

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

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1. Introduction

This year is the second year of Social Capital Management Research Center (the "Center"), which was newly opened in NILIM. The first research center organization concerning construction management techniques is Estimation Technical Research Center, installed in Public Works Research Institute in 1991. In 1997, this organization was expanded to Construction Management Technical Research Center to study construction management techniques under the further improved system and has been studying for 20 years since then. During this period, research areas have changed and expanded according to realignment of the organization in response to changes in social conditions. The present subjects of research comprise various fields, including estimation, public bidding / contracting methods, project evaluation, analysis of economic effects, ICT utilization / total optimization of concrete works for construction productivity improvement, information infrastructure such as CIM, landscape and ecology, 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 second year, including future prospects.

2. Productivity improvement of construction works

When Japan is faced with depopulation and super-aging society, in order to enhance growth potential by improving productivity, the MLIT is working on 20 projects including i-Construction. The purpose of i-Construction is to improve the productivity of construction site by 20% not later than fiscal 2025 using ICT in the whole construction production process, which also contributes to working-style reforms for development / securing of workers on a mid- and long-term basis.

(1) Works using ICT

Technologies to obtain three-dimensional position data using satellite positioning, 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 to promote on-site introduction of such technologies and implemented study in the current fiscal year on revetment, tunnel, maintenance work, etc. to expand work items. We intend to continue the study on further expansion of work items, continual improvement of standards, new technology utilization methods, etc.

(2) Introduction / dissemination of CIM

CIM (Construction Information Modeling / Management) contributes to efficiency enhancement / upgrading of a series of construction production systems using three-dimensional models and is expected to produce the effect of productivity improvement as shown in Figure.

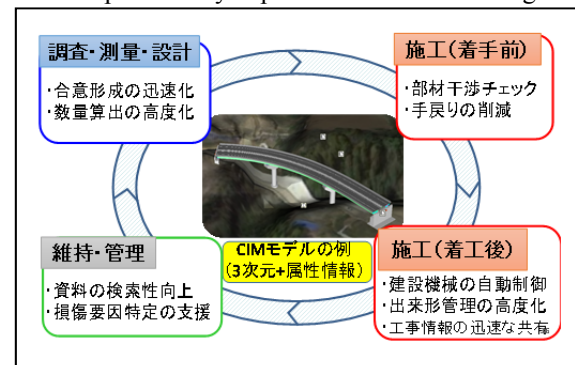


Figure: Effects of CIM

The Center has been studying procedures and standards for introduction / dissemination of CIM, and implemented study in the current fiscal year on creation of standard specifications to utilize CIM models for construction contract documents and drawings, quantity calculation method using CIM, etc. In order to further promote introduction and dissemination, we also continue the studies on formulation of specifications / standards for data exchange, simple three-dimensional model creation methods for existing structures, specific utilization methods in maintenance phase, etc.

3. Improvement of public bidding / contracting methods for public works

Public bidding / contracting methods have been continuously improved according to the demand of the

times and changes in social situations. As a recent example, the Act on Promoting Quality Assurance in Public Works ("Quality Assurance Act") was revised in 2014 to add quality assurance for the present and future public-works and development / securing of human resources on a mid- and long-term basis 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. Utilization of CIM is also expected to advance total optimization more efficiently. In order to increase the cases where this public bidding / contracting method is applied, the Center is proceeding with the study leading to revision of the operation guidelines, including analysis of projects that adopted this method and organization of the matters to be improved.

In July last year, "Guidelines for application of public bidding / contracting methods in disaster restoration" (MLIT) were established so that appropriate recovery projects are promptly undertaken after disaster in response to the recent disasters that are intensifying and frequent. The Center investigated and analyzed the disaster cases in the past projects under direct control and organized the basic concept for application of public bidding / contracting methods that contribute to early recovery so that the concept is reflected in the content of the guidelines above. In view of the recent disasters that frequently occur in the country, significance of working for disaster restoration appropriately is increasingly rising regardless of project owners and dissemination / utilization of these guidelines for local governments' projects is therefore becoming important. We intend to follow up as appropriate while watching the status of utilization.

4. Green infrastructure contributing to urban disaster prevention / mitigation

In the National Spatial Strategies, decided by the Cabinet in 2015, green infrastructure was defined to advance the sustainable and attractive national land and regional development utilizing the various functions of natural environment in both structural and non-structural aspects, such as social capital development and land use. The Center prepared "Guidelines for Planning / Design / Administration of Disaster Prevention Park (revised, second version)" in September last year by adopting the concept of administration based on the state of use in the

Kumamoto Earthquake so that the function of city parks as one of green infrastructure is sufficiently demonstrated. The Center is also proceeding with the study on the planning / realization method contributing to disaster prevention / mitigation, not only parks but the whole green area for disaster prevention including roads, rivers, and private wood land. We intend to increase knowledge on more effective management of green infrastructure while proceeding with example collection and analysis and return findings to society.

5. Measures for restoration from the Kumamoto Earthquake disaster.

In the works for restoration from the Kumamoto Earthquake disaster, which happened in April 2016, advanced technical knowledge about bridges etc. has been required and a division was installed in April last year by stationing research personnel on the site in order 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 August last year, 16 months after the occurrence of the Earthquake, service of the Aso Choyou Great Bridge Route, which was seriously affected by the disaster, was resumed, which gave great momentum to restoration of the region (Photo). We intend to provide technical support to restoration works, including the Aso Great Bridge and advance the study on aseismic structure enabling easy functional recovery by collecting and analyzing information obtained on the site according to the progress of work and reflecting it in technical standards.



Photo: Resumed service of the Aso Choyou Great Bridge Rout (Aug. 2017)

6. Conclusion

We intend to continue the study on social capital management according to on-site needs so that study findings are applied to practical activities using up-to-date ICT technologies, which are remarkably progressing, including AI, IoT, and high-speed large capacity communication.