

The Environmental Building

A model for the 21st century



BRE

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BRE's Environmental Building provides a model for offices for the 21st century. Innovative and environmentally advanced, it demonstrates the way for the future based on a platform of new low-energy targets.

It is the first building to use, as part of the design brief, the Performance Specification drawn up by the Energy Efficient Office of the Future (EOF) Group, a partnership between BRE, manufacturers, designers, fuel utilities and other building professionals. The building has achieved the highest possible BREEAM rating.

Research and monitoring criteria were developed at the planning stage, and performance assessment, which has run from the outset, is continuing after occupation.

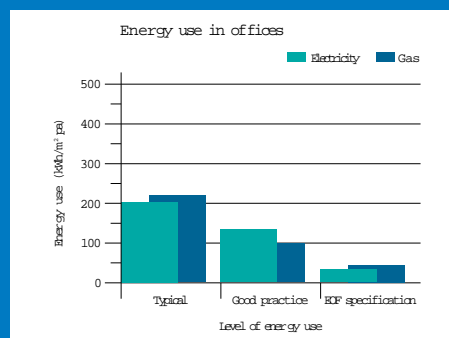
Low-energy brief

The building aims not only to provide a working office with low energy consumption in use, but also to serve as a large-scale experimental facility for evaluating various innovative technologies. The Performance Specification, a key element of the building brief, dictates performance targets for energy consumption and carbon dioxide (CO₂) emissions. The targets: 47 kWh/m² for gas; 36 kWh/m² for electricity; and 34 kg/m² for CO₂ emissions, represent a 30% improvement on current best practice and were to be met by:

- avoiding or minimising the use of air-conditioning
- maximising the benefits of the building fabric in terms of reducing/smoothing the heating and cooling loads
- minimising the use of artificial lighting while actively exploiting daylight
- applying the appropriate level of automatic and user controls.

However, energy efficiency is only acceptable when the design leads to a comfortable, healthy working environment. Consequently, the EOF Performance Specification considers thermal, visual and aural comfort; environmental health issues; and indoor air quality.

The design strategies used in response to the specification are summarised on the following pages.



Office energy consumption data

Innovative building design

Daylighting

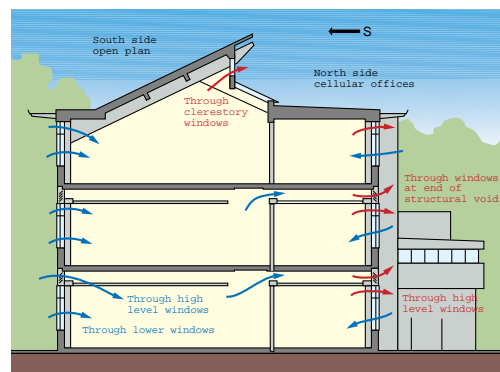
The use of daylighting has been maximised with solar gain being reduced by moveable external louvres on the south side of the building. These louvres also control glare while still allowing daylight in and views out, avoiding the 'blinds down, lights on' situation often prevalent in offices in winter.



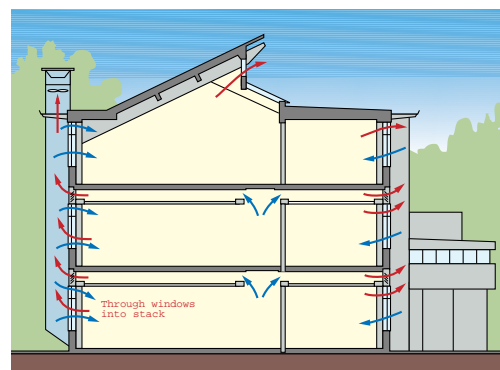
Good levels of daylight are achieved throughout the building

Natural ventilation

This has been utilised to minimise the use of fans. The use of a novel ceiling slab allows the building to be flexible in terms of space layout without hindering the natural ventilation pathways.



Cross ventilation, windy summer's day



Stack ventilation, hot still summer's day

Night and groundwater cooling

Air-conditioning has been avoided by exposing the ceiling slab. The slab absorbs heat during the day and is cooled down by ventilation at night. Pipes embedded in the floor can provide additional cooling utilising groundwater.



