Chapter 1

CO2 Rail Car
Blank

A. New Metric Part.

Step 1. Click File Menu > New.

Step 2. Click **Part Metric** from the list and click OK, **Fig. 1**. If you are not using SolidWorks templates (you should be), to change units - click Tools Menu > Options. Click Documents tab at top of dialog box and click Units in left column, select MMGS and click OK. Or in 2012, click Units in Status Bar at bottom right corner of your display.

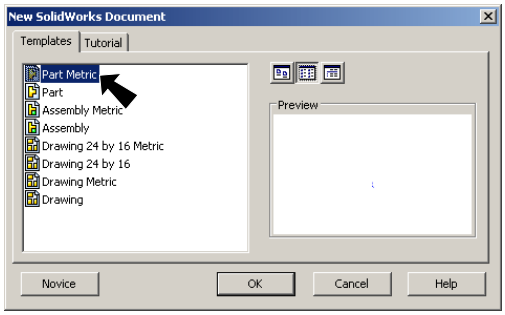

Fig. 1

B. Body.

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

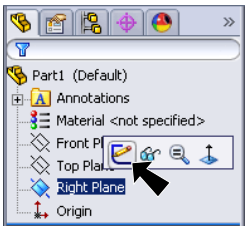

Fig. 1

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

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

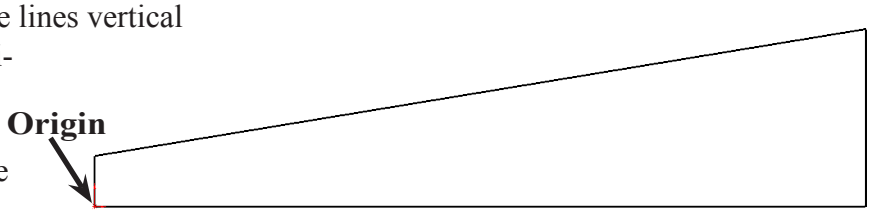

Fig. 3

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

Step 5. Add dimensions as shown in **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**.

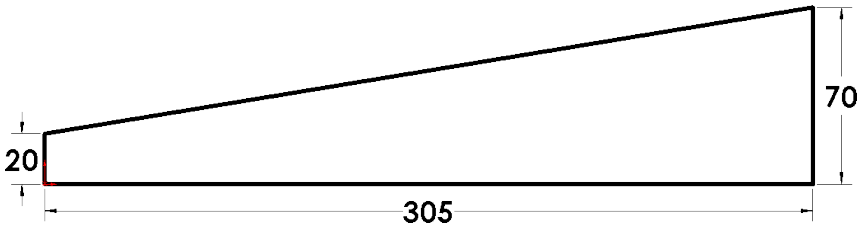

Fig. 4

Step 6. Click **Zoom to Fit** **(F)** on the View toolbar.

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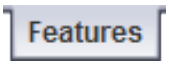
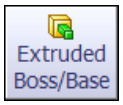
Step 7. Click **Features** 

on the Command Manager toolbar.

Step 8. Click **Extruded Boss/Base** 

on the Features toolbar.

Step 9. In the Property Manager set:
End Condition **Mid Plane**, **Fig. 5**
Depth **42**
click OK , **Fig. 6**.

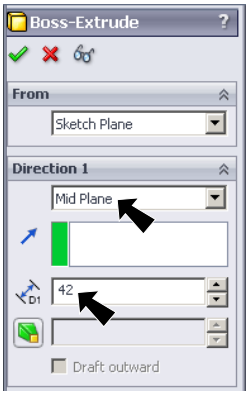


Fig. 5

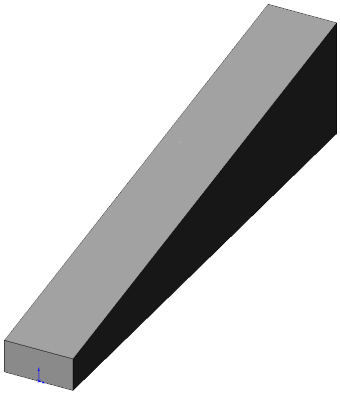


Fig. 6

C. Save as "BLANK".

Step 1. Click File Menu > Save As.

Step 2. Key-in **BLANK** for filename and press ENTER.

D. Cartridge Hole.

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

Step 2. Click the **back face** of the body and click **Sketch** on the Content menu, **Fig. 7**.

Step 3. Click **Wireframe** on the View toolbar.

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

Step 5. Draw a circle for the cartridge hole, **Fig. 8**.

