Risk Management for Erection of the Footbridge FB1 at NWK

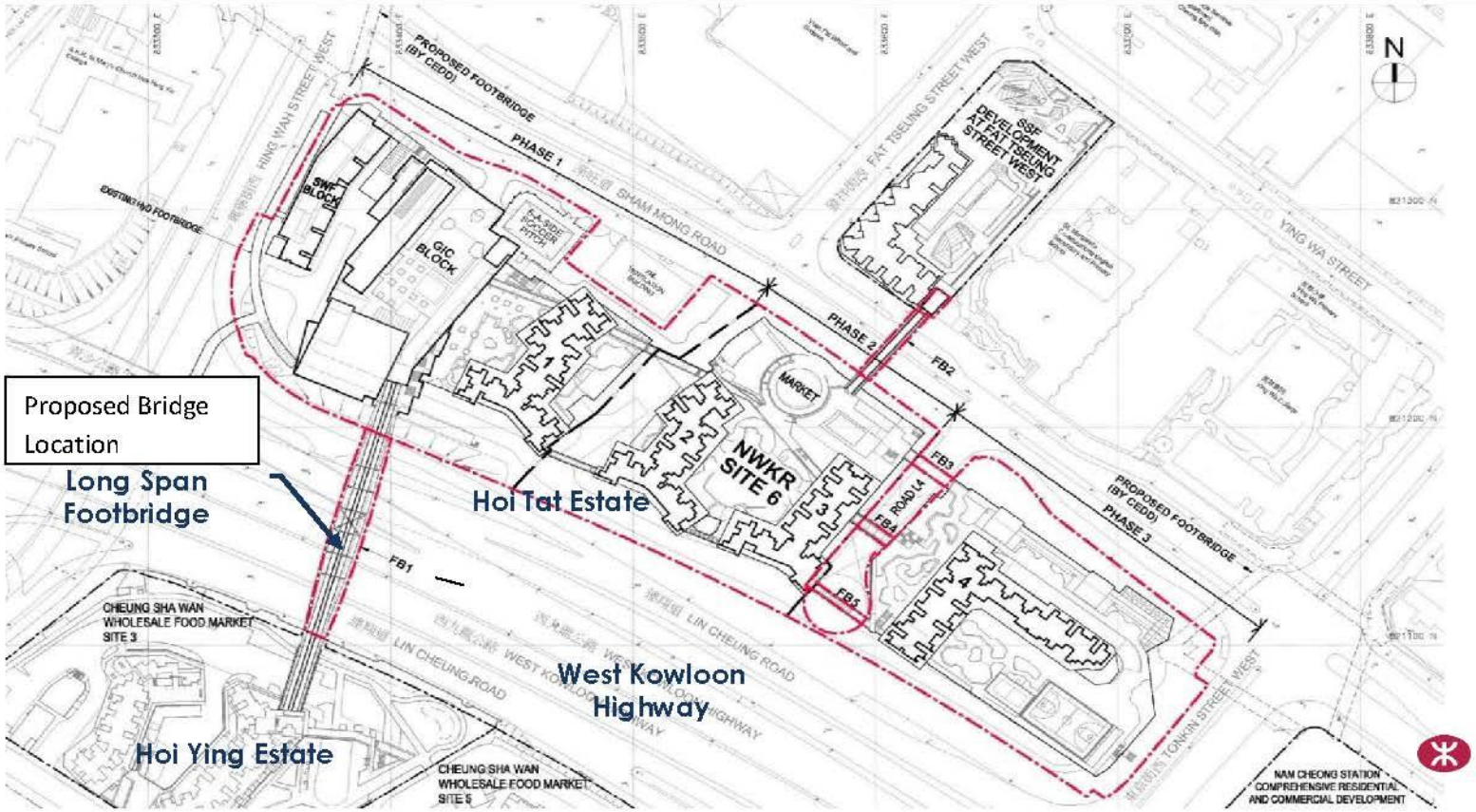
Presented By :

