CHAPTER 3

Fundamentals II

PROJECT EXERCISE

This project exercise provides step-by-step instructions for creating the front, top, and right views of a 5.5 × 3.5 × 2 block, as shown in Figure P3–1.

In this project, you will learn how to do the following:

- Create a new design file.
- Set the working units.
- Place elements in the design, using the Place Line, Place Block, Place Circle, and Place Arc tools, with precision input and tentative snapping.

There are more efficient ways to draw the objects. The intent of the exercise is to guide you through applying the concepts and tools presented in Chapters 1, 2, and 3. Your efficiency will improve as you learn to use more tools in later chapters.

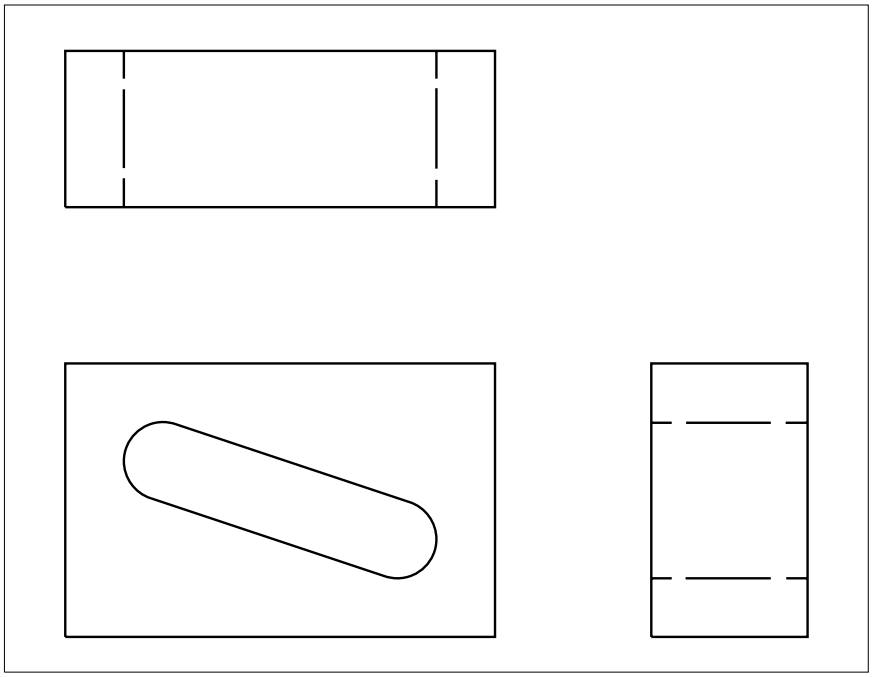


Figure P3–1 Completed project design

NOTE: As you complete each step in the project procedures, place a check mark by the step to help you keep up with where you are in the project.

CREATE A DESIGN FILE

In the following steps, you will start MicroStation and create a design file for the project.

STEP 1: Invoke the MicroStation program.

Example: Under Microsoft Windows XP, find the MicroStation program in the **Start** > **Programs** menu and select it.

STEP 2: In the MicroStation Manager dialog box, click the **New** File icon to open the New dialog box.

STEP 3: If the **Seed** text box does not show Seed2d.dgn as the seed file, click **Browse** and find and select Seed2d.dgn as the seed file.

STEP 4: In the **File Name** field, type **CH3.DGN**.

STEP 5: Click **Save** to create the file and close the dialog box.

STEP 6: In the MicroStation Manager dialog box, select CH3.DGN from the file names list box and click **Open** to open the new file in MicroStation.

SET THE WORKING UNITS AND GRID SPACING

This procedure presents the steps to do the following:

- Set the working units, both Master Unit and Sub Unit, to inches.
- Set the Grid Master to 0.1 (0.1 of an inch between the dots) and the Grid Reference to 10 (1 inch between the crosses).
- Set the Element Attributes.

STEP 1: In the MicroStation application window, select **Settings > Design File**.

STEP 2: In the DGN File Settings dialog box, select the **Working Units** category, and set the **Modify Working Unit Settings** fields as shown in Figure P3–2.

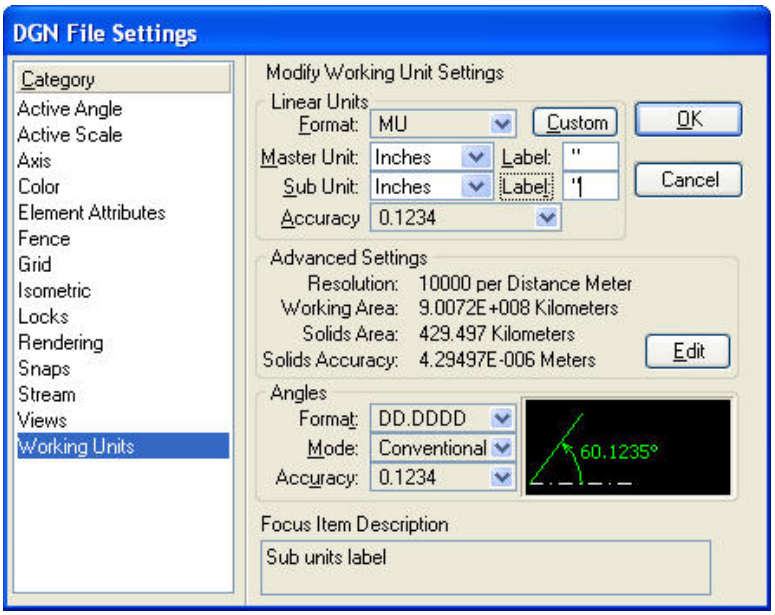


Figure P3–2 Design File Settings dialog box—Working Units setup

STEP 4: In the **Design File Settings** box, select **Grid** from the **Category** list and set the **Grid Master** and **Grid Reference** as shown in Figure P3–3.

