MAE 656 - Advanced Computer Aided Design

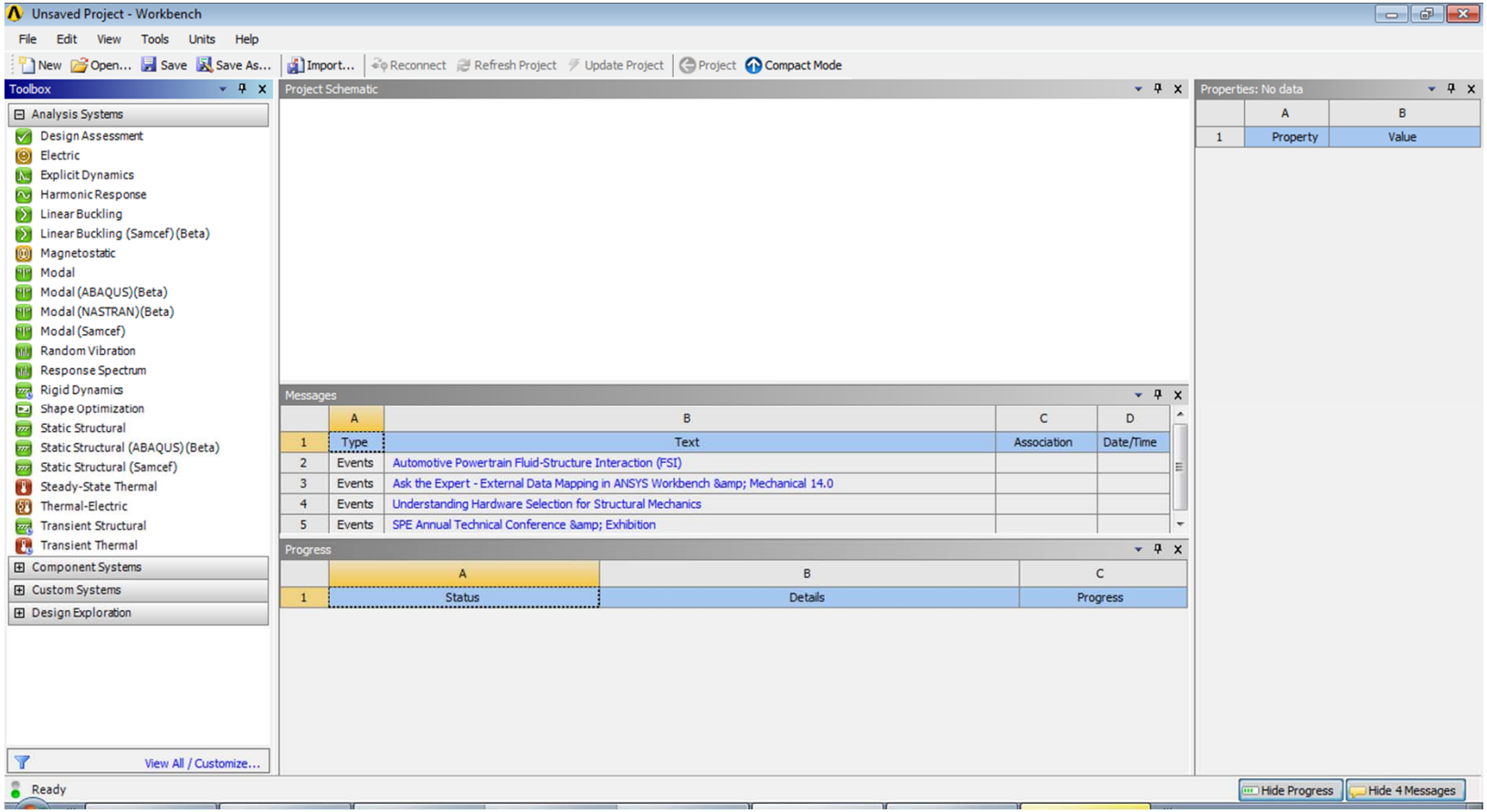
02. Ansys Workbench – Doc 01

Introduction to Ansys Workbench

Main Screen

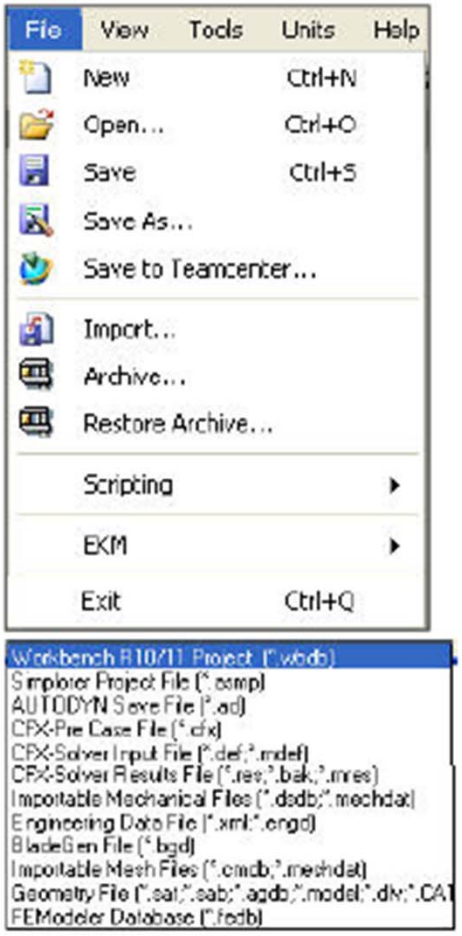
Components:

Top menu – Toolbox – Messages – Progress – Project Properties



Top Menu – File

- Create/Open/Save a Workbench project file
- Saves data from all the components
- Import: Import files (for acceptable file types, see Import options)
- Archive: Quickly generate a single compressed file (.wbpz or .zip file) containing all pertinent files for easy transfer. Zipped file can be saved at any required location
- Restore Archive: Unzip and open zipped project files
- Scripting: Record and Run journal files
- EKM: Launch and connect to EKM i.e. Engineering Knowledge Manager

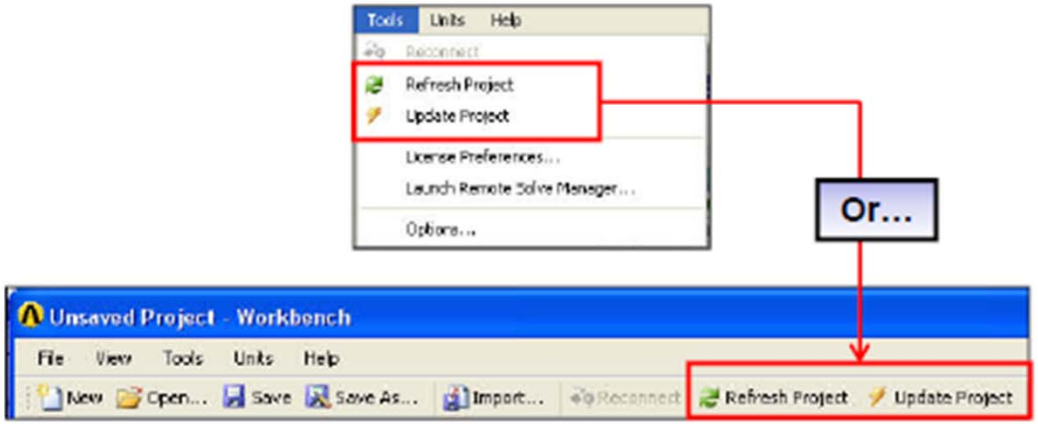


Top Menu – View

- Refresh and Reset Window layout
- View Toolbox, Toolbox Customization, Project Schematic, Messages, Progress , etc. windows on Project page
- Reset Workspace restores current workspace to default settings
- Reset Window Layout restores original window layout

