

# ARCH 2431. Building Technology III

## Building Information Modeling with Revit

### *Steel Connections* *#6 Diagonal Bracing*

 AUTODESK® REVIT®  
DESIGN • CONNECT • OPTIMIZE

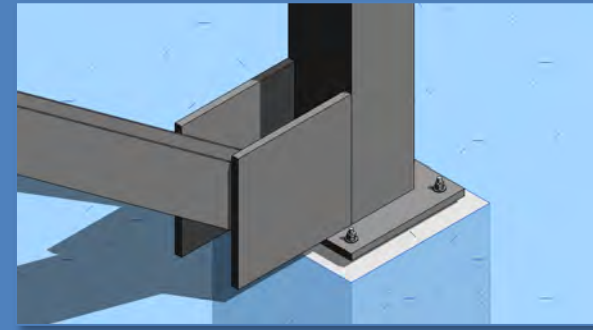


Professor Paul C. King, RA, AIA, ARA

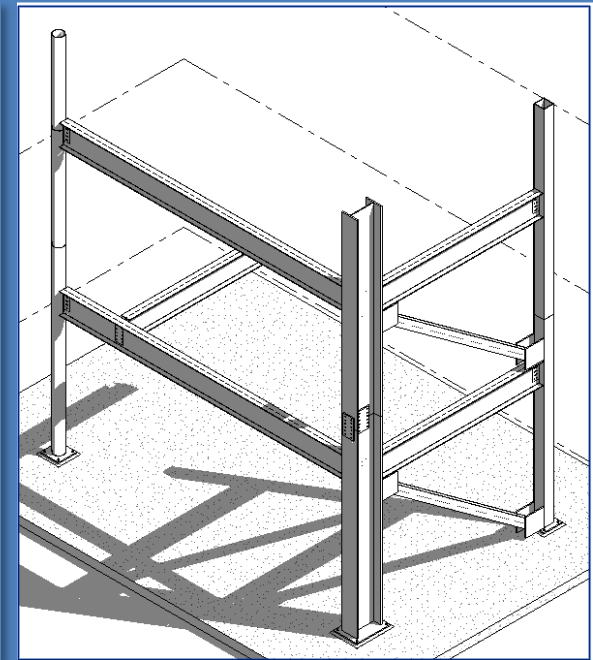
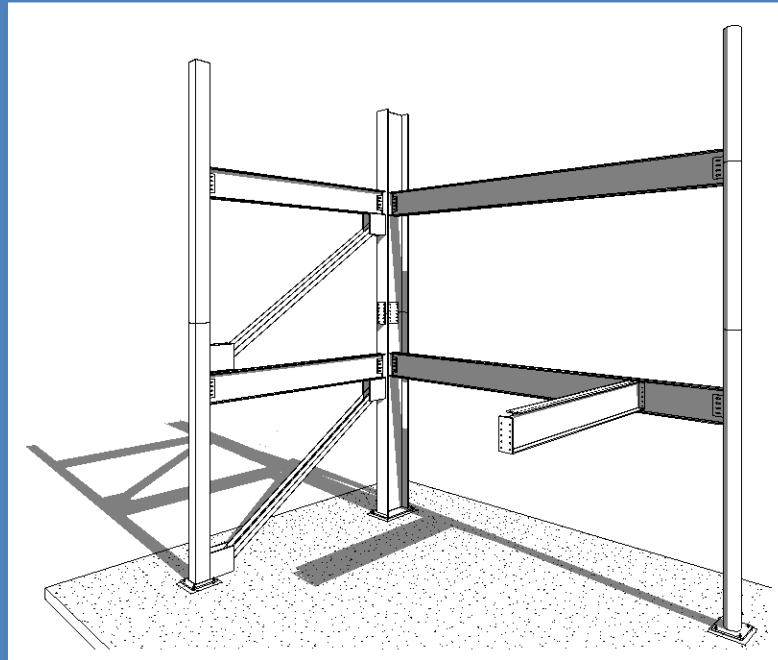
[Prof.Paul.King@Gmail.com](mailto:Prof.Paul.King@Gmail.com)

[Pking@CityTech.Cuny.Edu](mailto:Pking@CityTech.Cuny.Edu)

- **Diagonal Bracing Connections**
- New Family
- Structural Framing – Beams & Braces
- W18 x 59
- Rotate 90
- Reference Planes & Parameters
- Load into Project
- Place & Align
- Rotate
- New Family
- Bracing Endplate
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- Copy
- Isometric View
- Sheet Views



