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建造業議會

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CIC CHAIRMAN
LEE SHING-SEE
AN INDUSTRY POISED FOR TRANSFORMATION

議會主席
李承仕工程師
笑看行業轉型

CONTENTS
目 錄

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About the Construction Industry Council

The Construction Industry Council (CIC) was formed on 1 February 2007 under the Construction Industry Council Ordinance (Cap. 587). The CIC consists of a chairman and 24 members representing various sectors of the industry including employers, professionals, academics, contractors, workers, independent persons and government officials.

The main functions of the CIC are to forge consensus on long-term strategic issues, convey the industry's needs and aspirations to government, provide training and registration for the construction workforce and serve as a communication channel for the government to solicit advice on all construction-related matters.

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《築目》是建造業議會（議會）每半年出版一次的免費期刊。《築目》編輯委員會（編委會）歡迎各界向我們表達意見、觀點和投稿，並接受中英雙語稿件，唯是否採納及發表由編委會決定。讀者如欲與《築目》編委會聯絡，可透過電郵corpcomm@hkcic.org、電話(852)2100 9000、傳真(852)2100 9090等方式，或郵寄至香港灣仔告士打道138號聯合鹿島大廈15樓建造業議會。

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關於建造業議會

建造業議會根據《建造業議會條例》（香港法例第587章）於2007年成立，由一位主席及24名成員組成，成員來自代表業內各界別的人士，包括聘用人、專業人士、學者、承建商、工人、獨立人士和政府官員。

議會的主要職能是就長遠的策略性事宜與業界達成共識、向政府反映建造業的需要及期許，為業內勞動力提供培訓及註冊，並為政府提供溝通渠道，取得與建造業所有相關事項的意見。

MESSAGE FROM THE

EXECUTIVE DIRECTOR

OF THE CONSTRUCTION INDUSTRY COUNCIL

Welcome to the second issue of *Aedifice*, which aims to be not merely the journal of the Construction Industry Council (CIC), but also the voice of the Hong Kong construction industry as it undertakes one of its most important transitions into a centre of excellence and a driver of technological innovation. With its in-depth interviews and thought-provoking essays on matters of local and global concern, it is designed to be a showcase for Hong Kong's dynamic construction industry with the view of informing the local industry stakeholders and construction-related organisations outside Hong Kong.

The main interview in this issue features Ir LEE Shing-see, Chairman of the CIC, who expresses his overall optimism for the construction industry in Hong Kong, given the implementation of the 10 Major Infrastructure Projects by the Hong Kong Special Administrative Region government and the continuing developments and needs of Hong Kong's vibrant private sector. Ir LEE remains mindful of the crucial issues that the industry must face, such as an ageing workforce, critical skills mismatches and the need to make the profession more attractive to new recruits as well as harness the potential of new technologies to replace labour-intensive work and create other skilled positions within the industry.

The CIC intends to build upon the foundations created by the landmark Construction Industry Review Committee (CIRE) Report – *Construct for Excellence*, which was released in 2001 and outlined 109 recommendations relating to all aspects of the construction industry. Now that most of these recommendations have been accomplished or met to varying degrees, the CIC needs to develop a new strategic direction based on agreed future activities and goals.

The CIC held a retreat to bring together Council members representing the various industry stakeholders to review the strategic direction of the CIC and to establish a consensus regarding the way forward on six long-term strategic objectives: formulate the industry's vision and goals; develop a competent and multi-skilled workforce, foster a culture of safety; enhance productivity; green the built environment; and strive towards sustainable development.

As a result, the CIC has recently commissioned a consultant to comprehensively review the Hong Kong construction industry, and to formulate a forward-looking strategic plan, measurable success factors as well as pragmatic recommendations to tackle all major issues of the industry, so as to strive for excellence and continuous improvement for the industry's sustainable growth. The study will be completed by the third quarter of 2015. In the meantime, please keep an eye on our CIC website for the updates of this important study.

While safety remains the priority, working at height remains one of the key areas of concern of the industry as accidents have occurred in recent months with a regularity that causes concern. With ongoing engagement with the industry we are constantly looking for best practices that the industry could examine to ensure the health and safety of workers in this area. In this issue of *Aedifice* we are delighted to include a contribution from our friends from Towngas, Mr. Victor KWONG, Ir Peter CHAK and Ir CHEUNG Pak-kin, who share with us their experiences in progressive safety enhancements for working at height.

On the other hand, the CIC is also constantly looking at how we can monitor the health condition of site workers. The Pilot Medical Examination Scheme (PMES) is a research project commissioned by the CIC and undertaken by the Building and Real Estate Department of the Hong Kong Polytechnic University. Prof Albert CHAN of the Faculty of Construction and Environment has once again contributed an essay in this issue outlining the preliminary findings from PMES that have relevance for the construction industry.

To encourage the wider adoption of building information modelling (BIM) in Hong Kong, the CIC has taken the lead in collaborating with stakeholders on several initiatives to date. With 2014 being a dedicated "Year of BIM", a series of conferences, seminars, workshops, events and publicity activities were held last year to raise the profile and knowledge of the benefits of BIM. In this issue of *Aedifice*, Ms. Stella WONG, one of our staff who works primarily on promoting the wider adoption of BIM in the local construction industry, discusses the types of construction contract that would be most successful in the use of BIM.

Another important issue relating to construction contracts would be the enactment of the The Contracts (Right of Third Parties) Ordinance, which as Mr. Joseph CHUNG and Miss Genevieve LAM of the Deacons law firm explains, would enable a person who is not a party to a contract to enforce terms of the contract under certain circumstances. The implications of the *Ordinance* for the construction industry are discussed in detail in their write up which we hope would provide you with some insights while drafting contracts for your next project.

With its own research department as well as the CIC research fund, the Council is tasked to conduct practical research projects that are expected to be beneficial to the construction industry. Our research agenda includes four projects aimed at raising productivity, which cover an assessment of performance, a comprehensive productivity appraisal, how to integrate constructability in project planning and design, and benchmarking productivity in Hong Kong.

Introducing the five write ups about issues of concern to the industry are messages from the relevant Committee Chairmen: Mr. CHEUNG Hau-wai, Chairman of Committee on Construction Safety; Ir Kevin POOLE, Chairman of Committee on Environment, Innovation and Technology, Ir CHEW Tai-chong, Chairman of Committee on Procurement and Subcontracting; and Prof. Christopher LEUNG, Chairman of the Committee on Productivity and Research. The continuous support of these construction figureheads and others in the industry is the momentum that enables us to push our industry ahead.

I hope you find this second issue of *Aedifice* helpful and instructional. The CIC always welcomes your feedback.

Christopher TO

建造業議會
執行總監的話

歡迎閱讀第二期《築目》。本刊是建造業議會（議會）出版的期刊，致力為香港建造業發聲。創新科技的湧現正帶領建造業界邁向卓越。今期的深入訪談以至討論建造業界關注課題的各篇文章，不但讓本地以至海外建築相關組織了解我們的發展進程，更展示了香港建造業的蓬勃面貌。

今期訪問的主角、議會主席李承仕工程師喜見香港特別行政區政府推出十大基建項目，加上私營市場持續發展、需求殷切，相信建造業前景將一片光明。惟李主席亦對勞動力老化、技能錯配等業界面臨的關鍵問題表示關注，並提出必須提升行業形象以吸引年青人入行，同時善用創新科技來取代人力工作，在業內創造更多技術職位。

在2001年發表的建造業檢討委員會（建檢會）報告書《建業圖新》就建造業各個範疇提出了109項改善措施，為議會的工作奠定了基礎。今天，報告書列舉的大部份任務經已完成，其餘的也發展至一定程度，因此議會必須為日後的工作確認目標及制訂策略，務求更上一層樓。

代表業界不同持份者的一眾議會成員舉行了集思會，重新審視議會的策略性方向，並為未來發展路向尋求共識，達成六項長遠策略目標：制訂業界的願景與目標、建立多專多能的工作團隊、培育安全文化、提升生產力、綠化建造環境，以及致力可持續發展。

議會最近委託了一家顧問機構，全面審視本地建造業，力求為業界制定一個前瞻性的策略性計劃，訂定可量度的成功因素，就業界的主要問題提出務實建議，並與政府進一步合作，為業界帶來和諧穩定的可持續發展。預期研究於2015年第三季完成，讀者可留意議會網站就相關研究發表的最新消息。

安全是建造業的首要課題，近月接連發生的工業意外更讓人關注到高空工作安全。我們長期與業界合作，不斷尋找最佳作業方式為業界提供參考，確保工人的健康與安全受保障。我們很高興邀請到煤氣公司的鄺超靈先生、翟志堅工程師及張柏堅工程師為今期《築目》撰文，分享他們如何循序漸進提升高空工作安全。

另一方面，議會一直從不同渠道監控工地人員的健康狀況，並委託了香港理工大學建築及房地產學系執行建造業工人醫療體檢試驗計劃的研究。建設及環境學院的陳炳泉教授再次為今期《築目》撰文，談論研究的初步結果以及對建造業的意義。

為鼓勵在香港更廣泛地採用建築信息模擬（BIM），議會率先與各持份者攜手推出多項措施，並於2014「建築信息模擬年」舉辦了一系列會議、研討會、工作坊、宣傳和推廣項目活動，提高公眾對BIM及其好處的認識。在本期《築目》，專責為議會推動本地建造業更廣泛地採用BIM的王素兒女士討論了哪種合同類型最有利BIM的發揮。

《合約（第三方權利）條例草案》容許並非合同任何一方的人士，在某些情況下能夠執行合同的條款，其立法將是另一項與工程合同相關的重要議題。的近律師行的鍾偉傑律師與林思妍律師在他們的文章中詳細討論了該法例對建造業的影響，希望能為讀者在草擬下一份項目合同時提供一些參考。

議會的職能之一是進行對建造業有實際效益的研究，因此設有獨立的研究部門及研究撥款。我們現有的研究議程包括旨在提高生產力的四個項目，涵蓋表現評估、綜合生產力評估、整合項目則劃及設計時顧及施工狀況，以及為香港制訂生產力基準。

除了這五篇論述業界議題的文章，議會轄下各專責委員會的主席亦於本期《築目》中分別報告了各委員會的近況，他們分別為建造安全專責委員會主席張孝威先生、環境、創新及技術專責委員會主席潘嘉宏工程師、採購及工程分判專責委員會主席周大滄工程師，以及生產力及研究專責委員會主席梁堅凝教授。感謝這些建造業翹楚與業界上下共濟同舟，推動業界不斷向前邁進。

希望本期《築目》亦能於您有益。一如以往，議會歡迎您的寶貴意見。

陶榮

AEDIFICE INTERVIEW

IR LEE SHING-SEE

GBS, OBE, JP

A civil engineer by profession, former Secretary for Works and Permanent Secretary (Transport & Works), Ir LEE Shing-see has served the Hong Kong public since he graduated from The University of Hong Kong in 1964 and joined the Hong Kong Government. Ir LEE was one of the 15 members of the Construction Industry Review Committee, which led to the establishment of the Provisional Construction Industry Co-ordination Board and then the Construction Industry Council in 2007, where he served first as a member and then took over as Chairman since 2010. In this issue of Aedifice, Chairman LEE draws on his more than 50 years of experience to celebrate the Hong Kong construction industry's dynamism and innovation and paint an optimistic picture of the sector in the years to come.

OUR ERA OF TRANSFORMATION

Ir LEE Shing-see, Chairman of the Construction Industry Council, sees the industry's future as secure, thanks to the 10 Major Infrastructure Projects first announced in the Hong Kong Special Administrative Region (HKSAR) Government's 2007-08 Policy Address as an economic development and employment generation opportunity.

The government initiatives, combined with the needs of a vibrant private sector, have created an ideal environment in which the construction sector can develop. "Construction in Hong Kong has never been at such a thriving stage," says Chairman LEE. "Public projects are reaching their peak, while there are ever-growing developments in the private sectors to meet the compelling needs of this city."

Yet as Chairman of the CIC, he remains mindful of the crucial issues that the industry must face, such as an ageing workforce, critical skills mismatches and the popular misconception of a construction industry rooted in the "4Ds" — dirty, dangerous, demanding and disorganised. "This has led to a tight manpower situation in the industry, which remains a major area of concern," he says.

Those seemingly opposing forces, Chairman LEE notes, have created a dynamic in the industry that can only be alleviated by innovation. "Set against the current demand-supply situation, the local construction industry is at a stage of transformation, where all of us must look at how we can work differently to achieve a breakthrough in productivity and competitiveness," he declares.

At the forefront of innovation is the arrival and development of new technologies. "It is important that we harness their potential to replace labour-intensive work, while at the same time creating other skilled positions within the industry," Chairman LEE says. "Through pursuing such a strategy we will enhance the image of the industry and develop a more efficient, highly trained workforce with skills that are valued around the world in the long run."

Chairman LEE believes there has never been a better time to consider a career in the construction industry in Hong Kong. "We are now undergoing one of the busiest periods of construction in Hong Kong's history and the forecast is that this activity level is to continue for the coming decade," he says. "With so many major projects underway and planned ahead, a new entrant to the industry can be sure of a bright future with many opportunities for growth in his or her chosen profession."

FRESH IDEAS

The attraction of new blood, Chairman LEE expects, will drive a rejuvenation of the industry and encourage innovation. "On top of the surging demand for construction industry talent, there is an immediate need to produce skilled craftsman in all construction trades to work on various major infrastructure projects," he says. "While providing training for various construction trades, CIC is consequently also looking for instructors to add to its training staff. Experienced craftsmen in a host of areas, ranging from plumbing and marble-laying to welding, are in huge demand."

Already, Hong Kong's construction industry is making progress in terms of bringing new materials and processes to project sites. "We have been continuously working on developing and implementing innovative techniques," says Chairman LEE, noting that the CIC has initiated or funded several projects that aim to develop advanced construction materials which could not only meet demanding practical requirements, but also improve the quality of entire projects. He cites the CIC's commissioning of a "Study on River Sand Substitutes for Concrete Production and Cement Sand Mortar Production" as an example.

This aims to investigate the potential for using processed sand as a substitute for concrete to enhance the overall performance of final concrete. In addition, researchers, with the support of the CIC, have been developing a special type of concrete that has both high strength and high elastic properties for tall buildings. Innovation, Chairman LEE stresses, is also occurring among stakeholders within the industry. "The local ready-mixed concrete manufacturers are developing their own innovative high-performance concrete products with an optimised design mix or green concrete using environmentally friendly recycled raw materials."

Such industry-university research collaboration has been playing an extremely important role, as it helps to effectively facilitate knowledge development, technology transfer and thought leadership, as well as promote the application of innovative techniques for productivity and performance enhancement of the industry.

"Serving as a link between the academia and the industry, the CIC is dedicated to steering research to suit the industry needs and we set up the CIC Research Fund aiming to encourage local research activities and the use of innovative techniques in the construction industry," says Chairman LEE.

The CIC will continue to fund and support innovative techniques, as well as act as a clearinghouse to develop implementation programmes in order to further the relationship between the industry and research. "The outstanding outcomes of CIC-funded research projects with practical values can be implemented and promoted within the Hong Kong construction industry as on-the-ground applications," Chairman LEE observes. "Up until the end of 2014, about HK$25 million has been granted to 24 research projects, covering many research areas, including concrete and construction technology, productivity, safety and low-carbon technology."

BETTER COOPERATION

Stakeholders in both construction industry as well as universities and research institutes have taken action to facilitate better collaboration. Chairman LEE cites the construction-related research institutes established by local tertiary institutions to initiate research projects that are of pressing need to the industry. "They frequently invite industry practitioners to universities to teach technical courses, share engineering experience and exchange industrial information," says Chairman LEE. "In addition, construction industry stakeholders are soliciting research support from the universities and research institutes by directly consulting researchers to provide solutions for their practical problems, as well as seeking assistance from relevant intermediary organisations such as the Hong Kong Productivity Council and Hong Kong Green Building Council to line up avenues for collaboration on the application of technologies."

Industry players, Chairman LEE stresses, have already seen the win-win equation that sustainable building materials represent for both the industry and consumers. "Sustainability is a growing concept which is now indispensable for the city's development. The construction industry needs to create an integrated planning concept in relation to environmental protection, sustainable construction and other areas conducive to

Serving as the key platform for communication between the industry and the government to deliberate on issues of industry-wide concern, major successes have been achieved by the CIC over the years in reaching consensus and instilling strategic partnership among various stakeholders.

improving construction quality. What we have to do in the future is to create a liveable environment lasting for the coming generations."

As a result, industrial stakeholders are making great efforts to improve the environmental performance of the materials to contribute to the sustainability of the industry. "Recycling and reusing of waste for the production of construction materials has been applied in Hong Kong for pavement bricks, cement and concrete," Chairman LEE points out. "Such eco-friendly construction materials have been widely used in government public projects and received positive feedbacks." However, CIC will not rest on its laurels when it comes to promoting further advanced research. On-going projects being funded by CIC are investigating the potential for recycling used timber formwork into cement-bonded particle board, or developing ultra-ductile cementitious waterproofing rendering from recycled plastic.

CONCRETE RESULTS

The efforts of CIC in developing sustainable processes and using environmental friendly designs and materials are embodied in the ZCB, Hong Kong's first zero carbon building, which was completed in 2012 by CIC in collaboration with the HKSAR Government, a project that Chairman LEE sees as significant. "In Hong Kong, buildings account for 60 per cent of total greenhouse gas emissions, more than any other sector. By transforming the built environment to be more energy-efficient and climate-friendly, the construction sector can play a major role in reducing the threat of climate change. As such, the construction industry has a significant role to play in greenhouse gas emissions reduction."

ZCB can demonstrate to the industry how eco-technology and design apply to buildings, homes and offices as well as actively promoting zero / low carbon living lifestyle to the general public, Chairman LEE adds. The project also sends an important message to the increasingly engaged community at large. "ZCB was built, aiming to not only showcase state-of-the-art eco-building design and technologies to the construction industry both internationally and locally, as well as sharing knowledge and expertise in low-carbon and zero-carbon building design and technologies, but also to raise community awareness of low carbon living in Hong Kong, reducing greenhouse gas with concerted efforts."

The CIC can bring together research and industry in order to seamlessly integrate innovation on the ground through a cohesive and inclusive dialogue. Processes such as Building Information Modelling (BIM) can help improve construction efficiency through better information flow among project participants, improved design capability and enhanced project logistics management. "To harness this potential, we need to secure the commitment

of senior management to invest in information technology (IT) and to build up a critical mass of IT users within the industry," Chairman LEE points out. "BIM is one of the CIC's key initiatives in promotion of construction innovation and the CIC declared BIM Year 2014 to facilitate its implementation of BIM in the Hong Kong construction industry."

Currently, CIC is working together with industry stakeholders to set common standards and develop a common data infrastructure. In 2014, a series of forums, lectures and seminars were conducted to help with the promotion of BIM. "We want to push stakeholders into taking actions that move industry towards the adoption and implementation of BIM, as well as to collect views and feedback from the industry during the development of standards.

Above all, safety remains a core concern for the industry and the CIC's achievements in this field continue to be made. For the past three years, the CIC has organised, with the Development Bureau, an annual Construction Safety Week designed to promote and work towards our goal of "zero accident". The CIC continues to hold technical seminars on safety-related issues, and regularly publishes its safety alerts, as well as guidelines and instructive posters about topical issues, to enhance safety awareness and promote good practices.

MOVING TOGETHER

Overall, Chairman LEE says, the CIC will remain of vital importance to developing the construction sector with its missions to propagate improvements across the entire industry. The CIC is empowered to formulate codes of conduct, administer registration and rating schemes, steer forward research and manpower development, facilitate adoption of construction standards, promote good practices and compile performance indicators. "The main functions of the CIC are to forge consensus on long-term strategic issues, convey the industry's needs and aspirations to government, provide training and registration for the construction workforce and serve as a communication channel for government to solicit advice on all construction-related matters."

The Chairman also sees a role for the industry as part of the Hong Kong community as a whole. "Being itself a public body, the CIC and its underlying committees, task forces and working groups are formed from members representing various sectors of the industry including employers, academics, contractors, workers, Government officials and professionals — many of whom are construction professionals such as engineers, surveyors and architects who aspire to contribute to the broader society and thus serve as advisers with their expertise in various sectors and make recommendations to the Government on industry-related issues," he observes.

Chairman LEE points out that many such professionals freely give their time to the CIC's committees as well as fulfil other community service roles. The Chairman is himself the Convenor of the Panel on Promoting Testing and Certification of Construction Materials Trade, a member of the Airport Authority Hong Kong and the Development Committee of the West Kowloon Cultural District Authority and the CreateSmart Initiative Vetting Committee, as well as a co-opted member of the Youth Education, Employment and Training Task Force of the Commission on Poverty.

Community service, he adds, comes naturally to construction industry professionals through their involvement in developing the physical framework that Hong Kong society occupies. "On top of the usual initiatives such as the annual Safety Week and the establishment of the Construction Charity Fund which focus on the welfare of construction practitioners and their families, the CIC also adopts the market practice in organising and joining Corporate Social Responsibility (CSR) campaigns," he says. "For instance, the Green Joyful Home for Disabled Project of Habitat for Humanity China and visits paid to the Tung Wah Group of Hospitals Tai Tung Pui Care & Attention Home last year involved CIC instructors and trainees applying their technical skills to house the needy and renovate the premises."

STRONG FOUNDATION

The CIC remains true to its roots, with the *Construct for Excellence* — Report of the Construction Industry Review Committee submitted to the Chief Executive in January 2001 that led to the creation of the CIC as a vital foundation. The construction industry, while being a main pillar of our economy, was once "fragmented and beset with an adversarial culture" which impeded long-term development, notes Chairman LEE, quoting the Report's description. "It concluded that a statutory industry co-ordinating body encompassing all key sectors should be formed to promote the culture of self-regulation in a market-driven environment."

Since its establishment in 2007, the CIC's activities have been anchored on the tasks listed in the Report covering the whole spectrum of construction activities to improve the quality and cost-effectiveness of the industry. "Serving as the key platform for communication between the industry and the government to deliberate on issues of industry-wide concern, major successes have been achieved by the CIC over the years in reaching consensus and instilling strategic partnership among various stakeholders," Chairman LEE says. "Now that the industry is becoming unified, the CIC is developing a new strategic direction based on agreed future activities and goals for the next 10 years."

The CIC recently commissioned a consultant to comprehensively review the local construction industry with a goal to devise a strategic vision and direction for the industry that will address the short-term skill shortage, enhance health and safety procedures, enhance industry productivity and improve overall quality and performance. As Chairman LEE sums up: "We will formulate a forward-looking strategic plan, measurable success factors as well as pragmatic recommendations to tackle all major issues of the industry, so as to take the cooperation further with government and bring harmony and sustainability to the industry."

《築目》專訪

李承仕工程師

金紫荊星章，OBE，太平紳士

李承仕先生是資深土木工程師、前工務局局長及環境運輸及工務局常任秘書長（運輸及工務），自1964年於香港大學畢業後便加入香港政府為廣大市民服務。李工程師亦是當年建造業檢討委員會15位成員之一，協力推動成立臨時建造業統籌委員會，及後於2007年建造業議會成立後出任議會成員，並於2010年起擔任主席至今。經歷建造業滄海桑田五十載，李主席在本期《築目》中寄語香港業界活用其獨有的生氣和創造力，攜手共建更精彩的未來。

轉型時代

議會主席李承仕工程師表示，香港特區政府於《2007至2008年度香港行政長官施政報告》公布的十大建設計劃不但促進經濟發展，為社會提供就業機會，更令建造業界在未來得以穩步向前。

政府施政和私營市場的需求為建造業締造了十分理想的發展環境。李主席表示：「香港建造業正處於前所未見的全盛時期。為滿足市民的迫切需求，工務工程進行得如火如荼，私營項目發展也在日益增長。」

然而作為議會主席，對於建造業面對的主要問題始終保持警惕，例如勞動力老化、技能錯配嚴重、以及公眾長久以來對建造業的4D誤解：骯髒（dirty）、危險（dangerous）、辛苦（demanding）、凌亂（disorganised）。「種種因素導致建造業出現人手緊絀，正是我們現在最關注的狀況。」

要轉危為機，李主席認為必須採用創新的方式：「從當前的供求情況來看，本地建造業正處於轉型階段。我們必須發展新的工作模式，在生產力和競爭力上尋求突破。」

研發和應用嶄新技術是創新的第一步。李主席說：「採用嶄新技術不但能取締勞動力密集的工序，同時更能在業界創造其他技術職位。這樣我們就能提升建造業整體形象，並建立一支高效而訓練有素的技術團隊，獲世界各地的市場青睞。」

李主席深信現在是投身香港建造業的最好時機。「香港建造業正經歷有史以來最繁忙的時期，預測未來十年將維持相若的工程量。此起彼落的大型工程項目為新人提供了很多機會在自己選定的專業中發揮所長，前景將是一片光明。」

創新思維

李主席期待新人的加入能為業界注入生機及創意。「現時建造業界求才若渴，尤其各重點基建項目均亟需不同工種的技術大工參與施工。議會在提供各類工種培訓的同時，亦在徵集更多人手成為培訓導師。從管道、雲石鋪設到焊接等領域均需要具經驗的師傅加入。」

香港建造業現已於工地引入新式的材料及施工程序。李主席表示議會「一直致力研發及應用創新技術」，並已展開或資助數個先進建築材料的研究項目，希望研發出能解決實際需求、同時提升整體工程質素的材料。議會的「混凝土和水泥砂漿生產用河砂替代品研究」就是最佳例子。

這項研究旨在分析於混凝土生產過程中使用機製砂作為替代物以提升整體性能的可能。此外，議會正支持一支研究團隊研發一種適用於高樓、具高強度和高彈性的特殊混凝土。李主席又指業界持份者也在進行自己的創新研究。「本地預拌混凝土製造商正自行研發採用優化設計組合的創新高性能混凝土產品，另外亦有研發採用可循環使用原料的環保混凝土。」

此類業界與學院之間的合作研究有效促進知識發展、技術轉移及思想領導，同時在提倡使用創新技術以提升行業生產力及表現方面亦扮演著重要的角色。李主席說：「作為學術界及業界之間的橋樑，議會致力於推動有助滿足業界需求的研究，我們更設立議會研究撥款，旨在鼓勵本地研究活動及於建造業內使用創新技術。」

議會將繼續撥款支持創新技術，同時發揮交流中心的功能，發展可深化業界與研究之間關係的行動計劃。「議會研究撥款資助項目的研究成果均具有實際價值，可應用於香港建造業的工程項目中。」李主席指：「直至2014年底，我們已撥款2500萬港元，用於24個不同領域的研究項目，包括混凝土、建築技術、生產力、建造安全及低碳科技等。」

合作無間

業界持份者及學術研究人士均主動尋找雙方合作的契機。李主席提到，由本地大專院校設置的建築相關研究機構時有提出應對行業迫切需要的研究項目。「他們常邀請我們的從業員往大學教授技術課程，分享工程經驗及交換行業消息。此外，建造業持份者亦時有直接諮詢大學及研究機構中的研究人員以尋求實際問題的解決方案，更向如香港生產力促進局及香港綠色建築議會等的 中介機構尋求協助，以就各項應用技術展開合作。」

李主席強調，業界人士均認同可持續建築材料能為行業及消費者帶來雙贏。「可持續性是一個成長中的概念，與當今城市的發展有著密不可分的關係。建造業需要建立一套綜合環境保護、可持續建築及其他有助提升施工質素的規劃理念，而我們需要做的，正是創造適合未來數代人生活的居住環境。」

因此，業界持份者正努力改進材料的環保性能，為行業的可持續發展出一分力。李主席指：「在香港，建築材料生產過程中產生的廢物已獲回收及重用為路面磚、水泥及混凝土，並被廣泛應用

作為業界與政府間討論業界議題的重要溝通平台，議會多年來已成功協助不同持份者達成共識及展開策略性合作。

於工務工程項目中，效果甚佳。然而，議會不會因而自滿，只會繼續埋首作進一步研究。其他由議會撥款支持進行的項目包括研究回收木模板用作水泥刨花板、以及將回收塑料用作高延展性防水膠結材料。」

碩果累累

於2012年落成的零碳天地是議會與香港政府攜手採用環保設計及材料打造而成的香港首座零碳建築，亦是議會在可持續發展方面的重要成果。李主席指：「在香港，建築物佔總溫室氣體排放量的60%，較其他行業為高。倘能改革建築環境，使之更具能源效益及有利於全球氣候，則建造業在減輕氣候變化威脅上起着關鍵作用。由此可見，業界應時刻注意減少溫室氣體排放。」

零碳天地可向整個業界彰顯應用於樓宇、家庭、辦公室等的生態技術，同時向公眾推廣零碳/低碳生活方式。李主席續指：「零碳天地的建成，除了向國內外建造業展示現代化的生態建築設計及科技，還分享了我們在低碳及零碳建築設計及技術上的知識與專業技能。零碳天地更喚醒了香港社區的低碳生活意識，鼓勵大家一同為減少溫室氣體排放而努力。」

議會凝聚業界力量和科研成果，建立對話平台，使創新科技能順利地應用在實際工程中。建築信息模擬（BIM）等技術讓項目參與者之間能更好地交流資訊，改善設計及優化項目物流管理，最終提升建造效率。「為充分利用這類技術，我們須確保高級管理層投資於資訊科技，並於業內培養大批這方面的用戶。BIM是議會在促進建築創新方面的重點項目，我們更將2014年定為建築信息模擬年，鼓勵香港建造業更廣泛地使用這項技術。」

議會於2014年舉辦了一系列論壇、講座及研討會以推廣BIM，近來更積極與業界持份者合作，制訂通用標準及建立通用資料架構。「我們希望推動業界持份者坐言起行應用BIM，同時在制訂標準過程中，不斷收集來自業界的觀點及意見。」

重要的是，議會在業界最關注的安全問題上亦取得了不錯的成績。李主席表示，議會在過去三年除每年均與發展局舉辦建造業安全周鼓勵業界人士實踐「零意外」，同時亦持續舉辦安全相關問題的技術研討會，並定期就不同議題出版安全提示、指引及海報，以提升業界的安全意識及宣傳良好作業方式。

協力同行

總體而言，李主席認為議會在推進整體建造業發展中將繼續扮演重要角色。為改善整個行業，議會將制定操守守則、管理註冊及評級計劃、督導前沿研究和人力發展、促進業界採用建造業標準、推廣良好作業方式和制訂表現指標。「議會的主要職能是就長遠的策略性事宜與業界達成共識、向政府反映建造業的需要及期許，為業內勞動力提供培訓和註冊，並為政府提供溝通渠道，取得與建造業所有相關事項的意見。」

李主席視建造業為香港整體社區的一個重要組成部分。「作為公營機構，議會及其轄下委員會、專責小組及工作小組均由代表業內各界別的人士組成，當中包括聘用人、專業人士、學者、承建商、工人、政府官員及專業人士。他們當中有工程師、測量師及建築師等建築專才，熱心貢獻廣大社會，常利用自己在不同領域的專業知識，就行業相關的問題向政府提出建議。」

李主席指，許多建築專業人士均無私奉獻時間於履行議會的工作

及其他社區服務。主席本人同時亦擔任香港檢測和認證局推動建築材料行業檢測和認證服務小組召集人、香港機場管理局董事會、西九文化區管理局發展委員會及創意智優計劃審核委員會成員、以及扶貧委員會青年教育、就業和培訓專責小組增補委員。

建築專業人士為香港社會的發展塑造了理想的環境，體現了他們對社區的貢獻。「除了議會每年均舉辦的建造業安全周以及為建造業從業人員及家人成立的建造業關懷基金，議會亦一如大型企業般組織並參與企業社會責任活動。例如我們去年探訪仁人家園及東華三院戴東培護理安老院，議會的導師及學員便一展所長，為有需要人士提供免費家居維修服務。」

堅實基礎

議會的成立可追溯至於2001年1月呈交給行政長官的建造業檢討委員會報告書《建業圖新》。李主席引述報告書其中一項主要意見，指儘管建造業是本港經濟的主要支柱之一，但業內界別「各自為政，壁壘分明」，妨礙行業的長遠發展，議會始終引以為鑑。「報告書總結，應成立一個涵蓋各主要界別的法定業界統籌機構，以求在市場主導的環境下建立自我規管的文化。」

自2007年成立以來，議會的工作一直專注於提高建造業各個範疇的質素和成本效益。「作為業界與政府間討論業界議題的重要溝通平台，議會多年來已成功協助不同持份者達成共識及展開策略性合作。」李主席續說：「現在業內各界已漸趨團結，議會正在草擬一份未來十年的策略性計劃，為日後的工作確認目標。」

議會最近委任了一家顧問機構，全面審視本地建造業，力求為業界訂定策略性願景及方向，以應對短期的技術短缺、完善健康及安全程序、提高業界生產力以致整體質量與表現。訪問最後，李主席總結道：「我們將制定一個前瞻性的策略性計劃，訂定可量度的成功因素，就業界的主要問題提出務實建議，並與政府進一步合作，為業界帶來和諧穩定的可持續發展。」

MESSAGE FROM CHAIRMAN OF COMMITTEE ON CONSTRUCTION SAFETY

To sustain the momentum and further promote safety in the construction industry, the Committee on Construction Safety (Com-CSY) continues its efforts to work with industry stakeholders through various channels.

