Practice 5b
Work with Basic Modify Tools

Practice Objective

- Use basic modify tools, such as Move, Copy, Rotate, and Array.

In this practice, you will use **Move** and **Copy** to create grid lines with columns using existing elements in a project. You will then rotate one of the grid lines and the columns along that grid line and mirror the new grid lines to create the opposite part of the building. Finally, you will array a set of columns around an arc and create a grid line of the array, as shown in Figure 5–53.
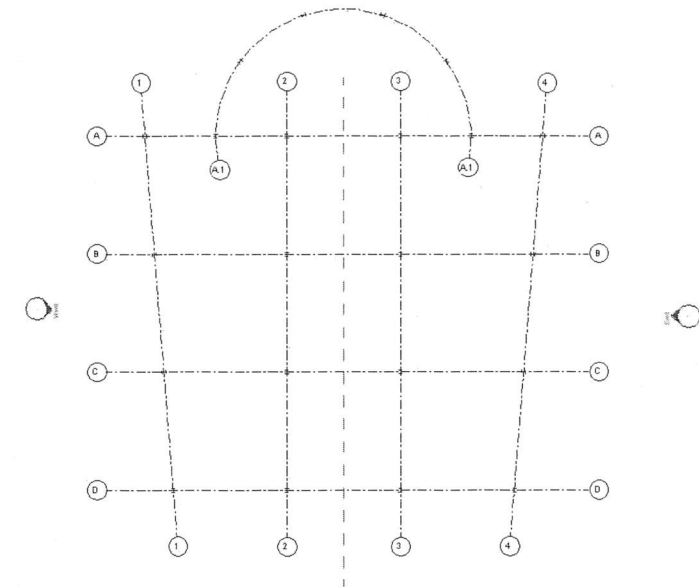

Figure 5–53

Task 1: Move and copy elements.

1. Open **Structural-Editing-M.rvt** from the practice files folder.

2. The file should automatically open to the **Structural Plans: Level 2** view.

3. Select **grid line A** and the structural column that is at the intersection. (**Hint:** Hold <Ctrl> to select more than one element.)

4. In the *Modify | Multi-Select* tab>Modify panel, click (Copy).

5. In the Options Bar, select **Multiple**, as shown in Figure 5–54.

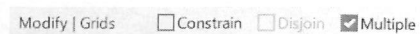Modify | Grids ☐ Constrain ☐ Disjoin ☑ Multiple

Figure 5–54

6. Pick a point anywhere along grid line **A** for the start point.

7. Move the cursor down below grid line **A** and type **7400**. Create two more copies that are **7400mm** apart for a total of four horizontal grid lines.

8. Click ⌖ (Modify) to end the **Copy** command.

9. Select grid line **1** and the four columns along grid line **1**. Copy the elements to the right at a distance of **7400mm** until you have a total of four vertical grid lines with the associated columns. Click ⌖ (Modify) to end the command.

10. Click twice inside each grid bubble and renumber the grid lines as shown in Figure 5–55.
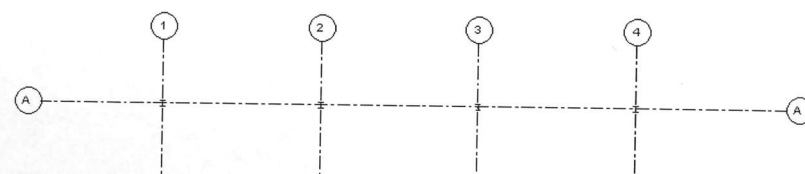

Figure 5–55

11. Zoom in on the column at grid intersection **A1**.

12. Select the column (but not the grid line). In the *Modify* tab>Modify panel, click ✛ (Move) and move the column **1800mm** to the left, as shown in Figure 5–56.
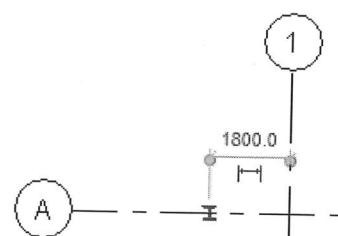

Figure 5–56

13. Click ⌖ (Modify).

14. Save the project.

Task 2: Rotate elements.

