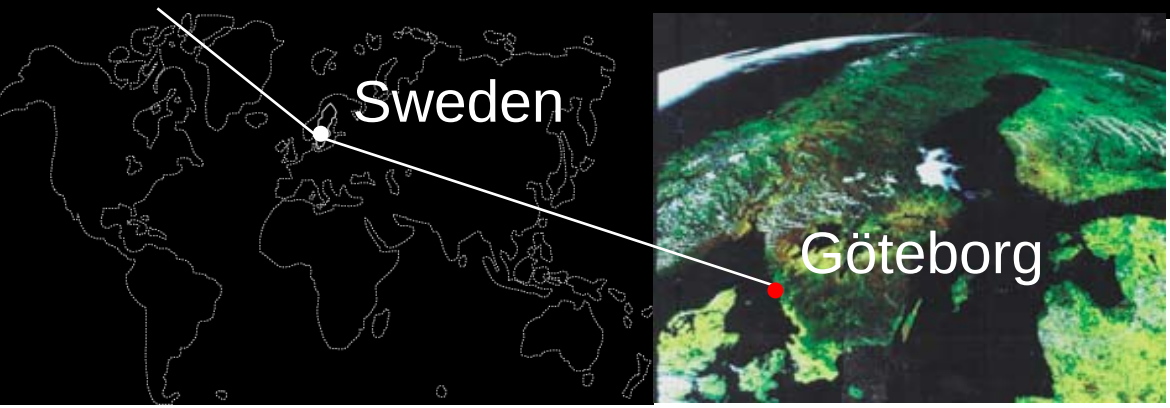
CHALMERS

University of Technology

Göteborg,
Sweden’s second largest city,
with 500 000 inhabitants



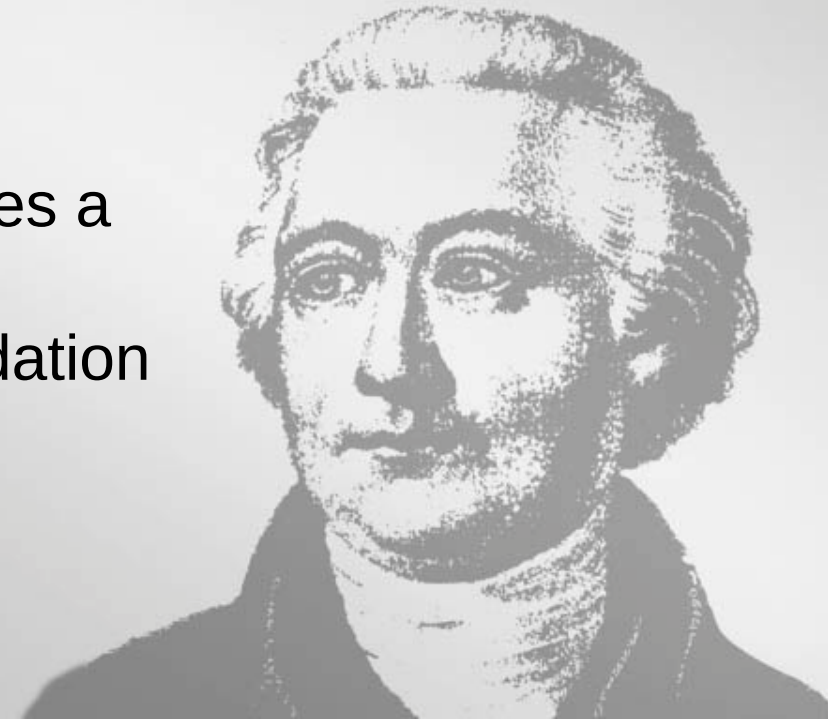



... situated on the beautiful
west coast of Sweden
... with two pleasant campuses
in the centre of Göteborg

1829 Chalmersska Slöjdeskolan is founded by the will of William Chalmers

1937 Chalmers becomes a governmental university with the authority to award doctoral degrees

1994 Chalmers becomes a private university, owned by a foundation



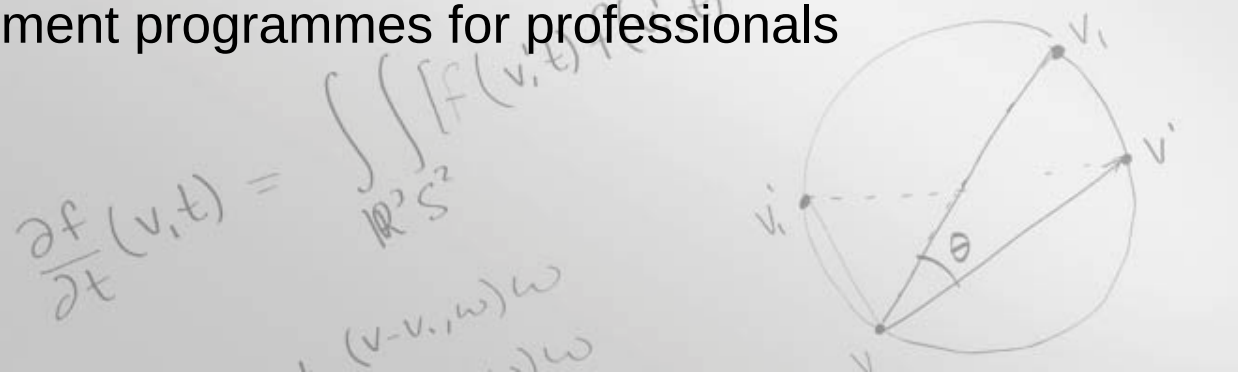
Education

- Engineering preparatory year
- BScEng and BSc programmes, 3 years
- MScEng and MArch programmes, 5 years
- Nautical programmes, 3–4 years

- Master’s programmes, 2 years

- Licentiate and doctoral programmes

- Continuing development programmes for professionals



MScEng Programmes, 5 years

- Architecture and Engineering
- Automation and Mechatronics Engineering
- Chemical Engineering
- Chemical Engineering with Engineering Physics
- Civil Engineering
- Computer Science and Engineering
- Electrical Engineering
- Engineering Physics
- Industrial Design Engineering
- Industrial Engineering and Management
- Information Engineering
- Mechanical Engineering

MArch Programmes, 5 years

- Architecture
- Architecture and Engineering

Chalmers' Departments

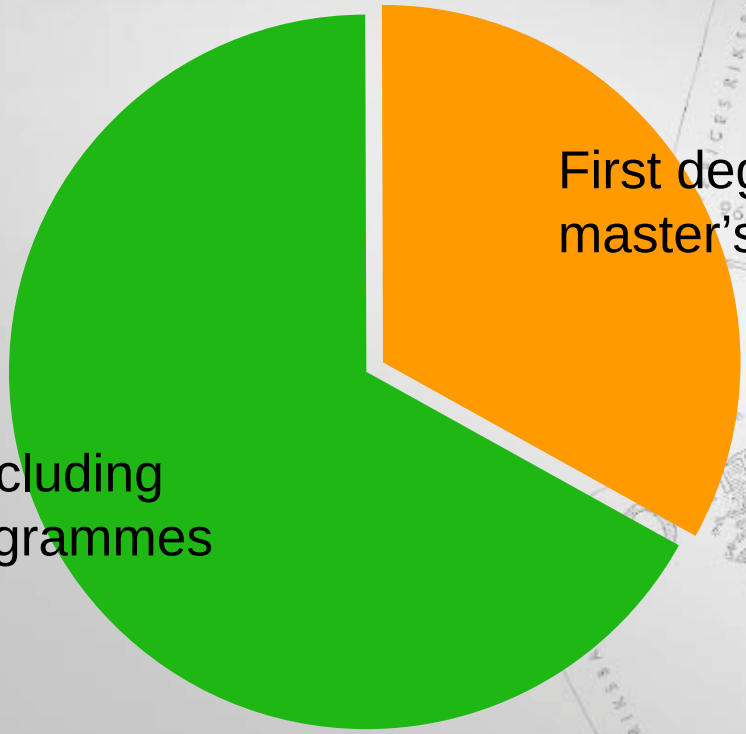
- Applied Mechanics
- Applied Physics
- Architecture
- Chemical and Biological Engineering
- Civil and Environmental Engineering
- Computer Science and Engineering
- Energy and Environment
- Fundamental Physics
- Materials and Manufacturing Technology
- Mathematical Sciences
- Microtechnology and Nanoscience
- Product and Production Development
- Radio and Space Science
- Shipping and Marine Technology
- Signals and Systems
- Technology Management and Economics

Joint with Göteborg University:

- Centre for Environment and Sustainability
- IT University of Göteborg

Chalmers Income

SEK 2.1 billion



First degree and Master's programmes

6000 students in MScEng and MArch Programmes

- 950 degrees awarded 2006

1500 students in BScEng and BSc Programmes

- 300 degrees awarded 2006





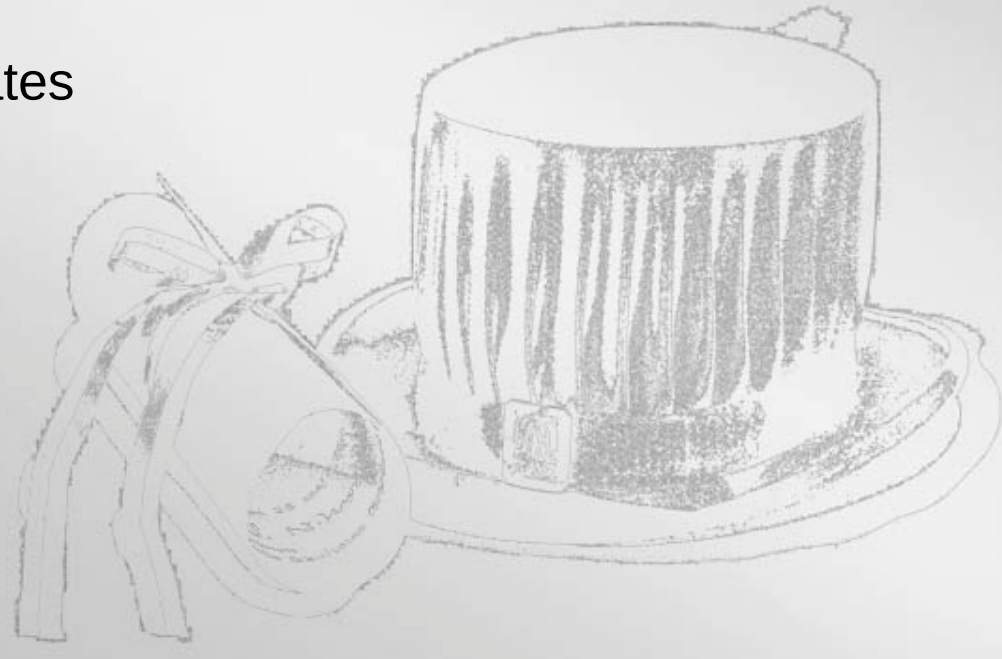
Students

Doctoral programmes

1030 doctoral students

306 degrees awarded 2006

- 154 PhDs
- 152 licentiates

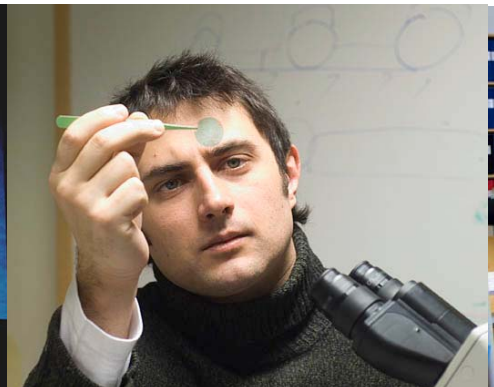


2170 employees

- 1440 teaching and research staff
- 730 technical support and administrative staff

Scientific Articles

- 921 peer reviewed scientific articles
- 555 peer reviewed conference contributions

Division of Structural Engineering

Concrete Structures

Steel and Timber Structures

- Design and performance of load carrying structures for buildings, bridges and other civil engineering structures
- Modelling, analysis and simulation of materials, components and structures
- Structures with new materials and combinations of materials

