

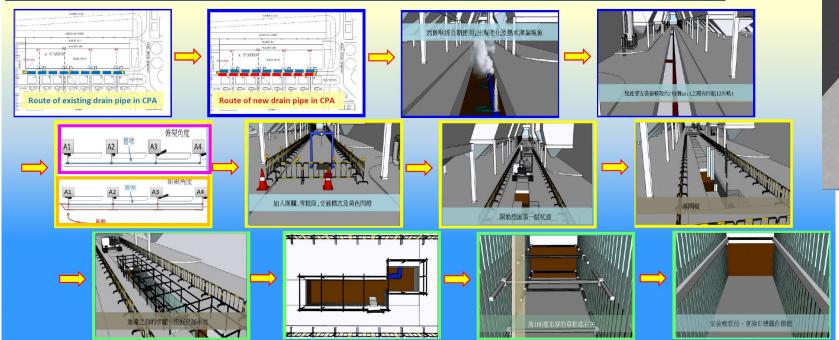
# **Building Information Modelling (BIM)**



Submission ID:	1718
Product:	PBS18-003 AutoCAD Revit LT Suite Commercial New Single-user ELD Subscription
Site:	CPPS Boiler Blowdown Common Drain Modification, Castle Peak Power Station
User:	Contractor (SME)

Use:	Addressing all foreseeable risks with manageable mitigation actions
Merits:	<ul> <li>Better understanding on design and construction details leading to cost reduction by 8%</li> <li>Co-ordination time ↓ 8%</li> <li>In-advance simulation of work sequence allowed better safety planning and performance</li> </ul>

#### Apply BIM for Trench Excavation and Installation of Shoring Sheets & Concrete Layer

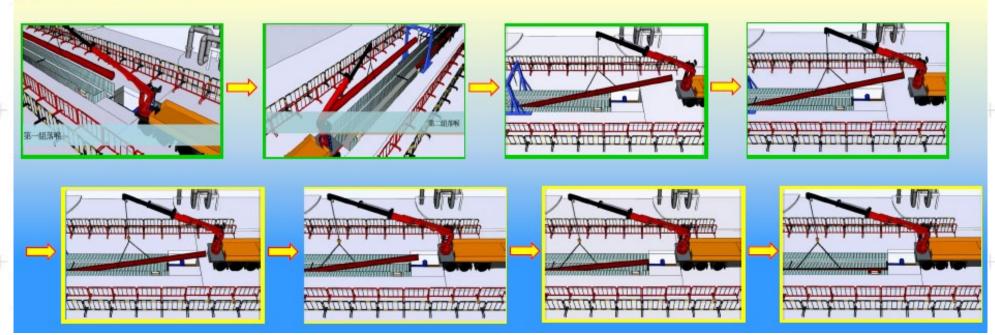




Submission ID:	1718
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Site:	CPPS Boiler Blowdown Common Drain Modification, Castle Peak Power Station
User:	Contractor

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### **Apply BIM for Pipe Laying**





Submission ID:	1718
Product:	PBS18-003 AutoCAD Revit LT Suite Commercial New Single-user ELD Subscription
Site:	CPPS Boiler Blowdown Common Drain Modification, Castle Peak Power Station
User:	Contractor

Use:	Addressing all foreseeable risks with manageable mitigation actions
Merits:	<ul> <li>Better understanding on design and construction details leading to cost reduction by 8%</li> <li>Co-ordination time ↓ 8%</li> <li>In-advance simulation of work sequence allowed better safety planning and performance</li> </ul>

#### Photo Album For Site Work for Pipe in A4 Boiler











Waling & Structs















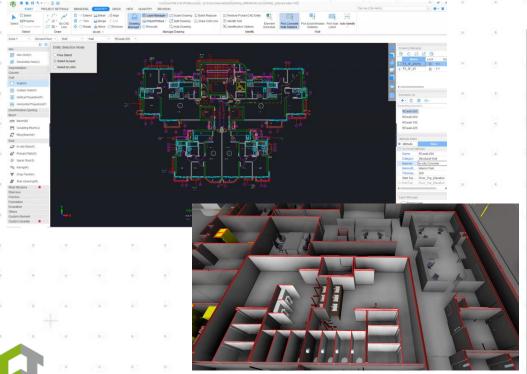




Submission ID:	5695
Product:	PBS19-005 Cubicost TAS +
Site:	1224-Place Student Residence at Police School Road, HKU, Wong Chuk Hang
User:	Sub-contractor (Non-SME)