In mid 2014, the Com-CSY formed a new task group to explore, develop and implement innovative design to enhance construction safety. The Task Group on Application of Innovative Design to Enhance Construction Safety was set up to deliberate the feasibility of the application of innovative designs to support safety-at-work practice in construction sites; to explore the possibility to test and evaluate the innovative design at the CIC training centre and/or on construction sites; to work out a suitable business and system implementation plan that pursues industry buy-in if possible; and to develop the promotional strategy for innovative designs where appropriate. The Task Group held its inaugural meeting in August to discuss various innovative designs and it is expected that a trial run for some of them would commence in the coming months.

The Com-CSY is highly concerned about recent safety incidents in the construction industry. To provide quick reference for frontline construction personnel on the relevant safety measures, a Technical Seminar on Safety Operation of Mobile Cranes was held in July while another Technical Seminar on Construction Work Safety Near Water was held in December.

To raise awareness of the CIC Guidelines, the Com-CSY actively takes part in workshops and briefing sessions organised for industry practitioners. The Com-CSY gave a presentation to enhance the knowledge of the responsible persons in managing their lifts and escalators under the *Lifts and Escalators Ordinance* in the four briefing sessions organised by the Electrical and Mechanical Services Department and Home Affairs Department for property management companies and lift owners in September and October. Another presentation was given to introduce the new CIC *Guidelines on Planking Arrangement for Providing Working Platforms on Bamboo Scaffolds* in the Seminar on Bamboo Scaffolding Safety for Construction Industry organised by the Occupational Safety and Health Council (OSHC) in October.

Pursuant to the Construction Safety Week 2014 held in May, the CIC and the OSHC jointly launched the Construction Safety Forum and Award Presentation Ceremony for the second year, as well as the Good Housekeeping Promotional Campaign to sustain the momentum to improve safety and health in the working environment. The campaign is for all organisations interested in improving housekeeping at their workplaces and experiencing the benefits of good housekeeping techniques. Consisting of the Good Housekeeping Workshops and the Good Housekeeping Competition, the Good Housekeeping Day kicked off on 4 February 2015 with a forum and an award presentation ceremony.

Falls from height are one of the most common accidents in the construction industry leading to serious injuries and fatalities. A construction safety poster on *Working at Height Safety* was published in September to provide simple and clear messages to industry stakeholders on good working at height safety practices. In the meantime, the Com-CSY is pleased to note Mr. Victor KWONG, Ir Peter CHAK and Ir CHEUNG Pak-kin from Towngas have kindly contributed an article on “Progressive Safety Enhancement for Working at Height”, and Prof. Albert CHAN has again contributed an article on “Monitoring the Health Conditions of Construction Workers for a Sustainable Construction Industry”.

Let us work hand-in-hand with industry stakeholders to strive for zero accidents in the construction industry of Hong Kong.

CHEUNG Hau-wai

建造安全專責委員會主席的話

建造安全專責委員會（委員會）持續透過不同渠道與業界持份者共同協作，致力於建造業內推廣安全。

於2014年中期，委員會成立了一個新的工作小組，加強探索、發展和實踐工地安全的創新設計。工作小組的設立旨在討論應用創新設計以支持工地的工作安全的可行性；探討於建造業議會訓練中心和工地測試和評估創新設計的可能；如適用，訂定合適的系統實施計劃以鼓勵業界支持及使用；和如合適的情況下，為上述的創新設計探討及制定推廣策略。工作小組的首次會議已於8月舉行，會上大家探討了多項創新設計，而部分設計也將在未來數月開始試行。

委員會十分關注建造業內最近發生的安全事故。為就相關安全措施向前線施工人員提供便捷參考，我們先後於7月及12月舉行流動式起重機安全操作技術研討會以及近岸建造工程的安全技術研討會。

為提高公眾對議會指引的重視，委員會積極參與一系列為從業員舉辦的研討會及簡介會。9月和10月期間，機電工程署和民政事務總署為物業管理公司及升降機擁有人舉辦了四場簡介會，我們亦即場講解《升降機及自動梯條例》中關於負責人管理升降機及自動梯的有關事項。此外，我們還在職業安全健康局（職安局）於10月舉辦的建造業棚架工作台安全講座中，介紹了議會的《竹棚架工作平台安排指引》。

除了在5月舉行的建造業安全周2014外，議會連續第二年與職安局聯合舉辦建造業安全分享會暨頒獎典禮以及良好工作場所整理推廣計劃，後者以各行業中有意採用良好技術整理工作場所的機構為對象，力求保持並提升工作環境的安全與健康狀況。計劃包括良好工作場所整理工作坊及比賽，而2015年2月4日進行的良好工作場所整理日將設研討會暨頒獎典禮。

高處墜落是建造業中最常見的事故之一，常導致傷亡。今年9月推出的《高處工作安全》海報，簡明地向業界持份者講解了高處工作安全措施。此外，我們很榮幸能邀請到香港中華煤氣有限公司鄺超靈先生、翟志堅工程師及張柏堅工程師為本刊撰寫文章「循序漸進提升高空工作安全」，亦感謝陳炳泉教授再次為我們撰寫文章「監察工人身體狀況以確保建造業可持續發展」。

讓我們與業界持份者攜手努力，帶領香港建造業邁向零意外。

張孝威

Progressive Safety Enhancement for WORKING AT HEIGHT

The Hong Kong and China Gas Company Limited (Towngas) ensures safe operation in all work tasks. The traditional method of installation and maintenance of gas risers and appliances at customer premises required technicians to work on bamboo scaffolds erected on the facades of buildings. Therefore, technicians were exposed to the risk of working at height. In view of this, Towngas developed a progressive safety enhancement programme at different levels, from elimination to administrative approaches such as the SafetyBox, Smart Quadcopter and other methods.

INTRODUCTION TO TOWNGAS

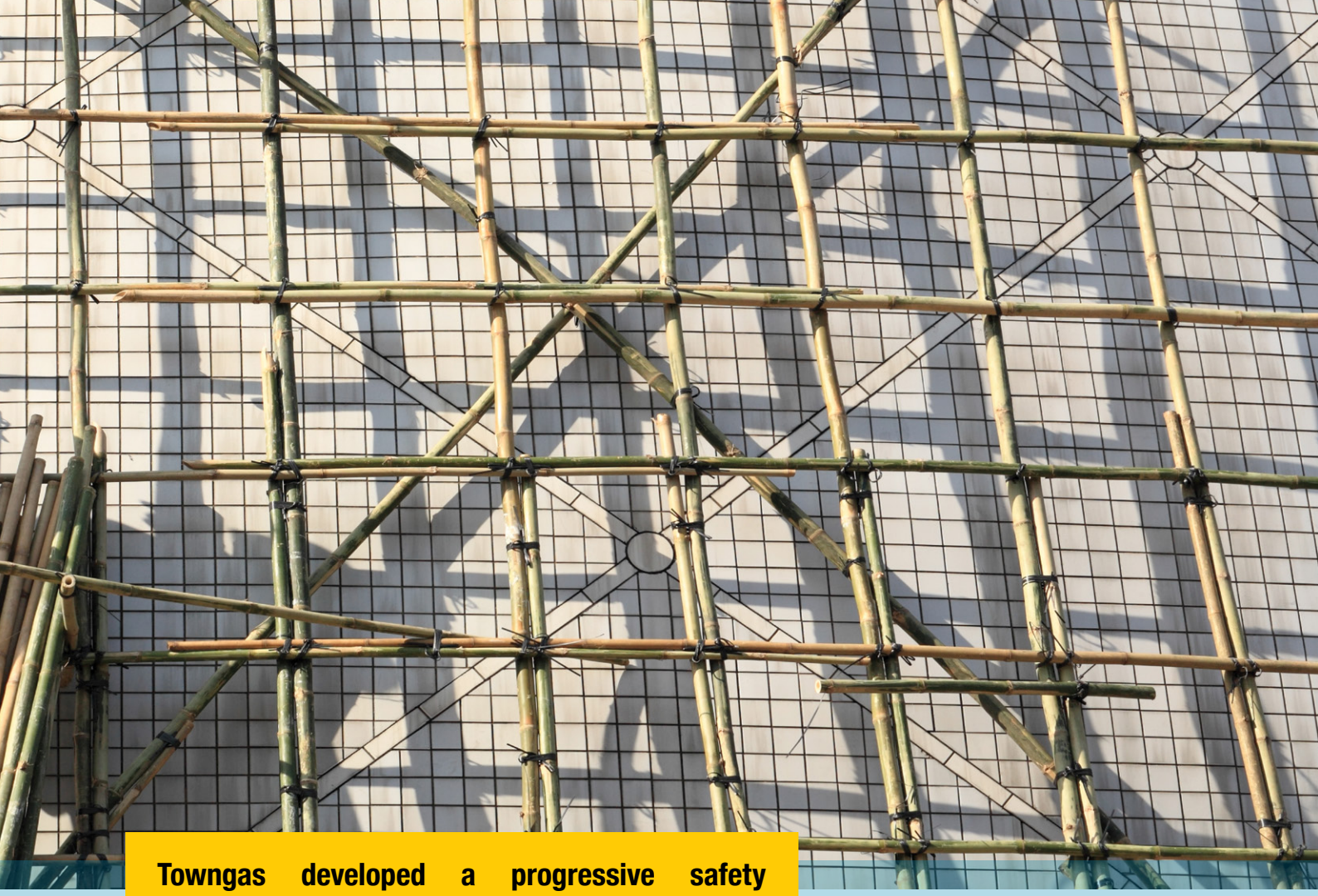
Founded in 1862, Towngas was Hong Kong's first public utility. Today, we are one of the largest energy suppliers in Hong Kong, operating with world-class corporate management and leading-edge business practices. For the past years, Towngas has been growing with Hong Kong, evolving from a simple gas company supplying fuel for street lamps to our current leading position in the energy industry in the greater China region. Our core business in the territory consists of the production and distribution of gas, marketing and sale of gas, the sale of gas appliances, as well as comprehensive after-sales services. With a pipeline network consisting of more than 3,500km of gas pipes, we supply town gas to more than 1.8 million customers in Hong Kong. Expanding our business horizons in recent years, we have diversified our business into telecommunications, building services, engineering and the new eco-energies, among many others.

The mission of Towngas is to provide our customers with a safe, reliable supply of energy and the caring, competent and efficient service they expect, while working to preserve, protect and improve our environment. Town gas is supplied to individual customers through the gas riser installed on the facades of buildings. Installation, maintenance and replacement of gas risers and appliances require working at height operations. Installation and maintenance of gas risers and appliances were traditionally conducted on bamboo scaffolds erected on facades, where technicians were exposed to the risk of working at height. In order to minimise the risk of working at height in installation, maintenance and replacement of gas risers and appliances, Towngas developed progressive safety enhancement programme for working at height operations.

WORKING AT HEIGHT IN INSTALLATION, MAINTENANCE AND REPLACEMENT OF GAS RISERS AND APPLIANCES

Safety is our priority; Towngas ensures safe operation in every step of all work tasks. Provision of comprehensive after-sales services is one of our missions and Towngas provides regular safety inspection on gas risers and appliances every 18 months. Similarly, traditional methods of riser inspection and replacement once again involved bamboo scaffolds erected on facades.

According to the Occupational Safety and Health Statistics 2013 published by the Labour Department, 22 fatal accidents were reported in Hong Kong's construction industry. Among these fatal accidents, 15 of them were classified as "Fall of Person from Height", which account for nearly 70% of total fatal



Towngas developed a progressive safety enhancement programme at different levels, from elimination to administrative approaches such as the Safety Box, Smart Quadcopter and other methods.

accidents in Hong Kong's construction industry. Given that working at height is a high-risk work task, Towngas strives for excellence to minimise the risk of working at height operations in different levels.

SAFETY ENHANCEMENT PROGRAMME FOR WORKING AT HEIGHT IN TOWNGAS

A comprehensive working at height control programme was launched to cover all stages of work, from the provision of installation service to preventive maintenance. According to hierarchy of control (Fig. 1), the application of high-level control measures is preferred, ranking from elimination, substitution, engineering control and others. With the objective "Growth = Innovation x Implementation (G = I2)" for continual improvement in Towngas, we have initiated various innovative projects to enhance working at height condition by safety design, such as the Safety Box, Smart Quadcopter, Smart Pipe and others. Apart from innovative ideas for elimination and substitution, equipment improvement is another way for advancement, including Smart Gondola and Tailor-made Platform Ladder. Furthermore, administrative controls for enhancement in training and monitoring, including "Interactive Working at Height Training Class" and "Comprehensive Active Monitoring System", are implemented to enhance the knowledge, awareness and compliance of our frontline workers. With the development and application of progressive safety measures for working at height, technicians can work in a safer way.

SAFETY DESIGN

Everlasting Gas Pipe Coating and Advanced Collar Pipe Fittings

In order to deliver town gas to our customers, vertical service risers and horizontal service laterals are installed to connect our underground gas pipes to the gas meters at our customers' premises. These service pipes often work at low-pressure ranges and are usually made of galvanised steel (GI), being inter-connected by threads and fittings. Since the pipes are installed at outdoor areas and exposed to adverse weather conditions and corrosive solutions, pipe corrosion may be found. If defects are found on the gas risers, maintenance or replacement work is required. Normally, technicians are required to work on a scaffold for maintenance and replacement of gas risers, subjecting them to the risk of falling. In this regard, we developed the "Everlasting Gas Pipe Coating" and "Advanced Collar Pipe Fittings" to increase the lifespan of gas pipes and reducing the maintenance work necessary, thus avoiding working at height operations.

In pipe factories, epoxy (a form of polymer) is pre-coated on pipe surfaces to protect them from direct contact with ambient air. Extended covers on collar pipe fittings were also developed to enable the application of paste-type pipe sealing materials to the area between the externally threaded pipe and the internally threaded fitting, as well as in the space between redundant threads and the specially designed collar fitting cover. This practice ensures the full coverage of sealant material on the whole range of machine-cut threads. Since the application of the modified collar fittings in 2000, no corrosion has ever been found on threaded pipe areas of our town gas GI pipes for more than 14 years. Therefore, the need for working at height for pipe maintenance is significantly reduced.

Safety Box

The installation of a new water heater requires replacement of the water heater wall sleeve. With the traditional method of replacing water heater wall sleeve, scaffolds are required to allow technicians to work on the external wall of building. Towngas developed the "Safety Box", a tool set that allows technicians to carry out the works inside the customer's premises for some wall sleeve replacements. The "Safety Box" set contains a foldable metal box and a quick-fit mounting mechanism. It takes only a few simple steps to enclose the entire wall sleeve. It prevents the fall of the wall sleeve, tools and debris from height during work, which may lead to injuries and damages. With all works carried out indoors, the scaffolding works become unnecessary; customers can save the induced costs and inconvenience caused to them. Most important of all, technicians can work in a safer indoor workplace and the risks of working at height at the external wall are avoided.

Procedures for Setting up Safety Box

1 Safety Box set
2 Demolish wallsleeve
3 Install Safety Box
4 Remove after use

VICTOR KWONG

Mr. Victor KWONG is the Chairman of the Towngas Environmental Working Committee and Head of Corporate Health, Safety and Environment.

Mr. KWONG has more than 30 years of experience in the areas of occupational health, safety and environmental protection. He is responsible for the development and implementation of proactive safety and environmental management systems of the corporation. Mr. Kwong is the President of the Federation of Occupational Safety and Health Associations. He is also the co-opted member of CIC Committee on Construction Safety and member of Labour Advisory Board – Committee on Occupational Safety and Health and Director of Business Environment Council.

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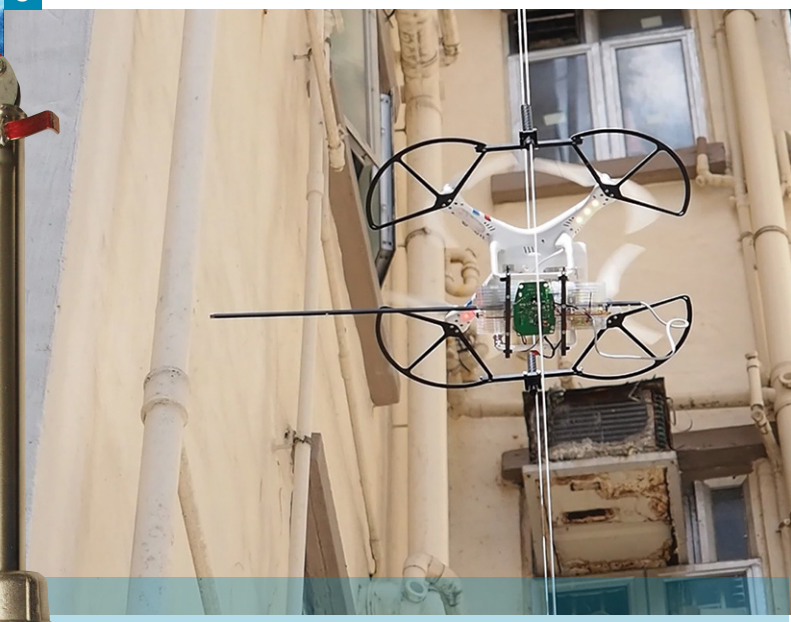


Smart Quadcopter

Towngas provides regular safety inspection of gas risers every 18 months. Traditionally, technicians are required to work in customers' premises or on bamboo scaffold for riser inspection, putting them at risk of a fall from height. In order to adopt higher level in hierarchy of control to avoid technicians working on the scaffold, Towngas developed the Smart Quadcopter for riser inspection. The idea came from the shooting of TV shows using remote control helicopters. A Smart Quadcopter consists of a remote control helicopter, a high definition camera and a gas sensor. The Smart Quadcopter is used for riser inspection of target buildings. During the operation, a parapet wall clamp is installed and fixed on the roof and guide wires set down from the clamp and fixed to the apron with a counterweight on the ground. A helicopter equipped with a high-definition camera and extendable gas detector flies from the ground to the roof to check the condition of the gas risers. Technicians remotely control the helicopter from the ground floor. Images can be viewed instantly while video can be recorded for later review. A gas leakage is signalled by a red light on the screen. Smart Quadcopter greatly reduces the inspection time of risers. Apart from enhancement in productivity, there is no need for bamboo scaffolding. The biggest advantage of Smart Quadcopter is to avoid technicians having to work on scaffolding and the risk of falling objects and fire hazards are greatly reduced.

Smart Pipe

When defects are found on service lateral of a gas riser during regular safety inspection, pipe replacement used to be carried out on bamboo scaffolding. In view of this, Towngas developed Smart Pipe, which allows technicians to renew the service lateral in the indoor area of customer premises. The principle is to insert a rubber ball to seal up the upstream end temporarily. Then, expansion sealant is used to form a new plastic pipe inside the damaged service lateral supplanted by the Smart Pipe. After passing a gas soundness test, gas supply can be resumed without affecting the supply pressure. Smart Pipe eliminates technicians working on the scaffold. Furthermore, work can be done more efficiently and effectively.

6

5 Smart Quadcopter
6 Smart Pipe

7

EQUIPMENT IMPROVEMENT

Tailor-Made Platform Ladder

Gas water heaters are occasionally installed inside balcony false ceilings, and this location is not convenient for installation and maintenance works. In this situation, a technician is subject to the risk of falling from the balcony when replacing or repairing water heaters in these premises. After risk assessment, it was decided to devise a suitable working platform as a safer measure. There were more challenges owing to the workplace restrictions. The access door to the balcony is narrow, while there is a difference in floor levelness between the balcony and the living room. An appropriate working platform was not available in the market so Towngas developed its own Tailor-Made Platform Ladder to suit this workplace. This foldable working platform is only 500mm wide and uses adjustable legs and lockable wheels to go through the narrow balcony doors and stand firmly even though the living room and the balcony are on different levels. The platform is also equipped with necessary safety features such as guardrails, toe-boards, access steps and handrail. Other safety measures are also taken, such as a minimum of two technicians required to attend the tasks to minimize the need to ascend and descend. The technician working on the platform also wears a safety harness. A Beam or U anchorage is adopted for securing the safety harness. Moreover, we also encourage the use of tool lanyards to prevent the fall of tools and cordless hand tools to avert tripping over electrical cords. All these measures aim to ensure the work safety of our technicians.

Smart Gondola

During regular safety inspections, technicians check the gas risers by Smart Quadcopter. If replacement work is required, the Smart Pipe can be used for the renewal of the service lateral. However, if defects are found on the main vertical riser, outdoor pipe replacement work is required. We prefer using a suspended working platform over bamboo scaffolding for higher stability and integrity. Unfortunately, a normal suspended working platform can swing irregularly, creating an unstable working environment, which causes several hazards, including loss of balance, falls from height and other issues. In view of this, the Smart Gondola is used to provide a safer and more stable working environment for technicians. It consists of a suspended working platform and suction disc with a vacuum pump. The gondola is attached to the wall by a suction disc to provide a stable platform. In the design stage, the reaction force, wind load, suction power on different surface materials and other factors were considered and calculated. A suction power indicator is installed to aid the technicians.

8

7 Tailor-made platform Ladder
8 Smart Gondola

ENHANCEMENT IN TRAINING AND MONITORING

Interactive Working at Height Training

Apart from providing a safety design and equipment to enhance working at height safety, Towngas developed the "Interactive Working at Height Training". "Interactive Working at Height Training" aims to deliver working at height safety knowledge through practical and interactive training methods. The training is conducted in the Health, Safety and Environment Resources Centre, which is an interactive training area at Towngas headquarters. Immediate response system is used for pre-tests, post-tests, surveys, and voting during the training to evaluate effectiveness and enhance interactions. Apart from delivering safety messages, practical usage of fall protection equipment is an additional highlight. Different types of fall protection equipment, including full body safety harness, transportable temporary anchorage device and others, are located in the centre. Colleagues are required to select and wear appropriate fall protection equipment correctly based on different scenarios randomly selected in the computer. Interactive training makes working at height safety training more effective and impressive, thus enhance the safety awareness of technicians about accident prevention.

PETER CHAK

Ir Peter CHAK graduated from the University of Hong Kong with an honours degree in Industrial Engineering. He obtained his MBA at the University of Hong Kong as well. He has made dedicated commitment and contribution to the engineering field for years. He is a member of the Institution of Gas Engineers and Managers in the United Kingdom and is also a Chartered Engineer. He is a Fellow of the Hong Kong Institution of Engineers (HKIE). He was the Chairman of the Manufacturing and Industrial Division of HKIE for 2009/10 and 2010/11, and Council Member of HKIE for 2007/08 and 2008/09. In addition, he was the Chairman of the Institution of Gas Engineers and Managers, Far East District Section for 2011/2012.

Ir CHAK joined Towngas in 1982. He has been actively engaged in a wide array of work in gas appliances and pipings installation, customer maintenance services, project design and planning, process re-engineering, quality management, strategic development, market research and development, appliances sales and marketing, etc. At present, he is the Customer Enquiries and Installation Services Manager of Towngas, looking after all activities on residential gas appliances and pipings installation as well as overseeing the operations of the Customer Service Hotline (or Call Centre) of the company.

Comprehensive Active Monitoring

To ensure implementation of safety measures and communication with frontline technicians, a comprehensive active monitoring system has been developed and implemented. Colleagues at different levels are required to conduct safety inspections on a regular basis. Senior management of corresponding departments conducts safety inspections in the workplace and discusses the effectiveness of the implementation of safety measures with frontline technicians. Modifications of safety measures, including the development of Smart Gondola, Smart Quadcopter and others were discussed and brainstormed. Besides, management shows visible support through regular safety inspections. Middle management, including engineers and officers, check the compliance of safety measures in workplaces proactively. Frontline supervisors conduct pre-work risk assessments to assess the physical and mental condition of technicians, changes in the environment and others before commencement of work to ensure all potential hazards are addressed. Corporate Health, Safety and Environment Department conducts ad-hoc and surprise checks of workplaces to verify the implementation of control measures and responsibilities of management. Through comprehensive active monitoring system, roles and responsibilities in safety inspection of colleagues in all level are clearly defined. Also, colleagues can communicate and discuss with frontline technicians regarding implementation and effectiveness of safety measures, especially for innovative projects.

9 Interactive Working at Height Training

Towngas strives for excellence in improving health and safety. We develop progressive enhancement of working at height safety at different levels, from planning to monitoring. Safety designs, including Everlasting Gas Pipe Coating and Advanced Collar Pipe Fittings, Smart Quadcopter, Smart Pipe and Safety Box, were developed to avoid technicians working on the scaffolds. In an engineering approach, we enhanced the working environment by developing Tailor-made Platform Ladder and Smart Gondola. In order to enhance effectiveness of working at height safety training, Interactive Working at Height Training was developed as an in-house training programme. Colleagues at different levels actively monitor the implementation of safety control measures to ensure compliances. In the future, Towngas will continue to search for ways to improve the health and safety aspects of its operations.

CHEUNG Pak-kin

Ir CHEUNG Pak-kin joined Towngas as a gas craft apprentice in 1977. Throughout his 38 years of service in the company, he has worked in various sections in the customer service field and has accumulated solid technical knowledge and work experience in the installation, inspection and maintenance of the gas appliances and installations. He is currently the Senior Customer Maintenance Services Manager, leading a workforce of over 360 employees to serve more than 1.8 million residential, commercial and industrial Towngas customers in Hong Kong.

Ir CHEUNG is a Chartered Engineer, a Corporate Member of the Hong Kong Institution of Engineers as well as the Institution of Gas Engineers and Manager. He is currently a committee member of the Institution of Gas Engineers and Managers – Far East District Section.

循序漸進提升

高空工作安全

香港中華煤氣有限公司（煤氣公司）以安全為首要考慮，確保每項工作均安全進行。為用戶進行的傳統煤氣立管及設備的安裝與保養需要技術員於大廈外牆搭建的竹棚架上工作。因此，技術員會有從高處下墜的風險。有見及此，煤氣公司提出了不同等級、從消除風險到行政監察等一系列提升安全的方案，包括安全箱、立管檢查飛行器等，致力從各層面降低高空工作的風險。

煤氣公司

煤氣公司於1862年成立，是香港歷史最悠久的公用事業機構，亦是本港規模最大的能源供應商之一，企業管理和營運均達到世界級水平。過去150年來，煤氣公司與時並進，與香港一起成長，由初期供應煤氣以燃點街燈的小型企業，發展到今天已在大中華能源行業中傲視同儕。我們的核心業務包括生產、輸配及營銷煤氣、銷售煤氣爐具，以及提供全方位售後服務。公司在香港的供氣網絡管道全長逾3,500公里，為超過180萬客戶供應煤氣。近年，公司更致力拓展電訊、樓宇建設工程、新興能源開發及應用等項目，使業務更趨多元化。

煤氣公司的使命是為客戶供應安全可靠的能源，並提供親切、專業和高效率的服務，同時致力保護及改善環境。安全可靠的煤氣透過安裝於大廈外牆的立管輸送到每位客戶的家中，而傳統的安裝、維修、更換煤氣立管及其他設備都涉及高空工作。技術員需要於大廈外牆搭建的竹棚架上工作，因此可能會有不慎下墜的風險。有見及此，煤氣公司積極研發及建立創新安全改善項目，提升高空工作的安全性。

安裝、維修、更換煤氣立管及其他設備涉及的高空工作

煤氣公司以安全為首要考慮，我們確保每項工作均在安全情況下進行。傳統的煤氣立管及產品安裝需要技術員於大廈外牆搭建的竹棚架上工作。與此同時，技術員亦需要每18個月在大廈外牆的竹棚架上或入戶進行定期安全檢查。因此，技術員進行相關工作時，可能會產生不慎下墜的風險。

根據勞工處發布的《職業安全及健康統計數字2013》，香港建造業於當年共發生22宗死亡意外。當中，「人體從高處墮下」共15宗，佔事故總數的七成。煤氣公司就此積極從各個層面實施降低高空工作風險的措施。

煤氣公司高空工作安全改善項目

煤氣公司建立全面的高空工作風險控制計劃，涵蓋安裝及維修服務的每個步驟。按照風險控制等級，實施高層次的控制措施，如消除法、取代法及工程控制等，以更有效地控制風險。我們以煤氣公司持續改善理念「企業增長＝創新力X執行力」為目標，建立多個創新的安全設計項目來提升高空工作安全水平，包括安全箱、立管檢查飛行器、聰明管等。除了應用安全設計項目來降低風險，我們亦致力研發設備及器材，如吊船穩定器、梯台等。同時，我們亦於訓練及監察層面採取不同的行政控制措施來提高員工的知識及遵行意識，如互動高空工作安全訓練、全方位職安健監察計劃。隨著不同高空工作安全項目的建立和應用，技術員能夠更安全地進行工作。

煤氣公司提出了不同等級、從消除風險到行政監察等一系列提升安全方案，包括安全箱、立管檢查飛行器等，致力從各層面降低高空工作的風險。

安全箱安裝步驟
1 安全箱
2 拆除牆蓋
3 完成安裝
4 用後移除

安全設計

永垂不朽

源源不絕的煤氣經由地下管道連接外牆立管傳送至每位客戶的家中。這些立管一般以鍍鋅鋼製成，在低壓範圍下使用，並以螺旋接頭接駁。由於立管一般安裝在戶外空間，暴露於惡劣天氣及接觸腐蝕性液體時，可能導致管道鏽蝕，在管道需要維修或更換時，技術員往往需要於外牆的棚架上工作，即構成下墮的風險。因此，煤氣公司研發「永垂不朽」來延長立管的壽命，以減少進行維修及更換工程的頻率。「永垂不朽」是在立管製造過程當中塗上環氧樹脂來避免與空氣直接接觸，另外，我們還研製了特別設計的管件，延長管件的邊緣，並把漿糊狀的密封料均勻塗抹於管材的所有裸露部分（包括管道螺紋與管件螺紋之間，及管道突出管件的螺紋部分）。「永垂不朽」技術能確保喉管及接頭均被覆蓋，自2000年應用此技術以來，有關喉管14年未有發現螺紋連接處鏽蝕問題。因此，涉及高空工作的喉管更換工程大大減少。

安全箱

安裝煤氣熱水爐時，需要更換外牆上的熱水爐套管。傳統更換熱水爐套管的方法需要技術員於外牆俗稱「狗臂架竹棚」的懸空式竹棚架上工作。有見及此，煤氣公司研發了「安全箱」讓技術員於客戶單位內更換部份熱水爐套管，避免在懸空式竹棚架上工作。「安全箱」由一個可摺疊的金屬箱及快速裝配裝置組成。技術員只需進行簡單步驟便可包圍整個舊的熱水爐套管，避免套管、工具及碎石等從高處墮下。使用「安全箱」可省卻搭建懸空式竹棚架，減少對客戶造成的影響。最重要的是技術員能夠在室內工作，從而避免進行高空工作。

