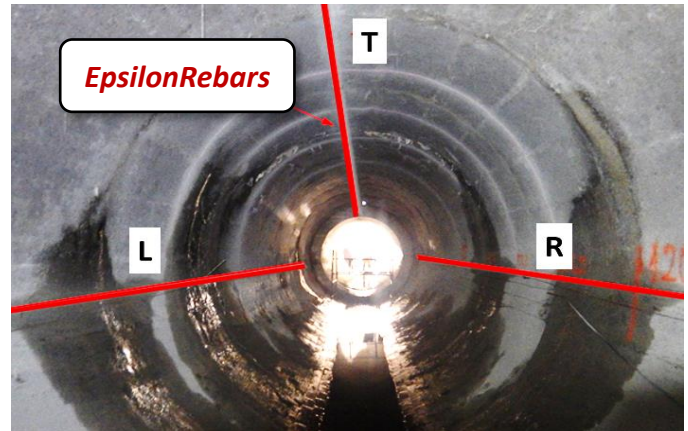


Sewer concrete collector during its strengthening with GRP panels

EpsilonRebar: Case Study

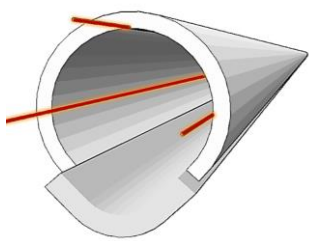
The concrete sewage collector in question was constructed in 1964 and now reinforced with Glass-fiber Reinforcement Plastic (GRP) panels. To verify the strengthening process, EpsilonRebars (ER) and EpsilonSensor (ES) from **Nerve-Sensors** family were installed inside the near-to-surface grooves. ERs go longitudinally over 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

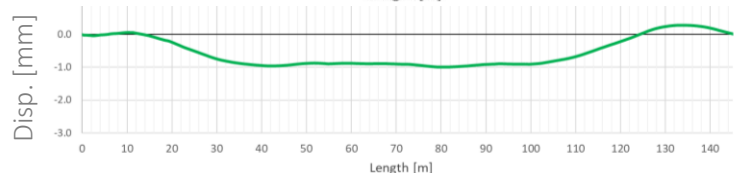
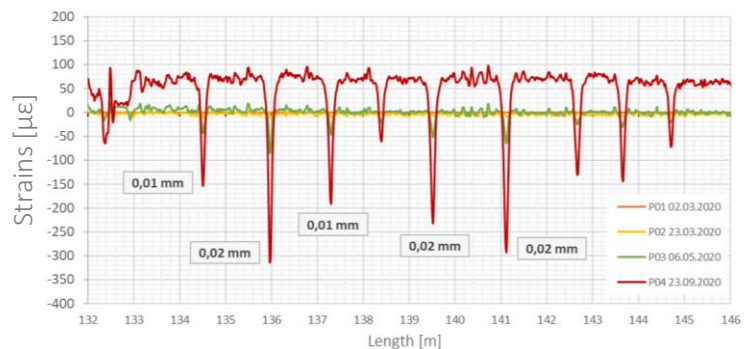
- Detection of **all the cracks** between the old segments (with width estimation)
- Calculation of **vertical displacement** profiles (settlements) along the length
- Full deformation **control during strengthening** process (injection + FRP panels)
- **Reliable monitoring system** working in extremely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

Example results



Nerve-Sensors allowed for direct measurements of strains and temperatures, as well as detection of extremely small cracks and their width changes estimation. What is more, 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 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