



Haringey Sixth Form College

(New Classrooms)

Energy Statement

September

2022

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DOCUMENT CONTROL SHEET

Report Reference	PP2030/H6C/RT/202209-RT
Issue Purpose	For Planning
Client	Thornwood Joinery Ltd
Author	Ryan Thrower
Approved By	Neil Rothon
Date of Issue	27 th September 2022

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1. EXECUTIVE SUMMARY

- 1.1 NRG Consulting have been appointed to undertake an Energy Statement on a proposed development at **Haringey Sixth Form College, White Hart Lane, N17 8HR**, situated within the London Borough of Haringey.

The proposed development is for:

A new building provides two new classrooms , 4 tutorial rooms, reception entrance area, landscaped garden with raised beds for use by students, located within an unused area within the overall 6th form campus.

- 1.2 SBEM calculations have been undertaken and this document illustrates a reduction in CO₂ emissions over the baseline of Part L via:

Energy Efficient Measures (*Be Lean*)

- High levels of thermal insulation to achieve U-Values lower than the Part L 2021 notional building specification.
- Mechanical Ventilation with Heat Recovery
- LED Lighting with high luminous efficacy (105lm/W)
- Air Permeability target of 3 m³/(hm²) @50Pa

Decentralised Energy (*Be Clean*)

Due to the small size and heat demand of the scheme and the distance from the scheme to any proposed district heating networks, no connection too nor provision for a future connection has been allowed for.

Renewable Technologies (*Be Green*)

The buiding will be served by an individual ASHP. This has been currently modelled using design parameters for efficiency (SCOP of 5.5).

- 1.3 A carbon emissions table is shown below illustrating the savings at each stage of the energy hierarchy.

	CO ₂ Emissions (Tonnes per Annum)	
	Regulated	
Baseline: Part L 2021 of the Building Regulations (TER)	1.5	Regulated CO ₂ Savings at ‘Be Lean’ over Part L 2021 64.66%
Be Lean: Energy Demand Reduction	0.5	
Be Clean: Supply Energy Efficiently	0.5	
Be Green: Renewable Energy (DER)	-0.02	
Regulated CO ₂ Savings at ‘Be Green’ over Part L 2021	100.28%	
Table: Carbon Emissions Table		

- 1.4 This report illustrates how the design of the proposed development has been developed to incorporate energy efficient features and renewable energy to achieve a **Net-Zero Carbon** scheme.

2. POLICY FRAMEWORK

- 2.1 The proposed development falls within the Government's "minor" category of planning applications.

NATIONAL POLICY – NPPF (2021)

The delivery of sustainable development is at the foundation of the NPPF, which defines it as "meeting the needs of the present without compromising the ability of future generations to meet their own needs."

REGIONAL POLICY

The London Plan - March 2021

The London Plan sets out high-end goals for the whole of London based on the Energy Hierarchy. It also states that its overarching goal is for London to become a zero-carbon city. This will require reduction of all greenhouse gases, of which carbon dioxide is the most prominent.

Local Boroughs should ensure that all developments maximise opportunities for on-site electricity and heat production and reduce carbon emissions in-line with the stages of the Energy Hierarchy. In-line with the Zero Carbon Policy, all CO₂ emissions should be offset via a mixture of on-site and off-site measures.

Policy SI2	Minimising greenhouse gas emissions
Policy SI3	Energy Infrastructure
Policy SI 4	Managing heat risk
Energy Assessment Guidance: Greater London Authority Guidance on preparing energy assessments as part of planning applications (June 2022)	

GLA – Energy Assessment Guidance (June 2022);

On 15th June 2022, with the implementation of Part L of the Building Regulations (2021) and SAP 10.2 a new GLA guidance note was released to supersede the April 2020 guidance.

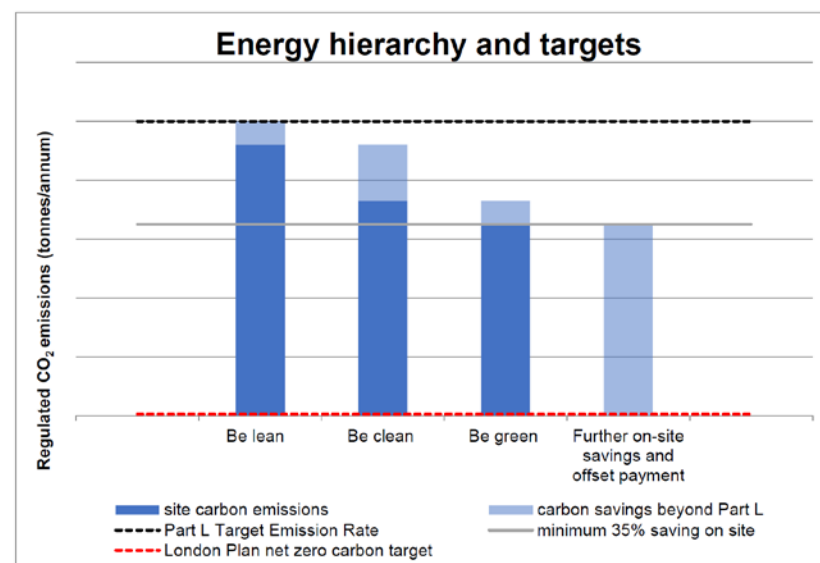
The main clarification of the June 2022 guidance was to confirm that the minimum expected carbon reduction on-site was to remain at 35% better than Part L 2021; the same target as the previous Building Regulation version. A new benchmark target of 50% better than Part L 2021 has been introduced for residential developments also. The cover note for the new version states:

Background

On 15 June 2022, national building regulations were updated to enhance energy performance standards for new buildings through Part L 2021. A new Part O 2021 was also introduced, updating requirements to tackle overheating.

The Mayor's Energy Assessment Guidance has been updated to explain how London Plan policy should be applied now that these regulations have taken effect. This note summarises the key updates.

Part L 2021 is a stepping-stone towards the Future Homes Standard and Future Buildings Standard which the Government is expected to consult on in 2023 and introduce in 2025.



