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Tips and Tricks for Effective Rebar Detailing in Revit

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About the speaker

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- Senior Product Owner at Autodesk working on expanding the rebar modeling and detailing capabilities of Revit
- Structural Engineer
- Certified Professional in Revit and AutoCAD

Class Summary

In this class, you will learn how to get the most out of the reinforcement modeling and detailing tools available in Revit software. You will learn tips and tricks for configuring your rebar project and working with rebar shapes and rebar constraints. You will learn techniques for presenting rebar in construction drawings and extracting fabrication data using schedules and tags. Finally, you will learn best practices for placement and adjustment of free-form and shape-driven rebar, area, and path reinforcement.

Key Learning Objectives

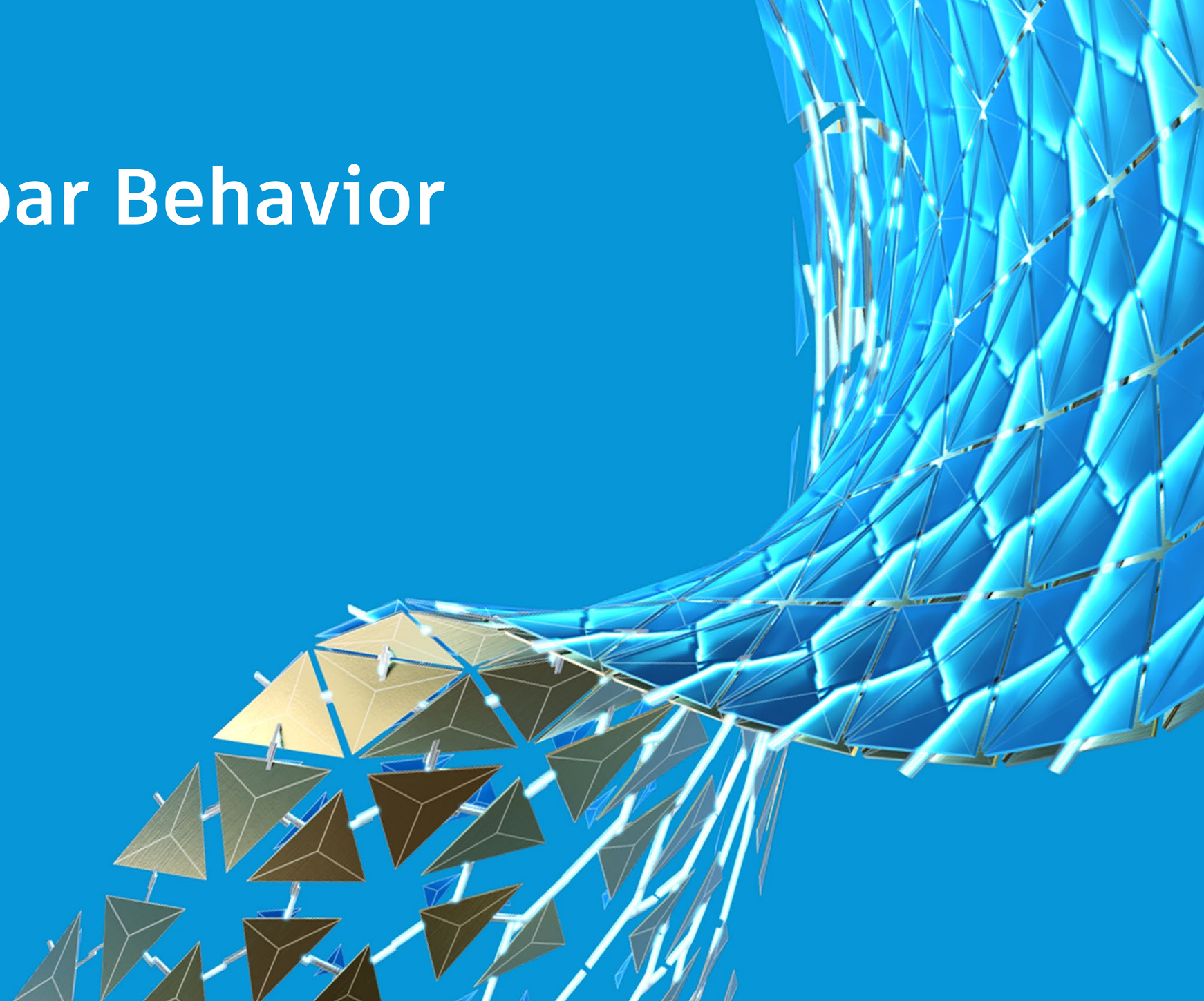
DISCOVER TIPS, TRICKS, AND BEST PRACTICES FOR THE REBAR MODELING AND DETAILING TOOLS IN REVIT

DISCOVER A VARIETY OF PRESENTATION TECHNIQUES TO SHOW REBAR CLEARLY IN BOTH CONSTRUCTION DRAWINGS AND MODEL VIEWS

LEARN HOW REBAR SHAPES WORK AND HOW REBAR REACTS TO CHANGES OF THE HOST OR OTHER BARS

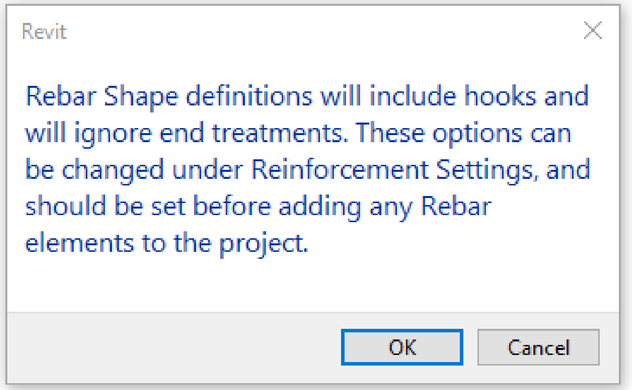
DISCOVER THE VARIOUS REBAR PROJECT SETTINGS AND SELECT THE BEST OPTION FOR THE TASK AT HAND

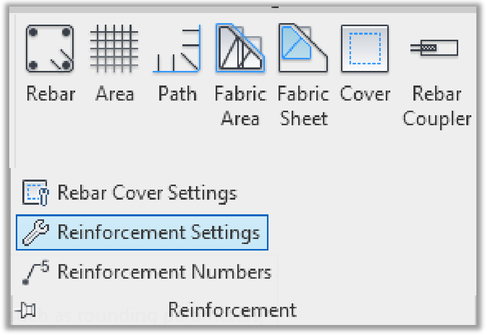
General Rebar Behavior

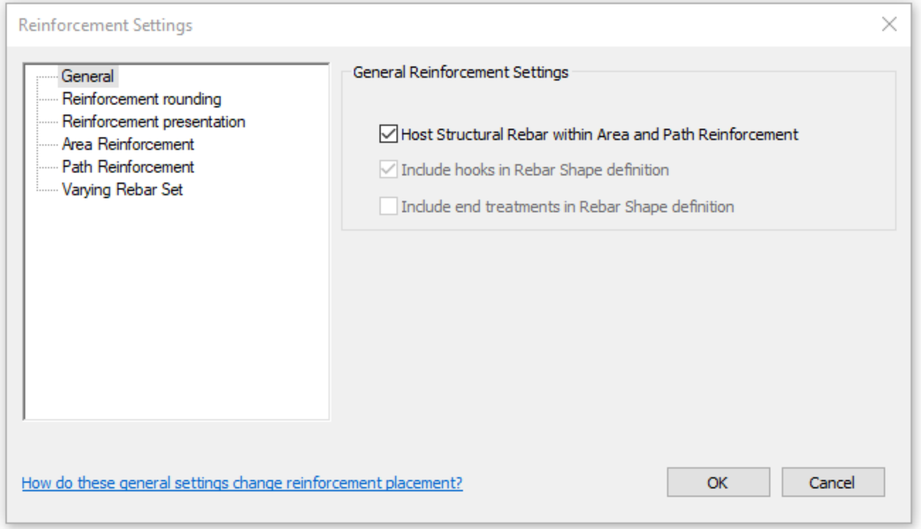


1. Include hooks or end treatments in the rebar shape definition

- **Check the include hooks in the rebar shape definition option**
  - Go to the Structure tab > Reinforcement > Reinforcement settings > General

