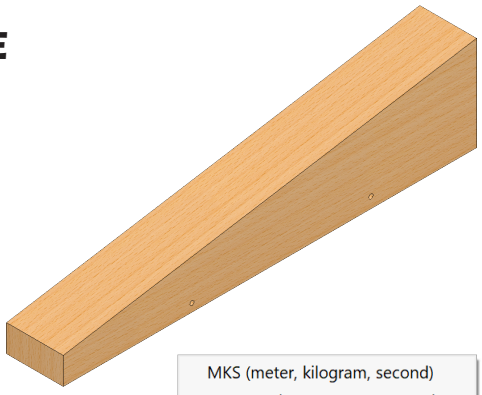
CO2 Rail Car E
Blank



A. New Metric Part.

Step 1. Click File Menu > New.

Step 2. Click **Part Metric** from the list of templates and click OK.
If you are not using SOLIDWORKS templates (you should be) to change units, in the status bar at the bottom right corner of graphics area click Unit System and **MMGS**, **Fig. 1**.

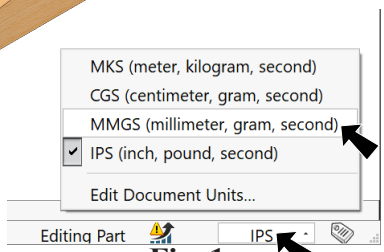


Fig. 1

B. Body.

Step 1. Click **Right Plane** in the Feature Manager and click **Sketch** on the context toolbar, **Fig. 2**.

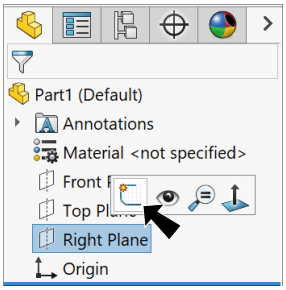


Fig. 1

Step 2. Click **Line** **(L)** on the Sketch toolbar.

Step 3. Starting at the Origin sketch the lines in **Fig. 3**.
Use the inferencing line, the dotted line that appears when you sketch the lines to keep the side lines vertical and the bottom line horizontal. Do not add any extra lines. If you make a mistake, use Undo, **Ctrl-Z**.

Step 4. Click **Smart Dimension** **(S)** on the Sketch toolbar.

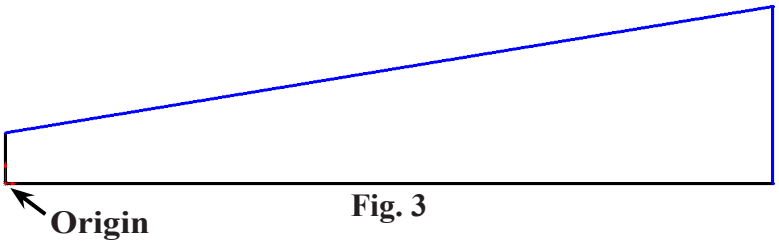


Fig. 3

Step 5. Add dimensions, **Fig. 4**.
To Smart dimension click the line then move the cursor out away from the line and click. Key-in the dimension and press ENTER. Arrange the dimensions as shown in **Fig. 4**.

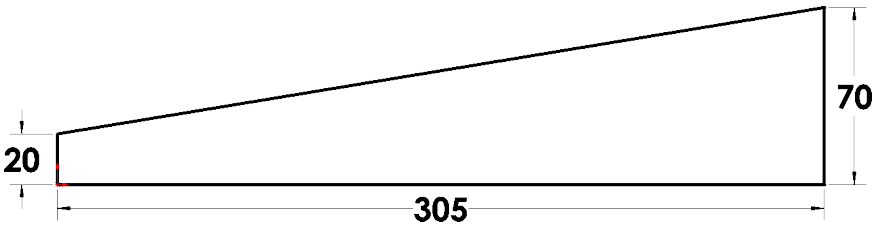


Fig. 4

Step 6. Click **Features** Features on the Command Manager toolbar.

Step 7. Click **Extruded Boss/Base** Extruded Boss/Base on the Features toolbar.

