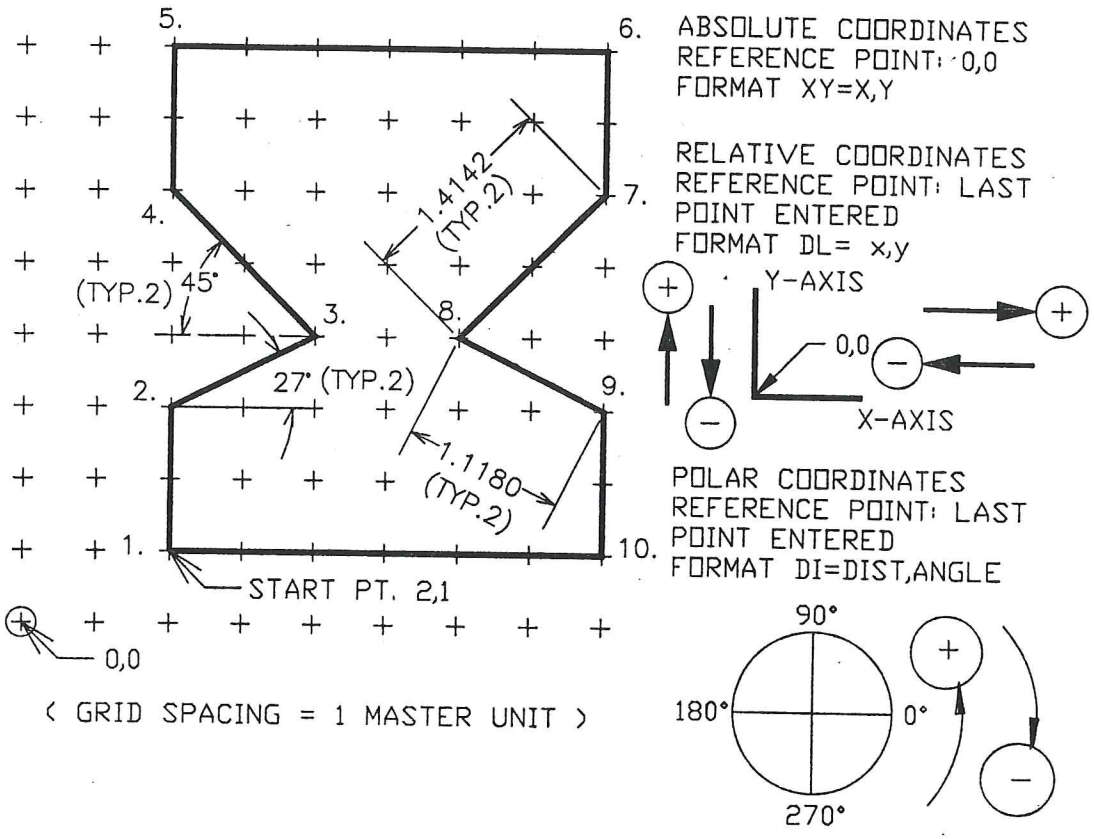
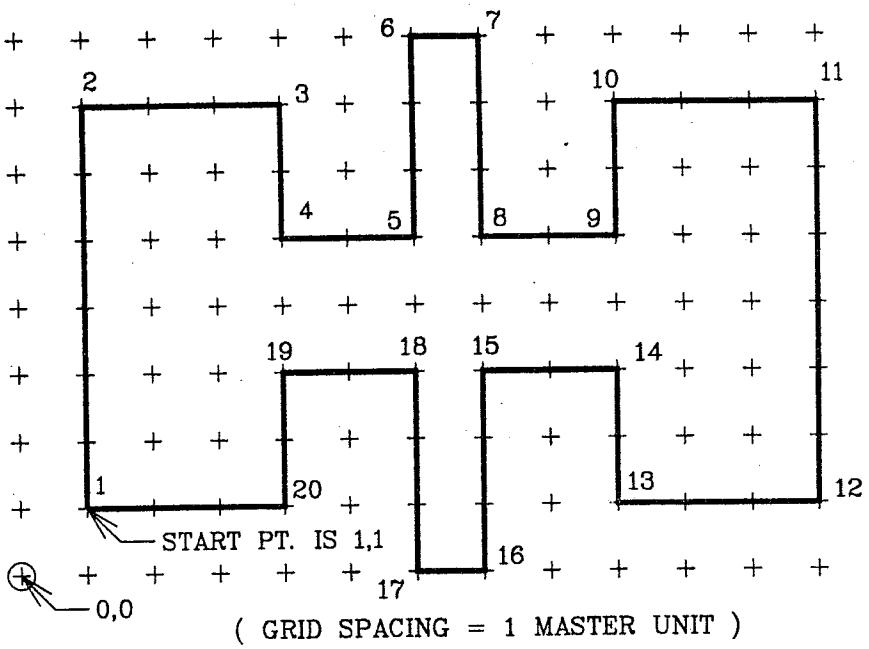


	ABSOLUTE	RELATIVE	POLAR
1.	XY=2,1	XY=2,1	XY=2,1
2.	XY=2,3	DL=0,2	DI=2,90
3.	XY=4,4	DL=2,1	DI=1.1180,27
4.	XY=2,6	DL=-2,2	DI=1.4142,135
5.	XY=2,8	DL=0,2	DI=2,90
6.	XY=8,8	DL=6,0	DI=6,0
7.	XY=8,6	DL=0,-2	DI=2,270
8.	XY=6,4	DL=-2,-2	DI=1.4142,225
9.	XY=8,3	DL=2,-1	DI=1.1180,333
10.	XY=8,1	DL=0,-2	DI=2,270
1.	XY=2,1	DL=-6,0	DI=6,180

FIGURE 2-12 Review of the Coordinate Systems.

EXERCISES

Exercise 2–1



ABSOLUTE COORDINATE EXERCISE
FORMAT IS XY=X,Y (X COORDINATE), (Y COORDINATE)

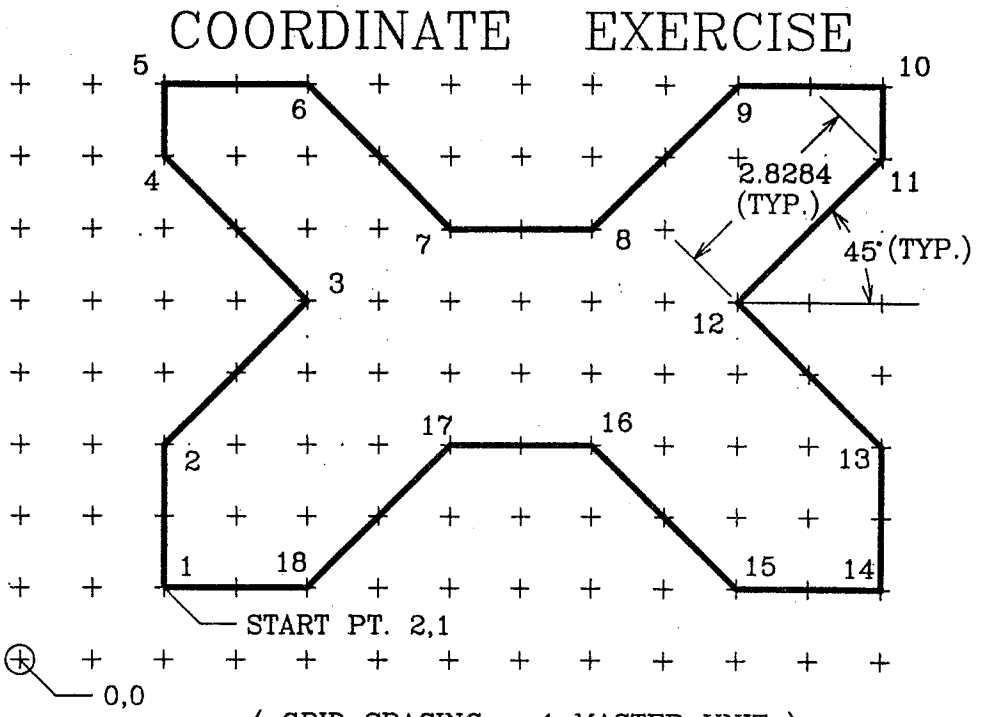
REFERENCE POINT IS (0,0)

KEY–IN THE COORDINATES NESSARY TO DRAW THE FIGURE

1. STARTING POINT IS 1,1
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____ BACK TO 1. _____

FILL IN THE COORDINATES BEFORE DOING THE DRAWING

Exercise 2-2



(GRID SPACING = 1 MASTER UNIT)

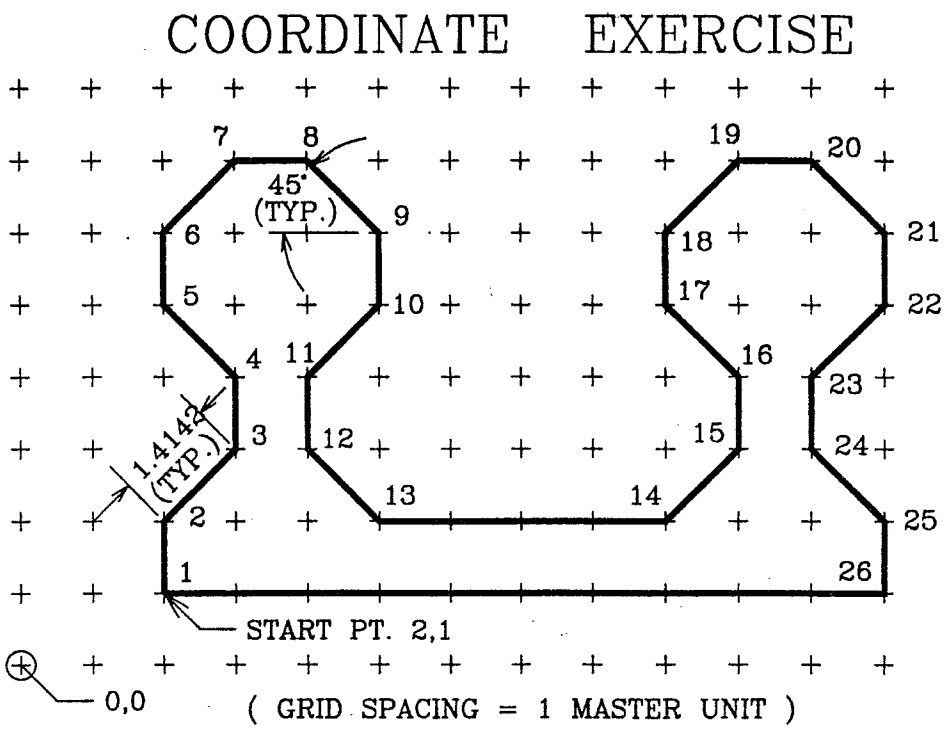
POLAR COORDINATE EXERCISE
FORMAT IS DI=DISTANCE,ANGLE
REFERENCE POINT IS THE LAST POINT ENTERED

KEY-IN THE COORDINATES NECESSARY TO DRAW THE FIGURE

1. STARTING POINT IS 2,1
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____ BACK TO 1 _____

FILL IN THE COORDINATES BEFORE DOING THE DRAWING

Exercise 2-3



USE ABSOLUTE, RELATIVE, OR POLAR COORDINATES TO COMPLETE THIS EXERCISE

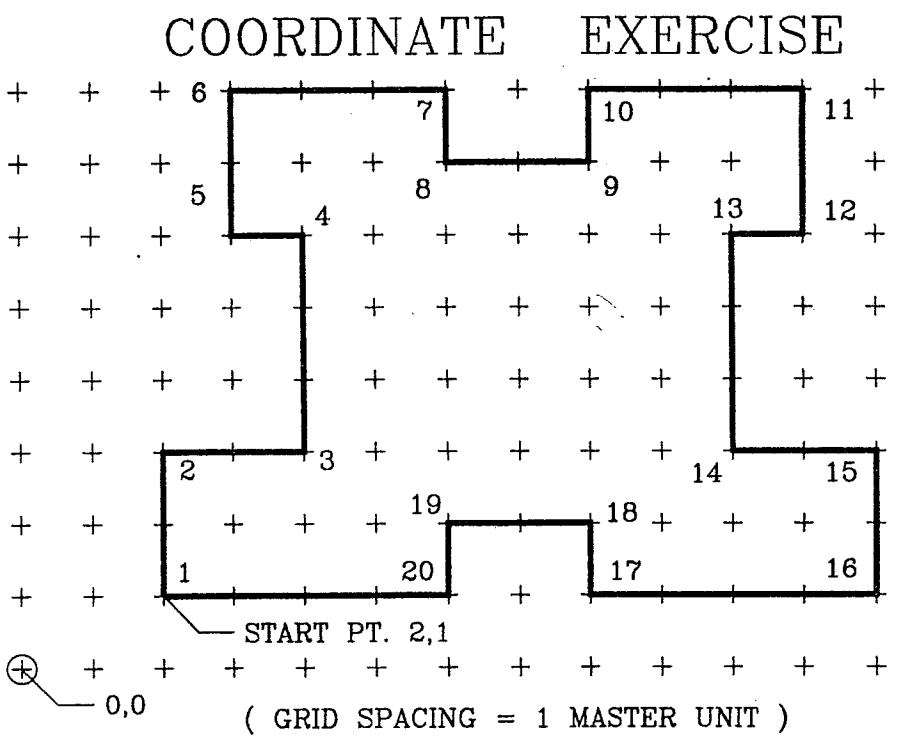
KEY-IN THE COORDINATES NECESSARY TO DRAW THE FIGURE

START POINT IS 2,1

1. _____	14. _____
2. _____	15. _____
3. _____	16. _____
4. _____	17. _____
5. _____	18. _____
6. _____	19. _____
7. _____	20. _____
8. _____	21. _____
9. _____	22. _____
10. _____	23. _____
11. _____	24. _____
12. _____	25. _____
13. _____	26. _____ BACK TO 1. _____

FILL IN THE COORDINATES BEFORE DOING THE DRAWING

Exercise 2–4



RELATIVE COORDINATE EXERCISE
FORMAT IS DL=X,Y
X= (DIST. + OR − ALONG THE X AXIS)
Y= (DIST. + OR − ALONG THE Y AXIS)
REFERENCE POINT IS THE LAST POINT ENTERED

KEY-IN THE COORDINATES NECESSARY TO DRAW THE FIGURE

1. STARTING POINT IS 2,1
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____ BACK TO 1 _____

FILL IN THE COORDINATES BEFORE DOING THE 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.

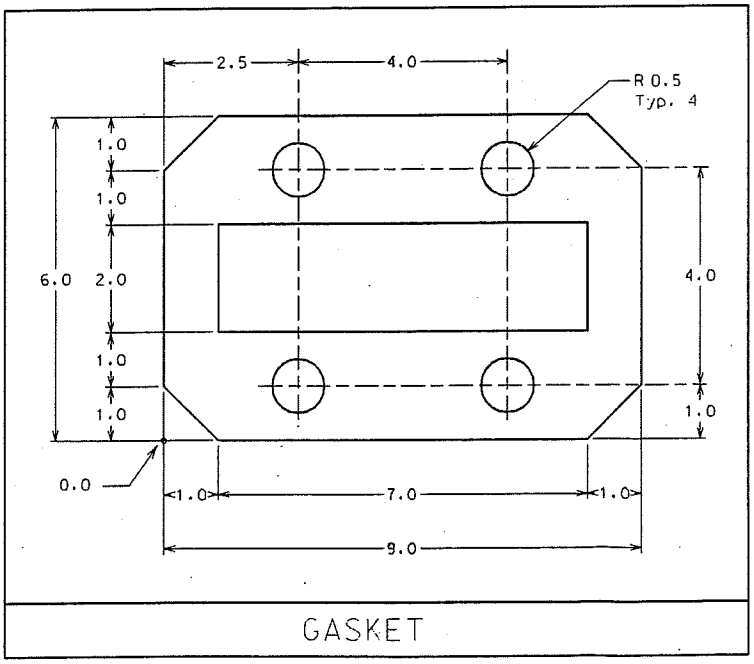
SETTING	VALUE
Seed File	2dEnglishGeneral.DGN
Working Units	Master Units = Inches, Sub-Units = Inches
Coordinate Readout	Master Units
Grid	Master = 0.25, Reference = 4, Grid Lock set to ON
Object Elements	Color = White (0), Level = Object, Style = 0, Weight = 1
Hidden Lines	Color = Green (2), Level =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

Try placing d

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



THE FOLLOWING IS A CONVERSION TABLE THAT ALLOWS CADD TEXT TO MATCH STANDARD LEROY AND KROY TEXT SIZES.

FONT 1: LEROY TEXT WITH NORMAL SPACING
FONT 9: LEROY TEXT WITH NON PROPORTIONAL SPACING(EACH CHARACTER TAKES THE SAME AMOUNT OF SPACE) TO BE USED FOR TABULAR OUTPUT AS IT ALLOWS COLUMNS TO LINE UP.

