

Hong Kong Offshore LNG Terminal Project

Safety Considerations for Offshore Construction In Hong Kong

22 Sep 2023

Part 1 – What Would Be Covered

The following is included in this first part:

- Recent “Offshore” projects in HK
- Example project – the HK Offshore LNG Terminal
- Key Safety Considerations
- Concluding Remarks

A Ground Improvement Project

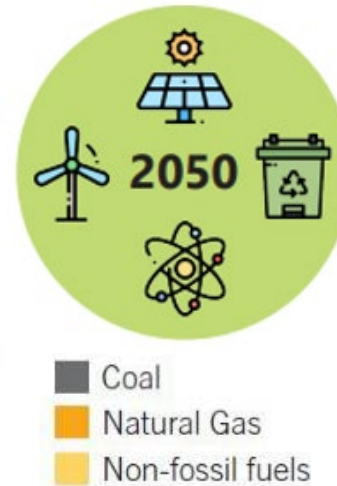
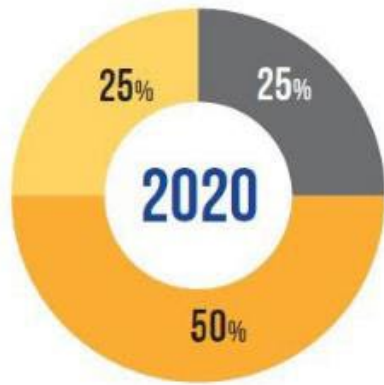
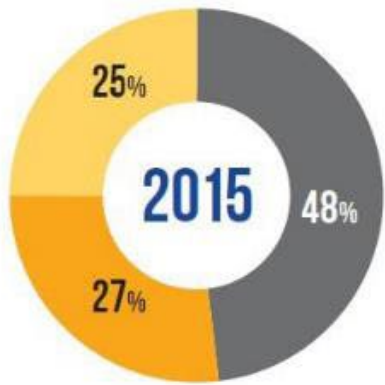


