

Driving Data Centre Development

With demand for cloud data capacity in Hong Kong forecast to triple by 2019, surveyors have an important role to play in the city's vision of becoming a regional digital storage hub.

Wilson Lau

HKEX opened its five-storey, 31,400 sqm data centre in the Tseung Kwan O Industrial estate in January 2013

Photo: HKEX





Sr Patrick Pan
Vice President of Corporate Real Estate and Facilities Management at HKEX



Sr Tony Tse Wai-chuen
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Sr Alfred Hon
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The market for data centre development is heating up and Hong Kong is advantageously positioned to become a regional hub. Not only does it have the robust telecommunications infrastructure and financial services excellence required to attract international organisations, but its proximity to the mainland Chinese market – yet its maintenance of the rule of law and protection of data privacy – make it a favourable data centre host for mainland corporations as well.

The gross floor area of data centres in the city rose from 300,000 sqm in 2012 to 460,000 sqm in 2015. Sr Tony Tse Wai-chuen, a general practice surveyor who is a member of the Legislative Council and a past president of HKIS, believes the demand for data centres in Hong Kong will continue to rise rapidly as many multinational corporations have their regional headquarters here. He adds that by the government’s estimation, current data centre capacity needs to grow by 100 per cent to accommodate the forecast three-fold increase in cloud data capacity from 2014 to 2019.

Data centres in Hong Kong are categorised in four tiers depending on requirements, with tier four the highest. Broadly, they fall under three types: purpose-built data centres; data centres located within an organisation’s existing premises; and centres located in renovated industrial buildings. The government has a number of favourable policies for data centre development, and has extended measures to facilitate such development in industrial buildings. Tse says that applications for the allocation of eligible industrial spaces for data centre use are free of charge, and nowadays take only two weeks in process, compared with no less than nine months in the past. He adds that the government is also setting aside more land reserve for data centre development – the Tseung Kwan O Industrial Estate, for instance, will be allocated additional sites of total site area of about 20,000 sqm for such activities.

	Tier I: Basic Components	Tier II: Redundant Maintainable	Tier III: Concurrently Tolerant	Tier IV: Fault Tolerant
Number of Delivery paths	Only 1	Only 1	1 Active, 1 Passive	2 Active
Redundant Components	N	N + 1	N + 1	2 (N + 1) S+S
Support Space to Raised Floor Ratio	20%	30%	80-90%	100%
Initial Watts/m ²	60-90	120-150	120-180	150-240
Ultimate Watts/m ²	60-90	120-150	300-450	450+
Raised Floor Height	30cm	45cm	80-90cm	80-90cm
Floor Loading Kilograms/m ²	415	488	732	732+
Utility Voltage	208, 480	208, 480	12-15kV	12-15kV
Months to Implement	3	3 to 6	15 to 20	15 to 20
Year First Deployed	1965	1970	1985	1995
Annual IT Downtime Due to Site	28.8 hrs	22.0 hrs	1.6 hrs	0.4 hrs
Site Availability	99.671%	99.749%	99.982%	99.995%

Photo source: © 2001 The Uptime Institute

Data centres are mission-critical facilities with special technical and regulatory requirements, and surveyors are often commissioned to work on their development. “Building or commissioning a data centre is eye-wateringly complex and expensive,” says Sr Patrick Pan, Vice President of Corporate Real Estate and Facilities Management at Hong Kong Exchanges and Clearing Ltd. (HKEX). “Each element, including the financing, planning, design, construction and operation needs specialist skills.”

Pan joined HKEX in 2011 and was involved in the construction, commissioning and operation planning of its data centre in the Tseung Kwan O Industrial Estate. “At the construction phase, Surveyors collaborate with the roles of Project and Facility Manager on intensive design, development and operation planning,” he says. “Surveyors provide advice on land acquisition and review statutory regulations regarding site selection, development controls. They also identify potential risks and impact, look after the project and operation costs; vendors

management, works scheduling, ensure sustainable construction, and monitor statutory compliances.”

When it comes to operation, the Facility Manager of a high-tier data centre controls operational expenses, supervises building maintenance for disturbance-free under 24/7 operation, and manages the Business Continuity Plan to ensure continuing operation of these critical facilities. The manager also advises on property and building regulations including Occupational Health and Safety and insurance assessments and claims.