Introduction of the Research Group

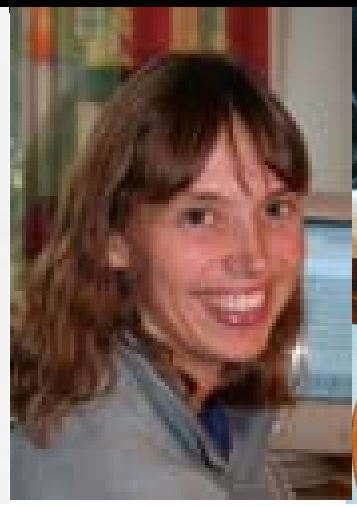
Concrete Structures

Structural Engineering
Chalmers

Kent Gylltoft


Kent Gylltoft


Björn Engström


Karin Lundgren


Mario Plos


Tomas Kutti


Ingemar Löfgren

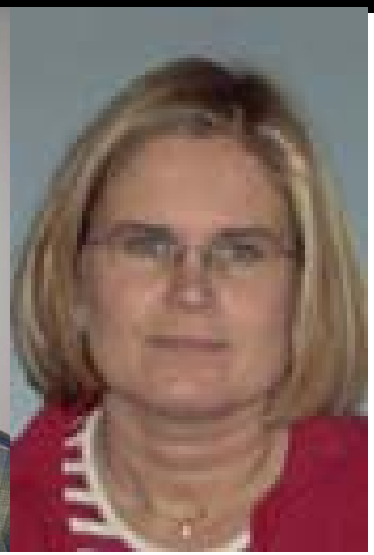

Per-Ola Svahn


Joosef Leppänen

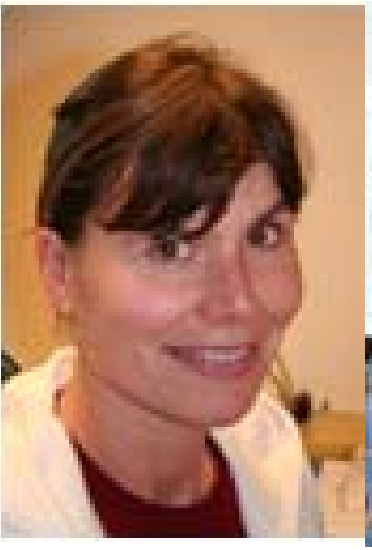
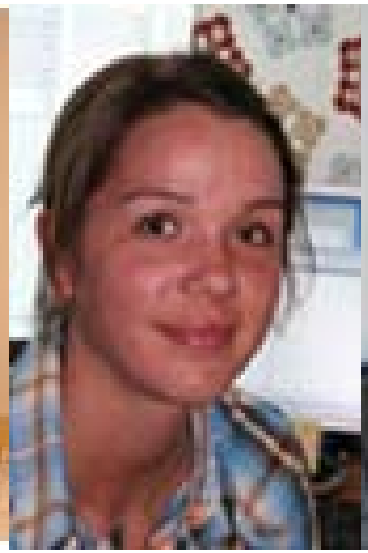
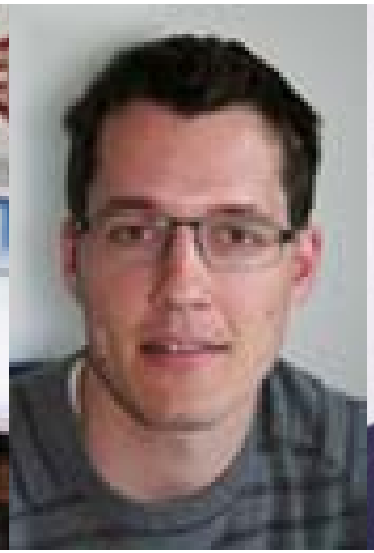

Steve Svensson


Ralejs Tepfers



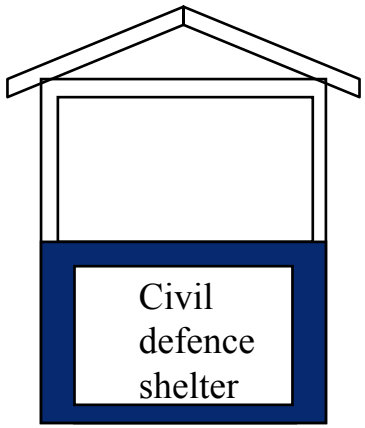


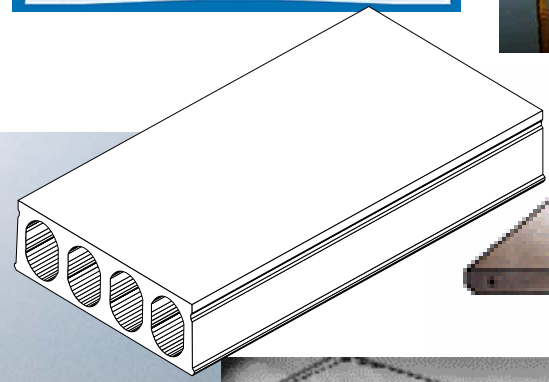
Rasmus Rempling Peter Harryson Helen Broo

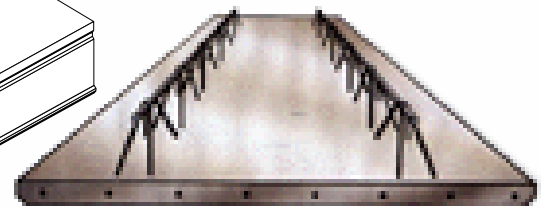





Anette Jansson Ulrika Nyström Hendrik Schlune Kamyab Zandi Hanjari

Examples of applications

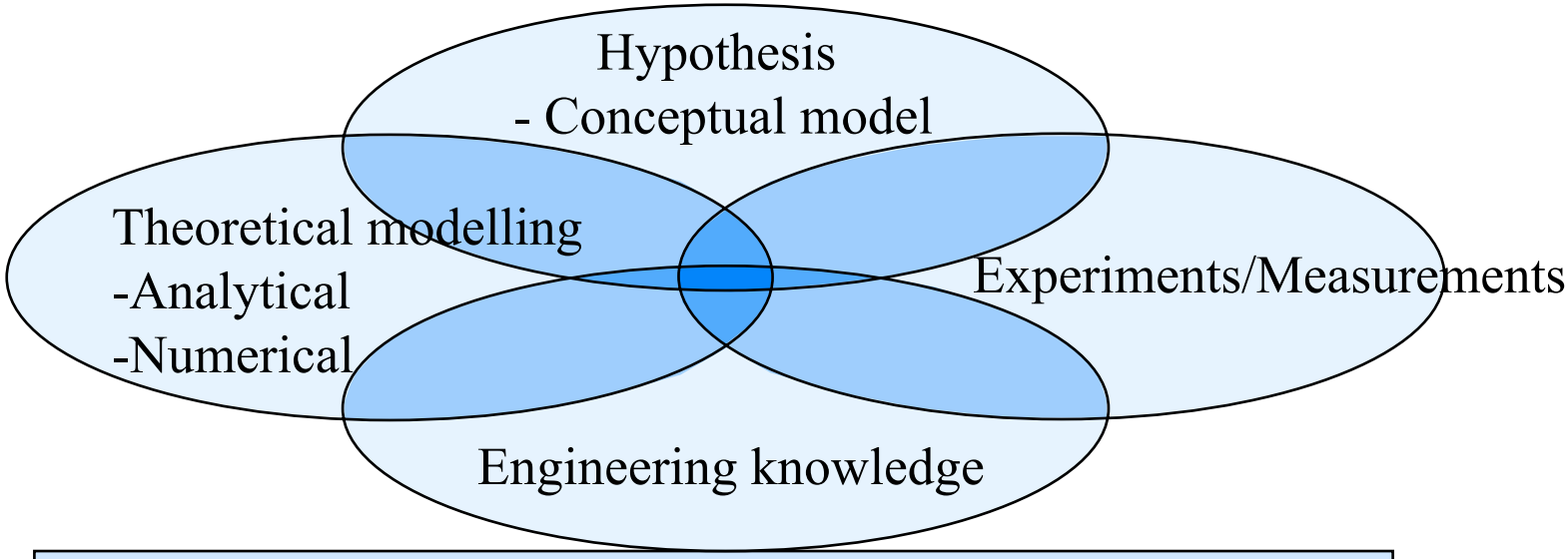






Research methodology

Strategic combination of theoretical analyses and experiments for understanding of the mechanical behaviour of concrete structures



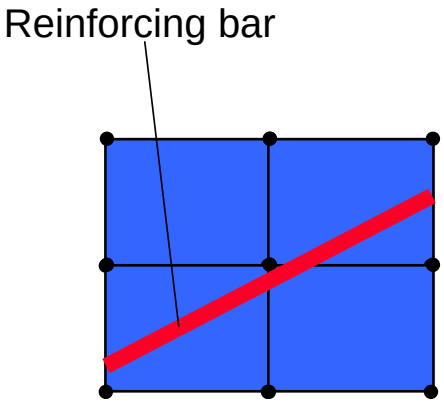
Understanding of mechanical behaviour

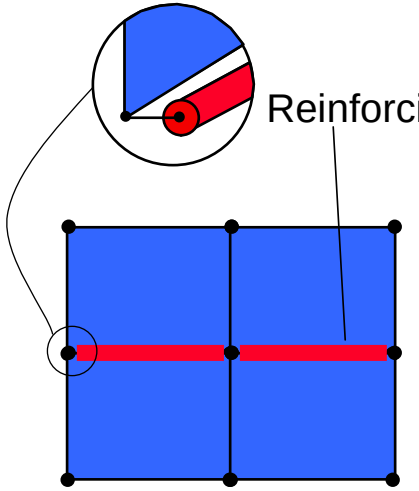
Safer and more effective structural design methods
Positive influence on the environment

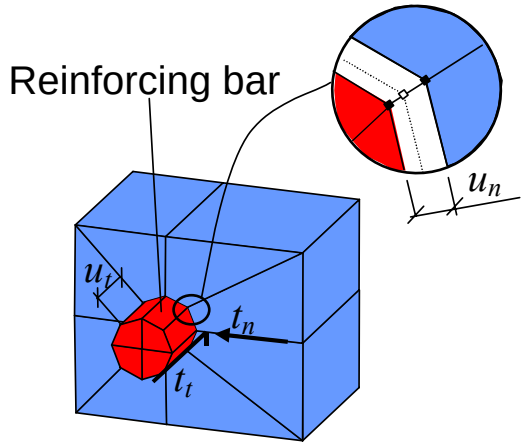
Chalmers Concrete Structures - Present strength areas

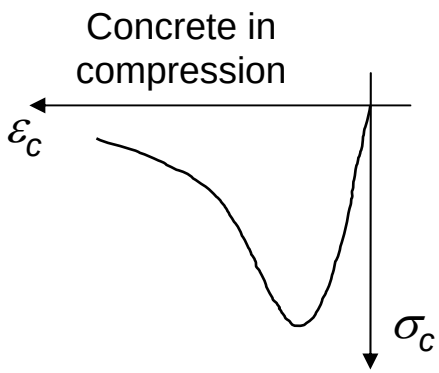
- Our research methodology
- Development of finite element modelling for reinforced concrete structures
- Bond and anchorage
- Dynamics
- Durability
- Assessment of excisting structures

