midas Gen
Integrated Design system for Buildings and General Structures

Moscow City Palace Tower
midas Gen
Integrated design system
for buildings and general structures
Why midas Gen?

Midas Gen

Intuitive User Interface
The intuitive user interface, contemporary computer graphics and substantially fast solver speed are some of the highlights of midas Gen. The user-oriented input/output features and significant analysis capabilities enable the practicing engineers and researchers to readily undertake structural analyses and designs for all types of buildings and even complex and long-span structures.

Advanced Analysis Features
midas Gen offers conventional analysis capabilities as well as other analyses such as geometric nonlinear analysis reflecting large displacement, boundary nonlinear analysis, pushover analysis, construction simulated analysis reflecting time dependent material properties, heat of hydration analysis, etc.

Accurate and Practical Results
Diverse ranges of specialty finite elements in conjunction with the latest theories of structural analyses render accurate and practical results. It is prominent for providing convenience, efficiency, versatility and productivity.

Design Capabilities
midas Gen provides design capabilities using various standards of different countries reflecting conventional as well as unusual design conditions, leading to optimal design. midas Gen has been used for over 20 years and applied to over an uncountable number of projects successfully, thereby, demonstrating its credibility and stability.

Integrated design system for buildings and general structures

Burj Khalifa (UAE)
Torre Eurosky (Italy)
Moscow City Palace (Russia)
Shanghai Expo Japan Pavilion (China)

2008 Beijing Olympic Main Stadium (China)
midas Gen is a Windows-based, general-purpose structural analysis and optimal design system.

The intuitive user interface, contemporary computer graphics and substantially fast solver speed supporting 64-bit OS are some of the highlights of midas Gen.

The user-oriented input/output features and significant analysis capabilities enable the practicing engineers and researchers to readily undertake structural analysis and design for even complex and large structures.

The fastest Multi-Frontal Solver and the latest analysis algorithms instantly bring accurate and practical analysis results.

In addition, midas Gen provides design capabilities using various standards of different countries leading to an optimal design solution.

**Why midas Gen?**

- **High-end Analysis Features**
  - P-Delta & Large Displacement Analysis
  - Dynamic Analysis (Time History, Response Spectrum, etc.)
  - Base Isolators & Dampers
  - Pushover Analysis
  - Inelastic Time History Analysis
  - Staged post-tensioning
  - Catenary Cable Structure
  - Heat of Hydration Analysis

- **Intuitive User Interface**
  - Works Tree (Input summary with powerful modeling capabilities)
  - Models created and changed with ease
  - Floor Loads defined by areas and on inclined plane
  - Built-in Section Property Calculator
  - Tekla Structures, Revit Structure & STAAD interfaces

**High-end Analysis Features**

- Construction Stage Analysis
- Post-tension Analysis
- Boundary Nonlinear Analysis
- Pushover Analysis
- Heat of Hydration Analysis
- Detail Analysis
The menu system is structured to **readily gain access** to all the functions required for modeling, analysis, design and results checking tasks. It **minimizes the motion** of the mouse thereby **maximizing the efficiency** in the entire design process.

**Walk Through Mode**

Model rendering provided in various view points

**Task Pane**

A new concept tool, which enables the user to freely set optimal menu system

- A new concept menu system comprising frequently used menus
- Procedural sequence defined by the user for maximum efficiency
- Auto-links to manuals, technical papers and tutorials
- Links to corresponding dialog boxes for ease of checking input data
**Steel & Concrete**

<table>
<thead>
<tr>
<th>DB</th>
<th>Code Name</th>
</tr>
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<tbody>
<tr>
<td>ASTM</td>
<td>American Society for Testing Materials</td>
</tr>
<tr>
<td>EN</td>
<td>European Code</td>
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<tr>
<td>BS</td>
<td>British Standards</td>
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<td>Deutsches Institut Fur Normung e.v</td>
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<tr>
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<td>Canadian Standards Association</td>
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<tr>
<td>GB</td>
<td>Chinese National Standard</td>
</tr>
<tr>
<td>JGJ</td>
<td>Chinese Engineering Standard</td>
</tr>
<tr>
<td>JTJ</td>
<td>Chinese Transportation Department Standard</td>
</tr>
<tr>
<td>CNS</td>
<td>Chinese National Standard</td>
</tr>
</tbody>
</table>

**Modules for Multi-tower Buildings**

midas Gen provides automatic generation of floor diaphragm for each tower and wind & seismic loads can be assigned by towers.

