

## Design Software

### Use of Software Packages Employed in Civil Engineering Applications

- Structural Engineering
- Transportation Engineering (pavement design, highway design etc.)
- Environmental Engineering
- Construction management
- Water resource and Hydraulics Engineering
- Geotechnical engineering

## Software used in Civil Engineering

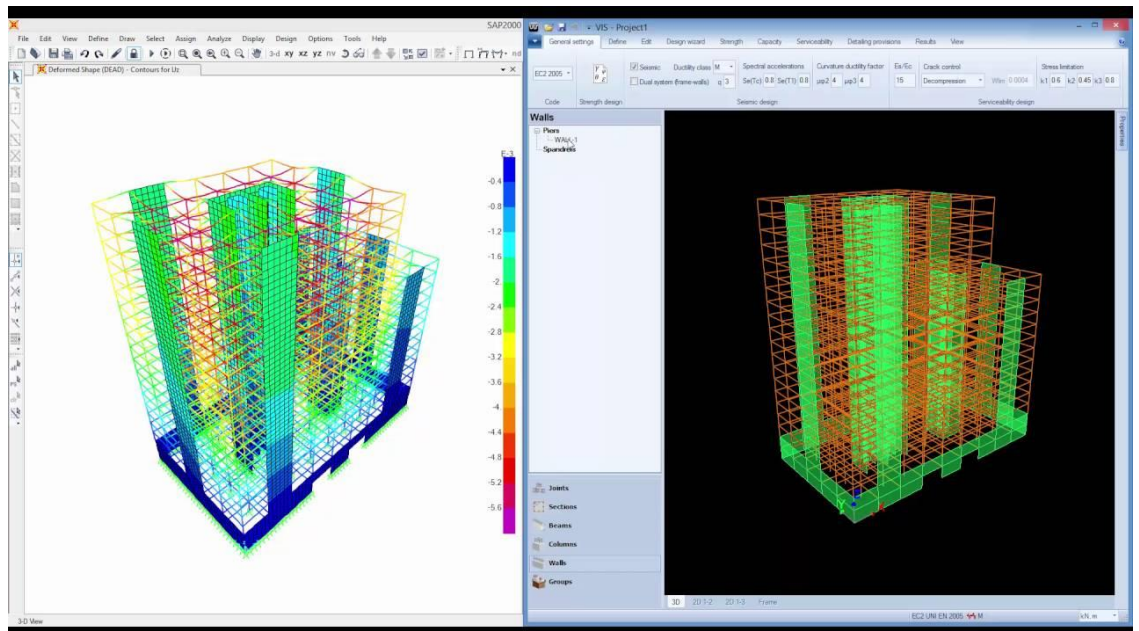
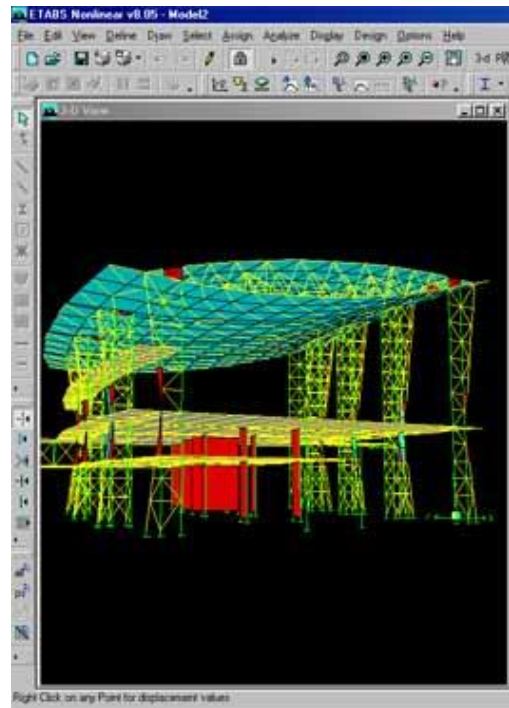
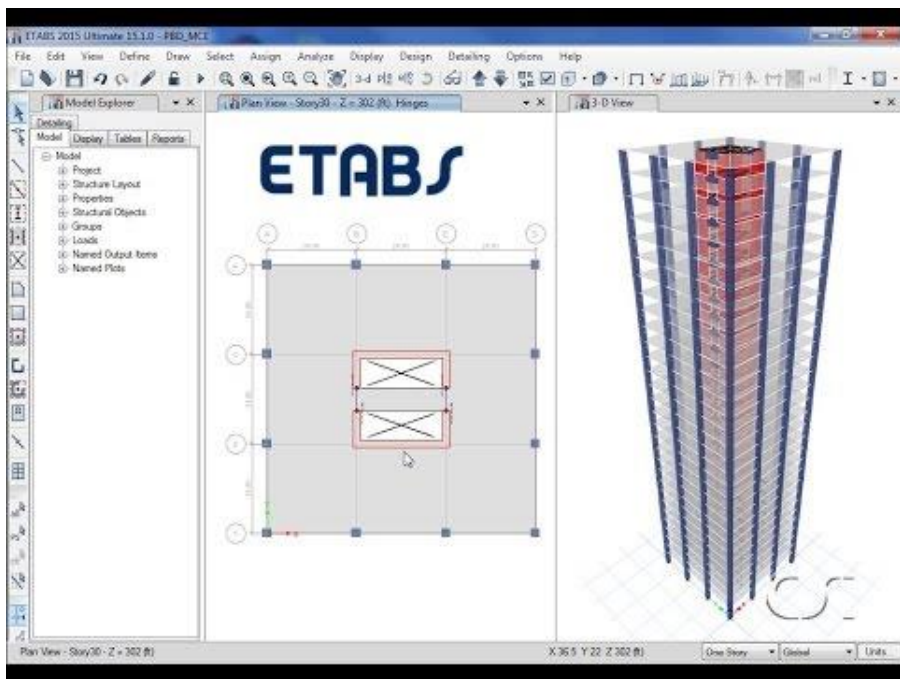
### Structural Engineering

