
Research Center for Infrastructure Management Activities for the Third Year and Future Prospects

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1. Introduction

Researches in Research Center for Infrastructure Management (the "Center") cover a wide range of fields, including estimation, public bidding / contracting methods, project evaluation, analysis of economic effect, construction work using ICT, utilization of the three-dimensional data from research to maintenance, urban greening, ecosystem conservation, landscape / historical community development, and support of recovery from the Kumamoto Earthquake disaster. The following introduces main activities of the Center, which is now in the third year from installation, including future prospects.

2. Efforts for productivity improvement

The MLIT is making all-out effort for productivity enhancement by designating the year of 2016 as the "year to start productivity innovation" and the year 2019 as the "year to achieve productivity innovation." For productivity improvement in construction sites, the MLIT is also working for "i-Construction" as one of the important measures, which utilizes three-dimensional data, ICT, etc. in each stage of construction process, including research, design, construction, test, maintenance, and renewal. From this year, Public/Private R&D Investment Strategic Expansion Program (PRISM) is also promoting i-Construction, and the Center is also working for research based on PRISM.

(1) Works using ICT

Technologies to obtain position data using satellite positioning and three-dimensional data using laser scanner, etc. are progressing, and works using ICT that utilizes such technologies to conduct engineering survey, automatic control of construction machines, work progress control, etc. have been implemented in earthwork, pavement works, and dredging works. The Center has been studying formulation of standards for promoting the introduction of the above-mentioned devices into construction sites. In fiscal 2017, such

standards were just revised to allow for survey with an echo sounder and work progress control using the history of construction machines. We continue to study on the expansion of types of works and utilization of new technologies.

(2) Introduction / dissemination of CIM

The MLIT has been using CIM models since fiscal 2012 as one of the activities for utilization of three-dimensional data.

CIM (Construction Information Modeling/Management) aims to facilitate information sharing among the persons concerned with the project and thereby achieve efficiency improvement / upgrading of the construction production system by introducing 3D models from the stages of planning, research, and design to the stages of construction and maintenance. The Center is also studying procedures and standards for the introduction and dissemination of CIM. The Center will also study three-dimensional models available for calculating the quantity of civil engineering works, simple 3D models of existing structures, etc. for further utilization of CIM models. The Center also intends to study CIM introduction for machines and equipment.

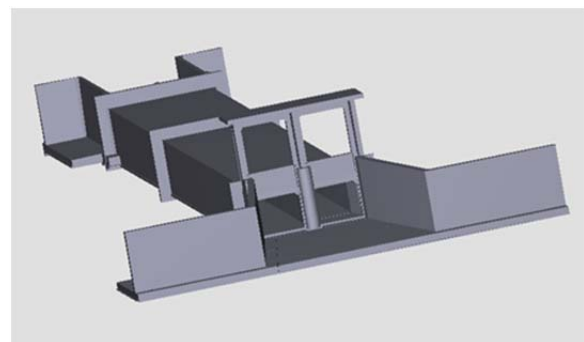


Fig. Expansion of the applicable types of works for "3D Annotation Standards (Draft)"
(Figure is an example of sluice)

(3) New technologies including IoT and AI

The Center is also working for introduction of new technologies including IoT and AI by studying

measures for preventing construction work accidents using AI, data creation for time series changes in construction sites in view of automatic construction / process control, etc. We intend to aim at productivity improvement by taking in new technologies actively.

3. Improvement of public bidding / contracting methods

Public bidding / contracting methods have been continuously improved according to the demand of the times and changes in social situations. As a result of the 2014 revision of the Act on Promoting Quality Assurance in Public Works ("Quality Assurance Act"), quality assurance for the present and future public-works and development / securing of human resources on a mid- and long-term basis were added to the purpose of the Act, and introduction / utilization of various bidding / contracting systems were included. Such systems include the technical proposal / negotiation method, which requests the builder's technical cooperation from the design stage, and is also consistent with the concept of front-loading / concurrent engineering (parallel / joint work), which aims at total optimization of the construction production process.

For this technical proposal / negotiation method, operation of the guideline started in 2015, and projects using this method began to appear in 2016. However, such projects are still few in the country and we are organizing effects of application, issues, and improvement matters considering the status of implementation in construction stage, technical proposal / negotiation method is applied to construction works in which the owner cannot determine optimal specifications or conditions requisite for specifications. We intend to continue the study to facilitate the progress of such works.

4. Traditional construction method supporting community-specific historic scenery

Since the establishment of the Act Concerning the Maintenance and Improvement of Historic Scenery in 2008, the movement of "Historical community development" is becoming active as seen from the fact that 70 municipalities were certified for their historic scenery maintenance and improvement plans (as of the end of Dec. 2018).

In such circumstances, repairing / maintenance sites of buildings that constitute historic scenery of the community are faced with the issue of how to secure

human resources, materials, funds, etc. concerning the traditional construction method specific to the community. The Center is therefore working for sharing the basic concept, specific ideas, and know-how in implementing sustainable community development through maintenance / utilization of traditional construction methods by conducting hearings from experts concerned, research of similar activities in the country, etc. We intend to continue researches for development of unique and good communities.

5. Support of restoration from the Kumamoto Earthquake disaster

In the works for restoration from the Kumamoto Earthquake disaster, which occurred in April 2016, advanced technical knowledge about bridges etc. has been required and a division was installed in April 2017 by stationing research personnel on the site to accelerate the project. This division is providing prompt and elaborate technical support on the site and contributing to early restoration for projects led by Regional Development Bureaus and local governments.

In July last year, restoration of the Kuwazuru Bridge by exchanging the hanging cable of the cable-stayed bridge was finished and shared. The division also gives advice on future management in addition to guidance for restoration. While providing technical support for early recovery, we intend to reflect the knowledge obtained in technical standards and study aseismic structure etc. enabling easy functional recovery based on the same knowledge.



Photo: Kuwazuru Bridge after restoration

6. Conclusion

As new technologies including IoT and AI are remarkably progressing, we intend to improve on-site productivity and study social capital management according to site needs using these new technologies.