

Intergenerational Centre, Merton

Sustainability Statement

The Merton Intergenerational Centre is a single story building with a gross internal area of 615m². To meet a challenging programme, an early decision was made to use prefabricated modular construction. Most of the building will be built off-site and delivered to site in container size pre-assembled units. The lightweight prefabricated volumetric approach is in line with government initiatives based on the 1998 Egan Report for sustainable construction and efficiency in the building industry through industrialised building methods. The advantages of modular construction include:

- The construction process is more controlled, so the volume of construction waste should be minimised and any waste is more likely to be recycled or used on the next project.
- The travelling distance of the factory workforce is likely to be less than that of an equivalent on site workforce who traditionally travel significant distances in order to construct buildings.
- Fewer materials/natural resources will be consumed in the manufacture of lightweight modular constructed buildings compared to a traditionally constructed building.
- The noise and disruption to the neighbouring schools and residents should be minimised as much of the construction works will occur off site, at the factory.
- Prefabricated construction will be higher quality - fewer defects with work completed in factory conditions.

The expected high occupancy levels and the need to provide more control of comfort conditions for the users, including the very old and the very young, indicate a requirement for mechanical cooling. Modular, lightweight construction does not offer the same resistance to temperature rises that a more heavy weight construction might, because lightweight construction does not contain significant "thermal mass". We recognise that characteristic of lightweight construction and have selected a ground source heat pump technology that, in effect, provides the lightweight construction with a seasonal underground thermal mass in the form of thermal banks. Excess heat generated in the building during the summer is stored in thermal banks to be extracted during the winter. This technology is called "Interseasonal Heat Transfer".

The new IGC building will be the first project to combine Egan inspired prefabrication with a thermal bank heating / cooling technology, a combination that will produce a sustainable lightweight construction. It is appropriate that this initiative is in Merton, a borough that has been a leader in sustainable building.

MINIMISING THE NEED FOR COOLING

In order to minimise the need for cooling we have included high insulation levels, canopies to shade windows, solar reflective glazing through improved "G" values and intelligent lighting controls to minimise internal gains.

ENERGY EFFICIENCY / MINIMISING CARBON DIOXIDE EMISSIONS

The following strategies have guided the sustainable design for winter and summer conditions:

- A ground source heat pump with an intelligently controlled thermal heat bank to provide low carbon, high efficiency, heating and cooling
- High efficiency lighting with daylight dimming and occupancy sensors
- U values shall be improved by at least 20% over Building Regulations 2006
- Low air permeability rates, 5m³/hr/m² @ 50Pa

ENSURING A 20% REDUCTION IN CO₂ EMISSIONS WITH ON-SITE RENEWABLE ENERGY

The initial proposal outlined in the submitted Sustainability Statement included a biomass boiler to provide low carbon heating during the winter and an air source heat pump to provide cooling during peak summertime conditions. Although this heating and cooling strategy provides around a 25% saving in carbon dioxide emissions over a conventional gas boiler and chiller installation, the design team has reviewed available technologies to find a more elegant and more efficient solution.

A ground source heat pump coupled with a thermal bank has been selected and is the basis of the energy and emissions proposal in this revised Sustainability Statement. Ground source heat pumps using this technology are able to provide both low carbon heating and low carbon cooling by extracting heat from the ground during winter and “dumping” heat back to the under-ground thermal bank during the summer. Conventional ground source heat pumps typically have a seasonal Coefficient of Performance [CoP], a measure of efficiency, of around 3. A coefficient greater than 2 is required to yield a carbon emission saving over a gas boiler. The CoP can be increased by using the ground as a thermal bank. Heat generated in the summer is transferred to the ground thermal bank to be used during the heating season. A ground source heat pump coupled with a thermal bank is able to achieve significantly higher CoP's over a conventional ground source heat pump and therefore higher carbon dioxide savings,

Ground temperatures typically remain at a constant 10°C all year round, if the ground is left undisturbed. In a conventional heat pump, ground temperature drops towards the end of the heating season to around 2 or 3°C as the ground source heat pump extracts heat. This means that the CoP of a conventional ground source heat pump drops during the heating season and averages around 3. If the ground is used as a thermal bank, to store excess heat generated by the building during the summer, the ground temperature around the ground source heat pump can be raised to around 18 to 20°C. This has the effect of raising the CoP of the ground source heat pump to around 5, significantly improving efficiency and reducing carbon dioxide emissions. The thermal bank retains and makes use of the excess heat generated by the building and its occupants during the summer that would otherwise be lost to the environment with the use of conventional chiller units and air source heat pumps. A further saving in carbon dioxide emissions is achieved by using heat recovery on the internal room heat/cool emitters by transferring heat from the rooms that are overheating, to the rooms which are still cold. This feature is expected to be used during late spring and early autumn.

The ground source heat pump with intelligently controlled thermal bank is an elegant and low carbon solution to an otherwise demanding building. The attached calculation sheet details how the ground source heat pump coupled with the heat bank compares to a naturally ventilated gas heated building requiring no mechanical cooling. The gas heated building has total CO₂ emissions of approximately 26 tonnes per year. The ground source heat pump with thermal bank has a total emissions of only 18 tonnes per year, this is approximately equal to a 32% saving in CO₂ emissions. Ground source heat pumps are recognised by the London Renewables Toolkit as a renewable energy source. During the detailed design stage a Part L2A Building Regulation compliant model will be produced to verify this calculation.

WATER CONSUMPTION

In line with the BREEAM requirements, water consumption will be minimised by incorporating low water use sanitary ware such as:

- Aerating taps
- 6/4ltrs WC's
- Flow restricted showers <9l/min

In addition, sanitary supply shut off valves and water monitoring and leak detection systems will also be included which will minimise any unnecessary waste of water. The water monitoring and leak detection systems will monitor all water entering the site. An alarm will be raised in the event of a leak.

A pulsed meter will be provided to allow consumption of the potable water supply to be easily monitored.

RAINWATER HARVESTING

A rainwater harvesting system will be included in the scheme design. Rainwater will be pumped to all WC outlets and external bib-tap to allow irrigation of the gardens. The system design will be based on a pressurised plant installation and will divert to mains water supply when the tank is low.

Care will be taken to ensure that all local Water Authority requirements will be met and that full back flow prevention measures will be included to eliminate the risk of contamination of the potable cold water supply.

MINIMISING AIR POLLUTION

In order to mitigate air pollution throughout the life time of the development and as in line with the BREEAM requirements, all insulants will have both a global warming potential of less than five and an ozone depletion potential of zero.

MINIMISING LIGHT POLLUTION

A light spill diagram for the site and current external lighting scheme has been included. This is our current scheme; however this may be developed dependent on the design and funding. The following strategy has been used:

- Car park and existing pedestrian route: columns
- Walkways: bollards
- Paved activity areas near the building: integrated with the canopy design

All external lighting shall follow ILE guidance on reducing night time pollution and BREEAM requirements on the use of photocells and time clocks shall be met to ensure lights can be turned off between the hours of 2300 and 0700hrs.

BREEAM

The BREEAM Assessment provides a succinct methodology for indicating how sustainable a building is within its environment. Merton Intergenerational Centre has been registered as a Bespoke assessment 2006. The project aims to achieve a 'Very Good' rating.

SUMMARY

This document outlined the strategies used to minimise the building's impact on the environment whilst at the same time promoting a healthy and comfortable indoor environment. All aspects of the design, including renewable energy sources, have been considered.

Halcrow Yolles 23 January 2009