Track 進程

T2主幹路及茶果嶺隧道
TRUNK ROAD T2 AND CHA KWO LING TUNNEL
第五期 ISSUE 5 12/2023

Maximising Safety and Efficiency: The escalating prevalence of using Precast Elements in Tunnel Construction

預製組件建隧道 安全靈活效率高

2023

1 月 JAN

隧道內部結構工程進行中

Works of tunnel internal structure in progress

西面通風大樓結構工程進行中

Structural works of West Ventilation Building in progress

2 月 FEB

東面通風大樓結構工程展開

Structural works of East Ventilation Building commenced

5 月 MAY

隧道通風管道工程展開

Works of Tunnel Overhead Ventilation Duct (OHVD) commenced

10 月 OCT

隧道機電設施工程展開

Works of tunnel electrical and mechanical (E&M) facilities commenced

隧道內部結構及其預製組件

TUNNEL INTERNAL STRUCTURE AND ITS PRECAST ELEMENTS

上期提到T2主幹路及茶果嶺隧道的海底隧道路段是由兩部隧道鑽挖機（TBM）建成的，今次我們將會向大家介紹隧道的內部結構。T2隧道的內部結構主要分為上、中、下三個部分，各有不同的設施和用途。

In the previous issue, it was mentioned that the sub-sea tunnel sections of Trunk Road T2 and Cha Kwo Ling Tunnel were built by two tunnel boring machines (TBMs). In this issue, we will introduce the internal structure of the tunnel, which is mainly divided into upper, middle and lower parts, each serving different purposes and equipping with various facilities.

預製組件 Precast Elements

T2項目中超過 95% 的隧道內部結構由預製組件建成。組件在內地工場生產後，再運送到地盤存放及安裝。這樣不但能讓隧道內的不同工序可同時進行，更大大提高了工程的施工效率及安全性，同時提高質量控制。

In the T2 Project, over 95% of the tunnel internal structure is constructed by precast elements. After fabrication in the Mainland factories, precast elements are transported to the construction site for storage and installation. This allows various construction activities to be carried out simultaneously inside the tunnel, improving efficiency and safety while also enhancing quality control.

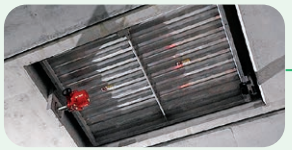
預製組件用於不同隧道結構部分，包括：
Precast elements are used in different parts of the tunnel structure, including:

- 通風管道 Overhead Ventilation Duct (OHVD)
- 道路護欄 Parapet
- 隧道襯砌 Tunnel Lining
- 跨管通道 Cross Passage
- 行車路面及隧道設施走廊 Road Deck and Service Gallery

通風管道 Overhead Ventilation Duct (OHVD)

隧道上方的通風管道以板形預製組件建成，能通過內置的機動風閘為隧道提供新鮮空氣以維持空氣質素，並於緊急情況時抽走隧道中的煙霧。

The OHVD located at the upper part of the tunnel is constructed by precast slabs. It supplies fresh air to maintain the tunnel air quality and extracts smoke in case of emergency through built-in motorised dampers.

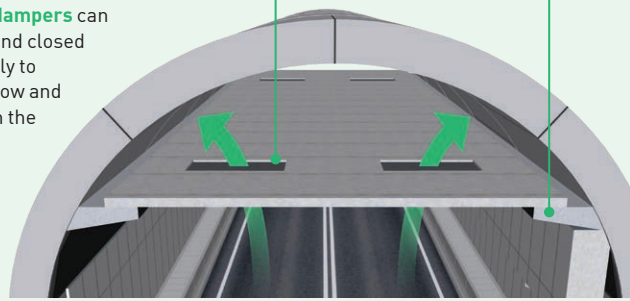


機動風閘可自動開關以控制隧道內的空氣流動及空氣質素。

Motorised dampers can be opened and closed automatically to control airflow and air quality in the tunnel.

牆身樑托是唯一於現場澆築的混凝土結構，用以承載上方的通風管道面板。

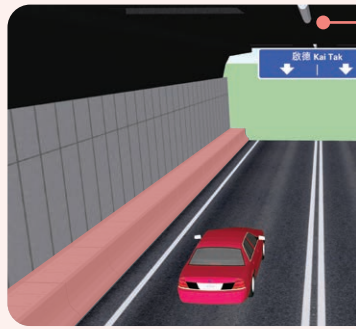
Wall-side Corbel is the only cast in-situ reinforced concrete structure to support the OHVD Slabs.



行車道 Carriageway

隧道中間部分為行車道，設有交通標誌及照明。兩旁設有逃生通道供緊急情況下使用。

The middle part of the tunnel is the carriageway equipped with traffic signs and lighting. Escape routes are provided at the two sides for use under emergency.



