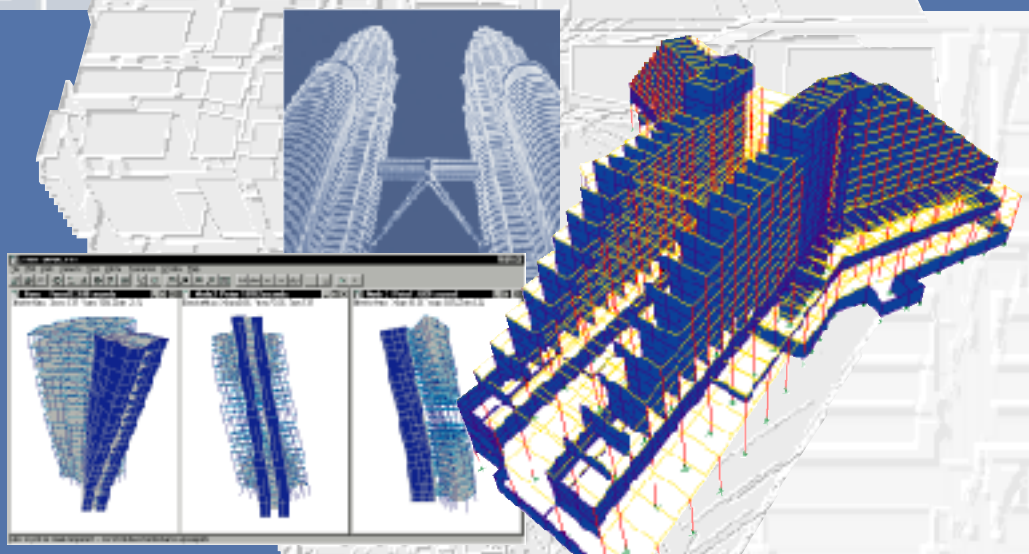
INTEGRATED DESIGN AND ANALYSIS SOFTWARE FOR BUILDING SYSTEMS

FOR WINDOWS® 95/98/NT/2000



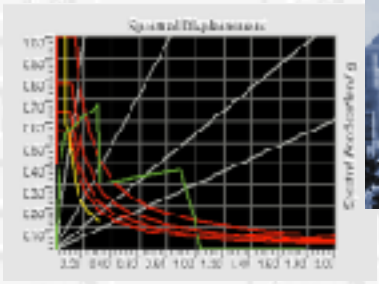
ETABS®

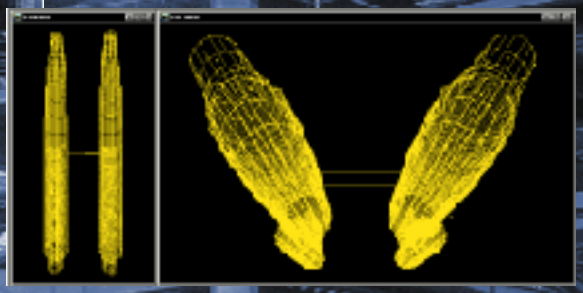
LINEAR AND NONLINEAR STATIC AND DYNAMIC ANALYSIS AND DESIGN OF BUILDING SYSTEMS

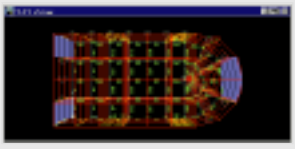
COMPUTERS & STRUCTURES INC.

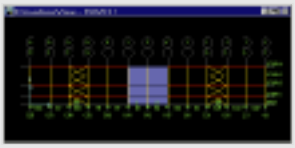
CSI®

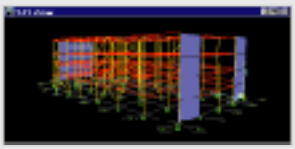
STRUCTURAL AND EARTHQUAKE ENGINEERING SOFTWARE

