Part L 2006 – goals, mechanisms, potential impacts

with particular focus on ADL1a for new housing

Robert Lowe

8 July 2006

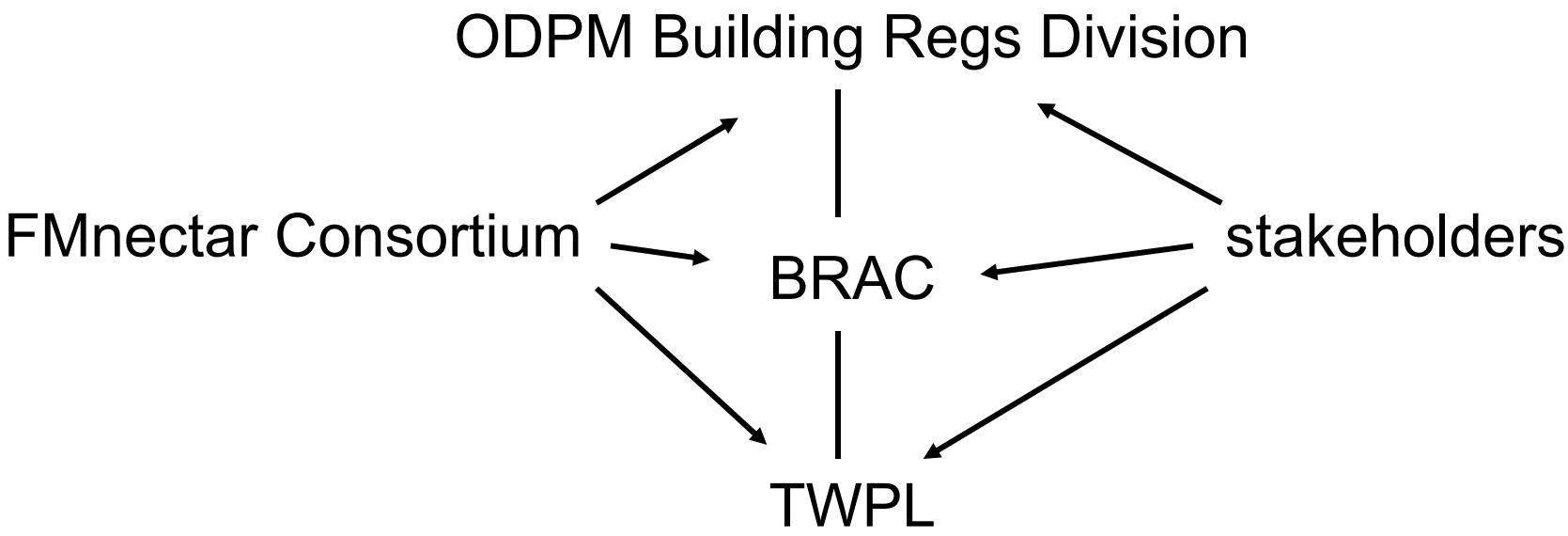
presentation structure…

- Part L review process
- 4-part structure of the new Part L
- summary of changes since 2002
- criteria for compliance
- practical examples
- low and zero carbon technologies
- U values and thermal bridging
- airtightness
- implications for new build
- wider impacts on industry

Part L review process

consultation document	July 2004
consultation process	September 2004
working up of draft ADs	October ’04 – March ’05
publication of draft ADs	July 2005
working up of final ADs	August ’05 - March ’06
publication of final ADs	March 2006

Part L review process



drivers and enablers

- Energy White Paper
- Energy Efficiency: The Government's Plan for Action
- EU Directive on the Energy Performance of Buildings
- Sustainable & Secure Buildings Act 2004

Energy White Paper

- need for 60% reduction in CO_2 emissions by 2050
- crucial role for Building Regulations

