Glenalmond Street Housing

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Glenalmond Street Housing

A small estate of 16 affordable homes in the East End of Glasgow which features a geothermal energy system, solar water heating, passive ventilation and use of solar gain. The site is also car-free.

<< View of housing development, showing atrium space and terraced housing

^ Front elevation of a terraced house

BACKGROUND

In 1997 Scottish Homes (later Communities Scotland and now part of the Scottish Government) sponsored a competition for the creation of a sustainable housing development. Interested parties were given the opportunity to apply for a Housing Association Grant to support the initiative. Shettleston Housing Association is a community-based body managed by a voluntary committee of tenants and community representatives. Though reluctant to embrace a scheme on sustainable qualities alone, the association was attracted to a development that combined alternative energy sources and high insulation levels in order to reduce running costs for tenants. A critical factor in the submission with which John Gilbert Architects helped Shettleston Housing Association win the competition was the proposed use of a geothermal energy system.

APPROACH

When the competition to build the development was won, the housing association pre-let the flats and houses that would be created and set up a tenant focus group to contribute to discussions about the design, internal layout, fittings and finishes. The pre-letting also allowed for the fulfilment of individuals' specific requests, provided they came within budget. For example, residents could opt for the inclusion of a tiled bathroom at the expense of basic house decoration, or French doors in place of floor coverings in the bathroom.

The proposal to make this a car-free development was resisted initially by the Roads Department (of Glasgow City Council). But the Planning Department was supportive of the fact that this would result in more secure and private spaces and a relatively child-friendly environment, and approved the suggested measures.

The key aspects of the architect's approach were:

- To address the best use of the site, in terms of housing layout, aspect and solar perspectives
- To research construction techniques that used sustainable materials
- To aim to conserve rather than supply energy
- To research the best materials available locally, taking into consideration their life-expectancy, and trying to anticipate any related issues of maintenance
- To discuss with the people who were going to inhabit the buildings to establish their needs at the outset

The conditions of the grant imposed relatively tight guidelines on the project. The compact nature of the project reduced the opportunity for large-scale cost reductions, but this was balanced by the fact that the site was easy to develop, being beside the road and with services near.

The commitment to a vehicle-free development reduced hard-landscaping costs, allowing funding to be re-routed into alternative heating systems. Additional costs included £5,000 for solar water panels; £2,000 for solar air ventilation and £3,000 for water recycling. These elements were funded by a grant of £10,000 from Forward Scotland.

v Back gardens to terraced housing

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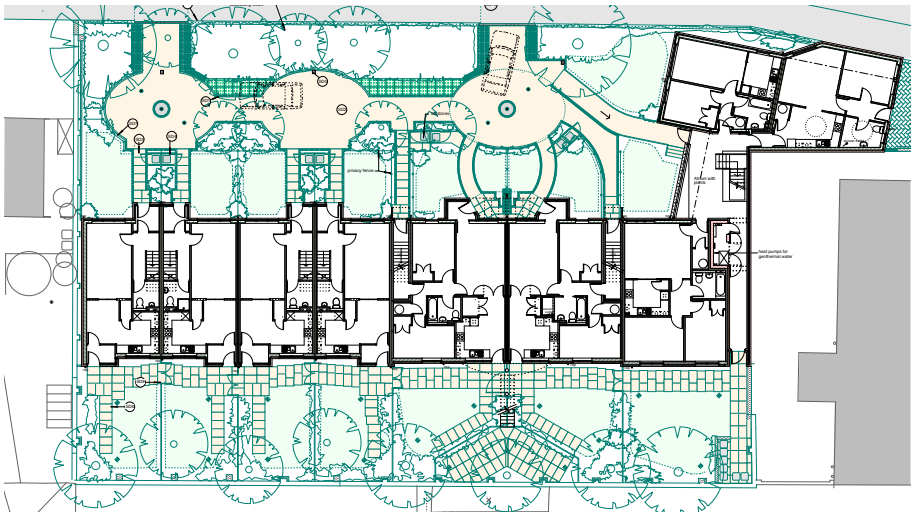
PROCESS

Site layout

The flats were made south-facing, with a 2-storey single-glazed ‘solar close’ maximising solar gain; the terraced houses were orientated in an east-west direction to avoid overshadowing the gardens, while allowing sunlight to filter through both sides of the building. The vehicle-free layout increased the green space available. Trees were planted on the west perimeter to protect houses from excessive solar gain in the evenings. The rear gardens are planted and beech hedging used at the front of the development. Bin stores were located at the front of the estate, facilitating a more secure terraced layout. A solar-heated ‘sunspace’ was incorporated into the top-most south facing flat.



