Wales Building Regulations 2014 Part L

New Build Non-Domestic – Part L2A

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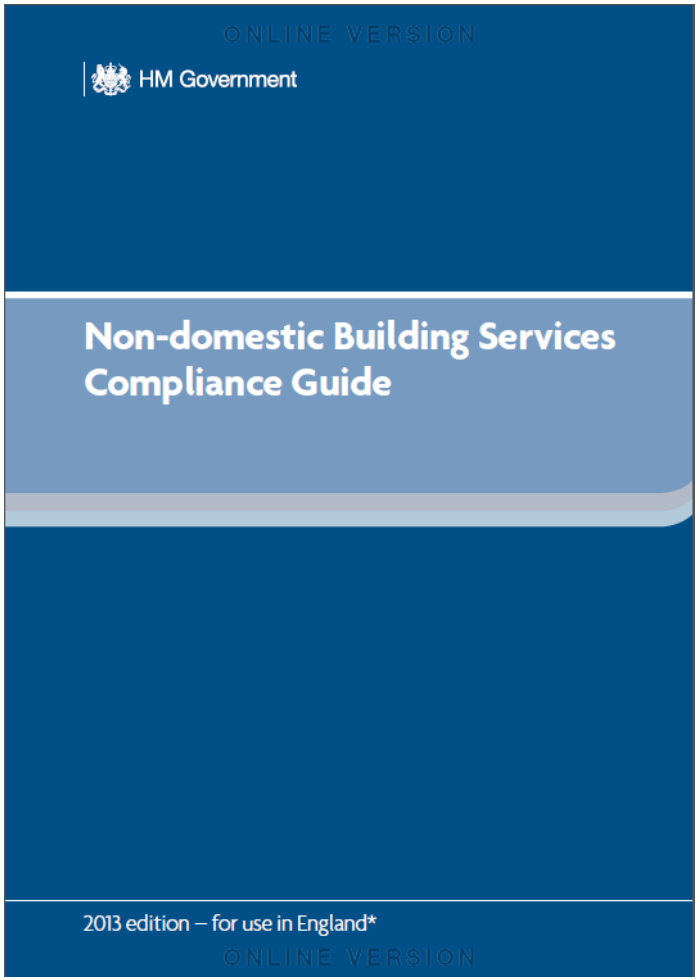
Recap on 5 criteria for Building Regulations Part L2A compliance

Criteria:

1. Building Emission Rate ≤ Target Emission Rate
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 2: Limits on design flexibility

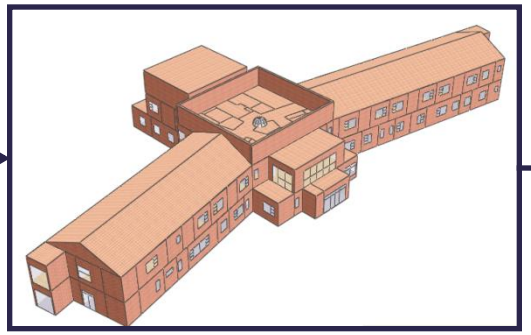
- Non-domestic Building Services Compliance Guide
- Reasonable Provision…
- Values that should not be worse than
- Example:
- Notional Building, chiller:
  - SEER = 4.5
- Back stop, air-cooled chiller:
  - SEER = 2.55



Criterion 1 – Target Emission Rate (TER)
Recipe / Aggregate approach in 2010

Notional Recipe Approach

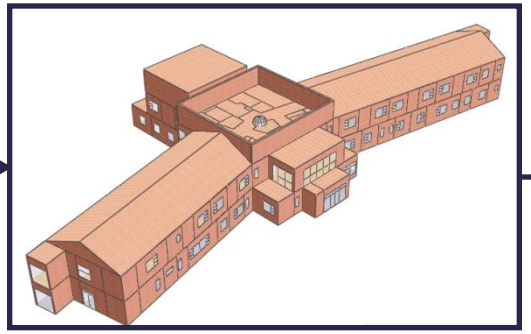
Actual U-values and efficiencies



Actual Building

BER

Actual size, shape, orientation, uses, weather and system types but.... ....notional U-values and efficiencies



