Part L 2010 Constructing Excellence Wales

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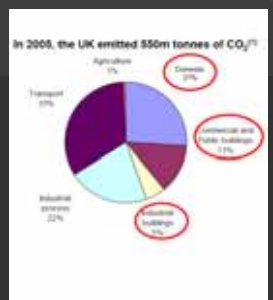
Minimum standards

1. Background - Policy context
2. Changes to Part L – Domestic and Non Domestic
3. Relationship to Part F
4. SAP
5. SBEM

Background

Buildings account for 45% of UK carbon emissions

- Also security of supply and fuel poverty issues
- Raising energy efficiency standards via Building Regulations is key
- Ensure health standards not compromised



Policy context

- A developed alternative option to provide aggregate 25% for new building stock rather than per building
- 2010 notional (TER) with no improvement factor based on relative cost effectiveness of making energy efficiency improvements for typical building components
- Some buildings deliver more than 25%, some less – optimised to deliver national target of 25% when applied across build mix
- Separate aggregates for domestic and non domestic buildings
- Maximises CO2 reduction per unit investment, more pronounced
- for non-domestic
- • Government proposed approach for 2010 is ***"flat 25%" for new***
- ***homes*** and ***"aggregate 25%" for new non-domestic buildings***

Background

- Domestic Time line – Set to deliver Zero Carbon by 2016 in England for all new build
- Non Domestic – Set to deliver Zero Carbon by 2019 for all new build
- Consultation in England for the existing stock
- cost-effective energy efficiency measures available to all households
- emissions from households (and business premises) reduced by at least 80%, and as far as possible be approaching zero

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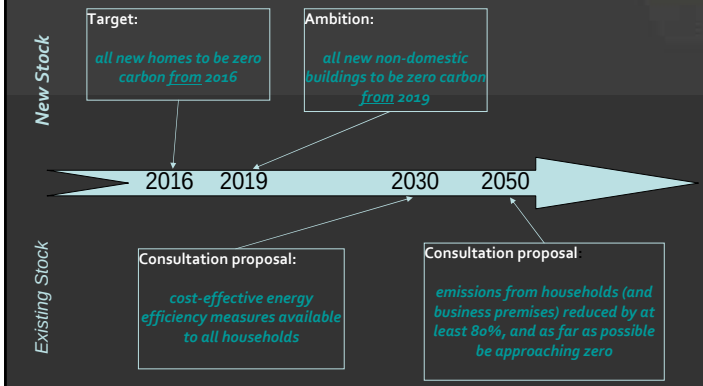
Part L in a developing policy landscape



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Part L in Policy context - Domestic

- The 25% improvement required by Part L 2010 includes 2.5% reduction in carbon emissions envisaged due to the new 125 litres per person per day Part G requirement
- Zero carbon
  - The current format of Part L1 is heavily influenced by the EPBD
  - European parliament voted in the EPBD re-cast to require all new buildings to be net zero carbon by 2016
  - The 25% and 44% levels proposed for Part L 2010 and 2013 for new homes remain unaffected by the zero carbon proposal (and it's hierarchy).

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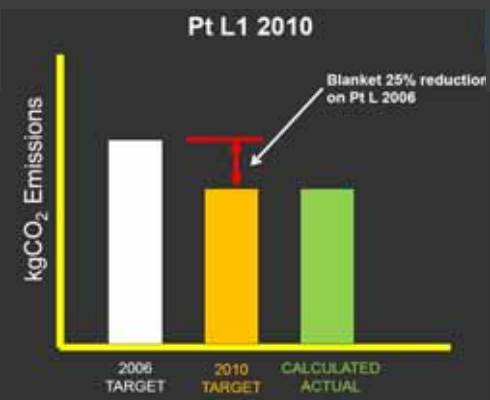
Part L in Policy Context



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Part L in Policy Context - domestic

- The Code for Sustainable Homes
  - Will need to change in 2010, so that the energy requirements of the Code do not fall beneath the 2010 requirements.
  - Code 2010 released later this year. Changes will be introduced in some areas including Energy & Surface Water Run off.

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Part L 2010 – Policy Context

- Non Domestic more un clear
- Issues around the definition of the notional building and the approach being used with the Aggregate Approach.
- No defined mechanism for non domestic (Code for Sustainable Buildings)

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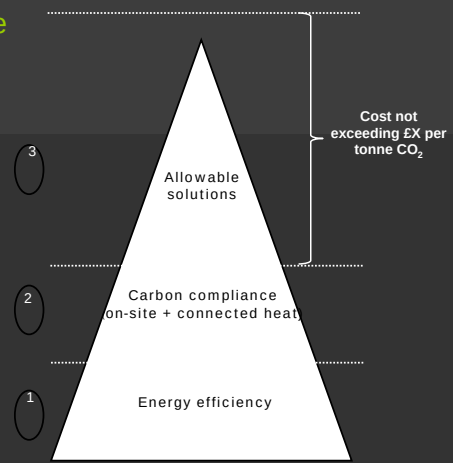
The Future



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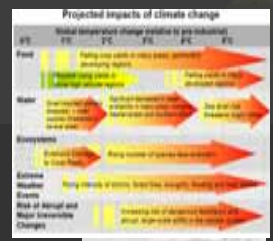
The Future Policy

- Strengthening of R&D programmes
- UKCIP Climate projections
  - Future of building regulations will need to consider adaptation to climate change in light of the recent UK climate projections
- The Eco-design of Energy Using Products Directive (EuP)
  - will set performance standards for a variety of products that will effect the carbon emission from building.
  - This needs to be accounted for in 2nd Tier compliance guides)



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Climate Change

- Report released recently by Bill Gething – Designing for Future Climate
- The Earth's climate is changing – wetter winters and drier summers will affect existing buildings and alter the requirements of new ones. Whatever the cause of climate change, we will need to adapt our buildings so that they can cope with higher temperatures, more extreme weather and changes in rainfall.

