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EDCM Building Services Consulting Engineers

Project

ENERGY STATEMENT FOR THE PROPOSED SAFESTYLE UK UNIT

At

WOMBWELL, BARNSLEY

For

Safe Style UK

By

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ENERGY STATEMENT

FOR THE

PROPOSED SAFESTYLE UK FACILITY

STATION ROAD INDUSTRIAL ESTATE, WOMBWELL

BARNSLEY

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1.0 Introduction

1.1 General

This Energy Statement has been prepared in support of the Planning Application for the proposed industrial development for Safestyle UK at Station Road Industrial Estate, Wombwell, Barnsley.

This energy statement is intended to show the predicted energy demand of the proposed development and the degree to which the development meets and exceeds current energy efficiency standards.

The report provides an energy assessment for the proposed development showing predicted annual demands for heating, hot water, ventilation, lighting and power together with the carbon emissions resulting from this energy consumption.

As this is a new building then the development will need to comply with Part L2A 2013 of the building regulations – "Conservation of Fuel and Power in Buildings other than Dwellings".

An estimate of the building energy consumption is provided in the tables at the rear of this report and is based upon SBEM calculations carried out. The summary BRUKL output and Building rating is included at the rear of this document.

It should be noted that the carbon emissions calculations have been carried out to Part L 2013 2A standards.

Full input data can be provided if required in support of the calculations.

1.2 Energy Statement

Barnsley Council's Planning Policy encourages all development to seek to minimise energy use and carbon emissions. Specifically, in order to achieve compliance with the above planning standards this scheme, as new build, would need to achieve a 15% reduction in CO2 emissions against the requirements of the 2010 Building Regulations.

The energy calculations utilised within this report for the proposed industrial unit are based on the use of gas fired condensing boiler plant serving radiators to offices and back of house areas (toilets and locker areas), water heating by storage cylinder fed from this boiler plant, mechanical extract ventilation to all toilet and sanitary areas. Heat pump heating and cooling cassettes will be provided to first floor offices and canteen with heat recovery fresh air ventilation. The industrial areas will be heated by gas fired warm air heaters complete with destratification fans.

The calculations carried out show the calculated TER and BER and highlight the individual loads associated with lighting, heating, cooling, ventilation and hot water.

In the base case SBEM calculations no additional renewable technologies have been included.

In the PV option 35kWp of photovoltaic array has been included mounted on the roof facing a South Easterly direction.

2.0 Executive Summary

2.1 Policy Target

The current building in its base case does not achieve compliance with current Building Regulations Part L 2A 2013 CO2 emissions as shown in the summary table below.

However the planning documents also require a 15% reduction in CO2 emissions from the predicted energy demand of the building for new developments over 1,000m2. The following table confirms that the addition of 35kWp of photovoltaic panels not only achieves compliance with Part L 2013 but also achieves the required 15% reduction in CO2 against Building Regulations 2010 levels.

2.2 Baseline Emissions for Development

As stated within the introduction to this report SBEM calculations have been undertaken for the building. The output from these calculations are included at the rear of this report whilst below is a summary of the results.

SUMMARY OF TER and BER (Part L 2013)							
Building	**Area m2**	**TER kgCO2/m2. annum**	**TER kgCO2/ annum**	**BER kgCO2/m2. annum**	**BER kgCO2/ annum**	**% improvement over Part L 2010**	**% improvement over Part L 2013**
Safestyle Base	6,078	20.7	125,814	21.4	130,069	5.62%	-3.38%
35kWp PV array SE Facing	6,078	20.7	125,814	19.4	117,913	15.28%	6.28%

The table above shows the individual building calculated TERs and BERs and also the CO2 emissions relative to the requirements of Part L 2010 and 2013

2.3 Energy Demand Minimisation Measures

The starting point for the determination of energy improvements or indeed renewable integration must be the establishment of the base load. In this instance the base load has been established by use of SBEM software.