	LEROY TEMPLATE SIZE					
PLOT SCALE	100 PT TX=	120 PT TX=	140 PT TX=	175 PT TX=	200 PT TX=	240PT TX=
1/8"	.8	.96	1.12	1.4	1.6	1.92
1/4"	.4	.48	.56	.7	.8	.96
1/2"	.2	.24	.28	.35	.4	.48
1"	.1	.12	.14	.175	.2	.24
10'	1	1.2	1.4	1.75	2.0	2.4
20'	2	2.4	2.8	3.5	4.0	4.8
30'	3	3.6	4.2	5.25	6.0	7.2
40'	4	4.8	5.6	7.0	8.0	9.6
50'	5	6.0	7.0	8.75	10.0	12.0
60'	6	7.2	8.4	10.5	12.0	14.4
100'	10	12.0	14.0	17.5	20.0	24.0
200'	20	24.0	28.0	35.0	40.0	48.0
400'	40	48.0	56.0	70.0	80.0	96.0
1000'	100	120.0	140.0	175.0	200.0	240.0
2000'	200	240.0	280.0	350.0	400.0	480.0

English Scales Can Be Written Dimensionless →

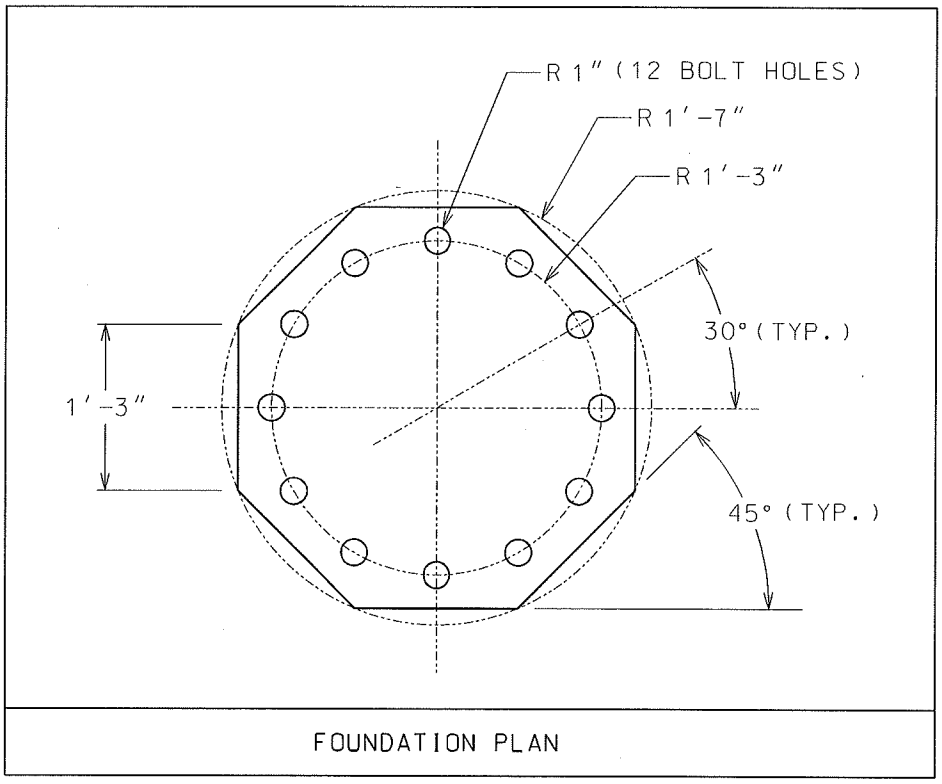
	1" = 8 ft	1:96
	1" = 4 ft	1:48
	1" = 2 ft	1:24
	1" = 1 ft	1:12
*	1" = 10 ft	1:120
	1" = 20 ft	1:240
	1" = 30 ft	1:360
	1" = 40 ft	1:480
	1" = 50 ft	1:600
	1" = 60 ft	1:720
	1" = 100 ft	1:1200
	1" = 200 ft	1:2400
	1" = 400 ft	1:4800
	1" = 1000 ft	1:12,000
	1" = 2000 ft	1:24,000 ← TOPO MAPS

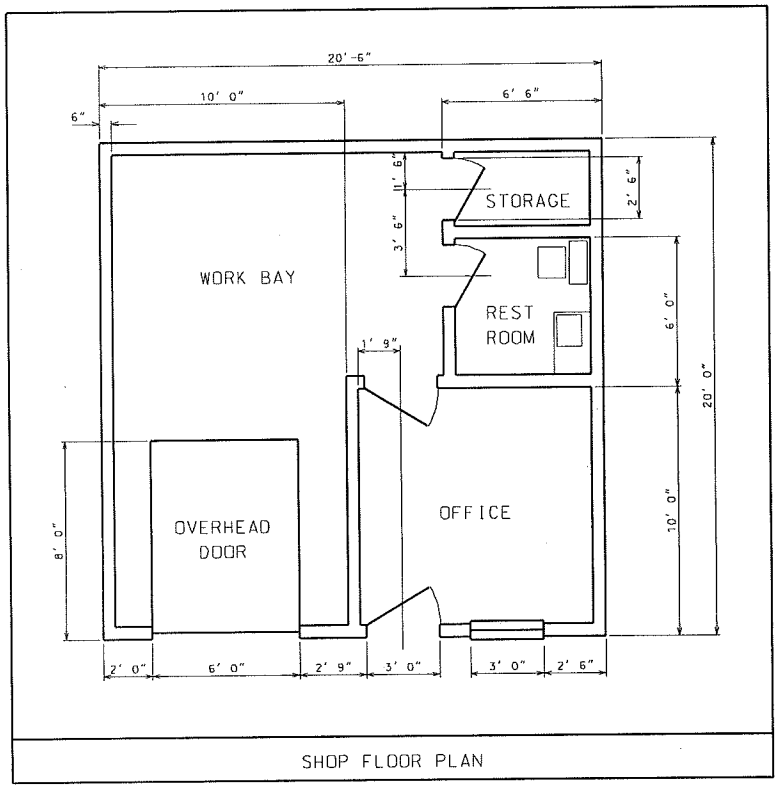
Metric Scales are Dimensionless

1:50	(≈ 5 scale)
1:100	(≈ 10 scale)
1:250	(≈ 20 scale)
1:500	(≈ 40 scale)
1:1000	(≈ 80 scale)

* $\frac{1\text{"}}{10\text{ ft}} \Big| \frac{\text{ft}}{12\text{"}} = \frac{1}{120}$

Exercise 3–4
FOUNDATION PLAN





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

Exercise 3-6

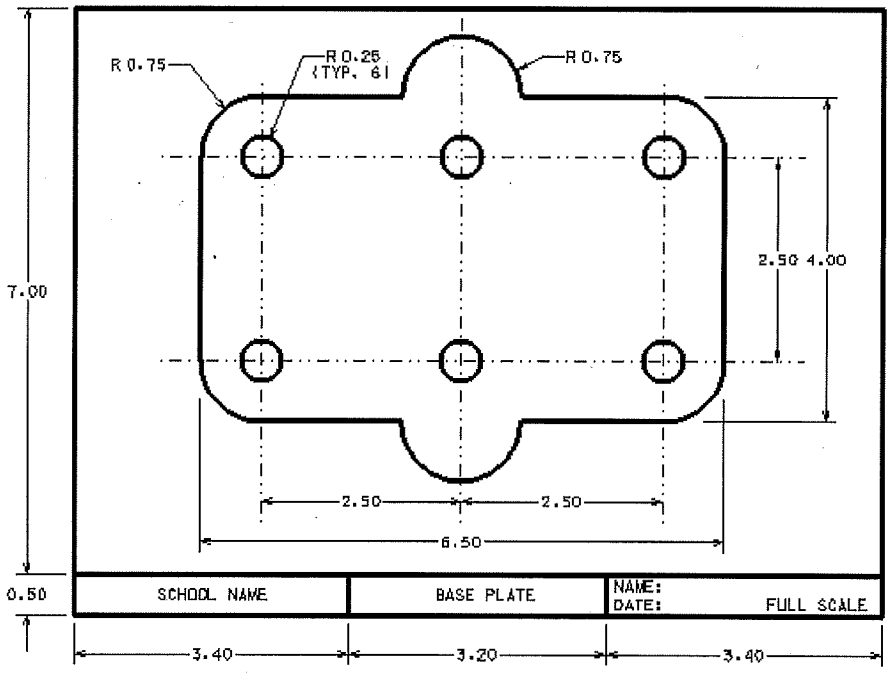


Figure P4–1 Completed project design

PREPARE THE DESIGN FILE

This procedure has you start MicroStation, create a design file, and enter the initial settings.

STEP 1: Invoke MicroStation program.

STEP 2: Create a new design file named **CH4.dgn** using the **seed2d.dgn** seed file.

STEP 3: In the Design File dialog box:

- Select the **Working Units** category and set the **Master Unit** and **Sub Unit** to Inches.
- Select the **Coordinate Readout** category and set the **Coordinates Format** to **Master Units**.
- Click the **OK** button to close the Design File dialog box.

STEP 4: Open the design File dialog box again, select the **Grid** category, set the **Grid Master** to 0.1 and the **Grid Reference** to 10, turn OFF the **Grid Lock**, and click **OK** to close the dialog box.

STEP 5: Click the **Active Snap Mode** icon in the Status bar and, in the Snaps menu, select **Keypoint** mode while pressing SHIFT.

STEP 6: Select **Settings > Level > Manager** to open the Level Manager settings box, and create the following level names and assign the properties:

- Objects

- Center Lines
- Title Block – Color to blue (1), Line Style to 0 (solid line), and Line Weight to 2.

STEP 7: In the Attributes tool box, set the **Active Level** to **Title Block**.

STEP 8: Click **Active Snap Mode** on the Status bar and select **AccuSnap** from the Snaps menu.

STEP 9: In the AccuSnap settings box, turn the **Enable AccuSnap** check box ON, turn on any other AccuSnap settings you want to use for tentative snapping, and close the settings box.

STEP 10: Select **File > Save Settings**

DRAW THE BORDER AND TITLE BLOCK

This procedure presents the steps for drawing the border and title block, as shown in Figure P4–2.

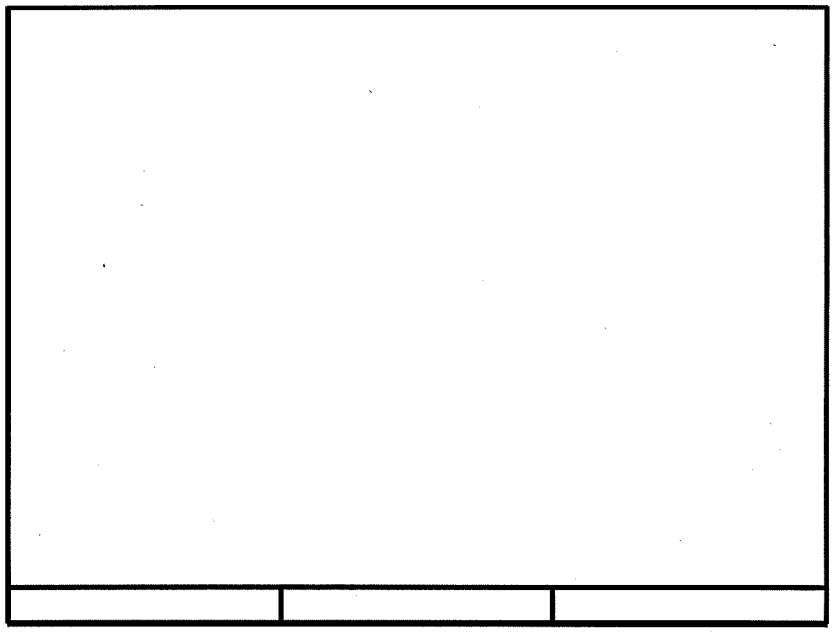


Figure P4–2 Border and title block before the title block text is entered

STEP 1: Create the border by drawing a block ~~12~~ 10 inches wide by ~~9~~ 8.5 inches tall, with the lower left corner at coordinate **0,0**.

STEP 2: Fit the view.

STEP 3: Create the title block area by drawing a horizontal line across the width of the block and one-half inch above the bottom of the block.

STEP 4: Divide the title block into three sections of equal width by drawing two vertical lines.

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

Compare your completed border to the one shown in Figure P4–2.

FILL IN THE TITLE BLOCK TEXT

This procedure has you place text in the title block, as shown in Figure P4–3.

Figure P4–3 Filled-in title block

STEP 1: Set the Active **Line Weight** to **0**.

STEP 2: Invoke the Place Text tool from the Task Navigator tool box (active task set to Text) and, in the Tool Settings window, click the expand arrow on the lower right corner of the box to display additional tool settings.

STEP 3: Set the values in the Text tool settings as shown in Figure P4–4.

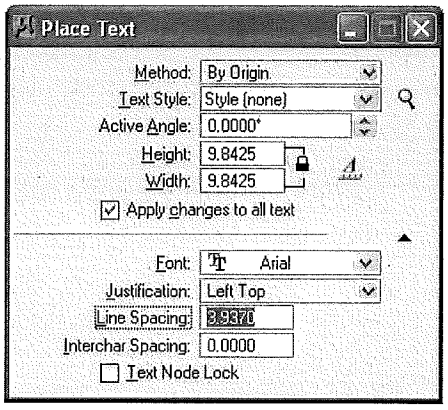


Figure P4–4 Enter the text parameters shown here

STEP 4: In the Text Editor window, type a school or company name and place the text in the left title block area.

STEP 5: Clear the Text Editor window, type **BASE PLATE** in the window, and place the text in the center title block area.

STEP 6: In the Tool Settings window, set the **Height** and **Width** to 0.125 and the **Justification** to **Left Top**.

STEP 7: Use either the Zoom In or Window Area tool to zoom in close to the right title block area.

STEP 8: In the right title block area, place the text shown in Figure P4–3. Key-in **Name:** and your name, press ENTER, key-in **Date:** and today's date, and then key-in three spaces and the scale information.

STEP 9: Fit the view and select **File > Save Settings**.

Compare your completed title block to the one shown in Figure P4–3.

DRAW THE CENTER LINES

This procedure describes the steps required to draw a horizontal and vertical centerline, and then use the Copy Parallel tool to create the other three centerlines, as shown in Figure P4–5.

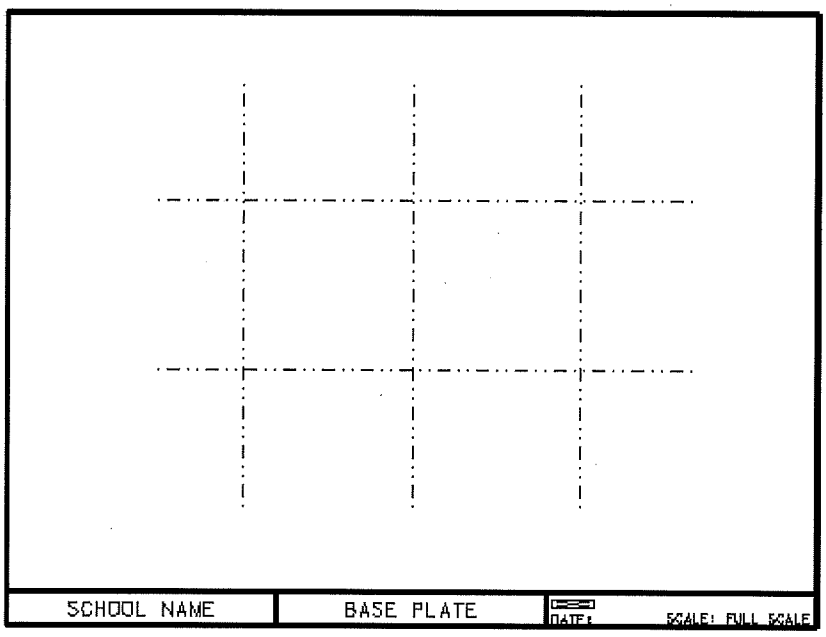


Figure P4–5 Completed centerlines

STEP 1: In the Attributes tool box, set the **Active Level** to **Center Lines**, set the **Active Color** to **green** (2), the **Active Line** Style to **6** (center line), and the **Active Line Weight** to **0**.

STEP 2: Place the top horizontal centerline 8 inches long starting at coordinate **2.25,6.25**.

STEP 3: Place the left vertical centerline 6.25 inches long starting at coordinate **3.5,1.75**.

STEP 4: Invoke the Move Parallel tool from the Manipulate tool box. In the Tool Settings window, turn ON the **Make Copy** and **Distance** check boxes, and key-in **2.5** in the **Distance** text field.

STEP 5: Select the horizontal centerline, move the pointer below the line, and click the Data button to place a copy of the line 2.5 inches below the original line.

STEP 6: Click the Reset button to release the line and then select the vertical centerline.

