REPORT ON:
UK BENCHMARK HOUSE

Dr Carlos Jimenez-Bescos - Building Engineer
& Senior Lecturer in Construction
University of Westminster

Dr Leon Crascall - Architectural Technologist
& Senior Lecturer in Architecture
University of Suffolk

www.activehouse.uk

Active House Alliance (UK Chapter) Ltd
Registered in Scotland (SC72790) at
Woodside Way, Glenrothes. KY7 4ND

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UK Benchmark

How does a typical UK house type perform?

Active House UK was commissioned by VELUX A/S to assess a typical ‘mass built’ UK house-type against the Active House Radar.

The house is a common typology in the UK. This actual design belongs to a national house builder, but is common to many other developers also.

This report provides an overview of the results of the Active House radar assessment. It should be read in conjunction with the Active House Specification 3.0 and the file (.JSON) for this project. Further property data is available on request.

The property data was supplied by the developer via the Future Homes Hub.

Benchmark house drawing

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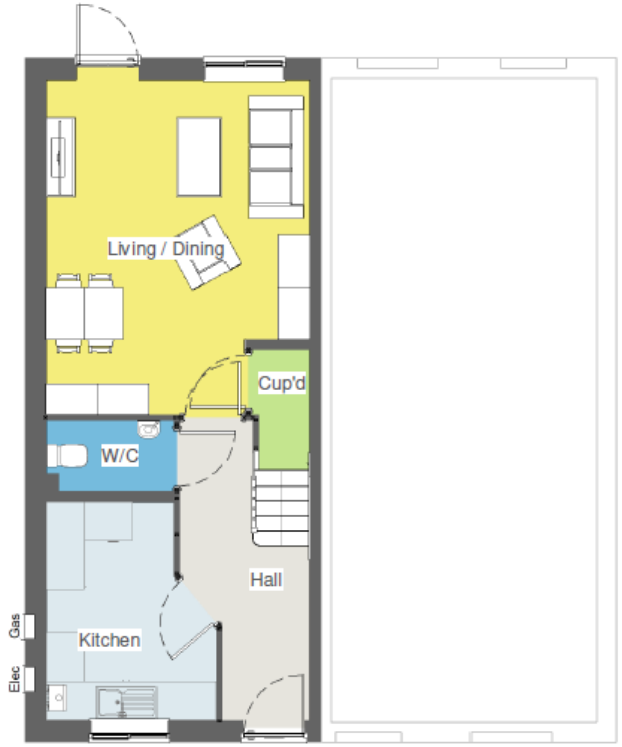
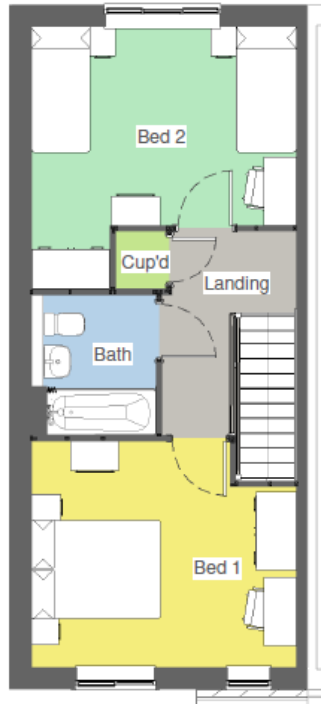
What is the benchmark house?

- Semi 2 bedrooms
- Floor area of 81.34 m^2
- Located in London
- Built to UK Building Regulations
- Heating with combi boiler and radiators
- No MVHR
- No cooling
- No PV
- Standard Construction





