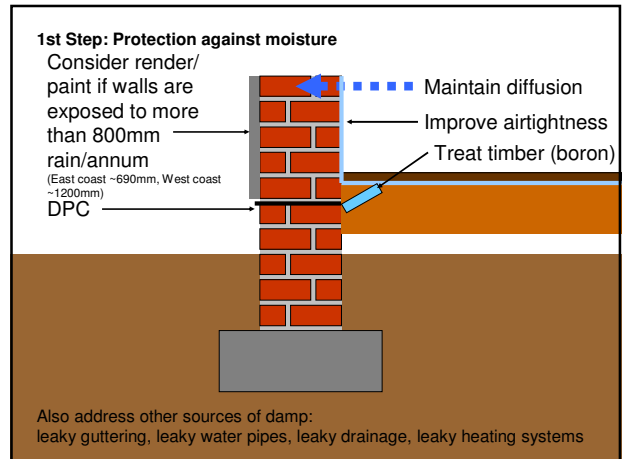
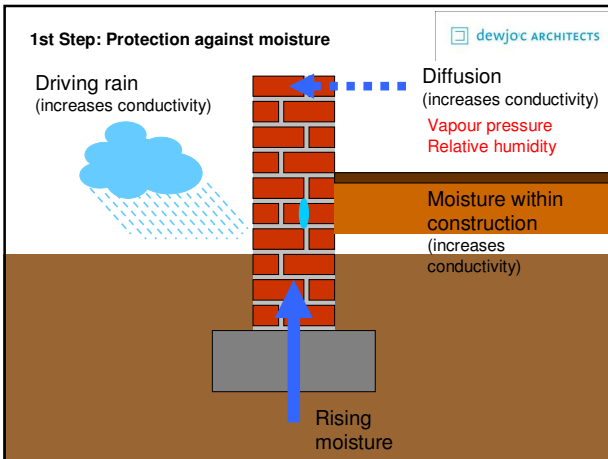
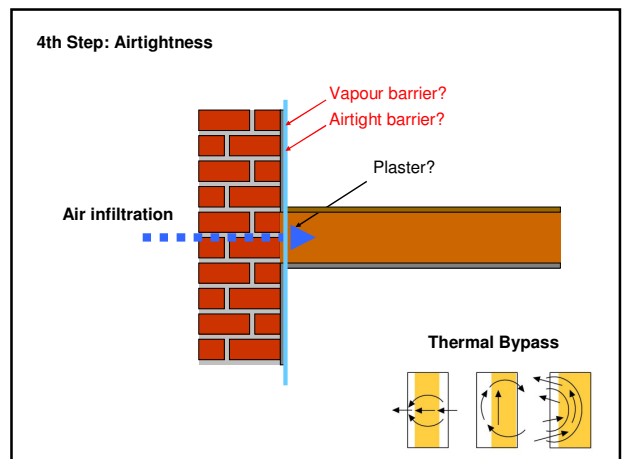


Procuring Passivhaus: Experiences from working with an RSL

Retrofit

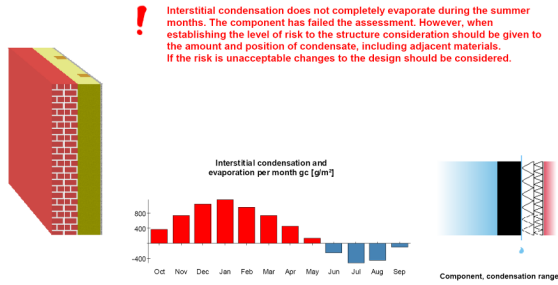


Internal or External



5th Step: Moisture Diffusion

Calculation according to BS EN ISO 13788

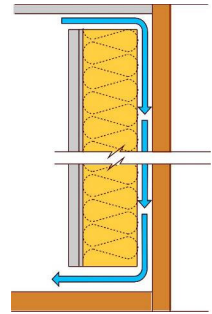


Closed Loop: Internal Insulation

The problem is poor airtightness

....which leads to convection

Condensation, mould growth



PHI [2000]

WUFI Analysis (Kunzel 1996):

