# ARCH 2431. Building Technology III

## Building Information Modeling with Revit
## Day 04

*Introduction to Steel Connections Assignment*
*Columns & Beams*

Professor Paul C. King, RA, AIA, ARA

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Day 04
Connections Intro

- Assignment Description
- New Project File
  - Levels
  - Grids
  - Dimensions
- New 3D Family
- W24 x 162 Column
  - Reference Planes
  - Parameters
  - Extrusion
  - Height Parameter
  - Family Category
- Load into Project
- New 3D Families
  - HSS Pipe Column
  - Formula Parameter
  - HSS Square Column
  - W 21 x 162 Beam
  - Place Beam
  - Snap, Align & Copy
  - Modify Round Column Family
- Project File Sheet

Building Technology III

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# *Introduction to Steel Connections Assignment*

Creating 3D families build the 3D Revit model described in the assignment.

These 3d Families will be assembled in a project file named as follows:

*FirstLastName-Connections-AR2431-SP20-Professor.rvt*

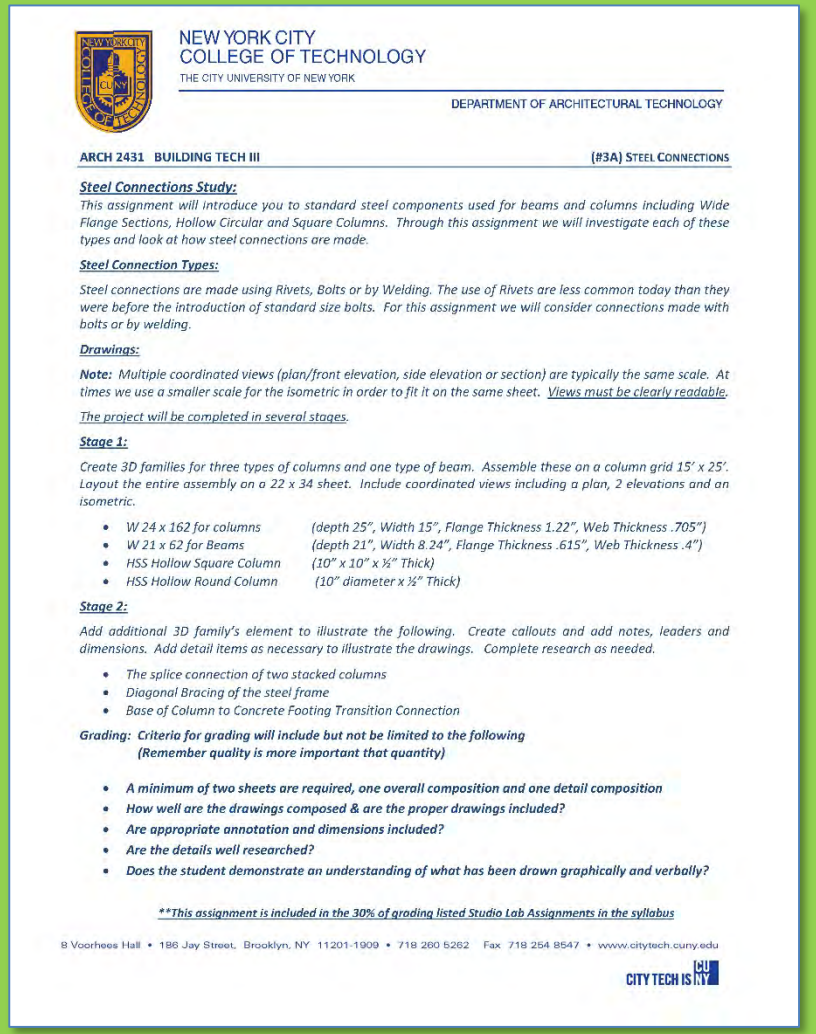
As specified create families using modifiable parameters.

Format the assembly on a 22 x 34" titleblock. As before be certain your photo and name is on each sheet.

Create additional sets of coordinated views of assembly connections at enlarged scale along with an isometric.

Add annotation (notes and leaders) dimensions and detail items as necessary to clarify the details.

Review class readings and conduct additional research as needed to complete the assignment.



NEW YORK CITY
COLLEGE OF TECHNOLOGY
THE CITY UNIVERSITY OF NEW YORK

DEPARTMENT OF ARCHITECTURAL TECHNOLOGY

**ARCH 2431 BUILDING TECH III** **(#3A) STEEL CONNECTIONS**

***Steel Connections Study:***

*This assignment will introduce you to standard steel components used for beams and columns including Wide Flange Sections, Hollow Circular and Square Columns. Through this assignment we will investigate each of these types and look at how steel connections are made.*

***Steel Connection Types:***

*Steel connections are made using Rivets, Bolts or by Welding. The use of Rivets are less common today than they were before the introduction of standard size bolts. For this assignment we will consider connections made with bolts or by welding.*

***Drawings:***

***Note:*** *Multiple coordinated views (plan/front elevation, side elevation or section) are typically the same scale. At times we use a smaller scale for the isometric in order to fit it on the same sheet. Views must be clearly readable.*

*The project will be completed in several stages.*

***Stage 1:***

*Create 3D families for three types of columns and one type of beam. Assemble these on a column grid 15' x 25'. Layout the entire assembly on a 22 x 34 sheet. Include coordinated views including a plan, 2 elevations and an isometric.*

- *W 24 x 162 for columns* (depth 25", Width 15", Flange Thickness 1.22", Web Thickness .705")
- *W 21 x 62 for Beams* (depth 21", Width 8.24", Flange Thickness .615", Web Thickness .4")
- *HSS Hollow Square Column* (10" x 10" x ½" Thick)
- *HSS Hollow Round Column* (10" diameter x ½" Thick)

***Stage 2:***

*Add additional 3D family's element to illustrate the following. Create callouts and add notes, leaders and dimensions. Add detail items as necessary to illustrate the drawings. Complete research as needed.*

- *The splice connection of two stacked columns*
- *Diagonal Bracing of the steel frame*
- *Base of Column to Concrete Footing Transition Connection*

***Grading: Criteria for grading will include but not be limited to the following***
***(Remember quality is more important that quantity)***

- ***A minimum of two sheets are required, one overall composition and one detail composition***
- ***How well are the drawings composed & are the proper drawings included?***
- ***Are appropriate annotation and dimensions included?***
- ***Are the details well researched?***
- ***Does the student demonstrate an understanding of what has been drown graphically and verbally?***

*****This assignment is included in the 30% of grading listed Studio Lab Assignments in the syllabus***

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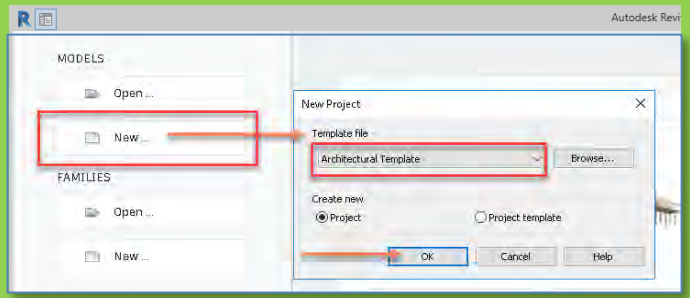
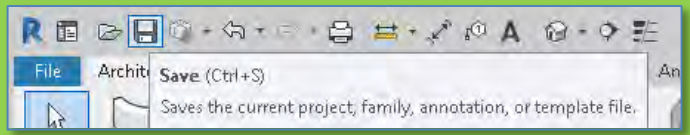
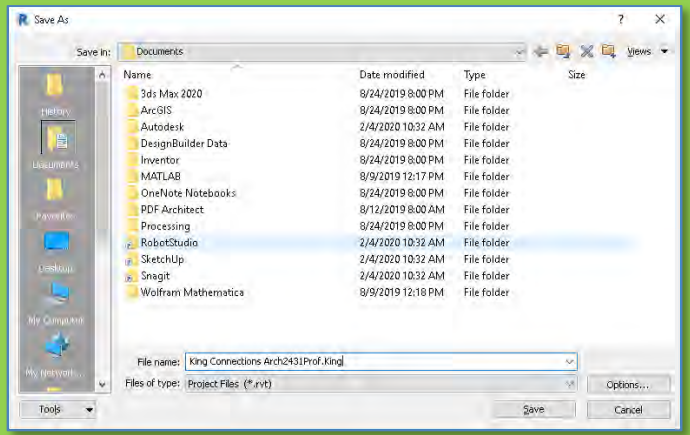
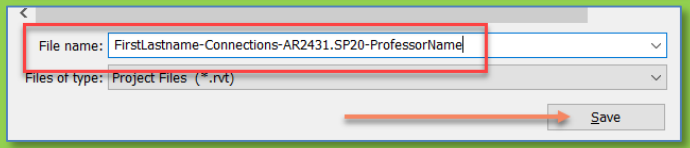
# Creating a New Project File




- Create a new Project File
  - Architectural Template
- Save and Name the File
- Select an appropriate directory
  - *(do not work from your USB! This will cause all backup files to be saved there and fill up your drive and potentially crash the program.)*
- Name the file as follows:
  - *FirstLastname-Connections-AR2431.SP20-ProfessorName.rvt*

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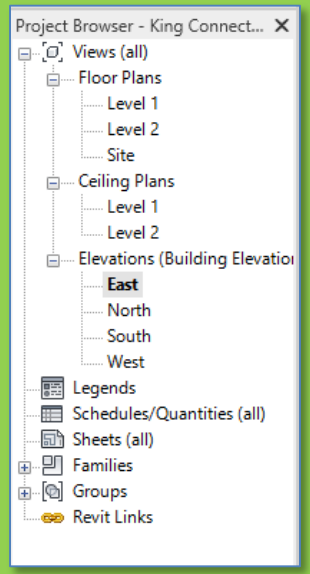
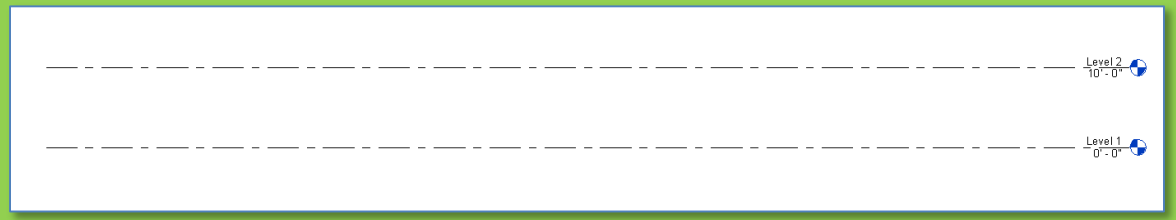
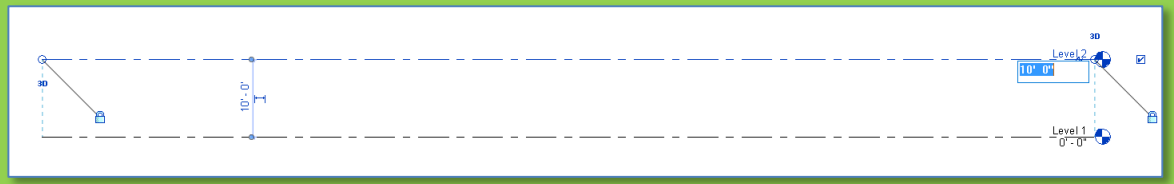
# Modify Level 2 elevation from 10 to 12 feet



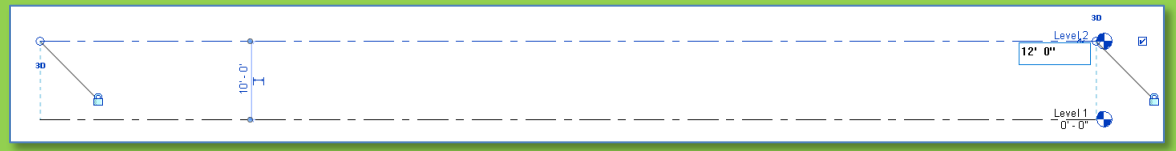

- Project Browser
  - Select the East Elevation




- Select Level 2
  - Highlight the Elevation [10’-0”]




  - Change the Elevation to [12’-0”]



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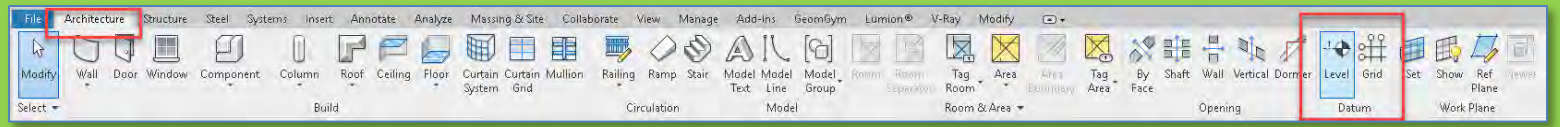
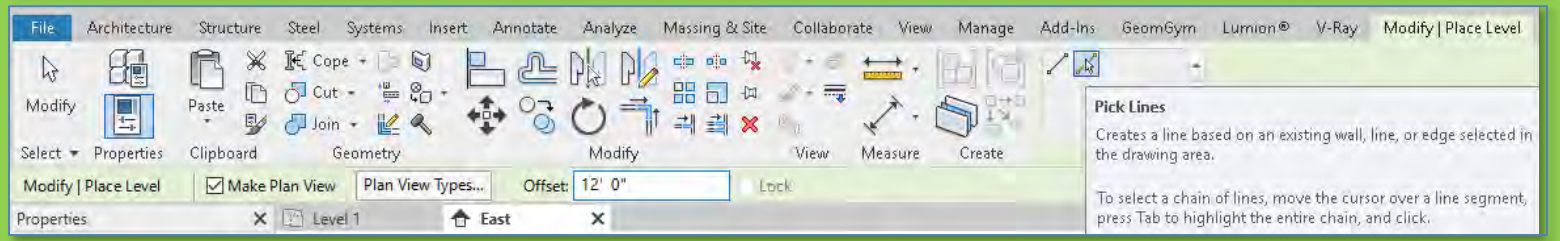
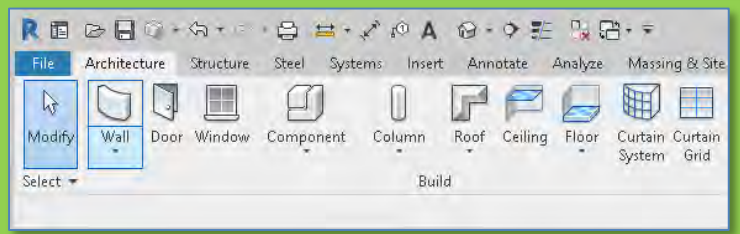
# Add Level 3






- **Architecture Ribbon**
  - Activate **East** view then select **Level**
  - Method = **Pick Lines**
- Set **Offset** to 12'-0" & [Yes] **Make Plan View**
  - Move cursor just above Level 2
  - Select and Level 3 will be created
- Select the **Modify** Button to end command

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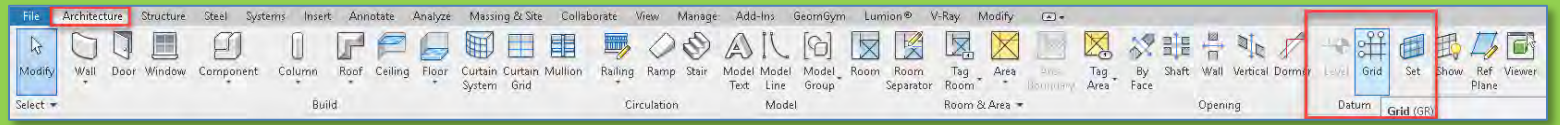
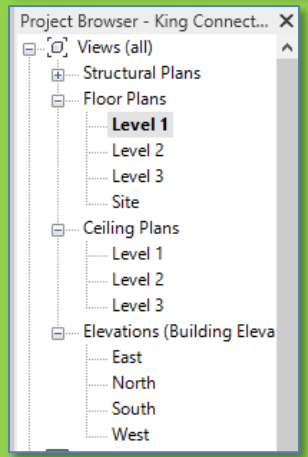
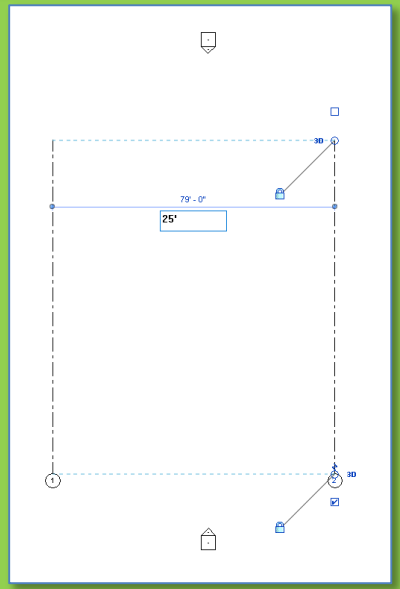
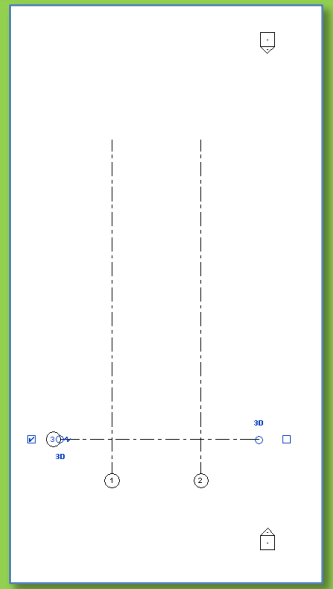
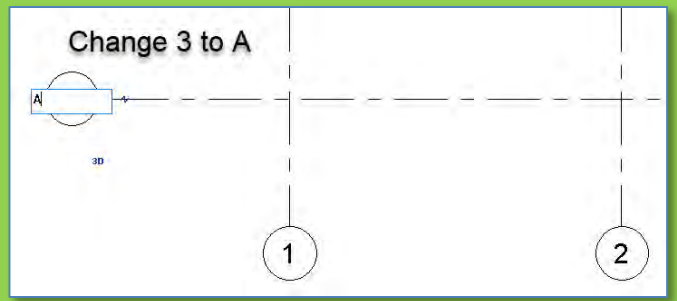
# Add Column Grids on Level 1








- Set Level 1 as the current view
  - Architecture Ribbon > Grid
- Draw Vertical Grid 1 from top to bottom
- Draw Vertical Grid 2 from top to bottom
  - Modify Spacing to 25 feet
- Draw Horizontal Grid (will be numbered 3)
  - Change Name from 3 to A

