

Command Summary

Button	Command	Location
	Attach Top/Base	• Ribbon: Modify / Walls tab>Modify Wall panel
	Detach Top/Base	• Ribbon: Modify / Walls tab>Modify Wall panel
	Join Geometry	• Ribbon: Modify tab>Geometry panel, expand Join
	Join/Unjoin Roof	• Ribbon: Modify tab>Geometry panel
	Reference Plane	• Ribbon: Architecture tab>Work Plane panel
	Roof by Extrusion	• Ribbon: Architecture tab>Build panel, expand Roof
	Roof by Footprint	• Ribbon: Architecture tab>Build panel, expand Roof
	Set Work Plane	• Ribbon: Architecture tab>Work Plane panel
	Show Work Plane	• Ribbon: Architecture tab>Work Plane panel
	Unjoin Geometry	• Ribbon: Modify tab>Geometry panel, expand Join
	Vertical (Opening)	• Ribbon: Modify / Roofs tab>Opening panel
	Viewer	• Ribbon: Architecture tab>Work Plane panel

Chapter 13

Modeling Stairs, Railings, and Ramps

When modeling in Revit®, you can easily create basic stairs in straight, u-shaped, and multi-landing configurations. To create more complex shapes, you can convert runs and landings to sketches. Ramps can also be created by specifying runs and landings. Railings can be added automatically with the Stair and Ramp commands, or you can sketch railings on stairs and add them to balconies and decks.

Learning Objectives

- Create and modify component-based stairs made of runs, landings, supports, and railings.
- Convert runs and landings to sketches.
- Add and modify railings that are connected to stairs, as well as free-standing railings for balconies.
- Create ramps to make your design accessible.

13.1 Creating Component Stairs

As with other Revit elements, stairs are smart parametric elements. With just a few clicks, you can create stairs of varying heights and designs, complete with railings. Stairs can be created by assembling stair components (as shown in Figure 13-1), or by sketching a custom layout.

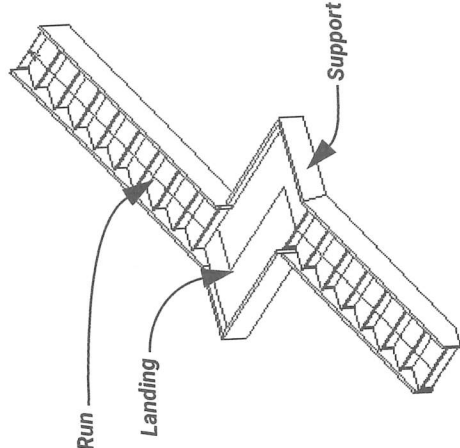


Figure 13-1

When creating component-based stairs, there are three parts of a stair that can be assembled, as shown in Figure 13-1:

- **Runs:** The actual stair tread and riser elements. These include straight runs which can be combined for multi-landing stairs, spiral stairs, and L-shaped and U-shaped winders.
- **Landings:** The platform between runs. These are typically created automatically and then modified if needed.
- **Supports:** The stringer or carriage that structurally holds the stair elements. These can be created automatically or you can pick the edges where you want the different types to go. These can be placed on either side of the stairs or in the center of the stairs.
- Railings are typically added in the **Stair** command. They display after you complete the stair.
- You can select and edit each of the components while you are in stair edit mode, or after the stair has been created.
- Each component of the stair is independent but also has a relationship to the other components. For example, if steps are removed from one run they are added to connected runs to maintain the overall height, as shown in Figure 13-2.

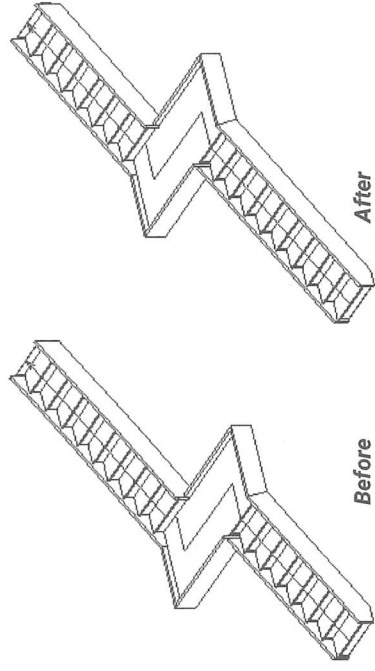


Figure 13-2

Creating Runs

To create a component stair, you must first place the run elements. There are six different options available in the Components panel, as shown in Figure 13-3 and described as follows:

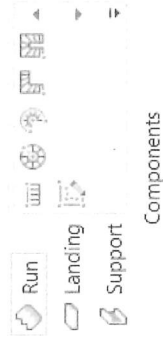


Figure 13-3

	Straight	Draws a straight run by selecting the start and end points of the run.
	Full-Step Spiral	Draws a spiral run based on a start point and radius.
	Center-Ends Spiral	Draws a spiral run based on a center point, start point, and end point.
	L-Shape Winder	Draws an L-shaped winder based on the lower end.
	U-Shape Winder	Draws a U-shaped winder based on the lower end.
	Create Sketch	Opens additional tools where you can sketch stair boundary and risers individually.

Note: Component stairs can include a mix of the different types of runs.

Hint: Stairs and Views

When creating stairs you can work in either plan or 3D views. It can help to have the plan view and a 3D view open and tiled side by side. Only open the views in which you want to work and type **WT** to tile the views.

How To: Create a Component-Based Stair

1. In the *Architecture* tab>*Circulation* panel, click  (Stair).
2. In the *Type Selector*, select the stair type, as shown in Figure 13-4.

Note: The stair type can impact all of the other settings. Therefore, it is important to select it first.

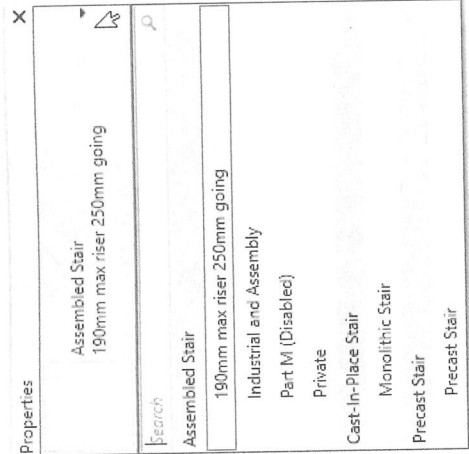


Figure 13-4

3. In *Properties* (shown in Figure 13-5), set the *Base Level*, *Top Level*, and any other information that is needed.

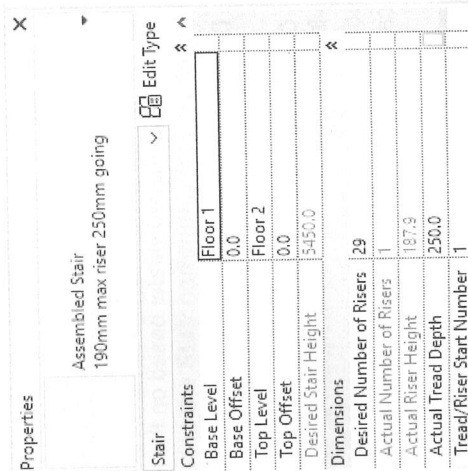


Figure 13-5

4. In the *Modify | Create Stairs* tab>*Tools* panel, click  (Railing), select a railing type in the *Railings* dialog box (as shown in Figure 13-6), and specify whether the *Position* is on the *Treads* or *Stringer*. Click **OK**.

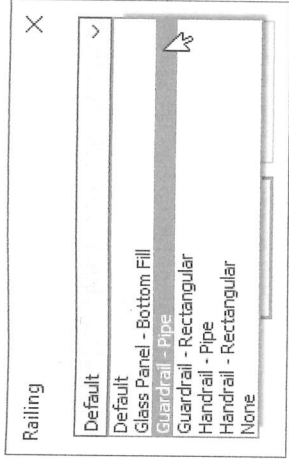


Figure 13-6

Note: Railings can also be added and modified after the stair has been placed.

5. In the *Modify | Create Stair* tab>*Components* panel, click  (Run) and then click  (Straight).
6. In the *Options Bar* (shown in Figure 13-7), specify the following options:
 - **Location Line:** Select **Exterior Support: Left, Run: Left, Run: Center, Run: Right**, or **Exterior Support: Right**.
 - **Offset:** Specify a distance from the *Location Line*. This is typically used if you are following an existing wall but do not need to have the stairs directly against them.
 - **Actual Run Width:** Specify the width of the stair run (not including the supports).
 - **Automatic Landing:** Creates landings between stair runs (recommended).



Figure 13-7

7. Click on the screen to select a start point for the run. A box displays, indicating the stair orientation and the number of risers created and remaining, as shown in Figure 13-8.

Note: If you are creating a complex stair pattern, sketch reference planes in the *Stairs* command to help you select the start and end points of each run.

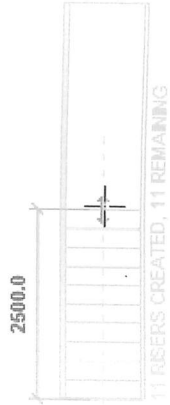


Figure 13-8

- For straight stairs of a single run, select a second point anywhere outside the box to create the run.
- For multi-landing or u-shaped stairs, select a second point inside the box for the length of the first run, move the cursor in the direction of the turn, then select a start point and an end point for the next run.
- If the stair is going in the wrong direction, click  (Flip) in the *Modify | Create Stair* tab > Tools panel.

8. Click  (Finish Edit Mode) to create the stairs, complete with railings.

Creating Other Types of Runs

While most stairs are created using straight runs, there are times when you need to create specialty runs, such as spirals and winders or when you need to sketch a stair such as that shown in Figure 13-9.

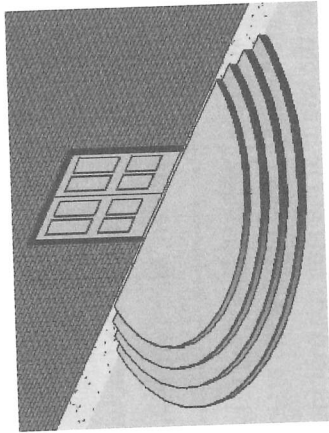


Figure 13-9

How To: Create a Full-Step Spiral Run

1. Start the **Stair** command and set up the properties as needed.
2. In the Components panel, click  (Full-Step Spiral).
3. Select the center point of the spiral.
4. Select (or type) the radius of the spiral. The run is created, as shown in Figure 13-10.

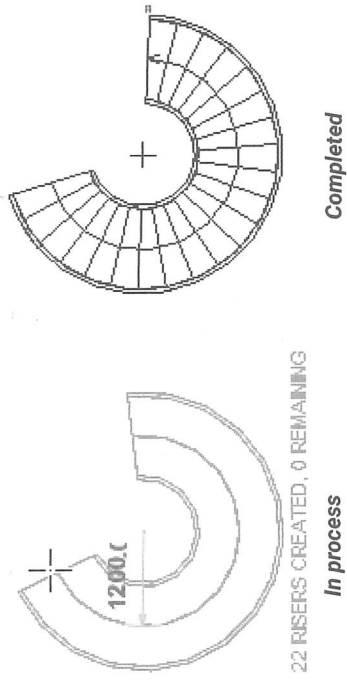


Figure 13-10

How To: Create a Center-Ends Spiral Run

1. Start the **Stair** command and set up the properties as needed.
2. In the Components panel, click  (Center-Ends Spiral).
3. Select the center of the spiral.
4. Select (or type) the radius of the spiral, as shown on the left in Figure 13-11.
5. Drag the cursor to display the number of risers, as shown on the right in Figure 13-11.

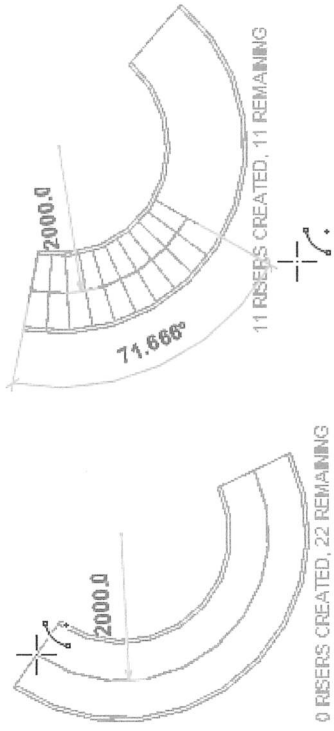


Figure 13-11

Note: You can create spiral stairs with landings with this option.

How To: Create Winder-Based Stairs

- 1. Start the **Stair** command and set up the properties as needed.
- 2. In the Components panel, click  (L-Shape Winder) or  (U-Shape Winder).
- 3. Click a start point to place the overall stair.
- 4. Select the stair and use the arrow controls to modify the length, as shown in Figure 13-12.

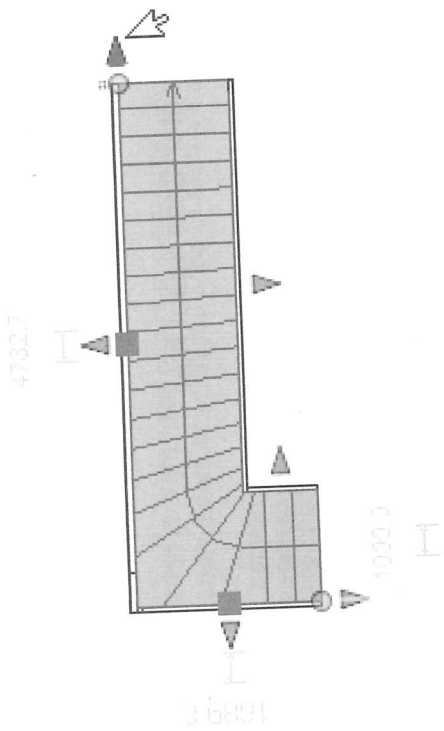


Figure 13-12

How To: Sketch a Stair

- 1. Start the **Stair** command and set up the properties as needed.
 - In many cases, a custom stair is shorter and should be set using a base and top offset from the same level, as shown in Figure 13-13. By default, a stair height is from level to level.

