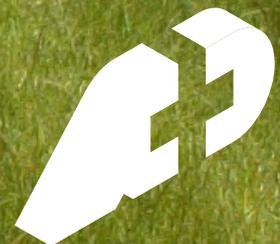


Natural Power Offices

Case Study produced by the A+DS
Sust. Programme.



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Natural Power Offices

An office where two-thirds of the timber used in its construction was grown on the client's estate, and which is powered by the client's hydro scheme.

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BACKGROUND

The Forrest Estate in Galloway is one of the largest private woodlands in Scotland. It is owned by Fred Olsen Limited, also the proprietor of the Natural Power Company. In 1999 the Estate commissioned an architect to build a comfortable, healthy and bright office space of around 360 sq. m. for Natural Power, located on the Forrest Estate. The facility was to accommodate up to 18 workers, and be based on a hot desking design for complete flexibility. In developing the office building, the company aimed to use timber sourced from the Estate, meeting the company's objectives for the diversification and expansion of its operations. Timber was cut using a portable sawmill and air-dried on location for around 16 weeks before construction started.



> Forrest Estate with the Natural Power office in the distance

APPROACH

The client had a total commitment to meeting its aims for sustainable design and was very knowledgeable about sustainable features. The architect Neil Sutherland was selected for his experience in designing in timber and his 'Norwegian' style approach to producing simple but elegant designs. Neil Sutherland has been particularly concerned with developing an appropriately robust, versatile and sustainable modern building tradition for the Highlands and rural Scotland, and already had experience of incorporating a number of sustainable design elements. These included the elimination of chemical treatments through appropriate materials selection and designs; use of local timber and earth sheltered features including retaining walls and grass roofs; and reduced energy use both in terms of embodied energy and life-time energy use. But the office for Natural Power was Sutherland's first office design.

Both client and tenant were directly involved in renewable energy systems. For the Forrest Estate, early investment in hydropower schemes (in 1983) was followed by diversification into continuous cover commercial forest

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management and using land to grow native timber species instead of raising livestock. Forrest Estates had a commercial rationale for using building materials grown on their own estate. The 'organic' nature of the building was also consistent with the ethos of other local businesses, which included an organic farm.

For Natural Power, the building provided an identifiable company image for a business promoting renewables. One of the aims of the building was that it should show that renewables have sound business sense, costing little more to use and bringing long-term cost benefits.

PROCESS

The project was managed by the chartered surveyor, who acted on behalf of the client. The frame was built and erected by Carpenter Oak and Woodland Limited, a timber frame specialist. Other materials were sourced by the architect. A local builder provided the labour required.

All timber, with minor exceptions, was sourced in Scotland - with two thirds coming from the Forrest Estate.

- Large section heartwood Douglas Fir for principal timber frame with exposed post and trusses
- European Larch for soleplates and counter battens
- Green Oak for exposed balcony and escape stair (60 minutes structural integrity for fire)
- Less durable Norway Spruce was used for floor joists and framing
- The staircase was locally fabricated using Oak and Sycamore
- Scottish Sycamore and other Scottish hardwoods were used for other internal finishes
- Appropriate timbers were also used to avoid the use of chemicals

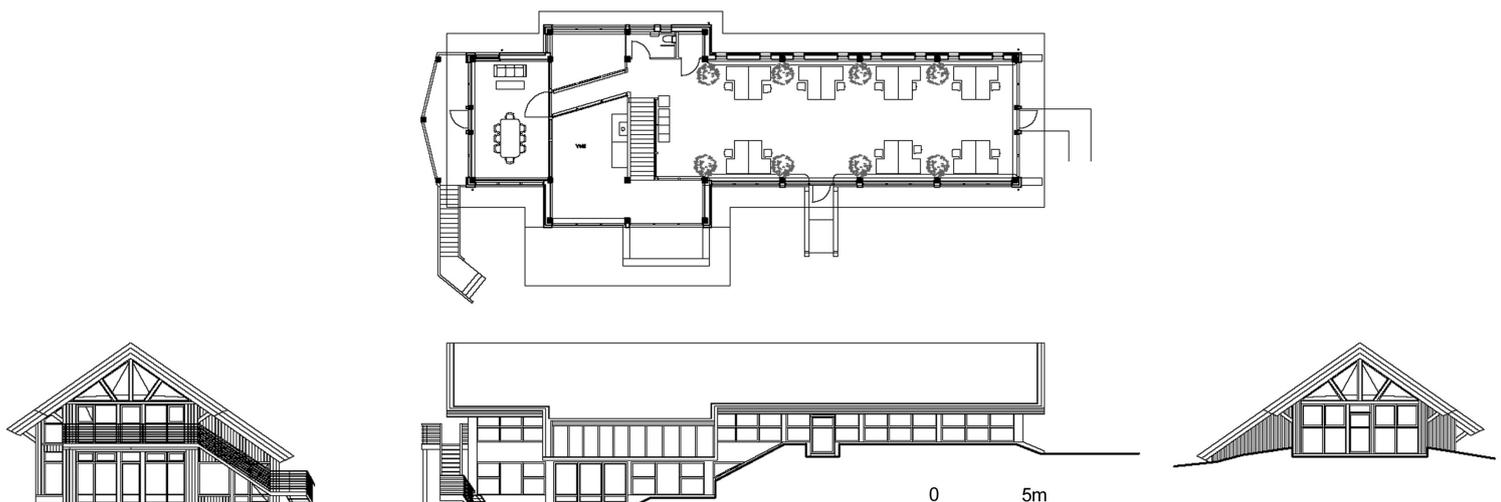
Sawmill waste was used for path materials and mulch. Locally quarried stone was used for the car park base. Recycled materials were used such as Warmcell insulation. The 150mm turf for the roof was stripped from the site and the adjacent hill. Ground water from taken from a nearby bore hole, and drainage was to a septic tank.