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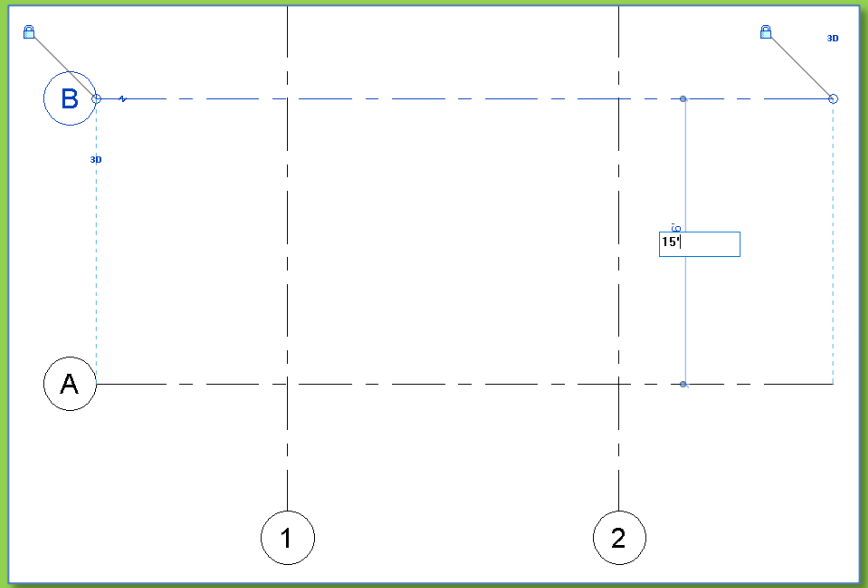


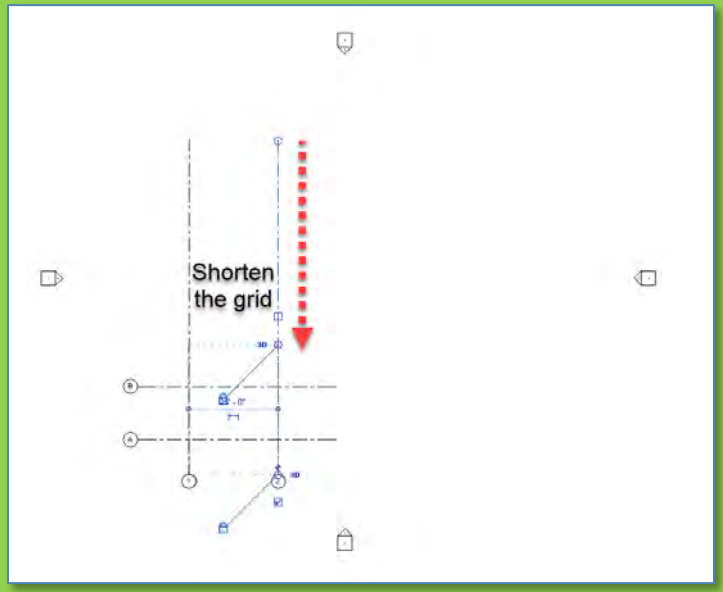


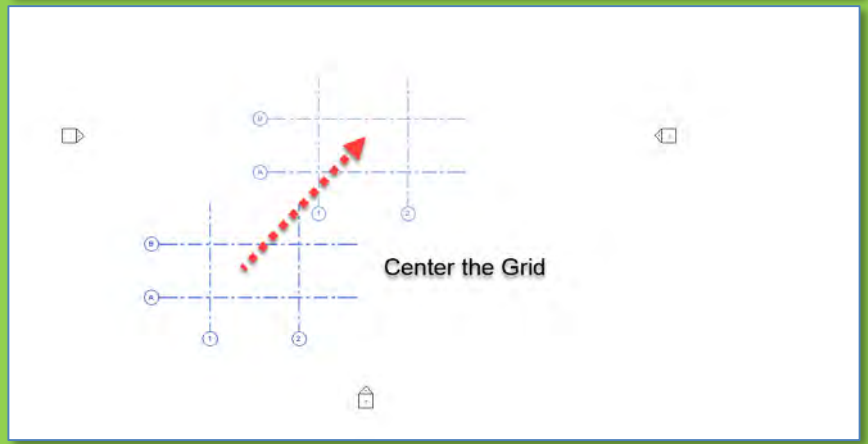


- Draw Grid Line B
  - Set Spacing to 15’-0”
- Shorten the Grid Lines
- Move & Center the Grid
  - Select Grid & Drag

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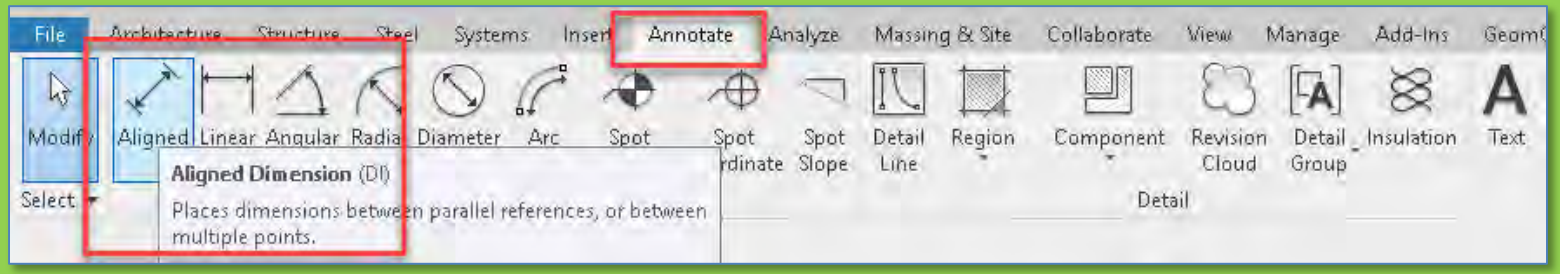
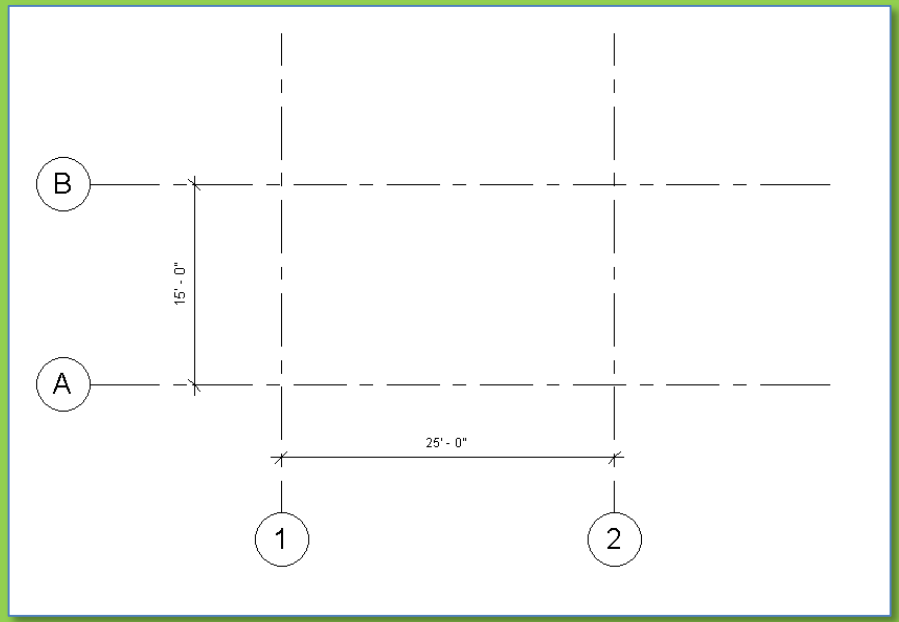
# Add Dimensions




- Annotate Ribbon
  - Aligned Dimension
- Add vertical dimension
- Add Horizontal Dimension

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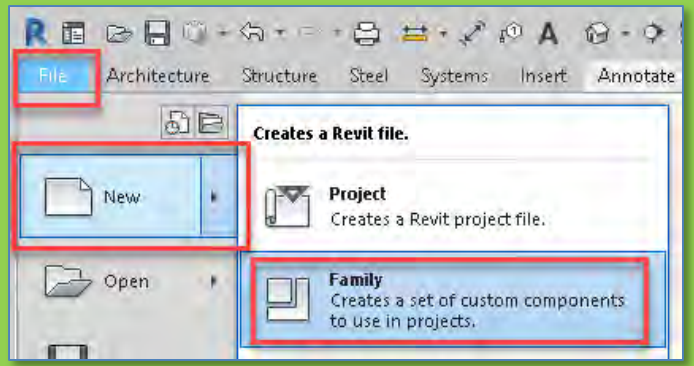
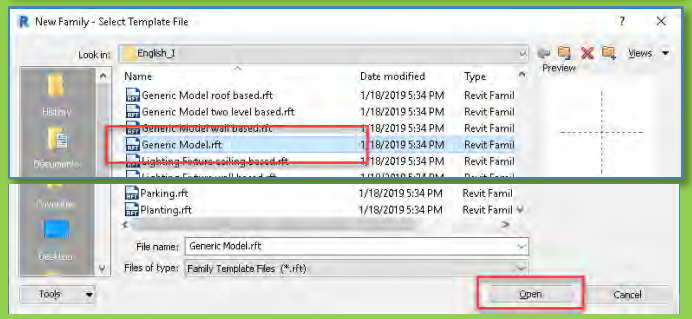
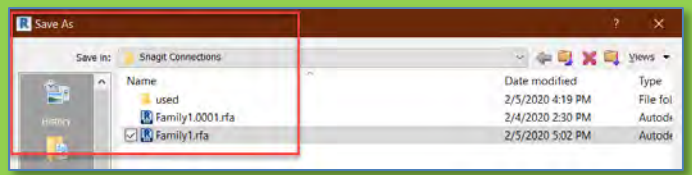
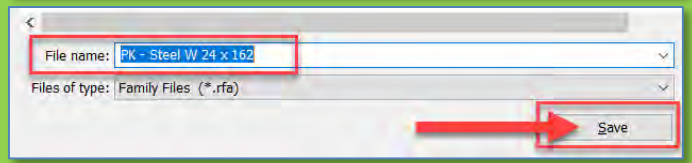
# Creating a new 3D Family File

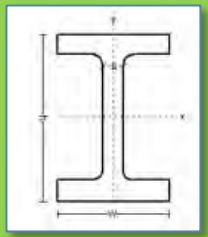



- We will repeat this for each component of the Steel Connection Assembly
- **Create a new Family**
  - File > New > Family
  - Generic Model Template
- **Save and Name the File**
- Select an appropriate directory
- Name the file as follows:
  - *Initials- Description*
  - *PK – Steel W 24 x 162*



| Designation | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| Imperial (in x lb/ft) | Depth h (in) | Width w (in) | Web Thickness $t_w$ (in) | Flange Thickness $t_f$ (in) | Sectional Area ($in^2$) | Weight (lb/ft) |
| W 24 x 162 | 25 | 13 | 0.705 | 1.220 | 47.7 | 162 |
| W 24 x 146 | 24.7 | 12.9 | 0.650 | 1.090 | 43.0 | 146 |

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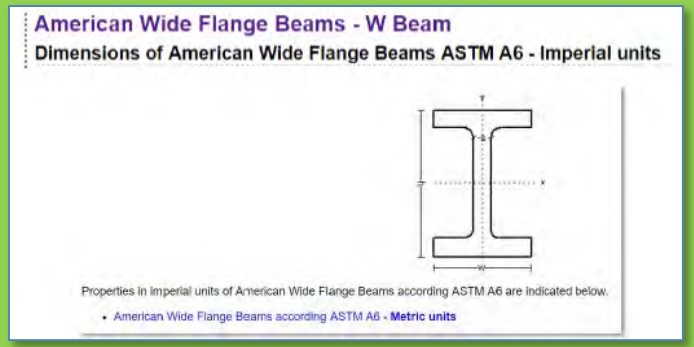
# Wide Flange W 24 x 162



American Wide Flange Beams - W Beam

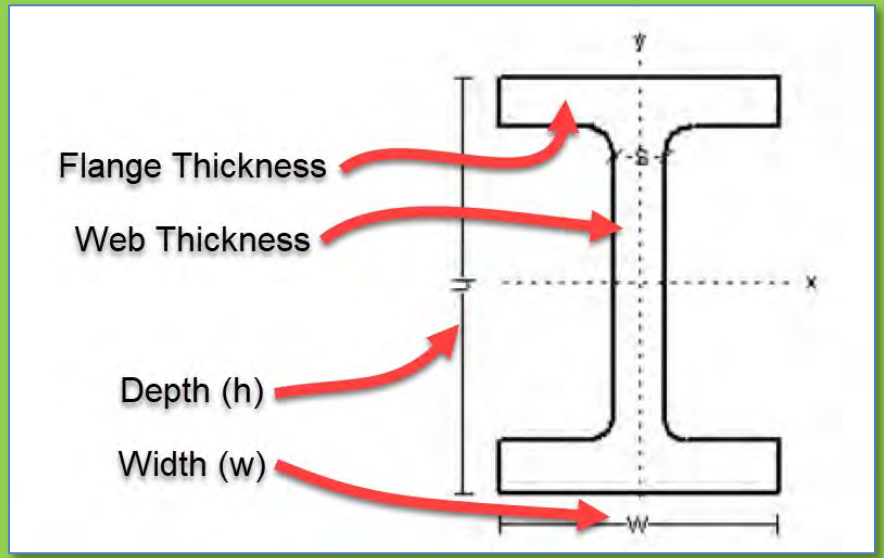
Dimensions of American Wide Flange Beams ASTM A6 - Imperial units

Properties in imperial units of American Wide Flange Beams according ASTM A6 are indicated below.

- American Wide Flange Beams according ASTM A6 - **Metric units**

- ***W 24 x 162***
  - *Depth (h) = 25”*
  - *Width (w) = 15”*
  - *Web Thickness = .705”*
  - *Flange Thickness = 1.220”*

| Designation | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| Imperial (in x lb/ft) | Depth h (in) | Width w (in) | Web Thickness $t_w$ (in) | Flange Thickness $t_f$ (in) | Sectional Area ($in^2$) | Weight (lb/ft) |
| W 27 x 178 | 27.8 | 14.09 | 0.725 | 1.190 | 52.3 | 178 |
| W 27 x 161 | 27.6 | 14.02 | 0.660 | 1.080 | 47.4 | 161 |
| W 27 x 146 | 27.4 | 14 | 0.605 | 0.975 | 42.9 | 146 |
| W 27 x 114 | 27.3 | 10.07 | 0.570 | 0.930 | 33.5 | 114 |
| W 27 x 102 | 27.1 | 10.02 | 0.515 | 0.830 | 30.0 | 102 |
| W 27 x 94 | 26.9 | 10 | 0.490 | 0.745 | 27.7 | 94 |
| W 27 x 84 | 26.7 | 9.96 | 0.460 | 0.640 | 24.8 | 84 |
| W 24 x 162 | 25 | 13 | 0.705 | 1.220 | 47.7 | 162 |
| W 24 x 146 | 24.7 | 12.9 | 0.650 | 1.090 | 43.0 | 146 |




Source of Information:
https://www.engineeringtoolbox.com/american-wide-flange-steel-beams-d_1319.html

Additional Reference for steel components:
http://products.anssteel.com/category/steel?

| | | | | | | |
|---|---|---|---|---|---|---|
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# Family Ribbons and Project Browser Views

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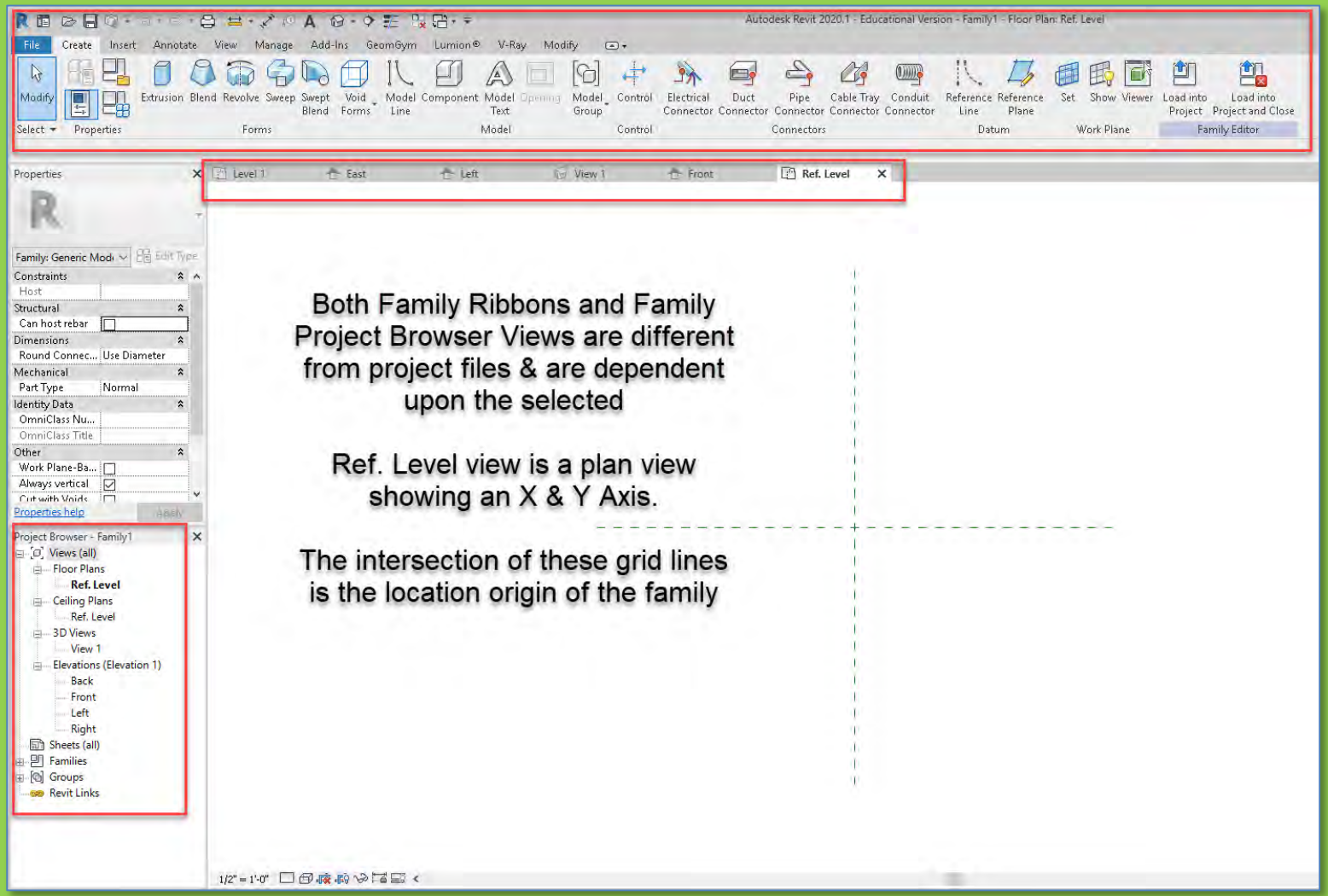


