

SELFBUILD ON A SHOESTRING THE 50K HOUSE IDEAS COMPETITION

THE WORLD'S FIRST PRETENSIONED FLAT-PACK MODULAR BUILDING SYSTEM

Flat-pack *ecobuild* house

Scheme description

This contemporary style house can be clad using a variety of various cladding materials to respond to the local vernacular.

The main floor plans respond to the competition brief requirements, and the additional floor plans illustrate expansion of the house as the family size increases from a two bed, to a three bed and finally to four bed, maximising full use of the site.

The building system is highly flexible with regard to opening sizes and orientations, and the house has been designed with generous glazing, affording natural light and views out to both the front and rear.

The upper storey is articulated in dark rainscreen cladding panels (these can be interchanges with a variety of finishes - timber, brick slips, etc.).

The front garden has refuse storage and lockable bicycle storage. The entrance porch is formed by the cantilevered projection of the upper floor.

Internally the open plan dual-aspect ground floor space provides natural light from both front and rear, as well as light from above from the stairwell.

Doors to the rear open out to a patio area and the rear garden.

Construction Innovation

Building construction methods have varied little since Roman times and are based on gravity structures. With this in mind, this Versatile Building System was conceived using applied engineering, design experience and mass production manufacturing techniques. Intuitively it would be reasonable to expect that in the 21st century new homes will be assembled on site from a set of precision made components.

The same manufactured cassettes elements are used for floors, walls, ceilings and roof, which is unique, leading to mass customisation.

The cassettes are a combination of monocoque construction combined with a frame that enhances the structural integrity. This produces a structure that optimises the benefits of both types of construction: it is extremely strong and lightweight in which the cassettes can be handled.

This modular construction system enables the construction of any size, shape or architectural style of building using just one simple hand tool. The same hand tool is used to assemble the stairs, windows and door cassettes. With this unique modular patented system, all elements and fittings for one house are transported to site flat packed on only two lorries.

It is the world's only pre-tensioned three-dimensional interlocking building system and has the lowest carbon footprint within the construction industry.

- 1: Front elevation
- 2: Rear elevation
- 3: Internal view from living room
- 4: Internal view towards kitchen

1	2
3	4



Plans / elevations / section (1:100)

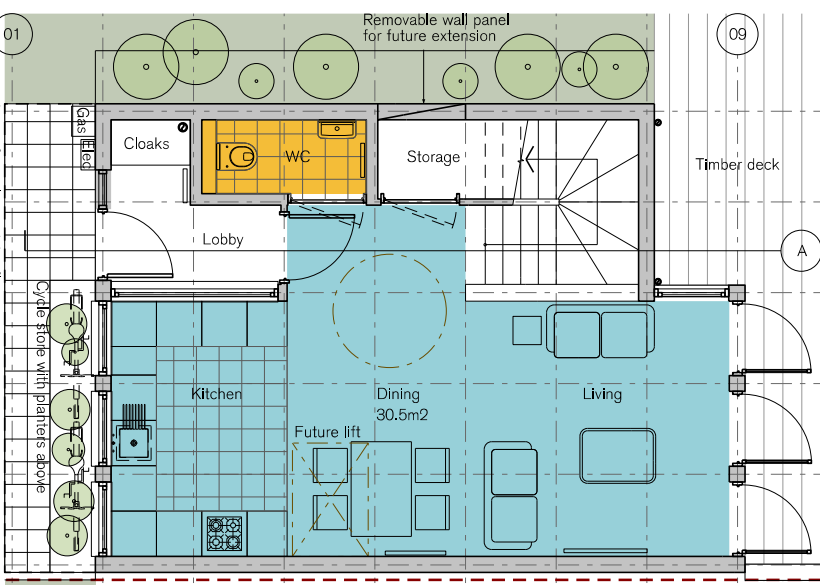
The building system is based on the 1200mm grid module (from which this house is developed), and can also work in 600mm and 300mm modules, making it highly flexible.

With clear spans of up to 7m using standard components, making possible the open plan ground floor plan without the need for any additional structural elements.