# Diagonal Bracing Connections



# Diagonal Bracing Connections

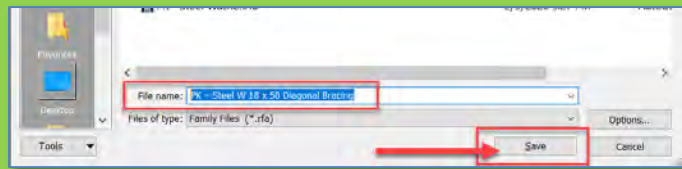
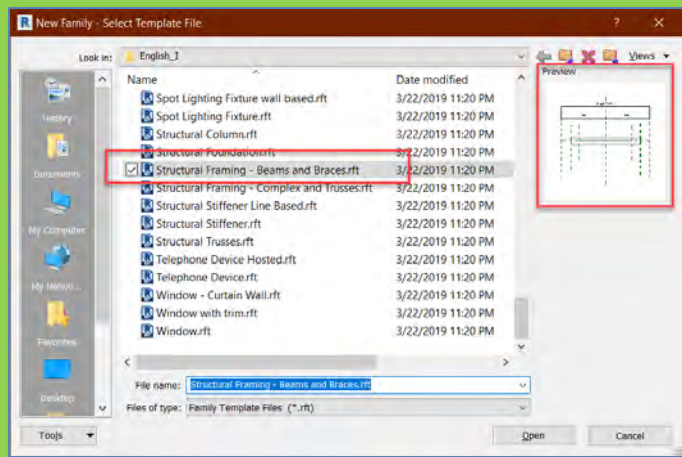
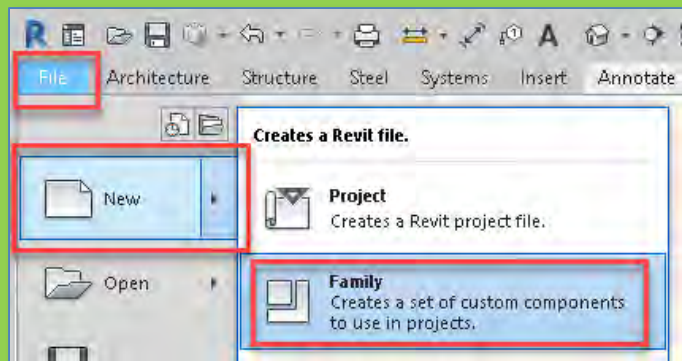
Diagonal bracing and solid concrete shear walls add lateral stability to buildings. Building made of concrete typically use only concrete shear walls. Steel frame buildings may either make use of concrete shear walls or diagonal bracing connected to the steel beam and column structure.



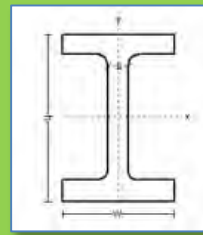
<https://skyciv.com/technical/bolts-vs-welds-vs-rivets-for-steel-connections/>

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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
  - **Structural Framing – Beams & Braces**
- Save and Name the File
- Select an appropriate directory
- Name the file as follows:
  - Initials- Description
  - *PK – Steel W 18 x 50 Diagonal Bracing*

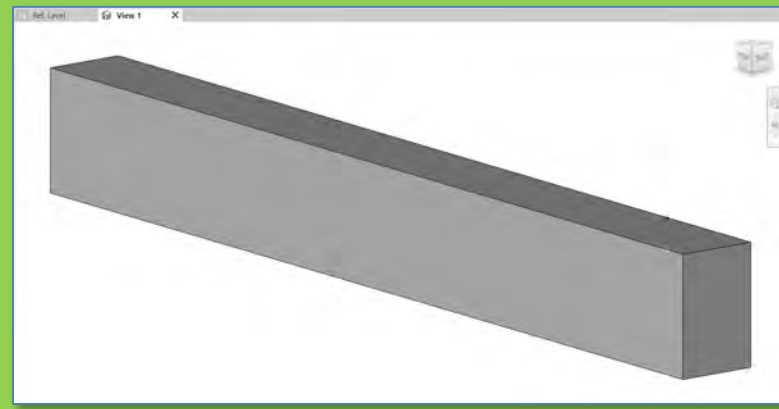
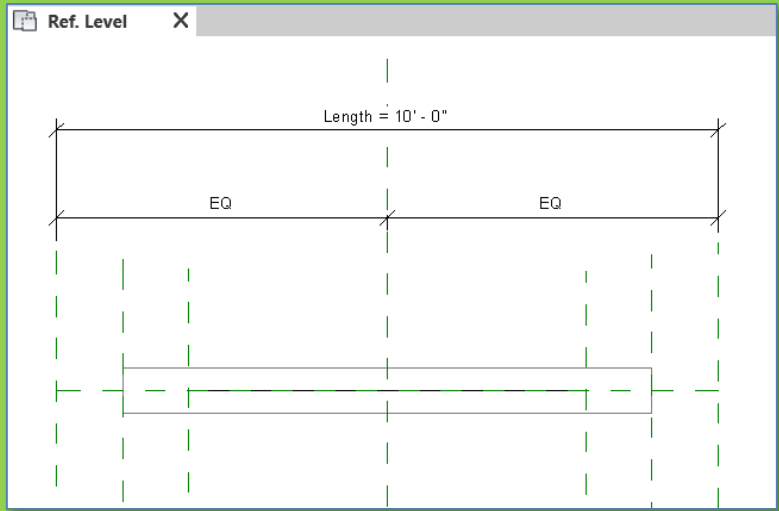


Designation	Dimensions									
	Imperial (in x lb/ft)	Depth h (in)	Width w (in)	Web Thickness t <sub>w</sub> (in)	Flange Thickness t <sub>f</sub> (in)	Sectional Area (in <sup>2</sup> )	Weight (lb/ft)			
W 18 x 60	18.2	7.56	0.415	0.695	17.6	60	984	50.1	108	13.3
W 10 x 55	10.1	7.53	0.390	0.630	10.2	55	690	44.9	90.3	11.9
W 18 x 50	18	7.5	0.355	0.570	14.7	50	800	40.1	88.9	10.7
W 10 x 46	10.1	6.00	0.360	0.505	13.5	46	712	22.6	70.8	7.4