Site layout

Materials selection

- Locally sourced materials included bricks from Uddingston just outside Glasgow and cladding of larch grown in Perthshire. The ironmongery chosen was aluminium made in the UK: brass ironmongery was rejected as it was made in China or India. UK-made brass ironmongery was available but was too expensive.
- Recycled or re-used materials included brick reclaimed from the former buildings on the site, stone setts and paving slabs and material from other Housing Association properties including insulation, floorboards re-used in attic spaces, and two complete bathroom suites saved from other jobs. This would not have been possible without the commitment of the Housing Association’s Development Officer.
- Insulation was made from recycled newsprint; panel material made from wood-fibre sheathing.
- Timber was used as the main construction material – timber windows and doors were specified; a certain amount of concrete was used for foundations and screeds. Untreated softwood boarding and OSB (Orientated Strand Board) was used in place of chipboard as a means of reducing formaldehyde content.
- Entrance flooring was made from natural rubber rather than vinyl.
- Aluminium gutters were used at low level in preference to PVC.
- Calcium silicate boards and render-finish were used on wall areas in place of brick.

Reclaimed local brick

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Solar water panels located on south-facing roofs

RESULT

From the point of view of energy-saving and heating, the key features of the development are:

Insulation and solar gain

- Walls, floors and roofs were insulated to higher than minimum building regulation standards, with breathing wall construction and 300mm of cellulose in the roof and 160mm in the walls
- Air tightness was improved by using Warmcell insulation to fill all voids
- Buffer spaces were provided at the front and the back doors of the houses and main-door flats. These are unheated lobbies that can also be used as utility spaces
- Low e double glazed units were installed in all doors and windows
- The two-storey solar atrium for the flats allows plants to grow inside and gives a pleasant and welcoming space.

Heating

- Solar water panels located on the south-facing roof of the flats provide heat to a 10,000 litre thermal storage tank, pre-heating the water for individual cylinders and the communal heating system
- Water at 12 degrees Celsius is taken from a disused coal mine 100 metres under the site, then raised in temperature to 55 degrees by a condensing heat pump and passed to the thermal storage tank
- The solid ground floor of the units provides a degree of thermal mass
- The communal heating system is efficient at reducing CO2 emissions
- Simple thermostat controls in living rooms ensure that once sufficient temperature has been reached in living areas, the energy is switched to heat the hot water cylinders. This provides an incentive to conserve energy since tenants who reduce energy losses in rooms have more free hot water.

Ventilation

- Solar ventilation system in four of the large terraced houses takes preheated air from the roof space and directs it to hallways.
- Passive stack ventilation system is used for bathrooms and kitchens.

IN USE

Tenants were enthusiastic about the design of their homes, which boasted features such as generous room sizes, second bathrooms, and loft spaces to accommodate personal-computing equipment. Resident turnover has been very low. Low energy bills were also attractive, with one tenant reporting a reduction in energy bills of almost 60% per month. Tenants took time adjusting to the system. This was partly because the heating system was designed to work with low water temperatures and, as a result, radiators were not as warm to touch as in normal wet radiator systems, although ambient temperatures were warm enough. Monitoring showed that some tenants maintained high ambient temperatures in their homes because heating costs were so economical. Immersion heaters fitted to hot water cylinders to boost water temperature were rarely used. Maintenance costs for geothermal and solar systems were included in a nominal charge to tenants which became part of the low monthly rent.