Given the building is constructed to current standards the following U Values have been used in the calculations.

External Walls	0.26 W/m2K
Roof	0.18 W/m2K
Glazing	1.70 W/m2K
Air Leakage	5 m3/hr.m2 @ 50Pa

Full input data for the SBEM calculations can be provided if required.

3.0 FITs and RHIs

Feed In Tariffs (FITs)

The Department of Energy and Climate Change (DECC) has used powers in the Energy Act 2008 to introduce a system of feed-in tariffs (FITs) to incentivise small scale (less than 5MW), low carbon electricity generation.

The FITs scheme went live on 1 April 2010. Through the use of FITs DECC hope to encourage deployment of additional low carbon electricity generation, particularly by organisations, businesses, communities and individuals who are not traditionally engaged in the electricity market. This "clean energy cash back" will allow many people to invest in small scale low carbon electricity, in return for a guaranteed payment both for the electricity they generate and export.

FITs are available to a range of small-scale low carbon electricity generators (<5MW). There are three key components to the scheme:

A generation tariff: a payment for every kWh of electricity generated. The level of this tariff will vary depending on the size and type of technology and the date when it is installed.

An export tariff: a payment for any electricity which is exported to the grid. This is paid over and above the generation tariff, either at a guaranteed flat rate of 4p/kWh or at the open market value.

Reduced electricity bills: the amount of electricity generated by the installed technology will reduce that needed to be purchased from a supplier.

Tariffs are exempt from income tax, but tariff income is subject to Corporation Tax.

The FITs provide a long-term incentive – most technologies will receive support for 20 years. The timescale is 20 years for solar PV and 10 for micro CHP, after which the technology will be re-assessed. The generation tariff is set at different levels for different technologies, according to costs and how much electricity is expected to be generated.

Not all technologies are eligible for FITs. Those which are eligible include:

- anaerobic digestion (AD) for biogas used in electricity production
- hydro-electric
- solar electric photovoltaic (PV)
- wind; and
- small-scale gas-powered combined heat and power (CHP) – up to 2kW.

Renewable Heat Incentive (RHI)

On 10 March 2011, the Government announced the details of the Renewable Heat Incentive policy to revolutionise the way heat is generated and used in buildings and homes. The scheme was introduced in two phases.

In the first phase, long-term tariff support was targeted in the non-domestic sectors, at the big heat users - the industrial, business and public sector – which contribute 38% of the UK's carbon emissions. Under this phase there was also support of around £15 million for households through the Renewable Heat Premium Payment.

The second phase of the RHI scheme saw households moved to the same form of long-term tariff support offered to the non-domestic sector in the first phase. This transition was timed to align with the Green Deal however it was finally introduced in Spring 2014.

Key aspects of the non-domestic sector

Support for a range of technologies and fuel uses including solid and gaseous biomass, solar thermal, ground and water source heat-pumps, on-site biogas, deep geothermal, energy from waste and injection of biomethane into the grid

RHI payments to be claimed by, and paid to, the owner of the heat installation or producers of biomethane for injection

Payments will be made quarterly over a 20 year period

For small and medium-sized installations (up to and including 45kWth), both installers and equipment to be certified under the Microgeneration Certification Scheme (MCS) or equivalent standard, helping to ensure quality assurance and consumer protection

Tariff levels have been calculated to bridge the financial gap between the cost of conventional and renewable heat systems, with additional compensation for certain technologies for an element of the non-financial cost

Heat output to be metered and the support calculated from the amount of heat used for eligible purposes, multiplied by the tariff level

Biomass installations of 1 MWth capacity and above will be required to report quarterly on the sustainability of their biomass feedstock for combustion and where they are used to produce biogas

4.0 Options for Incorporating Sustainability and Renewable Energy Technology

Having taken the appropriate steps to ensure the building is designed to minimise baseline carbon emissions it is then necessary to consider renewable energy technologies which may be relevant to the project.

