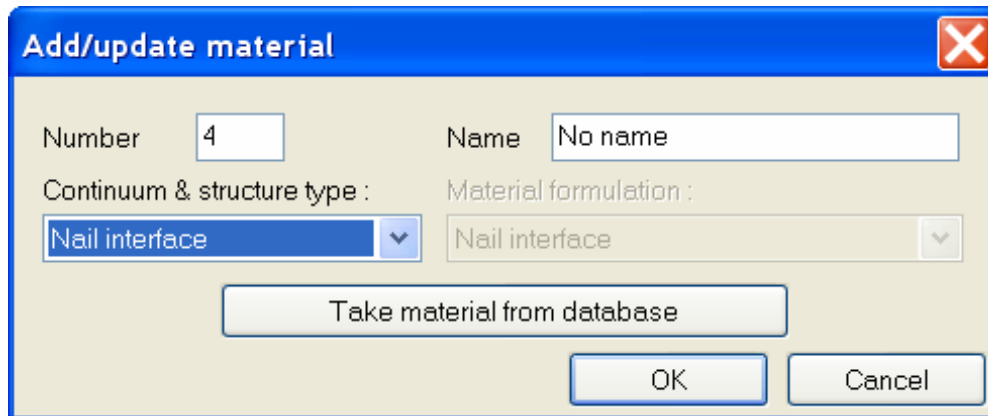


2.3.3.2.5 NAIL INTERFACE

Window 2-699: Selecting Nail interface model

Contact interface material dedicated for 2D/3D nails modeled as beam elements embedded in the continuum can be selected from the combo-box Continuum & structure type.



Window 2-699

Window 2-700: Material data

Data	Use & Set up
Elastic	<p>optional</p> <ul style="list-style-type: none"> • Direct values of interface stiffness is set OFF(default). Elastic stiffness of the contact surfaces is set automatically basing on properties of surrounding media. The user may, if necessary, change the default using: <ul style="list-style-type: none"> ★ normal stiffness K_n multiplier $\{[-], [> 0], [0.01]\}$ i.e. $K_n = \text{multiplier} * K_n^{def}$ ★ tangential/normal stiffness ratio $K_t/K_n \{[-], [> 0], [0.01]\}$ • Direct values of interface stiffness is set ON. User must set elastic properties of the interface explicitly specifying: <ul style="list-style-type: none"> ★ normal stiffness $K_n, \{[kN/m^3], [> 0], [10000]\}$ K_n is equivalent to $K_n = E/h$ where h is the depth of the very thin weak (interface) layer and E is its elasticity modulus. ★ tangential stiffness $K_t, \{[kN/m^3], [> 0], [10000]\}$ K_t is equivalent to $K_t = G/h$ where h is the depth of the weak layer and G is its shear modulus.

Non--Linear	<p>obligatory</p> <p>If <input type="radio"/> Direct input is set ON data for adhesive law describing contact interface material model are:</p> <ul style="list-style-type: none"> • contact zone diameter (equivalent to the diameter of the injection zone) $\{[m], [\geq 0], 0.1\}$ (valid only for small deformation contact formulation) • ultimate shear stress τ, $\{[kPa], [\geq 0], 0\}$ (valid only for small deformation contact formulation) <p>If <input type="radio"/> Inherit data from continuum materials is set ON then user may set up ultimate shear stresses for each material for Continuum or Continuum for structures; the current contact strength parameters are inherited then from the adjacent continuum elements by the calculation module</p>
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Remarks:

1. Elastic stiffness of the contact surfaces are set as:

$$K_n^{\text{def}} = \min \left(\frac{E_1}{h_1}, \frac{E_2}{h_2} \right) \frac{A}{\sqrt{N_{\text{eq}} \varepsilon}}$$

where: E_i Young moduli of adjacent continuum, h_i adjacent element sizes normal to the interface, ε -machine precision, A experimental tuning factor ($= 10^{-4}$) and N_{eq} is a number of equations in the linear system

2. Penalty elasticity constants are estimated automatically by the program. However, user may modify this setting by means of multipliers or direct values of penalty factors. It is worth noting that:
 - Reduction of K_n (and K_s as well), is sometime helpful in maintaining convergence

Window 2-700

Window 2-701: Strength parameters inherited from adjacent continuum

If **Inherit data from continuum materials** is set ON then user may use a single nail interface material for all nail interface elements along the nail independently on number of different soil layers (for instance nail installed in the layered subsoil). By pressing the button **Setup** one gets the access to the sorted (by numbers) list of materials for continuum and may set values for τ to be used in the nail interface adjacent to that material. This list is shown in the figure below

Nonlinear Nail interface

Contact zone diameter: 0.1 [m]

Strength parameters:

Direct input

Ultimate shear stress: 100 [kN/m²]

Inherit data from adjacent continuum materials

Setup

Data mode: Standard

Contact properties

	Material	Model	Original continuum strength parameters			Standard Interface data			Piles interface data				Nails/Fixed anchor zone interface data	
			Phi [rad]	c [kN/m ²]	Psi [rad]	tg(Phi) mult.	c mult.	tg(Psi) mult.	tg(Phi) mult.	c mult.	tg(Psi) mult.	Tensile bearing capacity qt [kN/m ²]	Compressive bearing capacity qc [kN/m ²]	Ultimate shear stress tau [kN/m ²]
1	No name	Mohr-Coulomb	30	20	0	0.6	0.6	0.6	0.6	0.6	0.6	0	1e+038	100

Remarks:

1. Values to be set for nail interface are highlighted by yellow color
2. The current values of plastic parameters for models designed for continuum are listed in cells Original continuum strength parameters; if a given model is described by means of friction angle, cohesion and dilatancy angle (like M-C model, Cap, D-P or HS-small) then these original strength parameters are placed in non-editable cells Standard interface data (filled by a gray color); for other models (like Elastic) user must set the reference strength parameters (in this case cells are white and can be edited)
3. This list is common for all nail interface materials

Window 2-701

Related Topics

- *theory: NAIL INTERFACE*