CivilFEM®

Only One Software for all Your Civil Engineering needs.

- INDUSTRIAL BUILDINGS, SKYSCRAPERS, STADIUMS.
- SEISMIC CALCULATIONS.
- NUCLEAR, THERMAL AND WIND POWER STATIONS.
- OFF-SHORE AND NAVY STRUCTURES.
- BRIDGES (CONCRETE, STEEL, COMPOSITE, ETC).
- PRESTRESSED CONCRETE STRUCTURES.
- TUNNELS.
- FOUNDATIONS (SLABS, PILES, WALLS, ETC).
- GEOTECHNICAL PROBLEMS.
- DAMS (CONCRETE, LOOSE MATERIALS, ETC.)
- SUSPENSION AND CABLE STAYED BRIDGES, SINGULAR BUILDINGS, ETC.
- QUALITY CONTROL, VALUATION AND MODIFICATION OF CIVIL WORKS.

Shaping dreams into reality

Only professionals like you know how many hours of calculation, research and reviewing are necessary to erect a bridge or build a dam. That is why your job requires more than just a software for design and calculation of structures. What we offer you, is a quality synergy for all the Civil Engineering projects that you come across.

Based on the advanced capabilities of ANSYS®, the prestigious world leader of the CAE market, we have developed a state-of-the-art software specialized for the Civil Engineering field, comprised of a general module and three advanced complementary and optional modules.

With ANSYS and CivilFEM, not only do you benefit from the latest technology in Finite Element Analysis for the Construction industry, but also you obtain a software that optimises your labour hours, costs and the performance of your enterprise, enabling you to innovate every day and realise all the dreams of Civil Engineering that will persist throughout history.

90 of the 100 most prominent engineering companies in the world have already benefited from this advanced technology. Now you have the chance.

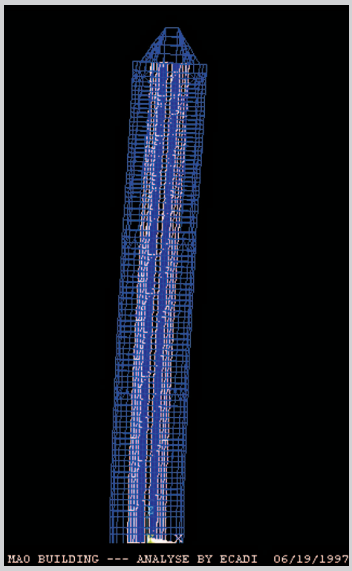
CivilFEM®

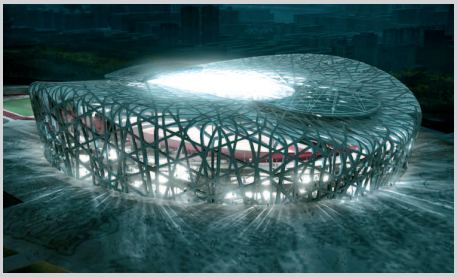
CivilFEM with ANSYS

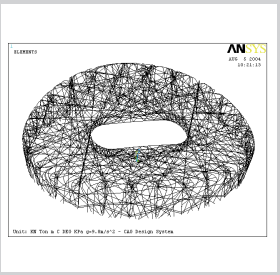
The most comprehensive Civil Engineering Software

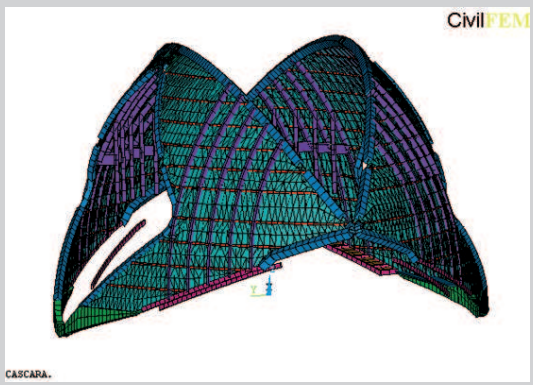
CivilFEM with ANSYS is the most advanced, comprehensive and reputable finite element analysis and design software package available for structural engineering projects. The system combines the state-of-the art general purpose structural analysis features of ANSYS (ISO-9001) with the high-end civil engineering specific structural analysis capabilities of CivilFEM, making it a unique and powerful tool for a wide range of civil engineering projects. Since the two programs are completely integrated, CivilFEM supports all types of advanced analysis supported by ANSYS running as a single software. ANSYS is the finite element software used by many of the TOP100 engineering firms in the world with 30 years of constant growth (NASDAQ ANSS).

