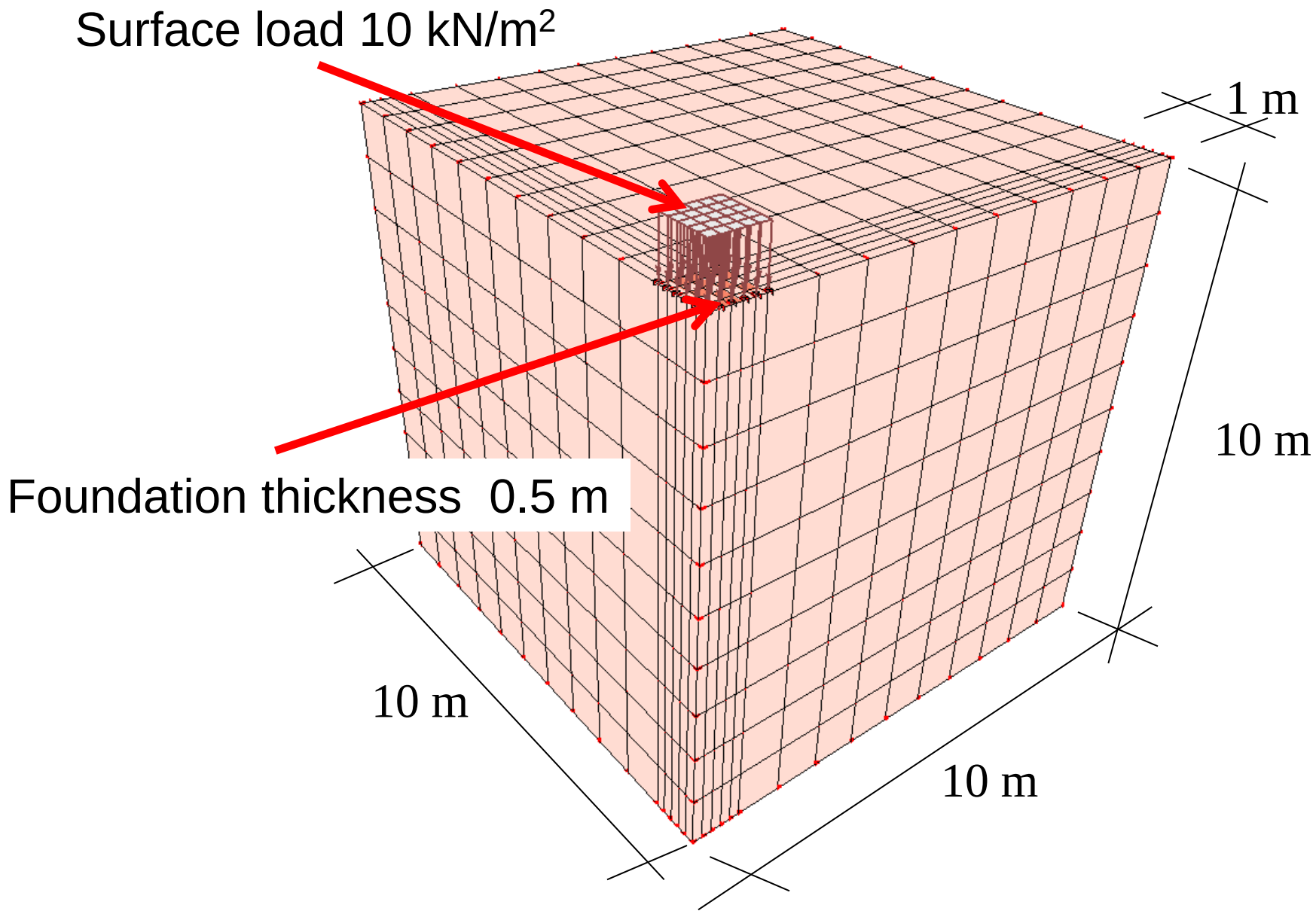
Lecture 1 - Foundation

Foundation

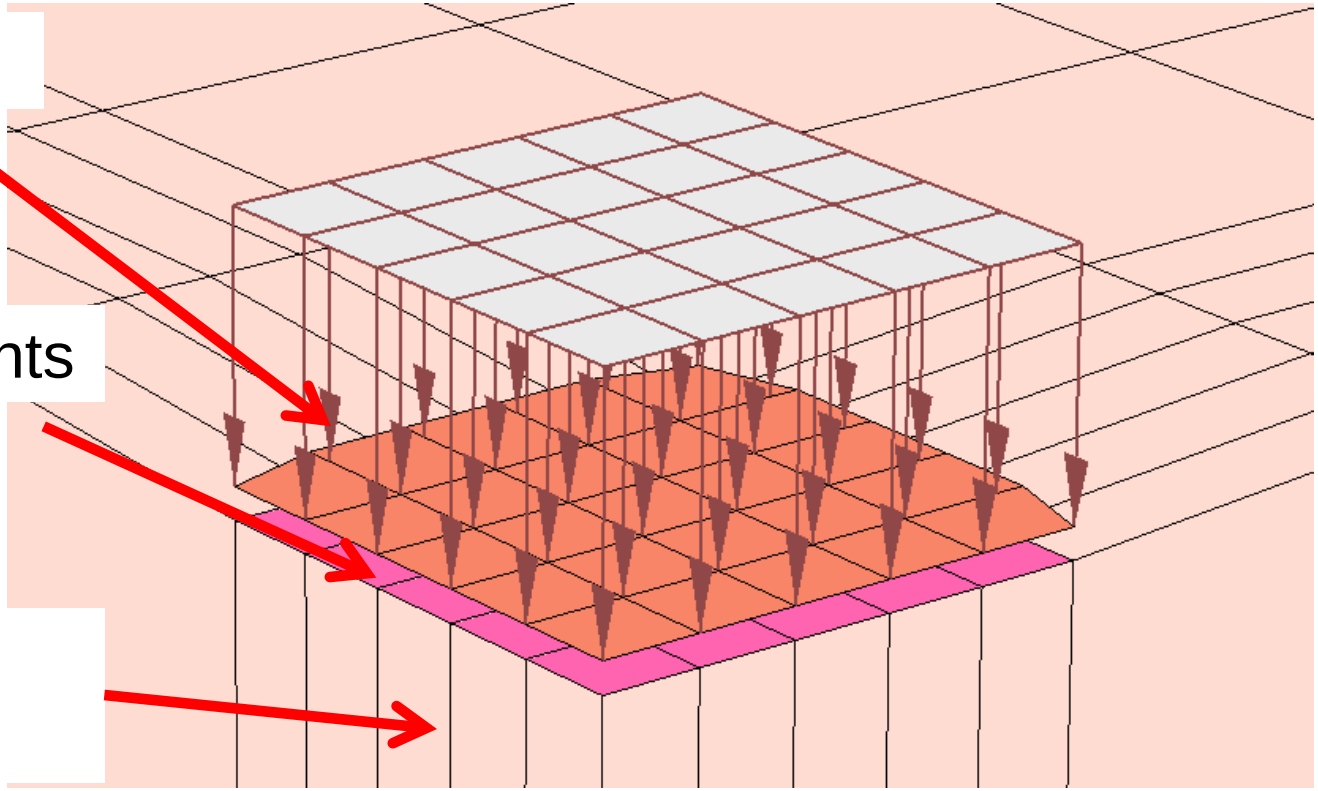

Surface load 10 kN/m²
1 m
10 m
Foundation thickness 0.5 m
10 m
10 m

Foundation

Shell elements

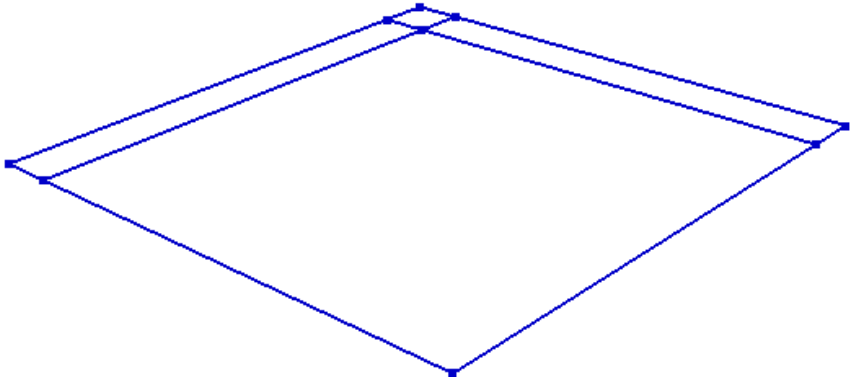
Interface elements

Continuum 3D elements

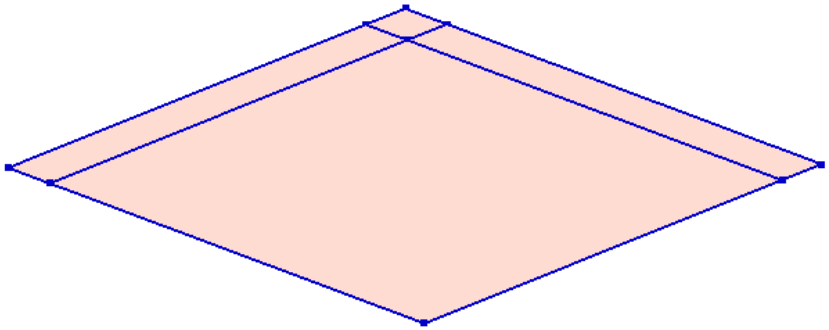


Overview

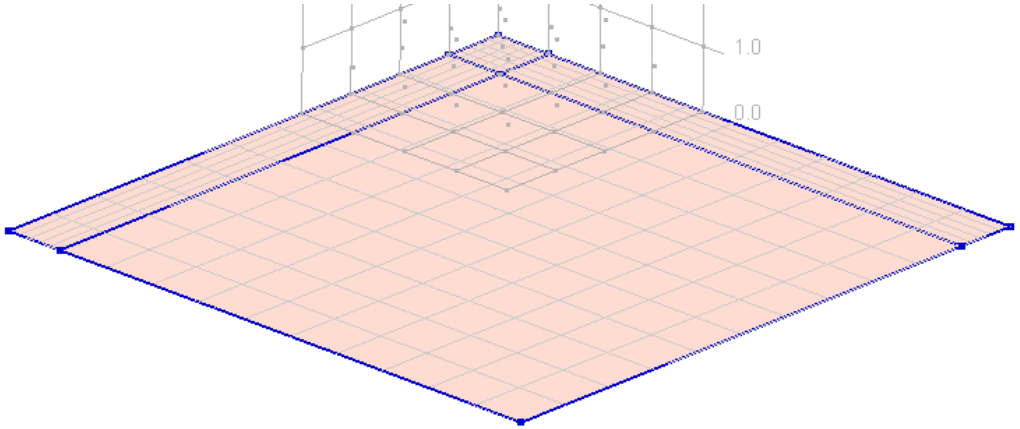
1. Lines



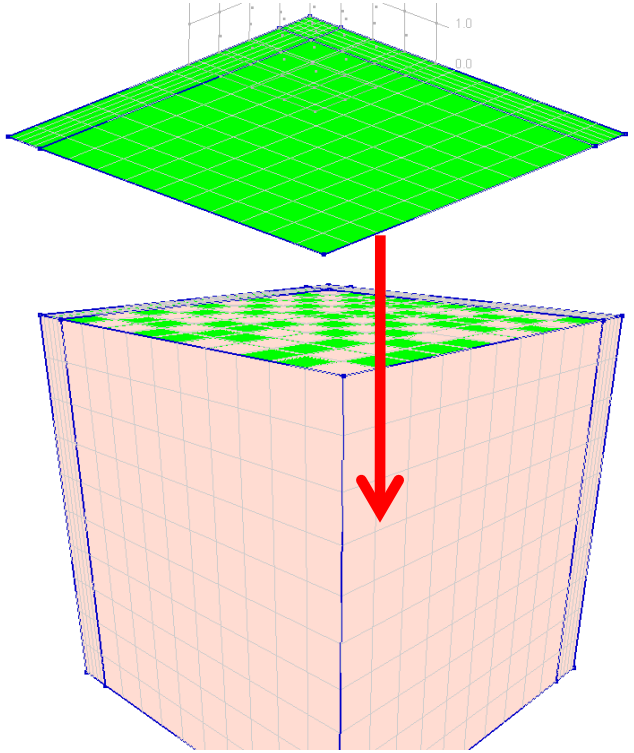
2. Continuum 2D subdomain



3. Virtual mesh for Continuum 2D Subdomains

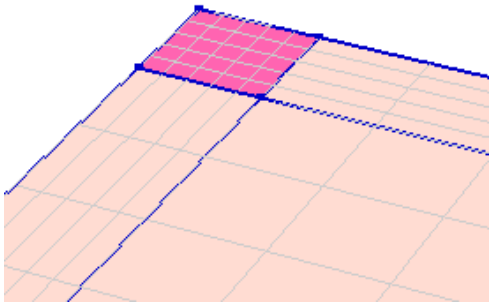


4. Extrude 2D subdomain

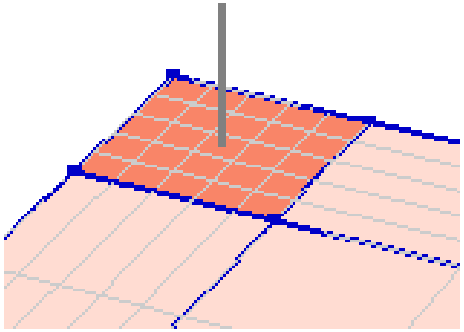


Overview

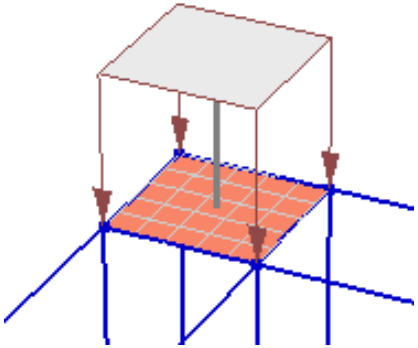
5. Interface element on subdomain face



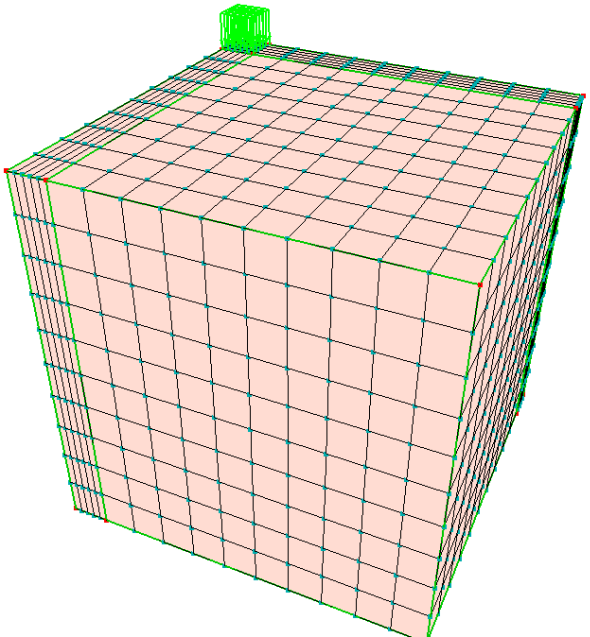
6. Shell element on subdomain face



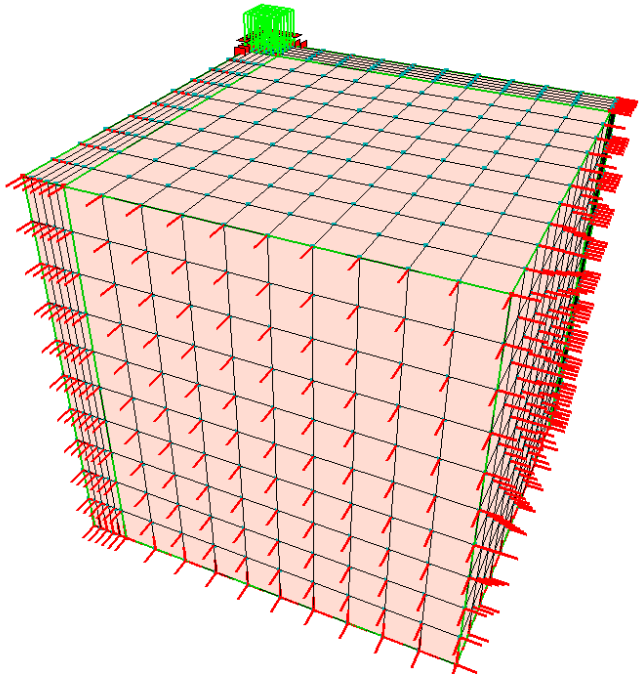
7. Surface load on subdomain face



8. Virtual to real mesh



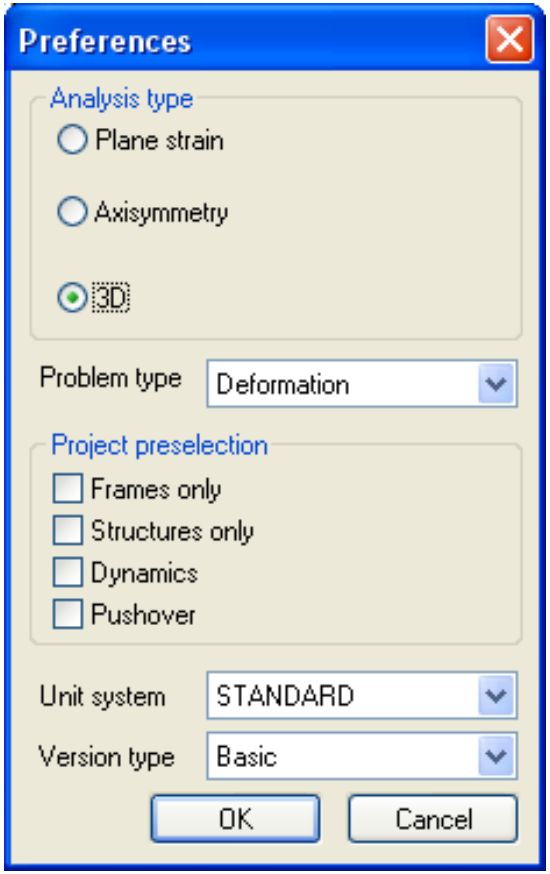
9. Solid boundary conditions on box



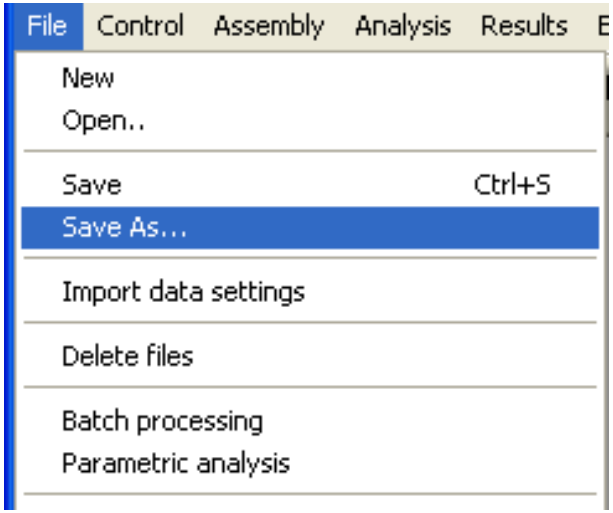
Run Zsoil

In Preferences select :

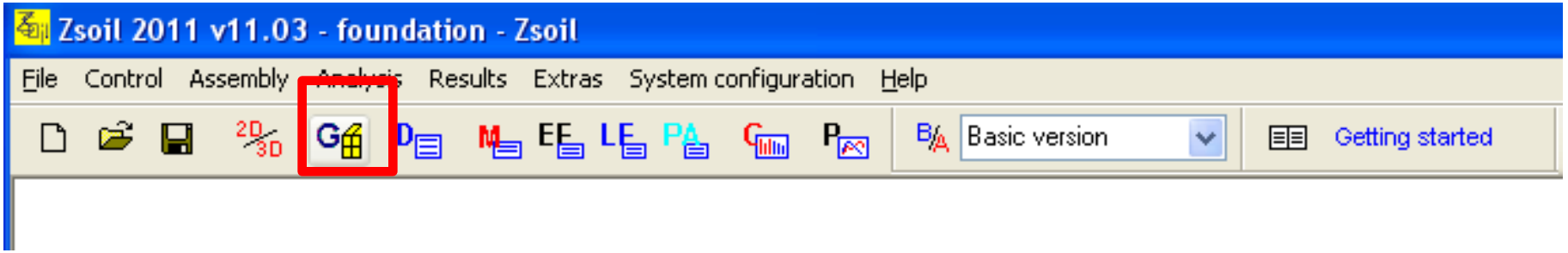
- **Analysis type as 3D**
- **Problem type as Deformation**



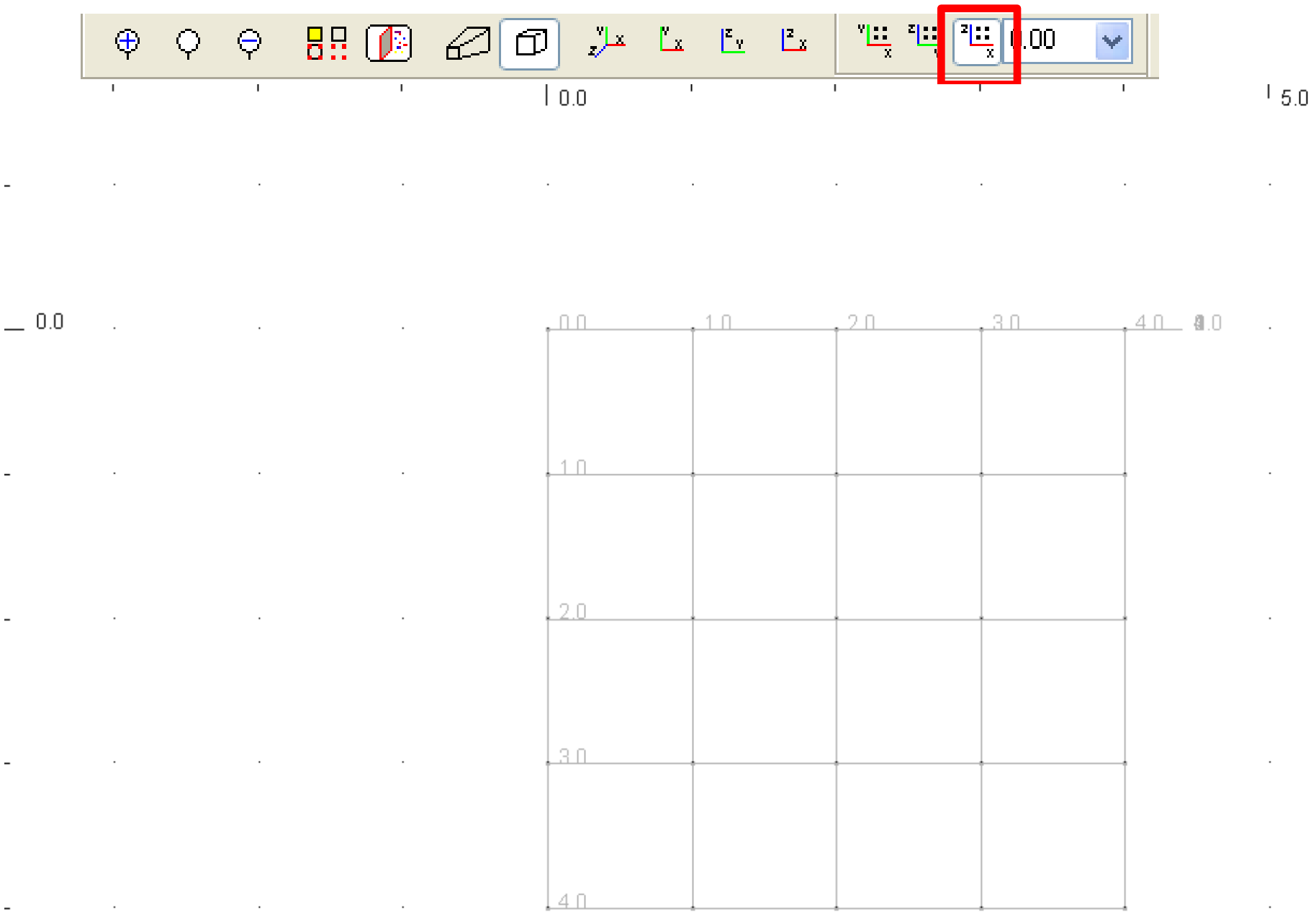
Save project as:
Foundation.inp



Run preprocessing choosing Assembly\Preprocessing from top menu or icon from top toolbar



