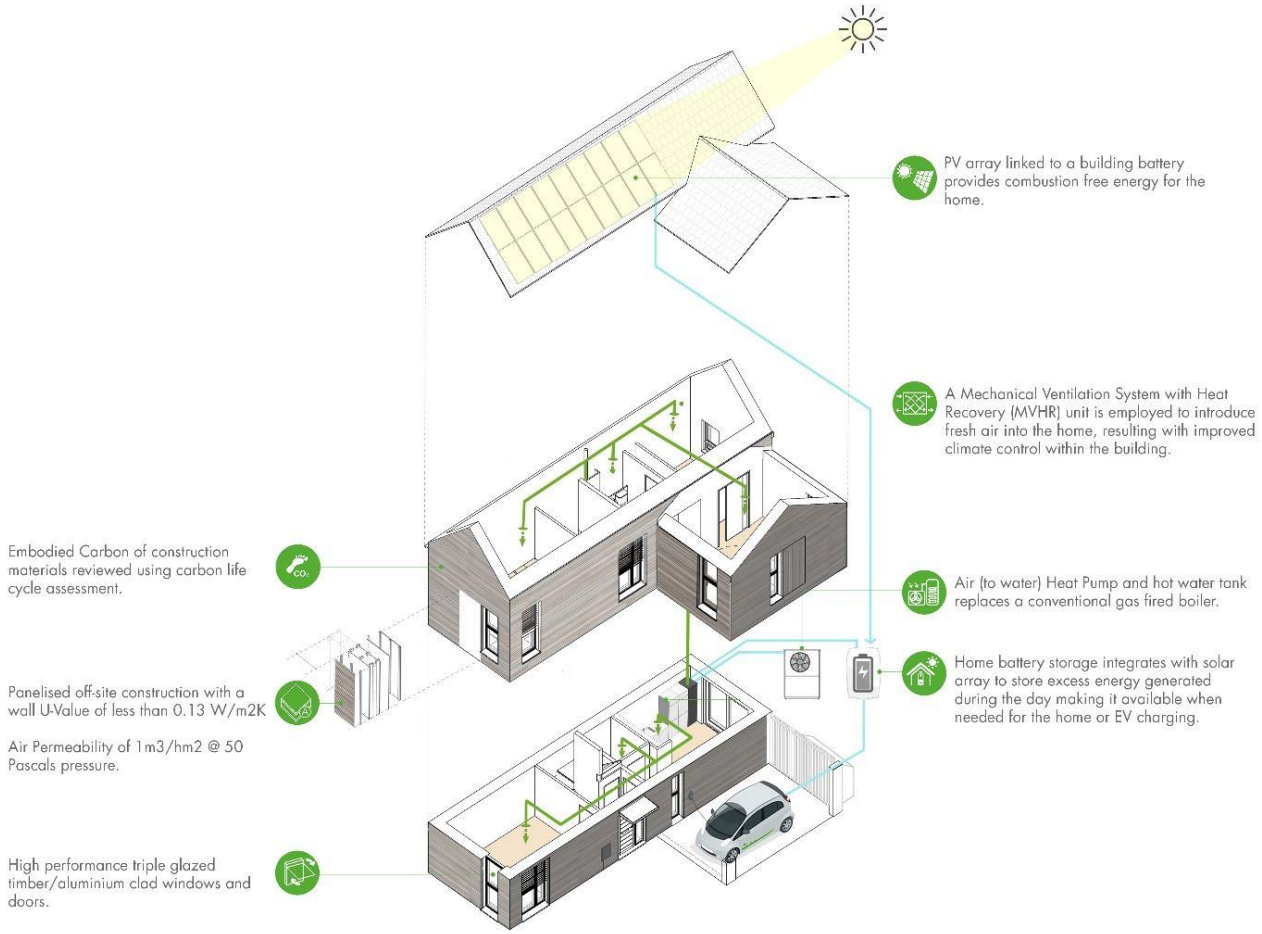



Cellulose insulation is made from recycled newspaper and pressure pumped into cassettes. It has a very low embodied energy and is hygroscopic – providing a degree of humidity control as part of a 'breathing' wall construction
The walls could be finished in a water based, solvent free, low VOC mineral paints.
A 38mm Service void protects the vapour control and airtightness line from damage.
Zero added formaldehyde OSB panel with integrated vapour control taped at all joints and penetrations and sourced from FSC-certified timber.
The floor could be finished in a Natural Linoleum floor covering (a low VOC emitter) instead of Vinyl PVC, Porcelain tiles or no- to low VOC carpet.
Cellular glass insulation slabs formed of post-consumer glass waste have a high compressive strength (without creep or deformation) and resistance to water and water vapour making it an appropriate substitute for extruded polystyrene.
A reinforced concrete ringbeam minimises the use of concrete compared to a mass raft foundation.
Crushed Recycled Hardcore provides a base for the building and groundworks.
Timber frame walls panels are manufactured off-site. Formed using breathable materials. We are exploring the potential to use locally sourced home grown timber for structural elements as well as cladding.
Wall Finish Type 1
Wall Finish Type 2
Wall Finish Type 3
Locally sourced home grown Western Red Cedar or Welsh Larch left untreated to naturally weather. Forests sequester carbon by capturing carbon dioxide from the atmosphere into the harvested wood.
CO2
Lime render finish on external wood fibre carrier board. Lime produces considerably less CO2 emissions than cement based renders.
Locally quarried 15-25mm thick natural stone slips on external wood fibre carrier board. Cost effective, Lightweight and ease of installation provides the appearance of authentic stonework.

All electric low-cost living

Homes as power stations: designed to be as energy-efficient and self-sufficient as they could, starting with triple glazing, insulation and airtightness.

Then adding MHVR, Air source heat pump, a 4kWp PV array and home battery.