Notional Building

TER

Criterion 1 – Energy Efficiency

- Existing Part L concentrates on CO_2
- CO_2 makes it possible to “greenwash” with renewable technologies, especially biomass.
- Desire to implement **Energy Efficiency test** before application of renewables as FEES in England for domestic
- Other EU member states implementing EPBD use **primary energy** as metric for energy regulations (Republic of Ireland, Germany, Italy)
- Primary Energy was proposed for Wales in Consultation

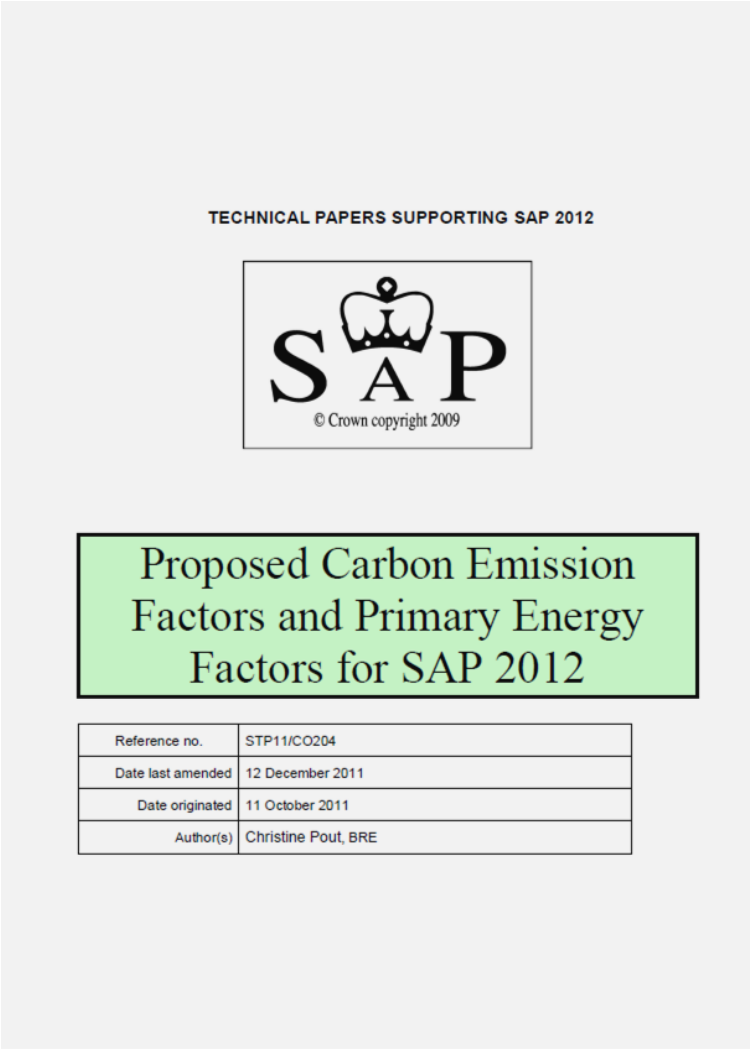
Criterion 1 – What is primary energy?

- Primary Energy is:

  energy which has not undergone any conversion or transformation process.

- Example, primary energy factor (PEF) for grid electricity: 2.58

- i.e. 2.58 units of primary fuel consumed for every 1 unit of electricity delivered



TECHNICAL PAPERS SUPPORTING SAP 2012

SAP

Proposed Carbon Emission Factors and Primary Energy Factors for SAP 2012

Reference no.	STP11/CO204
Date last amended	12 December 2011
Date originated	11 October 2011
Author(s)	Christine Pout, BRE

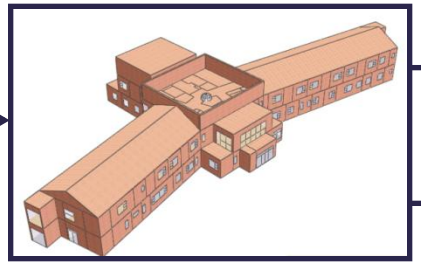
Criterion 1 – What is primary energy?