LOCAL POLICIES

2.2 The following Planning Policies from the local authority are relevant to this report:

London Borough of Haringey

- Local Policy SP4 – Working towards a low carbon Haringey
- Local Policy DM21 – Sustainable Design, Layout and Construction.
- Local Policy DM22 – Decentralised Energy

Policy SP4 – Working towards a low carbon Haringey

Over the life time of the Local Plan, reducing energy use in buildings and working towards a low carbon borough will be one of the key challenges facing Haringey. The Council will promote the measures outlined below to reduce carbon emissions from new and existing buildings.

In line with London Plan policy, the Council will promote and require all new developments to take measures to reduce energy use and carbon emissions during design, construction and occupation, by incorporating the following measures:

a. From 2011 onwards, all new residential development will achieve a minimum 25% reduction in total (regulated) CO2 emissions in line with Code for Sustainable Homes Level 4 energy standards, and should aim to achieve Level 6. All new residential development shall be zero carbon from 2016 onwards; and

b. From 2011 onwards all new non-residential development shall be built to at least BREEAM “very good” standard and should aim to achieve BREEAM “excellent” or the current nationally agreed standard. All new non-residential development shall be zero carbon from 2019.

The Council will promote low-carbon energy through the following measures:

- a. Requiring all developments to assess, identify and implement, where viable, site-wide and area-wide decentralised energy facilities including the potential to link into a wider network;
- d. All new developments are required, where viable, to achieve a reduction in predicted carbon dioxide emissions of 20% from on site renewable energy regeneration, which can include connections to local sources of decentralised renewable energy.

Policy DM21 – Sustainable Design, Layout and Construction

Proposals should:

- a Apply the energy hierarchy to minimise energy use in order to meet, and if possible exceed, minimum carbon dioxide reduction requirements;
- b Apply the cooling hierarchy to reduce the potential for overheating and limit reliance on mechanical air conditioning systems;
- c Maximise opportunities to enhance biodiversity on-site, including through appropriate landscaping, Sustainable Drainage Systems, living roofs and green walls
- d Wherever possible, use building materials with high environmental performance ratings; and
- e Seek opportunities for locally sourced labour.

Consideration will be given to the use of carbon offset payments, to be secured by planning obligations, where it can be demonstrated that proposals are unable to meet carbon dioxide emission reduction targets on-site.

Policy DM22 – Decentralised Energy

Subject to other policy requirements, proposals that contribute to the provision and use of Decentralised Energy network infrastructure will be supported.

Communal energy systems

All development that incorporates site-wide communal energy systems should examine opportunities for extending such systems, irrespective of whether it is connected to a DE network.

All development that incorporates site-wide communal energy systems should optimise opportunities for extending such systems beyond the site boundary to supply energy to neighbouring existing and planned future developments.

Existing and planned future DE networks

All development proposals should prioritise connection to existing or planned future DE networks. All major development located within 500 metres of an existing DE Network, and minor new-build development located within 25 metres, will be expected to secure connection to that network subject to demonstration of technical feasibility and financial viability.

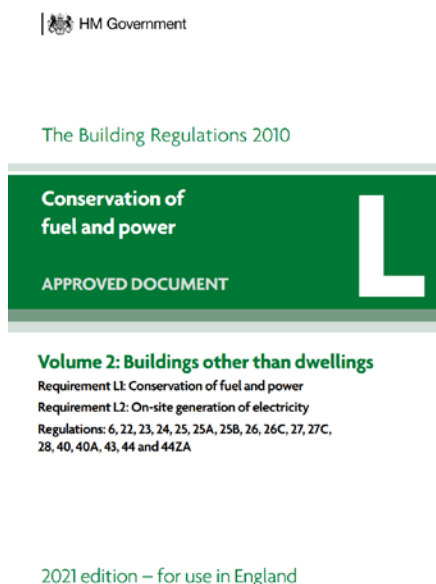
BUILDING REGULATIONS (PART L 2021 & FUTURE HOMES STANDARD)

- 2.3 On 24th July 2018 the Department for Business Energy & Industrial Strategy (BEIS) published their update to SAP 9.92 (Part L 2013), called SAP 10.

In October 2019, the Ministry of Housing, Communities and Local Government (MHCLG) then issued consultation on changes to Part L of the Building Regulations. Dubbed *The Future Homes Standard*, it is an aspiration to ensure all new homes will have low carbon heating and “world-leading levels of energy efficiency” by 2025 and is intended to be the primary driver in achieving the Governments desire to reduce carbon emissions in the creation of new-build housing stock.

On the June 15th 2022, Part L 2021 of the Building Regulations came into force. As per the requirements, all new homes must produce 31% less CO₂ emissions than that of Part L 2013 in-order to achieve Building Regulation compliance.

- 2.4 The major change in the regulations is the change in carbon factor of electricity to represent the decarbonisation of the National Grid and the push towards net-zero carbon developments.



Fuel	SAP 2012 CO ₂ (kgCO ₂ /kWh)	SAP 10 CO ₂ (kgCO ₂ /kWh)	Part L 2021 CO ₂ (kgCO ₂ /kWh)	Percentage Reduction
Main Gas	0.216	0.210	0.210	2.75%
Electricity	0.519	0.233	0.136	73.8%

Table: Change in Carbon Factors from Part L 2013 to Part L 2021

3. ENERGY CALCULATIONS - “Be Lean”

3.1 In order to estimate the CO₂ emissions for the site, an SBEM Calculation has been carried out by a licensed and accredited Non-Domestic Energy Assessor using IES Virtual Environment v7.

3.2 The baseline CO₂ emissions covered by Part L 2021 of the Building Regulations will be expressed as the Target Emissions Rate (TER). This covers regulated carbon emissions from:

- Heating
- Cooling
- Hot Water
- Lighting
- Auxiliary (Pumps and Fans)

3.3 Passive Design

Passive design measures utilised by the architect in the concept and development of the schemes design include:

- High levels of insulation have been proposed in excess of the Part L 2021 notional values.
- Through good design and careful construction, air infiltration will be minimised and thus a low Air Permeability target has been sort.
- Optimising orientation and site layout to reduce energy demand.
- Provision of cross-ventilation.
- Maximising thermal mass where possible to reduce internal temperature variation.
- High performance glazing system and façade design to reduce heat demand and increase solar gains.
- Thermal Bridging has been reviewed and appropriate industry schemes have been proposed.
- Extensive Green Roof to assist in moderating the urban heat island effect.