Note: Change the level offsets before starting to sketch the stair.

Constraints	
Base Level	Level 1
Base Offset	0.0
Top Level	Level 1
Top Offset	1000.0
Desired Stair Height	1000.0

Figure 13-13

- 2. In the **Modify | Create Stair** tab>Components panel, click  (Run) and then click  (Sketch).

- 3. In the **Modify | Create Stair>Sketch Run** tab, use  (Boundary),  (Riser), and  (Stair Path) to draw the parts of the stair, as shown in Figure 13-14.

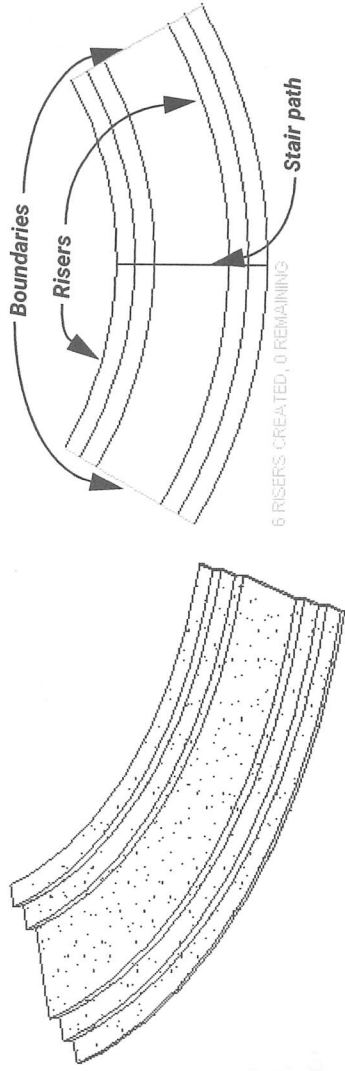


Figure 13-14

- 4. Click  (Finish Edit Mode).
- 5. If you want to add a landing, you can sketch one.
- 6. Click  (Finish Edit Mode) to complete the final assembly.

Creating Landings

Landings are typically created automatically between any breaks in runs. Once finishing the stair, you can easily modify the landings to create custom designs. There are two additional options to create landings, as shown in Figure 13-15:

- **Pick Two Runs:** Places the landing at the correct height between the runs.
- **Create Sketch:** Enables you to sketch the shape of the landing, but you must place it at the correct height.

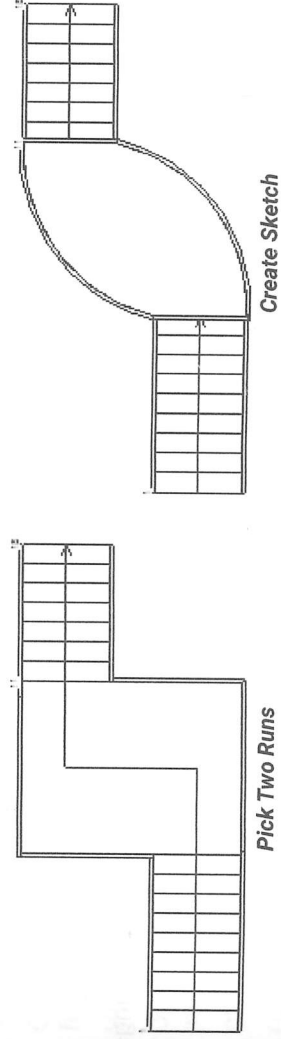


Figure 13-15

- You can connect runs with a landing as long as the start level and end level of the runs are at the same height.

Adding Supports

Stair supports are included in the stair type if needed. However, you might want to delete them and add them later. Note that this only works if the stair type has supports that are specified in the Type Properties.

How To: Add Stair Support Components

1. If there are no supports, double-click on the stair and in the *Modify / Create Stair* tab> Components panel, click  (Support) and then click  (Pick Edges).
2. Select the edge on which you want to place the support. Hover your cursor over the first support and press <Tab> if you have more than one connected edge on which you want to place the supports.
3. Finish the stair as needed.

Hint: Troubleshooting

When working with stairs and other elements, Warnings (such as the one shown in Figure 13-16) display when something is wrong, but you can keep on working. In many cases, you can close the dialog box and fix the issue or wait and do it later.

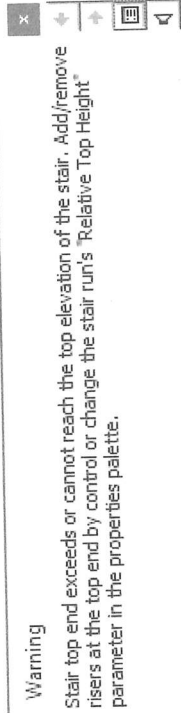


Figure 13-16

Sometimes Errors display where you must take action. These force you to stop and fix the situation.

When you select an element that has a related warning,  (Show Related Warnings) displays in the ribbon. When selected, it opens a dialog box in which you can review the warning(s) related to the selected element. You can also display a list of all of the warnings in the project by clicking  (Review Warnings) in the *Manage* tab>Inquiry panel.

Practice 13a Create Component Stairs

Practice Objectives

- Create a component stair.
- Model a custom sketch stair.

In this practice, you will create U-shaped stairs in each of the stairwells. Figure 13-17 shows the completed practice. You will also create a sketched stair at the entrance to the building.

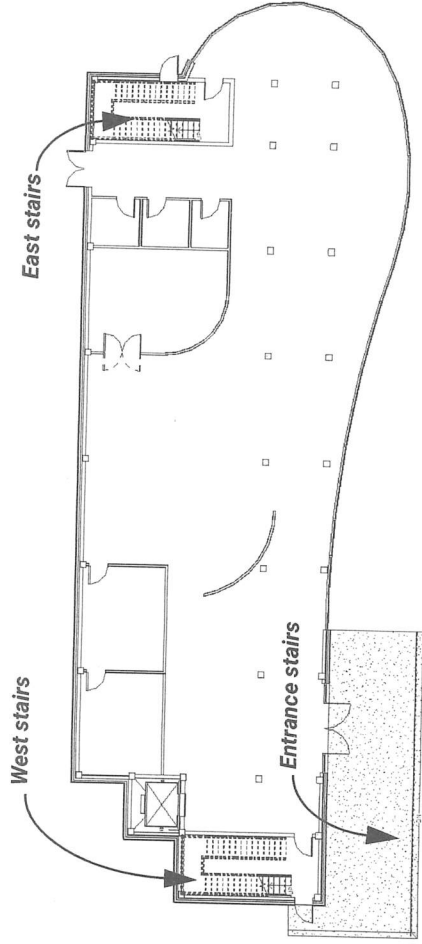


Figure 13-17

Task 1: Create Stair 1 on the first floor.

1. Open the project **Arch-Stairs-M.rvt** from the practice files folder.
2. Open the **Floor Plans: Floor 1 - Stairs-West** view. This is a callout view from the main floor plan.
3. Hide the grid lines and sections, and turn off the crop region.
4. Open the **3D - West Stairs** view. The walls have been set to transparent so you can see the stairs.
5. Close any other views except for **Floor 1 - Stairs-West** and **3D - West Stairs**.
6. Click on the **Floor 1 - Stairs-West** tab to make it the active view. Tile the views by typing **WT** and then type **ZA** to zoom all.
7. In the *Architecture* tab>Circulation panel, click  (Stair).

8. In Properties, set or verify the following properties:
- In the Type Selector: **Assembled Stair: Hotel Stairs**
 - Base Level: **Floor 1**
 - Base Offset: **0.0**
 - Top Level: **Floor 2**
 - Top Offset: **0.0**

Note the Desired Number of Risers is 29.

9. In the *Modify | Create Stair* tab>Tools panel, click  (Railing). In the Railings dialog box, select **Hotel Stair Guardrail**, as shown in Figure 13-18. Verify that the *Position* is set to **Treads** and click **OK**.

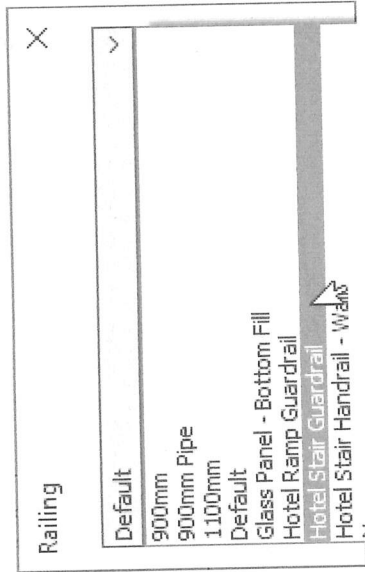


Figure 13-18

10. In the *Modify | Create Stair* tab>Work Plane panel, click  (Reference Plane). Draw a horizontal reference plane **1200mm** from the interior side of the top wall of the stairwell. Copy or offset another reference plane from the new reference plane **3500mm** to indicate the start of the run, as shown in Figure 13-19.

Note: Use *Pick Lines* and set the *Offset* in the *Options Bar*.

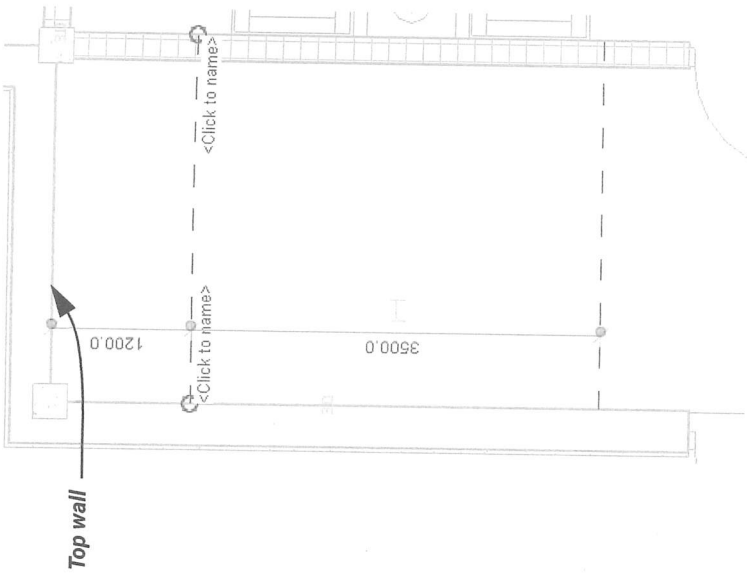


Figure 13-19

11. Click  (Modify).
12. In the *Modify | Create Stair* tab>Components panel, click  (Run).
13. In the Options Bar, set the *Location Line* to **Run: Left**, the *Offset* to **0.0**, and the *Actual Run Width* to **1200mm**. Verify that **Automatic Landing** is checked.
14. Pick the start point of the first run on the interior side of the exterior wall, as shown in Figure 13-20. Pick the second point near the reference plane and the interior side of the exterior wall.
15. Move your cursor to the opposite side of the stairwell to start the second run.

16. Pick the start point for the second run at the intersection of the wall and the reference plane, as shown in Figure 13-20. Pick the second point past the completed number of stairs.

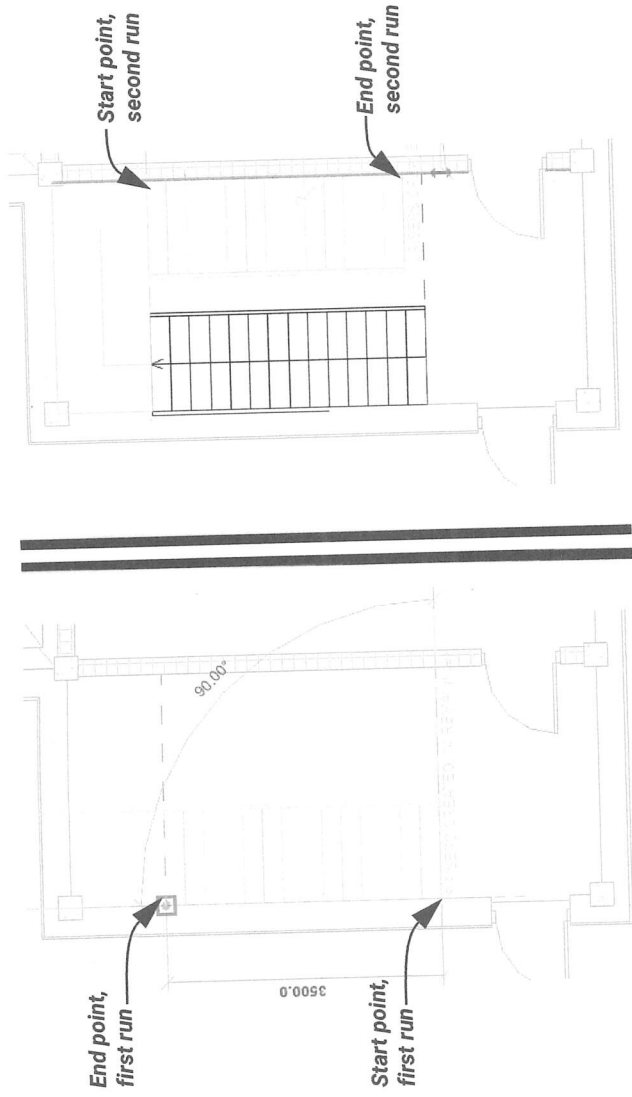


Figure 13-20

17. Click  (Finish Edit Mode). The stairs with railing display.
18. Type **TW** to tab the views and **ZA** to zoom all.
19. Save the project.

Task 2: Create the east stairs on the first floor.

1. Open the **Floor Plans: Floor 1 - Stairs-East** view and type **ZA** to zoom all.
2. Repeat the process outlined above to create a stair in this stairwell, using the same stair and railing type and the same Options Bar settings and Properties.
3. Save the project.

