
lighthouse
Martin Rose
Sheppard Robson

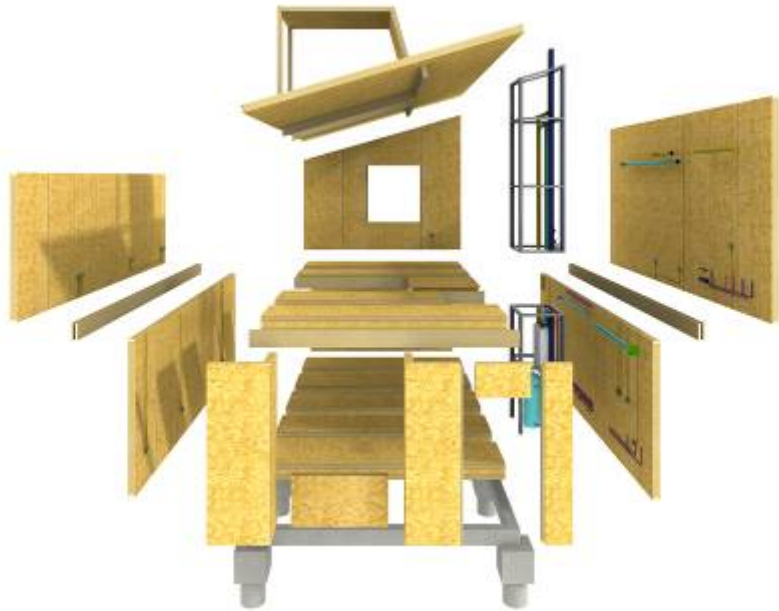
the past

KINGSPAN TEK

Service Integrated Insulated Structure

Current System

Proposed System



DESIGN FOR MANUFACTURE COMPETITION

Office of the Deputy Prime Minister
Creating sustainable communities

English Partnerships
The National Regeneration Agency

Supported by dti

SixtyK Consortium

SixtyK House

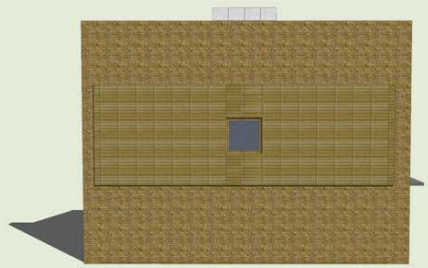
Environmentally Engineered | Design Directed | Flexible Futures

SixtyK Consortium

Detailed Design - 2 Bed House

SOUTH EAST STREET ELEVATION - 1:100

PERSPECTIVE VIEWS

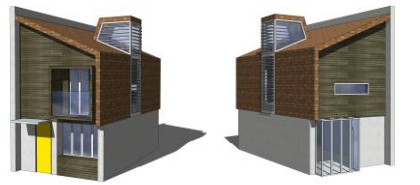


PERSPECTIVE ELEVATIONS - 1:100*

SixtyK Consortium

* ELEVATIONS ARE IN PERSPECTIVE, FRONT MOST FACE IS 1:100

LINTON



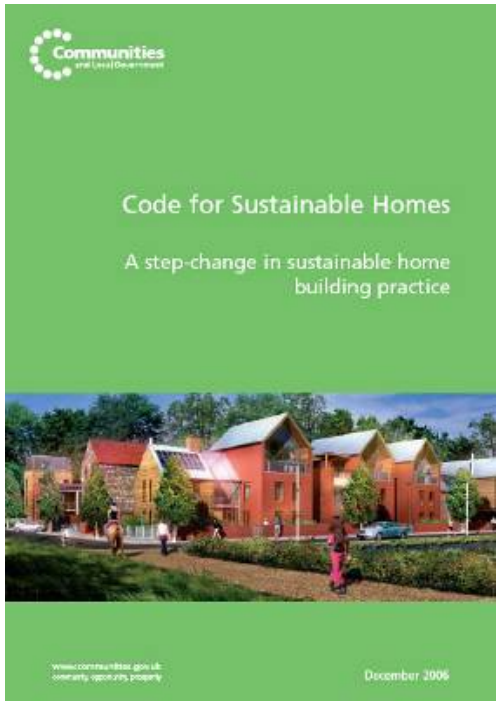

SIXTYK
HOUSING TYPES
SHEPPARD ROBSON

Off-site 2005

Innovation Park
BRE
Garston
Watford

CLIMATE FOR CHANGE

ZERO CARBON FUTURE



The way we live is changing.

Today home ownership is an environmental responsibility; individually we have a duty to cut energy consumption and collectively we must create communities which are sustainable and can be adapted to deal with future climate change.

THE CODE

The Code for Sustainable Homes

The Code for Sustainable Homes is the single national standard for house building.

Its ambition is clear; guiding the design and construction of sustainable homes to set world class standards that reduce the impact our homes have on the UK's carbon emissions.

The Code uses a rating system - indicated by stars (1 to 6) - to communicate the overall sustainability performance of a home. The performance is split into nine design categories:

Energy & carbon dioxide
Materials
Ecology
Waste
Pollution
Health & well-being
Water use
Surface water run off
Management

TIMELINE

THE CODE

Level 1	36 Points (Mandatory + 33.3 Points)	▪ Above Regulations ▪ EcoHomes 2006 Pass ▪ EST Good Practice
Level 2	48 Points (Mandatory + 43.0 Points)	▪ EcoHomes 2006 – Good
Level 3	57 Points (Mandatory + 46.7 Points)	▪ EcoHomes 2006 VGood ▪ EST Best Practice ▪ Conventional Water fittings
Level 4	68 Points (Mandatory + 54.1 Points)	▪ Grey water/Rainwater ▪ Passive House (approx)
Level 5	84 Points (Mandatory + 60.1 Points)	▪ Zero SAP ▪ Significant Renewables
Level 6	90 Points (Mandatory + 64.9 Points)	▪ Zero Operational Carbon ▪ Most Code Credits achieved

How will the Code effect the quality of housing in the UK?

THE CODE

Will it compromise lifestyle ?

Kingspan Group plc

SHEPPARD ROBSON

ARUP

CCB evolution

MACFARLANE WILDER
URBAN & ENVIRONMENTAL LAND PLANNING

DAVIS LANGDON

CHORUS

lighthouse

LIGHTHOUSE AND THE CODE

HOW IT ACHIEVES LEVEL 6




For Code Level 6, the mandatory heat loss parameter is very low (0.8) placing very high demands on the building envelope. The parameter is an expression of the combined effect of building volume, floor area, envelope surface area, insulation ('U' value), thermal bridging, envelope air-tightness, glazing performance and relative area, together with the chosen methods of ventilation.

Success is dependant on the effective combination of passive elements and active systems.

HOW IT ACHIEVES LEVEL 6




To achieve net zero carbon operation, building envelope must be as efficient as possible and energy demand must be reduced to an absolute minimum. Only when the lowest possible total energy requirement has been established, and fluctuations in demand on a daily and annual basis are understood, can a realistic solution for the provision of renewable energy be engineered.