Step 8. In the Property Manager set:
under Direction 1, **Fig. 5**
End Condition **Mid Plane**
Depth D1 **42**
click OK ✔.

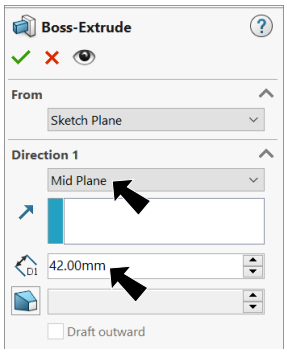


Fig. 5

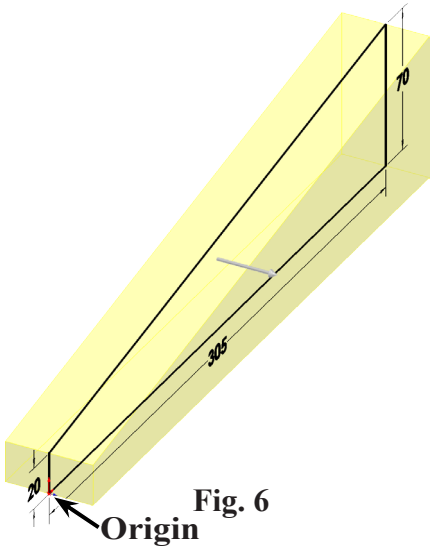


Fig. 6

C. Save as "BLANK".

Step 1. Click File Menu > Save As.

Step 2. Key-in **BLANK** for filename and press ENTER.
Tip: Create a **Rail Car E** folder in your My Document folder to save your Rail Car E project files. At cudacounty we go a step further, and create a Tech Ed [school year] folder and in that folder we create the Rail Car E folder.
Documents\Tech Ed 23-24\Rail Car E.

D. Cartridge Hole.

Step 1. Click **Back** on the Standard Views toolbar. (**Ctrl-2**)

Step 2. Click **back face** and click **Sketch** on the context toolbar, **Fig. 7**.

Step 3. Click **Circle** (**S**) on the Sketch toolbar.

Step 4. Sketch a circle for cartridge hole, **Fig. 8**.

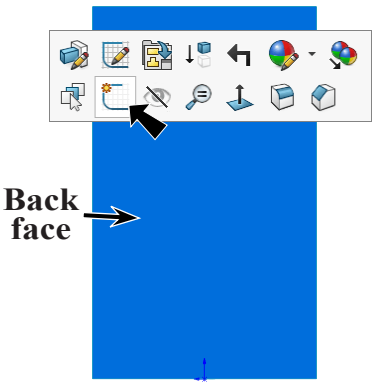


Fig. 7

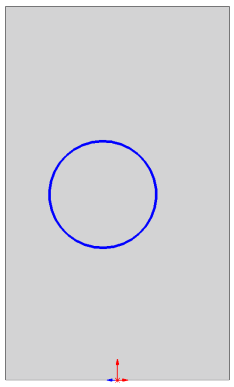


Fig. 8

Step 5. **Unselect Circle tool**. To unselect, **right click graphics area and click Select** from menu.

Step 6. **Ctrl click centerpoint of circle** and **Origin** to select both, **Fig. 9**.
Release Ctrl key and click **Make Vertical** on the context toolbar.

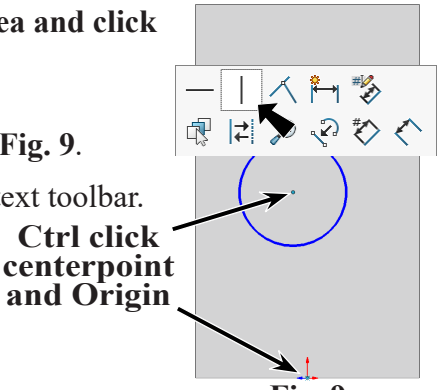


Fig. 9

Step 7. Click **Smart Dimension** 

(**S**) on the Sketch toolbar.

Step 8. Add dimensions, **Fig. 10**.

