Autodesk AutoCAD

In Mechanical Engineering Design

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Mechanical Engineering Drafting Essentials

Working Drawings:

- Orthographic Projection Views (multi-view, auxiliary view, details and sections)
- Drawing Set (Part, Assembly, Explosion)

Presentation Drawings:

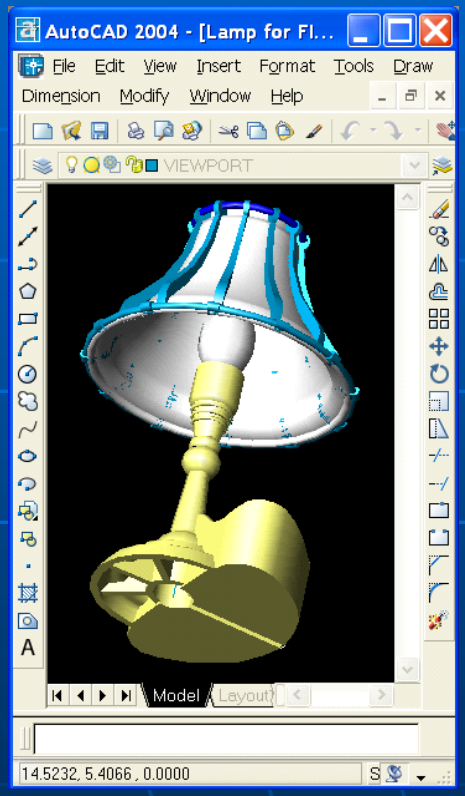
- Axonometric (Isometric, Dimetric and Trimetric)
- Oblique (general with ¾-Z, cabinet with ½-Z, cavalier)
- Perspectives (1-point, 2-point and 3 point)

CAD Programs:

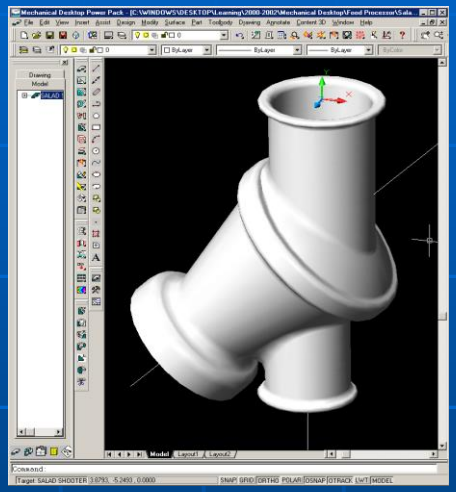
- Autodesk family (AutoCAD & AutoCAD Mechanical, Mechanical Desktop, and Inventor)
- Parametric 3D (Mechanical Desktop, Inventor, SolidWorks, SolidEdge, and CATIA)

Edward's Design Samples

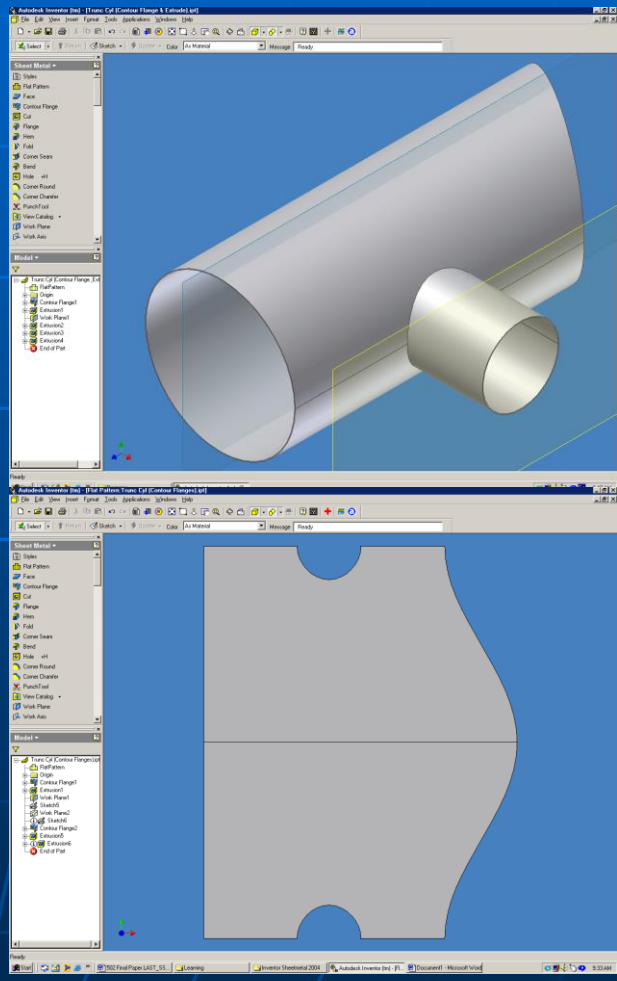
AutoCAD
Lamp Shade & Base



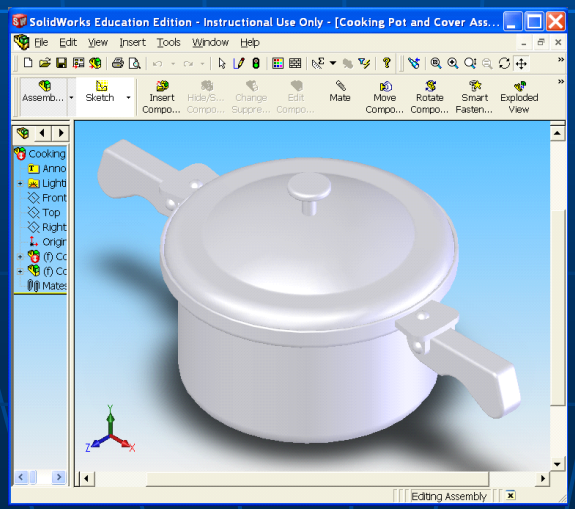
Merchanical Desktop
Salad Shooter Attachment



Inventor
Sheet Metal



SolidWorks
Steam Cooker

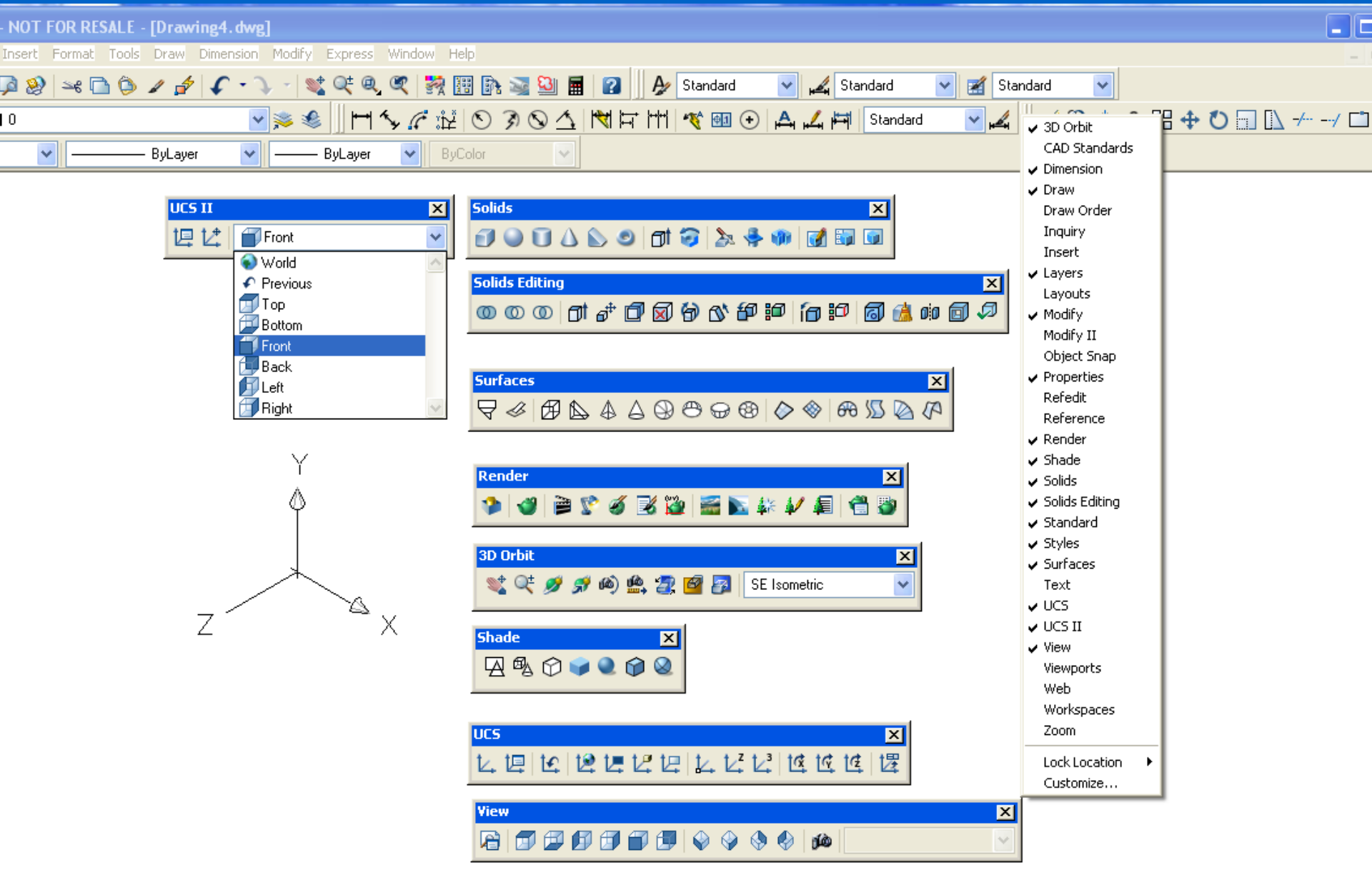


AutoCAD 3D Modeling/Rendering & Creating of 2D Views from 3D Models

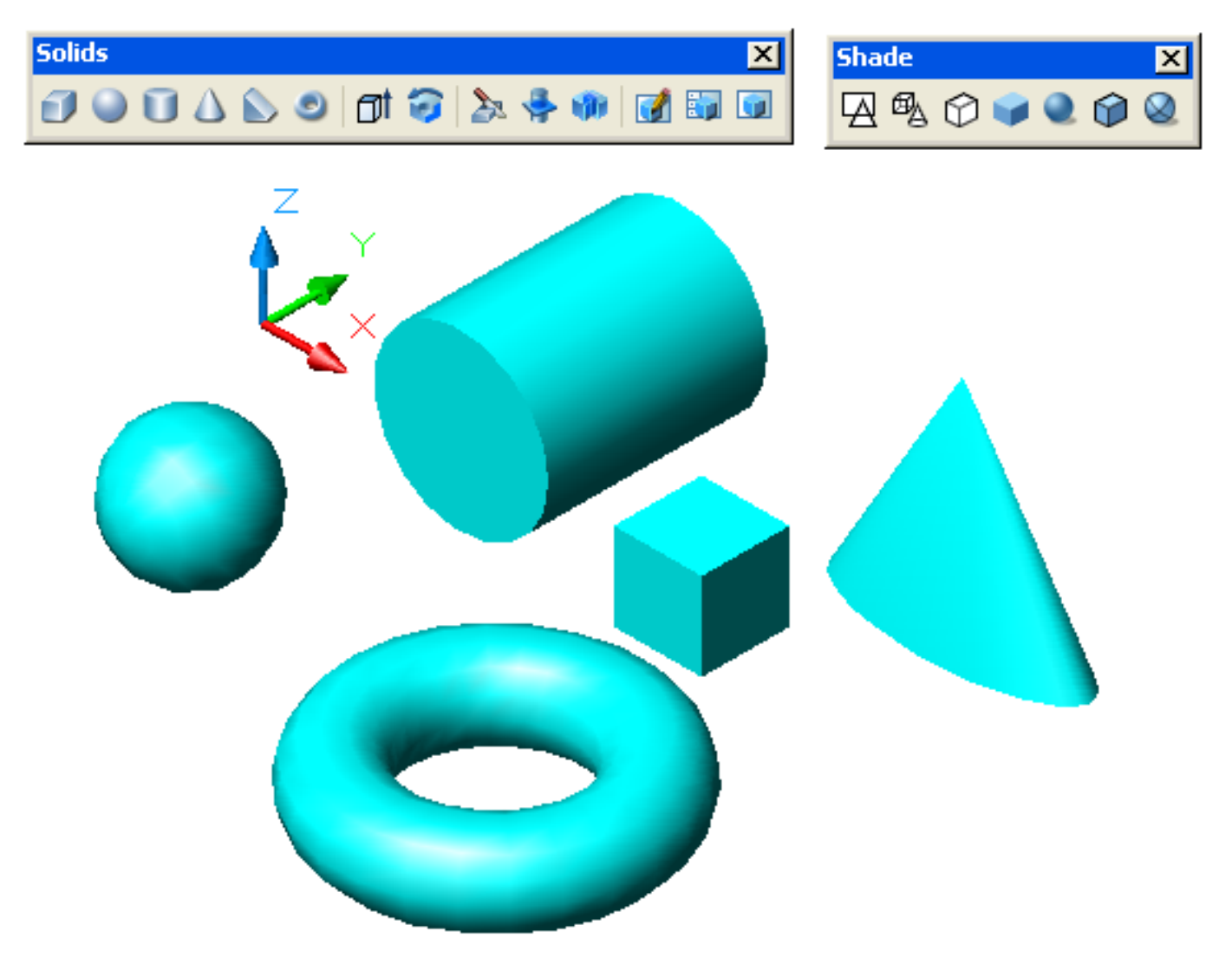
Basic Steps

- ***3D Modeling tools:*** Create 3D models of mechanical parts and assemblies in the Model Space
- ***Rendering tools:*** Apply photorealistic material rendering effects on parts
- ***2D Drawing view tools:*** Extract 2D orthographic and isometric views in the Paper Space, from 3D models created in the Model Space