Technology to reduce energy consumption

Technology to generate renewable energy

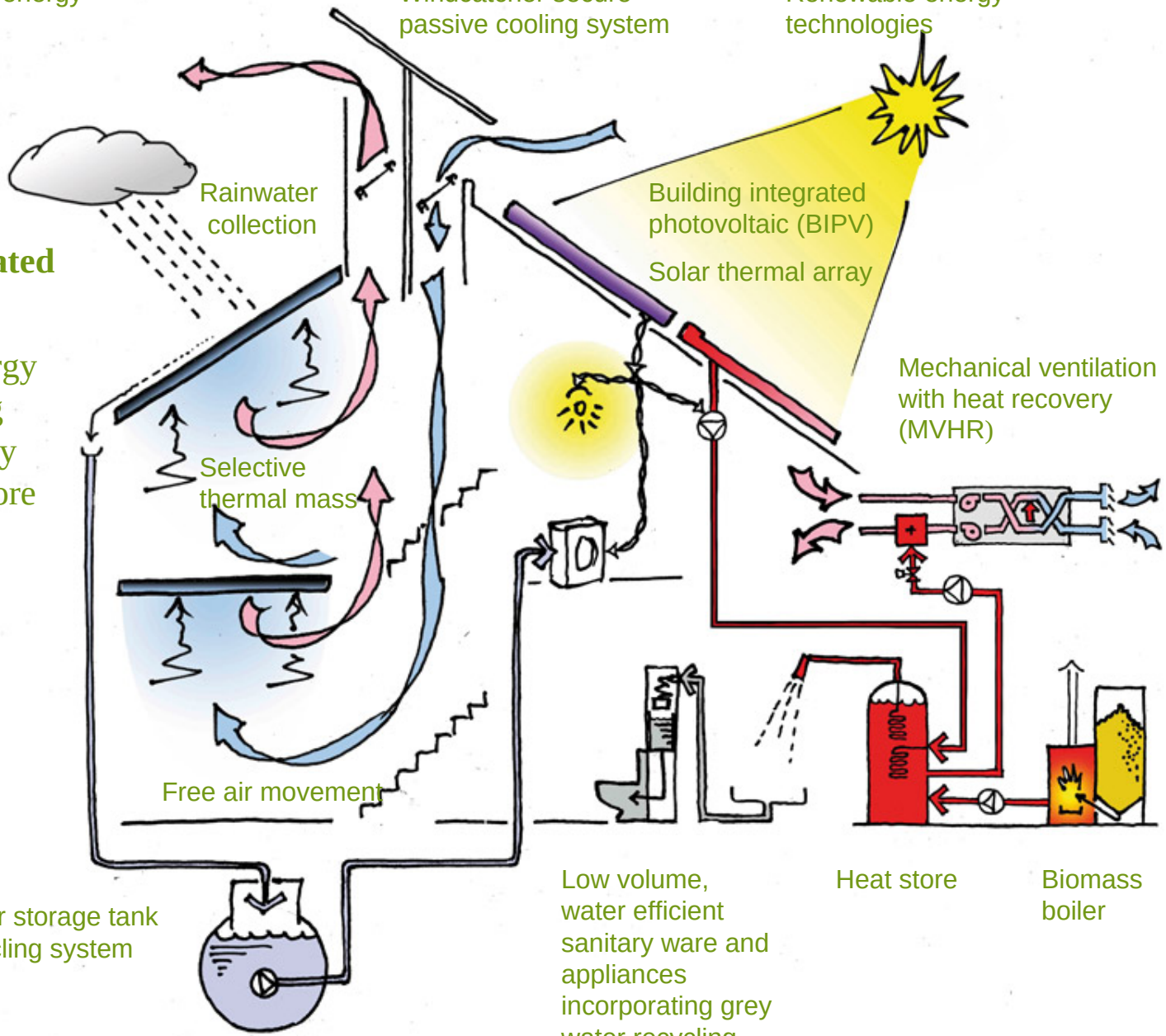
Passive and active energy reducing systems

Windcatcher secure passive cooling system

Renewable energy technologies

Services are fully integrated

With smart metering and monitoring recording energy consumption and enabling occupants to identify if any wastage is occurring, a more environmentally aware lifestyle is promoted.



HOW IT ACHIEVES LEVEL 6




Energy & carbon dioxide

• Walls, roof, floor U-values = 0.11W/m²K – Kingspan TEK System 284mm thick (2x 142mm)

• Windows = 0.7W/m²K (inc. timber frame), triple glazed, gas filled (NorDan)

• Air permeability = 1m³/h/m² at 50 Pa

• Thermal bridging max 4.5% of surface area

• Mechanical ventilation = 88% efficient heat recovery MVHR with specific fan power 0.92W/l/s (Kingspan KAR)

• Lighting – 100% compact fluorescent

• Dedicated drying room with permanent fittings

• Energy labelled A++ white goods

• External lights, and internal lights to circulation areas on PIR (presence detection)

• Dedicated cycle storage

• Allowance for home office facilities

• On-site renewable energy: 4.7kW, 47m² photovoltaic's

• 10kW automatic wood pellet boiler (only 2kW required, but

• Automated wood pellet store / hopper, filled three times a year

• 4m² solar hot water to eliminate wood resource used in summer

HOW IT ACHIEVES LEVEL 6




Materials

Walls and roof – Kingspan TEK structurally insulated panels (SIPS)

Cladding – sweet chestnut from managed coppice

All timber products from FSC or PEFC sources

Paved surface from recycled or sustainable sources

Natural rubber flooring with 50% recycled content

Ecology

Improved biodiversity through native planting and creation of surface water environment (swale)

Health & Well Being

High daylight factors to key areas – 1.5 - 2%

Provision of private external spaces (balconies)

Lifetime homes amenity standards

Water

Potable water reduction: Low water shower (6 litres/min) and taps. Dual flush WC (4/2 litres) 160 litre bath (Hansgrohe)

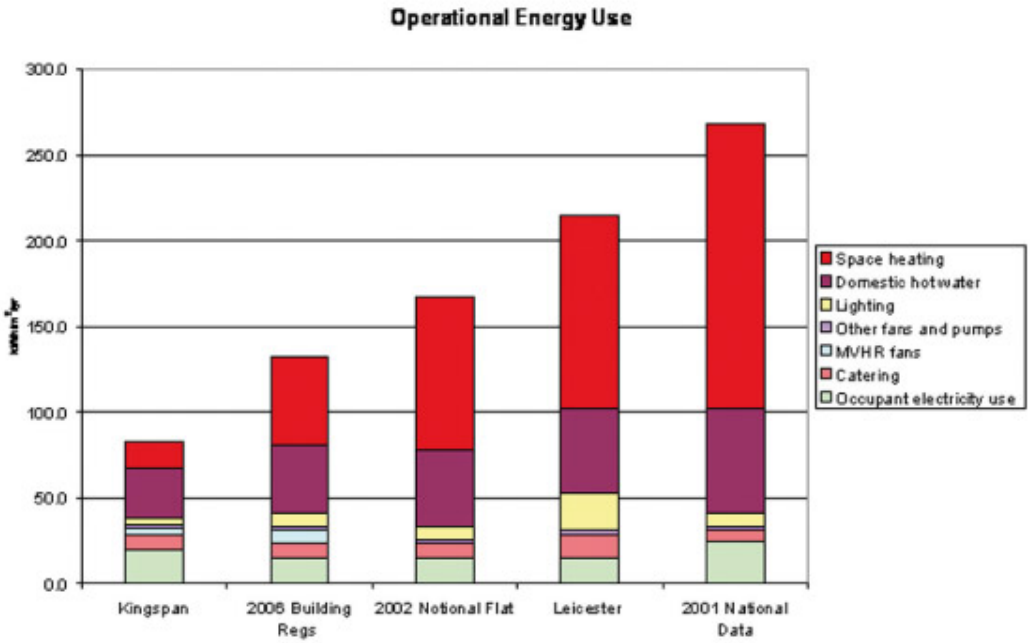
Water labelled A++ washing white goods (Miele)

Grey water recycling for WC flushing (Ecoplay)

Rainwater harvesting for washing machine and irrigation (Envireau)

CARBON FOOTPRINT

This chart compares the estimated energy use for Kingspan with benchmarks and measured data. The Building Regulations estimates were done for a similar size and shape house



