

### 29<sup>th</sup>-31<sup>st</sup> Mar 2017

Regal Kowloon Hotel 71 Mody Road, Tsim Sha Tsui, HKSAR, China **富豪九龍酒店** 中國香港尖沙咀麼地道71號

## Proceedings

LGG

BIM, Control & Utility Management for Smart City and The Sponge City

建築信息模擬在智慧城市及海綿城市的控制與管綫管理

Organizers:















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## The CIC Chairman

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Mr. Ka-kui CHAN, BBS, JP 陳家駒 先生、銅紫荊星章、太平紳士

Chairman, Construction Industry Council 建造業議會 - 主席

Mr. CHAN is the Chairman of the Construction Industry Council (CIC). He is a quantity surveyor with over 40 years of experience in the construction field. Previously, he was the Chairman of the Construction Industry Training Authority and Vice-President of Hong Kong Construction Association. Mr. CHAN is a Fellow Member of the Hong Kong Institute of Surveyors. He is an Adjunct Professor of the Hong Kong Polytechnic University, an Honorary Fellow and a Court Member of the City University of Hong Kong.

Mr. CHAN is a stern supporter of "innovation" in construction. During the tenure of his Chairmanship, the CIC sets up the Innovation and Technology Application Centre to promote innovation and technology application, and also the Committee on BIM to spearhead the development of BIM implementation in the Hong Kong construction industry.

## Welcoming Message



#### Message from the ICUMAS 2017 OC Chair Ir Dr. King WONG (黃敬 博士、工程師)

Good days Ladies and Gentlemen,

Welcome you all from different parts of the world who all keen on knowing more about Location, Condition and Management for utilities.

I am very pleased as the Chair of the Organizing Committee for the ICUMAS 2017 (the International Conference on Utility Management and Safety). It has been fifth time for me since ICUMAS 2009 (the 1st ICUMAS). Prior to ICUMAS, we also had 3 conferences in 2003, 2005 and 2007 respectively, in 2-Coast-and-4-Places including Hong Kong.

ICUMAS, which was initiated by the Hong Kong Institute of Utility Specialists (HKIUS), is a major conference held by the International Institute of Utility Specialists (IIUS) and being supported by local professional bodies, government departments, academia, industry partners, etc. to discuss and share the popular issues on utility management and safety.

The 1st ICUMAS was held in 2009 and we had the 2nd, 3rd and 4th occasions in 2011, 2013 and 2014, respectively. In 2015, we had Utility Safety & Practical Competition which successfully attracted over 1500 entries. The first three ICUMAS were held in Hong Kong, and the 4th ICUMAS was held in Beijing, PRC. Looking into the future, we wish to have more outside Hong Kong.

The theme for ICUMAS 2017 is "BIM, Control & Utility Management for Smart City and The Sponge City" (建築信 息模擬在智慧城市及海綿城市的控制與管綫管理). Smart city and Sponge city are hot topics for all the developed cities, Hong Kong has no exception.

There is a keen connection between smart city/sponge city and utilities. Without utilities, cities could never be as smart as expected. Indeed, utilities affect our city safety, security and livings. Good utility management (which may be divided into Location, Condition and Management) with the help of controls and the use of BIM and GIS yield in good safety, security and hence good livings of citizens.

For the ICUMAS 2017, the Joint Organizers and Co-organizers are:

#### Joint organizers

- International Institute of Utility Specialists (IIUS) 國際管綫專業學會
- Hong Kong Institute of Utility Specialists (HKIUS) 香港管綫專業學會
- Construction Industry Council (CIC-Hong Kong) 香港建造業議會
- 4) Control, Automatic & Instrumentation Division, The Hong Kong Institution of Engineers (HKIE CAD) 香港工程師學會 控制、自動化及儀器儀表分部

## Welcoming Message

#### Co-organizers

- 1) Smart City Consortium (SCC) 智慧城市聯盟
- 2) Chartered Institution of Civil Engineering Surveyors (Hong Kong Branch) (CICES) 英國特許土木工程測量師學會 (香港區)
- 3) Community, Construction Professionals' Development Centre (CCPDC) 社區、建造及工程專業發展中心
- Underground Pipeline Committee of CACP, China 中國城市規劃協會 - 地下管線專業委員會

#### **Objectives of ICUMAS :**

The objectives of ICUMAS including setting up platforms for practitioners in the utility industry (including clients, consultants, academics, industry from engineering, surveying, and professional utility specialists, etc.) to share their views on utility management and safety. The conference also serves the following purposes:

#### - Establishment of International Standards

Different practices are adopted by different utility parties all over the world. By strengthening the communication among the utility professionals, ICUMAS would facilitate the establishment of international standards in utility specialists industries.

ICUMAS also offer chances to know about the latest developments on condition assessment technologies and the skill-set or best practices for locating utilities within the required accuracy specified in contracts or in HKIUS standards.

#### - Communication Platform

ICUMAS provides an excellent platform and opportunity in keeping abreast of the latest knowledge and experiences about utility management and safety, offering a channel to network with different fields of smart city, smart utility, utility specialists, etc., and promoting continuous cooperation among utility industry worldwide.

#### - Personal Development

The delegates will have a precious opportunity to learn about the latest practices and recent developments in smart city, sponge city, control, utility planning, production, management and safety from all corners of the world.

I took up the Presidency of HKIUS on 1st April, 2013 and have been serving for two terms until 31st March, 2017. Stepping down as President of HKIUS which was formed by 8 members' formation committee chaired by myself in 2000-2002, I shall stand as the Convenor of IIUS (International Institute of Utility Specialists) which was formed by some 100 professionals from over 20 cities in 2013 and headquartered in HKSAR.

The main objectives of IIUS including Professional Standards, Course Accreditations, Publications and professional promotion via ICUMAS. We wish ICUMAS to be continued and we also wish ICUMAS will be held in your city with IIUS as your keen support.

In the near future, we will try our every best efforts to transform the Journal of ICUMAS as an international SCI (Scientific Citation Index) journal specialized in utilities.