ELEMENT	PART L2a LIMITING FABRIC PARAMETERS	PROPOSED U-VALUES (W/m ² K)
<i>Walls</i>		
External Wall - Brick	0.26 W/m ² K	0.143 W/m²K
External Wall - Cladding	0.26 W/m ² K	0.098 W/m²K
<i>Floors</i>		
Ground Floor	0.18 W/m ² K	0.1 W/m²K
<i>Roof</i>		
Roof	0.16 W/m ² K	0.095 W/m²K
<i>Openings</i>		
Doors	1.6 W/m ² K	1.6 W/m²K
Windows & Rooflights	1.6 W/m ² K	1.2 W/m²K
<i>Air Permeability</i>		
3 m³/(hm²) @50Pa		
<i>Table: Proposed Fabric Specification</i>		

3.4 Active Design

The development will incorporate efficient building services to limit carbon emissions, including:

- A zero-NOx heating system
- LED Lighting
- Mechanical Ventilation with Heat Recovery
- Time and Temperature Zone Control

The proposed building services are compliant with the recommendations of the Non-Domestic Building Services Compliance Guide.

ELEMENT	PROPOSED DETAILS
Ventilation	Mechanical Ventilation with Heat Recovery
<i>Heating – Be Lean</i>	<i>Air Source Heat Pumps – SCOP of 2.64</i>
Heating – Be Green	Air Source Heat Pumps - SCOP of 5.5
Heating Controls	Time and Temperature Zone Control
Heat Emitters	Underfloor Heating
Hot Water	From ASHP
Lighting	LED (105 lm/W)
Lighting Controls	Auto on / off to communal areas Manual on/off to teaching areas
Cooling	No
<i>Table: Proposed Mechanical and Electrical Specification</i>	

Unregulated Emissions

3.5 Unregulated energy use and their associated carbon emissions are often generated from systems or processes that are harder to quantify than regulated emissions which are from fixed systems.

3.6 Unregulated energy use is not counted within Part L carbon emission figures for the purpose of Part L compliance. This is because the emissions from these items are too variable between buildings and depend on occupant behaviour and optional specification i.e. different levels of office equipment (small power) or external lighting and lifts. For the proposed development this would be:

- Equipment
- External Lighting

3.7 Unregulated CO₂ emissions have been calculated from the BRUKL document. These have then been translated into CO₂ by multiplying by the electric carbon factors.

Due to the nature of these emissions, it is impossible to predict by how much they can be reduced as this relies outside the control of the authors and developers. Therefore, these emissions as noted will remain the same throughout the energy hierarchy.

Carbon dioxide emissions (tonnes CO ₂ per annum)	
Proposed Development – Unregulated CO ₂ emissions	0.8

Total Space Heating Demand and EUI

3.8 Energy Use Intensity (EUI) is a measure of the total energy consumed in a building annually.

It includes both regulated (fixed systems for lighting, heating, hot water, air conditioning and mechanical ventilation) and unregulated (cooking and all electrical appliances, and other small power) energy.

It does not include energy use from electric vehicle charging or any reduction in EUI due to renewable energy generation on-site.

For these figures, illustrated below, the *Be Seen* methodology has been used in their calculation.

	EUI (kWh/m ² /year)	Space Heating Demand (kWh/m ² /year)
<i>Benchmark</i>	65	15
Proposed Scheme	53.96	13.24
<i>Table: EUI and Space Heating Demand</i>		

	CO ₂ Emissions (Tonnes per Annum)	
	Regulated	
Baseline: Part L 2021 of the Building Regulations (TER)	1.5	Regulated CO ₂ Savings at ‘Be Lean’ over Part L 2021 64.66%
Be Lean: Energy Demand Reduction	0.5	
Table: Carbon Emissions Table (Be Lean)		

4. DECENTRALISED ENERGY – *Be Clean*

- 4.1 In the context of the London Plan, decentralised energy refers to low- and zero-carbon power and/or heat generated and delivered within London. This includes microgeneration, on-site energy networks, through to large-scale heat networks.
- 4.2 The London Heat Map displays nearby connections to Heat Networks within London including both proposed and future connections as well as displaying areas of heat network opportunities.

Connection to Existing Heating Networks (and Future Networks)

Feature	Description/Unit
Nearest Existing District Heat Network	Energetik (Meriden Water)
Distance from Scheme	600m
Table: Existing Heat Network Details	

Feature	Description/Unit
Nearest Proposed District Heat Network	Upper Lea Valley
Distance from Scheme	540m
Proposed Year of Operation	In construction
Table: Proposed Heat Network Details	

- 4.3 Based on the type, location and size of scheme, as well as the high on-site carbon reduction, no connection to an existing or future district heat network is proposed.