Richard Fung & Ben Fong

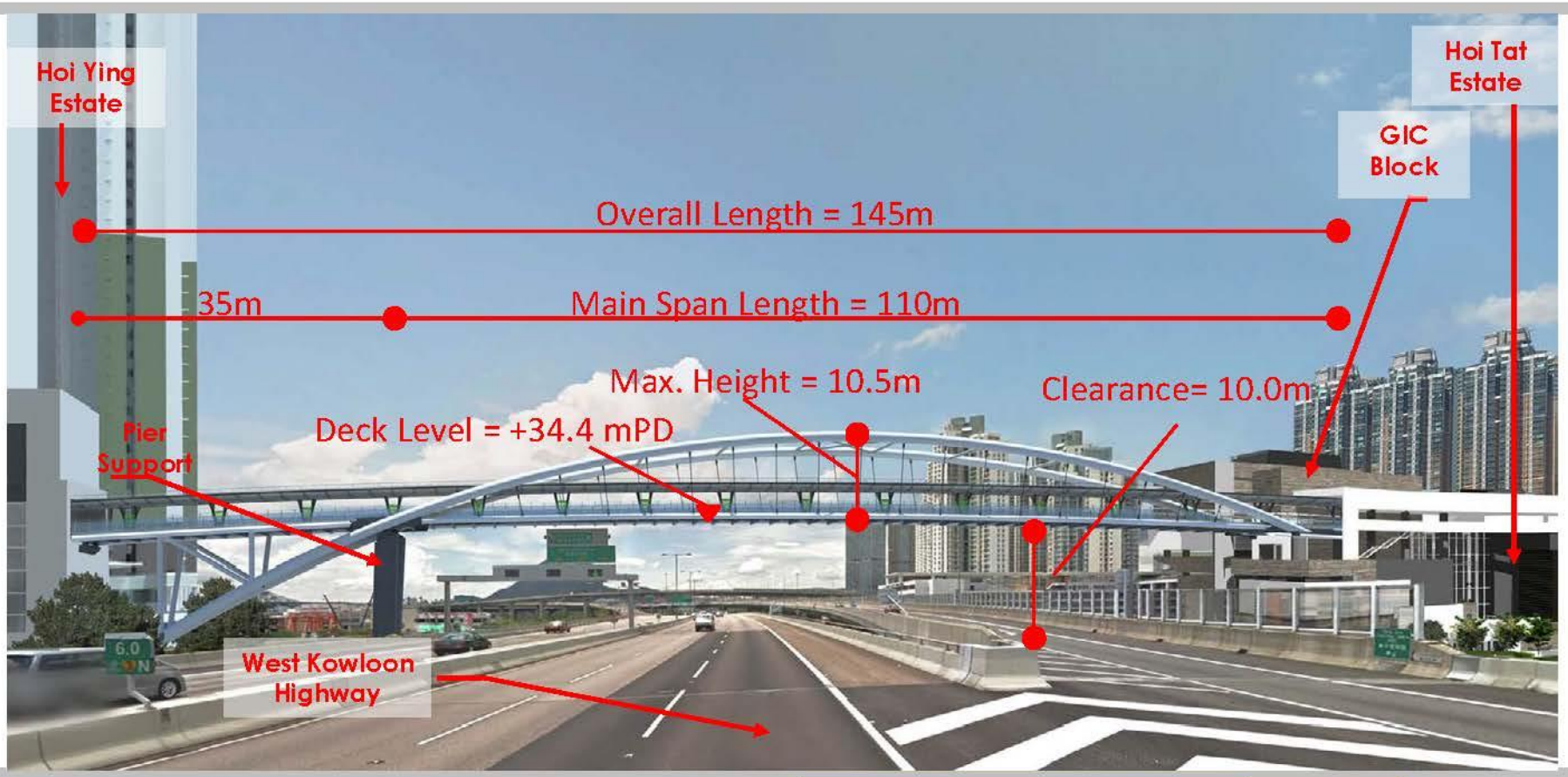
We Build, We Serve, We Create

Content

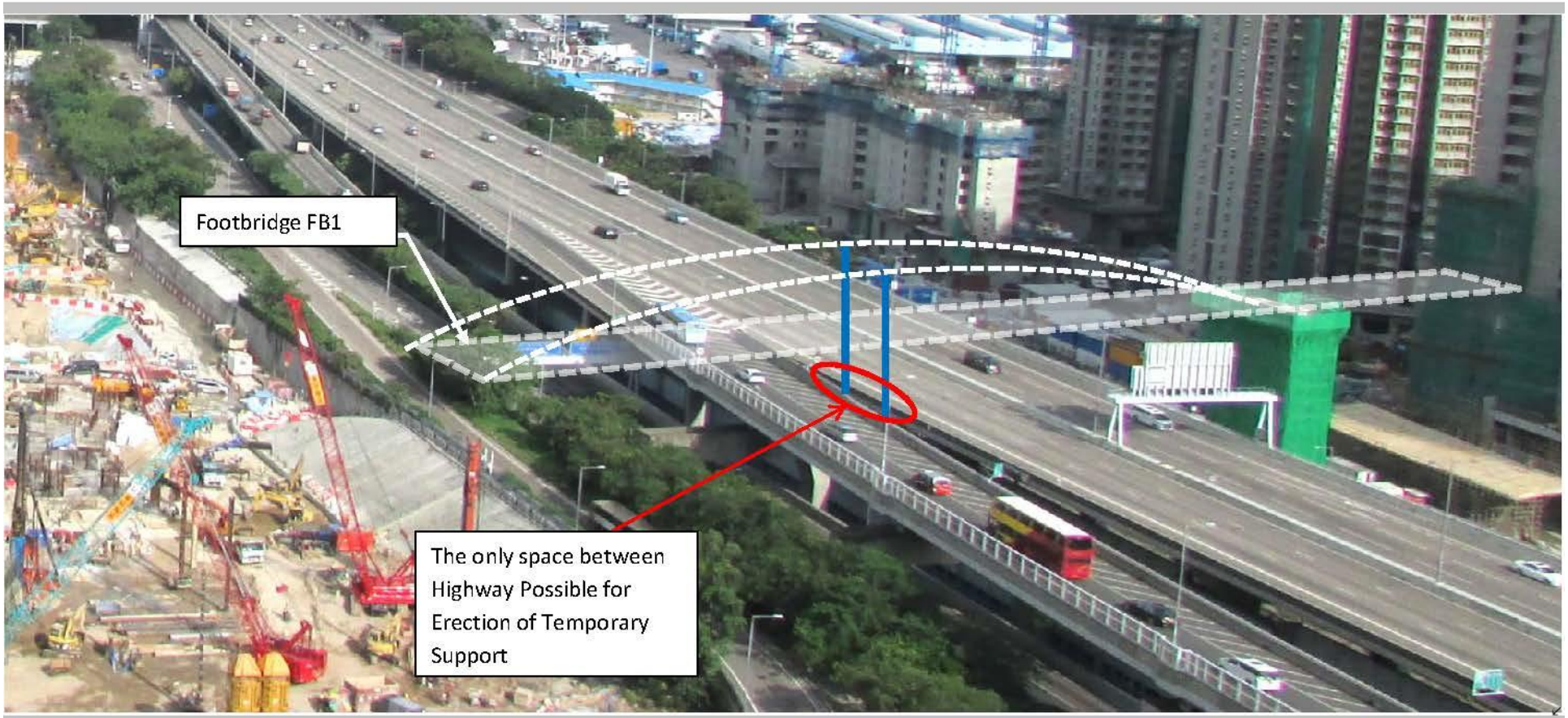
Particulars of Footbridge FB1 – Layout Plan



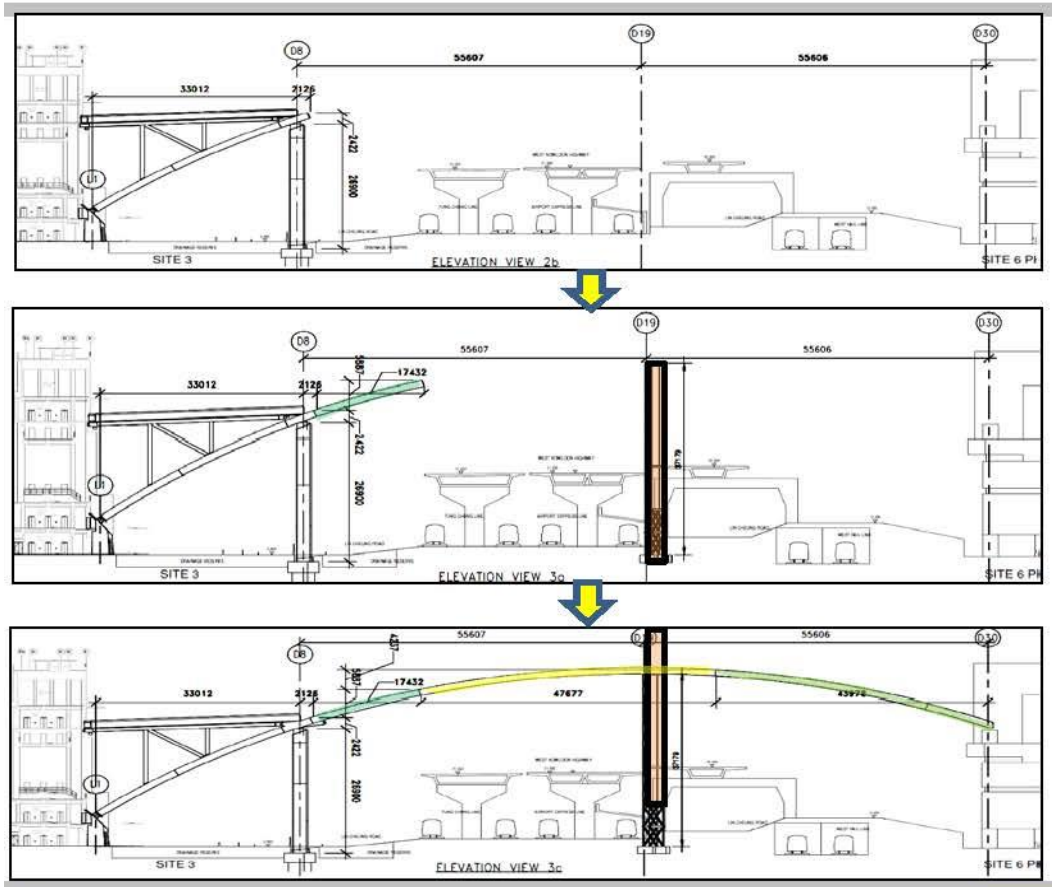
Particular of Footbridge FB1 - Elevation