預製通風管道面板
Precast Overhead Ventilation Duct (OHVD) Slabs

每件重10.5噸　Unit weight: 10.5 tonnes

其中設有通風口的面板會預先於暫存區裝上機動風閘。

Slabs with ventilation openings are pre-installed with motorised dampers at the segment yard.

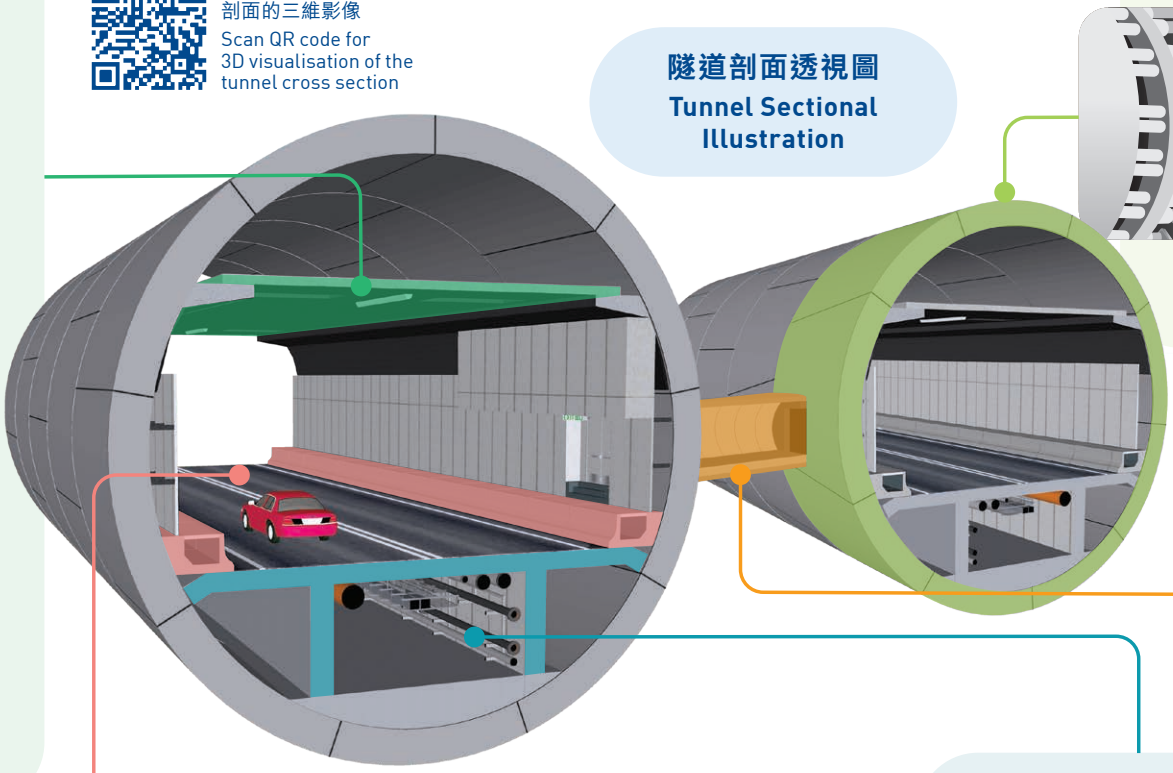
完成裝嵌的模組會一併運送至隧道內安裝。

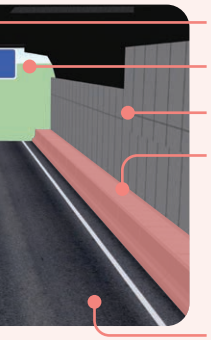
The completed modules are then transported to tunnel for installation.

掃描QR code檢視隧道剖面的三維影像

Scan QR code for 3D visualisation of the tunnel cross section

隧道剖面透視圖
Tunnel Sectional Illustration





照明 Lighting

交通標誌 Traffic Sign

搪瓷面板 Vitreous Enamel Panel Cladding

沿行車道兩旁的**道路護欄**能保護隧道結構免受車輛撞擊，同時用作逃生通道及放置消防栓喉管。

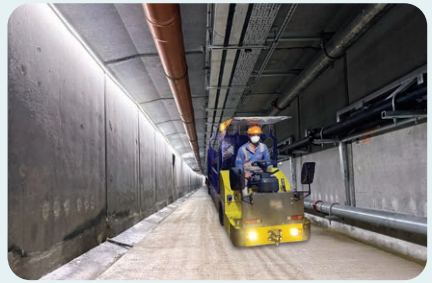
Parapet along the two sides of the carriageway can protect the tunnel structure from vehicle collisions. It also serves as an escape route and accommodates the fire hydrant pipe.