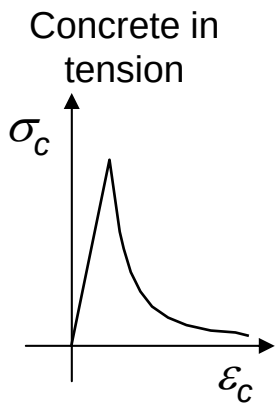
Modelling of reinforced concrete

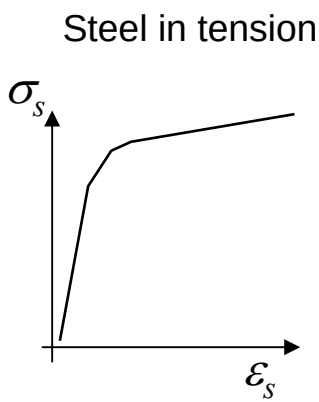


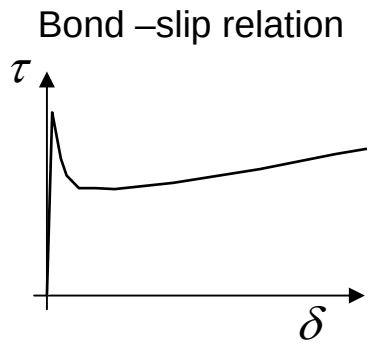


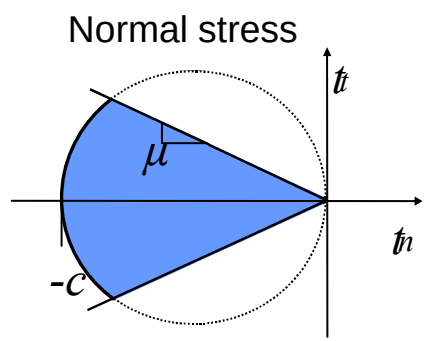




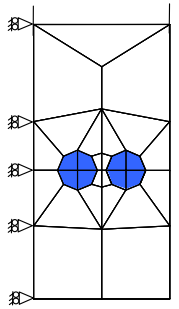




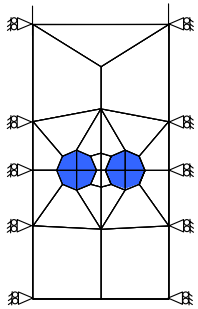




Frame corners
Reinforcement splices



kant



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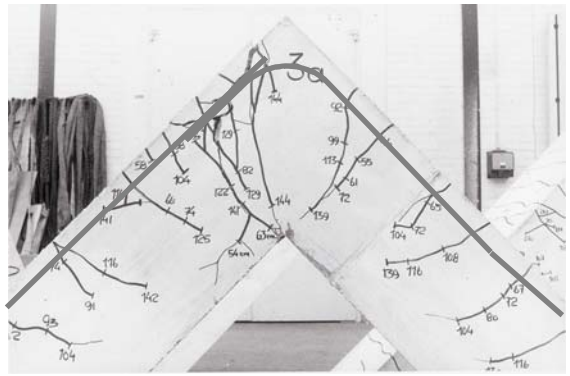
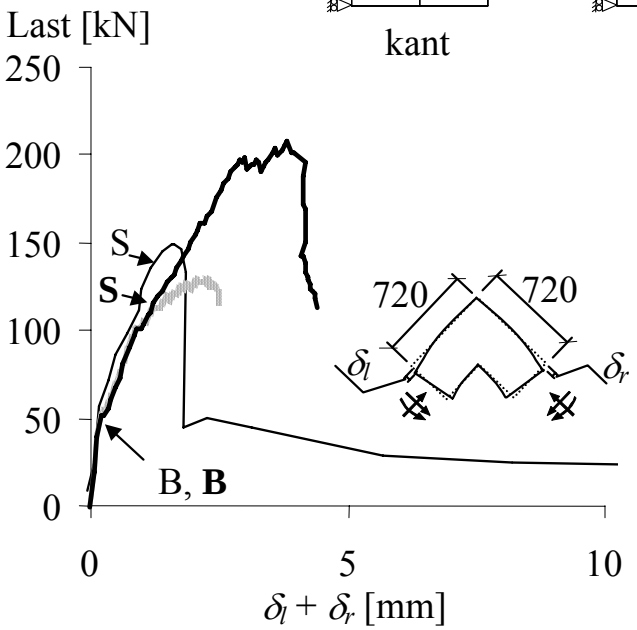
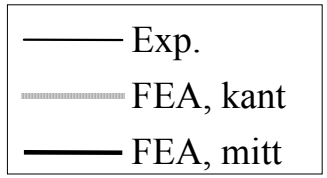
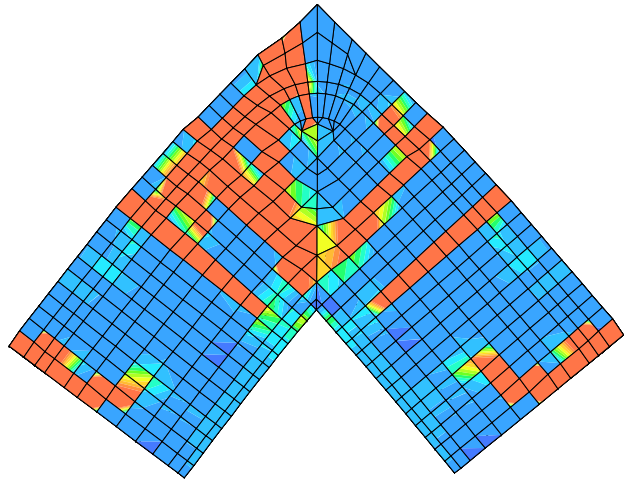
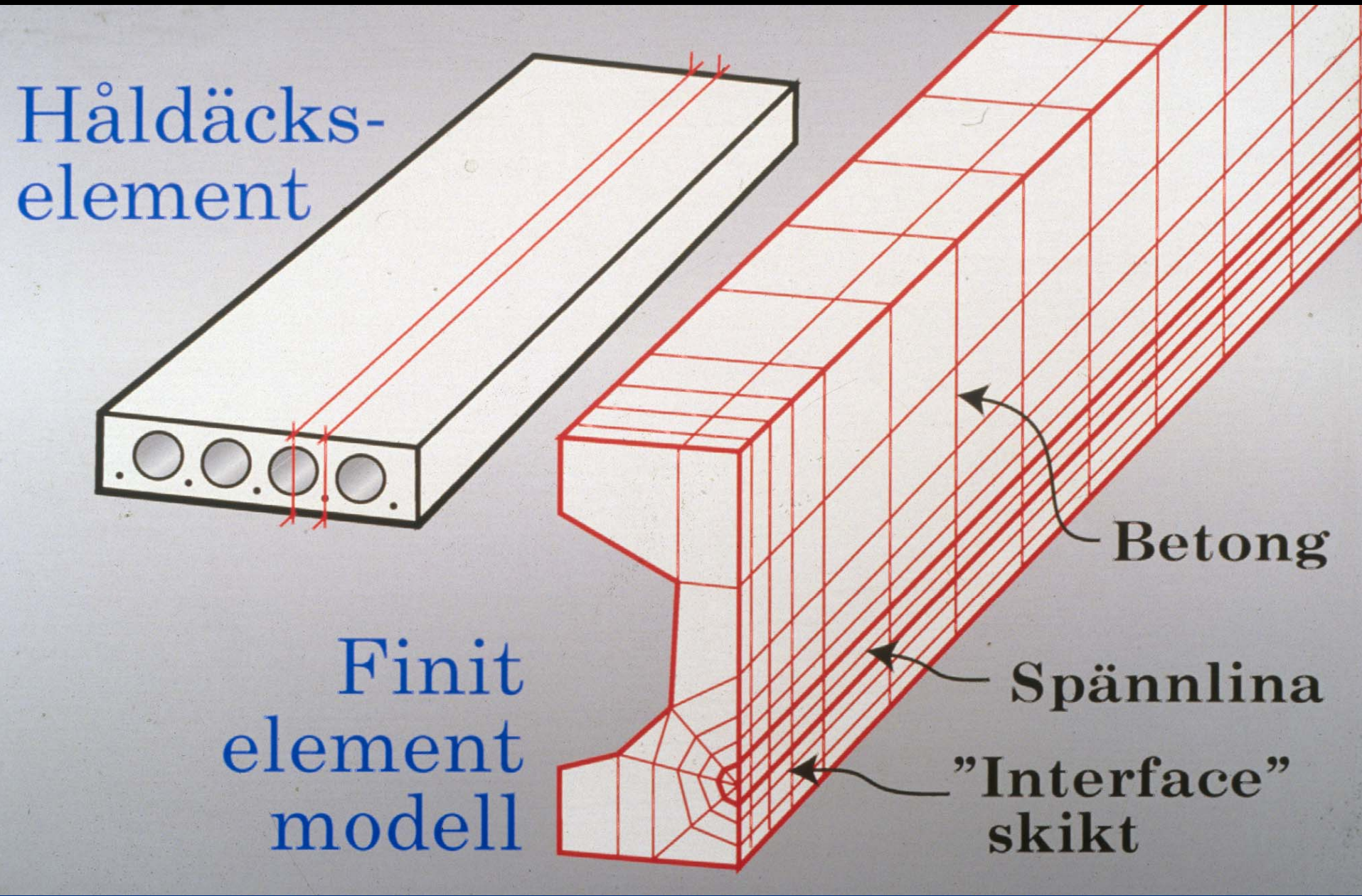
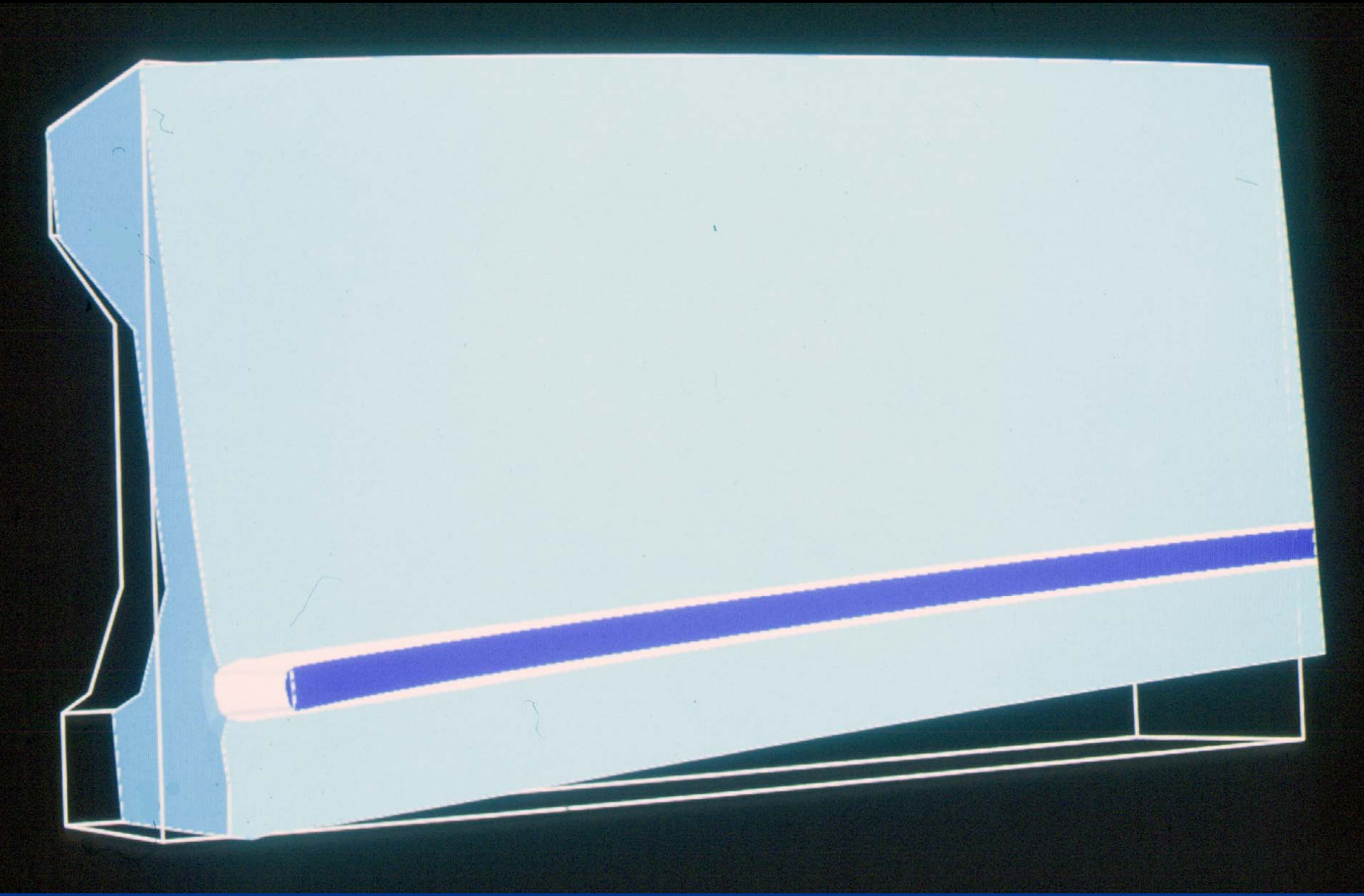


