HONG KONG AIR CONDITIONING

Hong Kong in 1976 (photos: Brian Roberts)

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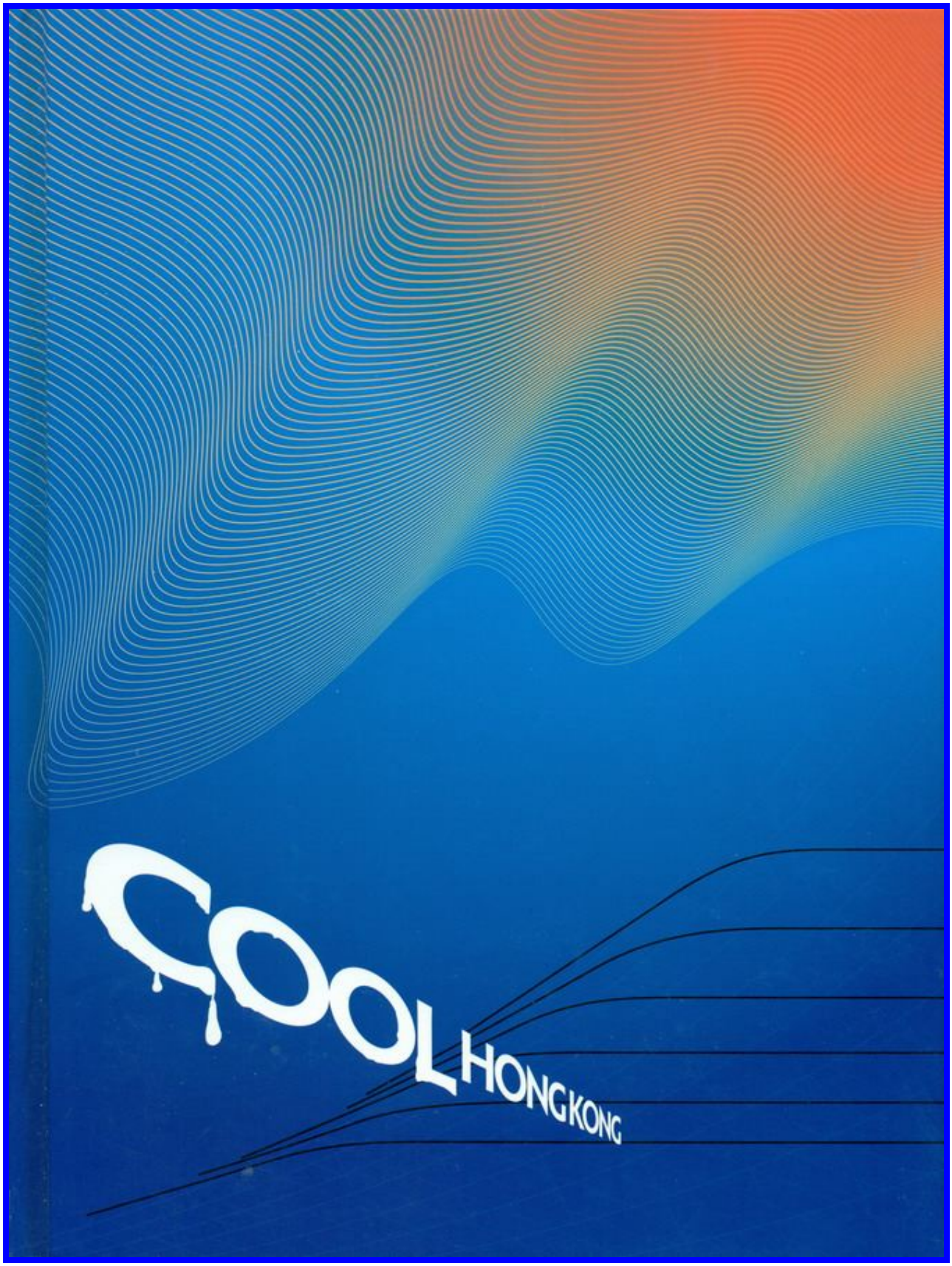

Introduction

by Philip C H Yu and Victoria Caplan

The technological underpinnings of our lives are too often easy to ignore. We only tend to notice them when they go wrong. In Hong Kong today, people take air conditioning for granted. It is part of their everyday lives; so much so that people complain vociferously if they lack it on a hot and humid summer day!