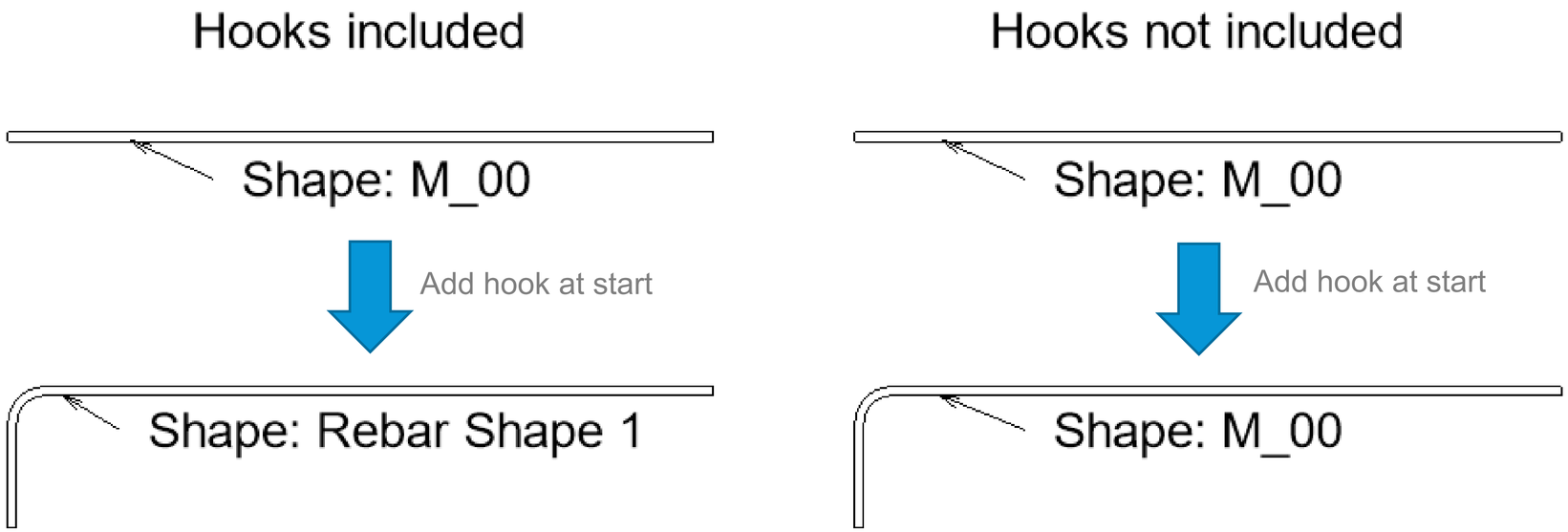






1. Include hooks or end treatments in the rebar shape definition

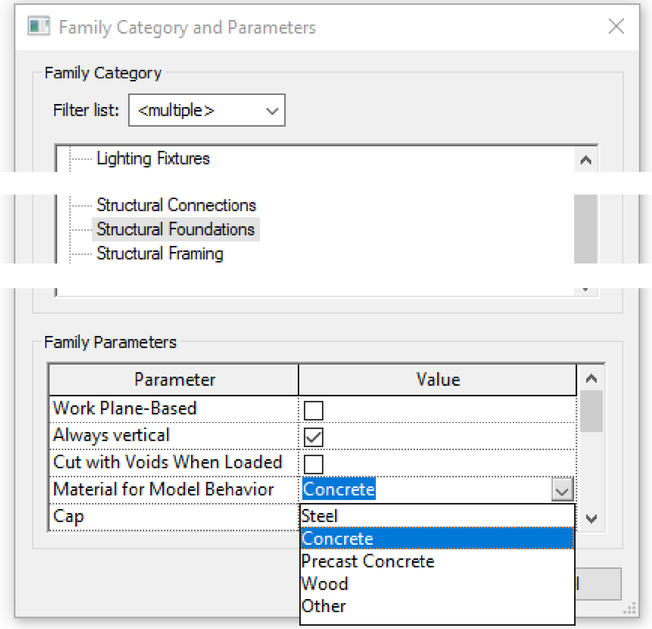
- **Add hook to a rebar**
  - Hooks included > New shape is created (Rebar Shape 1)
  - Hooks not included > the shape matches to 01 or M_01



2. Valid host for rebar

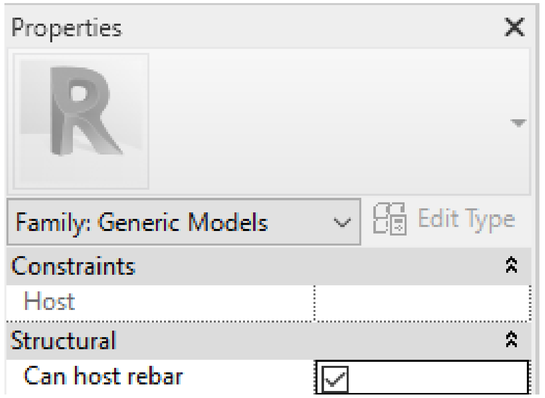
- **Category**
  - Structural Framing
  - Structural Columns
  - Structural Foundations
  - Structural Connections
  - Floors
  - Walls
  - Foundation Slab
  - Wall Foundation
  - Slab Edge

- **Material for Model Behavior**
  - Edit the family
  - Go to the Family Category and Parameters
  - Change the Material for Model Behavior to Concrete, Precast Concrete or Other

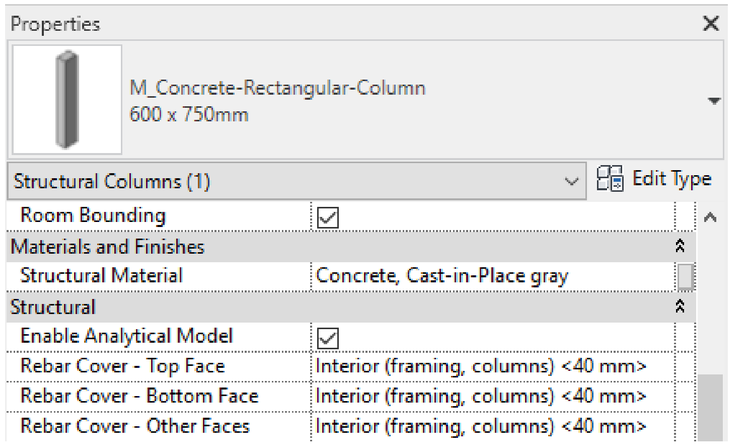


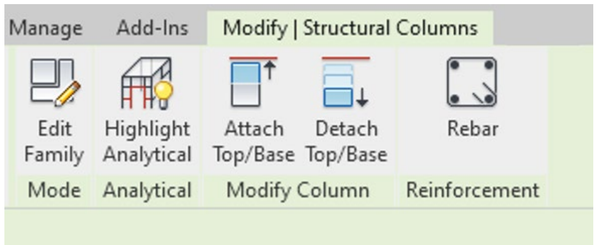
2. Valid host for rebar

- **Make a Generic Model a Rebar Host**
  - Edit the family
  - Check the “Can host rebar” option in the Properties Palette



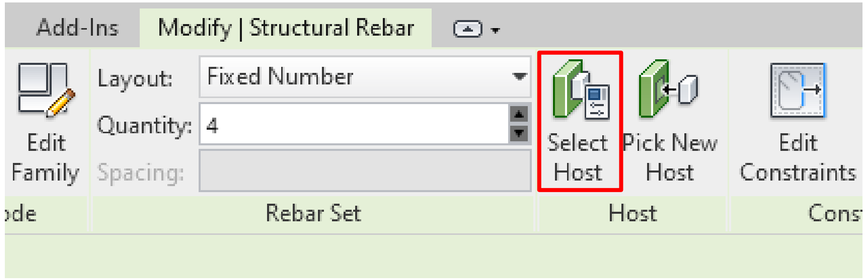
- **Check if an element is a valid host**

