

Anatomy of A Sustainable Building in Hong Kong

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Scientific breakthroughs of the 20th Century brought about revolutionary technologies that drive up efficiency expectations in terms of cost and return. The revolutionary breakthroughs made many missions possible - tall intelligent buildings of supreme heights are the remarkable ones. Yet how to balance the health of Mother Nature with human greed for optimal growth is an issue that needs good planning. It is particularly important for metropolitan cities of geographical confinements. This paper looks at how Two International Finance Centre (2IFC) coped with the sustainability issues with emphases on the users and management points of view.

Accountability in Getting Taller

“Tall people make big money - each inch of height makes about \$789 a year in pay over shorter co-workers”, an interesting discovery found by the University of Florida in year 2003.¹

If tall people make more money, tall buildings might also be able to help the users to work smarter or happier. Otherwise there should not be so many taller and taller buildings being constructed in these years. The trend of developing tall buildings is noticeable, especially in the Asia Pacific region. Among the top 10 tallest buildings in the world today, eight are located in the Asian countries. China, Hong Kong and Taipei nurtured six out of the top ten: Taipei 101 in Taipei (no. 1 tallest), Jin Mao Building in Shanghai (5th tallest), Two International Finance Centre in Hong Kong (6th tallest), CITIC Plaza in Guangzhou (7th tallest), Shun Hing Square in Shenzhen (8th tallest), and Central Plaza in Hong Kong (10th tallest)². From the construction point of view, constructing skyscrapers might not be economy to both the landlord and the building managers. Also, in the world of increasing concern on the



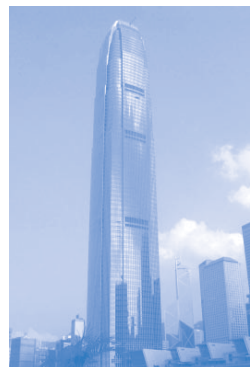
long-term value and environmental friendliness issues today, tall buildings should indeed be accountable in their longer runs of life. This paper is going to look at the sustainability of Two IFC from the users and management points of view.

Profile of the Property

With the building height of about 420 meters which is almost of the same height as The Peak, Two International Finance Centre (2IFC) is the tallest building in Hong Kong and the 6th tallest building in the world today. Same as most skyscrapers of other cities, 2IFC is located in the heart of the central business district. Being the second

phase of the whole IFC development, it lies on a very prime commercial site in Hong Kong - the superstructure on the Airport Express Hong Kong Station. The whole IFC development takes a total site area of 430,000 sq. ft., constructed in three phases:

Phase I - A 3-storey shopping mall (South IFC Mall) and a 38-storey office tower (One IFC). It came into the market at the end of 1998 after the opening of Chek Lap Kok Airport.



Phase II - Another 3-storey shopping mall (North IFC Mall) and an 88-storey office tower (Two IFC). It was completed in year 2003.

Phase III - A 5-star hotel (Four Seasons Hotel) and a serviced apartment block which is expected to come to service by the end of year 2005.

The three Phases together provide a 4-storey basement parking of 1,800 spaces and a total floor area of 4.68 million sq. ft.

On 2IFC alone, it has an 88-storey office tower that provides 1.9 million sq. ft. of GFA at a construction cost of HK\$2.6 billion (about US\$333.33 million). It is a joint development of five strong property developers and financiers in Hong Kong (Sun Hung Kai Properties Limited, Henderson Land Development Company Limited, The Hong Kong and China Gas Company Limited, Bank of China, and MTR Corporation). With such a special background and presentation, 2IFC has unsurprisingly become the most expensive office tower in Hong Kong today (monthly rent at the level of HK\$70 dollars per sq. ft. or US\$96.60/sq. m.).³ In order to maintain its high value in the market, 2IFC has, by design, characterized its uniqueness in addition to its land-marking height.

The Caring Mechanicals & Electricals

Comprehensive House Transport

Display monitors and directories are installed at reception counters and inside lift cabs. These monitors provide updated news headlines, financial information and flight schedules to the tenants and pedestrians of the building.

There are 63 high-speed passenger lifts in 7 zones. Each passenger lift supports a loading of 1,600kg in which 21 people can be carried per service. To enhance the level of security control, card access is obliged in passenger lifts. There are 2 other service lifts serving all levels (One supports 1,350kg at 2.m/s and the other supports 3,000kg at 4.m/s). Besides elevators, there are escalators for transit from the ground floor main entrance to the third floor main lobby. Two other car park lifts are assigned for transit

between the third floor main lift lobby and the basement car park.

The 2IFC is the first in Hong Kong to adopt the double-decker lifts design, for which lift lobbies for transfer are designed at 32/F, 33/F, 53/F and 54/F. To cater for comfort and for efficiency, speeds of the lifts are differentiated to run at 6m/second for the low zone and 8m/second in the high zone.

