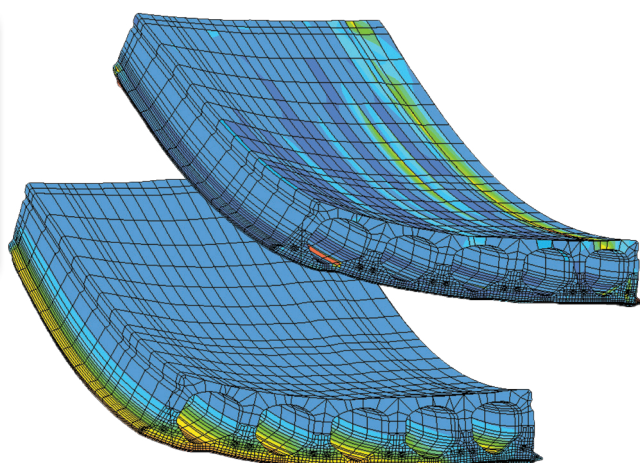


DIANA

SOLUTIONS FOR STRUCTURAL FIRE ANALYSIS

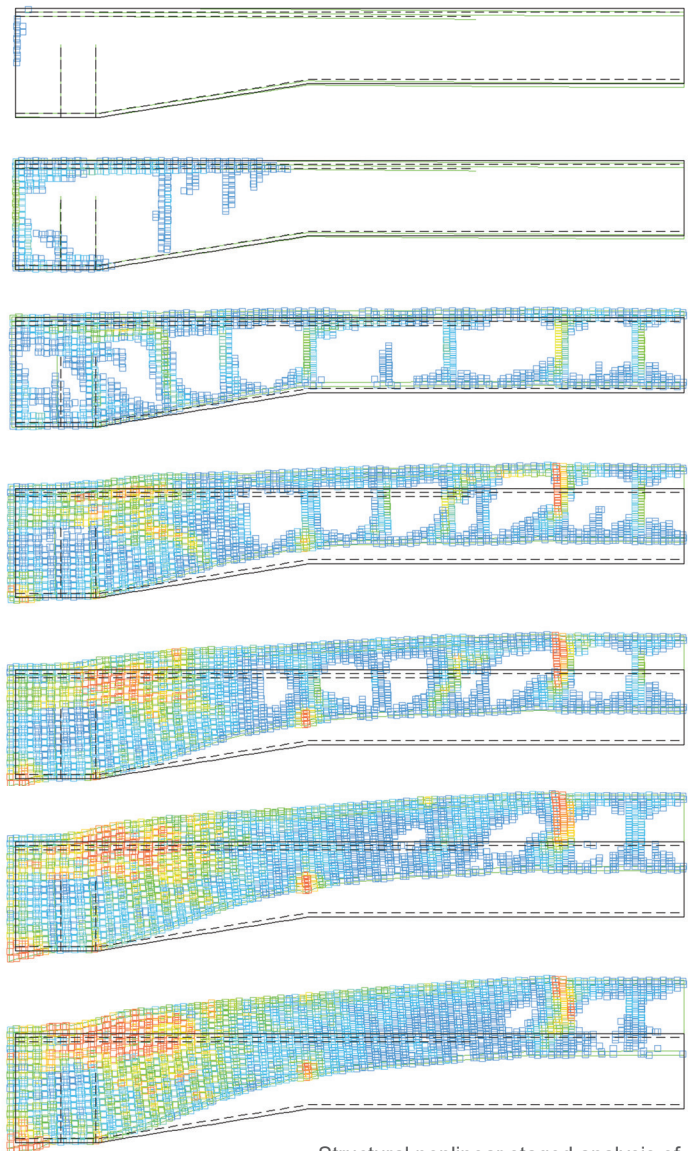
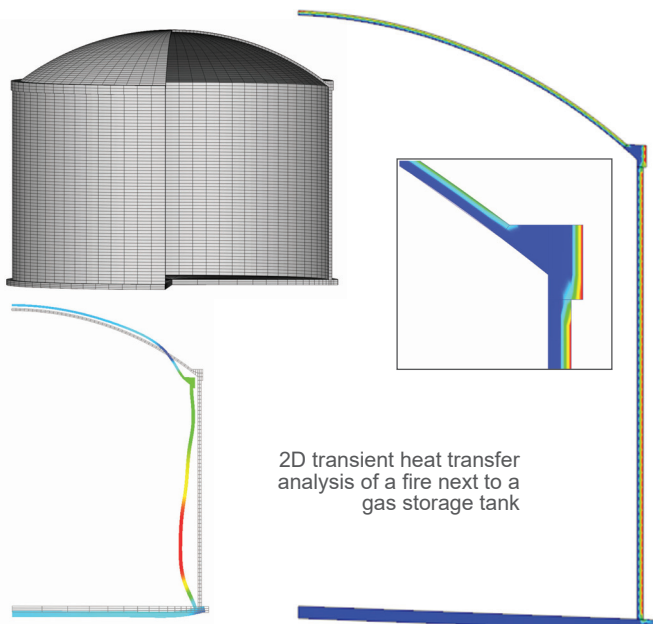


