

# Revit® Structure 2013 Basics

Framing and Documentation

Elise Moss



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## **Lesson One**

### ***Structural Columns and Walls***

After completing this lesson, you will be able to:

- Load structural columns
- Create structural column types
- Create openings in structural columns
- Use AutoCAD profiles to create a structural column family
- Add and modify structural columns
- Edit a wall profile
- Add an opening in a wall



- 
- Pin columns in position to prevent columns from moving.
-

## Command Exercise

### ***Exercise 1-1 – Load a Structural Column***

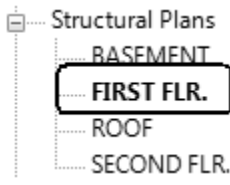
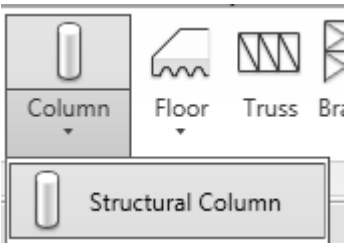
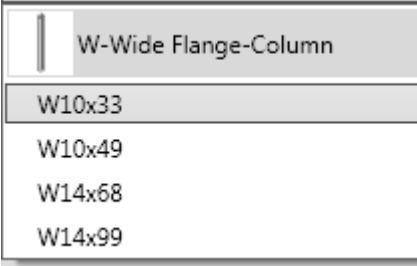


Drawing Name: **i\_columns.rvt**

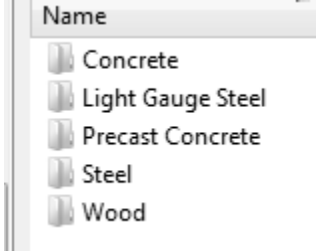
Estimated Time to Completion: 10 Minutes

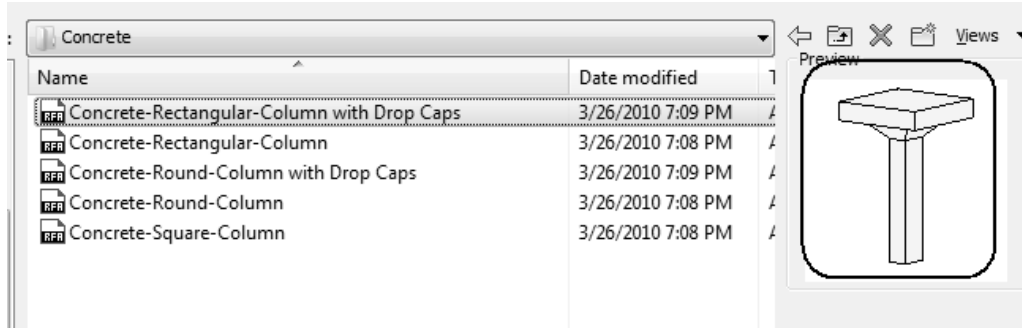
#### Scope

*Load a structural column*

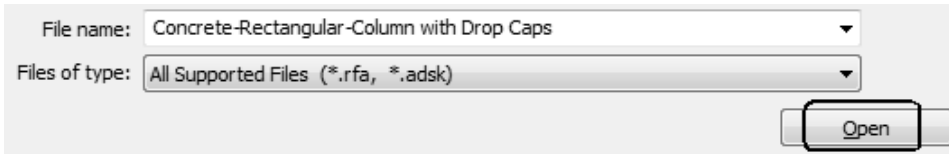
#### Solution

-  Activate the **FIRST FLR Structural Plan** in the Project Browser.
-  Activate the **Structure** ribbon.  
Select **Column**→**Structural Column**.
-  In the Type Selector, note that there are several Wide Flange- Columns available.
-  Select **Load Family** on the Mode panel.
-  Browse to the *Structural Columns* folder.

6.  Note the columns are sorted by material type in alphabetical order.  
Select the *Concrete* folder.
7. Highlight the *Concrete - Rectangular Column with Drop Caps*.



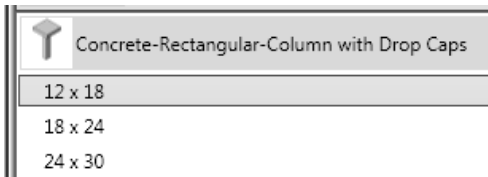
Note that you see a preview of the family in the Preview window.

8. 

Press Open to load the the *Concrete - Rectangular Column with Drop Caps* family.

9. You are trying to load the family *Concrete-Rectangular-Column with Drop Caps*, which already exists in this project. What do you want to do? If you see this dialog, select the second option.



10.  On the Properties Pane:  
Select the Type Selector to see the different sizes available for that family.

11. Close without saving.

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## Command Exercise

### ***Exercise 1-2 – Modify a Structural Column Family***

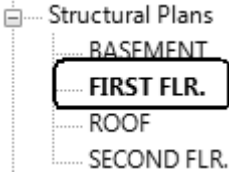
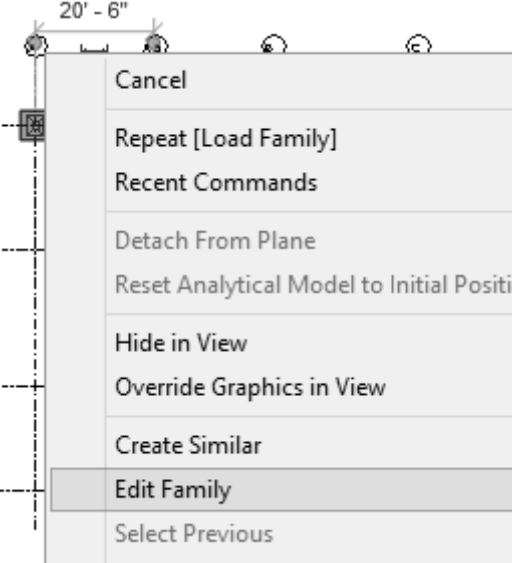
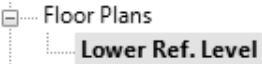
---

Drawing Name: **modify\_columns.rvt**  
Estimated Time to Completion: 10 Minutes

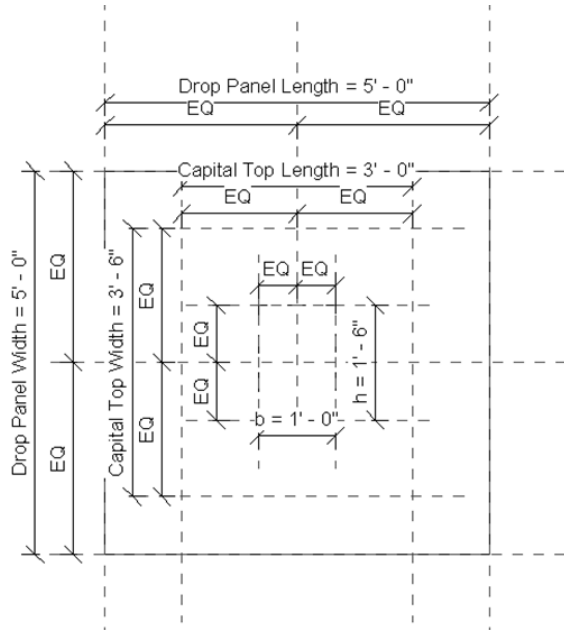
#### Scope

*Modify a Wall Profile*

#### Solution

-  1. **Structural Plans** Activate the **FIRST FLR Structural Plan** in the Project Browser.  
The screenshot shows a tree view under 'Structural Plans' with levels: BASEMENT, **FIRST FLR.**, ROOF, and SECOND FLR.
-  2. Select the column located at **A1**. Right click and select **Edit Family**.  
A new file will open with the column family.  
The screenshot shows a plan view of a column with a context menu open. The menu items are: Cancel, Repeat [Load Family], Recent Commands, Detach From Plane, Reset Analytical Model to Initial Position, Hide in View, Override Graphics in View, Create Similar, **Edit Family**, and Select Previous. A dimension line above the column indicates '20' - 6".
-  3. **Floor Plans** Activate the **Lower Ref. Level** in the Project Browser.  
The screenshot shows a tree view under 'Floor Plans' with levels: **Lower Ref. Level**.