The HK Offshore LNG Terminal

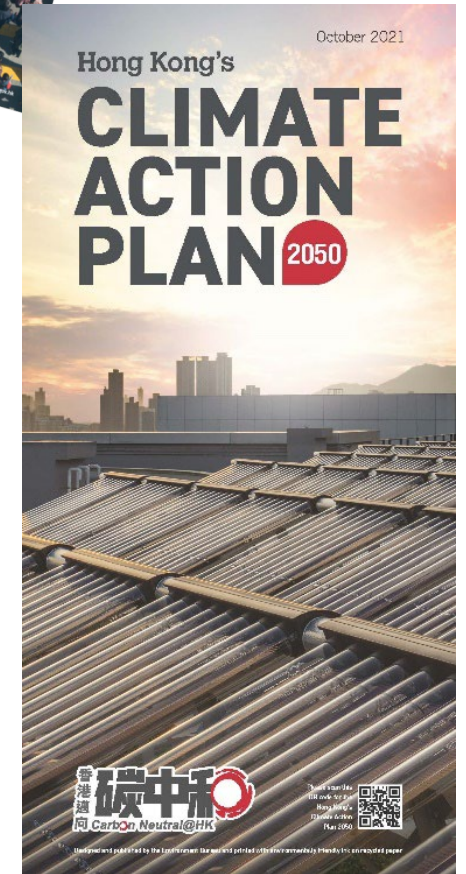


Project Background

REDUCTION OF COAL IN FUEL MIX FOR ELECTRICITY GENERATION 2015-2030



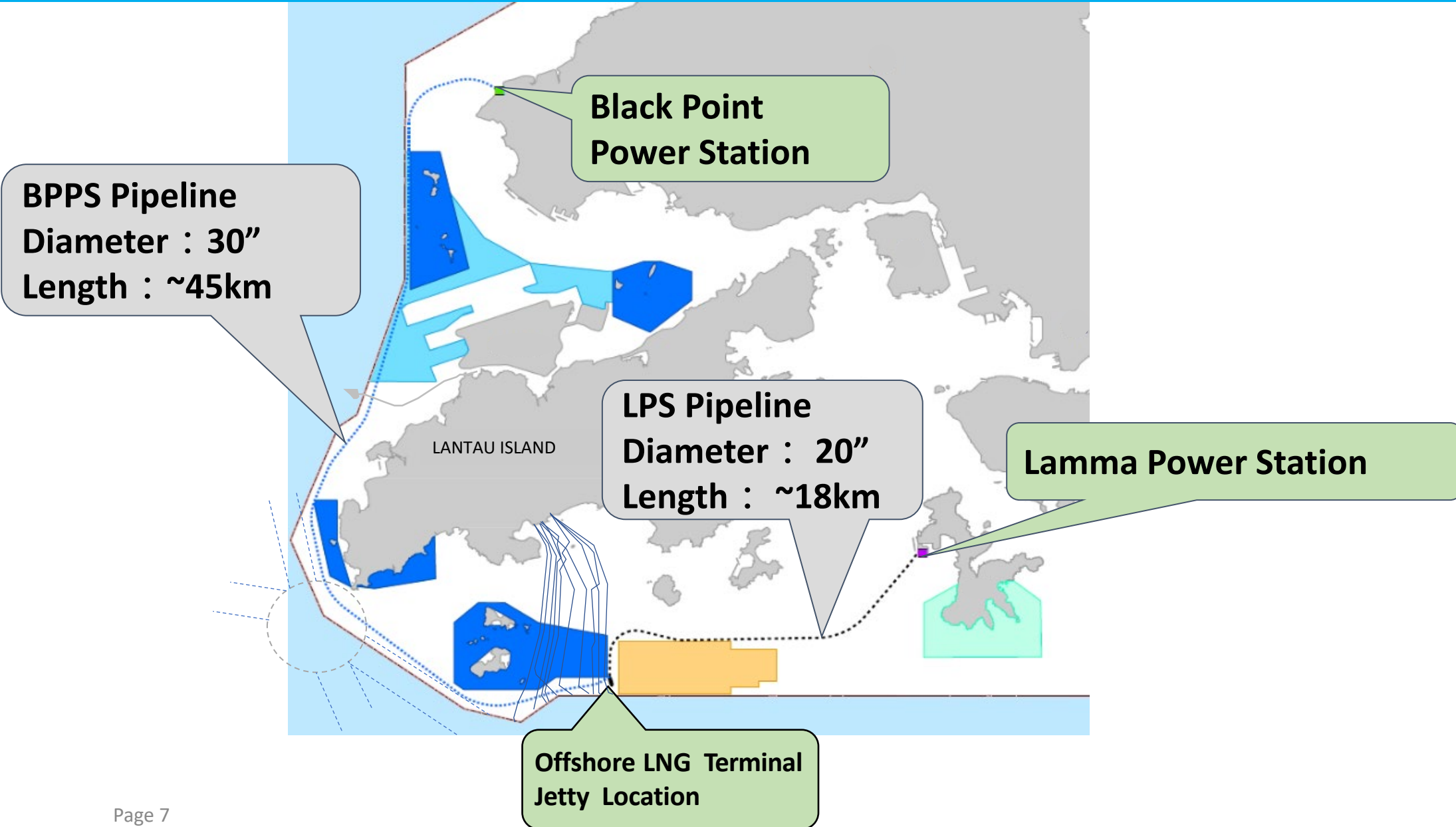
Natural gas is an important bridging fuel for power generation and plays a key role in delivering the HKSAR's long-term decarbonisation strategy outlined in its Climate Action Plan 2050



Natural Gas Currently Supplied to Hong Kong for Power Generation



Overall Layout Plan



The Terminal

LNG Carrier
(LNGC)

Floating Storage
Re-gasification Unit
(FSRU)



Client (The Company)	Castle Peak Power Company Limited (Capco), Hongkong Electric Company (HEC) and Hong Kong LNG Terminal Limited (HKLTL)
Contract	Engineering, procurement, and construction (EPC)
Contractor	Offshore Oil Engineering Co. Ltd (COOEC) 中國海洋石油公司 Local sub-contractor - Paul Y Construction Co., Ltd.
Contractor's Consultant	Arup
Contract Commencement Date	January 2020
Commercial Operation Date	3 July 2023
Scope of Works	<ul style="list-style-type: none"> • Package A – Jetty Facilities: owner is HKLTL • Package B – Approx. 45km BPPS Pipeline and GRS by Capco • Package C – Approx. 18km LPS Pipeline by HEC



Key Safety Considerations



Offshore Construction Readiness

Although the project achieved reasonably good safety performance, it is clear the industry in Hong Kong needs to get more prepared in tackling marine civil engineering projects. The following areas are highlighted for broader discussions:

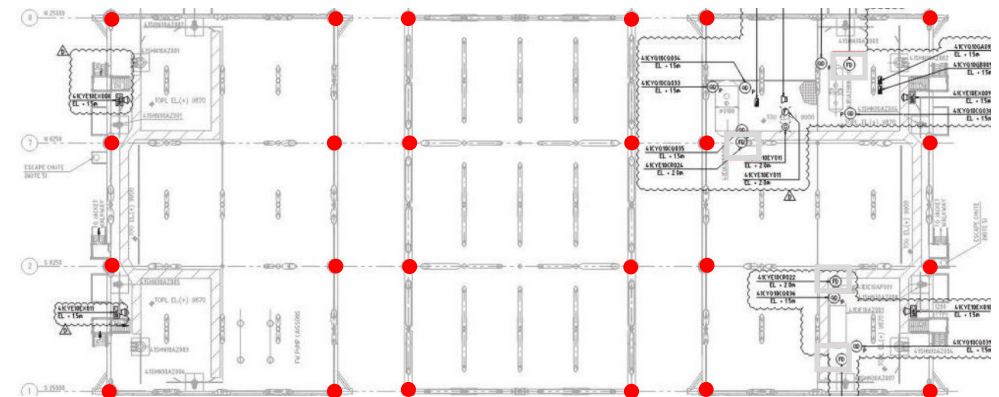
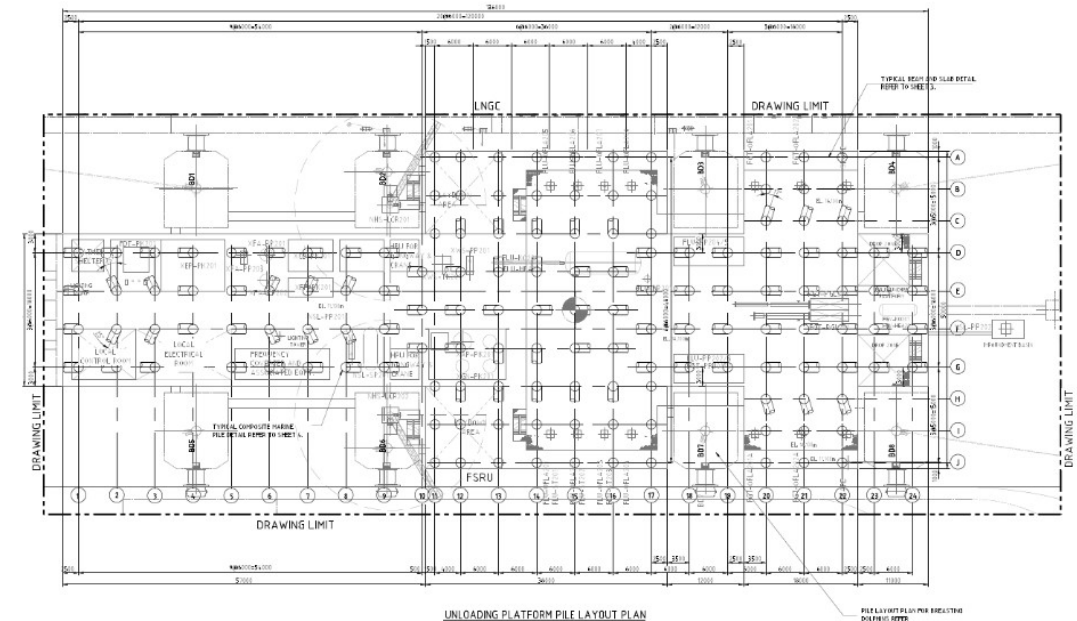
- The design
- Real Offshore experience
- Boat Transfer
- Work culture
- Diving
- Technologies
- Regulations
- The Blue Card

Will illustrate with a few examples

The Design

The original piling design was very different and heavily influenced by local “land work” approach:

- It was based on more readily available pile sizes and normally that would be more economical
- Offshore works always strive to minimize the time spent offshore
- Subsequent design changed to much larger pile sizes that need to be specifically fabricated
 - 1.8m diameter steel piles
 - 50mm thick
 - ~90m long in 2 segments, first weights ~130t
- Worked closely with BD to replace trial piles and loading tests on these friction piles
- Design based on overseas offshore codes – but carried out parallel design using local codes



Real Offshore Experience

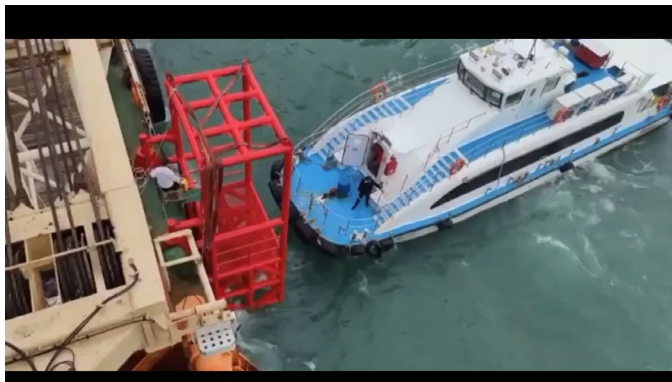
Absolute no substitute for actual experience.

