

Duneland

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Duneland ecoVillage



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It should come as no surprise that building housing in Findhorn is a lot different from building housing in Glasgow and the central belt. We have government policies which try to encourage 'a sense of place' but in building social housing (or should I say when we were last building social housing), we are constrained by requirements set by funding agencies, local and central government which often conflict with trying to create such a sense of place.

The requirement for '*adoptable roads*' means that housing layouts take more cognisance of the needs of refuse trucks than the people who might live there. Front gardens become paved over for car parking and soft landscaping is only used to fill in the spaces left over, rather than to create pleasant environments. Secured by design standards result in a preponderance of fencing with a landscape designed for surveillance rather than horticulture. In terms of achieving sustainability (much encouraged before by the now defunct Communities Scotland), providing the most economical unit often takes precedence over long term sustainability. We accept that meeting the more onerous Scottish Building Regulation Standards will do much to improve the energy efficiency of our houses. However leadership and direction is needed if our housing is to really take hold of a sustainable lifestyle, one where how we live is as important as what we live in.

Members of the Findhorn Foundation who formed the company 'Duneland Limited' have always been conscious of the need to build with nature, to reduce a building's impact on the environment and to develop a sustainable community. The history of housing in the Findhorn Foundation has shown that they are able to put their ecological ideas into practical realities which work.

Twenty years ago I visited Findhorn and met with John Talbott who had written an excellent book called 'Simply Build Green'. It described his experience of trying to build ecologically and it recounted both the successes and failures along the way. I learnt a lot from it and appreciated more than anything how he talked about why things did not always work. In this article I'd like to try to explain what I think Duneland are achieving and to touch on some difficulties that I feel everyone can learn from.

What is Duneland?

Since 1981, the Findhorn Foundation Community has been developing the Ecovillage within their ethos of working with nature, not against it. The Ecovillage at the park is a clear demonstration of how they have managed to combine the practical with the social, economic and spiritual aspects of life. In many respects it is a good example of what a community of people working together can achieve.

Duneland Ltd was set up in 1997 as a social enterprise company with 69 shareholders, 44 of whom are resident within 5 miles of The Park. The company purchased the land of the Wilkie estate with the combined aims of ensuring the protection of and public access to, the Dunes, maintaining and developing the existing woodland, while providing a reasonable return to its investors through appropriate development of the ecovillage project in cooperation with the community as a whole. In 2001 it founded the Findhorn Dunes Trust and donated 175 acres of this coastal land and marram grass landscape to allow it to be protected as a nature reserve in perpetuity and it is now also recognised as a site of National Importance for lichens <http://www.findhornhinterland.org/ecology/lichen-survey/>.

Following a masterplan prepared by GAIA architects, an area of land known as the Magic Triangle area, north of the Community's "Universal Hall", was identified for development. We were appointed in 2009 to develop 25 houses with a range of mixed types: two and three bedroomed houses; some flats, a number of which will be rented out by Park Ecovillage Trust who are acting as a social landlord; a number of ancillary buildings such as a common room, where members of the housing 'cluster' can meet, cook and eat together and be involved in a variety of communal activities; a bike store, a laundry and 7 '*flexi-units*'.

The flexi-units were designed to be workspaces or offices that could be used by people living in the houses. Issues of rates and VAT meant that most of the flexi-units became integral with the houses they were connected to. However it did create a much greater variety of house types. This first phase (known as East Whins) should be completed by the end of this year by the contractor Kier Milne.

Process of Design and Procurement

It was clear from the start that both the Findhorn Community and members of Duneland wanted to be closely involved in the whole design process. There were a number of people who lived in Findhorn and whose skills and input we could draw on. Our approach was to start with 3 days intensive design workshops (*or charrettes as they are now called*). We would have meetings in the day to discuss different features, key requirements and criteria that Duneland wanted to meet, then in the evening, the design team would develop these ideas into different layouts and approaches. In this process Matt Bridgestock and John Gilbert worked with Chris Morgan of Locate Architects.

After the second day an approach emerged where the houses were to be grouped into small courtyards, protected from the prevailing wind but allowing maximum solar gain to each house. On the third day a design began to take shape placing the access road near the wooded area where it would be in most shade and having the housing in rows providing semi public courtyards, allowing the natural environment to filter in between the houses.

