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香港職業安全衛生協會
THE HONG KONG OCCUPATIONAL SAFETY AND HEALTH ASSOCIATION

Development and Application of Ultra-high Strength Steel S960 in Footbridge Construction

Author: DCK JV (Joint Venture of Daewoo E&C Co., Ltd, Chun Wo C&E Co., Ltd and Kwan Lee Holding Limited)

Background

The contract encompasses the comprehensive construction of the Fanling Bypass Eastern Section, which spans approximately 2 kilometers between Shek Wu San Tsuen North and Lung Yeuk Tau. This major infrastructure project includes several critical components to enhance transportation efficiency and local amenities. The Project Manager is AECOM Asia Co., Ltd. and the Contractor is DCK JV (Joint Venture of Daewoo E&C Co., Ltd, Chun Wo C&E Co., Ltd and Kwan Lee Holding Limited).

The project is set to significantly enhance regional infrastructure by constructing a dual two-lane roadway, which will integrate various structural types, including viaducts, at-grade roads, and underpass sections. A key feature will be the development of the Lung Yeuk Tau Interchange, designed to facilitate seamless connectivity between the Fanling Bypass Eastern Section and the existing Sha Tau Kok Road – Lung Yeuk Tau. Additionally, the project includes the construction of a footbridge over

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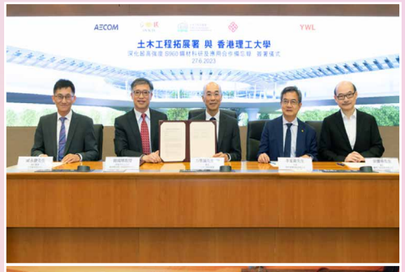
the Ng Tung River, complemented by a combined cycle track and footbridge over the Lung Yeuk Tau Interchange, thereby promoting sustainable transportation options. To support effective wastewater management, a sewage pumping station will be established adjacent to the interchange. The initiative will also involve reprovisioning of community facilities, including the On Lok Mun Street Playground, a public toilet, and a refuse collection point, enhancing local amenities for residents. Lastly, road junction improvements within the North District will improve traffic flow and safety, contributing to a more efficient transportation network.

The major project includes a comprehensive suite of associated works designed to ensure the infrastructure's structural integrity and functionality. This encompasses thorough ground investigations to assess soil conditions, alongside geotechnical instrumentation and monitoring to guarantee stability and safety throughout construction. Essential slope and retaining wall construction will be implemented to manage the terrain effectively and prevent erosion. Furthermore, installing drainage and sewerage systems will facilitate efficient stormwater and wastewater management, while water supply infrastructure upgrades will accommodate increased demand. To address environmental concerns, noise barriers will be installed to mitigate the impact of traffic noise on surrounding areas. Additionally, the project will incorporate traffic control and surveillance systems to enhance the monitoring and management of traffic flow. Necessary electrical and mechanical works will be undertaken to support the overall functionality of the infrastructure, complemented by landscaping enhancements aimed at improving the aesthetic quality of the surrounding environment.

The World's First Use of Ultra-high Strength S960 Steel in Footbridge Construction

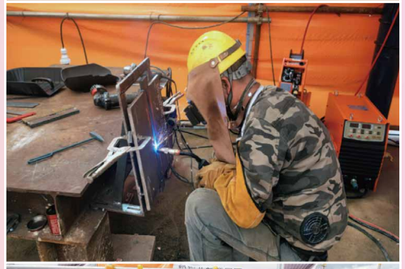
The Fanling North New Development Area, Phase 1- Fanling Bypass Eastern Section (Shek Wu San Tsuen North to Lung Yeuk Tau) project is now in full swing. The Civil Engineering and Development Department (CEDD) is committed to enhancing the efficiency and sustainability of the works in the North District and making the district a sustainable community. Thus, the CEDD has collaborated with the Hong Kong Polytechnic University (PolyU) to jointly develop a brand new bridge design and construction technique using sustainable construction material, ultra-high strength S960 steel for the construction of two footbridges, which is the world's first application of S960 steel in bridge construction.