**File Manipulation**

- Direct Data Transfer with Tekla Structures, Revit Structure & STAAD
- Import/Export (AutoCAD DXF, MSC.Nastran, MGT, etc.)
- Merge Data Files
- Unlimited Undo/Redo & Step Return using History

**Steel & Concrete**

- Interface with Tekla Structures, Revit Structure & STAAD
- Wall element for modeling shear walls considering openings
- Tension-only element for modeling steel bracing
- Various combined sections for steel members
- Tapered section for modeling haunched beam
- Section Property Calculator for modeling irregular sections
- Stiffness Scale Factor for beam and plate elements for considering stiffness of cracked sections
- Wall Stiffness Scale Factor for considering decrease in shear stiffness due to openings
- Multi-linear point spring support for modeling piles and stiffness of soil
- Surface spring support for modeling mat foundation and stiffness of soil
- Beam End Release for modeling shear connection of steel members
- Beam End Offset and Panel Zone Effect for considering rigid zone in the connections of beams and columns
- Node Local Axis for modeling inclined support
- Loads to Mass for automatically converting gravity loads such as superimposed dead loads and live loads to mass
- Automatic generation of stories and floor diaphragms
- Accidental eccentricity for flexible diaphragm
- Defining ground level for generating static seismic and wind loads
- Building generation wizard
- Defining modules for multi-tower building
midas Gen provides SPC, which calculates stiffness data for any shape or form. The section shape can be drawn, or a DXF file can be imported. The shape and properties of the generated section can be exported to midas Gen.

**Section Property Calculator**

- SPC (Section Property Calculator)
- An unit structures such as a frame, an arch, a truss, a plate and a shell may be modeled by this automated modeling tool independently and may be combined later with the total model.

**Structure Wizards**

- Accidental eccentricity for the flexible floor diaphragm can be considered in the response spectrum analysis. Accidental torsion is considered for each individual masses and calculated by the product of inertia force and accidental eccentricity at each masses.

**Semi-rigid Diaphragm**

- The Model Window can represent common model shapes as well as shapes generated by hidden lines, removal of hidden surfaces, shading, lighting, dispersion of color tone, etc. The model, analysis and design results may be displayed in rendering views. The input status of the model or each type of analysis and design results can be visually verified by “walking through or flying over” the interiors of structures.

**Walk Through Effect**

- The Model Window can represent common model shapes as well as shapes generated by hidden lines, removal of hidden surfaces, shading, lighting, dispersion of color tone, etc. The model, analysis and design results may be displayed in rendering views. The input status of the model or each type of analysis and design results can be visually verified by “walking through or flying over” the interiors of structures.
midas Gen

Loads

• midas Gen enables us to specify all types of nodal, element, point, surface, dynamic, prestressing and thermal loads encountered in practice

• Typical Beam Loads for applying floor loads

• Floor Loads by areas

• Static seismic loads and wind loads based on various international building codes

• Hydrostatic Pressure Loads for applying lateral earth pressure

• Load combination based on various design codes

• Load group generation load cases from load combinations

Static Wind and Seismic Loads

midas Gen generates static wind and seismic loads on a building structure for each story. All one has to do is to provide the applicable standard and the building data.

<table>
<thead>
<tr>
<th>Wind Load Code</th>
<th>Seismic Load Code</th>
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<tr>
<td>IBC</td>
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<tr>
<td>UBC</td>
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<td>Taiwan</td>
</tr>
<tr>
<td>Korea</td>
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</tr>
</tbody>
</table>

Dynamic Loads

Seismic analyses can be performed while implementing dynamic loads and nonlinear elements.

