Study on Countermeasures against Uplift of Sewage Manhole

Whole term | 2006.12～2008.3

(Purpose)
In this study, we investigate the effects of Three countermeasures against uplift of sewage manhole in liquefiable saturated sandy deposit during earthquakes. Two-steps experiments using large-scale earthquake testing facilities are planned to be carried out in this study. And our purpose is to compile technical knowledge and learning about Three Countermeasures, such as application, design, planning, and maintenance.

(Outline)
1. The flow of this study
Figure-1 shows the flow of this study.

<table>
<thead>
<tr>
<th>Selection the applications counter-measures</th>
<th>Improve 1/5scale experiment</th>
<th>Improve 1/2scale experiment</th>
<th>Technical manual</th>
</tr>
</thead>
</table>

![Fig 1 Study flow]

Japan Institute of Wastewater Engineering Technology accepted five applications by private companies about countermeasures against manhole uplift. And three countermeasures were selected for the reason of practicability. These countermeasures are experienced through the 2-steps experiments by comparison with non-countermeasure manhole, and improve and inspect each effect of them. Finally we formulate technical manuals by each method.

(Summaries of Three Countermeasures against Manhole Uplift)
Three Countermeasures that we deal with in this study are as follows.

<table>
<thead>
<tr>
<th>Applicant</th>
<th>SHINMEI RUBBER INDUSTRIES CO.,LTD.</th>
<th>CHIYODA GEOTECH CO.,LTD.</th>
<th>JAPAN LADDER HOLE INDUSTRIAL ASSOCIATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Method</td>
<td>WIDE Safety Pipe method</td>
<td>ANCHOR WING</td>
<td>Flange Manhole Surfacing Prevention Method of Construction</td>
</tr>
<tr>
<td>Mechanism of Method</td>
<td>To dissipate excess pore water pressure, drainpipes are install in wall of manhole.</td>
<td>To prevent manhole uplift, anchors install on outside manhole.</td>
<td>Flange makes resisting force against manhole uplifting. Weight on flange increases the apparent weight of manhole.</td>
</tr>
<tr>
<td>Outline of Method</td>
<td><img src="#" alt="Ground Manhole Pore water Drainpipe" /></td>
<td><img src="#" alt="Ground Manhole Anchor" /></td>
<td><img src="#" alt="Ground Manhole Non-Liquefiable Layer Flange Weight" /></td>
</tr>
</tbody>
</table>
(Study schedule)

- We are going to carry out the 2-steps experiments with large-size earthquake testing facilities.
- We gather result of the experiments and investigate the effects of three countermeasures of manhole uplifting, and formulate technical manuals by each methods with additional examination and analysis.

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Key words: Manhole, Soil liquefaction, Excess Pore Water Pressure, Uplift