Research on Countermeasures to Prevent Uplift of Sewage Manholes (WIDE Safety Pipe method)

<table>
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<th>Year of Research</th>
<th>2006～2008</th>
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(Purpose)
This research investigated the effects of the three countermeasures to prevent uplift of sewage manholes in liquefiable saturated sandy deposits during earthquakes. Two-step experiments using large-scale earthquake testing facilities were planned and carried out for this research. Another purpose was to compile technical knowledge and learning about the three countermeasures, such as application, design, planning, construction and maintenance. In this report, we introduce the ‘WIDE Safety Pipe method’ which is one of the three countermeasures.

(Outline)
1. Outline of the WIDE Safety Pipe method
   The ‘WIDE Safety Pipe method’ is a counter-measure that dissipates excess pore water pressure through drainpipes installed in the surrounding ground from inside the manhole. And these drainpipes maintain sufficient friction between the manhole and ground to prevent the manhole from uplifting.

2. Research Flow
   The ‘WIDE Safety Pipe method’ was tested through 2-step experiments to compare it with a manhole without a countermeasure. Each step included two different manhole scales (1/2 scale and 1/5 scale) and the improvement effects were inspected.

   We analyzed the data from experiments to compile technical knowledge and learning we formulated as a technical manual.

(Results)
We issued the “WIDE Safety Pipe Method Technical Manual”. The following are the key points.

   (planning)
   We need to perform two phase planning to study the possibility of soil liquefaction and the possibility of manhole uplifting.

   (design)
   We calculated the excess pore water pressure ratio necessary to keep maintain adequate friction to prevent manhole uplifting and determined the details of the drainpipes.

   (construction)
   We selected the construction method and maintenance procedures to apply when the ‘WIDE Safety Pipe Method’ is applied to existing and new manholes.

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