http://www.dti.gov.uk/energy/whitepaper/ourenergyfuture.pdf

EU Directive

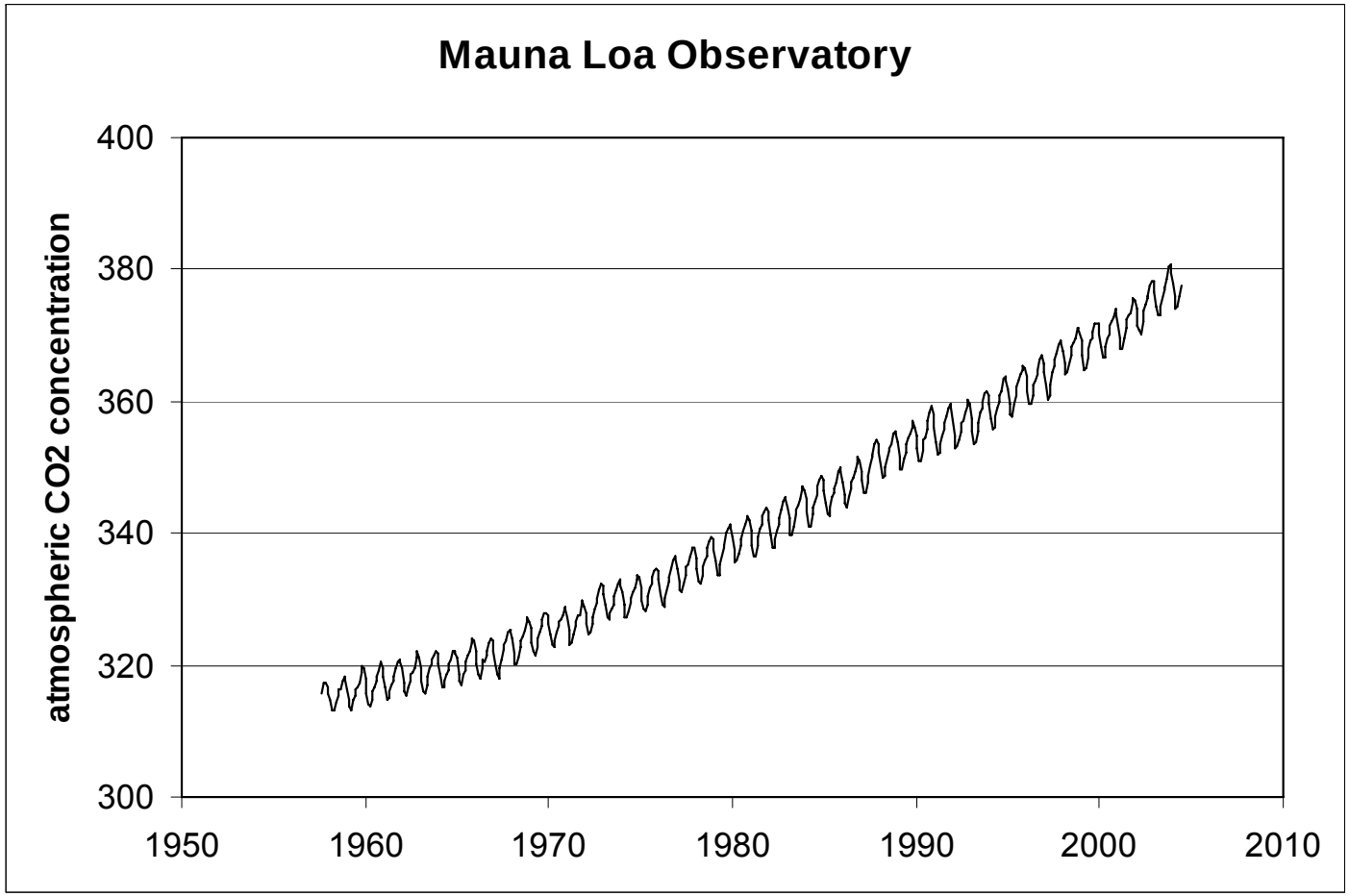
Article 3: requires a single whole-dwelling energy performance methodology – SAP 2005 / iSBEM

Article 4: requires standards to be set for new and existing buildings

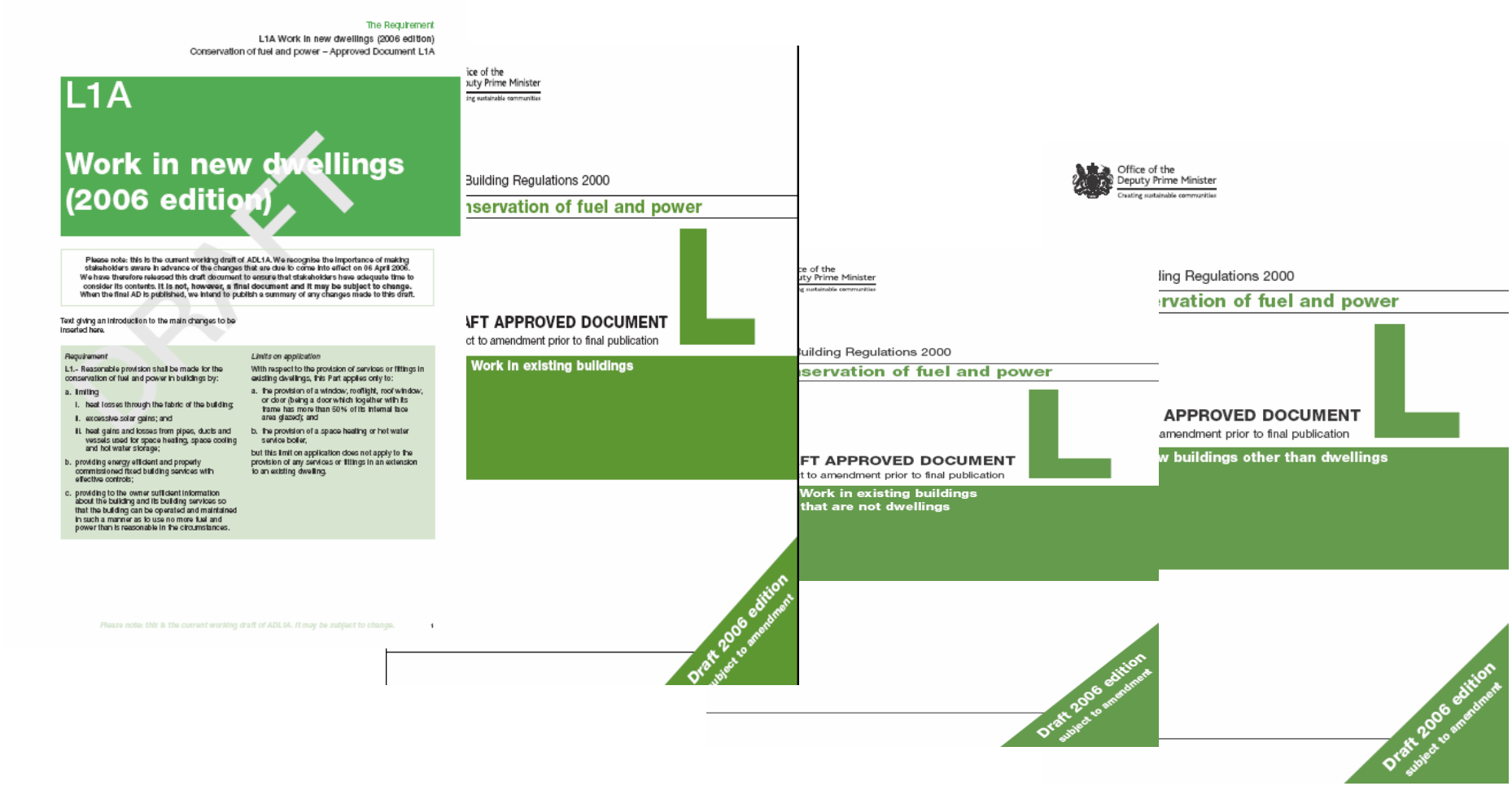
Article 5: requirements for new buildings

