# CarbonLite Retrofit Update

## Dr Tina Holt

# This time last year…

- **Why do we need CarbonLite Retrofit?**

- **Because retrofit can be a delicate balancing act…**

# Why do we need CLR?



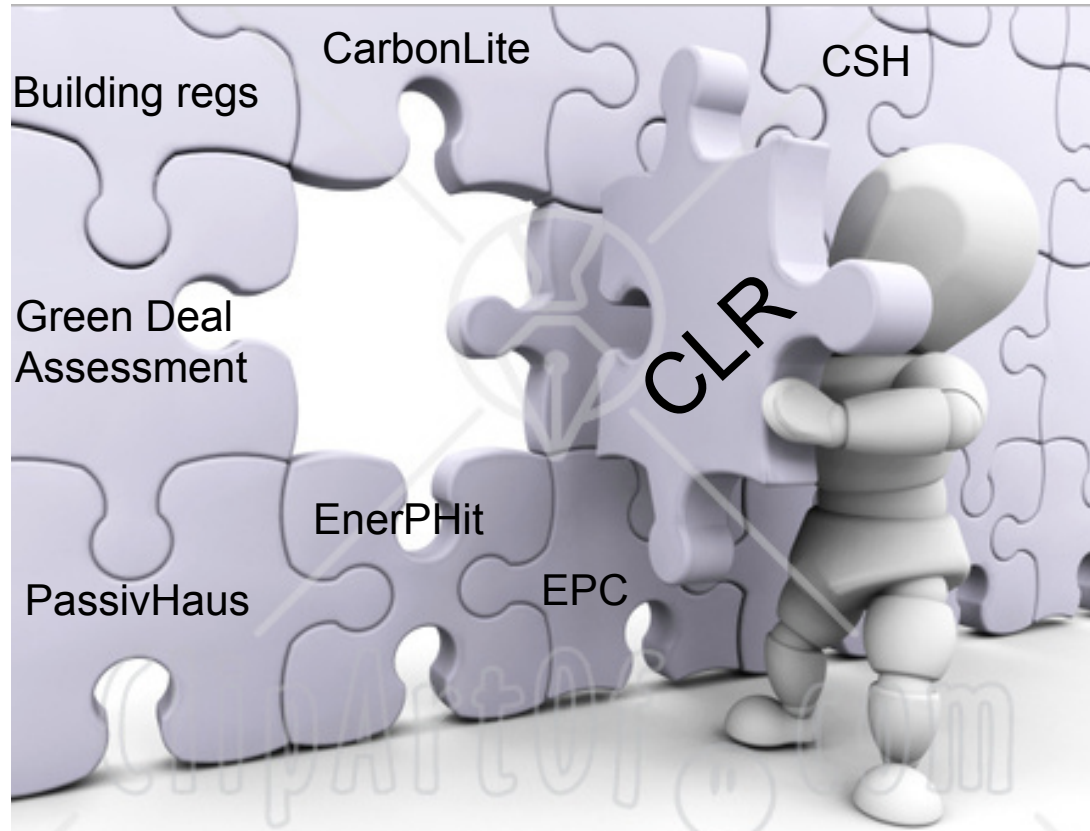- …**because we want to avoid the potential pitfalls that may result from retrofit**

