press information

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LAKE SHORE: OUT OF THE ASHES

Sustainability outline

atelier ten

CarbonNeutral® company

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Sustainability at Lakeshore

The Brief

Urban Splash set a very challenging brief for the team to explore all possible options for energy efficiency and the use of renewable resources. Our aim is to make this one of the most efficient developments in the country, despite it being an adaption of an existing building.

Having recently obtained Planning consent for the scheme we have the majority of strategies determined and integrated into the proposals. The renewables proposals are still under review and currently are based on offsetting 100% of Landlords energy requirements through a combination of small-scale wind energy and Photovoltaic installations.

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The Challenge

The adaptive re-use of an existing building structure such as this is a highly sustainable first step as the saving on materials for construction is enormous. The listed status of the building, the very deep floor-plates and its highly glazed facades however represent considerable challenges in terms of energy use, daylight and quality of environment.

The building has enormously deep floor plans, which were typical in US style corporate offices of the period. In order to counter this and produce apartments of manageable dimensions including a circulation route within the building the central 'atrium' space has been carved out, and covered with an ETFE roof. This brings light to the back of the apartments but also provides a thermally effective buffer space to the outside which results in most of the apartments having a very small exposed external wall area and despite it being fully glazed the heat losses are very low per square meter of occupied area.

All of the glass on the facades will be new and will be very high performance low 'E' double glazed units with gas filling and selective coatings to minimise heat loss in winter and summer solar gain while allowing plentiful daylight into the space. All of the glazing is recessed back from the structure line providing some shading from high angle radiation in summer.

Apartments are heated by underfloor heating supplied from an energy centre which includes ground and water source heat pumps and gas fired boilers. The base heating load which represents 80% of the annual heating energy use will be met by the ground source system. The more exposed apartments on the upper floor require some cooling availability in summer; this can also be provided from the heat pump system and effectively puts the removed energy into storage for the winter months.

All apartments have individual continuous mechanical extract ventilation serving bathrooms and kitchens. This innovative, low-energy form of ventilation enables the normal trickle vents to be omitted from the windows thereby reducing the heating demand associated with air infiltration by more than 50%.Lighting to apartments is being designed to maximise the use of integrated low energy light sources and landlords lighting will be switched throughout by combination daylight and movement sensors. Urban Splash will control both construction and supply chain to ensure that all materials are sourced from environmentally responsible suppliers with appropriate certification.

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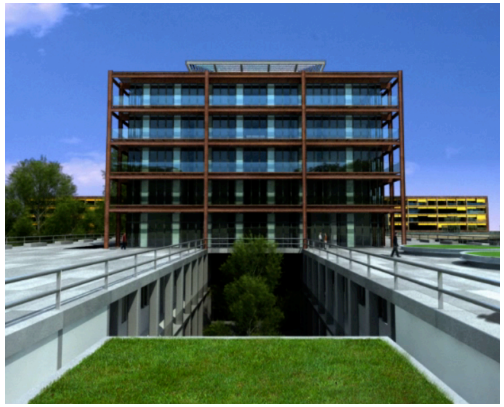

Renewable energy from the ground

The apartments will be heated using a combined ground and lake-source heat pump system. Plastic pipes will be installed within boreholes, drilled to a depth of some 250m. Chilled water pumped through the pipes will absorb heat from the ground which is anticipated to be at a steady temperature of 11-14°C and as such represents a useful heat source.

The chilled water, which now has been warmed by its passage through the boreholes now delivers its energy to a heat pump (basically a fridge working in reverse) where a compressor increases the temperature to 50°C for delivery around the buildings to the apartments. For every five units of energy supplied as heating only one unit of electricity is used to drive the compressor and so the system is extremely efficient. When grid electricity is used the carbon emission is 0.025kg from every unit of heat, compared to 0.053kg if a gas-fired boiler were used instead. Urban Splash intend to purchase their electricity from renewable electricity providers such as EcoTricity, further reducing the carbon emissions from 0.025kg per unit down to zero.

