

# Construction Materials from the BioEconomy

## NZEB and Emerging Legislation

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# Energy Performance of Buildings Directive

- Member states to ensure that all new buildings are “Nearly Zero Energy Buildings” by 31st Dec 2020
- Member states to ensure that all new buildings owned and occupied by Public Authorities are ‘Nearly Zero Energy Buildings’ after 31st Dec 2018
- Major Renovations to be at Cost Optimal Level in Building Codes .

# Energy Performance of Buildings Directive

Nearly Zero Energy Buildings are defined as.....

*“nearly zero-energy buildings” means a building that has a very high energy performance, as determined in accordance with Annex I. The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby;”*

# LEGISLATION – Under Development

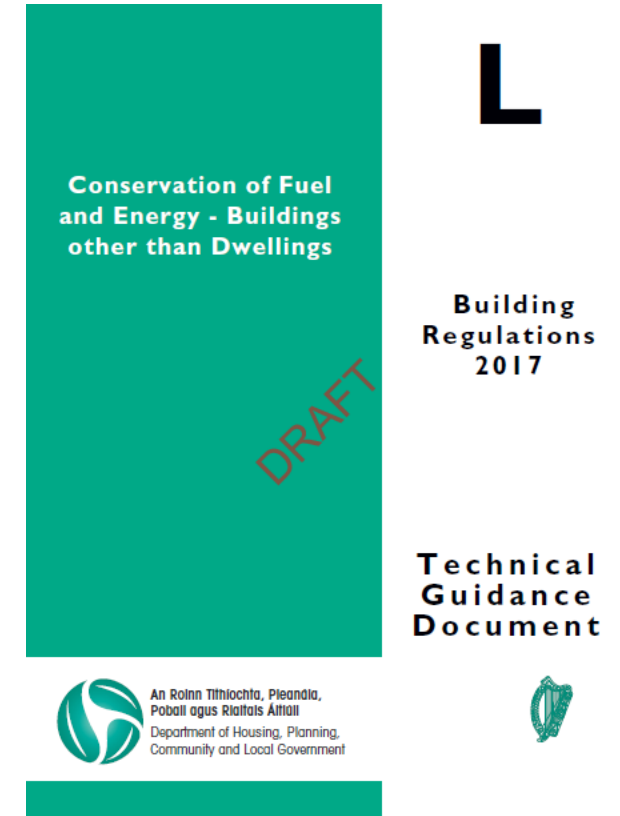
## NON DOMESTIC

- Was out for public consultation Q2 2017
- Due to be published Q4 2017

## New Build:

- Based on NEAP Software with New Reference Building (60% improvement on Current Regulations)

	Option 1:	Option 2:
MPEPC:	1.0	0.9
MPCPC:	1.15	1.04
Renewable Energy Ratio:	20%	10%



# Non Domestic Buildings – Actual Building is compared to Reference Building

Parameter	Current Regulations Reference Building	Proposed Regulations Reference Building
Area/ Volume	Same as actual building	Same as actual building
Opening Areas	Offices – 40% of exposed wall	Offices – 40% of exposed wall
Walls	0.27 W/m <sup>2</sup> K	0.18 W/m <sup>2</sup> K
Roof	0.16 W/m <sup>2</sup> K	0.15 W/m <sup>2</sup> K
Floor	0.25 W/m <sup>2</sup> K	0.15 W/m <sup>2</sup> K
Thermal Bridging	Add 16% to fabric heat loss	Length of Junction x Advanced psi value
Air Permeability	10 m <sup>3</sup> /hr/m <sup>2</sup>	5 m <sup>3</sup> /hr/m <sup>2</sup> floor area < 250m <sup>2</sup> 3 m <sup>3</sup> /hr/m <sup>2</sup> floor area > 250m <sup>2</sup>
Window	2.2 U value 0.72 Solar Transmittance	1.4 U value 0.4 Solar Transmittance