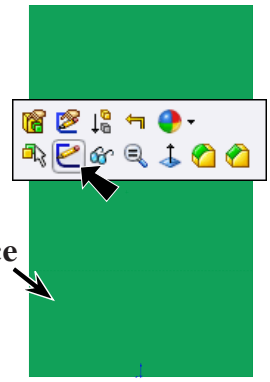


Fig. 7

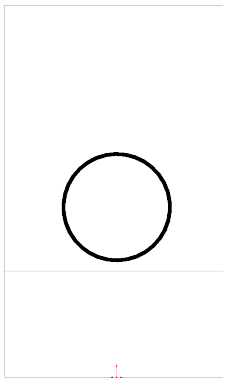


Fig. 8

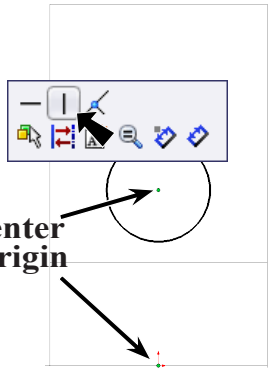


Fig. 9

Step 6. **Right click drawing and click Select** from menu to unselect Circle tool.

Step 7. **Ctrl click centerpoint of circle** and **Origin** to select both, **Fig. 9**.
Release Ctrl key and click **Make Vertical** on the Content menu.

Step 8. Click **Smart Dimension**

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

Step 9. Add dimensions as shown in **Fig. 10**. To Smart dimension circle, click the circle then move the cursor out away from circle and click. Key-in **20** for diameter and press ENTER. To add other dimensions, click circle and edge of body, move cursor just off of body and click. Key in dimension and press ENTER.

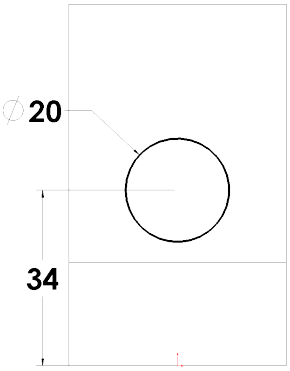
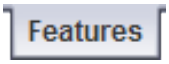
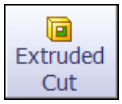


Fig. 10

Step 10. Click **Features** 

on the Command Manager toolbar.

Step 11. Click **Extruded Cut** 

on the Features toolbar.

Step 12. In the Property Manager set:
under Direction 1, **Fig. 11**
Depth **52**
click OK , **Fig. 12**.

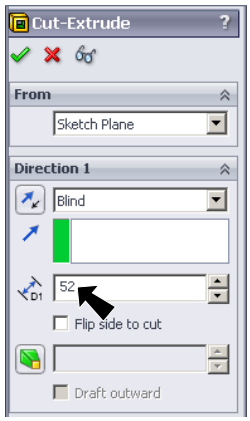


Fig. 11

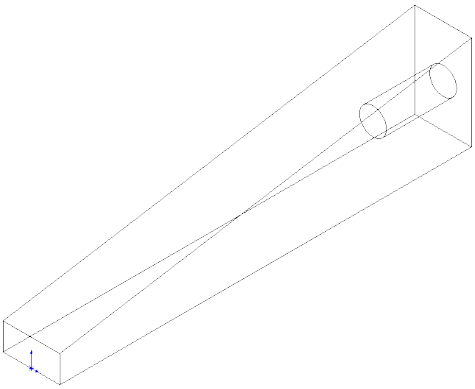


Fig. 12

Step 13. Click **Isometric** on the Standard Views toolbar. (**Ctrl-7**)

Step 14. Save. Use **Ctrl-S**.

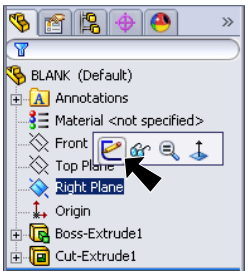


Fig. 13

E. Axle Holes.

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

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

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

Step 4. Draw two circles for the axle holes, **Fig. 14**. Draw the back hole slightly above the front hole. **Do not** align circles, do not use the inferencing line, the dotted line that appears when you draw the second circle.

