


Close Out of Outstanding Carbon and Energy Items

Project Regent High School (formally South Camden Community College)
Subject Formal BuroHappold Engineering Response
Project no 025901
Date 7 November 2014

Revision	Description	Issued by	Date	Approved (signature)
00	For BAM	NW	07.11.2014	

1 Aims of Design Note

The purpose of this design note is to address and close out outstanding energy and carbon items for Regent High School (formally South Camden Community College) in relation to the following:

1. Provide evidence to discharge planning conditions 22 and 24– see Section 2.1
2. Address other energy and carbon items raised by BAM – see Section 2.2
3. Respond to comments from Independent Certifier – see Section 2.3

2 Carbon & Energy Items

2.1 Evidence to Discharge Planning Conditions

2.1.1 Planning Condition 22

Condition 22 states that the following must be achieved:

A 60% reduction in CO₂ emissions below the Part L 2006 baseline and provide 'As-Built' NCM calculations confirming the 60% reduction.

Evidence

Final Part L results demonstrate that a reduction of 60.1% is achieved in relation to the Part L 2006 Target Emission Rate (TER). Therefore Planning Condition 22 is adhered to. The final Part L results include the impact of the as installed renewable technologies. Performance has reduced slightly from 60.6% reduction to 60.1%.

Emissions (kgCO ₂ /m ²)	Heating	Cooling	Auxiliary	Lighting	DHW	Equipment	Total	% Reduction from TER
Target Emission Rate TER Part L 2006	9.1	2.6	4.9	9.2	5.1	8.1	39.0	
Building Emission Rate BER Part L 2006 Mean, Lean and Green Measures Applied	3.7	0.4	1.6	5.0	2.3	2.6	15.6	60.1%

Table 1: Part L 2006: Final TER vs. BER

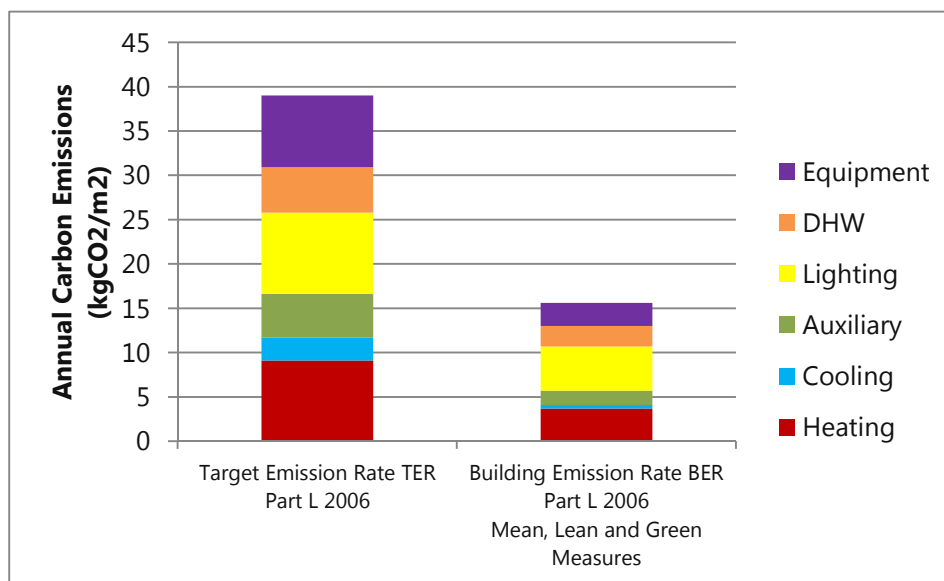


Figure 1: Part L 2006: Final Annual Carbon Emissions

2.1.2 Planning Condition 24

Condition 24 states that the following must be achieved:

Renewable technologies to be installed in accordance with the details listed in the energy statement to achieve the 60% reduction.

