# PYC

Jasper Meade

@pycgroup

www.pycgroup.co.uk

# Timber frame with woodfibre and Warmcel Insulation

- Introduction to PYC
- The development of energy efficiency with timber frame systems
- System materials – Woodfibre insulation and Warmcel cellulose fibre insulation – airtightness and windtightness
- PYC offsite manufacturing
- Quality and monitoring

# PYC projects over the years







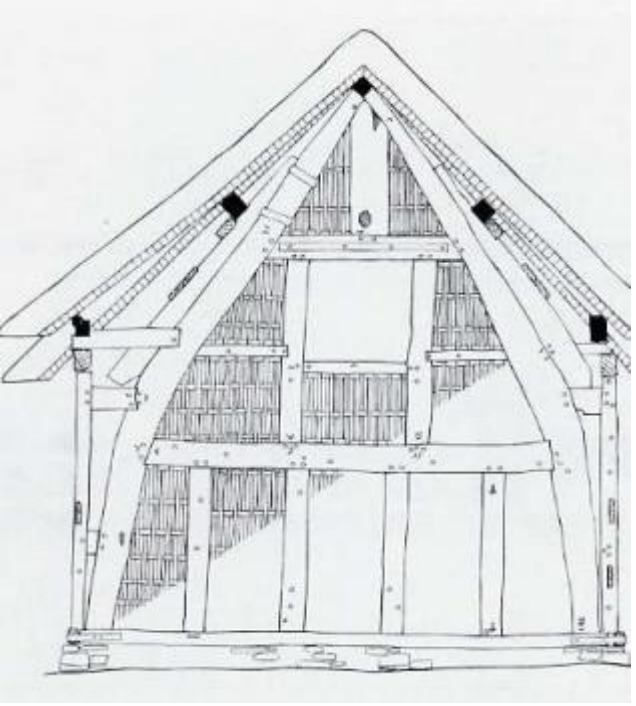







# ‘The House Building Factory’

# PYC House Building Factory and Passivhaus Offices




# Timber Frame
## systems & energy efficiency Developments

*Traditional building methods*

# Developing demands - improving detailing and performance

90mm & 140mm CLS Systems

# Additions to the CLS single stud systems

- Increasing depth
- Cutting cold bridging

50mm x 50mm to ceilings

50mm x 50mm to walls

Stick built frame wrapping steel portal

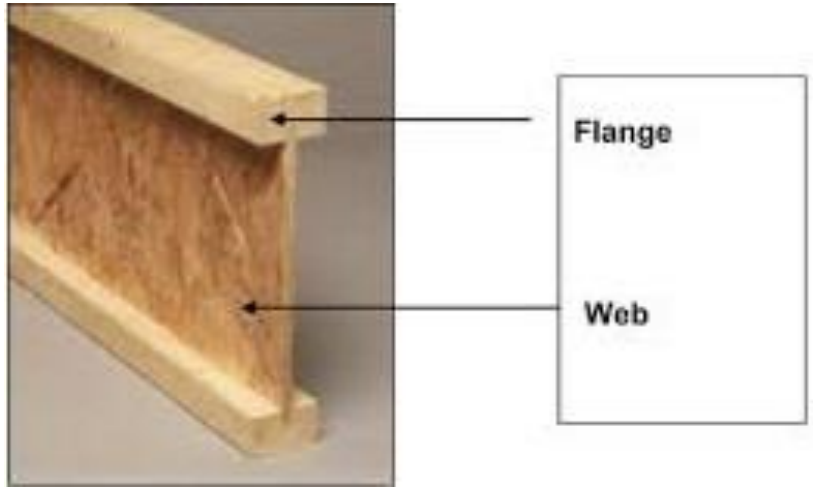
# Posi joist systems

Cold bridging issues through steel

# Twin frame and Larsen truss stud systems

- Separation of inner and outer walls
- reduces cold bridging
- More on site works