STEP 7: Make two parallel copies of the vertical centerline.

Compare your completed centerlines to Figure P4–5.

DRAW PART OF THE BASE PLATE OUTLINE

This procedure draws the left half of the base plate outline using the Place Line, Fillet, and Arc tools, as shown in Figure P4–6. The figure shows the top arc as it is initially placed. The arc is mirrored after placement to correct its orientation.

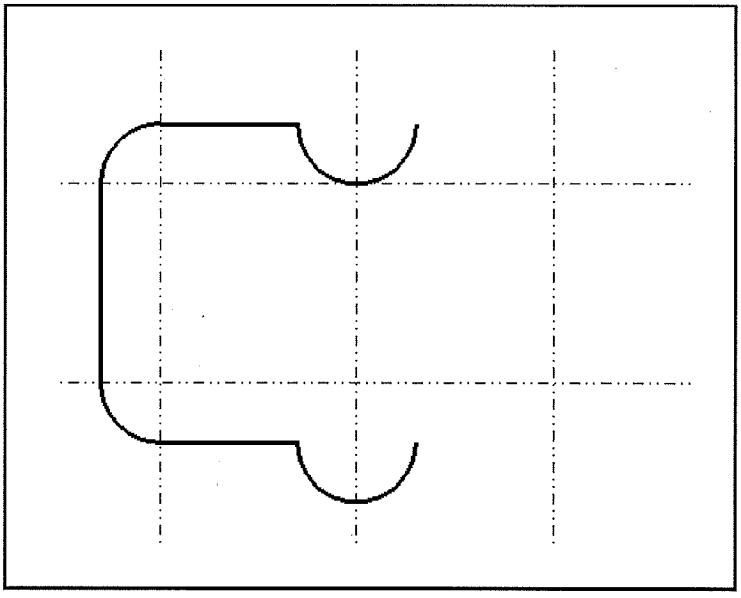


Figure P4–6 Result of drawing the left half of the base plate outline

STEP 1: In the Attributes tool box, set the **Active Level** to **Object**, set the **Active Color** to **white** (0), the **Active Line** Style to **0** (solid line), and the **Active Line Weight** to **2**.

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

STEP 3: Invoke the Place Line tool from the Task Navigator tool box (active task set to Linear) and place three lines using the following precision key-ins (see Figure P4–7):

- XY=5.25,3
- DI=2.5,180
- DI=4,90

- DI=2.5,0

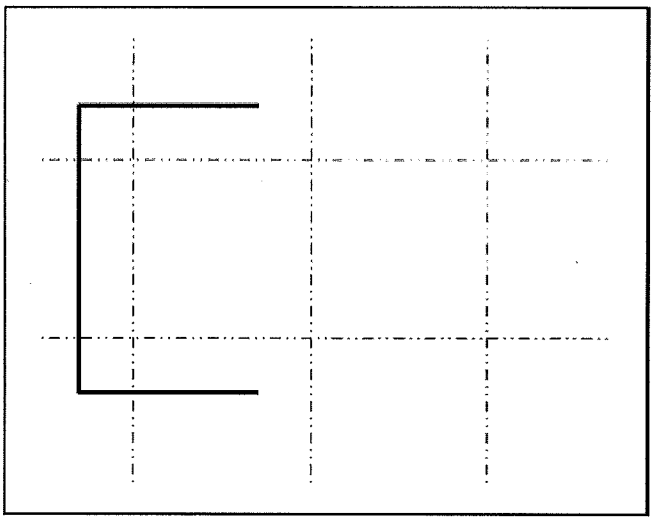


Figure P4–7 View after placing three lines in Step 2

STEP 4: Invoke the Construct Circular Fillet tool from the Modify tool box. In the Tool Settings window, key-in **0.75** in the Radius text field and select **Truncate > Both**.

STEP 5: Select the bottom horizontal line and then select the vertical line.

STEP 6: Click the Data button to complete placing the circular fillet.

STEP 7: Construct a circular fillet at the intersection of the vertical line and the top horizontal line.

STEP 8: Invoke Place Arc from the Arcs tool box. In the Tool Settings window, make the following settings:

- Select **Method > Edge**.
- Turn the **Radius** check box ON and key-in **0.75** in the associated text field.
- Turn the **Start Angle** check box ON and key-in **180** in the associated text field.
- Turn the **Sweep Angle** check box ON and key-in **180** in the associated text field.

STEP 9: Drag the pointer toward the right end of the bottom horizontal line until AccuSnap snaps to the end of the line. Click the Data button to accept the point and place an arc at the end of the line.

STEP 10: Drag the pointer toward the right end of the top horizontal line until AccuSnap snaps to the end of the line. Click the Data button to accept the point and place an arc at the end of the line.

COMPLETE THE BASE PLATE OUTLINE

This procedure uses the Mirror tool to complete the outline of the base plate, as shown in Figure P4–8.

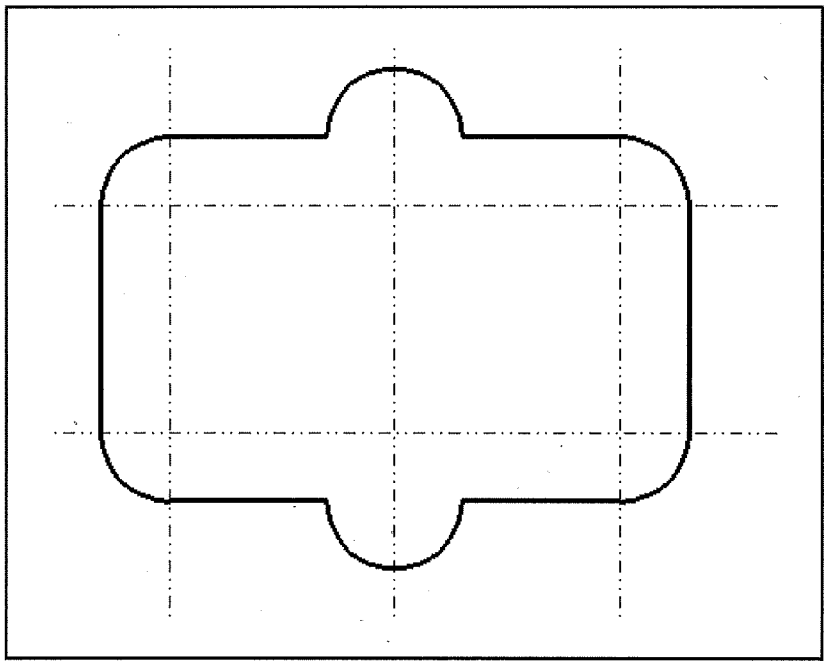


Figure P4–8 Completed base plate outline

STEP 1: Invoke the Mirror tool from the Manipulate tool box. In the Tool Settings window, select **Mirror About > Horizontal** and turn the **Make Copy** check box OFF.

STEP 2: Select the top arc and drag the pointer toward the right end of the top horizontal line until AccuSnap snaps to either the end of the line or the arc.

STEP 3: Click the Data button to accept the snap point and mirror the arc, and click the Reset button to release the arc.

STEP 4: In the Tool Settings window, select **Mirror About >** Vertical and turn the **Make** Copy check box ON.

STEP 5: Click the Active Snap Mode button in the Status Bar and in the Snaps menu, make **Center** the permanent snap mode.

STEP 6: Select the top, left fillet and drag the pointer toward the center of one of the arcs until AccuSnap snaps the arc center.

STEP 7: Click the Data button to accept the snap and place a mirrored copy of the fillet, and then click the Reset button to release the arc.

STEP 8: Using the center of one of the arcs as the mirror axis, create mirrored copies of the other fillet, the two horizontal lines and the vertical line.

Compare your design to Figure P4–8.

PLACE THE BOLT HOLE CIRCLES

This procedure uses the Place Circle and Array tools to place the bolt hole circles in the design, as shown in Figure P4–9.

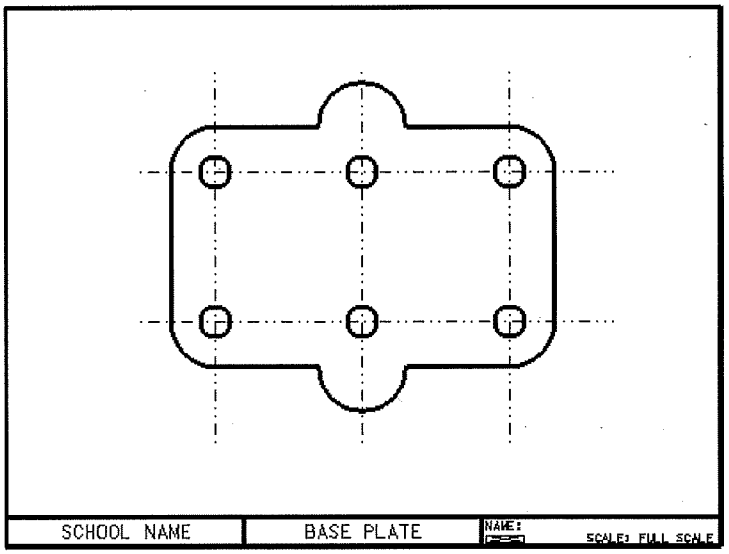


Figure P4–9 Design after placing the bolt hole circles

STEP 1: Click Active Snaps Mode on the Status bar, and in the Snaps menu, make **Intersection** the permanent snap mode.

STEP 2: Invoke the Place Circle tool from the he Task Navigator tool box (active task set to Circles). In the Tool Settings window, select **Method > Center**, turn ON the checkbox at the bottom of the window, select **Radius** from the drop-down menu, and key-in a **Radius** of **0.25**.

STEP 3: Move the pointer toward the intersection of the bottom and left vertical centerlines until AccuSnap snaps to the intersection.

STEP 4: Click the Data button to place a circle at the intersection and click the Reset button to release the circle as shown in Figure P4–10.

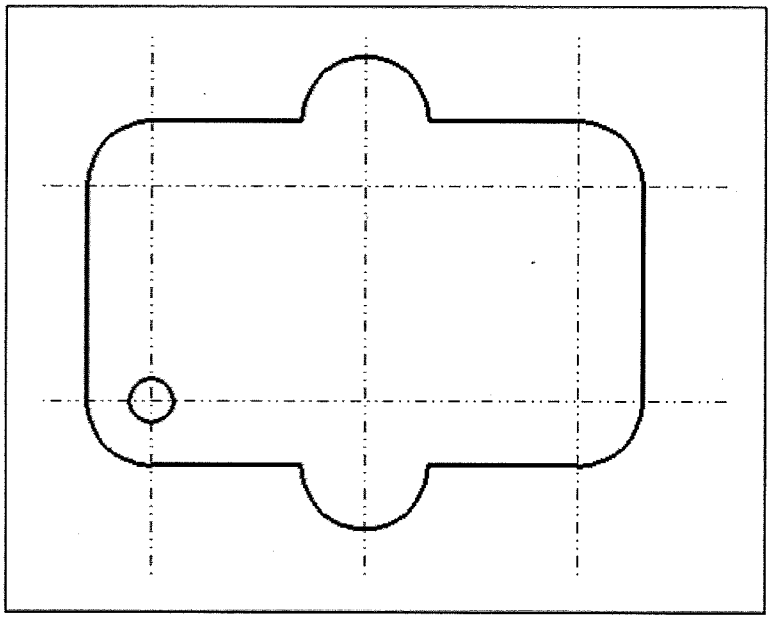


Figure P4–10 A circle is placed on the lower left center intersection

STEP 5: Invoke the Construct Array tool from the Manipulate tool box. In the Tool Settings window, make the following settings:

- **Array Type > Rectangular**
- **Active Angle:** 0
- **Rows:** 2
- **Columns:** 3
- **Row Spacing:** 2.5
- **Column Spacing:** 2.5

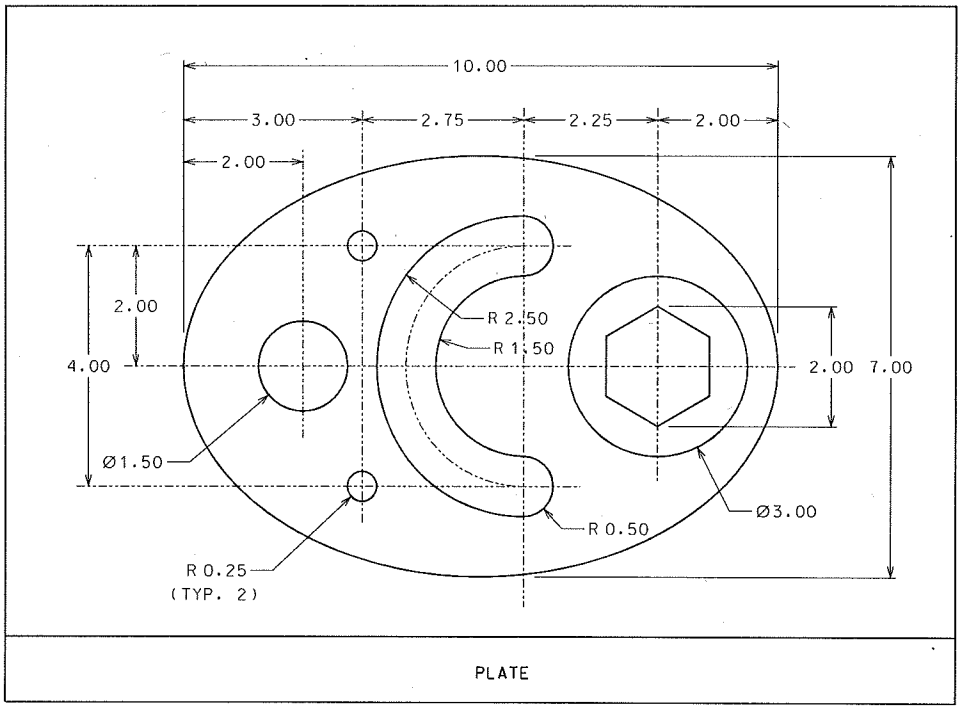
STEP 6: Select the circle and then move away from the circle and click the Data button to accept the circle and construct the rectangular array.

STEP 7: Select **File > Save** Settings.

Compare your design to Figure P4–9.

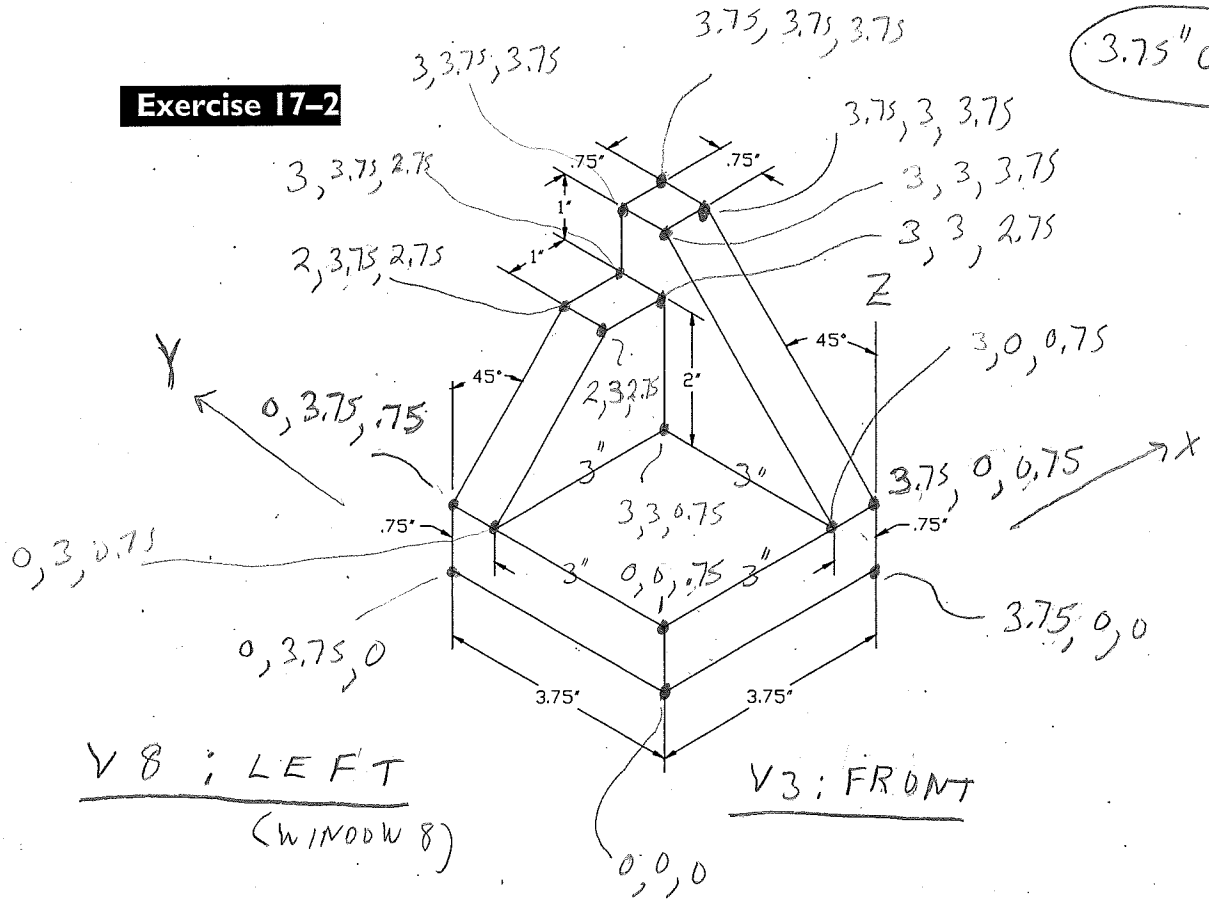
Exercise 4–2

PLATE



V2 : ISOMETRIC

Exercise 17–2



V8 ; LEFT
(WINDOW 8)