Article 6: requirements for existing buildings

Article 7: energy performance certificates


Mauna Loa Observatory
atmospheric CO2 concentration
400
380
360
340
320
300
1950
1960
1970
1980
1990
2000
2010

Draft Approved Documents July 2005 (http://www.odpm.gov.uk/)



main changes in the 2006 revision

- single primary compliance route based on updated SAP
- whole house CO_2 target ($kg/m^2/a$) for space heating + water heating + lighting
- 20% reduction in CO_2 emissions compared with notional 2002-compliant gas heated dwelling
- accredited construction details and improved treatment of thermal bridging
- sample pressurisation testing

main changes in the 2006 revision

ADL1 2002 compliance methods:

- elemental
- target U value
- carbon rating

main changes in the 2006 revision

ADL1 2002 compliance methods:

- ~~elemental~~
- ~~target U value~~
- carbon rating

main changes in the 2006 revision

ADL1 2002 compliance methods:

- ~~elemental~~
- ~~target U value~~
- CO_2 targets

new compliance criteria

criterion 1: predicted CO_2 emissions $\leq$ target

criterion 2: limits on design flexibility

criterion 3: prevention of excessive solar gains

criterion 4: quality of construction & commissioning

criterion 5: provision of information - O&M instructions and Energy Performance Certificate

CO_2 targets and design flexibility

- extensive design freedom allowed within the CO_2 target
- target and design CO_2 emission rates are calculated using SAP 2005 www.bre.co.uk/sap2005

