TOKYO OUTER RING ROAD

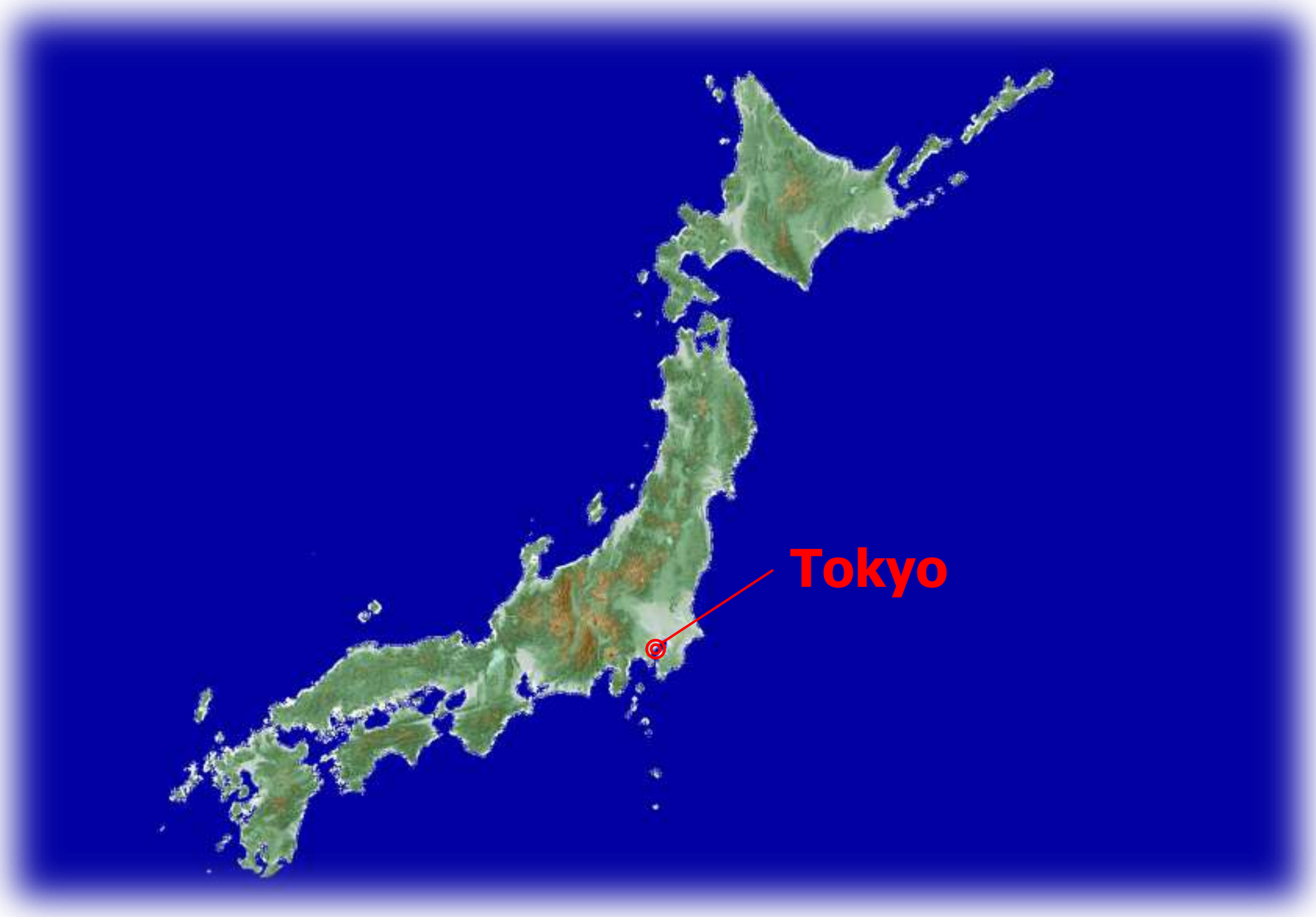
Main Road Tunnel (Northbound) Oizumi-Minami Project

طريق طوكيو الدائري الخارجي

بناء الجسور

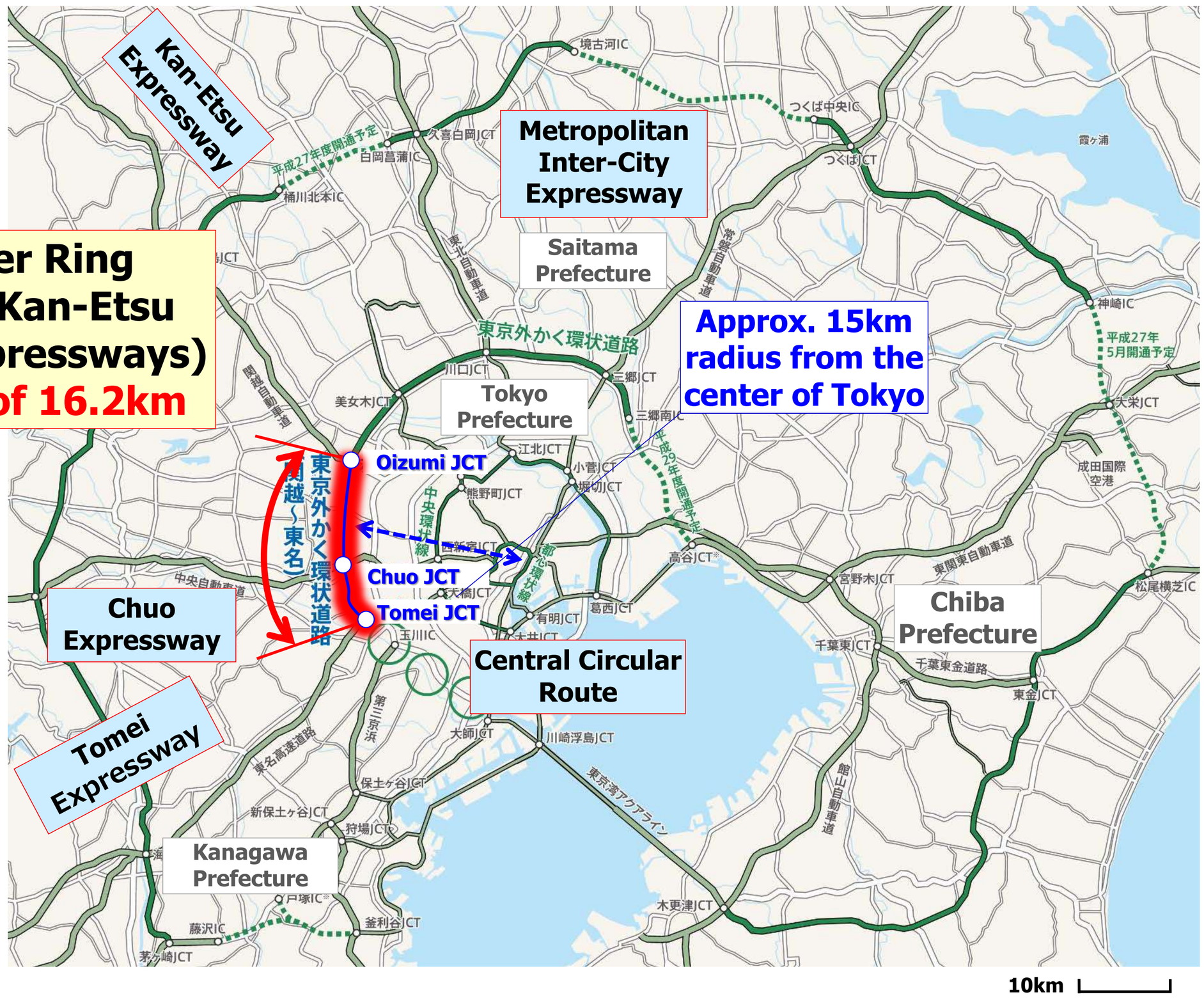
① Project overview

1. Map of Japan



2. Map of road network

Tokyo Outer Ring (connecting Kan-Etsu and Tomei Expressways)
Total length of 16.2km



