Student Notes:

CATIA V5 Training

Foils

2D Layout for 3D Design

Version 5 Release 19
August 2008

EDU_CAT_EN_LO1_FF_V5R19

About this course

Objectives of the course

Upon completion of this course you will be able to:

- **Create 2D Layout views in a 3D environment**
- **Export 2D geometry to a 3D environment**
- **Create drawings from 2D Layout views**

Targeted audience

Mechanical Designers

Prerequisites

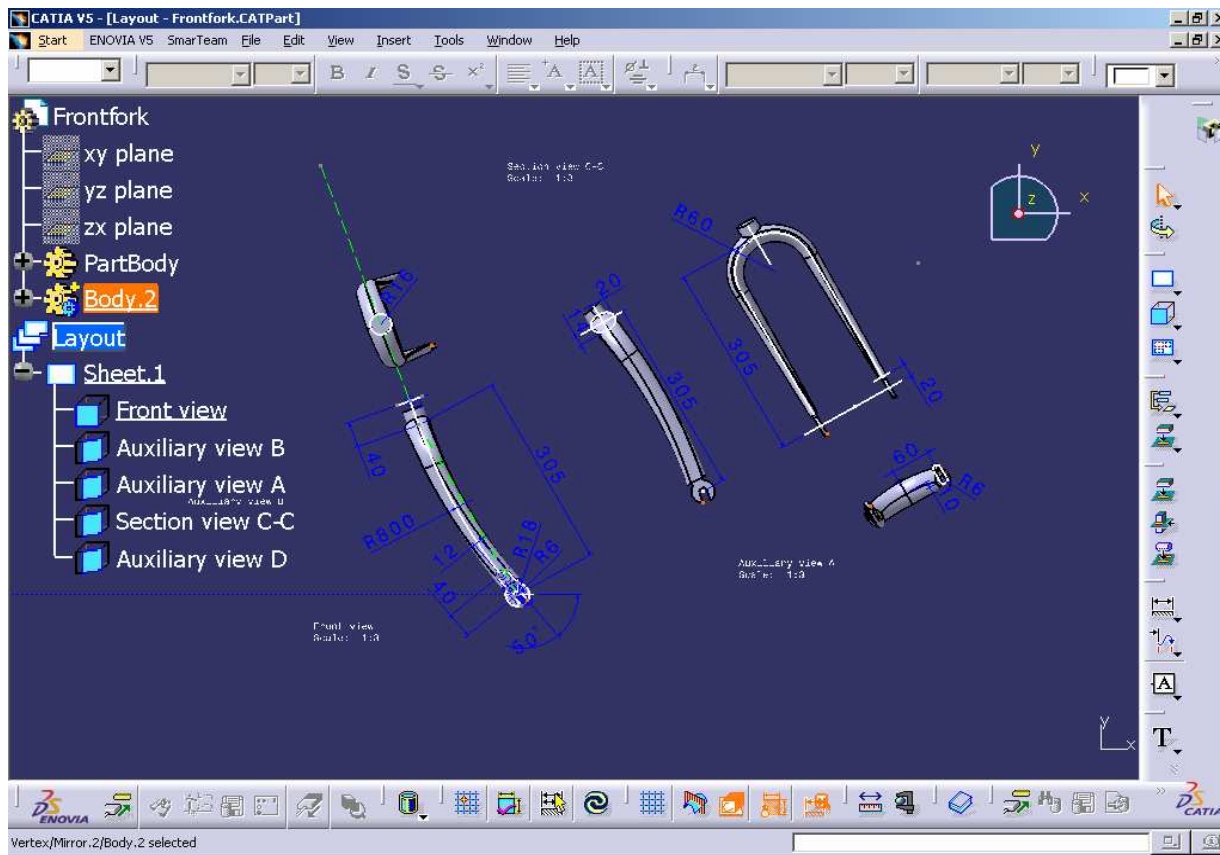**Students attending this course should be familiar with CATIA V5 Fundamentals.**

1 day

Student Notes:

Table of Contents

Introduction: 2D Layout for 3D Design

You will become familiar with the 2D Layout for 3D Design workbench and interface.

Introduction to 2D Layout for 3D Design Workbench

2D Layout for 3D Design workbench has the following benefits:

- **A tool to create specifications**
  - **2D preliminary geometry (parts only)**
  - **Dimensioning, tolerancing, annotations, dress-up**

- **2D Layout of 3D design**
  - **Drafting-like sheets and views**
  - **Transparent background and visualization filters for each view**
  - **Advanced print management**
  - **Drawing creation from 2D Layout**

- **Concurrent 2D & 3D**
  - **Generation of 3D geometry from 2D geometry**
 - **In editing context with transparent display of 3D**

- **Generative Drafting can still be used for deliverables**
  - **Generation of initial design information (geometry, dimension, dress-up, etc.)**
  - **Creation of view types not available into 2D to 3D design (breakout, broken, detail, etc.)**
  - **Generation of geometry exact & normalized (fillets, etc.)**
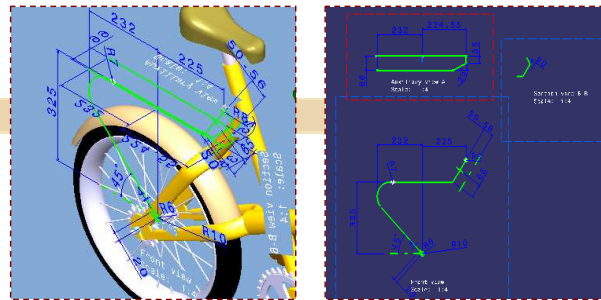
General Process

The general process of designing a part using the 2D Layout for 3D Design workbench is given below:
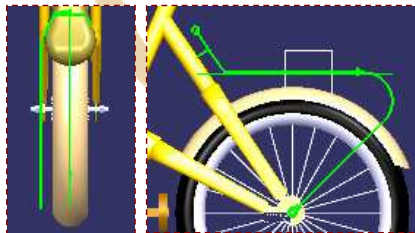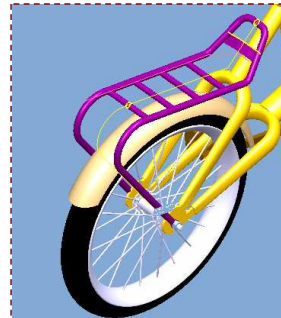
1 **Define 2D Layout sheets**
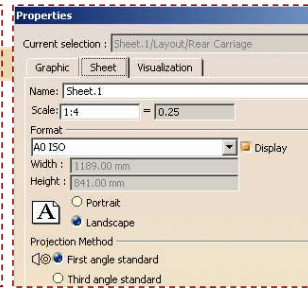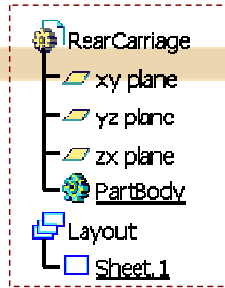
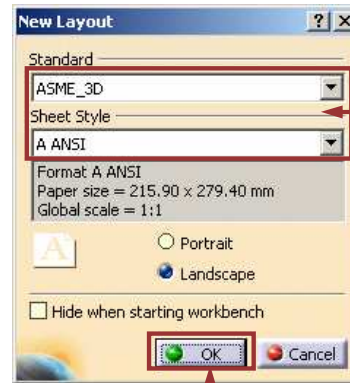**2** **Create 2D Views**
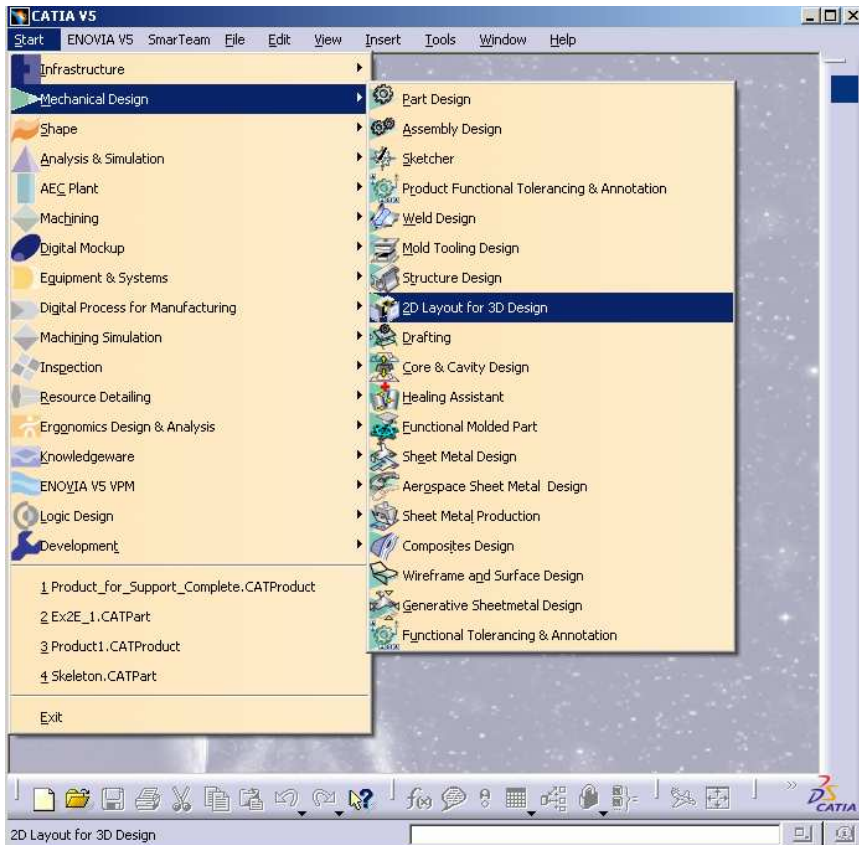
3 **Export 2D Geometry**

4 **Complete design in GSD / Part Design workbench**

Accessing the 2D Layout for 3D Design Workbench

Click Start > Mechanical Design > 2D Layout for 3D Design.

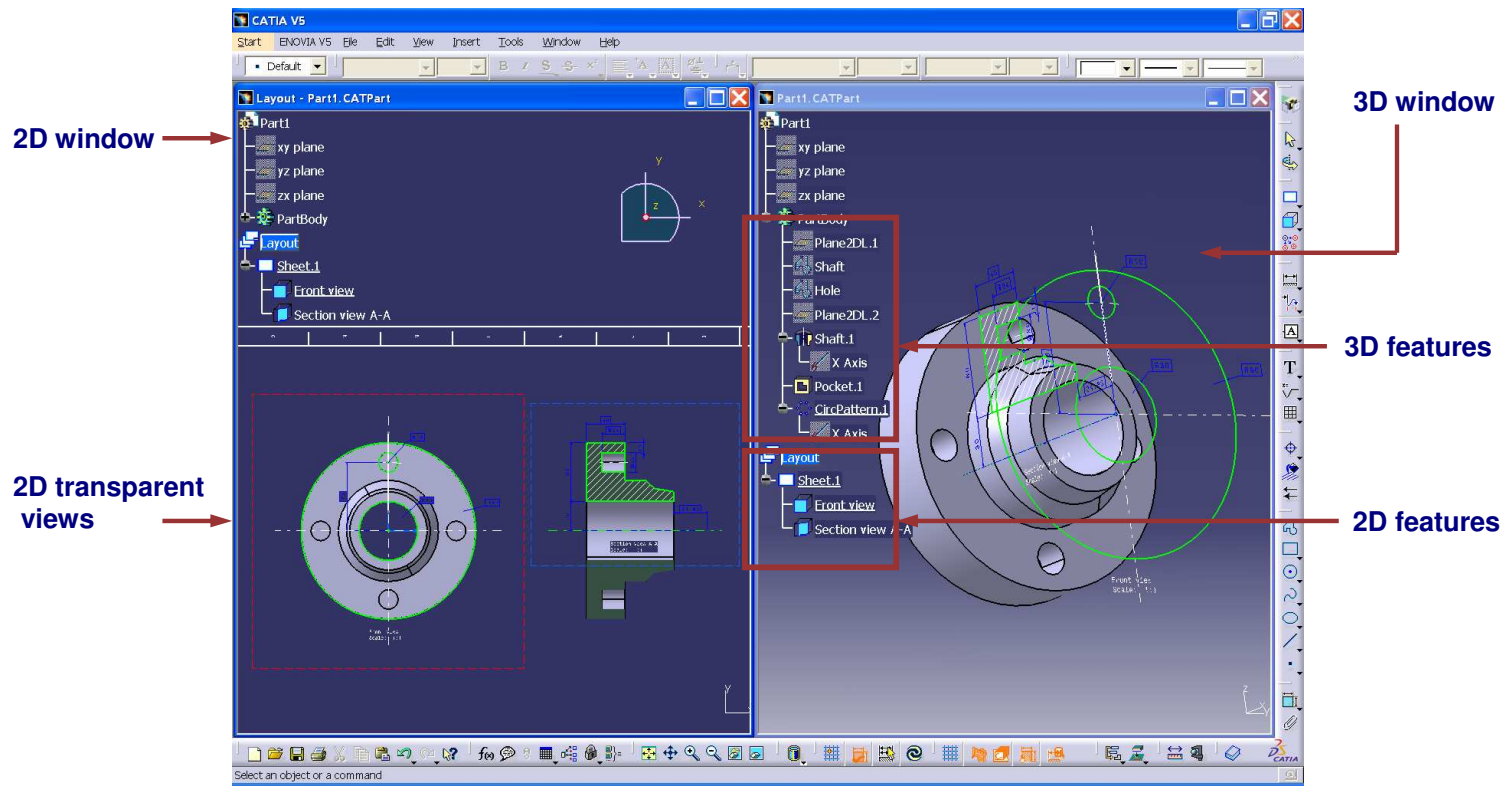**Select the layout format and the standard to be used**

