
# Leitch Street

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

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# Leitch Street

*A development of 87 homes for a Housing Association on a brownfield site, which incorporates a CHP system, SUDS and Homezone principles.*

## BACKGROUND

In 2001 Communities Scotland were encouraging housing associations to take sustainability seriously and established a specific fund to support certain measures to increase sustainability in developments by housing associations. Cloch Housing Association responded to this situation by branding their development of 87 homes on brown field land next to the railway line in Greenock as an Eco-Village, and set about drawing up a brief for a sustainable housing development. They used The Royal Incorporation of Architects in Scotland (RIAS) to carry out the initial team selection and specified a single appointment with sub-consultants. Beyond the stated requirement to propose 'sustainable' housing, the competition brief was open in its requirements, though limited by the need to remain affordable in terms of public sector housing procurement. John Gilbert Architects were appointed through a traditional price and quality bidding process.

## APPROACH

Cloch Housing Association had not undertaken a development with a sustainable brief before and while the funding from Communities Scotland stipulated substantial sustainability measures, Communities Scotland did not provide any back-up or support in terms of how to implement these. The client is happy to admit that while they were keen to include every sustainable measure they could think of, they had little idea what they were taking on, although they did acquire specific advice on the CHP/ District Heating system from Enconsult Environmental Consultants. John Gilbert Architects had previously carried out a number of projects with a 'sustainable' brief. Even where sustainability did not form a specific part of the brief for this project it remained an important parameter as far as the architects were concerned. They did not feel that this limited the choice they could offer their clients or that it should make their buildings more expensive to build or to live in. This was based on a belief that the social, economic and environmental benefits of following and developing a sustainable housing brief should be directly reflected in the quality of life of those who live in the finished houses.

The client's brief led to a design approach which was both open in its search for appropriate design solutions and practical in terms of understanding what would and would not be affordable.

Several social aspects of sustainability were also applied in the approach to this development:

- Urban regeneration – re-use of a genuine brownfield site;
- Meeting local housing priorities;
- Housing for Varying Needs standards were applied, providing enhanced floor areas to address changing future needs;
- Accessibility: barrier-free access throughout;
- Secured by Design and Homezone principles were applied: including defensible public open space, safe play area and traffic calming measures.

<< Typical exterior view of buildings

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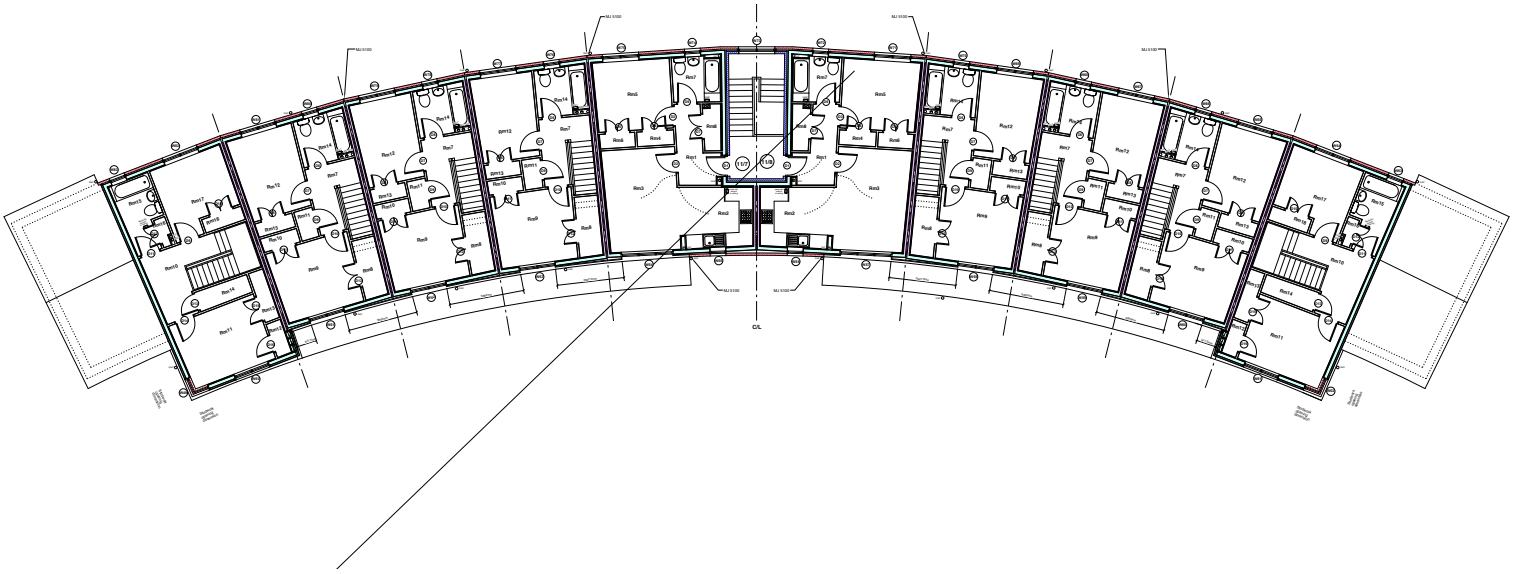