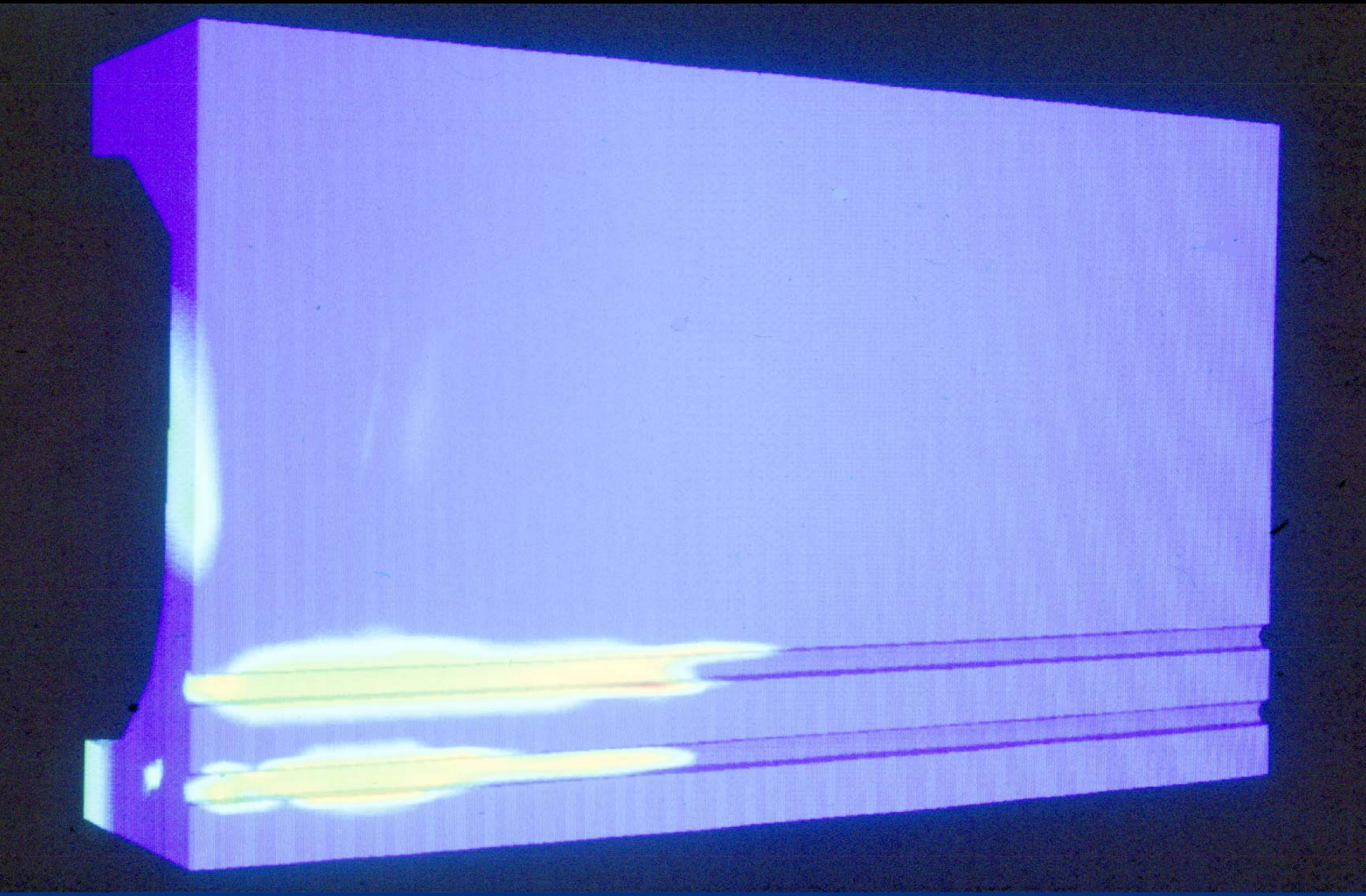






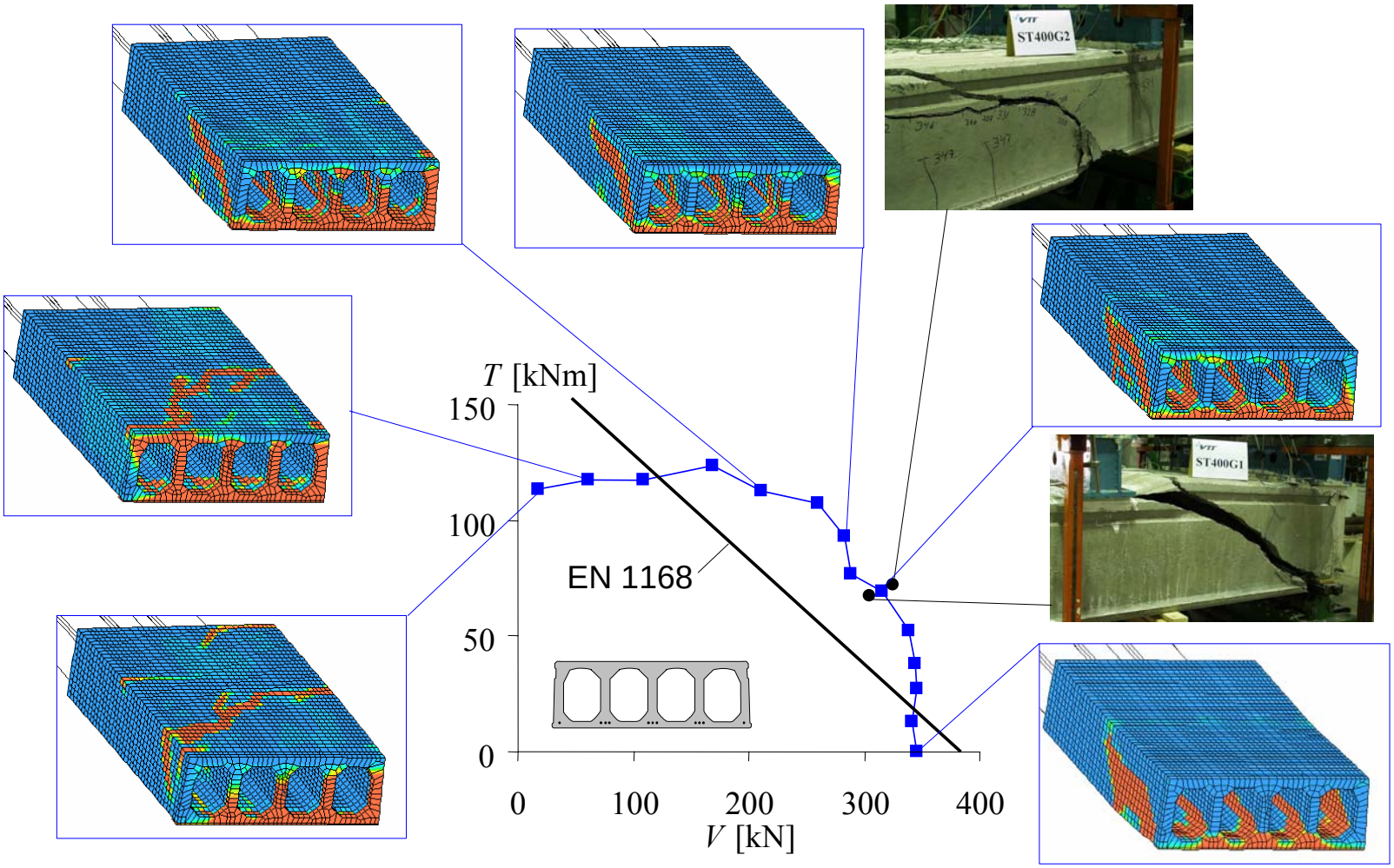

Håldäcks-
element
Finit
element
modell
Betong
Spännlina
”Interface”
skikt



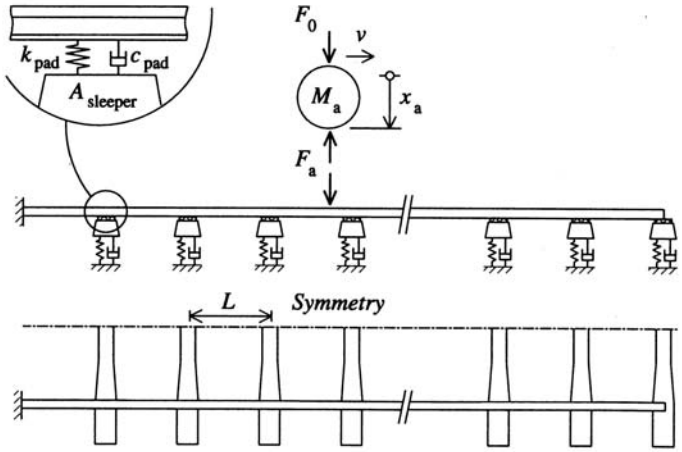


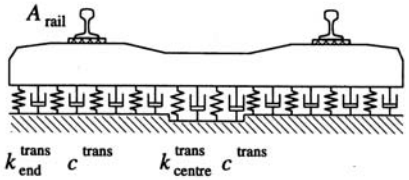
Shear and torsion

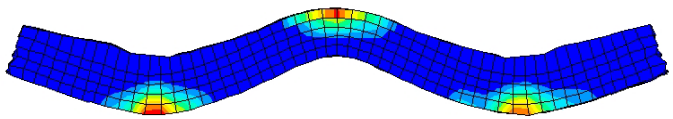
Interaction diagram (400 mm)

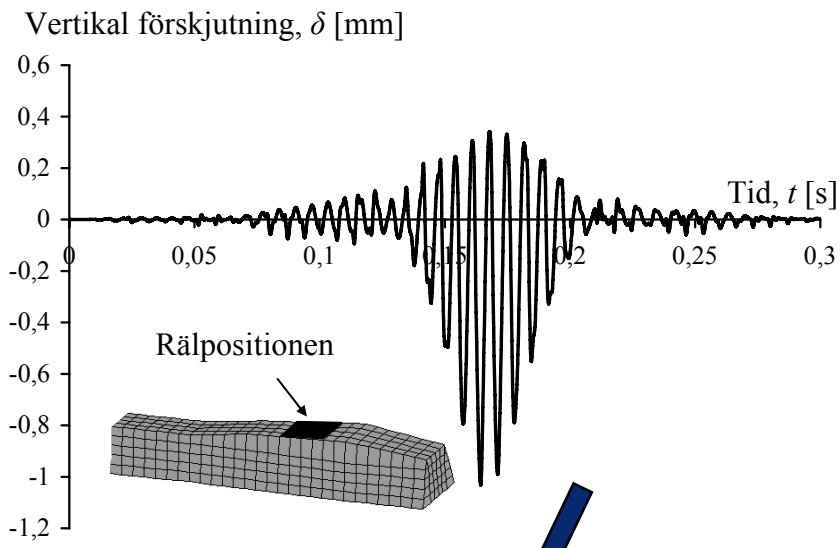


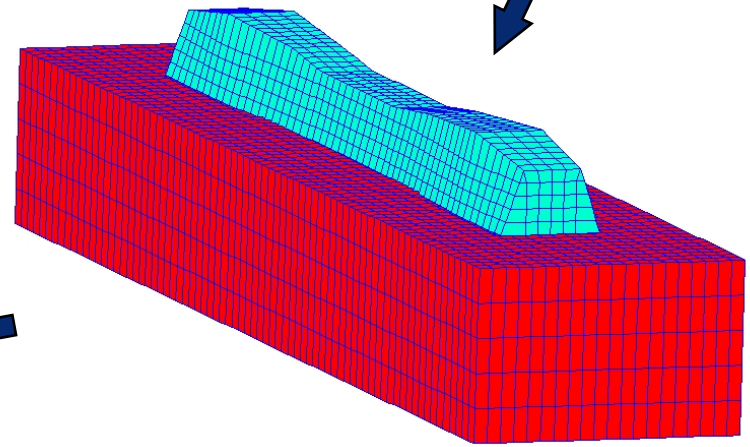
Coupling of track model and sleeper model