Taking these opportunities, I thank all who helped for the successful completion of ICUMAS 2017. They are our Joint Organizers, Co-organizers, Paper Vetting Panel Members chaired by Ir Dr. Peter Tse, Supporting Organizations, Sponsors, Exhibitors, industrial and student helpers, and special thanks are due to the Government departments and the Development Bureau, HKSARG who supported ICUMAS 2017. Without your support, ICUMAS would not have been completed in good order. Without your support, the utility profession would not have been developed as remarkable as it is.

Thanks for your unfailing support and keen to see you again somewhere in the world via ICUMAS.

King WONG, FHKIUS, FIIUS, RPUS, FHKIE, FICE, FIMechE, CFIOSH, FBCS, FCIWEM, FCInstCES Chair, Organizing Committee, ICUMAS 2017 30th March, 2017, HKSAR







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#### DAY 1 CONFERENCE – 30th March 2017 (Thursday)

Time	MAIN HAL	L	
8:30 - 9:00	REGISTRATION		
9:00 – 9:30	OPENING CEREMONY		
	Moderator: Ir C. K. NG (President Elected, HKIUS) Welcoming, Guest of Honor and Keynote Speech		
9:00 - 9:10	Welcoming and Keynote Speech Mr. Ka-kui CHAN, BBS, JP (Construction Industry Council)		
9:10 - 9:20	Guest of Honor Speech Ir Chi-keung HON, JP (Development Bureau)		
9:20 - 9:25	Souvenir Presentation for Guest of Honor Group Photo		
Time	Keynote Speech		
9:25 - 9:55	Ir Dr. King WONG (Hong Kong Institute of Utility Specialists) Topic: Overview and Challenges of Utility Profession - A Case From Hong Kong		
9:55 - 10:15	Ir Chung-leung WONG, JP (Water Supplies Department) Topic: Towards Smart Water Supply in Hong Kong - the Water Intelligent Network		
10:15 - 10:35	Ir Fedrick KAN (Drainage Services Department) Topic: Stormwater Management in Hong Kong – Towards a Sustainable and Resilient City		
10:35 - 11:00	Mr. YU Shu-xi 俞述西先生 (廣州市安全生產協會) Topic: Improving Utility Safety for Guangzhou City 對加強廣州地下管線安全管理的一點思考		
11:00 - 11:15	Coffee Bre	vak	
	SESSION 1 (MAIN HALL) Location & Condition Moderator: Ir Dr. Wallace LAI	SESSION 2 (BREAKOUT ROOM 1) Management Moderator: Dr. Jack C P CHENG	
11:15 - 11:40	Ir Dr. Wallace LAI Lab-based Validation of Utility Survey Technologies and Methods	Ir Chun Keung NG Evolution of BIM and Information exchange in project lifecycle	
11:40 - 12:05	Dr. Lewis MAKANA Mapping and Assessing the Underworld: A Novel Approach to Utility Management in Smart and Sponge Cities	Mr. ZHANG Yong Ming 張永命 先生 Key points on survey of hidden peril of water supply pipelines in Guangzhou City	
12:05 - 12:30	Mr. LIANG Kong Zheng Recent Robotic Technology For infrastructure and Utilities Construction And Maintenance: A Review	Ms. WANG Ming Zhu, Annie Transformation of Semantic Information-rich Underground Utility Models Between BIM and Web GIS	
12:30 – 12:55	Ir Kwok Leung NGAI Smart Water Network in Hong Kong	Dr. Jack C P CHENG BIM, Augmented Reality and Computer Vision: Opportunities and Challenges for Utility Management	
12:55 - 14:00	LUNCH Venue: Montparnass	se Room. 2/F	
	Venue: Montparnasse Koom, 2/F		
	MAIN HALL - CIC'S BIM SESSION on 3	0 March 2017	
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	DAY 2 CONFERENCE – 31st M	arch 2017 (Friday)	
8:30 - 9:00	REGISTRATION		
	MAIN HAI	LL CONTRACTOR OF CONTRACTOR	
Time	Keynote Speech Moderator: Ir Dr. Chung-nin KO		
9:00 - 9:20	Mr. Eric YEUNG (Smart City Consortium) Topic: What Makes "A Smart City" Smart		
9:20 – 9:45	<b>Mr. Pengiran MATUSIN MATASAN</b> (ASEAN Federation of Land Surveying and Geomatics) ASEANFLAG 東南亞測繪協會 <i>Topic: ASEAN Surveyors - Forging Synergies, Focused Initiatives</i>		
9:45 – 10:10	<b>Mr. Martin KEE</b> (Institution of Gas Engineers & Managers - Far East District Section) 燃氣專業學會 - 遠東區分會 <i>Topic: How Natural Gas Changes Cities in Mainland China?</i>		
10:10 - 10:35	Prof. Yehiel ROSENFELD (Israel Institute of Technology) Topic: Harnessing Evolving Technologies for Better Quality of Life in Cities		
10:35 - 11:00	<b>Prof. Samuel T. ARIARATNAM</b> (Arizona State University) Topic: Consequences of Poor Mapping and Locating Practices During Horizontal Directional Drilling		
11:00 – 11:15	Coffee Break		
	SESSION 1 (MAIN HALL) Location & Condition Moderator: Ir Prof. Peter W. TSE	SESSION 2 (BREAKOUT ROOM 1) Management Moderator: Ir Dr. Pui-lam NG	
11:15 – 11:40	Ir Prof. Peter W. TSE Recommended Certification Process For Education Programs and Training Schemes In Physical Asset Management	Ir Dr. Pui-lam NG Utilisation of Engineered Cementitious Composites (ECC) for Manhole Cove	
11:40 – 12:05	Mr. SUN Shi Long Study of Piezoelectric Vibration Energy Harvester Design with Magneto Rheological Elastomers	Mr. ZHENG Hong Biao 鄭洪標 先生 Application of digital technology in pipeline detection	
12:05 – 12:30	Mr. Javad ROSTAMI Detection of Hidden Corrosion in Pipes Carrying Gas into Hong Kong Residential Buildings by Ultrasonic Guided Waves and Advanced Signal Processing Technique	Mr. HO Chun Yiu, Alan The Design of Internal Alignment Clamp for PE Pipe Fusion	
12:30 – 12:55	Mr. Larry GILLANDERS Small-Diameter Pipe Rehabilitation - Patented Lead Free, Leak Free Epoxy Lining Technology	Mr. WONG Chan Kong, Chris Gas Network Asset Life Cycle Costing Model	
12:55 - 14:00	LUNCH Venue: Montparnase	se Room, 2/F	
	MAIN HALL (I	Day 2)	
Time	Keynote and Guest Speech Moderator: Dr. Isabelle Y. S. CHAN		
14:00 - 14:20	Keynote Speech <b>Sr Dr. Mohd Yunus MOHD YUSOFF</b> (Department of Survey Mapping, Malaysia) <i>Topic: Governance of Underground Utility Mapping in Malaysia</i>		
14:20 - 14:40	Guest Speech Ir Dr. Peter TSE (City University of Hong Kong) Topic: Condition Assessment to Pipes		
14:40 – 15:00	Guest Speech Mr. LIANG Hao 梁豪 先生 (廣州市市政集團有限公司) Topic: A Trenchless Repair Technology of Large Diameter Drainage 大直徑排水幹管非開挖修復成套技術		
15:00 - 15:20	Guest Speech Dr. ZHANG Jian-jun 張健君 博士 (深圳市市政設計院) Topic: Integrated Pipeline Tunnel Used in Municipal Engineering in China 綜合管廊在市政工程中的應用		
15:20 - 15:40	Guest Speech Mr. William KWAN (Hong Kong Broadband Network Limited) Topic: GIS – Enabling a Smarter Optical Network Monitoring Systems		
15:40 - 15:50	Coffee Bro	bak	
15:50 - 17:15	"UTILITY PROFESSIONALS SUMMIT" Utility Survey Methods and How Accurate Surveys Can Help in Project Safety and Progress? Moderator: Ir Dr. King WONG (Hong Kong Institute of Utility Specialists)		
17:15 -17:30	CLOSING CER Presentation of Souvenirs, Aw	EMONY ards and Group Photos	

