

Project Documentation

Gebäude-Dokumentation

1 Abstract / Zusammenfassung



Office building for Business and Education Centre in Devon

1.1 Data of building / Gebäudedaten

| | | | |
|---|--|---|------------------------|
| Year of construction/ Baujahr | 2017 | Space heating / Heizwärmebedarf | 12 kWh/(m²a) |
| U-value external wall/ U-Wert Außenwand | 0.116 W/(m²K) | | |
| U-value basement ceiling/ U-Wert Kellerdecke | 0.110 W/(m²K) | Primary Energy Renewable (PER) / Erneuerbare Primärenergie (PER) | 0 kWh/(m²a) |
| U-value roof/ U-Wert Dach | 0.093 W/(m²K) | Generation of renewable energy / Erzeugung erneuerb. Energie | 0 kWh/(m²a) |
| U-value window/ U-Wert Fenster | 0.82 W/(m²K) | Non-renewable Primary Energy (PE) / Nicht erneuerbare Primärenergie (PE) | 101 kWh/(m²a) |
| Heat recovery/ Wärmerückgewinnung | 87.1 % | Pressure test n ₅₀ / Drucktest n ₅₀ | 0.6 h-1 |
| Special features/ Besonderheiten | Solar collectors for hot water generation, heat recovery from wash water/grey water, rainwater utilisation | | |

1.2 Brief Description

Office building for Business and Education Centre in Devon

This small office building was commissioned by a husband and wife team, each running their own businesses. The rectangular, single-storey building has a treated floor area of 139m² and was built in a countryside location in East Devon. The long elevations of the rectangular building face east and west. West-facing clerestorey windows bring additional light into the core of the building. A wood-burning stove generates most of the heat required on very cold overcast days. The very small amount of domestic hot water is provided by an instantaneous water heater. The architectural firm Alchemilla Architects Ltd designed and contract managed the project. The building will have been inhabited for one full year in August, at which point a review of the performance of the building will be carried out.

1.3 Responsible project participants / Verantwortliche Projektbeteiligte

| | |
|--|--|
| Architect/ Entwurfsverfasser | Wiebke Rietz, Alchemilla Architects Ltd http://www.alchemillaarchitects.co.uk |
| Implementation planning/ Ausführungsplanung | Wiebke Rietz, Alchemilla Architects Ltd http://www.alchemillaarchitects.co.uk |
| Building systems/ Haustechnik | The Green Building Store http://www.greenbuildingstore.co.uk |
| Structural engineering/ Baustatik | Allwood Timber Contruction http://www.allwoodtimber.co.uk |
| Passive House project planning/ Passivhaus-Projektierung | Wiebke Rietz, Alchemilla Architects Ltd http://www.alchemillaarchitects.co.uk |
| Construction management/ Bauleitung | Wiebke Rietz, Alchemilla Architects Ltd http://www.alchemillaarchitects.co.uk |
| Certifying body/ Zertifizierungsstelle | Mead:Energy & Architectural Design Ltd www.meadconsulting.co.uk |
| Certification ID/ Zertifizierungs ID 17440_MEAD_PH_2018011 9_KM | Project-ID (www.passivehouse-database.org) ID 5451 |
| Author of project documentation / Verfasser der Gebäude-Dokumentation | Wiebke Rietz, Alchemilla Architects Ltd http://www.alchemillaarchitects.co.uk |
| Date, Signature/ Datum, Unterschrift | |

2 Photographs of views from accessible sides



East elevation, the MVHR in- and outlets visible.



North elevation, the only window, facing into a small garden area, was added at a late stage, but was made small enough to not have any impact on the overall performance