4.

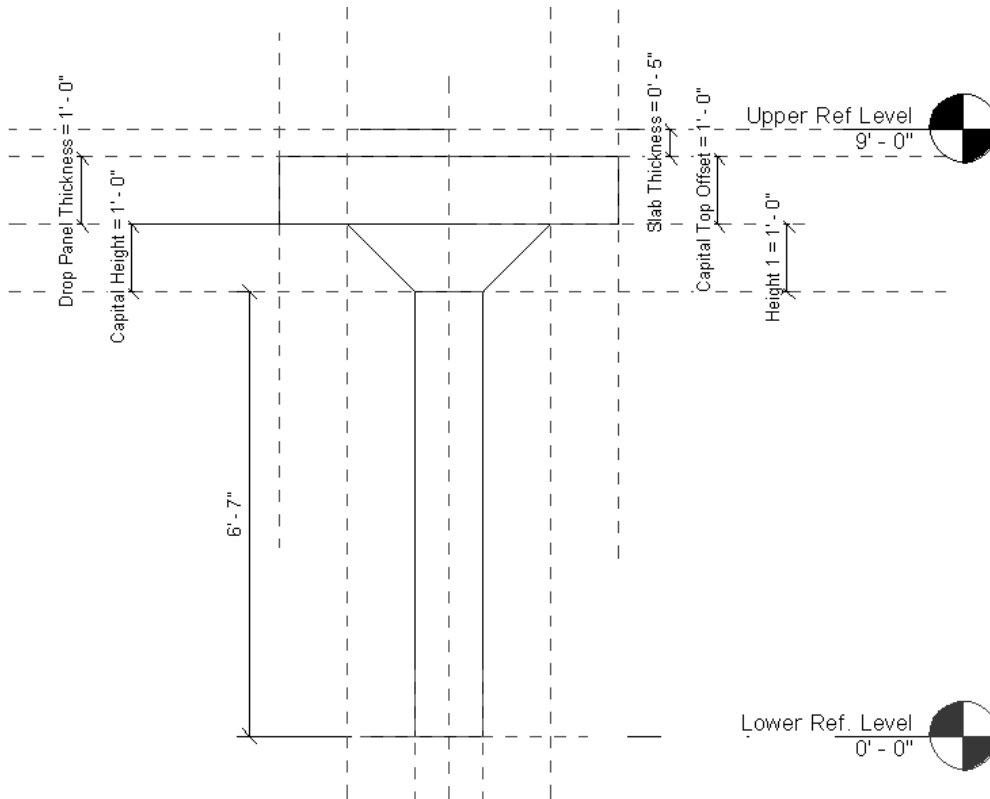


Study the parameters assigned to the different dimensions.


5.  Elevations (Elevation 1) Activate the **Front Elevation** in the Project Browser.

- Back
- Front**
- Left
- Right

6. Note how the levels control the height of the column.

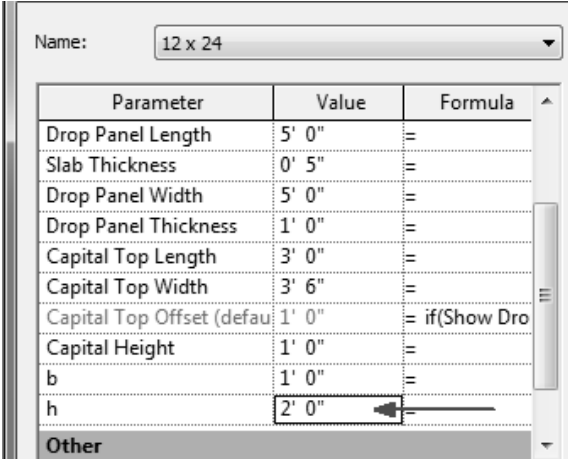


7.  Activate the **Lower Ref. Level** in the Project Browser.


8.  Select **Family Types** on the Properties panel.

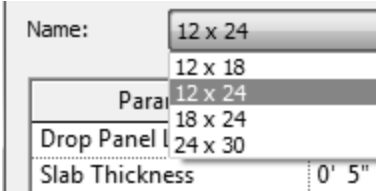
9.  Select **New** under Family Types.

10.  Type **12 x 24** for the Name.  
Press **OK**.

11.  Change the value of h to **2' 0"**.

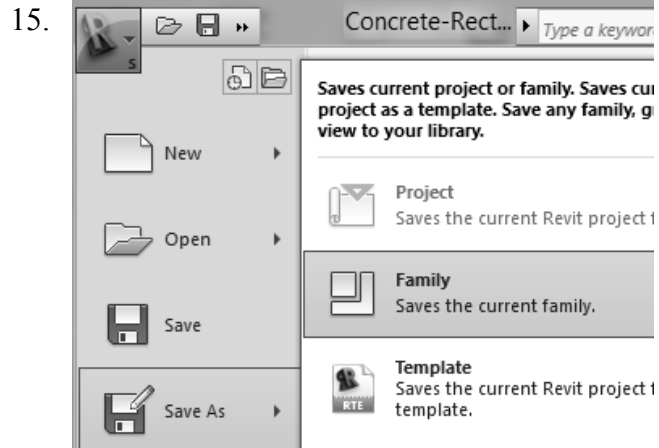
Parameter	Value	Formula
Drop Panel Length	5' 0"	=
Slab Thickness	0' 5"	=
Drop Panel Width	5' 0"	=
Drop Panel Thickness	1' 0"	=
Capital Top Length	3' 0"	=
Capital Top Width	3' 6"	=
Capital Top Offset (defau	1' 0"	= if(Show Dro
Capital Height	1' 0"	=
b	1' 0"	=
h	2' 0"	=

12.  Press the **Apply** button.  
Observe how the column changes.

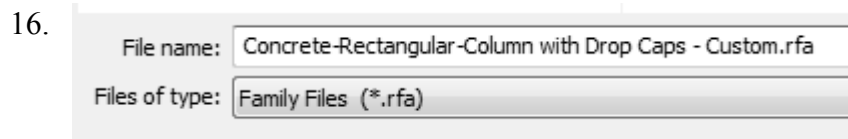
13.  Select each size in the type drop-down list.  
Press the **Apply** button.  
Observe how the column changes.

14. Press **OK**.





Go to the Applications Menu.  
Select **Save As**→**Family**.



Browse to your exercise folder.  
Save the family as a Custom family.

17. Close any open files without saving.

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## Command Exercise

### ***Exercise 1-3 – Create an Opening in a Structural Column***

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Drawing Name: **modify\_columns.rvt**  
Estimated Time to Completion: 10 Minutes

#### Scope

*Modify a Wall Profile*

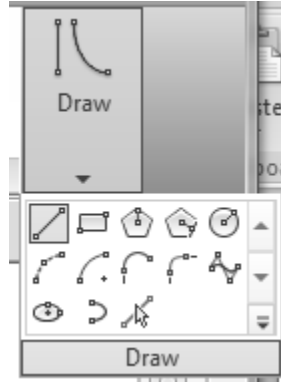
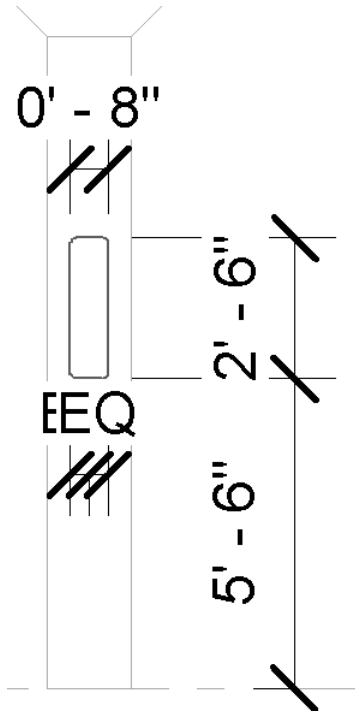
#### Solution

1.  Activate the **West Elevation**.

2.  Activate the Structure ribbon.  
Select the **By Face** tool on the Opening panel.

3.  Left click to select the face of the column.

4.