Click OK

User Interface

**The working document is a CATPart with a dedicated 2D Window in addition to the usual 3D window.**

2D window

3D window

3D features

2D transparent views

2D features

User Interface: Tools (1/2)

A list of some commonly used tools in the 2D Layout for 3D Design workbench are listed in the table shown below:

Icon/ Option	Name of the Tool/Option	Description
	Invisible	Hides both the 2D background (i.e. the 3D representation of 2D elements which do not belong to the current view, but to other views) and the 3D background (i.e. the representation of all 3D elements, including edges, faces and 3D wireframe)
	Standard	Shows both the 2D and the 3D background.
	Unpickable	Prevents from selecting all elements in both the 2D and the 3D backgrounds, even though you can see them. You can just handle 2D elements.
	Low intensified	Applies a low intensity light for all elements in both the 2D and the 3D backgrounds.
	Unpickable low-intensified	Introduces a low light for all elements in both the 2D and the 3D backgrounds. Additionally, although you can see these elements, you cannot select them. You can just handle 2D elements in the current view.
	New View	Creates a projection view in an existing layout.
	New Section/Auxiliary view	Creates a section view, a section cut or an auxiliary view.

User Interface: Tools (2/2)

Icon/ Option	Name of the Tool/Option	Description
	New Section From 2 Planes	Creates two aligned section views or aligned section cuts using two existing 3D planes as supports.
	New View From	Creates a view from an existing view, or from a 3D plane.
	3D Profile	Creates a profile feature on the view support plane, and create a profile feature on a plane parallel to the view support plane.
	3D Plane	Creates a 3D plane feature.

User Settings (1/2)

Before working with the 2D layout for 3D design, activate the following options.

- **In the Visualization toolbar, make sure that the 'Sketcher Grid' and the 'Cutting Plane' icons are inactive.**

- **Also in the same Visualization toolbar, make sure that 'Display Backgrounds as Specified for Each View', 'Show Constraints' and 'Analysis Display Mode' icons are active.**

- **In the Tools toolbar, ensure that the Create Detected Constraints icon is active. You can configure the other icons as required.**

- **To create associative geometry in case of use-edge, activate the 'Create associative use-edges' option from the Tools > Options > Mechanical Design > 2D Layout for 3D Design > Geometry.**
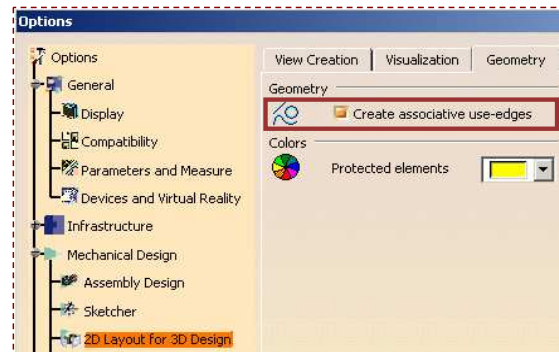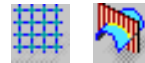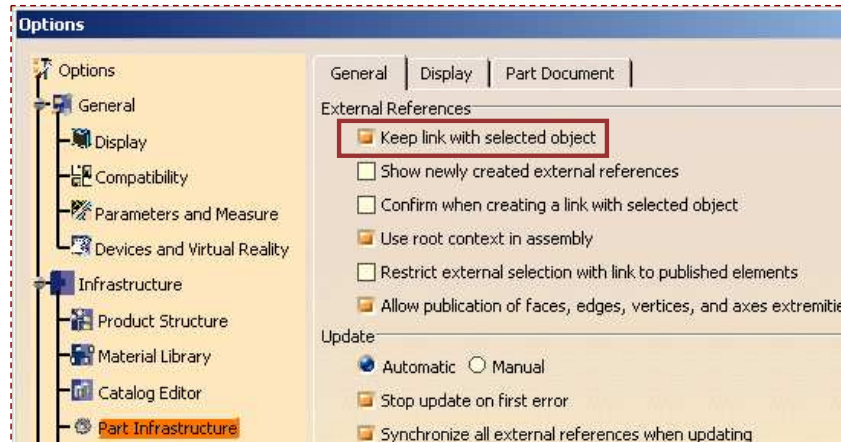
User Settings (2/2)

- **Activate the 'Create driving dimension' option from the Tools > Options > Drafting tab.**
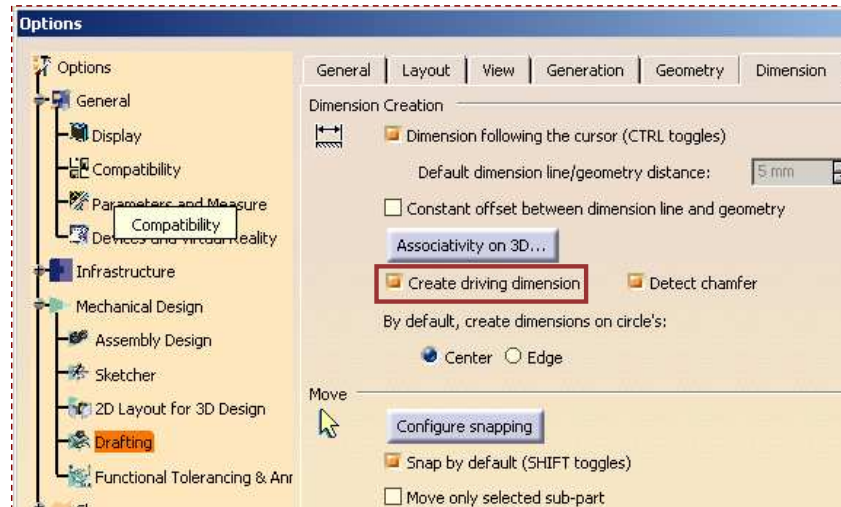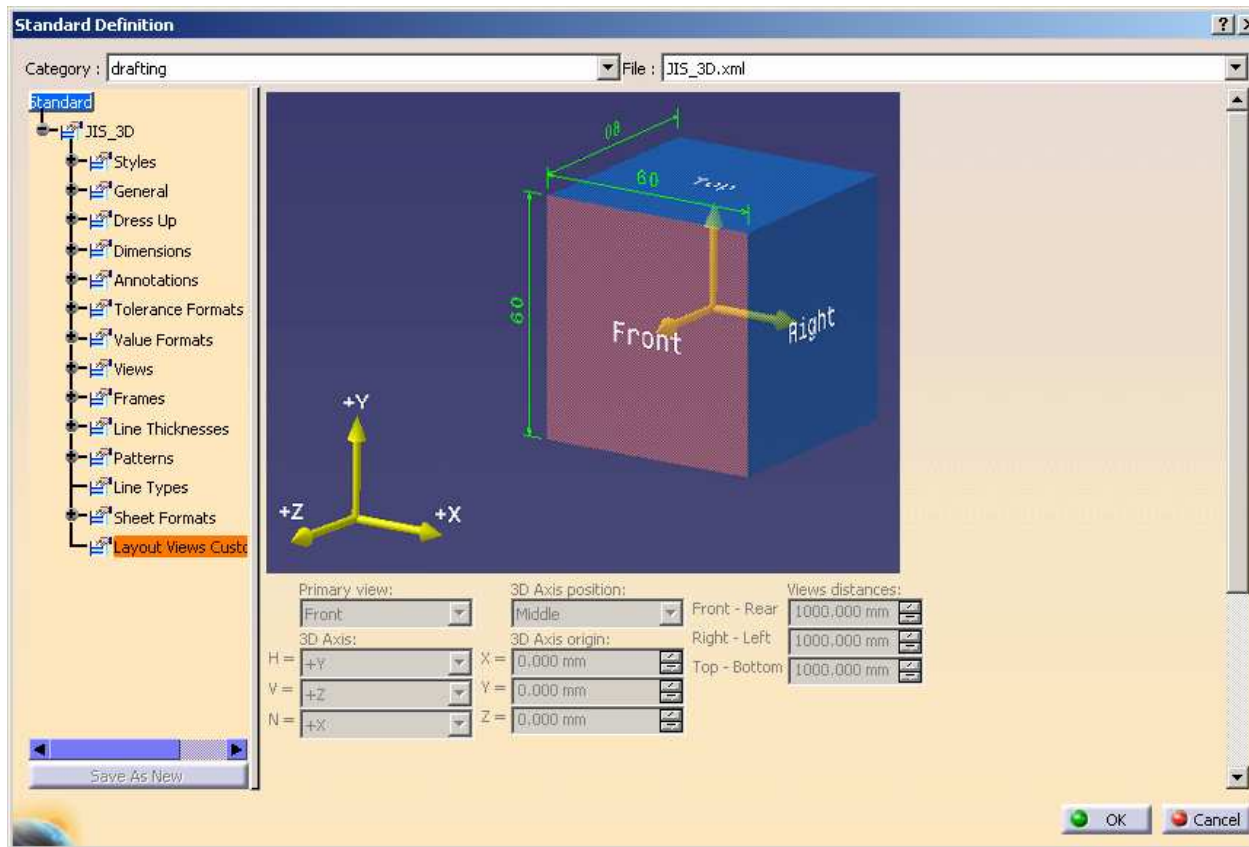

- **Activate the 'Keep link with selected object' option from the Tools > Options > Infrastructure > Part Infrastructure > General tab.**

Setting the Standards

You can set the drafting standards by accessing Tools > Standards > Drafting. You can select the 3D standard you want to use in order to configure it (position of the 2D views into the 3D one, etc.)
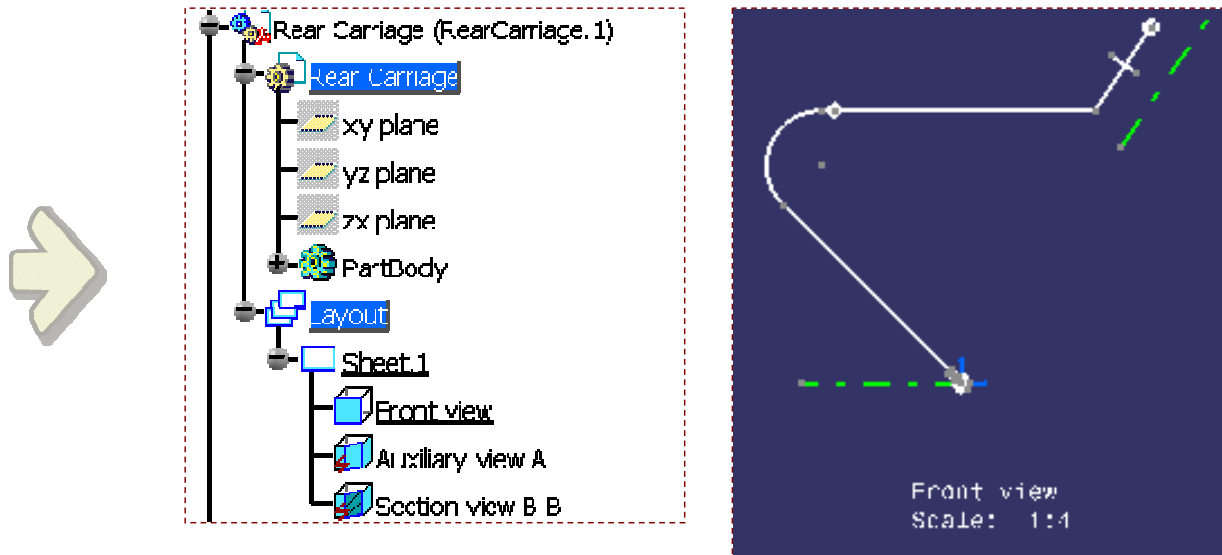
2D Layout Creation

In this lesson, you will learn to create 2D Layout views and add 2D Geometry in these views.