Because data centres are considered fundamental infrastructure, many organisations have stringent requirements. Surveyors need to be familiar with relevant basic design principles before they can make constructive contributions during the preliminary design stages i.e. floor loading; raised floor; configuration of plant rooms; high headroom; waterproofing system; flooding control. Given the current rapid technological advancement across sectors, however, Pan believes that it is impossible to predict the ongoing technologies advancement for data centres that will operate for 20 years or more. “The design must be flexible. A successful data centre should be easy to upgrade and allow for changes in layout and components,” he advises.

When working on land acquisition, surveyors should pay particular attention to the surrounding environment. They should take note of potential sources of pollutants and environmental issues, such as land contamination, corrosive gas and noise pollution, and the potential for any hazardous explosions in neighbouring facilities. “[In addition], a high-tier data centre should have sufficient space to house a large number of high-capacity facilities and servers, with a high ceiling level and floor loading,” Pan says. “A sufficient, stable and reliable power supply is essential to its operation. High-tier data centres should have dual power feeds, provided by separate power substations, and are equipped with standby power generators and uninterruptible power supply (UPS) for all critical loading. Data Centres also need cooling facilities to maintain an optimal temperature range.”

Sr Alfred Hon, a quantity surveyor and director of Rider Levett Bucknall, says the cost-significant items in the construction of a data centre are the mechanical and electrical (M&E) services and the structural elements. “The primary goal of a data centre is to guarantee high-level performance of the IT equipment,” he says. “It requires reliable M&E service provisions for the

power and cooling infrastructure, with adequate output to maintain the peak loads of the IT equipment. M&E service provisions are extensive and may constitute at least 50 per cent – and in some data centres of highest tier over 60 per cent – of the total building cost.”

Hon explains that M&E service provisions usually include main power feeds from high-voltage transformers and switchgears, power distribution units (PDU) backed up by the uninterrupted power supply (UPS) system and diesel generators, and air-conditioning systems using computer room air-conditioning (CRAC) units. These units have large cooling capacity to control the temperature and humidity of data halls and deal with the immense heat dissipation from computer racks.

“As a data centre is at the core of the storage, management and distribution of data and information, there are also other special M&E systems for protection of the equipment,” Hon says. “A gas flooding fire suppression system, pre-action fire sprinkler system, smoke detection and fire alarm system, and water leakage detection system, can be used to ensure damage to expensive IT equipment is minimised in the case of a hazard.”

“Also, secured access control is always required, and this necessitates the installation of extensive CCTV surveillance systems and computerised access control systems. The IT equipment, coupled with the extensive provisions for M&E systems – which involve heavy plant and equipment – impose an immense load on the structure of a data centre. As such, the structural frame and supporting foundations may account for up to 25 per cent of the total building cost, which is comparatively higher than those of other building types.”

Many data centres in Hong Kong exist as co-location centres, where equipment, space and bandwidth are available to retail customers to rent. Subsequently, Tse says, general practice surveyors should gain an in-depth understanding of the specifications and differences between the four tiers of data centres when assessing the accurate valuation of data centres as an asset class. “They need to pay close attention to the latest supply and demand situation,” he says, “and assess the government’s land supply earmarked for data centres, as well as the current value.”

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不論是興建或營運一座高規格的數據中心，都是非常複雜、價值不菲，融資、規劃、設計、建造和營運等每個環節都需要專業技能。

促進數據中心發展

據估計，到了2019年，香港對雲端數據容量的需求將增至目前的三倍。在香港成為地區數據樞紐的路上，測量師發揮舉足輕重的作用。

Wilson Lau

數據中心發展市場日趨活躍，香港萬事俱備，可望成為地區樞紐。本港具備完善的電訊基礎設施、卓越的金融服務，可吸引各國機構；亦鄰近中國內地市場，而且法治穩健、資料私隱保障妥善，因而亦成為內地企業首選的數據中心選址。

香港數據中心的總樓面面積在2012年為300,000平方米，至2015年達460,000平方米。謝偉銓身兼產業測量師及立法會議員，曾任香港測量師學會會長。他認為，許多跨國企業將地區總部設在香港，將帶動本港對數據中心的需求節節急升。他又指，至2019年，雲端數據容量料將增至2014年的三倍。據政府估計，現時數據中心的容量需增加一倍，才足以容納雲端數據容量的增幅。

香港的數據中心依標準分為四級，第四級規格最高。數據中心大致分成三類：專為特定目的而設的數據中心、位於機構現有樓宇內的數據中心，以及位於翻新工廈內的數據中心。政府設有多項政策，支持數據中心發展，並將有關措施推而廣之，惠及工廈內的數據中心。謝偉銓表示，申領符合數據中心規格的工業用地完全免費，以往的申請至少需時九個月，現今則只需兩週。他補充說，政府亦增加預留土地作興建數據中心，當中，將軍澳工業邨將獲額外分配約20,000平方米的數據中心用地。