Hydrostatic Pressure Loads

The hydrostatic pressure loads are calculated at each corner node of the elements. The point pressure is obtained by multiplying the distance from the given surface of the fluid by the density of the fluid.
Construction Stage Analysis

midas Gen provides Construction Stage Analysis capability, which reflects the time dependent material properties of concrete such as modulus of elasticity, creep and shrinkage. Change in material properties are reflected while simulating construction sequence with respect to the change in geometry, boundary conditions and loads relative to time.

Floor Vibration Analysis

Serviceability of floor structures can be evaluated by dynamic time history analyses. midas Gen provides a number of time history forcing functions for walking loads for floor vibration.

- Baumann, IABSE, AIJ, Allen & Rainer

Analysis

- Linear Static & Thermal Analysis
- Dynamic Analyses (Eigenvalue, Response spectrum & Time History)
- P-Delta Analysis
- Buckling Analysis (Critical Buckling Load Factors & Modes)
- Moving Load Analysis
- Heat Transfer Analysis (Steady State & Transient)
- Construction Stage Analysis (Strength, Creep & Shrinkage)
- Column Shortening Analysis (Elastic/Creep & Shrinkage)
- Geometric Nonlinear Analysis
- Pushover Analysis (Concrete, Steel and Masonry)
- Boundary Nonlinear Time History Analysis
- Inelastic Time History Analysis (Lumped/Distributed Hinges, Fiber Elements)
- Material Nonlinear Analysis (Von-Mises, Tresca, Mohr-Coulomb & Drucker-Prager)
- Structural Masonry Analysis
- Analysis for finding Unknown Forces by Optimization
- Heat of Hydration Analysis (Thermo-elastic, Maturity, Creep, Shrinkage & Pipe Cooling)
**Finite Element Library**

- General Beam element
- Tapered Beam element
- Truss element
- Compression only element
- Tension only element
- Cable element
- Plate element (Thick/Thin, In-plane/Out-of-plane Thickness & Orthotropic)
- Plane Stress element
- Plane Strain element
- Axisymmetric element
- Wall element (In-plane, Out-of-plane Bending)
- Solid element (Hexagon, Wedge & Tetrahedron)
- Gap element
- Hook element
- Visco-elastic System
- Hysteretic System
- Lead Rubber Bearing Isolator
- Friction Pendulum Isolator
- Beam element considering warping

**Pushover Analysis**

Pushover analysis of a 3 dimensional frame structure used for performance based design can be carried out for reinforced concrete, structural steel and steel-concrete composite sections.

- Performance based design as per FEMA, Eurocode 8 and Masonry
- Various Hinge Types (Truss/Beam/Column/Wall/Spring), Multi-linear Hinge and User-defined Hinge
- Displacement control & Force control
- Target displacement & Performance Point based on Capacity Spectrum Method
- Checking for acceptable performance (Drift limits, Deformation and Strength capacity)

**Inelastic Time History Analysis**

For the seismic design and assessment of a structure, midas Gen offers a wide range of hysteresis hinge models such as kinematic hardening, Takeda, slip, etc. in the inelastic time history analysis.
Boundary Nonlinear Time History Analysis

midas Gen offers boundary nonlinear time history analysis, which enables us to analyze and evaluate seismic isolators and dampers. Gap, Hook and hysteretic system are also provided.

Material Nonlinear Analysis/Plasticity Analysis

midas Gen offers material models for the analysis of nonlinear behaviors of steel, concrete, rock, etc. (Von-Mises, Tresca, Mohr-Coulomb & Drucker-Prager)

Geometric Nonlinear Analysis

Large displacement analysis encountered in cable supported structures, cable net structures, long span structures, etc. can be performed reflecting the change in geometrical deformations.

Heat of Hydration Analysis

midas Gen provides heat of hydration analysis capabilities through heat transfer and heat stress analyses. Heat of hydration analysis by construction stages reflects the change in modulus of elasticity due to maturity, effects of creep/shrinkage, pipe cooling and concrete pour sequence.