TAISEI CORPORATION
https://www.taisei.co.jp/english/

TAISEI CORPORATION
For a Lively World

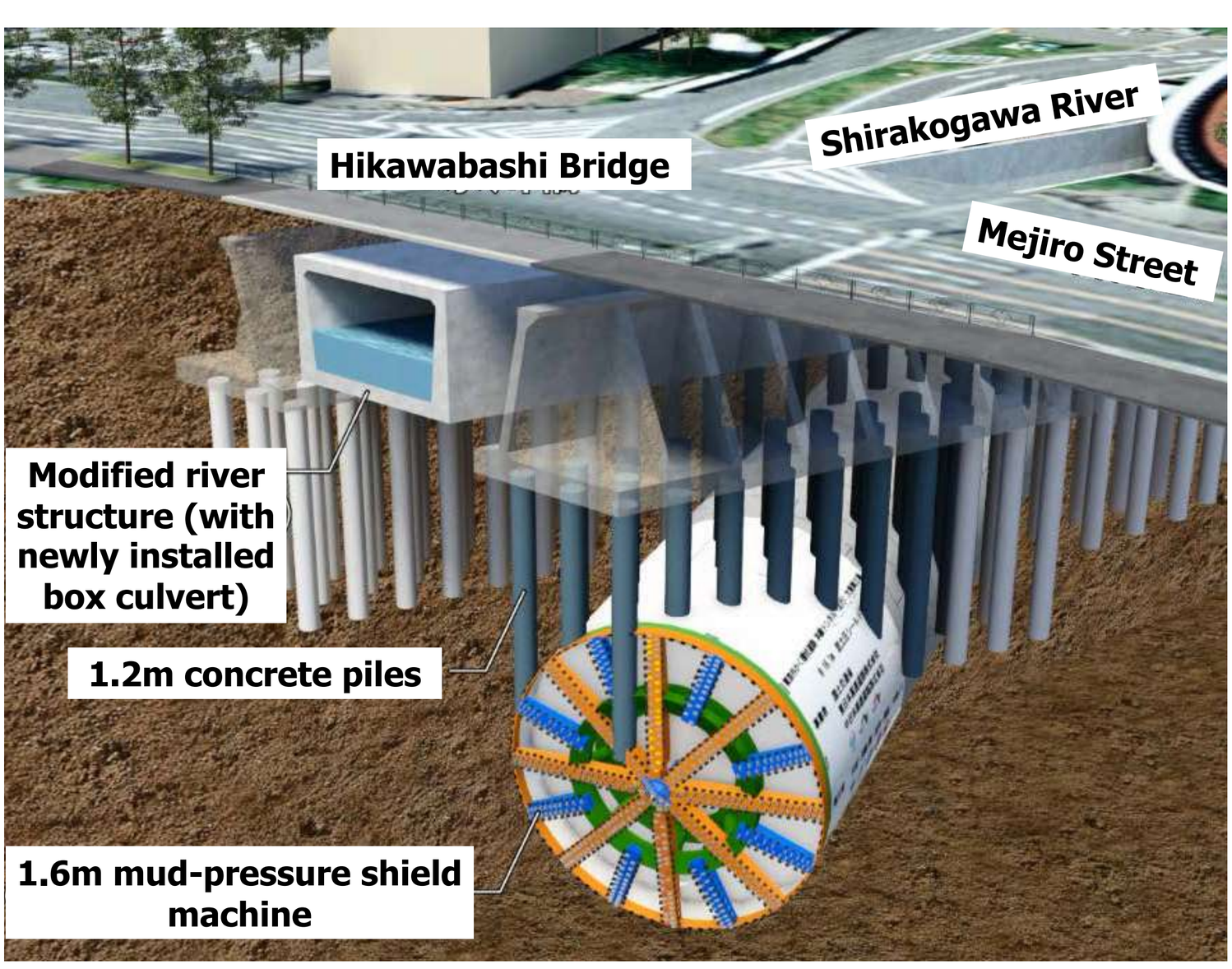
TOKYO OUTER RING ROAD

Main Road Tunnel (Northbound) Oizumi-Minami Project

طريق طوكيو الدائري الخارجي

بناء الجسور

2. Direct cutting of existing concrete piles



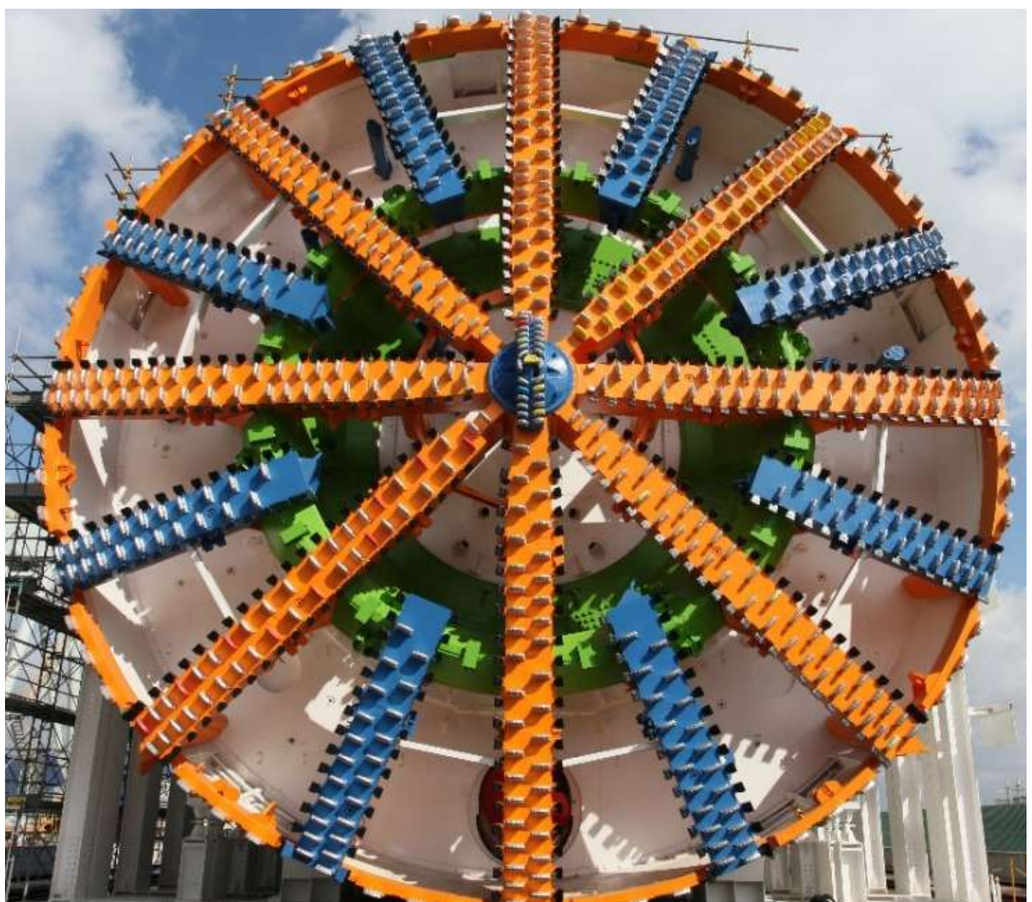
Overview of existing piles

[Shirakogawa River shore protection]
Steel-reinforced concrete piles
Φ1.2 m x 19 piles

[Hikawabashi Bridge base (Mejiro Street)]
Concrete piles
Φ1.2m x 27 piles

Existing underground Φ1.2m piles will be directly cut using:
An inclined cutter head (5°) fitted with specially reinforced pre-cutting bits.
The cutting performance has been validated through a verification test simulating the actual piles.

3. Features of the cutter head and bits

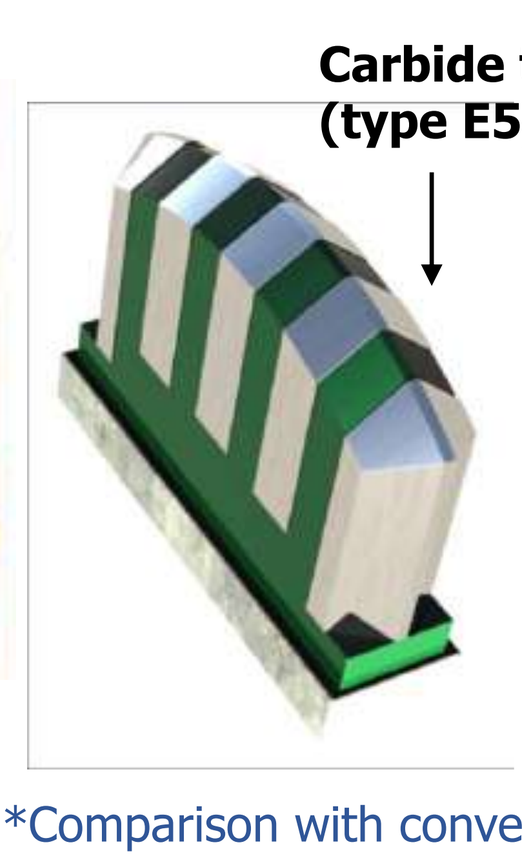


Cutter head front view (66.4% opening)

5°-inclined cutter head

Specially reinforced pre-cutting bits

Carbide tip (type E5)



Optimized for obstruction cutting

[Cutter head]
5°-inclined cutter head

[Bit]
Specially reinforced pre-cutting bits (1,155 bits mounted)
Fan-shaped, tough and impact-resisting type

Three times as much tip volume as conventional cutter bits*

No bit replacement required for over 7km of excavation (margin of 1.7 over the planned excavation distance)

[Cutter rotation and propulsion drive mechanism]
High-speed cutter rotation of 0.86 rpm
Very low-speed propulsion of 1 to 10 mm/min.