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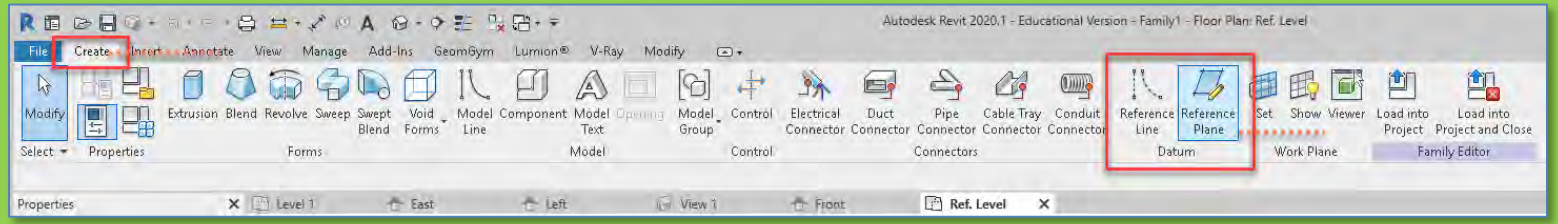
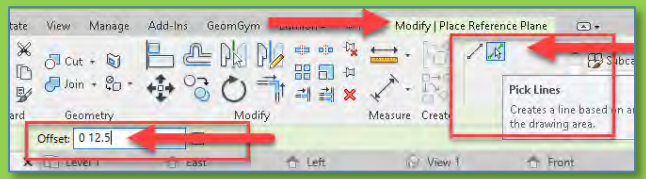
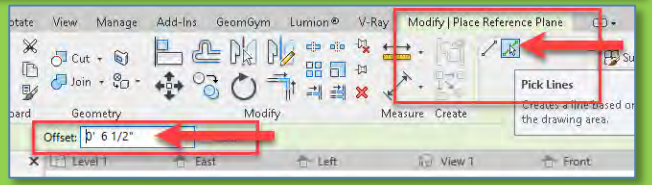
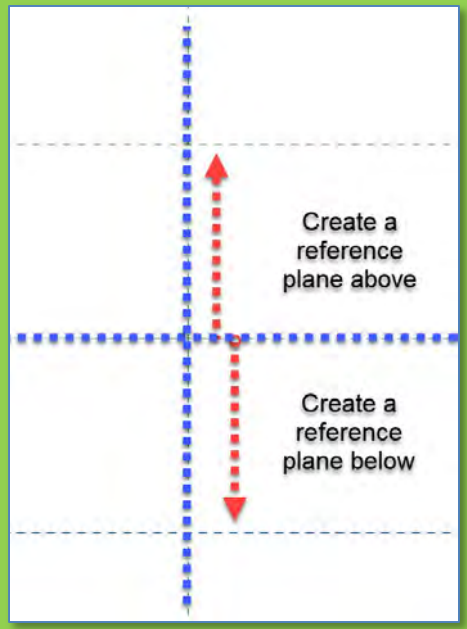
# Add Reference Planes for the Depth & Width



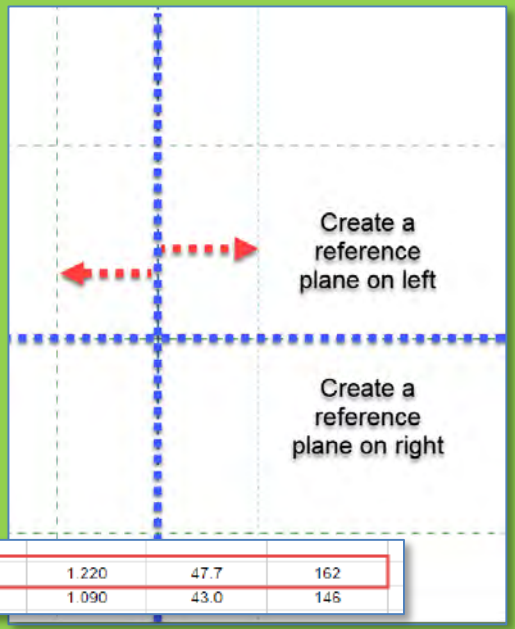




- ***W 24 x 162***
- *Depth (h) = 25”*
- *Width (w) = 15”*




- Create Ribbon
  - Reference Plane
- Depth pick lines
  Offset (25/2 = 12.5”)
  - Add two
- Width pick lines
  Offset (13/2 = 6.5 “)
  - Add two




| | | | | | | |
|---|---|---|---|---|---|---|
| W 24 x 162 | 25 | 13 | 0.705 | 1.220 | 47.7 | 162 |
| W 24 x 146 | 24.7 | 12.9 | 0.650 | 1.090 | 43.0 | 146 |

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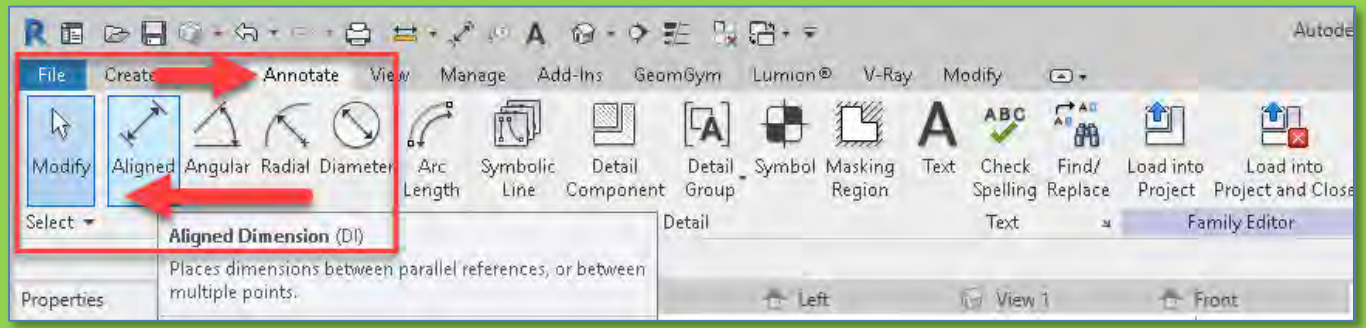
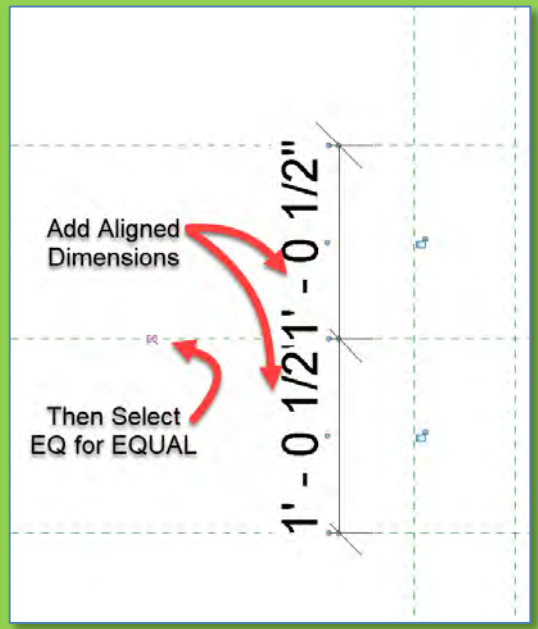
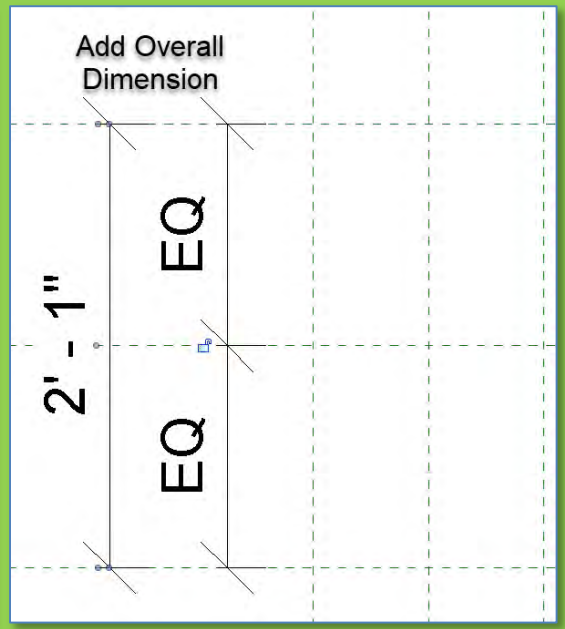
# *Add Dimensions* & define adjustable Parameters

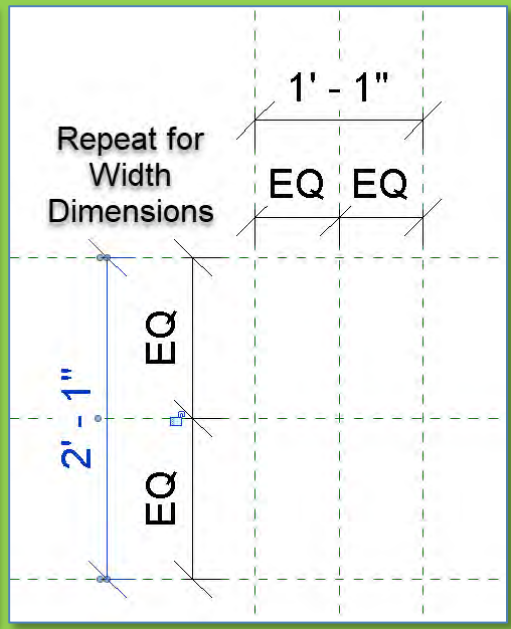



- *W 24 x 162*
- *Depth (h) = 25”*
- *Width (w) = 15”*

- Annotate > Aligned (Add two dimensions then EQ) Then Overall & Repeat



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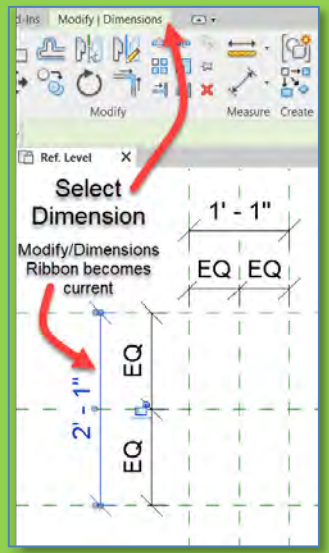
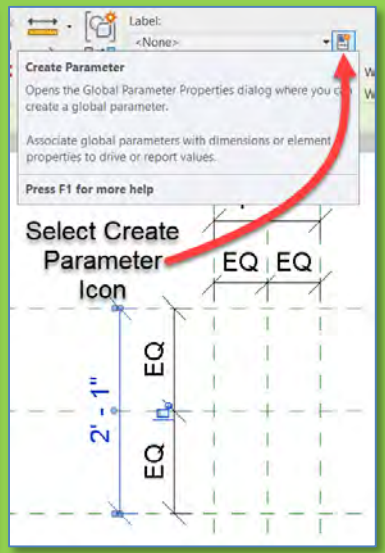
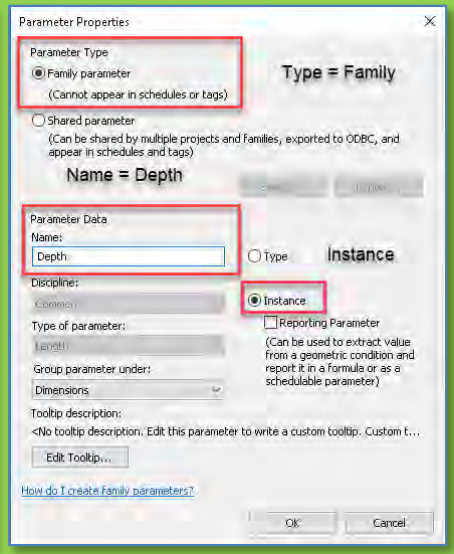
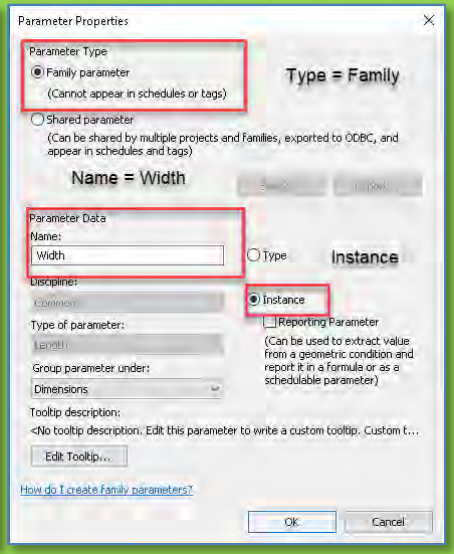
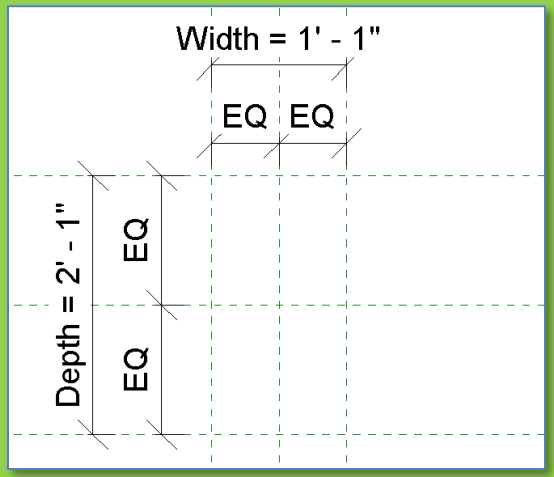
# Add Dimensions & *define adjustable Parameters*




- Select Depth (2'-1") > Create Parameter
  - Type = Family
  - Name = Depth
  - Instance
- Select Width (1'-1") > Create Parameter
  - Type = Family
  - Name = Depth
  - Instance

- ***W 24 x 162***
- *Depth (h) = 25"*
- *Width (w) = 15"*

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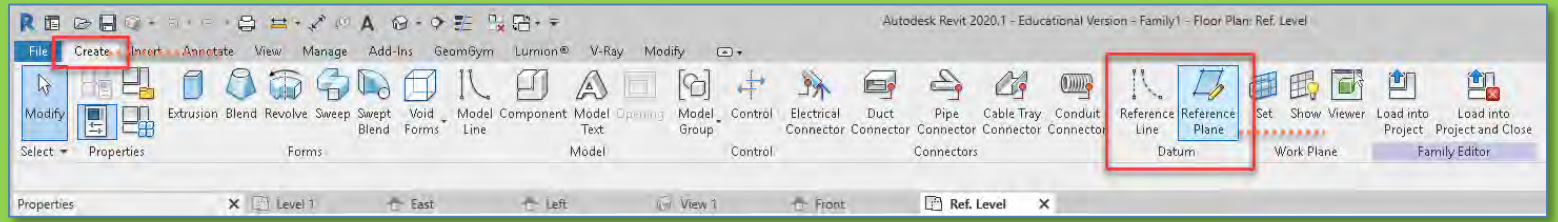
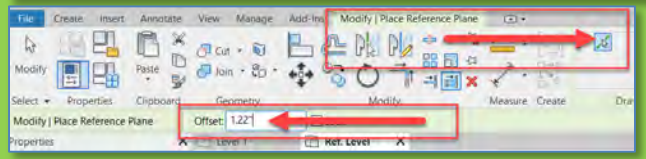
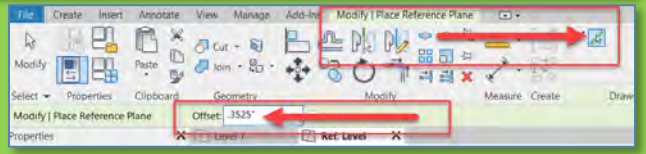
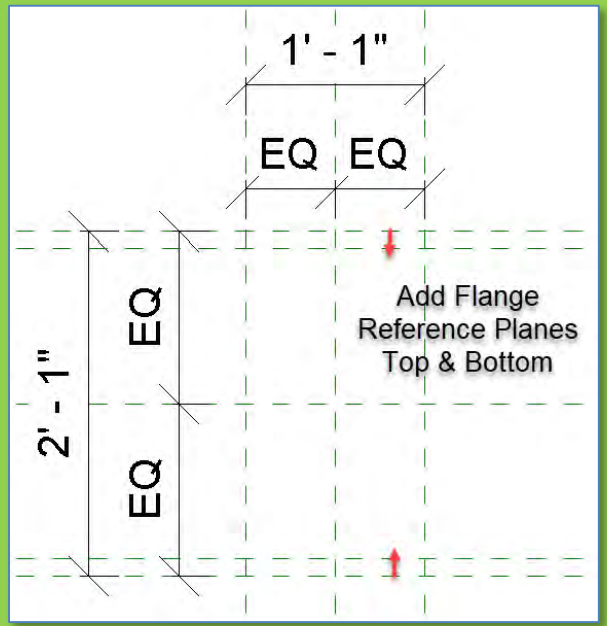
# Add Reference Planes for Web & Flange



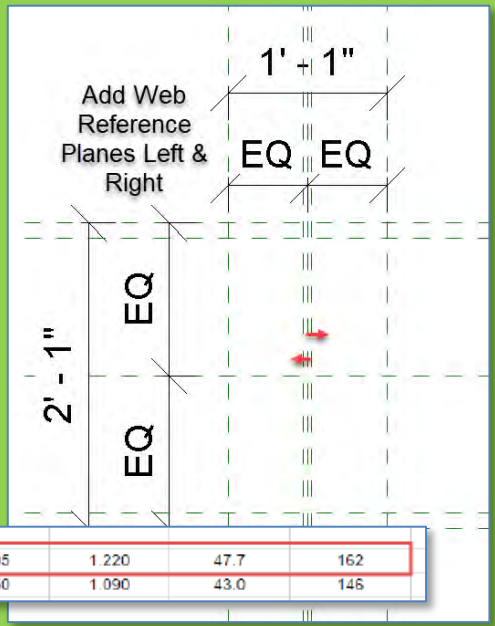




- ***W 24 x 162***
  - *Web Thickness = .705"*
  - *Flange Thickness = 1.220"*




- Create Ribbon > Reference Plane
- Flange pick lines Offset (1.22")
  - Add both top and bottom
- Web pick lines Offset (.705/2 = .3525")
  - Add two left and right




| | | | | | | |
|---|---|---|---|---|---|---|
| W 24 x 162 | 25 | 13 | 0.705 | 1.220 | 47.7 | 162 |
| W 24 x 146 | 24.7 | 12.9 | 0.650 | 1.090 | 43.0 | 146 |

