Lesson 15 Sweeps

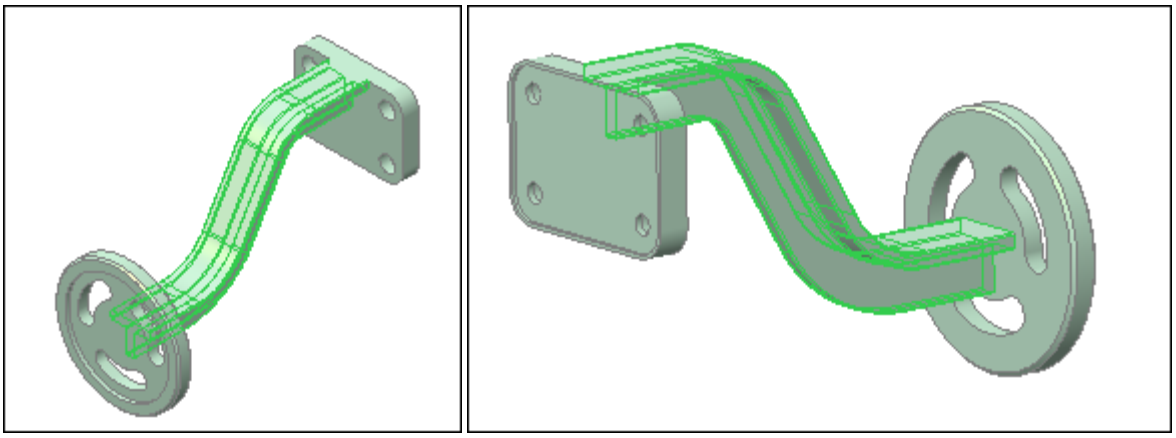


Figure 15.1 Bracket

OBJECTIVES

- Create a **constant-section sweep** feature
- Sketch a **Trajectory** for a sweep
- Sketch and locate a **Sweep section**
- Understand the difference between adding and not adding **Inner Faces**
- Be able to **Edit** a sweep

REFERENCES AND RESOURCES

For **Resources** go to **www.cad-resources.com** > click on the PTC Creo Parametric 3.0 Book cover

- Lesson Lecture
- Book Projects PDF
- Project Lectures
- Quick Reference Card
- Configuration Options

SWEEPS

A Sweep is created by sketching or selecting a *trajectory* and then sketching a *section* to follow along it. The Bracket, shown in Figure 15.1, uses a simple sweep in its design. A *constant-section sweep* (Fig. 15.2) can use either trajectory geometry sketched at the time of feature creation or a trajectory made up of selected datum curves or edges. The trajectory [Figs. 15.3 (a-c)] must have adjacent reference surfaces or be planar. When defining a sweep, Creo Parametric 3.0 checks the specified trajectory for validity and establishes normal surfaces.

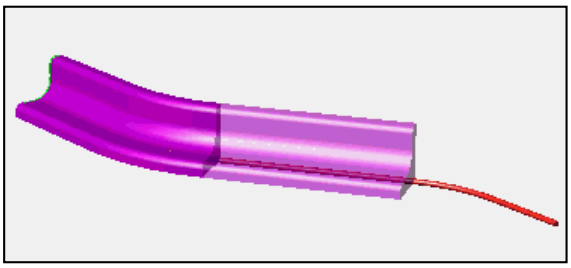
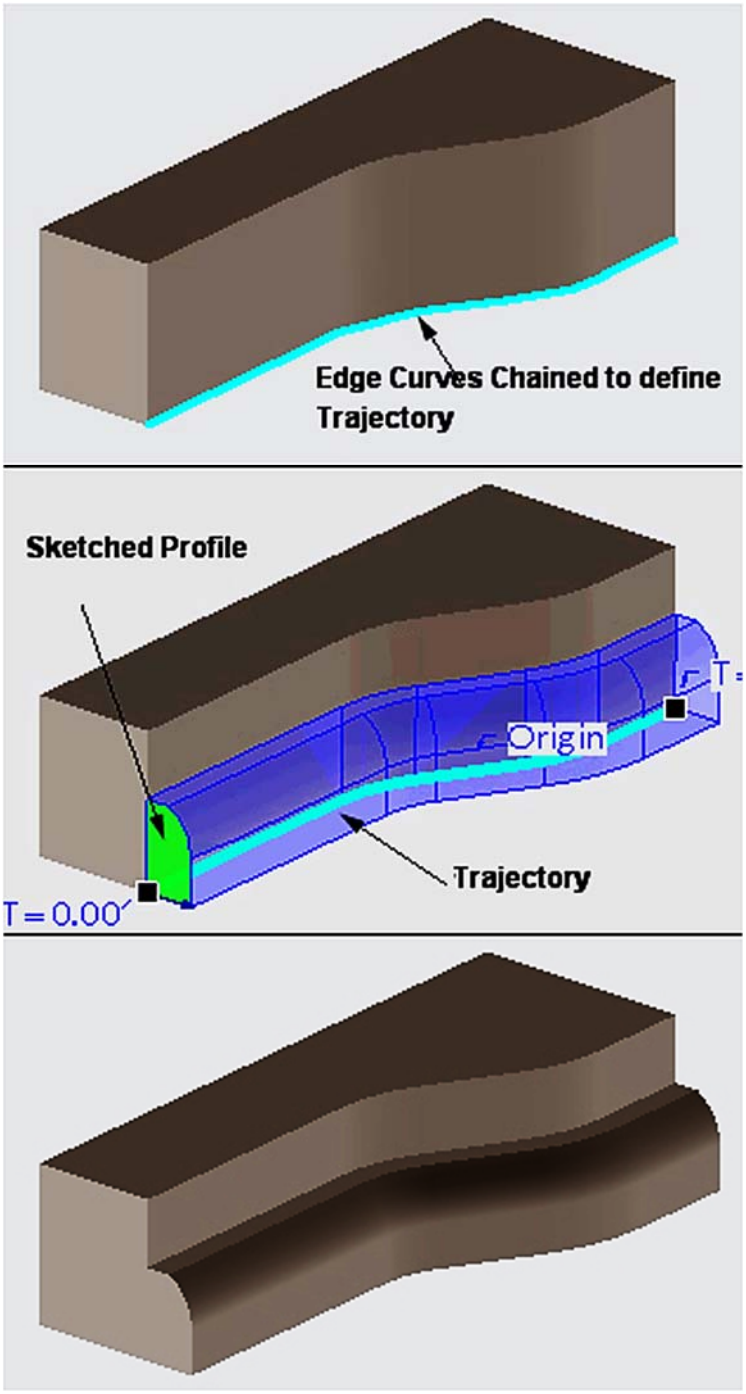


Figure 15.2 Sweep Forms



Figures 15.3(a-c) Sweep Trajectory and Section

Lesson 15 STEPS

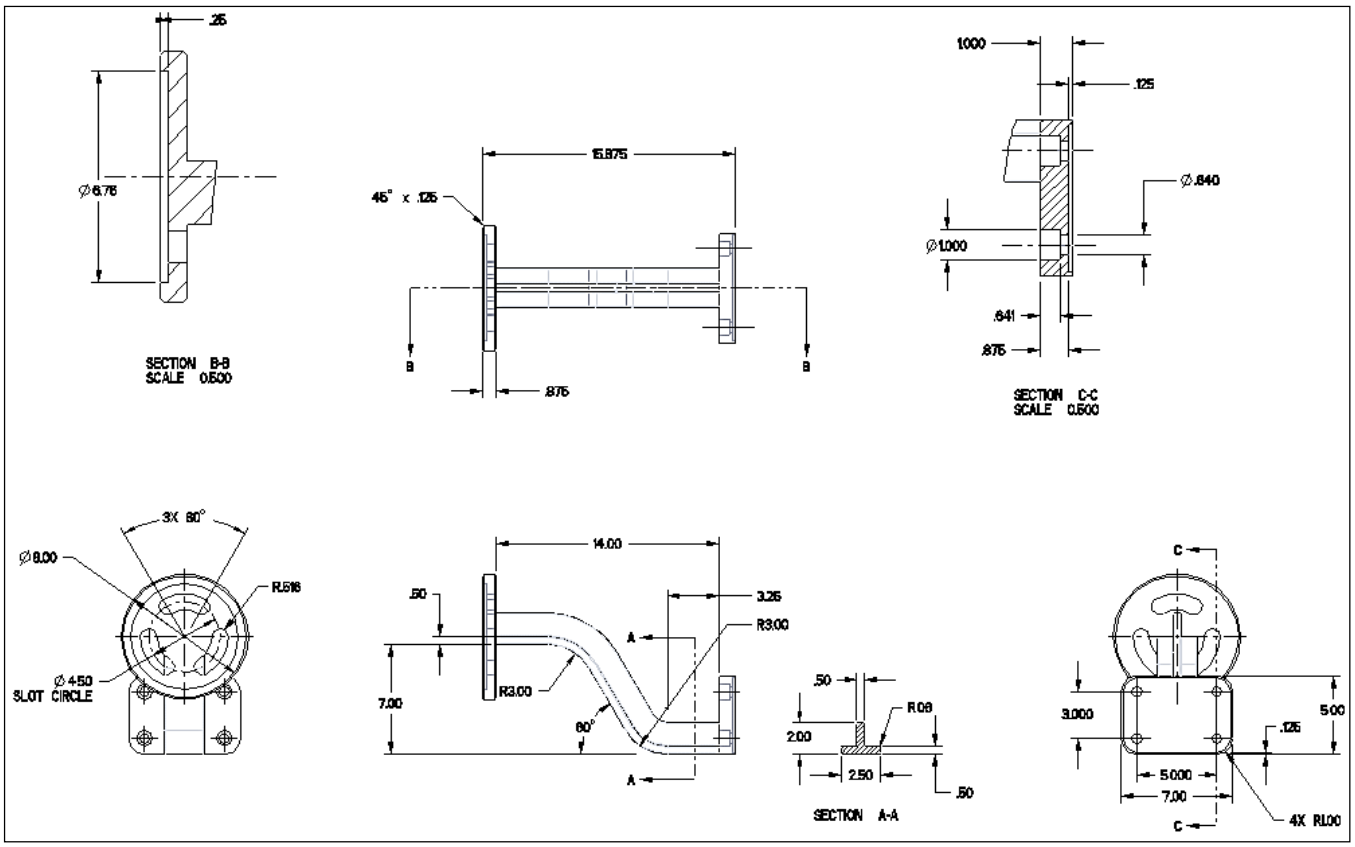


Figure 15.4 Bracket Detail

Bracket

The Bracket (Fig. 15.4) requires the use of the Sweep command. The T-shaped section is swept along the sketched *trajectory*.

Start a new part. Press: **Ctrl+N** > Name **bracket** > **Enter** > **File** > **Prepare** > **Model Properties**

- **Material** = al6061.mtl
- **Units** = Inch lbm Second

Set Datum  and **Rename** the default datum planes and coordinate system:

- Datum **TOP** = **C**
- Datum **FRONT** = **A**
- Datum **RIGHT** = **B**
- Coordinate System = **CSYS_SWEEP**

In the Model Tree, click on **BRACKET.PRT** > **RMB** > **Info** > **Model** [Fig. 15.5(a)] >  close the browser panel > in the Graphics Window, **LMB** to deselect

Color: set the model color as desired [Fig. 15.5(b)]

Model Info : BRACKET

PART NAME : BRACKET

MATERIAL FILENAME: AL6061

Units:	Length:	Mass:	Force:	Time:	Temperature:
Inch lbm Second (Creo Parametric Default)	in	lbm	in lbm / sec^2	sec	F

Feature List

No.	ID	Name	Type	Actions	Sup Order	Status
1	1	B	DATUM PLANE		---	Regenerate
2	3	C	DATUM PLANE		---	Regenerate
3	5	A	DATUM PLANE		---	Regenerate
4	7	CSYS_SWEEP	COORDINATE SYSTEM		---	Regenerate
5	40	---	PROTRUSION		---	Regenerate

Figure 15.5(a) Bracket Information (*your Browser Window information may appear differently)*

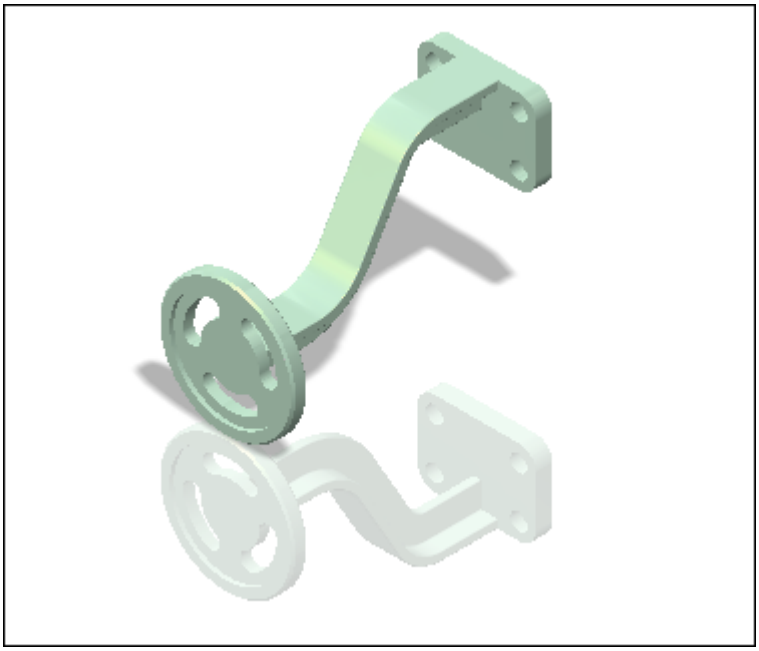


Figure 15.5(b) Bracket Color (your display may appear differently)

The extrusions on both sides of the swept feature are to be created with the dimensions shown in Figures 15.6(a-j).

