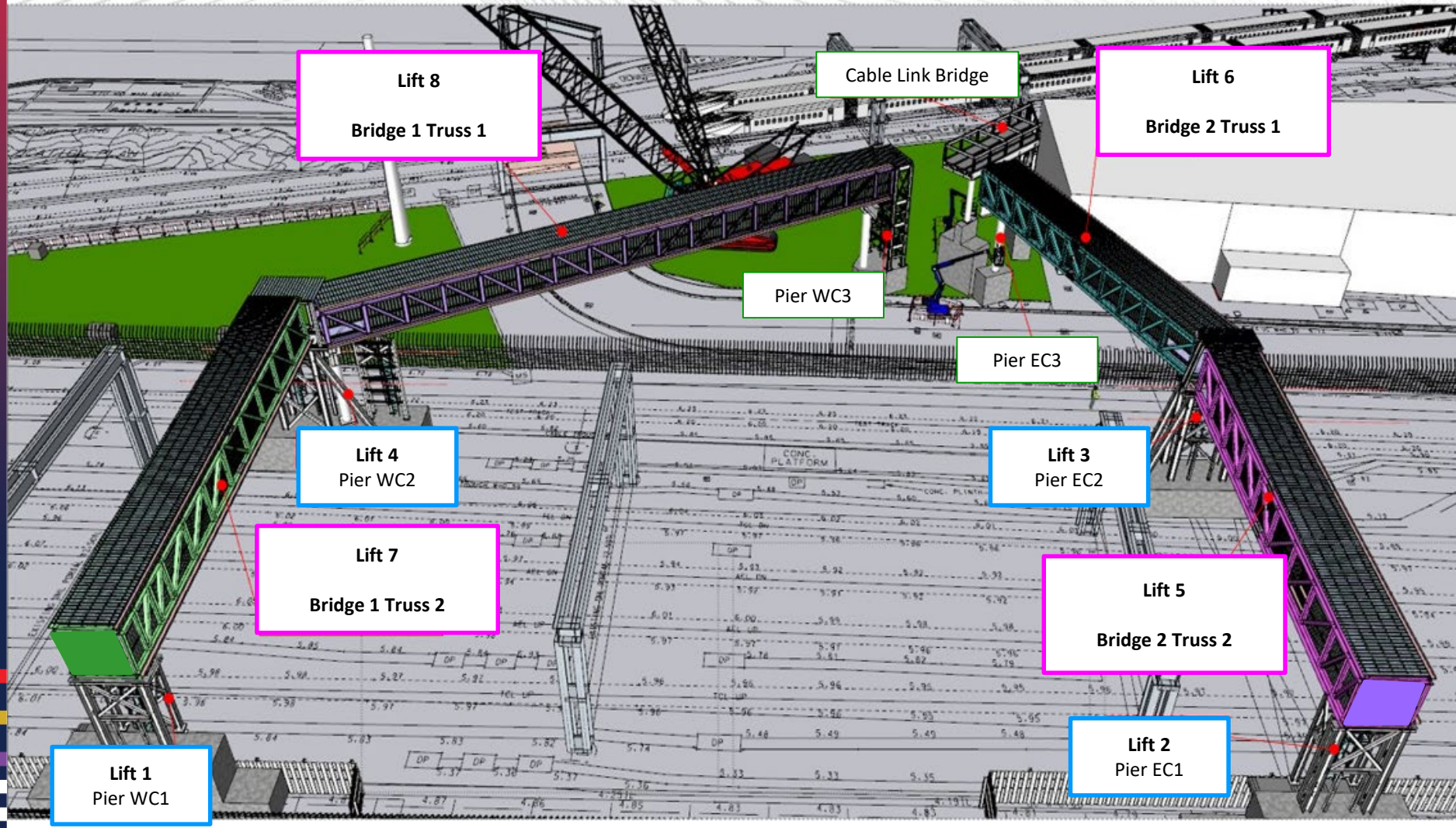
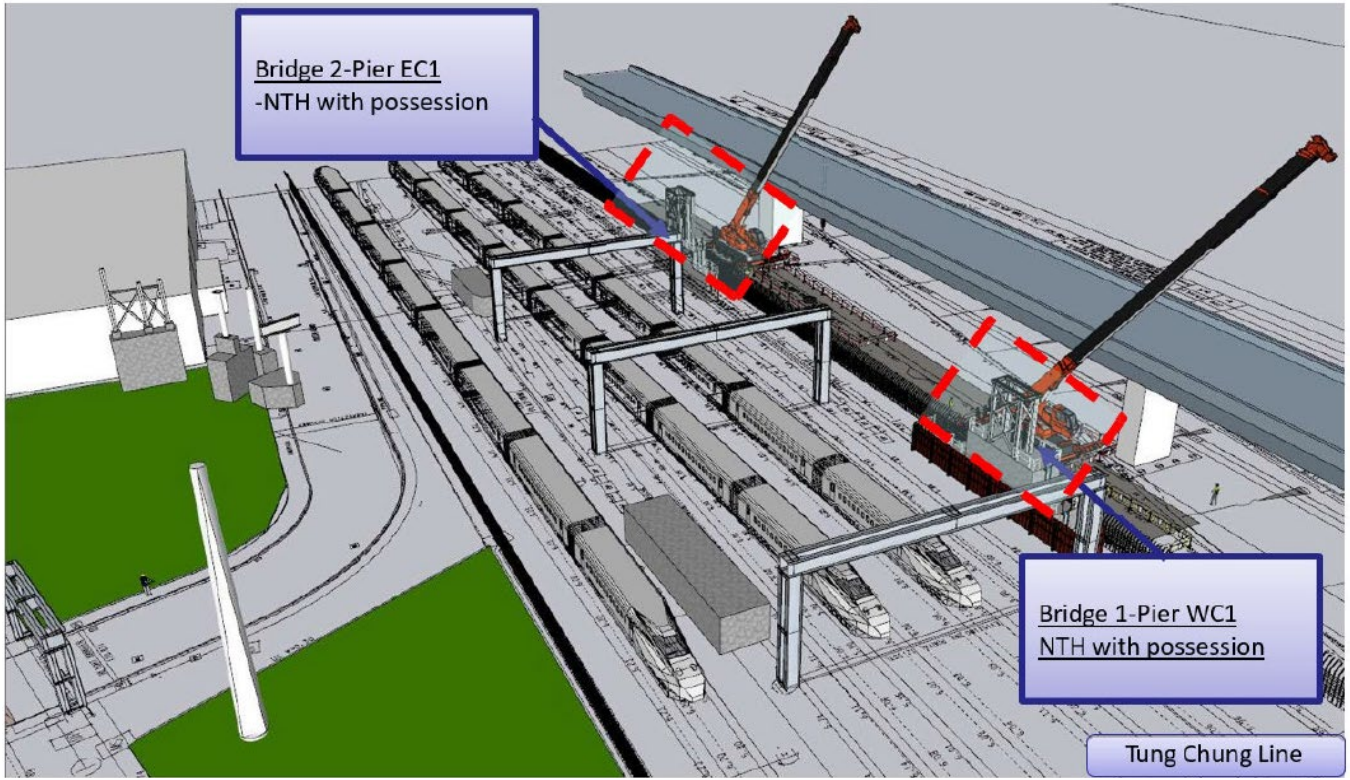
Collaboration in Lifting Safety

Life First Walk the Talk
Webinar on Safety Roles & Responsibilities (Lifting Operation)
19 April 2023 (Wednesday)

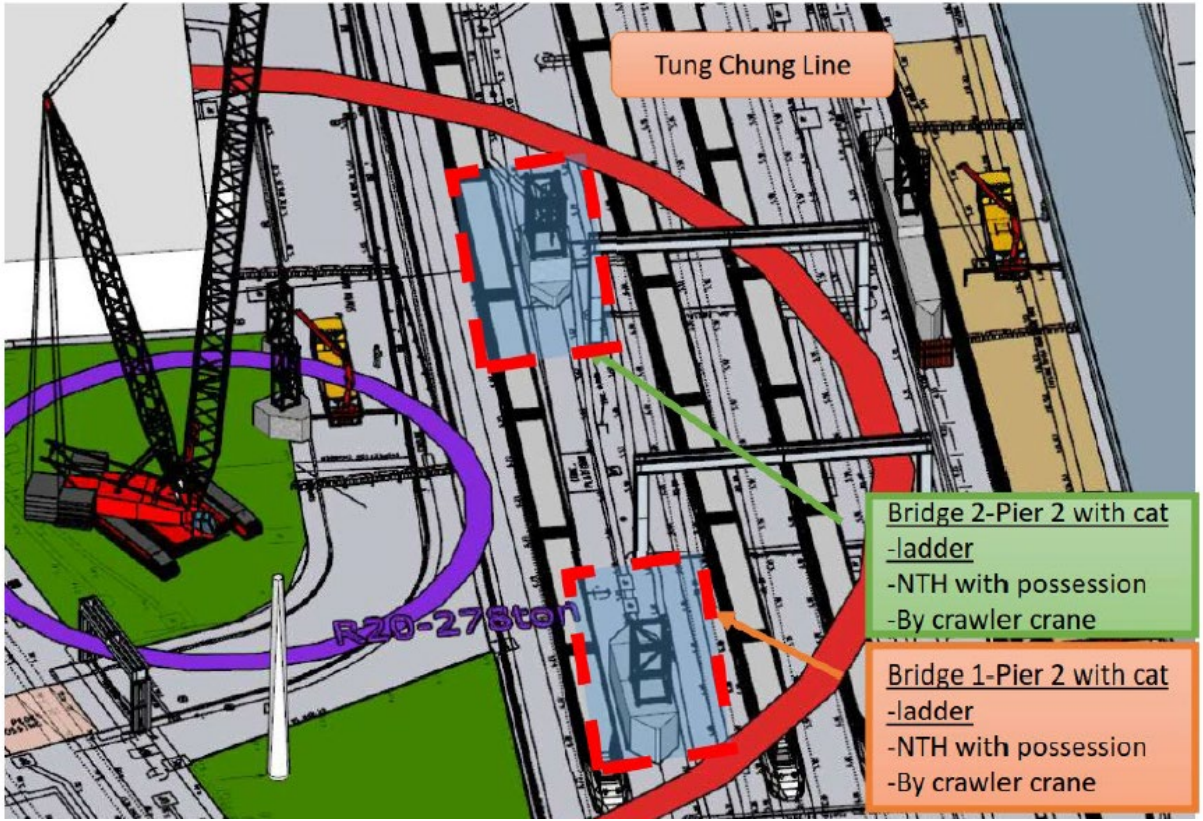
Background and Introduction


Lift 8
Bridge 1 Truss 1
Cable Link Bridge
Lift 6
Bridge 2 Truss 1
Pier WC3
Pier EC3
Lift 4
Pier WC2
Lift 3
Pier EC2
Lift 7
Bridge 1 Truss 2
Lift 5
Bridge 2 Truss 2
Lift 1
Pier WC1
Lift 2
Pier EC1

