

# Survey and investigation concerning water diversion characteristics in storage pipelines and connecting manholes (Kyoto city)

Year of Research

2012 • 2013

Implementation of anti-inundation measures

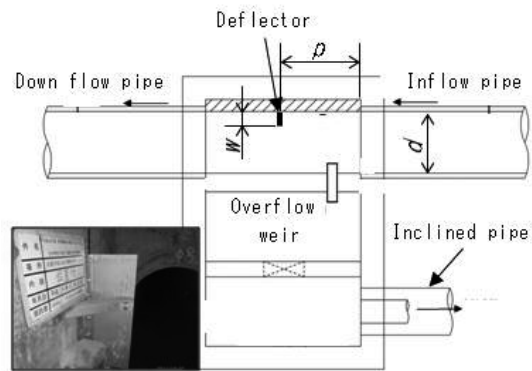
**(Purpose)**

The Higashi Oji trunk sewer line that was built in the Higashiyama district is a facility for anti-inundation and improvement of combined sewer system, and in order to effectively use its storage functionality it is important to implement water diversion with the planned volume at connecting manholes. This research was carried out over two years with the aim of understanding the effect of a deflector installed to improve water diversion characteristics, understanding the impact that the down flow function of the steep slope pipes that link the water diversion manholes with the Higashi Oji trunk sewer line has on anti-inundation and improvement of combined sewer system, and to determine whether it is necessary to improve water diversion function by applying the knowledge gained through research thus far to storage pipelines other than the Higashi Oji trunk sewer line.

**(Results)**

(1) Effect of deflector installation

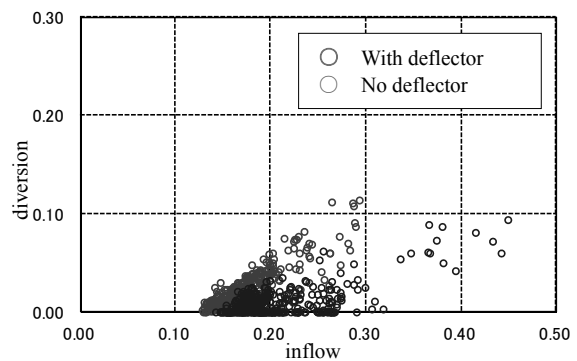
The flow volume, water level, and flow conditions are shown in **Figure 1**. The results of continuous measurement of the water diversion characteristics with measuring devices we installed are as shown in **Figure 2**. The installation of the deflector was shown to increase the volume of water diversion. The facilities in the scope of the survey and the rainfall during the survey period are shown in **Table 1**.



**Figure 1: Deflector installation overview**

**Table 1 Survey scope and rainfall**

Pipes	inflow pipe $\phi$ 800mm, inclined pipe $\phi$ 300mm
Deflector	Installation location( $p$ ):780mm( $\approx d$ )
	Overhang width( $w$ ):133mm( $=1/6d$ )
Rainfall	The observed rainfall in the survey period (8 Nov - 22 Jan) was 0.5mm/10min or more on 21 occasions



**Figure 2: Effect of deflector installation**

(2) Impact on countermeasure effects from down flow functionality of inclined pipes

The results of past investigations concerning steep slope pipe down flow capacity were applied to the analysis model for the Higashiyama district and a numerical simulation was implemented. This revealed that of the 14 locations in which steep slope pipes were installed, one location had the potential for insufficient down flow capacity. We proposed additional pipe installation henceforth to compensate for this lack of capacity.

(3) Evaluation of water diversion manholes in other districts

We evaluated water diversion characteristics by applying knowledge gained through prior research (including in other cities) to the 37 installed water diversion manholes in the 12 storage pipelines including the Kichijoin trunk sewer line. The results showed that for the water diversion manholes that aim to reduce pollution load, the tendency is to be similar to the water diversion characteristics assumed in the numerical simulation. As such, it can be considered that there is little necessity to improve the water diversion characteristics in order to improve confluence. However, for water diversion manholes intended to anti-inundation, the application of criteria obtained through offsite calculation was not in the scope of this research, and so no evaluation of their water diversion characteristics was performed. As such, it is necessary henceforth to separately identify the issues for these water diversion manholes.

**(Summary)**

We quantitatively evaluated the water diversion characteristics of a deflector and verified the effect of its installation with an onsite survey and offsite calculations. We also revealed that a lack of down flow capacity in the inclined pipes could potentially cause flooding. It can be considered that by utilizing the results of this research, planned water distribution can be achieved and effective operation of storage pipes is possible.

※ Kyoto city, Japan Institute of Wastewater Engineering and Technology  
Inquiries ; R&D Team 2: Hiroshi Kouchiwa, Yuji Ito, Shigeru Tsukada, Kimitoshi Sato, Ryo Matsuoka  
[03-5228-6598]

Key words	Anti-inundation measures, improvement of combined sewer system, deflector, inclined pipe
-----------	------------------------------------------------------------------------------------------