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- 節省現場工人數目
- 成本節約
- 減少現場安裝產生建築廢物
- 提高安裝過程中的安全

我們在以下將分享一個工程項目採用「綜合(機電)預製模組」技術 (MTP) 的經驗，並在後兩節中總結其優點及可改善方向。

以下在某工程項目中，應用「綜合(機電)預製模組」(MTP)，共設計了 20 個「機電模組」金屬結構架，及其在場外製建及現場組裝的過程。

### 設計階段

首先要考慮的是需要有足夠空間去配合升降台的裝配工作。現時辦公室走廊(約1.6米寬度)並不是一個合適採用吊頂金屬結構架安裝的地方。因此最終選定了在 3/F 開放式教學室，其尺寸為 40m(L) x 10.5m(W) x 7.5m(H) (圖 1) 進行MTP工程。

### 「建築信息模擬技術」(BIM)的使用

為了協調「綜合(機電)預製模組結構架」(MTP)中的可用空間，我們採用「建築信息模擬技術」(BIM)用於空間協調、碰撞和模組化安裝檢測。

## 頭條報道 Headline

### 綜合製造和裝配的設計(DfMA) 經驗分享

定安工程有限公司 - 唐啟昇

景福工程有限公司 - 王明輝

### 導言

[綜合製造和裝配的設計] (DfMA) 是一種專注於簡化製造和裝配效率的設計方法。在過去幾年，香港特區、建造業及各持份者已開始採用DfMA，以推廣建築工程「預製建造模式」，例如「組裝合成」建築法(MiC)、「綜合(機電)預製模組」(MTP)、「預製體積建設」(PPVC)等預製建造模式。