07/2023



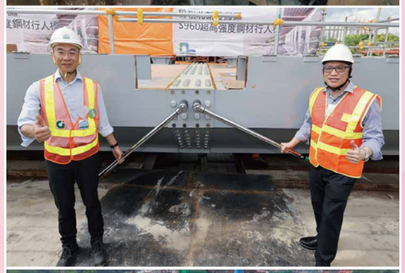
The CEDD and PolyU signed a Memorandum of Understanding to deepen collaboration in the research and adoption of high-strength steel for facilitating the use of ultra-high strength S960 steel in bridge construction projects, witnessed by the engineering consultant, AECOM, the Contractor, DCK JV and the design consultant, YWL.

08/2023-06/2024



Ultra-high strength S960 steel welding trial mimicking actual operation condition and welding test at construction site

06/2024



Section of ultra-high strength S960 steel footbridge assembly ceremony

08/2024

Lifting bridge segments at construction site

Looking Forward

The use of ultra-high-strength S960 steel in the construction of the footbridge highlights a successful collaboration between the government, academia, and industry. This innovative application not only establishes a technological foundation for future bridge construction projects but also significantly reduces carbon emissions during the building process, promoting sustainable development.

Benefits of using S960 steel include:

- Higher tensile-strength than normal-strength steel effectively reduces overall steel consumption, improves resistance to deformation, enhances fatigue strength, and lowers construction costs.
- A lighter bridge deck design that results in a slimmer bridge structure, reducing the number of required piles.
- An asesthetically streamlined appearance.
- Enable the use of smaller lifting equipment, which decreases safety risks.
- A significant reduction in carbon emission.
- Improved construction efficiency, leading to shorter construction timelines.

Looking ahead, this project aims to enhance the transportation network in Fanling, fostering a greener and more livable environment for the community. By integrating modern engineering practices with community-focused improvements, this initiative will be crucial in advancing the overall development and sustainability of the region.

Smart Site Safety System

The “Smart Site Safety System” has been extensively adopted in this Project with the collaboration of CEDD and AECOM. This innovative system incorporates smart safety devices designed to monitor site conditions and identify safety hazards effectively. It features a communication network that transmits data collected from these devices to a centralized management platform. By collecting and transferring real-time data, the system ensures the frontline safety staff immediately alerted whenever potential hazards are detected, enhancing overall safety on the construction site.

4D Building Information Modelling

By using 4D simulation of construction sequences, the project team can create detailed safety plans, method statements, and site layout plans before construction begins. These simulations incorporate necessary safety measures into animations for specific tasks, such as bridge rotation and temporary traffic arrangements, are produced with the required safety measures incorporated. Such techniques have been effectively used in safety training, significantly enhancing the safety awareness of frontline supervisors and workers. Additionally, they help the project team communicate work arrangements to the public more clearly.

Internet of Things (IoT) Sensors and Virtual Reality (VR) Technology

By utilizing solar-powered sensors, noise levels and air quality can be monitored in real time. Workers are provided with smart helmets and smart watches equipped with various communication chips to effectively track their health conditions, particularly in hot weather, ensuring their safety and well-being. Additionally, a virtual construction site environment can be created using VR technology. With VR glasses, safety training that simulates the actual site environment can be conducted, enhancing safety awareness among trainees. Furthermore, AI cameras continuously monitor site conditions around the clock. By employing face recognition and electronic lock technologies, access to hazardous areas, such as work at heights on the bridge deck is restricted to qualified workers only. These devices also detect potentially unsafe behaviors, such as the absence of proper personal protective equipment (PPE), and can monitor traffic conditions on highways, instantly notifying the project team in the event of collisions or congestion for prompt emergency response.

