

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.,

Consultants:

AECOM Asia Company Ltd

COWI A/S , Demark

Shanghai Municipal Engineering Design Institute (Group) Co., Ltd, Joint Venture

Tunnel Engineering Consultants (TEC, Netherlands)

Guangzhou Metro Design and Research Institute Co., 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.





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Description of HZMB immersed tunnel

- The HMZB tunnel is 6.7 km long of which the immersed section is 5.6km long.
- It is made up of 33 tunnel elements of which 28 straight elements and 5 curved elements.

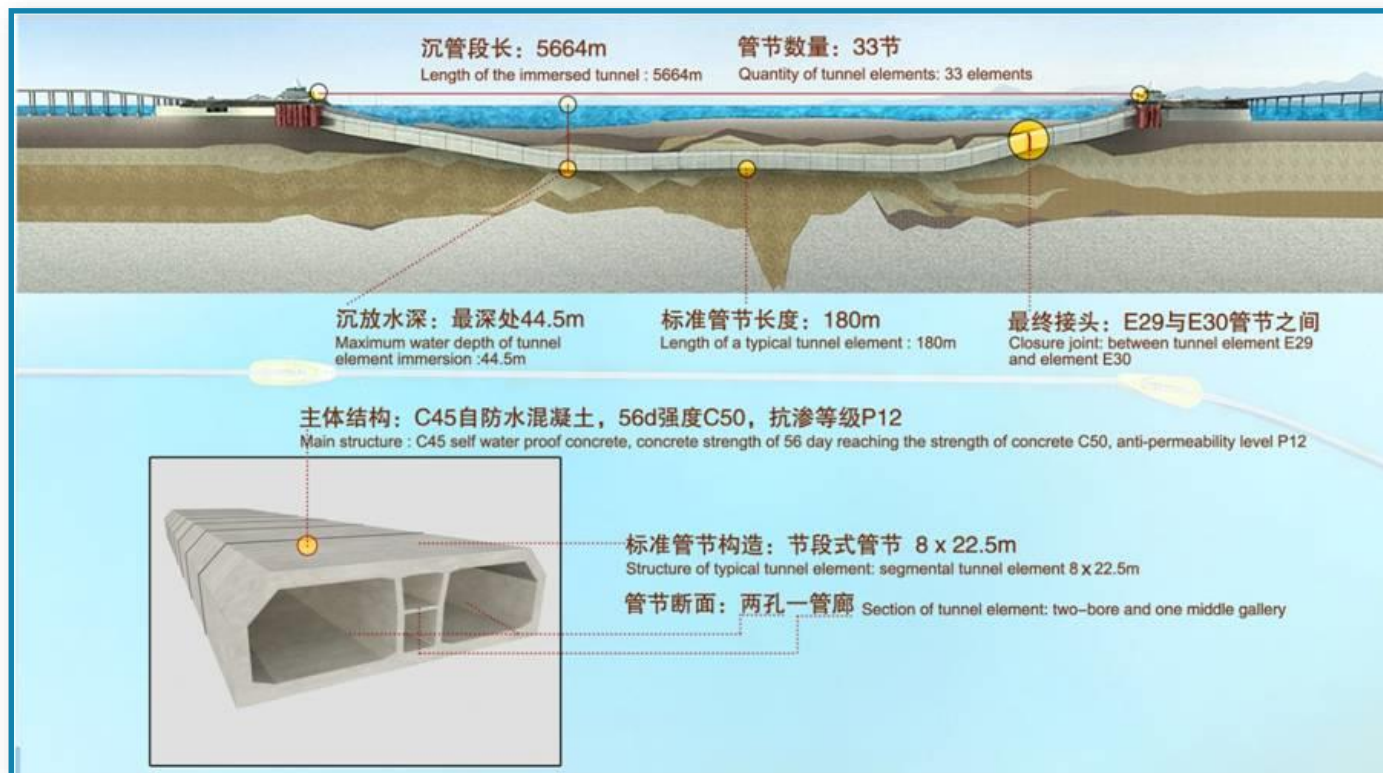




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- Typically a tunnel element (180m in length), 11.4m in height, 37.95m in width, is made of segments, has a weight of approx. 76,000 tons;
- The HZMB tunnel is placed on a very deep level of about 45 m below sea, the back cover is up to 22 m thick.





