

# PERMAHAUS 1 A R R I V A L

## THE APPROACH

1. Clear ordering of spaces to accommodate arrival - car parking, entrance emphasised by pergola structure and car shelter for easy transition on arrival
2. Planting and shelters define outdoor rooms and control views through to lake beyond
3. External walls and timber frame structures create strong definition showing where to go but planting used to soften and create the public face of the house to the communal areas
4. Public face of the site allows restricted glimpses through to the private realm beyond
5. Pergola provides frame for climbing fruit with herb garden at front to encourage social interaction



### Woodland edge

A wider space planted with native broadleaf species: This creates habitat, shelter belt for the house, a visual screen and seclusion for the boat house. Wildlife further encouraged through installation of bat boxes and hibernacula for amphibians and riparian mammals such as water vole *Arvicola terrestris* amphibius.

Species mix: *Alnus glutinosa*, *Betula pendula*, *Salix pentandra*, *Sambucus nigra* & *Sorbus aucuparia edulis*. Alder & birch are quick-growing riparian specialists selected for quick effect, waterside erosion control and in the case of alder, nitrogen fixing to promote soil fertility, reducing maintenance effort and fertilizer requirements.

*Sambucus nigra* & *Sorbus aucuparia edulis* provide abundant bird food, or could be foraged for home made country wines.

### The Boathouse: Getaway & Gateway

The secluded boat house is shielded from the main house by the native trees, and provides a different quality of rustic simplicity, allowing the occupants to really get away from it all. It contains a small wood-burning stove and mezzanine platform for occasional additional guests, teenagers in need of privacy, or simply bulk storage. The boat house may optionally include a wood-fired sauna. Housing boats, and incorporating a jetty, the boat house also becomes the gateway to water-borne transport around the network of channels that criss-cross the estate. A bench provides a place for quiet contemplation, or unobtrusive vantage point from which to watch children playing in the water. The boat house is constructed from locally-sourced timber and thatch, creating local employment & supporting traditional skills.

## THE LANDSCAPE

### Overall concept

The garden serves as an edge that integrates the house & landscape in a gradual continuum from luxurious, controlled indoor spaces to wild natural space. It connects the two visually, functionally and through various energy transactions (such as the production of food, use of local firewood). The potential for the building fabric to dominate as the defining design element is tempered by the interconnection of interior and exterior Spaces. This is achieved through the use of transitional spaces, outdoor rooms, views into the garden with its wild spaces, and the conscious invitation to wildlife to share the outdoor spaces. This creates opportunities for experiences that transcend the boundary of the building envelope, such as birdwatching from the house. Deciduous trees to the south provide shelter and some shade to the house in the summer and admit the sun in the winter.

Numerous fruit trees and bushes in the garden support wildlife while allowing residents to enjoy the abundance of the garden.

The estate coppice provides fuel for a wood-burning stove in the boat house and charcoal for barbecues, integrating the house into its locality, providing carbon neutral fuel, providing local employment opportunities for coppice workers, enhancing the habitat value of the coppice, and offering unique experiences for residents through educational activities such as coppice management, green wood working crafts, charcoal burning etc. "Charcoal burn, wine & pizza" nights run by the estate coppice manager could form a unique activity for residents who are interested in land-based activities.

### Patio

A place for barbecues, outdoor dining and sunbathing in the summer, with a fire-pit for use on cooler nights and in winter.

### Pergola walk

A shaded space to look onto the sunny garden, to approach the orchard, and to grow vine fruit up.

### Orchard/forest garden

Numerous fruit trees around the plot enable residents to use the fruit or leave it to attract wildlife. Fruit varieties are selected for low maintenance, reliability and early cropping to coincide with peak holiday season: Plum 'Herman'; Cherry 'Celeste'; Pear 'Beth'; Apple 'Worcester Pearmain' (other apple varieties selected to provide a long harvesting season).

Orchard understorey can be planted with soft fruit bushes for maximum productivity or native grasses and wildflowers to promote biodiversity and attract pollinating insects.

A hammock strung between trees provides a place for lazy afternoons with a favourite book.

A compost bin allows kitchen waste to be recycled back into the soil to feed the fruit trees.