4.1 Photovoltaic Panels

Photovoltaic panels utilise energy in the form of rays of light from the Sun and are therefore required to be mounted on either a south facing roof or wall to ensure energy output is maximised.

Photovoltaic systems convert energy from the sun into electricity through semi conductor cells. Systems consist of semi-conductor cells connected together and mounted into modules. Modules are connected to an inverter to turn their direct current (DC) output into alternating current (AC) electricity for use in buildings. Photovoltaics supply electricity to the building they are attached to or to any other load connected to the electricity grid. Excess electricity can be sold to the National Grid when the generated power exceeds the local need. PV systems require only daylight, not sunlight to generate electricity (although more electricity is produced with more sunlight), so energy can still be produced in overcast or cloudy conditions. Photovoltaics are generally blue/grey in colour and can be used successfully in all parts of the UK. PVs are an eligible technology under the FIT scheme at a rate of 10.25p per kWhr

Photovoltaic panels come in modular panels which can be fitted to the top of roofs (looking similar to a roof light) and in slates or shingles which are an integral part of the roof covering (looking similar to normal roof tiles). Photovoltaic cells can be incorporated into glass for atria walls and roofs or used as cladding or rain screen on a building wall.

They can also be attached to individual items such as bus shelters, street lights, parking meters, motorway noise barriers or the sides of bridges.

Photovoltaic systems can be discreet through being designed as an integral part of the roof. An ‘invisible’ design using slates or shingles as opposed to an architectural statement is likely to be preferable if in a sensitive area.

Ideally photovoltaics should face between south-east and south-west, at an elevation of about 30-40°. However, in the UK even flat roofs receive 90% of the energy of an optimum system. They are particularly suited to buildings that use electricity during the day - offices, retail and schools.

Costs

Budget costs for photovoltaic arrays are £1,500 - £6,000 per kWp. kWp is peak kW output. The area required to generate 1 kWp will vary depending upon the type of panel from 6m2 to 14m2.

Payback periods were originally likely to exceed 25 years however each kWp installed is likely to save 360kg of carbon per year. The advent of FITs has reduced the payback period to around 7 - 12 years

The annual cost saving brought about by incorporating this technology is detailed within the Tables at the rear of this report for specific areas of photovoltaics (based on the nominal 15% CO2 reduction) this also takes into account the maintenance costs associated with cleaning to ensure maximum performance.

Suitability for the Safestyle Development

For the Safestyle scheme an array of panels could easily be located on the building roof to contribute to the electricity load of the areas shown in the tables and the aspect of the roof is South easterly.

Sufficient panels could be accommodated to achieve the 15% CO2 reduction and any excess energy generated could be exported to the grid.

4.2 Conclusions

Table 1 at the rear of this report shows the estimated total annual energy requirement for the proposed scheme as assessed based on SBEM calculation figures for the proposed development.

As a Planning requirement a further 15% reduction in CO2 emissions has been targeted and the following tables show the area of panels, equipment capacity, capital costs, cost savings and pay back periods.

In the case of PV arrays these would be roof mounted panels and would be largely unobtrusive and given the nature of the site probably represent a possible solution dependent upon the reaction of Planning.

5.0 Renewable Options Cost Appraisal

5.1 Notes

5.1.1 General

1. Energy savings have been calculated at current energy costs of 11.9 per kWhr electric and 5.5p per kWhr gas. An assumption of 5% increase in fuel costs per annum has been used to calculate the 20 year total payback. However, given the current escalation in fuel costs generally and the likelihood this will continue, it is possible that the actual energy savings are likely to exceed by some way the estimates provided in the tables.

2. The maintenance cost assumptions are for planned preventative costs only such as cleaning filters, general checks, greasing bearings etc. But do not include breakdown costs.

5.1.2 Photovoltaics

1. Again the size of array is based upon the 15% requirement and the kWp represents the output of the array.

2. The details are based on a mono or polycrystalline type panel mounted on the roof of the buildings with an installation frame to give a 30 degree angle of repose facing south east.