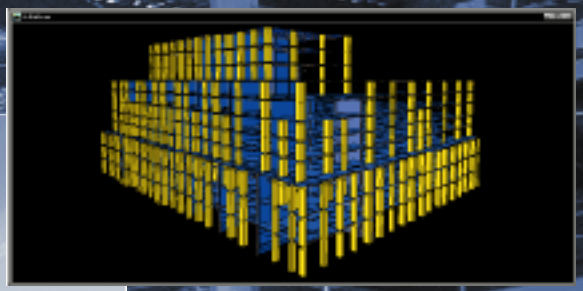












LINEAR AND NONLINEAR STATIC AND DYNAMIC ANALYSIS AND DESIGN OF BUILDING SYSTEMS

THIS IS ETABS®

USER FRIENDLY GRAPHICAL INTERFACE

- Fully integrated interface within Windows 95/98/NT/2000
- Optimized for modeling of multistory buildings
- CAD drawing/editing for fast, intuitive framing layout
- 3D model generation using plans and elevations
- Fast generation of model using the concept of similar stories
- Automated templates for typical structures
- Easy editing with move, merge, mirror and replicate
- Convenient dividing and meshing of design objects
- Accurate dimensioning with guidelines and snapping
- Quick-draw options to create objects with one mouse click
- Multiple views in 3D perspective with zooming and panning
- Onscreen assignment of properties, loading and supports
- Powerful grouping, selection and display options
- Cut, copy and paste options
- Unlimited levels of undo and redo
- 3D perspective, plan, elevation, developed elevation, and custom views
- Graphical custom section designer
- Cut/Paste geometry to and from spreadsheets
- Import and export of .DXF file for model geometry
- Multiple simultaneous rectangular and cylindrical grid systems
- Detailed context-sensitive online help
- Analysis integrated with post-processing and design
- Right button click for element or design information

For nearly thirty years, the TABS and ETABS series of computer programs have defined the standard for building analysis and design software, and the tradition continues with this latest release of ETABS.

These programs were the first to take into account the unique properties inherent in a mathematical model of a building, allowing a computer representation to be constructed in the same fashion as a real building: floor by floor, story by story. ETABS uses terminology familiar to the building designer such as columns, beams, braces and walls rather than nodes and finite elements.

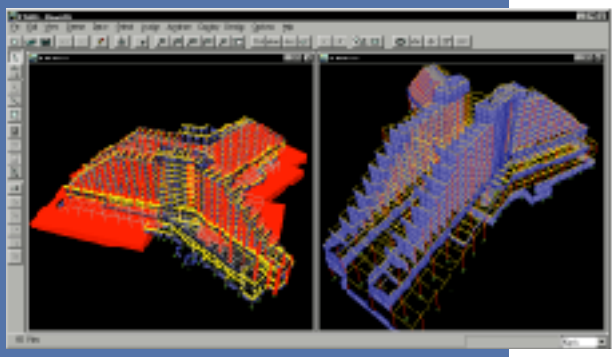
In any endeavor, a tool tailored to a specific task is the most efficient. For buildings, ETABS provides the automation and specialized options needed to make the process of model creation, analysis and design fast and convenient. Tools for laying out floor framing, columns, frames and walls, in either concrete or steel, as well as techniques for quickly generating gravity and lateral loads offer many advantages not available from most general purpose finite element programs. Seismic and wind loads are generated automatically according to the requirements of the selected building code. All of these modeling and analysis options are completely integrated with a wide range of steel and concrete design features.

While ETABS is familiar and straightforward to use for the building designer, it also offers many sophisticated analytical and design capabilities not found in other commercial programs. Full dynamic analysis, including nonlinear time-history capabilities for seismic base isolation and viscous dampers, along with static nonlinear pushover features offer state-of-the-art technology to the engineer doing performance design. Powerful features for the selection and optimization of vertical framing members as well as the identification of key elements for lateral drift control provide significant time savings in the design cycle. In addition, because ETABS includes complete and detailed steel and concrete design calculations for beams and columns, braces, walls and slabs, the time typically associated with the transfer of data between analysis and design programs has been eliminated. This design integration, in combination with the fact that ETABS generates CAD output files, means that production drawings can be generated faster and with greater accuracy.

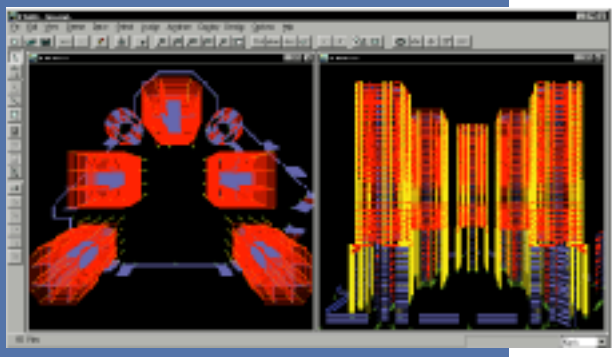
ETABS has long been a favorite for the analysis and design of buildings, and whether the project is a one story shopping center or the tallest building in the world, this latest release offers the comprehensive tools needed to produce timely, efficient and elegant engineering solutions.