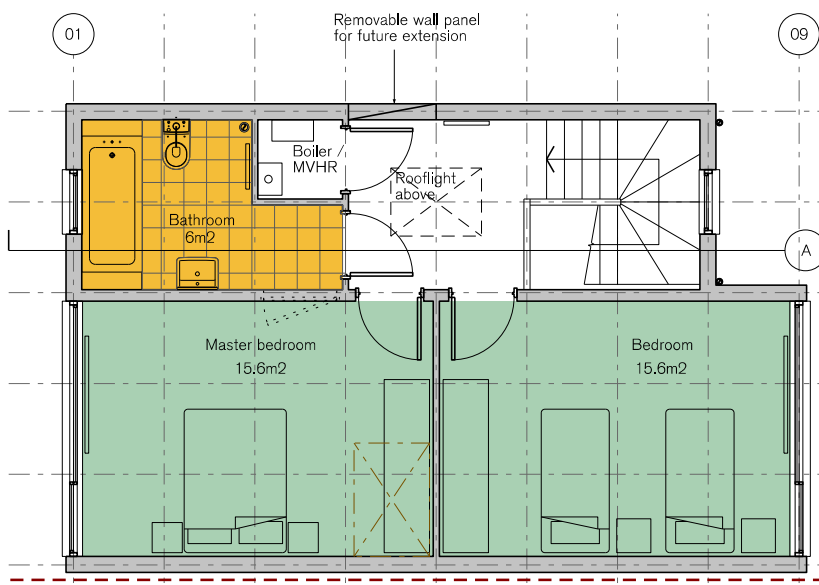
With generous floor to ceiling height of 2600mm.

Rooms sizes are generous and allow for a variety of configurations. The total house area is 95m² which is achieved by adopting the grid module and exceeds the competition minimum floor area of 80m² by 18%.

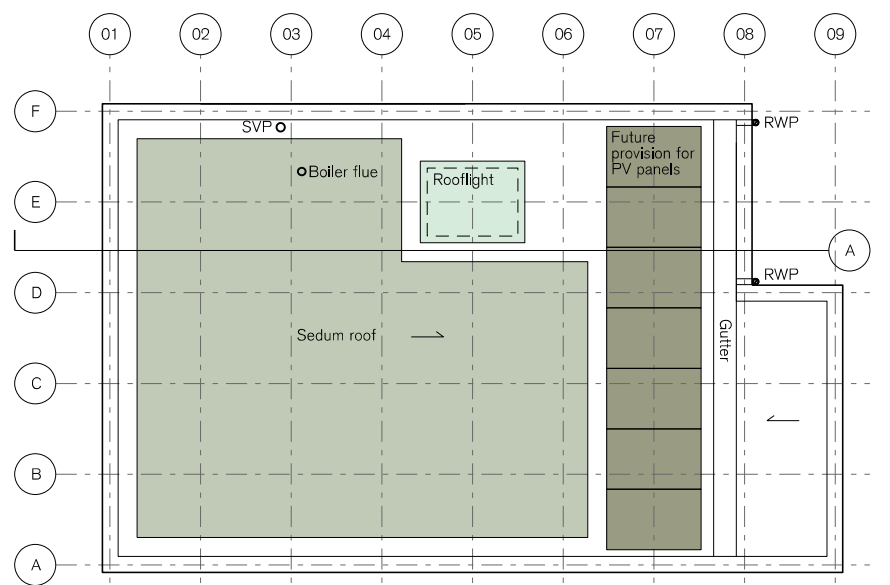
The design is fully compliant with Lifetime Homes requirements.



Ground floor plan 44m² (Total: 95m²)



First floor plan 51m²



Roof plan

Building System

From the finish foundation slab the complete building fabric (three-layer external fabric system) can be erected and made watertight within five days.

The installation of Plug & Play services for the electrical, plumbing and heating are integrated within the inner panels.

A further five weeks is required to fully complete the building before handover.

Benefits

One simple hand tool required to assemble the building. Quick and easy to assemble.

As a pretensioned building, the use of lintels has been eliminated.