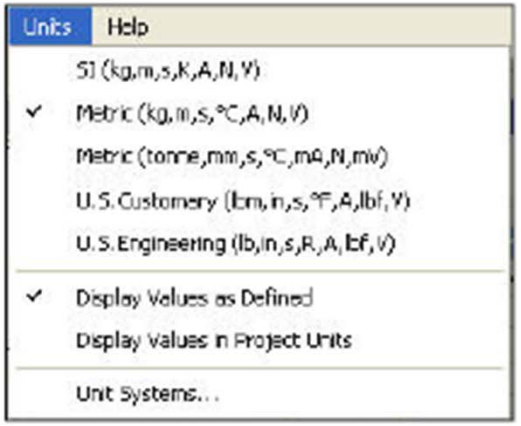
Top Menu – Tools

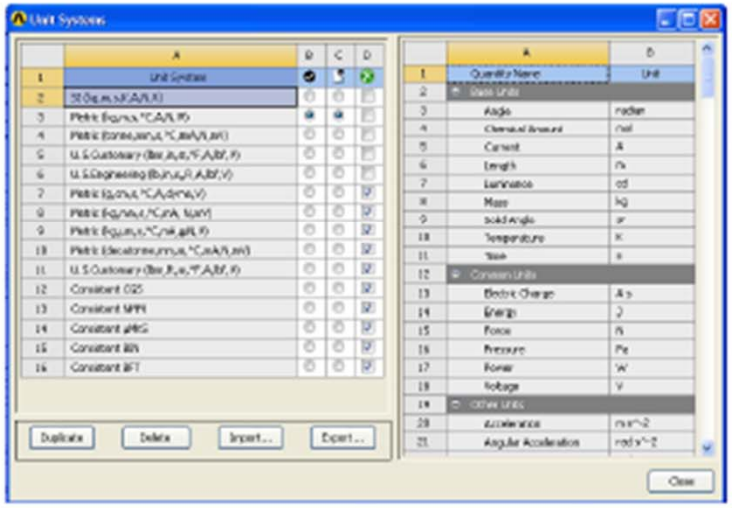
- Refresh or Update entire project
- Modify Global Settings through 'Options …'



Top Menu – Units

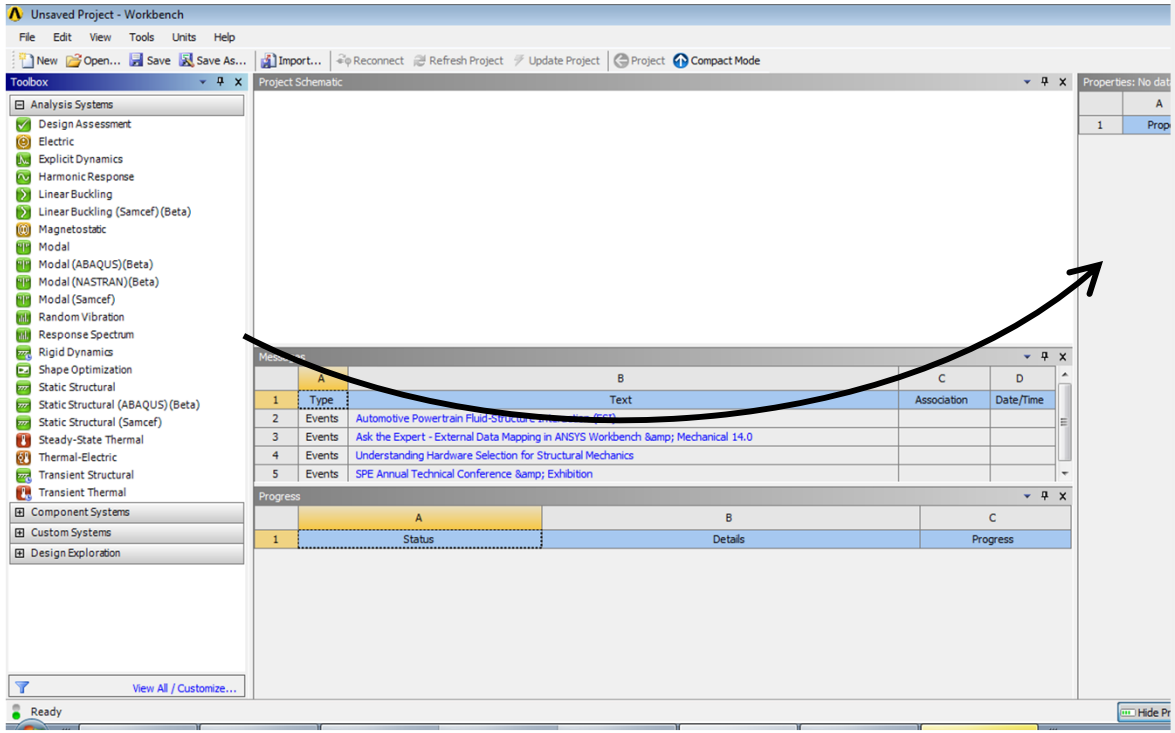
- Select Unit System to be used for the project
- Sets the default unit system for all systems
- Units can be changed within components like DM, AMP
- Display Values as Defined : displays value and unit as defined in Workbench or original source application
- Display Values in Project Units : displays values converted to selected project unit system
- Modify Unit Systems through 'Unit System …'