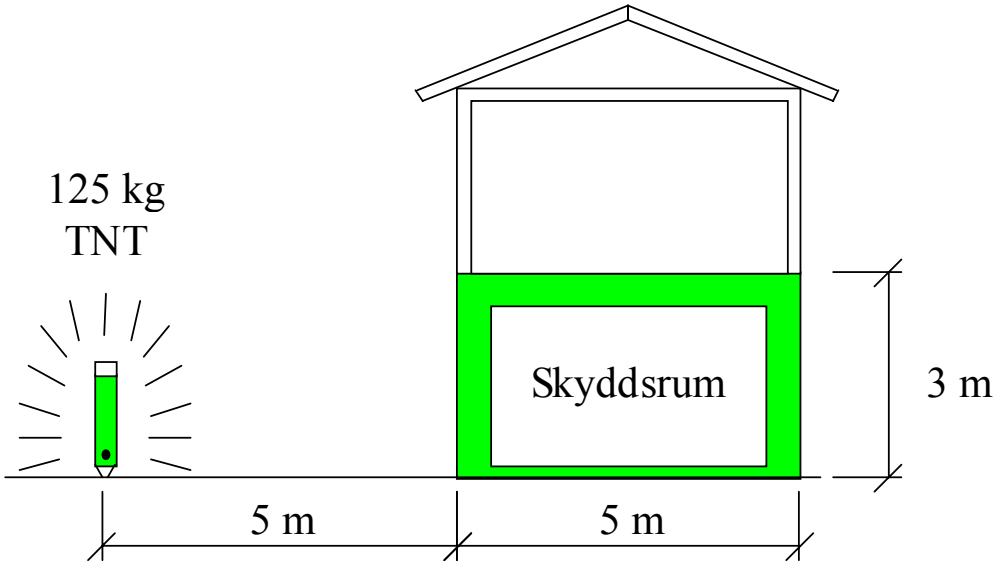


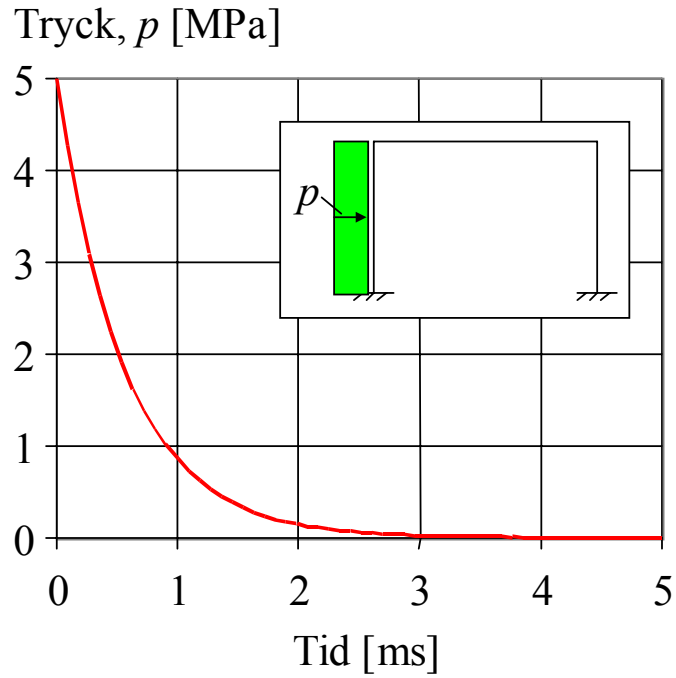




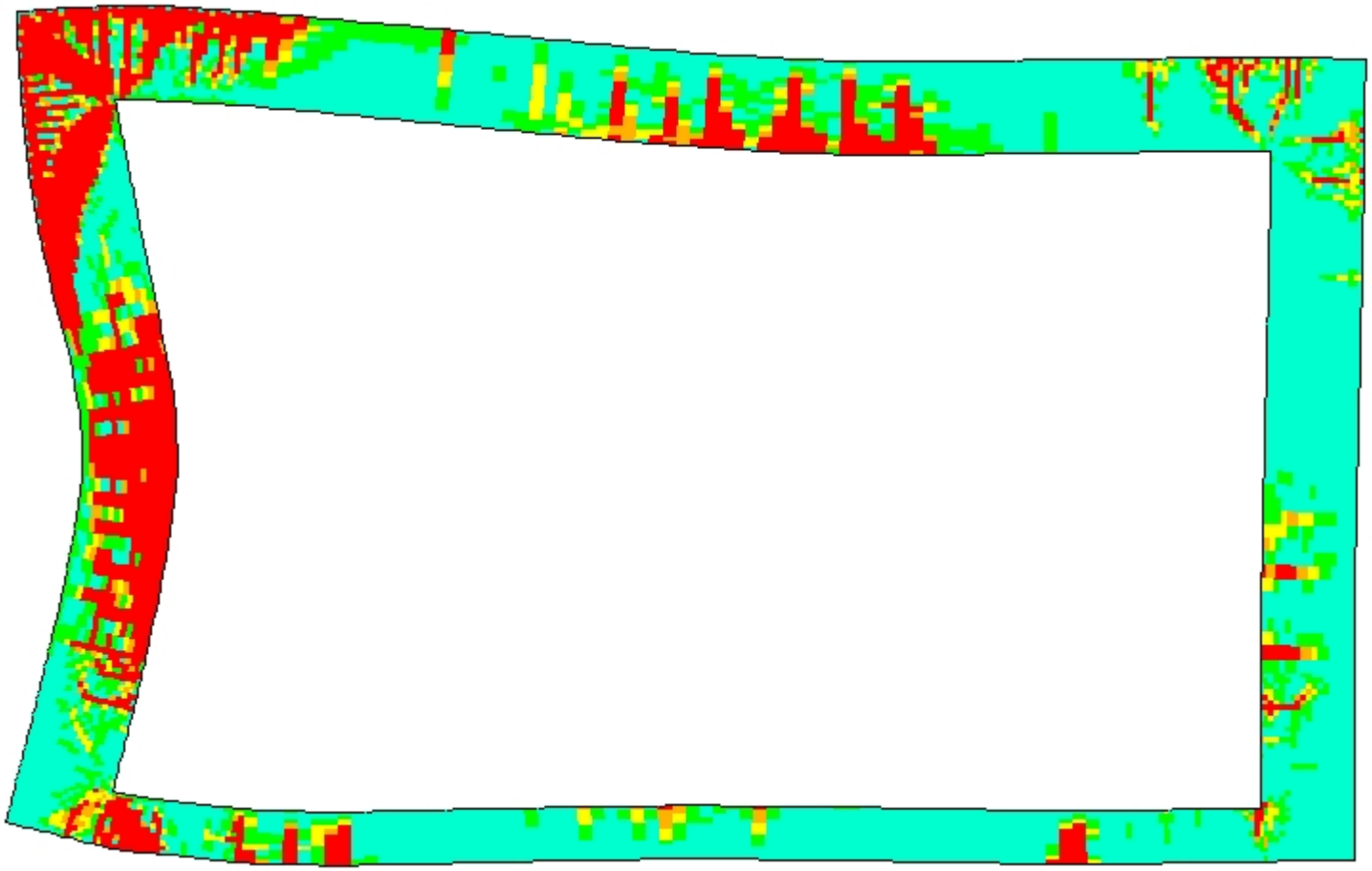






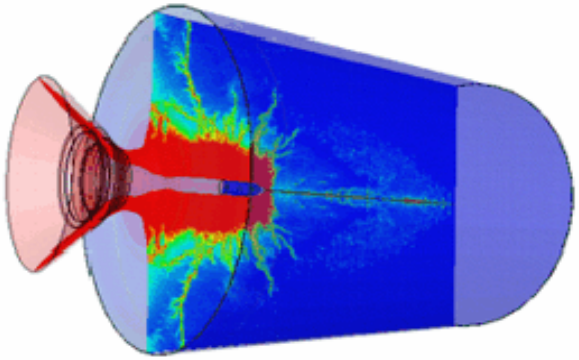


Explosion load on civil defence shelter

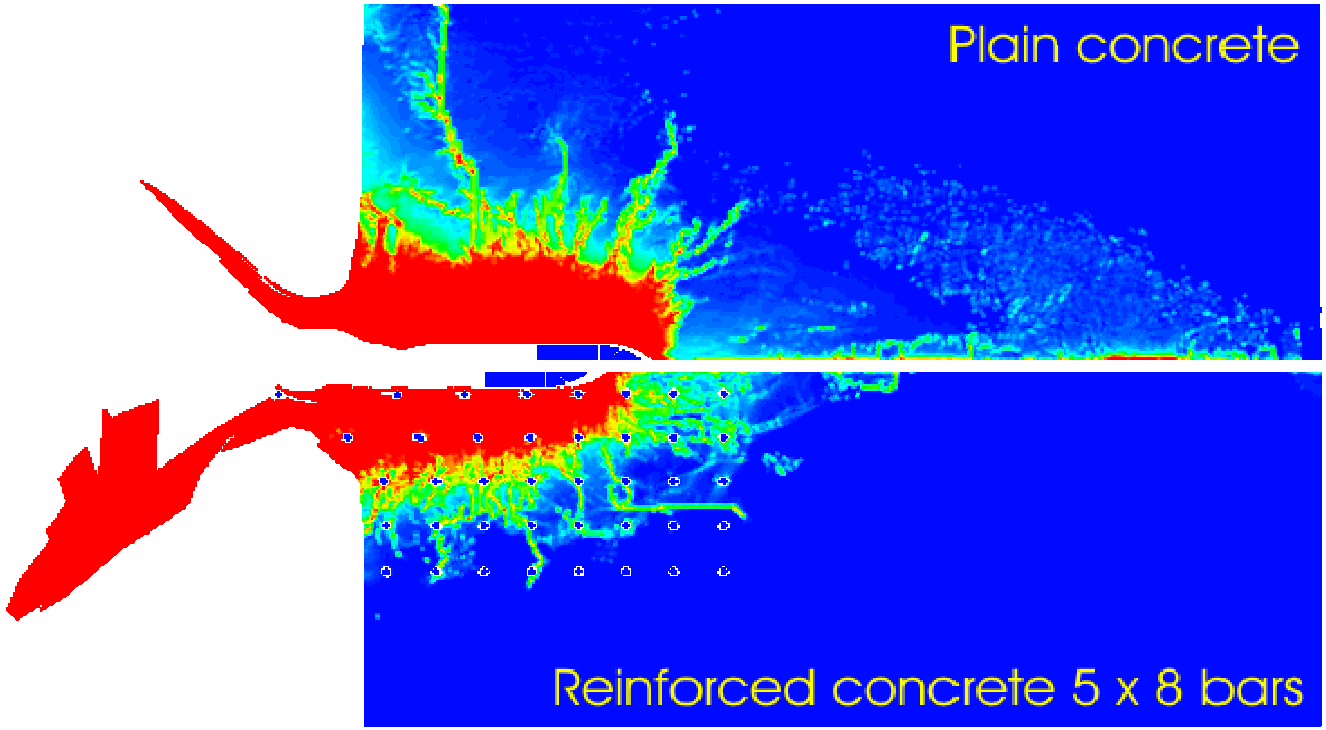


Crack development in civil defence shelters during first 10 ms

Projectile impact on plain and reinforced concrete



Numerical analyses of projectile penetration in concrete

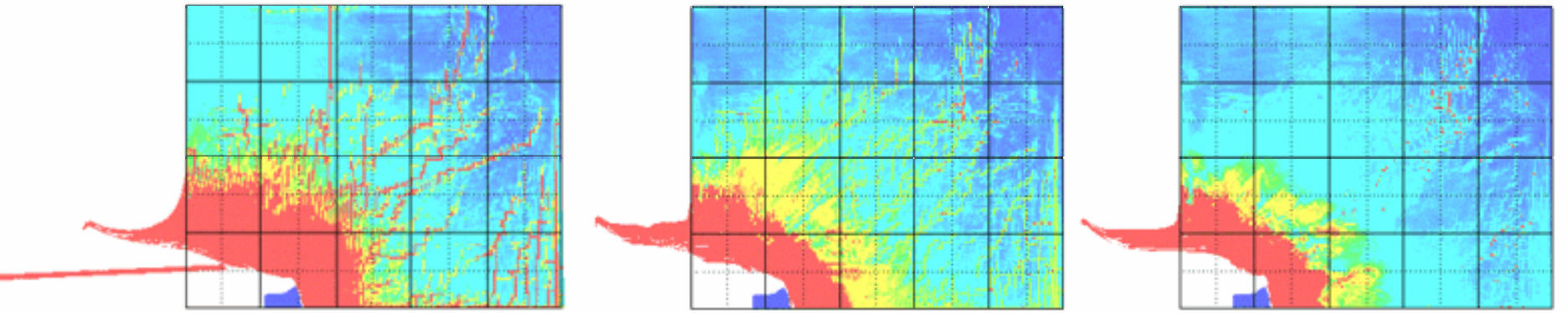


Normal concrete

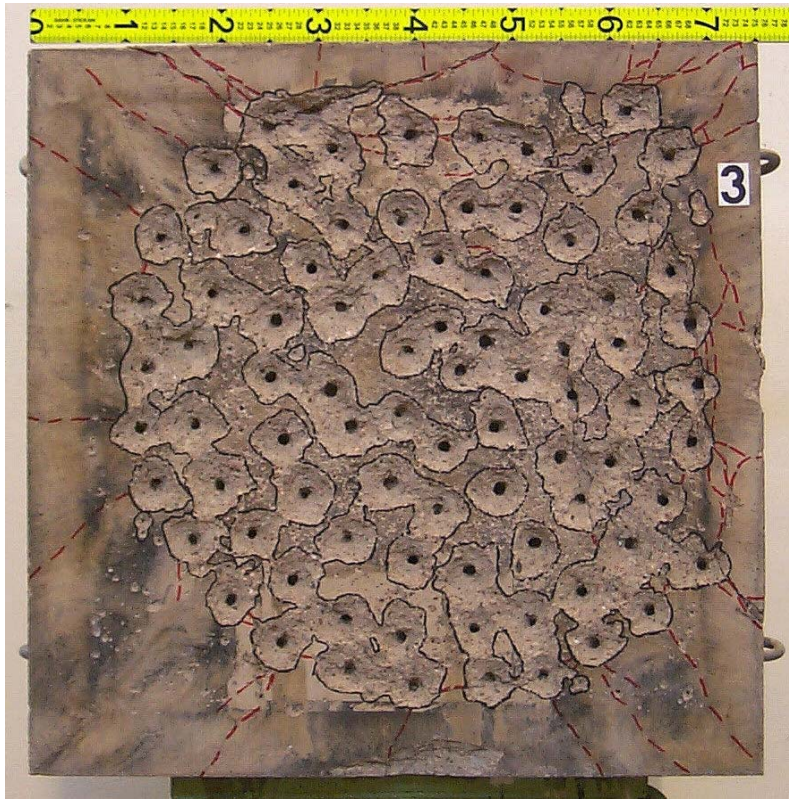
Fibre-reinforced concrete

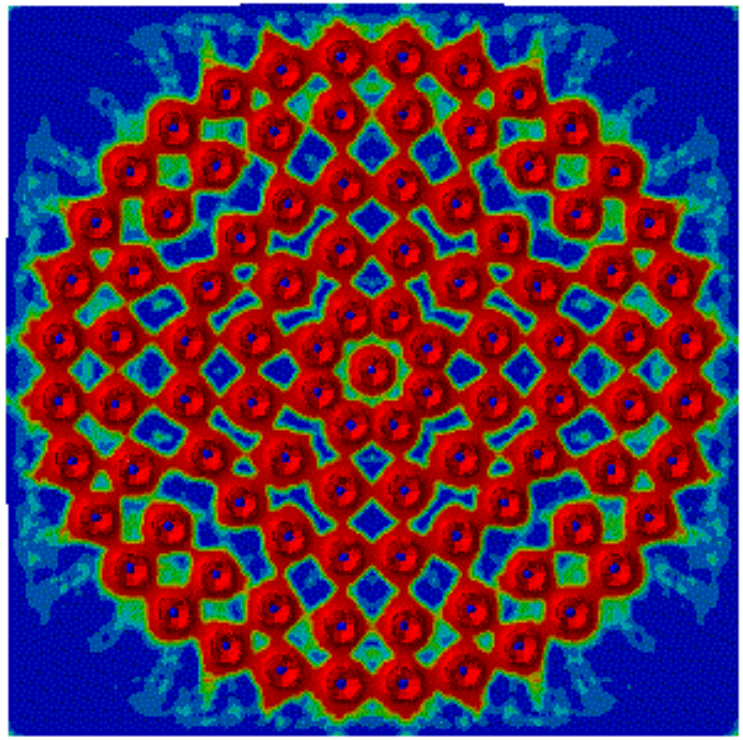
Volume fraction 0.2%

Volume fraction 0.75%

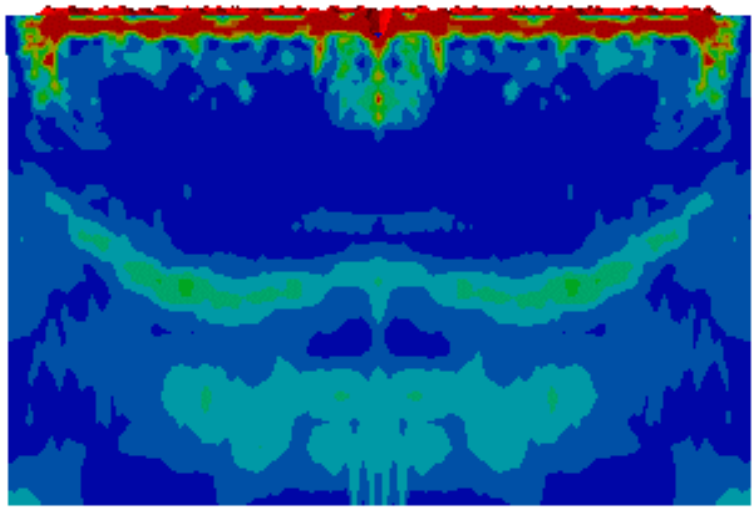


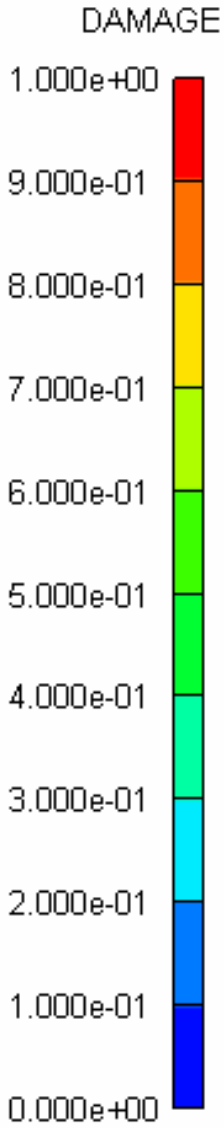
Experiment and simulation



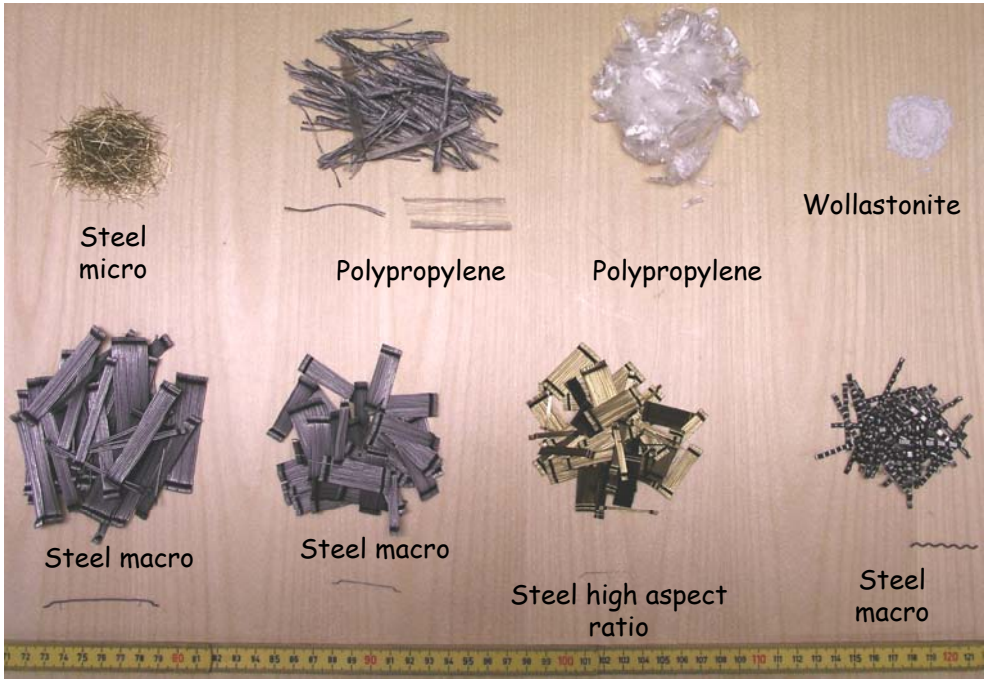