Solar thermal: The energy statement stated that there would be 190m² solar thermal. The solar thermal spec submitted for discharge indicates that there will be 36m² solar thermal panels. The applicant should clarify why this has changed from the original proposals.

PV: The energy statement stated that there would be 133m² PV panels. The PV spec submitted for discharge indicates that there will be 265m² PV panels. The applicant should clarify why this has changed from the original proposals.

Note that provided the 60% reduction in CO₂ emissions below the Part L 2006 baseline has been met and the 20% reduction through renewables has also been met (or through reasonable endeavours for which there is a clear narrative been met as far as possible), the above changes to renewables should not be a problem.

Evidence

Although the amount of solar thermal panels has reduced since the Energy Statement was submitted for Planning, the amount of PV panels has substantially increased. Carbon emission savings in relation to electricity have a more significant impact therefore, the latest analysis based on the as installed renewable technologies, confirms that the targets are achieved. The table below demonstrates that there is a 1.6% reduction in relation to carbon emissions saved, compared to the saving achieved in the Energy Statement for Planning.

Technology Type	Planning Energy Statement			As Installed Technologies		
	Energy Statement Panel Area (m ²)	Energy Statement Energy Saved (kWh)	Previous Carbon saved (kgCO ₂ /m ²)	Actual Panel Area (m ²)	Actual Energy Saved (kWh)	Actual Carbon Saved (kgCO ₂ /m ²)
PV Panels	133	15960	0.67	265	31800	1.34
Solar Thermal	190	57000	0.86	36	10800	0.16
Total	323	72960	1.53	301	42600	1.50

Table 2: Energy & Carbon Savings from Solar Thermal and PV Panels: Comparison of Planning Areas vs. As Installed Areas

Following the 'passive, active, renewables' energy hierarchy, the evidence for Planning Condition 22 demonstrates that an overall carbon emissions saving of 60.1% is met as shown in the tables below.

Emissions (kgCO ₂ /m ²)	Heating	Cooling	Auxiliary	Lighting	DHW	Equipment	Total
Part L (2006) TER	9.1	2.6	4.9	9.2	5.1	8.1	39.0
Passive Measures	8.5	0.4	1.6	9.2	3.3	2.9	25.9
Passive and Active Measures	6.4	0.4	1.6	5.0	3.2	2.9	19.5
Passive, Active & Renewables	3.7	0.4	1.6	5.0	2.3	2.6	15.6

Table 3: TER vs BER - Passive, Active & Renewables Measures – Carbon Emissions

Emissions (kgCO ₂ /m ²)	Total	% Reduction	Target Met?
Part L (2006) TER	39.0		
Passive, Active & Renewables	15.6	60.1%	✓

Table 4: TER vs BER - Passive, Active & Renewables Measures – % Reduction

In relation to the target of 20% renewables, while analysing the contribution of the as installed renewable technologies (including ground source heat pumps), results demonstrate that the carbon savings reduction is 19.9%. If this is rounded to 2 significant figures, the target of 20% is complied with as shown in the table below:

Emissions (kgCO ₂ /m ²)	Total	% Reduction	Target Met?
Passive and Active Measures	19.5		
Passive, Active & Renewables	15.6	19.9%	✓

Table 5: Carbon Savings from Renewable Technologies

The graph below displays the carbon savings:

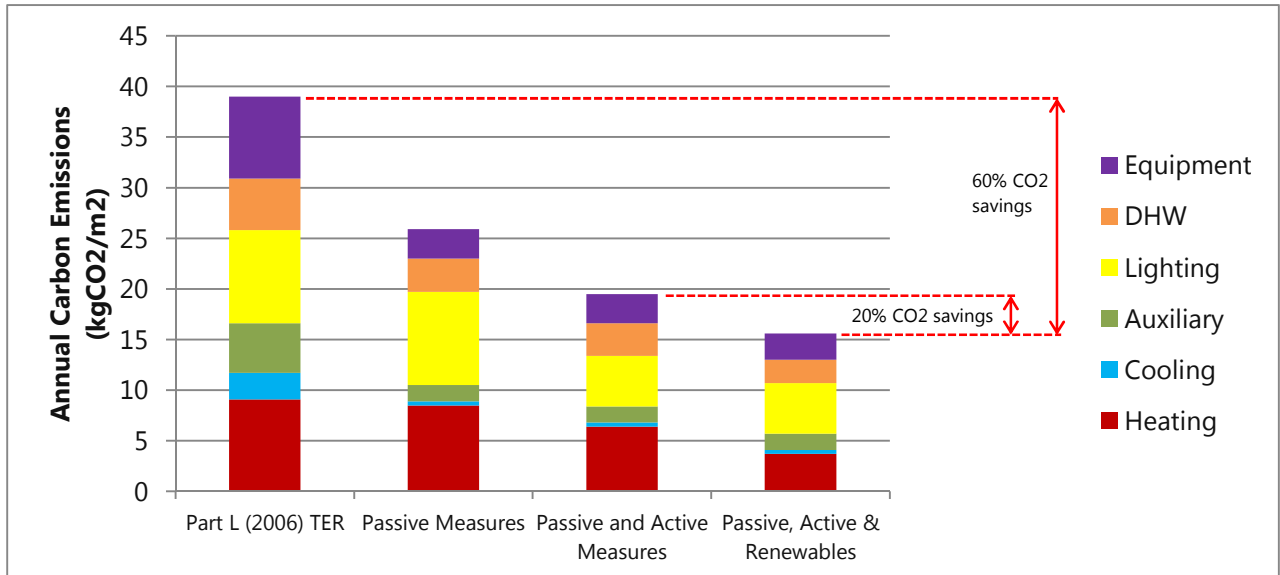


Figure 2: Part L 2006: Final Annual Carbon Emissions

2.2 Energy and Carbon Item Raised by BAM

Query from Jim McCormack – BAM on 31/10/2014:

"I am also advised that we should have the BRUKL report and also the EPC's for the completed building (all we have been issued to date is the EPC's done at design stage in 2010.). Would you please chase up these for us as we are contractually obliged to deliver all this information to Camden and they are part of our design appointment outputs with you."

Response:

BuroHappold Engineering has reviewed the contract and it is not stated that BuroHappold Engineering are contractually obliged to produce construction stage EPCs.

2.3 Responses to Comments from Independent Certifier

1- What is the CO₂ rating of the project?

Response:

A rating – 23,875 kgCO₂ per year.

2- How many GJ/100m³ consumption?

Response:

3.47 GJ/100m³

3- There are discrepancies between the AR and CP and what is installed in relation to room temperature set points and control, i.e. When heating and cooling are enabled and where dead bands are placed. Therefore we requested the energy model to

A) answer points 1 and 2 above

B) 1 and 2 will have been derived from amongst other things - the operational strategy, i.e. How much heating and cooling is in use and at what expected frequency and temperature (consumption), this will allow BAM to set up the building as the AR, CP and in line with the Energy Model, the consumption then can be controlled and the building will (all things being equal) perform as design.

Response:

B) In use predicted heating and cooling energy consumption is included below:

Energy Use	Heating	Cooling
Energy Consumption (kWh)	135,359	12,800
Energy Consumption (GJ/100m ³)	0.71	0.08

Table 6: Predicted Heating and Cooling Energy Consumption

The temperature setpoints per space type are included below to allow BAM to set up the building in line with the heating and cooling assumptions embedded into the energy model. See Tables 8, 9, 10 and 11 for detailed of the heating setpoint temperatures applied throughout the day and throughout the year.

