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TM54 Operational Energy Assessment;
Design Stage
For 12Nos flats & retail
Studio, 1-3 Bedroom flats &
2No Retail Units

Mixed Use Development
13 Bedford Road
London
N22 7AU

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Document History

Date	Rev	Checked	Auth.	Comments
21 Nov 24	0	OA	JA	ISSUED
10 Feb 25	1	OA	JA	Updated-ASHP Profile -page 8

1.0 EXECUTIVE SUMMARY

This document has been produced for 13 Bedford Road, London. The purpose of this assessment was to determine the expected operational energy usage in the mixed-use development when under full occupation, as in accordance with the methodology outlined in CIBSE TM54 2022 document.

The results indicated that the annual energy consumption for the residential part of the building is approximately 103,978kWh/yr, with consumption in the retail approximately 50,787kWh/yr

2.0 INTRODUCTION

AJIBS Design was commissioned to undertake the CIBSE TM54 Operational Energy assessment for the proposed building refurbishment and extension of a mixed-use development located at 13 Bedford Road N22 in London.

At the time of the assessment, the project was at the RIBA stage 2 to stage 3 and based on the level of design at the time, the modelling was based on available information presented to the design team, anticipated usage patterns and occupancy profiles. The building systems were not fully designed at this stage, therefore building systems' templates were applied to the models.

The new development is a 5-storey building located at the junction of Bedford Road and Alexander Park Road, with 2nos retail units on the ground floor and 12nos flats, ranging from studio to 3bed flat accommodation from the first to fifth floors. The apartments are connected to share common circulation spaces via corridors, stairs and a lift on the upper floors. The bin and bicycle stores and plantroom to be located at ground floor level.

3.0 BENCHMARKING AND TARGETS

Current Industry guidance is from the RIBA 2030 Challenge, the London Energy Transformation Initiative (Climate Emergency Guide), for how new buildings can meet the climate change targets.

The client had also demonstrated a commitment to work towards a net zero carbon delivery plan, with the scale of application of renewable energy technology at the early stages of the project.

The results of the modelling analyses shall be compared against latest CIBSE benchmarks as available online, showing energy usage in all types of buildings, with value set points for “good practice” and “typical practice”.

In the case of this development, the CIBSE online benchmarks have being based on CIBSE Guide F (2012) and Department of Business, Energy and Industry Strategy BEIS.

-Operational Energy Usage Intensity in kW/m²/yr -

Building Types- Electricity use only		Current Industry Benchmarks Nov24		Sources
	Best Practice	Good Practice	Typical Practice	
Flats elec heated	35 (2030) LETI	85	123	BEIS
Retail-depart store	140 (2010) TM46	237	294	CIBSE Guide F

Usage- Elec only fuel type

- National BEIS Nov 2024

Sample size-6,493	kWh/m2/yr
11%	55
28%	Less than 80
51%	Less than 125
79%	Less than 160
92%	Less than 220

4.0 METHODOLOGY

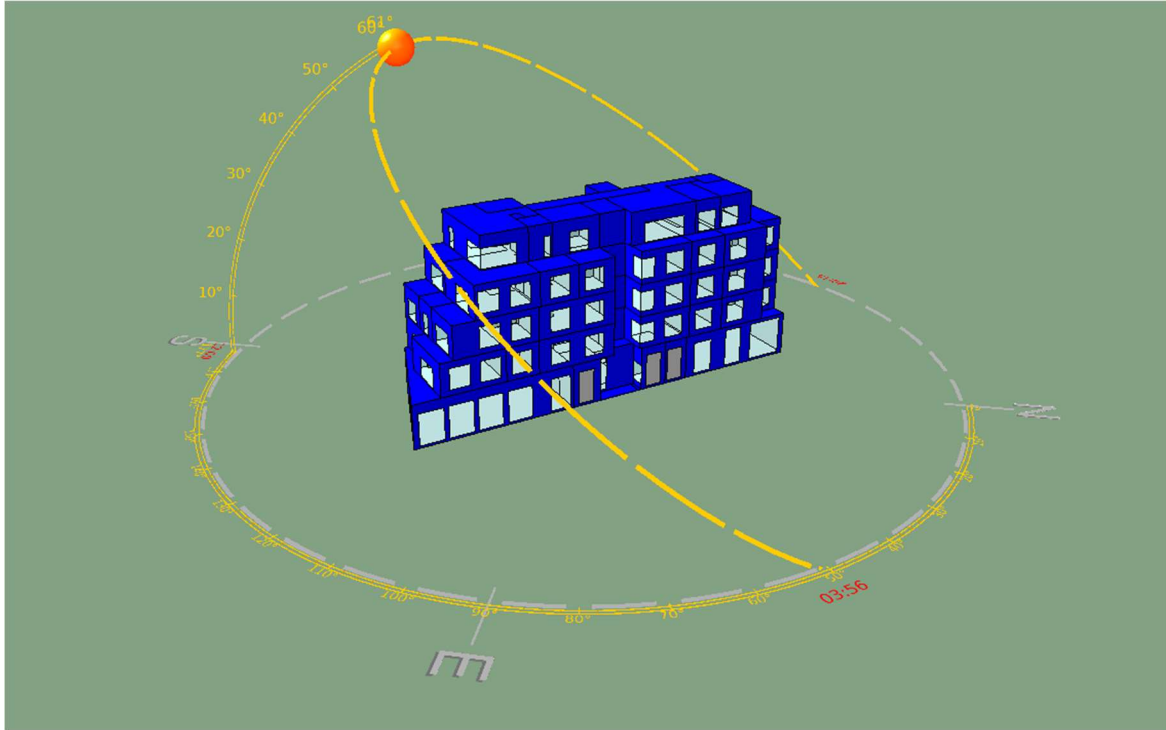
The operational energy consumption assessment was carried out using the methodology in CIBSE TM54 guide using the IESVE Dynamic Simulation Modelling (DSM) software version 2024 which include input data and assumptions for base case model.