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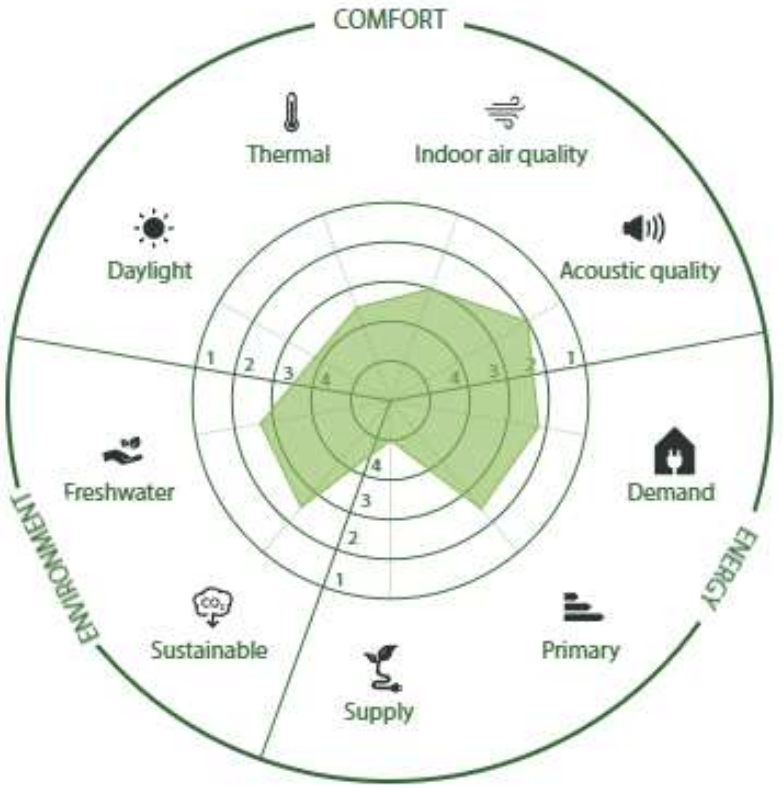
Active House Results

Active House is a methodology for evaluating and scoring a building against nine parameters, based on the **Active House 3.0 Specification**, on a scale of 1 (best) to 4 (worst).

The radar (right) provides an overview for each of the nine parameters of the benchmark house.

Some of the data is required for statutory compliance but in many cases, further modelling or calculations are required.

The Radar is generated by inputting the calculation data using the tool at **radar.activehouse.info.** The data for this project is available as .JSON file for use in the tool.



UK Benchmark House Results Radar

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Active House Radar

Overview of scores

(Target is 2.5)

DAYLIGHT	3.8
THERMAL ENVIRONMENT	3.5
INDOOR AIR QUALITY	3.0
ACOUSTIC QUALITY	2.0
ENERGY DEMAND	2.2
PRIMARY ENERGY PERFOMANCE	2.4
ENERGY SUPPLY*	OUT OF CATEGORY
SUSTAINABLE CONSTRUCTION	2.5
FRESHWATER CONSUMPTION	2.7

* No renewable energy supply in the benchmark house. The AH tool requires a minimum value to be entered, which cannot be zero, so a value of 1 kWh/m2 was added to thermal and electrical supply. Nevertheless, PV panels are becoming the norm for new construction.