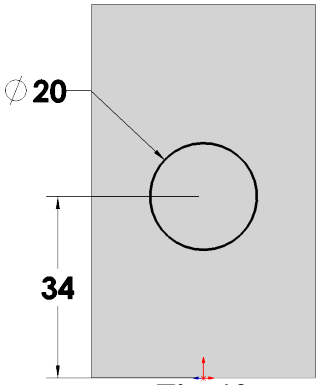
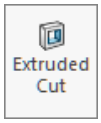


Fig. 10

Step 9. Click **Isometric**  on the Standard Views toolbar. (**Ctrl-7**)

Step 10. Click **Features** 

on the Command Manager toolbar.

Step 11. Click **Extruded Cut** 

on the Features toolbar.

Step 12. In the Cut-Extrude Property Manager set:
under Direction 1, **Fig. 11**
End Condition **Blind**
Depth  **52**
click OK  .

Step 13. Save  (**Ctrl-S**).

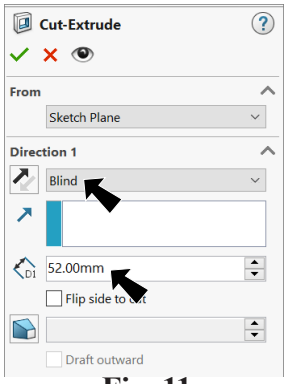


Fig. 11

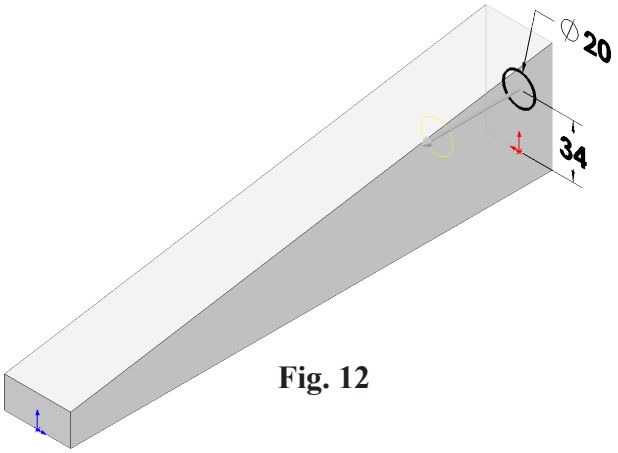


Fig. 12

E. Axle Holes.

Step 1. Click **Right Plane**  in the Feature Manager and click **Sketch**  on the context toolbar, **Fig. 13**.

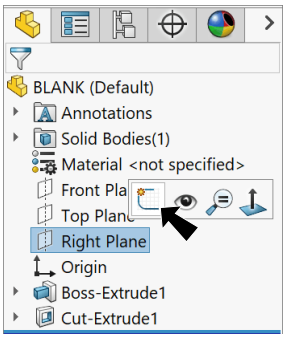


Fig. 11

Step 2. Click **Normal To**  on the Standard Views toolbar. (**Ctrl-8**)

Step 3. Click **Circle**  (**S**) on the Sketch toolbar.

Step 4. Sketch **two circles** for the axle holes, **Fig. 14**.

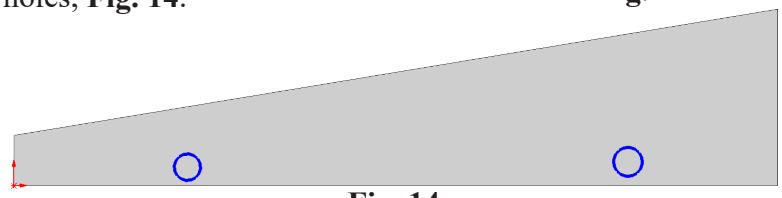


Fig. 14

Step 5. Click **Smart Dimension** 

(S) on the Sketch toolbar.

Step 6. Add dimensions, **Fig. 15**.
Dimension all to the Origin  .
To dimension to Origin, hover over Origin and click when dynamic Origin  is highlighted.