1. Select **grid line 1**.

2. In the *Modify | Grids* tab>Modify panel, click ↻ (Rotate).

3. Move the center of rotation by going to the Options Bar and clicking **Place**. Select the midpoint of column **D1** as the center of rotation.

4. Specify the first ray of rotation by clicking on the **A1** grid intersection.

5. Specify the second ray of rotation to finish the rotation by selecting the midpoint of the column you moved **1800mm** to the left of grid line **1** earlier, as shown in Figure 5–57.
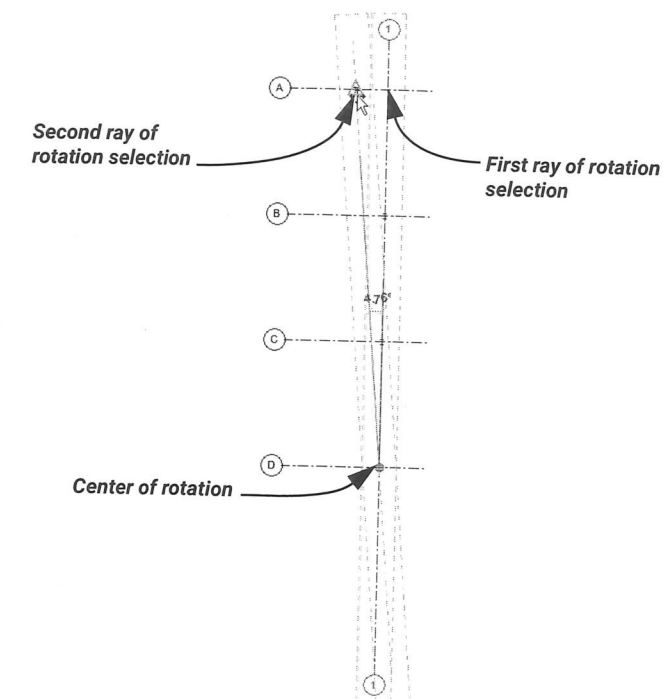

Figure 5–57

Task 3: Rotate columns to match grid line.

1. Zoom in on the **A1** grid intersection. Select the column at the **A1** intersection.

2. Click ↻ (Rotate). Keep the center point in the current location, which is the center of the column.

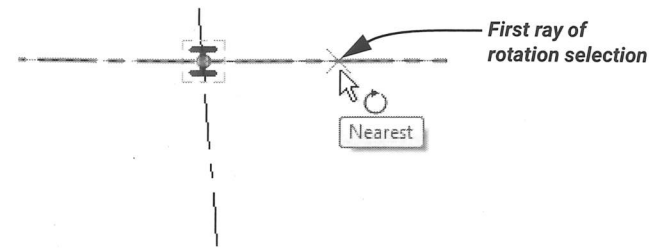3. For the first ray of rotation, select a point to the right along grid line **A**, as shown in Figure 5−58.

Figure 5−58

4. For the second ray of rotation, select a point along grid line **1**, as shown on the left in Figure 5−59. The column is now rotated perpendicular to the angle of grid line **1**, as shown on the right in Figure 5−59.
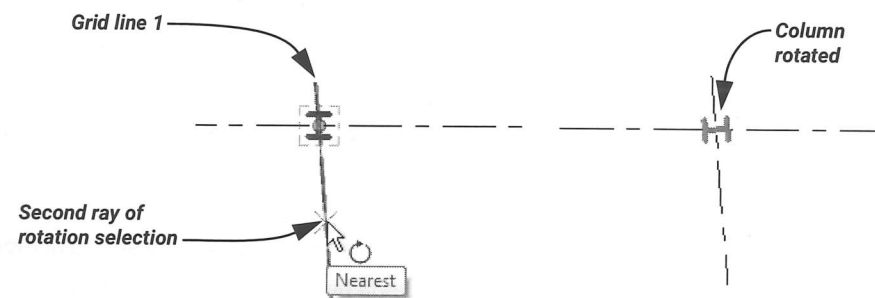

Figure 5−59

5. Repeat the process for the rest of the columns along grid line **1**.

6. Click ▹ (Modify).

7. Save the project.

Task 4: Mirror elements.

