Introduction

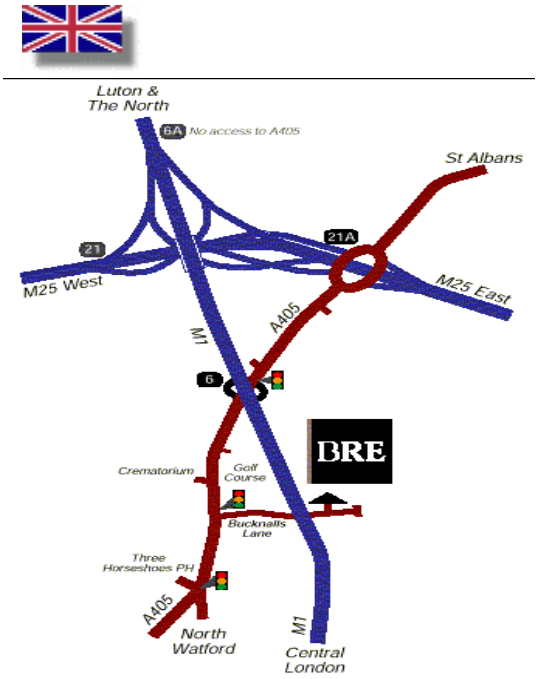
The new building for BRE (Building Research Establishment) B16, contains office space for 100 staff and 800m² of conference facilities. In the design focus was made on energy use. This resulted in 30% lower use then current best practice, by making use off the sun, cross ventilation and bore holes to store heath. Further care was taken in choosing materials. The materials of the old building on the site have been reused in the new building for 96%, although not all in the Environmental Building.

The building consists of two parts approximately 1300m² of offices for about 100 staff and about 800m² of seminar facilities. The building is approximately 2040m² of total gross area and 1470m² or net usable area. The stack facade of the building faces almost exactly north south with the main seminar room on the north side of the offices. The offices are 30m X 13.5m with the long axis running east west, and the west wall connecting to the entrance atrium. The stacks and the solar shading are on the southerly facade of the offices.

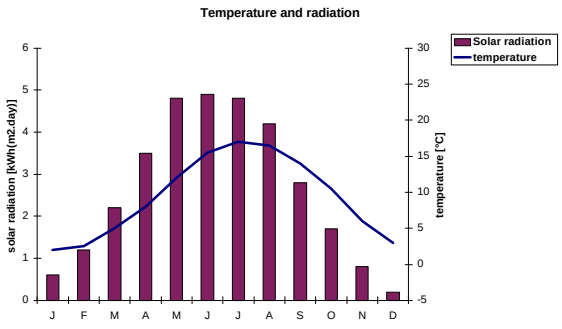
During the design process, it was decided to follow a two stage tender process, as this would allow a main contractor to be appointed early in the life of the project. They would then be able to advise on buildability issues and assist with the value engineering of the project. This was considered necessary due to the highly integrated approach of architecture, services and structure within the design.

Client/owner	*BRE*
	www.bre.co.uk
Architect	*Feilden Clegg Architects*
Project manager	*Bernard Williams and Associates*
Service Engineers	*Max Fordham and Partners*
Structural Engineers	*Buro Happold*
Main contractor	*John Sisk*
Structural Engineers	*Buro Happold*
Quantity surveyors	*Turner and Townsend*
Landscape architects	*Nicholas Pearson*
Associates space planning	*DEGW*

Regional and Urban Context

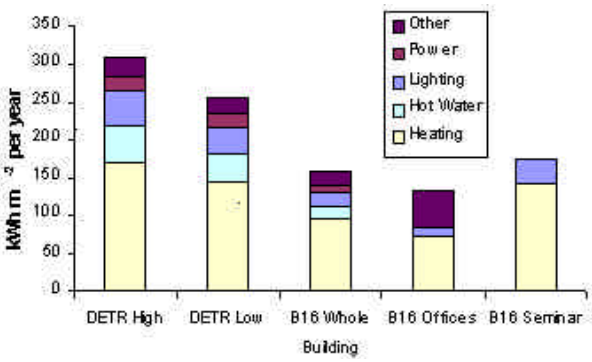


The office is built on the BRE site at Garston, which is a suburban setting. The BRE-campus consists of a large number of buildings virtually surrounded by countryside, however with the M1 rather close to one side of the site. The new building is right in the middle of the campus and was used to try to provide a focus to the site.



Climate

Type of climate	*mild, sea climate*
Altitude (m)	
Latitude	*51°29 NB*
Longitude	*0°27 WL*
Average ambient temp (°C)	*9.6*
January	*3.5*
July	*16.5*
Degree days (base 18°C)	
Global irradiation (kWh/m²)	
Sunshine hours (h)	*1,574*



The graph shows the relatively high energy score of the BRE-building compared to normal (DETR high) and good (DETR low) practice in the region.

Low-Energy: The targets 40 kWh/m² for gas, and 35 kWh/m² for electricity are nearly met (respectively 47 and 36) by the following measures:

- Avoiding/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.