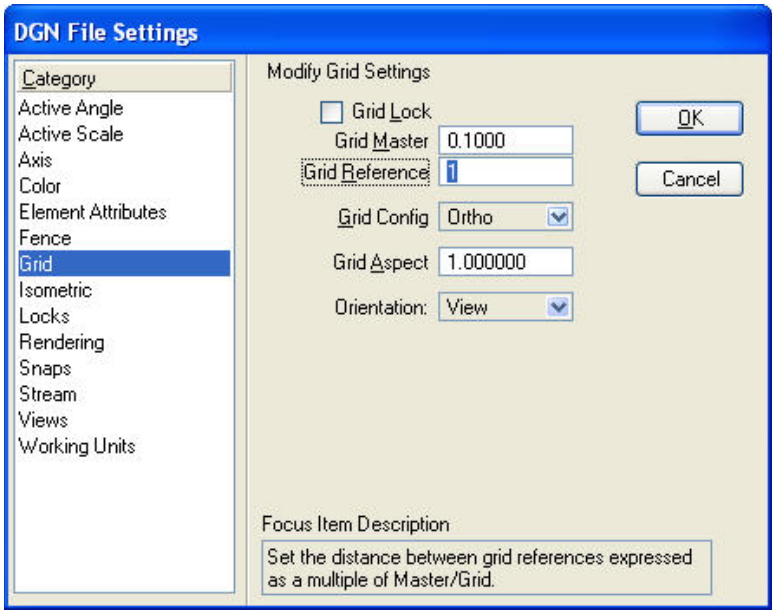


Figure P3–3 Design File Settings dialog box—Grid Units setup

STEP 5: Click on the **OK** button to close the **Design File Settings** box and save the changes.

STEP 6: In the MicroStation menu bar, select **Settings > Level > Manager** to open the **Level Manager** settings box.

STEP 7: In the **Level Manager** settings box, click the **New Level** icon to add a new level to the list. The new level appears in the **Level Manager** settings box with a default level name that is selected for editing, as shown in Figure P3–4.

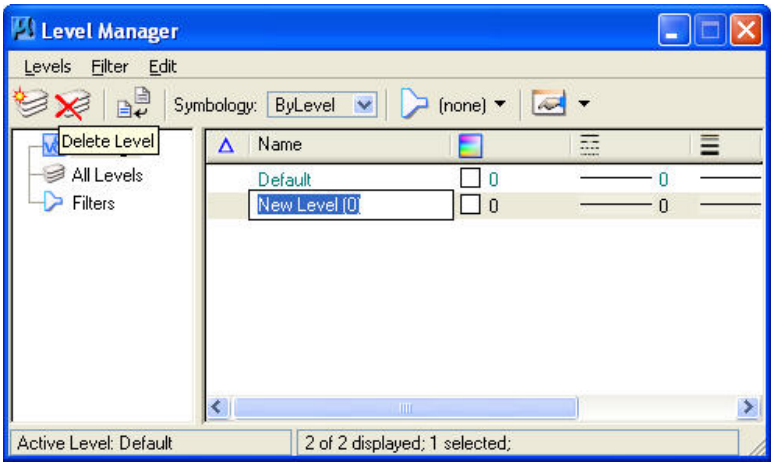


Figure P3–4 The Level Manager settings box showing a new level

STEP 8: Type "Border" (without the quotation marks) in place of the new level's default name and press ENTER. Set **Color** to blue (1), **Line Style** to 0 (continuous) and **Line Weight** to 2.

STEP 9: Using the procedure in Steps 7 and 8, create the following level names and assign properties:

- Objects – **Color** to red (3), **Line Style** to 0 (continuous), and **Line Weight** to 2.
- Holes – **Color** to green (2), **Line Style** to 1 (short dashes), and the **Line Weight** to 1
- Temp Lines – **Color** to green (2), **Line Style** to 1 (short dashes), and **Line Weight** to 1.
- Hidden–**Color** to white (0), **Line Style** to 2 (hidden), and **Line Weight** to 1.

STEP 10: Close the **Level Manager** settings box by clicking the **Close** button ("X") on the right end of the title bar.

STEP 11: Select **File** > **Save Settings**.

DRAW THE BORDER USING PRECISION INPUT

This procedure presents the steps to do the following:

- Use the XY absolute coordinates to draw an 18 inch by 12 inch border.
- Invoke the Fit View tool to see the complete border outline in the View window.

STEP 1: In the Attributes toolbar, set the **Active Level** to Border.

STEP 2: From the menu bar, select **Utilities > Key-in**.

STEP 3: Invoke the **Place Block** tool from the Task Navigator tool box (active task set to Polygons), and select the **Orthogonal Method** from the Tool Settings window.

MicroStation prompts:

Place Block > Enter first point

Click in the Key-in window's input field, key-in **XY=0,0**, and press ENTER.

Place Block > Enter opposite corner

Key-in **XY=18,12** in the Key-in window and press ENTER.

STEP 4: Invoke the **Fit View** tool from the View Control Bar to display the complete border outline in the selected view.

STEP 5: Select **File > Save Settings**.

After drawing the border, the drawing should look like Figure P3–5.

Figure P3–5 Completed border outline

DRAW THE VIEWS OF THE BLOCK

This procedure presents the steps for employing the *XY* absolute coordinates and Intersection snaps to draw the front, top, and right views of the block.

STEP 1: In the Attributes toolbar, set the **Active Level** to Objects.

STEP 2: Draw the top and right views of the block by invoking the **Place Block** tool and selecting the **Orthogonal Method** in the Tool Settings window.

MicroStation prompts:

Place Block > Enter first point

Click in the Key-in window's input field, key-in **XY=2,7.5**, and press ENTER.

Place Block > Enter opposite corner

Key-in **XY=7.5,9.5** in the Key-in window and press ENTER.

Place Block > Enter first point

Click in the Key-in window's input field, key-in **XY=9.5,2**, and press ENTER.

Place Block > Enter opposite corner

Key-in **XY=11.5,5.5** in the Key-in window and press ENTER.

STEP 3: Click the **Active Snap Mode** icon 0n the Status Bar to invoke the **Snap Modes** pop-up menu, point to **Intersection** snap mode, and hold down SHIFT while you click the Data button or Reset button. Intersection snap is set as the Active Snap Mode.

Note: The next step uses Intersection snap to identify the diagonally opposite corners of the front view. Two snaps are required to identify the intersections where the corners are to be placed. The intersections are at the meeting points of imaginary extensions of the sides of the top and right-side views.

STEP 4: Draw the front view of the block.

MicroStation prompts:

Place Block > Enter first point

Tentative snap to LINE 1 and to LINE, 4 as shown in Figure P3–6. Click the Data button to accept the Intersection snap and define one corner of the block.

Place Block > Enter opposite corner

Tentative snap to LINE 2 and to LINE 3, as shown in Figure P3–6. Click the Data button to accept the Intersection snap to complete drawing the block.