FULL 3D BUILDING MODEL
LINEAR STATIC AND DYNAMIC ANALYSIS
STEEL AND CONCRETE FRAME DESIGN
STEEL COMPOSITE BEAM DESIGN
CONCRETE SHEAR WALL DESIGN AND SLAB DESIGN

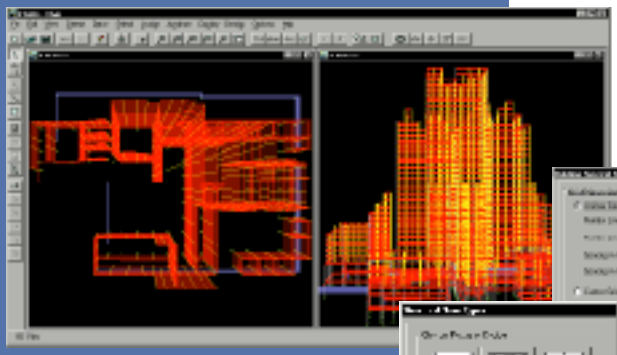
ETABS® PLUS



CONCRETE SHEARWALL BUILDINGS



MULTIPLE TOWERS



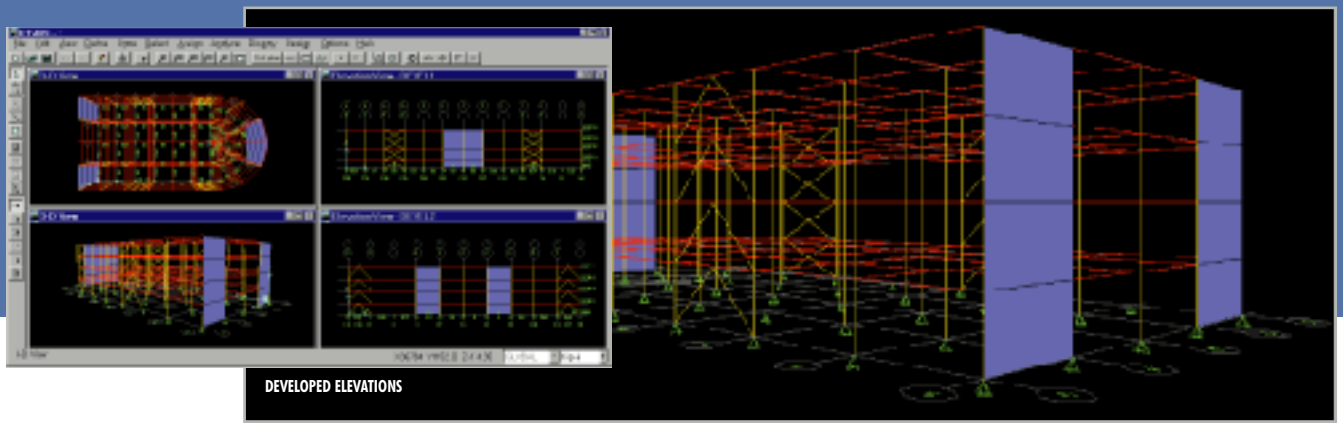
STEEL HIGHRISE BUILDINGS

ETABS PLUS FEATURES

Building Model
- Multiple simultaneous rectangular and cylindrical grid systems
- Story definitions using the concept of similar Stories
- Building modeled as Area, Line and Point objects
- Common labeling of Objects between similar Stories
- Area objects for: Walls, Slabs/Decks, Openings, Springs, Mass, Loads
- Line objects for: Columns, Beams, Braces, Links, Springs, Mass, Loads
- Point objects for: Supports, Springs, Mass, Loads
- Rigid Diaphragm definitions
- Built-in database of steel sections
- Graphical Section Designer for defining custom sections