AutoCAD 3D Modeling & Rendering Tools



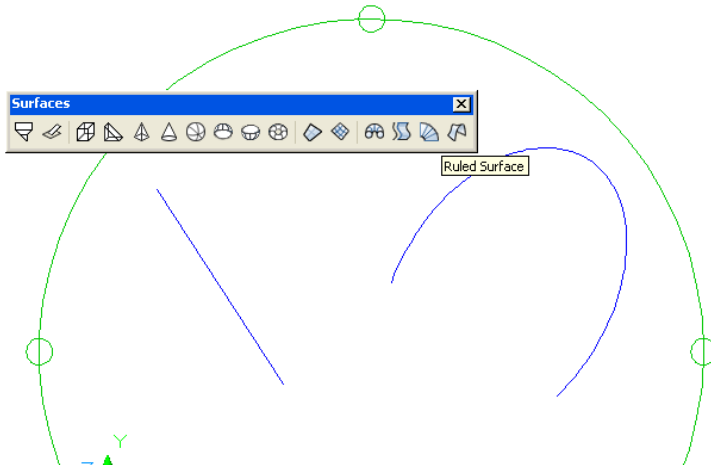
AutoCAD 3D Modeling Tools

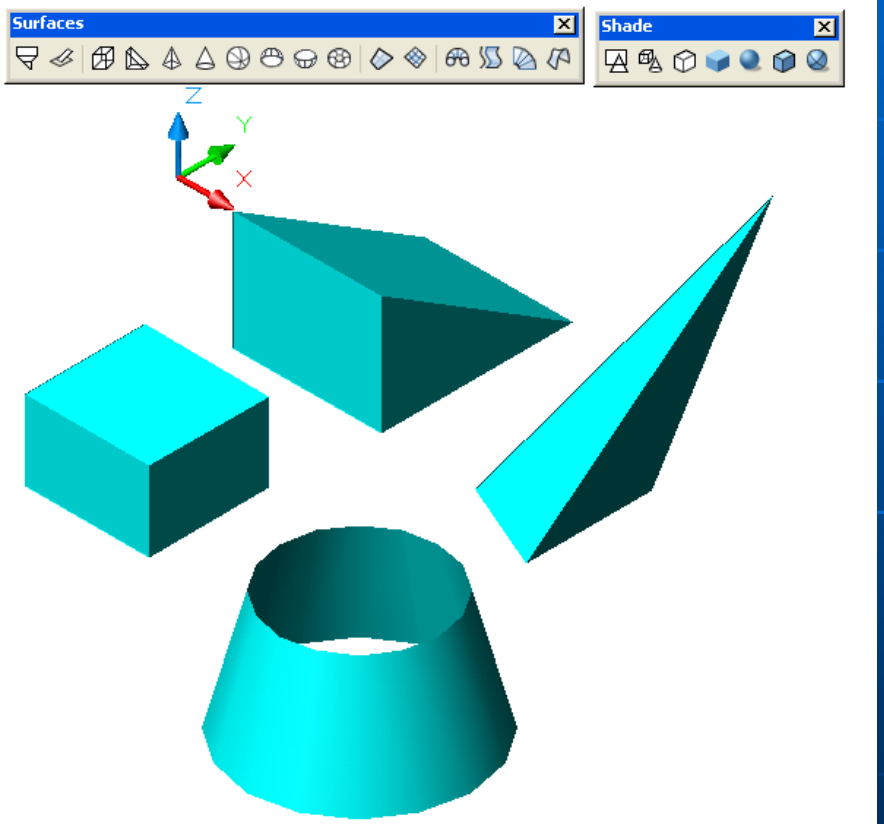


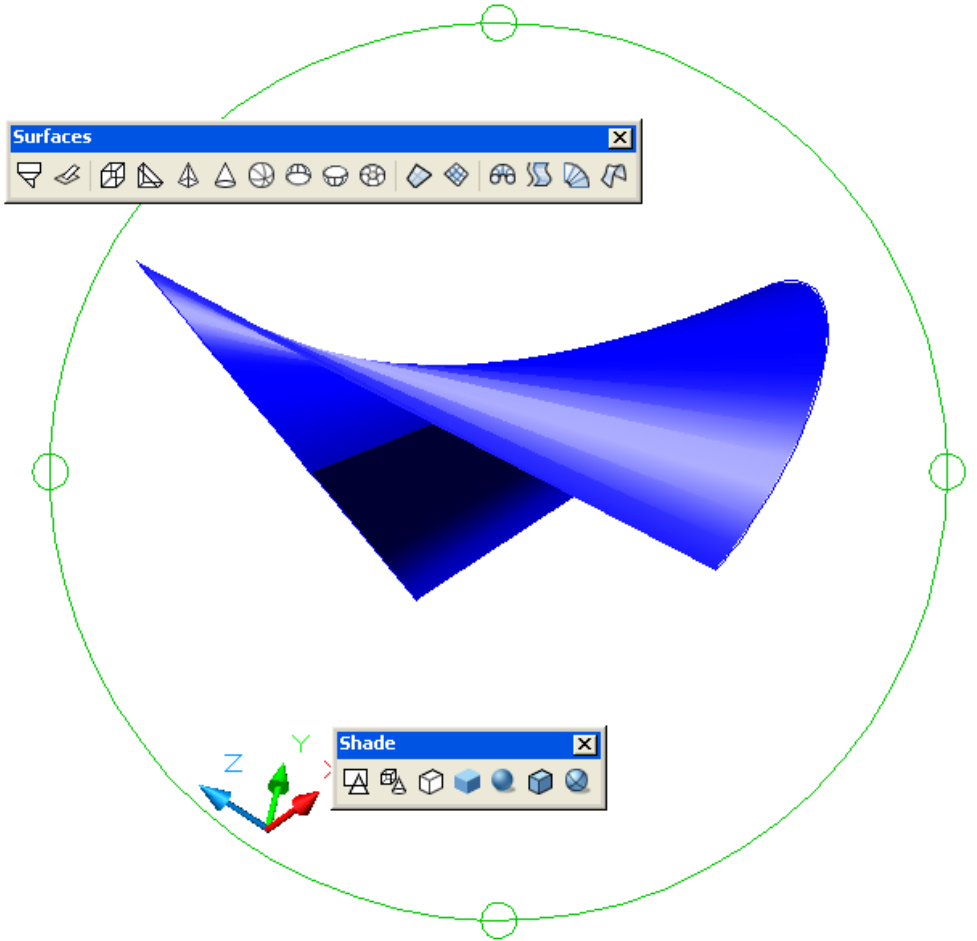
Solid modeling tools: Predefined Solid Primitives

AutoCAD 3D Modeling Tools

Surface modeling tool: Ruled Surface





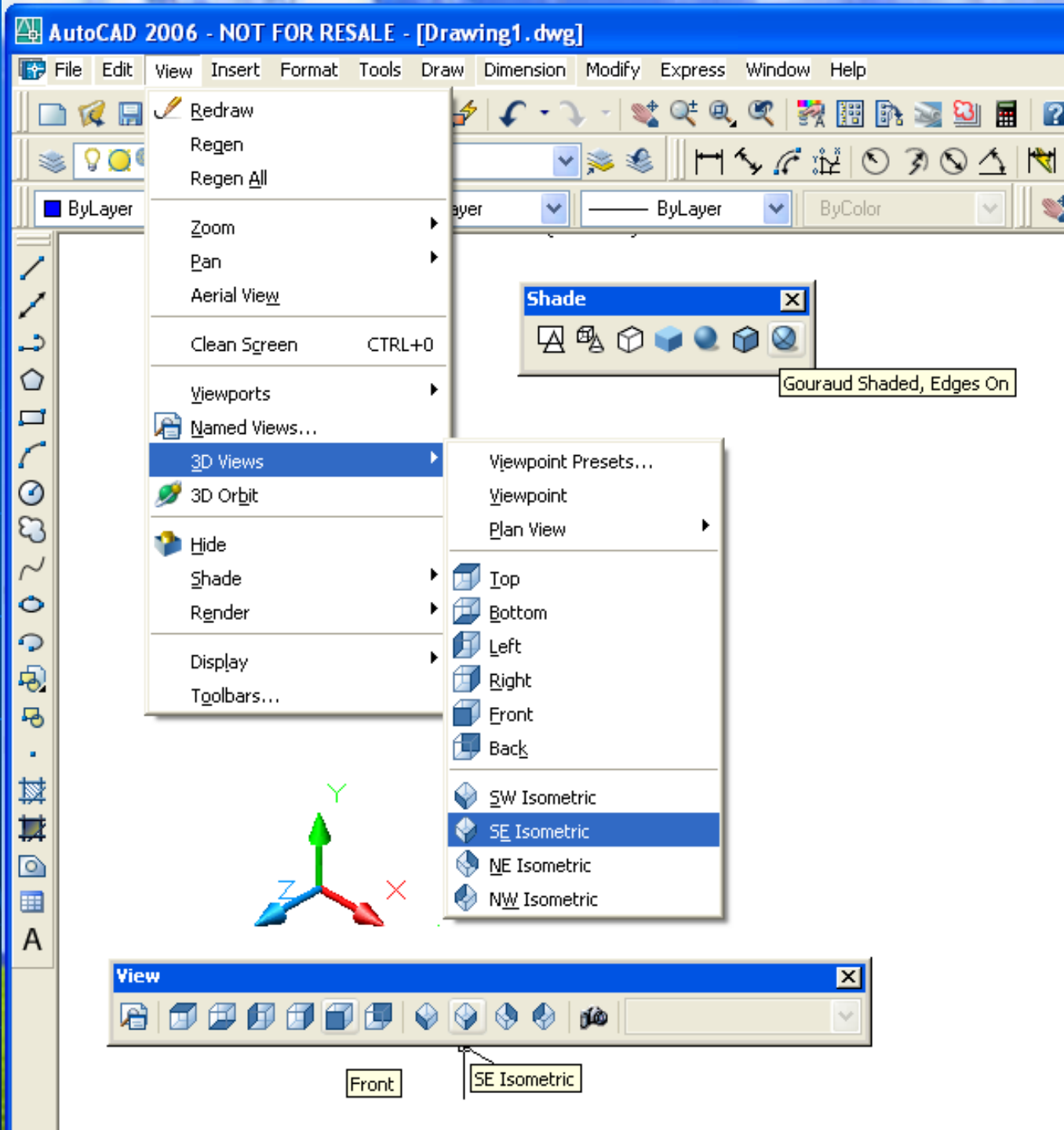


Surface modeling tools: Predefined Surface Primitives

Creating An AutoCAD 3D Solid Model in the Model Space

Settings:

- Set to Front, SE Isometric for convenient visualization in the 3D environment
- Set to Gouraud Shaded Edge On for convenient visualization of 3D model



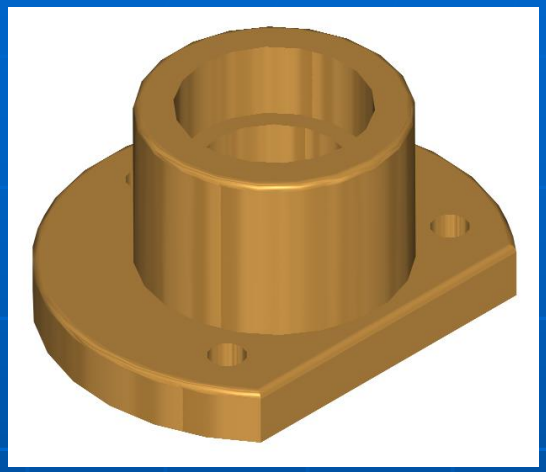
Basic Steps for Creating 3D Solid Models

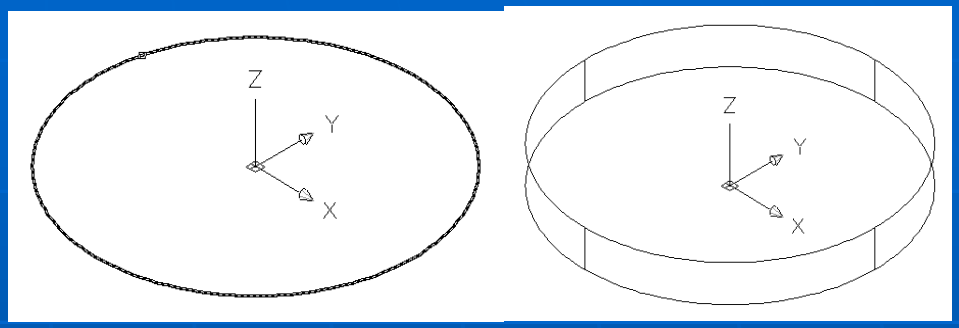
- Use various Draw tools to draw closed profile sketch; use the Region tool to turn the closed profile sketch into a single profile if necessary;

- Use the Solids tools (Extrude, Revolve, Shell, etc) to create 3D solid parts using the profiles; use tools from Modify tool bar to add 3D fillets and chamfers, to array and to rotate the 3D parts; use Solid Editing tools to union, intersect and subtract 3D parts and to perform other editing tasks;

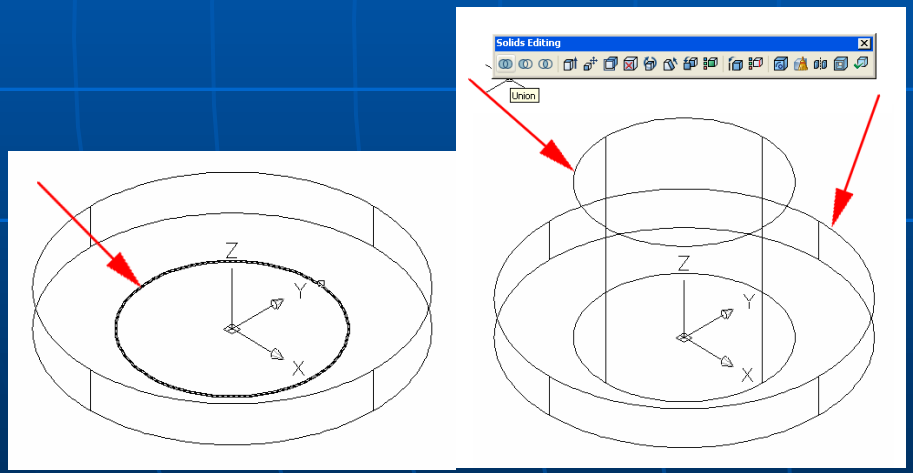
- When necessary, during the creation of profile and 3D parts, use Orthographic UCS Tools (Front, Top, Right) from UCI II tool bar to rotate the XY Planes to relevant views; in addition, use the UCS tools to move, rotate the UCS to different parts of the model, to create new UCS defined by 3 points, or to return to the default WCS.

