HAZAMA ANDO CORPORATION

Nepal's First Road Tunnel Built with Japanese ODA
Nagdhunga Tunnel

1. Project Overview

The Nagdhunga Tunnel construction project, planned at the western edge of the Kathmandu Basin, is Nepal's first road tunnel financed by Japanese Yen Loan as part of Japan's Official Development Assistance (ODA).

This project is planned on the main highway connecting the capital Kathmandu with major cities such as Pokhara, and involves the construction of a 5,560m bypass road including a 2,688m tunnel.

Location map

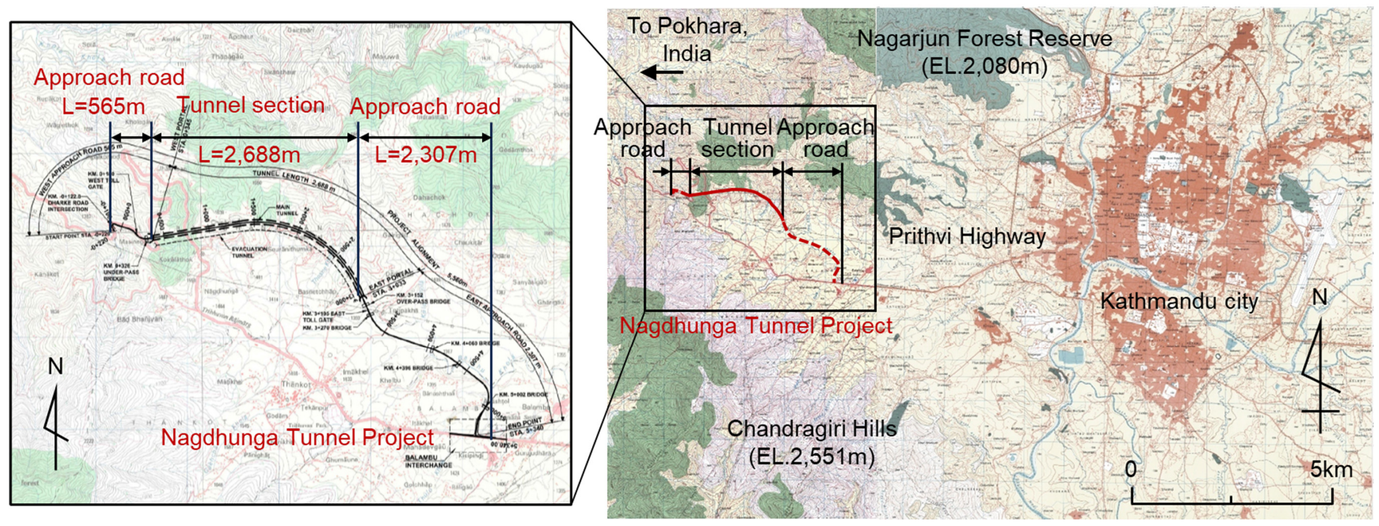
Project specifications

Project	Nagdhunga Tunnel Construction Project
Location	Chandragiri Municipality to Dhunibesi Municipality, Bagmati Province, Nepal
Employer	Department of Roads, Ministry of Physical Infrastructure and Transport, Federal Democratic Republic of Nepal
Consultant	Nippon Koei Co., Ltd. / Eight-Japan Engineering Consultants Inc. / Japan Civil Consultant Co., Ltd. / GEOCE Consultants P. Ltd. / ITECO P. Ltd. Joint Venture (JV)
Contractor	Hazama Ando Corporation
Contract Period	November 14, 2019 – April 25, 2026
Scope of Work	Total Length 5.560m (Tunnel Section 2,688m, Open Section 2,872m) , 2 Bridges, Emergency Facilities, Road Facilities, Roadside Station (RSS), Pavement, Signage, Toll Booths, Management Vehicles and others
Contract Conditions	Compliant with the FIDIC MDB Edition, Escalation Clause, No Milestones, Defects Notification Period (DNP) 1 year, Delay Liquidated Damages 0.1%/day, MAX 10%, Dispute Board (DB) provisions included.

