

# 13/WSD/17

## Design, Build and Operate First Stage of Tseung Kwan O Desalination Plant

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Water Supplies Department



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# TKODP ARCHITECTURAL DESIGN

Architectural Project Unit Limited (APU) acts as the Project Architect and Authorized Person for the First Stage of Tseung Kwan O Desalination Plant (TKODP). Playing a crucial role in the Architectural and Landscape Design of the project, APU applies the company philosophy - Design for Quality to the fullest in developing the architectural design of TKODP.

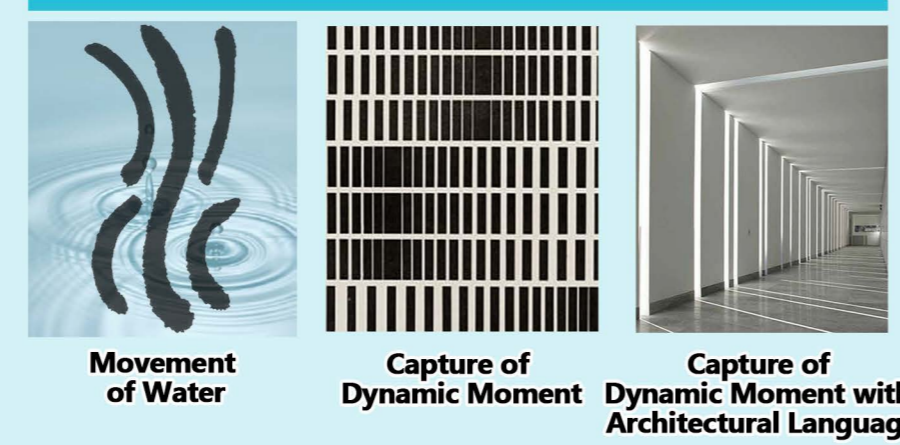
With a mission of building a new landmark in Hong Kong that perfectly balances both aesthetic desire and functional needs, they considered innovative technologies of construction and sustainable building are the keys to success.



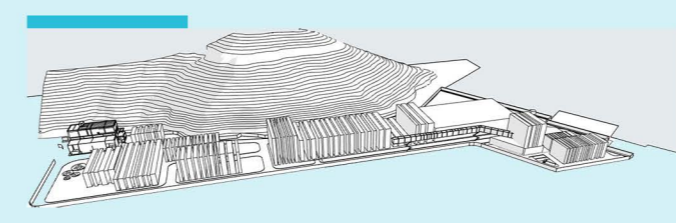
Architecture captures the history, culture and technology of the society. Our design is inspired by the natural water wave and the Chinese elements.

The design adopts a linear interpretation of water wave in macroscopical scale. By designing the striplike enclosure for the buildings, elements of water and environmental components are exhibited throughout the building blocks.

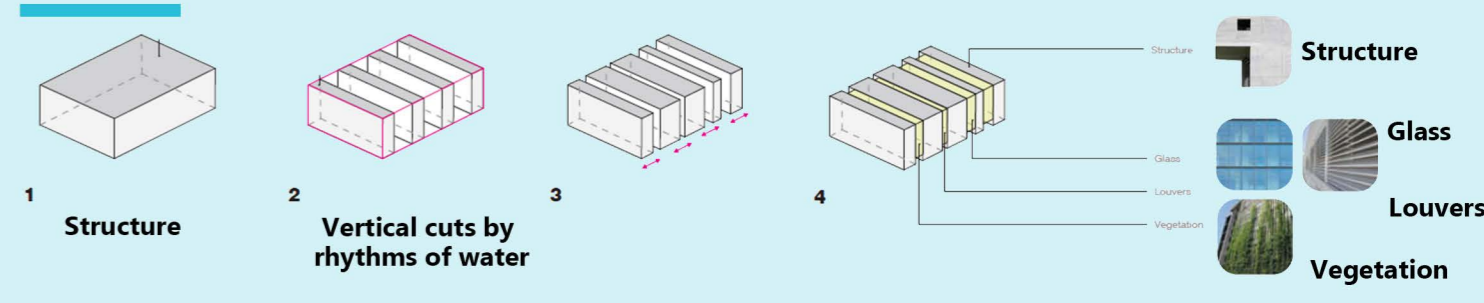
The blue-toned architectural feature fins are another key design component which will be installed in wavy form outside the main buildings.