Optimised for a panelised approach

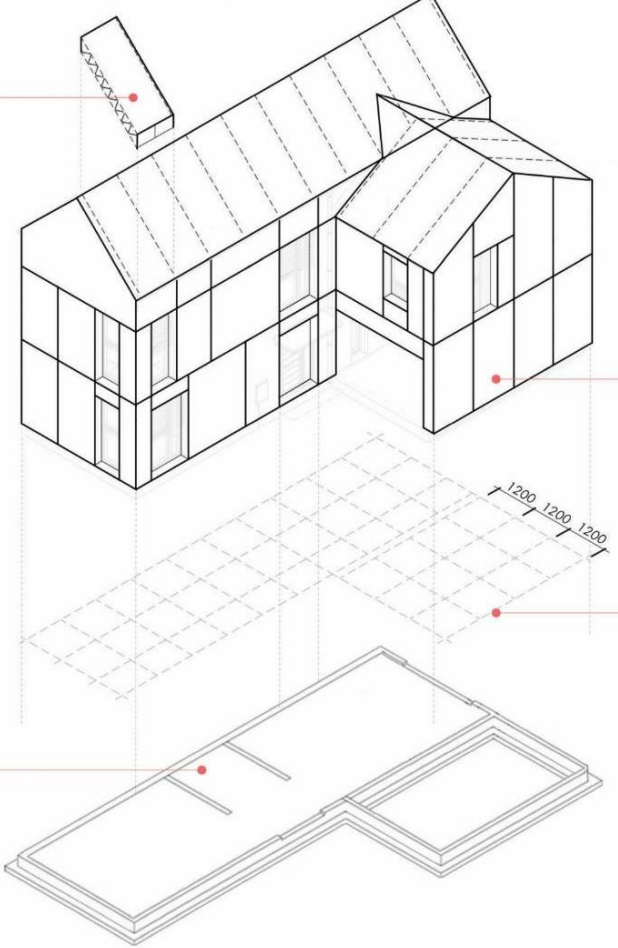
Quality Control:
Insulation and vapor barriers are installed in the factory under strict quality checks.

Construction Speed:
Reduced moisture risk/ weather damage during site erection.

Sustainability:
Potential to minimise material waste.



Roofs formed using offsite prefabricated cassettes or attic trusses for potential 'rooms within a roof' to design in flexibility and support the changing needs of individuals and families at different stages of life.





Highly insulated and airtight offsite prefabricated timber wall panels delivering a U-Value of less than 0.15 W/m2K and Airtightness of 1 or less air changes per hour at 50 Pascals pressure.



Design to reduce the use of concrete by replacing the slab with Recycled Foamed Glass and Natural Hydraulic Lime Screed. Concrete is minimised to a perimeter ring beam.



Design to reduce overall material use through optimizing building dimensions to standard sheet sizes minimising waste.

Early stage engagement with SO modular

Design Optimisation & Value Engineering:
Involving timber specialists at concept stage allowed engineers to refine panel layouts, assess Welsh timber product feasibility, and find cost-saving opportunities in manufacture, delivery, and erection before production began.

> *"The necessary fabric performance, thermal efficiency, and airtightness required serious consideration…*
>
> Warren Rowlands, Head of Production & Technical Efficiency at SO Modular, Neath



Factory fire treatment: fire performance achieved with timber cladding



Roof and Wall cassettes: rapid weatherproofing and minimising prolonged work at height



Weathering details: high-performance, moisture-tight barrier



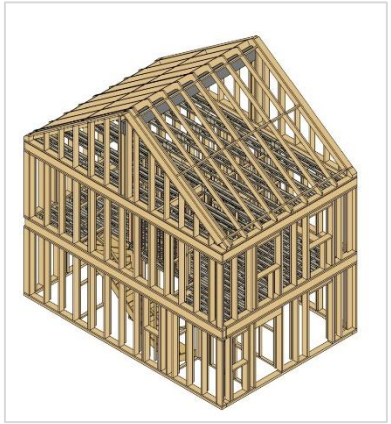
Factory floor mock-ups: precisely replicate intended junctions under safe, controlled conditions.



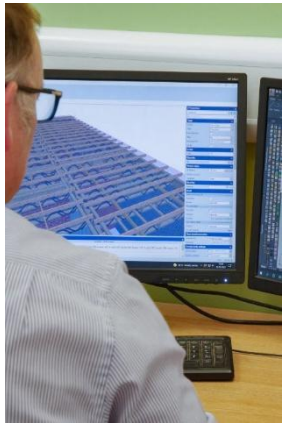
Automated nailing bridge

CAD/BIM data translating it directly into precise mechanical operations

An automated nailing bridge (often referred to as a CNC multifunction bridge or sheathing station) is a specialised computer-controlled machine for fixing timber studs and sheathing boards (like OSB or plywood)



IFC export files to CAM / Exporter Extensions



Co-ordination of frame design

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Blown-in wood fibre pumped into wall and roof panels, provide seamless, high-performance thermal layer

The X-Floc EP800 is an industrial blow-in injection panel designed for the automated, high-precision filling of timber frames with loose insulation materials like wood fibre.







Automated nailing bridge

Key Strategies to Maximise Offsite Timber Framing

Closed Panels: Highly complex, factory-finished panels arrived on-site pre-insulated, with pre-installed windows, doors, and internal air boarding/external weather linings.

Faster build program with frames made watertight within 4 days.