Creating A 3D Solid Model in the Model Space

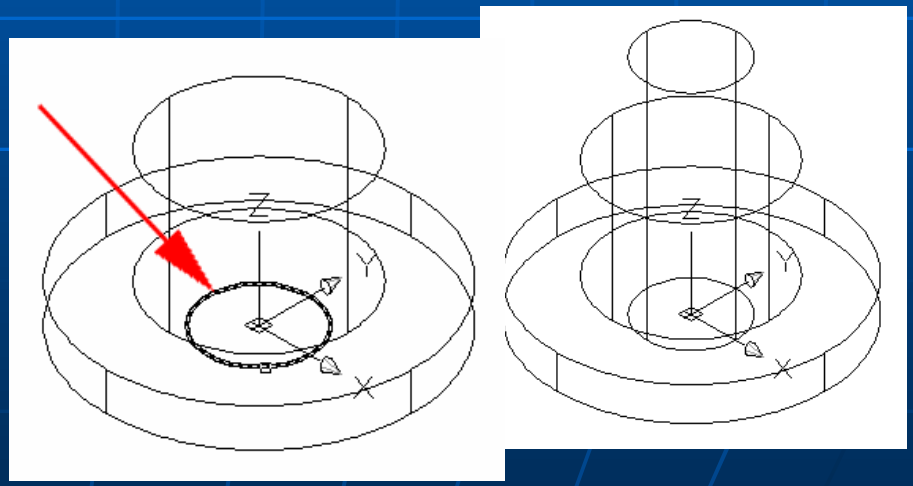




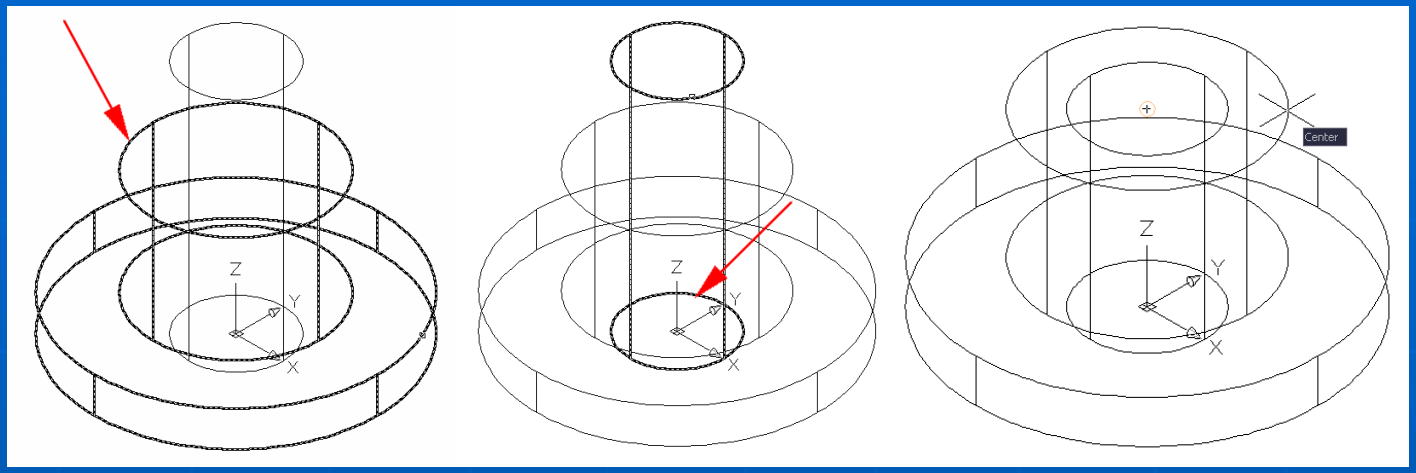
- Base profile and solid (Extrude)



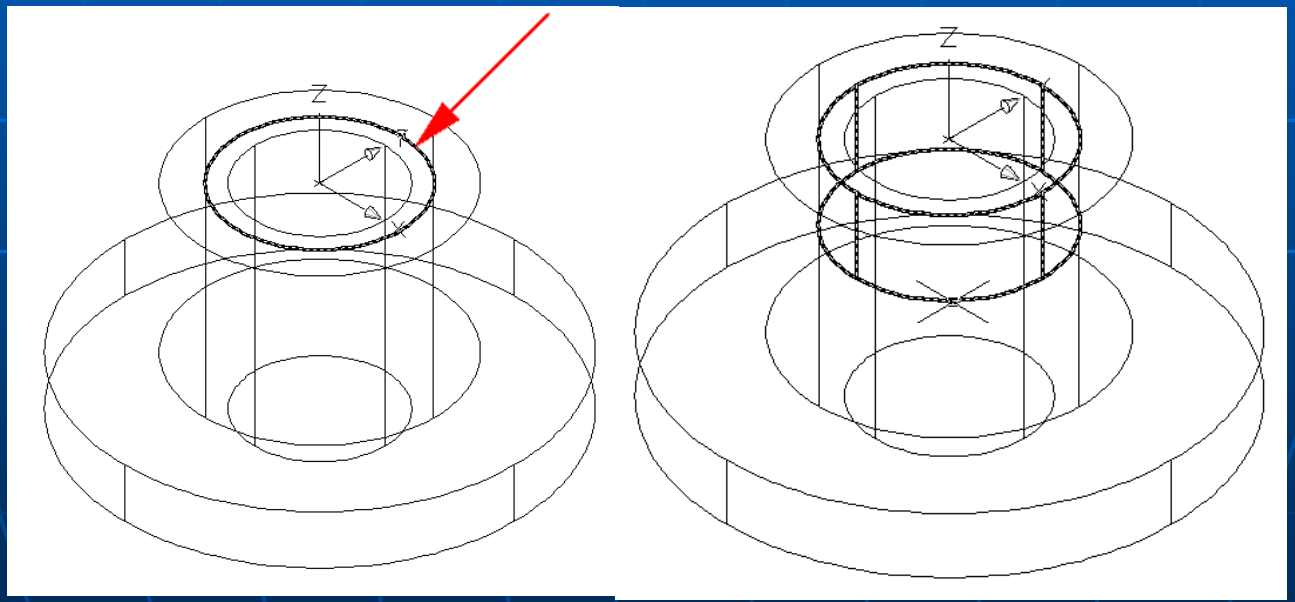
- Boss profile and solid (Extrude)
- Uniting the base and the boss (Union)



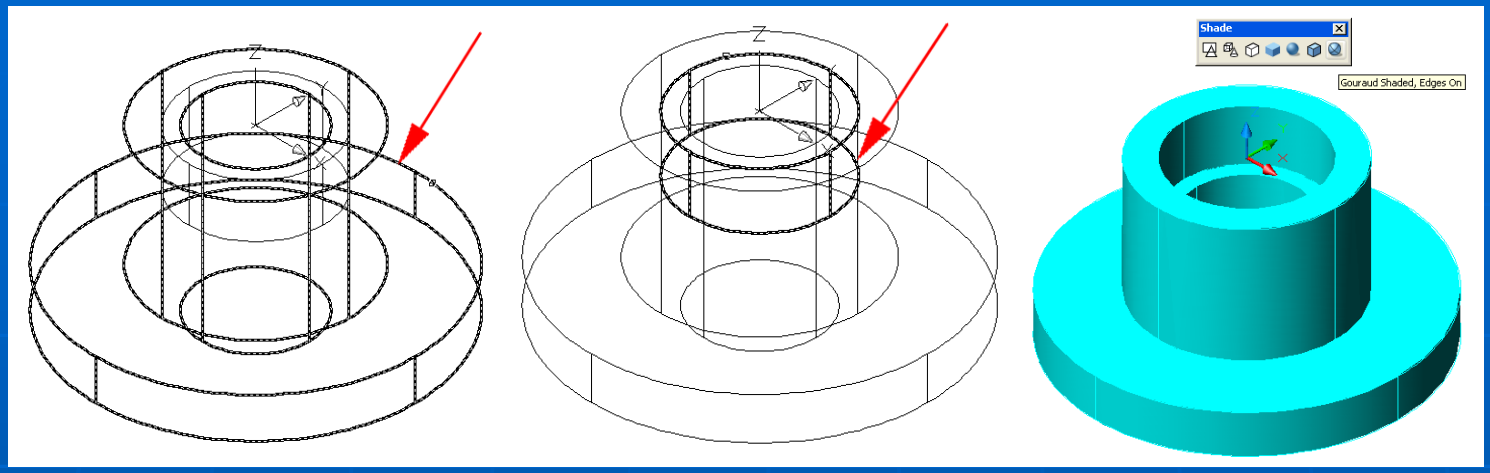
- Central through hole profile and solid (Extrude)



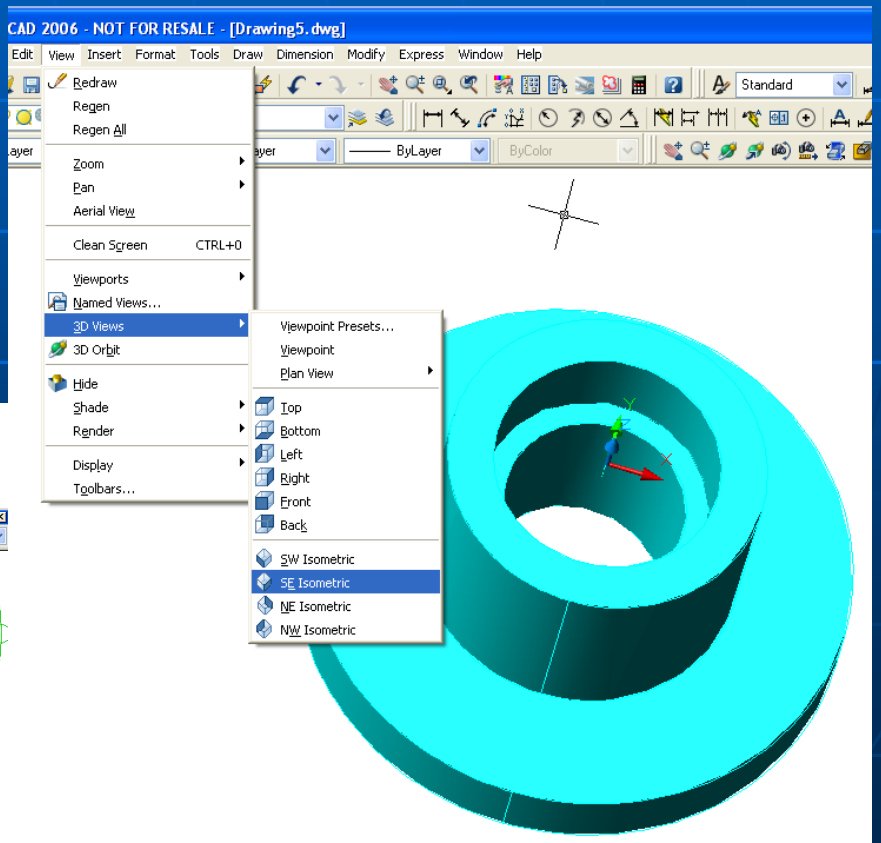
- Removing the central through hole from the main body (Subtract)



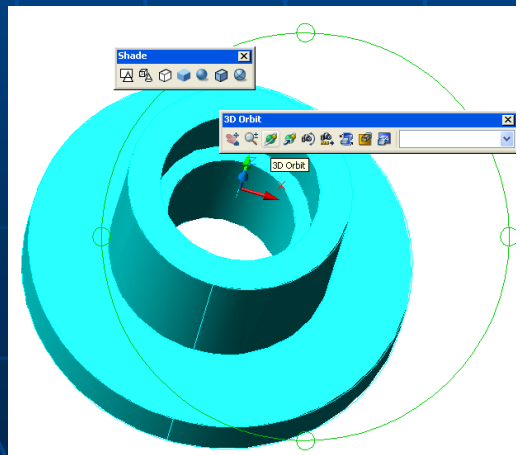
- Central counterbore profile and part (Extrude)

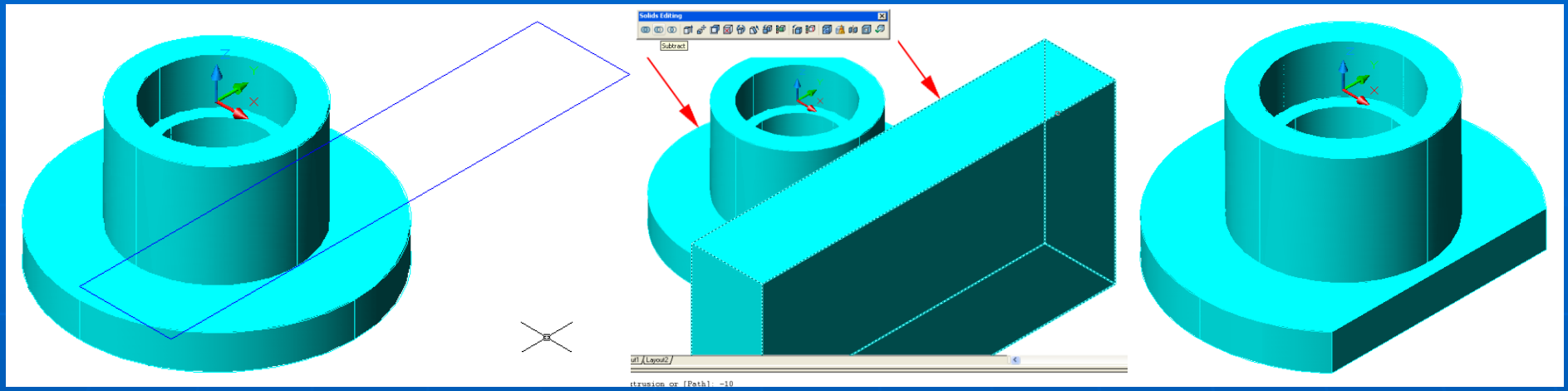


- Removing the central counterbore from the main body (Subtract)