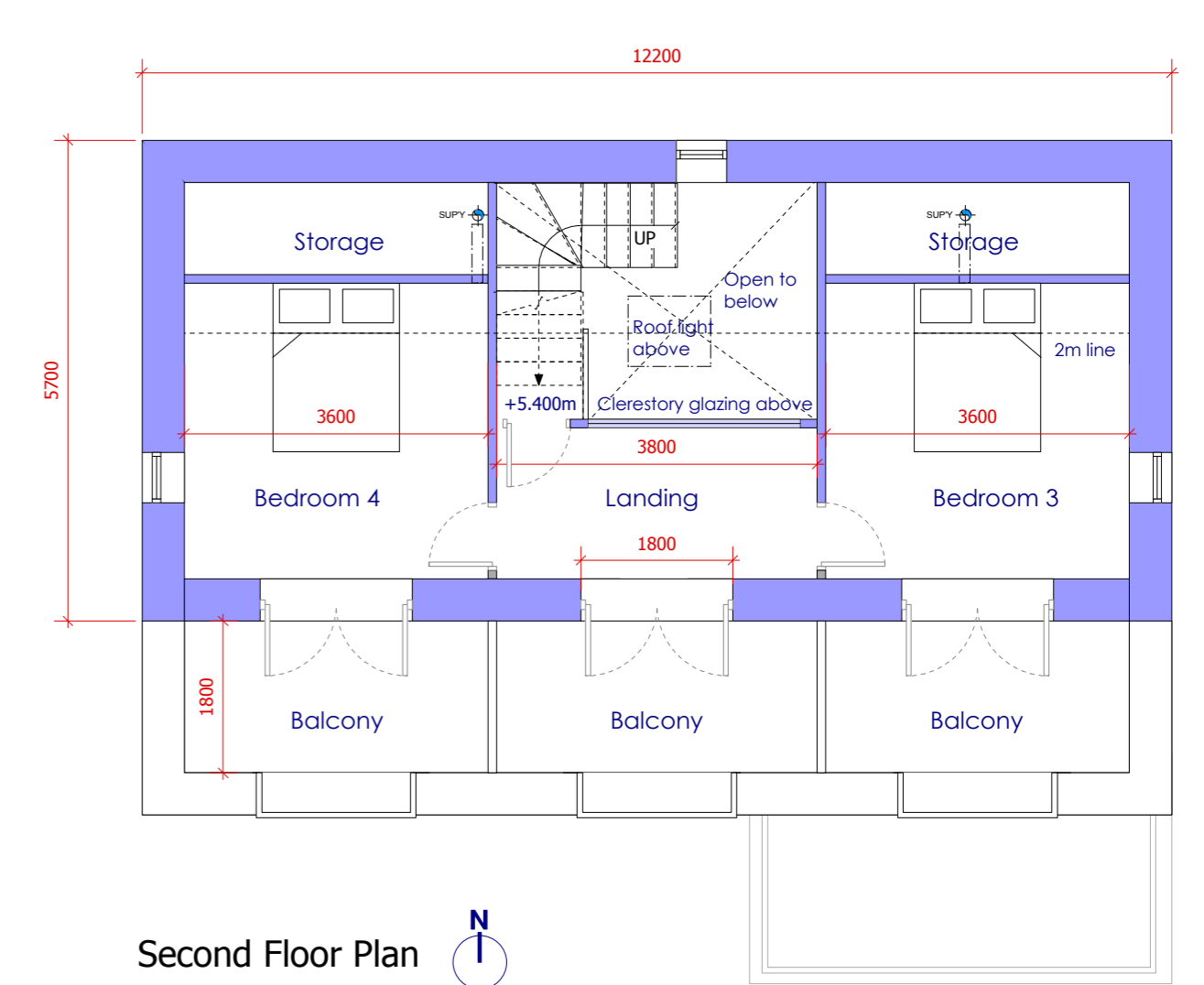
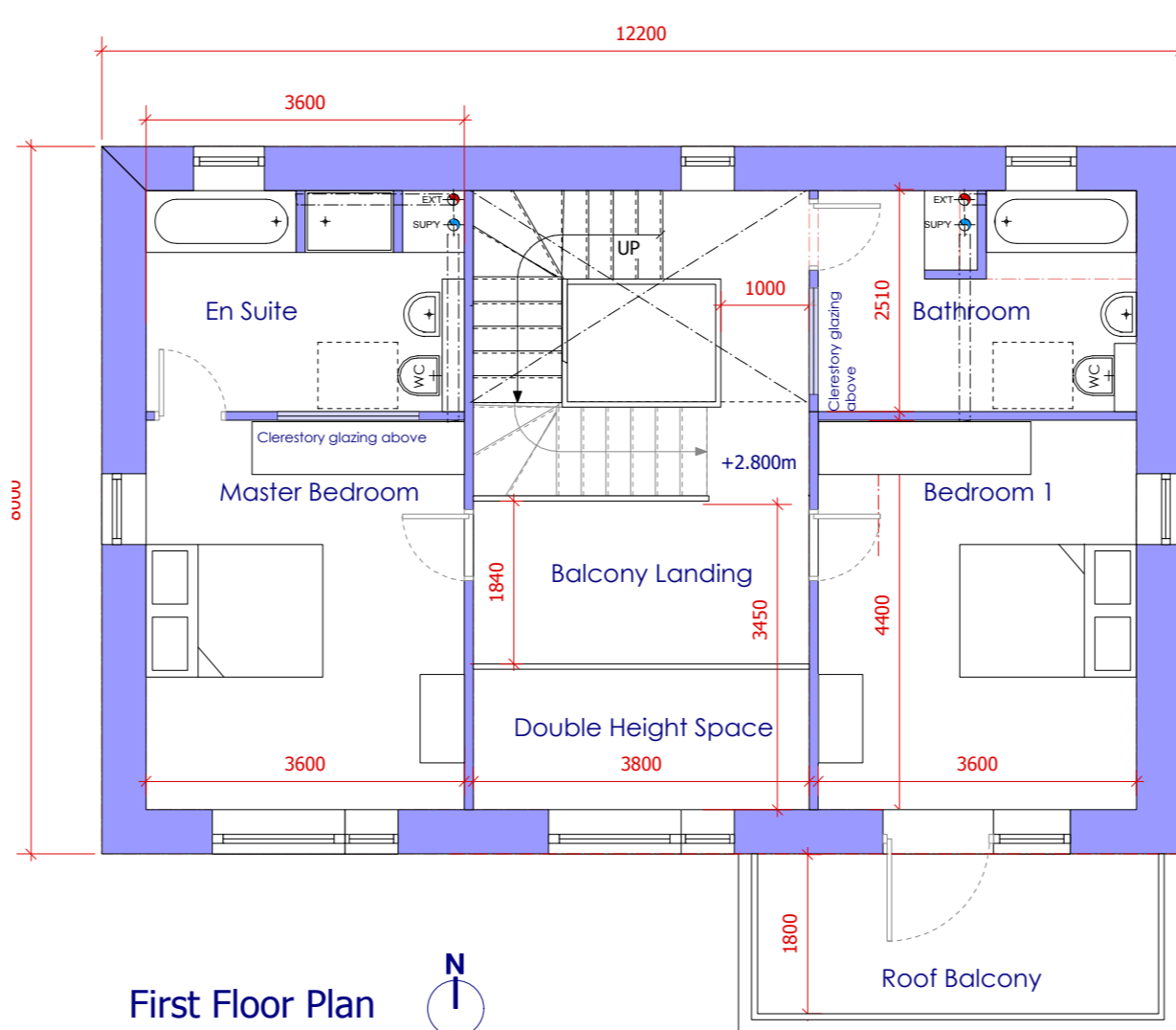
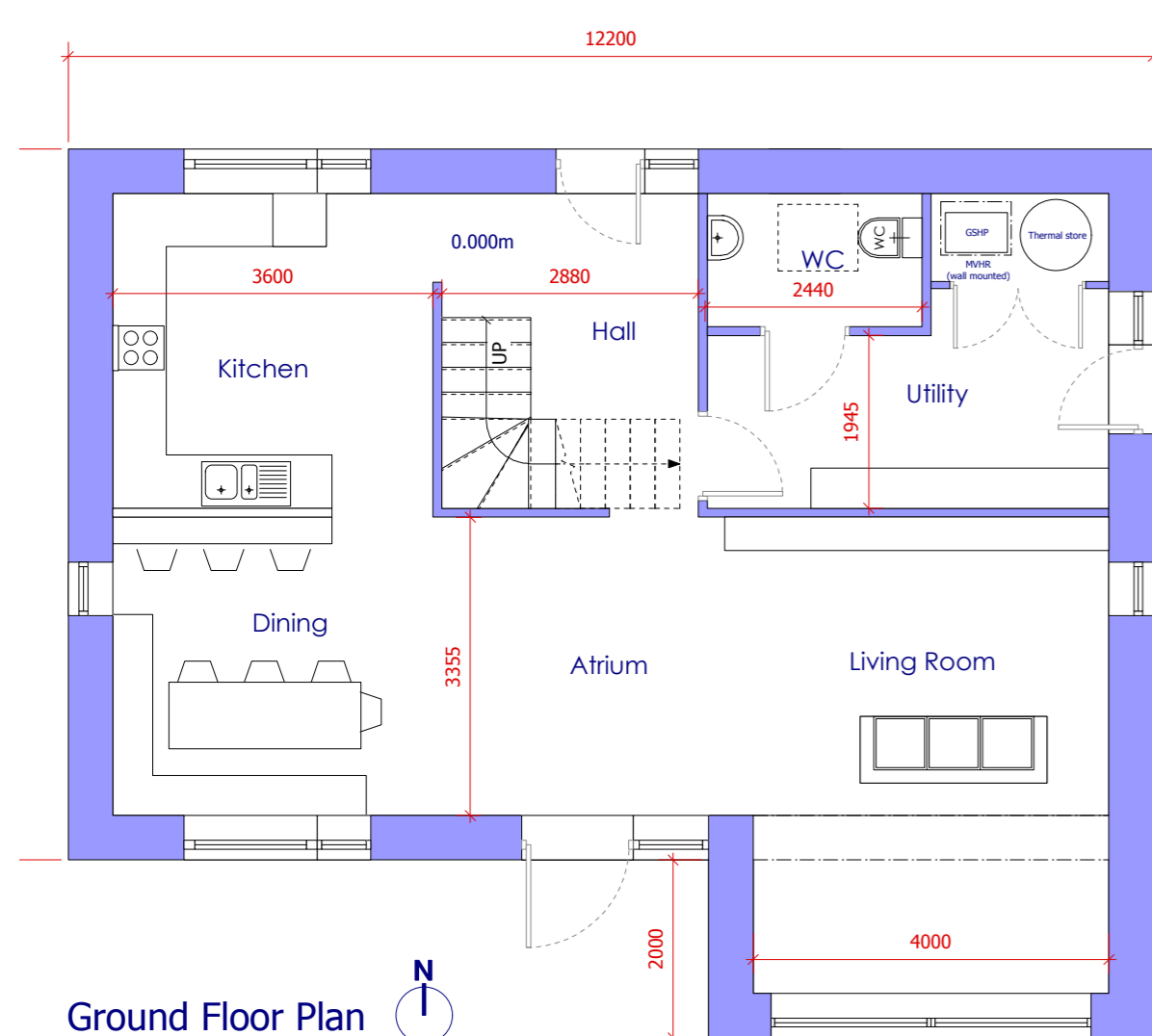
### Bird Hide/Nest

A space for complete escape and seclusion, to sit quietly and contemplate, watch nature, or sleep outdoors.

### Open areas

Sunny lawn for sunbathing on the grass, hosting larger garden parties, children playing, camping out, or to convert into a kitchen garden, for residents who are keen gardeners.

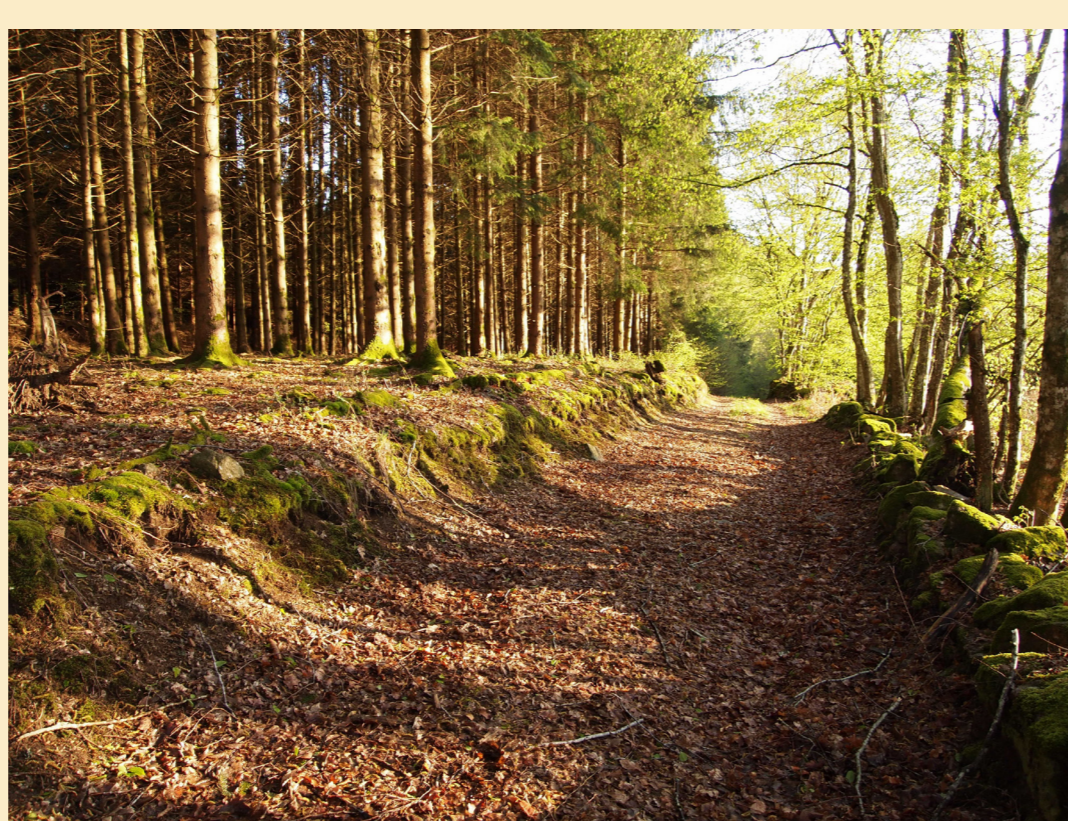
## THE HOUSE - plans



Once we'd entered the site we knew we'd come to a special place. It really felt like getting away to a world of new possibilities to explore the natural world, the beauty of the surroundings and to play. Just what was required.

It also felt like a community. One where we were able to be together or enjoy taking things at our own pace and retreat into our own 'home-stead' if we wanted to.

The whole arrival felt like we had taken off urban blinkers and restored that feeling of adventure with new stories about to unfold. From parking the car to moving our things in felt like we were moving through a series of special places each giving us another aspect of being outdoors, with the excitement of a rich natural habitat and the wilderness just beyond. The house feels like our perfect cosy, spacious



and warm woodland retreat.

Parts of the garden look like an extension of the house and it feels like being close to nature. The herb garden is going to be really useful as well as the great smells from the plants. Looking forward to making the most of them in the kitchen. The finishes outside and inside the house are warm and natural. They fit in with the surroundings and giving us that sense of a healthy indoor atmosphere with the benefit of the physical beauty displayed to its full.