Rear view of flats, atrium and terraced housing

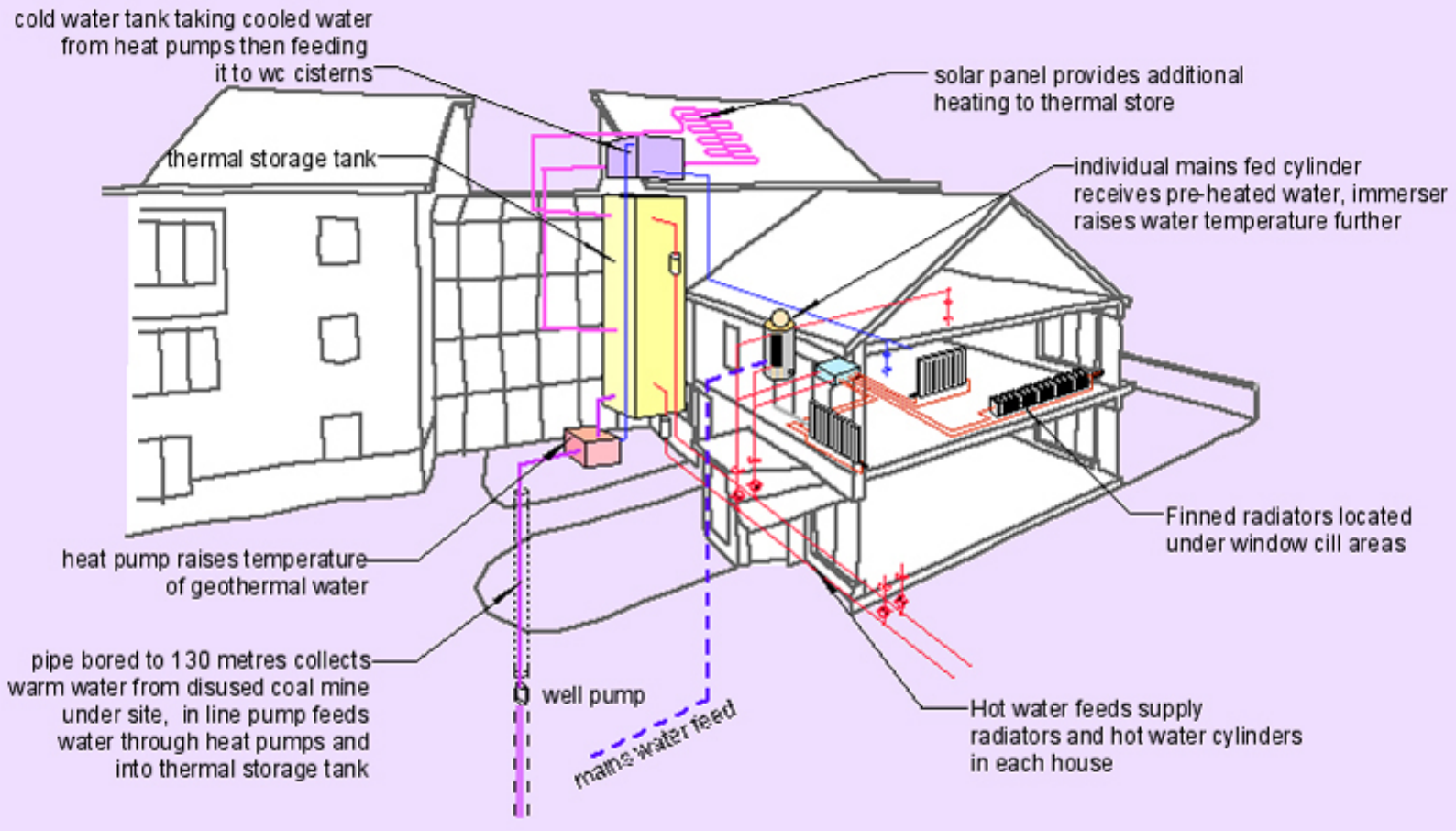

Diagram showing the geothermal heating system used at Glenalmond Street

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Front elevation and gardens of terraced housing

Although some tenants requested larger gardens to provide a greater play area for children, no economic way of laying out the site could be found to accommodate these. The lack of parking spaces has not been viewed as a negative factor. The vehicle-free element of the development proved important in securing community safety. Adjacent estates with adjoining car-parks are often disrupted by the regular congregation of local youths.

The overall design is simple, while materials and detailing are aesthetically pleasing and of a high standard. Design features have resulted in increased levels of daylight, make for a more pleasant interior environment, while reducing energy use.

Resident turnover has been low, with flats rarely coming up for rent since the build was complete. There has been a distinct absence of vandalism despite large expanses of glass in the sunspace. And while glass-cleaning costs have led to maintenance of common areas being slightly more expensive than other schemes, overall maintenance costs are acceptable.