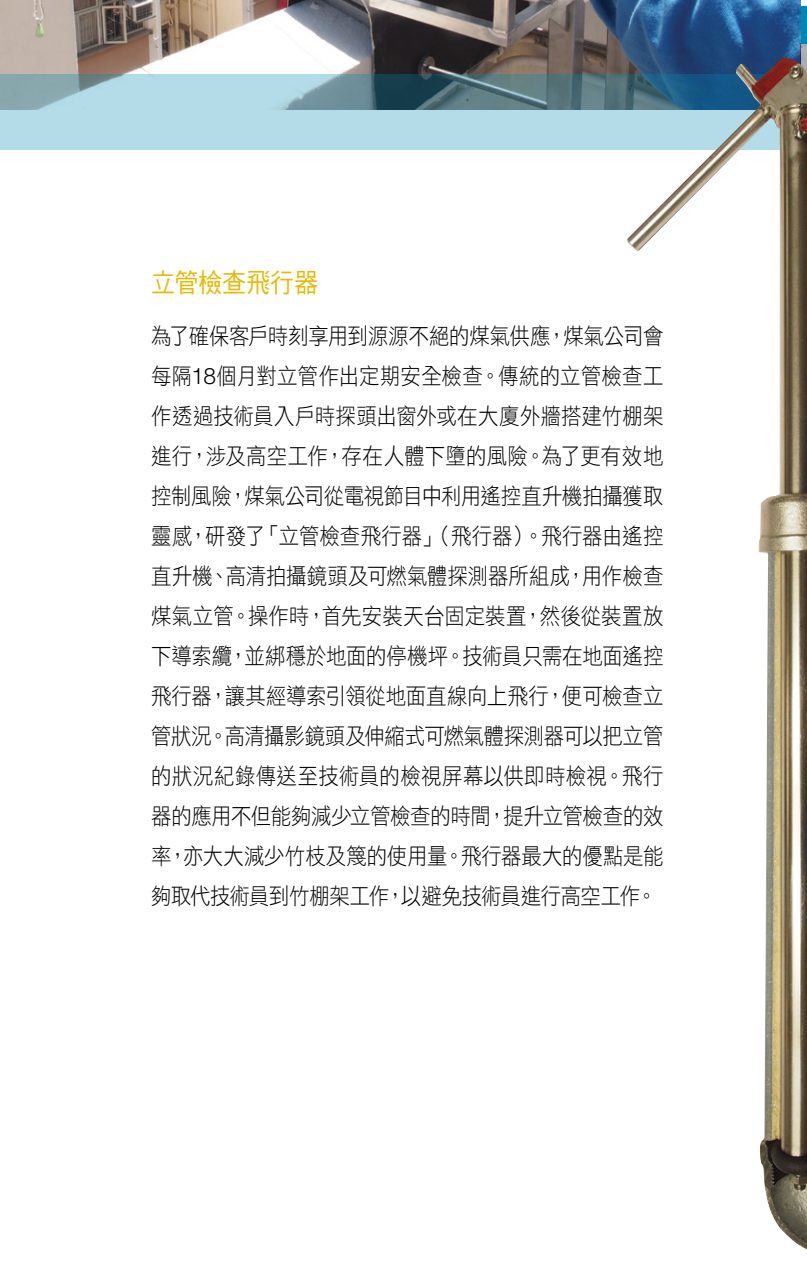
鄺超靈

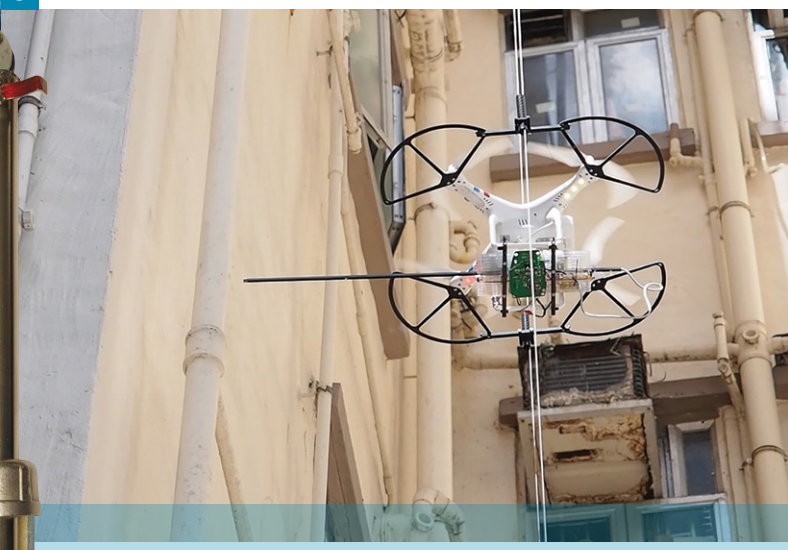
鄺超靈先生為煤氣公司企業安全及風險管理總監及環保工作委員會主席。

鄺先生擁有超過30年的職業健康、安全及環保經驗，主要負責有關安全及環境管理系統的研發與推行。鄺先生同時亦擔任香港職業安全健康聯會會長，及為建造業議會建造安全專責委員會委員、勞顧會之職安健委員會委員及商界環保協會董事局委員。

立管檢查飛行器

為了確保客戶時刻享用到源源不絕的煤氣供應，煤氣公司會每隔18個月對立管作出定期安全檢查。傳統的立管檢查工作透過技術員入戶時探頭出窗外或在大廈外牆搭建竹棚架進行，涉及高空工作，存在人體下墮的風險。為了更有效地控制風險，煤氣公司從電視節目中利用遙控直升機拍攝獲取靈感，研發了「立管檢查飛行器」（飛行器）。飛行器由遙控直升機、高清拍攝鏡頭及可燃氣體探測器所組成，用作檢查煤氣立管。操作時，首先安裝天台固定裝置，然後從裝置放下導索纜，並綁穩於地面的停機坪。技術員只需在地面遙控飛行器，讓其經導索引領從地面直線向上飛行，便可檢查立管狀況。高清攝影鏡頭及伸縮式可燃氣體探測器可以把立管的狀況紀錄傳送至技術員的檢視屏幕以供即時檢視。飛行器的應用不但能夠減少立管檢查的時間，提升立管檢查的效率，亦大大減少竹枝及篾的使用量。飛行器最大的優點是能夠取代技術員到竹棚架工作，以避免技術員進行高空工作。





聰明管

如橫向分支立管於定期安全檢查時發現問題，一般技術員會於懸空式竹棚架上進行更換工作。這樣，技術員會有由高處墮下的風險。因此，煤氣公司研發了聰明管，讓技術員於室內更換橫向分支立管。聰明管的原理是利用活動膠波把破損的喉管前端位置暫時封上，再利用套件將膨脹密封劑注入，從而凝成一條新的膠管，取代破損的喉管。測漏完成後便可恢復煤氣供應，不會影響供氣量。聰明管同樣能夠取代技術員到竹棚架工作，防止了高空工作的風險及對客戶造成的影響。同時，工作也能夠更有效地進行。

5 立管檢查飛行器
6 聰明管

翟志堅

翟志堅工程師畢業於香港大學，持有工業工程榮譽學士學位，並考獲香港大學工商管理碩士學位。他既是香港工程師學會資深會員，又是英國燃氣專業學會會員及特許工程師，多年來積極參與及推動工程界的發展。多年來，他曾擔任2009/10年度及2010/11年度香港工程師學會製造及工業分部主席，2007/08年度及2008/09年度的香港工程師學會理事，及英國燃氣專業學會遠東區分會2011/12年度的主席。

翟工程師於1982年加入香港中華煤氣有限公司（或稱煤氣公司）工作。他從事不同範疇的工作，包括氣體爐具及喉管的安裝、客戶維修服務、工程項目的設計、流程的改善、品質管理、策略發展、市場調查及發展、產品銷售及推廣等。現時，翟工程師是香港中華煤氣有限公司的客戶諮詢及安裝服務經理，主要負責住宅爐具及喉管的安裝及客戶服務熱線的管理及營運等工作。

7

設備提升

度身訂製梯台

少數住宅發展項目中，煤氣熱水爐安裝在陽台的假天花上，安裝位置難以讓技術員進行安裝及維修工作。這樣，技術員進行相關工作時，可能會有不慎從陽台墮下之風險。經過全面性風險評估後，我們發現使用合適工作台可降低相關風險。但是，狹窄的陽台空間及陽台與室內空間水平位置不一，導致未能直接使用典型的工作平台。因此，我們度身訂製梯台進行相關工作。梯台僅闊500毫米，配有可調教的支撐，可上鎖的輪子及一般的安全措施，如圍欄、底護板、上落腳踏及扶手等，可靈活地於狹窄的陽台使用。工作時，最少需要兩位技術員以減少上落，促進工作，而站在梯台上的技術員亦需要佩帶全身式安全帶，並繫穩至牢固點上。與此同時，為了防止物件下墮及人員被電線絆倒，我們亦鼓勵使用工具連接繩及充電式手提電工具。

吊船穩定器

煤氣公司使用立管檢查飛行器進行定期安全檢查，利用聰明管更新橫向分支立管。如直身立管需要進行更換，技術員便需要於室外進行更換工作。為了穩定性及完整性，我們傾向使用吊船進行工作。但是，一般吊船會不規則地擺動構成不穩定工作環境，使工作人員可能因失去平衡而從高處墮下。有見及此，煤氣公司研發了吊船穩定器，為技術員提供更安全穩定的工作環境。吊船穩定器的概念來自玻璃吸盤及吸塵器，由吊船組合真空泵及吸盤而成。此項目旨在利用吸盤把吊船吸附在外牆，提供更穩定的工作環境。各項因素如工作時的反作用力、風力、不同材質上的吸力等，已於設計階段經考慮及計算。

8

7 度身訂製梯台
8 吊船穩定器

張柏堅

張柏堅工程師於1977年加入煤氣公司成為氣體技工學徒，至今已在公司服務38年。他曾於客戶服務領域的多個部門工作，並在爐具及管道的安裝、檢查及維修等範疇，累積了豐富的工作經驗及技術知識。張工程師現任職高級客戶維修服務經理，帶領一支超過360人的團隊，為全港超過180萬煤氣用戶提供檢查及維修服務。

張工程師為英國燃氣專業學會及香港工程師學會的會員，並是一名特許工程師。同時，他亦致力於公共事務，現為英國燃氣專業學會遠東區分會的委員會成員。

加強訓練及監察

互動高空工作安全訓練

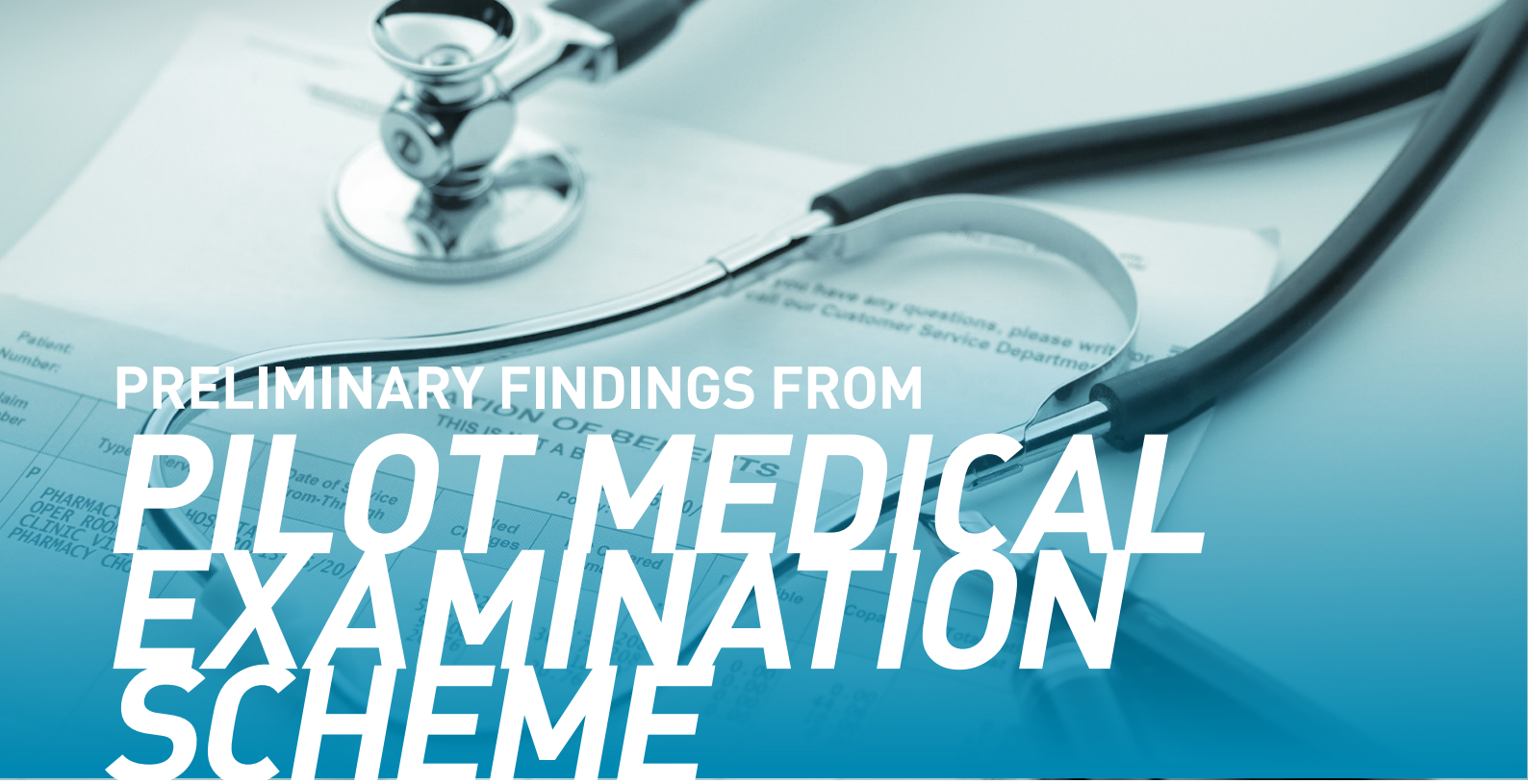
除了提供安全設計及提升設備以提升高空工作安全外，煤氣公司亦建立「互動高空工作安全訓練」為技術員提供具實踐性及互動性的訓練，以提升他們的相關知識。訓練在煤氣公司總部的健安環資源中心進行，當中配備了各式各樣的安全設備供試用體驗。同時，即時回應系統亦在訓練中用於訓練前後的測驗、調查及投票，以評估效率及加強互動。實踐如何正確地使用防墮設備是訓練的另一重點。學員需要根據不同情景，正確地選擇及佩帶各種防墮設備，如全身式安全帶、流動式臨時防墮繫穩裝置等。互動式訓練使高空工作安全訓練能更有效地進行，也令學員印象更深刻，從而加強技術員的安全意識，預防意外發生。

全方位職安健監察計劃

為了確保安全措施的落實和保持與技術員的溝通，煤氣公司建立了全方位職安健監察計劃。各階層的同事需要作定時安全巡查。相關部門的高級管理人員除進行安全巡察外，更需與技術員溝通，討論安全措施的實行狀況、實用性及探討如何改善安全措施，如吊船穩定器、立管檢查飛行器等。同時，定期安全巡察亦可顯示管理層對職安健的支持。中層管理人員，如工程師和主任，應主動定期巡察以確保安全措施的遵守。前線主管則需進行工作前風險評估以確保查出所有潛在問題，如評估技術員的生理及心理狀態、環境的改變等因素。與此同時，企業安全及風險管理部亦應通過突擊巡查以確保各階層安全措施及責任的落實。全方位職安健監察計劃亦有助各階層同事清楚瞭解職安健的角色和責任。同時，緊密的溝通能加強安全措施的應用及效用，特別是安全設計方面。

9 互動高空工作安全訓練

煤氣公司不遺餘力地加強安全及保持從業者的健康。我們從設計到監察的各個層面建立循序漸進的安全改善項目來提升高空工作安全水平。安全設計上，永垂不朽、立管檢查飛行器、聰明管及安全箱等設備均能避免技術人員於竹棚架上工作。工程層面上，我們度身訂製梯台及吊船穩定器來提供更安全的工作環境。為了加強高空工作安全訓練的有效性，我們還設計了互動高空工作安全訓練。與此同時，全方位職安健監察計劃使各階層同事主動地監察安全措施的落實和遵守情況。展望未來，煤氣公司將繼續尋找不同可能性來提高各方面的工作安全和保持從業者的健康。



PRELIMINARY FINDINGS FROM PILOT MEDICAL EXAMINATION SCHEME

FOR CONSTRUCTION WORKERS IN HONG KONG

The Pilot Medical Examination Scheme for Construction Workers (PMES) is a commissioned research project aiming to analyse construction workers' general health conditions in terms of gender, age, work trades, body mass index, blood pressure, blood cholesterol level, pain experience, dietary and exercise habits. Its scope is to provide basic health examinations to 10,000 construction workers in the territory and currently we have collected data from 529 workers in 26 construction sites. Some preliminary analysis results have been obtained based on the current sample. It is found that more than half (58.9%) of the workers are overweight. Relatively few workers (27.4%) have active pain symptoms and the most frequently reported pain spots are the lower back (36.5%), shoulders (17.2%) and knees (9.9%). Regarding dietary habits, on average, workers consume enough water and protein daily, but not sufficient fruit and vegetables as recommended by dieticians. A substantial number of male workers (41.0% of the whole sample) smoke, and the habit decreases with age. As to exercise, fewer than half (43.4%) of the workers regularly warm up before work. However, very few workers (15.1%) complete relaxation and stretching exercises after work. The current findings serve as the first step towards further analyses to understand the interfering effect of education, dietary and exercise habits on health outcomes of the workers.

INTRODUCTION

The Pilot Medical Examination Scheme (PMES) is a research project commissioned by the Construction Industry Council and undertaken by the Building and Real Estate Department of the Hong Kong Polytechnic University. It aims to analyse the general health conditions of local construction workers in terms of gender, age, work trades, body mass index, blood pressure, blood cholesterol level, pain experience, dietary and exercise habits. The scope of the project is to provide basic health examinations to 10,000 construction workers in the territory. As a report of an ongoing project, this paper presents the preliminary findings of the PMES project as of January 2015.

METHODOLOGY

The research team is composed of medical staff and research personnel. The medical staff are responsible for measuring the workers' blood pressure and taking their blood samples for laboratory testing. The research personnel measure the weight and height of the workers, and conduct face-to-face interviews with the workers regarding their demographic information, pain experience, dietary and exercise habits. The research team visits each construction site during lunch breaks and the test and interview takes about 15 minutes per worker.

Demographic information of the sample

The majority of the workers (87.0%) are male and aged in their 40s to 60s. The average age of the whole sample is 46.31 (SD=11.42). The age distribution is presented in Table 1. It is similar to the CIC registry of the all registered workers in the territory.

Age Range	Number	Percentage
Below 20	1	0.2%
20-29	59	14.5%
30-39	66	16.2%
40-49	100	24.6%
50-59	147	36.1%
Above 60	34	8.4%

1 Age Distribution

Education level of the sample is presented in Table 2. The majority of the workers completed primary school (23.6%) or secondary school (60.7%).

Education Level	Number	Percentage
None	18	4.4%
Primary School	96	23.6%
Middle School	144	35.4%
High School	103	25.3%
Diploma	20	4.9%
Associate Degree	8	2.0%
Bachelor	17	4.2%
Others	1	0.2%

2 Education Level

Ethnicity of the sample is presented in Table 3. The majority of the workers are permanent Hong Kong residents (89.9%), with the rest being Mainland Chinese (9.3%) and South Asians (0.7%).

Ethnicity	Number	Percentage
Hong Kong	366	89.9%
Mainland Chinese	38	9.3%
Pakistani	2	0.5%
Nepalese	1	0.2%

3 Ethnicity

RESULTS

BMI

Body mass index (BMI) is calculated based on the formula of BMI = body weight (kg)/height2 (m2). The mean BMI of the sample is 24.14 (SD=3.48). The BMI distribution is presented in Table 4. The majority of the workers (63%) are normal or slightly overweight (BMI: 18.5-24.9). Of the total, 37% are moderately or severely overweight (BMI over 25).

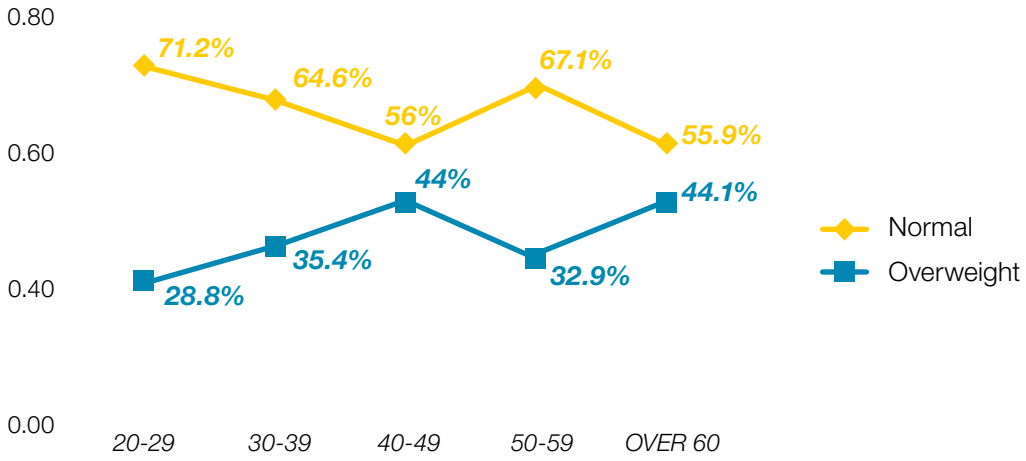
BMI Range	Number	Percentage
Underweight (<18.5)	13	3.2%
Normal (18.5-22.9)	152	37.8%
Overweight – At Risk (23.0-24.9)	90	22.4%
Overweight – Moderate (25.0-29.9)	122	30.3%
Overweight – Severe (>30.0)	25	6.2%

4 BMI Distribution

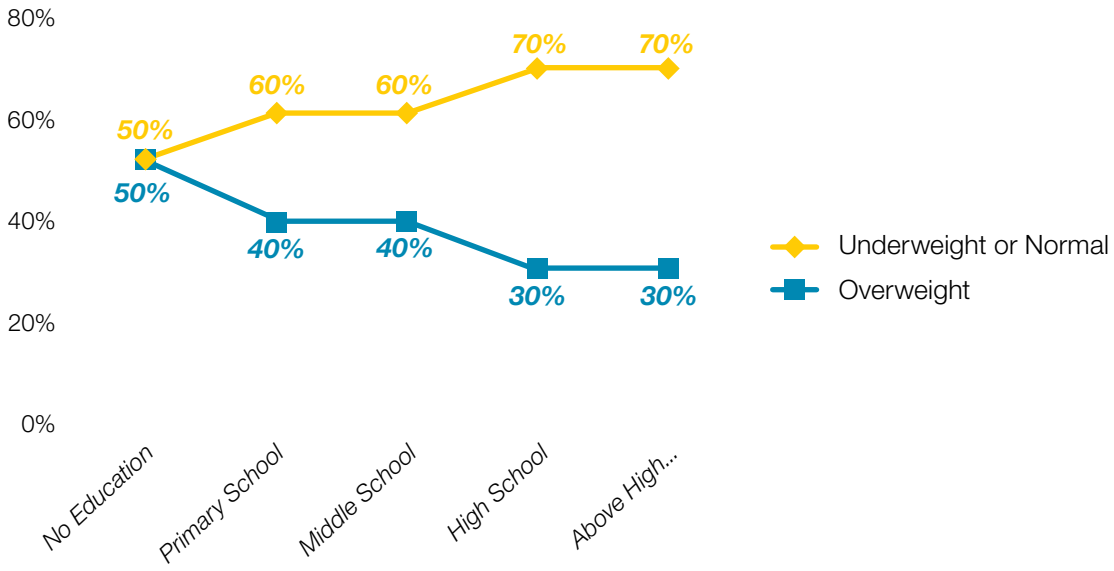
The current findings serve as the first step towards further analyses to understand the interfering effect of education, dietary and exercise habits on health outcomes of the workers.

A cross-tabulation between BMI and age group shows that as age increases, the percentage of overweight workers also slightly increases, with the age groups of 40-49 and over 60 having the worst overweight rate (44%).

BMI and education level have a negative association. as education level increases, the percentage of overweight workers slightly drops.



5 BMI by Age Group Distribution

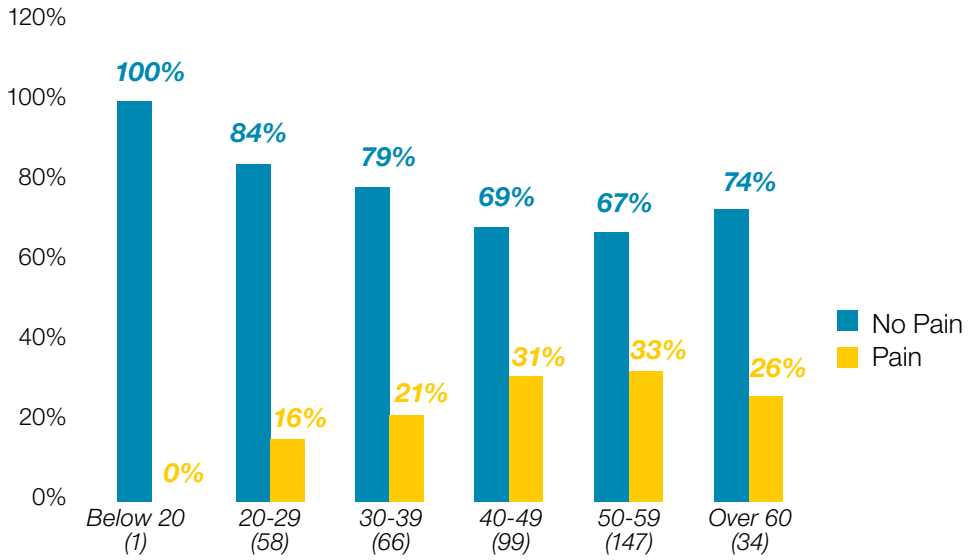


6 BMI by Education Level Distribution

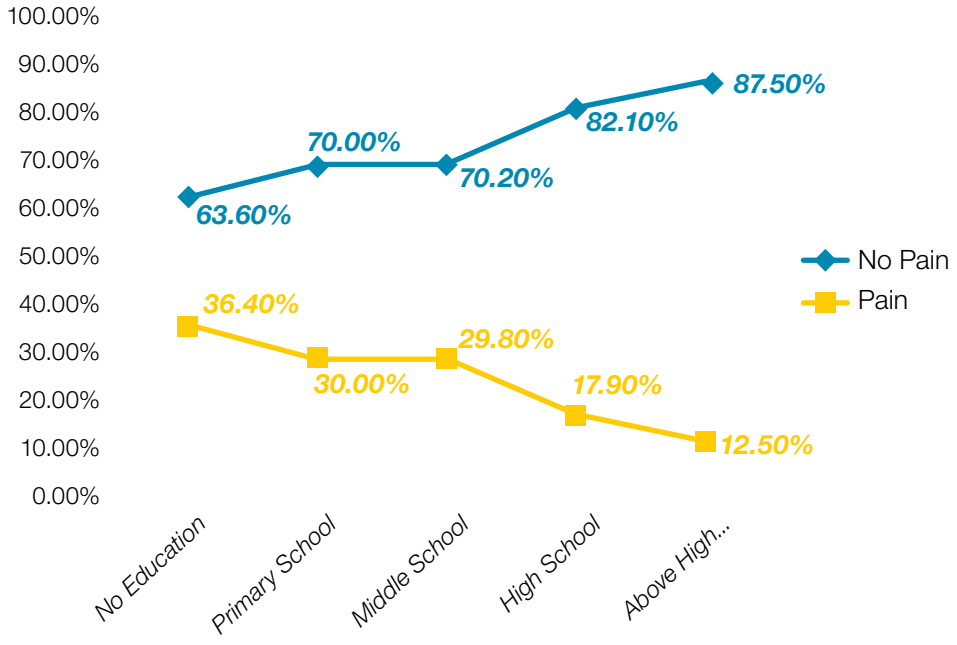
Pain Experience

The survey results showed that more than one quarter (27.4%) of the workers have active pain symptoms (in the past 24 hours). Most frequently reported pain spots are lower back (70 times, 36.5%), shoulder (33 times, 17.2%), and knees (19 times, 9.9%). A cross-tabulation between the pain experience and age group showed that in general, pain experience increases with age.

Similarly, pain experience has a negative association with education level. pain experience decreases as education level increase.



7 Pain Experience by Age Distribution



8 Pain Experience by Education Level Distribution

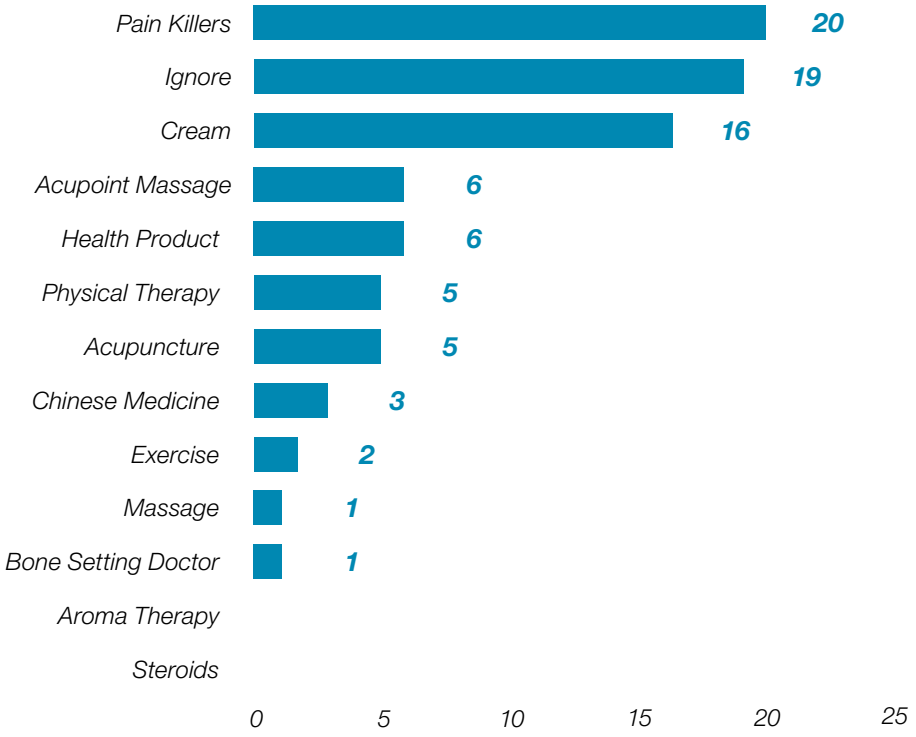
As for pain severity, the workers are asked to rate their pain symptoms in a 10-point scale for the severity of the worst pain, the slightest pain, the average pain and present pain. It can be seen that in general the pain symptoms are not severe.

Figure 10 shows the common treatment used by the workers to relieve their pain symptoms. Taking painkillers is the most used method. Many workers also ignored their pain symptoms. The use of relieving creams and liniments is the third most used method for pain treatment.

Negative impacts caused by the pain symptoms on the workers' daily living is also assessed. The workers were asked to rate whether their pain symptoms have affected their mood, walking ability, work, relationships, sleep and hobbies, on a 0-10 scale. The results are shown in Table 11. It can be seen that in general the pain experience did not affect much of the daily life of the workers.

