Building Regulations Part L 2010

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28th April 2010

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We've signed The Copenhagen Communiqué

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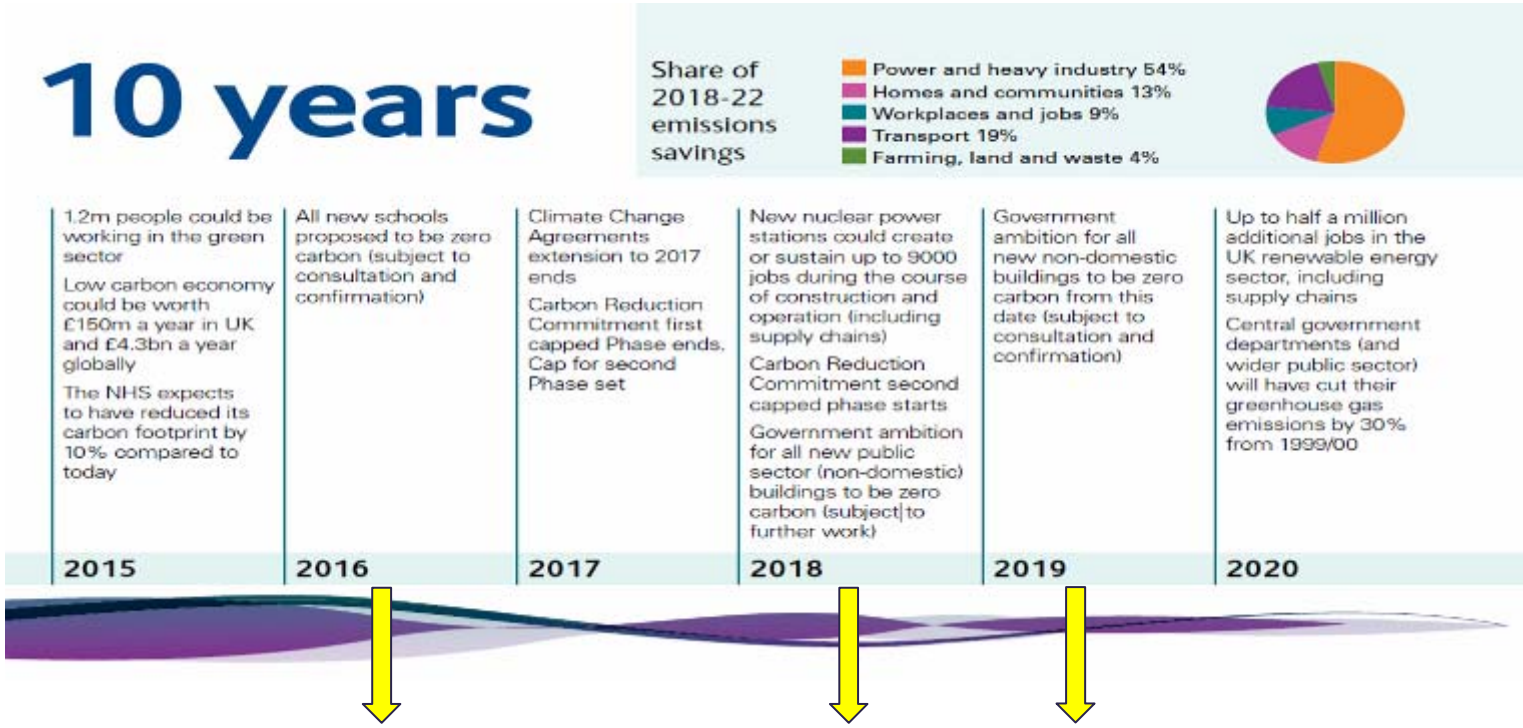
Summary of presentation

- Objectives of Part L 2010
- Key changes to non-domestic new build compliance
- Key changes to existing non-domestic refurbishment

2010 Part L objectives

- 25% reduction in CO_2 relative to 2006 Part L target.
- Reduce energy consumption as well as CO_2 emissions
- Improvements in actual rather than predicted performance
- Another step on the journey towards zero carbon

UK low carbon transition plan



Zero Carbon:

- **New Schools**
- **New public buildings**
- **New non-domestic buildings**

L2A - The new building compliance process (non-domestic)

Criteria:

1. **Building Emission Rate ≤ Target Emission Rate** (reg. 17C)
2. **Limits on design flexibility**
3. **Limiting the effects of solar gains in summer**
4. **Quality of construction & commissioning**
5. **Providing information / O&M instructions**