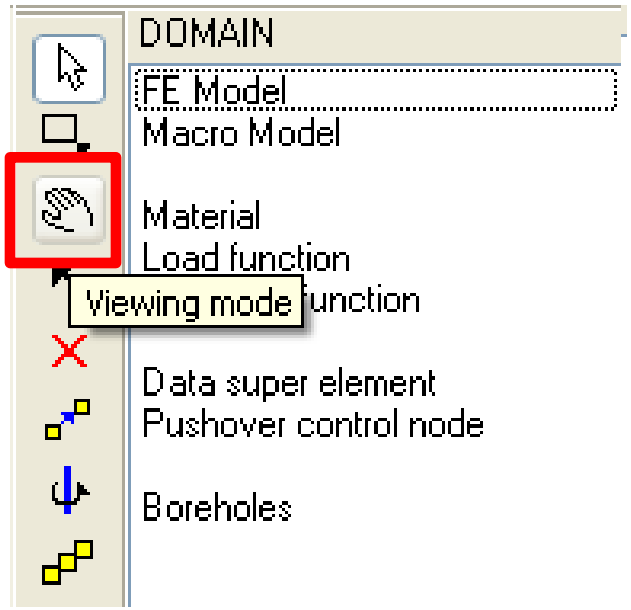
Set XZ projection

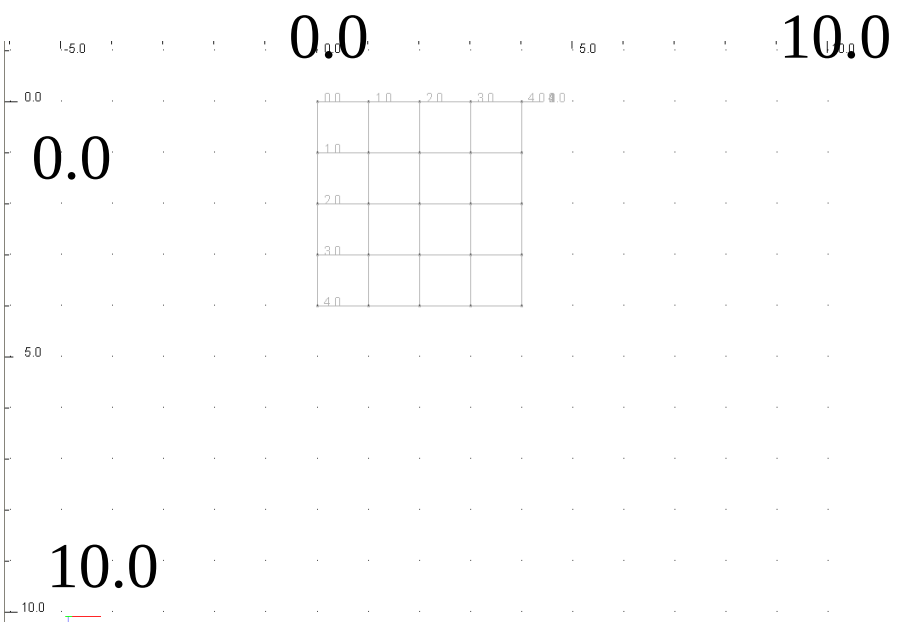


Change camera position

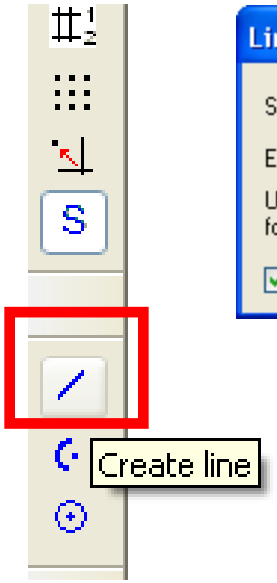
Pick **Zoom out** icon several time or use mouse wheel to change camera distance from the objects

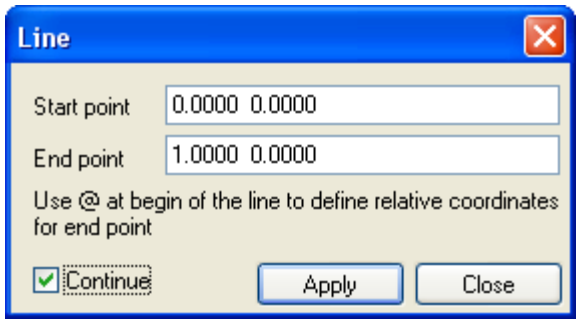
Pick **Viewing mode** icon and change camera position with the mouse keeping left button down





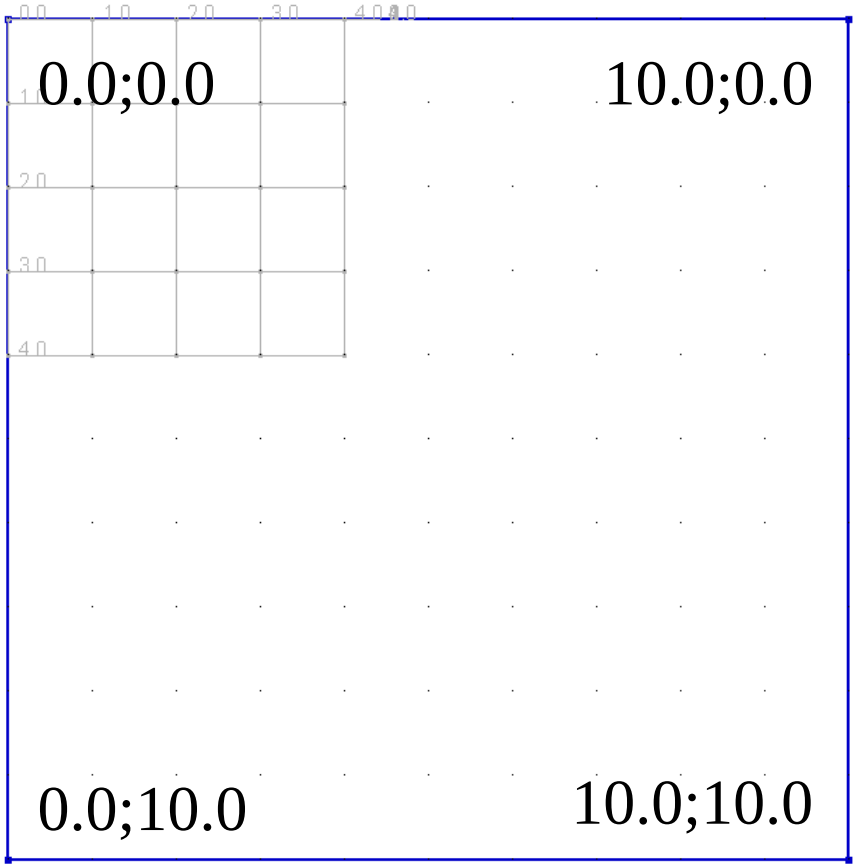
Create lines



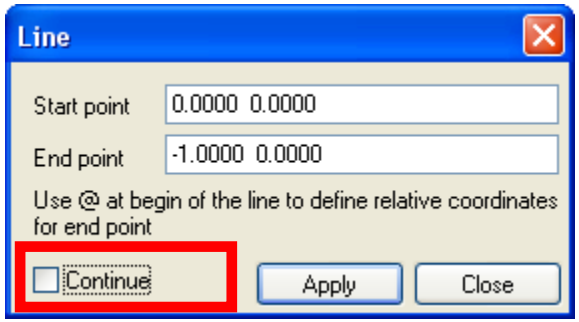


Create 4 lines clicking grid points

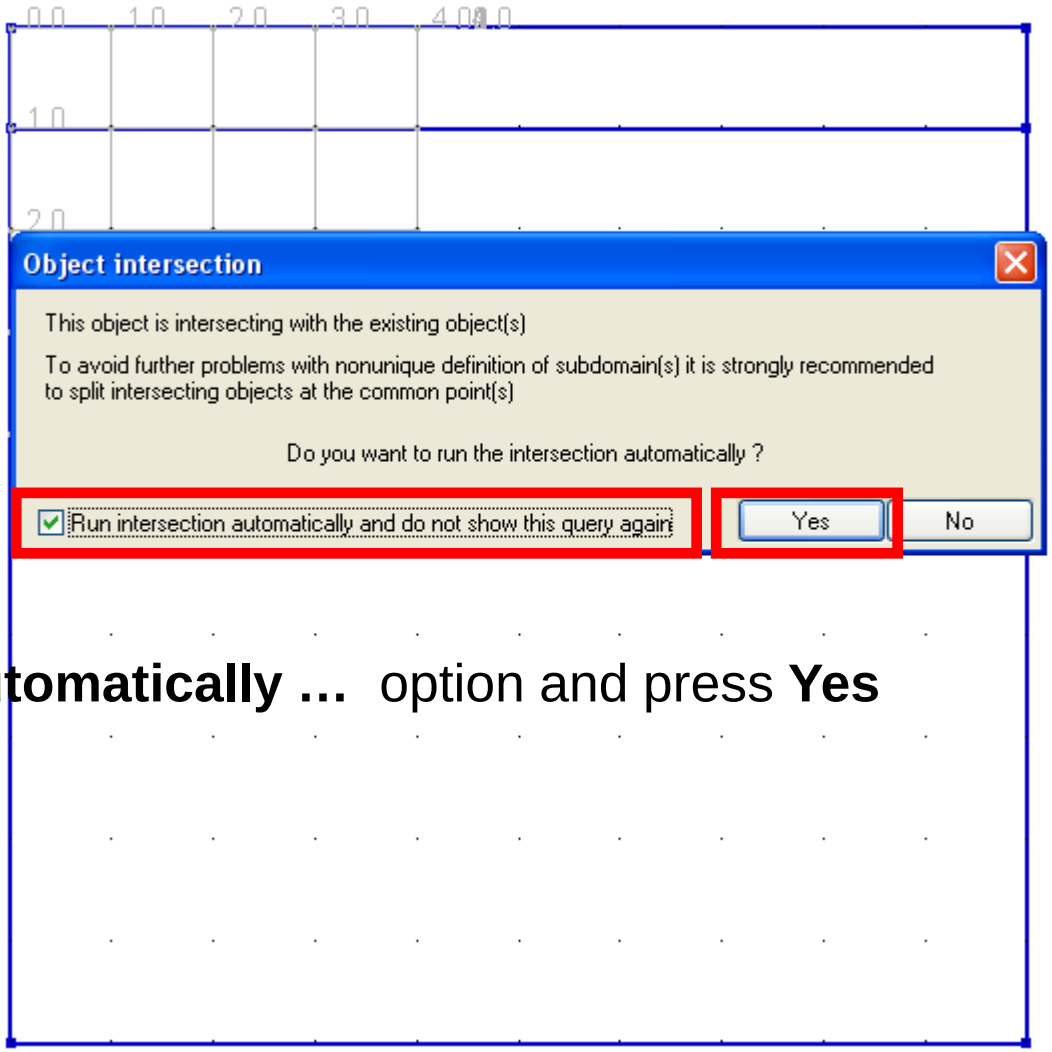
Use rules on top and left side to find cursor position



Create lines



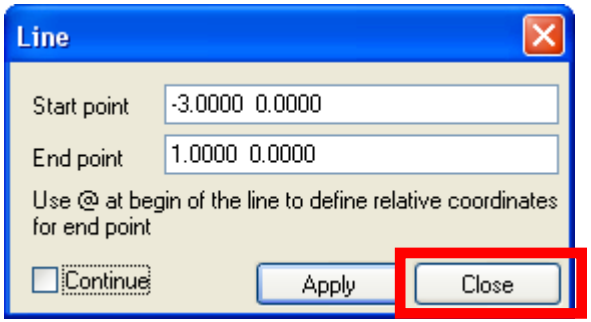
Turn off **Continue** check box
Create line

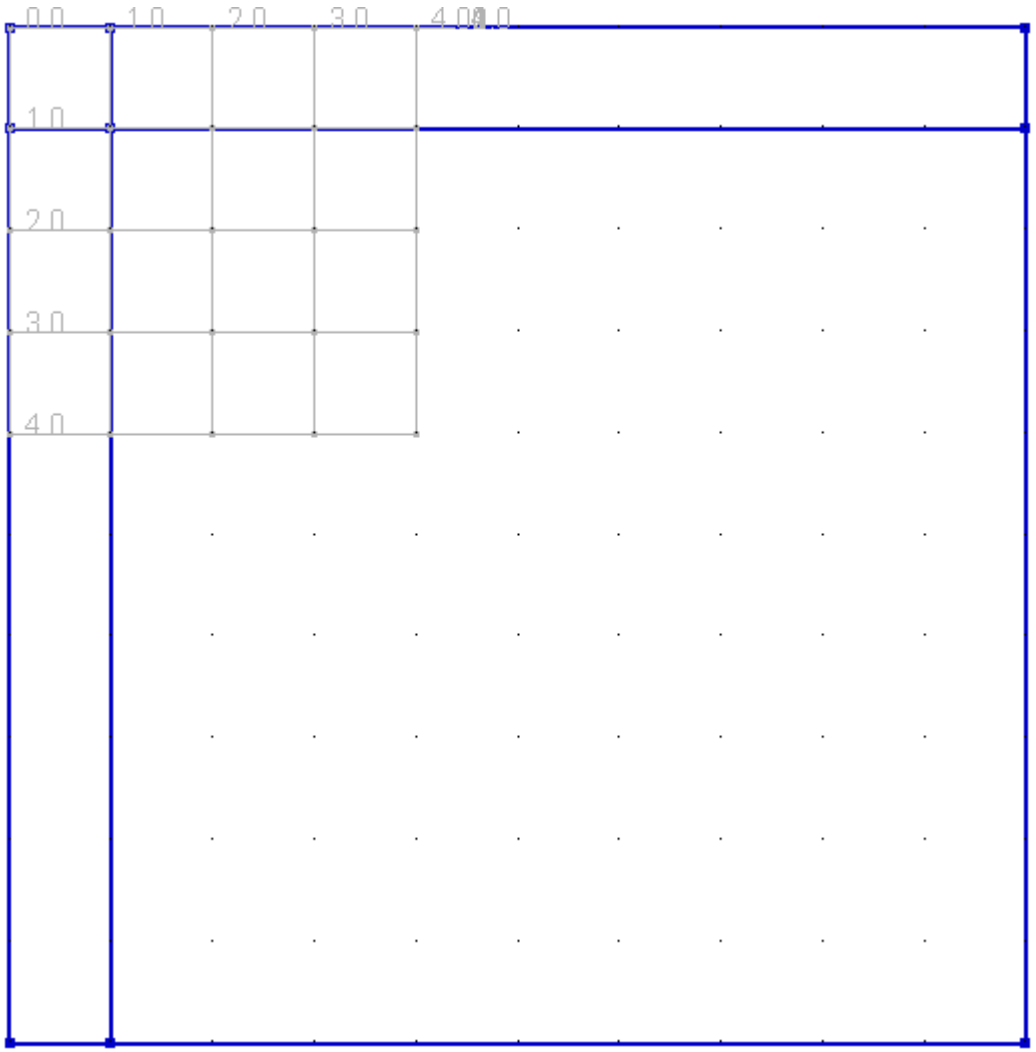


Activate **Run intersection automatically …** option and press **Yes**

Create lines

Create line
Close Line dialog box

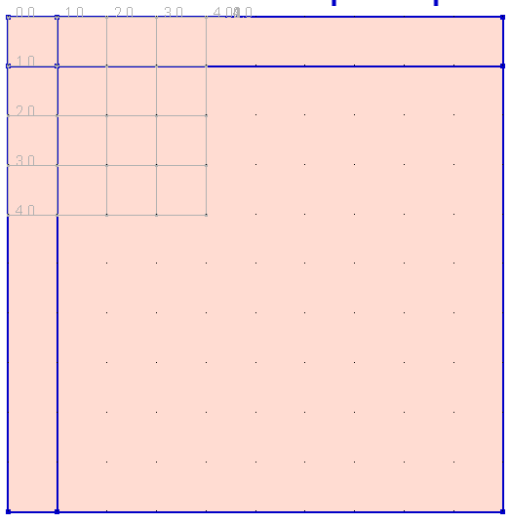


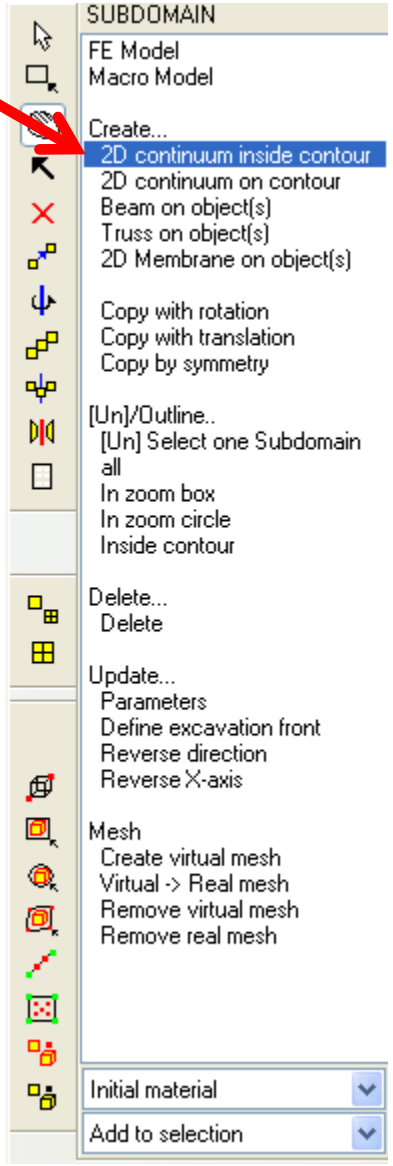


Create Continuum 2D inside contour

1. Macro Model\Subdomain\ 2D Continuum inside contour

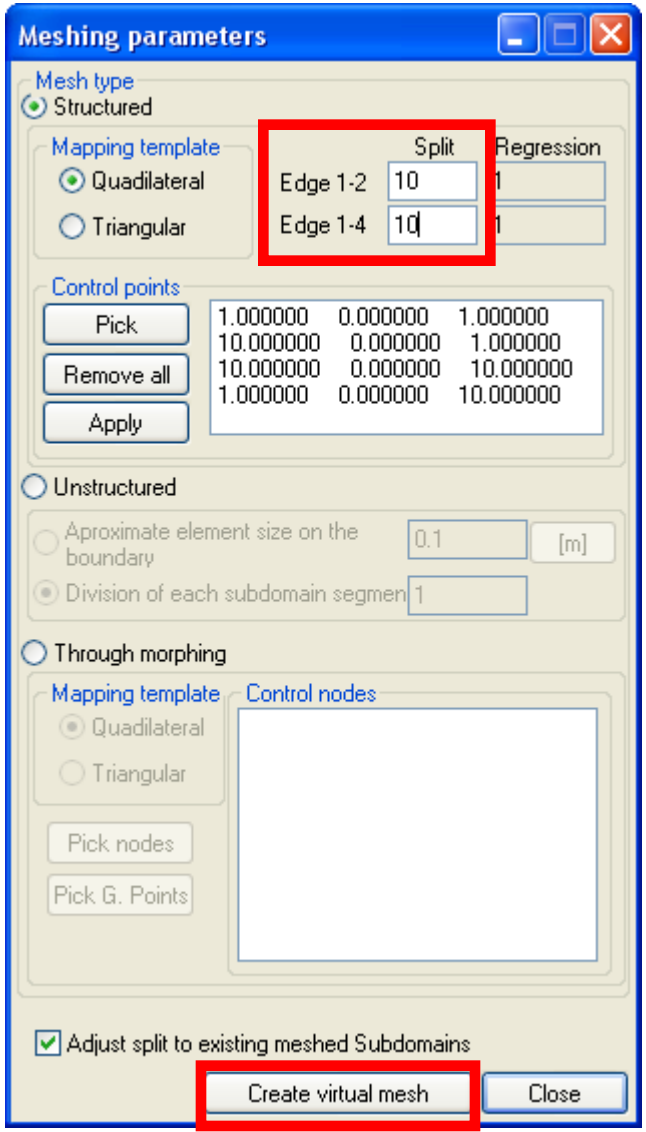
2. Pick 4 times to create 4 subdomains

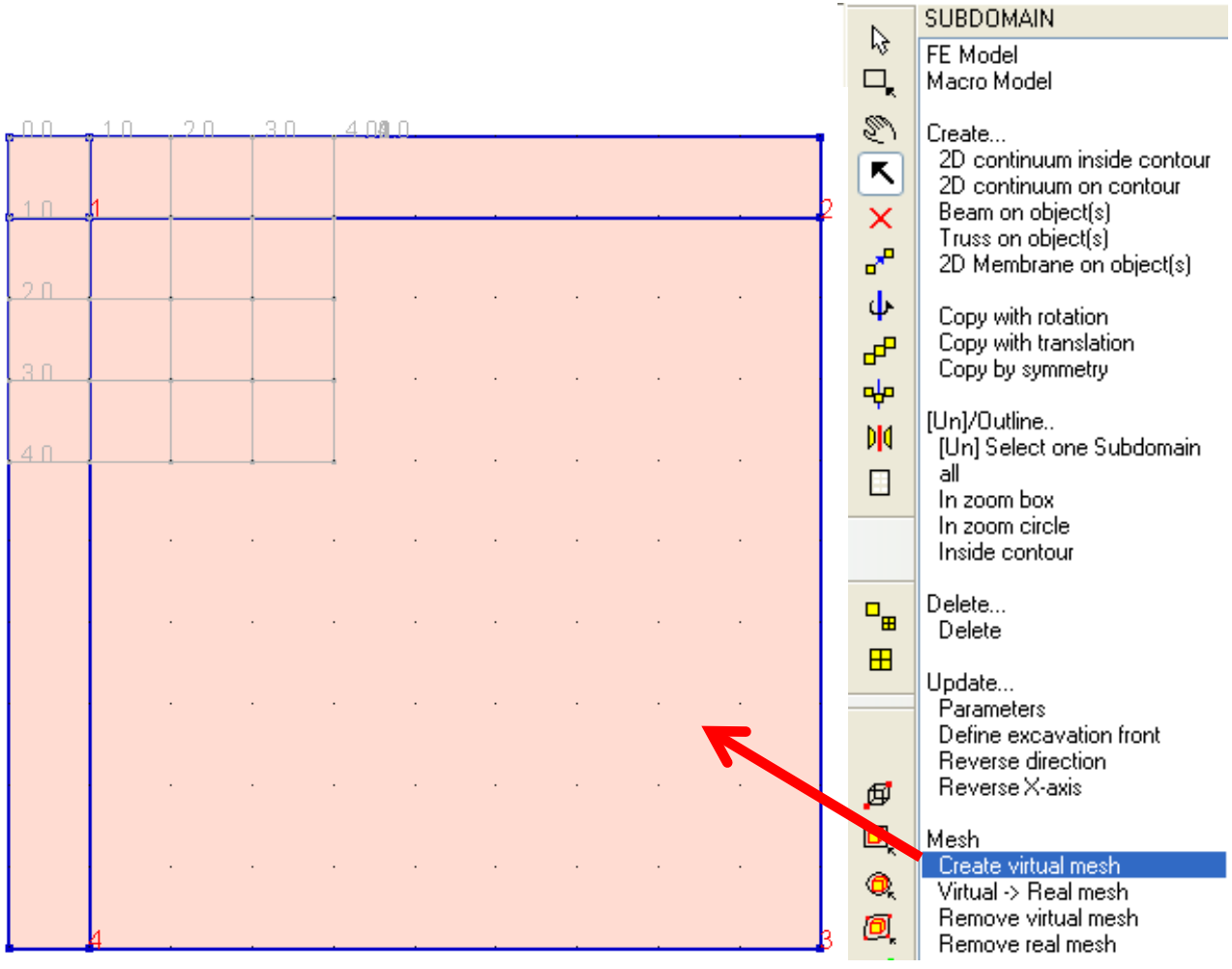




Create virtual mesh

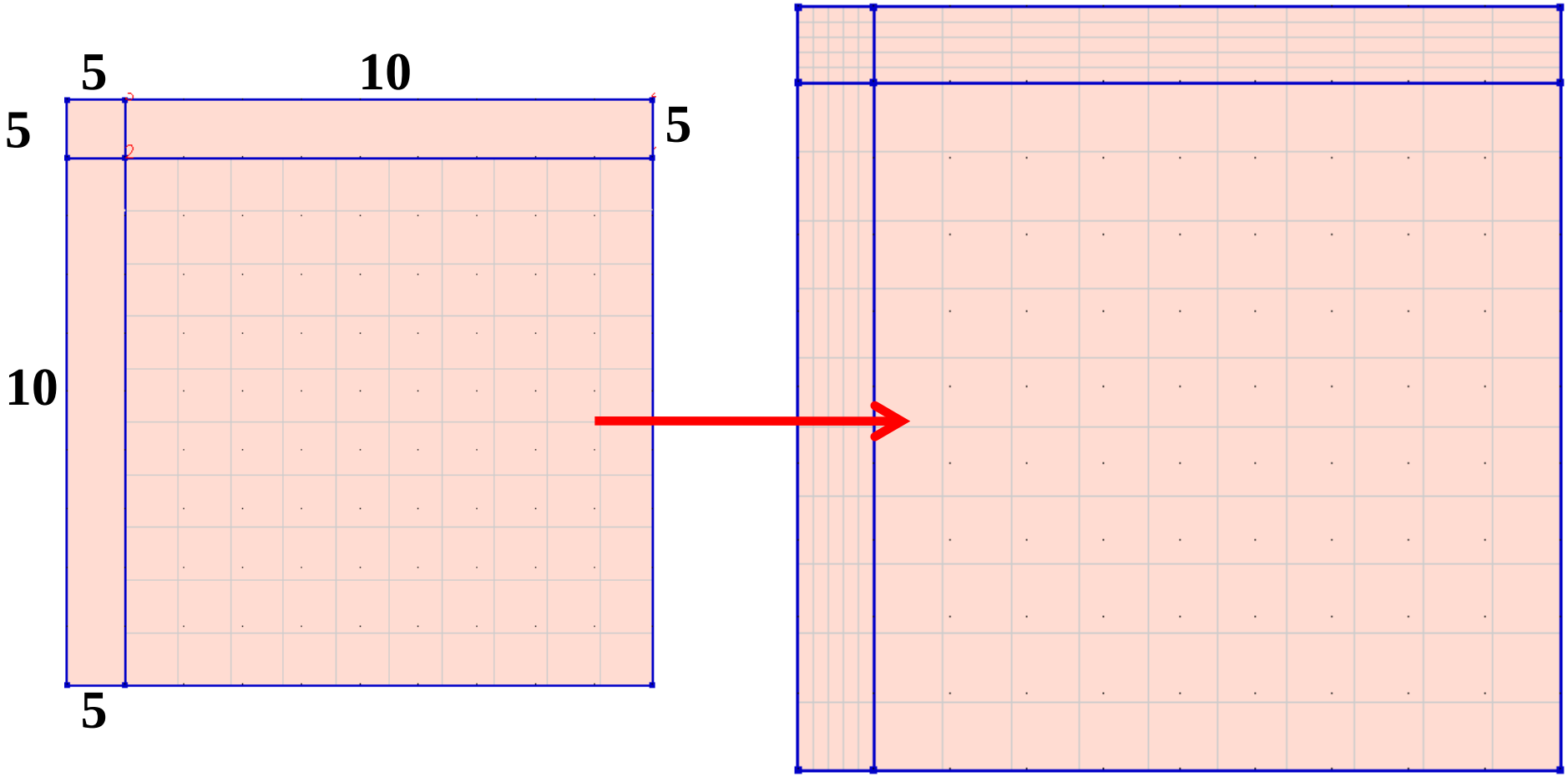
1. Macro Model\Subdomain\ Create virtual mesh
2. Pick Subdomain discontinuous
3. Set Split for Edge 1-2 and 1-4
4. Press button Create virtual mesh





