

Concrete slab strengthened with FRP composites: strains & cracks

Nerve-Sensors: Case Study

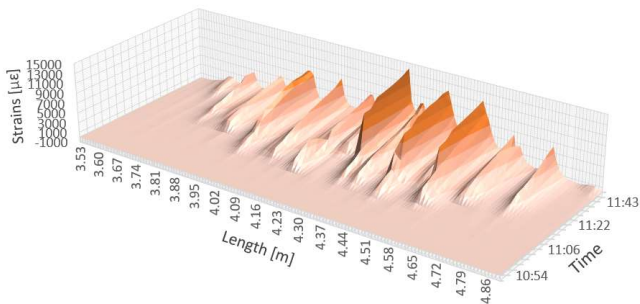
The reinforced concrete slabs were investigated in laboratory conditions in mechanical four point bending tests. Some were strengthened with FRP material to analyse this solution's effectiveness. However, the application of FRP prevented visual inspection of cracks. That is why all the slabs were equipped with distributed optical fibre strain sensors placed in-between the concrete and the strengthening material, which allowed for the detection of all cracks invisible to the naked eye.



Benefits of application

- Detection of **all cracks** between the concrete and FRP material
- Knowledge about **cracks invisible to the naked eye and other techniques**
- Thousands of measurement points **without disturbing structural connection**
- Successful measurements **during the entire test until structural failure**

Example results



One of the research goals was to compare structural behaviour (including crack morphology) of concrete slabs with and without FRP strengthening. DFOS strain sensors installed within the structural connection allowed to complete this task successfully. The figure below shows the example strain profile and corresponding cracks detected during mechanical bending tests.

 **5 700** measurement points

 **57 m** of sensing path

 **38 x** strain sensor

 **short-term** (load tests)

 project **partner:**

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