Task 3: Sketch entrance stairs.

1. Open the **Floor Plans: Floor 1** view.
2. Hide the grid lines, sections, and tags by selecting one of each and typing **VH**.
3. In Properties, in the *Underlay* section, set the **Range: Base Level to Floor 1** and **Range: Top Level to Unbounded**. This displays the outline of the entrance roof that you will use as a guide to create custom stairs.

4. In the *Architecture* tab>*Circulation* panel, click  (Stair).
5. In Properties, set or verify the following:
 - In the *Type Selector: Cast-In-Place Stair: Monolithic Stair - Hotel*
 - **Base Level: Floor 1**
 - **Base Offset: (negative) -300mm**
 - **Top Level: Floor 1**
 - **Top Offset: 0.0**
 - **Desired Number of Risers: 2**
6. In the *Modify | Create Stairs Sketch* tab>*Tools* panel, click  (Railing). In the Railing dialog box, select **None** and click **OK**.
7. In the *Components* panel, click  (Run), then click  (Create Sketch).
8. In the *Draw* panel, click  (Boundary), then click  (Pick Lines). Select the ends of the roof outline that are labeled "Boundary lines" in Figure 13-21. (Note: The sketch lines in the following images have been widened for emphasis.)
9. Modify the boundary lines to terminate at the outside of the wall, as shown in Figure 13-21.

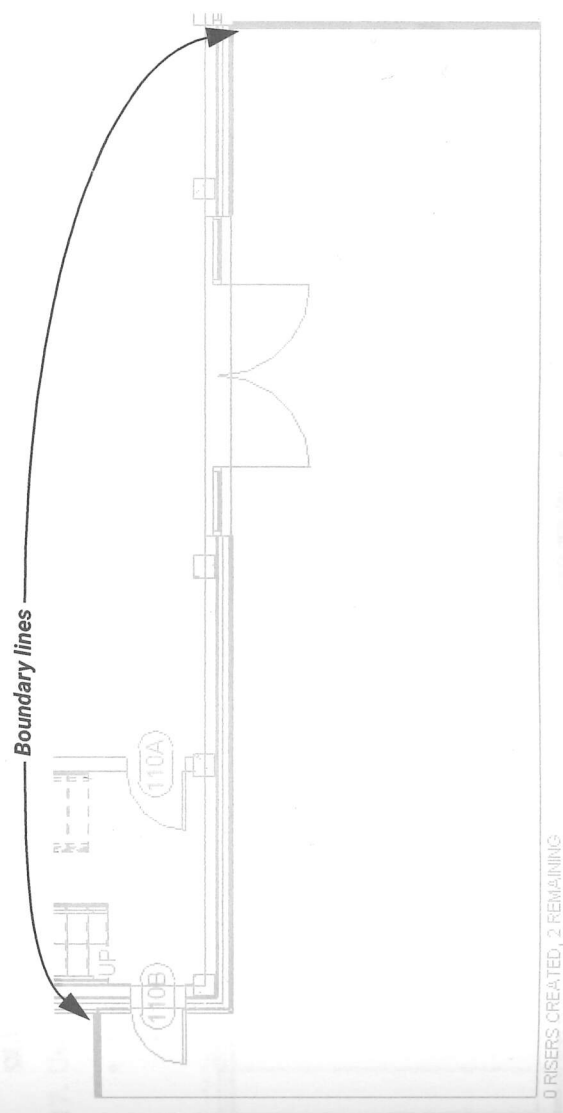


Figure 13-21

10. Click  (Pick Lines) to select the other sides of the roof outline (labeled "First set of riser lines" in Figure 13-22).

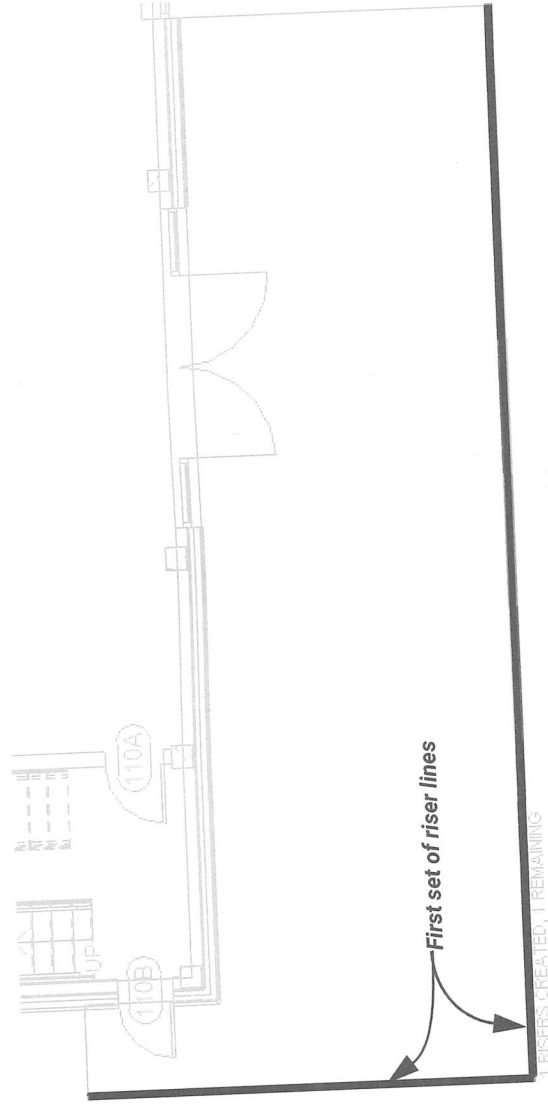


Figure 13-22

11. With  (Riser) still selected, click  (Pick Lines). In the Options Bar, set the Offset to 300mm. Offset another set of risers outside the outline, as shown in Figure 13-23.

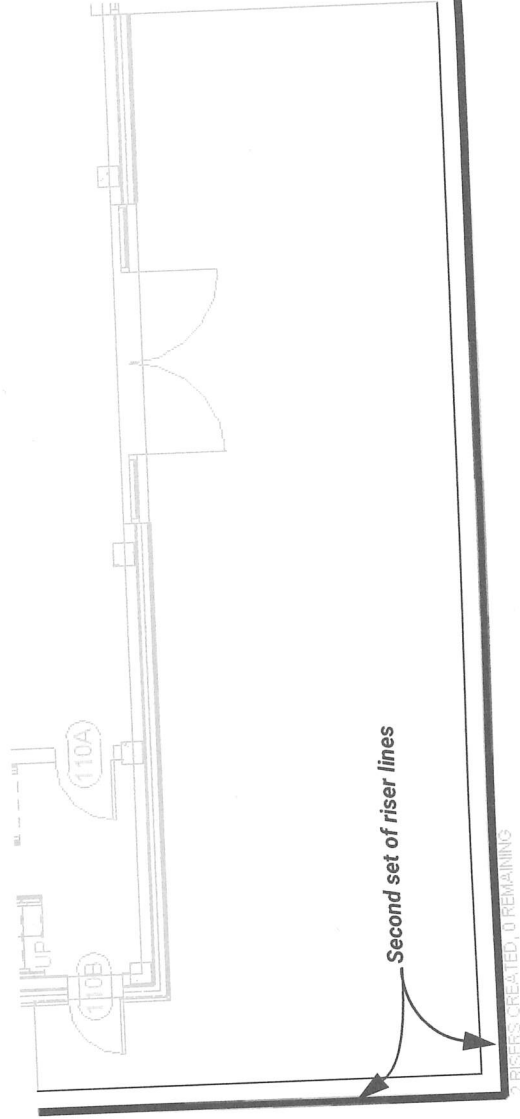


Figure 13-23

12. Click  (Modify).
13. Use  (Trim/Extend to Corner) to clean up the intersections of the boundary lines and outside risers, as shown in Figure 13-24.

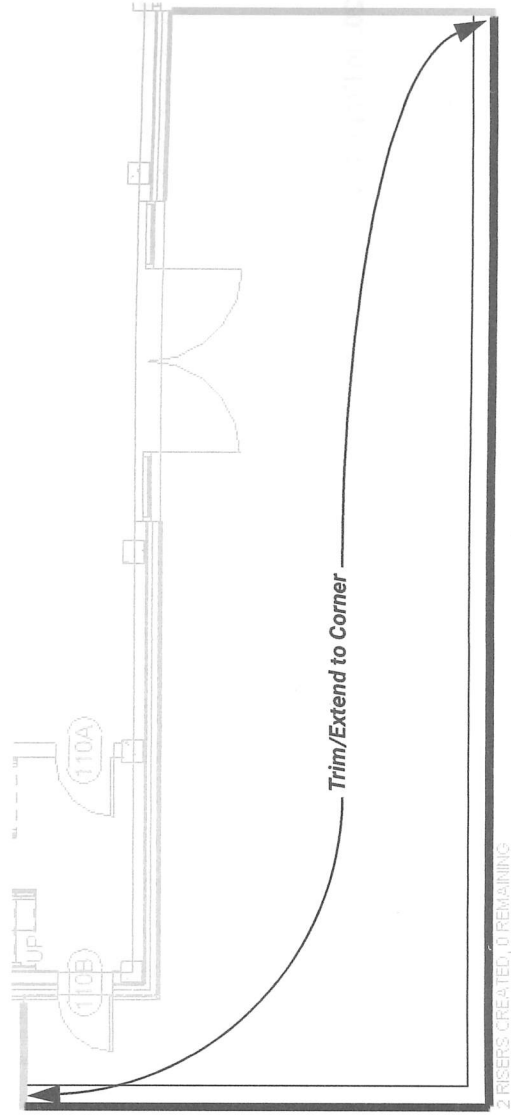


Figure 13-24

14. Click  (Finish Edit Mode) to complete the stair portion of the assembly.
15. In the **Modify | Create Stair** tab>Tools panel, click  (Flip). This will flip the risers to the correct direction.
16. In the **Modify | Create Stair** tab>Components panel, click  (Landing) and then  (Create Sketch).
17. Use **Pick Lines** to create the boundary for the landing, as shown in Figure 13-25.
- If needed, use  (Trim/Extend to Corner) to clean up all the intersections of the boundary lines.

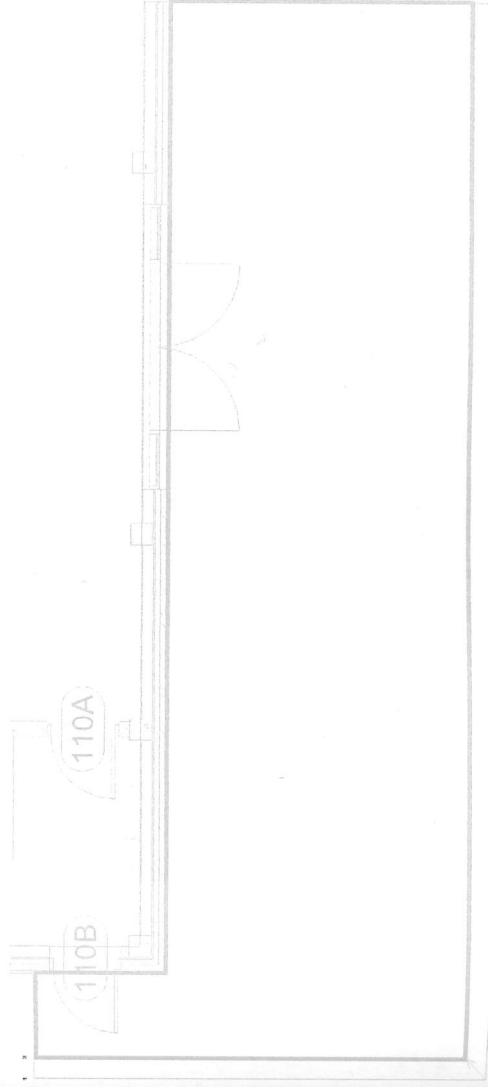


Figure 13-25

18. Click  (Finish Edit Mode) twice to create the full stair assembly.
- Ignore any warnings that display.
19. Select the **DN** tag on the stairs, as shown in Figure 13-26.



Figure 13-26

20. In Properties, uncheck **Show Up Text** and **Show Down Text**, as shown in Figure 13-27.

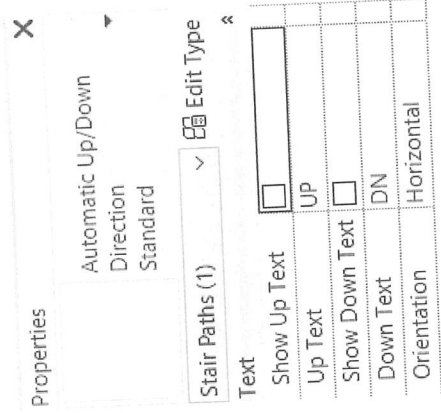


Figure 13-27

21. In Properties, set the **Underlay>Range**: Base Level to **None**.
22. View the stairs in 3D, as shown in Figure 13-28.

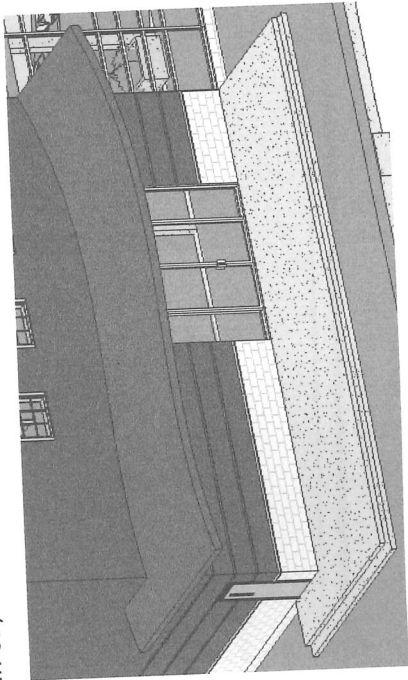


Figure 13-28

23. Save and close the project.

End of practice

13.2 Modifying Component Stairs

Stairs can be modified in a variety of ways. For example, in Figure 13-29, a straight stair with a landing has been modified to make one run wider than the other and the landing wider than both runs, creating a balcony. The landing has been further customized by sketching a curved feature.