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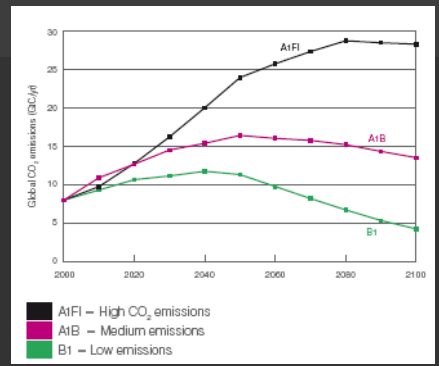
Climate Change – latest data



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Climate Change

- Mean daily maximum temperatures increase everywhere. Increases in the summer average are up to 5.4ºC (2.2 to 9.5ºC) in parts of southern England and 2.8ºC (1 to 5ºC) in parts of northern Britain.
- Increases in winter are 1.5ºC (0.7 to 2.7ºC) to 2.5ºC (1.3 to 4.4ºC) across the country.
- Changes in the **warmest day of summer** range from +2.4ºC (–2.4 to +6.8ºC) to +4.8ºC (+0.2 to +12.3ºC), depending on location, but with no simple geographical pattern.

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The Future – In England

Review Building Control

- These proposals include:
  - limiting changes to regulation to pre-published periodic review points;
  - more stringent enforcement powers available to local authorities;
  - a risk based compliance mechanism allowing local authorities to focus on projects at high risk of non-compliance; and
  - making the guidance and procedures more user friendly for all those that use them.

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The Future in Wales

- Building Regulations set to be devolved in 2011, with the first changes planned for 2013.
- First changes announced 9th July 2010, in a policy statement available on the WAG website .
- www.wales.gov.uk/housing
- 55% improvement above Part L 2006 for domestic, non domestic to follow.

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Wales Part L

- Modelling done on off gas and gas options using fixed fabric improvements.
- U- Values
  0.15 walls
  0.13 floor
  0.11 roofs
  Windows of 1.4

bre

Wales Part L

Air tightness above 3 to mitigate the use of MVHR

Thermal Bridging of 0.04

Attention to detail on site imperative

Then some technologies to deliver the uplift.

Fabric set for good

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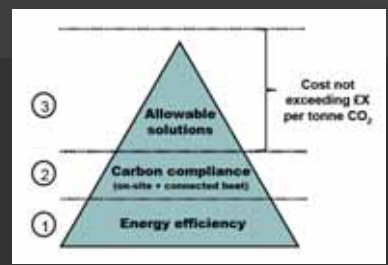
Wales Part L

- Zero Carbon on site to be set at about 70% ?
- The rest from allowable solutions



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Transitional Arrangements for 2010

1. Read the statutory instrument, which gives guidance on the transition arrangements. The key clauses can be paraphrased as follows:

2. Part L (and F) 2006 continues to apply if:
   a. Work has started on site prior to 1 October 2010 and initial notice and full plans have been submitted
   b. Work has not started on site but an initial notice and full plans submission is given before 1 October 2010, in which case the work must be started before 1 October 2011.

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Technical Content – Changes to Part L1A Domestic

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Compliance – 5 Criterion

1 - Achieving the TER – Cannot be exceeded

2 - Limits on Design Flexibility

3 - Limiting the effects of Solar Gain

4 - Building Performance Consistent with DER

5 – Provisions for Energy efficient operation of the buildings

bre

Changes to approach

Overheating is a design issue, not a compliance one
Building Regs do not set minimum daylight requirements

New Homes

- Inclusion of updated weather data in SAP Appendix P.
- Thermal mass now included in main SAP calculations, no longer implicit.
- When seeking to limit solar gains, consideration should be given to the provision of adequate levels of daylight
  < 20% of floor area may lead to poor levels of daylight.

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Over heating

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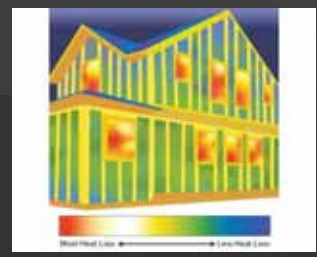
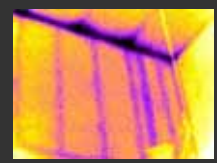
Changes to approach

- Use of Accredited details and advanced accredited details now has to be verified, rather than implicit.
- 3 routes to compliance





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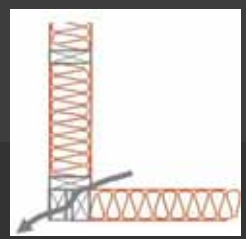
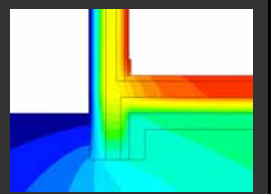
Thermal Bridging

1. Default (y = 0.15) – severe penalty if no steps to reduce bridging
2. Sum (length x psi-value) for each junction (including junctions with party walls)
3. psi-values from:
   – accredited construction details (accreditation scheme to be set up)
   - – calculated in accordance with BR 497 (+25%)





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Changes – Air permeability

5.18 On each development, an air pressure test should be carried out on three units of each ***dwelling type*** or 50 per cent of all instances of that ***dwelling type***, whichever is the less. For the purposes of this Approved Document, a block of flats should be treated as a separate development irrespective of the number of blocks on the site. The ***dwelling(s)*** to be tested should be taken from the first completed batch of units of each ***dwelling type***.