Create the sketch shown.



Draw a rectangle.

The rectangle is 2' 6" x 8 ".

Center the rectangle on the column by applying an EQ dimension between the reference plane and two horizontal dimensions.

Position the sketch so it is 5' 6" from the Basement Level.



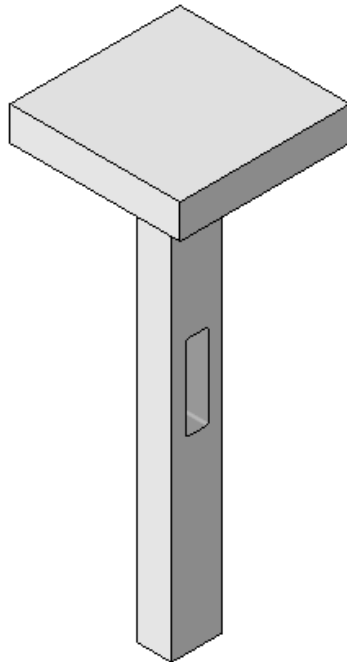
Add a 1" fillet to each corner using the Fillet Arc tool.

5.



Select the Green Check on the Mode panel to finish the opening.

6.



Switch to a 3D view so you can inspect the new opening.

7. Close without saving.

## Command Exercise

### ***Exercise 1-4 – Use AutoCAD Profile to Create a Structural Column Family***

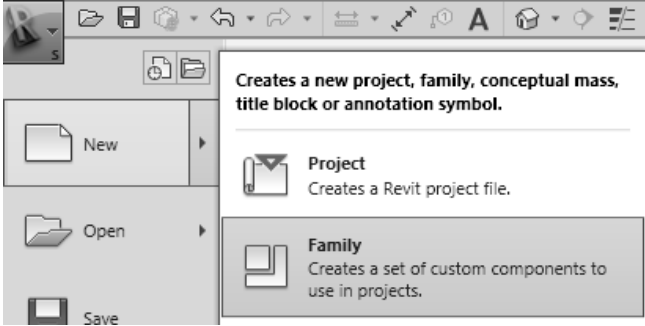
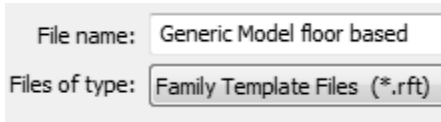
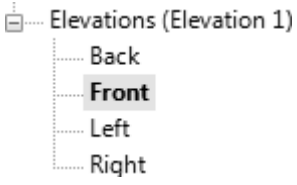


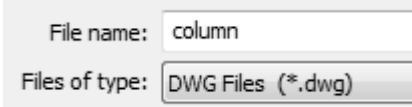
Drawing Name: **column.dwg**

Estimated Time to Completion: 60 Minutes

#### Scope

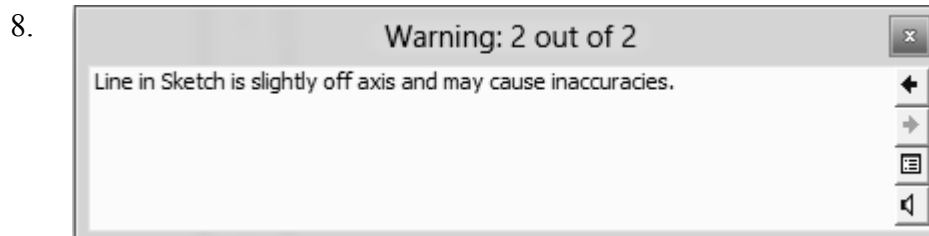
*Create a custom column family*

#### Solution

-  On the Application Menu:  
Go to **New→Family**.
-  Locate the *Generic Model floor based* template under the *Imperial Templates* folder.  
Press **Open**.
-  Activate the **Front** elevation.
-  Activate the **Create** ribbon.  
Select **Revolve** from the Forms panel.
-  Activate the **Insert** ribbon.  
Select the **Import CAD** tool.
-  Locate the *column.dwg* file in the exercise folder.



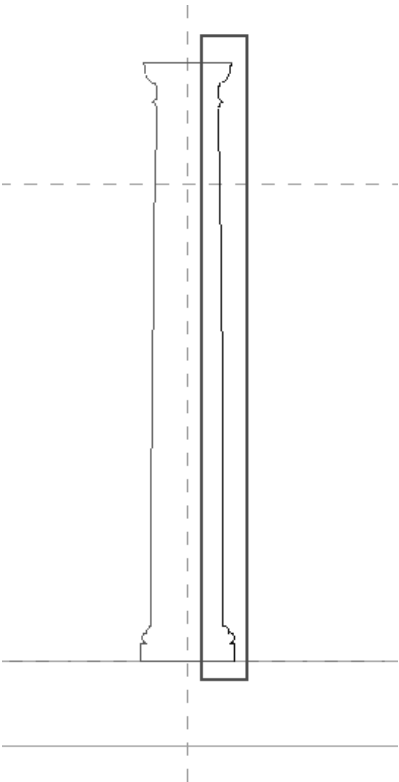
Set Colors to **Black and White**.  
 Set Layers to **All**.  
 Set Import Units to **Auto-Detect**.  
 Set Positioning to **Manual- Origin**.  
 Press **Open**.



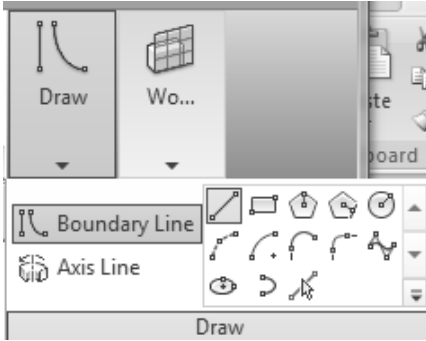
Revit will provide a couple of warnings, which can be ignored.

9. Right click and select Zoom to Fit.

*You can also double click the mouse wheel to Zoom to Fit.*

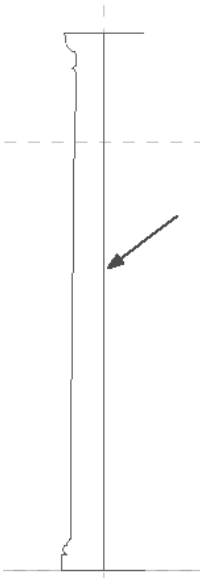
10.  Window around the right side of the column.  
 Delete the right side by pressing the Delete key on the keyboard or right click and select **Delete**.

11.



Highlight Boundary Line.  
Select the **Line** tool on the Draw panel.

12.



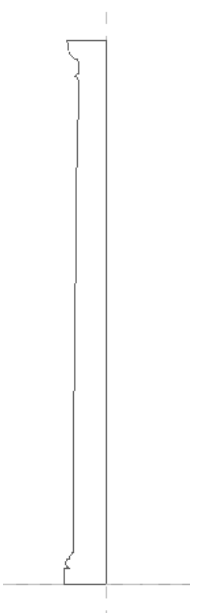
Draw a vertical line to close the profile.

13.

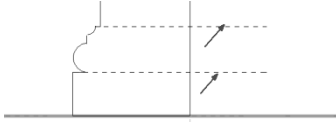



Select the **Trim** tool from the Modify panel.

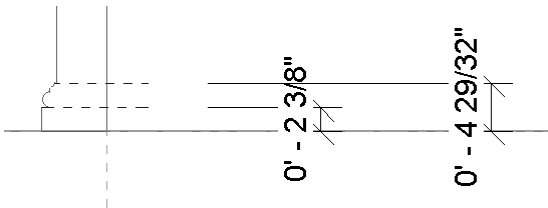
14.



