Bridges

*In-depth bridge survey technologies*
- *Vibration and shape measurement for performance diagnosis*

Regarding the performance of bridges with severe deterioration, the conventional maintenance and management methods centered on visual inspection were limited to stop-gap measures to repair only the damage concerned. To meet clients’ requests to know the level of load bearing, durability, etc. of such deteriorated bridges, we propose non-destructive inspection approaches that can easily measure the shape and vibration of those structures and assess their health level.

◆ **Non-destructive inspection approaches**

We propose

1. measuring the vibrations of structures by laser beam, etc.  
2. measuring shapes in 3D at high speed by laser beam, etc.

- When measuring the vibrations at many points of bridge girders, we can **efficiently conduct the survey** by using a laser Doppler velocimeter that is **easily movable**.
- We can measure damaged parts in 3D by scanning the shape of seriously damaged bridge girders, etc.
- By directly analyzing the 3D shape data, we can **accurately assess the effect of deterioration**.
In-depth bridge survey technologies (cont.)
-Vibration and shape measurement for performance diagnosis-

◆ Structure performance identified by our vibration measurement method

Vibration and distortion of a PC girder deteriorated by salinity

Results of measurement of the number of passing vehicles by vehicle weight

Features
1. Can assess changes in the state of a structure quantitatively by measuring continuous vibration and distortion and analyzing characteristic values.
2. Can calculate the vehicle weights and traffic volume of passing vehicles from the results of measuring the vibrations and distortion of bridges, and determine the actual status of traffic load.
3. Based on vehicle weights and traffic volume, we can check for fatigue of the floor slabs and main beams of bridges in a way suited to the actual situation.
In-depth bridge survey technologies (cont.)

◆ Structure performance identified by our 3D shape measurement method

Features
1. The 3D shape measurement method enables high-precision measurement in a short time with a laser scanner, high-precision photographic measurement system (3D photogrammetry system), etc.
2. By accurately measuring the forms of deformation, cracks, deteriorated sections due to collision and other external forces, progress of corrosion and fatigue, etc. and conducting non-linear analysis, we can accurately assess the effects of deterioration on structures.
3. By placing reinforcing members fitted to actually measured shapes and analyzing them, we can identify and propose effective reinforcing solutions.