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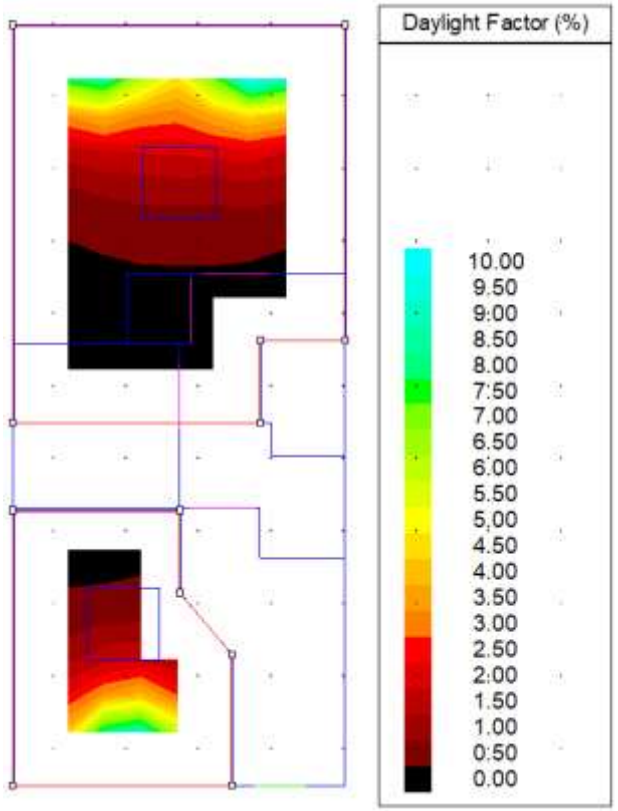
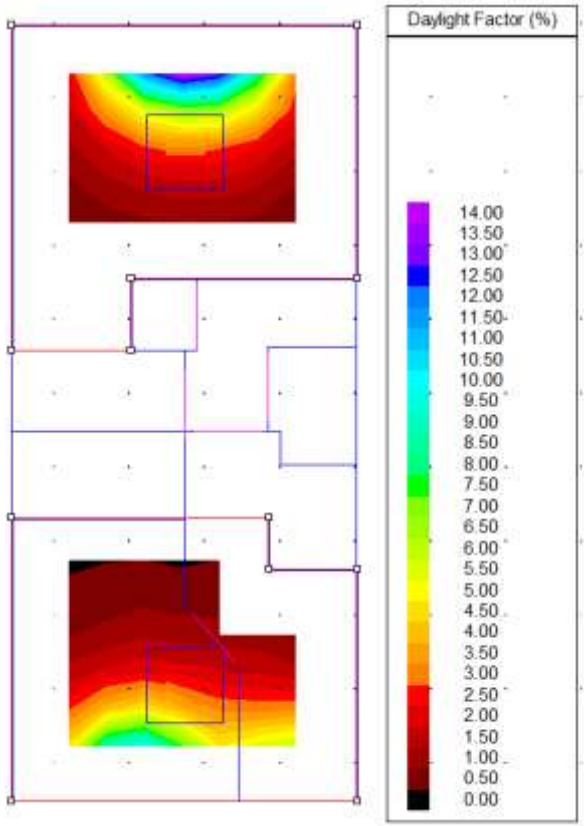
Daylight (Score: 3.8)





Active House allows for daylight to be measured using Daylight Factor of Daylight Autonomy.

Daylight Factor was used for this benchmark.

Comfort
- Daylight
- Thermal environment
- Indoor air quality
- Acoustic quality

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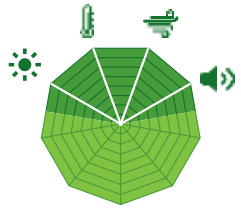
Daylight (Score: 3.8)



Comfort
Daylight
Thermal environment
Indoor air quality
Acoustic quality

- Targeting for a 2% daylight factor:
- Over 40% of the occupied space in the ground floor
- Over 50% of the occupied space in the first floor

- Missed opportunity with the West elevation with no windows
- No windows in WC and bathroom