V3 ; FRONT

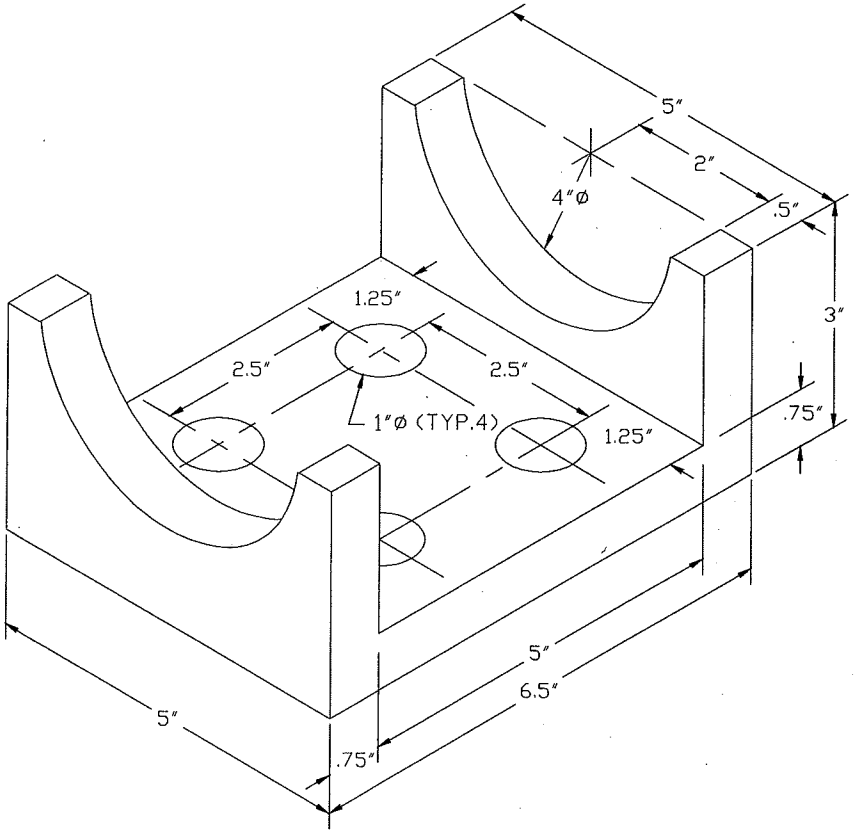
CHAPTER 17

3D Design and Rendering

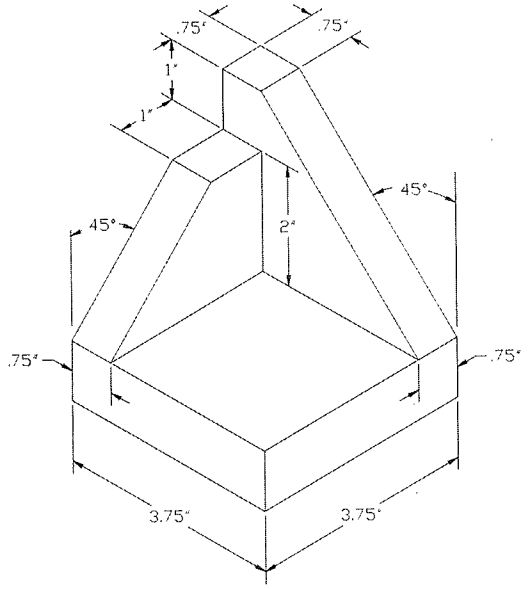
DRAWING EXERCISES 17–1 THROUGH 17–5

Lay out the objects shown in *3D* form. Create the design to the given dimensions.

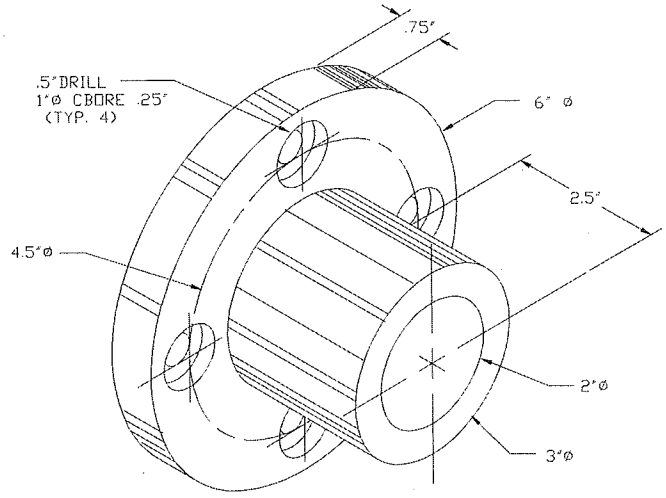
Exercise 17–1



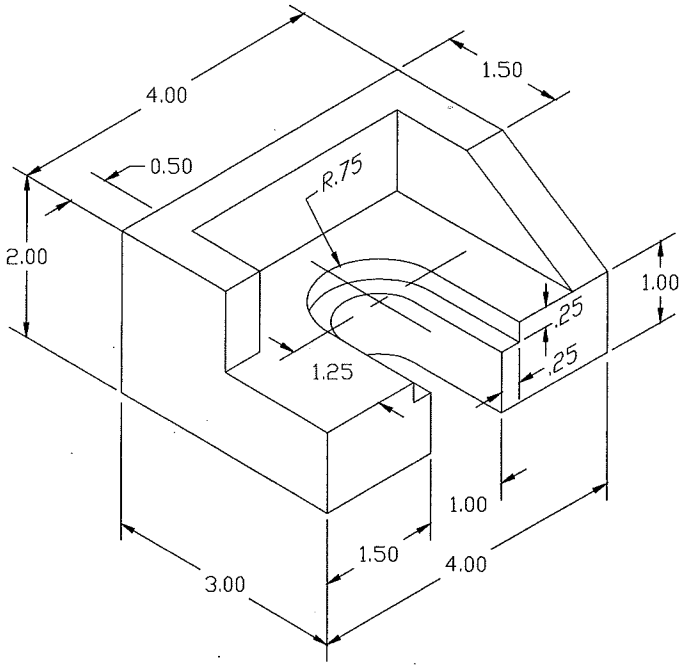
Exercise 17–2

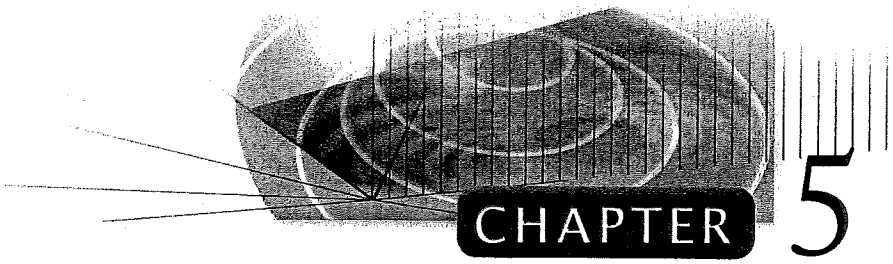


Exercise 17–3



Exercise 17–4





CHAPTER 5

AccuDraw and SmartLine

PROJECT EXERCISE

This project exercise provides step-by-step instructions for creating the design shown in Figure P5–1. The intent is to guide you in applying AccuDraw and SmartLine.

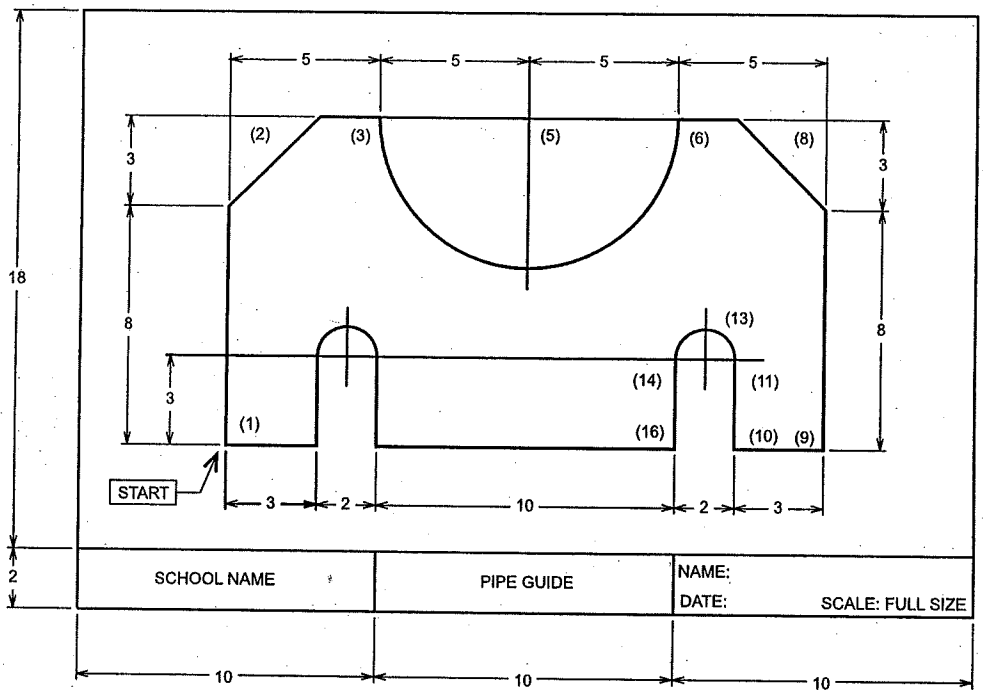


Figure P5–1 Completed project design

Notes: The dimensions are not part of this project. They are included in Figure P5–1 only to show the size of the design.

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.

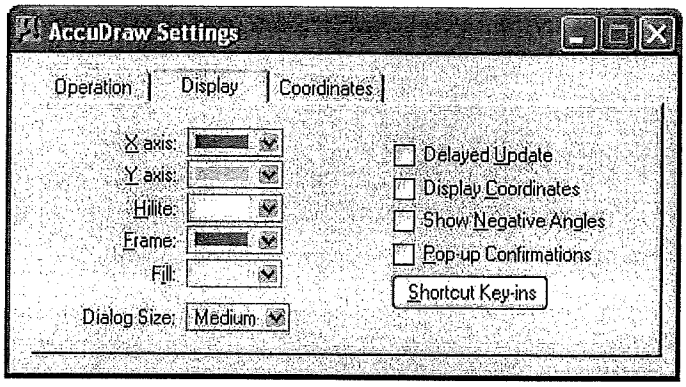


Figure P5–4 AccuDraw Display settings

STEP 10: Click the **Coordinates** tab and make the settings shown in Figure P5–5.

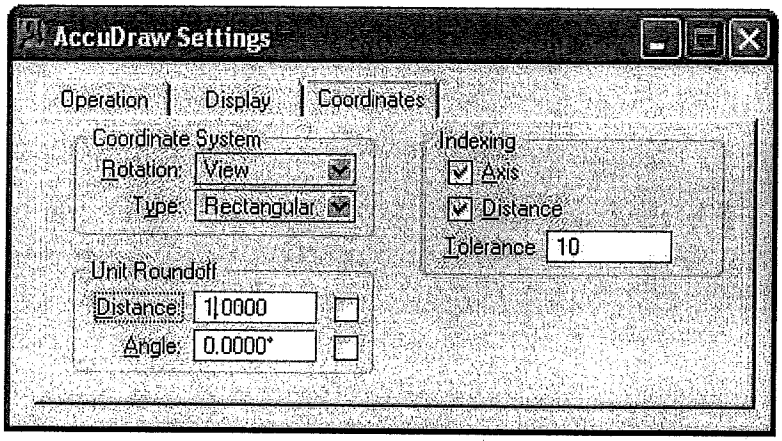


Figure P5–5 AccuDraw Coordinates settings

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

DRAW THE BORDER AND TITLE BLOCK

Draw the border and title block as shown in Figure P5–1, employing AccuDraw to aid in element placement.

STEP 1: Invoke the Place Block tool from the Task Navigator tool box (active task set to Polygons) and select the **Orthogonal Method.**

MicroStation prompts:

Place Block > Enter first point

Place a data point to define the lower left corner of the border.

Place Block > Enter opposite corner

- Place your name to the right of "NAME."
- Place today's date to the right of "DATE."

DRAW THE DESIGN

Draw the pipe guide shown in Figure P5–1 using AccuDraw and SmartLine.

STEP 1: Invoke Place SmartLine from the Task Navigator tool box (active task set to Linear), as shown in Figure P5–6. In the Tool Settings window, set the **Vertex Type** to **Chamfered**, and key-in **3** in the **Chamfer Offset** text field.

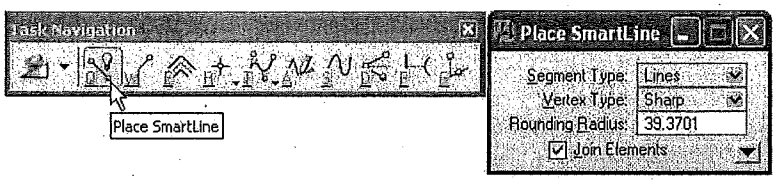


Figure P5–6 Invoke Place SmartLine and set the Chamfer Offset to 3

Note: Numbers in parentheses have been added to the following MicroStation prompts and to Figure P5–1, to help you keep up with where you are in the procedure for drawing the pipe guide. Those numbers do not appear in the MicroStation prompts on the screen and will not be drawn.

MicroStation prompts:

(1) Place SmartLine > Enter first vertex

Move the pointer over the lower left corner of the border block until AccuSnap snaps to the corner and click the Tentative Button. Key in the letter O to center the AccuDraw compass over the tentative point. In the AccuDraw coordinates box key-in 5.5 in the Y text field and 5 in the X text field. Click the Data button to start the SmartLine.

(2) Place SmartLine > Enter the next vertex or reset to complete

Move the pointer up until the AccuDraw coordinates box displays 11.0000 in the Y text field and click the Data button to complete placing the first SmartLine segment.

(3) Place SmartLine > Enter the next vertex or reset to complete

Move the pointer to the right until the AccuDraw coordinates box X text field displays 5.0000 and click the Data button.

The completed portion of the pipe guide should match Figure 5–7.

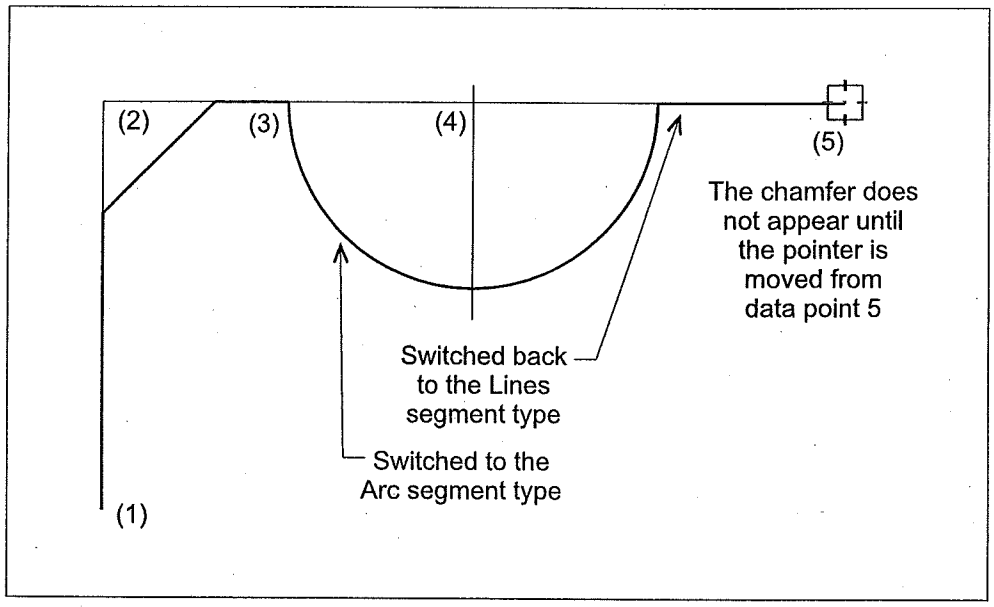


Figure P5–8 The completed left and top sides of the pipe guide

(9) Place SmartLine > Enter the next vertex or reset to complete

Move the pointer down until the AccuDraw coordinates box Y text field displays -11.0000, and click the Data button.