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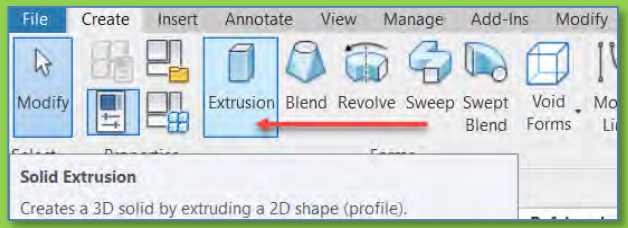
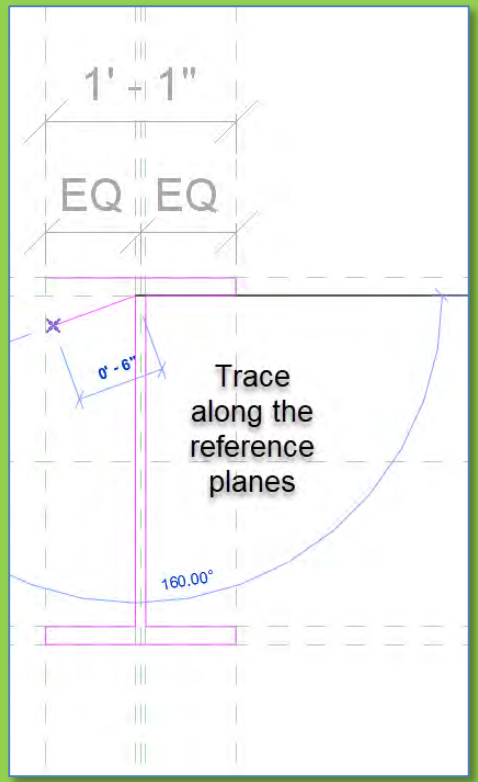
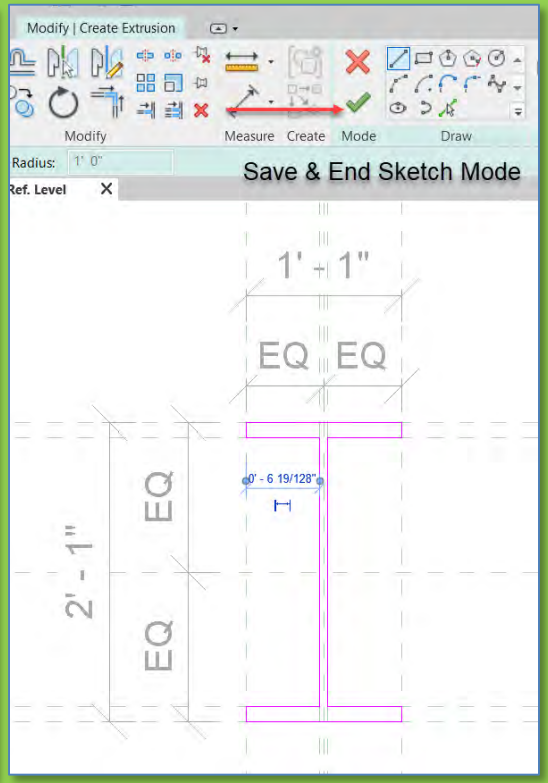
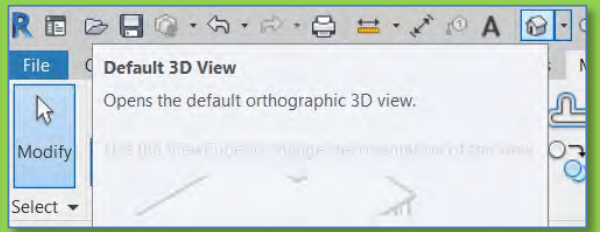
# Create the Extrusion

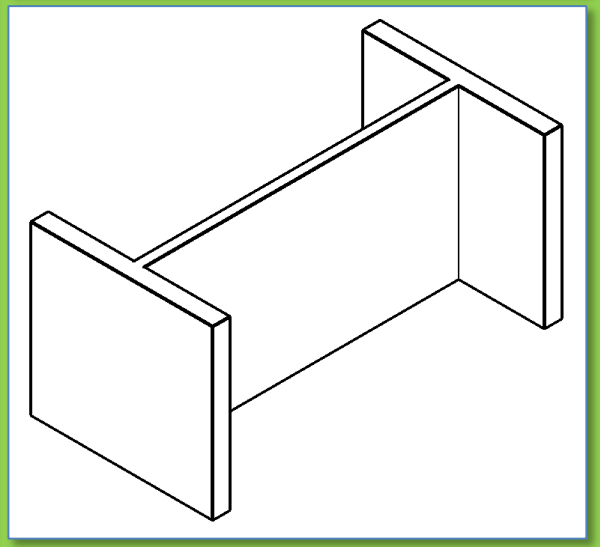



- Create Ribbon > Extrusion (Solid)
  - Lines (trace the shape using reference planes)
  - Green Check (Save and end Sketch Mode)
  - Default 3D View



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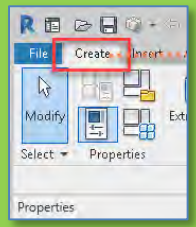
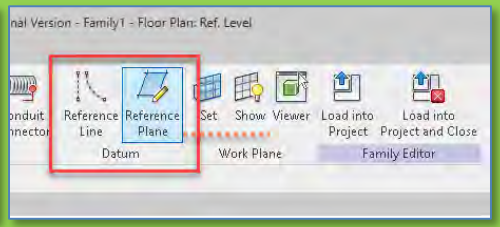
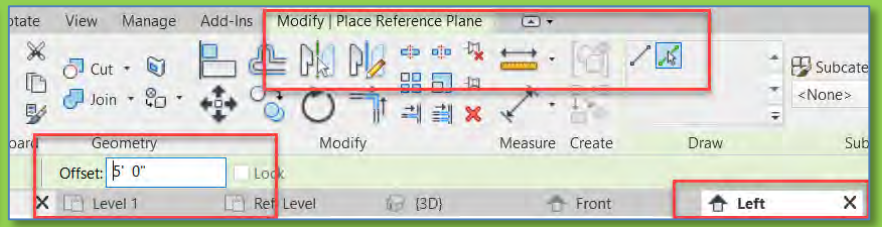
# Add Reference Plane for Height & Lock Top & Bottom

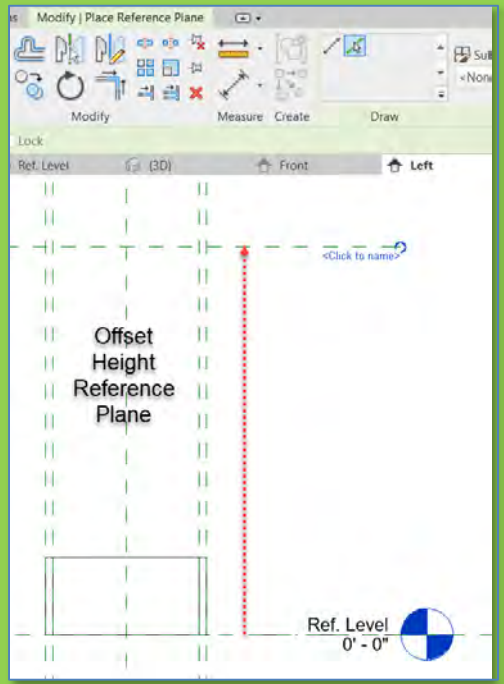


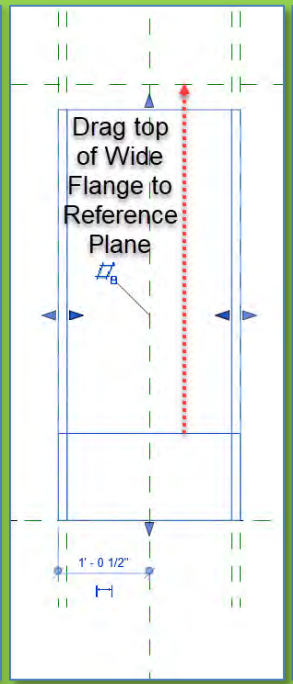



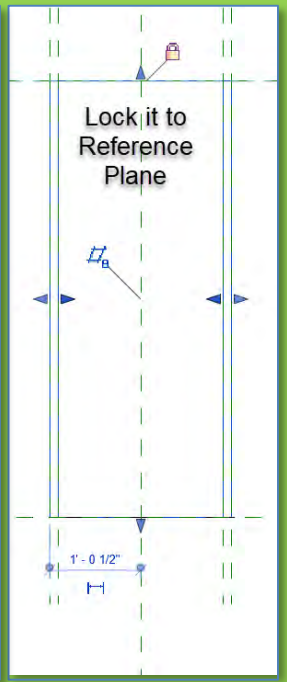



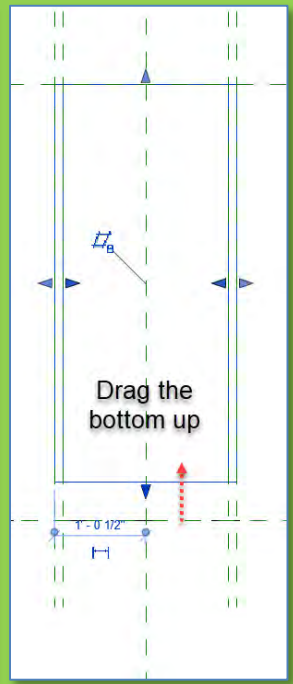

- Left View> Create > Reference Plane
- Pick Lines (offset 5'-0")

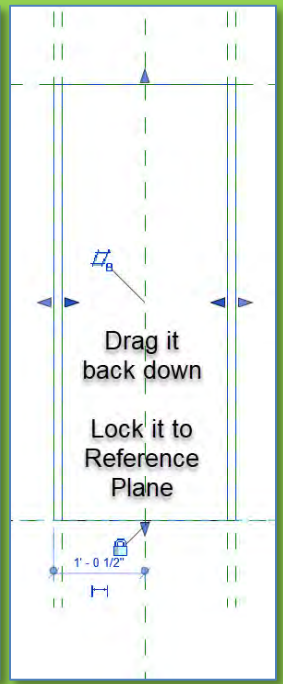
- Drag top to reference plane and lock it
- Drag bottom up then back don and lock it



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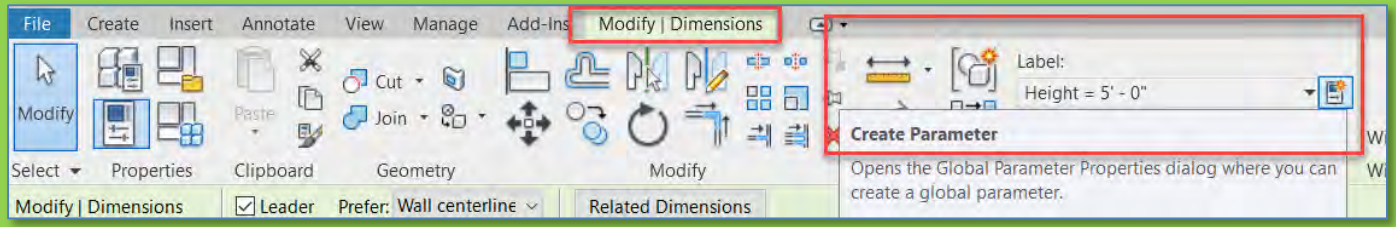
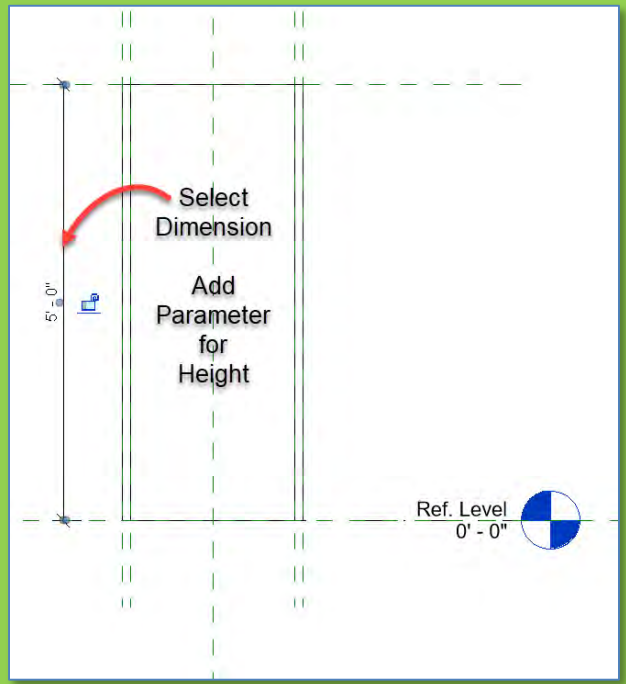
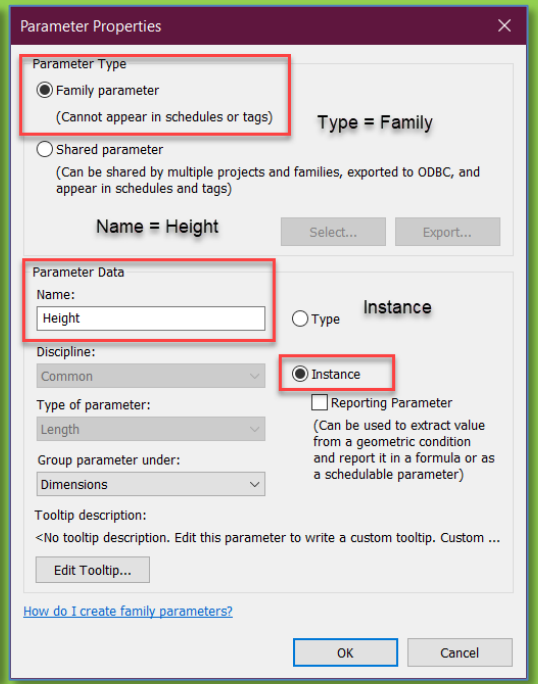
# Add Dimension and Parameter for Height




- Select Dimension
- Create Parameter
  - Type = Family
  - Name = Height
  - Instance

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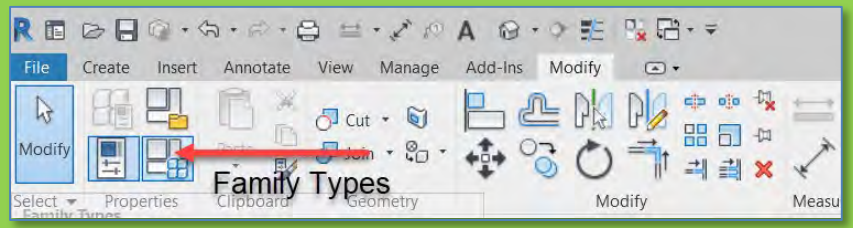
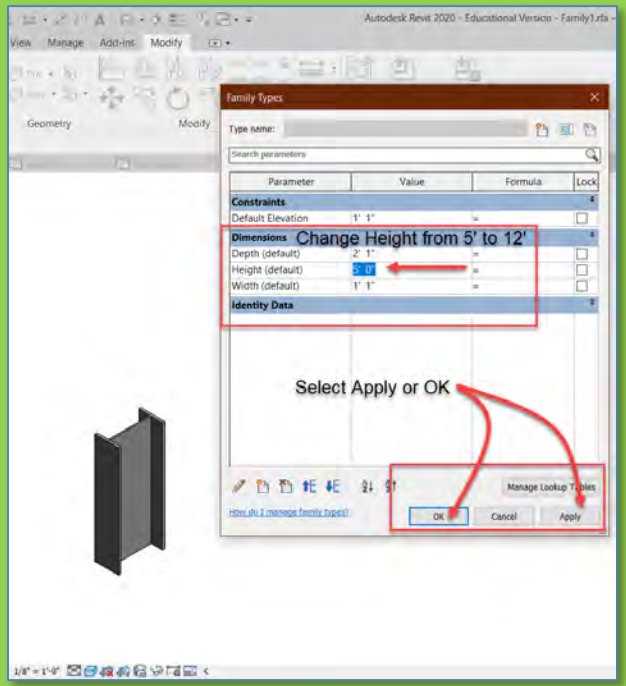
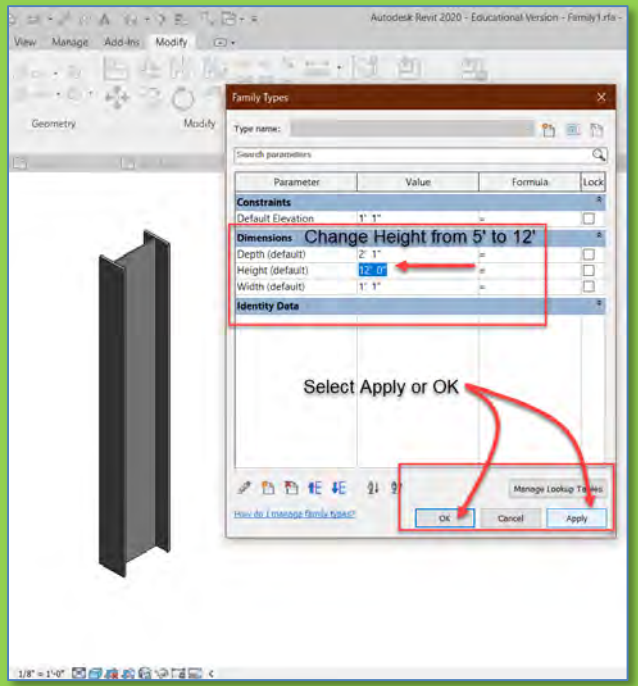
# Using Parameters to Control the 3D extrusion




- Properties > Family Type
  - Notice the list of parameters
- Change Height from 5’ to 12’
  - Notice the 3D model updates