London Heat Map

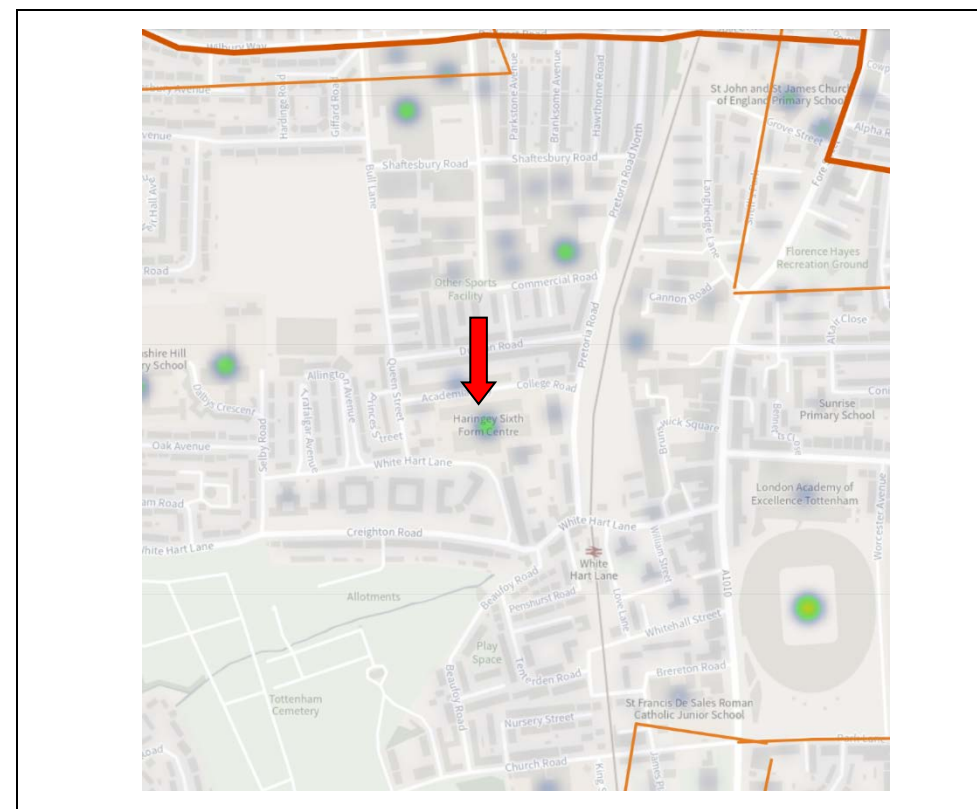


Figure : London Heat Map

5. RENEWABLE ENERGY - “Be Green”

5.1 The London Plan (2021) defines renewable energy sources as:

“Energy derived from a source that is continually replenished, such as wind, wave, solar, hydroelectric and energy from plant material, but not fossil fuels or nuclear energy. Although not strictly renewable, geothermal energy is generally included.”

The London Plan (2021) sets out high-target goals of maximising all possible avenues for renewable energy on site.

5.2 Based on recent legislation such as the Clean Air Act as well as the location of the proposed development, the following technologies have been discounted:

- Wind Turbines
- Biomass
- Hydropower / Wave Technology
- Biogas / Biofuel

5.3 The feasibility of remaining renewable and low carbon technologies is highlighted in the table opposite.

5.4 It is expected that to maximise on-site renewable energy generation wherever feasible including the provision of Solar PV to feasible roof spaces.

5.5 Following a review of the available technologies, the following have been chosen to be integrated into the scheme:

- Air Source Heat Pumps
- Photovoltaic Panels (Solar PV)

FEASIBILITY						
Technology	Considerations					Overall Feasibility
	Cost	Noise	Land Use	Tariffs	CO ₂ Offset	
Photovoltaic Panels (PV)	Notwithstanding the increased cost of PV installation due to supply-chain issues and shipping costs, the rise in the cost of electricity decreases payback time and thus make the technology suited for the scheme and combines with the Green Roof provision. This is despite a decreased CO ₂ offset in Part L 2021.					Yes
Air Source Heat Pumps (ASHP)	ASHPs provide a low-temperature heating system at high efficiency (450% here) and work well with underfloor heating as the chosen emitters. Due to the continued decarbonisation of the National Grid, associated CO ₂ offset with the system would					Yes
Ground Source Heat Pumps (GSHP)	GSHPs are like ASHPs but operate at slightly higher efficiencies due to drawing heat from the ground, a source that is warmer than the outside air, especially in Winter. However, the technology is more expensive than Air Source and requires either significant horizontal space for a <i>slinky</i> style system or deep boreholes as part of a vertical system. As this is not proposed here, ASHPs are more suited to the scheme.					No
Solar Thermal	As the proposed building-use is a Classroom Block and the only hot water demand is for the Hand Basin in the WC, Solar Thermal would not be suited to the scheme.					No
Table: Renewable Energy Feasibility						

PV System Details	
PV Proposed	10 kWp
Module Output	400 Watts (Datasheet in Appendices)
Number of Panels	25
Tilt of Collectors	10 degrees or 35 degrees
Over-Shading Factor	<20%
<i>Table:</i> Proposed PV Specification	

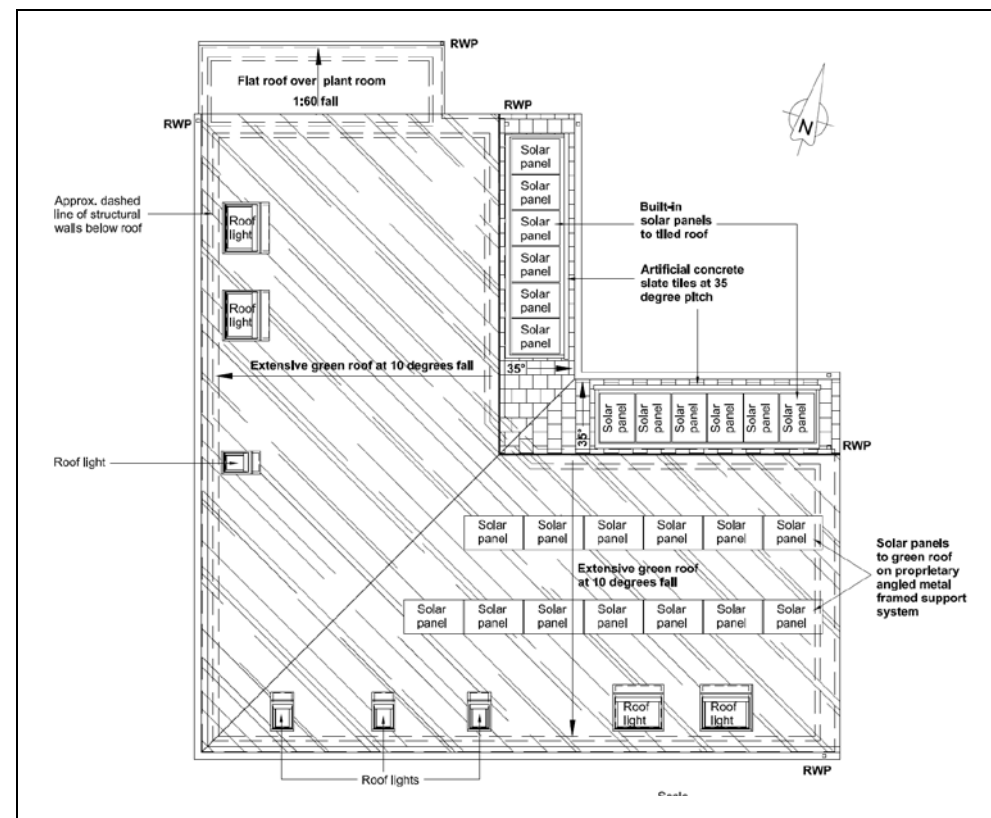


Figure: Proposed PV Layout Plan

ASHP Provision & Details

6.5 An Air Source Heat Pump has been proposed to provide the heating and hot water for the scheme. The technology has been chosen because:

- It is a high efficiency system that can cater for the space heating and hot water of the proposed development;
- Requires less capital cost than GSHP and other renewable technologies;
- Works complimentary with the proposed PV Panel provision.
- It is simple to install when compared to other renewable technologies.