3. The annual energy generated is based on average figures for the area of 1025 kWhrs per annum per installed kWp of cell.

There are other options for photovoltaic arrays known as building integrated in which case the cells replace conventional cladding or roofing panels or glazing.

6.0 Table 1 – Annual Energy Demand

ANNUAL ENERGY ESTIMATION							
Area	m2	Gas (Heating and Hot Water)	Electric (Cooling, ventilation, Lighting & power)	Gas	Electric	Total	15% CO2 Reduction
		kWhrs/annum.m2	kWhrs/annum.m2	Annual kWHrs	Annual kWHrs	kWhrs/annum	Kg CO2
Safestyle Base	6,078	34.63	27.39	210,481.14	166,476.42	376,957.56	19,161.54
Total	6,078			210,481.14	166,476.42	376,957.56	19,161.54

7.0 Table 2 - Renewable Energy Option Summary

Technology	Installed Power kW	Extra over Installed Cost	Annual kWhr generated / saving	Annual CO2 Saving kg	Annual Energy saving £	FIT / RHI Income per annum	Carbon saved in 20 years	Energy Saving post payback up to 20 Years	Income post payback up to 20 years
15% Target			19,162	19,162					
Wind Turbine									
Solar Thermal									
Photovoltaics	35	£56,000.00	36,225	19,163	£4,311	£4,242	383,261	£69,167.00	£55,145.00
Biomass Boiler Plant									
Solar Wall South Elevation									
Solar Wall East Elevation									
Ground Source Vertical									
Ground Source Horizontal									
Air Source Heat Pumps									

8.0 Table 3 - Photovoltaics

kWp	kWp	Area of PV m2	kWhrs / Annum generated	Annual energy cost saving	Annual CO2 saving kg	Installation Cost	FIT income per annum	Payback Years	Energy Saving post payback up to 20 Years	Income post payback up to 20 years
Safestyle Base	**35**	**228**	**36,225**	**£4,310.78**	**19,163**	**£56,000.00**	**£4,241.95**	**7**	**£69,167**	**£55,145.00**
TOTAL	**35**	**228**	**36,225**	**£4,310.78**	**19,163**	**£56,000.00**	**£4,241.95**	**7**	**£69,167**	**£55,145.00**

FIT Tariff 11.71p / kWhr Maintenance £150 / annum per building

9.0 BRUKL Output Document and Energy Rating Base Case

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Safestyle UK

As designed

Date: Fri Jan 23 14:31:14 2015

Administrative information

Building Details

Address: Valley Road, Station Road Industrial Estate, Wombwell, Barnsley, S73 0BS

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.2.d.2

Interface to calculation engine: Design Database

Interface to calculation engine version: v26.03

BRUKL compliance check version: v5.2.d.2

Owner Details

Name: Information not provided by the user

Telephone number: Information not provided by the user

Address: Information not provided by the user, Information not provided by the user, Information not provided by the user

Certifier details

Name: Information not provided by the user

Telephone number: Information not provided by the user

Address: Information not provided by the user, Information not provided by the user, Information not provided by the user

Criterion 1: The calculated CO_2 emission rate for the building should not exceed the target

The building does not comply with England Building Regulations Part L 2013

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	20.7
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	20.7
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	21.4
Are emissions from the building less than or equal to the target?	BER > TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services should achieve reasonable overall standards of energy efficiency

Values not achieving standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.27	0.35	CANTEEN Wall 1
Floor	0.25	0.25	0.25	1ST AID Exposed Floor 1
Roof	0.25	0.18	0.18	1ST AID Exposed Roof 1
Windows***, roof windows, and rooflights	2.2	1.7	1.7	COR Window 1
Personnel doors	2.2	-	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	2.54	2.54	COR Door 1 (High Usage Entrance Door)

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]

$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]

* There might be more than one surface where the maximum U-value occurs.

