ANSYS 6.0 Contact Wizard

Enhancements to the Contact Wizard at 6.0

Background on Contact Wizard

- **The contact wizard provides a useful means of generating pairs for contact analyses using surface-to-surface 17x contact elements (TARGE169-170, CONTA171-174).**

- **To generate contact pairs after meshing your model, you can use the menus (GUI) or command-input:**
  - **Menu:** `Main Menu > Preprocessor > -Modeling- Create > Contact Pair > Contact Wizard`
  - **Command:** `Fnc_CWz_Entry`
- **To view or edit the contact pairs generated, the following menu (GUI) or commands can be issued:**
  - **Menu:** `Main Menu > Preprocessor > -Modeling- Create > Contact Pair > View and Edit`
  - **Command:** `Fnc_CWz_ViewPair`

Contact Enhancements at 6.0

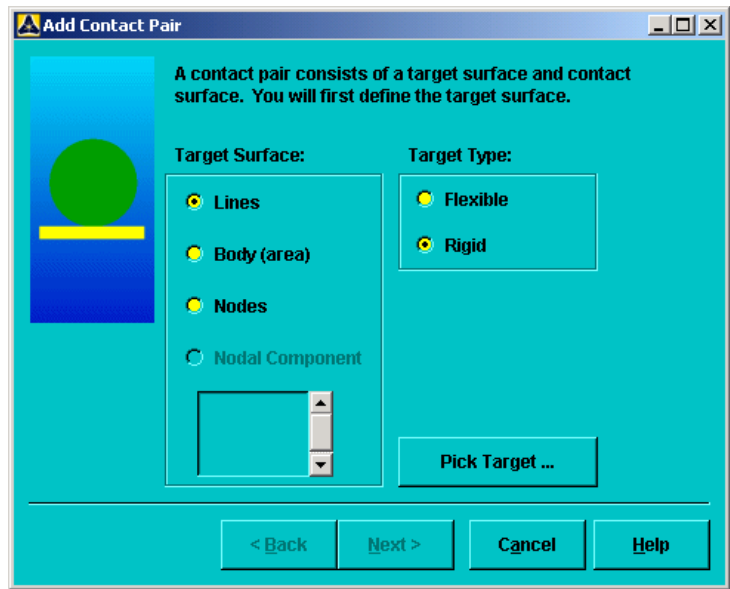
- **At ANSYS 6.0, there have been more enhancements to the 17x contact elements.**
  - **Thermal-only option for heat transfer analyses**
  - **Exponential decay friction model for dynamic coefficient of friction**

- **Consequently, the Contact Wizard has been improved to provide support of all contact features which have been added in 5.7 and 6.0 to provide better accessibility of contact options.**
  - **“Body” definition of contact added**
  - **Contact options dialog box has been reorganized**
  - **Detection of structural, thermal, or coupled-field analyses**
  - **Ability not only to view but to redefine contact options through “View/Edit Pair” interface**

Contact Wizard Interface

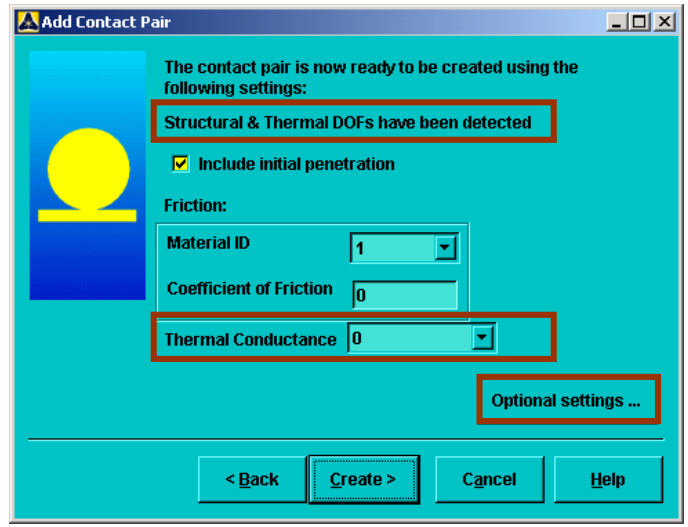
- **The following slides will cover the changes to the interface when using the Contact Wizard to create contact pairs:**
  - **Menu:** `Main Menu > Preprocessor > -Modeling- Create > Contact Pair > Contact Wizard`
  - **Command:** `Fnc_CWz_Entry`