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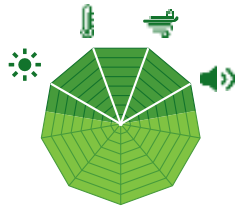
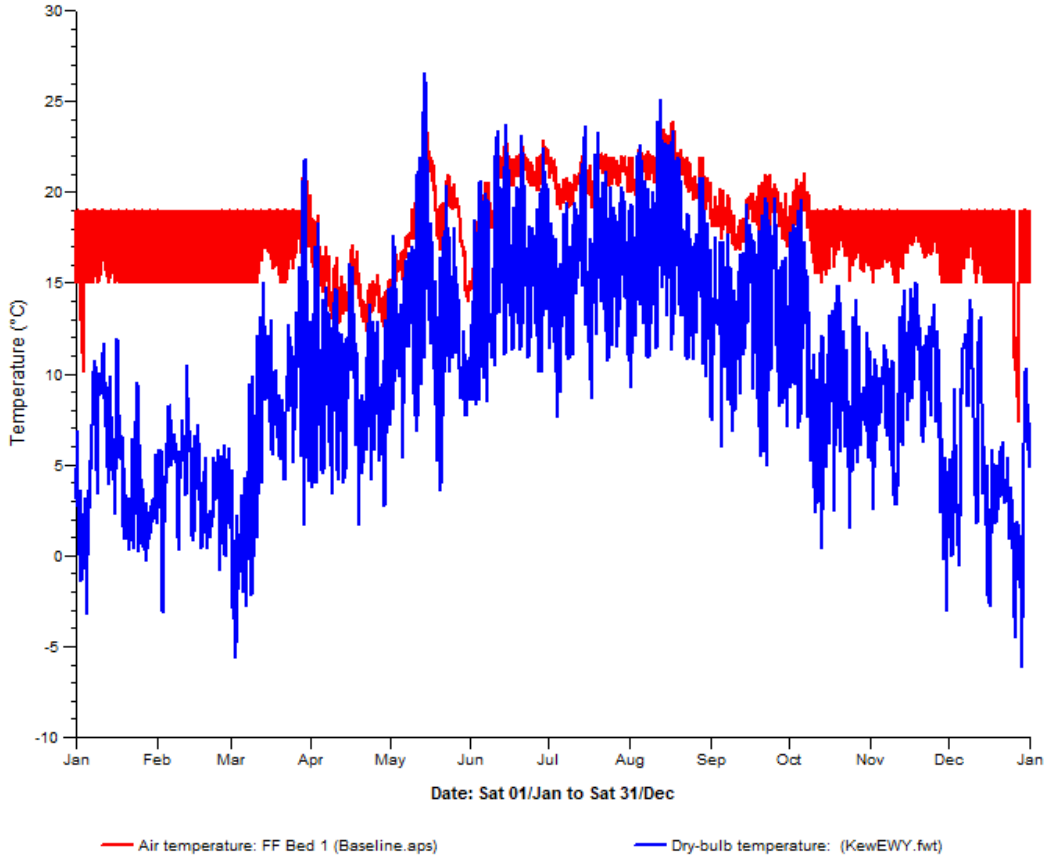
Thermal Environment (3.5)





- Maximum and minimum operative per room
- Score in relation to Outdoor temperature
- Hours of used and number of people for a weighted score

Comfort
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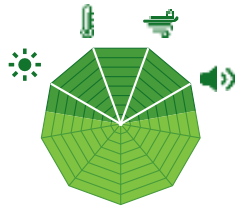
Indoor Air Quality (Score: 3.0)



Comfort
- Daylight
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GF Living/Dining 3

CO2 concentration above outdoor
< 800 ppm

Kitchen GF 3

CO2 concentration above outdoor
< 800 ppm

Bedroom 1 1F 3

CO2 concentration above outdoor
< 800 ppm

Bedroom 2 1F 3

CO2 concentration above outdoor
< 800 ppm

- Good values for CO2 concentration
- Still opportunities to improve
- Good ventilation help to improve indoor air quality but no MVHR

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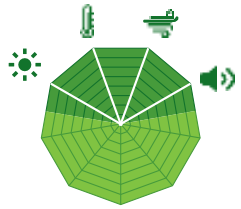
Thermal Environment (Score: 3.5)



GF Living/Dining					3.5
Room with air conditioning?	Summer category	Winter category	Summer score	Winter score	
no	Good level	Lowest level	3	4	

Kitchen GF					3.5
Room with air conditioning?	Summer category	Winter category	Summer score	Winter score	
no	Good level	Lowest level	3	4	

Bedroom 1 1F					3.5
Room with air conditioning?	Summer category	Winter category	Summer score	Winter score	
no	Good level	Lowest level	3	4	

Bedroom 2 1F					3.5
Room with air conditioning?	Summer category	Winter category	Summer score	Winter score	
no	Good level	Lowest level	3	4	