Occurrence of a fire may often result in loss of serviceability and/or the collapse of a structure. Economic damage, and more importantly loss of life, are major risks. Engineers are obliged to certify structural safety, to provide sufficient time to evacuate and await the arrival of emergency services. Codes and standards help engineers with rules for assessing fire safety. However, these rules do not necessarily guarantee optimal design, or are applicable to all types of structures. In these cases, numerical analysis become indispensable.

During fire, thermal strains develop within the structure, these add to strains from mechanical loading, shrinkage and creep. Materials also undergo thermal degradation of their mechanical properties, this may result in damage to the structure: cracking in concrete and plastification in steel. DIANA offers all of the necessary analysis functionality to assess structural behaviour under fire, also taking into account pre-existing structural damage due, for example, to an earthquake.

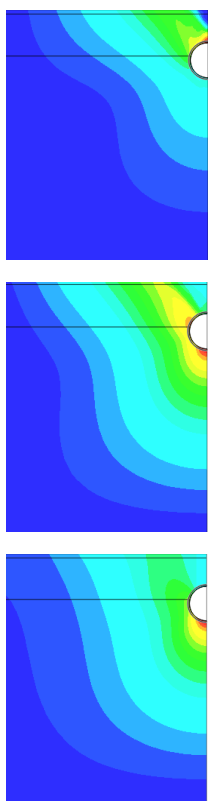
Dedicated Analysis Features

- Coupled thermo-stress with automatic conversion of temperature field to mechanical loading
- Possibility to add/remove elements or change boundary conditions during the analysis
- Heat transfer by conduction, convection and radiation
- Temperature and time dependence of thermal material properties
- Boundary elements for environmental conditions
- Automatic changing to lower order elements from stress to flow analysis to guarantee strain compatibility from temperature field loads to stress analysis