External Insulation

- Reduces absorption of rain water
- Mineral wool dries out twice as fast as EPS (2yrs rather than 4yrs)
- Mineral wool should not be installed on wet masonry walls (greater risk of damage if a frost is likely)
- If a frost is likely consider EPS insulation or cladding rather than rendering
- Insulation thickness has little influence (mean temperature compensates for increased diffusion resistance)

Hens [2002]

Example

140m masonry
150mm insulation
15mm render

U-value 0.2 W/m²K

Hens [2002]

- 2mm gap behind = 12% increase in heat loss
- 7.5mm gap behind = 203% increase in heat loss
- 15 mm gap behind = 520% increase in heat loss

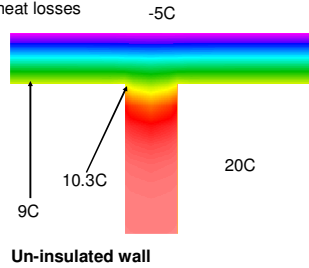
Fully adhered systems offer greatest chance of success

Continuous perimeter adhesive with two central blobs per board second best option

Thermal Bridging

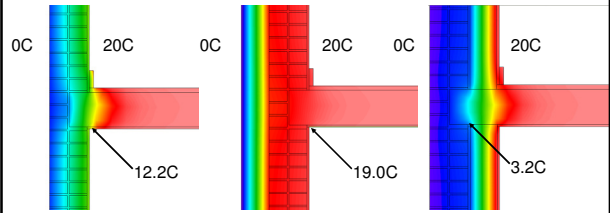
2nd Step: Reduce Thermal Bridges

- Primary purpose: to preserve structure
- Secondary purpose: to prevent condensation and mould growth
- Tertiary purpose: to reduce heat losses

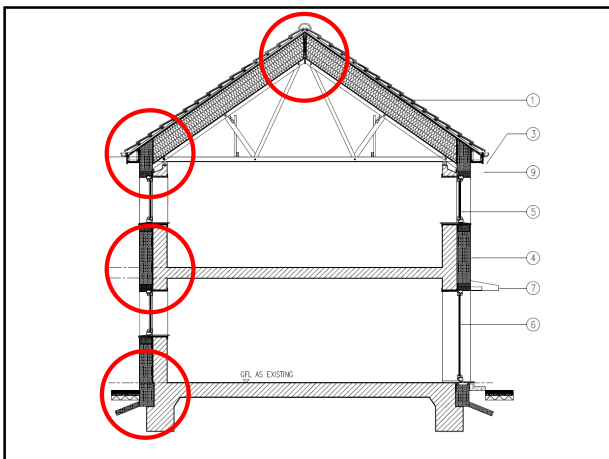


Surface temperatures to be determined in accordance with BS EN 13788:2002

2nd Step: Reduce Thermal Bridges
Intermediate Floor



Details



edge insulation from 750mm to just 450mm vertical insulation below ground is an increase in CO₂ of 0.7kgCO₂/m².a.

Omission of all the insulation below ground increases CO₂ by > 2.1 kgCO₂/m².a



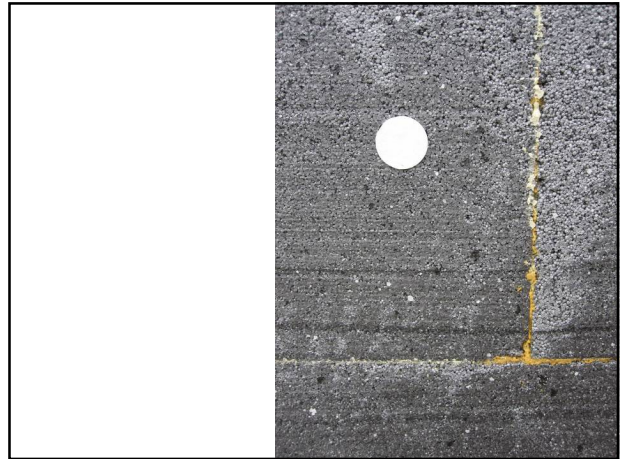
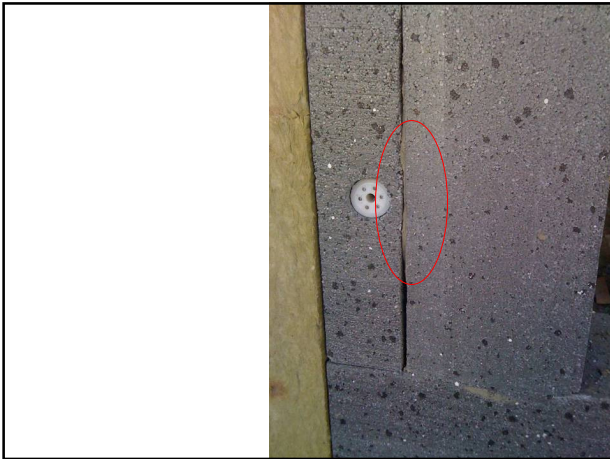
Floors:

- Existing insitu concrete ground floor would need to be upgraded with 75mm insulation to achieve 80% CO2 emissions reduction
- Most cost effective insulation thickness = 20mm (impact upon ceiling height, door height and staircases (as a trip hazard) would also need to be taken into consideration)

....To achieve the same whole house performance – as achieved with 20mm insulation to the floor – by using the roof and the walls alone both building elements would require upgrading to a U-value of 0.07 W/m2K - to achieve this U-value we have needed 500-650mm of insulation !!





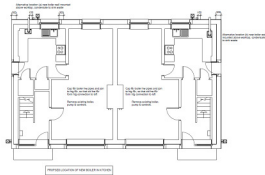
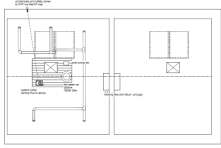


Services



MVHR

Siting the flue



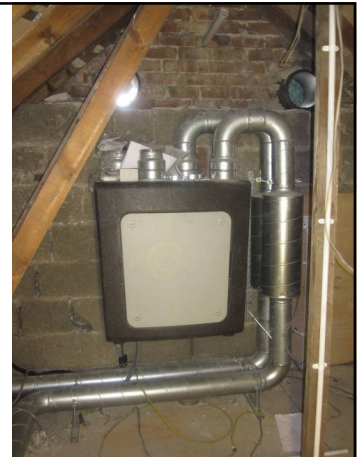
- Locating gas flues / supply/exhaust:
- BS EN 13141 Ventilation for residential ventilation (Pt1. Externally and internally mounted air transfer devices)....
-ended up using Dutch guidance for siting of air inlets as it was more appropriate
- (*Air Infiltration Review, Vol19, No 3, June 1998*)

90% efficient SAPQ

12% reduction due to defects in testing method

= 73%

Passivhaus Certified MVHR Units
 > 90% efficient would reduce CO2 emissions by > 0.4 kgCO2/m2.a



Filter Types

- 'external' filter box = filter change ~ every 3 months (but can need custom insulation ££)
- F7 grade filter on supply rather than F5 (in accordance with PassivHaus best practice : on grounds of air quality)
- Pragmatically you can allow site conditions to determine regularity filter changes (monitor dirt)

MVHR: a frost valve to draw warm air into the unit from the loft space, instead of a separate pre-heater

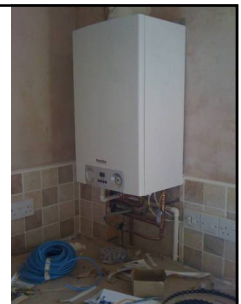
Automatic extract using humidity considered good idea for tenants

dutch guidance



There's gas in the kitchen
 what am I gonna do?

- Fear: Gas supply, airtight building, carbon monoxide
- Boiler – balanced flue vented (no problem)
- Cooker/hob = BS 5440-2 (Specification for the Installation and Maintenance of ventilation provision for gas appliances)



- BS 5440-2: Table 6 gives the ventilation requirements for “Domestic oven, hotplate, grill or any combination thereof” for a range of room volumes, and for room volume > 10m³ the requirement for permanent air vent size is “nil”.
- The volume of our smallest kitchen here is 15m³ (and the house 160m³) so there is no requirement for additional air supply.
- Openable windows are provided in all kitchens.

Solar Hot Water

EST and Department of Energy and Climate Change “SHW saves £50 per annum and maintenance costs are very low”.