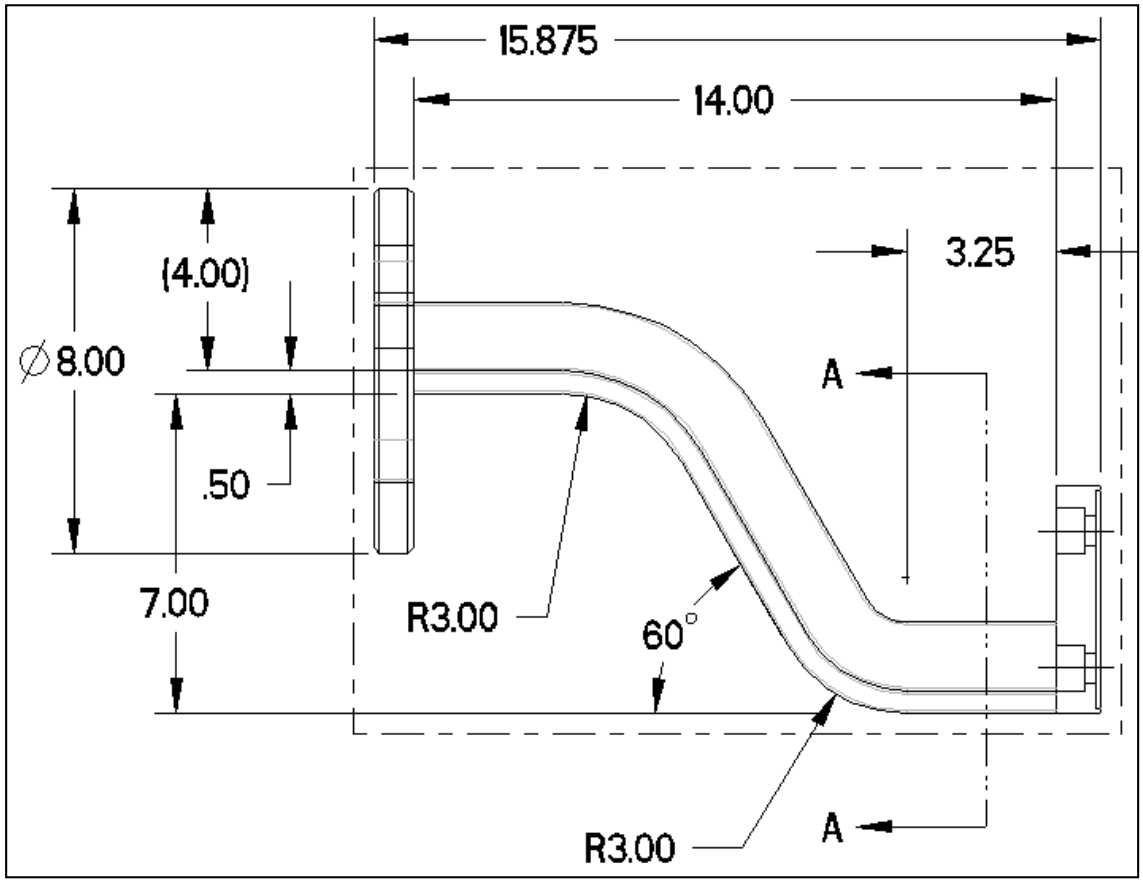


Figure 15.6(a) Bracket Drawing, Front View

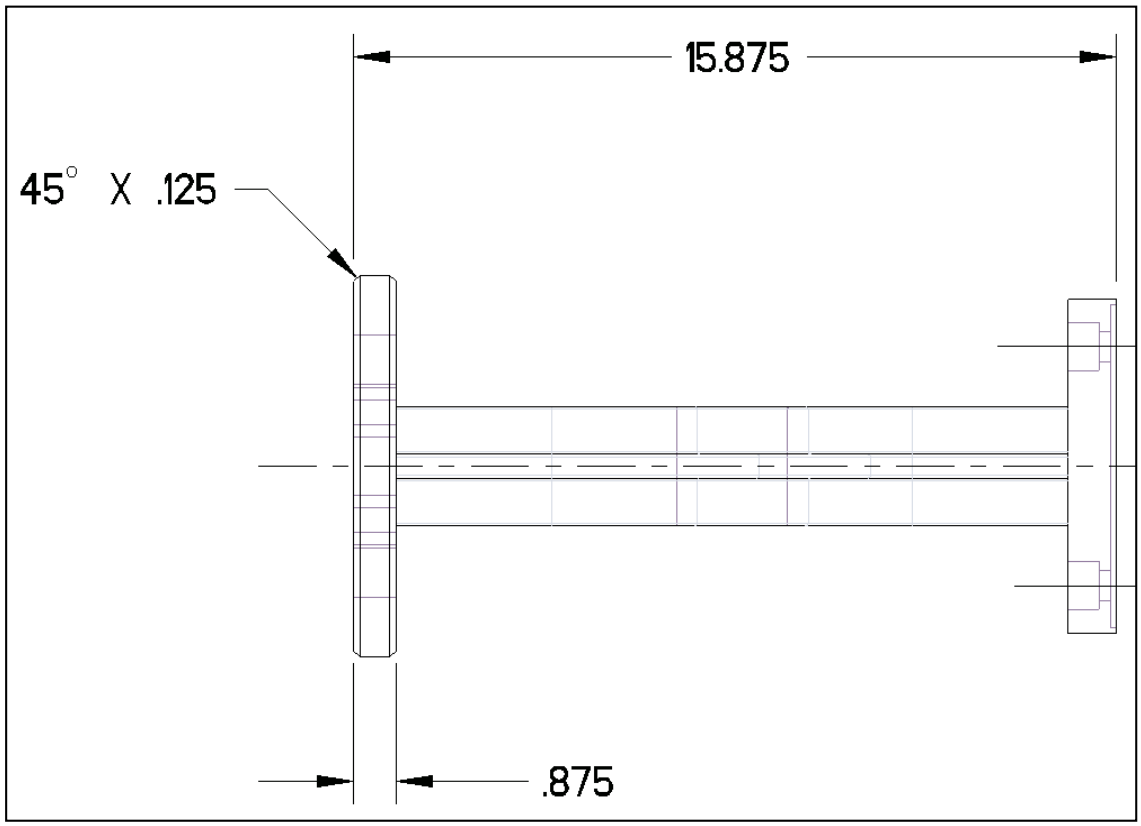


Figure 15.6(b) Bracket Drawing, Top View

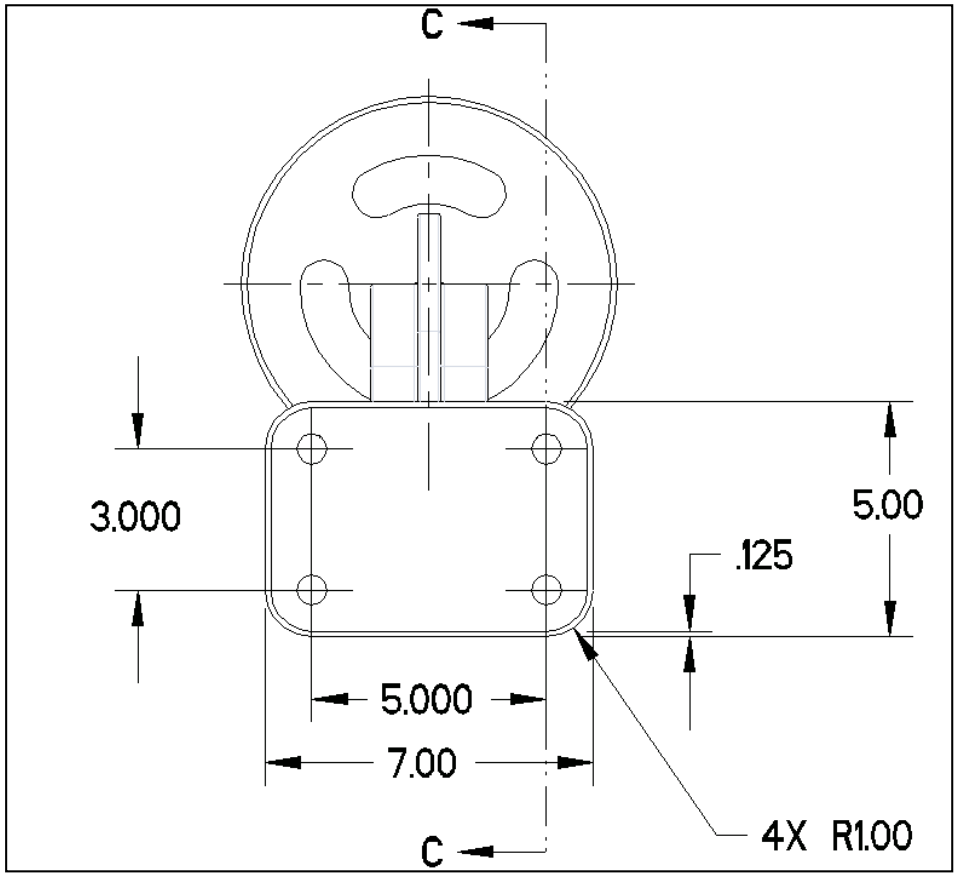


Figure 15.6(c) Bracket Drawing, Right Side View

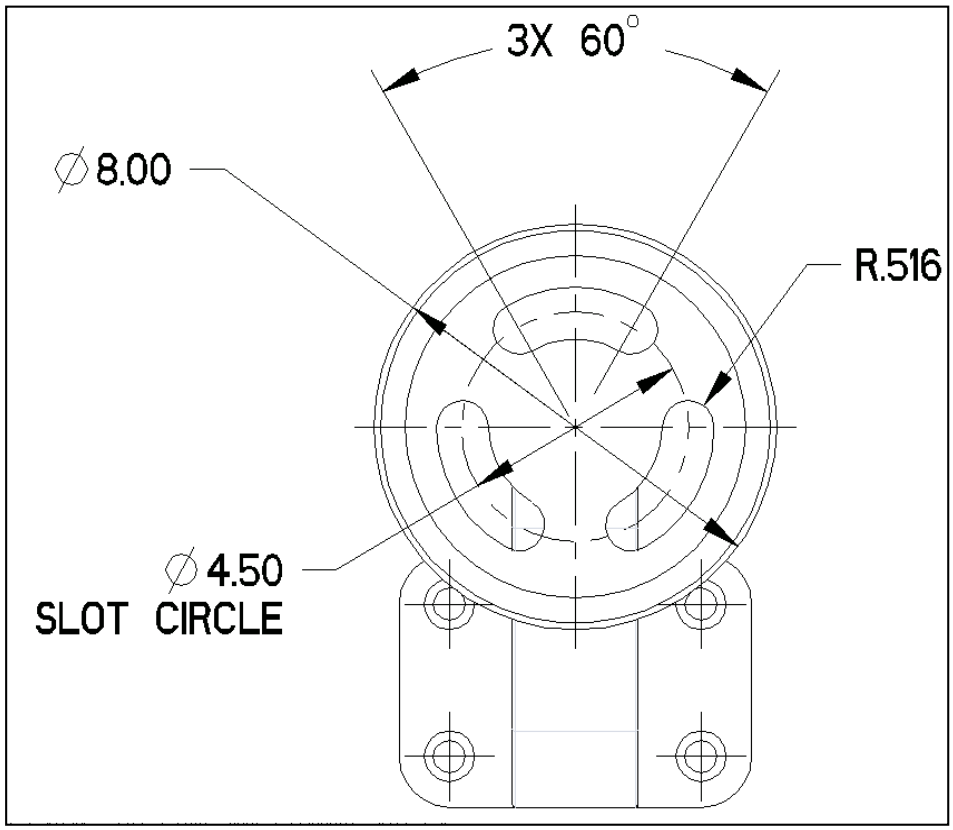


Figure 15.6(d) Bracket Drawing, Left Side View

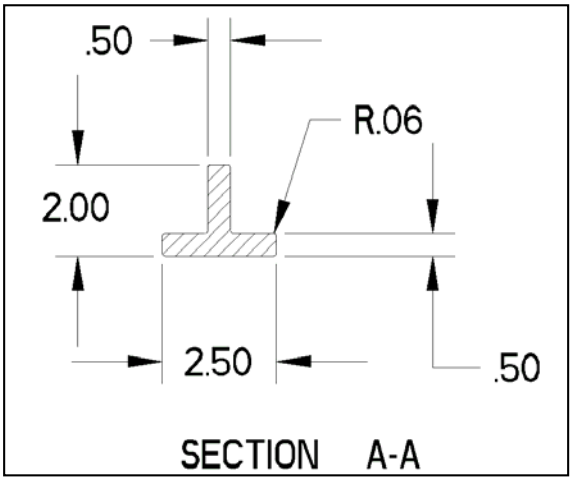


Figure 15.6(e) SECTION A-A

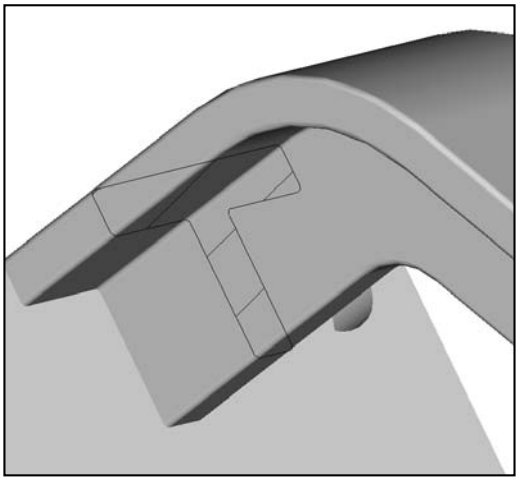


Figure 15.6(f) Swept Arm

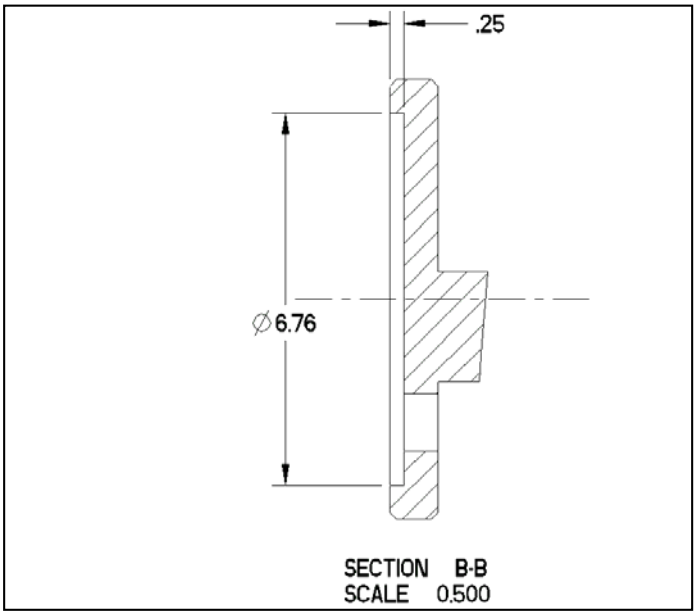


Figure 15.6(g) SECTION B-B

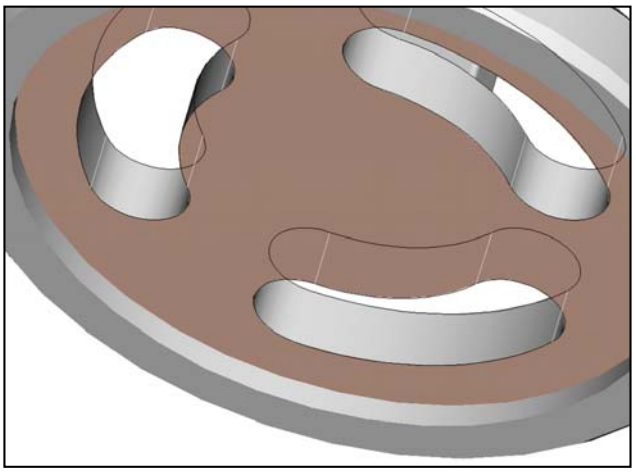


Figure 15.6(h) Cut

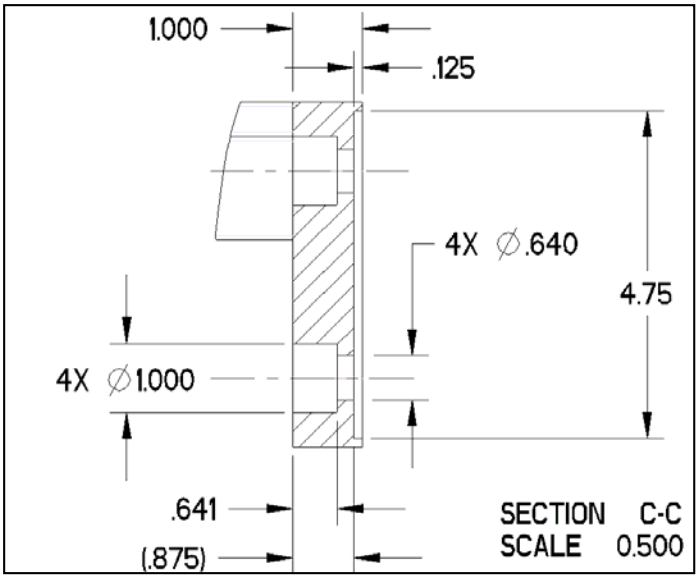


Figure 15.6(i) SECTION C-C

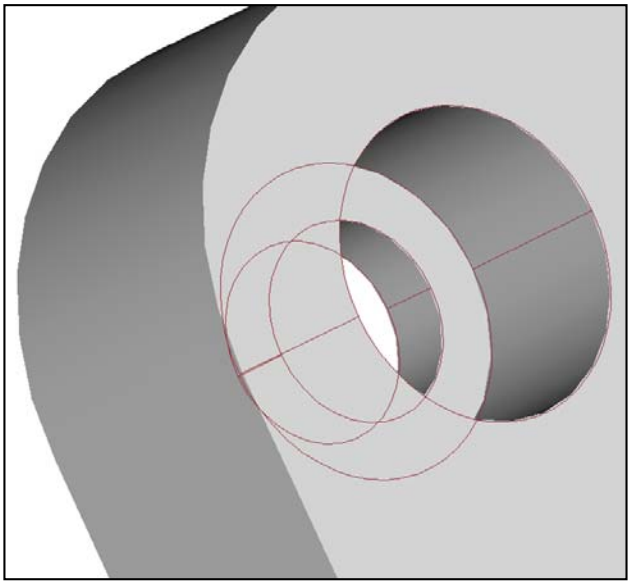


Figure 15.6(j) Counterbore Hole

Start by modeling the first feature [Fig. 15.7(a)], it will be used to establish the sweep's position in space. Sketch the extrusion on datum **A** (**FRONT**) [Fig. 15.7(b)] and centered on **B** (**RIGHT**) and **C** (**TOP**). After having SET Datum Tag annotations and renaming the default datum planes: pick datum **B** from the Model Tree **>** **RMB** **>** **Properties** **>** **Text Style** **>** Height **0.15625** **>** **Enter** **>** **Apply** **>** **OK** **>** **OK** **>** repeat for datum **C** and datum **A** **>** **Ctrl+D** **>** in the Graphics Window, **LMB** to deselect **>** **Ctrl+S** **>** **OK**

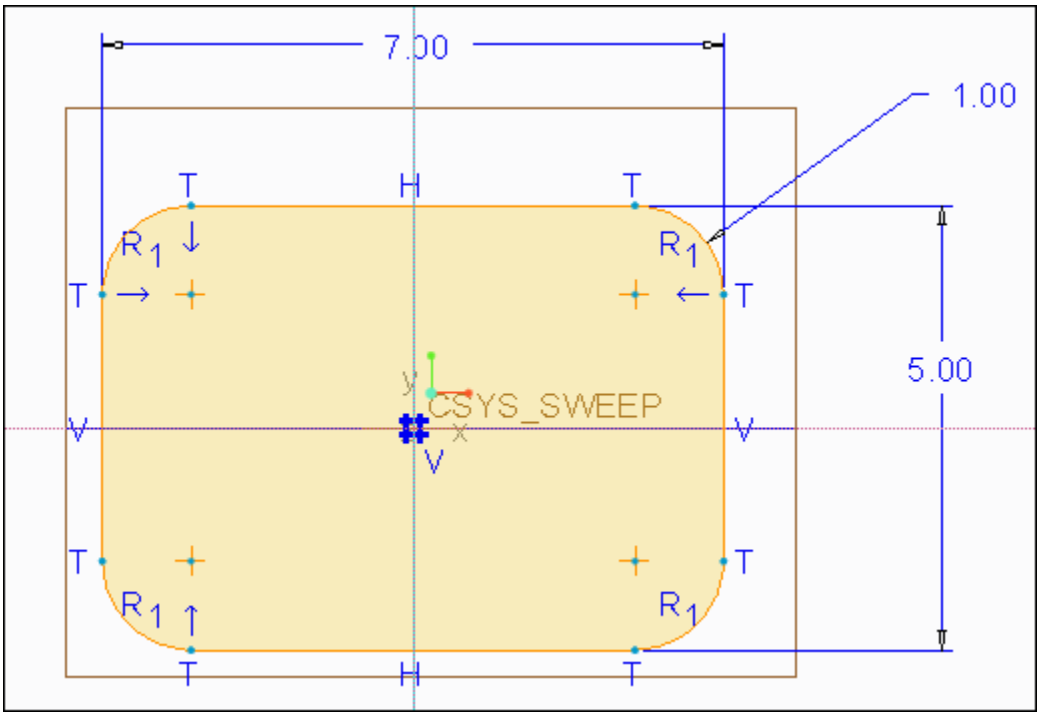


Figure 15.7(a) Bracket's First Section

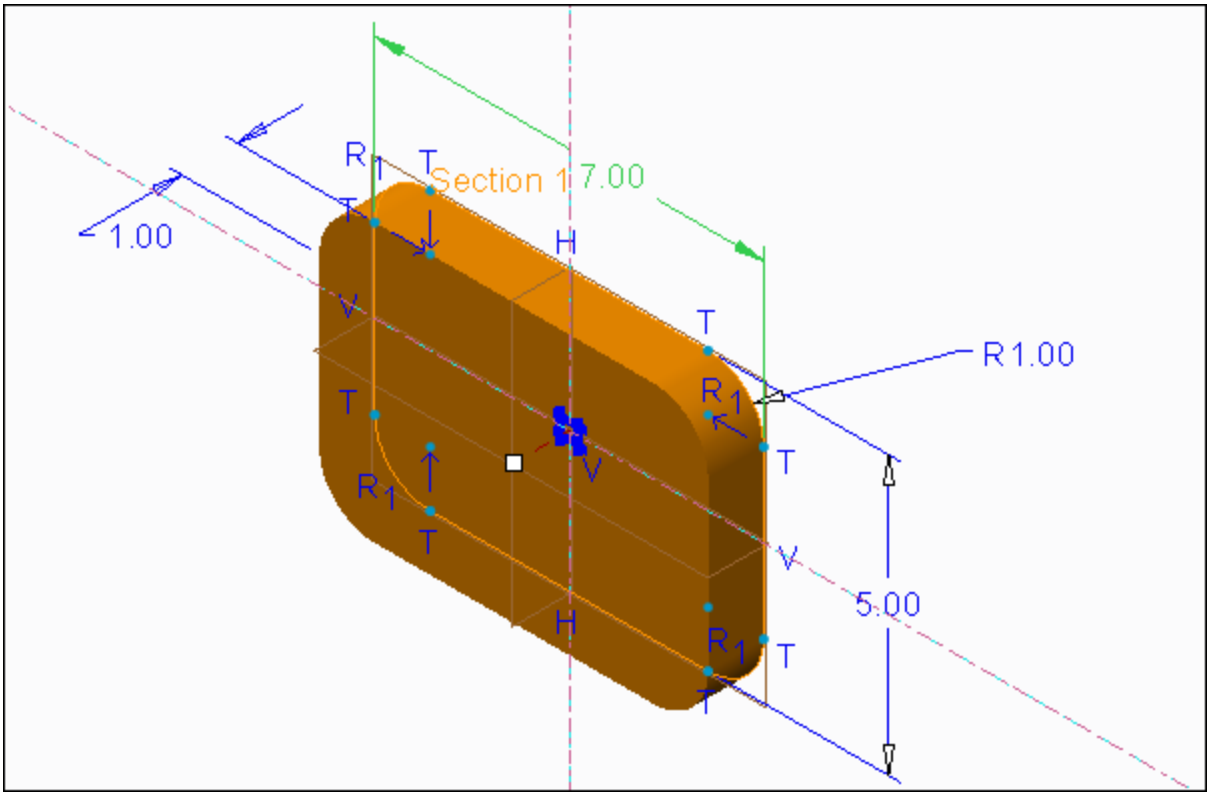


Figure 15.7(b) Completed Extrusion

Click: Sweep > Datum > **Sketch** > select datum **B** as the sketching plane [Fig. 15.8(a)] > Orientation **Top** > **Sketch** > Sketch View > in the Graphics Window, press **RMB** > **References** > in the References dialog box, delete datums **A** and **C** and add the front and top faces of the first extrusion [Fig. 15.8(b)] > **Solve** > **Close**

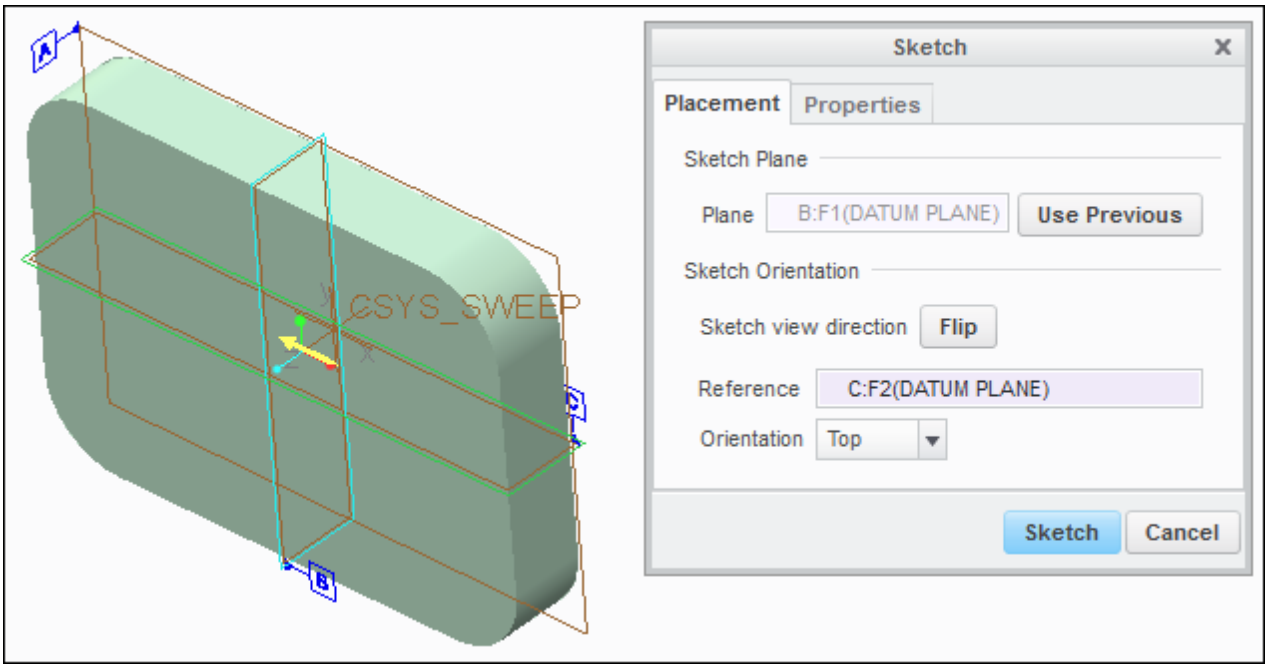


Figure 15.8(a) Select Datum B as the Trajectory Sketching Plane, Orientation is Top

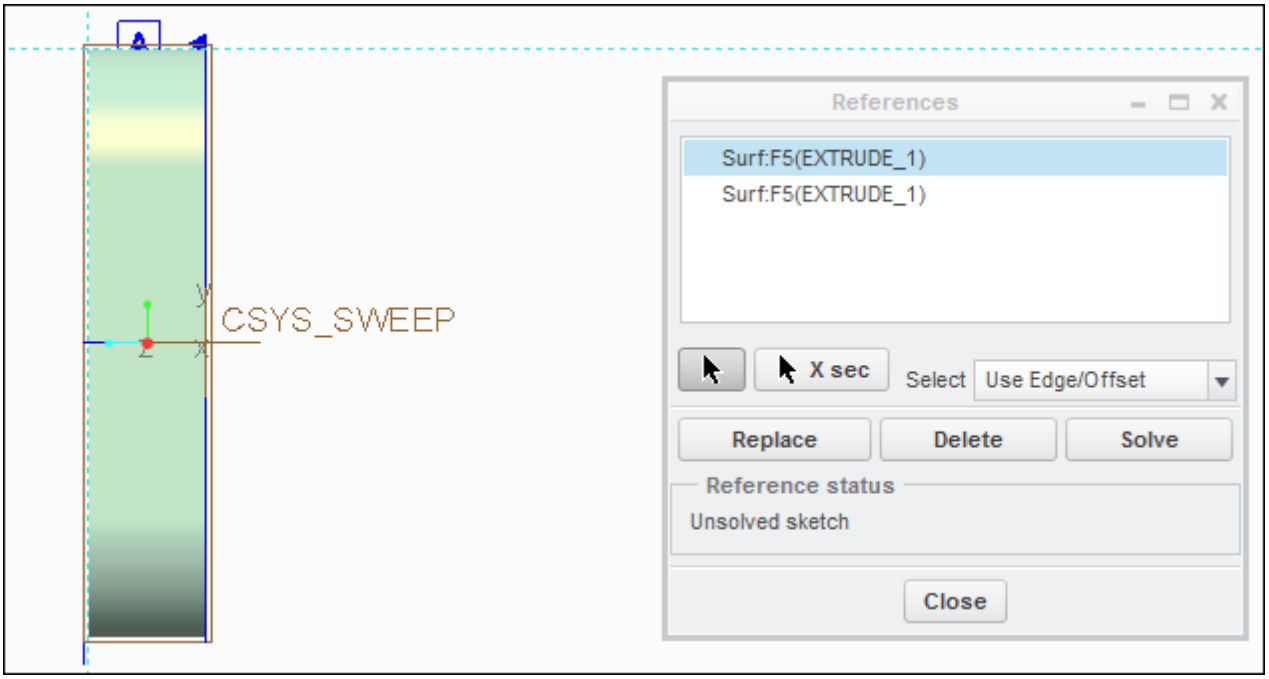


Figure 15.8(b) Delete Datums A and C and add the Front and Top Surfaces as References

Sketch [Fig. 15.8(c)], add fillets, dimension, and modify the trajectory [Fig. 15.8(d)] >

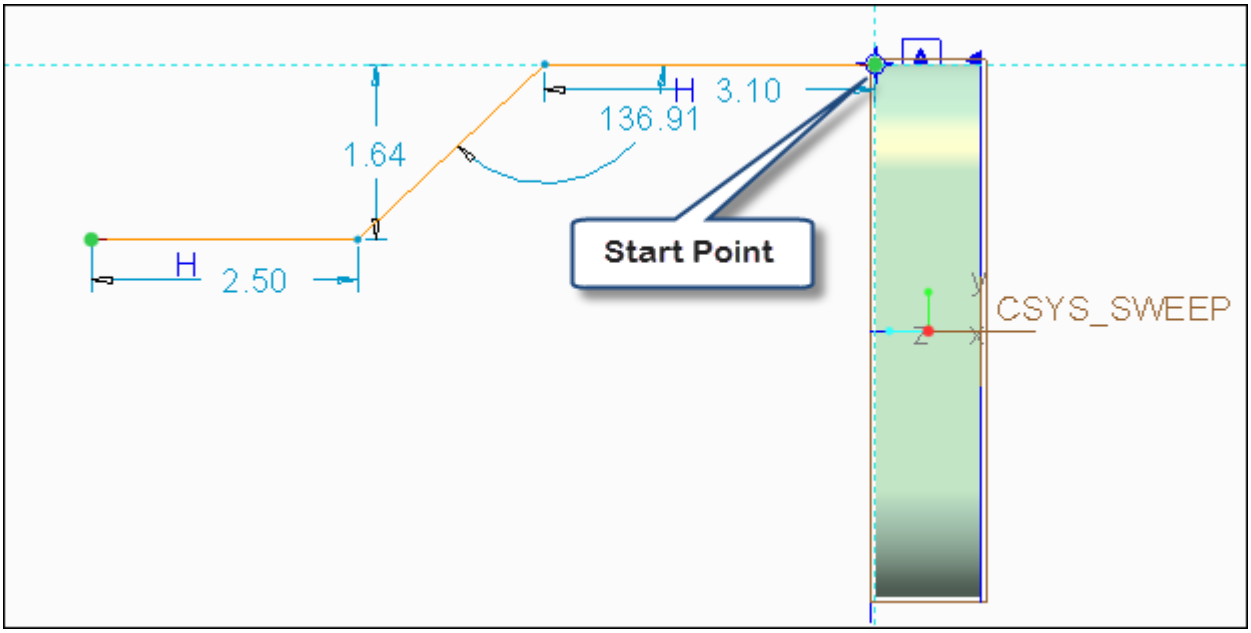


Figure 15.8(c) Sketch the Three Lines. Start the trajectory by sketching a horizontal line from this position.