	Mean	SD	Minimum	Maximum
Worst Pain	4.92	2.81	0	10
Slightest Pain	1.47	1.86	0	8
Average Pain	3.26	2.23	0	8
Present Pain	1.98	2.37	0	10

9 Pain Severity



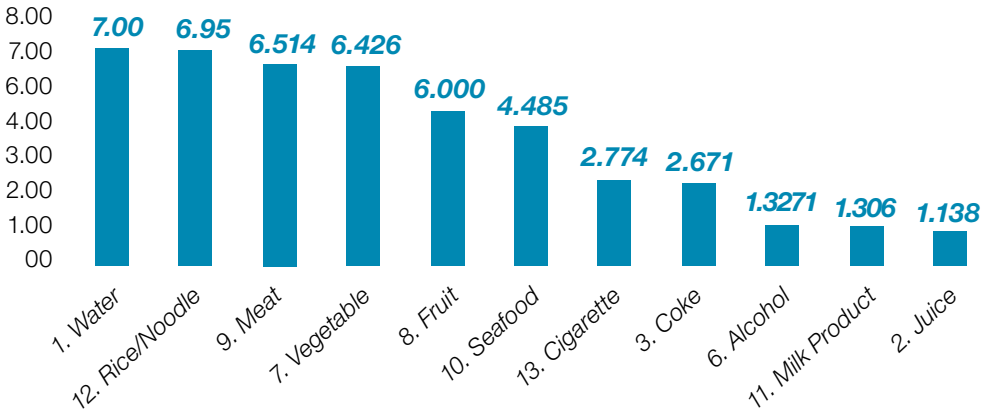
10 Pain Treatment Method Used by Workers

	Mean	SD	Minimum	Maximum
Affect Daily Life	2.6	2.77	0	10
Affect Mood	2.23	2.80	0	10
Affect Walking Ability	2.28	2.98	0	10
Affect Work	2.14	2.98	0	10
Affect Relationship	0.51	1.54	0	8
Affect Sleep	2.35	3.02	0	10
Affect Hobbies	1.46	2.69	0	10

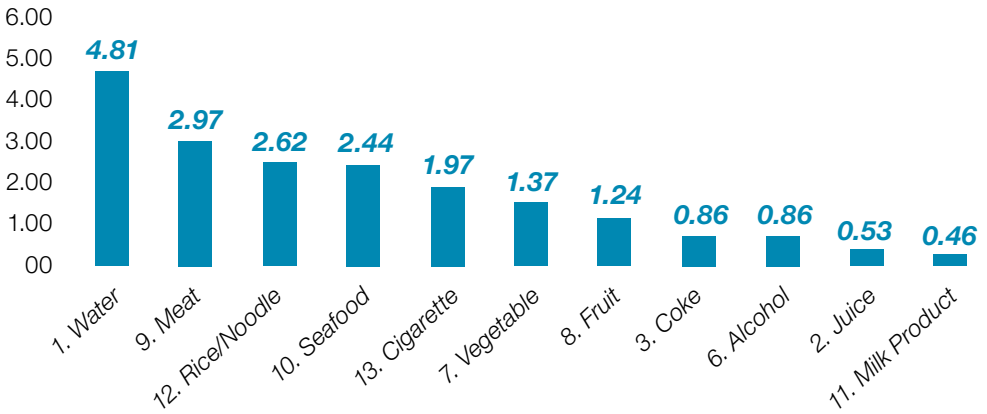
11 Pain Influence on Workers' Daily Living

Dietary Habits

The workers were also interviewed about their daily dietary habits. The amount and frequency of intake of water, juice, soft drinks, alcohol, vegetables, fruit, meat, fish, rice/noodle (carbohydrates), and dairy products were asked. Smoking habits were also assessed. Frequency of intake is measured on a weekly basis. The workers indicated how many days they consume a certain food. Quantity of intake is the amount of servings for one day, such as one bowl of rice/one glass of milk and etc. The results are shown in Figure 12 and 13. It can be seen that water, fruit, vegetables, meat and rice/noodle are frequently consumed by the workers. Water and meat intakes are sufficient; however, rice/noodle, fruit and vegetable intakes are less than the sufficient as recommended by dieticians. For fruit intake, only 17.8% of workers eat a sufficient amount (two or more servings) each day. For vegetable intake, only 8% of workers reach the sufficient amount (three or more servings) per day.



12 Mean Frequency of Food Consumption in a Week



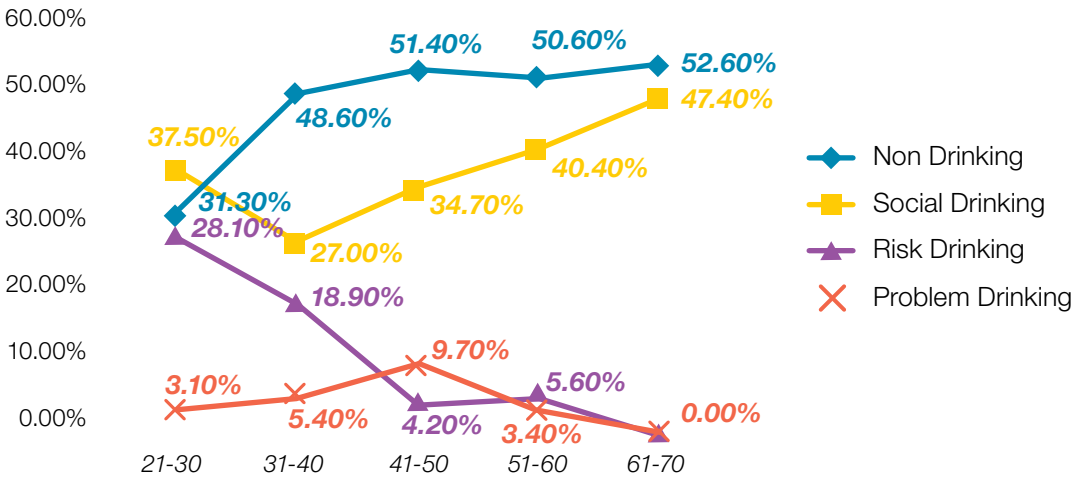
13 Mean Quantity of Food Consumption in a Day

Drinking habits were accessed according to the alcoholic treatment criteria by Tung Wah Hospitals (http://atp.tungwahcsd.org/basic.php), which states that the appropriate amount of alcohol intake is fewer than three servings per day and fewer than 15 servings per week for males and fewer than two servings per day and fewer than 10 servings per week for females. According to this criterion, 86% of the worker sample do not have any alcohol-related problem, while 49% do not drink any alcohol at all and 37% drink only socially. However, 9% of the sample exceeds the daily amount or the weekly amount of appropriate alcohol consumption, and another 5% of the sample exceeds both daily and weekly amount. In total, 14% of the sample has some problematic drinking behaviour.

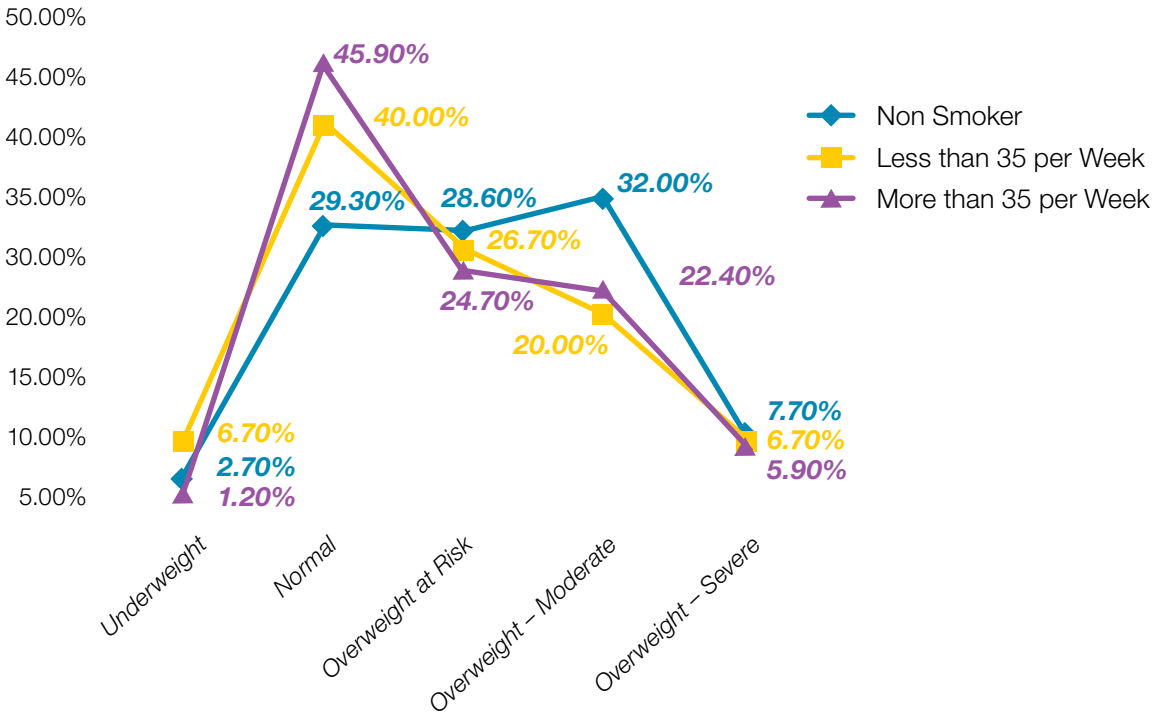
Moreover, drinking seems to decrease with age. Figure 14 shows the association between drinking behaviour and age group. It can be seen that as age increases, heavy drinking behaviour drops in percentage.

Smoking is reported by 41% of the workers, all of whom are male. Cross-tabulation between BMI and smoking behaviour found that smokers had a lower percentage of overweight percentage, although some other health hazards may result

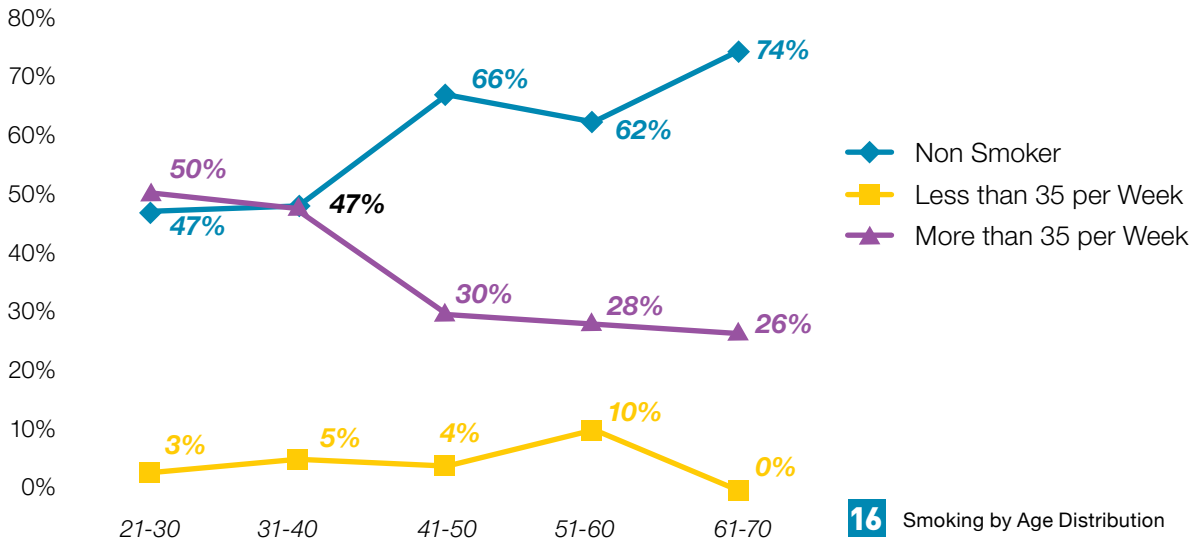
It is also found that the percentage of heavy smokers decreases as age increases (see Figure 16).



14 Drinking Behaviour by Age Distribution



15 Smoking by BMI Distribution



16 Smoking by Age Distribution

Exercise Habit

The workers were asked if they do any warm up or relaxation exercise before and after work. Results showed that less than half the workers (43.4%) do warm up exercise before work, most of which are organised by their company. However, very few workers (15.1%) do relaxation exercise after work.

It is hoped that as the project continues, larger sample sizes in the future will enable further analyses to examine the interfering effect of education, dietary and exercise habits on health outcomes such as BMI, blood pressure and cholesterol level. Also, with more substantive data on workers' pain experience, pain and exercise specialists can design exercises specifically targeted to relieve certain pain symptoms common among construction workers. The current findings serve as the first step towards these goals.

ACKNOWLEDGEMENT

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ALBERT CHAN

Prof. Albert CHAN is the Head of the Department of Building and Real Estate of the Hong Kong Polytechnic University. His research and teaching interests include project management and project success, construction procurement and relational contracting, construction management and economics, construction health and safety and construction industry development. Apart from teaching and research, Prof. Chan has been commissioned by a number of organisations to provide consultancy services in project management and construction health and safety. He has produced more than 600 publications in refereed journal papers, international refereed conference papers, consultancy reports and other outlets.

The research team includes Prof. Francis WONG, Dr. GUO Yueping and Dr. YI Wen from the Department of Building and Real Estate of Hong Kong Polytechnic University; Dr. TENG Yue, Prof. Joanne CHUNG, Prof. Daniel CHOW and Dr. Louisa CHUNG from the Department of Health and Physical Education of Hong Kong Institute of Education; Dr. Del WONG from Sports & Recreation Research Centre and Human Performance Laboratory of the Technological and Higher Education Institute of Hong Kong; Dr. Henry SO from the Department of Nursing and Health Sciences of Tung Wah College and Mr. Marcy CHOY from Ginger Knowledge Transfer and Consultancy Limited

香港建造業工人

醫療體檢先導計劃

初步調查結果

建造業工人醫療體檢先導計劃（PMES）是一項由香港建造業議會委託的研究項目，旨在分析建築工人的一般健康狀況，數據收集包括性別、年齡、工種、身體質量指數（Body Mass Index，簡稱BMI）、血壓、膽固醇水平、痛症、飲食以及運動方面的習慣。體檢先導計劃目標是為全港一萬名建築業工人提供基本的健康檢查。目前我們已收集了來自26個建築工地、529名工人的健康數據，並基於當前樣本獲得了一些初步的分析結果。研究發現，超過半數的工人（58.9%）體重超重。相對較少（27.4%）的工人有疼痛症狀，最常申報的痛點是腰（36.5%）、肩部（17.2%）和膝關節（9.9%）。根據飲食習慣的數據顯示，工人每天攝取的水和蛋白質數量足夠，但水果和蔬菜的攝入量不足。吸煙者均為男性（佔整個樣本的41.0%），並隨著樣本的年齡增加而減少。至於運動的習慣，只有不到一半的工人（43.4%）在開始工作前進行熱身活動；極少有工人（15.1%）在下班後進行放鬆/伸展運動。目前的調查結果為日後進一步分析了解教育、飲食和運動習慣對工人健康的干預作用打下了基礎。

簡介

醫療體檢先導計劃（PMES）是由香港建造業議會委託香港理工大學建築及房地產學系進行的一項研究項目。其目的在於透過收集性別、年齡、工種、BMI、血壓、膽固醇水平、痛症、飲食及運動習慣的數據，分析本地建築工人的一般健康狀況。體檢先導計劃的目標是為全港一萬名建築工人提供基本健康檢查。作為一個進行中的項目，本報告匯報了截至2015年1月的初步調查結果。

研究方法

本計劃的研究小組由醫務人員和研究人員組成。醫務人員負責測量工人的血壓，並採集他們的血液樣本進行化驗。研究人員量度工人的體重和身高，並進行面對面的訪談，了解工人的人口統計信息、痛症經歷、飲食和運動習慣等。研究小組於工人午休時間訪問各個工地，體檢均於工人午休時間進行，每名工人大約需要15分鐘完成整個程序。

樣本的人口統計信息

樣本工人大部分為男性（87.0%），處於40至60歲之間。女性僅佔樣本13%。整個樣本的平均年齡為46.31歲（SD=11.42歲）。年齡分布列於表1。該樣本的年齡分布類似於建造業議會公布的建築業工人註冊信息統計數據。

年齡段	人數	百分比
低於20歲	1	0.2%
20-29歲	59	14.5%
30-39歲	66	16.2%
40-49歲	100	24.6%
50-59歲	147	36.1%
大於60歲	34	8.4%

1 樣本的年齡分布

樣本的教育水平列於表2。大多數工人的教育程度為小學（23.6%）或中學（60.7%）。

教育水平	人數	百分比
無	18	4.4%
小學	96	23.6%
初中	144	35.4%
高中	103	25.3%
文憑	20	4.9%
副學士	8	2.0%
學士	17	4.2%
其他	1	0.2%

2 樣本的教育水平

樣本的種族分布列於表3。大部分工人是香港永久居民（89.9%），其餘為中國大陸居民（9.3%）或其他東南亞國籍人士（0.7%）。

種族	人數	百分比
香港	366	89.9%
中國大陸	38	9.3%
巴基斯坦	2	0.5%
尼泊爾	1	0.2%

3 樣本的種族

研究結果

BMI

身體質量指數（BMI）是根據體重指數=體重（公斤）/身高2（米2）的公式來計算的。樣本的平均BMI為24.14（SD=3.48）。BMI的分布列於表4。大多數工人（63%）屬於正常或輕度超重（BMI:18.5-24.9）。樣本的37%為中度或嚴重超重（BMI超過25）。

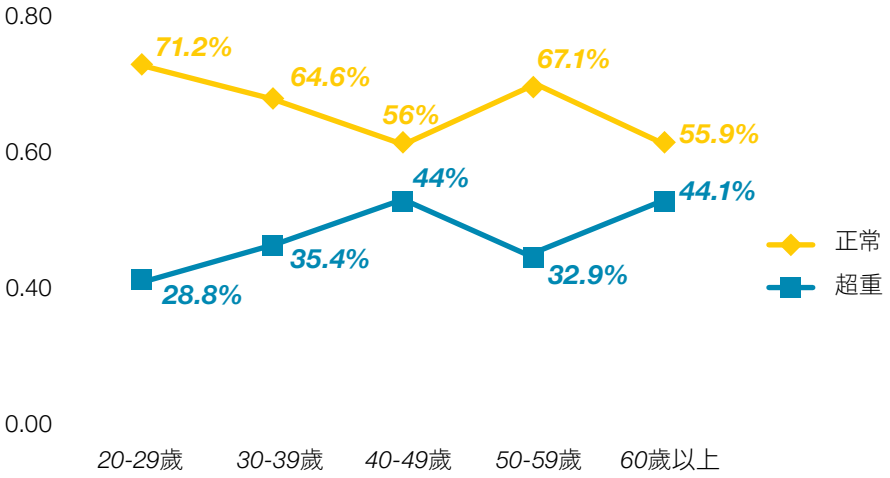
BMI範圍	人數	百分比
過輕（<18.5）	13	3.2%
正常（18.5-22.9）	152	37.8%
輕微超重（23.0-24.9）	90	22.4%
中度超重（25.0-29.9）	122	30.3%
嚴重超重（>30.0）	25	6.2%

4 樣本的BMI分布

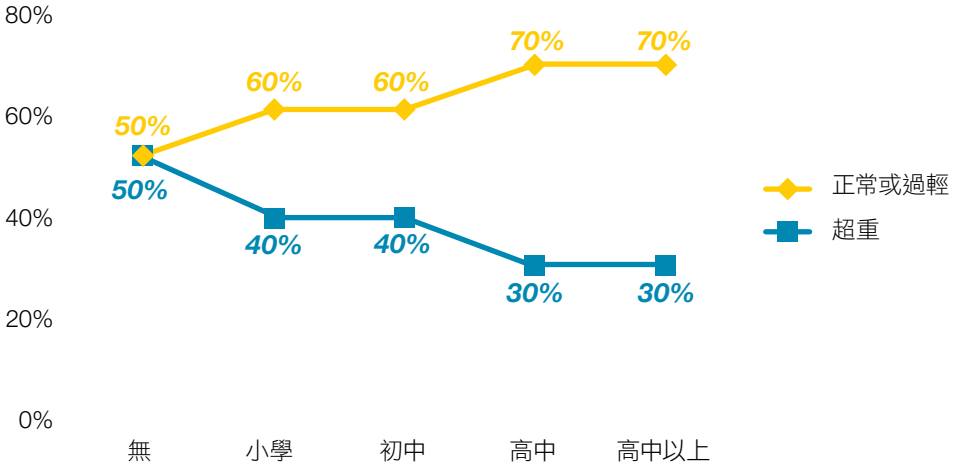
目前的調查結果為日後進一步分析了解教育、飲食和運動習慣對工人健康的干預作用打下了基礎。

BMI和年齡組（見圖5）之間的交叉分布顯示，隨著年齡的增長，體重超標的工人的比例也略有增加，40-49歲組和超過60歲組具有最高超重率（44%）。

相反，BMI和教育水平則呈負相關。如圖6所示，隨著教育水平的提高，超重工人的百分比略有下降。



5 BMI與年齡組的交叉分布

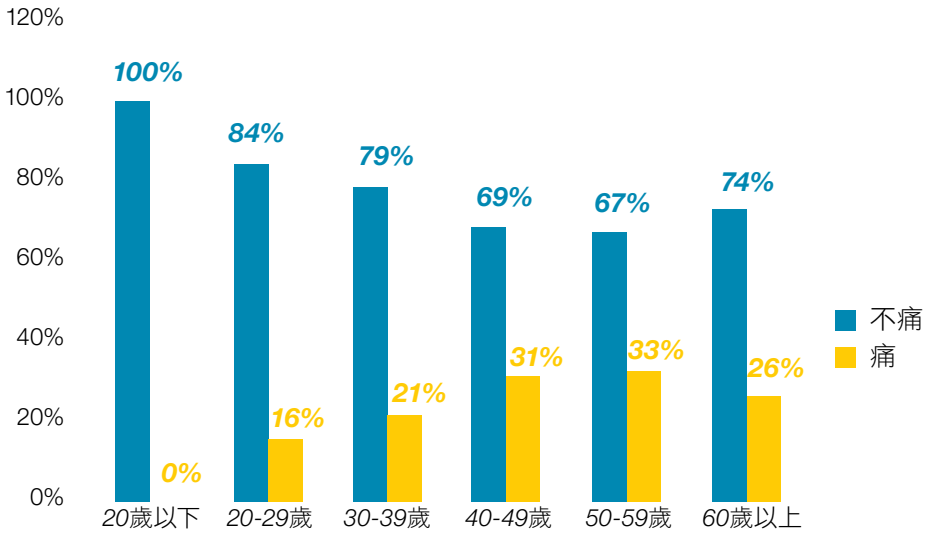


6 BMI與教育水平的交叉分布

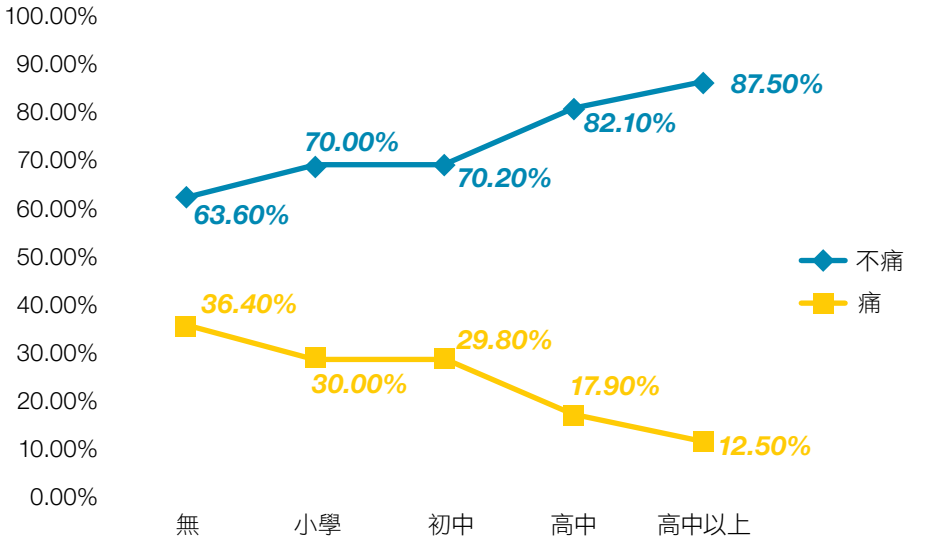
痛症體驗

本次調查結果顯示，超過四分之一（27.4%）工人有即時的疼痛症狀（在過去24小時內）。最常見的痛點是腰（腰背）（70倍，36.5%）、肩膀（33次，17.2%）和膝蓋（19次，9.9%）。痛症體驗和年齡組之間的交叉分布（參見圖7）顯示，在一般情況下，疼痛體驗隨著年齡增長而增加。

同樣地，痛症的體驗與教育程度呈負相關。如圖8所示，痛症體驗隨教育程度的增加而減少。



7 痛症與年齡組交叉分布



8 痛症與教育程度交叉分布

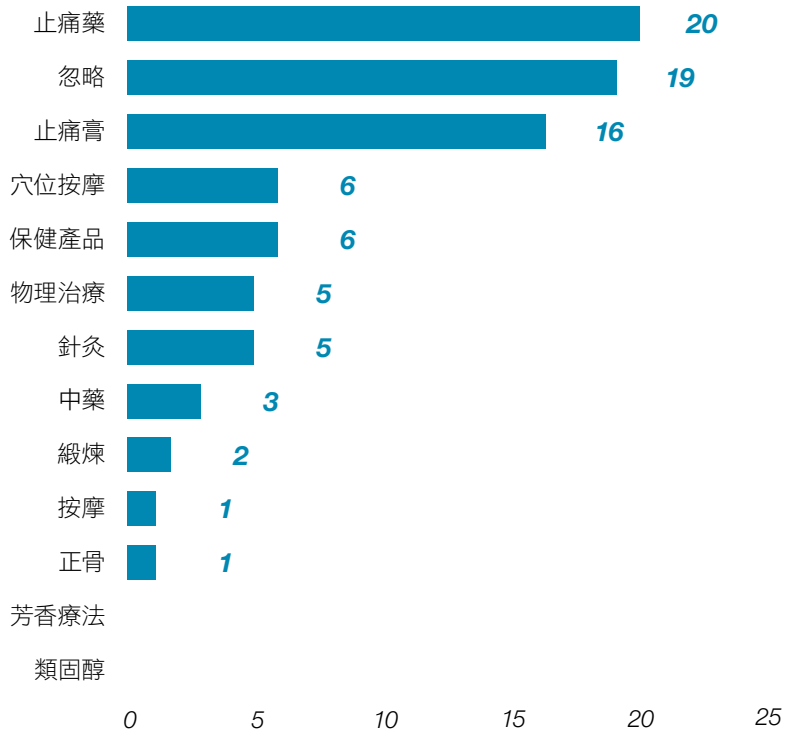
至於疼痛的嚴重程度，工人們在由0至10的刻度上評價自己痛症的嚴重程度。評價對象分別為最嚴重時的疼痛程度，最輕微時的疼痛程度，平均的疼痛程度和現時的疼痛程度，結果示於表9。從中可以看出，工人們的疼痛症狀一般並不嚴重。

圖10顯示了工人所使用的止痛方法。止痛藥是最常用的方法，許多工人亦選擇了忽略他們的痛症。止痛膏是第三常用的止痛方法。

我們對於疼痛症狀對工人日常生活造成的負面影響也進行了訪問。工人被要求對他們的疼痛症狀是否影響他們的情緒、行走能力、工作、人際關係、睡眠和愛好用0-10級的刻度進行評分。結果示於表11。從中可以看出，一般的疼痛體驗沒有對工人的日常生活造成嚴重影響。

	平均值	標準差	最小值	最大值
最嚴重時的疼痛程度	4.92	2.81	0	10
最輕微時的疼痛程度	1.47	1.86	0	8
平均的疼痛程度	3.26	2.23	0	8
現時的疼痛程度	1.98	2.37	0	10

9 疼痛的嚴重程度



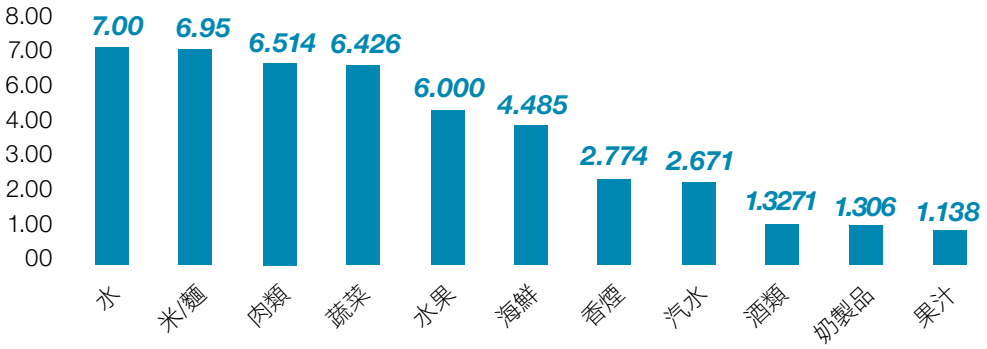
10 工人使用的止痛方法

	平均值	標準差	最小值	最大值
影響日常生活	2.6	2.77	0	10
影響情緒	2.23	2.80	0	10
影響行走能力	2.28	2.98	0	10
影響工作	2.14	2.98	0	10
影響人際關係	0.51	1.54	0	8
影響睡眠	2.35	3.02	0	10
影響愛好	1.46	2.69	0	10

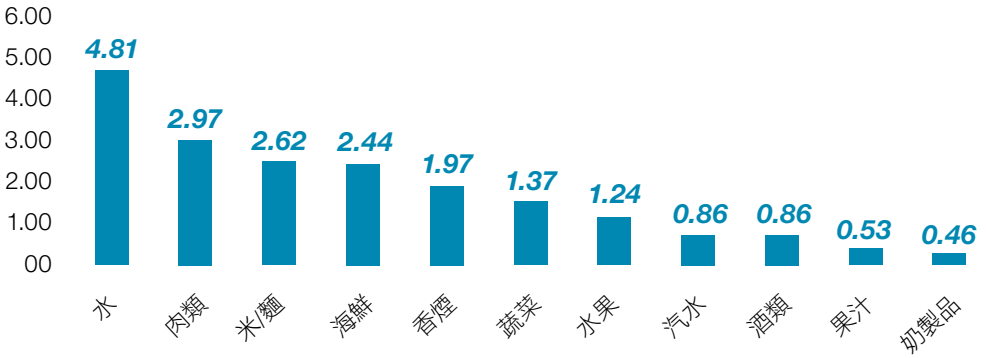
11 疼痛對工人日常生活的影響

飲食習慣

研究人員還訪問了工人日常的飲食習慣，詢問了他們日常對水、果汁、軟飲料、酒、蔬菜、水果、肉、魚、米/麵（碳水化合物），和乳製品的食用頻率及數量。我們對工人的吸煙習慣也進行了訪問。攝入頻率的計算以週為基礎。工人們表示他們一週有多少天會食用某種食物。攝取份量是以一天為單位，如每天一碗飯/一杯牛奶等。結果示於圖12和圖13。可以看出，水、水果、蔬菜、肉類和米/麵是工人經常食用的食物。水和肉類的攝入量是足夠的；然而，米/麵、水果和蔬菜的攝取量不足以達到營養師建議的數量。只有17.8%的工人每天攝入足夠的水果（2份或以上），至於蔬菜的攝入量，只有8%的工人達到每天足量（3份或更多）。



12 每週攝取各種食物的頻率



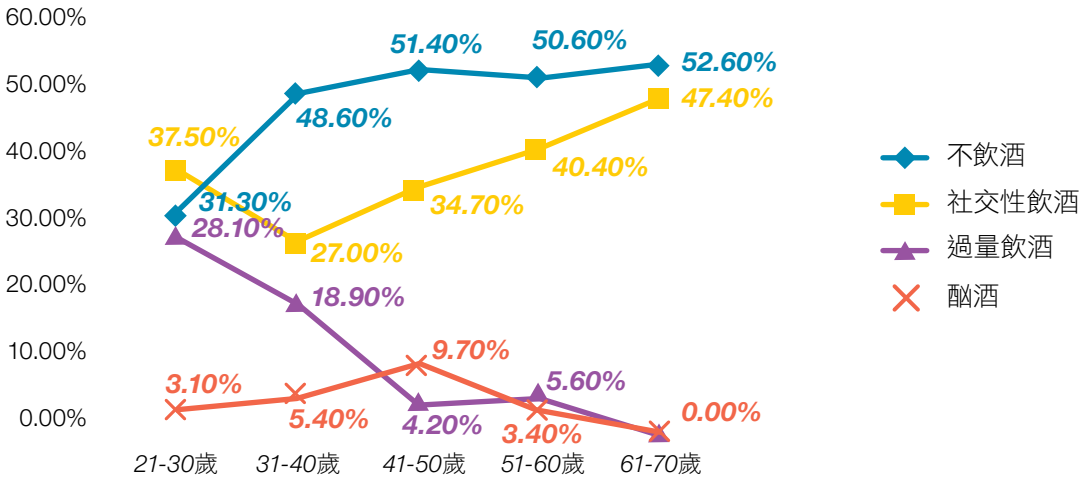
13 每日各種食品的平均攝入量

飲酒習慣是根據東華三院制定的戒酒治療標準（http://atp.tungwahcsd.org/basic.php）進行量度的。根據標準，男性每日酒精攝入量應小於3份，每週攝入量應小於15份，女性每日攝入量應小於2份，每週攝入量應少於10份。根據該標準，樣本中86%的工人沒有酒精相關的問題。其中49%的工人從不飲酒。另外37%的工人只是適量飲酒。然而，有9%的工人超過了每日或每週的適當飲酒量，另外有5%的工人兩者皆超過。總共有14%的工人有一定的問題飲酒行為。