Most larger developments will include many ***dwelling types*** *– and multiple units of each type should be tested to confirm the robustness of the designs and the construction procedures.*

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Changes

- Increase in sampling rate (~ doubled) for domestic developments
- Change to 'Test method B' from ATTMA Guide - trickle vents temporarily sealed rather than just closed - better test of building envelope
- Alternatives for small developments
- Criteria for non-BINDT registered
- testers - recent calibration of kit and appropriate training

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Air Permeability

- Typically over 80% of our time is spent indoors and we need the air that we breathe to be healthy – especially important for vulnerable groups
- Key part of the revision of ADF is how dwellings should be ventilated in the future
- ADF (2006) guidance has been designed to work at assumed permeability of 3 m3/h/m2 at 50 Pa
- Part L changes encourage air-tightness so more homes will tend towards 3 m3/h/m2 : adequate purpose provided ventilation is needed to maintain healthy IAQ

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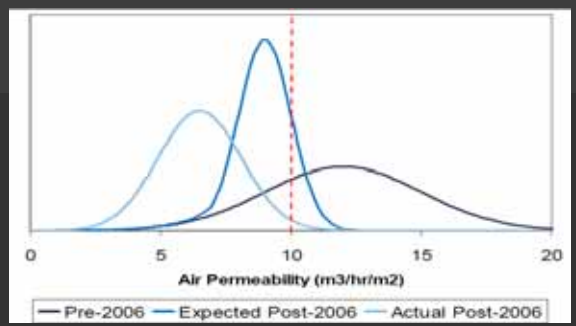
Air Infiltration Rates



~30% of new dwellings tested < 5 m3/h/m2
~3-5% of new dwellings tested < 3 m3/h/m2
Future dwellings are expected to become tighter

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Air Permeability

A dwellings air permeability must be determined by using one of the following methods:

Method 1. If a dwelling has been pressure tested, the results of that pressure test must be used for that dwelling.

Method 2. If a dwelling has not been pressure tested, then the air permeability for that dwelling should be the average test result obtained from *other dwellings* of the same *dwelling type* on the development. Increased by a margin of +2.0 $m^3/h/m^2$ at 50Pa

Method 3. On small developments of no more then 2 dwellings, the builder may:

a) Demonstrate that during the preceding 12 month period, a *dwelling* of the same *dwelling type* constructed by the same builder had been pressure tested as in method 2 (above) and has achieved the design air permeability of $10m^3/h/m^2$ at 50Pa

b) Avoid the need for any pressure testing by using a value of $15m^3/h/m^2$ at 50Pa.

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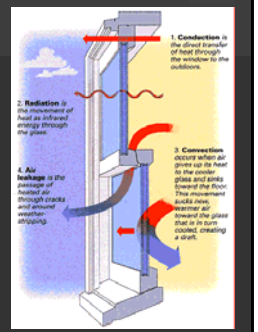
Changes - Windows

- All new buildings have target of 25% reduction in Carbon Dioxide (CO_2) emissions compared to 2006 levels
- Window Energy Ratings (WERs) will become the main compliance for replacement windows in homes
- Alternative route retained for window U values
- Increased focus on limiting solar gain in summer (reducing load on air-conditioning or need to install air conditioning)
- Increase in performance to u-value of 2.0



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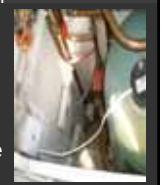
Commissioning

- Domestic Building Services compliance guide to be followed
- Commissioning plan to be provided to BCB with deposit of plans
  - Identify systems to be tested
  - Specify the tests to be carried out
- Benefits
  - Encourage the team to think about commissioning at the appropriate point in the design/construct process.
  - Provide advance notice to BCB as to what commissioning work is proposed. As the work proceeds, they can satisfy themselves that the necessary activities are being completed.



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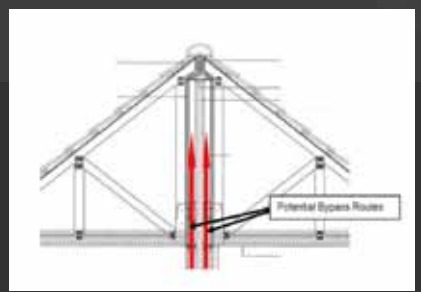
Party Wall Heat By Pass

- Apply default value unless effective solution can be verified for Party Wall and other thermal bypasses



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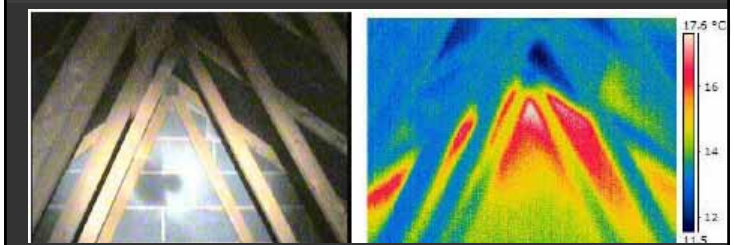
Party Wall



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Design implications

None of these measures go towards the 25% improvement required

- Solid: U = 0.0
- Unfilled cavity no edge sealing U = 0.50
- Unfilled cavity with edge sealing U = 0.20
- Filled and sealed cavity U = 0.0

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Internal Gains

Gains have been reviewed

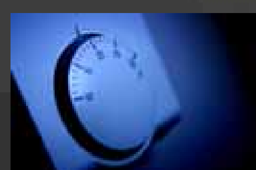
Source	(A) Typical gains	(B) Reduced gains
Metabolic	60 × N	50 × N
Lighting	equation (L8) in Appendix L	equation (L8a) in Appendix L
Appliances	equation (L11) in Appendix L	equation (L11a) in Appendix L
Cooking	35 + 7 × N	23 + 5 × N
Water heating	$1000 \times (52)_m \div (n_m \times 24)$	$1000 \times (52)_m \div (n_m \times 24)$
Losses	-40 × N	-40 × N
Pumps and fans	Table 5a	Table 5a

- Reduced gains are assumed for DER calculation (therefore increasing space heating requirement)

bre

Boiler Efficiency

- Single SEDBUK efficiency no longer used in SAP calculations
  – Replaced by separate space and water heating efficiency (varies by month)
- – Provides more precise modelling for low energy housing
- – SEDBUK still basis for minimum standard in building regulations
- Reduction of lab test efficiencies supplied by manufacturers (capped)
- Also minor alterations to SEDBUK to deal with anomalies which have arisen. Revised efficiency values (e.g. down rating of SEDBUK values in SAP based on field trial evidence)



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Heat Pumps

- Include heat pump performance based on test data
  (similar to boilers)
- • Encourages improvements to heat pump performance
- Still indicate good improvement, but due to carbon intensity of fuel, not as good as they used to be.