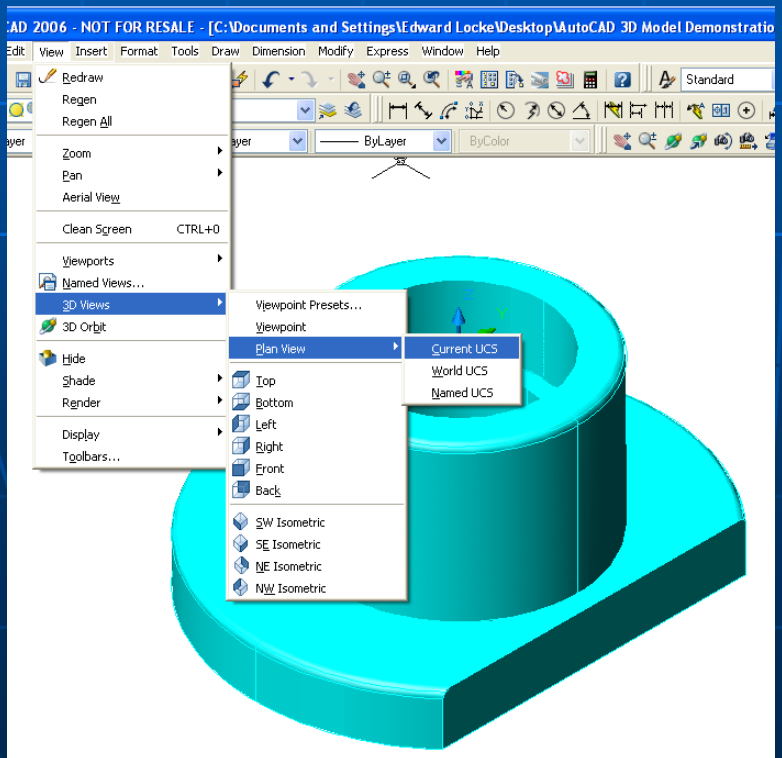


- Using 3D Orbit and SE Isometric tools to view the 3D model

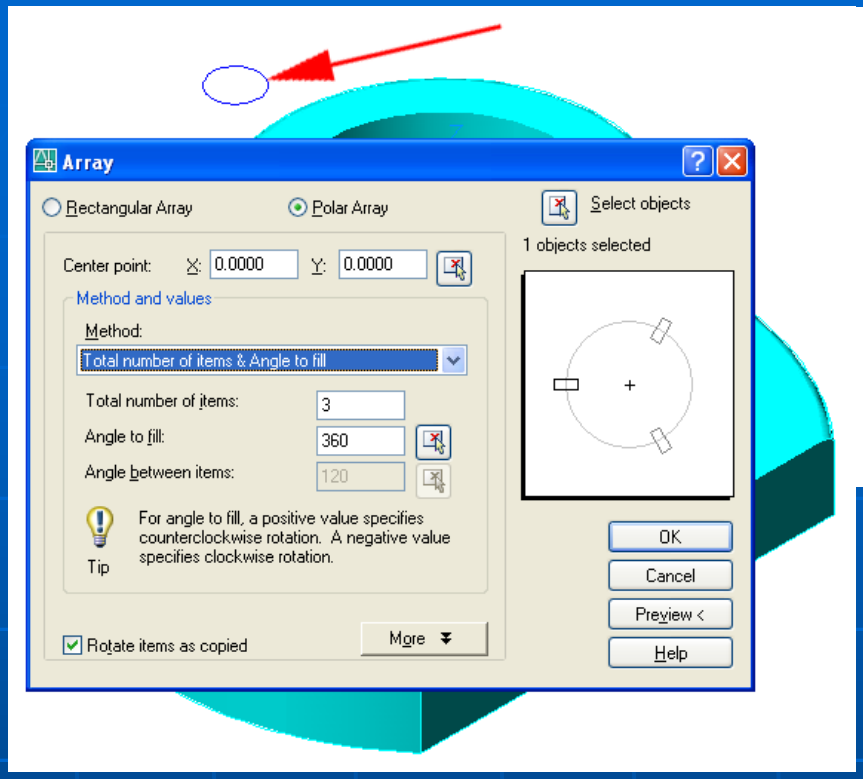


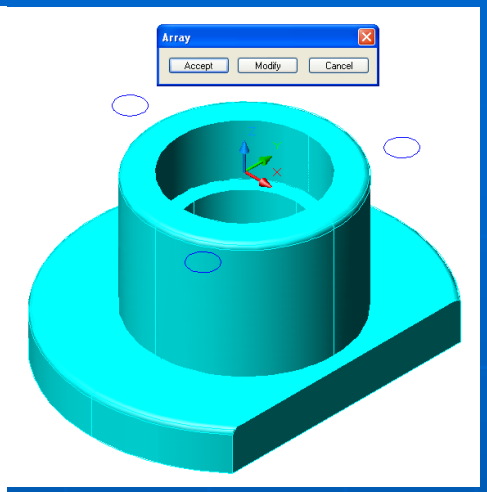


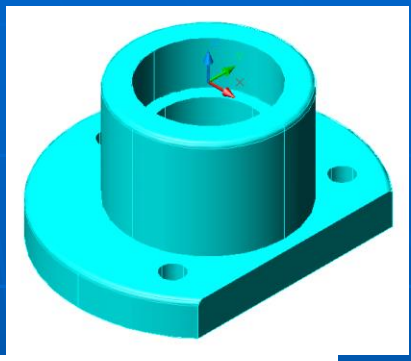
- Creating the profile (left) and the prism (center, Extrude) to cut a straight edge from the base (Subtract)

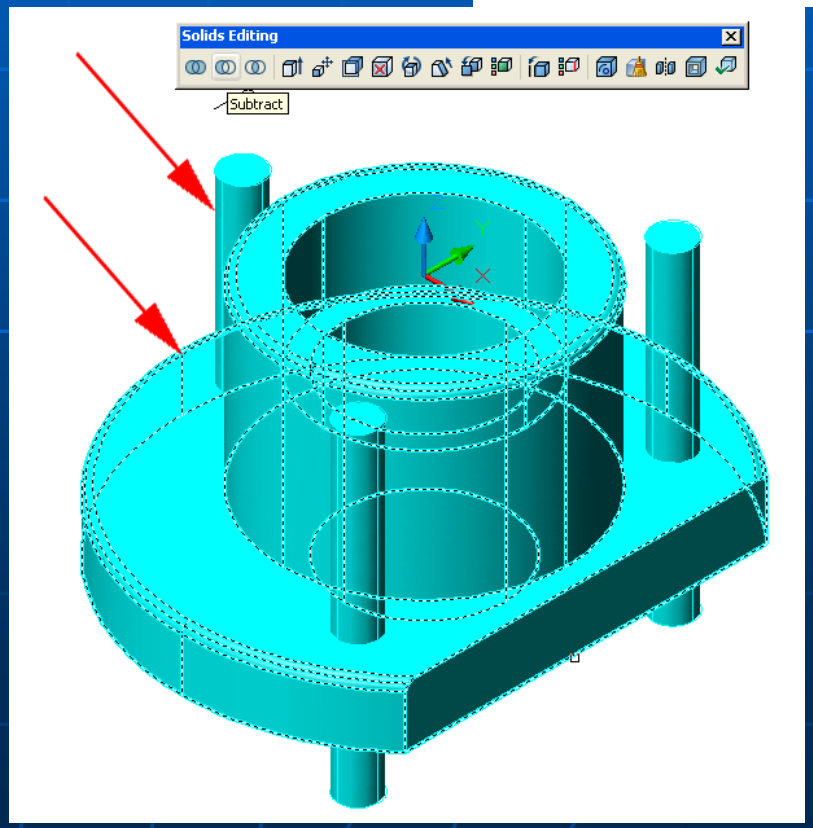


- If desired, switching to the Plane View of the Current UCS;
- Creating the profile for the small hole on the left side.

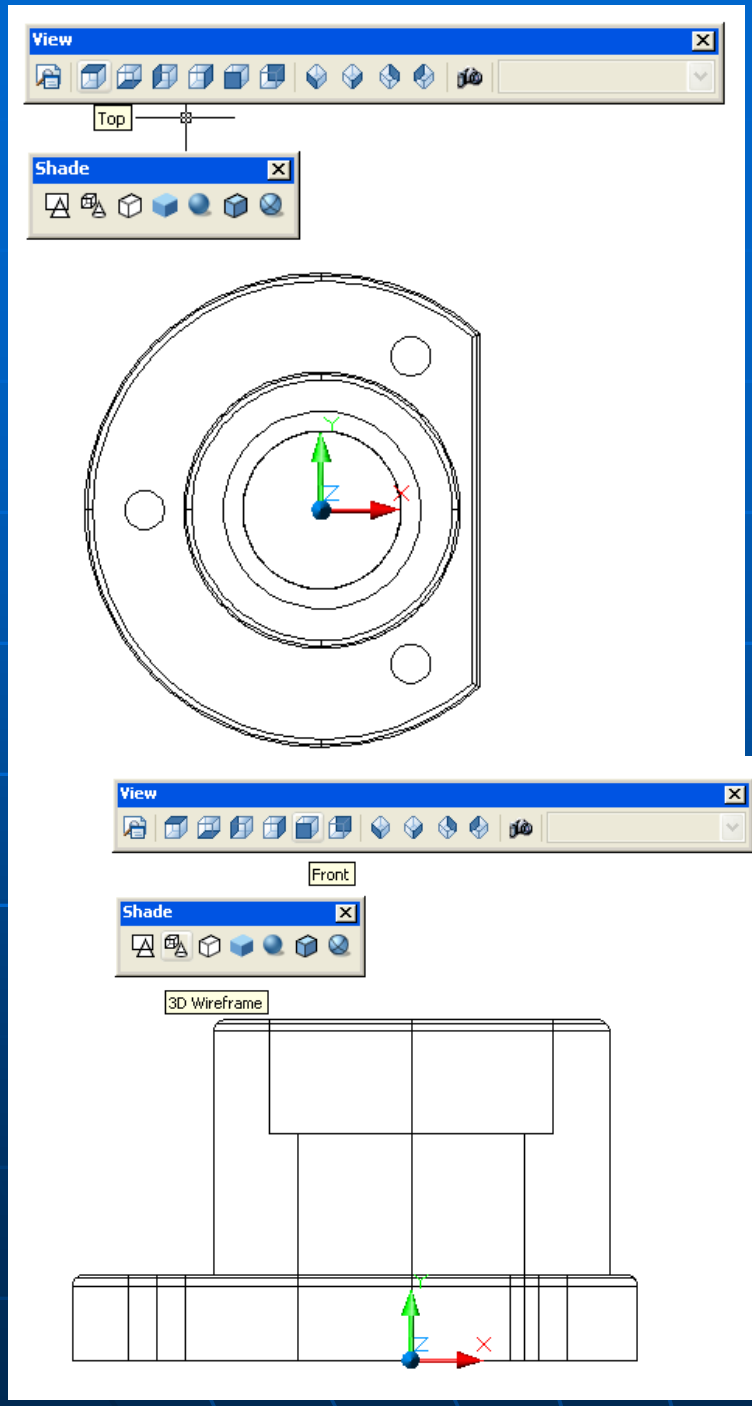


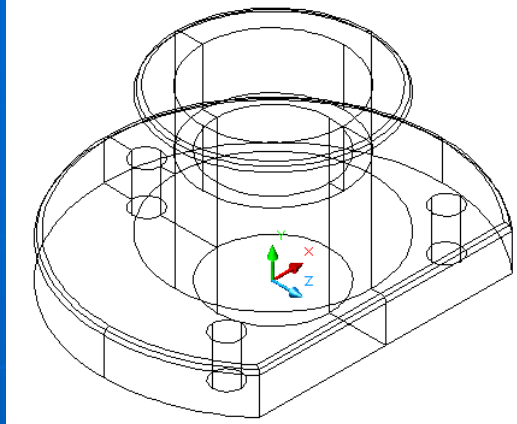






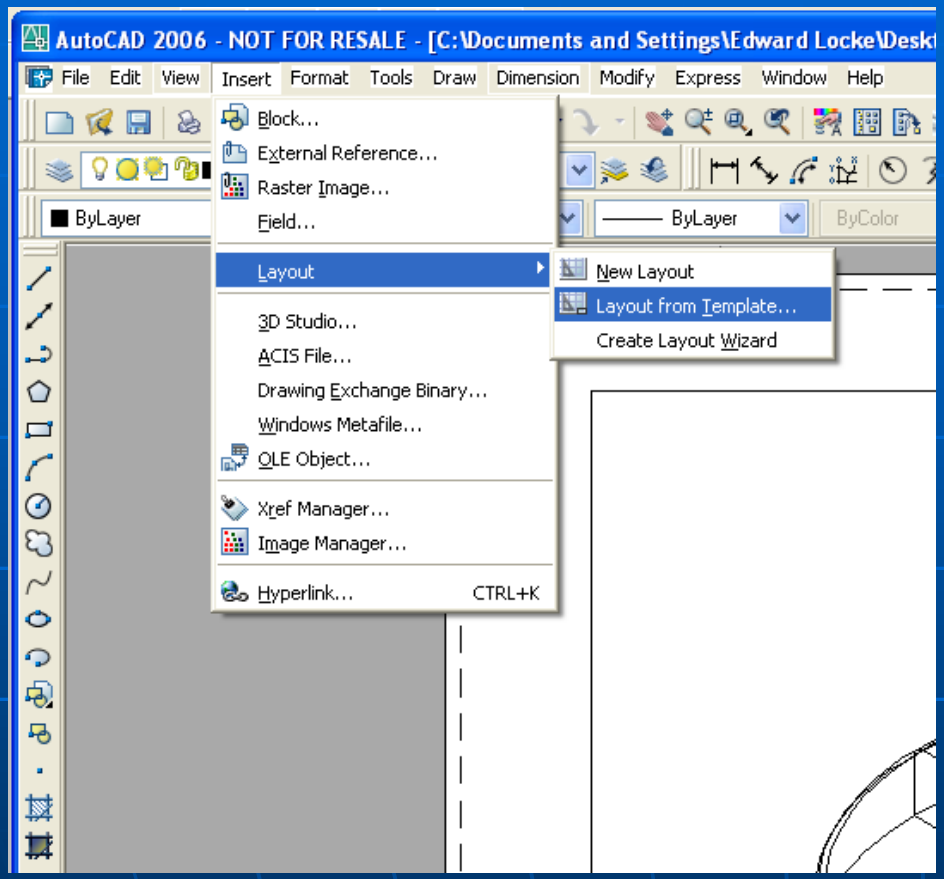
- Creating additional small hole profile (Array, Polar Array)
  - Creating cylinders (Extrude) to remove the small holes from the base (Subtract)

