

greenhouse gas emissions. Specific features include:

The building envelope is super insulated - typically a 300-350mm thick rockwool envelope. The high levels of insulation in the walls, floor and roof minimises heating requirements, resulting in an overall heat loss of only 15kW for the whole building .

Electricity is generated by an array of photovoltaic panels on the South facing roof with a peak electrical output of 11kW, producing an estimated annual output of 14,000 kWhours. The building is connected to the electric grid, sometimes importing and sometimes exports electricity to a "Green" electricity provider.

A "heat-pump" is used to provide heating and hot-water, taking low-grade heat from the lake by circulating water in plastic pipework sunk in the bottom of the lake. This pipework carries pure water & anti-freeze and the effect of the system on the lake water temperature is negligible. A heat pump operates on a reverse refrigeration principle, so that the amount of heat provided by the system is equivalent to over three times the amount of electricity it uses.

Additional heat is provided by roof mounted hot-water solar panels, and the heat from both sources is stored as hot water in an insulated thermal store. This supplies under-floor heating throughout the building and hot-water to the kitchen, toilets and classroom.

The building has been specified to achieve at least a 'very good' rating under the BREEAM environmental assessment procedure. Additional environmental features have been incorporated to achieve this including storage space and facilities for recyclable waste materials.

Windows sizes were calculated to achieve good levels of daylight in all rooms, reducing the need to use artificial lighting. They also maximise solar heat gains in winter whilst

controlling direct sunlight in summer and provide window openings for a good ventilation air flow

Control systems for heating lighting and ventilation were selected to meet user needs in the simplest practical way, whilst maintaining good energy efficiency.

Outline Specification of Building Services

The design is in accordance with:

- Current editions of all relevant British and European Standards
- CIBSE Design Guides and Codes of Practice
- The Water Regulations
- Current Building Regulations
- HSE Guidance on control of Legionella
- BSRIA Environmental Code of Practice for Buildings and their Services

Fixtures & Fittings

Many of the fixtures, fittings and furnishings have been sourced to meet our environmental aspirations including:

- Office furniture – bought second hand
- Café and conference room furniture – from Ikea. Tables are made from off cuts from other products. Solid timber from managed forests – inherently recyclable
- Noticeboards – made from re-cycled timber

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Attenborough Nature Centre

Information about our building

Conception, planning & funding

A long held dream of many to have Education & Visitor facilities at Attenborough Nature Reserve became a reality when both planning permission and funding for the project were achieved between October 2002 and August 2003.

Many criteria had to be met to put such a structure on a flood plain, a conservation area and Site of Special Scientific Interest, a nature reserve and green belt land.

So works were also completed on external areas to introduce new habitat areas to attract a greater diversity of wildlife along with exemplar mitigation works to reduce the risk of flooding to the surrounding areas.

The principal funding for the project was initiated with a grant from the East Midlands Development Agency who had aspirations to have an exemplar eco-building in the region – to demonstrate good practice to other organisations.

Added to by a large grant from the RMC Environment Fund (a tax levy on mineral extraction to mitigate the effects of extraction on the local community), the Heritage Lottery Fund, English Nature, Countryside Agency and valuable partnership and financial support from Broxtowe Borough Council, the green light was lit in mid 2003.

This fact sheet explains the environmental aspirations of the design for the centre in three separate areas :

- The specification of materials
- The method of construction of the building
- The environmental performance of the building.

Materials specification

In specifying materials for use in the building, the architects tried, as far as possible, to follow the advice and guidance of the following publications :

"The Handbook of Sustainable Building"
"The Green Guide to Specification"
"The National Building Specification Greening Report"

Foundations - 300mm diameter sleeved concrete augered piles, were used due to the poor ground conditions. Augered [drilled] piles were used rather than driven [hammered] piles to reduce noise pollution during installation. Precast concrete ground beams and stilt support legs elevate building above the 100 year flood plain level. Concrete was chosen for durability in flooded conditions and consequent low maintenance.

Steel frame ground floor structure – the main building sits on a steel frame with factory galvanised finish . This method of was chosen because it offered speed of construction and economy of materials, achieving minimum size and weight of structural members. The factory galvanised finish should achieve a substantial lifespan [20-25 years] for the steelwork without the need for re-coating. This offers advantages over a paint finish, which might

typically need repainting every five years.

Ground floor - Softwood joists sit on the steel frame [borate preservative treated where necessary]. The timber is from FSC accredited sources [UK sourced if possible, alternatively Scandinavian]. 300mm of Rockwool insulation, (volcanic rock) is used in all areas. The timber is treated with borates to preserve against rot, which also acts as a fire retardant.

The ground floor is underdrawn with cement fibre board to give rot proof, water and fire resistant surface finish, which will also be maintenance free.