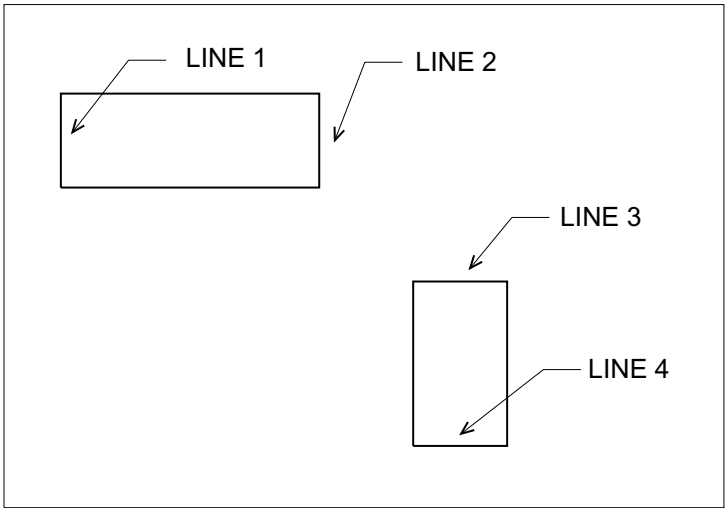


Figure P3–6 Identifying the lines whose intersections are used to draw a rectangle

After drawing the rectangle boxes, the drawing should look like Figure P3–7.

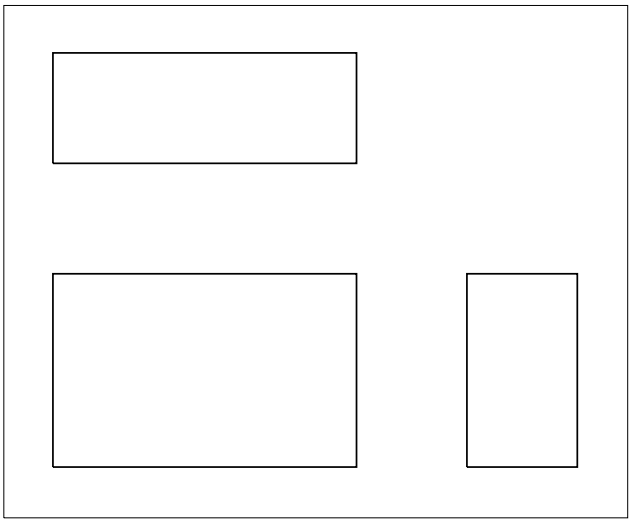


Figure P3–7 Completed drawing of rectangles

DRAW TEMPORARY CONSTRUCTION CIRCLES ON THE FRONT VIEW OF THE BLOCK

This procedure presents the steps for employing the *XY* absolute coordinates to draw two circles in one of the blocks. In a later procedure, these circles will aid in the drawing of a slot in the object and will then be deleted.

STEP 1: In the Attributes toolbar, set the **Active Level** to Holes.

STEP 2: Select **File > Save Settings**.

STEP 3: Invoke the **Place Circle** tool from the Task Navigator tool box (active task set to Circles). In the Tool Settings window, select **Center** in the **Method** menu, select **Radius** in the **Diameter/Radius** menu, turn ON the **Radius** check box, and enter **0.5** Master Units in the **Radius** edit field, as shown in Figure P3–8.

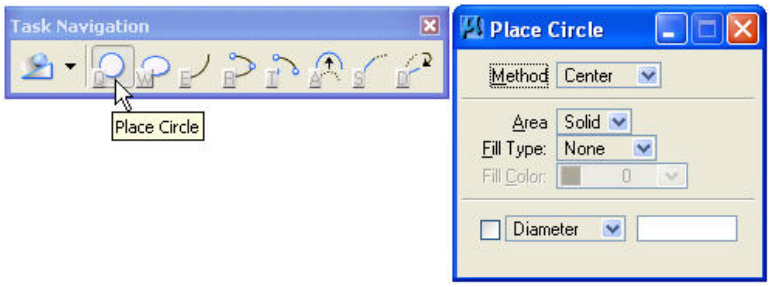


Figure P3–8 Place Circle Tool Settings window

STEP 4: Draw two circles.

MicroStation prompts:

Place Circle By Center > Identify Center Point

Click in the Key-in window's input field, key-in **XY=3.25,4.25**, and press ENTER to draw the first circle.

Place Circle By Center > Identify Center Point

Click in the Key-in window's input field, key-in **XY=6.25,3.25**, and press ENTER to draw the second circle.

DRAW TEMPORARY CONSTRUCTION LINES

This procedure presents the steps for drawing four temporary construction lines that are used in a later procedure as an aid to drawing hidden lines for the slot in the top and right-side views of the block. The procedure uses AccuSnap to start the lines on Keypoints of the circles and temporary snap modes to end the lines perpendicular to the top and right-side view of the block.

STEP 1: In the Attributes toolbar, set the **Active Level** to **Temp Lines**.

STEP 2: Click the **Active Snap Mode** icon in the Status Bar to invoke the **Snap Modes** pop-up menu, point to **Keypoint** snap mode, and hold down SHIFT while you click the Data button or Reset button. Keypoint snap is set as the Active Snap Mode.

STEP 3: Open the **AccuSnap Settings** box from the **Snap Modes** pop-up menu by clicking the **Active Snap Mode** icon in the Status Bar and selecting **AccuSnap** from the menu.

STEP 4: Make the following AccuSnap settings:

- Turn ON the **Enable AccuSnap** check box.
- Turn ON the **Show Tentative Hint** check box.
- Turn ON the **Display Snap Icons** check box.
- Turn ON the Play sound On Snap check box (if you want to hear an audible signal when a snap point is located).
- Turn ON the **Pop-up Info** check box.
- In the **Pop-up Info** menu, select the **Automatic** option.

STEP 5: Close the **AccuSnap Settings** box.

STEP 6: Invoke the **Place Line** tool from the Task Navigator tool box (active task set to Linear) and turn OFF the **Length** and **Angle** check boxes in the Tool Settings window.

Note: The first data point of each construction line is placed using AccuSnap and the Active Snap Mode (Keypoint). The second data point is placed using a temporary snap mode (Perpendicular). When you select Perpendicular snap from the Snap Modes menu, do not hold down SHIFT because that would change the Active Snap Mode from Keypoint to Perpendicular.