#### *Etabs*

- ✓ Structural analysis and design of buildings
- ✓ Fast linear and nonlinear analytical power
- ✓ Design capabilities for a wide-range of materials, and graphic displays, reports, and schematic drawings that allow users to decipher and understand analysis and design results
- ✓ CAD drawings can be converted directly into ETABS models or used as templates onto which ETABS objects may be overlaid

#### *SAP2000*

- ✓ Analysis and design of structures
- ✓ 3D object based graphical modeling environment
- ✓ Integrated design code features can automatically generate wind, wave, bridge, and seismic loads with comprehensive automatic steel and concrete design code checks per US, Canadian and international design standards



# Software used in Civil Engineering

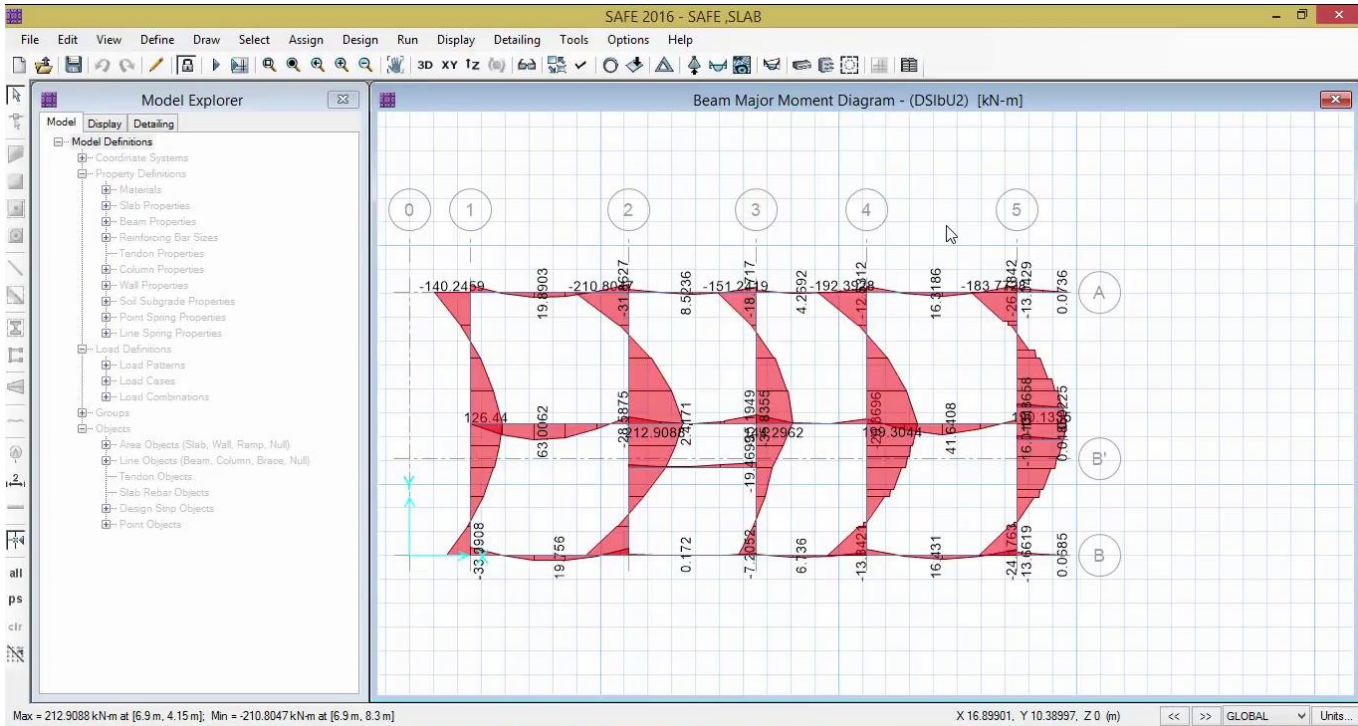
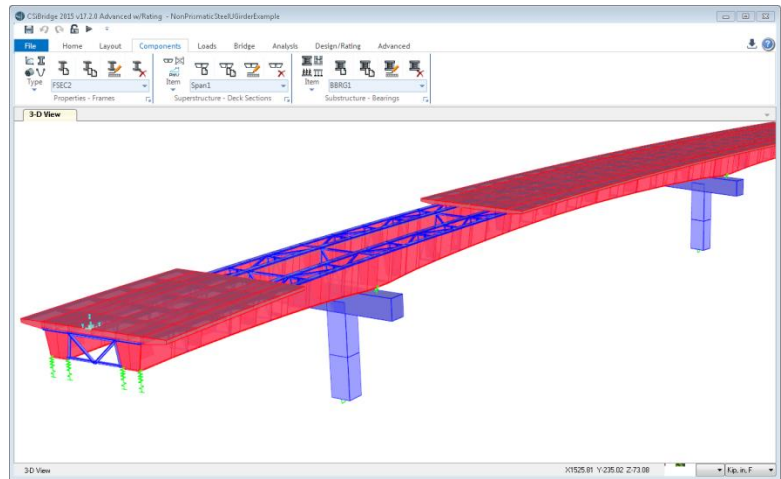
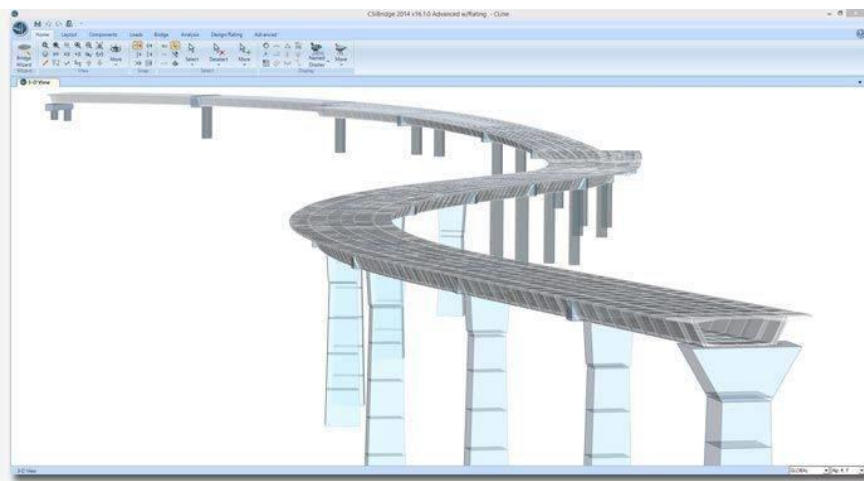
## Structural Engineering

### *CSiBridge*

- ✓ 3-D Bridge analysis, design and rating
- ✓ Complex bridge geometries, boundary conditions and load cases
- ✓ AASHTO LRFD design is included with automated load combinations, superstructure design and the latest seismic design

### *SAFE*

- ✓ Design of slabs, mats and footings
- ✓ Concrete floor and foundation systems from framing layout to detail drawing production
- ✓ Can import/bring in data from CAD, spreadsheet, or database programs