Association staff experienced some difficulty initially in maintaining the heating system – electronic controls failed intermittently and impurities in the mine water resulted in the requirement of a more sophisticated filter system. To maintain tenant and committee confidence in the communal heating installation, a back-up system was installed, and a thorough maintenance schedule. Tenants initially raised concerns that the heating system was complex to operate but over time all tenants have been able to manage its operation.

KEY LESSONS

Building control and planning departments are often happier to accept traditionally successful design principles than to consider innovative proposals. As a result the approval processes for such schemes can be lengthy, even if proposed measures are in line with governmental objectives on sustainability.

The client needs to allow time in the development process to deal with non-standard issues. In this case, the architect's knowledge of sustainable techniques was critical in maintaining the programme timetable. The Association's Development Officer was a key figure in retaining sustainable features and in delivering the project and also in encouraging the architects to continue to be innovative in their approach.

Had the site been a difficult area to develop, fewer sustainable features might have been introduced. Tight subsidy arrangements can now prevent clients from developing sustainable elements on awkward sites.

Many sustainable features have dual benefits – car-free areas can result in less public space to be underused or misused; energy saving results in cost saving benefits for tenants on low incomes, increasing the overall level of satisfaction with the housing.

Maintenance costs for innovative systems should be built into rental structures, although the functionality and durability of new systems, by their nature, cannot always be calculated in advance.

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The designer recognised that even on such a small, tightly funded scheme, there is no long-term benefit from compromising design and that it is important to form a close relationship with both client and users to contribute to a successful, sustainable design. Tenant involvement in the design was important as it allowed for tailoring of design elements to meet individual needs.

More use could have been made of loft spaces if UK building regulations did not impose tighter fire-escape restrictions than their European counterparts.

Recycled materials are good value, and are often better quality than new materials. However, while the re-use of say, bathroom suites is possible, it is not necessarily more economical.

A water recycling system complete with storage tank and an independent feed system was installed to recycle some of the waste mine water, by feeding toilet cisterns. However ferrous-oxide compounds become brown and sticky when exposed to the air, resulting in blocked valves and discolouration of toilet basins. Returning water to the mine also proved difficult, as it is not always possible to find a void mine space, and boreholes may be easily blocked by rock falls and silting. The decision was made to discontinue the system.

Complex technical solutions should have simply operated back up systems in case of failure. The client has some reservations about a single heating system serving multiple users, given the number of people that can be affected by a fault in the system. 'Fit and forget' technologies would be favoured over technologies with multiple moving parts liable to breakdown and requiring expensive maintenance and repair.

There were some difficulties in specifying certain materials through a design-and-build contract. The use of larch, for example, required a nominated sawmill supplier to source a top-quality variety. Despite the fact the contractors were asked to use a fly-ash self-levelling screed (a by-product of power stations) they decided to use ready-mix concrete.

The contractors also failed to use specified low level street-light bollards, opting instead for a different variety, which failed to function correctly.

Schemes should acknowledge that levels of building skills within the UK can be poor. While there was an option for some prefabrication, the contractors deemed that there was not enough repetition of units involved to merit such an approach. Neither was the area deemed sizeable enough to accommodate crane-lifting of panels.

Local purchasing may not appeal to contractors who prefer to use specific builders' merchants.

Residents using atrium sun space

Project Information

Location:	Glenalmond Street, Glasgow, G32 7UG
Client:	Shettleston Housing Association
Date completed:	1999
Project value:	£700,000
Gross Internal floor area:	1383 sq. m.
Architect:	John Gilbert Architects
Structural Engineer:	Montgomery Smith and Partners
Services Engineer:	Enconsult
QuantitySurveyor:	Armours
Landscape Architect:	Horner & Maclellan
Specialist Consultant:	Solar Energy Systems (Solar Panel Insulation); Nuaire (Solar Ventilation); Vitral (Atrium Glazing)
Main contractor:	Robison & Davidson
Core Funders:	Communities Scotland (then Scottish Homes)
Additional Funding:	Forward Scotland
Awards:	Scottish Housing and Environmental Innovation Awards 1998 - Envirobuild Award 1998, highly commended Civic Trust commendation, 2000

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