

Innovation – the lessons from Slateford Green

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Canmore Housing Association's contribution to the Millennium was a 120-unit mixed tenure development at Slateford Green, Edinburgh. This was a complex development, which incorporated a large number of innovative features – both in terms of product and of process. Scottish Homes (now Communities Scotland) commissioned an evaluation of the development and building process. The general conclusion of the evaluation is that Slateford Green is a high quality development produced by a good team and which, on the surface, appears to be working well. Through *'incremental innovation'* it has tried out (or the residents are trying out!) new techniques that, if proven, will improve the sustainability of housing in Scotland. It has attracted international recognition, and won the award for redevelopment in the Scottish Urban Regeneration Forum Awards for Best Practice in 2001

Background

Slateford Green consists of 69 flats for social rent, 39 for shared ownership and 12 for outright sale through Malcolm Homes Ltd – Canmore's unregistered sister association. The development was the subject of an architectural competition. The innovative features of the winning design included: car-free status; a recyclable aluminium roof; engineered timber structural carcass; breathing wall membrane; warmcell insulation; district heating system; passive stack ventilation; photovoltaics; grass paved service strip; ponds/reedbeds; detailed landscaping. The winning design was submitted and executed by Edinburgh based architects Hackland + Dore, with Summers and Partners as Quantity Surveyors, Harley Haddow Partnership as Structural and Services Engineers, Summers (Project Management) Ltd as Planning Supervisor and Hart Builders (Edinburgh) Ltd as main contractor.

Project history

Slateford Green has its origins in the Lothian Regional Council's 1994 transport strategy – including the promotion of 'car free' developments. It was envisaged that Slateford Green would be 'car free' – residents would not have a car of their own, but would become members of a citywide Car Club. Thus there would be no on-site parking, and access would be restricted to service and emergency vehicles.

The project started in mid 1995, and from the start the Association aimed for a development that was a 'uniquely blended application of leading innovative ideas, market products, new technology, energy efficiency and ecologically sound concepts and practices'. In 1996, The Royal Incorporation of Architects in Scotland was invited to manage a two stage competition, open to both Scottish and Dutch architects on a brief that included energy efficiency, ecological, barrier-free and low maintenance considerations, along with the car free requirement. Hackland + Dore impressed the judges – particularly with their ingenious proposal to use the waste superheated water from the adjoining distillery for a district central heating scheme.

Assessment of the development was not dealt with under streamlined procedures. Negotiations between the design team, the Association and Scottish Homes centred round the tenure mix (Canmore wanted to

include 'mid rent' which was abandoned in favour of shared-ownership), a monitoring and evaluation framework (which was not pursued because no-one could agree who paid for it), and costs of the innovative features. The cost plan was submitted in September 1997.

These costs are the *additional* capital costs of incorporating 'environmentally sensitive materials' rather than using traditional methods. They were chosen on the basis that they should produce either savings in energy costs or planned maintenance.

With a final works cost of £6,880,685, the building cost £898 per square metre. The final grant awarded by Scottish Homes was £4.2m.

The Association calculated savings of £250 per year in heating and hot water. There was no financial impact assessment of the car free element. A life cycle cost exercise estimated a reduction in major repairs of 13%, which led to a reduction of 25% in the major repairs provision in the grant calculation. So far there has not been any assessment of the costs in use, or of the impact on maintenance.

The development includes a community facility that was eligible for funding under Scottish Homes' Social and Environment Grant Scheme.