# Non Domestic Buildings – Actual Building is compared to Reference Building

Parameter	Current Regulations Reference Building	Proposed Regulations Reference Building
Heating/ DHW Efficiency	0.73 CoP	91%
Cooling Efficiency for A/C Bld	SEER – 1.67	SEER – 4.5
Lighting	3.75 W/m <sup>2</sup> /100 lux	65 lm/circuit watt
Occupancy Control	Local Manual Switching	Automated
Daylight Control	Local Manual Switching	Automated
Central Ventilation SFP	2 W/l/s	1.8 W/l/s
Variable Speed Control	No	Yes
Renewable Energy Ratio	None	20%

## Non Domestic Back Stop U values – New Buildings

Fabric Element	Area Weighted Average W/m <sup>2</sup> K	Elemental U value W/m <sup>2</sup> K
Roof – Pitched – Insulated at Ceiling Pitched – Insulated on Slope Flat	0.16 0.16 0.2	0.3
Walls	0.21	0.6
Ground Floor/ Exposed Floor	0.21	0.6
Doors/ Windows/ Rooflights	1.6	3.0

# New Materials

- Agreement Certificate





# LEGISLATION – Under Development

## Existing Buildings

Major Renovations to Cost Optimal Standards

Define as “*more than 25% of the surface area of the building envelope undergoes renovation*”

Provide menu of measures to bring to cost optimal when more than 25% of surface area being renovated:

- Upgrade inefficient heating systems
- Upgrade inefficient cooling
- Upgrade inefficient lighting systems

Building Type	Major Renovation - Cost Optimal Performance kWh/m <sup>2</sup> /yr
Retail Air Conditioned	338
Office Natural Ventilated offices and other Buildings	124
Office Air Conditioned	180
Hotel Air Conditioned a	342
Schools	60
Other Air Conditioned Buildings	338
Other Naturally Ventilated Buildings	124

DRAFT

# LEGISLATION – Under Development

## Major Renovations

**Par 2.3.2** When calculating the proportion of surface area undergoing renovation the area of the whole building external envelope should be taken into account including i.e. external walls, roofs, floors, windows, doors , and roof windows and lights

Works to the surface area of the building include the following:

- Cladding the external surface of the element
- Drylining the internal surface of an element
- Replacing windows
- Stripping down the element to expose the basic structural components (brickwork/blockwork, timberframe steelframe, joists, rafters etc.) and then rebuilding to achieve all the necessary performance requirements. Painting, replastering or rendering are not considered a major renovation for this part of the regulation.

**Par 2.3.4** The following improvements are normally considered to be cost optimal and will typically be economically feasible when more than 25% of the surface area of a building is being upgraded

- Upgrading heating systems more than 15 years old and with an efficiency of less than that shown in in table 10
- Upgrading cooling and ventilation systems more than 15 years old and a cooling unit Energy Efficiency Ratio less than that in Table 14 and/or Specific Fan Power greater than that in Table 12 and by the provision of new plant and
- Upgrading general lighting systems that have an average lamp efficacy of less than 40 lamp-lumens per circuit-watt and that serves greater than 100m<sup>2</sup> to the guidance in section 2.2.7.

## Non Domestic Back Stop U values – Material Alterations

Fabric Element	Area Weighted Average W/m <sup>2</sup> K	Elemental U value W/m <sup>2</sup> K
Roof – Pitched – Insulated at Ceiling Pitched – Insulated on Slope Flat	0.16 0.25 0.25	0.35
Walls – Cavity Walls – Other	0.55 0.35	0.6
Ground Floor	0.45	
Exposed Floor	0.25	0.6
Doors/ Windows/ Rooflights	1.6	3.0