** 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.

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

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	5

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- GF Toilets & Lockers

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	-	-	-
Standard value	0.91*	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 gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

2- FF Office & Canteen

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.95	3.53	-	-	-
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. For types <=12 kW output, refer to EN 14825 for limiting standards.					

3- Engineers Stores

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	-	-	-
Standard value	0.91*	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 gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

4- Glass Store

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.95	-	-	-	-
Standard value	0.91	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

5- Factory Area

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.95	-	-	-	-
Standard value	0.91	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- Default DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	0.015
Standard value	N/A	N/A

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
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 supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

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	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
1ST AID	-	-	0.5	0.5	-	-	-	-	-	0.8	0.5
COR	-	-	0.5	0.5	-	-	-	-	-	0.8	0.5
DECO	-	-	0.5	0.5	-	-	-	-	-	0.8	0.5
FEMALE	-	-	0.5	0.5	-	-	-	-	-	0.8	0.5
LOCKERS	-	-	0.5	0.5	-	-	-	-	-	0.8	0.5
MALE	-	-	0.5	0.5	-	-	-	-	-	0.8	0.5
STAIR	-	-	0.5	0.5	-	-	-	-	-	0.8	0.5
CANTEEN	-	-	0.5	0.5	-	-	-	-	-	0.8	0.5
LOBBY	-	-	0.5	0.5	-	-	-	-	-	0.8	0.5
MAN	-	-	0.5	0.5	-	-	-	-	-	0.8	0.5
OPS	-	-	0.5	0.5	-	-	-	-	-	0.8	0.5
STAIR2	-	-	0.5	0.5	-	-	-	-	-	0.8	0.5
ENG.1	-	-	0.5	0.5	-	-	-	-	-	0.8	0.5
ENG.2	-	-	0.5	0.5	-	-	-	-	-	0.8	0.5
GLASS	-	-	-	-	-	-	-	-	-	-	N/A
WARE	-	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting

Zone name	Luminous efficacy [lm/W]			General lighting [W]
	Luminaire	Lamp	Display lamp	
Standard value	60	60	22	
1ST AID	-	129	-	30
COR	-	121	-	181
DECO	64	-	-	61
FEMALE	-	124	-	44
LOCKERS	-	112	-	377
MALE	-	116	-	76
STAIR	-	121	-	43
CANTEEN	67	-	-	1233
LOBBY	-	155	-	98
MAN	70	-	-	197

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
OPS	71	-	-	124
STAIR2	-	153	-	50
ENG.1	89	-	-	123
ENG.2	86	-	-	183
GLASS	83	-	-	358
WARE	81	-	-	19853

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
DECO	N/A	N/A
CANTEEN	N/A	N/A
MAN	N/A	N/A
OPS	N/A	N/A
WARE	NO (-89%)	YES

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	6078	6078
External area [m^2]	14371.2	14371.2
Weather	LEE	LEE
Infiltration [m^3/hm^2@ 50Pa]	5	5
Average conductance [W/K]	3666.49	4309.65
Average U-value [W/m^2K]	0.26	0.3
Alpha value* [%]	7.98	29.78

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
100	**B2 to B7 General Industrial and Special Industrial Groups**
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Inst.: Hospitals and Care Homes
	C2 Residential Inst.: Residential schools
	C2 Residential Inst.: Universities and colleges
	C2A Secure Residential Inst.
	Residential spaces
	D1 Non-residential Inst.: Community/Day Centre
	D1 Non-residential Inst.: Libraries, Museums, and Galleries
	D1 Non-residential Inst.: Education
	D1 Non-residential Inst.: Primary Health Care Building
	D1 Non-residential Inst.: Crown and County Courts
	D2 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/m^2]

	Actual	Notional
Heating	29.28	37.41
Cooling	0.5	0.76
Auxiliary	5.81	3.16
Lighting	21.07	18.46
Hot water	5.35	4.57
Equipment*	29.83	29.83
TOTAL**	**62.02**	**64.35**

* 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.

