GUIDELINES FOR NON-LINEAR FINITE ELEMENT ANALYSIS OF RC STRUCTURES

Beatrice Belletti, DICATeA, University of Parma, Parma, Italy
Max A.N. Hendriks, Faculty of Civil Engineering and Geosciences, Delft University of Technology, Delft, the Netherlands
Cecilia Damoni, Guest researcher at DICATeA and Delft University of Techn.

ABSTRACT

Although the use of nonlinear analyses as a tool for design of new and assessment of existing structures increases year by year, it is not commonplace yet. The potential of nonlinear analysis is still beyond doubt. The state-of-the-art in nonlinear finite element analysis (further: NLFEA) of reinforced concrete has progressed to the point where such procedures are close to being practical, everyday tools for design office engineers. The Dutch Ministry of Transport, Public Works and Water Management initiated a project to critically evaluate existing software for nonlinear analysis of concrete structures and write guidelines for nonlinear finite element analyses in order to reduce model and user factors that would introduce additional uncertainties in the safety assessment. Indeed, changes in usage and need of extending service life of existing infrastructure in the Netherlands has resulted in an increased interest of the assessment of structural safety of reinforced and prestressed concrete bridges and viaducts. In particular, shear failure is a concern because of stricter shear strength rules in the design codes, increased loading due to heavier traffic as well as the need for additional traffic lanes on existing structures, and uncertainty in material properties of structures that were built in the 1960-1980's. In the presentation, the applicability of the first version of these guidelines is examined by providing the results of some exemplary beams, which were tested experimentally, used as benchmark.

Keywords:
Nonlinear finite element modeling, Reinforced concrete beams, Shear failure, Guidelines