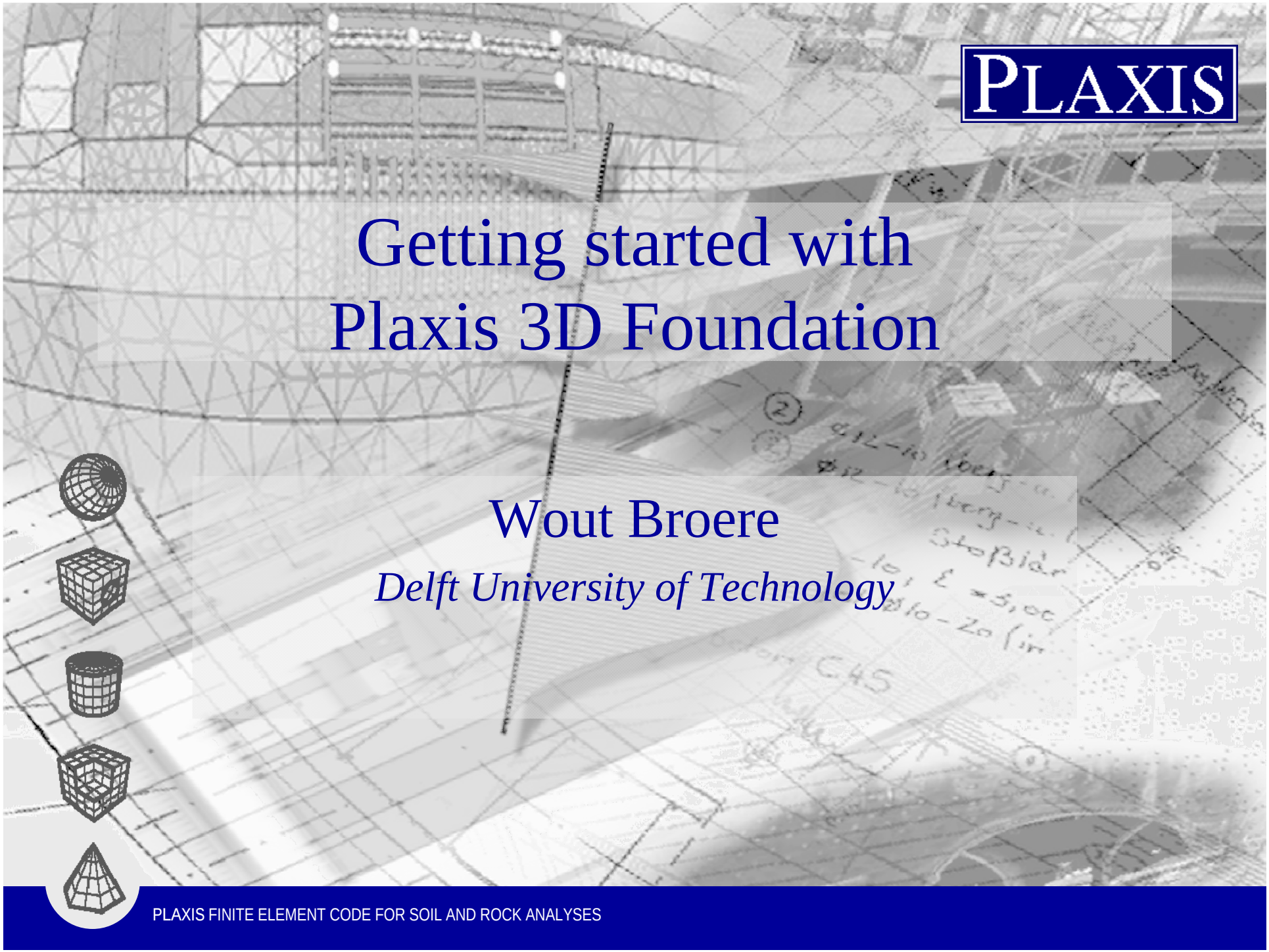


PLAXIS

Getting started with Plaxis 3D Foundation

Wout Broere

Delft University of Technology

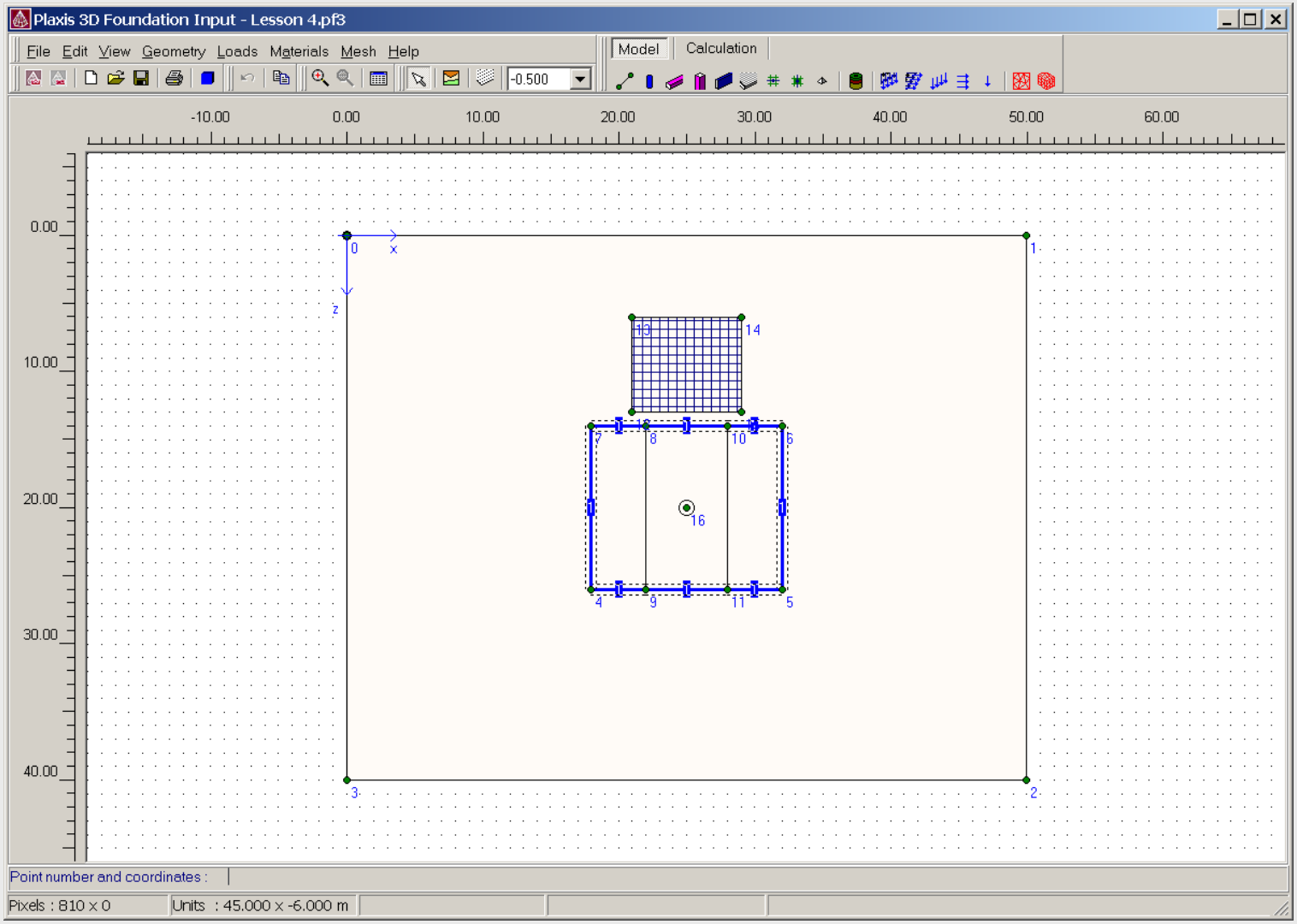
Modelling aspects

- Top view approach
- Soil layering based on borehole information
- Structures defined at work planes (y-levels)
- Automatic mesh generation
- Definition of calculation phases has been integrated in the Input program