The assessment has taken into account the building end uses such as heating, cooling, lighting, fans and pumps (auxiliary) servers, lifts and Domestic Hot Water (DHW) energy consumption and operating hours and occupancy factors associated with the development to determine the inputs used in the DSM.

The zoning has adhered to the proposed metering strategy of the entire building, which is based on the meter points in each dwelling, One meter to cover the landlord areas, One meter to each shop unit to ensure the accountability, also to capture and control energy performance of the building during occupation,

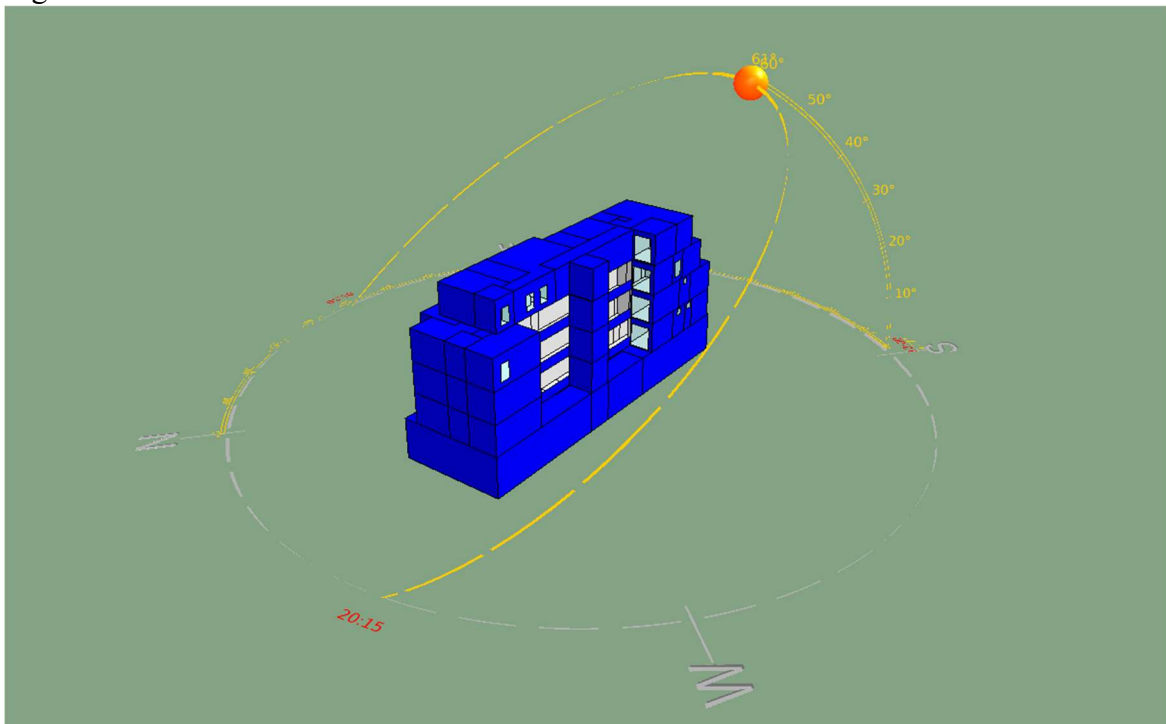
5.0 INPUT DATA

Figure 1



Graphical Representation of the thermal model- Suncast 1

Figure 2



Graphical Representation of the thermal model - Suncast 2

The Fabric performance of the building was set as detailed below

U-Value	W/m2.K
Wall	0.15
Ground Floor	0.13
Roof	0.11
Door	0.8
Window	0.8 (g-value 0.5)
Air Permeability-Residential	0.83 l/s.m2
Air Permeability-Shop	1.3 l/s.m2