### ORGANIZING COMMITTEE (OC)

Name	Title	Organization			
CHAIRMAN					
Ir Dr. King WONG	President	Hong Kong Institute of Utility Specialists			
黄敬 博士 工程師 管綫專業監理師	Convenor	International Institute of Utility Specialists			
	CO-CHAIRMEN				
Ir Kam-to LAI 黎錦圖 上栏即	Senior Network Operation Manager	The Hong Kong and China Gas Co. Ltd.			
Ir Dr. Louis LOCK 樂法成 博士 上桯師	Division Chairman	The Hong Kong Institution of Engineers, Control, Automation & Instrumentation Division			
Ir Walter LAM 林偉德 工程師	Construction Manager	MTR Corporation Limited			
	ORGANIZING COMMITTEE	MEMBERS			
Ir Dr. Peter TSE 謝偉達 博士 工程師	Director of SEAM Lab	Department of Systems Engineering & Engineering Management, City University of Hong Kong			
Ir Dr. Vincent HO 何世傑 博士 工程師	General Manager Corporate Safety	MTR Corporation Limited			
Ir Dr. Pui-Iam NG 吳沛林 博士 工程師	Council Member	Hong Kong Institute of Utility Specialists			
Sr Ching-yee Miranda LUI 呂靜儀 測量師	Chairlady	Chartered Institution of Civil Engineering Surveyors (Hong Kong Region)			
Mr Wai-man LAM 林偉文 先生	Committee Member	Chartered Institution of Civil Engineering Surveyors (Hong Kong Region)			
Mr. Cheuk-yin HO 何焯賢 先生	General Manager	BUDA Engineers and Consultants Co., Ltd			
Ir Dr. Chung-nin KO 高松年 博士 工程師	Chief Technology Officer	Kam Yuen (Group) International Ltd			
Dr. Jack C.P. CHENG 鄭展鵬 博士	Associate Professor	Department of Civil and Environmental Engineering, The Hong Kong University of Science and Technology			
Ir Wah-ming LEUNG 梁華明 工程師	Sr Engineer / Research & Development	Drainage Services Department The Government of the HKSAR			
Mr. Yau-bun LAM 林又彬 先生	Committee Member	The Hong Kong Institution of Engineers, Control, Automation & Instrumentation Division			
Ir Dr. Raymond CHEUNG 張偉文 博士 工程師	CAS(W)5	Development Bureau (Works Branch), The Government of the HKSAR			
Mr. Chun-man Roy SO 蘇俊文 先生	Vice Hon. Secretary	Hong Kong General Building Contractors Association			
Ir S. L. MAK 麥樹麟 工程師	Secretary	The Institute of Measurement & Control, Hong Kong Section			
Ir Wing-hay TSANG 曾永晞 工程師	Honorary Secretary	The Hong Kong Institution of Engineers Mechanical, Marine, Naval Architecture and Chemical Division			
Ir Wai-cheung FUNG 馮偉章 工程師	Technical Manager	U-Tech Engineering Company Limited			
Mr. Chin-pang Duncan CHAN 陳展鵬 先生	Project Manager	Hang Tone Drainage Engineering Limited			
Mr. Chin-man CHEUNG 張展文 先生	Director & General Manager	FORWIN Site Investigation Engineering Ltd.			
Mr. Kei-hong Victor CHOW 周杞匡 先生	Project Manager	UtilityINFO (1 Call) Limited			
Mr. Philip FERGUSON	Director	Pipeline Condition Assessment Pty Ltd.			
Mr. Po-lung Ken HUNG 洪寶龍 先生	Director	Country Sky Engineering Ltd.			
Ir Kai-man Jim KO 高繼文工程師	Vice President	Hong Kong Institute of Utility Specialists			
Mr Kam-hung Herman KWOK 郭錦鴻 先生	Director	Jetrod Pipeline Consultant and Engineering Limited			
Mr. Kam-wah Wallace LAI 賴錦華 先生	Technical Manager (Maintenance)	Harbour City Estates Limited			
Mr. Pak-Iun Alan LO 羅柏麟 先生	Manager	Innopipe Engineering Co. Limited			
Ir Chun-keung NG 伍振強 工程師	BIM Consultant	Build.IT			
Mr. Wai-Iun Ric NG 吳偉麟 先生	Engineer In-Charge	Freyssinet Hong Kong Limited			
Mr. Sai-man Simon SO 蘇世文 先生	General Manager	MSDI Limited			
Mr Chee-man Paul TANG 鄧志民 先生	Council Member	Hong Kong Institute of Utility Specialists			
Mr. Hoi-yuen Paul TSUI 徐開源 先生	Managing Director	ESRI China (HK) Ltd.			
Mr Chun-fai WONG 黃駿暉 先生	Director	APC Surveying & Building Limited			
Mr. Shu-wai Isaac YING 應書偉 先生	Director	Toptime Technologies Co., Ltd			
Mr. Po-tsun Patrick YUEN 阮步臻 先生	Director	Patrick Yuen Underground Detection Company Limited			
Dr. Wing-hong Ivan FUNG 馮穎匡 博士	Chairman	The Institute of Safety and Health Practitioners			
Mr. Yiu-tung Anthony CHAN 陳耀東 先生	President	The Hong Kong Registered Contractors Association			
Mr. Lit-yin LAM 林烈賢 先生	Chairman	The Hong Kong Institution of Engineering Surveyors			
Mr. Hon-wai Jacky LAM 林漢威 先生	Chief Executive Officer	Smart City Consortium			
Mr. Tony Chan 陳平 先生	Senior GIS Solution Manager	Esri China (Hong Kong) Limited			