CivilFEM with ANSYS products address the particular concerns of structural simulation, providing all the power of ANSYS capabilities-as well as all CivilFEM specialized features-in order to deliver the highest-quality, most reliable structural simulation results available.









CivilFEM with ANSYS

→Structural Analysis Types

- Static analysis.
- Dynamic analysis.
  - ·Modal analysis (Damped and Prestressed).
  - ·Transient Linear and Non-Linear.
  - ·Harmonic Response.
  - ·Response Spectrum and PSD.
- Buckling.
  - ·Linear.
  - ·Nonlinear.

→Geometric Nonlinearity

- Large Strain.
- Large Deflection.
- Stress Stiffening.
- Spin Softening.

→Material Nonlinearity

- Isotropic Hardening Plasticity.
- Kinematic Hardening Plasticity.
- Combined Kinematic and Isotropic Hardening.
- Hyperelasticity.
- Viscoplasticity and Viscoelasticity.
- Creep and Shrinkage.
- Swelling.
- Temperature-dependent properties.
- Pressure-dependent plasticity (Drucker-Prager).

→Non-linear elements

- Cables and Compression only Spars.
- Contact Elements with Friction.
- Surface-to-surface.
- Node-to-surface.
- Node-to-node.
- Pretension element.
- Control (switching) elements.
- Cracking and crushing solids.
- Element birth and death (non-linear construction sequence simulation).
- Non-linear beams.
- Non-linear springs.
- Non-linear solid reinforced concrete element.

→Optimization

- Powerful design and Topological optimization.
- Parametric simulation and sensitivity analysis.

→Additional Features

ANSYS Parametric Design Language (APDL).

- Macros.
- Parametric modelling.
- Arrays parameters, do-loop features.
- Cyclic symmetric analysis.
- Adaptative meshing.

→Material Library

- Database with all the materials considered by most international codes.
- Non-linear and time-dependent material properties can be intuitively defined to carry out construction sequence analysis.
- User-defined material library.

→Civil Section Library

- Any generic cross section, made up of different materials, can be easily defined through the CivilFEM GUI.
- Any cross section is automatically divided into small facets (called "tessela") allowing to study in detail its internal behaviour even when are used in the model when beam elements.
- User-defined section library.

→Solid Section Capture

- Checking anddesign of generic cross sections captured from a 3D Solid Element model.
- Calculating the equivalent forces and moments by integrating the stresses over each selected section.

→Smart Load Combinations

- Any load combination scenario can be quickly and easily simulated by using the load combination wizard.
- The loads are automatically combined and multiplied by variable coefficients in order to achieve maximum or minimum results predefined by the user. The concurrent actions can be also plotted.

→Steel Code Checking

- Eurocode 3, AISC-LRFD, British Standard 5950, Chinese code GB50017, EA, Others (*).

→Concrete Code Checking and Design

- Eurocode 2, EHE, ACI 318, CEB-FIP (Model Code), British Standard 8110, AS3600 (Australian), GB50010 (Chinese), Others (*).

→Shell Reinforcement

- Wood Armer Reinforcement (Flexure).
- CEB-FIP (Flexure+Shear+Membrane Forces).

→Open and Closed Frames.

- Automatic analysis and reinforced concrete design of open and closed frames under roads.

→Seismic Utilities

- Automatic spectrum definition according to Eurocode Nº 8, NCSE-02 (Spanish), GB50011 (Chinese), Others (*).
- Automatic mode combination according to code specifications.

→Connection With SAP2000

- Automatic import of a SAP2000 finite element model into CivilFEM.