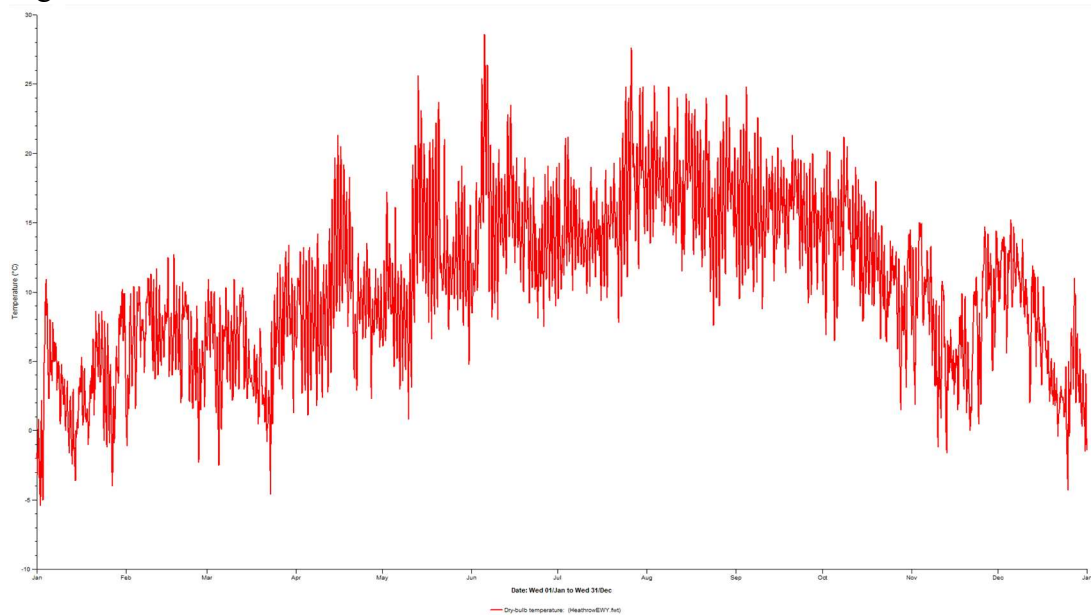
Weather files imported into the model;

London Heathrow

ApacheSim

Simulation Weather File:

Figure 3



Occupancy profile- Annual occupancy average

Internal Gains – People

Building	Occupancy Sensible Gain (W)	Occupancy Latent Gain (W)	No. of People	Profile
Residential	75	55	ss per CG Architect	Always on
Retail	75	55	1 in 5m ²	Retail hours
Communal Areas	n/a	n/a	n/a	n/a

Lighting

Building	Lighting Sensible Gain (W/m ²)	Profile
Residential	0.5 - 3.8	18-23h
Retail	0.5 - 4	Retail hours
Communal Areas	3.5	Always on
External lighting	1.5kW	6pm to 7am

Small Power – Equipment

Building	Equipment Sensible Gain (W/m ²)	Profile
Residential	White Goods profile	
Retail	100	7am -11am
Water Booster	500 Watts	Always on
Communal Areas	n/a	n/a

White Goods and operation hours assumptions;

	Equipment	Power Consumption (W)	Operating time per day, average
1	Cooker 4 hobs	6000	1hr 15mins
2	Oven	2500	30mins
3	Microwave & Grill	700	20mins
4	Kettle	1000	30mins
5	Fridge, freezer unit	120	2hrs
6	Washing machine	220	3hrs
7	Television	100	3hrs
8	Internet Hub & security	100	3hrs
9	Mobile phones	10	5hrs per person
10	Tablets	50	4hrs per 3 persons
11	PC computer	100	2hrs per 2 persons
12	Hair Dryer	1500	5mins per 2 persons
13	Shaver	20	5mins per 2 persons

Heating System - Air source heat pump, data

– Seasonal efficiency-delivery eff – SCoP kW/kW

Building	ASHP (SCoP)	ASHP (SEER)	Profile
Studio	3.6	n/a	10-hour
Apartments	3.6	n/a	10-hour
Retail Unit	3.6	6.5	Retail Hours
Communal Areas	n/a	n/a	n/a