Cannot simply extend “land work” practices to offshore – cover more in Part 2 by Karl & Julie

People Transfer

This is always the biggest safety concern:

- Crew boats vs “Billy Puge” vs motion compensated gangways
- Know the limits and be prepared to sit out certain weather periods
- Again comes down to experience and training
- Need to enhance our training coverages, the current “coloured cards” are not sufficient, green or blue
- The most effective mitigation is to accommodate people onboard
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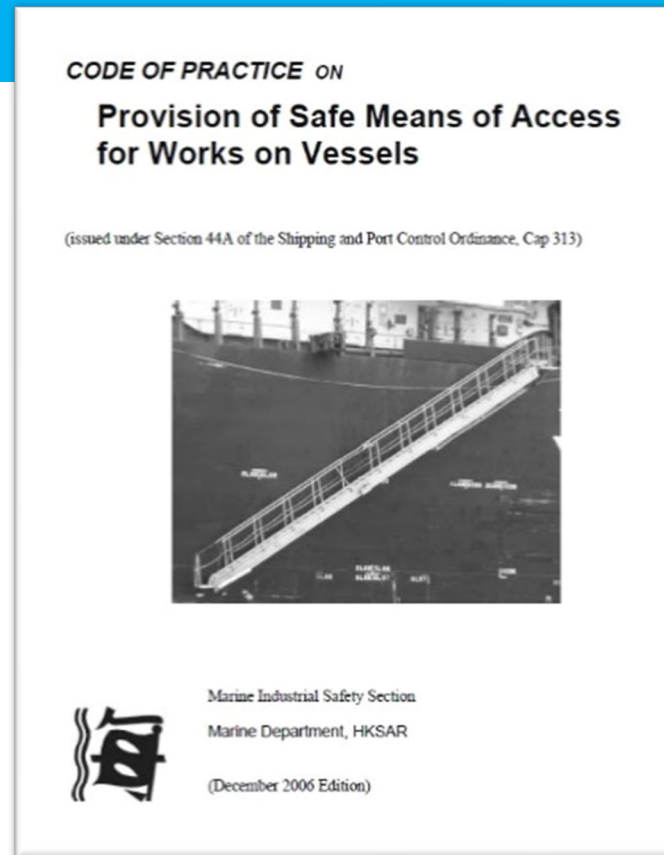


Our Local Guidelines

- Guideline from Authority really needs updating
- Covers accommodation ladder and gangways etc
- It permits the use of man cage; not specifically covers use of baskets like Billy Pugh



Accommodation Ladder



Man Cage



Billy Pugh

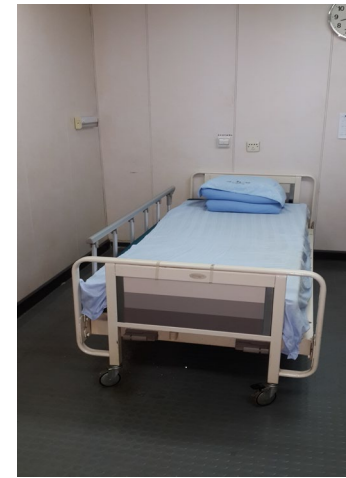
- Most common practice in offshore boat transfer
- Often the preferred option to man cage
- Need some training and strict safety procedures

Local Working Culture

- We are all used to day time working and return home daily; sometimes we have shifts
- One important consideration on safety is to reduce the number of boat transfer as far as possible. This points to staying onboard for a period of time hence work pattern would be different to our norm!
- Again, based on the philosophy of minimizing on-site works, offshore works often go round the clock to achieve this.
- Our Employment Ordinance stipulates rest days requirements to the workforce, which is good in normal circumstances, but increases the difficulties in managing resources.