Ground floor layout of central crescent

Computer generated Image of the development


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Communities Scotland funding stipulated the provision of a Combined Heat and Power (CHP) system, and Scottish Water stipulated the installation of a Sustainable Urban Drainage System (SUDS) because they felt that the existing infrastructure could not cope with additional surface water drainage, and the burn at the low end of the site was at risk of flooding the main Glasgow to Greenock road)

Other measures that came to be specified in order to provide warm, comfortable homes that could be run at reasonable cost were:

- Maximising good day lighting while optimizing but controllingsolar gain; solar path modelling was used to establish the optimum orientation of houses on this north-facing site. This led to the provision of a solar heated 'sunspace' on the upper storey of the larger houses and a south-facing glazed entrance atrium to the flats;
- Natural ventilation, through passive rather than mechanical systems;
- Insulation and air-tightness.

In order to reduce costs, the development was tendered with another project nearby.

Frontage of typical house

## PROCESS

**CHP system:** A gas turbine generates base load electricity and the waste heat passes through a heat exchanger which then acts as a lead boiler providing heating and hot water for the whole development. Two secondary boilers provide additional heating during the colder months of the year and the CHP unit generates base load electricity throughout the year. A gas fired system was selected for reasons of reliability of supply. The plant room for the CHP system is located on the southern side of the development.

**SUDS system:** All hard surfaces on the site and rainwater from the roofs of the houses discharge via a SUDS system below the roadway to four deep soakaways within the site. The road surface itself is designed as a permeable surface, so there are no road gulleys in the development.

**Improving insulation and air tightness:** The houses have breathable wall and roof construction and avoid the use of materials which may 'off-gas'. Insulation and frame linings consist of 145mm Warmcell cellulose insulation and Panelvent to walls; 200mm glass fibre insulation in loft spaces and Pavatex vapour permeable fibreboard sarking to roofs. The attic voids were unvented, thus saving energy through better airtightness in the loft spaces.

Where the opportunity existed, local manufacturers were specified, e.g. bricks from Ibstock's Uddingston brickworks.

View along crescent

A timber frame system and cladding materials were specified to minimise the environmental costs of production, both in terms of pollutants and

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embodied energy. This included avoiding the use of PVC where possible (and affordable) and minimising the use of cementaceous products above ground level.

The planting schedule consisted of tree and shrub species which would occur naturally on the site. Grass specification included clover to avoid specification of chemical nitrates and to suit the local (damp) environment.

An on-site crusher provided recycled hardcore (crushing brick and concrete from on and off site) for the ground floor slabs although specification restrictions meant that this could not be used below shared ownership houses or in the SUDS system.

Because of the proximity to a railway, houses had to be designed and laid out to reduce noise levels. Difficulties in reaching agreement with Railtrack meant that instead of replacing the existing fence, a new acoustic perimeter fence had to be erected inside the original perimeter.

While the project was on site a number of briefing sessions were set up with the architect, services engineer and client to explain the operation, management and maintenance requirements of the CHP system. Maintenance manuals and householders' handbooks were issued to the client on completion.

Any contamination inherited with the brownfield site was encapsulated in-situ rather than removed.

