

# CASE STUDY PART L 2010 Compliance

Building Type: **Office**

Location: **Leeds**

Building Environment: **Air-conditioned**

## CRITERIA 1 & 2 COMPLIANCE:

Taking a standard 2006 compliant office building as our starting point, we can highlight the challenge faced in meeting 2010 compliance.

A decent building and services specification - which comfortably meets 2006 compliance by a **12%** margin – now fails 2010 compliance by **34%**.

Bolt on compliance can be achieved through Solar Photovoltaics, but at a cost. In the region of **£135,000** of solar panels would be required to act as a 'fix' in this instance.

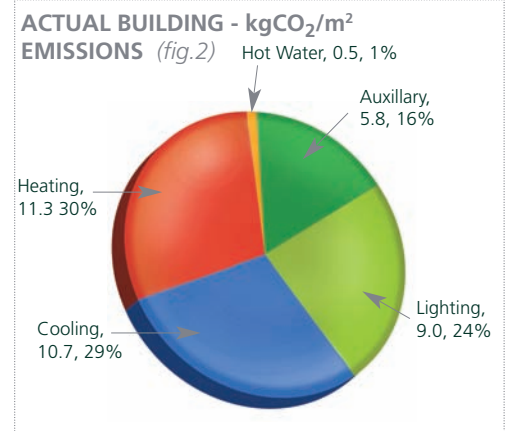
Improving building fabric alone fails to make up the difference. A holistic approach to improved fabric and services provides the only realistic route to cost effective compliance.



## Base Building Specification:

BUILDING FABRIC		
Walls		0.22 W/m <sup>2</sup> K
Floor		0.2 W/m <sup>2</sup> K
Roof		0.2 W/m <sup>2</sup> K
Windows		2.0 W/m <sup>2</sup> K
Air-Tightness		10 m <sup>3</sup> /hr.m <sup>2</sup>
BUILDING SERVICES		
Office Heating	Fan Coils	Gas 89%
Office Cooling		Chiller EER 3.4
Mechanical Ventilation	SFP 1 W/l.s	70% Heat Recovery
WC Heating	Radiators	Gas 89%
Hot Water	700 Litre	Gas 89%
Office Lighting	12 W/m <sup>2</sup>	PIR & Daylight Dimming
Other Lighting	12 W/m <sup>2</sup>	PIR

SPECIFICATION	2006		2010		
	BASE	BASE	PV	FABRIC	HOLISTIC
Notional	71.8	37.7	37.7	37.7	37.7
TER	51.7				
BER	45.6	50.5	37.4	39.5	37.2
Criterion 1	✓	✗	✓	✗	✓
Criterion 2	✓	✓	✓	✓	✓

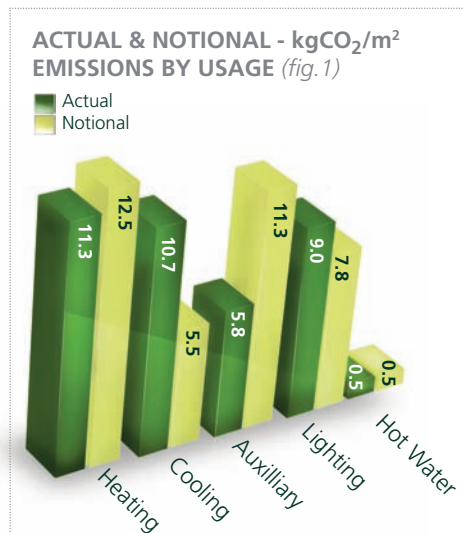


## Specification Improvement Scenarios:

'BOLT-ON' PHOTOVOLTAIC	
PV	215m <sup>2</sup>
Type	Monocrystalline
Orientation	South
Inclination	30°

FABRIC IMPROVEMENTS	
Walls	0.08 W/m <sup>2</sup> K
Floor	0.08 W/m <sup>2</sup> K
Roof	0.08 W/m <sup>2</sup> K
Windows	1.0 W/m <sup>2</sup> K
Air-Tightness	3.0 m <sup>3</sup> /hr.m <sup>2</sup>

HOLISTIC SOLUTION	
Roof	0.18 W/m <sup>2</sup> K
Windows	1.8 W/m <sup>2</sup> K
Air-Tightness	3.0 m <sup>3</sup> /hr.m <sup>2</sup>
Chiller EER	4.0
Boiler Efficiency	92%
Pumps	VS
Lighting	8 W/m <sup>2</sup>