Offshore Construction – Living Onboard



Offshore Construction – Diving

We have been raising the standards by requiring the Diving Contractor and Diving Team members to be qualified by International Commercial Diving Organization (IMCA/ ADCI) instead of Recreational diving organization (i.e. PADI, NAUI)

- Diving Team Member Competence Assurance → Systematic Training and competence requirements
- Diving Equipment Assurance (i.e. LARS, Decompression Chamber)
- Diving Management System Assurance → Regular Self Audit & 3rd party audit

6 Competence Tables – Diving Division			
6.1 Contents			
Code	Job Function	Assurance Tables (2020)	Assessment Tables (2020)
D01	Diving Superintendent*	10	22
D02	Bell Diving Supervisor	11	28
D03	Air (Surface Supplied) Diving Supervisor	12	36
D04	Bell (Saturation) Diver	13	44
D05	Air (Surface Supplied) Diver	14	49
D06	Life Support Supervisor	15	55
D07	Life Support Technician	16	61
D08	Assistant Life Support Technician	17	65
D09	Tender	18	69
D10	Senior Dive Technician	19	72
D11	Senior Dive Technician (Surface Supplied Only)	20	77

Job Function: Air (Surface Supplied) Diving Supervisor		Job Category: D03
Entry Level Qualifications	Acceptance Criteria	
Completed diver training to IMCA-recognised air (surface supplied) diver qualification	Valid training/competence certificate	
Demonstrated competence as an offshore air (surface supplied) diver (in accordance with IMCA C 003) and has completed 200 offshore commercial dives	Signed logbook confirming experience	
Completed and passed air (surface supplied) diving supervisor training course	Valid certificate	
Completed 2000 hours as 'trainee' air supplied supervisor on air control panel on a minimum of 100 surface dives over a minimum period of 60 days	Signed logbook confirming experience	
Demonstrated competence as an air (surface supplied) diving supervisor (in accordance with IMCA C 003) by the end of the period as a 'trainee' supervisor	Satisfactory offshore reports	
Passed IMCA air diving supervisor examination	Current valid certificate	
Passed offshore medical suitable for geographical area of work	Current valid certificate	
Passed offshore survival course suitable for	Current valid certificate	

Extracted from "Guidance on Competence Assurance and Assessment" – IMCA C 003

Shanghai Salvage Company
IS A CONTRACTOR MEMBER OF



International Marine Contractors Association

AREAS OF MEMBERSHIP
DIVING AND MARINE DIVISIONS
PROVIDING
SURFACE-SUPPLIED DIVING OPERATIONS
REGION
ASIA-PACIFIC



Iain Grainger
IMCA President 2019-20

VALID UNTIL
1 FEBRUARY 2021



IMCA members undertake to act as responsible members of the Association and are willing to be audited against compliance with relevant IMCA guidelines by their clients.

Offshore Construction – Diving

On top of the management system set out by the IMCA/ADCI, CLP also closely monitor the safety of the diving works via a Manned Diving Monitoring.

(Plan – Do – Check – Act)

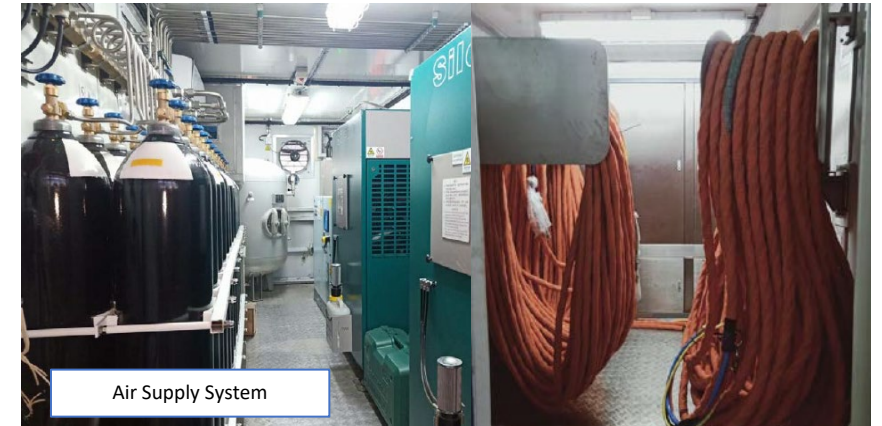
- Diving Activities Register with Quarterly Review & forecasting
- Diving Approval Procedure
 - Authorized Approver appointed by CLP
 - Issue Approval after adequate plannings & Assessments
- Joint pre-mobilization diving equipment onsite verify check
 - Permit to works



Diving control panel



DCC



Air Supply System



LARS

Offshore Construction – Technology Advancements

Remotely Operated Vehicle (ROV) developments

- Can replace diving in certain situations
- Collaborate more with technology companies / institutions in continuous development
- Not just for providing visuals; robotic advancements have made many tasks possible
- Work closely with divers – not a competition, the goal is to improve construction safety



Offshore Construction – Technology Advancements

Potential of drone for offshore inspection works

Tradition offshore inspection involve scaffolding or visual access from vessel could be dangerous, expensive, time-consuming and with a lot of site constraints.