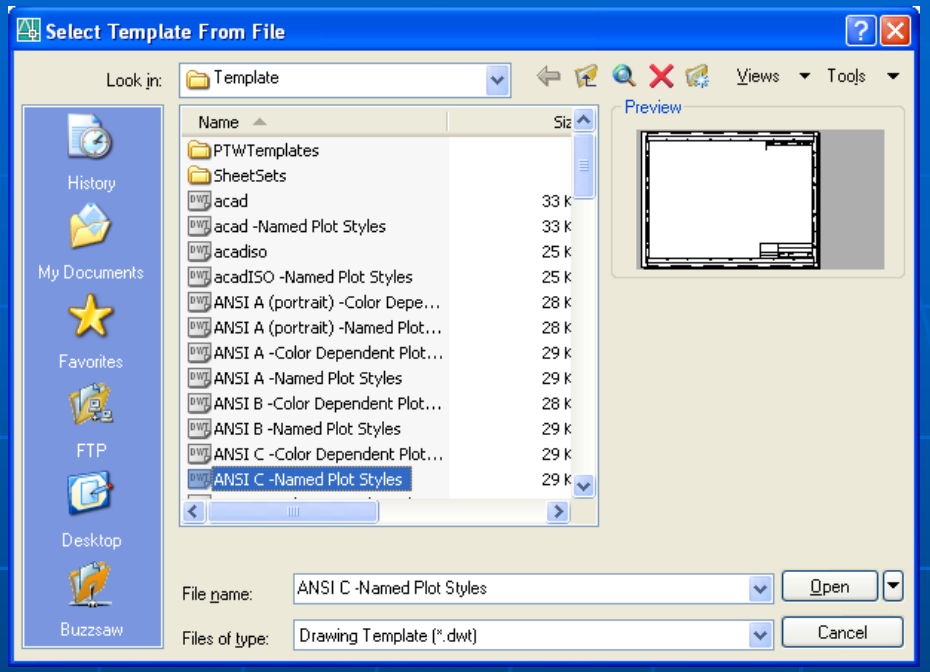


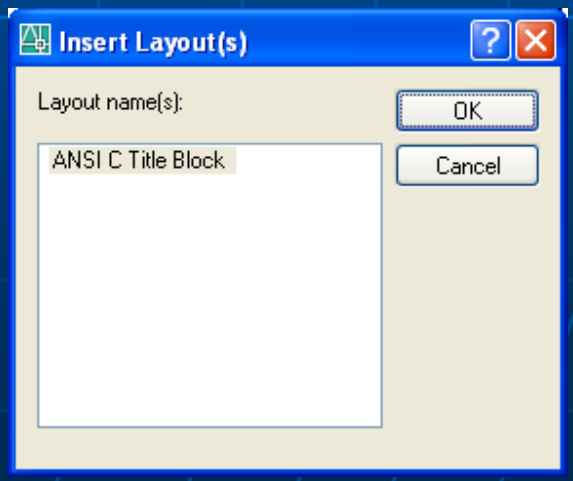


- Using the View tools to see the 3D model from different viewing planes (Top, Front, Right)

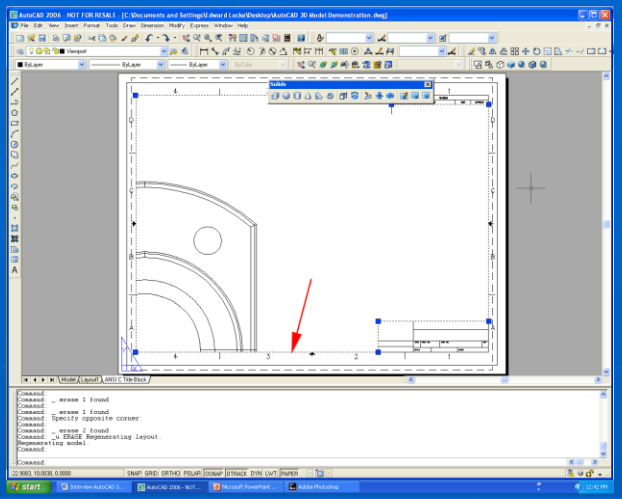
Creating A 2D Multi-view Drawing in Layout Space

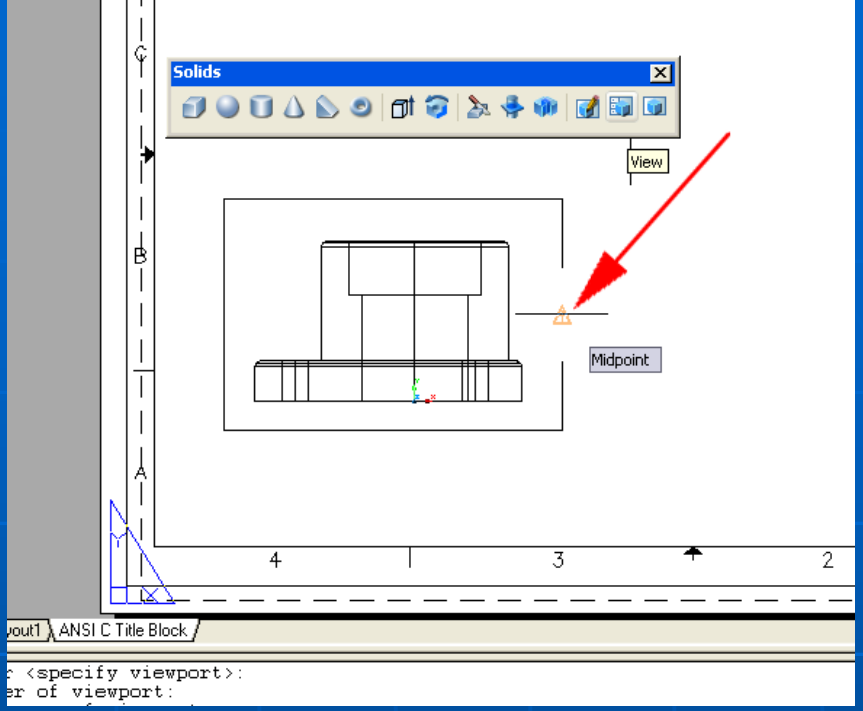


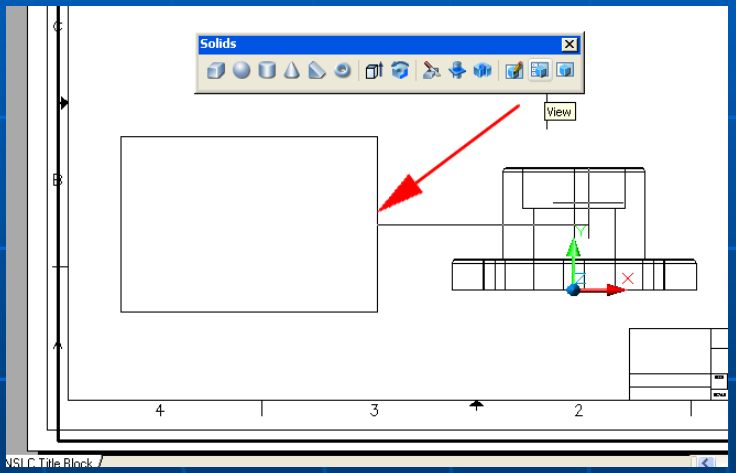


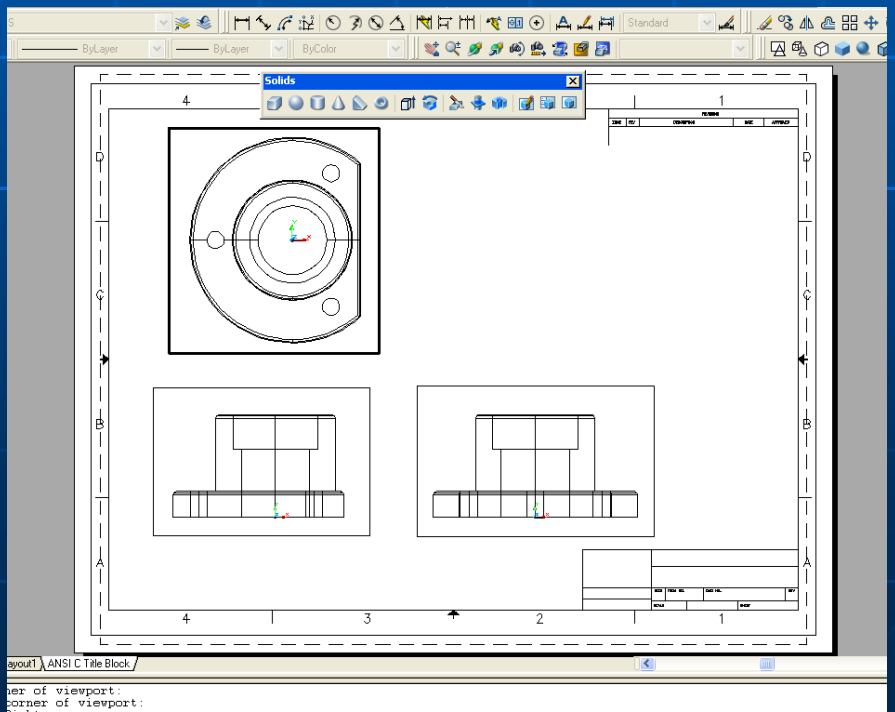


- Switching to Layout space; and
- Inserting a Layout from Template.

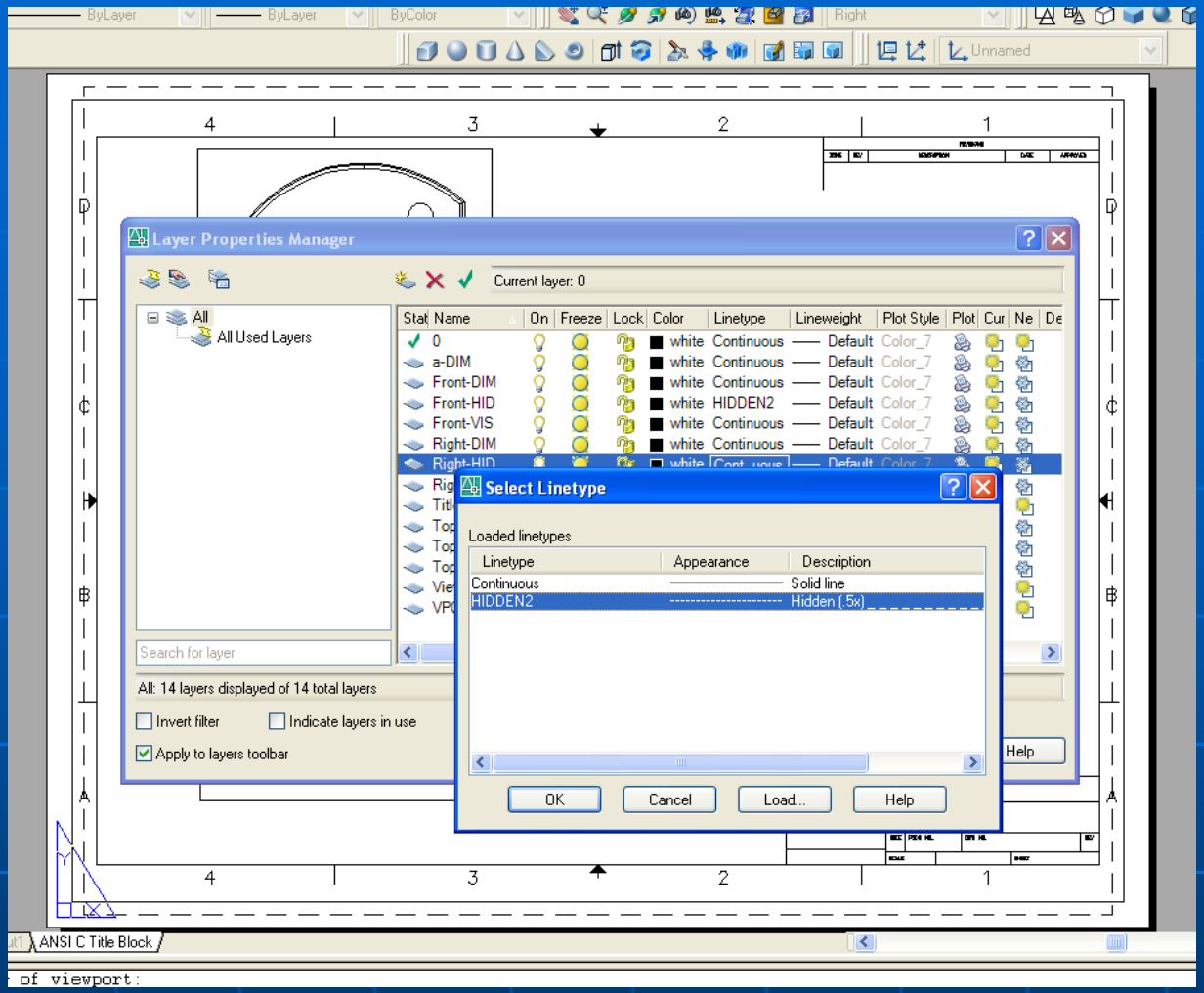


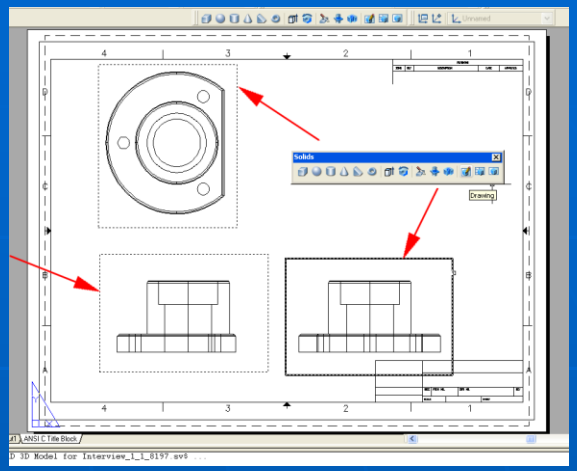


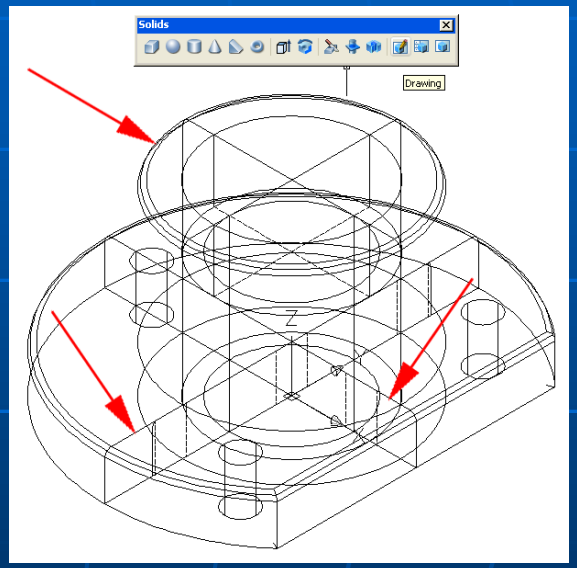




- Deleting the default Viewport;
- Using the Solview tool to create the top view (UCS option), and front and right views (Orthographic option).