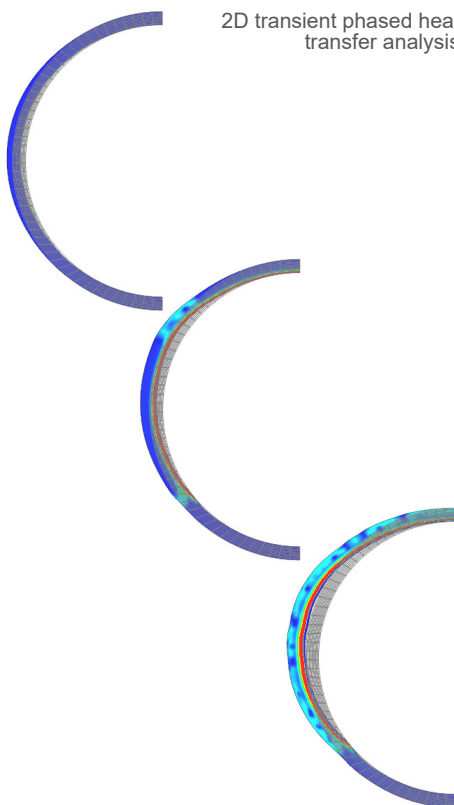


Material Models

- Isotropic and orthotropic thermal expansion
- Isotropic elasticity with temperature dependent thermal expansion, Young's modulus and Poisson's ratio
- Isotropic plasticity with temperature dependent yield stress: Tresca and Von-Mises
- Isotropic plasticity with temperature dependent cohesion: Mohr-Coulomb and Drucker-Prager
- Smeared crack models with:
 - Temperature dependence of the tension cut-off and tension softening
 - Temperature dependence of shear behaviour
 - Temperature dependence of compression functions
- Discrete crack model with temperature dependence of the tension cut-off and tension softening
- Visco-elasticity with temperature dependent Young's modulus: Power law, Kelvin and Maxwell chains
- Transient creep
- User-supplied subroutines



2D transient phased heat transfer analysis



General Product Functionality

Element types

- Truss
- Timoshenko, Bernoulli, and Mindlin beam
- Plane stress and plane strain
- Complete/general plane strain
- Axisymmetric
- Plate bending
- Flat, curved and layered shells
- Solid
- Composed (line/surface)
- Interface
- Contact
- Discrete spring/dashpot
- Base spring
- Bounding
- Point mass/damping
- Embedded reinforcements
- Flow
- Embedded pile
- Boundary surface
- Perfectly Matched Layers (PML)

Preprocessing

- CAD like geometry modelling functionality
- Parasolid built-in tools
- Import CAD/Revit file formats
- Python scripting
- Advanced selection methods
- Advanced geometry modelling
- Boolean operation for solid modelling
- Auto clash detection
- Geometry check and repair tools

- Practical mouse snapping
- Auto-, map- and protrude-mesh methods
- Hybrid mesher
- Mesh manipulation and check functionality
- Loads and boundary conditions applicable both on geometry or mesh
- Function based definition of loads and boundary conditions
- MS-Excel compatible tables

Postprocessing

- Contour and vector plots
- Iso-surface, slice, clipping and partition plot
- Diagram and vector plot
- Results extraction to MS-Excel compatible table
- Screen-shots in different picture formats
- Results animation
- Automatic report generation

Solution procedures

- Automatic solver selection
- Out-of-core direct equation solvers
- Nonlinear equation solvers
- Automatic substructuring
- Eigenvalue analysis
- Newton-Raphson, Quasi-Newton, Linear and Constant stiffness iterative procedures
- Load and displacement control incremental procedures
- Arc length control incremental procedure
- Adaptive load and time increments (auto load step option)
- Automatic incremental loading
- Direct, iterative and eigen solvers with parallel processing
- Updated and total Lagrange geometrical nonlinear formulation

Services

Support & training

Successful finite element modelling requires sound understanding of the background theory with good engineering judgment. We at DIANA FEA BV, together with our partners, are dedicated to provide the highest level of service for DIANA:

- Personalised hotline and Email support by highly qualified staff
- Customised training solutions
- Regular training courses
- Extensive technical and theoretical manuals
- Online training sessions

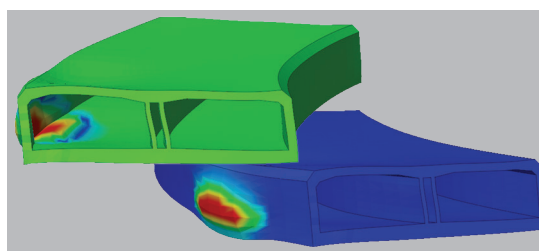
Analysis consultancy

DIANA FEA BV offers to carry out analysis consultancy projects on behalf of their clients which includes the analysis with DIANA and the interpretation of results

Software services

DIANA FEA BV Consultants and software development team can provide customised solutions for your engineering problems:

- Specialised software with dedicated GUI
- New modelling capabilities development and implementation
- Integration with customer software



© DIANA FEA BV 10.1, 2016

DIANA FEA BV

Delftechpark 19a

2628 XJ Delft

The Netherlands

+ 31 (0) 88 34262 00 (T)

+ 31 (0) 88 34262 99 (F)

(Headquarters)

WWW.DIANAFEA.COM