Criterion 1 – Target Emission Rate (TER)

2006 TER	**= 2002 Notional building × Adjustment factor (~76% to 72%)**
2010 TER	**= 2010 Notional building (*no adjustment factors*)**

Basis of 2010 Notional building

- The 2010 Notional building is intended to yield the required 25% reduction in CO_2 on aggregate when applied to projected mix of new buildings

- The specification of the Notional building in based on delivering equal marginal abatement costs across all components

Projected mix of new buildings

Non-domestic building type	% of mix	CO_2 reduction
Shallow plan (heated only)	1	22%
Shallow plan (Air conditioned)	1	40%
Deep plan (Air conditioned)	40	26%
Warehouse	33	34%
Hotel	6	16%
School	4	27%
Retail	12	21%
Supermarket	2	26%

The Notional building – System seasonal efficiencies (SSEER)

Notional building	
2006	2010
Space heating : 73% to 83% Hot water : 45% Cooling : 1.67	Space heating : ~80% Hot water : 88% or 90% Cooling : 3.60

The Notional building – Differences in specific fan powers

Notional building	
2006	2010
Air handling unit : 2.0 (no heat recovery)	Air handling unit : 1.8 (heat recovery at 70%)
Fan coils : n/a	Fan coils : 0.5
Zonal ventilation : 1.2	Zonal ventilation : 0.9
Zonal extract : 0.8	Zonal extract : 0.6
Local extract : 0.5	Local extract : 0.4

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The Notional building – Differences in heating fuel

Notional building	
2006	2010
Natural gas *(unless Actual building does not have mains gas then it uses fuel oil)*	**Uses the same fuel as the Actual building** *(apart from heat pumps, heating fuel emission factor caped to fuel oil)*

This generally means that it will be more difficult to get compliance simply by using bio-fuels.

The Notional building – Differences in fabric

Notional building	
2006	2010
Wall: 0.35 W/m²K	Wall: 0.26 W/m²K
Roof: 0.25 W/m²K	Roof: 0.18 W/m²K
Glazing: 2.20 W/m²K	Glazing: 1.80 W/m²K
Air permeability of 10 m³/hour at 50Pa	Air permeability of 5 m³/hour at 50Pa

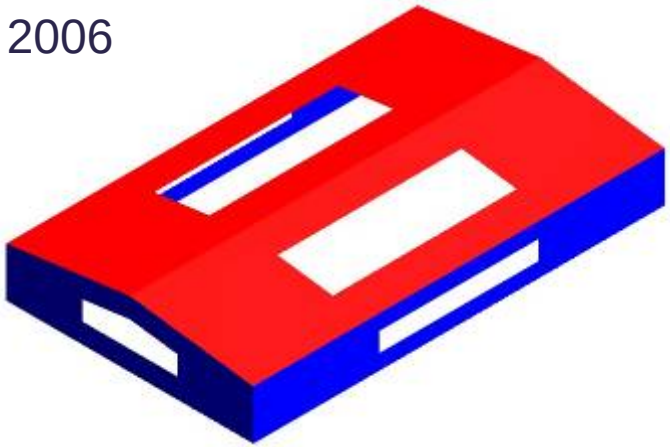
The Notional building – Differences in openings

Notional building	
2006	2010
Windows: • 40% in offices • 30% in residential • 15% in industrial Rooflights : 20% Glazing based on low-e hard coat glass (g-value of ~0.72)	Side-lit activities get windows: Lesser of (40% of facade area OR 1.5m high × facade width) Roof-lit activities : 12% rooflights Glazing based on high performance soft coat glass (g-value of ~0.4)

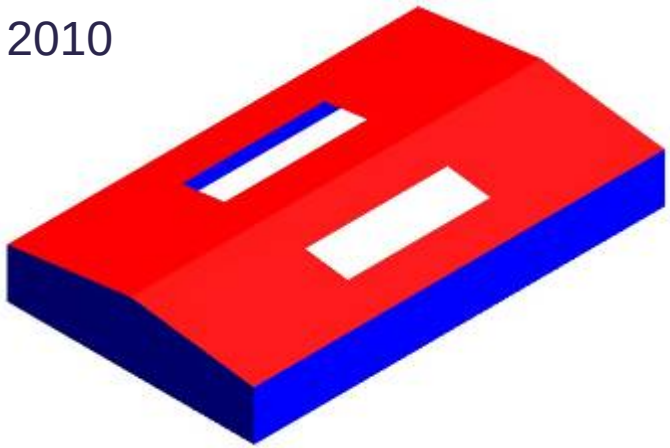
The Notional building – Differences in openings (examples)