External decking areas - Naturally durable untreated oak decking, [service life 30-60 years], from sustainable European sources, fixed to oak battens with stainless steel screws. The decking is supported on galvanised steel framing.

Balustrading to decking areas - The toughened glass panels [on public side of the building] are maintenance free [apart from cleaning] and extremely durable. They have the advantage of low visual impact so as not to impair views out from the building across the reserve.

Wall construction – A breathing wall, panel construction using softwood timber framed panels [softwood from sustainable Scandinavian sources]. Walls are clad externally with naturally durable oak boarding [service life 30-60 years], from sustainable European sources on borate preservative treated battens on bitumen impregnated fibreboard sheathing.

The whole 300mm thick wall cavity is filled with 300mm thick Rockwool insulation, achieving a low wall U-value.

Walls lined internally with plasterboard, taped and filled.

Roof structure [pitched roofs] - Factory lacquer finished Glu-laminated main sup-

port beams with engineered timber web beams spanning between main support beams. Engineered timber was specified due to large spans being unsuitable for softwood. Engineered timber has environmental benefits using small sections of wood, and waste wood materials to create engineered timber products that can outperform basic timber.

Roof finish externally - stainless steel sheeting has been used on low formaldehyde plywood. Stainless steel was chosen as it suits low pitches required generally for the roof [to reduce visual impact of the building], combined with its long term durability [Service life 60-100 years] and inherent recyclability. The Stainless steel used is also made from up to 70% recycled steel.

Roof construction [flat roofs, warm roof construction] - borate preservative treated joists lined internally with plasterboard. 19mm WBP plywood decking with EPDM single ply membrane, mechanically fixed to 150mm cork insulation, mechanically fixed to decking. EPDM flashings to abutments with pitched roofs and rooftop upstands.

EPDM is a rubber sheet membrane, which when mechanically fixed is inherently recyclable, and offers one of the best environmental options for flat roof coverings. Cork insulation is environmentally friendly, using a renewable resource, and it can be mechanically fixed enhancing its recyclability.

The rooflights in the main access corridor are aluminium frame flat glass, double glazed with high performance low U-value glazed units. Anodised aluminium frames were used for low maintenance and improved recyclability.

Anodised aluminium guttering and stacks used for low maintenance and improved recyclability

Doors and windows – The curtain walling is satin anodised aluminium framing with thermal break. Anodised aluminium frames are used for low maintenance and improved recyclability. Glazing to curtain walling are high performance low U-value units. All other windows, and glazed external doors, are oak framed. Oak is from Northern European sources and has a service life of 30 – 60 years.

Finishes - The Internal wall finishes, are generally plasterboard dry lining with all joints taped and filled. Some walls to have low formaldehyde plywood sheathing exposed and wax oil as wall finish. Some walls clad in oak horizontal boarding, with wax oil finish. Floor finishes : Rubber sheet flooring is used to wet areas primarily. Natural rubber was chosen as the most environmentally friendly safety floor finish.

Linoleum to most other areas as it is a durable, low maintenance environmentally friendly flooring product. Linoleum consists of renewable raw materials such as cork, linseed oil and jute, and its degradability is good, especially when used with a wax floor polish finish.

Recycled carpet is used in the Conference Room and office.

All skirtings architraves etc. are oak with a clear lacquer finish.

Fittings - Sanitary fittings are all environmentally friendly, e.g. w.c.'s to Armitage Shanks Ventura range with low water consumption. Urinals are Armitage Shanks Aridian waterless urinals. Washbasins are low water use type.

All pipework to sanitary fittings is polypropylene [PP] not PVC based plastics. PP was chosen as the most environmentally sound pipework specification

Mechanical and electrical – Pipework to mechanical installations are copper or polyethylene based.

Wiring to electrical installations is LSZH (low smoke, zero halogen) insulation rather than PVC.

Services / Drainage—The building has water and electrical supplies and telephone lines. These are brought in a single trench below ground along Barton Lane, into the existing car park, and sleeved underground to the building, along the peninsula.

No mains drain connection is present, waste water is pumped to a holding tank adjacent to the roundabout.

Construction method

Given that the building is sited in the flood plain of the River Trent and in an SSSI, which is also a nature reserve, the method of construction aimed to limit its environmental impact by maximising off site pre-fabrication and construction to minimise time taken on site. A window of opportunity to build the building was identified between October 2003 and March 2004 for Phase 1 and July 2004 and March 2005 for Phase 2. This short construction time minimised the impact of construction noise and activity to periods outside the critical mating seasons of birds.

Because of the risk of flooding, elements that will definitely from time to time be submerged in water were chosen for durability including:

Stainless steel column supports to the access ramp

Concrete column legs to the building.

Environmental performance

A key design strategy was to provide a building with renewable energy resources that will meet the annual energy needs of the building in normal use, thus providing zero net