

## Study on effective sewerage development for unsewered areas

Year of Research

2007

### (Purpose)

(1) Study on innovative sewerage development methods

Regarding the social experiments introducing technologies proposed in the Quick Project for Prompt Sewerage Development, which started in FY 2006, examination and evaluation was carried out toward development and application of innovative technologies. In addition, this study included support for the Steering Committee for Quick Project.

(2) Study on cost functions

As preparation for revision of “Effective Domestic Wastewater Treatment Planning Manual (2001)” to cope with recent socio-economic change, the manual’s cost functions were updated in this study.

### (Results)

(1) Study on innovative sewerage development methods

- ① As an idea for low-cost sewer construction, “sewer plumbing inside street drain” was additionally proposed.
- ② For evaluating proposed sewer development methods, five out of seven innovative technologies applied in the social experiments were studied, and as a result significant reduction of construction cost and time was verified as shown in the following table:

Table -1 Reduction of construction cost and time through introduction of innovative technologies

Innovative sewer construction technologies	Construction cost reduction ratio	Construction time reduction ratio
Exposed piping for pipe culverts	24%	58%
Continual application of improved inverted siphons	Approx. 30-70%	Approx. 20-60%
Variable slope sewer construction using bent pipes	Approx. 20%	Approx. 20%
Reuse of dug soil as pipe foundation	24%	20%
Use of liquefied stabilized soil as backfilling material	4%	33%

(2) Study on cost functions

The cost functions for the manual were updated as below:

Table -2 The proposed cost functions

Facility	Item	Proposed cost functions	Existing cost functions
Wastewater treatment plant	Construction cost	$C = 620 \times Qd^{0.637} \quad (Qd < 300)$ C : Construction cost of wastewater treatment plant (10 <sup>4</sup> yen), Qd : Maximum daily flow (m <sup>3</sup> /d)	$C = 493 \times Qd^{0.676} \quad (Qd < 300)$ (Variables are the same as shown left)
	Operation and maintenance cost	$M = 10.7 \times Qa^{0.782} \quad (Qa < 300)$ M : Operation and maintenance cost of wastewater treatment plant (10 <sup>4</sup> yen/year), Qa : Average daily flow (m <sup>3</sup> /d)	$M = 47.8 \times Qa^{0.501} \quad (Qa < 300)$ (Variables are the same as shown left)
Pipe	Construction cost	Gravity flow sewer: 65 thousand yen/m (in case of constructed with open cut method) Force main: 35 thousand yen/m (ditto)	Gravity flow pipe: 75 thousand yen/m (in case of constructed w/ open cut method) Force main: 47 thousand yen/m (ditto)
	O/M cost	57 yen/m/year	80 yen/m/year
Manhole type pumping station	Construction cost	8,800 thousand yen/unit (Pump unit installation only; manhole construction excluded)	10,000 thousand yen/ unit (Same as shown left)
	O/M cost	200 thousand yen/unit/year	500 thousand yen/unit/year

**(Summary)**

(1) Study on innovative sewerage development methods

The social experiments and the development of the innovative technologies are to be continued to FY 2008, and will be evaluated by the Steering Committee for Quick Project.

(2) Study on cost functions

The proposed cost functions are to be introduced in the revised version of “Effective Domestic Wastewater Treatment Planning Manual”, which is expected to be published in FY 2008.

Entrusted Study: The Ministry of Land, Infrastructure and Transport (Sewerage and Wastewater Management Dept.)

Contact : Toshiaki Shimizu, Takashi Terakawa, Yoichi Ishikawa

Key words

Quick Project for Prompt Sewerage Development, Innovative sewerage development methods, Effective wastewater treatment development, Cost functions