Industrial

2006



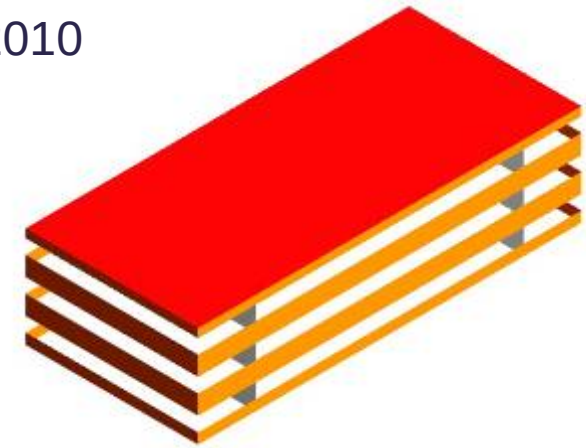
2010



Office

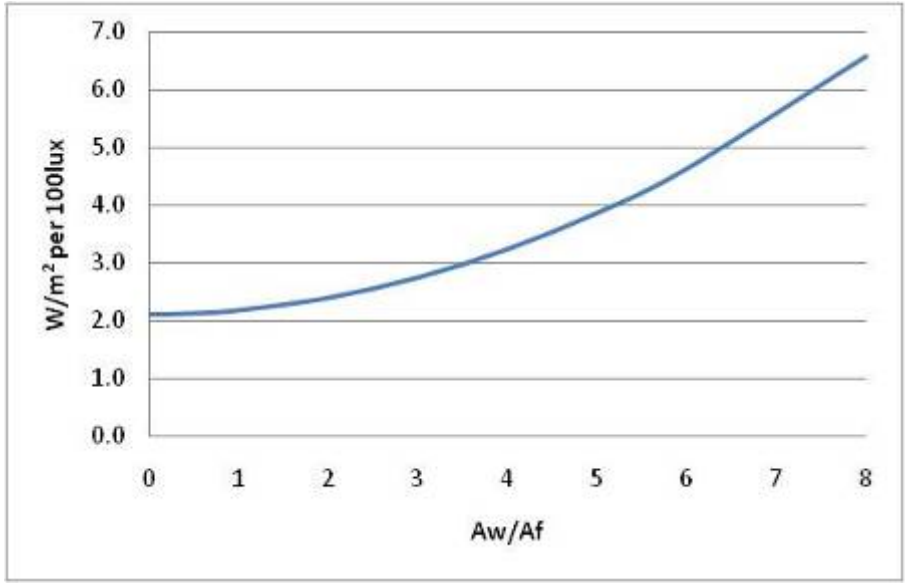
2006

2010



The Notional building – Lighting

Notional building	
2006	2010
Lighting: 3.75 or 5.20 W/m²/100lux	Power density curve + photo electric dimming



Shell & Core

- Designer models “Shell” areas with assumed “fit-out”
- Shell areas will be included in “As-designed”, but excluded from “As-built” CO_2 calculations
- BRUKL will highlight “Shell” areas and summarise assumed data
- CO_2 calculation is repeated following first fit-out of “Shell” areas

Criterion 2 – Design limits

- **Fabric parameters same as 2006** (*i.e. Area weighted average U-values*)

- **Efficiency of building services and lighting generally improved** *(see "Non-domestic building services compliance guide")*

A important note is that the performance of the 2010 Notional building generally exceeds these design limits,

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Sample design limits for heating systems from latest draft

Gas, oil and biomass-fired boilers (a) New buildings		**Boiler seasonal efficiency (gross[5])**
Natural gas	Single boiler system	86%
	Multiple-boiler system	82% for any individual boiler 86% for the overall multi-boiler system
LPG	Single boiler system	87%
	Multiple-boiler system	82% for any individual boiler 87% for the overall multi-boiler system
Oil	Single boiler system	84%
	Multiple-boiler system	82% for any individual boiler 84% for the overall multi-boiler system
Biomass		75%
Gas, oil and biomass-fired boilers (b) Existing buildings		**Boiler seasonal efficiency (gross)**
Natural gas		82%
LPG		81%
Oil		84%
Biomass		75%

