

Study on damage to existing road earthwork structures and survey on soundness assessment

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Keywords: earthwork structure, damage, periodic inspection

1. Introduction

The function and performance of road earthwork structures must be maintained in order to ensure safety and the smooth state of road traffic. Periodic inspection procedures were formulated in 2014 for sheds (covered ways, etc.) and large culverts (closed conduits, etc.) out of road earthwork structures, and inspections based on these procedures are progressively carried out.

The tendency for damage to the structures and causes of the damage are comprehended for identifying the issue based on the results of periodic inspections in a study for making inspection more reliable and efficient.

2. Damage characteristics of existing road earthwork structures

The results of the periodic inspections in fiscal 2014 of 144 sheds and 220 large culverts facilities of national highways under direct government control have been organized, and analyses were conducted with respect to the structure's soundness and deformation in relation to the structural type and the completion year and the like.

For sheds, the judgment classification of structure soundness into four classes from I to IV showed that about 15% were classified as I (healthy), about 42% as II (preventive maintenance stage), and 42% as III (early action stage) with no IV (emergency action stage) class. The trend as viewed by the completion year is that, the newer the sheds, the larger the proportion of sheds in healthy condition (Figure 1), although there are variations. The characteristics of deformations occurring by the structure type are that cracks, peeling/rebar exposure, and water leak/build-up at the pile caps are notable for RC structure sheds, cracks at the superstructure and valley side structure are notable in sheds with PC structures, and corrosion of braces and corrosion of shoes at the leg are significant for sheds made of steel. These results confirm that deformation is significant at different members and the type of deformation varies according to each structure type. According to the results of these inspections, about 70% of sheds were built over 30 years ago, and it is assumed that they have started to show deformations in the joint sections that cause water leakage and corrosion in steel materials.

For large culverts, the judgment classification of structure soundness was 41% as I, 50% as II, 9% as III, and no IV. In the trend viewed by completion year, the newer the facilities, the larger the proportion of facilities

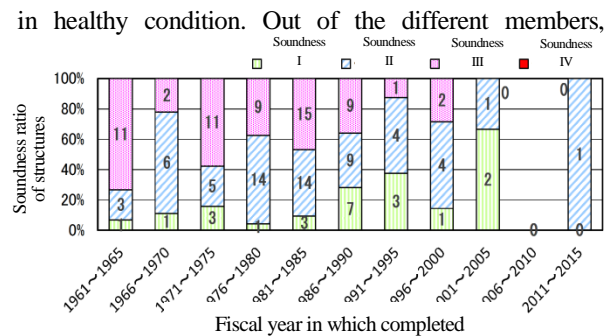


Fig.1 Completed year and soundness of structures (Shed)

deformation occurred most frequently in the top slabs and side walls. Of the types of deformation, cracks were particularly notable, with peeling/rebar exposure and water leakage/free lime also tending to occur often. Comparison of the evaluation of the extent of deformation of cracks (classified into classes b to e, as the extent gets larger) between the top slabs and the side walls, both with a large extent of deformation, confirms that the ratio of class e that represents a large extent of deformation is higher in the top slabs (Figure 2). There is a tendency that class e cracks are more liable to occur in a facility where the earth cover is thin, possibly due to the influence of loads from vehicles traveling on the road above.

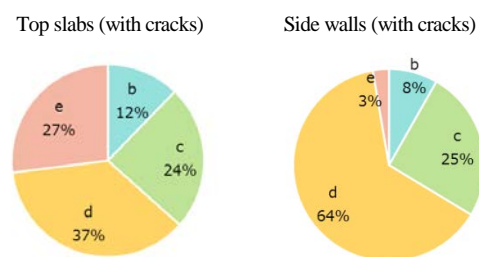


Fig. 2 Comparison of deformation between the top slabs and the side walls (large culverts)

3. Conclusion

Periodic inspections of sheds and large culverts started in fiscal year 2014, and the plan is that going forward an analysis with even higher accuracy will be conducted by continuing to accumulate inspection data.