ETABS

HISTORY

- In use for 30 years
- Developed by Computers and Structures, Inc. (CSI)
  -
- Current version: *ETABS* 9.7.4

HOW IT IS USED

- ETABS, was used to create the mathematical model of the Burj Khalifa, currently the world's tallest building, designed by Chicago, Illinois-based Skidmore, Owings and Merrill LLP (SOM).
  - gravity, wind, and seismic response were all characterized using ETABS
- ETABS is commonly used to analyze: Skyscrapers, parking garages, steel & concrete structures, low rise buildings, portal frame structures, high rise buildings
- From simple to extremely complex: "ETABS is the solution, whether you are designing a simple 2D frame or performing a dynamic analysis of a complex high-rise that utilizes non-linear dampers for inter-story drift control."
- Allows user to design everything from scratch.
- 3D modeling
- Realistic modeling and distribution of loads using meshing tools and precise user input in regard to building components.
- Features:
  - Easy to use user interface
  - Realistic modeling
  - Loading per individual code requirements
    - Seismic
    - Wind
    - Load combinations
    - Live load reduction
    - Area, line, point, and thermal loads
- Analysis options:
  - Response spectrum analysis
  - Time history analysis
  - P-Delta analysis
  - Sequential construction
  - Pushover analysis
- Design:
  - Steel frame design
    - Automatic member sizing – No preliminary design required

- ▪ Virtual work based optimization for lateral deflections
- Concrete Frame Design
- Composite beam design
- Shear wall design
  - o Calculates reinforcing requirements for overturning & shear
- Steel Joist Design
- Output:
  - o 3D Deformed geometry
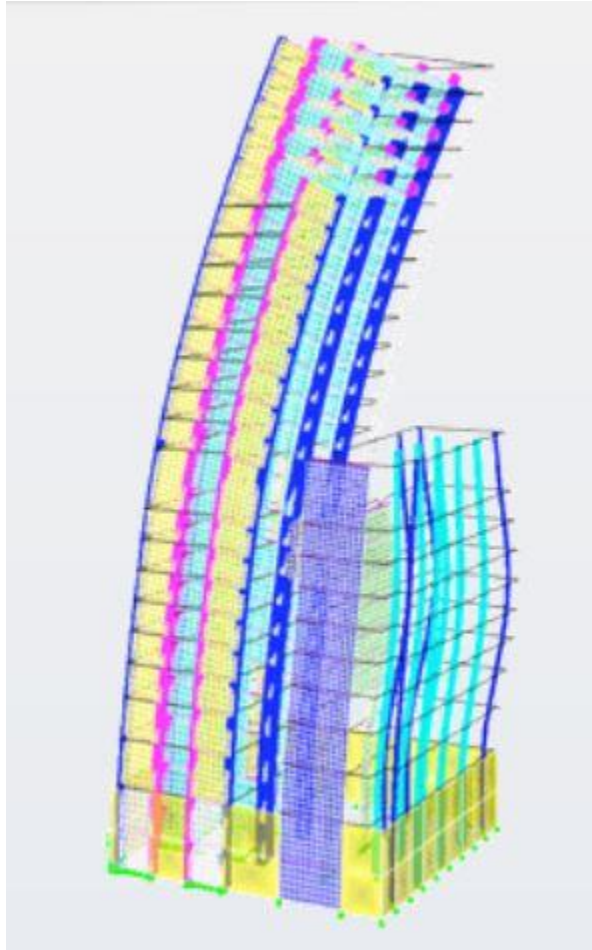
    ▪
  - o Moment, shear, and axial force diagrams
  - o Section cuts
  - o Video Animations
- Various import/export options including Revit Structure

COST / AVAILABILITY

- Free demo version available
  - o http://www.csiberkeley.com/support/downloads/software-trial-request
- Licensing is provided on a case by case basis. Contact the CSI Sales support team for more info.

TUTORIAL SOURCES / LINKS

- Helpful video tutorials
    - http://www.csiberkeley.com/etabs/watch-and-learn#page=page-1
- ETABS knowledge base
    - https://wiki.csiberkeley.com/display/etabs/Home
- In depth description of ETABS version 8 with an incredible range of learning tools
    - http://www.comp-engineering.com/downloads/manuals/ETABS/English/Welcome%20to%20ETABS.pdf

SOURCES

http://www.csiberkeley.com/etabs

http://en.wikipedia.org/wiki/ETABS

Autodesk® Robot™ Structural Analysis Professional

Autodesk® Robot™ Structural Analysis Professional software provides structural engineers with advanced building simulation and analysis capabilities for large, complex structures. The software offers a smooth workflow, enabling engineers to more quickly perform simulation and analysis of a variety of structures.