- **Added to the Contact Wizard is an option to define a contact or target by body, not only by its surfaces [lines (2D) or areas (3D)]**
- **When using the "body" option, contact/target elements are then generated on the entire exterior of the model.**



Contact Wizard Interface

- After defining your target and contact surfaces, the Contact Wizard determines if thermal and/or structural DOF are present.
- If the model contains structural DOF, then *coefficient of friction* is available to be input

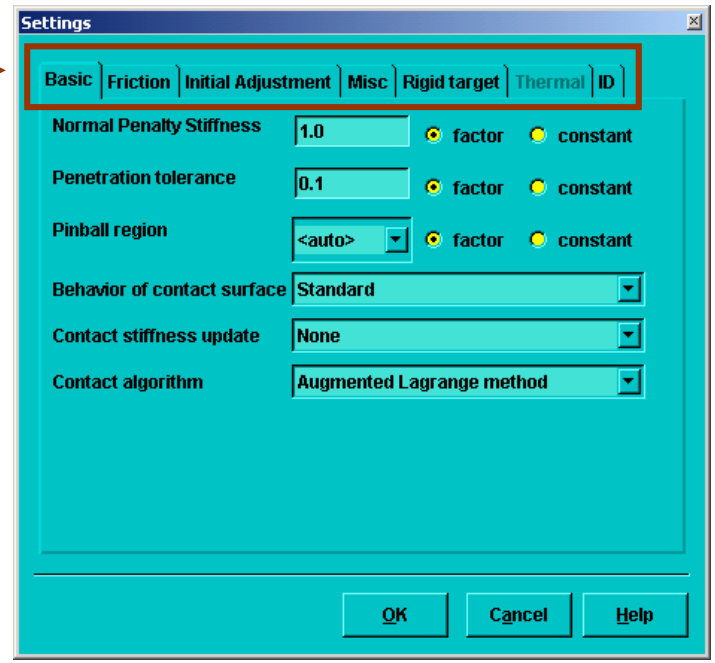


- If the model has thermal DOF, *thermal conductance* is also available to be input in the dialog box.

- *The dialog box associated with the "Optional Settings" button will be described next.*

Contact Wizard - Optional Settings

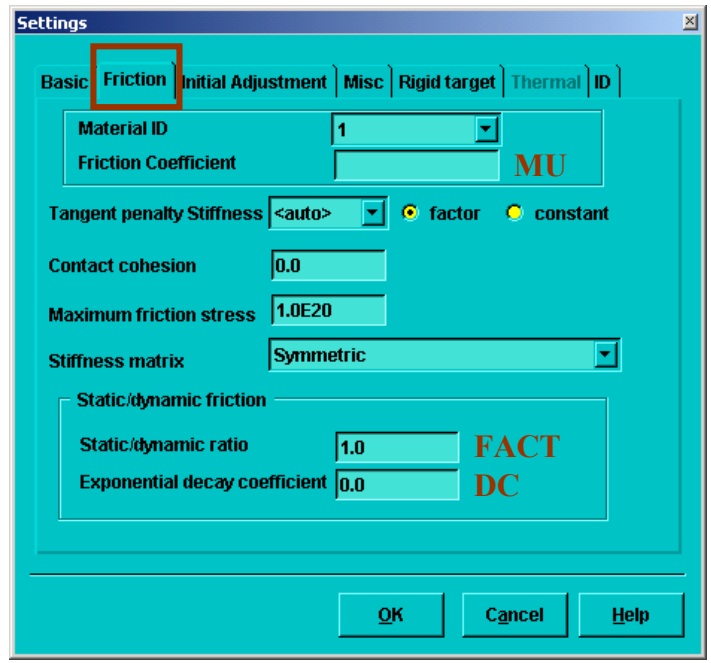
- There are now more “tabs” to provide control over all of the options available in the 17x contact elements.