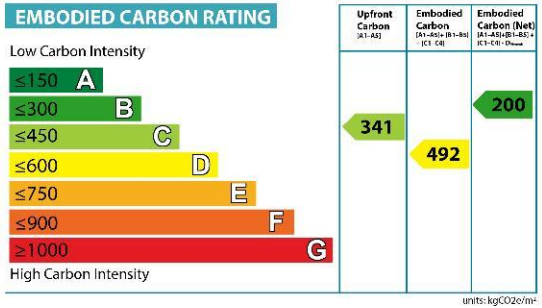




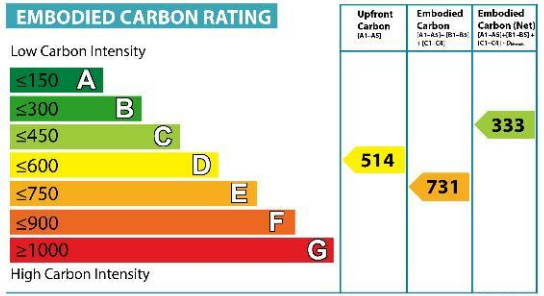


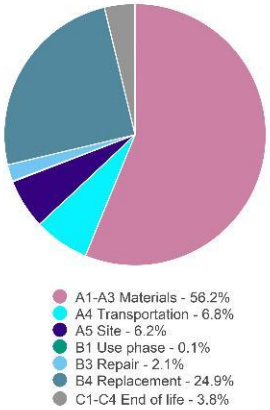










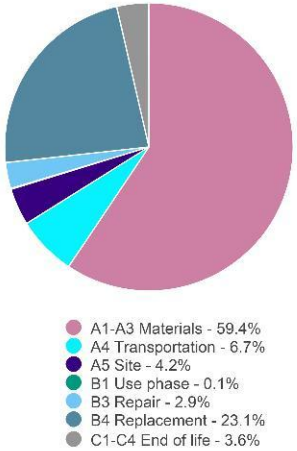


Life Cycle Stage Breakdown

Stage	kg CO2e
A1-A3 Materials	33342
A4 Transportation	4036
A5 Site	3656
B1 Use phase	62
B3 Repair	1216
B4 Replacement	14785
C1-C4 End of life	2231
Total	**59328**

Biogenic carbon storage
35,222 kg CO2e

Embodied Carbon Net
24,106 kg CO2e (24t CO2e)



Life Cycle Stage Breakdown

Stage	kg CO2e
A1-A3 Materials	41035
A4 Transportation	4629
A5 Site	2867
B1 Use phase	62
B3 Repair	2013
B4 Replacement	15982
C1-C4 End of life	2477
Total	**69065**

Biogenic carbon storage
37,559 kg CO2e

Embodied Carbon Net
31,506 kg CO2e (32t CO2e)

Best performer vs Worst performer

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Lessons:

- ☑ **Develop a shared vision, a supportive client is essential**
- ☑ **Form Factor matters** (energy, embodied cardon and cost)
- ☑ **Don't use SAP ratings as targets** (PV can be used to game the system)
- ☑ **Low carbon below dpc is hard**
- ☑ **Larch cladding Mortgage-ability issues - restricted to rented homes**
- ☑ **Traditional truss roof more cost effective**



Prove of concept



UK’s largest home-grown timber development built to set a precedent for future housing projects across Wales.

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TAI ARY CYD

The project House designs Cymraeg

Standardising sustainable, timber-based affordable homes for Wales.

BECOME A PARTNER

FIND OUT MORE



STRIDE TREGLOWN

Tai ar y Cyd (in a nutshell)

25 social landlords have collaborated to create a **pattern book** and **performance specification** for 15 house types

Aim is to achieve a step change in **operational** and **whole life carbon**

Build out their **pipeline** of new zero carbon **affordable** homes

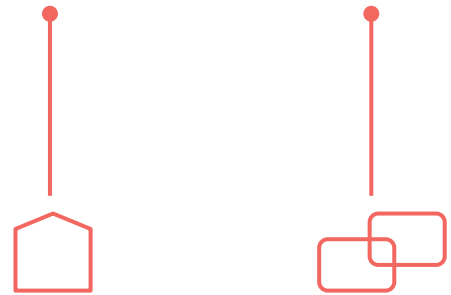
Aggregating pipeline **demand** to unlock a strong, sustainable, and short local supply chains

Build Better homes and, over time, **drive down costs**.

What's in a name?

TAI AR Y CYD

[Ta-Ee-Ah-R-Uh-Keed]



Tai

Homes

ar y Cyd

Together

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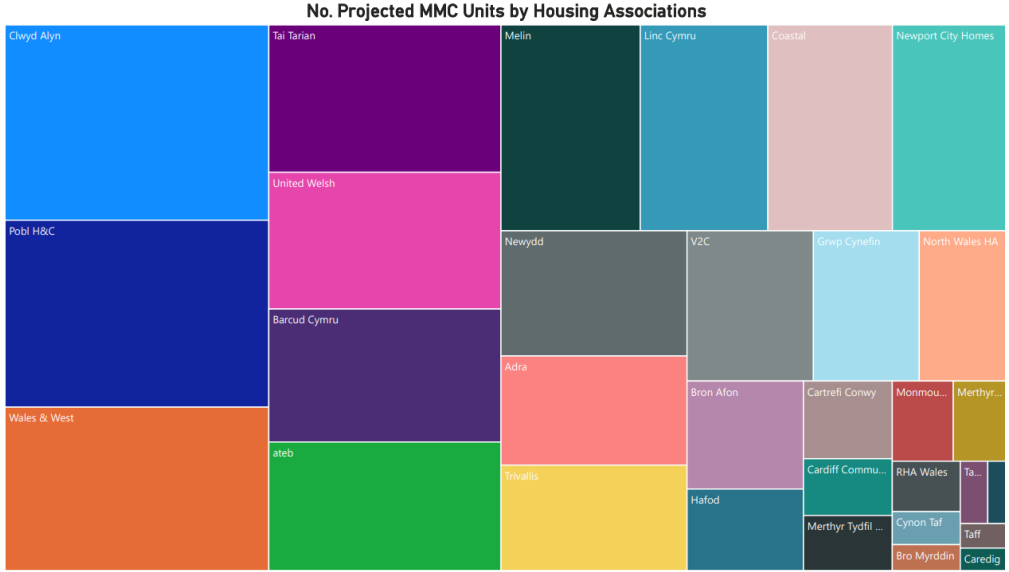
Stakeholders and Participants