# I-beam systems

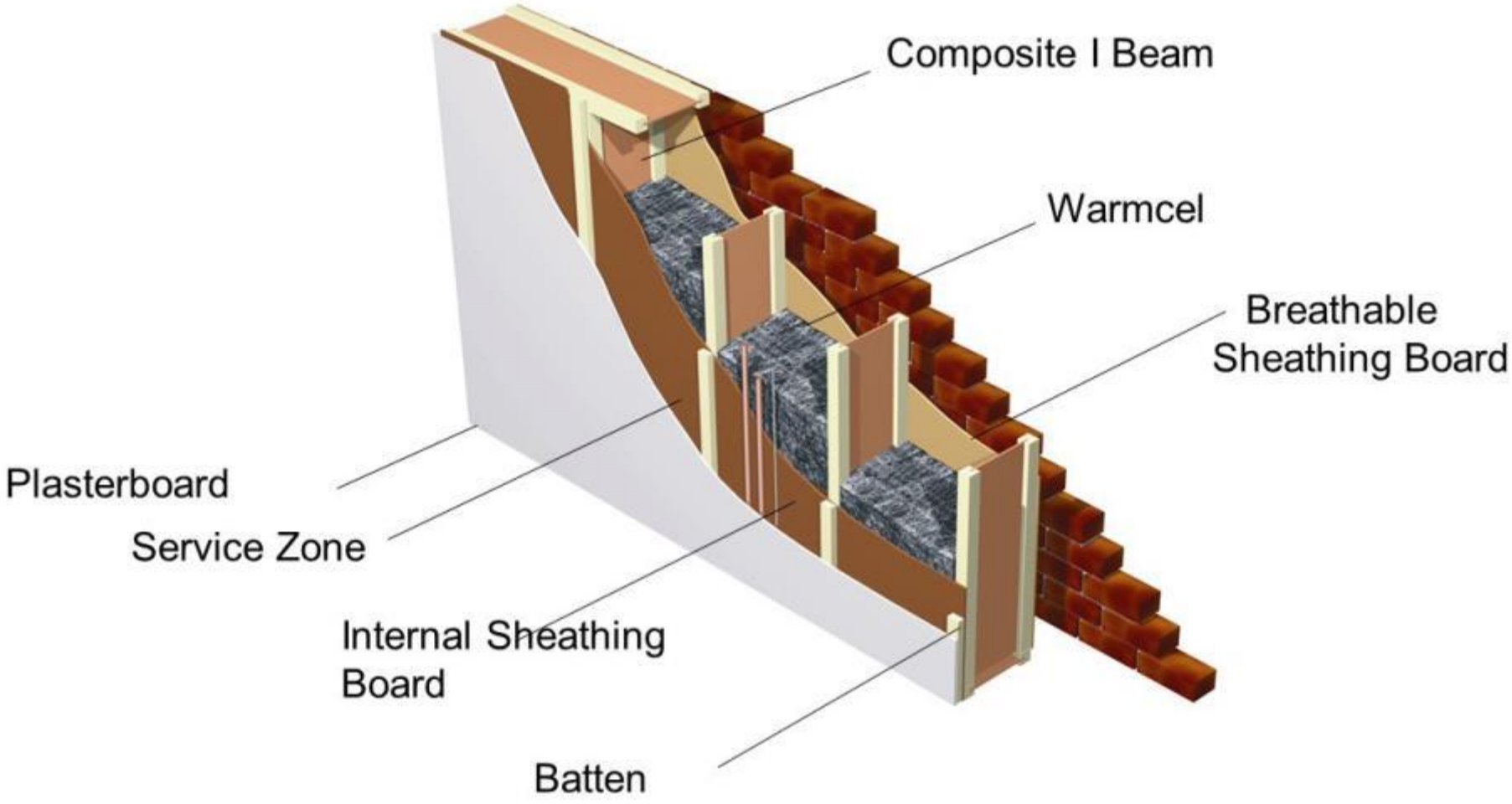

Minimising cold bridging

# Energy efficiency design challenges & solutions
# Specifications and materials

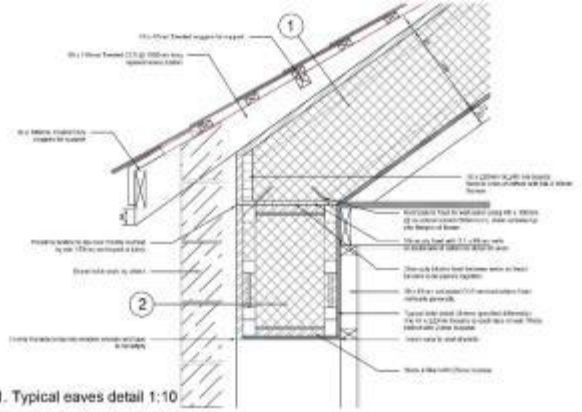
- Cold bridging
- Insulation
- Airtightness
- Windtightness
- Windows and solar gain
- Ventilation with heat recovery

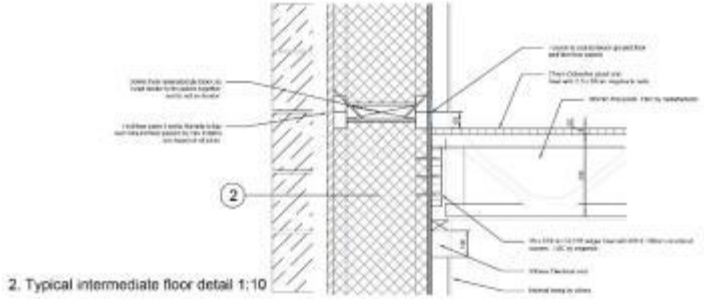
- ‘I-beam’ systems
- Full fill with Warmcel
- Pro clima system
- Woodfibre boards
- GBS triple glazed windows
- Systemair MVHR

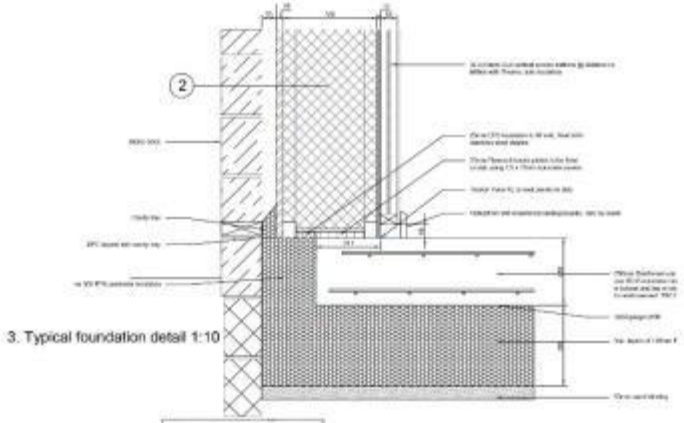
# I-beam wall construction for reduced cold bridging



# I-beam systems




Section details

---> Auxiliary calculation to the right

| Assembly no. | Building assembly description | | | | | | Interior insulation? |
|---|---|---|---|---|---|---|---|
| 1 | Walls | | | | | | |

Heat transfer resistance [m²K/W] interior $R_{si}$: 0.13
exterior $R_{se}$: 0.04

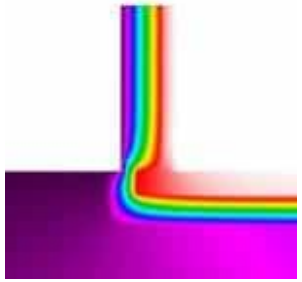
| | Area section 1 | λ [W/(mK)] | Area section 2 (optional) | λ [W/(mK)] | Area section 3 (optional) | λ [W/(mK)] | Thickness [mm] |
|---|---|---|---|---|---|---|---|
| 1. | Plasterboard | 0.250 | | | | | 15 |
| 2. | Batten service void | 0.130 | batten | 0.130 | batten | 0.130 | 25 |
| 3. | OSB | 0.130 | | | | | 15 |
| 4. | Warmcel | 0.038 | Ibeam flange | 0.130 | Ibeam flange | 0.130 | 47 |
| 5. | Warmcel | 0.038 | | | Ibeam web | 0.130 | 306 |
| 6. | Warmcel | 0.038 | Ibeam flange | 0.130 | Ibeam flange | 0.130 | 47 |
| 7. | Isoplaat | 0.049 | | | | | 25 |
| 8. | | | | | | | |

| Percentage of sec. 1 | Percentage of sec. 2 | Percentage of sec. 3 | Total |
|---|---|---|---|
| 92% | 6.2% | 1.6% | 48.0 cm |

U-value supplement: W/(m²K)

U-Value: 0.091 W/(m²K)

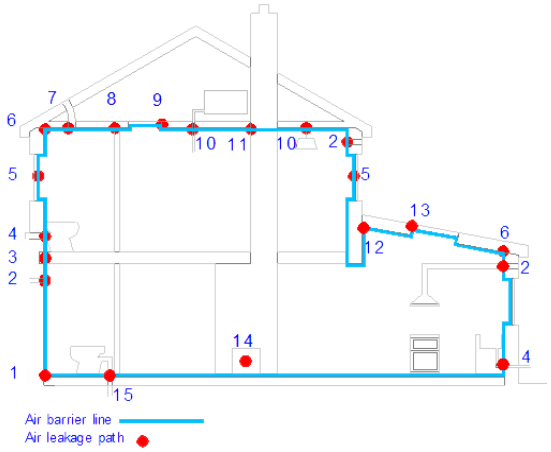
PHPP wall U Value calculator



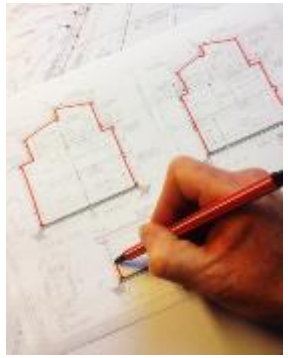
Cold bridge free

# Airtightness – Define the airtightness layer and details

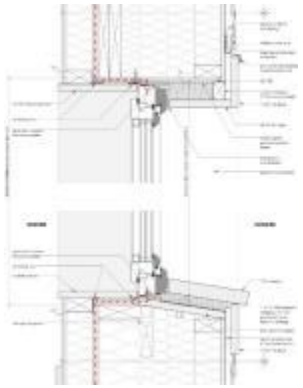
**RED** Line Rule




From plans…



…to details…



…to practise…

pro clima
Intelligent Airtight Systems
airtight air-right

# Windtightness with woodfibre boards

**Woodfibre Construction Boards**

- Weather protection
- Wind barrier
- Insulation protection
- Sound resistance
- Decrement delay

