

8-3 Ensuring the Stability of Trench-Type Radioactive Waste Disposal Facilities

— Examination of Waste Acceptance Criteria of Sand Filling to Reduce Voids in Waste Packages —

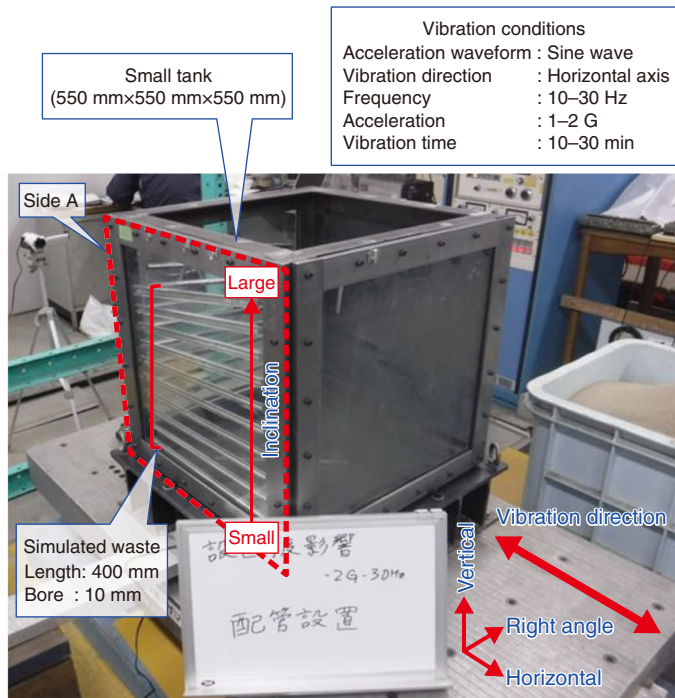


Fig.8-9 Test setup, including box and vibrator

To see the state of sandy soil filling the simulated waste container, a half-split tube was placed on the glass surface in a tempered glass box simulating a metal container. The vibration conditions were chosen as easily possible ones.

This work prototyped a trench-type disposal of very low-level radioactive wastes generated in the research and development of the nuclear energy as well as medical, industrial uses of radioisotope expect nuclear power plant in Japan. The metal waste was placed into metal containers for ease of handling and to prevent the radioactive materials from scattering.

However, voids remain in the filled containers because current regulation does not require them to be fully solidified (e.g., by filling in the voids with sand or cement). Large voids may lead to depressing the cover soil of trench-type disposal facility after long time period. It is thus necessary to fill the containers with sand to reduce the void volume to or below 20%. The void volume in a container can be evaluated on the basis on the weight and density of sand inserted into a container.

This work therefore aimed to examine the filling property of simulated wastes in a container to develop waste acceptance criteria relevant to standard filling conditions and methods to reduce the void space.

Heat transfer tubes in which a high voids are remained was used as simulated wastes. And we closed the heat transfer tubes of one side were used as a difficult filling condition of simulated

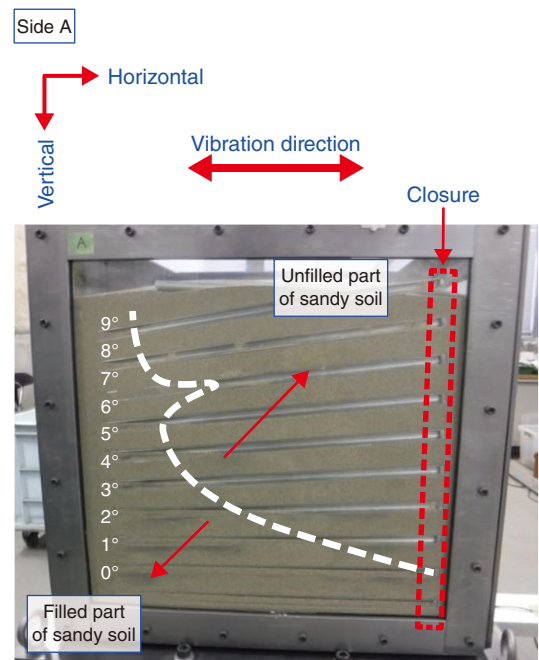


Fig.8-10 Resulting

Nine simulated wastes were installed with a 1° increment from the horizontal direction over 30 minutes of vibration using an acceleration and frequency of 2 G and 30 Hz, respectively.

wastes (Fig.8-9). As waste is normally placed into a container at random, the heat transfer tubes were placed into a test box in a way that its inclination is larger toward the upper side. The box was then filled with soil while being vibrated on a shaking table. The filling property was visually observed after a certain period of vibration.

The results indicated that box was densely and uniformly filled with soil, leaving the void volume to or below 20% when the heat transfer tubes were set horizontally to the direction of vibration. On the other, the filling rate of soil in the heat transfer tube reduced as the inclination of the heat transfer tube increased (Fig.8-10).

Overall, the void volume of the containers could be reduced to meet the standard when the waste tubes were set horizontally to the direction of vibration. Based on the result, the test conditions for the actual size (about 1 m³) of the metal container were clarified.

Future work will aim to develop filling methods and waste acceptance criteria for metal wastes disposed of in metal containers and confirm them via full-scale tests.

Reference

Nakata, H. et al., Waste Acceptance Criteria for Waste Packages Destined for near Surface Disposal Containing Radioactive Waste from Research, Industrial and Medical Facilities – Study on a Method that Fills Voidage in Waste Package with Sandy Soil –, JAEA-Technology 2017-031, 2018, 41p. (in Japanese).