Sewerage Technologies

Sewerage System Services

Float-less Method for Manholes

Renovation Design Software for Aging Sewers using Non-linear Crack Analysis: SPRana

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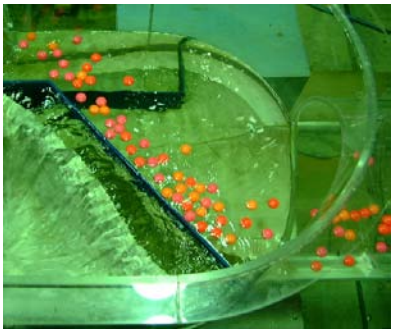
Sewerage System Services

Diversion weir

- To provide effective separation technology for floating trash in a combined sewer system.

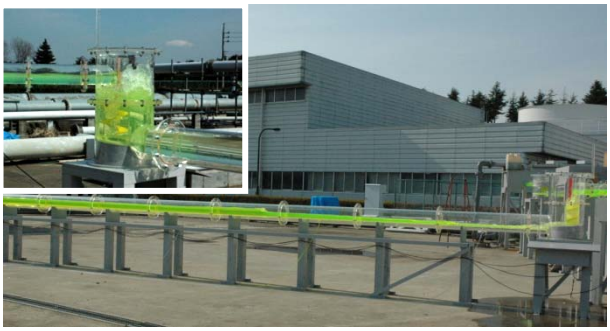


Drop shaft

- To determine the dimensions of various types of drop shafts

Long inverted siphon

- To propose air treatment technology and countermeasures against surging and hydraulic bore.



Float-less Method for Manholes

Background

- **Many manholes were uplifted due to soil liquefaction during earthquakes such as the 2011 off the Pacific coast of Tohoku Earthquake.**
- **The uplift of sewer manhole causes serious damages to the function of sewer system and traffic obstruction of emergency vehicles.**
- **A countermeasure named 'Float-less method' was developed to prevent the uplift of sewer manholes during earthquakes (Pat. No. 4603852).**

Uplift of the manhole on the road

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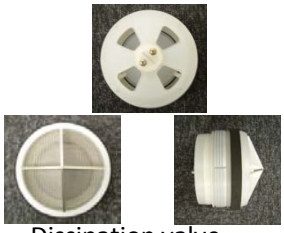
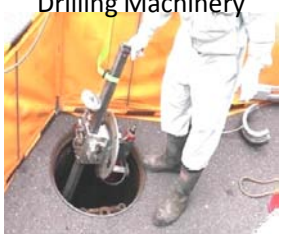
Traffic obstruction of Emergency vehicles

Floating manhole due to the 2011 off the Pacific Coast of Tohoku Earthquake

Drilling Machinery



Dissipation valve



Drilling in the manhole

Installation of the valves

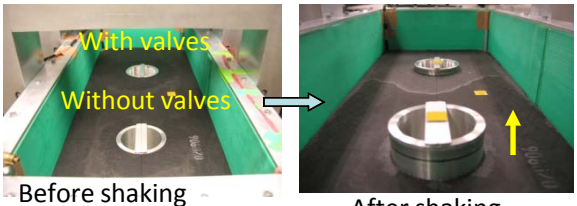
Float-less method

Features of 'Float-less Method'

- The float-less method prevents the uplift of manholes by installing dissipation valves on a existing manhole and release excess pore water pressure through the valves
- The dissipating valves are installed with the exclusive drilling machinery.
- The work is speedy and needs no excavation.
- The construction cost can be significantly reduced because of no replacement of manholes.

NK centrifuge testing

NK's geotechnical centrifuge was used to verify the effectiveness of the float-less manhole and prepare its design standard.



Before shaking

After shaking

The centrifuge model test

Country	Project	Reference Page
Japan	13,800 manholes will be installed globally by 2016	-

Renovation Design Software for Aging Sewers using Non-linear Crack Analysis : SPRana

Under renewal works

After renewal works

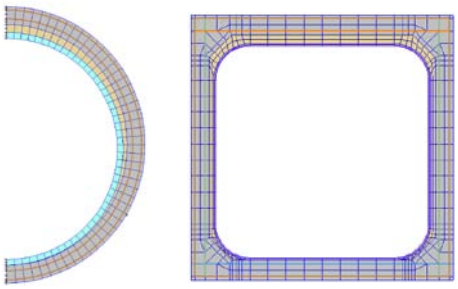
Renewal of an aging sewer with the SPR method

To evaluate the load-carrying capacity of aging and renovated RC sewers, a non-linear FEM analysis (SPRana), taking crack behavior into account has been developed to update and replace the current design practice of using semi-composite renovation method based on the limit state design concept.

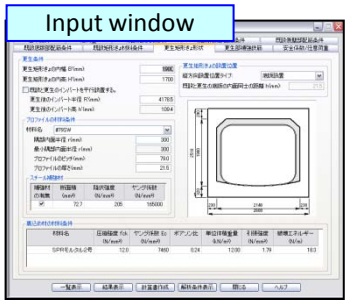
Features of 'SPRana'

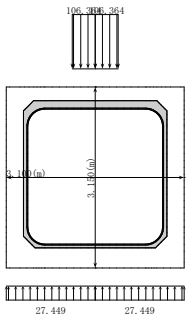
- Sprang (Sewage Pipe Renewal Analysis System) is a design-oriented computing software for the SPR (Sewage Pipe Renewal) method which is a renovation method for aging swears.
- SPRana contains an automatic mesh-generation function for various types of the cross-sections of swears, such as pipe, box culvert, horseshoe culvert and so on. It also has a windows-type input-output feature to facilitate its operation.
- Not only verification against dead load & live load but also verification against seismic load can be made for the sewers based on the responded displacement method.

Automatic mesh-generation function

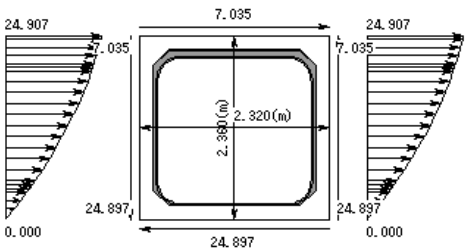


Input window





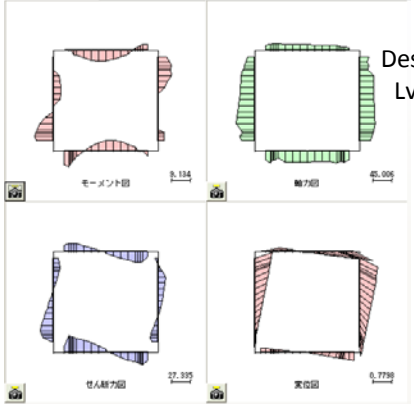
Load Conditions



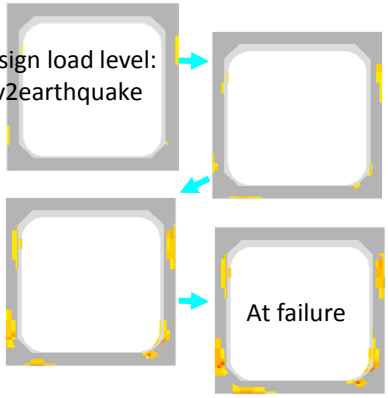
◆Verification against seismic load

Verification results screen

Sectional force distribution



Crack propagation



Features of SPRna