Analysis of the Effect of Accumulated Fallen Leaves on Drainage at Catch Basin Cover (Research period: FY2015 to FY2018)

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1. Introduction

As one of the causes of road flooding, cases where accumulation of fallen leaves around the cover of or inside catch basin prevents rainwater from flowing into sewer pipes were reported. Since the possibility of the accumulation of fallen leaves on and around basin cover greatly affecting drain capacity was indicated based on the accumulation of fallen leaves inside the basin according to past studies [1)], it is important to grasp the effect of fallen leaves on catch basin cover and drain capacity in the basin in studying measures for reducing the frequency of road flooding. We therefore conducted an experiment to confirm the effect of accumulation of fallen leaves around the basin cover on the drain capacity of basin cover.

2. Outline of the experiment

The experiment was conducted on a total of 253 cases of basin cover drainage using a real-size road model (Fig. 1) in combination of 3 types of fallen leaves including zelkova, no fallen leaves, 3 types of the accumulation of fallen leaves (1 / 3 / 5 kg), 3 types of basin covers (Fig. 2), 3 conditions of water supply (1.3 / 2.6 / 4.3 L/s) corresponding to rainfall of 30 / 60 /100 mm/h, and 3 types of road longitudinal slopes (0.5 / 2.0 /6.0%). As means for accumulating fallen leaves, assuming fallen leaves flowing from upstream during rainfall, we spread evenly a half of the accumulation of fallen leaves on road gutters in advance, about 4.5 m upstream from the catch basin cover, and additionally input the other half in divided amounts after elapse of one minute from the start of water supply.

Drainage from the basin cover was measured in the triangular weir by evaluating the value ("drainage rate")

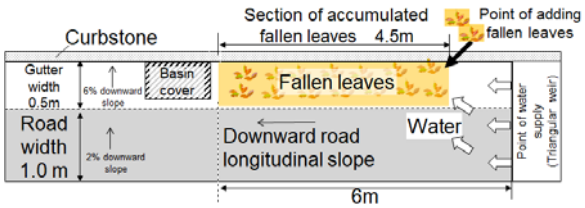

Fig. 1. Model plan view

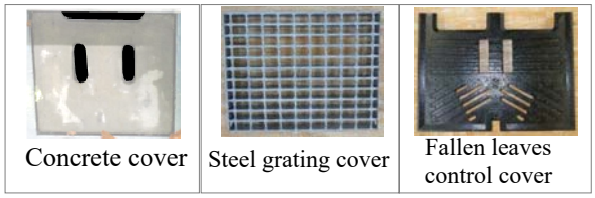

Fig. 2. Basin cover type

obtained by dividing drainage (L/s) by water supply (L/s) as drainage capacity of the basin cover.

3. Experiment results

Table 1 shows the results of drainage experiment on the steel grating cover by changing road longitudinal slope, water supply, and accumulation of zelkova fallen leaves ("Amount of accumulation"). In order to check the difference of drainage rate according to whether fallen leaves are present or not, the drainage rate when there are no fallen leaves and 3 drainage rates of the three types of accumulation of fallen leaves of zelkova were compared under the same conditions of road longitudinal slope and water supply. In all the 27 cases, the drainage rate when zelkova fallen leaves were accumulated was smaller than the drainage rate of no fallen leaves. Further, drainage rates for each amount of accumulated fallen leaves under the same conditions of road longitudinal slope and water supply were compared in order to confirm the difference of drainage rate according to the difference of accumulated amount of zelkova leaves. In 5 out of 9 cases, maximum value was observed when the amount of fallen leaves was 1 kg, intermediate value, when 3 kg, and minimum value, when 5 kg. In the other 4 cases (Table 1, yellow hatches), when the accumulated amount was the maximum (5 kg), the drainage rate was not the minimum value and we continue to analyze the experiment results.

Table 1 Experimental results

Road longitudinal slope (%)	Water supply (L/s)	Drainage rate (%)			
		No fallen leaves	Amount of zelkova fallen leaves		
		0kg	1kg	3kg	5kg
0.5	1.3	100.0	100.0	59.8	75.9
0.5	2.6	100.0	58.5	41.3	41.3
0.5	4.3	100.0	54.7	35.0	33.1
2.0	1.3	100.0	71.0	59.8	71.0
2.0	2.6	100.0	75.7	45.2	38.7
2.0	4.3	100.0	72.4	38.9	27.1
6.0	1.3	100.0	57.7	57.7	68.7
6.0	2.6	97.8	75.7	63.4	61.7
6.0	4.3	98.2	56.0	54.7	48.7

Maximum value. Minimum value Intermediate value

1) 2018 NILIM Report, p.49
http://www.nilim.go.jp/lab/bcg/siryou/2018report/ar2018hp019.pdf