	Cost plan	Outturn
◆ Aluminium roof	£137,500	£167,119
◆ Structural Carcass	£214,500	£64,108
◆ Breathing Wall Membrane	£5,000	£5,472
◆ Warmcell Insulation	£21,000	£51,686
◆ District Heating System	£451,000	£306,249
◆ Passive Stack Ventilation	£40,000	£59,810
◆ Photovoltaics	£102,500	0
◆ Grass paving to service strip	£5,000	£8,744
◆ Reed Beds/ponds	£93,500	£55,206
Total	£1,069,500	£718,394

The contract was pre-Egan; it was planned as a two-stage tender, with the tender documents based on the Scottish Building Contract Contractor's Designed Portion Sectional Completion Edition with Quantities (July 1997) Edition:

- ◆ The first stage covered approximately 60% of the total project. This was billed and tendered by a short list of tenderers. It included - site clearance, civils, retaining walls, drainage, substructure, roads, precast stairs, district heating pipe-work, external services, external rainscreen details, stair core finishes, community centre frame, main building frame.
- ◆ The second stage was billed as a provisional sum. It was to be tendered in packages on a rolling programme during the course of the works. It included internal services (eg. stand by boilers, heat exchangers)

There were four main 'Contractor Designed Portions'

- ◆ Ground Improvement Works
- ◆ Timber Frame
- ◆ Aluminium Roof
- ◆ District Heating

The process involved the architect specifying a proprietary product, the manufacturer of which had effectively 'licensed' a number of contractors. They were asked by the main contractor to tender for designing and installing the product. This then made the main contractor effectively part of the design team, and not simply building to a set of architect's detailed working drawings.

Site work started in October 1998. Progress was smooth, with little evidence of the kind of acrimonious relationships that can emerge in developments that are learning experiences all round.

The contractor has embraced the Egan principles, and was enthusiastic about getting involved in both process and product innovation. His involvement with the partnership was to add a 'buildability' element. For example, the original design used in-situ concrete retaining walls. Hart persuaded the partnership to use pre-cast retaining walls that enhanced the build time by about four weeks.

In terms of the construction, much of it arrived on site in prefabricated sections. The timber frame, the stairs, door sets and other elements came direct from the contractor's supply chain. The main contractor's role was largely one of being a Management Contractor, dealing with logistics and co-ordinating the work of subcontractors.

This approach is claimed to have reduced wastage and theft on the site. The problem is verifying that in retrospect. There is nothing that would indicate that the claims are not justifiable, but to confirm them would have required that the site work be monitored at the time.

The first flats were handed over in November 1999, and the building was formally opened in June 2000 by Sarah Boyack MSP, the then Minister for Transport and the Environment.



Lessons from the development process

Slateford Green was a complex development process, involving an architectural competition, a two-stage tender process and arrange of new products. Innovation always involves taking risks about new processes and/or products. Inevitably not everything will work – indeed there is an argument that since innovation is pushing out boundaries some failure is inevitable, and that innovation that does not have some failure is not innovation!

The main conclusion is that the development process was successful because of the quality of the partnership, and that the lessons are:

- ◆ choosing the right partners is critical. Competitive processes (whether architectural competition or contractor tendering) involve an element of good fortune – which happened in this case. Competition of this kind adds to the management difficulties!
- ◆ sticking to the brief and not making major changes as you go along is important. This may mean holding your nerve! It also means that the joint vision of the outcome is there as a main driver
- ◆ having the design team locally based helps communication with the client.
- ◆ involving the main contractor at as early stage as possible does help with buildability (depending of course on the contractor). To do this the main contractor has to share the vision (not be simply seen as a deliverer of someone else's vision) and his experience and expertise has to be recognised by the rest of the partnership.
- ◆ new value for money assessments procedures need to be used for innovation projects (for both fees and contracts) – following the 'Modernising Procurement' agenda. Slateford Green was a mid size contract. The tendered element was approx. 60% of the total value of the contract. The remainder was still being designed when the contractor joined the partnership and thus Hart was able to make a

reasonable contribution. For innovation work, where the vision and the execution of the vision need to be developed together, and where getting the partnership right is crucial, Communities Scotland should consider whether an approach based on 'open book' negotiation may be preferable to the traditional tendering route.