Room Type	Heating Setpoint	Cooling Setpoint
Cellular Office: Mech Vent	20°C / 12 °C	n/a
Cellular Office: Mixed Mode	20°C / 12 °C	n/a
Cellular Office: Nat Vent	20°C / 12 °C	n/a
Changing facilities	22°C /12 °C	n/a
Circulation area	15°C /12°C	n/a
Circulation area: Arcade	15°C /12°C	n/a
Classroom: Mech Vent	18°C /12°C	n/a
Classroom: Mixed Mode	18°C /12°C	n/a
Classroom: Nat Vent	20°C / 12 °C	n/a
Common room/staff room/Lounge: Mech Vent	20°C / 12 °C	n/a
Common room/staff room/Lounge: Nat Vent	20°C / 12 °C	n/a
Dry Sports Hall: Mech Vent	15°C /12°C	n/a
Dry Sports Hall: Mixed Mode	15°C /12°C	n/a
Eating/drinking Area: Mech Vent	18°C /12°C	n/a
Eating/drinking Area: Mixed Mode	18°C /12°C	n/a
Food Preparation Area	18°C /12°C	n/a
Hall/Lecture Theatre/Assembly: Mech Vent	18°C /12°C	n/a
Hall/Lecture Theatre/Assembly: Mixed Mode	18°C /12°C	n/a
High Density IT Workspace: Mech Vent	18°C /12°C	n/a
High Density IT Workspace: Mixed Mode	18°C /12°C	n/a
High Density IT Workspace: Nat Vent	18°C /12°C	n/a
IT Equipment	15°C /12°C	25 constant
Laboratory: Mixed Mode	18°C /12°C	n/a

Laboratory Prep Room	18°C /12°C	n/a
Meeting Room: Mech Vent	20°C / 12 °C	n/a
Meeting Room: Nat Vent	20°C / 12 °C	n/a
Music Practice Room	18°C /12°C	n/a
Plant Room	12 constant	n/a
Reception	20°C / 12 °C	n/a
Storage Area	15°C /12°C	n/a
Toilet: Supply and Extract	18°C /12°C	n/a
Toilet: Extract Only	18°C /12°C	n/a

Table 7: Heating & Cooling Setpoints

The tables below displays the detailed temperature parameters applied to the various space types, throughout the day and year.

15°C / 12°C Schedule

Applicable to: Circulation area, Circulation area: Arcade, Dry Sports Hall: Mech Vent , Dry Sports Hall: Mixed Mode, IT Equipment, Storage Area.

Temperatures Applied	End month:	End day:
constant 12°C	Jan	9
Mon – Fri 08:00 – 18:00: 15 °C, 18:00 – 08:00: 12°C, Sat – Sun all day: 12 °C	Feb	13
constant 12°C	Feb	20
Mon – Fri 08:00 – 18:00: 15 °C, 18:00 – 08:00: 12°C, Sat – Sun all day: 12 °C	Mar	20
constant 12°C	Apr	3
Mon – Fri 08:00 – 18:00: 15 °C, 18:00 – 08:00: 12°C, Sat – Sun all day: 12 °C	May	29
constant 12°C	Sep	4
Mon – Fri 08:00 – 18:00: 15 °C, 18:00 – 08:00: 12°C, Sat – Sun all day: 12 °C	Oct	23
constant 12°C	Oct	30
Mon – Fri 08:00 – 18:00: 15 °C, 18:00 – 08:00: 12°C, Sat – Sun all day: 12 °C	Dec	22
constant 12°C	Dec	31

Table 8: Annual & Daily Heating Profile: 15°C / 12°C

18°C / 12°C Schedule

Applicable to: Classroom: Mech Vent, Classroom: Mixed Mode, Eating/drinking Area: Mech Vent, Eating/drinking Area: Mixed Mode, Food Preparation Area, Hall/Lecture Theatre/Assembly: Mech Vent, Hall/Lecture Theatre/Assembly: Mixed Mode, High Density IT Workspace: Mech Vent, High Density IT Workspace: Mixed Mode, High Density IT Workspace: Nat Vent, Laboratory: Mixed Mode, Laboratory Prep Room, Music Practice Room, Toilet: Supply and Extract, Toilet: Extract Only.

