

ASPHALT IN THE DELTA FLUME



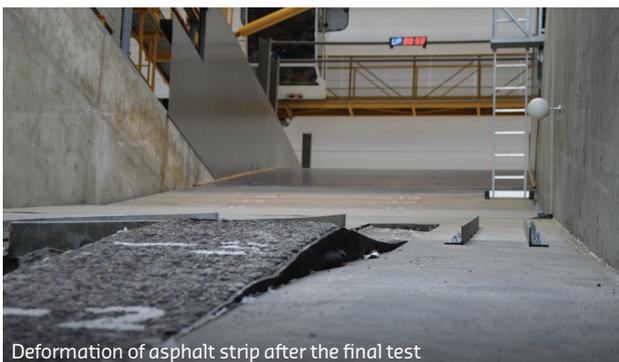
Preparation of the test dike in the Delta flume for the asphalt strips



Four 50-year-old asphalt strips during wave attacks



Wave attack on the visitor's day



Deformation of asphalt strip after the final test

Asphalt is frequently used as a revetment to protect dikes against wave erosion. The asphalt is usually applied directly on the sand core of the dike and it deteriorates gradually over several decades. There comes a point at which it may no longer be able to withstand the impact of heavy waves. This project provides unique information about how old asphalt deforms when subjected to heavy wave attack in combination with defined water levels in the dike body.

The Wetterskip Fryslân water authority commissioned Deltares to test 50-year-old asphalt from the Lauwersmeer dike in the north of the Netherlands. The aim was to validate the present safety assessment and design methods for asphalt revetments. In addition, it was hoped to extend the applicability of the methods to situations in which the phreatic water level in the dike is relatively high.

Eight eight-metre-long strips of asphalt were taken from the Lauwersmeer dike. These samples were positioned in two full-scale dikes in the Deltares Delta Flume. The first dike was made from relatively poorly compacted sand and the best asphalt strips. The second was made from well compacted sand and the poorest asphalt strips. The wave height was increased step by step during each experiment until the maximum wave height of two metres was reached. The water level in the sand body of the dike was then raised as the dike was subjected to severe wave attack until the structure collapsed.

The performance of the test dike was monitored with a suite of instruments including 25 pressure gauges to measure wave impact, 16 strain gauges and glass fibres to measure the deformation of the asphalt strips, 16 break wires to detect cracks in the asphalt and 12 pressure cells in the subsoil. The instrumentation provided 150,000 measurements per second during the tests. The test results show that old asphalt, although worn out, can still withstand severe wave attack very well. However, when the phreatic water level inside the dike body is approximately at the same level as the outside water level, the revetment quickly collapses. This new knowledge will be used by Deltares and Rijkswaterstaat to improve the safety assessment and design methods for asphalt on dikes. It will extend the lifetime for asphalt revetments and result in specific guidelines for the design of dikes to prevent high water levels in the sand under the asphalt.

This project was carried out in cooperation with a specialist in asphalt on roads and dikes, Kiwa-Koac, and Delft University of Technology. The project received financial support from the National Flood Risk Management Programme. 

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Further reading:

<https://www.deltares.nl/en/news/storm-test-on-frisian-asphalt-can-save-millions-on-dikes-throughout-the-netherlands/>