# A bit of a leap…



Basic energy efficiency

Low energy retrofit

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# The missing piece



Bringing moisture robust, low energy retrofit to the mainstream in a formal way

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# This year…

1. **Progress to date**
2. **Course Content**
3. **Quizzes, homework and tutorials**
4. **What do you get at the end?**
5. **Into the future**
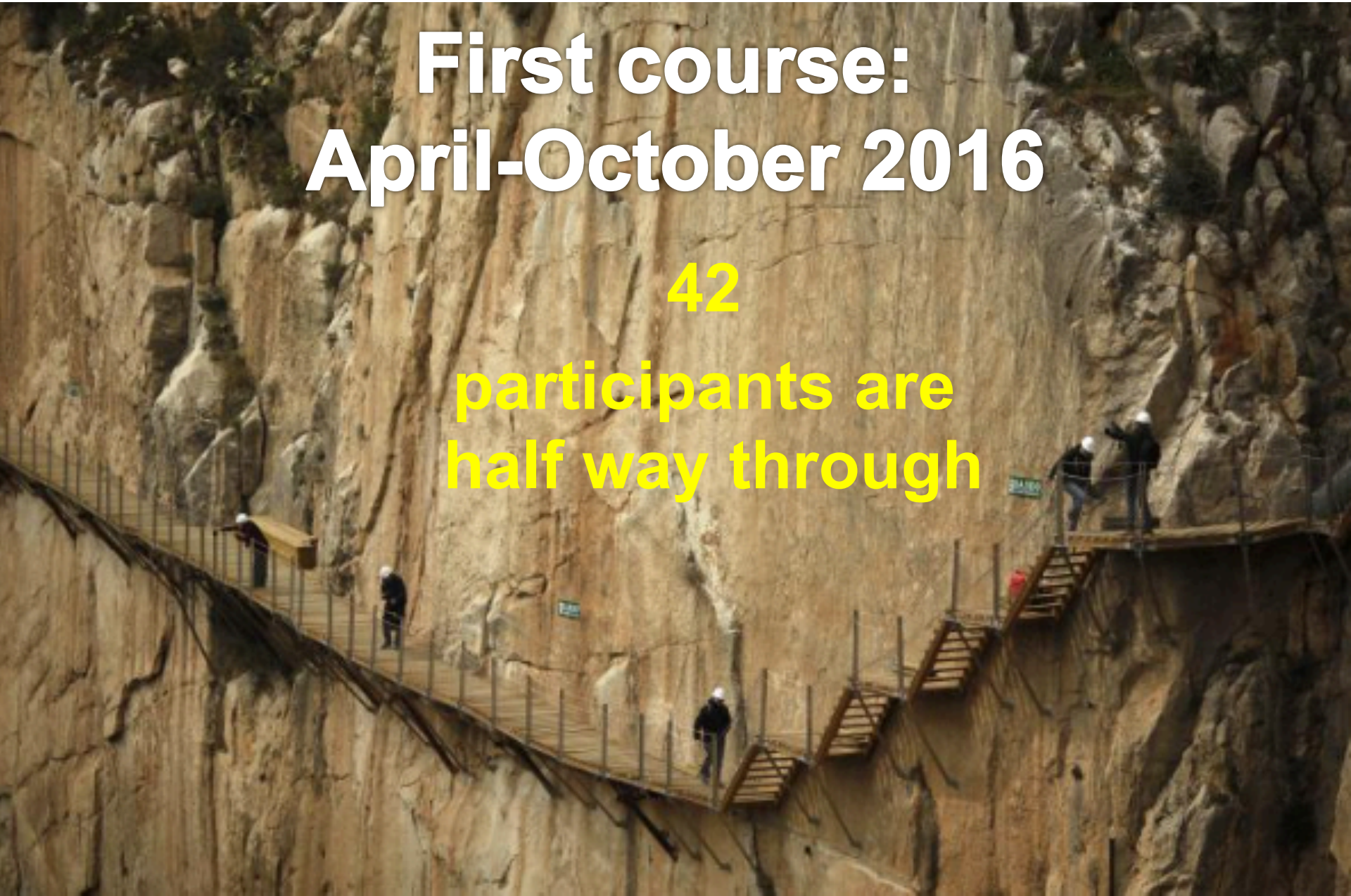
# Early 2016: 20 pilot users gave feedback



**Pilot users – a mixture of backgrounds, many with very extensive retrofit expertise**

# First course: April-October 2016

## 42

### participants are half way through

# Next run: Oct 2016 to April 2017



**Bookings already being made…**

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# The course is in 8 modules:

**Module 1 – Intro to CarbonLite Retrofit**

**Module 2 – Climate and weather**
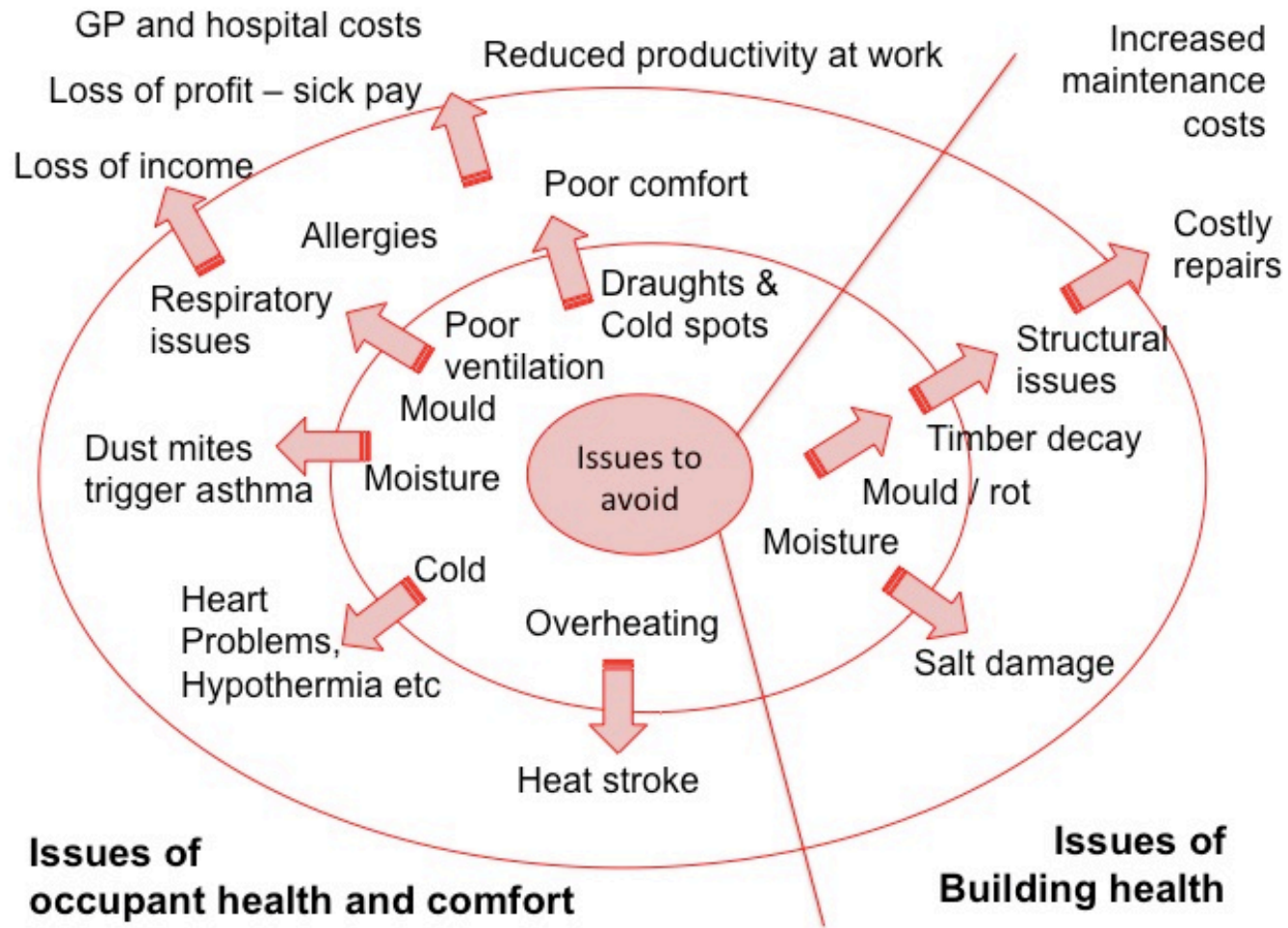
**Module 3 – UK construction**

**Module 4 – Heat and energy targets**

**Module 5 – Moisture and air quality**
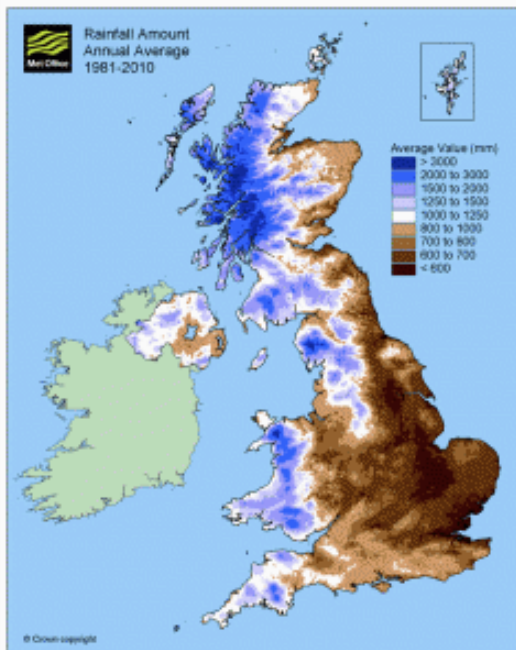
**Module 6 – Case studies**

**Module 7 – Building services**

**Module 8 – Financial rationale**

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# Module 1: Introduction to CLR