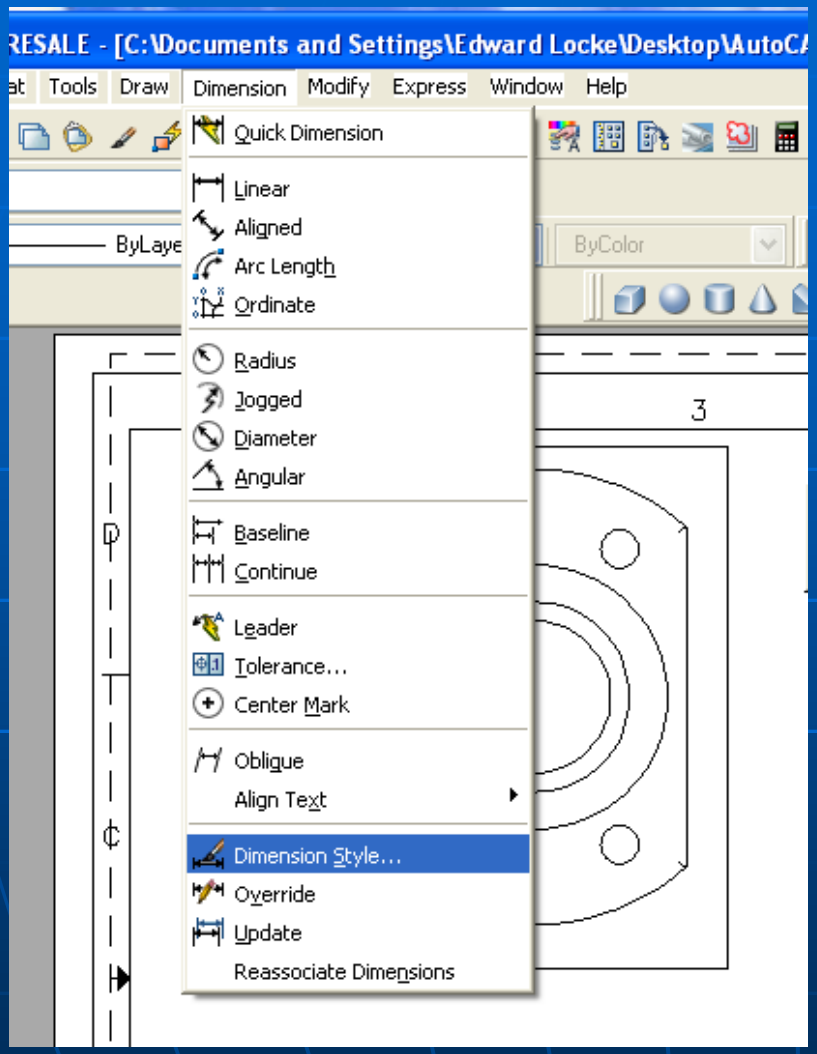


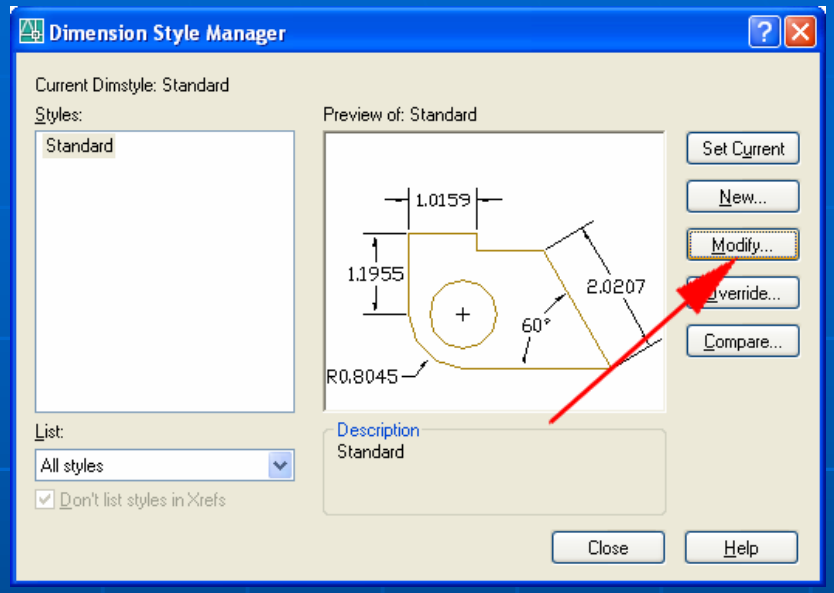


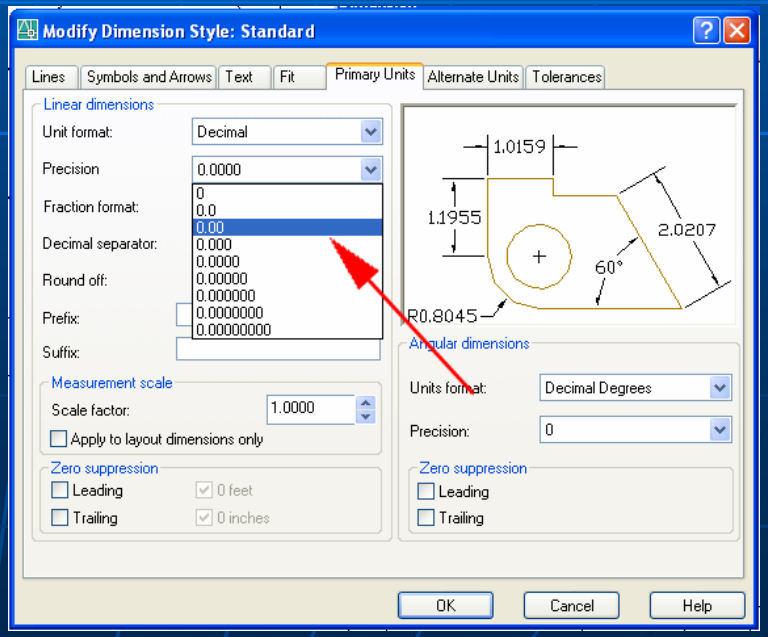


- In the layers created by the Solview operations, changing the linetype of HID layers to HIDDEN2 (Layer Property Manager);
- Creating Soldraw drawing view from the Solviews, which appear in Layout space but reside in Model space.

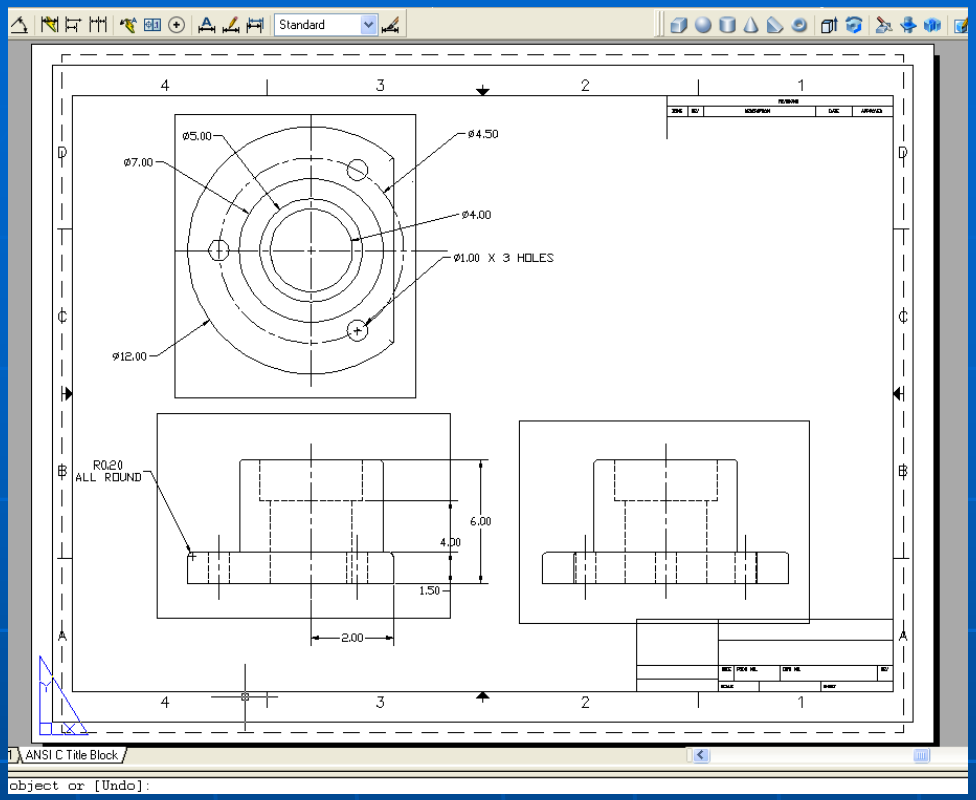
Applying dimensions to Soldraw Views

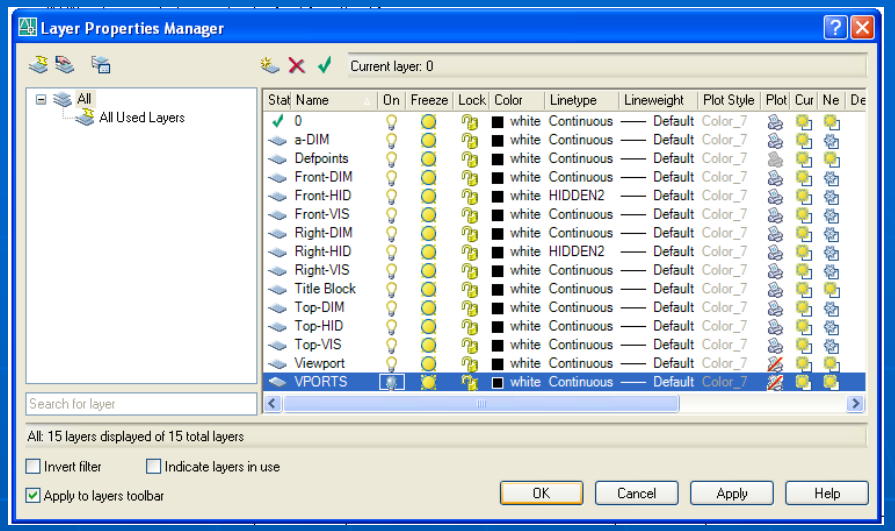


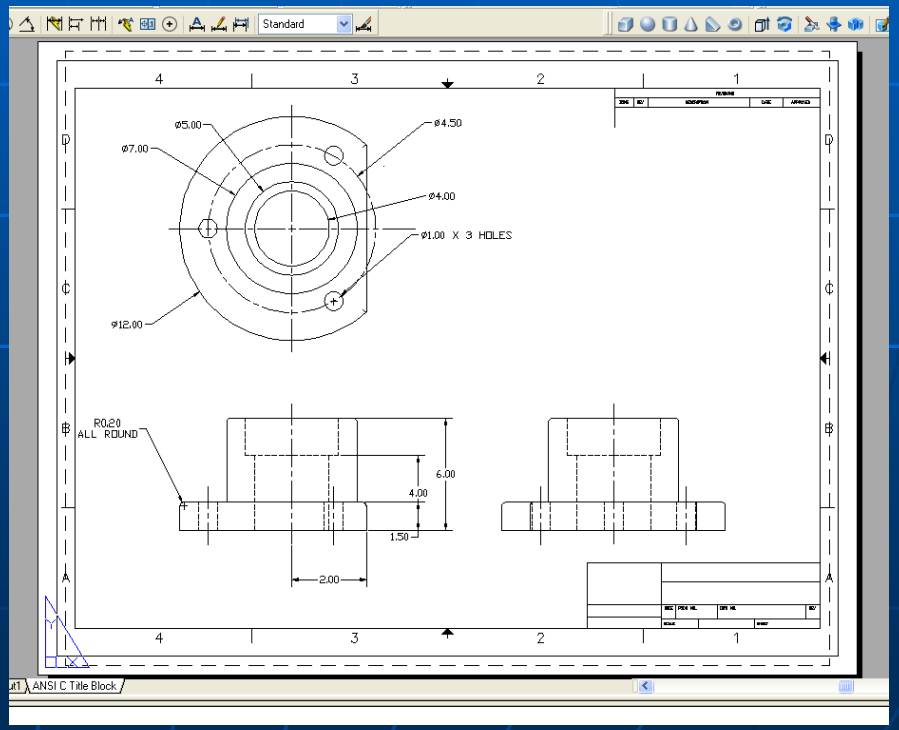




- Changing the Precision of dimensions to 0.00.

