Simplified Building Energy Model

SBEM Build Standards

Industrial Unit
Balmoral Group
Thurnscoe
South Yorkshire

Amendments

Date	Change	Document Version
20/11/2016	Original Specification Issued.	Version 1

All changes made to a version are marked in blue

Date: 20 November 2016
Quote No: PPBE1982
SBEM Version: 5.2
Document Version: 1

Dear Sirs

Re: Industrial Unit Thurnscoe

The draft SBEM calculation for the new build Industrial Unit is now complete. The calculations have been carried out based on the 2013 Building Regulations.

I have used the information supplied, where information was not available I have used the building regulations minimum standards, the SBEM default figures or made some assumptions in order to finalise the calculations and demonstrate compliance.

With the information listed in the build standards below the building complies with building regulations Part L2A.

To achieve compliance I have had to make several assumption / changes. Can you please review and let me know if these are acceptable or if you require any changes. The main points are :-

The building has been specified as industrial process.
The industrial process area is specified as unheated, therefore the wall and ceiling between it and the heated offices will need to be insulated.
Air conditioning to all heated spaces.
Mechanical ventilation with heat recovery to all office spaces except those accessible from the industrial process area (i.e. canteen, toilets and locker room).
The SBEM calculation only considers thermal properties for the heated areas therefore the unheated industrial process thermal properties are not included in the calculations. To satisfy the minimum building regulations I have specified these elements with minimum insulation levels to achieve the minimum building regulations requirements.
The main energy user in the building is lighting therefore high efficiency lighting has been included with various controls (see details).

As you will see form the speciation below I have made several assumptions relating to HVAC. These are not meant as a design specification only as guidance of what needs to be included in the SBEM. If you do have any specific requirement for the HVAC which are different to what I have assumed, please let me know and I can update the calculations.

The building does comply without the need for renewable energies but these could be included if required.

If you do have any queries about the information specified, please do not hesitate to give me a call.

Yours Sincerely

Glenn Shewan

Building Regulations Standards

for

Re: Industrial Unit Thurnscoe

External Wall to offices	U value = 0.21 W/m^2 K 100 mm Kingspan metal cladding
Internal wall between office and unheated process area	U value = 0.28 W/m^2 K Details to be confirmed
Floor to office area	U value = 0.11 W/m^2 K 50 mm Kingspan rigid foam insulation
Roof to office areas	U value = 0.14 W/m^2 K 150 mm Kingspan metal cladding
Internal wall	Stud partitions
Internal Floor	Suspended timber
Windows	U value = 1.80 W/m^2 K Solar transmittance = 0.72 Light Transmittance = 0.80
Space Heating	Split system air conditioning throughout al office spaced COP = minimum of 4.0 EER = minimum of 4.0
Water Heating	Electric under sink hot water heaters 15 litre storage No secondary circulation Showers Electric instant hot water heater No hot water storage facility No secondary circulation system included
Supply Extract Ventilation	Mechanical ventilation with heat recovery to all office spaces except those directly off the industrial process area (i.e. canteen, toilets and locker room). Maximum specific fan power of 0.9 W/l/s Minimum heat recovery efficiency of 75%

Extracts	Extracts to all toilets and showers Fans remote from zone Maximum specific fan power = 0.50 W/l/s
Renewable Energy	None
Air Conditioning	None
Lighting	Minimum 90 lumens per watt throughout Photoelectric controls to all office spaces and industrial process area with maximum parasitic power of 0.1 W/m^2 Occupancy sensing control to all toilets with maximum parasitic power of 0.1 W/m^2
Electric Power Factor	<0.9
Sub Metering for HVAC including "out of range alarm"	No
Sub Metering for Lighting including "out of range alarm"	No
Accredited Construction Details	No
Air Permeability	5.00 $m^3/h/m^2$ Therefore, an air test will be required on completion
Building Activity	Industrial Process
Other Notes	Unheated industrial process area No activity allocated to floor space above canteen, toilets and lockers area

Elements of the unheated industrial process area that are not included in the SBEM