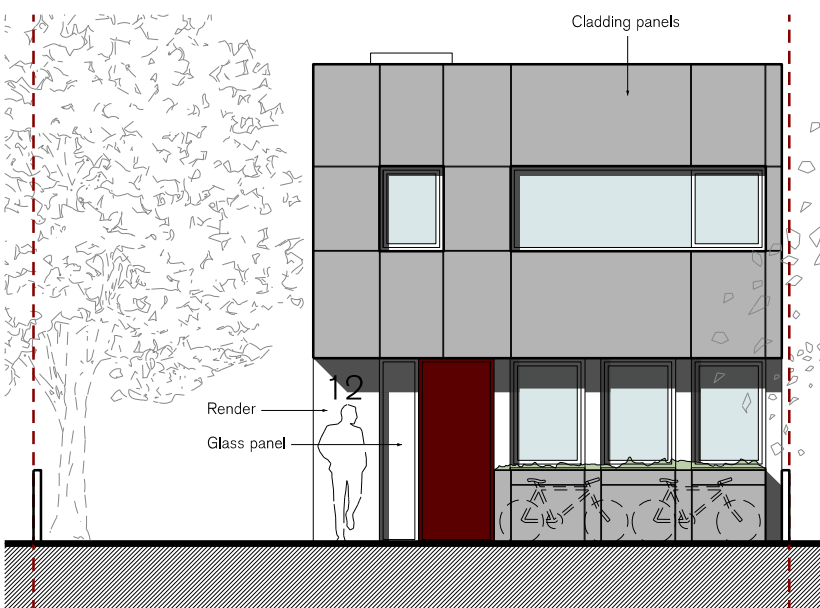
No special lifting equipment required. Due to the building light weight only a simple foundation is required.

A variety of external cladding finishes can be used to meet local vernacular styles.

Each home can be easily extended at any time to meet the requirements of a growing family.

Easy to adapt and retrofit when new materials and technologies become available in the future.

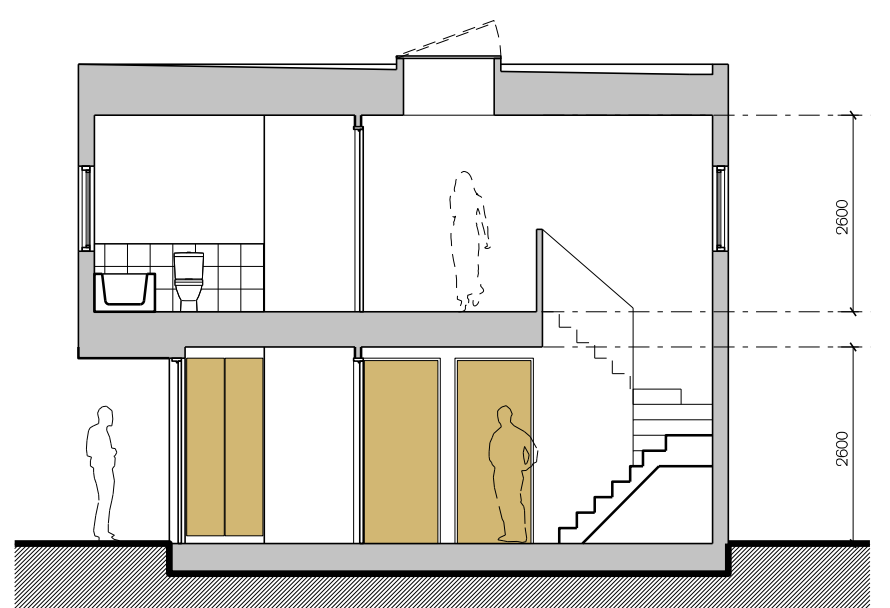
All cassette elements are fully demountable and can be reused and reconfigured to form other types of buildings.



Front elevation



Rear elevation



Section A

Technical

The build-up of the external fabric consists of three layers, internal cladding cassettes and exterior cladding cassettes, both are clamped to the superstructure.

The system is based on a fabric first solution (Build Right, Ventilate Right), the tolerance of each manufactured cassette is within +/- 0.5mm. A sealed airtight structure is achieved by sandwiching a neoprene gasket between each cassette junction: the air leakage within the system is expected to be below 3m³/hr/m² @ 50Pa.

Also with no air voids within the fabric, the risk of condensation is greatly reduced, or even eliminated.