^ Home zone paving and streetscaping

## RESULT

The development comprises a total of 87 properties for mainstream rental and shared equity. The properties include flats, terraced and semi-detached houses; they are spread along one gently snaking main road (Macgillvaray Avenue) which backs onto the railway line, and in four other smaller groups. Entrances to Macgillvaray Avenue come off Leitch Street and Weir Street. Four of the houses are supported accommodation. Environmental consultants 'Ecodyn' were appointed by Cloch Housing Association to carry out an environmental audit and provided a 'Very Good' EcoHomes certification.

The layout and detailing was approved as Secured by Design. The Homezone principles have been successful in creating streets that are not dominated by traffic use, where children feel comfortable to play, although some residents continue to park across pavements.
Tenants are known to be happy with the houses, and with the layout of the estate, and tenants rarely move out. The houses are of a better size and higher quality than the nearby private housing. Because of specification of materials (including larch cladding, galvanised railings, high specification doors and windows), on-going maintenance on the fabric of the buildings has been minimised.

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Although the local authority would not adopt the roadways for five years because of lack of knowledge and confidence in the SUDS system, the system has worked well, even though it was an unusual type of system when installed.

^ Front gardens and parking bays

Although the Housing Association had considerable problems in getting aspects of the CHP system to function effectively (see IN USE and KEY LESSONS sections), the system has provided power, hot water and warm homes to tenants at reasonable cost. The CHP turbine provides all electricity required apart from at peak usage time, including the power for immersion elements in hot water tanks in all the houses. The design of the system was adapted (and a new turbine engine installed, see IN USE and KEY LESSONS sections) due to higher than expected overall energy consumption due to the engine operating 24/7. At times when demand for electricity is low, (for example at night) it may be cheaper to draw electricity from the grid and switch the engine off – this would be done through remote monitoring by the energy service company managing the system (see IN USE below). Power can also be drawn from the grid if the engine needs servicing or any temporary faults develop in the system.

## IN USE

Both the Housing Association and its tenants are extremely pleased with the houses and with the development as a whole, which works as planned. However, initial problems with the CHP system, which are only now being resolved, seven years after the scheme was completed, have affected the Housing Association's views of the scheme. The CHP problems have been as follows:

**Poor heat distribution**
Caused by – bad workmanship when laying distribution pipes (observed at the time), poor specification and cost savings which led to removal of recommended central filtration and installation instead of small filter pots in each house, which choked frequently.
Solved by – extensive flushing of distribution pipes; removal of individual filter chambers in houses and installation of central filtration in main plant room.

Even with these changes the system has still not been able to provide satisfactory heat to two houses that lie at the furthest point from the plant room. Despite being offered alternative accommodation the tenants in these houses chose not to move – one measure of the popularity of the houses. The housing association has now installed individual gas boilers to these houses.

∨ Entrance to flats via sunspace

**Deterioration of turbine engine**
Caused by – the way the system was designed meant that the engine had to operate 24/7. In addition, the turbine would periodically stall because the gas supply pipe and meter were not of sufficient capacity.
Solved by – installation of larger gas supply pipe and replacement of engine, programmed to run only on demand, and draw electricity from grid if it calculates that that is the cheaper option. Installation of larger gas meter will increase overall costs of providing energy.

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> A safe place to play

**Higher than expected energy consumption**
Caused by – despite being issued with handbooks, the tenants needed extensive training in order to achieve the right balance of heating and hot water for their needs. If heating was kept on all day, there would be no hot water at night; to achieve hot water in the morning, heating had to be turned down at night; if the house was too hot in the day, the heating had to be turned down in preference to windows being opened; a cold radiator might not mean a cold house and the need for heating to be turned up.
Solved by – continual advice given to tenants; changing radiators in all houses from double panel to single panel. The Housing Association are planning to install energy monitors in all properties (taken out from the original scheme as a saving) to encourage tenants to monitor their energy usage. The Association also intends to charge tenants for the energy they use rather than charge a flat rate per tenant. They hope that this will encourage tenants to use the system efficiently and in the way that was originally envisaged.

**Managing the system**
As indicated by the above, the Housing Association has had continual challenges over a long period of time in order to get the CHP system to meet the task for which it was designed. This situation was not helped by the Service Engineering Company that carried out the specification and installation going out of business shortly after the scheme was completed. The Housing Association has resolved this situation by handing over the responsibility for designing, supplying, installing, maintaining and managing the system to a single Energy Service Company, Cogenco. This company has carried out all the recent adaptations mentioned above and will monitor and maintain the system from now on. As part of this contract, the Housing Association purchase the energy generated by the CHP system from Cogenco.