reference values for notional dwelling

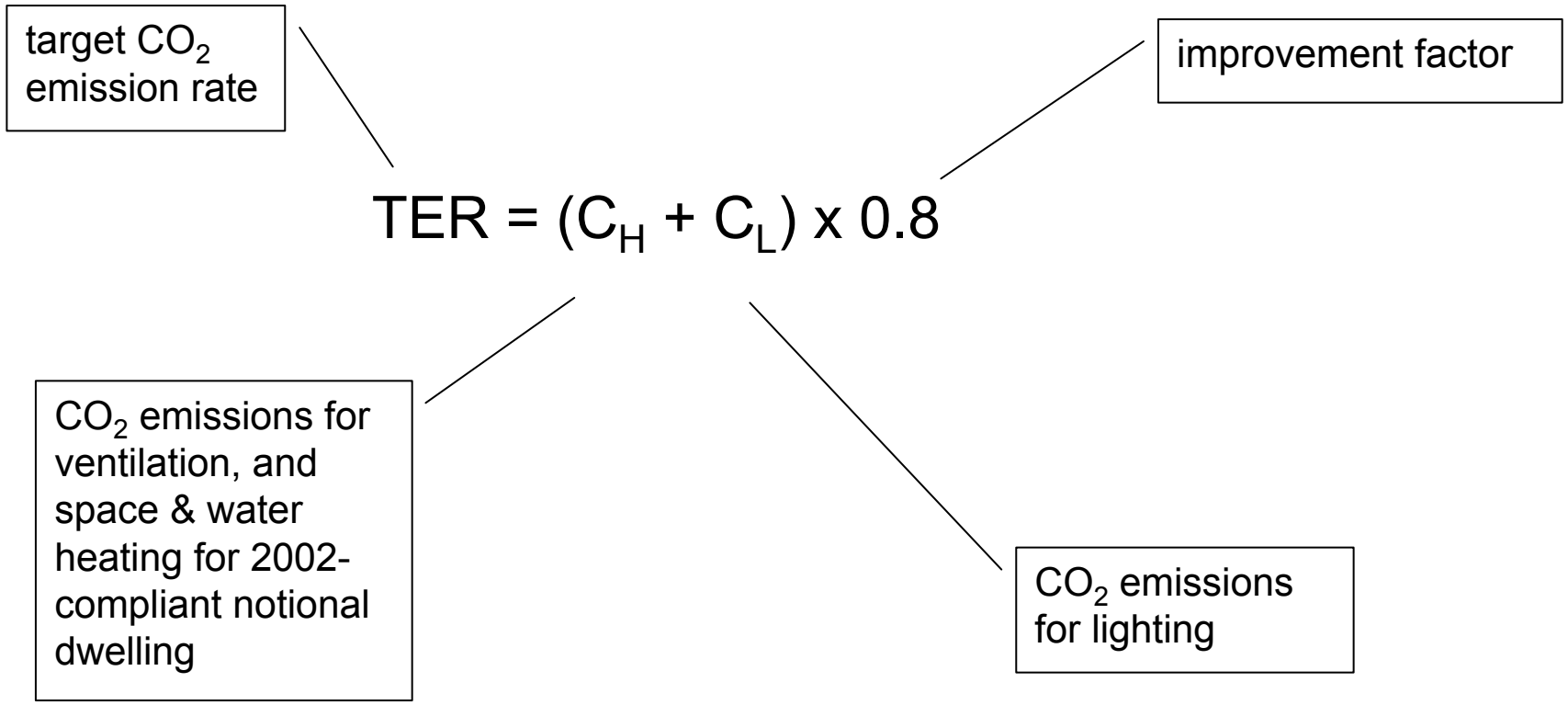
- U values
- heating system design
- air tightness and ventilation system
- etc.

(Table R1 in SAP 2005)

reference values for notional dwelling

Element or system	Value
Size and shape	Same as proposed dwelling
Walls	U = 0.35
Floors	U = 0.25
Roofs	U = 0.16
Windows and doors	U = 2.0 (25% of floor area) double glazed, low-E hard coat, Frame factor 0.3, one opaque door of 1.85 m²
Living area fraction	Same as proposed dwelling
Shading and orientation	All glazing orientated E/W; average overshading
Allowance for thermal bridging	0.11 x total exposed surface area.
Ventilation system	Natural
Air permeability	10 m³/m².h at 50 Pa
Chimneys	None
Open flues	None
Fans or passive vents	3 for dwellings with floor area greater than 80 m^2, 2 for smaller dwellings
Heating fuel (space and water)	Mains gas (unless specified otherwise)
Heating system	Boiler and radiators, water pump in heated space
Boiler	SEDBUK 78% room-sealed fanned flue
Heating system controls	Programmer + room thermostat + TRVs; boiler interlock
Hot water system	Stored hot water, heated by boiler; separate time control for space and water heating
Hot water cylinder	150 litre cylinder insulated with 35 mm of factory applied foam
Primary water heating losses	Primary pipework not insulated, cylinder temperature controlled by thermostat
Secondary space heating	10% electric in notional and proposed, unless a secondary heater (gas fire, open fire, etc) is specified or provision made (e.g. flue or chimney)
Low energy light fittings	30% of fixed outlets; 30% also to be applied in proposed dwelling.

targets for gas heated dwellings



targets for fuels other than gas

fuel factor partially offsets higher carbon intensities of electricity, oil and lpg…

