

Research on sewerage facilities seismic countermeasures plan in basin-wide sewerage systems in Yamanashi Prefecture

Whole term

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(Purpose)

The October 2004 Niigata Prefecture Chuetsu Earthquake, which occurred after the Hanshin-Awaji Earthquake, caused large scale damage to sewerage facilities and affected the lives of residents.

Therefore, in November of that year the “Committee to Investigate Seismic Technical Measures for Sewerage Facilities” (Chairman: Professor Kazuhiro Tanaka, Nihon University) was established. The Committee pointed out that seismic countermeasures of existing sewerage facilities had not progressed and proposed ways that seismic countermeasures should be applied to sewerage facilities in the future to consider the time axis, in the “Report of the Committee to Investigate Seismic Technical Measures for Sewerage Facilities”(Hereafter, called “THE REPORT”)in August 2005. And so, “The sewerage facilities seismic countermeasures emergency construction project” was founded in April 2006, and “Guidance of sewerage facilities seismic countermeasures emergency plan decision(draft)”(Hereafter, called “THE GUIDANCE”) that showed a plan decision technique necessary to the project was published by Sewerage and Wastewater Management Department City and Regional Development Bureau Ministry of Land, Infrastructure and Transport and Japan Sewage Works Association. Since THE REPORT states that predicting the damage state of sewerage facilities due to earthquakes is important to carry out seismic countermeasures, “Manual concerning Methods of Predicting Damage to Sewerage Facilities and Methods of Utilizing the Result of These Prediction”(Hereafter, called “THE MUNUAL”) was published , based upon deliberations of “Committee to Investigate Seismic Technical Measures for Sewerage Facilities(Chairman: Professor Kazuhiro Tanaka, Nihon University)”.

This research examined the following matters with the objective of devising sewerage facilities seismic countermeasures emergency plan in three basin-wide sewerage systems in Yamanashi Prefecture referring to THE REPORT, THE MUNUAL, and THE GUIDANCE.

- ① Estimating damage to sewerage facilities at large-scale earthquake in Yamanashi Prefecture
- ② Setting of seismic measures priority level ,and examination of seismic measures of trunk sewer
- ③ Arrangement of seismic measures of Sewage treatment plants and examination of the priority of these measures

(Results)

1. Estimation of sewerage facilities damage

1) Direct damage

The direct damage assumption of the sewerage facilities was executed based on THE MUNUAL. On pipeline facilities, damage ratio was set up, on based THE MUNUAL, by seismic intensity, soil liquefaction hazard, and type of pipeline. And damage extension, damage amount, and damage ratio at each grid cells were calculated. On sewage treatment plants and pump stations, damage type of each facility is classified on based THE MUNUAL and damage amount were calculated. In addition, the damage situation map was made from these calculated result

2) Function obstacle population

Function obstacle population was calculated by multiplying damage ratio of pipeline facilities at each grid cells and sewerer population at each grid cells

2. Seismic measures priority level of trunk sewer

Five factors were extracted from the following two evaluation items, each factor was assumed to be 5 point full marks, pipelines in the full marks 25 point 20 points or more were evaluated that the priority level is high. In addition, force pipeline, inverted siphon under river, superannuated pipeline, and pipeline constructed under the first emergency transportation road were evaluated that the priority level is high.

- ① Risk of reputation of damage(by execution method of pipeline ,by earthquake intensity and soil liquefaction hazard)
- ② Importance(by emergency temporary housing construction planned site, by emergency transportation road, and by railroad and river)

(Future Plans)

Seismic Countermeasures of the basin-wide sewerage systems in Yamanashi Prefecture are scheduled to be executed in the future. Moreover, it is scheduled to be settled on in shape that the plan of the Seismic measures of the public sewerage in the prefecture considered the estimation of damage result.

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Key words

Estimation of sewerage facilities damage,
Sewerage facilities seismic countermeasures emergency plan