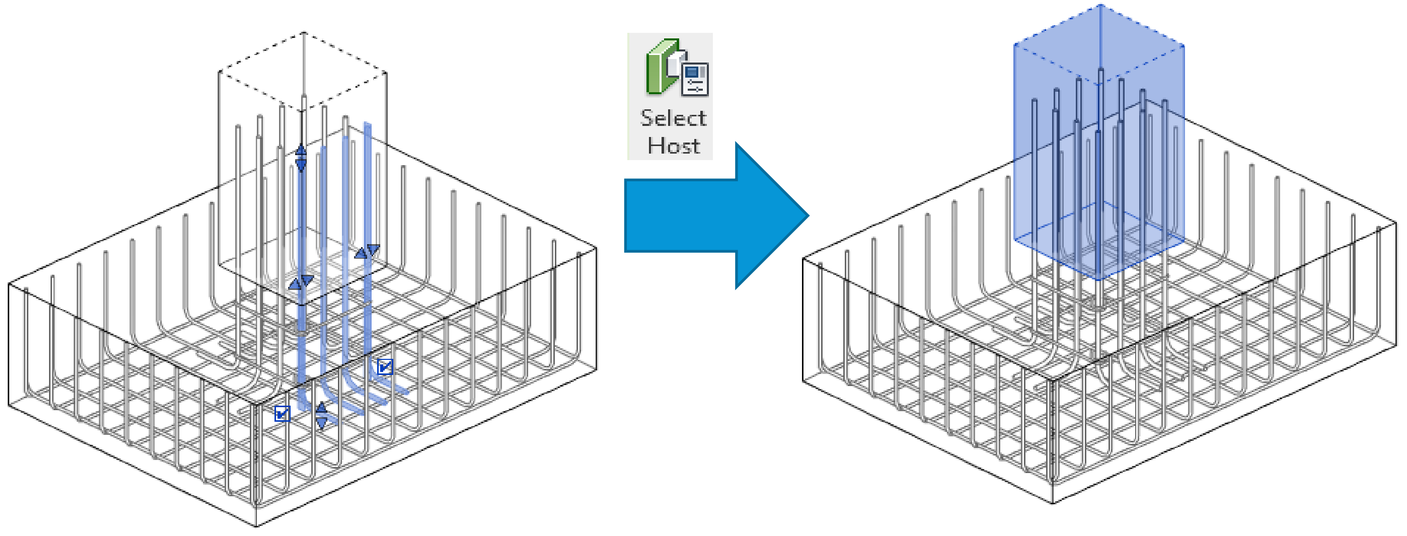




3. Find the rebar host

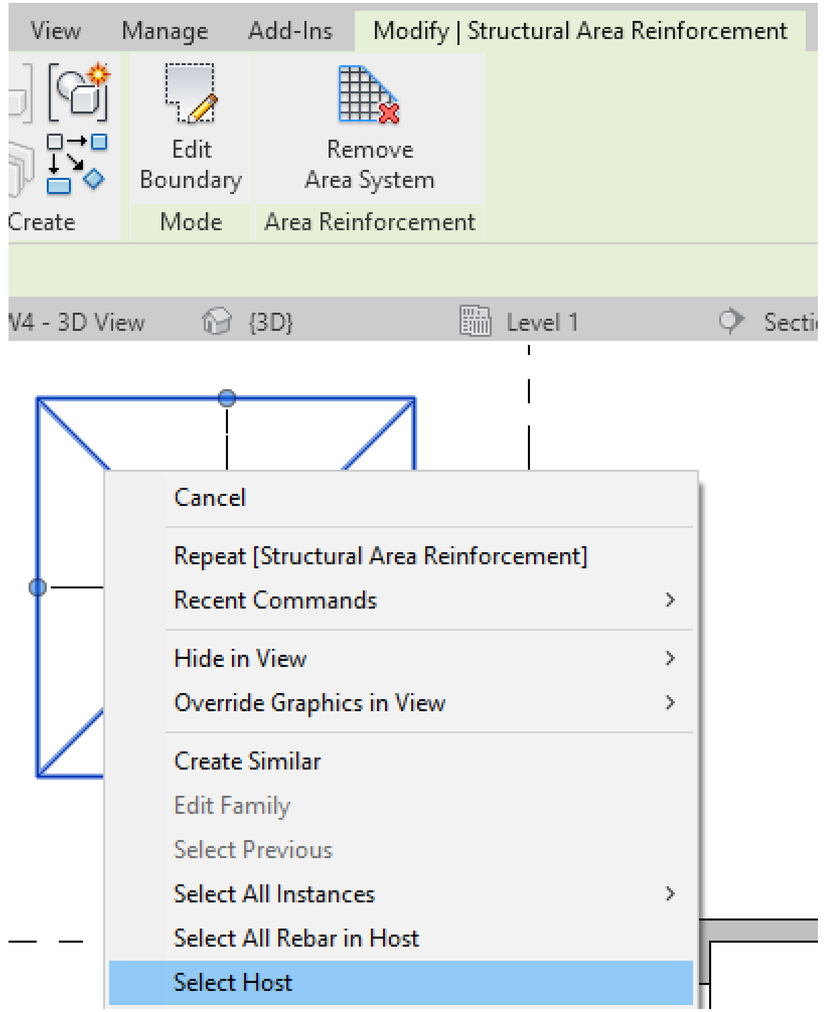
- **Select one or more rebar sets**
  - In the contextual ribbon, click the Select Host command





3. Find the rebar host

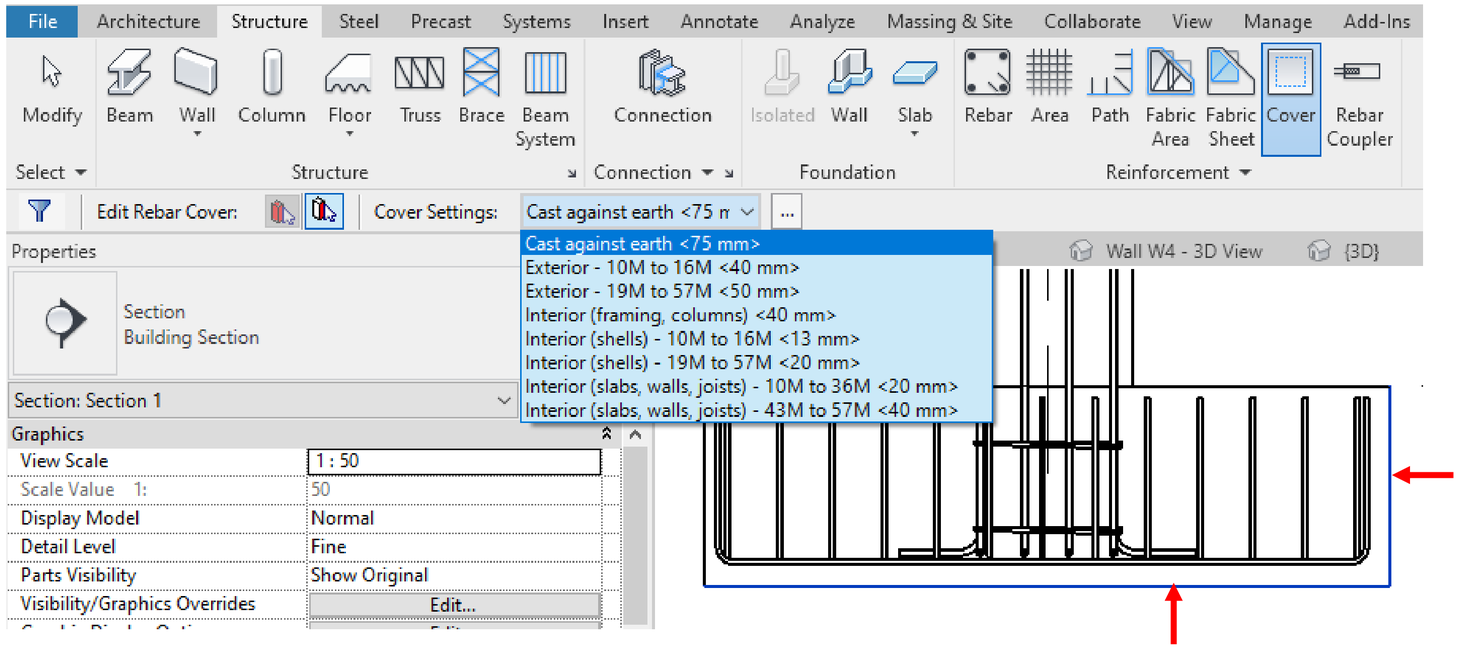
- **Select Rebar, Area or Path Reinforcement**
  - Right click > Select Host



4. Control the concrete cover by element face

To set the cover for the entire element or just a specific face, use the Cover tool:

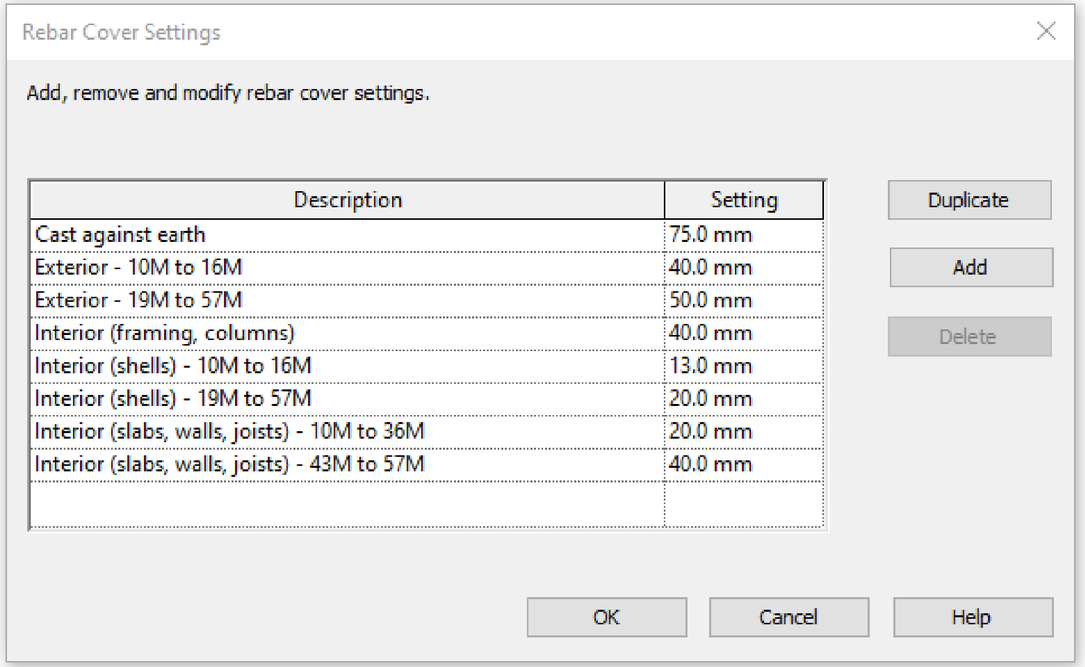
- Click Structure tab > Reinforcement panel > Cover
- In the options bar select the Pick Faces command
- Click one or more element faces (Ctrl to add to the selection) for which you want to adjust the cover
- Select the cover setting from the drop-down in the Options Bar



