Acharacle Primary School, Ardnamurchan

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A new primary school at Acharacle - 40 miles west of Fort William – has been delivered as the result of a partnership between 3 main entities:- it is first and foremost the result of over 20 years' campaigning by the local community, and then five years hard work by the client, The Highland Council, and ultimately pioneering ecological design architects Gaia.

In 2003 Gaia took a group of people from Scotland to look at schools in Norway, and amongst our group was Brian Hemming, who was in charge of schools procurement for The Highland Council. Later that year we were approached to write the brief for the Acharacle Primary School, on the understanding if that we wrote the brief it would be maintain its green credentials, whoever became the eventual architect for the project.

After the completion of the brief writing the project went out to tender and Gaia were the successful bidders. Whilst The Highland Council does have a PPP and PFI programme, Acharacle School was taken out of this process. Gaia were very eager to get this commission, on the basis of traditional procurement, because the council then had more control over what was being delivered – and especially in relation to its green credentials – often not fully understood – and therefore at risk of not being effectively delivered by contractors. One of the things that became very clear when we visited Norway and Germany was that the schools that were procured traditionally were much more likely to deliver a green agenda than those procured thorough PFI.

Design

The new Acharacle School was given a very restricted site – in that it was to be built within the playground of the original school. The design and form, therefore, were established pretty well from the outset, due to the tight spatial constraint. The new building has been designed to provide a healthy, state-of-the-art, low-tech. and low carbon environment for pupils, staff and the community for generations to come – a school for many generations of Ardnamurchan children and a base for cultural events for the whole local community.

A series of workshops were held with the children, staff and wider community to discuss the design of the school, from the outset – and this resulted in a two-winged layout with a central, communal entrance. The ‘classroom wing’ is oriented east-west to optimise useful solar gain, while the ‘community wing’ is aligned close to a north-south axis. The brief document was written in full consultation with the school community and Gaia presented the evolving scheme designs at these workshops, and identified clearly where the design had met the requirements of their stated community needs (incorporated into the brief).

A very important element of the design is the community wing, which is primarily arranged around a big hall. This hosts the Annual 'Feis' event, which is a traditional Gaelic arts and culture festival with music and poetry. The Feis in Ardnamurchan is a very important local flagship event –and reinforces the school itself, which teaches in both the English and the Gaelic medium. The Feis was held in the main hall for the first time in 2009, marking the significance for the wider community, and their close involvement in the school project. For the 2010 event the Bleecher seating had been added – completing a community fund-raising cycle going back many years.

Eco-minimalism

The design of the school was undertaken from the very outset to deliver a model of 'Eco-minimalism' – a philosophy which seeks to use careful design to achieve sustainable construction, rather than attempt to achieve it through the addition of superfluous, 'bolt-on' technologies and their associated energy, cost and maintenance penalties.[1]

[1] Liddell, H. (2008) "Ecominimalism – the antidote to Eco-bling". RIBA Publications, London.

Construction

The school is also the first example in the UK of 'Brettstapel' construction[2] – a glue-less form of massive timber construction, which in this instance (and pending a production facility to produce it in Scotland) was imported from Austria. This has helped to create a highly insulated and airtight school, which easily achieves the internationally recognized German 'Passivhaus' standard, (albeit without adopting the Mechanical Ventilation Heat Recovery system that the Passivhaus Institute regards as mandatory for certification). Other solid timber used in the project, such as decking, battens, bridge glulams, and beads were from homegrown timber. "The bulk of the building – the superstructure - was procured from Austria in prefabricated elements with a core of massive timber. We knew the factory very well, from a European Community research project and they were able to give the client a guarantee that the building fabric would reach Passivhaus standard - which means that, for all but long winter periods, heating is not required, as it is very airtight and with very thick with insulation on the walls. We also chose this route at the time (around 3 years ago) as we had worked on an experimental project using massive timber, and there was the possibility of procuring a package deal from Austria. At that point the UK Pound was strong against the Euro and we were set to make a saving of around half a million pounds. But with the subsequent significant problems with the exchange rate, the promise of savings was never delivered. That came as a big disappointment to us.

Features and Performance

Under regular occupancy conditions there will be no heating requirement; the heat from the occupants and electronic equipment being sufficient to heat the building. The hot water for the kitchen, WCs and changing rooms is supplied from highly insulated hot water cylinders. In turn, the water is heated by electric immersion elements powered by a 9kW wind turbine that is sited on a hill behind the school. Internal air quality is controlled by a combination of natural ventilation and the use of hygroscopic and zero emission materials throughout the school. Natural day-lighting levels have been optimised to ensure an average daylight factor (DF. ave) of 4.5%, and controlled, energy-efficient lighting installed throughout.

Acharacle Primary School wall sample

This is the first school in the UK, as far as we are aware, that is heated by the children – there is only a backup heating system for the lag-time following a long holiday break in usage of the building.

In this school we were fulfilling the agenda that we have been working to for a long time, which is based around creating healthy indoor climates by using healthy and hygroscopic materials. Dealing with moisture and using benign (non-toxic) materials is a core part of our specification. Our approach is not just about saving the environment; it is also about using materials that we know are not dangerous to health.

[2] www.brettstapel.org

There is an alarming proportion of openly available building materials that are dangerous to health, and we have helped author a report on this for the Scottish Government. There are 55,000 building materials, and only 3% of these have ever been tested for toxicity. This is a major issue that people are either not aware of or not taking sufficient notice of, because they are over-focussed on energy saving and carbon reduction. If there is one over-riding thing that we are proud of about this school it is that we are confident that we have created an indoor environment that is free of any toxic chemicals - which surprisingly could be unique in the UK. We even had the furniture specially designed using non-toxic materials. We discovered at the time that there was no school furniture in the UK that did not have materials that were off-gassing toxins to the environment. After a long search we eventually found a supplier who was willing to go the extra yard and produce non-toxic furniture as a pilot project for the Acharacle School. And this was the only company in the UK willing to go that extra yard! There has been a prevailing culture in the UK, which has not shown interest in such issues.

Post Occupancy Evaluation

To help ensure the smooth running of the building once it is completed, and to record successes and failures in the project for the benefit of the design team and client, Gaia and the M+E consultants, Arup, have been employed for 2 years after the building was occupied (in May 2009) - to ensure effective user patterns for the building, and highlight technical issues, which – as well as fine-tuning the running of this particular school can also inform not just future schools but also other future construction projects.

Innovation is core to our practice and we have been involved in this approach to sustainability for the past thirty years. We have worked all over Europe to bring best worldwide practice to Scotland. The practice embodied in the school has been popular in Scandinavia but the wider public and the construction industry have only been interested in sustainability over the past few years - for the first 25 years of our practice it was a big challenge to get most people interested in sustainability. This school can be seen as the result of our experience of working in this area for thirty years, and so far the children love the school, and everyone within the community is very appreciative.

Key features of the school also include: concentration on conservation of resources through use of efficient electrical appliances (i.e. lights) and water fittings (i.e. taps, toilets and showers) before considering the required demand; collection of rainwater for use in toilets; monitoring displays to keep the school children aware of energy consumption, water consumption, temperature, humidity and CO2 levels in the school; procurement of loose school furniture which has been developed to minimise off-gassing of harmful VOCs.

Externally, the form of the building provides sheltered areas for children to use and maintain, and a colour consultant has provided a colour scheme for the inside and outside of the building that is both vibrant and stimulating, and has been designed to enhance the experience of those using the school.

Acharacle School has featured in a number of conferences and debates over the past two years, and was a finalist for the Green Building of the Year award in 2009.

All images courtesy of Gaia Architects.