

## Research Trends and Results

# Development of Technology to Clarify State of Damage to Road Bridges by an Earthquake

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### 1. Introduction

As preparation for large-scale earthquakes such as the Tokyo Inland Earthquake or the Nankai Trough Earthquake, this research developed technology for real-time clarification of earthquake damage and obstruction of traffic on road bridges as areal information in order to be able to more quickly and efficiently open roads to traffic after a large-scale earthquake.

### 2. Analysis of disaster cases

Of results of emergency inspections by the Tohoku Regional Development Bureau after the 2011 Great East Japan Earthquake (1,504 bridges on government managed highways), results indicating the state of damage on 485 road bridges that suffered damage effecting their passibility or their bearing strength were analyzed. The results showed deformation near the end bearings (girder ends) of 80% of the bridges as shown in Figure 1, and clarifying this deformation (level difference etc.) of girder end bearings by this earthquake revealed obstacles to passability of almost all the bridges. And judging from the emergency restoration history, it is possible to presume that traffic will be blocked by a level difference of 100mm or more, and on road bridges with approach cushions placed to prevent a level difference on the approach behind their abutments, level differences of 100mm did not occur, confirming the level difference reduction effect of approach cushions.

### 3. Trial of earthquake damage clarification technology

Based on the results presented in 2., focusing on deformation near the end bearings (girder ends) of road bridges, in FY2013, full-size experiments and long-term observations were conducted on the NILIM grounds, to build a road bridge earthquake damage clarification technology system like that shown in Figure 2. In FY2014, with the cooperation of regional development bureaus, the system was installed and operated as a trial on five bridges with different structures, and its operability and state of its measurements are now being verified. Figure 3 shows how it was installed.

### 4. Future efforts

In the future, we wish to develop a highly trustworthy

and reliable road bridge earthquake damage clarification technology by continuing to conduct trial observations and organize and analyze the state of measurements to improve the system.

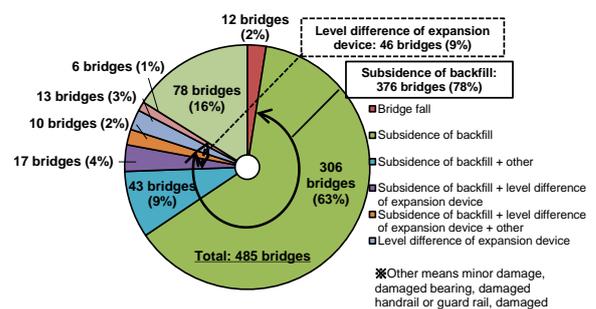


Figure 1 Factors causing earthquake damage to bridges

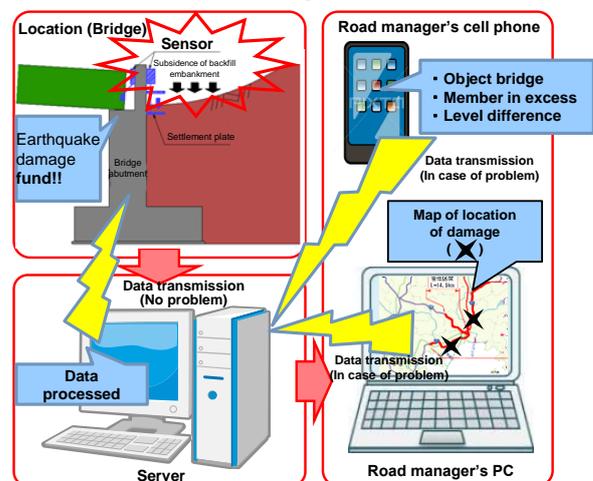


Figure 2 Outline of the Road Bridge Earthquake Damage Clarification Technology



Figure 3 Installation case