Particulars of Footbridge FB1 - Highway Under Footbridge



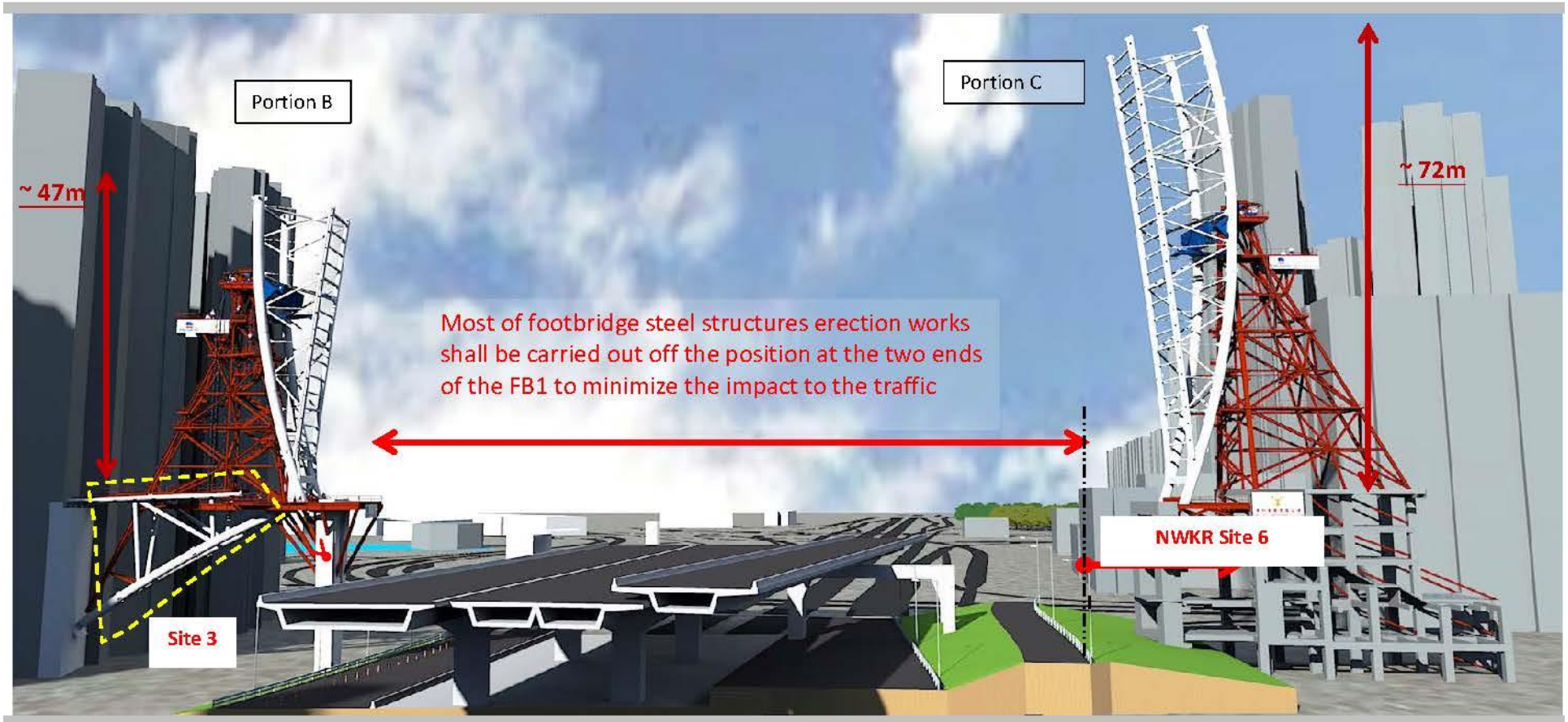
Risk & Constraint For Traditional Construction Method



High Risk of Traditional Method

- Limited headroom for temporary pier support construction under Highway Structure
- Temporary Pier Support very close to MTR Airport Railway Lines and normal work hours are between 1:45am to 4:30am.
- Limit of Time of occupying Public Road for Erection of Temporary Pier Support and Footbridge Structure. Works to be carried out only at night with many times of road lanes closure.

Proposed Innovative Construction Method



Consideration During Fabrication Works

Weight and Length of Segments are so fabricated such that they can be handled and transported to site.

Consideration During Fabrication Works - Trial Assembly

Trial Assembly of Main Arch

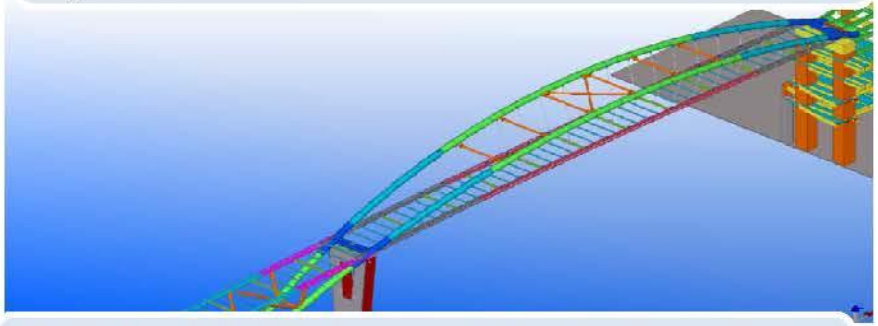
Connection Between Portion B and C

Trial Connection of Working Platform at Portion B to Portion C Connection Point

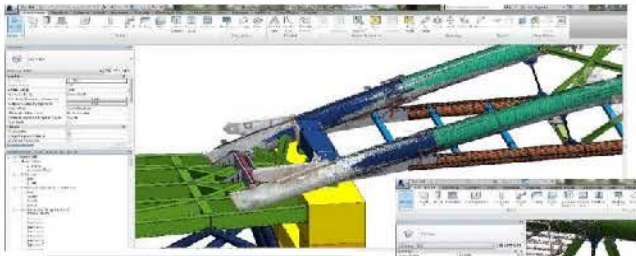
Consideration During Fabrication Works - Trial Assembly

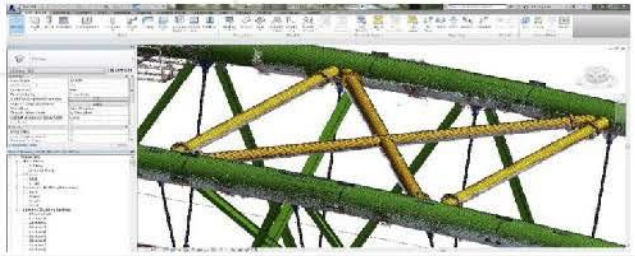
Point Clouded Model of Factory Assembly by Laser Scan