Lessons from the innovative products

Both the Association and the design team had ambitions to incorporate as many innovative products as possible. They may have been over ambitious, although they succeeded in most cases, even if there had to be some changes in detailed specification. There were three main innovations proposed that were not incorporated:

Grey water treatment - Despite early indications of support from SEPA and East of Scotland Water Authority, the treatment of grey water using the reed beds within the development had to be abandoned because the authorities would not let it happen. The reed bed was still incorporated into the development, taking some of the run off of surface water, acting as a coolant at the bottom end of the courtyard and as a design feature. It may have been ahead of its time – the latest SEPA rules would allow some grey water treatment. However, to allow grey water treatment on site would have required a 3 pipe plumbing system to be built in. When the decision was made to abandon the treatment proposals the additional pipe work was also abandoned.

Photovoltaics - The photovoltaics were removed on both cost grounds and on viability in total energy terms – as a saving in capital costs to bring the costs to the benchmark cost and also taking into account the embodied energy costs. Photovoltaics are an excellent example of the problem of innovation – they are so new in the market that the costs are prohibitive, and will remain so until a mass-produced programme is underway. Grants may now be available from a variety of sources.

Use of waste heat from the distillery - The district heating system was designed to use the waste heat from the adjacent distillery. It was to involve a heat exchanger in the distillery, with back up gas boilers in the development to cope with distillery shut down periods. All flats would have a further back up immerser for hot water. Heating costs would be included as part of the rent; those flats sold would have a metering system and be charged by the association. While the technical problems could be solved the proposal was abandoned late on when the distillery would only grant a seven-year guarantee of supply, rather than the twenty sought by the association. Gas-fired boilers have replaced waste heat as the energy source, while the basic design remains as a district heating system. Abandoning the waste heat scheme is the major innovation loss in this development. Canmore took the decision to abandon the scheme without discussing the difficulties with Scottish Homes, who should have been able to bring in other government agencies and NGOs concerned with renewable energy and climate change. A seven-year supply period, properly monitored, would at least have enabled a longer-term assessment of the benefits of using waste heat – both to the occupants and the reduction in CO2 emissions.

The original innovation - **a car free development** – has been successful. A recent survey identified that only 26% of households had a car compared to a city average of 55% (Scheurer, 2001). The number of house sales was less than originally planned (only 12 out of 26 – the other 14 being converted to shared-ownership). The press has suggested that Malcolm had difficulty in selling flats because of the car free image. Estate agents have advised that while the car free image did not help, it was only part of the reason for poor sales, along with issues such as the unusual architecture, mixed tenure and the district-heating scheme. There is no evidence that potential tenants turned down a tenancy on the basis of the car free status. In 2000, only 17% of those on the Association's waiting list owned a car. Unfortunately, the Edinburgh Car Club, which was outwith the control of the

Association, failed. An attempt is being made to create a new car club.

The assessment of sustainability issues

Many of the 'innovations' in Slateford Green are now recognised as part of a sensible 'green' strategy. They involve the use of recycled materials – eg the joist system, 'warmcell'; natural and 'low tech' processes rather than energy consuming systems – eg passive stack ventilation (even if Slateford Green had to have some mechanical assistance); and the use of non-toxic materials. Most of these have involved additional capital costs in Slateford Green, and have been justified on the basis of benefits either on reduced energy consumption or lower maintenance.

The challenge is how to prove these justifications. While each of the 'green' elements was justified (the benefit) on the grounds of a more sustainable approach, there was little long term cost benefit assessment, no calculations of reduced CO2 emissions, nor the amount of recycled material as a percentage of the total material, or the reduced energy requirements – either in use or embodied.

At the beginning of the project a whole series of ecological and environmental objectives were set out. There is, however, virtually no way of assessing whether they were or are being achieved. The proposals at one time to set up a 'green scoring' system and to utilise the BREEAM environmental assessment system came to nought.