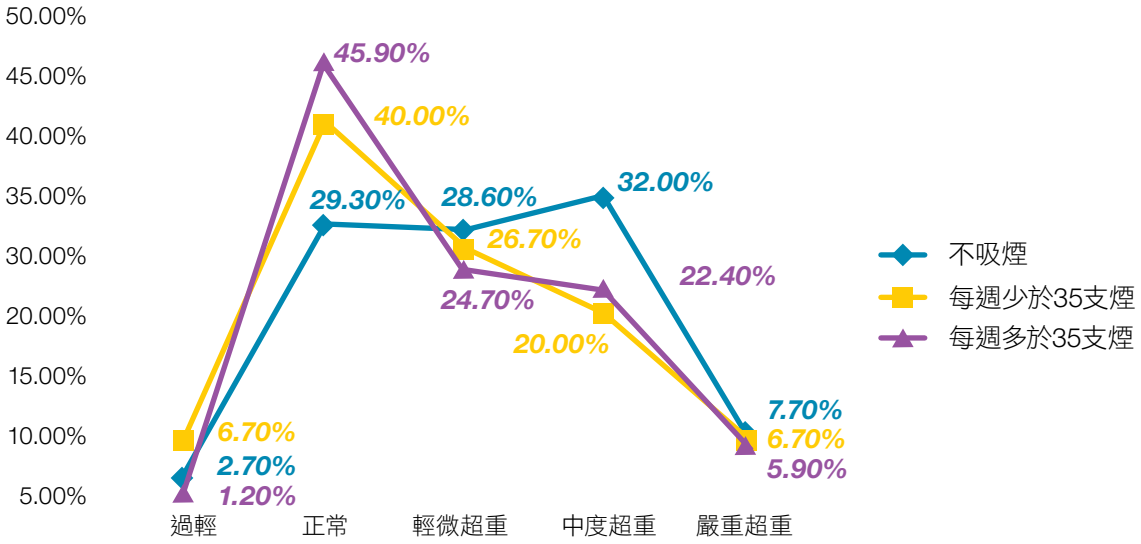
此外，飲酒行為似乎隨著年齡的增長而降低。圖14顯示出飲酒行為和年齡組之間的關聯。可以看出，隨著年齡的增長，有過量飲酒行為的百分比下降。

關於吸煙的統計結果顯示，有41%的工人吸煙，並全部為男性。BMI和吸煙行為之間的交叉列表顯示，吸煙者之中超重的百分比較低，然而吸煙可能帶來其它的健康危害（參見圖15）。

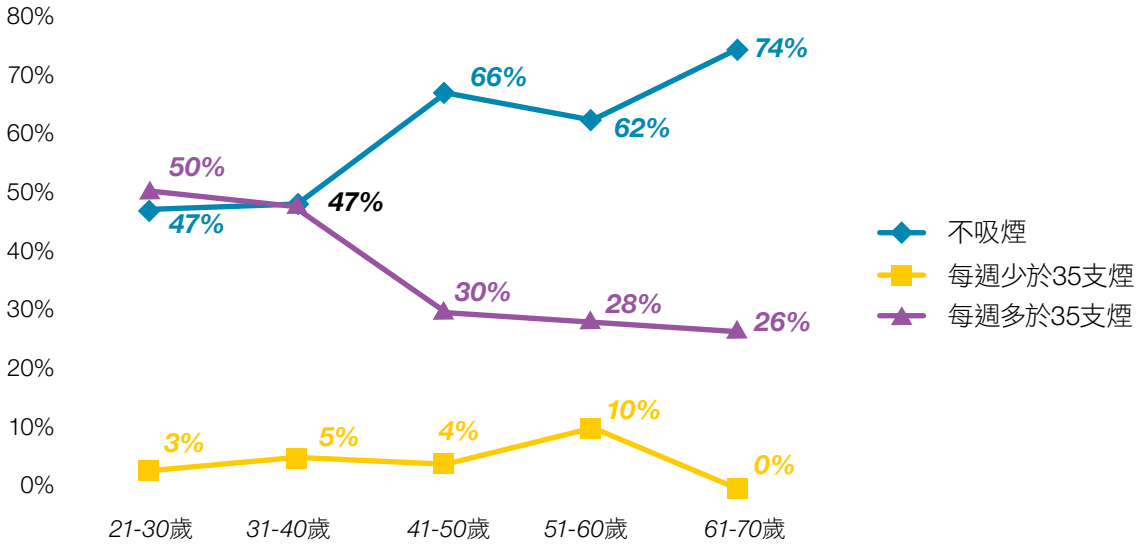
我們亦發現，重度吸煙者的百分比隨著年齡的增長有所降低（見圖16）。



14 飲酒行為與年齡組的交叉分布



15 吸煙與BMI的交叉分布



16 吸煙與年齡的交叉分布

運動習慣

受訪工人亦被詢問他們是否在工作前/後進行任何熱身/放鬆運動。結果顯示，只有不到一半的工人（43.4%）在工作前進行熱身運動，其中大部分是由公司組織的。然而，很少有工人（15.1%）在工作後進行放鬆運動。

感謝

本文所介紹的研究工作由香港建造業議會的贈款支持（參考號K-ZJJP）。本文是題為“建築工人醫療體檢先導計劃”的研究項目的一部分，該項目亦已/將會產生具有共同背景和研究方法的其他研究成果。我們亦感謝所有前線工人在此項研究中的參與。

我們希望隨著項目的繼續，未來將有更大的樣本量可以進行進一步的分析，研究教育、飲食和鍛煉習慣對健康結果（如體重指數、血壓和膽固醇水平）的影響。此外，關於工人痛症的充足數據使疼痛和運動專家能夠設計專門的練習項目，以減輕某些建築工人中普遍存在的疼痛症狀。當前的研究結果是實現這些目標的第一步。

陳炳泉

陳炳泉教授是香港理工大學建築及房地產學系系主任。他的研究和教學領域包括項目管理和項目成功、建設採購和承包關係、施工管理和經濟學、建設健康和安全，以及建築行業的發展。除了教學和研究，陳教授亦受一些組織委託在項目建設管理的健康和安全方面提供顧問服務。他在權威期刊、國際會議等發表了600多篇論文、顧問報告和其他書面作品。

是次研究團隊包括香港理工大學建築及房地產學系的黃君華教授、郭月萍博士及伊文博士；香港教育學院健康與體育學系的滕月博士、鍾慧儀教授、周鴻奇教授及鍾明恩博士、香港高等科技教育學院運動及康樂研究中心及人體表現實驗室的王培林博士、東華學院護理及健康科學學系的蘇賜福博士及轉型知識轉移及顧問有限公司的蔡明德先生。

MESSAGE FROM CHAIRMAN OF COMMITTEE ON ENVIRONMENT, INNOVATION AND TECHNOLOGY

As stated in my previous message back in the May issue of *Aedifice* last year, the Committee of Environment, Innovation and Technology have organised a programme of events in 2014 – the Year of BIM; and I am now pleased to share with you certain developments of significance that have happened in the second half of the year.

In August 2014, our CIC representatives went to Beijing to attend the Joint APEC-ASEAN Workshop on Utilising Building Information Modelling to Increase Building Performance. At the workshop, our secretariat staff, Mr. Ivan KO, presented the *Roadmap for Building Information Modelling Strategic Implementation in Hong Kong's Construction Industry* in which he highlighted CIC's initiatives scheduled for the next two years.

One of the highlights of the year occurred in September when three major client sectors came together in a collaborative workshop to share valuable opinions on the "Development of BIM Implementation Strategies". This was followed in October by representatives attending the Second Government Symposium Expo in Singapore. Our BIM Working Group Chairperson, Ms. Ada FUNG, presented the upcoming initiatives in BIM implementation in the Hong Kong construction industry to overseas delegates.

Participation of the public has been encouraged through the CIC website. For example, the draft of the BIM Standards Volume 1 – Project Execution Plan has been uploaded by our Task Group to obtain views from different sectors of our society.

To start 2015 with a strong impetus, we will be holding one of the key activities of the year, the CIC BIM Excellence Awards, to raise the awareness of BIM and recognise the outstanding achievements of the pioneer practitioners in our industry.

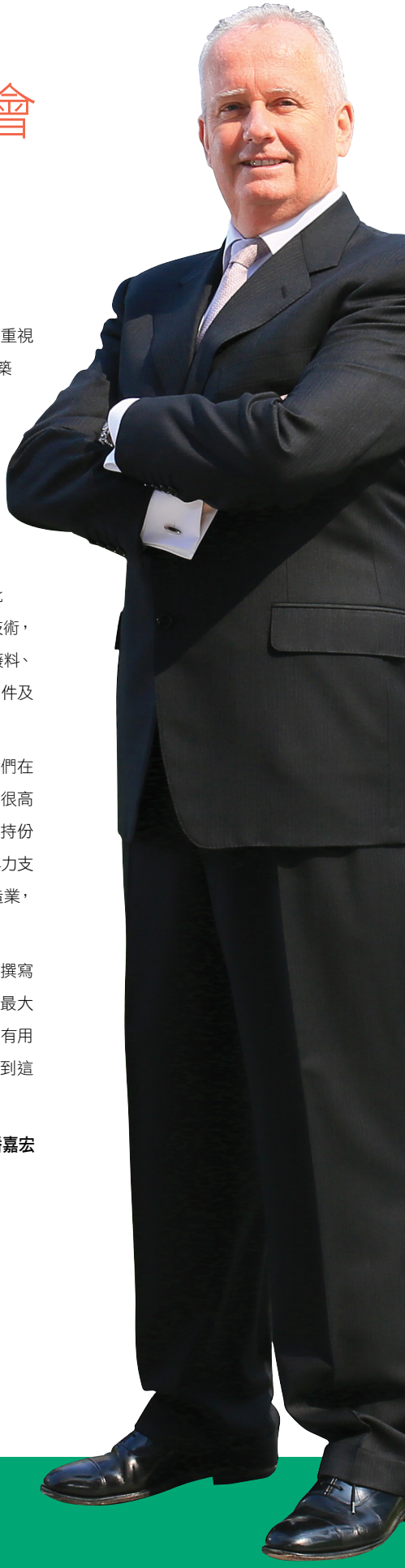
Apart from BIM, I would also like to assure you that we have continued to support research into the industry's long pursuit of more environmentally friendly building materials as alternatives to river sand. Our Task Force has been researching a number of potential substitutes for river sand, studying recycling from waste glass and old concrete and developing a local construction standard on aggregates for mortar with reference to the existing international standards. We have posted each study on the CIC website and will continue to update the progress of them for the public's information and comment. In addition we continue to support initiatives on a range of issues including the application of RFID in construction waste monitoring and exploring the feasibility of wider application of prefabrication and modularisation in the local construction industry.

In summary, 2014 has been a busy year whereby many initiatives have been carried forward. I am delighted to see we are making progress towards our mission of striving for excellence in our industry, which has only been achieved through the generous involvement of our stakeholders. I look forward to the continued enthusiastic support and collaboration from our stakeholders in the years ahead as we drive towards a successful and sustainable construction industry that is an internationally recognised asset of Hong Kong.

Last but not least, I would like to thank our secretariat staff, Ms. Stella WONG, whose article on "Contract types that bring most value to construction projects through BIM" is in this issue of *Aedifice* and we hope it is seen as a useful source of information about the industry.

Kevin POOLE

環境、創新及技術專責委員會主席的話



正如我於去年5月出版的《築目》中提到，環境、創新及技術專責委員會為2014建築信息模擬（BIM）年籌劃了一系列活動。很榮幸在此與各位分享下半年的各項進展。

去年8月，議會代表前往北京參加亞太經合組織與東盟合辦的研討會，主題為「應用BIM以提升建築效能」。在研討會上，議會秘書處的高振漢先生發表了《香港建造業策略性推行建築信息模擬路線圖》，談及議會計劃於未來兩年推出的相關措施。

去年另一項重點活動是於9月舉行的協作研討會。三大界別的業主聚首一堂，就「BIM的實施策略發展」分享寶貴意見。我們接着在10月參加了於新加坡舉行的第二屆國際政府研討會，議會實施建築信息模擬路線圖工作小組主席馮宜萱女士，向各國代表展示了即將於香港建造業推行的一些BIM措施。

我們鼓勵公眾透過議會網站積極參與討論。我們的工作小組已將《建築信息模擬標準第一卷——項目執行計劃》初稿上載至議會網頁，以徵求社會各界人士的意見。

而作為2015年的重點活動之一，議會將頒發卓越建築信息模擬獎，讓業界對BIM有更深認識，並表揚業內先驅的傑出貢獻。

除BIM之外，我們還致力應對業界一直重視的環保問題，繼續尋找取代河砂的建築材料。我們的專責小組已就此進行了一系列的調查，研究如何循環使用廢玻璃、舊混凝土，並以現有國際標準為依據，完善有關於砂漿骨料的本地建造標準。我們已將相關研究上載至議會網頁，並將持續更新，供公眾參考和提出建議。除此之外，我們還積極研發不同方面的新技術，例如研究應用射頻識別技術監測建築廢料、探索於本地建造業更廣泛地使用預製件及模組技術的可能。

總體說來，在2014這忙碌的一年內，我們在許多方面的工作均取得可喜的進展。我很高興見到業界繼續精益求精，亦感謝各位持份者的積極參與。我期待大家未來繼續鼎力支持並攜手為香港締造可持續發展的建造業，傲視同儕。

最後，感謝秘書處的王素兒女士為我們撰寫了「透過建築信息模擬為工程項目帶來最大價值的合同類型」，為業界提供了極為有用的資訊，各位可在今期的《築目》中讀到這篇文章。

潘嘉宏

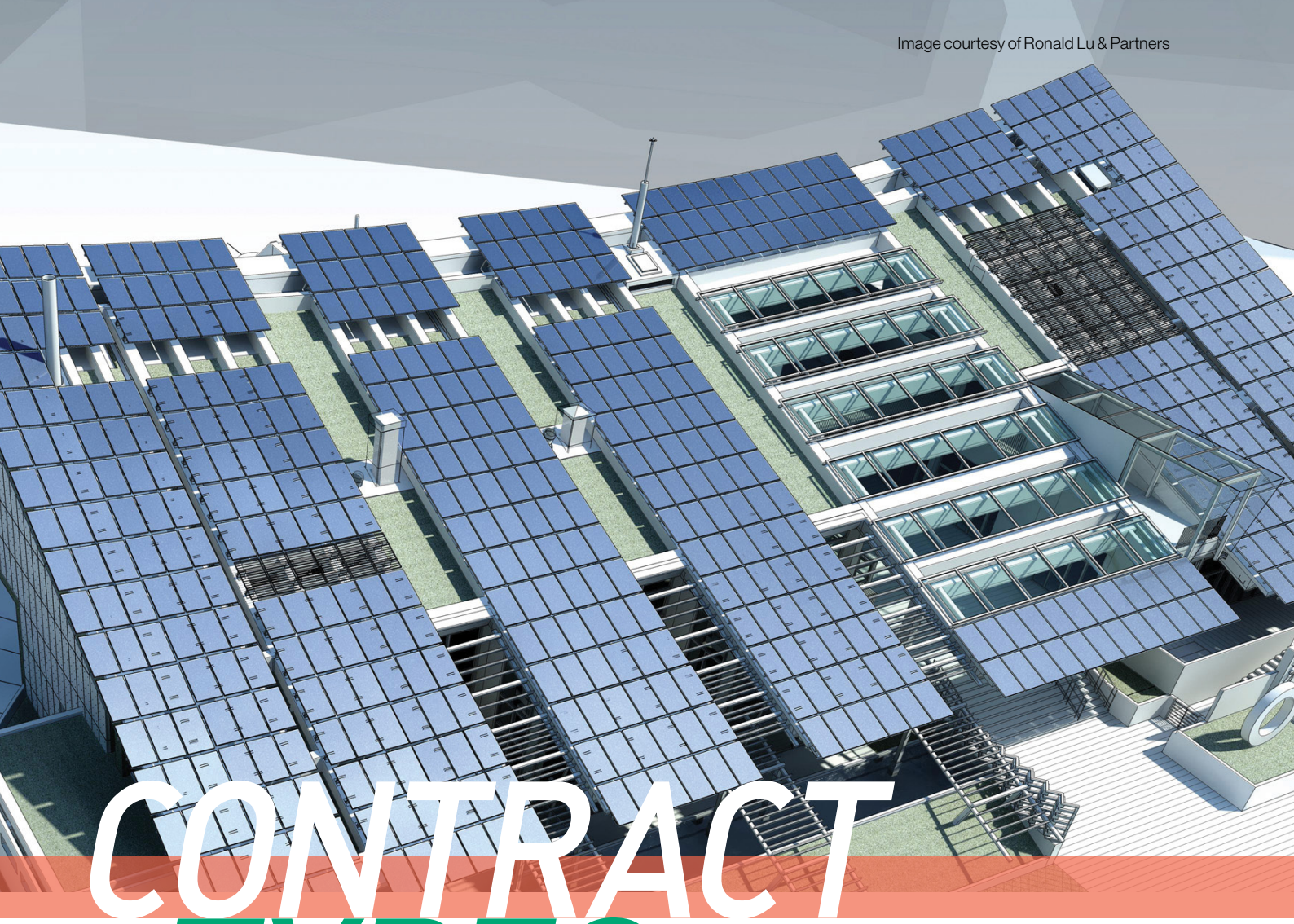


Image courtesy of Ronald Lu & Partners

CONTRACT TYPES THAT BRING MOST VALUE TO CONSTRUCTION PROJECTS THROUGH BIM

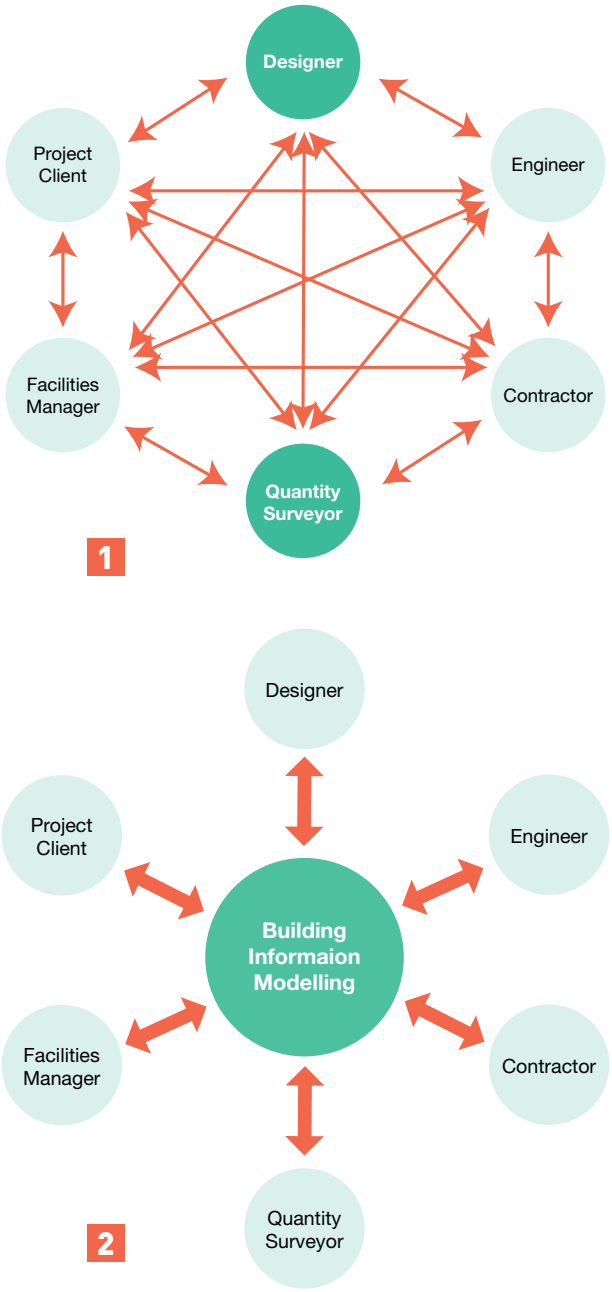
Building Information Modelling (BIM), which provides many capabilities in project management, has recently been a hotly discussed issue in the construction industry. From the practical experience of early adopters, it is realised that we need to change our current workflow to obtain the maximum benefits from BIM. The project delivery method or contract type under which a project is managed defines the workflow and constitutes an important factor to the success of BIM adoption. This paper will study the limitations of applying BIM to traditional project delivery methods; other new contract types available in the market; and how they can bring further value to BIM implementation with examples. The impact and potential risk they bring to the market by changing the role and involvement of different stakeholders will also be investigated.

INTRODUCTION

Construction project management has been a challenging topic all over the world. The industry needs to cope with rising labour and material costs, unforeseeable conditions, tight construction schedules, aging infrastructure, increasingly stringent regulatory requirements and higher customer expectations. It is even more challenging in the urban areas with growing population and congested space. In recent years, the introduction of building information modelling (BIM) provides a good solution and has been favored by many professionals in the industry.[1]

BIM is not simply a 3D drawing tool but a new way to holistically manage information relating to a construction project throughout its entire life cycle. It allows other useful information (e.g. design specification, material properties, construction cost, date of installation and maintenance history) to be integrated in the model and acts as a centralised communication platform between various parties for better collaboration, decision-making support, and problem solving. With the proven success of early adopters, the use of BIM is becoming more popular in construction projects. Examples of application include clash detection, work sequence simulation, financial control, asset management, and other areas.[1, 2]

Emphasising strongly on collaboration, BIM can also be seen as a new working process because it changes the way information is communicated through the idea of an integrated approach.[3] The contract type or project delivery method selected to manage a project defines the workflow of project management. There is close correlation between the two and implementing BIM in a suitable workflow can reap more of its benefits. In order to maximise return on investment in BIM adoption, there has been a lot of debate on what is the best workflow for BIM to yield the most value out of it. Some suggest early involvement of the contractor and facility management to advise on constructability and selection of equipment for BIM coordination through the use of Design and Build (DB) Contract. Others promote the shared risk and award concept with the introduction of New Engineering Contract (NEC) and Integrated Project Delivery (IPD) Contract.



Comparison of information exchange methods
1 Traditional Information Exchange
2 BIM Information Exchange

BIM's value cannot be fully realised in a project without implementing it under a proper workflow or procedure driven by an appropriate project delivery method.

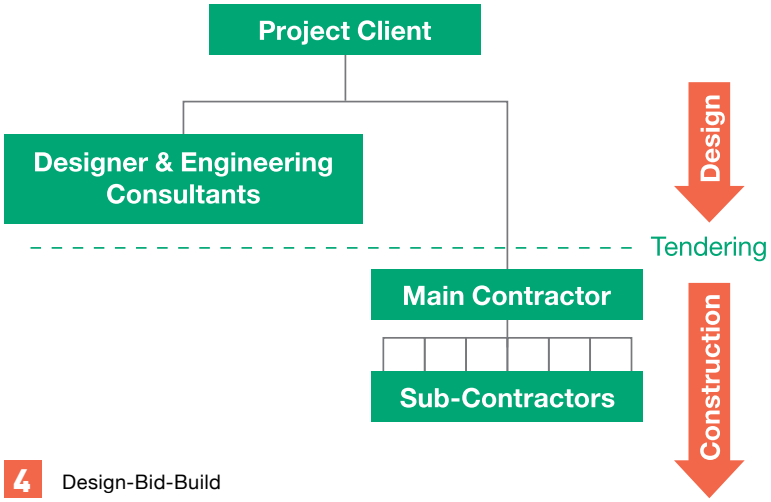
TRADITIONAL PROJECT DELIVERY METHOD (DESIGN-BID-BUILD)

When a project client wants to start a construction project, it is important to consider its delivery method. Various types are available depending on the project nature, the client's needs, and the willingness to take risks. But traditionally, the Design-Bid-Build (DBB) process is commonly adopted. The chart below shows the approximate percentages of delivery methods used in the United States market.

Under the DBB structure, a team of designer and engineering consultants is hired to formulate the design. Then the project will go through a competitive tendering stage for various main contractors who have expressed interest to bid. The one with the best pricing offer and technical proposal will be awarded the contract to carry out the construction work with sub-contractors (if applicable).

Design-Bid-Build (DBB)	60%
Construction Management at Risk (CMAR)	25%
Design-and-Build (DB)	15%
Integrated Project Delivery (IPD)	<1%

3 The percentage of different project delivery methods used in the US market in 2012.[4]



4 Design-Bid-Build

Although DBB is the most commonly employed contract type in public works in the United States, one main disadvantage of this project delivery method is that the designers and engineering consultants sometimes cannot incorporate construction methods and facilities details into their design. They need the input from the main contractor and/or sub-contractor to finalise design details with them. As a result, design problems may still exist during project execution. It exposes the project client to the risks of construction programme delay and budget overrun caused by varying orders.[4, 5]

Even with the use of BIM, this situation cannot be fully eliminated due to the limitation of this procurement structure. Many project clients in Hong Kong are now starting to apply BIM in their projects. They require contractors to carry out the clash detection responsibility with BIM, either by handing over a design BIM model to contractors for development into a construction model or by asking contractors to build an integrated BIM model with sub-contractors (if applicable) from a set of 2D drawings based on some specific standards.[6] In a mega scale transport project in Hong Kong, the contractor is required to report potential problems identified in BIM such that claim opportunities can be secured.[7, 8] However, project delay and budget overrun due to design error come up from time to time.[9] Quite a few stakeholders in the Hong Kong's construction industry believe that such practice should be changed as it is most useful to carry out clash detection during the design phase rather than passing the problem to the main contractor to resolve.

DESIGN AND BUILD

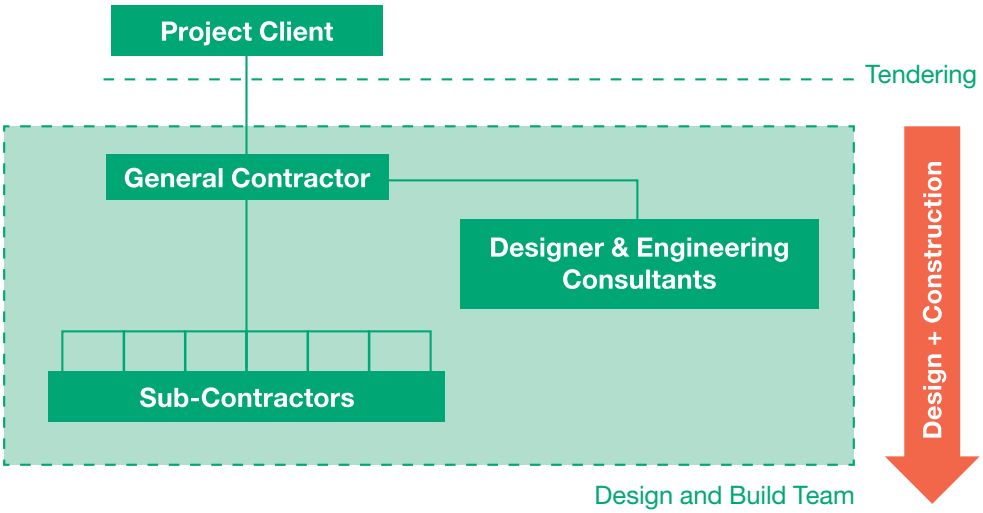
In view of the shortcomings of the traditional DBB method, there have been some thoughts of hiring a pre-construction adviser to carry out BIM coordination and provide input in the design as in the successful cases of the residential building, Opus, and the commercial building, One Island East, in Hong Kong.[10] However, some may worry that such practice could affect price competition and fairness in the tendering process.

More recently, an alternative arrangement known as Design and Build Contract is being considered to allow the contractor to work with the designer at an early stage on the construability issue using BIM without compromising the above concerns.[11]

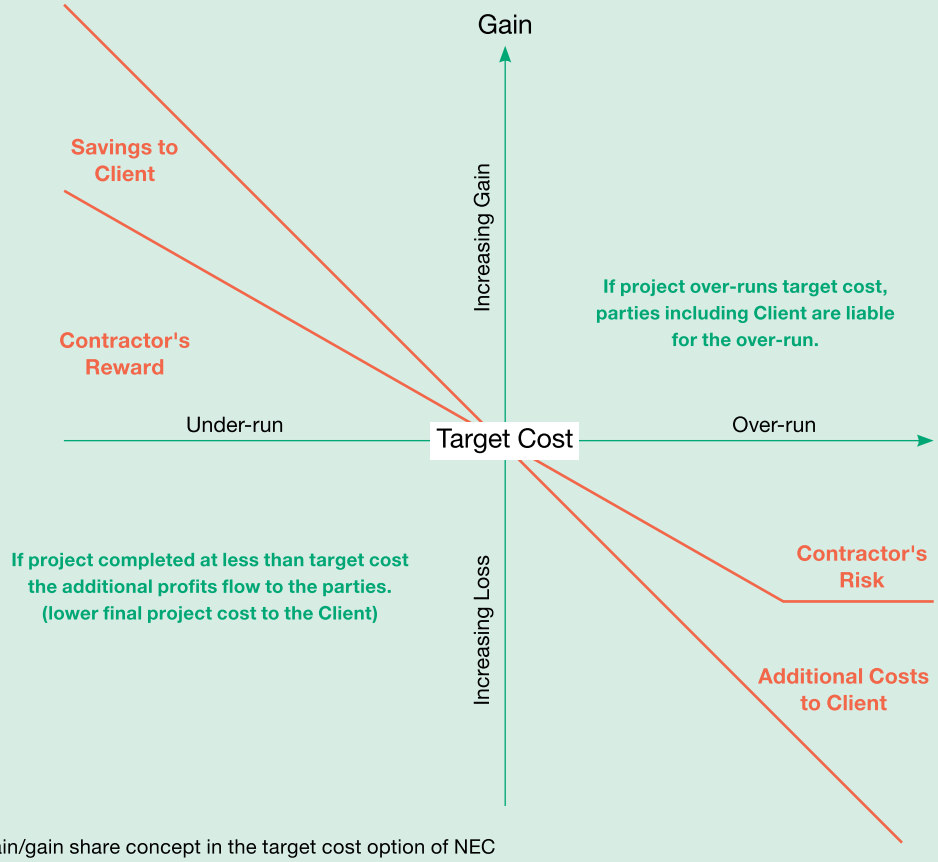
The DB procurement method works by appointing a general contractor to coordinate both design and construction work under a single contract. The project client only needs to engage a single entity for project management in this simple structure. Budget control of the project can be achieved by establishing a Guaranteed Maximum Pricing agreement if preferred.[4, 5] This procurement procedure does not only encourage the use of BIM in the early stage but also facilitates multiple disciplines to coordinate more closely through BIM.

The Hong Kong Housing Authority's Integrated Procurement Approach (IPA) is a build-on of this concept. They leverage the concept to fit their long-term development strategy by including the innovation element in the tender submission requirement. Tenders are not only evaluated based on pricing and technical proposals but also on the application of innovative technology. It allows tenderers to deploy their creativity in construction so that better value and higher quality products can be delivered with improved productivity. This new IPA practice embraces the key benefits promoted by BIM and was successfully launched in the Public Residential Housing Development at the Anderson Road Sites A & B in 2012/2013 along with BIM.[12]

A drawback of this procurement structure is that the project client has less influence on the selection of designer and it may not be preferable when a unique design feature is required. Also, the general contractor will have to bear a higher risk than the traditional project delivery method and this may be reflected on the price.[4, 5]



5 Design and Build



6 The pain/gain share concept in the target cost option of NEC

NEW ENGINEERING CONTRACT

Another commonly discussed procurement method that can function well with BIM is NEC. NEC is an umbrella of contract forms developed and implemented in the United Kingdom by the Institution of Civil Engineers since 1993. Similar to BIM's spirit, it promotes the principles of collaboration, mutual trust, and partnership between various parties involved in a project.

In NEC, there is a risk-reduction mechanism to require the contractor to report potential risks proactively throughout the construction process before any compensation event (i.e. claims) is possible. The project client also has the responsibility to conduct risk reduction meeting to solve these problems in a timely manner to reduce any cost and time implication so that the need to handle disputes at the final account process is minimised.

Besides, there is an option of target cost to stipulate the pain/gain share spirit by establishing an open book account practice in which all contract payments are based on actual costs. Any saving or budget overrun beyond the target would be shared among all parties on a pre-defined ratio. This sharing of information practice merges well with BIM's centralised database feature.[13, 14]

NEC is currently promoted by the Development Bureau in Hong Kong and has been successfully adopted by the Drainage Services Department in the improvement project of Fuk Man Road Nullah in Sai Kung with a cost saving of 5% achieved and project duration shortened by 6 months.[15] A drawback of NEC is that large amount of resources is required in the risk-reduction process. The concepts it introduces are still quite new in the local industry and so it is not commonly adopted in Hong Kong yet. However, with the aid of BIM, efficiency of problem solving can be improved to ease out some of the workload. A guide on how to use BIM with NEC3 contracts was published in the UK in 2013 to facilitate the implementation of BIM in project management.[16]

INTEGRATED PROJECT DELIVERY

Similar to NEC, Integrated Project Delivery is another contract type developed in the United States that supports the same set of collaboration principles through the integration of people, systems, business structures and practices. It encourages the involvement of talents and insights of all key participants, not just the prime players in the upper stream but also those in the lower stream such as subcontractors, equipment suppliers and facilities operators right from the conceptualisation stage.