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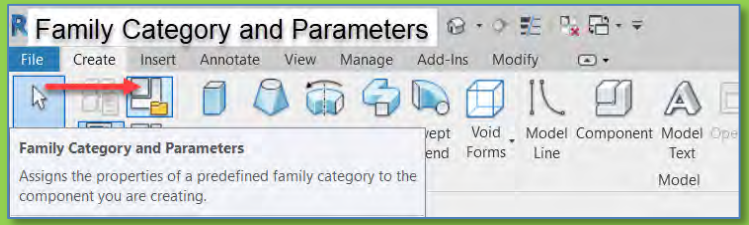
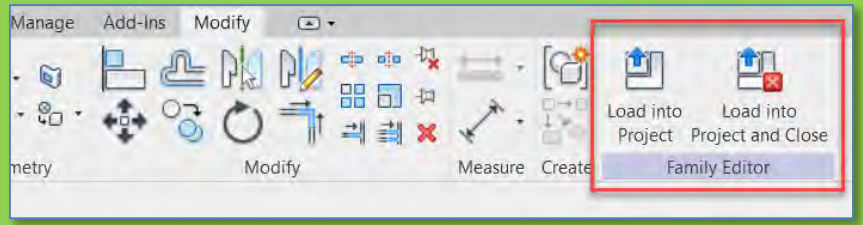
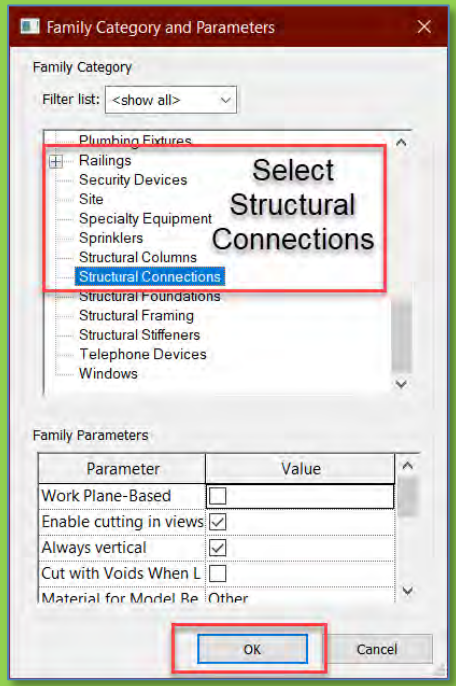
# Set Family Category to Structural Connections

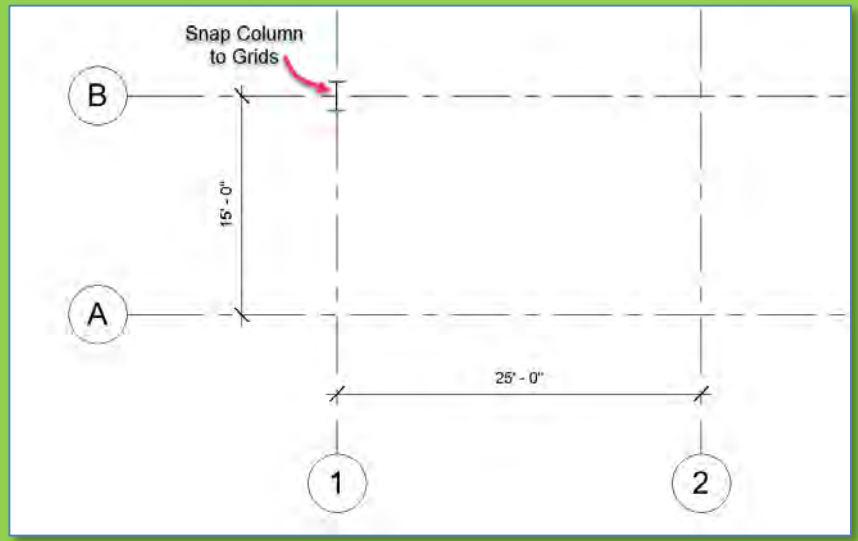



- Family Category & Parameters
- Select Structural Connections
- Save the file
- Load into Project
- Snap to Column Grids B & 1

- **Load into Project**
  - (family file remains open)
- Load into Project and Close
  - (family file will close)
- The family is saved inside the project file



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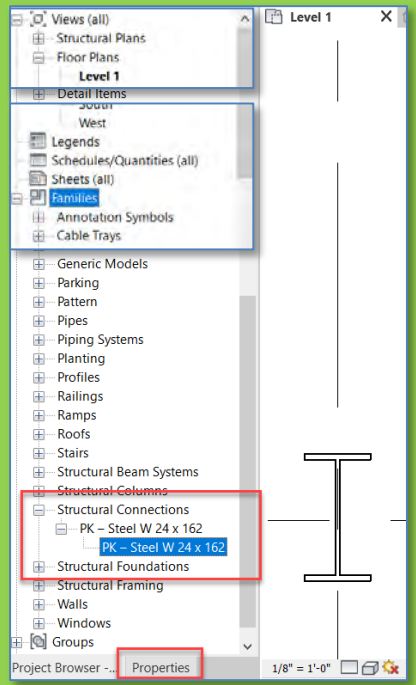
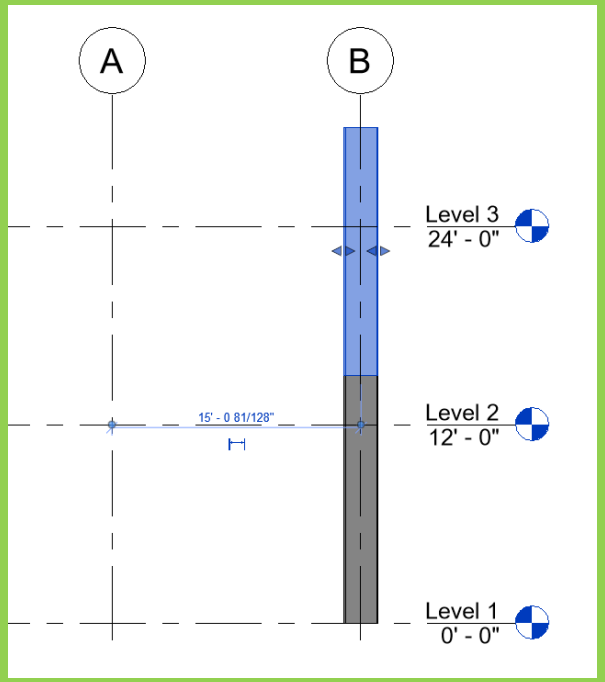
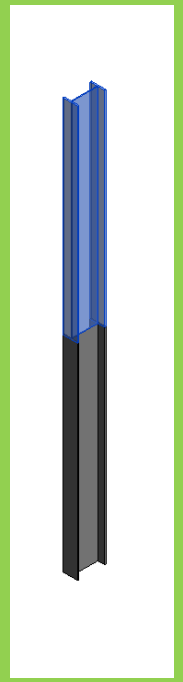
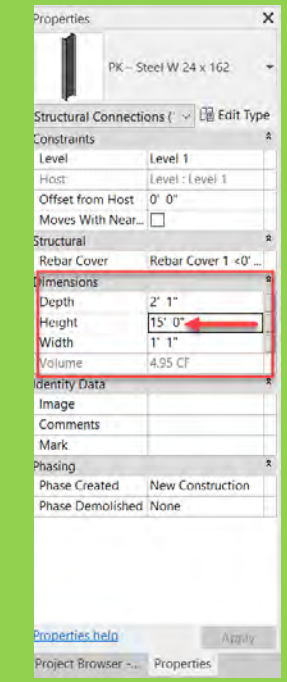
# Look under Family Category for Structural Connections

- In the project browser the family will show in the category “Structural Connections”
- To create additional copies either copy the one already in the project or drag it from the project browser into the project
- Modify the height of the first column to 15’-0” (12’ for the Level + an extra 3 feet)
- Make a copy 15 feet above the first column





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# HSS High Strength Steel Pipe Columns

## Steel Pipe Columns - Allowable Loads

**Allowable concentric loads for steel pipe columns**

Sponsored Links

The tables bellows indicates allowable concentric loads for steel pipe columns:

### Standard Steel Pipe

| Nominal Pipe Diameter (inches) | Wall Thickness (inches) (mm) | Effective Length of Column (feet) (m) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 |
| | | Allowable Concentric Loads ($10^3$ lbf) (kN) | | | | | | | |
| 3 | 0.216 | 38 | 34 | 28 | 22 | 16 | 12 | 10 | |
| 3 1/2 | 0.226 | 48 | 44 | 38 | 32 | 25 | 19 | 15 | 12 |
| 4 | 0.237 | 59 | 54 | 49 | 43 | 36 | 29 | 23 | 19 |
| 5 | 0.257 | 83 | 78 | 73 | 68 | 61 | 55 | 47 | 39 |
| 6 | 0.280 | 110 | 106 | 101 | 95 | 89 | 82 | 75 | 67 |

### Extra Strong Steel Pipe

| Nominal Pipe Diameter (inches) | Wall Thickness (inches) (mm) | Effective Length of Column (feet) (m) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 |
| | | Allowable Concentric Loads ($10^3$ lbf) (kN) | | | | | | | |
| 3 | 0.300 | 52 | 45 | 37 | 28 | 21 | 16 | 12 | |

- *For Round Column HSS 10* Outside Diameter 10" Thickness = .5"

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 0.500 | 259 | 251 | 243 | 234 | 224 | 214 | 203 | 191 |
| 10 | 0.500 | 332 | 325 | 318 | 309 | 301 | 291 | 281 | 271 |
| 12 | 0.500 | 400 | 394 | 387 | 379 | 371 | 363 | 353 | 344 |

Note that the effective column length depends on the column configuration. The values above is valid for columns with rotation free and translation fixed in both ends.

Source of Information: https://www.engineeringtoolbox.com/american-wide-flange-steel-beams-d_1319.html
Additional Reference for steel components: http://products.anssteel.com/category/steel?

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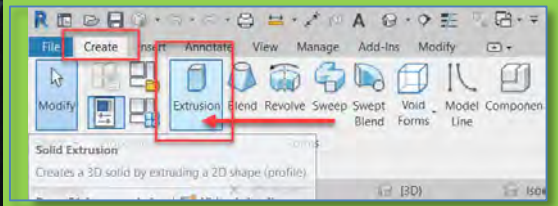
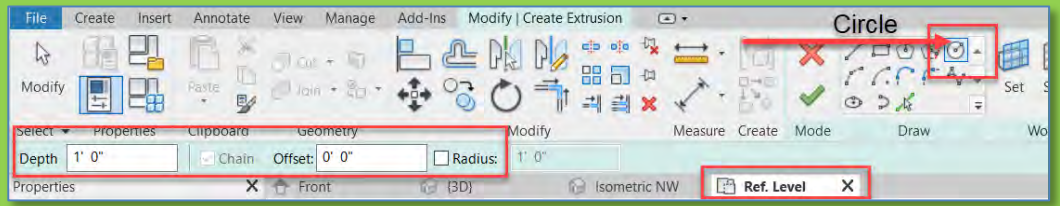
# HSS High Strength Steel Pipe Columns (Create)

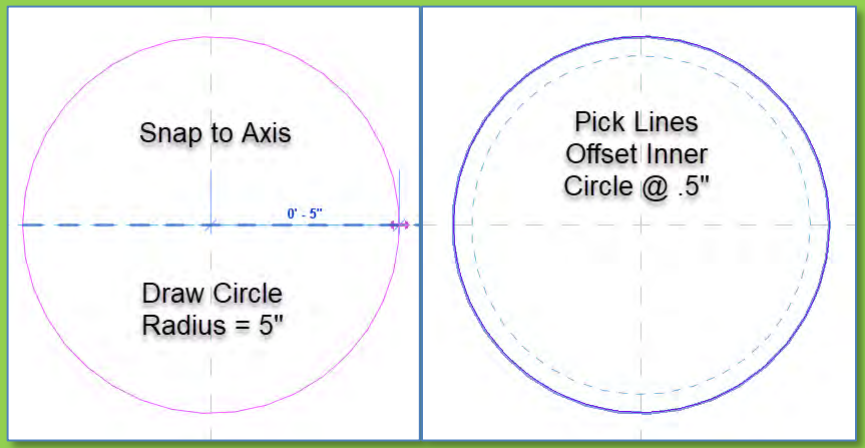
- *For Round Column HSS 10* *Outside Diameter 10" Thickness = .5"*

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 0.500 | 259 | 251 | 243 | 234 | 224 | 214 | 203 | 191 |
| 10 | 0.500 | 332 | 325 | 318 | 309 | 301 | 291 | 281 | 271 |
| 12 | 0.500 | 400 | 394 | 387 | 379 | 371 | 363 | 353 | 344 |

- *New > Family > Generic Model* *Save_as Initials-HSS-Round 10 x .5*
- *Create > Extrusion > Circle (radius 5") > Pick Lines (.5")*



*Set Family Category to Structural Connections*

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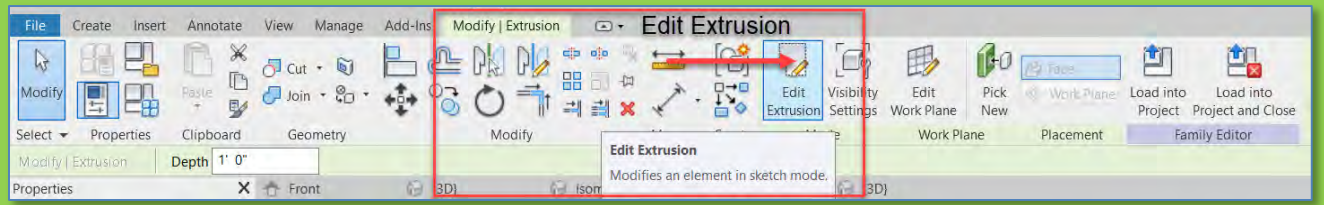
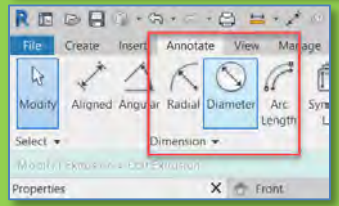
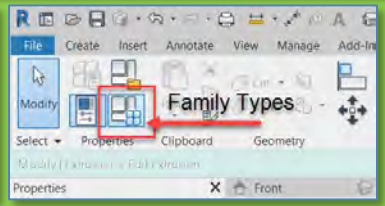
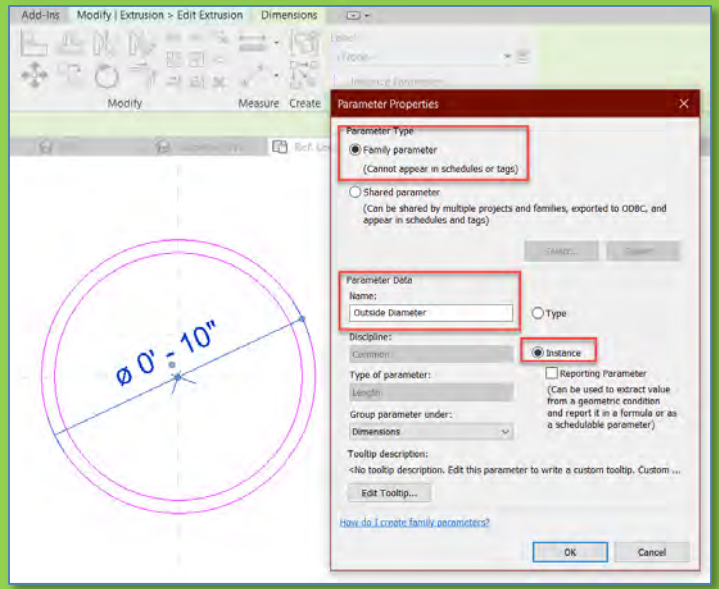
# HSS High Strength Steel Pipe Columns (Parameters)

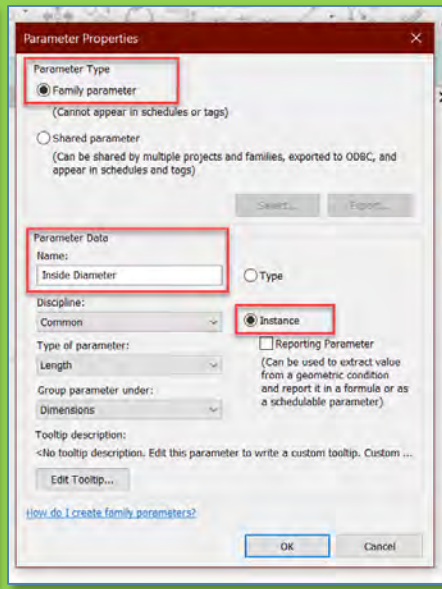


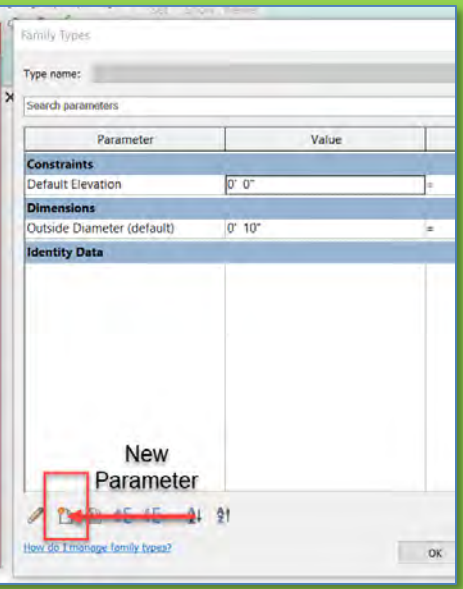



- *Edit Extrusion > Annotate > Diameter*
- *Add Parameter (Outside Diameter)*
- *Family Type > New Parameter (Inside Diameter)*



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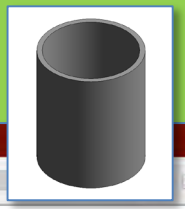
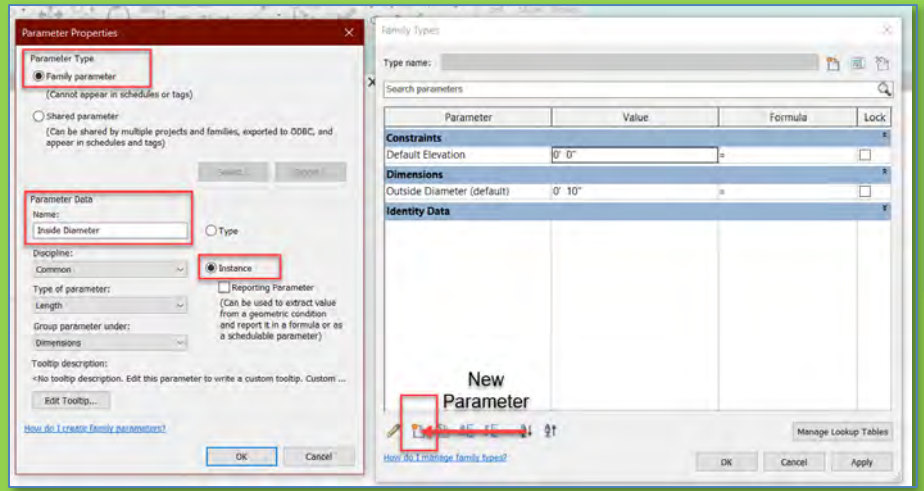
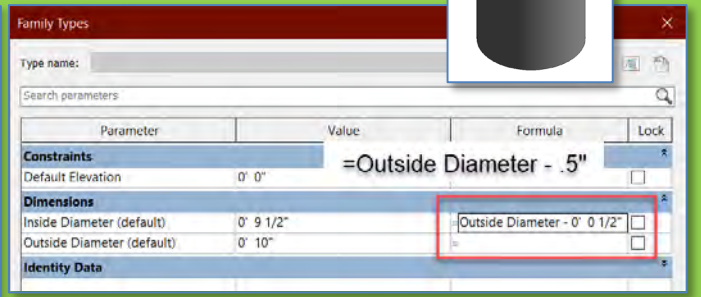
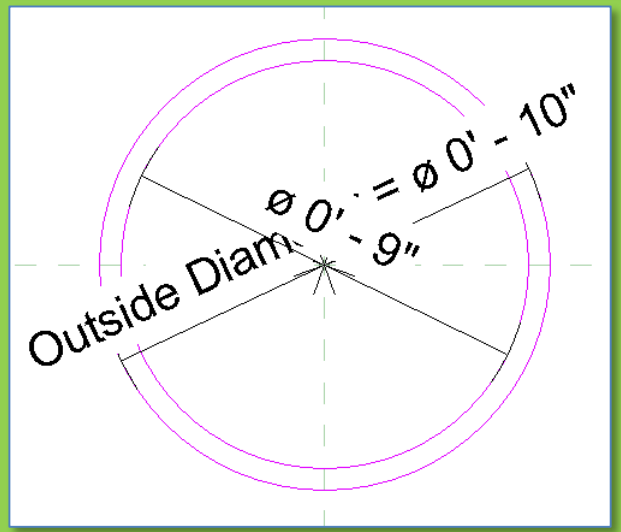
# Add Formula to Parameter