STEP 7: Draw the construction lines using appropriate tentative snaps to place the end points.

MicroStation prompts:

Place Line > Enter first point

Move the pointer toward point QUA 1, as shown in Figure P3–9, until AccuSnap snaps to the keypoint at that location. When the snap occurs, click the Data button to accept the Tentative snap point.

Place Line > Enter endpoint

Click the Active Snap Mode icon in the Status Bar and select Perpendicular snap mode. Tentative snap to LINE 5 as shown in Figure P3–9 and click the Data button to accept the Tentative Point.

Place Line > Enter endpoint

Click the Reset button to terminate the line sequence and allow you to start a new line.

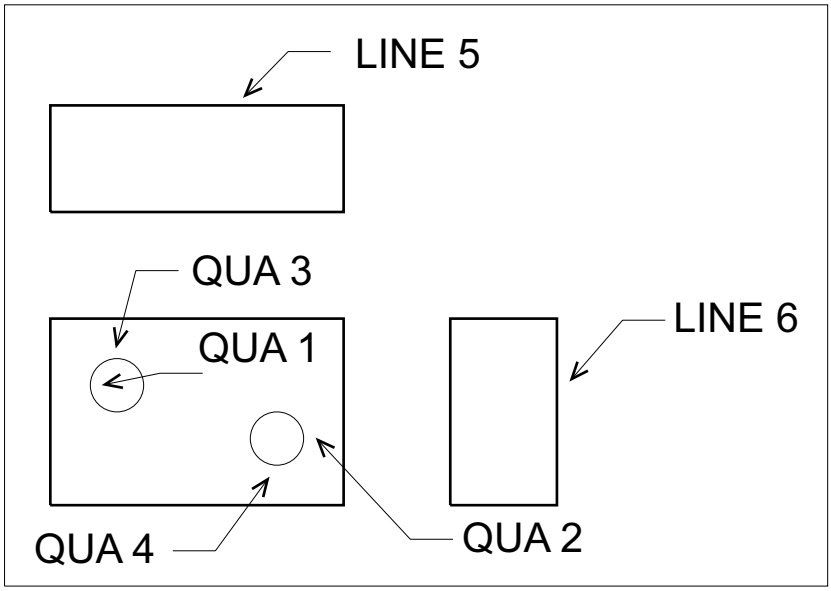


Figure P3–9 Identifying the points to draw additional lines

STEP 8: Draw the other three construction lines using the same method as Step 4, above, and Figure P3–10 for reference points:

Draw the lines	From:	To:
	QUA 2	LINE 5
	QUA 3	LINE 6
	QUA 4	LINE 6

The design should look like Figure P3–10.

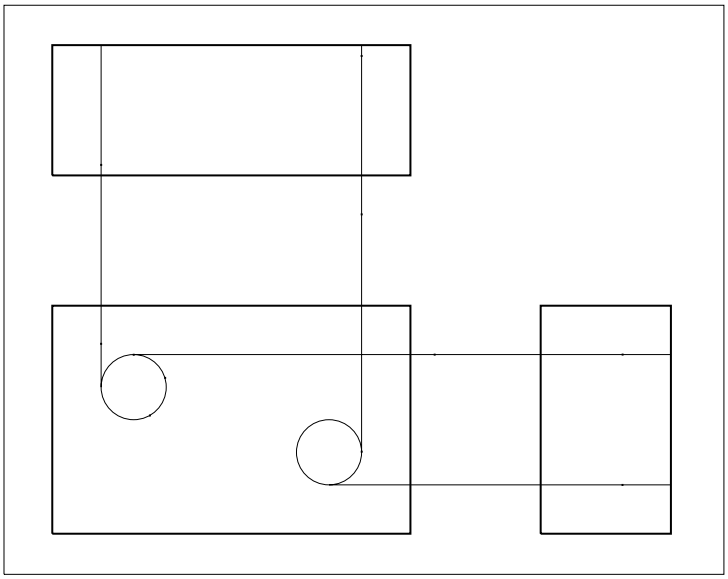


Figure P3–10 Completed drawing of construction lines

DRAW HIDDEN LINES ON THE TOP AND RIGHT-SIDE VIEWS

This procedure presents the steps for using Intersection snap to draw the four hidden lines on the top and right-side views of the block to indicate where the slot is cut through the block from front to back. The temporary construction lines that were drawn in the previous procedure aid in placing these hidden lines and are deleted after the hidden lines are drawn.

STEP 1: In the Attributes toolbar, set the **Active Level** to Hidden.

STEP 2: Invoke **File > Save Settings**.

STEP 3: Click the **Snaps** icon in the Status bar, and select **Intersection** mode while pressing SHIFT. Intersection snap mode is set as the Active Snap Mode.

STEP 4: Invoke the **Place Line** tool and draw the hidden lines using intersection snap to identify the starting and ending points of each line.

MicroStation prompts:

Place Line > Enter first point

Move the pointer toward POINT 1 as shown in Figure P3–11 until AccuSnap snaps to the intersection of the block and construction line, and then click the Data button to accept the Tentative snap point.

Place Line > Enter endpoint

Move the pointer toward POINT 2 as shown in Figure P3–11 until AccuSnap snaps to the intersection of the block and construction line, and then click the Data button to accept the Tentative Point.

Place Line> Enter endpoint

Click the Reset button to terminate the line sequence.

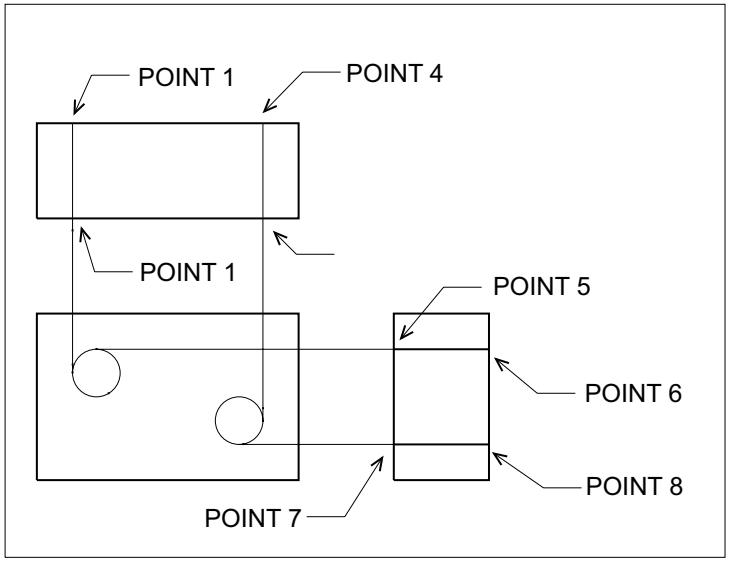


Figure P3–11 Identifying the end points of the hidden lines

STEP 5: Draw the other three hidden lines using the same method as step 4 above and Figure P3–12:

Draw the lines	From:	To:
	POINT 3	POINT 4
	POINT 5	POINT 6
	POINT 7	POINT 8

STEP 6: Select **Settings > Levels > Display** to display the Level Display settings box and turn off the **Temp Lines** level.