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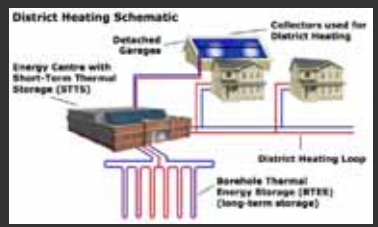
Community Heating

- More flexible options for combinations of fuels
- Boiler efficiency from test data
- Allowance for electricity used for pumping



Lighting

- **What did Part L 2006 call for?**
  - for 1 in 4 light fittings to be low energy, or for 1 every 25m2
  - for all these fittings to be dedicated fittings
  - 40 lumens per circuit-watt or better as the definition of low-energy.
- **How does Part L 2010 differ?**
  - it asks for 3 in every 4 outlets to be low energy
  - but it *relaxes* the requirement for the fittings to be dedicated, meaning that people will be free to switch over to any old bulb after the building is finalised
- • the new efficiency threshold is increased to 45 lumens per circuit-watt.

Information to Owners

The owner of the dwelling should be provided with sufficient information about the building, the fixed building services and their maintenance requirements, so that the building can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances.

The operating and maintenance instructions should clearly explain how to operate the systems efficiently - including adjusting the timing and temperature control settings and basic routine maintenance.

The information should include the data used to calculate the DER/TER along with the recommendations report from the EPC – to inform the occupier of how energy performance may be further improved in the future.

It is recommended that an electronic copy of the DER/TER (SAP calculation) is retained for future analysis.

Helpful Documentation

- Domestic Building Services compliance guide
- http://www.planningportal.gov.uk/uploads/br/domestic_building_compliance_guide_2010.pdf

Key Changes Summary

Document Format:
Restructured into 7 sections
Criterion 1-5 amended to better reflect changes in SAP 2009 and ADL1A 2010

Notification of Works:
Must submit 'Design Stage' SAP report to BCB before work commences

Stringent energy/CO2 performance requirements:
25% improvement DER/TER 2010
44% improvement DER/TER 2013
Zero-carbon 2016

Criterion 1: Secondary Heating
Default secondary heating removed.

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Summary Key Changes

Criterion 1: Internal Lighting
Default 30% removed – accurate % value for fixed lighting now accepted

Design Limits:
Lower (better) limiting (area weighted average) U-values required for walls and roofs

Criterion 4: Accredited Construction Details/Thermal Bridging:
New conventions for demonstrating reasonable provision has been made to limit thermal bridging. (3 methods).

Party Walls and Thermal Bypasses:
Now recognised that party walls may not be zero heat loss elements. New (area weighted average) U-values assigned to party wall construction types

bre

Summary Key Changes

Air Permeability and Pressure Testing:
Clear guidance on new sampling frequencies.

Trickle vents can now be temporarily sealed whilst testing dwellings.

Provision of Information:
More comprehensive home user information
To include information on potential future energy improvements.

Section 7:
New section providing guidance on use of modelling packages.

Special Guidance;
1) Guidance provided on calculating heat loss from swimming pool basins.

2) Guidance on inclusion of conservatories and porches.

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Technical Content – Changes to Part L2A Non - Domestic

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The Requirement – Schedule 1

- L1. Reasonable provision shall be made for the conservation of fuel and power in buildings by:

(a) limiting heat gains and losses

(i) through thermal elements and other parts of the building fabric; and (ii) from pipes, ducts and vessels used for space heating, space cooling and hot water services;

(b) providing fixed building services which—

(i) are energy efficient; (ii) have effective controls; and (iii) are commissioned by testing and adjusting as necessary to ensure they use no more fuel and power than is reasonable in the circumstances;

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Schedule 1

- **(c) providing to the owner sufficient information about the building, the fixed building services and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances**

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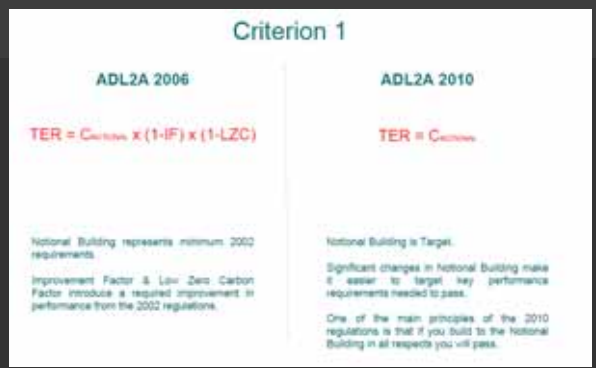
Part L 2A – Changes to Criterion & Implications



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Part L 2A – Changes to Criterion & Implications

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Part L 2A – Changes to Criterion & Implications

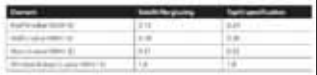
Notional Building - Constructions

ADL2A 2006

Notional Building U-Values equal to minimum U-Values required

Air Permeability = 10 m³/m².h @ 50Pa

ADL2A 2010



Notional Building U-Values lower than Criterion 2 U-value requirement.

Although Notional Building U-values have been reduced, these do not form limiting figures for Criterion 2.

If actual building only meets minimum Criterion 2 requirements further improvements will likely be needed elsewhere to offset better Notional Building.

Air Permeability = 5 m³/m².h @ 50Pa

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Part L 2A – Changes to Criterion & Implications

Part L2A – England & Wales

Construction Element	Criterion 2 U-Value Requirement 2006 (W/m².K)		Criterion 2 U-Value Requirement 2010 (W/m².K)
	Weighted Average	Worst Individual Element	Worst Individual Element
Roof	0.25	0.35	0.25
Wall	0.35	0.7	0.35
Curtain Wall	2.2	3.3	2.2
Floor	0.25	0.75	0.25
Window / Rooflights	2.2	3.3	2.2
Pedestrian Door	2.2	3	2.2
High Usage Entrance Doors	6	6	3.5
Vehicle Access Door	1.5	4	1.5
Roof Ventilators	6	6	3.5

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Part L 2A – Changes to Criterion & Implications

Notional Building - Systems

ADL2A 2006

- No Heat Recovery
- Heating Fuel either Nat. Gas or Oil
- Heating SCOP 73%, 78% or 83%
- Cooling SEER 1.67
- Central Mech. Vent SFP 2 W/l/s

ADL2A 2010

- 75% Eff. Heat Recovery
- Same Heating Fuel as Actual Design
- Heating SCOP 88% or 82%
- Cooling SEER 3.5
- Central Mech. Vent SFP 1.8 W/l/s

Notional Building Systems significantly more efficient than previous Notional Building.