眾所周知，使用「預製建造模式」的好處是：

- 縮減總體項目工程時間
- 提高產品品質

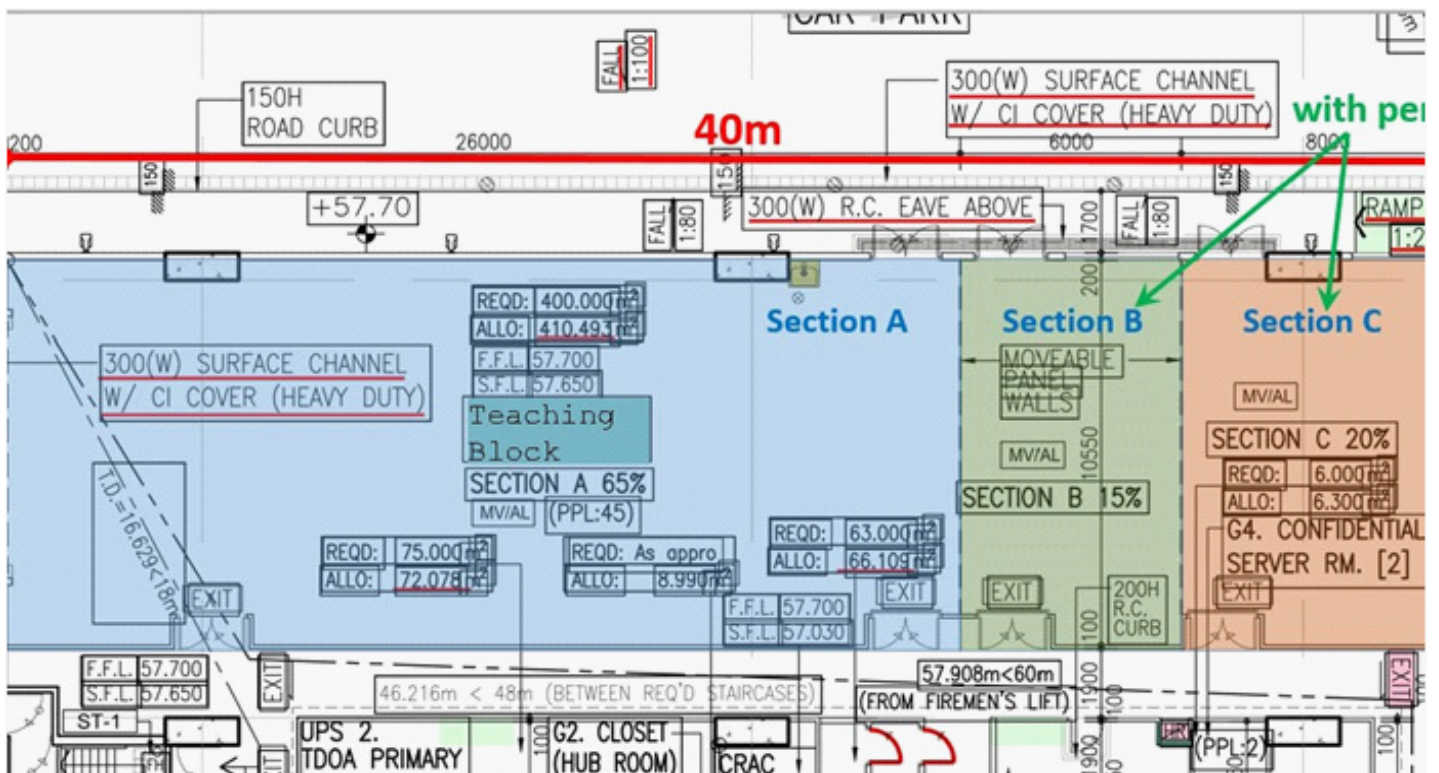
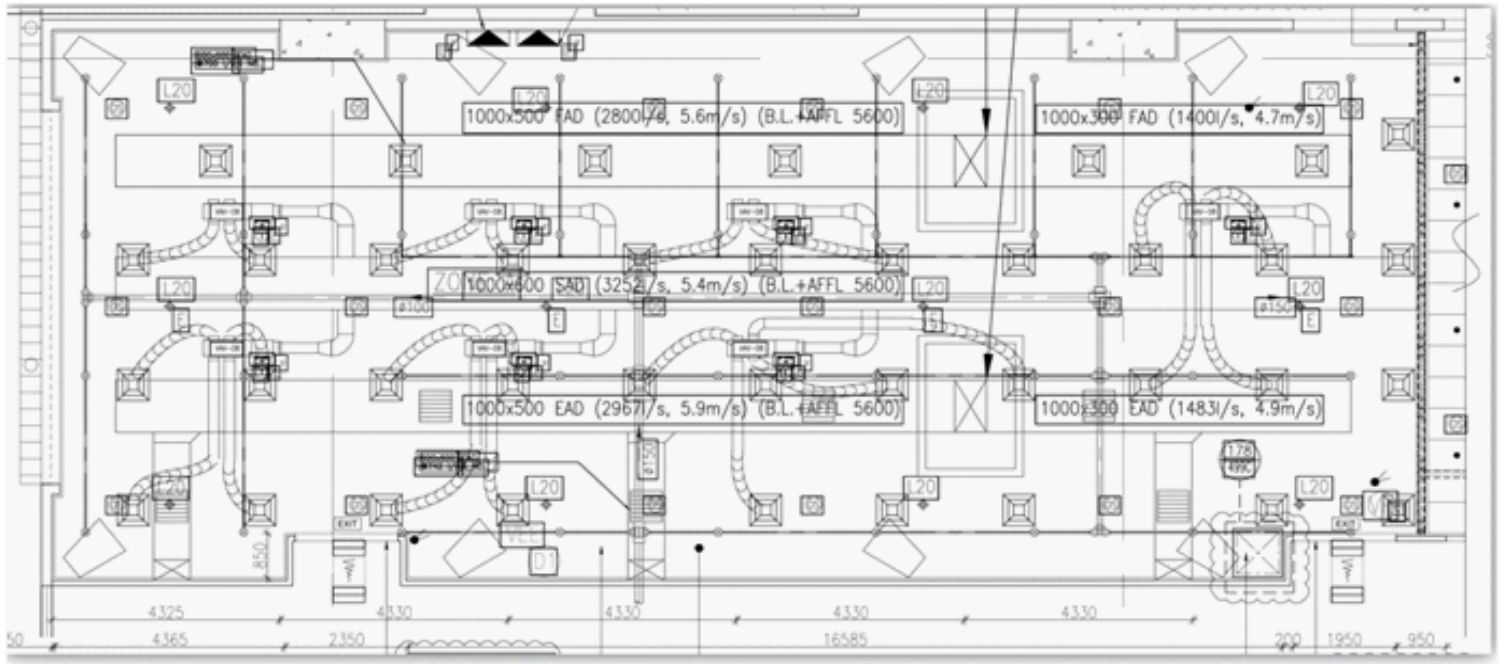