Sample of guidance of boiler controls in new buildings

Table 5: Recommended minimum controls package for new boilers and multiple boiler systems		
Boiler plant output	**Package**	**Minimum controls**
<100 kW	A	a. Timing and temperature demand control, which should be zone specific where the building floor area is greater than 150 m^2. b. Weather compensation except where a constant temperature supply is required.
100 kW to 500 kW	B	a. Controls package A above; and b. optimal start/stop control with either night set-back or frost protection outside occupied periods; and c. two stage high/low firing facility in boiler, or multiple boilers with sequence control to provide efficient part-load performance. Note: The heat loss from non-firing boiler modules should be limited by design or application. For boilers that do not have low standing losses, it may be necessary to install isolation valves or dampers.
>500 kW individual boilers	C	a. Controls package A and Controls package B; and b. for gas-fired boilers and multi-stage oil-fired boilers, fully modulating burner controls.

Sample credit system for existing buildings from latest draft

Table 8: Heating efficiency credits for measures applicable to boiler replacement in existing buildings

Measure		Heating efficiency credits % points[10]	Comments
A	Boiler oversize ≤20%	2	Boiler oversize is defined as the amount by which the maximum boiler heat output exceeds the system heat output at design conditions, expressed as a percentage of that system heat output. For multiple-boiler systems the maximum boiler heat output is the sum of the maximum outputs of all the boilers in the system.
B	Multiple boilers	1	Where more than one boiler is used to meet the heat load.
C	Sequential control of multiple boiler systems	1	Applies only to multiple-boiler/module arrangements. It is recommended that the most efficient boiler should act as the lead in a multi-boiler system.

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Sample design limits for heating systems from latest draft

Heat pump systems	CoP (Heat generator efficiency)
All types (except absorption heat pumps and gas-engine heat pumps) for space heating	2.2 (220%) when operating at the rating conditions[6]
All types (except absorption heat pumps and gas-engine heat pumps) for domestic hot water heating	2.0 (200%) when operating at the rating conditions
Absorption heat pumps	0.5 (50%) when operating at the rating conditions
Gas-engine heat pumps	1.0 (100%) when operating at the rating conditions
Gas and oil-fired warm air systems	**Thermal efficiency (net)**
Gas-fired forced convection (natural gas)	91%
Gas-fired forced convection (LPG)	91%
Direct gas-fired forced convection	100%
Oil-fired forced convection	91%

Sample design limits for CHP and HWS from latest draft

CHP		CHPQA quality index	Power efficiency
All types		105	20%
Electric (primary) heating		**Seasonal efficiency**	
Boiler		N/A	
Warm air		N/A	
Domestic hot water systems		**Thermal efficiency (gross)**	
Direct-fired	Natural gas	73%	
	LPG-fired	74%	
	Oil-fired	75%	
Indirect-fired (dedicated hot water boiler)	Natural gas	80%	
	LPG-fired	81%	
	Oil-fired	82%	
Electric DHW heaters	Electricity	100%	

Sample design limits for comfort cooling from latest draft

Comfort cooling systems	Energy efficiency ratio (EER)
Packaged air conditioners – single duct types	2.5
Packaged air conditioners – other types	2.5
Split and multi-split air conditioners	2.5
Variable refrigerant flow systems	2.5
Vapour compression cycle chillers, water cooled <750 kW	3.85
Vapour compression cycle chillers, water cooled >750 kW	4.65
Vapour compression cycle chillers, air cooled <750 kW	2.5
Vapour compression cycle chillers, air cooled >750 kW	2.6
Water loop heat pump	3.2
Absorption cycle chillers	0.7
Gas engine driven variable refrigerant flow	1.0

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Sample design limits for ventilation system from latest draft

System type	SFP (W/(l/s))	External system pressure drop (Pa)
Central mechanical ventilation system including heating and cooling	1.8	400 supply 250 extract
Central mechanical ventilation system including heating only	1.6	400 supply 250 extract
All other central mechanical ventilation systems	1.4	400 supply 250 extract
Zonal supply system where the fan is remote from the zone, such as ceiling void or roof mounted units	1.2	200
Zonal extract system where the fan is remote from the zone	0.6	200
Zonal supply and extract ventilation units such as ceiling void or roof units serving a single room or zone with heating and heat recovery	2.0	150
Local supply and extract ventilation system such as wall/roof units serving a single area with heating and heat recovery	1.8	150
Local supply or extract ventilation units such as window/wall/roof units serving a single area (e.g. toilet extract)	0.4	30
Other local ventilation units	0.6	30
Fan assisted terminal VAV unit	1.2	30
Fan coil units (rating weighted average*)	0.6	30