- The “Basic” tab provides access to the most commonly-used input for the contact elements.
  - The *Normal Penalty stiffness* (FKN) may be changed, if needed: 10 for bulk deformation, 0.1 for bending-dominated behavior
  - The *Behavior of contact surface* (KEYOPT(12)) is often used in cases of changing behavior from standard to bonded contact

Contact Wizard - Friction Settings

- All parameters related to friction are conveniently defined under the “Friction” tab.
  - The friction coefficient can be respecified in this dialog box. Leaving *Friction Coefficient* to blank or zero describes frictionless behavior.
  - *Contact cohesion* allows for non-zero frictional stress even when normal pressure is zero.



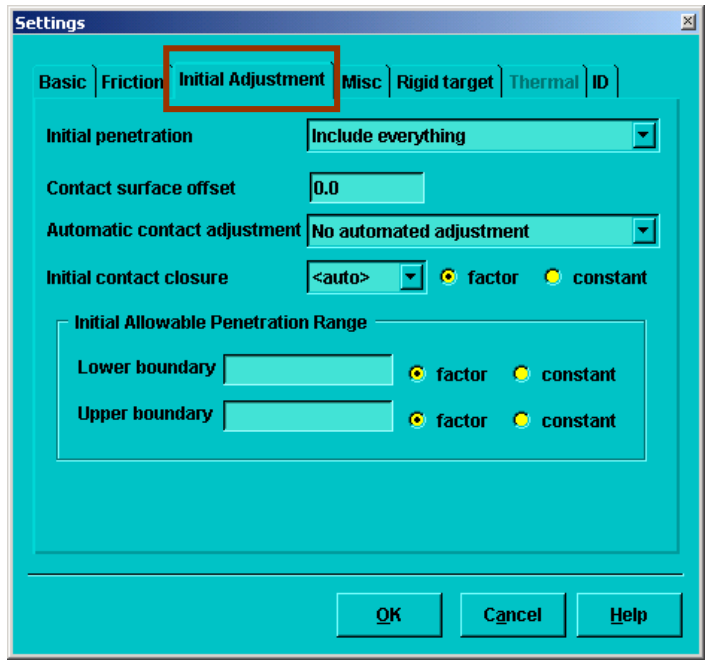
  - Conversely, *Maximum friction stress* provides a limiting value for the frictional stress.
  - The options for *Static/dynamic friction* are new at 6.0:

$$\mu = \mathrm{MU} \cdot \left(1 + (\mathrm{FACT} - 1) e^{-\mathrm{DC} \cdot V_{rel}}\right)$$

Slip rate calculated by ANSYS

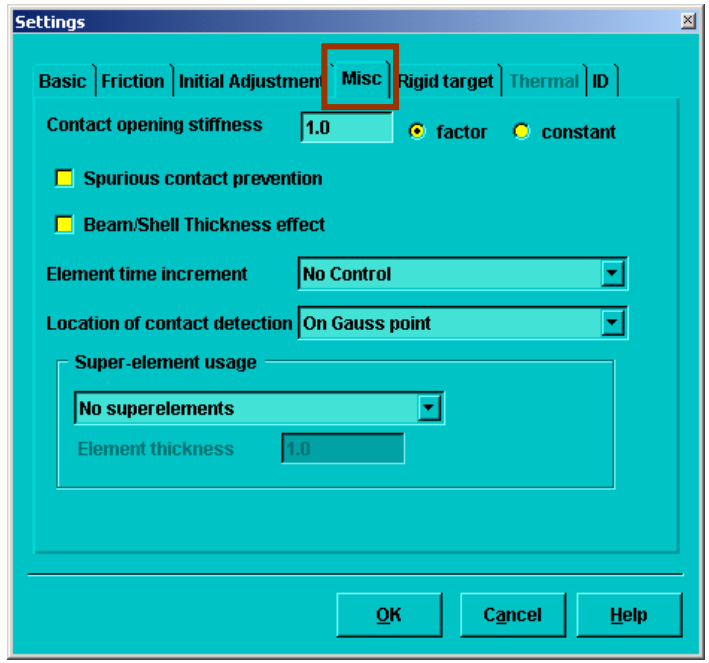
Contact Wizard - Init. Adjust. Settings

- Options related to *Initial Adjustment* are also located together in a separate tab.
  - *Initial penetration* (KEYOPT(9)) pop-up menu allows the user to select initial penetration behavior
  - *Contact surface offset* (CNOF), *Initial contact closure* (ICONT), and *Initial Allowable Penetration Range* (PMIN/PMAX) are also located in this dialog box.