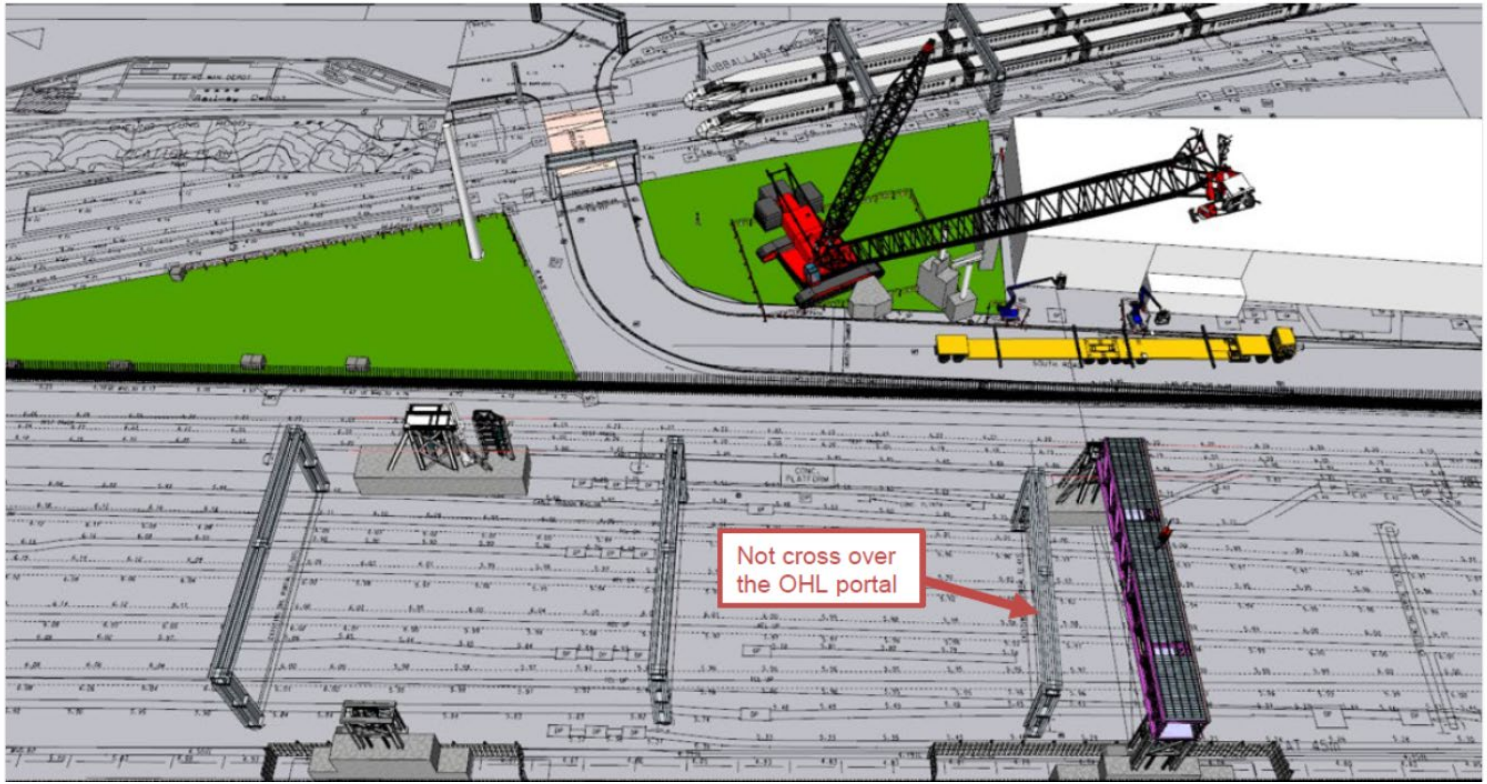
Major lifting 1 & 2



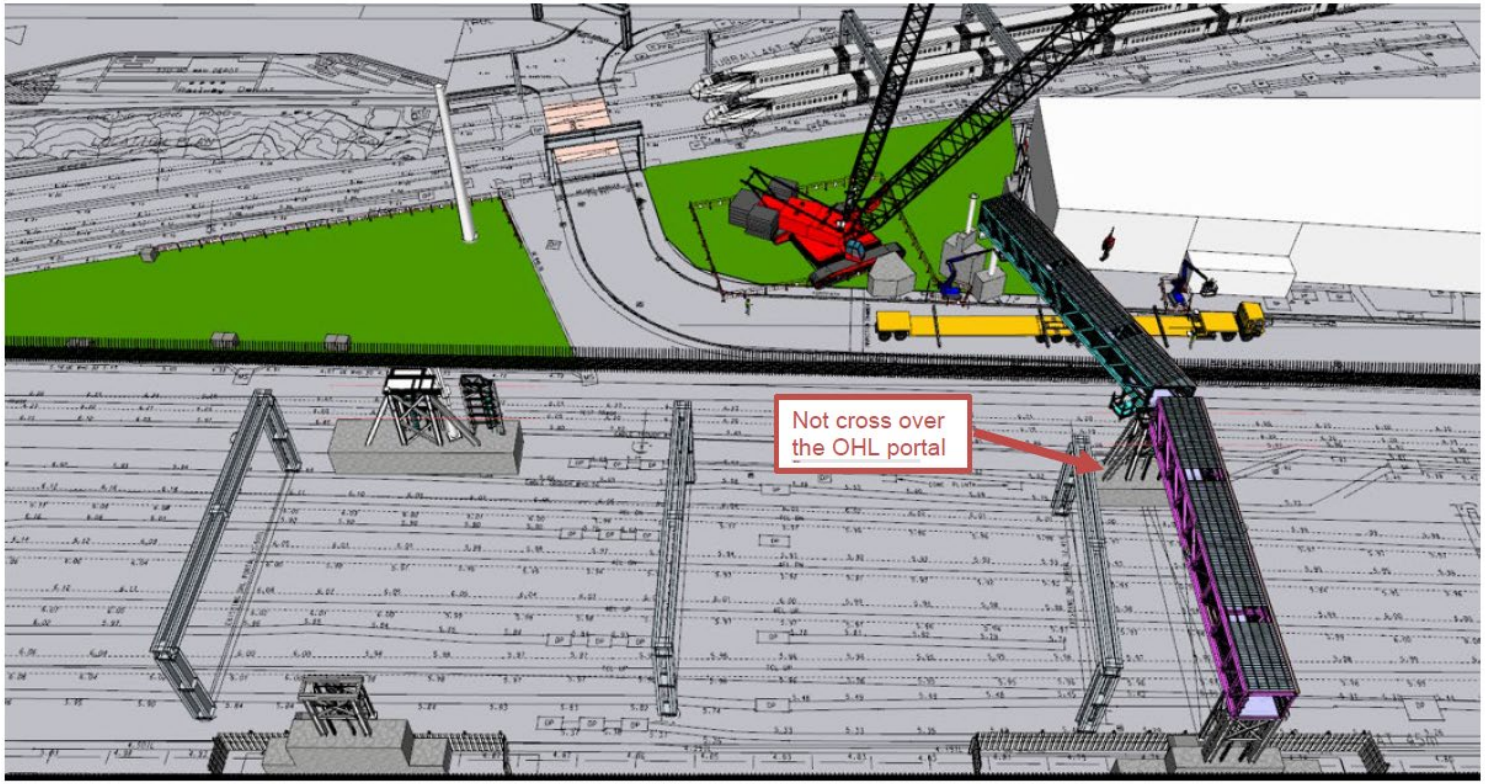
Major lifting 3 & 4



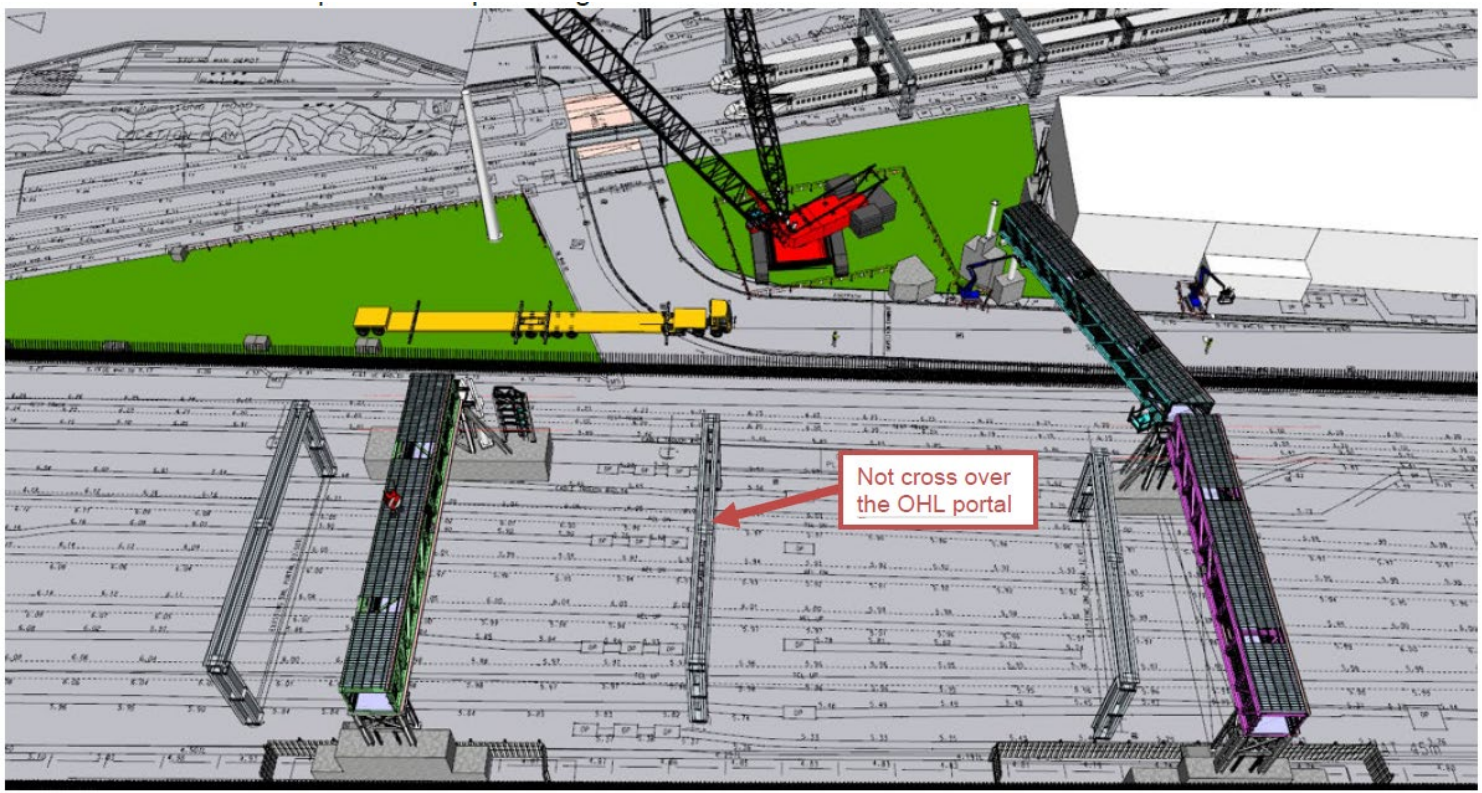
Major lifting 5



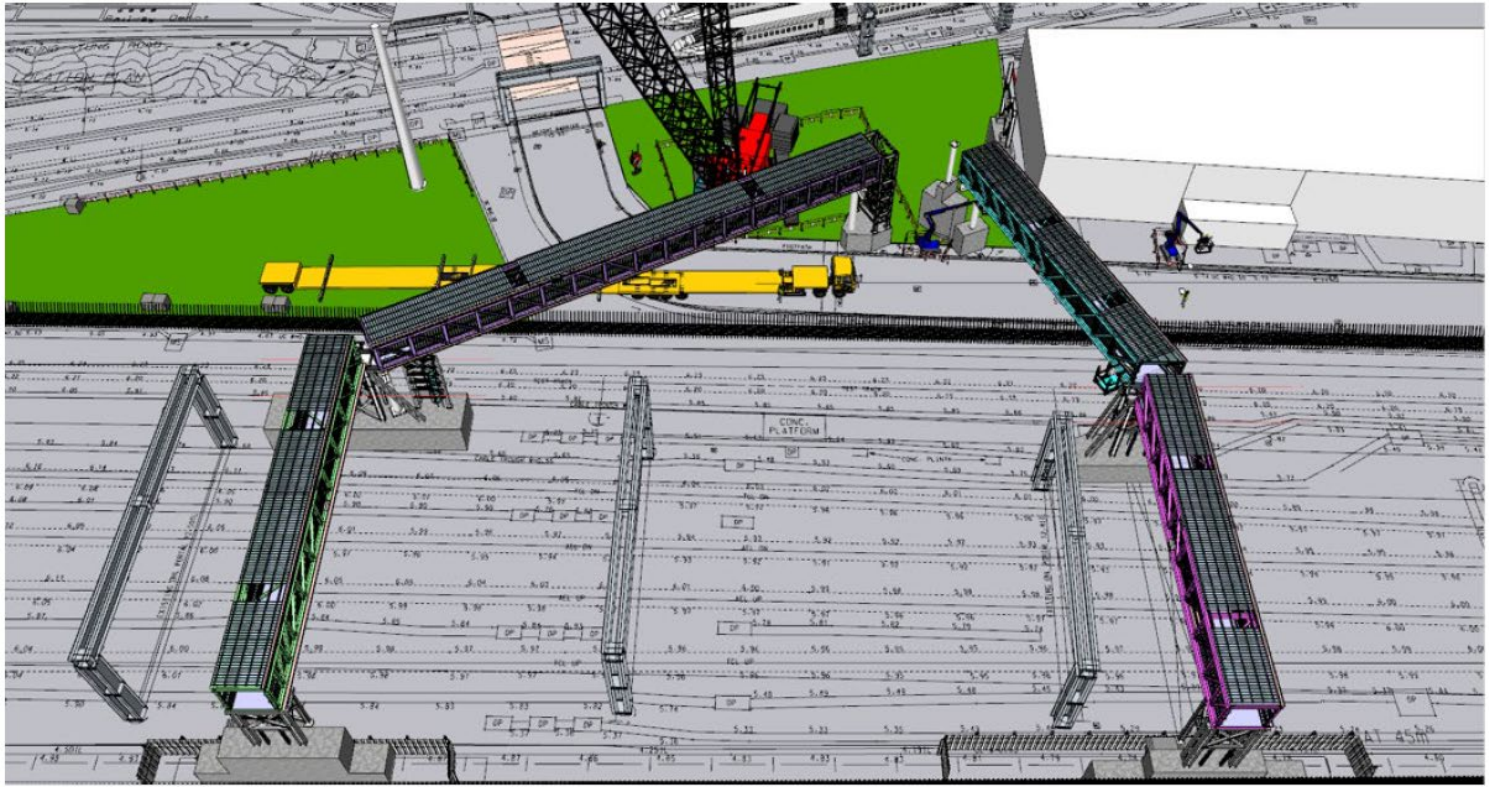
Major lifting 6



Major lifting 7



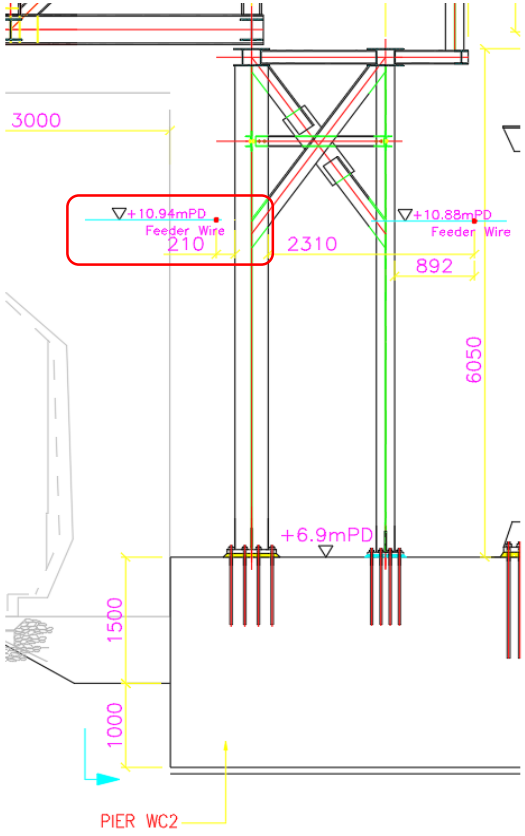
Major lifting 8



Cable bridge installation

Major Lift	All during	Maximum weight	Maximum working radius	Minimum horizontal clearance from existing structure
8 nos.	NTH (non traffic hour)	109.5 ton at 19 m	68.6 ton at 50 m	210mm

Minimum horizontal clearance



How can you 100% sure it goes as planned?

(Main contractor)

CIC Sharing – Safety Role and Responsibility

Construction of Cable Bridges at MTR Siu Ho Wan Depot

生命第一 LIFE FIRST

CONSTRUCTION INDUSTRY COUNCIL 建造業議會

MTR港鐵

Paul Y 中国铁建

How to plan and organise the lifting operation?

Safe System Mechanism

Team Work

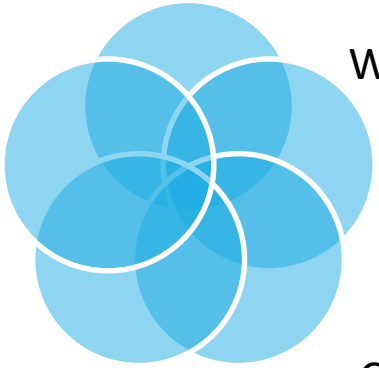
Client's Representative

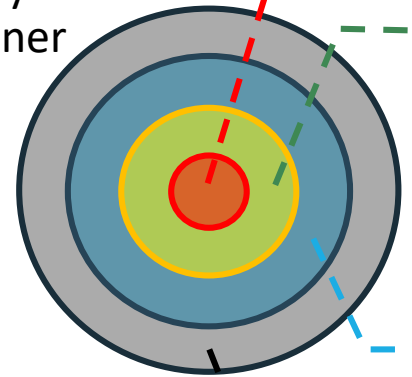
Safety Personnel

Temporary Work Designer

Frontline

Main Contractor





Strategic Level
(High-level Decision Making)

Tactical Level
(Line Management)

Operational Level
(Supervising)

Behavioral Level
(Works Executing)