Component	SFP (W/(l/s))
Additional return filter for heat recovery	+0.1
HEPA filter	+1.0
Heat recovery – thermal wheel system	+0.3
Heat recovery – other systems	+0.3
Humidifier/dehumidifier (air conditioning system)	+0.1

Sample design limits for lighting from latest draft

Internal lighting	Lighting efficacy
General lighting in office, storage and industrial areas	55 luminaire lumens per circuit-watt
General lighting in other types of space other than office areas	55 lamp lumens per circuit-watt
Display lighting	22 lamp lumens per circuit-watt

Table 47: Luminaire control factors for use in new and existing buildings

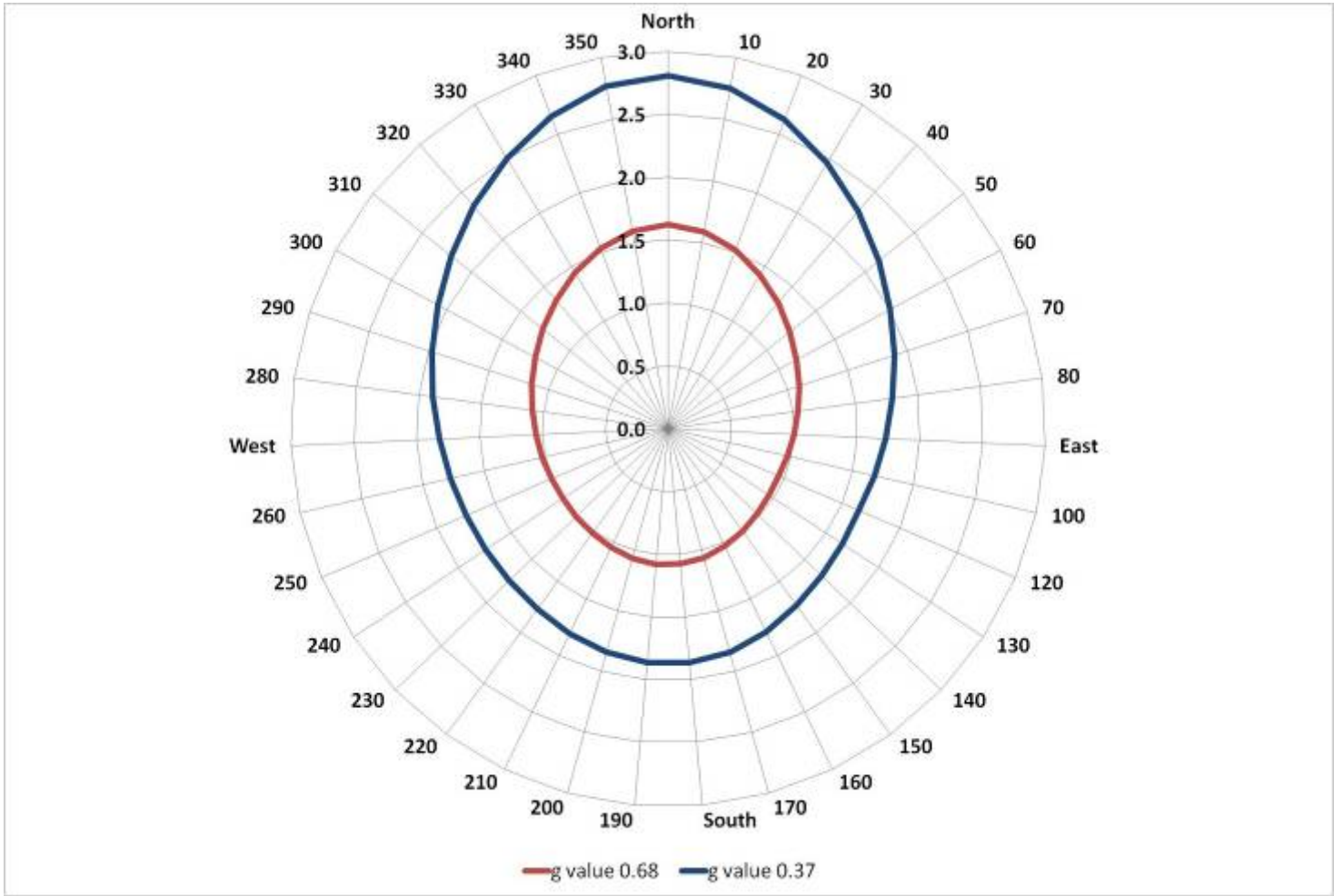
Light output control	Control factor
a. The luminaire is in a daylit space and its light output is controlled by photoelectric switching or dimming control, with or without override.	0.9
b. The luminaire is in a space that is likely to be unoccupied for a significant number of operating hours, and where a sensor switches off the lighting in the absence of occupants but switching on is done manually except where this would be unsafe.	0.9
c. Circumstances a. and b. combined.	0.85
d. None of the above.	1.0