Block and Building

Natural Ventilation: is 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.

Night and ground water cooling: Air-conditioning is avoided by exposing the ceiling slab. The slab absorbs heat during the day and cools down by ventilation at night. Pipes embedded in the floor can provide additional cooling utilising groundwater.

Lighting: A fully integrated intelligent and efficient lighting system is installed. It compensates automatically for daylight level and occupancy. Each light can be controlled separately.

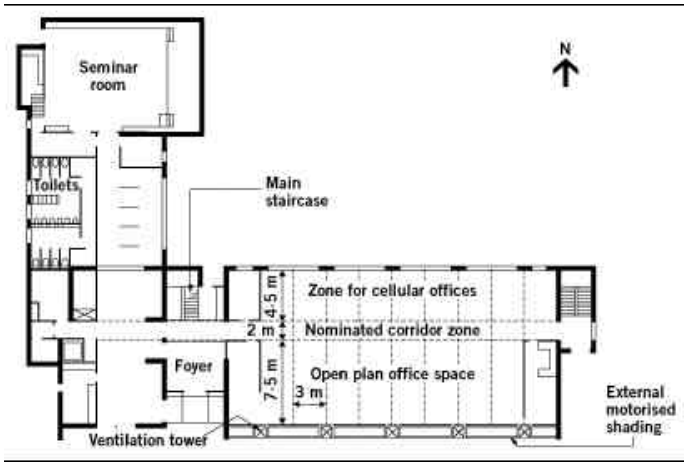
Controls: The operation of the building system is controlled automatically using the latest integrated technology. Occupants also have a high degree of control over their local environment by overriding automatic control of the lights, louvers, windows and heating. In addition, they can manually open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

Photovoltaic array: The 47m² PV provides electricity directly to the building.

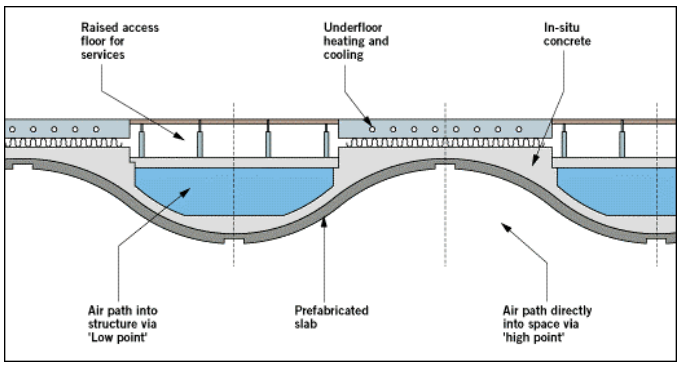
Material resources availability: demolition waste of the former building has been reused.

Transportation systems: The site is well connected to motorways, although immediate access is through residential areas. There are bus services to both local towns within 500m and a railway station one mile away.

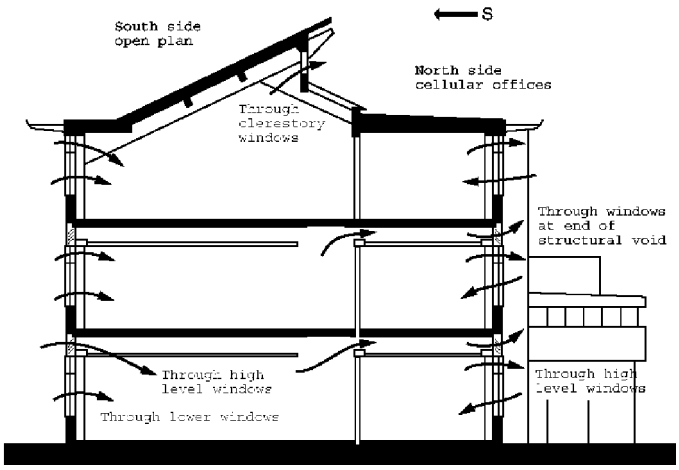
Water management: Low water products are used where appropriate. Borehole water is used in the cooling of the building. The building is connected to the mains water supply and sewerage.