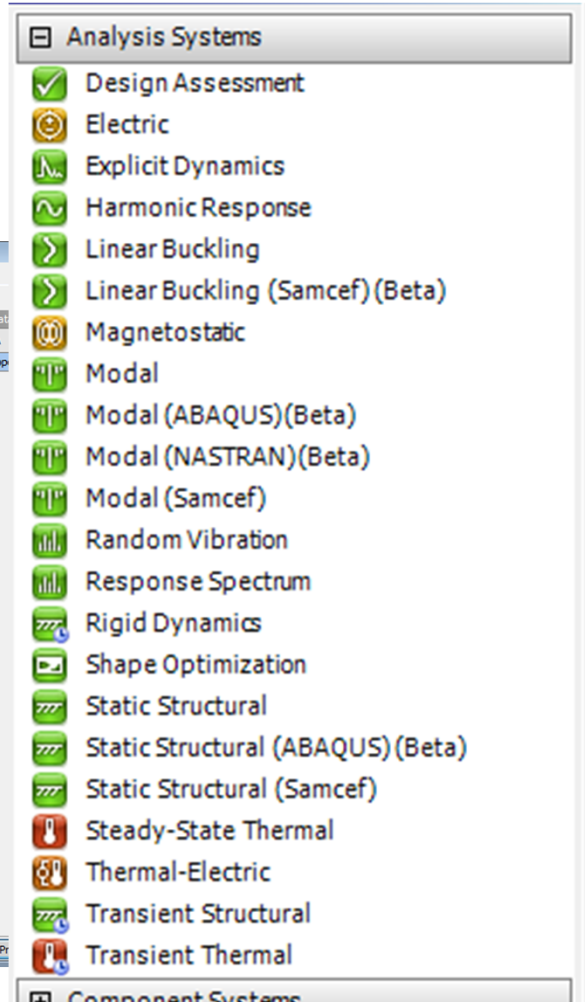




Toolbox – Analysis Systems

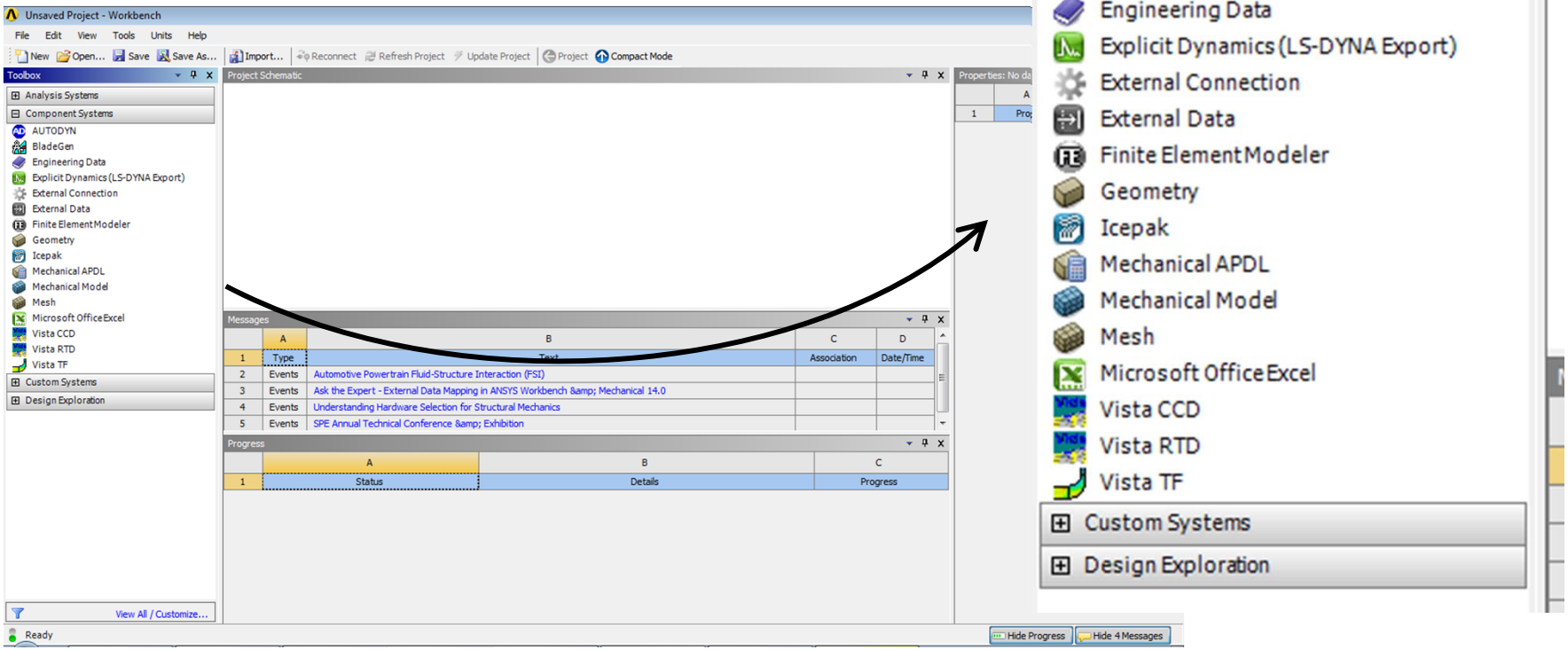
We have already predefined systems:





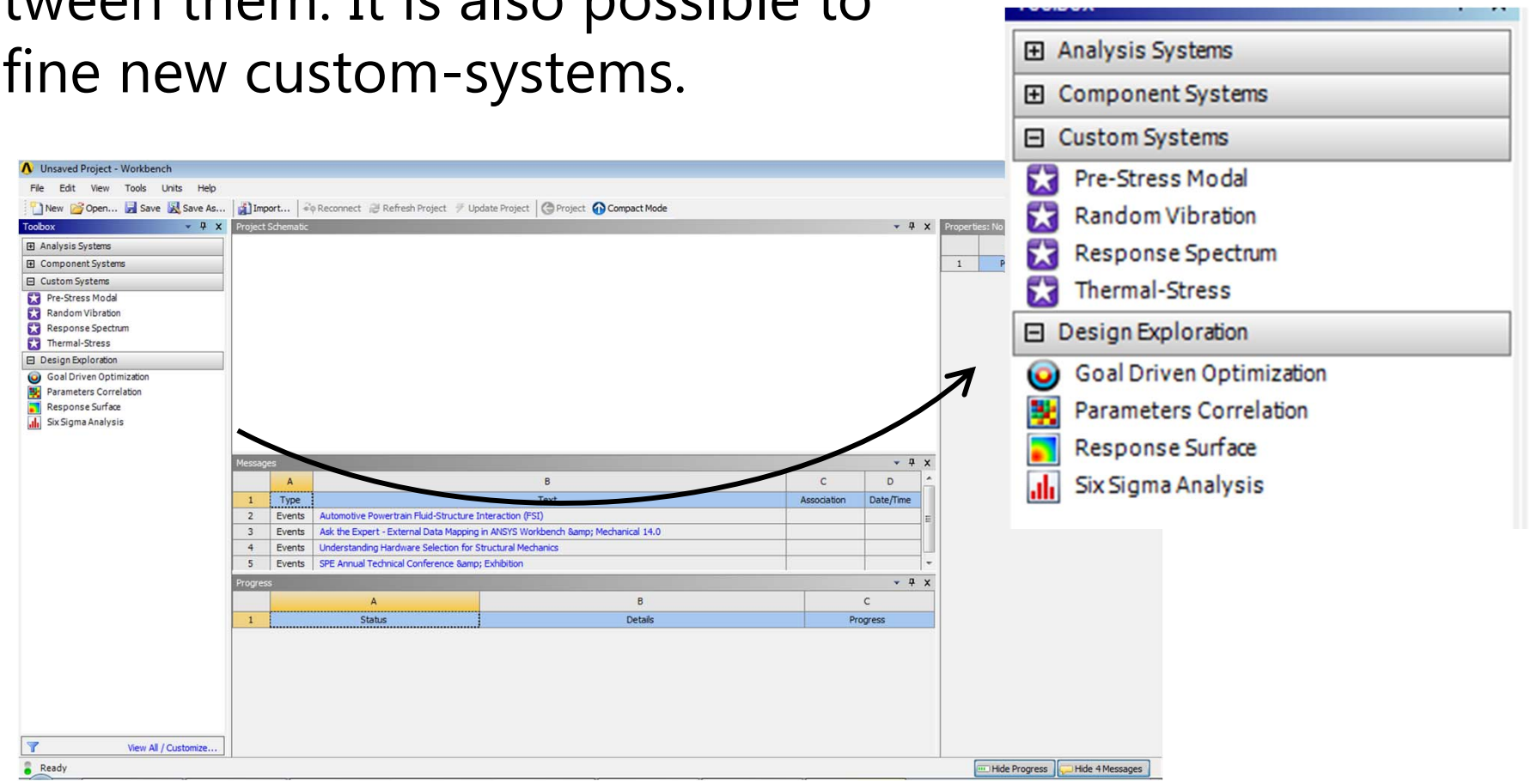
Toolbox – Component Systems

We have the individual components of the systems:



Toolbox – Custom Systems

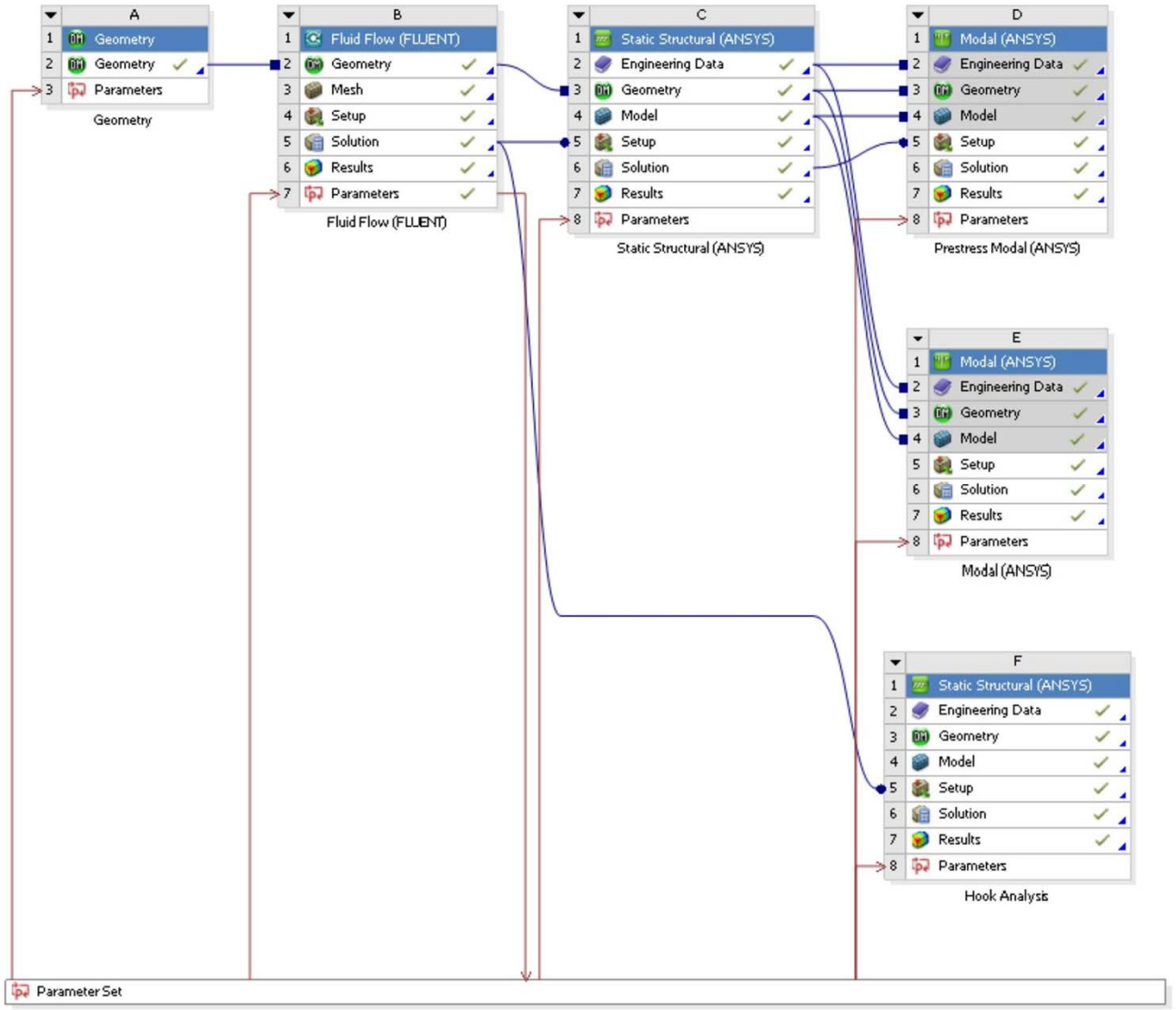
We have predefined some systems with some interactions between them. It is also possible to define new custom-systems.