External Wall to process area	U value = 0.35 W/m^2 K Kingspan metal cladding
Floor to process area	U value = 0.21 W/m^2 K Uninsulated concrete floor
Roof to process area	U value = 0.25 W/m^2 K Kingspan metal cladding
Roof lights to process area	U value = 2.20 W/m^2 K Solar transmittance = 0.60 Light Transmittance = 0.60
Doors to process area	U value = 2.20 W/m^2 K
Roller shutter doors to process area	U value = 1.50 W/m^2 K

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Balmoral Group Thurnscoe

As designed

Date: Sun Nov 20 15:40:19 2016

Administrative information

Building Details

Address: Warehouse, Balmoral Group, Thurnscoe, ,

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.2.d.2

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v4.7.0

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

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name: Glenn Shewan

Telephone number:

Address: , ,

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	16.3
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	16.3
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	16.2
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	0.23	0.28	1. grd - circ_P_13
Floor	0.25	0.21	0.21	1. grd - off 1_S_3
Roof	0.25	0.14	0.14	2. first - IT room_R_8
Windows***, roof windows, and rooflights	2.2	1.8	1.8	1. grd - off 1_G_7
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	-	-	"No external high usage entrance doors"

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

* 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	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- split system air con

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	4	4	-	-	-
Standard value	2.5*	2.6	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.

1- HWS2 electric shower

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

2- HWS1 15 litre

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	1	0.024
Standard value	1	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**
1. grd - ind process unheated	-	-	-	-	-	-	-	-	-	-	N/A
1. grd - off 1	-	-	-	0.9	-	-	-	-	-	0.75	0.5
1. grd - circ	-	-	-	0.9	-	-	-	-	-	0.75	0.5
1. grd - stairs	-	-	-	0.9	-	-	-	-	-	0.75	0.5
1. grd - store 1	-	-	-	0.9	-	-	-	-	-	0.75	0.5
1. grd - off 2	-	-	-	0.9	-	-	-	-	-	0.75	0.5
1. grd - wc male prod	-	-	0.5	-	-	-	-	-	-	-	N/A
1. grd - store lockers	-	-	-	-	-	-	-	-	-	-	N/A
1. grd - canteen ind process	-	-	-	-	-	-	-	-	-	-	N/A
1. grd - wc female prod	-	-	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		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
1. grd - wc male off	-	-	0.5	0.9	-	-	-	-	-	0.75	0.5
1. grd - off reception	-	-	-	0.9	-	-	-	-	-	0.75	0.5
1. grd - tea	-	-	-	0.9	-	-	-	-	-	0.75	0.5
1. grd - shower	-	-	0.5	0.9	-	-	-	-	-	0.75	0.5
1. grd - off prod mgr	-	-	-	0.9	-	-	-	-	-	0.75	0.5
1. grd - off prod	-	-	-	0.9	-	-	-	-	-	0.75	0.5
1. grd - canteen office	-	-	-	0.9	-	-	-	-	-	0.75	0.5
1. grd - wc female off	-	-	0.5	0.9	-	-	-	-	-	0.75	0.5
1. grd - store cleaner	-	-	-	0.9	-	-	-	-	-	0.75	0.5
1. grd - plant	-	-	-	0.9	-	-	-	-	-	0.75	0.5
1. grd - reception	-	-	-	0.9	-	-	-	-	-	0.75	0.5
2. first - IT room	-	-	-	0.9	-	-	-	-	-	0.75	0.5
2. first - tea	-	-	-	0.9	-	-	-	-	-	0.75	0.5
2. first - wc male	-	-	0.5	0.9	-	-	-	-	-	0.75	0.5
2. first - wc female	-	-	0.5	0.9	-	-	-	-	-	0.75	0.5
2. first - meet	-	-	-	0.9	-	-	-	-	-	0.75	0.5
2. first - store cleaners	-	-	-	0.9	-	-	-	-	-	0.75	0.5
2. first - shower	-	-	0.5	0.9	-	-	-	-	-	0.75	0.5
2. first - circ	-	-	-	0.9	-	-	-	-	-	0.75	0.5
2. first - off 1	-	-	-	0.9	-	-	-	-	-	0.75	0.5
2. first - meet conference	-	-	-	0.9	-	-	-	-	-	0.75	0.5
2. first - off 3456	-	-	-	0.9	-	-	-	-	-	0.75	0.5
2. first - off 2	-	-	-	0.9	-	-	-	-	-	0.75	0.5
2. first - stairs	-	-	-	0.9	-	-	-	-	-	0.75	0.5