瀝青路面 Bituminous Pavement

預製道路護欄件
Precast Parapet Units

每件重2.4噸
Unit weight: 2.4 tonnes

隧道設施走廊 Service Gallery



隧道襯砌 Tunnel Lining

每條隧道管的主要結構是由約1,000個內部直徑12.5米的隧道壁環相連組成，各以9件**預製混凝土襯砌組件**拼合而成。

The main structure of each tunnel is formed by about 1,000 contiguous tunnel lining rings of 12.5 metres inner diameter. Each ring is composed of 9 pieces of **precast concrete lining segments.**

預製隧道襯砌件
Precast Tunnel Lining Segments

每件重12.6噸 *
Unit weight: 12.6 tonnes*

* 特殊組件除外
except for special segments

跨管通道 Cross Passage

隧道每100米設有一條長約14米，闊3米的**跨管通道**，連接兩條隧道管道，作為緊急逃生通道。

A **cross passage** of about 14 metres in length and 3 metres in width connecting the two tunnel tubes is provided every 100 metres for escape under emergency.

預製跨管通道件
Precast Cross Passage Segments

每件重11噸
Unit weight: 11 tonnes

由於採用了預製組件建造行車路面，我們利用了**隧道下方的空間作為一條隧道設施走廊**，放置隧道的機電、排水及消防設施，讓隧道人員可以隨時進行相關檢查及維修工作而毋須影響隧道內的交通。走廊配置了電動車方便檢查和維修人員工作以及讓消防員能更快速到達現場。

Thanks to the adoption of precast road deck, we utilise **the space underneath the tunnel carriageway as a service gallery** to house the E&M facilities, drainage and fire services for the tunnel. This enables tunnel operators to carry out inspection and maintenance works at any time without affecting the tunnel traffic. Electric vehicles are provided inside the service gallery to facilitate inspection and maintenance works by tunnel operators and allows firefighters to quickly reach the fire location.

預製行車路面 Precast Road Deck

每件重25噸　Unit weight: 25 tonnes

龍門起重機 Rail-mounted Gantry Crane

預製件暫存區設有起重量達50噸的軌道式**龍門起重機**，可將不同種類的隧道預製組件整齊排列好，再安全地吊運至多用途車輛上。

The segment yard is equipped with **rail-mounted gantry cranes** of up to 50-tonne lifting capacity for proper stacking of different types of precast elements and loading onto multi-service vehicles safely.

多用途車輛 Multi-Service Vehicle (MSV)

多用途車輛承重量達120噸，而且可以前後雙向移動，能靈活和安全地運送預製組件到隧道內安裝。

The **MSV** has a 120-tonne loading capacity. It can move in both forward and reverse directions for flexible and safe transport of precast elements to the tunnel for installation.

全新啟德社區聯絡中心

BRAND NEW KAI TAK COMMUNITY LIAISON CENTRE

歡迎參觀社區聯絡中心，體驗多款互動遊戲！
Come visit the new CLC and experience various interactive games!

1 虛擬實境（VR）：操控隧道鑽挖機
Virtual Reality (VR): Tunnel Boring Machine Operation

訪客置身模擬隧道鑽挖機控制室內，透過虛擬實境技術操作控制板和不同的監控熒幕，以控制隧道鑽挖機進行挖掘任務。

The game places the visitors in a simulated TBM control room, where they operate the control panels and various monitoring screens through the use of VR technology, guiding the TBM in conducting excavation tasks.

2 擴增實境（AR）：隧道偵測大作戰
Augmented Reality (AR): Tunnel Inspection Challenge

訪客將化身工程師，利用平板電腦操控搭載智能隧道質量檢測系統的無人機，於限時內找出隧道內的缺損位置，並根據缺損類型找到合適修復方案。

Visitors step into the role of engineers, entrusted with the responsibility of identifying defects in the tunnel and promptly finding out appropriate repair solutions within a limited time frame. The inspection is carried out with a drone equipped with the "3S Tunnel Defect Inspector" system, controlled through a tablet.

3 混合實境（MR）：組裝隧道鑽挖機
Mixed Reality (MR): Tunnel Boring Machine Assembly

透過混合實境技術，訪客將身臨其境於隧道工地組裝隧道鑽挖機。訪客按編號順序將隧道鑽挖機的組件移放到正確位置並進行組裝，加深對隧道鑽挖機組件及組裝過程的認識。

Through the use of MR technology, visitors are transported into a virtual tunnel construction site where they can engage in the assembly of a TBM. Visitors are challenged to accurately position and assemble the components of the TBM in the correct order based on their serial numbers. The experience provides a deeper understanding of the TBM components and the assembly process.