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The Art of Occupational Safety and Health in the Hong Kong West Cluster

Author: Hong Kong West Cluster OSH Team, Hospital Authority

It is universally acknowledged that occupational safety and health (OSH) are firmly rooted in science. However, science alone is insufficient to foster and uphold an OSH culture. In practice, we require more than mere scientific principles; a touch of artistry is often essential. Despite notable progress in recent years, there remains much to achieve in the local context. To advance staff safety and fortify the safety culture, a systematic approach, with meticulous planning and regular updates to adapt to the swiftly evolving clinical environment, is imperative. To this end, the OSH Team of the Hong Kong West Cluster (HKWC) has embraced this challenge with determination.

For an institution as extensive and intricate as the Hospital Authority, it would be unrealistic to anticipate complete incident-free operations. What is paramount is that while incidents may transpire, none escalate to a level of major safety concern. Nonetheless, the quality of OSH services must be consistently upheld to meet the legitimate expectations of colleagues regarding workplace safety. Since 2013, the HKWC OSH Team has concentrated on the proactive identification of hazards and the provision of superior staff-centric services to eliminate or mitigate these risks. In 2014, the HKWC OSH risk inventory was established, encompassing key chemical, physical, and environmental hazards. A three-year OSH rolling plan was subsequently devised based on the risk levels of identified hazards. This plan facilitated the annual conduct of numerous environmental surveillance assessments (Photos.1 & 2) for risk quantification, providing a quantitative foundation for designing and monitoring the efficacy of control measures. Concurrently, safety awareness was bolstered through diverse OSH training sessions and routine field inspections. Moreover, procurement specifications were aligned with essential safety standards and design to ensure workplace safety. This integrated approach, coupled with active staff engagement, is deemed the most effective and indispensable strategy for addressing OSH concerns and preempting potential crises at an early stage.

We have gathered some evidences to support the notion that a proactive approach in managing job-related hazards will bring about sustained positive outcomes at the cluster level. These outcomes include enhanced job satisfaction, heightened staff commitment, and improvements in overall performance and productivity. Although these metrics are subjective, they are supported by concrete data, exemplified by a significant 48.5 percent reduction in the Injury of Duty (IOD) rate and a 38.2 percent decrease in Sick Leave rate from 2018 to 2023. Creating and preserving a safe working environment necessitates collective effort; hence, commitment of the top management is essential to provide the requisite support. Are there any other avenues worth exploring? Can we further enhance our OSH culture? Let us put our heads together and work on it.

Photo 1: Conducting a personal assessment of noise and chemical exposure is essential for evaluating the effectiveness of existing current control measures and ensuring sustained workplace safety

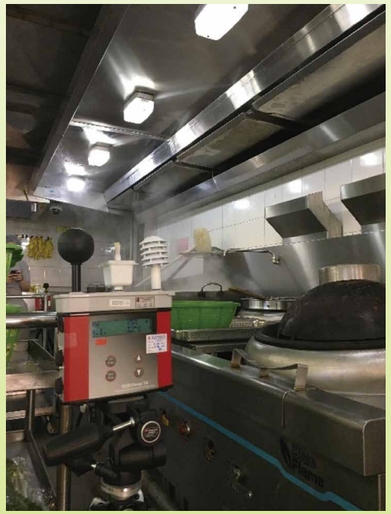

Photo 2: A comprehensive cluster heat stress assessment for catering was conducted from June to September to ensure effective management of heat stress issues throughout the summer months