→Connection With FLAC3D

- Automatic export-import of an CivilFEM model into FLAC3D.
- FLAC3D Structural element reinforcements.

→General Utilities

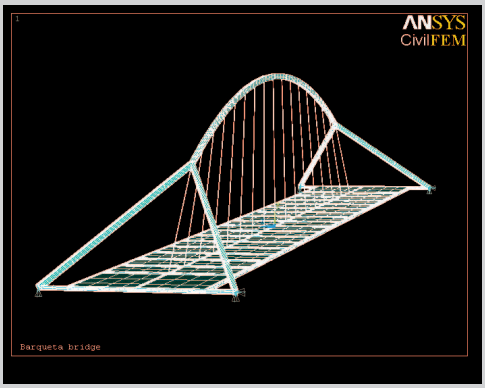
- HTML listing and graphic results.
- Export/Connection with MS-EXCEL.

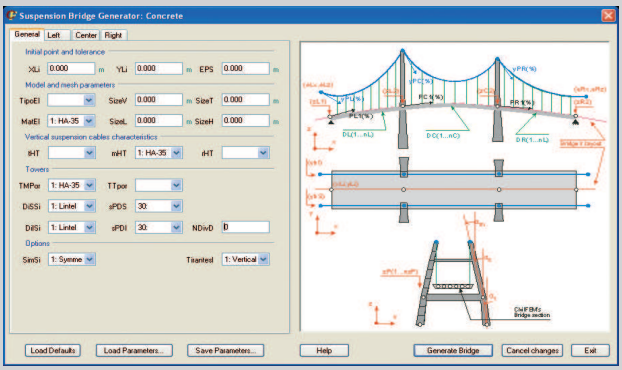
(*) For further information, please contact your distributor.

BRIDGES AND CIVIL NONLINEARITIES MODULE

Innovating at all levels

The bridges and civil nonlinearities module provides a complete solution that enables the bridge designers to solve complex problems with tools that demonstrate the latest advances in technology. It allows you to intuitively generate mesh and load, and analyze and design according to codes, any complex bridge by using powerful wizards. Furthermore, its complete integration with CivilFEM and ANSYS ensures that any kind of static, dynamic, linear and nonlinear analysis can be easily performed.





BRIDGES AND CIVIL NONLINEARITIES MODULE

→Library of Common Bridge Cross Sections

- Definition of common bridge sections by specifying basic dimensions.
- Automatic "mesh" generation for the defined sections to calculate section properties. Any generic bridge section can be easily defined through the GUI.

→Bridge Layout Design (Plan and Elevation View)

- Allows generating the bridge layout from common engineering blueprints and parameters (mileage points, curvature radius, inclination, etc). It works like a complete "layout program" intuitively defining any complex layout.
- Automatically creates the 3D alignment from the definition of plan and elevation views.

→Automatic Generation of the Finite Element Model (Beam and Solid elements)

- Beam element model: Allows for a trial and error procedure using beam elements.
- Automatic discretization of the beam element cross sections (allows to analyse the section's internal behaviour using beam elements).
- Automatic solid element model: More accurate design can be performed using solid elements just by changing the element type and running the analysis again.

→Suspension/Cable Stayed Bridge Model Wizards

- Just enter the number of segments and the corresponding data to generate the entire bridge model for both 3D beam and solid elements.
- Optimization of the geometry and initial tension of cables for Suspension and Cable Stayed bridges.

→Moving Load Generator (Vehicle library)

- Automatically generates the required loadsteps for one or more vehicles moving throughout the bridge deck. These loads are automatically combined during postprocessing using the smart combination tool of CivilFEM.
- Database of standard design code vehicle loads (Caltrans, AASHTO, High-speed trains, etc.) and possibility of defining any generic vehicle with its corresponding load pattern.
- Definition of vehicle type: rigid or flexible (adaptable to trajectory).

→Automatic Surface Load Generator

→Prestressed Concrete Utilities (please refer to the Prestressed Concrete Module for more advanced features)

- Introduction of prestressing cables along the structure. The program calculates an equivalent system of forces at each node of the element crossed by the tendon.