圖 1 平面圖則



**(Reflected Ceiling Plan of Section A)**

圖2 綜合天花設計圖

因為消防元件安裝的法定要求，花灑喉管不適合在MTPR中使用。如圖2中綜合天花設計所示，只有電氣及空調系統被採用為建造金屬結構架的元件。

**規劃**

我們與主承辦商協調，確定每個系統所需的詳細空間、允許每個系統使用的空間呎吋、以及制定規則解決不同元件排位衝突。對需要更嚴格公差的較大設備和器材元件進行詳細建模。此技術在建模時節省了大量時間，如其他系統在特定位置需要額外的空間時，則也提供了靈活性。

而在模組結構框架設計中亦已考慮下列維護問題:

- 在最頂層應放置比較少機會維護元件- 空氣管道等
- 須在框架各層之間提供合適維修空間
- VAV 箱應放置在最底層有利於日常維護

- 線槽應放置於低層可供後續的佈線工作，例如數據和弱電系統佈線。

下一步是設計MTPR 結構架尺寸，由於線槽的標準長度為 2.44米，因此框架的長度應為標準線槽的倍數。經過協調和建模，確定了8種類型及共20個模組。

機電元件	電氣和弱電線槽、供風和回風管道、VAV 箱
房間大小	40m L X 10.5m W x 7.5m H
模組大小	4.8m x 2.2m X 1.44m
模組數目	20
模組類型	8

