



Advanced analysis of a new cable-stayed Danube bridge

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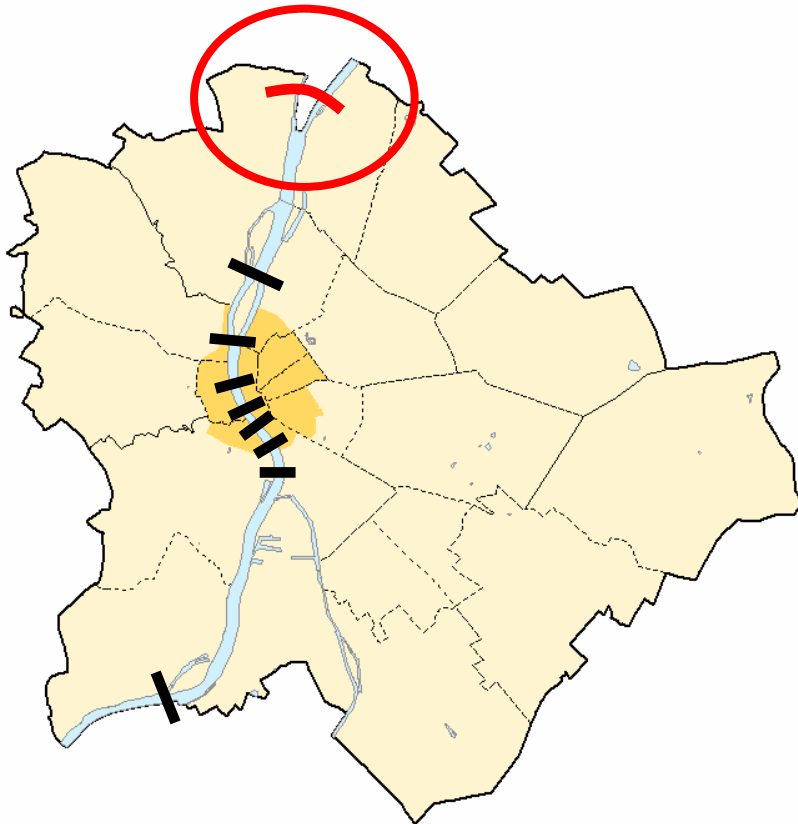
PhD Student

Prof. László DUNAI

Supervisor



Introduction





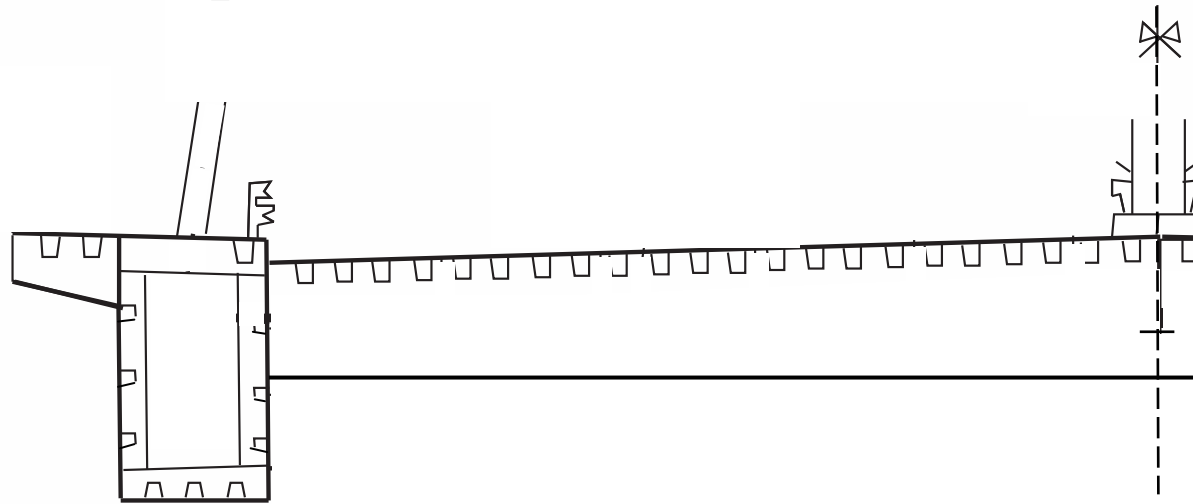
Introduction

Total length: 600 m

Pilon height: 97 m

Middle span: 300 m

Girder width: 35 m



Design: CEH Co., Budapest, Hungary



Introduction

BUTE, Dept. of Structural Engineering:

INDEPENDENT ANALYSIS AND DESIGN

- Static
 - Stability
 - Aerodynamics
 - Earthquake
-
- Construction process
 - Construction stages
 - Service stage

MODEL

Methodology

Pre-processing:

MATLAB



Analysis:

ANSYS



Post-processing,
 Visualisation,
 Result evaluation:

MATLAB

Microsoft **Excel 2000**
 MICROSOFT OFFICE

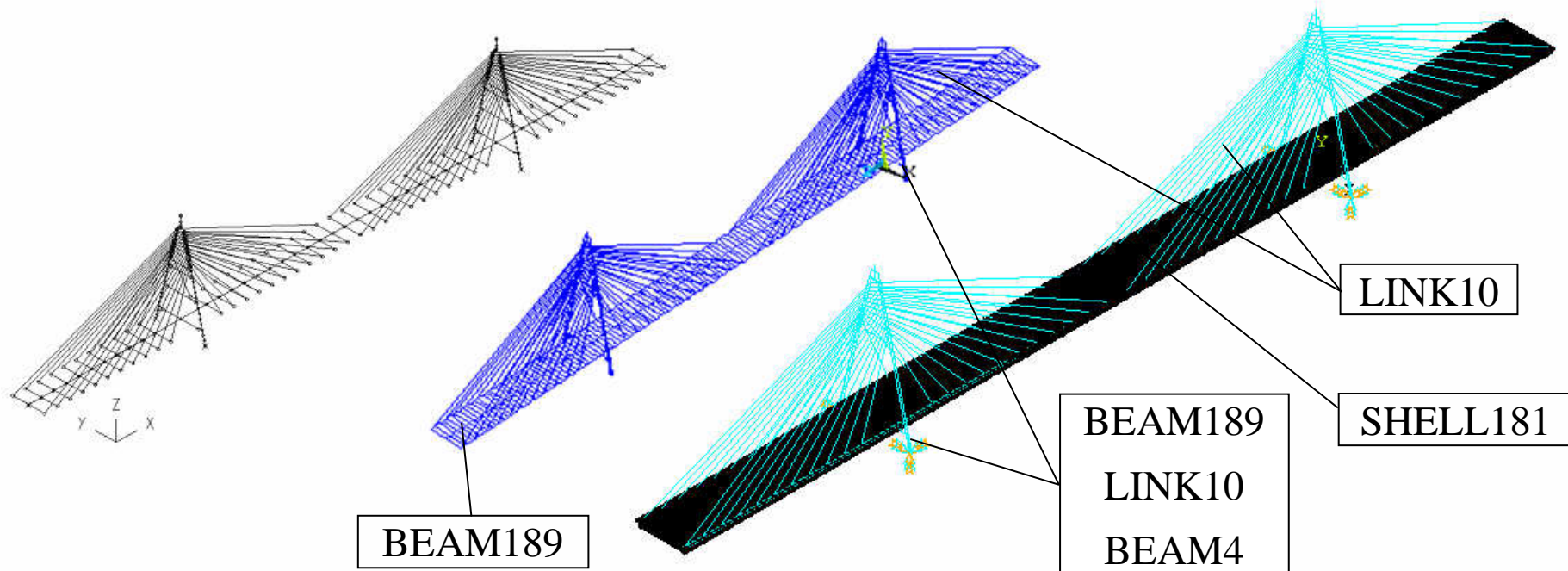
The ANSYS window displays a bridge model with various parameters and a table of material properties. The Excel window shows a spreadsheet with a graph of stress distribution.

Anyagjellemzők	jellemzők	E
alacsony beton	276000	34000
alacsony acél	0	190000
alacsony beton	0	200000
alacsony beton	0	200000
alacsony beton	276000	34000
alacsony beton	0	200000



Models

Beam Model #1 (problem-oriented software)	Beam Model #2 (Ansys)	Mixed Model (Ansys)
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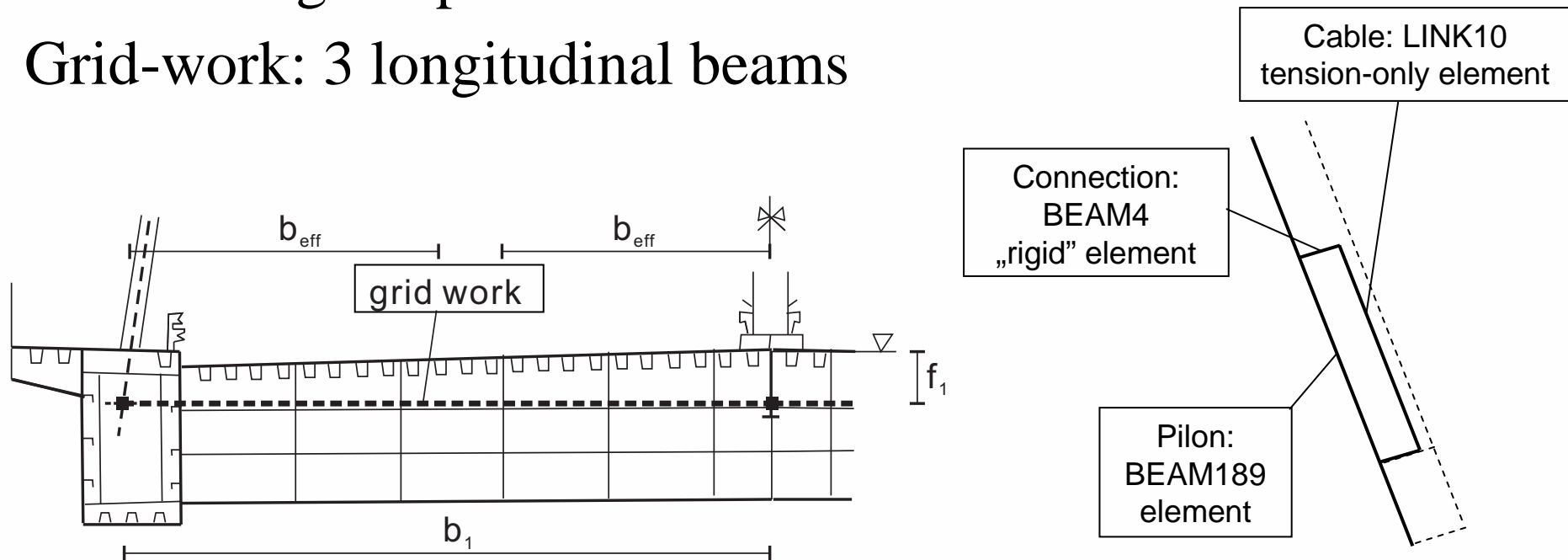