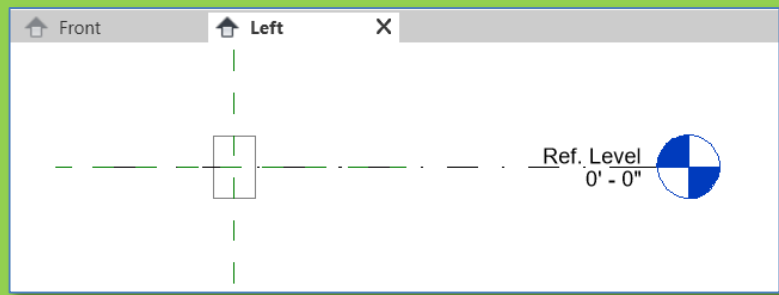


# Structural Framing Beams & Bracing Family

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**W 18 x 50 for diagonal bracing**  
beam will be rotated 90 degrees on axis



# W18 x 50 Beam for Diagonal Bracing

- Diagonal Bracing Connections
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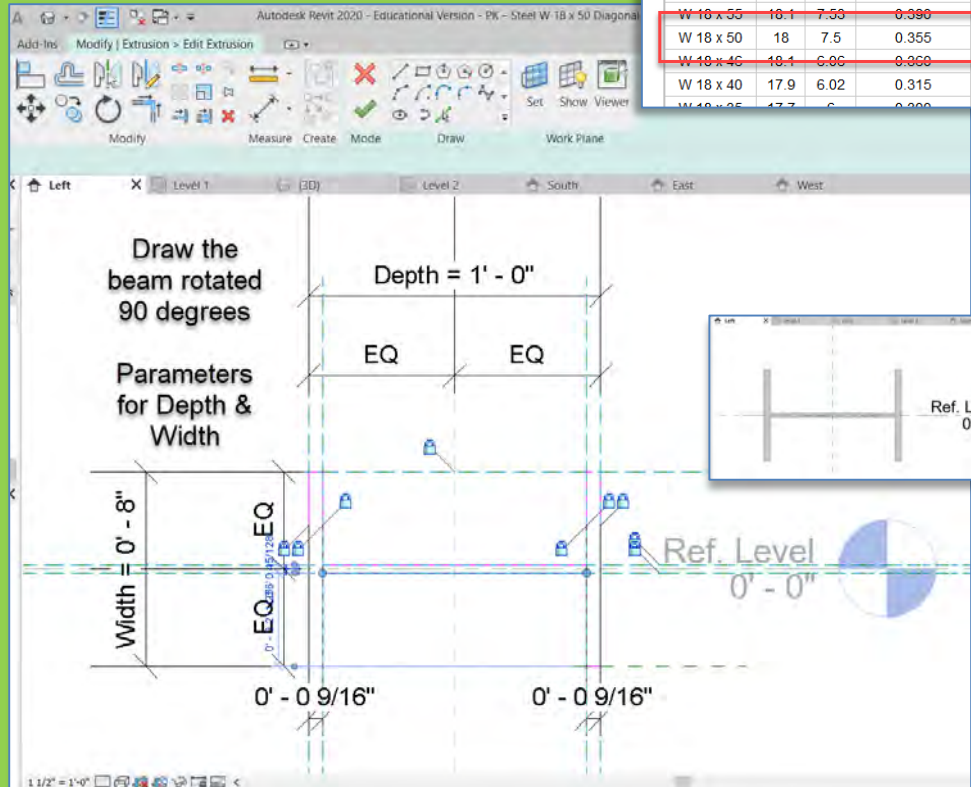
Use W 18 x 50 for diagonal bracing beam will be rotated 90 degrees on axis

Depth = 8"  
Web .355"

Width=7.5"  
Flange = 0.570"

Designation Imperial (in x lb/ft)	Depth h (in)	Width W (in)	Web Thickness t <sub>w</sub> (in)	Flange Thickness t <sub>f</sub> (in)	Sectional Area (in <sup>2</sup> )	Weight (lb/ft)	Static Parameters			
							Moment of Inertia I <sub>x</sub> (in <sup>4</sup> )	I <sub>y</sub> (in <sup>4</sup> )	Elastic Section Modulus S <sub>x</sub> (in <sup>3</sup> )	S <sub>y</sub> (in <sup>3</sup> )
W 27 x 178	27.8	14.09	0.725	1.190	52.3	178	6990	555	502	78.8
W 27 x 161	27.6	14.02	0.660	1.080	47.4	161	6280	497	455	70.9

W 18 x 65	18.4	7.59	0.450	0.750	19.1	65	1070	54.8	117	14.4
W 18 x 60	18.2	7.56	0.415	0.695	17.6	60	984	50.1	108	13.3
W 18 x 55	18.1	7.53	0.390	0.630	16.2	55	890	44.9	96.3	11.9
W 18 x 50	18	7.5	0.355	0.570	14.7	50	800	40.1	88.9	10.7
W 18 x 46	18.1	6.06	0.360	0.605	13.5	46	742	22.5	78.8	7.4
W 18 x 40	17.9	6.02	0.315	0.525	11.8	40	612	19.1	68.4	6.4



To make it easier to work set the Depth to 1'-0" and the Width to 8"