As same fuel in used in Notional Heating System less Credit is given to Low Carbon Systems (i.e. Biomass boiler)

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Part L 2A – Changes to Criterion & Implications

Fuel Factors

ADL2A 2006

Fuel	Carbon Emission Factor (kg/kWh)
Nat. Gas	0.194
LPG	0.234
Oil	0.265
Biomass	0.025
Grid Electricity	0.422
Grid Displaced Electricity	0.568

ADL2A 2010

Fuel	Carbon Emission Factor (kg/kWh)
Nat. Gas	0.206
LPG	0.251
Oil	0.306
Biomass	0.019
Grid Electricity	0.591
Grid Displaced Electricity	0.591

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Part L 2A – Changes to Criterion & Implications

Notional Building – Lighting Power

ADL2A 2006

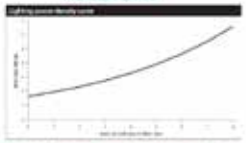
Office, Storage, Industrial
3.75 W/m2 per 100lux

All Other Spaces
5.2 W/m2 per 100lux

Notional Building lighting falls into one of two categories based on room activity.

Along with the design Lux level a lighting power is established for each space.

ADL2A 2010



Notional Building uses Wall/Floor ratio to determine each zones Lighting Power Density.

Generally larger spaces will have a Lighting energy significantly lower than 2006 Notional Building.

As well as a reduced energy consumption there is a reduced internal gain resulting in a lower cooling load.

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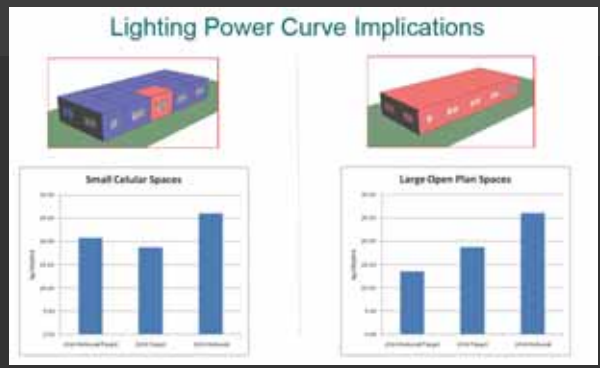
Part L 2A – Changes to Criterion & Implications

Lighting Power Curve Implications



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Part L 2A – Changes to Criterion & Implications

Criterion 3

ADL2A 2006

Typically based on Overheating assessment with DSY '05 weather Data.

Pass based on percentage of occupied hours exceeding a Operative Temperature of 28°C

Only Applicable to Naturally Ventilated Spaces (incl. mixed mode)

ADL2A 2010

No longer an Overheating requirement.

Pass based on comparison of aggregated solar gain against a reference window.

Applicable to all spaces regardless of Space Conditioning Type

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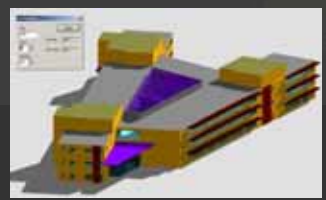
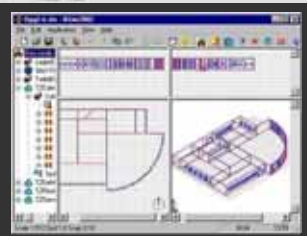
Dynamic Simulation Models

- No doubt that the changes announced will re focus design teams minds on how to demonstrate compliance.
- A complicated building will need to use a more in depth analysis of what is going on in the building
- Simple building – Simple process.





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SBEM v DSM

SBEM	Dynamic Simulation (DSM)
•Compliance Tool	•Design & Compliance Tool
•Monthly heat balance (12 months time steps)	•Dynamic sub hourly simulation (min 8760 hours time steps)
•Simple geometry	•Complicated geometry (CAD data)
•6 orientations	•Unlimited orientations
•Simple solar	•Advanced solar penetration (window approaches other)
•Simple HVAC	•Detailed HVAC (window approaches other)
•Simple natural ventilation	•Detailed natural ventilation control
•Simple renewable models	•Detailed renewables linked to weather data
•Quick calculation (steady state)	•Detailed calculation will take longer
•Only suitable for smaller schemes	•Can be used on small schemes but more likely larger schemes
•Not appropriate for Atria	

bre

Energy Meters

- Building over 1000m² - energy meters
  - all renewables monitored separately
  - 90% of fuel consumption to be assigned to end usages
  - automatic meter reading and data collection facilities

Centralised switching to allow a building manger to switch off all non used circuits.

bre

Design Implications

- In general, the approach is different for each building type in the 2010 Regs. –software users will need to be aware that buildings will require a much more integrated design and clear stage by stage analysis
- Exceeding the Notional Building will be far more rigorous than the2006 approach
- If an electric system is specified –this will only compete with the TER 2010 in highly insulated buildings. Otherwise fuel selection will have to be improved.
- There's less scope for rescue measures without Renewables. Fuel factor changes mean that the overall quality of building design is addressed with the hope that this leads to better building design

bre

Minimum Energy Efficiency Ratio (EER) for comfort cooling

Type		Minimum Cooling Plant full load EER
Packaged air conditioners	Single duct types	2.5
	Other types	2.5
Split and multi-split air conditioners		2.5
Variable refrigerant flow systems		2.5
Vapour compression cycle chillers, water cooled <750KW		3.85
Vapour compression cycle chillers, water cooled >750kW		4.65
Vapour compression cycle chillers, air cooled <750kW		2.5
Vapour compression cycle chillers, air cooled >750kW		2.6
Water loop heat pump		3.2
Absorption cycle chillers		0.7
Gas engine driven variable refrigerant flow		1.0

bre

Maximum specific fan powers and pressure drop in air distribution systems in new buildings

System type	Maximum SFP, W/l/s	Maximum 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	160
Local supply and extract ventilation systems such as wall/roof units serving a single area with heating and heat recovery	1.8	160
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

bre

Minimum lighting efficacy in new buildings

Lighting type	Minimum lighting efficacy, %
General lighting in office, industrial and storage areas	The average initial efficacy should be not less than 55 luminaire lumens per circuit-Watt.
General lighting in other types of space	The average initial efficacy should be not less than 55 lamp lumens per circuit-Watt.
Display lighting	The average initial efficacy should be not less than 22 lamp lumens per circuit-Watt.

bre

TER Comparison

bre

Air Permeability

Air testing

All new buildings other than dwellings greater than 500 m^2 must be air tested and achieve an air tightness of better than 10 $m^3/hr/m^2$ of external surface area (including floor area).