Use:	Automation for measurement for tender estimation		
Merits:	• ↑ 200% (Traditional 21 man-day -> 7 man-day)		

Cost table are stored in Cubicost library. Commercial team can reuse the information from previous projects. Mistake can be avoided, and good practice can be referred due to lesson learnt from a central library.



I Ex	mport Select CAD Data Import	Clear M Clear Clear	Operate Gri	rge Column py Column d	Batch eplace					
٧	Vorksheet:	▼ Element	Group: Column	▼ ElementT	ype: Column 5	Minimum U	nit in Drawing: m	m ▼ Identify S	ingle-Section Data	aas: Radius 🔻
1	Name	Width * Hei	Summary Info					Steel Ratio	Remarks	Correspon
2	Column Ref.:								RC243	Zone-1[1]
3	Level	Size	Reinforcement	Steel Section	Links	Elevation Type	Section X-X	Concrete Grade	Remarks	Zone-1[1]
4	Basement 4	900x900	28T40	UC3	T10-100	В	23-23	C100	Comp C olumn	Zone-1[1]
	Basement 3 to	900x900	28T40	UC3	T10-100	С	23-23	C100	Comp C olumn	Zone-1[1]
5				UC3	T10-100	С	11-11	C80	Comp C olumn	Zone-1[1]
	1st store y to 6	900x900	24T32	003	110-100	_				

- eration Steps:
- l. Select the worksheet; 2. Select element group; 3. Select element type; 4. Select column title;
- Select the floor to which the element belongs (all information of the corresponding row will be saved to the selected floor);
- 6. Click Identify button, and corresponding elements will be generated.

Submission ID:	3154
Product:	PBS18-002 Architecture Engineering & Construction Collection IC Commercial New Singleuser ELD 3-Year Subscription
Site:	Jardine House Chiller Replacement Project
User:	Sub-contractor (Non-SME)

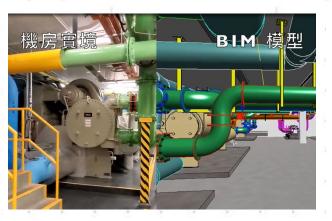
Use:	e: Chiller plant design and visualisation	
Merits:	<ul> <li>Reduced misunderstanding and rework by clash analysis in BIM model</li> <li>Improved design efficiency and accuracy</li> </ul>	+

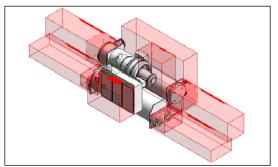


[Chiller and pipework setting out was reviewed by BIM]



[Clash analysis among chiller, structural support and other E&M service (e.g. air duct, cable tray, etc) was performed before chiller positioning]





[Visualization of the maintenance clearance by BIM]



# **Advanced Construction Technologies (ACT)**



Submission ID:	4694
Product:	PA20-075 Trimble XR -10 with Hololens 2
Site:	Residential Development at To Shel Street, Shatin
User:	Contractor (SME)

Use:	Overlay BIM model in physical environment for site co- ordination and identifying issues
Merits:	<ul> <li>MEP coordination time ↓ 30%</li> <li>Time for identifying potential problem ↓ 28%</li> <li>Overall project period ↓ 18%</li> </ul>





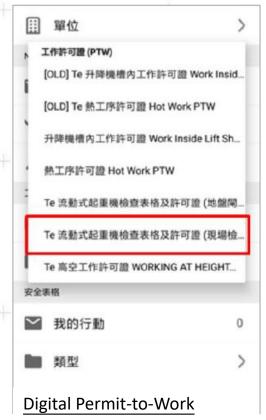


From authorized by Design Consultant of BIM Model export IFC file Upload to Trimble Connect and Position Setting