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# Module 2: Climate and Weather

> " *Climate is what you expect. Weather is what you get.*



Rainfall Amount
Annual Average
1981-2010

Average Value (mm)
> 3000
2000 to 3000
1500 to 2000
1250 to 1500
1000 to 1250
800 to 1000
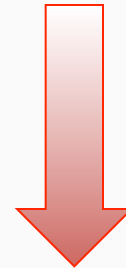700 to 800
600 to 700
< 600

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*UK average rainfall – showing the rain shadow effect. Source: Met Office*

This module looks at the way our climate affects our buildings.

It considers this on different scales:

- global
- national
- regional
- site
- building
- microclimates within the building and its fabric

The implications of sun, wind, rain and flooding are summarised.

This module also looks into the future and considers how climate change will modify the climates that we experience now.
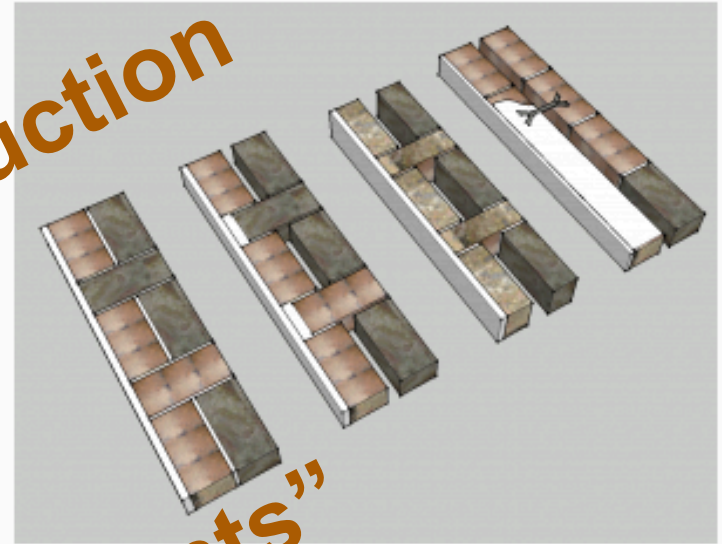
# Module 3: UK Construction

This module starts with a summary of changes to typical UK construction over the last 150 years.

It has a lesson on typical traditional construction and another on non-traditional UK construction.

Examples of as built and retrofitted non-traditional buildings are given.

Even within "standard construction", there is considerable regional variation in wall and floor characteristics – examples are given to illustrate these.

Finally, the effect of existing defects (sometimes as a result of previous "improvements") is discussed. Understanding these defects is critical to selecting a suitable retrofit strategy.

*Early cavity wall types*

*Traditional construction*

*Non-traditional construction*

*Regional variation*

*Previous "improvements"*

# Module 4: Heat & energy targets

This module covers:



Form Heat Loss factor =
Heat loss area / Treated Floor area

Halve the heat loss area,
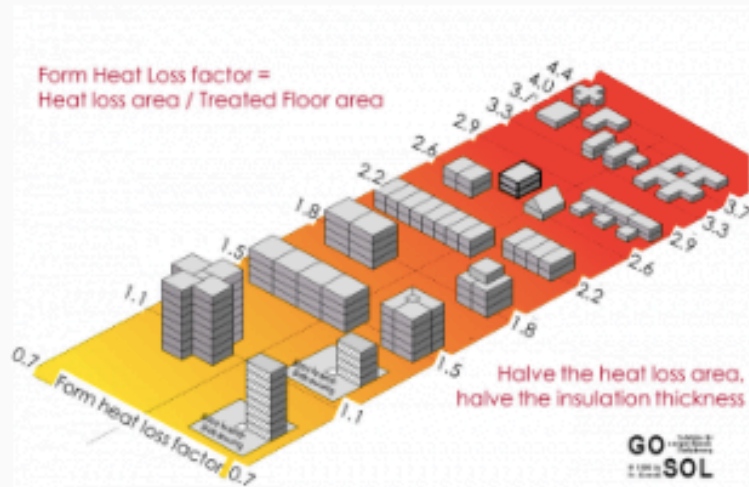halve the insulation thickness