模組佈置方案如圖3所示，包括4類模塊類型結構見圖4。

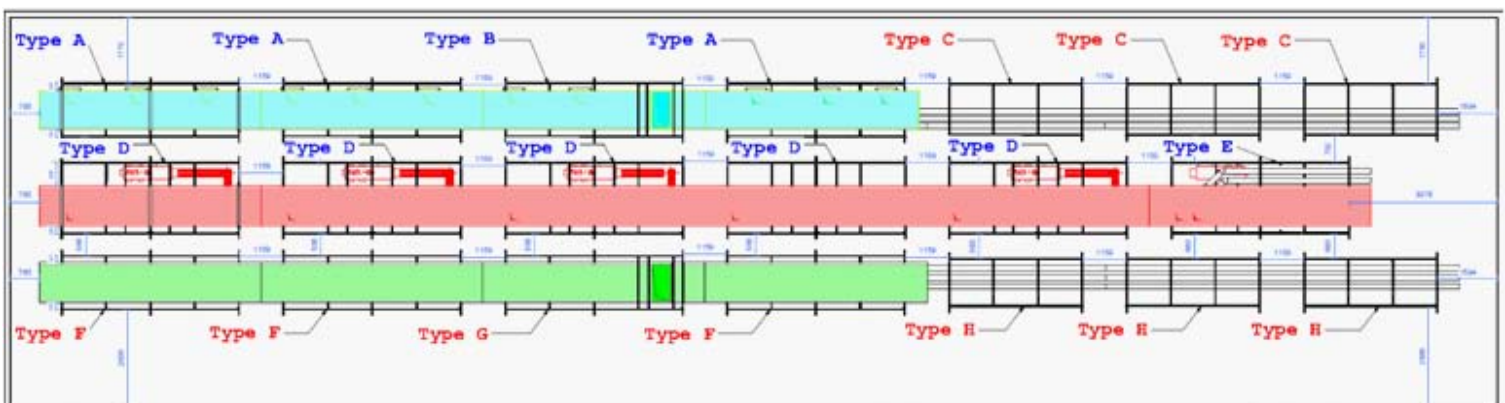


圖3 平面圖 - 總體排列

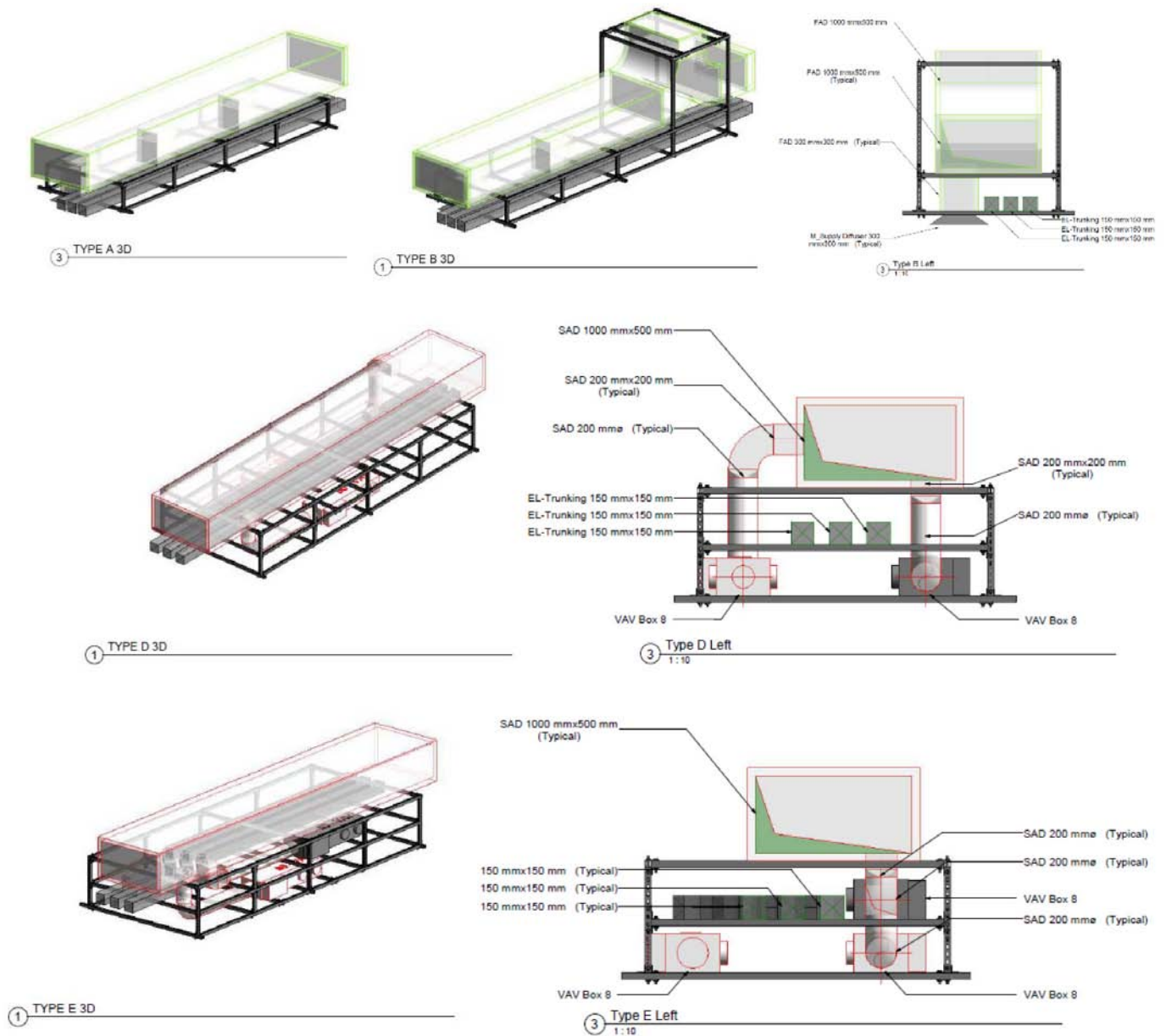


圖4 A型、B型、D型、E型的模組化結構

## 建造和裝配階段

場外工場（見圖5）：為了盡量減少運輸時間和成本，在場外工地寫字樓範圍內的空地設置了一個工場，該工場就在工地旁邊。模組框架可以在工場內制建及移動，並配有標準裝卸台裝載到貨車上。