(10) Place SmartLine > Enter the next vertex or reset to complete

Change the SmartLine Vertex Type to Sharp. Move the pointer to the left until the AccuDraw coordinates box X text field displays –3.0000 and click the Data button.

(11) Place SmartLine > Enter the next vertex or reset to complete

Move the pointer up until the AccuDraw coordinates box Y text field displays 3.0000 and click the Data button.

(12) Place SmartLine > Enter the next vertex or reset to complete

Change the SmartLine Segment Type to Arcs.

(13) Place SmartLine > Enter arc center

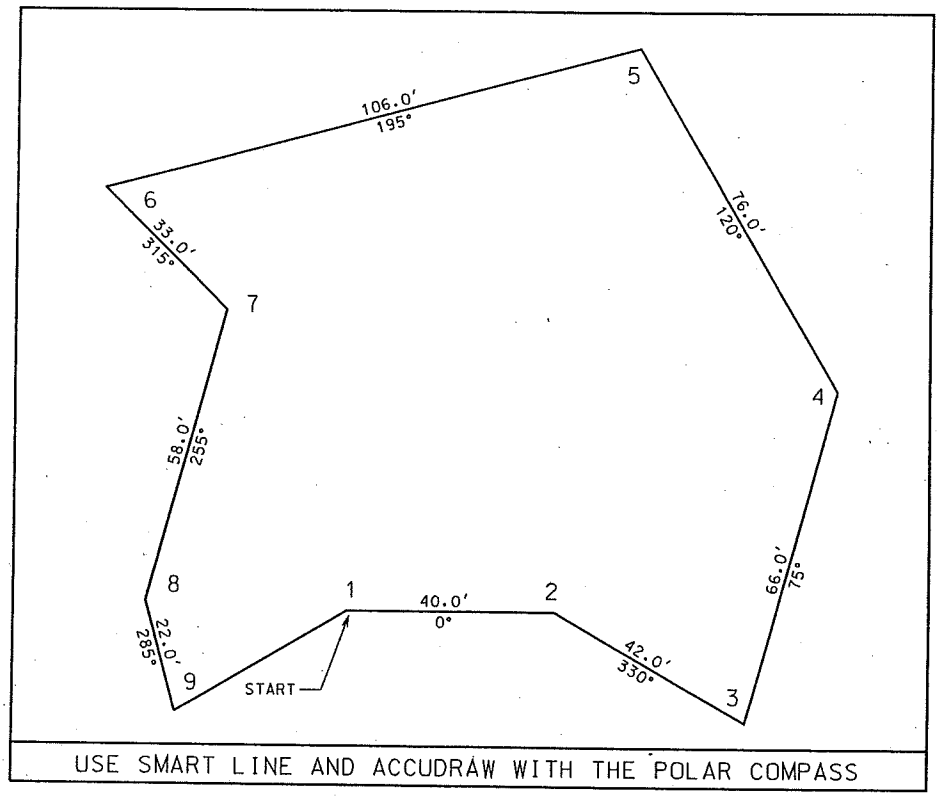
Move the pointer to left until the Accu-Draw coordinates box X text field displays –1.0000, and click the Data button to define the center of the arc.

(14) Place SmartLine > Define sweep angle

Move the pointer to left until the AccuDraw coordinates box X text field displays –1.0000 and click the Data button to complete the arc.

Exercise 5–4

PLOT PLAN



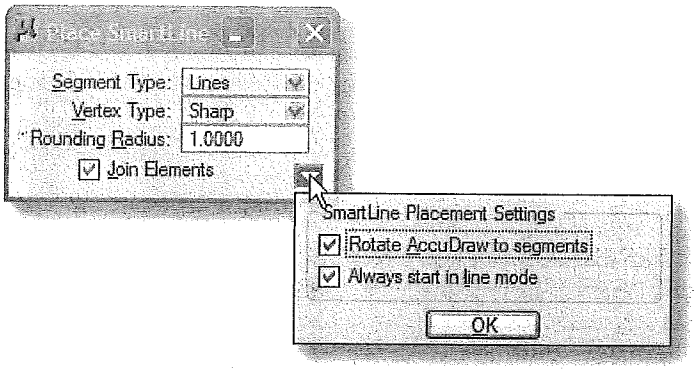


FIGURE 5–26 *The SmartLine Placement Settings box*

If the **Rotate AccuDraw to Segments** check box is ON, the AccuDraw compass rotates so that its *X-axis* is in line with the angle of the segment to which it is attached. If the check box is OFF, the compass rotation is always zero, with its *X-axis* parallel to the design plane's *X-axis*. This check box overrides rotations in the AccuDraw Settings box.

If the **Always Start in Line Mode** checkbox is ON, SmartLine always starts with the **Segment Type** set to **Lines** when it is selected from the Linear Elements tool box. This occurs even if it was left set for Arcs the last time it was used.

Using SmartLine with AccuDraw

The following example illustrates the use of SmartLine and AccuDraw by creating the simple design shown in Figure 5–27. The letters in the figure point to the locations of all data points. It assumes the design file has its Master and Sub Units both set to inches and the active view window is set to display an area of about six by eight inches.

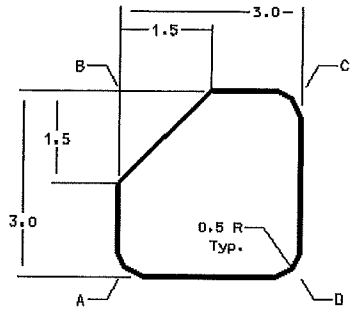


FIGURE 5–27 *Example of a drawing made with the SmartLine tool*

1. If AccuDraw is not active, invoke the AccuDraw tool.
2. Open the AccuDraw Settings box.
3. On the **Coordinates** tab, lock the **Distance** roundoff value at **0.5** inch, lock the **Angle** roundoff value at **90** degrees, select the **Polar** Coordinate System **Type**, and close the AccuDraw Settings box.
4. Invoke SmartLine from the Lines tool box.

5. In the Tool Settings window, select the **Lines Segment Type**, select the **Chamfered Vertex Type**, key-in a **Chamfer Offset** of 1.5 inches, turn ON the **Join Elements** check box, and, in the **Extended Settings** part of the settings box, turn ON the **Rotate AccuDraw to Segments** check box.
6. Define a point near the bottom left of the view window to start the object (Point A).

NOTE

Because the AccuDraw distance roundoff value also forces the first data point to a multiple of the roundoff value on the design plane grid, the point may not be placed exactly where the Data button was clicked.

7. Move the pointer up until the AccuDraw settings box **Distance** field displays 3 inches and click the Data button (Point B).
8. Move the pointer to the right until the AccuDraw settings box **Distance** field displays 3 inches and click the Data button (Point C).

NOTE

The 1.5 inch offset chamfer does not appear until there is room for it on the line segment (when the pointer has moved at least 1.5 inches to the right).

9. In the Tool Settings window, select the **Rounded Vertex Type** and set the **Rounding Radius** to 0.5 inch.
10. Move the pointer down until the AccuDraw settings box **Distance** field displays 3 inches and click the Data button (Point D).
11. Slide the pointer to the left until the AccuDraw settings box **Distance** field displays 3 inches and touches the starting point of the SmartLine (Point A) and click the Tentative button.
12. If the **Closed Element** check box is OFF in the Tool Settings window, turn it ON.
13. Click the Data button to close the element and complete the SmartLine operation.

The completed element should be identical to the element shown in Figure 5–27 (without the dimensions and letters).

Open the Exercise Manual PDF file for Chapter 5 on the accompanying CD for project and discipline specific exercises.

REVIEW QUESTIONS

Write your answers in the spaces provided.

1. How is AccuDraw activated?

   _____

2. Name the two coordinate systems that can be used with AccuDraw.

   _____

3. Name three settings that can be adjusted in the AccuDraw Settings box **Operation** tab.

   _____, _____, and _____.

4. What is the purpose of rounding off AccuDraw distances and angles?

   _____

5. How are previous values recalled in the AccuDraw settings box?

   _____

Manipulating a Group of Elements

PROJECT EXERCISE

This project exercise provides systematic instructions for creating the design shown in Figure P6–1. The intent is to guide you in applying Element Selection and Fence manipulations.

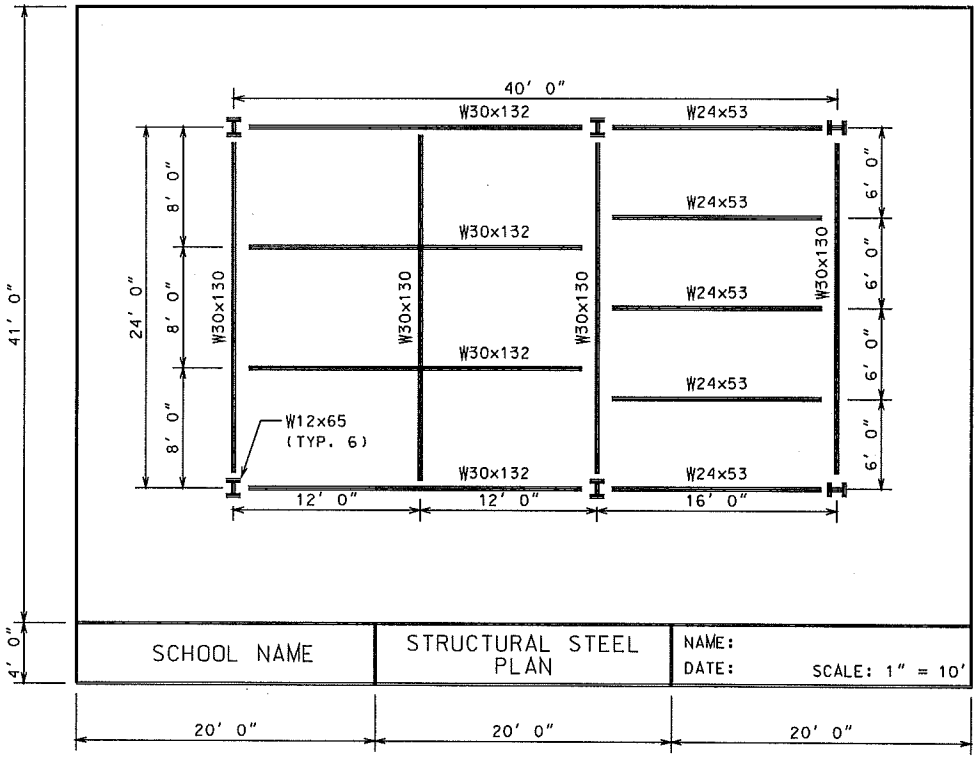


Figure P6–1 Completed project design

Note: The text and dimensions placed on the structure and members are not part of this project. They are included in Figure P6–1 as an aid to drawing the design.

PREPARE THE DESIGN FILE

This procedure starts MicroStation, creates a design file, and enters the initial settings.

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.

STEP 1: Invoke MicroStation program.

STEP 2: Create a new design file named CH6.DGN using the seed2d seed file.

STEP 3: In the Design File dialog box:

- Make sure the Working Unit is set to Feet for Master Unit and Inches for the Sub Unit.
- Set the Grid Master to 0.5, the Grid Reference to 2, and turn the Grid lock.

STEP 4: Select **Settings > Level > Manager** to open the Level Manager settings box and create the following level names and assign the properties:

- Objects – Color to green, Line Style to (solid line), and Line Weight to 2.
- Structure – Color to blue, Line Style to 0 (Solid line), and Line Weight to 2.
- Title Block – Color to red, Line Style to 0 (solid line), and Line Weight to 2.

STEP 5: Invoke AccuDraw from the Primary Tool box.

STEP 6: Open the AccuDraw settings box from the Settings drop-down menu, and adjust the values as follows:

- *Unit* ***Roundoff Distance***$: $Set to 0.5 and turn the check box ON.
- *Unit* ***Roundoff Angle***$: $Set to 90.000 and turn the check box ON.
- *Coordinate System:* Set the **Rotation** to Top and the **Type** to Rectangular.
- *Operation:* Set the check boxes for Floating Origin and Smart Key-ins to ON; and for Context Sensitivity and Auto Point Placement, set them to OFF.

STEP 7: Using Figure P6–1 as a guide, draw the border and title block on level Title Block.

- Replace "SCHOOL NAME" with your school or company name, or make up a name.
- Place your name to the right of "NAME."
- Place today's date to the right of "DATE."

DRAW THE FIRST I-BEAM

This procedure describes the steps required to draw the I-beam shown in Figure P6–2.

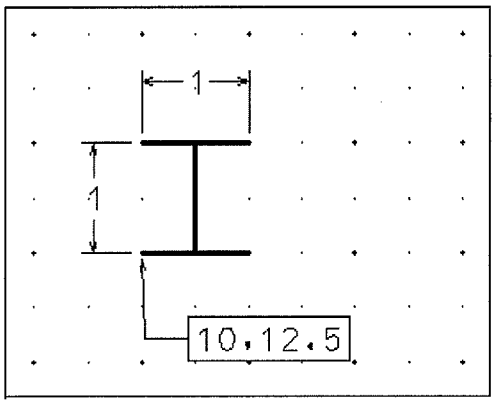


Figure P6–2 Draw the first column

STEP 1: If View Window 2 is not open, select the **Views** submenu from the **Window** drop-down menu, and turn on View Window **2**.

STEP 2: From the **Window** drop-down menu, select the **Cascade** option.

STEP 3: Fit View Window 1.

STEP 4: Set the Active Level to Objects.

STEP 5: Invoke **Save Settings** from the **File** drop-down menu.

STEP 6: Invoke the Place Line tool from the Linear Elements tool box.

MicroStation prompts:

Place Line > Enter first point

Keypoint snap to the lower left corner of the border block, type O to release the AccuDraw origin, and drag the cursor so the X-axis is set to 10.0000 and the Y-axis is set to 12.5. Click the Data button to locate the start of the bottom I-beam line.

Place Line > Enter endpoint

Drag the cursor so the X-axis is set to 1.0000 and the Y-axis is set to 0.0000. Click the Data button to complete the line.

Place Line > Enter endpoint *(Click the Reset button.)*

STEP 7: In View Window 1, invoke the Window Area tool, then, in the Tool Settings window, set the **Apply to Window** option to **2**.

MicroStation prompts:

Window Area > Define first corner point

Place a data point about 2 feet above and to the left of the I-beam line that was just completed.

Window Area > Define opposite corner point

Drag the dynamic rectangle below and to the right of the line, then place a data point to place the view area in View Window 2.)

STEP 8: Invoke **Save Settings** from the **File** drop-down menu.

STEP 9: In View Window 2, use Center Snap to place a vertical 1'-long line centered above the line you just drew, then place a 1'-long top horizontal line centered above the vertical line, as shown in Figure P6–2.

SELECT AND GROUP THE I-BEAM LINES

This procedure groups the three lines forming the I-beam so they can be manipulated as one element.

STEP 1: Invoke the Element Selection tool from the Main tool tool, and then select the **Block** Method and **New** Mode in the Tool Settings window.

MicroStation prompts:

Element Selection > Place Shape for elements to add to set

Position the cursor above and to the left of the I-beam, then press and hold down the Data button while you drag the Selection rectangle around the I-beam. Release the Data button to select the three lines.

STEP 2: Invoke the **Group** option from the **Edit** drop-down menu. MicroStation creates a group of the three selected lines. Click the Data button to remove the selection.

CREATE THE TWO ROWS OF COLUMNS

This procedure uses the Copy Element, Rotate Copy, Place Fence Block, and Copy Fence Contents tools with AccuDraw to create the two rows of three I-beams each, as shown in Figure P6–3.

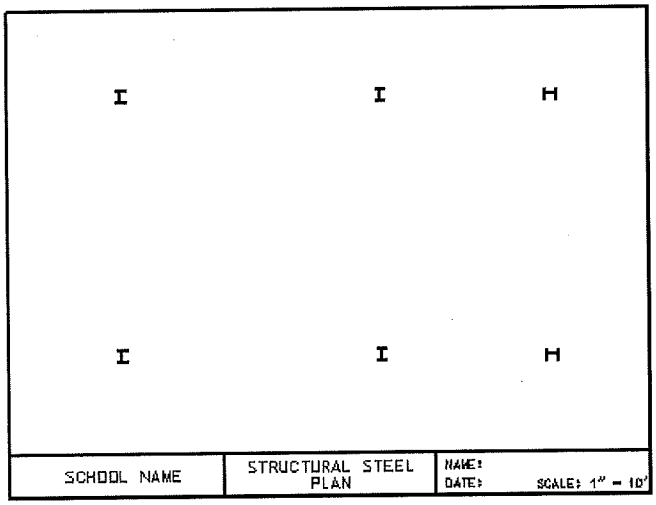


Figure P6–3 Two rows of I-beams

STEP 1: Click the title bar of View Window 1 to return focus to it.