### Linear Interpretation of Movement



### Language in Architecture



**A**

**PRODUCT WATER STORAGE TANK & ELECTRICAL BUILDING**  
This is the first building you will see from the entrance. The architectural fins with colors symbolizes the water wave. The Garden in the front is a rainwater garden that collects rainwater for its irrigation.

**B**

**DFMA PANELS**  
There are 5 buildings in the project using DfMA panels as the facade.

**D**

**ADMINISTRATION BUILDING**  
Being the one and only curtain wall building, the Administration Building will shine like a diamond in TKODP. All its occupiers can easily enjoy the stunning sea view of Joss House Bay.

**C**

**GREEN FEATURES**  
At the lower roof of the RO building, we showcase the green features of the TKODP, including the PV panels, building skylight and green roof. This is also a nice place where visitors can take a look into the RO building and see how it operates.

**E**

**LANDSCAPE GARDEN**  
This is the drop off area where visitors can start their journey at a beautiful seaside garden. One may enjoy the sea view from the observation deck.

### WHY DFMA?

"DfMA panels are the main feature of the facade design. The modules have some magic figures to make it work."



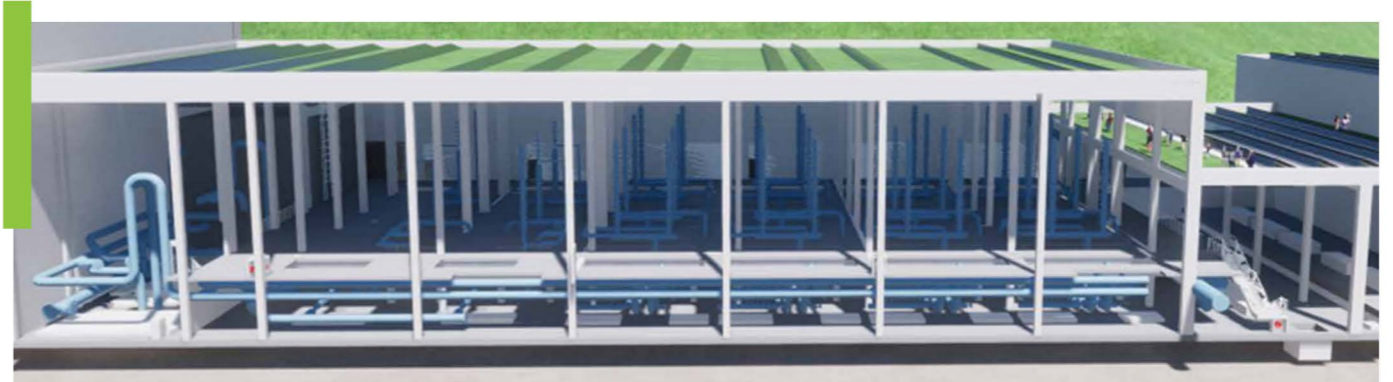
**BENNY HUI**  
Architectural BIM Manager  
He is our BIM expert who handled all standards of details, BIM modeling and BIM coordination issues.

When we talk about the construction of plant buildings, we need to consider the difficulties in moving the equipment into the buildings. If the building skin is another system which allows the equipment to move in as early as possible, this will greatly improve the whole construction process.

DfMA stands for Design for Manufacture and Assembly. DfMA, as its self-explanatory meaning, is an innovative design approach based on a theory of easy assembly. On the other hand, it is a LEGO prototype-like design concept of using modular sizes, repetitive units and standard types in the building system.

The implementation of DfMA in building the desalination plant is very successful and has achieved the following benefits:

- 1) Quality assurance for the panels at factory
- 2) Reduce risks for site works
- 3) Quick assembling for building parts

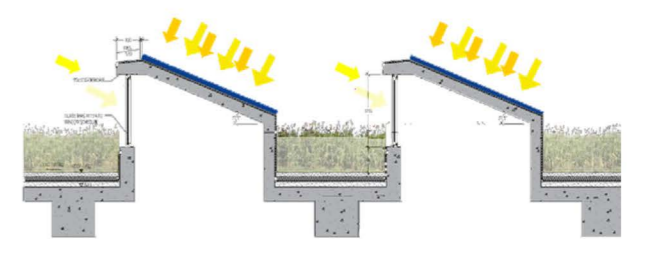


With a strong belief of "Architecture can impact the environment", we promote the nature and environmental awareness as the key elements of our design theme.