圖5 工地外加工場

## 模組化框架的製造

技術人員開始根據BIM圖紙制建模組化框架、風管和線槽，如圖6所示。在制建過程中，由於工場接近工地，他們可在現場進行勘測以驗證框架尺寸的任何偏差提供便利。



圖6 模組化框架的製造過程



圖7 運輸過程

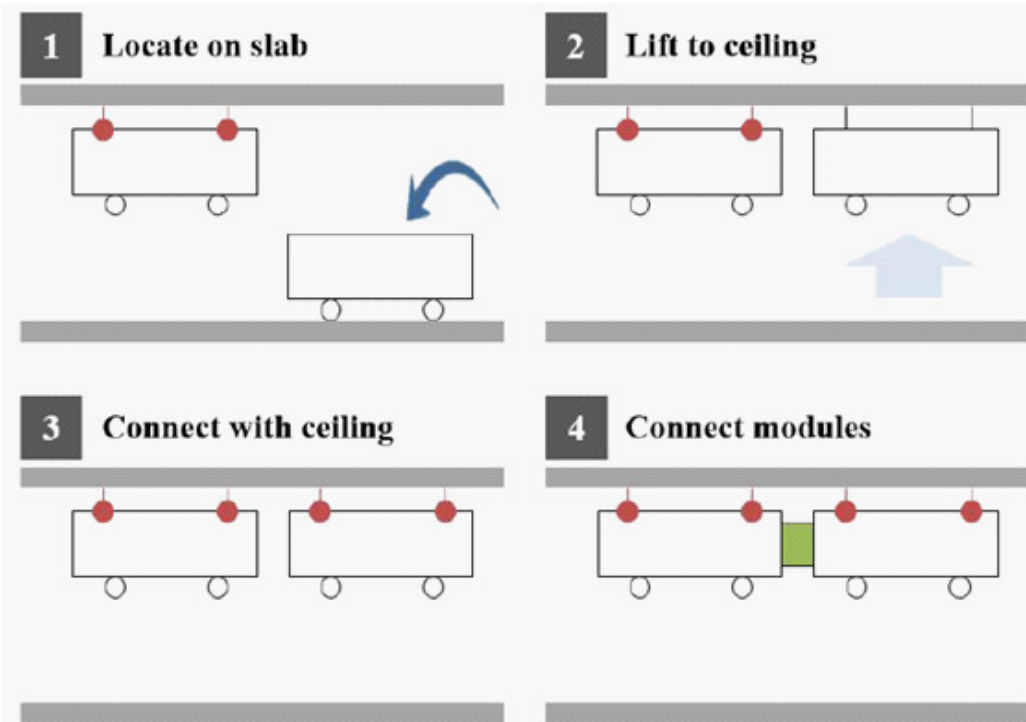


圖8 順序吊升方法

**運輸**

完成的模組化框架被裝載到貨車上，並運輸到工地（圖7）。

**現場裝配**

裝配和連接模組化框架流程如下：

模組放置在安裝位置下，然後模組由連接樓頂的手動滑輪和升降台提起。模組之間的空間為1.2 米（連接區）。此間距便於升降台用於模組之間的連接工作。模組框架橫向/垂直微調可通過調整U型槽吊碼移動，精確連接到相鄰模組，如圖 8 和工地照片圖 9 所示。

放置在安裝位置下的模組由手動滑輪和升降台吊起



在 1.2米連接區內連接工作  
模組裝配完成

圖9 模組裝配流程

## 綜合製造和裝配的設計(DfMA) 經驗分享

### 總結

下表總結以上20個模組框架與傳統施工方法的資源效益比較:

工作方案	預製建造模式技術
	所用資源 / 增益 / 損耗
場外模組製造時間	7天
現場組裝時間	14天
總施工時間	節省4天
製品質量	更好尺寸控制
現場工人數量	每天減少2工人
運輸成本	增加200%
安裝成本	節省8%
安裝產生的建築廢物	減少3%
施工安全	改善(由於現場工人數量減少)

總括上表,「預製建造模式」技術一般會帶來好處。

從經驗中,如各單位能配合以下有關事項,「預製建造模式」將帶來更佳效益。

- 早期確定各系統配置設計,有利於「預製建造模式」
- 建築師設計須考慮合適的「預製建造模式」空間,包括天花淨空、走廊/門的寬度,以方便內運和安裝
- 場外預製工場須要適當的大小和合適的位置,(靠近工地將比較適合MTP制建)
- 收貨單位儘早確定預製工場成品之驗收方案,特別是在政府項目,以避免須在現場重複驗收,造成假預製及資源浪費
- 組裝現場須有足夠空間供運輸及升降機器施工。

## Experience Sharing on DfMA

Teddy Tong Kai Sing, Majestic Engineering Co Ltd  
Angus Wong Ming Fai, Young's Engineering Co Ltd

Design for Manufacture and Assembly (DfMA) is a design approach focused on ease of manufacture and efficiency of assembly. Recently, HKSAR, construction industry and stakeholders have begun to promote DfMA for the off-site prefabrication of construction components such as Modular Integrated Construction (MiC), Multi-Trade Prefabrication (MTP), Prefabricated Prefinished Volumetric Construction (PPVC) in Hong Kong Building Projects.

In general, the benefits of using off-site prefabrication techniques have been widely known including: reduction of overall project schedule, improvement of product quality, reduction in the need for on-site workers, cost saving, reduction of construction wastage and improvement of safety during site erection.

The following areas of concern are for further improvements: typical configuration design and freeze in earlier stage, spatial consideration is designed by Architect including ceiling void, width of corridors/doors, adequate size and suitable location for Off-site prefabrication workshop (location near to site is adequate for MTP), inspection procedure should be established for off-site checking especially in Government projects to avoid double handling on site, adequate open space at site for delivery and lifting.