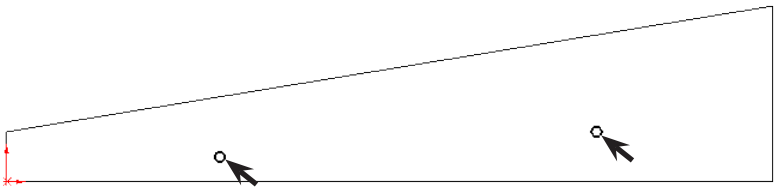
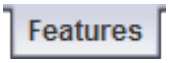


Fig. 14

Step 5. Click **Smart Dimension**

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

Step 6. Add dimensions as shown in **Fig. 15**. To Smart dimension circle, click the circle then move the cursor out away from circle and click. Key-in **3.18** for diameter and press ENTER. To add other dimensions, click circle and edge of body, move cursor just off of body and click. Key in dimension and press ENTER. Arrange the dimensions as shown in **Fig. 14**.

Step 7. Click **Features** 

on the Command Manager toolbar.

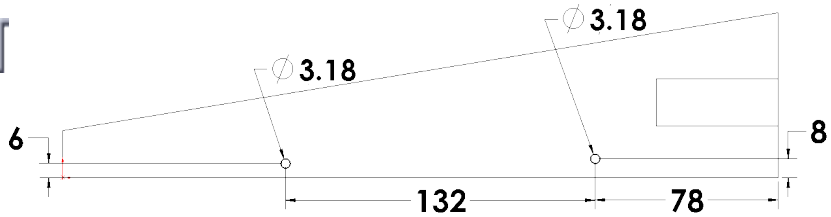
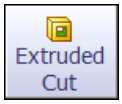


Fig. 15

Step 8. Click **Extruded Cut** 

on the Features toolbar.

Step 9. Click **Isometric** on the Standard Views toolbar.

Step 10. In the Property Manager set:
under Direction 1, **Fig. 16**
End Condition **Mid Plane**
Depth **42**
click OK , **Fig. 17**.

Step 11. Save. Use **Ctrl-S**.

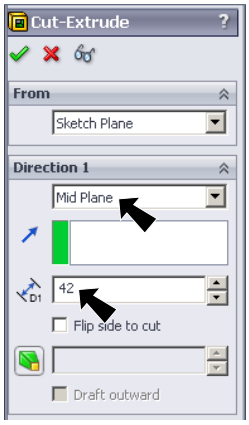


Fig. 16

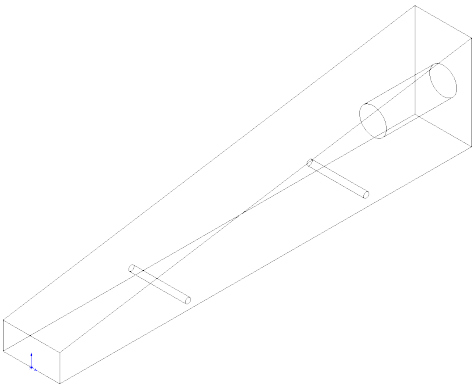


Fig. 17

F. Rename Features.

Step 1. Click **Shaded With Edges** on the View toolbar.

Step 2. **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

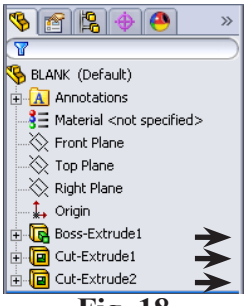


Fig. 18

Change

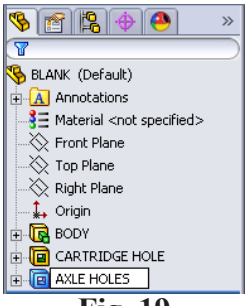


Fig. 19

G. Mate References.

Fig. 20

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.

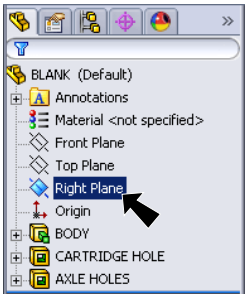


Fig. 21

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

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

Step 4. In the Mate Reference Manager:

under **Primary** Reference Entity, **Fig. 22**

set **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.

