



Crop Based Products within Buildings ; Case Study :

Straw bale Passivhaus Hickling, Norfolk 2016

CONSTRUCTION

PROJECT TYPE: Private house

EXTERNAL FLOOR AREA: 84m² plus lean-to shed

NUMBER OF STOREYS: 1.5

ARCHITECT/DESIGNER: Fran Bradshaw of Anne Thorne Architects

CLIENT: Fran Bradshaw, Georg Herrmann

CONTRACTOR: Several (see below)

PRODUCT CONSULTANT: Several (see below)

CONSTRUCTION TYPE: Timber primary frame, straw bale

STANDARD: Passivhaus

COST: £250,000

COMPLETION DATE: 2016

SELF BUILD ELEMENT: Straw bale, second fix

SITE TRAINING: Straw bale building and plastering courses run by Straw Works

This gorgeous 1.5 storey house was designed by Fran Bradshaw of Anne Thorne Architects with consultancy from Straw Works on the straw bale walls. It has a beautiful thatched roof using traditional local thatching methods and detailing, with locally grown materials. It has an internal Douglas Fir frame which looks spectacular! The straw bale walls sit outside the frame to get a continuous wall structure for excellent insulation and air-tightness - even more important for this project because it's to the Passivhaus standard, which is much higher than UK building standards but easily achievable in straw bale construction. As ever with projects Straw Works are involved in, *natural materials are used throughout for a healthy home for the future.*



FABRIC PERFORMANCE

AIR TIGHTNESS: 1.04 @ 50 Pa (provisional)

WALLS U VALUE: 0.107

ROOF U VALUE: 0.09

Air Tightness: Straw bale construction is extremely airtight already but we haven't had funding to test this yet, so to make absolutely sure this build used jointing tapes between clay plaster and timber elements (doors, windows, floorplates etc.), in common with standard Passivhaus detailing. It's currently achieving a standard of 1.04, with more work to follow - it's expected to achieve 0.6 on completion.

Ventilation: The Passivhaus standard requires the building to have a mechanical ventilation system with heat recovery (MVHR), though straw bale walls already use all natural materials which ensure a healthy indoor air quality free of toxic off-gassing, and the hygroscopic materials also help control moisture levels in the air.

Straw bale Passivhaus

Hickling, Norfolk

2016

DESIGNERS & CONSULTANTS

ARCHITECTS: Anne Thorne Architects

SERVICES DESIGN: Alan Clarke

STRUCTURAL ENGINEER: Paul Carpenter Associates

AIRTIGHTNESS CONSULTANT: Paul Jennings Aldas

CONTRACTORS & SUPPLIERS

Insulation, raft, Foamglas upstand, brickwork, roof boarding, window installation etc.: Broadland Building Service

Timber frame design and manufacture: Timber Frame Co.

Magnesium Silcate fireboard: Ecological Building Systems

Woodfibre board insulation: Natural Building Materials

Straw bale design and build: Straw Works

Straw supply: Longhay and the Thompson brothers

Thatching: Richard Houghton

Reeds: cut in West Somerton by Richard Starling

Airtightness tapes, MHVR design: Green Building Store

Windows: Optiwin (manufactured in Auerbach, Bavaria)

Window cills: steelwork by Broadland Products

Plastering and rendering: Danny Rodwell; materials supplied by Womersley's Ltd.

Warmcel: Payne Insulation, Norwich

Electrics: Sam Sheldon, Sea Palling

Solar Thermal and plumbing: London Solar

Staircase: James Young & Georg Herrmann

The Passivhaus Standard was developed in Germany in the early 1990s. It requires that a home uses less than 15 kWh of energy per m² per year for heating, which means that for most of the year the heat from the sun and given off by lighting & appliances and the people living there is enough to heat the entire building on its own without a central heating system - giving extremely low bills!

Most Straw Works buildings come close to a lot of the Passivhaus elements, though we normally use natural ventilation and slightly simpler details to keep things more cost effective and more accessible to self builders.



MATERIALS

The designers were focused on natural materials and high performance. The primary frame is made from large-section Douglas Fir using traditional pegged mortice and tenon jointing. The straw bale walls are built on a Foamglas block plinth, and plastered with clay to the inside, lime render to the outside.

The occupants report excellent thermal and humidity comfort and gentle acoustics - they're very happy!

External doors and windows are Passivhaus certified, with triple-glazing and highly insulated frames and panels.

Materials were sourced as close to the site as possible: straw was grown locally, the reed thatch was grown a mile from the roof, and the Douglas Fir for the frame was grown in Scotland.

MONITORING

Although the situation is improving, there is still a shortage of empirical information about how moisture and heat move through straw bale walls, so the clients have installed thermal and humidity sensors at various points in the building to gather valuable real-life data to help improve the accuracy of computer modelling for the future. It's also very interesting to be able to watch precisely how the day's rain shower affects the drying out of the renders and plasters!

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