Project Schematic

It is possible to solve different problems with shared data.

It is also possible to use results from one problem as input data to another one (i.e. fluid-structure interaction)



Static Structural System

We will work with the Static Structural system.

It is composed by:

Engineering data:

Definition of **material properties**

Geometry:

Def. of the problem **geometry**

Model:

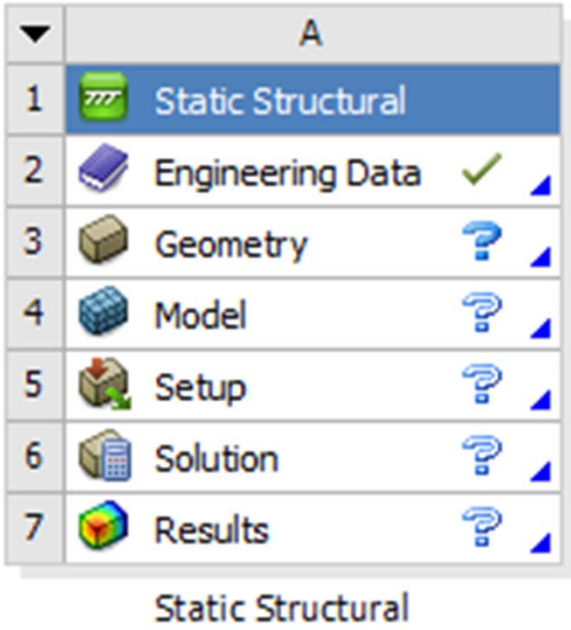
Def. of the **mesh**

Setup:

Def. of the **boundary conditions**

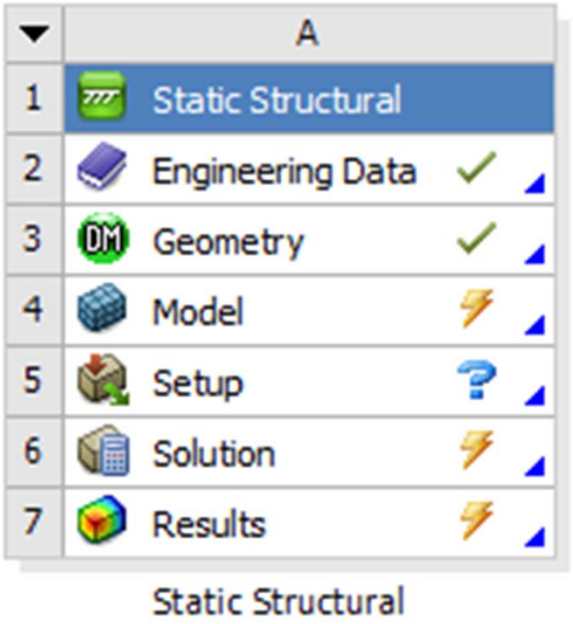
Results:

Contains the different results requied to the solver.



