
# PRIMROSE PARK

## PASSIVHAUS SCHEME

Plymouth Community Homes

mi-space creating communities

So Living

WARM: Low Energy Building Practice

mitchell architects

PCH MANUFACTURING WINDOWS, DOORS & MORE

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# Introduction

## Andrew Lawrie

Plymouth Community Homes

## David Pengelly

Mi-space


# The Project

- Plymouth CC ‘Get Plymouth Building’ Site
- Transferred £1 for Passivhaus Project
- Homes England – higher grant +£8kpu
- 72 Affordable Homes
  - 23 Shared Ownership
  - 49 Affordable Rented
  - 6 x 1 Bed Flats
  - 66 x 2 & 3 Bed Houses

| Scheme | Plot Price | Works/ unit | Fees/ Unit | TSC/ Unit | Grant/ Unit |
|---|---|---|---|---|---|
| Ham Drive | 4,529 | 110,143 | 13,695 | 128,367 | 18,824 |
| Southway Campus | 7,015 | 119,481 | 24,378 | 150,874 | 31,776 |
| Southway Primary | 1,842 | 123,787 | 25,053 | 149,519 | 34,997 |
| Bodmin Rd Passivhaus | 0 | 141,264 | 19,685 | 160,949 | 39,630 |
| **Mean:** | **2,854** | **126,928** | **22,696** | **152,041** | **31,307** |


# Development Facts

- Energy Requirement – Less than 15kWh/m2yr
- Floors - 0.035W/mK
- Walls - u-value of 0.150W/m2K
- Roofs - 0.094W/m2K
- Air Tightness – 0.6 @ n50 (Actual 0.4)
- MVHR- System Air VTC 200
- Boiler - Worcester GS 25i ERP
- Windows – PCH Synseal UPVC Triple Glazed

# The Passivhaus Standard

| | | |
|---|---|---|
| **Air-tightness** | 0.6ach @ 50Pa | ← **Comfort & Energy** |
| **Surface temp (windows)** | >17degC | ← **Comfort** |
| **Summer overheating** | Max 10% >25degC | ← **Comfort** |
| **Vent** | ~30$m^3$/hr.person | ← **Comfort** |
| **Heating and cooling** | 15kWh/$m^2$yr @20C<br>Or 10 W/m2 Heating Load | ← **Energy** |
| **Primary Energy** | 120kWh/$m^2$yr | ← **Energy** |

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# To Certify, or Not to Certify

**Passivhaus Principles?**

Or

**Passivhaus Certified?**

We have been asked this question several times and having now had the benefit of delivering some units I would state that the single largest benefit Passivhaus Certification brings is the robust validation process you go through. It holds the whole team to a standard that you cannot escape.


# The Challenges

- **Client**
  - **Lack of Experience** – visits/talks etc but just do it!
  - **Selecting a Team** – previous experience
  - **Procurement Route** – 2-Stage process
  - **Board Approval** – cost and rent cut
- **Contractor**
  - Fear – Lack of knowledge & Misconceptions
  - Air Tightness
  - Product Selection
  - Certification
  - Clarity from Passivhaus Consultants

