

Research on gate for combined sewer system improvement

Whole term

2001.4 ~ 2003.3

(Purpose)

Combined sewers, in which sewage and rain water are drained in a same sewer, have been long used by many cities (192 cities) which made efforts to disseminate sewers since they are economically advantageous thanks to its short construction period. Such efforts at an earlier stage have contributed to improve the living culture including public sanitation and prevention of submerged houses/buildings.

However, it is pointed that combined sewers have adverse effects on the public basin because they cause sewage to be flowed to the public basin through natural outfalls and drainage pumping stations when it rains.

“Sewage reservoir” is an effective means to reduce the untreated sewage discharged. It can reduce the amount of untreated water by retaining the water overflow from the treatment facilities when it rains and discharging when the weather improves. However, facilities such as ground water pool, drainage basin or reservoir pipes have problems because they require much space and expensive building cost. To overcome them, it is important to make the use of existing facilities. The flowing capacity of sewers has more room when the water amount is below the estimated precipitation. It appears that the amount for this extra room can be utilized as reservoir, solving the cost issue of facility construction.

This research investigates the possibility of installing gates in the existing sewers as well as its effect. It also intends to produce technical information providing outline, planning, design, construction and maintenance/management of the reservoir gates in the sewers.

(Result)

(1) Reservoir gate in the sewers

Reservoir gate is in principle installed in manholes located in the pump discharge area of confluence sewages and always closed allowing only the intercepted water (1Q to 3Q) to flow from the lower orifice member, utilizing the sewer as a reservoir pipe. The watermeter provided in the manhole tells to open the gate to discharge the water kept in the sewer down when the water level is high or water accumulation speed is fast. In case of a power interruption, the gate opens with a counterweight. This gate is equipped with not only a mechanical control but also a monitoring system utilizing a telephone line enables the remote control from a different place such as treatment facility or pumping station where an observer stations.

Providing a monitoring camera as necessary further facilitates the maintenance and management.

The facility with the aforementioned functions is to reduce the number of discharge of untreated water to the public basin such as rivers. It consists of a gate, a hydraulic unit for driving, an emergency release device, electrical control unit and a monitoring device. (See Fig.1)

(2) Effect of installation

The subject basin hardly suffered contamination load when the precipitation is less than 7mm/h, achieving 50% or more of the annual reduction ratio of the contamination load for each item. This reservoir gate in the sewer has turned out to be very effective in reducing the contamination load of the water discharged.

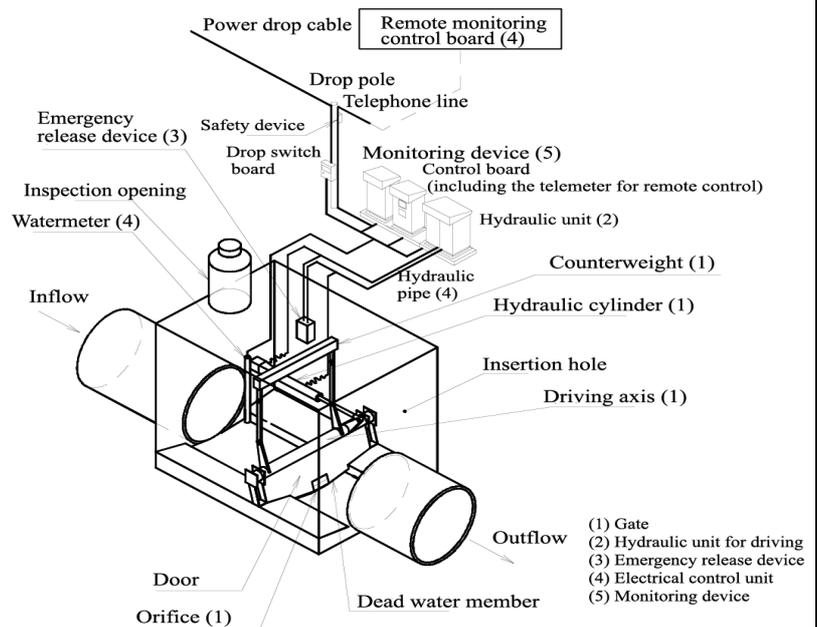


Fig. 1 Conceptual drawing of the reservoir gate in the sewers

(3) Cost-effectiveness

While installing a reservoir sewer (ϕ 2,000mm) with the same capacity as above costs about 750 million yen, the gate requires only 100 million so that the cost-effectiveness is significant. In order to achieve a diverted arrangement, at least 1,730m³ is required if it is without the gate while the system with the gate needs a reservoir unit of only 300m³. (The diverted arrangement referred here is according to “Guidance to the measures to improve confluence sewer system”, 2002, Japan Sewage Works Association.)

(4) Summary

This research finds that the reservoir gate in the sewers is an effective technique to improve confluence with high cost effectiveness.

It is expected that the effectiveness and safety of this facility is further advanced by establishing a real time control system to control the gate through the watermeter, radar pluviometer and road pluviometer installed in the relevant area.

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