Study on social experiment of public sewerage system in Hamamatsu City

Year of Research	2008	

(Purpose)

The Ministry of Land, Infrastructure and Transport started the Quick Project for Prompt Sewerage Development in FY2006. In the Quick Project, the social experiments have been implemented introducing innovative methods that enable cost and time savings in sewer construction based on local characteristics.

This study was conducted to evaluate performance and effectiveness of "Use of liquefied stabilized soil (LSS) as refill material" adopted in Hamamatsu City.

(Result)

Result of evaluation is shown below:

- Construction cost was reduced by 3%. In case that sheet piling is not required, cost reduction can be larger.
- Smaller paved surface subsidence was observed; therefore the impact to pavement is considerably less than conventional method.
- No deterioration, cracks, joint gaps, etc. was observed, therefore impact to pipes is considered to be negligible
- Construction period was reduced by 21%. Especially reduction of period during primary and final pavement work was quite large.
- Results from on-site permeability examinations demonstrated that permeability coefficient was quite low and that LSS is applicable as impermeable filling material.
- When sheet piles were removed within 2 hours after LSS filling, 100% ventricular filling rate was achieved (under condition of LSS filling length of 4m).
- More than 15 hours after LSS filling was required before spreading subbase course material, and more than 110 hours after filling before opening to traffic.
- Construction work was completed with accuracy within management standards.

Table-1 Result of evaluation

Evaluation item	Conventional method	New method	Result	Remarks
①Construction cost	74 million yen (63,000 yen/m)	72 million yen (62,000 yen/m)	3% reduction	1,161m (φ150,φ200) -Based on cost estimation including overheads -The lower column includes pavement repair cost due to surface subsidence
	87 million yen (75,000 yen/m)	Ditto	18% reduction	
②Impact to paved surface (Maximum subsidence)	15.3mm	6.3mm	Improved (General method ＞New method)	Standard of pavement repair in Hamamatsu City :20mm
③Impact to pipe (Deformation)	No problem found through CCTV survey	No problem found through CCTV survey	No adverse impact	CCTV survey checkpoints: pipe deterioration, cracks, joint gaps, etc.
④Construction period	Period of 450 days	Period of 360 days	21% reduction	1,161m (φ150,φ200) Days until final pavement work was completed
⑤Impermeability (Permeability coefficient)	Original ground 2.65×10^{-3} ～1.19×10^{-2}	1.73×10^{-6} ～4.06×10^{-6}	Impermeability improved	-Basically according to results from on-site permeability examinations -Results of original ground were conversion by Creager's correlation between D20 diameter and permeability coefficient.
⑥Ventricular filling rate after sheet pile removal	—	Within 2 hours after filling, 100% ventricular filling rate achieved	Sheet piles need to be removed within 2 hours after LSS filling.	Note that the solidification speed varies according to construction conditions. Solidification time in summer supposed to be less than 1 hour.
⑦Strength development speed	—	(Repulsion value by Yamanaka's hardness meter) More than 15 hours per 3.0mm depth	More than 15 hours after LSS filling required before spreading subbase course material	Note that the solidification speed varies according to construction conditions.
		(Unconfined compression strength) More than 110 hours, until strength reached 130 KN/m^2	More than 110 hours after filling required before opening to traffic	-Results were converted from Repulsion value by Yamanaka's hardness meter. -The solidification speed varies according to construction conditions.
⑧Construction accuracy	—	Meandering amount measured by laser survey was within management standard.	No problem	

(Summary)

In other fields than sewer construction, use of LSS is already considered as established technology though many construction practices.

As a result of this study, "Use of liquefied stabilized soil as refill material" was demonstrated to be a useful technology for sewer construction.

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