> Typical community activities within the development

# Leitch Street Housing

^ Typical back garden

## KEY LESSONS

This was a large scheme that provided high quality houses for rent; the houses are popular, energy costs have been comparable to developments with standard heating systems. The architects remain proud of the scheme and its design and layout. Though of an unusual design, the SUDS system has worked well. The only issue has been the problems in the functioning of the CHP system. Although these now seem to have been resolved, it is not yet known what impact this will have on the energy use of the scheme. While CHP in itself was not new at the time of the scheme's design, the client had no prior experience of the management issues involved in the maintenance and running of such a system and savings were made at the time of specification that with hindsight were clearly unwise. There were also problems in achieving the required level of workmanship installing the system. Some of these could perhaps have been solved at the time if the Association had been able to appoint a maintenance contractor to run the scheme, as recommended by Enconsult. The client's conclusion is that they 'bit off more than they could chew' in terms of the CHP system, and also that 'too many people were involved in the whole process.' The architects feel that had the services engineer been directly appointed by the client, rather than appointed by the architects as a sub-consultant (as requested by the client), the more direct relationship between client and consultant might have made it easier for the client to resolve the problems with the services side of the scheme as they continued to occur. The client has ultimately solved the problem of managing the CHP system by handing over the system to an Energy Service Company, and that would be their recommendation to anyone setting out on a similar journey.

Such a company can provide advice on the setting of tariff charges, procuring both gas and electricity and selling them on to tenants – an arrangement which the architects felt was also necessary.

The particular form of the SUDS system raised programming and sequencing issues on site: kit erection progressed ahead of groundworks leaving little space to progress the latter or for on-site storage and access; also the construction of the SUDS box needed to be co-ordinated with all of the site services.

The architect also commented that although a preference for local sourcing of materials was an objective at the outset, when dealing with a manufacturer with an international production base you have no control over whether materials come from their local factory. For these reasons the under-slab EPS floor insulation ended up coming by lorry from southern Europe.

Labour shortages, particularly a lack of good quality bricklayers and joiners, were a problem during the construction period, and this showed by the amount of work needing to be redone. The contractor was often able to rectify defects before they had come to the attention of the Clerk of Works, but the architect felt that the net result must have been a significantly higher than necessary amount of waste.

Innovation always carries some risk, and new systems are more likely to

incur installation delays, through unforeseen problems arising, and are more likely to malfunction once they are up and running. Clearly new contractual arrangements will have to be developed to deal with these situations when they arise. When systems malfunction or have teething problems, architects can accept this as a necessary if unfortunate side effect of innovation. It is less easy for the client, tenants or building managers to accept this. It is therefore important for designers to bear in mind the needs and nature of building users and the management capacities of the client and look to sustainable design solutions that are appropriate to both.

Typical rear elevation

## Project Information

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| Location: | Macgillvary Avenue, Macgowan Way, Leitch Street, Greenock, Inverclyde, PA15 2JT |
| Client: | Cloch Housing Association |
| Date Completed: | 2004 |
| Project Value: | £6,417,335 |
| Internal floor area: | 7,981 m2 |
| Architect: | John Gilbert Architects |
| Structural Engineer: | Elliott & Co |
| Services Engineer: | Enconsult |
| Quantity Surveyor: | JR Queenan Partnership |
| Specialist Consultants: | Landscape Architect: David Jenkins Associates |
| Main Contractor: | Kelvin Homes |
| Core Funders: | Communities Scotland |
| Additional Funding: | Inverclyde District Council for special needs adaptations |
| Image Credit: | John Gilbert Architects |

Architecture and Design Scotland

Bakehouse Close, 146 Canongate
Edinburgh EH8 8DD

Level 2, The Lighthouse, 11 Mitchell Lane,
Glasgow, G1 3NU

T: +44 (0) 845 1 800 642
F: +44 (0) 845 1 800 643
E: info@ads.org.uk

www.ads.org.uk/sust

**Architecture+Design**Scotland
Ailtearachd is Dealbhadh na h-Alba