- **Initiating the 2D layout**
- **Creating 2D Geometry in the Views**
- **Analyzing the Profile**

Initiating the 2D Layout

*You will see how to initiate a 2D Layout and start creating 2D Views in the 3D environment.*

Creating Projection Views

Projections views are created from the 2D window both in the 2D and the 3D window.

1 **Create a new layout selecting the standard**

2 **Click the New View icon. The Compass appears in the 2D Layout window. Simultaneously in the 3D window a view box appears.**

3 **Using the Compass in the 2D window the view can be changed. Position the created view to the required location and validate it by clicking in the 2D Layout window. The front view is created.**

4 **Create the required views using the 'New View' icon. The view type depends on it's position relative to the front view.**

Compass

View Box
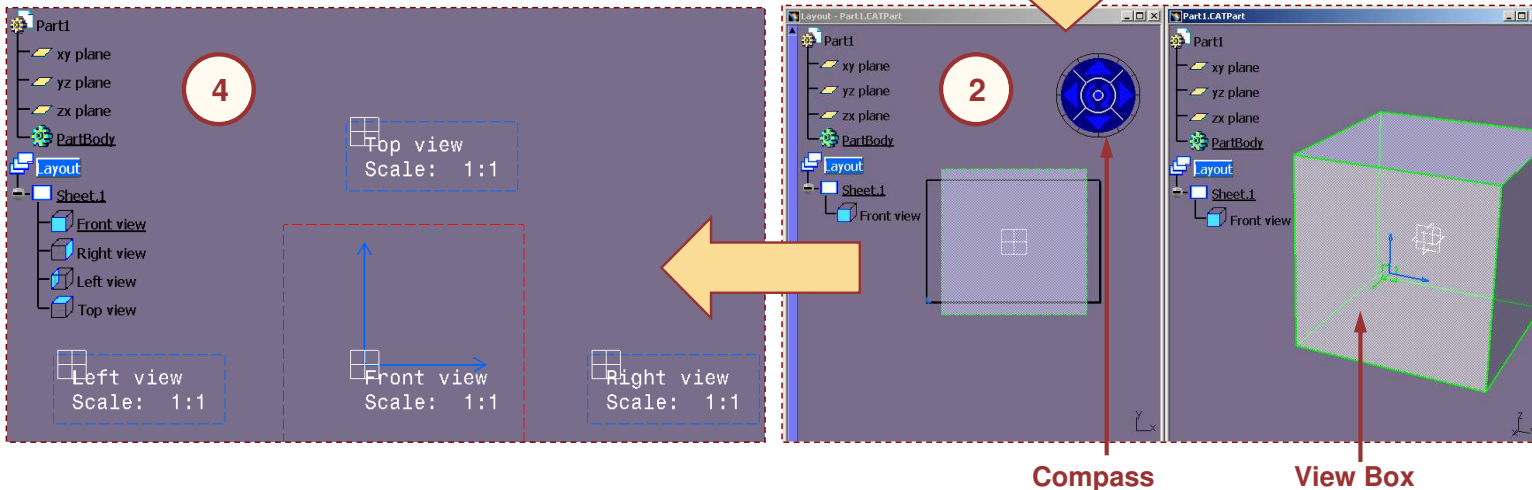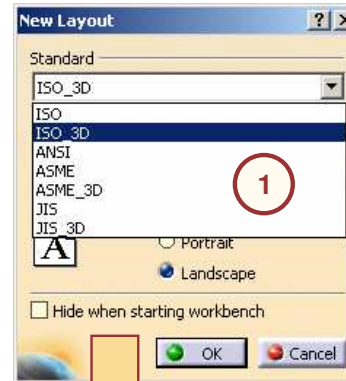
Setting Sheet Parameters

Before creating 2D Views, it is essential to set the Sheet parameters and choose an appropriate scale, projection angle and sheet size.

1   **Set the Sheet Scale**

2   **Edit the Sheet format (optional)**

3   **Define the Projection Method**
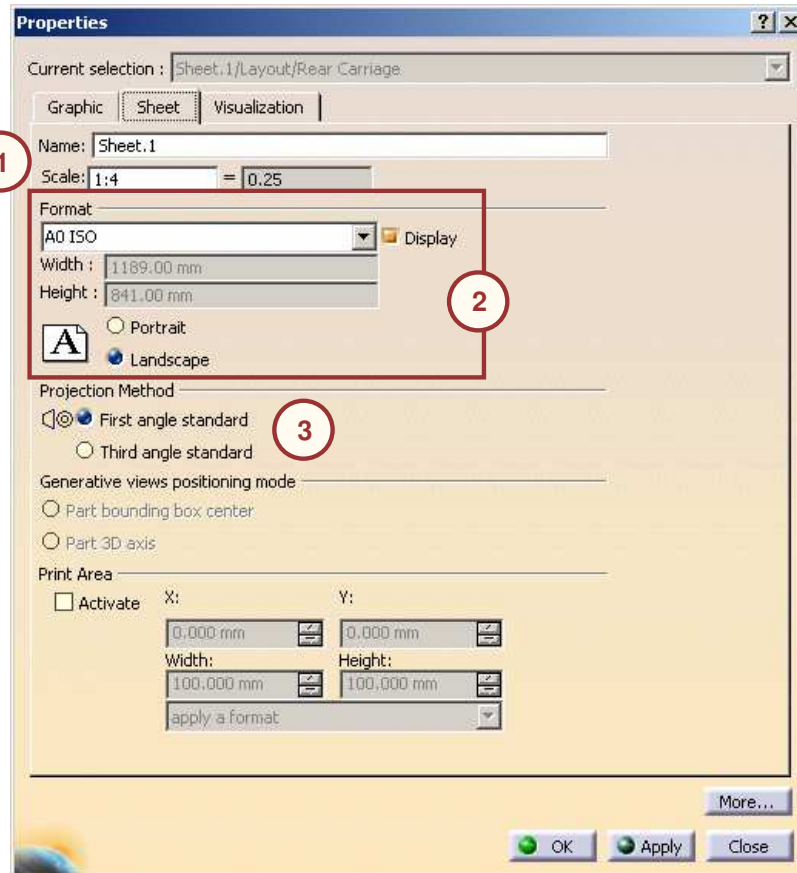
Creating Additional Views using 2D View Elements

You will see how to create Auxiliary and Section views using 2D view elements.

(1) **Click the New Section/Auxiliary View icon.**

(2) **Select in the 2D view a line which defines the support plane of the view.**

(3) **Select the option in the Tools Palette toolbar.**

(4) **Move the view to its position and click to validate its creation.**
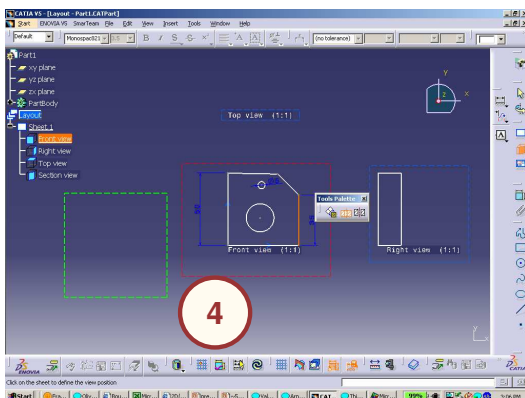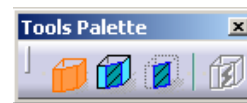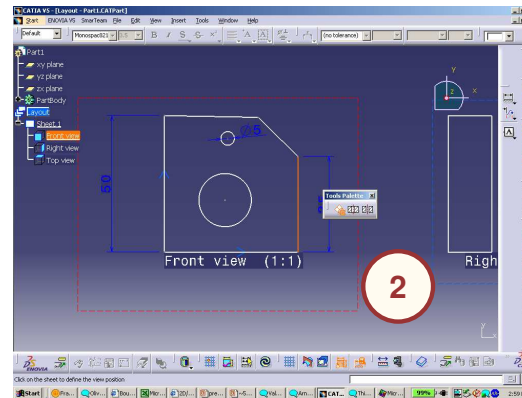
(5) **Create the 2D geometry in the view using the interactive drafting tools.**

Creating Additional Views using 3D View Elements

1

2

3

4

Click the Section From 2 Planes icon

Select two planes in the 3D window

Move the view to its position and click to validate its creation

Create the 2D geometry in the view using the interactive drafting tools

1

2

3

4

Click the Create New View From icon

Select a plane in the 3D window

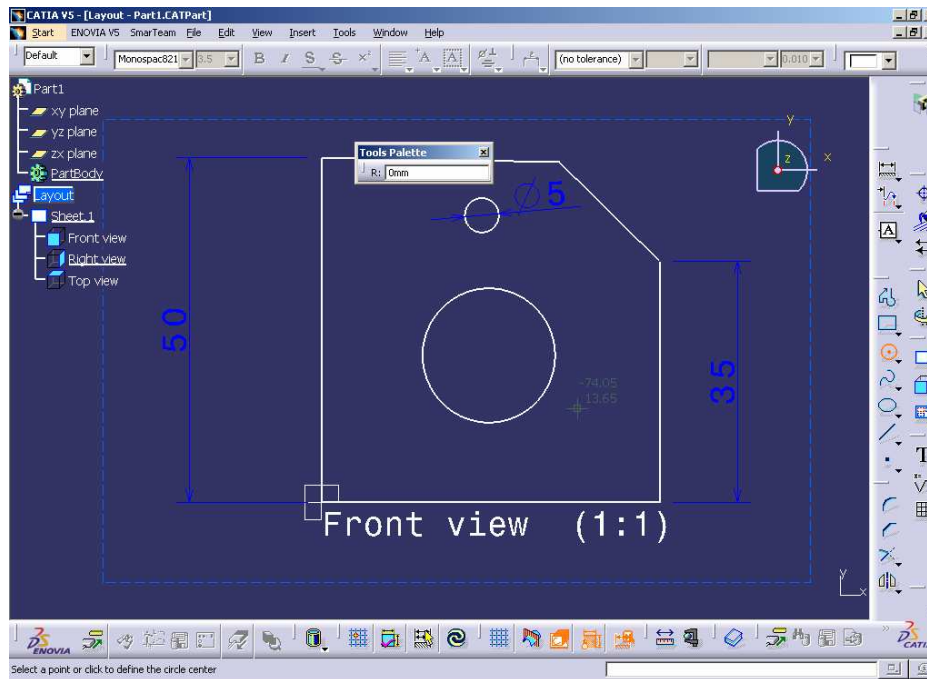**Move the view to its position and click to validate its creation**

Create the 2D geometry in the view using the interactive drafting tools

Creating 2D Geometry in the Views

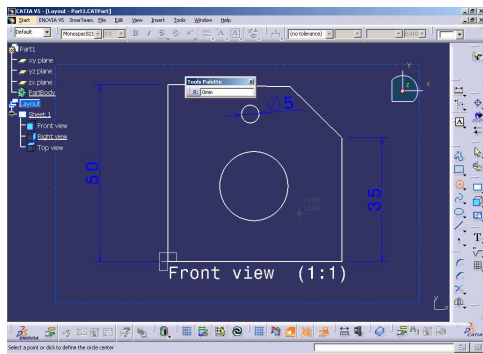*You will learn to create 2D Geometry in the 2D Layout Views.*

Creating 2D Geometry in the Projection Views

You will see how to create 2D Geometry into the projection views. Associativity between the views can be created using formulas linking the dimensions together.
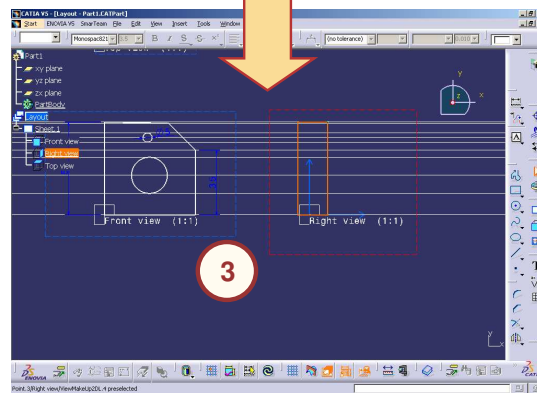
1   **Create the 2D geometry in the front view using the interactive drafting tools**

2   **Activate an other view to be completed. Display using the contextual menu on the front view the folding lines**
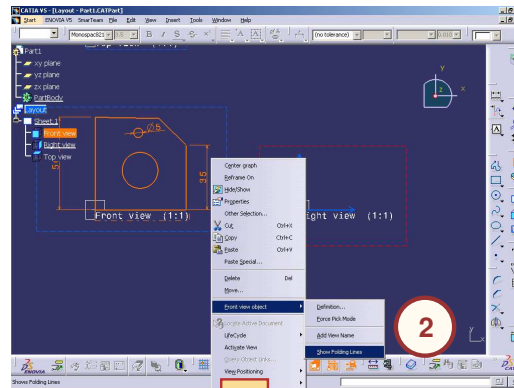
**3**   **Complete the other projection views using the folding lines**

3D Visualization and Use Edge Capabilities

You can visualize the 3D background in the 2D Layout and extract features from 3D to 2D using the 'Use Edge' tools.