A housing mix was set along with targets for energy conservation and supply, ecology and material requirements. By the end of the three days we had formed a good brief for the project and people were enthusiastic about what could be achieved.

When I look back at this initial period I can see the items that did not come to fruition, as ideas had to be researched and developed then costed to ensure we could achieve affordable housing and still maintain the key features that would make the scheme an exemplar of sustainability. Some of these 'lost' features will be discussed in this article.

In addition to the initial design charette we had a number of meetings involving key critical friends such as Dr Sue Roaf from Heriot Watt University. Regular meetings were held with Duneland's shareholders and the team managing the project. An open public meeting was held and designs and specifications were also approved by the Findhorn Community. The whole design process took 9 months before designs could be formalised sufficiently to apply for planning permission. It's worthwhile noting that funding for the development has really come from both Duneland and everyone who has bought into the project. Interested people placed a deposit on their house before anything was built and designs were developed knowing a number of individuals' requests. We had one prospective owner, a Dutchman, who wanted all the doors in his house to be 100mm higher than our standard door heights because he was a tall person. Although he did not follow through with the purchase we were intending to have the door heights raised. (*Interesting that the average height of men in the Netherlands is actually 8mm higher than men in the UK, which is maybe one of the reasons why european housing has higher ceilings than in the UK*).

As a group, the occupants of the 'cluster' have all had the opportunity to meet and discuss the common features in particular the design of the community room and kitchen which looks over the 'dancing green'.

A certain amount of risk was involved in this as once the building contract had been agreed, not all the houses had been sold. However once work started, people began to commit. In so doing they often wanted further changes to their house. Minor changes were usually not a problem, but later changes sometimes would have resulted in a claim from the contractor so had to be curtailed. As everyone wanted their own individual kitchen, an agreement was made with a kitchen supplier to work with each owner and provide the kitchen layout and specification, all to the individual's own budget.

Given that our office is in Glasgow and Duneland is in Findhorn, we had to have frequent skype discussions over the design and individual specifications. However face to face discussions were always best and now that the work is on site we have had to get used to the long travelling time.

The Setting

Truly 'duneland', the site lies on ancient shingle ridges, since overgrown with gorse and before that used as part of an airfield for RAF Kinloss. To the West and North is a further expanse of dunes. The site was largely flat although it steps up towards the North where a row of houses steps up to follow the level of the dunes.

Further phases are planned for the site, to the North and to the West, so these had to be planned for when making access arrangements.

There is a band of trees to the South of the site which cast a shadow over much of the site in winter months, so houses had to be laid out to make best use of the low winter sun. Ridge heights were kept as low as possible to prevent shading of the houses behind, and to the south they were more steeply pitched to make most of the winter sun for the solar thermal panels that are fitted for each house.

The housing is principally designed around two main cluster spaces, acting as sheltered social spaces. These cluster spaces will have views out to the adjacent forest, the 'dancing green' and the dunes beyond.

As it was agreed at an early stage that the road would not be to an 'adoptable standard', being a private road managed by Duneland, we could reduce its width from 5.5 metres to 3.5 metres and also omit a two metre wide pavement. Parking bays (33 in number) are provided along the access road with the understanding that residents will mostly be walking or cycling to their houses. There should be no large fences, as the land around the houses is to be shared and managed by the people in the development. A small area in front and behind each house is distinguished as being more private with a small raised berm. This approach to the environment is refreshing: the lack of fencing allows the houses to relate to the natural surroundings.

The Houses

The design of the houses is influenced by the desire to create buildings which use little energy, produce low carbon emissions, and are products of simple and economic timber construction.

The houses are one and a half storey at the front to give a village scale and also to present a steeper roof pitch for the solar panels, optimised for the spring and autumn equinox, when the use of solar energy is most beneficial.

The houses have a low roof pitch at the rear to reduce overshadowing by reducing the height of the ridge, and to keep the building volume as compact as possible.

The gable ends of the terraces face on to the road, this arrangement has a similar character to traditional fishing villages along the Moray coast. This configuration also maximises privacy to residents and reduces overlooking of the central open communal area.