Electrical Comforts

No surprise that 2IFC has got a well-designed electricity supply system. It has a 60kVA/floor generator back up and a 500 sq.ft. UPS room on the mechanical floor. Besides the dual sources feed high voltage power supply by the Supply Authority, there is a dual power supply riser for each floor. Like other intelligent buildings, a standby generator is installed for emergency power supply to the tenants. In emergency cases, the standby generator supports half of the normal lift services and air-conditioning services for about ten hours. In the office tower, there are four units of fire services generators at a 6.2 MVA installed capacity and 13 units of non fire services generators at a 18.9 MVA installed capacity.

Emergency fuel supplies is served by a standby oil storage tank that is constructed in the building, which is claimed to be the largest standby oil tank in Hong Kong. The management of 2IFC has contracted with an oil company to ensure the required oil supply can be provided to the building within two hours in cases of need.

For working comfort to the eyes of users of the building, electronic ballasts for office lighting and visual display units (VDU) for eliminating harmonic distortion to vision, were installed. To support the application of VDU, ultra low brightness luminaries matching the Chartered Institute of Building Services Engineers (CIBSE) Cat 1 and Cat 2 standard were imported.

Flexi Air-Conditioning

Air-conditioning is one of the very important facilities in the building. 2IFC is using seawater pumps for air-conditioner cooling. It has a total of 6 pump cells in which three duty pumps and one standby pump are built for the office tower. There are two air-

handling units per floor. It has a 35 cooling tons/ floor Essential Chilled Water Supply. Also, there is the VAV Ceiling Ducted System with perimeter zone heating in winter. A fully distributed intelligence Direct Digital Control for HVAC system is also installed. As a contemporary intelligent building, each of its VAV box can be switched on and off independently and remotely. There is also an Overall Thermal Transfer Value (OTTV) around 24 W/M². It fulfills over and above the local code requirement of not exceeding

extended by 2 hours per day at no additional charge to the tenants subject to agreement with the landlord. For some of the major tenants of 2IFC who are international financial institutions, flexible and long hours of air-conditioning supply carry special importance.

All-weather Telecommunications

Besides the well-designed fixed telecommunication system, 2IFC also has a dual dedicated riser duct



35 W/M². As well, a supplementary cooling system is available.

In the whole office tower, a total of ten 980 tons (LV) chillers (Normal) of 9,800 refrigeration tons contents and another eight 350 tons (LV) chillers (essential cooling) of 2,800 refrigeration tons contents are constructed.

To maintain a good indoor air quality (IAQ), Primary Air Units (PAU) are installed on the mechanical floors on 6/F, 33/F, 55/F and 56/F where the PAU would pre-treat the incoming air and allow fresh air supply to the AHUs, which can dilute the concentration of CO₂ level and keep 800 ppm fresh air in an office environment.

To allow more flexibility to tenants in adjusting indoor temperature, each 23,000 sq. ft. office floor can be set into a maximum of 72 individual air-conditioning control zones. Although the building's standard hours of air-conditioning supply is set in accordance to the majority Hong Kong office hours (8am - 7pm on Mon - Fri; 8am - 1pm on Sat), supply hours can be

for telecommunication cables, an in-house Voice and Data Backbone System, and an obstruction free raised floor for the telecommunication systems of the tenants.

As well, the building has installed a mobile phone reception amplifier at individual floor lobbies. Tenants of 2IFC can thus use mobile phones freely even when they are inside the lift cabs.

Hygienic Space Planning of Comfort

The comfort environment concept has been brought into 2IFC since inception. The whole design is to provide a physical and psychological comfy environment to the tenants of the building.

Hygiene

IFC attaches a lot of weight to the health of users of the buildings which is realized in the elimination of Sick Building Syndrome. High efficiency air filters and access doors in ductwork for duct cleaning are provided.

It maintains good air quality for each typical floor at a fresh air rate of 9 liter per person. It also adopts the CO₂ Control for Primary Air Quality Moderation.

Space Planning

The building adopted a ceiling return system, which means no return air duct but the supply air duct is set. This setting can reduce some ceiling void and make the ceilings higher. As a result, the towers have higher ceilings of about 2.7 meters for the general office floors and 3.3 meters for the trading floors.

Also, raised-floor of 190mm on the office floors and 340mm on the trading floors are built. These raised areas provide space for the tenants' cable and wire networking so as to allow users to have more effective working areas.

Users' Comfort

The building aims for low solar heat gain and low noise transmission through the application of double-glazed curtain wall. In other words, bigger windows and more natural lighting are available in the building.

In-house, office lighting is set with electronic ballast allowing flicker-free VDU operation hence eliminating eyestrains.

Furthermore, there is a telephone switching for the after hours A/C services via the building management system (BMS).

Safety Measures

Structural Design

Two IFC, with its 88-floor height, provided horizontal fire separation with four refuge floors and four emergency exit staircases. Its central concrete core combines with eight huge external columns and eight secondary columns to carry the structure's weight. The structure of the building is strengthened by four large, three-storey, steel outriggers that are reinforced to withstand windy conditions.

