



KING CHILLER

Camden council can afford to build a prestigious new office block in King's Cross featuring two public swimming pools and a library because of predicted energy savings of £500,000. An innovative chiller was a key specification in the low-energy design

The redevelopment of land around King's Cross station is an object lesson in urban regeneration. The project has a long way to go, but already the mix of high-quality offices, elegant squares and restored Victorian warehouses has turned a semi-derelict industrial zone into an uplifting environment.

Part of the appeal is the diversity and quality of tenants being attracted to the site, from Google to Central Saint Martins College of Arts and Design, and CIBSE award-winning engineer Hoare Lea.

One 2014 arrival will be the London Borough of Camden's 22,500m² Five Pancras Square on the King's Cross Central site, designed by Bennetts Associates. As well as 11 floors of offices for council workers, it will feature two swimming pools, a leisure centre, customer service area, café and public library.

There are two reasons why Camden can afford such a prestigious building: it is rationalising its property portfolio and selling valuable existing sites in central London; and it estimates the new building will cut its energy bill by £500,000 per year.

The new HQ will have a host of passive features, including exposed thermal mass, optimisation of daylight factors across the occupied floor plate, solar shading, angled to help minimise direct solar gain, and the ability to benefit from night-purging to cool the building naturally.

These measures, in conjunction with an energy-efficient ventilation system and an innovative modular central cooling system, adaptive control methodologies and connection to the King's Cross Central low carbon district heating network, is predicted

The pump selection and staging has also been addressed to provide effective operation to reduce energy consumption and reduce the end-uses running costs

to result in carbon emissions 50 per cent lower than the 2010 Building Regulation target.

High efficiency targets were set by the design team and to achieve them, the focus was put on innovation. The main items identified were chillers and chilled water auxiliary equipment, air-handling units and exhaust fans, lighting control and luminaire selection, power distribution, metering and sub-section pre-wired and pre-tested off-site.

The *CIBSE Journal* will publish a full case study on Five Pancras Square on completion, but this article focuses on the chiller, which M&E contractor Kier IME says is key to the building achieving – and exceeding – design performance targets. The Part-L compliance dynamic thermal model set a seasonal efficiency target of 4.9 SEER on a total building cooling load of 2.2MW, divided over two air-cooled chiller units.

All the central plant was targeted for improvement against the energy model with consideration given to the spatial constraints and co-ordination of a city-centre building.

A chiller system from Hitachi features in the scheme. The 14 RCME modules selected each have a maximum cooling capacity of 165kW and the high-efficiency screw chiller was shown to achieve a SEER of 5.31.

The screw compressor operates on refrigerant R134A, which is associated with high part load efficiency and reliability, and offers a three-year warranty. The RCME range achieves compressor efficiencies similar to more expensive and complex units.

Twin plate heat exchangers on each module are designed in series for greater efficiency, which in turn ensures the refrigerant velocity increases and constant distribution of the refrigerant flow across the exchange surface.

The chillers are built from three basic modules with ratings of 40HP, 50HP and 60HP. By combining them, higher capacity units can be achieved up to 1,280kW, with one

module set as master and the rest as slaves. All operate together as a single system.

The project team looked at mixing the chiller modules and variability of the capacities to suit the minimum/nominal/maximum load and finally settled on 14 x 60HP, which delivered the optimum efficiency against the spatial constraints.

If space was not a factor then a greater number of units with a smaller output would deliver higher efficiencies as they could be more closely controlled to match the load.





Each chiller for the King's Cross Kier project will be supplied with a power meter assembled at the factory. This will display total power and power per phase, frequency, power factor total, voltage phase to phase and phase to neutral, current three phases and neutral, with an hourly counter and time-integrated outputs.

Efforts have been made to stage the chiller units down to minimal load as low as 32kW. Pump selection and staging has also been addressed to reduce energy consumption and cut the end-uses running costs. The main pump sets run from 100 per cent (2.2 MW) to a minimum (220kW) and the secondary pump covers the range from 15 per cent (330kW) to 1.5 per cent (33kW).

Kier says its specification of innovative systems, including the chiller, means the envisaged post-construction BREEAM score is actually expected to be higher than the design-stage score of 93.05 per cent. The team is working towards a revised target of 96 per cent, which would make it the most sustainable building in the UK as assessed by the BREEAM rating process.

The building is expected to open for business in 2014, and will be closely monitored in terms of energy and water use. The effective operation of the chiller will be key to Camden achieving its expected energy savings and crucial in ensuring taxpayers don't contribute towards the project's costs. **CJ**




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