



Sustainability of Infrastructures vs. Climate Changes

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Summary

Climate changes became a challenge for the sustainability of infrastructures which are expected to perform during long life-cycles. However, “the forces of mother nature” reflected in codes; do not always cover caprices of the nature manifested in extreme weather events such as abundant snow falls, heavy winds, freezing rain, flooding, etc....which never occurred before. Examples from Quebec where generally snow falls are important, a “great” ice storm occurred in 1998 and heavy rains became a frequent phenomenon; can serve as examples for the behaviour of some infrastructures in unusual weather conditions. The character and the range of failures caused by snow, wind, ice build-up, etc... in regions regularly exposed to these loads, can serve as a reference for the performance of structures elsewhere, where hazards form climate changes; Forensic Engineering deals with such issues. A parallel between “poorly” designed structures and effects of climate changes leads to the conclusion that quality of design remains the main issue in the consideration regarding these aspects.

Keywords: Sustainability, infrastructures, climate changes, loads, forensic engineering, robustness, redundancy, retrofitting, strengthening.

1. Introduction

The words of Carlos Fernández Casado; “...in perfect union with Nature; however, we cannot forget our engineer goal of controlling it. Nevertheless, landscape beauty and its grandiosity get into contradiction with above attitude due to the fact that the engineer was taken over by nature, till the moment I learnt “natura parendo vincitur”, “to get control of nature but obeying it”. The Engineer shall always love nature... “, employed as the motto for the IABSE Symposium 2014, has new dimensions since the 80’s, when we realized that the climate changes take place and we have to deal with this new context. As a result, the Intergovernmental Panel on Climate Change was established by the United Nations in 1988 to review and assess information relevant to the understanding of the climate changes.



Fig. 1: Snow fall in Nice

Climate changes constitute a challenge for the sustainability of infrastructures which are expected to perform during long life; however, “the forces of mother nature” reflected in codes; do not always cover caprices of the nature manifested in extreme weather events such as abundant snow falls, heavy winds, freezing rain, flooding, etc... which never occurred before. Heavy snow falls and freezing rains in the United States and Canada or heavy winds in Northern Europe in December 2013 are the latest examples. Snowfalls in Nice or in Algiers as shown on Figures 1 and 2 are perhaps the most spectacular we could figure with regards to the weather.