Comfort
- Daylight
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- Winter scores suffer for a low heating set point
- First floor suffers from windows and roof choices

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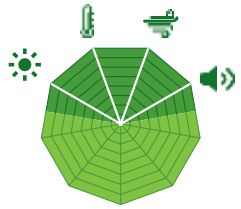
Acoustic Quality (Score: 2.0)



Comfort
- Daylight
- Thermal environment
- Indoor air quality
- Acoustic quality

GF Living/Dining 2

Inside system noise	Outside noise
< 25 dB, or below background noise	< 35 dB

Kitchen GF 2

Inside system noise	Outside noise
< 25 dB, or below background noise	< 35 dB

Bedroom 1 1F 2

Inside system noise	Outside noise
< 25 dB, or below background noise	< 35 dB

Bedroom 2 1F 2

Inside system noise	Outside noise
< 25 dB, or below background noise	< 35 dB

- Assumptions based on typical construction

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Energy

SCORES

Energy demand: (Score: 2.2)

Energy supply: (Score: OoC*)

Primary energy: (Score: 2.4)

* No renewable energy supply in the benchmark house. The AH tool requires a minimum value to be entered, which cannot be zero, so a value of 1 kWh/m2 was added to thermal and electrical supply. Nevertheless, PV panels are becoming the norm for new construction.

- Energy demand based on SAP results
  - Heating demand of 853.78 kWh/m^2
  - DHW demand of 961.91 kWh/m^2
  - Auxiliar energy (electricity) of 41.26 kWh/m^2
- Combi gas boiler to supply heating and hot water on demand
- Energy supply suffers from a lack of integration of renewables
- Lack of renewables affects the primary energy category

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Environment

- Freshwater performing very reasonable from Building Regulation standards
- Scope for grey and rainwater but impact mostly based on freshwater consumption
- Limited data available on bill of quantities due to lack of regulations. Use of UK industry norms.

Environment

Sustainable construction

Freshwater

ASPECT	VALUE	CRITERIA
Global warming potential (GWP) during building's life cycle.		1. < -30 kg CO_2-eq./m² x a 2. < 10 kg CO_2-eq./m² x a 3. < 40 kg CO_2-eq./m² x a 4. < 50 kg CO_2-eq./m² x a
Ozone depletion potential (ODP) during building's life cycle		1. < 2.25E-07 kg R_{11}-eq/m² x a 2. < 5.3E-07 kg R_{11}-eq./m² x a 3. < 3.7E-06 kg R_{11}-eq./m² x a 4. < 6.7E-06 kg R_{11}-eq./m² x a
Photochemical ozone creation potential (POCP) during building's life cycle.		1. < 0.0025 kg C_2H_4-eq./m² x a 2. < 0.0040 kg C_2H_4-eq./m² x a 3. < 0.0070 kg C_2H_4-eq./m² x a 4. < 0.0085 kg C_2H_4-eq./m² x a
Acidification potential (AP) during building's life cycle.		1. < 0.010 kg SO_2-eq./m² x a 2. < 0.075 kg SO_2-eq./m² x a 3. < 0.100 kg SO_2-eq./m² x a 4. < 0.125 kg SO_2-eq./m² x a
Eutrophication potential (EP) during building's life cycle.		1. < 0.0040 kg PO_4-eq./m² x a 2. < 0.0055 kg PO_4-eq./m² x a 3. < 0.0085 kg PO_4-eq./m² x a 4. < 0.0105 kg PO_4-eq./m² x a

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APPENDIX 1 – Tools for calculations