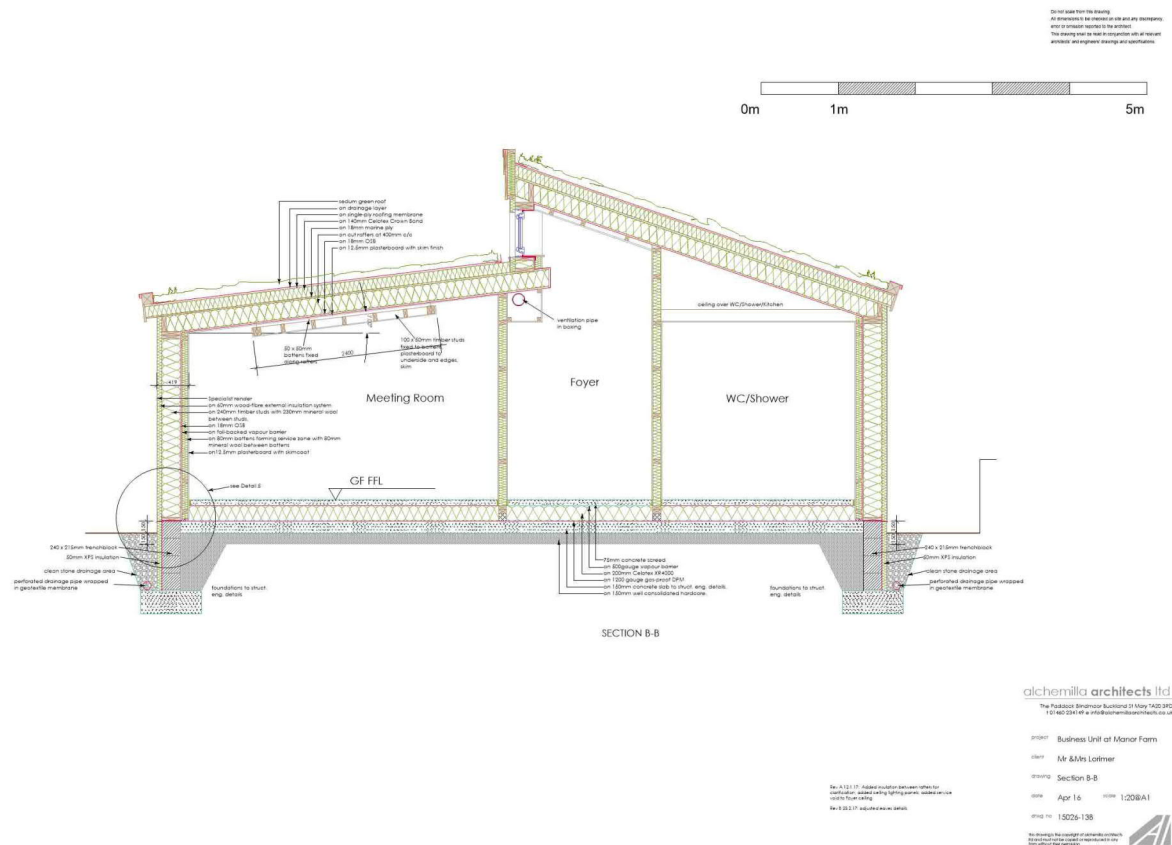
West elevation, the balustrade to the patio area was still unfinished when the photo was taken. The fenestration in this elevation helps with the overall energy balance.



Internal View of hallway, showing the light coming in from the clerestorey windows. To the left is the shower room and kitchenette, to the right is the meeting room and two offices. The hatch at high level provides access to some storage. At the other end of the hallway another hatch provides access to some of the pipework for the MVHR.