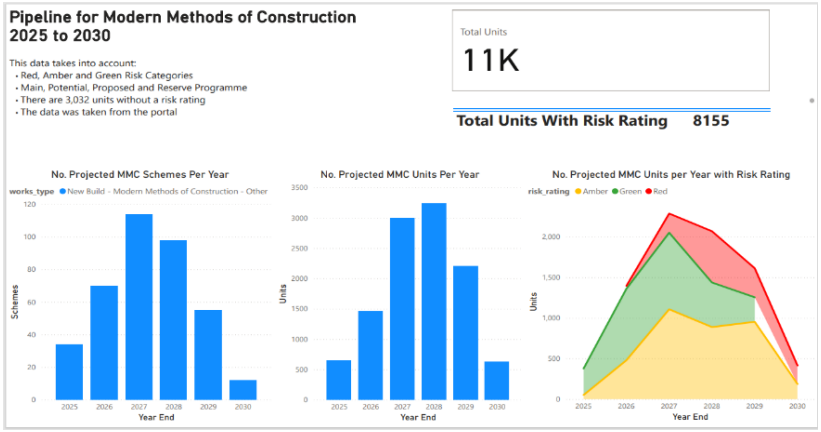


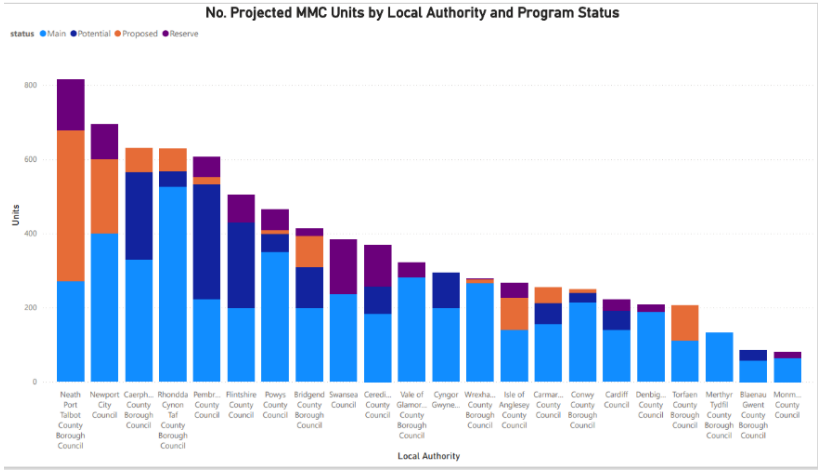
In Collaboration with:

Llywodraeth Cymru
Welsh Government

Aggregation and Pipeline Visibility







STRIDE TREGLOWN

The deliverables

- Pattern book of homes
- Performance Specification
- Design Guide
- Pattern book Details
- Engagement with timber frame manufacturers
- Developed Designs to RIBA 3
- Common Fabric and M&E Design



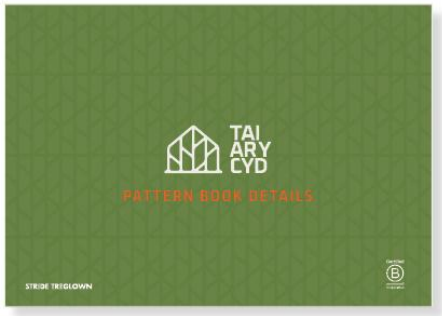
Pattern book of homes



Performance specification



Design guide



Pattern book details

Efficient

- Low energy demand
- Effective and healthy ventilation using heat recovery
- Future-proofed homes

Robust

- A robust airtight layer
- High quality where it matters - reduce need for replacements.
- Standardised panelised construction made in factory.

Climate responsible

- Fossil fuel free heating and hot water using heat pump technology
- Photovoltaic panels (PV) to reduce the reliance on the grid and save money on bills

Affordable

- Fossil fuel free heating and hot water using heat pump technology
- Photovoltaic panels (PV) to reduce the reliance on the grid and save money on bills

Healthy

- Fossil fuel free heating and hot water using heat pump technology
- Photovoltaic panels (PV) to reduce the reliance on the grid and save money on bills

Low Impact

- Fossil fuel free heating and hot water using heat pump technology
- Photovoltaic panels (PV) to reduce the reliance on the grid and save money on bills

Tai ar y Cyd Baseline Standard

Space heating demand
<40
kWh/m²/year
(Baseline backstop limit)

Energy Use Intensity (EUI)
<75 kWh/m²/yr
(Baseline Backstop limit)

Embodied Carbon
<800 kgCO e/m ²
(Baseline Backstop limit)

Tai ar y Cyd Enhanced Standard

Space heating demand
<15
kWh/m²/year*
(Enhanced Aspirational target)

Energy Use Intensity (EUI)
<35 kWh/m²/yr
(Aspirational target)

Embodied Carbon
<625 $kgCO_2e/m^2$
(Aspirational target)

Baseline Performance: Tai ar y Cyd aligns with AECB Carbon Lite standards.

Enhanced Standard: Passivhaus Classic targets further reductions in space heating demand.