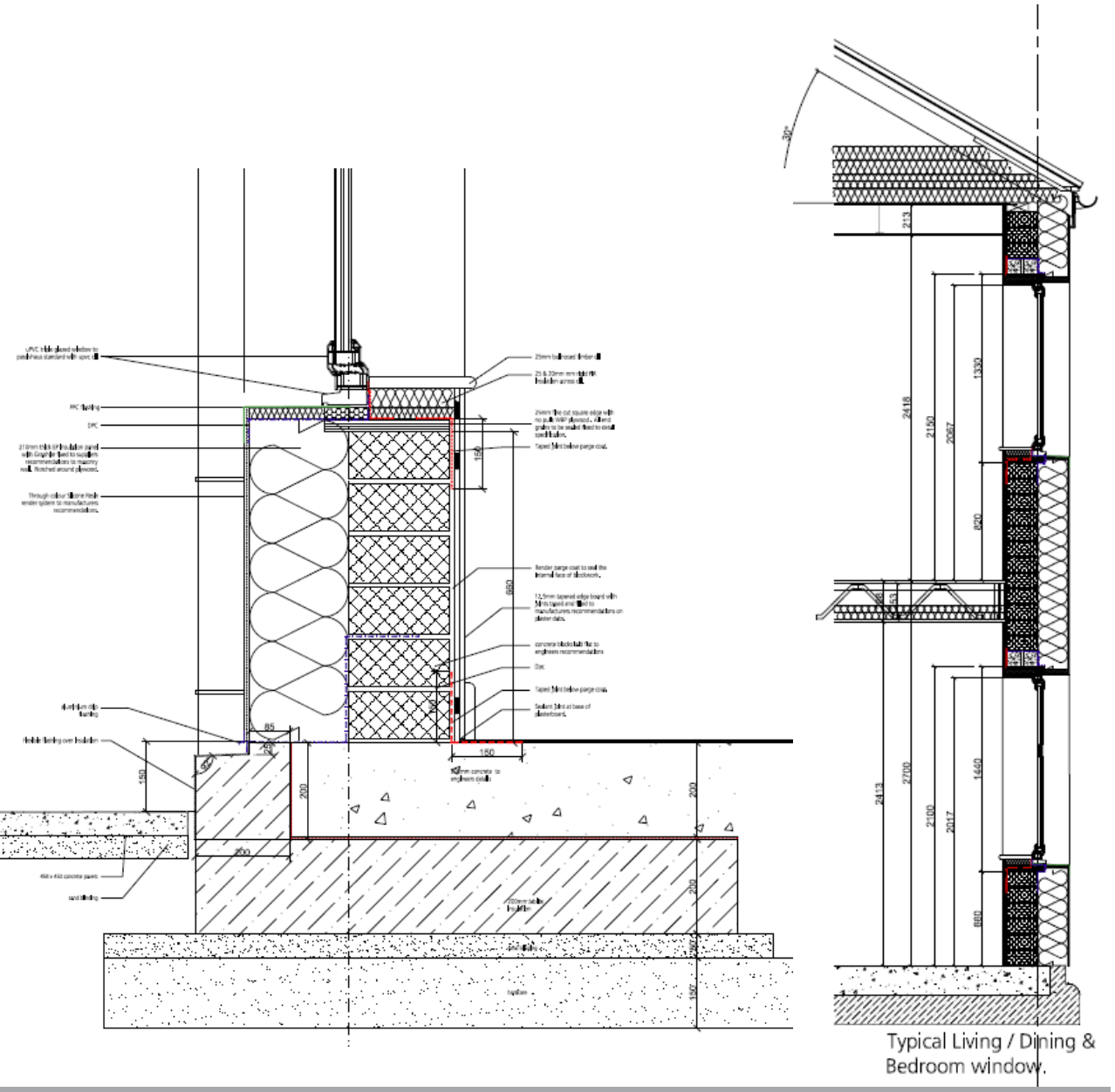

# The Solutions - Contractor

- Fear – Lack of knowledge bring the supply chain on journey & train.
- Air Tightness – Keep it simple direct delivery team
- Product Selection – Challenge everything accept nothing at face value
- Certification – Records, Records, Records and robust QA Plan & understanding the Audit process
- Clarity from Passivhaus Consultants – Persistence, developing relationships and turning the jargon into simple and clear solutions


# Construction Techniques

Various construction methodologies were design tested on the criteria of:

- **Passivhaus Principles**
  - Ease of achieving high insulation
  - Ease of achieving air tightness
- **Cost**
  - A key client driver was in achieving value for money
- **Buildability**
  - Ensuring our local supply chain could deliver the scheme
  - No complicated detailing