Criterion 3 – limiting solar gains

- **Any zone that is either occupied or mechanically cooled is subject to the new solar gain limit check (this includes second-hand solar).**
- **Solar gain limit check is set by solar energy aggregated between April and September (TRY weather tape)**
- **External shading and internal blinds are taken into account**

	Glazing area	g-value	Frame factor
Side-lit	1m high × full facade width	0.68	10%
Roof-lit (zone height<6m)	10% roof lights	0.68	25%
Roof-lit (zone height≥6m)	20% roof lights	0.46	15%

Criterion 3 – Example for London (Test reference year weather)



L2B - Work on existing buildings

- **Overall process generally unchanged**
- **Performance of building fabric and fittings generally improved**
- **Efficiency of building services and lighting generally improved**
  (see "Non-domestic building services compliance guide")

Standards for replacing fittings

Fitting	Standard
Windows, roof windows and glazed rooflights	1.80 W/m²K
High usage entrance doors	3.50 W/m²K
Other doors	1.80 W/m²K
Vehicular entrance doors (+ similar large doors)	1.50 W/m²K
Roof ventilators and smoke vents	3.50 W/m²K

Standards for replacing thermal elements

Element	Standard
Wall	0.28 W/m²K
Pitched roof – insulation at ceiling level	0.16 W/m²K
Pitched roof – insulation at rafter level	0.18 W/m²K
Flat roof or roof with integral insulation	0.18 W/m²K
Floors	0.22 W/m²K

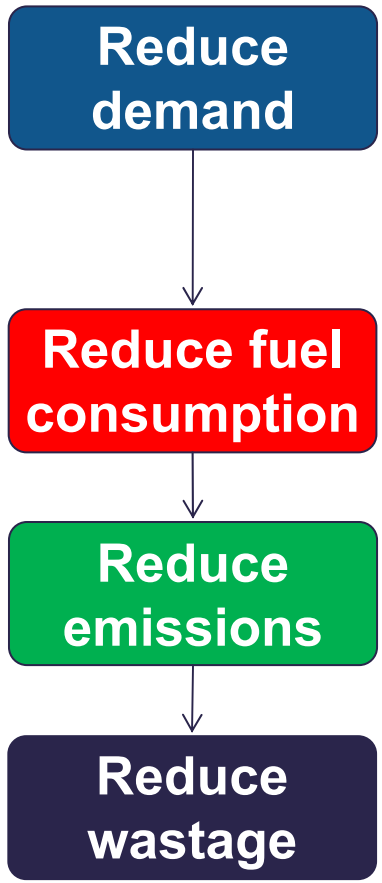
Upgrading retained thermal elements

- **Material change of use**
- **Existing element becomes part of thermal envelope, where previously it was not**
- **Consequential improvements**

Element U-values (w/m²K)	If worse than	Upgrade to
Wall – cavity insulation	0.70	0.55
Wall – external or internal insulation	0.70	0.30
Floors	0.70	0.25
Pitched roof – insulation at ceiling level	0.35	0.16
Pitched roof – insulation at rafter level	0.35	0.18
Flat roof or roof with integral insulation	0.35	0.18 / 0.20

In summary - the spirit of Part L

- **Passive component - reduce energy demand by making the building envelope as efficient as possible** *(i.e. reduce heat loss from conduction and infiltration, optimise the solar gain in terms of facade design)*
- **Active component – install high efficiency HVAC and lighting systems that are property commissioned and controlled**
- **CO_2 reduction – use mix of energy supplies and renewable sources that minimise carbon impact**
- **Provide appropriate operating instructions and monitoring to enable building owners/occupiers to effectively manage their energy use**



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