

## SUMMARY

**Title: Grands-Crêts bridge: inspection and reparation project**

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The object of this thesis is a concrete bridge build in the 50's in Vaud Canton (Switzerland). It is placed in the cantonal road between Vallorbe and Lausanne.

Its localisation has partially supposed a reduction of the heavy traffic. But by the other side its environmental exposition has been very severe. It is a wet and cold zone, thus in winter season the chlorurs used for melting the ice on the road are common.

It's a "healthy" bridge but it has certain proves that we are working with a bridge which has been suffering the last years; it can be easily proved looking to the armature's corrosion. By the other side the Suisse road regulations (SIA 263) have been recently modified increasing the maximal charge, so the structure could be overloaded. Those were the two main causes for the Government to carry out a study to evaluate the real state.

The study case is divided in three different parts:

1. An inspection
2. Structural security and service state verification
3. Reparation project

The inspection has been done as a visual inspection and it was determinant to find out the origin of the problems: the non permeability of the bridge's surface. The fact that the water could freely flow throw the surface, either in the joints or the concrete, make that the chlorurs –whose are mixed in the water and they come from the melting ice– directly attack either the columns or the underneath surface. This direct aggression leads to corrosion in the armatures and consequently the bars section decreases and the cracks break the concrete.

To develop the structural verification the bridge has been calculated using two different interpretations, in 2D and in 3D, thus we could place the charges where they were more unfavourable. The traffic charges have been updated using the Suisse latest regulations. The security coefficients, either for the materials performances or application charges have been also updated. Both models of calculation ran separately and independent, thus helped us to verify the results. The informatics tool used is based on EF. The different structural parts have been separately calculated and evaluated, then the weak points were localised.

The reparation project proposes a solution for the structural and durability problems which is based and thought to use BFUP (High Performance Fiber Concrete). This advanced material is characterized its non permeability and its high resistance. Thus, its utilisation gives us the chance to solve both problems with only one intervention.