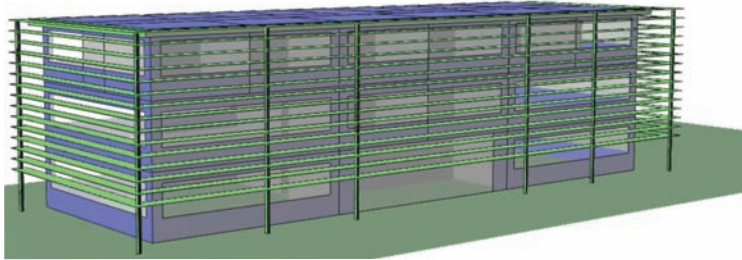
# CASE STUDY PART L 2010 Compliance

Building Type: **Office**

Location: **Leeds**

Building Environment: **Air-conditioned**

## CRITERION 3 COMPLIANCE: *Limiting Solar Gains:*



SPECIFICATION	2006		2010	
	METHOD A	METHOD B	ASSESSMENT TOOL	SOLAR GAIN CHECK
Base			SBEM	✗
Solar Shading	Not required as space has Air-Conditioning	Not required as space has Air-Conditioning	DSM	✓
Reduced Glazing			SBEM	✓
Solar Control Glass & Reduced Glazing			SBEM	✓

Criterion 3 compliance provides possibly the most significant challenge to compliance under 2010 Part L. Whereby 2006 Part L did not require compliance for spaces with mechanical cooling, no such allowance is available under 2010 Regulations.

Criterion 3 now requires all spaces with external glazing to have solar gains less than a specific target value. This target is generated from reference glazing within the notional building.

For side lit spaces, such as offices, solar gains must be less than those seen if all external elevations have a 1m high glazed strip and East facing orientation, with a reference G-value of 0.68 applied.

This change of approach means that glazing may have to be reduced, shaded or have expensive solar control glass.

In order to highlight the impact of these changes, our Case Study office building has again been assessed for compliance. The presence of mechanical cooling means that compliance was not required under 2006 regulations and the base specification does not comply under the 2010 Solar Gain Check method.

### 3 routes to compliance have been outlined;

1. Addition of Solar Shading (briese soleil) to East, South and West facades
2. Reduced glazed area – 33% reduction to offices and meeting rooms, 66% reduction to the reception
3. Solar Control glass to East, South and West facades and reduced glazing by 17% to the reception

While each of these 3 methods achieves Criterion 3 compliance, each has an impact on daylight available to the internal space, and therefore increases lighting energy consumption and total CO<sub>2</sub> emissions, affecting Criterion 1 compliance.

Solar Control glass, with a G-Value of 0.31, and 29% light transmittance, results in a significant cost increase beyond the 'base' design specification.

The addition of solar shading or the alteration of glazed areas, meanwhile, are likely to impact on planning approval if not recognised at early stages of design development.

### Criterion 3 Headlines:

- Criterion 3 calculations simplified
- Compliance results included in BRUKL report required by Building Control
- All occupied spaces, irrelevant of mechanical cooling
- Compliance is related to solar gains only, not internal gains or overheating
- Overheating and internal temperature remains as a design issue
- SBEM (simplified calculation method) does not fully recognise external shading
- Dynamic Simulation Modelling (DSM) links to sunpath/shading calculations, recognising complex solar shading geometries
- Trade off between limiting solar gains and maximising benefit of daylight impacts on overall compliance
- Recognising impact of Criterion 3 compliance prior to planning submission is essential
- Bolt-on air conditioning is no longer a 'fix' to compliance, fixes are now expensive or affect building's form
- Developers must recognise impact of Criterion 3
- Glass boxes may not be achievable, at least at an acceptable cost



For more information, contact Stroma Technology on the following **0845 621 11 11** alternatively email **comply@stroma.com**

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# CASE STUDY PART L 2010 Compliance

Building Type: **Library**

Location: **Southampton**

Building Environment: **Biomass Heating & Natural Ventilation**

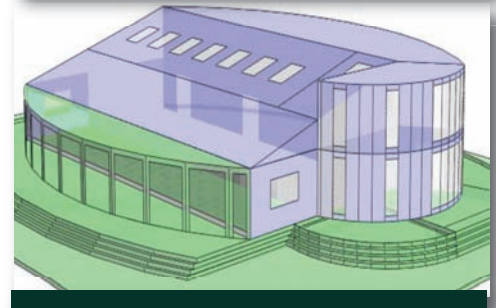
## CRITERIA 1 & 2 COMPLIANCE:

The negligible carbon emission factor associated with Biomass fuel meant almost guaranteed compliance under Part L 2006.