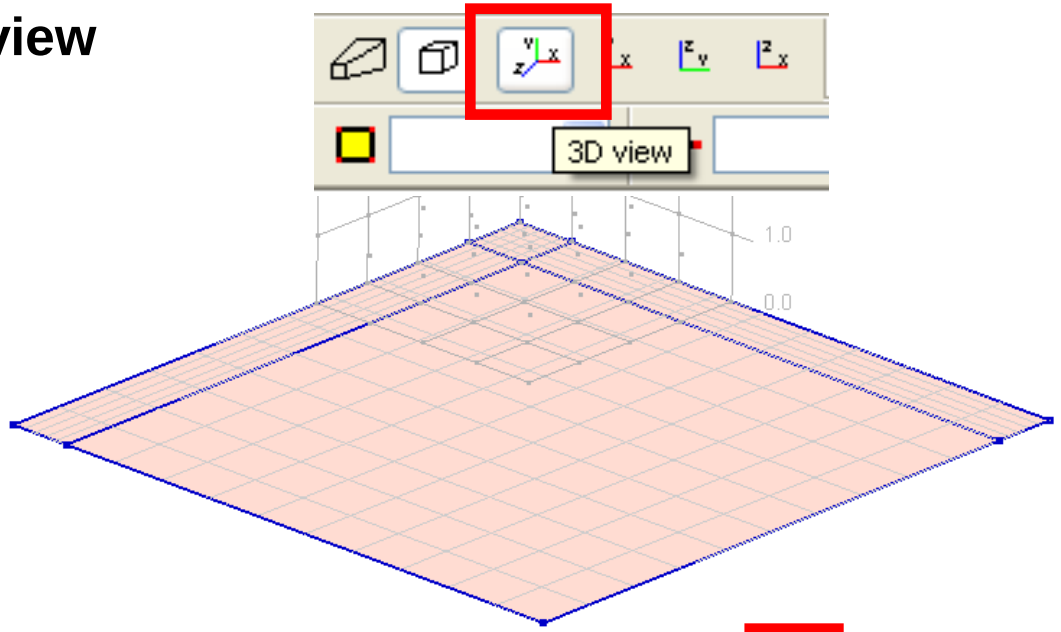
Create virtual mesh

1. Pick next Subdomain
2. Set Split for edges
3. Press button Create virtual mesh
4. Repeat steps 1-4 for next three subdomains

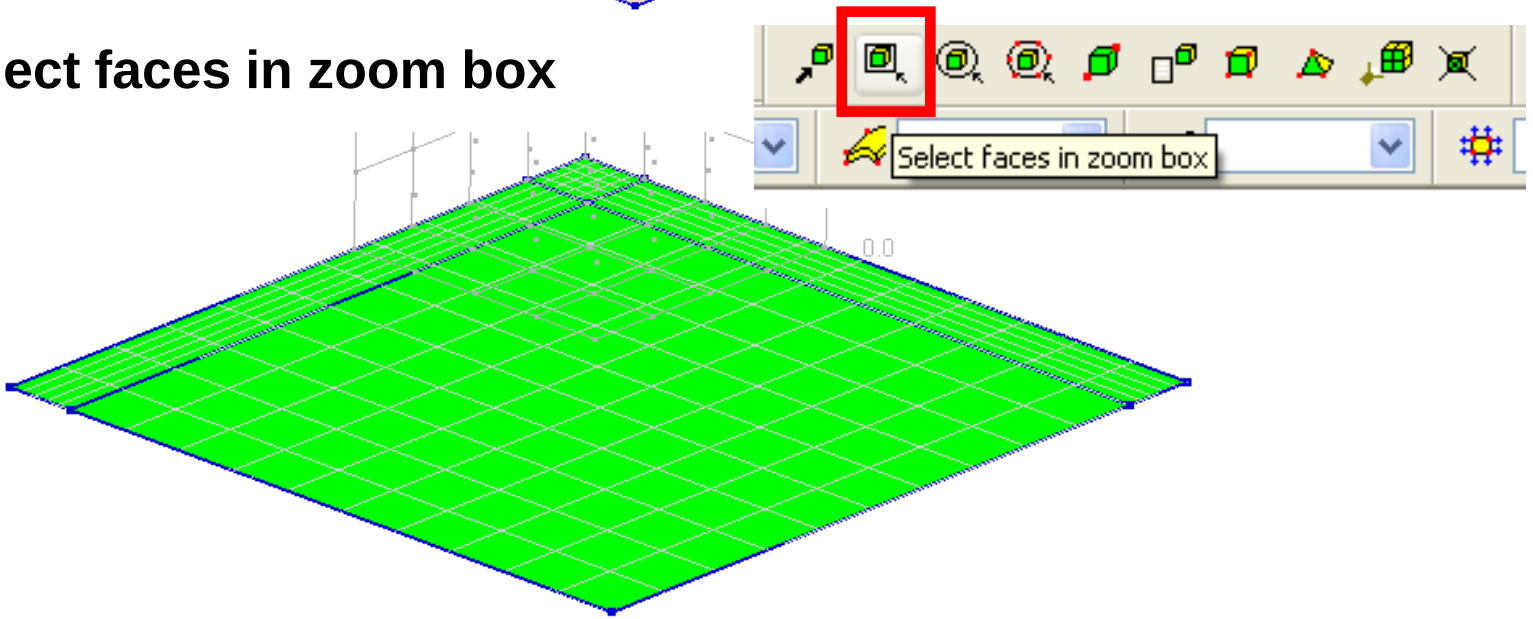


Create Continuum 3D by faces extrusion

1. **Set 3D view**

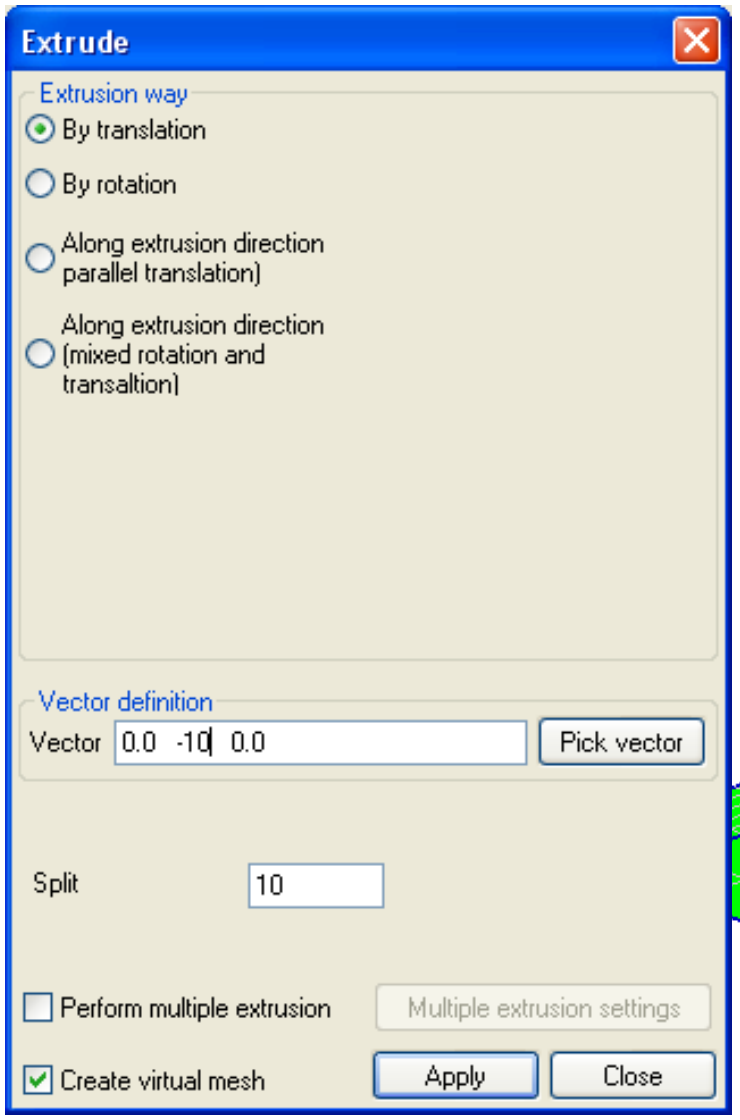


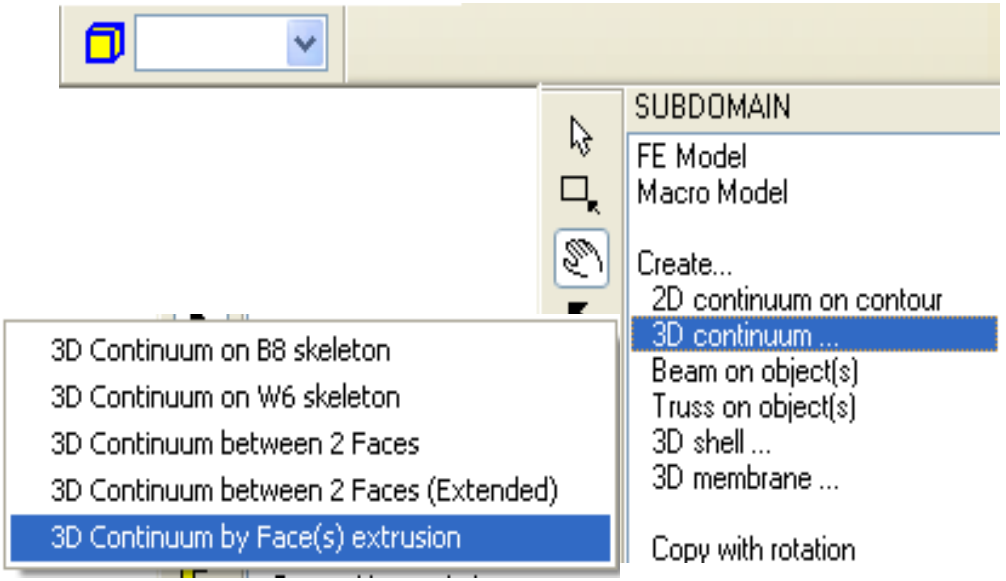
2. **Select faces in zoom box**

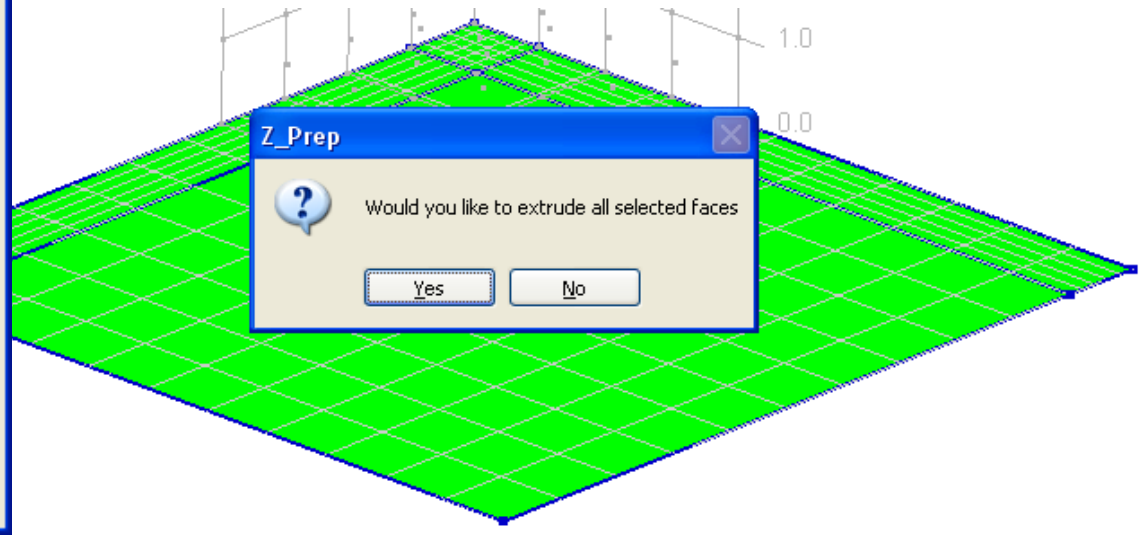


Create Continuum 3D by faces extrusion

3. **Macro Model\Subdomain\ 3D Continuum\ 3D Continuum by Face(s) extrusion**

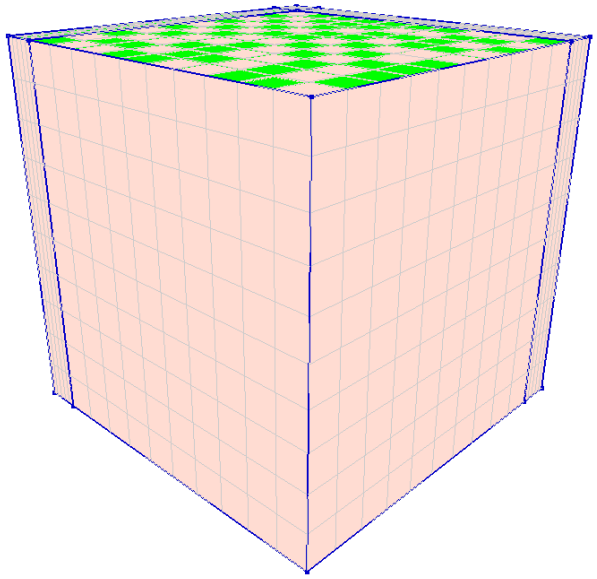


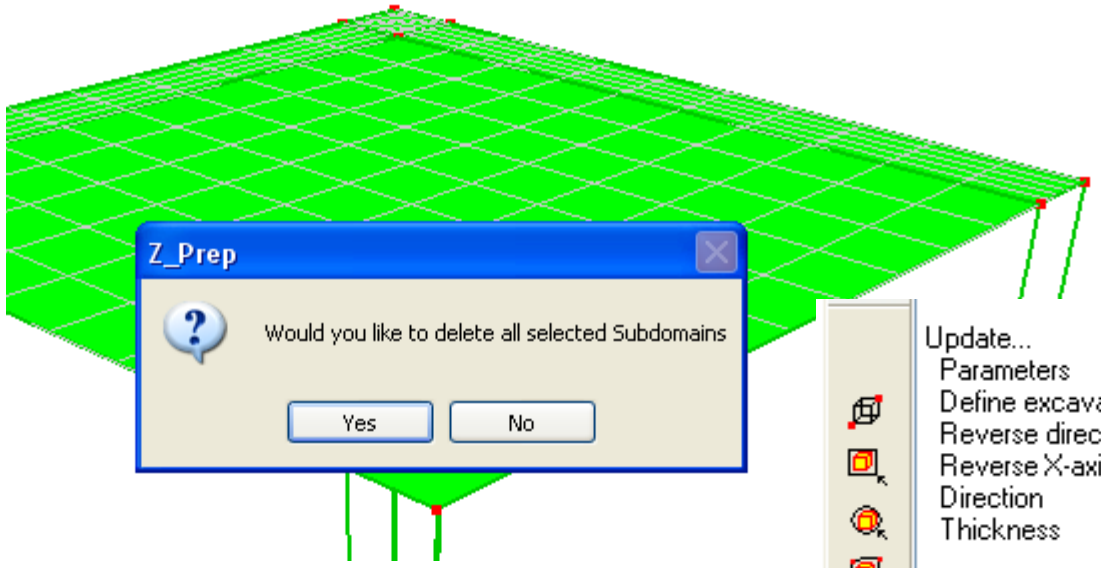




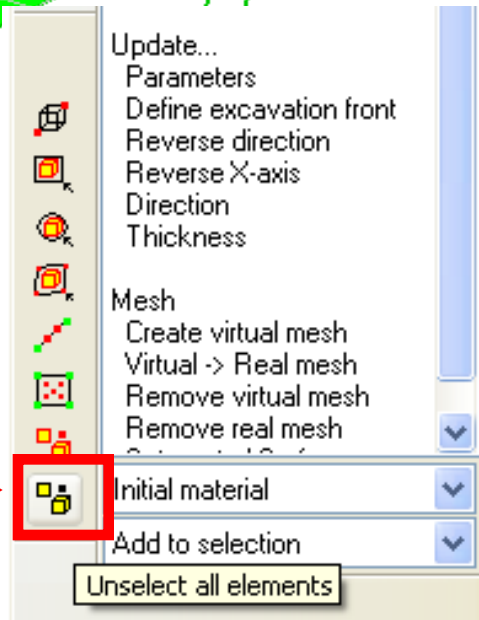
Delete Continuum 2D subdomains

1. CTRL-H – hide Continuum 3D subdomains
2. CTRL-A – select all
3. Delete from menu SUBDOMAIN => Continuum 2D subdomains will be deleted
4. CTRL-H – show Continuum 3D subdomains



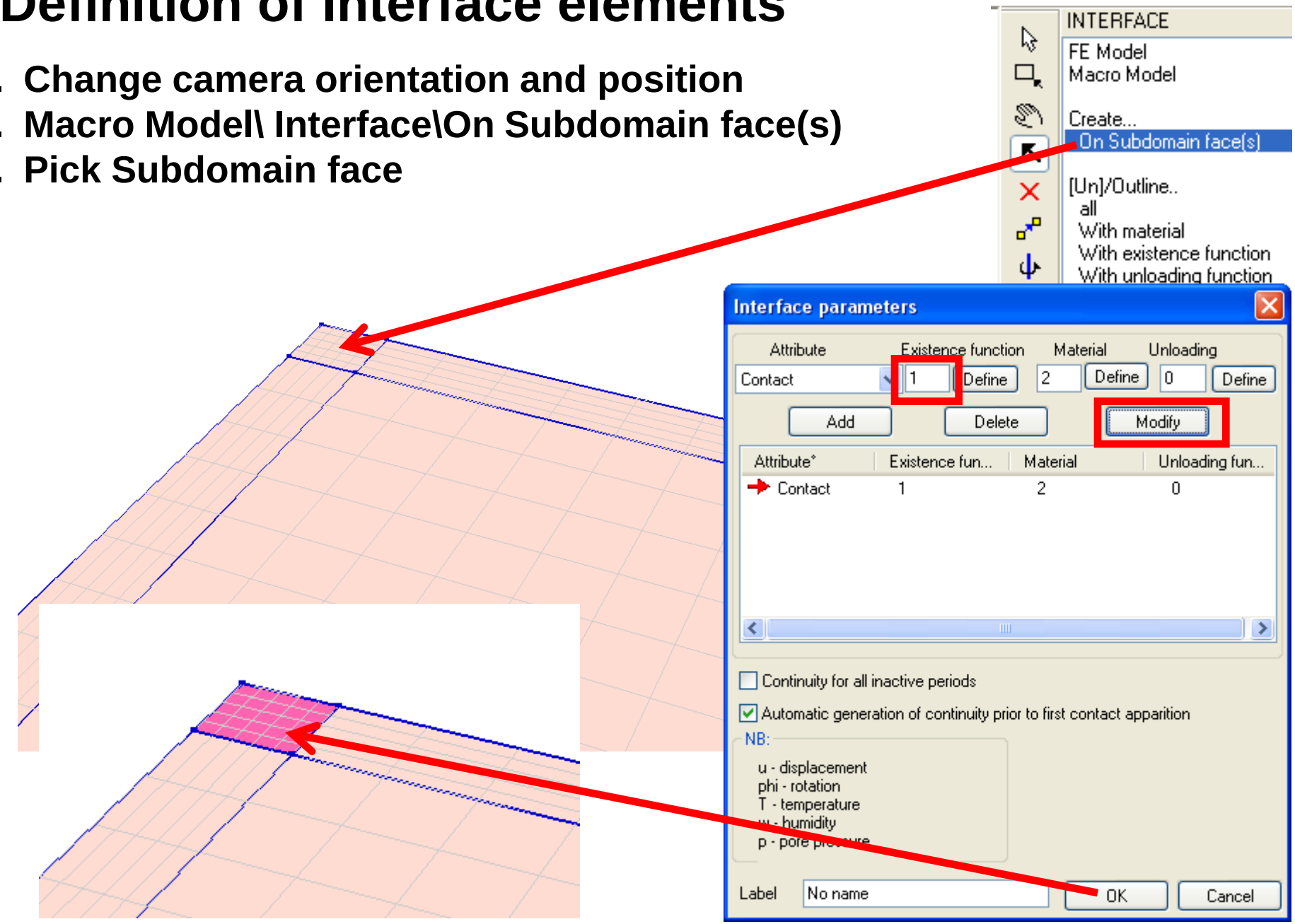


5. Unselect all elements



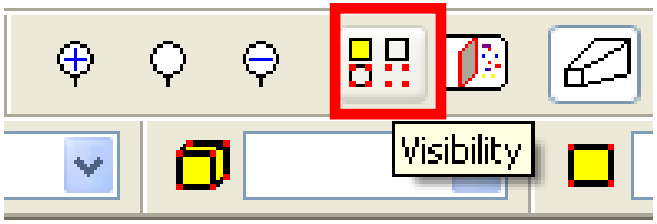
Definition of Interface elements

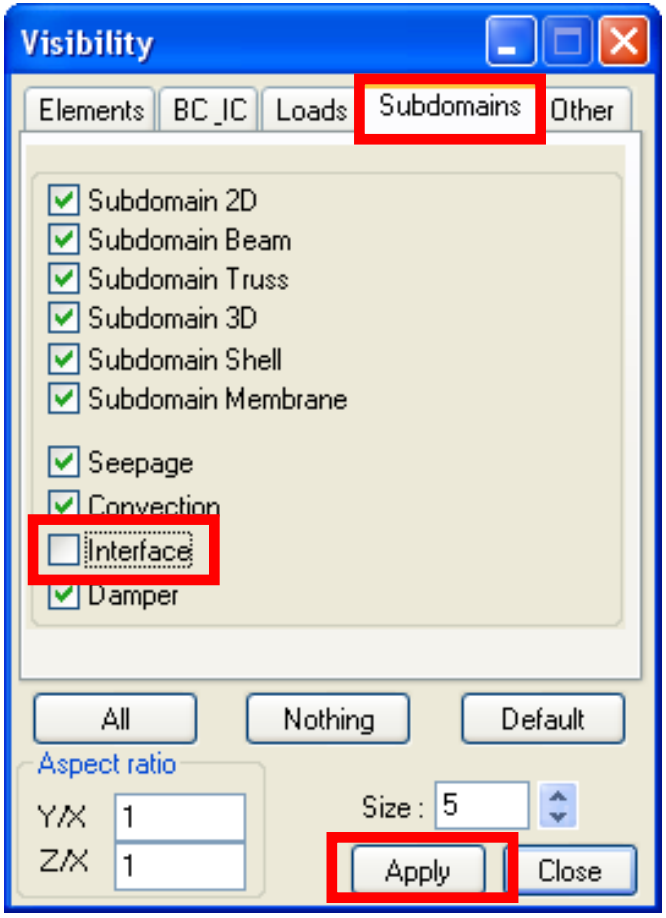
1. Change camera orientation and position
2. Macro Model\ Interface\On Subdomain face(s)
3. Pick Subdomain face

