Knowledge Base

Plug-in utility for visualizing damage in connector elements

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QUESTION

My model contains connector elements that can sustain damage. Is there a way to visualize the damage in the connectors?

ANSWER

The following applies to Versions 6.6 and higher)

An Abaqus/CAE plug-in application for this purpose is attached below. The plug-in reads the available history output related to connector damage and allows you to visualize only those connectors that satisfy a specified damage criteria. You may choose from the available steps, step times, and damage output variables. Several mathematical operators are available for the given damage output variable. Connectors can also be displayed using a pre-set color code definition showing the state of damage for a chosen step time.

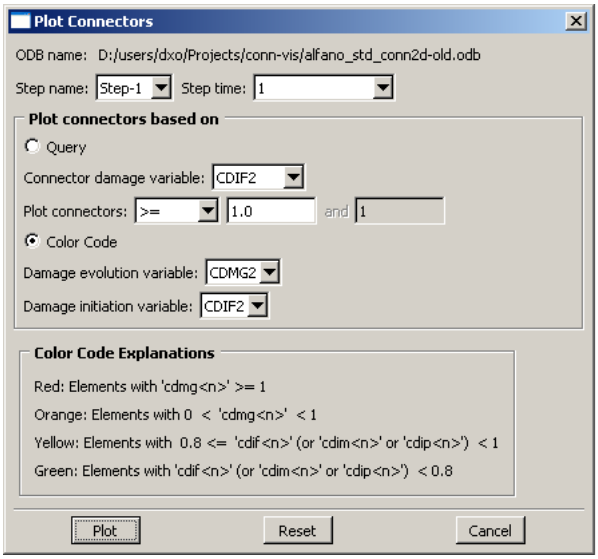
To install the plug-in, save the attached files to one of the following directories:

- *abaqus_dir*\abaqus_plugins where *abaqus_dir* is the Abaqus parent directory
- *home_dir*\abaqus_plugins where *home_dir* is your home directory
- *current_dir*\abaqus_plugins where *current_dir* is the current directory

Note that if the abaqus_plugins directory does not exist in the desired path, it must be created.

The next time Abaqus/CAE is started, a menu item named **Plot Failed Connectors...** will be available in the **Plug-ins** pull down menu from the **Visualization** module.

To launch the plug-in, open an output database with connector damage output and select **Plug-ins** → **Visualization** → **Plot Failed Connectors...**. The following dialog will be posted:



The following items are displayed in the dialog:

- **ODB name**: The name of the output database (.odb) displayed in the current viewport
- **Step name**: Pulldown list of the step names in the .odb
- **Step time**: Pulldown list of available step times for a particular step
- **Connector damage variable**: Pulldown list of applicable connector damage output variables for the chosen step
- **Plot connectors**: Operator pulldown list and two text fields to complete the operator definition when necessary. The possible operators are
  - **>=**: greater than or equal to
  - **<=**: less than or equal to
  - **==**: equal to
  - **between** The second text field is applicable only for the **between** operator and is used to specify the upper bound on the desired range.
- **Damage Evolution Variable** : Pulldown list of applicable **connector** damage evolution variables for the chosen step
- **Damage Initiation Variable** : Pulldown list of applicable **connector** damage initiation variables for the chosen step
- **Plot**: Plots the connectors matching the specified criteria
- **Reset**: Resets the .odb in the viewport by removing the connectors from the display
- **Cancel**: Closes the plug-in

To Plot connectors satisfying a given damage criteria:

1. Toggle on 'Query' radio button.
2. Select the step name, step time and connector damage variable.

3. Choose an operator and specify the necessary values in the applicable text fields. Click **Plot**.

For example, if you want to see the connectors with values of **CDIF2** greater than or equal to 0.5 in step 'Step-1' at step time '1.0', select the appropriate **connector** damage variable, step name and step time from the corresponding pulldown lists. Then select **>=** as the operator and enter 0.5 in the first text field (as shown in the figure above) and click **Plot**. **Connector** elements that meet the specified criteria are plotted in orange, and all other connectors are removed from the viewport. For plotting connectors that have a damage variable between a given set of values, select the **between** operator and enter the limits in the text fields. Supported history output variables include any beginning with **CDMG**, **CFAILST**, **CDIM**, **CDIP**, and **CDIF**.

To plot connectors based on color-coding:

1. Toggle on 'Color Code' radio button.
2. Select the connector damage initiation and evolution variables. If no evolution variables are available in the odb, color coding will be done only on initiation variables and vice versa.
3. Click **Plot**. Explanation of the color coding is given in the plug-in dialog.

Supported history output variables include any beginning with **CDMG**, **CDIM**, **CDIP**, and **CDIF**.

An example input file (Railcrush.inp) is included below. It is a crushing simulation of a beam joined by fasteners that are modeled with connector elements.

Usage Notes

1. The plug-in does not require a one-one correspondence between the frame plotted in the viewport and the time selected for visualization of the damaged connectors. For example, you may plot the connectors that have failed at the end of the analysis on the undeformed mesh. If there has been substantial deformation, this can help in visualizing how damage progresses in the connectors through the simulation.
2. When the damaged connectors are plotted, translucency is turned on (Opaqueness=0.85) to facilitate the visualization of connectors. It is turned off when you click **Cancel** or close the plug-in dialog.
3. The connectors plotted by the plug-in stay highlighted regardless of the plot mode (wireframe, hidden, filled, shaded) or type (undeformed, deformed, contour, symbol), allowing you to move between different results presentations.
4. If the connectors in the model are not displayed in the viewport before invoking the plug-in, the plug-in will only plot the connector points. If the connectors are displayed in the viewport before invoking the plug-in, the current **ODB Display Options** settings will be respected. Additionally, these settings can be changed while using the plug-in.
5. The plug-in removes from the viewport those connector elements that do not meet the plot criteria. When the plug-in dialog is closed (by clicking **Cancel** or the close icon) only the failed connectors will remain in the viewport. To restore all the connectors, click **Reset** in the plug-in dialog before closing. Note however, that the **ODB Display Options** settings will be set to their default values.

Revision History

05 Oct 06	Initial release of Version 1.1-1
30 Jan 07	Release of Version 1.2-1 with enhanced color coding options

Disclaimer

KEYWORDS **plugin, plug-in, customization, gui, python, script, damage, connector, connectors, fail, failure, r**

ATTACHMENT Railcrush.inp | connVis_plugin.zip | Answer_3129_Figure1a.png

SUBSCRIBE TO CHANGES ☐

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