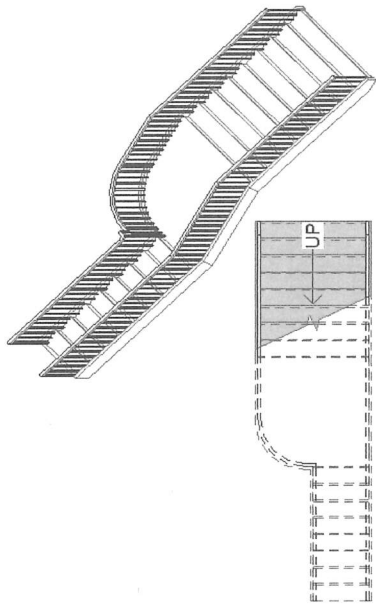


Figure 13-29

- Modifying stair components can be done when you first create the stair or later when you edit a stair.
- When working with a finished stair, you can change the type and properties, as well as flip the stair direction, as shown in Figure 13-30. You can select a stair run and use temporary dimensions to modify the length and width, as shown in Figure 13-31.

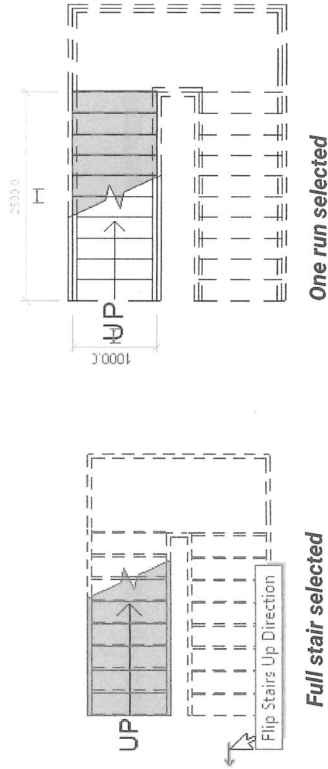


Figure 13-30

Figure 13-31

- To select a stair run, hover your cursor over the stair and press <Tab> to cycle through until the one you want highlights.

Editing Individual Stair Components

Within stair edit mode, you can make more significant modifications to individual components using temporary dimensions and shape handles, as shown in Figure 13-32. Numerous snaps and alignment lines are also available as you modify the components.

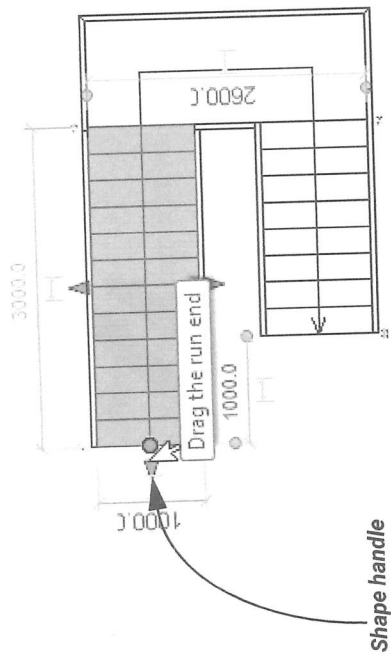


Figure 13-32

- To edit stairs, double-click on the stairs or, in the *Modify / Stairs* tab>*Edit* panel, click  (Edit Stairs).
 - The arrow shape handle at the end of a run lengthens or shortens the run and modifies the other run so that the overall number of steps stays consistent and retains the start and end level.
 - The circle shape handle at the end of a run lengthens or shortens the run, does not modify any other runs, but changes the start and end level.
 - The arrow shape handle on the sides of the runs or landings can be used to modify the width.
 - You can use temporary dimensions for the run width and connections to other elements, but not for run lengths. Use the shape handles instead.
 - When you have finished modifying the stair, click  (Finish Edit Mode).

Converting Components to Sketches

To customize a run or landing with more options, convert it into a sketch and modify the outline of the sketch, as shown for a curved landing in Figure 13-33.

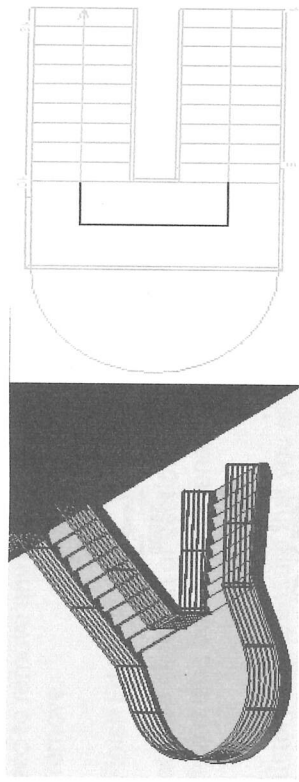


Figure 13-33

How To: Turn a Stair Component into a Sketch

- Select a stair.
- In the *Modify / Stairs* tab>*Edit* panel, click  (Edit Stairs).
- Select the run or landing that you want to customize.
- In the *Tools* panel, click  (Convert to sketch-based). Doing so turns the component into a custom sketched element.
- In the *Tools* panel, click  (Edit Sketch).
- Use the options in the *Modify / Create Stair>Sketch Landing (or Run)* tab>*Draw* panel to modify the boundary, riser, or stair path, as needed. The boundary of a landing is shown in Figure 13-34.

Note: Editing an existing landing is the easiest way to create a custom landing.

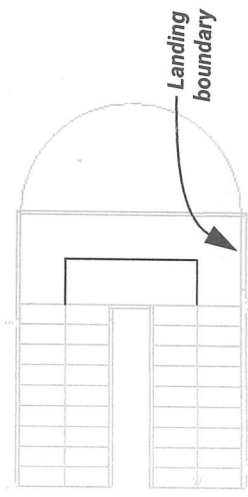


Figure 13-34

- Click  (Finish Edit Mode) to complete the sketch. Click again to return to the stair.

Multistory Stairs

Once you have created a component stair that runs from one level to another, you can expand that stair to extend to multiple stories. You can select which levels the multistory stairs extend to and skip levels as needed, as shown in Figure 13-35.

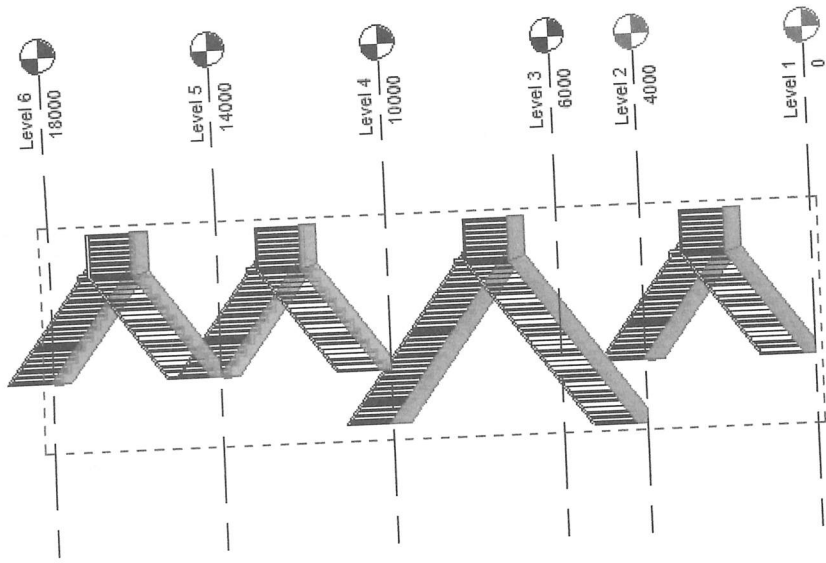


Figure 13-35

How To: Create Multistory Stairs

Note: You can also create multistory stairs while you are in the **Create Stair** command.

1. Open an elevation or section view where the base stairs and levels are displayed.
2. Select the stair that you want to turn into a multistory stair.
3. In the **Modify | Stairs** tab>**Multistory Stairs** panel, click  (Select Levels).

4. In the **Modify | Multistory Stairs** tab>**Multistory Stairs** panel, click  (Connect Levels).
5. Select the levels you want to connect. Hold <Ctrl> to select multiple levels.
 - If you need to remove any levels, click  (Disconnect Levels) and select the levels you want to remove.
6. Click  (Finish Edit Mode).
- If you are not in an elevation or section view when you start the **Multistory Stair** command, the **Go To View** dialog box displays, enabling you to select and open a view by clicking **Open View**.
- To edit multistory stairs, ensure that you are selecting the full multistory stair element, as shown in Figure 13-36. Press <Tab> to cycle through the various components of the stairs as needed.

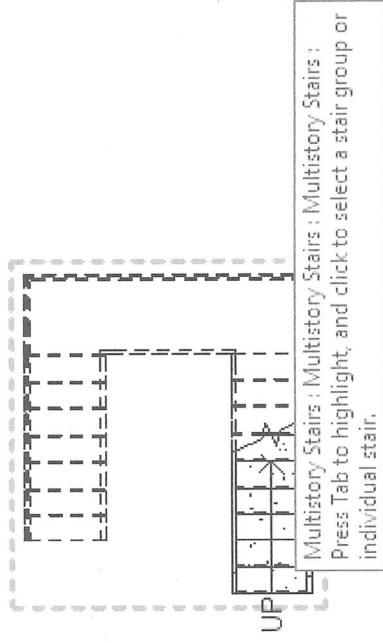


Figure 13-36

- If you change the height of a level, the stair components in the multistory stair are updated to match the new distance.
- If you change the type of a railing after a multistory stair has been placed, any runs of the same height (i.e., grouped together) are also updated. Runs of different heights would need to be modified separately.

Practice 13b

Modify Component Stairs

Practice Objectives

- Expand a set of stairs to multistory stairs.
- Cut out floors where stairs penetrate them.
- Create shafts.

In this practice, you will modify stairs and turn them into multistory stairs. You will also modify the floors for stair openings and add shafts to create openings for the upper floors. Figure 13–37 shows the completed multistory stairs in a building section view.

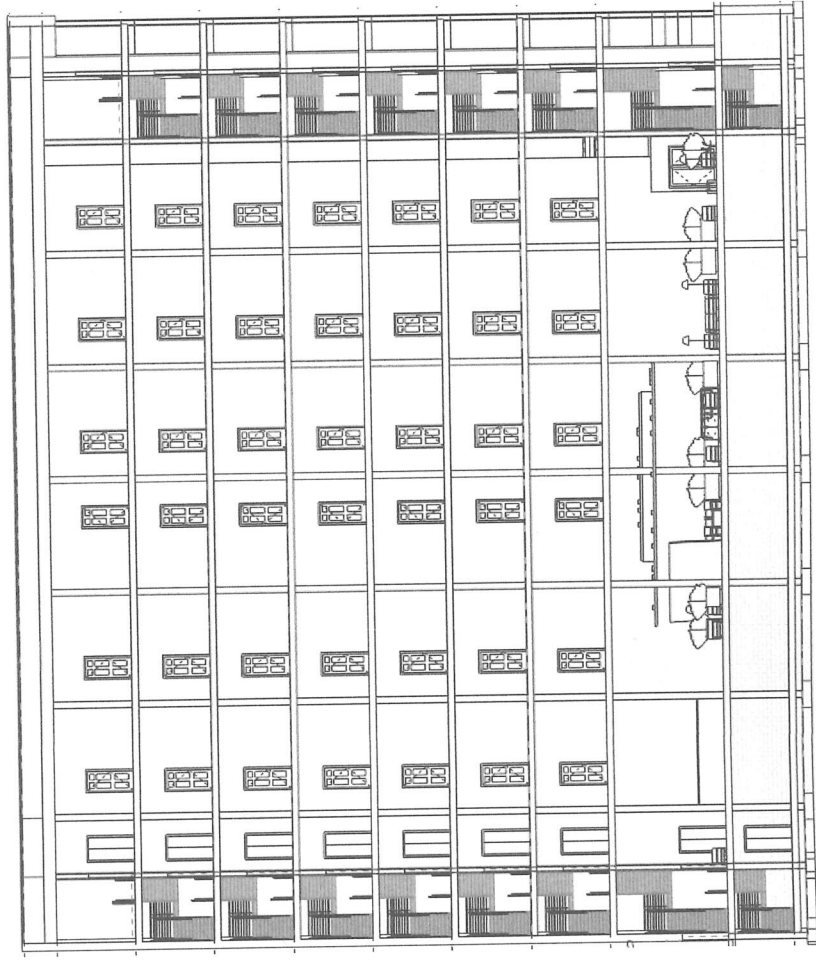


Figure 13–37

Task 1: Create multistory stairs.

1. Open the project **Arch-StairsModify-M.rvt** from the practice files folder.
2. Open the **Sections (Building Section): E/W Building Section** view. You will see the west stairs.
3. Select the assembled stair shown in Figure 13–38.

