

PART SEVENTEEN
BUILDING ANALYSIS
Low Carbon Building & Construction Strategies

Supported By:

1. Greenbox Associates Ltd, Dr Rachel Mitchell.
Architectural Engineering Sustainability Consultancy and Certified Passivhaus Designer.

2. TIEMANN & Co Ltd, Ralph Tiemann.
Chartered Structural Engineers.



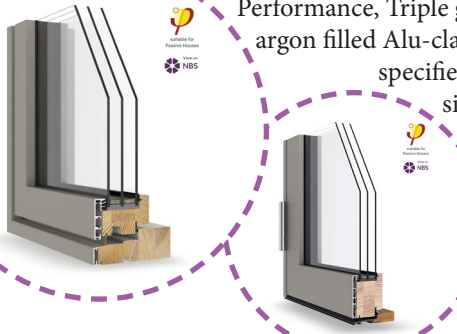
Building Analysis

Low Carbon Building & Construction Strategies
Construction

We choose materials and construction techniques with the least embodied energy, create the least waste, and use locally grown or manufactured materials to embody our buildings with an appropriate sense of place. We also design our buildings to very high insulating and air-tightness standards to ensure long-term sustainability.

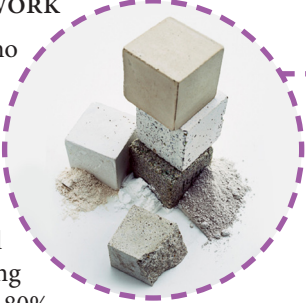
PASSIVHAUS WINDOWS & DOORS

To be Norrsken Passivhaus Certified High Performance, Triple glazed, triple sealed argon filled Alu-clad windows & doors specified throughout. Or similar approved.



LOW CARBON CONCRETE GROUNDWORK

The groundwork will be an 'Eco' no cement concrete such as Betolar Geoprime® Cement Free Concrete or Earth Friendly Concrete®, with a waterproofing admixture (such as Permatite®). This offers a high-performance, sustainable, cement-free concrete that utilises industrial side streams (blast furnace slag), reducing CO₂ emissions by up to 80%.



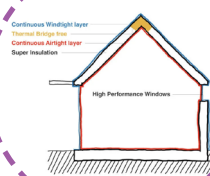
INTENSIVE GREEN & BLUE HYBRID ROOF

The combined intensive green and blue roof provides many passive benefits, such as higher thermal insulation, protection and extension of the roof life span, reduction in internal and external ambient noises, enhanced biodiversity, habitat creation, water storage (storm-water management) and controlled water release that can then be used within the building as part of the drainage/water treatment system.



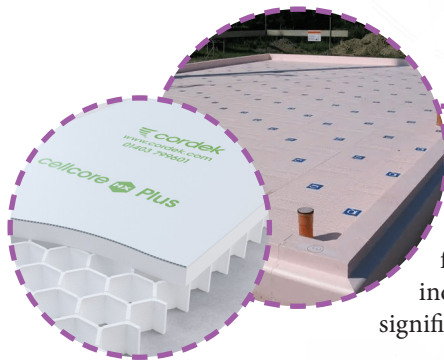
AIRTIGHTNESS APPROACH

Airtightness is achieved through a multi-pronged approach focusing on sealing CLT joints and protecting the overall structure with a continuous airtight layer (warm side) and breather membrane (cold side).



FULLY INSULATED RAFT SYSTEM

Fully insulated raft systems like ISOQUICK® EPS or Cordek Cellcore HX Plus®, provide superior thermal performance (thermal bridge free), and the concrete slab becomes a thermal battery stabilising indoor temperatures. Furthermore, its role as permanent formwork significantly accelerates the building and reduces concrete waste.



BIOSOLAR ROOF (PV)

The proposal includes installing nine mono-crystalline silicon AIKO N-Type Solar Panels with an estimated output of 6.12kWp. This combination of a dual-benefit system that increases the solar panels efficiency (~6%) due to the green roof cooling effect.



CLT ROOF, WALL & FLOOR PANELS

Prefabricated CLT panels will be unloaded and assembled on-site from the construction access route. CLT offers an environmentally friendly and lightweight yet strong alternative to a concrete slab. This solid engineered wood panel has superior acoustic and thermal performance and is also fast and easy to install, generating almost no waste on-site.



