Table of contents

EDITORIAL

Finite Element (FE) calculations – a paradigm shift

Words from the Scientific and Technical Counsel

FOREWORD

Recommendations and Advice Content – The list of authors

Let us know about your comments and feedback to improve the website!

INTRODUCTION

A short and broad introduction – Structural analysis and finite elements

PART 1 – THEORETICAL ELEMENTS

Chapter A. General Observations

Chapter A - General Observations

Chapter B. Structural Dynamics

Chapter B - Structural Dynamics

Chapter C. Static non-linear calculations

Chapter C - Static non-linear calculations

Chapter D. Civil Engineering

Chapter D - Civil Engineering

Chapter E. Typical post-treatment of Civil Engineering

Chapter E - Typical post-treatment of Civil Engineering

Chapter F. Geotechnical calculations

Chapter F - Geotechnical calculations

PART 2 – USEFUL ELEMENTS

Chapter A. Understanding the finite elements

A.1. What does a finite element software do? Example of framed structures.

A.2. Explicitly, what is a finite element?

Annex 1 – File of the matrix calculation example

Chapter B. Computational objectives and necessary characteristics of the tool

Creating a finite element computational model includes several steps. The choice of the tool is critical and depends on various criteria. A successful model requires good organization and preparation.

B.1 to B6 Criteria to be considered

B.7 Organization of the computational model

Chapter C. Good practices to create a model

The different levels of analysis and the complexity associated with the model have already been defined in the previous chapter before the modeling stage. This chapter highlights the simplifications that can be used to create a model that is structurally representative of the real-life structure and the loads it is subjected to.

C.1 Input data and units

C.2 Modelling of the main elements

C.3 Finite elements and meshing

C.4 Modelling of the non-structural elements or the equipment

C.5 Boundary conditions

C.6 Connections – links – assembly

C.7 Eccentricity

C.8 Combined cross-sections (beam/deck)

C.9 Materials

C.10 Behaviors specific to shear and torsion

C.11 Loads modeling

C.12 Further information related to volumetric elements

C.13 Further information related to non-linear calculations

C.14 Further information related to prestress

C.15 Further information related to phase calculation

C.16 Further information related to structural dynamics and seismic calculations

Chapter D. Analysis and processing of the results

D.1 General information about numerical calculations

D.2 Load combinations

D.3 Results processing

D.4 Validation rules: the behavior of concrete elements

D.5 Understanding and analyzing the peaks (case study about concrete)

D.6 Understanding and analyzing the peaks (case study about steel assembly)

D.7 Further information specific to dynamic calculations

Chapter E. How to ensure quality?

Below are some simple advice to assess the quality of the finite element calculations. The principal challenges are:

§ The proper use of the software

§ The appropriate modeling of the structural behavior

§ The traceability of the modeling hypotheses and results

The advice below covers the engineer's or the team's handling of the software, the verification controls that must imperatively conduct any engineer at the end of its modeling, and the tracing of the minimum items so that the work can be completed thereafter.

E.1 Starting with a new software

E.2 Model validation using self-checking

E.3 Traceability and group work

Chapter F. How to properly present the finite element calculation note?

This paragraph introduces the fundamental elements that must be present in a note to provide a clear description of a FE computational model.

F. How to properly present the finite element calculation note?

PART 3 – EXAMPLES AND COMPLETE CASE STUDIES

This part contains modeling examples for simple and more complex objects. They are presented as a complete or partial study or even a comparison of different models of the same structure.

If you happen to have an example that you wish to share with us of a complexity or paradox noticed on a part of a model, please send it to the following address: elements.finis@afgc.fr. (It could be a note about a real project rendered anonymously.)

Example A – Modelling a complex high-rise building

Example A – Modelling a complex high-rise building

Example B – Modelling of composite bridges

Example B – Modelling of composite and steel bridges

Example C – Modelling of beam grids

Example C – Modelling of beam grids

Example D – Simple example: modeling of a **Br wheel** [CH1]

Example D – Modelling of a Br wheel

Example E – Transverse bending of a prestressed concrete box girder

Example E – Transverse bending of a prestressed concrete box girder

Example F – Dynamic calculations of tanks

Example F – Dynamic calculations of tanks

Example G – Cable-stayed bridges

Example G – Cable-stayed bridges

BIBLIOGRAPHY

Link to the bibliography

FOLLOW-UP OF ADDS-UP AND MODIFICATIONS

List of adds-up and modifications

Révision #7
★Créé 8 June 2023 15:32:53 par Didier BRAZILLIER
Mis à jour 21 September 2023 15:40:36 par Paul Terrasson Duvernon