



## Complexity, Ingenuity, Creativity

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### Summary

Our built heritage suffers. It is becoming increasingly necessary to repair, strengthen and even upgrade its performance. The causes of damages and disorders we discover on our buildings and structures are as various as the reasons that lead us to reconsider the use we make of them. We are therefore faced with the need to understand the behaviour of old structures, discover their shortcomings and imagine how to act effectively in the least denaturing their sometimes highly representative heritage character. These reflections apply to both old buildings and the modern, civil and industrial equipment and call for new ways of thinking from our engineers.

**Keywords:** Heritage, refurbishment, methods of rehabilitation, case studies.

### 1. Introduction

How long should a new building, considered as useful and necessary, last?

What is the lifespan of a new sea lock, a hospital, a gym or a bridge connecting two islands?

This question is relevant to a Smartphone, a dishwasher or a car, but is inappropriate for what is supposed to be a heritage transmitted between generations.

What was supposed to be the lifetime of the tower of Pisa that we can admire for centuries, or even better, the Egyptian pyramids which are thousands of years old?

And much closer to us, what was the supposed life of the Eiffel Tower which was originally a temporary structure?

The sustainability of our built heritage is not measurable, and our mastery of it can only convince us that maintaining its wealth, possibly during several hundred years, will require regular maintenances and repairs and, certainly, frequent substantial reinforcements.

This heritage, whatever its estimated life : 20 years, 100 years or more, if in 200 years it is still considered as useful, it should still be there and in good condition.

It is therefore not surprising that the overall issue of maintaining our heritage in good condition, and in a condition that is useful to our society, is extremely complex.

**This complexity** comes from the **great diversity of this heritage**, the wide variety of **objectives and reasons** that lead us to repair, reinforce, renovate or "upgrade", and finally, from the complexity and specificity of the **processes and methods of execution** implied by these interventions.

All this requires **special knowledge** of the actors who will design and carry out these preservation works, work that will usually involve the **expertise and hands of skilled and creative artisans**, while new construction is increasingly a matter of machines.

Contrarily to popular belief, rehabilitation and strengthening interventions always are very specific actions which require imagination and creativity on top of the specific know-how.