Mechanism of role identification

Six step Approach

Project Director

Frontline Workers

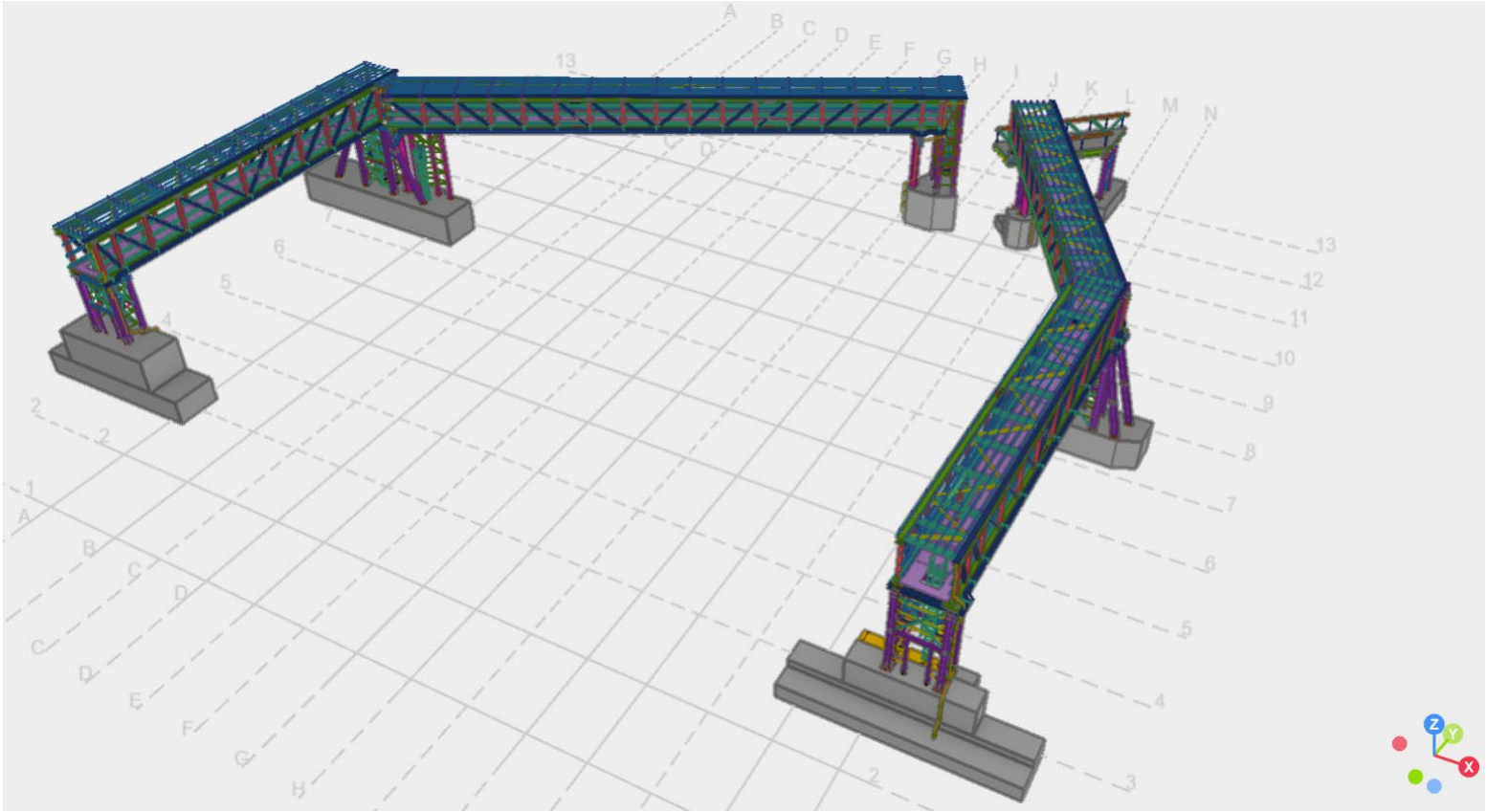
Project Manager

Engineer/ Foreman

Step 1: Accessing the task

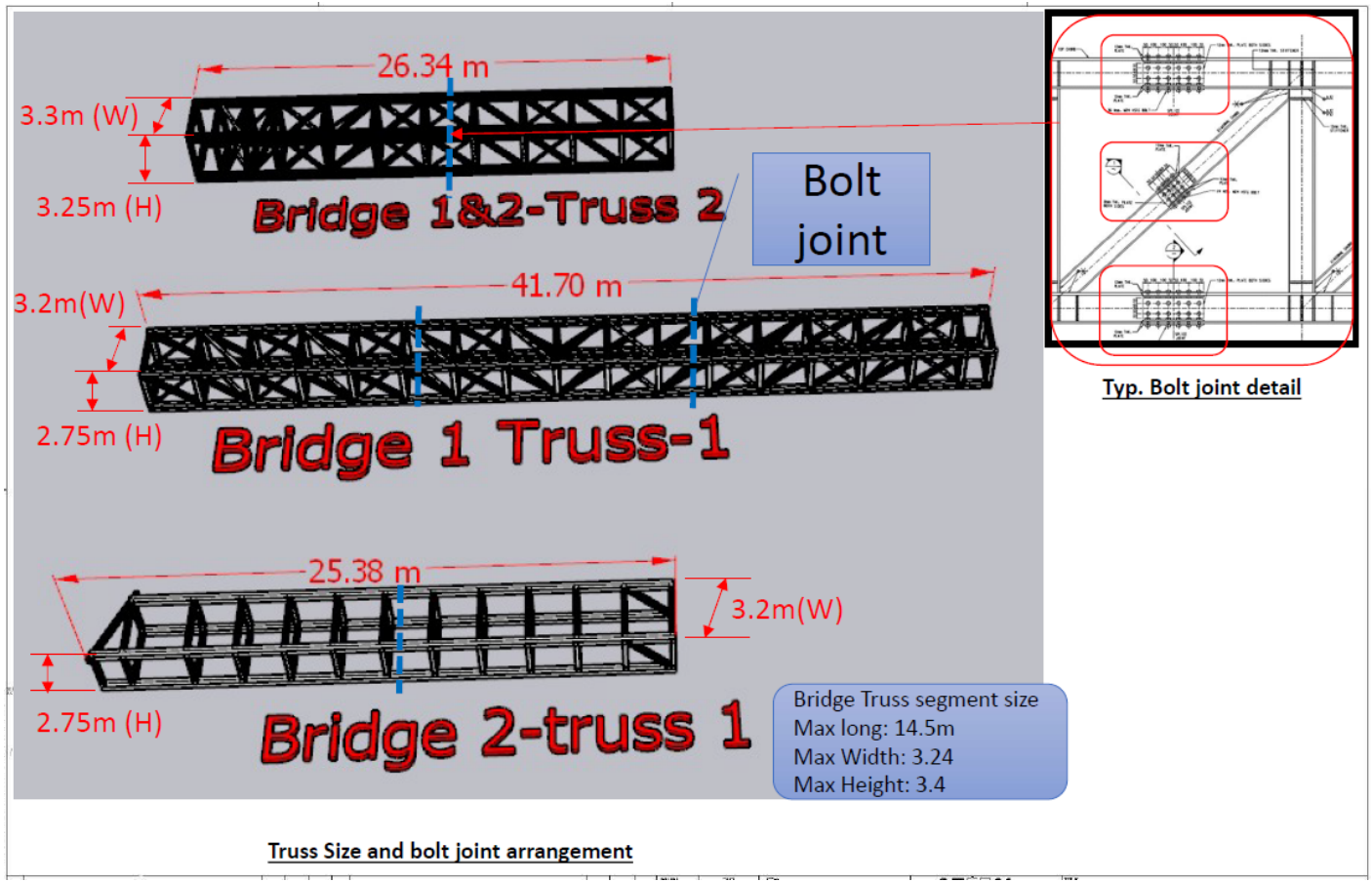
Accessing the task

Preparation of Lifting Plan in Pre-lifting Operation



Accessing the task

Preparation of Lifting Plan in Pre-lifting Operation



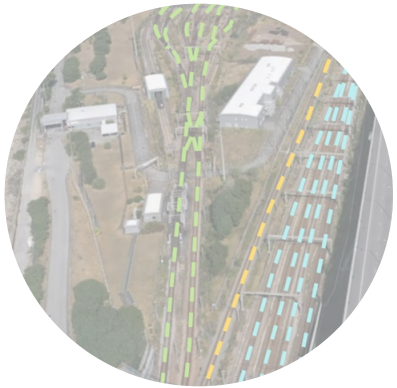
Truss Size and bolt joint arrangement

Accessing the task

Preparation of Lifting Plan in Pre-lifting Operation

Understand Site Constraints

Height & Length Restriction



Limited Working Hours

Railway Protection

Height (4m) and Length (17m) Restriction

Extra-low trucks (900mm) are needed for transportation

Tall mechanics are required to demolish and reassemble

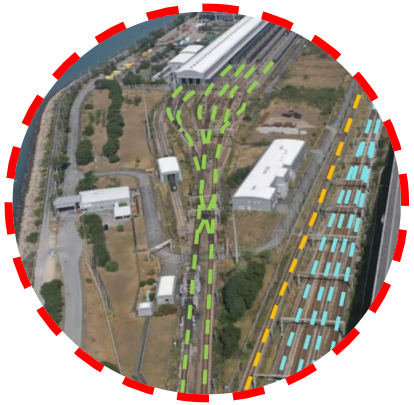
The Cable Bridges are assembly on site

Accessing the task

Preparation of Lifting Plan in Pre-lifting Operation

1. Understand Site Constraints

Height & Length Restriction



Limited Working Hours

Railway Protection

Non-Traffic Hours is defined the time between Last and First on the 2nd day transportation on the track (02:00am ~ 04:00am)

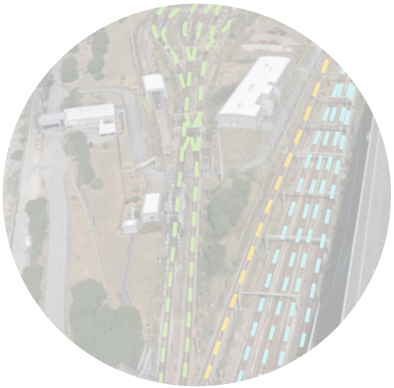
MTR Line	Work Hour
Tung Chung Line / Airport Express Line	NTH
Test Track	NTH / NPH
Depot Track	NPH

Accessing the task

Preparation of Lifting Plan in Pre-lifting Operation

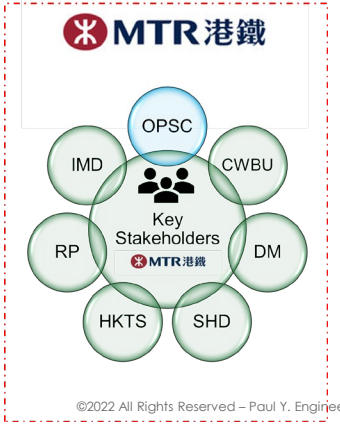
1. Understand Site Constraints

Height & Length Restriction



Limited Working Hours

Railway Protection

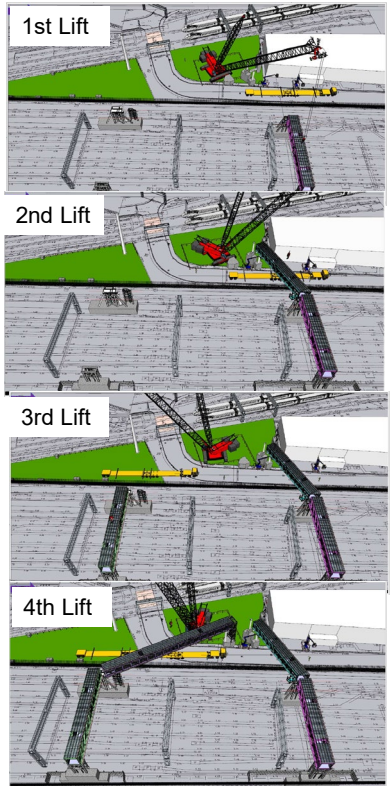


Railway Protection limits the plants and construction method, to minimize the impact on the MTRC operation due to the construction Competent Person (Track) for supervision the work to fulfill the Railway Safe Regulation

Accessing the task
Preparation of Lifting Plan in Pre-lifting Operation

2. Arrange the resources required

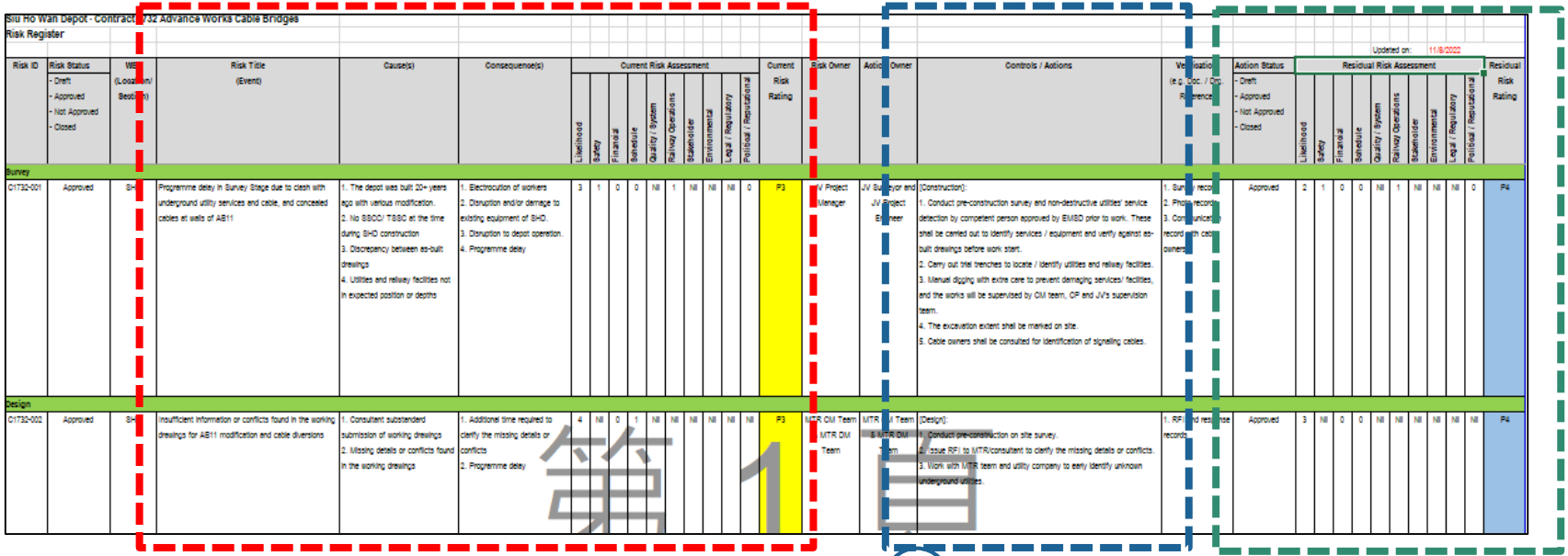
- Plants
  - ➢ 500t Crawler Crane with 250 Superlift Countweight
- Logistic
  - ➢ Fabricate the major parts and delivery to site for minor assembly
- Labour
  - ➢ Experienced and obedient



Step 2: Risk Assessment

Risk Assessment

Conduct of risk assessment to define safe lifting method Jointly



Siu Ho Wan Depot - Contract 1732 Advance Works Cable Bridges
Risk Register

Updated on: 11/8/2022

Risk ID	Risk Status - Draft - Approved - Not Approved - Closed	WBS (Location/ Bored No.)	Risk Title (Event)	Cause(s)	Consequence(s)	Current Risk Assessment: Likelihood	Safety	Financial	Schedule	Quality / System	Railway Operations	Stakeholder	Environmental	Legal / Regulatory	Political / Reputational	Current Risk Rating	Risk Owner	Action Owner	Controls / Actions	Verification (e.g. Doc. / Dwg. Reference)	Action Status - Draft - Approved - Not Approved - Closed	Residual Risk Assessment: Likelihood	Safety	Financial	Schedule	Quality / System	Railway Operations	Stakeholder	Environmental	Legal / Regulatory	Political / Reputational	Residual Risk Rating
Survey																															
C1732-001	Approved	SH	Programme delay in Survey Stage due to clash with underground utility services and cable, and concealed cables at walls of AB11	1. The depot was built 20+ years ago with various modification. 2. No SBOD/ TSBC at the time during SHD construction 3. Discrepancy between as-built drawings 4. Utilities and railway facilities not in expected position or depths	1. Electrocution of workers 2. Disruption and/or damage to existing equipment of SHD. 3. Disruption to depot operation. 4. Programme delay	3	1	0	0	Nil	1	Nil	Nil	Nil	0	P3	JV Project Manager	JV Surveyor and JV Project Engineer	[Construction]: 1. Conduct pre-construction survey and non-destructive utilities' service detection by competent person approved by EMSD prior to work. These shall be carried out to identify services / equipment and verify against as-built drawings before work start. 2. Carry out trial trenches to locate / identify utilities and railway facilities. 3. Manual digging with extra care to prevent damaging services/ facilities, and the works will be supervised by OM team, OP and JV's supervision team. 4. The excavation extent shall be marked on site. 5. Cable owners shall be consulted for identification of signalling cables.	1. Survey record 2. Photo record 3. Communication record with cable owners	Approved	2	1	0	0	Nil	1	Nil	Nil	Nil	0	P4
Design																															
C1732-002	Approved	SH	Insufficient information or conflicts found in the working drawings for AB11 modification and cable diversions	1. Consultant substandard submission of working drawings 2. Missing details or conflicts found in the working drawings	1. Additional time required to clarify the missing details or conflicts 2. Programme delay	4	Nil	0	1	Nil	Nil	Nil	Nil	Nil	Nil	P3	MTR OM Team & MTR OM Team	MTR JV Team & MTR OM Team	[Design]: 1. Conduct pre-construction on site survey. 2. Issue RFI to MTR/consultant to clarify the missing details or conflicts. 3. Work with MTR team and utility company to early identify unknown underground utilities.	1. RFI and response records	Approved	3	Nil	0	0	Nil	Nil	Nil	Nil	Nil	Nil	P4

1. Identify Potential Risks

Score the risk by different perspective, and "Current risk Rating" from matrix

2. Propose Mitigation Measures

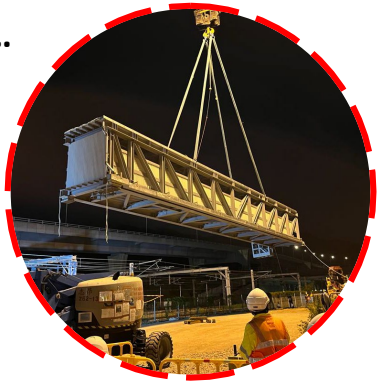
3. "Residual Risk Rating"

Evaluate the mitigated risk after carrying out the mitigation measures

Risk Assessment

Conduct of risk assessment to define safe lifting method jointly

Key Risk…



Heavy Lifting

High Voltage Overhead Line

Working at Height

Control Measures

80% utilization of the plant

500m3 RC footing has been cast for the plant sitting

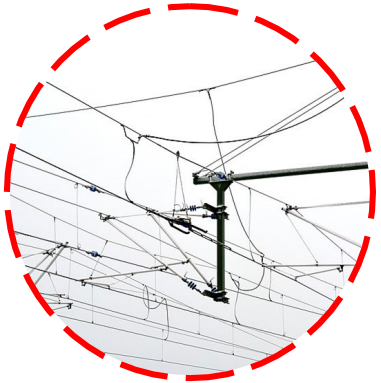
Webbing Slings are used as the lifting gear

Risk Assessment

Conduct of risk assessment to define safe lifting method jointly

Key Risk…

Heavy Lifting



High Voltage Overhead Line

Working at Height

Control Measures

Zig Zag Hoarding

Ensure 2m distant from the OHL

Protective Sleeves

installation to the Feeder Wires by MTR

Risk Assessment

Conduct of risk assessment to define safe lifting method jointly

Key Risk…

Heavy Lifting

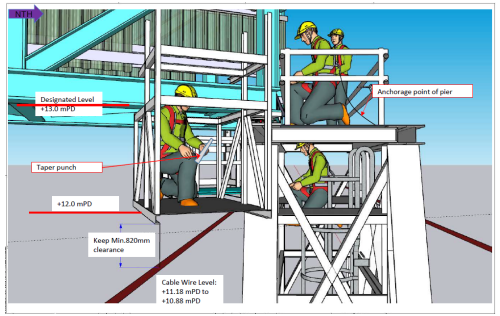
High Voltage Overhead Line

Working at Height

Control Measures

Temporary Hanged Platform

A stable platform temporary installed on the side of truss, to prevent the unsafe act of bolting