# Wrapping buildings with woodfibre boards

Windbarrier t&g boards

Woodfibre boards on roofs,

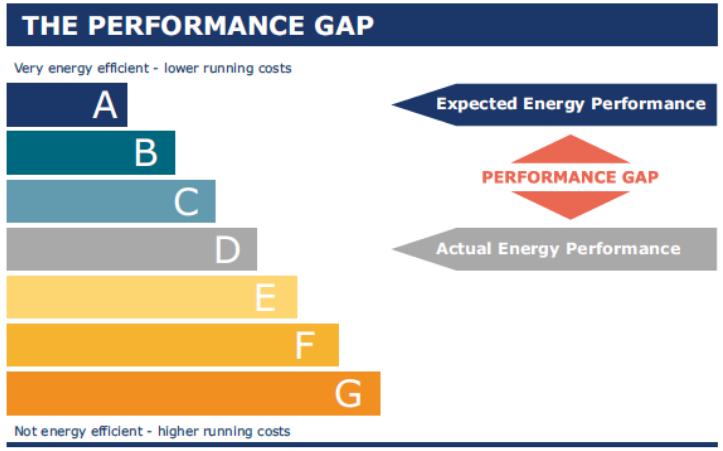
Render systems with detailing and finish options

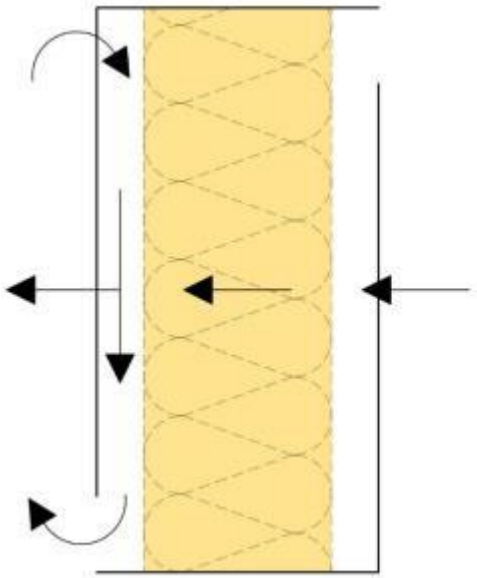
....boards against CLT,

..on clay blocks,

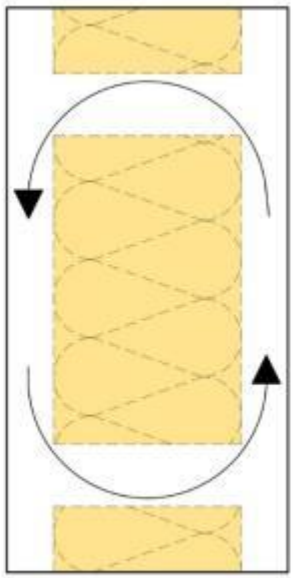
...on timber frame panels.