We seldom ask how air conditioning technology came be: when it developed, or who made it happen. This book sketches a brief history of cooling in general and, through the effort of many in the local air conditioning industry, documents the heating, air conditioning and refrigeration (HVAC&R) systems for 25 projects in Hong Kong. It reviews the air conditioning in government premises (page 30) which is an outline in miniature of the history of HVAC&R development. It also discusses some interesting applications for SARS wards (page 34), mass transit railway (MTR) stations (page 88), tunnels (page 36), etc as well as the future outlook of HVAC in Hong Kong (page 46).

The two most striking aspects of the development of cooling and air conditioning in Hong Kong are first, how quickly Hong Kong adapted technologies after they were invented, and second, how cooling technologies or methods are not just physical and technical, but have social and political aspects as well (page 12).

From antiquity to the twentieth century those who were rich and powerful tended to sweat less, because they could command cool goods and pay for others to work to keep them cool. After the mid-twentieth century, air conditioning continued to be used by some as a symbol of privilege and the question of whether air conditioning was a luxury or necessity at work was debated across society. At the same time, the development of the skyscrapers that characterize much of Hong Kong architecture made air conditioning an almost unquestioned part of everyday life for the vast majority of Hong Kong people.

Ice trade

It was in the 1830s, Frederick Tudor, a Massachusetts resident, initiated a large scale commercial ice trade. Starting with ice deliveries to Cuba and other Caribbean locations, he expanded the trade to Asia, with the first delivery of ice harvested from Fresh Pond in Cambridge Massachusetts to Calcutta in 1833 and later deliveries of ice to China in the late 1830s.[1]

Jardines imported the first consignment of ice to Hong Kong in 1843,[2] and the Ice House Company was established in 1845. 1847 was the date of the first known Tudor company delivery of ice to when 52,000 tons of ice arrived in Hong Kong and Whampoa. This ice was likely stored in the ice house built on Ice House Street in Central by public subscription in 1847. The price of imported ice was high, and could fluctuate between three and six cents per pound. The first commercial ice factory established in the U.S. in 1868 was able to sell ice at US$ 35 per ton. Soon thereafter, ice-

making equipment was shipped to Hong Kong and an ice-making factory was completed at East Point (now Causeway Bay) on Hong Kong Island in 1874, which is where The Hong Kong Ice Company established its headquarters in 1881. In 1892, the Dairy Farm depot was established on Lower Albert Road in Central, and became "Hong Kong's best known ice house". In addition to storing ice and selling cold and frozen food, by the 1920s there was a refrigerated room at the top of the building where people could pay to store their fur coats in the hot months. An example of refrigeration system for such application can be found in Nestle Dairy Farm Yuen Long Ice Cream Plant. (page 124).

Electrical cooling and advent of air conditioning

Like in the United States, air conditioning was introduced into public spaces first, such as banks and movie theaters. In the early 1930s, the Hongkong and Shanghai Banking Corporation (HSBC) in Central needed a new home.

The new building (demolished in 1982), the first fully air-conditioned building in the then Colony was opened in 1935.[1] Perhaps the air conditioning was one of the reasons that the Hong Kong Bank building was used as the government headquarters by the Japanese during 1941-1945.

> The vaults in which silver deposited with the government as security for the bank's note issues was [sic] kept had, for some time, been in a sorry state. Lack of temperature and humidity controls had caused straw sacks containing much of the silver to rot and the treasury floor was littered with loose coins, rotting straw, cockroaches, and rat droppings.[4]

The more 'posh' movie theaters, King's Cinema on D'Aguilar Street and Queen's Theater on Queen's Road (both in Central) opened in the 1920s, were air-conditioned in the late 1930s. Movie theaters were generally divided between local, showing mostly Cantonese or Mandarin films, and Western, showing mostly Hollywood or Ealing productions and these divisions continued after the Second World War. By the mid-1950s all the 'leading' (Western) cinemas were air conditioned.[5]

The development of air conditioning for hospitals dated back in the time when the Hong Kong government invited tenders for installing air conditioning in parts of Queen Mary Hospital (page 68) on 11 September 1935, and for the operating theater in Kowloon Hospital on 2 February 1938.[6] The works at Queen Mary were much larger, requiring the contractors to post a bond almost ten times larger than the one for the operating theater at Kowloon Hospital.