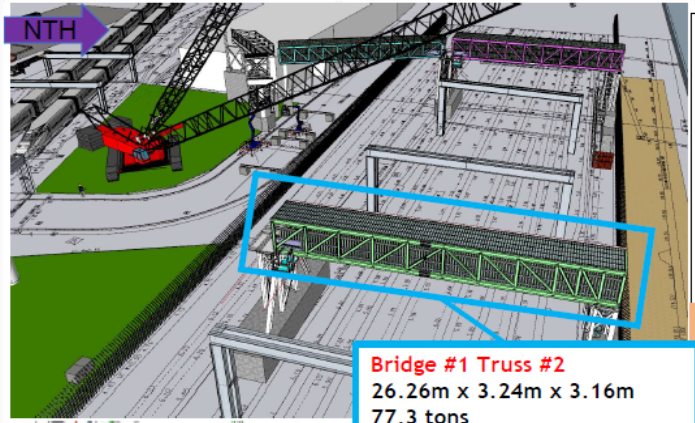


Step 3: Define Safe Method

1. Selection of Suitable Lifting Appliances and Gear
2. Inspection, test and examination of LALG
3. Assurance of competence of lifting team
4. Training of safe lifting procedures

Define Safe Method

Selection of Suitable Lifting Appliances and Gear

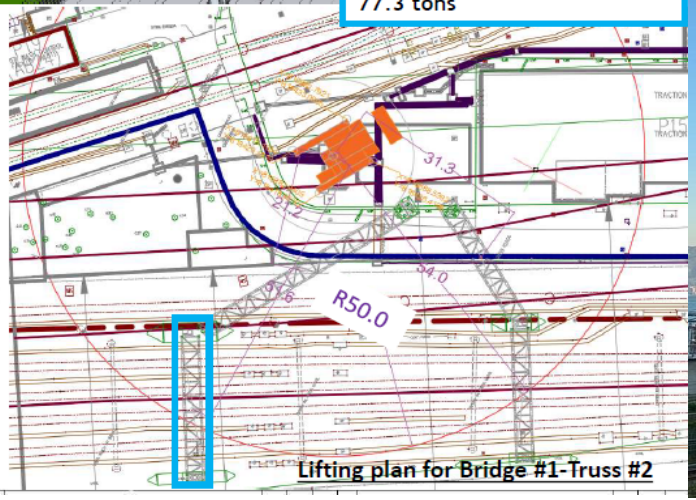


Bridge #1 Truss #2
26.26m x 3.24m x 3.16m
77.3 tons

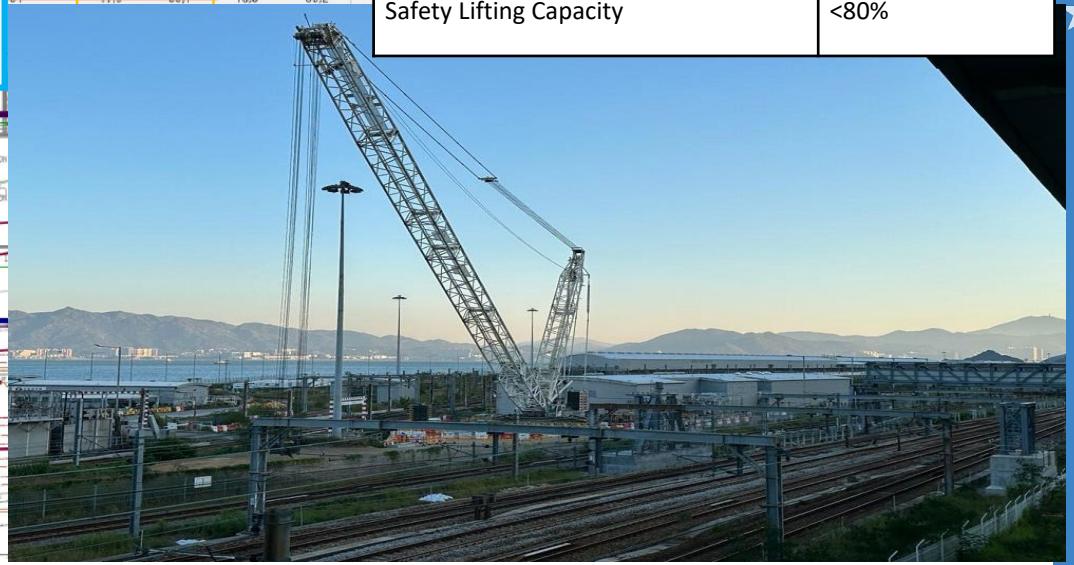
m	66 m 0 t 9 m t	66 m 0-250 t 10-16 m t	72 m 0 t 9 m t	72 m 0-250 t 10-16 m t
10	271,0	278,0	234,0	246,0
11	239,0	278,0	234,0	246,0
12	206,0	278,0	206,0	246,0
14	161,0	278,0	161,0	246,0
16	131,0	278,0	130,5	246,0
18	109,5	278,0	109,0	246,0
20	93,7	278,0	93,3	246,0
22	81,2	271,0	80,8	246,0
24	71,3	246,0	70,8	238,0
26	63,1	225,0	62,6	224,0
28	56,3	207,0	55,8	206,0
30	50,6	191,0	50,1	190,5
34	41,5	164,5	40,9	164,5
38	34,6	144,5	34,0	144,5
			28,5	128,2
46	24,6	111,7	23,8	114,2
50	20,9	97,5	20,0	101,2
			16,8	89,2

TEREX DEMAG CC2500-1
500 tons Crawler Crane

Max. Lifting Load	~110 tons
Max. Lifting Radius	50m
Super Lift Counterweight	250 tons
Safety Lifting Capacity	<80%

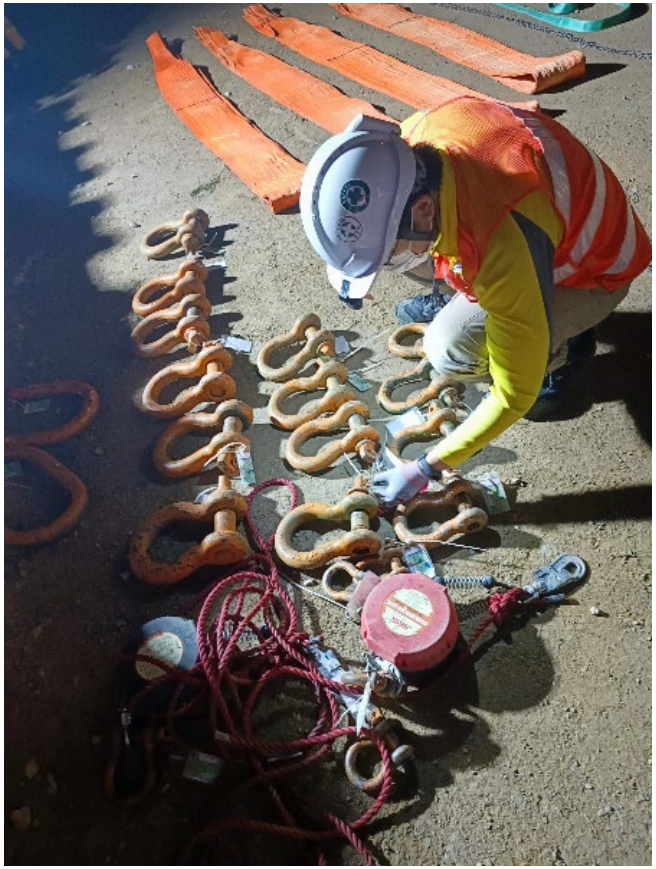


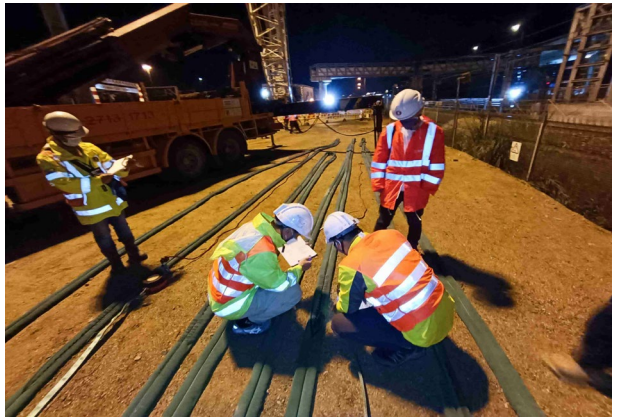
Lifting plan for Bridge #1-Truss #2



Define Safe Method

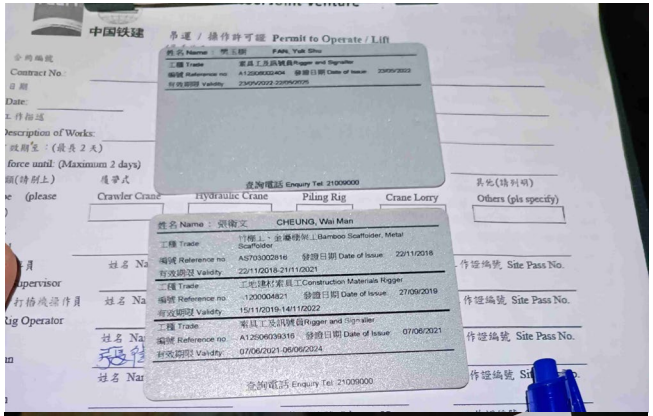
Joint Inspection, test and examination of LALG

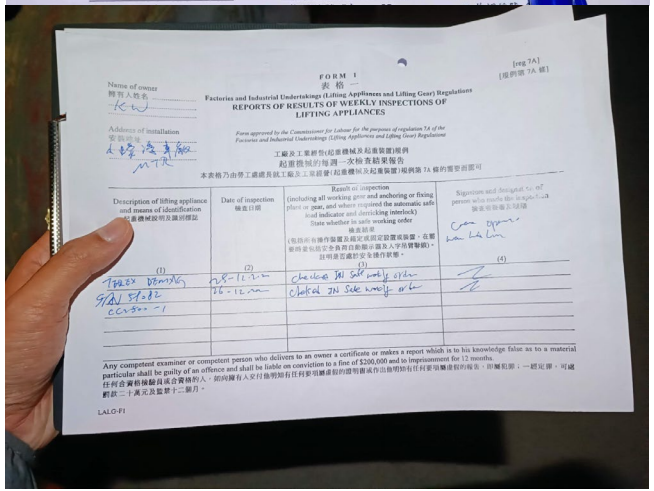




Define Safe Method

Assurance of Competence of lifting team



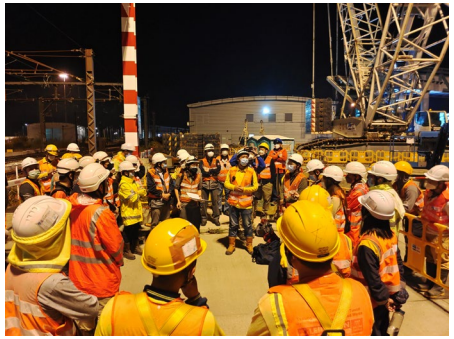


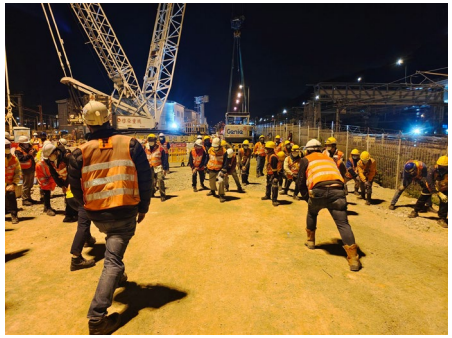
Qualification and Competence

- Crane Operator (License)
- Banksman (A12S Silver Card)
- Rigger (A12 Silver Card)
- Lifting Supervisor (Experience)

Define Safe Method

Joint Training of safe lifting procedures





[Operational & Behavioural]

- What is the lifting procedures? What is my position?

[Tactical]

- How to deliver clearly the planning to workers?
- The frequency?

! Every Participants should understand their role by participating **Pre-work and de-briefing**

Step 4: Implementation

1. Trial Lifting – Demo
2. Communication System
3. Qualification and Permit Check

Implementation

Full Scale Trial Lifting

1:1 Trial Lifting

- Demonstrate the lifting mechanics, method of lifting & techniques
- Double confirm the precise lift load
- Rehearse the lifting sequence and rundown by the crew

Implementation
Communication System

Area Management & Team Leaders

Demonstrate the lifting mechanics, method of lifting & techniques

- Double confirm the precise lift load
- Rehearse the lifting sequence and rundown by the crew

Implementation – Lifting Operation

Pre-Work Briefing,
LG and Weather Check

Possession

3-3-3 Lifting

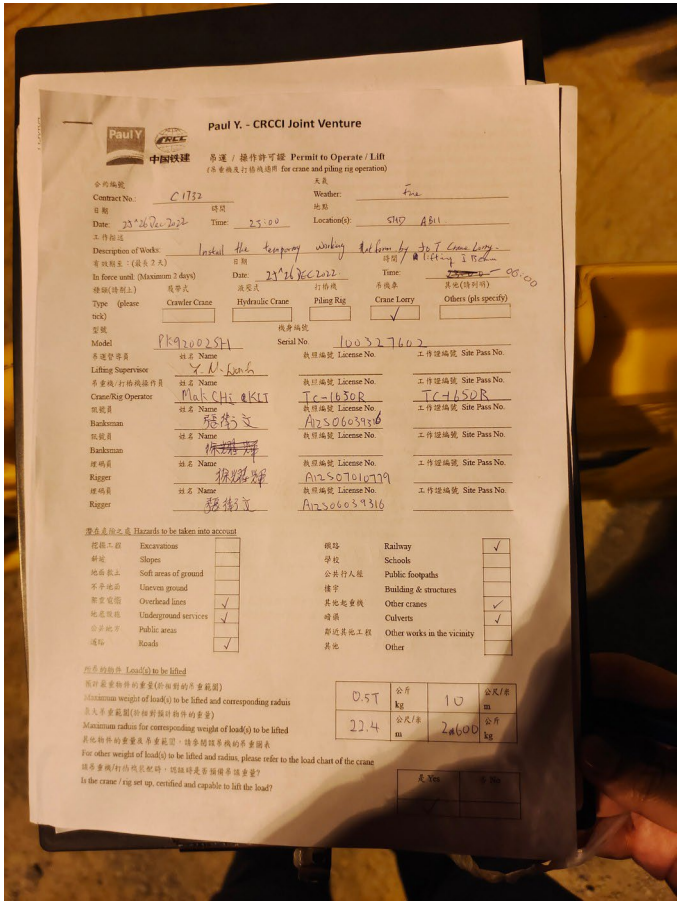
Positioning and bolting

Line Clear

	Activities	Target Time Period From	To	Duration (mins)	Check Point	Condition
A	**Setup before each lifting**					
1	Assembly the truss at stock yard (W3 and triangle area)					
2	Survey check the 500t Crawler Crane to the designated position as per lifting plan					
3	ICE check on lifting compliance in lifting plan (issue certificate)					
4	Check bonding between cable bridge and fault current return wire					
B	**Permit to lift (Pre check before lifting)**					
1	LA/LG compliance check	20:00	20:30	30		
2	Resources attendance check	20:00	21:30	30		
3	Weather condition check	20:00	22:15	30 or more		Call off if adverse Weather occur or within 2 hours
4	Check and rotate the 500t crawler crane in according to lifting plan	20:30	21:00	30		Check workability only on rotation function, the jib will not be rotated toward mainlines before 3-3-3 (i.e. 1:45)
5	Transport the truss from EVA to designated lifting area	20:30	21:00	30		
6	ICE check on temporary work (lifting) and issue loading certificate	21:00	21:30	30		
7	RPE check on super lift capacity and issue the certificate	21:00	21:30	30		
9	Issue the permit to lift	22:00	22:15	15	Check point #1 22:15	Abort lift if lifting permit not issued
10	Prework briefing to lifting team	22:15	22:45	30		
11	Confirm to TC and DYM to proceed	22:45	23:00	15		
C	**Lifting Operation**					
1	CP(T) report to TC and DYM to obtain authorization to set up protection	1:45	2:00	15		
8	Trial lifting 3-3-3 arrangement	1:45	2:15	30	Check point #2 2:15	Abort lift if survey check report out of tolerance; installation of baskets
2	Possession/SPA setup	2:00	2:10	10		
3	Possession/SPA Granted	2:10	2:15	5		
4	Lift the truss to the designated position	2:15	2:45	30		
5	Positioning / Pin	2:45	3:05	20	Check point #3 03:05	Abort lift if truss not landed on holding down bolts
6	Bolting and torque	3:05	3:35	30		
7	ICE certification	3:35	3:40	5		
8	Release lifting gear	3:40	3:50	10		
9	Remove temporary platform from truss and connect the bondings for electrical safety	3:50	4:10	20		
10	Site Clearance and Line Clear Check	4:10	4:30	20		

Implementation

Implementation of Safe Lifting Procedures



Paul Y. - CRCCI Joint Venture

Permit to Operate / Lift

Contract No.: C1732

Date: 23rd Dec 2022 Time: 23:00

Location(s): SHD ABII

Description of Works: Install the temporary working platform by 30T Crane Lorry

In force until (Maximum 2 days) Date: 23rd Dec 2022 Time: 06:00

Type (please tick): Crawler Crane | Hydraulic Crane | Piling Rig | Crane Lorry √ | Others (pls specify)