Model Details

Pilon cross-section: composite cross-section

Prestressing the pilons: beam and cable elements

Grid-work: 3 longitudinal beams





Modelling techniques

Time-dependent material properties

- Shrinkage of concrete
- Relaxation of prestressing cables
- Concrete creeping
 - Implicit creep option (Generalized Graham)
 - Hungarian standard's function not implemented

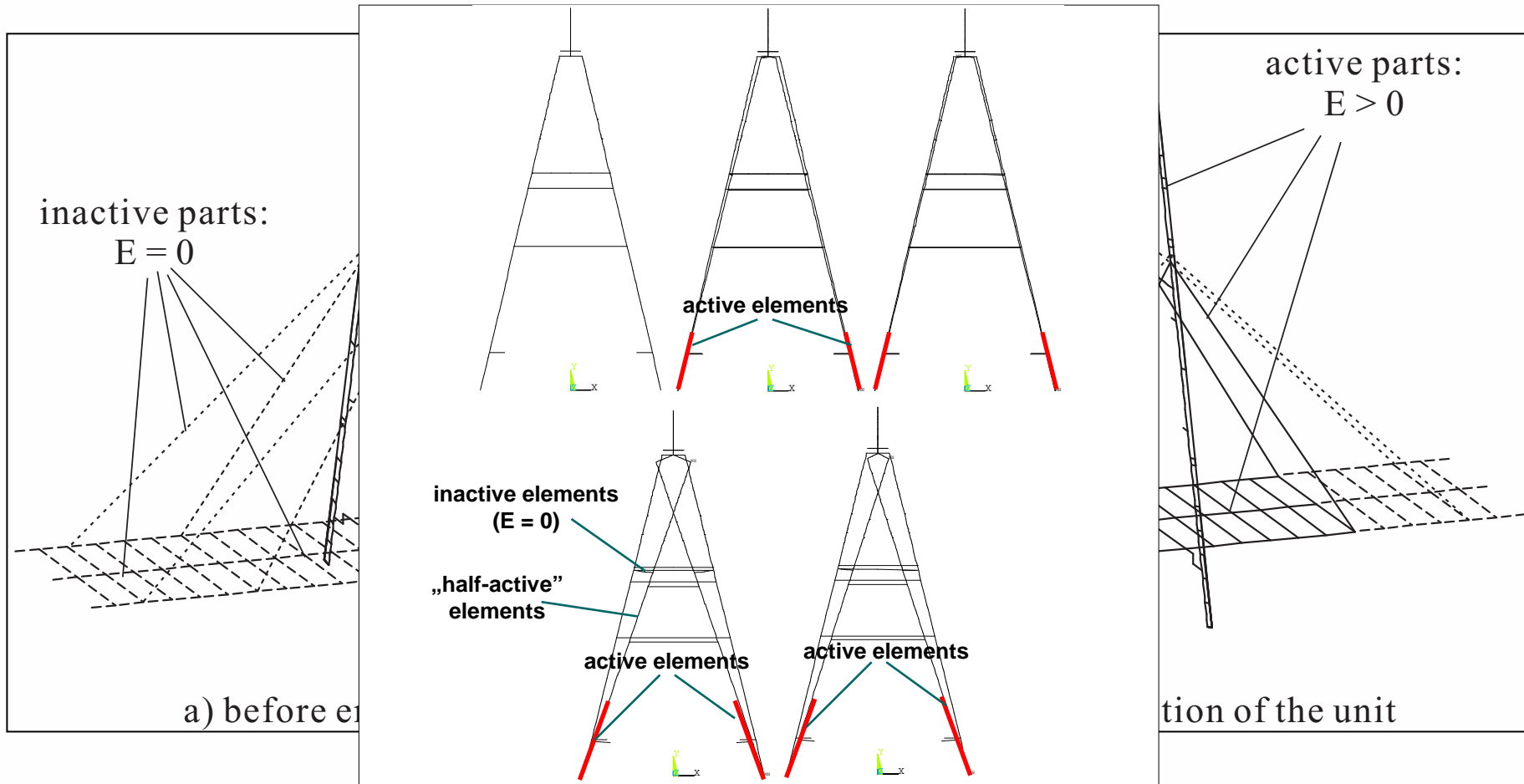
Time-dependent temperature load

Re-defining the creep function after each load step

Erection process simulation

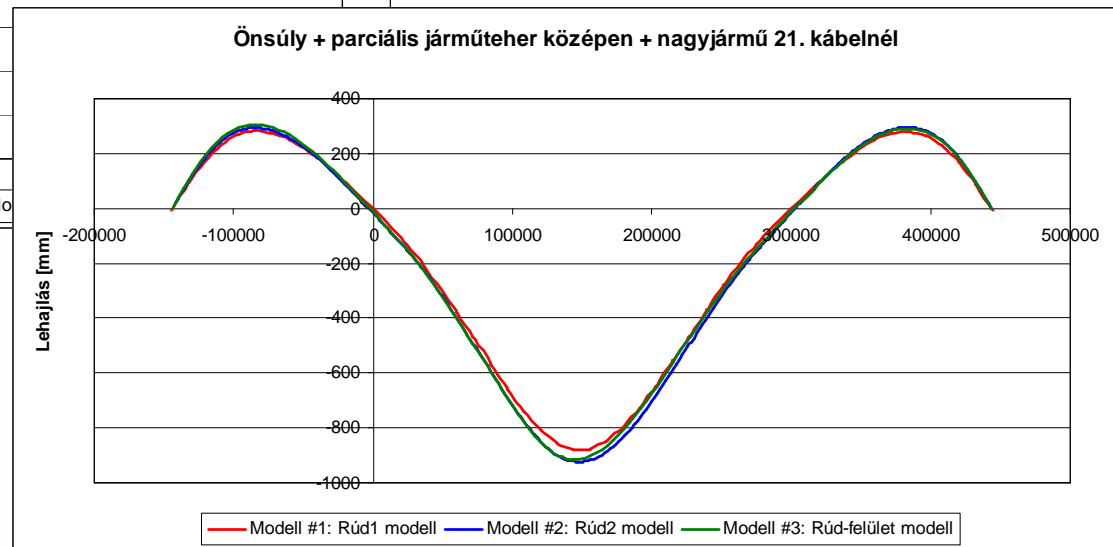
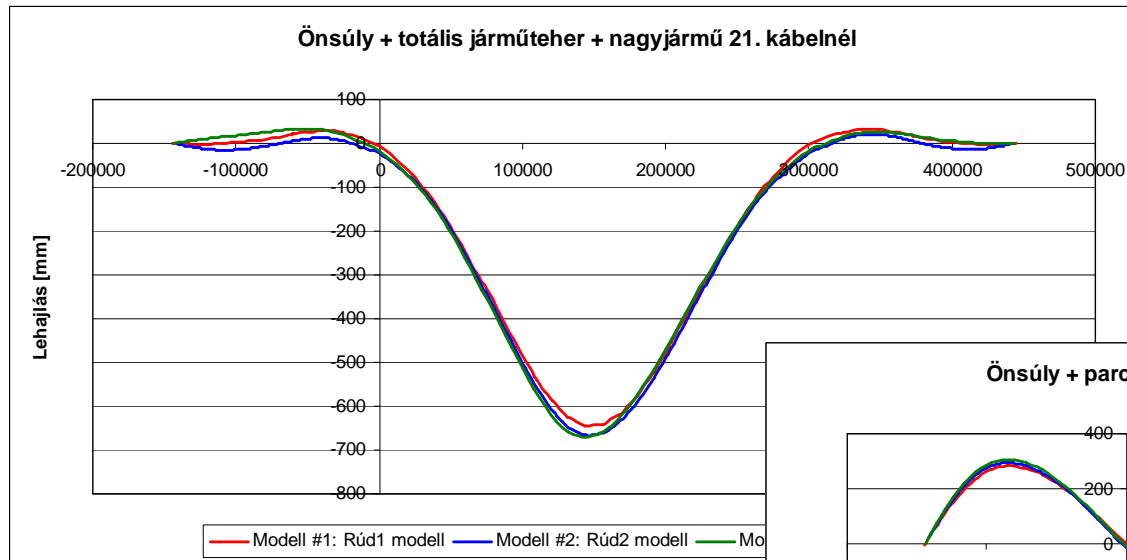
- Special birth & death option developed