# LEGISLATION – Under Development

## DOMESTIC

- Due to go for public consultation Q4 2017
- Due to be published Q1 2018

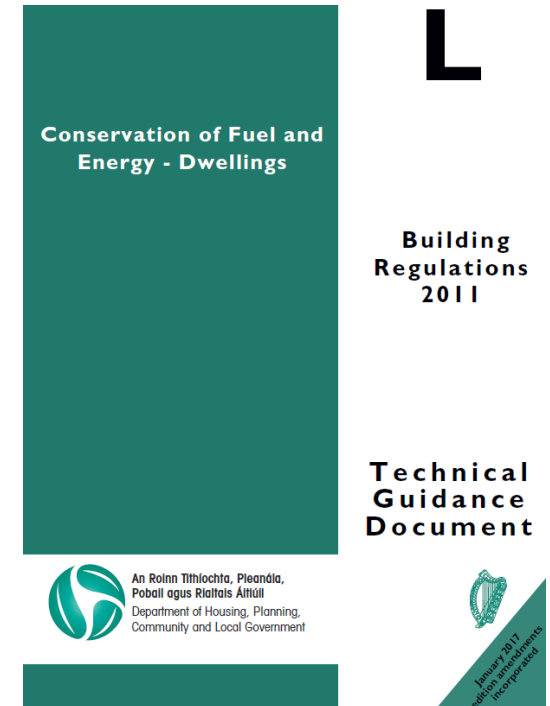
## New Buildings

Currently defined based on DEAP Software

MPEPC: 0.3 (25% improvement on Current Regulations)

MPCPC: 0.35 (25% improvement on Current Regulations)

Renewable is as per current 10 kWh/m<sup>2</sup>/yr



# LEGISLATION – Under Development

## Existing Buildings

Major Renovations to Cost Optimal Standards

Define as “*more than 25% of the surface area of the building envelope undergoes renovation*”

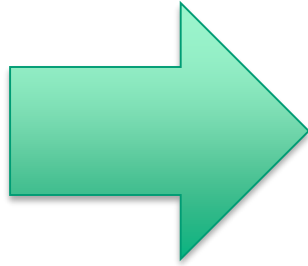
Provide menu of measures to bring to cost optimal when more than 25% of surface area being renovated:

- Upgrade inefficient heating systems
- Upgrade inefficient lighting systems



## What it means for typical house...

C3



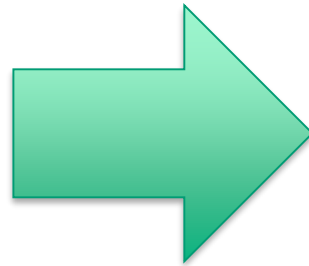
Wall U value 0.27

Roof U value 0.16

Boiler Efficiency 90%

Full Zone Time and Temperature Control

E2



Wall U value 0.27

Roof U value 0.16

Upgrade Windows to 1.8

Boiler Efficiency 90%

Full Zone Time and Temperature Control

# THERMAL BRIDGING

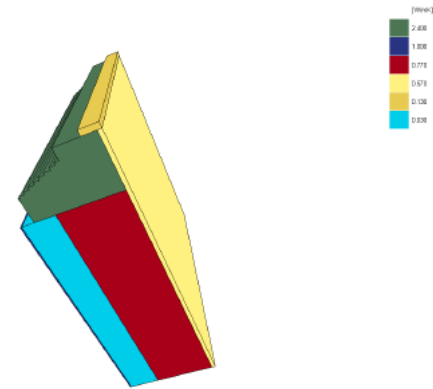
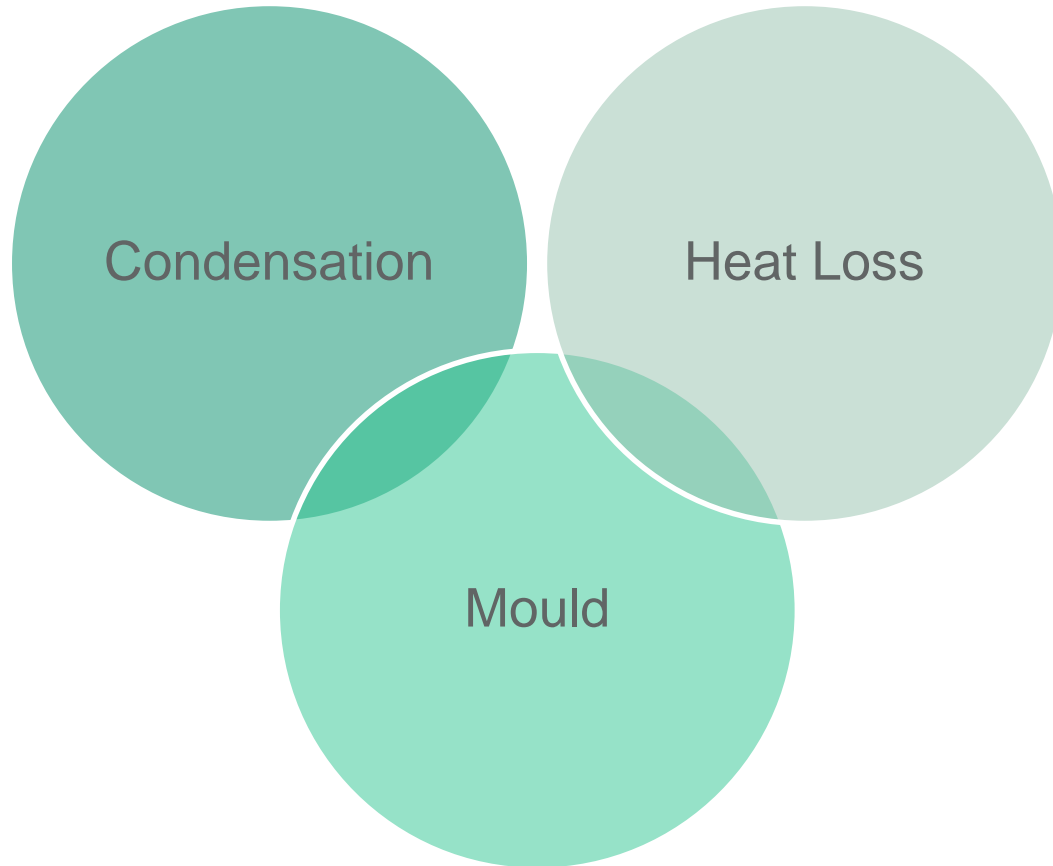


Figure G.13 - Materials modelled in TRISCO showing EWI terminated below the sill

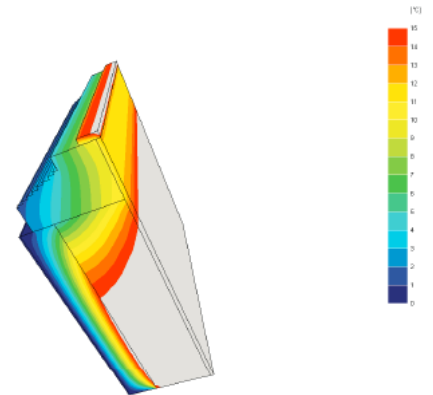


Figure G.14 - Thermal image of TRISCO output showing the internal surface to the rear of the sill is still significantly below 15 °C