# Principals of insulation performance
## - convection heat loss from inside to out

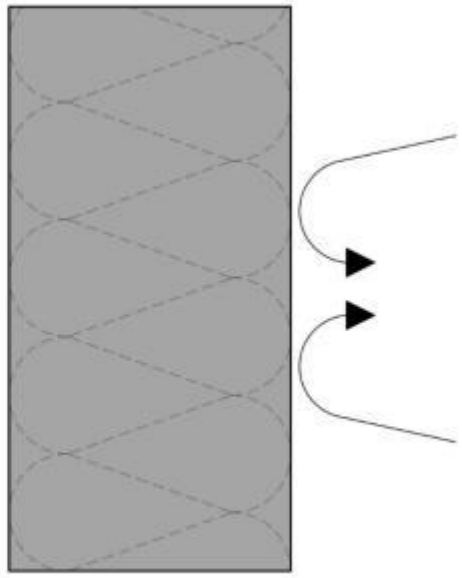


Open loop bypass



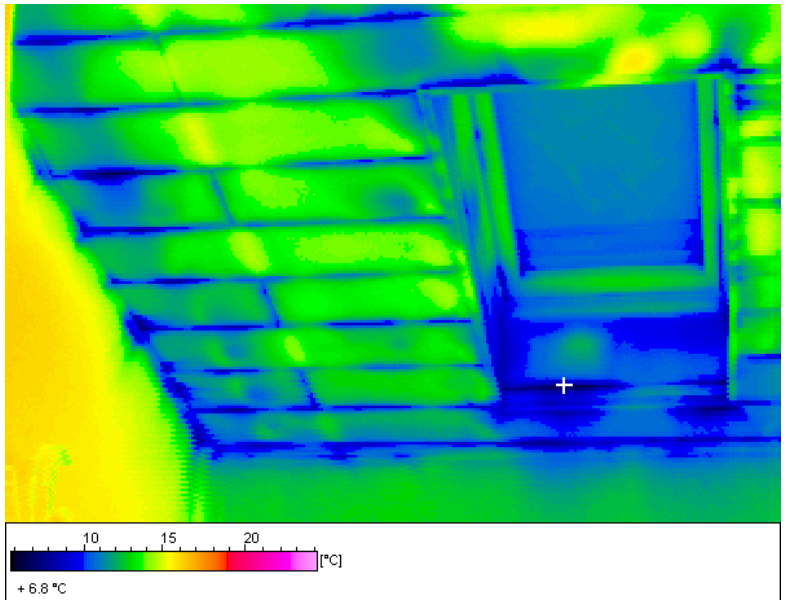
Closed loop bypass



No bypass

# Principals of insulation performance
## - Badly fitting insulation layers

Open loop bypass




Thermal imaging shows the truth

WARMCEL®

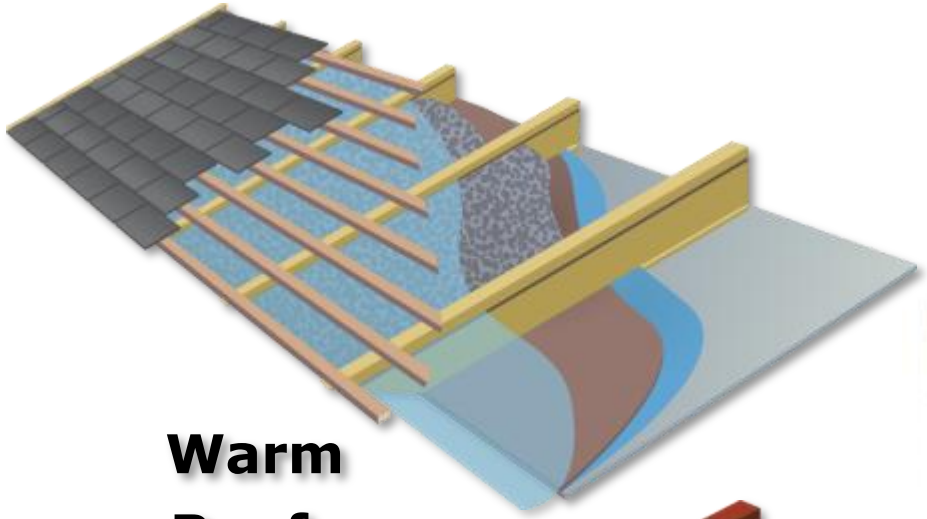
Insulation For Timber Frame


# Warmcel
## Cellulose Fibre Insulation

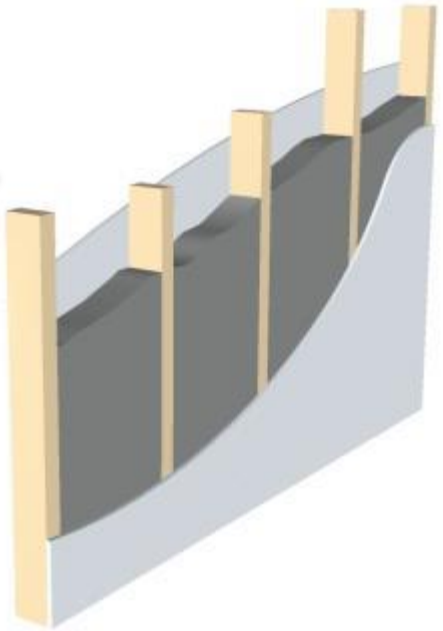
- Complete fill
- High specific heat capacity factor
- 30% improved airtightness
- Stable temperatures
- Exceptional sustainability
- High sound absorption properties