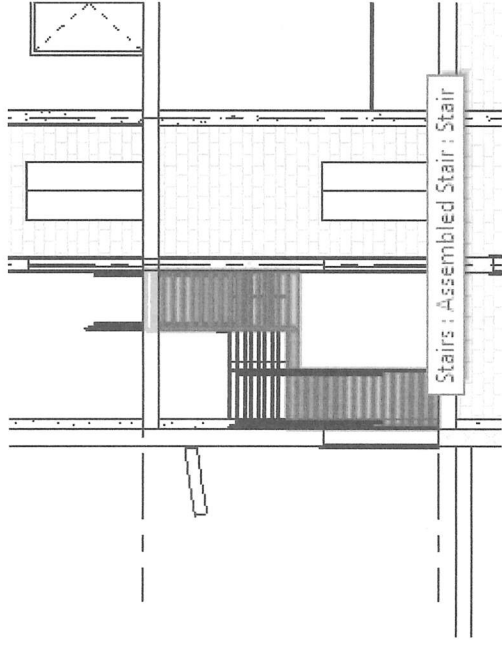


Figure 13–38

4. In the **Modify / Stairs** tab>**Multistory Stairs** panel, click  (Select Levels). In the **Multistory Stairs** panel, verify that  (Connect Levels) is selected.
5. Hold <Ctrl> and select the level lines for **Floor 3** to **Floor 8**. (Do not select the **Roof** or **Parapet** levels.)

6. Click  (Finish Edit Mode). The stairs are added between the rest of the floors, as shown in Figure 13-39.

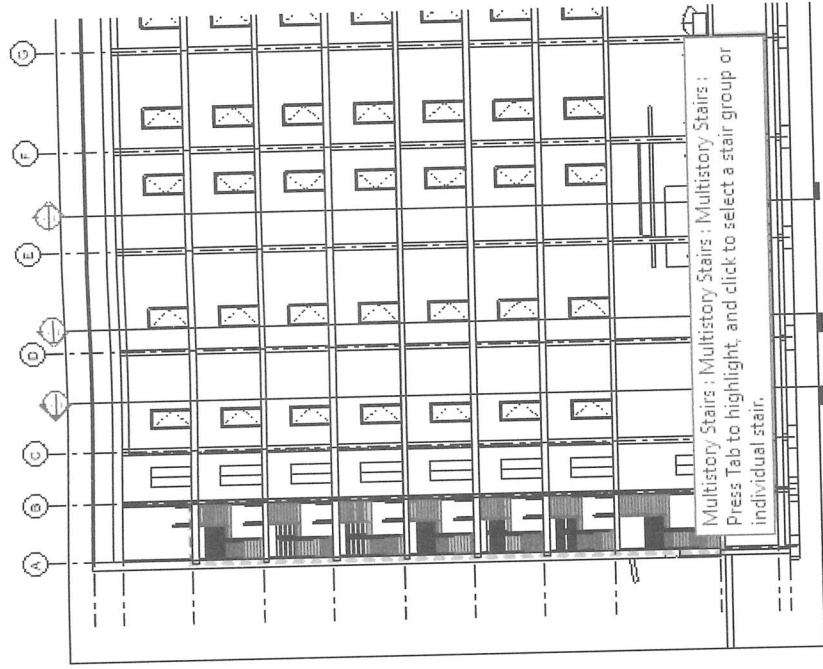


Figure 13-39

7. With the new multistory stairs still selected, in the **Modify | Multistory Stairs** tab>**Multistory Stairs** panel, click  (Connect/Disconnect Levels).
8. Click  (Connect Levels) and select the **Basement** level line, then click  (Finish Edit Mode). The stairs to the basement are added.
 - If needed to see the stairs on all of the floors, set the **Visual Style** to  (Consistent Colors).
9. Save the project.

You need to do this to the east stairs, but they are not visible in the building section view so you will need to modify the section in plan view.
10. Return to the **Floor 1** view.

11. Select the E/W Building Section line (do not select on the section marker head).
12. Pan over to the east stairs area.
13. In the **Modify | Views** tab>**Section** panel, click  (Split Segment).
14. Split the section close to the stairs; you will then click inside the east stairwell to place the split section, as shown in Figure 13-40.

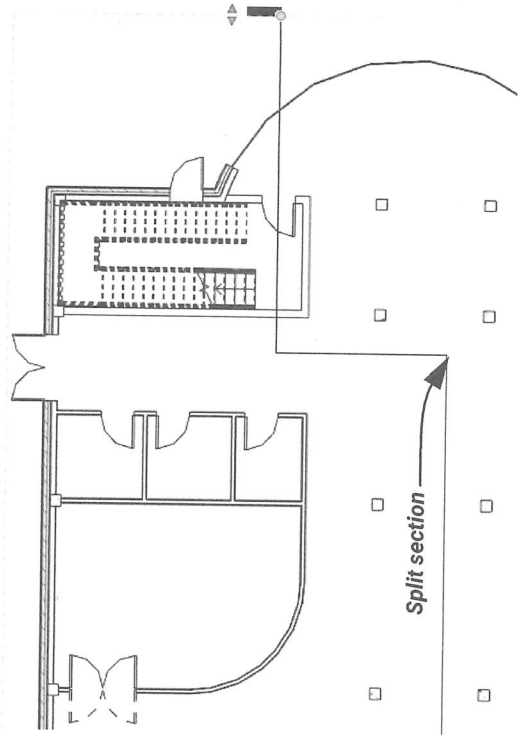


Figure 13-40

15. Click  (Modify).
16. Activate the **E/W Building Section**. You are now able to see the east stairs. Repeat the process of turning the east stairs into a multistory stair and adding stairs to the basement.
17. Save the project.

Task 2: Modify the second floor stair openings.

1. Open the **Floor Plans: Floor 2** view.

Note: If needed, toggle on  (Select Elements by Face).

2. Select the floor.
3. In the **Modify | Floors** tab>**Mode** panel, click  (Edit Boundary).
4. Zoom in to the west stairs.

5. Modify the floor boundary line so that it creates an opening for the west stairs, as shown in Figure 13-41.

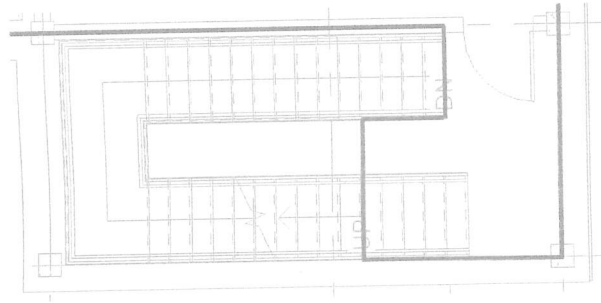


Figure 13-41

6. Pan over to the east stairwell and modify the floor boundary there as well, as shown in Figure 13-42.

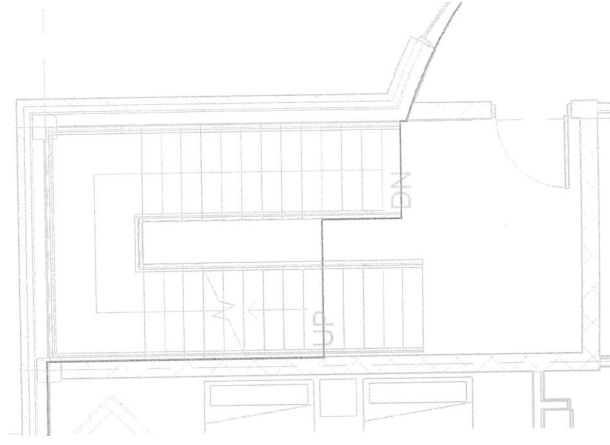


Figure 13-42

7. Use  (Trim/Extend to Corner) to clean up the intersections of the boundary lines.
8. Click  (Finish Edit Mode).
 - If prompted, select **Yes** to overlap the highlighted floor and select **Don't Attach** in the Attaching to floor dialog box.
9. Zoom out to display the entire second floor, as shown in Figure 13-43.

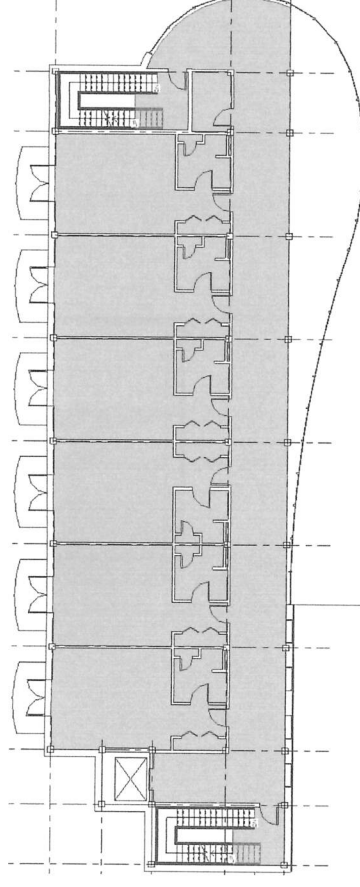


Figure 13-43

10. Click  (Modify).
11. Save the project.

Task 3: Add shafts in the stairwells.

1. Open the **Floor Plans: Floor 3** view.
2. In Properties, set the *Underlay>Range*: **Base Level to None**.
3. In the *Architecture* tab>Opening panel, click  (Shaft).

4. Draw the sketch of the shaft similar to that shown in Figure 13-44.

Note: You can use a shaft here because the openings are the same on all of the floors.

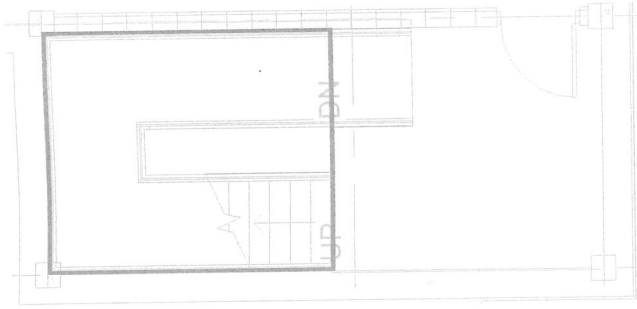


Figure 13-44

5. In Properties, set the *Base Constraint* to **Floor 3** with a *Base Offset* of (negative) **-300mm** and the *Top Constraint* to **Up to level: Floor 8** with a *Top Offset* of **0.0**.
6. Click  (Finish Edit Mode) to create the shaft.

7. Repeat the process on the east stairwell, as shown in Figure 13-45.

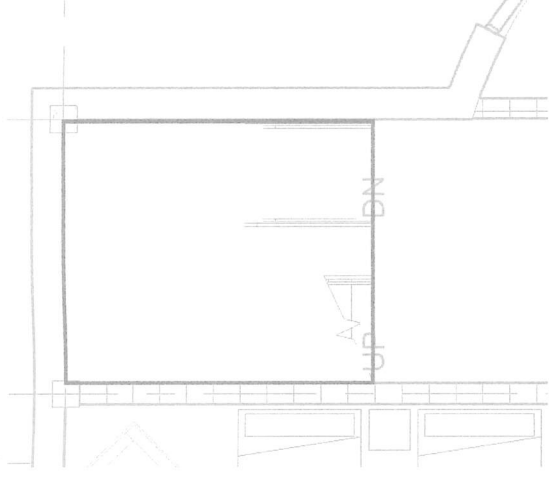


Figure 13-45

8. Save and close the project.

End of practice

13.3 Working with Railings

Railings are automatically created with stairs, but you can modify or delete them independently of the stair element. You can also add railings separately from the stairs for other locations, as shown in Figure 13-46.

Note: Hosts for sketched railings include floors, slabs, slab edges, the top of walls, and roofs. You can also add railings to topographic surfaces.

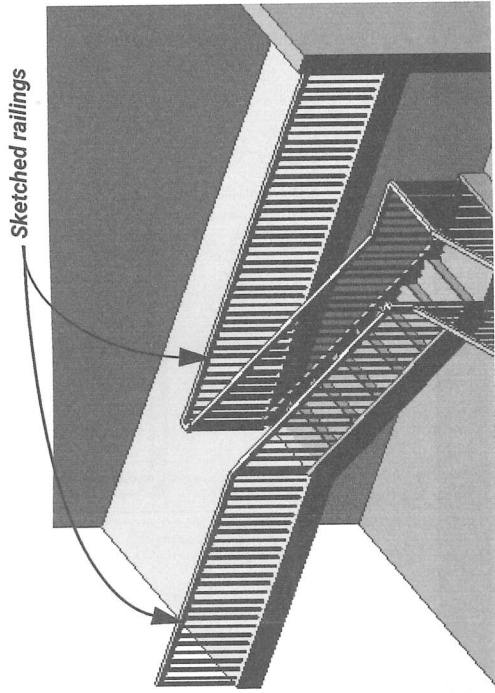


Figure 13-46

- You can add railings to existing stairs and ramps if they were not included when the stairs and ramps were created.

How To: Add Railings by Sketching

1. Open a plan or 3D view.
2. In the *Architecture* tab>Circulation panel, expand  (Railing) and click  (Sketch Path).
3. In the Type Selector, specify the railing type.
4. In the *Modify | Create Railing Path* tab>Tools panel, click  (Pick New Host) and select the element that you want the railing to associate to, such as a stair, floor, or top of a wall.
 - If you are working in a 3D or section view, you can select **Preview** in the *Modify | Create Railing Path* tab>Options panel and the railing displays while you are still in edit mode. This only works if you have selected a host.
 - If the host is sloped, the railing will follow the slope, as shown in Figure 13-47. The sketch displays at the host's level.

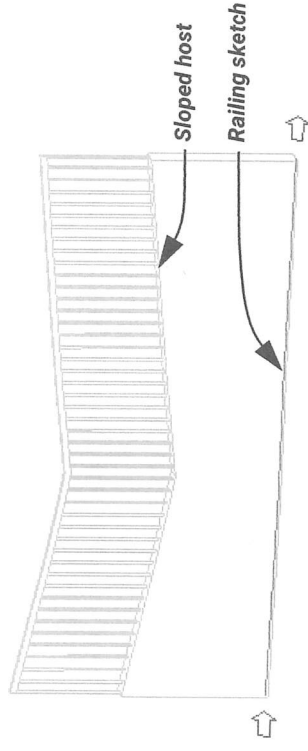


Figure 13-47

5. Use the Draw tools to sketch the lines that define the railings.
6. Click  (Finish Edit Mode) to create the railing.
 - The railing must be a single connected sketch. If it is not, you are prompted with a warning, such as the one shown in Figure 13-48.