$$TER = (C_H \times \text{fuel factor} + C_L) \times 0.8$$

targets for 2010

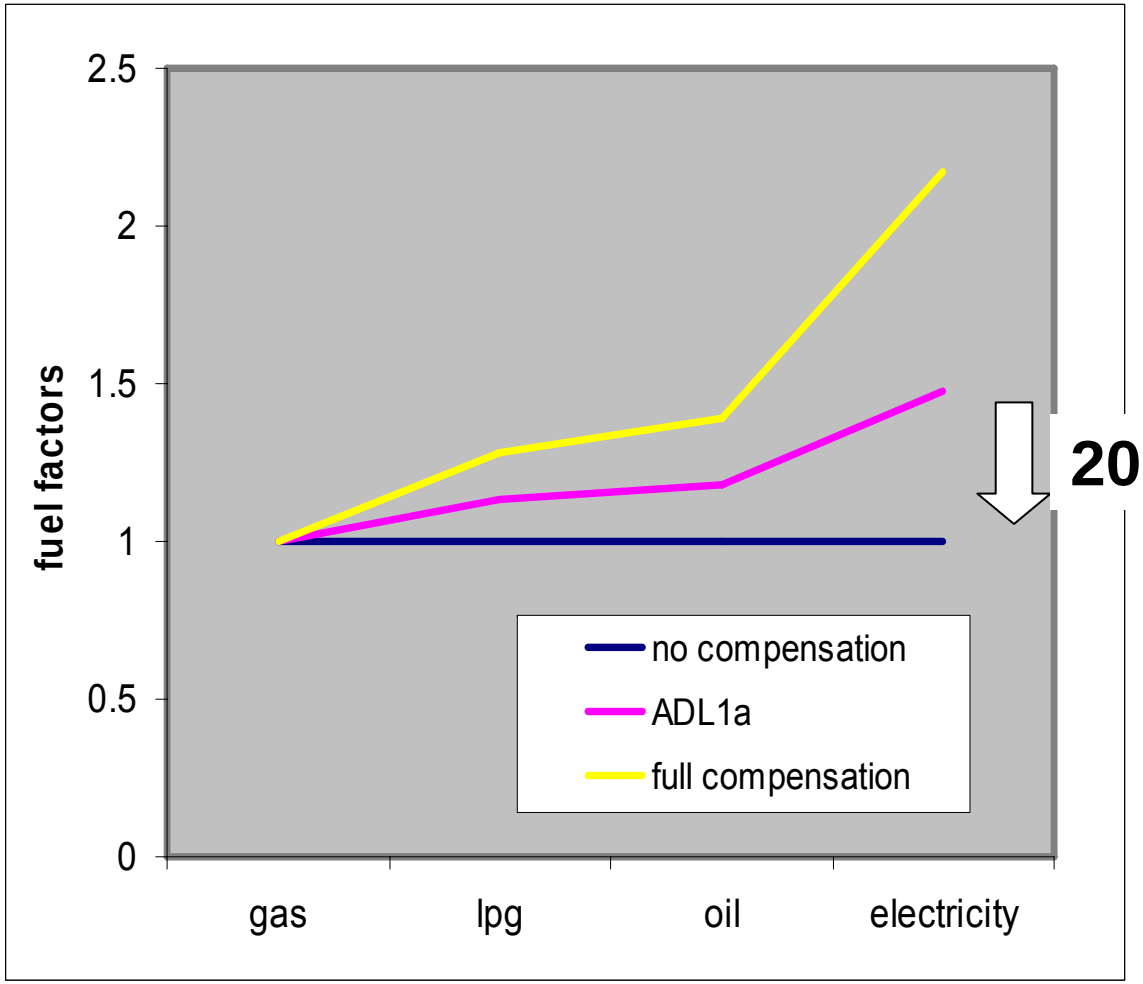
fuel factor <u>partially</u> offsets higher carbon intensities of electricity, oil and lpg…

$$TER = (C_H \times \text{fuel factor} + C_L) \times 0.6 \ ?$$

fuel factors…

Heating fuel	Fuel factor
Mains gas	1.00
LPG	1.13
Oil	1.18
Grid electricity (for direct acting, storage and electric heat pump systems)	1.47
Solid mineral fuel **	1.28
Renewable energy including bio-fuels such as wood pellets **	1.00
Solid multi-fuel **	1.00
** The specific fuel factor should be used for those appliances that can only burn the particular fuel. Where an appliance is classed as multi-fuel, the multi-fuel factor should be used, except where the dwelling is in a smoke control area, when the solid mineral fuel figure should be used.	

future fuel factors…



lighting

- CO_2 emissions for lighting depend on area of windows and nature of glazing
- fixed allowance for low energy lamps – performance of lighting system is not tradable against space & water heating

***indicative* performance values for gas heated dwellings…**

roofs	0.16 W/m^2K
walls	0.30 W/m^2K
floors	0.22 W/m^2K
windows	1.8 W/m^2K 25% of floor area
air leakage	7 m/h @ 50 Pa
boiler efficiency	SEDBUK band B

practical examples

Stamford Brook Project:

National Trust
Redrow Homes
Taylor Woodrow Homes
CITB
NHBC
CBA
Vent Axia
Leeds Metropolitan University
with ODPM

practical examples

Stamford Brook Project:

142 mm fully-filled wall cavities,
345 mm overall…

practical examples

high performance windows…

low & zero carbon technologies

solar hot water
at Gusto Homes
Nottinghamshire

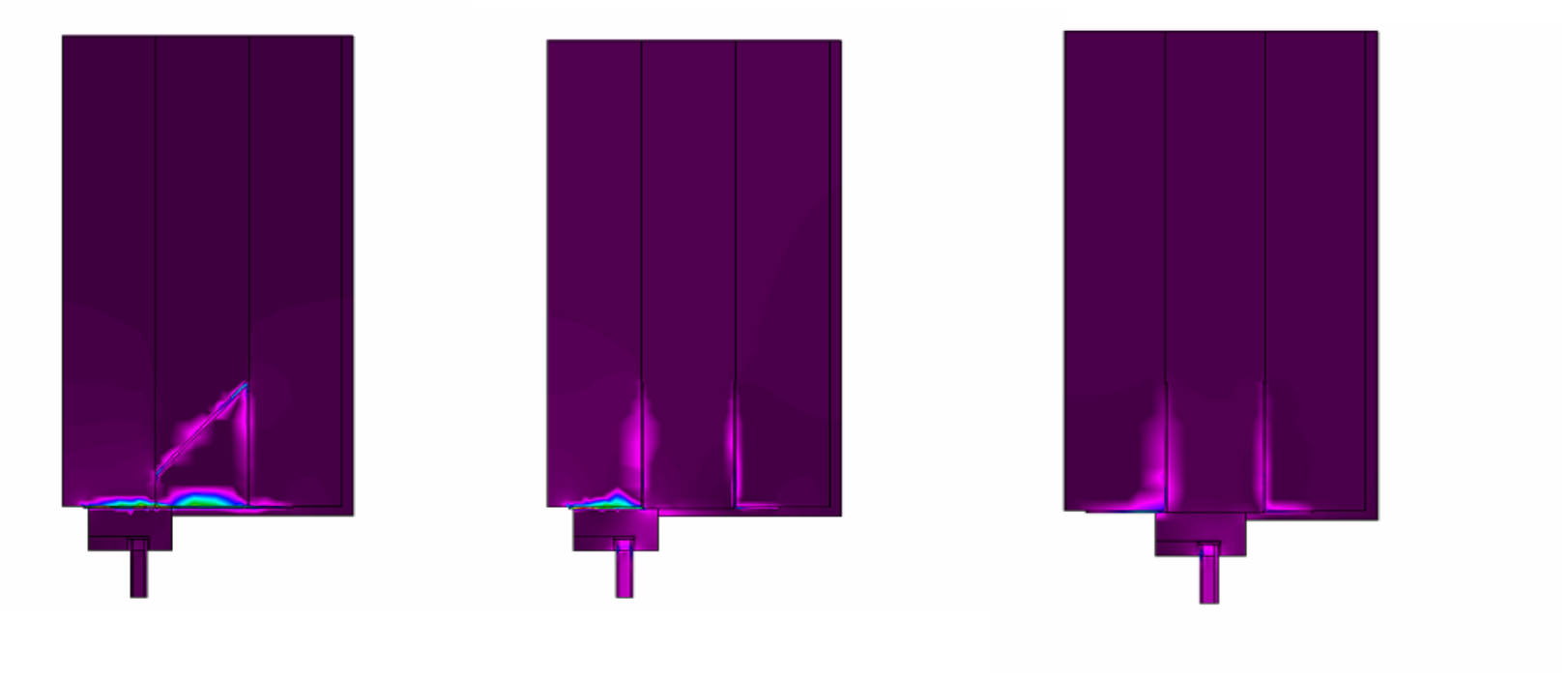
low & zero carbon technologies

combined heat and power (courtesy of Wilson)

low & zero carbon technologies

ground source heat pump at
Skelton Environment Centre (LEDA)

thermal bridging



thermal bridging

- *repeating* thermal bridging included in U values – as 2002 edition
- separate, additional allowance for *non-repeating* bridges
- defaults depend on use of *Accredited Construction Details*
- option to calculate thermal bridges provides additional scope for innovation

thermal bridging

if *Accredited Construction Details* <u>are</u> used:

- add 0.08 W/m^{2}K to all U values, OR
- use tabulated ψ values for junctions from SAP and calculate contribution to fabric heat loss using