If the floor area is less than 500 m^2 the designer may choose not to air test in which case a default value of 15 $m^3/hr/m^2$ must be assumed.

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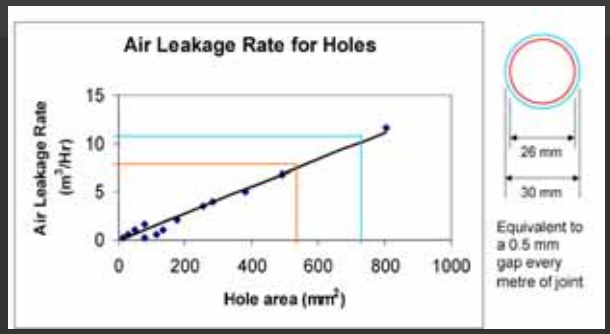
Impact



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Impact




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Impact

- The consequences of this kind of workmanship ?

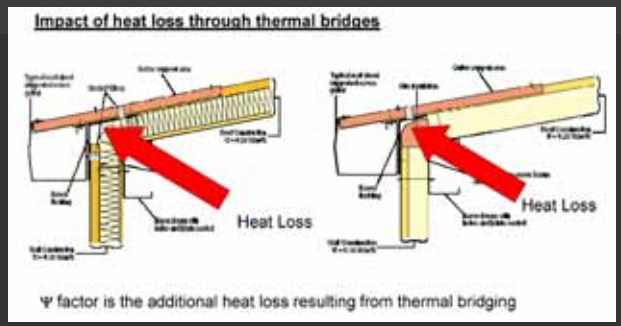
bre

Impact

- An air tightness of about 16M³
- End result – fails new Part L

bre

Thermal Bridging



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Thermal Bridging

Calculation of the Alpha Factor

- Overall linear thermal loss (alpha value) for the notional building should be less than 10% of the building fabric losses.
- Calculation to demonstrate this as follows :

$$\text{Alpha value (Target} < 0.10) = \frac{(\Psi \text{ factor 1} \times \text{Lin/m}) + (\Psi \text{ factor 2} \times \text{Lin/m}) \text{ etc}}{(\text{U Value} \times \text{Area 1}) + (\text{U Value} \times \text{Area 2}) \text{ etc}}$$

bre

Helpful guidance

- Additional information available

http://www.planningportal.gov.uk/uploads/br/non-domestic_building_compliance_guide_2010.pdf

bre

Key change - Summary

1. The situation for buildings other than dwellings is more complex as the “aggregate” approach has been adopted to reflect the relative ease of compliance of different types of buildings. Therefore, the reduction for any particular building will vary but when aggregated across the non-domestic sector build mix, an overall reduction of 25% is achieved.
2. There is encouragement to use accredited construction details (ACD) to reduce thermal bridging.

bre

Summary

3. The minimum air permeability limit remains at 10m3/hr/m2. However, the consultation proposed that the notional buildings would assume 7 and 5m3/hr/m2 for domestic and non-domestic buildings respectively. So it is important to achieve these lower limits, or carbon savings will need to be found elsewhere. Research has shown that the industry has learned to construct buildings to achieve reliably a pressure test of 5m3/hr/m2.
4. Consider the need for renewable energy systems from the start. Part L 2010 marks a point at which the limit of cost-effective improvement in energy efficiency has just about been reached and compliance will increasingly be dependent on some renewable energy generation or connection to a low-carbon energy supply.

bre

Summary

5. The efficiency requirements of mechanical ventilation systems have been tightened, which will lead to larger ducts and changes to riser sizes. It may also lead to a need for more efficient air-to-air heat recovery systems, so bigger air handling units and bigger and taller plant rooms.

6. There are energy rather than temperature limits for the calculation on overheating that apply to both naturally and mechanically cooled buildings. The calculation sets a standard based on an assumed glazing area, orientation and specification. Designers of both naturally ventilated and mechanically cooled buildings will need to pay greater attention to the balance between solar gain, glazing performance, shading and daylighting.

bre

Summary

7. A design-stage carbon calculation must be submitted to building control to enable them better to understand the building carbon reduction strategy and help improve on-site construction quality.
8. Explore the potential for “assignment” under the feed-in tariffs as a means of cost-effectively achieving compliance using renewable energy systems. Assignment allows the revenues from the feed-in tariffs to be “assigned” to a third party, which opens up the possibility of allowing a third party to invest in a renewable power installation, such as photovoltaics, thus easing Part L compliance costs. The feed-in tariff revenues would be paid to the third party

bre

Summary

- Simple building – simple modelling
- Complex building – complex modelling

bre

Relationship to Part F

bre

What is Air Tightness

Air leakage (or draughts) is the uncontrolled flow of air that enters the dwelling through gaps and cracks in the envelope

'Air permeability' = q_{50}

q_{50} = $m^3/(hr.m^2)$ @ 50 Pa

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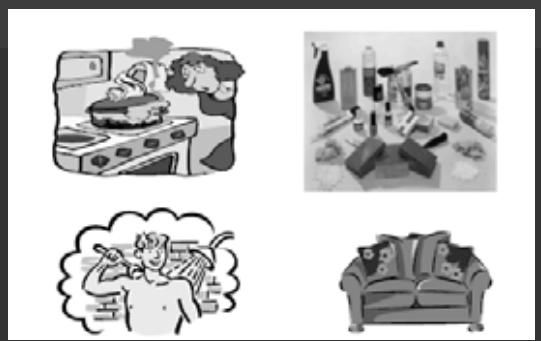
Why is it Important