6.6 While Air Source Heat Pumps do produce some noise as they require a fan and compressor to function – and are installed externally which may be in close proximity to sensitive receptors, there is not anticipated to be any issues due to the nature of the development, situated within the existing campus.

From manufacturer noise predictions this is usually circa 60dB when the measurement is taken at 1meter from the pump. Regardless, this will be picked up by the Acoustic Consultant with an assessment under BS 4142:2014+A1:2019 at planning condition stage once the final plant specification is known.

6.7 At this early stage, a specific Air Source Heat Pump make and model has not been specified and design parameters have been used based on similar projects and systems.

A final make & model will be supplied during M&E design at RIBA Stage 3 / 4.

ASHP System Details	
Area Used	All
Number of Heat Pumps	1
Size of Heat Pumps	TBC
Thermal Store	No
Make and Model	TBC
SCOP	5.5
Fraction of Heat	100%
<i>Table: Proposed ASHP Specification</i>	

6. CONCLUSION

- 6.1 A full energy strategy in-line with the energy hierarchy has been undertaken and this document illustrates a reduction in CO₂ emissions over the baseline of Part L 2021 via:

Energy Efficient Measures (*Be Lean*)

The scheme achieves over **64.66%** better than Part L 2021 via *Be Lean* measures thus exceeding the GLA target of 15% for the scheme.

Renewable Technologies (*Be Green*)

Air Source Heat Pumps will be provided alongside Underfloor Heating for maximum efficiency and carbon savings.

A 10kWp PV system is also proposed.

When the above measures are combined, the scheme will achieve **Net-Zero Carbon**.

- 6.2 A final carbon emission reduction table is shown on the opposite side of the page illustrating the savings at each stage of the energy hierarchy.

	CO ₂ Emissions (Tonnes per Annum)	
	Regulated	
Baseline: Part L 2021 of the Building Regulations (TER)	1.5	Regulated CO ₂ Savings at ‘Be Lean’ over Part L 2021 64.66%
Be Lean: Energy Demand Reduction	0.5	
Be Clean: Supply Energy Efficiently	0.5	
Be Green: Renewable Energy (DER)	-0.02	
Regulated CO ₂ Savings at ‘Be Green’ over Part L 2021	100.28%	
Table: Carbon Emissions Table		

Appendix 1



PROJECT: Haringey Sixth Form College - New Classrooms

Plots (1)	AREA (2)	TER <i>Part L 2021 Baseline</i> (3)	Total TER	DER 'Be Lean' (4)	Total DER 'Be Lean'	DER 'Be Green' (5)	Total DER 'Be Green'
	m ²	kg CO2/m ² /yr	kg CO2/yr	kg CO2/m ² /yr	kg CO2/yr	kg CO2/m ² /yr	kg CO2/yr
All	213.5	7.16	1,529	2.53	540	-0.02	-4
Total Site Area (m ²):						TOTAL DER CO2:	
214		TOTAL TER CO2:	1,529	TOTAL DER CO2:		540	TOTAL DER CO2:
							-4

Total Site TER	1,529	kg CO2/yr
Total Site DER	540	kg CO2/yr
CO2 Savings at 'Be Lean'	64.66%	%

Un-Regulated kwh - Equipment per m2	28.5	kWh/m2
Un-Regulated - Total - CO2	828	kg/CO2

Final CO2 Emissions at 'Be Green'	-4	kg CO2/yr
CO2 Savings at 'Be Green'	100.28	%

OVERALL RESULTS		
Total CO2 Reduction at 'Be Lean'	989	kg CO2/yr
Total CO2 Reduction at 'Be Green'	1,533	kg CO2/yr

Appendix 2



Project name

Be Lean**As designed****Date:** Tue Sep 27 20:57:32 2022

Administrative information

Building Details

Address: Haringey College 6th Form College, London, N17 8HR

Certifier details

Name: NRG Consulting Ltd**Telephone number:****Address:** 161-165 Kingsland Road, London, E2 8AL

Certification tool

Calculation engine: Apache**Calculation engine version:** 7.0.16**Interface to calculation engine:** IES Virtual Environment**Interface to calculation engine version:** 7.0.16**BRUKL compliance module version:** v6.1.c.0**Foundation area [m²]:** 199.72The 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	7.16
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	2.53
Target primary energy rate (TPER), kWh/m ² annum	74.74
Building primary energy rate (BPER), kWh/m ² annum	21.76
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	0.13	0.14	02000001:Surf[3]
Floors	0.18	0.1	0.1	02000001:Surf[7]
Pitched roofs	0.16	0.1	0.1	03000002:Surf[0]
Flat roofs	0.18	0.1	0.1	02000001:Surf[2]
Windows** and roof windows	1.6	1.2	1.2	02000001:Surf[5]
Rooflights***	2.2	1.21	1.21	02000001:Surf[0]
Personnel doors [^]	1.6	1.6	1.6	01000001:Surf[3]
Vehicle access & similar large doors	1.3	-	-	No Vehicle access doors in building
High usage entrance doors	3	-	-	No High usage entrance doors in building
U _{a-Limit} = Limiting area-weighted average U-values [W/(m ² K)] U _{a-Calc} = Calculated area-weighted average U-values [W/(m ² K)] U _{i-Calc} = Calculated maximum individual element U-values [W/(m ² K)] * 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/m ² K 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- ASHP with underfloor heating Be Lean Baseline Guide 7.9

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	-	0.2	-	0.85
Standard value	2.5*	N/A	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.					