Looking at the log book, the house pretty much takes care of itself and us- its really interesting to find out how it works. The smart control for electric is very 'clever'. Normally I wouldn't think much about turning lights off and all that but last night I turned off the lights and looked at the amazing night sky.





# PERMAHAUS 2 PERMACULTURE & PASSIVHAUS

## PERMACULTURE

### PEOPLE CARE

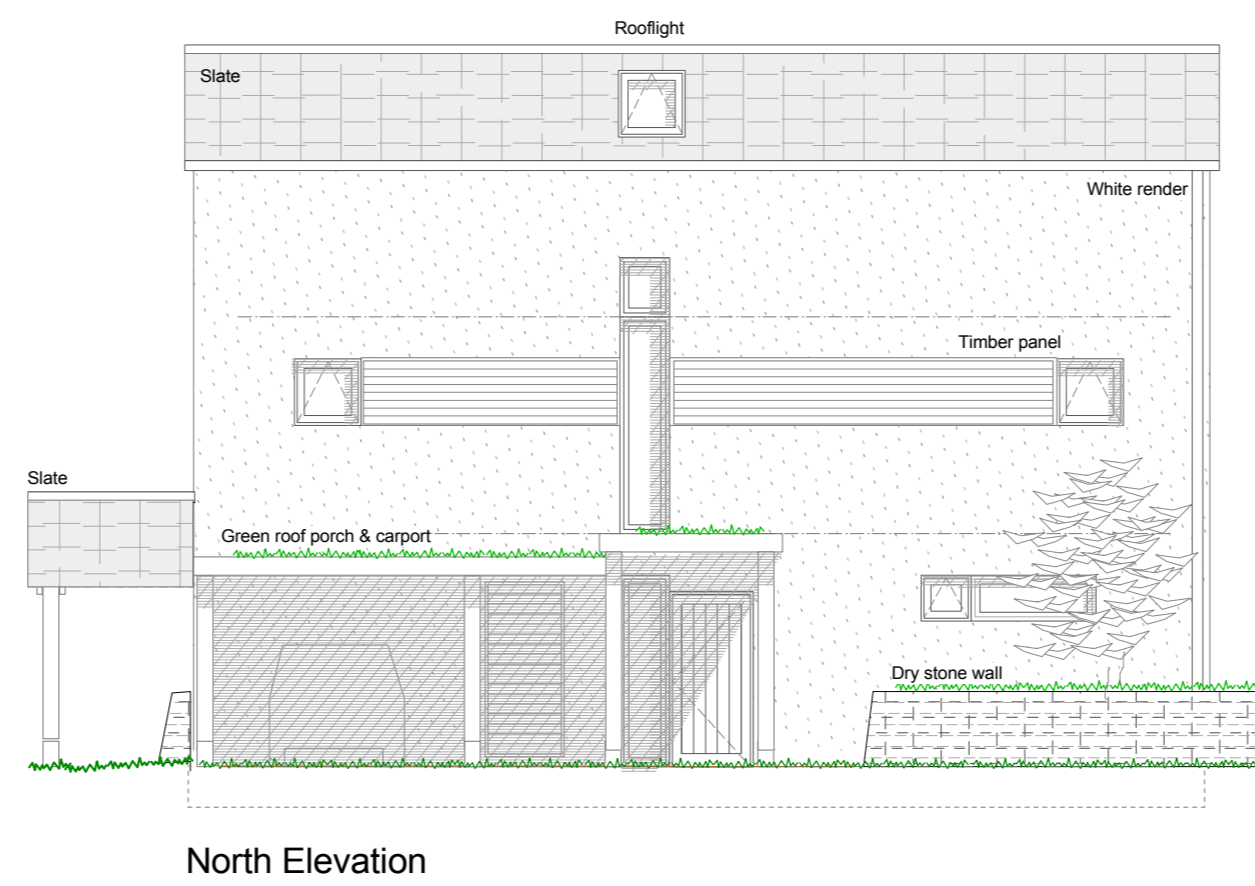
The home, gardens and wider landscape are a place for escape, rest & regeneration, nature connection, play, learning, pampering/relaxation, socialising/community connection, contemplation & reflection.

### EARTH CARE

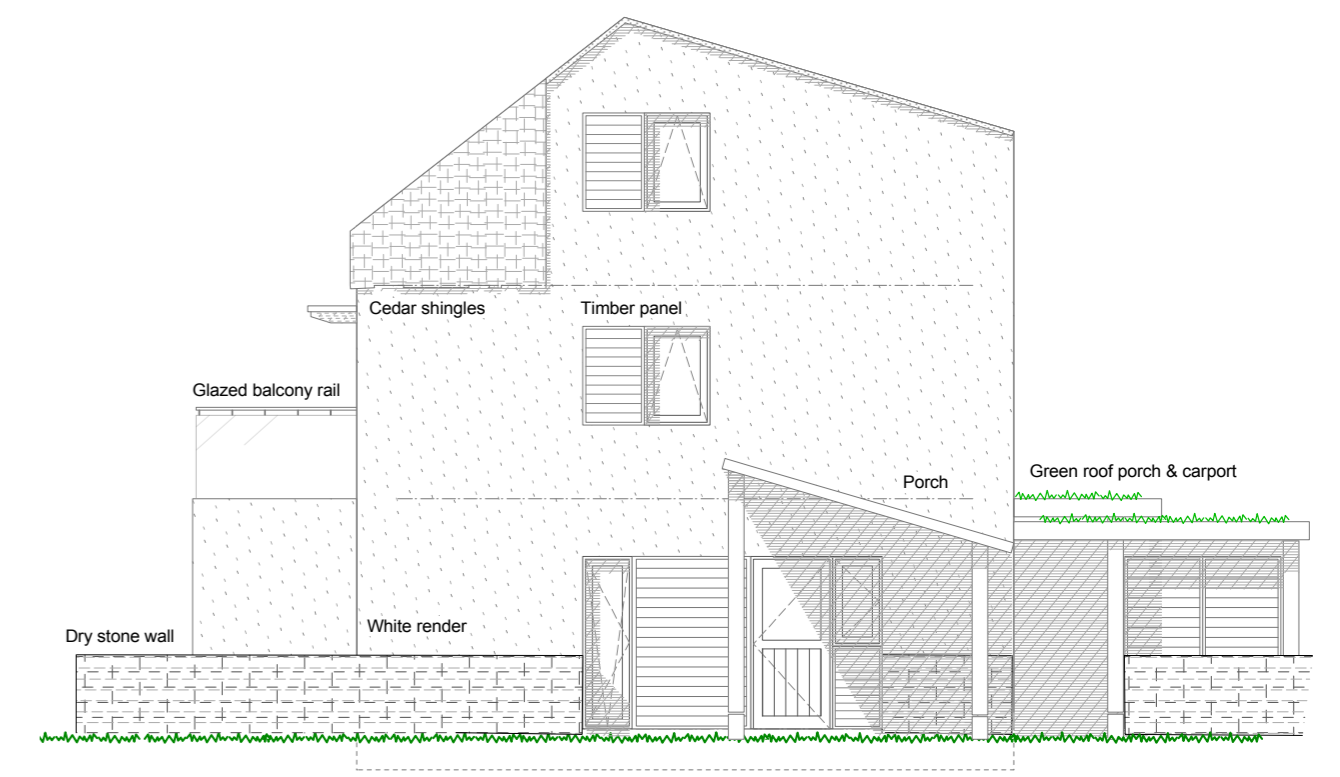
Low energy building, regenerative landscape (creating rich & diverse wildlife habitats)

### SETTING LIMITS to CONSUMPTION AND RE-DISTRIBUTING SURPLUS

Passivhaus standard explicitly sets limits to energy use in the building & reduces energy usage dramatically. Promotes holidaying in the UK, rather than abroad, reducing flights. Creating wild spaces in the garden invites wildlife to share the surplus of food.



North Elevation



East Elevation

### PRINCIPLES

#### Work with nature, not against

- Passive solar design
- Deciduous trees to south: leaves provide shade when it's needed (and don't when it isn't).
- Provide food and habitat to invite wildlife into the space, rather than having to go and look for it
- Where possible use natural, local resources & labour

#### Important functions supported by multiple elements

Function	Element
Escape	The home, garden, entire estate.
Rest	Bedrooms; lounge; sun loungers; garden seating; hammock; bird hide/nest
Nature Connection	Woodland edge; water's edge; bird hide/nest
Play	Lounge; garden; boat house; jetty; water's edge
Learning	Through direct observation of nature: Bird hide/nest, Woodland edge & water's edge.
Pampering/relaxation	Luxurious interiors; optional sauna in boat house; sun loungers; on-site spa; barbecue spaces/outdoor kitchen
Socialising/Community connection	Arbour to the public side of the house; kitchen window overlooking public space
Contemplation/reflection	Garden seats; fire pit; wood-burner; hammock; waterside seat/jetty
Recycling of wastes	Compost bin; ash from wood-burner & barbecue returned to soil as mulch for fruit trees; Rainwater capture for use on garden and e.g. car washing.