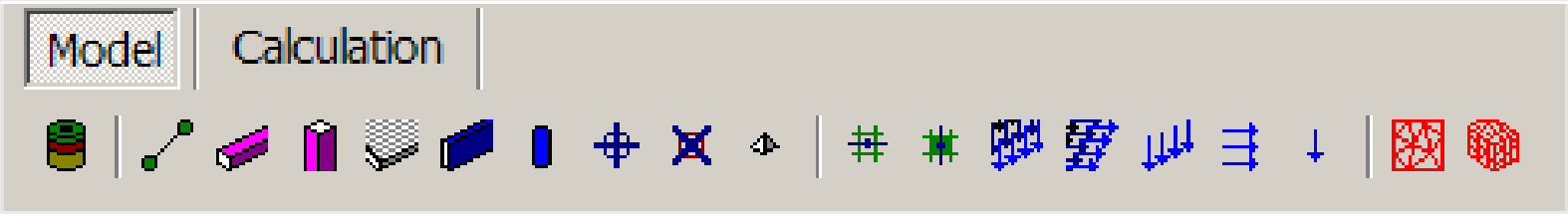


Input program



Input

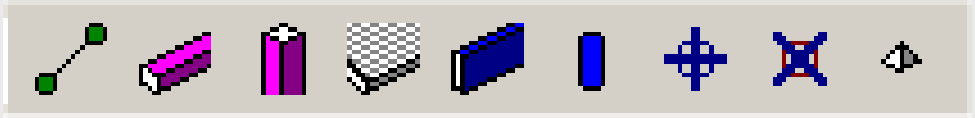
- General functions: New/Open/Save/Print/Copy/Zoom
- Definition and choice of workplanes
- Material sets database



- Composing a geometry model

Composing a geometry model

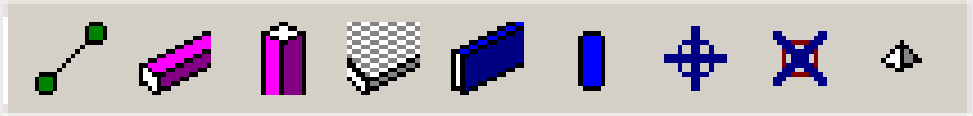
- Borehole definition tool



- Graphical input of geometry contour and construction elements

- Input of boundary conditions and mesh generation

Composing a geometry model



Geometry lines

Horizontal and vertical beams

Floors

Walls

Volume piles

Embedded piles

Ground anchors

Springs

Composing a geometry model

Line fixities (total, horizontal)

Distributed loads (horizontal planes)

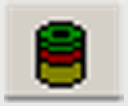
Distributed loads (vertical planes)