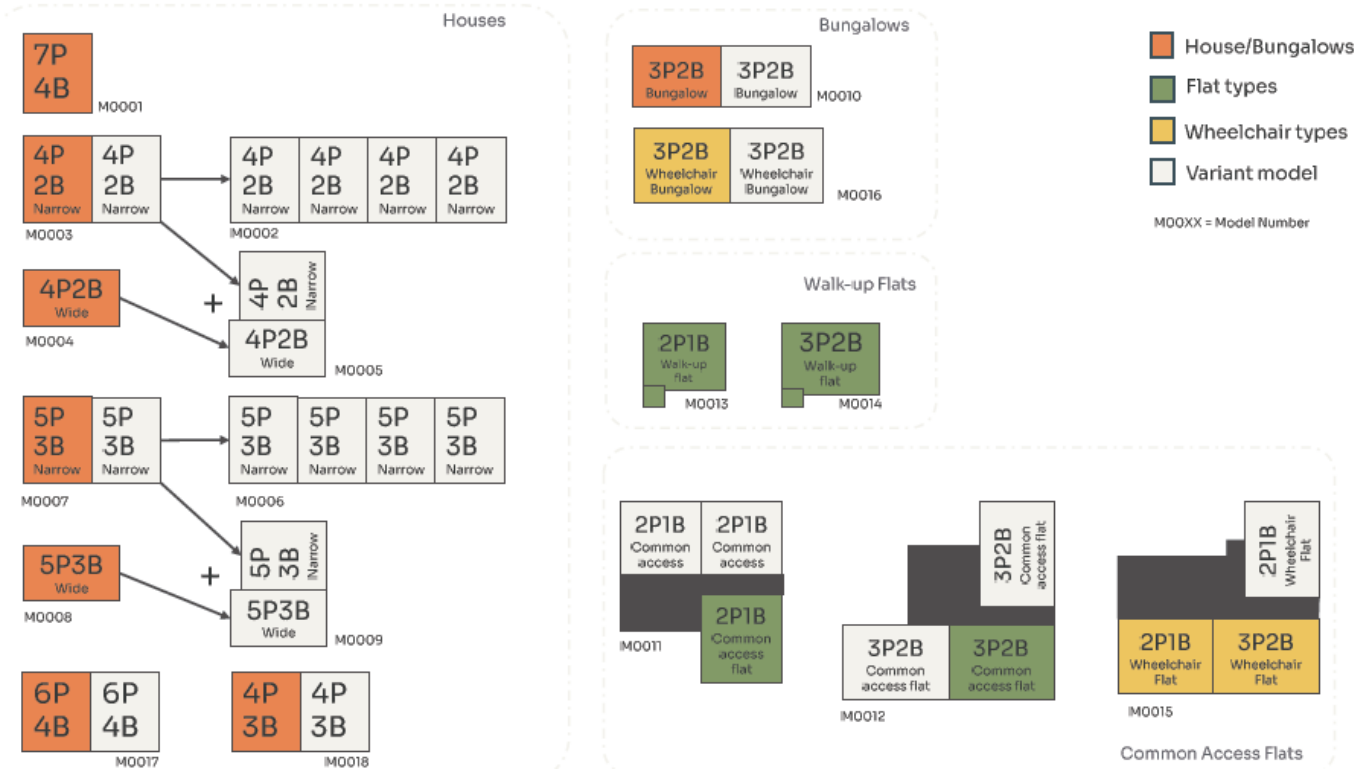
Pragmatic Approach: Recognizes challenges with form factor, orientation, overshadowing, and elevation constraints.

Alternative Standards: PHI Low Energy suits buildings unable to meet Passive House criteria.

AECB Carbon Lite

Certified Passive House
Passive House Institute

Pattern book House Types
95% coverage of typical affordable homes



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Form Factor

Heat Loss Area is the total surface area of the thermal envelope. This is the sum total of all the areas of insulated and airtight floors, walls, soffits and ceilings or roofs. It is measured at the outside face of the thermal envelope.

Treated Floor Area is the floor area of the rooms within the building that are heated.

Form Factor = ~~Heat Loss Area~~

Treated Floor Area

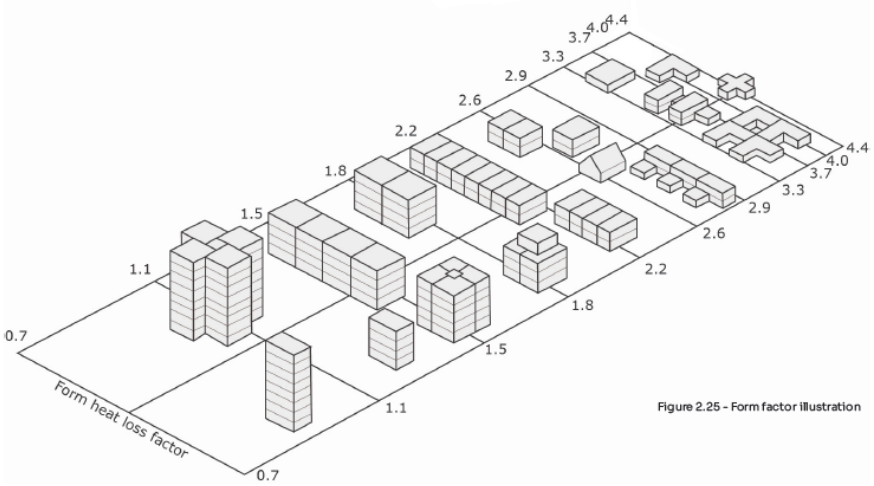
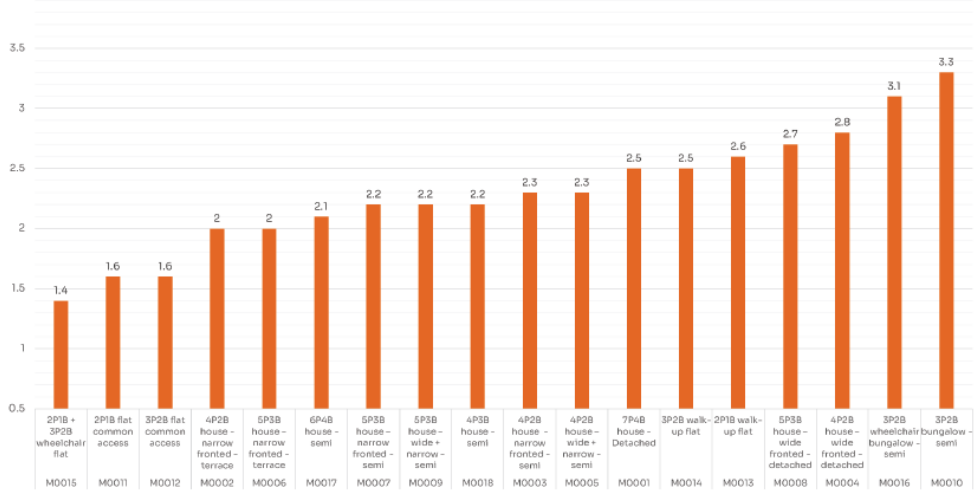