*Comparison with conventional obstruction-cutting bit performance

TAISEI CORPORATION
https://www.taisei.co.jp/english/

TAISEI CORPORATION
For a Lively World

TOKYO OUTER RING ROAD

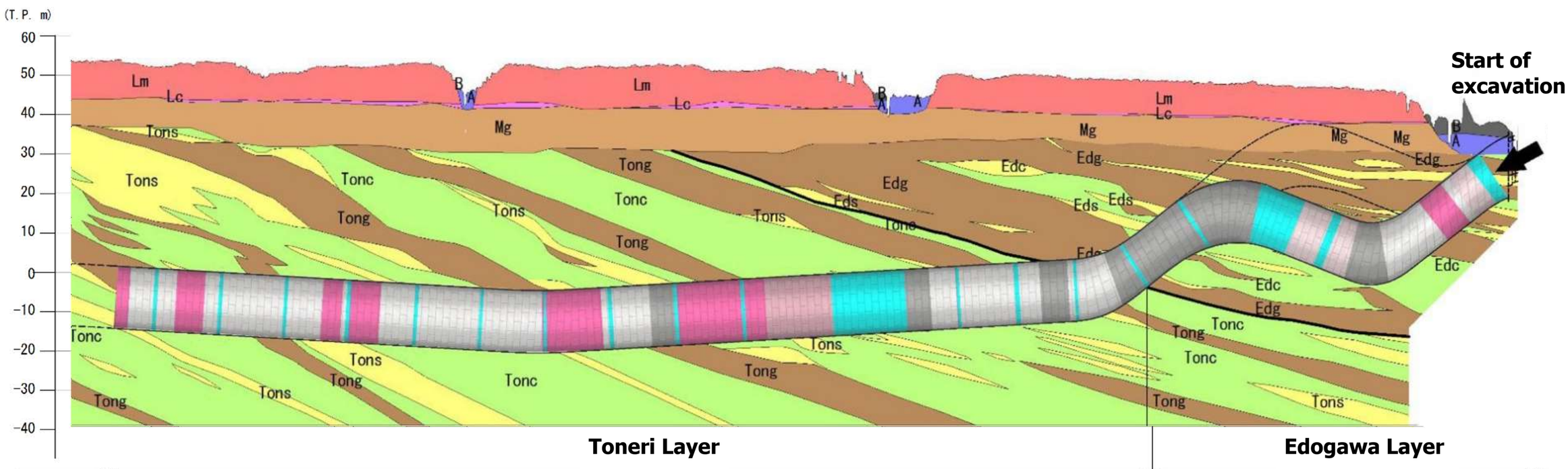
Main Road Tunnel (Northbound) Oizumi-Minami Project

طريق طوكيو الدائري الخارجي

بناء الجسور

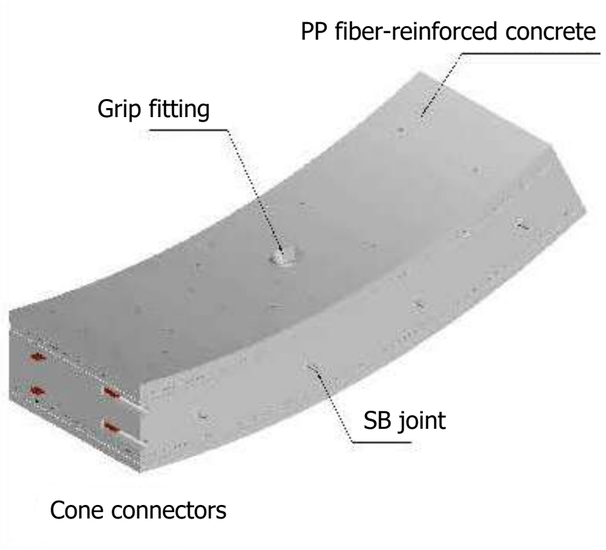
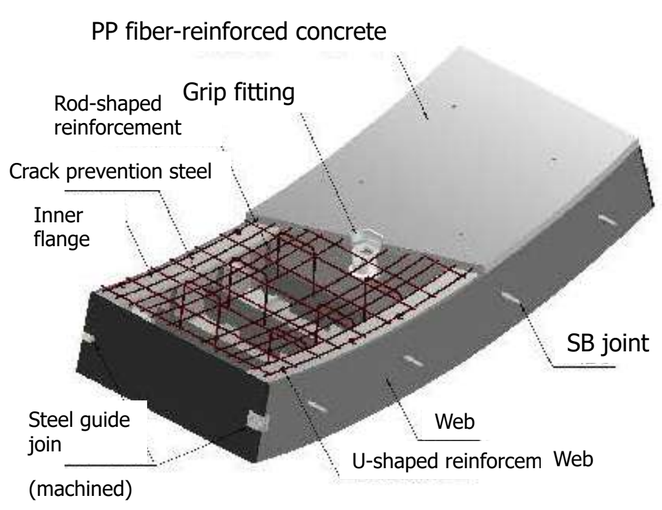
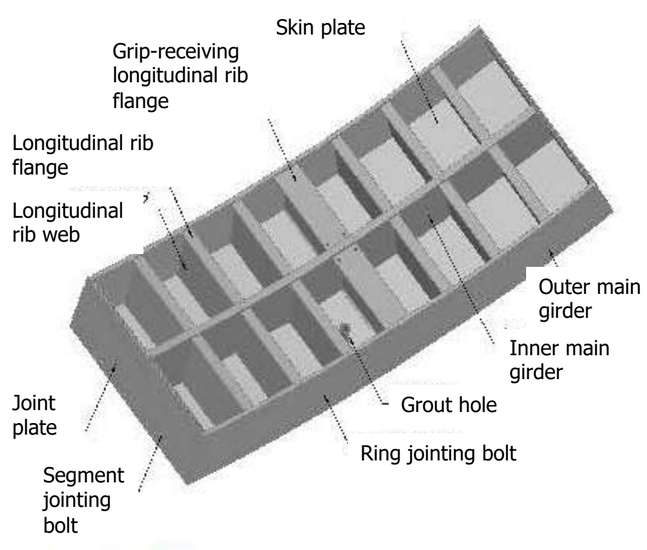
③ Segment overview

1. Longitudinal section of the geological layers



Main layers to excavate through	A layer containing alternating bands of compacted gravel, sand and hard cohesive soil	A layer predominantly consisting of compacted gravel but containing bands of compacted sand and hard cohesive soil

2. Features of the segments

Type	RC segment	HB® segment (synthetic)	Steel segment
Overview			
Dimensions, etc.	Outer diameter: 15,800 mm Girder height: 650 mm Width: 1,600 mm Arc length: 4,052 mm Number of segments: 13 (K: 1/4)	Outer diameter: 15,800 mm Girder height: 650 mm Width: 1,600 mm Arc length: 4,052 mm Number of segments: 13 (K: 1/4)	Outer diameter: 15,800 mm Girder height: 650 mm Width: 1,600 mm Arc length: 4,052 mm Number of segments: 13 (K: 1/4)

※Patent applied for HB segment (synthetic).