Line load

Vertical line load

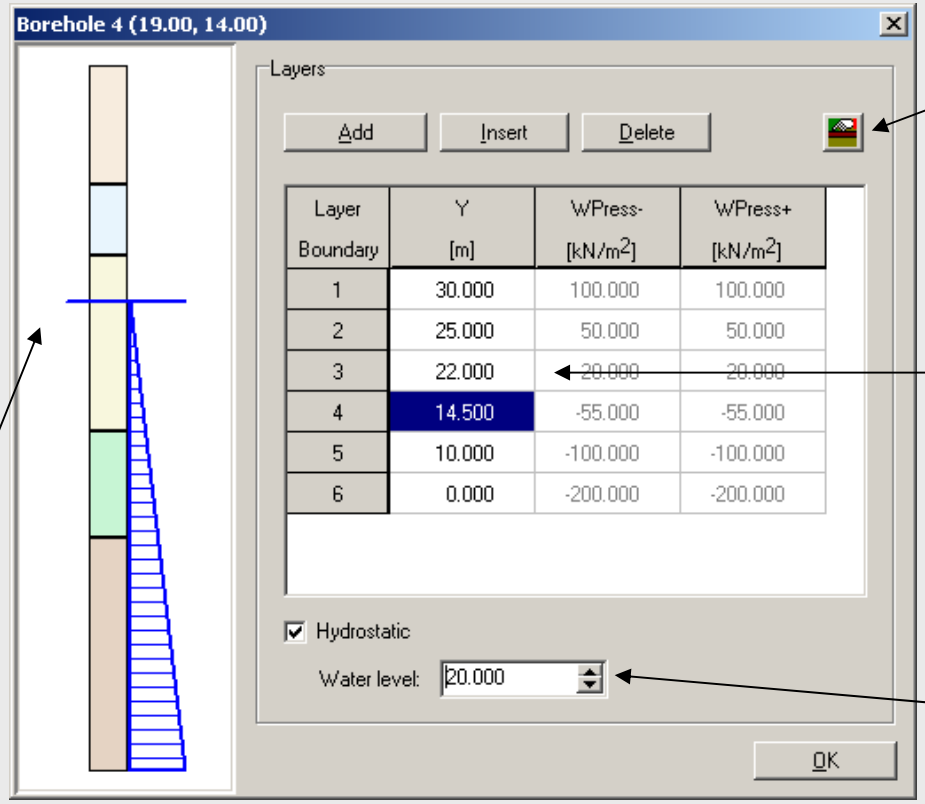
Point force

Defining the soil layers



- Specify the location of one or more boreholes
- Specify the soil layers per borehole
- Enter model parameters as data sets in a material data base
- Assigning data sets to the layers in the boreholes