Submission ID:	2130
Product:	PA18-035 Digital Works Supervision System (DWSS)
Site:	Residential Development at Kai Tak Area 1K Site, Kai Tak, Kowloon
User:	Contractor (Non-SME)

Use:	Safety and quality management (e-PTW)	
Merits:	<ul> <li>↓ checking time by using mobile apps</li> <li>↓ permit application time</li> <li>↑ safety and productivity</li> </ul>	+
	Paperless and quality record	





Digital record of plants entering the sites



Reviewing documents and acces

files for the safety performance of



Submission ID:	6749			
Product:	PA20-121 Advanced Truck-mounted Lifting Crane			
Site:	Kai Tak Development -Stage 5B Infrastructure Works at the Former North Apron Area			
User:	Contractor (Non-SME)			

Use:	Lifting operations
Merits:	<ul> <li>Operator informed about the real-time safe working load in remote controller</li> <li>↓ judgement by operator (human error)</li> <li>Warning and alerts for unsafe conditions detected</li> <li>↑ safety and productivity</li> </ul>







Dynamic real-time load chart and alerts displayed in remote controller



Warning given with crane locked whenever unsafe conditions detected (e.g. outriggers off the ground)

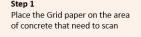




Safe lifting enabled in funded project

Submission ID:	3085
Product:	PA19-017 Concrete Scanning Machine
Site:	Primary School at Tonkin Street, Cheung Sha Wan
User:	Sub-contractor (Non-SME)

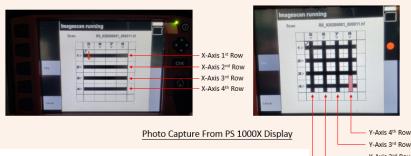
Use:	Mechanical Ventilation and Air Condition (MVAC) Installation
Merits:	<ul> <li>Speedy and accurate identification of concealed services</li> <li>Accurate drilling plan based on 3D visualisation</li> <li>↓ risk of damage of concealed services</li> <li>↑ safety and productivity</li> </ul>



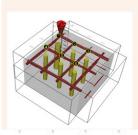


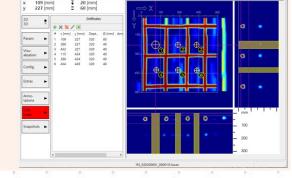


The scanning progress is indicated by a bar in display. The red bar showing scanning progress turns black when the length is reached.



We can create a drilling plan optimizes the drilling location





Drilling plan developed based on the scanned results to ensure safe drilling without damage to any concealed services



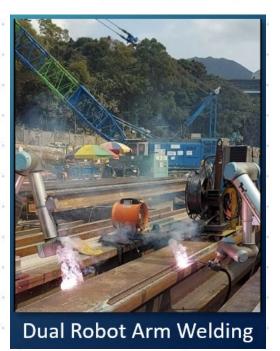


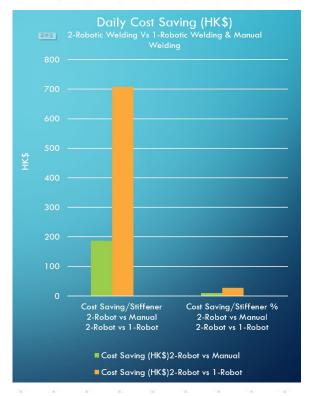
Injury due to accidental damage of concealed services can be avoided

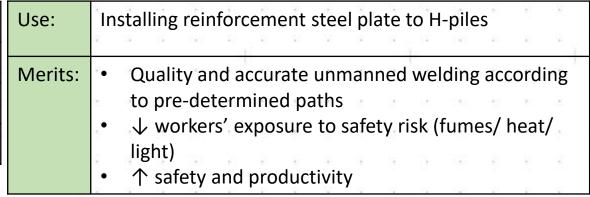


Speedy and accurate concealed rebar/ services scanning before drilling

Submission ID:	10563					
Product:	PA19-001 Adaptive Welding Robot					
Site:	Tung Chung New Town Extension (NL/2020/05)					
User:	Contractor (Non-SME)					