## **Guest of Honor**



Ir Chi-keung HON, JP 韓志強 工程師、太平紳士

Permanent Secretary for Development (Works), Development Bureau The Government of the HKSAR 香港特別行政區政府發展局 - 常任秘書長(工務)

Ir Hon Chi-keung has been appointed Permanent Secretary for Development (Works) since April 2015.

Ir Hon graduated from the Department of Civil Engineering, University of Hong Kong in 1980. He also obtained a master degree in Public Administration from the University in 1997. He is a fellow of the Hong Kong Institution of Engineers, Chartered Institute of Arbitrators and Hon. Fellow of Hong Kong Institute of Utility Specialists.

Ir Hon joined the Government as an Assistant Engineer in 1983. He was promoted to Chief Engineer in 1999, to Government Engineer in 2005 and to Principal Government Engineer in 2008. He was Project Manager of Hong Kong Island and Islands Development Office of the Civil Engineering and Development Department from 2008 to 2011. He has been Director of Civil Engineering and Development from January 2011 to April 2015 before his appointment as Permanent Secretary for Development (Works).



#### Ms. Ada Y S FUNG, BBS, JP 馮宜萱 女士、銅紫荊星章、太平紳士

Deputy Director (Development & Construction), Housing Authority, The Government of the HKSAR 香港特別行政區政府房屋署 - 副署長(發展與建築)

Ms. Ada FUNG is the Deputy Director of Housing. She supervises the Development & Construction Division of the Housing Department, overseeing all facets of work covering project management, planning, design and contract management, as well as establishing operational policies on procurement, design, construction, quality, performance assessment, dispute resolution, research and development, construction information technology, safety and the environment for public housing development in Hong Kong. She is an active member in the architectural field as well as in the construction industry in Hong Kong. She is Chairperson of Hong Kong Construction Industry Council (CIC) Committee on Construction Safety, Chairperson of CIC's Working Group on Roadmap for BIM Implementation, one of the directors of the Hong Kong Green Building Council, Past Chairperson of the APEC Architect Monitoring Committee of Hong Kong, past Chairperson of the Architects.

#### Topic: BIM in Hong Kong: What is Your Contribution?

#### Abstract:

The adoption of Building Information Modelling (BIM) in construction industry is a global trend. A number of countries have already required or will mandate adoption (e.g. Mainland China, European Union, Singapore, United Kingdom, Germany, Gulf Cooperation Council, South Korea, etc) in construction projects. Some of them have set up agencies (e.g. Canadian BIM Council) to manage nation-wide implementation of BIM and the introduction of good practices and standards. Hong Kong may risk loss of competitiveness in Asia Pacific Region in near future if we do not keep pace with the global BIM adoption.

The recent Policy Address stated that "BIM allows construction professionals to carry out design and construction works in a virtual environment, which helps avoid changes in the construction process as far as possible, reduce risks and render clarity to project costs in various stages. The Government will actively seek to require consultants and contractors to use this modelling technology when undertaking design of major government capital works projects from next year onwards."

We all could contribute to BIM implementation in Hong Kong. May I invite you to ask yourself what you could contribute for the betterment of BIM development in Hong Kong?



#### Ir Chung-leung WONG, JP 黃仲良 工程師 <sup>、</sup>太平紳士

Deputy Director, Water Supplies Department, The Government of the HKSAR 香港特別行政區政府 水務署 - 副署長

Ir WONG Chung-leung graduated from the University of Hong Kong in Civil Engineering in 1983. After graduation, he worked in an engineering consultant as assistant engineer and later engineer. He joined the Water Supplies Department (WSD) of the Hong Kong Special Administrative Region Government in 1989 as engineer. He worked in various divisions of WSD on areas including construction of waterworks, water supply and distribution, consultants management, water resources planning, asset management, water loss management, Dongjiang raw water supply system and grade management. Ir WONG obtained the degree of Master of Philosophy from the Hong Kong Polytechnic University in 1993. Before taking up the post of Deputy Director of Water Supplies, Ir WONG worked as Principal Assistant Secretary in the Development Bureau overseeing the policies on water supply, flood prevention and environmental management. Ir WONG is currently the Deputy Director of WSD responsible for the policies, development, operation, maintenance, customer services etc. for the water supply in Hong Kong and administration of the Department.

#### Topic: Towards Smart Water Supply in Hong Kong - the Water Intelligent Network

#### Abstract:

It is the mission of Water Supplies Department (WSD) to provide adequate, reliable and safe water supply to the people of Hong Kong and strive for continuous improvement. However, WSD is facing a number of challenges including the increasing water demand due to population and economic growth, competition for Dongjiang water from other cities in Guangdong, uncertainties brought about by climate change on water resources and the aging of the water supply system including the distribution network. To prepare for these challenges, WSD promulgated the Total Water Management (TWM) strategy in 2008 with emphasis on reducing the water demand while strengthening the water supply management. For taking forward the TWM strategy, WSD has been promoting water conservation and enhancing water supply network management as the key demand management measures as well as developing new water sources including desalination, reclaimed water, grey water recycling and rainwater harvesting on the supply side.