STEP 2: Invoke the Copy Element tool from the Manipulate tool box, then turn the **Make Copy** button ON in the Tool Settings window.

MicroStation prompts:

Copy Element > Identify element

Select the I-beam, type Y to lock the AccuDraw Y axis at 0.0000, then drag the manipulation pointer right to AccuDraw coordinate X = 24. Click the Data button to make the first copy in the bottom row.

Copy Element > Accept/Reject (select next input)

Type Y to lock the AccuDraw Y axis at 0.0000, then drag the manipulation pointer to the right to X = 16. Click the Data button to complete the bottom row, as shown in Figure P6–4.

Copy Element > Accept/Reject (select next input)

Click the Reset button to terminate the tool sequence.

STEP 3: In View Window 1, define a small Window Area, to be placed in View Window 2, around the right-most I-beam.

STEP 4: Click the title bar or border of View Window 2 to return focus to it.

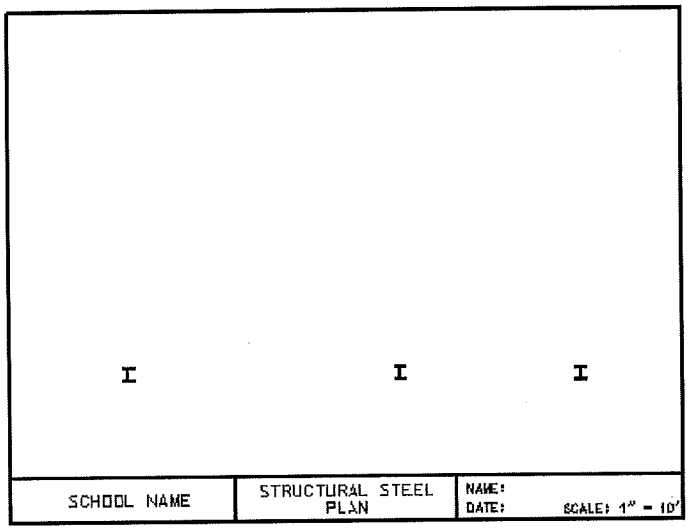


Figure P6–4 Bottom row after the I-beam is copied two times

STEP 5: Invoke the Rotate tool from the Manipulate tool box, then, in the Tool Settings window, set the **Method** to **Active Angle**, set the Active Angle to **90**, and set the check box for **Make Copy** to OFF.

MicroStation prompts:

Rotate Element > Identify element

Identify the I-beam.

Rotate Element > Enter pivot point (point to rotate about)

Click the Data button in the center of the I-beam's vertical line to pivot the I-beam about its center point, then click the Reset button.

STEP 6: Click the title bar or border of View Window 1 to return focus to it.

STEP 7: Invoke the Place Fence tool from the Fence tool box, then, in the Tool Settings window, set the Fence **Type** to **Block** and the Fence **Mode** to **Inside**.

MicroStation prompts:

Place a Fence Block > Enter first point

Place a data point above and to the left of the left-most I-beam.

Place a Fence Block > Enter opposite corner

Drag the dynamic fence image around the three I-beams, then place a data point to complete the fence.

STEP 8: Invoke the Copy tool from the Manipulate tool box, then, in the Tool Settings window, set the check boxes for **Make Copy** and **Use Fence** to ON.

MicroStation prompts:

Copy Fence Contents > Enter first point

Place a data point somewhere near the bottom of the view.

Copy Fence Contents > Enter point to define distance and direction

Type X to lock the AccuDraw X axis at 0.0000, then drag the manipulation pointer up to Y = 24. Click the Data button to create the top I-beam row, as shown in Figure P6–4.

Copy Fence Contents > Enter point to define distance and direction

Click the Reset button to terminate the tool sequence.

STEP 9: Invoke the Place Fence tool again to remove the fence.

STEP 10: Invoke **Save Settings** from the **File** drop-down menu.

DRAW THE OUTSIDE STRUCTURAL MEMBERS

This procedure places a Block element for the outside structural members, then uses the Partial Delete tool to cut away the parts of the Block that overlap the I-beams, as shown in Figure P6–5.

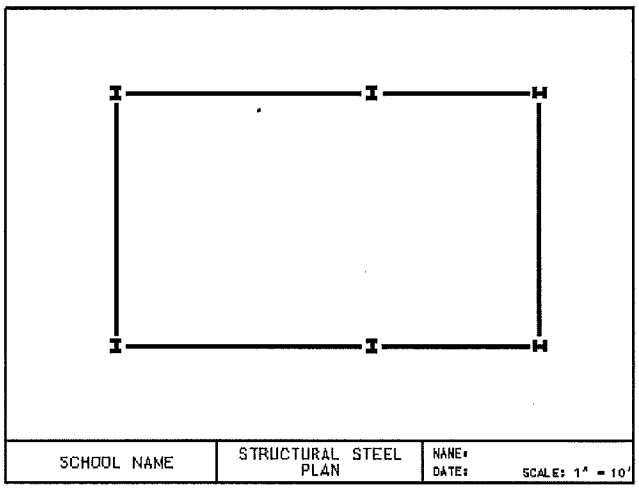


Figure P6–5 I-beams and outside structural members

STEP 1: Set the Active Level to Structure.

STEP 2: In View Window 1, place a Block element with its lower left corner in the center of the lower left I-beam and its upper-right corner in the center of the upper-right I-beam, as shown in Figure P6–6.

STEP 3: In View Window 1, define a small Window Area, to be placed in View Window 2, around the lower-right I-beam.

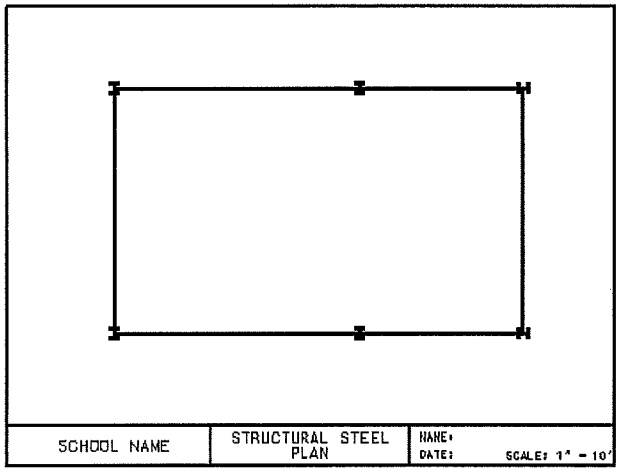


Figure P6–6 Result of placing a block for the outside structural members

STEP 4: Focus on View Window 2, then invoke the Partial Delete tool from the Modify tool box.

MicroStation prompts:

Delete Part of Element > Select start point for partial delete

Select the block one Grid point to the left of the I-beam in View Window 2.

Delete Part of Element > Select direction of partial delete

Drag the manipulation pointer a short distance toward the I-beam, and click the Data button.

Delete Part of Element > Select end point of partial delete

Drag the manipulation point to one Grid point above the I-beam, and place a data point to complete the partial delete, as shown in Figure P6–7.

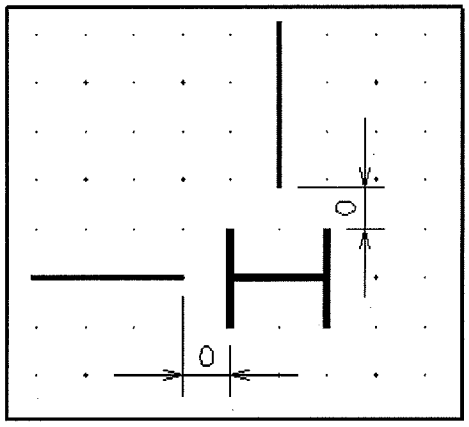


Figure P6–7 Amount of block to delete partially over each I-beam

STEP 5: Focus on View Window 1, then define a small Window Area, to be placed in View Window 2, around the upper-right I-beam.

STEP 6: Focus on View Window 2, then invoke the Delete part of the Element tool from the Modify tool box.

MicroStation prompts:

Delete Part of Element > Select start point for partial delete

Select the line one Grid point below the I-beam.

Delete Part of Element > Select end point of partial delete

Drag the manipulation pointer to one Grid point to the left of the I-beam, and place a data point to complete the partial delete.

STEP 7: Repeat Steps 5 and 6 for the other four I-beams.

DRAW THE INTERIOR STRUCTURAL MEMBERS

This procedure uses the Move Parallel and Extend Element to Intersection tools to draw the interior structural Members as shown in Figure P6–8.

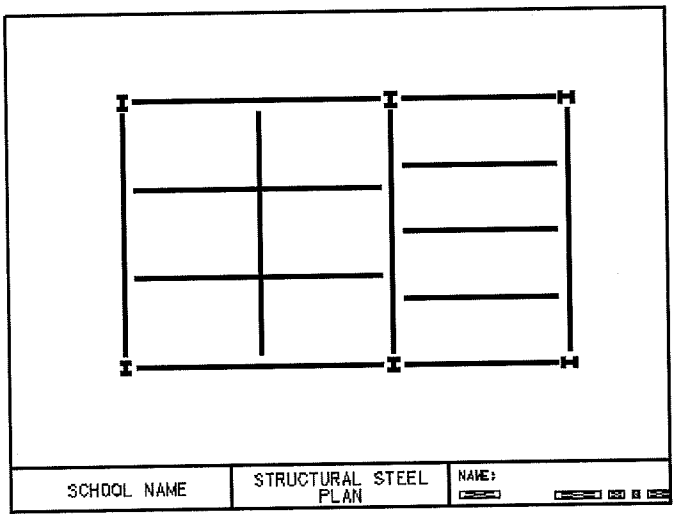


Figure P6–8 Completed interior structure members

STEP 1: Focus on View Window 1.

STEP 2: Invoke the Move Parallel tool from the Manipulate tool box, then, in the Tool Settings window, turn the check boxes for **Distance** and **Make Copy** to ON, and key-in **12** in the **Distance** edit field.

MicroStation prompts:

Copy Parallel by Key-in > Identify element

Select the left vertical line.

Copy Parallel by Key-in > Accept/Reject (select next input)

Move the manipulation pointer to the right of the element, and click the Data button two times to place two parallel copies of the line, as shown in Figure P6–9. Click the Reset button.

Copy Parallel by Key-in > Accept/Reject (select next input)

Click the Reset button.

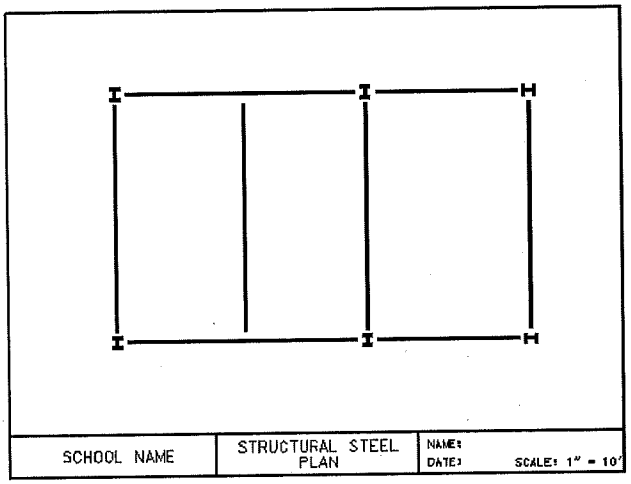


Figure P6–9 Place two parallel copies of the left vertical line, 12' apart

STEP 3: Make two parallel copies of the top left horizontal line, each 8' apart below the line, as shown in Figure P6–10.

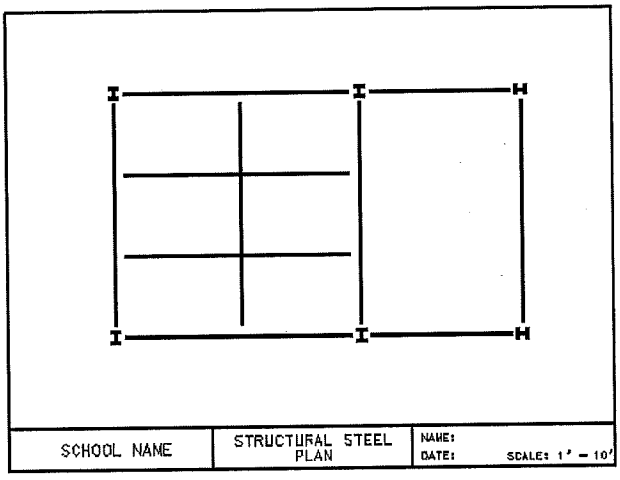


Figure P6–10 Place two parallel copies of the top left horizontal line, 8' apart below the line

STEP 4: Make three parallel copies of the top right horizontal line, each 6' apart below the line, as shown in Figure P6–11.

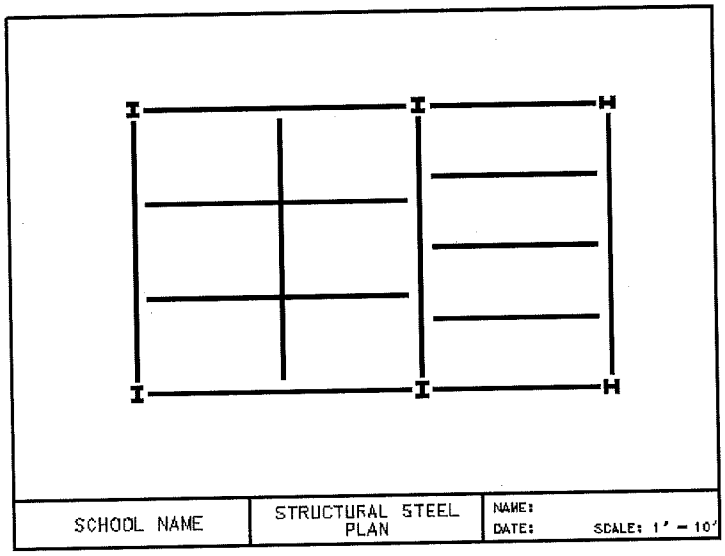


Figure P6–11 Place three parallel copies of the top right horizontal line, each 6' apart below the line

STEP 5: Invoke **Save Settings** from the **File** drop-down menu.

STEP 6: Refer to the Project Exercise in Chapter 9 for placing text and dimensioning.

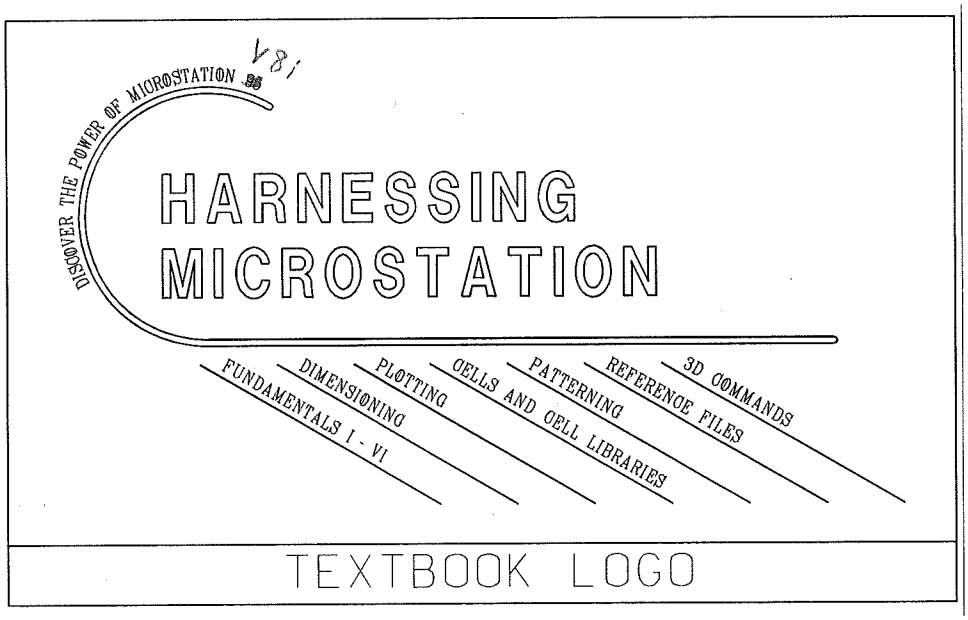
DRAWING EXERCISES 7–1 THROUGH 7–5

Use the following table to set up the design files for Exercises 7–1 and 7–2.

SETTING	VALUE
Seed File	seed2d.dgn
Working Units	Master Unit=Inches, Sub Unit=Inches
Grid	Grid Master = 0.1, Grid Reference = 10, Grid Lock ON

Exercise 7–1

TEXTBOOK LOGO



Ch. 8
Element Modification

PROJECT EXERCISE

This project exercise provides step-by-step instructions for creating the Utility–Storage Floor Plan shown in Figure P8–1. The intent is to guide you in applying the Multi-line setting, placement, and joints tools.