TAISEI CORPORATION
https://www.taisei.co.jp/english/

TAISEI CORPORATION
For a Lively World

TOKYO OUTER RING ROAD

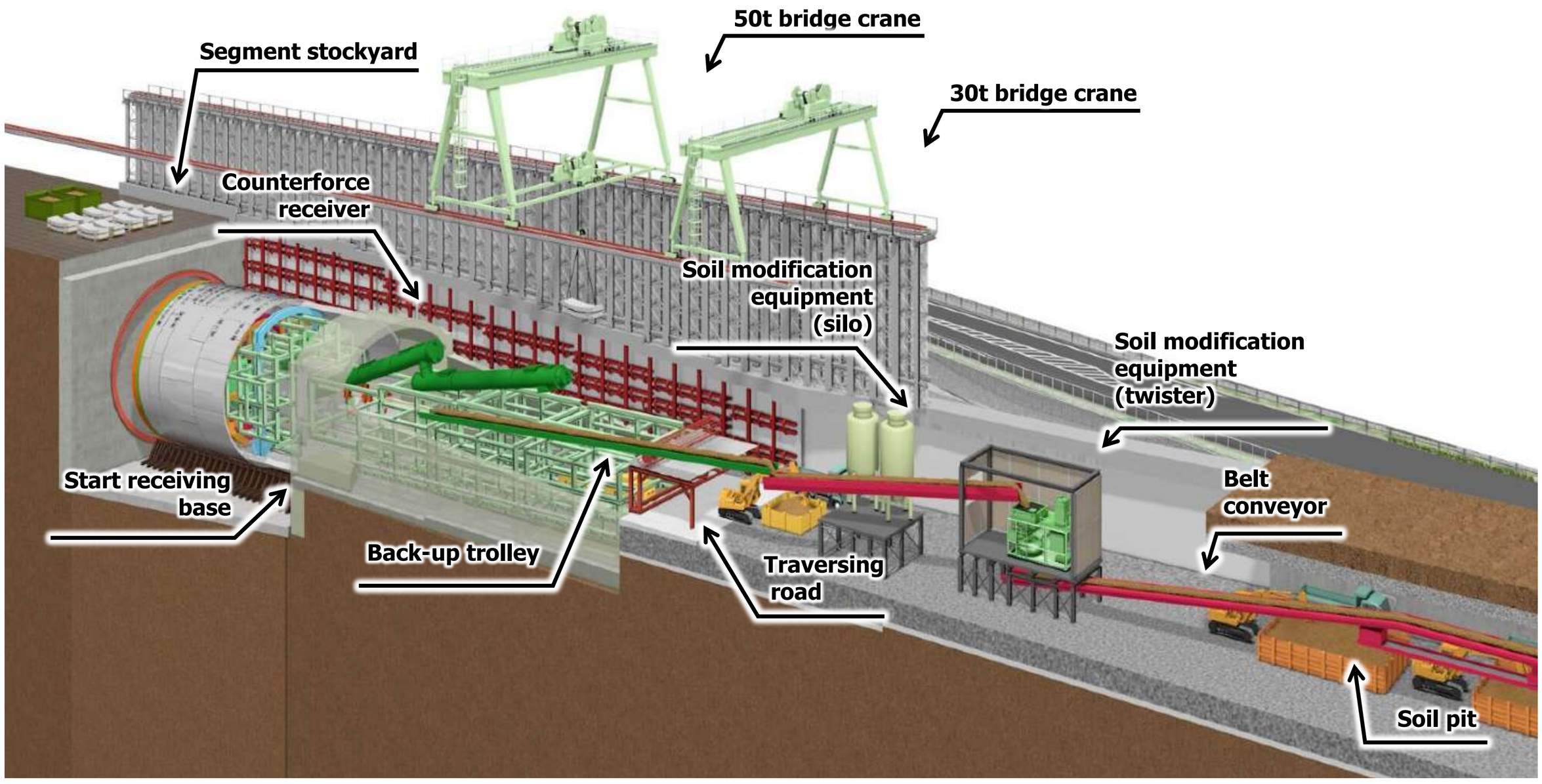
Main Road Tunnel (Northbound) Oizumi-Minami Project

طريق طوكيو الدائري الخارجي

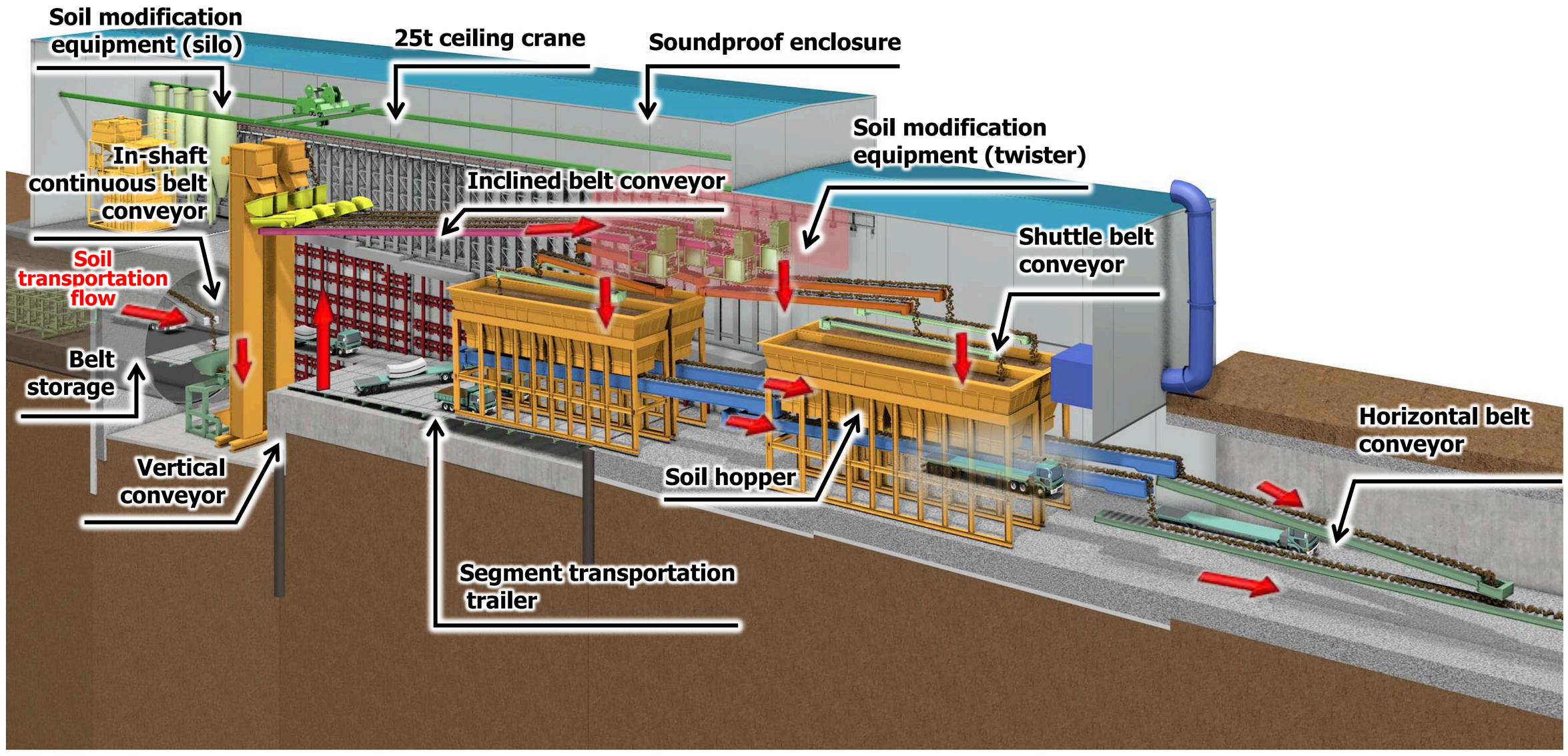
بناء الجسور

⑤ Equipment overview inside the vertical shaft

1. Initial excavation



2. Main excavation



Features

- ◆ Soundproof enclosure: 20m high x 20m wide x 130m long
- ◆ Soil stock capacity: 1,600m^3 (for 3R)
- ◆ No material stockyard at the starting base ⇒ Material to be supplied by direct vehicle delivery into the tunnel
- ◆ Daily estimates (maximum)
  - ・Soil transportation out of the tunnel: 6,000m^3 ×2 JV=12,000m^3/day
  - ・Vehicle traffic: 300 vehicles x 2 JV = 600 vehicles/day