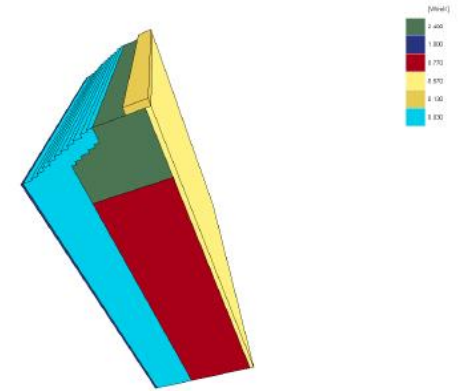


Figure G.15 - Materials modelled in TRISCO showing cut back sill

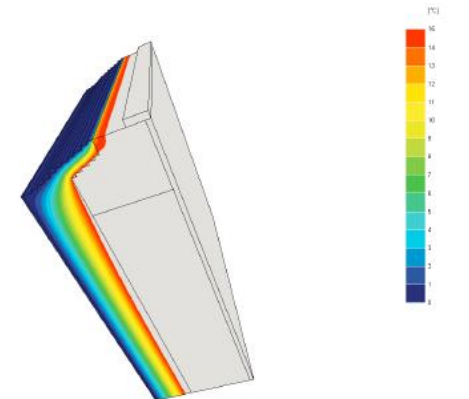
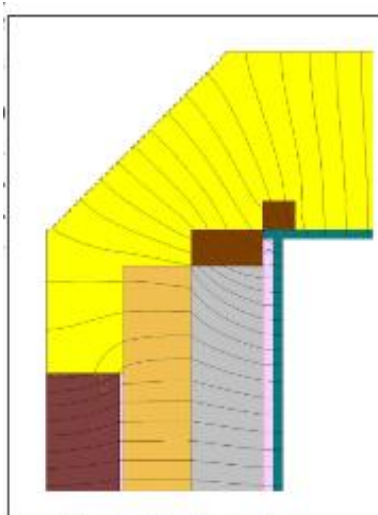
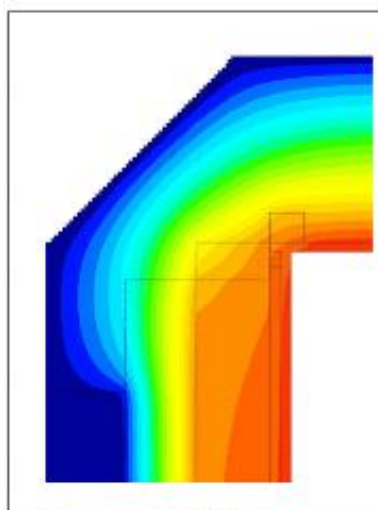


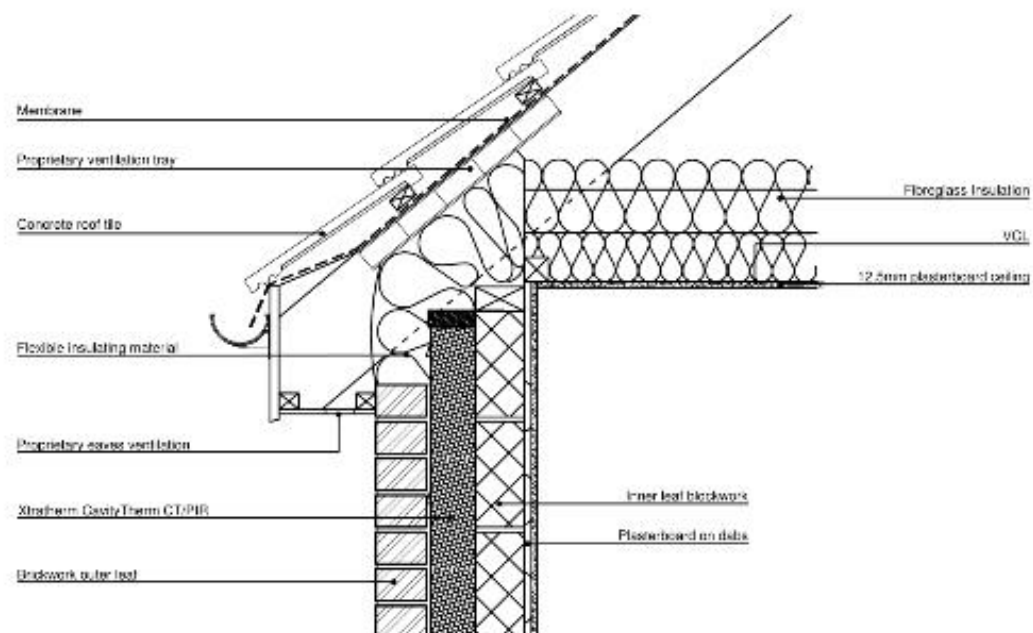
Figure G.16 - Thermal image of TRISCO output showing the internal surface to the rear of the cut back sill is significantly above 15 °C



Heat Flow Distribution diagram  
For illustrative purposes only.