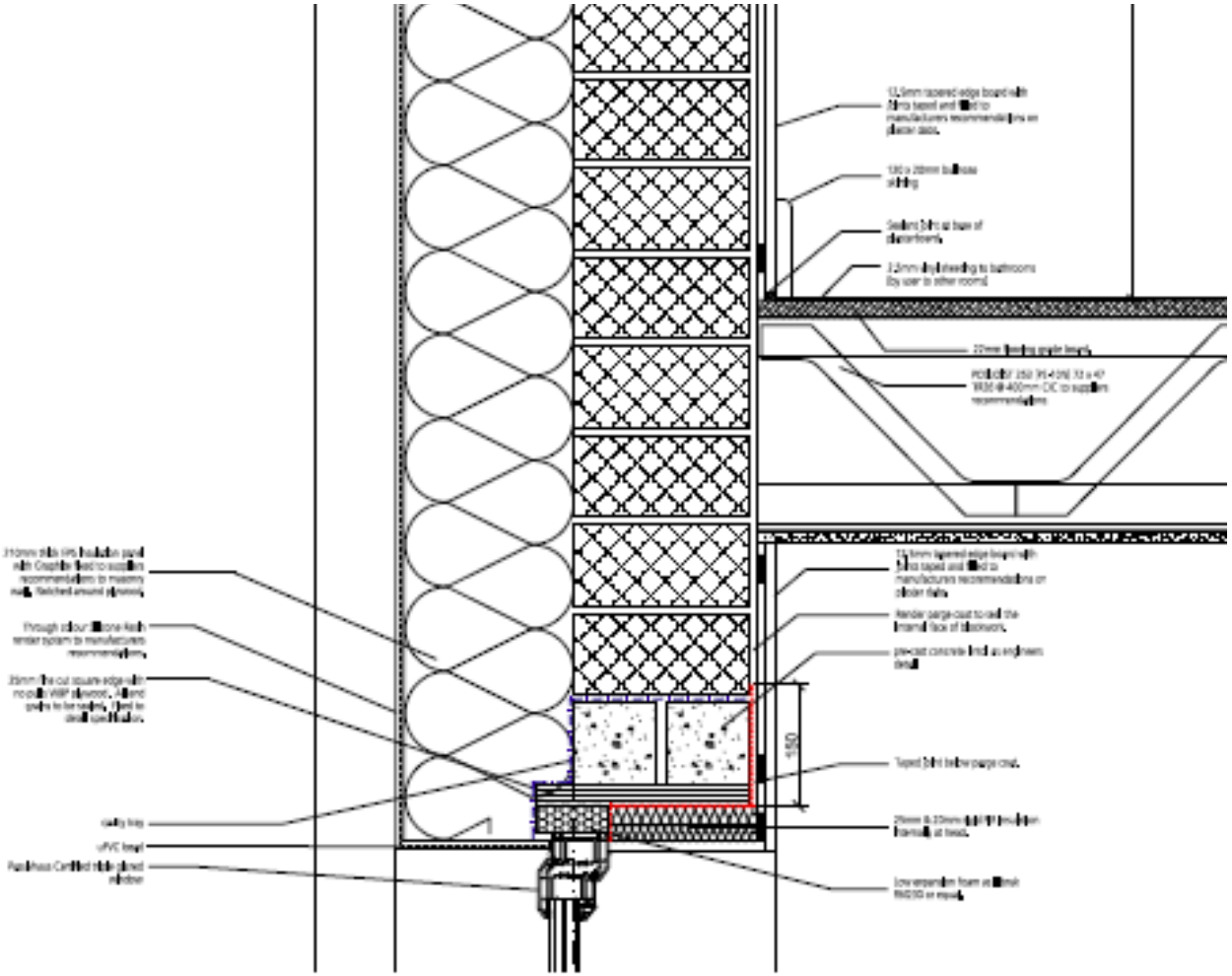
Typical Living / Dining & Bedroom window.

# Construction Techniques

## Simplicity

During the design development phase we came to understand the necessity to keep everything as simple as we could and whilst various other solutions for the construction methodology were tested the solution of a block leaf laid flat with an internal parge plaster coat and an external insulation render system met this key driver.

Other systems considered included off site SIP, Composite Panels and timber frames, however for us these all brought complexity and the associated increased risks.



# Construction Techniques

In addition to the principle of simplicity we also understood the real need to be fully designed before starting work on site.

And other than a couple of minor changes this we achieved.

So to summarise:

- Keep it simple
- Design it fully
- Build it right first time
- Record, Record, Record


| BN040 BODMIN ROAD PASSIVHAUS EXTRA OVER COSTS | | | Total Cost | Abnormal Costs | Abnormal Free Cost | E/O For Passivhaus | E/O For Passivhaus |
|---|---|---|---|---|---|---|---|
| | | | £10,400,000.00 | £650,000.00 | £9,750,000.00 | £772,877.32 | 7.93% |
| SITE | 5358 | M2 | £1,941.02 | £121.31 | £1,819.71 | £144.25 | 7.93% |
| PLOT | 72 | Nr | £144,444.44 | £9,027.78 | £135,416.67 | £10,734.41 | 7.93% |
| Elements Of Increased Costs | Supervision & Programme Implications | Parge Coat | Air Tightness | MVHR | Windows premium against Double Glass | MVHR Roof Penetrations and Weathering | Totals |
| | £30.00 | £15.00 | £28.91 | £50.25 | £15.68 | £4.41 | *£144.25* |

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# Commercial Facts

When considering Passivhaus you will need to think about the investment costs, however keeping the principle of simplicity in mind the extra over costs need not be extreme. At this scheme our assessment is as the table below.

We firmly believe that a cost increase of around 5% is achievable when keeping to the simplicity theme. The more complex the building the more the cost increase will be.

Areas of further cost savings are –

- Omit back up heating system
- Use membranes instead of smart ply
- Use of Non Passivhaus Certified products


# Post Construction Monitoring

## Post occupancy monitoring of Primrose Park

- Direct comparison of Passivhaus against a similar sized Building Regulations compliant scheme developed by PCH, both completed in 2018
- In-depth monitoring of 20 houses from each site including:
  - Internal conditions logged (temperature and humidity hourly)
  - Regular questionnaires
  - Energy readings
- The monitoring will run for 2 years

# Would we do it again?
# &
# Other questions.

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