

Colwall C of E Primary School- Sustainability Appraisal

1. Summary

We have assessed the energy consumption of the proposed Colwall C of E Primary School where significant improvements have been made to the building fabric performance and specification of building services to reduce the operational energy consumption and associated CO₂ emissions of the building. We have made benchmark assessments against the Part L2a (2013) minimum standards for U-values and associated efficiencies specified in the Non-domestic Building Services Compliance Guide. The following report presents the results of this analysis identifying energy and cost savings achieved based on the improvements to building fabric and building services against the minimum standards.

Note that the value assigned to equipment power consumption would be unaffected by these changes and has been excluded from this analysis.

2.1 Benchmark Model Energy Consumption

Energy Consumption by End Use [kWh/m²]		
	Actual	Notional
Heating	39	25.27
Cooling	0	0
Auxiliary	1.96	1.75
Lighting	15.13	12.94
Hot water	8.84	6.35
Equipment*	17.15	17.15
TOTAL **	64.92	46.31

* Energy used by equipment does not count towards the total for calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Figure 1. Colwall Primary School – Benchmark BRUKL Report

- Total Annual Energy Consumption: 82,400 kWh
- Annual gas consumption: 60,700 kWh at an estimated cost of £1820
- Annual electricity consumption: 21,700kWh at a cost of £2170

Note that in this case some form of renewables (such as PV panels) would be required to achieve compliance with Building Regulations Part L. The model as it stands exceeds the target emissions level by 35%

2.2 Improve Building Fabric to U-values as specified by Quattro Design Architects, and air tightness to 5m3/hr.m2

The improvements to the building fabric have a significant impact on the energy consumption for space heating as detailed below:

Energy Consumption by End Use [kWh/m²]		
	Actual	Notional
Heating	19.14	25.27
Cooling	0	0
Auxiliary	1.96	1.75
Lighting	15.08	12.94
Hot water	8.83	6.35
Equipment*	17.15	17.15
TOTAL **	45.01	46.31

* Energy used by equipment does not count towards the total for calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Figure 2. Colwall Primary School –Achieved U values SBEM (NDC)

- Total Annual Energy Consumption: 57,100 kWh
- Annual gas consumption: 35,500kWh at an estimated cost of £1060 (42% saving against benchmark)
- Annual electricity consumption: 21,600kWh at a cost of £2160

Note that in this case some form of renewables (such as PV panels) would be required to achieve compliance with Building Regulations Part L. The model as it stands exceeds the target emissions level by 24%

2.3 Further improvements made to building services specification including LED lighting, controls and improved boiler efficiency

The improvements to the building services, in particular the lighting, have a significant impact on the electrical energy consumption, and are sufficient to achieve compliance (when applied with the building fabric improvements as details above) with Part L2a (2013) of the building regulations.

Energy Consumption by End Use [kWh/m²]		
	Actual	Notional
Heating	19.31	25.16
Cooling	0	0
Auxiliary	1.99	1.77
Lighting	9.49	12.89
Hot water	7.55	6.57
Equipment*	17.45	17.45
TOTAL **	38.33	46.4

* Energy used by equipment does not count towards the total for calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Figure3. Colwall Primary School – Improvements SBEM (NDC)

- Total Annual Energy Consumption: 48,600 kWh
- Annual gas consumption: 34,000 kWh at an estimated cost of £1020 (44% saving against benchmark)
- Annual electricity consumption: 14,600 kWh at a cost of £1460 (33% saving against benchmark)

This option complies with the target emissions level defined by Building Regulations Part L, improving on the target value by 17%.

2.4 Photovoltaics

In addition to the improvements to the building fabric and building services above the minimum values as detailed above, we are considering the impact in terms of energy generation and revenue generated by a photovoltaic array.

The current proposal is subject to budget constraints however a solar array of 150m² has been targeted.

The targeted PV array would offer an annual electrical generation estimated at 18,500 kWh, with an associated electrical cost saving of £1,850. In addition to the savings due to onsite electrical generation, Feed-in-tariff (FIT) payments would be received at an estimated be £ 840. The estimated payback for this system would be 12 years.

Making the addition of the PV array to the proposed building model as defined in section 2.3, would lead to the target emissions rating defined by Building Regulations Part L being improved by 71 %.*