TAISEI CORPORATION
https://www.taisei.co.jp/english/

TAISEI CORPORATION
For a Lively World

TOKYO OUTER RING ROAD

Main Road Tunnel (Northbound) Oizumi-Minami Project

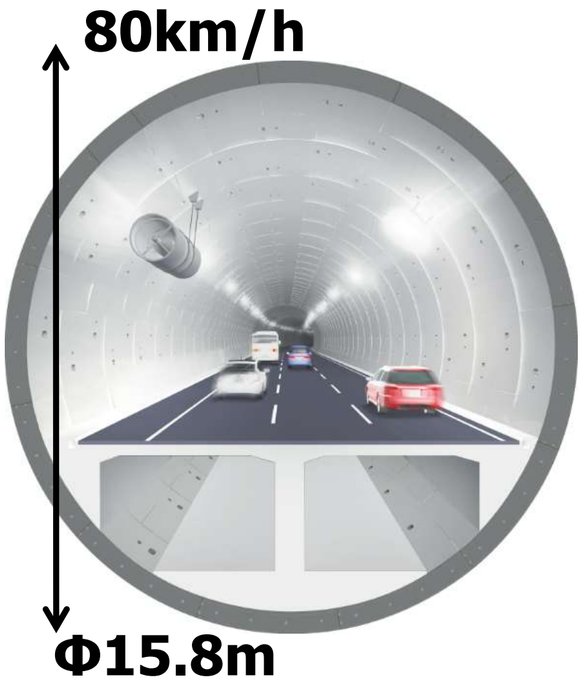
طريق طوكيو الدائري الخارجي

بناء الجسور

① Project overview

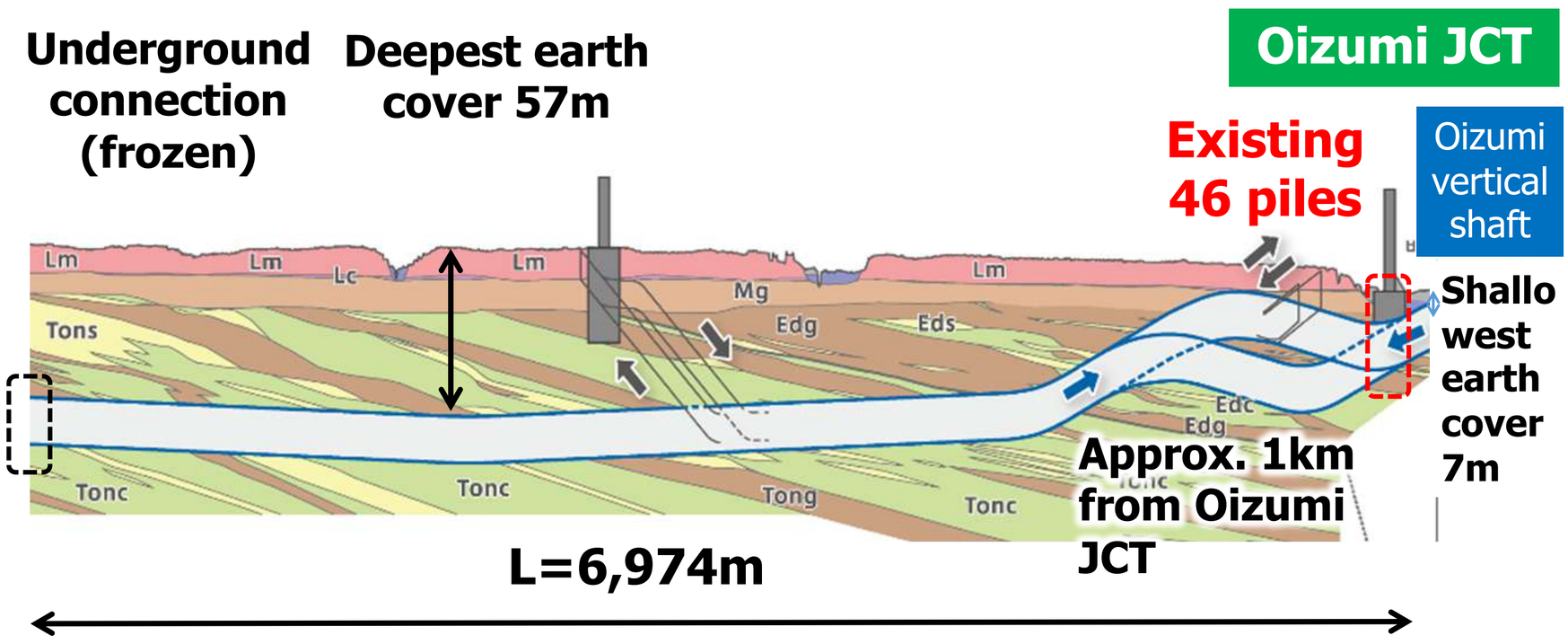
Tokyo Outer Ring Main Road Tunnel (northbound) Oizumi-Minami Project

Type 2 Class 1
80km/h



Φ15.8m

Project specifications



Tunnel length 6,974m, floor base 6,987m, eight transverse connection shafts, underground connection (freezing method)

Shield machine: Mud-pressure type, **outer diameter Φ16.1 m (largest in Japan)**

Segment: **Outer diameter Φ15.8m**, 650 mm thick, 1.6m wide, 13 segments

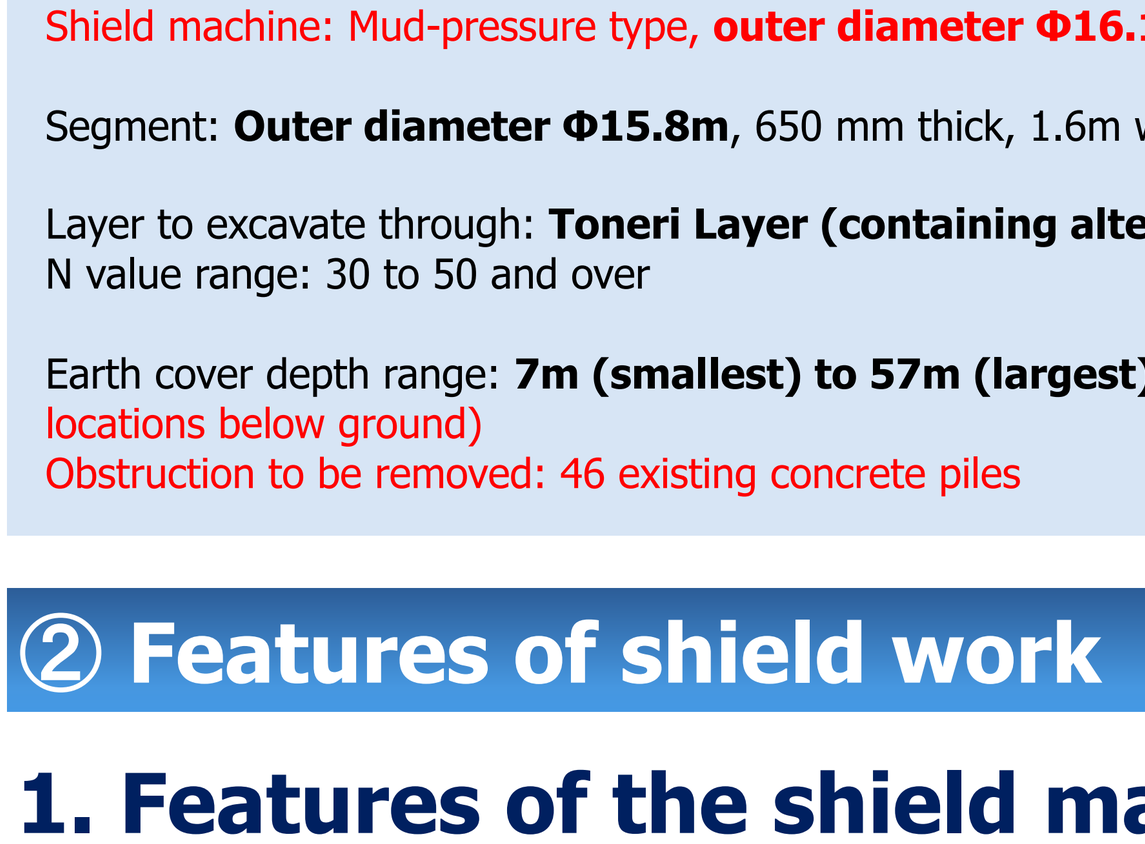
Layer to excavate through: **Toneri Layer (containing alternating bands of cohesive soil, sandy soil and gravel)**, N value range: 30 to 50 and over

Earth cover depth range: **7m (smallest) to 57m (largest)** ("Deep Underground Project Law" applied to 40m and deeper locations below ground)
Obstruction to be removed: 46 existing concrete piles

1km to attainment = 6km

② Features of shield work

1. Features of the shield machine



Φ16.1 m mud-pressure shield machine, temporarily shop-assembled at MHI Kobe Shipyard

Manufactured by: JIM Technology-

Features of the shield machine

- **Long-distance excavation capacity: 7km**
  Number of bits mounted: 1,155
- **Direct underground cutting of existing concrete piles with: Inclined cutter, obstruction-cutting bits**
- **High-speed excavation : 500m per month or more Semi-automatic erector, twin erectors**
- **Compatible with very deep excavation and high water pressure: 3-fold screw conveyors, TLL seals etc.**

TAISEI CORPORATION
https://www.taisei.co.jp/english/

TAISEI CORPORATION
For a Lively World

TOKYO OUTER RING ROAD

Main Road Tunnel (Northbound) Oizumi-Minami Project

طريق طوكيو الدائري الخارجي

بناء الجسور

4. Obstructing-pile cutting test

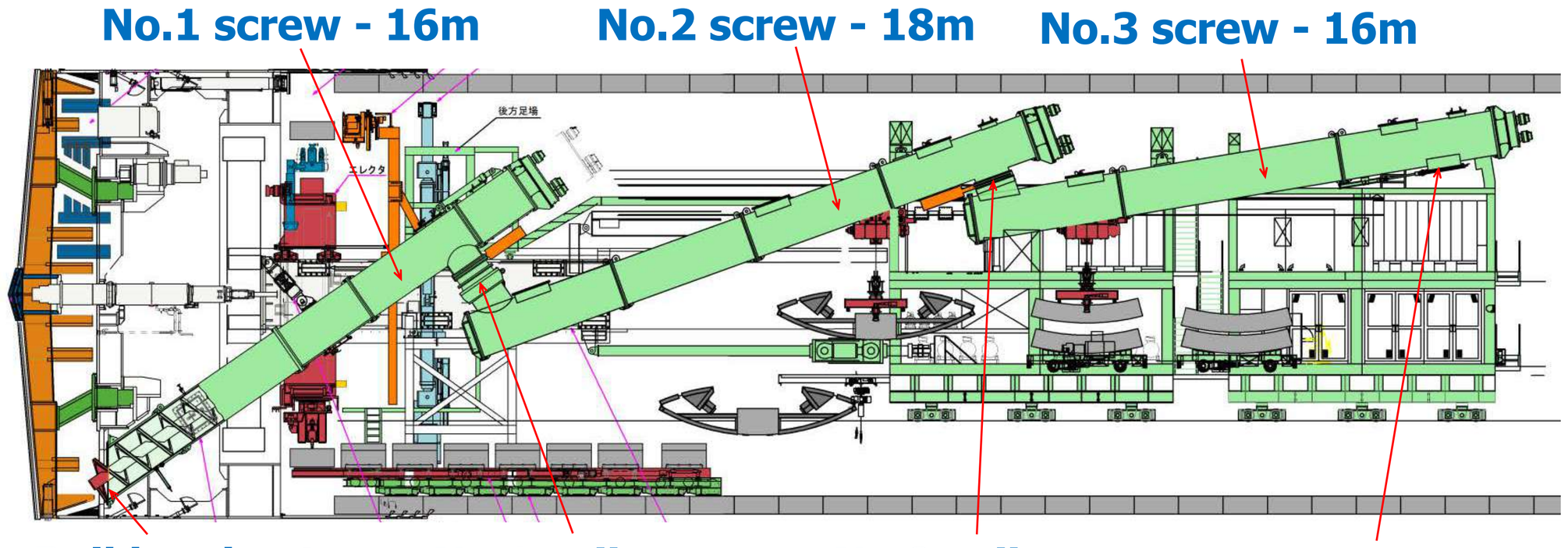
Testing (simulated single pile being cut)