Create the beam rotated 90 degrees

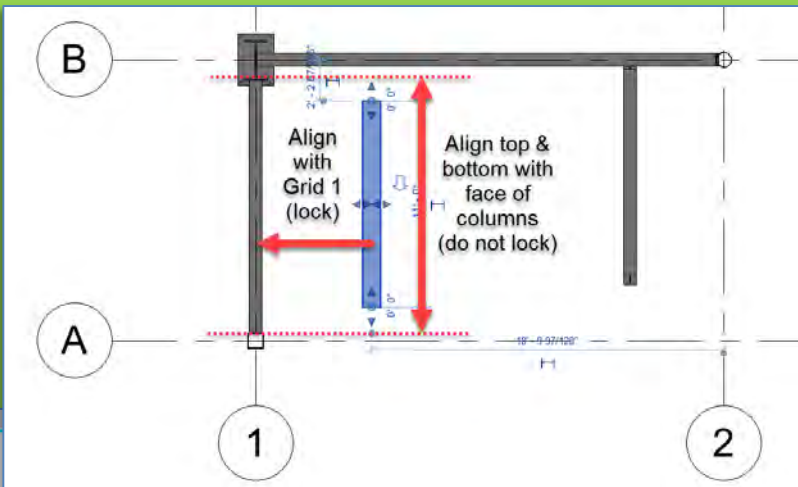
Add parameters for Depth and Width while editing the extrusion

Adjust the width to 8"

# Place & Align diagonal bracing (Structure Level 2)

- Diagonal Bracing Connections
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- Sheet Views

- Level 2 Structure View
- Drag Diagonal Brace into view
- Space bar to rotate and place



Align top & bottom to face of columns (do not lock)

Align with Grid 1



# Rotate the Beam from South View

Start Level – 10'6" End Level – 4'0"

- Diagonal Bracing Connections
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Properties

PK – Steel W 18 x 50 Diagonal Bracing

Structural Framing (Other) (1) Edit Type

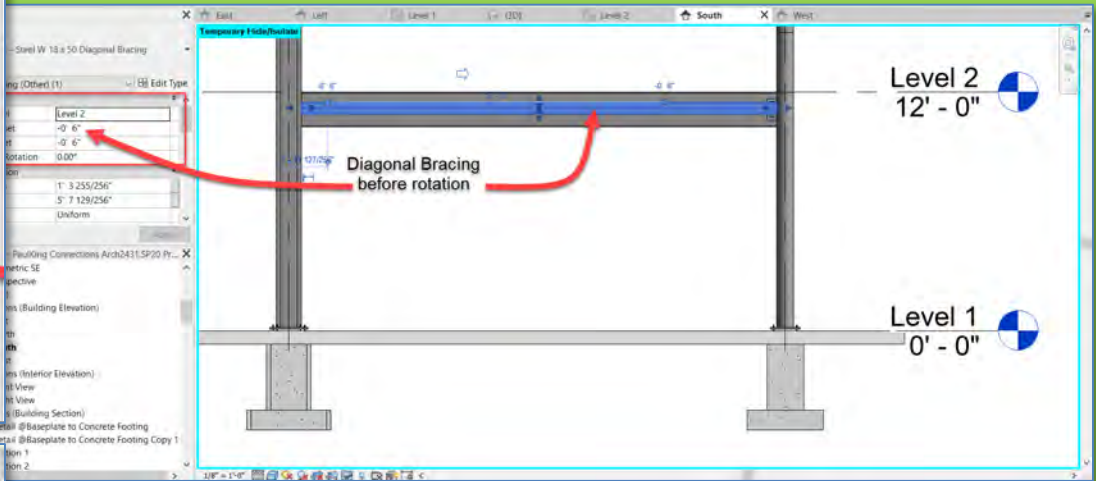
Constraints

Reference Level	Level 2
Start Level Offset	-0' 6"
End Level Offset	-0' 6"
Cross-Section Rotation	0.00°

Geometric Position

Start Extension	1' 3 255/256"
End Extension	5' 7 129/256"
yz Justification	Uniform

Apply



Properties

PK – Steel W 18 x 50 Diagonal Bracing

Structural Framing (Other) (1) Edit Type

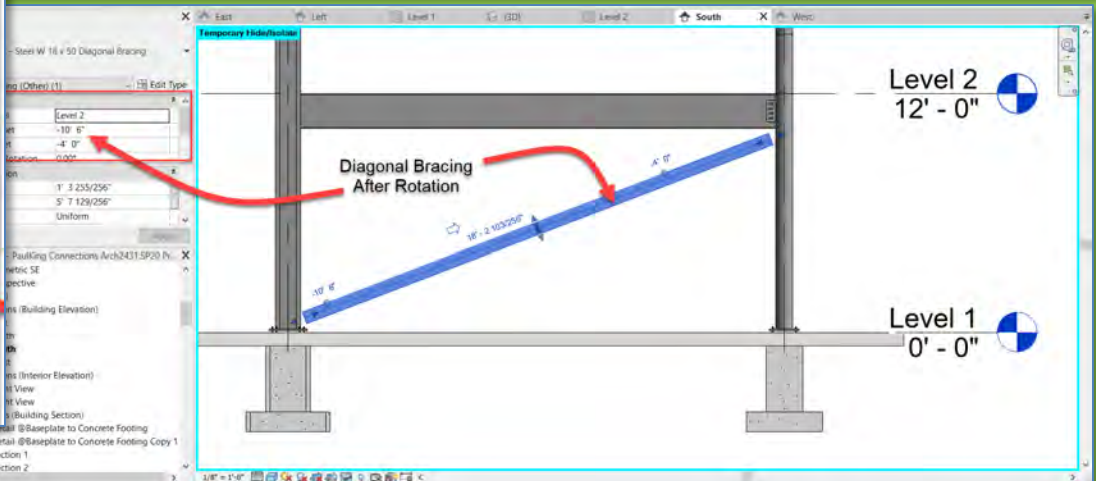
Constraints

Reference Level	Level 2
Start Level Offset	-10' 6"
End Level Offset	-4' 0"
Cross-Section Rotation	0.00°