$$H_{TB} = \Sigma \psi.l$$

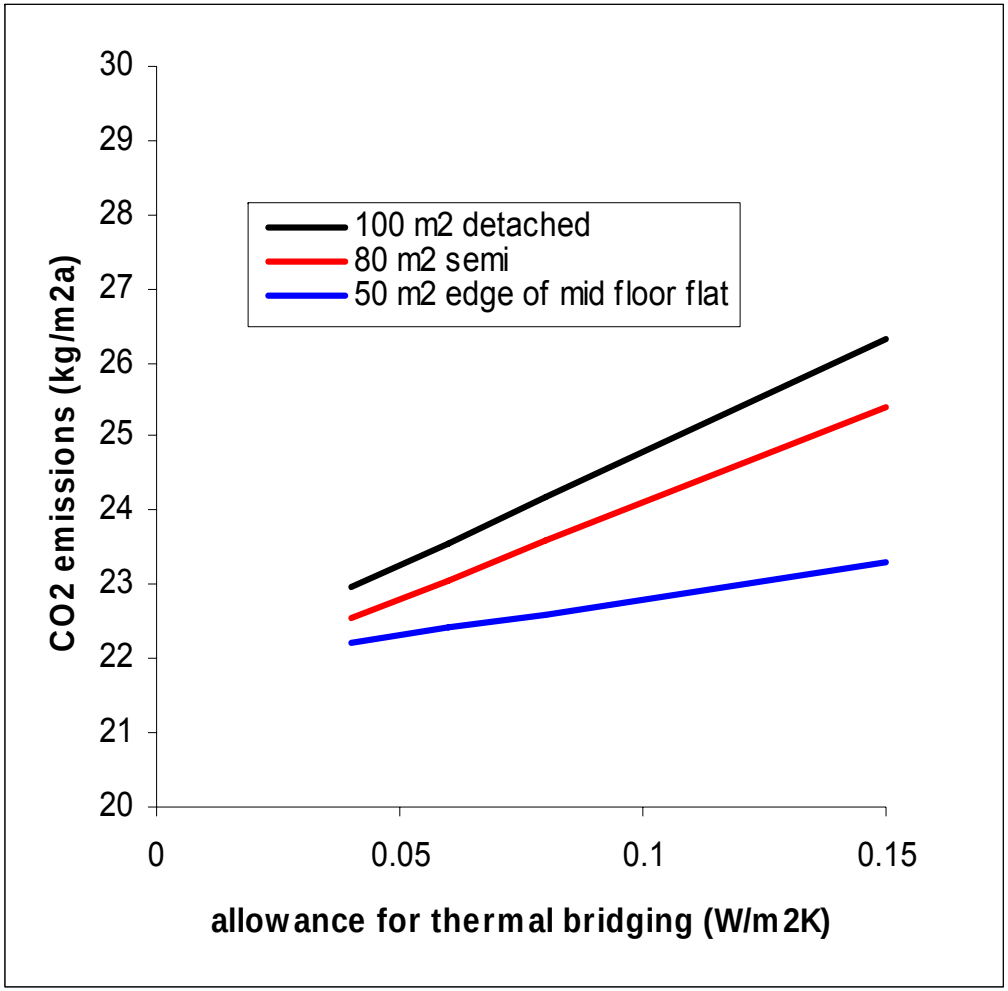
thermal bridging

if *Accredited Construction Details* are <u>not</u> used

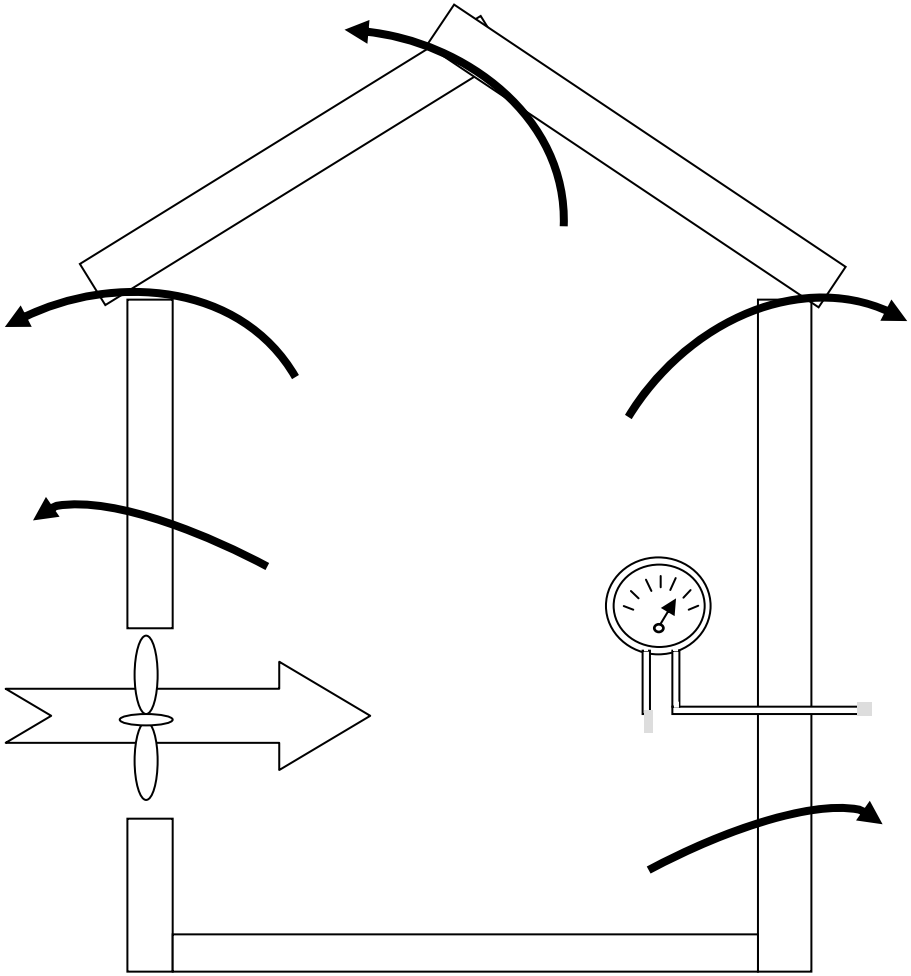
- add 0.15 W/m^{2}K to all U values, OR
- calculate ψ values for junctions using appropriate simulation software and calculate contribution to fabric heat loss using