Defining the soil layers: borehole



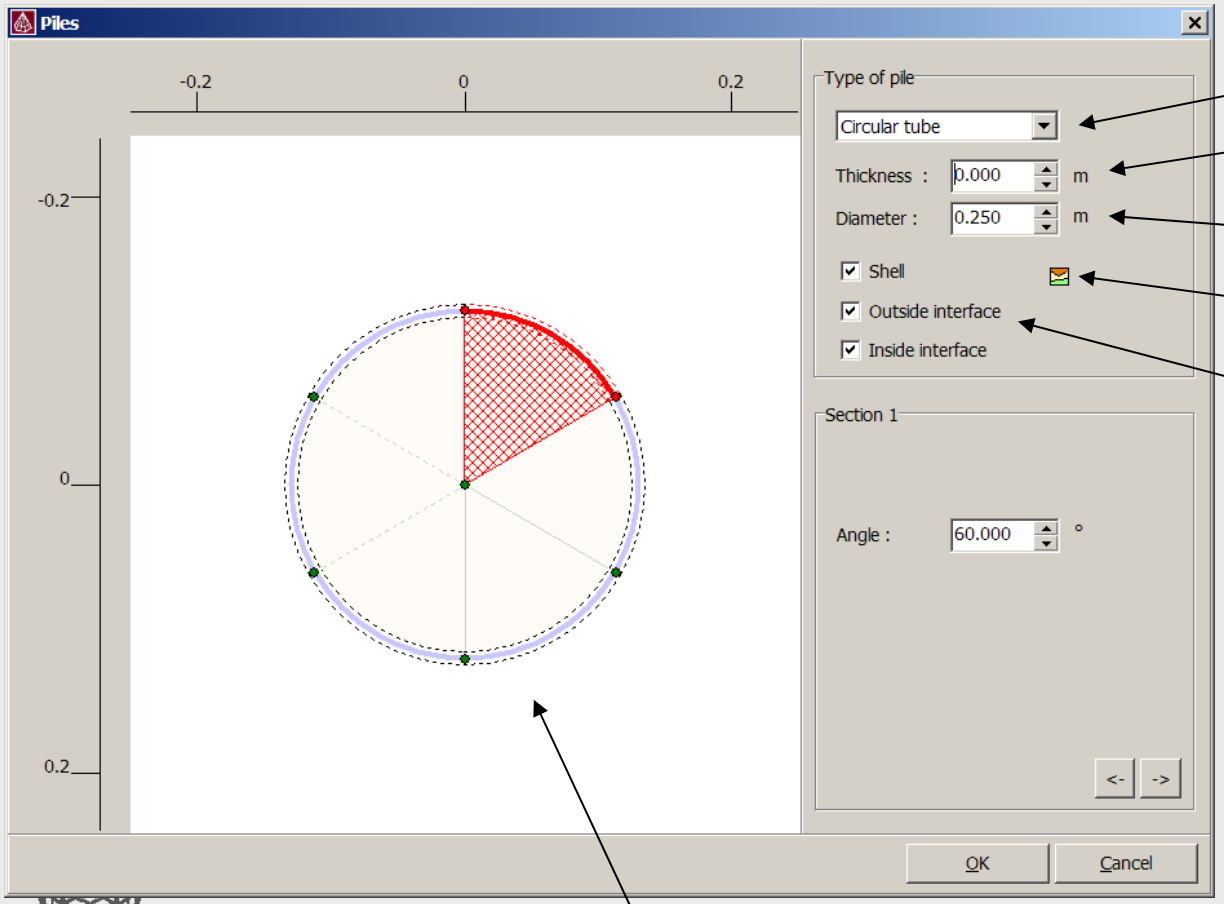
Define material sets

Specify layer boundaries

Define water level

Graphical representation of the soil layers with water level

Volume piles: pile designer



Pile type

Wall thickness

Pile diameter/size

Define material sets

Shell / Interfaces

Pile shape view

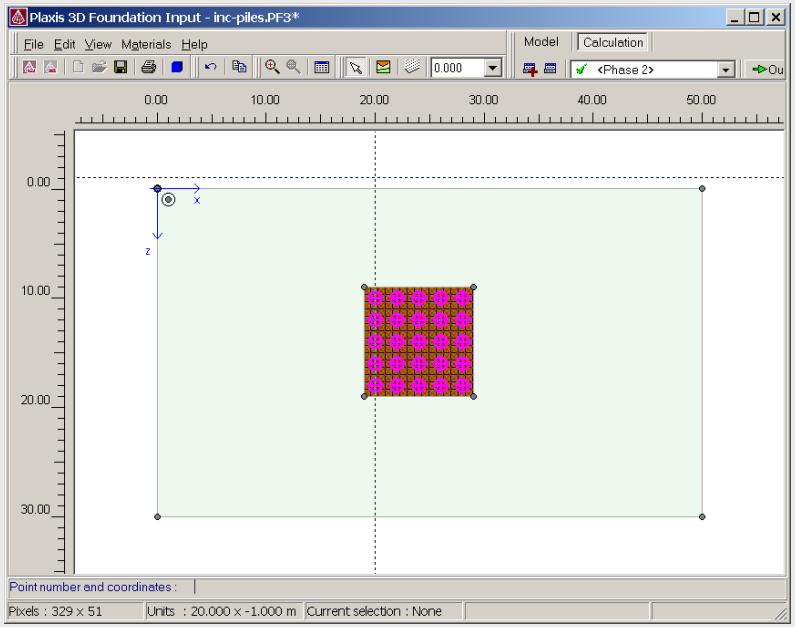
Assign a soil material set for a massive pile and a wall material set for a hollow tubular pile