STEP 7: Close the Level Display settings box.

STEP 8: Select **Update View** to clean up the view window.

The drawing should look like Figure P3–12.

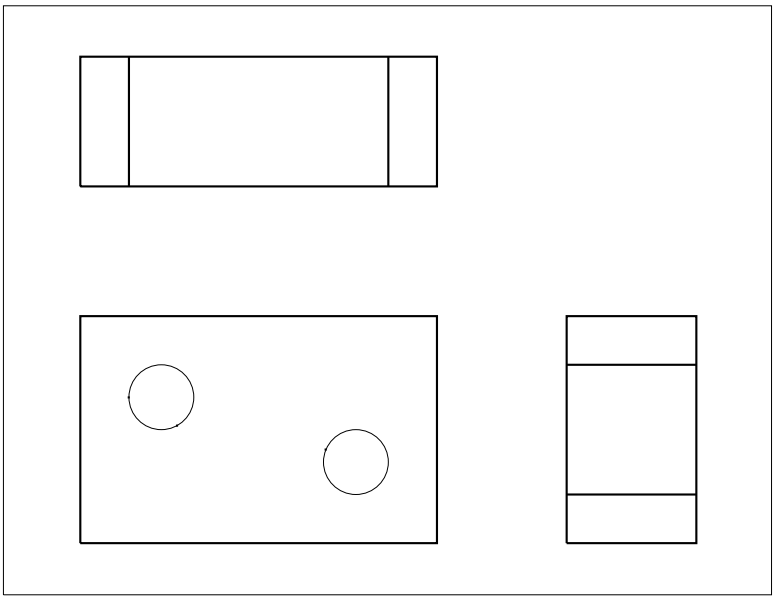


Figure P3–12 Completed drawing of hidden lines

DRAW THE SLOT ON THE TOP VIEW OF THE BLOCK

This procedure presents the steps for drawing two lines tangent to the circles on the top view of the block, drawing arcs to complete the slot, and then deleting the circles.

STEP 1: In the Attributes toolbar, set the **Active Level** to Object.

STEP 2: Invoke the **Place Line** tool and draw lines tangent to the circles using tentative snap.

STEP 3: Click the **Snaps** icon in the Status bar and select **Tangent** mode while pressing SHIFT. Tangent snap mode is set as the Active Snap Mode.

Note: AccuSnap does not work with Tangent snap mode, so you must click the Tentative button to snap to the circles.

MicroStation prompts:

Place Line > Enter first point

Tentative snap in the upper half of CIRCLE 1 as shown in Figure P3–13, and then click the Data button to accept the Tentative Point.

Place Line > Enter endpoint

Tentative snap in the upper half of CIRCLE 2 as shown in Figure P3–13, and then click the Data button to accept the Tentative Point.

Place Line > Enter endpoint

Click the Reset button to terminate the line sequence.

Place Line > Enter first point

Tentative snap in the lower half of CIRCLE 1 as shown in Figure P3–13, and then click the Data button to accept the Tentative Point.

Place Line > Enter endpoint

Tentative snap in the lower half of CIRCLE 2 as shown in Figure P3–13, and then click the Data button to accept the Tentative Point.

Place Line > Enter endpoint

Click the Reset button to terminate the line sequence.

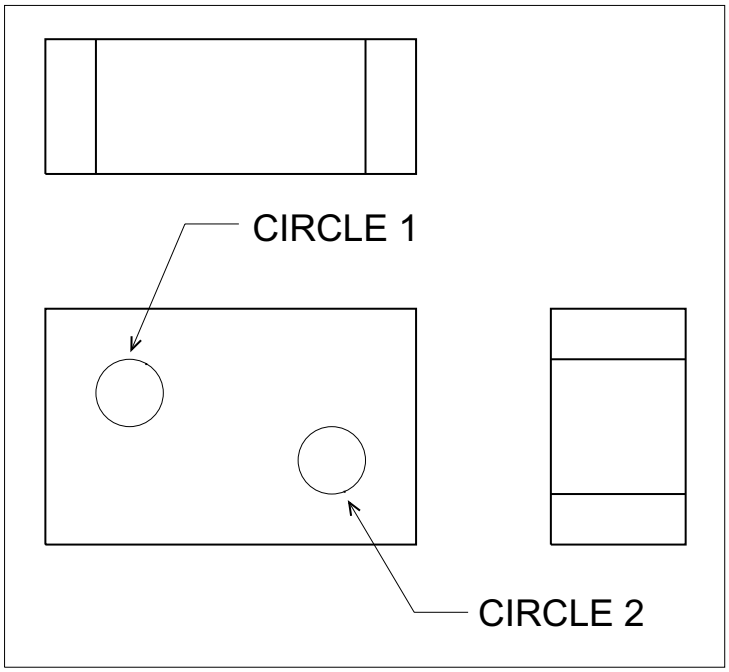


Figure P3–13 Identifying the tentative snap points to draw additional lines

STEP 4: Invoke the **Place Arc** tool from the Task Navigator tool box (active task set to Circles), and, in the Tool Settings box, select the **Center Method** and turn OFF the check boxes for **Radius**, **Length**, **Start Angle**, and **Sweep Angle**.

STEP 5: Click the **Active Snap Mode** icon in the Status bar, and select **Keypoint** mode while pressing SHIFT. Keypoint snap mode is set as the Active Snap Mode.

STEP 6: Draw two arcs to complete the cutout in the front view of the object. The center of the arcs will be at the center of the circles, they will start and end at the ends of the lines and they will sweep over the outer edges of the circles.