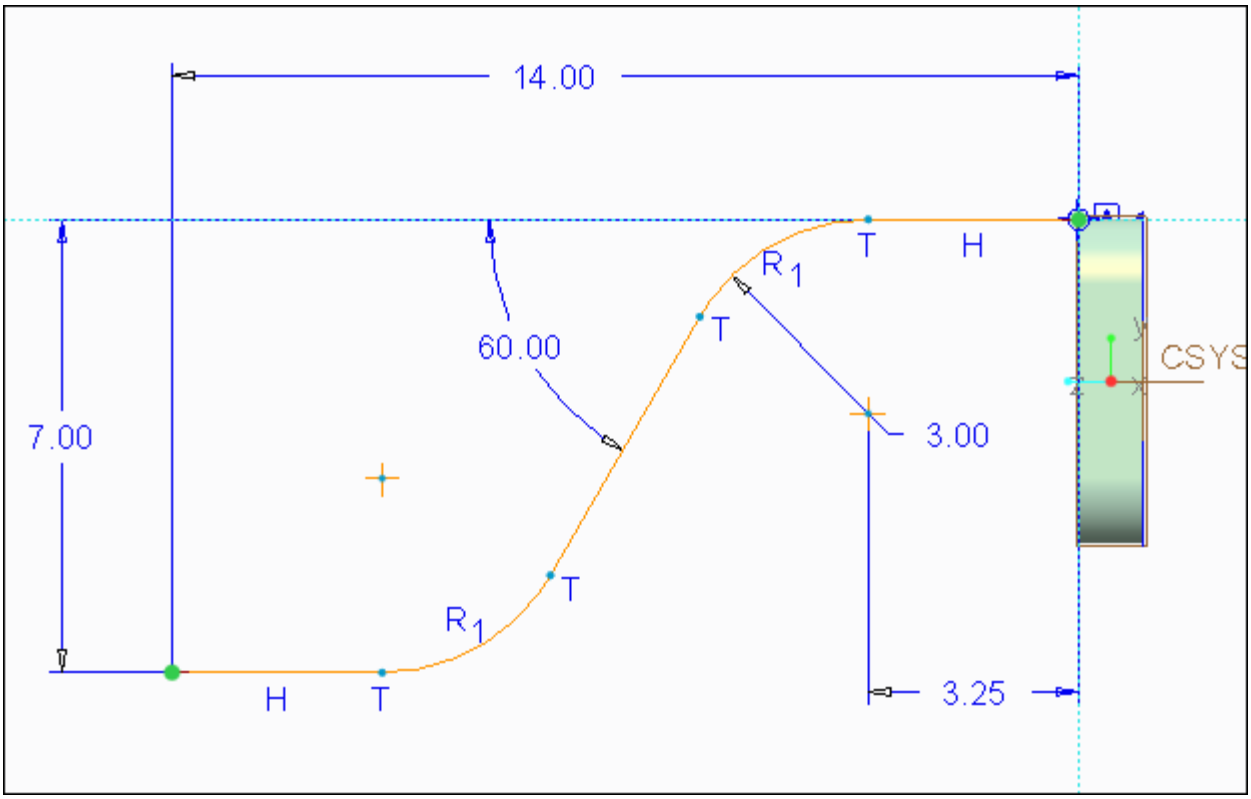


Figure 15.8(d) Completed Sketch

Press: **MMB** to spin the model > **Resumes the previously paused tool** [Figs. 15.8(e-f)]

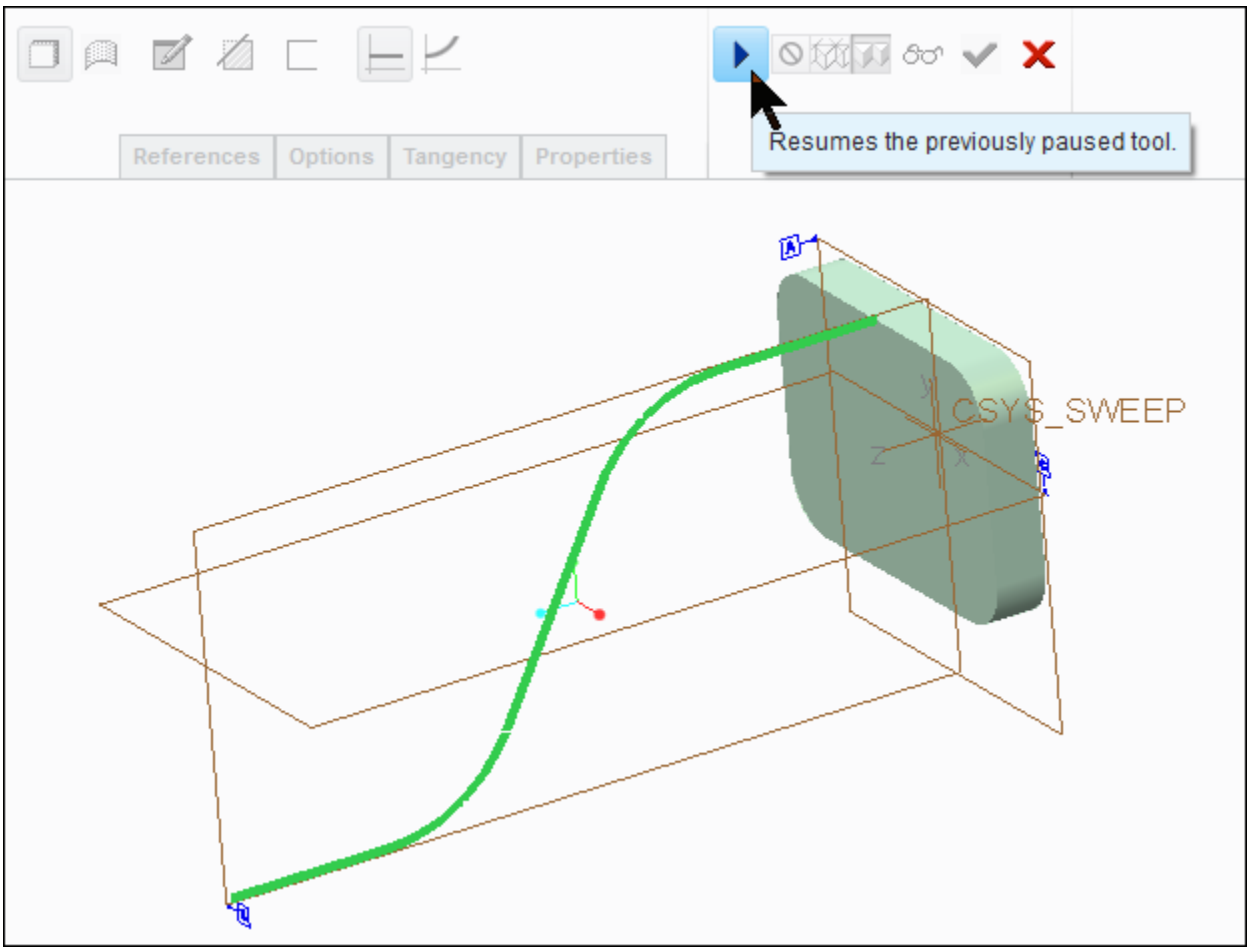


Figure 15.8(e) Resumes the previously paused tool

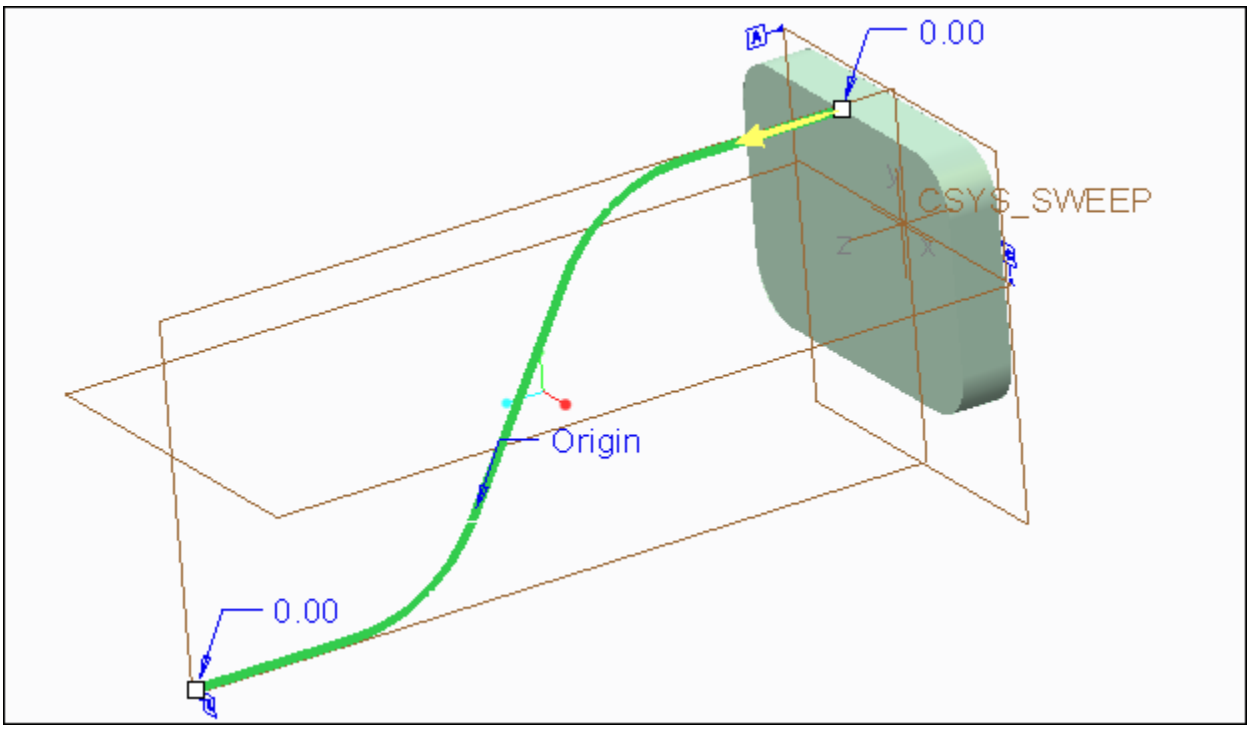


Figure 15.8(f) Trajectory

Click: **Create or edit sweep section** > Sketch View > Palette > **Profiles** tab [Fig. 15.9(a)] > double-click on T-profile > move the pointer away from the model > **LMB** to place the section [Fig. 15.9(b)] > **No Hidden**

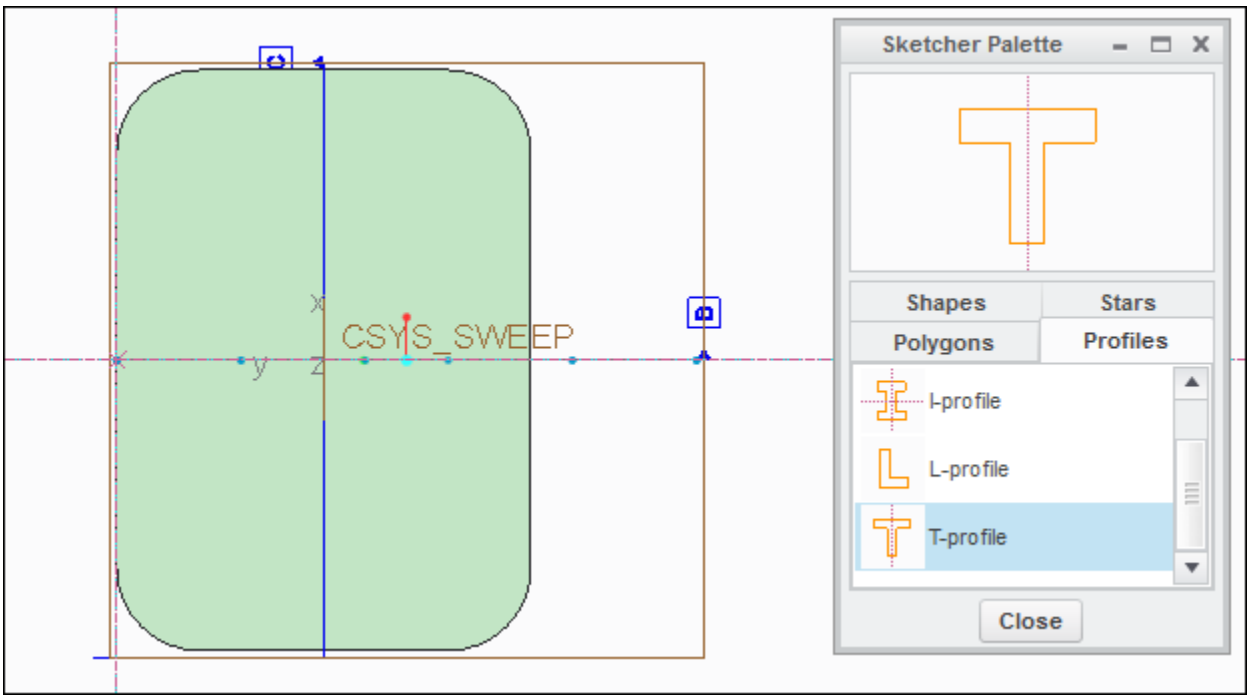


Figure 15.9(a) Sketcher Palette

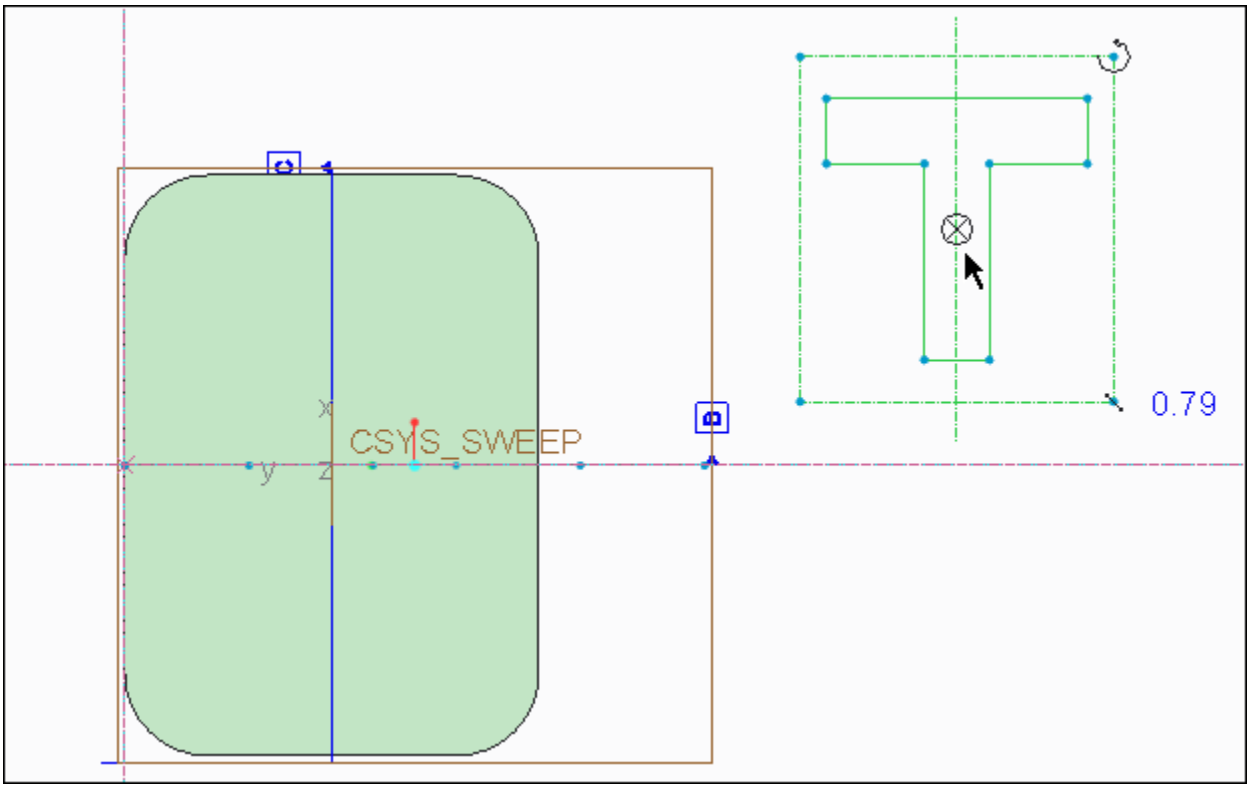


Figure 15.9(b) Place the Section

Place the pointer on the position handle [Fig. 15.9(c)] > press and hold down the **RMB** > move the position handle [Fig. 15.9(d)] (Note the **M**idpoint constraint) > drop the handle (release the **RMB**) in the new position [Fig. 15.9(e)] > place the pointer on the rotate handle [Fig. 15.9(f)] > press and hold down the **LMB** > move the pointer to rotate the section 90 degrees [Fig. 15.9(g)] > drop the handle (release the **LMB**) in the new position [Fig. 15.9(h)] > place the pointer on the position handle [Fig. 15.9(i)] > press and hold down the **LMB** > move the section to the start point of the trajectory [Fig. 15.9(j)] > drop the section in the new position [Fig. 15.9(k)] >  from the **Rotate Resize** ribbon > **Close** the Sketcher Palette dialog box

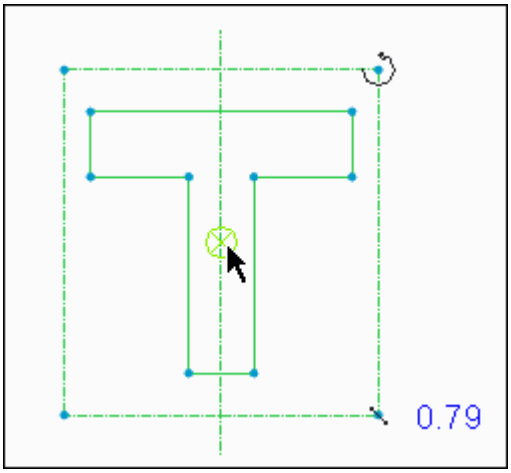


Figure 15.9(c) RMB on Move Handle

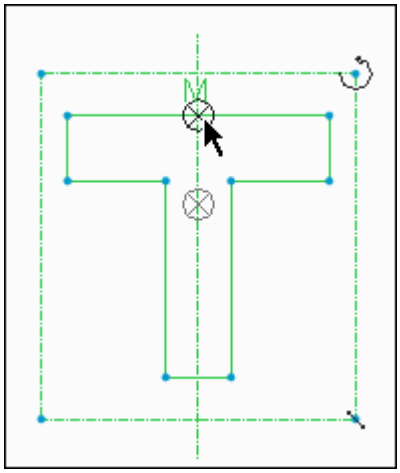


Figure 15.9(d) Move the Handle

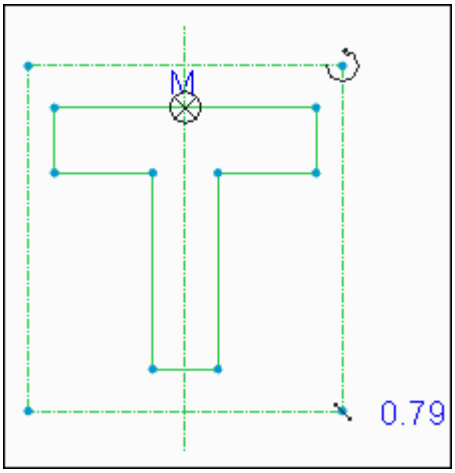


Figure 15.9(e) Drop the Handle

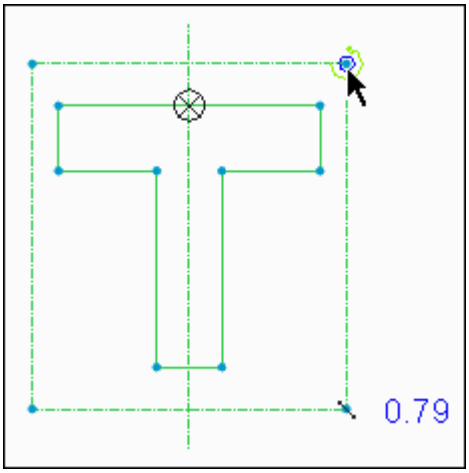


Figure 15.9(f) LMB on Rotate Handle

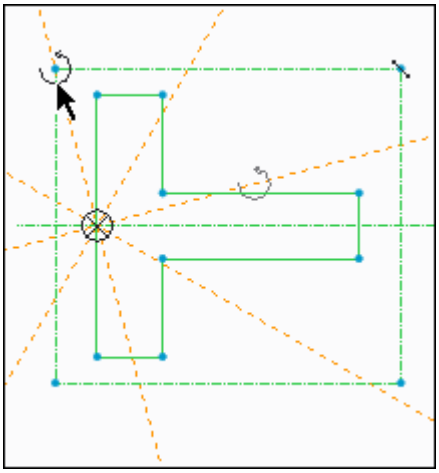


Figure 15.9(g) Rotate **90** Degrees

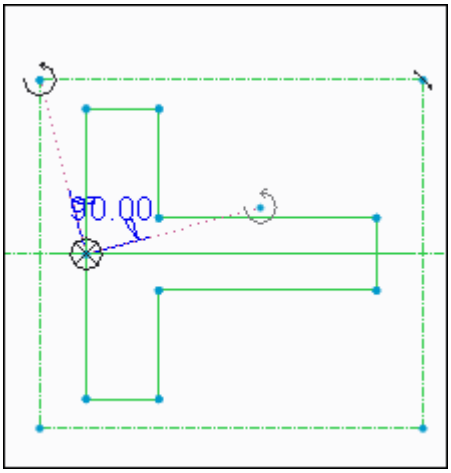


Figure 15.9(h) Rotated Section

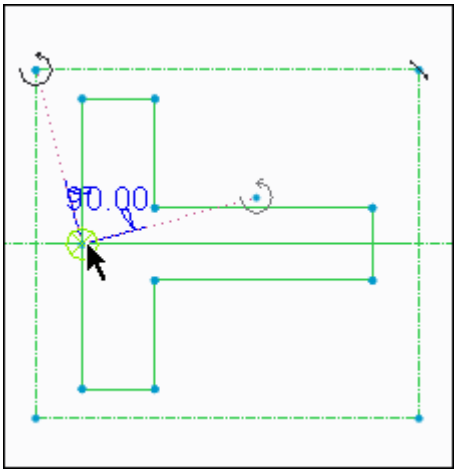


Figure 15.9(i) LMB on Move Handle

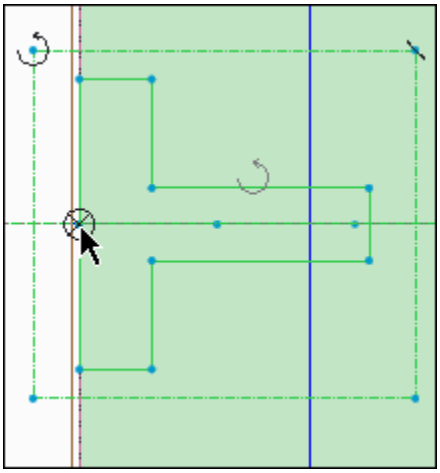


Figure 15.9(j) Place the Section

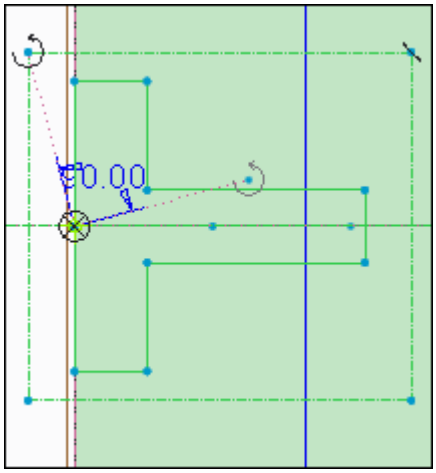


Figure 15.9(k) Drop Section

Add *eight* fillets > add constraints and dimensions [Fig. 15.9(l)] > using the dimensions of the detail drawing [Fig. 15.9(m)], modify the section [Fig. 15.9(n)] >  > press **MMB** to spin the part

