

# **SBEM CALCULATIONS**

**FOR**

**THE CART SHED,  
HARVEY'S FOUNDRY,  
HAYLE, CORNWALL**

<b>Calculation Status</b>	
<b>As Proposed</b>	✓
<b>As Designed</b>	
<b>As Built</b>	



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## 1.0 Introduction

Integrated Design Partnership has been commissioned to carry out preliminary SBEM calculations for the proposed phase 3 development at Harvey's Foundry, Hayle, Cornwall.

The development consists of two existing buildings (Plantation Store and Pattern Shed) that are to be refurbished and a new build extension (Cart Shed). These calculations only relate to the new build extension.

This document sets out results of the SBEM calculations and if necessary makes recommendations to achieve building regulations compliance. The calculations are also intended to provide preliminary information to inform the BREEAM pre-assessment for the development and in particular issue Ene01 – Reduction of CO<sub>2</sub> Emissions.

Calculations have been carried out using Hevacomp Design Database version 25.05, SBEM v4.1.d.0 Software and run against Part L 2010 regulations.

The information provided in this document relates solely to CO<sub>2</sub> emissions. It does not address all elements necessary for L2A compliance. The Designers should confirm compliance of their respective disciplines.

These calculations are required to demonstrate to building control that the proposed building and associated services will reduce CO<sub>2</sub> emissions by approximately 25%, depending on building type, compared to Part L 2006 standards.

CO<sub>2</sub> emissions are a function of the thermal performance of the building and the services contained within e.g. efficiency of the heating, hot water generation, lighting etc.

## 2.0 Summary of SBEM calculations

SBEM calculations were carried out using the "input data" detailed in the attached appendices. Where the necessary information is unavailable, for whatever reason, assumptions have been made or building regulation default values have been used.

It is important that the assumed / default values are confirmed as practical / achievable by the respective designers. Failure to meet or better the figures used will invalidate the Target Emission Rate (TER) / Building Emission Rate (BER) and could alter the SBEM status e.g. change a Pass to a Fail.

**TER = 21.4 Kg CO<sub>2</sub>/m<sup>2</sup> per year**

**BER = 11.1 Kg CO<sub>2</sub>/m<sup>2</sup> per year**

**STATUS = PASS**

The scheme as currently detailed in the attached appendices passes Building Regulations Part L Criterion 1: 'Predicted CO<sub>2</sub> emission from proposed building does not exceed the target.'

## Project name

**HARVEY'S - CART SHED**

As designed

Date: Mon May 28 09:54:30 2012

## Administrative information

## Building Details

Address: Hayle, Cornwall, , TR27 4HH

## Certification tool

Calculation engine: SBEM

Calculation engine version: v4.1.d.0

Interface to calculation engine: Design Database

Interface to calculation engine version: v25.05

BRUKL compliance check version: v4.1.d.0

## 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: Integrated Design Partnership

Telephone number: 01275 371777

Address: Station House, Station Road, Bristol, BS20 0AB

Criterion 1: The calculated CO<sub>2</sub> emission rate for the building should not exceed the target

1.1	CO <sub>2</sub> emission rate from the notional building, kgCO <sub>2</sub> /m <sup>2</sup> .annum	21.4
1.2	Target CO <sub>2</sub> emission rate (TER), kgCO <sub>2</sub> /m <sup>2</sup> .annum	21.4
1.3	Building CO <sub>2</sub> emission rate (BER), kgCO <sub>2</sub> /m <sup>2</sup> .annum	11.1
1.4	Are emissions from the building less than or equal to the target?	BER =< TER
1.5	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

## 2.a Building fabric

Element	U <sub>a-Limit</sub>	U <sub>a-Calc</sub>	U <sub>i-Calc</sub>	Surface where the maximum value occurs*
Wall**	0.35	0.25	0.25	0-LOBBY 1 Wall 1
Floor	0.25	0.2	0.2	0-LOBBY 1 Exposed Floor 1
Roof	0.25	0.15	0.15	0-TEA RM Exposed Roof 1
Windows***, roof windows, and rooflights	2.2	1.5	1.5	0-LOBBY 1 Window 1
Personnel doors	2.2	-	-	"No heat loss personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No heat loss vehicle access doors"
High usage entrance doors	3.5	-	-	"No heat loss high usage entrance doors"