1 — **Click the Display Backgrounds as Specified for Each View icon**

2 — **Extract, using the 'Use Edge' toolbar, the 3D features you need to complete the profile.**

To use the edges from 3D, set 'Create associative use-edge' option on, in the Tools > Option > Mechanical Design > 2D Layout for 3D Design > Geometry tab.
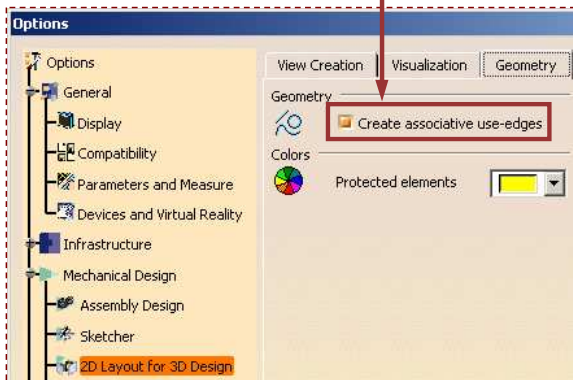
The 3D part is displayed in the 2D Layout, for the purpose of edge extraction.
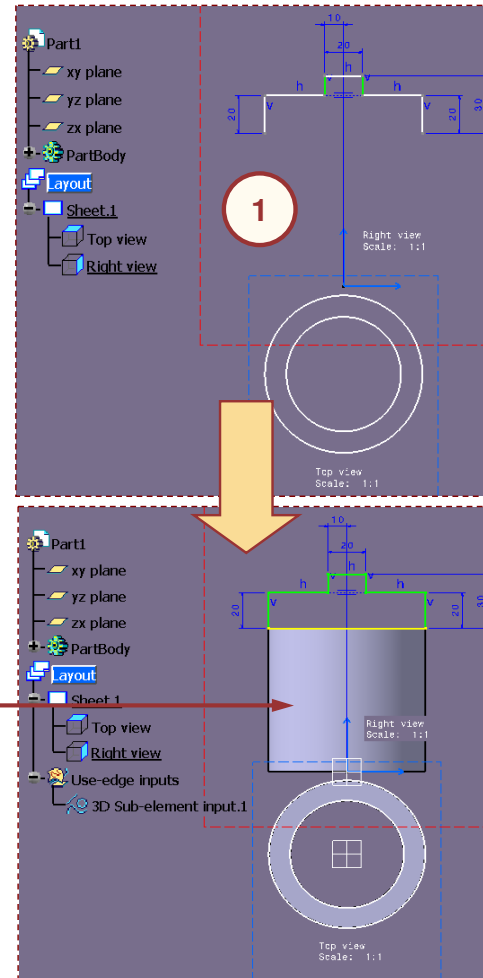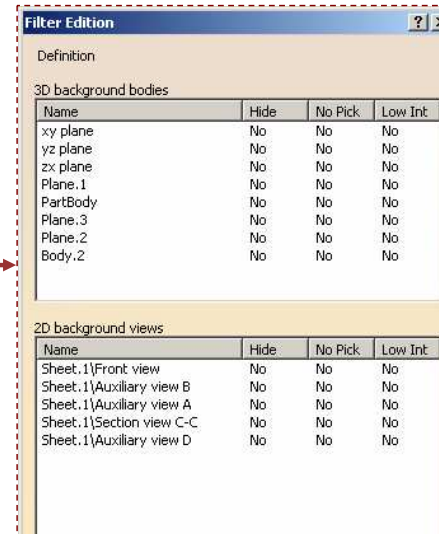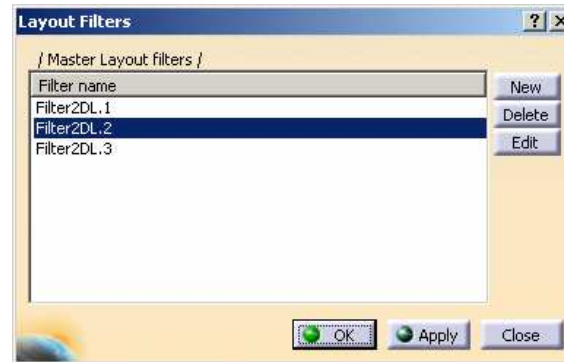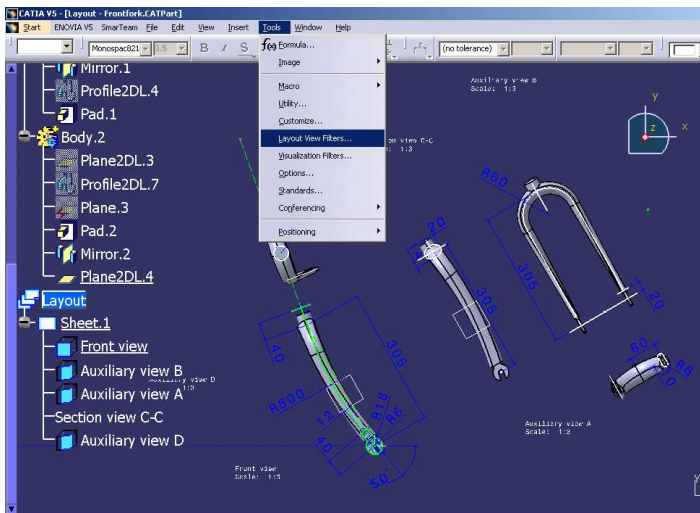
Managing the Background Visualization (1/2)

You will see how to set and manage Layout filters.

1   **Go to Tools > Layout view filters**

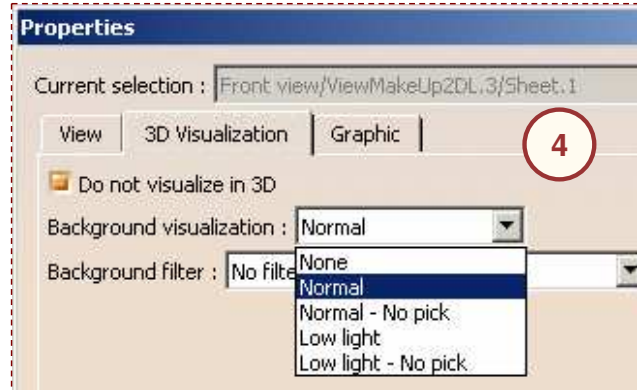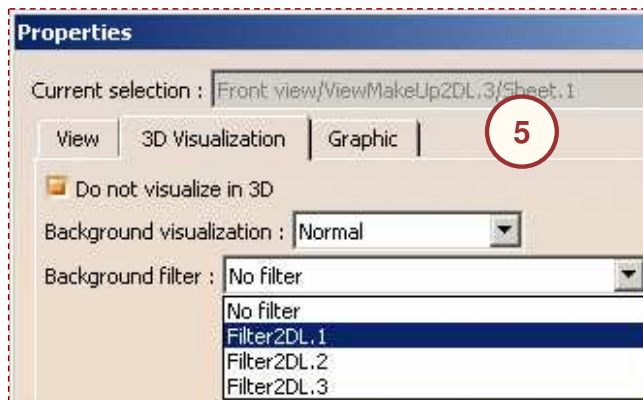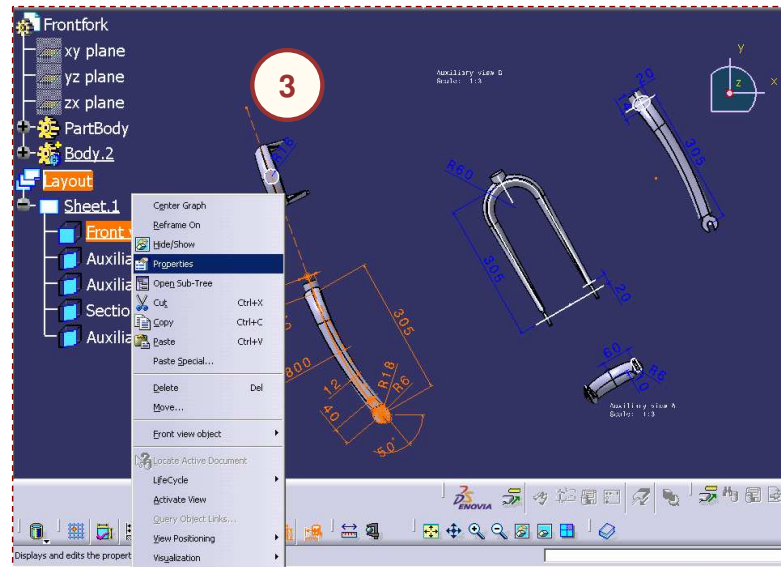**2**   **Create or edit an existing filter.**

**Filter Edition for each 2D background
views or 3D background bodies (i.e.
Hide   YES/NO
No Pick   YES/NO
Low Int   YES/NO)**

# Managing the Background Visualization (2/2)

3   **Right-click the selected view and access the properties.**

4   **Select the background visualization mode.**

5   **Select the visualization filter.**

Customizing Cutting Plane and Display Background Options

Student Notes:

You will learn, how to customize Cutting Plane and Display Background Options

- **You can activate 'Display when loading layout' option from Tools > Options > Mechanical Design > 2D Layout for 3D Design > Visualization.**
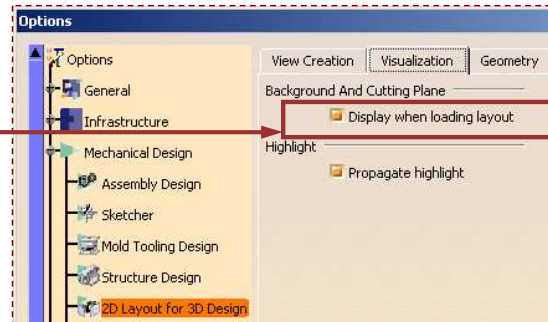
- **This option helps you to visualize the 3D Background and cut the section along the Cutting Plane. This option is activated by default.**

Section view A-A
Scale: 1:3
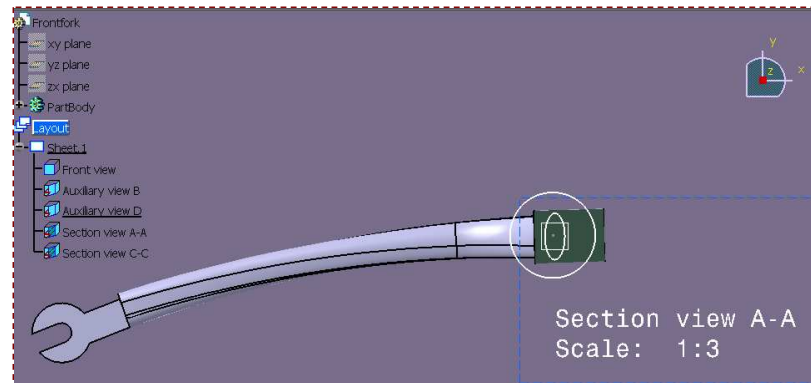
- **The 'Cutting Plane' and 'Display Background as Specified for Each View' icons will be highlighted in the Visualization toolbar, when the Layout is loaded.**

Customizing 2D Visualization Mode (1/2)