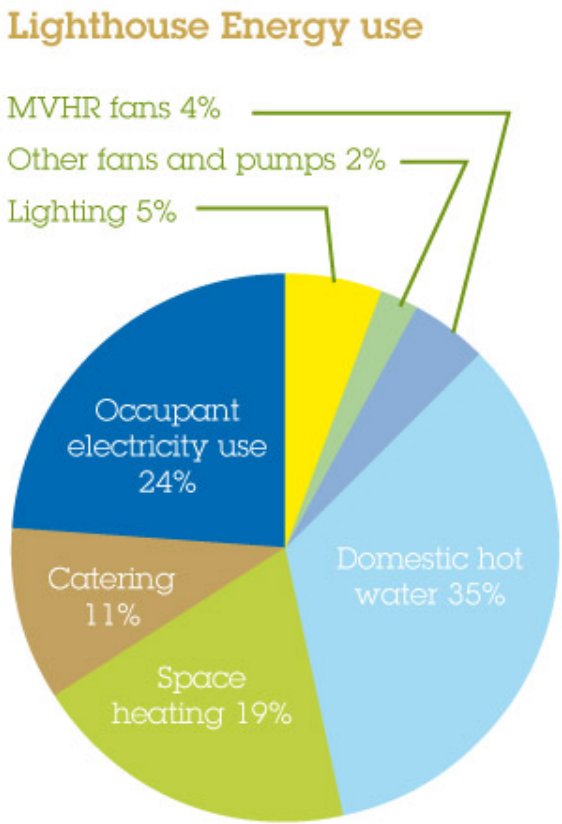
CARBON FOOTPRINT

The energy cost of running the Kingspan Lighthouse house will be about £31 per year.

This is solely for the wood pellets required for space heating (based on 1.8p/kWh) and hot water in winter.

There is no operational cost for electricity!

A house of the same size and shape but built to 2006 Building Regulations standards would cost about £500 a year in energy bills.