Geometric Position

Start Extension	1' 3 255/256"
End Extension	5' 7 129/256"
yz Justification	Uniform

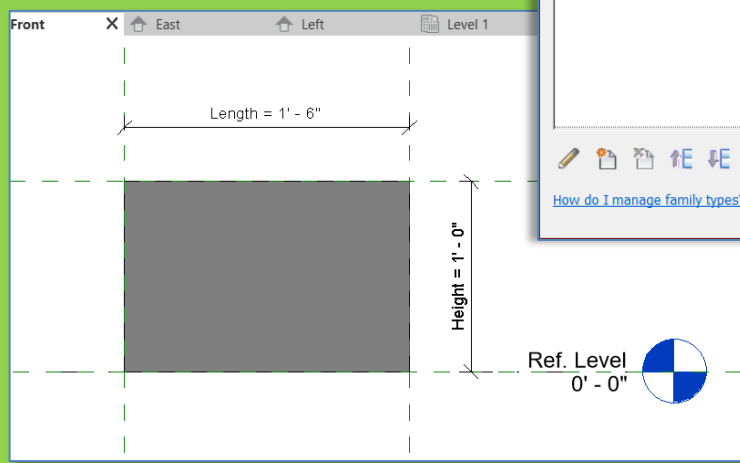
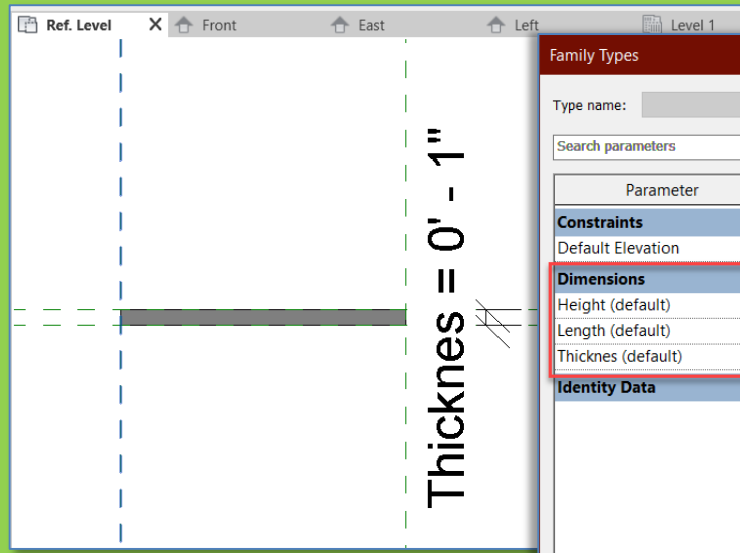
Apply





# Create New Family for Diagonal Bracing Endplate

- Diagonal Bracing Connections
- New Family
- Structural Framing – Beams & Braces
- W18 x 59
- Rotate 90
- Reference Planes & Parameters
- Load into Project
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Family Types

Type name: \_\_\_\_\_

Search parameters

Parameter	Value	Formula	Lock
<b>Constraints</b>			
Default Elevation	0' 0"	=	<input type="checkbox"/>
<b>Dimensions</b>			
Height (default)	1' 0"	=	<input type="checkbox"/>
Length (default)	1' 6"	=	<input type="checkbox"/>
Thickness (default)	0' 1"	=	<input type="checkbox"/>
<b>Identity Data</b>			

How do I manage family types?

OK Cancel

Parameters for:  
Height = 1'0  
Length = 1'6  
Thickness = 1"

Family Category and Parameters

Family Category

Filter list: <show all>

- Plumbing Fixtures
- Railings
- Security Devices
- Site
- Specialty Equipment
- Sprinklers
- Structural Columns
- Structural Connections**
- Structural Foundations
- Structural Framing
- Structural Stiffeners
- Telephone Devices
- Windows

Family Parameters

Parameter	Value
Work Plane-Based	<input type="checkbox"/>
Enable cutting in views	<input checked="" type="checkbox"/>
Always vertical	<input checked="" type="checkbox"/>
Cut with Voids When L	<input type="checkbox"/>
Material for Model Re	Other

OK Cancel

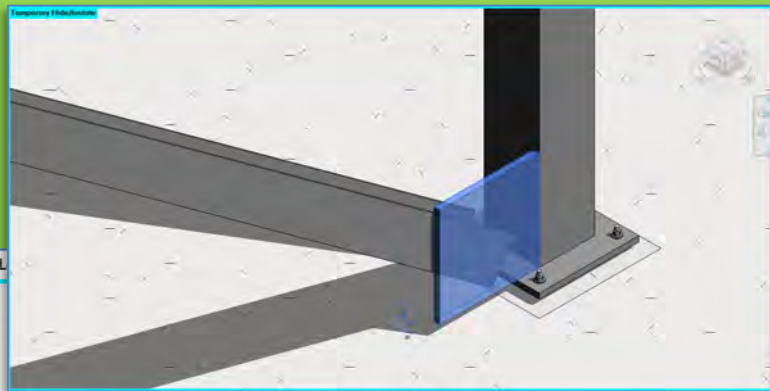
Family Category  
Structural Connections