With substantial completion of the 15-year programme of replacement and rehabilitation (R&R) of about 3,000 km of aged water mains, the condition of the water supply network in Hong Kong has been significantly improved as reflected by the substantial reduction in the number of water main bursts and leakage rate. Nonetheless, water mains in the water supply network will continue to age and deteriorate. Instead of continuing to rely solely on large-scale R&R works which is no longer cost effective, WSD has formulated a plan for implementation of the Water Intelligent Network (WIN) to maintain the healthiness of the water supply network and to reduce water loss.

Riding on technological advancement of sensors, telemetry, network management software and data analysis in recent years, and making reference to overseas experiences, WSD has been progressively establishing WIN in the fresh water supply network by adopting these advanced technologies. WIN will enable continuous monitoring of the water supply network in a holistic manner on District Metering Area (DMA) basis. Under WIN, tremendous amount of data, such as the flow and pressure collected from the DMAs, will be processed and analyzed by an intelligent network management computer system. Through the analysis, health of the water mains in the DMAs can be continuously monitored, and effective network management measures can be determined and judiciously applied to individual DMAs according to the condition of the water mains therein.

Looking ahead, WSD will make use of the opportunity in the Development of Anderson Road Quarry Site to try out more advanced smart water supply initiatives with a view to further enhancing the management of the water supply network.



#### Ir Fedrick Y F KAN 簡炎輝 工程師

Assistant Director, Drainage Services Department, The Government of the HKSAR 香港特別行政區政府 渠務署 - 助理署長

After graduation from the University of Hong Kong, Ir Kan worked in a consultant firm in Hong Kong and Public Utilities Board of Singapore for 10 years before joining the Drainage Services Department (DSD) of HKSARG in 1991. Since then, he has been working in various posts of DSD in connection with the planning, design and construction of drainage and sewerage projects in Hong Kong, including the first drainage tunnel in Kai Tak and the first flood storage tank at Tai Hang Tung; drainage and sewerage master planning; and operation and maintenance of DSD's assets. He also served as a Member of the Expert Panel on Enhancing Flood Protection in Singapore in 2011/12. He is currently the Assistant Director/Operations and Maintenance of DSD overseeing the flood control, district operation and maintenance as well as drainage and sewerage planning matters in the Territory.

#### Topic: Stormwater Management in Hong Kong – Towards a Sustainable and Resilient City

#### Abstract:

Sponge City, Water Sensitivity City and Water Resilient City are emerging hot topics in urban city planning. All these topics share a common principle, which is the emphasis on sustainability and resilience in the design of stormwater management. To accomplish our aspiration of steering Hong Kong towards a sustainable and resilient city, we have to understand the challenges and opportunities ahead in stormwater drainage planning.

One of the biggest challenges we are facing is the climate change impact. The Paris Agreement endorsed in COP 21 held in December 2015 has set up a clear target with the associated global commitments. The Government of the Hong Kong Special Administrative Region has promptly responded to this by establishing the Steering Committee on Climate Change and Working Groups to formulate the climate actions of various bureaus and departments.

Hong Kong is renowned as one of the most densely populated cities. The highly compacted environment has been imposing great difficulty in stormwater drainage planning. Nevertheless, Drainage Services Department has implemented different flood mitigation measures that are proved to be effective through the past years. To further combat against storm surge and the rising sea level due to the climate change effect, we have been investigating new measures to protect the low-lying areas. Innovative ideas with consideration of sustainable elements such as revitalising water bodies would form a vital part of the stormwater management in future. Yet, on top of implementing structural defensible infrastructures, adaptation and resilience to flooding should also be put in the agenda of investigation taking the view that there will be more severe and frequent extreme weather events due to climate change effect in the coming years.



#### Mr. Eric YEUNG 楊全盛 先生

Convener, Smart City Consortium 智慧城市聯盟 - 召集人

Eric Yeung is the Founder of FlexWorkflow Limited, which specializes in enterprise software system development and project implementation.

Under the leadership of Eric, FlexWorkflow achieved outstanding results, its success is well recognized by the IT sector. FlexWorkflow is the only Hong Kong software company which received two awards in different categories of the Asia Pacific ICT Awards (APICTA), it also received the Hong Kong ICT Awards (HKICT), and the China Outstanding Software Product Awards (COSPA) for four consecutive year. Eric graduated from Computer Science & Engineering of the Chinese University of Hong Kong. He also obtained the Master of Business Administration and Master's Degree in E-Commerce from the Chinese University of Hong Kong.

Eric plays an active role in IT industry. He is the Chairman of Hong Kong Software Industry Association, Vice Chairman of the Internet Professional Association, Council Member of Hong Kong Computer Society and Hong Kong Information Technology Joint Council. He is also a guest columnist in various famous newspapers and journals, writing articles on IT industry and youth issues. Eric also devotes his time and effort to various community services, especially in youth development and education. He promotes technology innovation to the youngsters and encourages them to contribute to the society.

As the Vice Chairman of the Hong Kong United Youth Association and Executive Vice President of the Hong Kong General Chamber of Small and Medium Business, Eric provides consulting services to different Government Advisory Committees. He is member of various Committees, such as the Advisory Committee on Innovation and Technology, Council for Sustainable Development, Committee on the Promotion of Civic Education, Small and Medium Enterprises Committee, Telecommunications Users and Consumers Advisory Committee (TUCAC), Telecommunications Regulatory Affairs Advisory Committee, Kowloon City District Youth Programme Co-Ordinating Committee and Kwai Tsing District Youth Programme Co-Ordinating Committee.

In 2010, Eric was honored with the Young Leader Award by the Junior Chamber International Hong Kong in recognition of his outstanding leadership talent as well as his significant contribution to the community.

#### Topic: What Makes "A Smart City" Smart

#### Abstract:

Most of the world's population today lives in cities. By 2030, the population of the cities around the world is expected to grow from 3.3 billion to 5 billion people. With the aim to improve the quality of life of people and enable sustainable growth, cities of different sizes around the world are embracing the idea of Smart City with numerous innovative applications and services being rolled out.