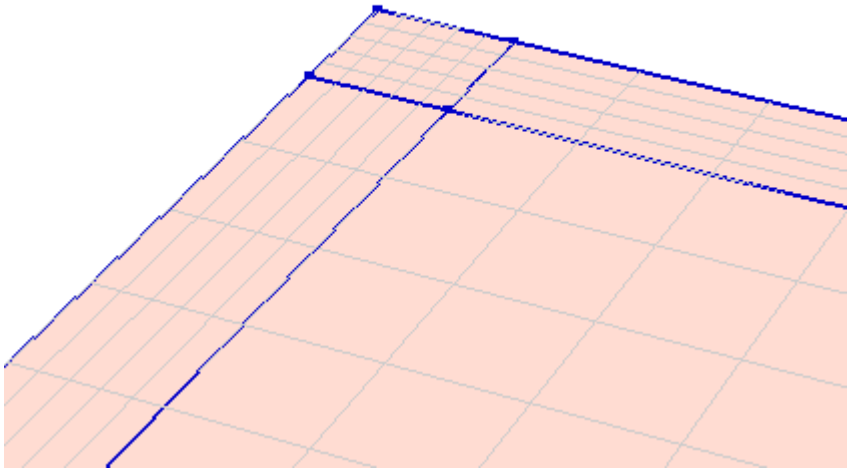


Definition of foundation

1. **Pick visbility icon**
2. **Hide inteface elelemnts**

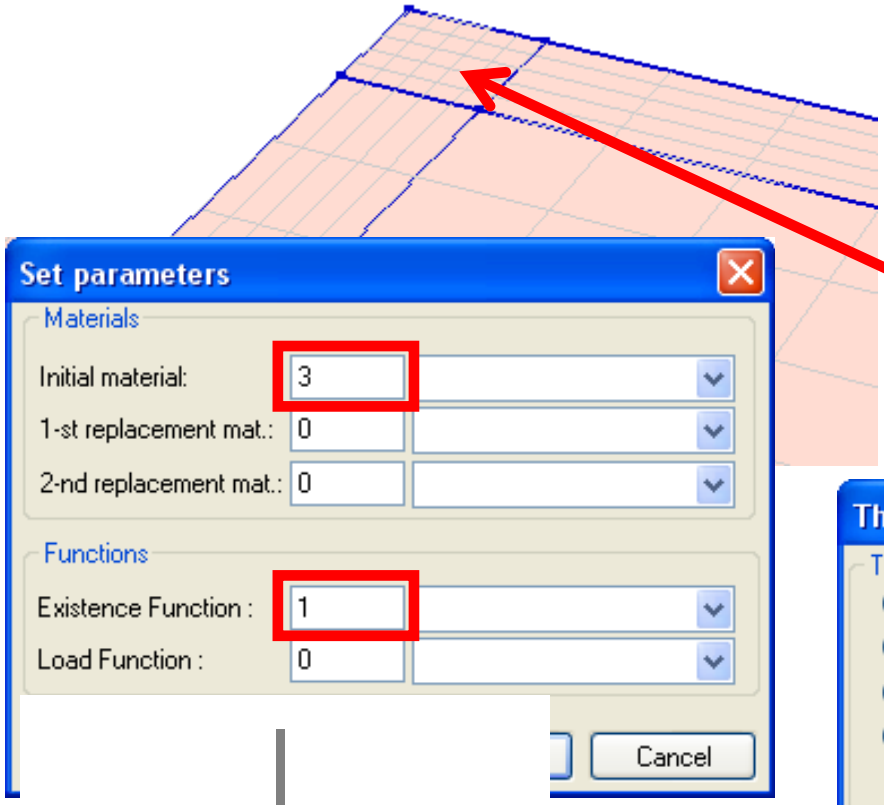


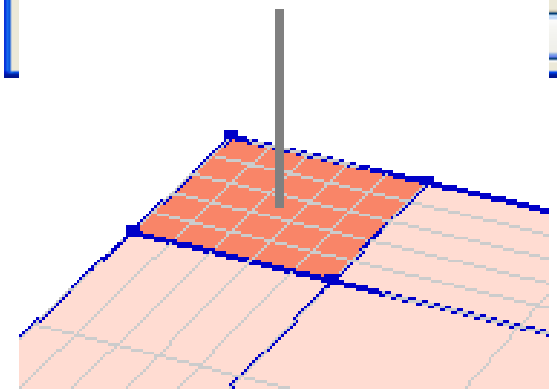


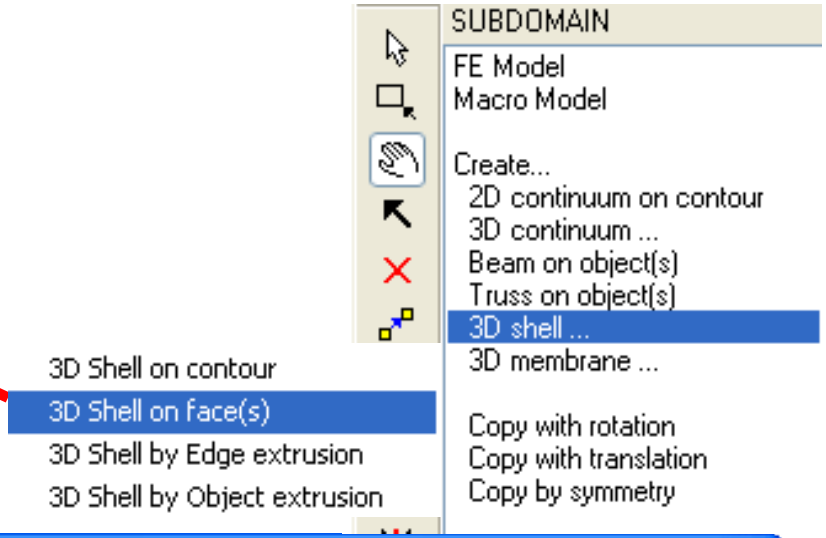


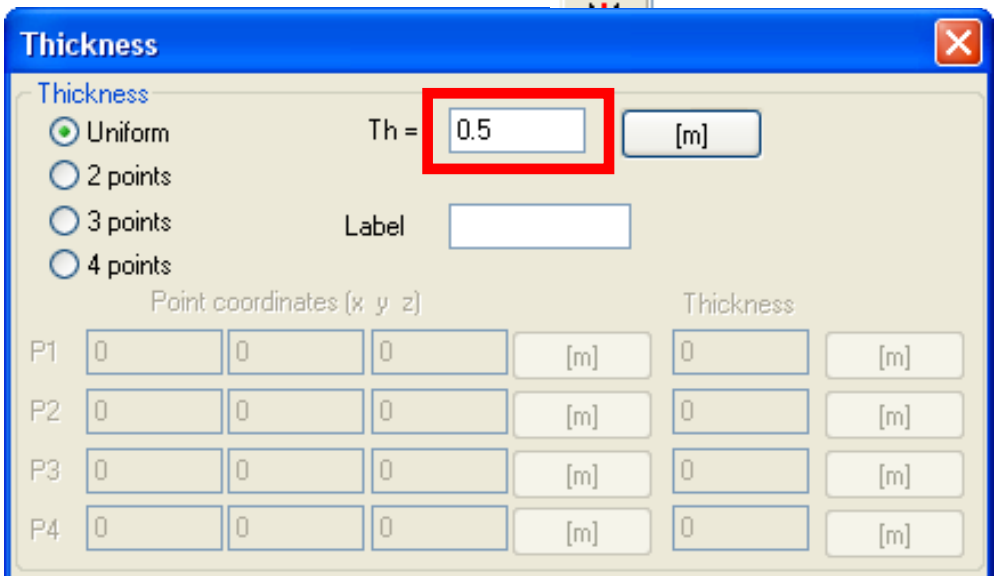
Definition of foundation

1. **Macro Model\Subdomain\ 3D shell\3D shell on face(s)**
2. **Pick Subdomain face**



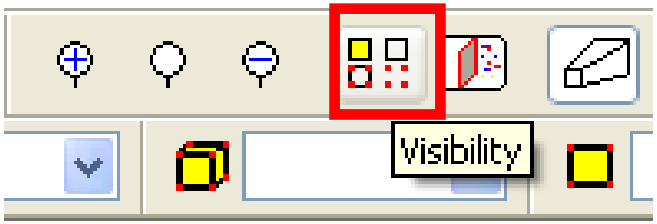


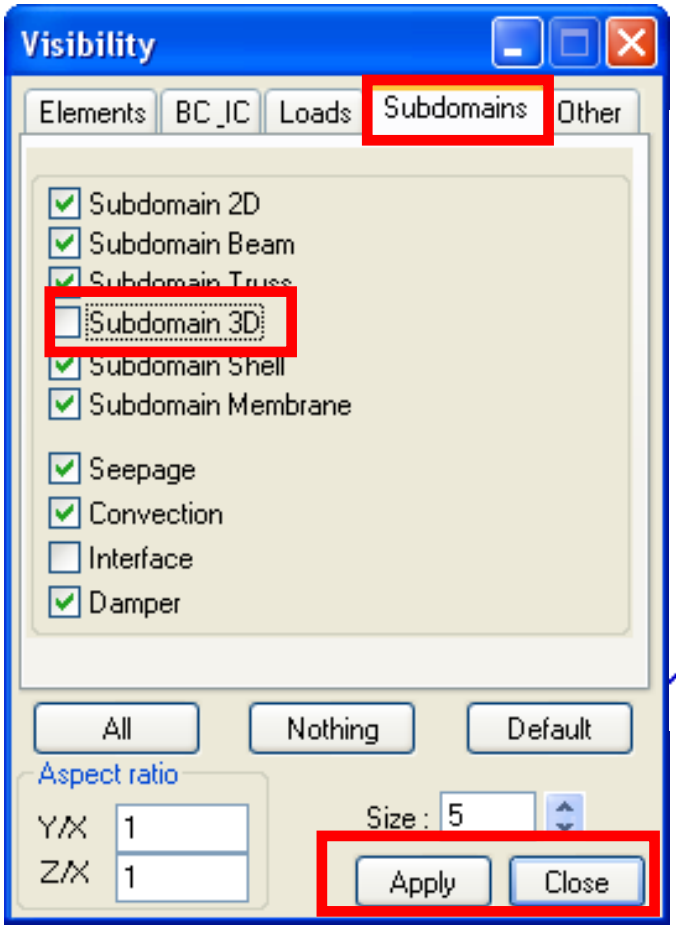


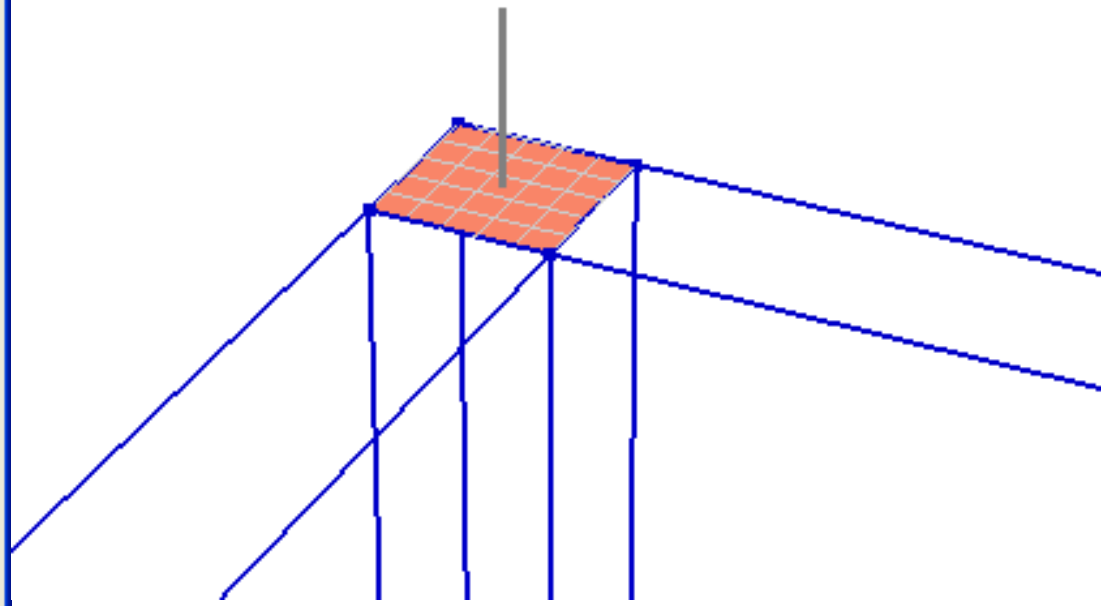


Definition of surface load

1. **Pick visbility icon**
2. **Hide Subdomain 3D**

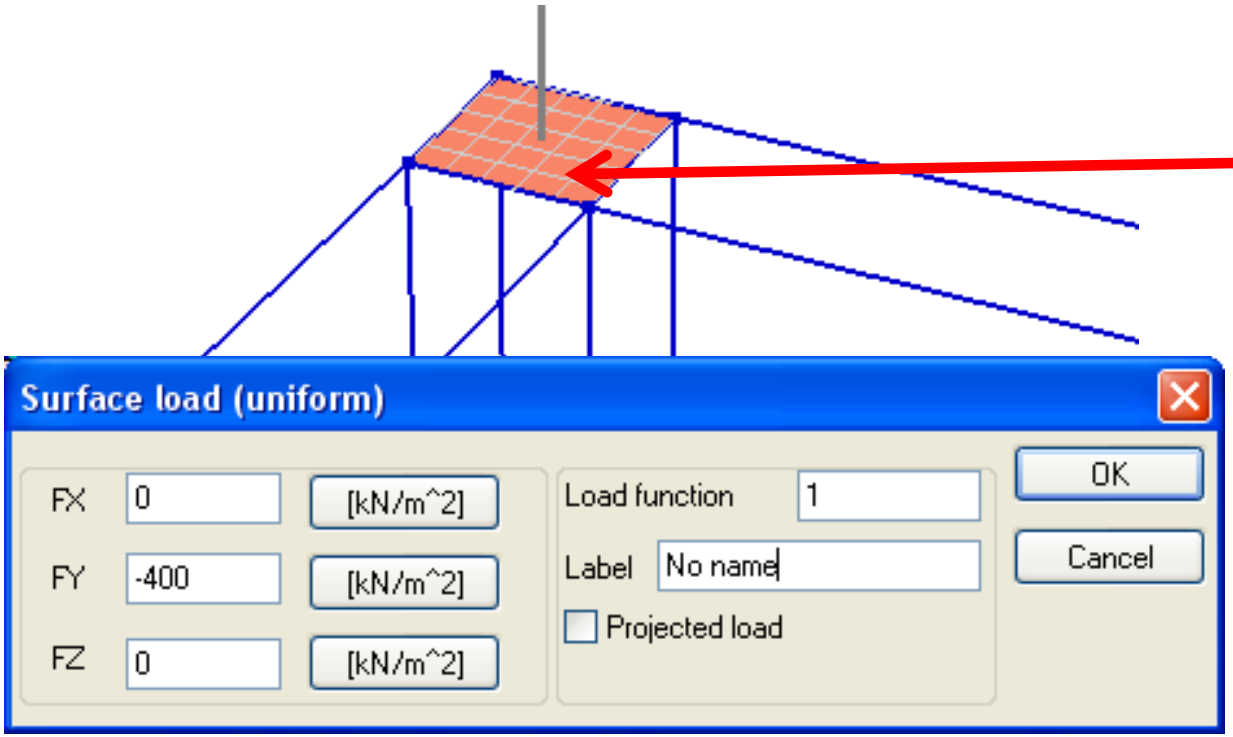


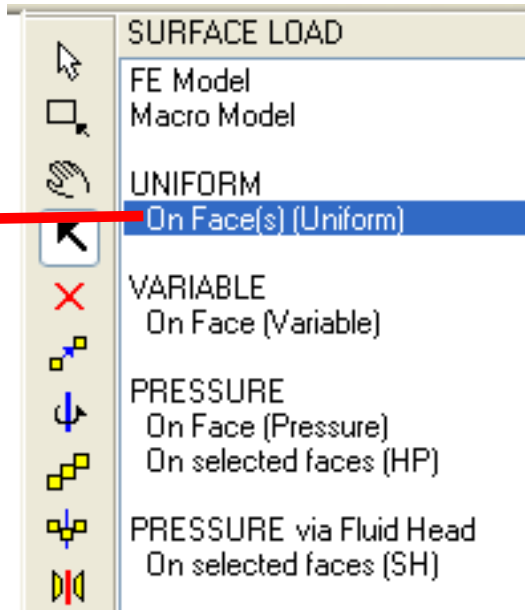


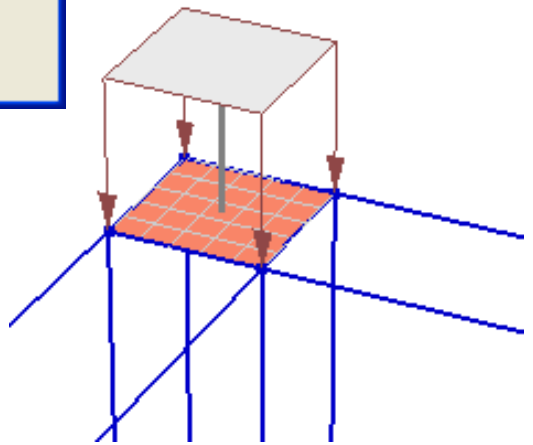


Definition of surface load

1. **Macro Model\Surface load**
2. **Hide Subdomain 3D**

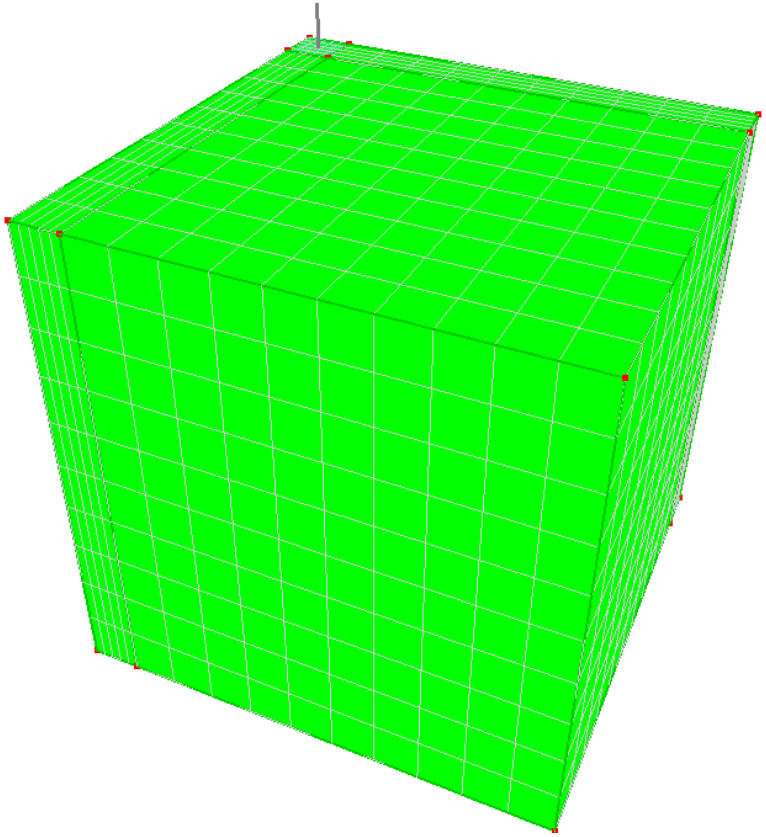


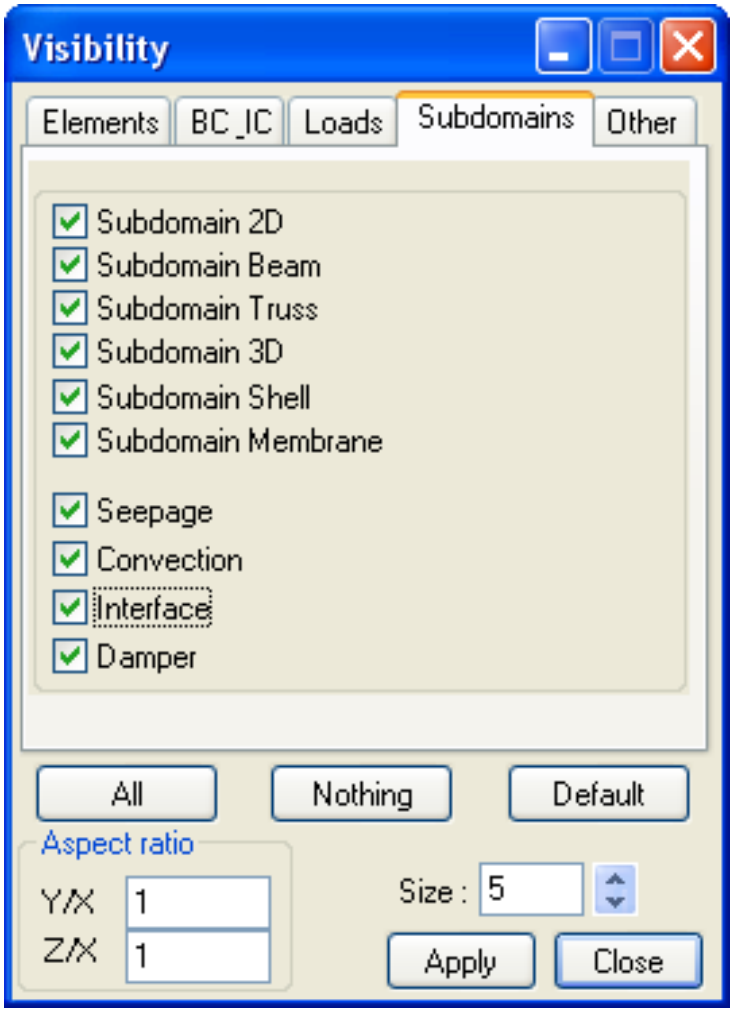




Real mesh generation

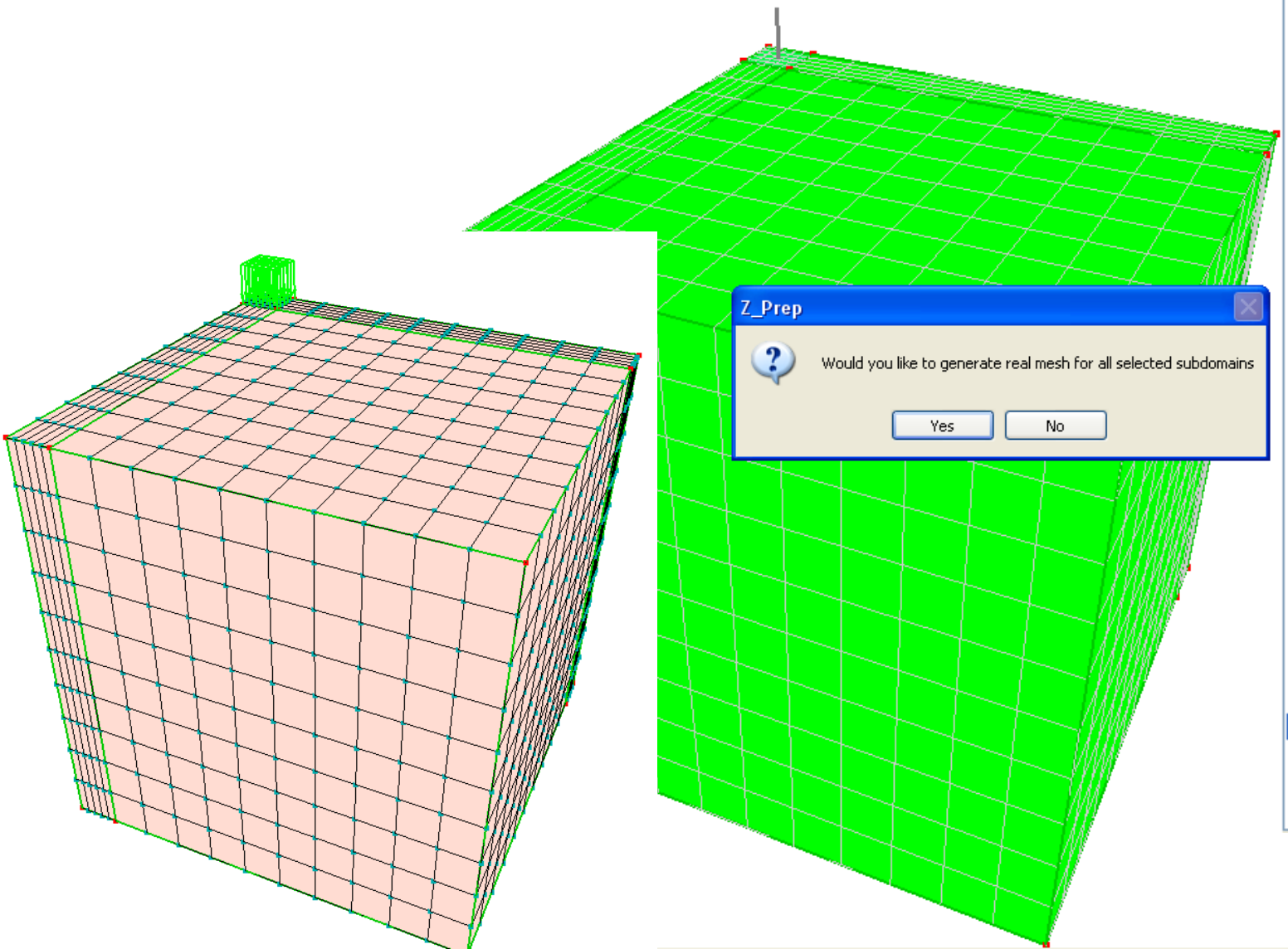
1. Pick visbility icon
2. Show Subdomain 3D
3. Show Interface
4. Ctrl-A – Select all





Real mesh generation

Macro Model\Subdomain\Virtual->Real mesh



SUBDOMAIN

FE Model
Macro Model

Create...
- 2D continuum on contour
- 3D continuum ...
- Beam on object(s)
- Truss on object(s)
- 3D shell ...
- 3D membrane ...

