

GROUND SOURCE



Merton IGC interior



Merton IGC exterior

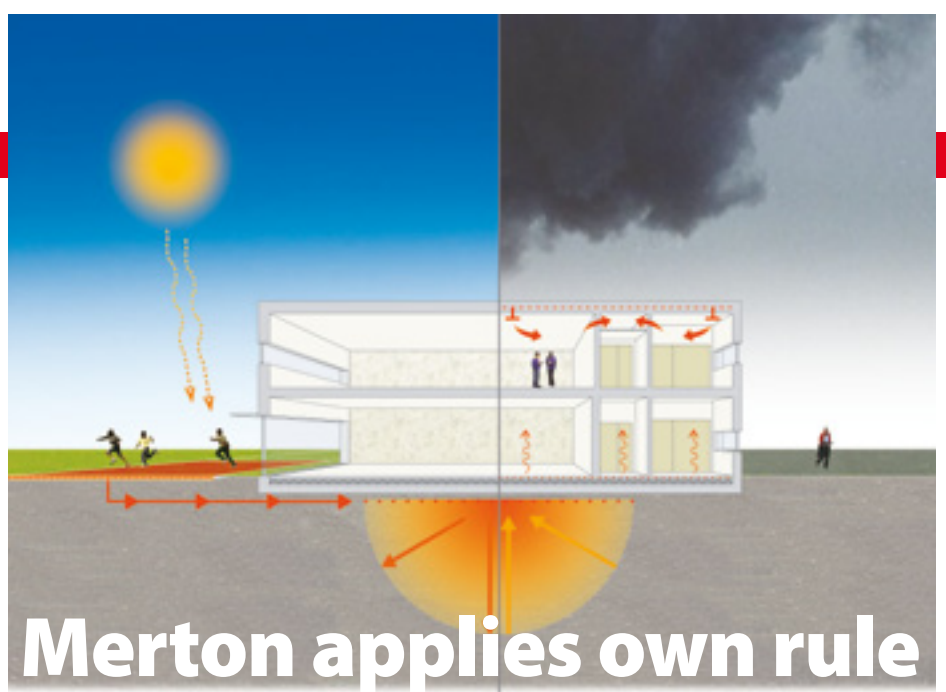


ICAX Skid

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Merton applies own rule

WHEN the UK's Merton Council won £1.5 million from the London Development Agency towards building the first purpose-built Intergenerational Centre (IGC), it relished the challenge, but faced two issues.

The first was how to build to a restricted budget and the second was how to follow, and even exceed, its own Merton Rule by ensuring the building was designed to generate at least 20% of on-site renewable energy.

The Council engaged Dean la Tourelle of Curl la Tourelle Architects to help realise its ambitions. Following time and cost pressures on the building, an early decision was taken to use modular construction. The benefits of constructing the building off-site can include meeting a tight timetable, but there are significant implications of using a building technique that involves a low thermal mass: buildings of light weight can be expensive to heat in winter and expensive to keep cool in summer because they lack thermal inertia.

INITIAL THOUGHTS

Initially, the architects looked to use a biomass boiler to achieve on-site renewable energy. Biomass boilers often get a big tick-in-the-box for being cheap to buy. However, two problems emerged. The first was revealed on closer examination of the lifecycle costs for, although a biomass boiler may be cheap to buy, it can be quite expensive to incorporate into an inner-city site with the need to construct a store for the fuel and a segregated tarmacked space for deliveries to be made. The implications of employing someone to manage the installation for half the year were also a concern.

The second problem came with the report from Halcrow Yolles, the M&E consultant, that this lightweight building would have to be cooled significantly in the summer. The building was due to be used during the day and in the evening, and not just in the week, but also at weekends. The passive heat gains from this high level of occupation pointed to the need for active cooling. The budget for incorporation of a biomass boiler installation for heating and a separate system for cooling pointed the budget into the red.

ELEGANT SOLUTION

The architect discussed these conundrums with colleagues and experts until he found that ICAX could provide one unified system, Interseasonal Heat Transfer (IHT), to provide the heating in winter and cooling in summer. The ICAX design uses Mitsubishi

two-pipe fan-coil units to extract the heat in summer. Instead of wasting the heat from the top of the building using chillers, the design stores the heat in a Thermalbank in the ground, constructed with a borehole field in the garden outside the building. Heat exchange with cold ground makes cooling radically less expensive than trying to waste heat into the hot summer sun.

In winter the ICAX Skid extracts the stored heat from the Thermalbank using a ground-source heat pump and returns the recycled summer heat back into the building. By starting with warmth from the Thermalbank instead of cold ground, the ICAX system manages to achieve a significantly higher co-efficient of performance from IHT than an unassisted ground-source heat-pump system would have achieved.