《竹棚架工作安全守則》2017年9月(第四版)及2024年4月(第五版)更新比對摘要

資料來源：某知名建築公司

因應勞工處更新了《竹棚架工作安全守則》，在此與會員分享兩個版本的差異以供參考。以下只列出重點摘要，請掃瞄二維碼查閱完整版本。

	2017年9月（第四版）		2024年4月（第五版）
			
頁數	內容	頁數	內容
2-3	2.4 “曾受訓練的工人” 2017年版冇此段	2-4	2.4“曾受訓練的工人” 2.4.2 在搭建懸空式竹棚架而言，除 2.4.1 段的要求外，曾受訓練的工人是指持有由建造業議會發出的有效“高級懸空式棚架安全訓練”證明書或“中級懸空式棚架安全訓練”證明書的人。相關工人可進行的工作見5.3.3(b) 段。
18-24	5.3 竹棚架的架設 / 擴建 / 更改 5.3.1 一般規定 (a) 須由曾受訓練的工人在合資格的人的直接監督下**架設、擴建或更改竹棚架**（《建築地盤（安全）規例》第38E條）。 2017年版冇此段	20-29	5.3 竹棚架的架設 / 相當程度上的擴建 / 更改 5.3.1 一般規定 (a) 須由曾受訓練的工人在合資格的人的直接監督下架設、相當程度上的擴建或更改竹棚架《建築地盤（安全）規例》第38E條）。合資格的人的直接監督工作應在安全的情況下進行，並專注於監督棚架及曾受訓練的工人的安全。該合資格的人不可同時參與相關竹棚架工作。 (p) 應為搭建棚架工人及使用棚架的人設置安全進出口到工作地點。其中一個方法是在樓宇 / 構築物及棚架中間提供一安全木板路。應使用提供了的進出口，不得沿棚架的直杆 / 大橫杆攀爬。當需要在棚層間進出時，安全進出口應： (i) 設置於連續棚層的進出口孔洞必須為交錯佈置，並因應工作需求，設置合適數量的進出口孔洞。（詳情見圖3） (ii) 在不使用時必須蓋好進出口孔洞。每一為孔洞而設置的覆蓋物，其構造須能防止人、物料及物品墮下，並須以粗體字清晰地標明，以顯示