MicroStation prompts:

Place Arc By Center > Identify First Arc Endpoint

Use AccuSnap to snap to ENDPOINT 1 as shown in Figure P3–14, and then click the Data button to accept the Tentative Point.

Place Arc By Center > Identify Arc Center

Tentative snap to the center of CIRCLE 1 as shown in Figure P3–14, and then click the Data button to accept the Tentative Point.

Place Arc By Center > Enter point to define sweep angle

Use AccuSnap to snap to ENDPOINT 2 as shown in Figure P3–14, and then click the Data button to accept the Tentative Point.

Place Arc By Center > Identify First Arc Endpoint

Use AccuSnap to snap to ENDPOINT 3 as shown in Figure P3–15, and then click the Data button to accept the Tentative Point.

Place Arc By Center > Identify Arc Center

Use AccuSnap to snap to the center of CIRCLE 2 as shown in Figure P3–14, and then click the Data button to accept the Tentative Point.

Place Arc By Center > Enter point to define sweep angle

Use AccuSnap to snap to ENDPOINT 4 as shown in Figure P3–14, and then click the Data button to accept the Tentative Point.

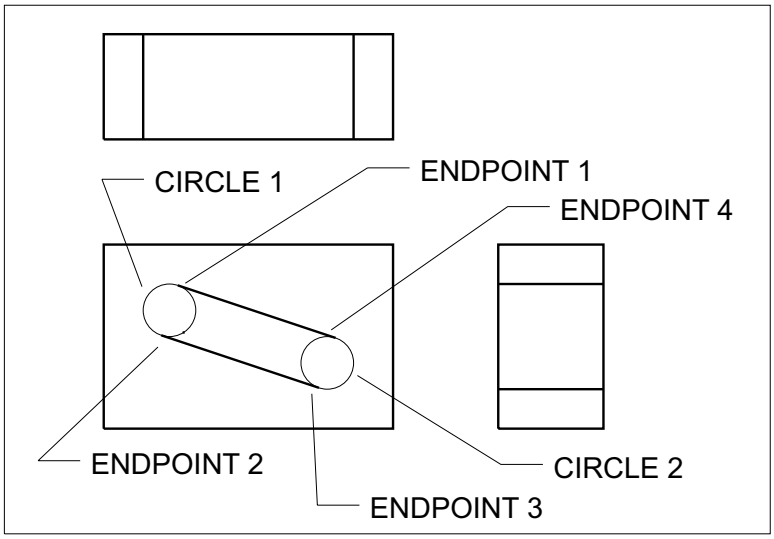


Figure P3–14 Identifying the tentative snap points to draw arcs

STEP 7: Turn OFF the display of the **Holes** level.

STEP 8: Select **Update View** to clean up the view window.

STEP 9: Invoke the **Save Settings** from the **File** drop-down menu.

The completed drawing should look like Figure P3–15.

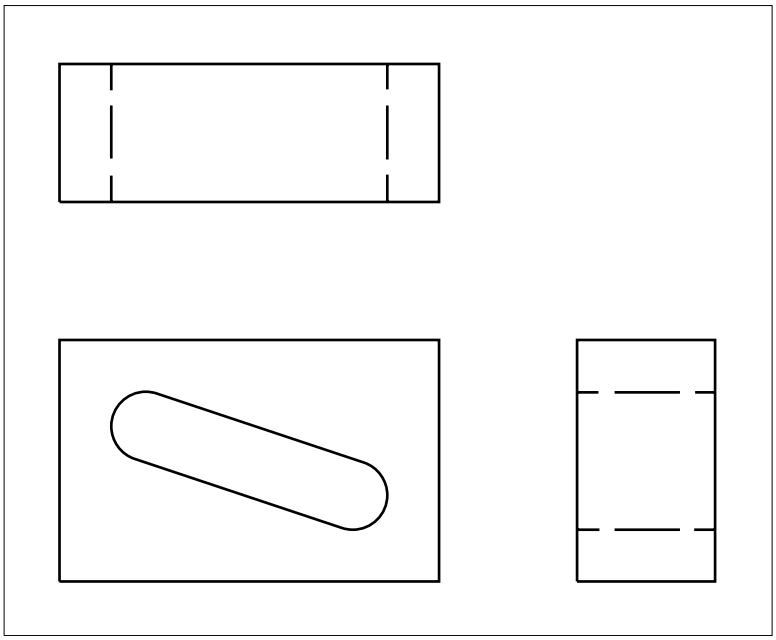


Figure P3–15 The completed drawing

DRAWING EXERCISES 3–1 THROUGH 3–6

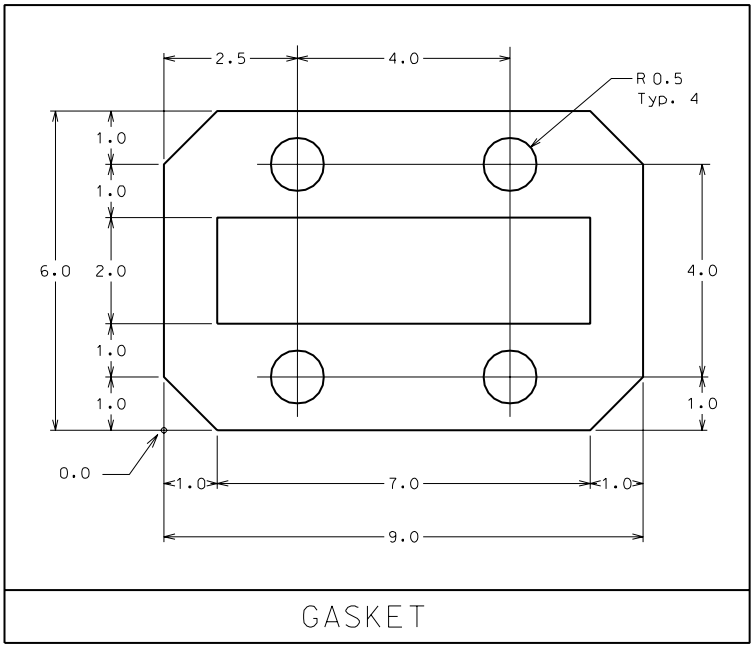
Use the following table to set up the design files for Exercises 3–1 through 3–5.