# Software used in Civil Engineering

## Transportation Engineering

### Pavement Design

#### *MICHPAVE*

- ✓ Analysis and design of Flexible Pavements
- ✓ Computes displacements, stresses and strains within the pavement
- ✓ It is able to account for the stress-dependent behavior of granular and cohesive soil layers

#### *RPD (Rigid Pavement Design)*

- ✓ Analysis and Design of Rigid Pavements
- ✓ Helps to adequately characterize the subgrade support and chose the best base type for the site conditions
- ✓ Gives the optimum joint spacing and predicts pavement will have corner breaks

# Software used in Civil Engineering

## Transportation Engineering

### Traffic Planning

#### *AnyLogic*

- ✓ Traffic planning, the simulation of changes, additions, or subtractions to a road network
- ✓ generating statistics for congestion and traffic jams
- ✓ traffic light timing and sequencing,

### Highway Design

#### *SierraSoft Roads*

- ✓ Design of any kind of road, roundabout, junction, intersection
- ✓ Geometrical design
- ✓ Intersection design

# Software used in Civil Engineering

## Environmental Engineering

### *WaterGEMS*

- ✓ Design of water distribution systems plus the ability to integrate with AutoCAD, and ArcGIS
- ✓ Locations and operation of valves etc for various options
- ✓ Provision for future expansions

### *WaterCAD*

- ✓ Water Distribution Modeling and Analysis
- ✓ Design new water systems and manage existing water networks
- ✓ Sizing and location of pipes, pumps, and tanks

### *SewerGEMS*

- ✓ Use the LoadBuilder module to control consumption, flow monitoring, land use, or census data in your GIS to automatically estimate and import sanitary loads for your sewer model.
- ✓ Runoff flows are computed and Analyze hydraulics and combined sewer overflows

### *SewerCAD*

- ✓ Modeling, Design and Analysis of Sanitary Sewers
- ✓ New system design and the rehabilitation of existing sanitary sewers
- ✓ Sizing and depth of pipes, assessment of capacity etc



# Software used in Civil Engineering

## Construction Management

### *Primavera P6*

- ✓ Project management application used worldwide
- ✓ Plan, schedule, and control large-scale programs and individual projects
- ✓ Balance resource capacity, allocate best resources and track progress
- ✓ Monitor and visualize project performance versus planned
- ✓ Financial management and human resource management

### *ProjectWise Construction Management*

- ✓ Collaboration between various stakeholders of project
- ✓ Real-time visibility into project performance, cost and risk
- ✓ Up-to-date project data and a detailed electronic construction record, accessible at all times
- ✓ Paper-based documentation and repetitive manual tasks reduced
- ✓ Rich, searchable record for ongoing operations

# Software used in Civil Engineering

## **Construction Management**

### ***SYNCHRO***

- ✓ 4D Digital Construction Environment which allows visual planning and project management process
- ✓ Create approach and accurately visualize, analyze, edit, and track entire project, including logistics and temporary works.

### ***MS Project***

- ✓ Streamline project, resources management, keep track of projects
- ✓ Scheduling features like Gantt charts
- ✓ Built-in customizable templates based on industry's practices

# Software used in Civil Engineering

## Water resource and Hydraulics Engineering

### ***HAMMER***

- ✓ Water Hammer and Transient Analysis
- ✓ Perform a transient analysis to locate trouble spots and determine appropriate surge control strategies
- ✓ Approximate the behavior of protective devices

### ***OpenFlows FLOOD***

- ✓ Flood modeling for understanding and mitigating flood risks in urban, riverine, and coastal areas
- ✓ Simulate all hydrological and hydraulic processes that occur in river basins, including rainfall, infiltration, surface runoff, channel flow, and groundwater flow

### ***StormCAD***

- ✓ Storm sewer development projects
- ✓ Cost-effective pipe sizes and invert elevations
- ✓ Design may be done from inside of AutoCAD environment

### ***Culvert Master***

- ✓ Analyze existing culverts and design new ones
- ✓ From simple barrel crossings to complex embankment cross-drain systems, with different shapes and sizes,

# Software used in Civil Engineering

## Geotechnical Engineering

### *PLAXIS*

- ✓ Analysis of soil and rock deformation and stability, as well as soil structure interaction and groundwater flow
- ✓ Simulation of the nonlinear and time-dependent behavior of soils. Pore pressures, model structures and the interaction between the structures and the soil, and take on projects of all types such as excavations, foundations, embankments, tunnels, mines etc