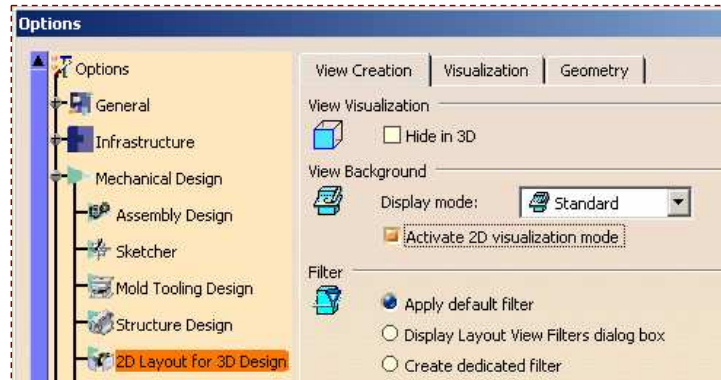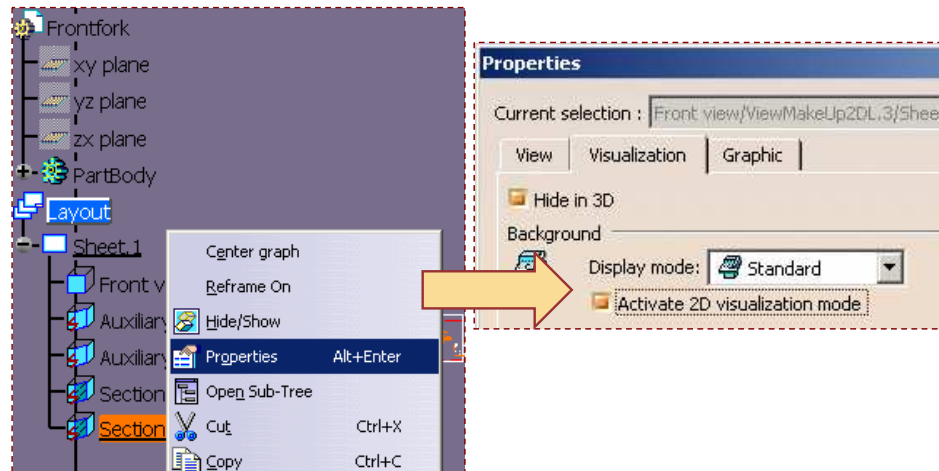**You will learn, how to Customize 2D Visualization Mode**

- **To customize this option, go to Tools > Options > Mechanical Design > 2D Layout for 3D Design > View Creation and 'Activate 2D visualization mode'.**
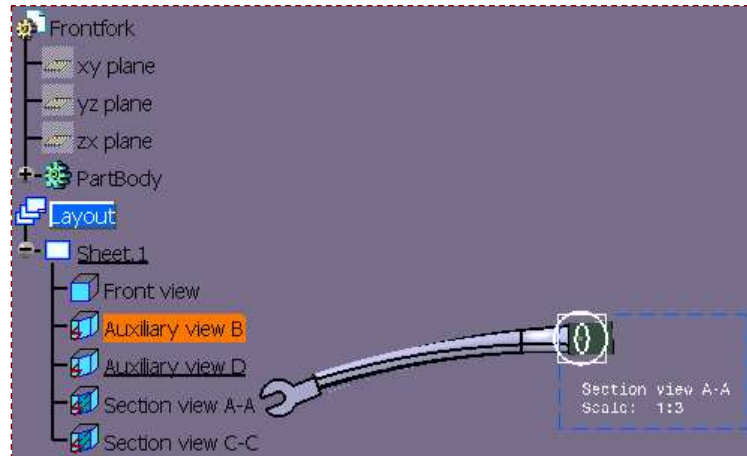
- **The option can also be set from the contextual menu of the view. Right-click the View, go to Properties > Visualization and activate 'Activate 2D visualization mode'.**

Customizing 2D Visualization Mode (2/2)

- **Deactivating the option, the solid part is displayed in the background.**

- **Activating the option, only the 2D Planar elements are displayed.**
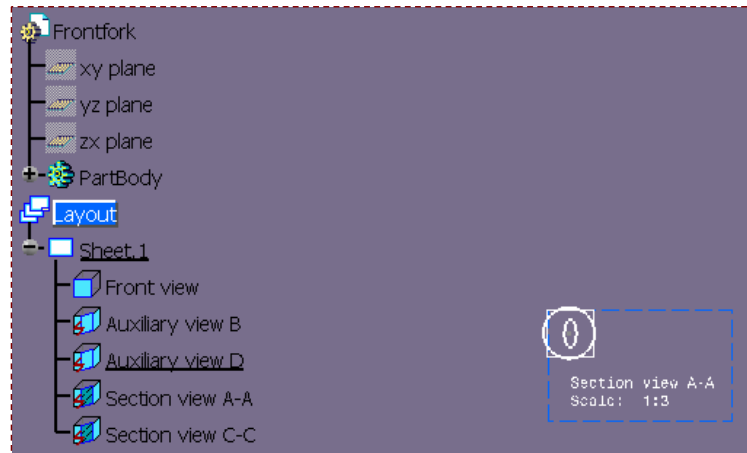
Exporting the 2D View to 2D layout

It is possible to export CATDrawing views in 2D layout view

(1) **Open the CATDrawing containing the 2D view to export**

(2) **Tools > Export Layout view**
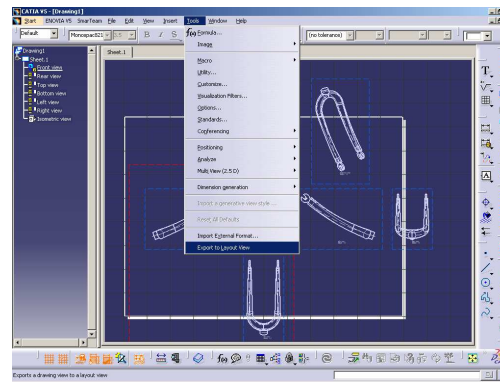
(3) **Select the element types you want to export**

(4) **Select layout sheet in which you want to export the CATDrawing view**
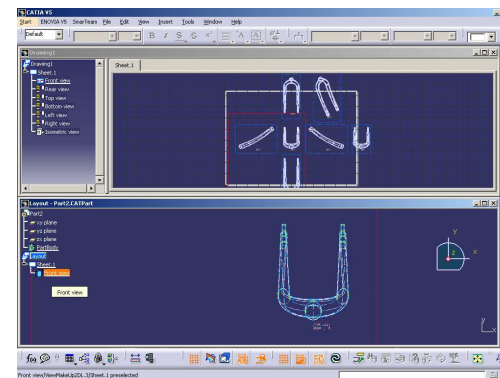
Using 2D Components

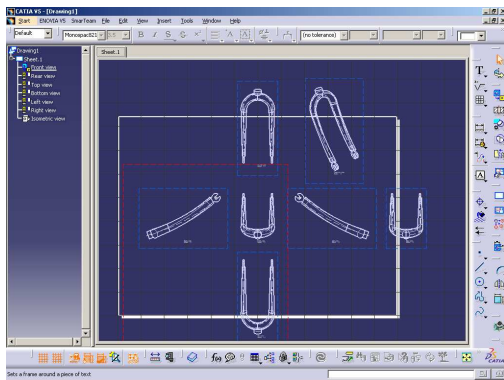**To speed up the view design, you can use the 2D component mechanism.**

1 **Create detail sheets and instantiate 2D components from the 2D layout CATPart**

2D components to be instantiated
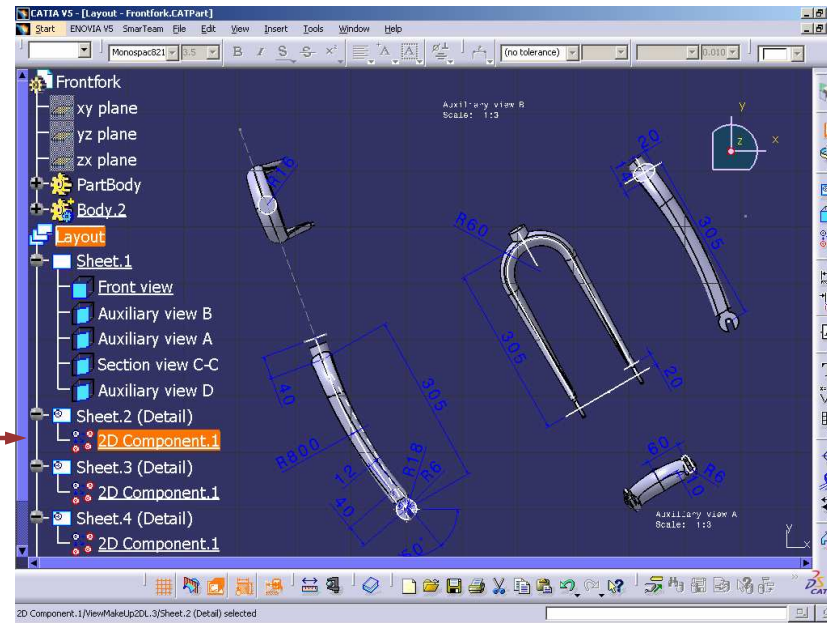
2 **Instantiate 2D components from the 2D component catalogs**

Back Clipping Capabilities

A frame or a plane can be used for clipping the 3D part in a 2D layout view.

1 Right-click the selected view, and go to Clipping > Activate Clipping Frame, from the contextual menu.

2 Define the frame or select the plane to define the clipping.

3 Clipping can be deactivated by right-clicking on the clipped view and by selecting the "Deactivate Clipping Frame" function from the contextual menu.
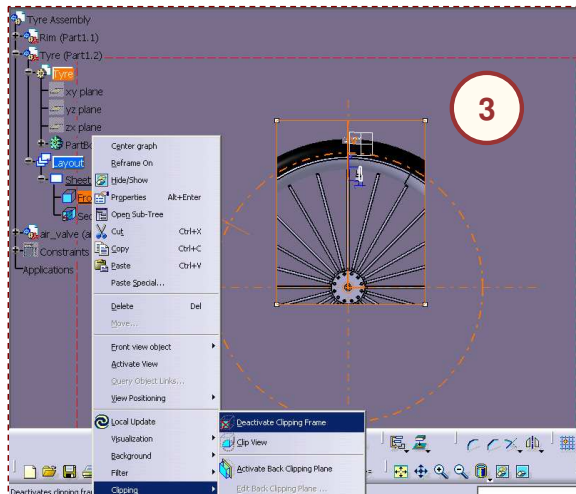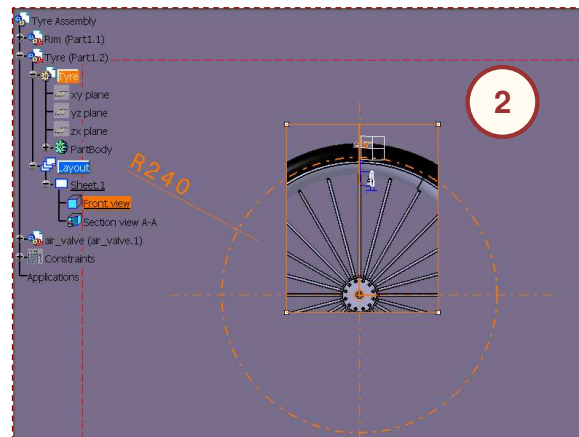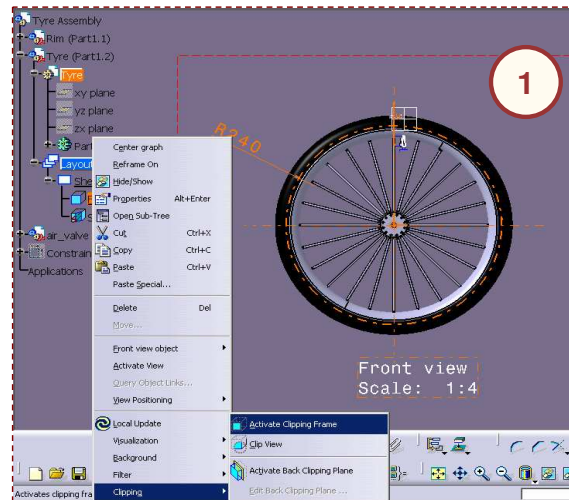
Creating Clipping Views

A circular or a polygonal profile can be used for clipping the 3D part in a 2D layout view.