GO **SOL**

*Diagram to show form factor for a range of different building examples*

- the basic physics of energy, power and the transfer of energy.
- annual energy consumption and how heat load is calculated.
- useful, delivered and primary energy
- energy performance and heat loss
- 5 key factors of thermal performance (in new build and retrofit)
- embodied energy in retrofit (the carbon 'burp')
- compares the 3 most common categories of houses
- uses these examples to look at form factor, heat loss, thermal bridges
- heat demand targets proposed for CLR Certification

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# Module 5: Moisture & air quality

This module considers:

- biological decay,
- where moisture in our homes comes from.
- how it exists in the building
- how it moves around / in / out of the building
- damage caused by salts in buildings
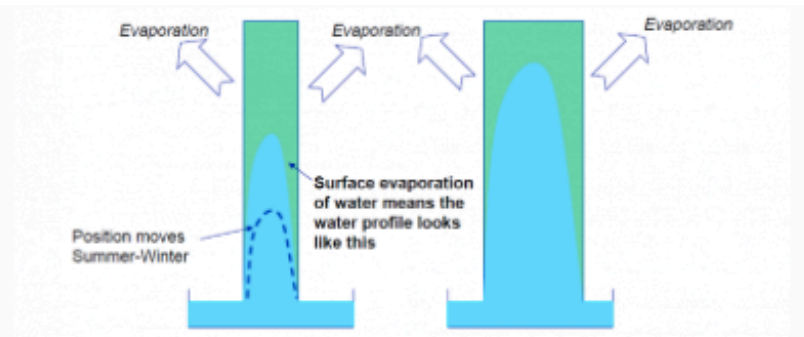- wetting and drying in buildings

*Diagram showing the damp front in walls of different thicknesses and in different seasons*

Evaporation    Evaporation    Evaporation

Position moves Summer-Winter

Surface evaporation of water means the water profile looks like this

**Definitions**
**Physics**
**Processes**
**Issues**
**Solutions**
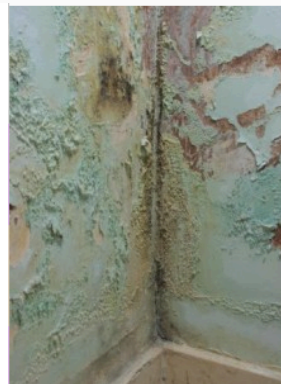
Processes such as evaporation, condensation, diffusion and capillary action are explained.

Problems and solutions are considered, along with heat sources and their effect on the different microclimates within a building. There are examples showing cases where issues have developed.

Hygrothermal modelling and monitoring is also covered.

*Photo showing damage caused by salts*

# Module 6: Case studies

Case studies are being added to this module over time. Examples include the following range of scenarios:
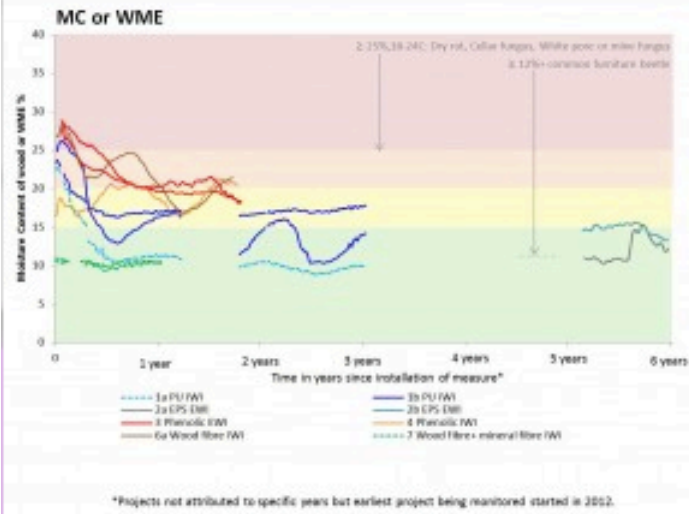


Graph of WME over time for several case studies

- solid brick walls with internal insulation
- solid brick walls with external insulation (permeable)
- solid brick walls with external insulation (semi-permeable)
- a loft space with condensation issues
- a misdiagnosed cavity wall, internally insulated
- a listed building with wood fibre internal insulation
- a barn conversion with timber frame internal wall insulation and ventilated cavity

Moisture monitoring in each case has been carried out and the results explained as part of the case study.