SETTING	VALUE
Seed File	Seed2D.DGN
Working Units	Master Units = Inches, Sub-Units = Inches
Coordinate Readout	Master Units
Grid	Master = 0.25, Reference = 4, Grid Lock set to ON
Object Elements	Color = White (0), Level = Object, Style = 0, Weight = 1
Hidden Lines	Color = Green (2), Level = Hidden Lines, Style = 2, Weight = 1
Center Lines	Color = Red (3), Level = Center Lines, Style = 4, Weight = 0

Note: Do not place the text or dimensions. Text placement is introduced in Chapters 4 and 7. Dimensioning is introduced in Chapter 9.

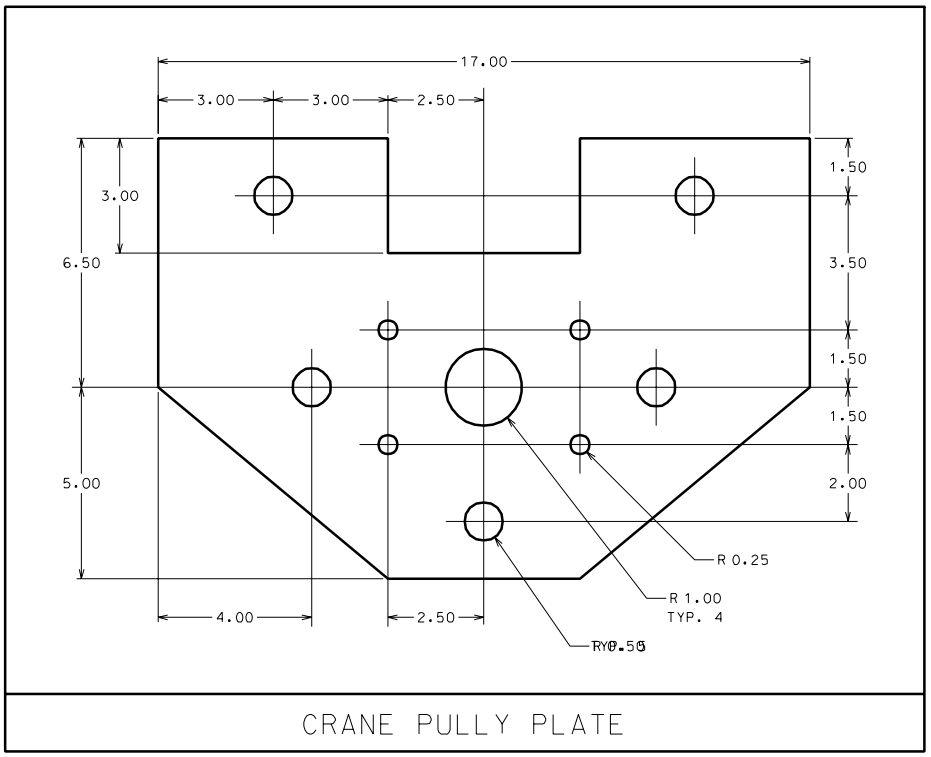
Exercise 3–1

GASKET

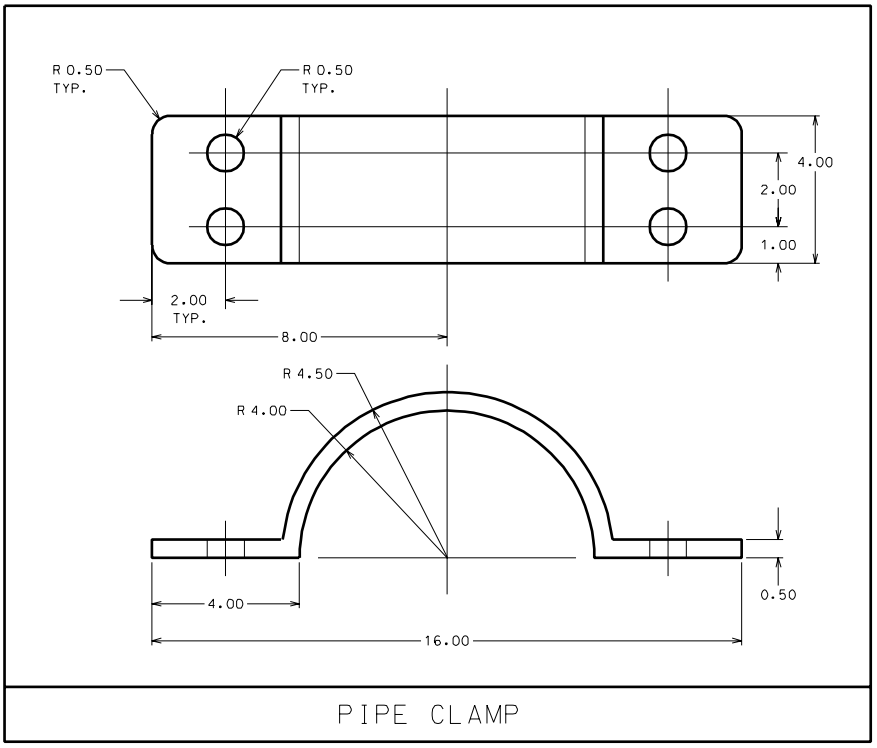


Exercise 3–2

CRANE PULLEY PLATE