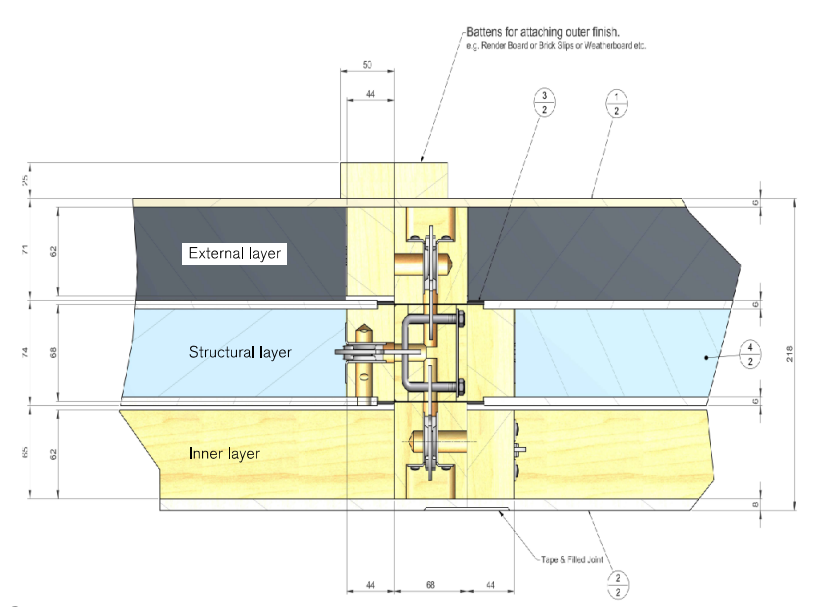
The external fabric meets the minimum CSH 4 requirements, Codes 5 & 6 can also be achieved, and Passivhaus requirements can also be met with an additional external layer.

A condensing combination boiler and MVHR system have been provided.

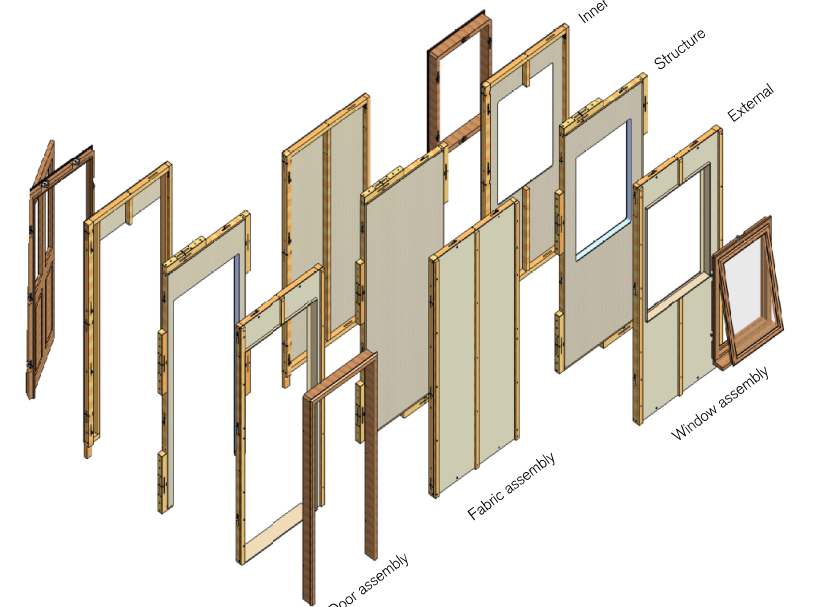
Provision has also been made for photovoltaic panels to be added at any stage, orientated south facing.

- 1: Panel elements being assembled in the factory
- 2: Only two lorry loads required for the complete house
- 3: This is the only tool required to assemble the whole house
- 4: House being assembled using the tool

1	2
3	4



Section through the three-layer external fabric



Exploded panels



Ecology

Ecological diversity will be encouraged with the planting of new trees and hedgerows to the site perimeter, encouraging a habitat for wildlife.

Provision to the roof structure has been made for the laying of a sedum green roof in the future.

Soft landscaping of shrubs to the front garden, flower beds and vegetable patch to the rear garden.