The character and identity of the development will be added to by the community, in the tradition of the existing Findhorn Foundation Community. The painted timber cladding in a palette of colours will give visual identity to the buildings.

The flats have the same design characteristics as the houses, but with a full two storey structure. The communal stairs spaces will be glazed front and rear. All the houses have a buffer space (lobby) with two doors. The south facing front lobby is designed as a sunroom and the rear north side is a utility space. Barrier free access is provided to all ground floor houses with metal gridded ramps which rise from the footpath level up to each entrance.

The ecovillage consists of 25 houses (all two storey) with the following mix:

10 No 2 bed houses

3 No 3 bed houses

12 No 2 bed flats designed for older people

6 No flexi-units each about 25m² (4 of which are integrated with adjacent houses) plus a large common room with facilities (85m²), bike store, workshop and laundry.

Construction

In the early days of design development we were very keen to try and source products locally. We considered using strawbale construction and had some meetings with the Modcell company who gave a talk to Duneland members. However it was soon evident that costs for its use, even although the panels could be made locally, were still a good deal more expensive than the target budget for the houses.

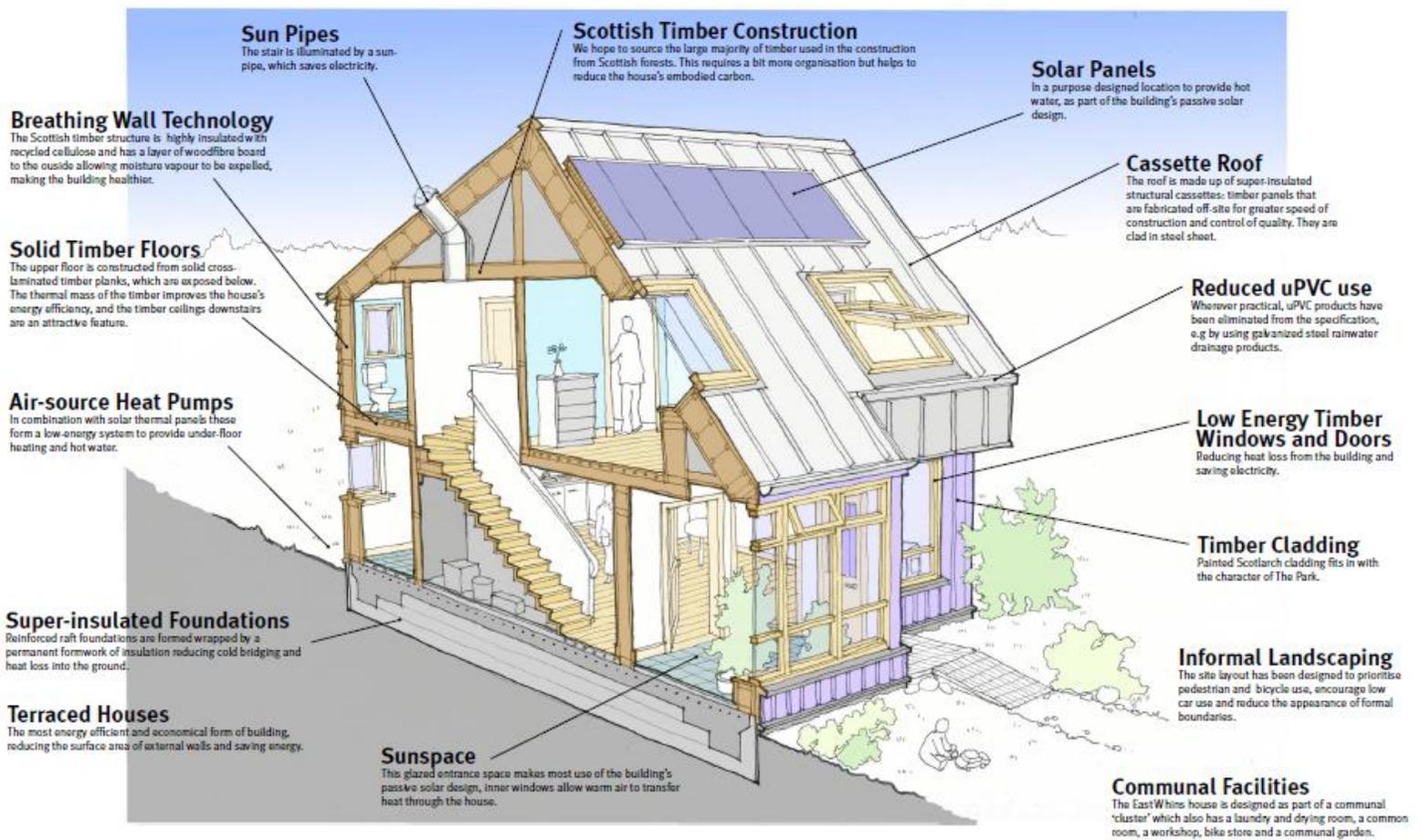
We also looked into using CLT (cross laminated timber) for the walls, roof and floors, but although we had used it successfully at the Scottish Housing Expo, it also proved to be too expensive. What we ended up with is a bit of a hybrid.