Drone provide an aerial perspective that allows for comprehensive analysis with minimising human manual intervention.

Drones can also be equipped with different equipment for collecting various types of data

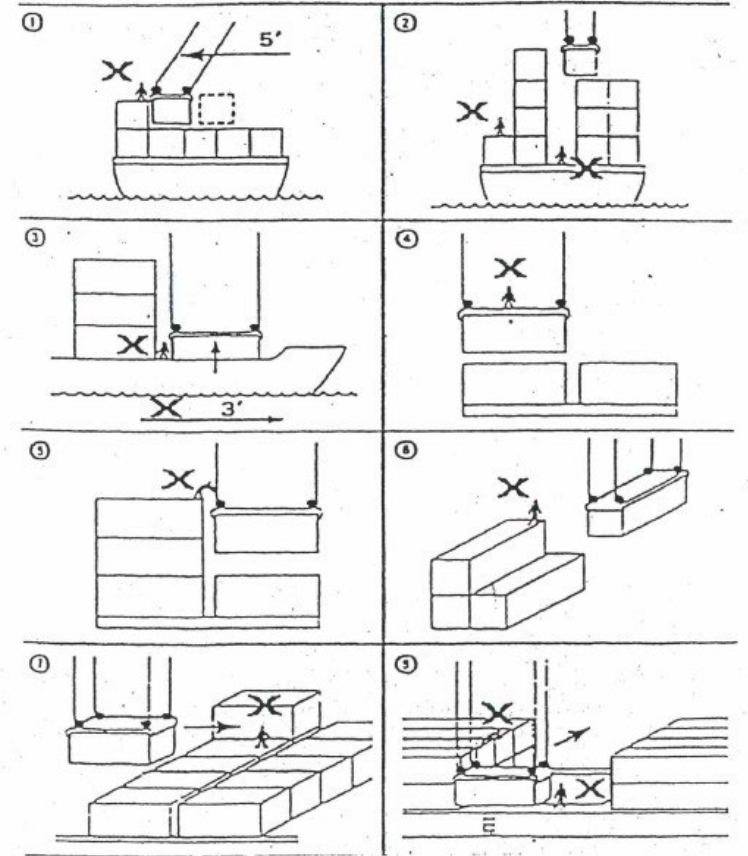
- Visual data - high-resolution images by RGB cameras.
- Thermal data - Heat maps by infrared (IR) sensors.
- LIDAR data- 3D image of the structure by LIDAR laser technology



Local Legislations

Compared with “Land Works”, marine construction regulations / guidelines have not been proactively looked at and the industry is trying to find ways to cope. Many areas would need to be visited in order to facilitate safe offshore marine construction, for examples:

- Construction Site (Safety) Regulations – adjustments needed to suit offshore works – eg Lifting
- Building (Construction) Regulations – adjustments needed to suit offshore works – eg Construction noise
- **Blue Card training** – enrich to cover construction related risks; the current form is tailored for cargo and bulk handling but gave a false sense of security to marine workers!
- Supervisions / training / qualifications (local and overseas) / pre-fabrications outside HK / Registrations / Codes etc



Lack of Offshore Construction Regulations

An example is the Regulatory Control over DGs on Special Purpose Vessel

Storage of DGs on vessel is mainly controlled by the Cap 295 Dangerous Goods Ordinance and other relevant ordinances, however these are for the general use purposes, i.e. one bottle for Argon and Carbon Dioxide each. Considering the need of offshore construction, these regulations are impractical and induce significant risks of marine lifting and transportation.

It is often that construction vessels are classified as “Special Purpose Vessel” which the (Cap. 295F) does not clearly cover the needs for DGs storage for construction purposes.

In our project, the authority will not issue the declaration of fitness and carriage permit as the construction barge is not classified as a DG or Oil Carrier.



Concluding Remarks for Part 1

- Cannot simply adopt the practices used for land projects
- Some fundamental issues to address by Governing bodies, eg Regulations, Practice Guidelines & Design Codes etc
- Need closer collaborations between Construction and Marine practitioners
- Prepare our “culture” of staying onboard as the No. 1 safety measure