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In order to balance the heat extraction through the year it is necessary to pump heat down into the boreholes in the summer months. This heat will come from two sources:

- Sunlight falling on the lake will warm the water; this heat energy will be extracted via a heat exchanger and returned via the boreholes to the ground. This is effectively seasonal solar storage.

- Energy from the apartments on the upper floors, which are comfort cooled due to their significant exposure to solar gain.
  With a conventional comfort-cooling system, the cooling comes at a price; the cooling process requires electrical input to drive. At Lakeshore heat taken from the apartments and put into the ground actually reduces overall energy consumption by warming the ground up thus enabling the heat pump to work more efficiently in winter.

The system is also connected to the lake by a suction pipe down one of the columns, this allows lake water to be used as a heat source when the temperature permits and provides the source for 'recharging' the boreholes in the summer.

The energy modeling undertaken indicates that a balance can be maintained in this way and the energy from the ground can then be viewed as 'renewable'.

The GSHP system is sized to meet 50% of the peak energy fired condensing boilers. The GSHP system will however provide as estimated 80% of the annual energy demand.

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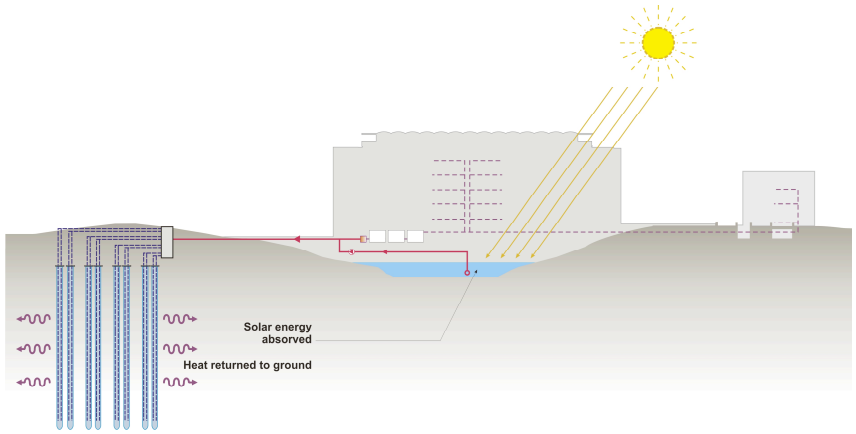
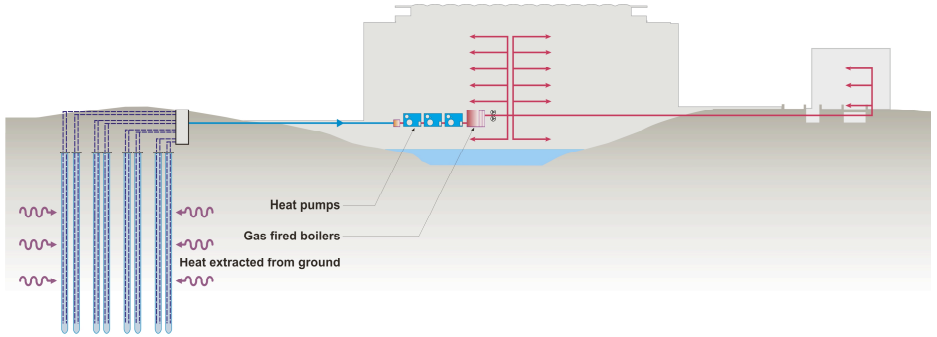


(summer section)



(winter section)

Environmental Elements

SKIN

The building envelope will comprise high performance double glazing units with low-e glass and an inert gas fill. The target u-value for the glazing panels is 1.5W/m²K.

Daylight is a key requirement in these deep plan spaces and so priority is given to a high visible light transmission (>75%) over shading performance. Detailed studies have been prepared of the apartments to confirm adequacy of daylight.