Manuel Welding with welding hazards (glare & toxic gas )





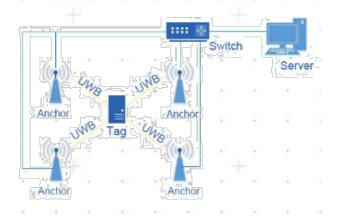
No site worker involved in robotic welding, there is no worker suffer from welding hazards

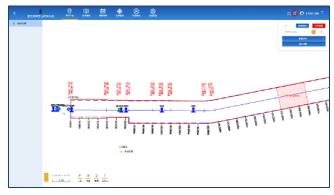


Dual robot arm welding to achieve cost saving and quality and safe welding operation

Submission ID:	5368
Product:	PA20-032 UWB定位系統 +
Site:	搬迁沙田污水处理厂往岩洞-工地開拓及連接隧道建造工程
User:	Contractor (Non-SME)

	Use:	Tunnel work		8		100			200	8	8
1		4									+
4	Merits:	• ↓ response time to emergency situations									
		• ↓ workers' exposure to safety risk (danger zone									
		access control/lo	catio	on t	rack	king	) 😅	0.50	3.6	80	
		• 个 safety and prod	duct	ivity	/ (m	oni <sup>.</sup>	tori	ng)	27	8	2





#### (2) 工人定位功能

實時統計工友數量及位置

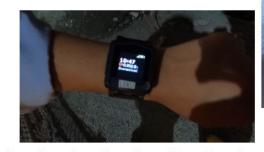
主動SOS求救功能



#### (3) 危險區域提醒功能

利用網絡平台設置危險區、機械作業 範圍、爆破施工範圍等;

工人行入危險區,手錶發出振動提醒。



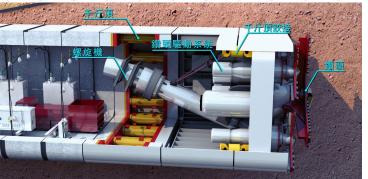
#### (4) 健康監測、通知功能



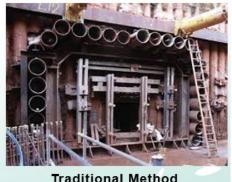
Submission ID:	1062				
Product:	Rectangular Tunnel Boring Machine (RTBM)				
Site:	Kai Tak Development – Stage 3B Infrastructure at former North Apron Area				
User:	Contractor (Non-SME)				

Use:	Trenchless Construction	n) 2	
Merits:	↓8000 tons of solid waste to public fill	Ř	*
	<ul> <li>↓1190 tons of steel temporary works</li> </ul>	30	8
	• ↓90% workers' exposure in confined space		
	<ul> <li>↓40% rebar fixer and no temporary works</li> </ul>	20	2
	<ul> <li>↓17 months for forming permanent tunnel</li> </ul>		
	structure		+





Unloading precast RC segments to shaft bottom for jacking



**Traditional Method** 



**Innovation Method** 

Submission ID:	3241		
Product: Remote Operated Vehicle Pipe Dredger (ROVPD)			
Site:	Desilting of Box Culvert at Outfall near Lai Ying Street		
User:	Sub-contractor (SME)		

Use:	Underwater desilting works	
Merits:	<ul> <li>↑ 200% output (6 ton/ day vs 2 ton/ day)</li> <li>↓ 100 working days (for 300 ton desilting work)</li> <li>No man-entry to confined space</li> <li>Enabled work in wet season/ high water level</li> </ul>	



ROVPD with built-in CCTV HD camera and sonar

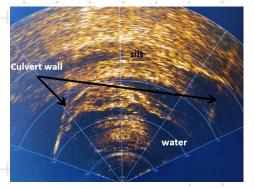
loading down to water for desilting work







1 Operator operating in the control room



Clear sonar image



No man-entry is required



Submission ID:	10655 (Pioneering Application)				
Technology:	nnology: 3D Metal Printing +				
Site: The Immigration Headquarters, Tseung Kwan O					
User:	Main contractor (Non-SME)				