Experiment and simulation

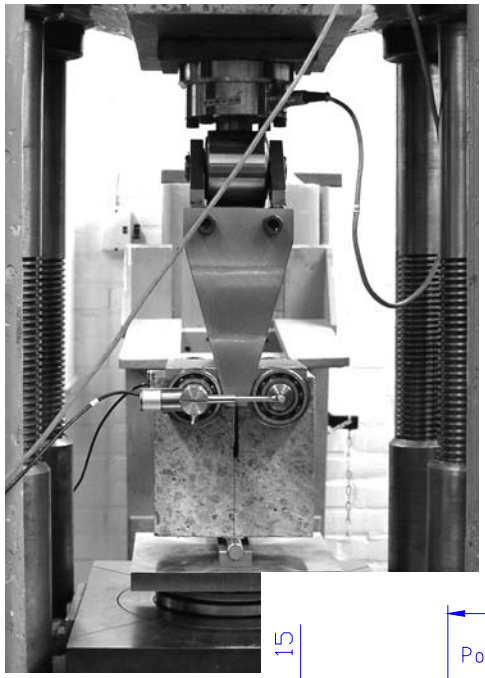


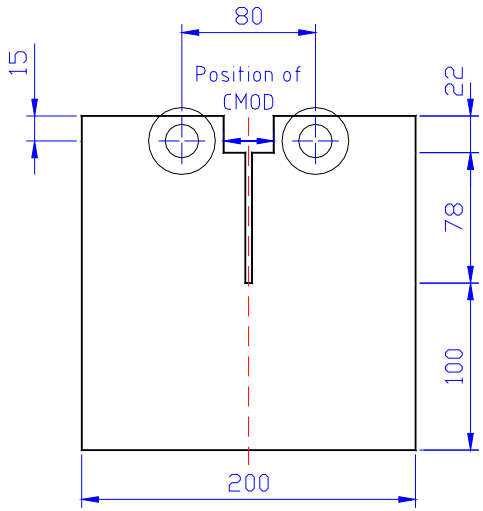


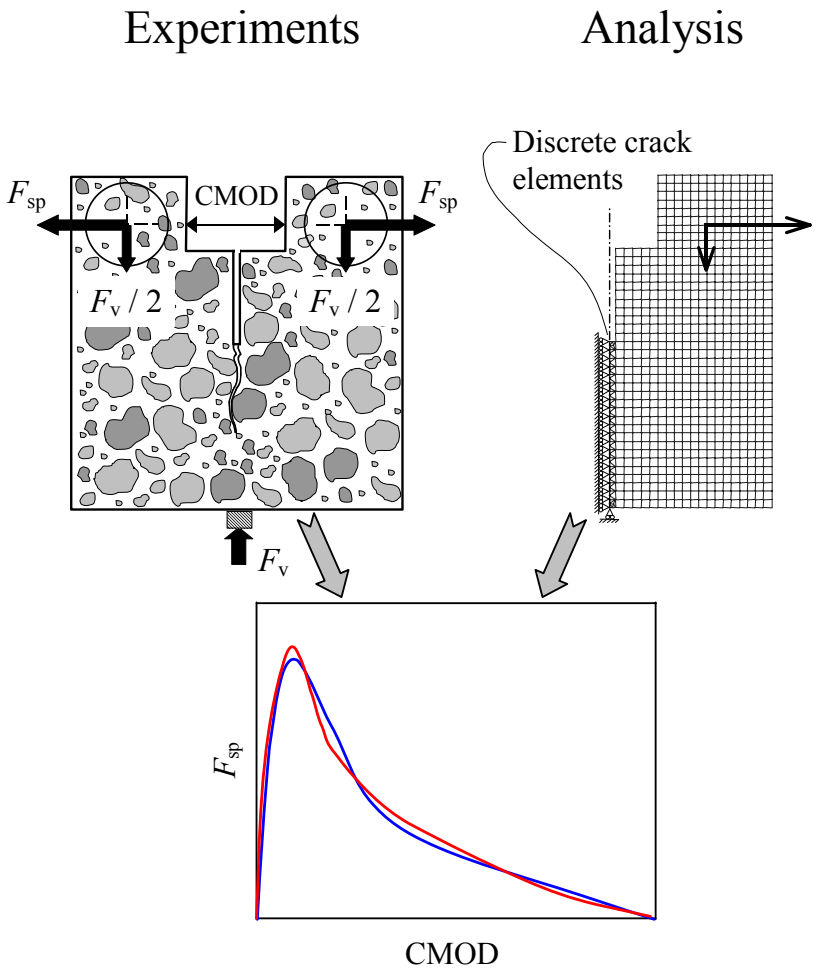
Fiber reinforced concrete



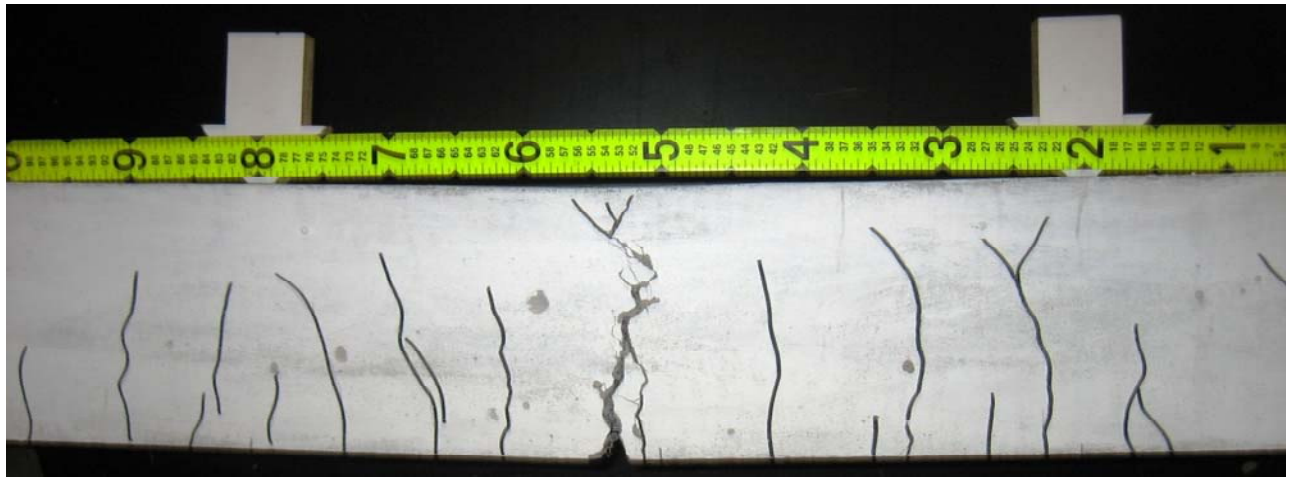
Material testing and parameter identification

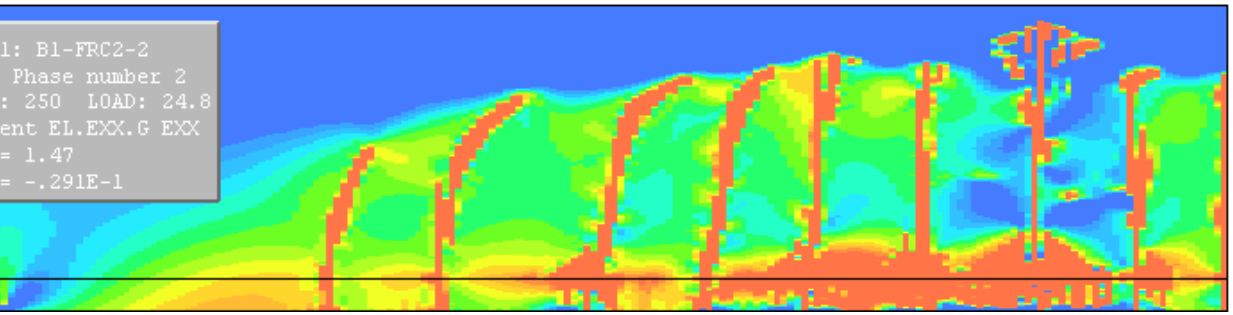






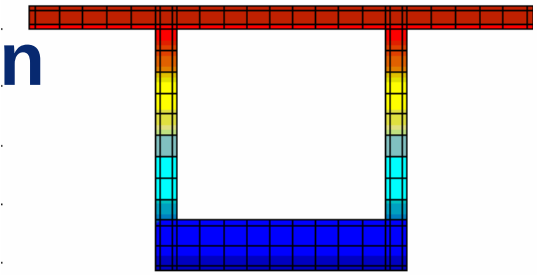
Average crack spacing from experiments vs analysis

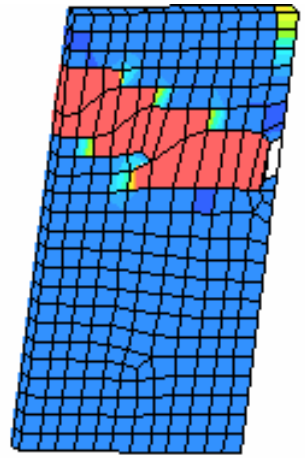




Load carrying capacity of damaged bridges

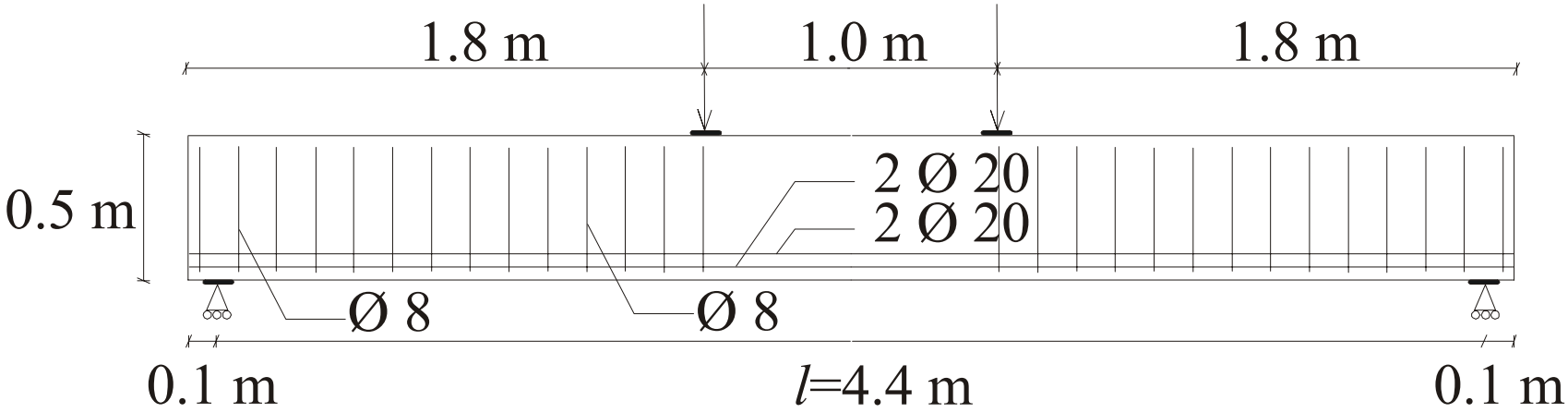
- Methods of evaluation due to damages and material detorioration
  - Corrosion
  - Freezing damages
  - Spalling of concrete cover
  - Damaged bond of reinforcement
- Methods and models for analyses of sections as well as whole structures