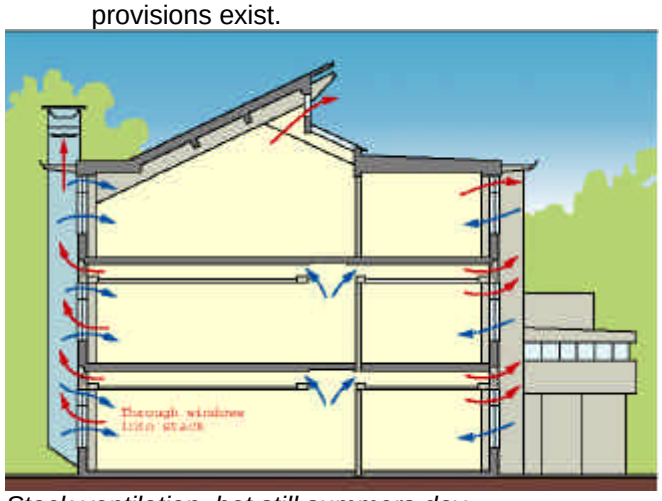
Green building aspects



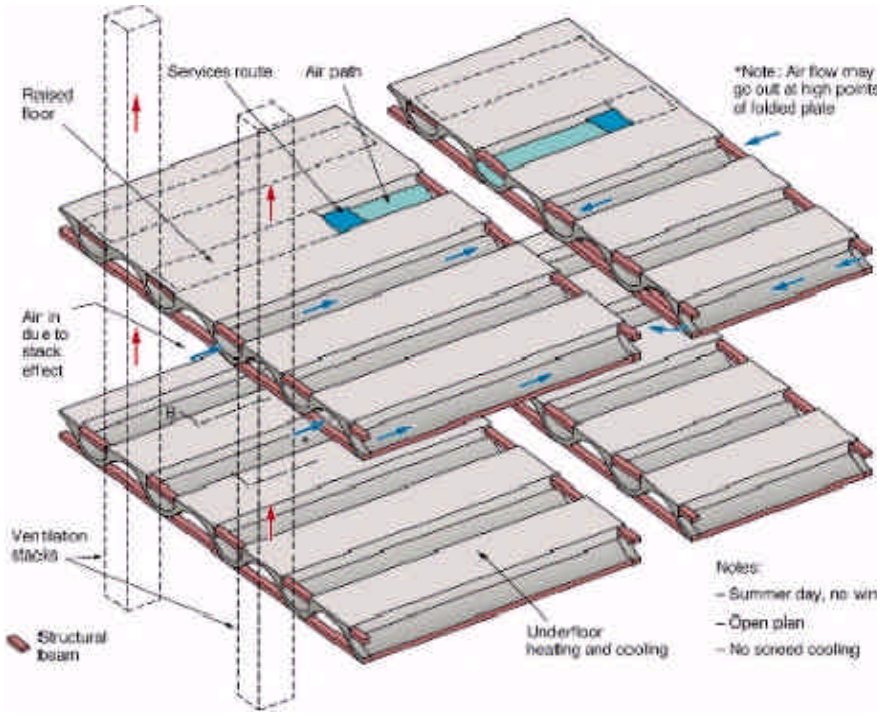
- Use of resource-efficient materials: In total 96% by volume of the old building No.16 has been recycled and lime mortar is used so bricks can be reused again.
- Minimisation of energy and materials waste throughout the life cycle.
- Design of the building shell for energy efficiency.
- Site planning using natural resources (solar, wind, shading and drainage).
- Operation and maintenance systems to support waste reduction and recycling.
- Public transport, teleworking and bicycle provisions exist.



Cross ventilation, windy summer's day



Stack ventilation, hot still summers day



Project Data	Project case		Reference case	
First construction	*December 1996*			
Construction costs (€)	*4,800,000*			
Urban plan				
Area (ha)				
Floor Area (m² gross floor area)	*2,100*			
Floor Area Ratio				
Transport				
Distance to car park	*min 20m*			
Distance to public transport	*about 500m*			
Frequency of public transport				
Bicycle storage	*Yes*			
Telecommunication	*yes*			
Waste separation				
Construction and demolition waste	*yes, and reuse*			
Household waste	*yes – paper*			
Design for deconstruction	*yes*			
Building Materials				
Construction	*masonry*			
Facades	*brick and block*			
Roof	*Aluminium, timber, concrete*			
Window frames	*timber*			
Internal walls				
Recycled materials	*96% of old building*			
Insulation	**area**	**U-value**	**area**	**U-value**
Ground floor area (m²/bldg)				
Roof area (m²/bldg)				
External wall area (m²/bldg)				
Window area total (m²/bldg)				
South (m²/bldg)				
Ventilation system	*cross ventilation, passive stack*			
Infiltration	*ditto*			
Exhaust	*ditto*			
Heat recovery	*no mechanical exhaust*			
Air exchange rate, heating season				
Back-up systems	**use (kW/h/m²/y)**	**system**	**use**	**system**
Space heating	*47*	*underfloor+wall rads, wet system*		
Domestic hot water		*central storage*		
Cooling	*0*	*night and ground water cooling*		
Electricity production		*mains supply, pv*		
Energy data	**kWh/m²y**			
Gas consumption	*47*			
Electricity consumption	*36*			
Domestic hot water				
Electricity (total)	*23*			
Lighting	*9*			
Fans + pumps	*0.5*			
Small power				
Solar systems				
Passive	*95 % net floor area not in need of artificial light during office hours*			
Active	*n*			
PV	*46 m²*			
Water				
Supply				
Toilet system (4, 6, 9 litres)	*6*			
Shower	*N/A*			
Bath	*N/A*			
Sewage				
Rainwater collection	*-*			
Grey water system	*-*			