數據中心肩負重任，須符合特別的技術標準及監管規定，測量師通常會獲委聘參與工程。香港交易及結算所有限公司（香港交易所）企業房地產及設施管理副總裁潘一莊測量師說：「不論是興建或營運一座高規格的數據中心，都是非常複雜、價值不菲，融資、規劃、設計、建造和營運等每個環節都需要專業技能。」

潘一莊於2011年加入香港交易所，參與將軍澳工業邨數據中心的興建和運作規劃。他表示：「在建造階段，測量師會與項目及設施經理合作，進行多番設計、發展及營運規劃工作。測量師會提供覓地方面的建議，並審視有關選址、發展管制的法例。他們亦負責找出潛在的風險及影響、監察項目及營運成本、管理供應商、編排工作、確保工程符合可持續發展理念、監管工程是否遵守法例規定。」

在營運方面，較高規格的數據中心會由設施經理負責控制營運開支、監管樓宇保養事宜，務求數據中心全天候運作暢順，並管理業務連續計畫，確保這類重要設施能夠持續運作。設施經理亦會就職業健康及安全、保險評估和索償等物業及建築物相關法定規例提供建議。

數據中心是基本的基礎設施，因此許多機構都有嚴格的要求。測量師須熟悉相關的基本設計原理，才能夠在初步設計階段提供有建設性的意見（例如：樓面負荷量、升高地台、機房配置、高樓底、防水系統、水浸控制）。然而，潘一莊認為，數據中心將運作廿年甚至更久，鑑於各行各業的科技日新月異，而我們無從預測未來科技發展，故他建議「設計必須靈活，以便日後完善設施、改建及更換設備，才算是成功的數據中心。」

測量師在覓地時應特別注意周圍環境，留意可能產生污染物及造成環境問題（如土地污染、腐蝕性氣體及噪音污染）的來源，亦要留意附近有否爆炸危險的設施。潘一莊表示：「此外，高規格的數據中心應具備足夠空間，樓底要高、樓面負荷量要大，以容納大批高容量的設施及伺服器。數據中心的運作必須有充足、穩定、可靠的供電，高規格的數據中心通常有兩種供電來源，一是不同的配電站，另有備用發電機及不間斷電源供應（UPS），以供儲存重要數據。數據中心亦需要冷卻設備，以維持理想溫度範圍。」

工料測量師韓志成是利比有限公司的董事，他表示，建造數據中心時，以機電設備及結構構件的成本最高。「數據中心的宗旨是確保資訊科技設備發揮最高性能，其電力及冷卻基礎設施需要可靠的機電設備，須有充足的輸出量，以維持資訊科技設備的最大負荷。機電設備範圍甚廣，可佔總建築成本一半以上，對一些最高規格的數據中心而言，更可佔逾六成。」

韓志成解釋，機電設備範圍包括以高壓變壓器及開關裝置作為主電源、電源分配器，並以不間斷電力供應系統及柴油發電機作後備電源，以及使用電腦機房空調裝置的冷氣系統。這類裝置的冷卻能力強，可控制數據中心的溫度及濕度，應付電腦架散發的大量熱氣。

韓志成表示：「數據中心肩負儲存、管理、分配數據及資料的重要作用，因此亦有其他特別的機電系統保護有關設備。一旦發生危險，氣體滅火系統、預動灑水滅火系統、煙霧偵測及火警警報系統、漏水探測系統都有助盡量減低昂貴的資訊科技設備遭受的損害。」

「此外，數據中心不能沒有安全的存取管制措施，必須安裝廣泛的閉路電視監察系統及電腦進出監控系統。資訊科技設備以及各種機電系統涉及重型機械與器材，是數據中心樓宇結構的一大負擔。因此，數據中心的樓宇結構及地基可佔總建築成本的四分之一，高於其他類型樓宇的成本。」

香港許多數據中心以主機託管形式運作，當中的設備、空間及頻寬都可出租予零售客戶。謝偉銓指，產業測量師今後在評估數據中心這類資產的準確價值時，應深入了解四級數據中心的規格與差異。「測量師需時刻留意供求形勢，評估政府的數據中心用地供應情況，以及這些用地的當時價值。」

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