

## Company Profile



Zero-Carbon Solutions was founded in 2006 to help introduce environmentally sound methods, products and thought into the UK built environment and construction industry.

The expertise of the Company is based on an informal association of graduate engineers, architects and energy experts from the UK,

Scandinavia, Germany and the Czech Republic.

Between them, the team have many years of practical experience in design and construction of low energy and passive houses with their associated energy supply and management solutions throughout Europe.

The company was founded and is headed by Danish civil engineer Niels Bjergstrom, a UK resident since 1990.

## Services and Products

### **Design and Engineering of Passivehouses and Low Energy Buildings**

Zero-Carbon Solutions offers full design services for small and mid-sized buildings to low energy or passivehouse standards, as well as project management and site supervision.

This includes architectural design and development, design of heating and ventilation, energy management, PHPP, SBEM and SAP calculations and consultation with planning authorities.

### **Renovation to Low Energy Standards**

Zero-Carbon Solutions offers development of renovation solutions to low energy standards, including those suitable for listed buildings.

With new-builds constituting only a couple of per cent of the housing stock every year, renovation to low energy standards is arguably considerably more important than securing energy efficiency in new buildings. However, this is not an area that enjoys the attention and support it deserves.

Especially in Germany, many good and cost effective renovation solutions have been developed, which, with modifications, are suitable for use in the UK.

### **Sustainable Town and Energy Planning**

Removing the inefficient and polluting large energy producers from the equation is an important ecological consideration. This should be a major target in all new developments and a national political goal.

Planning and building towards self-contained, sustainable towns and developments without external connections to utilities (possible exceptions are water and waste) requires expertise in a large number of different fields. New towns and developments must be planned to optimise the use of solar energy - and be able to produce and store energy locally based on sustainable principles.

Zero-Carbon Solutions can deliver all of this.

### **Project Management**

Passivehouses and other low-energy building types are extremely difficult to get right and require advanced project and site management methods. It is



also a significant advantage to use as high a degree of off-site construction as practical.

Producing these types of buildings, not to mention whole integrated developments, requires very close cooperation between different types of experts such as design engineers, architects, town planners and energy system planners and designers.

Any design may falter if it is not followed up on the build site through professional site management and the use of skilled workers.

Zero-Carbon Solutions can help train site managers, assess plans, suppliers and calculations to ease the way towards airtight and fully insulated construction.

### **Development of "Green" Policies**

Zero-Carbon Solutions' experts can advise and help to develop "green" corporate and public policies based on knowledge of a long range of successful (and failing) policies in both the private and the public sectors. We constantly gather knowledge covering the whole sector.

### **Scandinavian Homes**

Zero-Carbon Solutions import and build domestic houses from the Swedish/Irish company Scandinavian Homes.

These houses are built to low energy or passivehouse specification. The walls, including factory-installed doors and windows,



are trucked directly from factory in Sweden to the build site. Other components plus labour are sourced locally. We deliver the houses as airtight and weather-proof envelopes or if required, turn-key. A ventilation system is always included. Available detached, semi and terraced, 1 - 2½ stories.



## Calculations and Energy Assessments

Zero-Carbon Solutions undertake all standard, and several advanced calculations including:

### PHPP - PassiveHouse Planning Package

PHPP is an advanced planning tool developed by the PassivHaus Institut in Darmstadt, Germany.

**Passive House Verification**

Building: End-of-Terrace Passive House Kranichstein  
 Location and Climate: Darmstadt Kranichstein Standard Germany  
 Street: D-64289 Darmstadt  
 Country: Germany/Hesse  
 Building Type: Terraced House/Dwelling  
 Home Owner(s) / Client(s): Bauherrengemeinschaft Passivhaus  
 Street: D-64289 Darmstadt  
 Architect: Prof. Bot/Rüdiger/Westermeyer  
 Street: Jahnstr. 8  
 Postcode/City: D-64285 Darmstadt  
 Mechanical System: oeb Dipl.-Ing. Hubert Stäbe  
 Street: Bahnhofstr. 49  
 Postcode/City: D-64319 Pfungstadt

View of Construction: 1991  
 Number of Dwelling Units: 1 Interior Temperature: 20.0 °C  
 Enclosed Volume V<sub>e</sub>: 665.0 m<sup>3</sup> Internal Heat Gains: 2.3 W/m<sup>2</sup>  
 Number of Occupants: 4.5

Specific Demands with Reference to the Treated Floor Area	Applied: Monthly Method	PH Certificate:	Fulfilled?
Treated Floor Area:	136.0 m <sup>2</sup>		
Specific Space Heat Demand:	14 kWh/(m <sup>2</sup> a)	15 kWh/(m <sup>2</sup> a)	Yes
Pressurization Test Result:	0.2 h <sup>-1</sup>	0.6 h <sup>-1</sup>	Yes
Specific Primary Energy Demand (DHW, Heating, Cooling, Auxiliary and Household Electricity):	65 kWh/(m <sup>2</sup> a)	120 kWh/(m <sup>2</sup> a)	Yes
Specific Primary Energy Demand (DHW, Heating and Auxiliary Electricity):	37 kWh/(m <sup>2</sup> a)		
Specific Primary Energy Demand Energy Conservation by Solar Electricity:	10 kWh/(m <sup>2</sup> a)		
Heating Load:	10 W/m <sup>2</sup>		
Frequency of Overheating:	3 %	0W/m <sup>2</sup> 23 °C	
Specific Useful Cooling Energy Demand:	9 kWh/(m <sup>2</sup> a)	15 kWh/(m <sup>2</sup> a)	
Cooling Load:	9 W/m <sup>2</sup>		

It supports comprehensive energy balance calculations including seasonal variations, shading and solar gain. The system calculates energy gains and losses and takes almost all sources into consideration, including the risk of summer overheating.