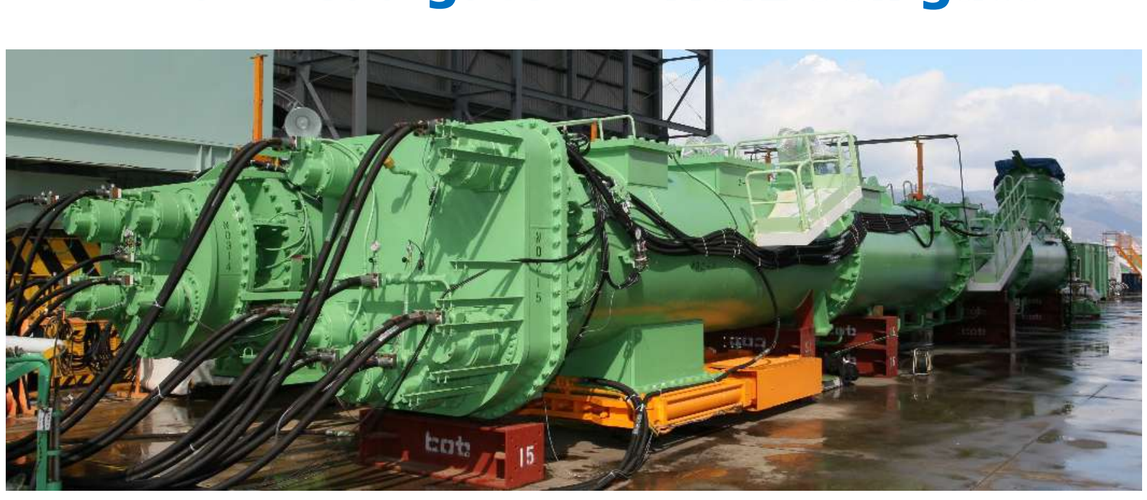
Testing (cutting through a simulated soil layer inside shaft)

Φ1.2 m RC pile cut

Steel reinforcement debris after pile cutting

5. 3-fold screw conveyor system





Φ1.5 m screw conveyor (No.2 and No.3)

Countermeasures against soil gushing and flooding under high water pressure

Compatible with largest depth of 67 m and water pressure of 0.7 MPa

Φ1.5 m screw conveyors: 3-fold configuration, 50 m long

⇒ Long configuration for greater plug effect

Soil gates: Four gates provided

Bulkheads + overall screw

TAISEI CORPORATION
https://www.taisei.co.jp/english/

TAISEI CORPORATION
For a Lively World

TOKYO OUTER RING ROAD

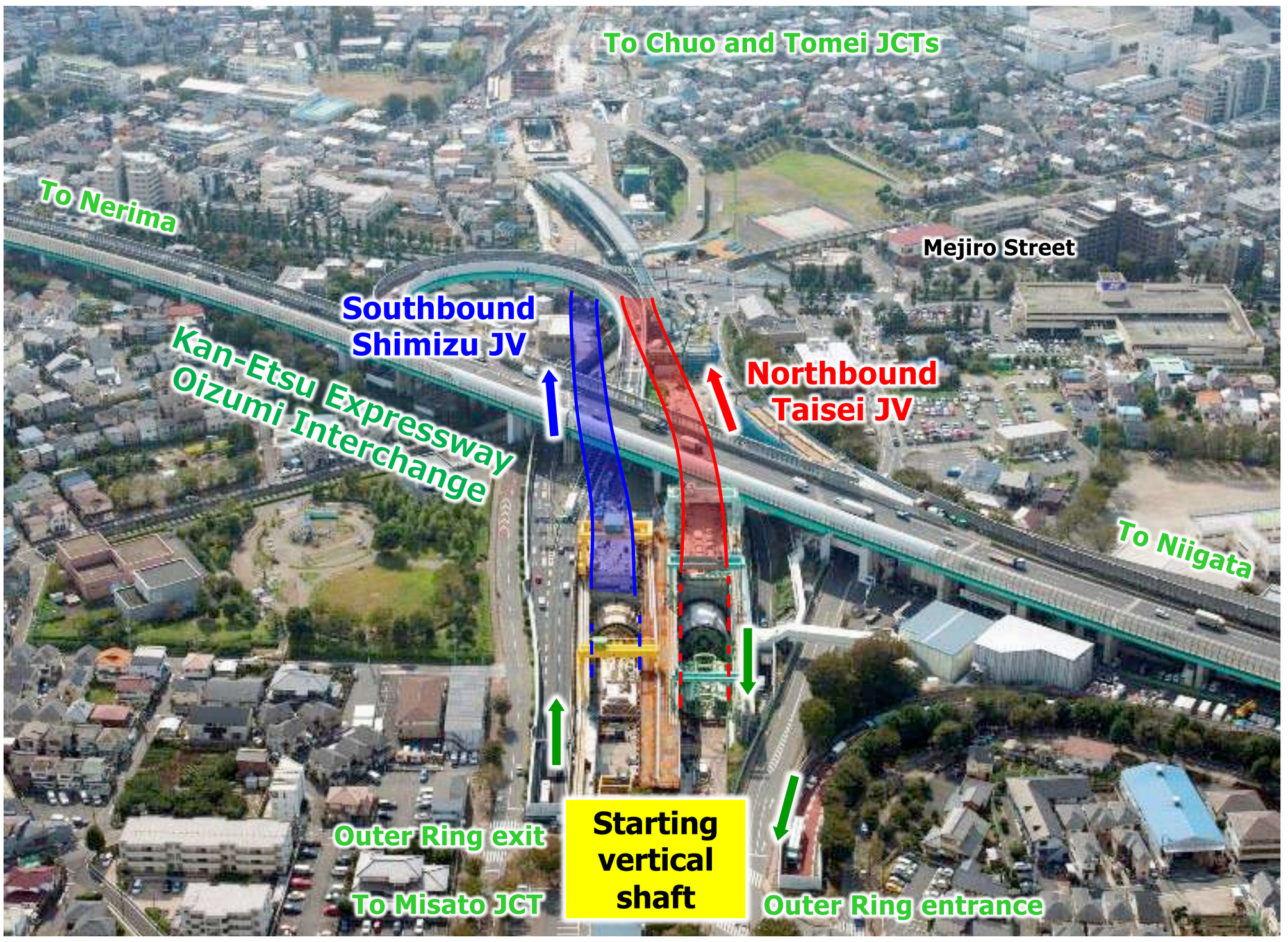
Main Road Tunnel (Northbound) Oizumi-Minami Project