Laser Scan by Trimble TX5



Revit Model with Segments for Engineering Design & Fabrication

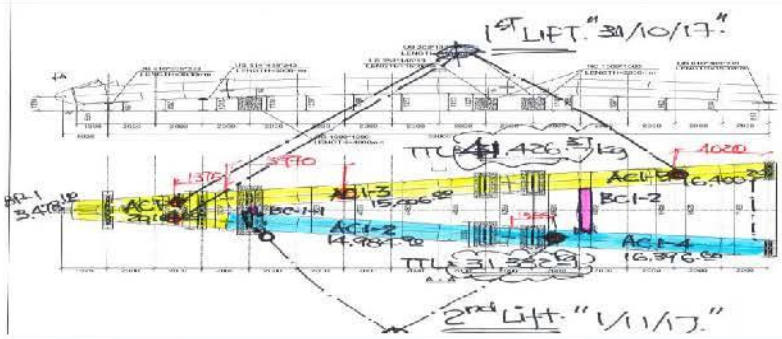




Verification of Revit Model

Safety Consideration For Portion A Erection Works

Assembly of Portion A Main Arch at Site Ground Level



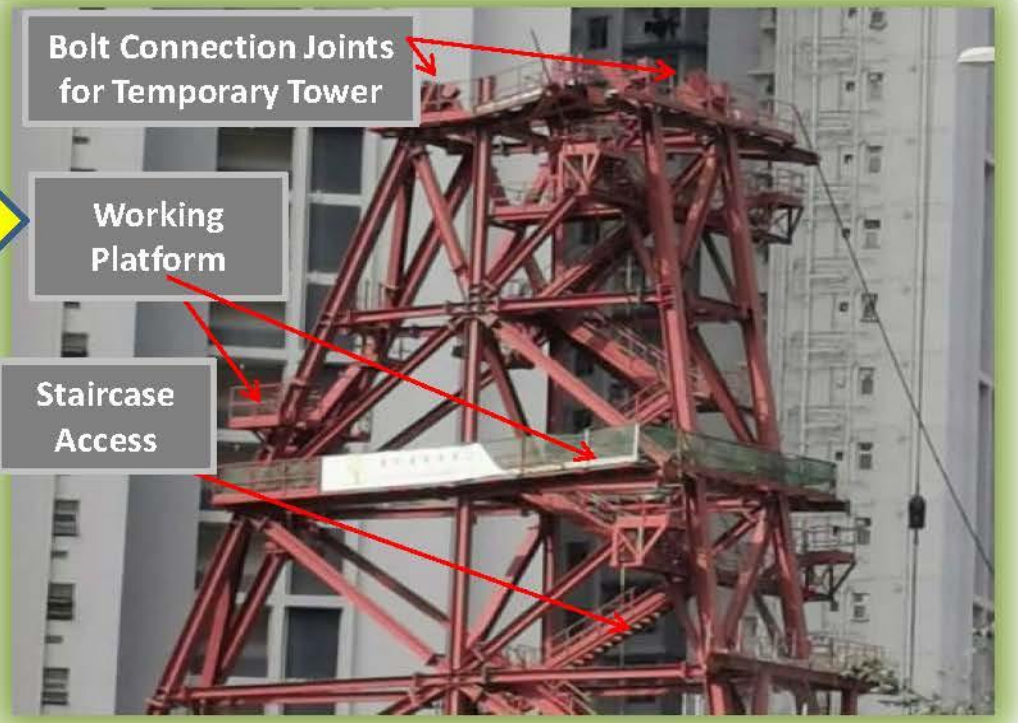
Each lifting eye was calculate by engineer ensure CG installation accurately

Fenced off lifting zone and supervision by Lifting Supervisor and Safety Officer

Installation of Portion A Main Arch

Safety Consideration For Temporary Tower Erection Works

Launching Towers were designed as **bolt connected**. The structure is assembled at ground level and then lift up to the erection position.

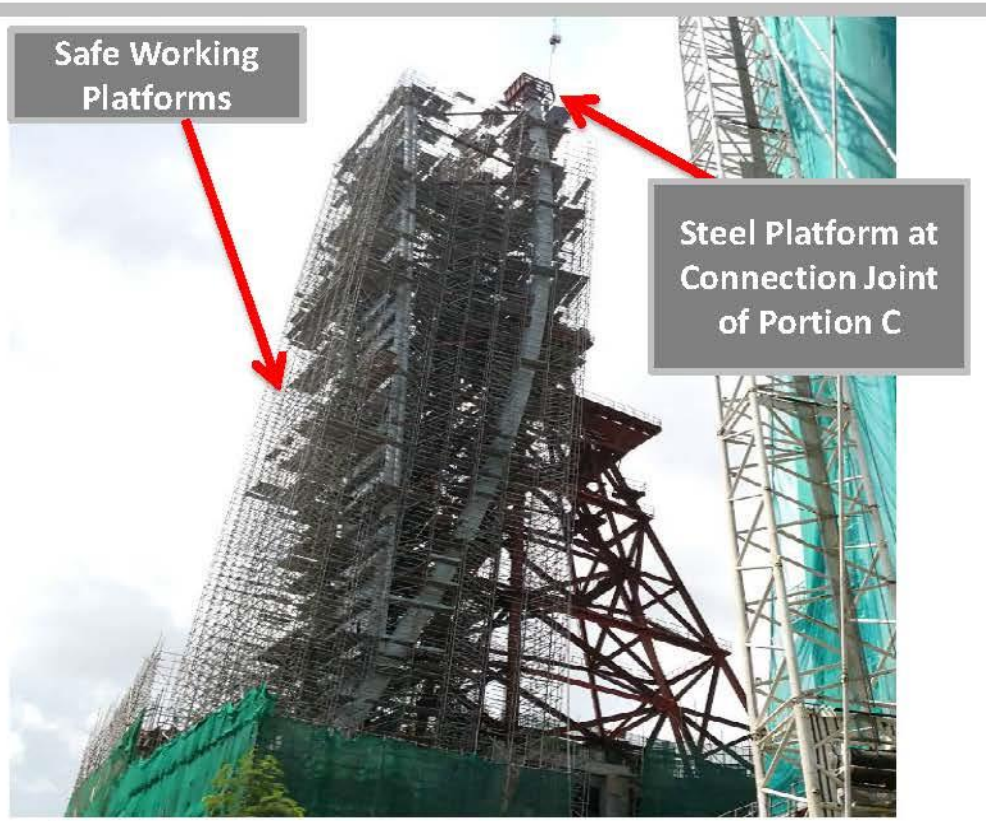


Temporary staircase and cat ladder or aerial platform are prefabricated for access to the working points.