Low-energy cooling. Underfloor pipework cools the floor slab using groundwater

Lighting

A fully integrated, intelligent and efficient lighting system has been installed which automatically compensates for daylight levels and occupancy, controlling each light separately.



Electric lighting is provided by a highly efficient and fully controllable luminaire system



Three-way sensor for the lighting system provides daylight and occupancy level sensing and a receiver for an infrared controller

Controls

The operation of the building systems is controlled automatically using the latest integrated technology. Occupants also have a high degree of control over their local environment by overriding automatic control of the lights, louvres, windows and heating. In addition they can manually open mid-level windows.



Occupants can override automatic settings for lights, louvres, windows and heating

Photovoltaic array

The 47 m² Building Integrated Photovoltaic (BIPV) array incorporated in the Environmental Building provides non-polluting electricity directly to the building. Utilising thin film amorphous silicon cells, the array seeks to explore issues associated with the integration of photovoltaics into vertical walling, building on previous demonstration installations within the UK.



The south-facing photovoltaic façade

Green features in the Environmental Building

As well as designing an energy efficiency building, every effort has been made to include environmentally friendly products and materials. The 'green' elements in the building are:

- 80 000 reclaimed bricks
- 96% of the old building was reclaimed or recycled
- reclaimed mahogany parquet flooring
- 90% of in-situ concrete used recycled aggregate
- ground granulated blast furnace slag used in the cement mix
- timber sourced from sustainable resources
- low-flush toilets
- environmentally friendly paints and varnishes.

Recycled parquet flooring came from the old County Hall building in London



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Planned monitoring of the Environmental Building

BRE will be conducting post-occupancy monitoring covering:

- energy consumption
- quality and comfort of the internal environment
- daylighting levels
- performance of glass louvres
- airflow in stacks and floors
- air change rates
- open plan space utilisation
- stresses in superstructure from construction and occupancy loads
- photovoltaics.

Results will be disseminated through various events and publications, including DETR's Best Practice programme and Thermie.

BREEAM

The standard-setting product BREEAM, and its derivatives – the Office Toolkit and the Environmental Standard Award for Homes – promote wider appreciation of the business benefits of superior overall environmental performance, provide guidance on how this can be achieved and give recognition to users for so doing.

Developed by BRE in partnership with industry, BREEAM is the world's first independent and comprehensive assessment method to cover the environmental performance of a building. It deals with issues at three levels: global atmospheric pollution; the local environment of the building; and the indoor environment.

BREEAM draws on a wealth of BRE's diverse expertise on a very wide range of issues, leading to a holistic environmental assessment method for buildings – whole building, whole lifetime, whole impact.

For further information contact the Centre for Sustainable Construction. Telephone 01923 664462.



Acknowledgements

The Energy Efficient Office of the Future project was coordinated by BRECSU as part of the Department of the Environment, Transport and the Regions' (DETR) Energy Efficiency Best Practice programme.

BRE would like to thank the following for their valuable contribution to this project:

Arup Research and Development
British Gas plc
Caradon Trend Ltd
Colt International Ltd
Eastern Electricity
Electricity Association
Hepworth Building Products Ltd
Laing Technology Group
Phillips Lighting Ltd
Pilkington United Kingdom Ltd
Stanhope Properties Ltd

Design and construction team:

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Architect: Feilden Clegg Architects
Services engineers: Max Fordham and Partners
Structural Engineers: Buro Happold
Quantity surveyors: Turner and Townsend
Landscape architects: Nicholas Pearson Associates
Space planning: DEGW
Planning supervisor: Symonds Travers Morgan
Main contractor: John Sisk

DETR's Energy Efficiency Best Practice programme

For further information, and for publications on other low-energy buildings, contact BRECSU Enquiries Bureau. Tel 01923 664258. Fax 01923 664787. E-mail brecsuenq@bre.co.uk



ENERGY EFFICIENCY
DEPARTMENT OF THE ENVIRONMENT,
TRANSPORT AND THE REGIONS

The BRE logo is the letters "BRE" in a bold, white, serif font, set against a black rectangular background.