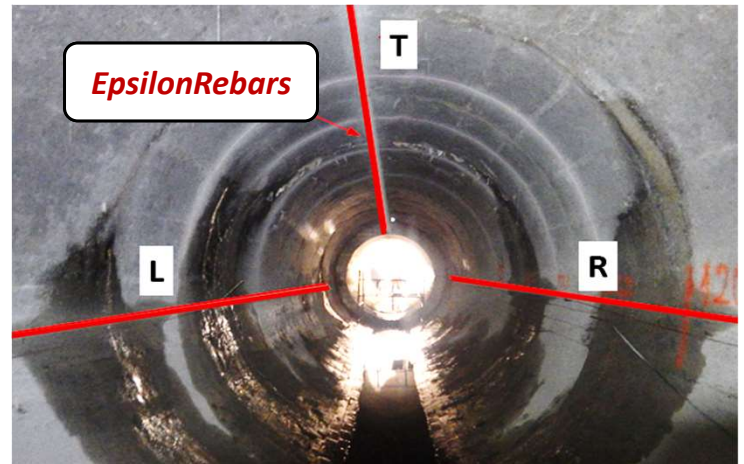


Sewer concrete collector during its strengthening with GRP panels



EpsilonRebar: Case Study

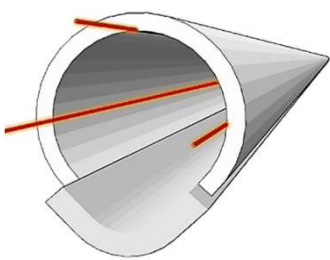
The concrete sewage collector was constructed in 1964 and is now reinforced with Glass-fiber Reinforcement Plastic (GRP) panels. EpsilonRebars (ER) and the EpsilonSensor (ES) from the Nerve-Sensors family were installed inside the near-to-surface grooves to verify the strengthening process. ERs were placed longitudinally over the entire 150 m long section, while ES was installed in selected key circumferences. The system allowed for detailed analysis of strains, cracks, displacements and temperatures.







Benefits of application

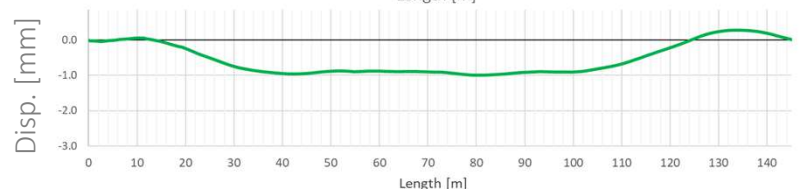
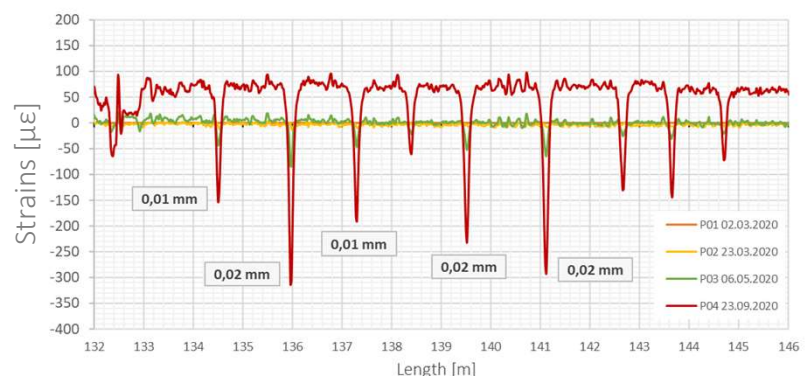
- Detection of **all the cracks** between the old segments (with width estimation)
- Calculation of **vertical displacement** profiles (settlements) along the length
- Full deformation **control during strengthening** process (injection + FRP panels)
- **Reliable monitoring system** working in extremely difficult external conditions

Example results



Nerve-Sensors allowed for direct measurements of strains and temperatures, as well as detection of extremely small cracks, including their width change estimation. Moreover, thanks to the appropriate sensors' arrangement, it was possible to calculate vertical displacements caused by the dead weight of GRP panels and mortar injection applied during strengthening. Example crack morphology along the safety critical section as well as vertical displacement profile over entire length are presented in the figures below.

-  **51 000** measurement points
-  **510 m** of sensing path
-  **3 x EpsilonRebar, 1 x ES**
-  **construction** (strengthening)



project partner:

**Warsaw University
of Technology**