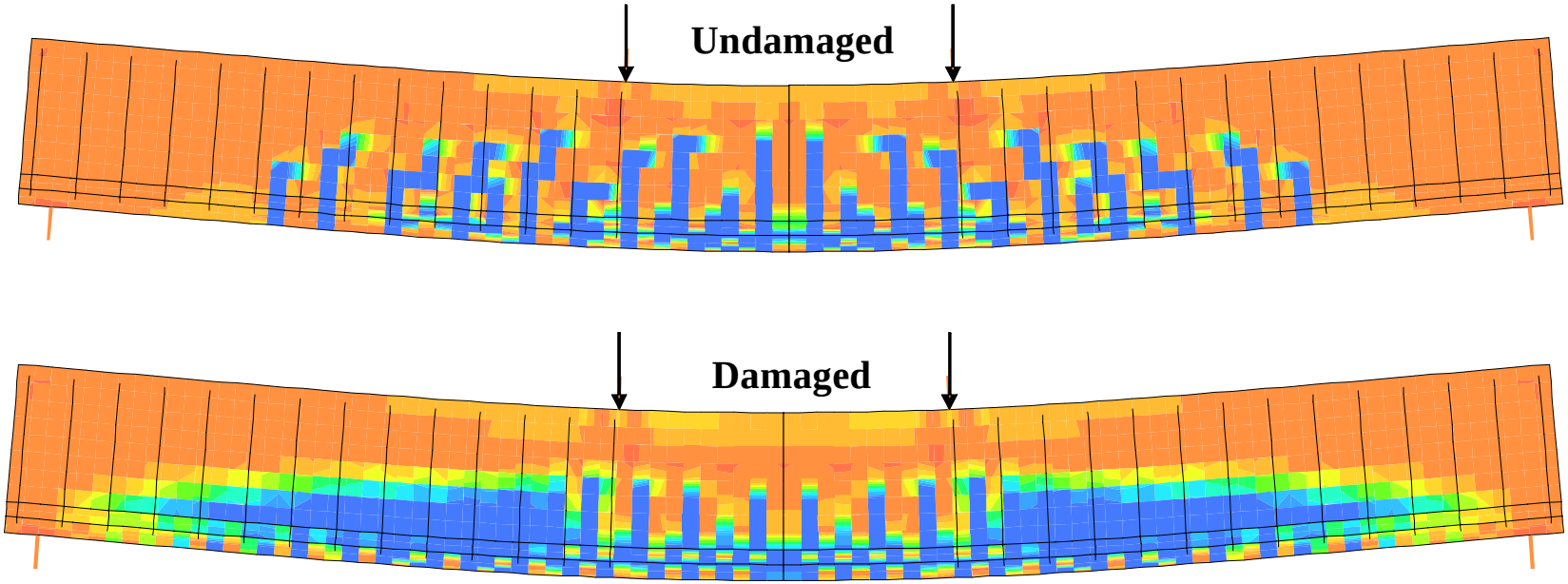


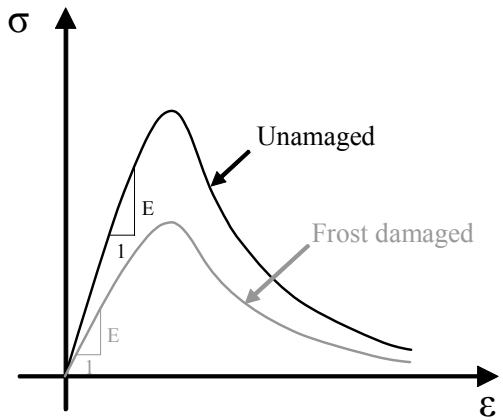


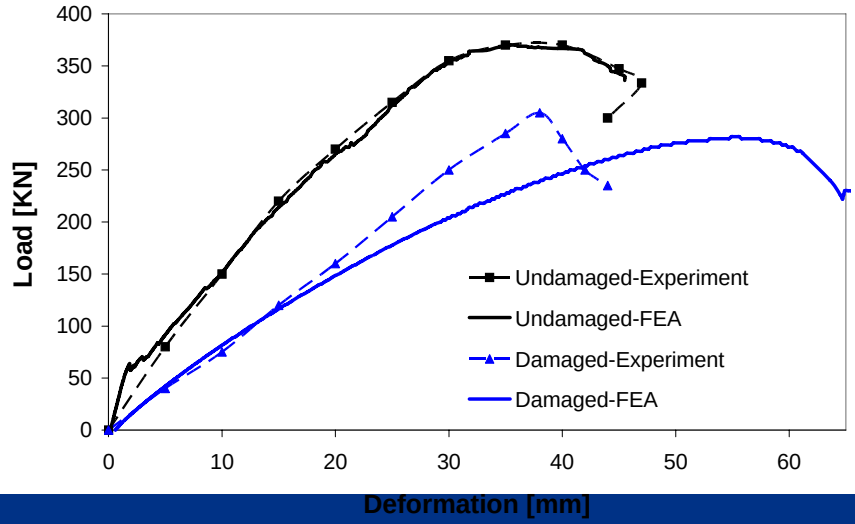
Load carrying-capacity of damaged bridges due to freezing and corrosion

Damaged beam




Undamaged
Damaged


σ
Unamaged
E
1
Frost damaged
E
1
ε

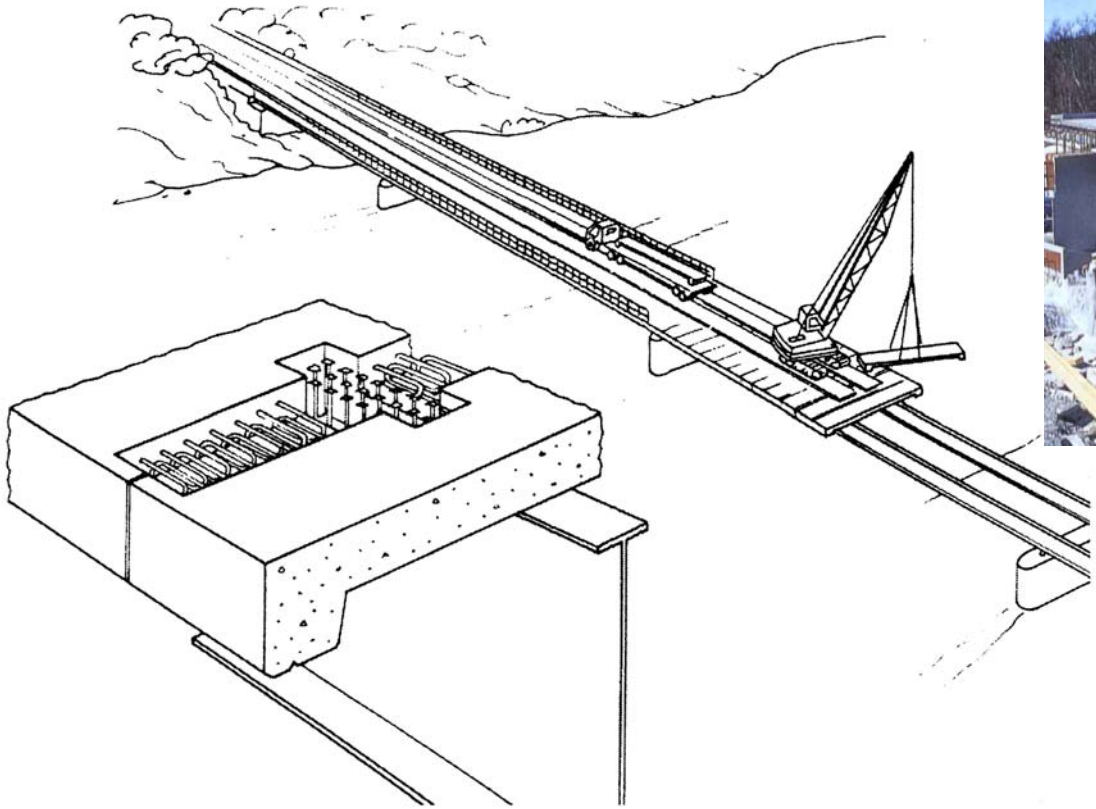

Load [KN]
400
350
300
250
200
150
100
50
0
0
10
20
30
40
50
60
Deformation [mm]
Undamaged-Experiment
Undamaged-FEA
Damaged-Experiment
Damaged-FEA

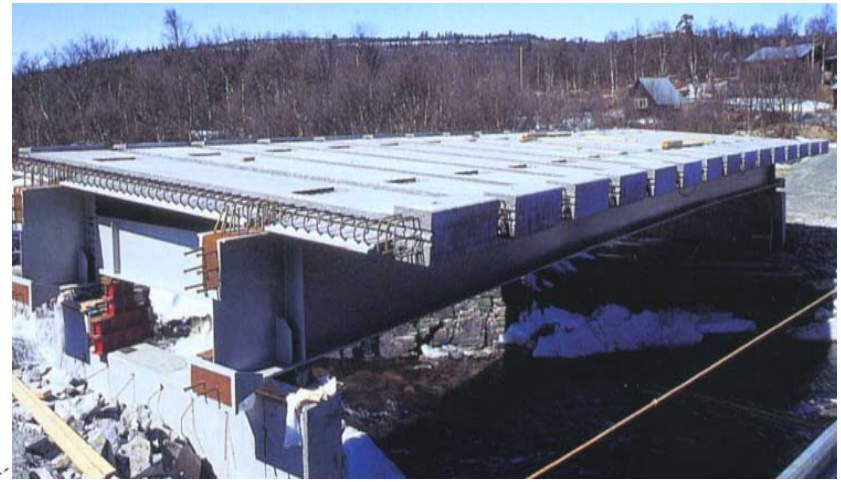
Industrial bridge construction

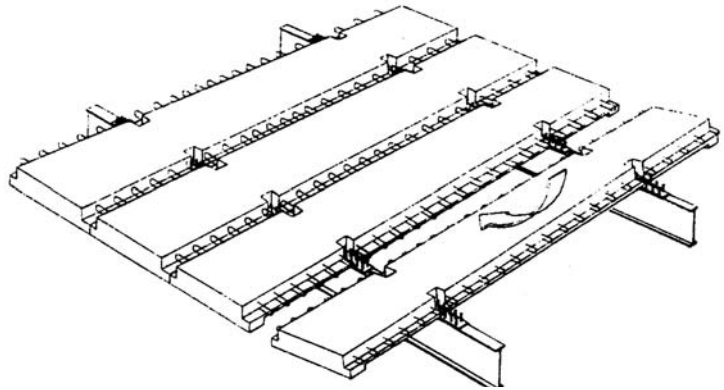
One reason for needs for development….