The walls are homegrown timber studs 220 thick with 60mm of tongued and grooved wood fibre covering the kit, finished externally with prepainted larch cladding (Scotlarch from Russwood).

The insulation is warmcell (*recycled paper insulation*) designed as a vapour permeable wall, used extensively in Findhorn. The prepainted larch boarding has been made in several different colours. We had considered using the pretreated Accoya cladding but found it was too expensive. Costs have always been a factor in the construction and one area we might have changed was the use of nail guns to fix the cladding. These are difficult to control and nails can often be punched too deeply into timbers.

The intermediate floors are solid timber CLT giving a largely clear span between cross walls. In the houses, the timber is left exposed as the ceiling finish, in the flats it has to be covered over for fire protection. The mass of the timber provides a good acoustic performance which we wanted to have for all the houses. It also introduces a degree of thermal mass and locks in carbon storage.

The roof cassettes were from 450 I beams. Originally designed to be filled with warmcell and fabricated entirely off site, but due to concerns over weight they had to be filled with glass wool and in some cases this was done on site. This proved to be not ideal. Our experience with the use of glass wool is that it rarely fills the space between the studs neatly. Gaps can be left and these are often not considered to be important by the person installing it, yet the effect on energy conservation is considerable. Voids can also be left because in very thick depths the wool can slump. Internally the roof cassettes had to be lined with two layers of Fermacell, a dense gypsum fibreboard, to meet acoustic standards because of the nearby airfield at Kinloss.



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The East Whins House

The foundation types varied, sometimes we had to dig deep to find a solid base, where we could use a raft foundation we used preformed polystyrene formers which are protected with cement board on one side allowing them to be left in place as a permanent shutter. This provides a very well insulated edge reducing the effects of cold bridging that can occur using more traditional methods. The overall thickness of the insulation under the foundations is 300mm.

The pitched roofs are finished in a treated steel sheet which can be recycled. The system looks similar to a zinc roof but is more economical.

We are able to fix the solar panels to the joint fins of the panels. The main disadvantage of the system is that any special welding or forming for outlets is not as easy as with zinc, jointing at such locations is more dependant on sealing with mastic or rubber fixings.

The community rooms that provide facilities for residents have a flat sedum roof. Sedums are already growing in some areas of the site and we would like to encourage their growth on our roofs. There is however little need for surface water containment as water drains freely into the sand bed layers of the site.

Energy Matters

Our main drive has been to reduce the need for energy use by ensuring we have a very well insulated fabric and reducing air infiltration through the fabric. The houses are not designed as passive houses, but the insulation standards are nonetheless high: U values are as follows: walls 0.14 Wm²K, floors 0.08 Wm²K roof 0.09 Wm²K . The installation of 60mm of fibreboard insulation on the outside reduces the impact of cold bridging from the large timber studs and helps to improve airtightness levels. Assessing the buildings energy use and CO₂ emissions gives the following figures:

house type	area	energy use per m2 per annum	CO ₂ emissions per m2 per annum
Ground floor flat gable	68.67m ²	80 kWh/m ²	14 kg CO ₂ /m ²
Ground floor flat terrace	74.76m ²	51 kWh/m ²	9 kg CO ₂ /m ²
Mid terrace house 3 bed	105m ²	82 kWh/m ²	15 kg CO ₂ /m ²
Mid terrace house 2 bed	95.5m ²	58 kWh/m ²	10 kg CO ₂ /m ²