Based on these calculations it is possible to tailor and dimension heating and ventilation systems to be as cost effective and environmentally friendly as possible.

**PASSIVE HOUSE PLANNING**  
**SPECIFIC USEFUL COOLING DEMAND**  
**MONTHLY METHOD**

Climate: Standard Germany  
 Building: End-of-Terrace Passive House Kranichstein  
 Location: Darmstadt Kranichstein  
 Winter Temperature: 23 °C  
 Building Type: Terraced House/Dwelling  
 Treated Floor Area: 136 m<sup>2</sup>

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Heating Degree Hours	167	163	167	123	93	65	57	62	82	119	143	177	143
Heating Degree Hours	117.2	10.4	11.9	10.6	10.0	9.3	7.9	8.1	9.9	14.4	10.6	11.4	114
Losses - External	1764	1530	1482	1164	890	677	542	552	776	1121	1410	1676	13551
Losses - Ground	126	117	120	116	113	94	89	86	92	101	106	119	1288
Losses - Summer Ventilation	724	627	696	489	360	266	246	314	448	587	804	937	6807
Sum Spec. Heat Losses	18.6	14.6	14.1	11.2	8.6	6.2	5.6	5.9	7.6	10.7	13.3	15.9	130.4
Solar Load North	38	42	73	104	140	154	173	84	50	30	30	1001	1001
Solar Load East	0	0	0	0	0	0	0	0	0	0	0	0	0
Solar Load South	89	201	226	203	200	288	272	209	272	216	100	72	2688
Solar Load West	7	14	21	32	40	39	40	35	27	16	6	5	269
Solar Load Horiz.	0	0	0	0	0	0	0	0	0	0	0	0	0
Solar Load Dynamic	19	36	54	83	105	104	107	94	69	43	21	13	746
Internal Heat Gains	244	220	244	236	244	226	244	244	236	244	236	244	2070
Sum Spec. Loads Solar + Internal	2.5	3.3	4.0	4.7	5.2	5.1	5.2	5.1	4.4	3.6	2.6	2.3	48.0
Utilization factor Losses	16%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Useful Cooling Energy Q	0	0	0	0	0	3	10	6	0	0	0	0	122
Spec. Cooling Demand	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1

Bar chart showing Specific Losses, Loads, Cooling Demand (kWh/(m<sup>2</sup> month)) from Jan to Dec. Legend: Sum Spec. Heat Losses (blue), Spec. Cooling Demand (red), Sum Spec. Loads Solar + Internal (green). Value: 13.3.

PHPP calculations constitute the basis for attaining Passivehouse certification but are also suitable to calculate the environmental impact of other types of buildings, including commercial buildings, schools, etc. It is currently the most advanced tool available for this purpose.

PHPP software, calculations and training is available from Zero-Carbon Solutions - as are Passivehouse certification services.

### SBEM - Simplified Building Energy Model

This calculation system is a part of the Department for Communities and Local Government's (DCLG's) National Calculation Methodology (NCM), the methodology prescribed by the UK government. SBEM, which is based on a Dutch method, is currently undergoing further development.

This system has been selected for use in connection with energy assessments for commercial properties. It will become mandatory for commercial buildings and some public buildings to go through assessment later

General | Project Database | Geometry | Building Services | Ratings | Building navigation

HVAC systems | [DHW] generators | SES | [DVS] generators | [WV] generators | Zones | Project

Record selected: HVAC for the example building

General | Heating | Cooling | System Adjustment | Control Directions | Zone Summary

Name: HVAC for the example building  
 Type: Central heating using water radiators

Heating system:  
 Heat source: [DHW] boiler  
 Fuel type: Natural gas

Cooling system:  
 Fan coil  
 VAV  
 Chilled water  
 Air conditioning

Check if the system also uses CHP

For the HVAC system, Ventilation is defined as zone gain

in 2008 and to supply and/or display Energy Performance Certificates (EPCs), either when put on the market or permanently.

Zero-Carbon Solutions' energy assessors are currently undergoing training to be able to carry out commercial and public building energy assessments as these are rolled out, starting April 2008.

### SAP - Standard Assessment Procedure

SAP is the standard procedure used to perform energy calculations of new dwellings, and in a simplified form, of existing dwellings.

This procedure must be regarded as obsolete for design purposes but is required to demonstrate compliance with Building Regulations. It should arguably be phased out. Prescribing specific calculation methods in law is generally a bad idea because it prevents industry from using state of the art science, delaying innovation and lowering quality.

### RdSAP - HIPs

Zero-Carbon Solutions perform Reduced SAP calculations and produce Home Information Packs locally for Lincolnshire.

### Airtightness (Blower Door) Tests

Zero-Carbon Solutions carry out airtightness tests on small to mid-sized buildings, including design of sampling schemes for domestic developments.

