Analysis of deterioration characteristics of road bridges based on regular inspection data

(Research period: FY 2015–2017)

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1. Objectives and background of the study

Road bridges managed by the national government have been regularly inspected since 2004, and records of objective, detailed conditions have been accumulated. These records are supposed to be organized as the statistical data of age-based deterioration to identify deterioration characteristics to utilize the knowledge for mid-to-long-term maintenance and management.

Therefore, to identify deterioration characteristics, the Bridge and Structures Division has been using the data accumulated from the regular inspections of bridges conducted by the national government to statistically analyze the deterioration characteristics of the different components of bridges under various conditions, such as the installation environment and planar positions of the components.[1]

2. Statistical deterioration characteristics based on inspection data

The national governments have been regularly inspecting bridges and recording the evaluation of the level of damages in up to five categories from a to e for each of 26 types of damage in detailed categories of the elements of bridge components. Thus, changes in the level of damage in the same elements within five years were counted, and the Marcov transition probability matrix was calculated.

Figure 1 is an example of the condition probability distribution for every five years based on the year of design, the onset of water leaks, and the generation of free lime in cracks on the concrete floor of bridges made with steel sheets prepared using the calculated Marcov transition probability matrix. Figure 1 shows the level of damage (a to e) by scoring it from 1.00 to 0.00 in units of 0.25, the deterioration curve in which the mean of the level of damage for every five years is regressed as the cubic function of the number of years passed, and the deterioration curve, which is the regression of the value of the mean ±σ. Differences in the mean deterioration characteristics under different conditions were reflected in the figure as the deterioration curves regressed under various conditions using a large amount of high-quality data. Meanwhile, the scattering around the mean value was still large. The result indicated that precision was expected to improve with the accumulation of data in the future in regard to identifying the mean deterioration characteristics of many bridges. Meanwhile, the scattering was large for the deterioration forecasting of individual bridges and elements.

3. Summary

It is necessary to examine how the outcomes of deterioration forecasting should be used in actual maintenance work while assuming that no correct answer is available for the deterioration forecasting of individual bridges and that the precision would not improve significantly. The analytical results of deterioration characteristics under different conditions and observation concerning precautions for the use of the analytical results have been released for use by road administrators.[2]

☞For detailed information

1) NILIM Report 2017. The Analysis of Road Bridge Deterioration Characteristics based on the Data of the Regular Inspections of Road Bridges
http://www.nilim.go.jp/lab/bcg/siryou/2017report/ar2017hp074.pdf

2) NILIM Reference No. 985. The Analysis of the Deterioration Characteristics of Road Bridges using the Data of Regular Inspections
http://www.nilim.go.jp/lab/bcg/siryou/tnn/tnn0985.htm

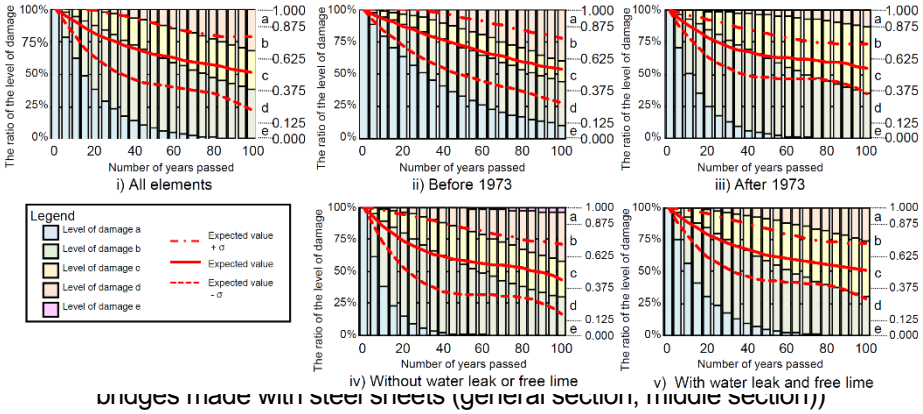

Figure 1: Ex :rete floor of bridges made with steel sheets (general section, middle section))