# Easy, flexible application. No waste.

## Minimise Construction Cost



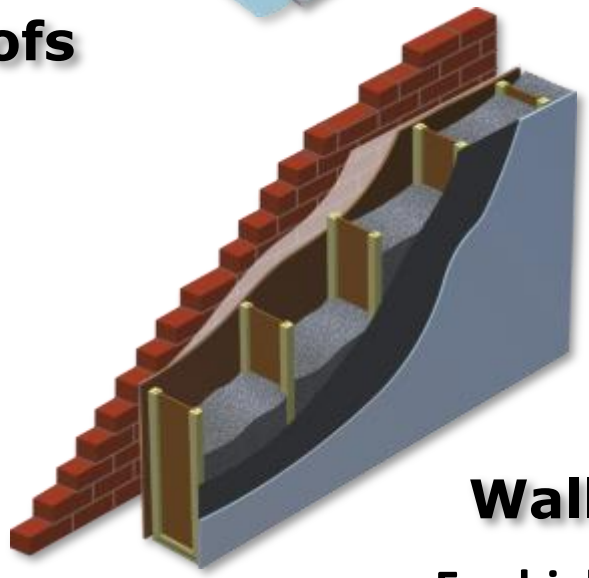
**Warm Roofs**



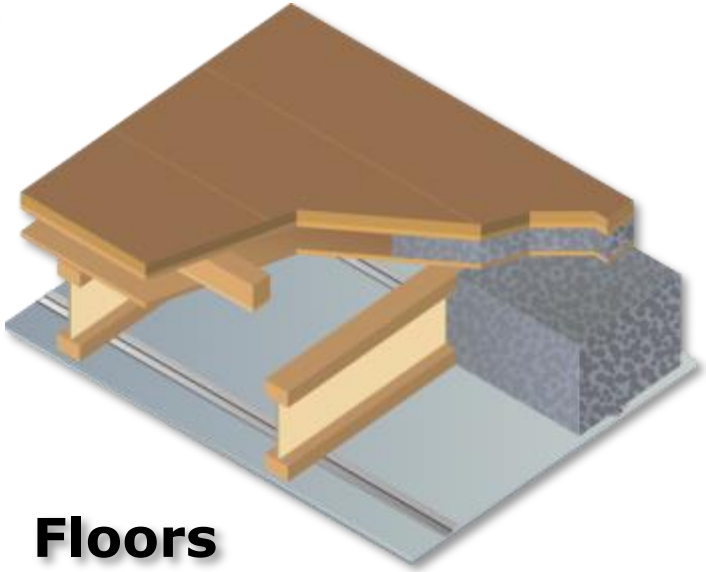
**Party Walls**

Sound insulation

**Lofts**



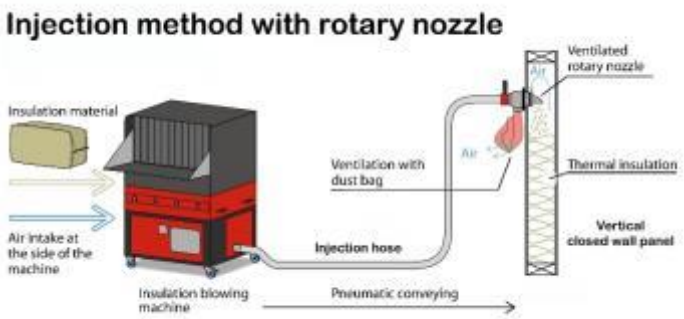
**Walls**

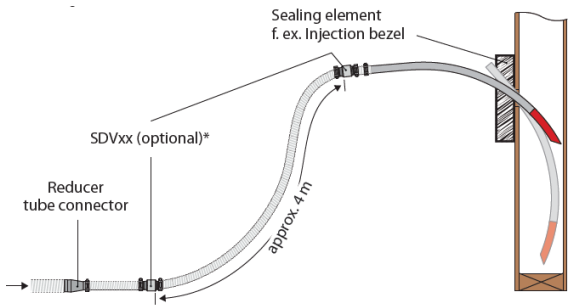


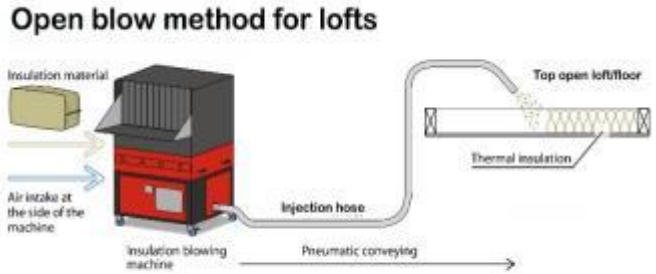
**Floors**

**For high thermal and acoustic performance**

# WARMCEL Installation Techniques



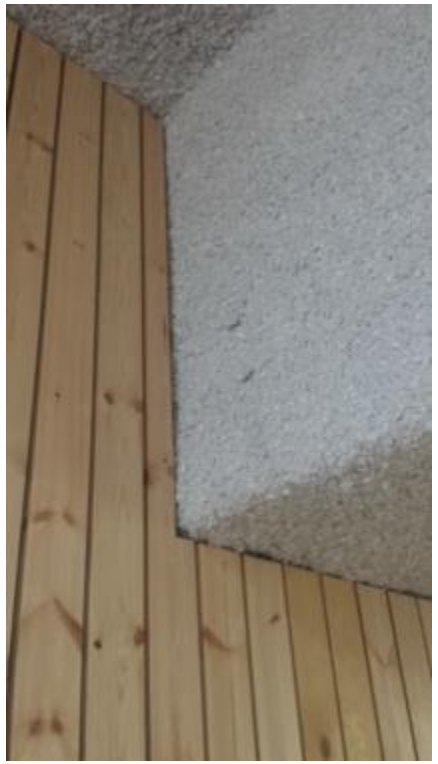



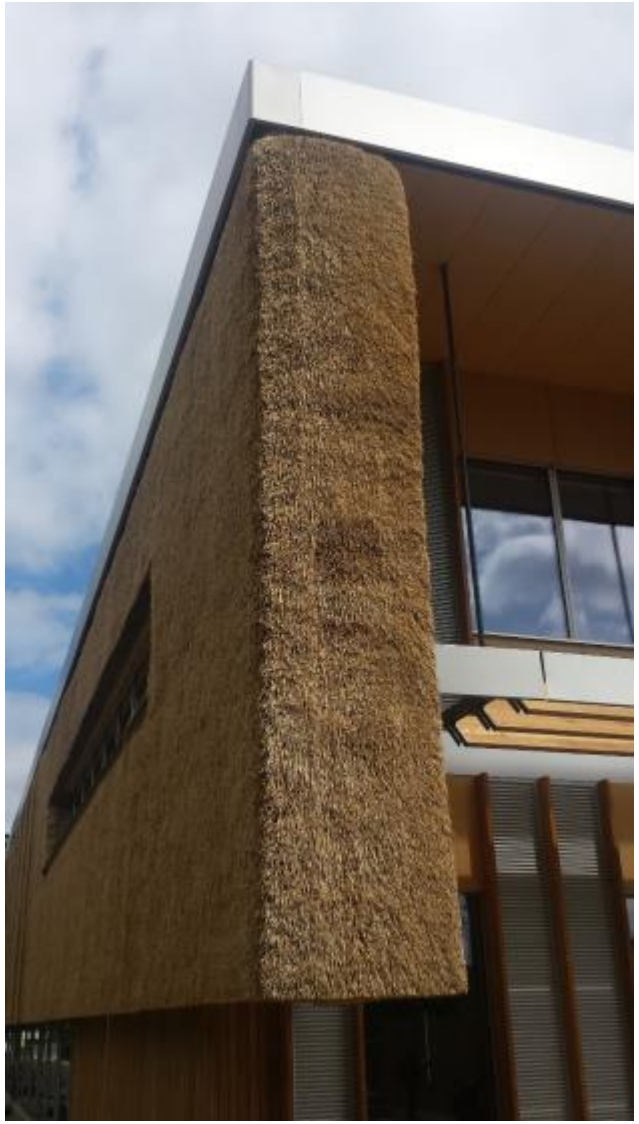

Behind membranes or boards application to walls or ceilings, blowing the insulation in under pressure insures full filled airtight voids.

# SOUNDCEL Acoustic insulation for sound deadening surfaces and partition floors and walls

Ceilings sprayed at high level




Exhibition back drop



Enterprise Centre - Passivhaus
University of East Anglia, Norwich

St Lukes School

Oak Meadow School

Passivhaus Builds

Dyfi Pathfinder Project, Machynlleth – UK’s first Passivhaus offices

Y Foel – UK's first Passivhaus used Warmcel & the pro clima systems

PYC House Building Factory & Passivhaus Offices

Mere - Wiltshire


Southport Eco Center

Uplands Cooperative housing - Stroud

48 Houses at Angelina Street, Cardiff

Edge, Near Stroud

Student Accommodation, Victoria Terrace, Aberystwyth

# Offsite or onsite construction

# – How to make the choice?

**Onsite** construction

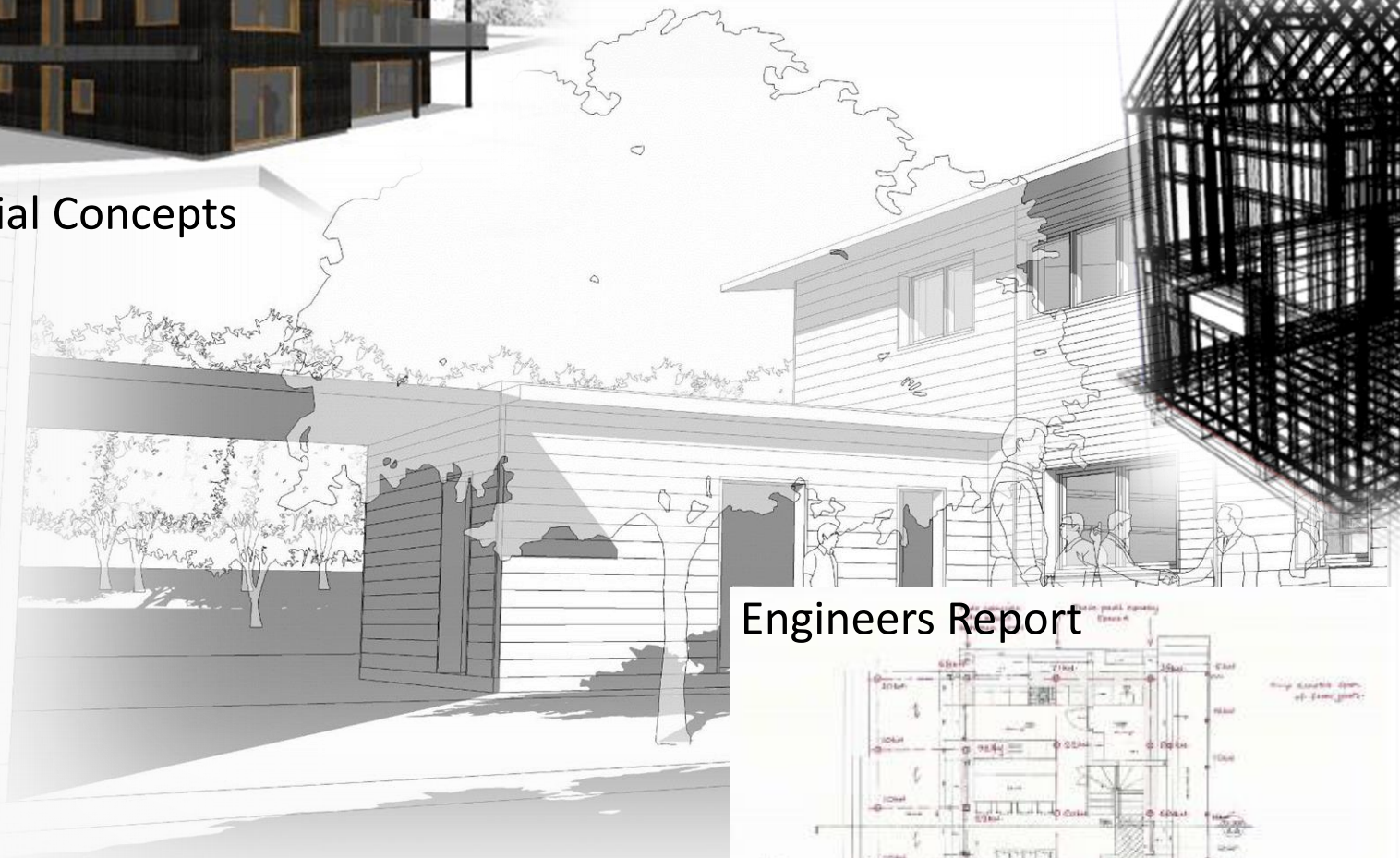
- Access is tight
- Delivery vehicle restrictions
- Site restrictions / overhead cables
- Onsite changes in design
- No time constraints
- Living in a lovely climate!