# Create New Family for Diagonal Bracing Endplate

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Level 1 Structure View

Drag Family close to column



Properties

PK – Steel Diagonal Bracing EndPlate

Structural Connections (1)

Constraints

Default Elevation 0' 0"

Identity Data

Type Image

Keynote

Model

Manufacturer

Type Comments

URL

Properties help

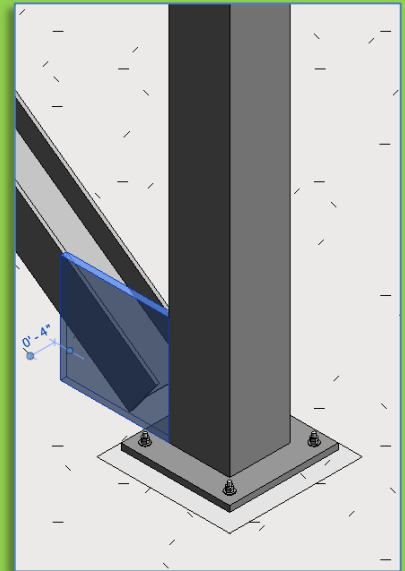
Apply

Project Browser - PaulKing Connections Arch2431.SP20 Pr...

- PK – Steel Baseplate Adjustable
  - PK – Steel Baseplate Adjustable
- PK – Steel Diagonal Bracing EndPlate
  - PK – Steel Diagonal Bracing EndPlate**
- PK – Steel Fin Plate Slotted
  - PK – Steel Fin Plate Slotted
- PK – Steel Splice Plate Double
  - PK – Steel Splice Plate Double
- PK – Steel W 21 x 62 Beam
- PK – Steel W 21 x 62 Beam Notched
- PK – Steel W 24 x 162
- PK – Steel W 24 x 162 Baseplate
  - PK – Steel W 24 x 162 Baseplate
- Structural Foundations

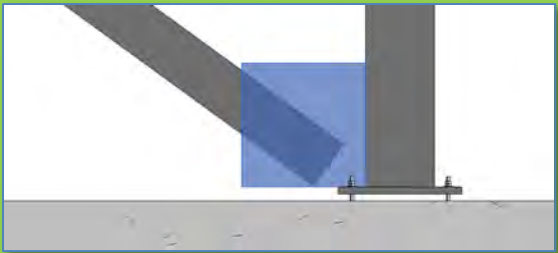
Level 1 Structure

Drag Endplate close to column

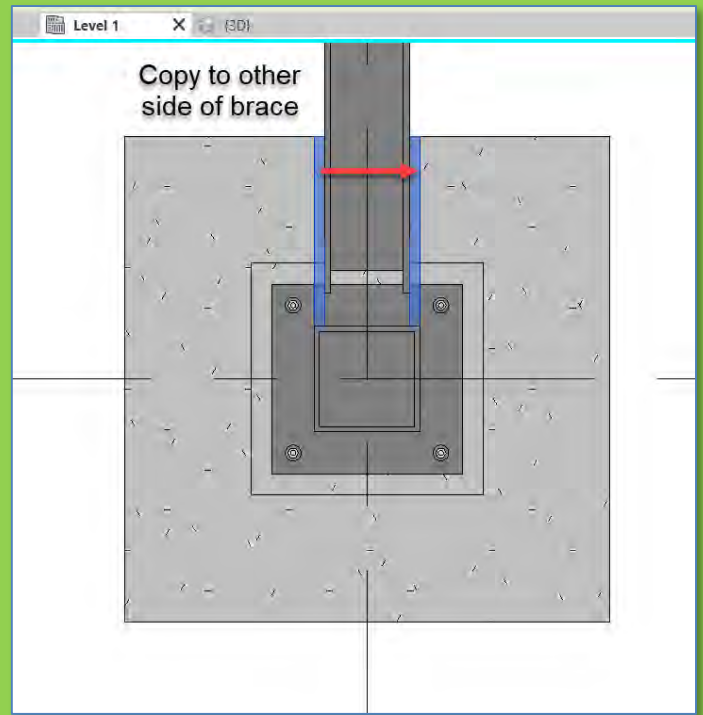
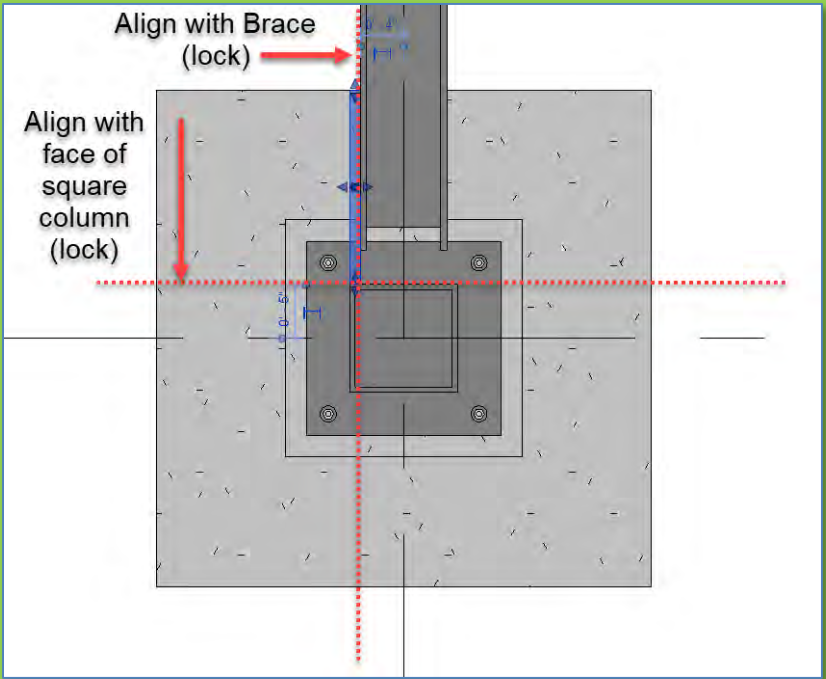
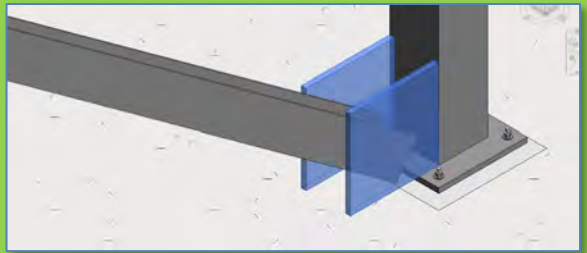