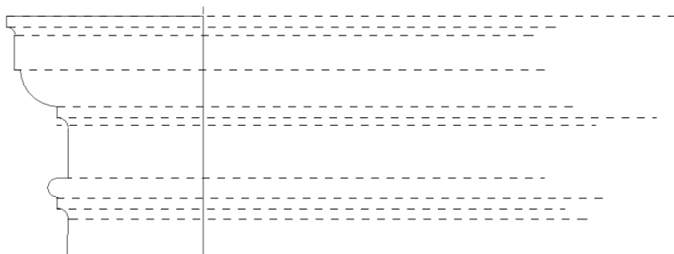
Use the Trim tool to clean up the profile.

15.  Zoom into the base of the column sketch. Activate the Create ribbon. Add two reference planes aligned to the two horizontal lines.

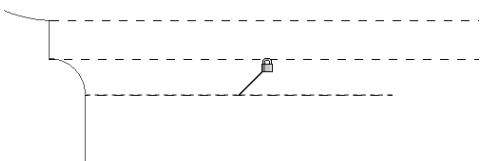
16.  Use the ALIGN tool to lock each horizontal sketch line to the reference plane.

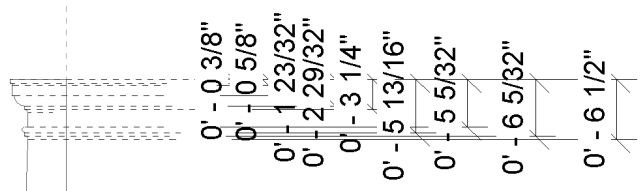
17.  Add an aligned dimension between each new reference plane and the Ref. Level.
- 0' - 2 3/8"
- 0' - 4 29/32"

*Be sure to select the Ref. Level and the reference plane - not the column sketch or floor!*


18.  Zoom into the top of the column sketch. Activate the Create ribbon. Add eleven reference planes aligned to the each horizontal point that defines the profile.

*Reference planes are used to control the geometry.*

19.  Use the ALIGN tool to lock each horizontal sketch point/line to the reference plane.

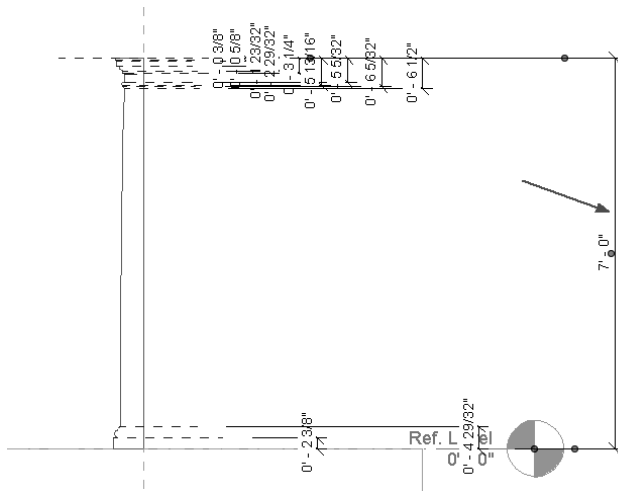
20.  Add an aligned dimension between each new reference plane and the top reference plane.
- 0' - 0 3/8"
- 0' - 0 5/8"
- 0' - 1 23/32"
- 0' - 2 29/32"
- 0' - 3 1/4"
- 0' - 5 13/16"
- 0' - 5 5/32"
- 0' - 6 5/32"
- 0' - 6 1/2"

*Be sure to select the reference planes - not the column sketch!*

21.  Select the top reference plane so it is highlighted. In the Properties pane, enter **Column Top** as the name for the reference plane.
- | Identity Data |            |
|---------------|------------|
| Name          | Column Top |

*Hint: By naming reference planes, they can be selected as work planes and used in formulas.*

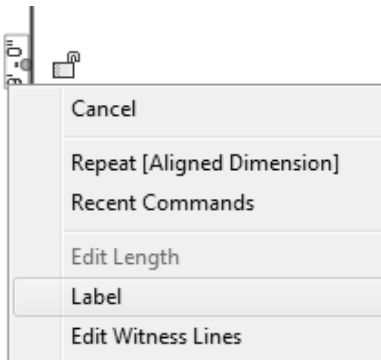
22.



Select the **Aligned Dimension** tool.

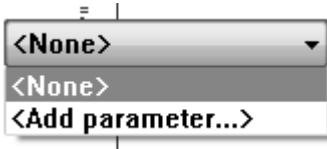
Add a dimension between the top reference plane and the Ref. Level at the bottom.

23.



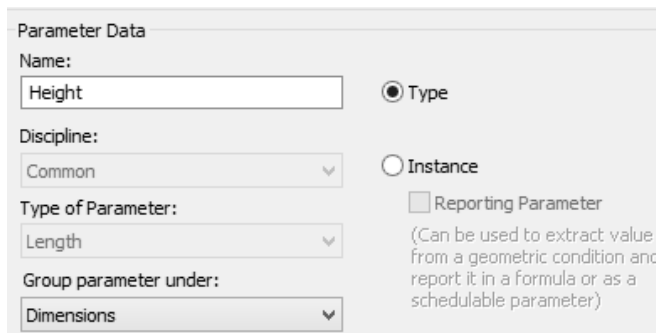
Select the dimension.  
Right click and select **Label**.

24.



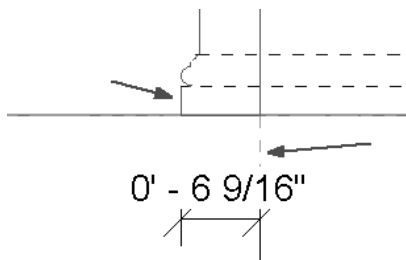
Select the **Add parameter** option from the Label dropdown list.

25.




Set the Name to **Height**.  
Enable **Type**.  
Press **OK**.

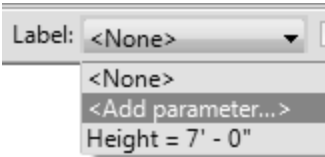
26.

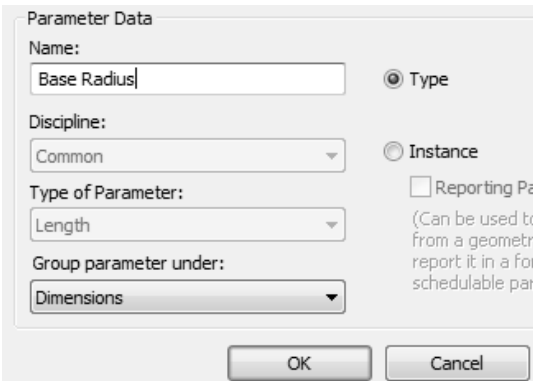


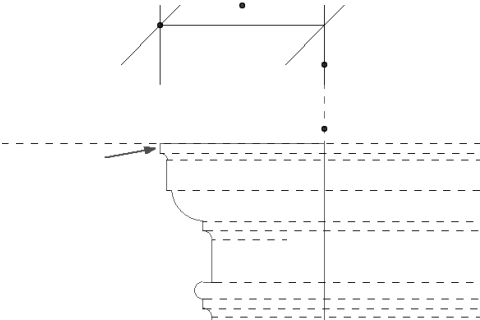
Add an aligned dimension between the base vertical line and the center reference plane.

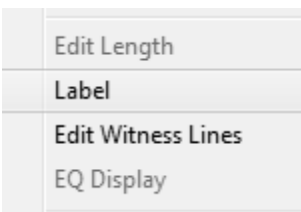


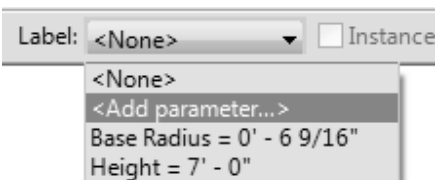
27.  Select the dimension.  
Right click and select **Label**.