#### Each element performs many functions

Element	Functions
The house	Escape; rest & regeneration, nature connection (albeit observation through windows), play, learning, pampering, socialising/community connection (hosting parties), contemplation & reflection
Balconies	Private outdoor space; views across landscape
Patio	Outdoor cooking; eating; drinking; reading; sunbathing (sun loungers); fire pit (contemplation; socialising/community connection)
Arbour	Socialising/community connection
Pergola	Private shaded seating area; climbing plant support; framing views;
Open areas	Play; Socialising/community connection (garden parties)
Orchard	Food production; wildlife habitat; Wildlife food; shade; hammock support; partial shelter belt
Woodland edge	Nature connection; food (foraging); Play; Learning
Boat house	Escape; nature connection (e.g. pond-dipping from the jetty); pampering (sauna); socialising/community connection (saying hello to passing boaters from the jetty)
Bird hide/nest	Nature connection; play; learning; outdoor sleeping

#### Use of Edges

- Transitional spaces between interior & exterior provides gradation of privacy, shelter, nature connection
- Semi-public arbour: safe & private, but with opportunities for casual social connection & community building
- Views into the garden from the house for nature observation
- Water's edge for amphibian & riparian wildlife habitat
- Woodland edge
- Boat house/jetty occupies edge between land & water, private space and public waterway

#### Stacking (make use of 3rd & 4th dimensions)

The framework of native broad leaf high canopy trees with fruit trees as a secondary storey provides numerous beneficial functions as it is. However, it is designed so that it could be easily developed into a productive, low maintenance forest garden by infilling the shrub, herbaceous, ground-cover, root and climbing layers over time, should residents wish to do so.

#### Relative location & energy efficient planning:

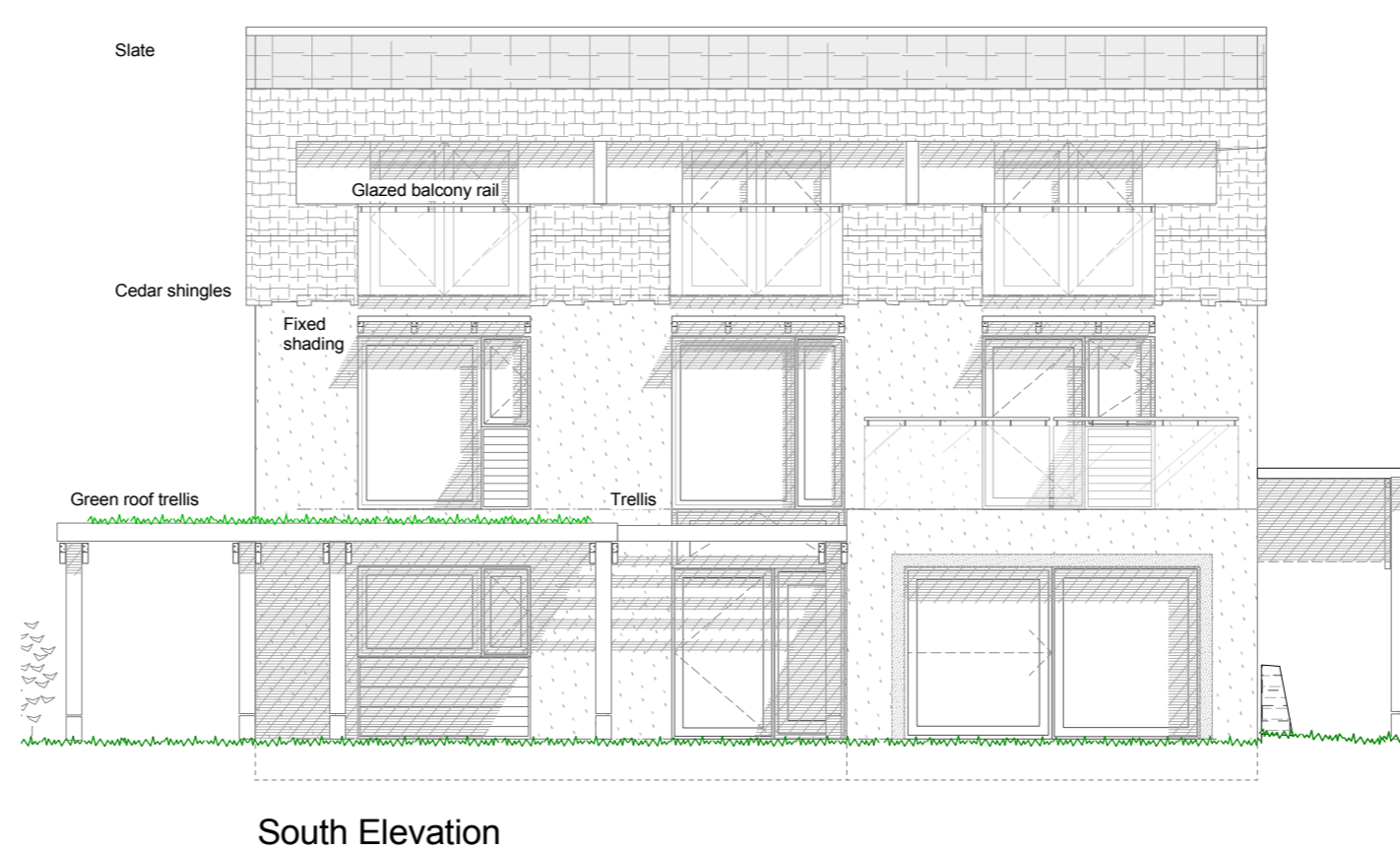
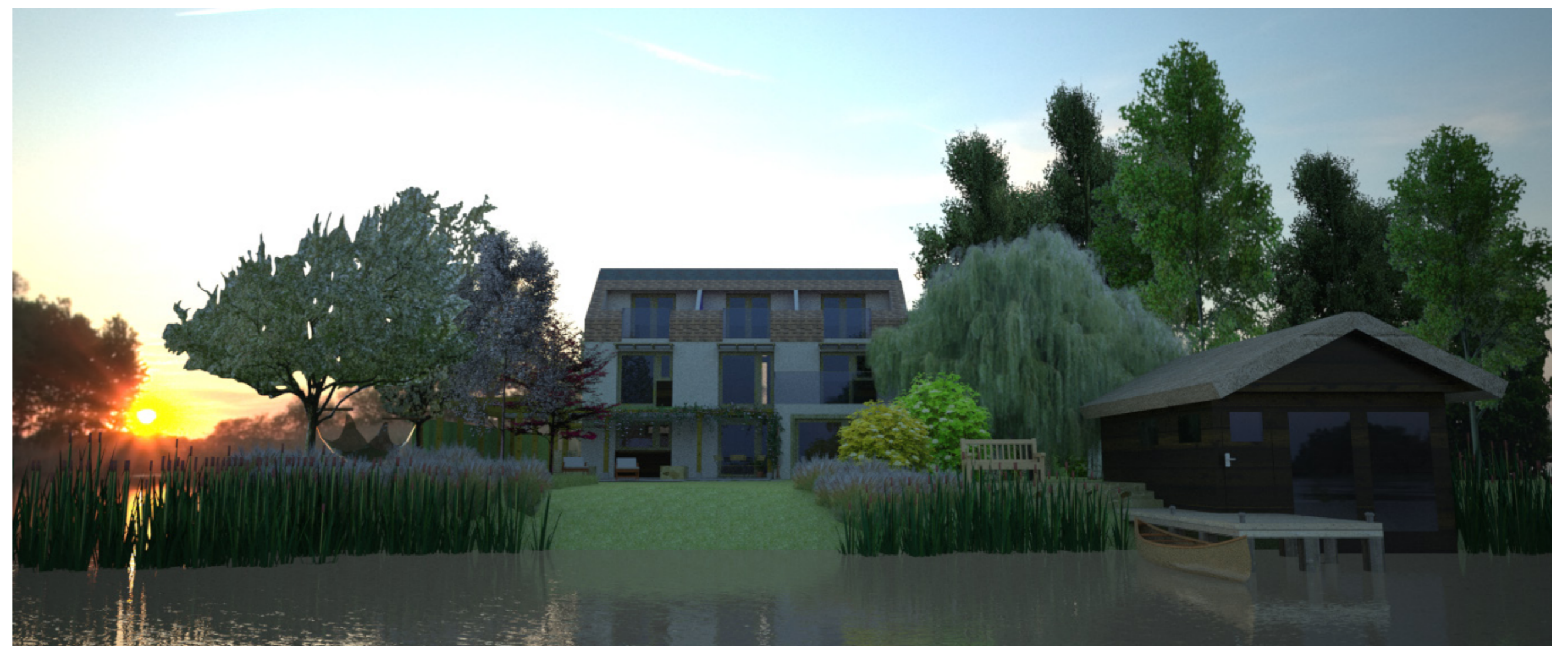
- Trees placed carefully across the plot to minimise shading when/where not wanted
- Areas of most intensive activity & with most regular maintenance needs placed closed to the home
- Compost bin placed in orchard, where compost will be used
- Functions that don't require sunlight placed to the north elevation (car parking, bulk storage etc)