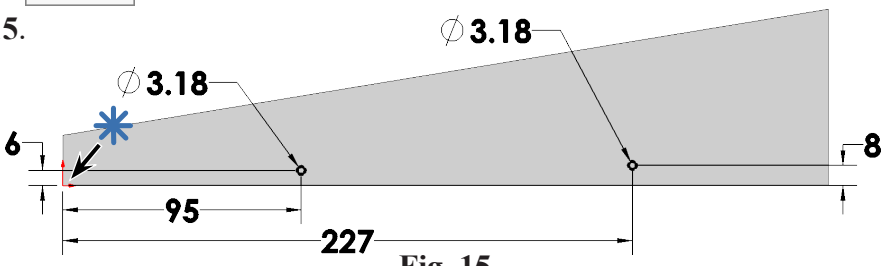
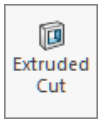


Fig. 15

Step 7. Click **Isometric**  on the Standard Views toolbar.

Step 8. Click **Features** 

on the Command Manager toolbar.

Step 9. Click **Extruded Cut** 

on the Features toolbar.

Step 10. In the Cut-Extrude Property Manager set:
under Direction 1, **Fig. 16**
End Condition
Through All - Both
click OK .

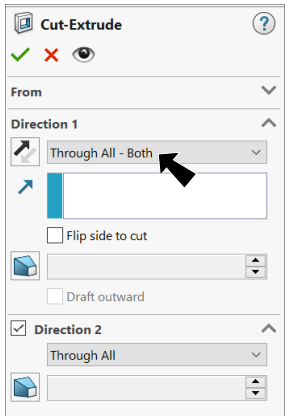


Fig. 16

Step 11. Save  **(Ctrl-S)**.

Fig. 17

F. Rename Features.

Step 1. **Rename Features** in the Feature Manager. To rename, slowly click twice over the Feature name (**F2**) and key-in new name, **Fig. 18** and **Fig. 19**.
Change:

Boss-Extrude1 to BODY
Cut-Extrude1 to CARTRIDGE HOLE
Cut-Extrude2 to AXLE HOLES

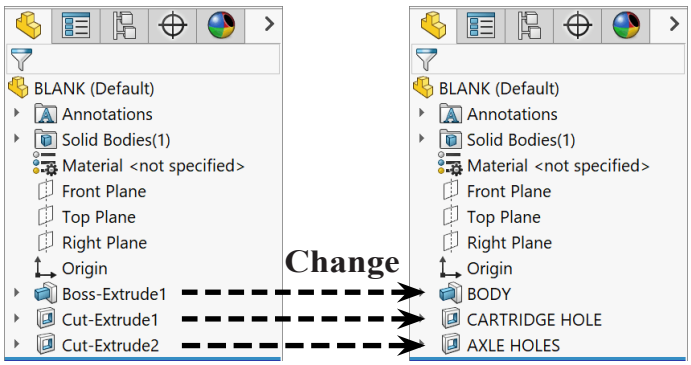


Fig. 18 **Fig. 19**

G. Mate Reference Front1.

Step 1. Click **Filter Faces** (**X**) on the **Selection Filter toolbar** at the bottom of the display, **Fig. 20**.
If necessary, use **F5** key to display the toolbar.

Fig. 20

Step 2. Click **Right Plane** in the Feature Manager to select Plane, **Fig. 21**.

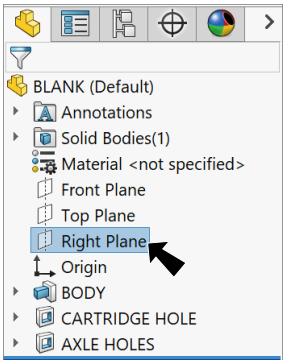


Fig. 21

Step 3. Click **Reference Geometry** on the Features toolbar and **Mate Reference** from the menu.

Step 4. In the Mate Reference Manager set:
under **Reference Name**, **Fig. 22**
key-in **Front1**
check **Create mates only when names match**
under **Primary** Reference Entity
Right Plane was preselected
Mate Reference Type **Coincident**
under **Secondary** Reference Entity
click in Entity box
and click **inside cylindrical face of front axle hole**, **Fig. 23**
click OK .