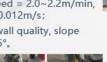
100	Use:	Large-scale 3D Metal Printing	100			200		8	
4	Merits:	• >70% time reduction	SA	1.4	190		Ř		+
		• >90% material saving	18	25	990	100	*1	8	6
3		<ul> <li>&gt;50% weight reduction</li> </ul>	83	8	150	59	80	(2)	
0.000	- WWw.	<ul> <li>Unlocked design potential</li> </ul>							

#### **Post Design Processing**

- Adjust parameters to acquire stable thin-wall deposition quality:
- Process parameters:
- CMT+P, wire feeding speed = 2.0~2.2m/min, printing speed = 0.010~0.012m/s;
- To maintain acceptable wall quality, slope angle should less than 45°.



Wall quality optimizing



Wall thickness → 4mm





### **Identify Printing Parameters**







S1-1







**Prefabricated Segments Assembled on Site** 

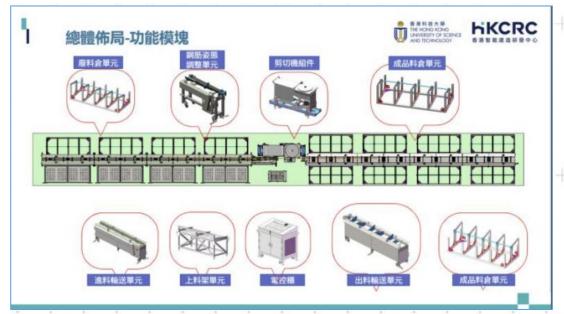


\$5-2

Submission ID:	23645 (Pioneering Application)				
Technology:	Modification of Traditional Rebar Cutting Machine				
Site:	Multiple sites for trial				
User:	Sub-contractor (Non-SME)				

Use:	Rebar cutting work
Merits:	<ul> <li>Reduce injury</li> <li>Reduce 50% labour and 29% cutting time</li> <li>Increase productivity by 1.42 times</li> <li>Reduce reliance on physically strong labour</li> <li>Collaboration with rebar fixing and sub-contractor trade association in development process to ensure future applicability</li> </ul>





**Modularisation of Components for Easy Delivery and Site Deployment** 

人工數量 (個)	3-4	1-2
配套人工成本 (HK\$/Day)	8800	4400
剪1條Y40鉄的 時長 (s)	45	31.8
產能(噸/天)	40	56.6

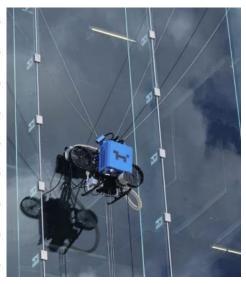
工友數量至少**減少至1到2個,甚至可以變成女工在剪鉄** 剪Y40鉄,產能**提高1.42倍** 



Submission ID:	14209
Technology:	Façade Cleaning Robot
Site:	城市大學賽馬會健康一體化大樓
User:	Sub-contractor (SME)

Use:	Curtain wall water test and cleaning before handover			
Merits:	Eliminate manual work at high level and external			
	wall			
	<ul> <li>Reduce 27 man-hours for a small elevation at 2/F to 3/F</li> </ul>			
	Objective assessment with full record			





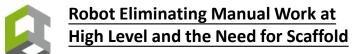
# 記錄數據



## 記錄影像及監測情況

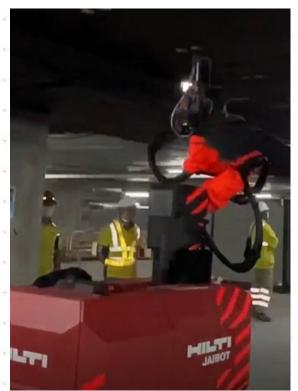


**Data Collection and Monitoring during the Water Test Progress** 

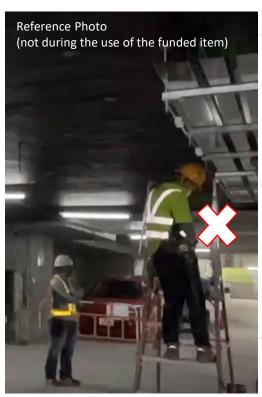


Submission ID:	13258		
Technology:	Drilling Robot + +		
Site: West Kowloon Express Rail Link Station			
User:	Main Contractor (Non-SME)		