Changing material properties

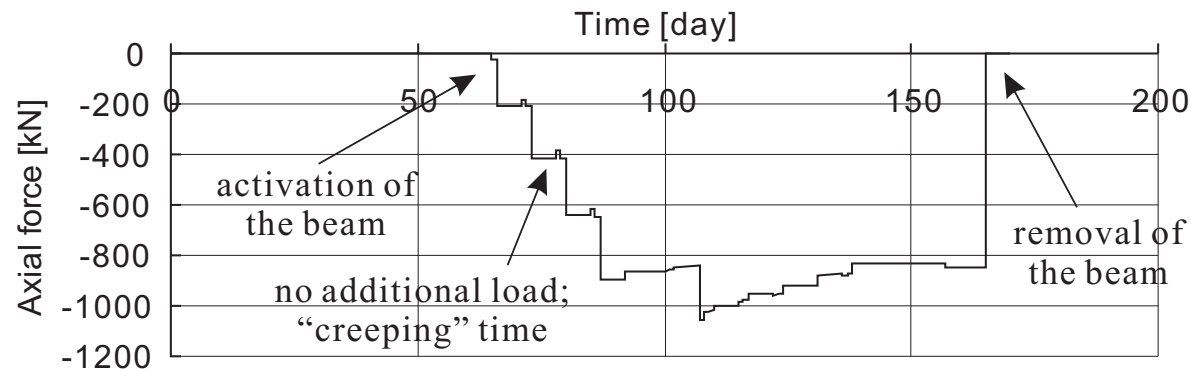
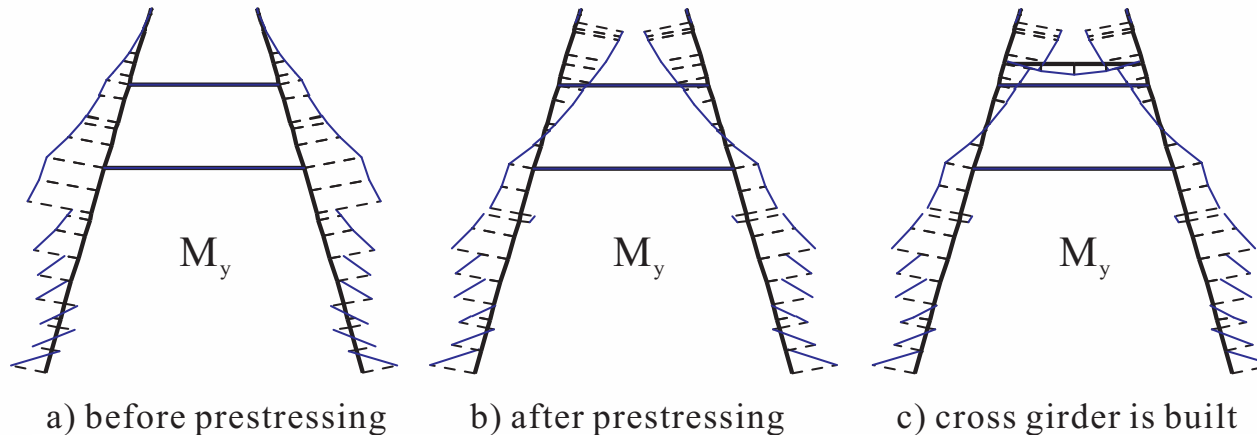




Pilot tests



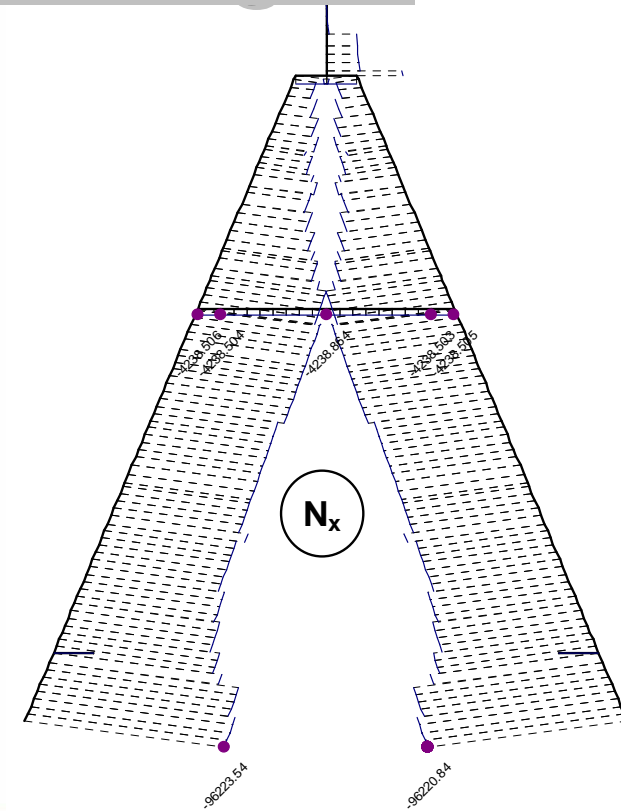
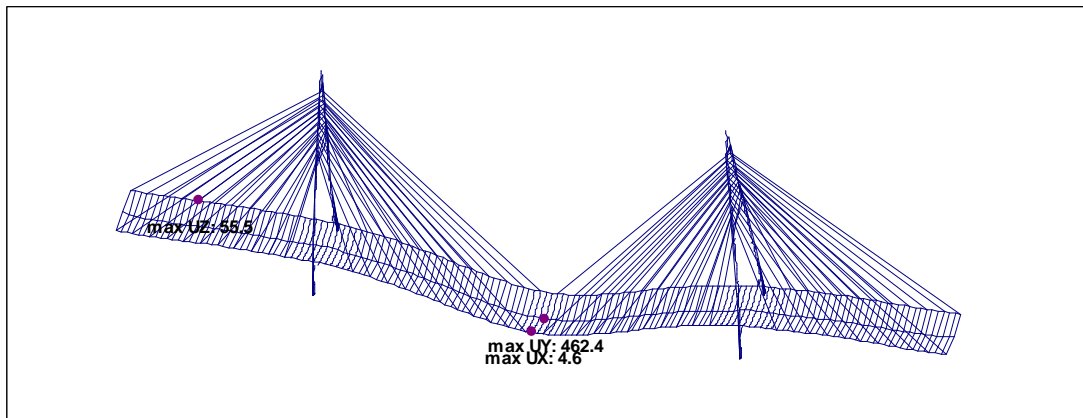
Static analysis - erection process