A number of publications show that BIM can fit well in the IPD structure. With the combined features of NEC and DB contract, both the advantages of collaboration and early involvement of key players can be realised in IPD by implementing BIM appropriately with it. Benefits of the adoption of BIM do not just stay in the levels of design and clash detection but could be further extended to operations and asset management under IPD.[17, 18, 19]

When managing a project with IPD, more time and effort may be spent in BIM coordination at the early stage striving for better design but these extra resources can be offset at the construction stage during which there would be fewer onsite problems to interrupt the construction program as a result of better planning. Innovative design and construction methods could be better generated when a pool of experts with different knowledge are working closely together. Some successful examples of the application of IPD with BIM are the construction of the California Pacific Medical Center on the Cathedral Hill site in San Francisco, the interior renovation of Autodesk AEC Headquarters in Massachusetts, and the St. Clare Health Center in suburban St. Louis.[20, 21, 22]

BIM's value cannot be fully realised in a project without implementing it under a proper workflow or procedure driven by an appropriate project delivery method. There is a need for the industry to further think of possible opportunities to gain maximum benefits from BIM.

The development and promotion of various new contract types in different countries (such as IPA, IPD, or NEC) may imply that there is a growing demand for the following in project management across the value chain of construction industry:

- ***Early involvement of key parties including main contractors, facilities managers, etc.***
- ***Collaborative and sharing approach***

These two components play important roles in BIM implementation and are vital in achieving breakthroughs in our current status.

An appropriate selection of project delivery method does not simply increase the chance of success of a project but also enhances productivity through the use of innovative technology built on a set of integrated information that BIM emphasises.

STELLA WONG

Ms. Stella WONG is a Senior Officer in the Hong Kong CIC. She was working in a major contractor in Hong Kong on various BIM projects and is now responsible for assisting the Working Group on Roadmap for BIM Implementation and Task Group on Establishing of Industry Standard for BIM Implementation established under the Committee on Environment, Innovation, and Technology of the CIC to:

- **set out the *Roadmap for BIM Strategic Implementation in Hong Kong's Construction Industry*;**
- **prepare BIM Standards for the Hong Kong Construction Industry; and**
- **carry out BIM promotional activities.**

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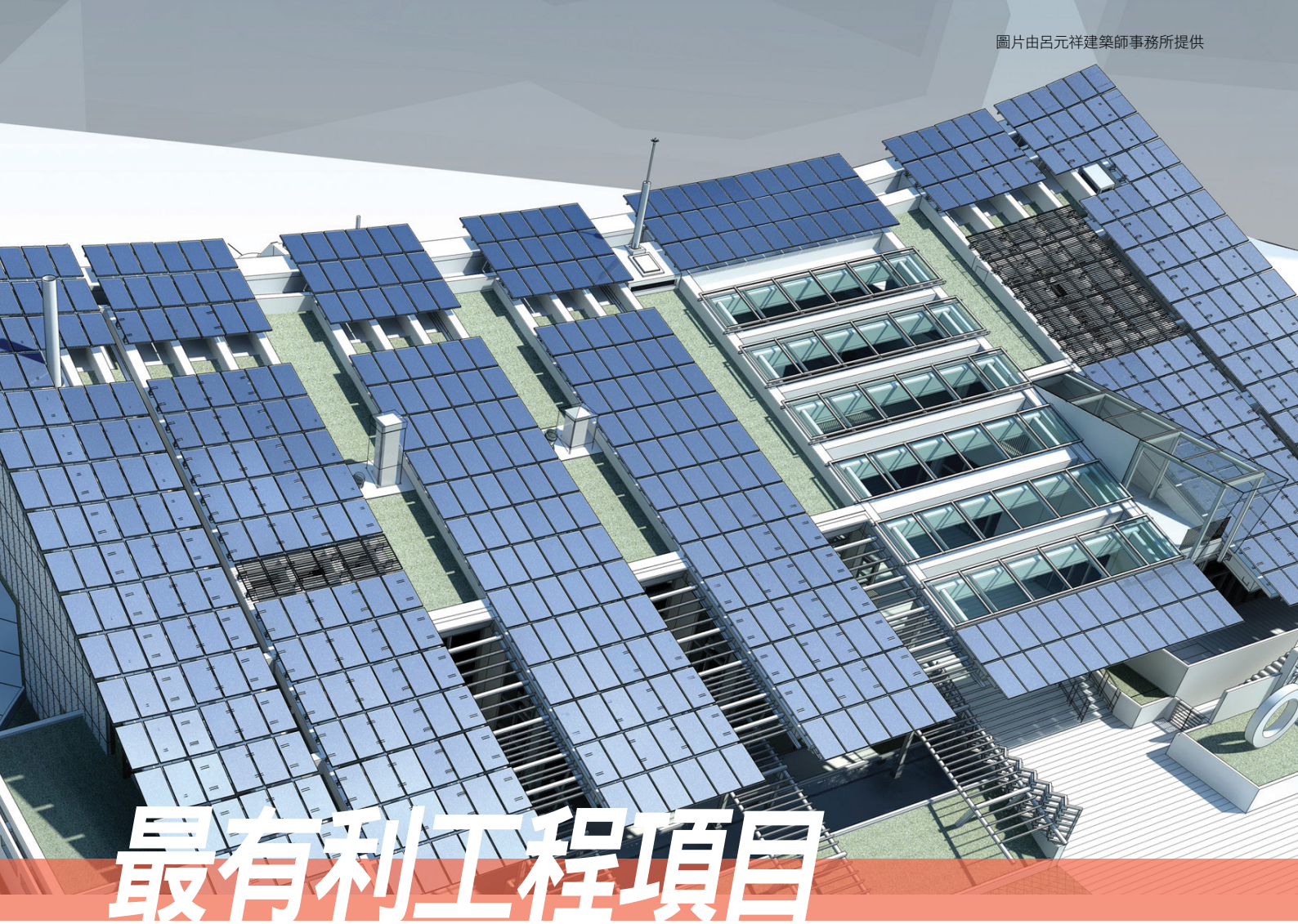


最有利工程項目

應用建築信息模擬的

合同類型

為項目管理提供多重功能的建築信息模擬(BIM),最近在建造業內成為熱門話題。從前期實踐經驗來看,我們需要改變現有工作流程,方能最利便BIM的發揮。具體說來,項目的交付方式與合同類型決定了工作流程,並成為能否成功應用BIM的關鍵因素。本文研究的內容包括:在傳統交付方式中採用BIM的局限性;市場上的其他新式合同類型;舉例說明這些新式合同類型如何幫助BIM發揮作用;同時亦探討持份者的角色及參與方式改變可能會為市場帶來的影響和潛在風險。

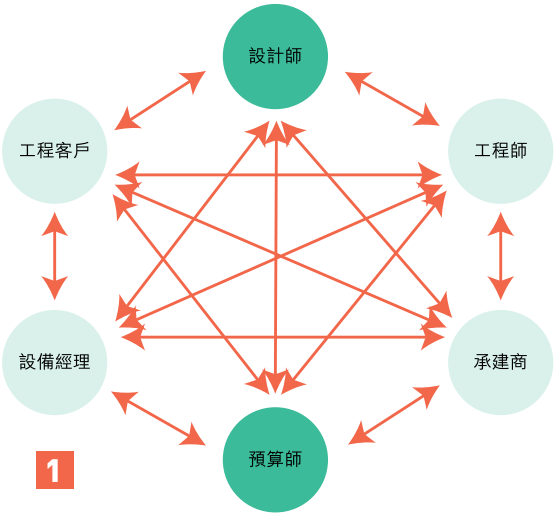
若項目未有採用合適的交付方式配合適當的工作流程或程序,BIM的功能就難以全面發揮。

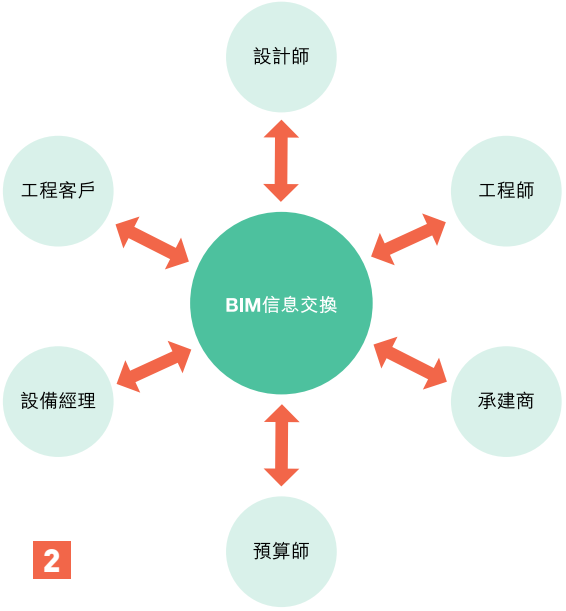
引言

工程項目管理在全世界均極具挑戰性。業界需要面對很多問題，諸如人力、物料成本不斷上升、難以預期且不可控制的外在因素、施工進度緊迫，基礎設施老化，監管制度要求日趨嚴格等，而且客戶的期望亦不斷提升。由於人口不斷增長與空間擁擠，在城市裡施工越趨困難。近年來，引入BIM為這些問題提供了更好的解決方案，並廣受業內人士青睞。

BIM不僅是一套三維繪圖工具，更是一套新型的全方位信息管理方式，這些信息與項目的整個生命周期息息相關。BIM能整合其他有用信息，例如設計規格、材料屬性、建築成本、安裝日期及維修紀錄等，並作為不同組織間實現更好協作、決策支持以及解決問題的中央交流平台。有了早期採用者的成功佐證，在建造項目採用BIM已漸趨普遍，並應用於諸如偵測衝突、工作序列模擬、財務控制、資產管理等不同範疇。

BIM強調協作，而由於它透過具整合性的設計方案改變了信息交流的方式，因此也是一種新的工作流程。合同類型或交付方式，往往決定了項目管理的工作流程。二者之間有著緊密關聯，在適當的工作流程中採用BIM則可獲更多裨益。為了從BIM的投資中得到最大回報，不同人士也在討論哪種工作流程才最有利BIM的發揮。有人主張使用設計連建造（DB）合約，盡早讓承建商和設施管理人員參與其中，協助分析可施工性並選擇BIM協調設備。另有人推崇新工程合同（NEC）與綜合項目交付合約（IPD），強調風險與利益共享的概念。





信息交換模式的比較
1 傳統信息交換
2 BIM信息交換

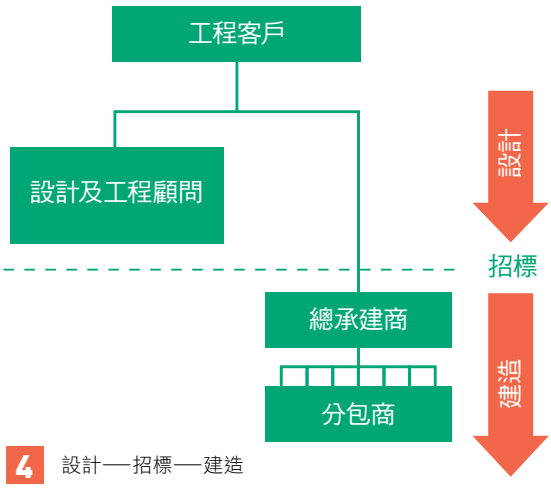
傳統交付方式（設計──招標──建造）

在工程客戶開始一個建設項目之前，需要慎重思考它的交付模式。根據項目性質、客戶要求以及風險意願，可以選擇不同的交付模式。設計──招標──建造（DBB）是常用的傳統方式。下表顯示了在美國市場上交付模式的大致使用比例。

設計—招標—建造（DBB）	60%
建造風險管理（CMAR）	25%
設計連建造（DB）	15%
綜合項目交付（IPD）	<1%

3 2012年美國市場上不同交付方式的大致使用比例

在DBB模式下，一隊設計師及工程顧問共同規劃項目的設計。之後，項目進入招標競爭階段，供感興趣的各總承建商投標。擁有最佳價位及工程建議的標書會贏得合同，並與分包商（如適用）一起開展工程。



4 設計──招標──建造

儘管DBB模式在美國的工務工程中獲廣泛採用，但其主要缺點在於設計師和工程顧問有時無法在提出設計時考慮到清晰的施工方法和設備細節，他們需要依賴總承建商或分包商的專業知識以落實設計細節。這樣做的後果是，很多設計問題直到項目完成投標並進入執行階段時才會曝露，讓客戶蒙受工程延誤及超支等風險。

由於採購結構的限制，即使採用BIM也無法徹底解決問題。在香港，如今已有很多工程客戶開始在他們的項目中採用BIM。他們要求承建商以兩種方式偵測衝突：一是要求承建商利用項目的BIM模型發展成建造模型，或是要求承建商與分包商一起（如適用）根據一些既定標準，從一套二維圖則中發展出BIM綜合模型。在香港一項超大規模的交通運輸項目中，承建商必須首先報告BIM鑑定出的潛在問題，然後才能申索補償。可是，由於設計失誤引起的工程延誤和超支情況仍會不時出現，香港的部分建造業持份者認為必須改變做法，在設計階段便進行衝突偵測，而不是把問題留給總承建商去解決。

設計連建造

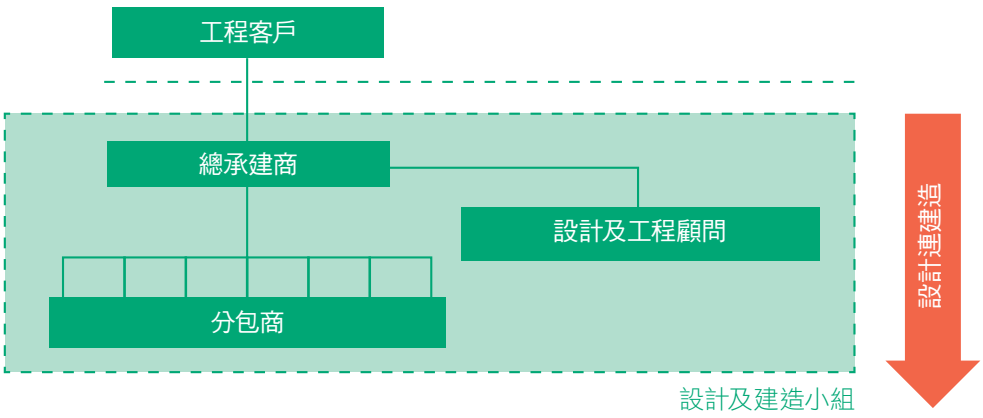
有鑒於傳統DBB模式的弊端，有人建議可以僱用前期工程顧問來進行BIM統籌並參與設計。香港採用這種方式的成功案例，有住宅建築物傲璇及商業大廈港島東中心。然而，始終有人擔心，這樣做會影響投標過程中的價格競爭與公平。

最近，有人開始考慮採用設計連建造（DB）合同。此舉讓承建商在早期採用BIM與設計師共商建造事宜，而不需要擔心價格競　和公平性等問題。

DB的運行方式是在單一合同下，指定承建商來協調設計和建造工程方面的事宜。據此簡單架構，項目工程客戶只需與一方共商項目管理。如需要的話，可透過簽署有保證的最高定價協議，來解決預算控制問題。這一方式不僅鼓勵在設計早期採用BIM，還能利用BIM促進多方面更緊密協調。

香港房屋署的綜合採購模式（IPA）正是基於這一概念提出的。他們利用這一概念，在標書呈交要求中加入創新元素，以配合長遠發展戰略。評估投標時，不僅強調價格與技術建議，還強調運用創新科技。它讓投標者在建造過程中適當加入創造性，這樣在提高生產力的同時獲得更具價值且質素更高的產品。全新IPA包含了BIM推廣的主要優點，2012至2013年度的安達臣道地盤A和B第1和第2期公屋發展計劃建造工程就是很好的例子。

此採購結構的一個缺點在於，工程客　在選擇設計師時擁有較小影響力，且當要求特殊設計時未必能收到滿意效果。此外，比起傳統交付方式，承建商須承受更高風險，且可能拉高價格。



5 設計連建造

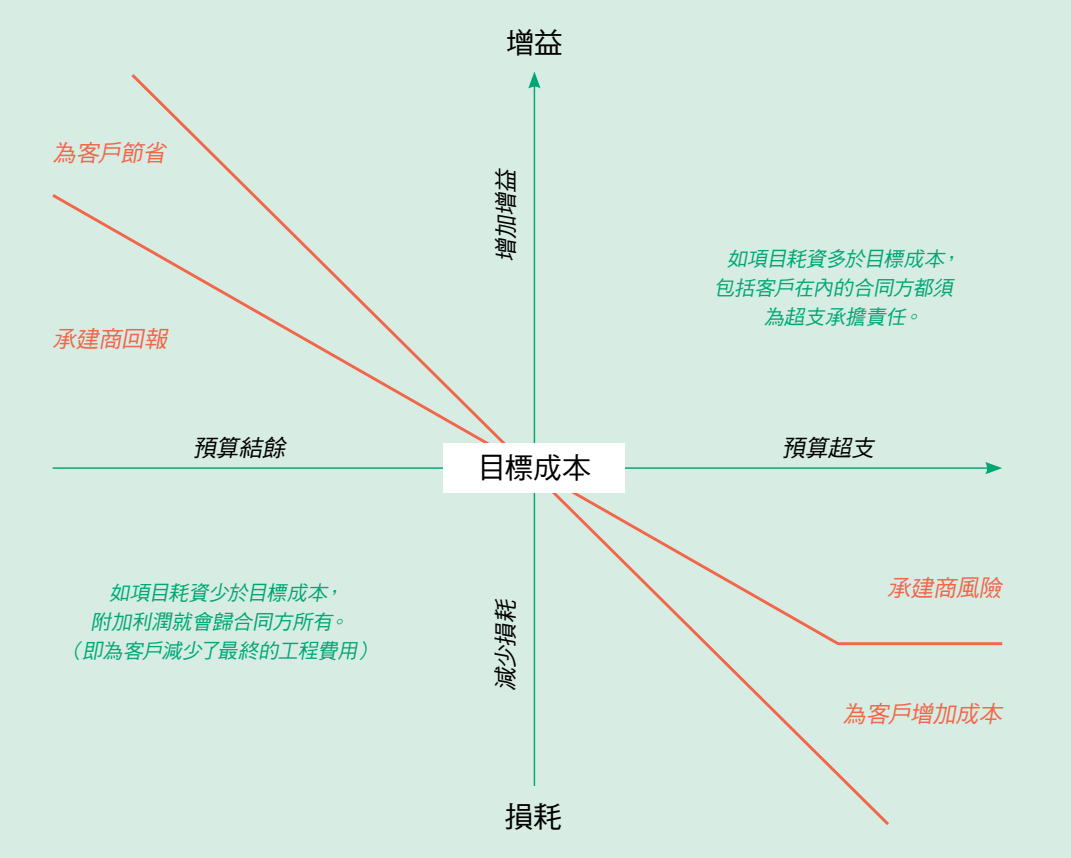
新工程合同

另一種適合BIM運作且引起廣泛討論的採購方式是新工程合同（NEC），自1993年由英國土木工程師學會研發及推行，是把不同範疇事項置在總合同下的一種合同形式，旨在宣揚合作、互信等原則，強調夥伴關係，鼓勵項目中不同組織的互相合作，與BIM所倡導的原則不謀而合。

在NEC中，有一項減少風險的機制，就是要求承建商在補償情況（例如索賠）發生前，要在建造過程中主動匯報潛在風險。項目客戶亦有責任舉辦減少風險的會議，以及時解決關於成本與時間的問題，以便減少在最終決算帳戶過程中產生的爭拗。

另外，訂定目標成本，建立公開的帳戶，列明所有合同支出均來自實際費用，可促進共同承擔的精神。如有與目標相差的盈餘或超支，由各方按預定比例共同分享或承擔。這樣的共享信息做法正好完美配合BIM的中央數據庫。

香港發展局正在大力推廣NEC，並將之成功運用於渠務署在西貢福民路明渠的改進方案中，節省了5%的費用及縮短了六個月工期。但NEC的缺點在於，花在降低風險程序的資源較多。對本地建造業而言，這一概念始終較新，因而尚未普及。然而，在BIM的輔助下，可以提高解決問題的效率，也減少工作量。2013年，英國出版了一本關於如何將BIM與NEC3合同結合使用的指南，有助在項目管理中採用BIM。



6 NEC目標成本中的利害共享概念

綜合項目交付

與NEC類似，綜合項目交付（IPD）是另一套來自美國的合約類型，同樣透過整合人力、系統、商業結構和營商手法，來支援同一套協作原則。這一合約類型不單強調上游參與者的貢獻，還鼓勵來自分包商、設備供應商、設施運營商等下游力量從概念發展階段開始參與。

很多著作已表明BIM與IPD能夠配合得很好。IPD結合了NEC及DB的優點，通過適當地採用BIM，重要角色的協作和早期參與便能帶來裨益。採用BIM除了方便設計和偵測衝突外，還可有利於運營與資產管理。

當以IPD管理項目時，可能需要在早期花費更多時間和精力在BIM協調方面，以尋求更佳設計，但這些額外功夫到了建造階段便可看到成果。因為有了更佳規劃，會減少干擾工程進度的現場施工問題。當來自不同領域的專家共同緊密合作時，就能產生創新的設計和施工方法。成功結合IPD與BIM的例子，有三藩市教堂山上的California Pacific Medical Center、麻省Autodesk　AEC總部的室內裝飾，以及位於聖路易市郊的St. Clare Health Center等。

若項目未有採用合適的交付方式配合適當的工作流程或程序，BIM的功能就難以全面發揮。建造業需要進一步探索發揮BIM最大優勢的可能性。

不同國家各自發展出不同類型的合同（如IPA、IPD或NEC）可能代表建造業價值鏈中的項目管理正出現這樣的需求：

- *讓總承建商和設施管理人員等重要單位於早期參與；*
- *協作和共享的合作方式*

以上兩者在BIM的實施上起著至關重要的作用，相信能幫助我們突破現時的情況。

選擇合適的交付方式，不單增加了項目成功的可能性，配合BIM收集的綜合數據和創新科技，更能提高生產力。

王素兒

王素兒女士曾於香港一家總承建商負責多個BIM項目，現為建造業議會高級主任，服務於議會轄下環境、創新及技術專責委員會兩個工作小組——實施建築信息模擬路線圖工作小組及設立實施建築信息模擬業界標準工作小組，主要職責包括：

- **製訂《香港建造業策略性推行建築信息模擬路線圖》**
- **為香港建造業訂定BIM標準**
- **負責BIM的推廣活動**

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MESSAGE FROM CHAIRMAN OF COMMITTEE ON PROCUREMENT AND SUBCONTRACTING

The Committee on Procurement and Subcontracting (Com-PNS) has continued to work with stakeholders in the construction industry to ensure a healthy development of the procurement and subcontracting system in Hong Kong.

Considerable progress has been made by the Com-PNS and its Task Forces in fostering a healthy procurement system, and I am pleased to inform stakeholders that the Com-PNS has published a series of well-received publications on the CIC website in the preceding months. These include:

(i) a *Procurement Alert on the Use of On-Demand Performance Bonds* published in September 2014, which gives recommendations on good practices in relation to the use of on-demand bonds in construction contracts as well as reminds industry stakeholders to act in a responsible manner when asking for on-demand bonds;

(ii) a *Procurement Factsheet on Owner-Controlled Insurance Programme* (OCIP) published in September 2014, which provides useful information on OCIP, including its benefits and limitations, critical success factors and its development and application in Hong Kong and overseas, for industry stakeholders' reference; and

(iii) *Reference Materials on the Selection of Consultants* published in November 2014, which gives recommendations on good practices in relation to the procurement of design and other consultants for construction projects.

To encourage the use of collaborative contracts in the local construction industry, I am pleased to announce that the CIC signed a Memorandum of Understanding for Collaboration with NEC Contracts United Kingdom in October 2014. The main purpose of the collaboration is to work together to raise awareness of the construction community to the increasing adoption of collaborative type contracts, of which NEC is one. I am also pleased to inform stakeholders that the Task Force on NEC3 Collaborative Contracts has completed the drafting of the Reference Materials on Frequently Asked Questions on NEC3 Collaborative Contracts and the Com-PNS is at the final stage of submitting the document for legal vetting and seeking approval from the Council for its publication in 2015.

The Task Force on Competition Law formed under the Com-PNS has in recent years undertaken various activities to represent the views of the construction industry in the development of Hong Kong's first cross-sector competition law and to explain the effect of the new *Competition Ordinance* to industry stakeholders. To further raise the awareness of the construction industry and to promote compliance with the *Competition Ordinance* that is expected to come into full force in 2015, a work plan of the Task Force for 2014/2015 has been formulated. As part of the work plan of the Task Force, a Competition Law mini-site will be launched at the CIC webpage and a series of industry-specific competition law publications, such as FAQs, Case Summaries, and Code of Conduct, will be published in 2015.

On fostering a healthy subcontracting system, a new Task Force on Enhancements to Subcontractor Registration Scheme (SRS) was set up in May 2014 with the objectives of reviewing holistically the strategic position and recommending enhancements to the operational framework of the SRS as well as identifying positive incentive(s) to encourage subcontractors' registration and wider adoption of the SRS. As part of its Terms of Reference, this new Task Force will also study the feasibility of categorising Registered Subcontractors into different classes under the SRS, review the need for introducing a mandatory registration scheme, identify motives and explore value-adding services to encourage Registered Subcontractors to upgrade themselves and build up their capacities, as well as conduct consultation among relevant stakeholders on the enhancement proposals as appropriate.

In this second issue of *Aedifice*, we are pleased to invite two legal practitioners, Mr. Joseph CHUNG and Miss Genevieve LAM, to tell us more about the latest development in relation to the *Contracts (Rights of Third Parties) Bill* in Hong Kong. I hope readers will find the article useful and interesting to read.

Once again, I am thankful for the tremendous efforts our members and stakeholders put in to achieving the above accomplishments.

CHEW Tai-chong

採購及工程分判專責委員會主席的話

採購及工程分判專責委員會（委員會）在2014下半年繼續與業界持份者合作，確保香港建造業的採購和分判制度健康發展。

委員會與轄下專責小組在建立和完善健康的採購制度上取得了可觀的進展，我們在過去數月已於議會網頁上載了一系列廣受歡迎的刊物：

(i) 於2014年9月發表的《於建造合約採用來索即付履約保證採購提示》，旨在提醒所有業界持份者，在建造合約要求提供來索即付履約保證時，必須以負責任的態度去處理；

(ii) 同樣於2014年9月發表的《建造合約僱主控制保險計劃（OCIP）採購便覽》，提供了關於OCIP的各項資料以供持份者參考，包括其優勢與局限性、關鍵成功因素、在香港及海外的發展及應用等資料；以及

(iii) 2014年11月發表的《甄選顧問公司參考資料》，展示了為工程項目甄選設計及其他相關的顧問公司時的良好作業方式。

為鼓勵本地建造業採用協作合同，議會已於2014年10月與英國Nec Contracts簽訂了合作協議備忘錄，旨在協力提升建造業界對有關協作合約（包括新工程合同）的應用正日漸普及之意識。另外，新工程合同第三版專責小組已完成草擬《新工程合同第三版常見問題參考資料》，文件現已提交法律顧問進行審核，待議會核准後將於2015年出版。

委員會轄下的競爭法專責小組近年已採取若干行動，就香港首條跨界別競爭法的發展代表業界發表意見，以及向業界持份者解釋新《競爭條例》的影響。為進一步提升建造業界對有關法例的意識以及促使業界遵守即將於2015年全面生效的《競爭條例》，專責小組已制定2014/15年工作計劃。作為計劃的一部分，議會將於2015年在其網站內設立一個競爭法的專題網頁，並會發表一系列為建造業擬備的競爭法刊物，例如常見問題、案例摘要及行為守則等。

為建立和培養一個健康的工程分判制度，我們於2014年5月成立了全新的提升分包商註冊制度專責小組，力圖全面檢討策略定位及提出對分包商註冊制度（SRS）運作框架之提升方案，並研究積極鼓勵措施及提出獎勵制度建議，鼓勵分包商註冊並特別在私營工程項目更廣泛採用SRS。全新專責小組的職權範圍還包括就註冊分包商在分包商註冊制度下分類為不同級別，研究當中可行性及建議有關機制；檢討引入強制性註冊制度的需要；識別可鼓勵註冊分包商自我提升和建立能力的因素；探索可具增值的服務；以及按情況與相關持份者就提升建議方案進行諮詢。

今期，我們很開心邀得鍾偉傑律師及林思妍律師為我們解讀《合約（第三者權益）條例草案》。希望讀者喜歡這篇文章並能從中獲益。

最後，我想再次感謝會員和持份者作出的努力。全賴各位的支持與協助，我們才能獲得今天的成就。

周大滄

WILL THE CONTRACTS (RIGHTS OF THIRD PARTIES) ORDINANCE

BE A BLESSING

TO THE CONSTRUCTION INDUSTRY

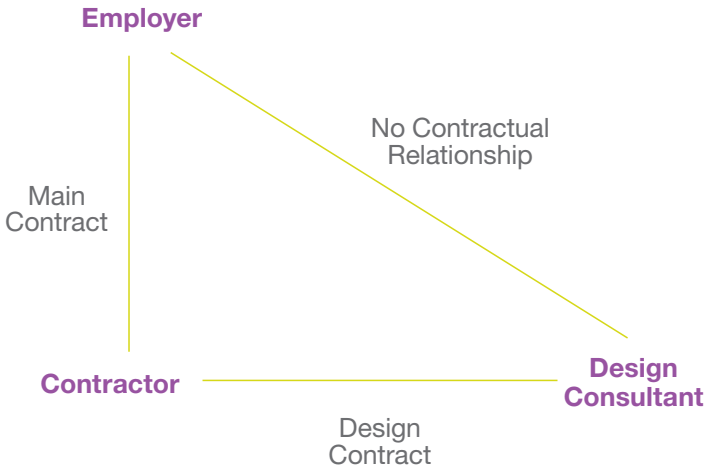
The Contracts (Rights of Third Parties) Ordinance has been promulgated in the Gazette and will come into effect on a day to be announced. Joseph CHUNG and Genevieve LAM of Deacons discuss the implications of the Ordinance to the construction industry

Under the present law in Hong Kong, a person cannot enforce rights under a contract to which he is not a party and equally, a person who is not a party to a contract cannot be made liable under it. Time and again, this sort of situation arises in construction projects, as there are many interacting parties.

With a view to aligning Hong Kong with other common law jurisdictions in this area of the law, the Hong Kong Government introduced the *Contracts (Rights of Third Parties) Bill* into the Legislative Council in March 2014. In November 2014, the Secretary for Justice moved the third reading of the *Bill*. The *Contract (Rights of Third Parties Ordinance) 2014* was promulgated in the *Gazette* in early December 2014 and will come into effect on a day to be announced.

The purpose of the *Ordinance* is to enable a person who is not a party to a contract to enforce terms of the contract under certain circumstances.

This article will discuss the changes that will be brought about by the *Ordinance* and the implications of the *Ordinance* to the construction industry.



1 A scenario with no contractual relationship between employer and design consultant

POSITION UNDER THE CURRENT LAW – DOCTRINE OF PRIVITY OF CONTRACT

The doctrine of privity of contract is that a person cannot acquire nor enforce rights under a contract to which he is not a party. Equally, the non-party cannot be made liable under the contract. The second principle can be easily understood as a matter of fairness. However, the first principle often presents practical problems. For instance, if party A has an agreement with party B to promise to do something for a third party, party C, and party A subsequently fails to perform that obligation to party C, under the doctrine of privity, party C would not be able to enforce the contract against party A because party C is not a party to the contract. To pose the question, would this not be unfair to party C when it was the intention of parties A and B to benefit party C in which case, why should party C (who may have suffered loss as a result of party A not performing his obligation under the contract) not be able to sue on the contract?

The problems with the doctrine of privity can be highlighted in the context of construction, a main contractor enters into a design and build contract with the employer and the main contractor engages a design consultant to carry out the design aspect of the main contract work. The contractual relationship is illustrated in figure 1. The design consultant does a poor job. Under the doctrine of privity, the employer would not have a cause of action against the design consultant under the main contract. If the employer were to commence legal proceedings, it could sue the main contractor (under the main contract) and the design consultant under tort, which would usually be complicated as it may be difficult to establish a direct duty of care owed by the design consultant to the employer.