	5.3.2 特別規定 (f) 如果棚架的高度超逾7米，縱行每4米或以下及橫行每7米或以下便須設置連牆器（俗稱拉搇），將棚架穩固地繫於樓宇/構築物表面（詳情見圖3）。舉例說，大橫杆/直杆與結構錨栓之間可以用鋼線連接，組成一連牆器，而結構錨栓則預置於樓宇外牆結構良好的構件上。所用的鋼線（直徑最小6毫米）及結構錨栓應有足夠的強度。此外，在每條連牆器的位置都應以一條短小及實際直徑不小於40毫米的竹竿（作為支杆用途）連接內棚及樓宇外牆，以限制棚架內移的幅度（連牆器位置的詳情見圖3及連牆器/支杆佈置詳情見圖4）。 2017年版冇此段		其用途，或穩固地固定於適當位置。（詳情見圖3） (iii) 額外架設的踏腳橫杆（“橫檔”）的距離應符合其他國家或國際標準或規定，例如英國標準BS EN 131-1:2015+A1:2019，其距離應為不小於250毫米和不多於300毫米。（詳情見圖3） (iv) 如棚架的闊度過於狹窄，以致未能設置交錯佈置的進出口，便應考慮其他可行方法，提供足夠和合適的安全進出口。（詳情見圖3） (u) 禁止棚架工人或其他工種的工人，擅自改動竹棚架（包括連牆器（俗稱拉搇））。 5.3.2 特別規定 (f) 連牆器是由一根金屬繫件和連牆撐組成，能有效約束側向拉力，並將棚架穩固地繫於樓宇/構築物表面（詳情見圖4及圖5）。為確保竹棚架的結構穩定性，包括在惡劣天氣下的狀況，連牆器的橫向間距不得超逾3米。如竹棚架架設在離地面少於100米的高度，連牆器的垂直間距不得超逾6.3米；如竹棚架架設在離地面100米或以上的高度，連牆器的垂直間距便不得超逾4.2米。此外，連牆器應遵行以下要求： (i) 大橫杆/直杆與繫穩螺絲之間可以用金屬繫件連接，而繫穩螺絲則預置於樓宇外牆結構良好的構件上。（金屬繫件佈置詳情見圖5）。金屬繫件和繫穩螺絲的要求如下： (1) 所用的金屬繫件需符合直徑最小6毫米，抵禦強度為每平方毫米250牛頓（250N/mm2），最少可伸長15%的軟鋼條；此外一捆鋼線或其他物料（例如狗臂架），只要能抵禦相同的拉力及具備相同的機械性能也可使用。 (2) 所用的繫穩螺絲的抗拉力應大於7千牛頓(kN)。其安裝的細則和程序，則以製造商的建議為準。所用的繫穩螺絲必須進行測試以確保其質量。有關的荷載測試，需要1.5倍於工作荷載，測試時間最短為3分鐘。此外，從測試儀器拉出的任何一個反力支柱”與繫穩螺絲中央的距離，最少應為繫穩螺絲直徑的8倍，以免“支承反力”減輕了測試儀器所拉出的測試力度。測試時，混凝土及繫穩螺絲之間不應有分離或斷裂跡象。應從棚架的不同位置選取連牆器的繫穩螺絲作樣本測試，測試的比率如下：5%或不少於5個（以較多者為準）。 (ii) 在每條繫件的位置都應以一條短小及實際直徑不小於40毫米的竹竿（作為連牆撐用途）連接內棚及樓宇外牆，以限制棚架內移的幅度（連牆撐佈置詳情見圖5）。
25-26	6. 竹棚架的檢查、維修及拆卸 6.1 竹棚架的檢查及維修 6.1.1 棚架在首次使用前須由合資格的人檢查，並且再由合資格的人在緊接每次使用前的14天內，定期地檢查，否則該棚架不應在建築地盤內使用（《建築地盤（安全）規例》第38F條）。 2017年版冇此段	30-32	6. 竹棚架的檢查、維修及拆卸 6.1 竹棚架的檢查及維修 6.1.1 棚架在首次使用前須由合資格的人檢查，並且再由合資格的人在緊接每次使用前的14天內，定期地檢查，否則該棚架不應在建築地盤內使用（《建築地盤（安全）規例》第38F條）。 6.1.2 承建商在惡劣天氣情況如颱風或強烈季候風等吹襲前，必須預先確保棚架的結構強度及穩固性，並在合理及切實可行範圍內採取所需的預防措施，包括但不限於以下要求： (a) 合資格的人應在該等天氣狀況及任何對棚架工程會有壞影響的天氣情況如強風或颱風發生前，對竹棚架進行徹底檢查，並作出所需的改善或加固。 (b) 在強風或颱風發生前，合資格的人亦應確保竹棚架的保護幕已降低及綁扎或拆除，並移除竹棚架上存放的物料。