d) axial force in the lower temporary beam

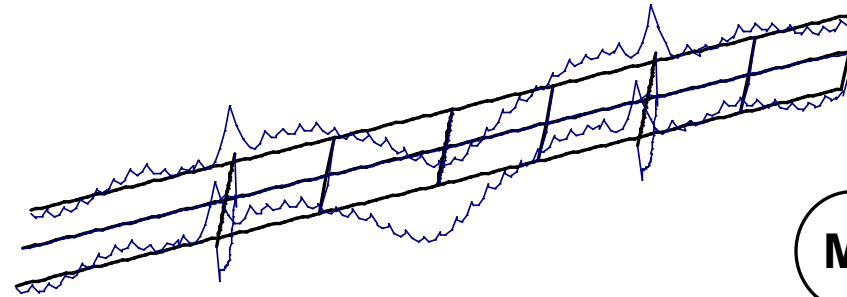


Static analysis - erection & service stages

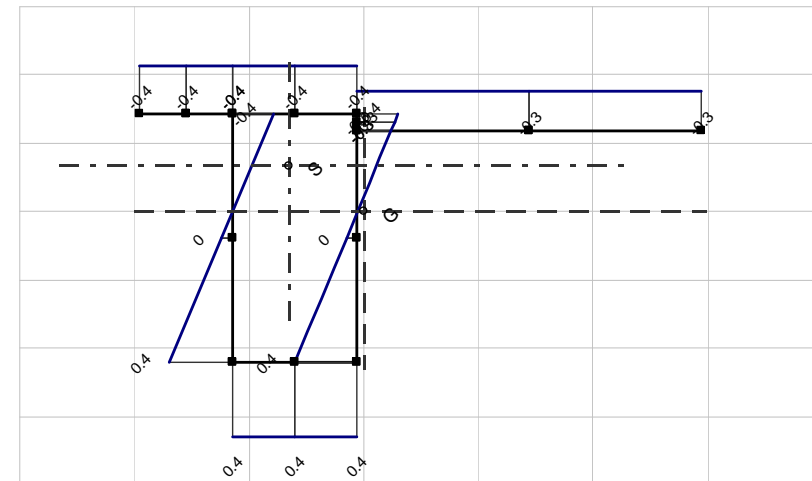
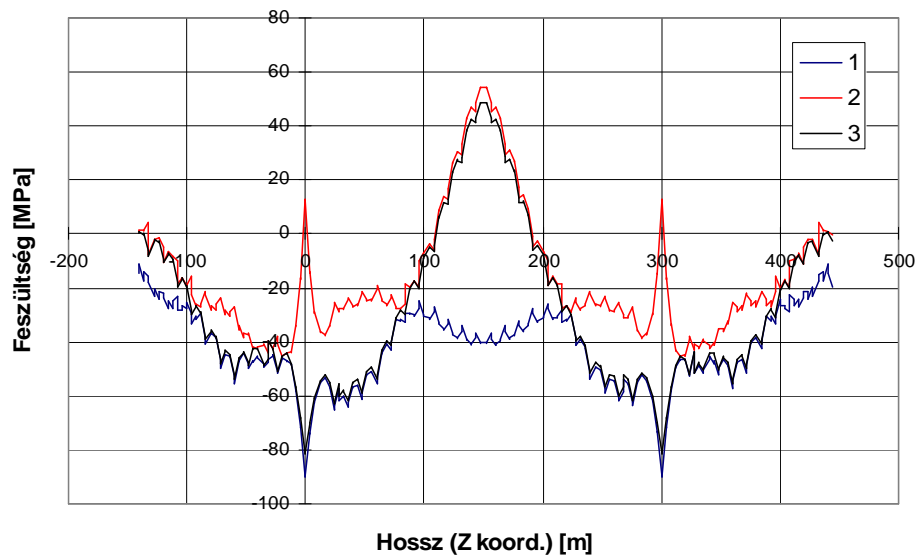




Code checking



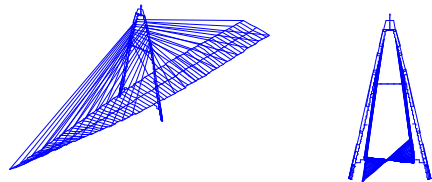
M_y



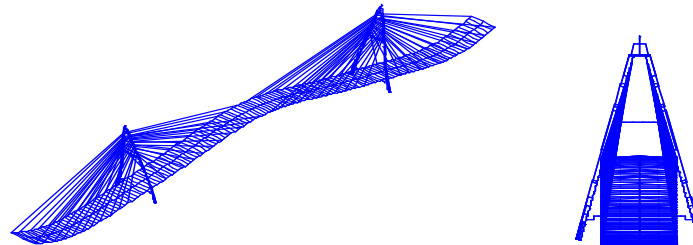


Modal & Eigenbuckling analysis

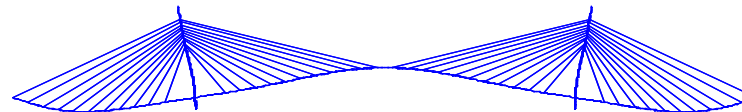
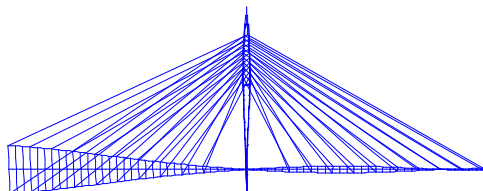
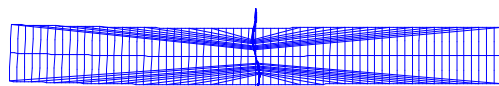
- Global stability
- Earthquake
- Aerodynamics