#### Cycling of energy, nutrients & resources

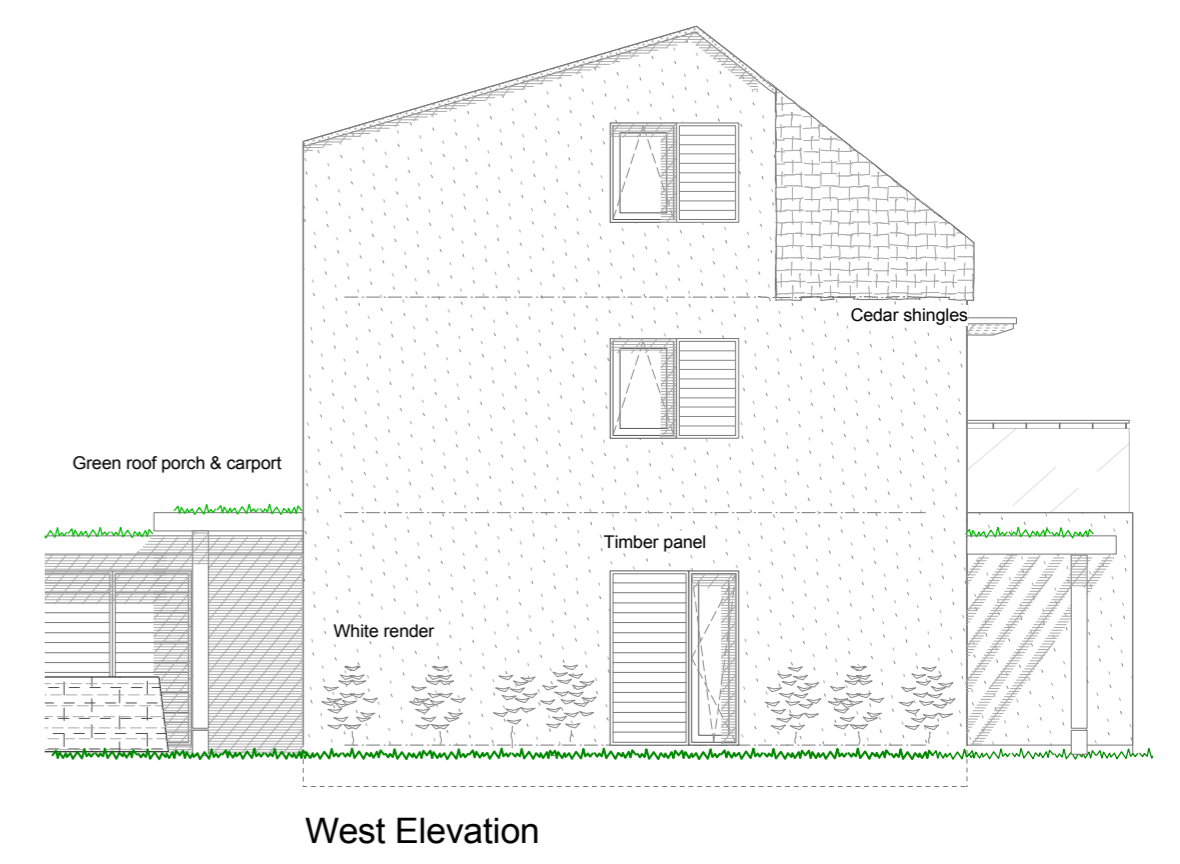
- Composting, use of wood ash on garden
- Supporting local economy helps to cycle financial resources locally

#### Encouraging Diversity

- Range of spaces to provide richer diversity of experiences for residents
- Multiple habitat types encourages biodiversity



South Elevation



West Elevation

Feel like we've been here forever and the time has flown. The house feels really calm to be in even with the kids in and out all the time. Its always comfortable warm - last night the temperature dropped suddenly even though it was a reasonable day. I didn't notice any heating coming on but it felt warm -like the heat is coming from all around. The air feels fresh too even though we closed all our windows last night. The first few days were very sunny and warm and the house was still really comfortable. It was bit of mini heatwave and I thought I'd have a restless night but slept like a baby.

We're actually spending a lot of the time outside in the garden. We've got to know 'the neighbours' - people we talked to when we were having our morning coffee sat out on the front side - I've pinched some of their coriander as they don't use it and there's loads in their garden.



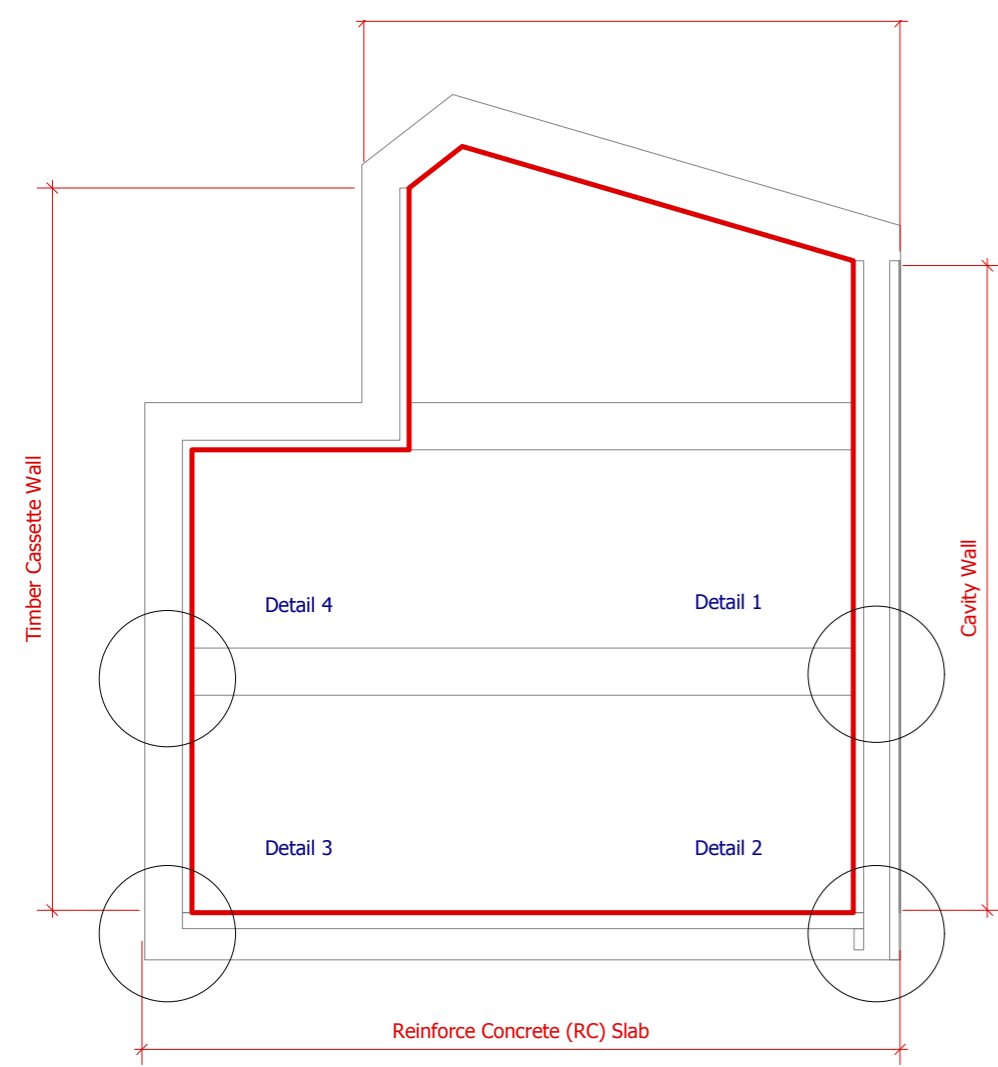
We went boating on the water - the boat house is a really neat little place too and I've been spending quite a bit of time just sitting down by the waters edge watching the grebes out in the middle of the water. In the boat and looking back at the houses there is sense of this place being the perfect community. You can see people out and about enjoying the place and activity yet it feels really quiet and secluded when we're out in the back garden area. Seen from the water its clear how the planting of the trees and hedges make each house feel its a bit lost in the wood but actually there's a lot of folk here.

The chance to play and be outdoors is great for the kids. They've spent a lot less time looking at the ipads though I did show them the read out from our electric use and explained how much less than we used at home.





## PASSIVHAUS DETAILS

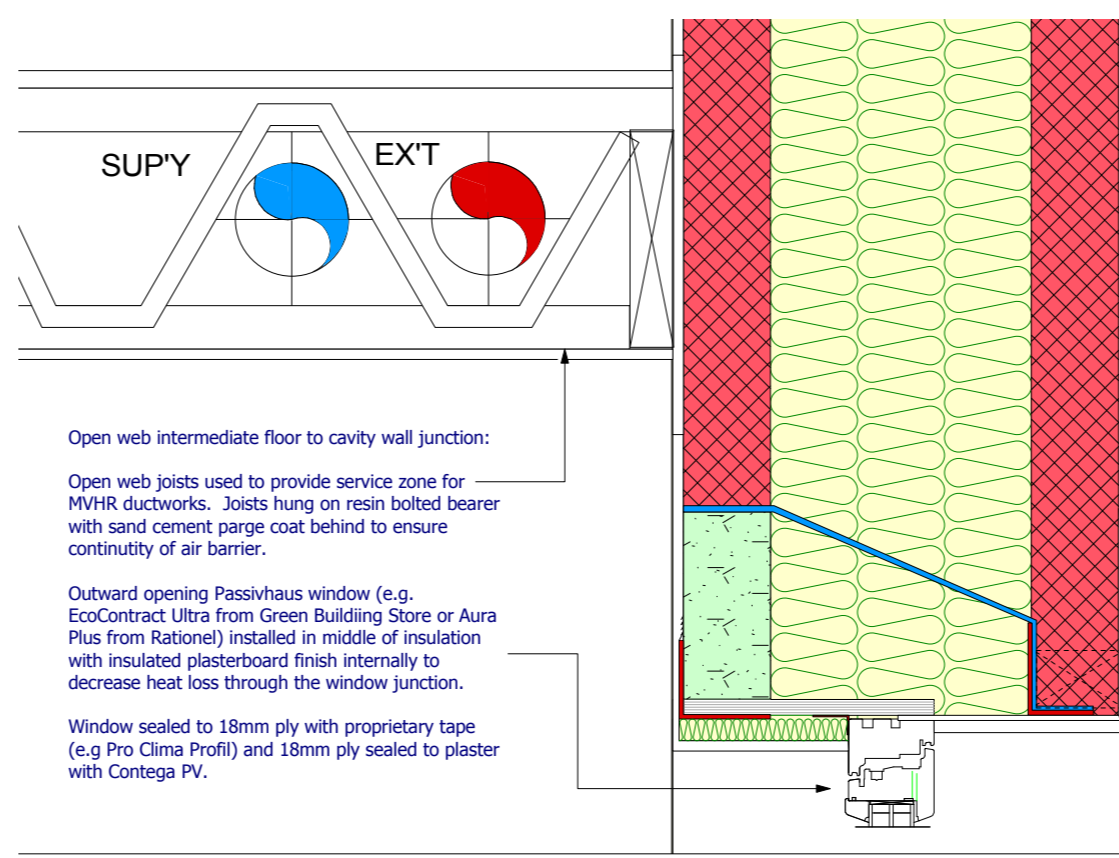


**Timber I-Beam Roof:**  
Proprietary air tightness membrane (e.g. Pro Klima DA) on 12mm OSB. Strip of membrane dressed over glu-lam ridge beam prior to laying of roof cassettes with membranes attached and subsequent sealing of the two membranes.