Safety Consideration For Main Structure Erection Works

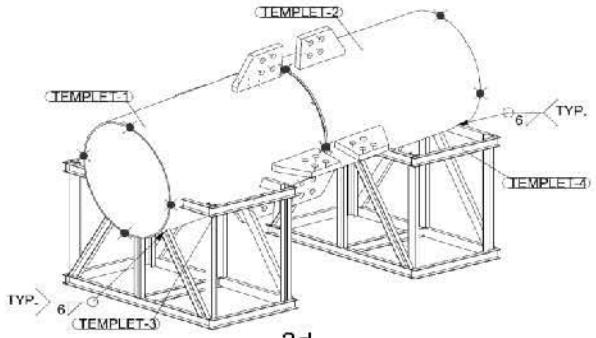
Steel Platform and Pin Support For Portion C Erection

Metal Scaffolding was erected in cope with Progress of Footbridge Structure Erection

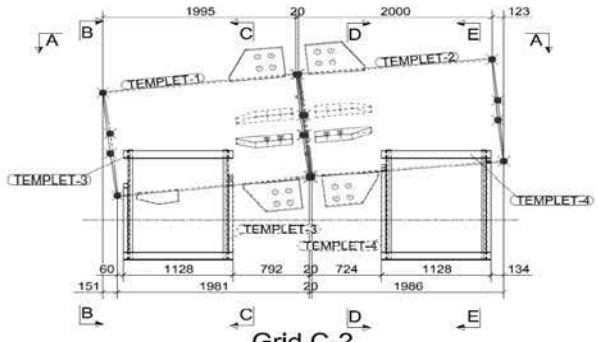


Erection of Footbridge Structure

Safety Preparation Before Lowering Operation



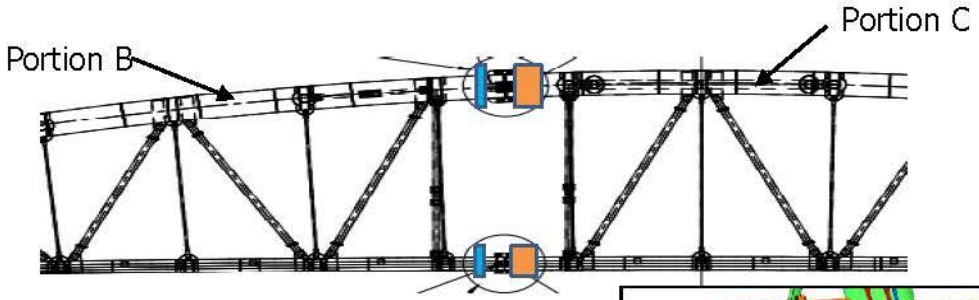
3d
1:10

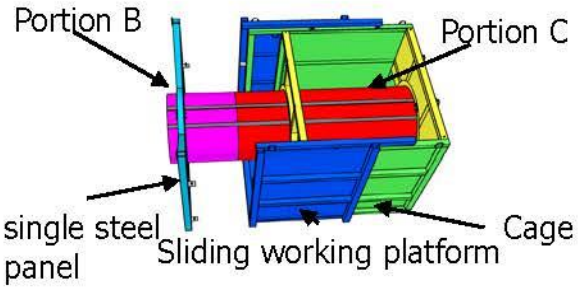


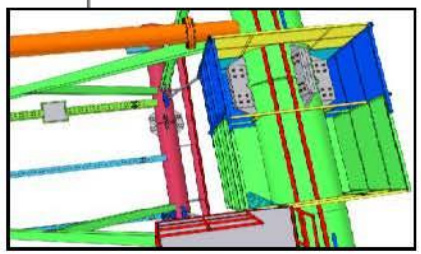
Grid C-2
1:10

Trial Bolting Up of the Connection for Training the Skilled Worker before the Lowering Operation.

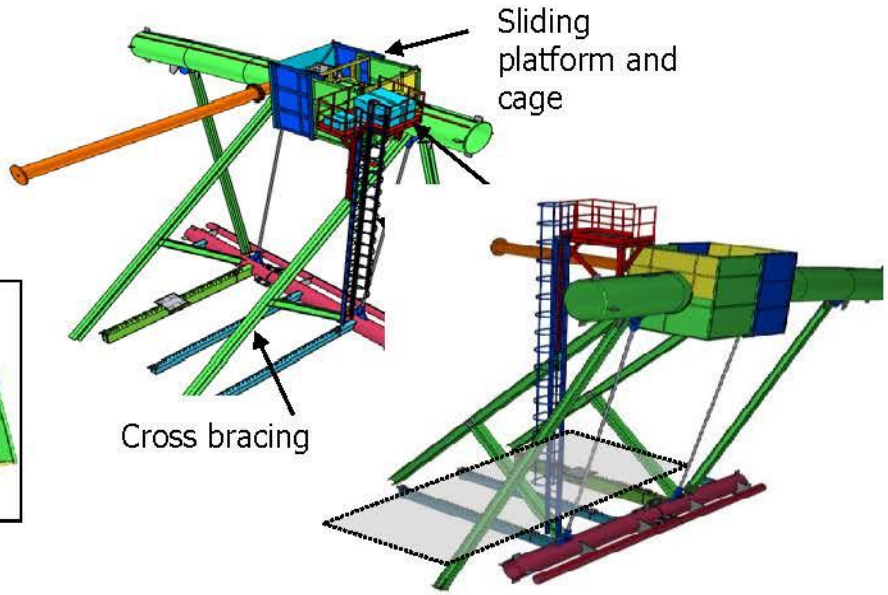
Safety Preparation Before Lowering Operation







Top View of Sliding working platform



Enclosed Platform was erected at Connections between Portion B & C and ensure Full Protection to the Public when carrying out Welding Works