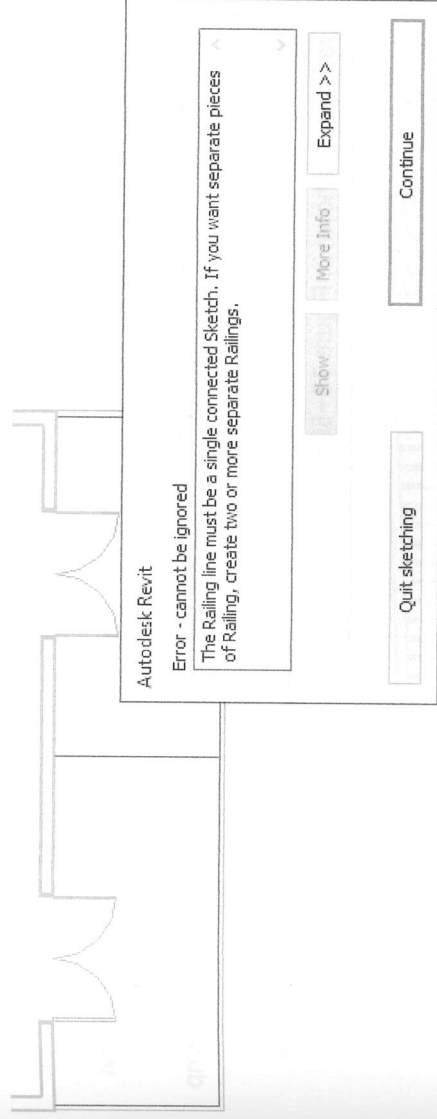


Figure 13-48

How To: Add Railings Using Place on Stair/Ramp

1. In the *Architecture* tab>Circulation panel, expand  (Railing) and click  (Place on Stair/Ramp).
2. In the *Modify | Create Railing Place on Stair/Ramp* tab>Position panel, click  (Stringer).
 -  (Place on Stair/Ramp) only works if there are no railings on the stair. If you want to add an additional railing (e.g., down the middle of a wide stair), you need to sketch the railing.
3. Select the stair or ramp where you want to add the railings.

Modifying Railings

Modifying railings can be as simple as changing their type, as shown in Figure 13-49. You can also edit the path of a railing.

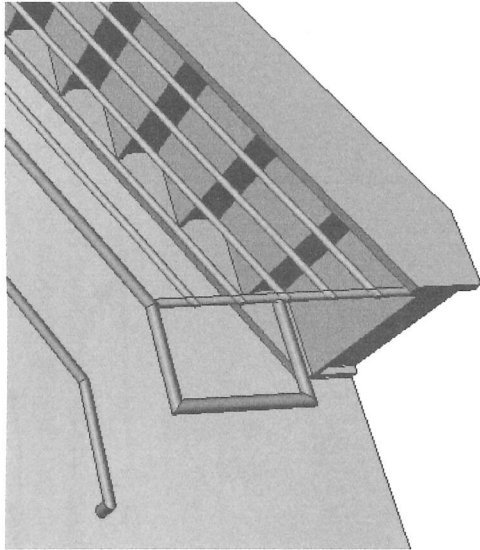


Figure 13-49

- You can delete railings separately from stairs or ramps. However, deleting a stair or ramp automatically deletes related railings.
- You can use the  (Split Element) command on railings. Doing so results in separate railings, as shown in Figure 13-50.

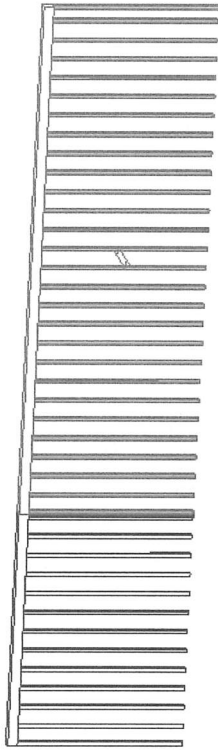


Figure 13-50

Editing the Path of a Railing

To edit the path of a railing, double-click on the railing, or select the railing and in the *Modify | Railings* tab>Mode panel, click  (Edit Path). This places you in edit mode, in which you can modify the individual lines that define the railing, as shown in Figure 13-51. You can create additional lines, but they must be connected to the existing lines.

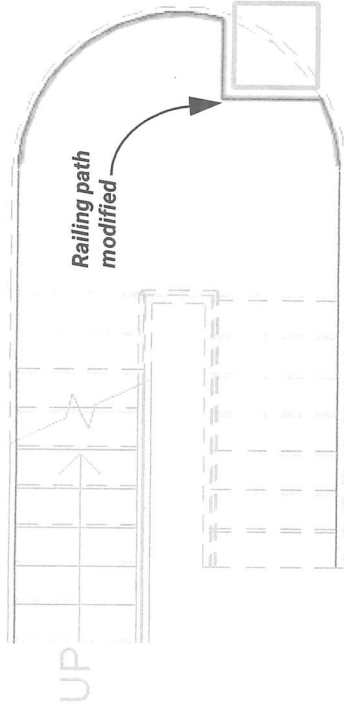


Figure 13-51

Note: Unlike many other elements in edit mode, railings do not have to be in a closed loop.

Practice 13c Work with Railings

Practice Objectives

- Modify railings and handrails.
- Add stand-alone railings.

In this practice, you will modify the railings in the stairwells by changing the railings against the wall to a new type. You will add stand-alone railings to connect the railing for Level 8 to the stairwell wall. You will also add railings to the interior balconies (shown in the completed practice in Figure 13-52) and to the exterior balconies.

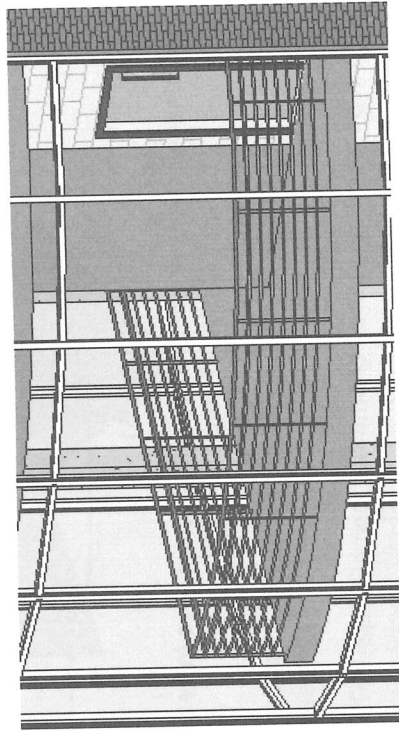


Figure 13-52

Task 1: Modify the railing type.

1. Open the project **Arch-Railings-M.rvt** from the practice files folder.
2. Verify that you are in the **Floor Plans: Floor 1 - Stairs-West** view.
3. In the **Quick Access Toolbar** > **Default 3D view drop-down list**, select  (Camera). Create a camera view looking from the door into the stairwell to display the new stairs and railings, as shown in Figure 13-53. (Your 3D view may differ from the image depending on your camera and target placement.)

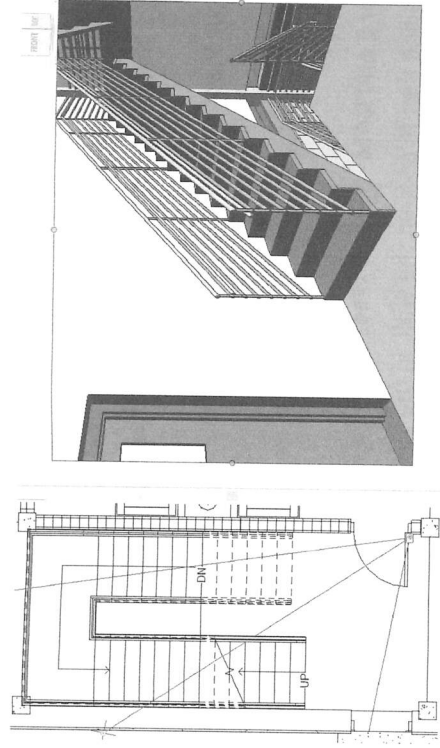


Figure 13-53

4. In the **Project Browser**, in **3D Views**, right-click on the new 3D view and rename it as **CAM - Floor 1 West Stairs**.
5. In the camera view, modify the crop region controls as needed to show the first run of the stair. Set the **Visual Style** to  (Shaded).

Note: Press <Ctrl>+<Tab> to move between the 3D Camera view and the Floor Plan view or use the view tabs at the top of the window.

6. Select the railing that is against the wall and in the **Type Selector**, select **Railing: Hotel Stair Handrail - Wall**. The railing type changes, as shown in Figure 13-54. In **Properties**, set the **Offset from Path** to **0**.

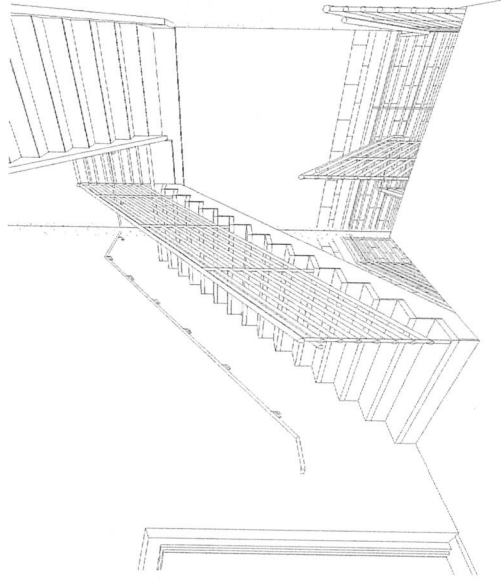


Figure 13-54

- 7. Repeat this on the east stairs.
- 8. Save the project.

Task 2: Modify the existing railing and connect a new railing.

- 1. Open the **Floor Plan: Floor 8** view and zoom in to the west stairwell. Close any other open views.
- 2. Create a camera view looking into the stairwell. Rename the new 3D view **CAM - Floor 8 West Stairs**.
- 3. Tile the **Floor 8** and **CAM - Floor 8 West Stairs** views.
- 4. Select the railing that is against the wall. In the Type Selector, select **Railing: Hotel Stair Handrail - Wall**. In Properties, change the *Offset from Path* to **0**.
- 5. Select the inside railing, as shown in Figure 13-55.

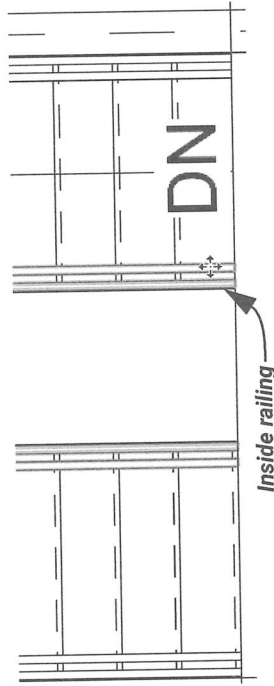


Figure 13-55

- 6. In the *Modify / Railing* tab>Mode panel, click (Edit Path), or double-click on the railing.
- 7. In the *Modify / Railings>Sketch Path* tab>Options panel, select **Preview**. This allows you to see the changes as you make them in the camera view.
- 8. In the *Modify / Railings>Sketch Path* tab>Work Plane panel, click (Ref Plane).
- 9. Draw a reference plane. Use the **Pick Lines** draw tool, set the Options Bar *Offset* to **100mm**, and hover your cursor over the edge of the floor, as shown in Figure 13-56.

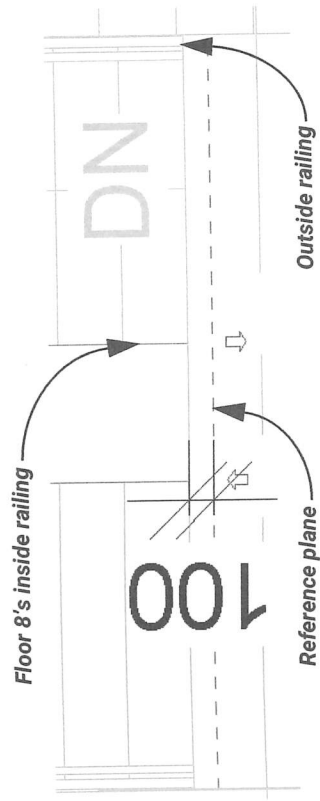


Figure 13-56

- 10. Click (Modify).

- 11. Drag the end of the inside railing on the down stairs only to meet the reference plane, as shown in Figure 13-57. (Dimension in figure is for reference only.)

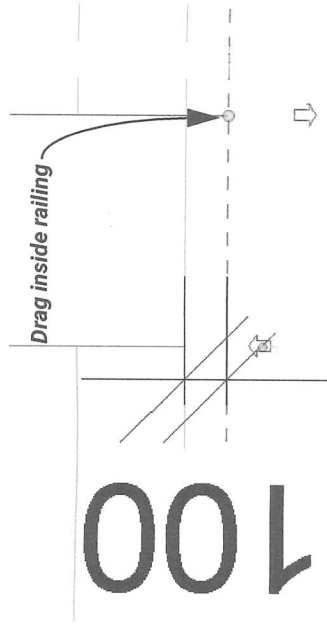


Figure 13-57

- 12. Click (Finish Edit Mode).

- 13. Click (Modify).

- Pan and zoom so you can see the exterior wall of the stairwell and the inside railing. You will need to add a railing from the wall, connecting to the stair railing.

- 14. In the *Architecture* tab>Circulation panel, click (Railing) and select (Sketch Path). Verify that the railing type is the **Hotel Stair Guardrail**.

- 15. In the Options Bar, select **Chain**.

- 16. In Properties, set the *Base Offset* to **0.0**.

17. Draw a reference plane 160mm from the edge of the floor and another one midpoint of the inside railing, as shown in Figure 13-58. (The dimension in the image is for reference only.)
- **Hint:** Type **SM** to force a snap to the midpoint of the end of the railing.