Energyplus

Dialux

OpenStudio

Velux Visualizer

Open Source

IDA ICE

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Acoustic quality

DesignBuilder

IESVE

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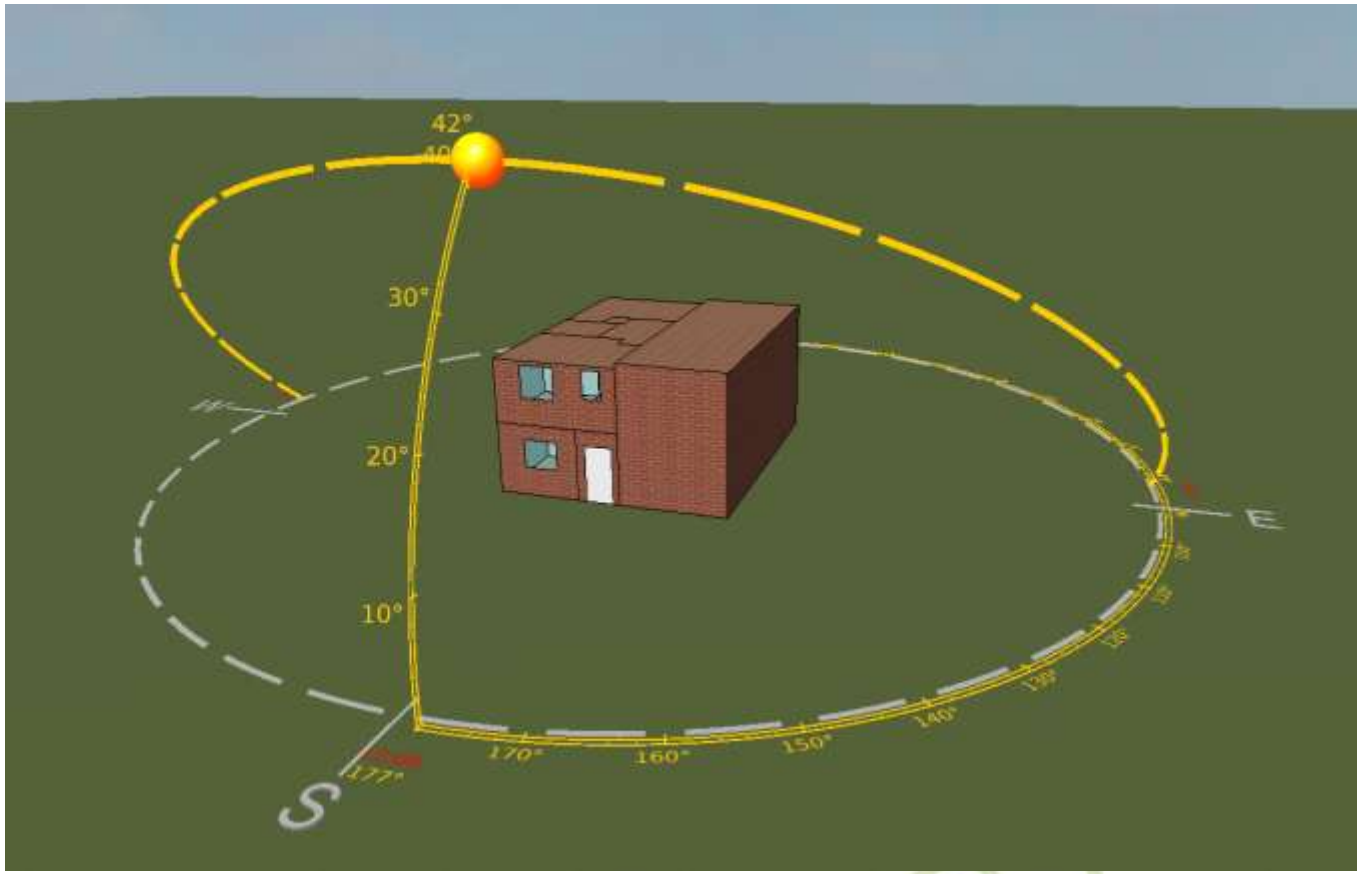
APPENDIX 2: Comfort – IESVE Model



Comfort
- Daylight
- Thermal environment
- Indoor air quality
- Acoustic quality

- Optimised to indoor temperature and CO_2 concentration
- Ideal occupants
- Summer windows opening above 22°C
- Infiltration and minimum fresh air

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