- Primary Energy helps reduce greenwash since, for example:
- Biomass PEF = 1.07 KWh / KWh
- Gas PEF = 1.02 KWh / KWh
- No incentive to use biomass in primary energy calculation
- SAP consultation includes no guidance on PEF for renewable electricity produced *on-site*...
- *...Taken as 1.0 in many member states but decided in Wales to take grid average to reduce greenwash further*

Criterion 1 – Introduction of Target Primary Energy Consumption (TPEC) in addition to TER

Retain Notional Recipe Approach

Actual U-values and efficiencies



Actual Building

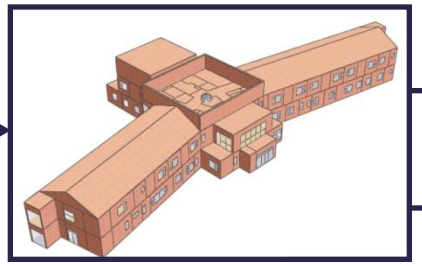
BPEC

BER

TER

TPEC

Actual size, shape, orientation, uses, weather and system types but.... ....notional U-values and efficiencies



Notional Building

Final published recipes – 20% CO_2 reduction

Element	Side lit or unlit (Heating only)	Side lit or unlit (Includes cooling)	Toplit
Roof U-value (W/m^2.K)	0.18	0.18	0.18
Wall U-value (W/m^2.K)	0.26	0.26	0.26
Floor U-value (W/m^2.K)	0.22	0.22	0.22
Window U-value (W/m^2.K)	1.6 (10% FF)	1.8 (10% FF)	N/A
G-Value (%)	40%	40%	N/A
Light Transmittance (%)	71%	71%	N/A
Roof light U-value (W/m^2.K)	N/A	N/A	1.8 (15% FF)
G-Value (%)	N/A	N/A	52%
Light Transmittance (%)	N/A	N/A	57%
Air-permeability (m3/m2/hour), note: GIA = Gross Internal Area			
GIA ≤ 250m^2	5	5	7
250m^2 < GIA ≤ 3,500m^2	3	5	7
3,500m^2 < GIA ≤ 10,000m^2	3	5	5
10,000m^2 < GIA	3	5	3

Final published recipes – 20% CO_2 reduction

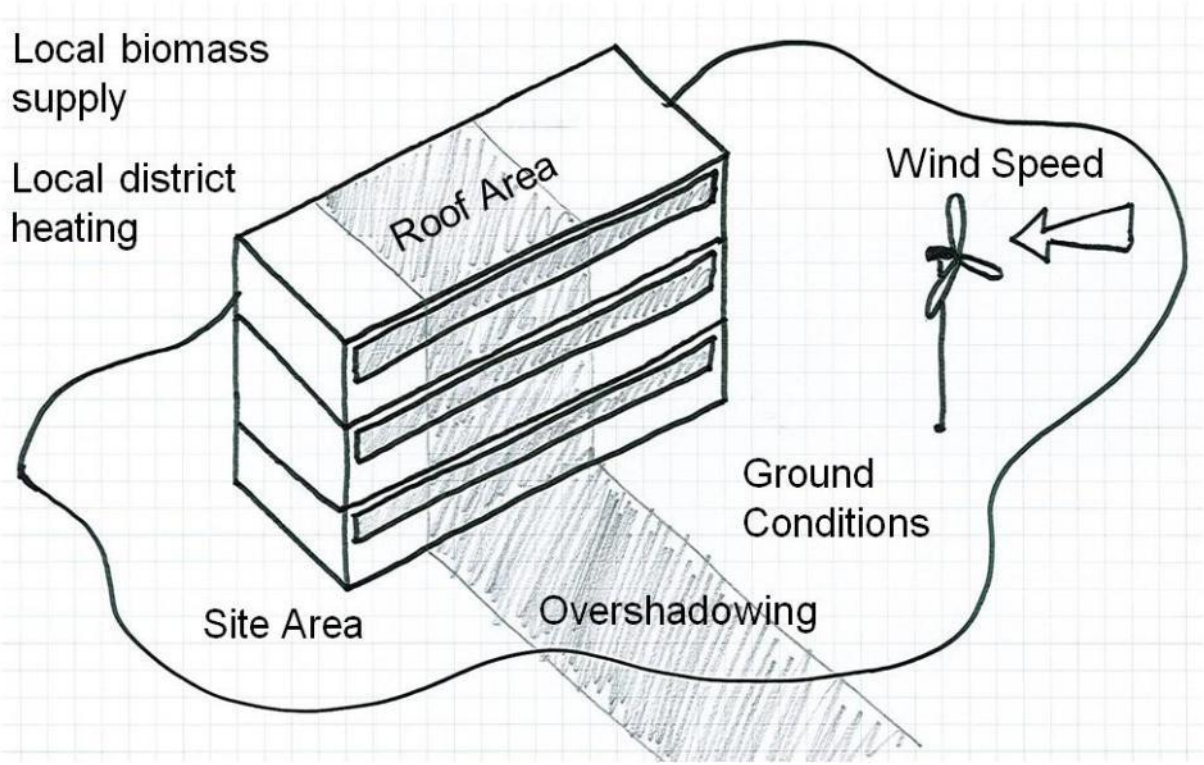
Lighting Efficacy (lm / circuit watt)	65	65	65
Occupancy control (Yes/No)	Yes	Yes	Yes
Daylight control (Yes/No)	Yes	Yes	Yes
Maintenance Factor	0.8	0.8	0.8
Constant illuminance control	No	No	No
Heating efficiency	91%	91%	91%
Central SFP (W/l/s)	1.8	1.8	1.8
Terminal Unit SFP (W/l/s)	0.3	0.3	0.3
Cooling (SEER / SSEER)	N/A	4.5 / 3.6	4.5 / 3.6
Cooling (mixed mode) (SSEER)	N/A	2.7	2.7
Heat recovery efficiency (%)	70%	70%	70%
Variable speed control	Yes	Yes	Yes
Demand control ventilation	Yes	Yes	Yes