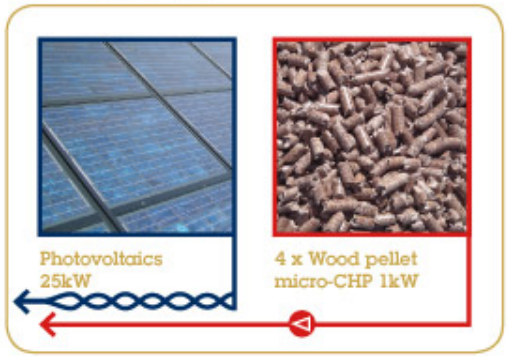


x1

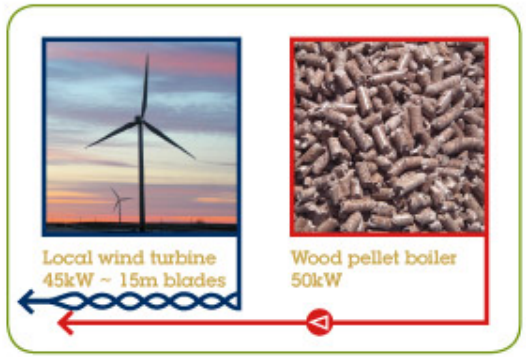
1UNIT

x25

25 UNITS



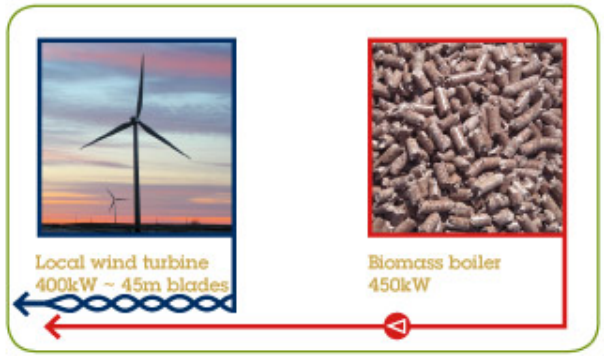
OR



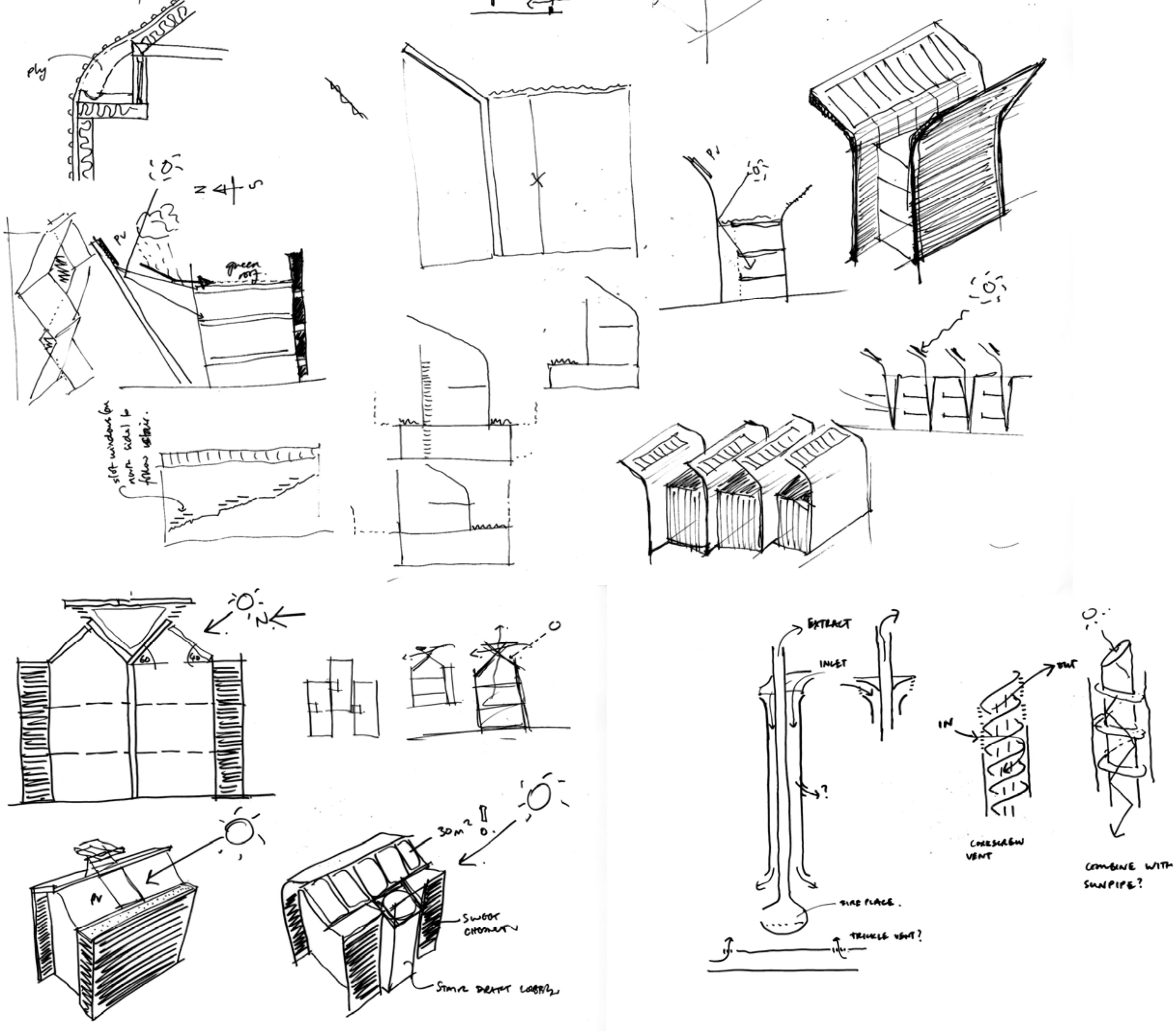
x250

250 UNITS

OR

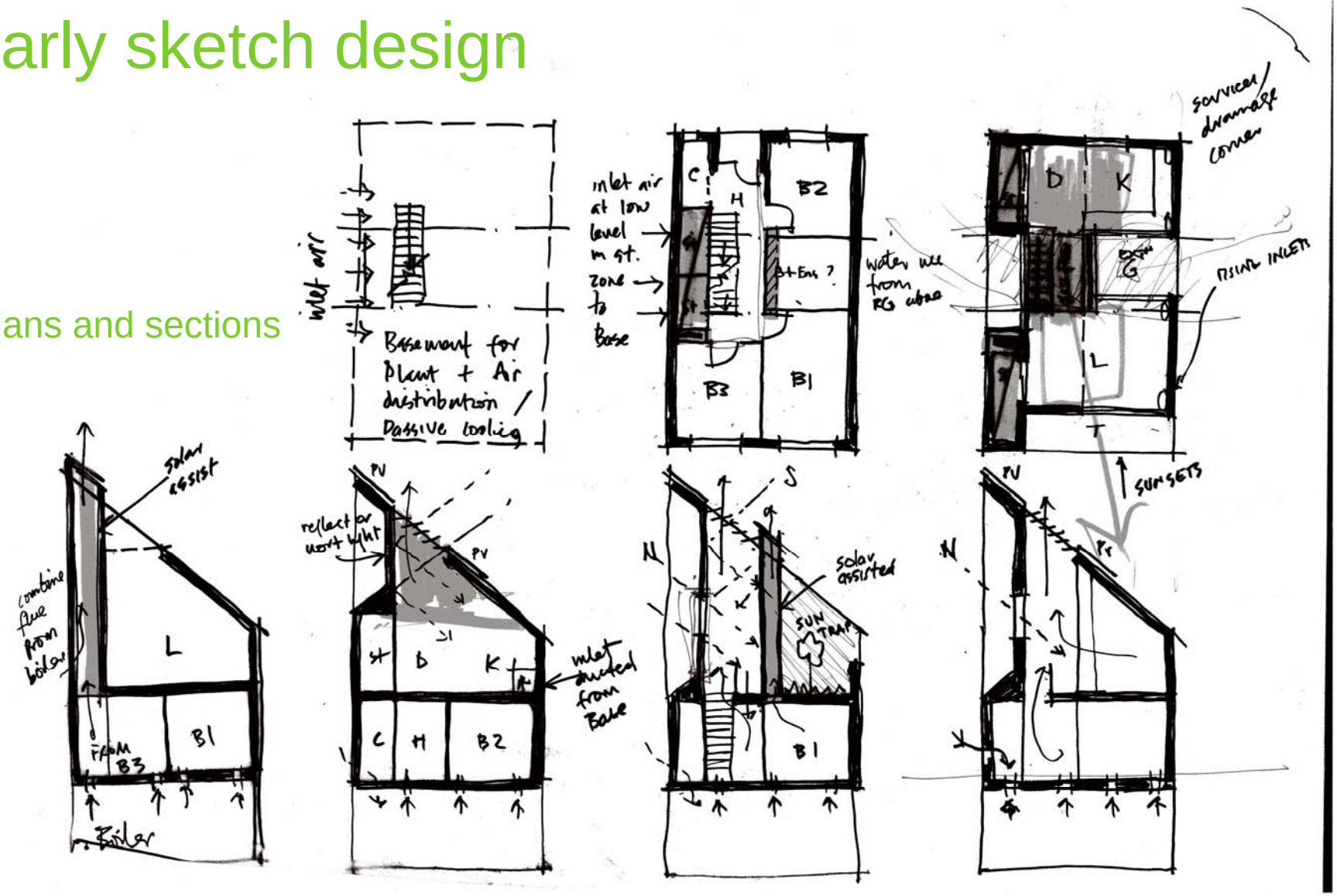


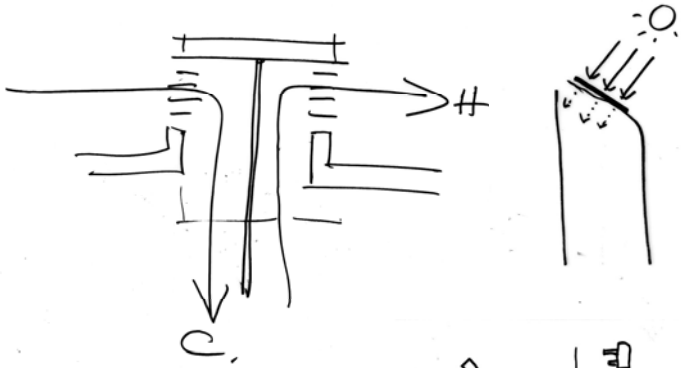
DESIGN

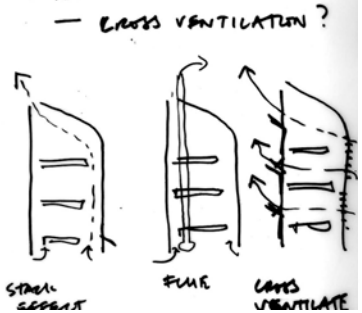

ply
PV
