

# Pitfalls in Passivhaus airtightness



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# Paul Jennings:



- Testing buildings for airtightness since 1987
- From the UK's first Passivhaus & EnerPHit projects:



Y Foel, Machynlleth

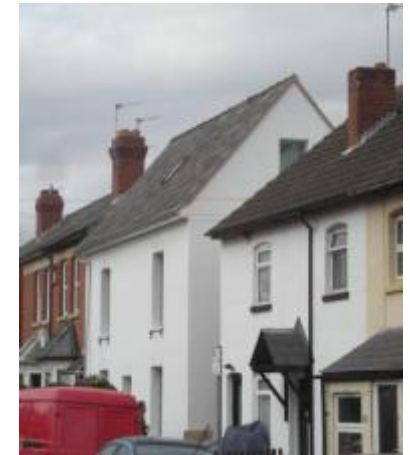
**0.3 AC/hr @ 50 Pa**



DVFP, Machynlleth

**0.3 AC/hr @ 50 Pa**

**Both tested 29<sup>th</sup> August 2008**



Grove Cottage, Hereford

**1.0 AC/hr @ 50 Pa –  
June 19<sup>th</sup> 2009**

# Getting to now:



Erneley Close (32)



Totnes  
PH B&B



Camden



Lancaster Co-Ho (44)



Mayville Community  
Centre

# Getting to now(2):



**Larch Corner – most airtight PH in the UK – 0.048 AC/hr @ 50 Pa**

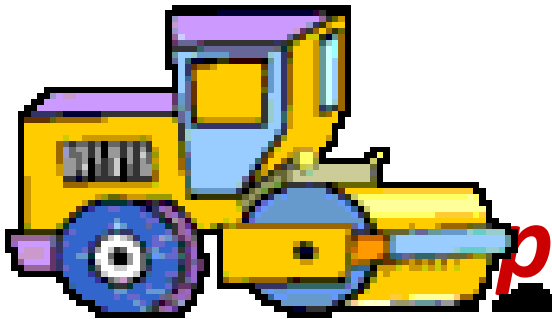
# Pitfalls – What Goes Wrong?



- **During Design**
  - Getting planning permission, then deciding on Passivhaus
  - Not considering buildability – are there built-in airtightness weak points? Can the design be tweaked to make delivering airtightness easier?
  - Inadequate information – are there: 1) Clear Air Barrier Strategy; 2) Air Barrier Drawings & Details; 3) Comprehensive Specifications; 4) Schedule of Penetrations; 5) Identified Hold Points; 6) Plan for Testing
- **Delivery Failures**
  - Procurement issues – are the materials correct, do the people on site have the right skills?
  - Management – overseeing works, change control & collation of evidence
  - Using the wrong volume in Air Change Rate calculations! Must comply with PHI requirements, not ATTMA (UK test standard). Excludes internal floors and partition walls, can be 25% smaller
  - Unable to complete a satisfactory test