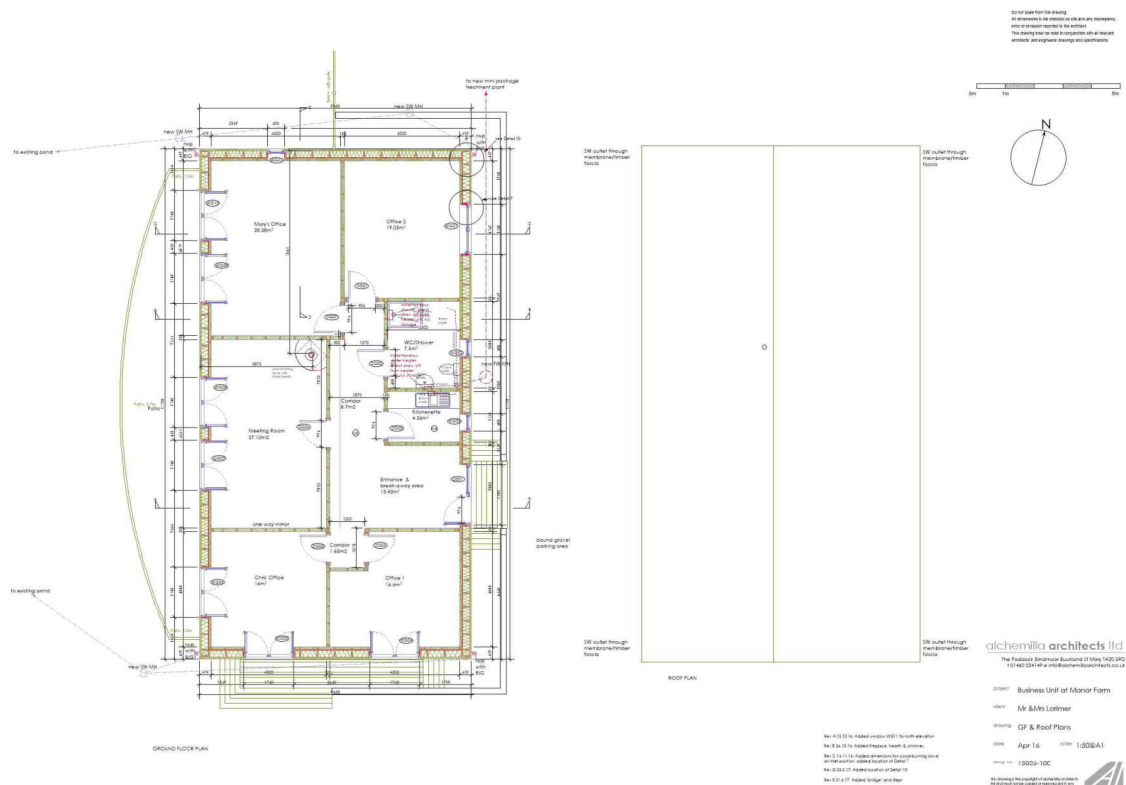
The South-facing elevation is shown on the cover page. This elevation is the most visible one when approaching the building.

3 Sectional drawing with description



Section BB is a typical section through the East-West width of the building, showing all the most important connection details as well as the clerestorey window installation arrangement. The completely continuous thermal insulation is clearly visible, as is the air-tightness layer. Each office has a central panel for the lighting to avoid having a ceiling service zone and to ensure the air-tightness layer is well protected in the long term. There is a useful area below the clerestorey windows for the central MVHR pipe.

4 Ground Floor Plan



5 Construction Details

5.1 Construction of floor slab



The concrete floor slab the day after it was poured.



The insulation is being fitted before pouring of the cement screed. The photo shows the junction with internal walls, which were filled with EcoTherm insulation to keep cold-bridging to a minimum.

Floor build-up: 75mm concrete screed on 500 gauge separating layer on 200mm Extratherm on 1200 gauge damp proof membrane on 150mm concrete slab on 150mm hardcore with sand blinding. U-value 0.110W/m²K.

5.2 Construction of exterior walls



The timber frame before the installation of the insulation.



This photo shows the mineral wool fitted between the studs, with the wood-fibre insulation in progress. The pipes are for the MVHR intake and outlet.

Wall construction: Proprietary external render on 60mm wood-fibre insulation on 239mm timber frame fully filled with Knauf Earthwool mineral wool insulation on 18mm OSB on 80mm service zone fully filled with mineral wool insulation on 12.5mm plasterboard with skim-coat. At ground level the external wood-fibre insulation is changed to XPS, to avoid damp in this area to damage the insulation. U-value: $0.116\text{W/m}^2\text{K}$.

5.3 Roof Construction



The roof after the mineral wool was fitted between the rafters, but before the foam insulation installation.



The EcoTherm insulation installation in progress.

Roof build-up: Green roof on single-ply membrane on 140mm EcoTherm on 18mm plywood on 220mm timber rafters fully filled with Knauf Earthwool on 18mm OSB on vapour barrier, taped, on 12.5mm plasterboard with skim-coat. U-value: 0.093W/m²K.