60
40
N
30m²
PV
STAIR DRAFT LOBBY
EXTRACT
INLET
?
FIRE PLACE.
TRICKLE VENT?
IN
OUT
CORKSCREW VENT
COMBINE WITH SUNPIPE?

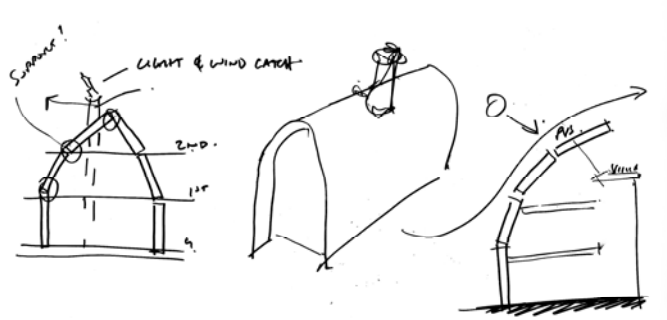
Early sketch design

Plans and sections



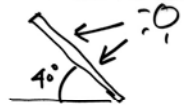




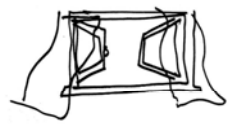


- MINIMISE POWER CONSUMPTION
- REDUCE TYPICAL CONSUMPTION BY 30%.