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Why HZMB project should be awarded

Reason 1 : Difficulties



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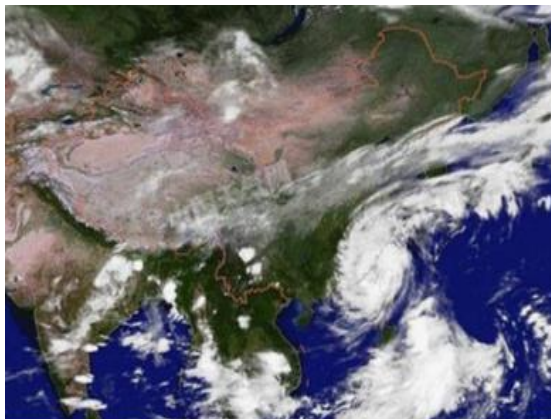
ENVIRONMENT CHALLENGES



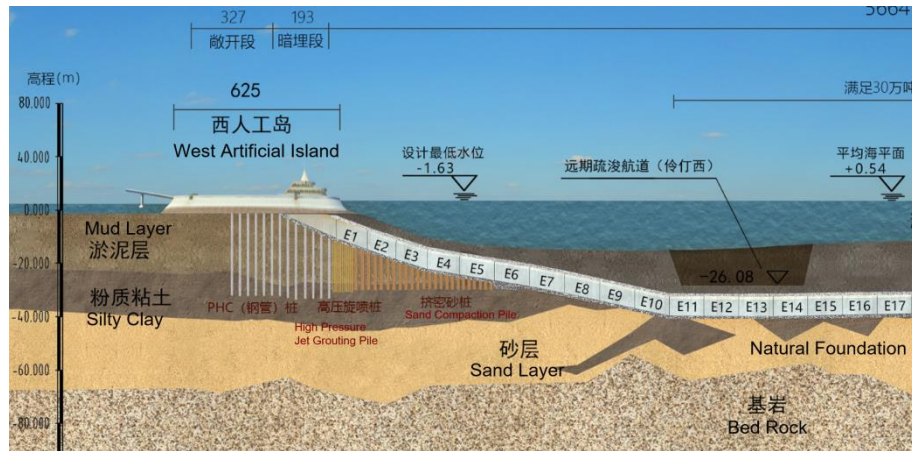
Project crosses the busiest navigation area of China.



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:



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MAIN INNOVATION TECHNOLOGY



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

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



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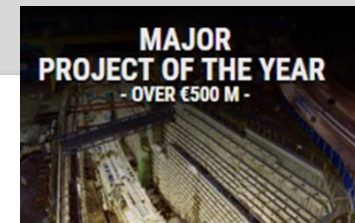
this project was evaluated as
Green construction Site
by China Construction Association

Reason 4 : Safety Performance

NO construction-related fatalities



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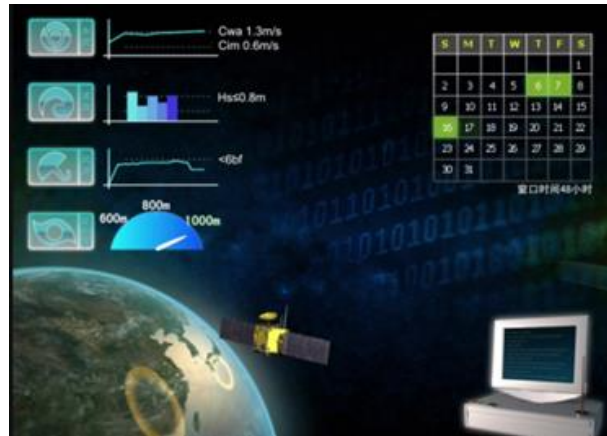
6S Management