طريق طوكيو الدائري الخارجي

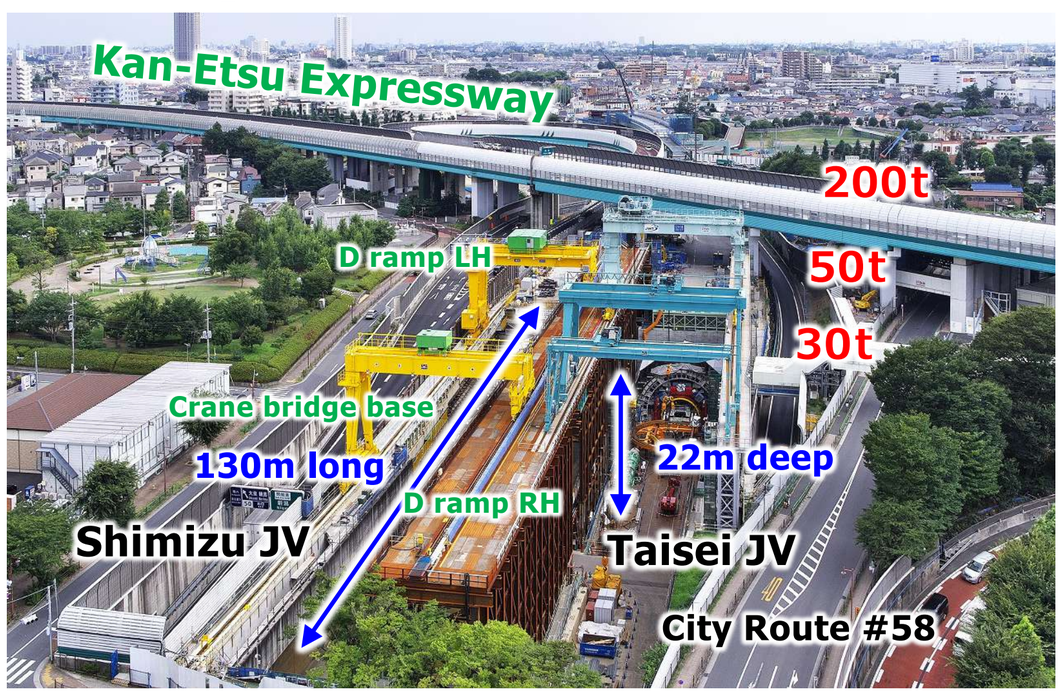
بناء الجسور

④ Vertical shaft to start the shield machine

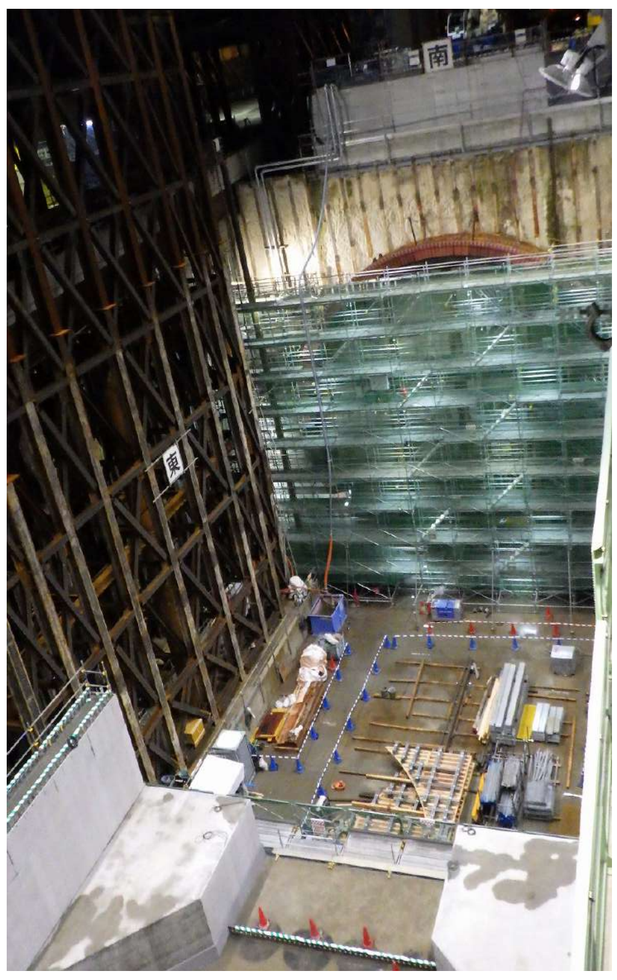
1. Overview of the starting vertical shaft



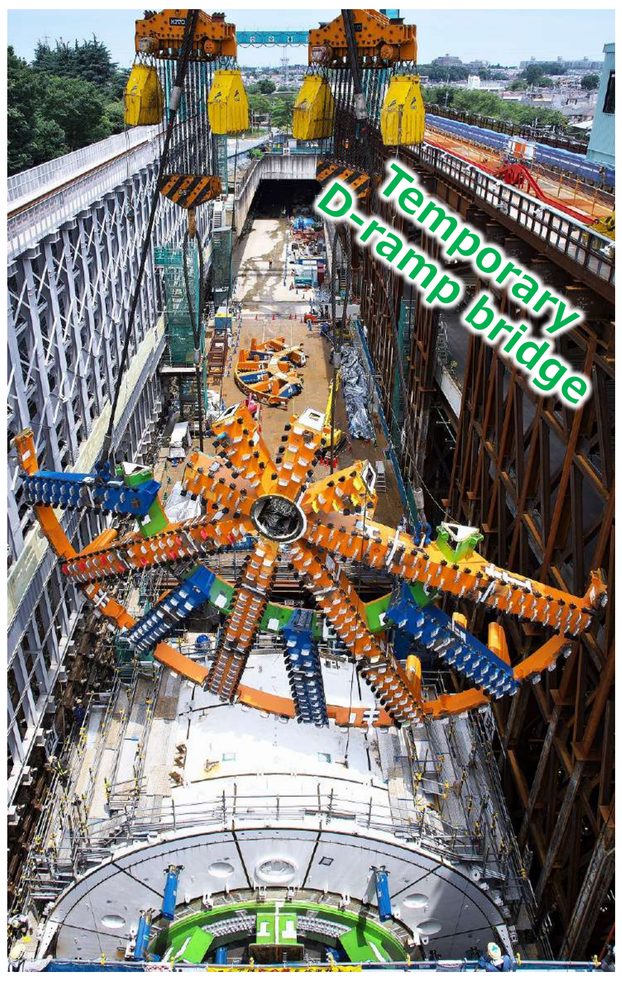
2. Shield machine assembly and starting in narrow space



Temporary installation of the starting vertical shaft



Inside of the vertical shaft



Shield machine being assembled

Features

- **Effective shaft width 17.7m (outer shield diameter Φ16.1m)**
- **Shaft depth: 9.5 m to 22.0m, length: 130m**
- **Working close to the Outer Ring Road (temporary D ramp)**
- **Assembly using 200t, 50 t and 30t gantry cranes**