### *gINT*

- ✓ Data management and reporting for geotechnical subsurface projects
- ✓ Subsurface reporting for soils, borelogs, lab tests etc

### *PEYSANJ*

- ✓ Bearing capacity & settlement, Pressure-meter test & plate loading test calculations
- ✓ Lateral earth pressure coefficients (static, seismic), soil liquefaction analysis etc

### *GE05*

- ✓ Slope stability analysis (embankments, earth cuts, anchored retaining structures, MSE walls, etc. From simple barrel crossings to complex embankment cross-drain systems, with different shapes and sizes,

**Equipment:** Pilon Wayfarer

**Start Date:** 9/1/2018

**Coordinates:**

**Method:** Percussive/Coring

**Bore Diameter (mm):** 150

**E** **N**

**Fluid Flush:** Water/Bentonite

**Core Diameter (mm):** 76

**Surface Elevation:** m

Borehole Progress			Graphic Symbol	Depth (m)	Strata Description	Sample No.	Sample/ Test Records	Sample Type & Depth (m)	Rock Core Quality							
Date	Casing Depth (m)	Water Depth (m)							TCR	SCR	RQD	FI				
9/1/2018				1	Light brown, slightly silty to silty, fine to medium grained SAND with rare gravels	B1		0.00								
					Loose, light brown to brown, slightly silty to silty, fine to medium grained SAND	S2	1,2/3,2,2,3 N=10	0.50								
						S3	2,2/3,2,3,2 N=10	1.00								
						S4	1,2/1,2,2,2 N=7	1.45								
					2	Loose, locally very loose, light brown to brown, slightly silty to silty, fine to medium grained SAND with some tiny shell fragments & cemented sand pieces	S5	1,2/1,1,2,1 N=5	1.95							
							S6	1,1/1,0,0,1 N=2	2.45							
					3				2.95							
					4					S7	1,2/3,2,2,1 N=8	3.50				
												3.95				
					5	Loose, light brown to brown, slightly silty to silty, fine to medium grained SAND	S8	1,1/0,1,2,2 N=5	4.50							
									4.95							
6					S9	2,3/2,2,1,3 N=8	5.50									
							5.95									
7	Very dense, light creamish brown, slightly silty to silty, fine to medium grained shelly SAND with frequent very tiny shell fragments with some calcarenite pieces (recovered as SPT's)	S10	3,8/11,14,16,9* N*=50/245 mm	6.50												
				6.89												
8					S11	5,10/13,17,20* N*=50/225 mm	7.50									
							7.87									
9					S12	5,12/16,19,15* N*=50/180 mm	8.50									
							8.80									
9/1/2018				10	Very weak to weak, light brown to reddish brown, fine to medium grained SANDSTONE			9.50								
10/1/2018																

Remarks: 1. Borehole was drilled up to 10.0 m depth below existing ground level  
2. Groundwater was not encountered during drilling

**Project:**

**Location:**

**Client:**

**Job No.:**

**Logged by:**

**Checked by:**

**Plate No.:**

## Design Software

### BIM

- **BIM (Building Information Modeling)** is a digital representation of physical and functional characteristics of a facility. A BIM is a shared knowledge resource for information about a facility/structure (Infrastructure: roads, metro etc, Utilities: water, gas, electricity etc) forming a reliable basis for decisions during its life-cycle; defined as existing from earliest conception to demolition.
- Traditional building design was largely reliant upon two-dimensional technical drawings (plans, elevations, sections, etc.).
- BIM extends this beyond 3D, augmenting the three primary spatial dimensions (width, height and depth) with time as the fourth dimension (4D) and cost as the fifth (5D).
- More recently there are also references to a sixth dimension (6D) representing building environmental and sustainability aspects, and a seventh dimension (7D) for through-life facility management. BIM therefore covers much more than just geometry.

# Software used in Civil Engineering

## Drafting & BIM

### DRAFTING

- ✓ AutoCAD
- ✓ SketchUP
- ✓ TurboCAD
- ✓ SolidWorks
- ✓ CATIA

### BIM

- ✓ Revit
- ✓ Civil 3D
- ✓ ArchiCAD
- ✓ BricsCAD