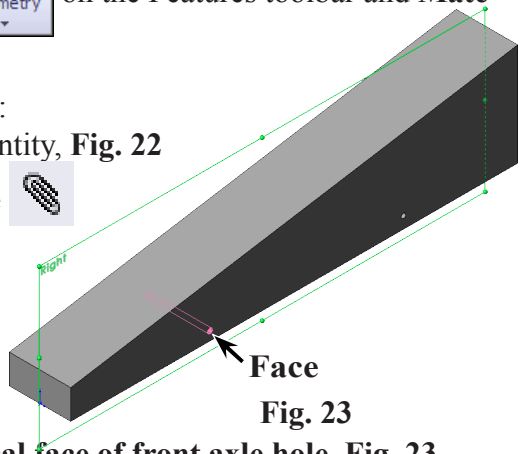


Fig. 23

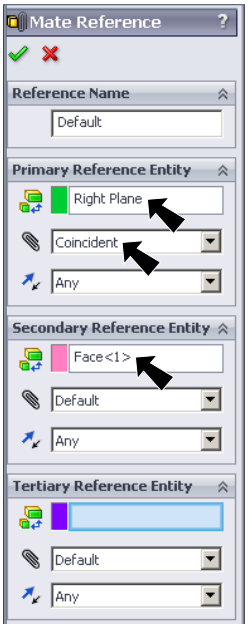


Fig. 22

Step 5. Click **Right Plane** in the Feature Manager to select Plane, **Fig. 21**.

Step 6. Click **Reference Geometry** on the Features toolbar and **Mate Reference** from the menu.

Step 7. In the Mate Reference Manager:

under **Primary** Reference Entity, **Fig. 24**

Mate Reference Type **Coincident**

under **Secondary** Reference Entity

click in Entity box and click **inside cylindrical face of rear axle hole**, **Fig. 25**

click OK.

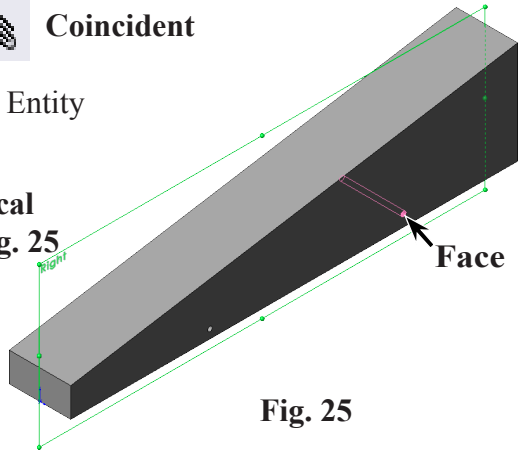


Fig. 25

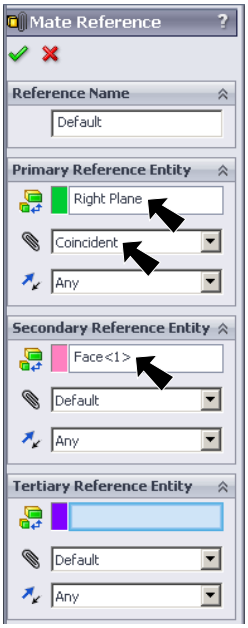


Fig. 24

Step 8. Turn off **Filter Faces** (**X**) on the **Selection Filter toolbar** at the bottom of the display, **Fig. 26**. Or **F6** key to turn off all filters.

Fig. 26

Step 9. Save. Use **Ctrl-S**.

H. Material Balsa.

Step 1. **Right click Material** in the Feature Manager and click **Edit Material**, **Fig. 27**.

Step 2. **Expand Woods** (click the +) in the material tree and select **Balsa**, **Fig. 28**. Click **Apply** and **Close**, **Fig. 29**.

Step 3. Save. Use **Ctrl-S**.