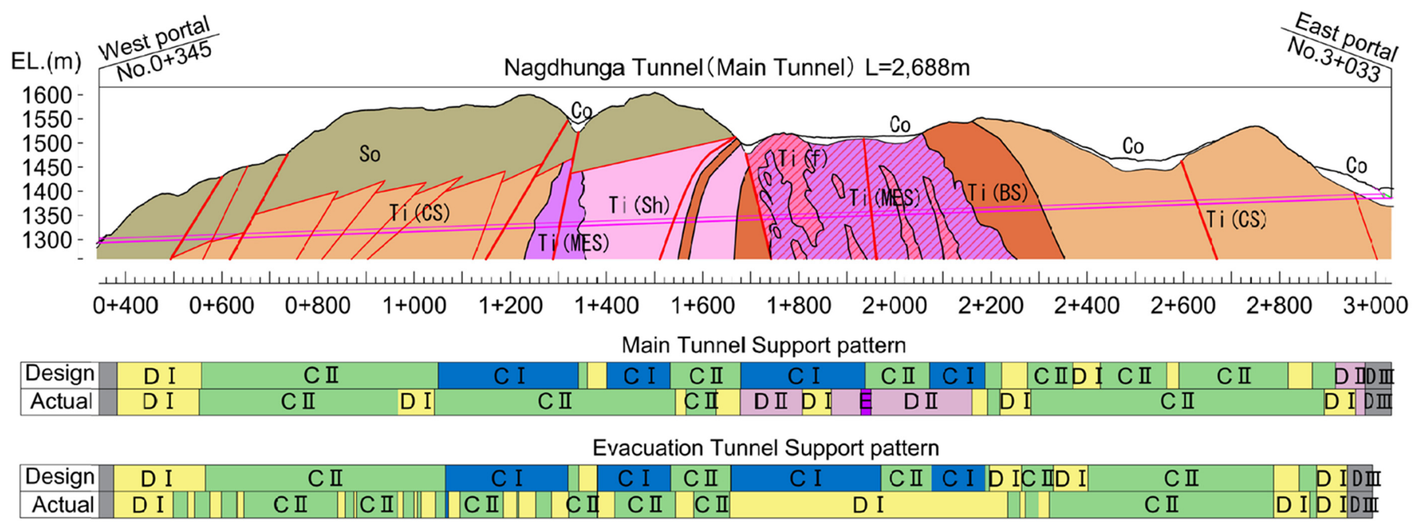
2. Geological Conditions

Nepal is located in the collision zone where the Indian Plate collides with the Eurasian Plate. Generally, in collision zones, folding of strata and reverse faults are formed by orogenic movements.

Around both tunnel portals, relatively fresh and well-organized strata were observed, with fine-grained sandstone to phyllite distributed at fracture intervals of up to approximately 50 cm. In addition, at the boundary between the Sopyang Formation and the Tistung Formation on the west side, thrust faults with a north-south strike and westward dip appeared repeatedly. Furthermore, in the central part of the tunnel, black schist to phyllite intercalated with fine-grained sandstone was predominant, with fractured zones crushed into schistose layers with widths of several millimeters.



Site location map



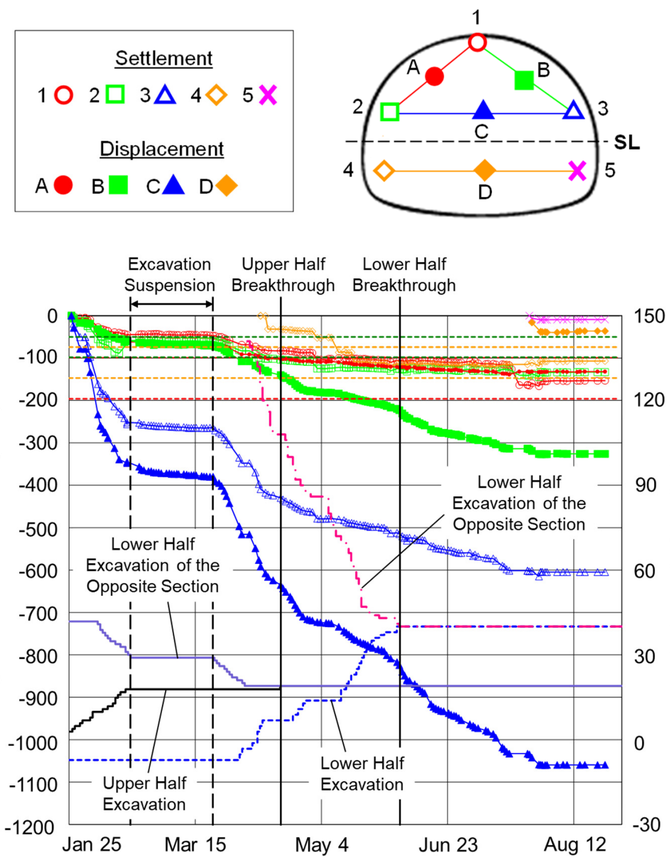
Geological profile and support pattern

3. Ground behavior during excavation

During excavation in the tunnel, horizontal displacement increased significantly, and large-scale deformations occurred continuously in the main tunnel, including rock bolt failure, deformation and buckling of steel support. The characteristics and causes of the deformation are summarized below.

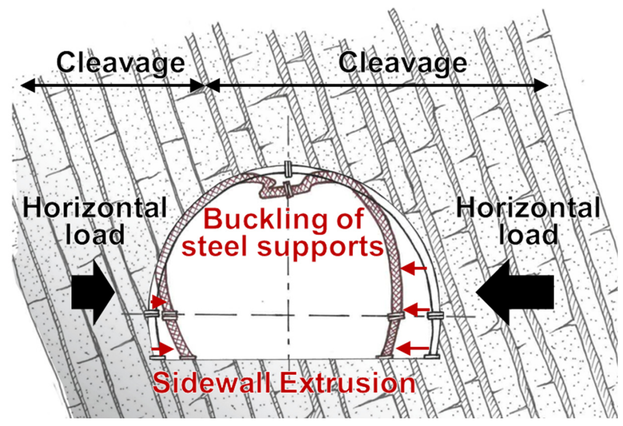
- Horizontal displacement is predominant with large displacement velocity and displacement amount (maximum 1,060mm).
- The progression of displacement is clearly related to excavation, and displacement increase stops during periods when excavation is suspended.
- In Nepal, initial ground stress is very large compared to Japan due to active orogenic activity.
- The geology is mainly black schist, with significant slickensides observed on the schistosity planes, and exfoliation due to cleavage is remarkable.
- The strike of the rock mass is parallel to the tunnel alignment, with a steep dip angle of approximately 60 to 90 degrees.
- Rock identification results showed no swelling clay minerals and no slaking properties were confirmed.

Based on the above, it is considered that the combination of multiple factors caused stress relief due to cleavage to progress deep into the ground mass immediately after excavation, and as a result of loads acting in the horizontal direction, significant deformation occurred.



Displacement progress during excavation

Examples of geological conditions



Cause of deformation

4. Conclusion

Various geological problems were encountered during excavation, but through advanced excavation technology and cooperation between Nepalese and Japanese engineers, both the main tunnel and evacuation tunnel were successfully broken through.

Currently, all tunnel construction work has been completed, and preparations are underway for the opening within this year.

Tunnel portal

Tunnel facilities