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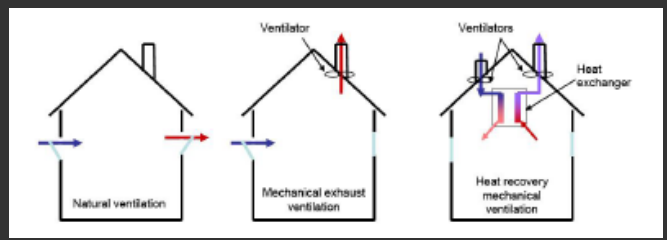
Ventilation approaches



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Research into decisions

- Study of 22 Part L 2006 naturally ventilated dwellings:
- Insufficient installation of trickle ventilation
- Under performance of intermittent extract fans
- Door under cuts often less than 10 mm
- Study of nine Part L 2006 dwellings with MEV
- In eight dwellings, the MEV systems failed to achieve their Design flow rates, in some cases by as much as 63%
- Poor installation and commissioning of system

bre

Evidence for Change

- UK evidence supports wider anecdotal evidence, and problems in other European countries
- Under performance is most important in airtight homes which are more reliant on ventilation provisions
- As a result Part F 2010 proposes different provisions for homes with high and low permeability

bre

Natural Ventilation

- Some designers question whether natural ventilation can provide sufficient ventilation in more airtight dwellings
- ADF 2010 recommends increasing ventilation provisions for natural ventilation systems. In particular, when q50 <= 5 m3/(hr.m2) @ 50Pa

bre

Installing and Commissioning

- Part F requirement to make it clear that all ventilation systems shall be installed and commissioned to ensure they operate as designed

For new dwellings only, new requirements for:

- Air flow rates of mechanical systems (including intermittent extract fans) should be measured on site
- Owner to be given information to operate and maintain natural and mechanical systems properly
- Check list to be given to building control body as evidence that all the above have been done

bre

Installing and Commissioning

- ADF 2006 recommended an internal door under cut of 10 mm above floor finish
- This is not always achieved – one reason being that the floor finish may not be known when the door is installed.

ADF 2010 recommends:

- If the floor finish is not yet fitted, an undercut of 20 mm should be made above the floorboards, or other surface
- The size of the door undercuts is included in the check list for building control

bre

Noise Limits

Why control noise?

- **Use of continuous mechanical ventilation systems may increase to meet more rigorous TER in ADL**
- **If the ventilation system is noisy the occupants may turn the units to a lower setting, or off**
- **This may be a bigger issue in tight dwellings**
- **Noise problems have been reported in other countries**

bre

Noise Limits

- Part F to require systems installed in new or existing dwellings to have been *type tested* and shown to meet specified sound power limits
- ADF (Appendix E) includes sound power limits and test specifications (ref. to BS EN 13141 series)

bre

Noise Limits

Table E1: Performance standards

Room type	Maximum A-weighted level L_{pA} dB	Maximum 125 Hz Octave band level L_w dB
Kitchens and other wet rooms	Outlet/inlet level 38[1]	Outlet/inlet level 48[1]
Bedrooms and living rooms	Outlet/inlet level 30[1]	Outlet/inlet level 40[1]
Air terminal devices if tested separately[2]	20	30
Casing level if not to be exposed in room[3]	40	45
Casing level if to be exposed in room	25	35
For all tests, no prominent acoustic tones should be present.	the sound power level in any 1/3 octave band must not exceed the sound power levels in the two bands adjacent to it by more than 5 dB over the frequency range 100 Hz to 10 kHz.	

1. If there is an inlet and an outlet serving the same room these values should be reduced by 3 dB.
2. Any air volume control devices should be set to give the highest noise level while achieving the required volume flow.
3. The unit is assumed to be above the ceiling or in a cupboard well sealed to the room.

bre

SAP 2009

Changes to SAP 2009

bre

Changes to SAP

- Key changes
- – Monthly calculation for heating
- – Cooling included
- – Thermal mass allowed for explicitly
- – Party wall heat loss
- – Thermal bridging
- – Updated weather data
- – Improved data on internal gains
- – Changes to treatment of boiler efficiency
- – Heat pumps
- – Treatment of community heating
- – Hot water demand revised
- – Carbon emission factors

bre

Monthly Calculation Basis

- Previous seasonal calculation is suitable for existing dwellings of conventional construction
- Calculation for each month is more satisfactory for very low energy dwellings with shorter heating seasons, especially as regards solar gains and solar collectors
- Monthly calculation allows for variation in efficiency of water heating from boilers

bre

Cooling

- Included for fixed mechanical cooling systems
- Depends on area cooled and characteristics of system

bre

Cooling

- Cooling down to 25 °C
- A to G Rating
- External Temperature
- Varies with region

bre

Cooling

•**Cooling load varies with region**

Should heating, solar radiation vary with region too?

bre

Thermal Mass

- Was implicit in SAP 2005 (not user input)
- Is part of input data in SAP 2009
- External walls, roofs, floors
- Internal and party walls, ceilings and floors
- Effect most pronounced for very low energy design

bre

Thermal Mass

- **Lightweight –timber frame**
- **Heavyweight –heavy blocks & concrete floors**
- **Reduced cooling demand**
- **Solar gains more useful**

bre

Thermal Bridging

- Four ways of calculating
- 1.'y value' = 0.15 **default**
- 2.Accredited Construction Details allowable if : measured lengths x **standard** psi values
- 3.Measured lengths x **calculated** psi values
- 4.Calculate 'y' for specific **dwelling types**

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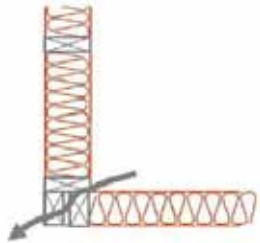
Thermal Bridging

- Party Wall junctions
- 25% Increase on calculated values when not Accredited Construction Details