Air-conditioning was not a norm in Government premises until 1970s. It was considered a luxury and was provided only to the most prestigious buildings like the Central Government Offices in Lower Albert Road, (page 70) and the old Supreme Court which is now the Legislative Council Building (page 60).

Window-shopping in free air-conditioned space

Shopping and commercial or residential mixed complex development with full air conditioning is now very common in Hong Kong. Many are located along MTR lines, and nowadays this concept has spread to the Mainland as well. The earliest developments of this kind include Ocean Terminal in 1966 (page 78). This air conditioned large space heralded a new way of shopping, socializing and eating in Hong Kong, leading the way to the popular pastime of window-shopping and consuming, altering the Hong Kong way of life

1 Weightman. Gavin. 2003. The Frozen Water Trade. New York: Hyperion.

2 Waters, Dan. 1990. Hong Kong Hongs with Long Histories and British Connections. Journal of the Hong Kong Branch of the Royal Asiatic Society, vol. 30, pp. 235-256.

3 Lambot, I. and Chambers, G. 1986. One Queen's Road Central: the Headquarters of Hongkong Bank since 1864. Hong Kong: HongkongBank.

4 Gillingham, Paul. 1983. At the Peak: Hong Kong Between the Wars. Hong Kong: Macmillan.

5 Wong, Cindy Hing-yuk and Gary W. McDonogh.2001. Consuming Cinema: Reflections on Movies and Market-places in Contemporary Hong Kong. In: Matthews, G. and Lui, T.K. eds. Consuming Hong Kong. Hong Kong: Hong Kong University Press.

6 Hong Kong Government. 1935. Hong Kong Government Gazette, no. S 264, p. 1739. Retrieved from http://sunzi1.lib.hku.hk/hkgro/view/G1935/222530.pdf December 27, 2007.

from working hard at 'getting' to enjoying 'spending'.

More and more shopping facilities have been built in the decades since, providing an expectation of air conditioned public space. Although this type of mixed development has been followed in Hong Kong for almost 40 years, we can recognize it as incorporating an important concept of design for green buildings. This type of development maximizes shared resources, reducing environmental impact and relieving strain on transportation or local infrastructure as a whole. Another feature of mixed commercial and residential complexes is the applications of large scale centralized air-conditioning system with a design energy efficiency of 0.6 kW per ton of cooling refrigeration versus 1.2 of a typical localized split type air-conditioner.

The first MTR line was opened in 1979 (page 88). Its air conditioning system was vital for its functioning and to keep millions of people breathing clean air in a comfortable environment on platforms, concourses and inside the trains as well. The Shek Kip Mei to Kowloon Bay section was the world's first completely air conditioned underground railway system.

Property development above MTR station is an unique feature of mass transit in Hong Kong. Their success is due to the fact that many have large shopping centres. These provide very convenient and comfortable environment for Hong Kong people to work and shop (and also live). Worldwide House and Admiralty Centre are among the first generation of this kind of developments.

In the 1980s and 1990s the building industry boomed in Hong Kong. High-rise modern buildings designed by world famous architects were completed one after another: HSBC Headquarters (page 96), Bank of China Tower (page 110), Pacific Place (page 106), Central Plaza (page 118), etc. They were all completed with the most advanced HVAC systems of their time; and with the current state-of-the-art centralized monitoring and controls. These direct digital control (DDC) systems performed tasks as simple as temperature control and as complex as automation of various building components or systems operation. During this period, the numerous building projects provided excellent opportunities to train building services engineers, who later became expert professionals in Mainland China and other Asian countries. The Hong Kong Polytechnic University was the first to offer tertiary education