→Construction Sequence Analysis

- Simulation of real non-linear construction process taking advantage of CivilFEM's time-dependent material properties and the possibility of activating and deactivating elements and materials during the analysis.

→Civil NonLinearities

- Changes in the cross section geometry and time-dependent properties due to construction processes.
- Large Deflection Buckling of Concrete Beam Elements, Non-linear redistribution analysis and Cracking and Yielding Phenomena.
- Concrete Creep and Shrinkage, material behaviour (according to codes or user-defined).

→Detailed Analysis of Piers, Cross Bracings, Diaphragms, etc.

→Moment-Curvature Diagrams

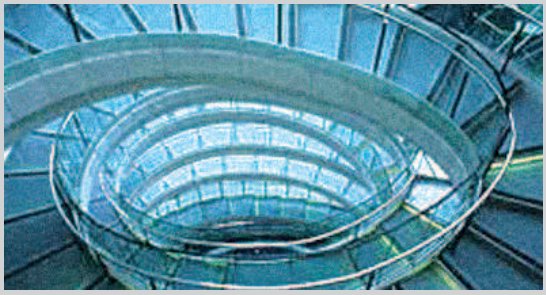
CivilFEM allows the calculation of the real moment-curvature diagram for a given section.

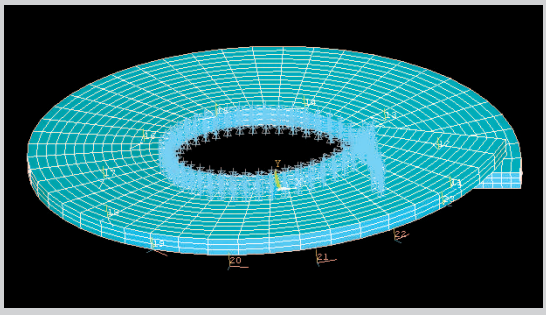
(*) For further information, please contact your distributor.

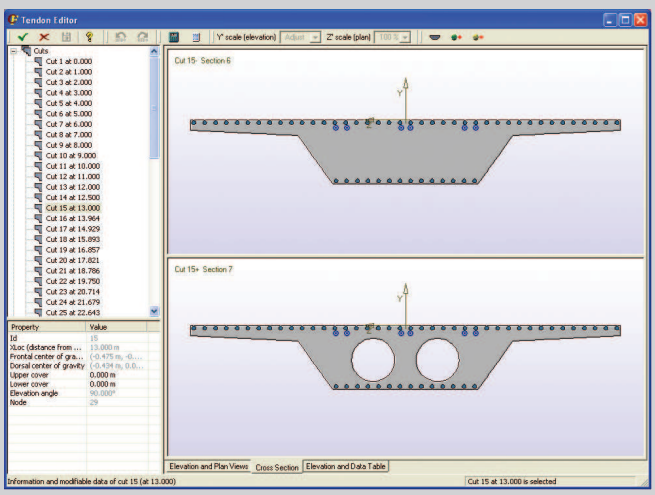
ADVANCED PRESTRESSED CONCRETE MODULE

Let your imagination set the limit

In addition to the state-of-the-art CivilFEM with ANSYS analysis and simulation tools, that can be used simultaneously, the Advanced Prestressed Concrete Module offers best in class specific features that enable users to handle easily all kinds of prestressed concrete structures. This module takes into account all the prestressing actions for performing advanced analysis and design procedures.







ADVANCED PRESTRESSED CONCRETE MODULE

→3D Tendon Geometry Editor (for Beam and Solid Element Models)

- Allows intuitive graphical definition of the tendon layout in both plan and elevation views.
- Positioning of 3D tendons based on reference points and curvatures. Automatic 3D alignment generation of the defined tendons. Second order Bezier curves are used by the program to create the tendon layout.
- Possibility of selecting and viewing a cross section with the corresponding location of tendons displayed. Many graphic options are available.
- Data table view with a graph and a list representation of all prestressing losses throughout the structure that can be customized by selecting or unselecting different options.