4. Control the concrete cover by element face

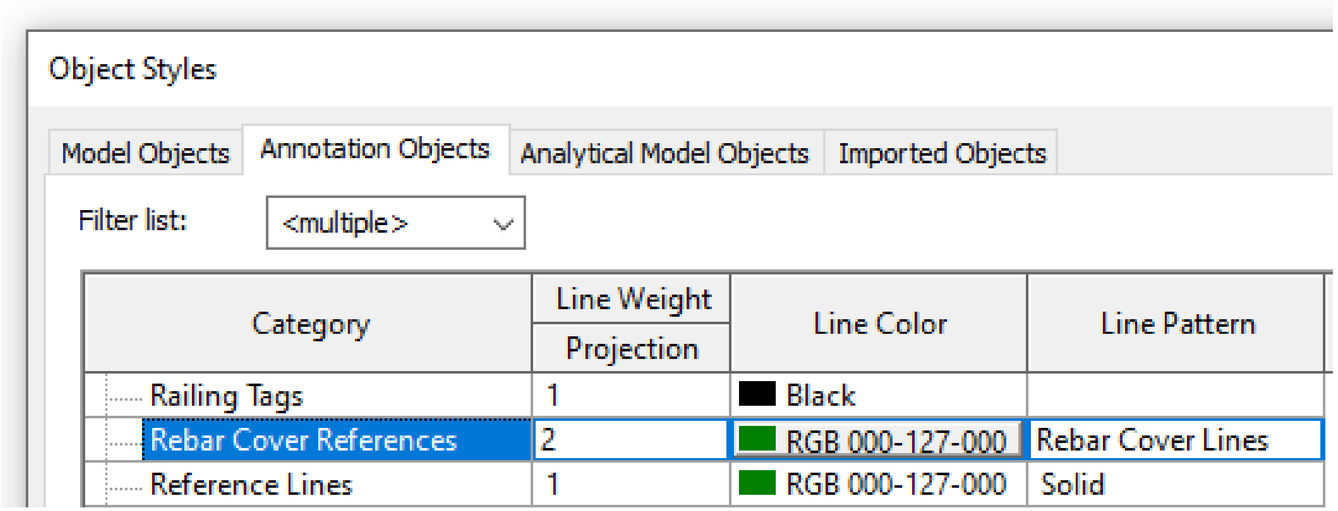
Rebar Cover Settings

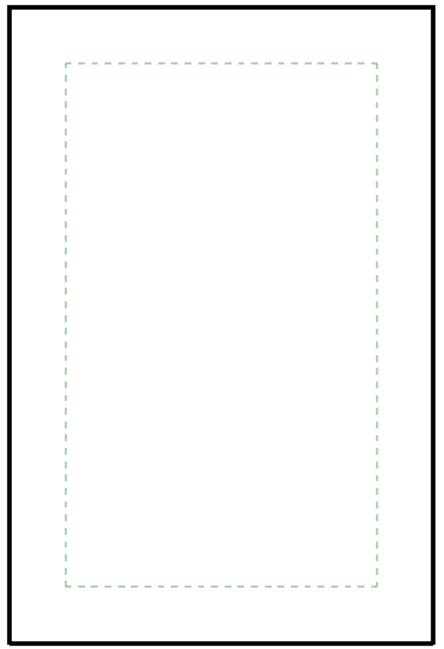
- Click … on the options bar



5. Edit the appearance of concrete cover lines

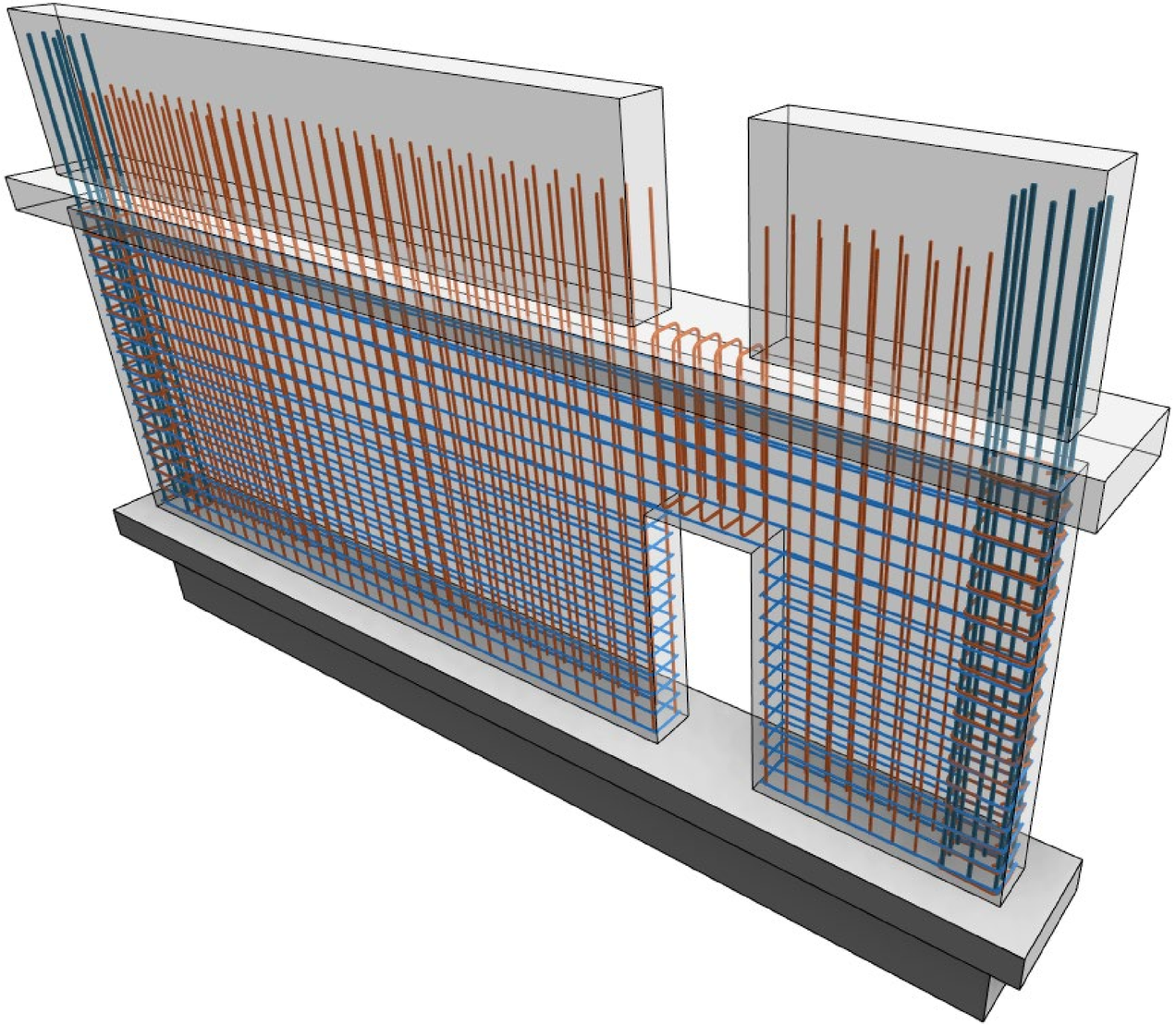
- Manage > Object Styles > Annotation Objects tab, find the Rebar Cover References category and edit the line weight, color and pattern