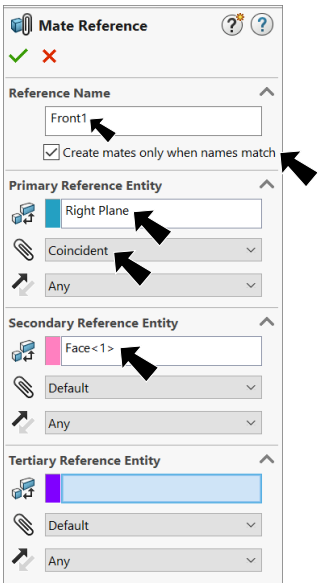


Fig. 22

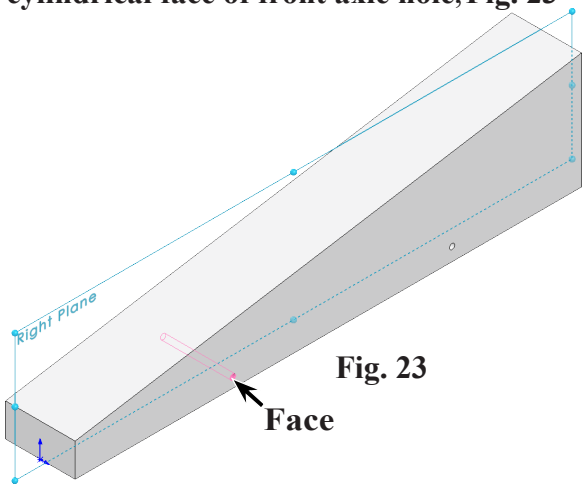


Fig. 23

H. Mate Reference Rear1.

Step 1. Click **Right Plane** in the Feature Manager to select Plane, **Fig. 24**.

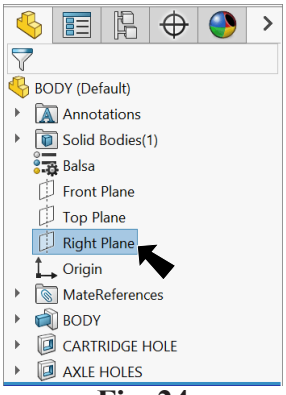


Fig. 24

Step 2. Click **Reference Geometry** on the Features toolbar and **Mate Reference** from the menu.

Step 3. In the Mate Reference Manager set:
under **Reference Name**, **Fig. 25**
key-in **Rear1**
check **Create mates only when names match**
under **Primary** Reference Entity
Right Plane was preselected
Mate Reference Type **Coincident**
under **Secondary** Reference Entity
click in Entity box
and click **inside cylindrical face of rear axle hole**, **Fig. 26**
click OK .

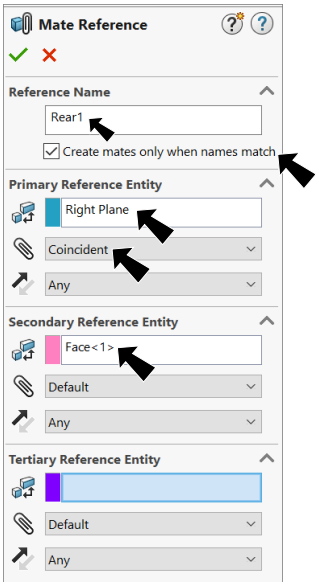


Fig. 25

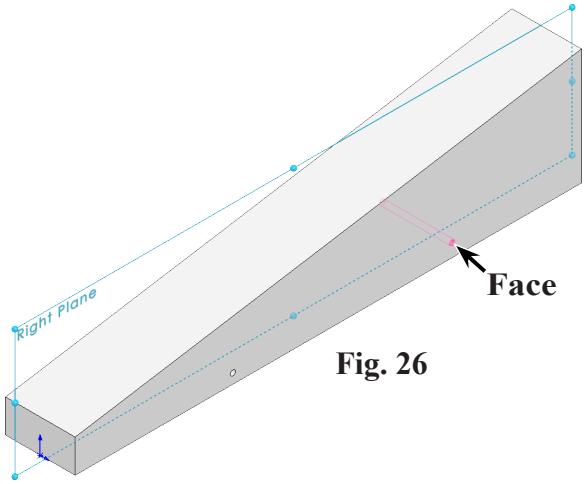


Fig. 26

Step 4. Turn off **Filter Faces** **(X)** on the **Selection Filter toolbar** at the bottom of the display, **Fig. 27**.
Or **F6** key to turn off all filters.