1. Delete grid line **4** and its columns. You are going to mirror grid line **1** and its columns to this location.

2. In the *Structure* tab>Work Plane panel, click ⊿ (Ref Plane).

3. In the *Modify | Place Reference Plane* tab>Draw panel, click ╱ (Line).

4. Draw a vertical line between **grid line 2** and **grid line 3** and use temporary dimensions to set the distances from each grid line to **3700mm**, as shown in Figure 5−60. When finished,
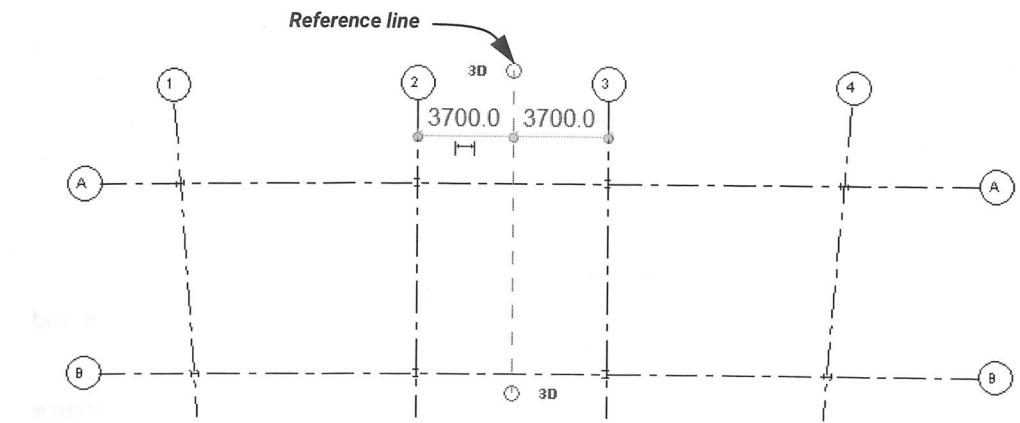
   click ▹ (Modify) to end the command.

Figure 5−60

5. Select **grid line 1** and all of the columns on the grid line. (To select multiple elements, draw a window around the group or hold <Ctrl> as you select.)

6. In the *Modify | Multi-Select* tab>Modify panel, click ⬔ (Pick Mirror Axis).

7. Select the vertical reference plane that you created earlier, as shown in Figure 5−61. Grid line **1** and all of its columns are mirrored about the selected reference plane. If the new grid line is not automatically renumbered, select the bubble and rename it to **4**.
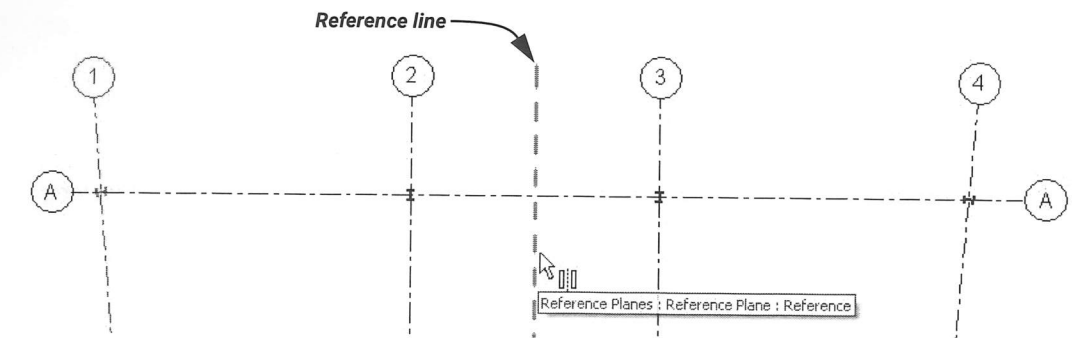

Figure 5−61

8. Click ▹ (Modify).

9. Save the project.

Task 5: Array elements.

1. Select the column at grid intersection **A3**. Click (Copy) and copy this *column* to the right by **4500mm**. The new copied column is now the current selected column.