2010 regulations limit the benefit of Biomass enormously by assigning the same fuel within the notional building.

Comfortable compliance with worst allowable U-value's and air-tightness is replaced by significant non-compliance in 2010.

Bolt on compliance can be achieved through Solar Photovoltaics, but at a cost. Approximately **£53,000** of solar panels would be required to act as a 'fix' in this instance. Improving building fabric performance alone does not provide compliance. A holistic approach – addressing U-Values, lighting and air-tightness provides the most cost effective and energy efficiency route to compliance.



## Base Building Specification:

BUILDING FABRIC		
Walls		<b>0.35</b> W/m <sup>2</sup> K
Floor		<b>0.25</b> W/m <sup>2</sup> K
Roof		<b>0.25</b> W/m <sup>2</sup> K
Windows		<b>2.0</b> W/m <sup>2</sup> K
Rooflights		<b>2.1</b> W/m <sup>2</sup> K
Air-Tightness		<b>10</b> m <sup>3</sup> /hr.m <sup>2</sup>
BUILDING SERVICES		
Heating	<b>Underfloor</b>	Biomass 89%
WC Ventilation	<b>SFP 1.5</b> W/l.s	No Heat Recovery
Hot Water	<b>50</b> Litre	Gas 90%
General Lighting	<b>12</b> W/m <sup>2</sup>	Manual Switching
Display Lighting	<b>12</b> W/m <sup>2</sup>	15 lm/W

SPECIFICATION	2006		2010		
	BASE	BASE	PV	FABRIC	HOLISTIC
Notional	<b>49.1</b>				
TER	<b>37.5</b>	<b>16.4</b>	<b>16.4</b>	<b>16.4</b>	<b>16.4</b>
BER	<b>26.3</b>	<b>23.8</b>	<b>16.0</b>	<b>23.2</b>	<b>14.6</b>
Criterion 1	✓	✗	✓	✗	✓
Criterion 2	✓	✓	✓	✓	✓

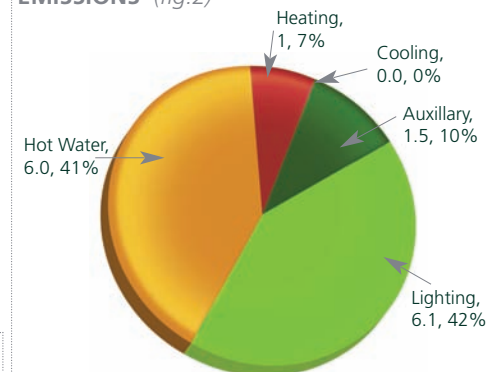
## Specification Improvement Scenarios:

'BOLT-ON' PHOTOVOLTAIC	
PV	<b>85</b> m <sup>2</sup>
Type	Monocrystalline
Orientation	South
Inclination	<b>30°</b>

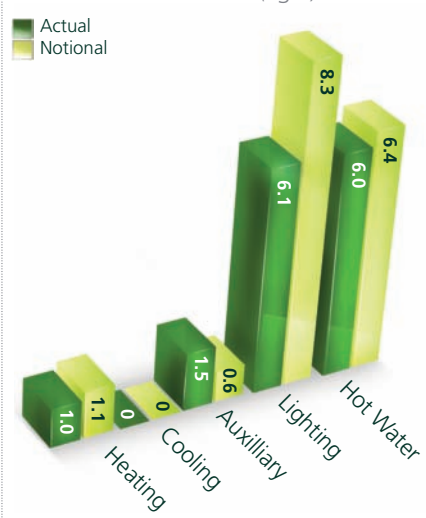
FABRIC IMPROVEMENTS	
Walls	<b>0.08</b> W/m <sup>2</sup> K
Floor	<b>0.08</b> W/m <sup>2</sup> K
Roof	<b>0.08</b> W/m <sup>2</sup> K
Windows/rlights	<b>1.0</b> W/m <sup>2</sup> K
Air-Tightness	<b>3.0</b> m <sup>3</sup> /hr.m <sup>2</sup>