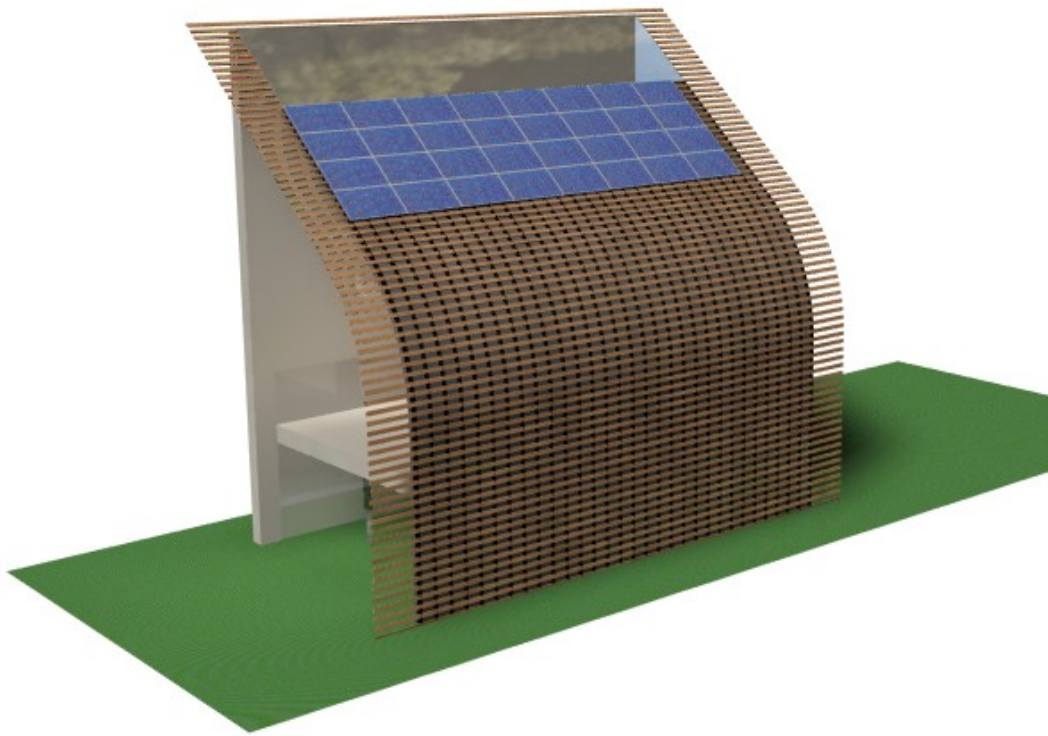
— MAXIMISE DAYLIGHT TO AREAS INHABITANTS USE THE MOST

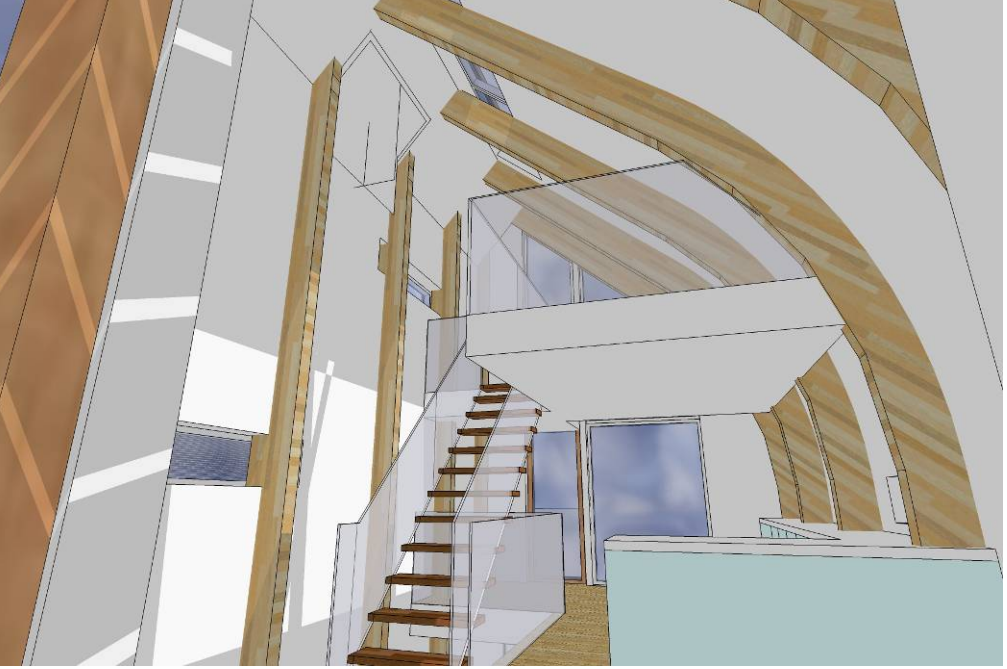


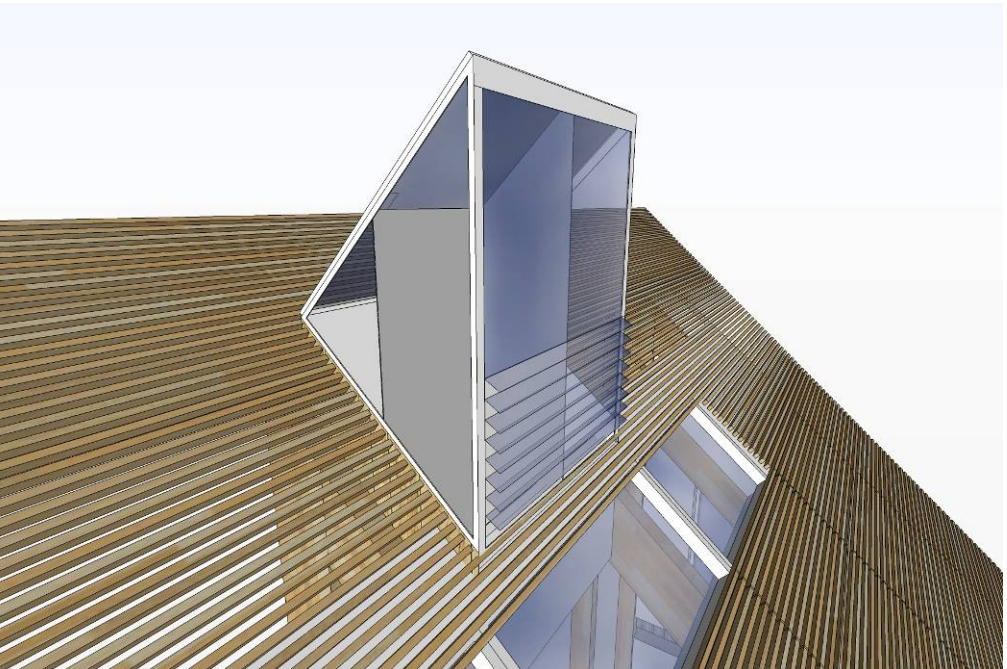
— PROVIDE 30m² PV PANELS

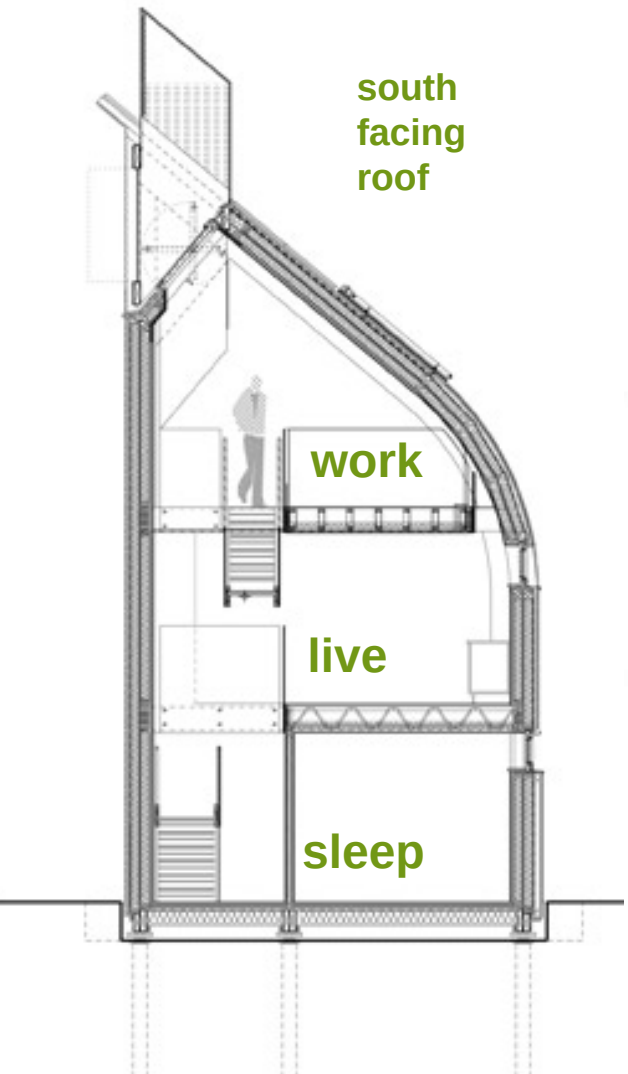


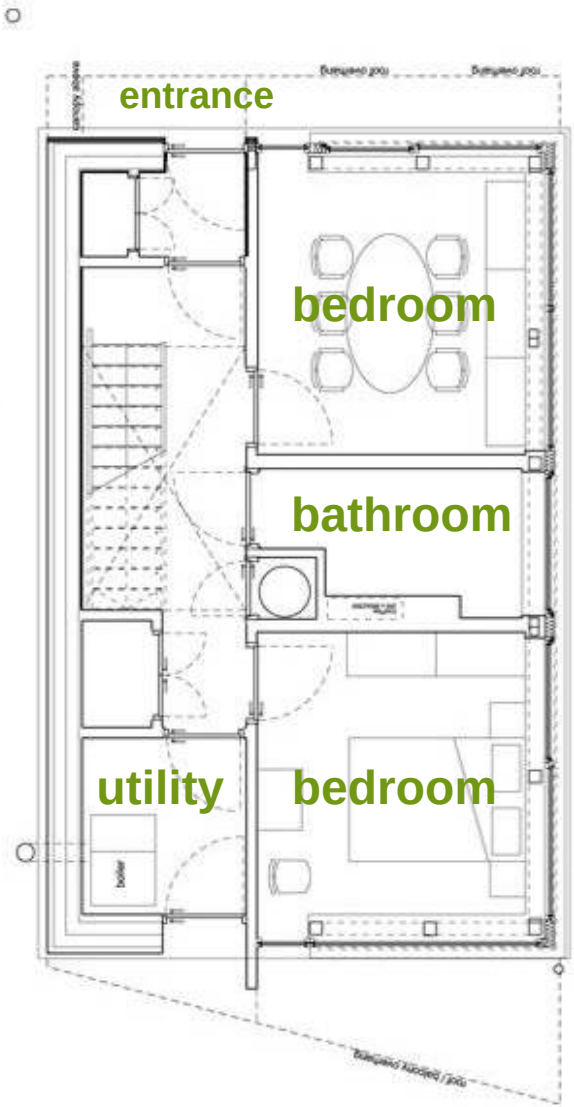
— NATURAL VENTILATION
— SEALED + TRICKLE > VENT - FANS.
OR
— CROSS VENTILATION ?