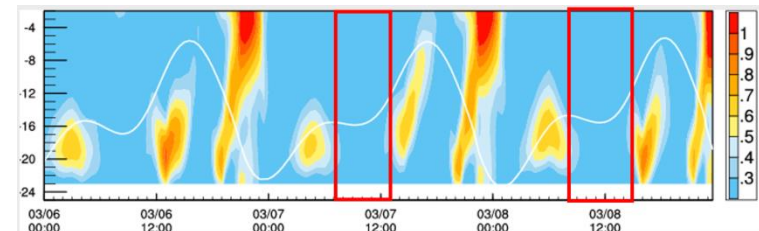
Chuzhou-Nanjing 7th November 2018



HZMB Immersed Tunnel



Chuzhou-Nanjing 7th November 2018

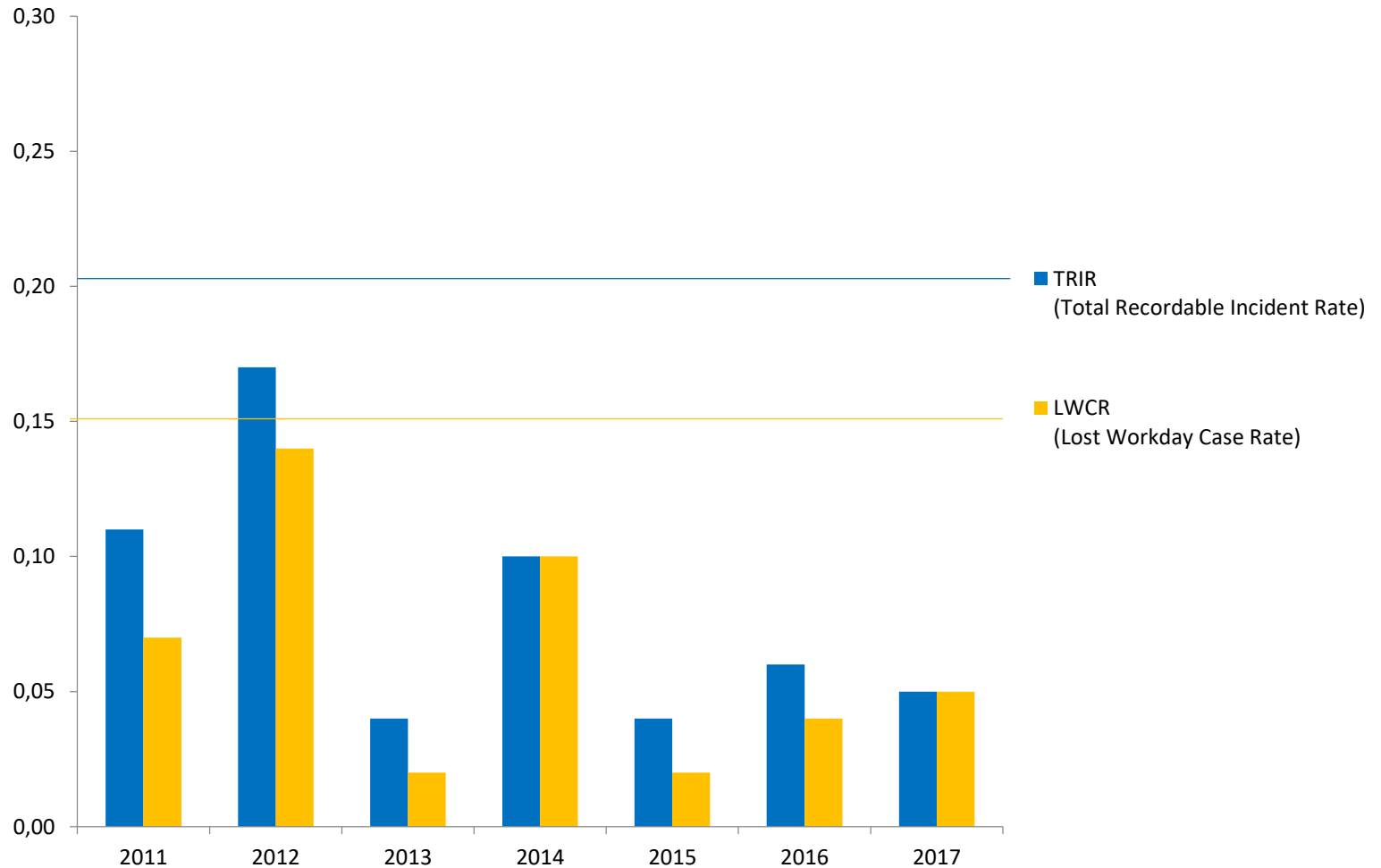


HZMB Immersed Tunnel



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Safety Statistics as per OSHA definitions



Chuzhou-Nanjing 7th November 2018

HZMB Immersed Tunnel



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this project was evaluated as
AAA level Safety Site
(the highest standards of safety and appreciation)
by Safety Branch of China Construction Association.

Reason 5 : Cost Saving



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Artificial Island Construction
with Large Steel Cylinders

VS

Artificial Island Construction
with dredging and rocks



Save time: 2 years

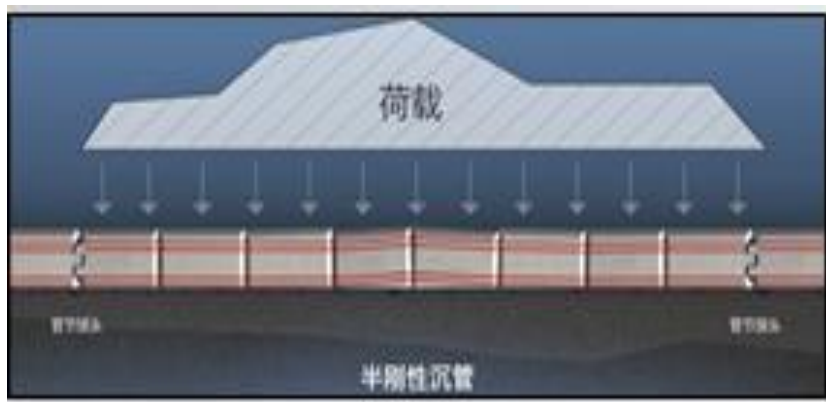
Save cost: 21.16 million Euros



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Semi-rigid tunnel concept **VS** Rigid tunnel concept



Save time: 1.5 years
Save cost: 130 million Euros

**Final joint is
prefabricated
and installed by crane**

VS

**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 .



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AS A WHOLE



**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.**