**Offsite** construction

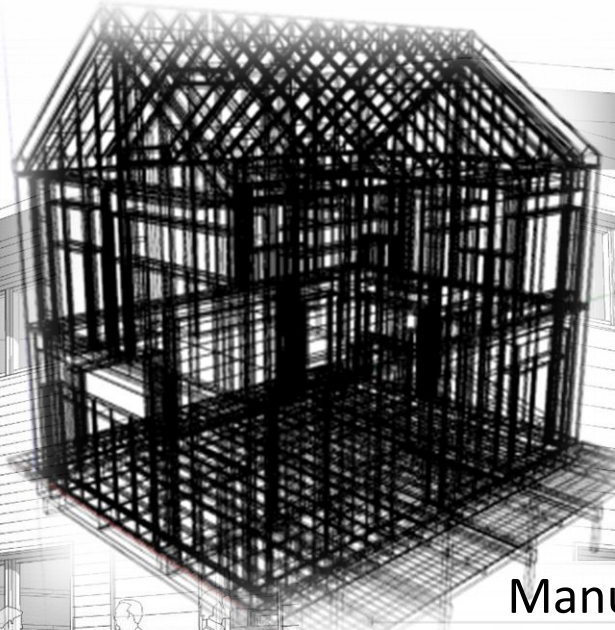
- Factory environment - weather implications
- Production line processes increase build speed
- Health and safety management improves
- High quality control through all processes
- Site overheads & programs reduced
- Less material wastage, WRAP -27%