Safety Preparation Before Lowering Operation

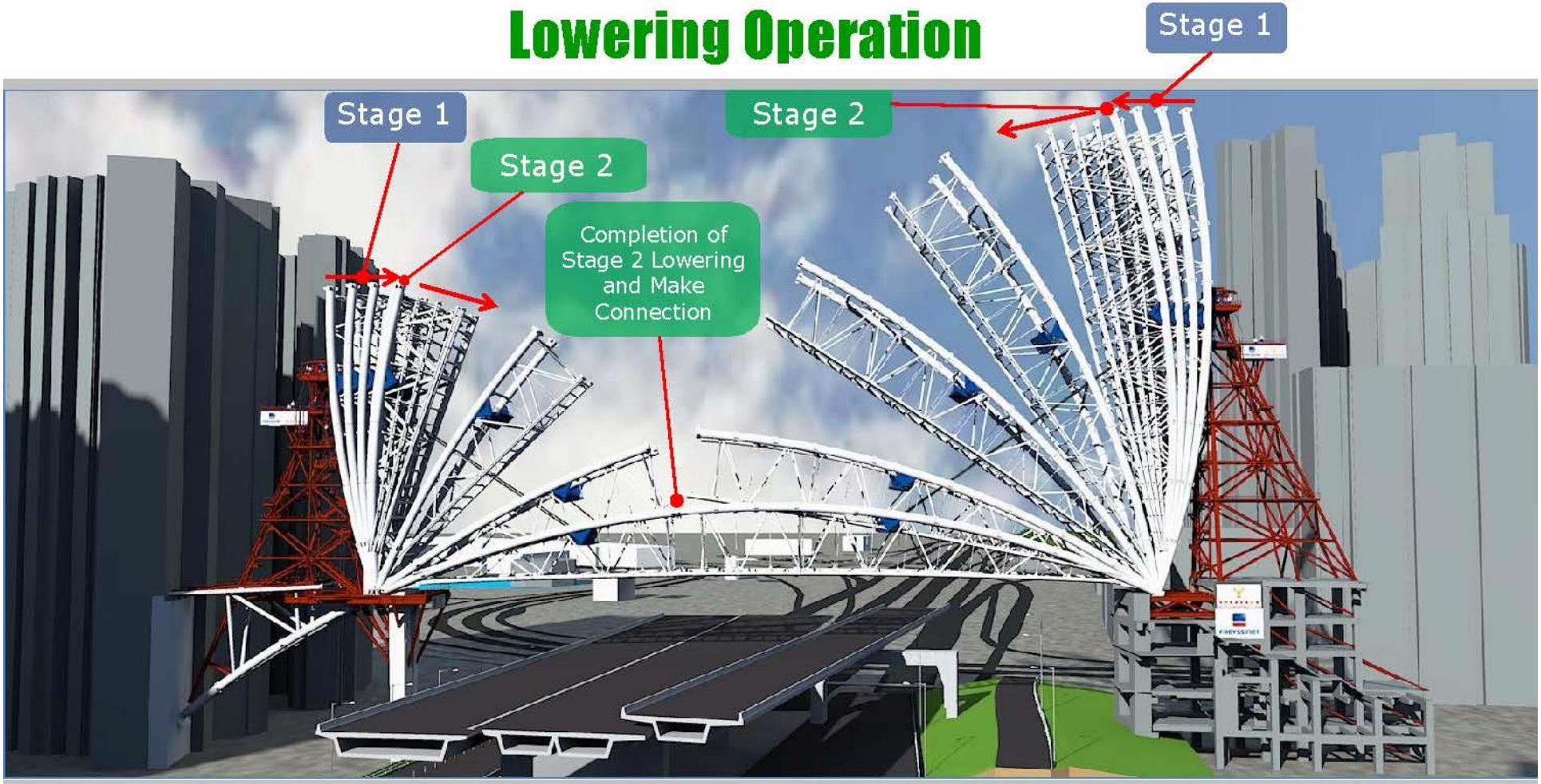
Provision of lighting for access tower

Pre-installed barriers and decking for workers safe working on FB1

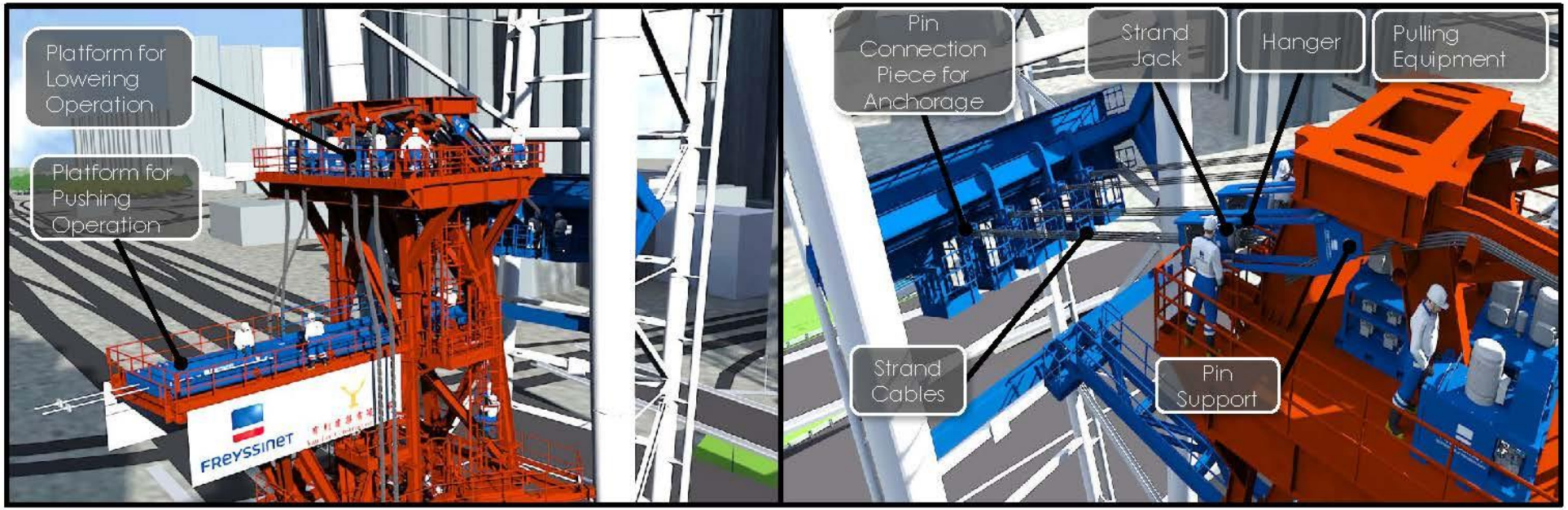
Provision of safe access and barriers

Preset safety nets on both sides

Lowering Operation

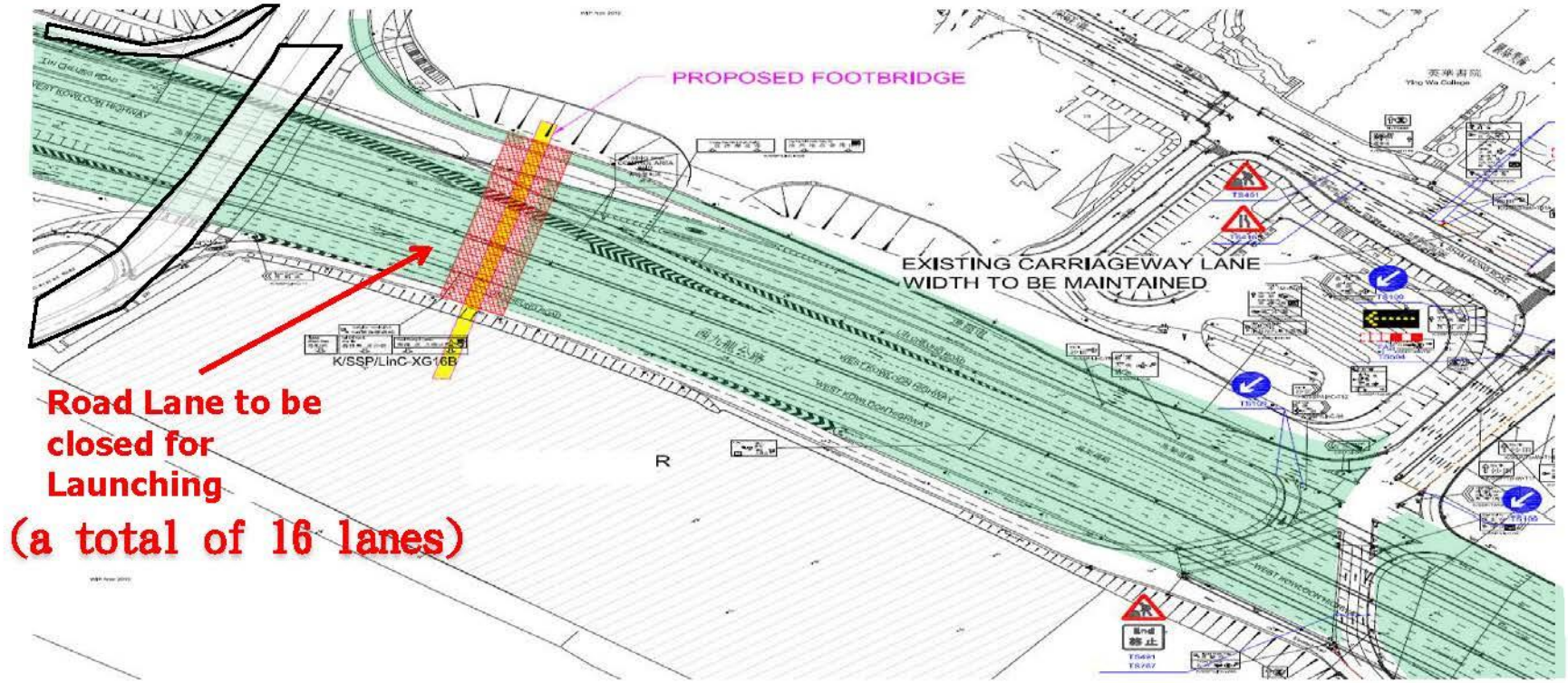


Lowering Operation – Stage 1 Pushing Footbridge Forward



Stage 1 to be carried out in Day Time 9:00am – 5:00pm

Lowering Operation – TTA For Stage 2



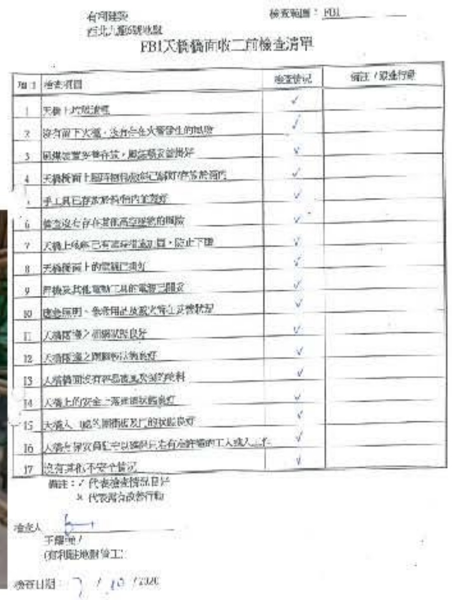
Safety after Lowering FB1

Provision of bamboo scaffold and safety net for safe working at height and public safety

Roll up safety net and check condition before Typhoon no.8

Safety after Lowering FB1

"Permit to work" implemented for work on FB1


有利建築

檢查範圍：FB1

FB1天橋橋面收工前檢查清單

項目	檢查項目	檢查情況	備註 / 跟進行動
1	[illegible]	✓	
2	沒有留下火種，沒有會生火警發生的風險	✓	
3	[illegible]	✓	
4	[illegible]	✓	
5	[illegible]	✓	
6	[illegible]	✓	
7	[illegible]	✓	
8	[illegible]	✓	
9	[illegible]	✓	
10	[illegible]	✓	
11	[illegible]	✓	
12	[illegible]	✓	
13	[illegible]	✓	
14	[illegible]	✓	
15	[illegible]	✓	
16	[illegible]	✓	
17	沒有其他不安全情況	✓	

檢查人

檢查日期：

Daily cleaning and checklist after works for the Bridge

Safety after Lowering FB1

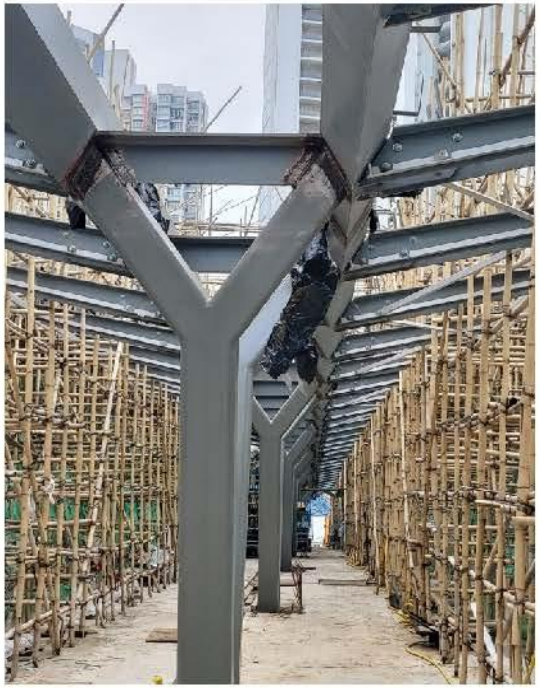
Specific training for high risk process

Paved full protection for hot work safety

Safety After Lowering FB1

Provision of Hoisting Frame with Electric Chain Block for Steel Member Lifting

Provision of Arial Platform for safe working at height



Erection of Canopy

Completion of FB1

Thank You

Title: Safety Forum 2020 for Works Contracts and Property Management Services Contracts

Super Safety Forum 2020 for Works Contracts
and Property Management Services Contracts
2 November 2020

VO: Here is the footage from
"Safety Forum 2020 for Works Contracts and Property Management Services Contracts"
which was held on 2 November 2020

Super Mr. Richard FUNG, Project Manager & Mr. Ben Fong, Senior Safety Officer of
Yau Lee Construction Company Limited
Topic: "Risk Management for Erection of the Footbridge FB1 at NWK"

VO: The speaker is Mr. Richard FUNG, Project Manager of Yau Lee Construction Company Limited
and Mr. Ben Fong, Senior Safety Officer of Yau Lee Construction Company Limited