- Copy with rotation
- Copy with translation
- Copy by symmetry

[Un]/Outline..
- [Un] Select one Subdomain
- all
- In zoom box
- In zoom circle
- Inside contour

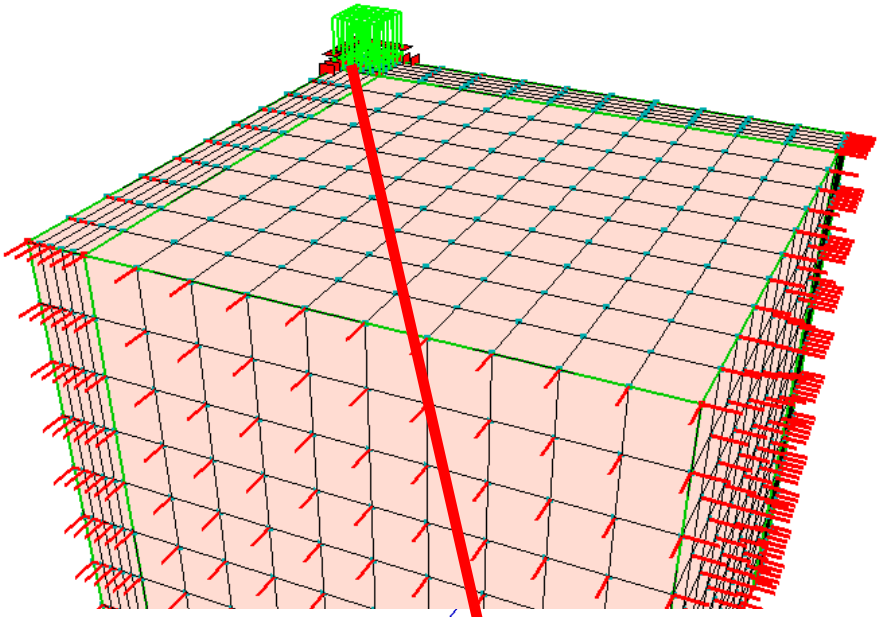
Delete...
- Delete

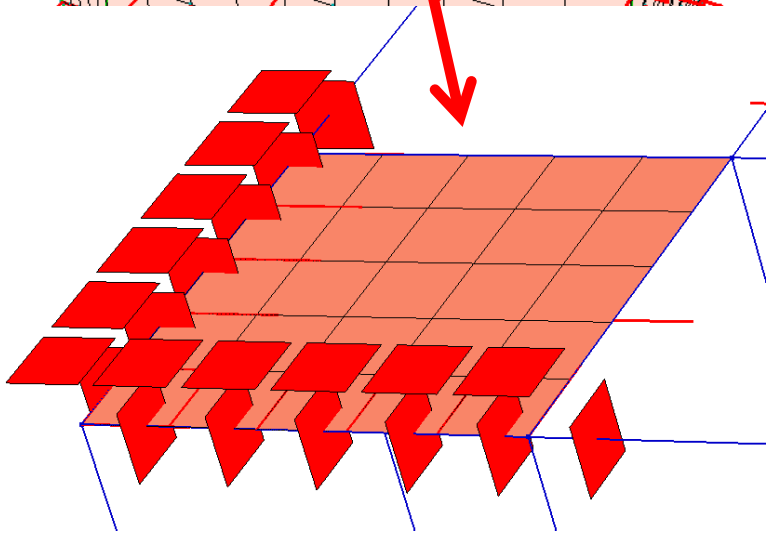
Update...
- Parameters
- Define excavation front
- Reverse direction
- Reverse X-axis
- Direction
- Thickness

Mesh
- Create virtual mesh
- Virtual -> Real mesh
- Remove virtual mesh
- Remove real mesh
- Set control Surface

Create Solid boundary conditions

FE model\Boundary Conditions\Solid BC\On box





SOLID BC

FE Model
Macro Model

Create...
On node
On element node

Add BC

On box

[Un]/Outline..
all
between 2 Nodes
between 4 Nodes
Box with 2 Nodes
In zoom box
In zoom circle
Inside contour
With load function
With existence function
With label

FE MODEL

DOMAIN
Macro Model

Node

Beam
Anchor
Continuum 2D
Continuum 3D
Shell
Shell one layer
Membrane
Infinite element

Interface
Interface (large deformation)
Seepage
Convection
Viscous damper
Shell Hinge

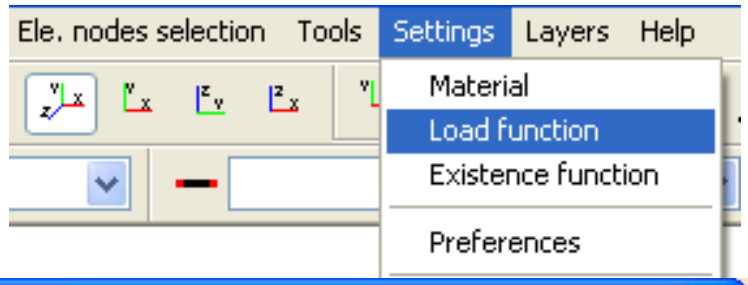
Boundary Conditions
Loads
Added masses
Distributed Fluxes
Initial Conditions
DRM domains

Solid BC

Temperature BC
Humidity BC
Pressure BC

Periodic BC

Load function



Load function

Function definition

Number 1 Name No name

Add Modify Delete

Function

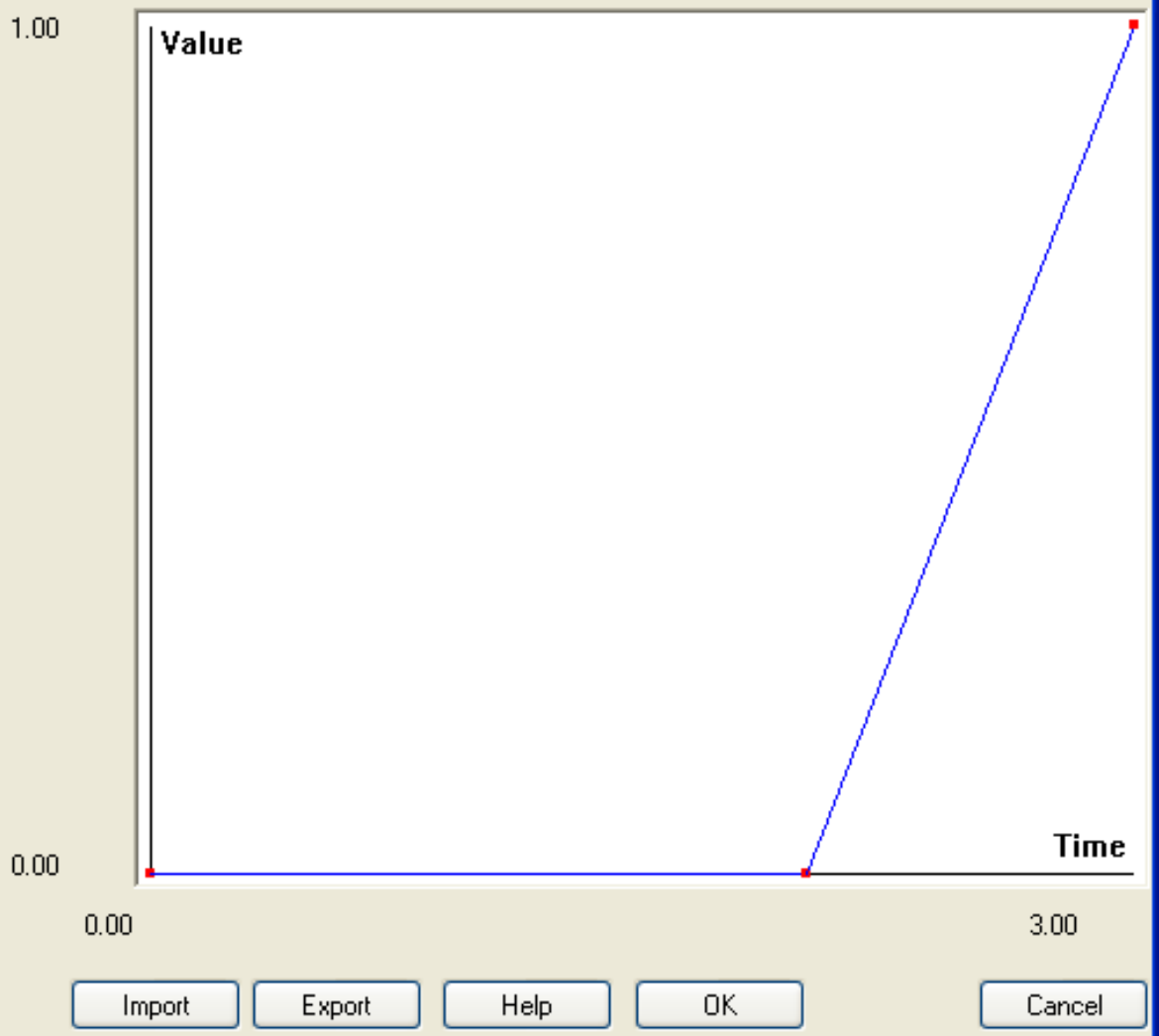
1 : No name

Time Value

3 [s] 1

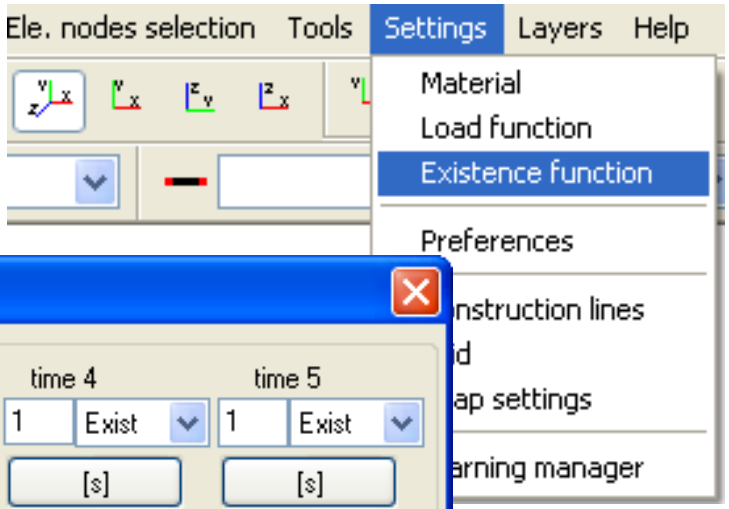
1	0.0000	0.0000
2	2.0000	0.0000
3	3.0000	1.0000

Insert
Modify
Delete
Delete all
Del. in range
Expression



Import Export Help OK Cancel

Existence function



Existence functions

Function definition

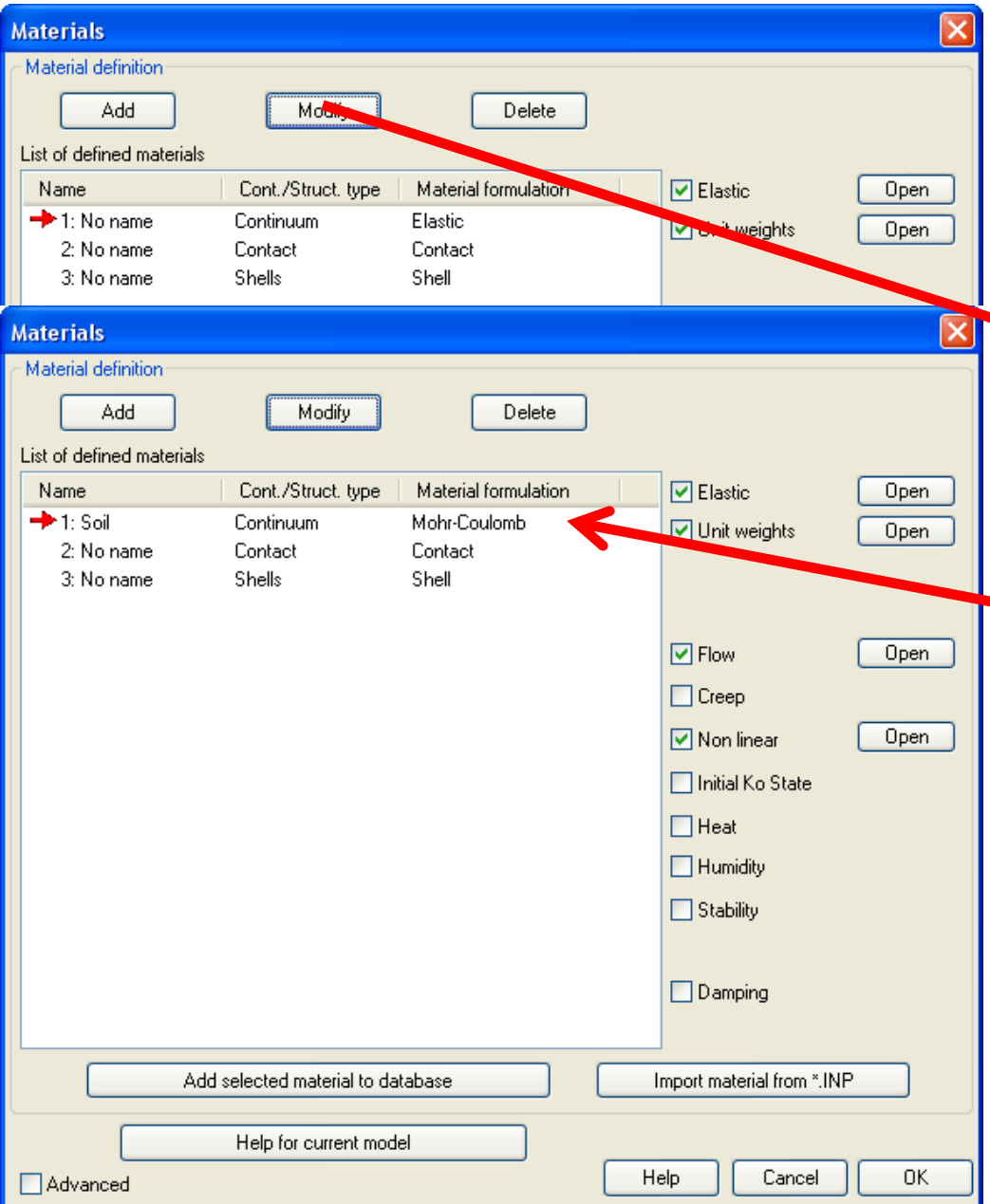
Number	Name	time 1	time 2	time 3	time 4	time 5
1	No name	1 Exist [s]	1 Exist [s]	1 Exist [s]	1 Exist [s]	1 Exist [s]

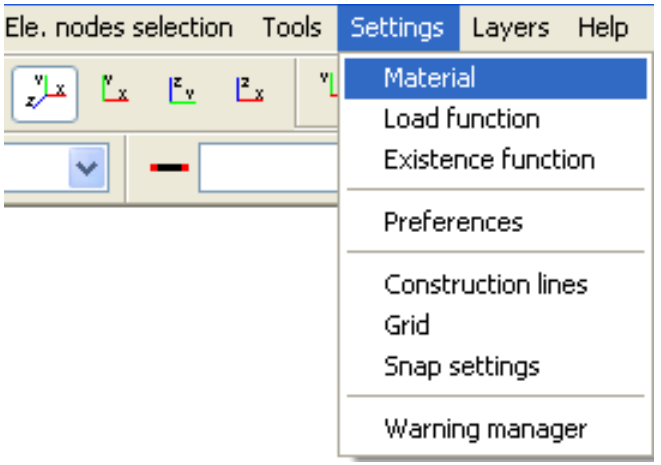
Add | Replace | Delete

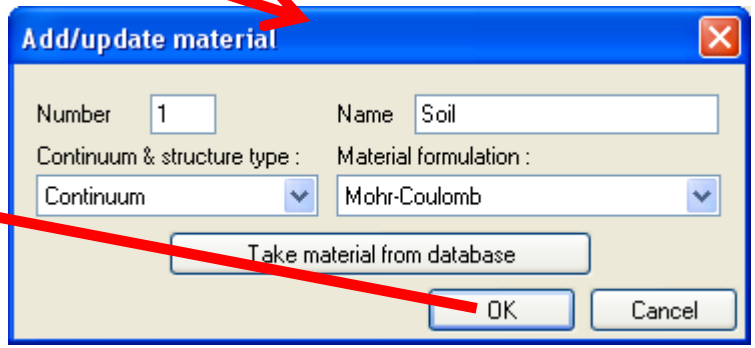
N°:name	T 1	Exist...	T 2	Exist...	T 3	Exist...	T 4	Exist...	T 5	Exist...
1 : No name	1.0000	exist	1.0000	exist	1.0000	exist	1.0000	exist	1.0000	exist

