



Release Notes

Version 1.8

Concept Analyst Ltd.
Durham University
School of Engineering
South Road
Durham DH1 3LE

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Version 1.8 of Concept Analyst contains the following enhancements over version 1.7:

1. Multizone analysis
2. Material property selection
3. CAMaterials file
4. Removal of work files
5. Notch definition
6. Move line operation
7. Add points enhancements and snapping on lines
8. Report file enhancements
9. Graph plot axis improvement
10. Application of pure shear

1. Multizone analysis

The capability has been added to consider the object to consist of two subregions, or 'zones'. These may have the same or different material properties. Two types of multizone analysis are permitted:

- ***General mated parts:*** Two shapes may be mated together using the command "Shape – Mate parts". After giving this command, use the cursor to select two lines (on different shapes) that are to be joined. These two lines must have the same length and the same orientation. A perfect bond will be assumed between the two parts. The shape to which the line clicked second belongs will be moved to mate with the other shape. Any shapes (holes) lying within the moved shape will also move through the same vector.
- ***Pin in hole:*** A circular hole in a part may be specified as being filled with a plug of another material. Use the command "Shape – Pin in hole" and then click inside the hole in question. Notice that a perfect bond is assumed between the two parts and so a non-linear contact analysis will not be performed.

Displacement boundary conditions must be specified in the (x,y) directions for multizone problems. Symmetry/rollers conditions are not supported for this type of analysis in this version.

See also the 'Material property selection' section below for allocation of material property sets to zones.

2. Material property selection

The facility to analyse multizone problems containing two different materials requires the material properties to be allocated to objects in a different way. The top-level menu “Material” contains two commands:

Select material: Offers a selection of material names (as read from the CAMaterials file). After selecting one of the options, click inside a zone to assign the selected material to that zone. (Note that in version 1.7 and earlier, the selected material was allocated to the object without requiring a click in the object – it is important that users of version 1.8 remember to click in the zone concerned to change its material property set).

Edit material: Allows the user to modify the material properties of the currently selected material. The new properties will continue to be used for the remainder of the session, or until changed again. However, the contents of the CAMaterials file will not be modified, so on closing the Concept Analyst session and starting a new session the original material properties will be restored.

In order to emphasise the above changes, and to distinguish more clearly between different materials in the model, the shapes have now been colour-shaded as follows:

First material listed in CAMaterials:	grey
Second material listed in CAMaterials:	blue
Third material listed in CAMaterials:	green
Fourth material listed in CAMaterials:	red
Fifth material listed in CAMaterials:	purple
Sixth material listed in CAMaterials:	orange
Seventh material listed in CAMaterials:	pink
Eighth material listed in CAMaterials:	olive
Ninth material listed in CAMaterials:	brown

By default, on entering the program the selected material is the second that appears in the CAMaterials file, i.e. aluminium, so shapes will be shaded in blue. Shading may be toggled on/off in the “Edit – preferences...” menu in the same way as one can toggle on/off drawing of point, elements and loads.

Notice also that it is shapes and not zones that have a material allocation. The material for each zone is taken as that for the shape that forms its outer boundary. This means that shapes that are used to define holes also have a material property, although of course this is not used in the analysis unless the “Pin in hole” command is given to signify that the hole is plugged with another material. The material allocation for a hole can be seen simply by moving the hole outside the shape that surrounds it.

3. CAMaterials file

The CAMaterials file definition has changed, omitting the shear modulus for each material, which can be calculated from the Young's modulus and Poisson's ratio for the isotropic materials handled by Concept Analyst.

4. Removal of work files

The temporary work files (CODA_A, etc.) that were created by version 1.7 and earlier have been removed and are no longer created. All computations are done in memory. This accelerates the analysis performance and removes any possibility of accidentally opening the work files for a different model.

5. Notch definition

The command "Shape – notch" allows the user to create a notch at some point on a straight line. Following the command the notch may be defined in two ways:

- ***Cursor definition:*** click (and hold) the left mouse button near the shape edge where the notch is to be created, and then drag into the object. Cursor movement perpendicular to the edge defines the depth of the notch, and cursor movement parallel to the edge defines the radius of the notch. Both dimensions are reported in the corner of the screen. Release the mouse button when satisfied with the geometry.
- ***Keyboard entry:*** double right click the mouse with the cursor near the shape edge where the notch is to be created. A dialog box opens to prompt the user for the (x,y) coordinates of the notch 'focus point' on the edge, and also for the radius and depth of the notch.

6. Move line operation

A new command "Shape – Move line" has been added. After giving this command, users may use a conventional click-and-drag operation to drag an edge of a shape to a new location. The length and orientation of the line will be unchanged, and the adjacent lines will deform to accommodate the movement. If either one of the adjacent lines is a circular arc, the command will fail to operate. However, if the line being moved is an arc then the command will work successfully.

On dragging the line, if the shift key is pressed the line is constrained to moving horizontally or vertically.

It is also possible to define a *group of lines* to move in this fashion. On the initial click selecting the line to move, if the shift key is depressed the user can click and drag a section of boundary, that becomes highlighted, that will be moved.

7. Add points enhancements and snapping on lines

The “Shape – Add points” command has been enhanced in two ways:

- The new point may now be added to a circular arc.
- If the shift key is depressed when the mouse button is clicked to define the new point, the new point will be snapped to the nearest location on the existing geometry. The shift key is not required when adding points to arcs, since it is assumed that the point is to be snapped onto the arc.

8. Report file enhancements

The report file has been updated with a few minor enhancements:

- The pathname and filename of the model file is reported in the Summary section. If the file has not yet been saved at the time of opening the report file, the report contains a statement to this effect.
- Non-zero displacement boundary conditions are also reported alongside the distributed loads.
- The material properties for multi-zone problems are also reported.

9. Graph plot axis improvement

The y-axis on a graph plot of results around the boundary now displays the maximum and minimum values for the graph. In version 1.7 and earlier the displayed values were for the top and bottom of the graph window.

10. Application of pure shear

The soft spring that is automatically applied to unconstrained models has been extended to allow application of a spring in both the x and y -directions. This means that the definition of a pure shear condition is greatly simplified. Users may define a

rectangular outer boundary to the object, and apply complementary shear stresses in the appropriate directions around all four edges.

Note that the deformed shape the results from this application of loads will not appear to be the classical parallelogram shape, because the very light displacement constraint causes a state of almost rigid body rotation. However, the contour display of stress components will represent the stresses due to shear loading.

Please consult the Concept Analyst User Guide for a more complete discussion of this topic, and for the recommended way of defining pure shear loading for best stability of the solution, especially in re-analysis.