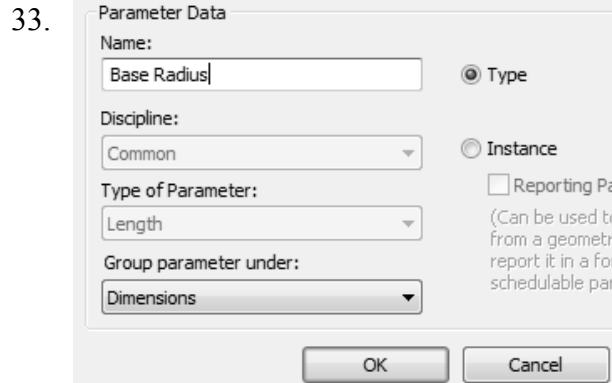
28.  Select the **Add parameter** option from the Label drop-down list.

29.  Set the Name to **Base Radius**.  
Enable **Type**.  
Press **OK**.

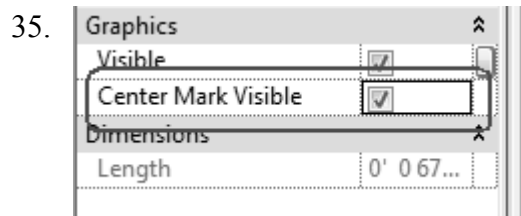
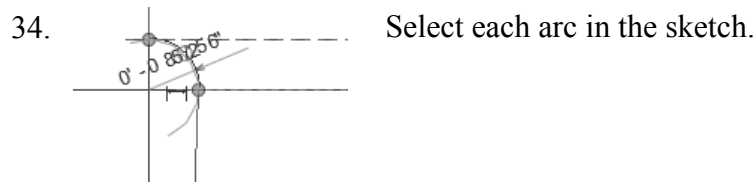
30. **0' - 6 5/32"** Add an aligned dimension between the top vertical line and the center reference plane.  


31.  Select the dimension.  
Right click and select **Label**.

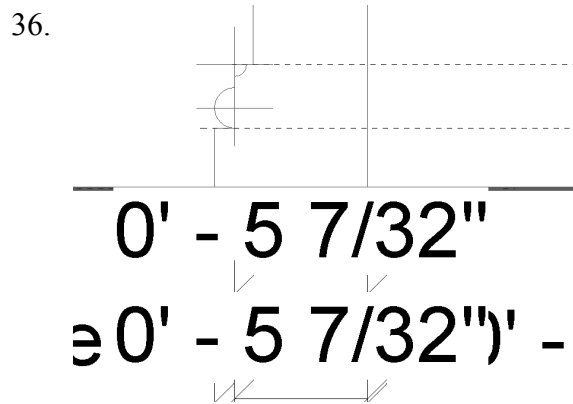
32.  Select the **Add parameter** option from the Label drop-down list.



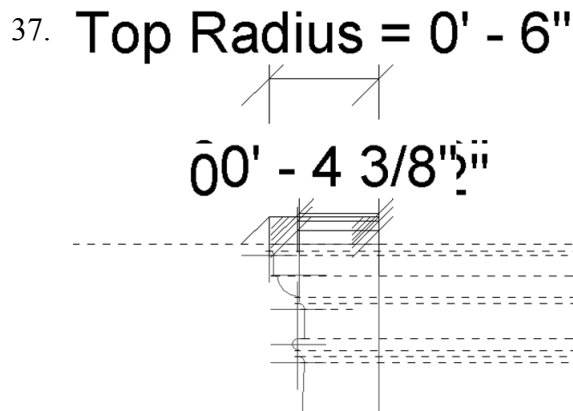
Set the Name to **Base Radius**.  
Enable **Type**.  
Press **OK**.




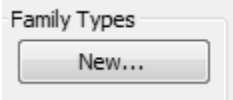
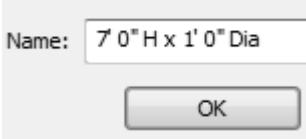
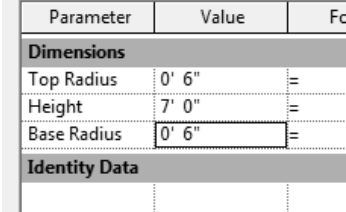


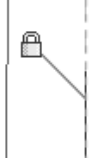
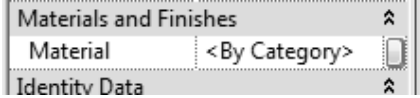

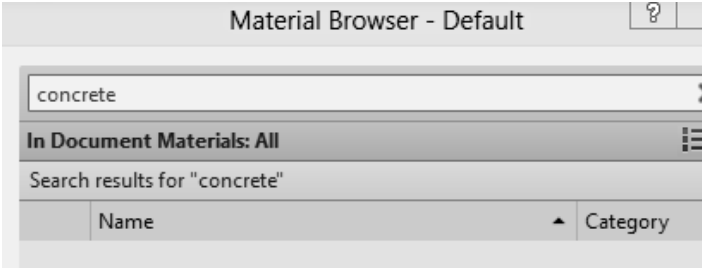
In the Properties pane:  
Enable **Center Mark Visible**.  
Repeat for each arc.



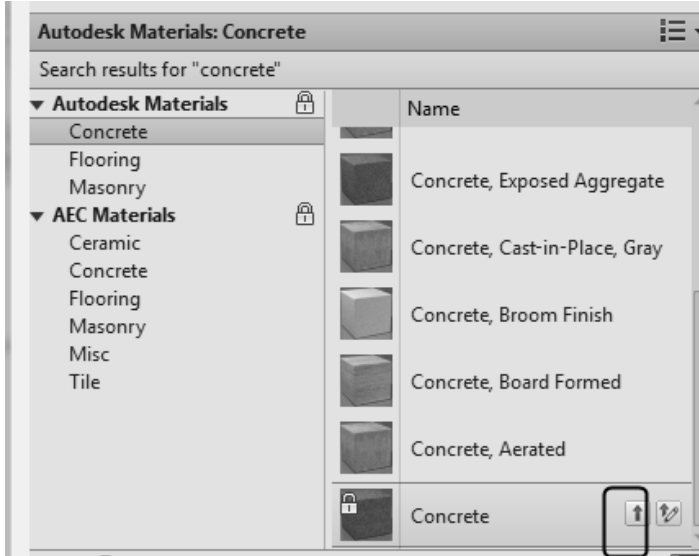
Add an aligned dimension between the center mark for each arc and the center reference plane.



The values of the aligned dimensions don't matter and shouldn't be locked. These dimensions just ensure that the geometry stays in a proper location.