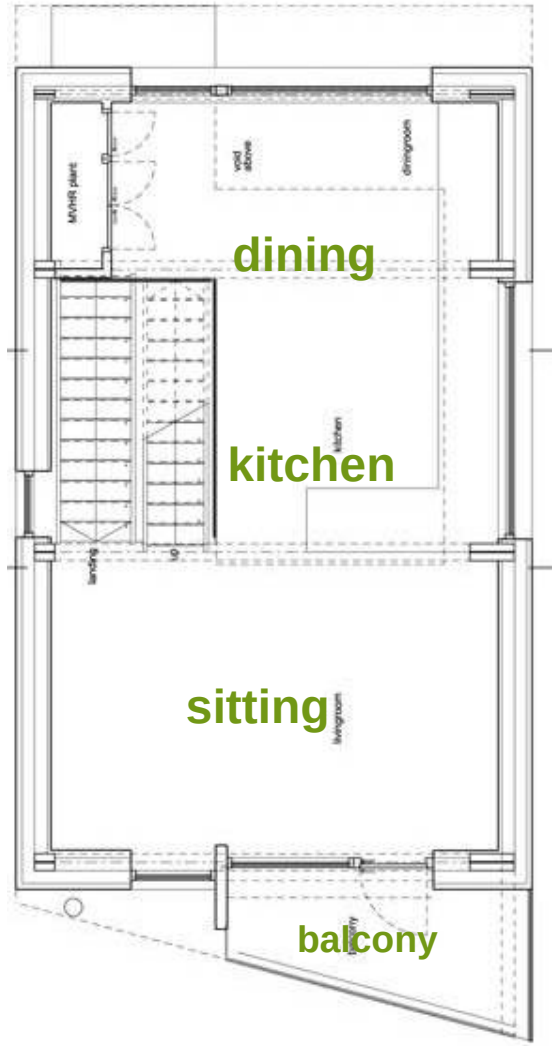












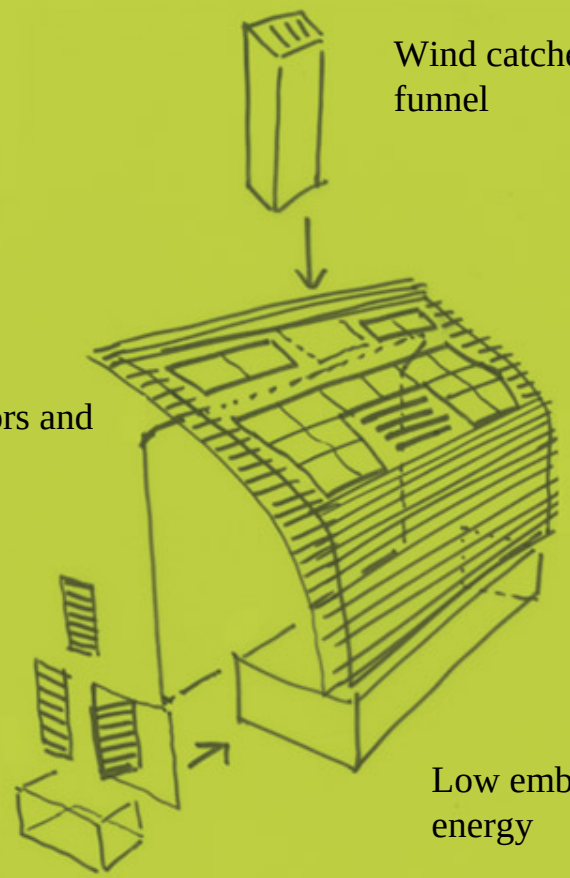
section

ground floor plan

first floor plan

general arrangement

ACCOMODATING FOR CLIMATE CHANGE

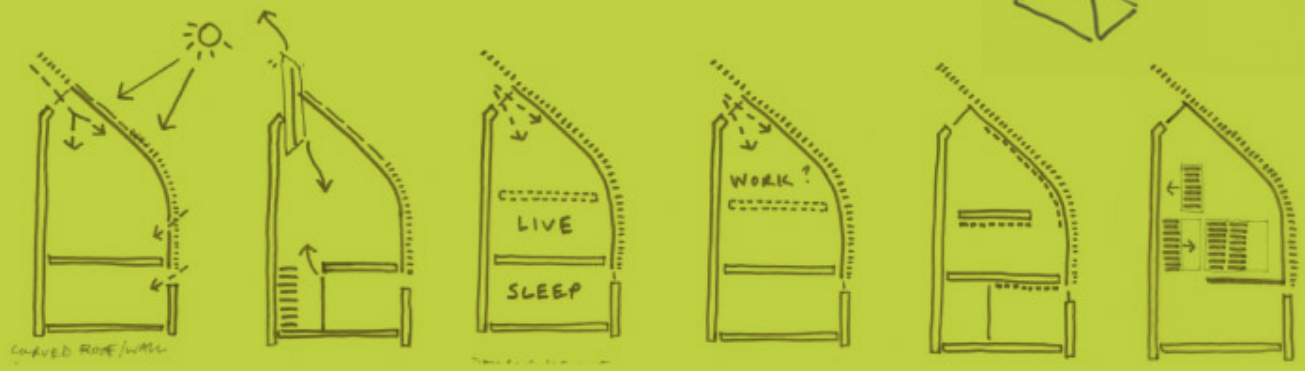


Wind catcher/ light funnel

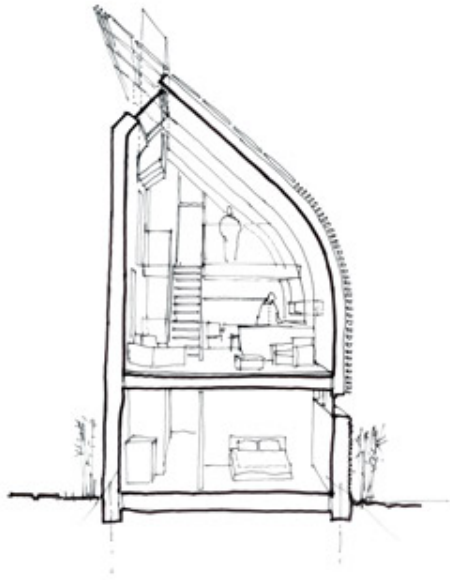
Solar collectors and shading

Selective thermal mass

Low embodied energy



SOLAR GAIN AND SHAD-ING

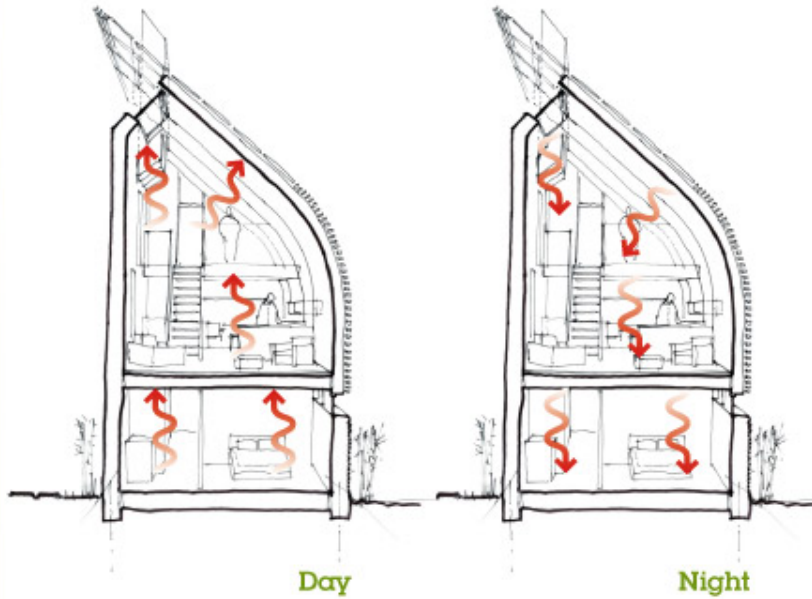


Solar gain and shading

• Shading to the west elevation is provided by retractable shutters restricting direct sunlight, minimising heat gain in the summer.

• maximise sun and daylight mid-season and winter. The passive design of the house must balance the technical considerations with the occupants' expectations who are more accustomed to light and airy living.

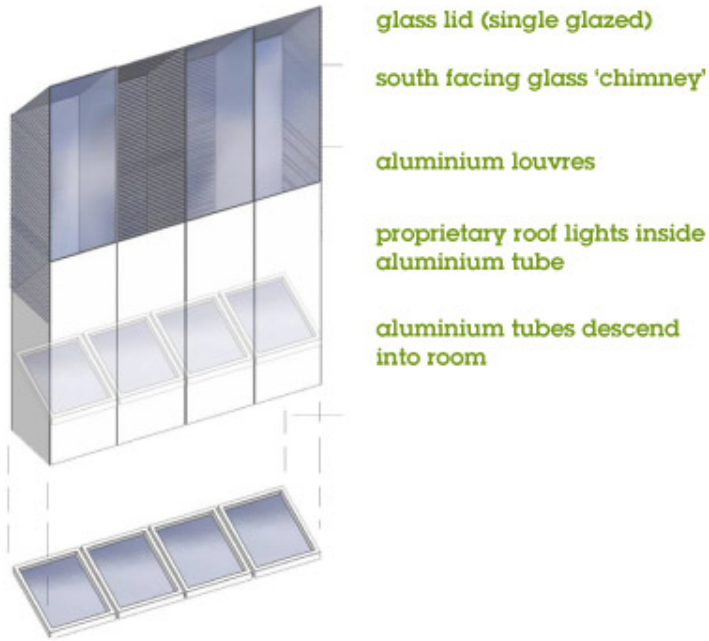
SELEC-TIVE THER-MAL MASS



Selective thermal mass

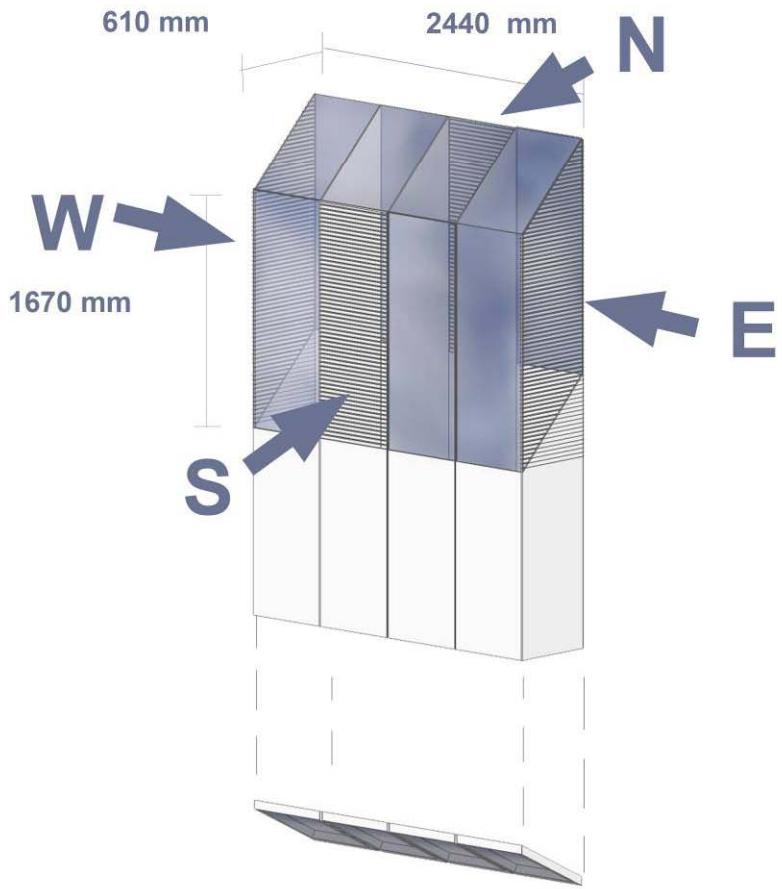
Phase changing material in the ceilings absorbs the room heat by changing from solid to liquid within microscopic capsules embedded in the board. This process is reversed when the room is cooled with the night air, working with the passive system of the wind catcher.