→Prestressing Losses

- Short-term prestressing losses are automatically considered for the effects of Anchorage slip, Friction and Elastic Concrete Shortening.
- Long-term prestressing losses are automatically considered for the effects of Creep, Shrinkage and Steel Relaxation of tendons.
- Variation of prestressing in tendons considered for the effects of prestressing order.
- Prestressing actions are calculated for both isostatic and hyperstatic structures.
- All the geometrical data and calculated losses for each tendon can be graphically displayed in a graph and in a table, which can be completely customized.

→Transference of the Prestressing Actions

- The resultant prestressing actions, after all the losses have been accounted for, are automatically transferred to the model creating an equivalent system of forces at each node of the element crossed by the tendon. Applicable for both beam and solid element models.
- Optimisation of the prestressing tendon location.
- Checking and Design according to codes taking into account the prestressing tendons for both Serviceability and Ultimate Limit State. Both Isostatic and Hyperstatic structures can be checked and designed.

→Applicable to any Prestressed Concrete Structure such as Slabs, Silos, etc.

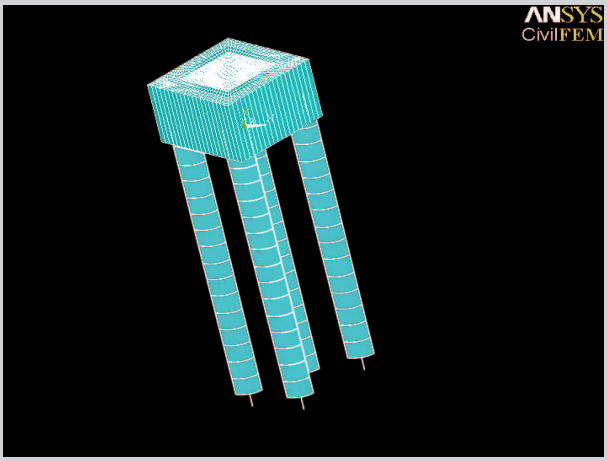
(*) For further information, please contact your distributor.

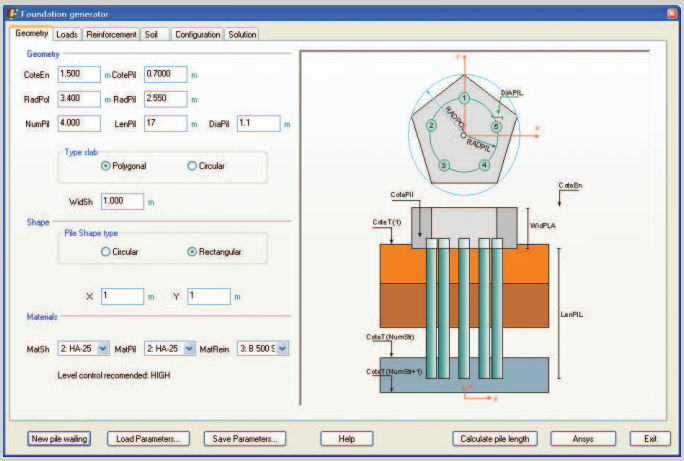
GEOTECHNICAL MODULE

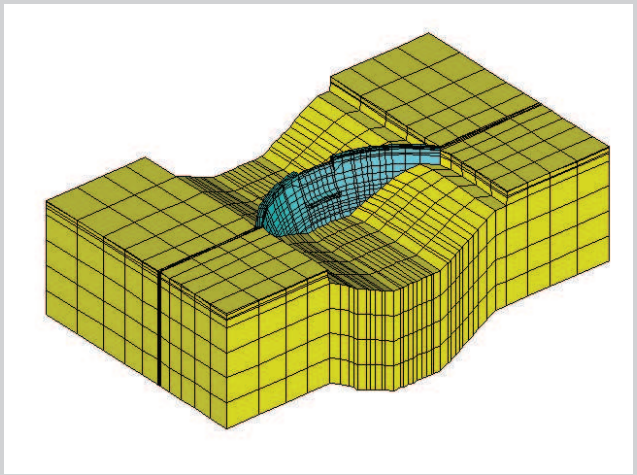
The perfect tool to conduct your project

The CivilFEM Geotechnical utilities were created with the aim of becoming a powerful tool to allow Civil Engineers to deal with the most typical as well as the most advanced 2D and 3D soil mechanics problems using all kinds of Beam, Shell and Solid elements. Its intuitive interface allows creating complex structural models and simulating soil-structure interaction rapidly and in detail, taking into account non-linear materials, geometry and contact conditions as well as the design and checking of the structural elements of the projects.