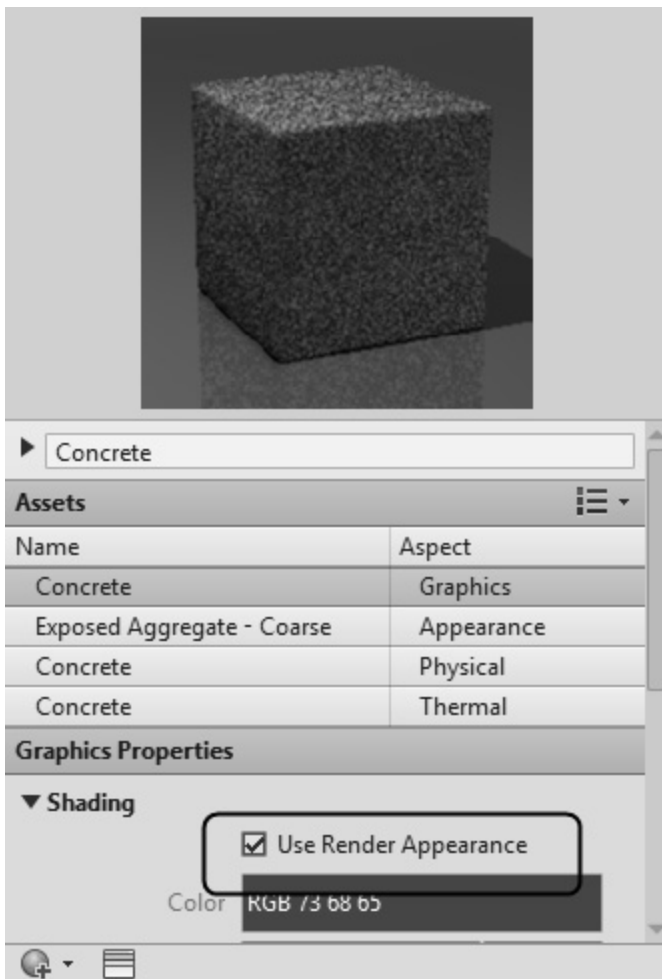
38.  Select the **Types** tool on the Ribbon.
39.  Press **New** under Family Types.
40.  Type **7' 0" H x 1' 0" Dia**.  
Press **OK**.
41.  Verify the Height is set to **7' 0"**.  
Change the Top and Bottom Radius to **6"**.  
Press **Apply** and verify that the sketch updates.  
Press **OK**.
- | Parameter            | Value | Fc |
|----------------------|-------|----|
| <b>Dimensions</b>    |       |    |
| Top Radius           | 0' 6" | =  |
| Height               | 7' 0" | =  |
| Base Radius          | 0' 6" | =  |
| <b>Identity Data</b> |       |    |
42.  **Axis Line** Highlight the Axis Line tool.
43.  Select the **Pick Tool** from the Draw panel.  
Select the center vertical plane.
44.  Lock the axis into position.
45.  In the Properties pane:  
Select the Material column.
46.  Highlight the **Default** material.  
Select **Duplicate** at the bottom left of the dialog box.
47.  In the Material Browser:  
Type **concrete** in the search field.

48.



Locate the Concrete material in the lower panel. Select the **Copy to Document** tool.

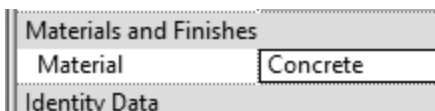
49.



Enable **Use Render Appearance**.

Press **Done**.  
Press **OK** to close the Material Browser.

50.



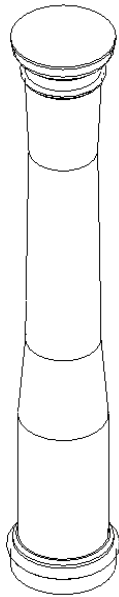
You should see the material listed in the Properties pane.


51. Switch to a 3D view.

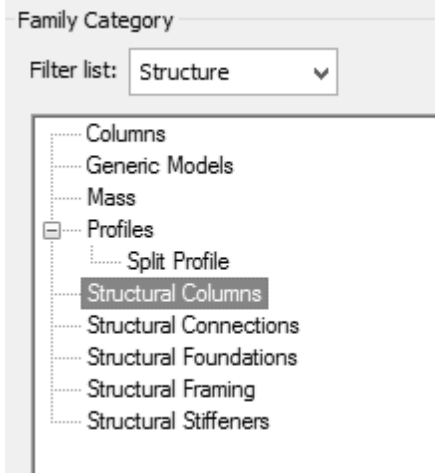
52. Select the **Green Check** to Finish the Revolve.

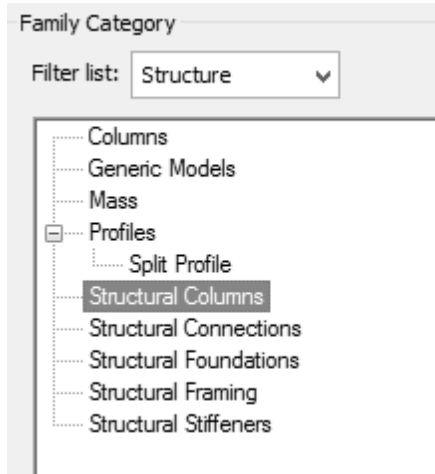


53. Your column should be formed.




54.  Activate the **Create** ribbon.  
Select the **Family Categories** tool.

55.  Select **Structural Columns**.  
Press **OK**.



*This adds the properties for Structural Columns to the family.*

56.  Save the column in your exercise folder.  
Name the file *Column - Grecian*.



## Command Exercise

### ***Exercise 1-5 – Add and Modify Structural Columns***

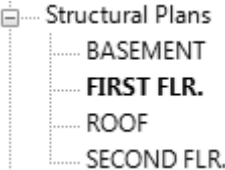
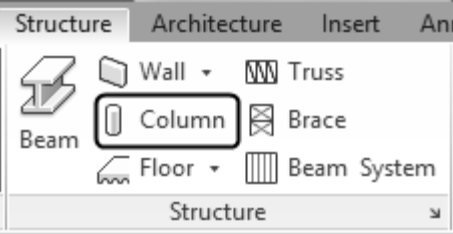
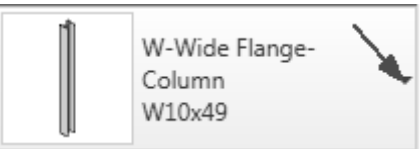

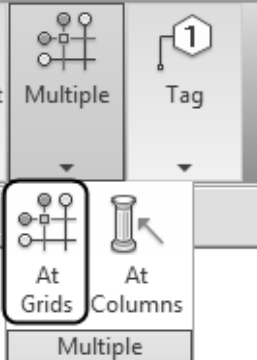
Drawing Name: **i\_columns.rvt**

Estimated Time to Completion: 30 Minutes

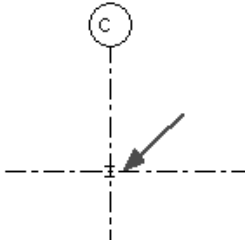
#### Scope

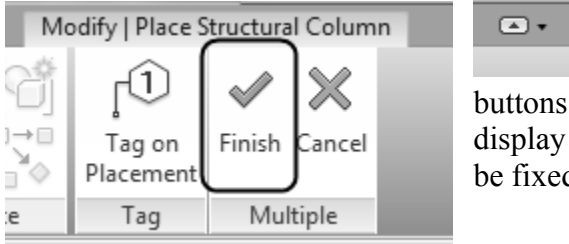
*Add Structural Columns*  
*Modify Structural Columns*

#### Solution

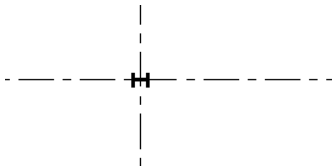
-  Activate the **First Flr.** under Structural Plans in the Project Browser.
-  Activate the **Structure** ribbon.  
Select **Column**.
-  Use the Type Selector to select **W-Wide Flange Column W10x49**.
-  On the Options bar:  
Set the Height to **ROOF**.
-  On the ribbon:  
Select **At Grids**.

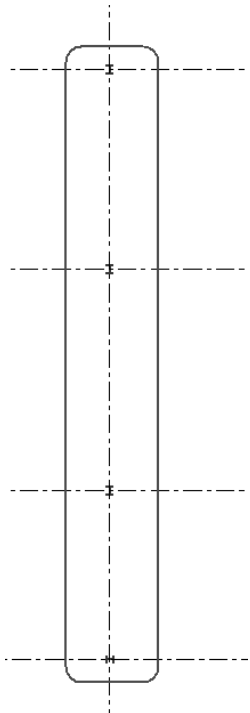
*To place columns at grid intersections, select the vertical and horizontal grid.*

6.  Select the C grid and the 1 grid to place the first column. Select **Finish** to confirm the placement. Repeat to place columns at C2, C3, and C4 by performing the following steps:
1. Select **At Grids**.
  2. Hold down the CTL key.
  3. Select a horizontal and vertical grid to identify the intersection.
  4. Select **Finish** to Place.

7.  To see the At Grids and the Finish buttons you may need to select the ribbon display tools. This is a bug in 2013 and may be fixed in a future service pack/release.