### HOW GREEN IT IS!

In designing modern buildings in the countryside, there always comes a challenge of minimizing the visual impact of the manmade features in nature. Our design maximized the use of greening by adding green roofs and green walls so that the desalination plant can peacefully blend in with the surrounding countryside.

Selection of environmental-friendly building materials such as durable Fairface concrete for façade, recycled building materials and systems is also adopted to reduce carbon emissions and achieve sustainability in the long run.



The tilted PV panels at roof provide electricity for the desalination plant

### THE POWER OF BIM

Using the Building Information Modelling (BIM) for this project, coordination across consultancies and client is efficient.

Especially this project kick-started at the outburst of the COVID-19, all of our presentations were conducted in virtual meetings. We generated images, animations and drawings to illustrate our design ideas. With the team members all over the world, the power of BIM also allowed us to communicate in the virtual world without thinking about different time zones.



BIM for RO Racks

So excited to see the project completion in year 2023! We put a lot efforts in doing the design. Hope you all like it!



**ALICE CHAN**  
Authorized Person & Design Architect  
She fosters the project design with her passions and creativity and promotes architecture excellence of the project.

### AWARD – WINNING TEAM

APU has been awarded the Merit prize of BIM consultant in HKIBIM award 2020. Our Oskar and Alice, also awarded as the winner of the competition - 40 under 40 designers 2021. APU has been awarded as the Asia's top 40 young professionals in the Architecture and Interior Design industry in A&D Awards 2021. More details can be founded in <https://aandawards.com/40-winners/>

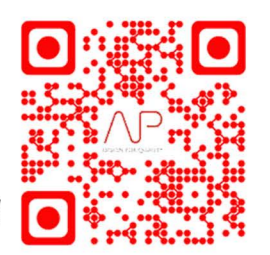
Our awards-winning team is united by a strong desire to deliver quality design that touches people's lives and hearts. Having people as one of our core values for striving for excellence, we honor a huge credit to our team of Hong Kong-based international experts.



We work day and night to meet all the deadlines...

**HENRY HO**  
Architect  
He is responsible for all statutory submissions and reports.

Come visit to know more about APU!



# CO<sub>2</sub> TANK DELIVERY & INSTALLATION

Carbon dioxide (CO<sub>2</sub>), being dosed in the post-treatment process in TKO desalination plant, is used for the addition of alkalinity to desalinated water in combination with saturated lime water. The CO<sub>2</sub> will be delivered in compressed liquid form by road tankers and be transferred to 5 nos. (for 135 MLD design) vertical, vacuum-insulated metal tanks of a unit capacity of 95m<sup>3</sup>, providing a storage capacity of 90 days for Stage 1 TKODP, or 45 days for both Stages 1 & 2.

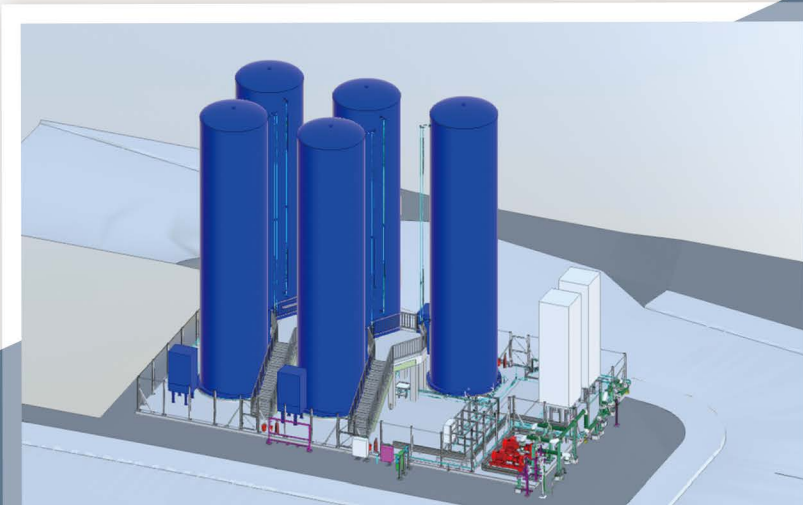
The delivery and installation of 5 nos. CO<sub>2</sub> tanks have adopted the DfMA (Design for Manufacture and Assembly) approach and gained the benefits, including time-saving in concurrent pre-fabrication (which takes approx. 7 months) and civil construction, achieving better quality control and safety supervision in the factory, minimizing temporary scaffolding and conflicts amongst different works trades arisen in the same tank farm area.

