Tower rises to the energy challenge

John Cremer

Any developer embarking on a project as ambitious as the 90-metre 18-floor International Commerce Centre in West Kowloon knows that the building will serve as both a physical landmark and a gifted opportunity to set new standards in design, technology and the incorporation of the latest environmentally friendly features.

From when the tower was first conceived as one half of Hong Kong’s 21st-century ‘harbour gateway’, mirroring Two IFC in Central, Sun Hung Kiu Properties made a point of adopting green concepts and the most energy-efficient practices.

Au Young Shiu-kong, a manager with Sun Hung Kiu’s project management department, said this approach anticipated the expectations of major institutions and catered to their needs. As office tenants, they would naturally benchmark against the highest European and North American standards when choosing new headquarters in Asia. And committing to take space in what, when fully completed in 2010, will rank as the world’s third-tallest building, they expected to have high-tech installations, tailor-made layouts and environmental thinking integrated throughout.

The company’s basic target was to achieve the HK-BCA (Building Environmental Assessment Method) platinum standard. By a rough count, the ICC now has more than 100 advanced green features.

A grand example, according to Pan Wai-kong, project manager with the Sun Hung Kiu Properties Group, was the energy-efficient air-conditioning system. Developed during a two-year research project with Polytechnic University, it has an intelligent control system, which can automatically adjust consumption and allow for efficient 24-hour ‘housekeeping’.

By collecting and analysing data on day and night temperatures plus seasonal variations, the system creates a baseline for optimum settings. A digital control on every floor enables zoning, variable air volume and automatic adjustments in lighting and ventilation. Moreover, each box can be reset remotely through the building management system. "Property managers and architects have been studying various office practices to design software and make sure it is working at maximum operational efficiency," Mr. Pan said. "With the temperature and occupancy controls, we can achieve an estimated 35 percent reduction in power consumption compared to conventional grade A office buildings."

Hundred of sensors help to monitor both indoor air quality and outside air. They measure carbon dioxide levels, to maintain them at international standards and provide a healthy working environment, while independent exhaust vents on typical floors improve ventilation and reduce indoor pollutants. Mr. Au Yeung emphasised that it was essential to make such systems adaptable. Tenants had specific requirements depending on their use of space and varying office routines, and there had to be scope for upgrades, with the possible use of wireless technology in future.

"Our technical teams prioritise protocols and the monitoring and evaluation specifications ask for open connectivity according to international standards, so the company is at no point locked into the use of certain products," he said.

Noting the need for the planning of environmental features to be holistic, he said that condensed water from the chillers was recycled twice. It was first recycled through the main cooling towers and then used to flush toilets.

There were double-glazed windows with low-emissivity coating to ensure good thermal insulation, and all the major mechanical and electrical systems were equipped with power analyzers. These made it possible to conduct energy audits, see which parts of the building consumed the most power, and identify solutions or make suggestions to tenants.

Mr. Pan was keen to see the initial reports, in particular on the "vertical transport" lift system. He was confident that new technology developed with manufacturer Schindler, coordinating access control, security functions and means to eliminate unnecessary energy consumption, would give a power saving of around 12 per cent compared with other high-rise structures.

The key, he said, was an intelligent system which enabled staff to make security moves in the lobby. This checked identities and authorisations, automatically assigned a lift number on the display panel, and automatically grouped passengers for the same or nearby floors in the same lift.

"The system was also able to "learn" user patterns if, for example, individuals regularly moved between different floors occupied by the same company during the day.

This will significantly reduce the number of lift trips and the travelling time, and also consume less energy by cutting the number of stops lift makes," Mr. Pan said.

He added that, in addition, lights and certain lift cars would automatically go into "sleep" mode, while graffiti resistant and low-voltage mechanisms would allow higher efficiency and better acoustic performance.

The company had made a commitment to use extra low sulphur diesel for emergency generators and variable frequency drives for pumps and fans. The firm had also recognised the importance of education about specifics and is in the broader context.

TAKING CARE OF THE NEIGHBOURS

Start planning a megahigh-rise in Hong Kong and one of the first things you have to consider is the impact the structure is going to have on the immediate environment and the neighbours.

In the case of the International Commerce Centre that meant studying in detail the effects of the new microclimate that would be created, including everything from downdrafts and the reflection of sunlight to pollution, heat build-up and the discharge from cooling towers.

It was considered very early in the design stage using established methods and CFD (computational fluid dynamics) models," said Au Young Shiu-kong, manager with Sun Hung Kiu Properties in the project management department. "Some things are inherent with the site, so you have to look at what is achievable and remember to balance internal and external aspects."

He noted that for any super high-rise building, downdraft was a serious issue. The company had gone through an exhaustive cycle of tests and simulations to decide where to locate wind deflectors. The firm had also analysed the likely flow and impact of cooling systems and its potential to minimise the effect of any pollutants and to avoid creating a heat island, particularly in the "dragon's tail" area of the site leading towards the Elements shopping mall. Other measures which took account of the environment included limiting the illumination of the building façade so as to mitigate the intensity of light facing residential complexes.

"You can’t look at one area, for example indoor air quality and outdoor air pollution," Mr. Au Yeung said. "Yet, we also have to significantly reduce the emission of pollutants and introduce noise (and other) mitigation measures."