Maintenance

Breakdown of Costs at todays prices:

Annually:

Clean Solar Thermal Panels and carry out annual servicing as recommended by manufacturer:
Pro-rata cost to use powered access platform (insistence by Health and Safety unit) @ £400 per day =
£20.00

Annual service = **£65**

Check all safety valves and repressurise Unvented Cylinder = **£20.00** . (This assumes that **NO replacement parts/safety valves are required** - the ‘blow-off’ safety valves are notorious for ‘sticking’ when manually lifted to check operation during this annual safety check, which could lead to either stripping down, cleaning and rebuilding, or more likely, renewal of the sticking valve - therefore seek a Five Year Guarantee on these manufacturers supplied valves during the tendering procedure to supply Unvented Cylinders).

- TOTAL ANNUAL COSTS = **£105.00**

Every FIVE YEARS (Additional to Standard Annual Service)

Depressurise and drain down Solar Thermal panels and connecting pipework, refill with Solar Thermal Glycol mixture and repressurise to manufacturers specification.

Labour @ **£35.00**

Glycol @ **£25.00**

- FIVE YEARLY ADDITIONAL COSTS = **£70.00**

Average Costs per Annum over Five Years = £105.00 + (£70.00 / 5) = £119.00 + VAT @ 20% (from 4th Jan 2011) =
£142.80

RSL maintained SHW costs **£92.80 more per annum over 5 years**

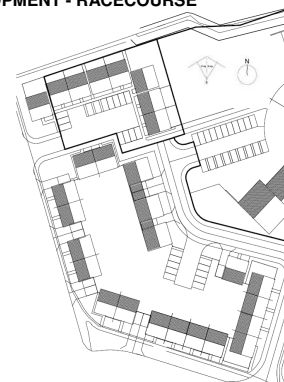
Occupants

- Training and information
- User guide
 - Heating (and holidays)
 - Cooling
 - Ventilation (and odours)
 - Hot Water
 - Clothes drying (and tumble dryers)
 - Airtightness (and cat flaps)
- Tenancy contracts

Racecourse Estate


28 UNIT PASSIVHAUS DEVELOPMENT - RACECOURSE

Before



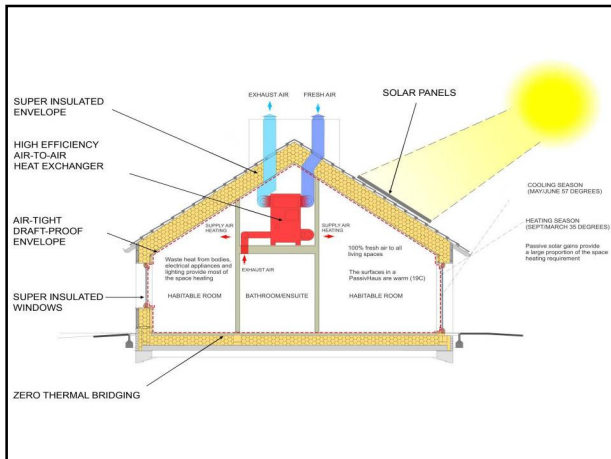
House Types

- Type 1S
- Type 1Sa
- Type 1N
- Type 2B3P (not PassivHaus)
- Type 2B4P (not PassivHaus)



The toughest units set the fabric performance standard


House Type



Things to watch out for

Doors and Windows

- Secured by Design
- Accessibility
- Threshold
- Ironmongery




Standard Centre Pane U-value
 42mm unit (4, 14, 4, 14, 4)
 0.6 W/m²K Argon

Laminated Glass Centre Pane U-value
 42.4mm unit (4, 12, 4, 12, 3/0.38/3)
 0.7 W/m²K Argon

Loss of 0.1 W/m²K!

Therefore either

- Choose new supplier with wider units
 48mm unit (4, 18, 4, 18, 3/0.38/3)
 0.6 W/m²K Argon, or
- use Krypton (0.5 W/m²K)



We chose Krypton.....

But did you know wider units can also achieve
 0.5 W/m²K using Argon

But it needs 60.4mm unit
 (4, 20, 4, 20, 3/0.38/3)

This is not currently available in the market
anywhere!



Timber fraction

Timber framers design vs ours:
 79% more timber

Timber framers design vs
 permissible design:
 41% more timber

Effective centres:

Theory: 600mm
 Design: 700mm
 Framers: 384mm