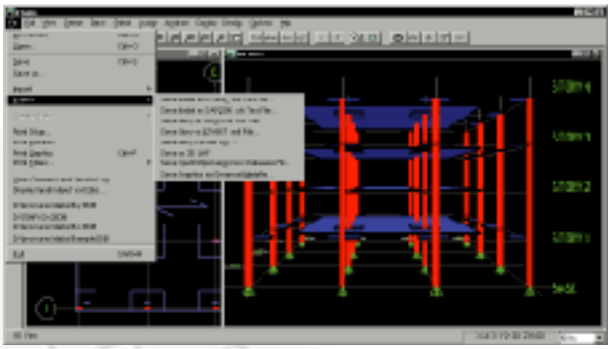
Building Loads
- No limit on number of independent load cases
- Gravity loads specified as point, line or area loads
- Automatic wind load generation: UBC, BOCA, ASCE, NBCC
- Automatic seismic load generation: UBC, BOCA, NBCC
- Built-in response spectrum and time history input
- Temperature and thermal-gradient loads
- Algebraic, absolute, SRSS, and enveloping load combinations
- Mass directly specified or calculated from gravity loads

Analytical Options
- Static and dynamic analysis
- Automatic meshing of frame members into analysis elements
- Automatic transfer of loads on decks/slabs to beams and walls
- Automatic meshing of decks/slabs for flexible diaphragm analysis
- P-delta analysis with either static or dynamic analysis
- Automated center-of-rigidity calculations
- Integrated output forces for walls/slabs/decks for all loads
- Explicit Panel-zone deformations
- Automatic tributary-area calculations for Live-Load reduction factors
- Construction sequence loading analysis
- Eigen and load-dependent Ritz vector determination
- Multiple Response Spectrum cases
- Modal combination by SRSS, CQC or GMC (Gupta) method
- Combination of three directions by ABS or SRSS method
- Static and dynamic response combinations and envelopes
- Multiple Time History cases
- Sequential Time History cases
- Seismic acceleration or displacement excitation
- Wind-load forcing functions
- Transient or steady-state excitation
- Envelope or step-by-step design for Time-History loads



DEVELOPED ELEVATIONS

Analysis Output Options
- Deformed and Undeformed geometry in 3D perspective
- Loading diagrams
- Bending-Moment and Shear-Force diagrams for Frames
- Stress contours for Shells
- Integrated-force diagrams for Wall Piers and Spandrels
- Interactive Section-force results using Groups
- Animation of deformed shapes
- Time-History deformed shapes as real time AVI files
- Displays of nodal and element time-history records
- Time History displays of function vs. time or function vs. function
- Response spectrum curves for any joint from Time History response
- Instantaneous on-screen results output with right-button click on element
- Selective or complete tabulated output for all output quantities
- Graphics output to screen, printer, DXF file, or Windows Metafile
- Tabulated output to screen, printer, or Access Database



SAFE™ FLOOR IMPORTS

THE ELEMENT LIBRARY

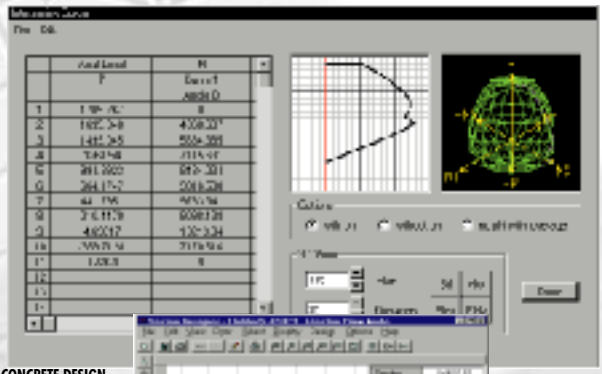
Underlying the ETABS object-based building models is a comprehensive analysis engine comprised of the following element types.

The 3D Beam/Column/Brace (Frame) Element
- Axial, bending, torsional and shear deformations
- Multiple non-prismatic segments over element length
- Ends offset from reference nodes in any direction
- Automated evaluation of offsets for joint size
- Moment and shear releases and partial-fixity
- Point, uniform and trapezoidal loading in any direction
- Temperature and thermal-gradient loading

The 3D Wall/Slab/Deck (Shell) Element
- Shell, plate or membrane action
- Thick-shell option
- General quadrilateral or triangular element
- Orthotropic materials
- Six degrees of freedom per joint
- Uniform load in any direction
- Temperature and thermal-gradient loading

The Joint Element
- Support
- Coupled or uncoupled grounded springs
- Force loads
- Ground-displacement loads