WIND CATCH-ER/ LIGHT FUNNEL



Located on the apex of the roof, above the central void over the staircase, the windcatcher provides secure passive cooling and ventilation. It catches the wind from any direction using any 2 of its 4 chambers. When opened, this cool air drops into the core of the house right down to ground floor level 'turbo charging' the natural stack effect. Hot, stale air from the living space and the ground floor sleeping accommodation is discharged via the remaining 2 uncharged chambers. Being fully glazed, the wind catcher also brings daylight deep into the plan of the house together with sky views reflected in it's polished fins .

option 3



WIND CATCHER

CON-
STRUC-
TION


CENTURY

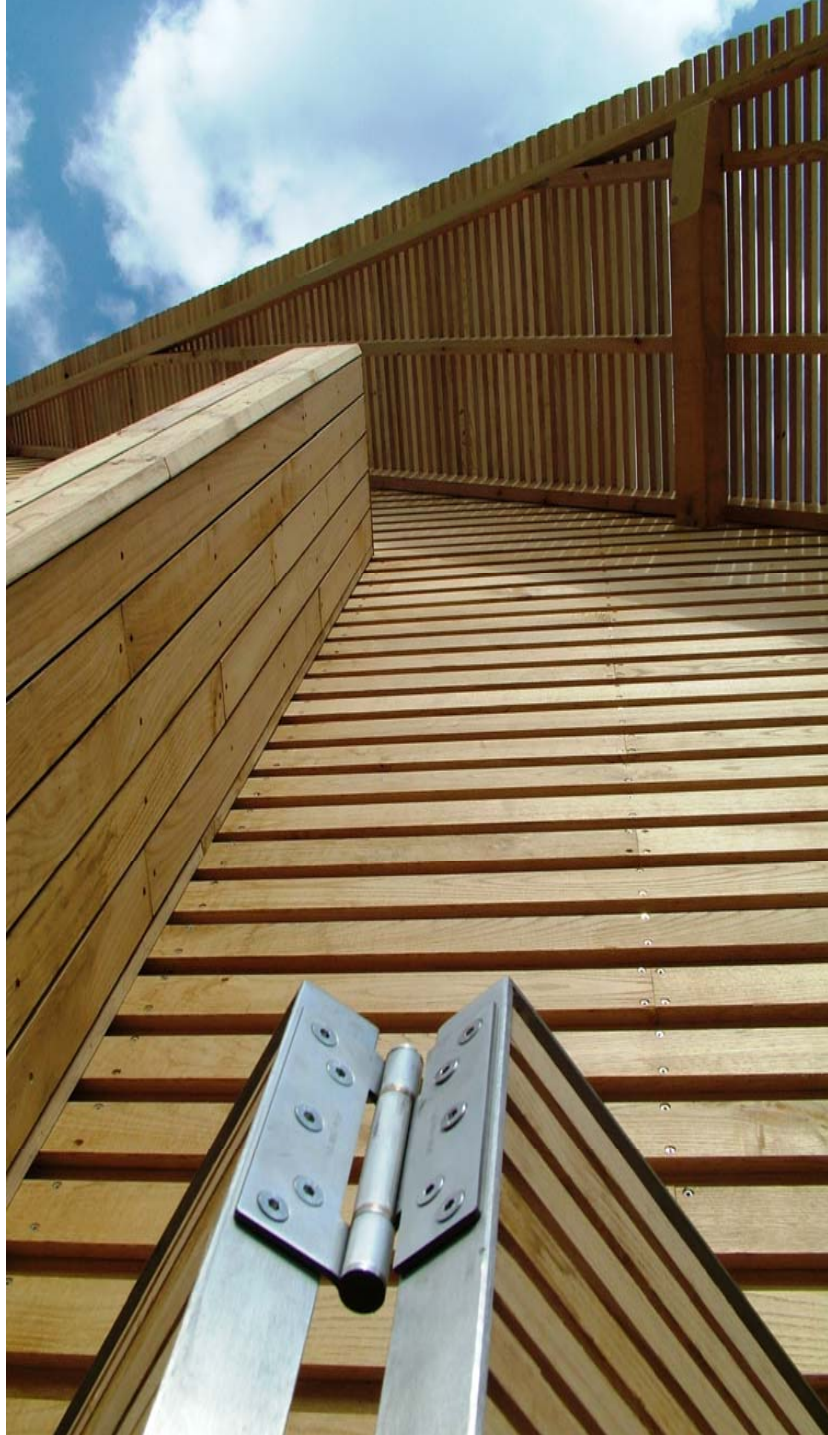

DEWALT

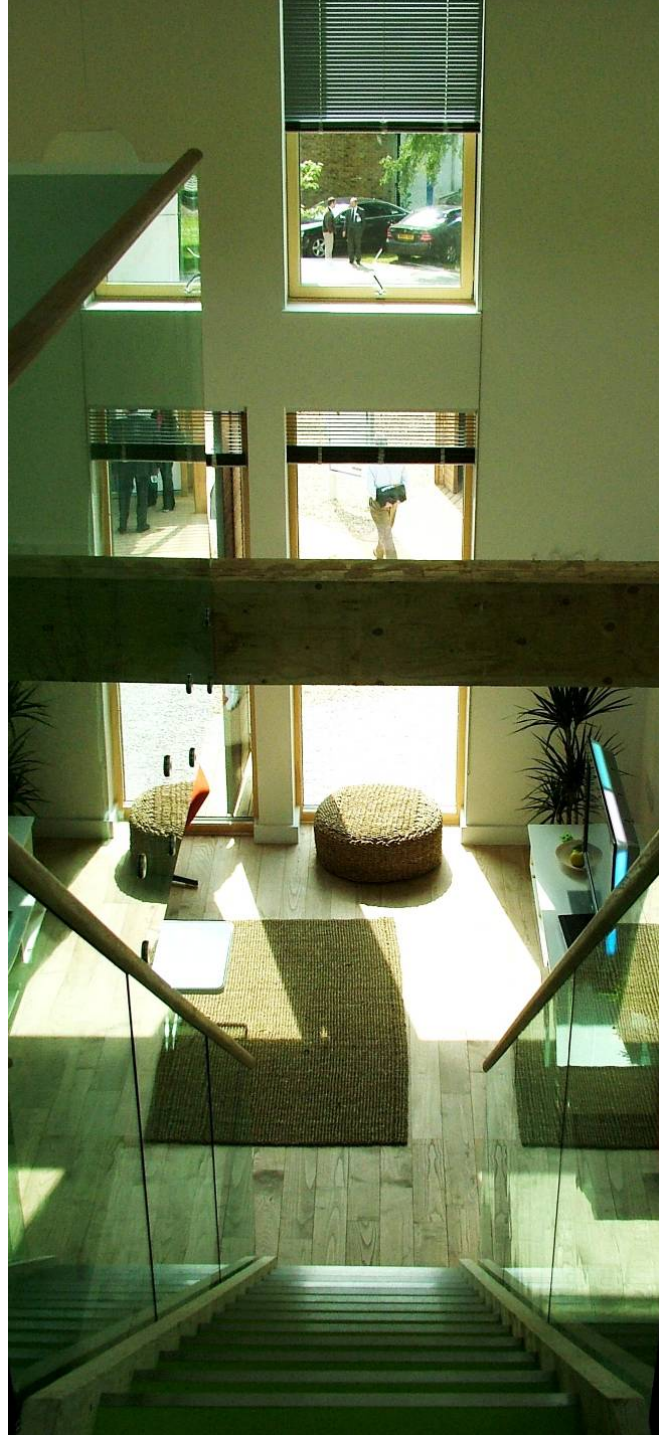

EXHI-
BI-
TION

EXHI-
BI-
TION

EXHI-
BI-
TION


Fire exit
S.B.





the present

the future?

onwards & upwards!

We have already learnt a great deal from lighthouse. But, it is only the beginning. Not only are we continuing to develop and improve on the performance of the prototype, we are developing a range of homes of different sizes and configurations – all with lighthouse ‘DNA’ – that can all perform at CSH levels 4, 5 and 6...


lighthouse
SHEPPARDROBSON

Potton lighthouse launch Grand Designs Live NEC

lighthouse will be available from 5th October as a Potton Limited ‘self-build’ product.


Thank you