	6.2 竹棚架的拆卸 拆卸工作須由曾受訓練的工人在合資格的人的直接監督下進行（《建築地盤（安全）規例》第38F條）。		6.2 竹棚架的拆卸 6.2.1 拆卸工作須由曾受訓練的工人在合資格的人的直接監督下進行（《建築地盤（安全）規例》第38E條）。**合資格的人的直接監督工作應在安全的情況下進行，並專注於監督棚架及曾受訓練的工人的安全。該合資格的人不應同時參與竹棚架的拆卸工作。**
33	竹棚架工作安全守則 圖 3：竹棚架連牆器及斜杆的位置（正面 — 不按比例） 連牆器之位置（每隔垂直距不多於 4 米及橫距不多於 7 米） 跨度：不超過 9 米 斜杆之位置 角度：不得超過 60° 而最理想的角度是 45° 備註：- (i) 小橫杆的位置沒有在此顯示。 (ii) 高度超過 7 米的竹棚架須裝有連牆器。	41	竹棚架工作安全守則 圖 4：竹棚架連牆器及斜杆的位置（正面 — 不按比例） 跨度：不超過 9 米 斜杆之位置 連牆器（由緊件和連牆撐組成）之位置（每隔橫距不多於 3 米；並直間距見備註 (ii)） 角度：不得超過 60° 而最理想的角度是 45° 備註：- (i) 小橫杆的位置沒有在此顯示。 (ii) 竹棚架離地面少於 100 米的高度，連牆器的垂直間距不得多於 6.3 米；竹棚架在離地面 100 米或以上的高度，連牆器的垂直間距不得多於 4.2 米。 (iii) 每支斜杆應與竹棚架的直杆和大橫杆綑扎。
34	竹棚架工作安全守則 圖 4：雙行竹棚架連牆器／支杆的構造細則（側面 — 不按比例） 樓宇表面 除此之外，在每條連牆器的位置，用實際直徑不小於 40 毫米的短竹竿（作為支杆用途）連接內棚及樓宇表面，以限制棚架之向內移動。 棚架與樓宇正面的結構鋼栓（預置於樓宇外牆結構良好的構件上）之間用鋼線連接（直徑最小 6 毫米），組成一連牆器。 棚架 備註：- (i) 對於建築中之樓宇，連牆器的錨固點可以預置在樓宇外牆結構良好的構件上。 (ii) 對於已建成之樓宇，可以用置於樓宇外牆結構良好構件上的膨脹式結構錨栓提供錨固點。	42	竹棚架工作安全守則 圖 5：雙行竹棚架連牆器（金屬緊件／連牆撐）的構造細則（側面 — 不按比例） 連牆撐： 除此之外，在每條連牆器的位置，用實際直徑不小於 40 毫米的短竹竿（作為支杆用途）連接內棚及樓宇表面，以限制棚架之向內移動。 樓宇表面 金屬緊件： 棚架與樓宇正面的緊固螺絲（預置於樓宇外牆結構良好的構件上）之間用鍍鋼線或鋼線連接（直徑最小 6 毫米），組成一連牆器。 棚架 備註：- (i) 對於建築中之樓宇，連牆器的錨固點可以預置在樓宇外牆結構良好的構件上。 (ii) 對於已建成之樓宇，可以用置於樓宇外牆結構良好構件上的膨脹式緊固螺絲提供錨固點。

免責聲明

本《文件》旨在比對勞工處 -《竹棚架工作安全守則》2017年9月（第四版）及2024年4月（第五版）更新內容。本《文件》內的資料只節錄勞工處《竹棚架工作安全守則》的部份內容，不會減輕、限制或取代任何人須依法履行法定職責的法律責任。資料使用人應自行評估本《文件》內的資料，按本身情況決定有關資料是否適用。如因使用或不使用本《文件》內的資料而招致任何損失或損害，本會概不負責。

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Current Members

As of end Dec 2024, there are 449 members in HKOSHA.

The following membership application were approved in November and December 2024

Approval of Membership

Name	Grade of Membership
CHEN Zi Jun	Associate Member
CHIEN Lim Wai, Samuel	Associate Member
CHAN Sui Lun	Member
HUI Cheuk Hin	Member
WONG Kai Cho, Stanley	Member

Sponsors of the Year 2024 *(In alphabetical order)*

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QUALITY DECOR. & DESIGN ENG. CO. LTD.
24E, Success Ind. Building, Sheung Hei Street, San Po Kong, Kowloon, H.K.
WEB: https://www.hkqualitydecor.com EMAIL: info@hkqualitydecor.com
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顯豐工程有限公司
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Aerial Engineering
宏達高空工程有限公司
電話 Tel (852) 2388 8116 電郵 Email Info@welltechaerial.com
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有利建築有限公司
Yau Lee Construction Co., Ltd.
10/F., Tower 1, Enterprise Square, 9 Sheung Yuet Road,
Kowloon Bay, Kowloon. Tel: 2753 4388

威煌安全
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Supporting Organization of the Year 2024

CONSTRUCTION INDUSTRY COUNCIL
建造業議會