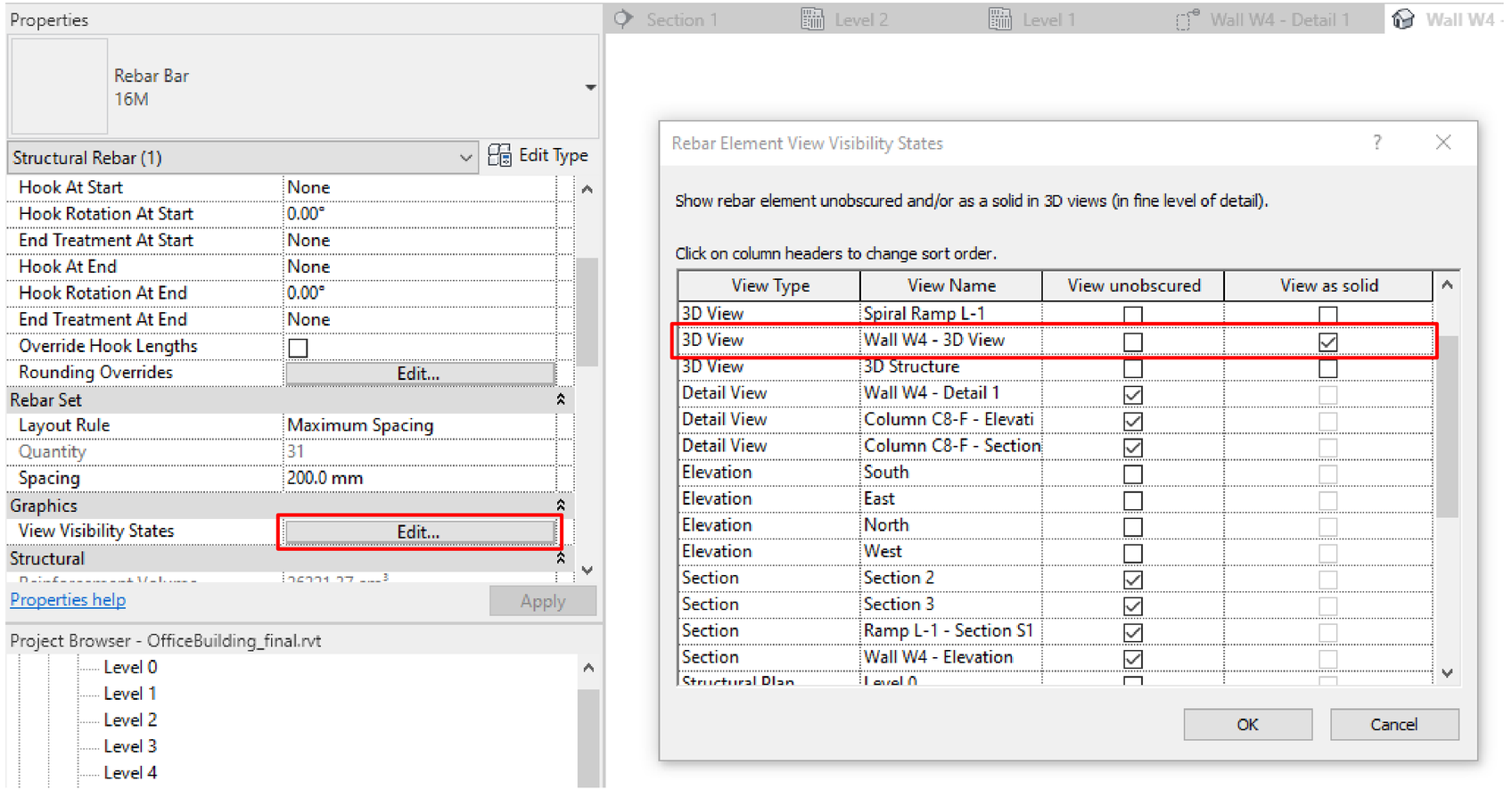
6. Presenting 3D rebar

- Add transparency to the concrete elements



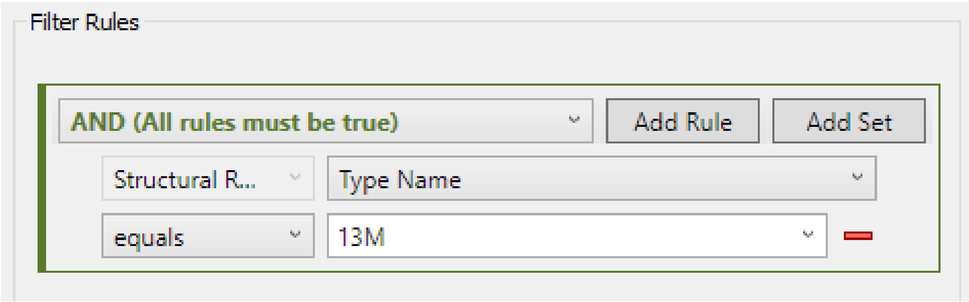
6. Presenting 3D rebar

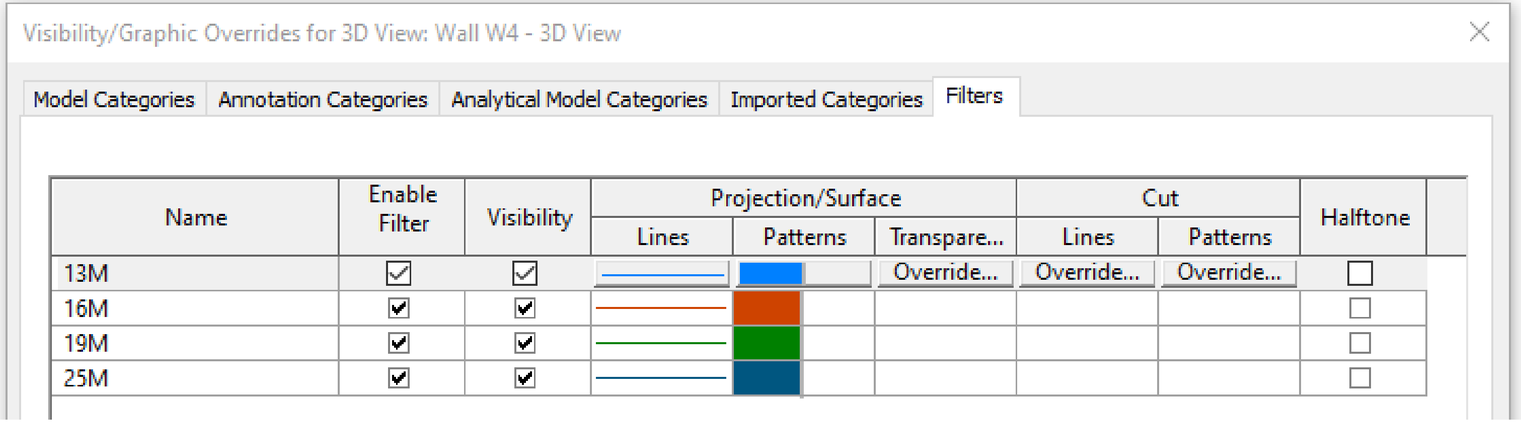
- Show the bars as solid and uncheck show unobscured
  - Set view level of detail to Fine



6. Presenting 3D rebar

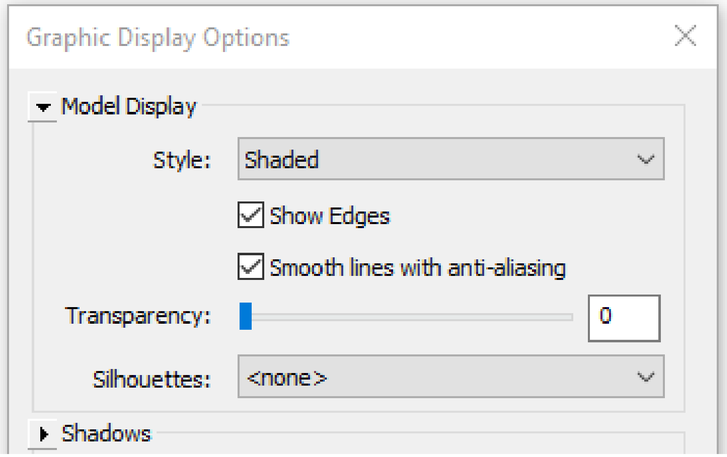
- Use filters to add color based on diameter or other property





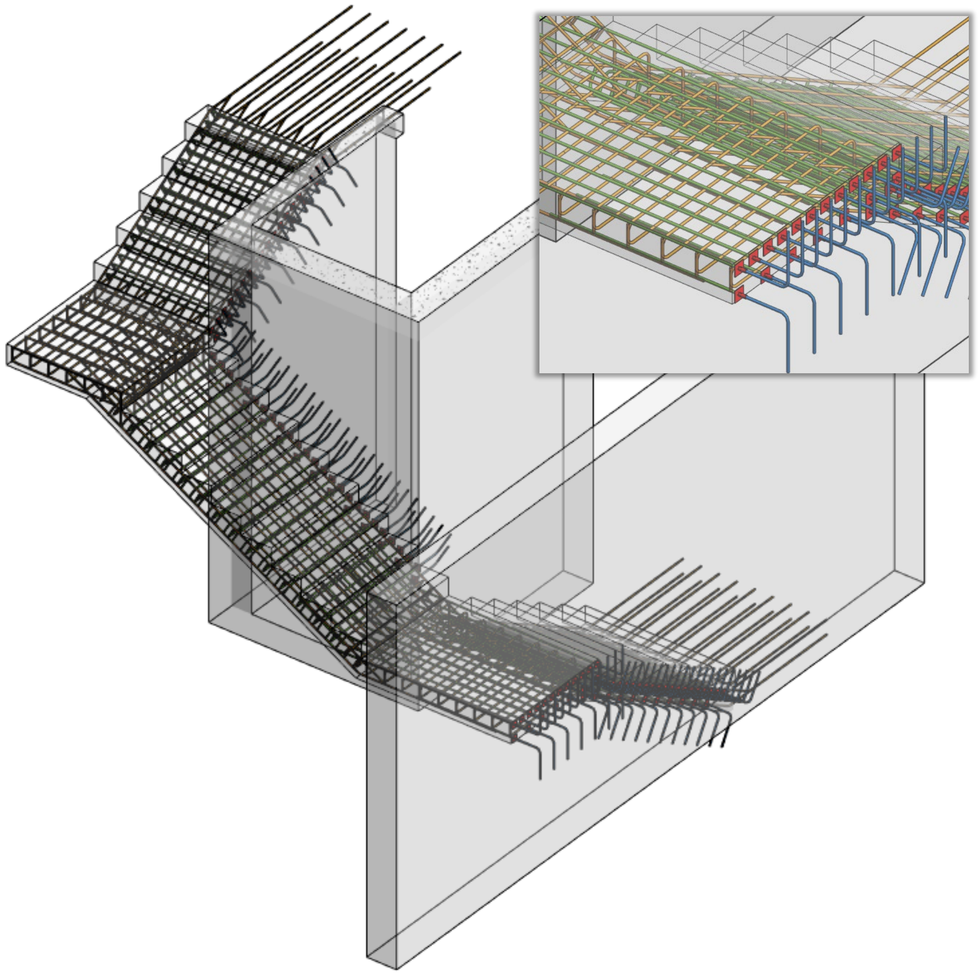
6. Presenting 3D rebar

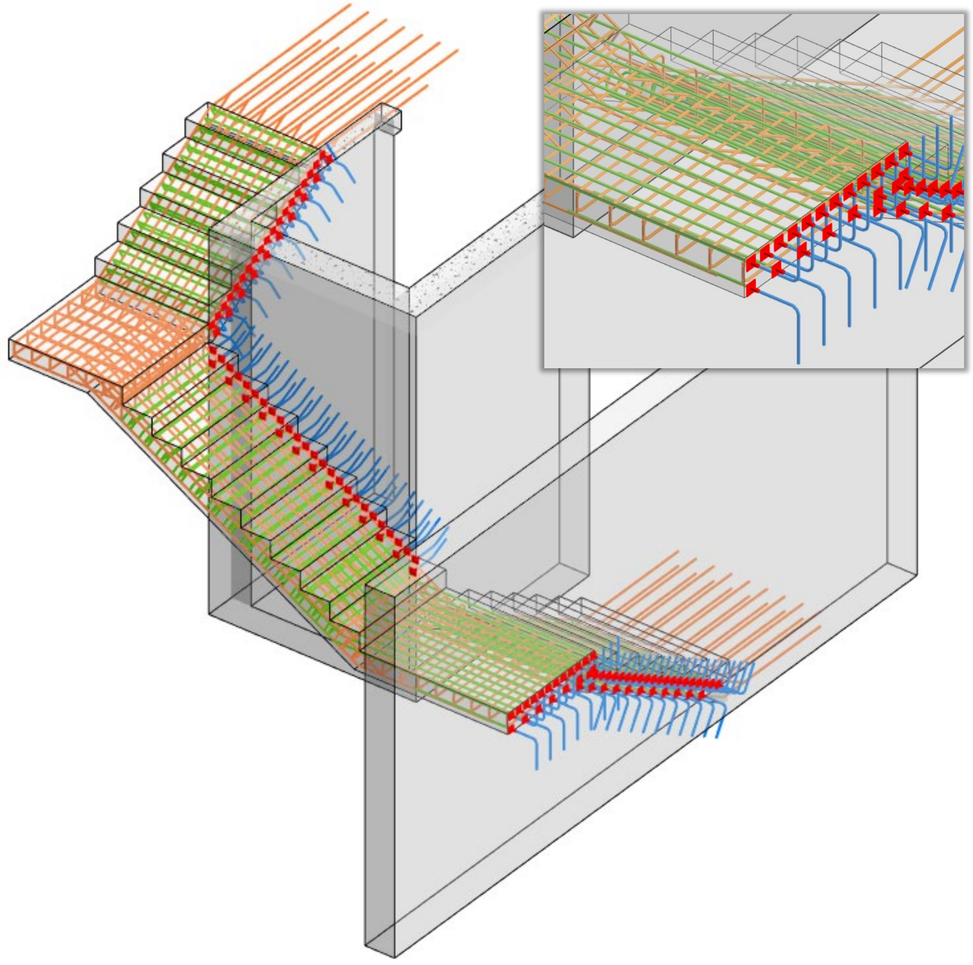
- Smooth lines with anti-aliasing in the 3D view