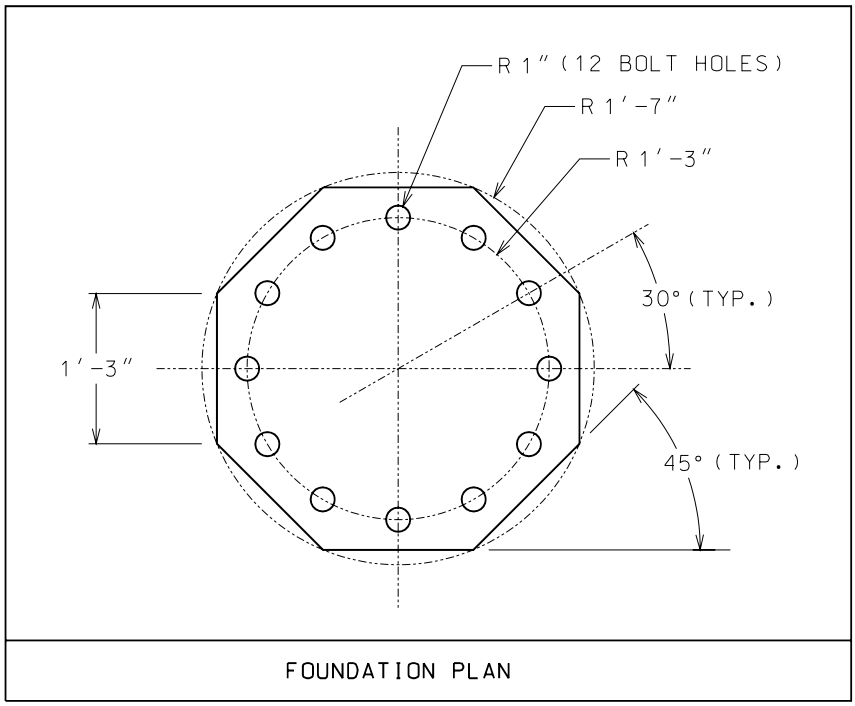


Exercise 3–3
PIPE CLAMP



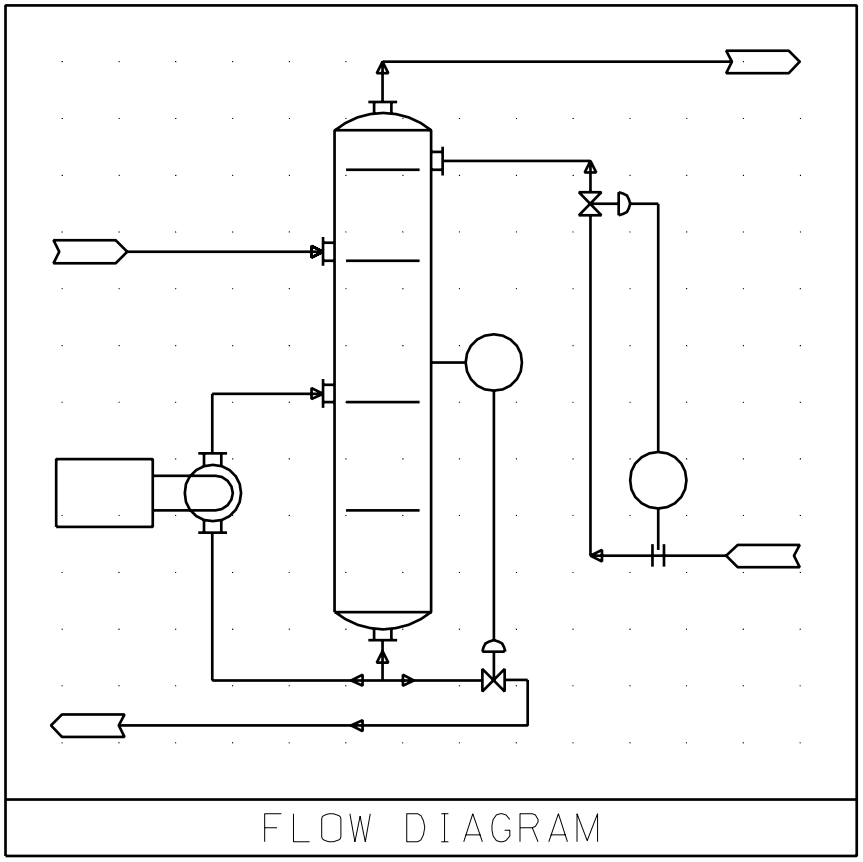
Exercise 3–4

FOUNDATION PLAN



Exercise 3–5

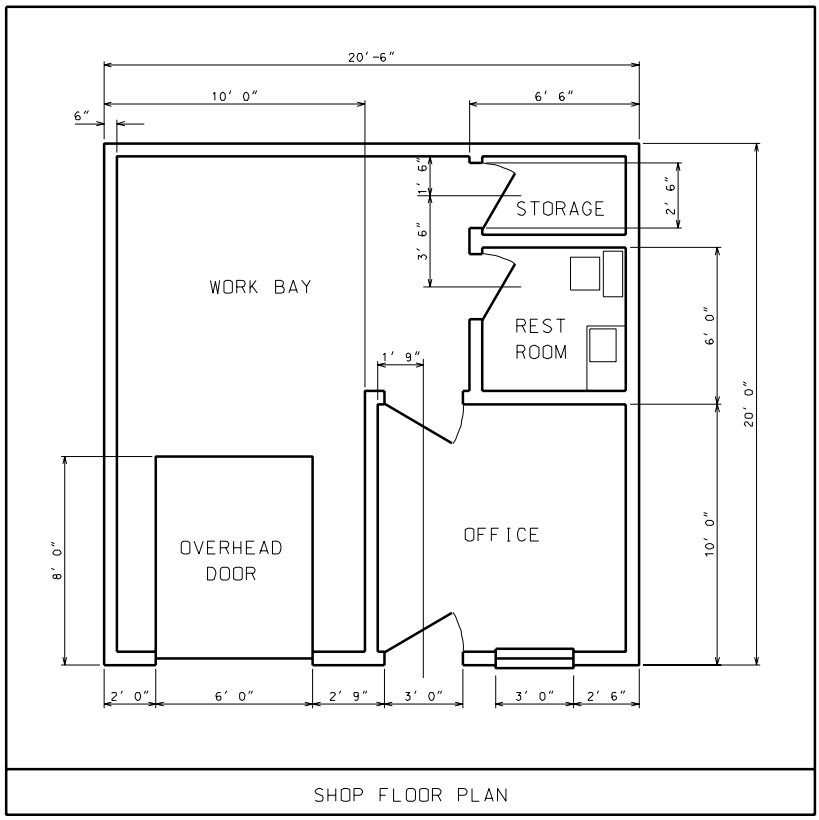
FLOW DIAGRAM



Exercise 3–6

SHOP FLOOR PLAN

SETTING	VALUE
Seed File	Seed2D.dgn
Working Units	Master Units = Feet, Sub-Units = Inches
Coordinate Readout	Sub Units
Grid	Master = 0.25, Reference = 4, Grid Lock set to ON
Object Elements	Color = White (0), Level = Object, Style = 0, Weight = 1
Hidden Lines	Color = Green (2), Level = Hidden Lines, Style = 2, Weight = 1
Center Lines	Color = Red (3), Level = Center Lines, Style = 4, Weight = 0



Use the following table to set up the design file for Exercise 3–6.