Model: PK92002SH1 Serial No.: 100327602

Lifting Supervisor: Y N Lam

Crane/Rig Operator: Mak Chi Kit — License No.: TC-1630R — Site Pass No.: TC1650R

Bankman: License No.: AIZS0603936

Bankman:

Rigger: License No.: AIZS0701079

Rigger: License No.: AIZS0603936

Hazards to be taken into account

Excavations		Railway	√
Slopes		Schools	
Soft areas of ground		Public footpaths	
Uneven ground		Building & structures	
Overhead lines	√	Other cranes	√
Underground services	√	Culverts	√
Public areas		Other works in the vicinity	
Roads	√	Other	

Load(s) to be lifted

Maximum weight of load(s) to be lifted and corresponding radius	0.5T	kg	10 m
Maximum radius for corresponding weight of load(s) to be lifted	22.4 m	2.600 kg	

For other weight of load(s) to be lifted and radius, please refer to the load chart of the crane

Is the crane / rig set up, certified and capable to lift the load? Yes √ No

Permits

- **To Lift**
- **To Operate**
- **To Release LG**

Step 5 & 6: Monitoring and Review

Monitoring and Review

Review

Monitoring

Construction

Construction Video

Siu Ho Wan Depot Property Development
Contract 1732 -
Cable Bridges and Associated Civil Works for Cable Diversion

Thank You

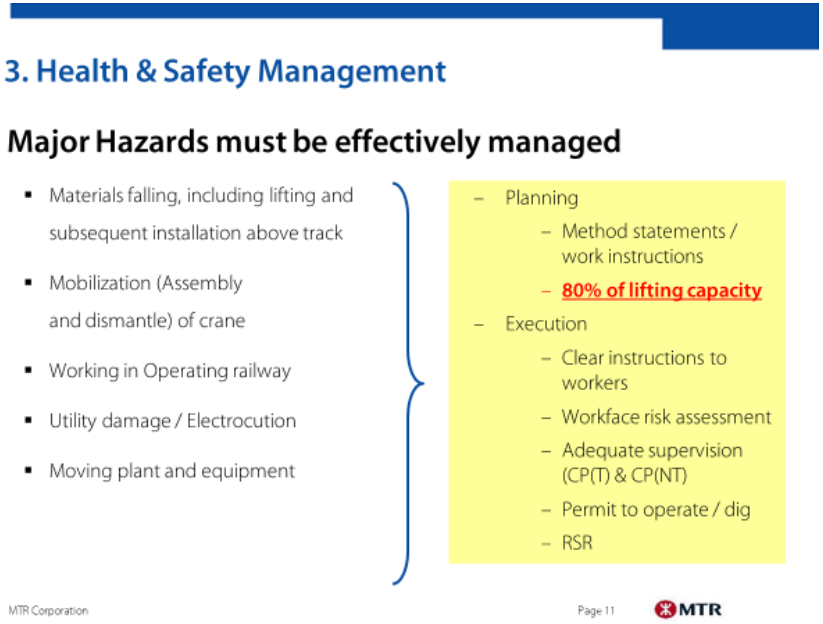

MTR
港鐵小蠔灣項目展開前期工程 - 慶祝架空電纜橋組裝完成
Advance Works for MTR's Oyster Bay Project in Full Action with Completion of Cable Bridge Celebration
Paul Y
CRCC
中国铁建

How can you 100% sure it goes as planned?

(Client)

EDoc, timing , 80% utilization and other constraints

- From development of design
- In scope of contracts
- Specified in tender document
- Assessed in tender assessment
- Emphasized in Inaugural and Initial meeting



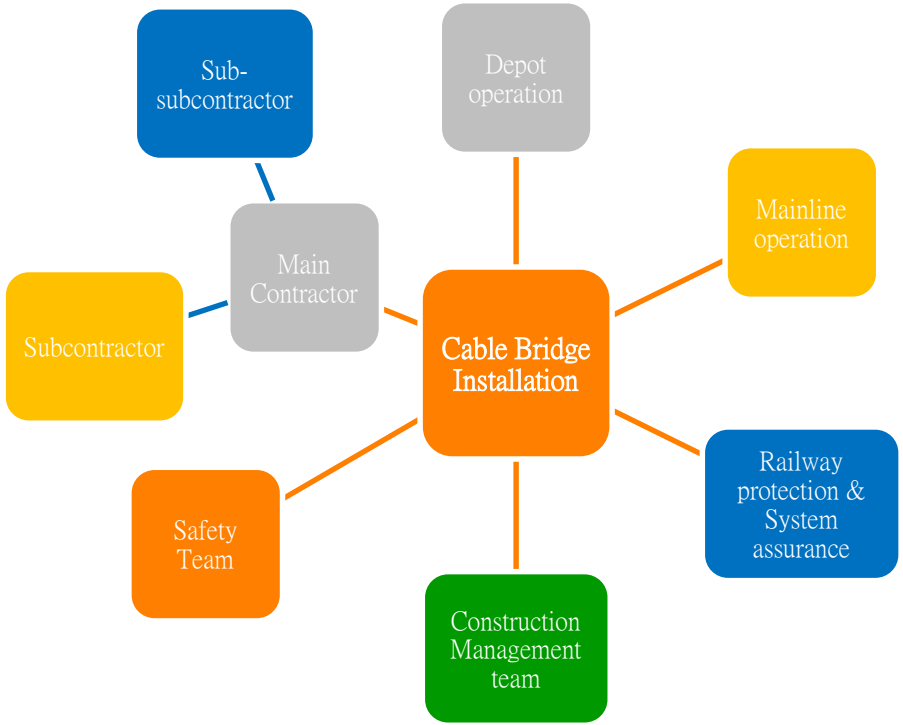
Joint workshops with real guys and stakeholders

Feb 2022

- First submission / workshop

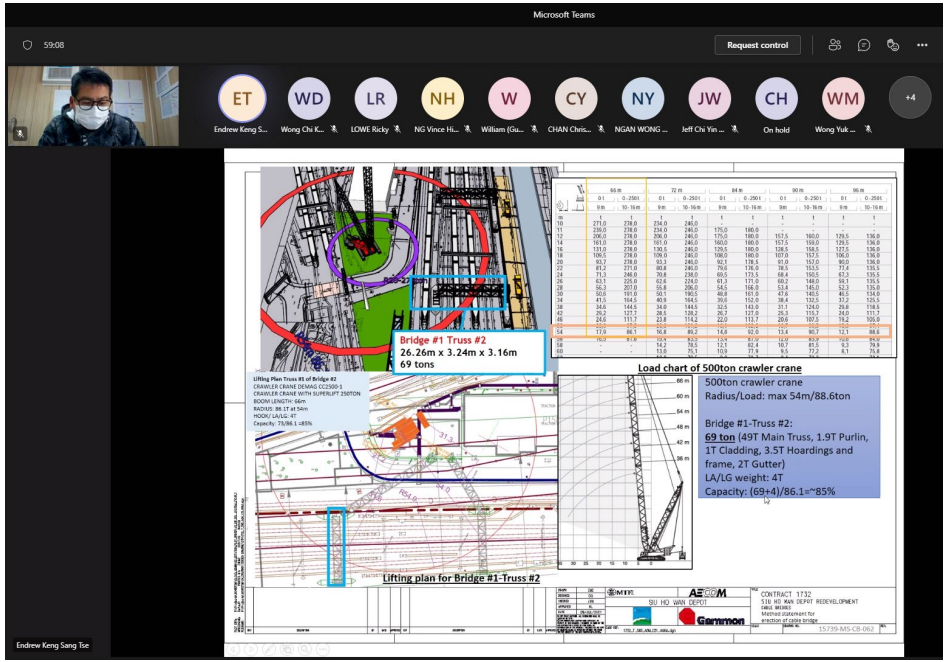
Nov 2022

- Approve to commence



Joint workshops

- More than 100 hours of preparation meetings
- Involving real guys
  - Crane operator
  - Sub-sub-contractor supervisor
- Scenario Planning
  - Every possible alternative



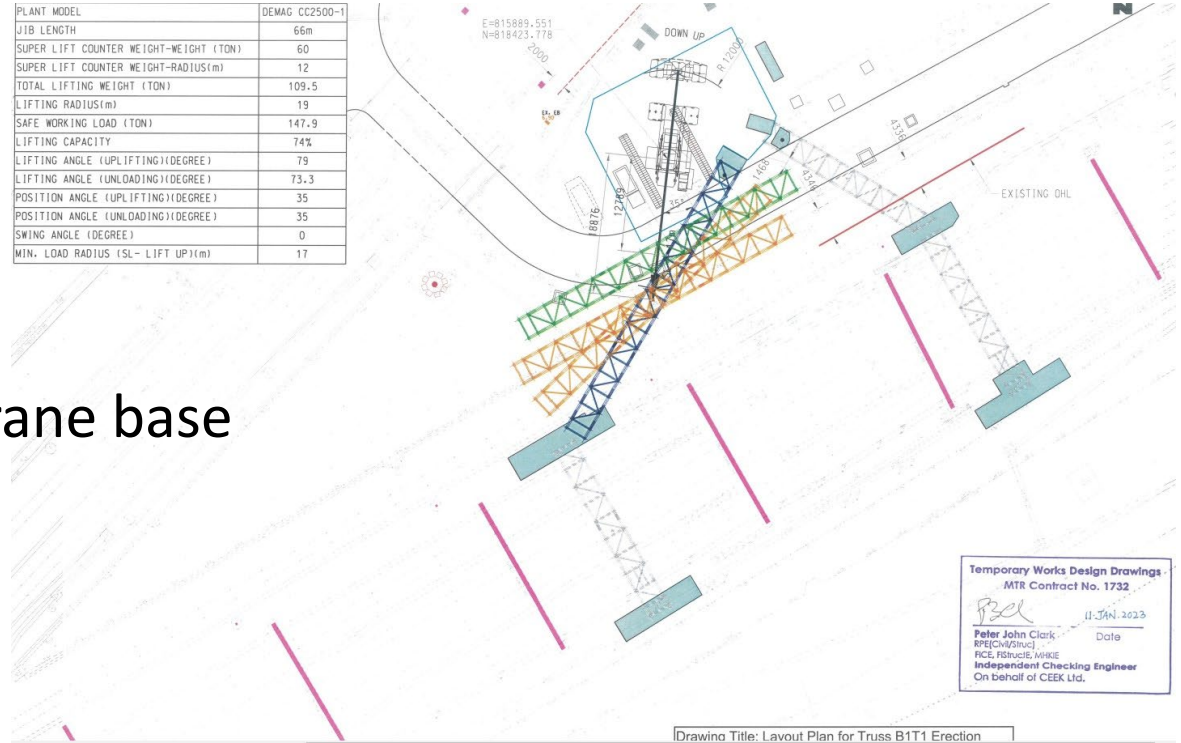
Step by step to detail every motion

- Detailed lifting plan
- Every angle
- Every motion
- Movement of the crane base

Step by step to detail every motion

- Detailed lifting plan
- Every angle
- Every motion
- Movement of the crane base

PLANT MODEL	DEMAG CC2500-1
JIB LENGTH	66m
SUPER LIFT COUNTER WEIGHT-WEIGHT (TON)	60
SUPER LIFT COUNTER WEIGHT-RADIUS(m)	12
TOTAL LIFTING WEIGHT (TON)	109.5
LIFTING RADIUS(m)	19
SAFE WORKING LOAD (TON)	147.9
LIFTING CAPACITY	74%
LIFTING ANGLE (UPLIFTING)(DEGREE)	79
LIFTING ANGLE (UNLOADING)(DEGREE)	73.3
POSITION ANGLE (UPLIFTING)(DEGREE)	35
POSITION ANGLE (UNLOADING)(DEGREE)	35
SWING ANGLE (DEGREE)	0
MIN. LOAD RADIUS (SL- LIFT UP)(m)	17



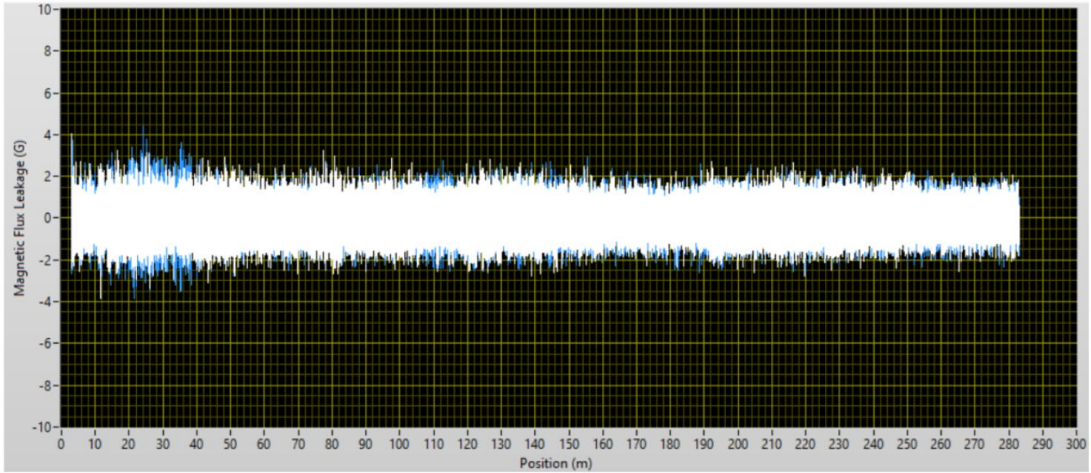
Maintenance record review of the 500 ton crane

維修日期	內容	時間	工作人員	備註	
2020-04-17	機底快接頭漏油(已經用喉箍削了)		啟榮	屯門	
2020-05-08	右邊履帶頭變速箱爆牙崩		傑明機械	屯門	
2020-05-10	因工地情況要59015右邊履帶換上暫用		傑明機械	屯門	
2020-05-13	正實右邊變速箱大軸承爆裂導致大細齒輪爆牙(已經在力士樂訂貨GPT 220 T3)		傑明機械	錦上路倉	
2020-05-19	換發動機油底夾口紙, 發現後備水壺喉爆裂		啟榮	錦上路倉	
2020-05-20	換上前59051水壺去59082發動機暫用		啟榮	錦上路倉	
2020-05-22	主臂頭杆坐位吊柱調絲繩		啟榮	錦上路倉	
10/6/2020	換右邊履帶潤滑油喉及油咀一套	2122h	啟榮	錦上路倉	
15/6/2020	後備水壺老化爆烈(已安排鄭工訂貨)	2122h	啟榮	錦上路倉	
15/6/2020	換發動机油底排油螺絲	2122h	啟榮	錦上路倉	
29/6/2020	後備水壺已換了全新及入了防銹水	2122h	啟榮	錦上路倉	
30/6/2020	清理底盤肥油及清理E滑輪組及油渣缸清水	2128h	啟榮	錦上路倉	
3/7/2020	換泵油格(9個格)	2132h	啟榮	錦上路倉	
6/7/2020	安裝右邊履帶變速箱	2132h	傑明機械	錦上路倉	
11/7/2020	清理主機身下坐履帶鎖軸	2132h	啟榮	錦上路倉	
16/11/2020	清洗發動機水箱及換新電池	2146h	啟榮	錦上路倉	
2/12/2020	換發動機油泵摩打牙油 (220牙油 10L)	2146h	啟榮	錦上路倉	
28/10/2021	換H1&H2鋼絲繩兩條800m	2927h	駿逸	錦上路倉	
13/12/2021	100噸大鈎由油打牛油		啟榮	錦上路倉	
17/12/2021	H2鋼絲繩太鬆		啟榮	九龍灣 危險倉	
17/1/2022	H1&H2鋼絲繩子彈頭長了改斷短	3252h	啟榮	體育園北1號	
5/3/2022	左右操控桿沒有動作(老鼠咬電線)	3380h	啟榮	體育園北 1 號	
14/3/2022	H1亂繩(机手問題)漏鏈條	3429h	啟榮	體育園北 1 號	欣 Ken
18/3/2022	H1卷繩感應器壞(等零件)	3456h	啟榮	體育園北 1 號	星 穎
22/3/2022	永基200噸钩換160噸钩30噸鈎	3492h	啟榮	體育園北 1 號	星 穎
12/4/2022	出現SL感應有問題未處理	3617h	啟榮	體育園北 1 號	星 穎
23/4/2022	H1,H2塔同步已經換感應器,超起呻油喉換了,左邊電腦屏已換上及轉位一拆一裝	3692h	啟榮 駿逸	體育園北 1 號	星 穎
2022-4-29,30	檢查左邊手柄有問題,已經換了清底幫好回來手柄都沒有動作暫用遙控問題尚未解決	3734h	啟榮	體育園北 1 號	星 穎
5/5/2022	永基200噸钩換160噸钩30噸鈎	3752h	啟榮	體育園北 1 號	星
23/9/2022	左右超起油杆換了一套密封圈	3873h	啟榮	錦上路倉	力東