6. Presenting 3D rebar

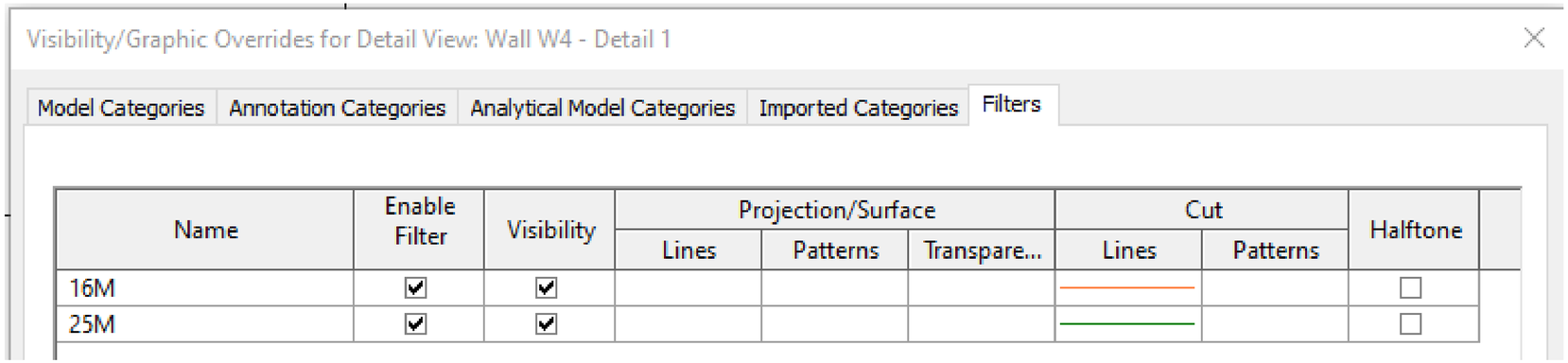
- Add color to the projection lines

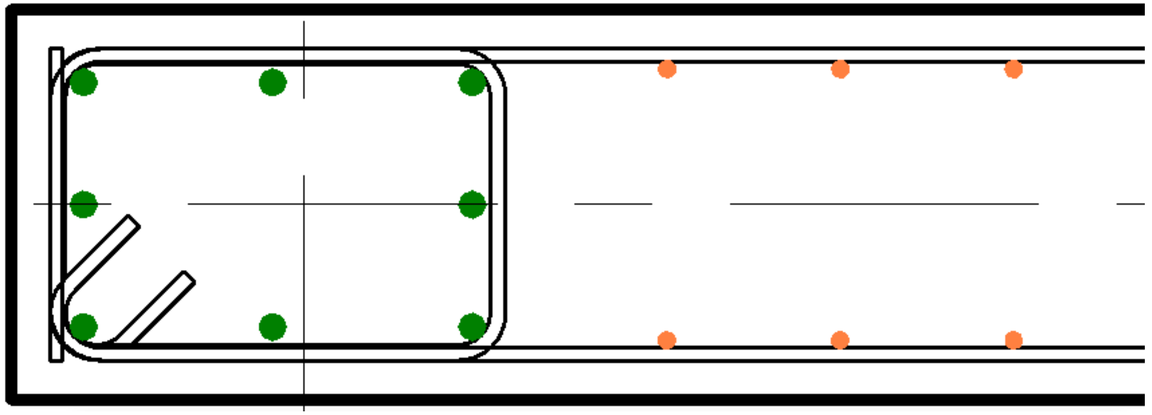




7. Setting the color for rebar cut by views

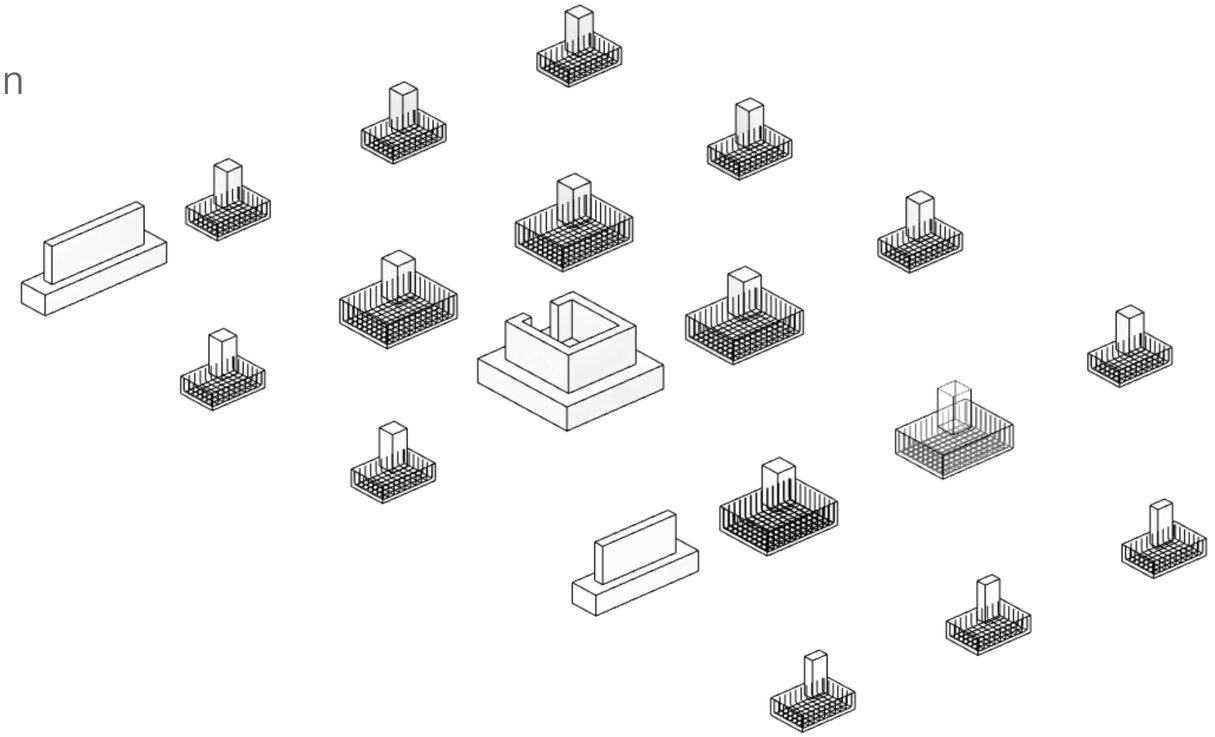
Set the color property for cut lines to add color to the circle resulting from the rebar being cut by the view





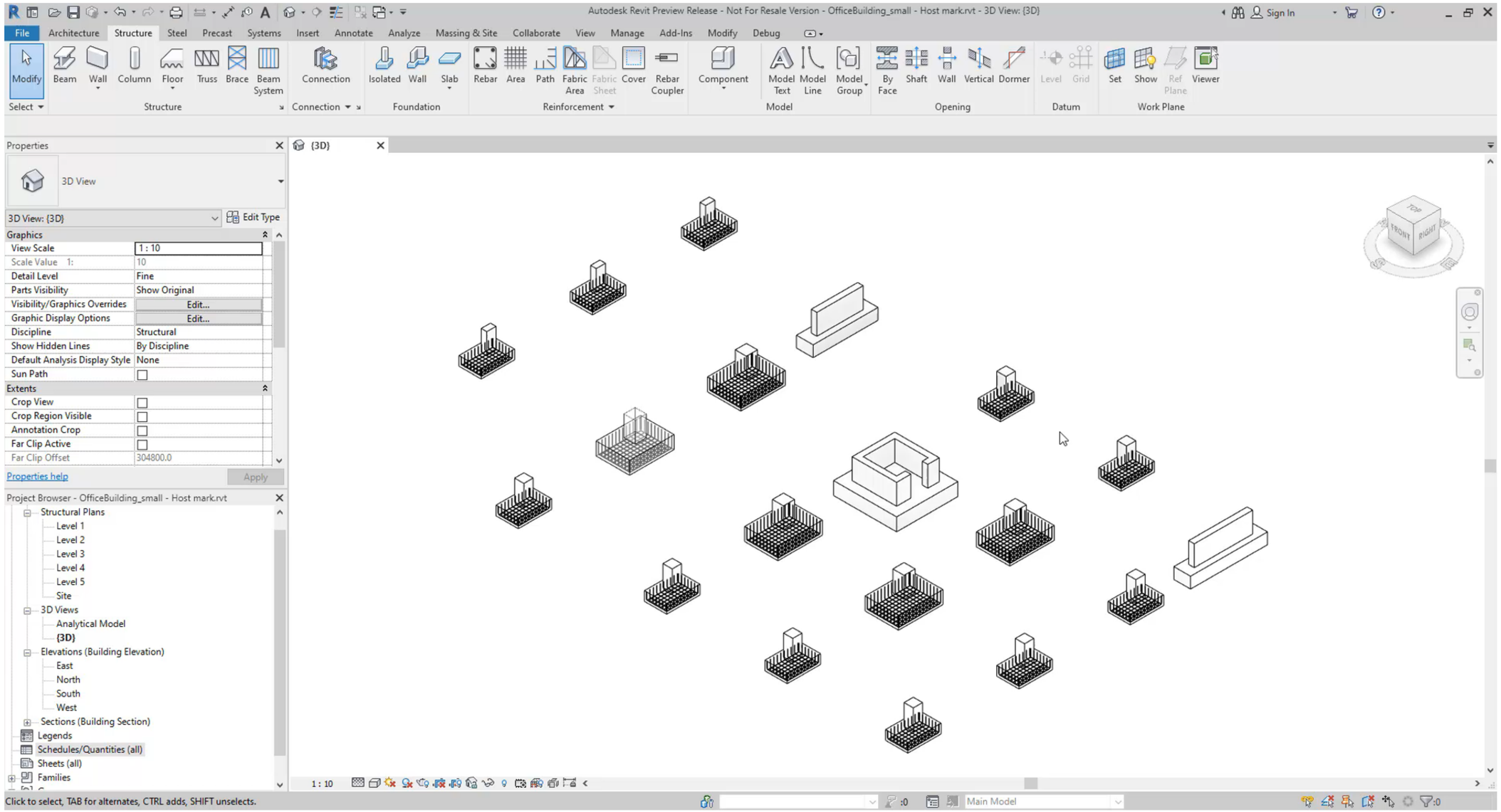
8. Count the number of bars per host

- Add identical Mark values to identical elements in your project
- Create a rebar schedule
  - Include *Host Mark*, *Host Count*, *Quantity* and other relevant parameters
- Create a calculated value called *Quantity by element = Quantity / Host Count*



