

## Study on Resolve the Urban Flood Phenomena

Whole term

2005.7 ~ 2006.3

**(Purpose)**

Since the law called Particular Urban River Flood Damage Protection Legislation enforced in May 2004, designation of the possible (expected) urban flood and submerged area (PUFSA) is under review. Flood Research Laboratory had held several “Urban Inundation Model Workshops” to examine the smooth designation method of the PUFSA, and has been investigating the applicability of the NILIM ver.1.0 (New Integrated Lowland Inundation Model) that was developed by FRL (Flood Research Laboratory), as well as other urban inundation models.

Although there has been frequent floods in urban area due to overflow from drainage systems, the data sets of hydraulics of submergence which are necessary for reviewing the model’s accuracy has not been accumulated. Moreover, hydraulics of the storm water inlets and connecting point between connecting pipe and drainage pipe had not been resolved. For these reasons, to determine analysis methods, “Urban Inundation Model Workshops” involving the literates had been newly held since 2005 fiscal year, and the investigations to resolve those hydraulic phenomena were set about.

This work has been carried out based on the examinations of the works of the 2005 fiscal year to understand the hydraulic phenomena, to review the hypothetical conditions of flow rate calculation inside the pipe that were used in the NILIM ver.1 and to propose improvement plans based on the experiments using the equipment that includes the conduit as ground surface, the main pipe and the manhole that connects the conduit and the pipe.

**(Results)**

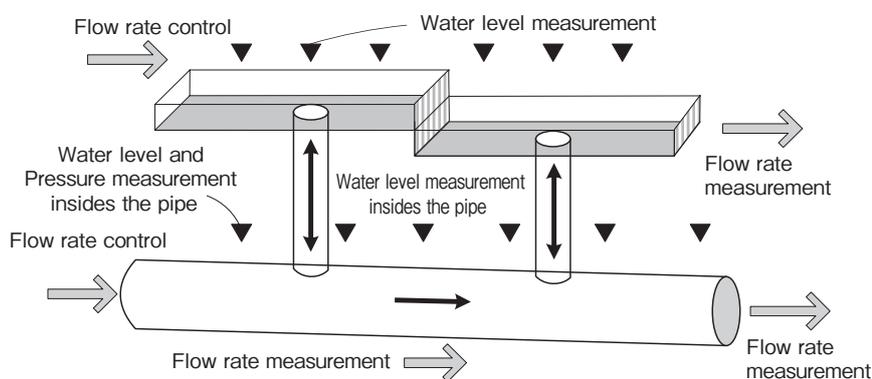
Based on the hydraulic experiment plan that was determined on the workshops of the 2005 fiscal year, two types of hydraulic experiments (type- A and B) had been carried out.

The each experiment’s results are as follows.

1. The experiment to identify basic hydraulic phenomena in the pipe: type- A

The experiments were carried out to identify the physical factor that rules ① the main pipe flow rate, ② the overflow rate from the pipe to the ground and, ③ reenter flow rate to the pipe. The results show as follows.

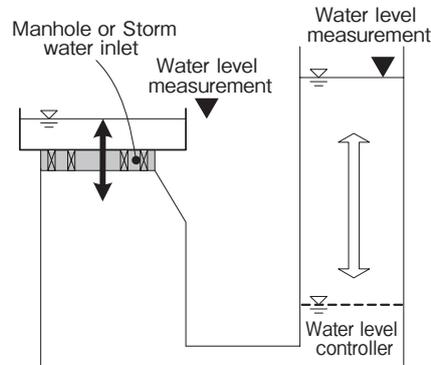
In both phenomena overflow from the pipe to the ground and reenter from the ground to the pipe, a significant correlation is confirmed, that is  $Q \propto \sqrt{\Delta h}$  ( $\Delta h$  : energy difference between the pipe and the ground water). This indicate that the flow rate calculation will be possible applying hydraulic equations such as an orifice equation ( $Q = \sqrt{2gh}$ ).



**Figure— 1 Concept of the experiment type- A**

2. The experiment to reveal the hydraulic natures of each drainage components in the phenomena both overflow and reenter : type-B

The experiments were carried out to identify the hydraulic phenomena of the each drainage components such as manhole and storm water inlet. That is to grasp hydraulic phenomena, next three experiments are conducted ; ① inflow from the ground to the pipe ; ② overflow from the pipe to the ground ; ③ reenter from the ground to the pipe.



Figure— 2 Concept of the experiment type- B

The results show as follows.

- (1) The flow coefficients obtained from each experiments are different, they have a tendency  $① < ③ < ②$  in order.
- (2) The flow rate through the rid of the manhole is extremely lower than that of the storm water inlets.
- (3) In the model NILIM ver.1.0, considering the use of the flow coefficients obtained from the each drainage components is necessary.

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key words

Urban submergences, Flood analysis, Specific urban river flood damages protection legislation