"No HWS in project, or hot water is provided by HVAC system"

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	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I			
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1		Zone	Standard
0/8 wc	-	-	0.4	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value		95	80	0.3
0/2 classroom		105	-	-
0/5 tutorial		105	-	-
0/1 classroom		105	-	-
0/7 tutorial		105	-	-
0/8 wc		105	-	-
0/9 store		105	-	-
0/6 tutorial		105	-	-
0/3 lobby		105	-	-
0/4 tutorial		105	-	-
0/10 plant room		105	-	-

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?
0/2 classroom	NO (-56.3%)	NO
0/5 tutorial	NO (-74.7%)	NO
0/1 classroom	NO (-23%)	NO
0/7 tutorial	NO (-75%)	NO
0/6 tutorial	NO (-86.9%)	NO
0/4 tutorial	NO (-73.9%)	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]	213.5	213.5
External area [m ²]	683.4	683.4
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	3
Average conductance [W/K]	115.54	218.75
Average U-value [W/m ² K]	0.17	0.32
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
 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

100 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	27.59	28.78
Cooling	0	0
Auxiliary	1.64	5.03
Lighting	8.35	5.31
Hot water	4.67	10.38
Equipment*	28.5	28.5
TOTAL **	42.23	49.5

* 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	29.97	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>29.97</i>	<i>0</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	233.94	287.95
Primary energy [kWh/m ²]	21.76	74.74
Total emissions [kg/m ²]	2.53	7.16

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 SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	250.1	0	29.5	0	1.7	2.36	0	2.64	0
	Notional	87.5	0	8.7	0	1.3	2.78	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

Appendix 3



Project name

Be Green**As designed****Date:** Tue Sep 27 20:50:01 2022

Administrative information

Building Details

Address: Haringey College 6th Form College, London, N17 8HR

Certifier details

Name: NRG Consulting Ltd**Telephone number:****Address:** 161-165 Kingsland Road, London, E2 8AL

Certification tool

Calculation engine: Apache**Calculation engine version:** 7.0.16**Interface to calculation engine:** IES Virtual Environment**Interface to calculation engine version:** 7.0.16**BRUKL compliance module version:** v6.1.c.0**Foundation area [m²]:** 199.72The 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	7.16
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	-0.02
Target primary energy rate (TPER), kWh/m ² annum	74.74
Building primary energy rate (BPER), kWh/m ² annum	-4.47
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	0.13	0.14	02000001:Surf[3]
Floors	0.18	0.1	0.1	02000001:Surf[7]
Pitched roofs	0.16	0.1	0.1	03000002:Surf[0]
Flat roofs	0.18	0.1	0.1	02000001:Surf[2]
Windows** and roof windows	1.6	1.2	1.2	02000001:Surf[5]
Rooflights***	2.2	1.21	1.21	02000001:Surf[0]
Personnel doors^	1.6	1.6	1.6	01000001:Surf[3]
Vehicle access & similar large doors	1.3	-	-	No Vehicle access doors in building
High usage entrance doors	3	-	-	No High usage entrance doors in building
U _{a-Limit} = Limiting area-weighted average U-values [W/(m ² K)] U _{a-Calc} = Calculated area-weighted average U-values [W/(m ² K)] U _{i-Calc} = Calculated maximum individual element U-values [W/(m ² K)] * 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/m ² K 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- ASHP with underfloor heating

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	5.5	-	0.2	-	0.85
Standard value	2.5*	N/A	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.					

"No HWS in project, or hot water is provided by HVAC system"

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	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I			
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1		Zone	Standard
0/8 wc	-	-	0.4	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value		95	80	0.3
0/2 classroom		105	-	-
0/5 tutorial		105	-	-
0/1 classroom		105	-	-
0/7 tutorial		105	-	-
0/8 wc		105	-	-
0/9 store		105	-	-
0/6 tutorial		105	-	-
0/3 lobby		105	-	-
0/4 tutorial		105	-	-
0/10 plant room		105	-	-

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?
0/2 classroom	NO (-56.3%)	NO
0/5 tutorial	NO (-74.7%)	NO
0/1 classroom	NO (-23%)	NO
0/7 tutorial	NO (-75%)	NO
0/6 tutorial	NO (-86.9%)	NO
0/4 tutorial	NO (-73.9%)	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]	213.5	213.5
External area [m ²]	683.4	683.4
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	3
Average conductance [W/K]	115.54	218.75
Average U-value [W/m ² K]	0.17	0.32
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
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100

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 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	13.24	28.78
Cooling	0	0
Auxiliary	1.64	5.03
Lighting	8.35	5.31
Hot water	2.24	10.38
Equipment*	28.5	28.5
TOTAL **	25.46	49.5

* 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	29.97	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>29.97</i>	<i>0</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	233.94	287.95
Primary energy [kWh/m ²]	-4.47	74.74
Total emissions [kg/m ²]	-0.02	7.16

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] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	250.1	0	14.2	0	1.7	4.91	0	5.5	0
	Notional	87.5	0	8.7	0	1.3	2.78	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
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ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Appendix 4





BACKSHEET MONOCRYSTALLINE MODULE

PRODUCT: TSM-DE09

PRODUCT RANGE: 390-405W

405W+

MAXIMUM POWER OUTPUT

0~+5W

POSITIVE POWER TOLERANCE

21.1%

MAXIMUM EFFICIENCY



Outstanding visual appearance

- Designed with aesthetics in mind
- Excellent cell color control by dedicated cell blackening treatment and machine selection.
- Thinner wires that appear all black at a distance



High customer value

- Lowest guaranteed first year and annual degradation;
- Designed for compatibility with existing mainstream system components
- Higher return on Investment



High power up to 405W

- Up to 21.1% module efficiency with high density interconnect technology
- Multi-busbar technology for better light trapping effect, lower series resistance and improved current collection



