Joint Research on Underground Stormwater Storage and Infiltration System Built of Plastic

Year of research	2008～2010	Implementation of anti-inundation measures

(Purpose)

Underground stormwater storage and infiltration systems built of plastic (hereinafter called "plastic storage system") are rapidly growing in the number of installations and increasing in size as one of the flood control techniques in recent years. Many manufacturers are developing the systems and the products are diversified in structure. Since those products are still young, none of them have undergone long-term evaluations based on design standards or guidelines. Moreover, evaluation methods for the strength have not been established.

Under these circumstances, there is a demand that a plastic storage system should meet some technical standards to ensure safe and reliable use over the long term. We have carried out this research to sort out the problems on design, construction and maintenance and compile a technical manual from them.

(Results)

(1) Examination of design methods

Unlike concrete, plastic is gradually deformed if it is used for a long time while bearing a load. In designing a storage tank, it must be ensured that the tank has certain levels of performance on various items, such as strength of the storage structure and long-term performance. We have set two types of design items: "collation items" that must be met to ensure safety and "check items" for which it is desirable to be met to seek added safety.

1) Collation item

We have set three collation items as a plastic storage system: [1] strength, [2] long-term performance and [3] earthquake resistance. We have clarified the evaluation methods and criteria.

2) Check item

We have set the following five check items to help design for obtaining higher safety. [1] FEM analysis, [2] stress at which tertiary creep occurs, [3] chemical durability, [4] uniformity of storage structure and [5] uniformity of plastic.

Figure 1 shows the procedure for designing a plastic storage system, going through the collation and check items.

(2) Notes and precautions on construction and maintenance

We have drawn up notes and precautions on backfilling, sheet laying, quality control and other operations that require extra attention during construction. About maintenance, we have clarified control items considered necessary from the characteristics of the plastic storage system and drawn up notes on inspections, their frequencies and precautions against disasters and accidents.

(3) Comparison with overseas facilities

We have researched into the standards on designing and testing in France and Britain, where the plastic storage systems are introduced earlier and many systems have been installed. The standards in those countries have been under revision at the moment and still on their way to establishment. We also compare the current standards with the one in Japan. They are different in evaluation method of long-term performance. The overseas standards do not have provisions on seismic loads, though it seems all the standards are almost on a same level in general.

(Future subejct)

There is no established theory about long-term performance prediction on a plastic storage system for 50 years from now. At the moment, long-term performance is estimated from the degree of deformation resulting from continuous application of a load. Physical properties of plastic materials are still on the way of research. For further enhancement of reliability, continuous efforts to improve design technology and evaluation technology are required.

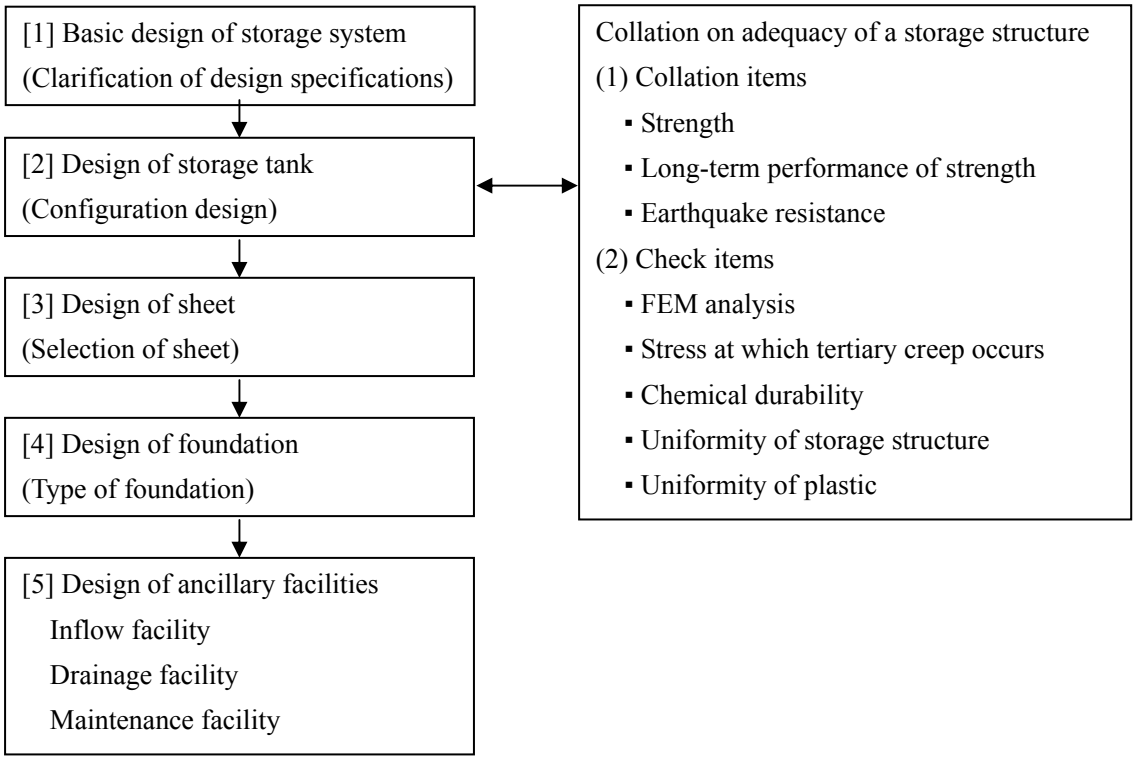

Figure 1 Plastic storage system design procedure

Collaborators: Ebata Corporation, Shinshinblock Co., Ltd., Sekisui Chemical Co., Ltd., Sekisui Techno Molding Co., Ltd., Chichibu Chemical Co., Ltd., Furukawa Electric Co., Ltd., Mikuni Plastics Co., Ltd., Meiji Rubber & Chemical Co., Ltd., Association for Rainwater Storage and Infiltration Technology, and Japan Institute of Wastewater Engineering Technology

Contact: Ryohei Sakane, Shizuo Yoshikawa, Shiro Tamura, Yoshihiko Fujita

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