5.4 Window Sections



The windows installed with the air-tightness layer taped to the windows and the OSB. Service zone installed but before fitting of the mineral wool.



The External view of the window installation.



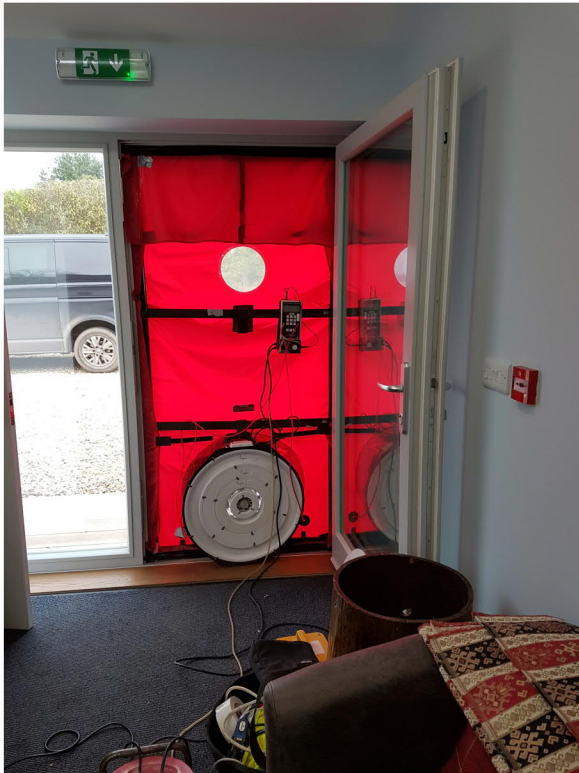
The wood-fibre insulation is being installed, overlapping the window frames.



The ceiling with the air-tightness sheeting in place.



The taping and air-tightness membrane near the clerestorey.