Static Structural

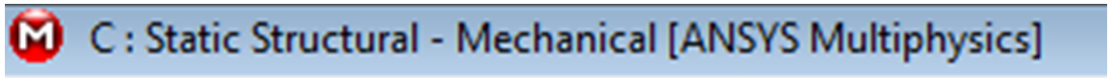
Static Structural System



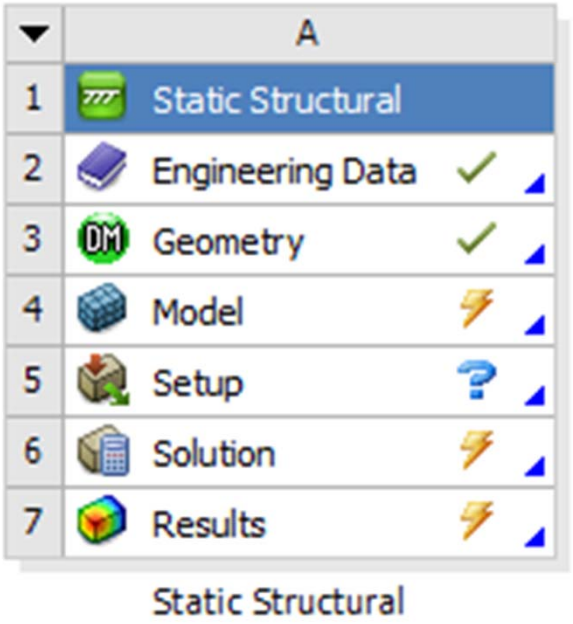
Defined in a new workbench window

Solved with Design Modeler

Solved with Mechanical module



Static Structural System

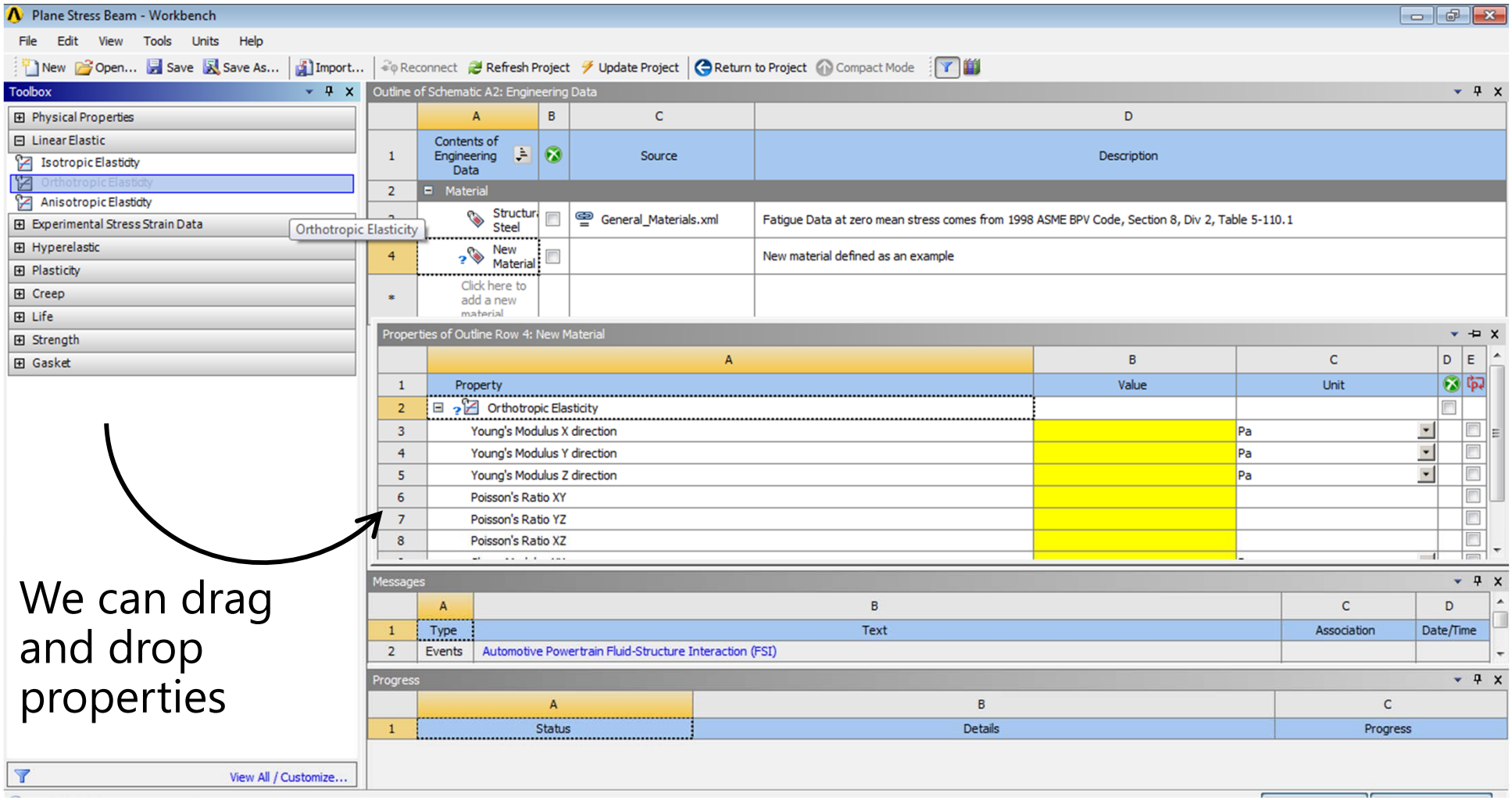


System properly defined and has no errors

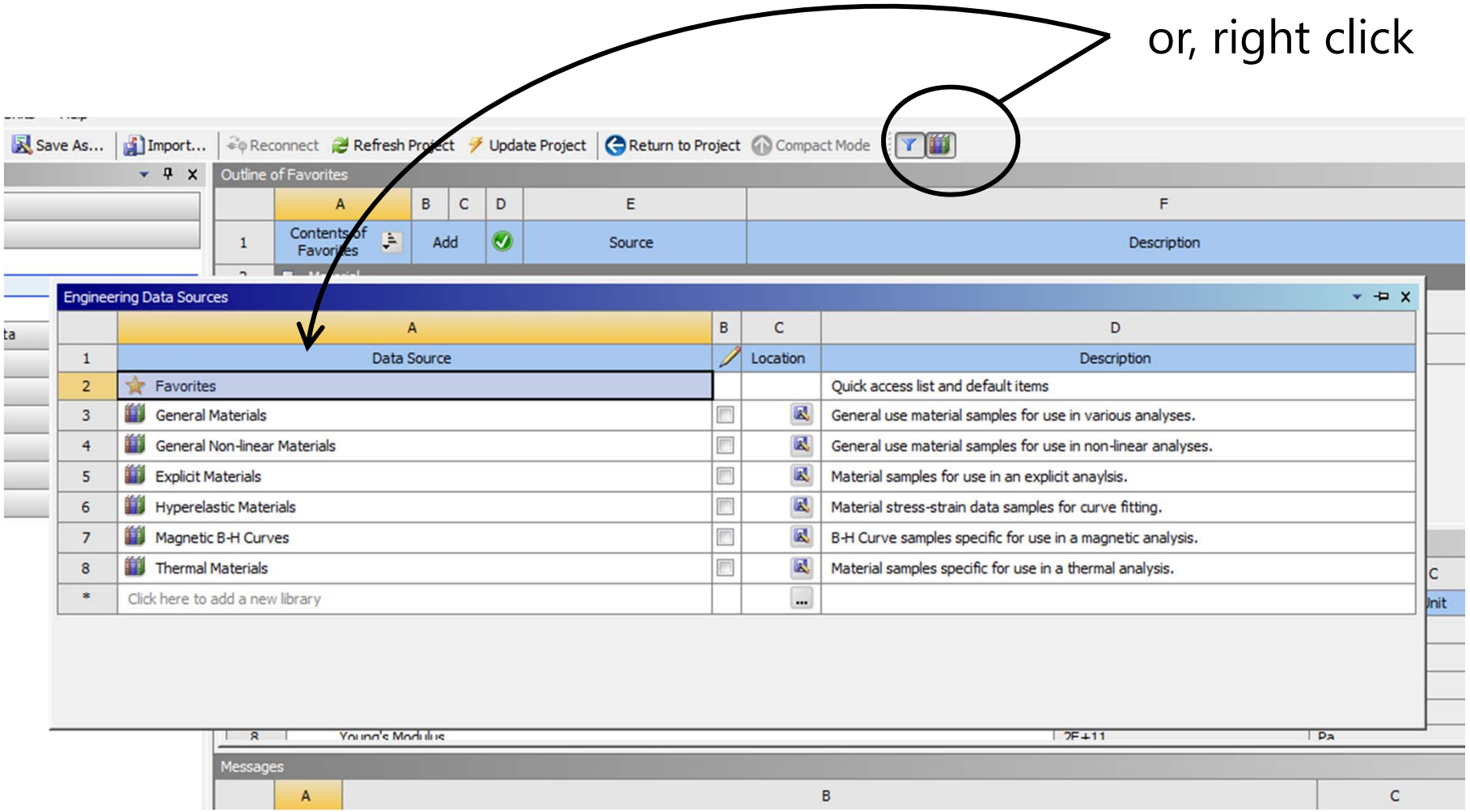
System already defined but that has to be updated because there has been modifications in upper levels

