

## Research Trends and Results

# More Efficient Civil Engineering Structure Management Using 3D Models

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### 1. What is CIM

The Ministry of Land, Infrastructure, Transport and Tourism is building and widely introducing a construction production system using a 3D model and an information integration platform (CIM). CIM stands for Construction Information Modeling, a method that introduces a 3D model from the surveying and design stage, develops it by linking it to the construction and maintenance management, thereby permitting various studies using the 3D model and increasing the efficiency of the construction production system.

### 2. Use for maintenance

The effectiveness of the use of the 3D model at the design and construction stage has been confirmed, but its use for maintenance has not been fully verified. So we are studying the use of the 3D model for maintenance.

There are two benefits of using the 3D model: three-dimensional visualization and gathering and integrating information in the 3D Model. Three-dimensional visualization is applied to prepare a 3D model of the structure including the topography, arrange vehicles and scaffolding for high lift works in the inspection and repair plans, clarify inspection routes, confirm work space, and so on (Fig. 1). Gathering and integrating information is done to perform integrated management of information associating information of use in maintenance in the 3D model, and managing inspection results that are displayed on the 3D model.<sup>1)</sup>

### 3. 3D model for maintenance

If a 3D model is prepared in detail, it is highly effective, but on the other hand, this increases the preparation cost. So one challenge is to describe the level of detail adequate for the 3D model according to purpose of use. So we studied the level of detail that will maximize the cost-effectiveness of a 3D model provided for maintenance. Figure 2 shows the results of a study of a 3D model for the area around girder end bearing supports carried out to confirm the work space during the preparation of an inspection and repair plan. In order to clarify a stereoscopic image of the girder ends and clarify the work space in detail, a detailed model including cross beams, lateral bracing, bearings, displacement limiters, bridge fall prevention devices and other small members

was prepared, otherwise, only the external shapes of major members were accurately modeled.

### 4. Future Plans

To advance use for maintenance, we will continue to study the level of detail of the 3D model and to develop standards for the delivery of 3D models.

[Sources]

1) Ministry of Land, Infrastructure, Transport and Tourism, National Institute for Land and Infrastructure Management: Guidebook to Bridge Maintenance Using 3D Models

[http://www.nilim.go.jp/lab/qbg/bunya/cals/pdf/guidebook\\_bridge\\_cim.pdf](http://www.nilim.go.jp/lab/qbg/bunya/cals/pdf/guidebook_bridge_cim.pdf)

Figure 1 Example of Use of a 3D-model to Plan Inspections

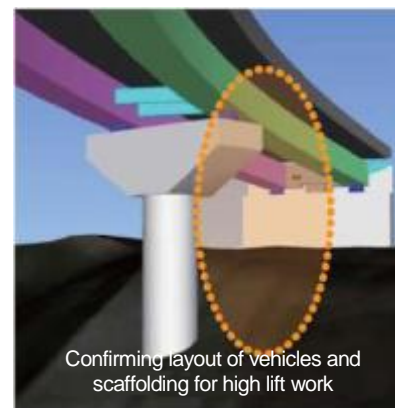


Figure 2 Setting the Level of Detail for a 3D Model around Girder Ends