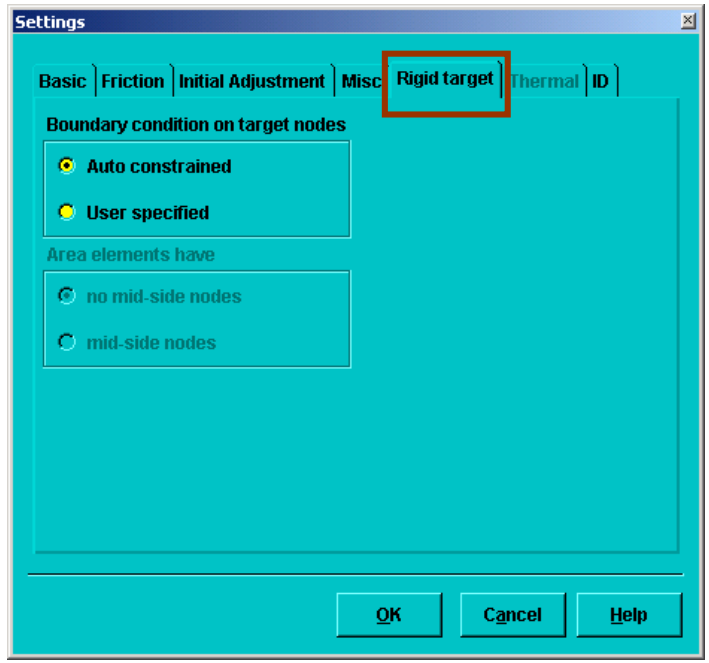
Contact Wizard - Misc. Settings

- Other options are lumped together in the “Misc” tab.
  - *Contact opening stiffness* (FKOP) is for bonded or no-separation contact behavior. FKOP is the stiffness required to ‘open’ the gap. Usually, the default should suffice, although the user can change it here.
  - *Beam/Shell Thickness effect* (KEYOPT(11)) is another useful option commonly used to account for the thickness effects of the geometrically 1D/2D elements. The 17x contact elements also account for thickness changes of SHELL181.



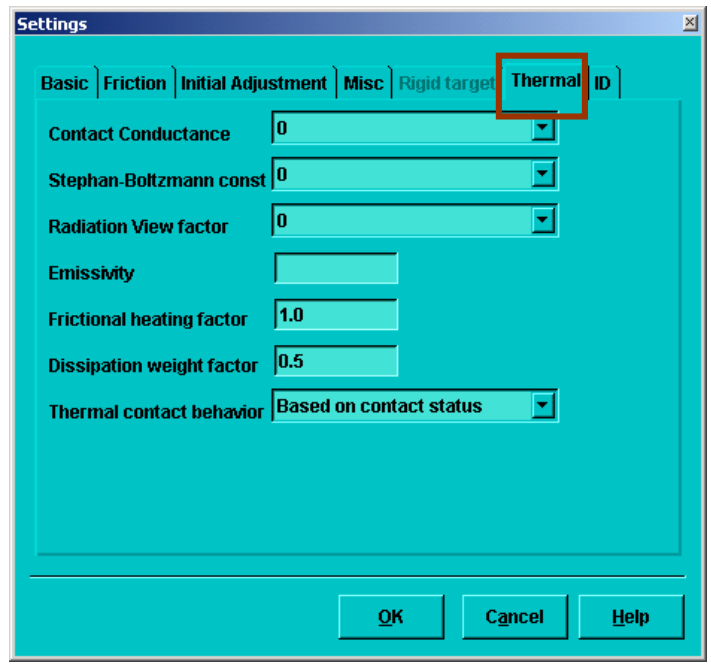
Contact Wizard - Target Settings

- **If rigid target surface is present, the "Rigid target" tab will be activated.**
  - ***Boundary condition on target nodes*** **(KEYOPT(2)), either allows ANSYS to auto-constrain the model, or leaves the decision to the user.**
  - **Note that, currently, a pilot node must be generated by the user manually, if the user would like to use pilot nodes to control the rigid target surface.**