- Underfloor heating

Domestic Hot Water- - Air source heat pump, data

Building	Heat Source	DHW Efficiency (100%)	Storage Volume (l)	Profile
Studio	ASHP	0.95	200	Always on
Apartments	ASHP	0.95	200	Always on
Retail Unit	ASHP	0.90	100	Retail Hours
Communal Areas	n/a	n/a	n/a	n/a

Ventilation- Auxiliary Energy Summary

Building	SFP (w/l/s)	Flow Rate (l/s)	Heat Recovery (%)	Profile
Studio	0.72	13	85	Always on
Apartments	0.83	8 per person	85	Always on
Retail Unit	1.6	10l/s/p	80	Retail Hours
Local Extract Fans	0.3	15	n/a	Always on
Communal Areas	n/a	n/a	n/a	n/a

Lift - Auxiliary Energy Summary;

Based on ISO 25745-2 for single lift

$$E_d = E_{rd} + E_{sd}$$

E_{rd} => running consumption & E_{sd} => Idle consumption

No of trips per day, low usage = 125

Category, sma;; residential – Cat. 1

Average travel distance ratio K_{av} = 0.49

Average car load factor K_L = 0.93

Ratios in idle & stand by modes; R_{id} = 0.13, R_{st} = 0.87

Using the above

Lift energy predicted to be: 5010.17 kWh

Management Factor

The actual operational energy consumption of buildings is affected by the way that the building is managed during operation. The base results of the DSM and energy consumption calculations assume the following;

- the building is well managed, with the systems being well maintained, controls calibrated
- energy saving features are being applied
- the energy use is being monitored and managed.

However, this may not be the case in operation, resulting in a higher than predicted energy use. For this assessment the base results assume a management factor of 1.0 and the higher result assumes a management factor of 1.05 to account for potential discrepancies between the operational management strategy and the design intentions

6.0 RESULTS

LANDLORD AREAS- INCL COMMUNAL AREAS;



RESIDENTIAL UNITS;



SAP SUMMARY; Compliance Model

PART L1 2021-SUMMARY									
REGULATED - COMPLIANCE CALCS <= EALConsult Full SAP Calc 29.10.24									
			kWh/year						
			Lean Annual Energy				PV generation		
APARTMENTS	Flats #	Areas m ²	Space Heating	Annual Electricity					
Studio - 1per	2	78	###	526.746	###	5,471.40	###	730.08	Predicted Annual Electricity Utilization (Excl Gen.) kWh/yr
1Bed - 2per	3	150	###	1,347.30	###	9,540.00	###	1,411.52	
2Bed - 3per	5	251	###	1,956.20	###	16,823.07	###	3,011.99	
3Bed - 5per	2	168	###	1,629.70	###	8,457.98	###	1,735.24	
3Bed - 6per	1	105	###	1,464.20	###	5,050.57	###	1,027.50	
		752		6,924.14		45,343.02		7,916.33	37,426.70



Energy Model Output Report

Project:	
Address:	
Climate File:	HeathrowEWY.fwt
Simulation:	Bedford Road (Retail).ape

Design Team:	
Energy Analyst:	
Owner:	
Conditioned Area (m²):	207,1200

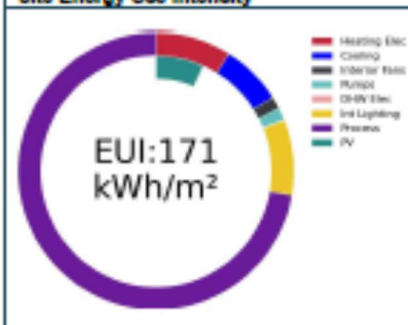
Annual Energy Consumption (kWh/m²/year) & CO2 kgCO2/m²/yr

Energy End Use	Site Energy	Source Energy	CO2 Emissions
Heating Fossil Fuel	0.0	0.0	0.0
Heating Electricity	16.2	25.6	2.5
Space Cooling	13.2	19.4	1.7
Fans Interior	2.8	3.9	0.4
Heat Rejection	0.0	0.0	0.0
Pumps	2.8	3.9	0.4
DHW Fossil Fuel	0.0	0.0	0.0
DHW Electricity	0.2	0.2	0.0
Interior Lighting	16.1	24.3	2.3
Exterior Lighting	0.0	0.0	0.0
Receptacle	0.0	0.0	0.0
Data Center	0.0	0.0	0.0
Cooking Fossil Fuel	0.0	0.0	0.0
Cooking Electricity	0.0	0.0	0.0
Elevators & Escalators	0.0	0.0	0.0
Refrigeration	0.0	0.0	0.0
Process	130.5	200.5	18.4
TOTAL (ex renewables)	182	277	25