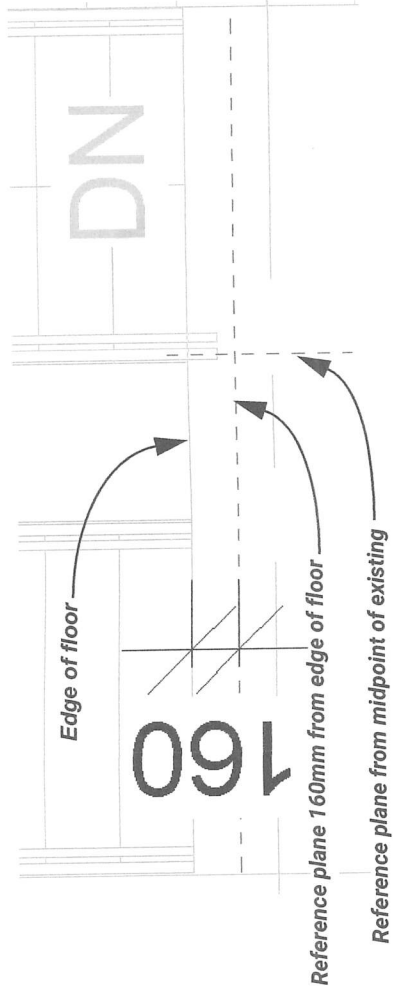


Figure 13-58

18. Click (Modify).
19. Sketch the railing path from the midpoint of the inside railing to the reference plane and then over to the wall, as shown in Figure 13-59.

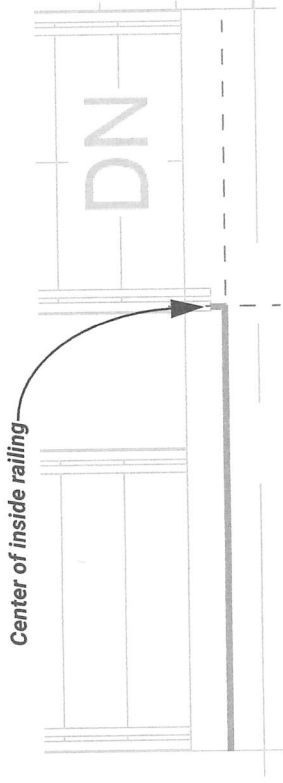


Figure 13-59

20. Click (Finish Edit Mode).
21. Click (Modify).

22. In the **CAM - Floor 8 West Stairs** view, review the new railing, as shown in Figure 13-60.

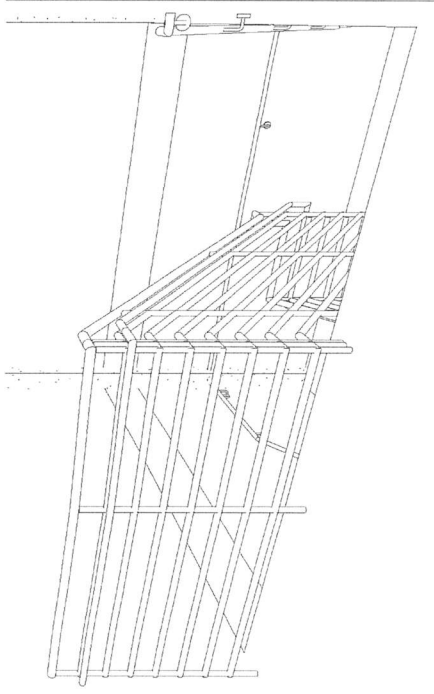


Figure 13-60

Note: If needed, select the new railing and click on the *Flip Railing Direction* control so the guardrail and handrails match.

23. Type **TW** to tab the views.
24. Save the project.

Task 3: Add balcony railings.

1. Open the **Floor Plans: Floor 2** view and pan and zoom over to the hallway and interior balcony.
2. In the **Architecture** tab>**Circulation** panel, expand (Railing) and click (Sketch Path).
3. In the Type Selector, select **Railing: Hotel Interior Balcony Guardrail**.
4. In the **Modify | Create Railing Path** tab>**Draw** panel, select (Pick Lines).
5. In the Options Bar, set the **Offset** to **300mm**.
6. Select the edge of the balcony floor, as shown in Figure 13-61. Make sure that the preview dashed line is on the inside of the building.



Figure 13-61

7. Continue adding railing with an **300mm** offset until you get to the east stairwell (include the curved section), as shown in Figure 13-62.

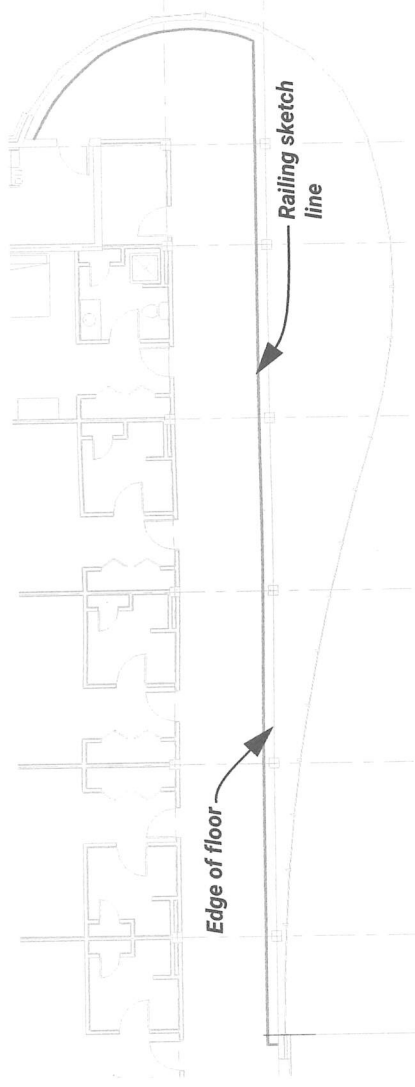


Figure 13-62

8. Add a railing that returns back to the wall, **300mm** from the edge of the brick exterior wall, as shown in Figure 13-63. (The dimension in the figure is for reference only.)

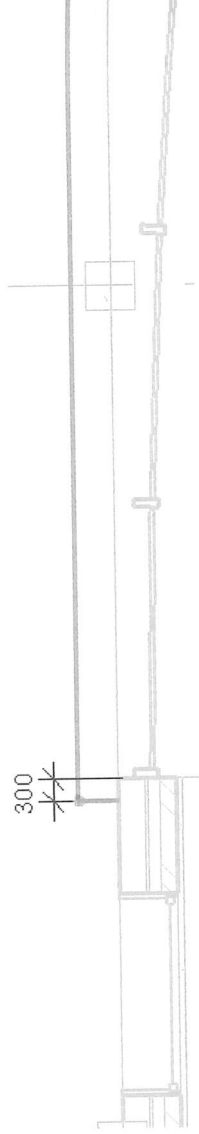


Figure 13-63

9. Use the **Trim** command and railing control grips to modify the sketch lines.
10. Click ☒ (Finish Edit Mode).
11. Zoom in on one of the outdoor balconies on the back of the building.
12. Start the **Railing** command again. In the Type Selector, select **Railing: Hotel Exterior Balcony Guardrail**.
13. In the Options Bar, set the Offset to **75mm**.

14. In Properties, set the **Base Offset** to (negative) **-100mm** and select the inside of the balcony floor edge to add railings to the balcony, as shown in the sketch in Figure 13-64. Just draw railings on one balcony.

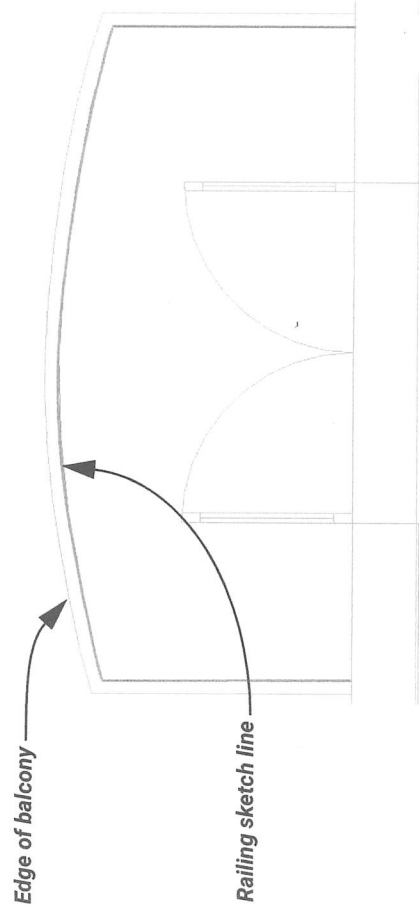


Figure 13-64

15. Click ☒ (Finish Edit Mode).
16. Copy the completed balcony railing to the other balconies on **Floor 2**.
17. Select all the railings both inside and out and copy them to the other floors.
 - Hint: Select one exterior balcony railing, right-click, and select **Select All Instances>Visible in View**, then press <Ctrl> to select the hallway railing as well.
18. In the **Modify / Railings** tab>Clipboard panel, select (Copy to Clipboard).
19. In the Clipboard panel, expand (Paste) and select (Aligned to Selected Levels).
20. In the Select Levels dialog box, select **Floor 3**, then press and hold <Ctrl> and continue selecting each floor up to **Floor 8**.
21. Click **OK**.

13.4 Creating Ramps

The process of creating ramps is similar to that of creating stairs with runs and automatic landings. You can also sketch a boundary with risers at the start and end of each slope. Ramps are most often used for short vertical distances, as shown in Figure 13-66, as they require a lot of space for their runs.

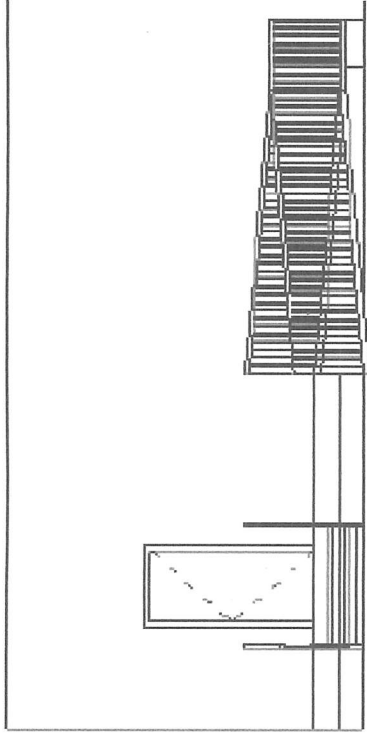


Figure 13-66

After a ramp has been created, you can add a spot slop annotation. A spot slop can be added to a ramp in elevation, 3D, plan, and section views.

- For more information on annotations, see *Chapter 15: Working with Annotations*.

How To: Create a Ramp Using Runs

1. In the *Architecture* tab>*Circulation* panel, click  (Ramp).
2. In the *Type Selector*, select the ramp type.
3. In the *Modify | Create Ramp Sketch* tab>*Tools* panel, click  (Railing) and select a railing type in the *Railing Types* dialog box. Click **OK**.
4. In *Properties*, specify the *Constraints*, especially *Base Level* and *Top Level* and their offsets (as shown in Figure 13-67), and other properties. The *Width* of the ramp is set in the *Dimensions* section.

Ramps		Edit Type
Constraints		
Base Level		Level 1
Base Offset		0.0
Top Level		Level 1
Top Offset		600.0

Figure 13-67

22. Open an exterior 3D view and verify the placement of all the railings, as shown in Figure 13-65.

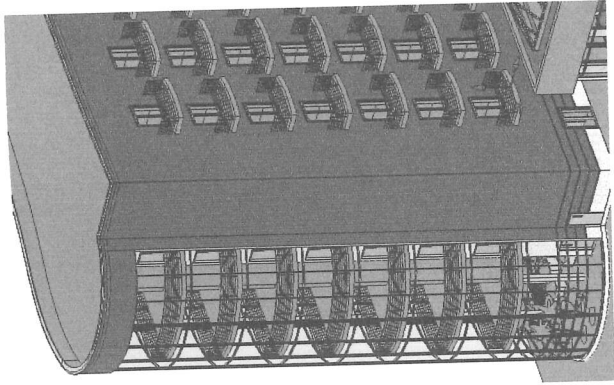


Figure 13-65

23. Save and close the project.

End of practice

5. Draw reference planes to specify the locations of the run start and end points before creating the ramp. The run is based on the centerline of the ramp.
6. In the Draw panel, click  (Run) and select a start point for the run. A preview box displays the ramp's orientation and length. Click  (Line) or  (Center-ends Arc) to switch between linear and curved runs.
 - Landings are automatically created between runs, as shown in Figure 13-68.

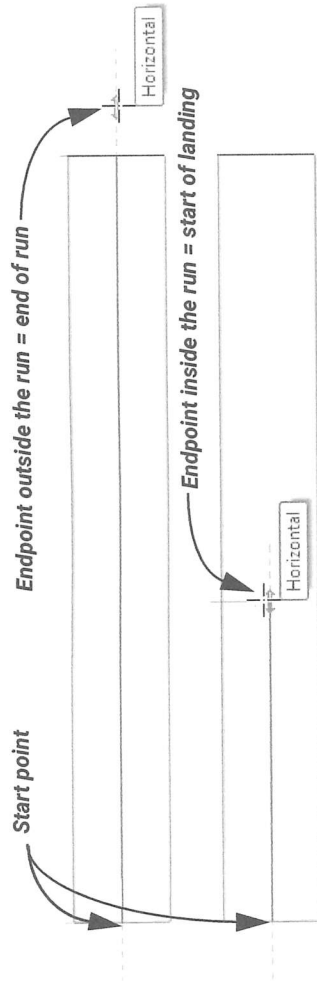


Figure 13-68

7. Click  (Finish Edit Mode). The ramp (including railings) is created.

How To: Sketch a Ramp Using Boundary and Riser

1. Click  (Ramp) and set up the ramp type and properties.
2. In the *Modify | Create Ramp Sketch* tab>Draw panel, click  (Boundary).
3. Use the draw tools to outline the sides (not the ends) of the ramp, as shown by the green lines in Figure 13-69.
4. In the *Modify | Create Ramp Sketch* tab>Draw panel, click  (Riser).

