The Immersed Tunnel
of Hong Kong-Zhuhai-Macao Bridge Link

Country: China

Presented by: Liang Heng
Project stakeholders:

Client's name: Hong Kong-Zhuhai-Macao Bridge Authority

Contractors: China Communications Construction Company Ltd.,


Supervisor: Sino-railway Wuhan Major Bridge Engineering Consultancy Co., Ltd. Joint Venture

Other stakeholders: The governments of Hong Kong, Guangdong Province and Macao
Short Description of Project
Description of HZMB Link

- Hong Kong-Zhuhai-Macao Bridge Link is a mega sea crossing, connecting Hong Kong, Zhuhai and Macao.
- This link is about 55 km long, consists of bridges, artificial islands and tunnels.
Description of HZMB immersed tunnel

- The HMZB tunnel is 6.7 km long of which the immersed section is 5.6 km long.
- It is made up of 33 tunnel elements of which 28 straight elements and 5 curved elements.
Typically a tunnel element (180m in length), 11.4m in height, 37.95m in width, is made of segments, has a weight of approx. 76,000 tons;

The HZMB tunnel is placed on a very deep level of about 45 m below sea, the back cover is up to 22 m thick.
Why HZMB project should be awarded
Reason 1: Difficulties
Project crosses the busiest navigation area of China.

Located within the protection zone of the Chinese white dolphin, a highly protected sea mammal.

Typhoons and tropical cyclones, strong wind, high humidity also frequently occur in the region.
The seabed consists of soft marine deposits and alluvium reaching 30 m deep.

High frequency of back siltation
Reason 2 : Innovations
Because:
It is one of the deepest immersed tunnels in the world and also the longest highway immersed tunnel.

The project is the first immersed tunnel built in open sea in China.

Numerous challenges and difficulties need to be solved. Innovation is the only way to achieve that.

We can conclude the innovations as the following 6 items:
1. Combination of Advanced Foundation Techniques
2. Semi-Rigid Tunnel Concept
3. Curved Immersed Tunnel Element Prefabrication
4. Alerting and Forecasting System for Towing and Immersion Operation
5. the Final Closure Joint
6. Artificial Island Construction with Large Steel Cylinders
Video

Chuzhou-Nanjing 7th November 2018
the HZMB Immersed Tunnel
Reason 3: Environment Protection
Tunnel site crosses the protection zone of **Chinese White Dolphin**

1. Prefabrication + Installation, minimized the activities and work in the sea

2. upgraded the construction vessels acoustics settings to minimize the noise and the interruption to ecosystem.

3. installed water recycle system on the artificial islands for cooling, watering

**Result:** **No** environment complaint

**Chinese White Dolphin** can be seen living around site

Chuzhou-Nanjing 7\textsuperscript{th} November 2018  
HZMB Immersed Tunnel
this project was evaluated as
**Green construction Site**
by China Construction Association

Chuzhou-Nanjing 7th November 2018

HZMB Immersed Tunnel
Reason 4: Safety Performance
NO construction-related fatalities
6S Management

Chuzhou-Nanjing 7th November 2018

HZMB Immersed Tunnel
Chuzhou-Nanjing 7th November 2018

HZMB Immersed Tunnel
Safety Statistics as per OSHA definitions

TRIR (Total Recordable Incident Rate)

LWCR (Lost Workday Case Rate)

Chuzhou-Nanjing 7th November 2018  HZMB Immersed Tunnel
this project was evaluated as

**AAA level Safety Site**

( the highest standards of safety and appreciation)

Reason 5: Cost Saving
Artificial Island Construction with Large Steel Cylinders

VS

Artificial Island Construction with dredging and rocks

Save time: 2 years
Save cost: 21.16 million Euros
Semi-rigid tunnel concept  VS  Rigid tunnel concept

Save time: 1.5 years
Save cost: 130 million Euros

Chuzhou-Nanjing 7th November 2018  HZMB Immersed Tunnel
Final joint is prefabricated and installed by crane

Final joint casting on site, using the framework underwater

Save time: 0.5 year
Reason 6: Sustainable Development
1. **Curved elements prefabrication** technology was developed for the first time.

2. **Semi-rigid tunnel concept** was developed and used for the first time.

3. Composite scheme of **Rock Block +Gravel Bed** for tunnel foundation was developed and used for the first time.

4. New product and construction method have lead to great **development and innovation and invention** in the equipment and control / survey system.

5. **Artificial Island Construction with Large Steel Cylinders** was developed and used in Other Project.
Put China to be one of the leaders in immersed tunnel countries

A great opportunity to stimulate innovation and education for engineering community

Remarkable infrastructure integrated Chinese engineers’ painstaking work, wisdom and spirit.

Chuzhou-Nanjing 7th November 2018

HZMB Immersed Tunnel