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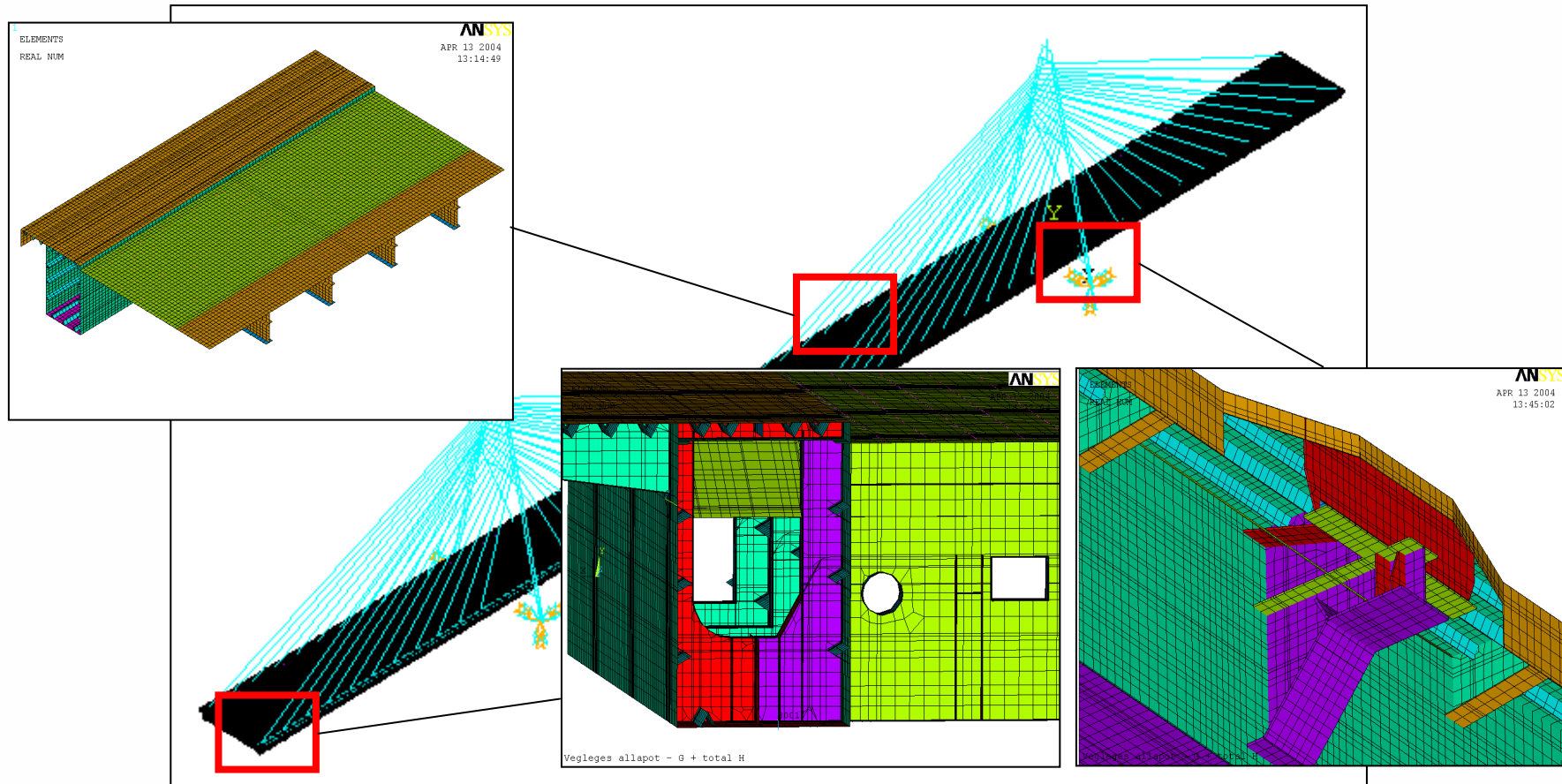