U<sub>a-Limit</sub> = Limiting area-weighted average U-values [W/(m<sup>2</sup>K)]U<sub>a-Calc</sub> = Calculated area-weighted average U-values [W/(m<sup>2</sup>K)]U<sub>i-Calc</sub> = Calculated maximum individual element U-values [W/(m<sup>2</sup>K)]

\* 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 <sup>3</sup> /(h.m <sup>2</sup> ) at 50 Pa	10	5

## 2.b Building services

The building services parameters listed below are expected to be checked by the BCO against guidance. No automatic checking is performed by the tool.

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 to 0.95

### 1- HVAC 1

Heating seasonal efficiency	Cooling nominal efficiency	SFP [W/(l/s)]	HR seasonal efficiency
0.95	-	-	-
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			NO

### 1- Harveys

Heating seasonal efficiency	Hot water storage loss factor [kWh/litre per day]
1	-

### Local mechanical ventilation and exhaust

Zone	Supply/extract SFP [W/(l/s)]	HR seasonal efficiency	Exhaust SFP [W/(l/s)]
0-TOILETS	-	-	1

### General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
0-LOBBY 1	140	-
0-LOBBY 2	160	-
0-MEETING	300	-
0-TEA RM	40	-
0-TOILETS	170	-
0-UNIT D	560	-

**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?
0-MEETING	YES (+15.8%)	NO
0-TEA RM	N/A	N/A
0-UNIT D	YES (+62.4%)	NO

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

Separate submission

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

Separate submission

# Technical Data Sheet (Actual vs. Notional Building)

## Building Global Parameters

	Actual	Notional
Area [m <sup>2</sup> ]	169.7	169.7
External area [m <sup>2</sup> ]	387.7	387.7
Weather	PLY	PLY
Infiltration [m <sup>3</sup> /hm <sup>2</sup> @ 50Pa]	5	5
Average conductance [W/K]	162.9	192.66
Average U-value [W/m <sup>2</sup> K]	0.42	0.5
Alpha value* [%]	15.91	12.26

\* 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
100	<b>B1 Offices and Workshop businesses</b>
	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: Telephone exchanges
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others - Stand alone utility block

## Energy Consumption by End Use [kWh/m<sup>2</sup>]

	Actual	Notional
Heating	28.79	46.02
Cooling	0	0
Auxiliary	3.93	2.27
Lighting	22.06	20.21
Hot water	1.79	2.16
Equipment*	29.32	28.88
<b>TOTAL</b>	<b>56.57</b>	<b>70.67</b>

\* Energy used by equipment does not count towards the total for calculating emissions.

## Energy Production by Technology [kWh/m<sup>2</sup>]

	Actual	Notional
Photovoltaic systems	16.99	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

## Energy & CO<sub>2</sub> Emissions Summary

	Actual	Indicative Target
Heating + cooling demand [MJ/m <sup>2</sup> ]	312	235.82
Total consumption [kWh/m <sup>2</sup> ]	56.57	70.67
Total emissions [kg/m <sup>2</sup> ]	11.1	21.4

## HVAC Systems Performance

System Type	Heat dem MJ/m <sup>2</sup>	Cool dem MJ/m <sup>2</sup>	Heat con kWh/m <sup>2</sup>	Cool con kWh/m <sup>2</sup>	Aux con kWh/m <sup>2</sup>	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
<b>[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity</b>									
<b>Actual</b>	87.9	224.1	28.8	0	3.9	0.85	0	0.95	0
<b>Notional</b>	131.2	104.6	46	0	2.3	0.79 / 0.81	0	----	----