Features:

Bidirectional link with Autodesk Revit
- -Facilitates collaboration between designers and engineers

- -Integrates analysis into BIM

Powerful workflows for structural analysis and documentation
- -Transfer the model and results to AutoCAD® Structural Detailing software to generate fabrication drawings

Advanced auto meshing and structural modeling capabilities
- -Independent manipulation and manual definition of individual panels

Localized for global markets
- -Perform structural analysis in one language and output in another

- -Use imperial and metric units in combination within the same structural model

Support for materials and design codes
- -More than 60 sections and materials databases from around the world

- -Work with country-specific section shapes, imperial or metric units, and country-specific building codes within the same integrated model

Integrated solution for concrete and steel
- -Integrate reinforced concrete design and steel design modules based on more than 40 international steel codes and 30 reinforced concrete codes.

Open and flexible API
- -Communicate with programs such as those in Microsoft office with ease

Structural loads and load combinations
- -Create defined loads of different natures, such as dead, live, wind, or seismic.

- -Apply various types of loads (such as nodal, linear, or planar)

Wide range of analysis capabilities

-Effective analysis of many types such as static, modal, non-linear, seismic, time history analysis etc.

State-of-the-art engineering analysis solvers

-Gives structural engineers the calculation speed to deliver accurate engineering analysis results for demanding structures in minutes versus hours

Support for reporting analysis results

-With many different ways to access and present analytical results, structural engineers can very quickly prepare the final structural documentation

http://www.autodesk.com/products/autodesk-simulation-family/features/robot-structural-analysis

History

- RISA Technologies has been developing cutting-edge structural design and optimization software since 1987.
- Created by RISA Technologies
- RISA-3D is popular among structural engineers because it is the easiest software to use.
- RISA is used by 24 of the top 25 U.S. design firms and in more than 70 countries around the world for all types of structures such as towers, skyscrapers, airports, stadiums, petrochemical facilities, bridges and roller coasters.

How it is Used

- RISA-3D is known as the most popular general 3D analysis/design software available
- Current software is RISA-3D v11
- Features:
    - State-of- the-Art Modeling Interface
    - Powerful Analysis
    - CAD-like drawing/editing environment
    - Seamless Integration with RISA programs
    - First-rate presentation of results
- Analysis Options:
    - Holds all necessary Design Codes
    - Accelerated true sparse solver for static analysis
    - True physical member modeling
    - Area loads with one-way or two-way distributions
    - Story drift calculations
    - Automatic self-weight calculations
    - Torsional warping calculations
- Design:
    - CAD-like drawing/editing environment
    - Universal snaps and object snaps
    - Graphic presentation of color-coded results and plotted designs
- Output:
    - 3D

http://www.technotrade.com.pk/images/20-3DLabContour.gif
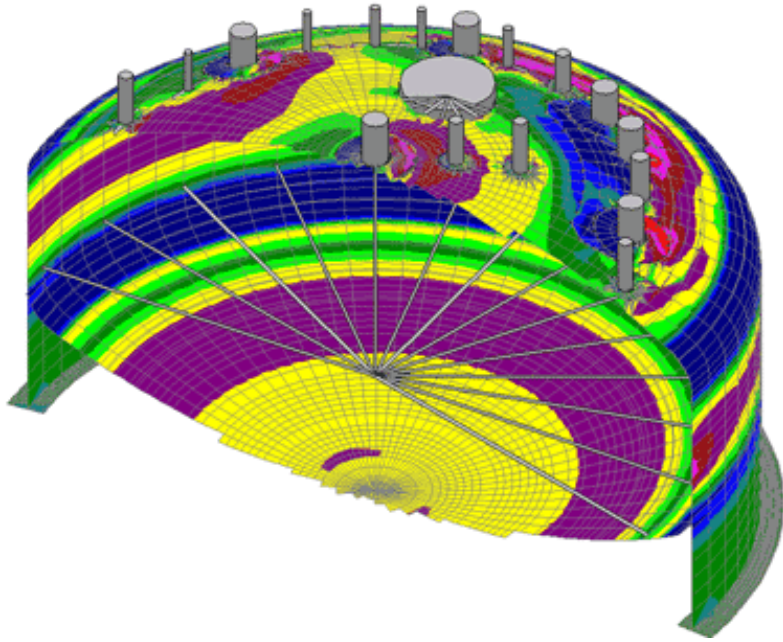
- With a well-trained team of engineers and software developers, we are working to meet the needs of our growing client base by implementing new design features and expanding the suite of software tools that we offer.
- The seamless integration of our product suite creates a powerful, versatile and intuitive structural design environment, ready to tackle almost any design challenge.
- RISA Technologies has worked with top companies in the structural engineering community to create bi-directional links with the following software:
    o Autodesk Revit Structure
    o Tower Numerics
    o WoodWorks
    o SDS/2
    o Tekla Structures
    o StruCad
    o Structural Desktop

Cost/ Availability

- RISA technologies offers a free Demo of all their software
    o http://www.risatech.com/downloads.html
- Contact RISA Technologies for purchase prices of RISA Programs