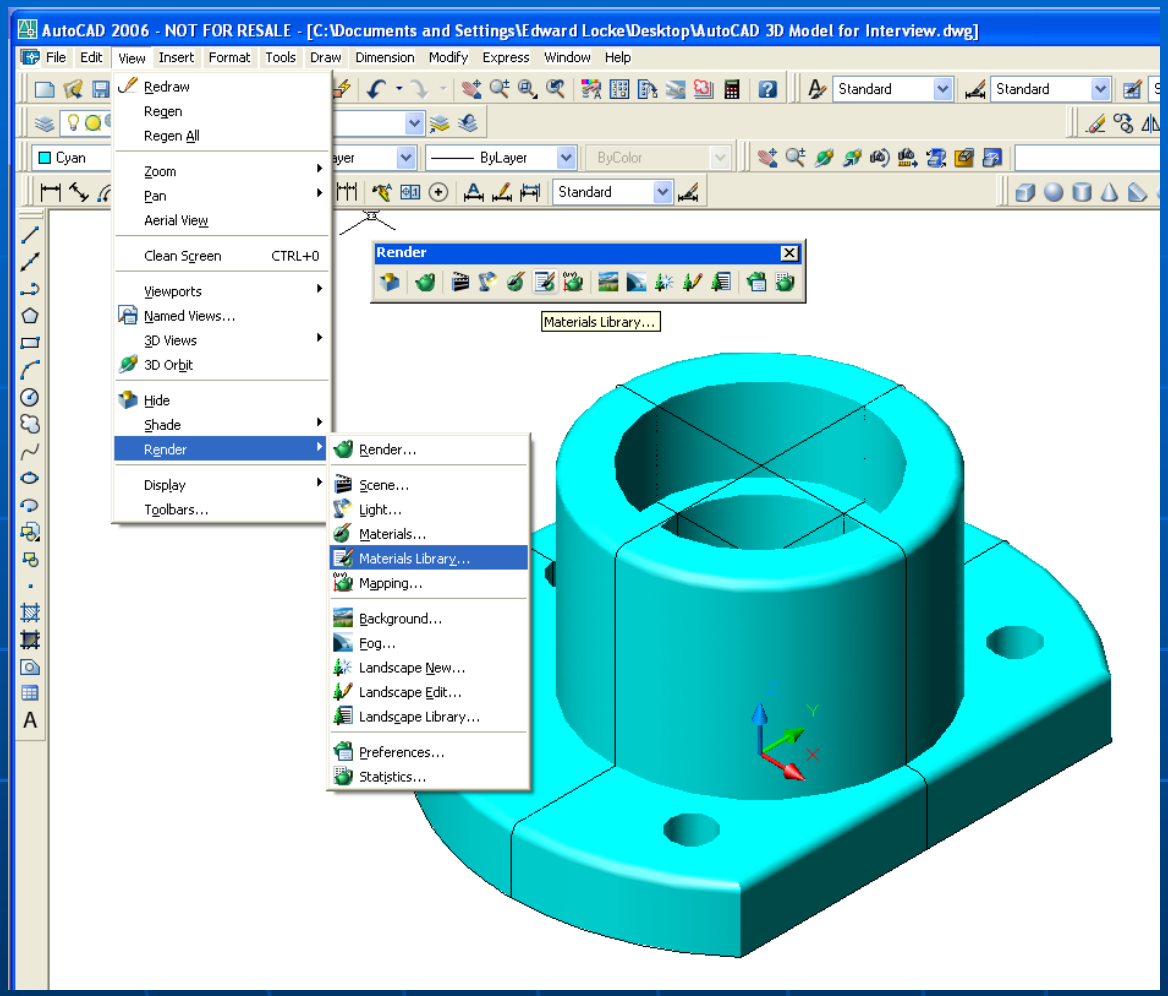


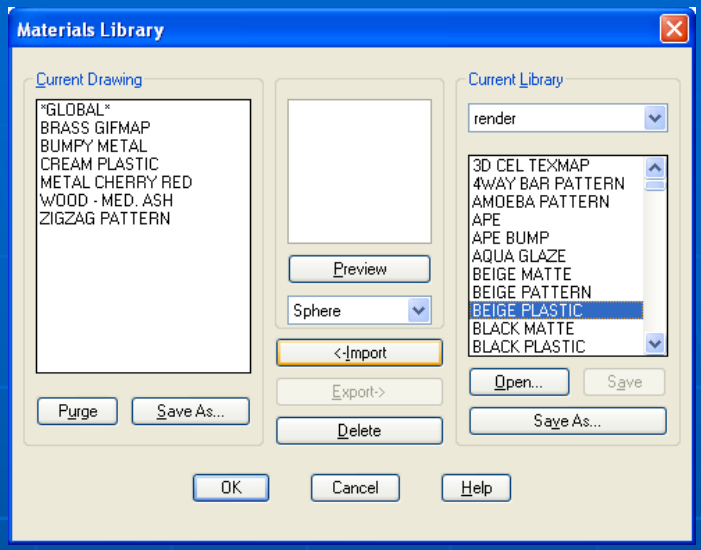


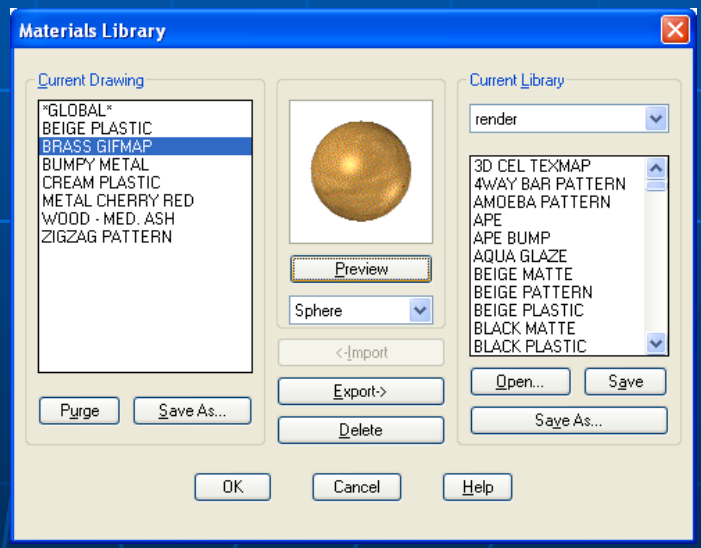


- Using various Dimensions tools and Object Snaps to create dimensions from Soldraw views; using Draw tools to create centerlines for holes;
- Selecting Supress Printing and turning Off the VPORT and viewport layers.

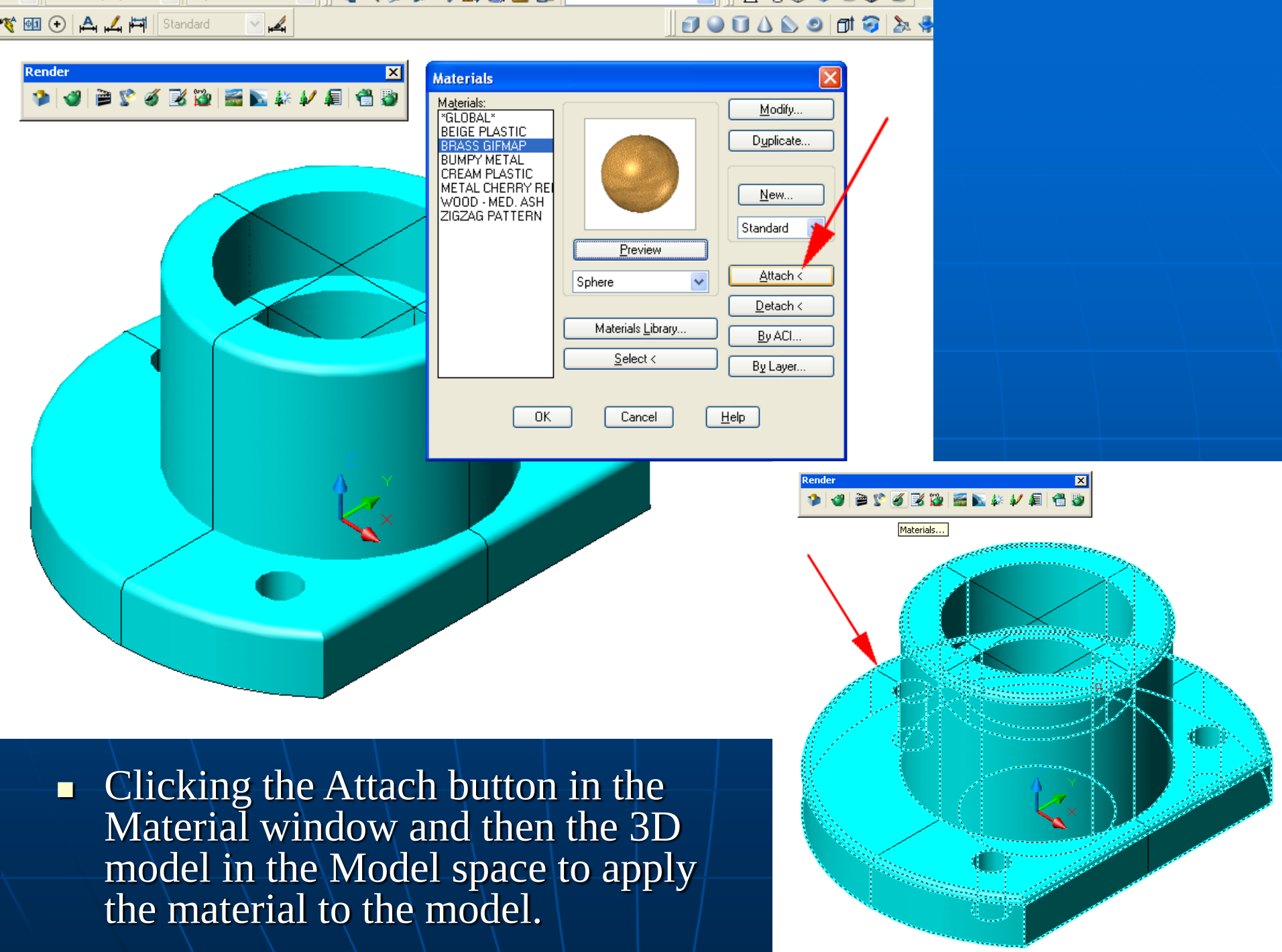
Rendering The 3D Solid Model in the Model Space



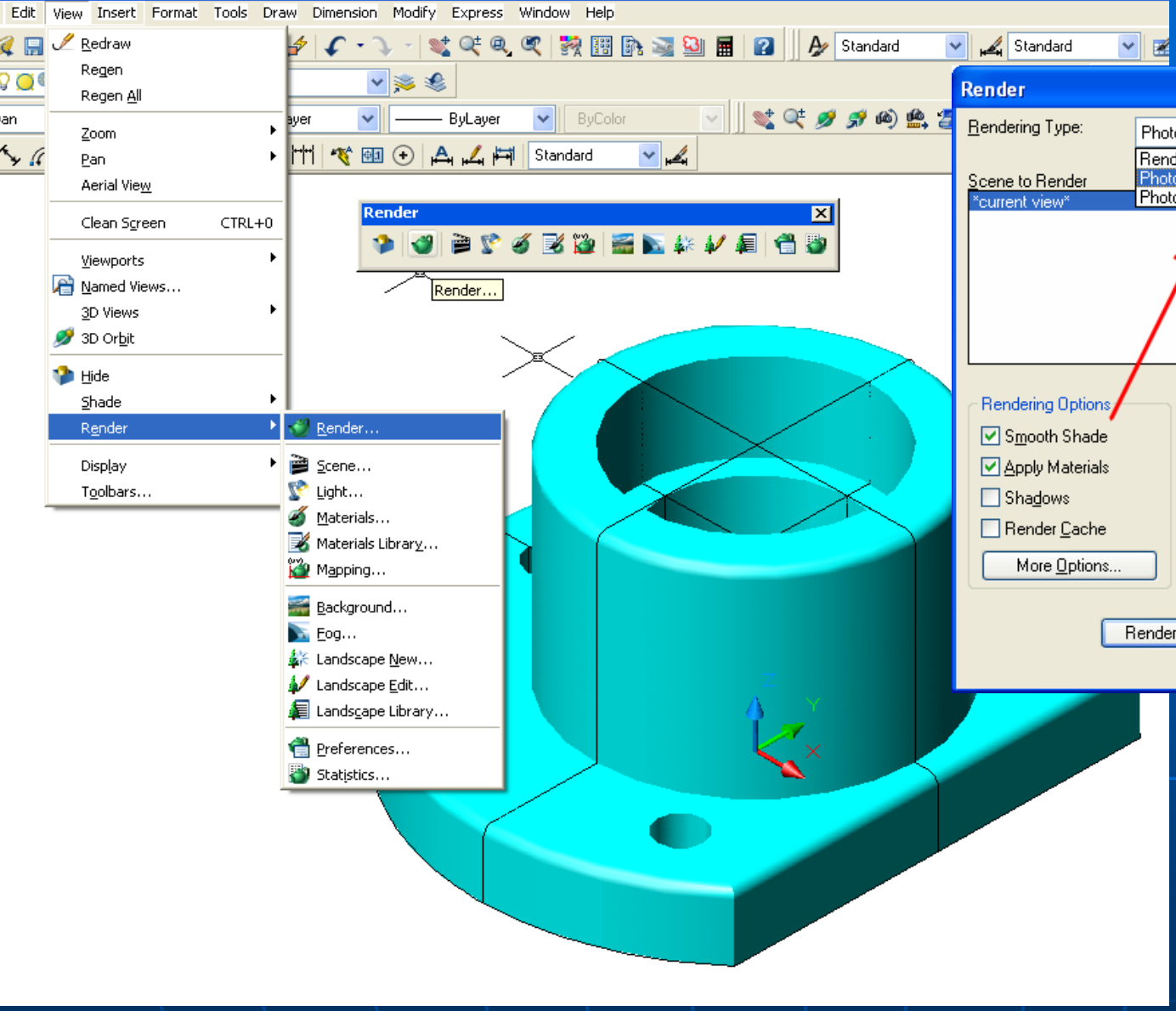


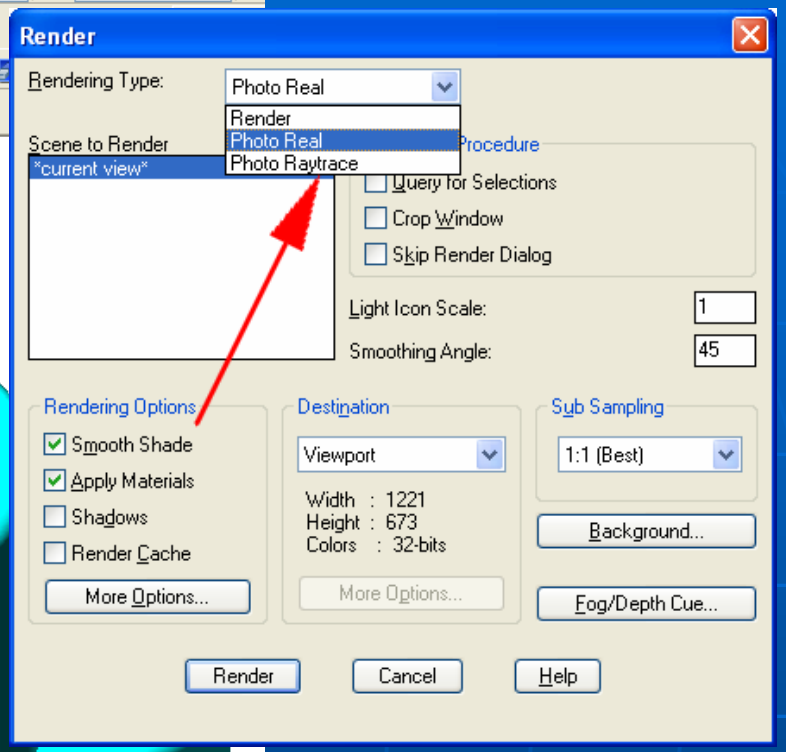


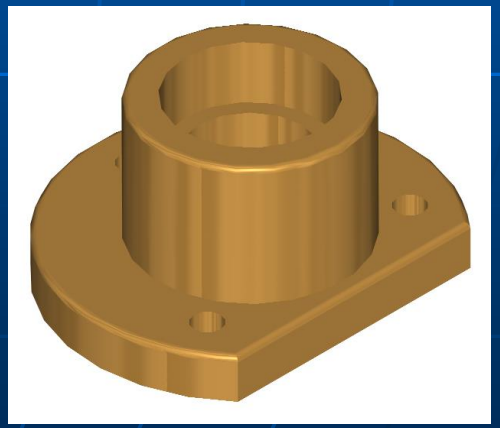
- Opening the Material Library (matlib);
- Importing material from Current Library to Current Drawing;
- Selecting a material for Preview.



- Clicking the Attach button in the Material window and then the 3D model in the Model space to apply the material to the model.