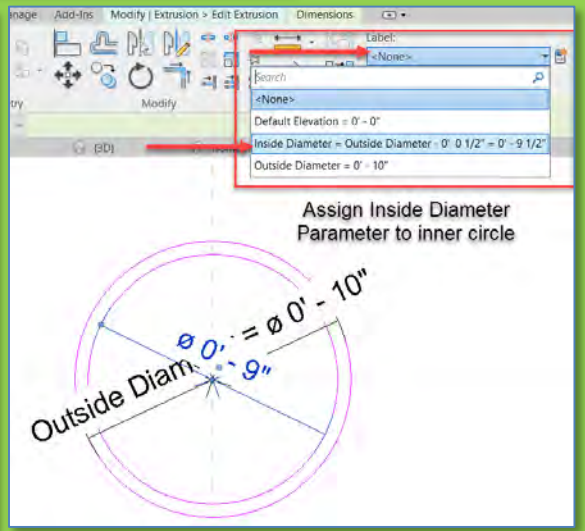





- *Inner circle is dependent on outer*
- *= Outside Diameter - .5”*
- *Annotate > Diameter (inner circle)*
- *Assign Parameter to Inner Circle Diameter*




- *Add additional reference plane and parameter to control the height*
- *Save and Load into Project file*

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# HSS Square Hollow Structural Sections

## Square Hollow Structural Sections - HSS

**Weight, cross sectional area, moments of inertia - Imperial units**

- *1 in = 25.4 mm*

| Nominal Size 3) | Weight | Wall Thickness | b/t 1) | h/t 1) | Cross Sectional Area 2) | I 1) | S 1) | r 1) | Z 1) | Torsional Stiffness Constant J | Torsional Shear Constant C | Surface Area |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *(in x in x in)* | *($lb_f$/ft)* | *(in)* | - | - | *($in^2$)* | *($in^4$)* | *($in^3$)* | *(in)* | *($in^3$)* | *($in^4$)* | *($in^3$)* | *($ft^2$/ft)* |
| 32 x 32 x 5/8 | 259.83 | 0.625 | 48.2 | 48.2 | 76.4 | 12300 | 771 | 12.7 | 890 | 19700 | 1230 | 10.34 |
| 32 x 32 x 1/2 | 210.72 | 0.500 | 61.0 | 61.0 | 61.9 | 10100 | 634 | 12.8 | 727 | 15900 | 991 | 10.45 |
| 32 x 32 x 3/8 | 159.37 | 0.375 | 82.3 | 82.3 | 46.8 | 7750 | 485 | 12.9 | 553 | 12000 | 750 | 10.51 |
| 30 x 30 x 5/8 | 242.82 | 0.625 | 45.0 | 45.0 | 71.4 | 10100 | 673 | 11.9 | 778 | 16200 | 1070 | 9.68 |
| 30 x 30 x 1/2 | 197.11 | 0.500 | 57.0 | 57.0 | 57.9 | 8320 | 555 | 12.0 | 637 | 13000 | 869 | 9.79 |
| 30 x 30 x 3/8 | 149.16 | 0.375 | 77.0 | 77.0 | 43.8 | 6370 | 424 | 12.1 | 485 | 9870 | 658 | 9.84 |

- ***For Square Column 10 x 10 x .5*** *Outside Dimension 10" x 10" Thickness 0.5"*

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 x 12 x 3/8 | 58.10 | 0.349 | 31.4 | 31.4 | 16.0 | 357 | 59.5 | 4.73 | 69.2 | 561 | 94.6 | 3.90 |
| 12 x 12 x 5/16 | 48.86 | 0.291 | 38.2 | 38.2 | 13.4 | 304 | 50.7 | 4.76 | 58.6 | 474 | 79.7 | 3.92 |
| 12 x 12 x 1/4 | 39.43 | 0.233 | 48.5 | 48.5 | 10.8 | 248 | 41.4 | 4.79 | 47.6 | 384 | 64.5 | 3.93 |
| 10 x 10 x 5/8 | 76.33 | 0.581 | 14.2 | 14.2 | 21.0 | 304 | 60.8 | 3.80 | 73.2 | 498 | 102 | 3.17 |
| 10 x 10 x 1/2 | 62.46 | 0.465 | 18.5 | 18.5 | 17.2 | 256 | 51.2 | 3.86 | 60.7 | 412 | 84.2 | 3.20 |
| 10 x 10 x 3/8 | 47.90 | 0.349 | 25.7 | 25.7 | 13.2 | 202 | 40.4 | 3.92 | 47.2 | 320 | 64.8 | 3.23 |
| 10 x 10 x 5/16 | 40.35 | 0.291 | 31.4 | 31.4 | 11.1 | 172 | 34.5 | 3.94 | 40.1 | 271 | 54.8 | 3.25 |
| 10 x 10 x 1/4 | 32.63 | 0.233 | 39.9 | 39.9 | 8.96 | 141 | 28.3 | 3.97 | 32.7 | 220 | 44.4 | 3.27 |
| 10 x 10 x 3/16 | 24.73 | 0.174 | 54.5 | 54.5 | 6.76 | 108 | 21.6 | 4.00 | 24.8 | 167 | 33.6 | 3.28 |
| 9 x 9 x 1/2 | 55.66 | 0.465 | 16.4 | 16.4 | 15.3 | 182 | 40.6 | 3.45 | 48.4 | 296 | 67.4 | 2.87 |
| 9 x 9 x 3/8 | 42.79 | 0.349 | 22.8 | 22.8 | 11.8 | 145 | 32.2 | 3.51 | 37.8 | 231 | 53.1 | 2.90 |

Source of Information: https://www.engineeringtoolbox.com/american-wide-flange-steel-beams-d_1319.html

Additional Reference for steel components: http://products.anssteel.com/category/steel?

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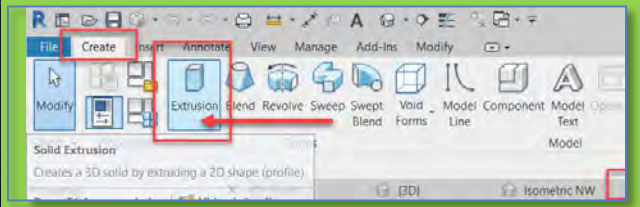
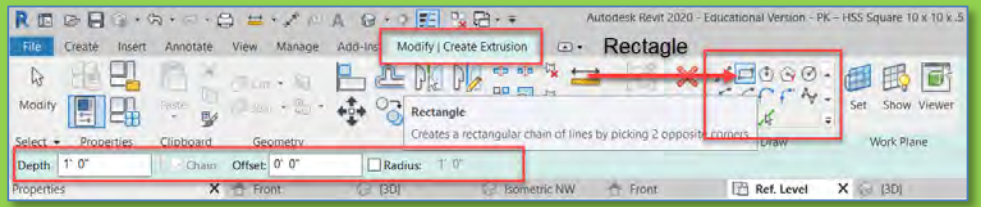
# HSS Square Hollow Structural Columns (Create)

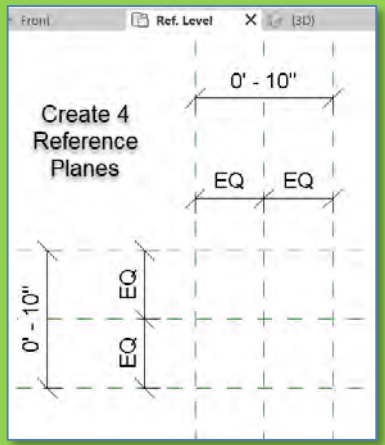
- *For Square Column 10 x 10 x .5 Outside Dimension 10" x 10" Thickness 0.5"*

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 x 10 x 5/8 | 76.33 | 0.581 | 14.2 | 14.2 | 21.0 | 304 | 60.8 | 3.80 | 73.2 | 498 | 102 | 3.17 |
| 10 x 10 x 1/2 | 62.46 | 0.465 | 18.5 | 18.5 | 17.2 | 256 | 51.2 | 3.86 | 60.7 | 412 | 84.2 | 3.20 |
| 10 x 10 x 3/8 | 47.90 | 0.349 | 25.7 | 25.7 | 13.2 | 202 | 40.4 | 3.92 | 47.2 | 320 | 64.8 | 3.23 |

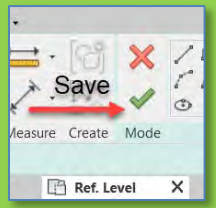
- *New > Family > Generic Model  Save_as  Initials-HSS-Square 10 x10x.5*
- *Create > Extrusion > Rectangle (10x10")  >Rectangle Offset .5"*

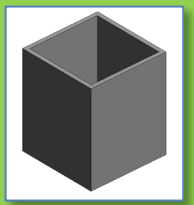


- *Draw & Lock to Reference Planes*
- *Add aligned dimension for inner rectangle*



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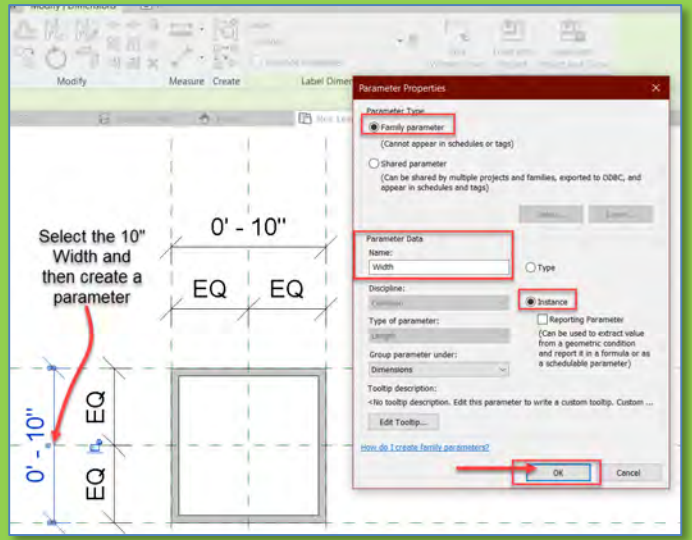
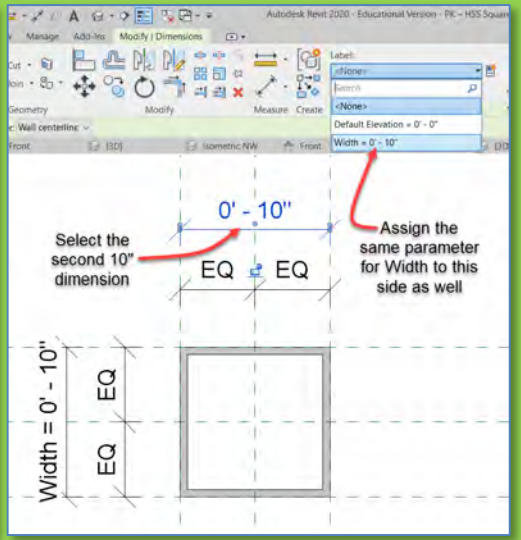
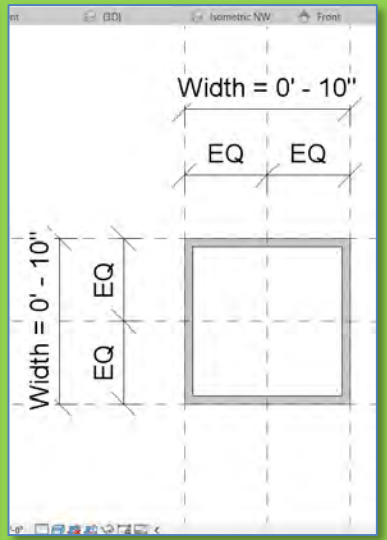
# HSS Square Hollow Structural Columns (Parameters)

- *For Square Column 10 x 10 x .5* Outside Dimension 10" x 10" Thickness 0.5"

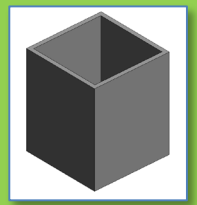
- *Select one of the 10" dimensions > Create Parameter (Width, Instance)*
- *Select the second 10" dimension > assign the same parameter*




- *Add additional reference plane and parameter to control the height*
- *Set Height to 12'*
- *Save and Load into Project file*



*Set Family Category to Structural Connections*

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# Create the W 21 x 62 Beam (use front view)

**For the Column use W 24 x 162 and for the Beam use @ 21 x 62**

| Designation | Dimensions | | | | | | Static Parameters | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Moment of Inertia | | Elastic Section Modulus | |
| Imperial (in x lb/ft) | Depth h (in) | Width w (in) | Web Thickness $t_w$ (in) | Flange Thickness $t_f$ (in) | Sectional Area ($in^2$) | Weight (lb/ft) | $I_x$ ($in^4$) | $I_y$ ($in^4$) | $W_x$ ($in^3$) | $W_y$ ($in^3$) |
| W 27 x 178 | 27.8 | 14.09 | 0.725 | 1.190 | 52.3 | 178 | 6990 | 555 | 502 | 78.8 |

- ***For Column W 24 x 162*** *Depth = 25" Width = 13" Web = 0.4" Flange = 1.22"*

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| W 27 x 84 | 26.7 | 9.96 | 0.460 | 0.640 | 24.8 | 84 | 2850 | 106 | 213 | 21.2 |
| W 24 x 162 | 25 | 13 | 0.705 | 1.220 | 47.7 | 162 | 5170 | 443 | 414 | 68.4 |
| W 24 x 146 | 24.7 | 12.9 | 0.650 | 1.090 | 43.0 | 146 | 4580 | 391 | 371 | 60.5 |
| W 24 x 131 | 24.5 | 12.9 | 0.605 | 0.960 | 38.5 | 131 | 4020 | 340 | 329 | 53.0 |
| W 24 x 117 | 24.3 | 12.8 | 0.55 | 0.850 | 34.4 | 117 | 3540 | 297 | 291 | 46.5 |
| W 24 x 104 | 24.1 | 12.75 | 0.500 | 0.750 | 30.6 | 104 | 3100 | 259 | 258 | 40.7 |

- ***For Beam W 21 x 62*** *Depth = 21" Width = 8.24" Web = 0.4" Flange = .615"*

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| W 21 x 68 | 21.1 | 8.27 | 0.430 | 0.685 | 20.0 | 68 | 1480 | 64.7 | 140 | 15.7 |
| W 21 x 62 | 21 | 8.24 | 0.400 | 0.615 | 18.3 | 62 | 1330 | 57.5 | 127 | 13.9 |
| W 21 x 57 | 21.1 | 6.56 | 0.405 | 0.650 | 16.7 | 57 | 1170 | 30.6 | 111 | 9.4 |
| W 21 x 50 | 20.8 | 6.53 | 0.380 | 0.535 | 14.7 | 50 | 984 | 24.9 | 94.5 | 7.6 |
| W 21 x 44 | 20.7 | 6.5 | 0.350 | 0.450 | 13.0 | 44 | 843 | 20.7 | 81.6 | 6.4 |

Source of Information: https://www.engineeringtoolbox.com/american-wide-flange-steel-beams-d_1319.html

Additional Reference for steel components: http://products.anssteel.com/category/steel?