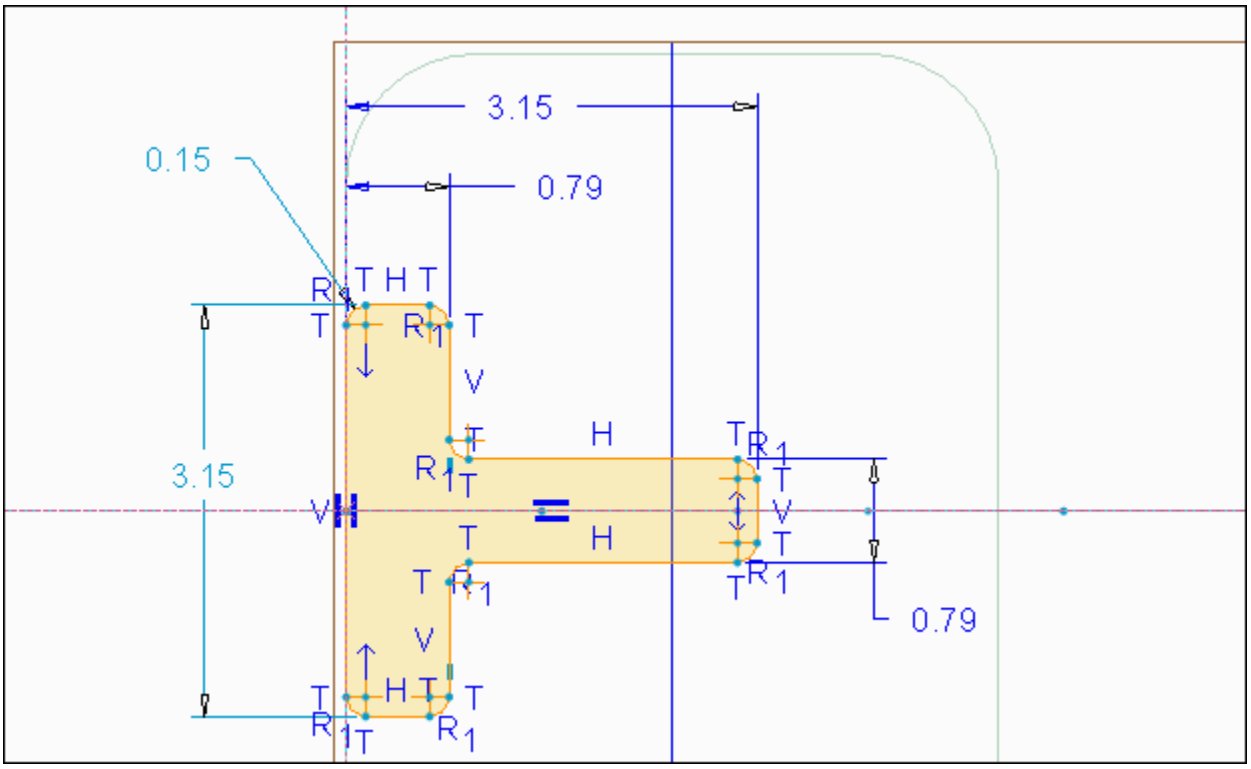


Figure 15.9(l) Add Eight Fillets, Constraints, and the Dimensioning Scheme

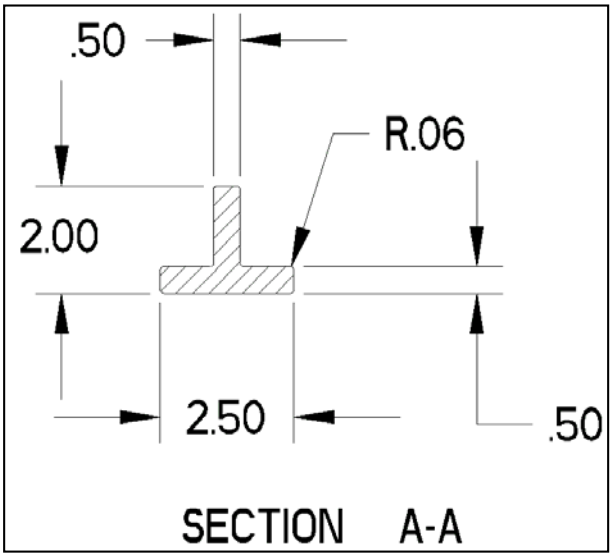


Figure 15.9(m) Section AA from Detail Drawing

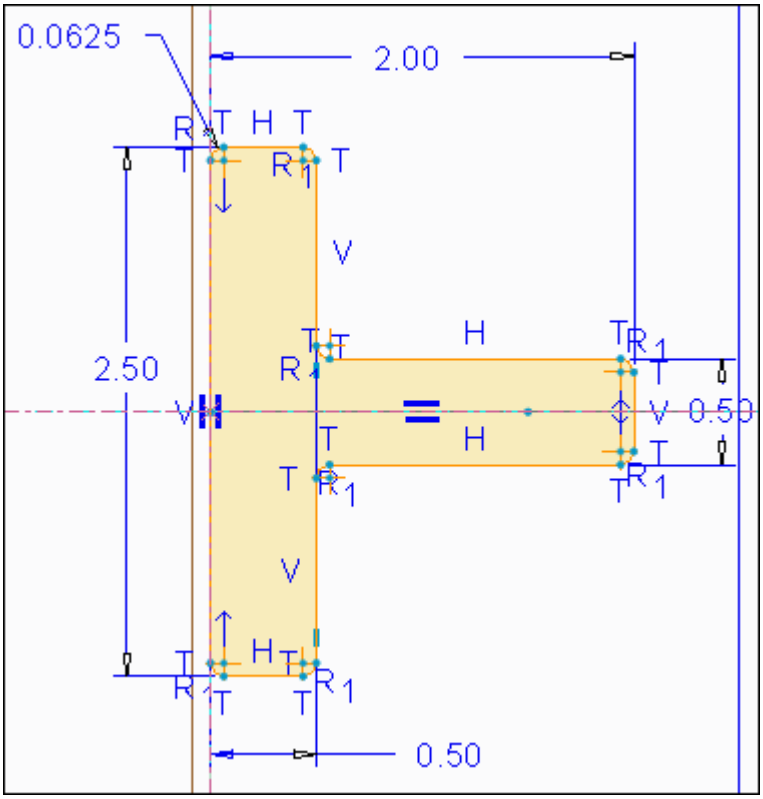


Figure 15.9(n) Modified Sketch

Click: **Shading with Edges** > **Ctrl+D** [Fig. 15.9(o)] > [Fig. 15.9(p)] > **Save**

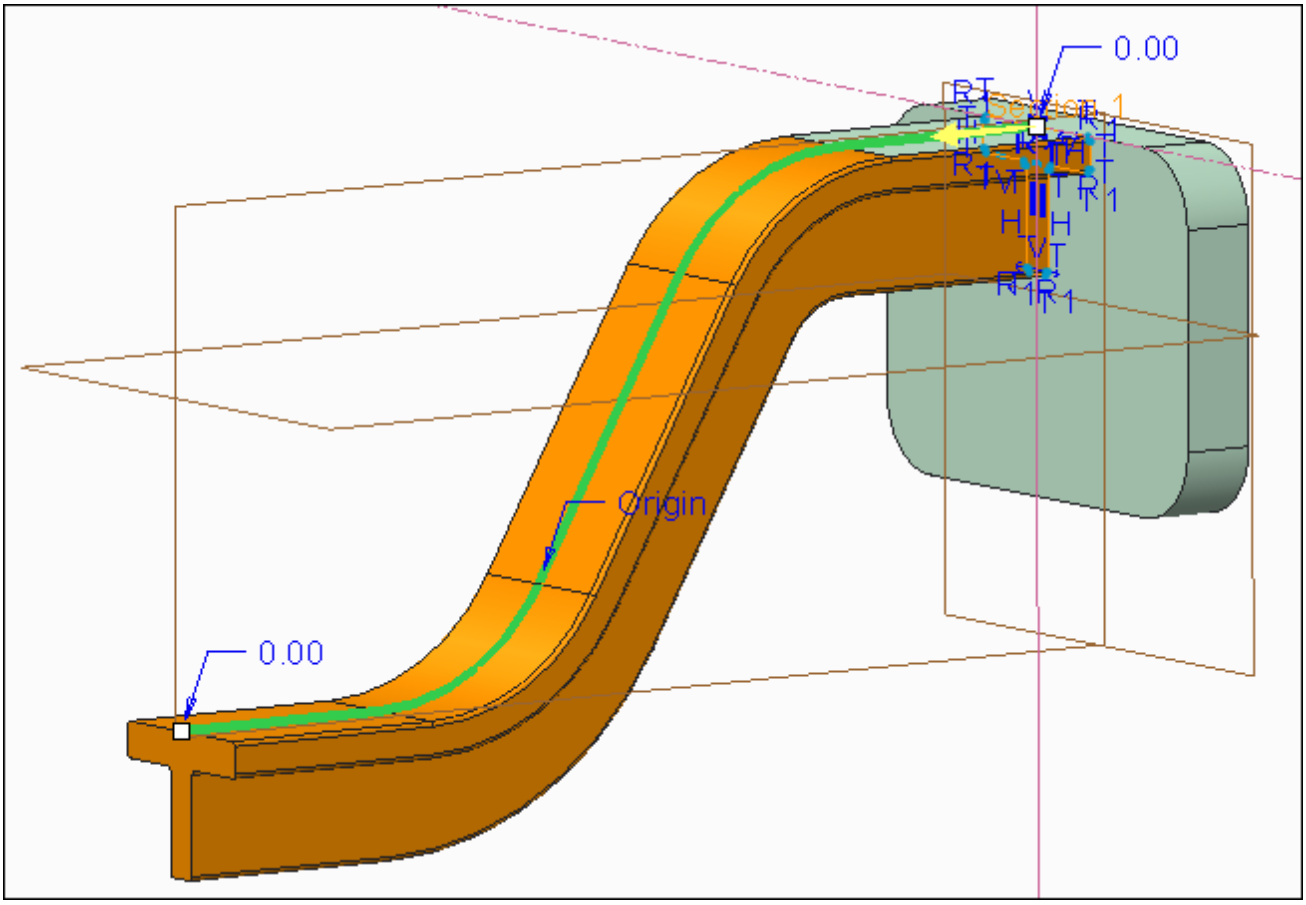


Figure 15.9(o) Shaded Sweep Preview

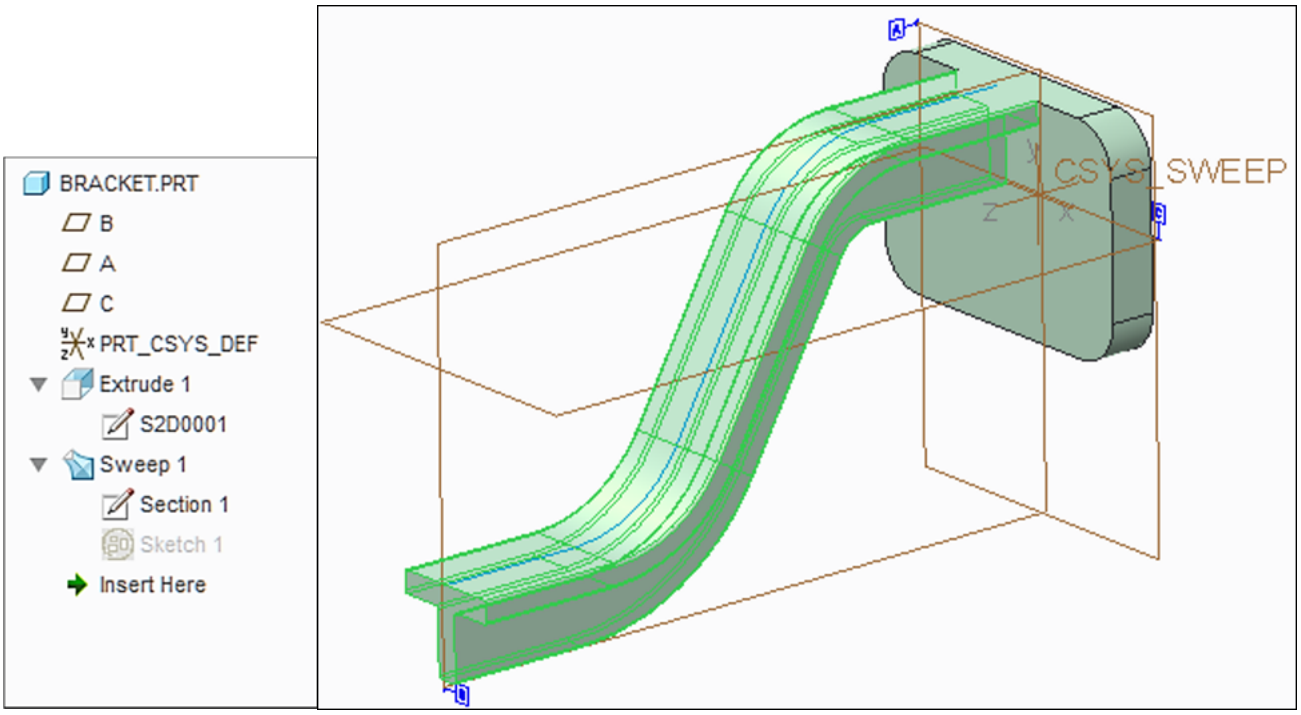


Figure 15.9(p) Completed Sweep

Add the next extrusion (∅**8.00** by **.875**) [Figs. 15.10(a-b)] > model the cut feature (∅**6.76** by **.250** deep) [Figs. 15.10(c-d)]

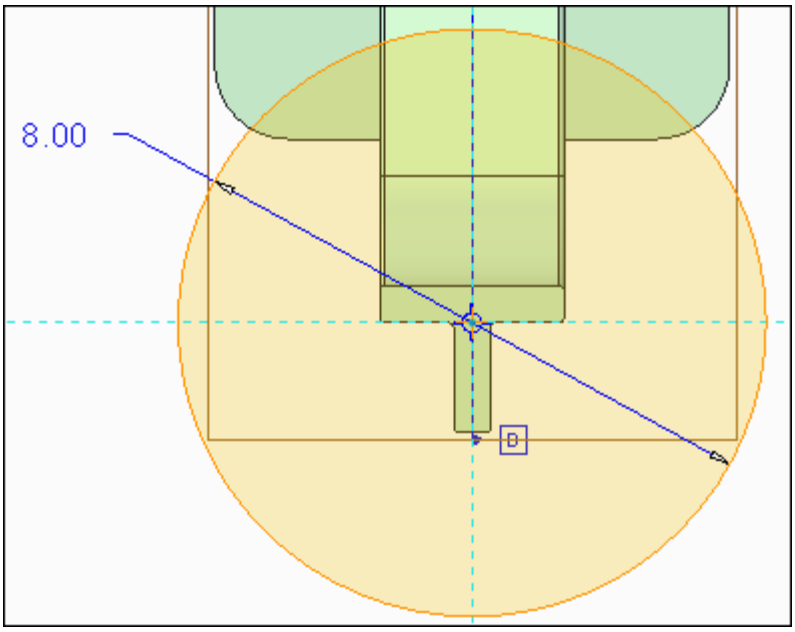


Figure 15.10(a) 8.00 Diameter

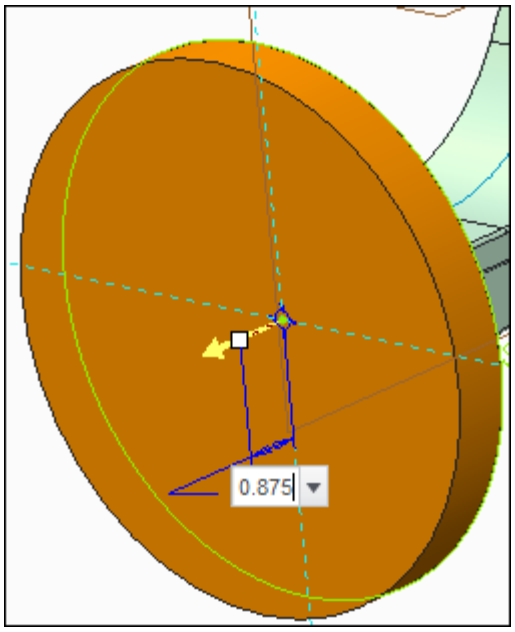


Figure 15.10(b) .875 Thickness

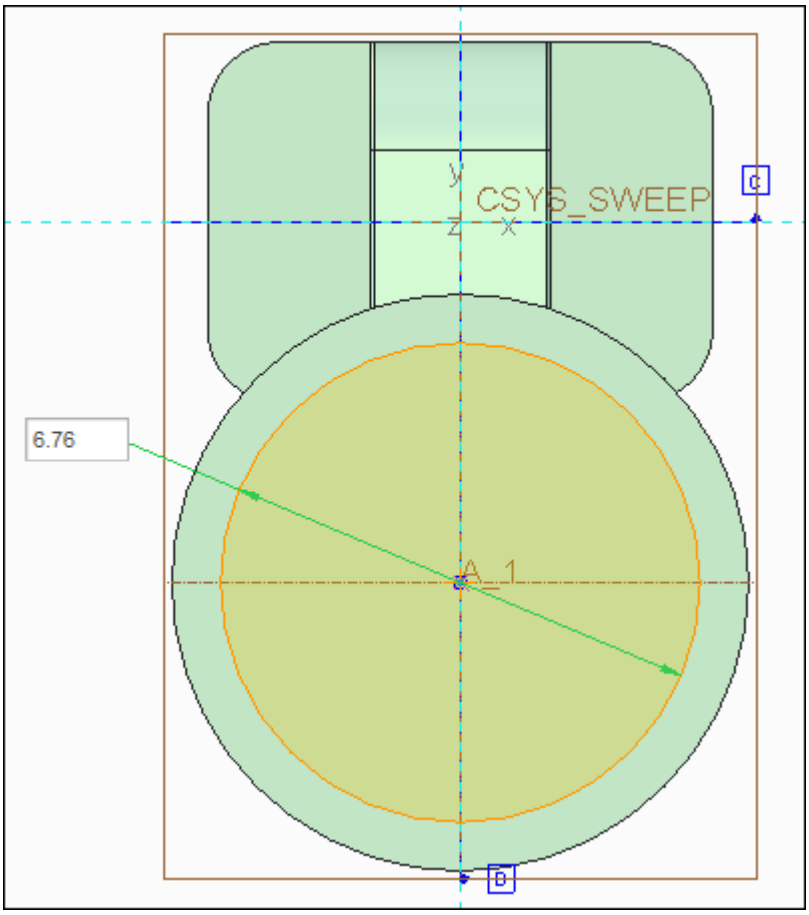


Figure 15.10(c) 6.76 Diameter

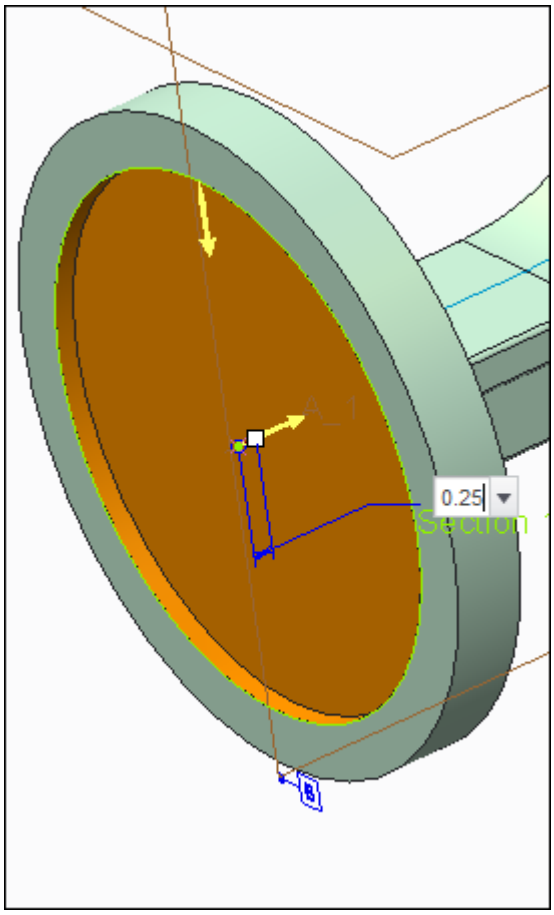


Figure 15.10(d) .250 Cut

Add chamfers (**45° X .125**) [Fig. 15.10(e)] > **Ctrl+D** > **Ctrl+S** > the next feature will be the slot [Fig. 15.11(a)]

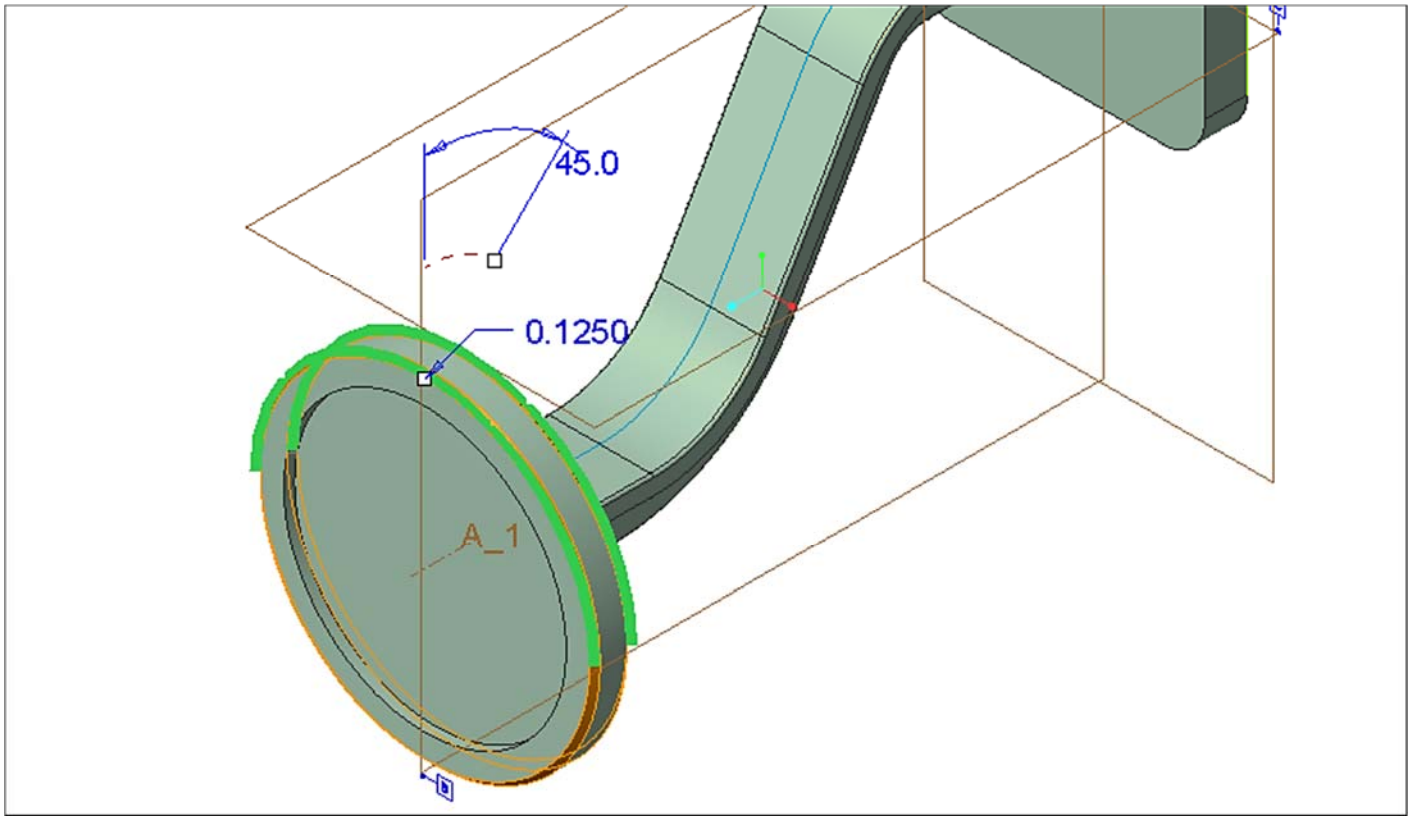


Figure 15.10(e) Chamfer

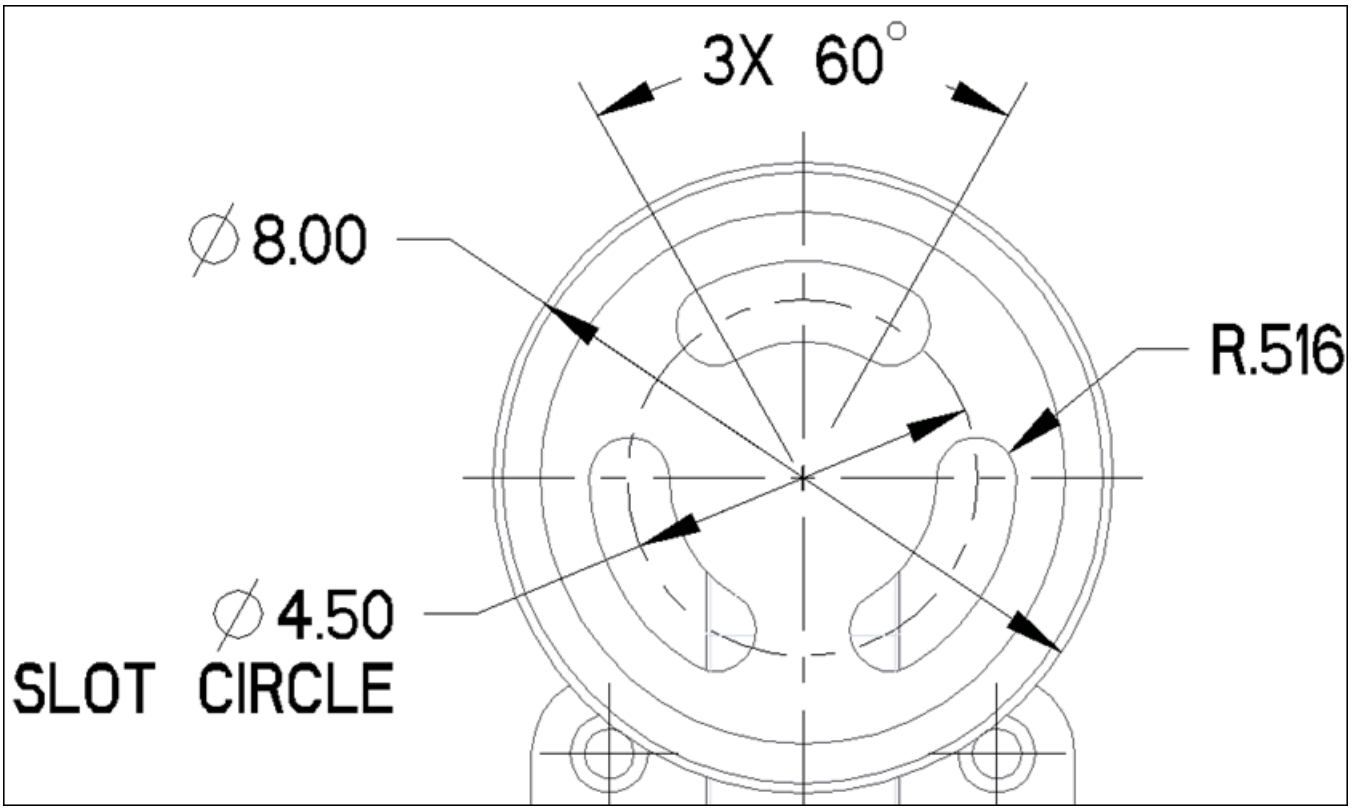


Figure 15.11(a) Patterned Slot

Click: Extrude **Extrude** > **Remove Material** > select the cut face as the Sketch Plane [Fig. 15.11(b)] > Sketch View > References > delete **F2(C)** > (in the References dialog box) > add axis **A_1** [Fig. 15.11(c)] > **Solve** > **Close**