Because of the complications and unfairness that could be brought about by the strict application of the doctrine of privity, over the years, sometimes the courts have found exceptions to the doctrine of privity in order to achieve justice. It further complicates this area of law. The doctrine of privity have also been criticised as being "artificial" and "contrary to the parties' intention to benefit a third party."

As a consequence, various common law countries, including England, some states in Australia, New Zealand and Singapore have abrogated the doctrine of privity by legislation. By the enactment of the *Ordinance*, Hong Kong has now taken a similar step.

KEY PROVISIONS OF THE ORDINANCE

The *Ordinance* will only apply to contracts entered into after the *Ordinance* is enacted. In other words, existing contracts are excluded.

The *Ordinance* will not apply to certain types of contracts, such as a bill of exchange (e.g. a cheque), promissory notes, contracts on negotiable instruments, deed of mutual covenant, contracts on a letter of credit and employment contracts.

So who would be a third party under the *Ordinance*? The *Ordinance* provides that the third party should be expressly identified in the contract by name, as a member of a class or as answering a particular description. Rights may also be conferred on a third party who is not in existence when the contract is entered into.

The specified third party would be able to enforce a term in the contract, if the contract contains:

(1) an express term to that effect; or

(2) a term which purports to confer a benefit on the third party.

Once the *Ordinance* comes into effect, the parties would need to comprehensively review their construction contracts (which are in most cases, complex) and identify where third-party rights are to be or not to be provided for and to amend the construction contracts accordingly.

The *Ordinance* provides that a third party is entitled to any remedy that would have been available to him in any action for breach of contract, had he been a party to the contract. The *Ordinance* also makes it clear that this does not affect a right or remedy of a third party that exists or is available.

If a third party has a right to enforce a contractual term under the *Ordinance*, the parties to the contract may not rescind or vary the contract in a way that alters that third party's right without the third party's consent. Such restriction on rescission and variation may be overridden if the contracting parties expressly exclude this restriction in the contract.

In terms of arbitration and exclusive jurisdiction clauses, the *Ordinance* contains provisions that, in effect, would bind a third party to an arbitration clause or exclusive jurisdiction clause contained in the contract as if it were a party to it.

The *Ordinance* allows third parties to assign their rights to enforce a term under the contract to another person. The assignment of such rights, may however be prohibited by an express term of the contract.

The *Ordinance* has also maintained the parties' freedom to contract out of the *Ordinance* should they wish to adhere to the doctrine of privity.

WHAT DOES THIS ALL MEAN TO THE CONSTRUCTION INDUSTRY?

At present, and in the construction industry, a not uncommon means to avoid the effects of the doctrine of privity is the use of a collateral warranty. This seeks to fill in the gap by creating a contract (the collateral warranty) between the third party and the contracting party thereby allowing a third party who has suffered loss to pursue against the contracting party under the terms of the collateral warranty. In the design and build scenario explained above, the employer would often require the design consultant (via the main contractor) to give a collateral warranty in respect of the design. For instance, the design consultant warrants directly to the employer that it has exercised all reasonable skill and care in the design of the relevant work. Figure 2 illustrates this. This would provide the employer with a direct cause of action against the design consultant under the terms of the collateral warranty should there be problems with the design.

Under the HKIA/HKIS private form1, before entering into a nominated sub-contract, the main contractor shall ensure that the nominated sub-contractor has given the sub-contractor warranty agreement to the employer in the form set out in the contract.

A collateral warranty does have its attractions, as this is something that people in the construction sector are used to using. It is a relatively short and standardised document. However, a collateral warranty can have its limitations and may not be able to cater for all situations, which is perhaps where the *Ordinance* would be able to fill in the gap. For instance, where a main contractor fails to pay a sub-contractor for work performed, the sub-contractor will not have a right of recourse against the employer.

To take another example, an ultimate purchaser in a building development would not have direct recourse against the building contractor if the building works were defective because the purchaser is not privy to the building contract and nor would it be usual for the building contractor to give a collateral warranty to the ultimate purchaser. The purchaser's only recourse would be against the developer, which would depend upon the terms of the sale and purchase agreement between the purchaser and the developer.

The *Ordinance* will apply to construction contracts unless they have been expressly excluded.

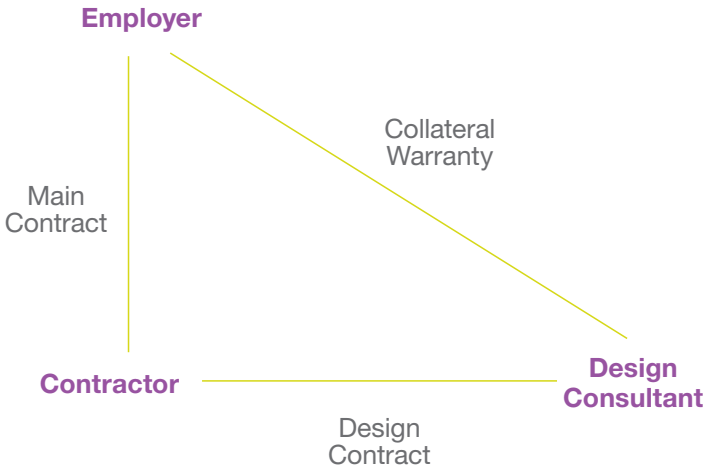
Construction projects usually involve a number of parties interacting. To name a few, the employer, project consultants, main contractor, sub-contractors, suppliers and the ultimate purchaser(s) in a building development. An immediate perceived advantage of the *Ordinance* is that it would help to identify third-party rights. But will it be that straightforward?

As explained above, for the third party to be able to enforce its rights under the *Ordinance*, the *Ordinance* requires the third party to be expressly identified in the contract by name, as a member of a class or as answering a particular description. Putting this into practice, identifying those third parties in the construction contract may need to be done with care and may not be a straightforward task.

There could be complications in the parties to the construction contract agreeing on which are the relevant third parties. In one of the standard forms of contract in England which has not contracted out of the England equivalent, *Contracts (Rights of Third Parties) Act 1999*, it took two years to amend the form in order to decide which third parties should benefit under the construction contract.

Another challenge is being able to identify all those third parties, whether by name or by class, especially during the preparation of the contractual documents, as many of these third parties may not become apparent until they enforce their rights.

Under the *Ordinance*, a third party may assign its rights arising from the *Ordinance* without the other parties' consent. Whilst this gives flexibility, drafters of construction contract should be careful as this could widen the scope of third-party rights.



2 A scenario with contractual warranty between employer and design consultant

There could also be arguments of whether a party falls within a specified class or answering a particular description of a third party.

Perhaps all of the above could be resolved through careful drafting with clearer description of the class or description of the third party in the construction contract or to expressly provide in the construction contract that all third-party interests are excluded other than those that have been expressly provided for in the contract.

Once the *Ordinance* comes into effect, the parties would need to comprehensively review their construction contracts (which are in most cases, complex) and identify where third-party rights are to be or not to be provided for and to amend the construction contracts accordingly. This is likely to be a cumbersome task. If, for whatever reason, third-party rights have been omitted, this would fall back to the doctrine of privity. Perhaps, and in this regard, collateral warranties may still provide more certainty on identification of third-party rights.

A benefit of the *Ordinance* is that it would allow contracting parties to incorporate terms in the collateral warranties into the construction contract, which could avoid the complexity of the

JOSEPH CHUNG

Mr. Joseph CHUNG is a Partner in the Construction & Arbitration Department of Deacons, and specialises in litigation and dispute resolution with particular emphasis on construction. He was previously a Barrister until he became a Solicitor in 2001. Mr. CHUNG has extensive experience in all aspects of construction in both private and public sector work, advising developers, contractors and consultants. Over the years in his practice as a construction lawyer, he has been involved in many high profile construction projects. Mr. CHUNG also sits as an Arbitrator.

parties' rights being scattered over different documents. In other words, it could be said that the *Ordinance* will replace the need of preparing a separate collateral warranty. Arguably, this would provide a more straightforward channel for the third party to enforce its rights and to avoid multiplicity of proceedings as all parties involved would be referring to the same construction contract. As explained above, the parties may agree that the third party will also be bound by an arbitration clause in the construction contract. So to take the above example of the ultimate purchaser, a typical scenario that could arise under the present regime is that the ultimate purchaser commences a legal action against the developer in the courts but the developer sues the main contractor for the same defect in arbitration, as typical construction contracts would contain an arbitration clause. Under the *Ordinance*, this sort of situation can be avoided.

The other side of the coin, and again using the ultimate purchaser situation, with the *Ordinance* taking effect the purchaser would first need to decide which party to sue. This may not be an easy task as it might not be possible to identify from the outset which party is responsible. On the side of caution, the purchaser would probably sue both the developer and the main contractor. The main contractor would probably then join in its sub-contractors. The effect of this would be to revert to multi-party proceedings, which would complicate the initial claim by the purchaser.

Under the *Ordinance*, a sub-contractor may also be able to benefit from an exclusion clause that the main contractor has included in the construction contract. Similarly, provisions may be included in the construction contract enabling the sub-contractor to sue the employer direct for non-payment. Obviously, whether or not such provisions can be included in the construction contract will be a matter for negotiation between the parties.

There are arguments both ways as to the perceived benefits of the Ordinance. While there may be areas in the Ordinance which could present some concern, it does seem to have its attractions as being flexible (allowing contracting parties to decide on which third-party rights should be conferred in the construction contract) and would bring Hong Kong up to date and in line with other common law jurisdictions on third-party rights.

During the early enactment of the Ordinance, as the implications of the Ordinance have yet to be fully tested and when the Ordinance gives the parties the freedom to contract out of the Ordinance, contracting parties are likely to adopt a more cautious approach and maintain the use of collateral warranties. However, in the long run, the perceived benefits from applying the Ordinance may outweigh such concerns through careful preparation of the construction contract.

GENEVIEVE LAM

Ms. Genevieve LAM is an Associate in the Construction & Arbitration Department of Deacons and practises in construction law. She has been involved in a number of construction-related litigation and arbitration disputes, including claims arising from delay, variations and construction defects. She also advises on construction, consultancy and other related contracts.

合約（第三者權益）條例草案
會否為建造業界帶來裨益

《合約（第三者權益）條例草案》（《條例》）近日已刊登於憲報內，生效日期將容後公布。的近律師行的鍾偉傑律師及林思妍律師將在本文中探討該條例對建造業的影響。

在香港現行法律下，如果某人並非合約當事方，他就無法行使其中權利，同樣，亦毋須承擔箇中義務。因為建造項目經常牽涉眾多交互方，所以這樣的情況屢見不鮮。

為使香港與其他地區於相關法律方面接軌，香港政府於2014年3月將《合約（第三者權益）法案》提交立法會。2014年11月，法案經律政司司長三讀通過。《合約（第三者權益）條例草案2014》於2014年12月上旬刊憲，生效日後將容後公布。

引入《條例》的目的，在於確保非合約當事方在特定情況下能夠執行合約條款。

這篇文章旨在探討《條例》可能帶來的變化及其對建造業的影響。

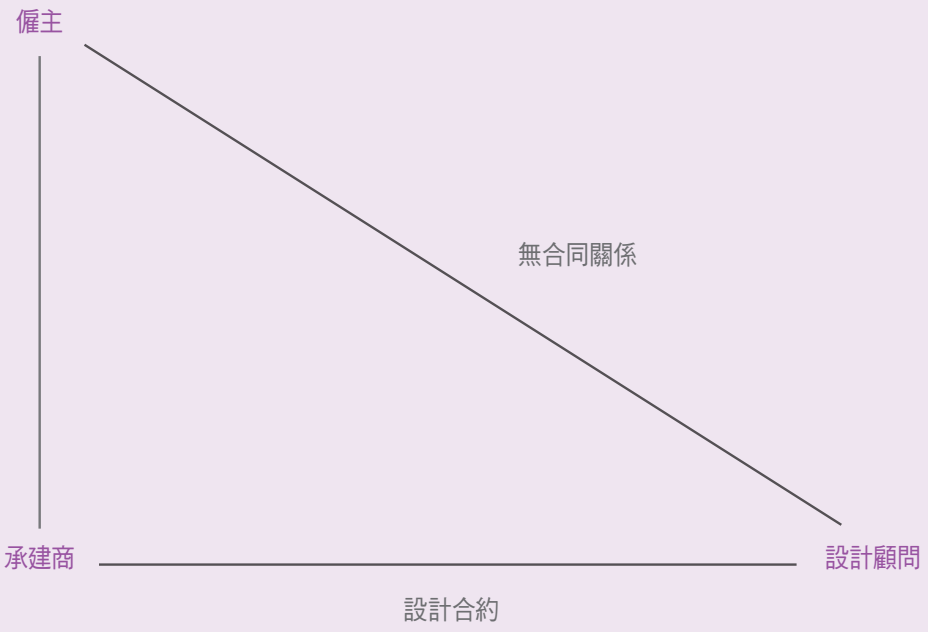
現行法律下，立約各方的相互關係原則

立約各方的相互關係原則是指，假設一個人並非合約的當事方，第一，他無法行使合約下的權利。第二，他也毋須履行合約中標明的義務。這裡提到的第二點基於公平的原則很容易理解，然而第一點在實際操作中卻常常出現問題。例如，如果當事方甲與乙簽訂協定為非當事方丙提供服務，但甲最終無法履行對丙的義務，根據立約各方的相互關係原則的規定，作為非當事方的丙無法要求甲承擔責任。那麼，當甲與乙的本意是做利於丙的事情時，這樣的結果對於丙便不太公平，為何當事方丙（因為甲未能妥善履行條約義務而承擔損失）無法根據合約提出控告？

立約各方的相互關係原則的不足在建造業領域尤為明顯。一般情況下，總承建商先與僱主簽訂設計連建造合約，再委託設計顧問承擔主要合約中關於設計的內容。他們之間的契約關係如圖一所示。如果設計顧問未能很好地完成工作，那麼根據立約各方的相互關係原則，僱主無法就主要合約的內容對設計顧問提出訴訟。他採取的方式只能是，透過主要合約對總承建商提出訴訟，並根據侵權行為法對設計顧問提出訴訟。而因為難以直接界定設計顧問對僱主應負的責任，這樣起訴的過程通常都會非常複雜。

由於過程繁瑣，嚴格應用立約各方的相互關係原則常導致不公平現象的產生，在多年的發展歷程中，有時法院為了達致公平目的，亦會作出立約各方的相互關係原則以外的判決。這一原則也被批評為「太武斷」及「違背惠及第三方的本意」。

有鑒於此，包括英國、澳洲個別省分、紐西蘭及新加坡在內的普通法系國家和地區已紛紛立法廢除了立約各方的相互關係原則。該《條例》一經實施，香港也邁出了類似的一步。



1 僱主與設計顧問的無合同關係情形

《條例》一旦生效，當事方需全面檢視建築合約（在大多數情況下均屬相當複雜），界定給予或不給予第三方權利之處並相應地修改建築合約。

《條例》的主要條款

《條例》只適用於其實施後所訂立的合約。換句話說，現行的合約將被排除在外。

《條例》並不適用於特定合約，例如匯票（如支票）、承付票、可流轉票據合約、公契、信用狀合約及僱傭合約等。

那麼誰會是《條例》下獲益的第三方？《條例》規定，第三方必須在合約中列明姓名、為某類社會等級中的成員或符合指定的描述。此外，在合約簽訂時並未存在的第三方也可獲授予權利。

在合約載有下列內容時，指定第三方可以強制執行合約中的條款：

1）具此效力的明訂條款；或

2）看來是賦予第三方一項利益的條款。

《條例》規定，凡假使某第三方是某合約的一方，便可在因違反合約而提起的訴訟中，獲得某項補救。《條例》同時明確表示這並不會影響第三者權利以及其可獲的補救。

如第三方有權透過《條例》強制執行合約的某條款，那麼在未經得第三方同意的情況下，合約各當事方將不得作出可能影響第三方權益的撤銷或更改合約。唯有合約當事方已在合約中清楚地排除了這項限制，才可撤銷或更改合約。

就仲裁和專有司法管轄權條款方面，根據《條例》規定，第三方可受合約中載有之仲裁條款或專有司法管轄權條款約束，則第三方可被視為如同合約中的當事方。

《條例》允許第三方把執行合約中某條款的權利轉讓予另一人。然而，這樣的權力轉讓可在合約中以條款形式被明令禁止。

在當事方願意採用立約各方的相互關係原則時，《條例》同時賦予立約各方不受《條例》約束的權利。

鍾偉傑

鍾偉傑律師是的近律師行建築及仲裁部門合伙人，專攻訴訟及爭議解決，特別擅長處理建築事宜。鍾律師於2001年成為事務律師前，已為執業多年的大律師，在處理私營及公營機構所有不同領域的建築工作，向發展商、承包商及顧問提供法律意見方面都有豐富經驗。他過往參與過多項知名的建築項目，此外，亦是一位仲裁員。

此舉對於建造業的影響

現今，避免立約各方的相互關係原則生效的一項常見手段是採用附帶保證。此舉力求避免第三方和締約方之間創訂新條約（附帶保證），而在附帶保證的條款規定下，蒙受損失的第三方可向合約雙方提出索賠。在上面提到的設計連建造方案中，僱主常常要求設計顧問（透過總承建商）提供涉及設計的附帶保證。例如，設計顧問會直接授權僱主，表明他已在相關工程的設計上運用了合理的技術和付出了心血。該情況如圖二所示。這樣，當設計出現問題時，根據附帶保證的條款，僱主便擁有了針對設計顧問的直接訴訟理由。

根據香港建築師／測量師學會合約文本1，在簽訂指定分包合約前，總承建商須確保指定分包商已根據合約規定與僱主簽署了擔保協議。

附帶保證的確有一定的裨益，並常應用於建築領域，是一個相對短但標準化的文件。然而，附帶保證也有一些缺陷，並難以應用於所有的情況中，這時，《合約（第三者權益）條例》草案便可發揮彌補的作用。譬如，當總承建商無法給分包商支付工作費用時，分包商便有權向僱主追債。

再舉一個例子，如發現建築工程有缺陷，發展項目的最終買家不具備對承建商的直接追索權，因為買家不參與建築合約，而通常情況下，承建商也不會為最終買家提供附帶保證。買家只可尋求發展商作出保證，而這一保障亦只能透過買家與發展商之間的買賣合約條款實現。

除被明確排除的情況，《條例》將適用於建築合約中。

建築項目通常會涉及到一系列相互關聯的合約方，譬如僱主、項目顧問、總承建商、分包商、供應商及發展項目的最終買家。《條例》的即時優點在於它能幫助鑑定第三方的權利。但是否能這樣直接呢？

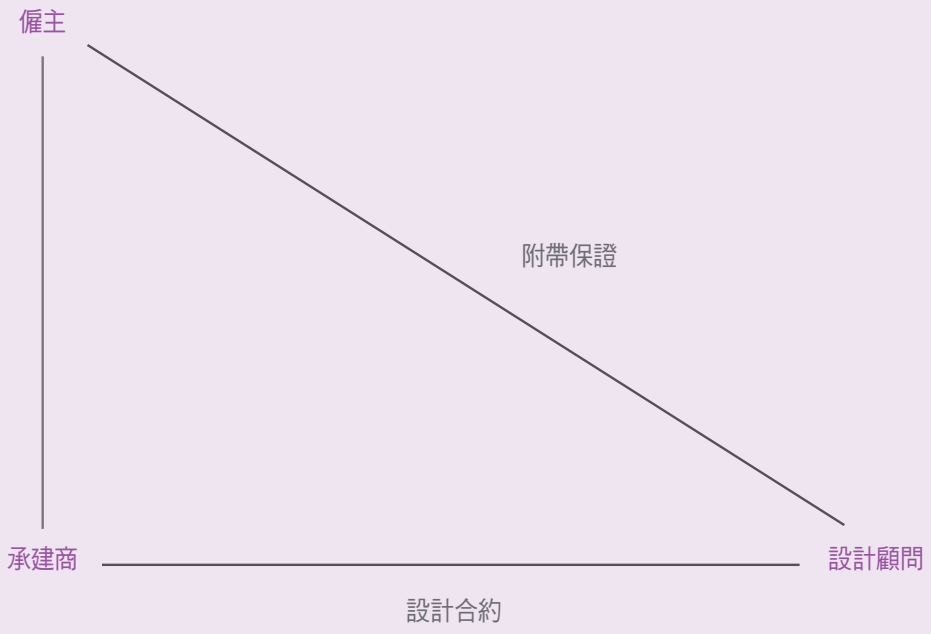
如前所述，透過《條例》行使權利的第三方需要明確標示於合約中，不論是標示為具體名字、某類別的成員還是符合特定描述。在實際操作中，需小心謹慎地在建築合約中鑒別這類第三方，而這也不是能直接、簡單完成的任務。

在界定建築合約中相關第三方的問題上，常常會節外生枝。在英國，受同類型法案《Contracts（Rights of Third Parties）Act 1999》約束的一份標準合約，便花了兩年時間於修訂合約以判定哪些第三方可透過建築合約獲益。

另一個挑戰是如何透過名字或等級鑒別第三方，特別是在合約文件的準備期間，因為很多第三方在行使權利前亦未必會顯而易見。

根據《條例》，第三方可在未經其他各方同意的情況下，轉讓由《條例》帶來的權利。這點極具靈活性，並可能擴大第三方的權利，因此擬訂建築合約時須格外小心。

關於某方不再是某個特定等級的成員或是不再符合某種第三方特定描述的情況，也頗有爭議。



2 僱主與設計顧問之間附帶保證關係情形

上述提到的所有問題，或許都可以透過製訂更詳細的等級規定、釐清第三方描述、或標明除了明確規定外，第三方可享有的利益而迎刃而解。

《條例》一旦生效，當事方需全面檢視建築合約（在大多數情況下均屬相當複雜），界定給予或不給予第三方權利之處並相應地修改建築合約。這會是非常繁瑣的工作，如果第三方權益被遺漏，那麼合約將回歸立約各方的相互關係原則。或許就這點而言，附帶保證更能幫助界定第三方權益。

《條例》的優點之一，是允許合約當事方將附帶保證中的條款合併於建築合約之中，這樣便可避免因為採用不同文件而難以明確衡量各方權利的情況。換句話說，可以說是《條例》取代了單獨準備附帶保證的需求。我們可以證明，這不單對於實施權利的第三方是更為直接的方式，也能避免繁多的法律程序，因為各方採用的均為同一份建築合約。如上所述，各方可訂明第三方受建築合約中的仲裁條款限制。就上述最終買家的案例而言，於現行政策下的典型情況就是，最終買家對發展商提出訴訟，但發展商就相同的缺失對總承建商提出仲裁，因為典型的建築合約通常包含仲裁條款。《條例》生效後即能避免這類情況。

但事情通常有兩面。同樣以最終買家為例，如《條例》生效，買家首先需要決定起訴哪一方，這其實頗有難度，因為從一開始就瞭解哪方需要承擔責任並不太可能。為謹慎起見，買家通常會同時起訴發展商與總承建商，而總承建商通常會拉上分包商。這麼做的影響是又恢復了繁多的程序，使最終買家的索償程序變得複雜。

依據《條例》，分包商可從總承建商於建築合約中加入的除外條款中獲益。同樣，條款也賦予分包商因無付款而直接起訴僱主的權利。顯然，不管這樣的條款是否出現在建築合約中，都會造成各方在協商時的困擾。

關於《條例》帶來的益處眾說紛紜，人們也對《條例》的使用有一些顧慮，但它的確足夠靈活（使合約各方更易確認合約授予的第三方權利），且能令香港在第三方權利法案上追上其他普通法系國家的步伐。

於《條例》生效初期，其影響還未被徹底檢驗，雖然《條例》給予各方自由不受其約束，合約各方還是願意採用較謹慎的方式並繼續使用附帶保證。然而，從長遠角度來看，只要小心擬備建築合約，採用《條例》獲得的直接利益還是大於其中的顧慮。

林思妍

林思妍律師是的近律師行建築及仲裁部門律師，擅長處理建築事宜，並曾參與多項建築相關爭議的訴訟及仲裁，包括施工延誤、工程變更及施工缺陷引起的申索。林律師亦就建築、顧問及其他有關合約文件提供法律意見。

MESSAGE FROM CHAIRMAN OF COMMITTEE ON PRODUCTIVITY AND RESEARCH

It is my honour to continue contributing to the construction industry by serving as the Chairman of the Committee on Productivity and Research (Com-PNR). The CIC has been putting tremendous effort into improving the overall productivity of Hong Kong's construction industry. Our committee's objective is to explore various innovative measures to drive for the excellence of the local construction industry by making it more effective and competitive.

The major infrastructure projects and housing programmes at present are providing sustained impetus for Hong Kong's construction industry. However, the soaring manpower demand, coupled with an aging workforce and succession gap, has become one of the most pressing issues we are currently facing. In order to turn this risk into opportunity, the CIC, on one hand, is bound to secure the existing manpower and nurture more for the near future. On the other hand, the Com-PNR considers elevating productivity and promoting innovation as the key for sustainable development of the local construction industry.

At the moment, four consultancy projects focusing on improving the productivity of Hong Kong construction industry at industry level and site level are being conducted at different stages. At the industry level, Key Performance Indicators (KPIs) will be established and compared with the rest of the world in the areas of productivity, site safety and sustainability, with the aim to analyse the position of Hong Kong's construction industry on the global stage and thereby to seek improvement on our competitiveness. In addition, we shall conduct a comprehensive investigation on the practices, procedures and standards adopted in the industry, which would provide us with the insight on factors strengthening or limiting construction productivity in Hong Kong.

Improving productivity at the site level is equally important to the enhancement of the construction industry's performance. A study has therefore been initiated to explore strategies and best practices to enhance project constructability in Hong Kong so as to improve time, cost and quality performance. To improve construction productivity in Hong Kong, a consultant will be commissioned to establish the benchmarks of productivity rate for 10 trades. The productivity performance of the selected trades will also be compared with that of other developed countries to identify possible ways for improvement.

Com-PNR had a fruitful year in 2014. Apart from the four consultancy studies mentioned, a total of 21 research projects were initiated under the CIC research fund (please visit CIC's website at www.hkcic.org for details of the research). With the support of the Task Force on Research, we proudly present the inaugural issue of the CIC Research Journal *Innovation in Construction (iCON)*. Acting as a sharing platform for various construction stakeholders, *iCON* presents updates and findings of the CIC-funded research. I believe these informative and valuable outcomes will facilitate the performance improvement of the entire industry. The Com-PNR will go to great lengths to disseminate these innovations in the hope of bringing real changes to our industry.

Looking ahead, we will collaborate further with various construction industry stakeholders to improve the productivity of our industry. I am thankful for the efforts our stakeholders and Committee Members devoted in our Committee's tasks. The Com-PNR will continue to strive for the sustainability of construction industry by joining hands with industry stakeholders to maximise our productivity.

Christopher LEUNG

生產力及研究專責委員會主席的話

我很榮幸能以生產力及研究專責委員會(委員會)主席的身分,繼續為建造業作出貢獻。多年來,議會為提高香港建造業的整體生產力付出了許多努力。我們致力發掘並採用多項創新措施,提高本地建造業的效率和競爭力,精益求精。

現時的基建項目與房屋規劃為香港建造業提供了持續的動力。然而,勞動力老化和人力斷層使人力需求激增,成為我們目前面對的重要問題。有見及此,議會一方面致力維持現有人力及培養生力軍以轉危為機;另一方面,委員會認為提高生產力和積極創新才是本地建造業可持續發展的關鍵所在。

如今,四個關於在業界與工地兩個不同層面提升香港建造業生產力的咨詢項目正進行得如火如荼。我們為整個行業設定主要表現指標(KPIs),將本地建造業的生產力、工地安全、可持續性和表現指標等眾多方面與世界各地區的情況進行比較,以瞭解香港建造業在全球的位置,從而提升我們的競爭力。此外,我們將全面審視業內的作業方式、程序和各項標準,從中分析可提升或降低香港建造業生產力的不同因素。

提高工地生產力,與提升建造業的表現同樣重要。因此,我們展開了一項透過策略及最佳作業方式提高本地工程可施工性的研究,希望能藉此節省時間、成本及提升質素和表現。為提升香港建造業的生產力,我們將委任一位顧問,為十項工種訂定生產力基準。此外,我們也會將這些工種的生產力表現與其他已發展國家的資料進行對比,從中尋找改善方法。

委員會在2014年收獲頗豐。除剛才提到的四個咨詢項目外,議會研究基金資助了21個研究項目(請瀏覽議會網頁www.hkcic.org)。在研究專責小組的支持下,我們推出了議會研究期刊《Innovation in Construction》(《iCON》)創刊號,為不同業界持份者提供分享平台,以向讀者展示議會基金支持之最新研究的進展。我相信這些豐碩成果能幫助整個行業提升表現。委員會將不遺餘力地宣傳這些創新研究結果,希望為行業帶來切實改變。

展望未來,我們將進一步與業界持份者合作,力求提升行業生產力。衷心感謝持份者與各委員一路以來為委員會作出的貢獻。委員會將繼續與持份者攜手,不斷提升生產力,驅使建造業持續發展。

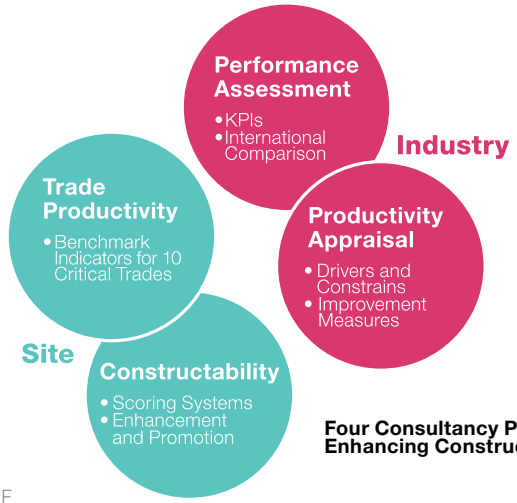
梁堅凝

RAISING CONSTRUCTION PRODUCTIVITY: A Research Agenda

The Construction Industry Council is greatly concerned about the level of construction productivity in Hong Kong, as the industry is currently facing a manpower shortage and global competitiveness concerns. While the CIC has issued a series of reports that show the industry's overall performance, the Committee on Productivity and Research (Com-PNR) is making a further step to benchmark construction productivity and to identify drivers and opportunities for improvement. Four consultancy projects will be initiated by the Com-PNR with the hope to bring the industry to a whole new level with greater efficiency and productivity.

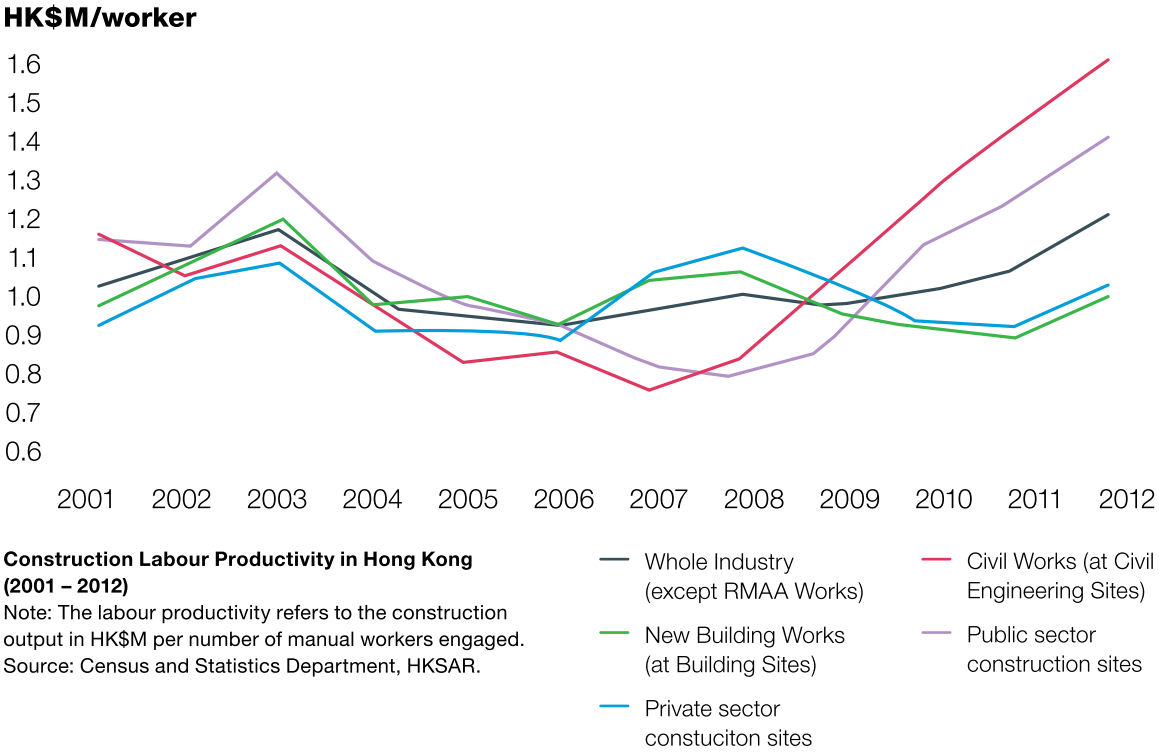
Productivity can be defined as a relationship between output produced by a system and quantities of input factors utilised by the system to produce that output.[1] Being one of the most influential variables governing economic production activities in construction,[2,3] productivity directly affects not only the progress and cost on building and infrastructure projects, but also the competitiveness of the industry in the global market. In order to increase productivity, the system must either produce more or better goods from the same resources, or the same goods from fewer resources.[4]

While construction labour productivity in Hong Kong has been increasing over the past five years, the industry is heavily reliant on conventional construction methods, which are labour-intensive. Hong Kong also tends to be relatively slow in the up-take of new construction technologies such as modular building systems and BIM. Hence, there is a lot of room for productivity improvement in the local construction industry.