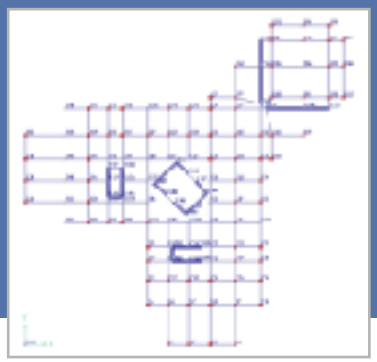
The Link Element
- Two node linear spring with 6 degrees of freedom
- Can be used to model Panel-zone deformations

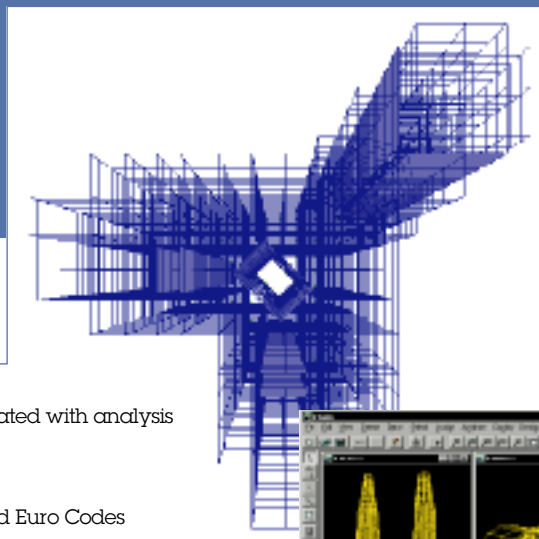


CONCRETE DESIGN INTERACTION CURVES

SECTION DESIGNER

A COMMITMENT TO SOFTWARE INNOVATION AND SUPPORT



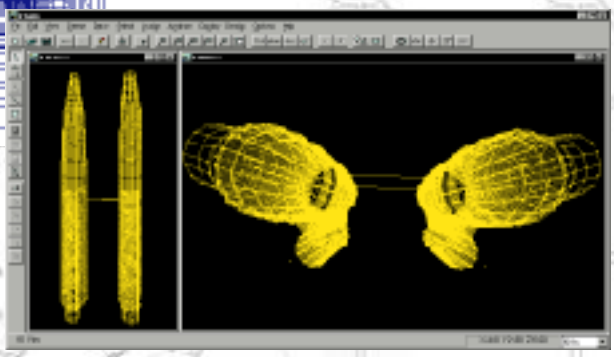


DESIGN OPTIONS

The following design options are fully integrated with analysis in the ETABS® graphical user interface.

Steel Frame Design

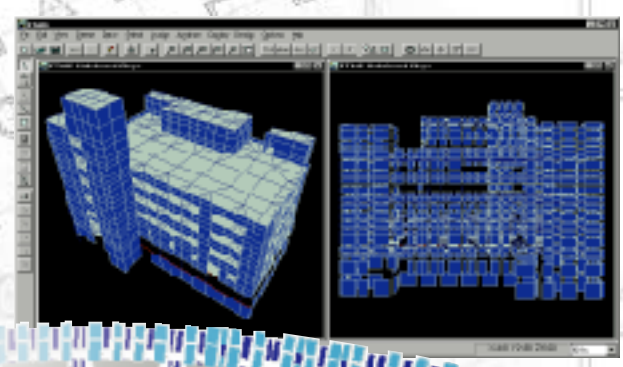
- Fully integrated steel frame design
- AISC-ASD, AISC-LRFD, UBC, Canadian and Euro Codes
- Design for static and dynamic loads
- Grouping for design envelopes
- Optimization for strength and lateral drift
- Seismic design of special moment-resisting frames
- Seismic design of concentric and eccentric braced frames
- Check of panel zones for doubler and continuity plates
- Graphical display of stress ratios
- Interactive design and review
- Summary and detailed reports including database formats



TALLEST BUILDING (1999)