The speaker will present the current situation and trends of the market of Smart City, also analyze the use of information and communications technology and sensing technologies in cities by examining this new way of city governing. Existing projects and initiatives were investigated to find out how, and to what extent, these tools are being employed by cities.



#### Mr. Martin W N KEE 紀偉毅 先生

Chairman, Institution of Gas Engineers & Managers -Far East District Section 燃氣專業學會遠東區分會 - 主席

Mr. Kee graduated from the Department of Engineering, The University of Hong Kong and holds a master degree in Business Administration. He joined the Hong Kong and China Gas Company Limited in 1990, and has been participating in HKCG's business development and operation in the Mainland since 1994. He is now the Director and Executive Vice President of Towngas China Company Limited responsible for the operation and management of the gas project companies in East China and Southwest regions. He is also in charge of various functional departments of the Headquarters. Mr. Kee is a member of the 13th Nanjing Committee and previously a member of the 11th and 12th Changzhou Committee of the Chinese People's Political Consultative Conference. Mr. Kee is also the chairman of Institution of Gas Engineers & Managers-Far East District Section (2016/17).

#### Topic: How Natural Gas Changes Cities in Mainland China?

#### Abstract:

With the rapid economic development in China in the past two decades, the quest for higher living standard and the demand for energy have been ever growing. However, serious pollution, air pollution in particular, has accompanied the rapid "coal-based" economic growth. China's coal consumption is still dominant making up 62% of the national primary energy consumption in 2016. With the Chinese government's pledge in the Paris Climate Change Summit 2015 to cut its greenhouse gas emissions per unit of gross domestic product by 60-65% from 2005 levels by 2030, natural gas, as a clean energy promoting sustainable development of the Chinese economy, has been playing and shall continue to play an important role in China's energy development.

The growing demand for natural gas has driven development and innovation in the gas industry in China. There have been tremendous improvements in gas infrastructures. There is now a well-developed national gas network and more natural gas storage facilities are available. There are more sources of natural gas supply including piped gas from Central Asia, liquefied natural gas (LNG) and unconventional gases to cater for the growing gas demand. Gas companies provide the society with more energy efficient natural gas applications not only in the domestic market but also in the commercial and industrial sectors – from traditional cooking and water-heating to space-heating and clothes-drying, from traditional catering and power generation to combined heat-and-power and vehicular fuel. While the Mainland energy market becomes more market-driven and customer-focused, there is a continuous raise in safety standard and customer service standard in the gas industry with an emphasis on innovations and new technologies.

How natural gas changes cities in Mainland China by bringing back the long lost blue sky is discussed with Yixing in Jiangsu Province and Maanshan in Anhui Province as examples.



 Mr. YU Shu-xi

 俞述西 先生

 廣州市安全生產協會 - 首席專家

 英國職業健康學會 - 名譽副會長

俞述西先生,原廣州市安全生產監督管理局首任局長、廣州市人民政府參事、廣州市安全 生產協會創會會長,現任廣州仲裁委員會仲裁員、廣州市人大常委會立法咨詢專家、廣 州市安全生產協會首席專家、英國職業安全健康學會(IOSH)榮譽副會長(榮譽證獲得 者)。

俞述西先生原學機械專業,後因工作需要,刻苦攻讀了中文、法律等專業。1968年至1984 年在企業歷任機械維修工、車間技術員兼安全員、廠長秘書等職務。1984年調往廣州市 人民政府經濟委員會後,在政府機關長期從事政策法規及行政執法等工作,為政府經濟改 革、行政執法及行政訴訟進行了大量的法律政策研究和決策工作,成功處理了大量重要經 濟、行政法律爭議和生產安全事故問題。

2007年,他接受政府委托參與廣州市人大立法工作,組織起草並參與制訂地方法規《廣州 市安全生產條例》。2013年,他受廣東省安全生產監督管理局委托,參與了廣東省人大 常委會地方法規《廣東省安全生產條例》的修訂和審議辯論工作,受到了行業界的普遍贊 譽。他曾兩次被中共中央宣傳部和國家司法部聯合評為全國法制宣教先進工作者,並被國 家安監局評為全國安監工作先進個人。

Topic: Improving Utility Safety for Guangzhou City 對加強廣州地下管線安全管理的一點思考

Abstract:

- 1. Risk of Utility Safety 不可對地下管綫風險掉以輕心
- 2. Current Situation 廣州地下管綫的現狀介紹
- 3. Current Practice 廣州地下管綫安全管理的一些做法
- 4. How to Improve Utility Safety 對加強廣州地下管綫安全管理的一點思考



#### Prof. Samuel T. ARIARATNAM

Professor and Construction Engineering Program Chair, Ira A. Fulton Schools of Engineering at Arizona State University

Dr. Samuel T. Ariaratnam is a Professor and Construction Engineering Program Chair in the Ira A. Fulton Schools of Engineering at Arizona State University with over 20 years of experience in trenchless engineering research and education. He has published over 250 technical papers and reports and is a co-holder of four patents. Dr. Ariaratnam has received numerous awards including the 2012 North American Trenchless Technology Person of the Year. Additionally, he has received recognition from the American Society of Civil Engineers (ASCE), where he received both the John O. Bickel Award and the Arthur M. Wellington Prize. Dr. Ariaratnam was elected as a Fellow of ASCE in 2015. He served as Chairman of the International Society for Trenchless Technology (ISTT) from 2010-2013 and currently serves as Vice Chairman of the ASCE Pipelines Division Executive Committee.

### Topic: Consequences of Poor Mapping and Locating Practices During Horizontal Directional Drilling

#### Abstract:

Underground construction in urban environments poses a challenge to contractors due to the amount of existing utilities beneath the surface. This is further complicated by the lack of sufficient and accurate records available on the location of these utilities. Trenchless technologies now play a major role in the installation of new utility infrastructure due to the inherent advantage of minimal disruption to surface activities compared to traditional open cut methods. Horizontal Directional Drilling (HDD) is the most common trenchless method currently being used worldwide, mainly due to the fact that the technology is capable of installing a wide range of utilities including water, wastewater, natural gas, electrical, oil pipelines, and telecommunications. This presentation discusses the consequences of poor mapping and locating practices and provides an insight into better ways of avoiding damage incidents when adopting HDD.