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APR 15 2004
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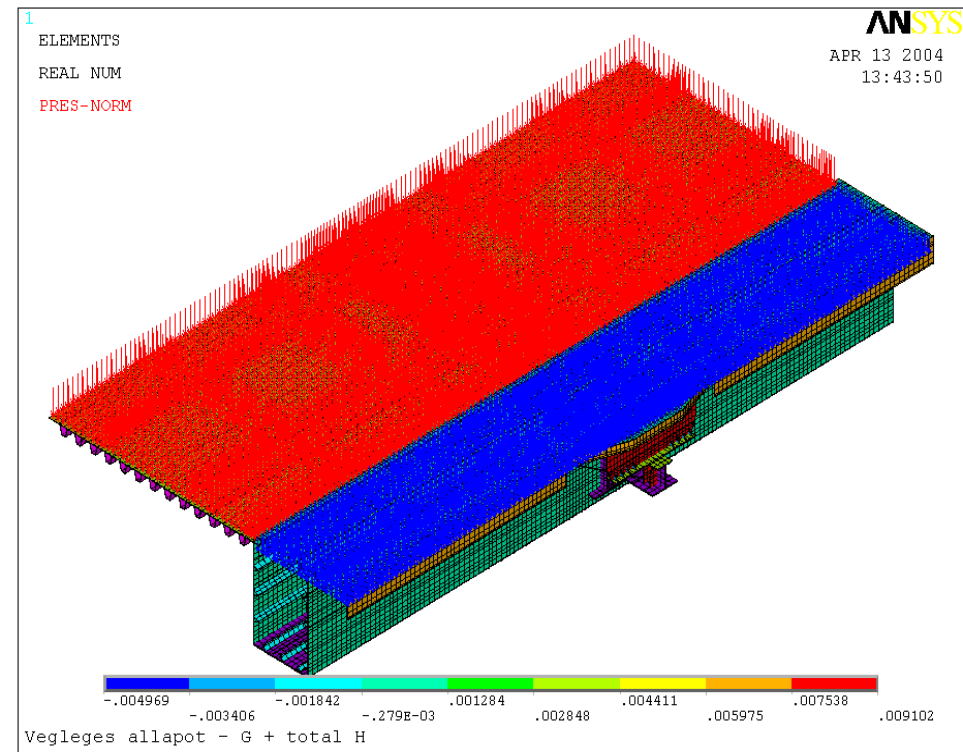


Mixed model - submodels



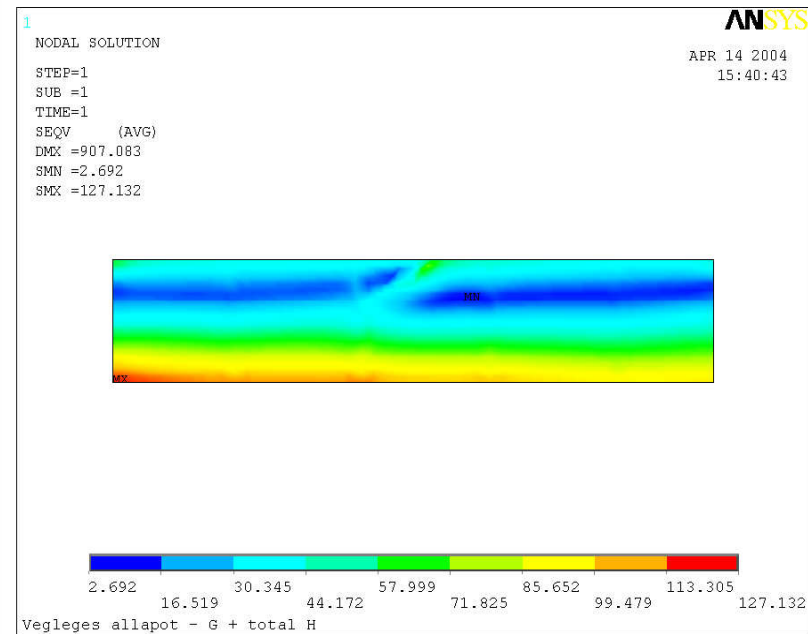
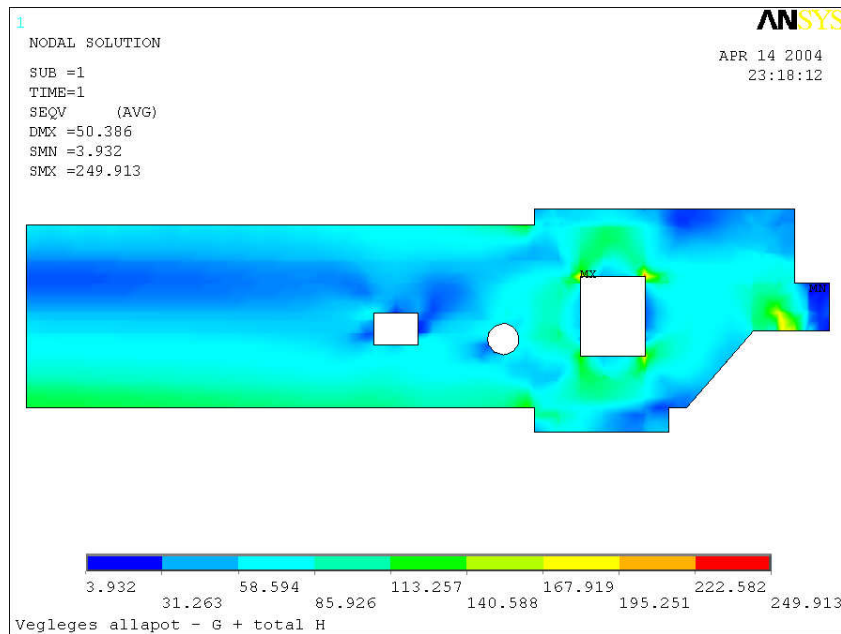


Submodelling technique





Static analysis - stress distribution





Conclusions

- A special modelling technique was developed and used
 - Beam model
 - Beam-shell mixed model
- Static, modal, eigenbuckling, earthquake analysis
 - Construction process
 - Construction and service stages
- Useful, efficient software background
 - Pre-processing, Analysis, Post-Processing
 - Documentation



Thank you for your attention!