With the capabilities of CivilFEM, a wide range of problems can be solved such as tunnels, dams, piles and micro piles, foundation slabs, geotextiles-geogrids, reinforced soils, retaining structures, etc.







GEOTECHNICAL MODULE

→Soil and Rock Library

- Geotechnical properties and correlations.
- User-defined library.

→Generation of Layered Soils

- Automatic generation of layered soil model and properties.

→Superficial Foundations

- Footing and continuous foundations.
  2D/3D soil-structure interaction models.
- Slab Foundations.
  3D soil-structure interaction models.
  3D Soil Foundation Stiffness models with the calculation of precise, average, maximum and minimum values.

→Deep Foundations

- Pile Cap Wizard:
  Automatic generation of regular polygonal or circular pile cap groups
  · Pre-Design of piles length.
  · Automatic calculation of the reinforcement amount required according to the selected Code (Punching, Primary and Secondary reinforcement of both sides for rigid and non-rigid pile caps).
  · Load pile test.

→Retaining Structures

- Calculation of Sheet Piles 2D/3D (automatic wizard).
  · Non-linear construction sequence analysis.
  · One or two sheet piles can be analysed simultaneously including anchors, water level, layered soils, applied loads, etc. with any CivilFEM cross section.
- Earth Pressure Utility.
  · Apply pressures and forces corresponding to active and passive pressure and soil weight on the selected elements.

→Underground Structures (Tunnels)

- Terrain Initial Stresses.
  ·Automatic calculation of the initial stresses without strain from a given topography.
- Hoek & Brown Failure Criteria (rocks).
- Plastic Constitutive models: 2D/3D Drucker-Prager and 2D Mohr-Coulomb (plain strain).
- Birth and Death of elements feature (construction and excavation sequence analysis).

→Improvement of Soils

- Birth and Death of elements feature for jet grouting and gravel column.

→Slope Stability Analysis

- Classic Failure Methods
  ·Fellenius.
  ·Bishop.
  ·Janbu and modified Janbu.
  ·Morgenstern price.
  ·US Corps of Engineers.
- FEM results.
- Actions on the model: seismic effect, loads and hydrostatic load over the slope surface.

→Seepage Analysis

- Obtain the water table and water pressure.
- Obtain the saturation line for 2D problems.
- Export the obtained pore water pressure to slope stability problems. The finite element mesh used in the two analyses can be different.
- Calculate filtered flows through boundaries.

→Plastic Constitutive models: 2D/3D Drucker- Prager and 2D Mohr Coulomb (plain strain), viscoplasticity, viscoelasticity, anisotropyplasticity, etc.

→Automatic Load Stepping to select suitable Load Increments

→Large Strain Calculations to follow significant changes in the geometry

→Safety factors defined as the ratio of the failure load to the working load

→Powerful Postprocessor: deformations, stresses, forces, reinforcement amounts, etc.

→2D/3D Dynamic compaction using cycling loads

(*) For further information, please contact your distributor.

Advantages of CivilFEM®

- Since CivilFEM with ANSYS is able to deliver results to all the calculations needed in all areas and departments, it stands as a corporate solution, shared by everyone.
- Improvement of quality throughout all Civil Engineering projects.
- Reduction of costs and time execution, as it allows to quickly evaluate different solutions and/or alternatives.
- Possibility to compare "a priori" solutions and more advanced designs.
- A prestigious tool, employed by 90 of the top 100 largest technologic enterprises in the world.

As from today, benefit from the most complete and advanced technological software.

Contact us,

with no commitment, and we will give you a customised demo.

info@civilfem.com | www.civilfem.com

Contact your local distributor: