



Satellite Business Park Energy Assessment

For Mileway

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Appendix A As Designed BRUKL

1. Introduction

Hydrock have been appointed to provide planning stage advisory services in relation to the demolition, design and construction of the proposed development at Satellite Business Park.

This document forms part of the detailed planning application for the site and will inform the City of Wolverhampton Council Planning Department of the proposed energy strategy in order for the development to meet the necessary compliance requirements.

The site is currently comprised of existing industrial buildings and is located within the administrative boundary of the City of Wolverhampton Council. The redevelopment will consist of the demolition of existing buildings and the construction of a building for use as a builders merchant. The proposed site plan is shown below in Figure 1.

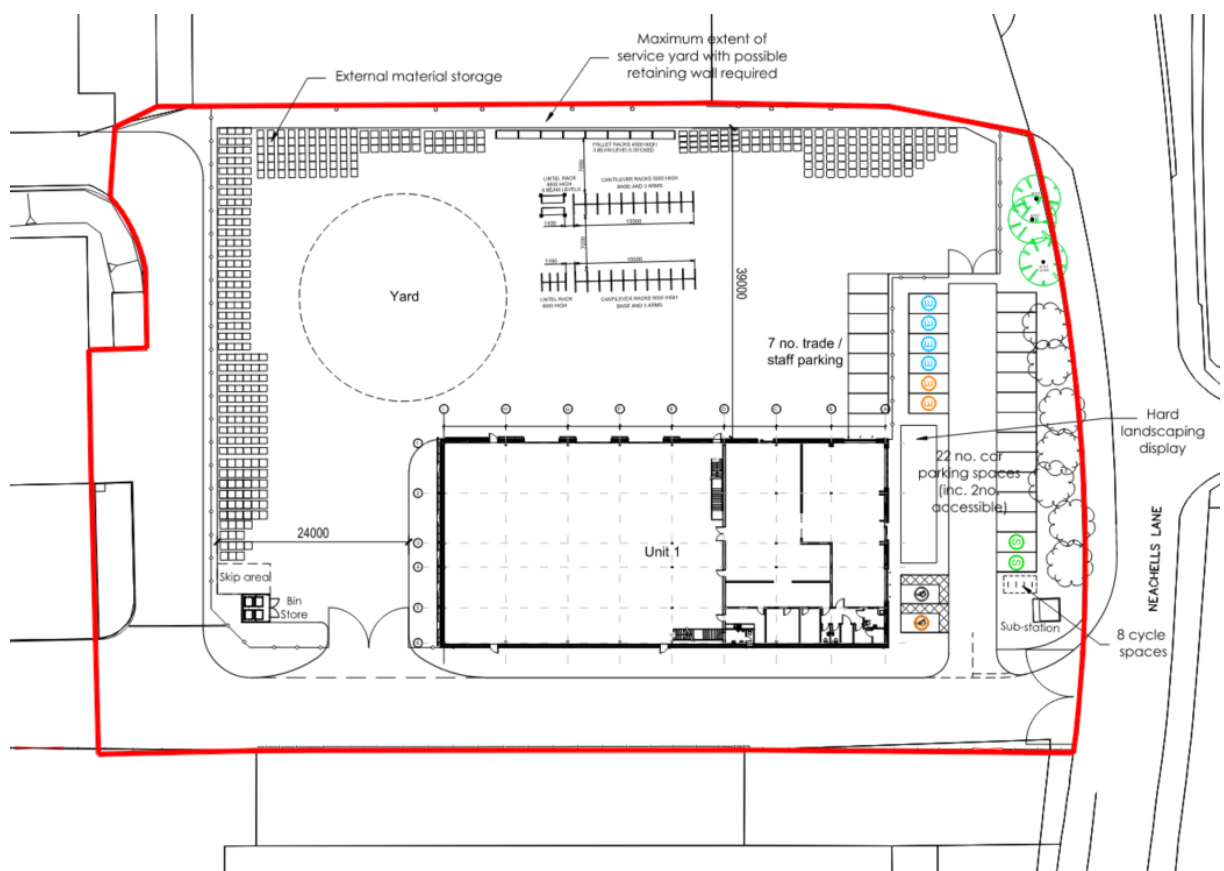


Figure 1: Proposed Site Plan

2. Compliance Requirements

2.1 Building Regulations Part L

The development will need to meet the standards set by the document, Building Regulations Approved Document Part L, Conservation of Fuel and Power, Volume 2: Buildings other than dwellings (2021).

These standards include meeting a Target CO₂ Emission Rate (TER) and a Target Primary Energy Rate (TPER), these must be calculated using one of the approved software tools. The predicted Building CO₂ Emission Rate (BER) and Building Primary Energy Rate (BPER) are calculated using the same software tool and must be lower or equal to the TER and TPER.

2.2 Local Planning Requirements

As well as meeting national policies and Building Regulations, the development will also be required to meet local policies. The following policies are adopted by Wolverhampton City Council and impact the Energy Assessment.

2.2.1 *ENV7 Renewable Energy*

Proposals involving the development of renewable energy sources will be permitted where the proposal accords with local, regional and national guidance and would not significantly harm the natural, historic or built environment or have a significant adverse effect on the amenity of those living or working nearby, in terms of visual, noise, odour, air pollution or other effects.

All non-residential developments of more than 1,000 square metres floor space and all residential developments of 10 units or more gross (whether new build or conversion) must incorporate generation of energy from renewable sources sufficient to off-set at least 10% of the estimated residual energy demand of the development on completion. The use of on-site sources, off-site sources or a combination of both should be considered. The use of combined heat and power facilities should be explored for larger development schemes. An energy assessment must be submitted with the planning application to demonstrate that these requirements have been met.

The renewable energy target may be reduced, or a commuted sum accepted in lieu of part or all of the requirement, only if it can be demonstrated that:

a variety of renewable energy sources and generation methods have been assessed and costed;

achievement of the target would make the proposal unviable (through submission of an independently assessed financial viability appraisal); and

the development proposal would contribute to achievement of the objectives, strategy and policies of the Core Strategy.

As the development has a floor space greater than 1,000 square metres, then it must incorporate generation of energy from renewable sources sufficient to off-set at least 10% of the estimated residual energy demand of the development.

3. Methodology

3.1 Approved Calculation Software

The proposed development was modelled using Integrated Environmental Solutions Virtual Environment (IESVE) Version 2023.4.

3.2 Model

The model was based on AEW Architect's drawing 12560-AEW-SI-XX-DR-A-0543 P03

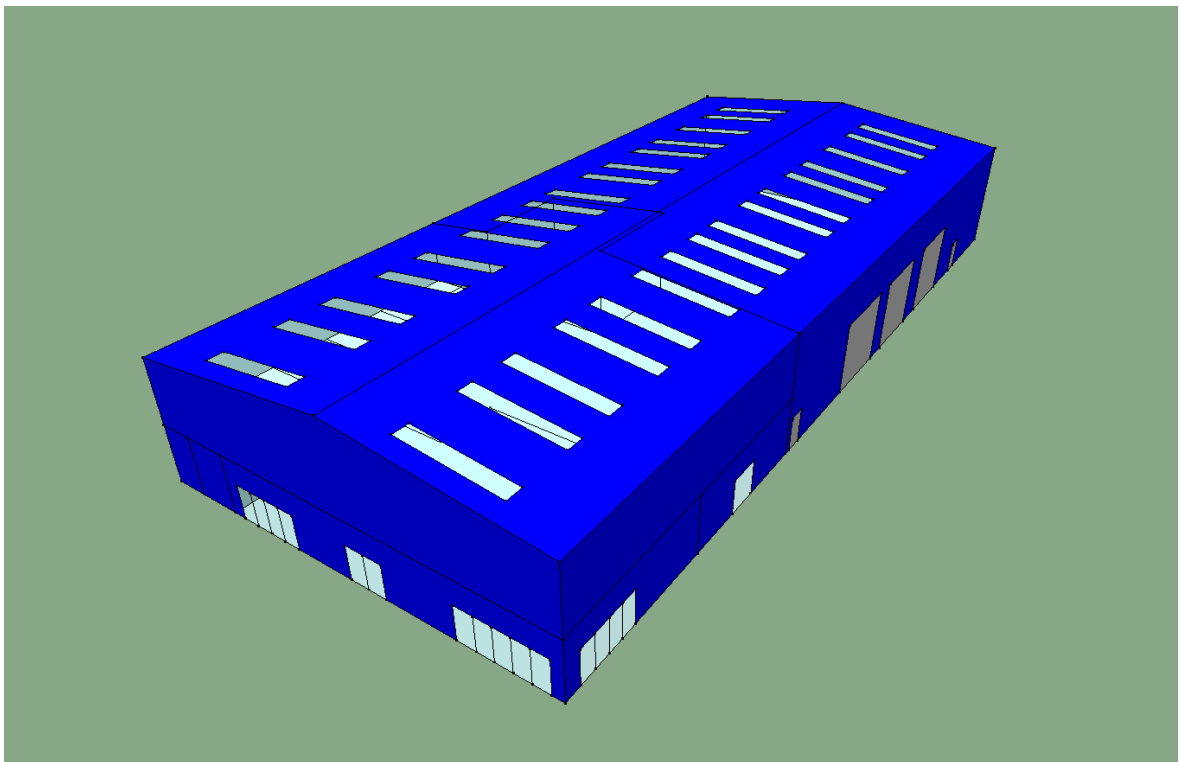


Figure 2: IES Model

3.3 Energy Hierarchy

To minimise the development's energy consumption the design followed the Energy Hierarchy; Be Lean, Be Clean, Be Green.

Be Lean – Reduce energy demand through passive design, including building form, fabric and glazing design.

Be Clean – Reduce energy demand by using energy efficient measures such as efficient building services.

Be Green – Reduce energy demand by utilising renewable technologies.



3.4 Fabric Inputs

3.4.1 Fabric U-Values and Thermal Mass

Table 1: Fabric U-Values

Building Element	Office U-values	Thermal Mass
Roof	0.18 W/m ² k	Very Lightweight
Wall	0.26 W/m ² k	Very Lightweight
Floor	0.18 W/m ² k	Very Lightweight
Vehicle Access Doors	1.30W/m ² k	Very Lightweight
Windows	1.60W/m ² k	N/A
Rooflights	2.20W/m ² k	N/A

3.4.2 Glazing G-Values

Window G-Value: 0.40

Rooflight G-Value: 0.40

3.4.3 Air Permeability

Air Permeability: 3m³/hm² @ 50Pa

3.5 Building Services Inputs

3.5.1 Heating & Cooling

Table 2: Heating & Cooling Efficiencies

Space	Heating / Cooling System Type	Efficiency
Circulation	Electric panel heating	100%
Cleaners Store	Electric panel heating	100%
Office / Showroom / Trade Floor	Multi-split air conditioner	SCOP - 3.5 / SEER - 5.0
Warehouse	None	N/A
WCs	Electric panel heating	100%

3.5.2 Ventilation

Table 3: Ventilation SFPs

Space	Ventilation System Type	SFP	HR
Cleaner's Store	Zonal extract system where fan is remote from zone	0.5 W/L/s	N/A
Office	Zonal balanced supply and extract ventilation units	2.0 W/L/s	85%
Warehouse	None	N/A	N/A
WCs	Zonal extract system where fan is remote from zone	0.5 W/L/s	N/A

3.5.3 Hot Water

Table 4: Hot Water System Inputs

System Variable	Input
Generator Type	Stand-alone water heater
DHW Delivery Efficiency	95%
Storage Volume	60 litres
Storage Losses	0.025 kWh/L/day

3.5.4 Lighting

Table 5: Lighting Inputs

Space	Occupancy Sensing	Dimming	Efficacy
Circulation	None	Yes	100 lm/W
Cleaners Store	Auto-on-off	Yes	100 lm/W
Office	Manual-on-auto-off	Yes	100 lm/W
Warehouse	None	Yes	100 lm/W
WCs	Auto-on-off	Yes	100 lm/W

3.5.5 Electric Power Factor

Electric Power Factor: < 0.9

3.6 Renewable Technology Inputs

Table 6: Renewable Technology

Renewable Technology	Panel Area	Efficiency	Angle to South
PV Panels	70m ²	20%	6° (angle of roof)

4. Results

4.1 BER and BPER

Tables 7 and 8 provides a summary of the BER and BPER against the TER and TPER calculated by the model. The results show the development, with fabric, services and renewable technology as described in this report, will meet Building Regulations Part L Volume 2 emission and energy targets.

Table 7: Target and Building Emission Rates

	TER	BER	Reduction
Emission Rate	1.57 kgCO ₂ /m ² /yr	1.47 kgCO ₂ /m ² /yr	6.4%

Table 8: Target and Building Primary Energy Rate

	TPER	BPER	Reduction
Energy Rate	16.53 kWh/m ² /yr	15.12 kWh/m ² /yr	8.5%

4.2 Renewable Energy Reduction

Planning policy ENV7 Renewable Energy requires the development to off-set at least 10% of the estimated residual energy demand using renewable sources. Table 9 shows using PV as detailed in this report, the development will off-set an estimated 38.2% of the energy demand.

Table 9: Renewable Energy Generation

	Building Energy Use	PV Energy Generation	Energy Off-Set
Estimated Energy	15.62 kWh/m ² /yr	5.96 kWh/m ² /yr	38.2%

5.0 Conclusion

The proposed development has been modelled using approved calculation software. Using the fabric inputs, building services efficiencies and PV panels as detailed in this report, the results show the development will comply with the energy and carbon criteria, set out in Building Regulations Part L Volume 2.

The modelling also shows that by incorporating PV panels as detailed in this report, the development will off-set more than 10% of the estimated residual energy demand and comply with planning policy ENV7 Renewable Energy.

Appendix A As Designed BRUKL

Project name

Satellite Park

As designed

Date: Tue Mar 26 15:48:46 2024

Administrative information

Building Details

Address:

Certifier details

Name:

Telephone number:

Address: , ,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.25

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.25

BRUKL compliance module version: v6.1.e.1

Foundation area [m²]: 505.83The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	1.57
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	1.47
Target primary energy rate (TPER), kWh _{PE} /m ² annum	16.53
Building primary energy rate (BPER), kWh _{PE} /m ² annum	15.12
Do the building's emission and primary energy rates exceed the targets?	BER =< TER BPER =< TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _a -Limit	U _a -Calc	U _i -Calc	First surface with maximum value
Walls*	0.26	0.26	0.26	SP000001:Surf[5]
Floors	0.18	0.17	0.18	NT000001:Surf[10]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.18	0.18	MZ000002:Surf[11]
Windows** and roof windows	1.6	1.6	1.6	SP000001:Surf[1]
Rooflights***	2.2	2.2	2.2	MZ000002:Surf[3]
Personnel doors [^]	1.6	-	-	No personnel doors in building
Vehicle access & similar large doors	1.3	1.3	1.3	NT000001:Surf[1]
High usage entrance doors	3	-	-	No high usage entrance doors in building

U_a-Limit = Limiting area-weighted average U-values [W/(m²K)]U_i-Calc = Calculated maximum individual element U-values [W/(m²K)]U_a-Calc = Calculated area-weighted average U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.

[^] For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	3

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- DX Split Heating & Cooling

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	5	0	-	0.85
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

2- Elec Heating

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	0.2	-	0.85
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

1- Hot Water

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.025
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter

NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

Zone name	ID of system type	SFP [W/(l/s)]									HR efficiency	
		A	B	C	D	E	F	G	H	I	Zone	Standard
	Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1		
Showroom		-	-	-	2	-	-	-	-	-	-	N/A
Office 2		-	-	-	2	-	-	-	-	-	-	N/A
Office 1		-	-	-	2	-	-	-	-	-	-	N/A
Acc WC		-	-	0.5	-	-	-	-	-	-	-	N/A
Cleaners Store		-	-	0.5	-	-	-	-	-	-	-	N/A
Server Room		-	-	-	2	-	-	-	-	-	-	N/A
WC		-	-	0.5	-	-	-	-	-	-	-	N/A
WC		-	-	0.5	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency		
	ID of system type	A	B	C	D	E	F	G	H	I	Zone	Standard
	Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1		
Canteen		-	-	-	2	-	-	-	-	-	-	N/A
Warehouse WC		-	-	0.5	-	-	-	-	-	-	-	N/A
Trade Area		-	-	-	2	-	-	-	-	-	-	N/A

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95	80	0.3
Showroom		100	-	-
Office 2		100	-	-
Office 1		100	-	-
Lobby		100	-	-
Acc WC		100	-	-
Switch		100	-	-
Cleaners Store		100	-	-
Server Room		100	-	-
WC		100	-	-
WC		100	-	-
Canteen		100	-	-
Warehouse WC		100	-	-
Mezzanine		100	-	-
Unit 1		100	-	-
Trade Area		100	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Showroom	NO (-24.5%)	NO
Office 2	NO (-74.5%)	NO
Office 1	NO (-58.3%)	NO
Server Room	N/A	N/A
Mezzanine	YES (+23.3%)	NO
Unit 1	YES (+19.3%)	NO
Trade Area	NO (-77.5%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	1951.9	1951.9
External area [m ²]	4042.8	4042.8
Weather	BIR	BIR
Infiltration [m ³ /hm ² @ 50Pa]	3	5
Average conductance [W/K]	1334.96	1330.01
Average U-value [W/m ² K]	0.33	0.33
Alpha value* [%]	25	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
100	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	3.07	2.79
Cooling	0.77	0.86
Auxiliary	2.1	0.87
Lighting	4.65	5.37
Hot water	5.03	4.05
Equipment*	34.97	34.97
TOTAL**	15.62	13.94

* 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.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	5.96	2.87
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>5.96</i>	<i>2.87</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	38.27	38.18
Primary energy [kWh _{PE} /m ²]	15.12	16.53
Total emissions [kg/m ²]	1.47	1.57

HVAC Systems Performance

System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	87.5	56.9	7.3	3.3	8.3	3.33	4.75	3.5	5
Notional	85.5	62	8.5	3.7	3.5	2.78	4.63	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity									
Actual	174.2	0	48.4	0	6.9	1	0	1	0
Notional	146.6	0	28.9	0	1.9	1.41	0	----	----
[ST] No Heating or Cooling									
Actual	0	0	0	0	0	0	0	0	0
Notional	0	0	0	0	0	0	0	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type