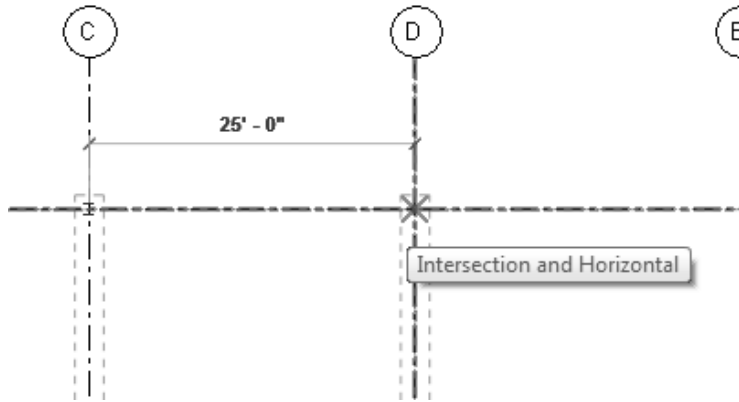
8. Right click and select **Cancel** to finish placing columns.

9.  Select the column at the **C4** intersection. Press the **SPACEBAR**. Note that the column rotates.

10.  Window around the four columns that have been placed. You should see the column type in the Properties pane.

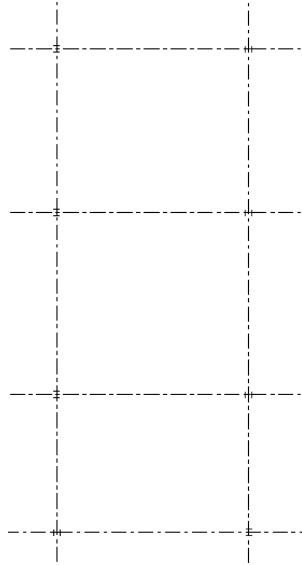
11.  Select the **Copy** tool from the Modify panel.

12.



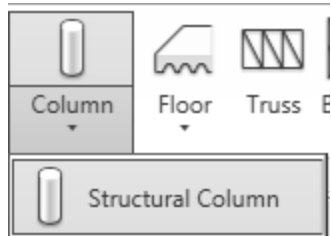
Select the C1 intersection as the base point and the D1 intersection as the target point. Note all the copied columns are highlighted. Press the **SPACEBAR**.

13.



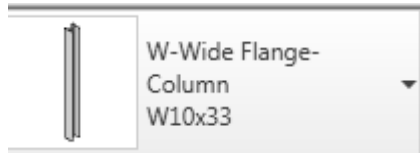
Note that the columns on the D grid have rotated 90 degrees.  
Press **ESC** to release the selection.

14.



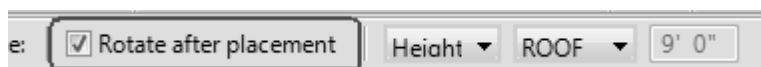
Activate the **Structure** ribbon. Select **Structural Column**.

15.



Use the Type Selector to select **W-Wide Flange Column W10x33**.

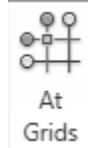
16. On the Options bar:




Enable **Rotate after placement**.  
Set the Height to **ROOF**.



17. Select the **At Grids** mode.  
 Select the **B** grid.  
 Select the **1** grid.  
 This sets the intersection to B1.

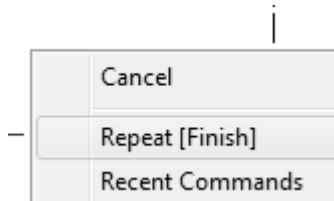


18. Press the **SPACEBAR**.  
 Note that the column rotates.

19.  Select **Finish** from the ribbon to complete the column placement.  
 Finish

*Note: If you press ENTER, you will re-initialize the grid selection and the column is not placed. This is a bug which may be resolved in a later release.*

20. Repeat to add columns at E1, F1, B4, E4, and F4.  
 Set the columns horizontal at each grid intersection.

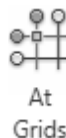


*Hint: You can also right click to select Finish once you have placed the column.*


21. Right click and select **Cancel** to exit placing columns.

22.  Activate the **Structure** ribbon.  
 Select **Structural Column**.

23.  Use the Type Selector to select **W-Wide Flange-Column W10x33**.

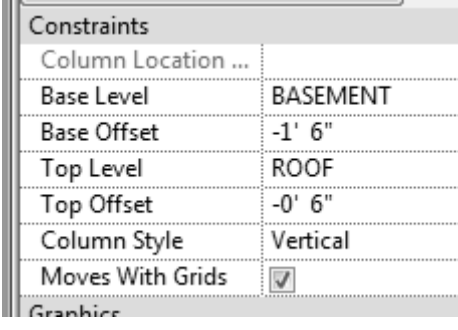
24.  Select the **At Grids** mode.


25. Hold down the **CTRL** key and select A1, A2, G1, and G4 intersections.

26.  Select **Finish** from the ribbon.  
Columns are placed at each intersection.

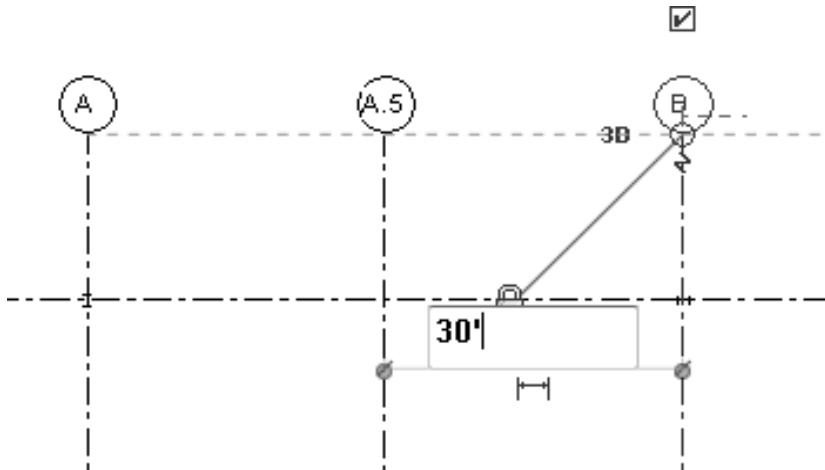
27. Select **Modify** or **ESC** to exit the column command.

28. Window around the columns so they are all selected.



29.  In the Properties pane:  
Set the Base Level to **BASEMENT**.  
Set the Base Offset to **-1' 6"**.  
*This places the column's bottom face 1' 6" below the BASEMENT level.*  
Set the Top Level to **ROOF**.  
Set the Top Offset to **-6"**.  
*This places the column's top face 6" below the ROOF level.*

30.  Press the **Apply** button at the bottom of the Properties pane.

31. Select the B grid.  
Change the dimension between A.5 and B to **30' 0"**.



*Note that the columns remain aligned to the grid.*

32.  **3D Views** Activate the 3D view.  


33. Close without saving.

## Command Exercise

### *Exercise 1-6 – Edit a Wall Profile*

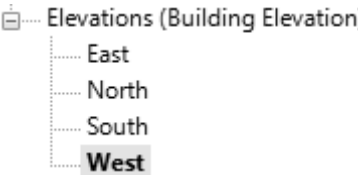
Drawing Name: **wall profile.rvt**

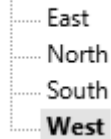
Estimated Time to Completion: 10 Minutes

#### Scope

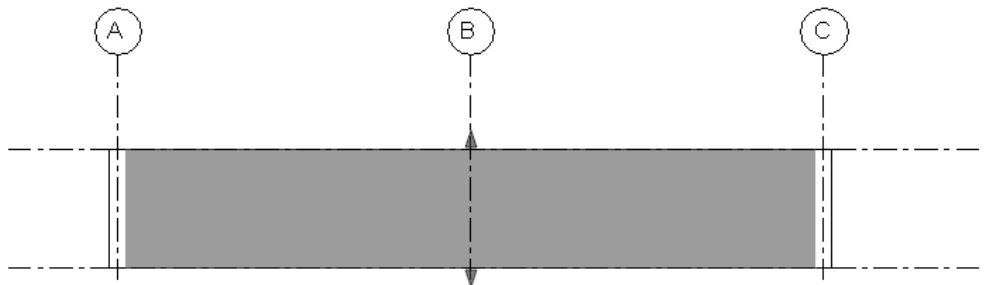
*Modify a Wall Profile*

#### Solution

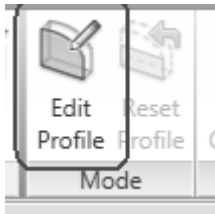
1.  Activate the **West Elevation** in the Project Browser.

