Contribution to early recovery with the establishment of Kumamoto Earthquake Recovery Division and overall technologies

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Keywords: Kumamoto Earthquake Recovery Division, road bridge, early recovery, advanced technological support

1. Introduction

The Kumamoto earthquakes in 2016 caused significant damage to road facilities. The road network connecting the Kumamoto and Aso areas remained disconnected for a long period of time. This report introduces the technical support that the National Institute for Land and Infrastructure Management (NILIM) provided for an early recovery.

2. The establishment of the Kumamoto Earthquake Recovery Division and its mission

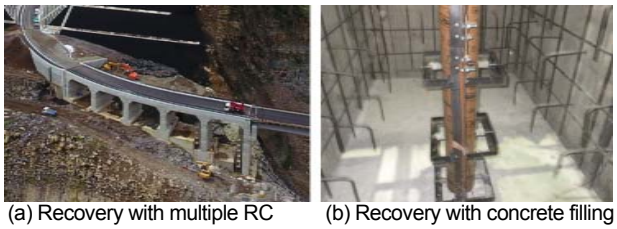
To accelerate the recovery and restoration from the Kumamoto earthquakes, the NILIM installed the Kumamoto Earthquake Recovery Division in April 1, 2017, in the village of Minamiaso, which was close to the disaster recovery sites. It was the first attempt by the NILIM to install an on-site division. The division is working while maintaining close contact with the Kumamoto Restoration Office installed on the same day in the Kyushu Regional Development Bureau in the same building.[1]

The Kumamoto Earthquake Recovery Division has two major missions. The first mission is to promptly solve problems that require advanced and special technologies for the recovery work on site. The second mission is to gather technical knowledge through the recovery work and engage in research for reflection in national technical standards and other references.

3. Technical ideas reflected in the restoration of the Aso Choyoo Bridge

The Aso Choyoo Bridge is a four-continuous PC box girder rigid frame bridge. The slopes around the bridge collapsed, and major subsidence occurred at the A1 abutments of the bridge as shown in photo 1. In this case, the bridge was restored with a multi-RC rigid frame structure as shown in photo 2 so that the bridge would be able to stand by itself while retaining enough support at the back while excavating and removing unstable ground based on the observation of the damage on the ground after the disaster.[2]

Meanwhile, the P3 bridge pier had a crack that penetrated through the mid-height where the inside was hollow. Based on knowledge of the NILIM about the mechanism of damage that can occur during an earthquake on a RC bridge pier with a hollow section, the hollow section where the crack was found was evaluated as losing the shear resistance function of the concrete.



(a) Recovery with multiple RC reinforcement structure (b) Recovery with concrete filling

Photo 2: Aso Choyoo Bridge that reopened after emergency restoration

Thus, the selected recovery method was to restore the shear resistance function by filling the hollow section with fluid concrete based on the comprehensive examination of the feasibility of the repair and its effects on other sections.[2]

4. Conclusion

The Kumamoto Earthquake Recovery Division is also conducting studies by taking advantage of being a research laboratory at the site of a natural disaster. The studies include tests using the cables of a removed cable-stayed bridge and measures to use recovery construction management data for future maintenance and management. The researchers are going to properly identify the needs of actual recovery sites and promote studies that would be useful at the actual sites and distribute the outcomes of such studies.

☞For detailed information

1) Civil engineering reference Vol. 59, No. 6, pp. 44-45, June 2017
2) Civil engineering reference Vol. 59, No. 10, pp. 46-49, October 2017