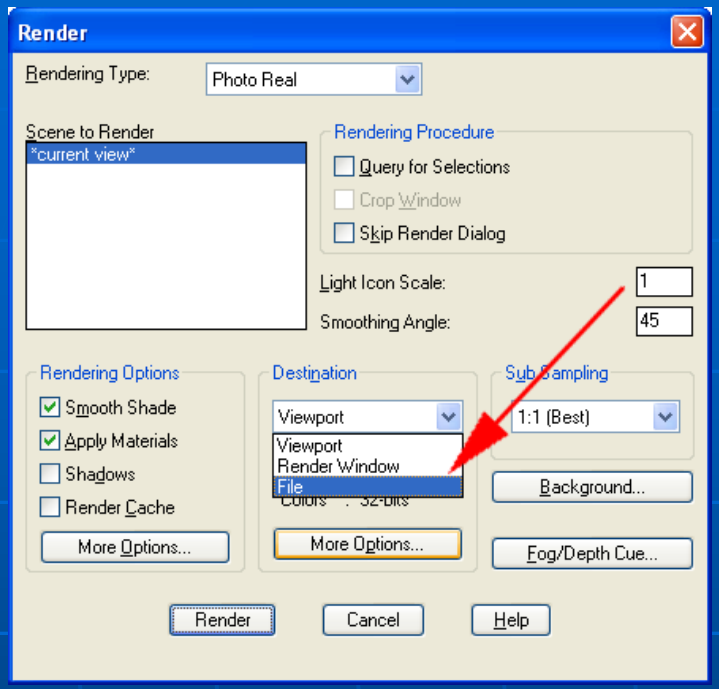


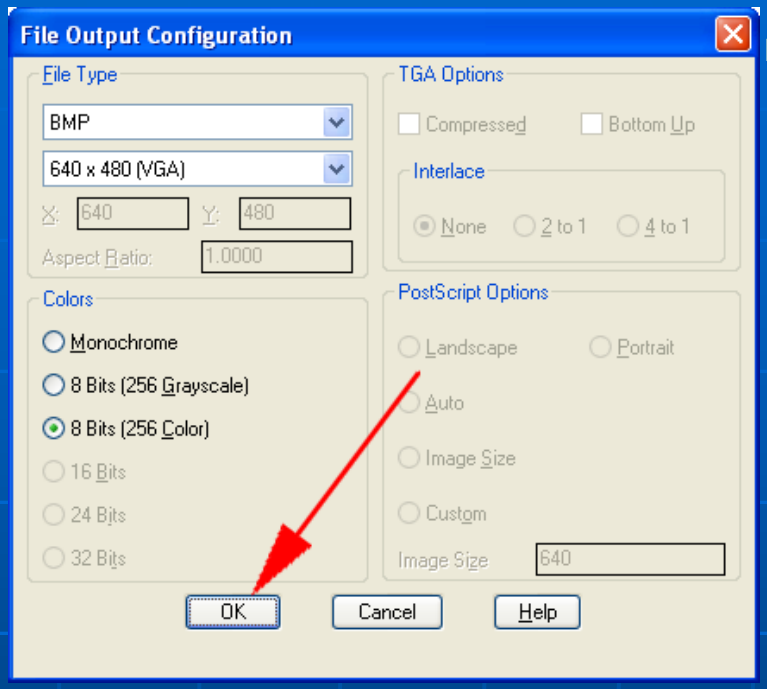


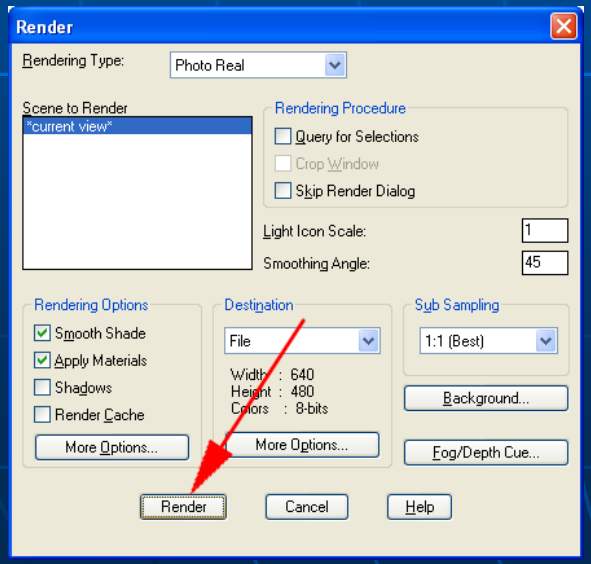


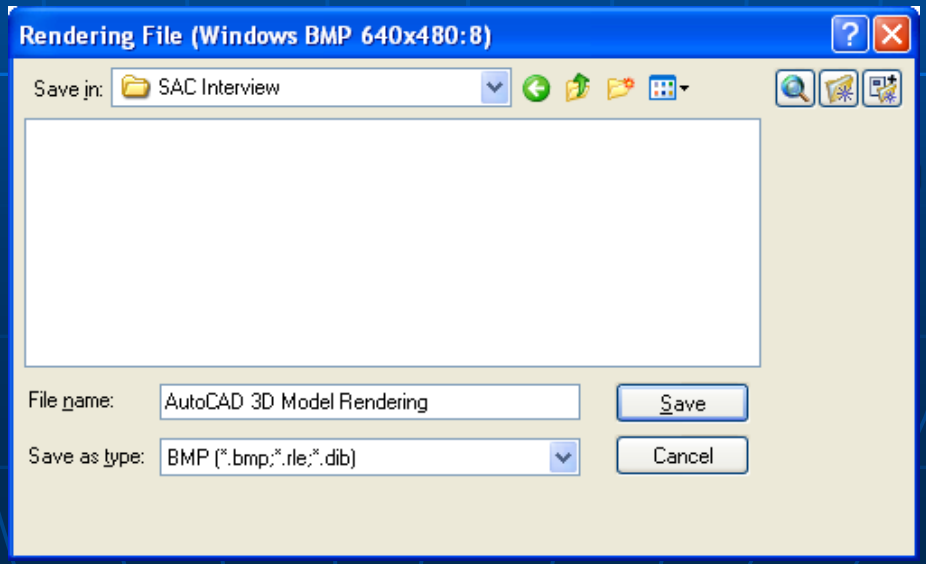
- Selecting the Render tool and the Photo Real option; clicking the Render button to see the rendered model in the Model space.

Saving a Raster Image File



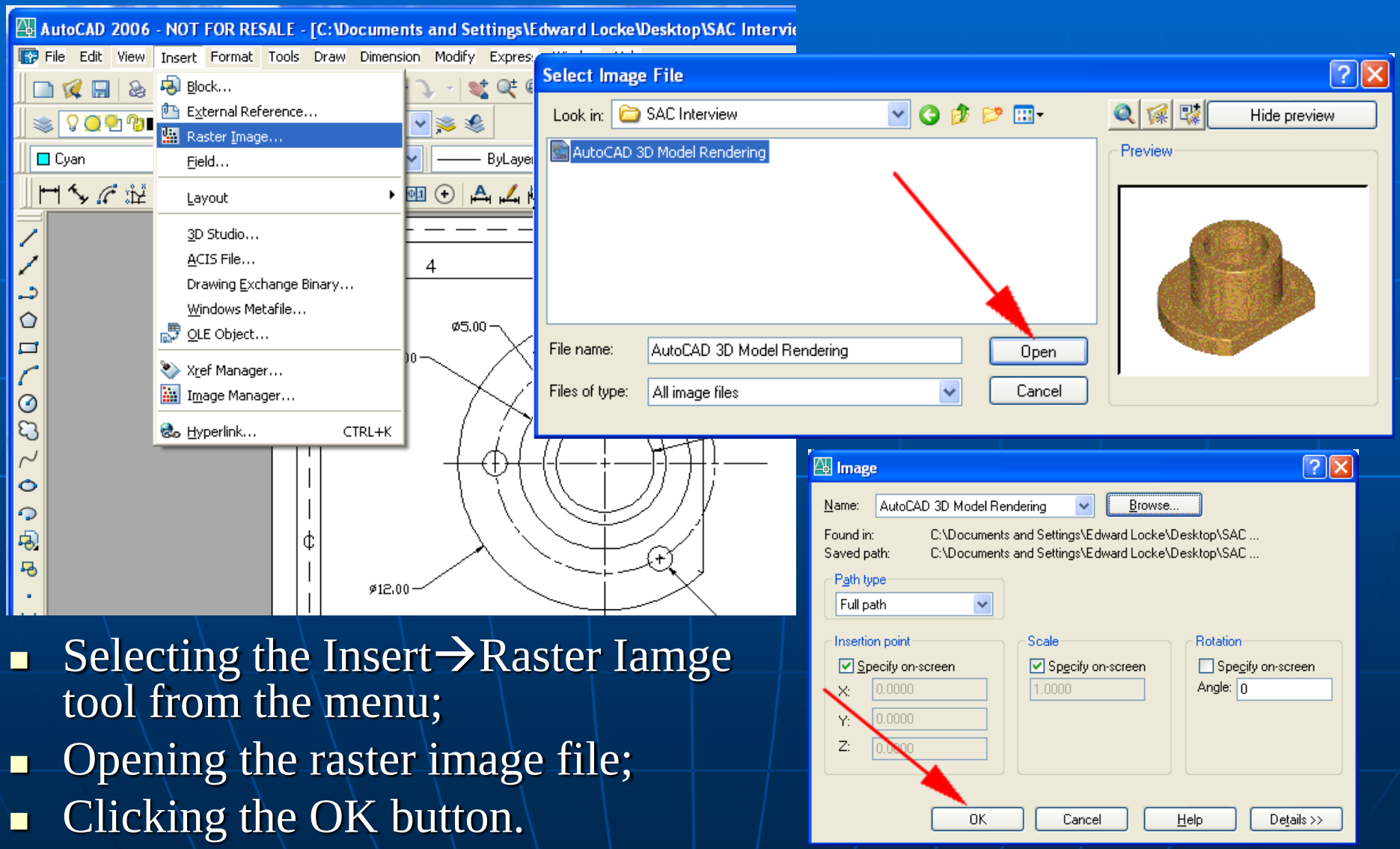




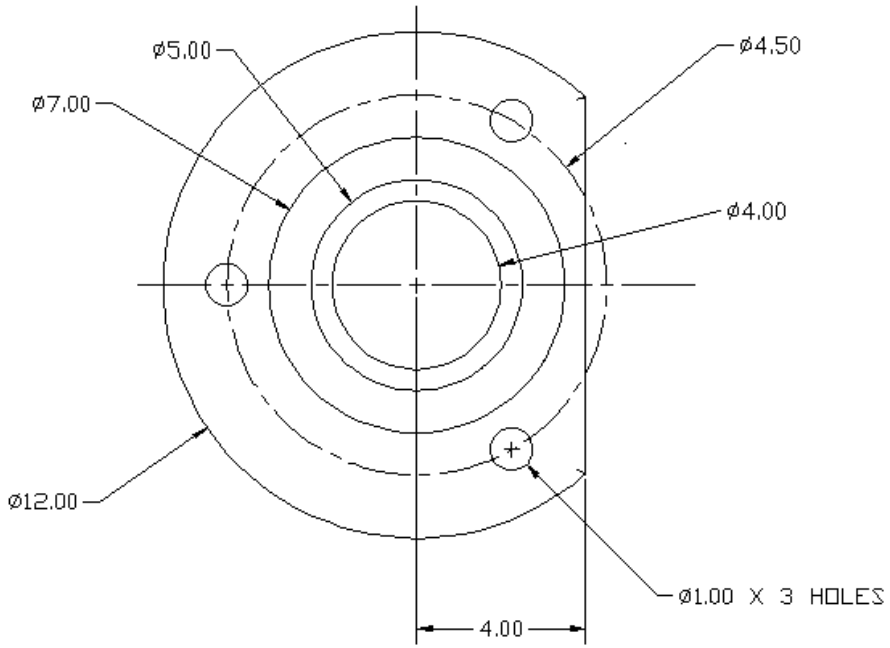


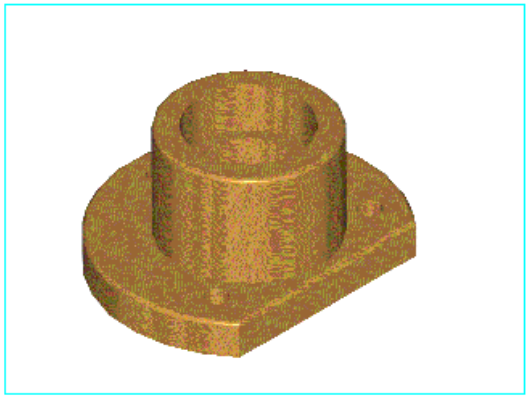
- Selecting the Render tool again and selecting the File option in Destination section; clicking the More Options… button;
- Clicking the OK button, then Render button, and then Save button.

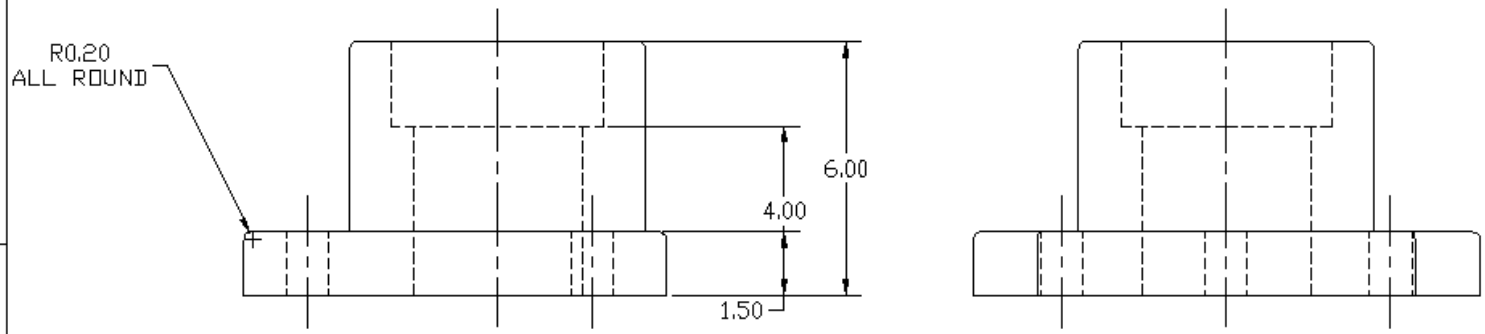
Inserting The Raster Image (Isometric View) in the Layout Space



- Selecting the Insert→Raster Iamge tool from the menu;
- Opening the raster image file;
- Clicking the OK button.


ø5.00
ø7.00
ø4.50
ø4.00
ø12.00
ø1.00 X 3 HOLES
4.00




R0.20
ALL ROUND
6.00
4.00
1.50