FLEXIBLE WOOD FIBRE INSULATION

Wood fibre insulation offers a sustainable, breathable, and high-performance eco-friendly, low carbon insulation made from wood waste. It offers excellent thermal insulation and superior moisture management and breathability contributing to healthier indoor air quality, while offering remarkable acoustic insulation for a peaceful living space.



LARSEN TRUSS (NARROW CHORDS)

The Larsen Truss (external insulation) System has been chosen for excellent thermal performance and low embodied carbon. Its design ensures insulation sits between narrow chords, minimising linear thermal bridging. Alternatively I-joists with thin flanges could be employed, to support the external wood fibre insulation.



OUTLINE SPECIFICATION:

Treatable Floor Area	= 560 m ²
Airtightness	= Less than 0.6 ach@50Pa
Upper Wall u-value	= 0.12 W/m ² K
Lower Wall u-value	= 0.14 W/m ² K
Roof u-value	= 0.12 W/m ² K
Floor u-value	= 0.13 W/m ² K
Triple Glazed Windows	= Whole window < 0.85 W/m ² K
Thermal Bridges	= Thermal Bridge Free Design
Frequency of Overheating	= 0% (>25°C)

DD Architects

© Copyright Didacious Designs Ltd



Land at Caldyne Park,
Turners Hill Rd,
West Sussex
RH10 4NB

Plumpton Pit Stop,
Ditchling Road,
Plumpton
BN7 3AF

Building Analysis

Low Carbon Building & Construction Strategies
External Materials

OTHER TECHNOLOGY:

- Highly Efficient Mechanical Heat Recovery Ventilation System
- Immersun unit (diverting excess PV energy)
- Nine highly efficient AIKO Photovoltaic Panels that individually provide up to 680Wp.
- 3x Tesla Powerwall plus 2x Tesla Expansion Packs, to provide a total batter storage capacity of 67.5 kWh.
- Vphase Voltage Optimisation and Low Energy LED lighting throughout.
- Building design certified independently to meet Passivhaus Classic credentials and to be a high-performance building.
- Biosolar Roof which maximises solar energy generation as green roof preserves ambient rooftop temperatures, keeping the modules at optimal output. The cooling effect increases panel output by up to 5%.

VERTICAL TIMBER CLADDING

Naturally weathered and locally sourced sweet chestnut cladding. The cladding system installed has been designed to mimic the bark on the surrounding woodland shadows and textures.

ROOT PROTECTION GRAVEL DRIVEWAY

An 'ecological' driveway grid, which protects the ground life and ecology of the site. It protects the soil against post-compression, the ground remains breathable, and it protects the groundwater from pollutants. It also provides root protection for old and trees in the area.

INTENSIVE GREEN & BLUE HYBRID ROOF

Alongside its many passive benefits (as mentioned on the last page) the rooftop will support a diverse selection of shrubs, native forbs and grasses, larger perennials and small trees. Merging the dwelling with its surrounding woodland whilst reflecting the original concept of an aged tree stump with vegetation growing on-top.

TIMBER SILLS & DETAILING

This will be accoya-treated timber, an ultra-high-performance, sustainable wood. Offering a long-lasting, durable non-toxic, 100% recyclable, lower carbon choice compared to hardwood.

LOG PILE WALLS

Dead wood collected during the extensive woodland restoration, will be utilised to form the extended wall lines that merge into the landscape. These walls will be left to naturally decay into the ground creating unique critical habitat features.

RECYCLED GABION WALLS

On-site recycled demolition waste produced from the removal of the existing fuel storage tank remains will be utilised in gabion cages for landscaping features such as soil retaining (ha-ha walling) and pond walling.

CORTEN STEEL LANDSCAPING DETAILS

Corten steel is allowed to rust in order to form a protective coating, which also allows it to develop a natural patina that blends with the surrounding landscape and materials. The key landscape features integrate this natural finish, such as edging, fencing and entrance details.

HORIZONTAL TIMBER CLADDING (SHOU SUGI BAN)

The horizontal cladding will be treated with an ancient and natural preservative method - Shou Sugi Ban. Producing a highly durable, long-lasting, fire resistant, low maintenance, non-toxic, natural pest repellent, eco-friendly cladding. This will subtly define the 'Ray Walls' whilst beautifully contrasting the naturally weathering vertical cladding.

THERMAL STRATEGY:

The Building will be **Continuously Externally Insulated** (warm roof, under slab insulation and external wall insulation). This will significantly reduce thermal bridging, condensation risk and improve the buildings overall airtightness and thermal performance.