Their presentation topic is
"Risk Management for Erection of the Footbridge FB1 at NWK"

Mr. Fung: Hello, guests
My name is Richard Fung and this is Ben Fong
We are here today to share our risk management experience
of
the Bridge No. 1 construction at Northwest Kowloon site
Here is an outline of what we will be talking about today
The first part is a general introduction to the bridge
The second part is about the risks and limitations

of traditional construction methods
The third part is about an innovative method that we have adopted
The fourth and fifth parts are on the safety considerations in production and installation
The project scope basically involved 4 public housing blocks
1 Home Ownership block, 1 building complex, 1 recreational facilities building and
the Bridge No. 1 extending to Hoi Ying Estate is our focus today
This bridge is 145 metres long, with 2 spans
The first span is 35 metres long and extends over Hoi Ying Estate
The second span is 110 metres long over an expressway
OK, let us talk about the geographical environment
Because the second span of the bridge was over an expressway
we could use traditional construction methods but limitations are numerous
This was because we did not have space for falsework
From this picture, we can see that in the middle of the bridge
there was some space for falsework
But if we used traditional construction methods
what were the risks and limitations?
We can take a look at this cross-section diagram
Basically, if we tried to install falsework in this gap
the gap was very narrow, so there was limited space
There would be a certain degree of risk if we placed machineries there
Secondly, the falsework would be located right next to the MTR tracks
which were very close and might affect the trains
That was quite a big risk
Thirdly, the bridge was on top of an expressway

so we could not close the road or carry out construction work during the day
This means all the work procedures would have to be done at night
If we adopted the traditional method
we would need to complete the work in phases over many nights
We would also need to close the road a lot of times
which would disrupt traffic and cause great inconvenience to the public
Based on these risks, which we really wanted to eliminate