The size of each tank is approximately 4m in diameter, 16m tall, and it weighs about 48 tons. To transport these large tanks, the CO<sub>2</sub> package plant supplier, Linde HKO Ltd., arranged five heavy-duty trailers to dispatch the tanks via the Mainland's expressway from Jiangsu's Nantong factory to ZhongShan Port of Guangdong Province. Upon arrival, the tanks were collected and unloaded onto the barges in a day. The barges then carried the tanks and sailed along the Pearl River, across the Victoria Harbour to the CEDD's pier at TKO 137 Area (nearby site boundary), which was reserved for berthing and unloading.

To facilitate transportation and handling of these large tanks from the pier to the CO<sub>2</sub> tank farm area, the TKO team had to prepare well ahead and coordinated with various participants in order to finish the activity safely on time, including-

- Set the foundation bolts (24 nos. M42 per tank) in position precisely with annular steel rings and precast the foundation slab of CO<sub>2</sub> tank farm area
- Plan the lifting positions of 1 no. 500-tons and 1 no. 200-tons rated mobile cranes such that they can jointly perform the tandem lifting of the tank, i.e. switch from horizontal position to upright alignment, and erected onto the plinths
- Develop the rundown, delivery routing and swept path of the trailer, arrange crane barges to berth earlier and implement the traffic control on-site during the period to minimize disturbance to the site activities
- Liaise with CEDD to make use of and clear the pier on schedule

In the end the entire operation for delivery and installation of CO<sub>2</sub> tanks were successfully completed within 2 days (15th & 16th March 2022) as planned.





# WINTER SOLSTICE CARE AND WARMTH HAPPINESS BETWEEN YOU AND ME



**Danny C.S. Hung**  
Executive Director  
China State Construction Engineering  
(Hong Kong) Limited



**Kelvin K.W. Lo**  
Director  
Water Supplies Department



**Andy Y. Kwok**  
Managing Director  
Binnies Hong Kong Limited

On 21 December 2021, China State Construction Engineering (Hong Kong) Limited (CS), one of the mother companies of the AJCV, organized a Winter Solstice event in our site. The event was broadcasted live to all CS construction sites and offices in Hong Kong as a show of unity and care to all workers and staff under CS. The senior representatives of WSD, AJCV, and Binnies, as well as a number of TKODP workers, were present to share this heart-warming moment.

The **Executive Director of CS, Mr. Danny C.S. Hung**, started the speech by looking back at the accomplishments of CS since its establishment in Hong Kong in 1979. CS has been responsible for building some of the most iconic structures. At the same time, CS has been a caring organization in society, as evident by the efficient construction of the multiple temporary quarantine facilities to combat COVID-19. The welfare and safety of staff were also key pursuits for CS, which staged the 'Life First' event in 32 of its sites since 2021. CS undertook the task of 'Site Smart' by integrating new technologies to enhance the safety of its sites. Mr. Hung then took this opportunity to emphasize the importance of working safely on site and wished a happy Winter Solstice to all.

The **Director of WSD, Mr. Lo Kwok Wah JP**, expressed his gratitude towards all site personnel and workers' effort in building the TKODP over the past two years with zero accidents. He stressed the importance of maintaining this outstanding spirit and performance on-site and wished all a happy Winter Solstice and a Merry Christmas.