Tutorial Sources/ Links

- Video Tutorials
    - http://www.risatech.com/onlinevideos/e_3dvideos.html
- Users Guides
    - http://www.risatech.com/e_tutorials.html

Sources

- **http://www.technotrade.com.pk/3/RISA-3D/**
- **http://www.risa.com/e_tutorials.html**
- **http://www.woodworks.org/design-tools/design-guides-standards/**

HISTORY

- First released in 1970
- Created to be a more efficient and specialized analysis program for civil structures
- Developer: Computers and Structures, Inc. (CSI)
- Current version: *SAP2000* 15.2.1

HOW IT IS USED

- ETABS is commonly used to analyze civil structures such as dams, communication towers, stadiums, industrial plants and buildings
- Can model and analyze simple 2D static frames to large complex 3D nonlinear dynamic systems
- **Features:**
    - Intuitive user interface
    - Fully integrated program that allows model creation, modification, execution of analysis, design optimization, and results review from within a single interface
    - The basic program SAP2000 BASIC can analyze up to 1500 nodes. The more advanced programs do not have a node limit
    - Fully interactive steel, concrete and aluminum frame member design for many American, Canadian and European design codes
- **Analysis options:**
    - Static linear/nonlinear analysis
    - Construction sequence loading
    - Dynamic response spectrum analysis
    - Dynamic linear and nonlinear time history analysis
    - Large displacement analysis
    - Bridge analysis
    - Buckling analysis
- **Design Options:**
    - Steel, Concrete and Aluminum Frame Design
        - Interactive design supported by design codes
    - Static and Dynamic loads
    - Ductile and non-ductile
    - Concrete column axial load – biaxial moment interaction diagram
- **Output:**
    - 3D perspectives of deformed and undeformed structural geometry
    - Bending moment, shear force, axial force and deflection diagrams
    - Stress contours
    - Animation of deformed shapes, mode shapes and time history behavior

- o Animated stress contours
- o Multiple windows simultaneously displaying different output parameters
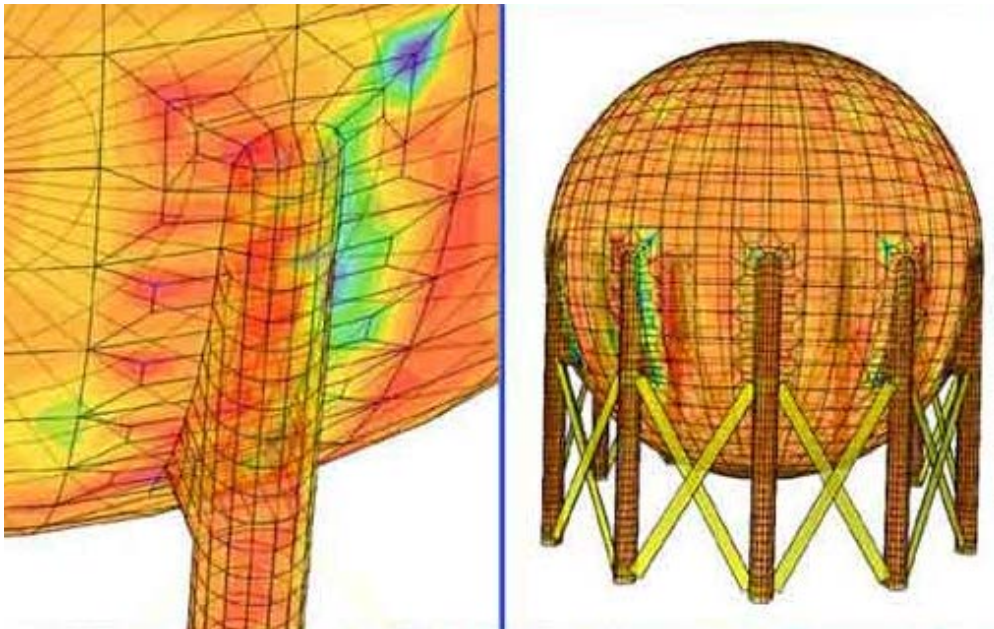
- **BIM Integration options:**
  - o Exporting from Revit Structure to create a new SAP2000 model
  - o Importing from SAP2000 to create a new Revit Structure model
  - o Tekla Structures (analysis) model may be merged to an already existing SAP2000 model
  - o Importing from SAP2000 to Tekla Structures

COST / AVAILABILITY

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TUTORIAL SOURCES / LINKS

- Helpful video tutorials
  - o http://www.csiberkeley.com/sap2000/watch-and-learn#page=page-1
- SAP2000 knowledge base
  - o https://wiki.csiberkeley.com/display/sap2000/Home
- SAP2000 Manuals
  - o http://www.comp-engineering.com/SAPManE.htm

SOURCES

http://www.comp-engineering.com/products/SAP2000/sap2000.html