Joint Research on Rainwater Infiltration Installation Plan (Central Konan Treatment Area, Otsu City)

Year of Research	2007	

(Purpose)

In urban areas, the rainwater infiltration area is decreasing as a result of progress in midtown redevelopment and suburban urbanization. As a result, urban flooding accompanied by inundation damage occurs frequently in the event of a short period of torrential rain. Conventionally, measures have been taken to facilitate rapid rainwater removal mainly by means of the installation of retention pipes and pump stations. However, runoff suppression measures by rainwater retention and infiltration are now attracting interest as a potential means of achieving further improvements, should they be targeted.

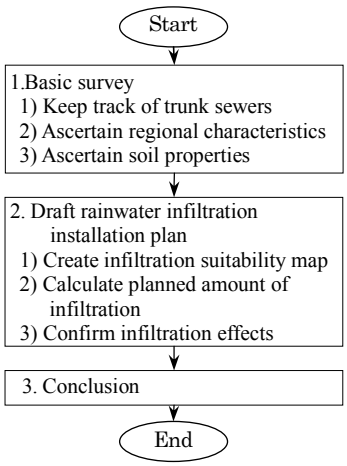

Figure 1 Work flow

These rainwater runoff suppression measures are also effective as a measure to prevent non-point pollution, and rainwater infiltration is being positioned as an urban groundwater recharge measure and an urban warming environmental mitigation measure. Otsu City created an infiltration suitability map, conducted an infiltration capacity verification test, and conducted a study on site planning and the effects of its introduction in the Otsu treatment area in FY2003 to 2005. In FY2006, and infiltration suitability map was created and a simplified study conducted on the effects of its introduction for the Kosei treatment area. For the remaining Central Konan treatment area (about 3,000 ha), this research explored the feasibility of a rainwater infiltration project and identified the effects of its introduction. The investigation was conducted following the work flowchart in Figure 1.

(Results)

(1) Summary of infiltration suitability map

1) In the entire Central Konan treatment area, the proportion of land suited to infiltration was 24.0% for permeable plate or block pavement, 25.9% for an infiltration galley or trench, and 24.4% for an infiltration manhole. Details are provided in Table 1.

2) The notable reasons for unsuitability were the selection of earth fill for permeable plate or block pavement and the selection of groundwater level for infiltration manholes.

Table 1 Area proportion by infiltration suitability rank

Infiltration suitability rank	Infiltration facility type					
	Plate, block, gutter		Galley, trench		Manhole	
	Area (ha)	Proportion (%)	Area (ha)	Proportion (%)	Area (ha)	Proportion (%)
1 Most suitable	222	7.8	273	9.6	184	6.5
2 Suitable	128	4.5	47	1.7	86	3.0
3 Somewhat suitable I	49	1.7	35	1.2	58	2.0
4 Somewhat suitable II	283	10.0	380	13.4	366	12.9
Subtotal	682	24.0	736	25.9	694	24.4
5 Somewhat unsuitable	497	17.5	315	11.1	289	10.2
6 Unsuitable	1,661	58.5	1,675	59.0	1,745	61.4
Subtotal	2,158	76.0	1,991	70.1	2,033	71.6
Data not available			114	4.0	112	4.0
Total	2,840	100.0	2,840	100.0	2,840	100.0

(2) Rough estimation of effects of installing infiltration facilities

1) Effects of infiltration facility installation

- If infiltration galleys are installed, the rainwater discharge capacity is increased by about 0.1 mm per hour throughout the entire treatment area.
- If infiltration galleys and infiltration trenches are installed, the rainwater discharge capacity is increased by 0.9 mm per hour throughout the entire treatment area.

2) Evaluation by runoff coefficient

- The share of infiltration facilities in the runoff coefficient (increment in runoff coefficient) is 0.001 to 0.0016 throughout the entire treatment area.

3) Evaluation by rainfall intensity

- The share of infiltration facilities in the rainfall intensity (increment in rainfall intensity) is 0.073 to 1.116 mm per hour throughout the entire treatment area.

4) Runoff reduction effect

- In the Asakawa drainage area, the peak runoff of the infiltration facilities will decrease by about 1.2 percent from the current 16.1 to an estimated 15.9 m^3 per second.
- In Asakawa drainage area, the total runoff of the infiltration facilities will decrease by 9.9 percent from the current 169,826 to an estimated 152,948 m^3, and the amount of infiltration will become 16,876 m^3.

(Future plan)

The effects of installing rainwater infiltration facilities throughout the entire Central Konan treatment area are low compared to those of other treatment areas. Thus, the necessity for rainwater infiltration installation to be started early is thought to be less urgent than that for other treatment areas.

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Key words	Rainwater infiltration, Infiltration suitability map, Runoff coefficient