Circular Clip View

1   **Right-click the View, and go to Clipping > Clip View from the contextual menu.**

2   **Select the Circle from Tools Palette that appears on the screen.**

3   **Create a circle in the view, where you want to keep the 3D Background as a Circular Clip.**

4   **A clipping view can be unclipped by right-clicking on the clipped view and by selecting the 'Unclip View' function from the contextual menu.**
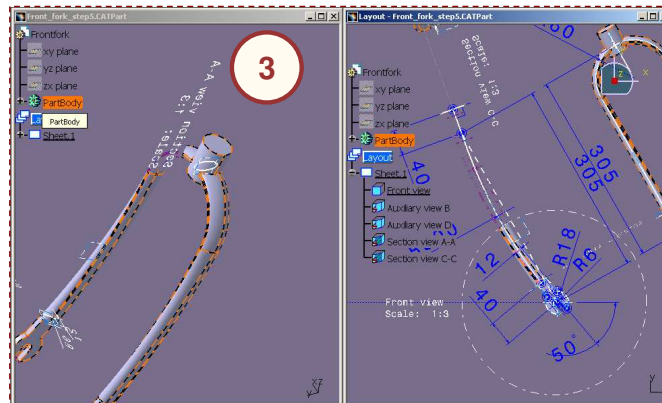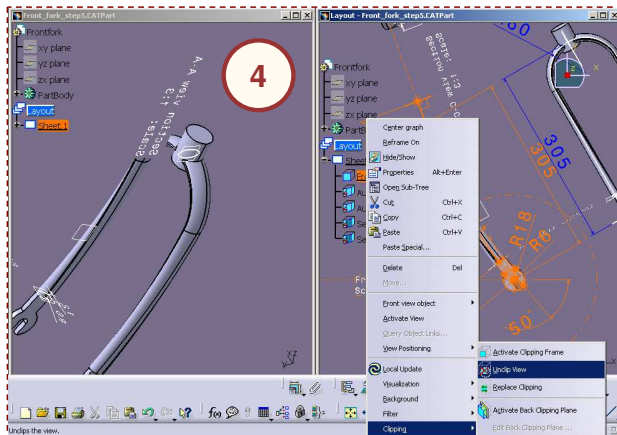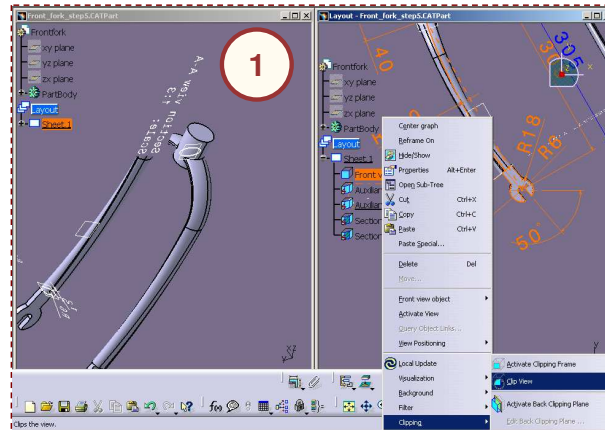
Dress-up Creation

2D layout to 3D Design product facilitates the designers by providing standard dimensions, annotations and dress-up capabilities. This is an important added-value as compared to the Sketcher.

Dress-up capabilities similar to those in the drafting workbench are available.

Analyzing the Profile

You will see how to analyze a profile for its constraint status.

Sketch Analysis

To solve problems with profiles, the 'Sketch Analysis' tool can be used.

- **For Sketch Analysis, go to Tools > Sketch Analysis. Or you can also access the tool from the 'Tools' toolbar.**
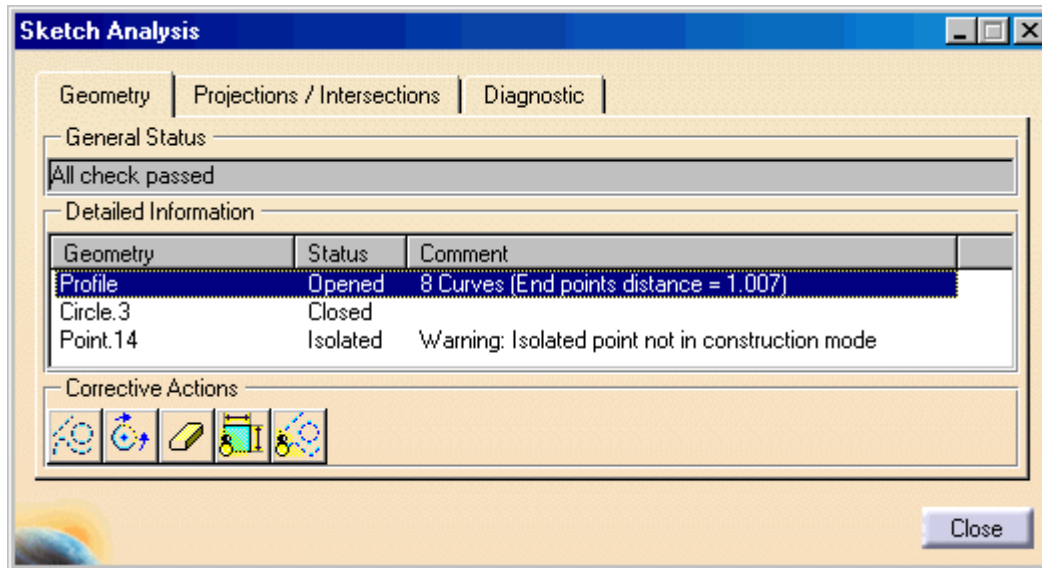
- **This tool can be used to determine a profile's constraint status (i.e., Under-constrained, Iso-constrained, Over-constrained, or Inconsistent), and where degrees of freedom still exist in the profile.**

- **The Sketch Analysis tool can also be used to determine if a profile is open or closed. This is useful if you receive an error when trying to create profile-based features.**

Sketch Analysis

Unresolved profile

Feature Definition Error

Topological operators : internal error.

OK
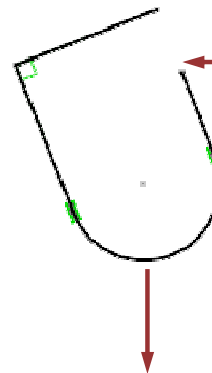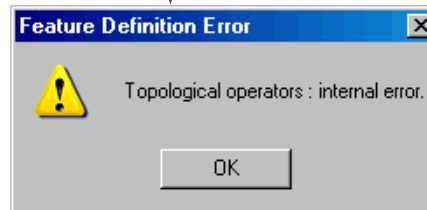
Sketch Analysis Window (1/3)

The sketch analysis window has three tabs. Each tab contains information to help analyze the profile.

The Geometry tab is used to determine if the sketch geometry is valid:

A. **The 'General Status' area analyzes several elements in the context of the entire sketch.**

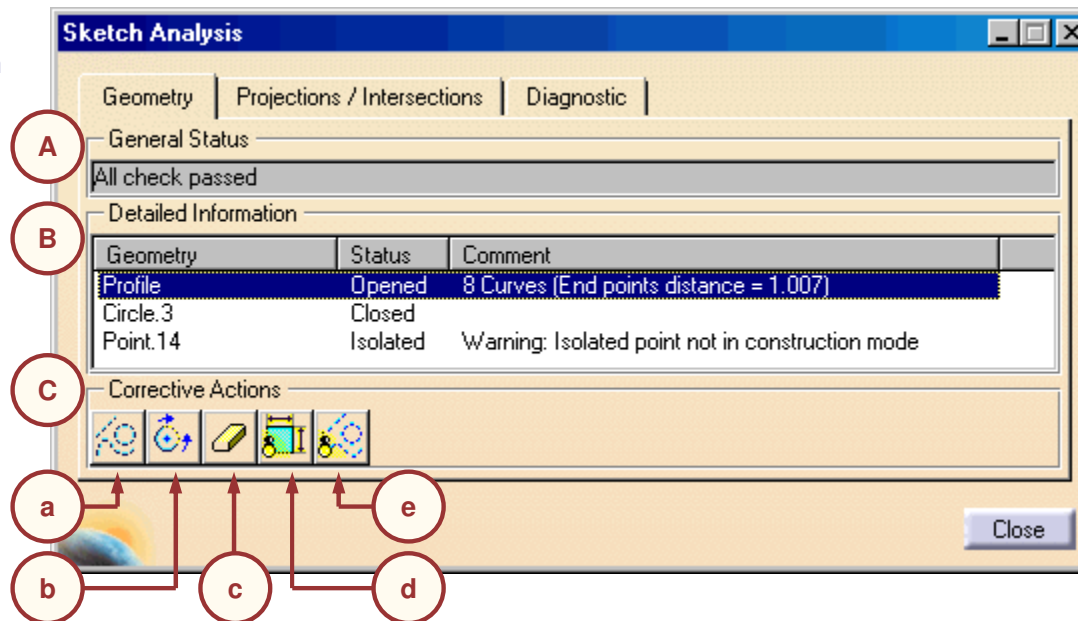**B.** **The 'Detailed Information' area provides a status and comment on each geometric element in the sketch.**

C. **The 'Corrective Actions' area lets you correct geometry. You can:**

    a. **Convert an element into a construction element.**

    b. **Close an open profile.**

    c. **Erase unwanted geometry.**

    d. **Hide all constraints.**

    e. **Hide all construction geometry.**

Sketch Analysis

| Geometry | Projections / Intersections | Diagnostic |

General Status
All check passed

Detailed Information

Geometry	Status	Comment
Profile	Opened	8 Curves (End points distance = 1.007)
Circle.3	Closed	
Point.14	Isolated	Warning: Isolated point not in construction mode

Corrective Actions

Close

Sketch Analysis Window (2/3)

The Projections/Intersections tab is used to determine the status of all projected elements:

A. **The 'Detailed Information' area provides a status and comment on each projected or intersected element in the sketch.**

B. **The 'Corrective Action' area lets you correct geometry. You can:**

    a. **Isolate geometry.**

    b. **Activate or Deactivate a constraint.**

    c. **Erase geometry.**

    d. **Replace 3D geometry.**

    e. **Hide all constraints.**

    f. **Hide all construction geometry.**

Student Notes:
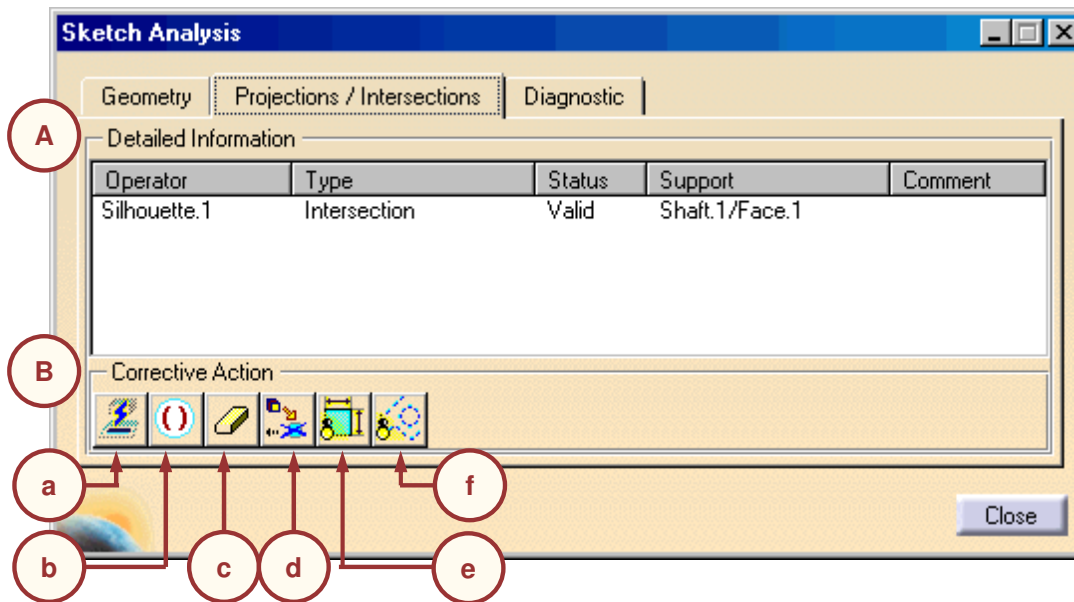
Sketch Analysis Window (3/3)

The Diagnostics tab displays a full diagnosis of all sketched geometry. It provides an analysis of the sketch as well as information on individual geometrical elements:

A. **The 'Solving Status' area provides an overall analysis of the sketched geometry.**

B. **The 'Detailed Information' area provides a description and status on each constraint and geometric element in the sketch.**