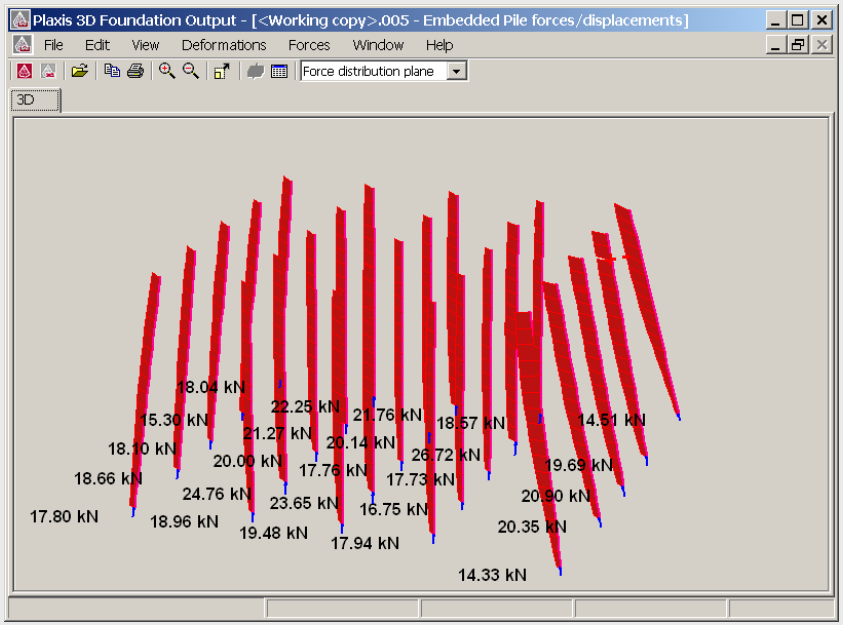
Embedded piles

- Special 1D pile model, arbitrarily through 3D mesh
- Soil interaction with a line-interface
- Skin friction and tip resistance
- For applications involving multiple piles







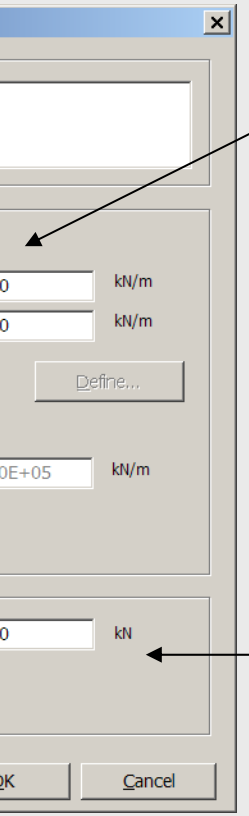


Embedded piles

Stiffness

Weight

Type



Skin resistance:

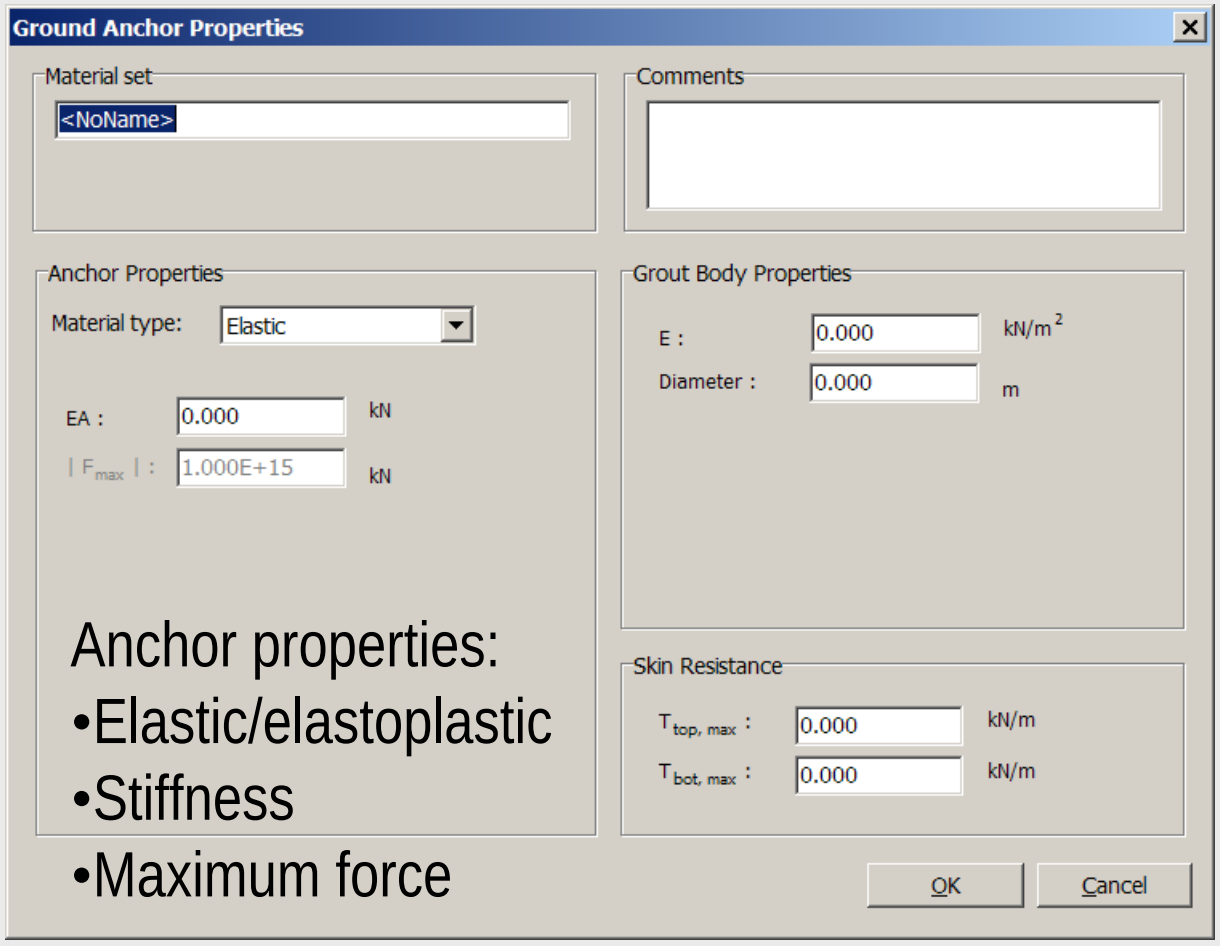
- Linear
- Multi-linear
- Layer dependent

Base resistance

Ground anchors

- Special 1D model, arbitrarily through 3D mesh
- Composite element:
  - Node-to-node anchor for the anchor rod
  - Embedded pile for the grout body
- Soil interaction only along grout body using a line-interface
- Only skin friction, no end resistance

Ground anchors



Anchor properties:
- Elastic/elastoplastic
- Stiffness
- Maximum force

Grout properties
- Stiffness
- Diameter

Skin resistance:
Maximum value at top and bottom





Generating a finite element mesh

- Fully automatic 2D mesh generation based on geometry model
- Global and local refinement options

- 3D mesh is an extension of the 2D mesh, taking into account the soil layers and workplanes.

Generating a finite element mesh

Mesh generation:

- 2D mesh + global and local refinements
- Semi-3D mesh based on 2D mesh + work planes + boreholes
  - Non-linear interpolation between bore holes (smooth surfaces)
  - Triangulate option (straight triangular planes and sharp edges)





Define calculation phases

- Initial phase
  - Gravity loading
  - K0 procedure
- Other calculation phases
  - Switch on/off soil, floors, walls, beams etc.
  - Generate water pressures for dry excavations
  - Change material sets for installation of walls, floors etc. modeled with volume elements.