The **Managing Director of Binnies, Mr. Andy Kwok Yim**, showed his appreciation towards CS for organizing numerous worker caring events, and the team of TKODP for a swift and safe project.

After the speeches and group photos, the senior representatives distributed Winter Solstice Packs to the workers, each including premium dried mushrooms, masks, sanitizers, and a 2022 calendar. Lastly, participants shared suckling pigs to wrap up this thoughtful event.





# GNSS MONITORING SYSTEM SMART SAFETY DEVICE



SCAN FOR  
INTRODUCTION  
VIDEO



This project involves a series of marine works, including the construction of intake and outfall temporary marine cofferdams for the retrieval of Tunnel Boring Machines. Under the traditional method, our surveyors were required to carry out on-site inspection regularly to check if the movement of the temporary marine cofferdams were within the allowable tolerance.

Given the difficulty of physically surveying the alignment and movement of the cofferdam at sea, our project adopted a new smart safety system, known as the Global Navigation Satellite System (GNSS) monitoring system, to provide real-time monitoring for the movement of the marine cofferdams. This system can also eliminate the risk of danger for the surveyors repeatedly disembarking from the vessel to climb onboard the temporary working platform/cofferdam.

The GNSS system utilizes different satellite systems, including GPS, GLONASS, and BeiDou systems, which can greatly reduce error and achieve accuracy within 2mm in terms of longitude, latitude, and height. The GNSS receivers are installed at the marine cofferdams, which wireless transmits the measurement data to the centralized management platform at the site office and the web-based viewing portal. Automatic messages will also be sent out to site management staff when the AAA levels are exceeded. Despite inclement weather, such as typhoons or rainstorms, our staff can still safely obtain the required monitoring data in the site office via the internet.

## TRANSCENDENCE COMPANY LIMITED SMART SITE MANAGEMENT PLATFORM



海宏技术有限公司  
TRANSCENDENCE COMPANY LIMITED

Transcendence Company Limited was established in 2014, with a vision to integrate and apply technology, such as big data, artificial intelligence (AI), cloud-based analysis, internet of things (IoT), 5G technologies, to the construction industry to drive productivity, quality and site safety.

In alliance with different technology companies, Transcendence Co Ltd. developed an integrated smart site digital platform, namely C-smart, performing key functions including Staff Management, Machine & Equipment Management, Material Management, Quality Management, Safety Management, Environment and Energy Consumption Management, Construction Surveying Management, Construction Progress Management and Construction Robots.

Transcendence Co. Ltd. plays an active role in the construction innovation industry and has undertaken over 20 smart site projects over the past few years. Transcendence Co. Ltd. has engaged in all kinds of construction works including building, civil engineering, foundation and E&M works, helping the construction projects to provide a bespoke design of smart site platform and applied different smart products to meet their specific needs and improve project efficiency and delivery outcomes.

The project team visited the C-smart Centre in Science Park to learn more about the digital platform and the latest technologies being adopted in the construction industry.