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## 搵食資料 *Notes To Trade*

### 香港房屋委員會 招標公告

香港房屋委員會招標公告可在以下網頁查看:  
<http://www.housingauthority.gov.hk/en/business-partnerships/tenders/>

## 會員動態 *Members' News*

香港電器工程商會 09/2020 - 12/2020年度新會員名單			
入會日期	申請會員名稱	會籍	代表人
Joining Date	Applicant Name	Membership Types	Representative
09/2020	聯誼工程有限公司 Associated Engineers, Limited	普通會員 Ordinary Member	吳志封先生 Mr. Ng, Chi Fung Nelson
10/2020	吳仲佳先生 Mr. Ng, Chung Kai Anthony	普通會員 Ordinary Member	
10/2020	創藝(香港)工程有限公司 Creation (HK) Engineering Limited	普通會員 Ordinary Member	李煒權先生 Mr. Lee, Wai Kuen
12/2020	翹科創意有限公司 Turnkey Technologies Limited	普通會員 Ordinary Member	譚志聰先生 Mr. Tam, Chi Chung Dennis
12/2020	卓誠策劃顧問有限公司 Reliable Solution Consulting Limited	普通會員 Ordinary Member	陳炳鴻先生 Mr. Chan, Peng Hung Murphy

## 恭賀盈電工程有限公司

### Congratulations to REC Engineering Company Limited

本會恭賀盈電工程有限公司中標於屯門第29區西公營房屋發展計劃建築工程的電力裝置工程，並祝順利如期完成。

On Behalf of Hong Kong Electrical Contractors' Association, we would like to convey our congratulations to **REC Engineering Company Limited** for the Electrical Installation for Construction of Public Housing Development at Tuen Mun Area 29 West (Sub-contract to Contract No. 20190505).



## 恭賀威電工程有限公司

### Congratulations to

### Wenden Engineering Service Company Limited

本會恭賀威電工程有限公司中標於白田邨第10期公營房屋重建計劃建築工程的電力裝置工程，並祝順利如期完成。

On Behalf of Hong Kong Electrical Contractors' Association, we would like to convey our congratulations to **Wenden Engineering Service Company Limited** for the Electrical Installation for Construction of Public Housing Redevelopment at Pak Tin Estate Phase 10 (Sub-contract to Contract No. 20190141).

## 機電·啟航 2020

### E&M Go! 2020

機電工程署香港機電業推廣工作小組與業界舉行一年一度的「機電·啟航2020」迎新典禮，已於2020年10月8日（星期四）以網上形式舉行，是次活動主題為「機電啟航，同抗逆流」，學生與來自各大機構的機電業學徒近800位網上參與是次典禮，由業內人士推動機電業界及香港的發展，培育加入機電業成為生力軍。

Electrical and Mechanical Services Department and the industry organised the annual "E&M Go!" Orientation Ceremony on 8 October 2020. About 800 young trainees, who have joined E&M training schemes organised by various public and private organisations, as well as their families attended the function. The event aims to encourage the trainees to pursue their aspirations in the E&M trade, and to portray a professional image for the E&M industry which keeps up with the times and offers bright prospects.



## 商會活動 Organised Activities

### 廣州國際照明展覽會

### Guangzhou International Lighting Exhibition

廣州國際照明展覽會已於2020年10月10日至13日（星期六至星期二）在廣州中國進出口商品交易會展館舉行。展商及觀眾透過一連串同期舉行的高端論壇會議及同業交流活動，2000多名參展企業，展覽規模橫跨19個展館。探討最新照明技術及設計新思維，拓展合作機會。

Guangzhou International Lighting Exhibition was held on 10 to 13 October 2020 (Sat to Tue) at China Import and Export Fair Complex, Guangzhou, China. Through a series of concurrent seminar & networking events, presenting cutting-edge lighting technology, inspired lighting design ideas and market intelligence. Some 2000 plus exhibitors took part in the fair spanning 19 halls at the China Import and Export Fair Complex.



### 2020年會員週年大會

### 2020 Annual General Meeting

2020年會員週年大會，已於2020年11月3日（星期二）假本會會址舉行。

2020 Annual General Meeting was held on 3 November 2020 (Tue) at HKECA Office.



### 香港建造學院畢業典禮2020

### Graduation Ceremony of HKIC 2020

2020年度香港建造學院畢業典禮已於2020年11月6日(星期五)假建造業零碳天地順利舉行。本會為贊助機構，恭賀及表揚畢業生在學習上所付出的努力及恆心，並投身業界一展所長。





## 商會活動 Organised Activities

### 香港建造學院畢業典禮2020 Graduation Ceremony of HKIC 2020

Graduation Ceremony of HKIC 2020 was held on 6 November 2020 (Fri) at Zero Carbon Park, 8 Sheung Yuet Road, Kowloon Bay, Kowloon, Hong Kong. Our association was a sponsor. Congratulations and commendations were made to the graduates for their hard work and perseverance in their studies, and showing their strengths in the industry.