5. Use the draw tools to specify the ends of the slope of each ramp, as shown by the black lines in Figure 13-69.

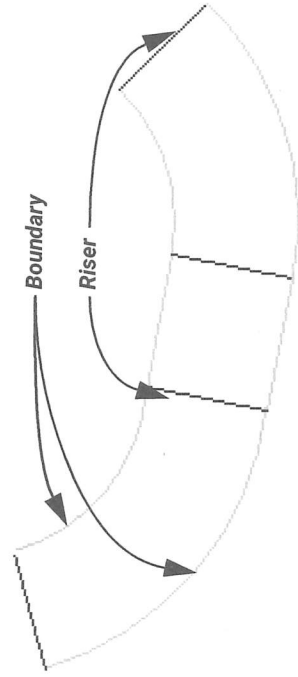


Figure 13-69

6. Click  (Finish Edit Mode).

Practice 13d Create Ramps

Practice Objectives

- Add a ramp.
- Modify ramp railings.

In this practice, you will create a ramp with railings and then modify placement of the railings. Figure 13-70 shows the completed ramp and railings.

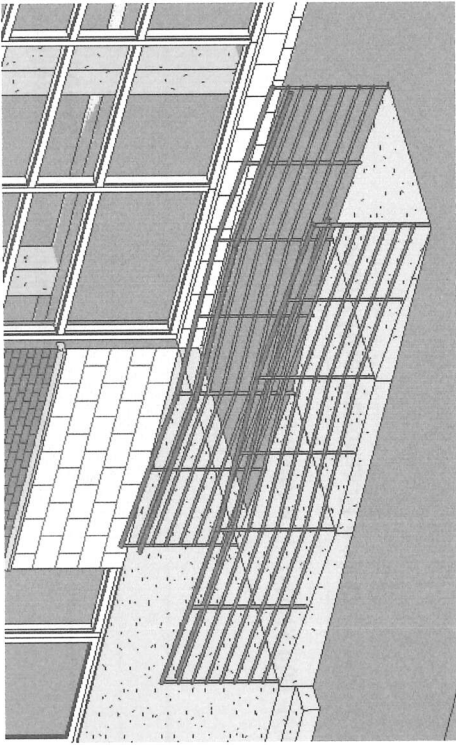


Figure 13-70

Task 1: Add a ramp.

1. Open the project **Arch-Ramp-M.rvt** from the practice files folder.
2. Verify that you are in the **Floor Plans: Floor 1** view.
3. In the **Architecture** tab>**Circulation** panel, click  (**Ramp**).
4. In the **Type Selector**, select **Ramp: Hotel Ramp**.
5. In **Properties**, set the following:

- **Base Level:** **Floor 1**
- **Base Offset:** (negative) **-300mm**
- **Top Level:** **Floor 1**
- **Top Offset:** **0.0**
- **Width:** **1800mm**

6. In the **Modify | Create Ramp Sketch** tab>**Tools** panel, click  (**Railing**), select the railing type **Hotel Ramp Guardrail**, and click **OK**.
7. In the **Work Plane** panel, click  (**Reference Plane**).
8. Draw the reference planes shown in Figure 13-71.

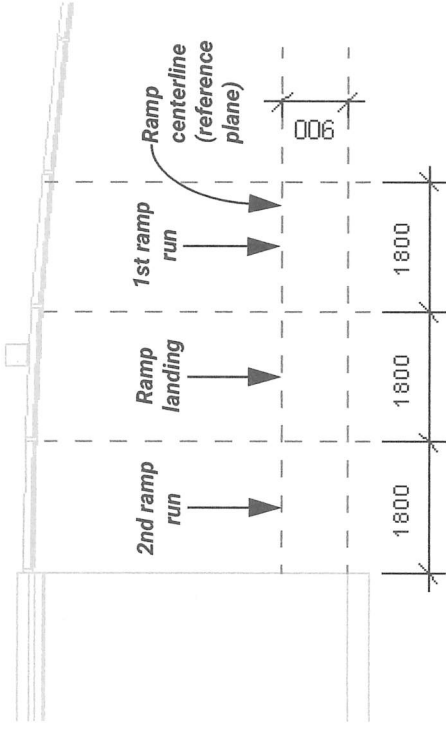


Figure 13-71

9. Click  (**Modify**) to return to the **Modify | Create Ramp Sketch** tab in the ribbon.
10. In the **Draw** panel, click  (**Run**).
11. Starting from the rightmost reference plane, pick the reference plane intersection as the start point. Move the cursor to the left and pick the next intersection as the second point, as shown in Figure 13-72.

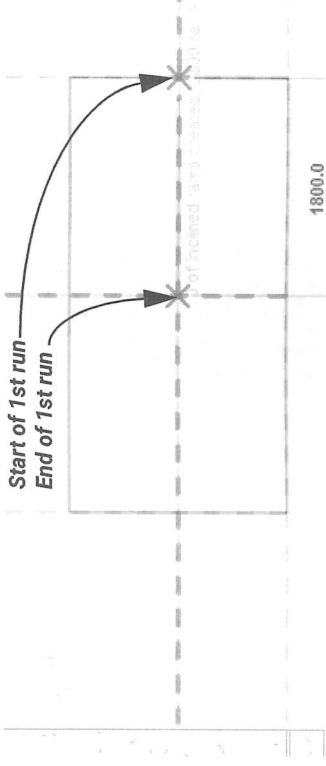


Figure 13-72

12. Still in the **Ramp** command, pick the next intersection to start the second run and then the last point at the entrance stairs, as shown in Figure 13-73.

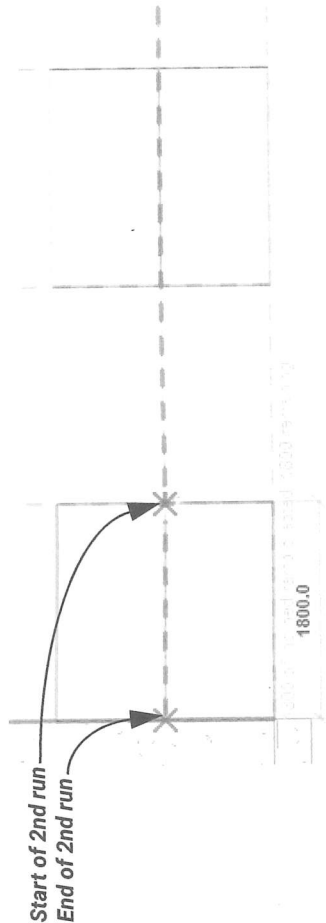


Figure 13-73

13. Click  (Finish Edit Mode).

Task 2: Modify ramp railings.

In this task, the railings need to be moved so that they are fixed on the ramp.

1. Select both of the railings and in Properties, change the *Offset from Path* to (negative) -50mm.
2. Open the 3D view and check that the ramp displays, as shown in Figure 13-74.
3. Zoom in to the railings. Note that they are sitting on the edge of the ramp (as shown in Figure 13-74) and need to be moved inward.

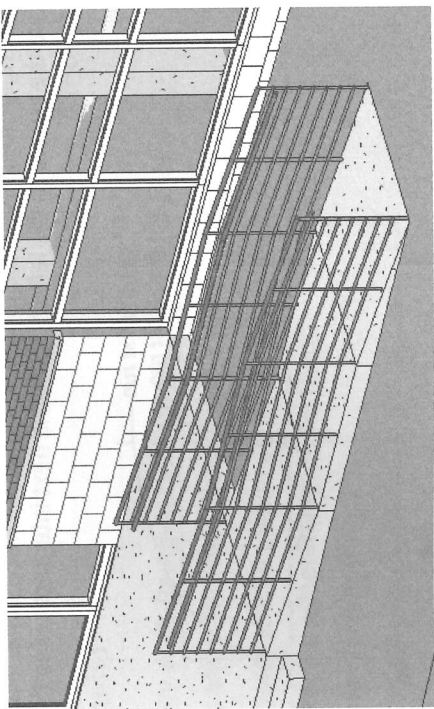


Figure 13-74

4. Save and close the project.

End of practice

Chapter Review Questions

1. Which of the following is NOT a stair component?
 - a. Runs
 - b. Landings
 - c. Treads
 - d. Supports
2. How do you modify a stair so that it is wider at the bottom than at the top, as shown in Figure 13-75?

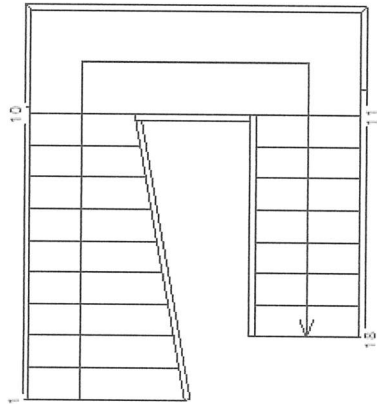


Figure 13-75

- a. Use the grips located at each corner of the stair and drag them to a new location.
 - b. Convert the run to a sketch and modify the boundary and riser lines.
 - c. Use <Tab> to cycle through components so that you only select the tread that you want to modify.
 - d. Explode the stair into components, and then use grips to modify the stair width.
3. When do you need to use the  (Railing) command? (Select all that apply.)
 - a. When you want an extra railing in the middle of very wide stairs.
 - b. When you create a stair or ramp.
 - c. When you create railings that are not attached to stairs or ramps.
 - d. When you use the **Stair by Sketch** command.

4. To create a stair that covers multiple floors (as shown in Figure 13-76), what needs to be done after you create the stair?

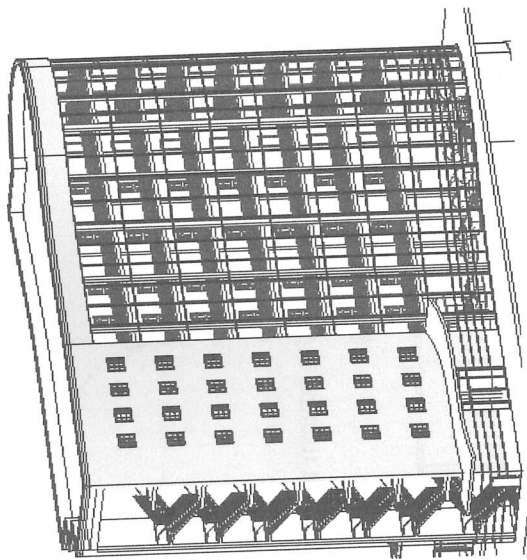


Figure 13-76

- a. In Properties, select the **Multistory Top Level** from the drop-down list of levels.
- b. Also select a stair created at the top level of the floors, right-click, and select **Multistory Stair**.
- c. Copy the new stair to the clipboard, use **Paste Aligned to Selected Levels**, and specify the levels where you want the stairs.
- d. Select the stairs, select **Connect Levels** in the ribbon, and then select the levels where you want stairs.
5. Which of the following elements is most helpful in specifying the start and end runs of ramps?
- a. Walls
 - b. Stairs
 - c. Sketch lines
 - d. Reference planes

Command Summary

Button	Command	Location
Stairs and Ramps		
	Convert to sketch-based	• Ribbon: <i>Modify</i> / <i>Create Stair</i> tab>Tools panel
	Select Levels	• Ribbon: <i>Modify</i> / <i>Stairs</i> tab>Multistory Stairs panel
	Connect/Disconnect Levels	• Ribbon: <i>Modify</i> / <i>Multistory Stairs</i> tab>Multistory Stairs panel
	Connect Levels	• Ribbon: <i>Modify</i> / <i>Multistory Stairs</i> tab>Multistory Stairs panel
	Disconnect Levels	• Ribbon: <i>Modify</i> / <i>Multistory Stairs</i> tab>Multistory Stairs panel
	Edit Sketch	• Ribbon: <i>Modify</i> / <i>Create Stair</i> tab>Tools panel
	Edit Stairs	• Ribbon: <i>Modify</i> / <i>Stairs</i> tab>Edit panel
	Flip	• Ribbon: <i>Modify</i> / <i>Create Stair</i> tab>Tools panel
	Landing (Stair)	• Ribbon: <i>Modify</i> / <i>Create Stair</i> tab>Components panel
	Run (Stair)	• Ribbon: <i>Modify</i> / <i>Create Stair</i> tab>Components panel
	Stair	• Ribbon: <i>Architecture</i> tab>Circulation panel
	Support (Stair)	• Ribbon: <i>Modify</i> / <i>Create Stair</i> tab>Components panel
	Ramp	• Ribbon: <i>Architecture</i> tab>Circulation panel

Button	Command	Location
Railings		
	Edit Path (Railings)	• Ribbon: <i>Modify / Railings</i> tab>Mode panel
	Railing	• Ribbon: <i>Modify / Create Stair (Create Stairs Sketch) (Create Ramp)</i> tab>Tools panel
	Railings>Place on Stair/Ramp	• Ribbon: <i>Architecture</i> tab>Circulation panel, expand Railing
	Railings>Sketch Path	• Ribbon: <i>Architecture</i> tab>Circulation panel, expand Railing
	Pick New Host	• Ribbon: <i>Modify / Create Railing Path (Railings)</i> tab>Tools panel

Construction Documentation

The third section of this guide continues to teach the Autodesk® Revit® tools, focusing on tools that help you to create accurate construction documents for a design.

This section includes the following chapters:

- Chapter 14: Creating Construction Documents
- Chapter 15: Working with Annotations
- Chapter 16: Adding Tags and Schedules
- Chapter 17: Creating Details