Export | Import | Automatic generation | Help | OK | Cancel

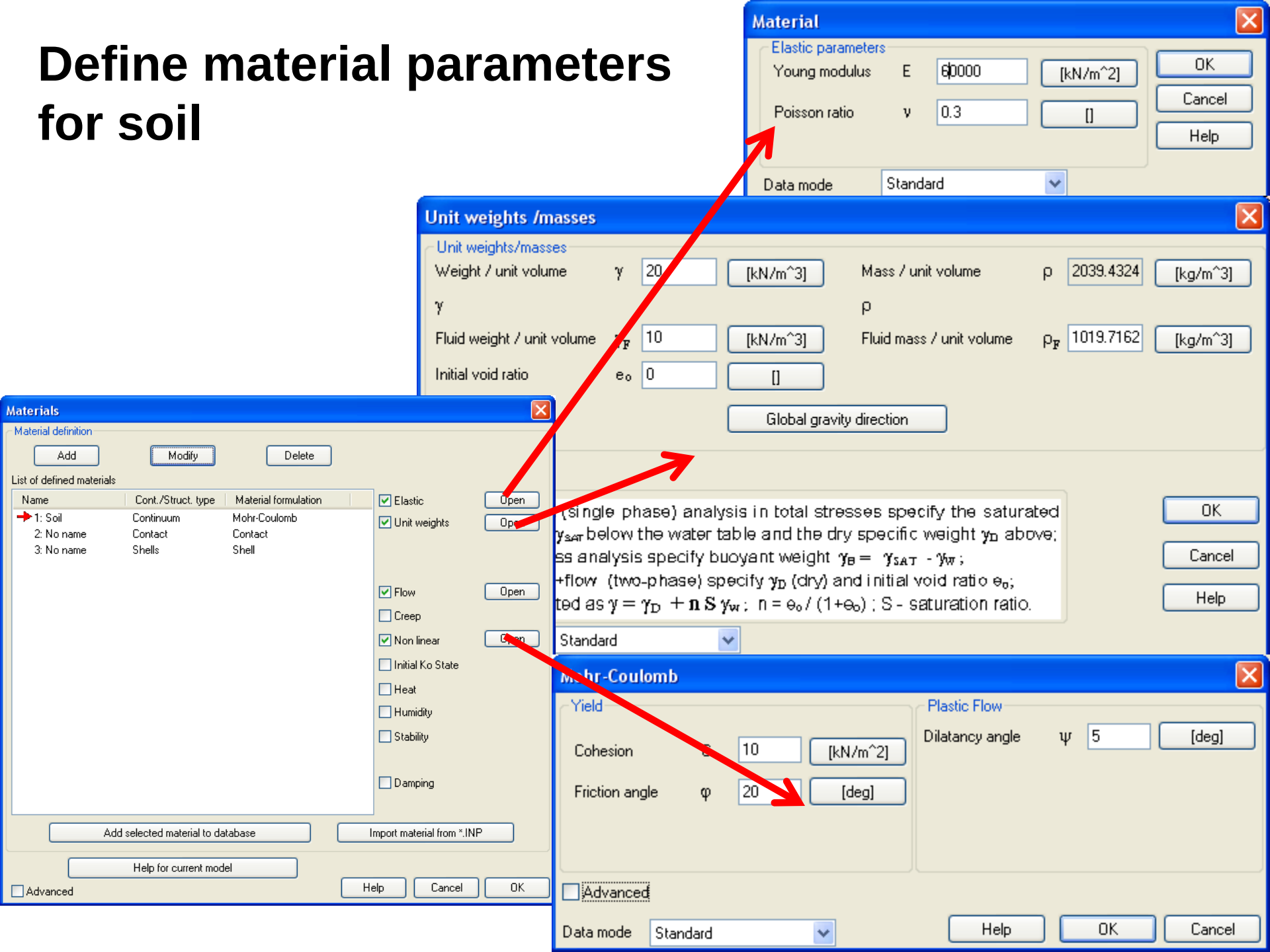
Define Materials for soil



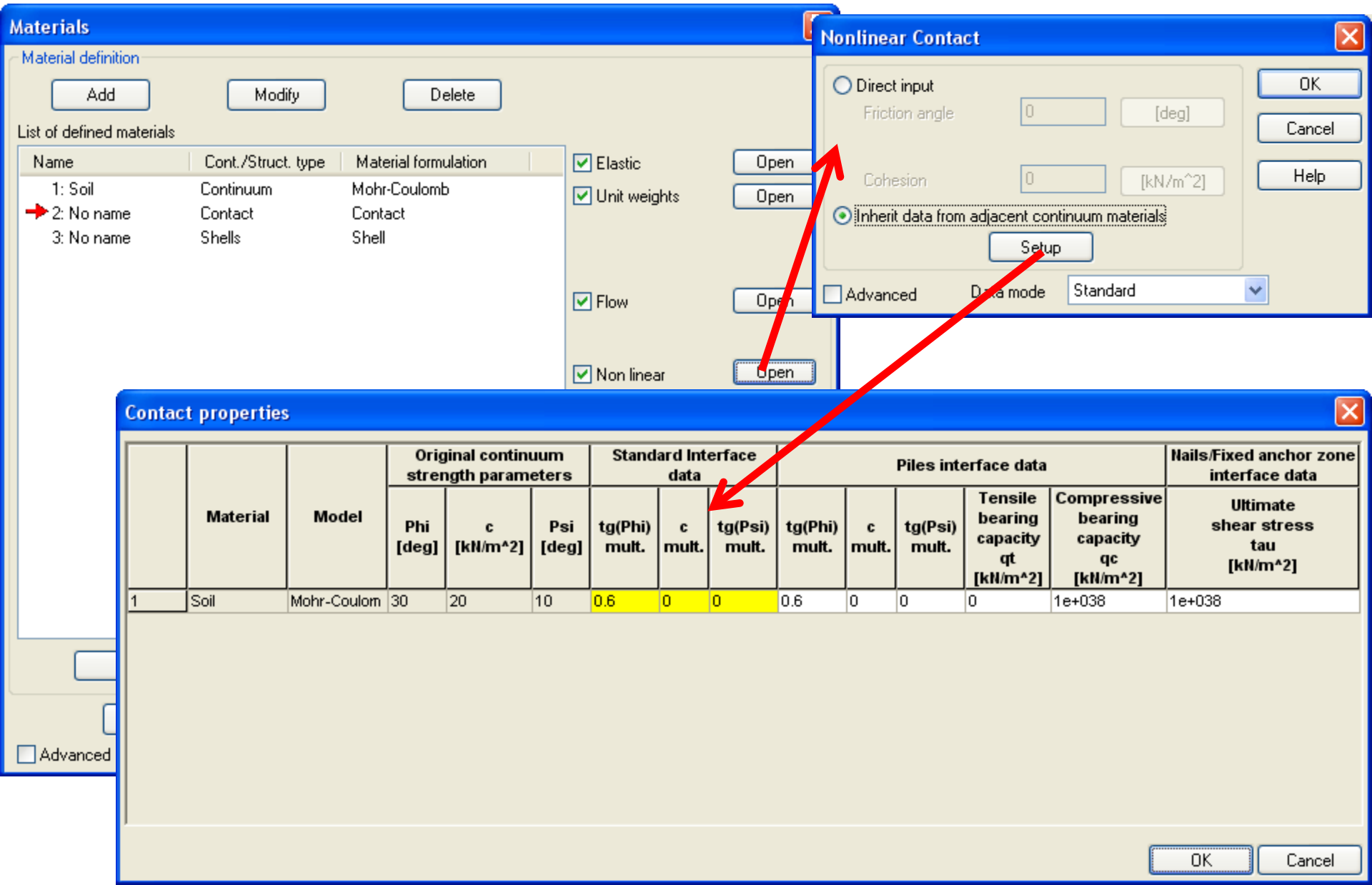




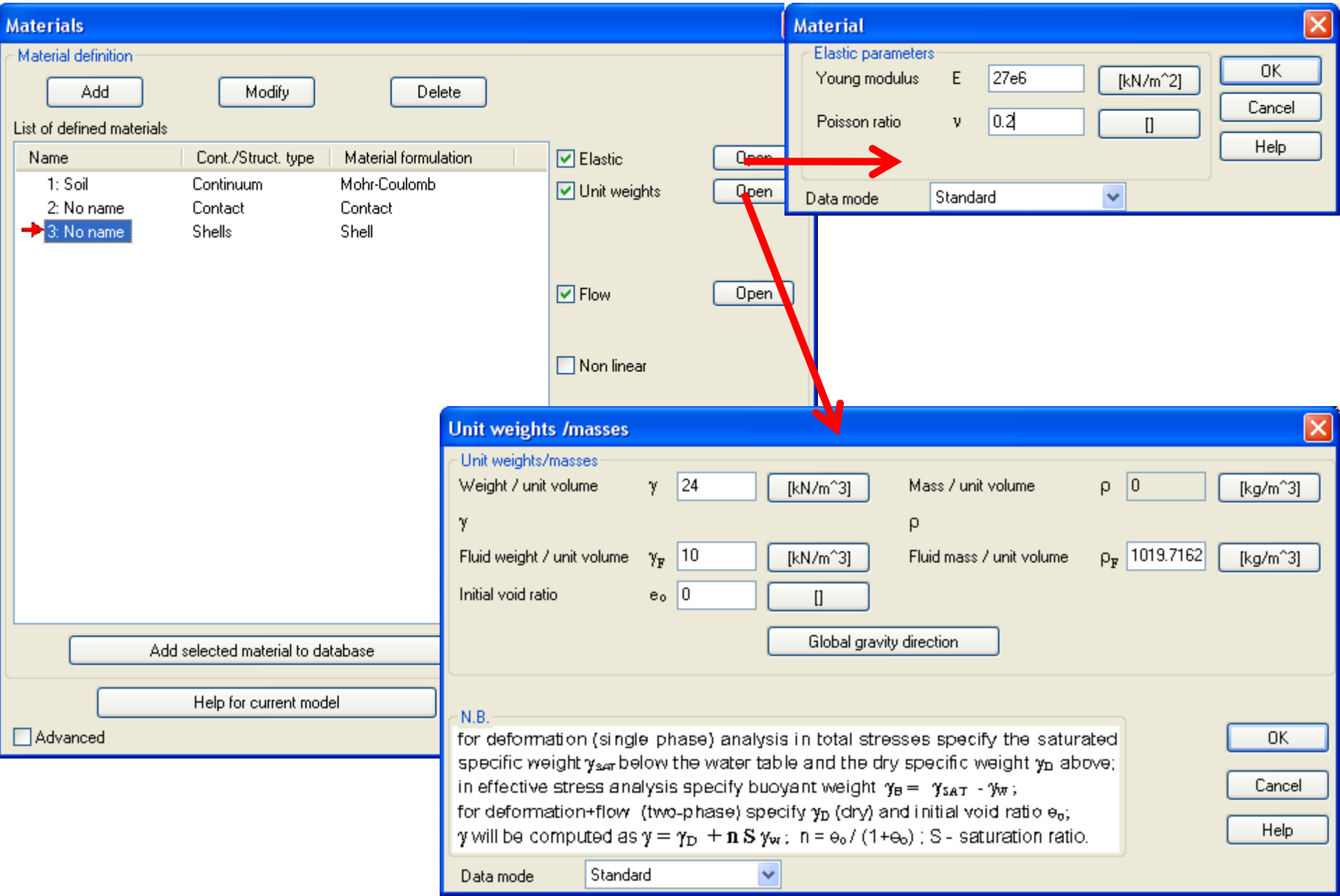
Define material parameters for soil



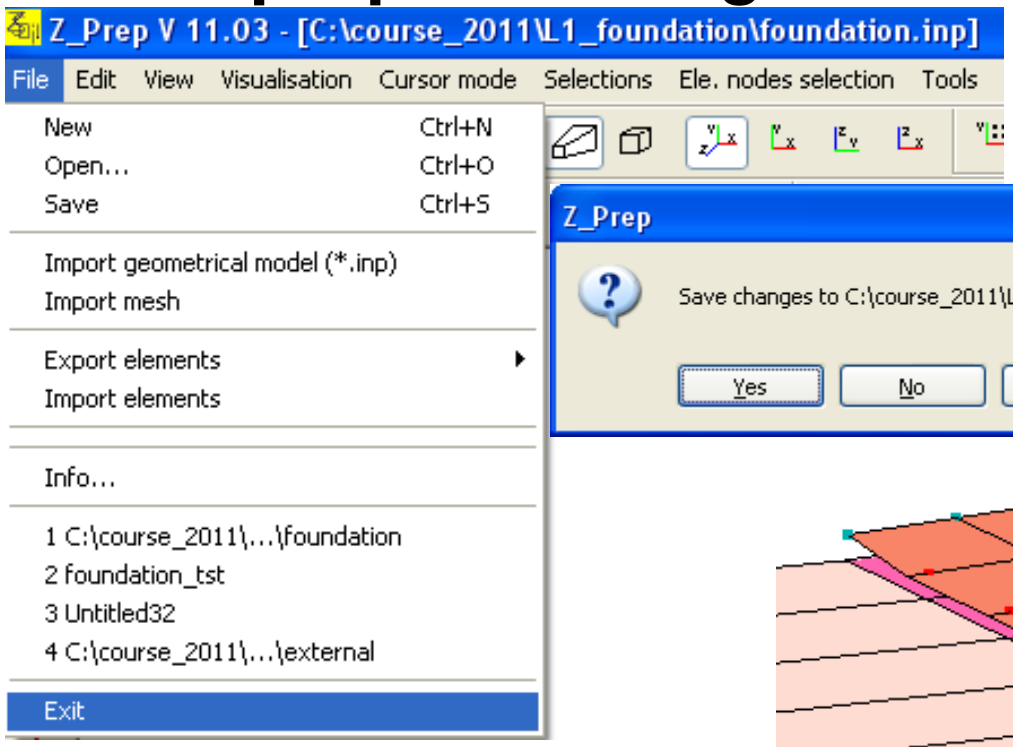
Define materials for interface



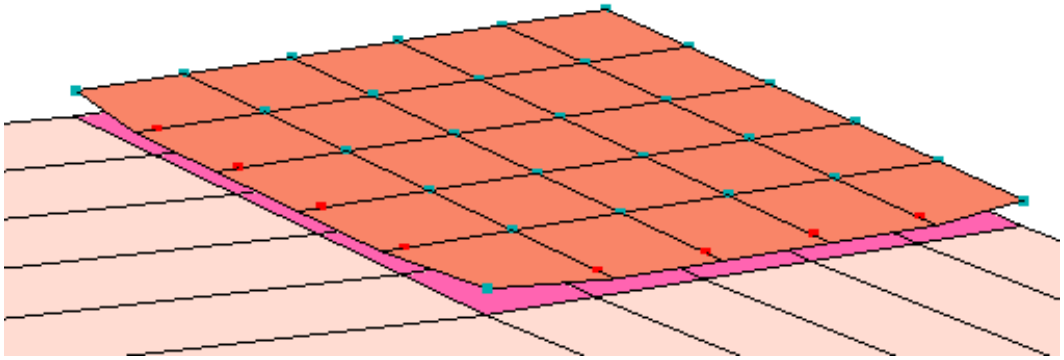
Define materials for shell



Close preprocessing

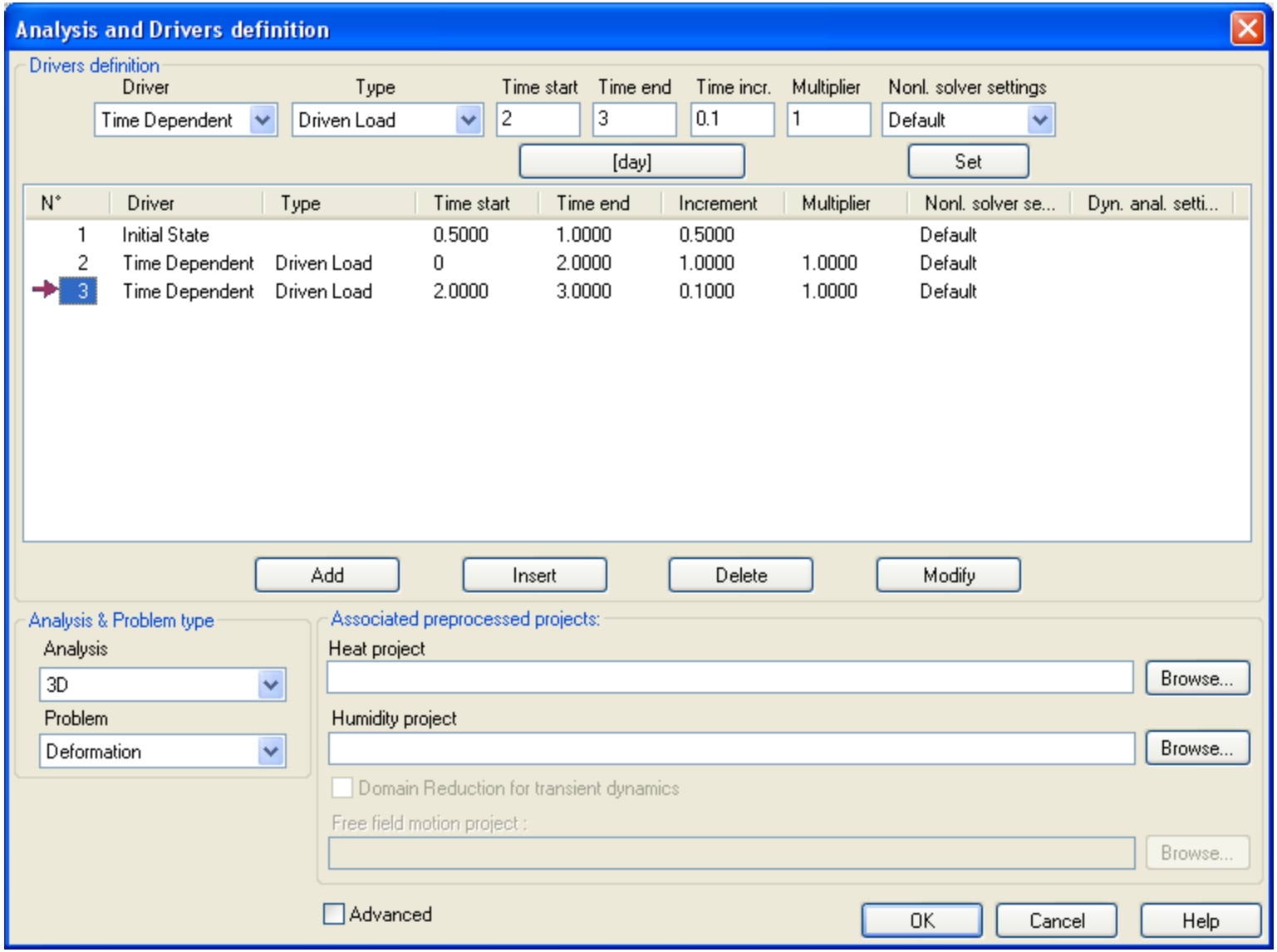


FILE\Exit -
with saving changes

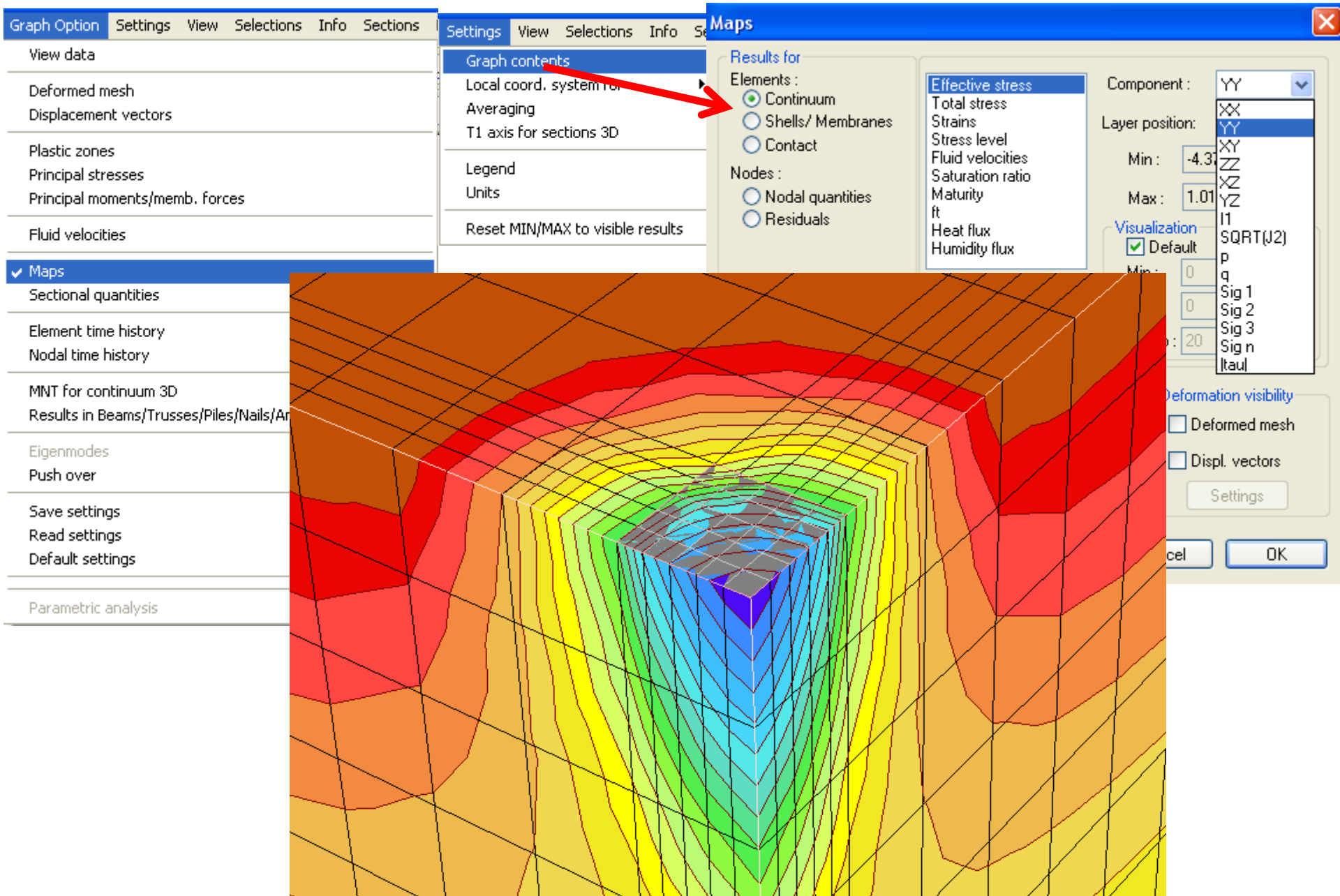


Ignore warnings and exit application

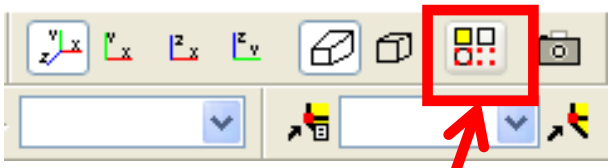
Define Drivers

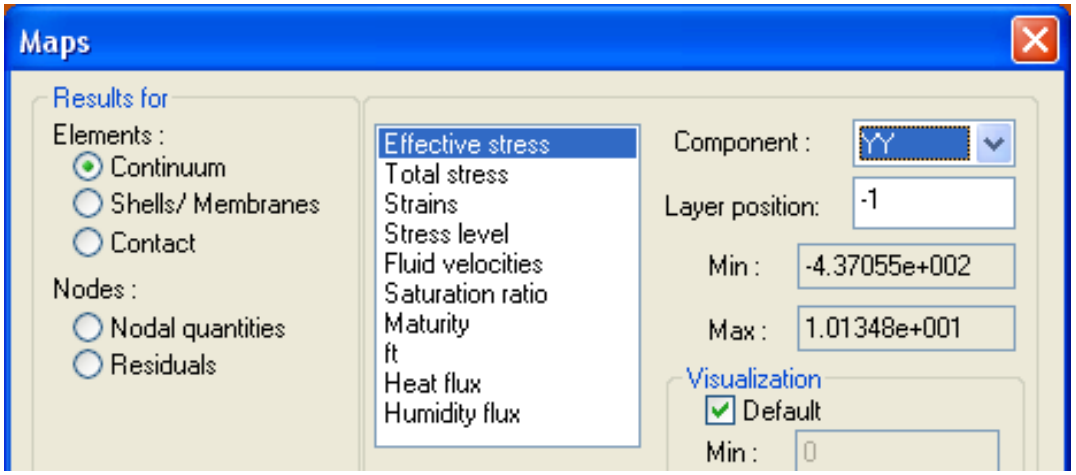


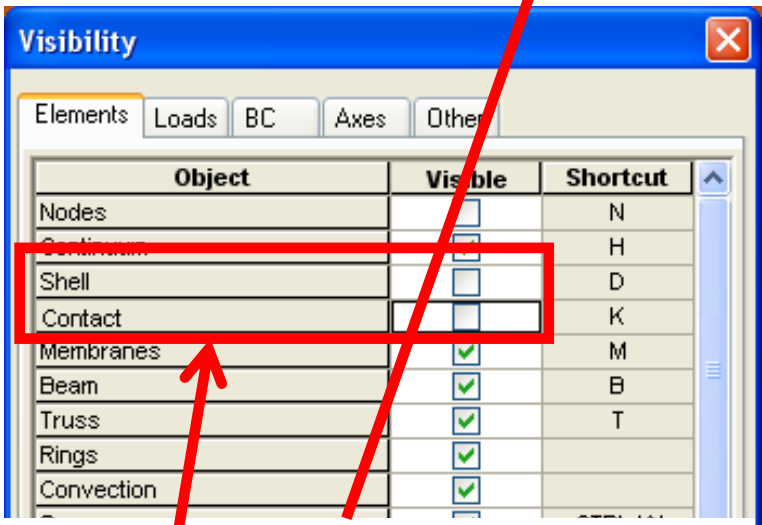
Postprocessing – Results maps



Postprocessing – Results maps

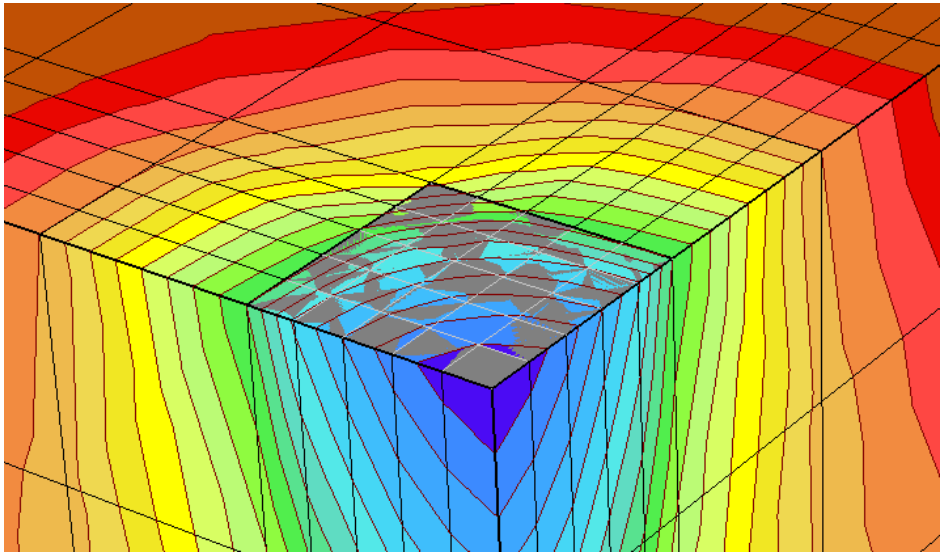


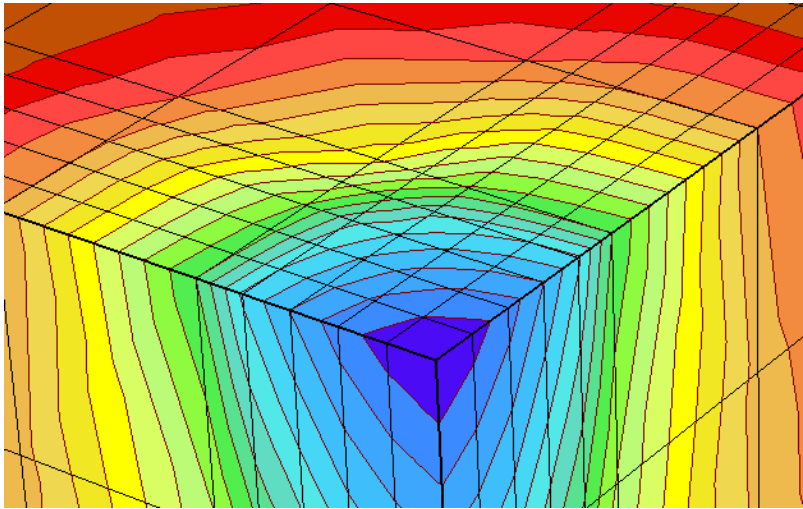




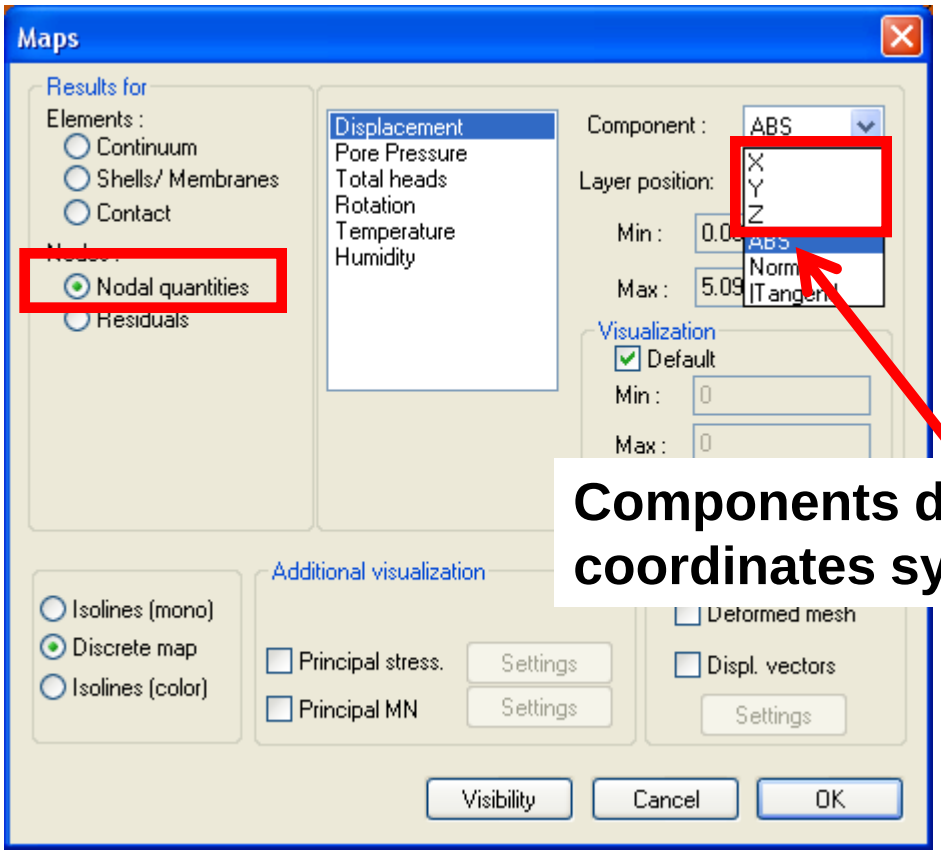
Results for Continuum selected
No results for shells and contact elements

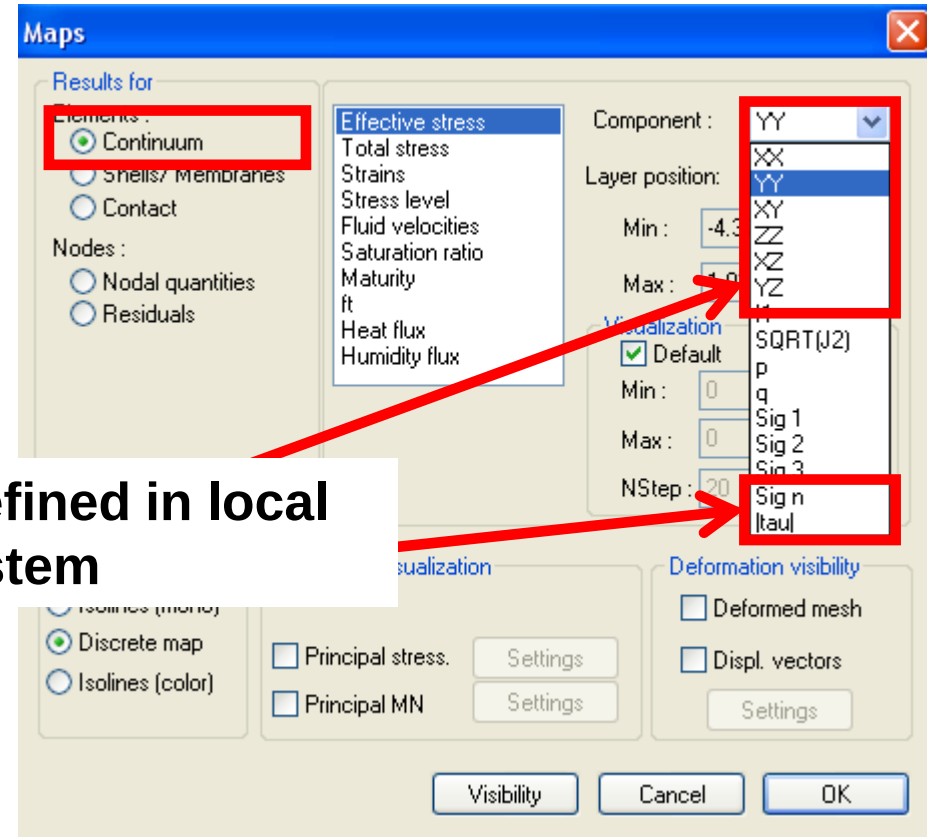
Open Visibility dialog box
Turn off elements with no active results





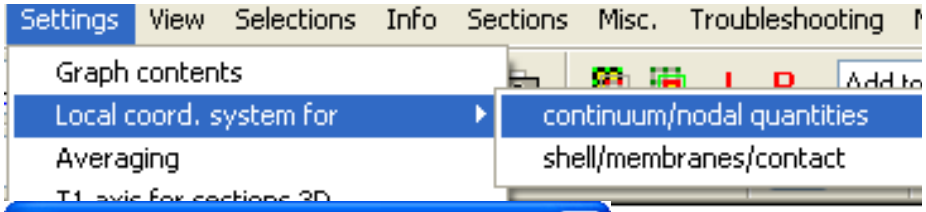
Results maps – local coordinates system for continuum/nodal quantities

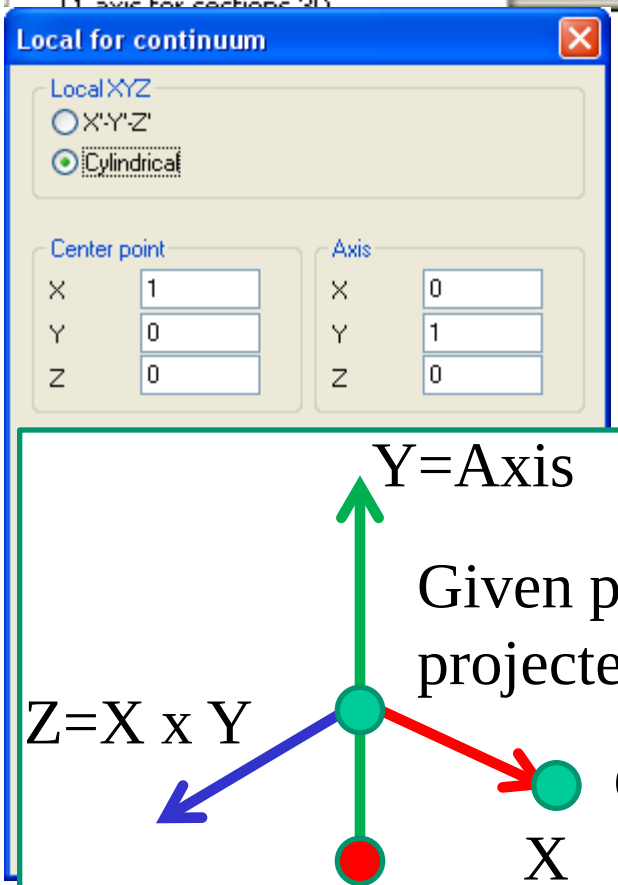


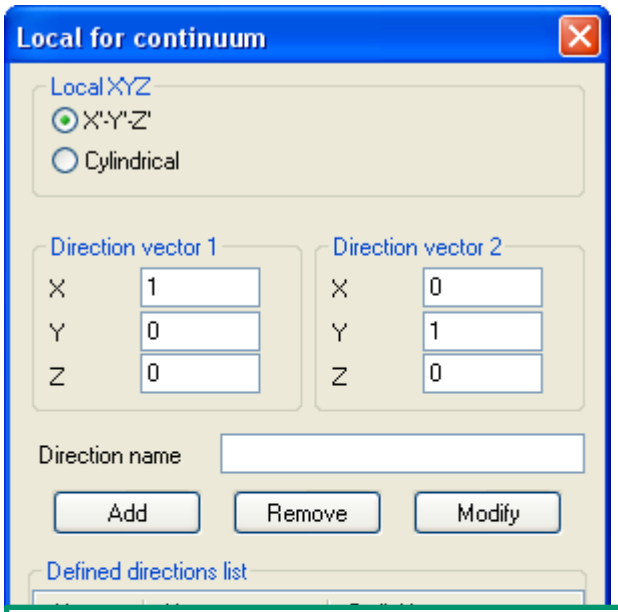


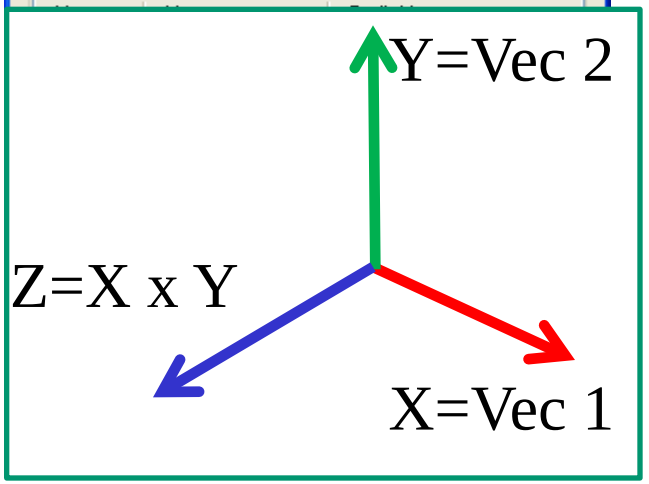
Components defined in local coordinates system