(upper) 6 text books on HVAC&R; and (lower) first and second edition of the Handbook by Mr Shank Wang

in building services engineering with a significant focus on HVAC&R system design and applications. A series of 6 text books developed by the late Mr Shan K Wang was known to all in the industry, which was later published in the US as 'Handbook of Air Conditioning and Refrigeration'. The Hong Kong Chapter of American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE) was the earliest pioneer to advance the science and art of HVAC&R with strong technical resources from its Headquarters in the United States. This organization played an important role to sharpen the technical edge of Hong Kong HVAC&R engineers in design, construction, commission, testing, maintenance, and operation.

The first great challenge of the second millennium in Hong Kong was the tragic outbreak of the SARS virus. However, the incident has improved people's awareness of public health. Now Hong Kong people will wear masks when they have symptoms of upper respiratory infections, to help prevent spreading communicable disease through respiratory droplets!

On 29 March 2003, ASHRAE Hong Kong Chapter jointly organized a forum with BSOME and the Hong Kong Polytechnic University's Department of Building Services Engineering, supported by CIBSE Hong Kong Branch and HKIE BS Division, to discuss measures of preventing the spread of the deadly virus through the air-conditioning and ventilation systems. Shortly after that, some of these industry

ASHRAE Hong Kong Chapter Board of Governors meeting in 2003

representatives formed "SARS Busters" team to devise a special air-conditioning system for a SARS ward in the hospital (page 34). Overall, the industry became more conscious of indoor air quality and the related design considerations for healthy buildings (page 22).

Building green and towards net-zero energy

The new millennium also woke up many people in and outside Hong Kong to the realization that deteriorating environmental conditions and climate change are serious issues that need to be remedied. Today, green building and sustainability considerations are the most important movements in our industry. Conventional approaches are being challenged, and sometimes made obsolete, while every building professional needs to re-think how building systems are designed, commissioned and operated, in order to minimize the use of energy, water, and other natural resources.

Several standards are used in Hong Kong to promote green and sustainable buildings. HK-BEAM is a green building rating system commonly used in Hong Kong to measure, certify and label the whole-life environmental sustainability of buildings. Two IFC is an example of 'new development' (page 140) and Jardine House, built in 1973, is an example of 'existing premise' (page 82).

The Professional Green Building Council (PGBC), a consortium of the local professional bodies, was formed in 2002 to promote a more sustainable built environment. LEED is a green building rating system developed by the US Green Building Council (USGBC) and widely used in many countries internationally. It 'landed' in Hong Kong in 2008.

One of the major features in green building projects is to enhance the energy efficiency, which means saving electricity (the main energy source for modern buildings). Saving electricity means saving power plant capacity, which reduces carbon dioxide (CO_2) emissions from burning fossil fuels (the main energy source for generating electricity). Carbon dioxide is thought to be one of the most significant greenhouse gasses that cause global warming or climate change. Therefore, saving energy not only saves money, it saves the environment as well. Improving energy efficiency is the most cost effective measure to protect the climate.

According to ASHRAE, air conditioning systems efficiency increased 49% from 1986 to 2006. Green building also promotes the use of alternative energy sources to reduce environmental impacts. To this end, photovoltaic (PV) applications can be found in some green buildings or energy efficient building (EEB) projects. The new Headquarters for Electrical and Mechanical Services Department (EMSD) completed in 2004 (page 144) is a demonstration of this trend. In the future, building energy may be minimized to the point such that it will be self-sufficient by the provision of photovoltaic (PV), wind turbine, and/or other renewable sources of energy supplies. It is known as Net Zero-Energy. More green features will be discussed in the chapter on future outlook of HVAC development in Hong Kong (page 46).