Resulting primary energy reduction

Building Description	Notional Building	Resultant target reduction
Primary School	SL-HO	8.5%
Office	SL-H&C	16.5%
Hotel	SL-HO	7.1%
Medium Warehouse	TL	10.0%
Community Hospital	SL-HO	12.2%
Multi-Residential	SL-HO	10.3%
Retail	SL-H&C	11.7%
Small Warehouse	TL	0.8%
Large Warehouse	TL	8.8%
Aggregate Total		**10.3%**

Need for Low and Zero Carbon Technologies in notional building?

- Once Energy Efficiency measures exhausted target can only be moved forward by assuming LZC technologies
- But which ones?



Need for Low and Zero Carbon Technologies in notional building?

- Conclusion: PV only technology applicable in all cases
- Recipe includes area of roof-mounted PV
- Expressed as 5.3% floor area (GIA)

Final published recipes – 20% CO_2 reduction

Lighting Efficacy (lm / circuit watt)	65	65	65
Occupancy control (Yes/No)	Yes	Yes	Yes
Daylight control (Yes/No)	Yes	Yes	Yes
Maintenance Factor	0.8	0.8	0.8
Constant illuminance control	No	No	No
Heating efficiency	91%	91%	91%
Central SFP (W/l/s)	1.8	1.8	1.8
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Cooling (SEER / SSEER)	N/A	4.5 / 3.6	4.5 / 3.6
Cooling (mixed mode) (SSEER)	N/A	2.7	2.7
Heat recovery efficiency (%)	70%	70%	70%
Variable speed control	Yes	Yes	Yes
Demand control ventilation	Yes	Yes	Yes
Area of PV, % floor area	5.3%	5.3%	5.3%

Resulting CO_2 reduction

Building Description	Notional Building	Resultant target reduction
Primary School	SL-HO	20.9%
Office	SL-H&C	27.1%
Hotel	SL-HO	10.6%
Medium Warehouse	TL	23.9%
Community Hospital	SL-HO	21.9%
Multi-Residential	SL-HO	20.5%
Retail	SL-H&C	18.9%
Small Warehouse	TL	15.2%
Large Warehouse	TL	20.1%
Aggregate Total		**20%**

Example 1: Air-conditioned Office

Element	Notional Building	Improve Chiller	Extra PV
Roof U-value (W/m^2.K)	0.18	0.18	**0.25**
Wall U-value (W/m^2.K)	0.26	**0.35**	**0.35**
Floor U-value (W/m^2.K)	0.22	0.22	**0.25**
Window U-value (W/m^2.K)	1.8 (10% FF)	1.8 (10% FF)	1.8 (10% FF)
G-Value (%)	40%	40%	55%
Chiller (SEER)	4.5	**5.5**	4.5
PV Array (kW(p))	8	8	**11**
TPEC (kWh/m^2.yr)	-	129.7	129.7
BPEC (kWh/m^2.yr)	-	127.3	132.8
TER (kgCO_2/m^2.yr)	-	22.6	22.6
BER (kgCO_2/m^2.yr)	-	22.1	22.0

