

# Research Study on Anti-Seismic Method for the Existing Sewerage Facilities

Whole Term

FY 2009 ~ 2010

Promotion of Earthquake Disaster Prevention

## (Purpose)

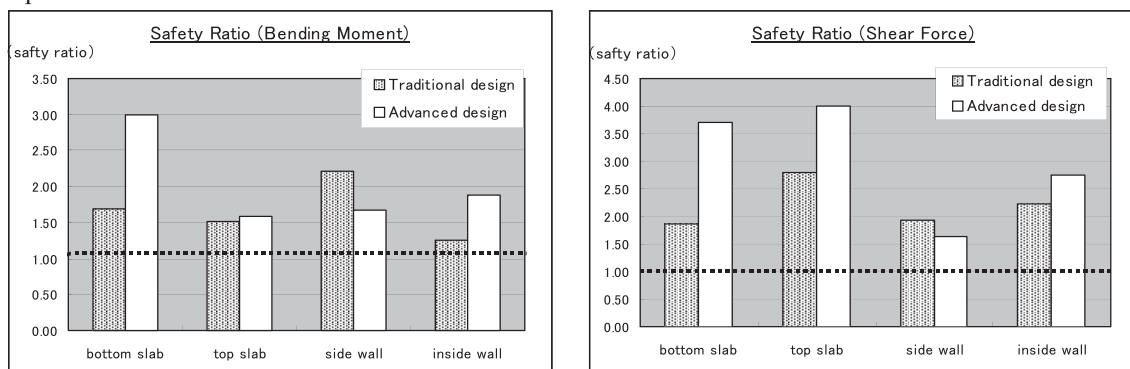
After 1995 South Hyogo Prefecture Earthquake, a lot of sewerage facilities have been equipped with anti-seismic capacities. On the other hand, existing facilities (wastewater treatment plants and pump stations, etc.) constructed before the anti-seismic regulation which was stringent in 1997 after the severe damage of the earthquake have some technical problems, such as the problems of construction during operating the facilities and the problems of restriction of the construction space.

This study is purposed to get some information of the trend of recent anti-seismic design and to survey the application of possibilities to the sewerage facilities.

## (Results)

### (1) Study on seismic design method

To evaluate the effectiveness of applying advanced design by using dynamic analysis which is broadly used for the seismic design in the other fields recently into sewerage facilities, an advanced method with a simplified model (rectangular tank) and traditional method was compared. As a result, the safety ratios get higher than the traditional method on the bottom slabs, top slabs, and inside walls (See Fig.-1); therefore the reinforcement volume could be decreased with the advanced method. Decreasing volume is a big advantage because the reinforcement construction of the bottom slab is one of the most difficult components.



**Figure-1 The Effect of Advanced Design Method**

### (2) Study on anti-seismic methods

Research on applicable anti-seismic methods (about 180 methods) for pipes, treatment plants, and pump stations was made and the methods were summarized to reinforcement points (See Table-1). In addition, flow-chart for the anti-seismic methods was made to select right methods easily.

**Table-1 Survey Items of Anti-Seismic Methods**

1	Method Name	6	Note
2	Purpose of Reinforcement	7	Records
3	Technical Outline	8	Unit Prices
4	Application Range	9	Evaluation by Third Party
5	Construction Condition	10	Contacts

### (Subjects to be studied forward)

Conducting the research for large-scaled wastewater treatment plants and pump stations in order to evaluate the effectiveness of decreasing reinforcement volume with dynamic analysis.

Collaborator: Collaborate Research from Liaison Board of Sewerage Technology Development; Sapporo city, Sendai city, Saitama city, Chiba city, Tokyo, Kawasaki city, Yokohama city, Niigata city, Shizuoka city, Hamamatsu city, Nagoya city, Kyoto city, Osaka city, Sakai city, Kobe city, Okayama city, Hiroshima city, Kitakyushu city, Fukuoka city and Japan Institute of Wastewater Engineering Technologies

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Key words

Technique of Seismic Design, Anti-Seismic Method, Dynamic Analysis, Decreasing Reinforcement Volume, Advanced Design