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It is not possible to achieve recommended daylight factors in all parts of the apartments, particularly kitchens, but the large viewing window at the exterior of each apartment is demonstrated to give a higher contact with the exterior than would be achieved with a more conventional apartments with 'punched' windows.

The contribution of the atrium arrangement to the daylight environment at the back of the apartments has also been studied in detail to determine the glazing configuration.

The building façade elements will be very well sealed to minimise winter infiltration. Trickle vents are not required as continuous mechanical extract as basic ventilation needs are met by the continuous mechanical extract ventilation systems. Apartments will be pressure tested to achieve a maximum infiltration target rate of 7m³/hr /m² façade area at 50pa pressure.

Atrium
Cutting the atrium through the centre of the building reduces the depth of apartment plans to manageable proportions and provides routes for public/private circulation around the interior.

The atrium will be covered by an ETFE roof, raised a storey height above the top floor with ventilators integrated into the support system. The ETFE roof provides exceptional daylight transmission (>80%) while allowing some control of solar gain and having a u-value equivalent to high performance double-glazing at a fraction of the weight.

The vents are operable for purposes of both ventilation and smoke control and will operate automatically in the summer to encourage a high throughput of air. When the vents are closed in the heating season the atrium acts as an effective thermal buffer space to reduce the heating demand on the apartments by catching solar gain through the roof by absorption into the internal surfaces.

The back of the apartments also benefit from the daylight that the atrium space introduces so that even otherwise 'internal' rooms receive some exposure to daylighting.

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Apartments
All of the apartments have services supplied from the Landlords central environmental infrastructure.

Heating and cooling water supplies will be metered via integrating flow meters in each apartment fed from the central GSHP system. Heating will generally be by underfloor heating pipes and the few apartments that will have cooling will have fan-coil units located in the fit out.

The Electricity supply to the building will be bulk purchased from an environmental supplier such as EcoTricity and will be distributed to tenants and owners and metered by the management company. Thus all occupants of the building will effectively sign up for green power. The long term benefit of this infrastructure decision is that in the future initiatives such as BioFuel CHP, Hydrogen fuel cells and the like can be added to further improve carbon efficiency without the necessity to re-wire the whole building.

We believe that this kind of flexibility is a vital part of the long-term strategy for the building.

The concrete surfaces within the apartments are being painted and left exposed to maximise thermal mass effects. These will help to keep the apartments cooler in summer and temperature stability in winter and will help to reduce peak system sizes. Lighting within the apartments will be designed to utilise only low energy light sources and will be concealed wherever possible to allow the most efficient linear sources to be used. Switching will be automated wherever possible to automatically shut off unnecessary lighting in circulation spaces, bathrooms and cupboards.

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Renewable Energy
Aside from the renewable component of the heating system represented but the ground source system, which we estimate to represent between 15% and 20% of the total energy demand for the development, we have three areas of renewable energy that are being developed:

- **Wind Energy**
  This is under review at the time of writing but studies are underway to develop the feasibility of locating between 3 and 6 “Quiet Revolution” type turbines in the landscape alongside the access road. These 16m high devices produce a peak of 5-6kW each and up to 12,00kWh per year. This part of Bristol is not particularly good for wind resource but whilst the viability of this proposal is questionable, the Client is willing to pursue it because of the proportion of landlord energy demand that can be thus provided (c. 20%).

- **Photovoltaics**
  The economics of PV panels remain as difficult as ever but costs have come down steadily in the last few years. At Lakeshore we are currently developing a proposal to integrate up to 500m² of thin film PV panel into the laminated glass balustrade on the south façade of the new blocks on the north side of the development. This would be sufficient to offset annual energy demands for Landlords lighting and car park lighting. Integrating the PV into the laminated glass as a substrate reduces the extra-over cost associated with framing and support that would otherwise be incurred.

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ENDS

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