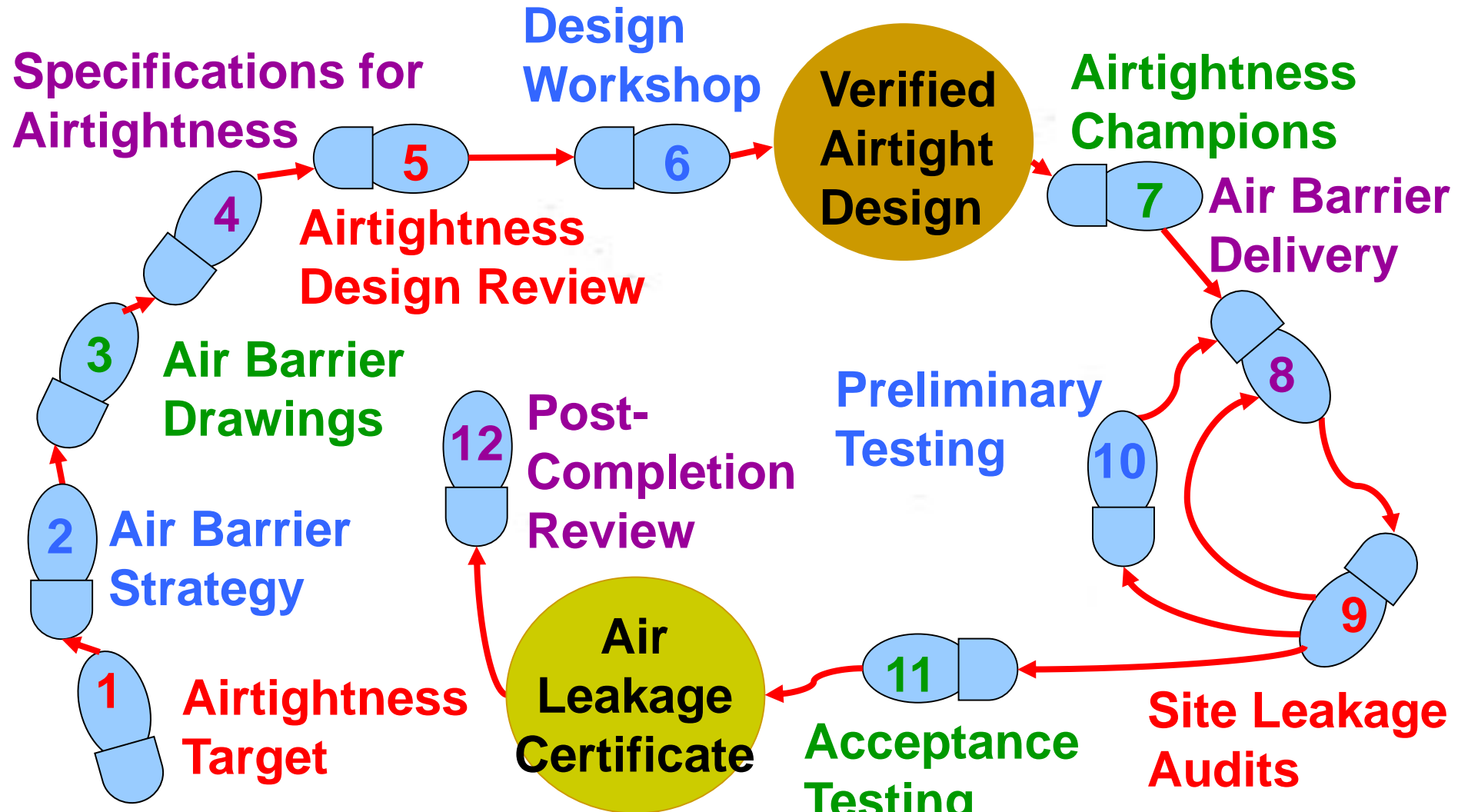
# Timings

- Good airtightness takes longer;
- Cannot muddle through;
- Fundamental cause of many problems on major UK low-energy projects to date is:

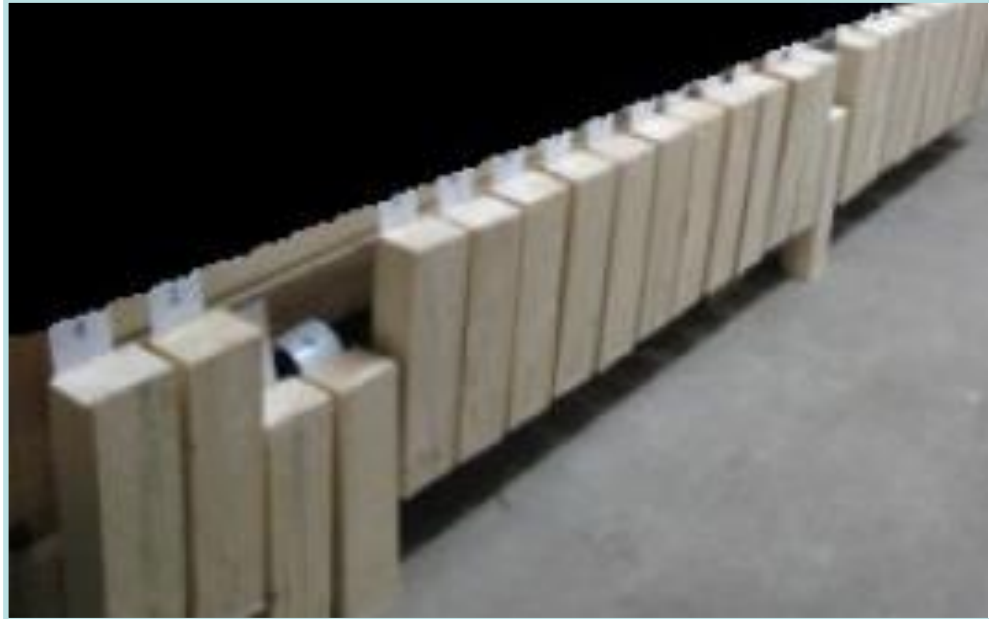


*program steamrollers quality  
quality*

# 12 Steps - Summary

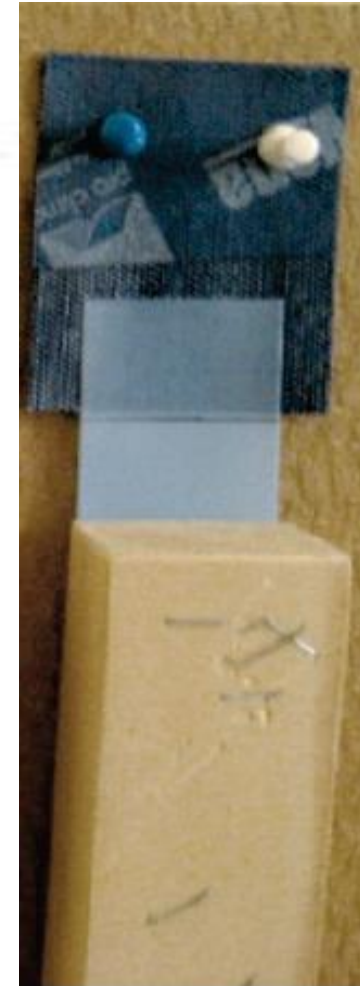


# Testing Tapes:



*Pictures: pro clima Intello+ Tour*

- **Testing for failure under shear stress**
- **~200g wooden blocks**
- **Stuck on with 10cm<sup>2</sup> of tape**
- **47 different tapes**



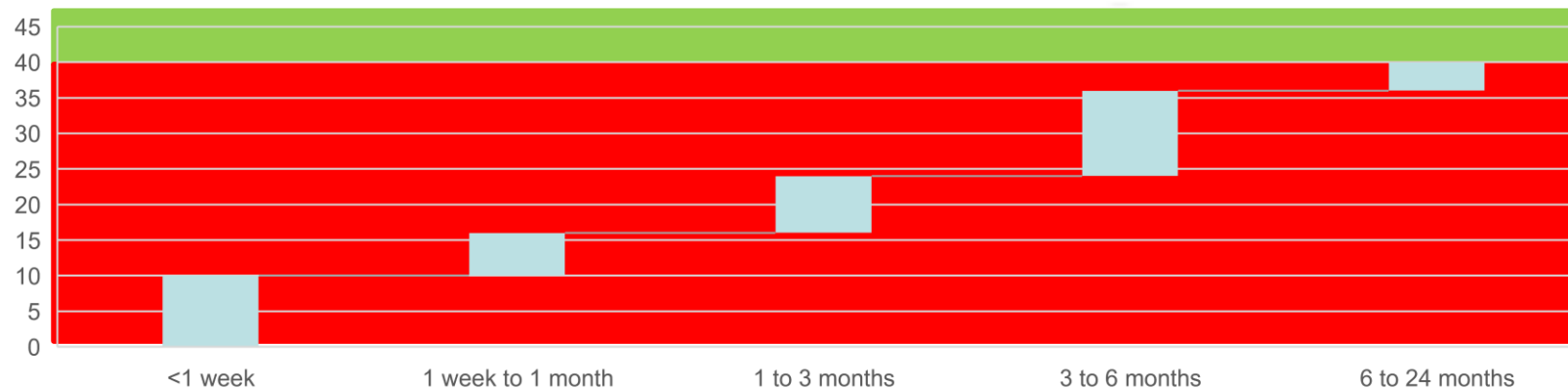


# Results of Tape Tests:



- 47 started test
- After 2 years
- Most have failed
- 7 remain attached
- 3 were pro clima tapes