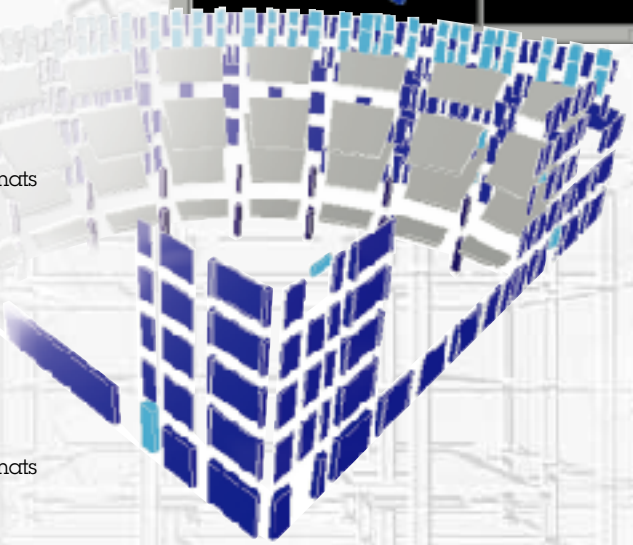
Concrete Frame Design

- Fully integrated concrete frame design
- ACI, UBC, Canadian and Euro Codes
- Design for static and dynamic loads
- Seismic design of intermediate/special moment-resisting frames
- Seismic design of beam/column joints
- Seismic check for strong-column/weak-beam design
- Graphical Section Designer for concrete rebar location
- Biaxial-moment/axial-load interaction diagrams
- Graphical display of reinforcement and stress ratios
- Interactive design and review
- Summary and detailed reports including database formats



Composite Beam Design

- Fully integrated composite beam design
- AISC-ASD and AISC-LRFD Specifications
- Automatic calculation of effective slab widths
- Numerous user-specified constraints
- Shored and unshored design
- Optimal design for strength and deflections
- Camber calculations
- Floor vibration analysis
- Graphical display of all design quantities
- Interactive design and review
- Summary and detailed reports including database formats

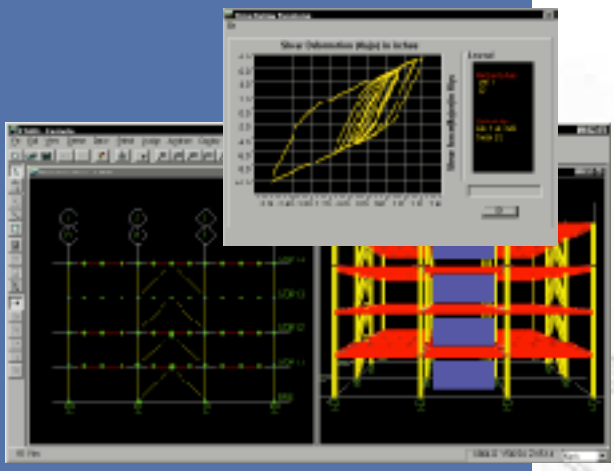


Concrete Shear Wall Design

- Fully integrated wall pier and spandrel design
- ACI, UBC and Canadian Codes
- Design for static and dynamic loads
- Automatic integration of forces for piers and spandrels
- 2D wall pier design and boundary-member checks
- 2D wall spandrel design
- 3D wall pier check for provided reinforcement
- Graphical Section Designer for concrete rebar location
- Graphical display of reinforcement and stress ratios
- Interactive design and review
- Summary and detailed reports including database formats

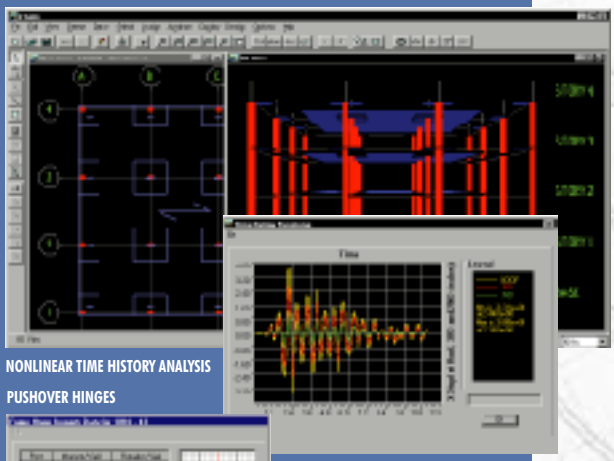
STATIC PUSHOVER ANALYSIS
NONLINEAR TIME HISTORY ANALYSIS
BASE ISOLATORS
VISCOUS DAMPERS
STRUCTURAL POUNDING