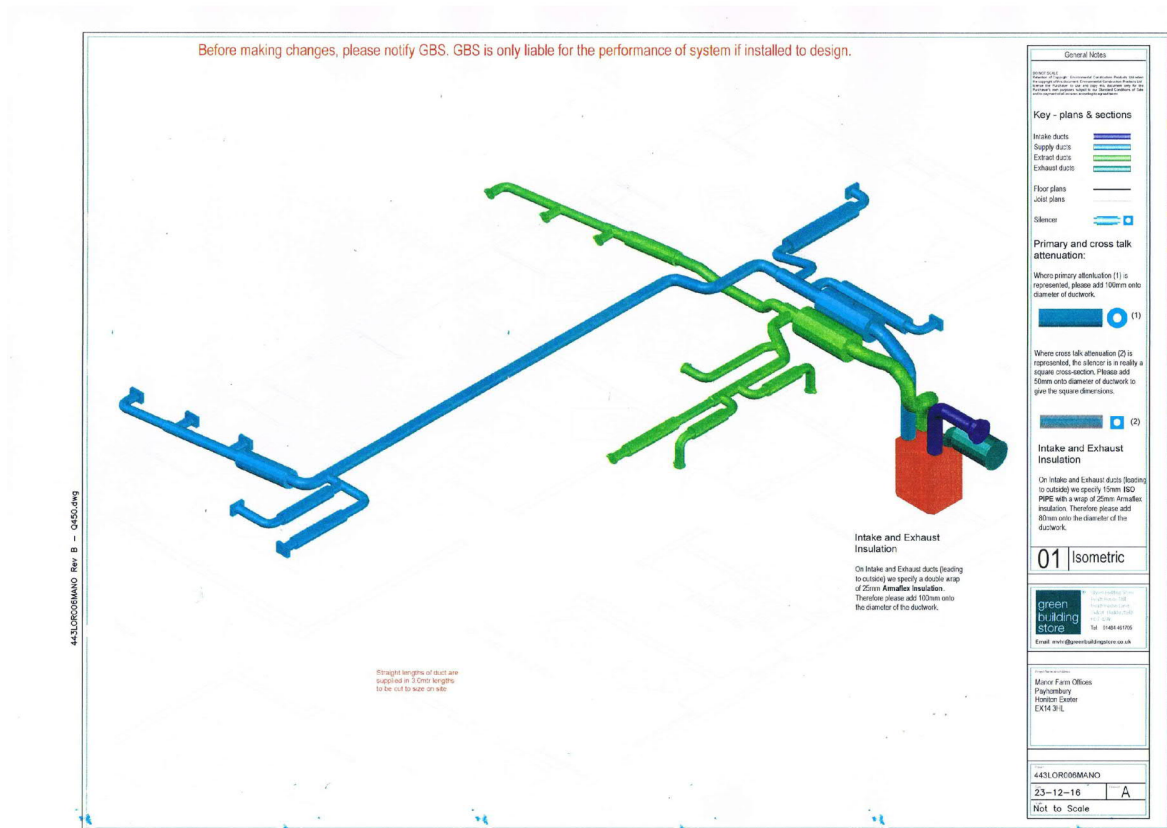


The final pressure test in progress.

Results of the pressure test on the 20/11/2017:

| AIRTIGHTNESS TEST - REPORT | | PASSIVE HOUSE | | ITS | |
|--|-------------------------------------|--|-----|---|-----|
| CUSTOMER | | SITE ADDRESS | | TEST DATE: 20/11/2017 | |
| Manor Farm Tale Payhembury Honiton Devon | | Business Unit Manor Farm Tale Devon EX14 3HL | | DATE OF CONSTRUCTION: 2017 TEST METHOD: <input checked="" type="checkbox"/> A <input type="checkbox"/> B CONTRACT REFERENCE: 138862 | |
| DESCRIPTION OF TEST: DETERMINATION OF AIR PERMEABILITY BY MINNEAPOLIS SINGLE FAN PRESSURISATION AND AND DEPRESSURISATION METHOD | | | | | |
| ENVELOPE AREA M ² | 446 | NET FLOOR AREA M ² | 146 | INTERNAL VOLUME M ³ | 363 |
| PASSIVE HOUSE TARGET | | 0.6 | | ACH@50Pa | |
| ACH @50Pa negative pressure | | 0.62 | | ACH@50Pa | |
| ACH @50Pa positive pressure | | 0.57 | | ACH@50Pa | |
| AVERAGE ACH @50Pa | | 0.6 | | ACH@50Pa | |
| SUPPORTING DOCUMENTATION | | | | | |
| ENVELOPE CALCULATION | <input checked="" type="checkbox"/> | Attached | | | |
| VOLUME CALCULATION | <input checked="" type="checkbox"/> | Attached | | | |
| TEST SHEET | <input checked="" type="checkbox"/> | Attached | | | |
| PLAN COPIES | <input checked="" type="checkbox"/> | Provided by Architect | | | |
| CALIBRATION CERTS. | <input checked="" type="checkbox"/> | Available on request. | | | |
| TEST ENGINEER : | | | | | |
| D J HICKS ATTMA REGISTERED TESTER No. 0014 | | | | | |
| TEST STANDARD : PASSIVE HOUSE STANDARD | | | | | |
| ITS Abbey Manor Business Centre, Preston Rd, Yeovil Somerset BA20 2BD Tel 01935 848569 | | | | | |

7.1 The ventilation ductwork



3D schematic plan of the ventilation ductwork.



The ductwork to the main meeting room.

The ductwork for this building was quite straightforward with a central duct running the length of the building for the supply air and a shorter run from the unit to the extract areas and rooms. Gaps under the doors provide some of the transfer of air from room to room. It was decided by The Green Building Store, who designed the system, that the meeting room should have extraction at one end and supply at the other. It is debatable however whether, by having supply ducts into this room, too much of the warm air created by the wood-burning stove gets re-supplied to this room, rather than being distributed to the other offices.

7.2 The central ventilation unit



The MVHR and pipework after installation.

A Zehnder ComfoAir Q ventilation unit was chosen and supplied by The Green Building Store. The intake and outlet pipes were kept short by placing the unit next to the east-facing external wall. The unit is very quiet, which was a concern raised by the client, who was very happy once it became clear that the unit cannot be heard in the offices. The size of the unit was kept in line with the day-to-day use by the client, catering for 4 to 6 people working in the building most days. The meeting room is used for larger assemblies of people only a few times a month. It was therefore deemed acceptable to open the patio doors on these occasions, should the air-quality become too poor. A larger unit would not only have resulted in more cost and more space being taken up, it would also create more noise.