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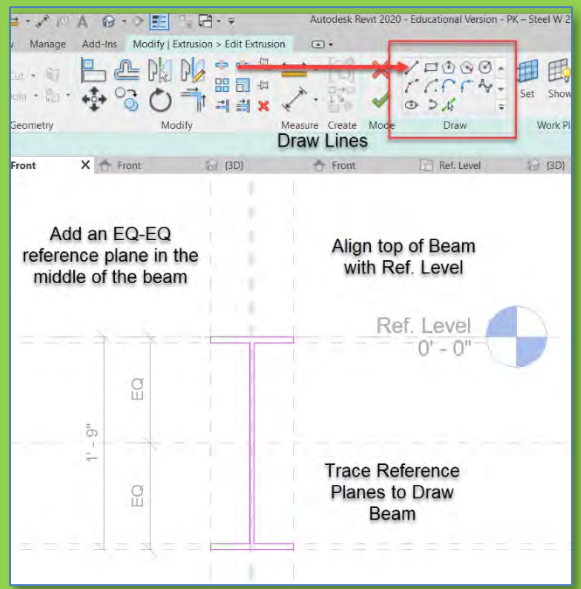
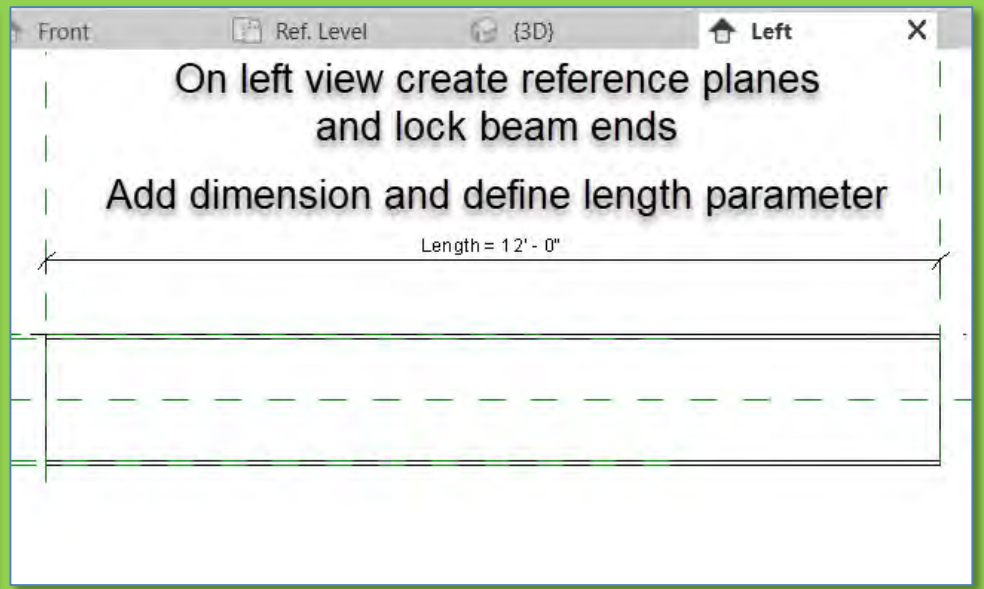
# Create the Beams (use front view)

- *For Beam W 21 x 62* Depth = 21" Width = 8.24" Web = 0.4" Flange = .615"

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| W 21 x 68 | 21.1 | 8.27 | 0.430 | 0.685 | 20.0 | 68 | 1480 | 64.7 | 140 | 15.7 |
| W 21 x 62 | 21 | 8.24 | 0.400 | 0.615 | 18.3 | 62 | 1330 | 57.5 | 127 | 13.9 |
| W 21 x 57 | 21.1 | 6.56 | 0.405 | 0.650 | 16.7 | 57 | 1170 | 30.6 | 111 | 9.4 |
| W 21 x 50 | 20.8 | 6.53 | 0.380 | 0.535 | 14.7 | 50 | 984 | 24.9 | 94.5 | 7.6 |
| W 21 x 44 | 20.7 | 6.5 | 0.350 | 0.450 | 13.0 | 44 | 843 | 20.7 | 81.6 | 6.4 |

- *New > Family > Generic Model* *Save_as Initials-Steel Beam W 21x62*
- *Draw from front view – align top of beam with ref. level*
- *Add Reference Plans same as for W 24 x 162 column – add extra plane at center of beam*
- *Create > Extrusion > Lines*
- *Add reference planes, add dimension and define parameter for length*
- *Save and Load into Project File*



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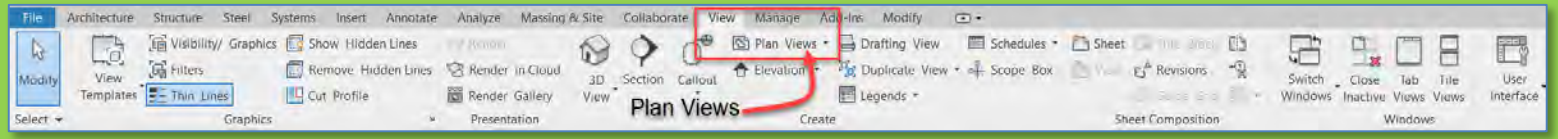
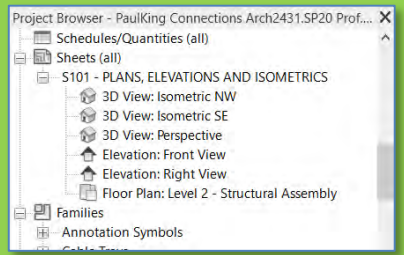
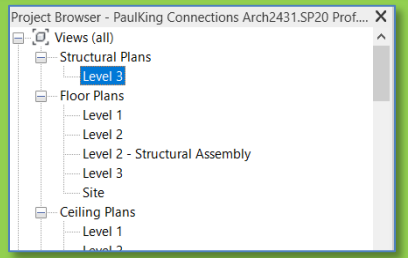
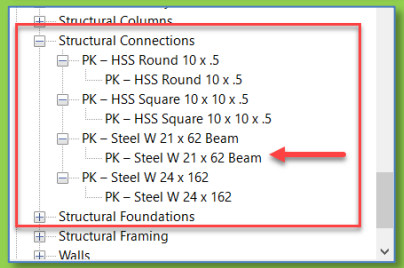
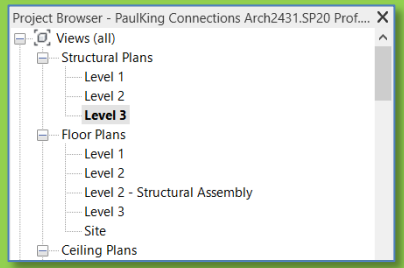
# To Place the Beams add Structural Plan Views

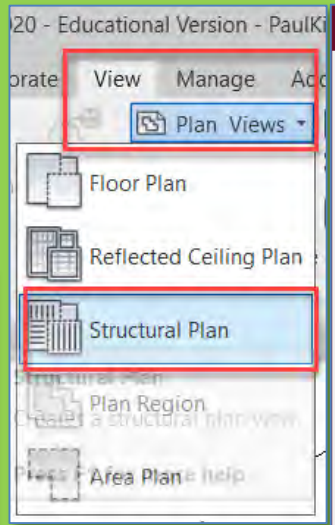


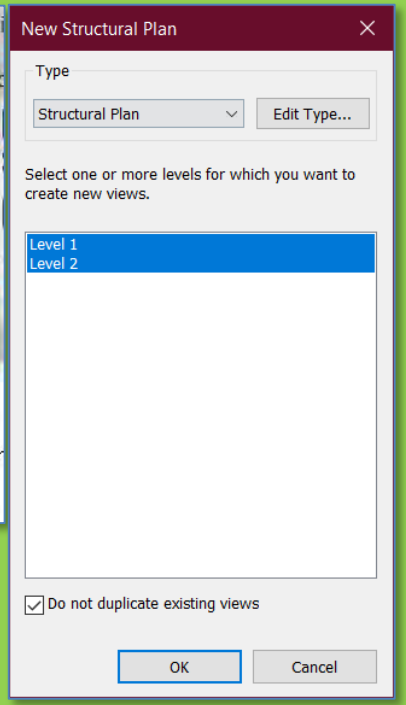




- *Review the project browser*
- *The families we created are located under "structural connections"*
- *A structural plan only exists for Level 3, the new level we added to the project file*

- *Add the missing structural views as follows:*
- ***View Ribbon > Plan Views > Structural Plan***
- *Select Level 1 & Level 2 > OK*
- *The new structural levels will show in the project browser*
- *Make Level 3 Structural the current view*

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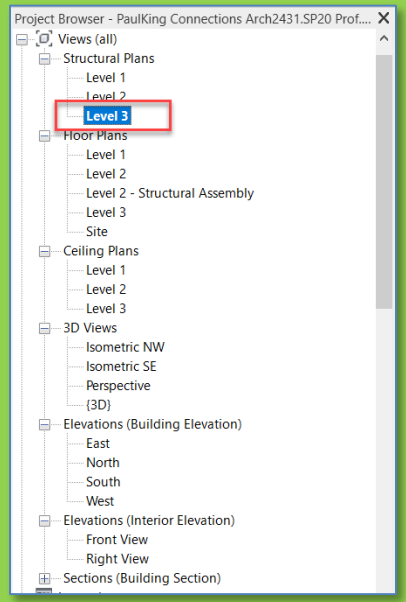
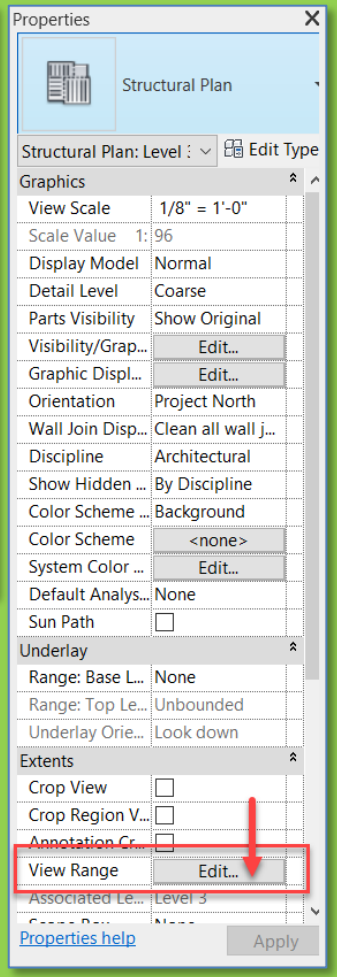
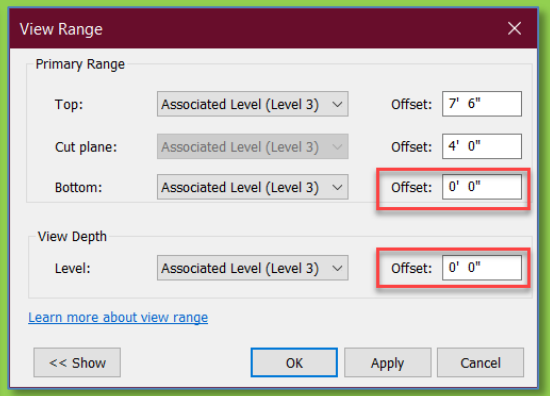
# Compare Floor Plans vs Structural Plans

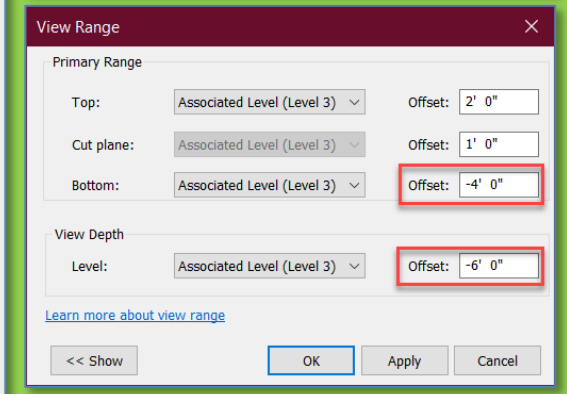



- *From the project browser compare the "view range" properties of a plan view vs a structural view*




- *View Range Floor Plan*
- *Bottom and View Depth Offsets are 0*




- *View Range Structural Plan*
- *Bottom Offset -4'0"*
- *View Depth Offset -6'-0"*

- *We will work from the structural views – as they allow us to see below the selected level. Remember beams are below the floor.*

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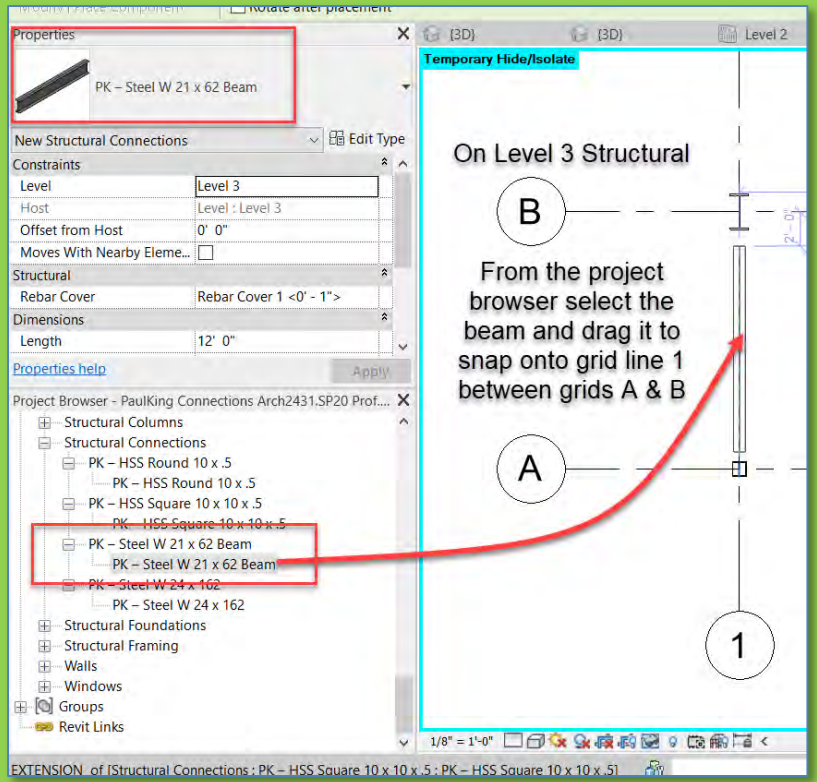
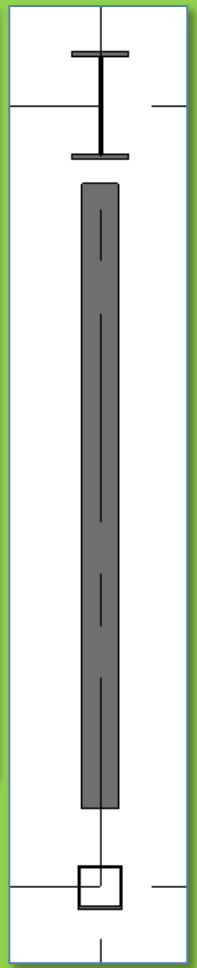
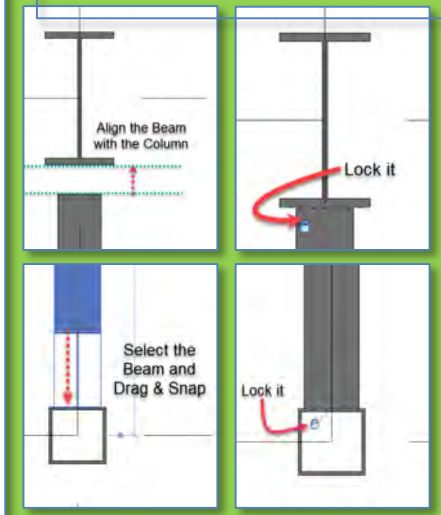
# Add the Beams to Level 3 – Grid Line 1 (A to B)



- *Align and snap the end of the beam to the column at Grid B*




- *From the project browser select the beam and drag it to snap onto <u>Grid line 1 between Grids A & B</u>*

- *Select and drag the other end and snap to the column at Grid A*

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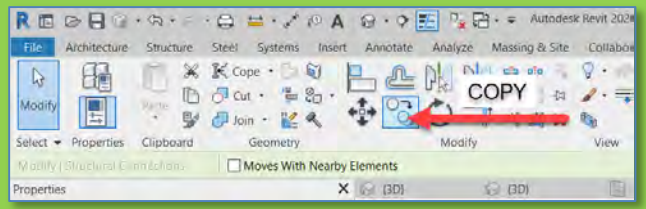
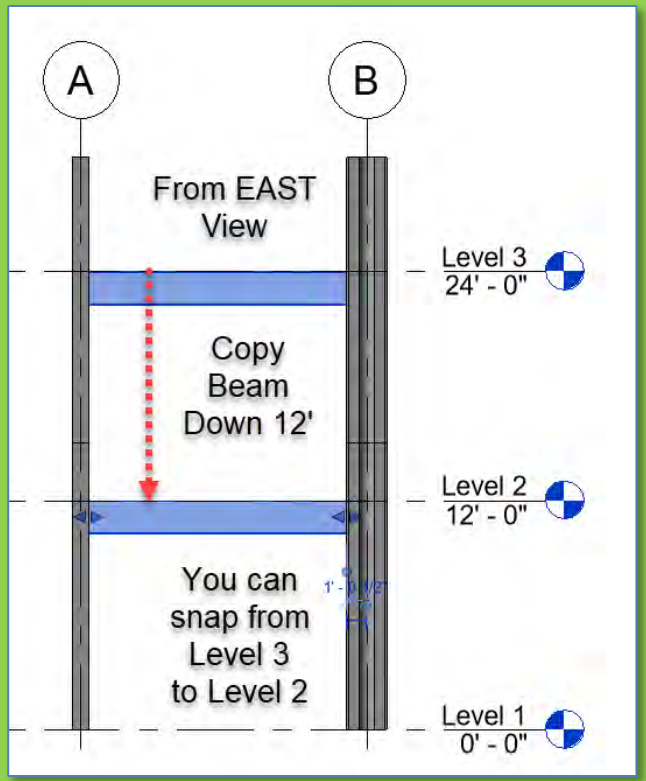
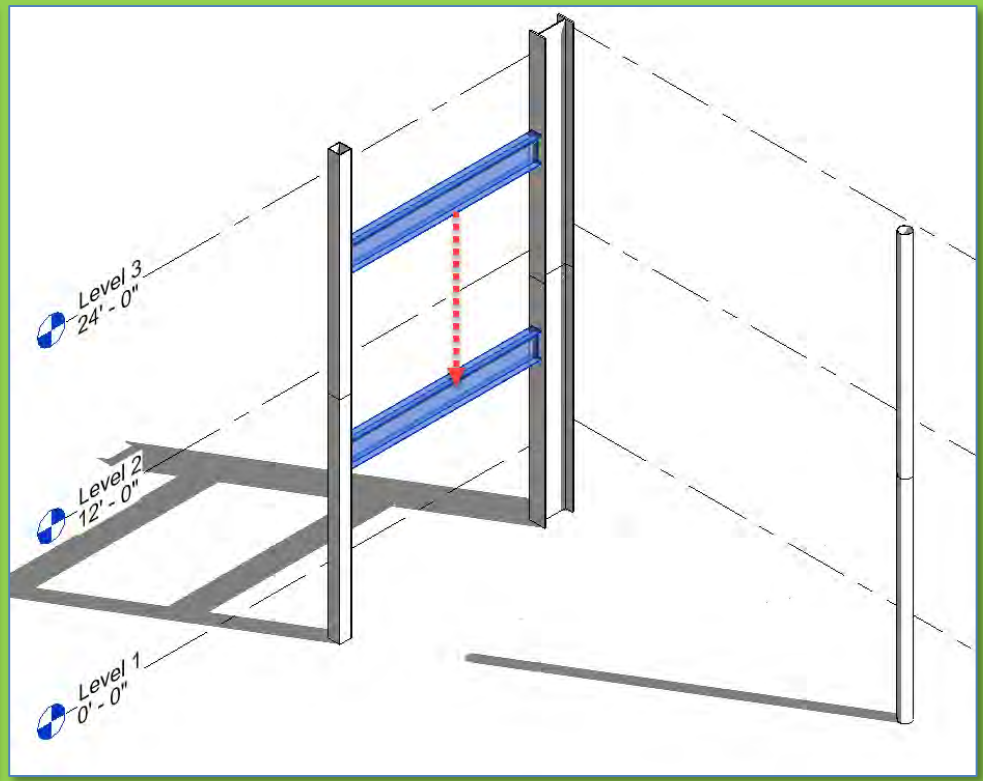
# Add the Beams to Level 3