$$H_{TB} = \Sigma \psi.l$$

thermal bridging and TERs



airtightness



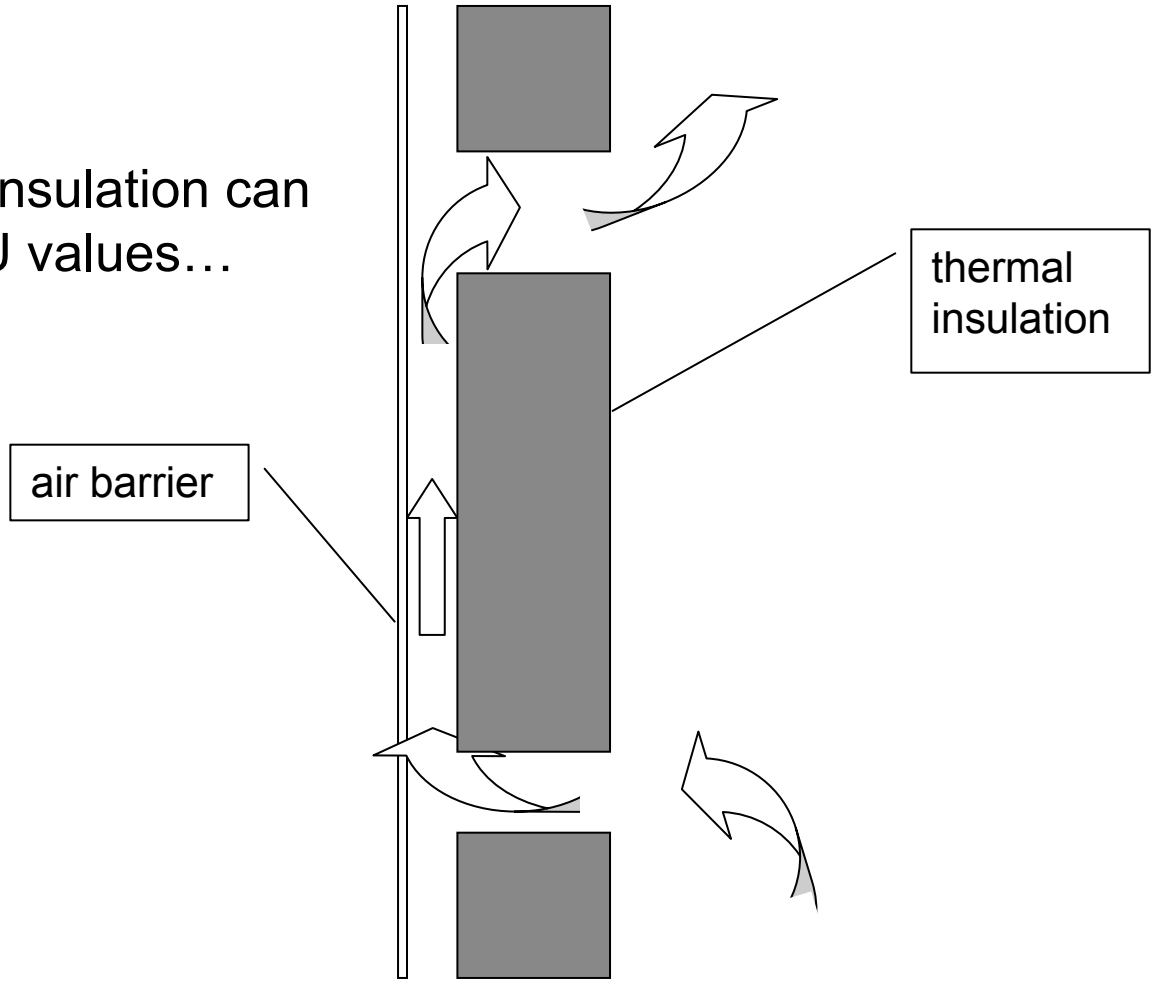
airtightness – the air barrier

airtightness

- air permeability better than 10 m/h at 50 Pa
- pressure testing of 2-5% of dwellings
- default air leakage of 15 m/h at 50 Pa for small builders

construction quality

poorly fitted insulation can double real U values…



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example compliance packages…

dwellings heated with lpg, oil or electricity will need to go beyond performance indicators for gas…

example compliance packages…

80 m^2 semi-detached house, electric heating

- soft coat low emissivity windows, U value 1.4 W/m^2K
- wall U value reduced to 0.25
- reduced thermal bridging

example compliance packages…

80 m^2 semi-detached house, oil heating

- soft coat low emissivity windows, U value 1.5 W/m^2K
- wall U value reduced to 0.26
- reduced thermal bridging
- boiler efficiency raised from 86 to 90%

SECTION 6

Possible future performance standards for Part L

6

Forecast Indicative Values

Based on these arguments, indicative standards for 2010 might be around the values given in the table below:

Table 3

Aspirational indicative U-values for 2010

Item	Indicative U-value
Roof	0.1
Wall	0.2
Windows, doors and rooflights (average)	1.4
Floors	0.2

If this indicative set of U-values was installed in the reference 55 m² mid-terrace house, along with a SEDBUK A boiler, it would achieve a further 12% improvement on the proposed 2005 standard. To achieve the further 25% overall improvement considered appropriate for 2010 would require a 2.5 m² solar hot water collector.

ADL1a as driver of technical and structural change…

ADL1a encourages:

- integrated design
- partnering and collaboration
- strategic approach to innovation
- market segmentation

ADL1a as driver of technical and structural change…

pre-requisites for success:

- enforcement
- on-going evaluation of impacts
- continued political and financial support for change
- stability of underlying conceptual structure
- early publication of proposals for 2010

www.odpm.gov.uk

www.projects.bre.co.uk/sap2005