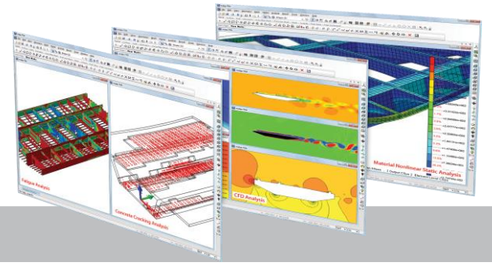
FEA

Advanced Nonlinear and
Detail Analysis System



https://www.midasoft.com/bridge/civil/products/midasfea

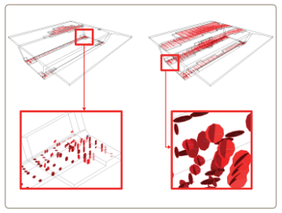
For more than last two decades, MIDAS Engineering Solutions have been used

in designing prominent landmark structures around the world

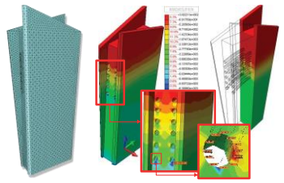
Product Overview

Application Areas

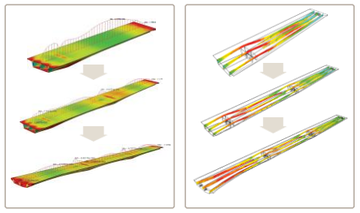
- Load Carrying Capacity Evaluation for PSC Box Girder (cracking)



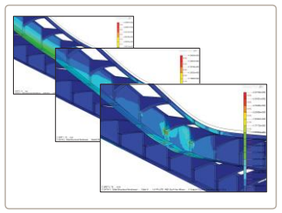
- Detailed Analysis for Concrete Structures (cable anchors)



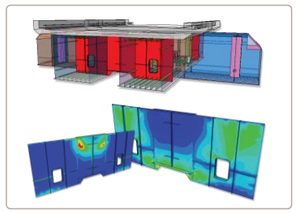
- 3D FEM Analysis for Segmental Bridges



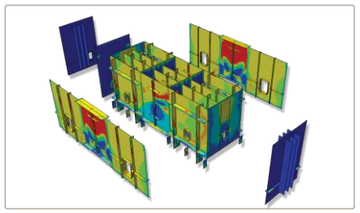
- Redundancy for Plate Girder System



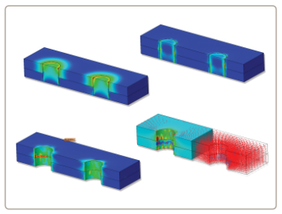
- Detailed Analysis of Steel Box Girder and Coping Connections



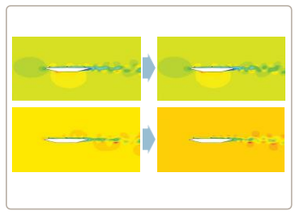
- Fatigue Analysis for Steel Bridges



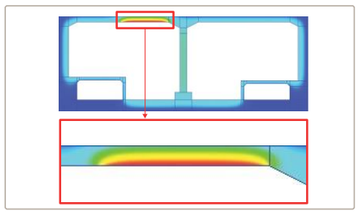
- Contact Analysis for Connecting Parts of Bridges



- Wind Evaluation for Bridge Sections



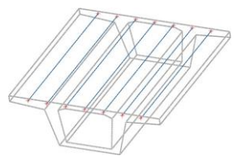
- Fire Analysis for Concrete Structures



2019 Enhancements

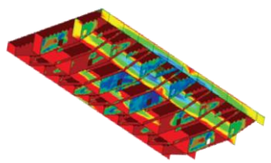
- **Embedded Interface Element**

An embedded line interface element is auto-generated from the line element embedded in a solid. It is not necessary for a solid to share the nodes with a line element in the modelling stage.



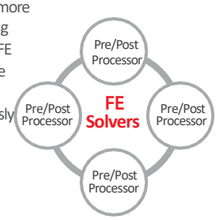
- **Strain-Life Approach for Fatigue**

Strain-Life Approach (E-N Method) estimates the fatigue from strain. When the structure includes a plastic region, E-N Method is more accurate than Stress-Life Approach (S-N Method).



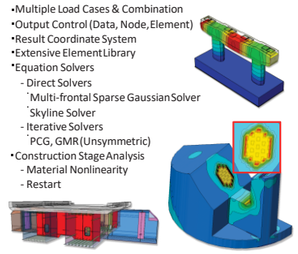
- **Pre/Post-processing Module for FEA**

A separated pre /post-processing module is now available for FEA. It is possible to combine more number of pre/post-processing modules than the number of FE solvers. A group of users in the same network can model and interpret results simultaneously and share FE solvers when performing analysis.

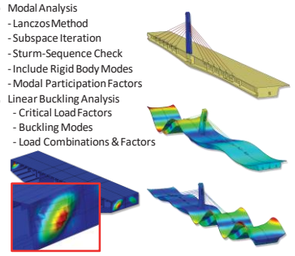


Analysis Capabilities

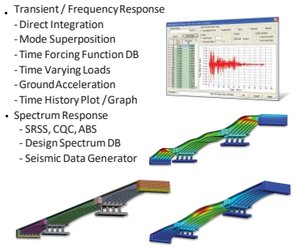
- **Linear Static Analysis**
  - Multiple Load Cases & Combination
  - Output Control (Data, Node, Element)
  - Result Coordinate System
  - Extensive Element Library
  - Equation Solvers
    - Direct Solvers
      - Multi-frontal Sparse Gaussian Solver
      - Skyline Solver
    - Iterative Solvers
      - PCG, GMR (Unsymmetric)
  - Construction Stage Analysis
    - Material Nonlinearity
    - Restart