# Add Diagonal Bracing Endplate

- Diagonal Bracing Connections
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- Align endplate with face of brace and face of square column
- Copy endplate to other side of brace

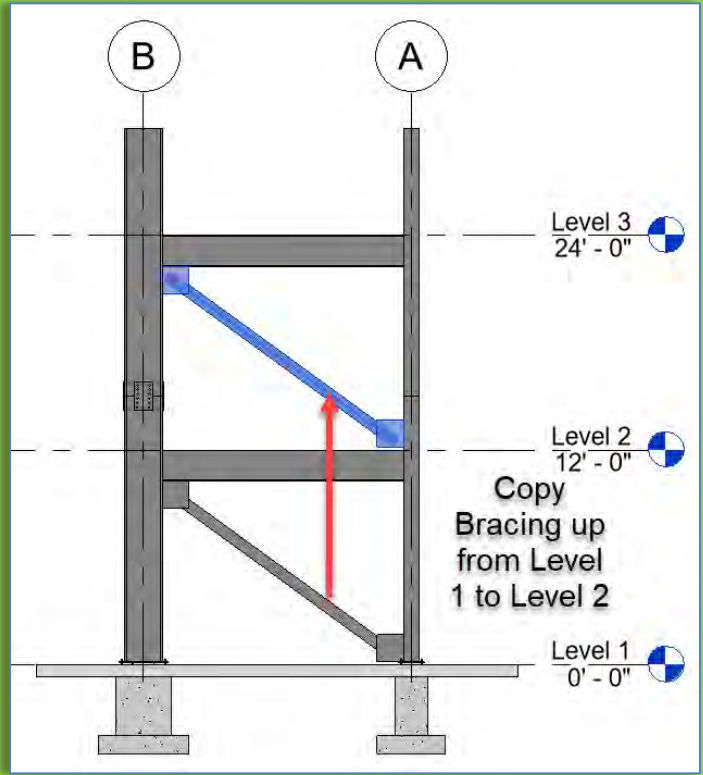
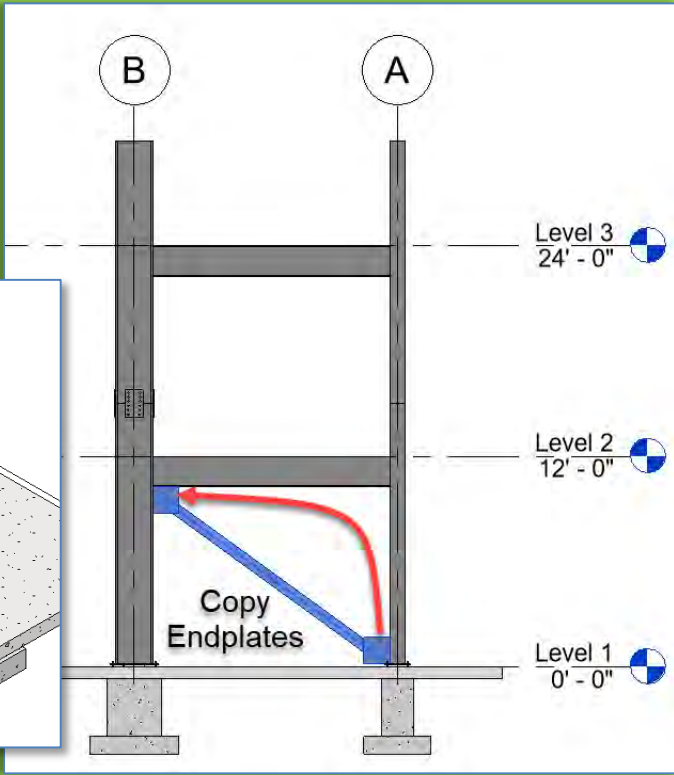
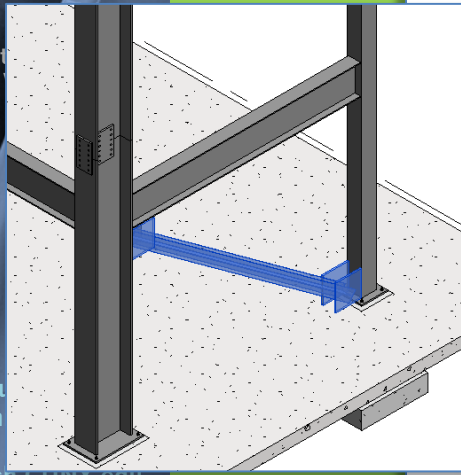