The passive solar design of the housing ensures that each house has as much sunlight as possible, with larger windows to the south and smaller windows to the north. Houses have been built with integral sun porches which are big enough for a couch (the individual's requirement!). In the flats there are integrated sunspaces off the living rooms. Here we are using the Danish Windoor system which allows the frameless glazing to be opened out to create an open balcony. Some residents opted for a larger living room without a sunspace. On the ground floor flats, residents can connect directly to the front garden area.

The Findhorn Foundation has always acted well in advance of ideas on energy efficiency and renewable energy. The new development will get its electrical power from the local network (NFD New Findhorn Directions) which is fed by Findhorn Wind Park's four community-funded turbines, which produce all the Community's electricity needs and in fact have enabled them to be a net exporter to the grid (*it should be noted that SAP calculations do not take into account the origins of the electricity*).

We had originally considered installing a communal woodchip boiler, however once grants for this were withdrawn it did not make economic sense. The fact is, the more we insulate our houses the less energy we need to heat them. Had the funds (or grants) been available, then a common biomass boiler could have worked, providing energy not just to East Whins, but also for the Universal Hall and later phases of housing. In the end we opted for air source heat pumps, one for each house, taking energy from the local network. Heat is then distributed through underfloor heating pipes.

Solar thermal panels are installed on all the south facing roofs at a pitch of 45°, these provide energy to hot water cylinders in each house, maximising gains from the spring and autumn sun. The panels are made locally in Forres by AES.

Some residents of the houses have requested an additional flue to allow them to fit a solid fuel stove. This was not factored into the buildings' heating calculations at design stage, and may cause them some issues with overheating. This conflict highlights the differences between a more traditional mode of rural green living and the more high-tech low-energy approach being fostered by the green agenda.

The need for minimum levels of ventilation under the building regulations did cause a problem, as people in Duneland quite naturally did not want to have to have mechanical ventilation. They were happy enough to rely on opening a window when they were needing to. However installing a system of natural ventilation was going to be difficult as trickle ventilation at window heads alone would no longer meet the technical standards. It made little sense to install large vents through each wall, since we would be losing energy here. In the end we did opt for a mechanical heat recovery system which we hope will not interfere with residents' lifestyle.

Unlike most housing developments, there is also a common laundry facility. This is integrated with a flexi-unit and the bike store. It has a drying room with large skylights to catch the sun and louvres for cross ventilation to encourage the drying of clothes within the laundry space.

Conclusion

The houses should be completed by the end of this year. We expect that people will add their own touches and start to plant and make use of the cluster spaces in between the houses. Time will tell how people settle in to their new houses and we will be keen to know how well the buildings perform in actual energy use. Given the state of social housing in Scotland we would like to see more developments follow this model.

Development team

Role	Company	Key Personnel
Client	Duneland Ltd	Bill Henderson, Jonathan Caddy, Ariane Burgess, David Hammond
Architect	John Gilbert Architects	Gillies MacPhail, John Gilbert, Matt Bridgestock, Nada Murtic
Structural Engineer	Fairhurst & partners	Ashley Guy, Bob Ramage
Civil Engineer	Thomas Clarke Associates	Thomas Clarke
Services Engineer	Greenroom IKM	Neil Pearson
Quantity Surveyor	Torrance Partnership	Mark Stevenson, Graeme Lyon
CDM Coordinator	Torrance Partnership	Steve Ashbolt
Main Civil Engineering Contractor	International Associates Ltd	Thomas Clarke
Main Building Contractor	Kier Milne	Robert Forbes
Clerk of Works	Duneland	Michael Sharpe, Simon Clark
Critical Friend	Heriot Watt University	Dr Sue Roaf
Critical Friend	Locate Architects	Chris Morgan

Contract Value (including civil engineering works)	£3,907,095
Total useable built area (all heated spaces, excludes laundry, workshop and cycle store but includes sunspaces)	2537m ² net
Total footprint area	1,936m ²
Total Site Area	0.78 Ha
Contract Period	40 weeks