- Checking of Crane maintenance history records

NDT for crane's hoisting rope

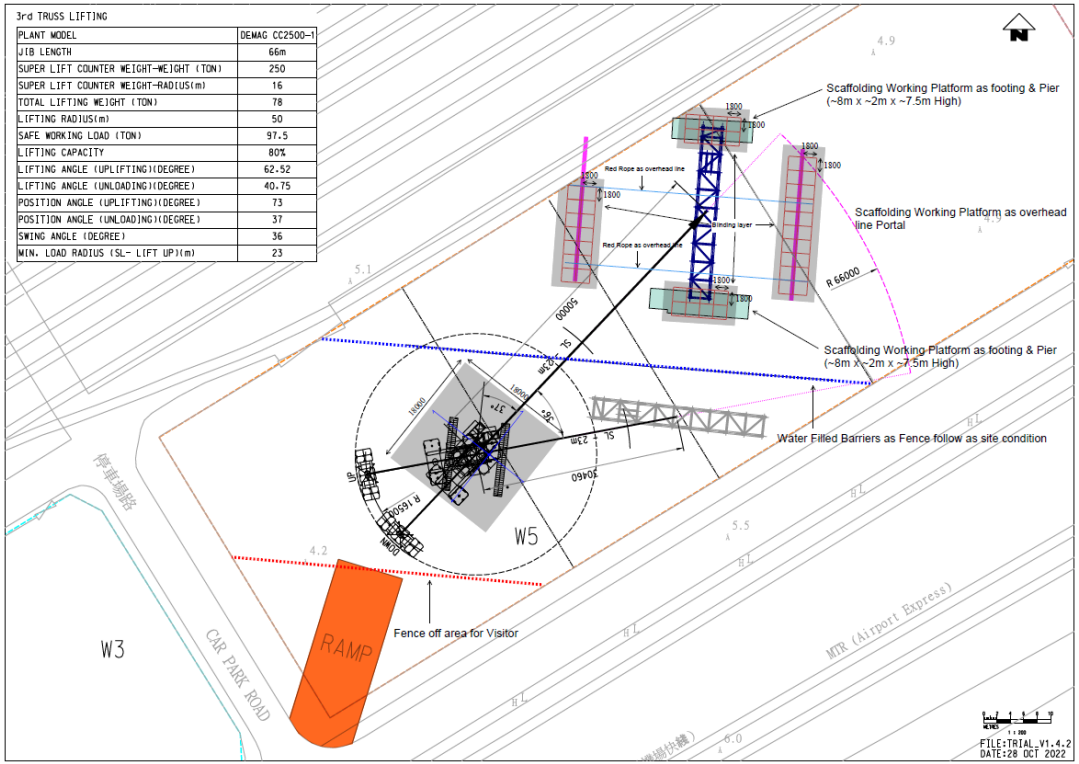
[PaulY-221208_SuperLift]



The inspected length of this wire rope was 280.197m. The overall waveform of the wire rope was quite uniform. There was a LF defect at 3.058m. There was no localized LMA defect. The ovality index of wire rope was relatively higher than general case. In short, this wire rope was in good condition.

Customer Name	Paul Y. CRCCI JV	
Crane Model	Crawler Crane Terex CC 2500-1 (500T w/ SuperLift)	
Equipment ID	N/A	
Inspection Location	MTR Siu Ho Wan Depot	
Wire Rope detail	Super lift (SL):	dia.26mm, Casar, SuperPlast 8
	Main hoist (FMH, RMH):	dia.26mm, HDL, 34WxK7 EPWSC dia.26mm, Bridon, 34(W)xK7 EPWSC
	Boom hoist (LBH, RBH):	Dia.28mm, Diepa, H50
Inspected rope length	Super lift (SL):	Approximate 280m
	Front main hoist (FMH):	Approximate 375m
	Rear main hoist (RMH):	Approximate 380m
	Left boom hoist (LBH):	Approximate 2.9m
	Right boom hoist (RBH):	Approximate 2.8m
Installation date	Super lift (SL):	02 Jul 2007
	Main hoist (FMH, RMH):	22 Dec 2021, 21 Dec 2021
	Boom hoist (LBH, RBH):	30 May 2007
Date of Inspection	2022-12-08	
Inspection direction	Moving downwards and then upwards	
Mak Kee Inspectors	Y.C. Chan, Alex So, Shing Chan	
On-site photos		

Trial Lift – Full scale mockup based an agreed plan



3rd TRUSS LIFTING

PLANT MODEL	DEMAG CC2500-1
JIB LENGTH	66m
SUPER LIFT COUNTER WEIGHT-WEIGHT (TON)	250
SUPER LIFT COUNTER WEIGHT-RADIUS(m)	16
TOTAL LIFTING WEIGHT (TON)	78
LIFTING RADIUS(m)	50
SAFE WORKING LOAD (TON)	97.5
LIFTING CAPACITY	80%
LIFTING ANGLE (UPLIFTING)(DEGREE)	62.52
LIFTING ANGLE (UNLOADING)(DEGREE)	40.75
POSITION ANGLE (UPLIFTING)(DEGREE)	73
POSITION ANGLE (UNLOAD]NG)(DEGREE)	37
SWING ANGLE (DEGREE)	36
MIN. LOAD RADIUS (SL- LIFT UP)(m)	23

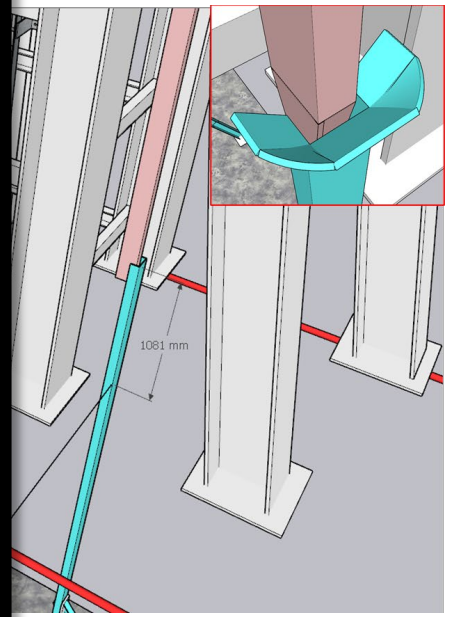
- Crane base
- Crane set up
- 1:1 mock up of constraints
- Lifting plan

Trial Lift – Full scale mockup when crane erected

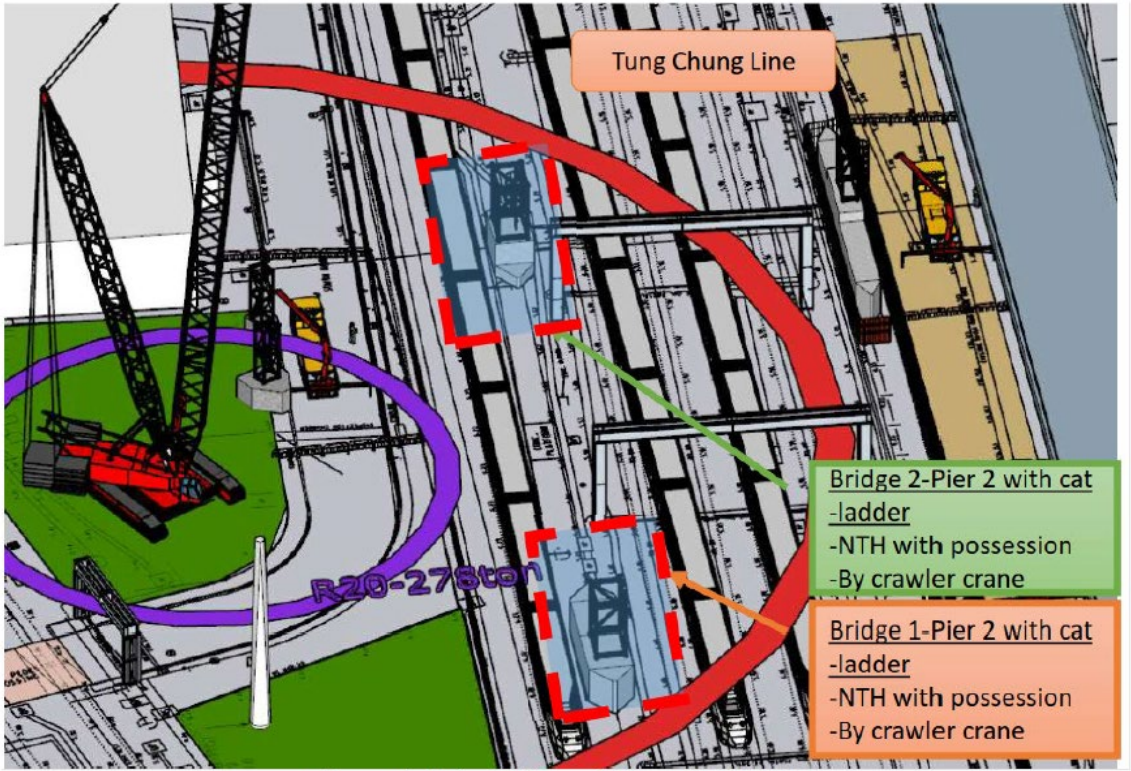
Trial Lift – Full scale mockup to verify every step

Trial Lift – Full scale mockup to practice

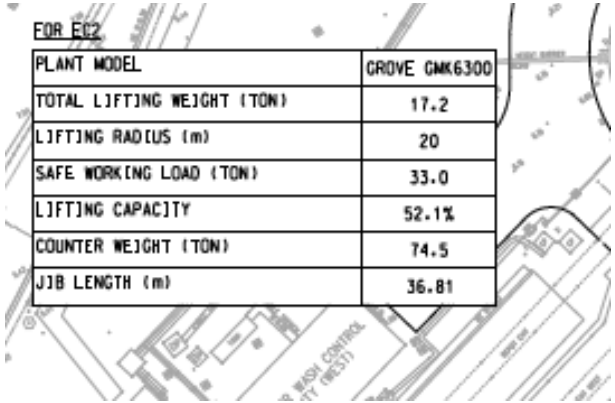
Trial Lift – Full scale mockup to minimize the uncertainties



When there is a change,

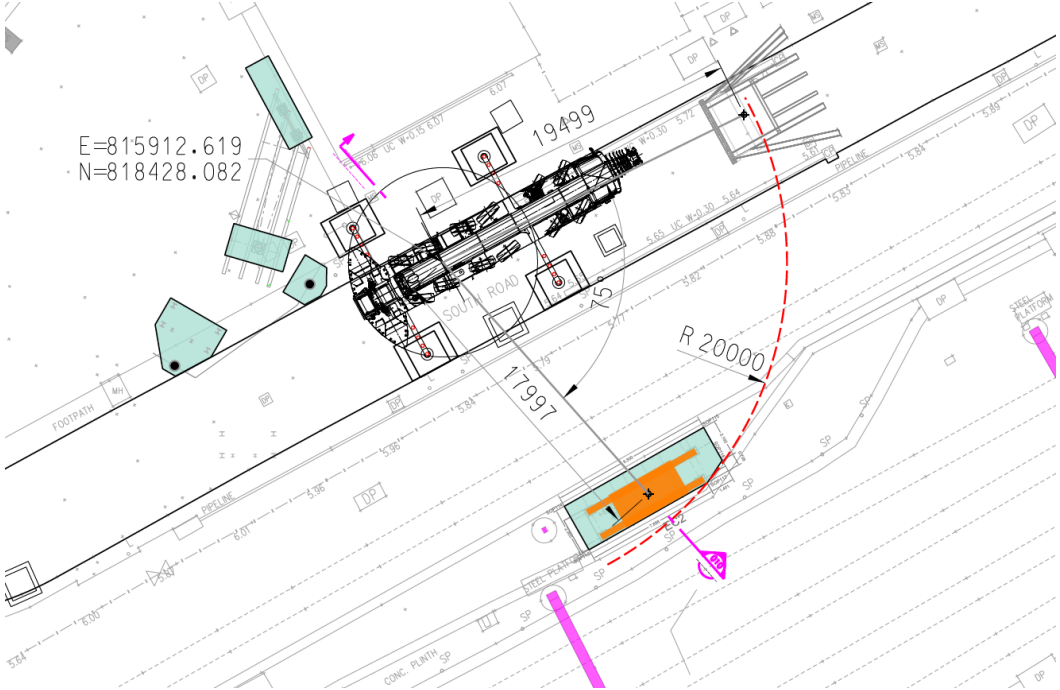


Change Management

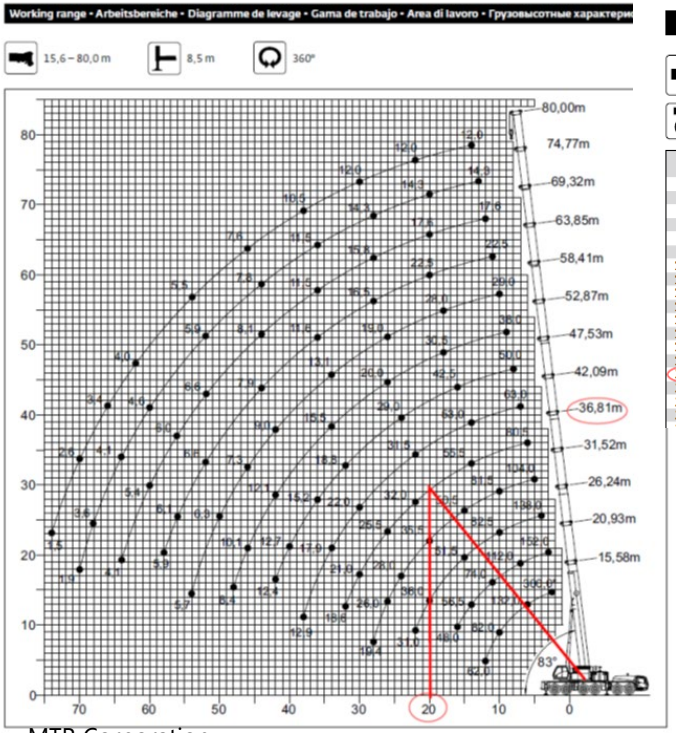


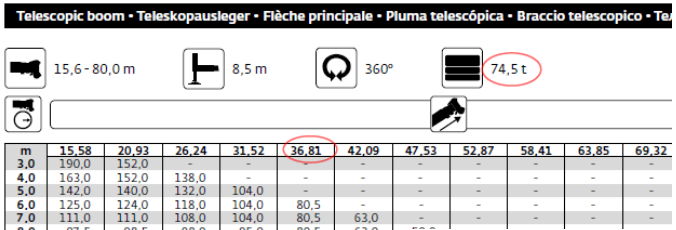
FOR EC2

PLANT MODEL	GROVE GMK6300
TOTAL LIFTING WEIGHT (TON)	17.2
LIFTING RADIUS (m)	20
SAFE WORKING LOAD (TON)	33.0
LIFTING CAPACITY	52.1%
COUNTER WEIGHT (TON)	74.5
JIB LENGTH (m)	36.81



Change Management





m	15,58	20,93	26,24	31,52	36,81	42,09	47,53	52,87	58,41	63,85	69,32
3,0	190,0	152,0	-	-	-	-	-	-	-	-	-
4,0	163,0	152,0	138,0	-	-	-	-	-	-	-	-
5,0	142,0	140,0	132,0	104,0	-	-	-	-	-	-	-
6,0	125,0	124,0	118,0	104,0	80,5	-	-	-	-	-	-
7,0	111,0	111,0	108,0	104,0	80,5	63,0	-	-	-	-	-
8,0	97,5	98,5	98,0	95,0	80,5	63,0					
9,0	85,5	86,0	86,0	85,0	80,0	63,0					
10,0	76,0	76,5	76,0	75,5	75,5	63,0					
11,0	68,0	69,5	68,5	67,5	68,5	61,5					
12,0	61,0	62,5	62,0	61,5	61,5	58,5					
13,0	-	56,5	57,0	56,5	55,5	55,5					
14,0	-	51,5	52,0	51,5	50,5	51,5					
15,0	-	47,0	47,5	47,0	46,0	47,0					
16,0	-	43,0	43,5	43,0	43,0	43,5					
18,0	-	-	37,5	37,0	38,0	37,0					
20,0	-	-	32,5	33,5	33,0	32,0					
22,0	-	-	27,5	29,0	28,5	29,0					
24,0	-	-	-	25,0	24,5	26,0					
26,0	-	-	-	22,0	22,5	22,5					