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	193.92	251.56
Primary energy* [kWh/m^2]	124.5	120.09
Total emissions [kg/m^2]	21.4	20.7

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

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: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	78.7	162.5	26.9	0	32.8	0.81	0	0.91	0
	Notional	155.6	121.2	52.8	0	39.3	0.82	0	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	49.3	163.3	3	10.1	20.4	4.61	4.49	4.95	6.32
	Notional	187.5	197	21.4	15.2	25.8	2.43	3.6	----	----
[ST] Central heating using water: convectors, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	109.4	117.5	37.4	0	22.8	0.81	0	0.91	0
	Notional	168.1	39.3	57	0	26.9	0.82	0	----	----
[ST] Flued forced-convection air heaters, [HS] Air heater, [HFT] Natural Gas, [CFT] Electricity										
	Actual	355.1	106.3	119.9	0	3.3	0.82	0	0.95	0
	Notional	572.2	32.3	194.1	0	0	0.82	0	----	----
[ST] Flued forced-convection air heaters, [HS] Air heater, [HFT] Natural Gas, [CFT] Electricity										
	Actual	90.7	94.6	29.1	0	3.3	0.87	0	0.95	0
	Notional	106.6	130.6	34.4	0	0	0.82	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

Key Features

The BCO can give particular attention to items with specifications that are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.26	COR Wall 1
Floor	0.2	0.25	1ST AID Exposed Floor 1
Roof	0.15	0.18	1ST AID Exposed Roof 1
Windows, roof windows, and rooflights	1.5	1.7	COR Window 1
Personnel doors	1.5	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	2.54	COR Door 1 (High Usage Entrance Door)

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5

Building Rating

	Heating	Cooling	Auxiliary	Lighting	Hot water	Total	
Actual	29.28	0.5	5.81	21.07	5.35	62.02	**kWh/m²**
Notional	37.41	0.76	3.16	18.46	4.57	64.35	**kWh/m²**

CO2 emissions mandatory requirement

BER	21.4	**kgCO2/m²**
Notional	20.7	**kgCO2/m²**
TER	20.7	**kgCO2/m²**
Pass CO2	**No**	

10.0 BRUKL Output Document and Energy Rating PV Option

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Safestyle UK PV Option

As designed

Date: Fri Jan 23 14:41:36 2015

Administrative information

Building Details

Address: Valley Road, Station Road Industrial Estate, Wombwell, Barnsley, S73 OBS

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.2.d.2

Interface to calculation engine: Design Database

Interface to calculation engine version: v26.03

BRUKL compliance check version: v5.2.d.2

Owner Details

Name: Information not provided by the user

Telephone number: Information not provided by the user

Address: Information not provided by the user, Information not provided by the user, Information not provided by the user

Certifier details

Name: Information not provided by the user

Telephone number: Information not provided by the user

Address: Information not provided by the user, Information not provided by the user, Information not provided by the user

Criterion 1: The calculated CO_2 emission rate for the building should not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	20.7
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	20.7
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	19.4
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services should achieve reasonable overall standards of energy efficiency

Values not achieving standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.27	0.35	CANTEEN Wall 1
Floor	0.25	0.25	0.25	1ST AID Exposed Floor 1
Roof	0.25	0.18	0.18	1ST AID Exposed Roof 1
Windows***, roof windows, and rooflights	2.2	1.7	1.7	COR Window 1
Personnel doors	2.2	-	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	2.54	2.54	COR Door 1 (High Usage Entrance Door)

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]

$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]

* There might be more than one surface where the maximum U-value occurs.

** 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.

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

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	5

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- GF Toilets & Lockers

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	-	-	-
Standard value	0.91*	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 gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

2- FF Office & Canteen

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.95	3.53	-	-	-
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. For types <=12 kW output, refer to EN 14825 for limiting standards.					