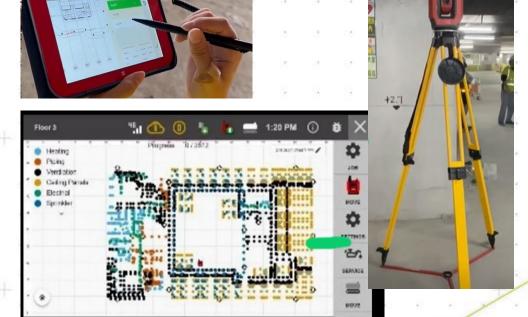
Use:	Ceiling bolt hole drilling works
Merits:	<ul> <li>Eliminate high level and scaffolding work</li> <li>30-40% productivity gain</li> <li>50% labour saving</li> </ul>
	21 AC 80 AND 00 07 NO 80 07 NO 60 080 30 30 NO



Remote-controlled and Semiautomated Drilling in Action



No Scaffold is Required for Typical Floor Height



Drilling Points input from BIM; Setting out by Total Station (not under this application)

Ready to start drilling. Confirm to start.

	Submission ID:	12317	Use:	Welding of steel sections (UC waling/strut)
	Technology:	Welding Robot +	Merits:	Eliminate manual close-distance hot work
	Site:	Non-public Housing Facilities at Diamond Hill CDA – Transport Infrastructure Works (Subway ELS)		<ul> <li>&gt;50% productivity gain</li> <li>&gt;50% labour saving (1 operator controlling 2 robots)</li> <li>Will use this technology in future even without</li> </ul>
-	User:	Sub-Contractor (SME)		contract requirement





# **Modular Integrated Construction (MiC)**



# MiC Case Study 1

Submission ID:	751, 2441, 2458
Site:	Innocell, Hong Kong Science and Technology Park
User:	Consultant (Non-SME), Contractor (Non-SME)

	Funded Item:	Specialist MiC Consultant, Plant and Modules
	Merits:	• Construction Period ↓ 12 months (30 -> 18
		months)
J		Non-inert Waste ↓79.5%





#### Material Wastage reduction

2324001141 Washage Teatherion		
	Project in Similar Scale (~500 Flat Units)	InnoCell (~420 Flat Units)
Rebar	5%	2%
Sanitary Fitting	7%	3%
Ironmongery	7%	3%
Tile (Internal)	10%	5%

#### Waste generation

	Project in Similar Scale (~500 Flat Units)	InnoCell (~420 Flat Units)
Non-inert waste	827.7 tonnes	169.53 tonnes
Compare to the waste generated in both projects for firs		

#### **Promote Productivity:**

- Large lifting capacity, high effectiveness with adoption of larger modules
- Effective in construction, with max. 15 modules installed per day
- Overall construction work completed in 18 months (Jul 2019- Dec 2020); 12 months ahead schedule
- The overall productivity increases 40% [(1-18/(18+12)%]



# MiC Case Study 2

Submission ID:	13042
Site:	Student Hostel, City University, Whitehead, Ma On Shan
User:	Contractor (Non-SME)

Funded Item:	Plant and Modules
Merits:	<ul> <li>9000 on-site man-days saved (&gt;30%)</li> <li>Overall project period reduced by 200 days (&gt;50%)</li> <li>Waste reduced (&gt;30%)</li> </ul>









Site progress photos

# MiC Case Study 3

Submission ID:	7371
Site:	Re-development of Purpose-built Elderly Home at Jat Min Chuen, Sha Tin
User:	Contractor (Non-SME)

Funded Item:	Plant and Modules	
Merits:	On-site skilled workers saved (>30%)	-
	Reduced project period (>20%)	1
	Waste reduced (>20% )	







MiC module installation in progress



**Completed Works** 



BIM Design to Off-site Production

# **Prefabricated Steel Rebar (STB)**



# **STB Case Study 1**

Submission ID:	4220
Product:	Pre-fabricated Steel Rebar (STB)
Site:	Commercial Development at 222-228 Wan Chai Road
User:	Contractor (Non-SME)