# Copy Bracing over then up to Level 2

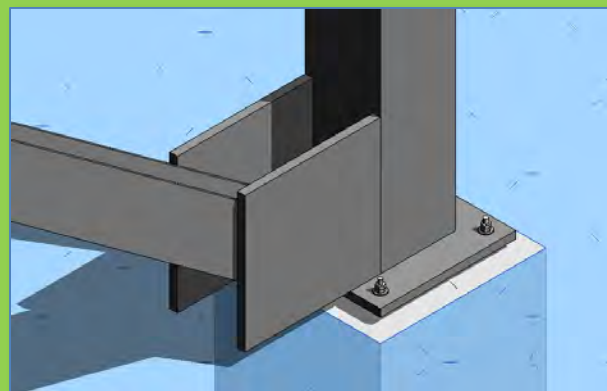
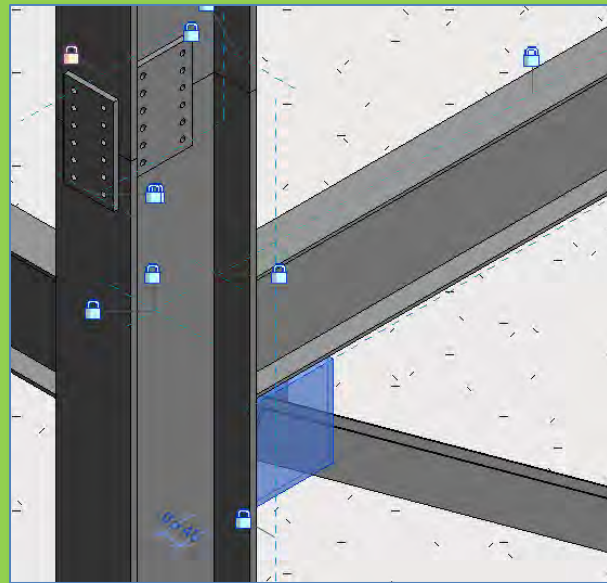
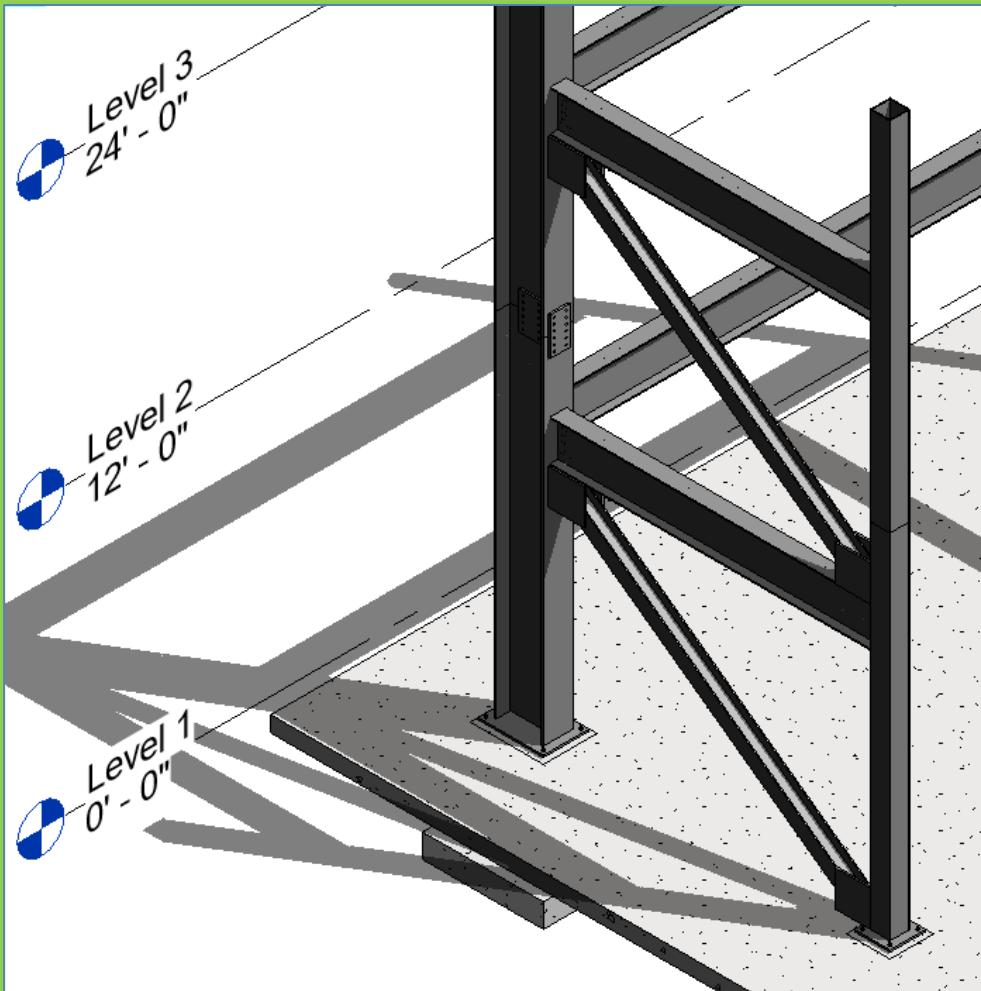
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- Copy Endplates up to top of diagonal bracing
- Copy diagonal brace and all four endplates up from level 1 to level 2
- Align and lock to Column and Beam



# Isometric Views of the Project File

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