Fig. 27

I. Material Balsa.

Step 1. **Right click Material** in the Feature Manager and click **Edit Material**, **Fig. 28**.

Step 2. Expand **Woods** (click ▸) in the material tree and select **Balsa**, **Fig. 29**. Click **Apply** and **Close**.

Step 3. Save (**Ctrl-S**).

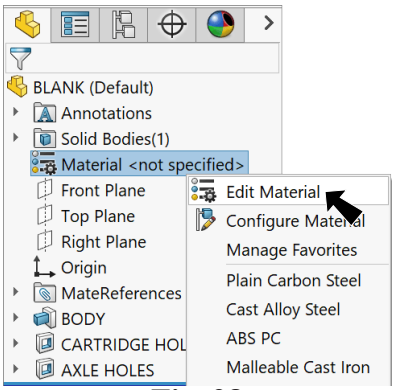


Fig. 28

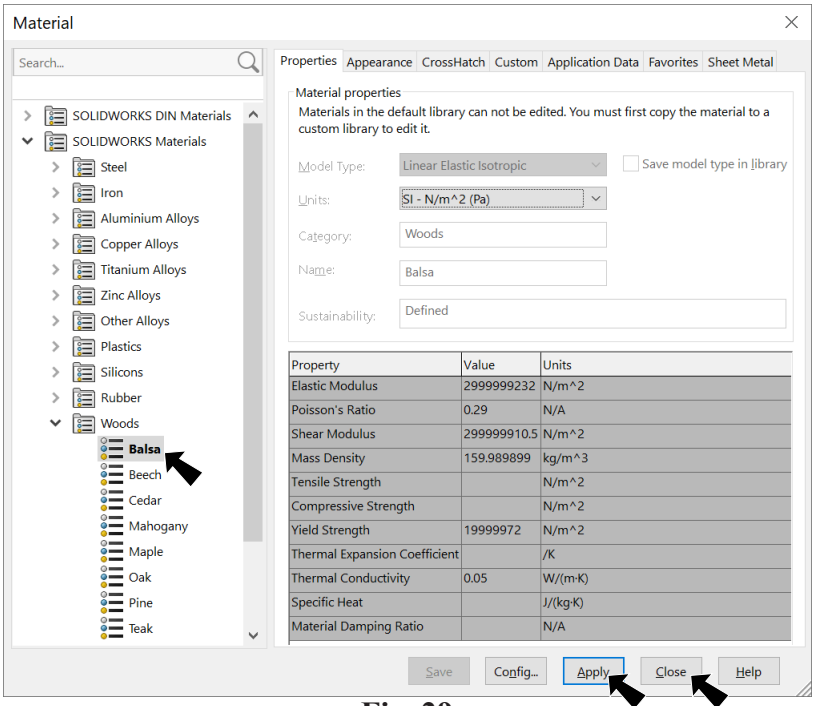


Fig. 29

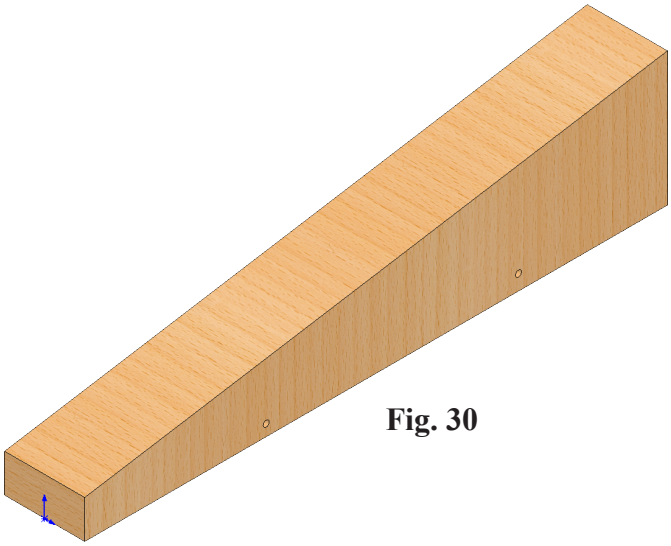


Fig. 30

J. Rotate Mapping.