### 亞洲創新建築、電氣、保安科技展覽會 2020 Build4Asia 2020

亞洲創新建築、電氣、保安科技展覽會2020已於2020年11月11日至13日（星期三至星期五）在香港會議展覽中心舉行。展覽提供一站式採購平台，展示建造業嶄新產品、科技及服務，包括建築材料、樓宇自動化系統、智能家居、安全檢測系統等，助您擴闊營商網絡並促進行業交流，是兩年一度不能錯過的行業盛會。

Build4Asia was held on 11 - 13 November 2020 (Wed to Fri) at the Hong Kong Convention and Exhibition Centre. As the No.1 Tradeshow for the Building, Electrical Engineering and Security Industries in Hong Kong, Build4Asia offered a wide array of products and services, ranging from building materials and automation, smart city technologies to total surveillance systems. Build4Asia is the ultimate B2B sourcing platform for companies to seek and widen their business opportunities.

### 亞洲創新建築、電氣、保安科技展覽會 2020 Build4Asia 2020



## 商會活動 Organised Activities

### 亞洲創新建築、電氣、保安科技展覽會 2020 Build4Asia 2020



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## 即將舉辦之活動 Upcoming Activities

### 2020 電力規例研討會

#### 2020 Electricity Regulations Technical Seminar

由機電工程署主辦，港九電器工程電業器材職工會和本會協辦的電力規例研討會將於2021年1月26日(星期二)舉行。歡迎各會員參加。

Technical Seminar on "Electricity Regulations" co-organized with EMSD and the HK & Kowloon Electrical Engineering & Appliance Trade Workers Union will be held on 26 January 2021 (Tue). All members are welcome to join.

### 廣州國際照明展覽會

#### Guangzhou International Lighting Exhibition

廣州國際照明展覽會將於2021年6月9日至12日(星期三至星期六)在廣州中國進出口商品交易會展館舉行。展覽會一直立足於全球照明行業的前沿，配合其發展。展商及觀眾透過一連串同期舉行的高端論壇會議及同業交流活動，探討最新照明技術及設計新思維，拓展合作機會。攜手共創照明行業的未來。  
Guangzhou International Lighting Exhibition will be held on 9 to 12 June 2021 (Wed to Sat) at China Import and Export Fair Complex, Guangzhou, China. Through a series of concurrent seminar & networking events presenting cutting-edge lighting technology, inspired lighting design ideas and market intelligence.

### 2021 年度週年會慶暨第二十四屆理事就職典禮

#### HKECA 2021 Anniversary Dinner Cum 24th Term Executive Committee Inauguration Ceremony

2021年度週年會慶暨第二十四屆理事就職典禮，將於2021年11月份舉行，歡迎各會員參加。詳情將容後公佈。

HKECA 2021 Anniversary Dinner Cum 24th Term Executive Committee Inauguration Ceremony will be held on November 2021. All members are welcome to join. The details will be announced.

### 2021 第二十期會刊

#### 20th Edition Association Journal

時光荏苒，不覺間本會之雙年刊第二十期又開始籌備，承蒙各會員與同業先進過去多年的鼎力支持，會刊內容越趨豐富。隨著會務迅速發展，會刊已成為本港業內廣泛傳閱之刊物，亦成為海外各友會間以至海內外工程從業員尋找產品資料的上佳媒體。本期(第二十期)會刊將發行1000本，本刊可發揮強大的廣告效力，有助推廣產品及服務，拓展商機。本會刊將於2021年11月出版，藉此良機，惠賜廣告。

Time passes quickly and it is time for us to prepare the 20th edition of our biennial Association Journal. With your continuous support over the past 19 issues, the Journal was able to grow along with the Association. With the enriched contents, the Journal is regarded as the most informative guide for own electrical industry. For the coming Journal, we plan to publish 1000 copies. With this large circulation base, we believe companies will find it worthwhile to promote their images, services and products through our Journal. The 20th edition of our biennial Association Journal is scheduled to release in November 2021. Your company is most welcome to place your promotional advertisement on the industry's most valuable guide.