Note: Gross internal area = 1,200m^2
All other values as per Notional building specification

Example 2: Distribution Warehouse

Element	Notional Building	Improve Air Permeability	Reduce PV
Roof U-value ($W/m^2.K$)	0.18	0.18	**0.16**
Wall U-value ($W/m^2.K$)	0.26	0.26	**0.20**
Floor U-value ($W/m^2.K$)	0.22	0.22	**0.18**
Air-permeability ($m^3/m^2/hour$)	5	**3**	**3**
Lighting Efficacy (lm / cW)	65	**55**	60
PV Array (kW(p))	40	40	**11**
TPEC ($kWh/m^2.yr$)	-	119.1	119.1
BPEC ($kWh/m^2.yr$)	-	117.2	105.8
TER ($kgCO_2/m^2.yr$)	-	19.7	19.7
BER ($kgCO_2/m^2.yr$)	-	19.4	19.6

Note: Gross internal area = 5,200m²
All other values as per Notional building specification

Treatment of Renewable Heat

- Biomass and Heat Pumps

- 2010
  - If biomass or heat pumps used in Actual building also used in Notional building
  - Little carbon benefit therefore from biomass boilers or heat pumps

- 2014
  - Primary Energy metric no longer necessitates 2010 approach
  - If gas available gas boiler assumed in notional (whether or not gas used in actual building)
  - If gas **not** available oil boiler assumed in notional

Treatment of Lighting

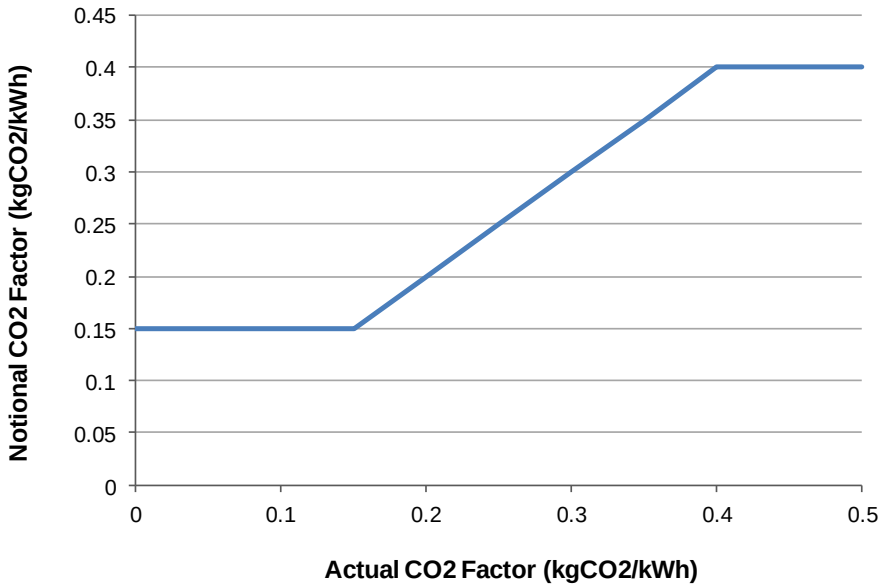
- 2010
  - Actual design lux level irrelevant – rebased to notional building value.
  - So supermarket designed to 2000 lux, rebased to notional building 800 lux.

- 2014
  - Actual installed lighting wattage used so penalising overlit spaces.
  - Maintenance factors are assumed in the notional and should be included in calculated values in the actual
  - Constant illuminance controls are available in the actual
  - LENI method can be used to show compliance with Criterion 2

Treatment of District Heating

- 2010
  - Notional CO_2 emission factor for heat supplied from district heating same as in actual.
  - Little carbon benefit from connection to district heating.

- 2014
  - Minimum CO_2 emission factor applied to notional building.
  - Allows carbon benefit where efficient district heating is employed.



Removal of Accredited Construction Details (ACDs)

- No quality assured accredited construction details schemes have been approved by the Secretary of State.
- The confidence factor of 0.02 W/mK or 25 per cent is no longer applied.

Thank you

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