### Key to terms

Heat dem [MJ/m <sup>2</sup> ]	= Heating energy demand
Cool dem [MJ/m <sup>2</sup> ]	= Cooling energy demand
Heat con [kWh/m <sup>2</sup> ]	= Heating energy consumption
Cool con [kWh/m <sup>2</sup> ]	= Cooling energy consumption
Aux con [kWh/m <sup>2</sup> ]	= 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 <sub>i-Typ</sub>	U <sub>i-Min</sub>	Surface where the minimum value occurs*
Wall	0.23	0.25	0-LOBBY 1 Wall 1
Floor	0.2	0.2	0-LOBBY 1 Exposed Floor 1
Roof	0.15	0.15	0-TEA RM Exposed Roof 1
Windows, roof windows, and rooflights	1.5	1.5	0-LOBBY 1 Window 1
Personnel doors	1.5	-	"No heat loss personnel doors"
Vehicle access & similar large doors	1.5	-	"No heat loss vehicle access doors"
High usage entrance doors	1.5	-	"No heat loss high usage entrance doors"
U <sub>i-Typ</sub> = Typical individual element U-values [W/(m <sup>2</sup> K)]		U <sub>i-Min</sub> = Minimum individual element U-values [W/(m <sup>2</sup> K)]	
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m <sup>3</sup> /(h.m <sup>2</sup> ) at 50 Pa	5	5

## Thermal bridges

There is at least one junction in the project whose linear thermal transmittance has been defined as having been calculated following a quality-assured accredited construction details approach in accordance with a scheme approved by the Secretary of State.

## Appendices

Appendix A – SBEM Building Fabric Data

Appendix B – SBEM Environmental Information

Appendix C – SBEM Ventilation Information

Appendix D – SBEM Domestic Hot Water Information

Appendix E – SBEM Lighting Information

Appendix F – Ground Floor Plan

## Appendix A – Building Fabric Information

Information provided by: Purcell UK and IDP

### Building Geometry, Layout and Orientation based on the following drawings:-

Purcell UK: 233183 - 204, 205, 206, 207

#### Construction 'U' Values

Element	W/m <sup>2</sup> K
Wall	0.25
Ground Floor	0.20
Roof	0.15
Doors (Glazed)	1.5

#### Glazing & Roof light Details

		Solar Gain Factors	
		Air Average	~
		Air Cyclic	~
U' Value	1.5	Env. Average	~
Light Transmission	~	Env. Cyclic Light	~
Shading Coefficient	~	Env. Cyclic Heavy	~

#### Air Permeability m<sup>3</sup>/h/m<sup>2</sup>

5
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Appendix B – SBEM Environmental Information

Information provided by: IDP

Area Ref	Heating	Fuel	Seasonal Efficiency	Cooling	Fuel	Seasonal Efficiency
All Areas	LTHW Boiler: Radiators	Gas	95%	–	–	–

Metering Information	
System has provision for metering?	YES
Meter warns of "out of range" values?	NO

Photovoltaic Panels	
Type	Monocrystalline Silicon
Area	25m <sup>2</sup> *
Inclination	30°
Orientation	South-West

\* The SBEM calculation assumes that the PV array will generate 2888 kWh of energy.

## Appendix C – SBEM Ventilation Information

Information provided by: IDP

Ref	Description	L/S/m <sup>2</sup>	Mech Supply	Supply SFP	Mech Extract	Extract SFP	Local Heat Recovery
0-TOILETS	WC's	5	~	~	Yes	1	~

Note 1 - Areas not identified with mechanical ventilation are assumed to be naturally ventilated. Compliance with Building Regulations with respect to window opening, trickle vents etc has been assumed.

Appendix D – SBEM Domestic Hot Water Information

Information provided by: IDP

Area Ref	Description	Secondary Circulation	Heater Efficiency	Fuel
All areas	Stand Alone Water Heater	N/A	100%	Electricity

## Appendix E – SBEM Lighting Information

Information provided by: IDP

Area Ref	Lighting Design	Controls
0-UNIT D	8 (W/m <sup>2</sup> /300lux)	Manual On / Off
0-LOBBY 1	7 (W/m <sup>2</sup> /200lux)	Manual On / Off
0-LOBBY 2	7 (W/m <sup>2</sup> /200lux)	Manual On / Off
0-TOILETS	8 (W/m <sup>2</sup> /200lux)	Occupancy Sensing (Automatic On / Off)
0-TEA RM	7 (W/m <sup>2</sup> /200lux)	Manual On / Off
0-MEETING	10 (W/m <sup>2</sup> /300lux)	Manual On / Off

General System Information	
Electric Power Factor	0.9 to 0.95
System has provision for metering?	YES
Meter warns of "out of range" values?	NO

Appendix F – Ground Floor Plan