ETABS® NONLINEAR



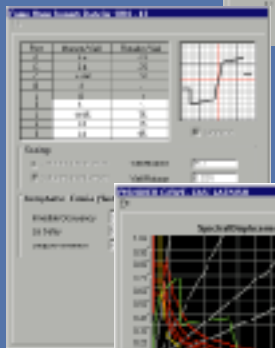
NONLINEAR LINK ELEMENTS

FORCE-DEFORMATION PLOTS (ABOVE)



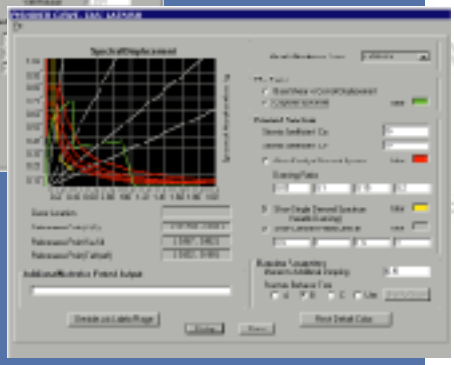
NONLINEAR TIME HISTORY ANALYSIS

PUSHOVER HINGES



TIME HISTORY TRACES

PUSHOVER CURVES



ETABS NONLINEAR FEATURES

ETABS Nonlinear extends the capabilities of the PLUS version to include the following static and dynamic nonlinear analysis options

Static Nonlinear Analysis Options
Large displacement option
Sequential loading option

Plastic Hinge Element
- Used as Spring, Link, Panel zone or inside Frame Elements
- Axial, flexural, shear and torsional behavior
- Axial-load/biaxial-moment interaction
- Multilinear behavior including softening
- Tabulated and Graphical display of hinge status

Specialization for Static Pushover Analysis
- FEMA 273, ATC-40
- Automated force-deformation relations for steel and concrete hinges
- Modal, uniform, or user-defined lateral load patterns
- Start from applied gravity load
- Capacity Spectrum conversions
- Effective damping calculation
- Demand Spectrum comparisons
- Performance point calculation
- Summary reports including plastic-hinge deformations

Dynamic Nonlinear Analysis Options
The nonlinear dynamic analysis option extends the capabilities of the Linear Time History option of the ETABS Plus by allowing for nonlinearity in predefined nonlinear elements.

Nonlinear Link Element
- Used with the Dynamic Nonlinear Analysis option
- Used as Link, Spring or as Panel zone
- Viscous damper with nonlinear exponent on velocity term
- Gap (compression only) and Hook (tension only)
- Uniaxial plasticity (all 6 degrees of freedom)
- Base isolator with biaxial-plasticity behavior
- Base isolator with friction and/or pendulum behavior
- Force or displacement vs. time plots
- Force vs. deformation plots

The Wilson FNA Method
The ETABS nonlinear time history analysis uses the new numerical integration technique known as the Wilson FNA (Fast Nonlinear Analysis) Method. The procedure uses an iterative vector superposition algorithm that is extremely efficient for analyzing structures with predefined, localized nonlinearity. The method has demonstrated significant reductions in processing times when compared with other nonlinear analysis methods.