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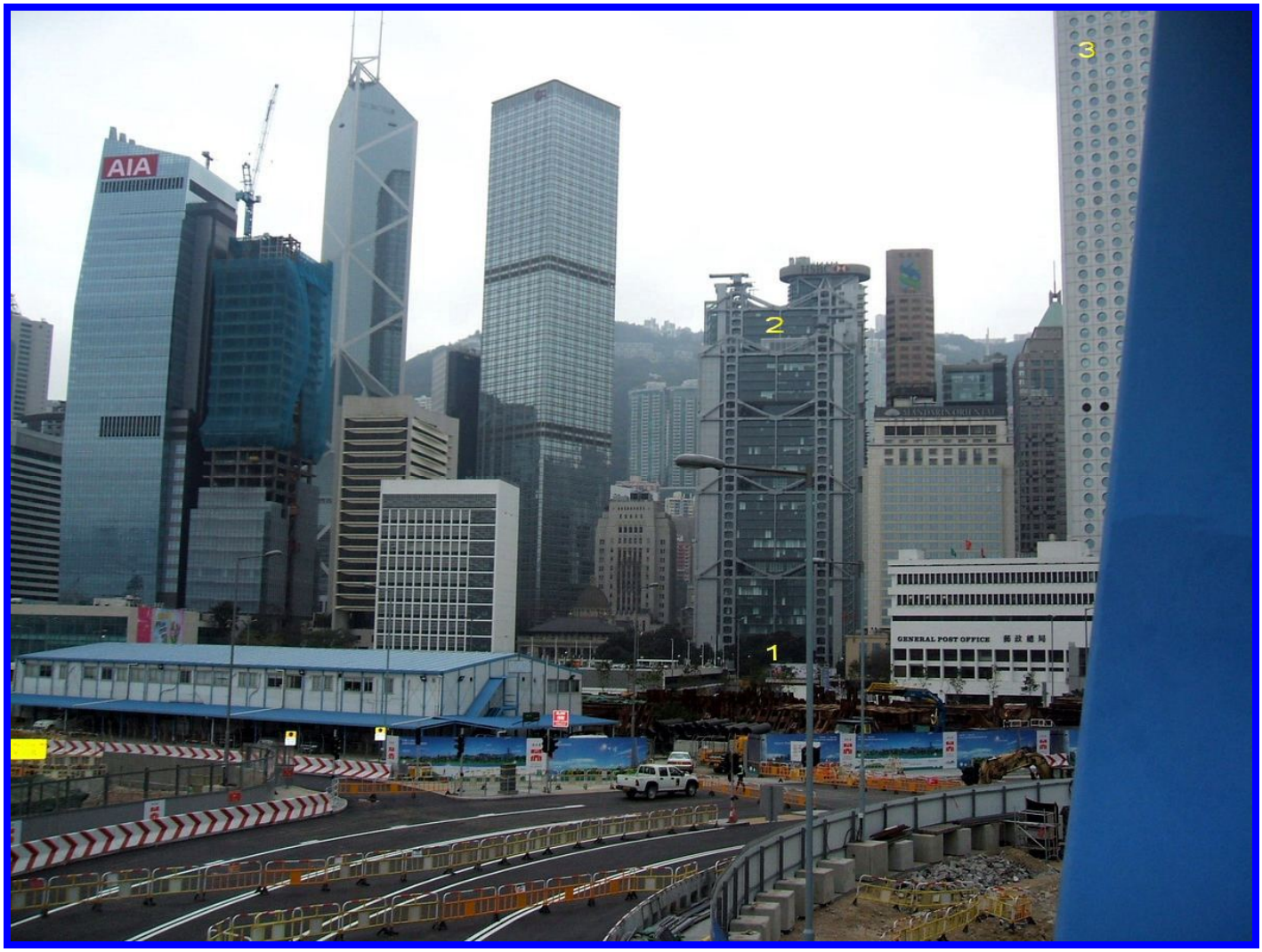
Hong Kong in 1976 (photos: Brian Roberts)



Hong Kong in 2012 (photo: Cynthia Townsend)

Numbered buildings are Air Conditioning Case Studies Included in this Electronic Book

[1] Site of the Hongkong Shanghai Bank of 1935 Demolished to make way for…..

[2] Hongkong Shanghai Bank of 1984

[3] Connaught Centre (now Jardine House) of 1985

Also featured is the Hong Kong Mass Transit Railway The first phase was completed in 1979 and the Peninsula Hotel, opened in 1928