Failure of tape samples



# EnerPHit success: Erneley Close, Manchester



- **2 blocks, 32 maisonettes**
- **New roofs, windows & doors**
- **Full external insulation**
- **Team of 4 airtightness champions**
- **Completed in May 2015**
- **Excellent resident feedback & post occupancy evaluation**



# Lessons from Erneley Close:

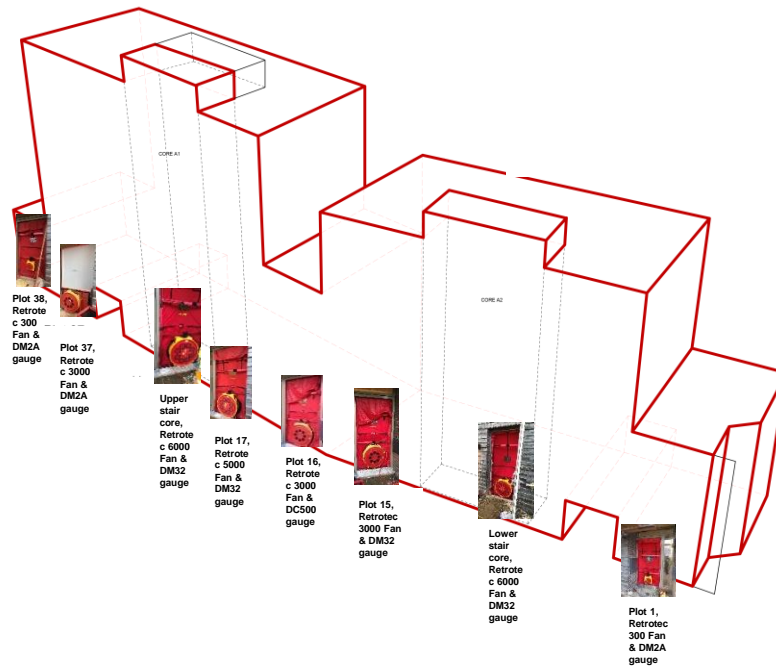


## Lessons during construction:

- Detailed survey required
- Be flexible
- Develop a solution on sample dwellings, then apply generally
- Train & develop airtightness champions
- Avoid works chasing funding
- Don't leave problem areas until the end



# Agar Grove, Camden, Details: Phase 1A of first PH area regeneration in UK



- 36 Maisonettes & flats off 2 stair cores & 6 individual entrances
- Designed to be certified as a PH block
- No internal airtightness between units
- Co-pressure tested on 27<sup>th</sup> March 2018
- 8 sets of door fan equipment operating in parallel

**Took most of the day to set up,  
& several hours to take readings**

# Lessons from 30 years of Airtightness:



**Fundamentally, delivering good airtightness is about attention to detail & effective management**

- during design
- on site

**Apply a robust approach, and plan for things going wrong**

- key staff sick or leaving
- missing materials and late deliveries
- last minute changes in design or detailing

**Provide training & get buy-in from everyone on site**

# To Conclude: Who has responsibility for airtightness?



## Design Team:

- Airtightness Design
- Hold Points
- Airtightness specification
- Delivery Process
- Responsibilities Matrix

## Site Management:

- Culture
- Quality Enforcement
- Variations
- Procurement
- Sequencing
- Testing
- Record Keeping

## Installer:

- Quality
- *Variations*
- *Program*

# Questions?



- **The really stupid question is the one left in your head after you leave!**

## **For further information:**

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