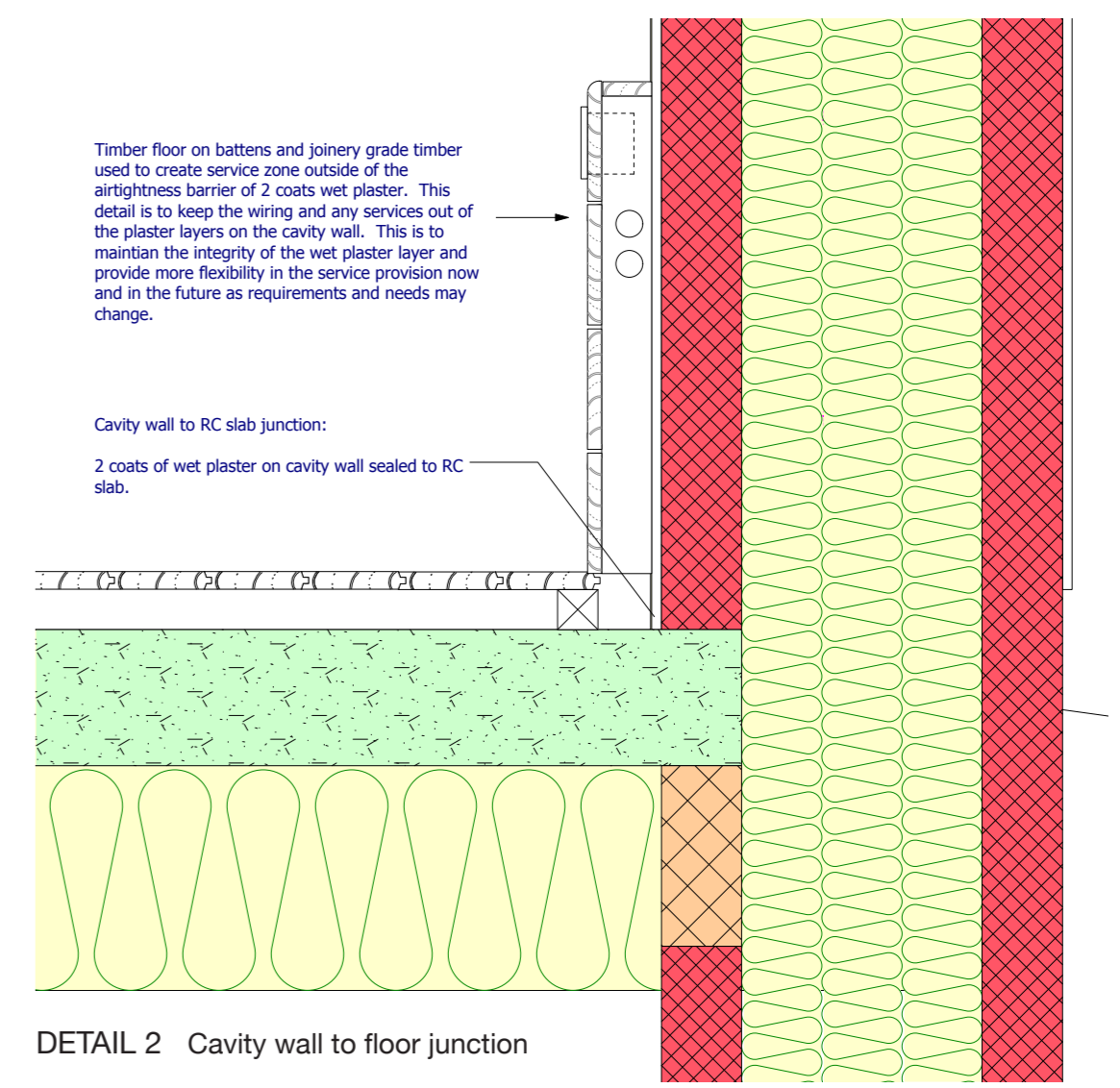
**Timber frame wall:**  
Proprietary air tightness membrane (e.g. Pro Klima DA) on 12mm OSB, with all joints taped and sealed to membrane in roof and connecting strip under wall plate at slab level.

**Cavity wall:**  
Two coats of wet plaster, continuous from RC slab, behind intermediate floor and stair stringers (as sand/ cement parge coat prior to placement of timbers) up to roof where it is sealed with proprietary fleece mesh strip (e.g. Pro Klima PV) to membrane underdrawn on roof.

**RC Floor:**  
Slab cast 100mm into inner leaf of cavity and timber frame walls. Sealed to cavity wall with 2-coat wet plaster and sealed to timber frame membrane with suitable airtightness tape.



DETAIL 1 Intermediate floor to cavity wall



DETAIL 2 Cavity wall to floor junction

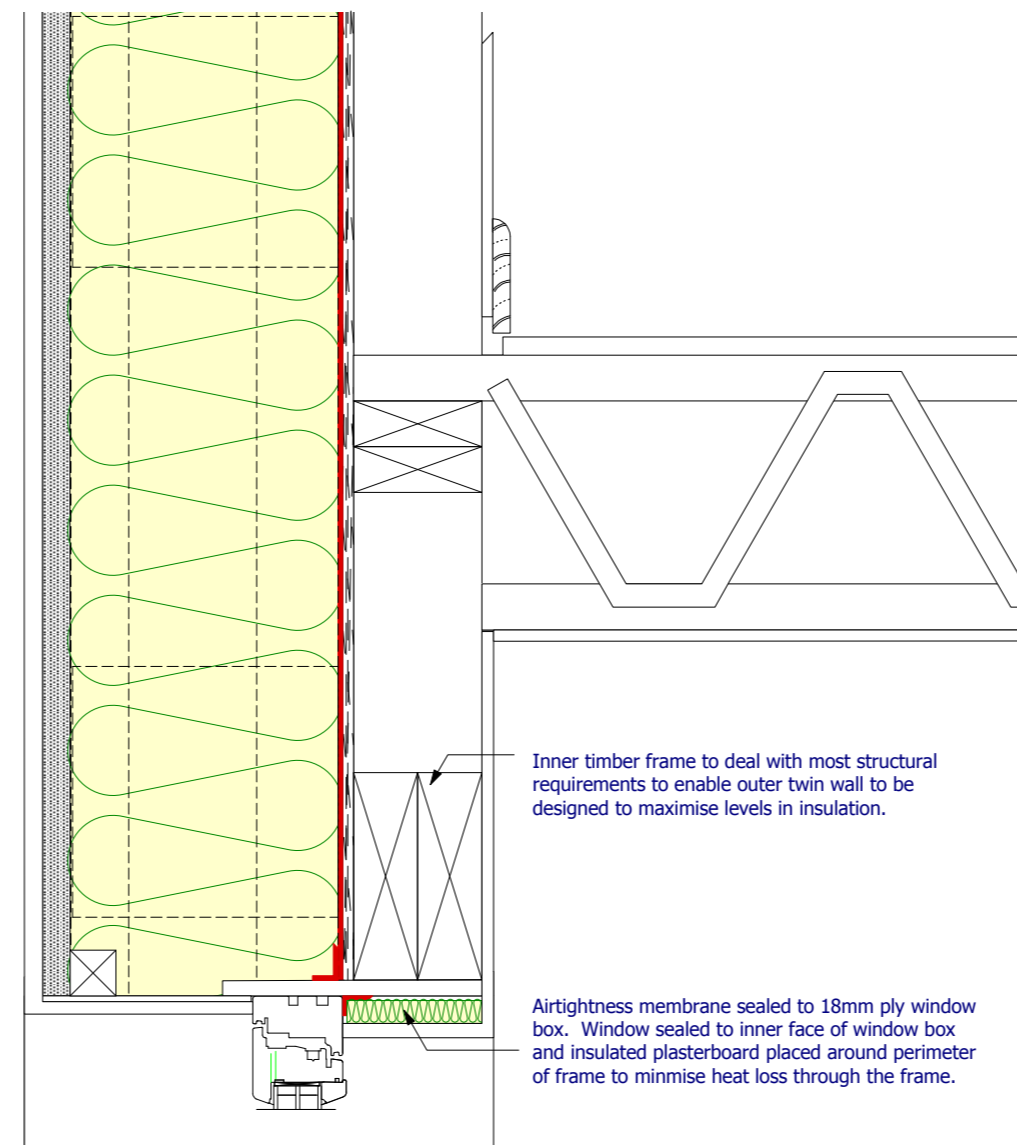
## INTERNAL ENVIRONMENT

Daylight maximised by openings that also are sized to prevent summertime overheating. This also emphasises the connection with the external landscape through the outdoor spaces around the house. Use of natural finishes internally create different levels of natural light locally allowing variety of conditions and effects.

