



# LIFETIME ENGINEERING

## of Buildings and Civil Infrastructures



Objectives of NATIONAL DISSEMINATION GROUPS in Thematic Network Lifetime: National information, demonstration, education and training of lifetime engineering

Demonstration project of lifetime engineering in SLOVENIA :

### R.C. BRIDGE STRENGTHENED WITH STEEL PLATES: BEHAVIOUR 21 YEARS AFTER THE INTERVENTION

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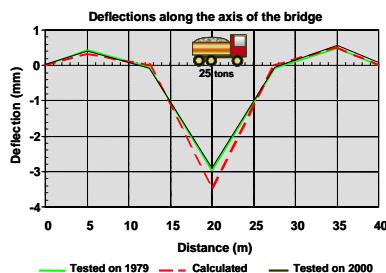
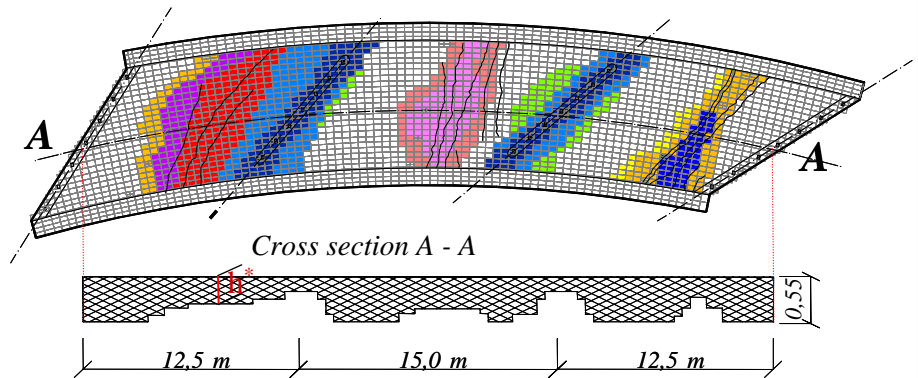
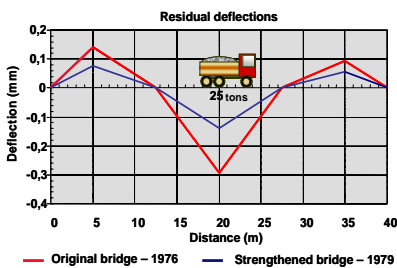
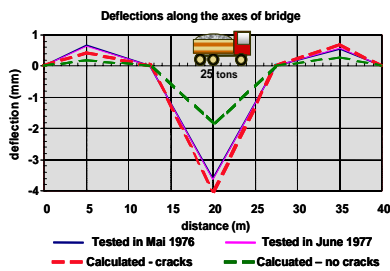


#### HISTORY OF BRIDGE

Constructed in 1976, strengthened with steel plates in 1979. Tested in 1976, 1979 and 2000.

#### STRENGTHENING

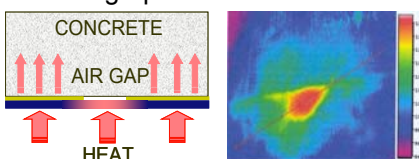
Injection of cracks by epoxy resin, applying of steel plates (200/6 mm) in amount of 40% of originally built-in reinforcement



The estimated depth of cracks was used for calculation of efficient depth of slab.

$$h_i = \sqrt[3]{\frac{12 \cdot I^*}{a}} \quad I^* = \frac{a^* b^3}{12} + a^* b^* y_c^2 + n^* p^* p^* \frac{D^4}{64} + n^* A_s^* y_s^2 + n^* i^* \left( \frac{\check{s}^* d^{\check{\delta}}}{12} + \check{s}^* b^* y_l^2 \right)$$

#### Thermographic detection of voids



#### CONCLUSIONS

The global behaviour of the strengthened bridge did not change in 21 years. The behaviour can be well predicted by computational tools if the depths of cracks are properly taken into account in computational model. The presence of voids between the concrete surface and steel plates can be efficiently detected by thermographic inspection.

#### Principal contractors of Thematic Network LIFETIME:

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- Taylor Woodrow Construction Ltd, UK
- CSTB Centre Scientifique et Technique du Bâtiment, FR
- Imperial College of Science, Technology and Medicine, UK
- Universität Karlsruhe (TH), TMB/Facility Management, DE



#### Thematic Network LIFETIME in figures:

- Working period: 1/6/2002 - 31/5/2005
- Participation: 96 partners from 28 countries
- Plenary workshops: 2002 Norway, 2003 Finland and 2005 France
- 25 National Dissemination Groups
- Funding from 5th Framework Programme: Competitive And Sustainable Growth (GROWTH) Programme