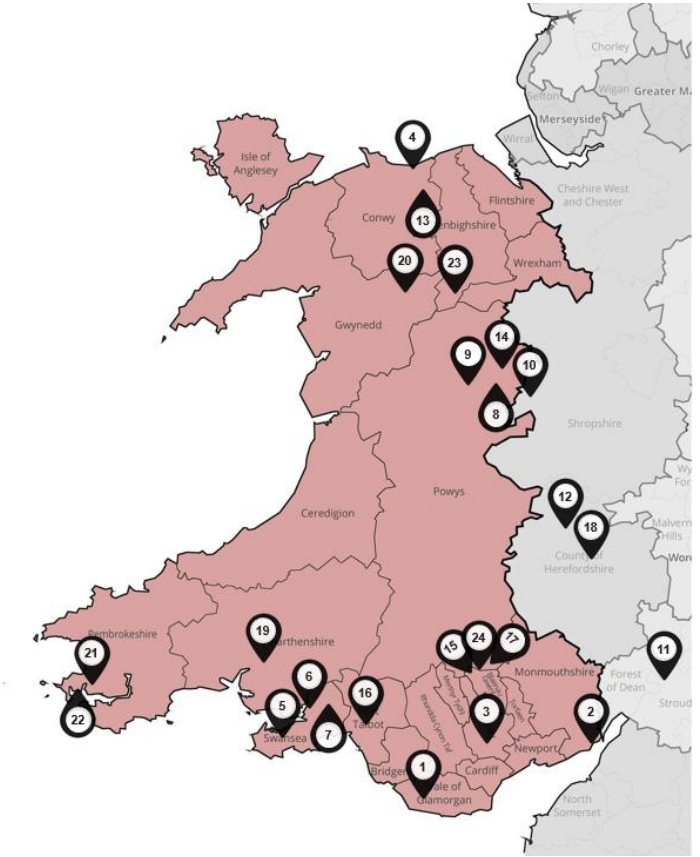
Figure 2.25 - Form factor illustration



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Supply Chain Engagement

Mapping of existing timber frame manufacturing sites has been undertaken to establish the potential supply chain locations that could serve construction of the Tai ar y Cyd Pattern Book homes.



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Developed in Collaboration



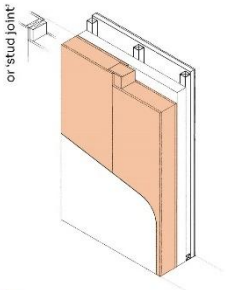








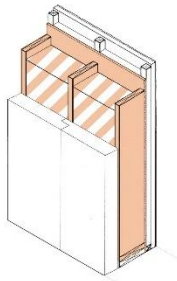
MMC Category 2: 2D Panelised



Structural Insulated Panel (SIP)

Panels are manufactured off-site and formed of two layers of OSB sheets bonded using polyisocyanurate (PIR) insulated foam or auto adhered using rigid Polyurethane (PUR) boards. The panels are jointed either using a mini-SIP spline piece (shown) or more conventional timber studs. Additional insulation is added on site to achieve enhanced U-Values.

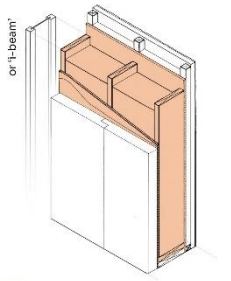
- PIR/PUR insulations will outperform mineral or natural insulation material resulting in thinner wall thicknesses for the same u-value.
- Airtightness generally easier to achieve using SIPs
- Insulation derived from petrochemicals causing resource depletion. Very high embodied carbon product.
- Non-breathable material with higer risk of interstitial condensation



Open Panel Timber Frame

Open Timber frame panels are manufactured off-site with sheathing and breatther membrane prefitted but left open backed with insulation and airtightness layers added onsite. Sometimes the insulation (typically PIR/PUR) is friction fitted at the factory. Additional insulation is added on site to achieve enhanced U-Values either internally or externally to the panel.

- Timber is a low embodied energy material and stores carbon from the atmosphere compared to SIPs.
- Open panels can allow greater flexibility and choice of insulation material although PIR/PUR foam is typically used for low u-values (not permitted for Tai ar y Cyd).
- A greater degree of care is required onsite to achieve airtightness.
- Thicker studs or Multiple insulation layers will need to be fitted on site for higher u-value performance.



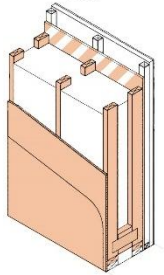
Closed Panel Timber Frame

Closed Timber frame panels are manufactured off-site using solid timber studs or I-beams with insulation, sheathing and internal boards all pre-fitted forming a closed cassette. Sometimes windows and doors can be pre-fitted in factory. Additional insulation is added on site to achieve enhanced U-Values either internally or externally to the panel.

- Increasing the level of off-site can enable better quality assurance. Over open panel types.
- Airtightness generally easier to achieve using closed panels over open panels.
- The closed panel manufacturing process requires investment in set-up/machinery over more typical open panel systems.
- Thicker studs or Multiple insulation layers will need to be fitted on site for higher u-value performance unless using solid stud alternatives such as I- beams

Can be used for Tai ar y Cyd projects

denotes off-site element. Hatching denotes occasionally factory fitted



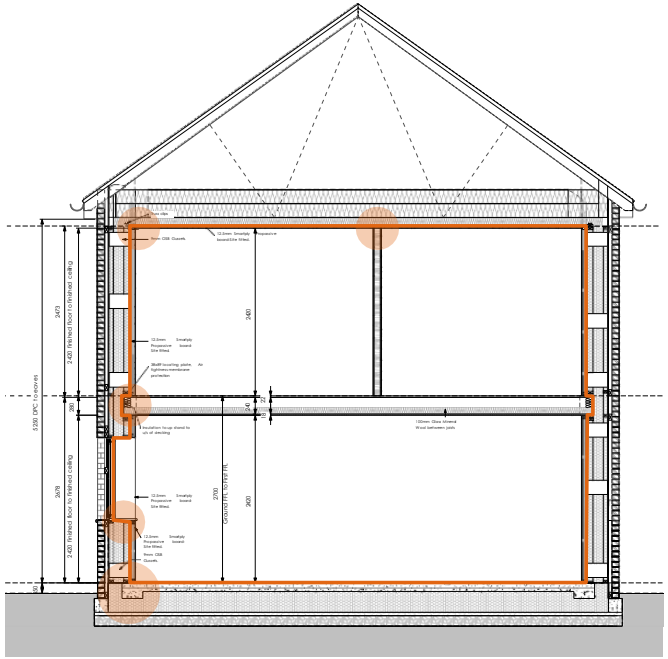
Twin Stud / Larsen truss

Twin stud panels are manufactured off-site. The inner and outer studs can be placed at varying distances apart using OSB/ply gussets or timber blocking according to the thermal performance required. Panels can be delivered open backed or closed with internal airtightness board prefitted. This typically allows for the use of low carbon insulation such as cellulose or wood fibre in a continuous deep zone which tends to be site installed.