The system is yet to be defined

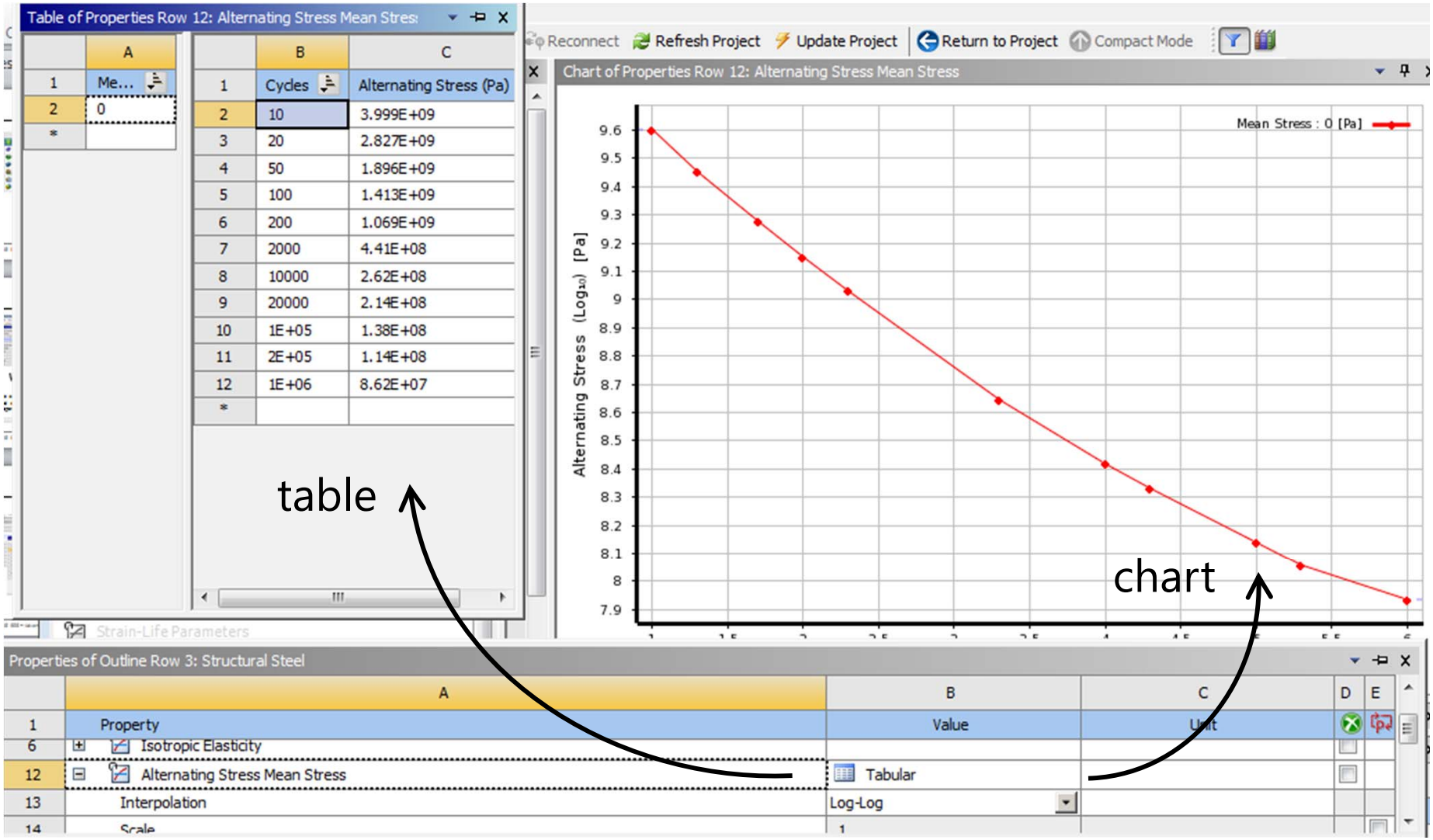
Engineering Data



Engineering Data Sources



Engineering Data - Charts & Tables



Engineering Data - Exercise

Create a custom material for Aluminum Alloy type 5052-O.

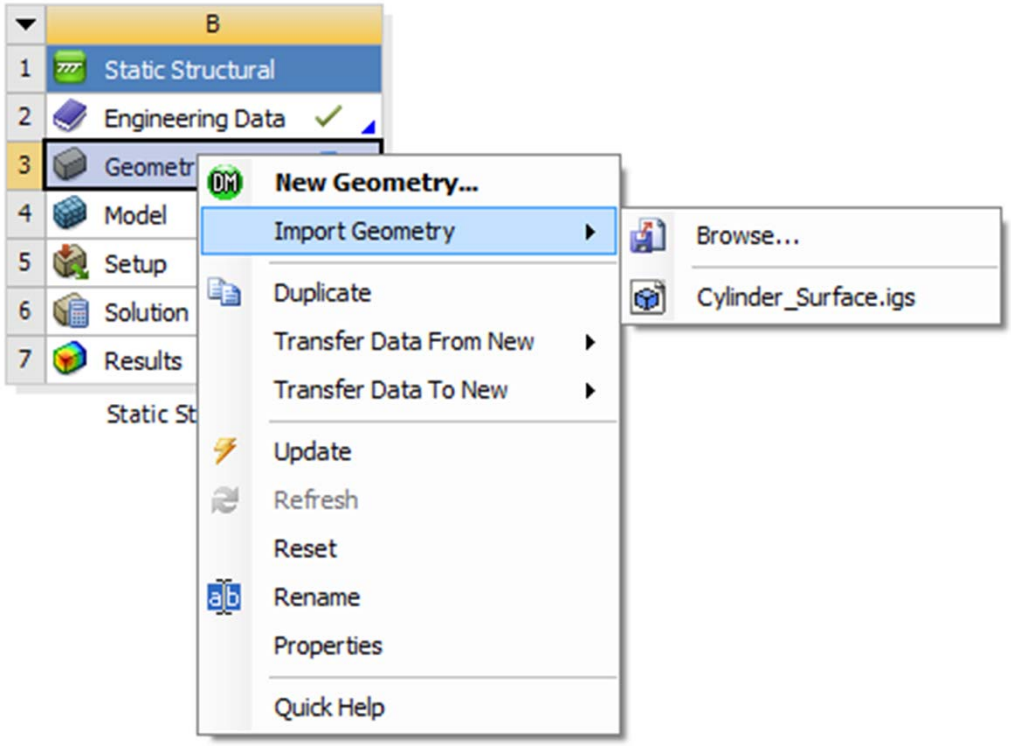
The parameters that have to be defined are those of:

- Density
- Thermal expansion
- Isotropic elasticity
- Yield and ultimate strength (defined as multilinear isotropic hardening)
- Yield and ultimate strength as failure variables to be used in an elastic material.

The numerical value of each parameter can be obtained from http://www.makeitfrom.com/

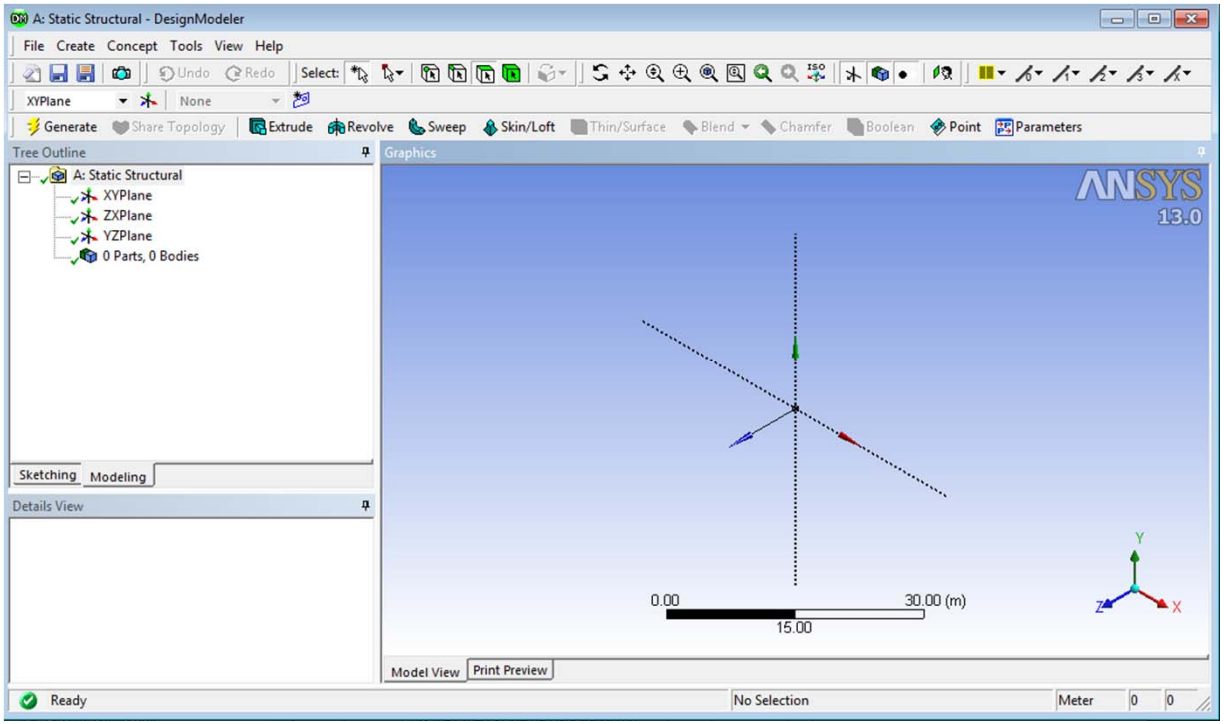
Design Modeler – Import Geometry

It is possible to import the geometry from other codes such as Catia, Rhinoceros, Solid Works, etc.