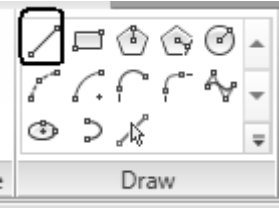


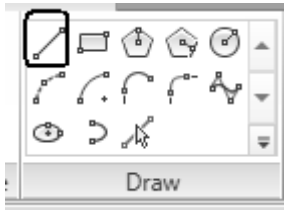
2. Select the wall.



3.  Select **Edit Profile** on the Mode panel.



4.  Select the **Line** tool from the Draw panel.



*You may need to play with the ribbon display tools to see the Draw panel.*

5.



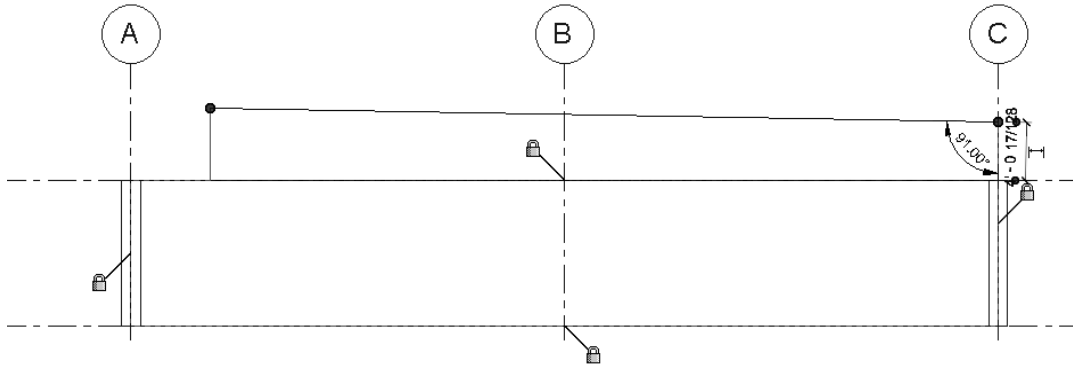
Draw a vertical line 5' 6" to the right of the A grid and 2' 6" high.

6.



Use the TRIM tool to delete the top line for the wall to the right of the short vertical line. Arrows indicate the selections for the TRIM tool.

7.



Extend the right vertical line up.  
Draw a new slanted line to close the profile.  
Set the angle to **91°**.



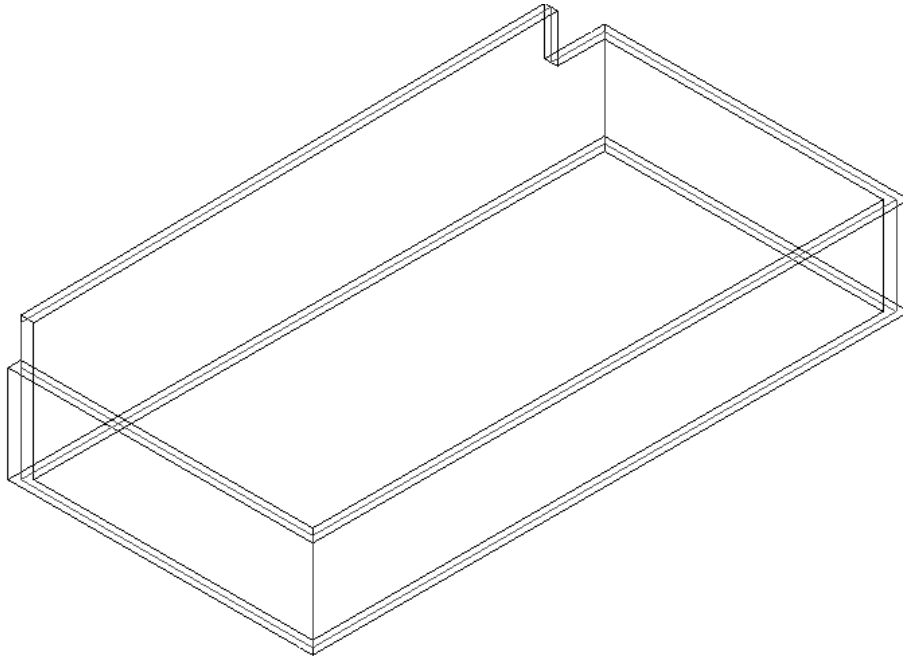
To set the angle: add a temporary angle dimension using the Angle tool in the Measure panel.

8. Select the **Green Check** on the Mode panel.



9.  Switch to a 3D view.

10. The wall profile has been modified.



11. Close without saving.

## Command Exercise

### ***Exercise 1-7 – Add an Opening in a Wall***

Drawing Name: **add\_opening.rvt**

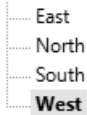
Estimated Time to Completion: 10 Minutes



#### Scope

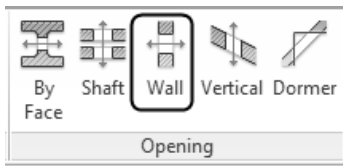
*Add an opening to a wall.*

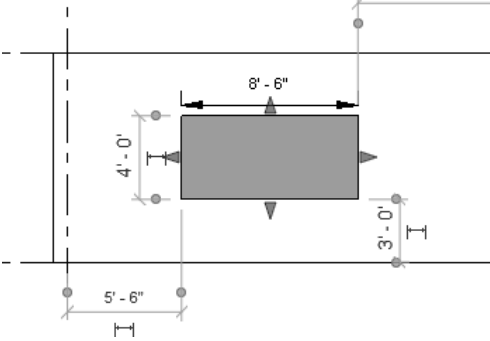
#### Solution

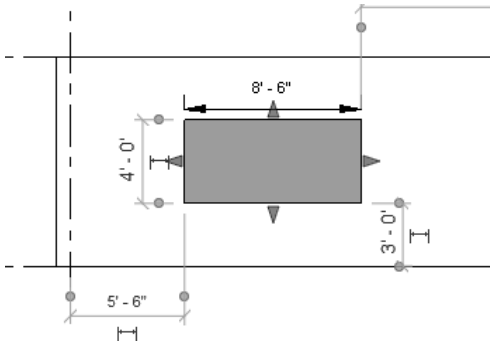
1.  Elevations (Building Elevation) Activate the **West Elevation** in the Project Browser.



2.  Activate the Structure ribbon.  
 Select the **Wall** opening tool on the Opening panel.



3.  Select the wall.  
Draw a rectangle.  
Adjust the size and position of the rectangle using the grips and temporary dimensions. Set the size of the rectangle to 4' 0" high x 8' 6" wide.

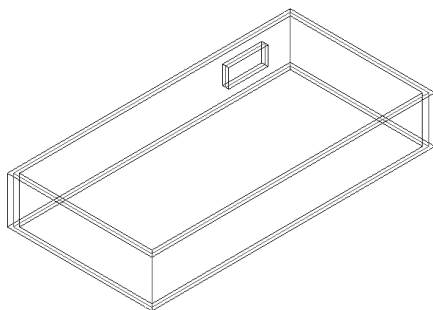


4. Position the rectangle 5' 6" to the right of the A grid and 3' 0" above Level 1.

5.  Switch to a 3D view.



6.  An opening to the wall has been added.



7. Close without saving.