Temperature Distribution diagram  
For illustrative purposes only.



### Calculation conditions

Thermal Resistance of insulation used in details:

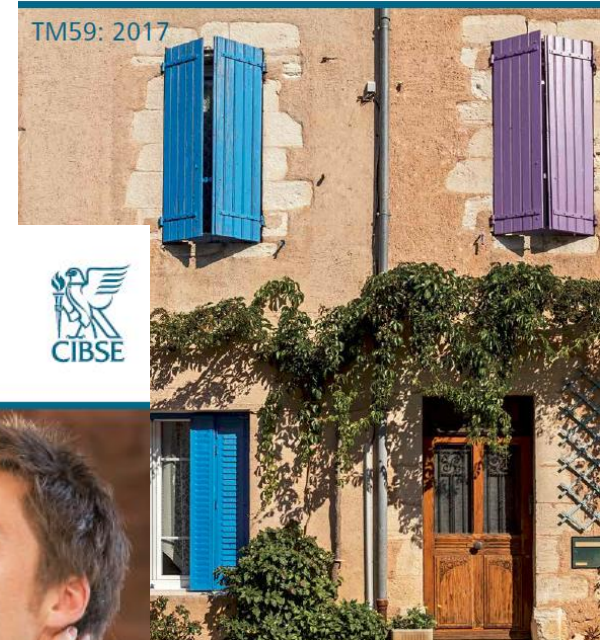
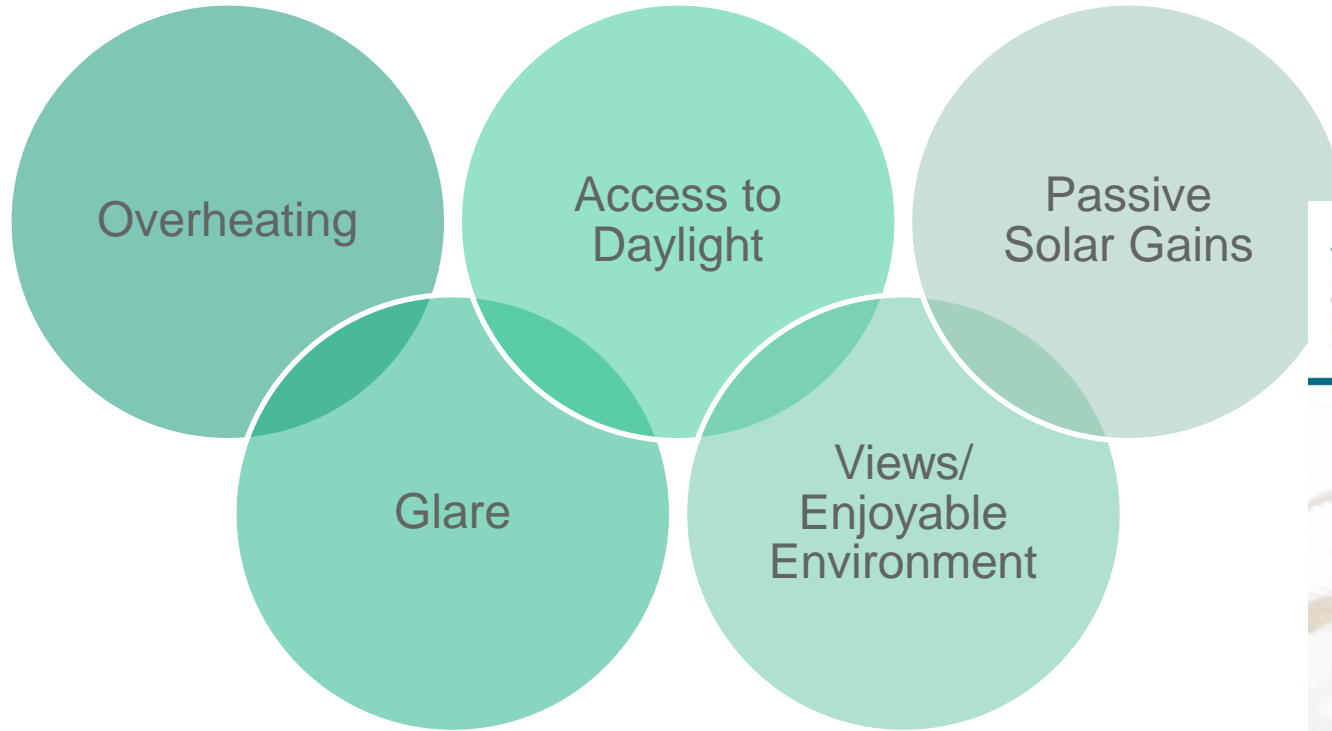
- Wall (cavity) - 4.52 (m<sup>2</sup>K)/W
- Roof - 6.25 (m<sup>2</sup>K)/W