ETABS®

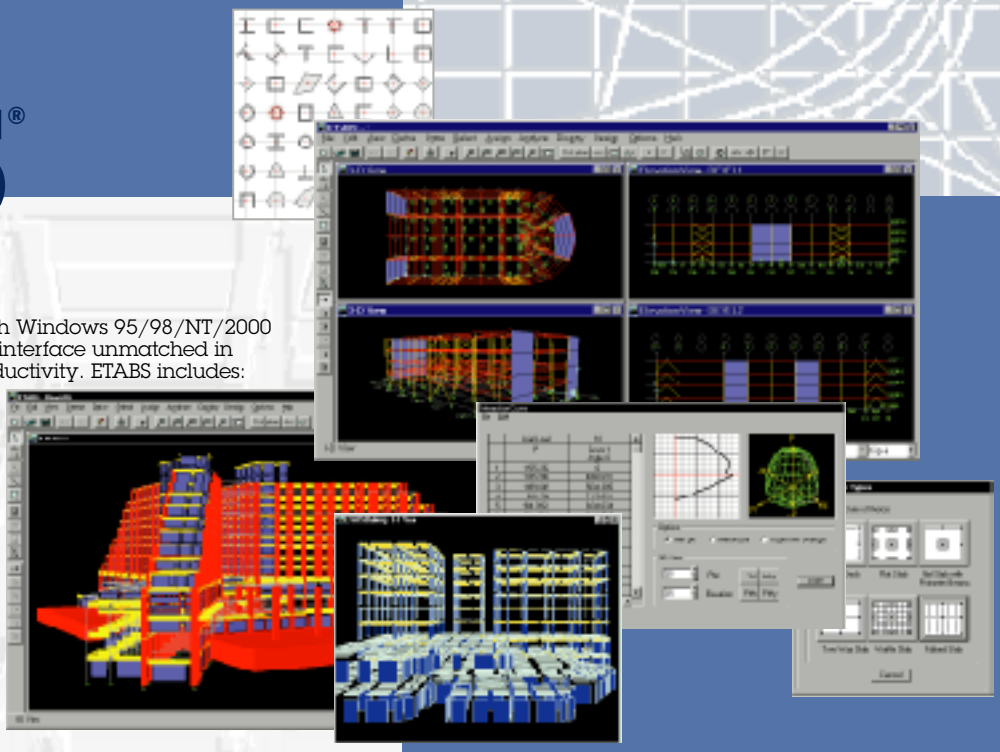
PLUS

ETABS PLUS is fully integrated with Windows 95/98/NT/2000 and features a powerful graphical interface unmatched in ease of use, sophistication and productivity. ETABS includes:

Full 3D Building Model
Building Terminology
Automated Gravity Load Tracing
Automated Wind Loads
Automated Seismic Loads

3D Finite Element Analysis
Frame, Shell, Joint, Link Elements
P-Delta Option
Linear Static Analysis
Modal Analysis
Response Spectrum Analysis
Linear Time History Analysis

Steel Frame Design
Concrete Frame Design
Composite Beam Design
Concrete Shear Wall Design

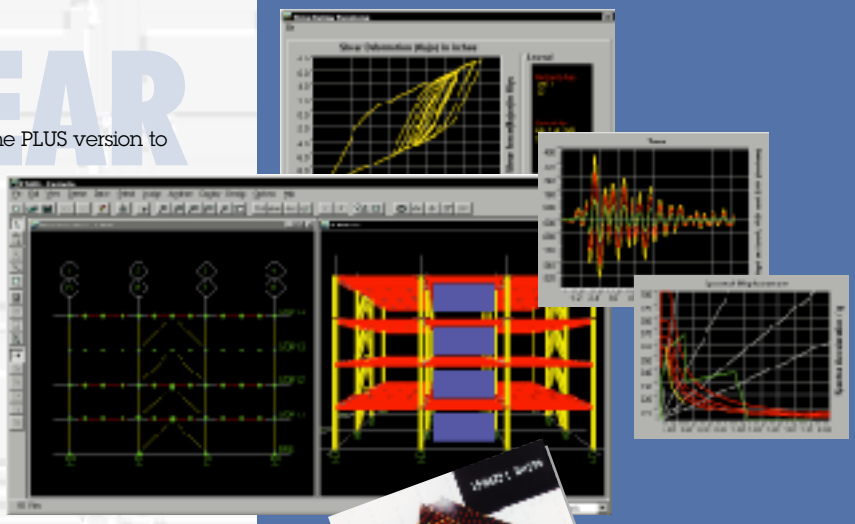


NONLINEAR

ETABS NONLINEAR extends the capabilities of the PLUS version to include nonlinear analysis options:

Static Nonlinear Analysis Options
Large Displacement Option
Sequential Loading Option
Plastic Hinge Element
Static Pushover Analysis – FEMA 273 and ATC-40

Dynamic Nonlinear Analysis Options
Gap/Hook Element
Damper Element
Plasticity Element
Base Isolator with Plasticity Behavior
Base Isolator with Friction/Pendulum Behavior



The ETABS Package comes with a comprehensive set of printed and online documentation including: User Manuals, Design Manuals, Tutorials, and the latest edition of the book *Three Dimensional Static and Dynamic Analysis of Structures – A Physical Approach with Emphasis on Earthquake Engineering*, a CSI publication authored by Professor Edward L. Wilson, Professor Emeritus, University of California, Berkeley.

COMPUTERS & STRUCTURES INC.

COMPUTERS AND STRUCTURES, INC.
1995 UNIVERSITY AVENUE
BERKELEY, CALIFORNIA 94704
510 845 2177 PHONE FAX 510 845 4096
info@csiberkeley.com e-mail
www.csiberkeley.com web