Design Modeler – New Geometry

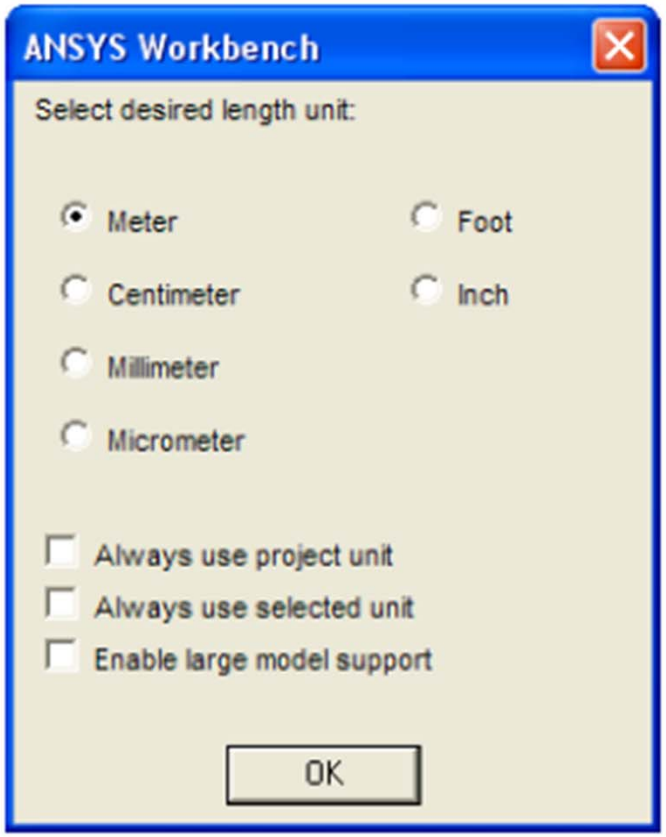
If instead of importing the geometry from another code or from another problem defined in the same workbench we decide to create a new geometry, clicking on NEW GEOMETRY will launch the desing modeler.



Design Modeler – Units

- Unit selection menu pops up immediately after DM launches

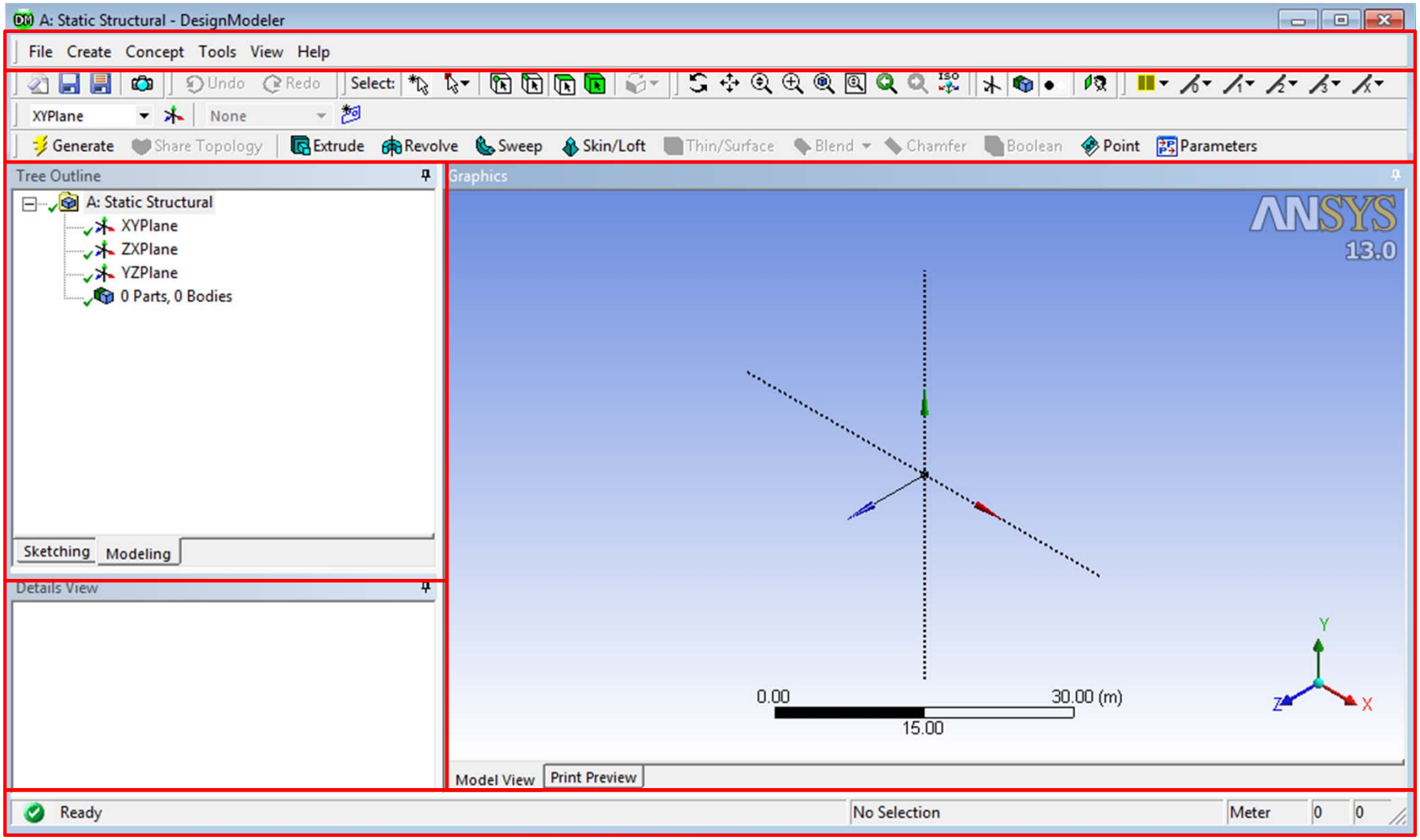
- **Always use project unit :** Project units set in Workbench will be used
- **Always use selected unit :** Unit selected from the panel will be used
- **Enable large model support :** enable this to create large models within a bounding box of 1000 cubic km.



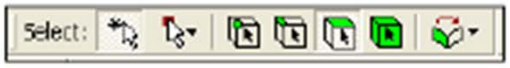
DM will no longer show the Units pop up panel in subsequent DM sessions if 'Always use project unit 'or 'Always use selected unit' is chosen.

Units cannot be changed mid-session

Design Modeler – Main Window



Design Modeler – Selection



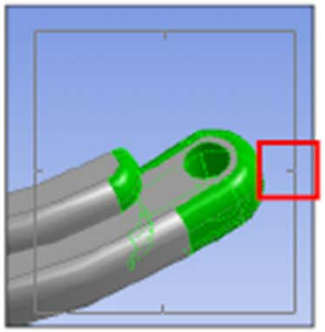
- Select Mode –
  - Select single entity
  - Select multiple entities
- Select Points
- Select Edges
- Select Faces
- Select Bodies

Selection Filters

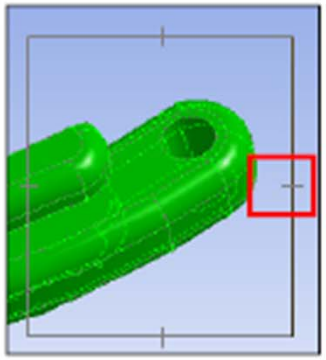
- Extend Selection for multiple entities –

Tricks on 'Selection'

- To select multiple entities, drag the mouse to create a box enclosing the entities



Drag from left to right to select the entities, completely enclosed in the box



Drag from right to left to select the entities, completely and partially enclosed in the box