Building Management System

A fully distributed intelligent system is in place for One and Two IFC. A central system is also available for the security system, fire services, HVAC Control, and Building Services Supervision. It is also one of

the few buildings in Hong Kong that had qualified for full compliance in year 2000 for passing through the Y2K computer bug challenge (One IFC was built in year 1998). It safeguarded the IT systems of the buildings.

Over 1000 CCTV cameras, accessed via turnstiles, are installed in and around the IFC development. The building has also adopted the Octopus Card access control system.

To streamline the handover procedures between the contractors and the management company, 2IFC had invited the input of a management company during the development stage. This allows the advising management company to add opinions to meet the technical requirements in some technical tenders, and also offer opinions on the kinds of materials to be used for floors, carpeting and wall coverings.

Octopus Card System

Octopus Card is the smart card system that was introduced by MTR Corporation in 1997. In recent years, the Octopus Card has served to establish a convenient "touch and go" payment culture in Hong Kong.

In 2IFC, Octopus Card is adopted for building access and lifts operation control. With this contactless smartcard system, all the travel logs of the tenant company's staff, visitors, contractors, workmen entering and exiting the building are recorded. A face recognition system is also adopted to provide a better control at the entrance/exit and lifts operating control during the off hours.

Security Precautions

The September 11 catastrophe signifies the importance of security management of tall buildings. As an anti-terrorist attack provision, 2IFC was designed to limit car sizes to reach certain structural columns so as to prevent car bombing.

To avoid indirect terrorist attacks, an X-ray checking machine is in service to monitor the mailing and postal packages of the in-house post office.

In addition, several trained dogs are used for guarding and detecting dangerous goods in both the



building lobby and car parks.

Personalized Services

Cleaning

The management provides high standard cleaning services that equates to that of a world-class luxury hotel. The cleaning team undertakes year-round cleaning of the building's glass curtain wall to stage the spectacular views of Hong Kong and Victoria Harbour.

In addition to the routine cleaning of public areas and



daily office cleaning, it also provides tailor-made and flexible cleaning schedules in accordance with individual preferences and special business requirements of tenants.

To ensure the required services can be handled in good time, a Real Time PDA/PC housekeeping report/work with bar code system is used for daily management.

Given the huge window frontage, the management of 2IFC found it difficult to locate a suitable automatic window cleaning system. To complete one round of window cleaning in 2IFC, it takes a team of window cleaners operating three gondolas from 7:00am - 12:00 mid-night everyday. As the building is slightly narrowing up at the upper part, gondolas with flexible extension arms are adopted for this special cleaning need.

Concierge

On top of the normal services provided by most commercial buildings, the concierge of IFC provides personalized services to its tenants - from restaurant reservations, travel arrangements to floral bouquets ordering.

Rather than traditionally processing all enquiries through a remote management office, the concierge services are directly accessible at the Ground Floor and First Floor entrance lobbies.

A Duty Manager is at service round the clock to answer enquiries and to provide assistance at a senior level in 2IFC.

Green Construction Techniques

2IFC has put in green construction techniques since the design stage. It was endeavored to optimize the use of mechanical construction and system formwork, prefabrication, recycled material, and steel construction so as to minimize formwork consumption.

From its first day of construction, the owner of the building has carried out an interactive approach. Numerous discussions were held with potential tenants to identify their specific requirements.

To ensure technical related requests from clients could be properly entertained, an in-house contractor was on board from day one.

Also, 2IFC has got a simple double-glazed low-e facade, an energy efficient building envelope of OTTV 23w/m, a CO2 control for primary air quality moderation, a primary air supply run around coil that provides sufficiently dry air supply to the building.

Building Sustainability in Practice

As a building of the 21st century, users' needs bear a very high rating since the design stage of 2IFC. Both the physical and psychological concerns of users are taken into prime consideration.

With the value-added agglomeration of the different kinds of hardware and software, no wonder the designs of 2IFC were endorsed by the industry with prizes and awards. In year 2004, Two IFC received the Commendation Award from the Hong Kong

Institution of Engineers. It has also achieved the rating of excellence according to The Hong Kong Building Environmental Assessment Method (HK-BEAM). Also, 2IFC was chosen the Intelligent Building of the year 2004 by the Asian Institute of Intelligent Buildings (AIIB). It received a historical high score of 95 out of 100 (distinction score) from the AIIB assessment.

According to the information of the building's design team, IFC is designed built to last up to 120 years of life.

Perhaps the following figures may best conclude the value of 2IFC being a building of sustainable designs that would satisfy human needs in concert with Mother Nature:

- The direct seawater-cooling chiller plant in lieu of air-cooled saves 30% of the energy consumption.
- The extensive use of variable speed drives saves up to 10%.

- The fluorescent light fittings with electronic ballast and energy saving lamps save 15% of the electricity.
- The fully integrated control for air-conditioning saves another 10%.

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¹ Tall People Make Big Money (17/10/2003). Journal of Applied Psychology

² <http://www.infoplease.com/ipa/A0001338.html>

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