Temperatures Applied	End month:	End day:
constant 12°C	Jan	9
Mon – Fri 08:00 – 18:00: 18 °C, 18:00 – 08:00: 12°C, Sat – Sun all day: 12 °C	Feb	13
constant 12°C	Feb	20
Mon – Fri 08:00 – 18:00: 18 °C, 18:00 – 08:00: 12°C, Sat – Sun all day: 12 °C	Mar	20
constant 12°C	Apr	3
Mon – Fri 08:00 – 18:00: 18 °C, 18:00 – 08:00: 12°C, Sat – Sun all day: 12 °C	May	29
constant 12°C	Sep	4
Mon – Fri 08:00 – 18:00: 18 °C, 18:00 – 08:00: 12°C, Sat – Sun all day: 12 °C	Oct	23
constant 12°C	Oct	30
Mon – Fri 08:00 – 18:00: 18 °C, 18:00 – 08:00: 12°C, Sat – Sun all day: 12 °C	Dec	22
constant 12°C	Dec	31

Table 9: Annual & Daily Heating Profile: 18°C / 12°C

20°C / 12°C Schedule

Applicable to: Cellular Office: Mech Vent, Cellular Office: Mixed Mode, Cellular Office: Nat Vent, Classroom: Nat Vent, Common room/staff room/Lounge: Mech Vent, Common room/staff room/Lounge: Nat Vent, Meeting Room: Mech Vent, Meeting Room: Nat Vent, Reception.

Temperatures Applied	End month:	End day:
constant 12 °C	Jan	9
Mon – Fri 08:00 – 18:00: 20 °C, 18:00 – 08:00: 12 °C, Sat – Sun all day: 12 °C	Feb	13
constant 12 °C	Feb	20
Mon – Fri 08:00 – 18:00: 20 °C, 18:00 – 08:00: 12 °C, Sat – Sun all day: 12 °C	Mar	20
constant 12 °C	Apr	3
Mon – Fri 08:00 – 18:00: 20 °C, 18:00 – 08:00: 12 °C, Sat – Sun all day: 12 °C	May	29
constant 12 °C	Sep	4
Mon – Fri 08:00 – 18:00: 20 °C, 18:00 – 08:00: 12 °C, Sat – Sun all day: 12 °C	Oct	23
constant 12 °C	Oct	30
Mon – Fri 08:00 – 18:00: 20 °C, 18:00 – 08:00: 12 °C, Sat – Sun all day: 12 °C	Dec	22
constant 12 °C	Dec	31

Table 10: Annual & Daily Heating Profile: 20°C / 12°C**22°C / 12°C Schedule**

Applicable to: Changing facilities.

Temperatures Applied	End month:	End day:
constant 12 °C	Jan	9
Mon – Fri 08:00 – 18:00: 22 °C, 18:00 – 08:00: 12 °C, Sat – Sun all day: 12 °C	Feb	13
constant 12 °C	Feb	20
Mon – Fri 08:00 – 18:00: 22 °C, 18:00 – 08:00: 12 °C, Sat – Sun all day: 12 °C	Mar	20
constant 12 °C	Apr	3
Mon – Fri 08:00 – 18:00: 22 °C, 18:00 – 08:00: 12 °C, Sat – Sun all day: 12 °C	May	29
constant 12 °C	Sep	4
Mon – Fri 08:00 – 18:00: 22 °C, 18:00 – 08:00: 12 °C, Sat – Sun all day: 12 °C	Oct	23
constant 12 °C	Oct	30
Mon – Fri 08:00 – 18:00: 22 °C, 18:00 – 08:00: 12 °C, Sat – Sun all day: 12 °C	Dec	22
constant 12 °C	Dec	31

Table 11: Annual & Daily Heating Profile: 22°C / 12°C**12 °C Constant Schedule**

Applicable to: Plant Room