Rear elevation of office building



Plan view and front, side and rear elevations



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Dumfries and Galloway Council was very supportive of the sustainable approach being taken by Forrest Estates. They liked the modernity of the design, that it was consistent with their image as 'The Natural Place' and that it would bring new jobs into the area, some of which were high-value. Their main concern about the building was that it could become a 'stranded asset' should Natural Power move out.

Building Control were initially concerned about the timber fire escape and requested that it should be built in metal. But they accepted the feature when assured that the timber used had at least 60 minute fire resistance.



^ Green roof with roof lights

RESULT

The building is placed on a hillock, set back from trees and laid out on an east – west orientation to maximise solar gain along the heavily glazed south face. The office is earth sheltered and built into the hill at the east, providing level access to the first floor. The elevated position allows for foul water to drain naturally to the septic tank.

The building has low embodied energy in both construction and use. It is completely free of external infrastructure support, using local hydropower from the Estate's own hydro scheme (installed in 1983), ground water from a bore hole and draining to a septic tank. Underfloor heating is also powered by the Estate's hydro scheme. 225 mm cellulose fibre is used throughout to provide high levels of insulation. Concrete blockwork partitions and a concrete floor slab provide large thermal storage potential.

Solar hot water panels provide hot water. Double glazing using low-emissivity glass is fitted throughout the building. Good solar orientation provides good natural daylighting, and generous overhangs provide good glare control. It was hoped to use locally grown wool for insulation but treatment costs proved too expensive. Water-based rather than organic paints were also used to reduce costs.

Standard Velux roof lights were used instead of ridge glazing to save costs and to allow for increased ventilation.

IN USE

The total cost of the development, including infrastructure provision, was £320,000, which was considered comparable with standard office construction costs. The building uses 70% less energy than an equivalent sized conventional building.

The office development has created work locally through harvesting the timber. The office itself also provides high-value jobs in the area. Many employees cycle to work and a car share scheme has also been set up. The building provides a good promotional footing for the occupant and is a sound and solid base for further sustainable activities.



Office building surrounded by rural landscape



Internal office space



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^ Evening view of Natural Power offices

KEY LESSONS

At the start of the process the client invested in a full feasibility study to investigate a number of possible sites for the building and to critically examine the various options for sustainable design. It was felt that this feasibility study was a useful reference point during the construction period and served to remind participants of the aims of the design set out at the start of the project.

An experienced lead consultant needs to be selected to integrate, direct and co-ordinate the project beyond a set of drawings and specification, to ensure that the integrity of the design is maintained throughout construction. The project demonstrated how rural buildings can achieve a high degree of sustainability by being built of appropriate local materials.

Contractors often lack the knowledge and experience of implementing a sustainable design, which is often offset through an increase in the tender price. In this case the procurement method used helped to reduce the overall costs to the client by removing risk from the contractor.

The architect was closely involved in the construction work, taking on a range of roles from sourcing and transporting timber from the Highlands, sourcing other materials and providing a costing service. This was to all intents and purposes an example of 'partnering' in the construction process, with open book accounting used instead of competitive tender. One advantage of this approach may be avoiding the need for a quantity surveyor, who may lack knowledge of the actual costs of specified sustainable features.

This approach also allows the architect to remain close to the design during the construction process, thereby reducing the extent to which the contractor can provide his own interpretation of the design. One disadvantage of the open tender process is the lack of cost certainty for the client, though careful budget control can provide a cheaper solution to the risk sharing process. As a result of experience on this project, the architect is now developing more sophisticated spreadsheet-based budgeting systems.

The client is planning to extend the office to provide space for additional workers, and has noticed that they are now able to source materials more cheaply. This is because the suppliers are more confident about sourcing these alternative materials, having seen their use proven in this building. In terms of material use, it was noted that sources need to be carefully checked – slate brought in from Wales and apparently 'Welsh' turned out to have been imported from Spain.



^ Internal office space with countryside views

Project Information

Location: Forrest Estate, Castle Douglas, DG7 3XS
Client: Forrest Estates
Date completed: 2001
Project value: £320,000
Gross internal floor area: 360 sq. m.

Architect +
Project Management: Neil Sutherland Architects LLP
Structural Engineer: AF Cruden Associates Ltd
Specialist Consultants: Carpenter Oak & Woodland
Main contractors: Colin Bosworth and Carpenter Oak & Woodland (for the timber frame)

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