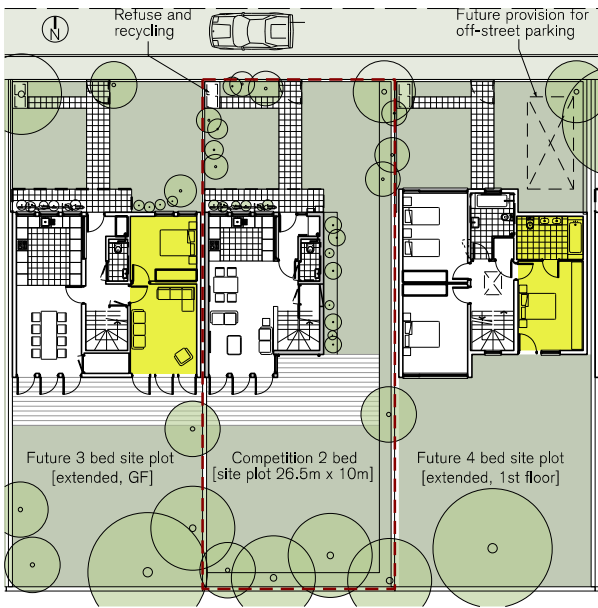
Rainwater harvesting can be incorporated for the storage of rainwater runoff and bathroom grey water; this is reused for flushing WCs and watering the garden.

Surface water will be allowed to soak away through permeable surfaces.

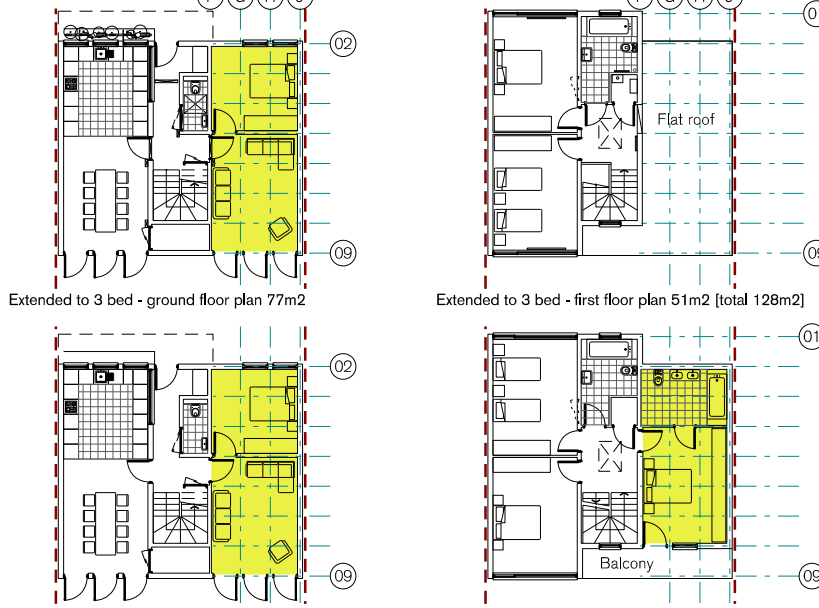
The building can be clad using a variety of finishes:

- 1: Render
- 2: Timber
- 3: Metal sheet
- 4: Brickwork

1	2
3	4



Plot plan showing future extended options on adjacent plots



Extended floor plans



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Works Package	Construction Element	Materials	Labour	Total
Works Package 1	Set up, Clearance, Demolitions....	£ -	£ -	£ -
Works Package 2	Foundations (up to DPC)	£1,830.00	£ -	£ 1,830.00
Works Package 3	Ground Floor Slab or Suspended Floor	£2,384.00	£ -	£ 2,384.00
Works Package 4	Drainage & Service Trenchwork	£610.00	£ -	£ 610.00
Works Package 5	Specialist Building System (eg timber frame, SIPs, etc if applicable)	£19,111.00	£ -	£ 19,111.00
Works Package 6	External & Internal Walls	£ -	£ -	£ -
Works Package 7	Intermediate Floor Zone (if applicable)	£5,490.00	£ -	£ 5,490.00
Works Package 8	Fireplace & Chimney (if applicable)	£ -	£ -	£ -
Works Package 9	Roof Structure, Insulation & Covering	£4,270.00	£ -	£ 4,270.00
Works Package 10	Joinery (Windows, doors, stairs, skirtings...)	£5,730.00	£ -	£ 5,730.00
Works Package 11	Specialist Products (eg; Eco products...)	£2,560.00	£ -	£ 2,560.00
Works Package 12	Electrical Installation	£1,525.00	£ -	£ 1,525.00
Works Package 13	Plumbing Installation	£915.00	£ -	£ 915.00
Works Package 14	Heating Installation	£2,005.00	£ -	£ 2,005.00
Works Package 15	Plastering (or dry-lining)	£183.00	£ -	£ 183.00
Works Package 16	Kitchen and Utility Units (+ appliances)	£1,830.00	£ -	£ 1,830.00
Works Package 17	Decorations & Wall Ceramics	£735.00	£ -	£ 735.00
Works Package 18	Floor Finishes	£790.00	£ -	£ 790.00
	TOTAL	£ 49,968.00	£ -	£ 49,968.00