### 三會舉行中華人民共和國成立72周年聯歡晚會

#### The 72nd PRC Anniversary Celebration Dinner

港九電業總會、香港電器業進出口商會及本會，將於2021年9月24日(星期五)在旺角彌敦道612號好望角大廈旺角倫敦大酒樓舉行中華人民共和國成立72周年聯歡晚會。歡迎各會員參加。詳情將容後公佈。

The 72nd PRC Anniversary Celebration Dinner jointly organized by "Hong Kong & Kowloon Electric Trade Association", "Hong Kong E.P.M. Importers and Exporters Association Ltd." and HKECA will be held on 24 September 2021 (Fri) at London Restaurant, Good Hope Building, 612 Nathan Road, Mong Kok, Kowloon. All members are welcome to join. The details will be announced in due course.



**盈電工程有限公司**  
**REC Engineering Company Limited**  
 (A wholly-owned subsidiary of Yau Lee Holdings Limited)



HVAC System



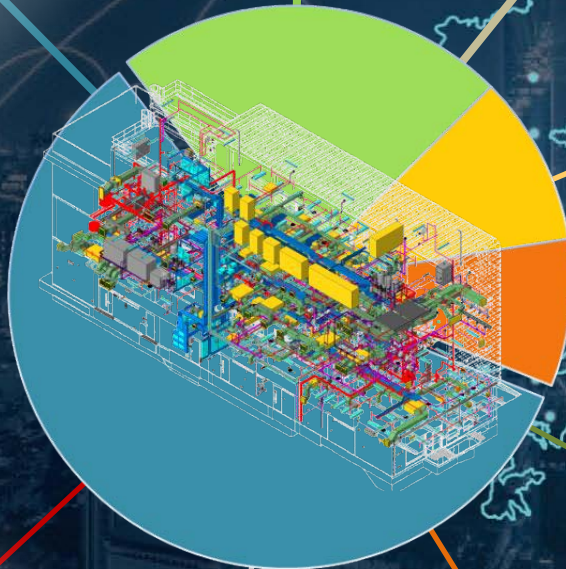
Plumbing & Drainage



Package Projects



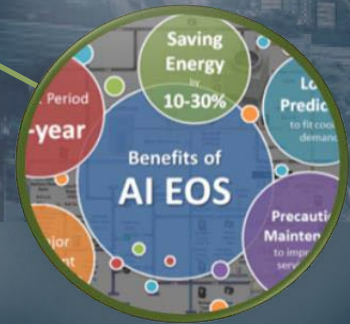
Fire Services



Environmental Engineering



General Services Installation



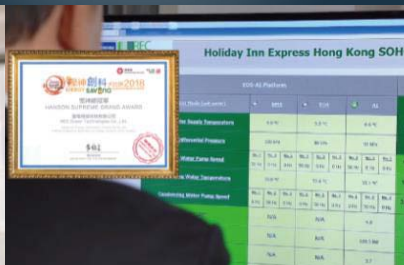
Green & Sustainability Technologies



Electrical Installation



O-Link Limited DfMA Services





**Wenden Engineering Service Co., Ltd. 威電工程有限公司**

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**Wenden Engineering Service Co Ltd**, incorporated in 1977 is an approved specialist contractor for public works and registered as a Minor Works Contractor in Building Department.



Air-Conditioning and Mechanical Ventilation Installation for Construction of Public Rental Housing Development at **Shek Mun Estate Phase 2, Shatin**

For many years, Wenden mainly engages in the supply, Installation, Maintenance and Alteration in the Air-conditioning System, Electrical Power Distribution, Lighting and Control, Broadcast Reception System, Emergency Diesel Generator, Plumbing and Drainage System, Sewage Treatment, Fire Services System, Steam and Compressed Air System, Liquefied Petroleum Gas, Water Pumpsets and Associated Pipework, Uninterruptible Power Supply System, Industrial Type Electrical System and Mechanical Plant and Equipment. Our Clients are mainly Government Departments, Public Utilities, Universities, Private Developers, Education Groups and Religious Groups.



**Haven of Hope Hospital**  
(MVAC Installation)



**Shui Chuen O Estate**  
(Electrical Installation)

Wenden is currently participating in Electrical Installation and Air-conditioning and Ventilation Installation for Construction of Public Housing Redevelopment at Pak Tin Estate Phase 10 and Air-conditioning and Ventilation Installation for Construction of Public Rental Housing Development Phases 1 & 2 and Subsidised Sale Flats Development at Diamond Hill Comprehensive Development Area (Sub-contract to Contract No. 20170225) for Hong Kong Housing Authority.