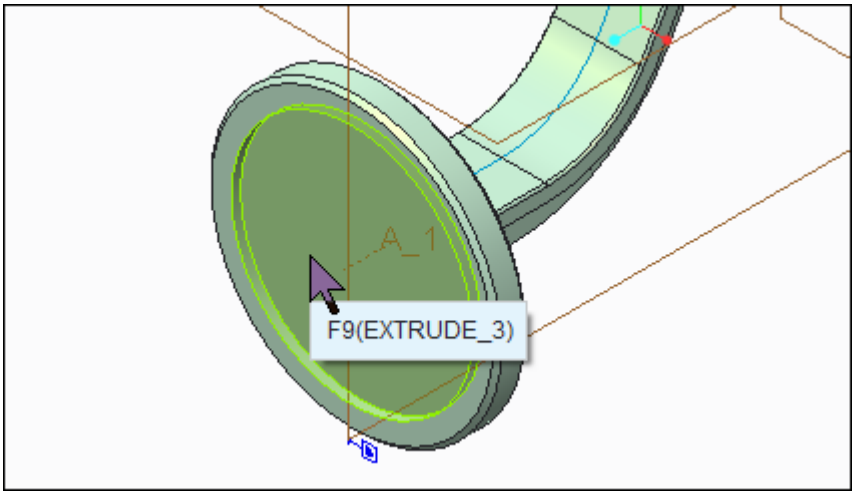


Figure 15.11(b) Sketch Plane

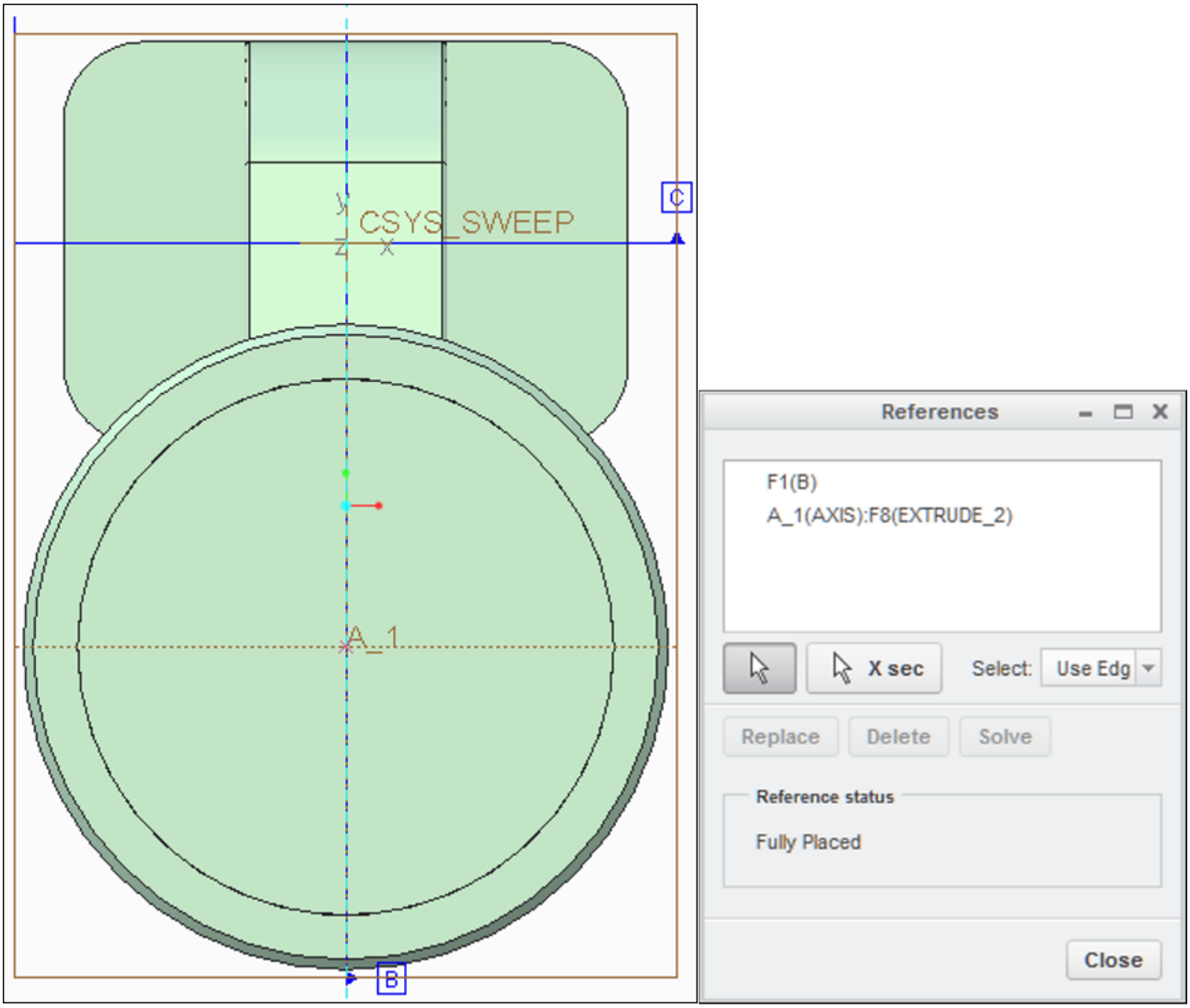


Figure 15.11(c) Sketch References

Add a sketcher point at the center of the round extrusion, click: Point [Fig. 15.11(d)] > **MMB** > **File** > **Options** > **Sketcher** > Show the grid, Snap to grid > **OK** > **No** > **Setup** Group > Grid > Polar > Static > Radial Spacing **.50** > **Enter** > Origin [Fig. 15.11(e)] > select the construction point > **OK** > Hidden Line [Fig. 15.11(f)]

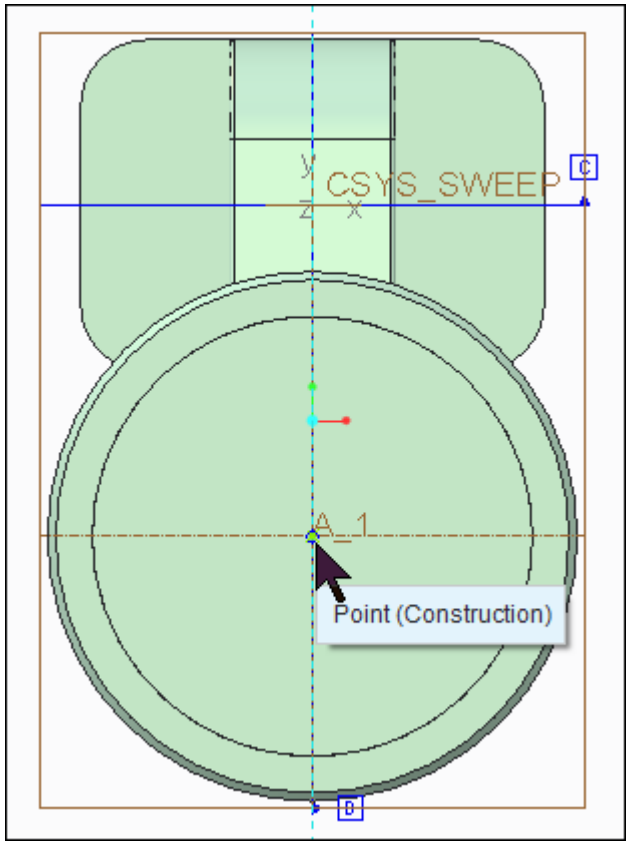


Figure 15.11(d) Add a Construction Point

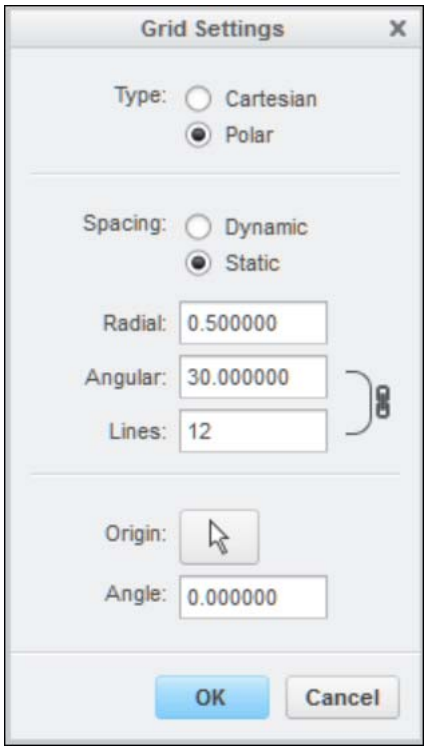


Figure 15.11(e) Grid Settings Dialog Box

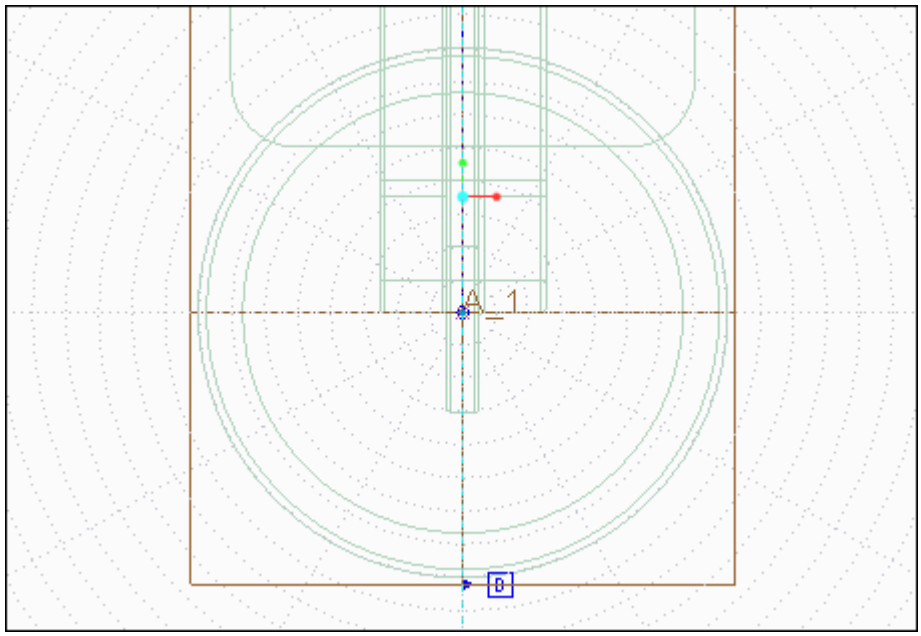
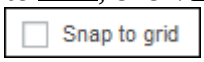


Figure 15.11(f) Polar Grid

In the Graphics Window, press: **RMB > Construction Centerline** > add a vertical and two angled centerlines > in the Graphics Window, **MMB > LMB** to deselect > press **RMB > Circle** > sketch a circle > in the Graphics Window, **MMB** to end the current tool > press **RMB > Construction** [Fig. 15.11(g)] > next to  , click:  *flyout* >  **Center and Ends** > sketch four arcs > **MMB > File > Options > Sketcher** > 

> **OK > No** > add dimensions, constraints, and modify dimension values [Fig. 15.11(h)]

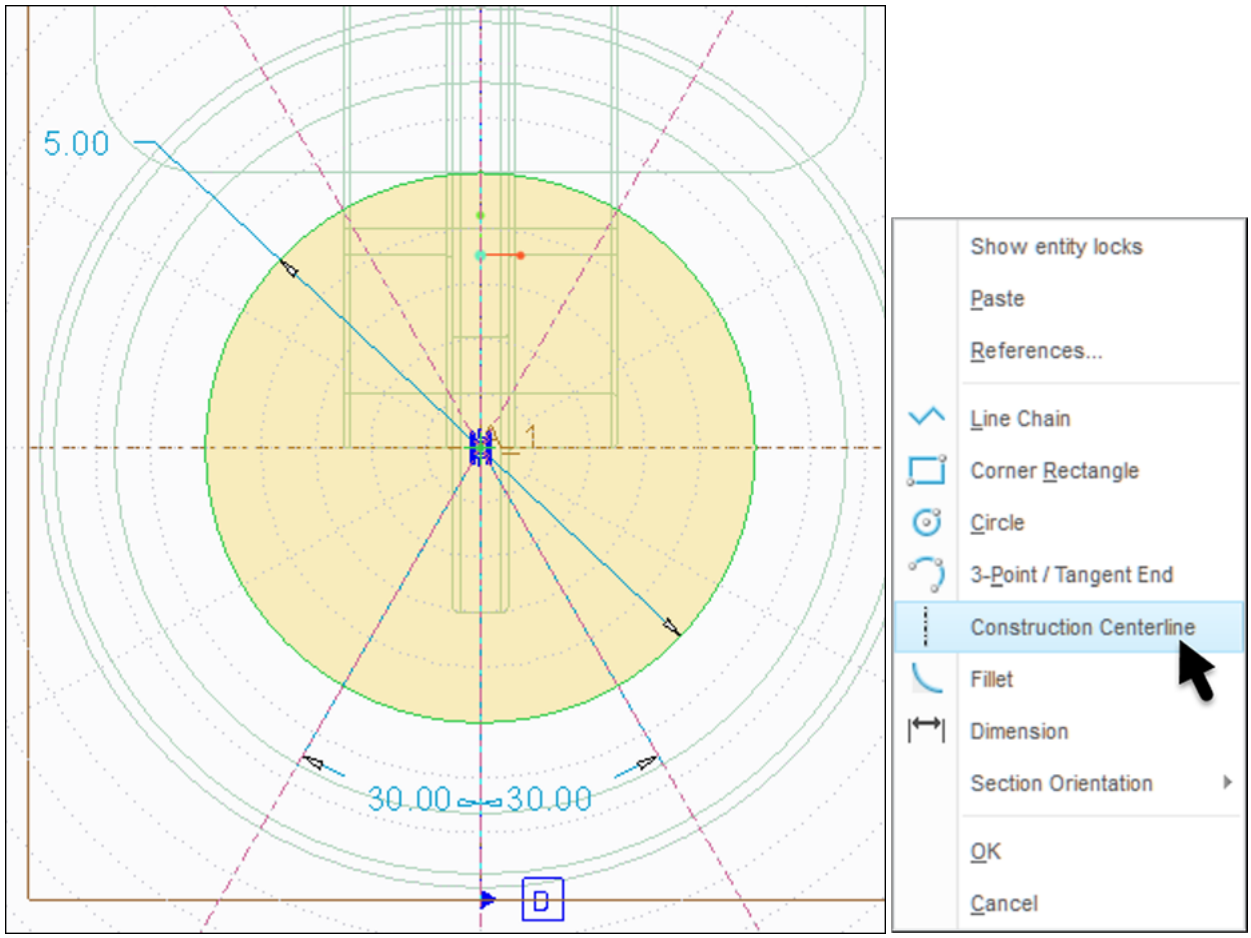


Figure 15.11(g) Change the Circle into a Construction Circle

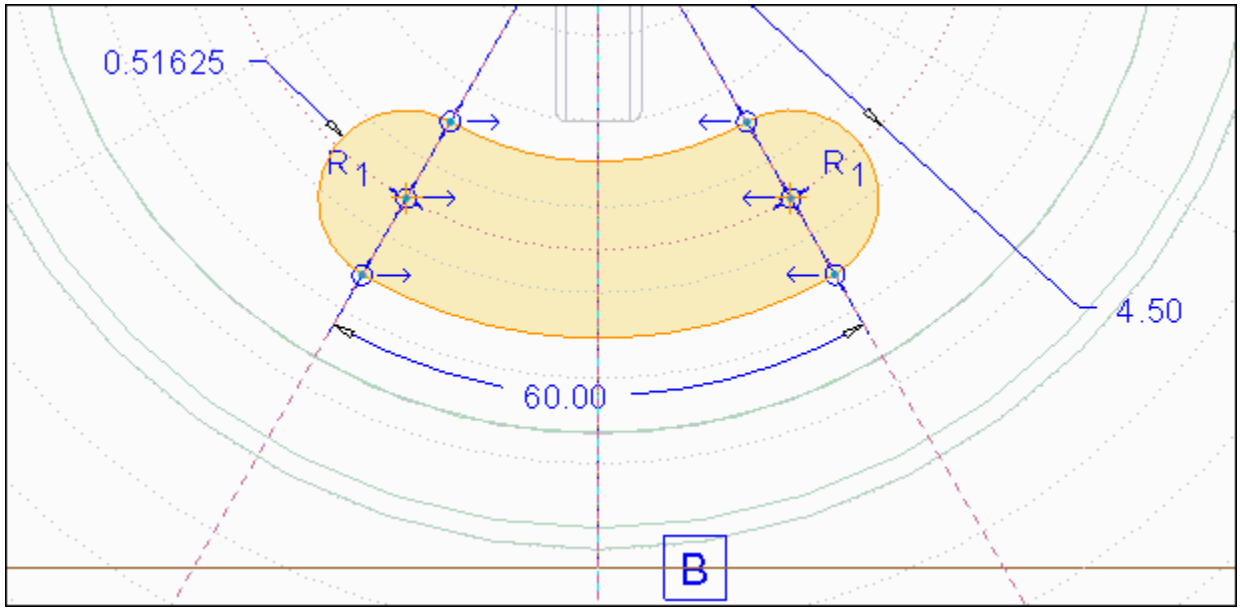


Figure 15.11(h) 0.51625 X 60-Degree Slot on a **4.50** Diameter Bolt Circle

Click: **Ctrl+D** > **Shading with Edges** > > in the Graphics Window, place the pointer on > press **RMB** [Fig. 15.11(i)] > **To Selected** > select the (back) surface of the circular extrusion [Fig. 15.11(j)] > [Fig. 15.11(k)] >

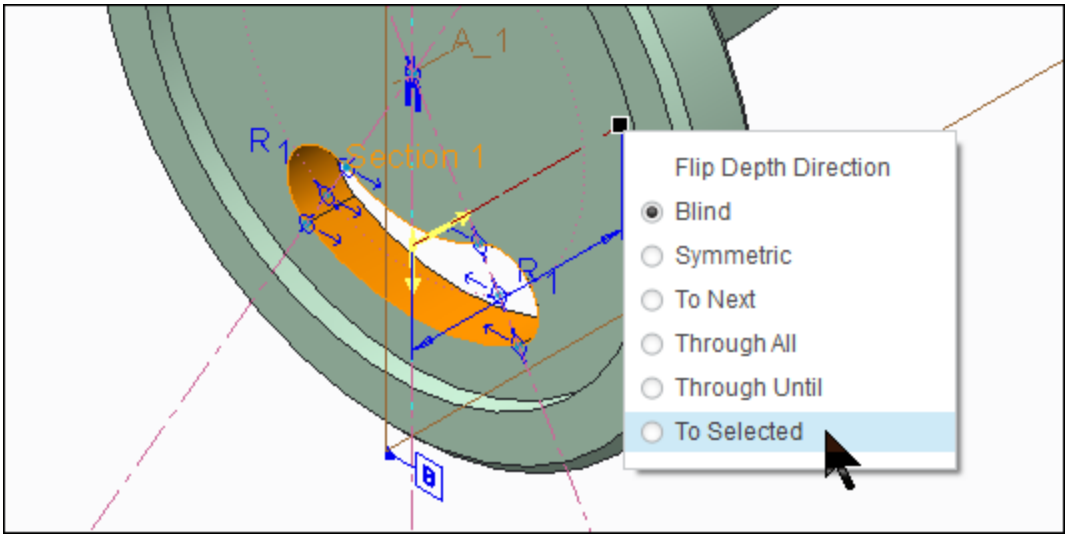


Figure 15.11(i) To Selected

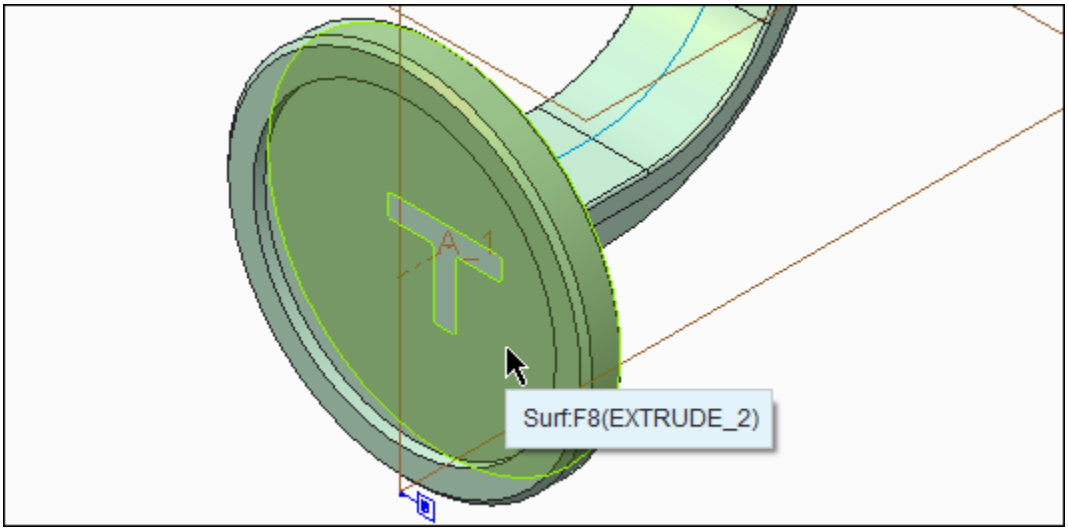


Figure 15.11(j) Select Back Surface of the Circular Extrusion

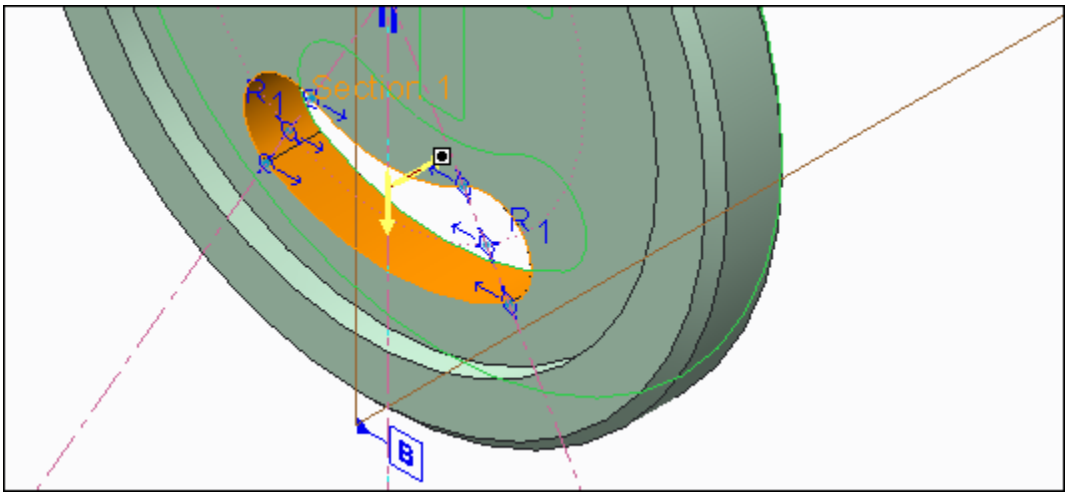


Figure 15.11(k) Slot

With the slot still selected, press: **RMB > Pattern** [Fig. 15.12(a)] >  > Axis > select **A_1** > 3 > **Enter**> 120.00 > **Enter** [Fig. 15.12(b)] >  [Fig. 15.12(c)] >  > **LMB** to deselect