# Design process

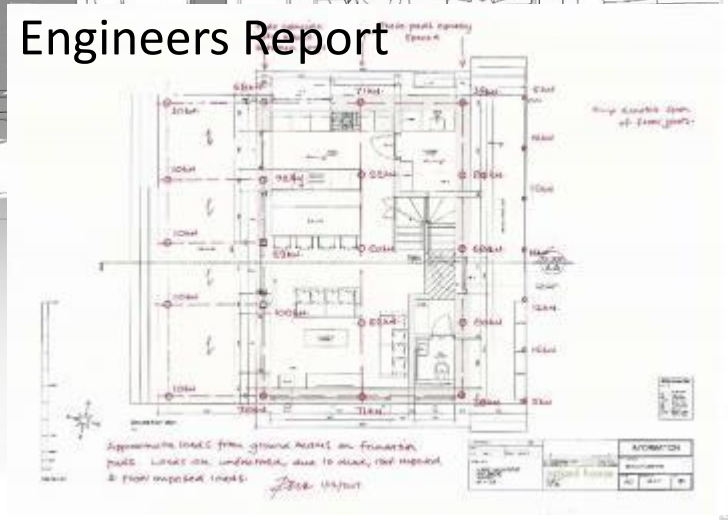
Initial Concepts



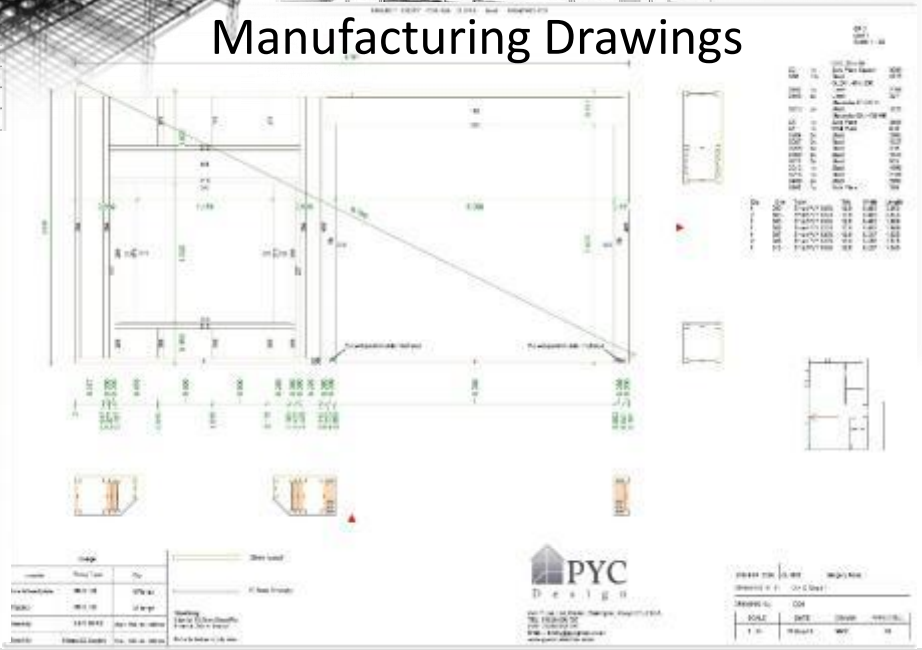
Timber frame modelling



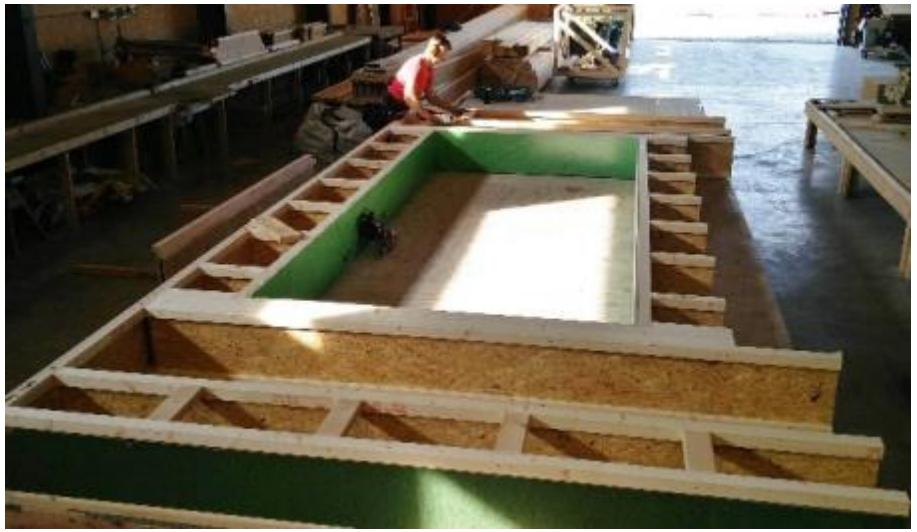
Engineers Report



Manufacturing Drawings



# Manufacturing process



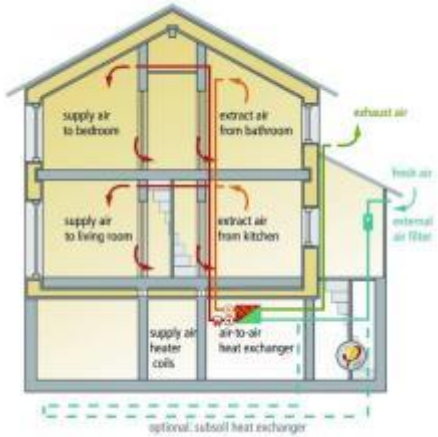

# Site delivery and erection

# Windows and fitted services

**Windows**

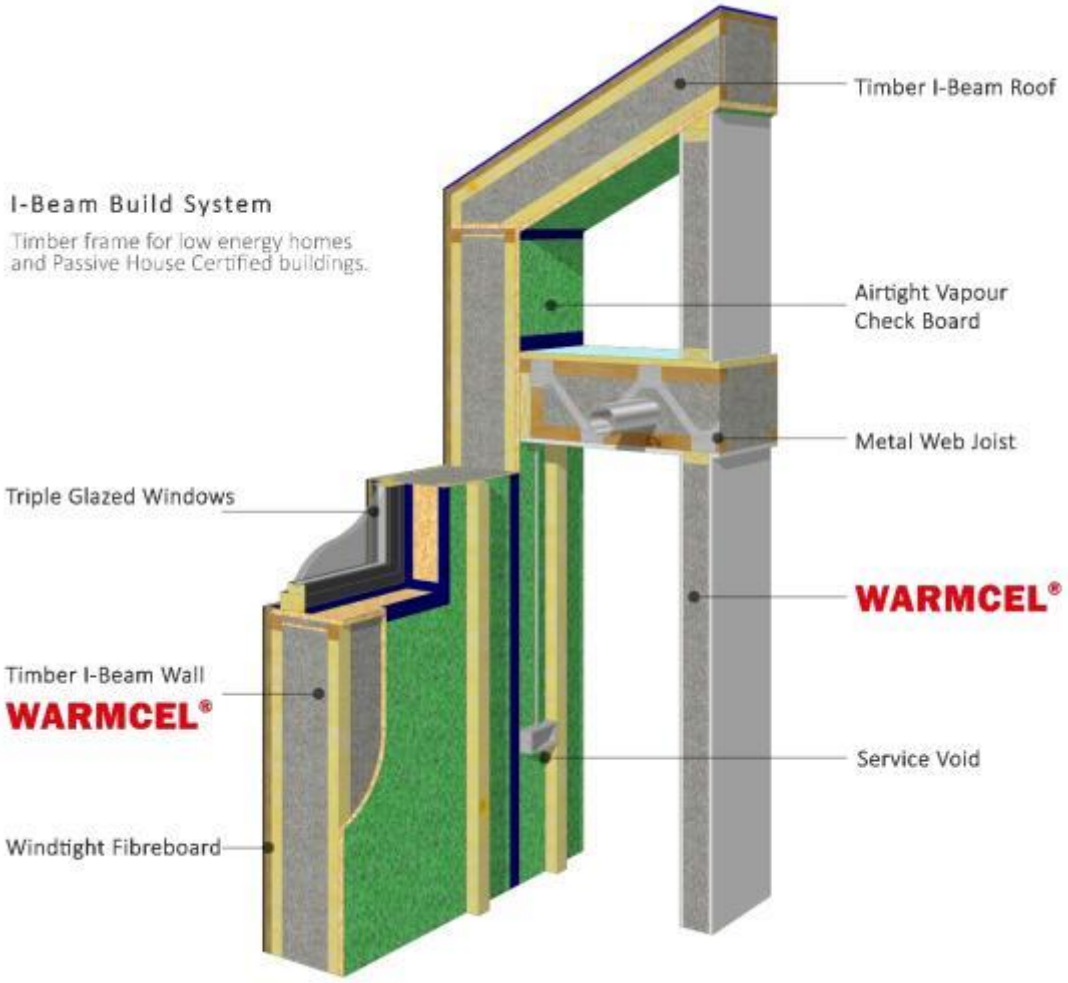
- engineered timber
- triple glazed
- thermal frames
- 10 year UK warranty

MVHR



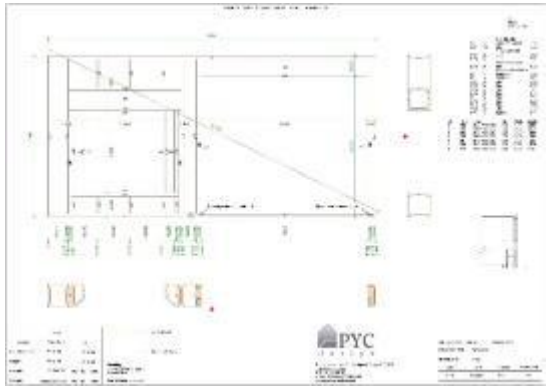

Rigid ducting

# Technical Information




- I-beams from 220mm to 450mm depths
- Warmcel Thermal conductivity – 0.038 W / m**2** K
- Medite Smartly Propassiv – airtightness 0.09 m3/m2/hr
- Pro clima – 100 + years durability 0.01 m3/m2/hr
- Thermal/Specific Heat Capacity = 2020 ± 6% J/kg.K
  (reduced over-heating in the summer – stable temperatures all year)
- Sequestered carbon – CO2 locked in for life
  (a fabric first zero carbon approach)
- Energy saving - a comfortable and healthy environment

# Quality control and evidencing for certification.

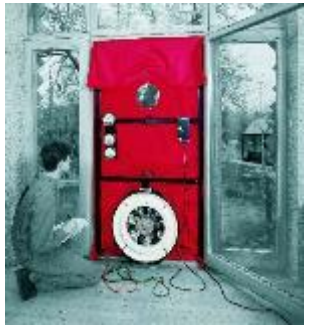


Drawing pack showing detailing and actual timber fraction

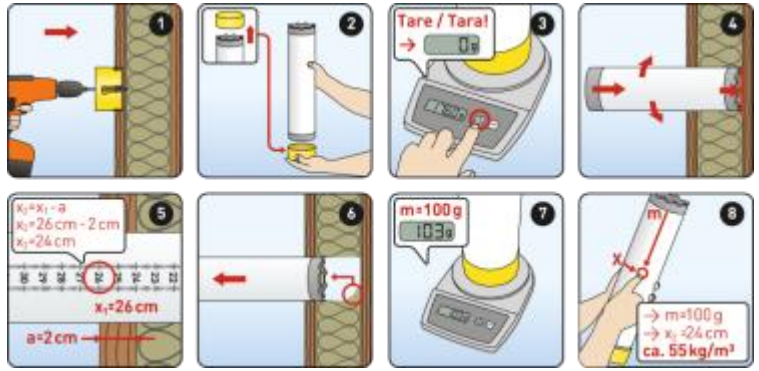
PHPP Calculations

All panels weighed for transport and crane info.

