



TRINITY ACADEMY SCHOOL, LEEDS

Mechanical & Electrical Engineering Services
Energy & Sustainability Report
AFS-IMT-XX-XX-RP-ME-00002

Revision P06

DOCUMENT REVISION HISTORY				Ref:	AFS-IMT-XX-XX-RP-ME-00002
Rev	Author	Verification	Date	Comments / Status	
P01	MD	AM	17/03/20	Preliminary	
P02	MD	AM	23/04/20	School name amended	
P03	MD	AM	28/04/20	Comments Incorporated	
P04	MD	AM	01/05/20	Comments Incorporated	
P05	NC	MV	02/07/20	Updated for Revised Planning Submission	
P06	NC	OP	29/11/23	Post-Occupancy Evaluation	

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Mechanical & Electrical Engineering Services
Energy & Sustainability Report

Status: S3
Revision: P06

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1.0 Introduction

This report has been compiled, on behalf of Galliford Try as the appointed main contractor to develop a new secondary school.

The proposed Site is currently allocated as a MX2-37 in accordance with Leeds City Council Site Allocation Plan (SAP).



This report is intended to provide an understanding of the energy and sustainability for the proposed secondary school.

The development consists of 2 number buildings, Main Secondary School Building and Secondary School Sports Block along with a car park and sports pitch facilities.



Extract from drawing Ares Landscape Drawing NE8643-ALA-XX-ZZ-DR-L-0001.

2.0 Energy and Sustainability

2.1 Building Performance and Optimisation

The environmental objectives of the scheme have been to reduce the operational building energy. This has been done by reducing the primary energy demand by ensuring that the fabric design and performance has been considered first. With an overarching requirement stipulated by Leeds City Council where the building must produce 20% less carbon dioxide than the equivalent building measured against 2013 Part L2A Building Regulations. This follows the Leeds City Council planning policy EN1.

The building physics analysis has been appraised and considered to test the optimum:

- Site orientation
- Building envelope design
- Thermal detailing
- Building air tightness
- Solar treatment to reduce heat gain
- Glazed area design to optimise daylight
- Passive design for ventilation and control of summertime overheating

2.2 Part L2 Building Regulations

The building design will be assessed in accordance with Building Regulations Part L2A 2013. Using building compliance modelling software, the results of the initial compliance assessment suggest that the building will comply with Part 2LA 2013.

2.3 Building Fabric Performance

To ensure that the building heat load demand is at a level such that it is still economical, and we have not gone past diminishing returns, following target u-values have been set:

- External Walls – 0.22w/m²k
- Ground Floor – 0.15w/m²k
- Roof – 0.17w/m²k
- Windows – 1.56w/m²k

Rooflights – 1.75w/m²k

A building air leakage value of 3m³/hr/m² at 50Pa has been targeted in design. Through robust construction the actual achieved value is **1.88 m³/hr/m²**

2.4 Sustainability

Leeds City Council are committed to delivering projects where sustainability is embedded as a key focus throughout the project, in line with their sustainability commitments.

Our aim is to provide an energy efficient building. The primary focus is to minimise energy usage through the fabric first approach. Efficient use of systems, plant and application of controls to suit zoning for HVAC plant and lighting will all contribute to the low energy consumption.

The renewable energy strategy has been directed to achieve 10% of its energy from low to zero carbon technologies via the Leeds City Council Planning requirements.

A number of different services concepts have been assessed along with their suitability for incorporating Low and Zero Carbon energy systems into the scheme. It has been concluded through the viability v's cost study that the new development would benefit from the District Heating scheme and air source heat pump technology.

There is an overall energy consumption of 42.78kWh/m² for the secondary school and with the use of the District Heating Scheme (Heating and Hot Water) and air source heat pump (Cooling), the energy consumption of 21.74kWh/m² (Heating), 8.44kWh/m² (Hot Water) and 0.11kWh/m² (Cooling) has a 70.8% renewable contribution.

$$21.74+8.44+0.11=30.29\text{kWh}$$

$$30.29/42.78=70.8\%$$

BRUKL Output Document  HM Government
 Compliance with England Building Regulations Part L 2013

Project name

East Leeds Free School As designed

Date: Thu Apr 23 11:08:38 2020

Administrative information

Building Details

Address: East Leeds Free School, Leeds, LS9 7QL

Certification tool

Calculation engine: Apache
 Calculation engine version: 7.0.12
 Interface to calculation engine: IES Virtual Environment
 Interface to calculation engine version: 7.0.12
 BRUKL compliance check version: v5.6.a.1

Owner Details

Name: Leeds City Council
 Telephone number: 0113 222 4444
 Address: Civic Hall, Claverley Street, Leeds, LS1 1UR

Certifier details

Name: CAD21 Ltd
 Telephone number: 0191 250 2211
 Address: 12 Berrymoor Court, Northumberland Business Park, Newcastle upon Tyne, NE23 7RZ

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	21.74	20.53
Cooling	0.11	0.05
Auxiliary	2.7	1.62
Lighting	9.8	13
Hot water	8.44	7.63
Equipment*	18.78	18.78
TOTAL**	42.78	42.83

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
 ** Total is net of any electrical energy displaced by CHP generators, if applicable.