HOLISTIC SOLUTION	
Walls	<b>0.2</b> W/m <sup>2</sup> K
Floor	<b>0.2</b> W/m <sup>2</sup> K
Roof	<b>0.18</b> W/m <sup>2</sup> K
Windows/rlights	<b>1.8</b> W/m <sup>2</sup> K
Air-Tightness	<b>5.0</b> m <sup>3</sup> /hr.m <sup>2</sup>
Vent Heat Rcvry	<b>70%</b>
Pumps	<b>VSD's</b>
Lighting	<b>8</b> W/m <sup>2</sup>

ACTUAL BUILDING - kgCO<sub>2</sub>/m<sup>2</sup> EMISSIONS (fig.2)



ACTUAL & NOTIONAL - kgCO<sub>2</sub>/m<sup>2</sup> EMISSIONS BY USAGE (fig.1)



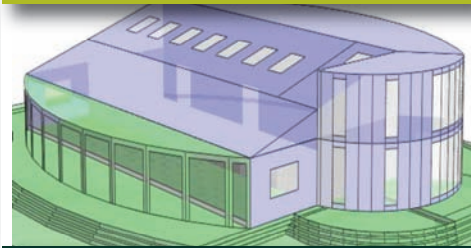
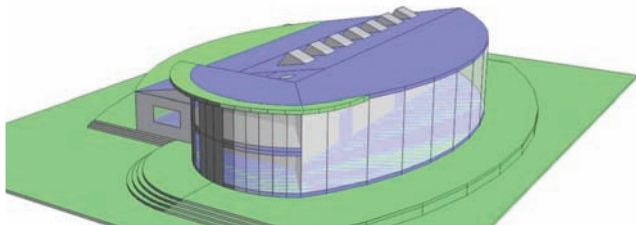
# CASE STUDY PART L 2010 Compliance

Building Type: **Library**

Location: **Southampton**

Building Environment: **Biomass Heating & Natural Ventilation**

## CRITERION 3 COMPLIANCE: *Limiting Solar Gains:*



SPECIFICATION	2006		2010	
	METHOD A	METHOD B	ASSESSMENT TOOL	SOLAR GAIN CHECK
Base	✓	✓	SBEM	✗
Solar Shading, 'north lights, reduced glazing	Not required	Not required	DSM	✓
Reduced Glazing			SBEM	✓
Solar Control Glass & Reduced Glazing			SBEM	✓

Criterion 3 compliance provides possibly the most significant challenge to compliance under 2010 Part L. Compliance no longer relates to internal temperature or total internal gains, but looks only at solar gains.

For side lit spaces, solar gains must be less than those seen if all external elevations have a 1m high glazed strip and East facing orientation, with a reference G-value of 0.68 applied.

This change of approach means that glazing may have to be reduced, shaded or have expensive solar control glass applied.

In this instance, rooflights provide daylight into an area with only a small amount of external wall, meaning solar gains in the actual building are vastly greater than those in the notional comparison.

Even where a large canopy has been designed to allow south facing glazing, the building as a whole fails to meet compliance, and as such other solutions are required.

### 3 routes to compliance have been outlined;

1. Redesign of rooflights to be 'north lights', additional canopy added over staff room and rooflight area reduced (pictured)
2. Reduced glazed area – Rooflights 55%, south glazing 46%, café glazing 75%
3. Solar Control glass to all facades and rooflights and reduced glazed area – Rooflights 43%, café glazing 50%

Each of these three solutions results in compliance, and require a number of different options to be employed. There is no easy, 1 fits all solutions to compliance in this relatively complex building.

In addition, Solar Control glass with a G-Value of 0.31 and 29% light transmittance, results in a significant cost increase beyond the 'base' design specification, as well as a significant reduction in available daylight. The impact of solar gains from the rooflights can only be overcome by changing to north lights, resulting in a major change to the appearance of the building, as well as impacting on cost and structural design.

Finally, without allowing natural daylight to the library area through rooflights or north lights, the additional energy consumption through lighting would have resulted in failing Criterion 1 compliance.

### Criterion 3 Headlines:

- Criterion 3 calculations simplified
- Compliance results included in BRUKL report required by Building Control
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