C. **The 'Action' area enables you to:**

    a. **Hide all constraints.**

    b. **Hide all construction geometry.**
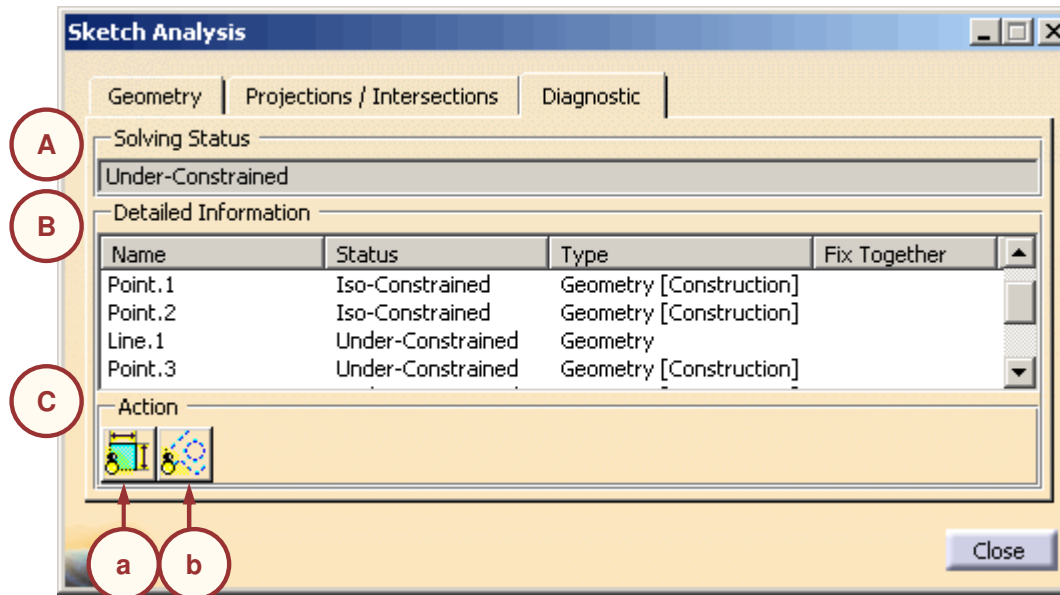
Performing a Quick Geometry Diagnosis (1/2)

**Use the following steps to analyze a sketch:**

(1) **Activate the View, containing the profile to be analyzed.**

(2) **Select the Sketch Solving Status icon.**

(2) ← Sketch Solving Status

(3) **The Sketch Solving Status window appears. It indicates the overall status of the Sketch Geometry. In this case, the sketch is under-constrained, even though the sketch appears to be all green (iso-constrained).**

(4) **Under-constrained and over-constrained geometrical elements are highlighted on the profile.**
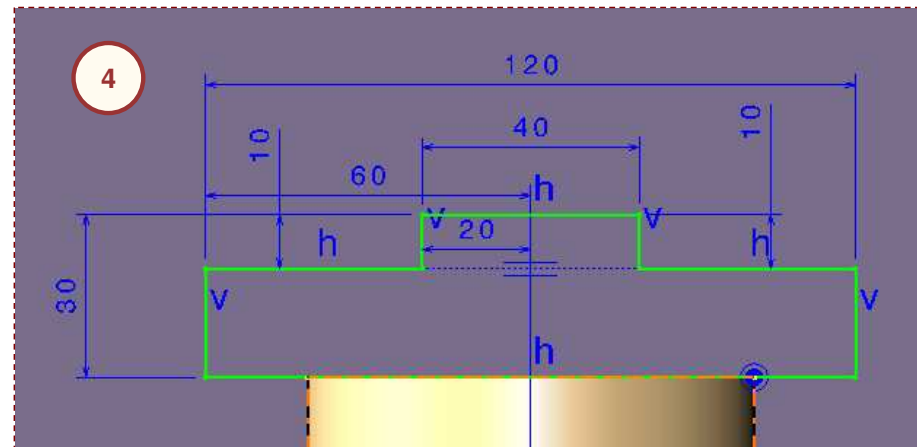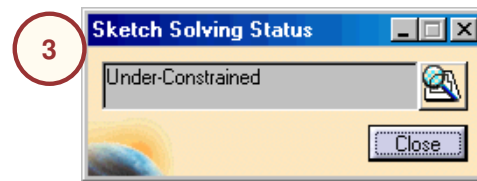
Performing a Quick Geometry Diagnosis (2/2)

Use the following steps to analyze a sketch (continued):

(4) **Select the Sketch Analysis icon in the Sketch Solving Status window or in the Tools toolbar.**

(5) **The Sketch Analysis window appears. In this example, the profile needs to be closed and the point needs to be changed to a construction element.**

(6) **Select Close to close the Sketch Analysis window.**
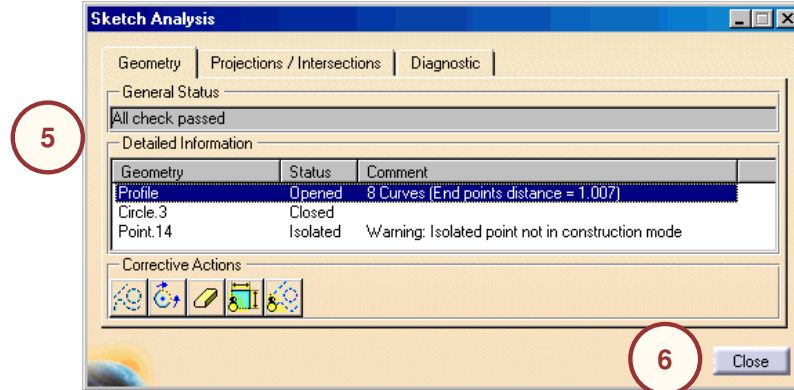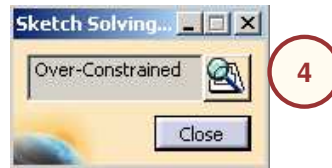
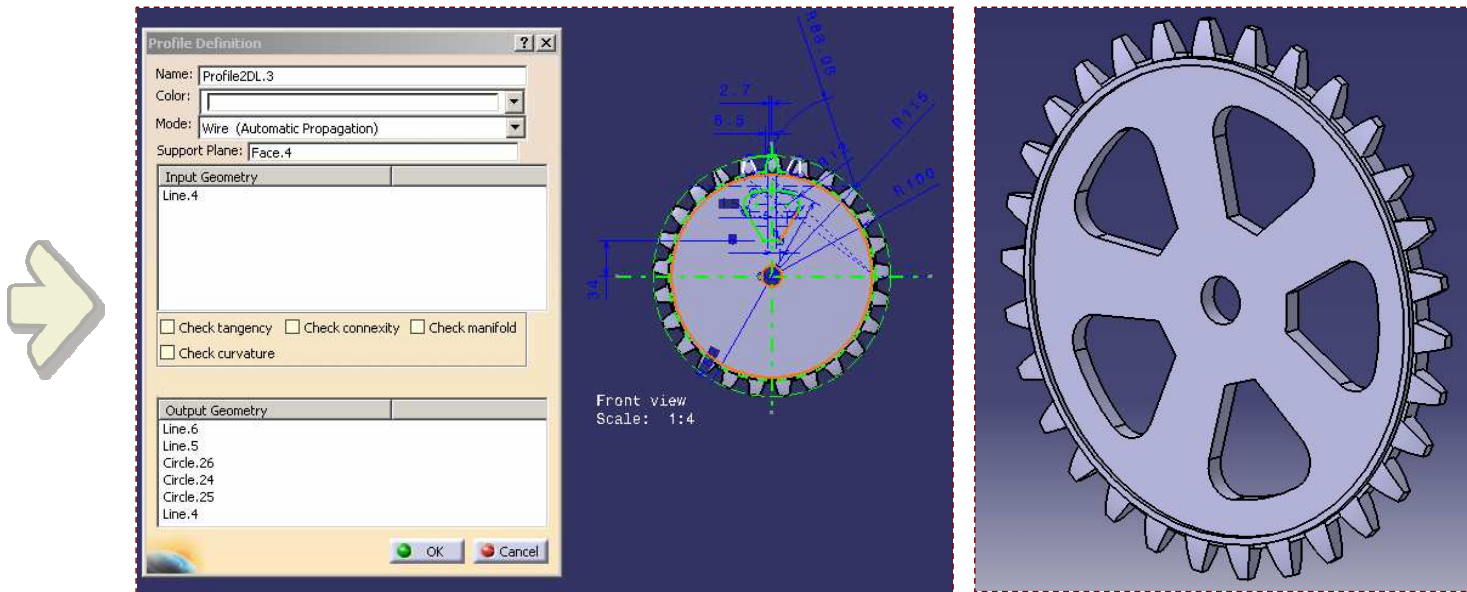# Using the 2D Layout Geometry

In this lesson, you will learn to create 3D geometry from the 2D Views.

- **Creating 3D Geometry from 2D Layout**
- **Exporting the 2D Layout**

Creating 3D Geometry from 2D Layout

*You will learn to export the 2D geometry to create 3D geometry.*
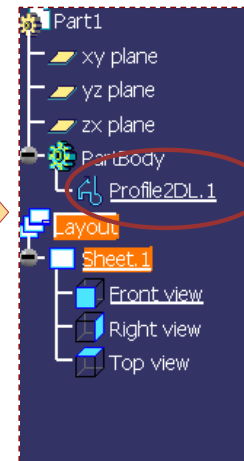
Create 3D Geometry from 2D Geometry (1/2)

You will see how to use 2D geometrical information to define 3D features.

Create profile features

1   **Click the 3D Profile icon**

2   **Select in the active view a element belonging to the profile you want to extract**

3   **Define the profile using the Profile Definition dialog box**
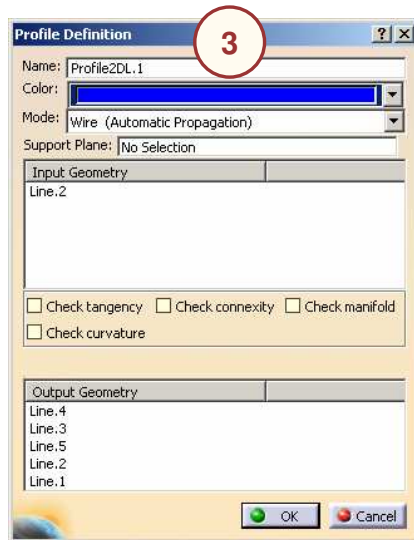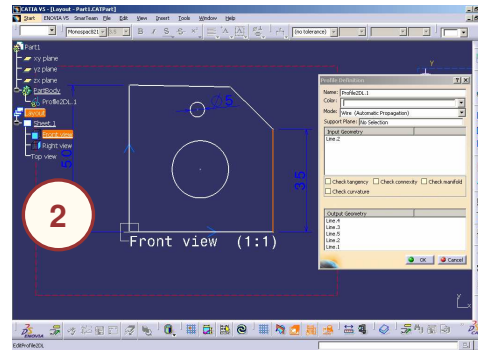
A 2D profile which can be used to define Pad, pocket, etc. is created In the 3D window
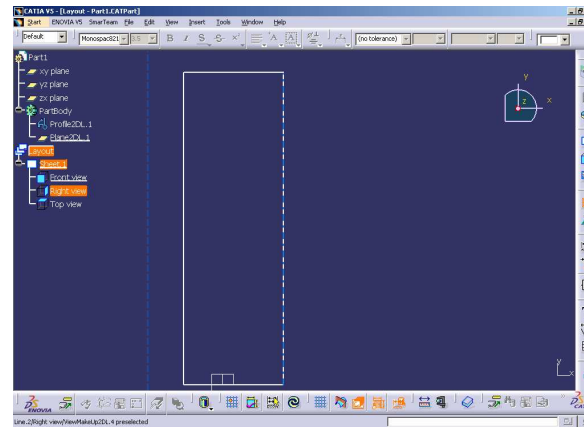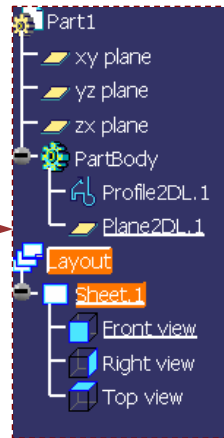
Create 3D Geometry from 2D Geometry (2/2)

Create planes

1 **Click the 3D Plane icon**

2 **Click a line in a 2D view**

**A plane is created
In the 3D window** →

After creating planes and profile feature, the corresponding 3D features can be designed.

Links Between 3D Geometry and 2D Layout (1/2)

The 2D Layout views can also be created using geometry of existing parts. An associative link exists between the parent and driven parts.