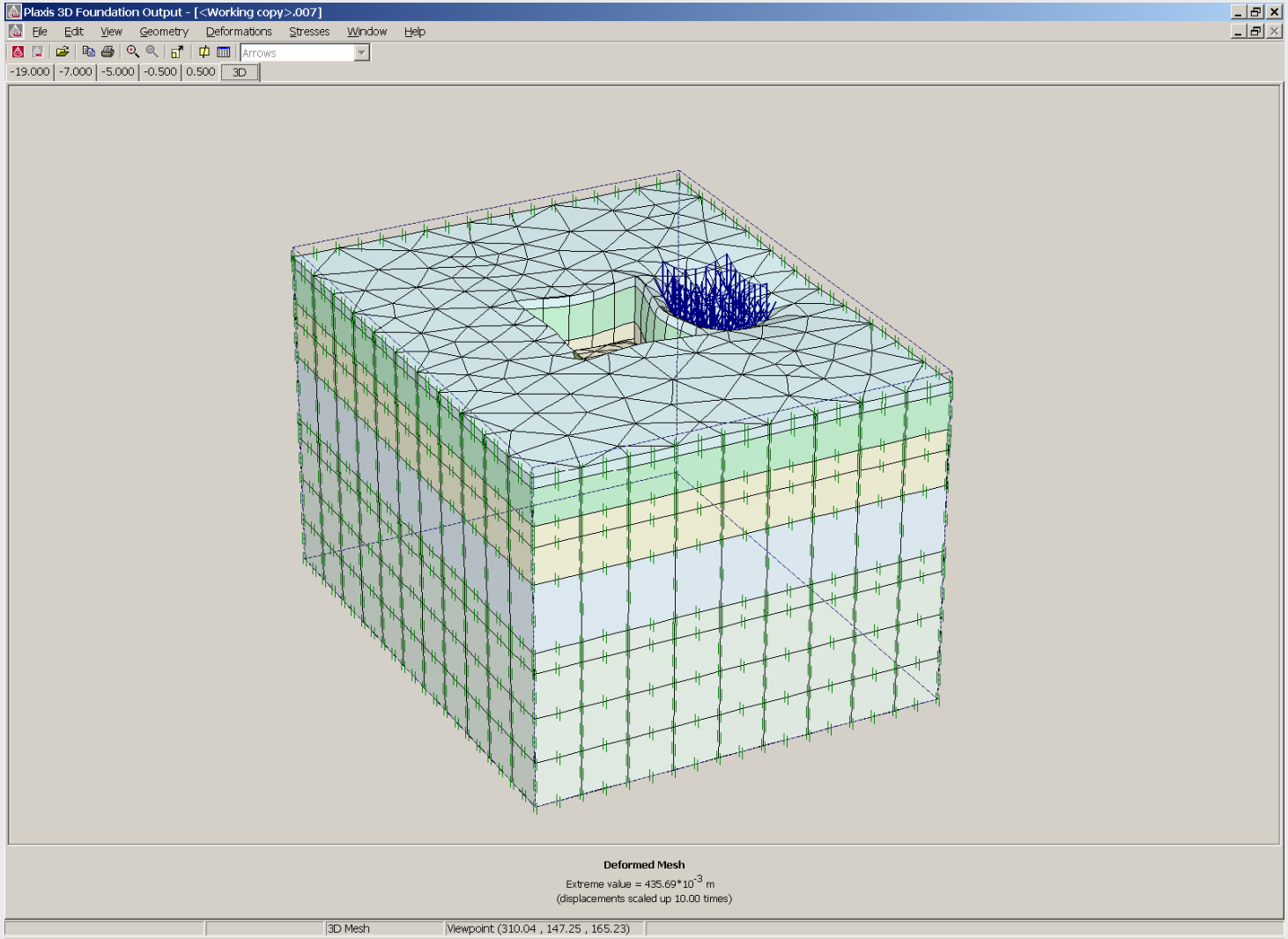
Defining calculation phases

- Plastic calculation or Consolidation
- Changing water conditions
- Multiple calculation phases can be pre-defined and executed at once.
- Preview option to see the defined phase in 3D prior to calculation
- Select points for generation of load-displacement curves or stress paths after the calculation





Output program



View results

- Graphical and tabulated output of displacements, stresses and structural forces
- 3D view or workplane view
- Output in cross sections
- Multiple output windows can be opened simultaneously (comparison of results)





Curves

- Integrated in the Output program
- Load-displacement curves
- Stress-strain curves