2. In the *Modify | Structural Columns* tab>Modify panel, click ⊞ (Array).

3. A warning dialog box opens. This issue will be corrected in later steps. Click **OK**.

4. In the Options Bar, click (Radial). Select **Group And Associate**, set the *Number* to **8**, and set *Move to:* to **Last**.

5. Relocate the center of the array by dragging ↻ to the intersection of the vertical reference plane, as shown in Figure 5–62. Alternatively, in the Options Bar, click **Place** next to *Center of rotation*. In the drawing, click to place the center of rotation.
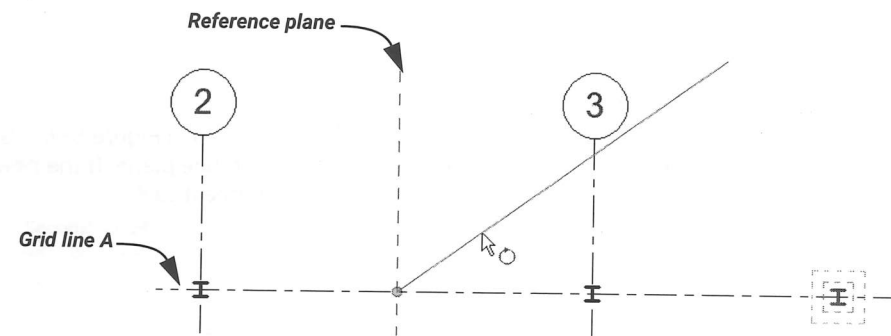

Figure 5–62

6. In the Options Bar, set the *Angle* to **180** and press <Enter>. The new columns display along the arc. The number of array is displayed at the top of the arc, allowing for further modifications to the number of arrayed items, as shown in Figure 5–63.
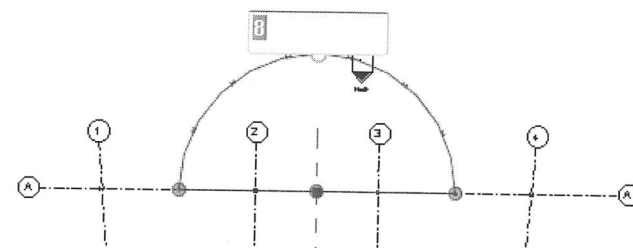

Figure 5–63

7. Change the number to **6** and the array updates.

8. Click in an empty space in the view to release the selection and end the Array command.

9. Draw a grid line for the new array of columns by going to the *Structure* tab>Datum panel and clicking ⌗ (Grid).

10. In the Draw panel, click ⬉ (Pick Lines).

11. Move the cursor over the area of the array. When your cursor is over the arc, it will highlight, as shown in Figure 5–64. Select it to create the grid line.
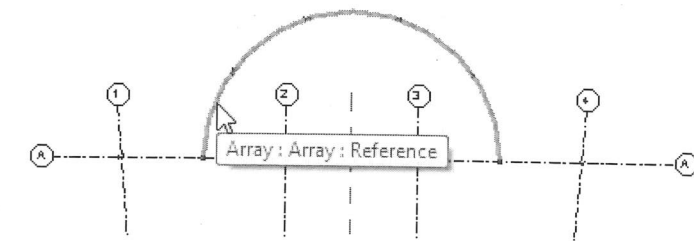

Figure 5–64

12. Click ⬉ (Modify).

13. The new grid bubbles are on top of the columns. Drag the grid bubbles down past the columns and rename the new grid line **A.1**, as shown in Figure 5–65.
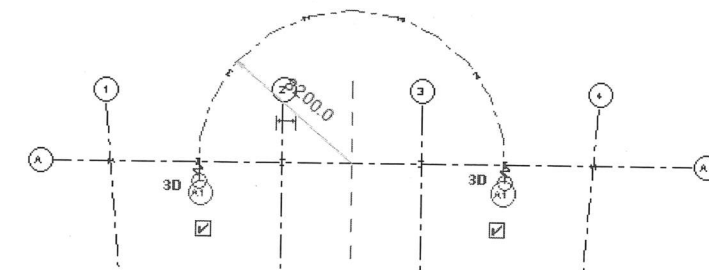

Figure 5–65

14. Save and close the project.

End of practice