Creation of Visual Inspection Criteria for Deterioration of PVC Pipes

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1. Introduction

In recent years, road cave-ins and similar accidents have been frequently seen. To prevent such accidents, the deterioration in sewers should be accurately detected.

Deterioration in sewers is commonly determined in accordance with visual inspection criteria using TV cameras, but these inspection criteria were established mainly for rigid pipes such as reinforced concrete pipes.

It is, therefore, difficult to detect deterioration with the conventional criteria for PVC pipes, which are plastic flexible pipes and account for about 50% of the total length of pipe in the country.

Considering such circumstances, NILIM has established visual inspection criteria (draft) for detecting deterioration in PVC pipes.

2. Preparation of visual inspection criteria for PVC pipes

For sewerage, rigid pipes such as reinforced concrete pipes and earthenware pipes, and plastic flexible pipes such as PVC pipes are mainly used. These two types of piping are greatly different in structure and material, so their characteristics of deterioration are also different. For example, reinforced concrete pipes are very strong but are susceptible to changes in material properties, while PVC pipes are not susceptible to such property changes but are susceptible to changes in shape.

Accordingly, NILIM collected and analyzed TV camera survey data from local governments in order to identify the deterioration characteristics unique to PVC pipes and create visual inspection criteria for deterioration, and conducted TV camera surveys of PVC pipes laid more than 30 years ago, and load-proof performance tests and two-dimensional nonlinear static analyses (CAE) of deteriorated PVC pipes.

Consequently, as deterioration characteristics of PVC pipe, the presence of overall section change (Photo 1) and local section change (Photo 2), and the relationship between cracking and load bearing capacity were clarified. Based on these findings, we added the flatness and deformation of PVC pipes to visual inspection criteria, and clearly positioned the inspection criteria for cracks, etc. (Table).

Photo 1: Example of Flatness **Photo 2: Example of Deformation**

3. Conclusion

The Japan Sewage Works Association is revising the Sewerage Maintenance Guideline, to which the visual inspection criteria for PVC pipes, created by NILIM, will be added.

Table: Visual Inspection Criteria (Extract)

	Rank		a	b	c
	Item	Operation	a	b	c
Inspection for each pipe	Damage and axial crack to pipe	Reinforced concrete pipe	Lack / Axial crack 5 mm or more in width	Axial crack 2 mm or more in width	Axial crack less than 2 mm in width
		Earthenware pipe	Lack / Axial crack at least one-half of the pipe length	Axial crack less than one-half of the pipe length	-
		PVC pipe	Map crack / Axial crack	-	-
	Flatness	PVC pipe	Flat with flexibility factor of 15% or more	Flat with flexibility factor of 5% or more	-
	Deformation (Projecting inward)	PVC pipe	Whitened or projecting inward less than 10% of the inner diameter of the pipe	Projecting inward less than 10% of the inner diameter of the pipe	-