- *Set **EAST** as the current View*
- *Select the **Beam on Level 3***
- *__Copy__ it down to **Level 2***



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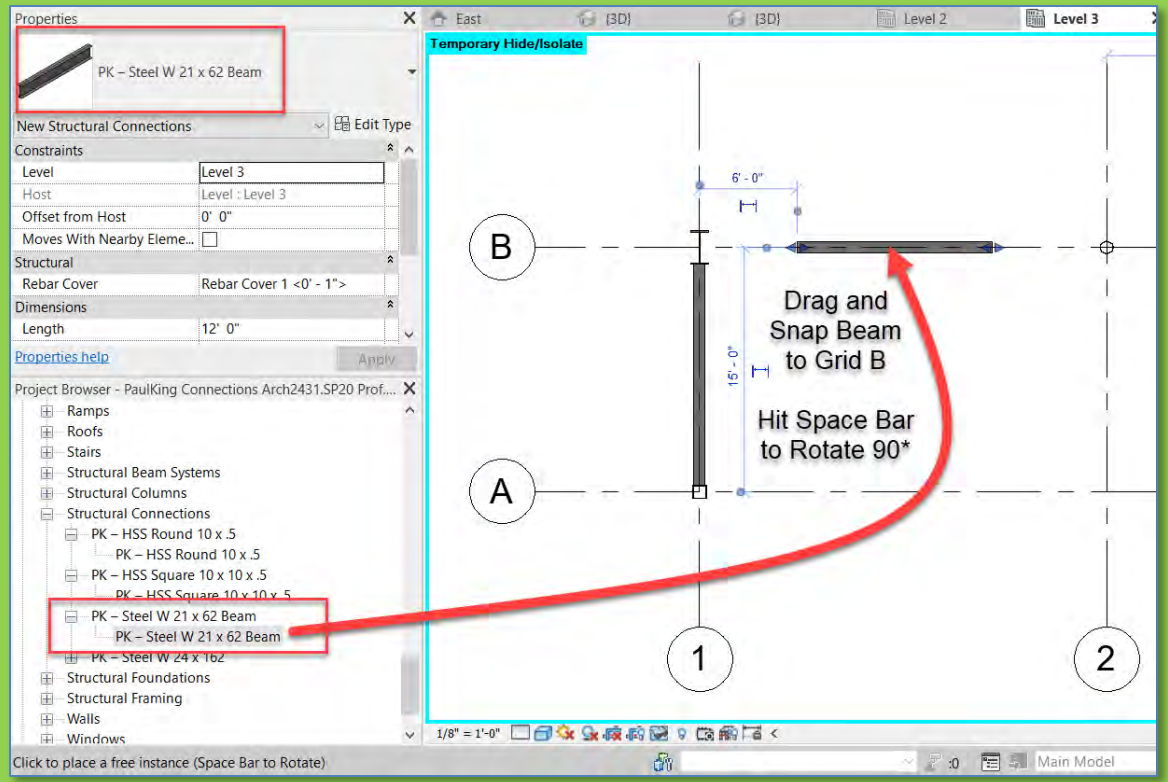
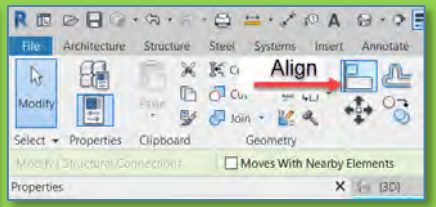
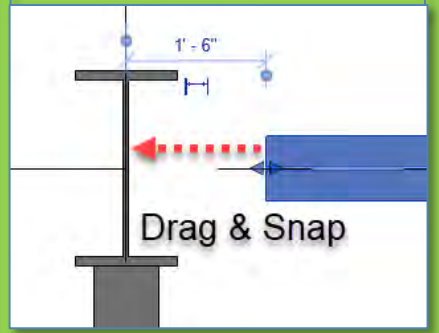
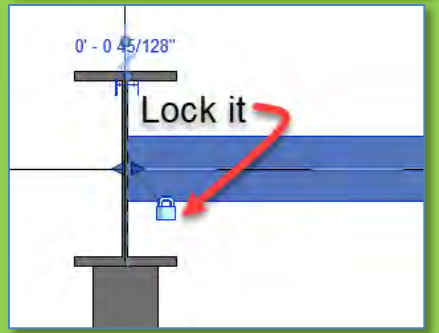
# Add the Beams to Level 3 – Grid Line B (1 to 2)




- *Align and Snap the end of the beam to the column at Grid 1*




- *We will not be able to snap to the round column without first modifying the column family to include reference planes for snapping*

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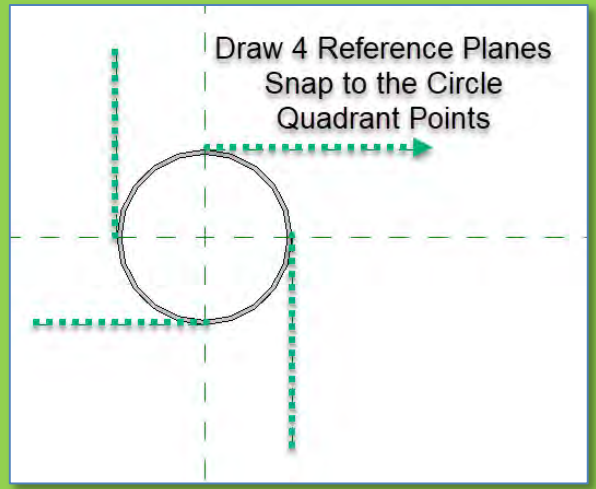
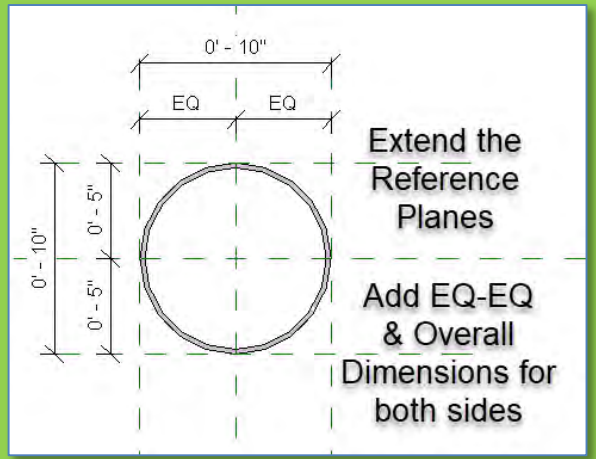
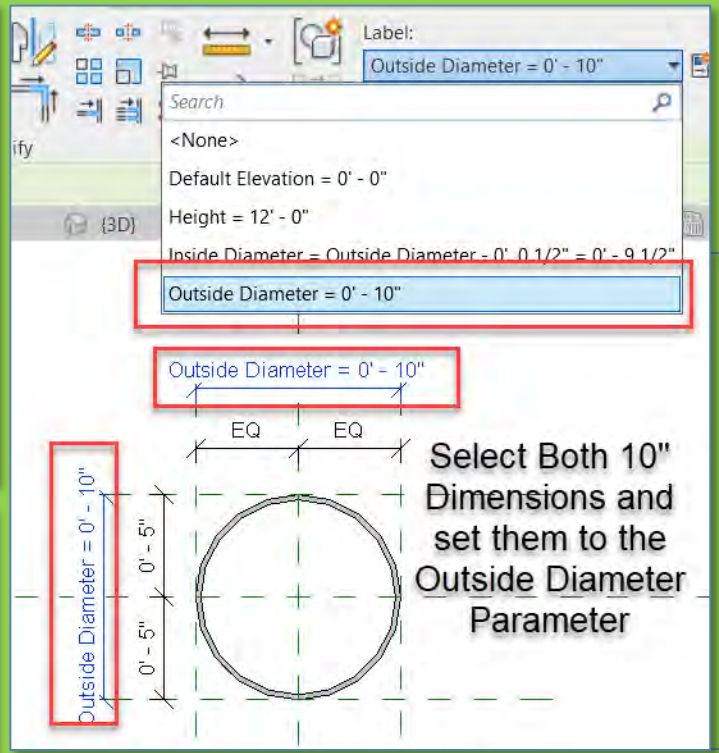
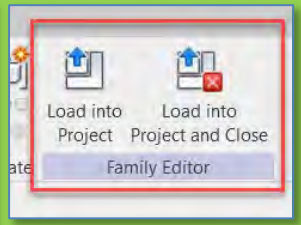
# Edit the Column Family (PK – HSS Round 10 x .5)




*The single parameter **Outside Diameter** will control the **column size** & the **distance between the reference planes** and by formula the **inside diameter.***

- *Draw **4 Reference Planes** snapping to quadrant points*
- ***Extend** the reference planes and **add dimensions***
- *Assign the **Outside Diameter Parameter** to the two overall dimensions*
- ***Load into Project***

→ Overwrite the existing version and its parameter values

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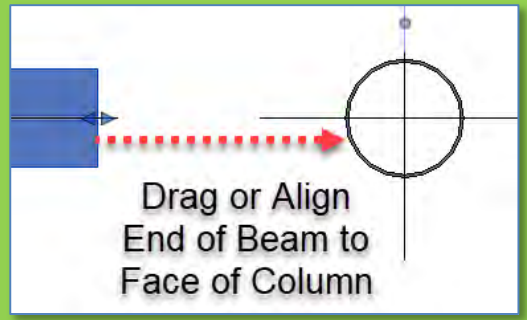
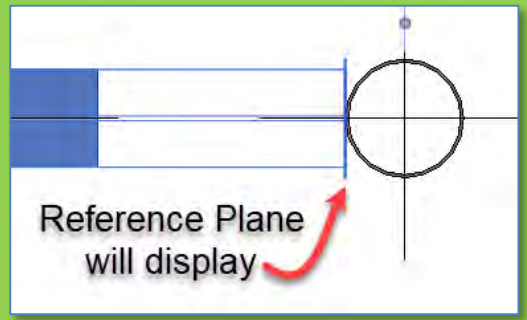
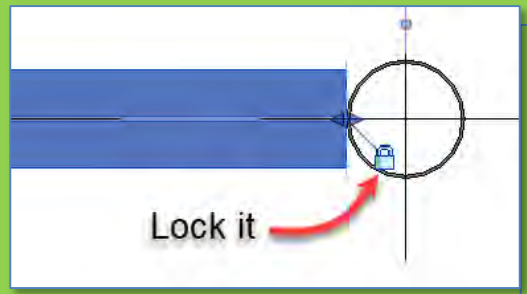
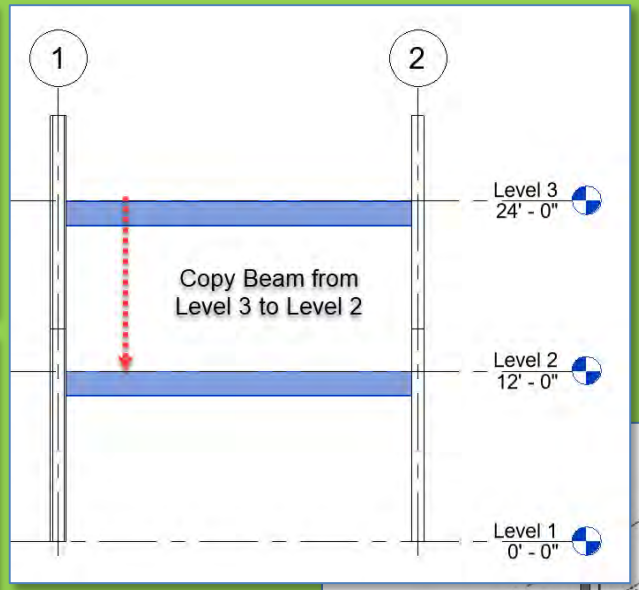
# Align the end of the Beam to the Column

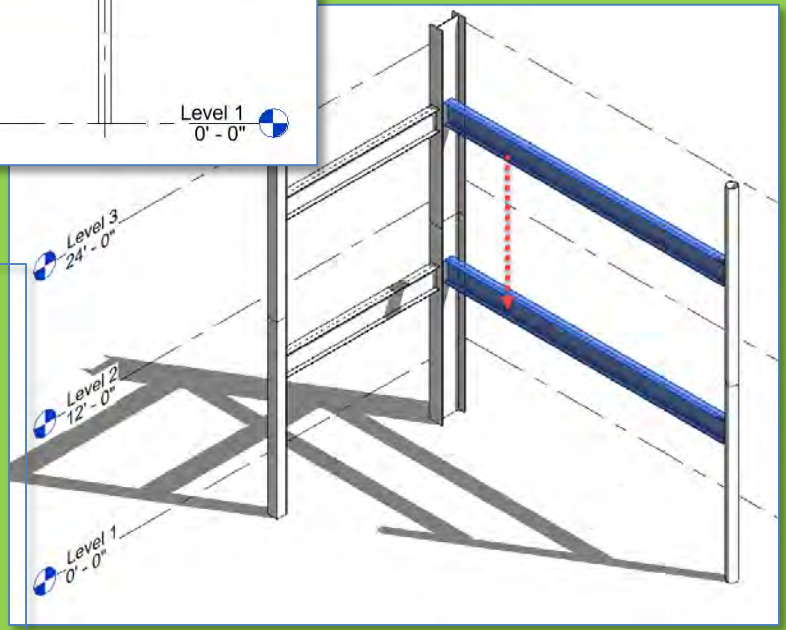



- *Copy the Beam from Level 3 down to Level 2*




- *Drag or Align the end of Beam to Face of Column*
- ***Lock it***

Prof. Paul C. King
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Day 04
Connections Intro

- Assignment Description
- New Project File
  - Levels
  - Grids
  - Dimensions
- New 3D Family
- W24 x 162 Column
  - Reference Planes
  - Parameters
  - Extrusion
  - Height Parameter
  - Family Category
- Load into Project
- New 3D Families
  - HSS Pipe Column
  - Formula Parameter
  - HSS Square Column
  - W 21 x 162 Beam
  - Place Beam
  - Snap, Align & Copy
  - Modify Round Column Family
- Project File Sheet

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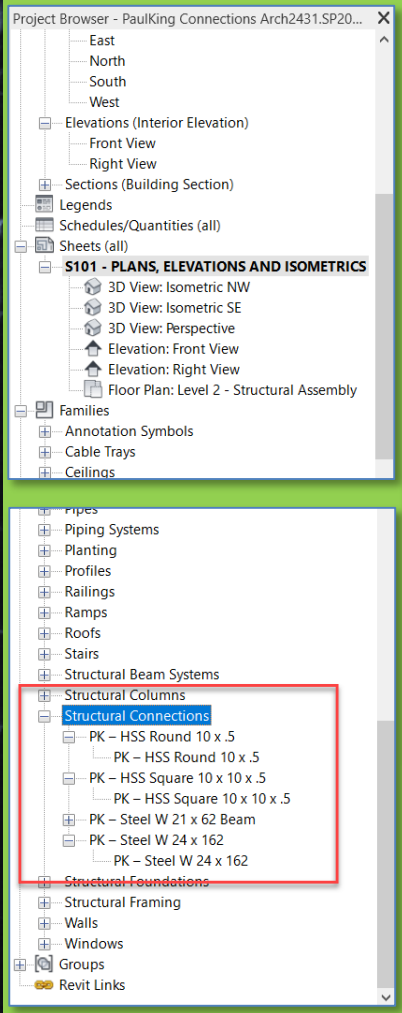
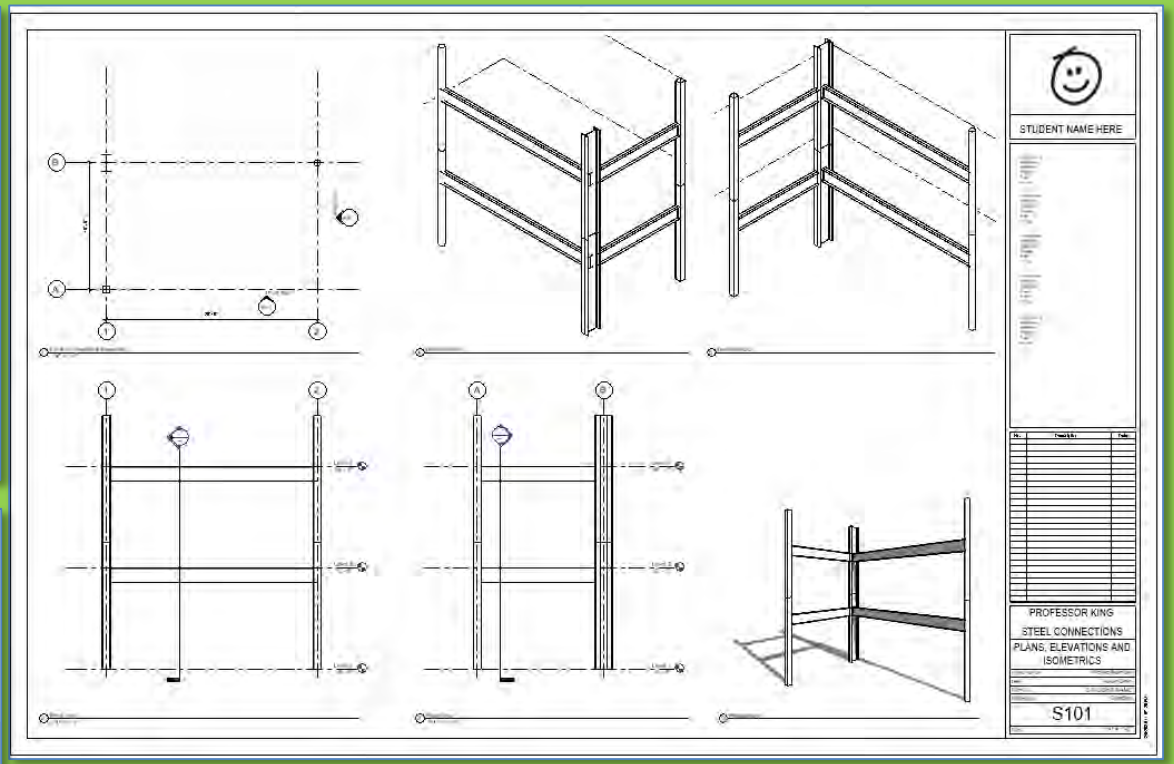
# Sheet layout 22 x 34




- *Plan View*
- *Front Elevation*
- *Side Elevation*
- *SE Isometric*
- *NW Isometric*
- *Perspective*

# ARCH 2431. Building Technology III

## Building Information Modeling with Revit
## Day 04

*Introduction to Steel Connections Assignment*
*Columns & Beams*

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