Research of Design Approach of 2 layered structure pipe

Whole term	2003.1～2005.12	

(Purpose)

Various material and systems are employed in sewer pipe rehabilitation systems. Technical development and installation records are remarkable. “A Guide to Pipeline Rehabilitation” published by Japan Sewage Works Association on June, in 2001 applies to only “self-supporting pipe” and “composite pipe.” 2 layered structure pipe is defined as “the existing pipe that have structural strength with a pipe lined using inversion method and formation but it is not applied to 2 layered structure pipes because relation between deterioration and load-carrying capacity etc. of the existing pipe is uncertain.

In this research, “2 layered structure pipe” is defined as “the structure where aged pipe can share a part of external force.” Structural analysis of 2 layered structure pipes and evaluation method of existing pipes are studied by using model tests in each system and a design approach considering deterioration, load-carrying capacity etc. is proposed.

This research aims to organize technical documents that can support efficient selection comparing with traditional self-supporting pipes by a concise approach based on deterioration research results of existing pipes.

(Contents)

（1） Questionnaire survey of the 2 layered structure pipe

Conduct a questionnaire survey against each municipality to comprehend the present situation of design of the 2 layered structure pipe and needs of the 2 layered structure pipe.

（2） Setting of damage models of assumed existing pipes

Examine existing materials of damaged condition of existing pipes and classify the damaged condition. Set damage models of assumed existing pipes based on the result of the examination.

（3） Deformation behavior analysis of 2 layered structure pipes assuming various damage models

Perform behavior analysis of 2 layered structure pipes assuming various damage models using pipe behavior analysis software in the previous step of tests and select appropriate existing pipes damage models used in static load tests and cyclic load tests based on the result of the analysis.

（4） Static load test

Perform static load tests using an earth tank for selected existing pipes damage models. Based on the test and analysis results, calculate ratio between deformation of rehabilitated pipes and stress in rehabilitated single layer pipe and 2 layered structure pipe

（5） Cyclic load test

To evaluate long-term effect, perform dynamic load tests simulating the cyclic load of 25-ton truck for the damage models used in the static load tests.

（6） Establishment of a design approach

Derive a design equation of pipe thickness for 2 layered structure pipes based on the analysis results and test results.

（7） Classification and organization of technical documents

Classify all this research and organize technical documents of the design approach for 2 layered structure pipes.

(Schedule)

Calculate a reduction coefficient in the proposed design approach using numerical analysis, static load tests and cyclic load tests.

Classify all this research and organize technical documents of design approach for 2 layered structure pipes.

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