High reliability

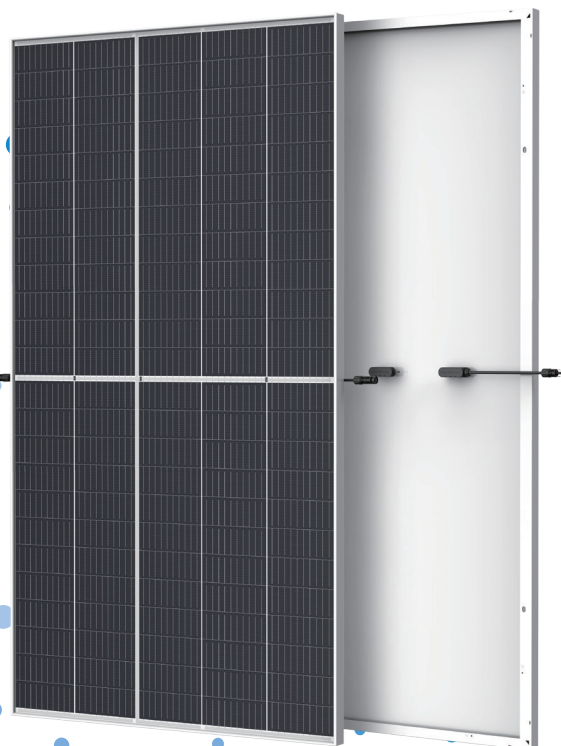
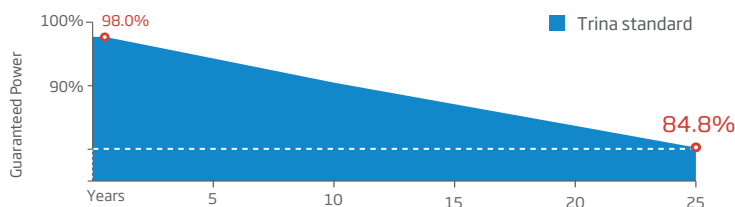
- Minimized micro-cracks with innovative non-destructive cutting technology
- Ensured PID resistance through cell process and module material control
- Mechanical performance up to 5400 Pa positive load and 2400 Pa negative load



High energy yield

- The unique design provides optimized energy production under inter-row shading conditions
- Lower temperature coefficient (-0.34%) and operating temperature

Trina Solar's Backsheet Performance Warranty



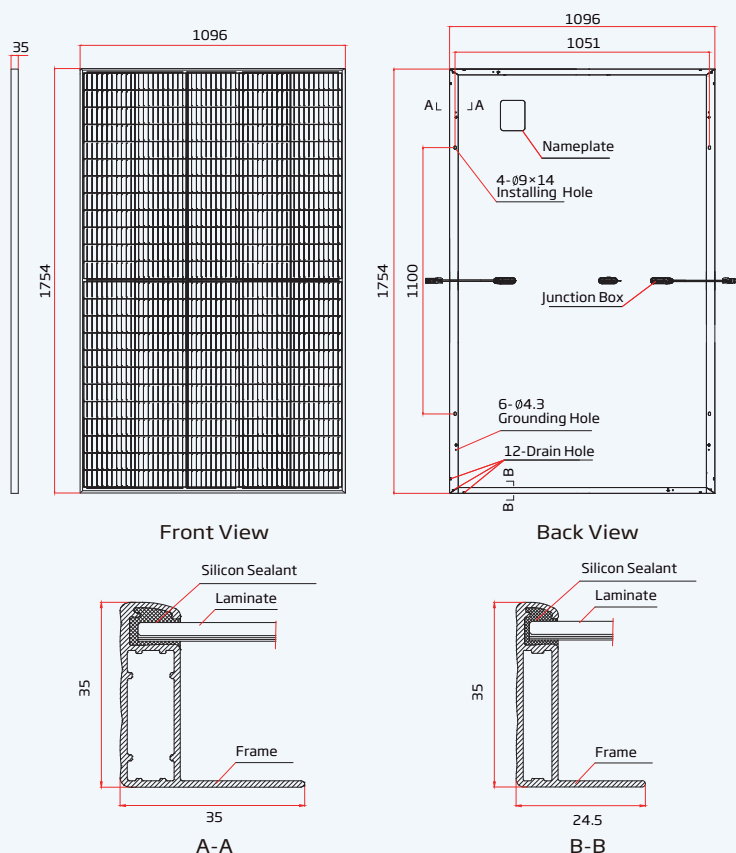
Comprehensive Products and System Certificates



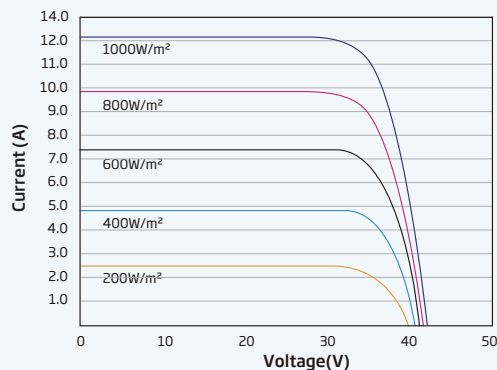
IEC61215/IEC61730/IEC61701/IEC62716
 ISO 9001: Quality Management System
 ISO 14001: Environmental Management System
 ISO14064: Greenhouse Gases Emissions Verification
 ISO45001: Occupational Health and Safety Management System



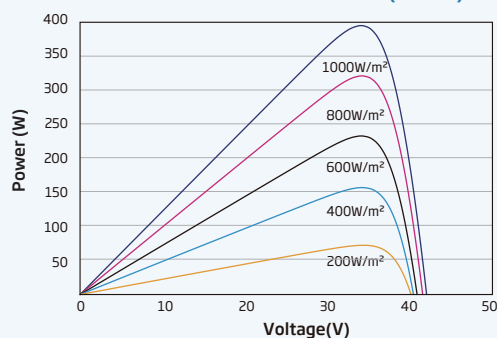
DIMENSIONS OF PV MODULE(mm)



I-V CURVES OF PV MODULE(395 W)



P-V CURVES OF PV MODULE(395W)



ELECTRICAL DATA (STC)

Peak Power Watts-P _{MAX} (Wp)*	390	395	400	405
Power Tolerance-P _{MAX} (W)	0 ~ +5			
Maximum Power Voltage-V _{MPP} (V)	33.8	34.0	34.2	34.4
Maximum Power Current-I _{MPP} (A)	11.54	11.62	11.70	11.77
Open Circuit Voltage-V _{OC} (V)	40.8	41.0	41.2	41.4
Short Circuit Current-I _{SC} (A)	12.14	12.21	12.28	12.34
Module Efficiency η_m (%)	20.3	20.5	20.8	21.1

STC: Irradiance 1000W/m², Cell Temperature 25°C, Air Mass AM1.5. *Measuring tolerance: ±3%.