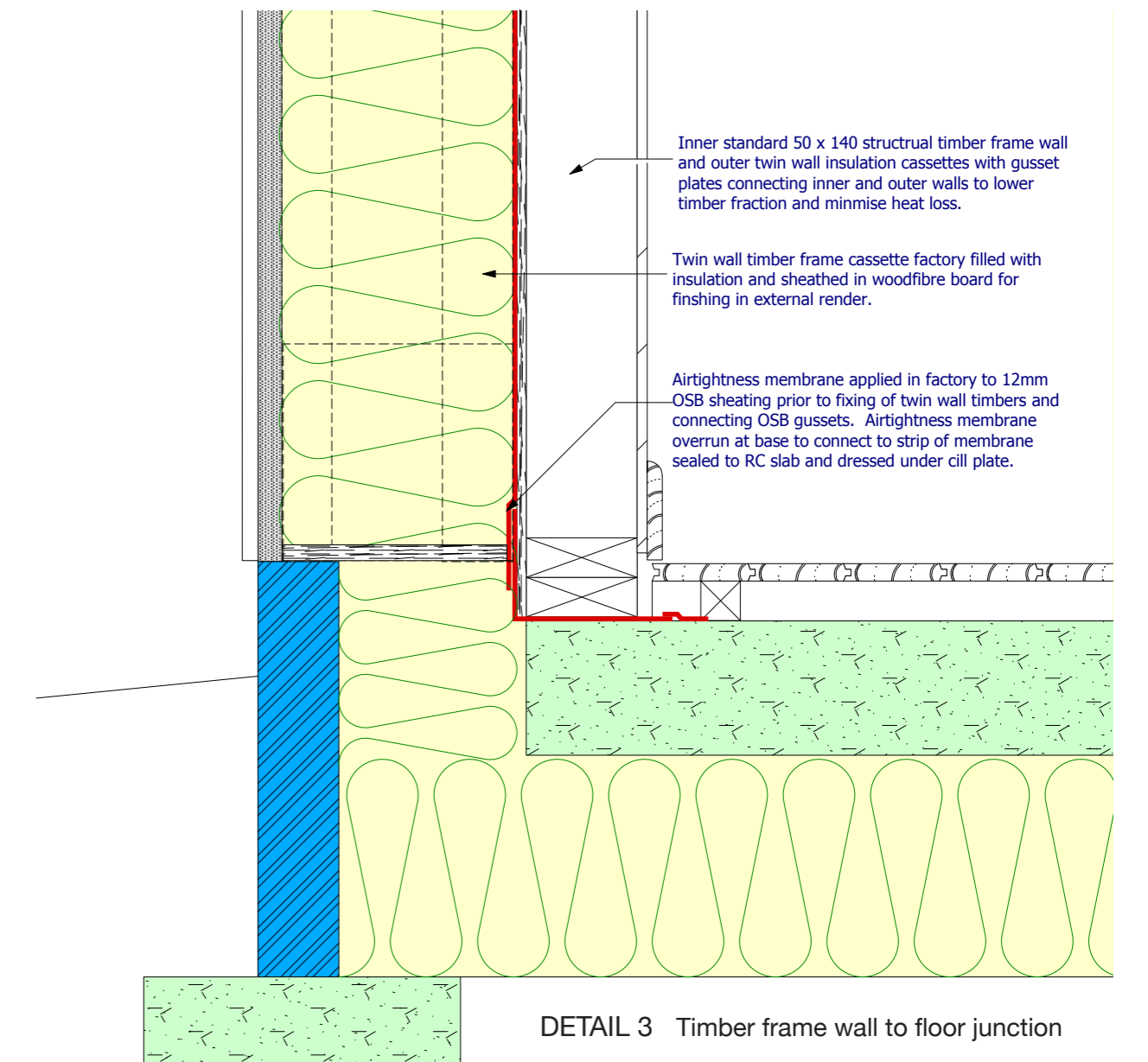
**Ventilation -** Passivhaus compliant MHRV provides a healthy indoor atmosphere through the heating seasons. In summer and good weather the windows and doors can be opened to allow free ventilation. The use of natural paints and predominance of natural materials with low VOC's internally create ensure low levels of pollutants in the indoor atmosphere.

**Acoustics -** Using timber panelling to walls inside will help keep the reverberation levels to a reasonable level leaving flexibility for hard and soft finishes in floor areas. Paving and decking finishes would reflect internal floor finishes to create continuity

**Heating -** A heat pump will provide the main space and hw heating. Potential high water table makes a ground source heat pump a high efficiency option. Solar hot water panels would be viable for a house with high occupancy. A small log burning stove would provide an occasional space heating alternative.



DETAIL 4 Timber frame wall to intermediate floor and window junction



DETAIL 3 Timber frame wall to floor junction

## THE SMART HOME

This term covers a wide variety of possibilities and the EcoHaus has focused core smart elements to provide comfort, convenience and energy savings whilst allowing the possibility to layer up additional levels of technology to further automate and provide information and entertainment systems.

A heat-pump is provided to make hot water and provide heating, optionally the feature log burner is able to supplement the heating and hot water. The Heat Recovery Ventilation (HRV) will automatically provide fresh air and regulate humidity whilst recovering >90% of the heat from the extracted air. Solar thermal systems integrated into the heat-pump are an option for those houses used more frequently. The smart, web accessible controller will regulate the temperatures whilst automatically learning through user adjustment and occupancy detection.

### The Smart Site

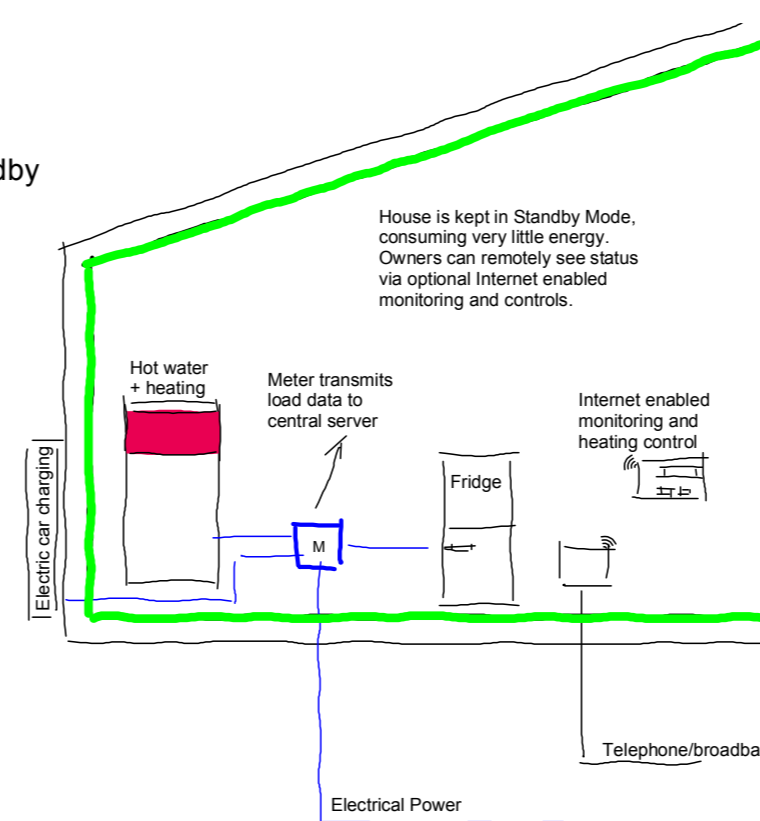
The site will only need electrical energy for the very low energy house to cover the lighting, appliances and the minimal heating loads. The smart grid features of the sites electricity network interact with the house to enable every home to have the benefits of reduced capital cost, reduced stress on the energy network and reduced energy costs. In each home the heat-pump, fridge/freezer, portable device chargers, electric/hybrid vehicle chargers will all cycle on and off to minimise use at peak demand times.

In brief the local smart network benefits are to regulate maximum demand and minimise peak loads. This will reduce site infrastructure capital costs, reduce supply losses, and allow site purchasing to reduce overall energy bills. The site sever to users web enabled mobiles or computers, and will (unlike the national smart meter roll out) allow users to be able to log into a web portal/mobile app to drill down and see real time actually electrical usage and calculated bills, detailed site and national grid information.

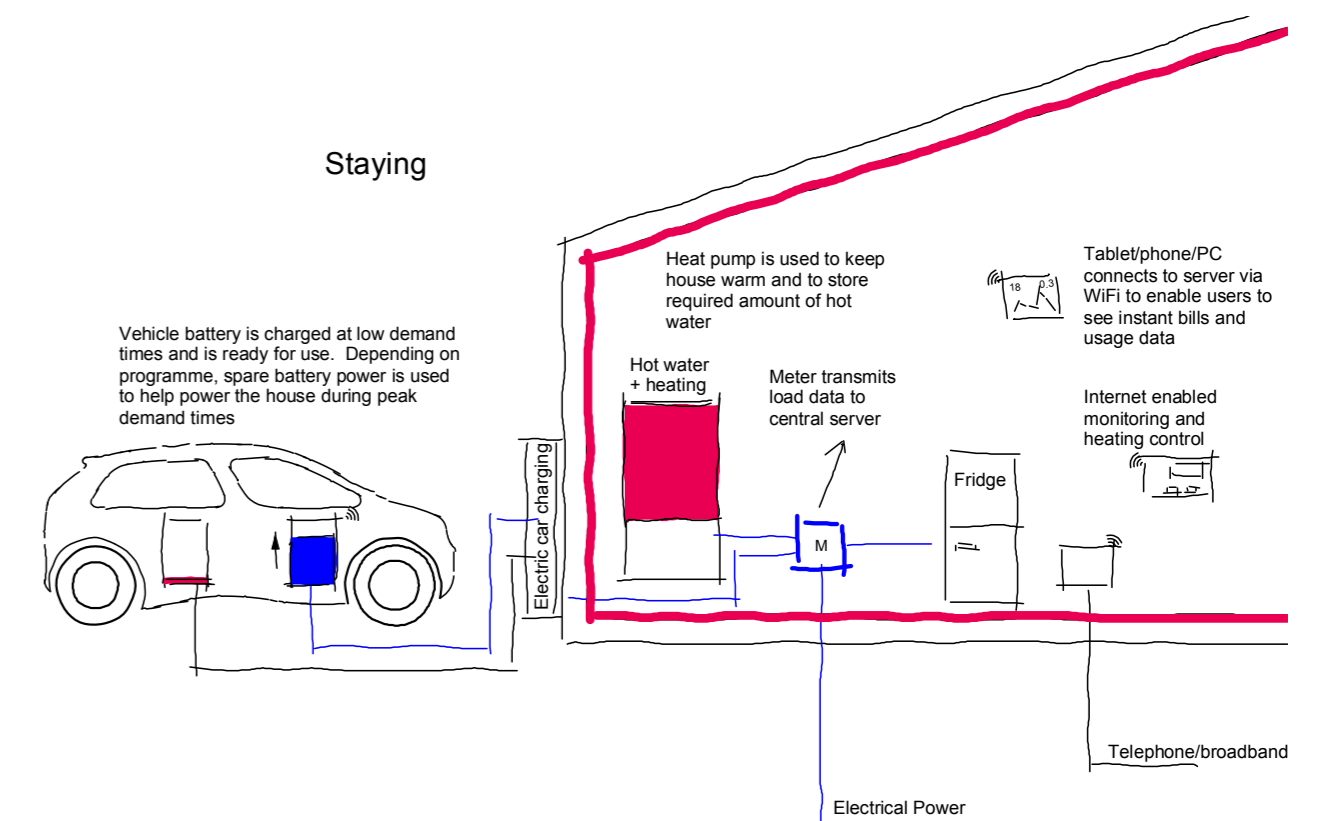
This central intelligence does not rely each house having complex proprietary smart meters and user interfaces, but instead replicates current commercial best practice.