Step 1. Click the part, click **Appearances Callout** on the context toolbar and click **BLANK**, **Fig. 31**.

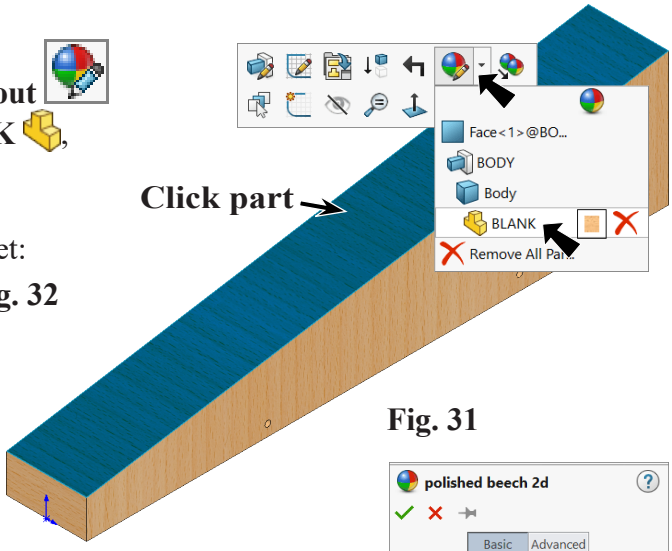


Fig. 31

Step 2. In the Appearances Property Manager set:

click **Mapping tab** Mapping, **Fig. 32**

under Mapping controls

click **Surface mapping**

Rotation 90

click **Regular size**

click OK .

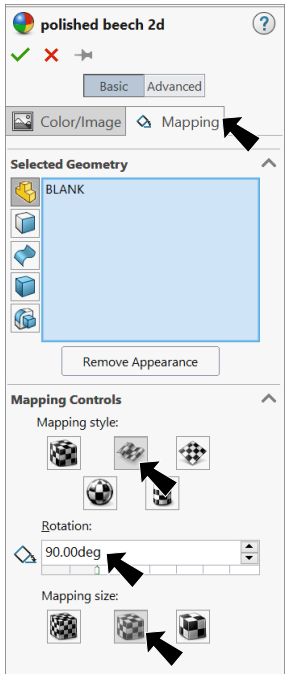


Fig. 32

Step 3. Save (**Ctrl-S**).

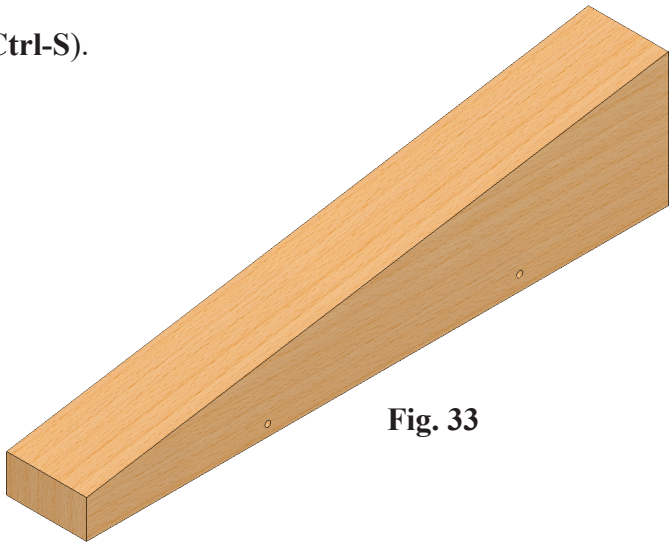


Fig. 33