

Research on the measures of the corrosion of sewer pipes

Whole term

1993. 12~1994.3

(Purpose)

Corrosion in sewerage systems due to hydrogen sulfide has become a serious issue recently. Especially, there has been much corrosion in separated sewer pipes at several occasions. Therefore, prior investigation, examination and implementation of a measure-process of corrosion, are necessary. In this study, literature was reviewed on the mechanism, investigation and diagnostic techniques of the corrosion. Then, the design factors of the main sewer were investigated.

(Results)

1) Literature review

(1) Reason for corrosion and its mechanism

The main reason for the sewer pipe corrosion is hydrogen sulfide in the wastewater. The inflow of wastewater having sulfurous organic matter and sulphate is decomposed by sulfate reducing bacteria under anoxic conditions, and it is totally reduced to hydrogen sulfide that escapes as gas. Released H₂S is dissolved in water on the surface of the sewer pipe. And it is oxidized to sulfuric acid by sulfate oxidizing bacteria such as *Thiobacillus*. Sulfuric acid produced like this corrodes the concrete.

(2) Measure-process

Measure-process for corrosion is as follows:

Checking regularly whether investigation is necessary, examining the deterioration, checking whether repair is necessary.

(3) Way of deciding the aforementioned facts

The necessity of an investigation is determined by eye investigations, and robot investigations of concrete particles on the surface, cracks, and steel corrosion. The necessity of a repair is decided in accordance with the investigations of the degree of deterioration, and the regulations for evaluating the necessity of a repair have been established by Japan Sewage Works Agency and the local governments.

2) Investigation of a case

(1) Investigation with the naked eye

The deterioration had been deepened at a distance of 10-25 m from the manhole at the upstream sewer and at the downstream sewer of the manhole, at which there was the confluence of sewage. Also, it was observed that deterioration had occurred and the coating had been exfoliated so that a repair by tar-epoxy would be needed, and exfoliated coal at the top of the sewer was visible too. More deterioration had occurred than that detected in the previous survey conducted in 1990. The side had also been deteriorating, and the area of coating had been lessening. There was a significant deterioration in the portion above the water level of the manhole, compared with that submerging in the waterway.

(2) Results of the degree of corrosion

Though, pH of the non-deteriorated layers indicated a high alkali condition, the deteriorated layers had become neutralized and acidified. Sulfate ion concentration was high in the surface deteriorated layer while it was very low in the others.

(3) Results of the strength-evaluating test

The compressive strength fell off at some sites. There was no structural problem in the second repair work; however the attention was paid on the effects of concrete particles in the

wastewater flow.

(4) Repair

The deteriorated and sectionally damaged parts were properly repaired, and the finishing process was also properly done.

(5) Prevention of hydrogen sulfide generation

Sources of hydrogen sulfide such as; pumping circulation of the effluent from the primary settling tank, the agitation in the storage tank in which the effluent from the primary settling tank is stored, addition of a metal agent /an oxidizing agent were examined.

Collaborators: Hiroshima Prefecture

Japan Institute of Wastewater Engineering Technology

Personnel in charge of the study: Kazuaki Sato, Takao Murakami, Atsushi Miyata

Keywords

Concrete, Corrosion, Deterioration, Hydrogen Sulfide