#### Sr Pengiran MATUSIN MATASAN

Immediate Past President, ASEAN Federation of Land Surveying & Geomatics (AFLAG)

Designation: Immediate Past President ASEAN Federation of Land Surveying & Geomatics (AFLAG)

- Former Surveyor General, Brunei Darussalam (1994-2005)
- President of Brunei Institution of Geomatics (2005-2007, 2014-present)
- AFLAG President (2005-2007; 2013-2015)

#### Topic: ASEAN Surveyors - Forging Synergies, Focused Initiatives

#### Abstract:

The establishment of The ASEAN Free Trade Area (AFTA) has opened the doors to greater cooperation, movement and liberalization of services and professionals. These have, amongst others, been realized through the Mutual Recognition Arrangement (MRA). It is nevertheless still quite a long and winding road ahead for the ASEAN Land Surveying and Geomatics professionals. This paper will explore the issues and concerns with regards to the due processes and procedures that will obviously need to be carefully navigated, streamlined and straightened out in order to realise the vision and objectives, as well as the opportunities, potentials and benefits of these liberalisation efforts to stakeholders of the ASEAN member nations and the role of The ASEAN Federation of Land Surveying and Geomatics (AFLAG). Through "Forming Synergies – Focussed Initiatives" AFLAG aspires to be the catalyst.



#### Prof. Yehiel ROSENFELD

Head, National Building Research Institute Head, Construction Engineering and Management Program, Faculty of Civil and Environmental Engineering Technion, Israel Institute of Technology

Yehiel Rosenfeld (born 1952) heads the Construction Engineering and Management Program at Technion – Israel Institute of Technology, where he is an Associate Professor that teaches Graduate and Undergraduate courses. He is also Head and a senior researcher at the Israeli National Building Research Institute – where he conducts studies and projects for government and for public and private organizations. He served as Visiting Professor at M.I.T. – Massachusetts Institute of Technology, where he had taught four full academic years (Sabbaticals) in addition to research collaborations.

Dr. Rosenfeld has gained a broad perspective of the construction industry worldwide as BOD (Board of Directors) member of two leading international organizations, CIB - The International Council for Research and Innovation in Building and Construction (the major International scientific organization of research institutes worldwide in building, construction and related fields), and IAARC - The International Association for Automation and Robotics in Construction. He has been engaged in the pioneering introduction and development of most innovative construction methods and technologies - including deployable structures, prefabrication, industrialization, automation, robotics and floating mega-facilities. He founded the Laboratory for Automation and Robotics in Construction - where construction technologies of the next generation had been developed. Many of his research projects, as well as theses of graduate students, and professional publications deal with conceptual and practical aspects of innovative approaches and technologies. He pioneered the application of Quality Circles to construction sites in Israel and in the USA for productivity gains. Currently, Professor Rosenfeld is promoting two nationwide projects: improving the guality record of the construction industry, and upgrading the dwelling standard in existing housing stocks through a sophisticated techno-economic, sustainable urban-regeneration plan. He acts as consultant and serves on important National and International professional committees, where he brings research into practice through interactions with top-level policy-makers, executives, and practitioners.

#### Topic: Harnessing Evolving Technologies for Better Quality of Life in Cities

#### Abstract:

To mention merely some of the most important features, best cities of the future should be:

Resilient, Friendly, Efficient, Smart, Healthy, Affordable, Satisfying, Clean, Self-sustained, Interesting, and Pleasant for all.

Achieving such attributes requires the combination and fusion of: Smart utilities, Multi-layer spongy infrastructure, Intensive use of IOT (Internet of Things), Green buildings and more.

Cities around the world have been constantly becoming more and more densely populated and, practically, "entangled" in many aspects.

This keynote address will present several major attempts to not only "cope with" but rather greatly enhance the quality of life in cities.

## **Guest Speakers**



#### Dr. Jack C P CHENG 鄭展鵬 博士

Associate Professor, Department of Civil and Environment Engineering The Hong Kong University of Science and Technology

Topic: BIM, Augmented Reality and Computer Vision: Opportunities and Challenges for Utility Management



 Mr. Hao LIANG

 梁豪 先生

 廣州市市政集團有限公司

Topic: Pipe Rehabilitation for Trunk Sewer 大直徑排水幹管非開挖修復成套技術



Ir Dr. Peter W T TSE 謝偉達 博士 工程師

Director of SEAM Lab, Department of Systems Engineering & Engineering Management, City University of Hong Kong

Topic: Recommended Certification Process For Education Programs and Training Schemes In Physical Asset Management



Dr. ZHANG Jian-jun 張健君博士 深圳市市政設計院 - 副總經理

Topic: Integrated Pipeline Tunnel Used in Municipal Engineering in China 综合管廊在市政工程中的應用

## **Paper Presenters**

#### **Location & Condition**

Lab-based Validation of Utility Survey Technologies and Methods LAI, Wallace W.L.

Key points on survey of hidden peril of water supply pipelines in Guangzhou City 廣州市供水管線隱患排查專案實施要點 ZHANG, Yongming 張永命

Recent Robotic Technology For infrastructure and Utilities Construction And Maintenance: A Review LIANG, Kongzheng

Recommended Certification Process For Education Programs and Training Schemes In Physical Asset Management TSE, Peter W.

Study of Piezoelectric Vibration Energy Harvester Design with Magneto Rheological Elastomers SUN, Shilong and TSE, Peter W.

GIS - based Drainage Pipeline Network Hidden Trouble Investigation Information System — Taking Xuchang Drainage Information Construction as an Example 基於GIS的排水管網隱患排查信息系統 - 以許昌排水信息化建設為例 LU, Zaihe and ZHENG, Hongbiao 盧在賀,鄭洪標

Detection of Hidden Corrosion in Pipes Carrying Gas into Hong Kong Residential Buildings by Ultrasonic Guided Waves and Advanced Signal Processing Technique ROSTAMI, Javad and TSE, Peter W.