we came up with a new, innovative way of construction
The main structure of the bridge could be constructed vertically
so most of the procedures could be completed within our site
thus minimising the negative impact on the public
On the left, you can see that the first span was basically
constructed using the traditional method
The second span was constructed vertically
You can see part of it on the left, on top of Hoi Ying Estate
The other part was on our Northwest Kowloon site
Before construction, we had to consider lifting and transportation issues
Before production, we calculated the safe working load of lifting on site
We could then produce based on our prediction of safe lifting load
Another issue was the length of the load we were lifting
We had to have an estimated maximum length
and we used that length for production in our factory
Because accuracy was very important for our new method of construction
we made an installation model at the factory
We made a smart trial assembly
to see if the components we manufactured
were the exact same size as what we needed for installation on site
in order to reduce the likelihood of error on site
We also used 3D scanning, a new technology commonly used
We scanned the test installation model at the factory
and then we produced a ‘Point Cloud Model’
We fed it into the computer to compare it against our
Building Information Modeling (BIM)
It turned out that the test installation model at the factory
only had very small differences from our original design model
If we completed this step, we could really reduce
the risk of alignment errors after the components arriving at site
because we had already checked in the factory
that what we had made is exactly the same as what was designed
After transporting the components to the site
we used the traditional method for Part A
and we also wanted to reduce the risks of working at height
As you can see on the top left, we did a test installation underneath
Nearly all the connection points were connected on the ground first
and then we lifted them up in two separate loads
The load we were lifting was quite large
and it was a component that our engineers had designed carefully so that
the lifting gear, their centre of gravity, pivot and lifting points were vertical
and that it was safe to put down the load
During lifting operations, we fenced off the area
to make sure no one could enter the lifting zone
We would like to mention that for our new method
we needed a temporary tower to support the main structure vertically
The tower was really big, so we needed to install it in parts

This meant dividing it into 4 to 5 parts
and assembling it on the ground as much as possible
to reduce the risk of working at height
Where possible, we tried to work at lower levels
After lifting the load, we usually had a metal working platform

for our workers to do connection works
In terms of design, we used bolt connection

so that no welding was needed on site
We could minimise welding work during installation and connection
Before constructing the main structure
we erected a working platform near the ground on the top left corner
This allowed workers to work on the platform
And later, while building the main structure
because it was vertically constructed
you can see that there were no real access routes
There was not any safe access for us
So we built a working platform
We then erected a metal scaffolding around the main structure
to let workers safely carry out connection and welding work
The metal scaffolding was built upwards as the main structure grew taller
After the main structure was completed, we dismantled the scaffolding
You see that we did a model of the connections too
Because when we put the bridge down
we only had one night for work, so time management is important
We were required to release the road for public use the next morning
so we needed to reduce the risk of working overtime
We found a space on site to do a model of the connections
to train our workers the procedures
to figure out how to make improvements to the process
and to control how much time we needed to complete it
From the experience, we could estimate the time needed that night
After we had set the bridge down
we had to release the road for the public use the next morning

but there was a connection point there that needed welding and touch up
How did we solve this problem?
We erected a temporary platform beforehand at the connection point
The platform had a sliding door
After the bridge was assembled and connected
We moved the sliding door to connect to the bridge
That night, the platform could be put into use immediately
and our workers worked on it
Afterwards, we could complete the welding procedures on that platform
That night, when moving the bridge to a vertical position and putting it down
we needed bright lights for the nighttime operation
so we installed some lights onto the temporary tower
We set up access routes and ladders also
to allow our workers to access their working platforms safely
While constructing the bridge vertically
we provided the platforms with planks and added sufficient safety barriers
After the bridge had been set down, our workers could work on top of the bridge

Also, for our main structure, we prepared safety nets on top of it

so that after it had been set down, the nets could hang down
and there would be instant protection on both sides
After completing the vertical construction of the bridge
according to our original design, we had to set it down
How did we do so?
We did it in two steps
The first step was Phase 1
where we had to push out the bridge part
It was originally set against our temporary tower
so we had to push it out first
This step was done within our site
so that we could do it at daytime without disturbing the public
and we could minimise the amount of nighttime work
Phase 2 was completed at night
For Phase 1, we had to arrange in advance where our workers would be
i.e. their standing positions and what tasks to perform when we pushed

Actually, for Phase 1, when we pushed out the bridge
we installed a launching platform here
so that workers could control that jack at the top
On top we had a strand jack
It allowed us to loosen the cables that were lifting the bridge

So when we pushed out the bridge
the strand jack would start loosening the cables
In other words, there was one platform on top and another at the bottom
That night, when we set the bridge down, it affected the entire expressway
so we had to close the whole road
including a total of 16 lanes
When we set the bridge down that night, we recorded a video for sharing purposes
This was what the bridge looked like, standing up vertically after construction
The date was 27 December last year (2019)
During the day, from 9:00 a.m. to 5:00 p.m.
we pushed the bridge out
We first pushed the part that covered Hoi Ying Estate
We had equipment monitoring and controlling the operation phase by phase
because we could not push it all in one go with this jack
We had to do it bit by bit
While the bridge was being pushed out, the strand jack loosened the cable
Here, in the afternoon, we pushed out Part C
That night, we launched the bridge
After launching, we started to do connection work
Then we prepared some safety nets
and hung them down for protection
Before the road could be reopened, the safety measures were all installed
OK, so this was what the bridge looked like after we lowered it

Mr. Fong: Hello, everyone
It is now my turn to talk about the risk management steps we took
in the remaining stages after we had lowered the bridge
On the left, as mentioned just now
we hung down some safety nets
then we added bamboo scaffolding on both sides

to stabilise the scaffolding nets and prevent objects from falling down
On the right was the bamboo scaffolding for the bridge
We considered the problem of strong winds during typhoons also
So, every time before Typhoon Signal No. 8 was hoisted
we asked qualified scaffolders to hang up the scaffolding nets
to prevent any impact on the public
While working on the bridge
we wanted to avoid having unrelated staff up there
so we arranged a security guard to station on the deck
All the workers on the bridge had to receive the relevant training
so that we could tell them what the appropriate work procedures were
We issued permits-to-work
to specialist staff who had to work on the bridge
On the right, you can see
we arranged for certain colleagues to do cleaning after work every day
so that no loose objects would be blown off the bridge or fall down from it
The foremen working on the bridge
would also check the deck before they ended work each day
and they filled in safety checklists and records every day
After our bridge had been launched
we had many red falsework to dismantle
A lot of complex work procedures to be handled
So we had to provide special training for our workers
to explain each and every work process to prevent any errors
while dismantling parts of the bridge or putting away the cables
We had some hot work processes
Before doing hot work, we had to add some protection to the bridge
to prevent any sparks from falling down
and affecting the public passing by below
In the middle of the bridge we had to install a covered walkway
Since we could not use a crane right in the middle of an expressway
we designed a portal frame with an electric chain block
It was tested by a registered professional engineer
who confirmed that the portal frame could lift our Y-shaped frame
and push it to a place further away
a special place for installation
We also provided elevated work platforms for all work above ground
for the safety of our workers
You can see on the right of the picture
that now, our frame is mostly finished
This is a mock-up of what the structure would look like permanently
These are the remaining work processes for our bridge
It will be completed in December this year
That is all of sharing today
Thank you

VO: Thank You For Watching