Structural Masonry Analysis

Masonry structures can be modeled with solid elements, which retain orthotropic material properties. The effect of nonlinearity such as tensile crack and compressive failure can be considered.
### Results

- **Story Drift** for Static and Dynamic Seismic Loads
- **Story Shear** for Response Spectrum and Time History Loads
- Mode Shapes
- Mass center and Stiffness center by story
- Center of building structure
- **Story Shear Force Ratio** for the columns and shear walls
- Overturning moment
- Torsional Irregularity Check
- Stiffness Irregularity Check
- Weight Irregularity Check
- Capacity Irregularity Check
- Defining modules for a multi-tower building
  - Story results for each module
- Bill of Materials
- Soil pressure in contour for soil underlying mat foundation or surrounding retaining walls

### Dynamic Report Generator

- Generate a report using analysis and design results from midas Gen. All the input and output data can be plotted in a diagram, graph, text, and table format.
  - All of the data entered in the report can be modified and saved by the user in MS Word format without any limitations. Using the Dynamic Report Regenerator, we can easily update contents of the report by reflecting changes in a model file.

### Beam Detail Analysis

- Member displacements, forces and stresses can be examined for various section locations.
- Detail forces and stresses in beam members resulting from detail analysis of individual elements can be verified in Beam Detail Analysis. **Any point in any section** can be examined.

### Post-Processing

- Member displacements, forces and stresses can be examined for various section locations.
- Detail forces and stresses in beam members resulting from detail analysis of individual elements can be verified in Beam Detail Analysis. **Any point in any section** can be examined.
### Design Codes

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<tr>
<th>RC Design</th>
<th>Steel Design</th>
<th>SRC Design</th>
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<td>SSRC</td>
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<tr>
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<td>KSSC-ASD</td>
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### Design Features

- **Automatic design/checking** of concrete frame, shear wall, steel frame and isolated footing
- **Providing reinforcement size and distribution** on the concrete section
- Automatic checking the minimum spacing of reinforcements
- Doubly-reinforced beam design
- Option for splicing
- Automatic calculation of effective length factor
- Automatic calculation of unbraced length factor
- User-defined moment redistribution
- International reinforcement DB (ASTM, EN, UNI, BS, NTC, GOST, IS, CSA, GB, JIS, CNS, KS)
- Optimal design based on the lateral displacement
- **Steel Optimal Design** based on the strength check
- Shear wall design considering boundary element
- **Strong Column-Weak Beam** design
- Detailed design report
- Star-batten section checking

### Design Report

- [Concrete Design Report](image)
- [Steel Design Report](image)

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**Integrated design system**

*for buildings and general structures*
Optimal Design

The optimal design feature of midas Gen optimizes the member sections, which determines the section dimensions automatically for the minimum sectional area (minimum weights) satisfying the specified design standard through verifying strength ratio (or stress ratio) in iterative analysis.

General Section Designer

midas GSD provides safety checks for any irregular RC, steel and composite sections. Moment-curvature curve and stress contour for cracked & uncracked elastic stress are generated by section analysis.

Footing Design

midas Gen automatically searches for an adequate footing size and the number of piles. It looks for satisfactory dimensions by checking all the entered nodes and load combinations. The results are produced only for the most severe load combination.

Graphical Display of Design Results

Reinforcing information such as rebar diameter, rebar spacing and required reinforcing steel area can be displayed.
Meshed Slab and Wall Design

midas Gen provides slab and wall design for meshed plate elements as per Eurocode 2-1-1:2004. midas Gen provides slab design for orthogonal / non-orthogonal reinforcement directions based on the Wood-Armer formula. Also smooth moment and shear forces are considered in slab and wall design. Static wind and seismic loads for flexible floors are automatically generated.

