Displacements of a road embankment above the strengthened substrate

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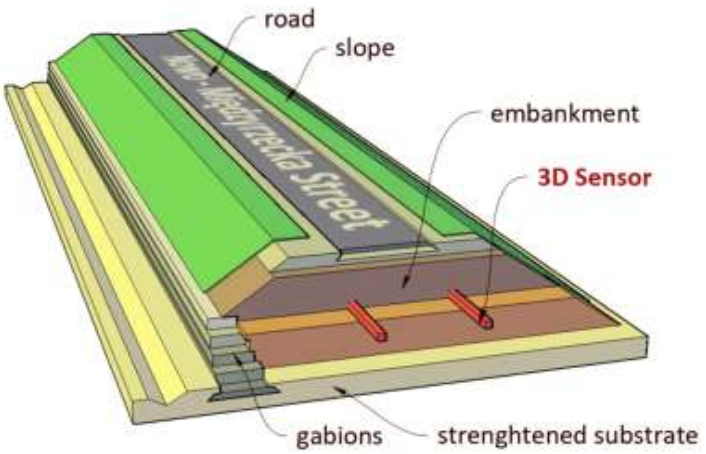
3DSensor: Case Study

Within this project, two 3DSensors were installed along a road embankment to measure its vertical displacements. Two independent lines of 3DSensors, each 48 m long, were provided, together with multiple reference measurement techniques: longitudinal and transverse inclinometers, spot tiltmeters and geodetic benchmarks. Vertical displacements were measured in a distributed way with 3DSensors and compared with the results of reference methods.



Benefits of application

- Composite core with a **wide elastic measurement range** up to ±4%
- **Thermal self-compensation** system, no need to measure temperature
- **Results** seen in **displacement values (mm)** thanks to a data conversion algorithm
- Very **high compliance** with reference measurement methods (incl. inclinometers)

Example results

3DSensors with composite cores were applied, each equipped with four optical fibres precisely arranged around the core. Taking advantage of the strain measurements in all fibres and using a trapezoid calculation method, vertical displacements were calculated with very high precision and in a distributed way along the sensor, with a spatial resolution of 10 mm. The results from 3DSensor are presented in the figure below (red line) together with the results of reference inclinometer measurements (green line). The compliance of both methods was very high; the mean difference was less than 0.1 mm with a standard deviation less than 0.5 mm along the entire measurement length. It is worth noting that the 3DSensors approach involves a thermal self-compensation system.

9 600 measurement points

96 m of sensing path

2 x 3DSensor

long-term monitoring

project **partner**:

Silesian University of Technology