

# PLAXIS 2D Dynamics

The most used tool for geo-engineering

PLAXIS 2D including PLAXIS Dynamics and PLAXIS PlaxFlow makes up a finite element package intended for the two dimensional analysis of deformation and stability in geotechnical engineering. It is a robust and user-friendly finite element package, developed for Geotechnical Engineering. It offers the tools professionals need in today's and tomorrow's world of high-tech building, to analyse complex projects.

Geotechnical applications require advanced constitutive models for the simulation of the non linear, time dependent and anisotropic behaviour of soils and/or rock. Although the modelling of the soil itself is an important issue, many projects involve the modelling of structures and the interaction between the structures and the soil.

The PLAXIS Dynamics Module is an extension to PLAXIS 2D. It offers the tools to analyse the propagation of waves through the soil and their influence on structures. This allows for the analysis of seismic loading as well as vibrations due to construction activities. PLAXIS Dynamics offers the possibility to perform dynamic calculations in individual calculation phases. ( $M\ddot{u} + C\dot{u} + Ku = f(t)$ )

#### Modelling:

- Time-dependent dynamic load systems for point loads, distributed loads and prescribed displacements (velocities, acceleration)
- Independent application of horizontal and vertical displacement (velocity, acceleration) components
- Absorbent (viscous) boundaries to absorb waves at the model boundaries
- Rayleigh damping ( $\alpha_r$  and  $\beta_r$ ) per material data set for soil layers and structures)
- Smooth meshes, to prevent numerical oscillations and internal reflections
- HSsmall model including small-strain stiffness, modulus reduction and hysteretic damping
- Upon request: UBCSAND liquefaction model (available as User-Defined Soil Model)

#### Calculations:

- Automatic time stepping using dynamic sub-steps
- Selection of Newmark time integration scheme ( $\alpha_N$  and  $\beta_N$ )
- Free vibration analysis
- Harmonic loads
- Import of SMC files for time-dependent dynamic loading

#### Results:

- Velocities and acceleration in addition to displacements
- Envelopes of structural forces and displacements
- Time-displacement, Time-velocity, Time-acceleration curves
- Switch from time-curves to frequency-curves using Fast Fourier Transform
- Pseudo Spectral Acceleration response spectrum
- Animations (creation of AVI files)

#### Applications:

- Single source vibrations
- Earthquake simulation
- Dynamic soil-structure interaction
- Evaluation of natural frequencies and resonance
- Embankment stability under dynamic loading
- Machine and traffic vibrations
- Impact loading
- Structural response under earthquake loading
- Racking of tunnel lining

These features are available in PLAXIS 2D 2010.