- **Slab Flexural Design / Checking**
  - Graphical display:
    - Recommended rebar size and spacing
    - Required rebar area
    - Required rebar ratio
    - Flexural resistance ratio
    - Wood-Armer moment
    - One-way flexural design
  - Detail report: Design results of slab members in a text format summary
  - Design moment table: Wood-Armer moments in a spread sheet table

- **Punching Shear Checking**
  - Graphical display:
    - Stress diagram in a critical perimeter
    - Punching shear check ratio
    - One-way shear check
  - Detail report: Verification results for punching shear with required shear rebar area in a text format summary

- **Slab Serviceability Checking**
  - Graphical display:
    - Stress checking (concrete, rebar)
    - Crack control (crack width, minimum rebar area, minimum bar diameters, minimum bar spacing)
    - Deflection (un-cracked & cracked section, Long term deflection considering creep effect)
  - Detail report

- **Wall Design / Checking**
  - Graphical display:
    - Recommended rebar size and spacing
    - Required rebar area
    - Required rebar ratio
    - Resistance ratio
  - Detail report
**Midas Gen**

**Automeshing**
- Midas Gen provides mesh generation features for slab and wall members. Generated mesh elements are fully compatible with analysis and design feature. Automesh considering interior nodes, elements and openings is available.
- Wall / Slab modeling and design
- Automatic generation of Static Wind and Seismic Loads for flexible floors
- Automatic consideration of interior openings and connectivity between Slab and Wall members

**Various Applications**
- [Arch tube]
- [Pumping plant]
- [Caisson]
- [Subway station]

**Automeshing and Design Procedure**
- Import def file and generate vertical members
- Create meshed slabs: Auto-mesh
- Create meshed walls: Map-mesh
- Building generation
- Displacement contour
- Slab design

**Auto-generation of Static Wind and Seismic Loads**
- Static Wind Loads
- Static Seismic Loads

**Capacity Design**
- Midas Gen offers automatic capacity design capability for concrete structures to provide the appropriate amount of ductility in the corresponding ductility classes.
- Beam, column, wall and beam-column joint
- EN 1998-1: 2004 (DCM/DCH)
- NTC (CD"B", CD"A")
- Design action effects are calculated in accordance with the capacity design rule. Special provision for ductile primary seismic walls is considered.
- Detailing for local ductility is considered.
  - max/min reinforcement ratio of the tension zone
  - the spacing of hoops within the critical region
  - mechanical volumetric ratio of confining hoops with the critical regions

**Capacity Design for Concrete Structures**
- Capacity design shear forces on beams
- Define ductility class and check design results
- Design envelope moments in walls
**midas Gen & Integrated Solutions?**

*midas Gen & Integrated Solutions* are one stop total solution from modeling/analysis/design to engineering drawings/shop drawings. Integrated modeling/analysis/design system by *midas Gen*, auto-generation of structural drawings/B.O.M by *midas DShop* and direct data transfer with *Tekla Structures & Revit Structure* are integral parts of midas Gen.

### CAD Interface

**CAD Interface**

Direct Data Transfer with Tekla Structures & Revit Structure

- Exporting all the standard, double and built up sections from Tekla/Revit to Gen
- Exporting all the defined material and section properties from Tekla/Revit to Gen
- Updating Tekla/Revit models based on optimally designed sections in Gen

### midas DShop

**Auto-drafting Module for midas Gen**

- midas Gen design results transformed into auto-generate structural drawings (General Notes / Plans / Sections / Member Schedules)
- Reinforcement Edit function by members (Beam, Column, Brace, Wall & Footing)
- Auto-generation of B.O.M. (Bill Of Materials)
- Drawing environment and edit functions identical to AutoCAD

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**Integrated design system for buildings and general structures**

- Intuitive User Interface
- RC / Steel / SRC / Meshed Slab and Wall Design
- Seismic Analysis, Pushover Analysis, Dampers & Base Isolators & Capacity Design
- Geometric / Material Nonlinear / Nonlinear Time History (fiber element)
midas Design+ is a collection of handy structural component design and detailing tools, which are easy to use and speed up the day-to-day design process. midas Design+ is developed to be simple, fast and accurate. It enables engineers to systematically and consistently manage design reports.

midas Design+ consists of a range of software modules for structural engineers to streamline the process of design and detailing into one design operation providing a competitive edge.