GMK 6300L

Outrigger Load Chart

Ref.-Nr. 3 194 8

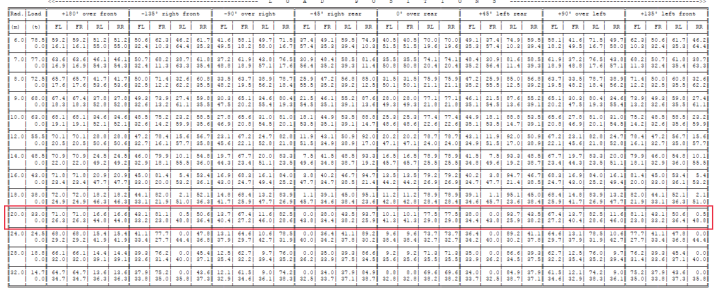
Main boom: 36,74 m

Telescoping ratio: Tel. sec. I – 0.00 | Tel. sec. II – 0.49 | Tel. sec. III – 0.49 | Tel. sec. IV – 0.49 | Tel. sec. V – 0.49 | Tel. sec. VI – 0.00

Counterweight: 74,5 t

Outrigger base: 8,700 x 8,500 m

Slewing range: 360°



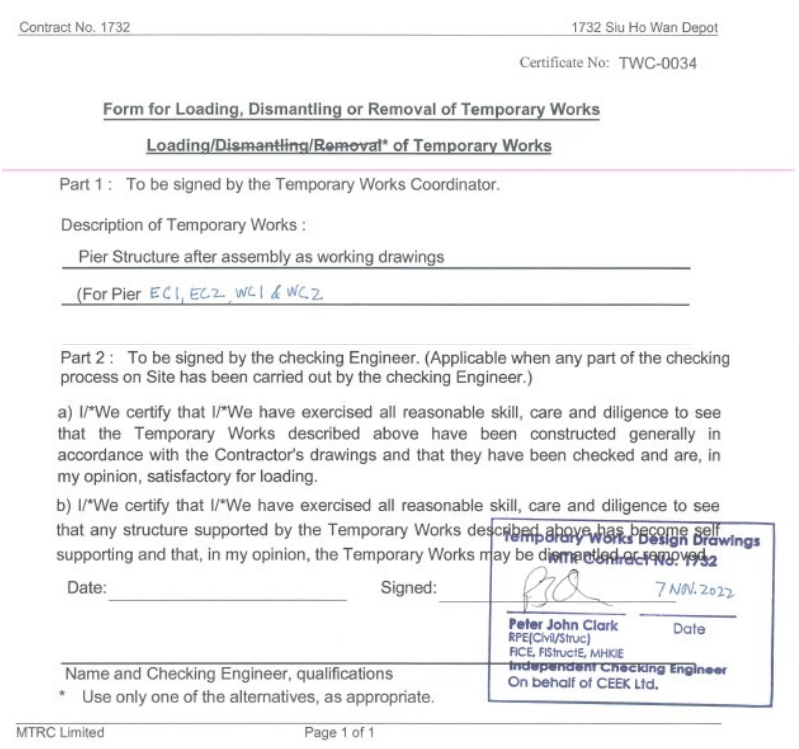
Outrigger loads are shown in t.

Max outrigger load = 937kN x 0.521
Provide 2.3m x 3m steel pad
Bearing Pressure = 70.3kPa <100KPa OK

Minute by minute and call off arrangement

	Activities	Target Time Period		Duration	Check Point	Condition
		From	To			
A	**Setup before each lifting**					
1	Assembly the truss or pier					
2	Survey check the 500t Crawler Crane to the designated position					
3	ICE check on lifting plan (issue certificate)					
B	**Permit to lift (Pre check before lifting)**					
1	LA/LG compliance check	20:00	20:30	30		
2	Resources attendance and weather condition check	20:00	20:30 (-22:15)	30 or more		Call off if adverse weather occur or within 2 hours
3	ICE check on temporary work (lifting) and issue loading certificate	21:00	21:30	30		
4	RPE check on super lift capacity and issue the certificate	21:00	21:30	30		
5	Trial lifting 3-3-3 arrangement	21:30	22:00	30	Check point #1 22:00	Survey check report Call off if out of tolerance
6	Issue the permit to lift	22:00	22:15	15	Check point #2 22:15	
7	Prework briefing to lifting team	22:15	22:45	30		
8	Confirm to Traffic Controller and Yard Master	22:45	23:00	15		
C	**Lifting Operation**					
1	CP(T) report to operation (Possession / SPA)	01:45	02:00	15		
2	Possession setup	02:00	02:10	10		
3	Possession Granted	02:10	02:15	5		
4	Lift the Truss/pier to the designated position	02:15	02:45	30		
5	Positioning/ Pin	02:45	03:05	20	Check point #3 03:05	
6	Bolting 16 nos. and Torque	03:05	03:35	30		
7	ICE certification	03:35	03:40	5		
8	Release lifting gear	03:40	03:50	10		
9	Remove temporary platform from truss	03:50	04:10	20		
10	Site Clearance and Line Clear Check	04:10	04:30	20		

ICE check for loading on structure



Contract No. 1732 1732 Siu Ho Wan Depot

Certificate No: TWC-0034

Form for Loading, Dismantling or Removal of Temporary Works

Loading/~~Dismantling/Removal~~* of Temporary Works

Part 1 : To be signed by the Temporary Works Coordinator.

Description of Temporary Works :

Pier Structure after assembly as working drawings

(For Pier EC1, EC2, WC1 & WC2.

Part 2 : To be signed by the checking Engineer. (Applicable when any part of the checking process on Site has been carried out by the checking Engineer.)

a) I/*We certify that I/*We have exercised all reasonable skill, care and diligence to see that the Temporary Works described above have been constructed generally in accordance with the Contractor's drawings and that they have been checked and are, in my opinion, satisfactory for loading.

b) I/*We certify that I/*We have exercised all reasonable skill, care and diligence to see that any structure supported by the Temporary Works described above has become self supporting and that, in my opinion, the Temporary Works may be dismantled or removed.

Temporary Works Design Drawings
MTR Contract No. 1732

Date: Signed: 7 NOV. 2022

Peter John Clark
RPE(Civil/Struc)
FICE, FIStructE, MHKIE
Independent Checking Engineer
On behalf of CEEK Ltd.

Date

Name and Checking Engineer, qualifications

* Use only one of the alternatives, as appropriate.

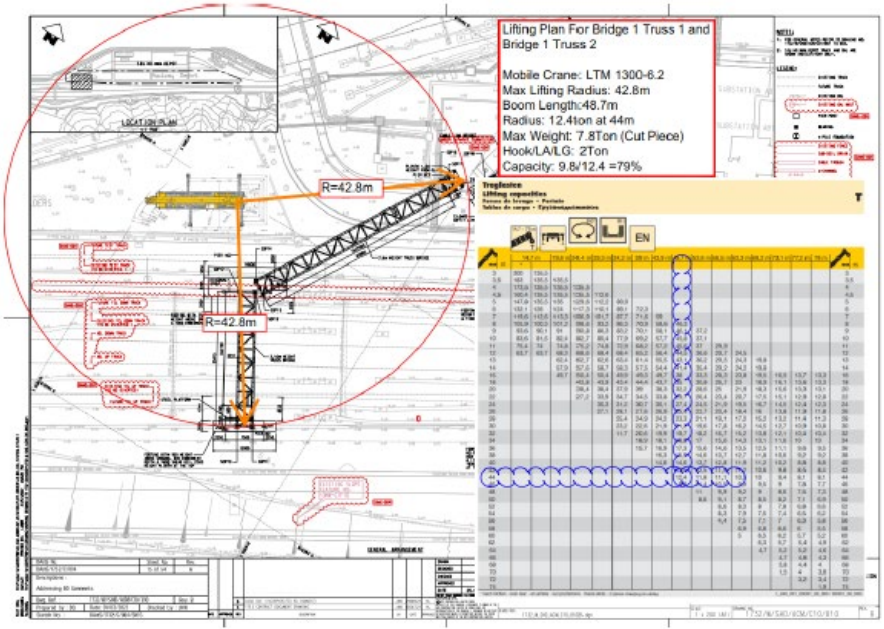
MTRC Limited Page 1 of 1

Emergency Action Plan

C1732 - Emergency Action Plan - Summary Table

Hazard Category	Scenarios	Timing	EAP Number
1) Crane Collapse	1.1) Jib collapse within site boundary (Vacant Land)	1.1.1) Day Time	refer to EAP No. 1
		1.1.2) Non-Traffic Hours	refer to EAP No. 1
	1.2) Jib collapse to Depot facilities	1.2.1) Day Time	refer to EAP No. 2
		1.2.2) Non-Traffic Hours	refer to EAP No. 2
	1.3) Jib collapse to track and OHL	1.3.1) Day Time	N/A (lifting work must be at NTH)
		1.3.2) Non-Traffic Hours	refer to EAP No. 3
2) Falling object during lifting and installation of Piers and Trusses	2.1) Falling object within site boundary (Vacant Land)	2.1.1) Day Time	refer to EAP No. 4
		2.1.2) Non-Traffic Hours	refer to EAP No. 4
	2.2) Falling object to Depot facilities	2.2.1) Day Time	refer to EAP No. 5
		2.2.2) Non-Traffic Hours	refer to EAP No. 5
	2.3) Falling object to track and OHL	2.3.1) Day Time	N/A (lifting work must be at NTH)
		2.3.2) Non-Traffic Hours	refer to EAP No. 6
3) Crash with OHL during lifting and installation of Piers and Trusses	3.1) Crash with Depot OHL	3.1.1) Day Time	N/A (lifting work must be at NTH)
		3.1.2) Non-Traffic Hours	refer to EAP No. 7
	3.2) Crash with operation line OHL	3.2.1) Day Time	N/A (lifting work must be at NTH)
		3.2.2) Non-Traffic Hours	refer to EAP No. 8
4) Crane Malfunction	4.1) Crane malfunction within site boundary	4.1.1) Day Time	refer to EAP No. 9
		4.1.2) Non-Traffic Hours	refer to EAP No. 9
	4.2) Crane malfunction and jib over the depot OHL	4.2.1) Day Time	N/A (lifting work must be at NTH)
		4.2.2) Non-Traffic Hours	refer to EAP No. 10
	4.3) Crane malfunction and jib over the operation OHL	4.3.1) Day Time	N/A (lifting work must be at NTH)
		4.3.2) Non-Traffic Hours	refer to EAP No. 11

Appendix C – Lifting Plan for 300 ton Mobile Crane (for emergency)

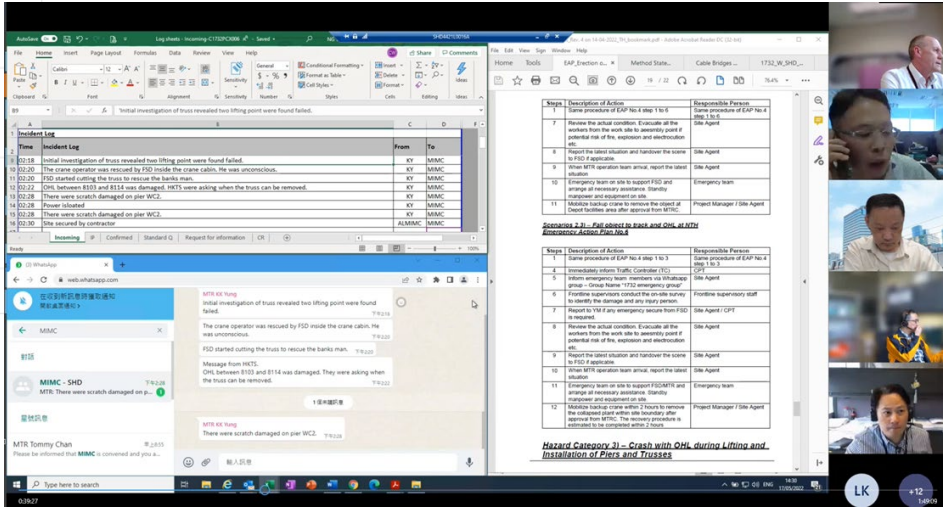


Emergency Action Plan

• Backup equipment and tools will be provided at site.	Checked before Permit to Lift	☐
• A crew of mechanician / spare part will be available on site for carry out repairing work if crane malfunction.	Checked before Permit of Lift	☐
• 30 nos. of workers will be available on site to carry out the recovery works upon MTR's instruction	Checked before Permit to Lift	☐

Reporting and high level management drill

Level	Impact		IOW	CIOW	CM	SCM	GM/PC	CWD	CPSM	PSM	SCSA	CSA	PCM	CEO	HRM	CEnvM	OCC and Station Manager
		Report the accident or incident to your supervisor, irrespective of nature and seriousness.	A/R														
1 Minor (Default)	• Restricted to site area only. • No emergency services involved. • No impact to the public. • No adverse media impact.	Report to the level of SCM and PSM		A/R	A/R					A/R							
2 Serious	• Restricted to site area only. • Emergency services involved. • No impact to the public. • Adverse media impact.	Report to GM/PC and PSM				A/R				A/R							
3 Major	• Involves areas outside of the site. • Involves injury to public or disruption to the public. • No disruption to operating railway. • Adverse media impact.	Report to the level of CWD					A/R	A/R									
4 Crisis	• Involves areas outside of the site. • Involves injury to public or disruption to the public. • Disruption to operating railway. • Adverse media impact.	Report to the level of CEO						A/R									
		Update the CSMC log "Notification Report of Issues Material to Safety" within 3 days						A/R									



You can delegate authority but not responsibility

Joint checking by MTR and PY CRCC JV

Work Description: 1732 Cable Bridge (Lifting of Pier WC1)

NTH 1 – Pier WC1: Key Mitigation Measures		tick as appropriate box
• Trial lift was carried out with: o Actual crane and crane team o Exact crane duty, slew and jib restrictors o Simulation of OHL and trackside fencing o Multiple lift practice and refinements	Done, 10 Nov 22	☑
• 100t mobile crane with Slew and Jib range can be set and locked to restrict movement into prohibited zone	Provided. Set up and verified precisely on lifting night	☑
• The lifting works will be carried out with SPA works with OHL isolation in NTH on Saturday^Sunday or public holiday.	SPA on 19^20 Nov 22 night	☑
• The maximum lifting load is within 80% of the Safe Working Load of Crane.	Checked, compiled	☑
• The ground condition will be checked by ICE for safe lifting operation.	Attached on appendix A	☑
• MTR's CP(T) to supervise the protection arrangement of mainline SPA.	Arranged	☑

Crane movement limitation switch

Set up of crane movement limitation

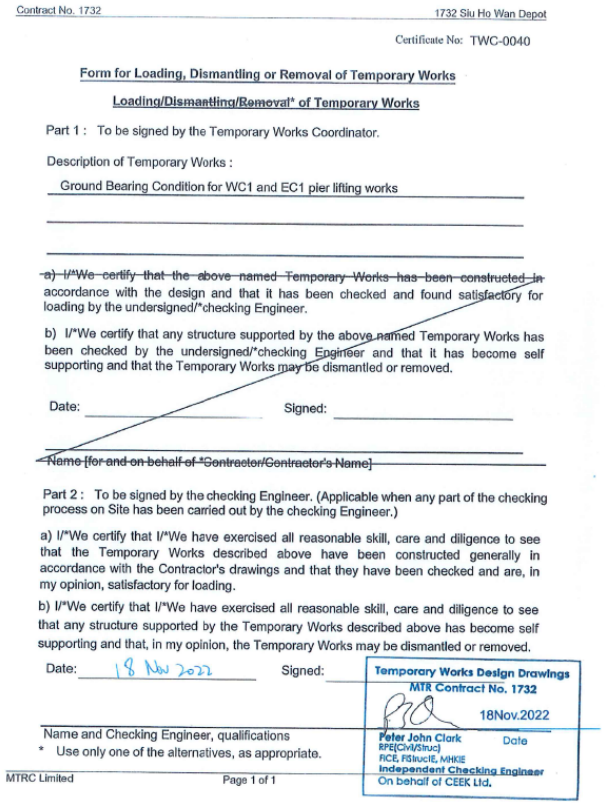
Pre-set limitation (from cad)		Site verification prior to lifting (as built)
Swing angle	35° to 35°	35° to 35°
Loading radius	12.8 to 18.9m	12.8 to 18.9m
Inclined angle (as shown)	79° to 73.3°	79° to 73.3°
Boom length (as shown)	66m	66m

Joint checking using checklist

Work Description: 1732 Cable Bridge (Lifting of Pier WC1)

NTH 1 – Pier WC1: Key Mitigation Measures		tick as appropriate box
• Trial lift was carried out with: o Actual crane and crane team o Exact crane duty, slew and jib restrictors o Simulation of OHL and trackside fencing o Multiple lift practice and refinements	Done, 10 Nov 22	☑
• 100t mobile crane with Slew and Jib range can be set and locked to restrict movement into prohibited zone	Provided. Set up and verified precisely on lifting night	☑
• The lifting works will be carried out with SPA works with OHL isolation in NTH on Saturday^Sunday or public holiday.	SPA on 19^20 Nov 22 night	☑
• The maximum lifting load is within 80% of the Safe Working Load of Crane.	Checked, compiled	☑
• The ground condition will be checked by ICE for safe lifting operation.	Attached on appendix A	☑
• MTR's CP(T) to supervise the protection arrangement of mainline SPA.	Arranged	☑

Ground condition checking



Contract No. 1732 — 1732 Siu Ho Wan Depot

Certificate No: TWC-0040

Form for Loading, Dismantling or Removal of Temporary Works

Loading/Dismantling/Removal* of Temporary Works

Part 1 : To be signed by the Temporary Works Coordinator.