3- Engineers Stores

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	-	-	-
Standard value	0.91*	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 gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

4- Glass Store

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.95	-	-	-	-
Standard value	0.91	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

5- Factory Area

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.95	-	-	-	-
Standard value	0.91	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- Default DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	0.015
Standard value	N/A	N/A

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
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 supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

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	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
1ST AID	-	-	0.5	0.5	-	-	-	-	-	0.8	0.5
COR	-	-	0.5	0.5	-	-	-	-	-	0.8	0.5
DECO	-	-	0.5	0.5	-	-	-	-	-	0.8	0.5
FEMALE	-	-	0.5	0.5	-	-	-	-	-	0.8	0.5
LOCKERS	-	-	0.5	0.5	-	-	-	-	-	0.8	0.5
MALE	-	-	0.5	0.5	-	-	-	-	-	0.8	0.5
STAIR	-	-	0.5	0.5	-	-	-	-	-	0.8	0.5
CANTEEN	-	-	0.5	0.5	-	-	-	-	-	0.8	0.5
LOBBY	-	-	0.5	0.5	-	-	-	-	-	0.8	0.5
MAN	-	-	0.5	0.5	-	-	-	-	-	0.8	0.5
OPS	-	-	0.5	0.5	-	-	-	-	-	0.8	0.5
STAIR2	-	-	0.5	0.5	-	-	-	-	-	0.8	0.5
ENG.1	-	-	0.5	0.5	-	-	-	-	-	0.8	0.5
ENG.2	-	-	0.5	0.5	-	-	-	-	-	0.8	0.5
GLASS	-	-	-	-	-	-	-	-	-	-	N/A
WARE	-	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting

Zone name	Luminous efficacy [lm/W]			General lighting [W]
	Luminaire	Lamp	Display lamp	
Standard value	60	60	22	
1ST AID	-	129	-	30
COR	-	121	-	181
DECO	64	-	-	61
FEMALE	-	124	-	44
LOCKERS	-	112	-	377
MALE	-	116	-	76
STAIR	-	121	-	43
CANTEEN	67	-	-	1233
LOBBY	-	155	-	98
MAN	70	-	-	197

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
OPS	71	-	-	124
STAIR2	-	153	-	50
ENG.1	89	-	-	123
ENG.2	86	-	-	183
GLASS	83	-	-	358
WARE	81	-	-	19853

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
DECO	N/A	N/A
CANTEEN	N/A	N/A
MAN	N/A	N/A
OPS	N/A	N/A
WARE	NO (-89%)	YES

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	6078	6078
External area [m^2]	14371.2	14371.2
Weather	LEE	LEE
Infiltration [m^3/hm^2@ 50Pa]	5	5
Average conductance [W/K]	3666.49	4309.65
Average U-value [W/m^2K]	0.26	0.3
Alpha value* [%]	7.98	29.78

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
100	**B2 to B7 General Industrial and Special Industrial Groups**
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Inst.: Hospitals and Care Homes
	C2 Residential Inst.: Residential schools
	C2 Residential Inst.: Universities and colleges
	C2A Secure Residential Inst.
	Residential spaces
	D1 Non-residential Inst.: Community/Day Centre
	D1 Non-residential Inst.: Libraries, Museums, and Galleries
	D1 Non-residential Inst.: Education
	D1 Non-residential Inst.: Primary Health Care Building
	D1 Non-residential Inst.: Crown and County Courts
	D2 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/m^2]

	Actual	Notional
Heating	29.28	37.41
Cooling	0.5	0.76
Auxiliary	5.81	3.16
Lighting	21.07	18.46
Hot water	5.35	4.57
Equipment*	29.83	29.83
TOTAL**	**62.02**	**64.35**

* 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.

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	3.81	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	193.92	251.56
Primary energy* [kWh/m^2]	124.5	120.09
Total emissions [kg/m^2]	19.4	20.7

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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
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Cool SSEER = Cooling system seasonal energy efficiency ratio
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HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

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Building fabric

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$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5