ELECTRICAL DATA (NOCT)

Maximum Power-P _{MAX} (Wp)	295	298	302	306
Maximum Power Voltage-V _{MPP} (V)	31.8	32.0	32.2	32.5
Maximum Power Current-I _{MPP} (A)	9.26	9.32	9.38	9.41
Open Circuit Voltage-V _{OC} (V)	38.4	38.6	38.8	38.9
Short Circuit Current-I _{SC} (A)	9.78	9.84	9.90	9.69

NOCT: Irradiance at 800W/m², Ambient Temperature 20°C, Wind Speed 1m/s.

MECHANICAL DATA

Solar Cells	Monocrystalline
No. of cells	120 cells
Module Dimensions	1754×1096×35 mm (69.06×43.15×1.38 inches)
Weight	21.2 kg (46.7 lb)
Glass	3.2 mm (0.13 inches), High Transmission, AR Coated Heat Strengthened Glass
Encapsulant material	EVA
Backsheet	Black-White
Frame	35mm(1.38 inches) Anodized Aluminium Alloy
J-Box	IP 68 rated
Cables	Photovoltaic Technology Cable 4.0mm ² (0.006 inches ²), Portrait: 280/280 mm(11.02/11.02 inches) Landscape: 1100/1100 mm(43.31/43.31 inches)
Connector	MC4 EV02 / TS4*

*Please refer to regional datasheet for specified connector.

TEMPERATURE RATINGS

NOCT (Nominal Operating Cell Temperature)	43°C (±2°C)
Temperature Coefficient of P _{MAX}	-0.34%/°C
Temperature Coefficient of V _{OC}	-0.25%/°C
Temperature Coefficient of I _{SC}	0.04%/°C

MAXIMUM RATINGS

Operational Temperature	-40~+85°C
Maximum System Voltage	1500V DC (IEC)
Max Series Fuse Rating	20A

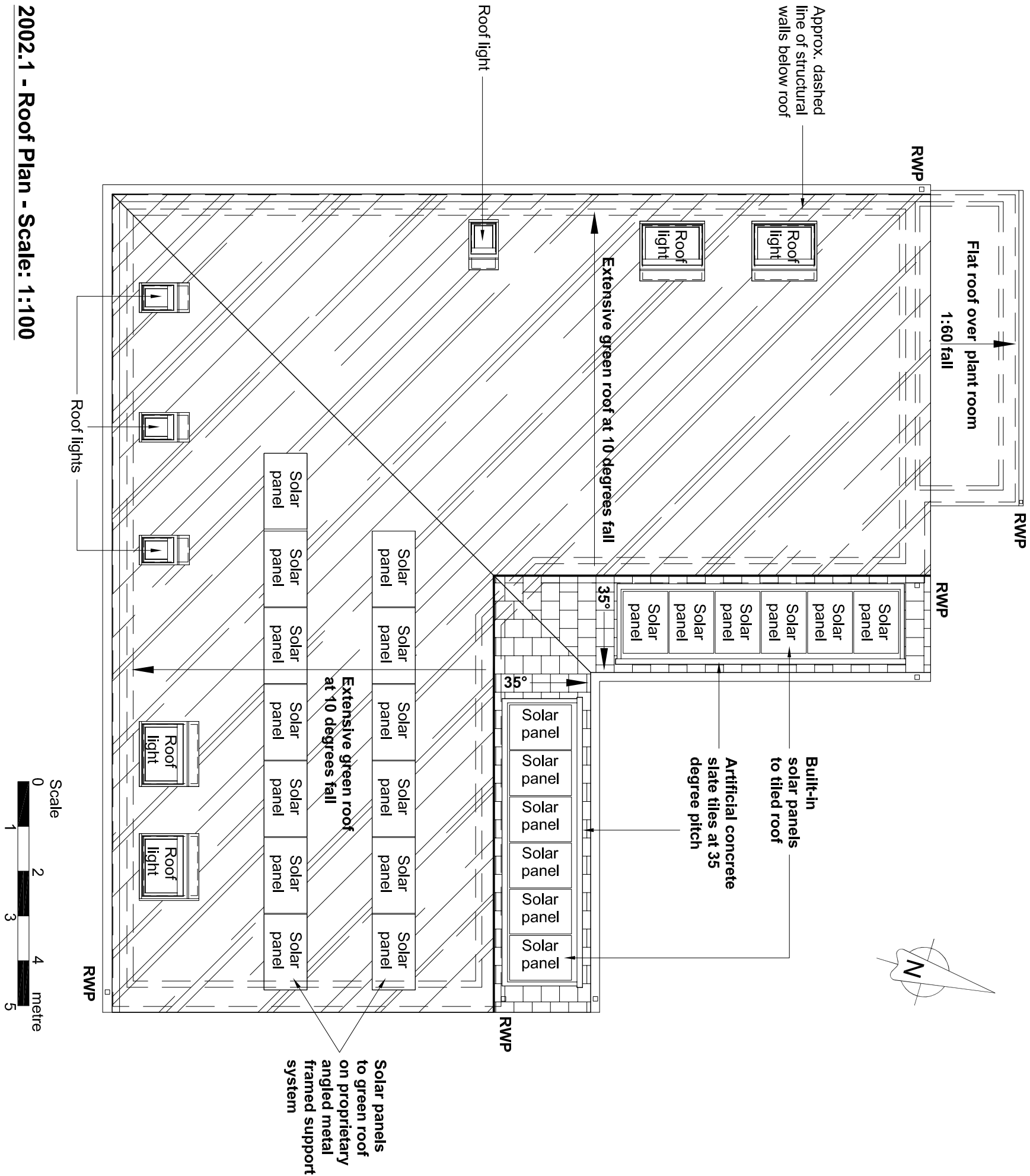
WARRANTY

12 year Product Workmanship Warranty
25 year Power Warranty
2% first year degradation
0.55% Annual Power Attenuation

(Please refer to product warranty for details)

PACKAGING CONFIGURATION

Modules per box: 31 pieces
Modules per 40' container: 806 pieces



Purpose of Issue:	TF Job No.
PLANNING	5338
Thornwood Interiors	
Haringey 6th Form College	
White Hart Lane, N17 8HR	
Roof Plan	

Drawing Number:	5338 -TF- ZZ -RF- DR-A-2003	Scale	S0	Rev.	P1
Drawn / Approved / Scale:	BMC/KDE / 1:100	Date:	@A3	Aug 2022	
ARCHITECTS · DESIGNERS					