As-designed BRUKL

BRUKL Output Document  HM Government
 Compliance with England Building Regulations Part L 2013

Project name

Trinity Academy Leeds As built

Date: Wed Feb 16 09:55:26 2022

Administrative information

Building Details

Address: Trinity Academy Leeds, LEEDS, LS9 7QL

Certification tool

Calculation engine: Apache
 Calculation engine version: 7.0.13
 Interface to calculation engine: IES Virtual Environment
 Interface to calculation engine version: 7.0.13
 BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Kyle Robinson (CAD21 Yorkshire)
 Telephone number: 0113 3970851
 Address: Pure Offices, 4100 Park Approach, Thorpe Park, LEEDS, LS15 8GB

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	15.18	15.38
Cooling	0.38	0.44
Auxiliary	3.93	1.83
Lighting	8.8	12.61
Hot water	16.36	13.33
Equipment*	23.06	23.06
TOTAL**	44.65	43.59

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
 ** Total is net of any electrical energy displaced by CHP generators, if applicable.

As-Built BRUKL.

2.5 Energy Metering and Monitoring

It is intended that the whole site will get one utility meter for the Electric, Gas and Water and will be sub-metered accordingly across the secondary school to allow individual billing. All energy meters will be linked to the BEMS system to enable readings to be recorded and monitored. Electrical energy metering will include sub metering for the Kitchen, Sports Hall, Sports Pitch Lighting, Electric Vehicle Charging, Lighting and Small Power per floor area.

We have allowed for providing the required areas to function for out of hours use and metering to monitor the usage of these areas for secondary billing and informed building management.

3.0 Conclusion

The submitted energy assessment demonstrates that there are a high percentage of carbon dioxide reductions from the use of the District Heating Scheme for the secondary school to ensure that there are sufficient reductions to meet the criteria required within policy EN1.

4.0 Post Occupancy Evaluation

To discharge planning condition 42, the design team are required to undertake a post occupancy evaluation to demonstrate the original objectives are met and to highlight and remediation measures if required.

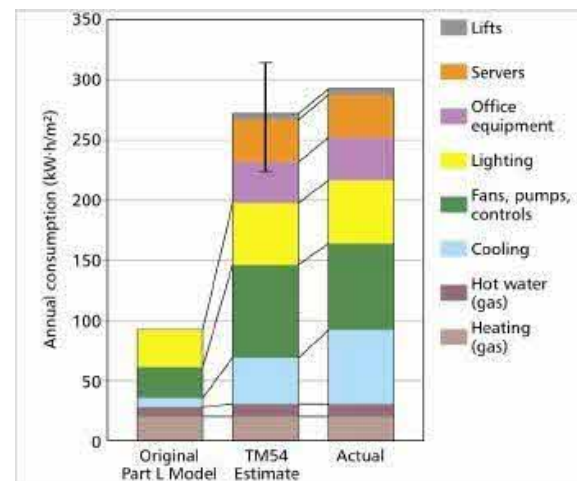
Planning condition 42:

42	Energy & sustainability (post-construction review)	Yes	Post-construction Sustainability Statement review and remediation measures / timetable for implementation if deemed
Within 6 months of the development being first used a post-construction Sustainability Statement review shall be submitted to and approved in writing by the Local Planning Authority to ensure the original targets/objectives as set out in the details agreed under condition No. 41 are being met and shall include appropriate remediation measures (including a timetable for implementation) where this is not the case. The building shall be operated in accordance with the agreed sustainability measures (and any required remediation) for its lifetime.		Post-occupation	

4.1 Energy Assessment

The original planning submission to discharge condition 41 provided data outputs from the Part L analysis (BRUKL), noted in section 2.4. Both As design and AS BUILT BRUKLs were provided upon project completion with suitable evidence provided to allow the project EPC to be lodged successfully with the BRE.

To undertake a true post occupancy evaluation we cannot compare the figures within the Building Regulations Part L BRUKL as the figure do not truly reflect the buildings operational energy consumption. See extract below which highlights the accuracy of both Part L and CIBSE TM54 assessments.



4.2 Assessment against Benchmarks

The scheme was designed to be compliant with the Department for Education 2019 Output specification, which stated each scheme should have an Energy Use Intensity Target of **75kWh/m2**. Based on a comparison against the current standard, the predicted operational energy of the building can be compared against the benchmark value stipulated within the Department of Education, Further Education Output Specification, Technical Annex 2H: Energy (November 2022). This value states an overall energy use intensity target of **67kWh/m²** and consists of the values indicated in the table, from the extract below.