Results maps – local coordinates system for continuum/nodal quantities

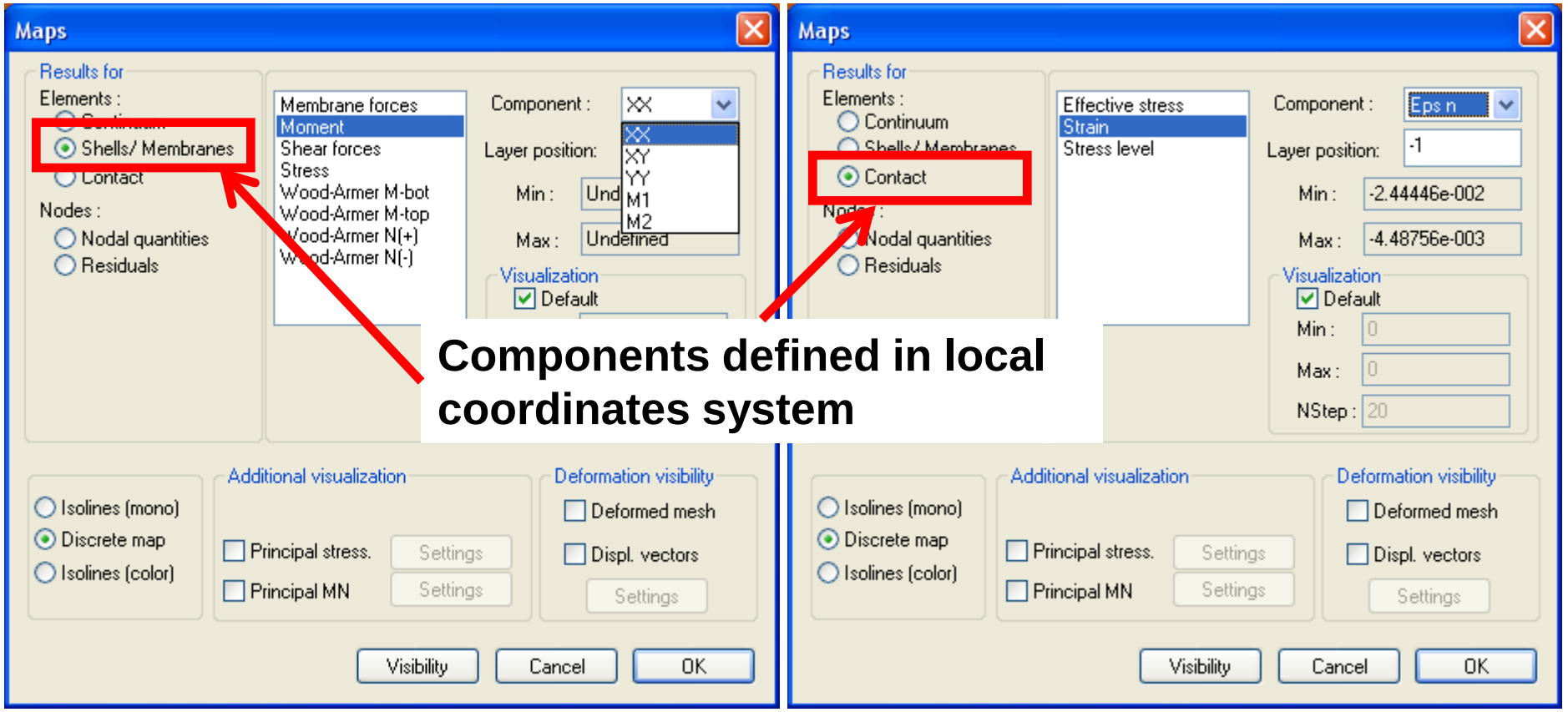




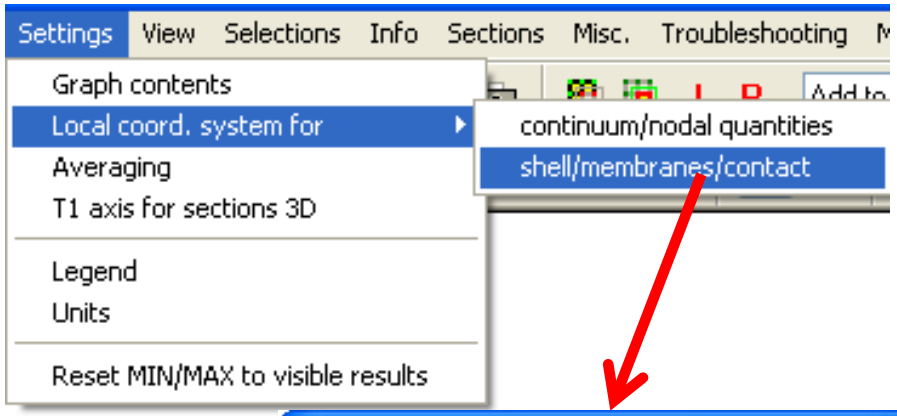


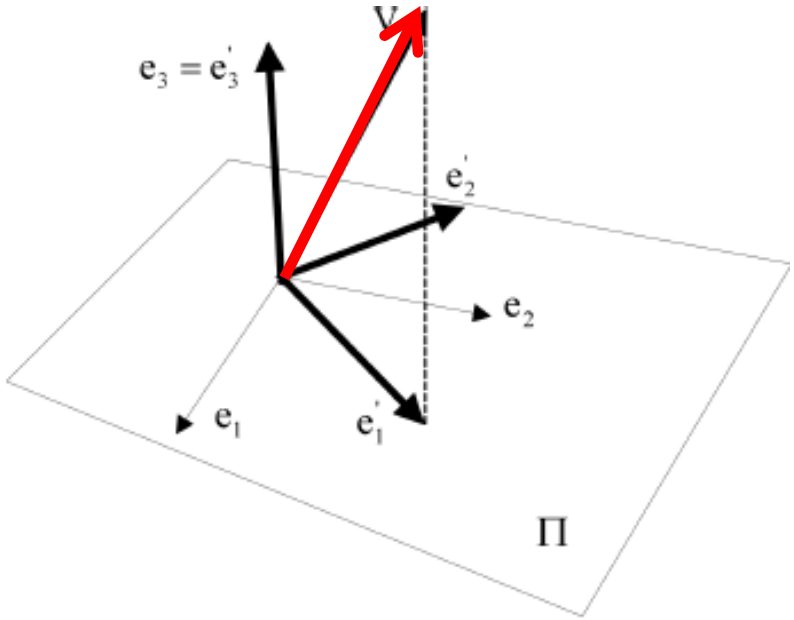


Results maps – local coordinates system for shell/membranes/contact

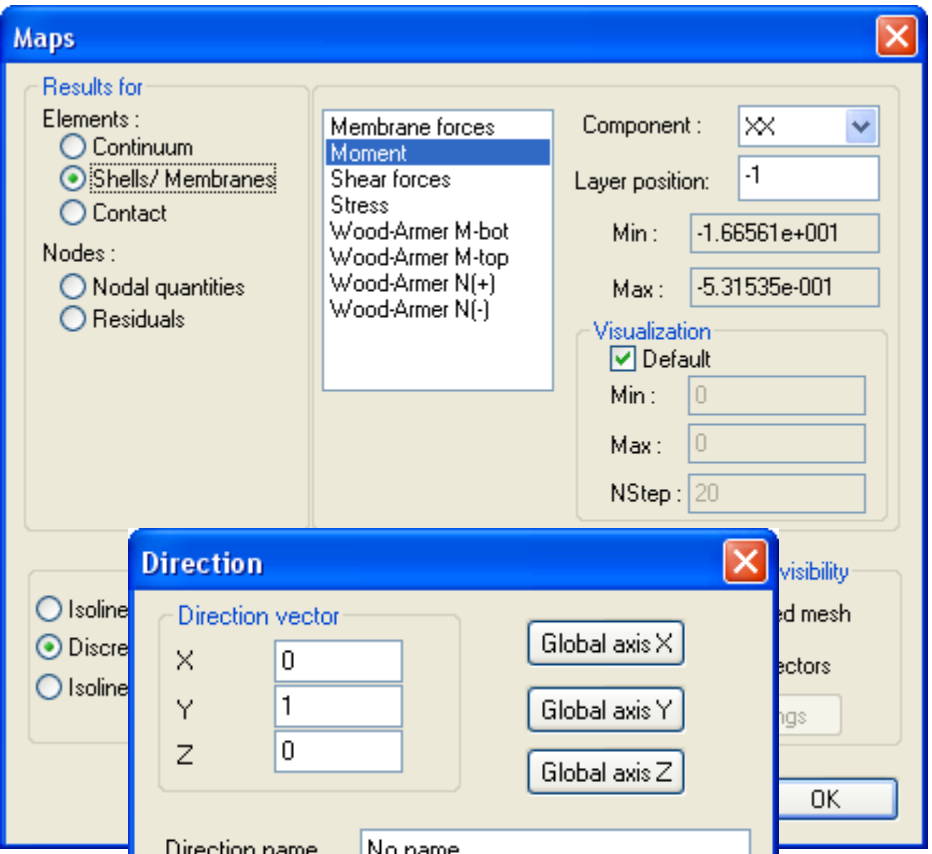


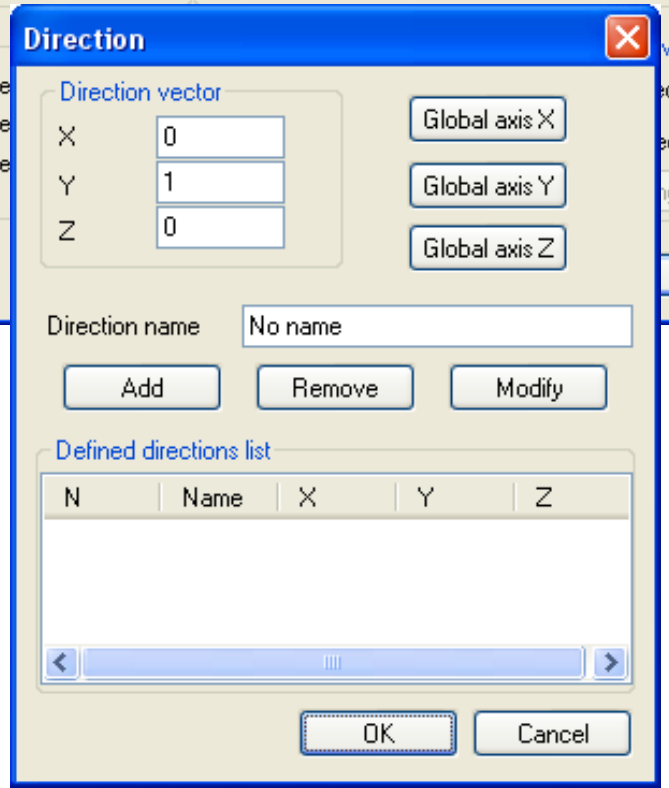
Results maps – local coordinates system for shell/membranes/contact

