

Recent Developments of the NLFEA Guideline

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Summary

The Dutch Ministry of Infrastructure and the Environment is concerned with the safety of existing infrastructure and expected re-analysis of a large number of bridges and viaducts. Nonlinear finite element analysis can provide a tool to assess safety using realistic descriptions of the material behavior based on actual material properties. In this way, a realistic estimation of the existing safety can be obtained utilizing “hidden” capacities.

Nonlinear finite element analyses have intrinsic model and user factors that influence the results of the analysis. This document provides guidelines to reduce these factors and to improve the robustness of nonlinear finite element analyses. The guidelines are developed based on scientific research, general consensus among peers, and a long-term experience with nonlinear analysis of concrete structures by the contributors.

The new version of the guidelines 2017 can be used for the finite element analysis of basic concrete structural elements like beams, girders and slabs, reinforced or prestressed. The guidelines can also be applied to structures, like box-girder structures, culverts and bridge decks with prestressed girders in composite structures. The guidelines are restricted to be used for existing structures.

The guidelines have been developed with a two-fold purpose. First, to advise analysts on nonlinear finite element analysis of reinforced and prestressed concrete structures. Second, to explain the choices made and to educate analysts, because ultimately the analysts stays responsible for the analysis and the results. An informed user is better capable to make educated guesses; something that everybody performing nonlinear finite element analyses is well aware of.

The deliverables in this context are:

- 1 - Guidelines for Nonlinear Finite Element Analysis of Concrete Structures
- 2 - Validation of the Guidelines for Nonlinear Finite Element Analysis of Concrete Structures,
Part: Overview of results
- 3 - Validation of the Guidelines for Nonlinear Finite Element Analysis of Concrete Structures,
Part: Reinforced beams
- 4 - Validation of the Guidelines for Nonlinear Finite Element Analysis of Concrete Structures,
Part: Prestressed beams
- 5 - Validation of the Guidelines for Nonlinear Finite Element Analysis of Concrete Structures,
Part: Slabs