3.2. New Buildings

3.2.1 DfE Fabric Energy Efficiency Standards

3.2.1.1 New Building(s) shall be designed to the Fabric First principle. [PM_40_20]

3.2.1.2 The minimum requirements associated with External Fabric are defined within Technical Annex 2C: Section 2.2, Table 1. [PM_10_20_90]

3.2.2 Energy Use Intensity Targets

3.2.2.1 To meet the EUI Targets, the energy model shall have energy end use for college per m² of GIFA (kWh/m²) excluding unheated areas (transition spaces). [PM_40_20]

3.2.2.2 The following EUI values define the minimum standards for New Building(s) and shall be achieved before the application of renewable technology. [PM_40_20]

Educational Building Type	Energy Use Intensity (minimum)	Units
Secondary School (with 6 th Form) and FE College	67*	kWh/m ²

Table 1 Energy Use Intensity Targets

* Note: Allow 2 kWh/m² for building related services

3.2.2.3 The breakdown below provides an indication of how to achieve the overall EUI targets, by end use system. [PM_40_30_27]

Parameter	Value	Units
Heating	8	kWh/m ²
Hot water	5	kWh/m ²
Internal lighting	8	kWh/m ²
Fans and pumps	5	kWh/m ²
Cooling	0	kWh/m ²
Lifts	1	kWh/m ²
Building related services	2	kWh/m ²
External lighting	6	kWh/m ²
Small power (Low Tech) *	10	kWh/m ²
Small power (Med Tech) *	15	kWh/m ²
Small power (High Tech) *	25	kWh/m ²
Catering	7	kWh/m ²
ICT equipment and active infrastructure	Included within Small Power	Included within Small Power

Table 2 End Use Energy Benchmarks

*College (targets shall be variable depending upon extent of curriculum delivery - as noted for FF&E Power) see Guidance for Low, Medium and High Tech definition. For Example: Low (academic curriculum), Medium (low to medium energy use in vocational training), High (high energy use in vocational training).

3.2.3 Net Zero Carbon in Operation

3.2.3.1 Technical Annex 2J sets out the DfE standards with respect to the definitions and requirements for Net Zero carbon in operation. [PM_10_20_90]

3.2.4 Operational energy and Equipment

3.2.4.1 Technical Annex 2J sets out the DfE standards with respect to legacy equipment and TM54 assessment assumptions. [PM_10_20_90]

A post occupancy assessment has been undertaken utilising data taken from the extensive metering provided the scheme. The screen shot below provided a high level overview of the weekly and monthly average consumptions and the total consumption since handover in Decemeber 2021.

Electric Meters Continued			
Meter Reference	Weekly	Monthly	Total
External LV/DB Future Sen	0.0 kW	0.0 kW	0.0 kW
External LV/DB Mains Meter	3439.0 kW	13814.0 kW	736308.0 kW
External LV/DB Sport Field	64.0 kW	256.0 kW	9904.8 kW
External LV/DB DB/CP	8.2 kW	32.8 kW	2020.7 kW
External LV/DB DB/CC	0.5 kW	77.0 kW	2735.9 kW
External LV/DB DB/LV	0.0 kW	0.0 kW	101.2 kW

This Week = 3439.0 kW (ok) @ 10

Water Meters			
Meter Reference	Weekly	Monthly	Total
Boundary Water Meter	0.0 m ³	0.0 m ³	52.0 m ³
Main Building Water Meter	21.0 m ³	-66.1 m ³	13647.7 m ³
Sports Hall Water Meter	1.6 m ³	10.6 m ³	286.5 m ³
CAT5 Meter	0.5 m ³	1.0 m ³	36.1 m ³
Sports Hall Leak Detection Meter	0.0 m ³	0.0 m ³	61.0 m ³

Gas Meters			
Meter Reference	Weekly	Monthly	Total
Incoming Gas Meter	2.5 m ³	-5.7 m ³	751.8 m ³
Kitchen Gas Meter	0.0 m ³	-66.0 m ³	5187.0 m ³

Heat Meter			
Meter Reference	Weekly	Monthly	Total
Heat Meter Reference			

The average weekly energy consumption figure of 3439kW in kWh/m² is equal to **64.5kWh/m²** (3439x168hrs / 8945m²). Direct comparisons cannot be made to the AS BUILT BRUKL values as the Part L assessment does not take into account the unregulated energy of the building i.e. what equipment is actually used. However the actual energy consumption is not significantly higher than the Part L value of **44.65kWh/m²**.

4.3 Post Occupancy Conclusion

The metering data obtained provides sufficient evidence to confirm the building is operating as designed and outperforming the relevant benchmark guidance.

No Remediation works required.