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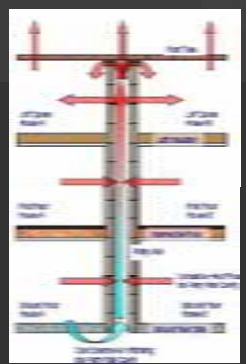
Party Walls

- Solid party walls treated as adiabatic (no heat loss)
- Cavity walls which have a thermal bypass
  - Unfilled cavity no effective edge sealing 0.5 W/m2K
  - With effective sealing 0.2 W/m2K
- Fully filled cavity with effective sealing treated at adiabatic



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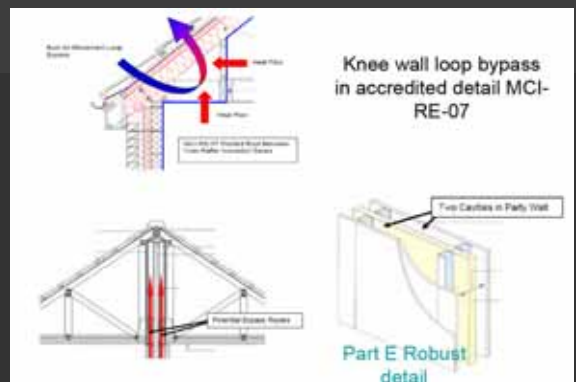
Party Wall



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Windows - Replacement

- No specific requirement for windows (other than “back stop” of window U value = 2.0 W/m^{2}K):
- Optimum combination of window g and U values will give best result in SAP
  - i.e. simply lowering the U value may result in worse overall performance
- House Builders could use highly efficient windows to offset other costs

bre

Domestic Hot Water

- Test data for combi boilers (EN 13203-2) for hot water service
- Annual hot water demand is reduced by 5% if <=125 litres/person/day target is achieved (all water use, hot and cold)

bre

CO2 Emissions

- Now kgCO2eq/kWh
- Takes into account other greenhouse gases, CH_4 and
- N_2O
- Wider consideration of upstream emissions
- New fuels – biodiesel (including blends), rape seed oil

	SAP 2005	SAP 2009
Mains gas	0.194	0.206
Electricity	0.422	0.591
Oil	0.265	0.284
Wood Pellets	0.025	0.037

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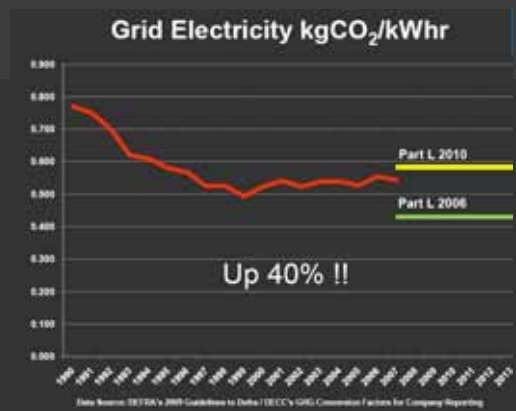
Carbon Emissions



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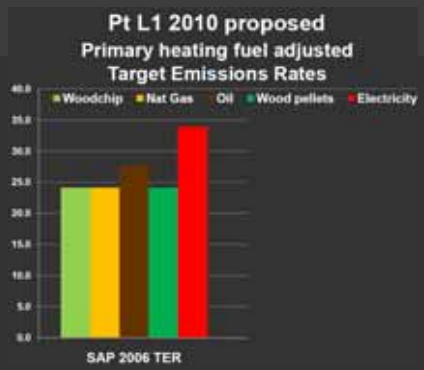
Carbon Emissions



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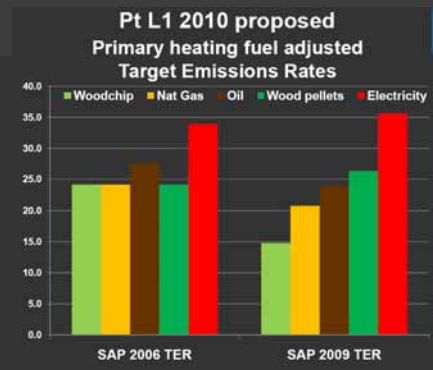
Carbon Emissions



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Lighting and Secondary Heating

- Low energy lighting - 100% counts towards meeting the target emissions rate . A minimum of 75% of light fittings must be low energy. If further low energy light fittings are also low energy, the full 100% will contribute towards meeting the target emissions rate (TER).
- SAP no longer assumes 10% of heating will come from electricity,
- In Part L 2010, there is no such penalty unless the dwelling has a chimney or flue and no appliance is installed; in such cases the calculation is the same as in 2006.

bre

Changes to SBEM

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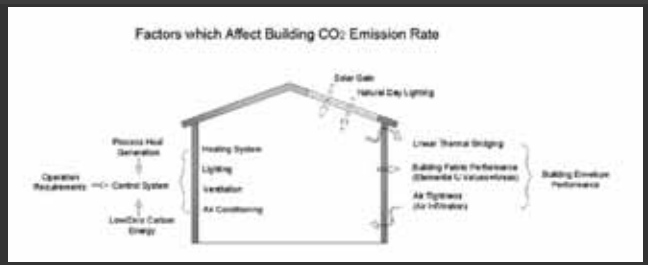
Factors to be considered



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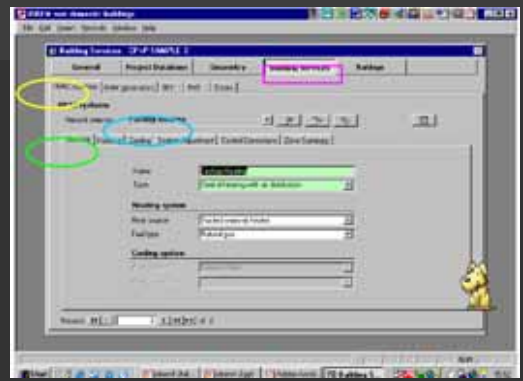
New elements in SBEM – Energy



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Lighting

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SBEM

- Additional inputs for renewables
- And hot water

- The building type sets the TER – different building give different improvements . This is taken care of by the software when you stipulate what the building is.

bre

Questions