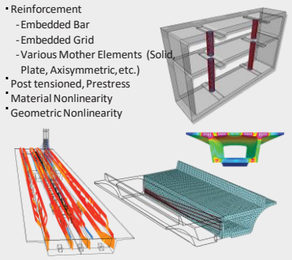
- **Eigenvalue Analysis**
  - Modal Analysis
    - Lanczos Method
    - Subspace Iteration
    - Sturm-Sequence Check
    - Include Rigid Body Modes
    - Modal Participation Factors
  - Linear Buckling Analysis
    - Critical Load Factors
    - Buckling Modes
    - Load Combinations & Factors



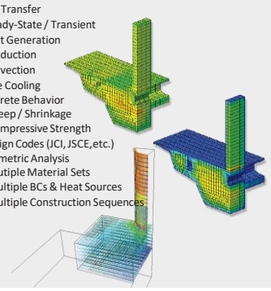
- **Dynamic Analysis**
  - Transient / Frequency Response
    - Direct Integration
    - Mode Superposition
    - Time Forcing Function DB
    - Time Varying Loads
    - Ground Acceleration
    - Time History Plot / Graph
  - Spectrum Response
    - SRSS, CQC, ABS
    - Design Spectrum DB
    - Seismic Data Generator



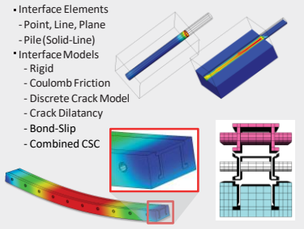
- **Reinforcement**
  - Reinforcement
    - Embedded Bar
    - Embedded Grid
    - Various Mother Elements (Solid, Plate, Axisymmetric, etc.)
  - Post tensioned, Prestress
  - Material Nonlinearity
  - Geometric Nonlinearity



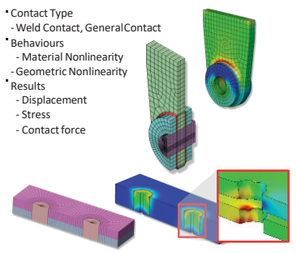
- **Heat of Hydration Analysis**
  - Heat Transfer
    - Steady-State / Transient
    - Heat Generation
    - Conduction
    - Convection
    - Pipe Cooling
  - Concrete Behavior
    - Creep / Shrinkage
    - Compressive Strength
  - Design Codes (JCI, JSCE, etc.)
  - Parametric Analysis
    - Mutiple Material Sets
    - Multiple BCs & Heat Sources
    - Multiple Construction Sequences



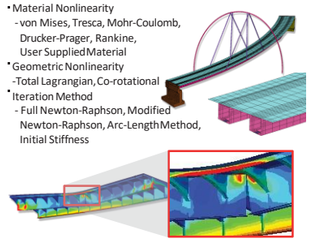
- **Interface Nonlinearity Analysis**
  - Interface Elements
    - Point, Line, Plane
    - Pile (Solid-Line)
  - Interface Models
    - Rigid
    - Coulomb Friction
    - Discrete Crack Model
    - Crack Dilatancy
    - Bond-Slip
    - Combined CSC



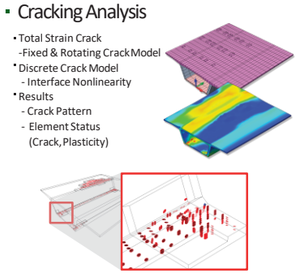
- **Contact Analysis**
  - Contact Type
    - Weld Contact, General Contact
  - Behaviours
    - Material Nonlinearity
    - Geometric Nonlinearity
  - Results
    - Displacement
    - Stress
    - Contact force



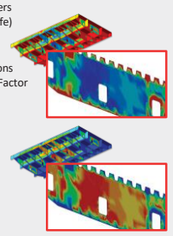
- **Nonlinear Static Analysis**
  - Material Nonlinearity
    - von Mises, Tresca, Mohr-Coulomb, Drucker-Prager, Rankine, User Supplied Material
  - Geometric Nonlinearity
    - Total Lagrangian, Co-rotational
  - Iteration Method
    - Full Newton-Raphson, Modified Newton-Raphson, Arc-Length Method, Initial Stiffness



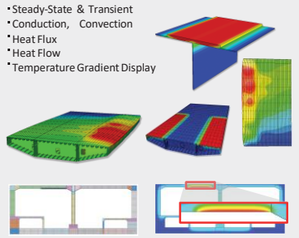
- **Cracking Analysis**
  - Total Strain Crack
    - Fixed & Rotating Crack Model
  - Discrete Crack Model
    - Interface Nonlinearity
  - Results
    - Crack Pattern
    - Element Status (Crack, Plasticity)



- **Fatigue Analysis**
  - Methods and Parameters
    - S-N Method (Stress-Life)
    - Load / Stress History
    - Rainflow Counting
    - Mean Stress Corrections
    - Stress Concentration Factor
    - Modifying Factors
  - Results
    - Cycles to Failure
    - Safety Factor (Cycles to Failure / Desired Repetition)
    - Damage estimation



- **Heat Transfer/Stress Analysis**
  - Steady-State & Transient
  - Conduction, Convection
  - Heat Flux
  - Heat Flow
  - Temperature Gradient Display



- **CFD Analysis**
  - CFD Models
    - Turbulence Models (RANS, k-ω, q -ω)
    - Compressible Flow
    - Incompressible Flow
    - Inviscid Flow
    - Unsteady Flow
  - Discretisation Scheme
    - 2nd-order (Spatial)
    - Dual time stepping (Temporal)
  - Boundary Condition
    - Far-field
    - Wall (Slip, Non-slip), etc.
    - Symmetric