Works Package 1	Set up, Clearance, Demolitions....	Not included
Works Package 2	Foundations (up to DPC) Materials for a simple strip foundation 45m2	£1,830.00
Works Package 3	Ground Floor Slab or Suspended Floor	£2,384.00
	Floor beams 9No	£366.00
	Ground floor panels 19No	£2,018.00
	Allowances for the supply of the offsite elements	
Works Package 4	Drainage & Service Trenchwork Materials for drainage and connections	£610.00
Works Package 5	Specialist Building System (eg timber frame, SIPs, etc if applicable) Allowances for the supply of the offsite elements	
	Panel Elements:	£19,111.00
	73 structural	£8,906.00 @ £122.00
	50 external	£4,575.00 @ £91.50
	71 internal	£5,630.00 @ £79.30
Works Package 6	External & Internal Walls	not required

Works Package 7 Intermediate Floor Zone (if applicable) £5,490.00
 Allowances for the supply of the offsite elements

Floor beams 9No	£854.00	@ £95.00
Floor panels 19No	£2,318.00	@ £122.00
Ceiling panels 19No	£2,318.00	@ £122.00

Works Package 8 Fireplace & Chimney (if applicable) not required

Works Package 9 Roof Structure, Insulation & Covering (51m2) £4,270.00
 Allowances for the supply of the offsite elements

Roof panels 19No	£2,318.00	@ £122.00
Roof beams 9No	£824.00	@ £91.00
Tapered insulation	£274.00	
WBP Plywood for the flat roof	£274.00	
One piece flat roof solutions EPDM, Materials	£365.00	
Roof light and assessors	£215.00	

Works Package 10 Joinery (Windows, doors, stairs, skirtings...) £5,730.00

7No Windows
 1No Entrance door with side glazing
 5No External doors
 8No Internal doors

Staircase	£750.00
Skirting material	£350.00

Works Package 11 Specialist Products (eg; Eco products...) £2,560.00

External cladding 35m2	£1,616.00
Fixings	£274.00
External render 20m2	£670.00

Works Package 12 Electrical Installation £1,525.00

The supply of looms and fittings including light switches and sockets for the plug and play system is £1,525.00.

Works Package 13 Plumbing Installations £915.00

The supply of the plug and play plumbing materials	£180.00
Soil stack etc	£150.00

Steel bath with shower mixer tap and bath panel	£105.00	
Bath Shower screen	£30.00	
2 No Wash hand basin with mixer tap	£100.00	
Vanity Unit for wash hand basin	£55.00	
2 No concealed wc & toilet seats	£105.00	
2No Vanity Unit for back to wall wc pan	£90.00	
Bathroom cabinet	£25.00	
General accessories	£75.00	
Works Package 14	Heating Installation	£2,005.00
The supply of the plug and play heating materials	£185.00	
Condensing combination boiler	£635.00	
Ducting for MVHR	£395.00	
Heating convector radiators 8No, inc towel rails	<u>£790.00</u>	
	£2,005.00	
Works Package 15	Plastering (or dry-lining)	£183.00
The panels are pre finished only making good required at the junction of the panels, materials required Tape & jointing compound (drylining)		
Works Package 16	Kitchen and Utility Units (+ appliances)	£1,830.00
Kitchen includes all units and appliances		
Works Package 17	Decorations & Wall Ceramics	£735.00
Wall tiles and adhesive and grout	£305.00	
Paint and material required	£430.00	
Works Package 18	Floor Finishes	£790.00
Vinyl throughout allow approx £7m2 @ 95m2	£670.00	
Accessories	£60.00	
Vinyl adhesive	£60.00	
Total		£49,968.00