Four Consultancy Projects Initiated by Com-PNR for Enhancing Construction Productivity Performance

In order to increase productivity, the system must either produce more or better goods from the same resources, or the same goods from fewer resources.



Construction Labour Productivity in Hong Kong (2001 – 2012)
Note: The labour productivity refers to the construction output in HK$M per number of manual workers engaged.
Source: Census and Statistics Department, HKSAR.

Given the tight manpower supply, stemming from a series of massive infrastructure and housing programmes, productivity should remain the focus of research to prevent the industry lagging behind our counterparts around the globe. Hence, the Com-PNR has initiated two plus two projects at the site and industry levels respectively to benchmark construction productivity and to identify drivers and opportunities for productivity improvement:

1. Assessing the Performance of Hong Kong Construction Industry: An International Comparison. A coherent approach for productivity measurement is urged by the Organisation for Economic Co-operation and Development.[5] Having compiled the set of Key Performance Indicators (KPIs), this project is expected to make cross-country comparisons to generate benchmarks for industry performance and thereby identify ways to enhance its competitiveness.

2. A Comprehensive Productivity Appraisal of the Hong Kong Construction Industry. A better understanding of the key drivers and constraints of the productivity performance is essential for policy makers and industry to prioritise their policy and actions for productivity improvement.[1] This project aims to improve construction productivity by recommending solutions to reinforce our advantageous position and at the same time overcome the long-standing hurdles in the industry.

3. Integrating Constructability in Project Planning and Design. A project with high constructability may help reduce and avoid delays and errors and thereby increase the probability of project success.[6] Methods for evaluating and enhancing project constructability will be proposed through this project.

4. Benchmarking the Construction Trade Productivity in Hong Kong. The measurement of trade-level productivity is a critical component that can be used to elevate the overall productivity of the industry.[7] Despite its importance, little research has been conducted to investigate productivity of individual construction trades in Hong Kong. Hence, this project will establish productivity benchmarks of selected trades for project planning and efficiency enhancement.

As endorsement and active participation of the industry is found to be crucial for any productivity enhancement strategies to succeed,[8] in each of these four projects, extensive experience-based feedback will be sought from a wide range of industry stakeholders and experts through interviews, focus group meetings, consultation forums and other methods.

ASSESSING THE PERFORMANCE OF HONG KONG CONSTRUCTION INDUSTRY: AN INTERNATIONAL COMPARISON (APR 2015 – JUN 2016)

To review the performance of the construction industry in Hong Kong, a set of KPIs covering the areas of productivity, health and safety, manpower and dispute resolution was established and published by the CIC. Riding on the momentum gained, the Com-PNR determined to expand the scope of the existing KPIs assessment to the international level in order to formulate a strategic plan for the sustainable development of the industry.

With an aim to advance its competitiveness, the performance of the Hong Kong construction industry will be benchmarked against other countries in this project by achieving the following objectives:

Identifying a set of KPIs for measuring the performance of the Hong Kong construction industry to facilitate historical and international comparisons

This project will firstly look into the pertinent KPIs in both Hong Kong and overseas countries. Subsequent to the review and data mapping, a set of KPIs covering economic, social and environmental dimensions will then be identified in order to evaluate the performance across various sectors of the industry. Three to five overseas cities or countries, including but not limited to Singapore, Korea, Japan, United Kingdom, United States, Australia and New Zealand, will be chosen for the benchmarking.

Collecting and compiling relevant data for the corresponding KPIs over the past 10 years to reveal the industry performance

By compiling the corresponding KPIs based on the data collected, the overall performance under each dimension will be summarised and consolidated to reveal the changes in the local industry performance over the past 10 years. Relevant authorities or agencies will be engaged to understand the data content and methodology. In parallel, the existing KPIs of the selected countries should also be collected to facilitate international comparison.

Comparing the compiled KPIs of the Hong Kong construction industry with overseas economies and thereby to assess the strengths and weaknesses of the industry

The overall local construction industry performance will subsequently be examined in contrast with the selected countries based on the compiled KPIs. Strengths and weaknesses of the local industry will therefore be examined and its position for each dimension is expected to be benchmarked on the global stage. Apart from pinpointing the causes of the performance discrepancies by consultations, whether the local industry could apply best overseas practices will also be analysed.

Formulating strategies and recommendations to enhance the performance and competitiveness of the Hong Kong construction industry for its sustainable development

Based on an in-depth investigation of the deviations between Hong Kong performance and that of other jurisdictions, strategies and measures will be recommended for its performance improvement. With the ultimate goal to sustain the industry development, plans for continuously monitoring and evaluating the industry performance will also be proposed. Besides the KPI reporting system at the industry, corporate and project levels will be investigated for its strategic development.

The Com-PNR is ambitious to formulate a forward-looking plan for the local construction industry to strive for its continuous improvement. With updates in the local KPIs and comparison with construction industries overseas, this project is going to provide us valuable insights on the journey of bringing the industry to new heights.

CHRISTOPHER LEUNG

Prof. Christopher LEUNG is the Head and Professor of the Department of Civil and Environmental Engineering at Hong Kong University of Science and Technology. His research interests include composite mechanics, application of fibre composites, fracture mechanics of cementitious materials as well as the mechanics-based design of fibre optic sensors. One of his early research has established the foundation for designing pseudo-ductile cementitous composites with strain-hardening behaviour, which has been widely applied in real projects in the United States, Japan and China. He has served as associate editor of many journals in his field and has received three research-related prizes and awards. Prof. LEUNG is a Fellow of Hong Kong Institute of Engineers and The International Union of Laboratories and Experts in Construction Materials, Systems and Structures. He is currently serving as the Chairman of the Committee on Productivity and Research under CIC.

A COMPREHENSIVE PRODUCTIVITY APPRAISAL OF THE HONG KONG CONSTRUCTION INDUSTRY (JUL 2015 – DEC 2016)

Facing the challenges of manpower shortage and the increasing global competition, it is imperative for our industry to elevate its efficiency and competitiveness in a holistic way. In view of this, the practices, procedures and standards currently adopted in the industry will be comprehensively and systematically reviewed and evaluated. We anticipate a strategic development plan can be formulated to enhance the productivity and efficiency of the Hong Kong construction industry.

This project aims to improve the productivity and efficiency of the local construction industry by streamlining its development process according to the following four objectives:

Identifying the drivers and constraints of construction productivity in five distinct areas:

(a) policy formation;
(b) regulatory requirements;
(c) planning and design;
(d) project management and administration, and
(e) site construction

Under this hierarchy of levels, both technical factors (including but not limited to, technology employed, procurement approach and project finance) and institutional factors (such as statutory compliance and adversarial relations) that affect construction productivity growth will be explored and evaluated through literature review and expert consultations. Drivers and constraints affecting both private and public sectors' productivity will be identified and analysed.

Analysing the relative levels of impact of the identified productivity drivers and constraints to the Hong Kong construction industry

Industry leaders and representatives of employers, consultants, contractors and sub-contractors will be approached and consulted to examine the impacts of the identified drivers and constraints to the local industry in terms of productivity level. More importantly, real case projects will be critically evaluated to explore how the influencing factors under the above-mentioned areas affect the productivity in the construction site.

Exploring measures, both locally and internationally, for improving productivity levels of the industry

In the anticipation of retaining its competitive advantages and overcoming the existing barriers, the feasibility of adopting international and local best practices in the Hong Kong construction industry will be fully investigated through consultations with overseas experts. Practical solutions to address the constraints for enhancing the industry's productivity and efficiency at the five stipulated levels will also be established correspondingly through extensive consultations with local industry stakeholders.

Formulating strategies and action plan to improve the productivity and efficiency of the Hong Kong construction industry

Having considered the impacts on the industry (e.g. cost, manpower, time savings) and impediments to implement (e.g. compliance of regulations, safety, technological and culture issues, etc), this project will conceive and work out effective strategies, measures and an action plan to improve the industry's productivity. Various industry stakeholders will at the end refine these recommendations through consultation forums.

INTEGRATING CONSTRUCTABILITY IN PROJECT PLANNING AND DESIGN (JUL 2015 – DEC 2016)

A crucial factor affecting construction efficiency and productivity is the constructability of a project, particularly in the case of a building development. Site staff should easily coordinate design requirements, while designs should allow economic use of contractors' resources and enable contractors to develop and adopt alternative construction details.[9] However, little emphasis is placed on buildability considerations during design development, which may lead to low operational efficiency, increased cost and, perhaps, difficulties in maintenance work. With this long-standing issue recognised in *Construct for Excellence* published in 2001, it has been urged that more integrated project delivery processes be implemented in the Hong Kong construction industry.

By enhancing constructability of construction projects in Hong Kong, this project aims at improving the time, cost and quality performance of the industry with the following objectives:

Identifying the factors affecting the constructability of a new building/ infrastructure project

By carrying out consultations with industry stakeholders, reviewing relevant literature, as well as conducting case studies of building and infrastructure projects from both the public and private sectors, factors contributing to project constructability will be identified and the current implementation of constructability in the local construction industry will be assessed. Causes impeding the implementation of constructability can thereby be traced in order to promulgate corresponding and pragmatic initiatives.

Devising scoring systems to evaluate the constructability of a project

Quantitative decision-making tools would be useful to derive prioritised scales for the identified constructability factors and the relative contribution of common construction systems in a project development toward constructability. We will seek advice from experienced industry practitioners and study comparable models overseas for establishing the mechanism, of which industry stakeholders will verify the feasibility for adoption in typical building and infrastructure projects.

Prioritising the means to enhance project constructability in Hong Kong

A list of measures and their potential use for improving the project constructability will be proposed. The financial and technical implications of these solutions will be analysed to ensure their feasibility and practicality. Apart from conducting case studies, feedback particularly from designers and contractors will be solicited through industry-wide consultations.

Exploring best practices to promote constructability in project planning and design

To improve constructability, quantified assessment of designs, alternative procurement route constructability review, and implementation of constructability programmes at different project stages are all essential to realise the goals and objectives of constructability in project delivery. In addition, there is a strong need for effective strategies to put constructability into practice in our industry. Recommendations will be sought from industry stakeholders to devise practical solutions for improved constructability.

By integrating constructability in project planning and design, this project is expected to enlighten the industry in pursuing greater emphasis on the constructability of designs at the start of the project, with the goals of cost-saving and productivity enhancement.

BENCHMARKING THE CONSTRUCTION TRADE PRODUCTIVITY IN HONG KONG (FEB 2015 – JUL 2016)

The local construction industry has paid inadequate attention to trade productivity, even though it is one of the most important contributing factors reflecting the efficiency of the workforce and impacting the progress of any construction project. Establishing benchmark indicators at the trade level would be valuable for builders to measure and evaluate trade productivity on a common platform. By providing this important information for project planning and works scheduling, the benchmarks are expected to help raise the overall productivity and competitiveness of the industry.

Local trade productivity benchmarks will be developed to achieve the goal set in this project according to the following four objectives:

Determining 10 most critical trades that affect the productivity

By analysing the construction process of typical building and infrastructure projects (i.e. through both critical path analysis and considering the volume of work of the trade) and expert consultations, the five most critical trades in building projects and another five in infrastructure projects would be identified. The analysis will cover public housing, private residential and office building projects in the building sector, as well as railway and highway projects in the infrastructure sector.

Developing methodology for measuring the productivity of the selected trades

Trade productivity hinges heavily on various elements of a construction project, including project type, project management, site conditions, worker's competence and supervision. Therefore, before defining and establishing the measurement framework of the selected trades' productivity, a review of the literature on the current practices or standards in productivity measurement in both the local and international construction industries will be conducted. Practical procedures of measurement and calculation of the trade productivity validated by relevant local trade experts will be set out for builders to analyse their own productivity performance.

Establishing benchmark indicators for the productivity of these trades

Based on the proposed measurement framework, data will be collected from on-going and recently completed projects in Hong Kong for developing productivity benchmarks of the 10 selected trades. To establish proper benchmarks, adequate sample size and appropriate selection of cases will be ensured.

Comparing and evaluating the productivity performance of these trades with that of other developed countries

With a view to improve the local trade productivity, it is crucial for us to look into the issue from a broader perspective. By comparing the productivity indicators of the selected trades in Hong Kong with those of other developed countries, the discrepancies will be pinpointed. More importantly, corresponding pragmatic measures for improvement will be proposed to the industry.

The Com-PNR will aspire to make the measurement framework and tools designed in this project more widely adopted by the local builders to review and evaluate their respective productivity performance of the selected trades, thus facilitating the productivity improvement of the entire industry.

JULIAN LEE

Ir Julian LEE is Manager – Research of the Construction Industry Council. He was formerly the Lead Engineer (Civil and Structural) of Worley Parsons Pte Ltd and Senior Engineer of Arup Singapore Pte Ltd. He is a Chartered Civil Engineer in the United Kingdom and a Registered Professional Engineer in Hong Kong. With more than 15 years of experience in the construction industry, Ir LEE has managed many different kinds of construction projects, including power plants, railways, underground tunnels and building development. Joining the CIC with the aim of promoting the application of innovation technology and good practices, Ir LEE manages construction-related research projects such as carbon labelling for construction materials to reduce the environmental impact of the industry.

In order to sustain the high level of construction activities as well as the competitiveness of our industry, it is of paramount importance to raise the productivity performance of the local construction industry. The Com-PNR is geared up for raising the productivity performance collectively by implementing the strategies devised based on the cross-country comparisons of KPIs and comprehensive industry appraisal, together with industry-wide adoption of the trade productivity benchmarks and constructability practices. The competitive edge of the industry can be sharpened to boost the progress of the major infrastructure projects and housing programmes that are currently in full swing.

JAMES WONG

Dr. James WONG is a Senior Officer – Research of the Construction Industry Council, facilitating research application and execution, as well as implementing relevant research outcomes for the construction industry in Hong Kong. He received a bachelor's degree in building technology and management and a doctorate in construction economics from the Hong Kong Polytechnic University, Hong Kong. Dr. WONG then worked as a Post-doctoral Research Fellow at the Department of Civil Engineering, the University of Hong Kong, managing diversified construction-related research and consultancy projects including construction economics and forecasting, construction procurement, project management, professional development and sustainability in construction.

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提升建築生產力的研究議程

現時勞動力短缺，影響建造業的國際競爭力，建造業議會（議會）因此非常關心香港的建築生產力水平。議會發表了一系列研究行業整體表現的報告，其轄下生產力及研究專責委員會（委員會）正進一步評估建築生產力、尋找誘因和機遇，以求進步。委員會將展開四個諮詢計劃，望能提升業界的效率和生產力至更高水平。

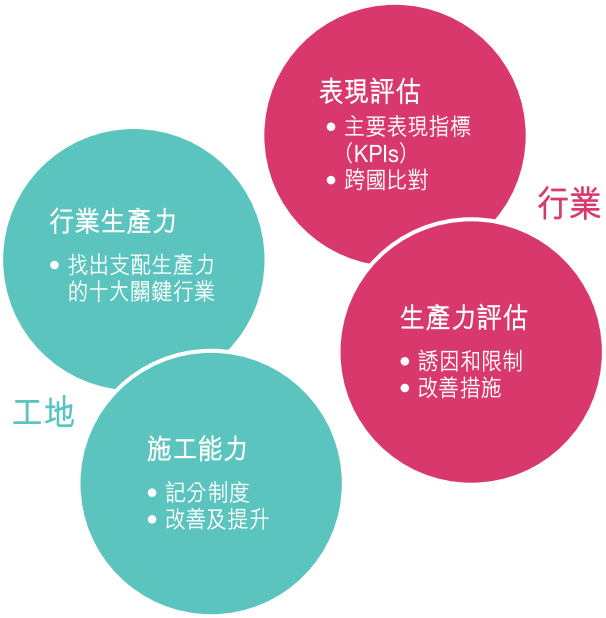

圖1　委員會為改善建築生產力表現而展開的四個諮詢項目

生產力是指一個系統的產出與系統用來生產該輸出的投入量之關係。[1] 生產力是支配建造業經濟生產活動之關鍵可變因素，[2,3] 直接影響建築及基建項目的進度和成本，以及業界於全球市場的競爭力。要提高生產力，系統必須運用相同資源生產更多或更好的產品；或運用更少資源來生產相同的產品。[4]

過去五年，香港的建築勞動生產力一直上升，行業倚重傳統的勞動密集型建築方法，如圖1所示。另外，香港在採用如模組建築系統和建築信息模擬（BIM）等新興建築方法的速度緩慢。因此，本地建造業的生產力還有待改善。

要提高生產力，系統必須運用相同資源生產更多或更好的產品；或運用更少資源來生產相同的產品。

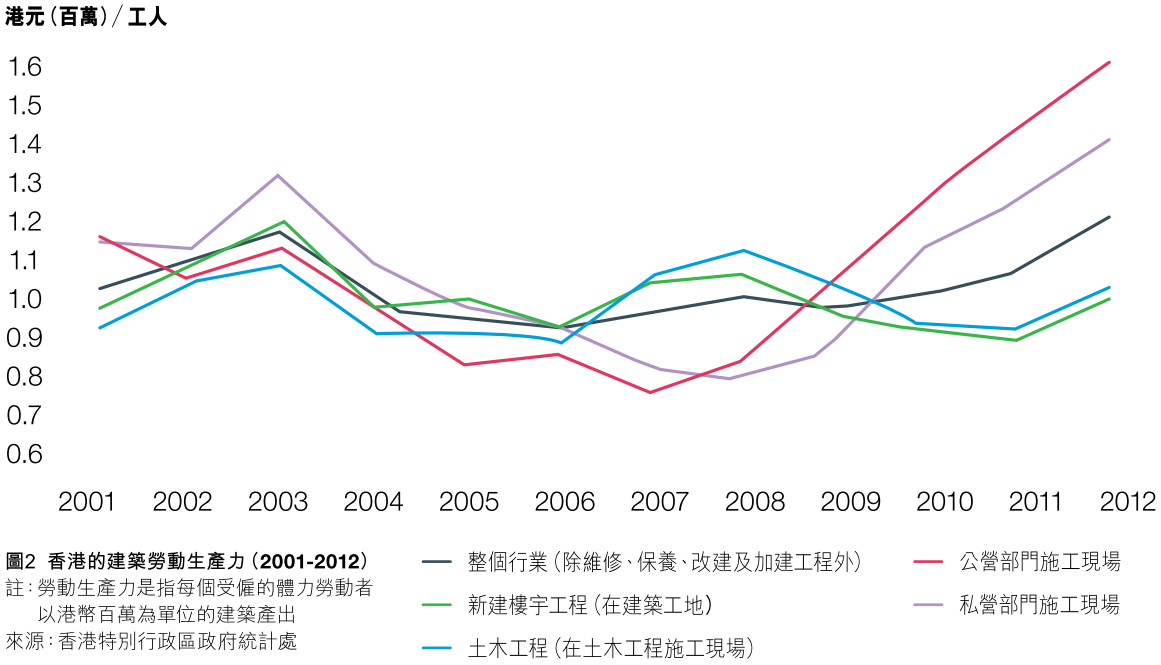

圖2 香港的建築勞動生產力（2001-2012）
註：勞動生產力是指每個受僱的體力勞動者以港幣百萬為單位的建築產出
來源：香港特別行政區政府統計處

一連串的大型基建和住宅項目令勞動力供應緊張，生產力應繼續為研究焦點，以防行業在全球市場落後於人。因此，委員會分別於建築工地和整體行業兩個層面上展開二加二研究項，以評估建築生產力、尋找誘因和機遇，從而提高生產力。

1. 評估香港建造業表現：跨國比對。經濟合作與發展組織（經合組織）大力推行了一個清晰而有條理的方法來量度生產力。[5] 主要表現指標（KPIs）已制訂，令這個計劃有望能進行跨國比對，以評估行業表現，從而設法提高競爭力。

2. 香港建造業生產力綜合評估。制訂政策的人和業界必須掌握影響生產力表現的關鍵誘因和限制，才能按緩急輕重調配政策和行動來求進步。[1] 這個計劃著力透過提出解決方法來鞏固行業的優勢，以改善建築生產力；同時又致力為行業解決根深蒂固的難題。

3. 於項目規劃和設計中結合可建築性。可建築性高的項目能有助減少和避免延期與出錯，因而加大項目成功的機會。[6] 這個計劃會提出評估和改善項目可建築性的方法。

4. 評估香港建造業工種的生產力。從工種層面來量度生產力是評估行業整體生產力的一大關鍵。[7] 雖然重要，但香港仍然缺乏調查個別建築工種生產力的研究。故此，這計劃會就指定工種來制訂生產力基準，以改善項目規劃工作和效率。

改善生產力的規劃要有成效，業界的支持和參與是不可或缺的。[8] 有見及此，這四項計劃會從訪談、專責小組會議、諮詢論壇和其他途徑，廣泛收集具經驗的業界代表和專家的意見。

梁堅凝

梁堅凝教授是香港科技大學土木及環境工程學系系主任，他的研究興趣涵蓋複合材料力學、纖維化合物的應用、膠結材料斷裂力學以及力學方法設計的光纖傳感器等。他的其中一個早期研究透過研究應變強化行為，奠定了設計偽延性水泥基複合材料的基礎，並被廣泛應用於美國、日本及中國的實際項目中。他擔任這一領域多本雜誌的副主編，並獲得三項與研究相關的獎項與榮譽。梁教授還是香港工程師學會和國際材料與結構研究實驗聯合會的資深會員，他目前在建造業議會擔任生產力及研究專責委員會主席。

評估香港建造業表現：跨國比對（2015年4月—2016年6月）

為鑑別香港建造業表現，議會制訂並公布了一套主要表現指標（KPIs），其內容涵蓋生產力、健康與安全、人力和爭議解決。委員會決定乘勢而上，將現有KPIs評核的範圍擴展至國際水平，以制訂周全計劃，令行業可持續發展。

為加強業界競爭力，本計劃會通過達至以下目標將香港建造業的表現與其他國家比較：

制訂一套KPIs來量度香港建造業的表現，從而跟過往和全球作比對

該計劃先研究香港和外國的相關KPIs。經過檢討和資料配對後，即能訂出一套範圍涵蓋經濟、社會和環境方面的KPIs以評估行業間的表現。測量基準將以三至五個海外城市或國家為本，新加坡、韓國、日本、英國、美國、澳洲和紐西蘭均可能入選。

收集和整理近十年相應KPIs的相關資料以展示行業表現

根據收集得來的資料，整理好相關的KPIs後，就能為每個層面的整體表現作總結，展示出本地業界近十年的轉變。相關專家和機構會深入分析資料和方法。與此同時，被選中國家的現有KPIs亦可收集作跨國比對。

將整理好的香港建造業KPIs跟海外經濟比較，從而評估行業的長處和短處

隨後，以整理好的KPIs為本，跟已選國家比對，審核本地建造業的整體表現，本地業界的長短之處就會一目了然，其各方面表現亦可按國際基準定位。除了透過咨詢來指出表現落差之成因外，計劃亦會分析本地業界能否推行最優良的海外做法。

制訂策略和提出建議來改善香港建造業的表現與競爭力，以達至可持續發展

仔細研究本地業界表現與其他國家的落差，並以此為本，提出策略和措施去改善情況。使業界穩定發展乃長遠目標，故此項目亦會提出長期計劃來監察和評估行業表現。若要周全發展，除行內的KPI報告系統外，公司和項目層面的事項也必須詳細研究。

為了使本地業界持續進步，委員會期望能開展一個有前瞻性的周全計劃。有了最新的本地KPIs和海外建造業的比較成果，本計劃能為我們帶來前所未有的視點，帶領行業開創一個全新天地。

香港建造業生產力綜合評估（2015年7月—2016年12月）

勞動力短缺加上環球競爭日趨激烈，建造業的當務之急是要全面評核其效率與競爭力。因此，業內最近推行的做法、程序和標準將被有系統而全面地檢討和評估。我們期待制訂出一個周全的發展計劃，以改善香港建造業的生產力和效率。

本計劃以下列四大目標為本，改進行業的發展過程，致力提高本地建造業的生產力和效率：

在五個不同的範疇中找出建築生產力的誘因和限制：
（甲）政策架構；
（乙）監管要求；
（丙）規劃與設計；
（丁）項目管理及執行和
（戊）工地施工

在這樣的框架下，計劃會包括文獻探討和專家咨詢，探究和評核影響建築生產力增長的技術因素（包括但不限於採用的技術、採購方法和項目財政）和制度因素（如遵從法制和對立關係）。影響公營與私營部門生產力的誘因和限制也在分析之列。

找到香港建築生產力的誘因和限制後，分析其相對影響

本計劃會咨詢業界領導和僱主、顧問、承建商和分包商代表，評估本地業界既有的生產力誘因和限制。更重要的是，計劃將評估真實項目，探討各項關鍵因素在上述範疇下如何於工地影響生產力。

為改善行業的生產力水平，研究本地和國際措施

計劃期望保持行業的競爭優勢和衝破現有障礙，因此會咨詢海外專家，研究是否可於香港建造業實踐國際和本地的最佳作業方式。在五大指定範疇下，改善行業生產力與效率有不同限制，計劃會廣泛咨詢本地業界的各方代表，找出具體解決方法。

為改善香港建造業的生產力和效率制訂策略和行動計劃

審視過影響行業的因素（如成本、人力、時間成本）和實踐的難處（如法規、安全、技術和文化問題）後，項目會設計和實踐奏效的策略、措施和行動計劃，以改善行業生產力。最後，在咨詢論壇上，行業的各方代表會修訂這些建議。

於項目規劃和設計中結合可建築性（2015年7月—2016年12月）

項目的可建築性影響建築效率和生產力，尤其於樓宇建築更是如此。設計要求應容許承建商善用其資源，並有彈性讓承建商可發展和採用其他建築細節。可是，設計發展往往甚少考慮可建造性，令運作效率下降、成本增加，甚至保養困難。2001年發表的《建業圖新》承認了這根深蒂固的問題，並指香港建造業必須採取更多整合的項目交付過程。

本計劃致力提升香港建築項目的可建築性，通過達至以下目標來改善業界的時間效率、成本運用和質素。

找出影響全新樓宇 / 基建項目可建築性之因素

計劃先咨詢業界各方代表，探討相關文獻，就公營與私營部門的樓宇和基建項目展開個案研究，並隨之找出影響項目可建築性的因素，從而評定本地建造業現時的可建築性。故此，計劃可查出窒礙可建築性的成因，推出相應的務實方案。

設置計分制度，評核項目的可建築性

量化的決策方法不但有助將影響可建築性的已知因素排序，更能幫助找出各種普遍建築系統對於項目發展的相對成效。推出制度前，我們會咨詢業內具經驗的專業人才，並研究海外類似的做法，再由業界各方代表審視它們是否適合在平日的樓宇與基建項目中實行。

將提升本地項目可建築性的方法排序

本項目將建議一系列方法並列明其作用，用以提升項目的可建築性。為保證方法務實而可行，我們會分析當中的經濟和技術影響。除了展開個案研究，我們還會廣泛咨詢業界，收集尤其來自設計師和承建商的各方意見。

研究於項目規劃和設計中改善可建築性的最佳作業方式

量化評核設計、其他採購途徑、審視可建築性、以及於不同施工階段實施針對可建築性的措施，皆是在項目交付過程中能令我們實踐項目可建築性的作業方式。再者，建造業急需奏效的策略來實踐可建築性。項目會先徵詢業界各方代表的建議，再設計務實的解決方案來提升可建築性。

於規劃和設計的階段結合可建築性，我們期望這個諮詢項目能使業界於開展項目時的設計階段格外注重其可建築性，從而節省成本和提升生產力。

評估香港建造業工種的生產力（2015年2月—2016年7月）

香港建造業工種的生產力十分重要，不但反映勞動力效率，更影響建築項目進度。儘管如此，本地建造業對此未有重視。於工種層面設立基準指標，能協助建築師在同一平台上量度和評測工種生產力。在項目規劃和工作安排中有了這個重要的基準後，建造業的整體生產力和競爭力就有望提升。

計劃會通過達至以下四大目標來制訂本地工種生產力基準：

找出對生產力有最大影響力的十大關鍵工種

本計劃先分析一般樓宇和基建項目的建築流程（即分析關鍵程序和考慮工種的工作量）並咨詢專家，再於樓宇項目和基建項目中，各找出五大關鍵工種。在樓宇範疇上，分析將涵括公共房屋、私人住宅和辦公大樓項目；而基建範疇則有鐵路和公路項目。

發展用以量度指定工種生產力的方法

工種生產力受項目類型、項目管理、工地狀況、工人水平和監管工作等各個建築項目的元素影響。因此，闡明和推出計算特定工種生產力量度框架前，項目會先研究本地和海外建造業量度生產力的現有方法與準則的相關文獻。計劃亦會向建築師提出獲本地相關行業專家認可的可行方案，來量度和計算工種生產力，以便他們自行分析生產力表現。

為這些工種制訂生產力基準指標

以項目所建議的量度框架為本，從香港剛落成和仍在進行的項目中收集資料，以為十個指定工種制訂生產力基準。我們確保會收集足夠的樣本和合適的案例，令基準完備而合理。

將這些工種的生產力表現跟其他已發展國家互相比對和評鑑

若要改善本地業界生產力，我們必先具備廣闊視野。將特定的香港工種生產力指標跟其他已發展國家比較，即能凸顯其中分別，並向建造業提出相應的務實方案。

本項目所設計的量度框架和工具能大大改善建造業上下的生產力，委員會希望本地建築師能善用之，從而檢討和評鑑他們在指定工種中各自的生產力表現。

李俊暉

李俊暉工程師是建造業議會研究經理，曾任Worley Parsons Pte Ltd首席工程師（土木及結構）和Arup Singapore Pte Ltd高級工程師。他是英國特許土木工程師及香港註冊專業工程師，在建造業擁有超過15年經驗，曾管理許多不同類型的建設項目，包括發電廠、鐵路、地下隧道和建築發展等。李工程師致力推動創新科技和良好作業方式，於議會內負責管理如建材碳標籤等與建築有關的研究項目，以減少行業對環境的影響。

若要保持頻繁的建築活動和保持建造業的競爭力，當務之急是提升本地建造業的生產力。建造業廣泛採用行業生產力基準和可建築的作業方式，委員會也準備就緒，以跨國KPIs比對和完備的行業評估為本，將設計好的策略付諸實行，以全面提升生產力。計劃定能提高行業的競爭力，使正如火如荼進行的各大基建和房屋項目同獲裨益。

黃明華

黃明華博士是建造業議會研究高級主任，負責推進研究項目的應用和實踐，以及推行與香港建造業相關的研究成果。黃博士持有香港理工大學建築技術和管理學士學位及建築經濟博士學位，後於香港大學土木工程系擔任博士後研究員，管理多元化的建築相關研究和諮詢項目，包括建築經濟與預測、工程採購、項目管理、專業發展及可持續發展建築。

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CONSTRUCTION INDUSTRY COUNCIL
建造業議會
Address 地址：15/F, Allied Kajima Building
138 Gloucester Road, Wanchai, Hong Kong
香港灣仔告士打道138號聯合鹿島大廈15樓
Tel 電話 ：(852) 2100 9000
Fax 傳真 ：(852) 2100 9090
E-mail 電郵 ：enquiry@hkcic.org
Website 網址 ：www.hkcic.org

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