- Continuity of insulation is achieved without additional layers added onsite enabling thermal bridge free construction.
- Enables use of hygroscopic insulants – providing a degree of humidity control as part of a 'breathing' wall construction.
- Wider cavity allows for the use of very low embodied carbon or recycled insulants.
- Currently a niche form of construction and local supply can be more limited.

De-risking airtightness

- Tai ar y Cyd has a formal air barrier strategy.
- Keep designs simple and consistent.
- Employ a robust airtight board strategy with tape joints. This is a critical element do not allow substitution on site.
- Require sensible site management processes in place, appoint or nominate an airtightness champion for projects.
- Require the undertaking of leakage tests whilst the air barrier is still accessible.
- Take extra care around service penetrations and door thresholds.







Use solutions for service penetrations designed for purpose of airtight sealing.



Robust panel solution– which reduces susceptibility to damage on site



robust airtight tape for creating airtight seals.

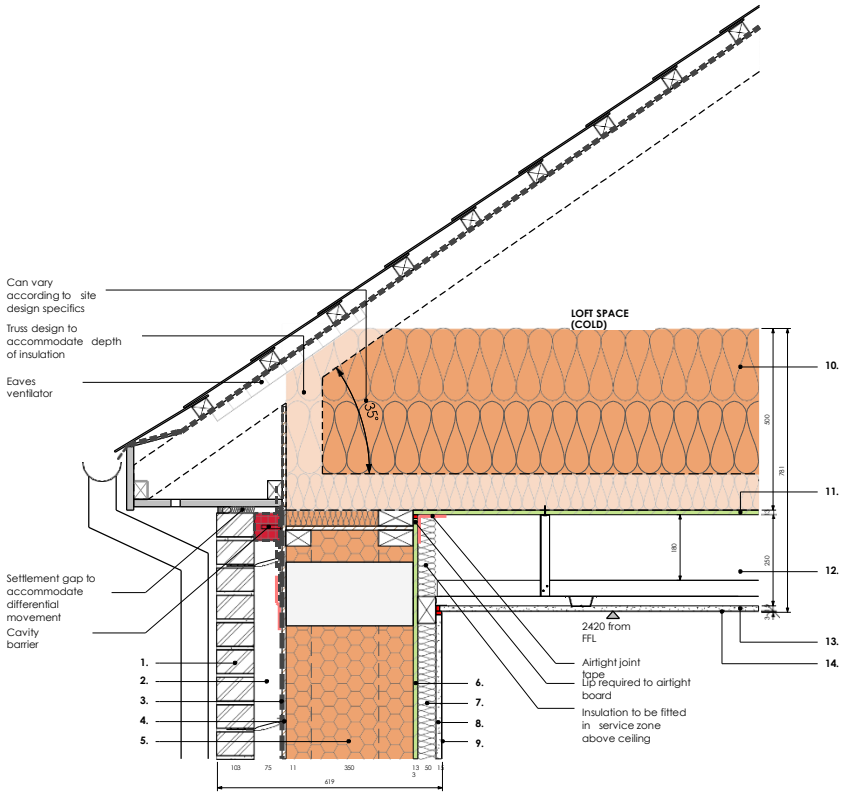


Airtight OSB jointed to primed screed / concrete slab using 100mm wide split backing airtightness tape.

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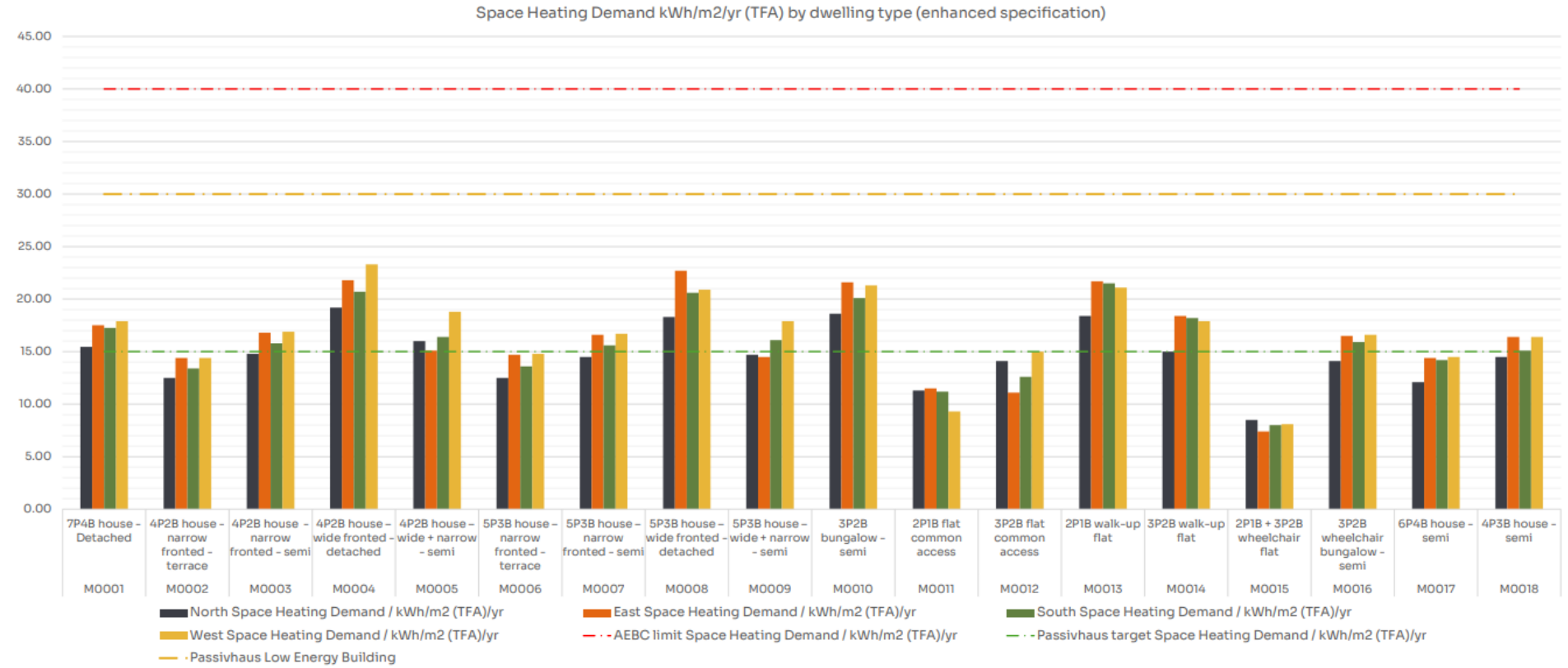
The details are critical