You can create the associative link by activating the 'Create associative use-edges' option from Tools > Options > Mechanical Design > 2D Layout for 3D Design > Geometry tab.
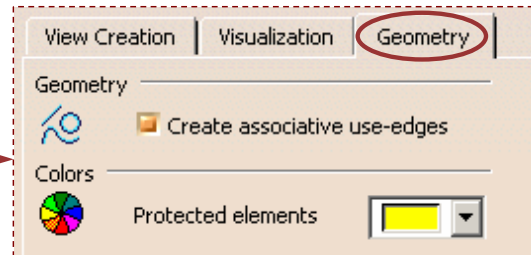
The changes in the original part are propagated to the 2D Layout.
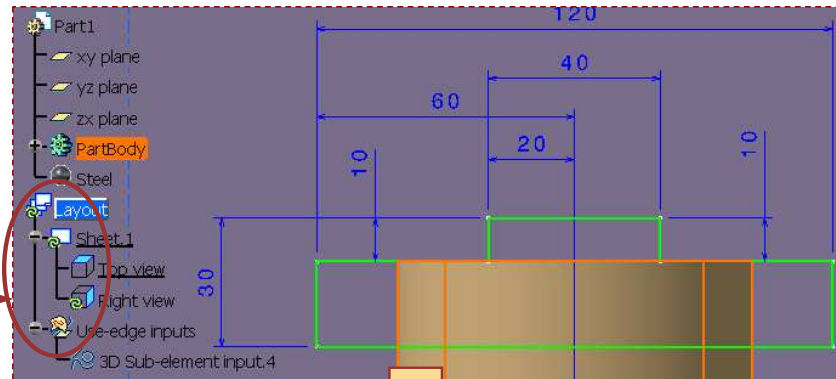
You have to locally update the 2D Layout views to drive the changes in the destination part.

In the example shown, a coincidence constraint is applied between the highlighted edge and the projected edge of the shaft.
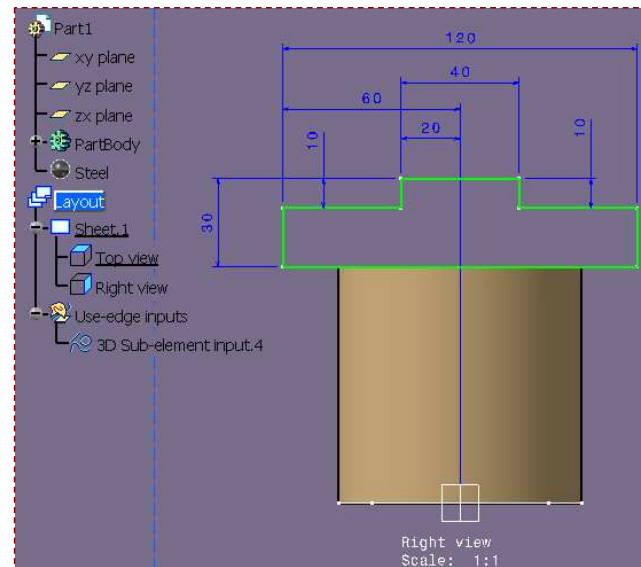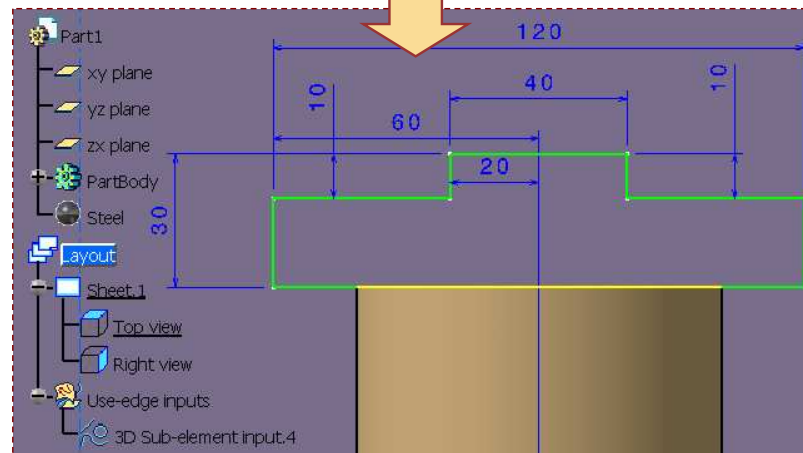
Links Between 3D Geometry and 2D Layout (2/2)

The Specification tree shows 'View Updation Required' symbol, since the shaft height is modified.
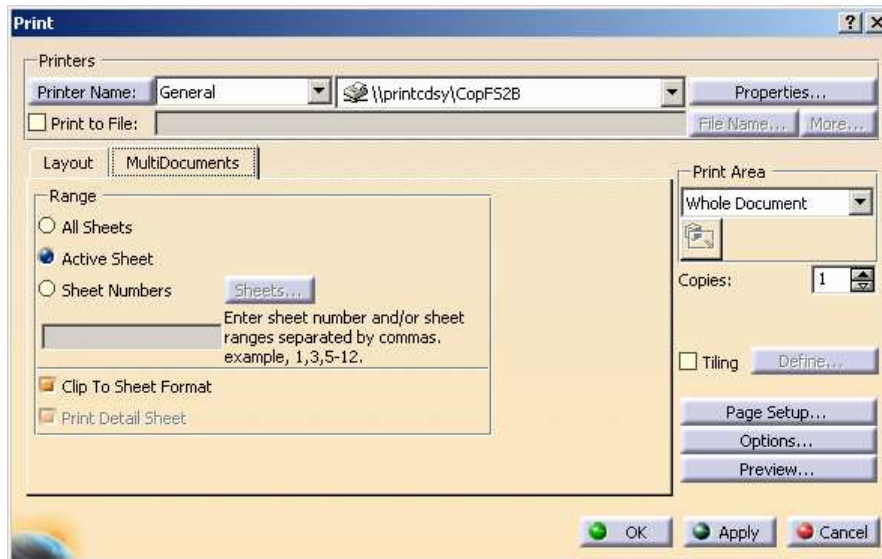

After Updation, the changes in the height of the shaft are reflected in the 2D Layout.

If the 'Create associative use-edges' option is deactivated, the use–edge will be non-associative with respect to the part.
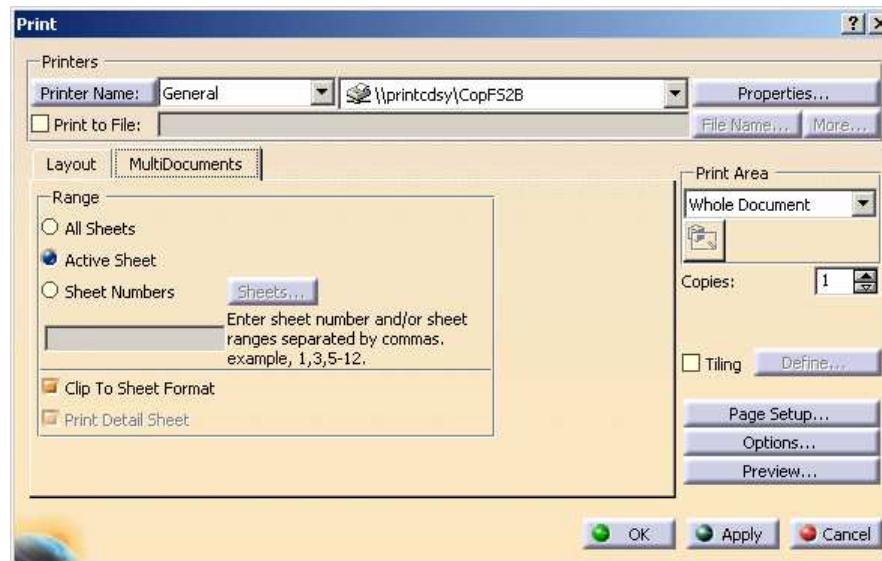
Exporting the 2D Layout

You will learn how to extract the output from 2D Layout and 3D Design workbench.
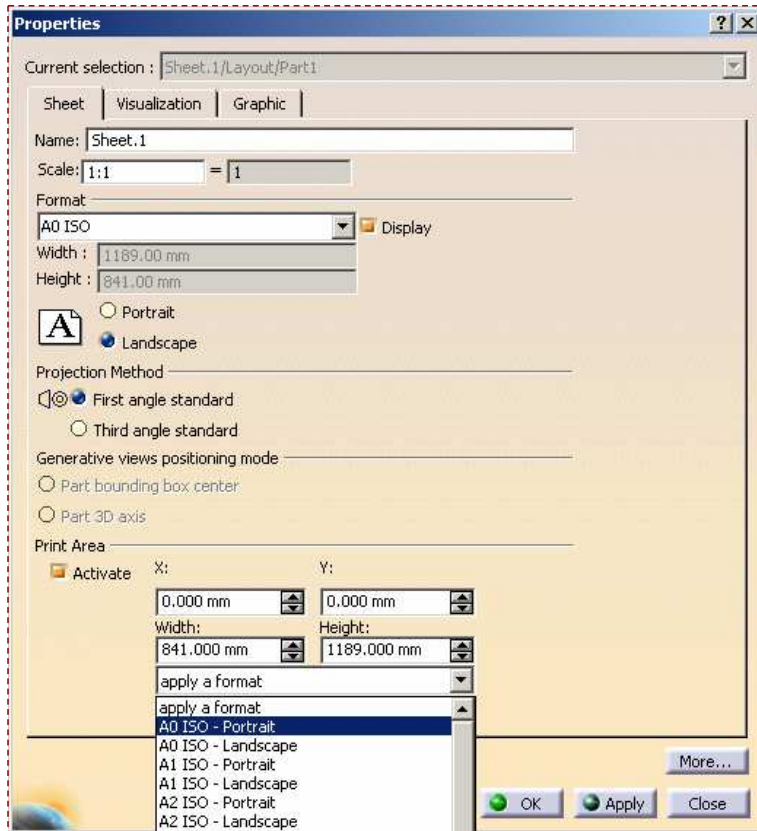
Print Capabilities (1/2)

You will see how to set print area and options for printing.

(1) **Activate the 2D or the 3D window to be printed by double-clicking**

(2) **Select "File > Print"**

(3) **In the Print window, set the various options for print**

Print Capabilities (2/2)

Through the contextual menu/properties of the sheet, it is possible to set the print options.

Create a Drawing from 2D Layout

A CATDrawing can be extracted automatically from the 2D to 3D CATPart document.

(1) **Go to Start > Mechanical Design > Drafting workbench.**

(2) **Select at this step a format compatible with the one used in the 2D Layout for 3D design workbench**
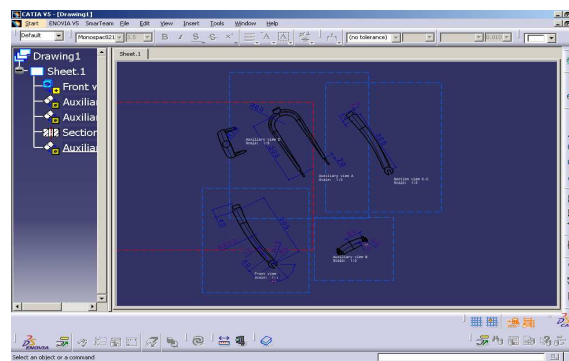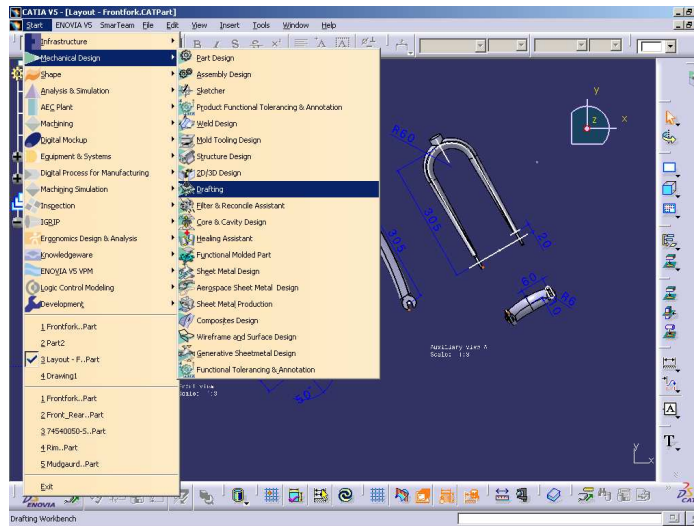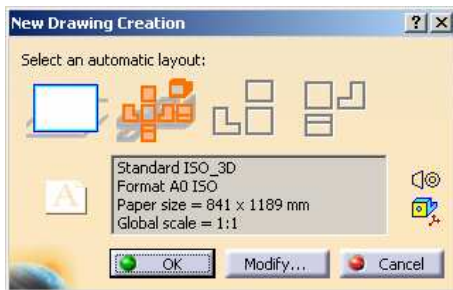
The created drawing can be completed using the generative drafting capabilities