**Product Range**

**RC Design**
- Slab
- Beam
- Column
- Irregular Column
- Shear Wall
- Combined Wall
- Basement Wall
- Retaining Wall
- Mat Foundation
- Pile Foundation
- Wall Footing
- Buttress
- Stair
- Corbel

**Steel Design**
- Beam & Column
- Base Plate
- Bolt Connection
- Weld Connection
- Crane Girder
- Purlin & Girth
- Web Opening

**SRC Design**
- Composite Beam
- Column
- CFT Column

**Aluminum Design**
- Beam
- Column

**Code Design**
- ACI 318-08, 11
- AISC-LRFD & ASD 05, 10
- AA-LRFD & ASD 05
- Eurocodes
Accurate Calculation Results

- Detail calculation reports for structural engineers
- Summary report with input data for checking
- Customization of the Word format report by the user

Intuitive GUI for Efficient Design

- Simple mode for individual components design
- Project mode for member groups by projects
- Compatible with CAD, MS Word & Excel

Reinforcement Drawing in DWG format

- Beyond component design tools, midas Design+ provide high efficient productivity with powerful auto drafting.
**Project Applications**

**Buildings**

- **Burj Khalifa (UAE)**
- **Guangzhou Twin Tower (China)**
- **Moscow City Palace (Russia)**
- **Torre Eurosky (Italy)**
- **Rolex Tower (UAE)**
- **Taipei Twin Tower (Taiwan)**
- **Hanoi Landmark (Vietnam)**
- **Omnix Tower (UAE)**
- **Gate of the Orient (China)**
Project Applications

Plant Structures

Campiche Power Plant (Chile)  Nghi Power Plant (Vietnam)  Angamos Power Plant (Chile)

Hadeed CCL Steel Plant (Saudi Arabia)  TAVAZON Steel Plant (Iran)  India IISCO Steel Plant (India)

Pohang Steel Plant (Korea)  Zhangjiagang STS Steel Plant (China)  Gwangyang Steel Plant (Korea)
Project Applications

Spatial Structures

2008 Beijing Olympic Main Stadium (China)  
2008 Beijing Olympic Basketball Arena (China)  
2008 Beijing Olympic Badminton Arena (China)  
FIFA World Cup Main Stadium (Korea)  
FIFA World Cup Daejeon Stadium (Korea)  
FIFA World Cup Jeonju Stadium (Korea)  
Inchoen International Airport (Korea)  
Beijing International Airport (China)  
Seoksan Subway Station (Korea)
Project Applications

Specialty Structures

USA Pavilion (Shanghai EXPO)  
German Pavilion (Shanghai EXPO)  
Japan Pavilion (Shanghai EXPO)

Tempietto di Villa Barbaro (Italy)  
Erdos Museum (Mongolia)  
Maritime Museum (China)

Jeongdongjin Resort Facilities (Korea)  
Saint Ignatius High School (Taiwan)  
Sungsanpo Marine Terminal (Korea)
**Introduction to MIDAS Family Programs**

**Building Engineering**

- **midas Gen**
  Integrated Design System for Building and General Structures

- **midas Design**
  Structural Component Design & Detailing

**Geotechnical Engineering**

- **midas GTS NX**
  Geotechnical and Tunnel analysis System

- **SoilWorks** (2D)
  Geotechnical Solutions for Practical Design

**Bridge Engineering**

- **midas Civil**
  Integrated Solution System for Bridge and Civil Structures

- **midas FEA**
  Advanced Nonlinear and Detail Analysis System

**Mechanical Engineering**

- **midas NFX**
  Total Solutions for True Analysis-driven Design
  Easy, Accurate and Practical Solutions

- **midas FX**
  General Pre & Post Processor for Finite Element Analysis

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**Propagation of Technology**

MIDAS IT provides useful technical and product information and online technical services through its web sites. In addition, MIDAS IT holds a series technical conferences, road shows, training and seminars worldwide to introduce the latest engineering and CAE technology.
MIDAS Global Network

a total of over 30,000 licences used worldwide in over 150 countries

Largest CAE Software Developer in Civil Engineering

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