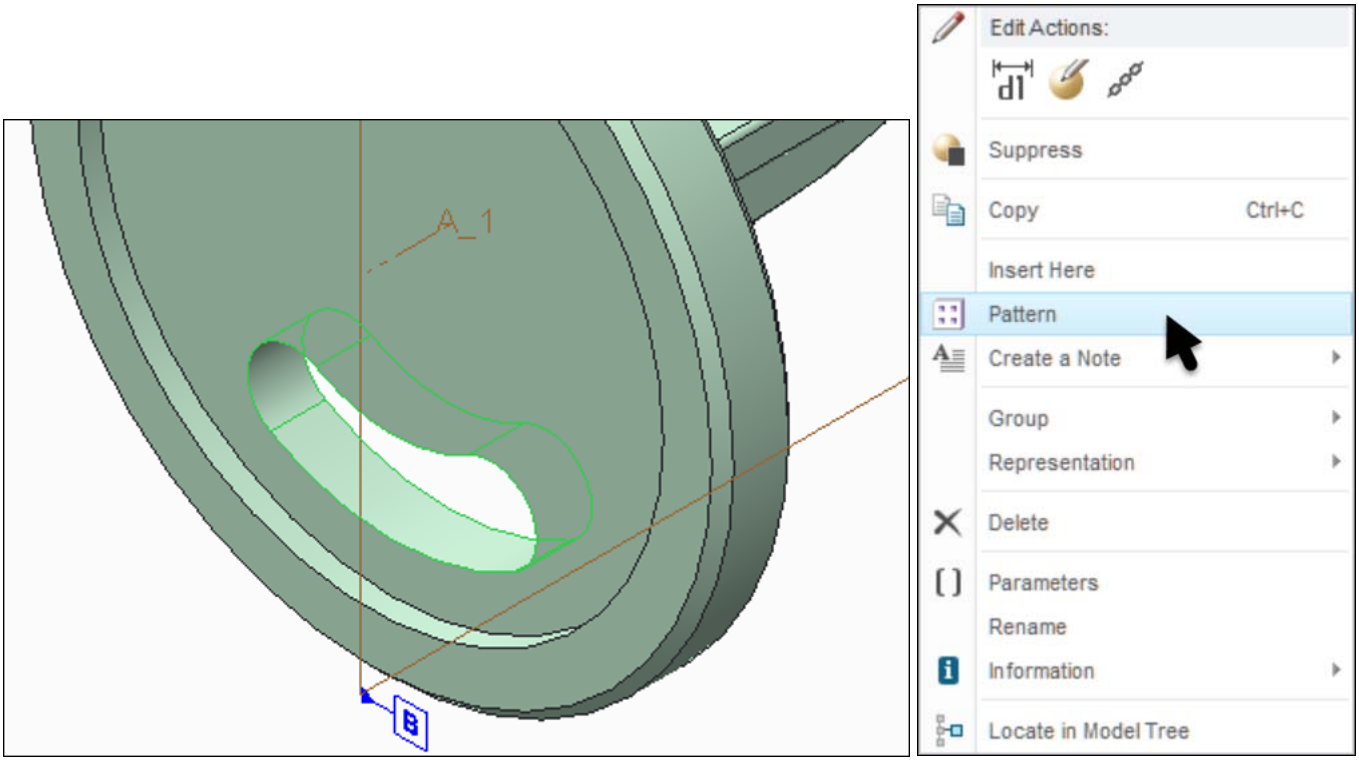


Figure 15.12(a) Press RMB > Pattern

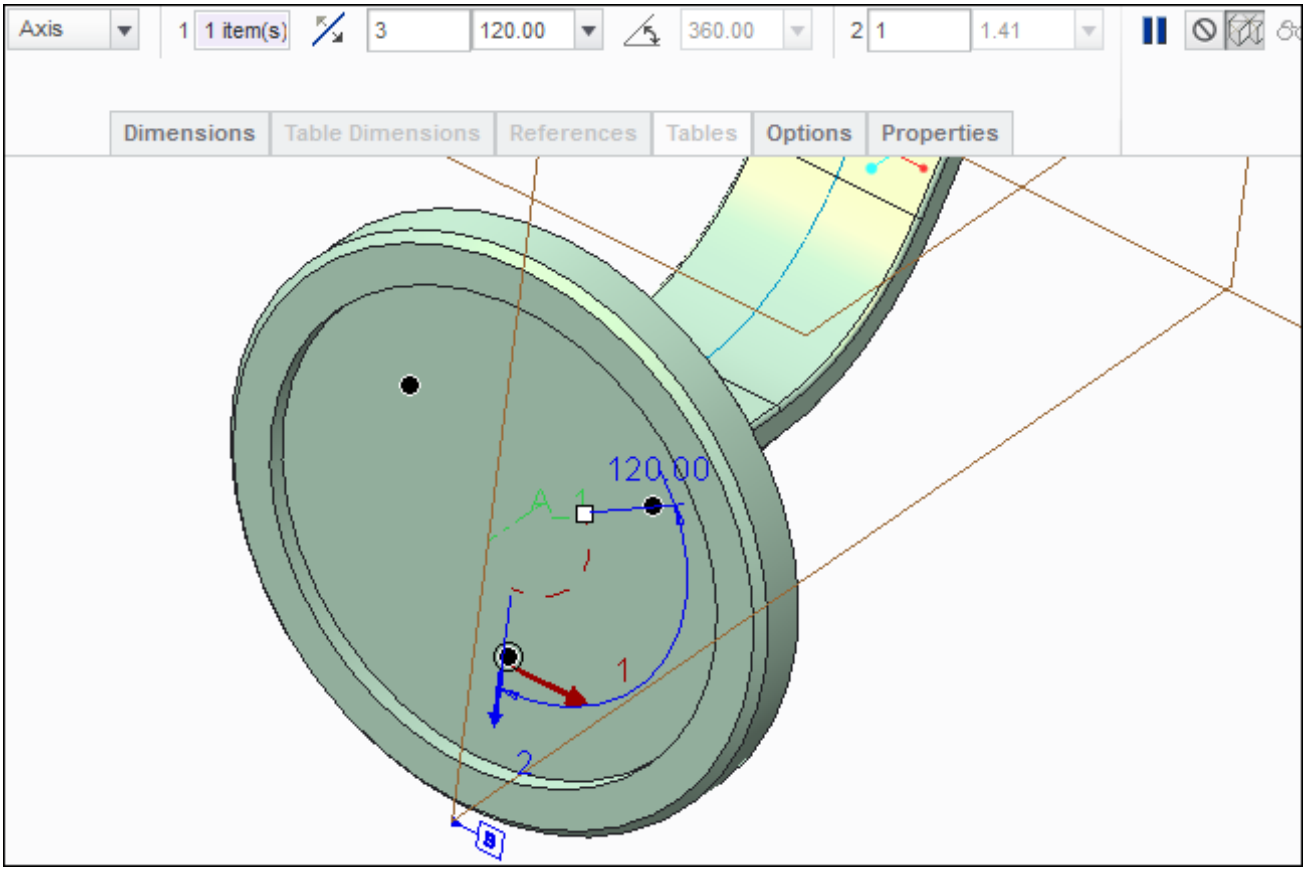


Figure 15.12(b) Pattern the Slot Using the Axis

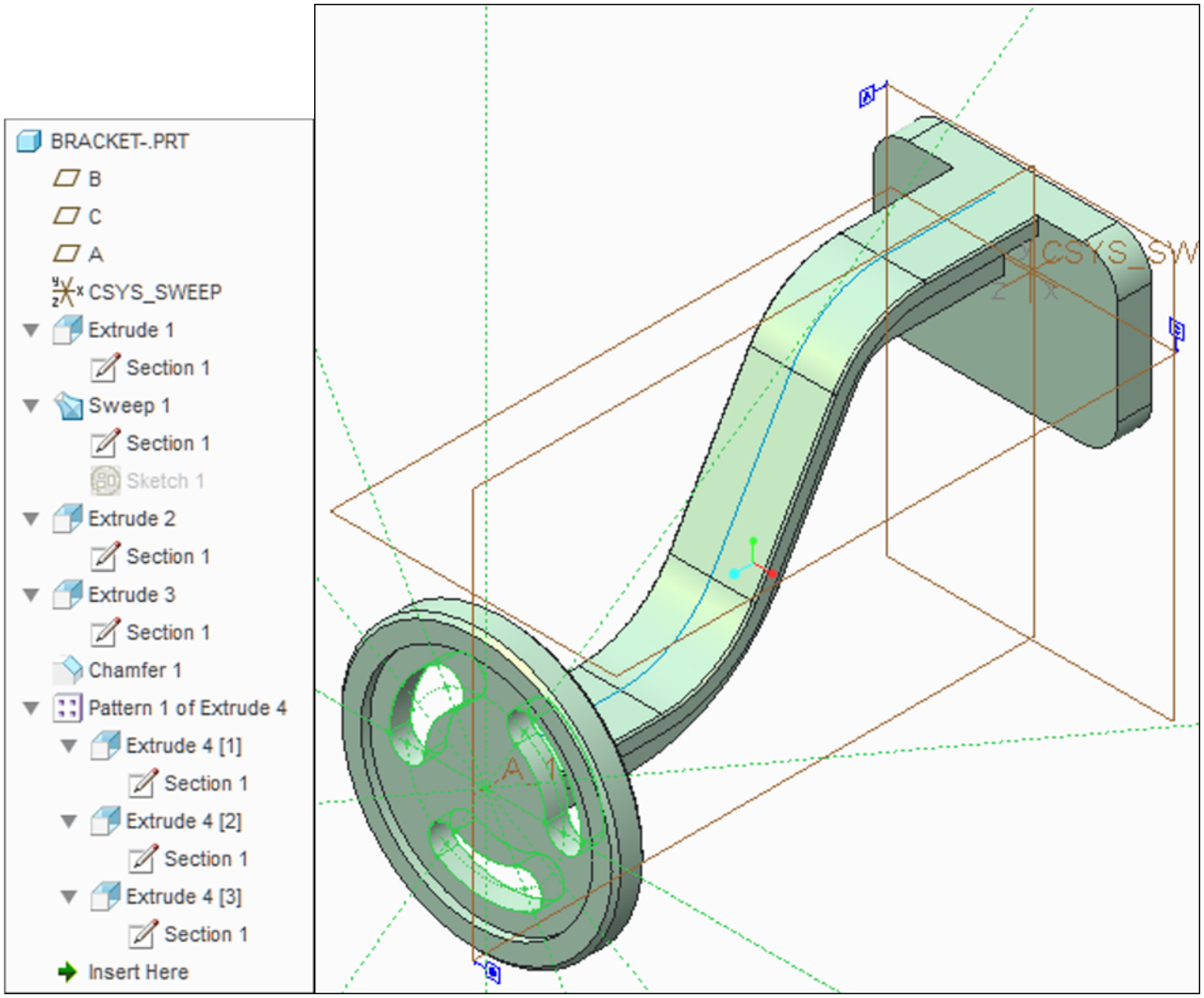
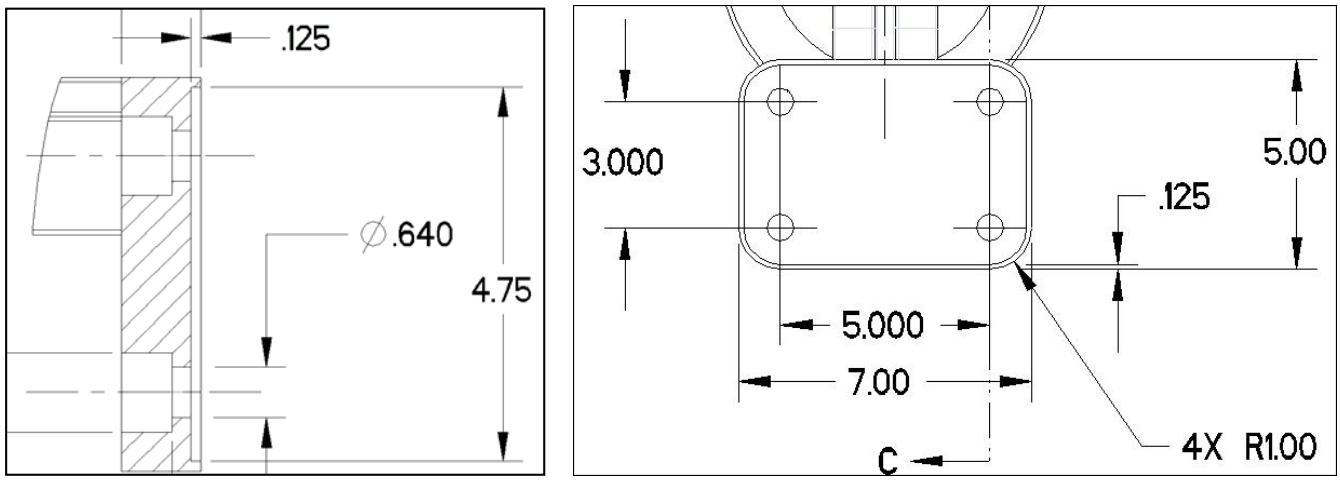


Figure 15.12(c) Completed Pattern

Model the face cut and then create and pattern the counterbore holes [Figs. 15.13(a-b)]



Figures 15.13(a-b) Create the Face Cut and Pattern Counterbore Holes

Click: Extrude **Extrude** > **Remove Material** > select the surface > **Setup** Group > **Display** > Disp Grid *off* > Offset **Offset** > **Loop** > select the surface > with the arrow pointing outward, *type:* **-.125** [Fig. 15.13(c)] > **Enter** > **Close** > if your value is rounded: select the **.13** dimension > press **RMB** > Round Display Value *(uncheck)* [Fig. 15.13(d)] > **LMB** to deselect

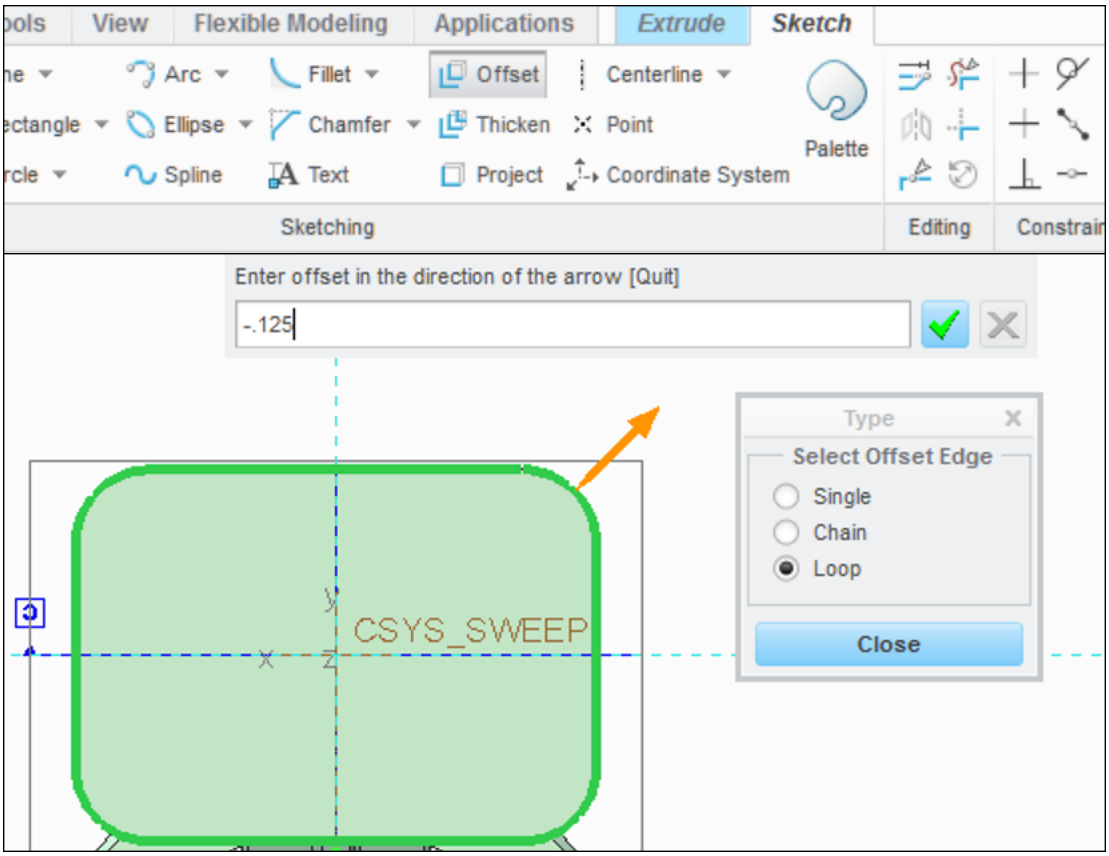


Figure 15.13(c) Use Offset Loop **-.125** (if the arrow points inward, enter .125)

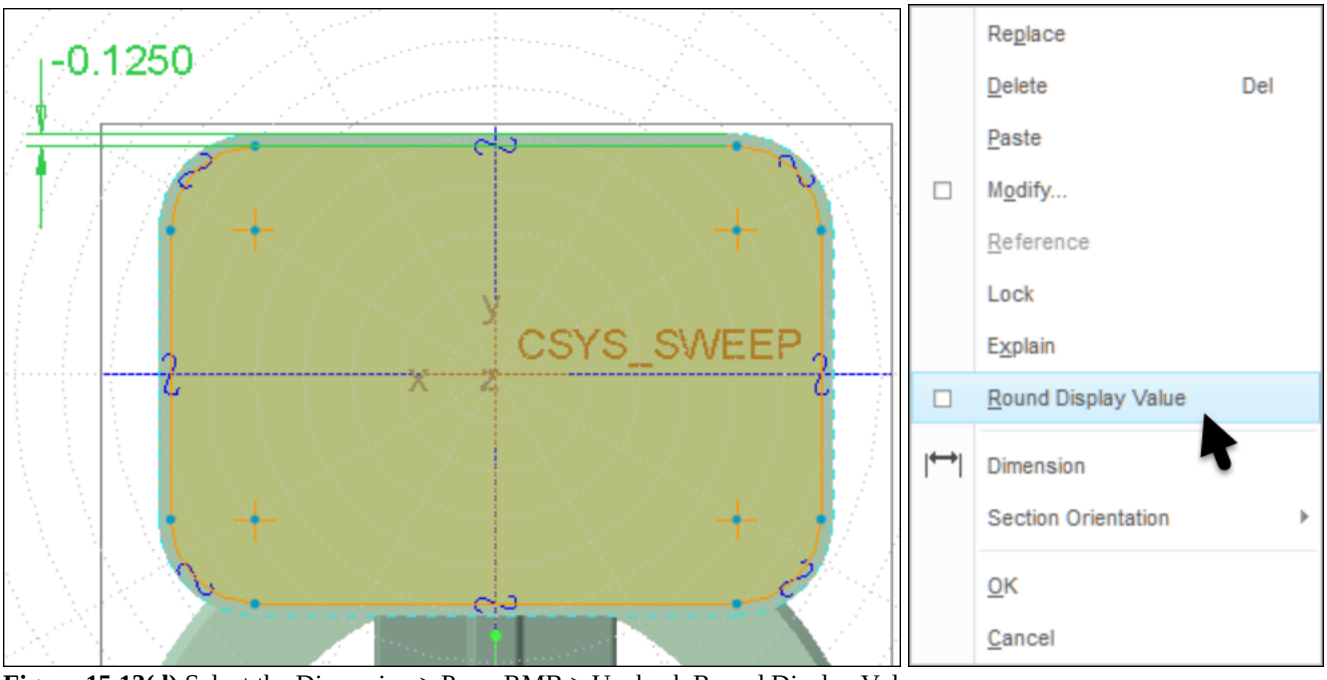


Figure 15.13(d) Select the Dimension > Press RMB > Uncheck Round Display Value

Click:  > for the depth, *type:* **.125** > **Enter** [Fig. 15.13(e)] >  > in the Graphics Window, **LMB** to deselect [Fig. 15.13(f)] > **Ctrl+S** > **OK**