Description of Temporary Works :

Ground Bearing Condition for WC1 and EC1 pier lifting works

~~a) I/*We certify that the above named Temporary Works has been constructed in~~ accordance with the design and that it has been checked and found satisfactory for loading by the undersigned/*checking Engineer.

b) I/*We certify that any structure supported by the above named Temporary Works has been checked by the undersigned/*checking Engineer and that it has become self supporting and that the Temporary Works may be dismantled or removed.

Date: _____ Signed: _____

~~Name [for and on behalf of *Contractor/Contractor's Name]~~

Part 2 : To be signed by the checking Engineer. (Applicable when any part of the checking process on Site has been carried out by the checking Engineer.)

a) I/*We certify that I/*We have exercised all reasonable skill, care and diligence to see that the Temporary Works described above have been constructed generally in accordance with the Contractor's drawings and that they have been checked and are, in my opinion, satisfactory for loading.

b) I/*We certify that I/*We have exercised all reasonable skill, care and diligence to see that any structure supported by the Temporary Works described above has become self supporting and that, in my opinion, the Temporary Works may be dismantled or removed.

Date: 18 Nov 2022 Signed:

Temporary Works Design Drawings
MTR Contract No. 1732
18Nov.2022
Peter John Clark Date
RPE(Civil/Struc)
FICE, FIStructE, MHKIE
Independent Checking Engineer
On behalf of CEEK Ltd.

Name and Checking Engineer, qualifications

* Use only one of the alternatives, as appropriate.

MTRC Limited Page 1 of 1

Ground bearing check

INTRAFOR	DRILLHOLE RECORD	HOLE NO.: 1730/SHD/DH70(S/P)
	Contract No. 1730	SHEET 1 of 5

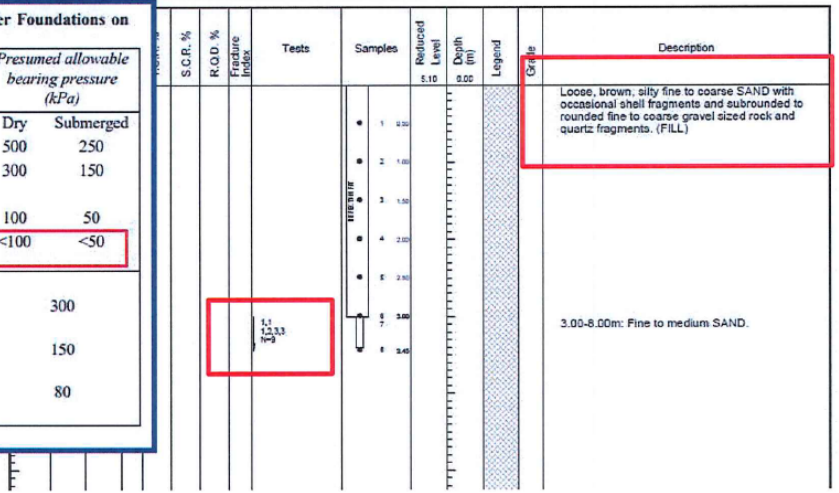
PROJECT : C1730 Ground Investigation for Siu Ho Wan Depot Property Development - Phase 1

METHOD : RC	CO-ORDINATES E 816004.54 N 818426.67	JOB NO. : SI2104
MACHINE & NO. : ZA019		DATE from 18/09/2021 to 27/09/2021
FLUSHING MEDIUM : Water	ORIENTATION Vertical	GROUND LEVEL + 5.10 mPD

Table 2.1 Presumed Allowable Vertical Bearing Pressure under Foundations on Horizontal Ground/Bedrock (Continued)

Category	*Description of rock or soil*	*Presumed allowable bearing pressure (kPa)*	
	Non-cohesive soil (sands and gravels):	Dry	Submerged
4(a)	Very dense – SPT N-value >50	500	250
4(b)	Dense – SPT N-value 30-50; requires pick for excavation; 50 mm peg hard to drive	300	150
4(c)	Medium dense – SPT N-value 10-30	100	50
4(d)	Loose – SPT N-value 4-10, can be excavated with spade; 50 mm peg easily driven	<100	<50
	Cohesive soil (clays and silts):		
5(a)	Very stiff or hard – Undrained shear strength >150 kPa; can be indented by thumbnail	300	
5(b)	Stiff – Undrained shear strength 75-150 kPa; can be indented by thumb	150	
5(c)	Firm – Undrained shear strength 40-75 kPa; can be moulded by strong finger pressure	80	

Notes:



Ground bearing check

GMK 4100L-1 — **Outrigger Load Chart** — **Ref.-Nr. 3 285 453**

Main boom: **27,84 m**

#Fehler#: Tel. sec. I = 0.50 Tel. sec. II = 0.50 Tel. sec. III = 0.50 Tel. sec. IV = 0.50 Tel. sec. V = 0.00 Tel. sec. VI = 0.00

Counterweight: **19,9 t**

Outrigger base: 8,660 x 7,200 m

Slewing range: 360°

<< LOAD POSITIONS >>

Rad.	Load	+180° over front				-135° right front				-90° over right				-45° right rear				0° over rear				+45° left rear				+90° over left				+135° left front			
(m)	(t)	FL	FR	RL	RR	FL	FR	RL	RR	FL	FR	RL	RR	FL	FR	RL	RR	FL	FR	RL	RR	FL	FR	RL	RR	FL	FR	RL	RR	FL	FR	RL	RR
5.0	48.0	33.0	33.0	21.3	21.3	24.0	35.7	12.3	36.6	14.1	30.7	14.7	49.1	9.0	20.7	27.3	51.6	11.8	11.8	42.5	42.5	20.7	9.0	51.6	27.3	30.7	14.1	49.1	14.7	35.7	24.0	36.6	12.3
	0.0	10.2	10.2	20.1	20.1	13.0	9.3	22.9	15.4	16.0	10.9	22.1	11.5	17.6	14.0	18.2	10.8	16.7	16.7	13.6	13.6	14.0	17.6	10.8	18.2	10.9	16.0	11.5	22.1	9.3	13.0	15.4	22.9
6.0	45.5	34.8	34.8	18.2	18.2	23.9	38.2	7.2	36.8	11.8	32.0	10.2	52.1	5.6	19.9	25.4	55.1	9.0	9.0	44.0	44.0	19.9	5.6	55.1	25.4	32.0	11.8	52.1	10.2	38.2	23.9	36.8	7.2
	0.0	10.6	10.6	19.7	19.7	13.0	9.9	22.1	15.6	15.7	11.2	21.4	12.2	17.1	13.9	18.1	11.5	16.3	16.3	14.0	14.0	13.9	17.1	11.5	18.1	11.2	15.7	12.2	21.4	9.9	13.0	15.6	22.1
7.0	42.0	35.8	35.8	15.5	15.5	23.5	39.6	3.1	36.4	9.9	32.6	6.4	53.6	2.9	19.0	23.6	57.0	6.7	6.7	44.6	44.6	19.0	2.9	57.0	23.6	32.6	9.9	53.6	6.4	39.6	23.5	36.4	3.1
	0.0	11.0	11.0	19.2	19.2	13.1	10.4	21.3	15.7	15.4	11.5	20.8	12.9	16.5	13.8	17.9	12.3	15.9	15.9	14.4	14.4	13.8	16.5	12.3	17.9	11.5	15.4	12.9	20.8	10.4	13.1	15.7	21.3
8.0	35.5	34.4	34.4	13.6	13.6	22.2	38.2	1.3	34.3	8.8	31.3	4.7	51.3	1.9	17.8	21.7	54.6	5.7	5.7	42.4	42.4	17.8	1.9	54.6	21.7	31.3	8.8	51.3	4.7	38.2	22.2	34.3	1.3
	0.0	11.4	11.4	18.8	18.8	13.1	10.9	20.6	15.9	15.0	11.9	20.1	13.5	16.0	13.8	17.7	13.1	15.5	15.5	14.8	14.8	13.8	16.0	13.1	17.7	11.9	15.0	13.5	20.1	10.9	13.1	15.9	20.6
9.0	30.0	33.0	33.0	12.3	12.3	21.2	36.6	0.3	32.4	8.1	30.0	3.6	48.9	1.4	16.9	20.1	52.2	5.0	5.0	40.2	40.2	16.9	1.4	52.2	20.1	30.0	8.1	48.9	3.6	36.6	21.2	32.4	0.3
	0.0	11.8	11.8	18.4	18.4	13.2	11.4	19.8	16.1	14.7	12.2	19.4	14.2	15.5	13.7	17.5	13.8	15.1	15.1	15.2	15.2	13.7	15.5	13.8	17.5	12.2	14.7	14.2	19.4	11.4	13.2	16.1	19.8
10.0	25.5	31.7	31.7	11.3	11.3	20.0	35.5	0.0	30.5	7.6	28.8	2.9	46.8	1.1	16.1	18.9	49.9	4.7	4.7	38.3	38.3	16.1	1.1	49.9	18.9	28.8	7.6	46.8	2.9	35.5	20.0	30.5	0.0
	0.0	12.3	12.3	18.0	18.0	13.3	11.9	19.0	16.3	14.4	12.5	18.8	14.9	15.0	13.6	17.3	14.6	14.7	14.7	15.6	15.6	13.6	15.0	14.6	17.3	12.5	14.4	14.9	18.8	11.9	13.3	16.3	19.0
12.0	19.5	30.2	30.2	9.8	9.8	17.7	35.0	0.0	27.3	6.8	27.4	1.6	44.2	0.5	15.1	17.2	47.3	3.9	3.9	36.1	36.1	15.1	0.5	47.3	17.2	27.4	6.8	44.2	1.6	35.0	17.7	27.3	0.0
	0.0	13.1	13.1	17.2	17.2	13.4	13.0	17.5	16.6	13.8	13.2	17.4	16.2	13.9	13.5	17.0	16.1	13.8	13.8	16.4	16.4	13.5	13.9	16.1	17.0	13.2	13.8	16.2	17.4	13.0	13.4	16.6	17.5
14.0	15.4	29.2	29.2	8.8	8.8	16.0	34.8	0.0	25.1	6.2	26.4	0.7	42.5	0.1	14.3	16.0	45.5	3.4	3.4	34.5	34.5	14.3	0.1	45.5	16.0	26.4	6.2	42.5	0.7	34.8	16.0	25.1	0.0
	0.0	13.9	13.9	16.4	16.4	13.5	14.0	16.0	17.0	13.1	13.8	16.1	17.5	12.9	13.4	16.6	17.6	13.0	13.0	17.2	17.2	13.4	12.9	17.6	16.6	13.8	13.1	17.5	16.1	14.0	13.5	17.0	16.0
16.0	12.1	28.1	28.1	8.2	8.2	15.2	33.8	0.0	23.6	6.0	25.4	0.4	40.8	0.0	13.8	15.1	43.6	3.3	3.3	33.0	33.0	13.8	0.0	43.6	15.1	25.4	6.0	40.8	0.4	33.8	15.2	23.6	0.0
	0.0	14.7	14.7	15.5	15.5	13.6	15.0	14.5	17.3	12.5	14.4	14.8	18.8	11.9	13.3	16.2	19.1	12.2	12.2	18.0	18.0	13.3	11.9	19.1	16.2	14.4	12.5	18.8	14.8	15.0	13.6	17.3	14.5
18.0	9.6	27.3	27.3	7.8	7.8	14.6	32.9	0.0	22.6	5.8	24.6	0.3	39.3	0.0	13.4	14.5	42.1	3.2	3.2	31.8	31.8	13.4	0.0	42.1	14.5	24.6	5.8	39.3	0.3	32.9	14.6	22.6	0.0
	0.0	15.5	15.5	14.7	14.7	13.8	16.0	13.0	17.7	11.8	15.1	13.4	20.1	10.8	13.1	15.9	20.6	11.4	11.4	18.8	18.8	13.1	10.8	20.6	15.9	15.1	11.8	20.1	13.4	16.0	13.0	17.7	13.0
20.0	7.7	26.6	26.6	7.4	7.4	14.1	32.3	0.0	21.8	5.7	24.1	0.1	38.3	0.0	13.1	14.0	41.0	3.1	3.1	30.9	30.9	13.1	0.0	41.0	14.0	24.1	5.7	38.3	0.1	32.3	14.1	21.8	0.0
	0.0	16.3	16.3	13.9	13.9	13.9	17.0	11.5	18.0	11.2	15.7	12.1	21.4	9.8	13.0	15.5	22.1	10.6	10.6	19.6	19.6	13.0	9.8	22.1	15.5	15.7	11.2	21.4	12.1	17.0	13.9	18.0	11.5
24.0	5.0	25.7	25.7	7.0	7.0	13.4	31.4	0.0	20.6	5.4	23.3	0.0	36.6	0.0	12.6	13.3	39.4	3.0	3.0	29.7	29.7	12.6	0.0	39.4	13.3	23.3	5.4	36.6	0.0	31.4	13.4	20.6	0.0
	0.0	17.8	17.8	12.3	12.3	14.1	19.0	8.5	18.7	10.0	16.9	9.6	23.9	7.8	12.7	14.8	24.9	9.0	9.0	21.2	21.2	12.7	7.8	24.9	14.8	16.9	10.0	23.9	9.6	19.0	14.1	18.7	8.5

Outrigger loads are shown in t.

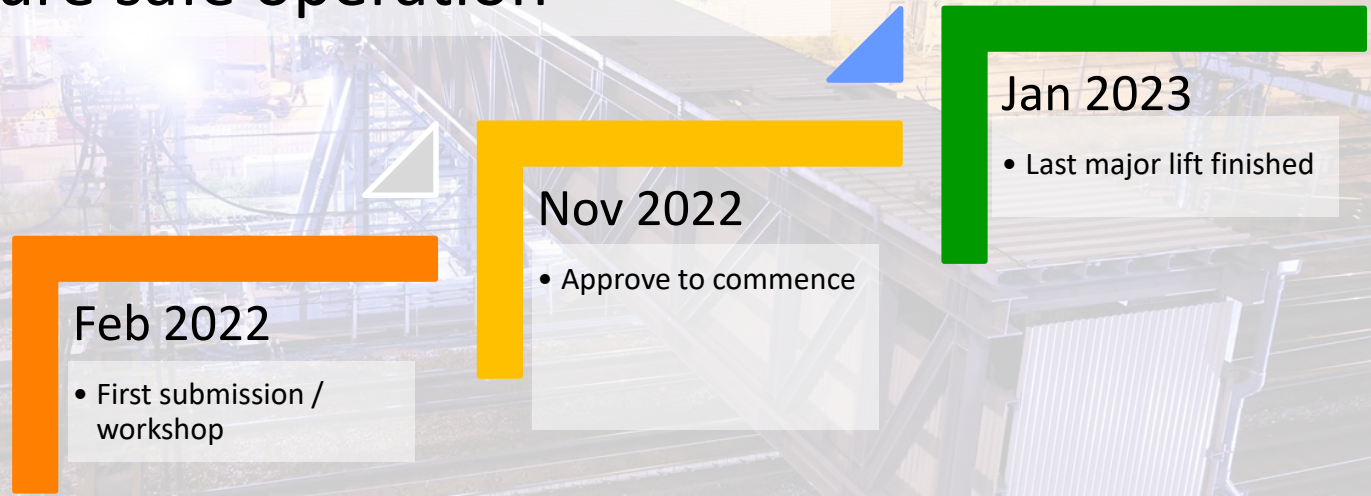
Max outrigger load=455kN
Provide 2.3mx3m steel pad
Bearing pressure=65.9kPa<100kPa OK!

Checklist (Wind speed)

• No lifting operation during adverse weather as defined below: o Tropical Cyclone Warning Signal No.3 or above is hoisted 4 hours before lifting operation. o Red/Black Rainstorm Warning Signal is hoisted 2 hours before lifting operation. o Thunderstorm warning is in force in SHD area and positive warning signal detected by lightning detector or HKO if storm within a range of 5km. o Wind speed reached 40km/h or above as recorded by anemometer on site. 3.96 km/h	Refer to issuance of Permit to Lift at check point time	☑
• 3-3-3 lifting arrangement will be adopted for each actual lifting with details below:-		☑

Cable bridge installation

- Collaboration and engagement are key to ensure safe operation



Joint effort of parties at different levels