**Governance of Underground Utility Mapping in Malaysia** MOHD YUSOFF, Mohd Yunus, JAMIL, Hasan, and MOHAMED YUSOF, Nor Ashikin

## Paper Presenters

#### Management

**Evolution of BIM and Information exchange in project lifecycle** NG, C.K. and SINGHAL, Avinash

Mapping and Assessing the Underworld: A Novel Approach to Utility Management in Smart and Sponge Cities MAKANA, Lewis O., METJE, Nicole and ROGERS, Chris D.F.

Transformation of Semantic Information-rich Underground Utility Models Between BIM and Web GIS WANG, Mingzhu and CHENG, Jack C.P.

Smart Water Network in Hong Kong CHUNG, Wai Fung, NGAI, Kwok Leung, SHOU, Stephanus and LAU, Tony

Utilisation of Engineered Cementitious Composites (ECC) for Manhole Covers NG, P.L., LI, H.D. and LEUNG, C.K.Y.

**The Design of Internal Alignment Clamp for PE Pipe Fusion** HO, Chun Yiu

Gas Network Asset Life Cycle Costing Model WONG, Chris C.K.

Small-Diameter Pipe Rehabilitation - Patented Lead Free, Leak Free Epoxy Lining Technology HAU, Lawrence Hawk Man

GIS – Enabling a Smarter Optical Network Monitoring Systems

KWAN, William

## Welcoming Message



#### Welcome Message from the Chief Editor

In the capacity of being the Chief Editor of the Panel for Paper Vetting and on behalf of the 5th International Conference on Utility Management and Safety 2017 (5th ICUMAS 2017), I am delighted to welcome you all to the conference of ICUMAS 2017. This year, the theme of conference is 'BIM, Control & Utility Management for Smart City and The Sponge City'. The conference attracted a significant number of expert papers that are related to the fields of utility location, utility condition, management as well as control and asset management. The authors of these papers comprising academics, government officials, industrial practitioners and scientists. All published papers have been refereed by specialist members of the paper vetting committee. The content and presentation of papers are in excellent quality.

The variety in the topic of papers is astonishing. The presented contents are versatile and in professional standard. The papers report the recent trends in BIM for infrastructure, rehabilitation of pipes, the asset life cycle cost modelling for gas network, utilisation of new material for making manhole covers, underground utility mapping and assessing, utility survey technologies and application in water supply pipelines, certification in engineering asset management, utility construction and maintenance via robotic technology, novel technology developed for the detections of pipelines and hidden corrosion occurred in risers, innovative design of an energy harvester made from smart materials etc. The knowledge and experience presented in these papers can definitely contribute significant impacts to the related scientific world and utility industry.

The Chairman of the Organizing Committee and the Chief Editor are indebted to the Chairman of each Paper Panel and the members of Paper Vetting Committee. They are Ir Dr. Wallace Lai, Ir Dr. Vincent Ho, Ir Dr. Louis Lock, Dr. Jack Cheng, Ir Dr. C. N. Ko, Ir Dr. P. L. Ng, Dr. Ivan Fung, and Mr. Ivan Ko, Miss Rebecca Lee and Miss Vicky Leung. With their excellent supports, the papers have been professionally reviewed and assessed. Valuable comments have been given to the authors to make their papers prepared in a more professional manner and better quality.

I look forward to your participation in making this conference a most memorable event for you and fellow delegates. By reading these papers, I hope that you will be enlightened and inspirited by them and then you will create more innovations to the sector of utilities and convert your city into a smart city in future.

#### Peter W. T. TSE

The Chief Editor for ICUMAS 2017

## **Panel Members for Paper Vetting**

#### Panel Chairmen for Paper Vetting

Utility Location field: Ir Dr. Wallace LAI	Assistant Professor Department of Land Surveying and Geo-Informatics The Hong Kong Polytechnic University
Utility Condition field: Ir Dr. Peter TSE	Director of SEAM Lab Department of Systems Engineering & Engineering Management City University of Hong Kong
Management field: Ir Dr. Vincent HO	General Manager, Corporate Safety MTR Corporation Limited
Control & Asset Management: Ir Dr. Louis LOCK	Division Chairman The Hong Kong Institution of Engineers Control, Automation & Instrumentation Division
Panel Members	
Dr. Jack C. P. CHENG	Associate Professor Department of Civil and Environmental Engineering The Hong Kong University of Science and Technology
Dr. Ivan FUNG	Assistant Professor Department of Architecture and Civil Engineering City University of Hong Kong
Ir Dr. Chung-nin KO	Adjunct Associate Professor
	The Hong Kong University of Science and Technology
Mr. Ivan KO	The Hong Kong University of Science and Technology Senior Manager – Training and Development, Construction Industry Council

The 5th ICUMAS has received good response of paper contributions from a wide spectrum of utilities profession. The contributed papers are of high quality and the selection process of best paper awards has been competitive. The decision on the selection was not easy for the panel members. Judging from the significance, originality, scientific rigour and clarity of the papers, the panel has finally selected the following papers for the best paper awards.

### **Best Paper Award**

Lab-based Validation of Utility Survey Technologies and Methods LAI, Wallace W.L.

Mapping and Assessing the Underworld: A Novel Approach to Utility Management in Smart and Sponge Cities MAKANA, Lewis O., METJE, Nicole and ROGERS, Chris D.F.

## **Best Student Paper Award**

Detection of Hidden Corrosion in Pipes Carrying Gas into Hong Kong Residential Buildings by Ultrasonic Guided Waves and Advanced Signal Processing Technique ROSTAMI, Javad and TSE, Peter W.

## Venue

The 5th ICUMAS 2017 is held in Regal Kowloon Hotel, located in the midst of downtown Tsimshatsui – Hong Kong's renowned commercial, touring and shopping district. The hotel provides the ideal environment for both business and leisure travelers and is easily accessible by major transportation systems in Hong Kong. It just takes 40 minutes (35km) drive from the Hong Kong International Airport.

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#### **Floor plan**





#### Hotel Map

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Global BIM Centre of Excellence 國際BIM研究院

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China Instrument and Control Society 中國儀器儀表學會

Chinese Taipei Society for Trenchless Technology

Construction Industry Development Board Malaysia

Guangzhou Association for Science & Technology 廣州市科學技術協會

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