

Surveillance study on effect of infiltration facilities introduction in Fukuoka City

Whole term

2003.7 ~ 2004.3

(Purpose)

The area served with sewerage of Fukuoka City is 16,239 ha as of the end of FY2002, and the area of 2,494 ha corresponding to about 15% of it is served with combined sewerage. Though combined sewerage has merits such that the execution of work is easy, it has various problems such as the discharge of untreated effluents in wet weather and impurities. So, Fukuoka City intends to positively grapple with a scheme of fully employing separate sewerage to solve those problems. Further, in addition to the scheme of fully employing separate sewerage, Fukuoka City is studying to introduce infiltration facilities for the purposes of obtaining the effect of reducing the diffused pollutant loads and contributing to the improvement of inundation safety.

The purpose of the present study is to quantize the effects of reducing the discharge of storm sewage and the pollutant load amounts by the infiltration facilities, for clarifying the effects of introducing infiltration facilities.

(Research policy)

(1) Facilities covered

The present study covered infiltration inlets, infiltration gutters and infiltration trenches, since they are abundantly used in the sewerage service and since numerous findings accumulated from experiments and investigations are available for them.

(2) Setting of infiltration amounts

1) Infiltration amount calculation conditions of respective types of infiltration facilities

The infiltration amounts of respective types of infiltration facilities were calculated under the following conditions.

- a. Infiltration inlets (square): Square inlets are not taken into account for calculation of infiltration amount, considering that the infiltration amount of the infiltration gutters includes that of the infiltration inlets (square) acting as road catch basins.
- b. Infiltration inlets (circular): For the area obtained by subtracting the areas of municipal roads and footways from the combined sewerage district area of 2,494 ha, the infiltration amount is calculated based on 20 inlets per ha*.
- c. Infiltration gutters: It can be considered that one gutter is installed on one side of a road or on each of two sides of a road, depending on the width of the road. The number of gutters installed is calculated for each case.
- d. Infiltration trenches: Trenches are not taken into account for calculation of infiltration amount, considering that the infiltration amount of the footways includes that of the infiltration trenches since calculation is made on the assumption that all the footways in the combined sewerage district are of water permeable pavement.

* From “Manual of Sewerage Rainfall Infiltration Techniques” (Japan Institute of Wastewater Engineering Technology)

2) Calculation of infiltration intensities of respective types of infiltration facilities

The infiltration intensity of each type of infiltration facilities was calculated as described below.

- a. Past infiltration experiment results of Fukuoka City were compiled and the specific infiltration amounts (m²) were calculated from the ultimate infiltration amounts (m³/hr).
- b. The specific infiltration amount (m²) of each experimental facility was converted into the equivalent ultimate infiltration amounts (m³/hr) of various standard structural drawings.
- c. The equivalent ultimate filtration amounts (m³/hr) were multiplied by various safety factors and influence coefficients to calculate a unit design infiltration amount (m³/hr).
- d. The unit design infiltration amount (m³/hr) was multiplied by the number of installed facilities, to calculate a design infiltration amount (m³/hr).
- e. The design infiltration amount (m³/hr) was divided by the area of the combined sewerage district, to calculate the infiltration intensity (mm/hr).

(Summary)

Based on the calculated infiltration intensities, the amounts of the discharge of storm sewage and the pollutant loads respectively reduced by the infiltration facilities were evaluated as the effect of introducing infiltration facilities. As a result, the introduction of infiltration facilities is expected to exhibit the effect of reducing them in both amount and quality, and was confirmed to be effective for the Combined Sewerage Improvement Plan and as an inundation control measure.

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Keywords

Combined sewer system, Making to branch, Infiltration facilities, Amount of flow decrease, Pollution load amount reduction