

Study on New Installation Techniques for Elimination of Sewer Unavailability in Ninohe City (Joubouji Area)

Years of Research

2007~2014

(Purpose)

In the Joubouji area of Ninohe City, the Municipal Septic Tank Installation Promotion Project has been adopted and efforts have been made to promote installation. However, because the houses are built close together, there is no space to install septic tanks and the installation has fallen behind schedule. Even in places where septic tanks have been installed, complaints have been filed in summer about the odor of the effluent from the septic tanks. With a view to improving the water environment and living environment, early implementation of centralized treatment by a sewerage system has been greatly desired.

To address these matters, Ninohe City applied to be a model municipality under the pilot project for the Quick Elimination of Sewer Unavailability established by the Ministry of Land, Infrastructure, Transport and Tourism in 2007, and the application was accepted.

The Project for the Quick Elimination of Sewer Unavailability recommends 16 new technologies that facilitate speedy and inexpensive installation. This study aims to investigate how these technologies can be introduced and be reflected in the sewers and culverts designs in Joubouji area in Ninohe City. Since 2 technologies out of 16 are for treatment facilities, however, they are excluded from this study.

In addition, the sections of pipelines to be installed by exposed piping from those designed in FY 2008 was identified and experiment for frost heave was implemented for the purpose of establishing the measures against this phenomenon peculiar in cold districts.

(Results)

1) Unavailability elimination techniques to be introduced

The Project for the Quick Elimination of Sewer Unavailability recommends 16 new installation technologies as shown in Table 1. They consist of eight (8) unavailability elimination techniques whose performance and the like require evaluation by means of a pilot social experiments and other eight (8) unavailability elimination techniques intended for widespread use not requiring evaluation of their performance and the like thereof. Six (6) techniques shown in shaded columns in Table 1 were applied in the section of pipelines studied in FY 2008.

2) Identifying the section of pipelines to be installed by exposed piping

As for the exposed piping planned in order to collect sewage from housing between prefectural road and Appi River, the investigation of current drainage system for the households in the corresponding area was implemented. Based on the investigation, a part of the area of about 30 households which exposed piping is to be applied were identified and this was reflected in the design.

3) Frost heave experiment

Exposed pipes are planned to be installed at the curb on the back of levee of Appi River. In Joubouji area, it is probable that frost heave peculiar to cold district may occur and may have adverse effects on the installed exposed pipes and their foundation. In order to establish measures against frost heave, a frost heave experiment measuring temperature, frost depth, and frost heave was carried out. However, it was a mild winter this year. Therefore, it was not confirmed whether there is a relationship between frost depth and frost heave since frost heave phenomenon did not occur whereas tendency about a relationship between temperature and frost depth could be identified. Therefore, frost depth was estimated to be 90 cm by estimation formula shown in 'Road soil work and drain work guideline' published by Japan Road Association in 1987 and frost heave was set to 15 cm with reference to literature and papers. These values were reflected in the detailed design in order to take frost heave into consideration.

Table 1. 16 new installation technologies

16 new installation technologies	
Unavailability elimination (UE) techniques requiring pilot social experiments	Exposed piping for pipes
	Consecutive employment of improved reverse siphons
	Construction in line with road alignment
	Use of displaced soil for pipes foundation
	Use of plasticized soil for pipes construction
	Factory-made, extremely small-scale treatment facilities (membrane separation type (PMBR))
UE Techniques intended for widespread use	Factory-made, extremely small-scale treatment facilities (contact oxidation type and membrane separation type)
	Construction of sewerage sewers by the use of street drains
	Gradient relaxation for drainage facilities
	Relaxation of upper of flow velocity
	Employment of improved reverse siphons
	Use of improved soil for foundations
	Omission of manholes by use of curved pipes or other means
	Extension of manhole intervals
	Long-distance application of small diameter pipe jacking method
	Expansion of manhole pump coverage

(Plans for the future)

In FY 2009 and after, 16 techniques of new installation technologies are planned to be investigated for their introduction to the remaining sections of the study area. In addition, 'Exposed piping for pipes' and 'Factory-made extremely small-scale treatment facilities (PMBR)' as 'Unavailability elimination techniques requiring pilot social experiments' are planned to be verified from FY 2010.

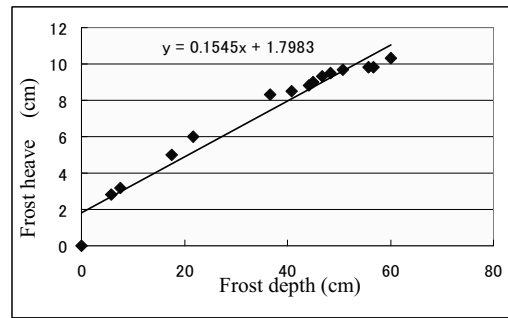


Figure 1. Relationship between frost depth and frost heave (reference)

Collaborators: Ninohe City, Japan Institute of Wastewater Engineering Technology
Contact : Hiroaki Morita, Yoshio Ehara, Yoshihiro Tanaka

Key words

Project for the Quick Elimination of Sewer Unavailability, new installation technologies, exposed piping, frost heave experiment