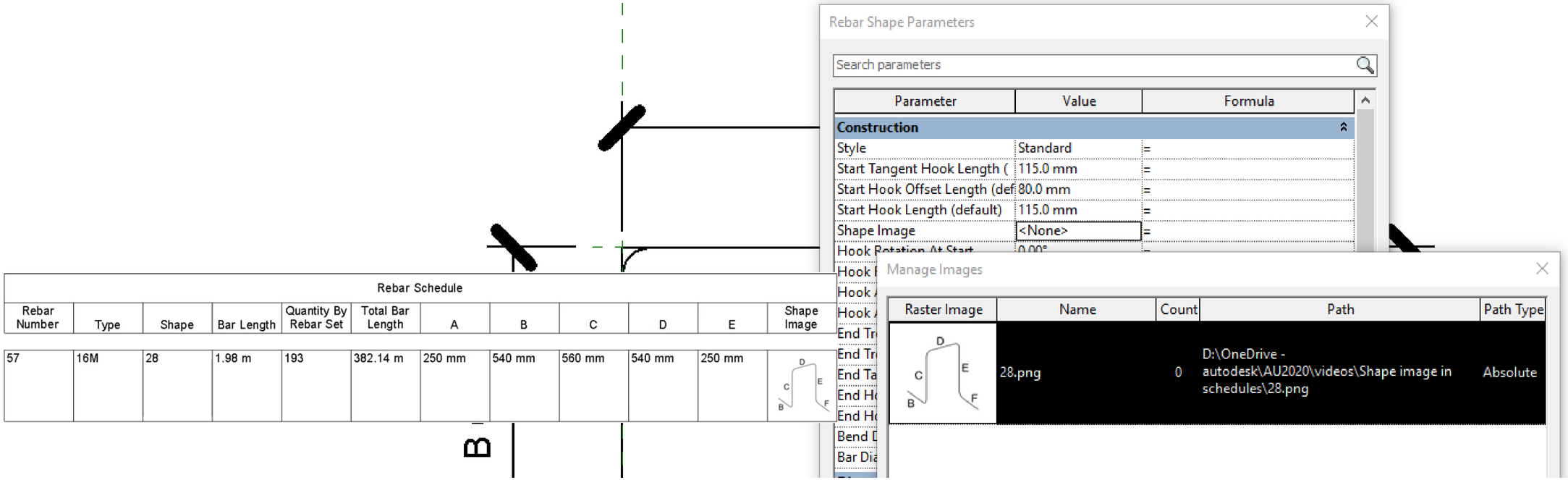
Rebar Number	Host Mark	Host Count	Shape	Bar Length	Quantity by Element	Quantity	A	B	C	D	E
1	F1	11	M_17	1840 mm	10	110	0 mm	400 mm	1120 mm	400 mm	0 mm
2	F1	11	M_17	2480 mm	7	77	0 mm	420 mm	1720 mm	420 mm	0 mm
3	F2	5	M_17	2840 mm	13	65	0 mm	600 mm	1720 mm	600 mm	0 mm
4	F2	5	M_17	3480 mm	10	50	0 mm	620 mm	2320 mm	620 mm	0 mm

8. Count the number of bars per host



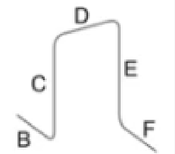
9. Show the shape image in schedules

- Edit the rebar shape family
- Go to Rebar Shape Parameters
- Edit the Image parameter and load the adequate shape image
  - The image should be generic, as it will be displayed for all bars using that shape



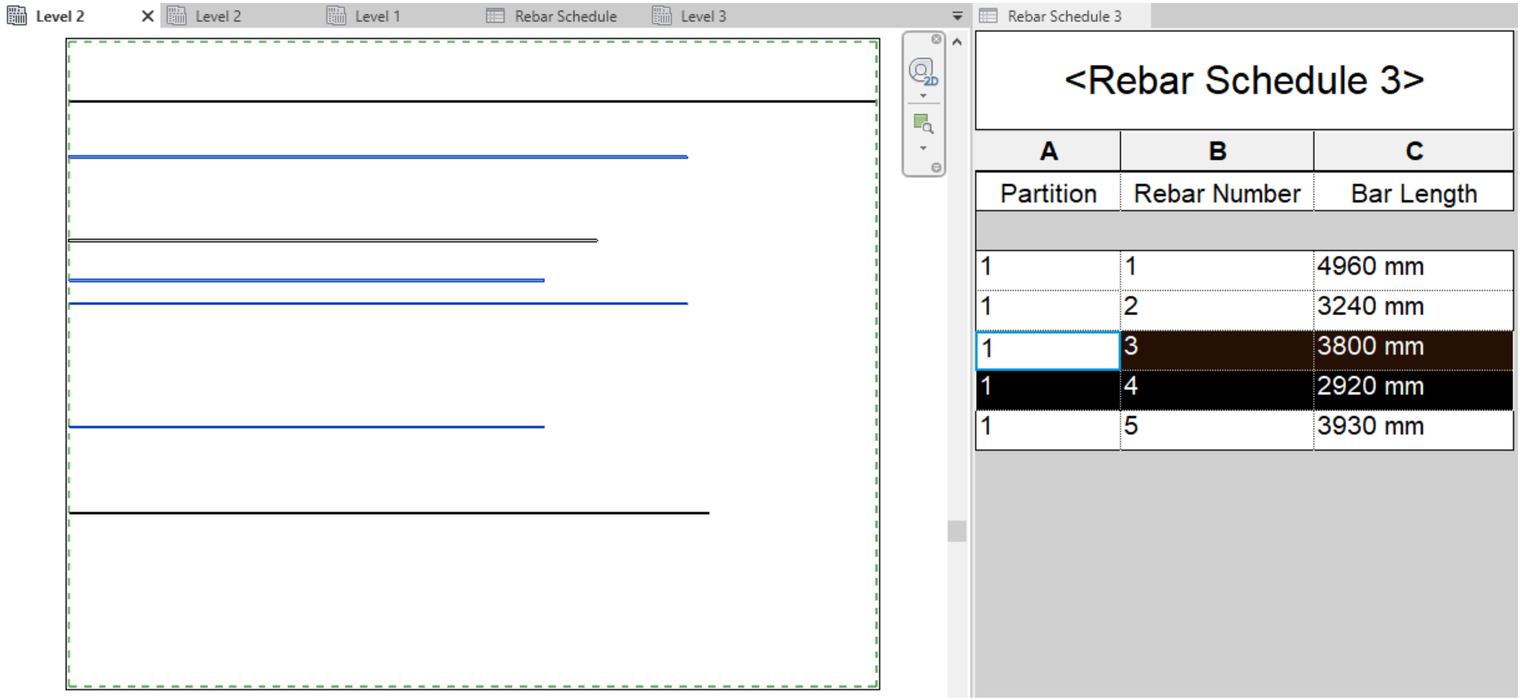
9. Show the shape image in schedules

- Reload into the project
- Create a rebar schedule that references the Image type parameter

Rebar Schedule											
Rebar Number	Type	Shape	Bar Length	Quantity By Rebar Set	Total Bar Length	A	B	C	D	E	Shape Image
57	16M	28	1.98 m	193	382.14 m	250 mm	540 mm	560 mm	540 mm	250 mm	

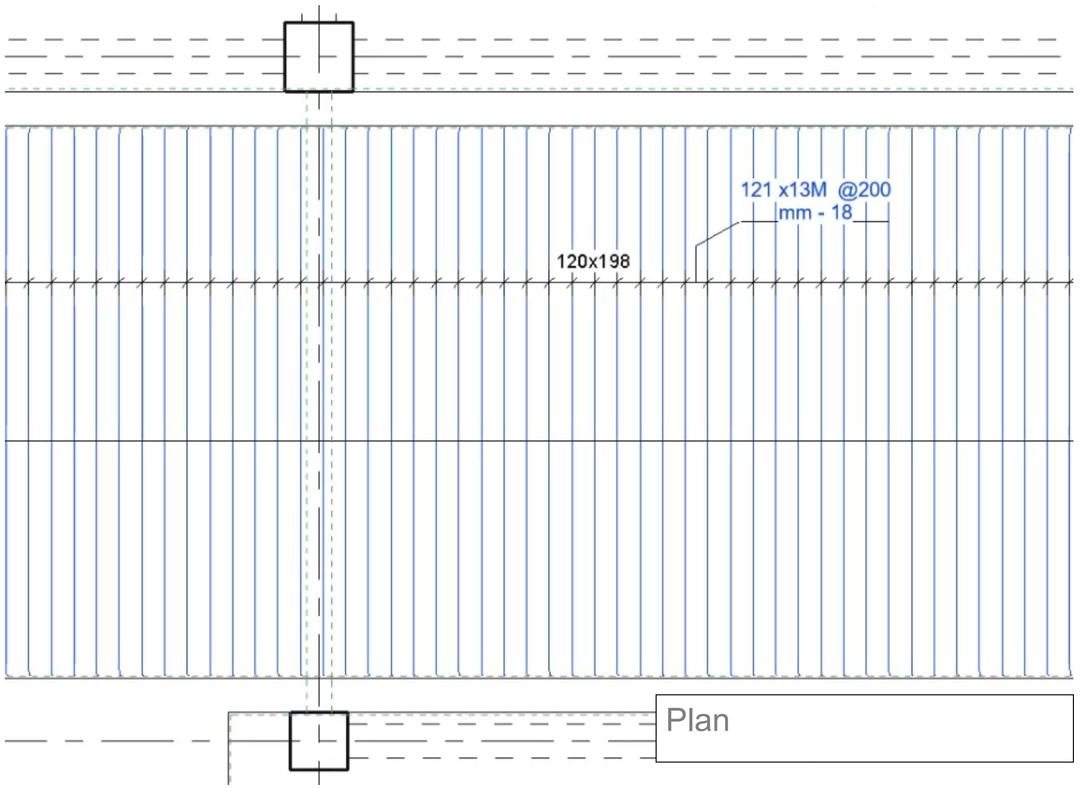
10. Select / Delete bars by rebar number using filters