Hash lines on the edges of box help to determine the type of selection

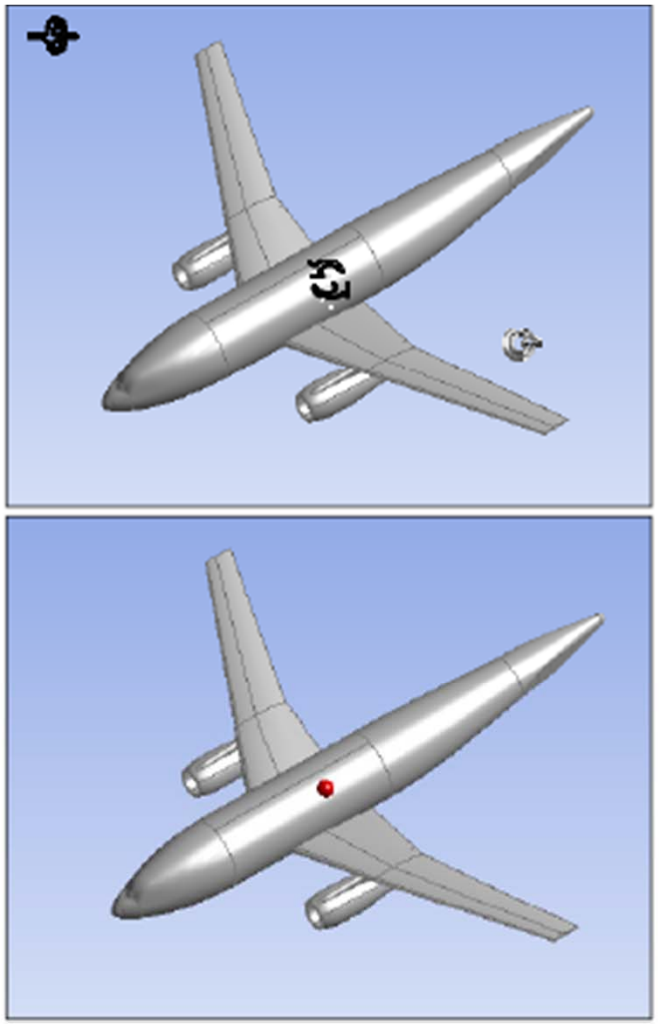
Design Modeler – View Toolbar

1. **Rotate** : For dynamic rotation of the object
2. **Pan**: To scroll the object around
3. **Zoom**: Zoom in or Zoom out the view by dragging LMB up or down respectively
4. **Box Zoom**: Zooms to the view enclosed by the box created by dragging the LMB
5. **Fit Model to Screen**: Zooms in to fit the full model in the screen
6. **Magnifier Window**: Zoomed in model will be displayed in a new window
7. **Previous View**: Works as Undo for the Displays
8. **Next View**: Works as Redo for the displays
9. **Set Iso View**: Set the model in Isometric view
10. **Display Plane**: Toggle to display the plane on or off
11. **Display Model**: Toggle to display the model on or off
12. **Display Points**: Toggle to display the points on or off
13. **Look at**: Orients the view normal to the selected Face or active Plane, or active Sketch

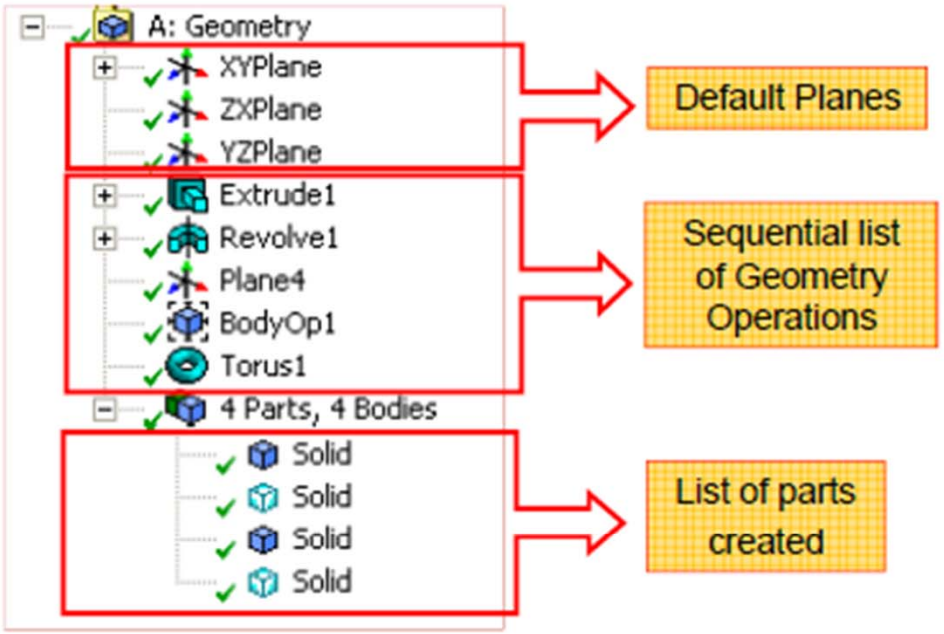
Design Modeler – View Toolbar

- Rotate Behavior (LMB):
  - Cursor outside center :
    Rotation about Z view
  - Cursor near center of graphics screen :
    Free rotations
  - Cursor near edge of graphics screen :
    Rotations about X (top/bottom) or Y (left/right) axes

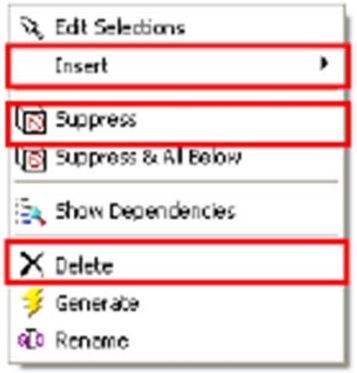
  - While in Rotate, Pan, or Zoom mode:
    - Left click on model: resets center of view and rotation at cursor location (identified by red dot)
    - Left click in open area re-centers model and rotation center to Centroid



Design Modeler – Tree Outline



Contextual menu upon RMB click



Insert can be used to add operations anywhere in the tree

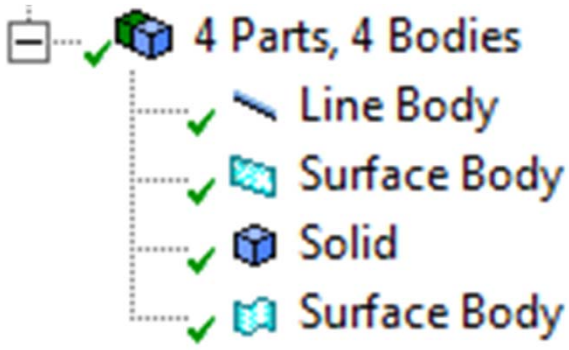
Suppress can be used to deactivate a selected operation

Delete can be used to delete a selected operation

It is recommended to suppress an operation instead of deleting it
It helps the user with the option of unsuppressing it if needed in the future

Design Modeler – Parts

There are four different types of parts. Each one can be used in a type of simulation: BARS, 2D, 3D and SHELLS.



Design Modeler – More info.

More information about how to work with design modeler can be found in the Ansys Training Lectures:

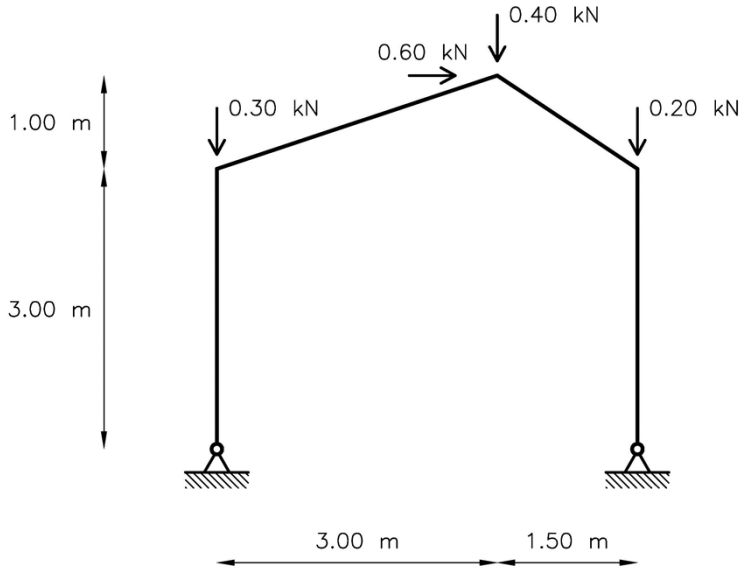
DM-13.0 – 01 – Planes and Sketches.pdf

DM-13.0 – 02 – 3D Operations.pdf

Design Modeler – Exercises

1. Import geometry Cylinder_Surface.igs to design modeler
2. Create structural frame defined in Assignment 01.
   1. Defining points manually
   2. Using point data "Frame Nodes.txt

      In this second case, the roof beams have a cross section: 5 x 10 x 0.1 cm



Design Modeler – Exercises

3. Create the triangular plate defined in the following figure to be solved as a 2D structure.
4. Create the triangular plate to be used as a 3D structure