Note: The dimensions are not part of this project. They are included in Figure P8–1 as an aid to drawing the design.

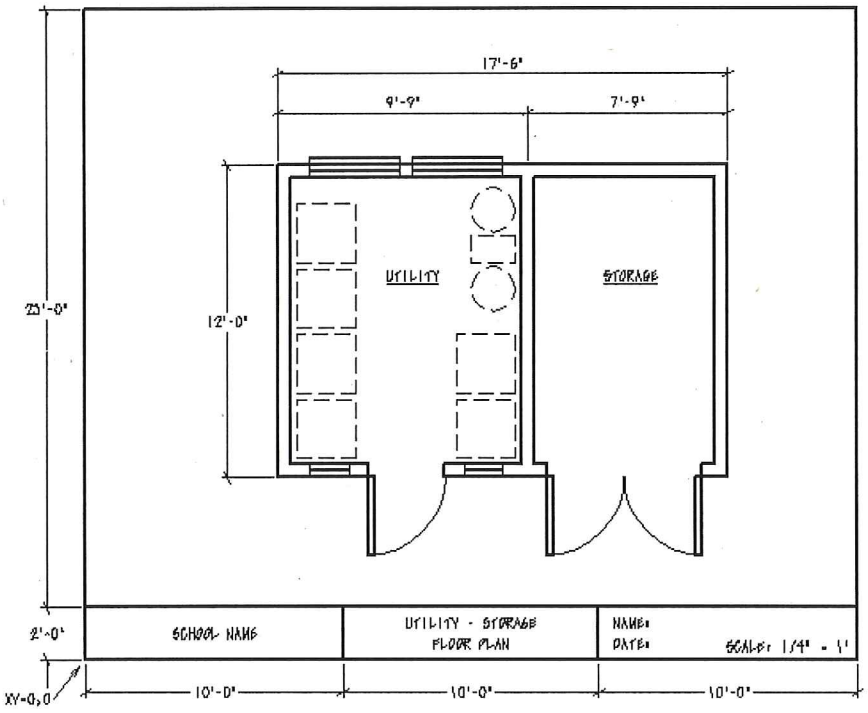


Figure P8–1 Completed project design

Prepare the Design File

This procedure starts MicroStation, creates a design file, and enters the initial settings.

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.

STEP 1: Invoke MicroStation, and create a new design file named CH8.DGN using the 2dEnglishArch.DGN seed file.

STEP 2: In the Design File dialog box set the following:

- Make sure the Working Unit is set to Feet for Master Unit and Inches for the Sub Unit.
- Grid Master to 0.5, Grid Reference to 2, and Grid Lock ON.

STEP 3: Invoke the Text settings box from the drop-down menu **Element**, and adjust the settings as follows:

- **Font** = 41 - Architectural
- **Text Height** = 0.4
- **Text Width** = 0.3
- **Line Spacing** = 0.4
- **Single-line and Multi-line justifications** = Center Center

STEP 4: Turn on AccuDraw, and make the following settings in the AccuDraw settings box:

- **Unit Roundoff Distance** = 0:1
- **Coordinate System Rotation** = Top
- **Coordinate System Type** = Rectangular
- **Operation Floating Origin** = ON
- **Operation Context Sensitivity** = ON
- **Operation Smart Key-ins** = ON
- **Operation Auto Point Placement** = OFF
- Open Coordinate Readout settings box, set Coordinates Format to Sub Units

STEP 5: Create the following levels and assign properties as indicated using the Level Manager settings box:

- Objects – **Color** to red (3), **Line Style** to 0 (continuous), and **Line Weight** to 2.
- Border - **Color** to green (2), **Line Style** to 0 (continuous), 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.
- Mline – **Color** to blue, **Line Style** to 0 (Continuous) and **Line Weight** to 1.

STEP 6: Select **Save Settings** from the **File** drop-down menu.

Draw the Border and Title Block

This procedure draws the border and title block, then places the required text in the title block.

STEP 1: Using Figure P8–1 as a guide, draw the 30' x 25' border and title block on level Border. Place the lower-left corner of the border at XY=0,0.

STEP 2: Fit the view window.

STEP 3: Place the title block text:

- Replace "SCHOOL NAME" with your school or company name, or make up a name.
- Place your name to the right of "NAME:"
- Place today's date to the right of "DATE:"

STEP 4: Select **Save Settings** from the **File** drop-down menu.

Create a Multi-line Profile

This procedure sets up the multi-line element to be used to draw the walls of the utility–storage floor plan.

STEP 1: Open the Multi-lines settings box by selecting **Multi-lines** from the **Element** drop-down menu.

STEP 2: In the Multi-lines dialog box, select **Lines** from the **Component** options menu.

STEP 3: If the Offset/Overrides list box contains more than two line components, delete all but two of them. To delete each extra line:

- Select a line in the Offset/Overrides list box.
- Select **Delete** from the dialog box's **Edit** drop-down menu.

STEP 4: Select the first line in the Offset/Overrides list box, then set the **Offset** to 0.0000 (the working line), and set the Attributes as shown in Figure P8–2.

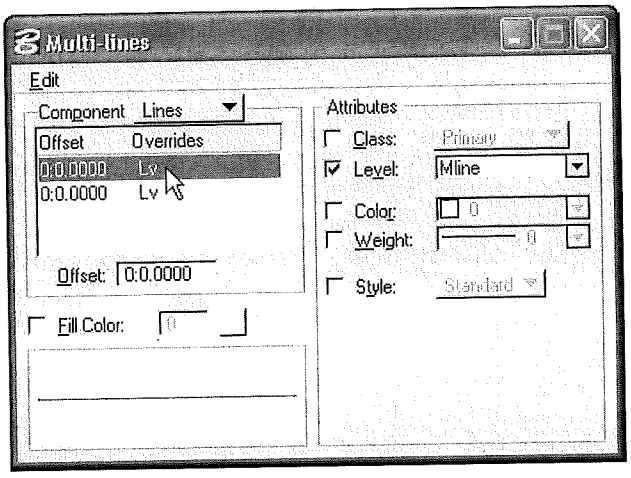


Figure P8–2 Settings for the working line in the wall's Multi-line profile

STEP 5: Select the second line in the Component list box and set the Attributes as shown in Figure P8–3.

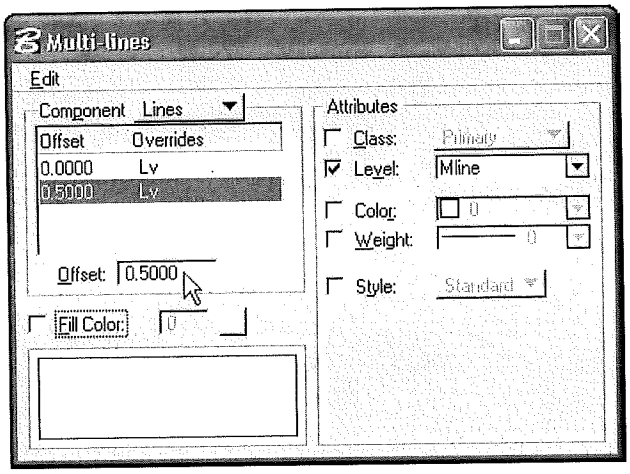


Figure P8–3 Setting the Attributes for the second line in the wall's Multi-line profile

STEP 6: Select **Start Cap** from the **Component** option menu, then set the cap type and Attributes as shown in Figure P8–4.

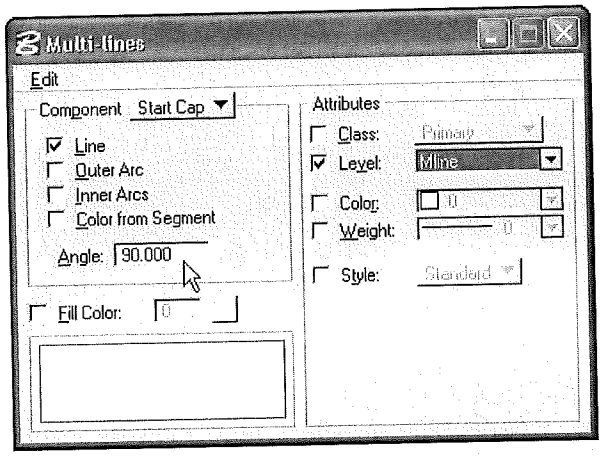


Figure P8–4 Start Cap settings for the wall's Multi-line profile

STEP 7: Select **End Cap** from the **Component** option menu, then set the cap type and Attributes as shown in Figure P8–5.

STEP 8: Select **Joints** from the **Component** option menu, then turn off the **Display Joints** check box.

STEP 9: Close the Multi-lines settings box.

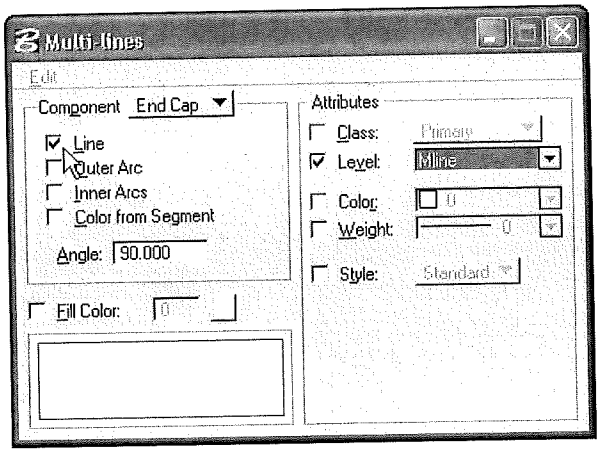


Figure P8–5 End Cap settings for the wall's Multi-line profile

STEP 10: Select **Save Settings** from the **File** drop-down menu.

Draw the Walls

This procedure uses the Multi-line tool and AccuDraw to draw the utility–storage floor plan walls, as shown in Figure P8–6.

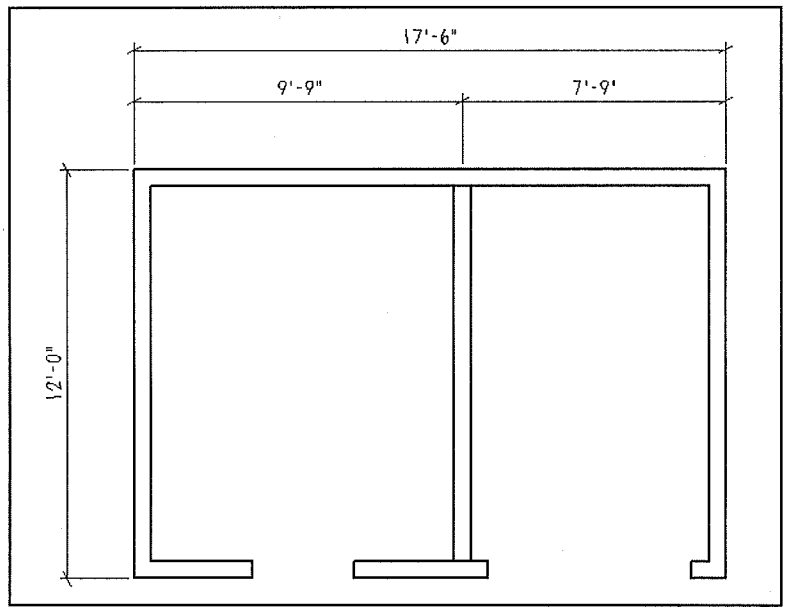


Figure P8–6 The walls before holes are cut for the windows

STEP 1: Set the Active Level to Objects.

STEP 2: Invoke the Place Multi-line tool from the Linear Elements tool box, then, in the Tool Settings window, select **Workline** from the **Place by** options menu and turn off the **Length** and **Angle** check boxes, as shown in Figure P8–7.

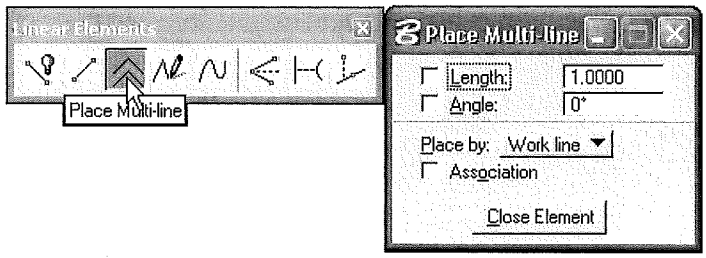


Figure P8–7 Invoking the Place Multi-line tool

MicroStation prompts:

Place Multi-line > Enter first point *(Keypoint snap to the lower-left corner of the border, press the **O** key to position the AccuDraw compass at the Keypoint, then place a data point at this offset from the compass: X = 24 and Y = 7.)*

Place Multi-line > Enter vertex or Reset to complete *(Place the next data point at this offset from the compass: X = 1 and Y = 0.)*

Place Multi-line > Enter vertex or Reset to complete *(Place the next data point at this offset from the compass: X = 0 and Y = 12.)*

Place Multi-line > Enter vertex or Reset to complete *(Place the next data point at this offset from the compass: X = 0 and Y = 17.5.)*

Place Multi-line > Enter vertex or Reset to complete *(Place the next data point at this offset from the compass: X = 0 and Y = 12.)*

Place Multi-line > Enter vertex or Reset to complete *(Place the next data point at this offset from the compass: X = 0 and Y = 3.5.)*

Place Multi-line > Enter vertex or Reset to complete *(Click the Reset button.)*

The completed Multi-line element is shown in Figure P8–8.

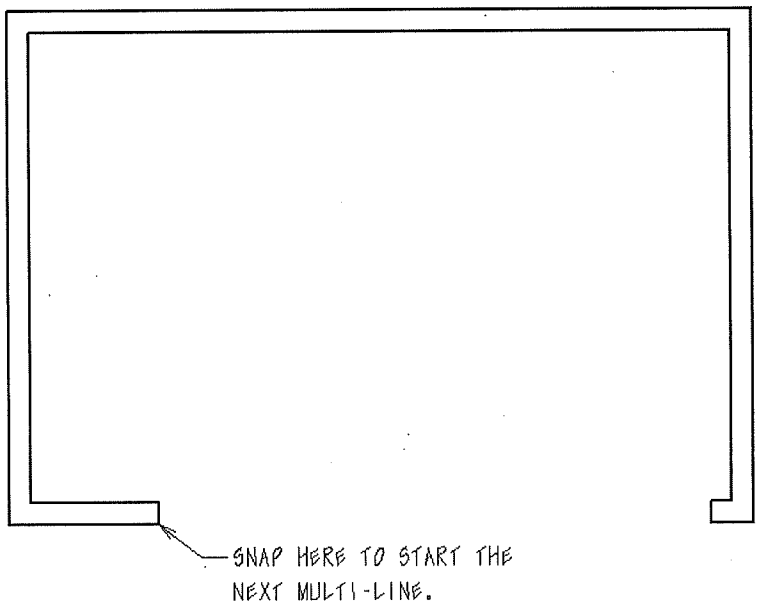


Figure P8–8 First Multi-line element

STEP 3: With the Multi-line tool still active, start the next short piece of multi-line outer wall by Keypoint snapping to the lower right corner of the bottom left horizontal wall, as shown by the note in Figure P8–8.

STEP 4: Press the **O** key to position the AccuDraw compass on the Keypoint.

STEP 5: Start the new Multi-line at this offset from the compass: $X = 3$ and $Y = 0$.

STEP 6: Place the next data point at this offset from the compass: $X = 4$ and $Y = 0$.

STEP 7: Click the Reset button to complete the Multi-line.

STEP 8: Use the Window Area tool to move in close to the walls you just completed, then click the Reset button to return to placing Multi-line elements.

The completed Multi-line element is shown in Figure P8–9.

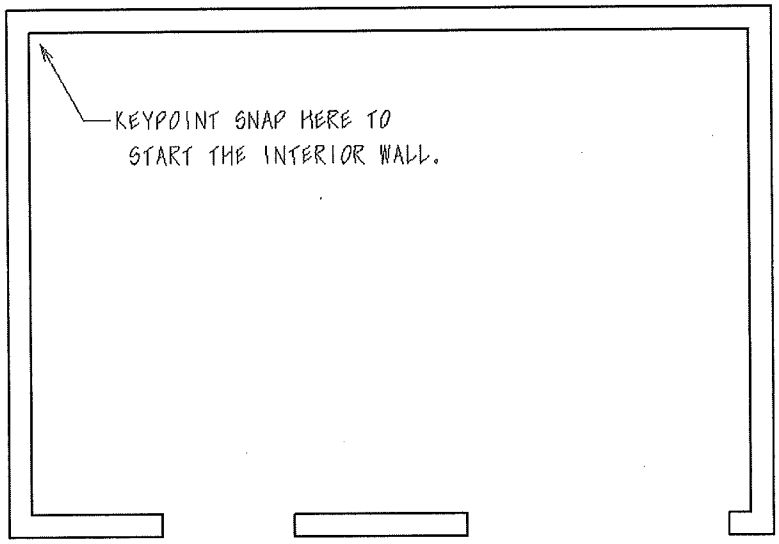


Figure P8–9 Completed outer wall Multi-line elements

STEP 9: Draw the interior wall by Keypoint snapping to the inside of the top-left corner of the outer wall, as shown by the note in Figure P8–9.