**Moisture monitoring in building assemblies**

# Module 7: Building Services
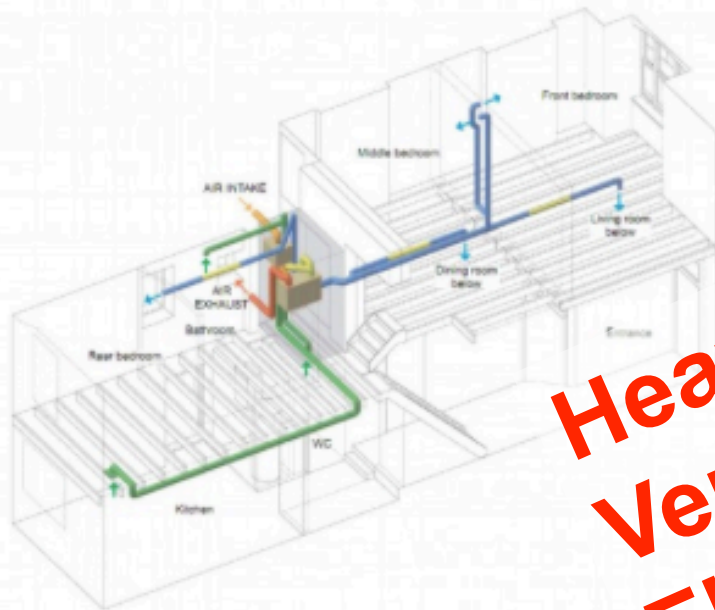


Mechanical ventilation with heat recovery

*Example of an MVHR system plan for a dwelling*

This module covers fuels and systems for heating and hot water (i.e. gas, oil, LPG, electricity and biomass with traditional and modern types of boilers)

It describes a range of ventilation systems including mechanical ventilation and heat recovery (MVHR) and mechanical extract ventilation (MEV) as well as other options.

it talks briefly about lighting and appliances, and renewable technologies.

**Heating systems**
**Ventilation systems**
**Electrical efficiency**
**Renewables**

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# Module 8: Financial rationale

## Module 8 – Financial rationale

This module considers the benefits of retrofitting and the disadvantages associated with "doing nothing" to a building.

It looks at the existing condition of the UK housing stock and the way that homeowners, landlords and government make decisions around home modifications.

Several methods for assessing or making a business case for retrofit are explained and compared (pay back period, discounted cash flow method, etc).

Extensive financial modelling of different types of house with different efficiency measures has been carried out.

Pros and cons of "do nothing"

Different ways to look at the retrofit business case

Cost benefits from individual to national scale

Detailed modelling of 3 common house types:
Light, medium and deep retrofits

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# Quizzes

- **At the end of each lesson**
- **True / False and multiple choice**
- **Some based on calculations**
- **Some based on reading the text**

Which of the following statements are true?

- ☐ Silverfish can cause structural damage in buildings
- ☐ Wet rot can be reduced by keeping the area dry and treating
- ☐ The activities of rots and beetles can have structural implications in some buildings
- ☐ Moulds are inhibited by alkaline substrates
- ☐ Water is essential for the growth of dry rot

# Home work and seminars

- **For the core modules, there is a <span style="color:blue">homework task</span>**

- **This is based on the module and focuses on a building of your choice (maybe your home or one of your relevant projects)**

- **This is sent to the tutor for that module**

- **Selected homeworks are used to consider key points and generate discussion in the <span style="color:blue">online tutorial</span>**

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# The end result…

- **Pass the quizzes and send in the homework = pass the course**

- **Provide details of your relevant experience and qualifications (to go on your AECB website profile)**

- **Everyone who passes the course listed on the AECB website**

- **Potential customers can find you on the CLR list and view your CLR-enhanced profile**

- **Start self-certifying your retrofit projects**

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# Into the future…

- **The course will be enhanced and updated as building knowledge evolves**

- **From 12 months after starting the course, participants will have access to it automatically**

- **An annual retainer fee gives ongoing access to the course (and notification of key changes to it)**

# CarbonLite Retrofit:

# filling the knowledge gap!



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