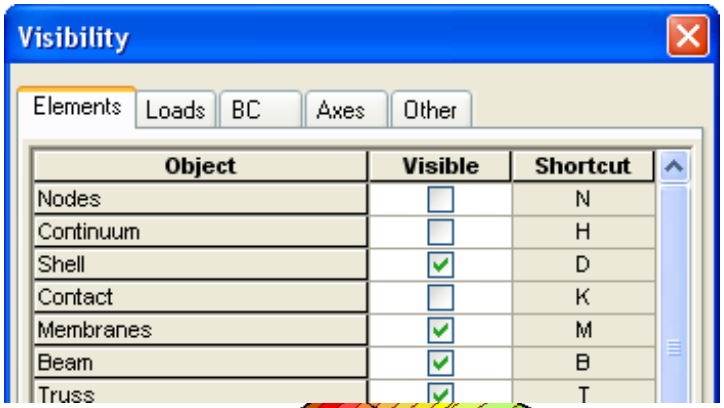


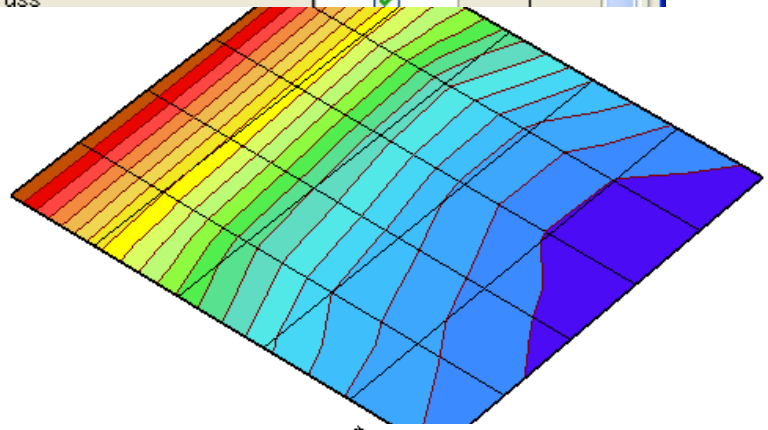


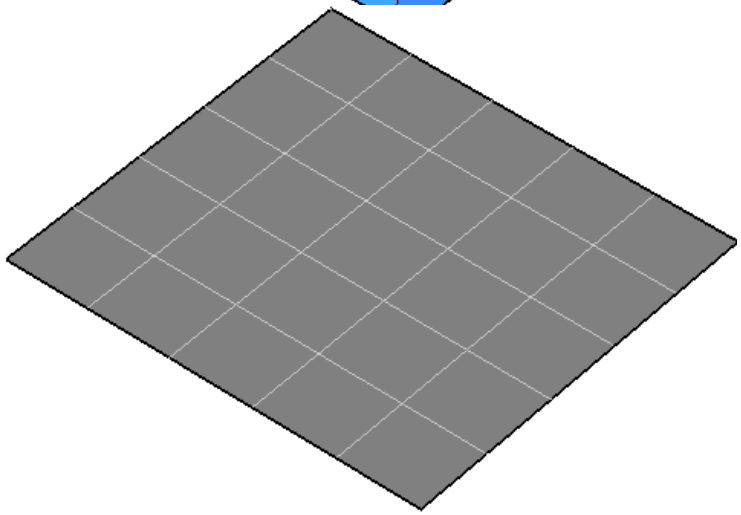
Maps – moments XX



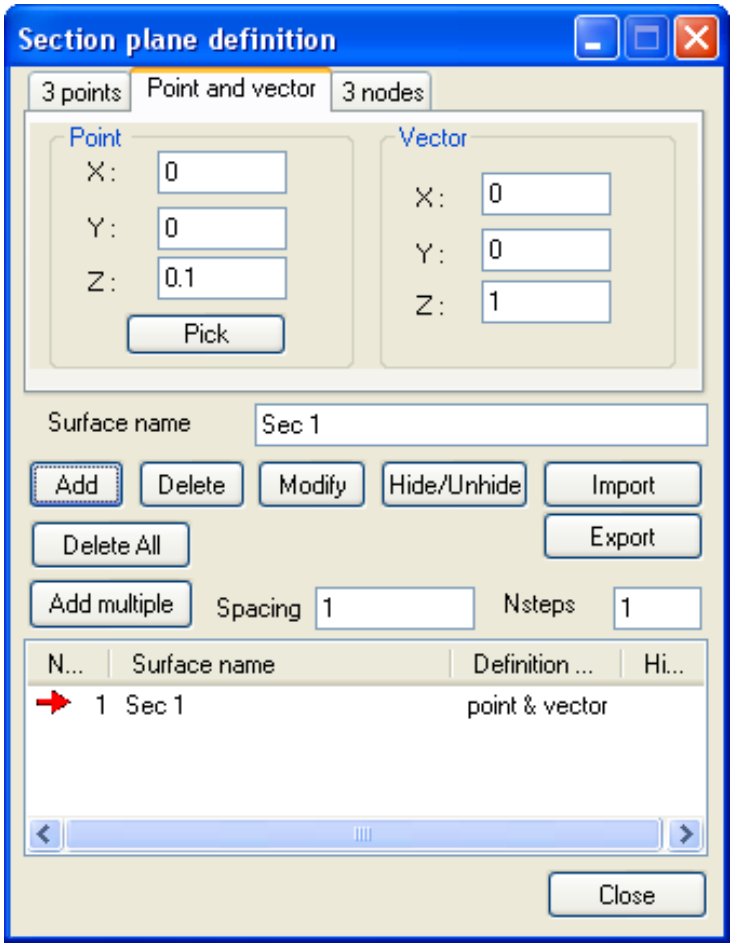


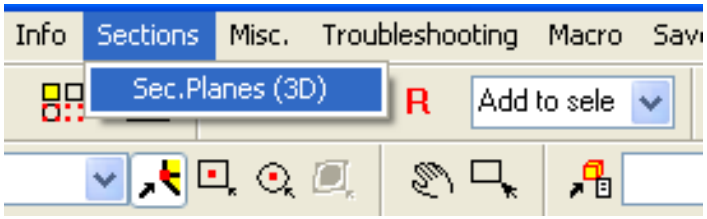


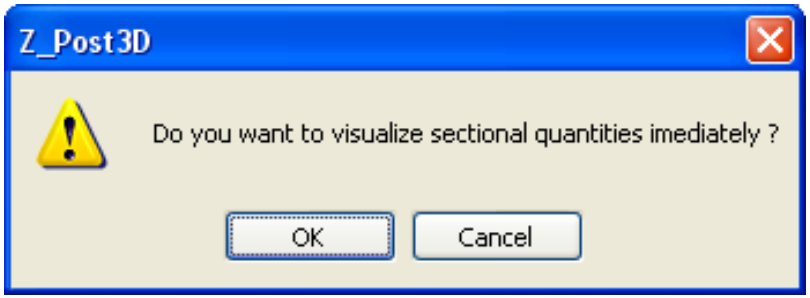


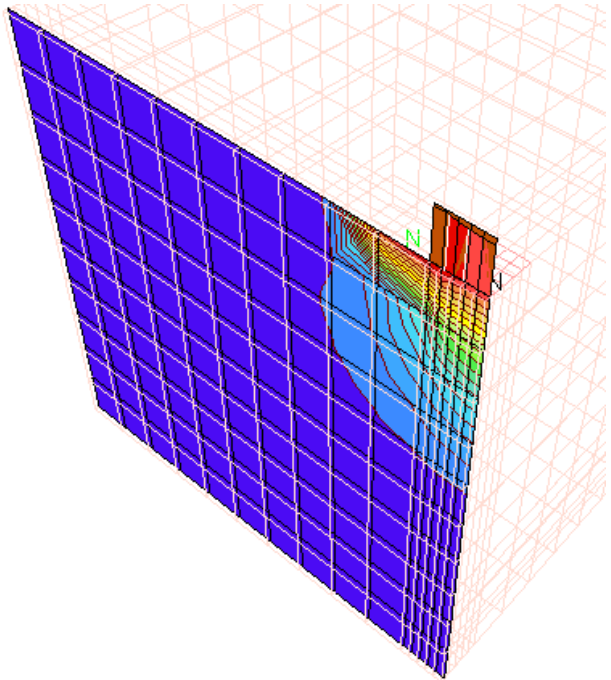


Sectional quantities

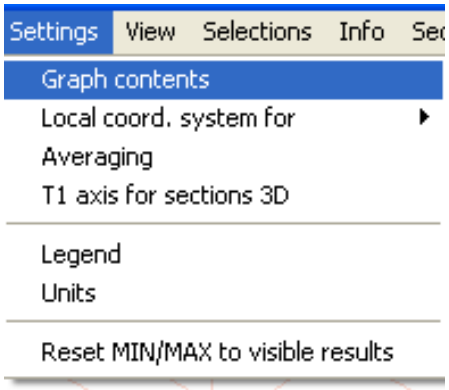


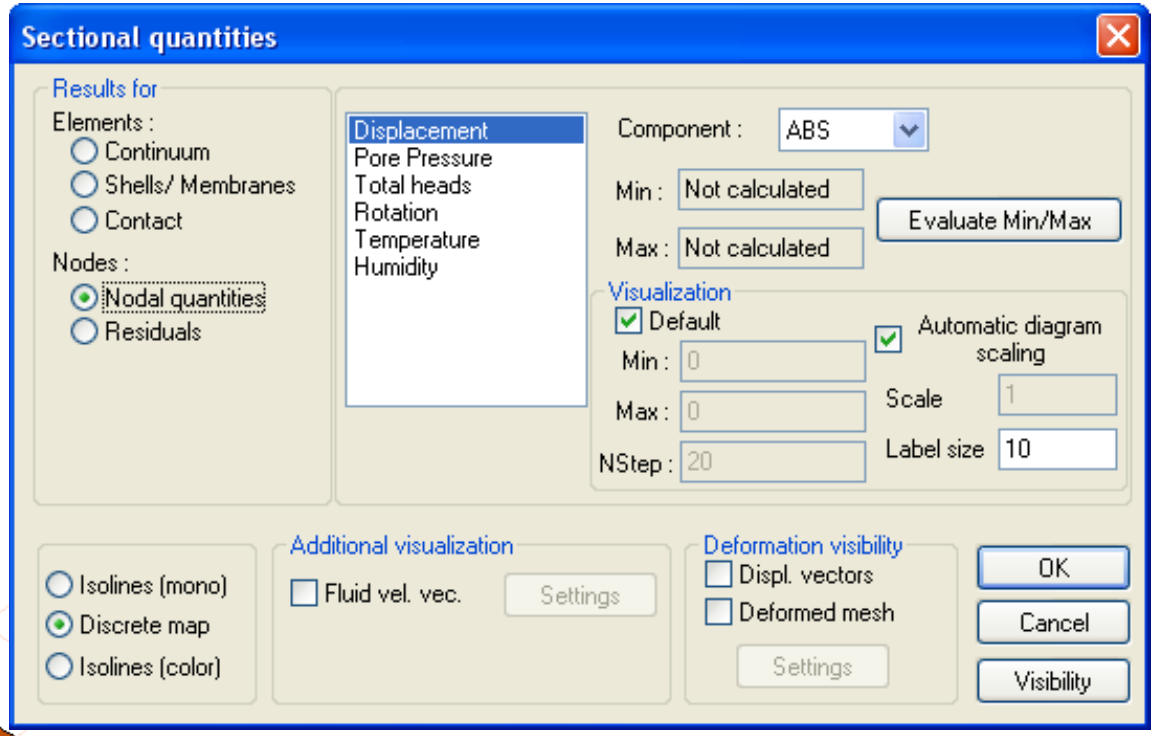


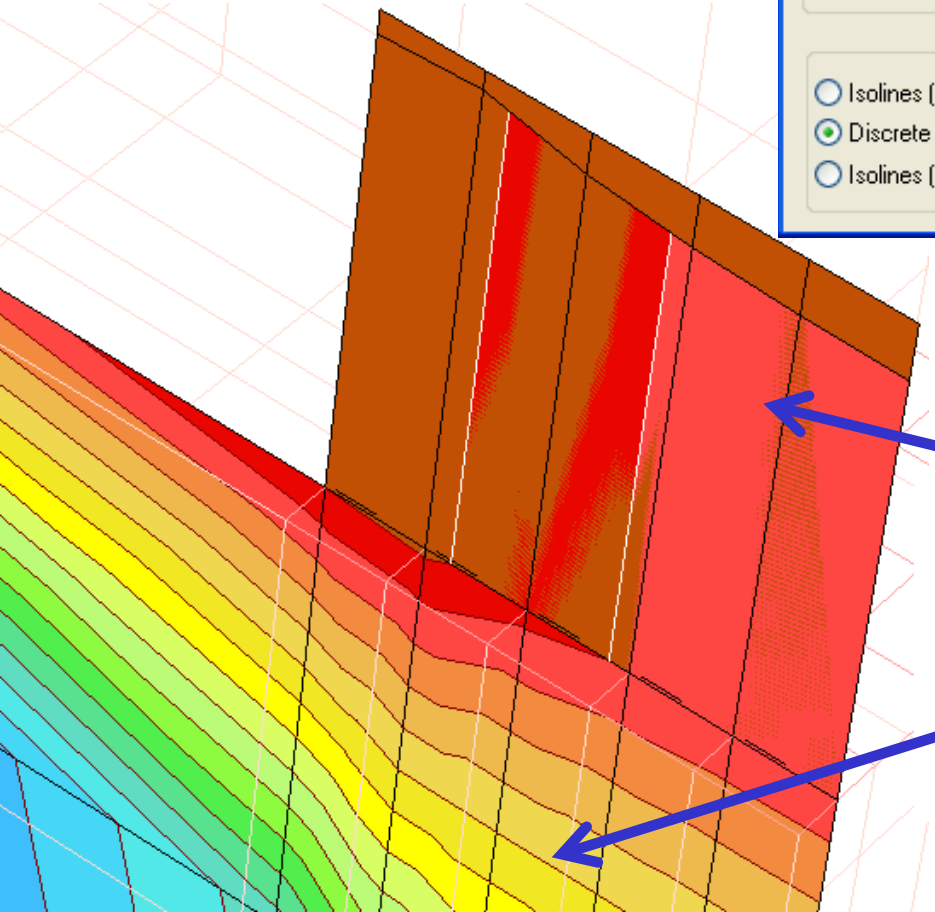




Sectional quantities



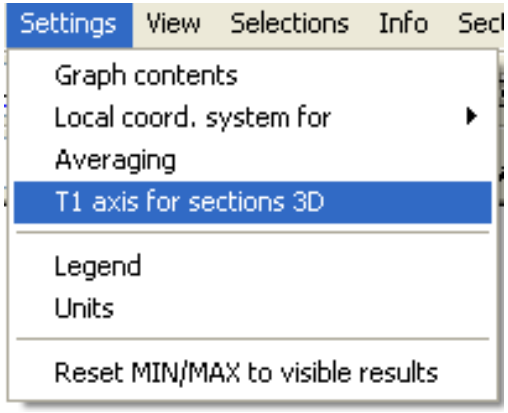


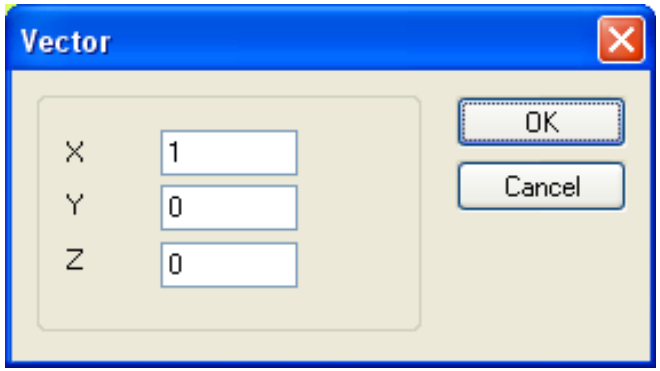


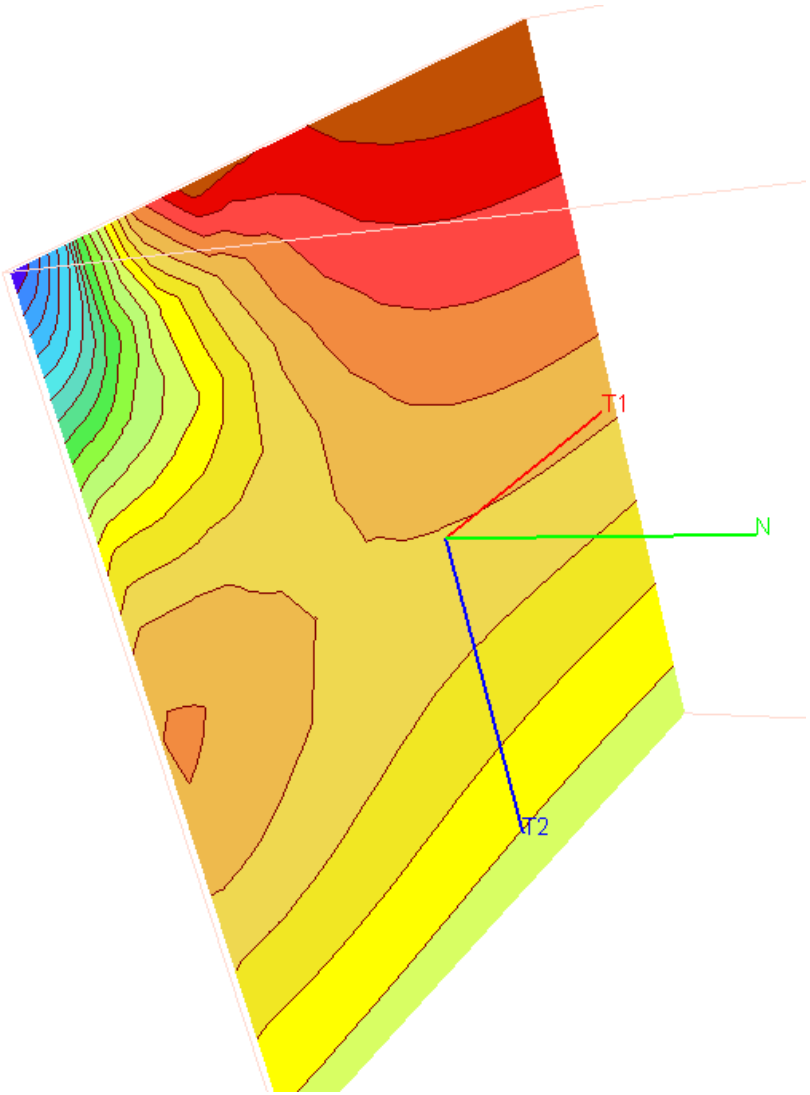
Diagrams for sections through Shell/Membrane/Contact

Maps for sections through Continuum 3D

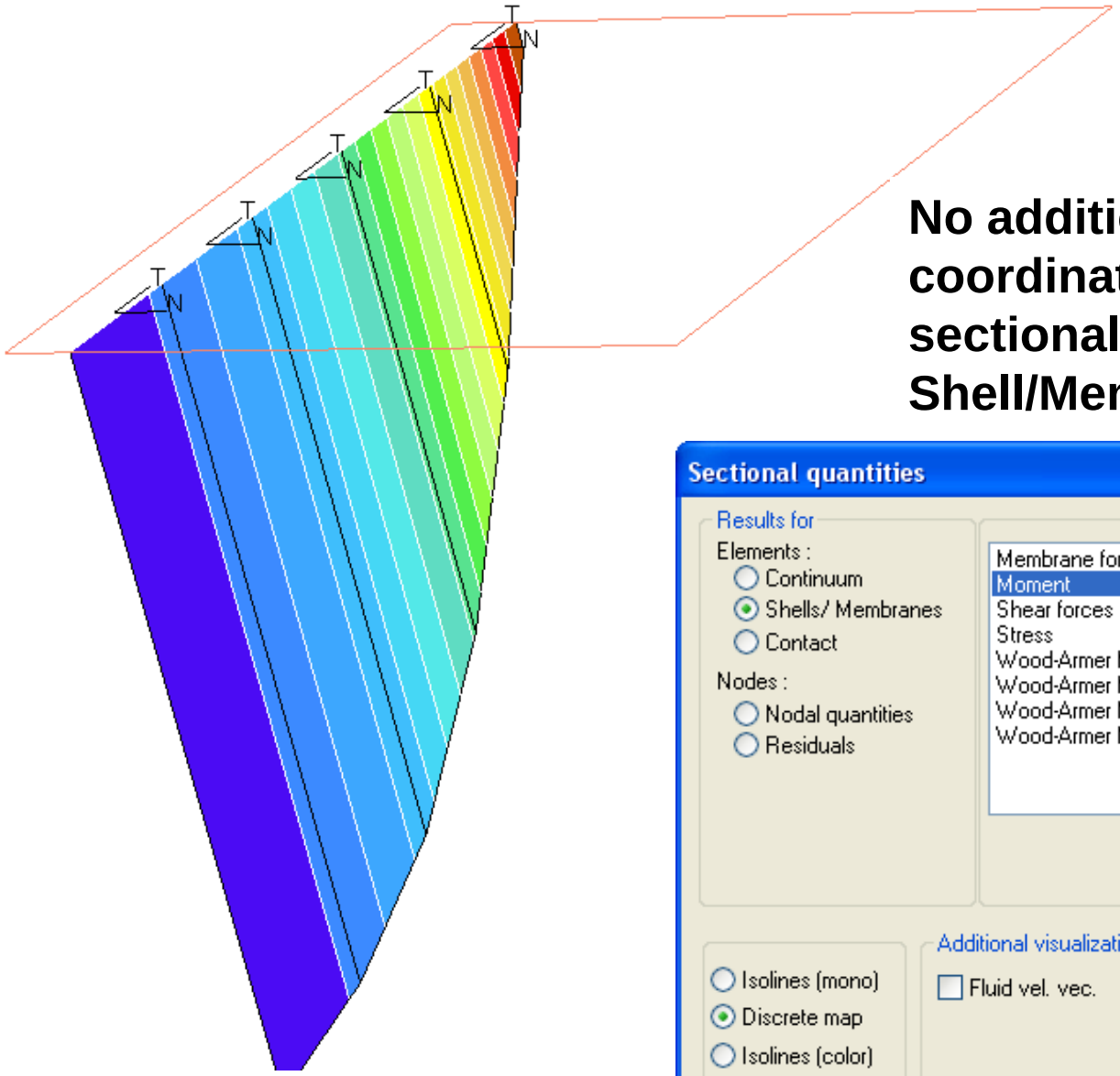
Sectional quantities – local coordinates system for continuum



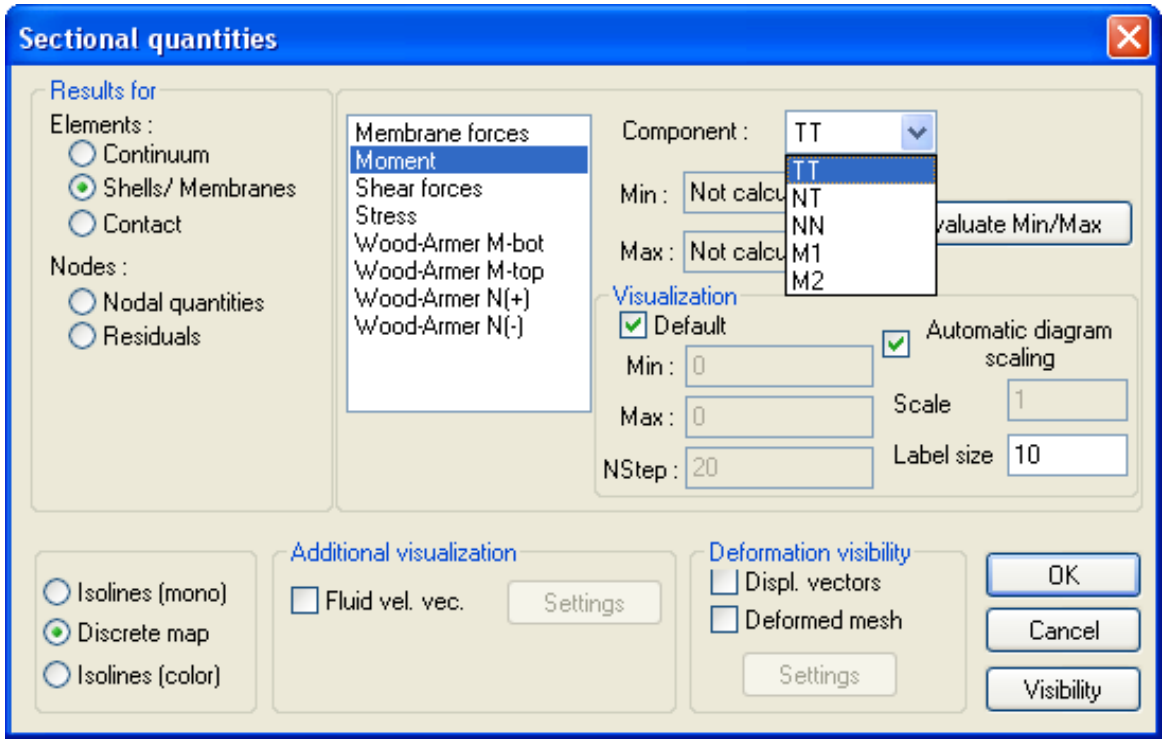




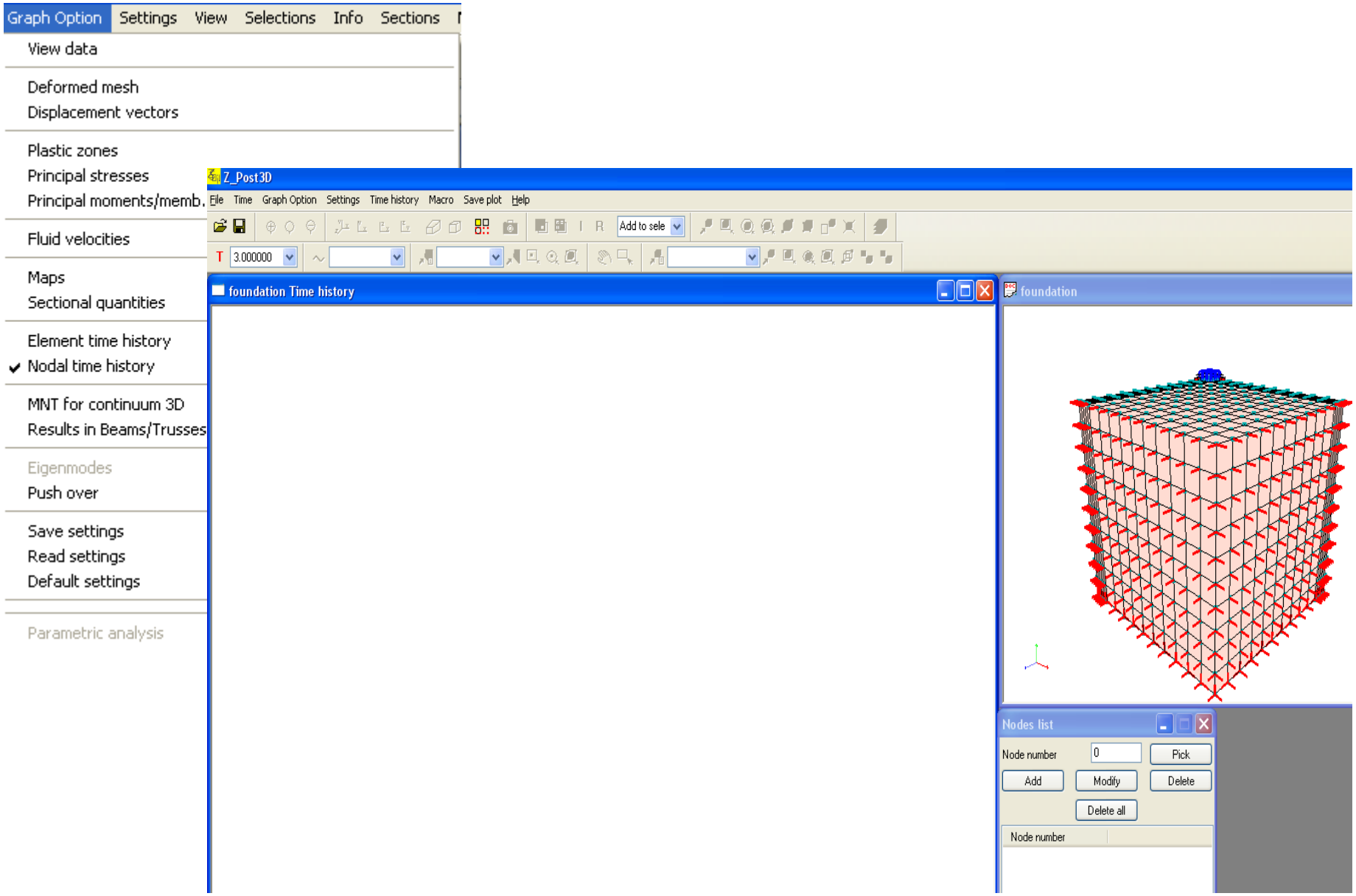
Sectional quantities – local coordinates system for shells/membranes/contact



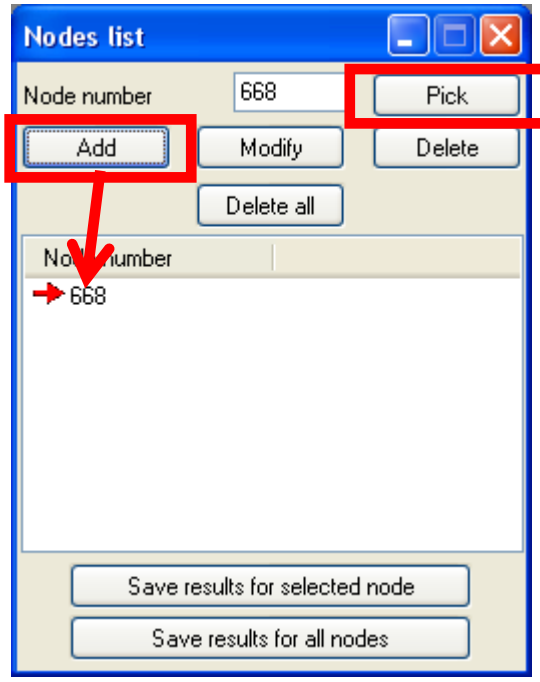
No additional definition of local coordinates system is required for sectional quantities through Shell/Membrane/Contact

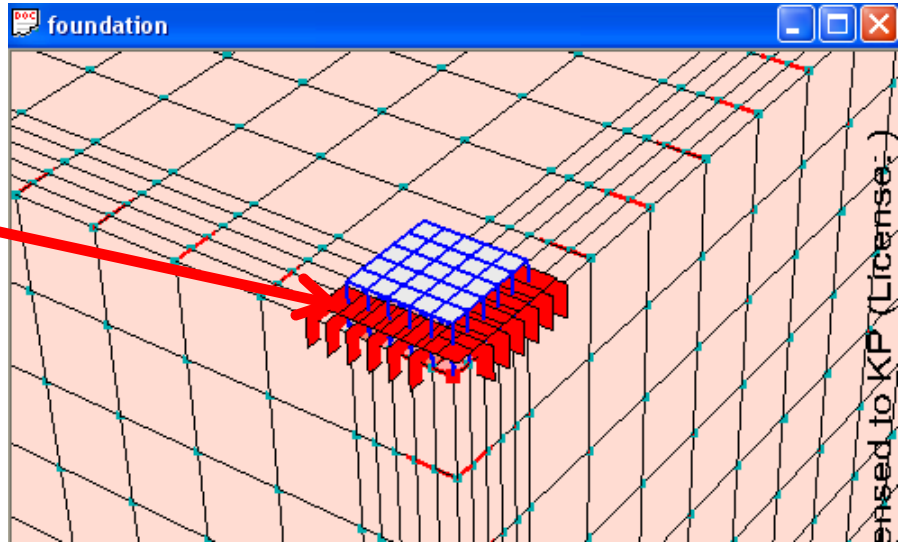


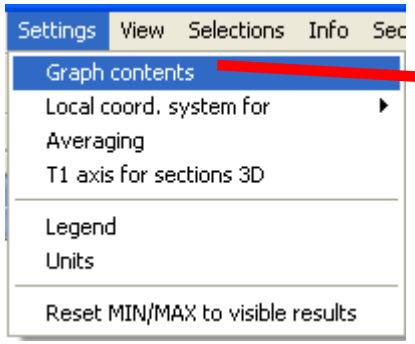
Nodal time history

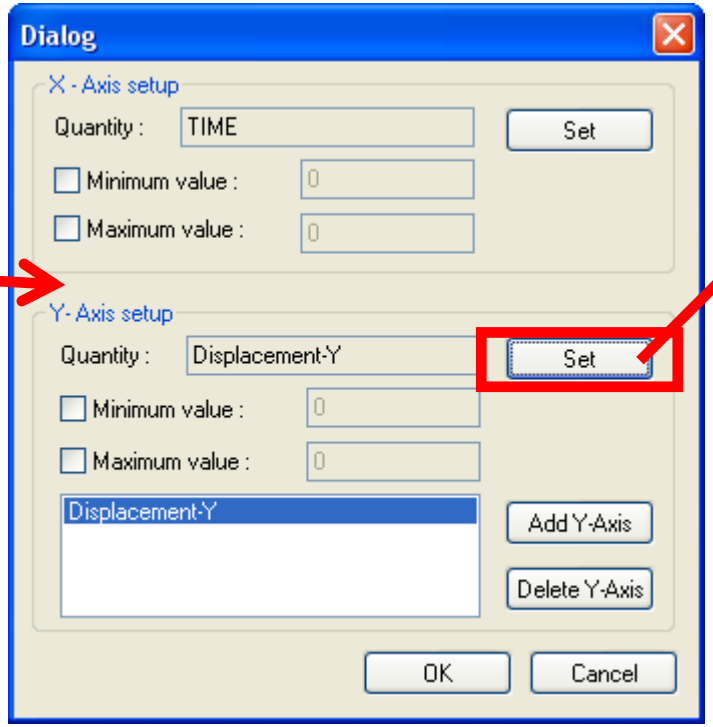


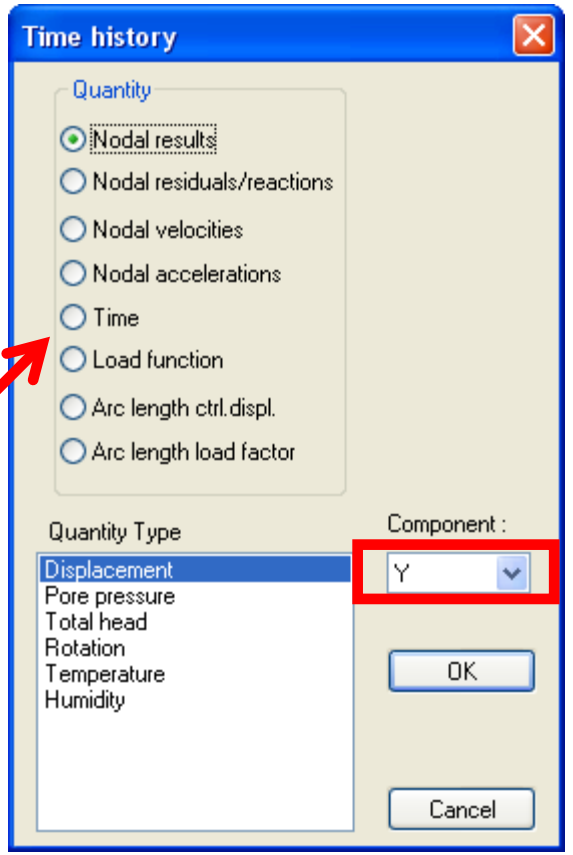
Nodal time history



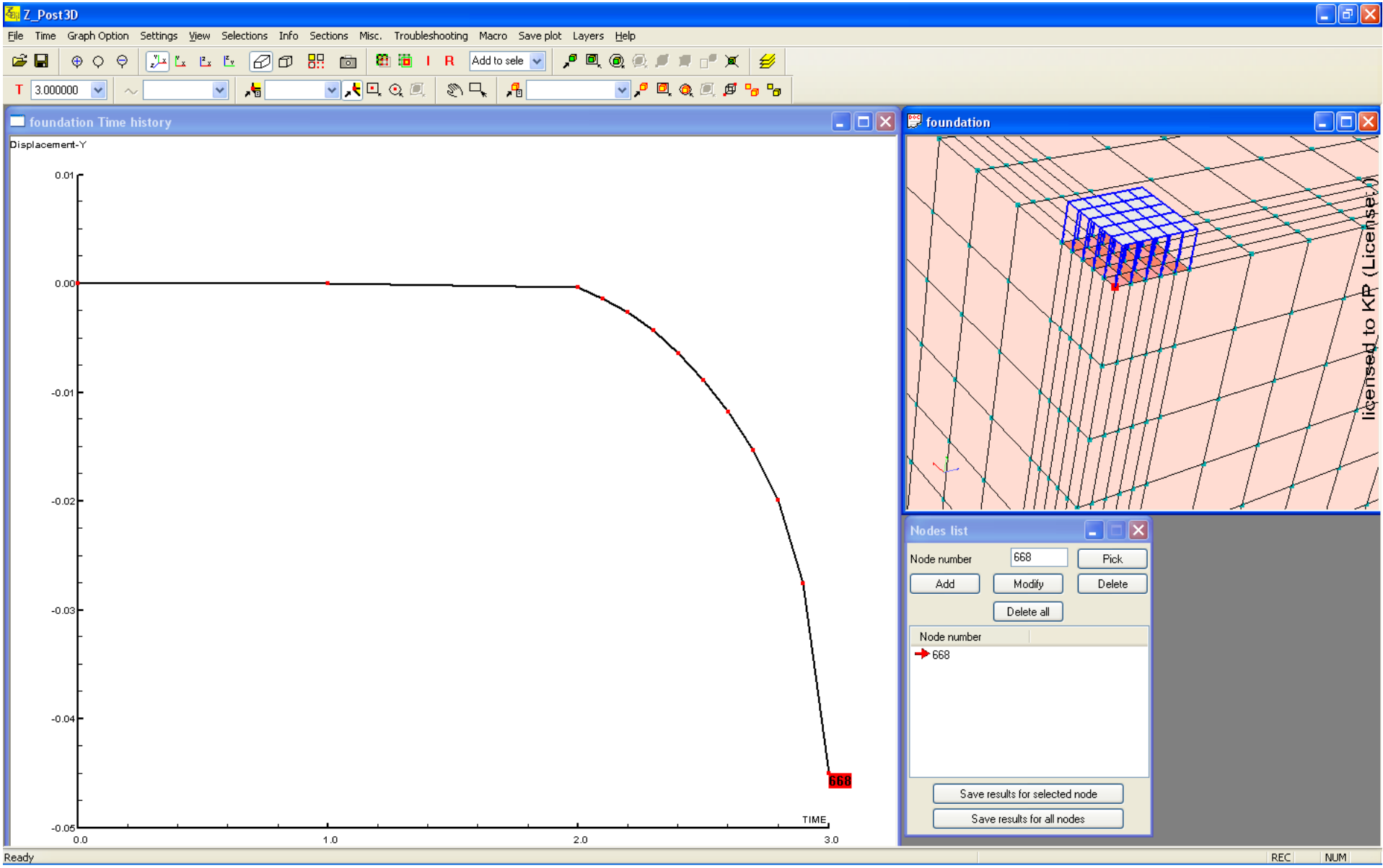








Nodal time history



Nodal time history