STEP 10: Press the **O** key to position the AccuDraw compass on the Keypoint.

STEP 11: Start the new Multi-line at this offset from the compass: $X = 9$ and $Y = 0$.

STEP 12: Place the next data point at this offset from the compass: $X = 0$ and $Y = -11$.

STEP 13: Click the Reset button to complete the Multi-line.

The completed Multi-line element is shown in Figure P8–6.

Cut Holes for Placing Windows in the Outer Wall

This procedure uses the Multi-line Joints tools to clean up the inner and outer wall intersections and to cut four holes in the utility room wall for windows, as shown in Figure P8–10.

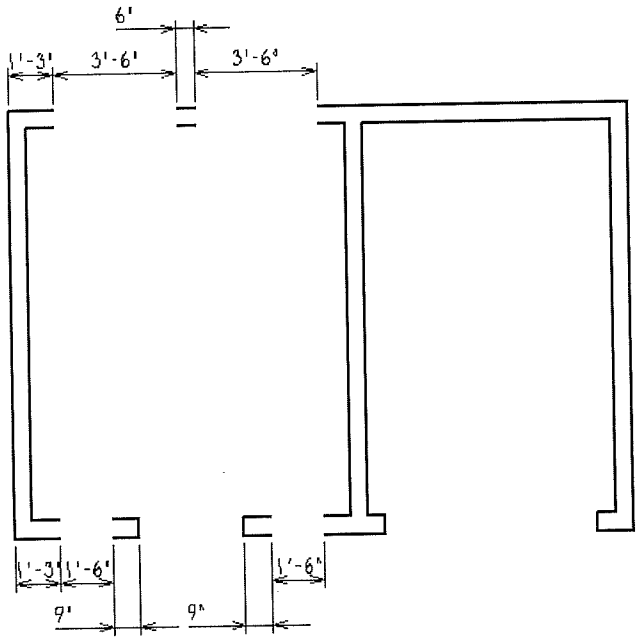


Figure P8–10 The walls after cutting holes for windows and wall unions

STEP 1: Open the **Multi-line Joints** tool box from the **Tools** drop-down menu.

STEP 2: To create the joint at the top of the interior wall, invoke the Construct Open Tee Joint tool from the Multi-line Joints tool box.

MicroStation prompts:

> Construct Open Tee Joint > Identify element *(Select the interior Multi-line element near its top, select the exterior Multi-line element, then click the Data button in space to complete the joint.)*

STEP 3: Repeat step 2 for the joint at the bottom of the interior wall.

STEP 4: To create the window openings next to the utility room door, invoke the Cut All Component Lines tool from the Multi-line Joints tool box.

MicroStation prompts:

Cut All Component Lines > Identify element *(Keypoint snap to the lower-left outside corner of the outer wall, then press the **O** key to position the AccuDraw compass on the Keypoint, and start the cut at this offset from the compass: X = 1.25 and Y = 0.)*

Cut All Component Lines *(Complete the cut at this offset from the compass: X = 1.5 and Y = 0.)*

Cut All Component Lines > Identify element *(Keypoint snap to the lower-left corner of the wall on the right side of the utility room door, then press the **O** key. Start the cut at this offset from the compass: X = .75 and Y = 0.)*

Cut All Component Lines *(Complete the cut at this offset from the compass: X = 1.5 and Y = 0.)*

STEP 5: Use the Cut All Component Lines tool to cut two 3.5'-wide window holes in the top wall of the utility room. Use the dimensions in Figure P8–10 as a guide.

Draw the Windows with the Place Multi-line Tool

This procedure changes the Multi-line settings, then uses the Place Multi-line tool to place windows in the opening created in the utility room exterior walls, as shown in Figure P8–11.

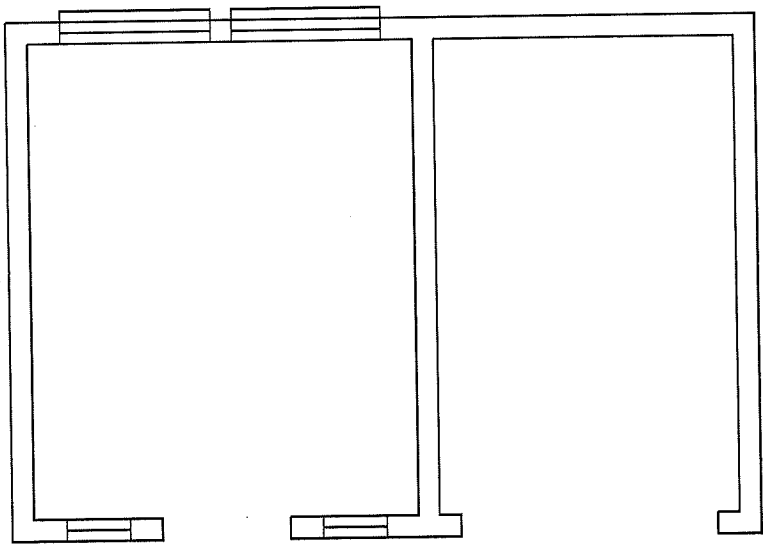


Figure P8–11 Utility room walls with windows inserted

STEP 1: Select **Multi-lines** from the **Element** drop-down menu.

STEP 2: In the Multi-lines settings box, **Insert a Line** component with an **Offset** of 0.25, and set the new line to the same attribute values as the other two line components.

STEP 3: Invoke the Place Multi-line tool from the Linear Element tool box, and place Multi-line elements in the spaces on each side of the utility room door.

STEP 4: In the Multi-lines settings box, **Insert** a fourth **Line** component with an **Offset** of 0.75 and set the new line to the same attribute values as the other three line components.

STEP 5: Place Multi-line elements in the spaces cut into the top utility room wall.

Complete the Floor Plan

This procedure places the equipment in the utility room and the room names in each room, as shown in Figure P8–12.

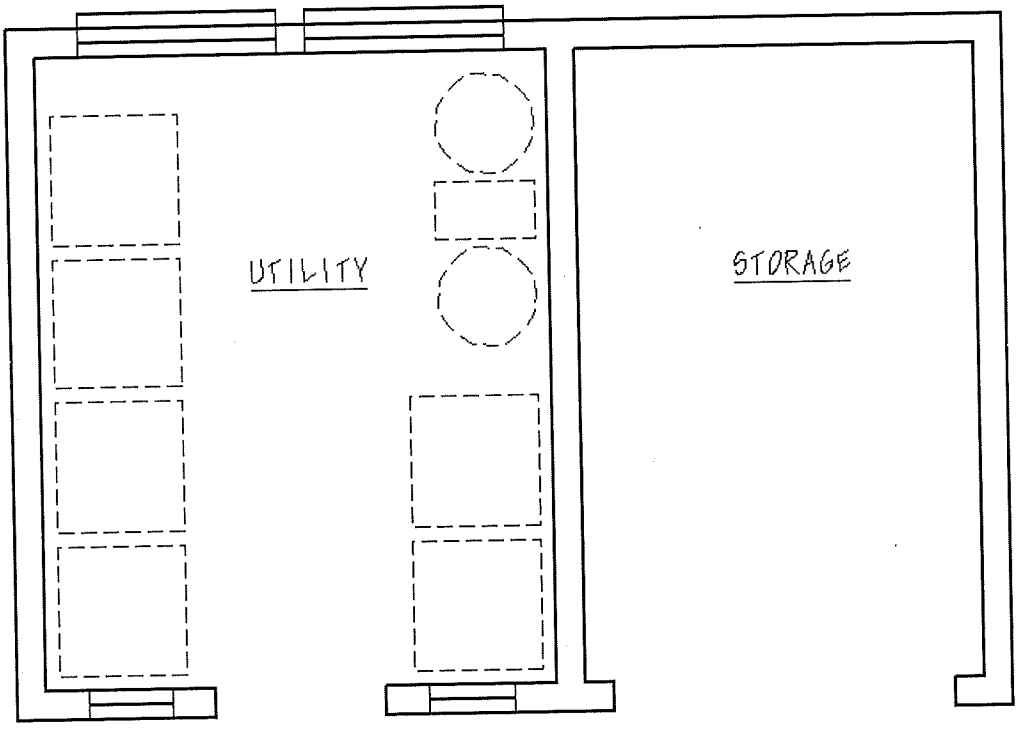


Figure P8–12 Completed floor plan

STEP 1: Place the equipment symbols in the utility room with the following dimensions:

- 6 each, 2.25' x 2.25' blocks
- 1 each, 1.0' x 1.75' block
- 2 each, 0.875-radius circles

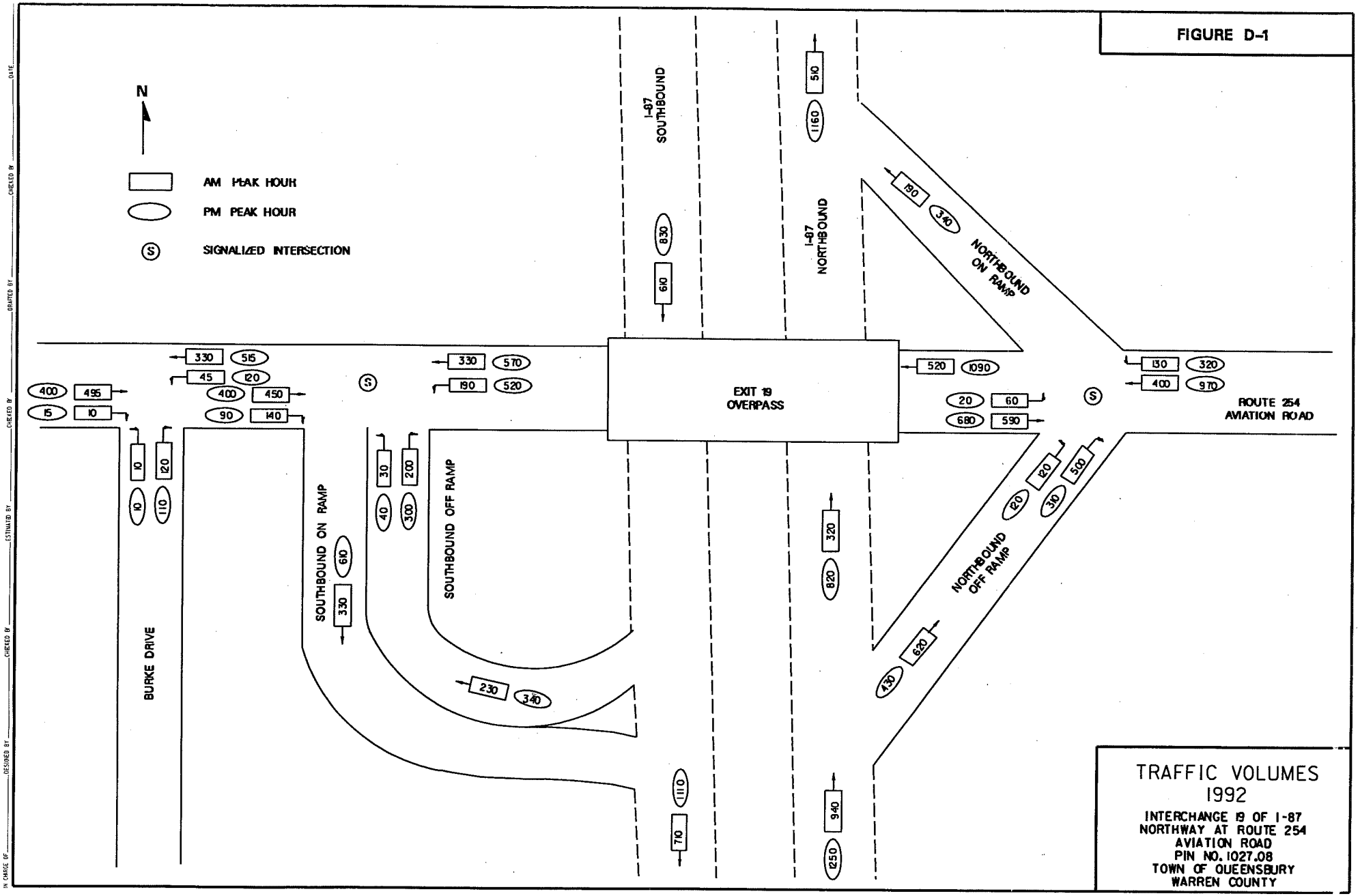
STEP 2: Place the room names with the same text font and size as the title block text.

STEP 3: Invoke the Fit View tool to fit the view in the window view.

STEP 4: Compare your design to Figure P8–1 and, if necessary, correct mistakes.

STEP 5: Compress the design and save the design settings.

FIGURE D-1



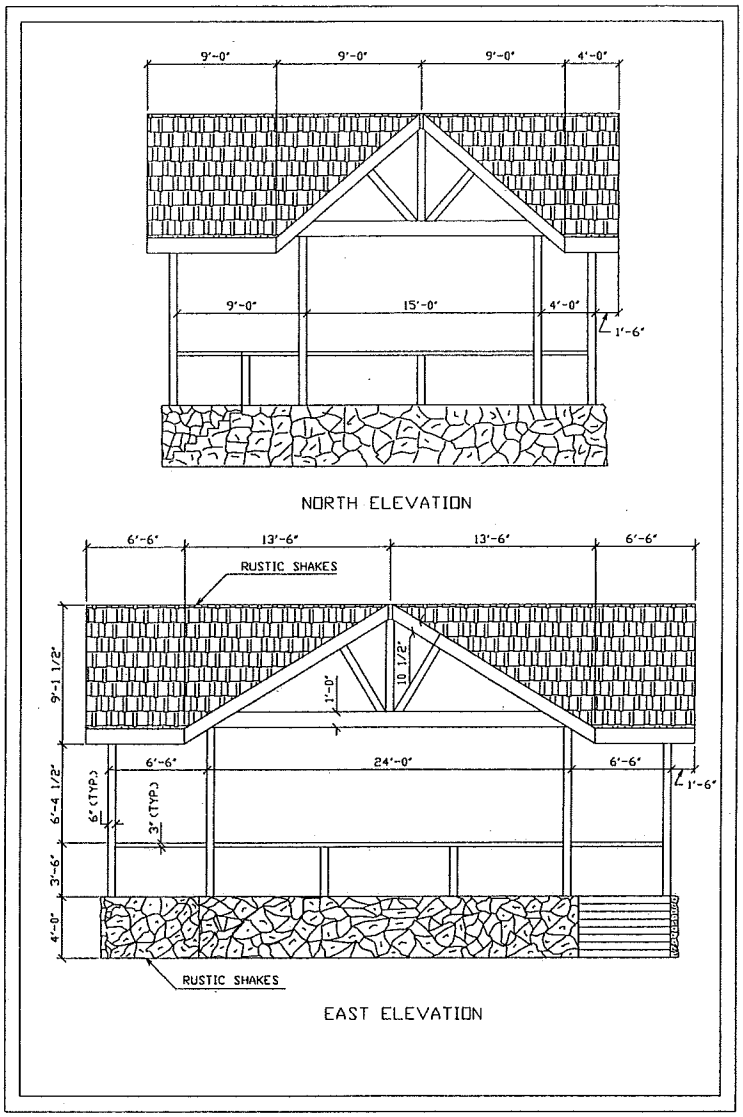
TRAFFIC VOLUMES
1992

INTERCHANGE 19 OF I-87
NORTHWAY AT ROUTE 254
AVIATION ROAD
PIN NO. 1027.08
TOWN OF QUEENSBURY
WARREN COUNTY

DATE
DRAWN BY
CHECKED BY
ESTIMATED BY
CHECKED BY
DESIGNED BY
IN CHARGE OF

Exercise 12–4

PARADE STAND



Steps for Creating Plan Drawing 1

Step 1: Download and File, Open bor100.dgn. What are the working units? Measure the size of the border. What scale do you need to plot the border at to plot on an 11" by 17" piece of paper?

Step 2: Download and File, Open tvbase.dgn. What are the working units?

Step 3: Create a new drawing called PL1ini.dgn in c:\temp and change the working units to match that found in step 1 and 2.

Step 4: Attach the border (bor100) as a reference file

Step 5: Attach the base map (tvbase) as a reference file

Step 6: Make sure snap, locate, and display are toggled on for both reference files

Step 7: Rotate the base mapping -135 degrees

Step 8: Move the border to line up with the beginning of the base map

Step 9: Use a fence (green lines on border) and clip the base map so that it fits within the border.

Step 10: Plot the drawing.