	Use:	Reinforcement bars for building construction	
ł			
	Merits:	• ↓ 20% wastage	0
		• $\downarrow$ 20% construction waste on site	S
		• ↓ 20% workers required	9
1		• 个 10% productivity	è
		↑ Quality ↓ 10% re-work	

### 地盤狹小問題:擠迫,缺乏開料場空間







Prefabrication in factory



On-site installation



# **STB Case Study 2**

Submission ID:	5360
Product:	Pre-fabricated Steel Rebar (STB)
Site:	Construction of Subsidized Flats Development at Diamond Hill Comprehensive Development Area
User:	Contractor (Non-SME)

Use:	Reinforcement bars for building construction
Merits:	• ↓ 50% workers required
	• 个 50% productivity
	• 个 Quality and safety
	• ↓ 30% construction waste on site



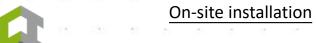
描述:

齊身鐵中使用的屈鐵(預數綱節)



描述:

Beam Stirrup (預製鋼筋)



On-site installation

# Manpower Development (MPD)

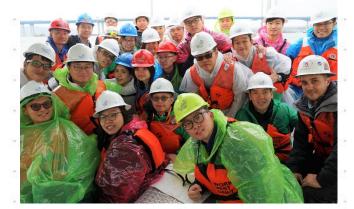


Submission ID:	3024
Programme Type and Name:	Non-local training/ visits for Practitioners - HKCA YMS Professionals Connection New York & Boston Delegation Trip
Location:	Boston and New York
Applicant:	Hong Kong Construction Association (HKCA)

Beneficiaries:	Young practitioners (32 nos.)
Programme Highlights and	<ul> <li>Exchange with American Society of Civil Engineers (ASCE) on BIM and MiC adoption in New York</li> </ul>
Experience Gained:	<ul> <li>Design workshop with prototypes built by delegates in a week, followed by presentation to local professors and architects</li> <li>Exchange session with MBA students from MIT on AI at MIT Senseable Lab</li> </ul>



Visit to Autodesk Technology Centre Innovative 3D printing technology was demonstrated by the printing of formwork which dismantling of formwork is not required and defects can be avoided on the concrete surface



Participants' Feedback 100% strongly agreed/ agreed:

- expected learning outcomes achieved;
- Knowledge in relevant areas deepened



Tappan Zee Bridge Project Using steel as an alternative to the ordinary reinforced concrete design and adopting a life cycle approach which took the maintenance of the structure into account



Submission ID:	1199
Programme Type and Name:	Non-local training/ visits for Students - 2019 Computing in Construction Summer School (CCSS)
Location:	Italy
Applicant:	Hong Kong Polytechnic University (PolyU)

Beneficiaries:	Tertiary students of construction-related programmes (18 nos.)
Programme	5-day course organized by the European
Highlights and	Council on Computing in Construction:
Experience	Robotic systems for inspection
Gained:	Mixed Reality
	<ul> <li>Real-time safety management</li> </ul>
	Block-chain technology — — — — — — — — — — — — — — — — — — —
	<ul> <li>Behavioural design and modelling, etc.</li> </ul>





#### Participants' Feedback

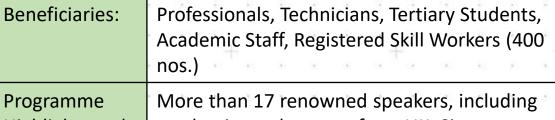
100% strongly agreed/ agreed:

- Inspired to purse further learning in related technologies;
- Knowledge in relevant areas deepened

"The lectures given by renowned professors on how the integration of construction and technologies like A.I. and blockchain uplifted productivity and enhanced site safety were to be honest beyond my wonders"



Submission ID:	2093
Programme Type and Name:	International Conference in Hong Kong – International Conference on Modular Integrated Construction: Innovating Higher
Applicant:	The University of Hong Kong (HKU)