Additionally if the site lends itself to these technologies, the house will work well from a site heat generating renewable technology such as anaerobic digestion or biomass CHP.

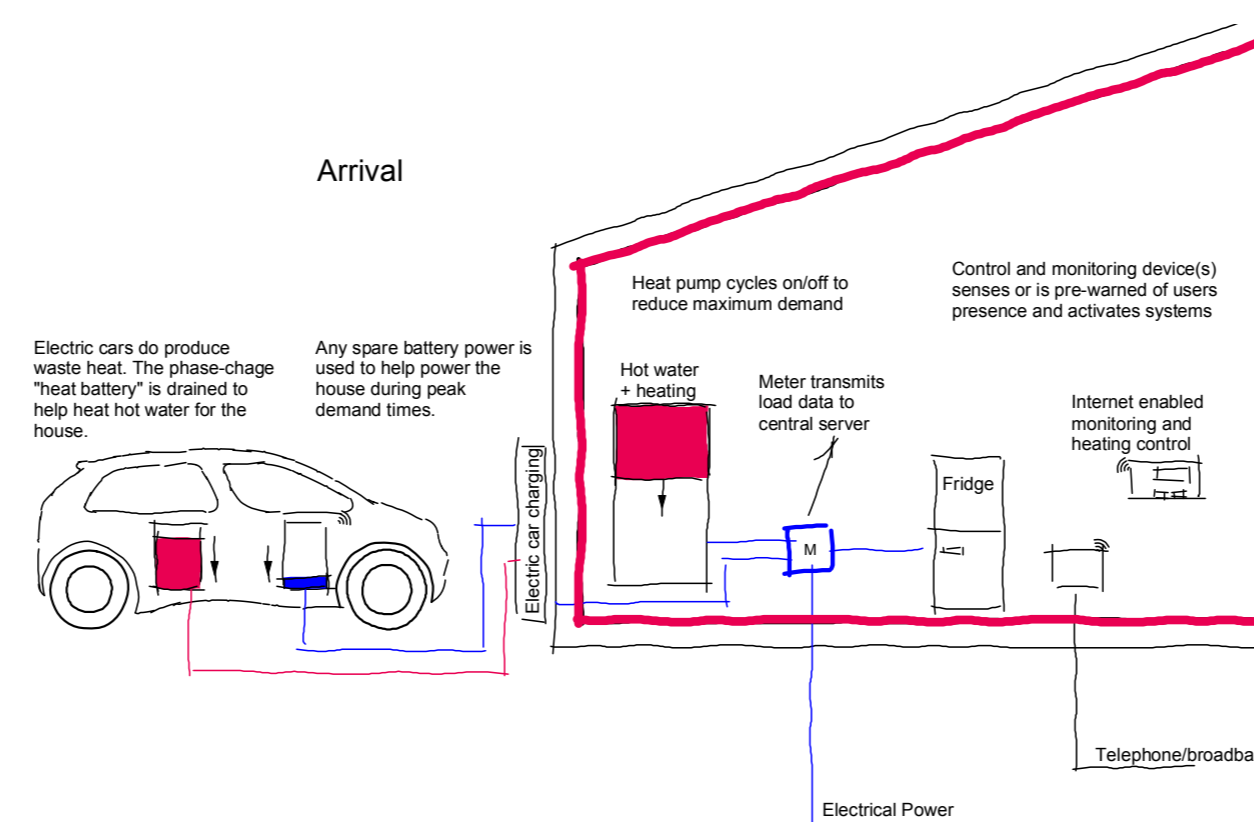
Away / Standby



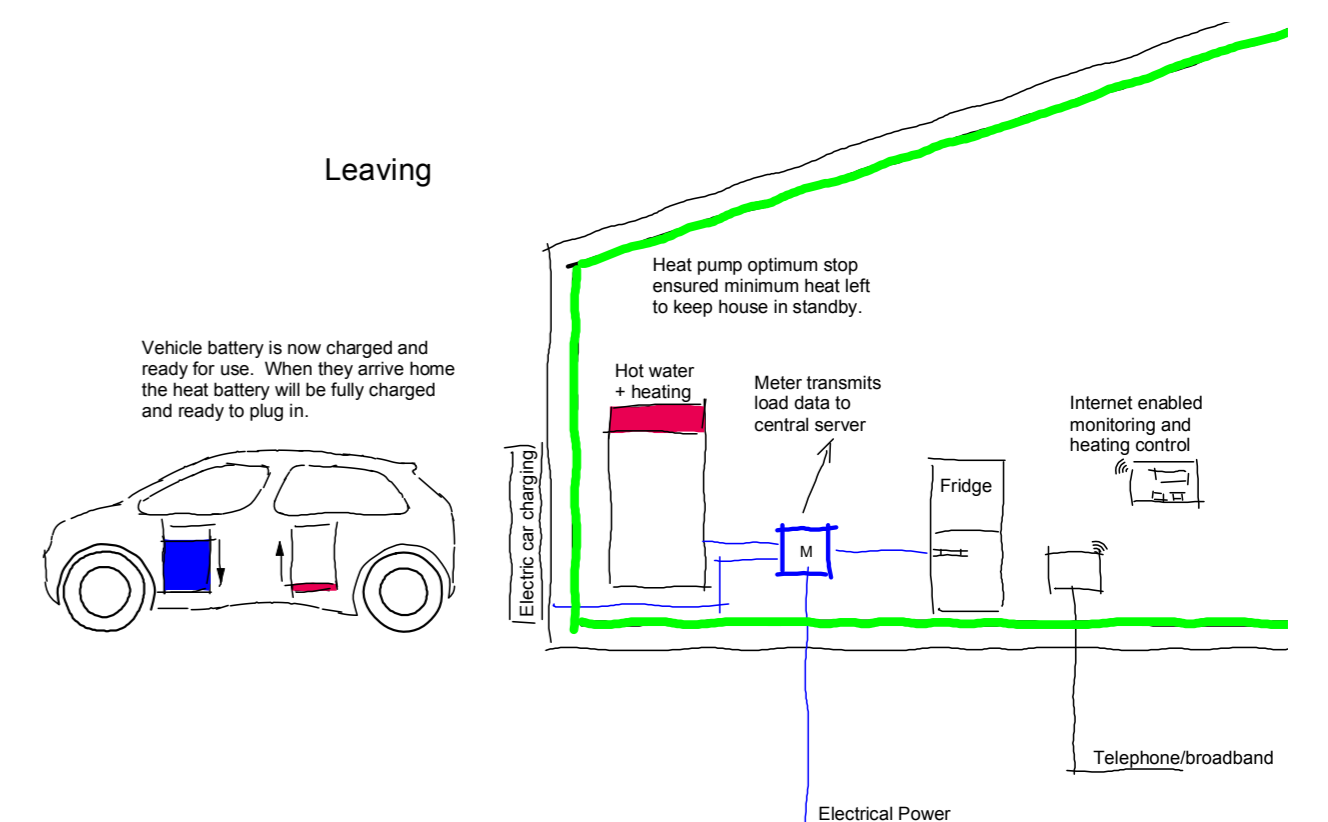
Staying



Arrival



Leaving



We're determined to make the most of it and spend the time doing our usual breakfast outside - luckily the weather was fine. There's a lot of birdlife out here and we think we saw a stoat yesterday - a first for all of us. Its going to be hard to leave here - really feel like staying another week. Looking forward to returning home but I'm definitely going to do something about those draughts in the living room and get some more insulation in the attic. I'm completely sold on this passivhaus thing. I was always a little concerned it was going to feel like being in a sealed container. Its completely the opposite and the air feels fresher inside than our own home where the drafts ensure we've always plenty of fresh air and we like having the windows open a lot.

The mix of high tec and getting back to nature works well in this place. The Smart Grid idea is a very neat way of making the being efficient



with electricity use. The connection with local traditional wood industries is great with the beautifully made hurdles used around the place and the locally made charcoal. We've been eating quite a lot from the garden too with the herbs and the fruit. Especially those little wild strawberries.

Being able to recycle things easily with a centralised place to put everything in the kitchen really helps. I see now how important the use of LED's for lighting (and they look great in the house) when you've got all the other energy demands to such a low level. The appliances are very cool looking and all seem to have the triple A rating. On my app I am told I've used less than half the energy I would have used at home even though we've not been 'trying'.

Looking forward to the next stay here..

