

Nominee: Telehouse Europe

Nomination title: Telehouse North Two: World first indirect adiabatic coolin system enables leading PUE efficiency of 1.16

Telehouse has operated at East India Dock since 1990. The existing campus, which comprises three data centre buildings, has become the site for Europe's first carrier-neutral colocation facility and is home to the London Internet Exchange (LINX), facilitating 70% of LINX members, as well as a backbone for the global internet network. The site is close to the financial centres of Canary Wharf and the City of London and has significant available power in the form of a privately owned, on-site 132kV substation and the 11kV local utility.

The Telehouse North Two Building is located on part of the former East India dock that was in-filled in the 1960s and left undeveloped until it was acquired for the Telehouse North Two project. Prior to construction, several challenges affecting the proposed site had to be overcome, including land contamination, a requirement for archaeological investigations to take place, the potential existence of unexploded ordnance dating from World War 2 and the nearby presence of the Blackwall Road tunnel, which was a major consideration in the design and construction phases. The site was also considered to be architecturally sensitive by the Local Authority Planners, who regarded it as a Gateway Location to Tower Hamlets, Docklands and the City of London, which lay beyond.

It was evident from the outset that a multi-storey facility would be required in order to provide sufficient accommodation for the project to be viable. The concept of a high rise data centre is not new but, in the past, these facilities have tended to conform to a traditional, water-cooled format with chillers and heat rejection plant accommodated at roof level and cooling to the technical areas delivered by conventional CRAH units.

The 'Real World' Application:

In order to achieve the energy efficiency, resilience and flexibility required by Telehouse, Cundall's innovative solution was to take the concept of a large-scale, air-cooled data centre and turn this on its side to create a 10-storey, high-rise data centre, employing indirect evaporative air cooling up one face of the building. Not only did this provide flexible, low energy cooling to the data halls but also crucially severed the relationship between the building's height, its total floor area and finite amount of plant space available at roof level (normally provisioned for cooling plant).

The resulting scheme is the world's first the world's first multi-storey indirect adiabatic cooling system' to achieve an industry leading PUE of 1.16, whilst providing a power capacity of 18.5 MW.

What distinguishes Telehouse North Two from other high rise data centres is that cooling plant for the technical areas is provided at each floor level in the form of indirect air cooling units mounted on an external plant gantry, which is concealed behind an architectural screen. The units deliver cool air directly into the data halls via a full height plenum wall, which runs along the entire length of the room. Air is supplied to the servers using a 'flooded room' principle. After passing across the servers, it is returned to the IAC units via hot aisle containment and a return air ceiling void.

The IAC units provide N+2 resilience and are supplied with evaporative cooling water, delivered via a fault tolerant distribution system.

The key aspect of the scheme is the design of the external plant gantry and screen, which is arranged to ensure segregation between intake and discharge air from the scavenger side of the IAC units. The IAC units operate by passing outside air across a heat exchanger, the secondary side of which contains air from the data hall. During periods of hot weather, the cooling potential of the scavenger air is boosted by the evaporation of water, which is sprayed directly into the heat exchanger.

With so many IAC units stacked up the side of the building, there would be a tendency for warm, moist air discharged from units on the lower floors to be re-circulated into the units on the upper levels above, thus causing them to be de-rated.

To overcome this risk, the gantry and screen were designed to ensure that intake and discharge air paths were segregated from one another, as much as possible. Extensive computational fluid dynamics (CFD) modelling of the external screen and plant gantry was undertaken to examine external air movement patterns, under both still air and windy conditions. The design evolved through several iterations, before the final, optimised solution emerged.

Subsequent testing of the IAC units during the IST (Integrated System Test) of the first two floors to be completed showed that the scheme was behaving exactly as predicted, and performed extremely well so the first phase of North Two opened in August 2016.

Awarded BREEAM Excellent standard, Telehouse North Two is the world's first multi-storey data centre to deploy evaporative cooling on such a scale, delivering an industry leading PUE of 1.16. With the campus being the primary home of the LINX, TN2's role in the Docklands campus helps to provide around 900 private and public peering ports into LINX, making Telehouse Europe's leading connectivity hub offering ultra-low latency routes to Europe, America, Russia, Africa and Asia.

With regards to power, it is the only UK data centre with an on-campus 132kV grid substation, delivering an industry leading power density of 4.5kW average per rack and dual redundant and diverse incoming power feeds. The design also allows for phased fit-out, so that Telehouse can defer the costs of providing cooling to each floor, until other floors have been fully populated. When fully deployed, the building will contain 8 No. standby generators, providing N +1 redundancy and delivering a total capacity of 18.5MW, supporting redundant 'A' & 'B' power feeds to customer's equipment from 2(N+1) configuration Uninterruptible Power Supply (UPS) sources. The result of this novel and highly flexible design is that Telehouse North Two can offer a range of solutions to meet their client's requirements, providing Shared Facilities Management (SFM) and Dedicated Facilities Management (DFM), with retail and wholesale options also available.

Why nominee should win

World First adiabatic Cooling System, proving a leading PUE of 1.16. More efficient than the top for DC providers in London.

This design utilises BIM and extensive computational fluid dynamics to achieve such an even distribution of cooling across 6 floors of white space. (8,000 Sqm of technical space)

Telehouse North Two is designed with future proof power options, allowing key industries to position power intensive services such as Cloud and Virtualisation within the data centre, without the need to be concerned about growing demand.

Architecturally, it is a landmark building, with its striking 'Circuit Board' façade providing an identity of the Telehouse campus. However, the most significant implication of the Telehouse North Two project is that it provides a template for how a large scale, highly efficient data centre can be constructed in a confined, urban location.