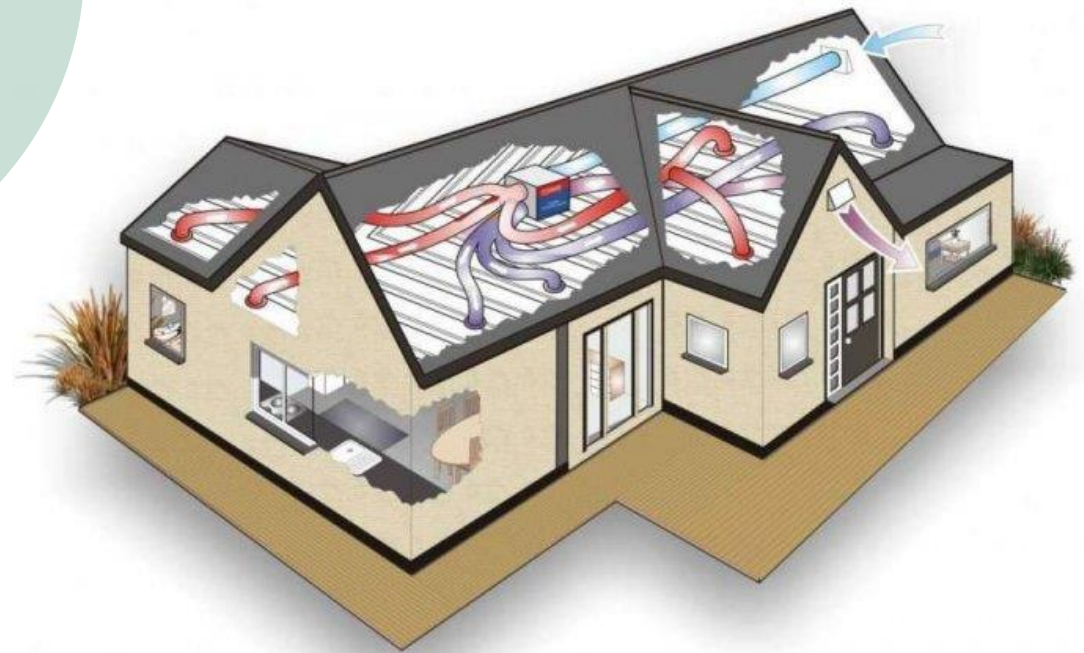
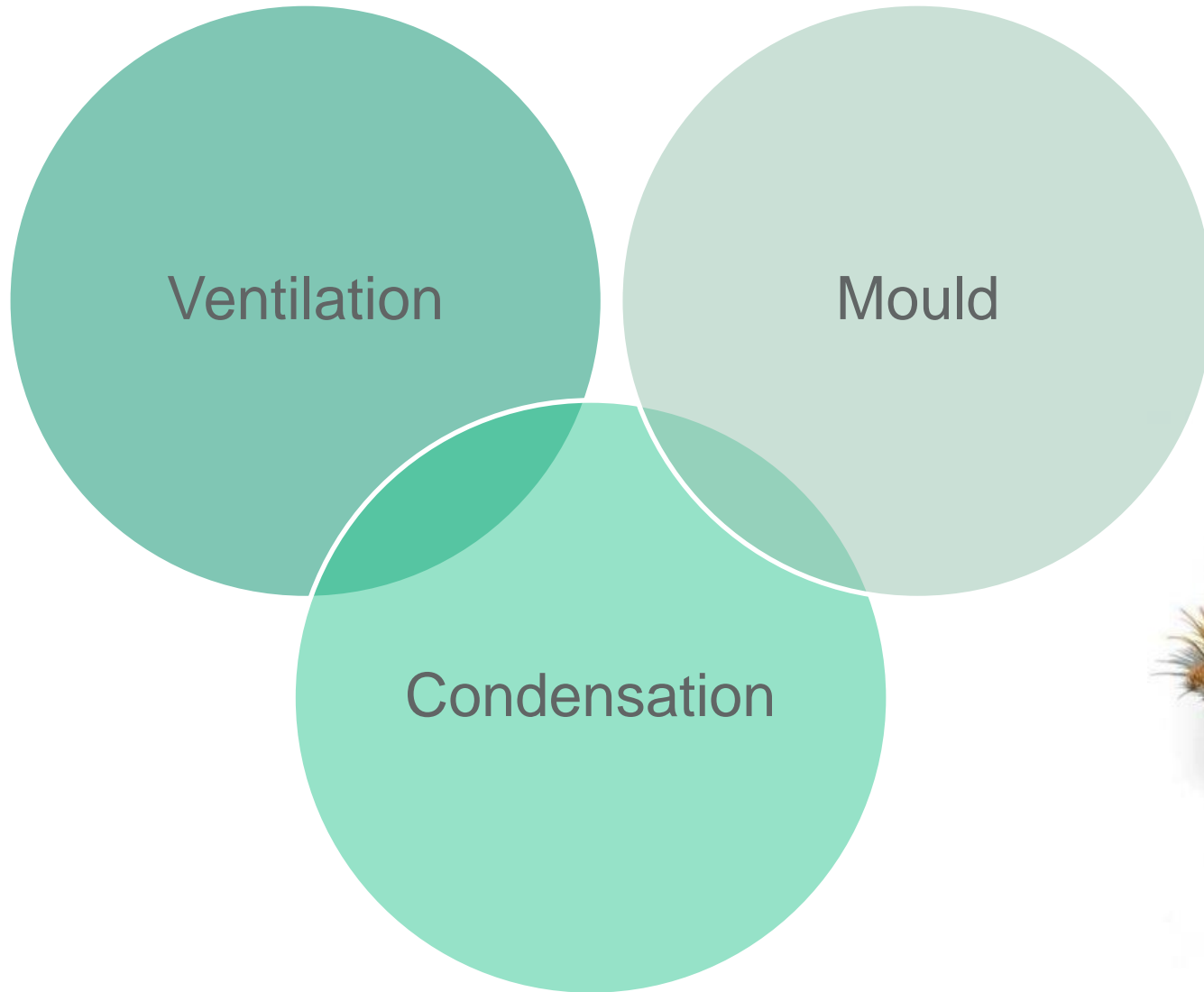


# INTERNAL ENVIRONMENTAL QUALITY - Overheating

Design methodology for the assessment of overheating risk in homes



# INTERNAL ENVIRONMENTAL QUALITY - Ventilation



# Hand Over

- Pressure Testing of Buildings
- Commissioning of Systems
- Duct Leakage Testing
- User Guide
  - Design Principles
  - Explain how to operate, control and maintain
    - Space Heating System
    - Hot Water Heating
    - Ventilation
    - Renewable technology
  - Direct to other data
    - Appliance Manuals
    - Advisory Report



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HOME USER GUIDE



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# Thank you