TAISEI CORPORATION
https://www.taisei.co.jp/english/

TAISEI CORPORATION
For a Lively World

TOKYO OUTER RING ROAD

Main Road Tunnel (Northbound) Oizumi-Minami Project

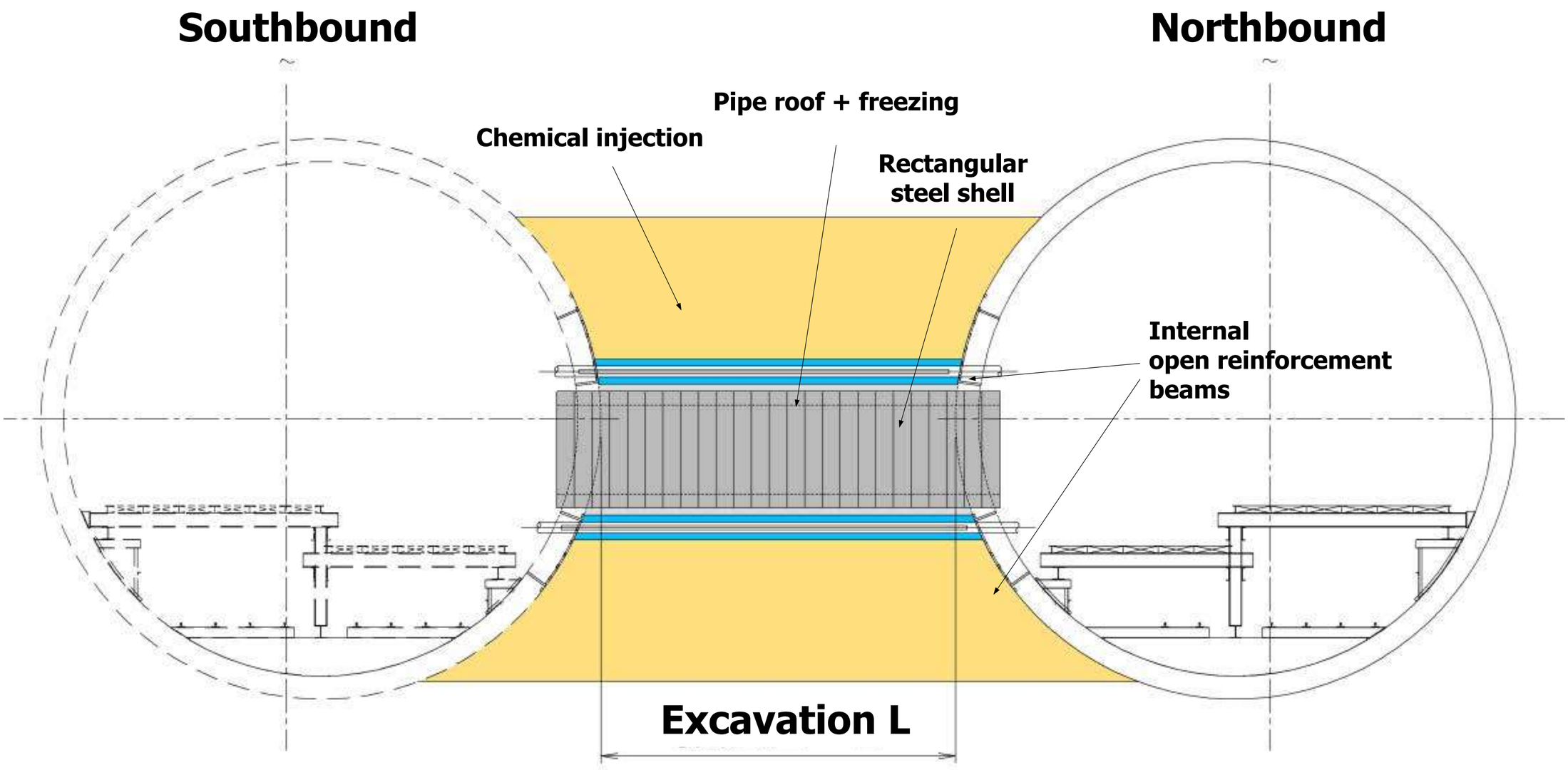
طريق طوكيو الدائري الخارجي

بناء الجسور

⑥ Transverse connection shaft and floor base construction

1. Transverse connection shaft construction

Structural overview

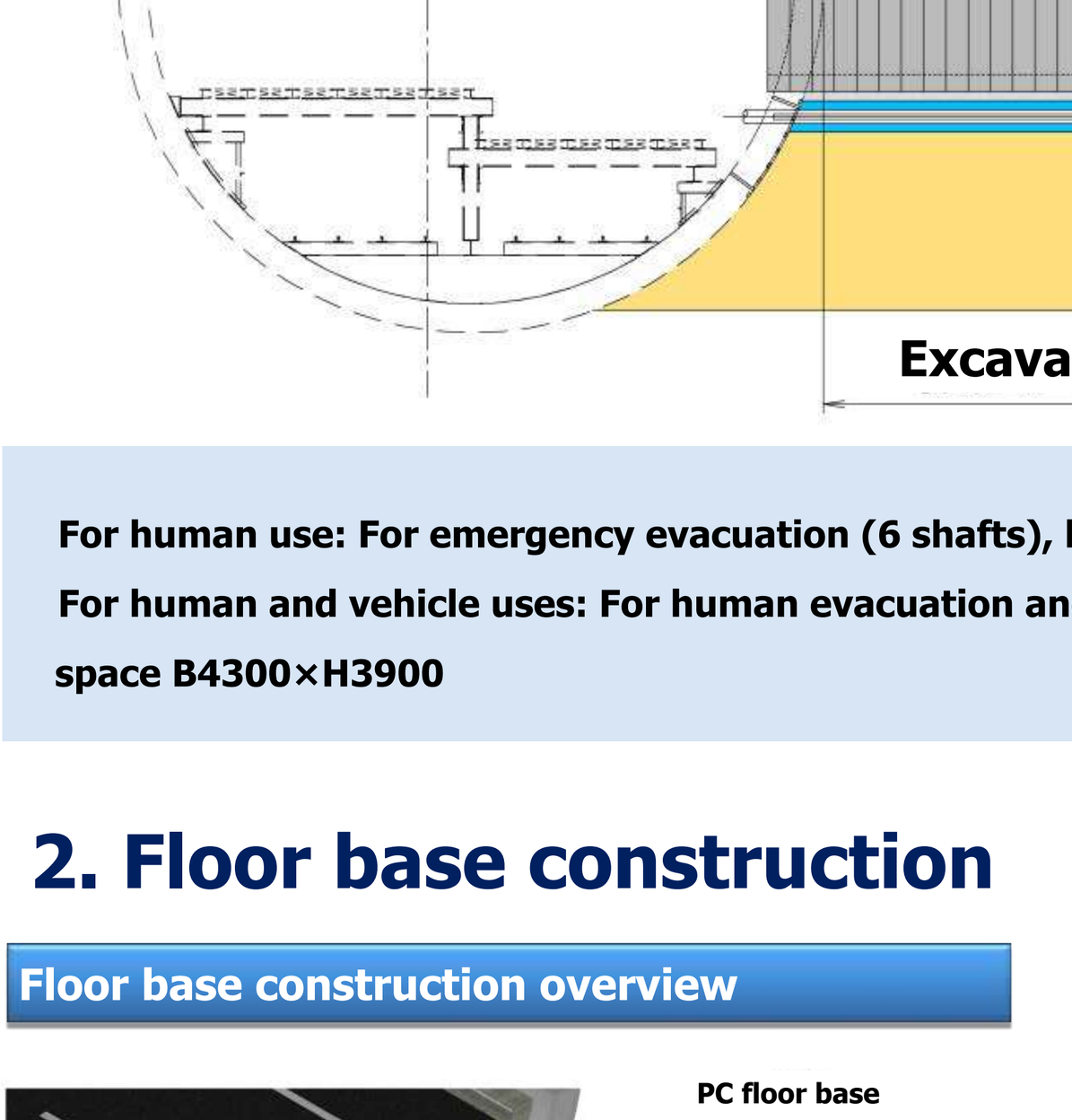


For human use: For emergency evacuation (6 shafts), hollow space B2600×H2500

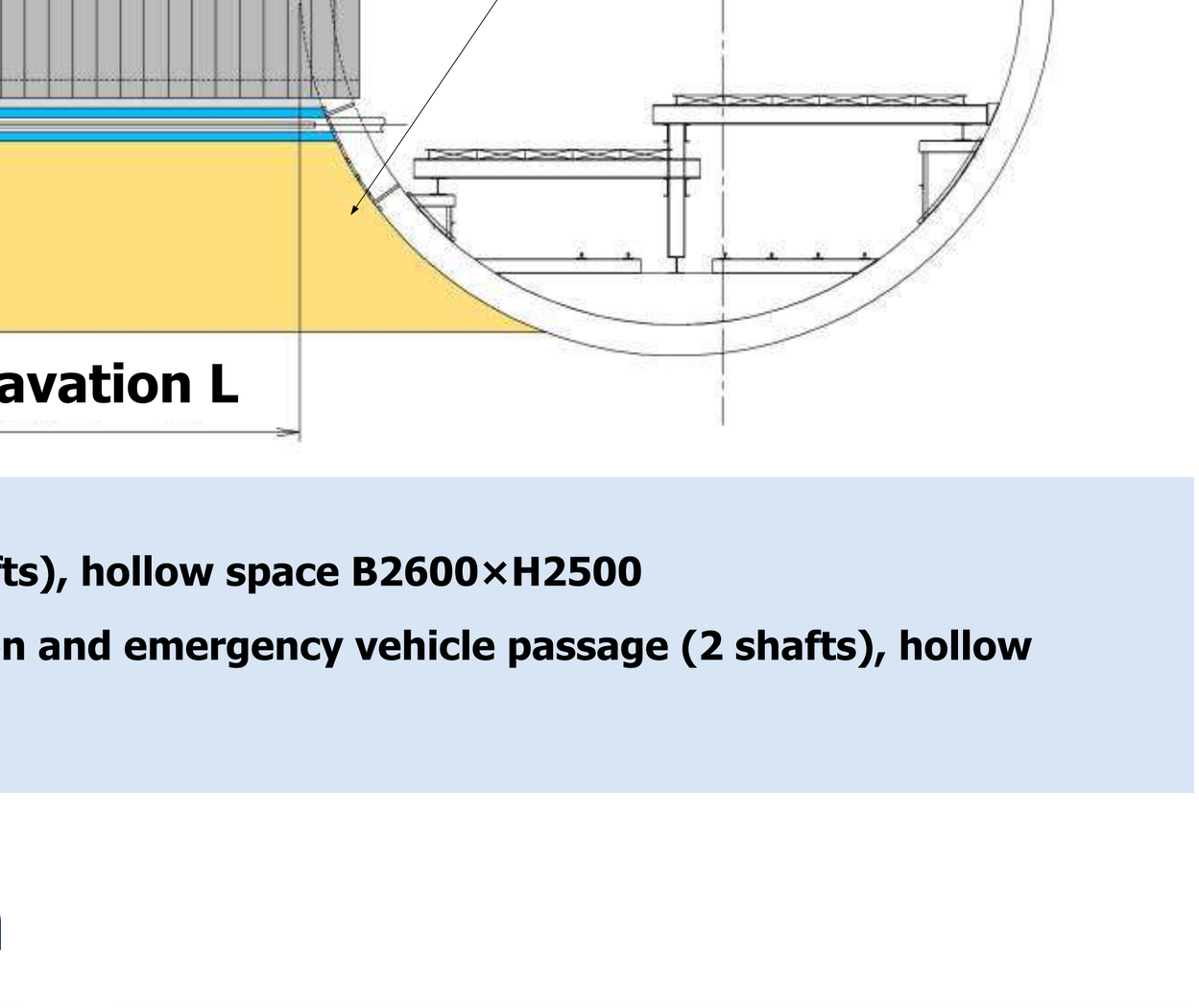
For human and vehicle uses: For human evacuation and emergency vehicle passage (2 shafts), hollow space B4300×H3900

2. Floor base construction

Floor base construction overview



PC floor base



Precast components to be used except for side walls and adjustment concrete blocks

Pre-stressing to be applied in the right-angle-to-bridge axis direction only L=5.5m

TAISEI CORPORATION
https://www.taisei.co.jp/english/

TAISEI CORPORATION
For a Lively World