- Timber trussed rafters are very familiar to the construction industry and are inexpensive and fast to erect.
- To create a ‘thermal bridge free’ junction, a raised heel truss allows for the continuity of insulation between the roof void and wall.
- Airtightness is dealt with at ceiling level with airtight board.

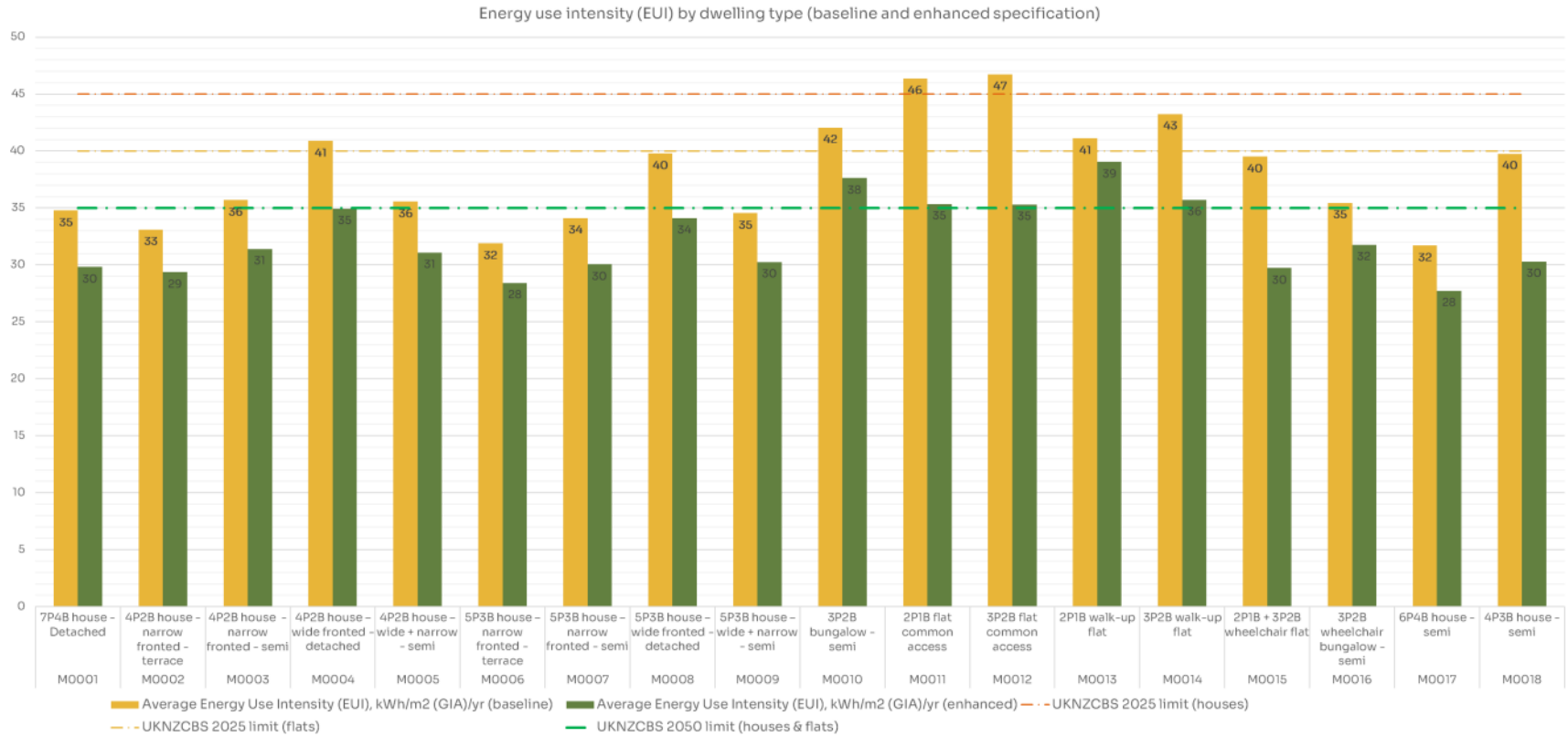


STRIDE TREGLOWN

PHPP performance modelling
Space heating demand (enhanced specification)



PHPP performance modelling
Energy Use Intensity (EUI)



Performance modelling

Whole Life Embodied carbon



STRIDE TREGLOWN



10 sites, 450 homes Prototyping – Use the pattern book – **feedback loops**

Procurement - Shift from project to aggregated **portfolio approaches**

People – Lived experience workstream – post occupancy framework

Fire testing of panels working with the Structural Timber Association (STA) and members

Evaluating the need for additional house types

Working with Warranty and insurance providers

stridetreglown.com

linkedin.com/company/stride-treglown

instagram.com/stridetreglown