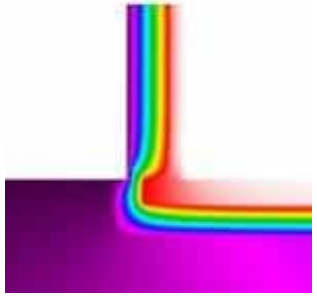
Calculations for timber / carbon content



Airtightness testing – guaranteed results possible




Warmcel density testing with specialist industry approved equipment



| Wall (Stud Thickness/mm) | Wall Type – I stud | U Value |
|---|---|---|
| 150mm | Brick – Cavity – Isoplaat – Warmcel –Intello Plus – Service Cavity - Plasterboard | 0.25 |
| 170mm | As Above | 0.21 |
| 200mm | As Above | 0.19 |
| 240mm | As Above | 0.16 |
| 300mm | As Above | 0.13 |
| 350mm | As Above | 0.11 |
| 400mm | As Above | 0.10 |
| 450mm | As Above | 0.09 |

Psi values U values and condensation prediction calculations


PYC
@pycgroup www.pycgroup.co.uk
@warmcel www.warmcel.co.uk

PYC

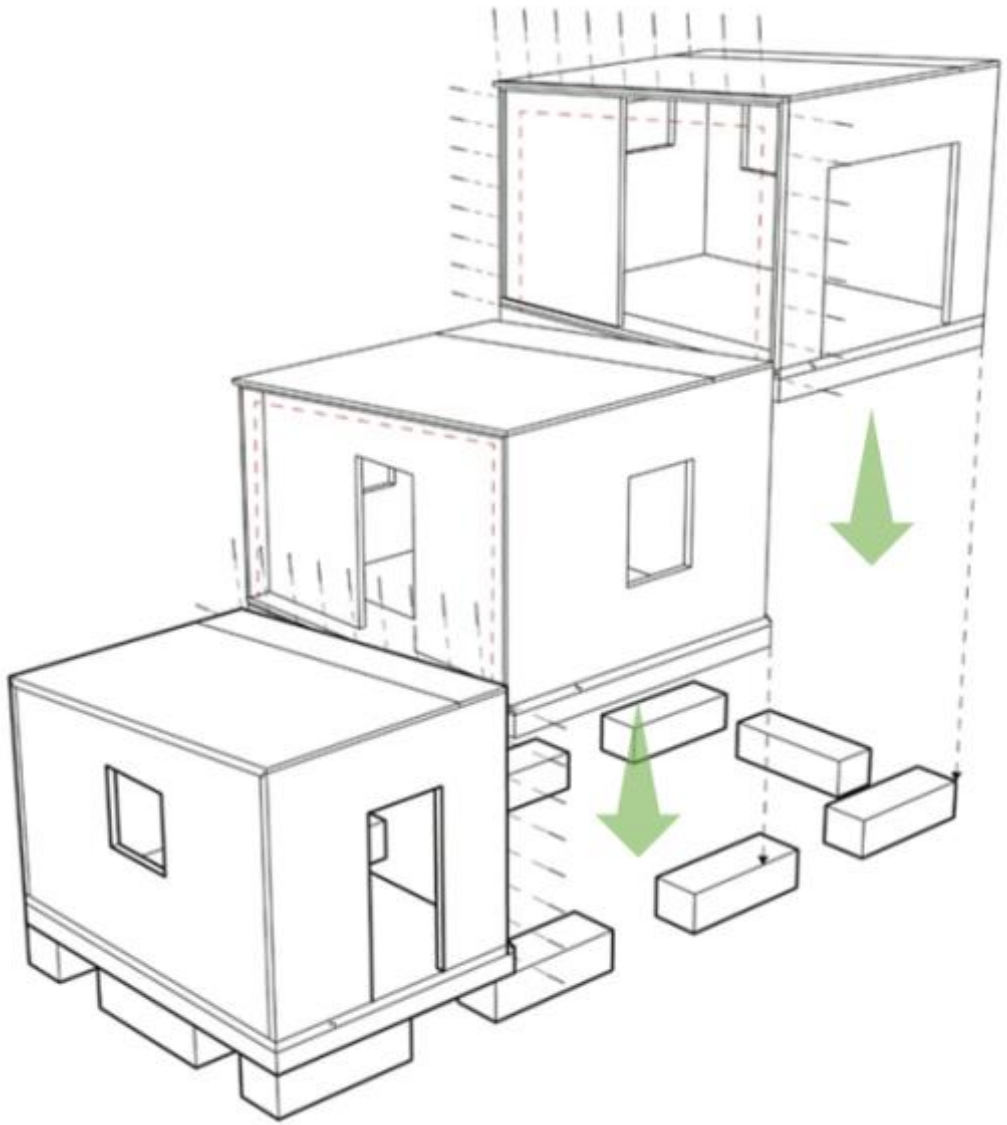
# **Modular** *adj.*:

Composed of standardized units

or sections for easy construction

or

flexible arrangement.



PYC

# Modular & volumetric construction

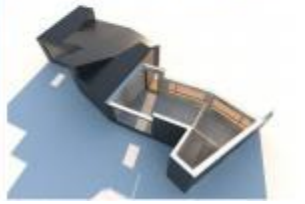














PYC

PYC

PYC

PYC

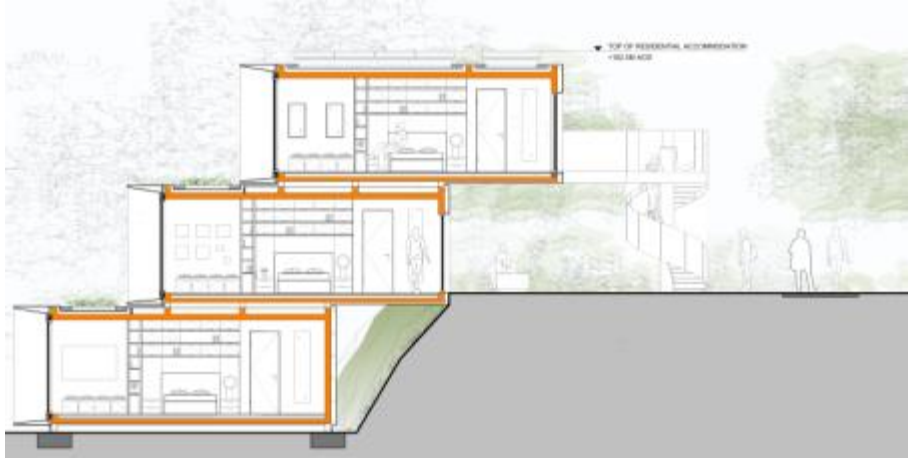
PYC

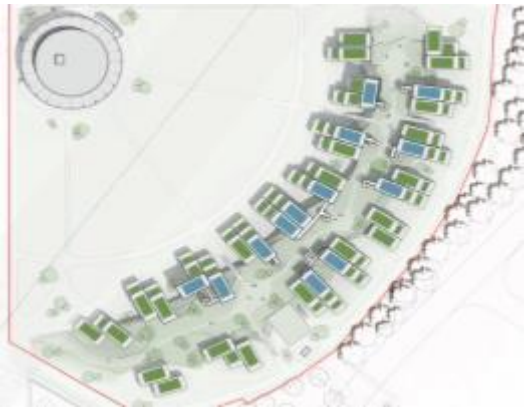
# Modular scheme

CarbonDynamic

dyson

WilkinsonEyre





dyson