“We only had short-term stability in the Thanet Sands and suffered loss of circulation in highly fractured chalk in some boreholes – perhaps due to the Wimbledon fault”

THERMAL MODELLING

The Interseasonal Heat Transfer approach is simple in principle, but effective. It does, however, rely on very detailed thermal modelling to ensure the design achieves a balanced thermal approach so that the heat stored in the Thermalbank each summer matches the heat extracted for heating each winter. The size of the Thermalbank is critical and its design is influenced by local geology, as well as the anticipated heating and cooling loads of the building.

The Mitsubishi WR2 system designed into the building is clever enough to extract heat from high-occupancy rooms on the south side of the building and transfer it to low-occupancy, shaded rooms on the north side. The system is alive to the changing needs of each space throughout the day.

ICAX SKID

The control mechanism for the IHT system, which provides heating in winter, cooling in summer and domestic hot water all year round, is contained in the ICAX Skid. The Skid, which was also constructed, assembled and tested off-site, incorporates a

Mitsubishi heat pump, heat exchangers, circulation pumps and electronic controls. The Skid, which arrived on the back of a lorry, now sits beside the building and regulates the temperatures inside it. It acts silently all year round, requires minimum maintenance and does not release any CO₂ on site.

MERTON RULE EXCEEDED

Although Merton requires all new buildings in the borough to generate at least 10% on-site renewable energy to achieve planning permission – The Merton Rule – the architect aimed to achieve over 20%. To quote from the Curl la Tourelle website: "We are always concerned about the impact that buildings have on the world's resources and work to ensure that sustainability issues inform functional, aesthetic and construction decisions."

Calculations on the realised design show that the carbon offset of using IHT, instead of gas-fired heating and standard air-conditioning on a benchmark building in the consultant's report, will be as high as 44%.

RENEWABLE HEAT INCENTIVE

The Merton Intergenerational Centre opened its doors on February 9, and provides a meeting place for activities for all generations in the local community. The government also published its proposals for the Renewable Heat Incentive in February and, subject to the proposals passing into legislation and the building receiving the hoped for approval, Merton Council should receive a clean-energy cashback of over £3,000/y for the renewable heat generated by ground-source heat pumps. Due to the efficiency of IHT, this is expected to be significantly larger than the cost of electricity used to heat the building.

The carbon saving of using IHT for cooling, as opposed to using standard air-conditioning, is calculated at 32%. However, the Renewable Heat Incentive proposals do not currently provide cashback for renewable cooling.

DRILLING

The high co-efficients of performance achieved by IHT rely on using a ThermalBank as a heat source in winter and a heat sink in summer, and balancing the temperature needs of the building with the thermal mass of the ground. Creating the Thermalbank at Merton using Rehau PE-Xa probes involved nine 125m boreholes, drilled by Terra Firma Ground Investigation for ICAX.

Mark Bradley of Terra Firma says: "We only had short-term stability in the Thanet Sands and suffered loss of circulation in highly-fractured chalk in some boreholes – perhaps due to the Wimbledon fault, which runs along the road by the site. We had to monitor our drilling mud closely, but only needed to install temporary casing in three boreholes, albeit down to 60m."

ECONOMIC RENEWABLE ENERGY

It used to be thought that renewable-energy solutions were always expensive to install, even if running costs were cheaper than traditional heating methods. Developments in ground-source energy and drilling expertise mean that the capital costs have reduced, and efficiencies have improved. These, combined with the advent of clean-energy cashbacks, mean that ground-source energy is becoming the obvious choice for those who want to save money, as well as those who want to save carbon emissions.

New geothermal rig from Boart

BOART Longyear has released the DB95GT, a versatile and compact multi-purpose drill, designed for commercial and residential geothermal applications. It can handle several drilling methods.

"In geothermal applications, operators are required to perform numerous functions, putting a huge burden on the rig to manage the drill string efficiently and safely," says Kevin Tomaszewski, product director at Boart Longyear. "The DB95GT is an ideal fit for contractors in this market, providing flexibility, power and a reduced footprint without compromising our commitment to safety."

Boart said the DB95GT is one of the most compact drills with double-head drilling capability on the

market, and its size enables operators to access confined locations that competitive rigs find difficult.

The DB95GT features 9,800kg pullback capacity and a torque rating of up to 24kN on its mast, making it ideal for various ground formations. High-efficiency hydraulics boost performance, delivering more power to the rotary head.

Safety features include a rod-management system composed of a removable rod rack, mounted on the drill, a pivoting main winch, a magnetic rod lift and a rod-alignment arm. Radio remote control safely positions the driller away from the borehole.

The DB95GT also lowers operational costs by mobilising quickly, minimising fuel consumption, and providing high feed and retract speeds.



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