Recommendations

There are six main recommendations arising from the evaluation:

- ◆ for innovation projects, Communities Scotland should decide about where it wants experimentation and recognise these as areas of shared risk. This would then allow clear agreement on criteria for value for money appraisal at the beginning, and to identify if there are areas where additional resources will be

made available. Communities Scotland should consider the creation of an innovation network to support new developments and an innovation fund to stimulate new processes and products.

- ◆ life cycle assessments – as distinct from capital costs – should be used for projects that involve innovation.
- ◆ Communities Scotland should establish methods for early and thorough examination of innovative items to assess the cost benefits over the life cycle of the building. This should include calculating the costs of both embodied energy and CO2 emissions. There may be benefits in these assessments being undertaken by a third party.
- ◆ given that there are national CO2 targets to meet, energy calculations should include estimates of CO2 emissions that could be compared with normative figures for equivalent house types. Further work should be undertaken to examine the potential of financial credits from Central Government for low emission housing developments that could be taken into life cycle costings
- ◆ all innovation projects should be subject to post completion evaluation to assess how far the anticipated benefits have been achieved, and the cost of these should be recognised from the outset
- ◆ Communities Scotland and Canmore Housing Association should jointly undertake a review of running costs, maintenance costs and resident satisfaction, and publish a technical evaluation of the environmental benefits over a period of time.

The way forward

Communities Scotland welcomes the findings and recommendations of the study. Slateford Green represents a holistic approach to innovation and sustainability and is a good example of partnership working within an established planning framework.

Associated with the proposed Social Housing Grant funding mechanism, Communities Scotland is commissioning work into updating the indicative cost

system, as well as whole life costing assumptions and techniques. We are also considering the merits of a dedicated innovations budget and intend revising our post completion review procedures and the methodology to gauge tenant satisfaction to ensure feedback informs both the housing association client and Communities Scotland. Lastly, Communities Scotland is analysing the findings of a survey of residents' expectations on taking up occupation at Slateford Green. A follow-up survey of their experiences of living there over the last eighteen months is also underway.

About the study

Raymond Young Consultancy carried out the study. The evaluation has reconstructed the processes as far as is possible. The files record decisions and correspondence, and therefore the basic development processes. However, the buildability aspects are more difficult to evaluate. In the early stages it was proposed that the construction phase should be observed (including productivity, contractor site and waste management) and that the performance of the completed building should be subject to a technical evaluation. Neither of these happened. Therefore the current evaluation is based on a desk study and a series of interviews with the key players in the development and building process.

Related Research

The car free elements of Slateford Green have been evaluated. See Jan Scheurer (2001) *Car Free Housing in European Cities*, Murdoch University, Perth, Australia (<http://www.wistp.murdoch.edu.au/publications/projects/carfree/carfree.html>).

A full evaluation of the Edinburgh City Car Club has also been undertaken. See System Three Social Research (2001) *Monitoring and Evaluation of the Edinburgh City Club*, Scottish Executive (www.scotland.gov.uk/cru/kd01/blue/carclub-01.asp).

The following Scottish Homes research publications consider related issues:

Lessons from Innovation in Design and Procurement in Projects Funded by Scottish Homes, October 2001, Precis 143.

Innovation in Construction: A European Analysis, May 2001, Precis 133.

HAG Competition Pilot Phase 2: Final Evaluation, July 2000, Precis 113.

Evaluation of Energy Efficiency Measures at Hutchesontown Multi-storey Blocks, March 1999, Precis 88.

Scottish Homes has also published a Sustainable Development Policy and two practical tools to assist all developers in

producing housing that is more sustainable. See Scottish Homes (2000) *Sustainable Development Policy*, Fionn Stevenson and Nick Williams (2000) *Sustainable Housing Design Guide* and Heriot-Watt University, School of Planning and Housing & Thirdwave (Scotland) Ltd. (2000) *Housing Quality Assessment Program*, all Scottish Homes.

Further Information

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