Concept for composite bridges

Prefabricated slab elements on steel beams

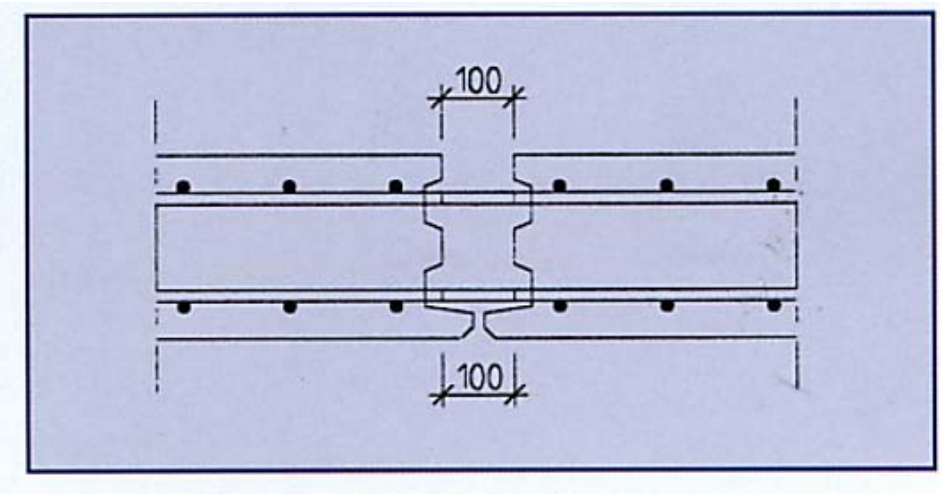






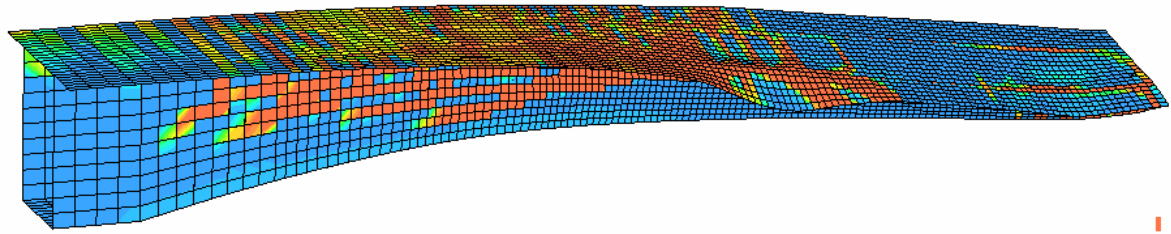
A new concept for the joints

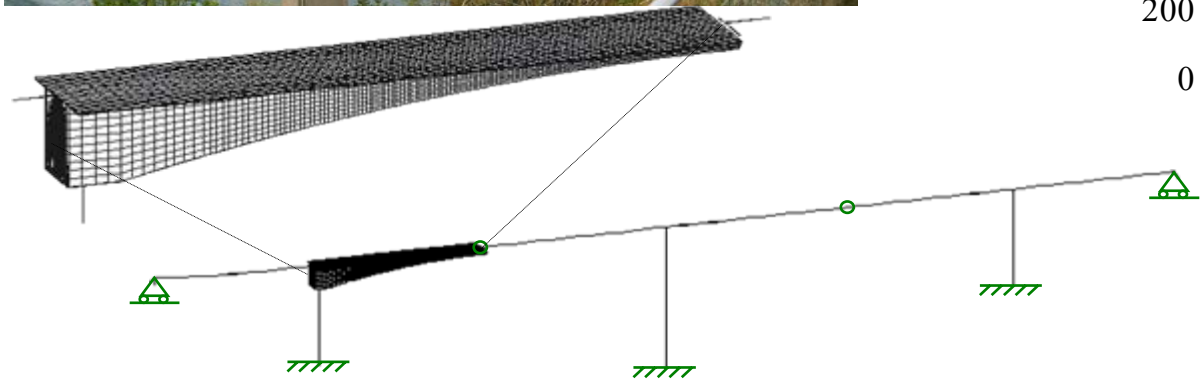
"Concrete welding"

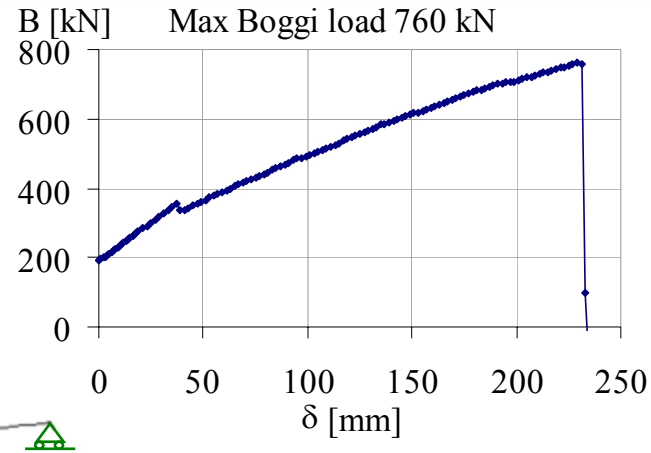


Assessment of concrete bridge

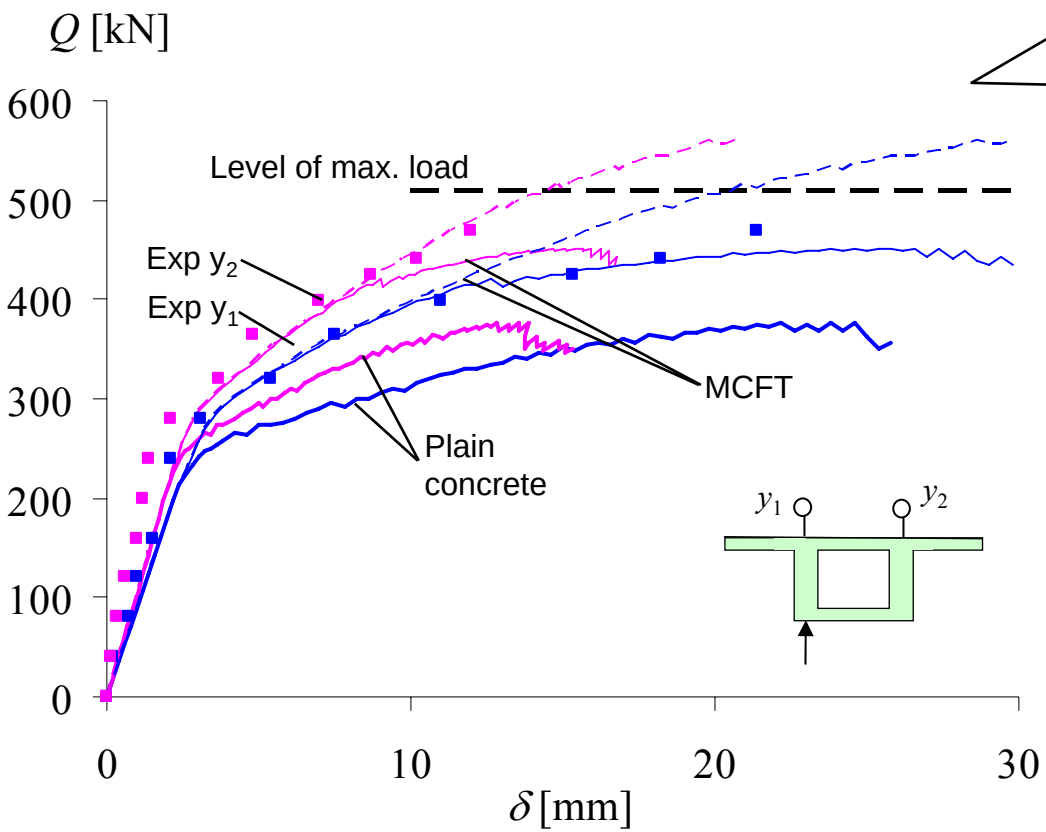
- failure governed by shear and torsion

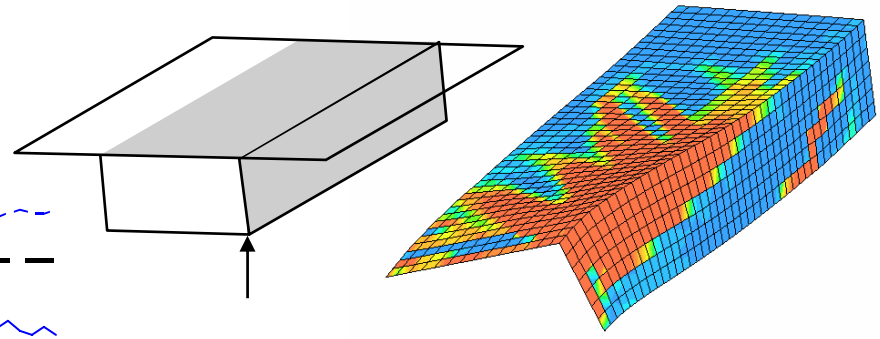


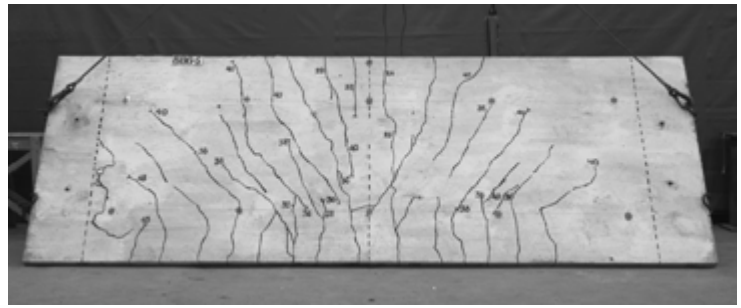


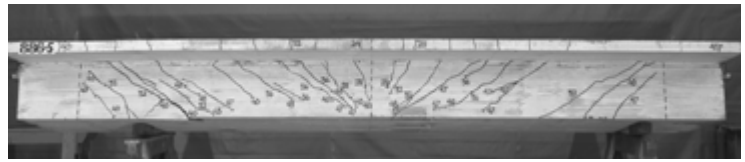


Verification of modelling method for shear and torsion









New Svinesund bridge

between Sweden and Norway

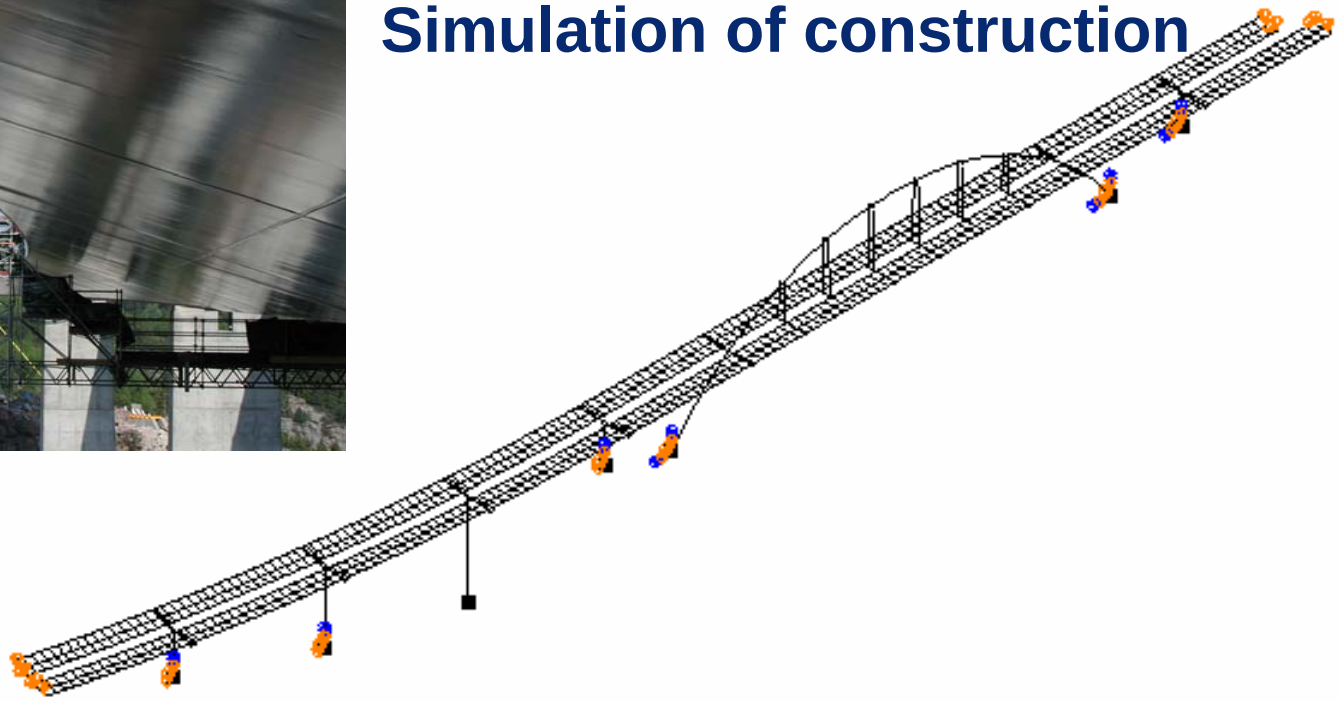
Byggd för Vägverket och Statens Vegvesen
av Bilfinger Berger AG

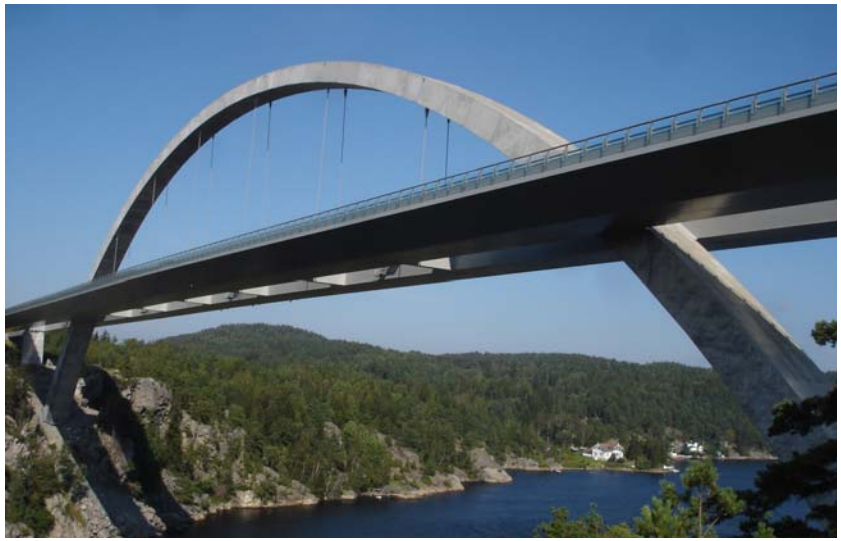
Computer modelling
of the new Svinesund bridge

Finite element method (FEM)

Bridge, including temorary parts

Simulation of construction





Model updating

– Improvement of FE-model