

# Mountain Tunnel Construction Using ICT

— Shin-Tomei Expressway Kawanishi Construction Yagayama Tunnel —

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## 1. Overview

The Shin-Tomei-Nagoya Expressway Kawanishi construction project was designated as construction project making full use of ICT to improve productivity through the joint efforts of the contractor and the client. This section introduces an example of ICT construction in the Yagayama Tunnel.

## 2. Using ICT

ICT technology is being actively utilized in the construction of the Yagayama Tunnel at each stage of the work process. Table 1 shows a list of examples of how ICT was used. This section reports on the use of BIM/CIM in mountain tunnel construction.

Type of work	Details of efforts
Tunnel excavation	Reduction of excess excavation by automatic control system for angle of insertion
Shotcrete	Large-volume shotcrete using a liquid quenching agent
Lining Concrete	Efficient placement of lining concrete by automatic compaction system
Underground earthwork	Underground earthwork ICT construction equipment for information-intensive underground earthwork
Inspection	Remote inspection system to improve work efficiency
Inspection and Maintenance management	Initial Inspection of concrete lining by mobile vehicle
Construction ~ Maintenance	Utilization of BIM/CIM in mountain tunnels

Table 1 List of ICT-based initiatives

## 3. Utilization of BIM/CIM in Mountain Tunnel Construction

### (1) Construction efforts

A ground-based laser scanner was used to acquire point cloud data before and after the lining concrete was placed, which was superimposed on a 3D model to create a cross-sectional drawing, and the thickness of the lining concrete and the tunnel interior were measured for use by the client in the formwork inspection (Figure 1).

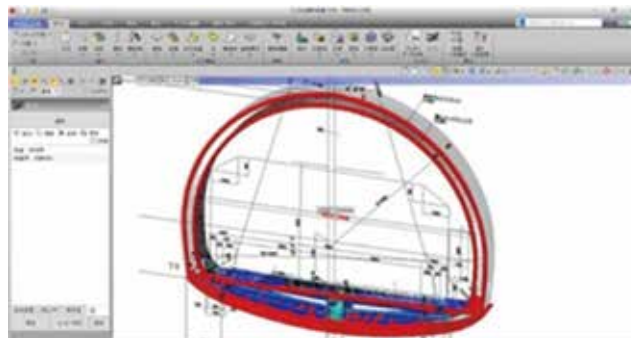


Fig. 1 Detection of finished shape by 3D model

### (2) Handover to facility construction and maintenance

As part of the data handed off from civil engineering to equipment construction and maintenance management, we acquired point cloud data for the entire underground tunnel line, creating a 3D model, adding traceability such as construction information and inspection records to the BIM/CIM model as attribute information, and updated the data at each stage of construction (Figure 2). Centralizing and upgrading data in 3D in all processes from survey and design to construction, inspection, maintenance management, and renewal was expected to improve productivity.

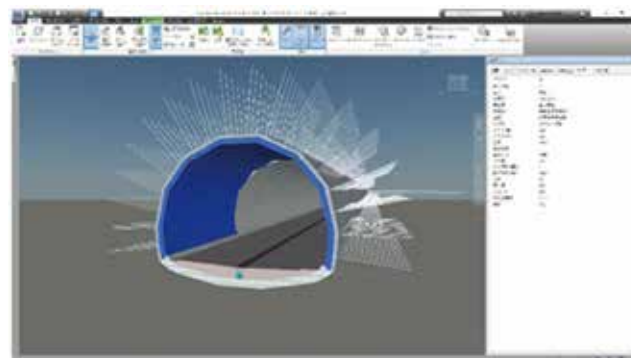


Fig. 2 Data handed off to maintenance management

## 4. Summary

This issue reported on some of the efforts being undertaken with the construction at Kawanishi. In the future, we will continue to make full use of ICT technology in all processes from surveying to maintenance management, and work together with the client and the contractor to improve productivity.