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
1. grd - ind process unheated	90	-	-	26782
1. grd - off 1	90	-	-	577
1. grd - circ	-	90	-	161
1. grd - stairs	-	90	-	51
1. grd - store 1	90	-	-	19
1. grd - off 2	90	-	-	581
1. grd - wc male prod	-	90	-	138
1. grd - store lockers	90	-	-	40
1. grd - canteen ind process	-	90	-	120
1. grd - wc female prod	-	90	-	81
1. grd - wc male off	-	90	-	77
1. grd - off reception	90	-	-	220
1. grd - tea	90	-	-	101
1. grd - shower	-	90	-	23
1. grd - off prod mgr	90	-	-	155

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
1. grd - off prod	90	-	-	517
1. grd - canteen office	-	90	-	100
1. grd - wc female off	-	90	-	77
1. grd - store cleaner	90	-	-	9
1. grd - plant	90	-	-	37
1. grd - reception	-	90	50	47
2. first - IT room	90	-	-	56
2. first - tea	90	-	-	140
2. first - wc male	-	90	-	121
2. first - wc female	-	90	-	112
2. first - meet	90	-	-	284
2. first - store cleaners	90	-	-	9
2. first - shower	-	90	-	35
2. first - circ	-	90	-	147
2. first - off 1	90	-	-	629
2. first - meet conference	90	-	-	433
2. first - off 3456	90	-	-	792
2. first - off 2	90	-	-	950
2. first - stairs	-	90	-	61

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?
1. grd - ind process unheated	NO (-38.3%)	NO
1. grd - off 1	NO (-38.1%)	NO
1. grd - off 2	NO (-37.1%)	NO
1. grd - canteen ind process	N/A	N/A
1. grd - off reception	N/A	N/A
1. grd - tea	N/A	N/A
1. grd - off prod mgr	N/A	N/A
1. grd - off prod	NO (-1.4%)	NO
1. grd - canteen office	NO (-6.7%)	NO
1. grd - reception	NO (-44.7%)	NO
2. first - tea	N/A	N/A
2. first - meet	NO (-6.7%)	NO
2. first - off 1	NO (-38.1%)	NO
2. first - meet conference	NO (-82.2%)	NO
2. first - off 3456	NO (-39.5%)	NO
2. first - off 2	NO (-0.8%)	NO

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?	YES
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]	6644.5	6644.5
External area [m^2]	15244.7	15244.7
Weather	LEE	LEE
Infiltration [m^3/hm^2@ 50Pa]	5	5
Average conductance [W/K]	5359.85	5291.97
Average U-value [W/m^2K]	0.35	0.35
Alpha value* [%]	31.53	25.95

* 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	1.64	2.18
Cooling	2.82	2.12
Auxiliary	1.55	1.56
Lighting	16.53	20.21
Hot water	8.62	9.86
Equipment*	32.57	32.57
TOTAL**	**31.17**	**35.93**

* 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]	260.28	247.63
Primary energy* [kWh/m^2]	95.69	88.87
Total emissions [kg/m^2]	16.2	16.3

* 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] No Heating or Cooling										
	Actual	140.9	112.2	0	0	0	0	0	0	0
	Notional	120.3	122.8	0	0	0	0	0	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	127.6	167.2	9.5	16.4	9	3.73	2.84	4	4
	Notional	110.2	159.2	12.6	12.3	9	2.43	3.6	----	----

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	0.21	1. grd - off 1_W_6
Floor	0.2	0.21	1. grd - off 1_S_3
Roof	0.15	0.14	2. first - IT room_R_8
Windows, roof windows, and rooflights	1.5	1.8	1. grd - off 1_G_7
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	-	"No external high usage entrance doors"

$U_{i\text{-}Typ}$ = 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