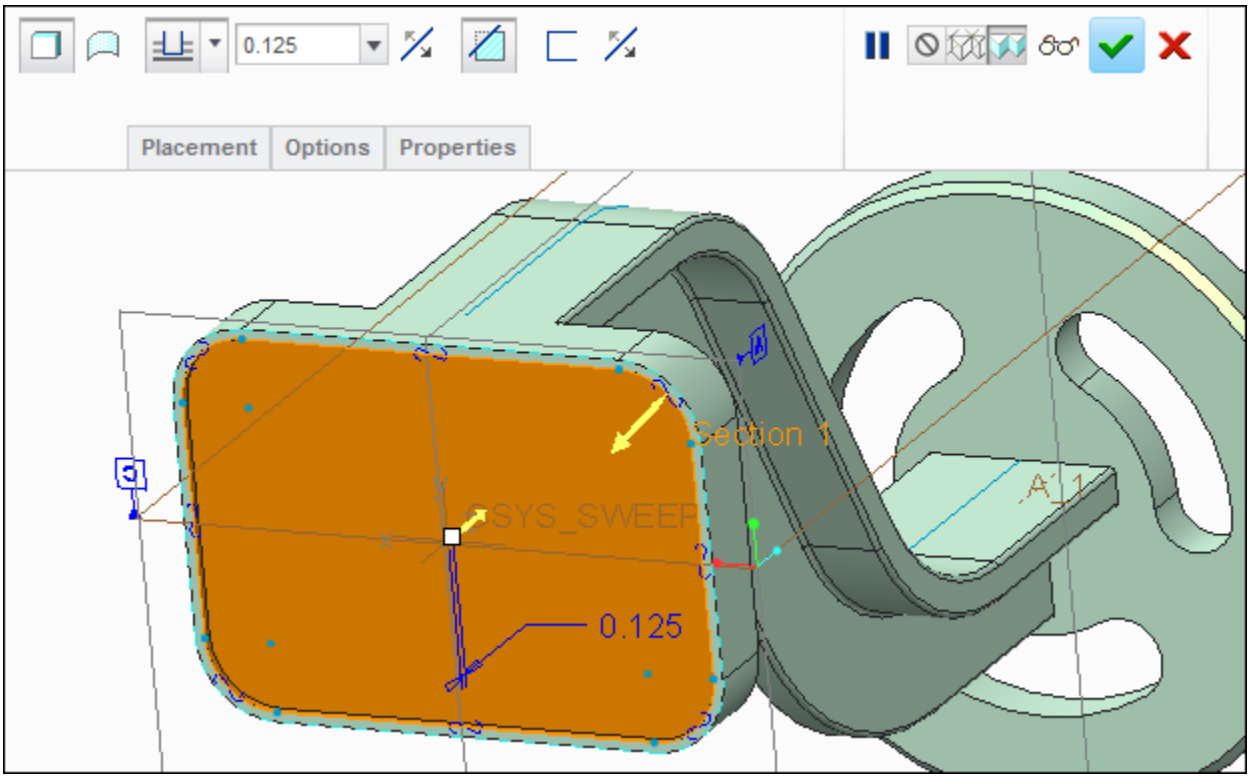


Figure 15.13(e) Cut Preview

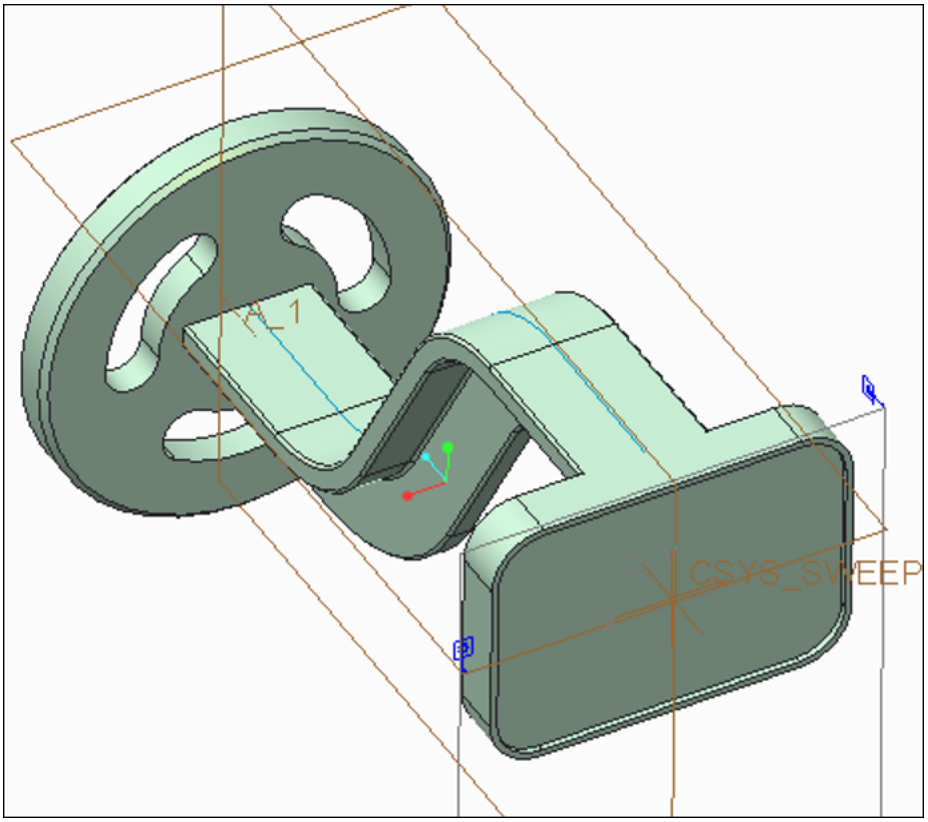


Figure 15.13(f) Completed Cut

Click: **Ctrl+D** > model the hole using the detail dimensions [Fig. 15.14(a)] > Hole **Hole** > **Placement** tab > place the hole per Placement requirements [Fig. 15.14(b)]

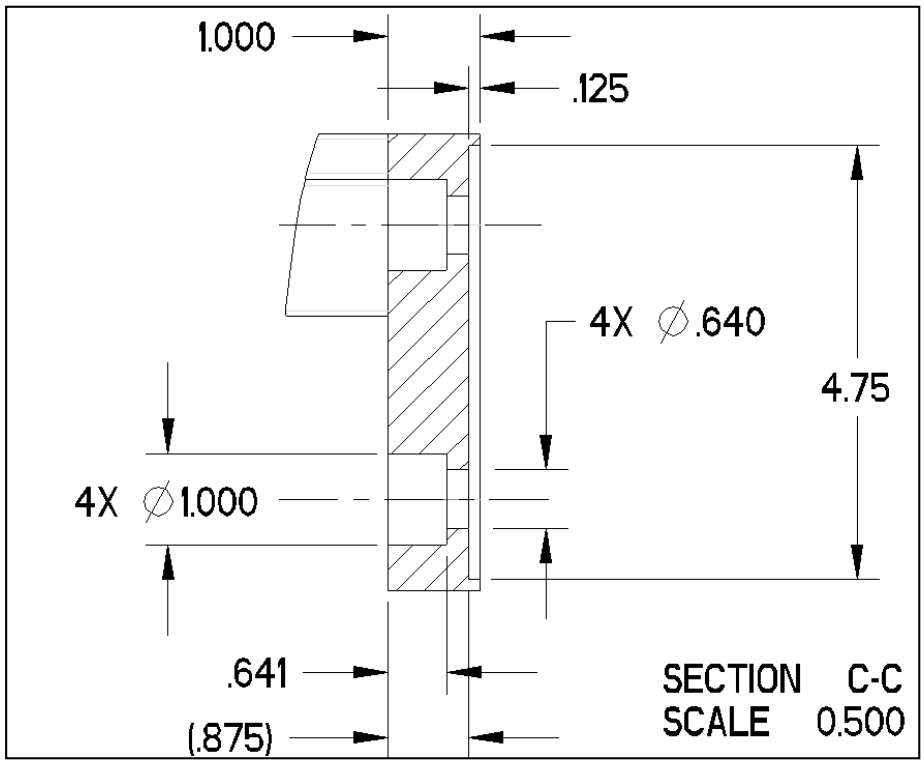


Figure 15.14(a) Counterbore Hole Detail

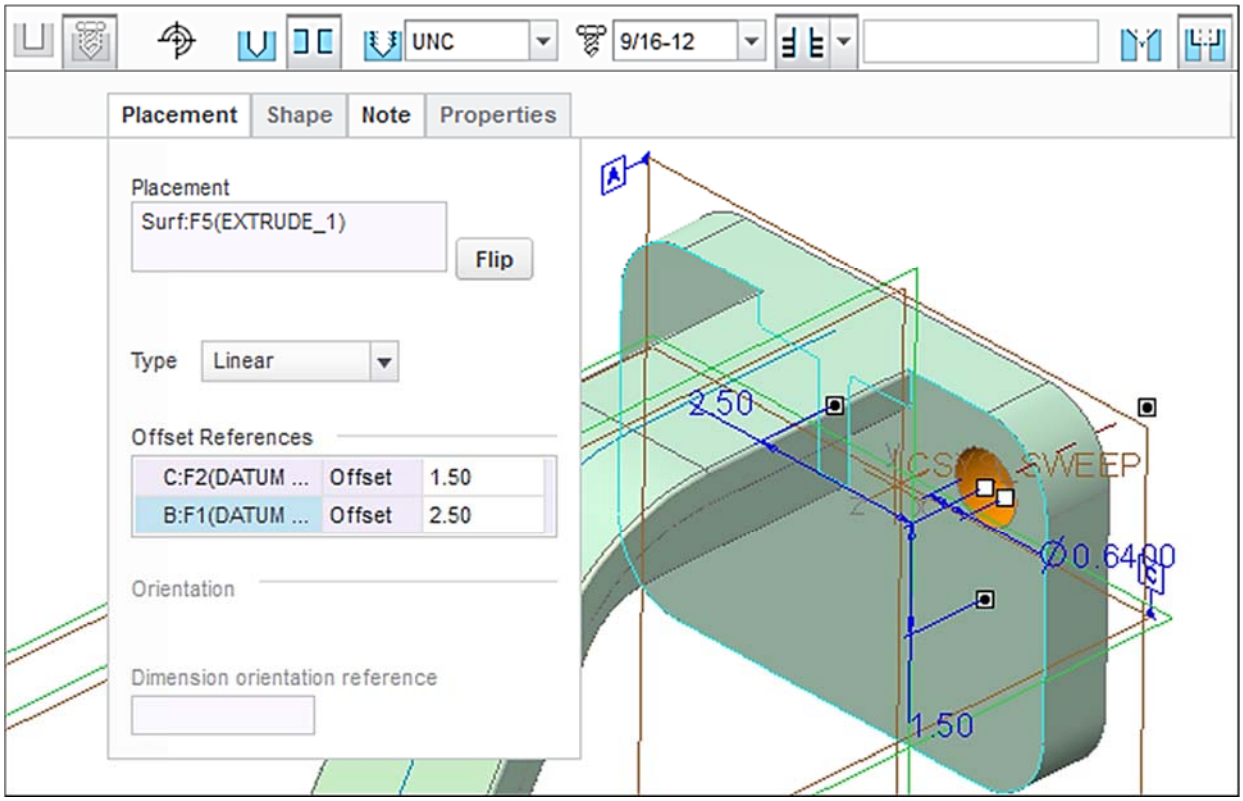


Figure 15.14(b) Hole Placement

Click: **Shape** tab > shape the hole per Shape requirements [Fig. 15.14(c)] >  > in the Graphics Window, press **RMB** > **Pattern** >  > **Dimension** > select for Direction 1 **2.50** > **Enter** > **Dimensions** tab > pick **Click here to** in the Direction 2 field > select for Direction 2 **1.50** > **Enter** > modify Increment ***2.50*** to **-5.00** > **Enter** > modify Increment ***1.50*** to **-3.00** > **Enter** [Fig. 15.15(a)]

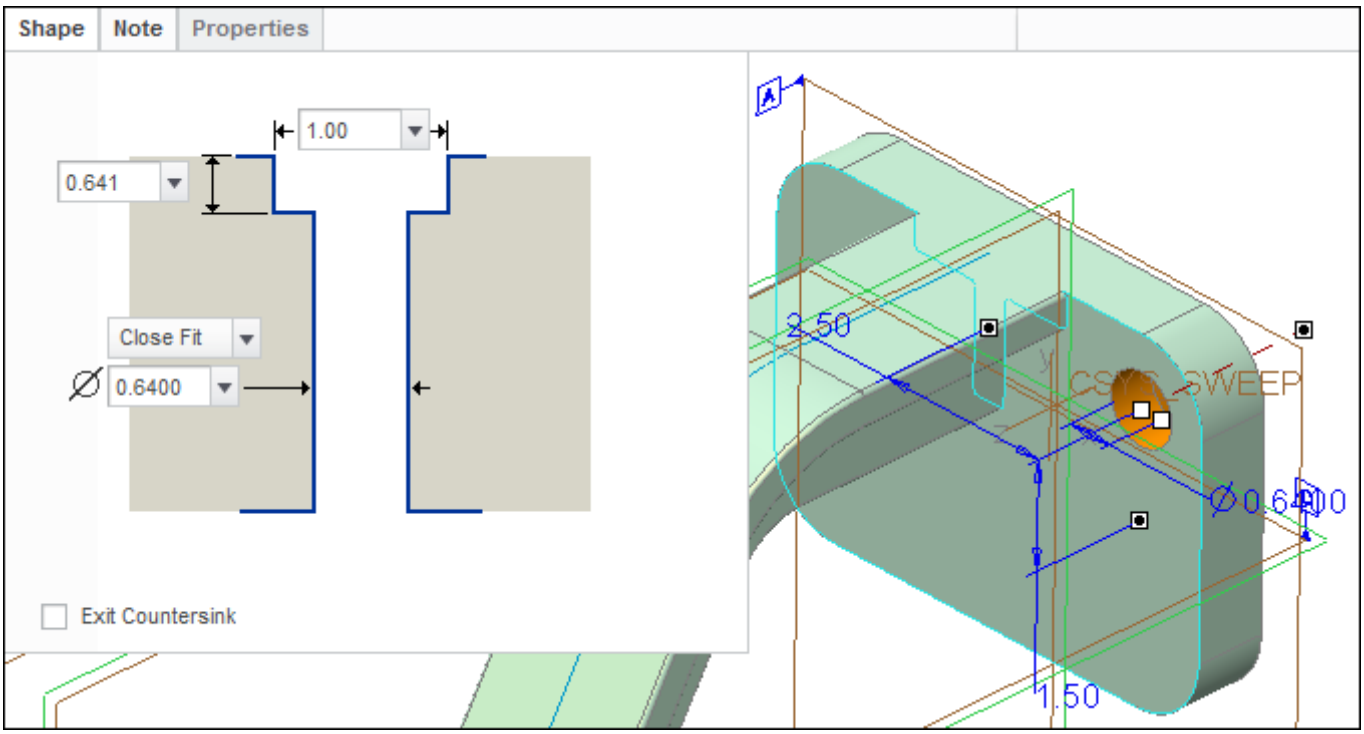


Figure 15.14(c) Hole Shape

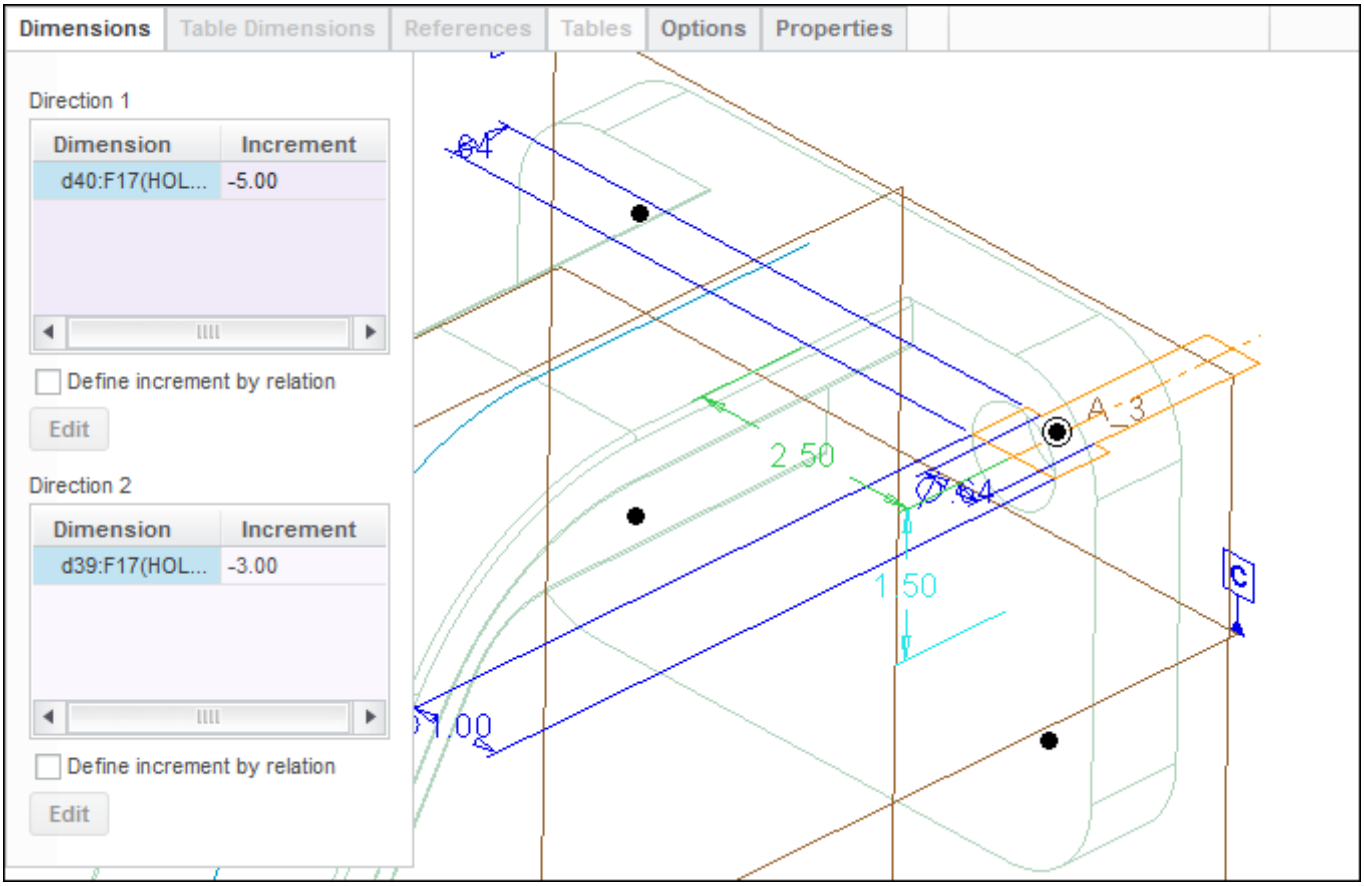


Figure 15.15(a) Pattern Dimensions

Click:  > in the Graphics Window, press **RMB** > **Edit** [Fig. 15.15(b)] > **LMB** > **View** tab >  *off* >  *off* > press the **Ctrl** key > select **Datums A, B,** and **C** from the Model Tree > **RMB** > **Hide** [Fig. 15.16(a)]

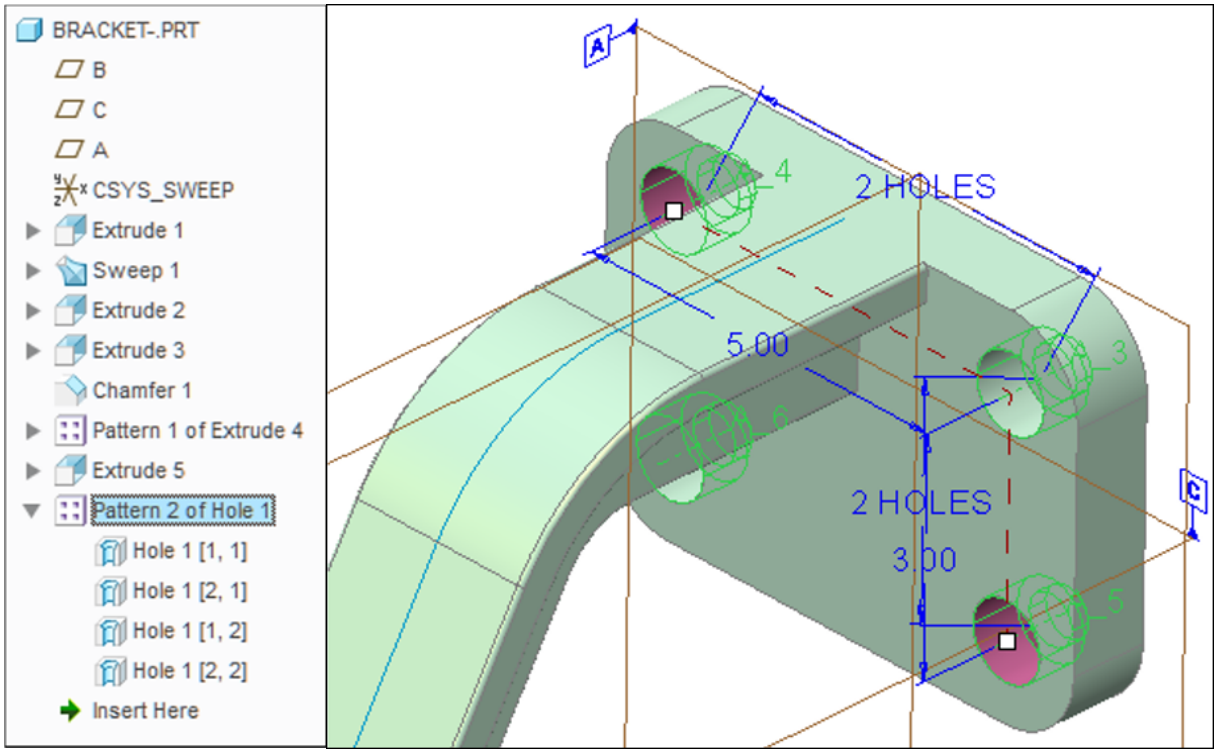


Figure 15.15(b) Pattern Dimensions

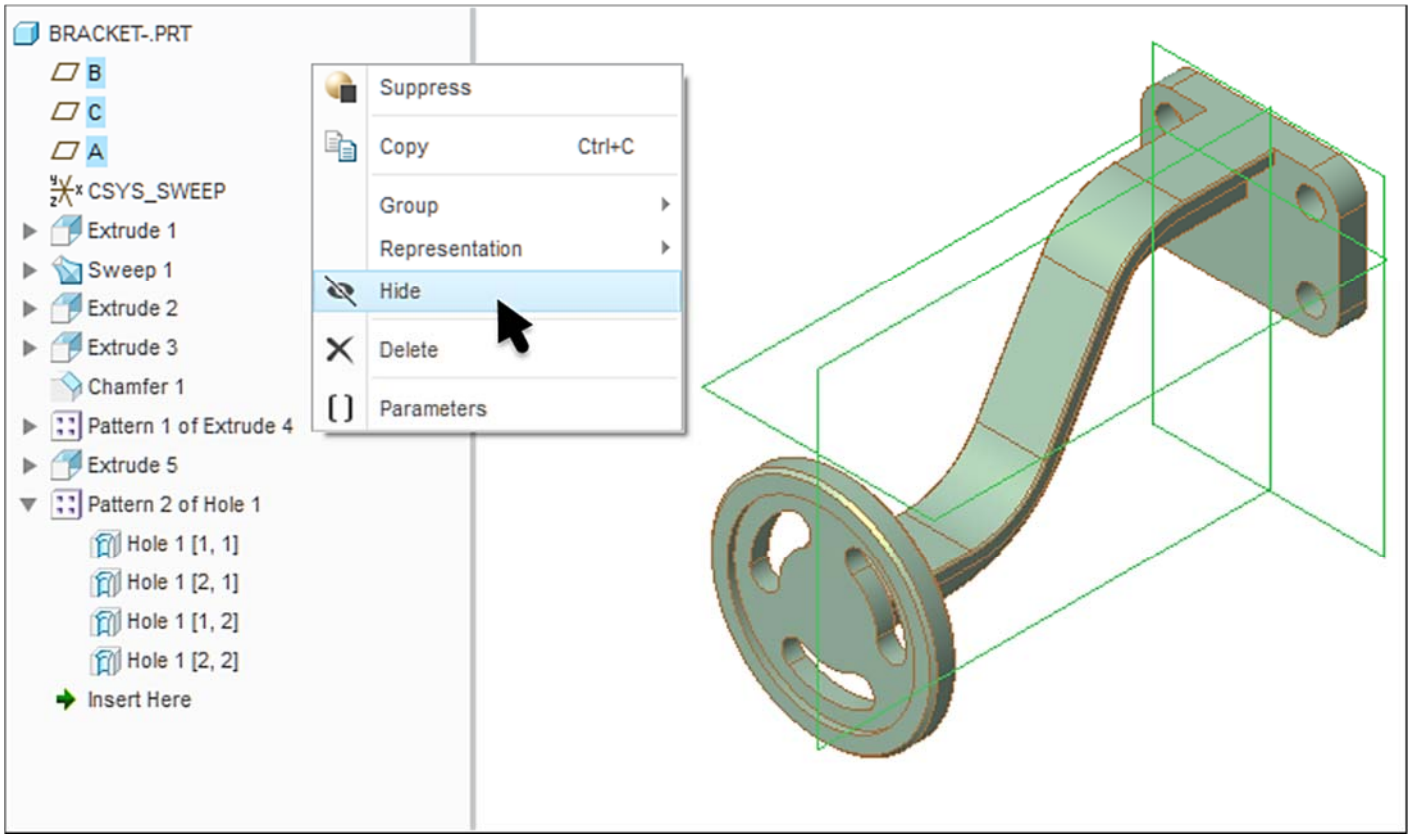


Figure 15.16(a) Hide the Datum Planes and the Sketch

Click: **File** > **Options** > **Model Display** > set as shown [Fig. 15.16(b)]