8 Description of the heat supply system



The wood-burning stove in the meeting room

In line with the common lore of PH it was assumed that a single heat-source in one room would suffice to keep the building warm throughout on particularly cold or sunless days. A 4.5kW HWAM room-sealed wood-burning stove was installed, with a direct air-intake pipe under the floor.

9 PHPP results

| Passive House verification | | | |
|----------------------------------|------------------------------------|-----------------------|----------|
| Photo or Drawing | | | |
| Building: | New office building | | |
| Street: | Lower Tale | | |
| Postcode/City: | EX14 3HL | | |
| Country: | UK | | |
| Building Type: | office building | | |
| Climate: | South West | | |
| Home Owner(s) / Client(s): | Chris & Mary Lorimer | | |
| Street: | Lower Tale | | |
| Postcode/City: | EX14 3HL | | |
| Architect: | Alchemilla Architects Ltd | | |
| Street: | The Paddock, Blindmoor | | |
| Postcode/City: | TA20 3RD | | |
| Mechanical System: | The Green Building Store | | |
| Street: | Heath House Mill, Heath House Lane | | |
| Postcode/City: | Golcar, Huddersfield, HD7 4JW | | |
| Year of Construction: | 2016 | Interior Temperature: | 20.0 °C |
| Number of Dwelling Units: | 0 | Internal Heat Gains: | 3.5 W/m² |
| Enclosed Volume V _e : | 535.0 | | |
| Number of Occupants: | 6.0 | | |

| Specific building demands with reference to the treated floor area | | use: Monthly method | |
|--|---|---------------------|--------------------------|
| | Treated floor area | 139.5 m² | |
| Space heating | Annual heating demand | 12 kWh/(m²a) | 15 kWh/(m²a) yes |
| | Heating load | 13 W/m² | 10 W/m² - |
| Space cooling | Overall specific space cooling demand | kWh/(m²a) | - - |
| | Cooling load | W/m² | - - |
| | Frequency of overheating (> 25 °C) | 1.3 % | - - |
| Primary Energy | Space heating and cooling, dehumidification, DHW, household electricity | 101 kWh/(m²a) | 120 kWh/(m²a) yes |
| | DHW, space heating and auxiliary electricity | 66 kWh/(m²a) | - - |
| | Specific primary energy reduction through solar electricity | kWh/(m²a) | - - |
| Airtightness | Pressurization test result n ₅₀ | 0.6 1/h | 0.6 1/h yes |

* empty field: data missing; '-': no requirement

| | |
|----------------|------------|
| Passive House? | yes |
|----------------|------------|

| | | | | | | | | | | | | | |
|---|---|-------|---------------------------|--|--|----------|------------|--|--|----------|------------|--|--|
| We confirm that the values given herein have been determined following the PHPP methodology and based on the characteristic values of the building. The PHPP calculations are attached to this application. | <table style="width: 100%;"> <tr> <td style="width: 50%;">Name:</td> <td style="width: 50%;">Registration number PHPP:</td> </tr> <tr> <td style="border-bottom: 1px solid black;"></td> <td style="border-bottom: 1px solid black;"></td> </tr> <tr> <td>Surname:</td> <td>Issued on:</td> </tr> <tr> <td style="border-bottom: 1px solid black;"></td> <td style="border-bottom: 1px solid black;"></td> </tr> <tr> <td>Company:</td> <td>Signature:</td> </tr> <tr> <td style="border-bottom: 1px solid black;"></td> <td style="border-bottom: 1px solid black;"></td> </tr> </table> | Name: | Registration number PHPP: | | | Surname: | Issued on: | | | Company: | Signature: | | |
| Name: | Registration number PHPP: | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| Surname: | Issued on: | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| Company: | Signature: | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

10.1 Overall construction costs: £1424.00/m². This is a very good cost per m² ratio, with building prices in the area currently generally ranging from £1500 to £2000/m².

10.2 Building costs: £197,923.54