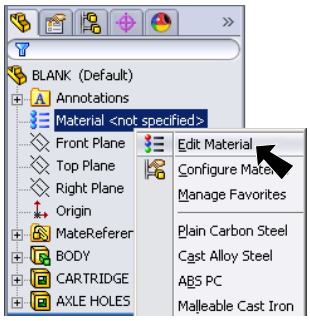


Fig. 27

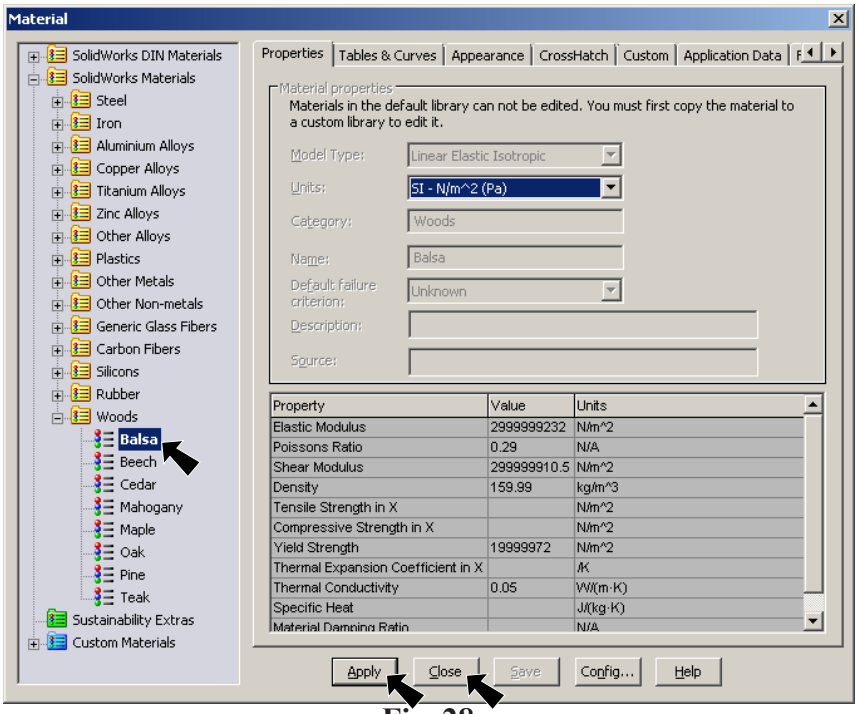


Fig. 28

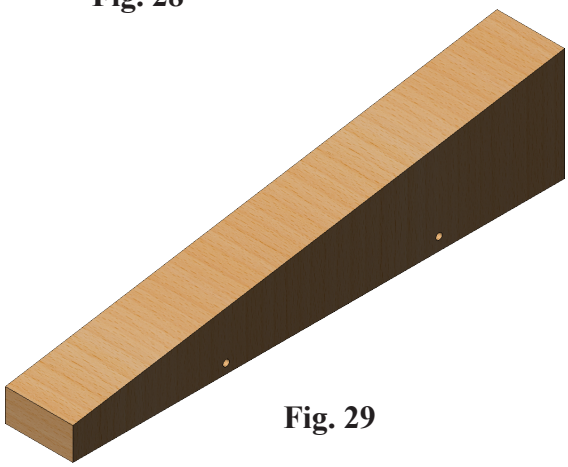


Fig. 29

I. Enable PhotoView 360.

Step 1. If necessary, turn on PhotoView 360. To turn on PhotoView 360, click Tools Menu > Add-Ins.

Step 2. In the dialog box scroll down to **PhotoView 360** and place a check in the check box under **Active Add-Ins** and **Start-Up**, **Fig. 30**. Click OK.

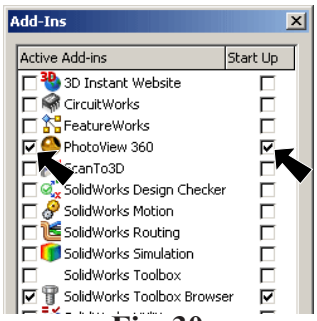


Fig. 30

J. Rotate Mapping.

Step 1. Click PhotoView 360 Menu > Edit Appearance.

Step 2. In the Property Manager:

click **Mapping tab**

, **Fig. 31**

under Mapping controls,

click **Surface mapping**
set **Rotation 90**

click **Small mapping size**

click OK
, **Fig. 32**.

Step 3. Save. Use **Ctrl-S**.

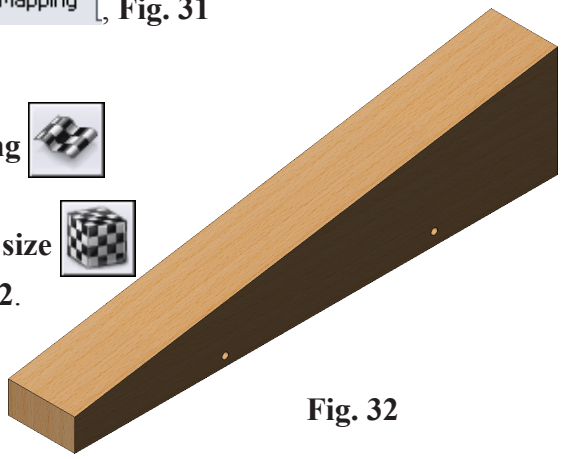


Fig. 32

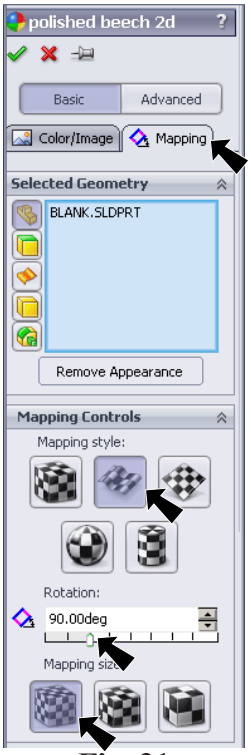


Fig. 31