# COMING 3-MONTH CHALLENGES

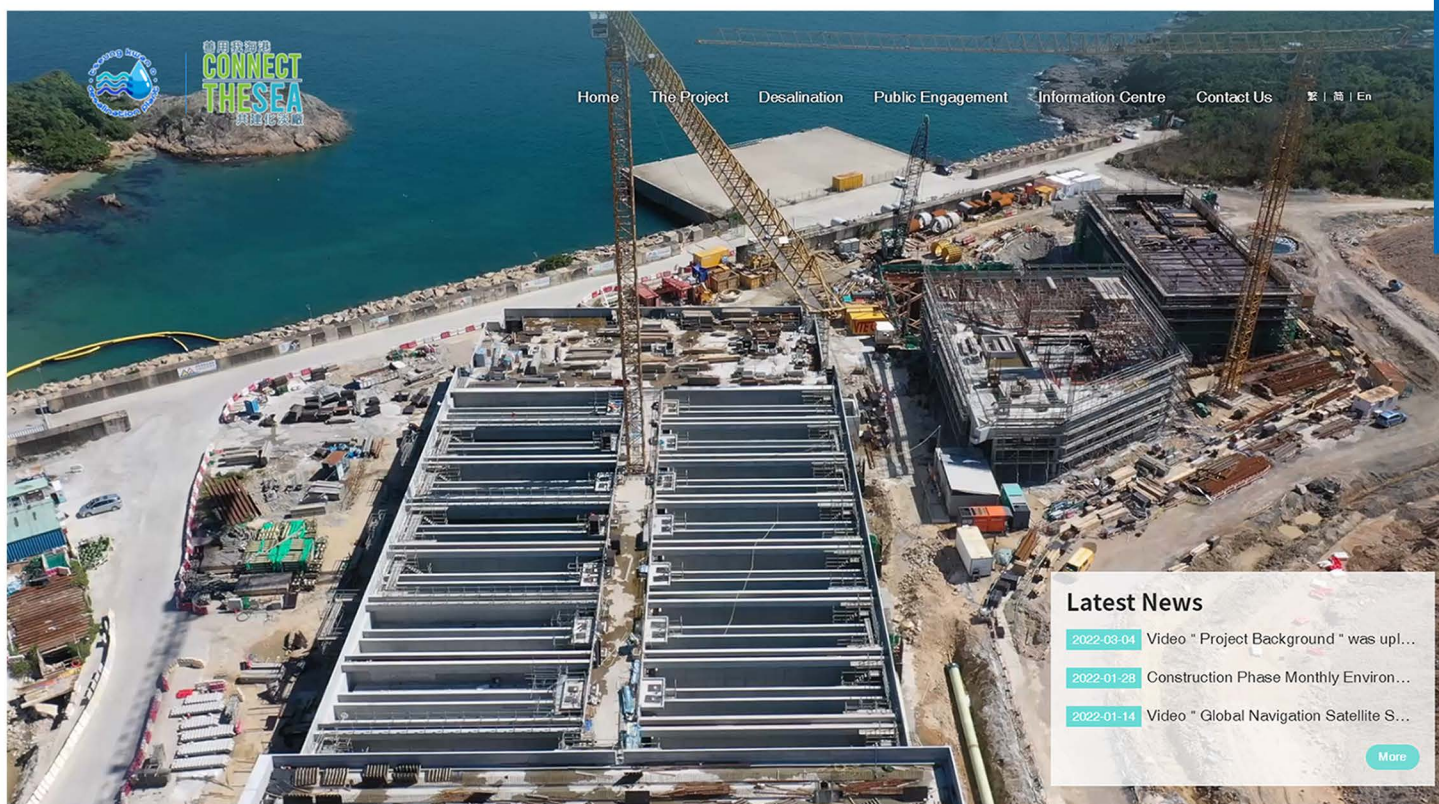
- Delivery and installation of DfMA lime silos
- Construction of the MiC Inspection Corridor
- Energization of 132kV substation
- Delivery of main pumps, power transformers and HV/LV switchboards
- Construction of marine structures

## NEW PROJECT WEBSITE LAUNCHING

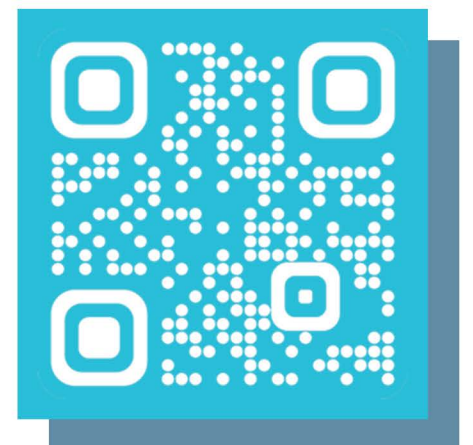
Our project website has a new look! Want to know how reverse osmosis desalination work? Want to know our latest progress? We have got you covered!

The revamped website now contains rich information about the Project. You will be presented with all aspects of the Desalination Plant, including the construction overview, numerous awards and introduction on the desalination process. On the front page you can scroll down to view the BIM model of the TKODP. Our numerous community engagements are also included to demonstrate our effort and passion in helping others in need. Besides, you can view our engaging videos capturing site safety, special features, innovations and more to come. You will experience a dynamic, welcoming and user-friendly website that can only be found in TKODP.

Visit our website to know more! Welcome to provide any suggestions!



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