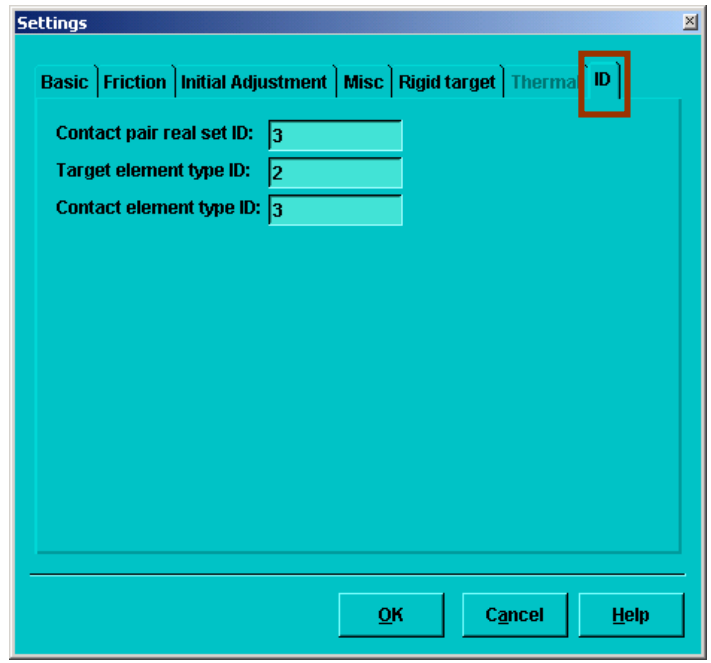
Contact Wizard - Thermal Settings

- If thermal elements (DOF) are present, the “Thermal” tab will be available.
  - Thermal *Contact Conductance* can be changed in this dialog box, too.
  - Radiation and frictional heating parameters are available.
  - The *Thermal contact behavior* (KEYOPT(3) for TARGExxx elements) can be changed, such that the contact surface is treated as a free surface.



Contact Wizard - ID Settings

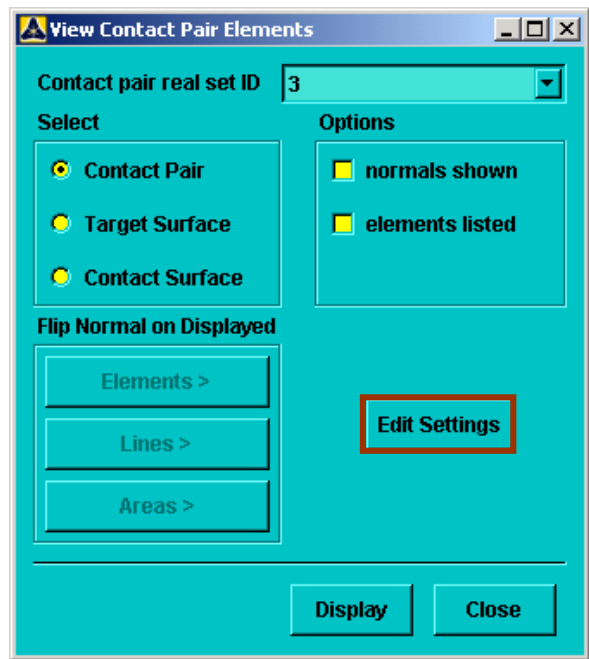
- If desired, the user can change the real constant and element type IDs in under the “ID” tab.



Viewing/Editing Contact Pairs

- **After generating the contact pairs, they can be viewed *and modified*:**
  - **Menu:** `Main Menu > Preprocessor > -Modeling- Create > Contact Pair > View and Edit`
  - **Command:** `Fnc_CWz_ViewPair`

- **The ability to modify contact pair options without using the conventional methods of changing element type options or real constants has been added at 6.0**
  - **The *Edit Settings* button brings up the Contact Wizard's *Optional Settings* dialog box, which was discussed previously**



Summary

- **The enhancements made to the Contact Wizard at ANSYS 6.0 enable users to take full advantage of the myriad of options available for the 17x surface-to-surface contact wizard in a well-organized, easy-to-use interface.**
  - **The Contact Wizard has some built-in logic to detect rigid bodies (if present) and physics type (structural, thermal, or coupled-field).**
  - **Recent enhancements to the 17x contact elements such as thermal contact and dynamic friction are now accessible from within the Contact Wizard**
  - **The options can be modified at any time through the "View and Edit" menu item, instead of requiring the user to manually change the element keyoptions and real constants.**