4 隧道沉浸式體驗
Immersive Experience of Tunnelling

新展區以360度沉浸式投影技術營造立體視覺空間，讓訪客恍如置身隧道工地現場進行鑽挖隧道、組裝隧道壁及更換磨損刀具等工作，沉浸式體驗工程實況。

By leveraging the power of 360-degree immersive projection technology, a captivating 3D visual environment is created in this new exhibition area, giving visitors the sensation of being fully immersed in a real tunnel construction site, engaging in tunnel boring, assembling tunnel walls and replacing worn-out cutting tools, providing a first-hand glimpse into the construction process.

開放時間
Opening Hours

星期一至五 Mon - Fri：9am-1:30pm / 2:30pm-6pm
星期六 Sat：9am-1pm
星期日及公眾假期 Sun & Public Holidays：休息 Closed

社區參與

COMMUNITY ENGAGEMENT

T2工程團隊一直致力於推廣工程項目，並透過參與不同展覽、舉辦互動工作坊及工地考察等活動，與市民和學生分享隧道建造工程的知識，以及各項創新科技於工程的應用。

T2 Project Team is committed to promoting the T2 Project and sharing the knowledge of tunnel engineering and innovative technologies with the public and students by participating in various exhibitions and organising interactive workshops and site visits.

2023

2月 FEB

中學到訪T2社區聯絡中心
School Visit to Community Liaison Centre

4月 APR

香港國際創科展2023
InnoEX 2023

5月 MAY

智慧城市巡迴展覽
Smart City Roving Exhibition

8月 AUG

CEDD暑期遊學團2023
CEDD Summer Programme 2023

12月 DEC

土木工程拓展青年學院 - 職場影子課
Youth Academy of Civil Engineering and Development – Job Shadowing

工程進度

PROJECT PROGRESS

1 進口車道
Approach Road

- 結構工程大致完成
  Structural works substantially completed

2 西面通風大樓
West Ventilation Building

- 結構及機電工程進行中
  Structural and E&M works in progress

3 海底隧道
Sub-sea Tunnel

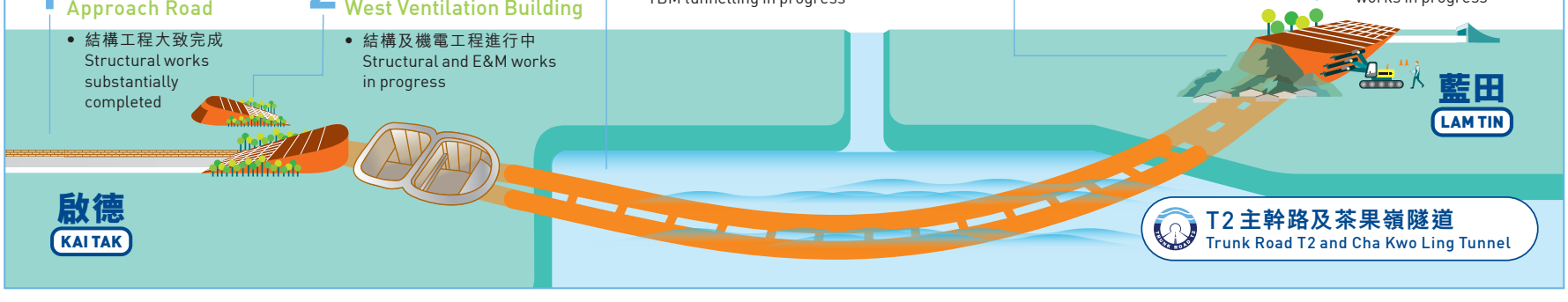
- 隧道內部結構工程進行中
  Works of tunnel internal structure in progress
- 隧道鑽挖機工程進行中
  TBM tunnelling in progress

4 茶果嶺隧道
Cha Kwo Ling Tunnel

- 隧道內部結構工程進行中
  Works of tunnel internal structure in progress

5 東面通風大樓
East Ventilation Building

- 結構及機電工程進行中
  Structural and E&M works in progress



如欲查閱更多有關T2主幹路及茶果嶺隧道的資料，請瀏覽網站：

Please visit the Trunk Road T2 and Cha Kwo Ling Tunnel project website for more project information:

感謝閣下瀏覽《進程》。
若對我們工程有任何意見，請將意見電郵至：

Welcome to our newsletter Track.
If you have any views on our project, please email us at:

www.trunkroadt2.hk　6130 8155　enquiry@trunkroadt2.com

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