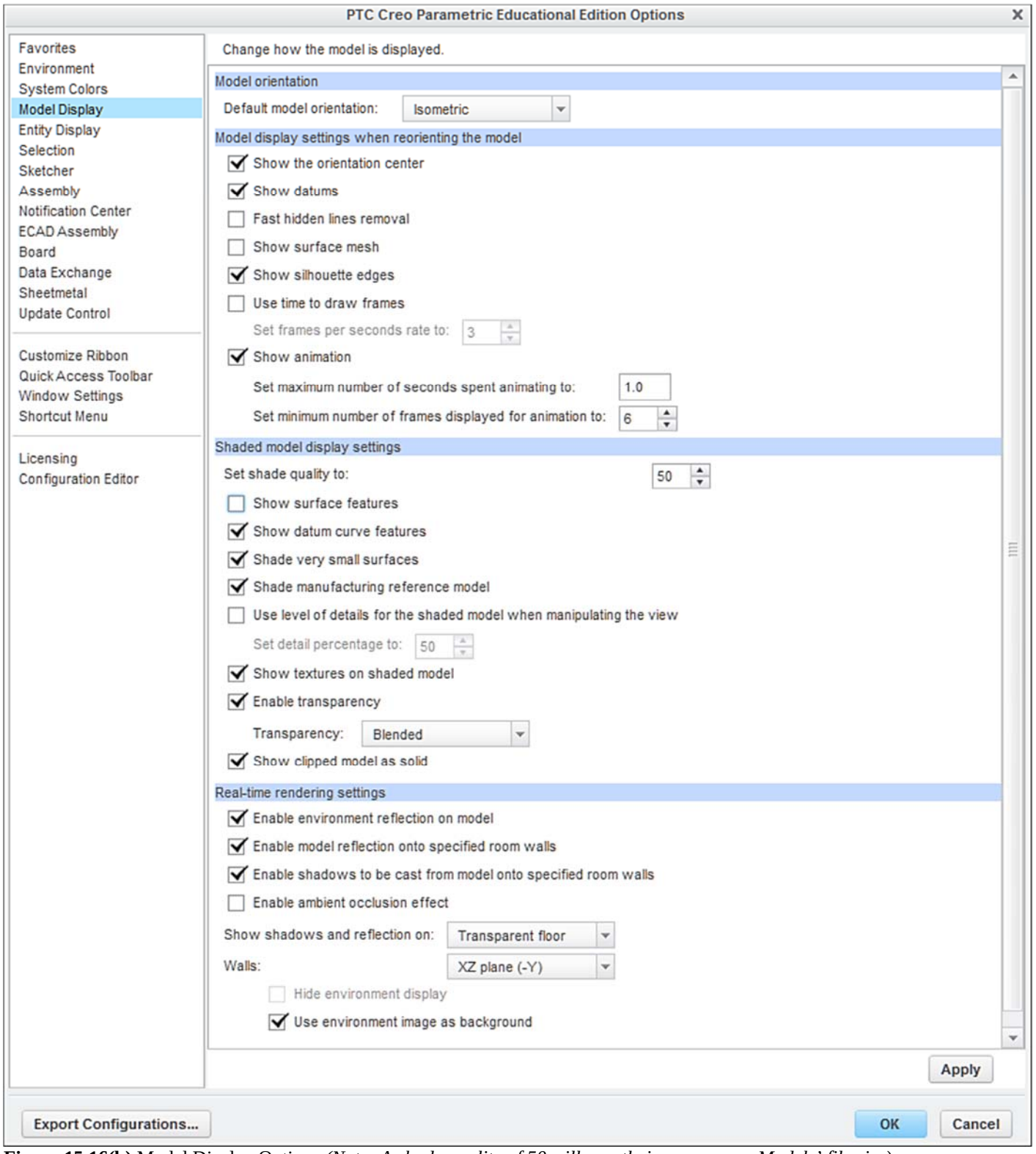


Figure 15.16(b) Model Display Options *(Note: A shade quality of 50 will greatly increase your Models' file size)*

Click: **Entity Display** > set as shown [Fig. 15.16(c)]

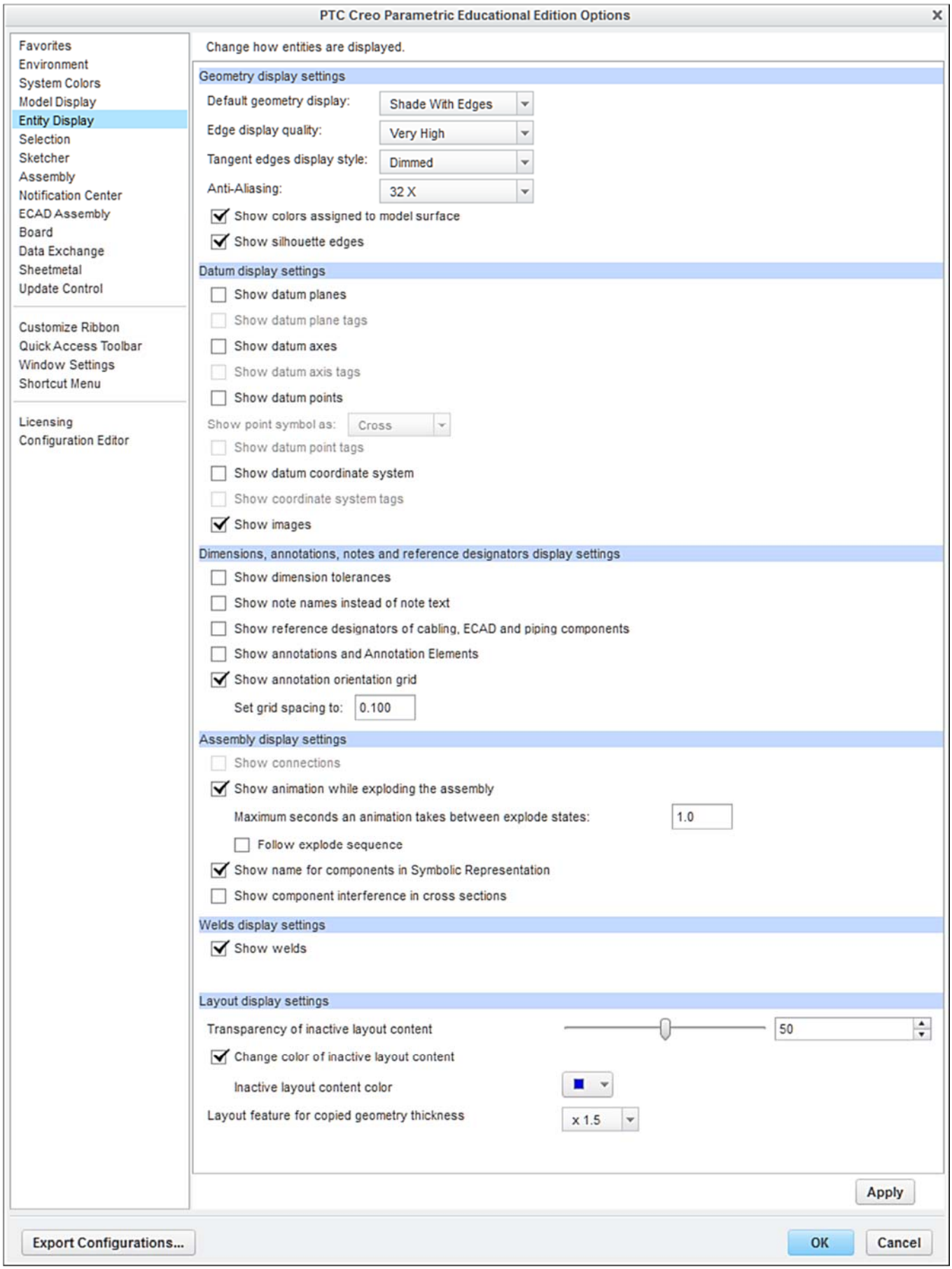


Figure 15.16(c) Entity Display Options

Click: **Environment** > set as shown [Fig. 15.16(d)] > **OK** > **No** > **Shading with Reflections** [Fig. 15.16(e)] > **View** tab > **Model Display** > **Temporary Shade** > **Ctrl+D** > **Ctrl+S**

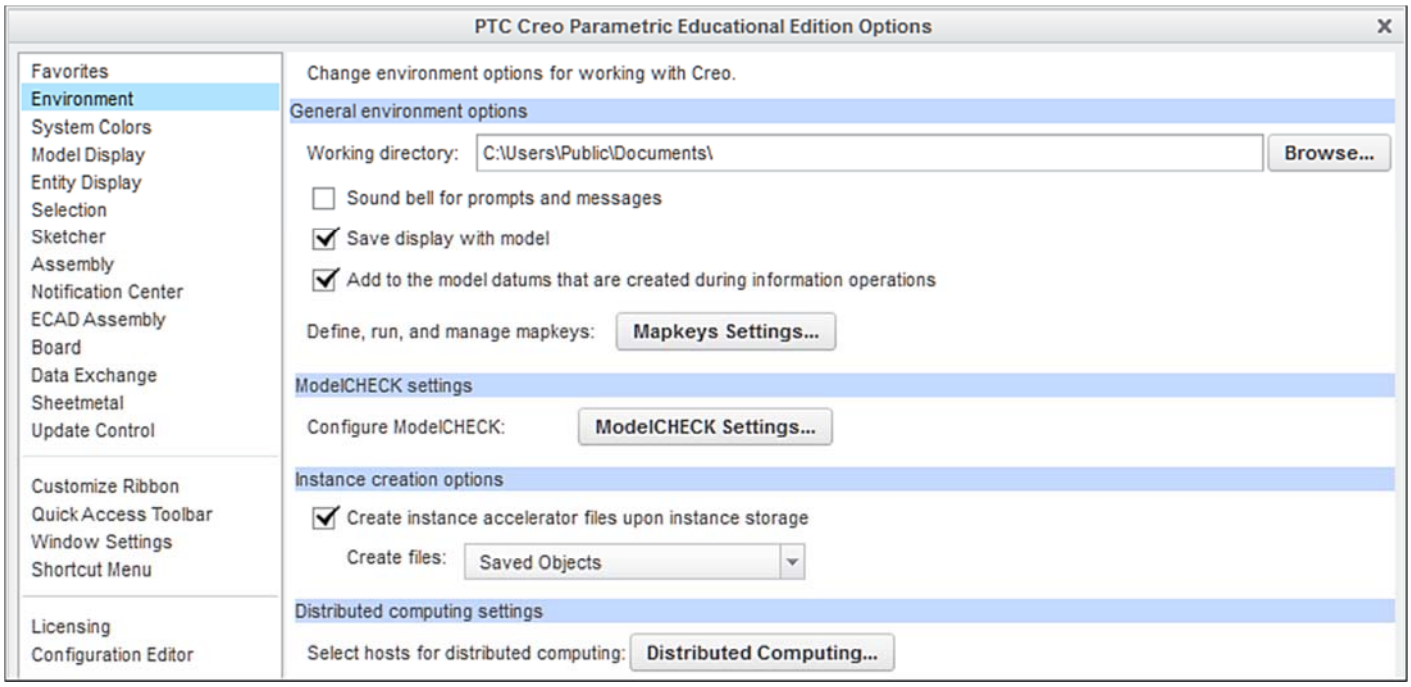


Figure 15.16(d) Environment Options (your Working directory may be different)

Figure 15.16(e) Shading With Reflections *(the quality of your graphics card and graphics settings may prevent this display)*

Click: **Render** tab > **Scene** > **Lights** tab > **OK** (if needed) > **Add new spotlight** > Name **Color for lighting** > adjust the slide bars in the Color Editor to the RGB values provided [Fig. 15.17(a)] > **OK** (from the Color Editor dialog box)

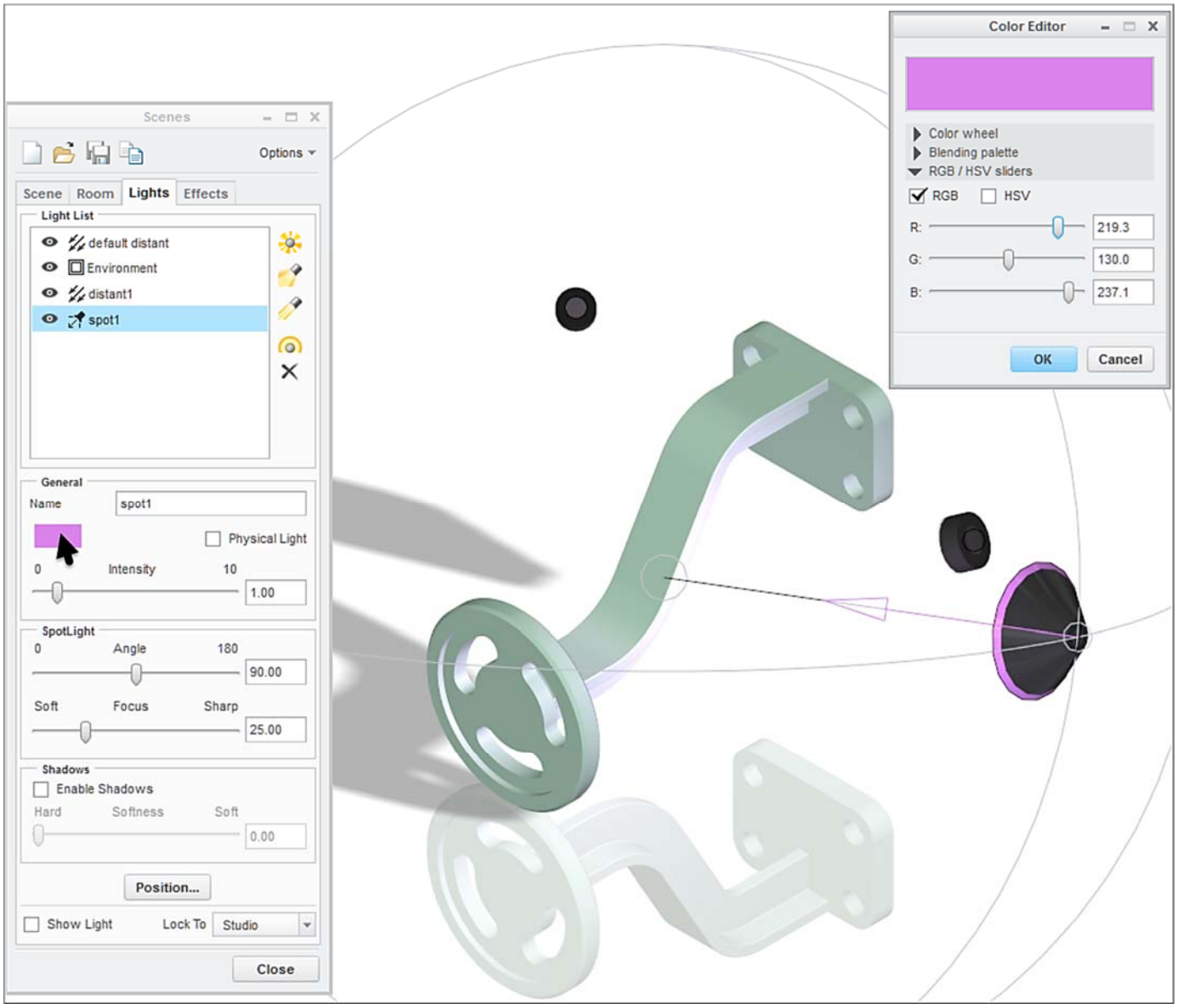


Figure 15.17(a) Light Setup

Click: *on* > **Ctrl+R** > Move the light from its default position to the other side of the model. Place the pointer on the circle behind the light (highlights) [Fig. 15.17(b)] > press and hold down the **LMB** > move the pointer to the other side of the model > release the **LMB** [Fig. 15.17(c)] > **Close** (the Scenes dialog box) > *off* > **Ctrl+S** > **Enter** > **File** > **Close**

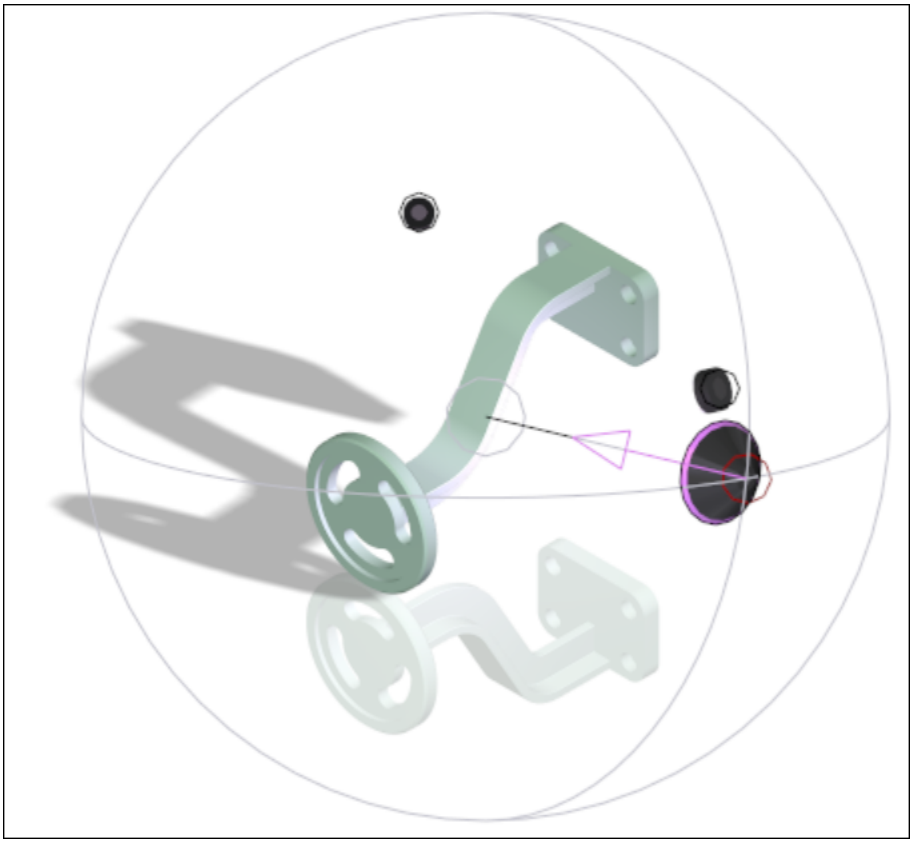


Figure 15.17(b) Move the Light (experiment with different positions)

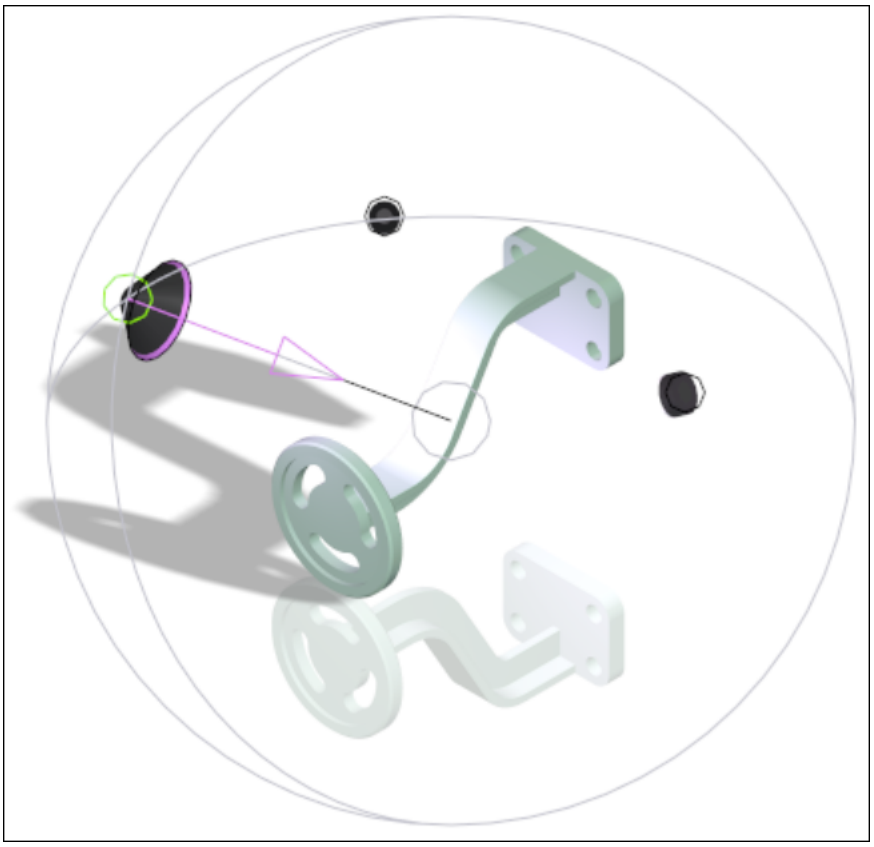


Figure 15.17(c) New Light Position (experiment with different positions)

Press: **Ctrl+N >** 

> Name **bracket > OK > OK >** detail the part as per **ASME Y14.5** using multiple views and sheets as you see fit (Fig. 15.18) **> Ctrl+S > OK > File > Manage File > Delete Old Versions > Enter > File > Save As > Type**  **> Zip File (*.zip) > OK > upload** the zip file to your course interface or attach to an email and send to your instructor and/or yourself **> File > Close > File > Exit > Yes**

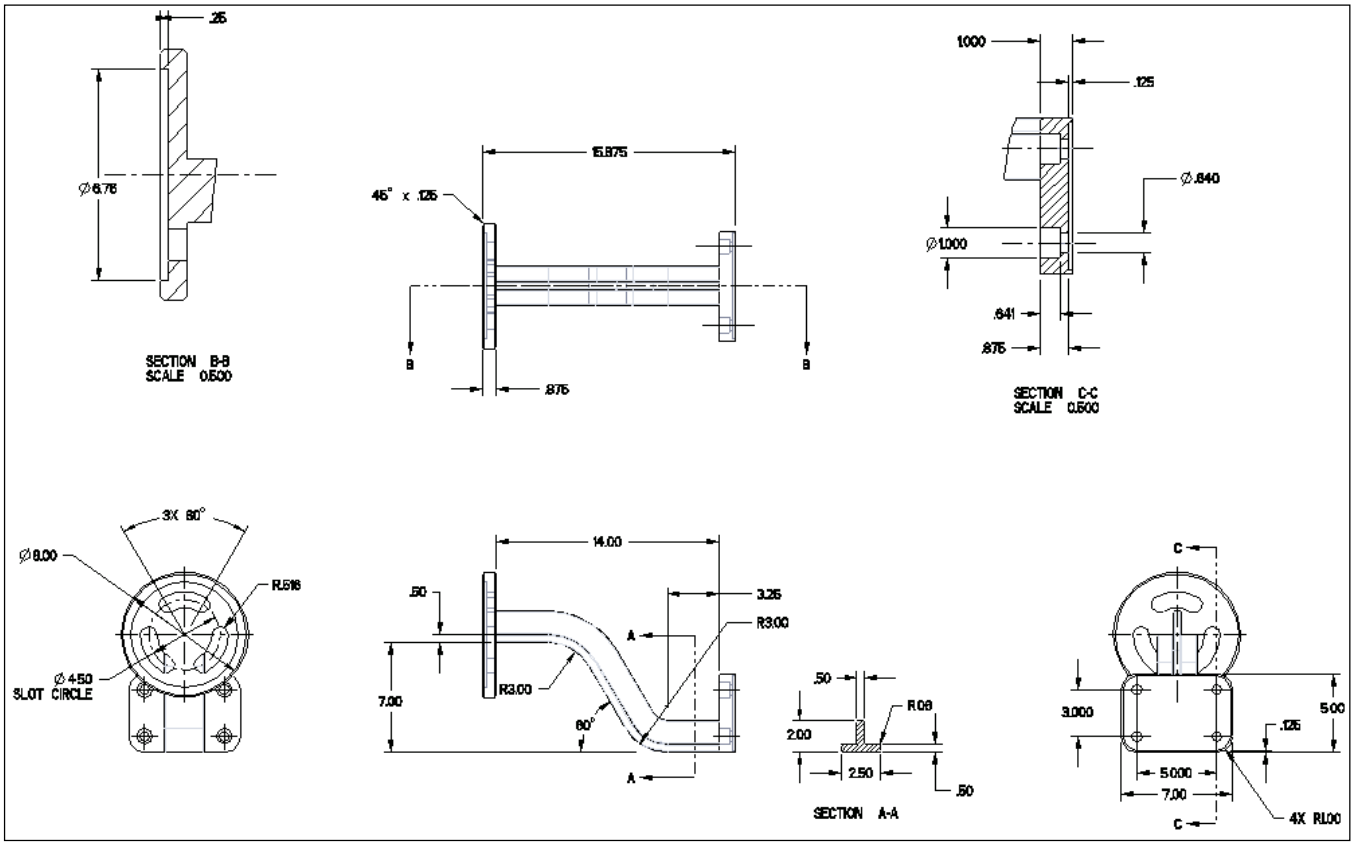


Figure 15.18 Possible Detail Views and Dimensioning Scheme

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