Programme
Highlights and
Experience
Gained:

More than 17 renowned speakers, including academics and experts from UK, Singapore, Canada, Australia, Ireland and Hong Kong shared their experience in modular construction and construction innovative technologies



#### Applicant's Feedback

- Programme objectives and learning outcome were achieved;
- Programme could deepened participants' understanding on MiC adoption



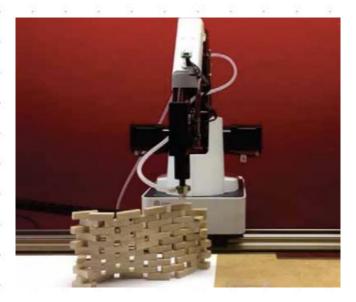




Submission ID:	3731
Programme Type and Name:	Local Collaborative Course - Multi-Axis Robotics Workshop for Architecture
Applicant:	The Chinese University Of Hong Kong School of Architecture (CUHK)

	Beneficiaries:	Tertiary Students, Academic Staff (19 nos.)
6		
£C.	Programme	Hands-on experience in coding and execution
Ċ.	Highlights and	of drawings, laser cutting and 3D printing using
ij.	Experience	robotic arms, sensors, computer vision, AI and
	Gained:	integrated computational design tools to
		achieve pick-and-place



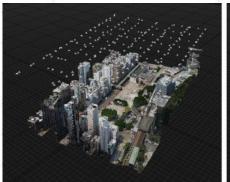


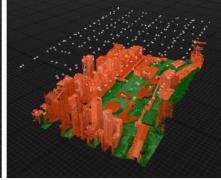
### Applicant's Feedback

- Participants can link design tools with robotics, and scale up toward construction activities.
- Participants gained familiarity with robotics protocols to leverage sensor-driven data to refine and evaluate their designs.
- GPT-based AI tools and more complex pickand-place action with more robotic system can be further explored
- 94% participants agreed they had acquired a deeper understanding on how to adopt the technology

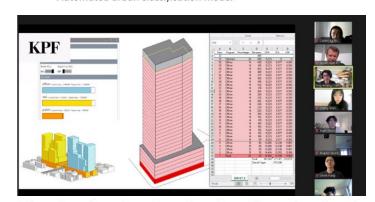


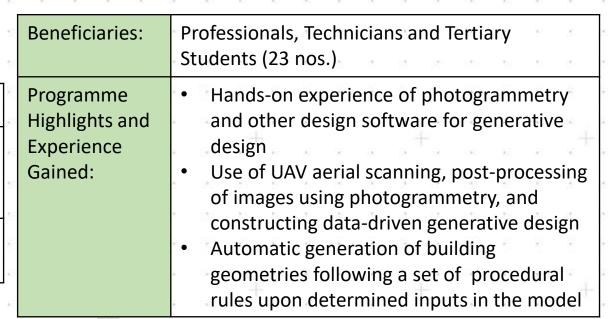
Submission ID:	4640	
Programme Type and Name:	Local Collaborative Course – Data-driven Design: UAV Photogrammetry Based Generative Architectural Design Methodologies	
Applicant:	School of Architecture, The Chinese University Of Hong Kong (CUHK)	

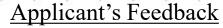




Automated urban classification model







- Although the learning curve was very steep and course was quite difficult, several students mentioned that they will continue to practice and develop their digital skills in their future coursework.
- A presentation on the workshop was given as part of the CAADRIA conference to international audience.



Submission ID:	9241
Programme Type and Name:	Non-local Visit cum Training for Students – Unlocking the full potential of Building Information Modelling with OpenBIM
Applicant:	City University of Hong Kong

Beneficiaries:	Tertiary Students, Academic Staff (33 nos.)
Programme Highlights and Experience Gained:	<ul> <li>Visit to buildingSMART Korea to learn open standard and workflow, interoperable data exchange and integration</li> <li>Visit to local AEC firms and BIM projects and universities (e.g. Incheon National University) to learn AI based design automation</li> </ul>







### Participants' Feedback

100% participants agreed that the learning outcomes were achieved and they were inspired to pursue further learning in construction technology.