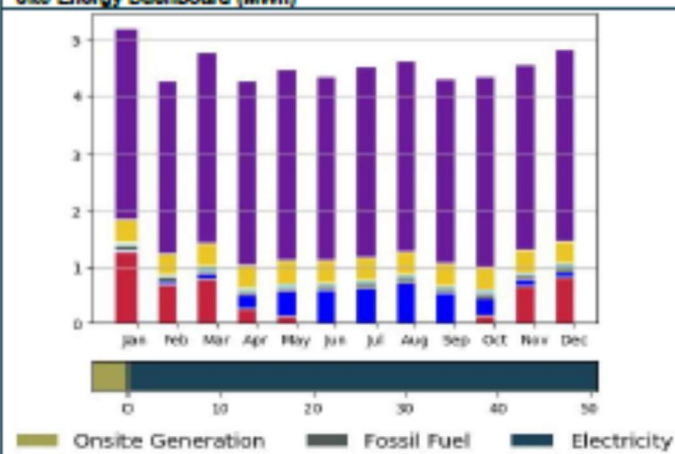
Project Viewer - 3D Model



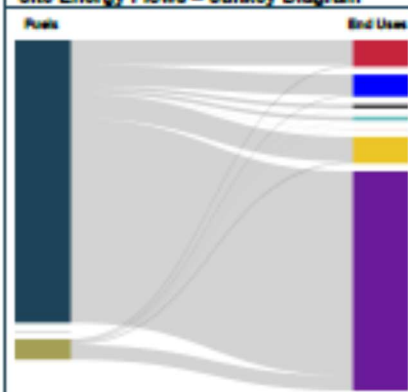
Site Energy Use Intensity



Site Energy Dashboard (MWh)



Site Energy Flows – Sankey Diagram



Annual Fuel Costs and Peak Demands

Fuels	Cost (£)	Peak Day	Peak Time	Peak Demand
Electricity	4,760.00	29-Jul	8:00	36.2 kW
Fossil Fuel	0.00	01-Jan	0:00	0.0 kW
Total	4,760.00	01-Jan	0:00	

Peak Energy Sources for Electricity (kW), Fossil Fuel (kW) and Onsite Power Generation (kW): Top 3 Contributors



7.0 REVIEW OF RESULTS

Unregulated, Detailed Use amd Special Functions														kW/m2/yr
COOKING		APPLIANCES kWh/yr												
No of O	kWh/yr	Fridge	Microwave	Washer	Dryer	Kettle	Hair dryer	Shaver	TV	Hub	Mob	PC	Tablets	
	400meals/yr	0.10kW-1.5/	0.7kW-0.3/24	0.2kW-3/24	2000W-0.5/24	900W- 0.25/24	1.5kW-0.1/24	0.015kW- 0.5/24	90W-2.5/24	30W- 3/24	4W-5/24	75W-1/24	25W-4/24	
	0.2kWh/meal	Bredem12 factors applied												
2	160	795.749	395.116	2,189.026	1,036.981	355.849	190.149	103.294	937	671	582	463	1,091	4,653.816
6	480	1,083.059	537.775	2,979.387	1,411.390	484.330	258.803	140.589	1,276	914	792	6,305	1,485	12,270.567
12	960	1,380.539	685.484	3,797.727	1,799.052	617.359	329.888	179.204	1,626	1,165	1,009	804	1,892	8,756.292
10	800	1,142.492	567.286	3,142.884	1,488.841	510.908	273.006	148.304	1,346	964	835	665	1,566	7,251.975
6	480	939.740	466.613	2,585.132	1,224.624	420.240	224.557	121.985	1,107	793	687	547	1,288	5,786.976
	2,880	5,342	2,652	4,198	1,989	2,389	365	396	6,293	4,506	3,124	8,784	7,322	42,917.015
														57

07.02.2025 - Updated										
		Space Heating	Annual energy ELE	Renewable Gen.	EUI	Survey Benchmarks Nov 2024			kgCO ₂ /m ² /yr	tCO ₂ /yr
	Areas	kWh/yr	kWh/yr (Reg & Unreg.)	kWh/yr (PV)	kWh/m ² /yr	Good Practice	Typical Practice	Ref. Doc		
Apartments 12Nos	752	6,924	80,334	7,916	107					
Landlord areas	257	75,556	23,644	0	92					
Residential					103	85	123	BEIS	14.5	14.6
Retail -Depart store	297	5,584	50,787	3,564	171	237	294	AD Part F	23.36	6.9