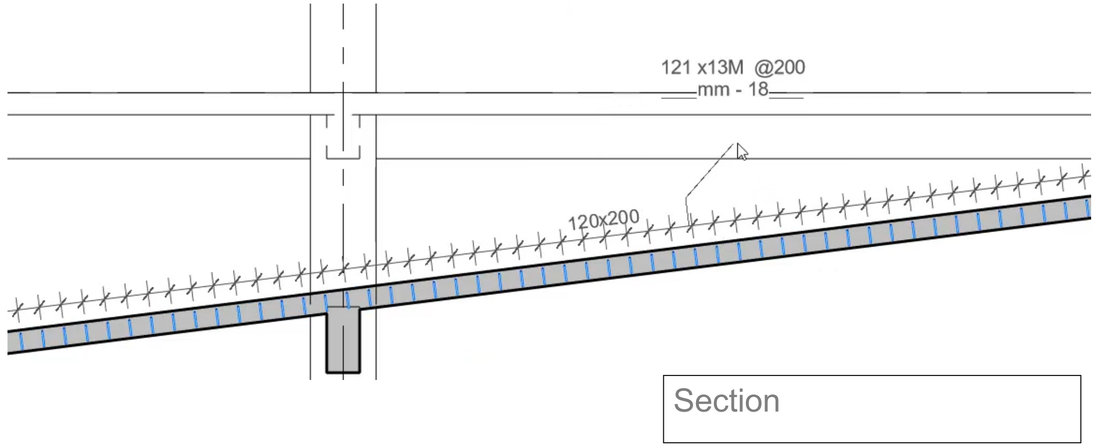
- Open a schedule and a model view side by side
- Filter by the rebar numbers you want to remove
- Select the rows in the schedule and switch to the model view
- Delete the selected bars



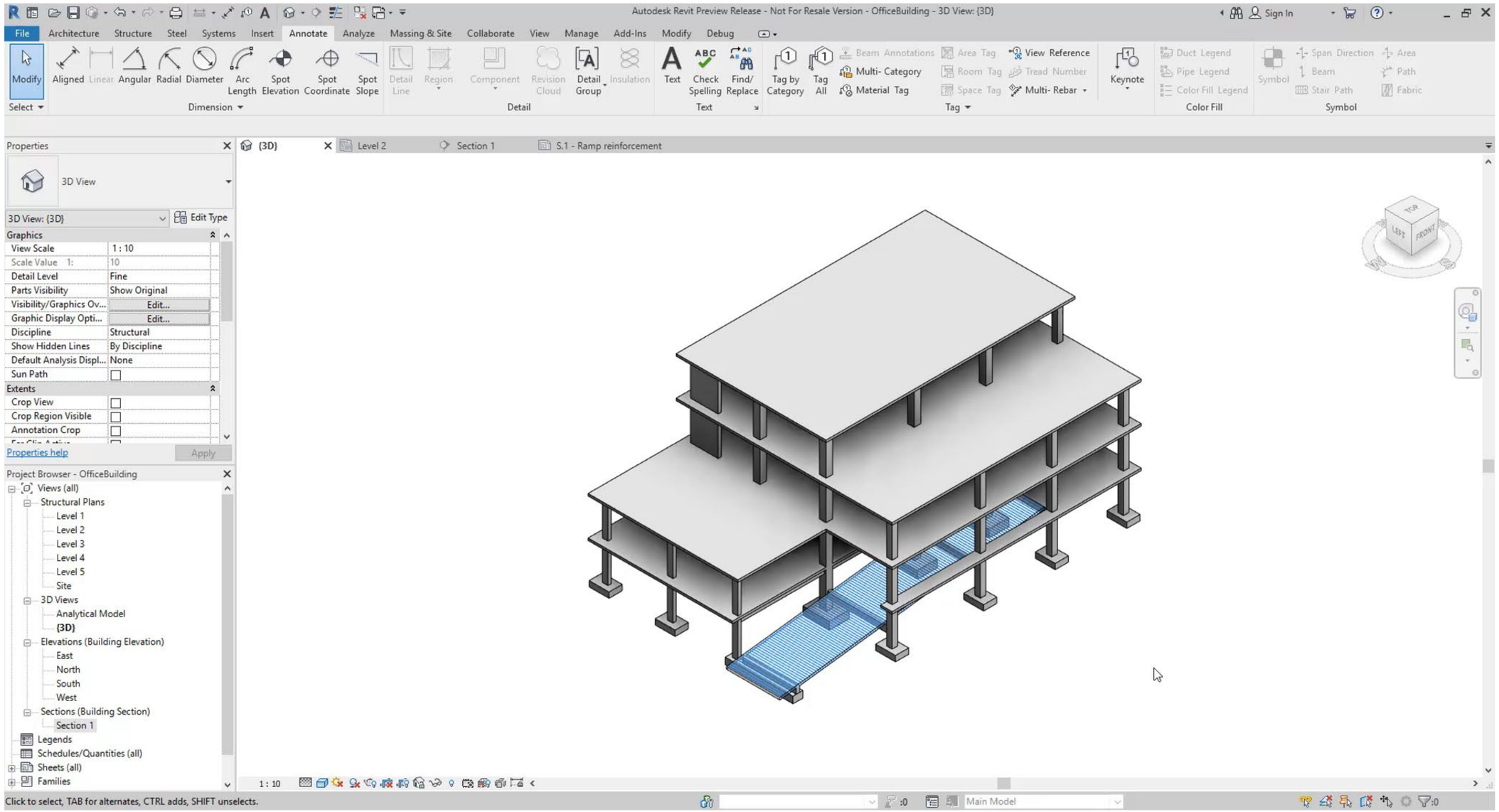
11. Multi-Rebar Annotations to sloped bars

Annotate single segment bars at any orientation, in 2D views by using Multi-Rebar Annotations



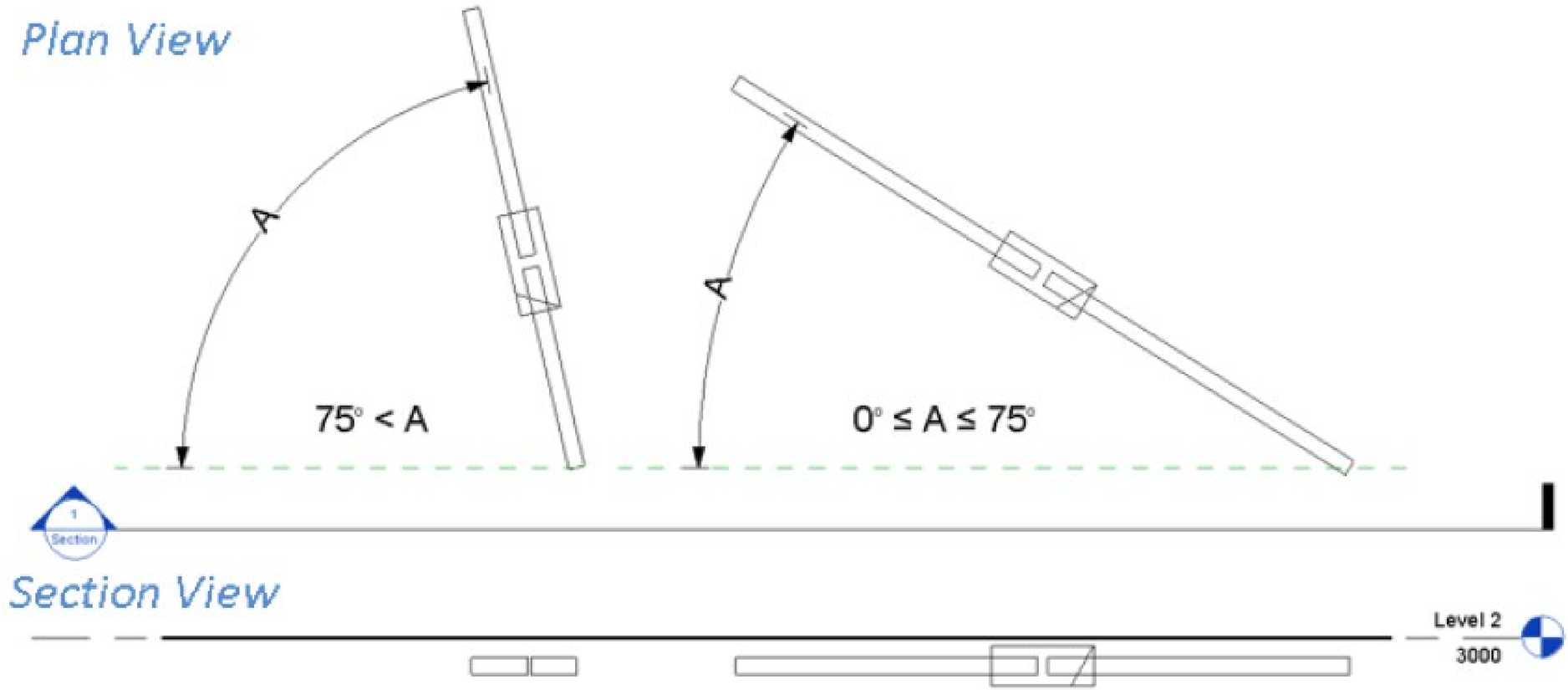


11. Multi-Rebar Annotations to sloped bars



12. Rebar couplers visibility in sections

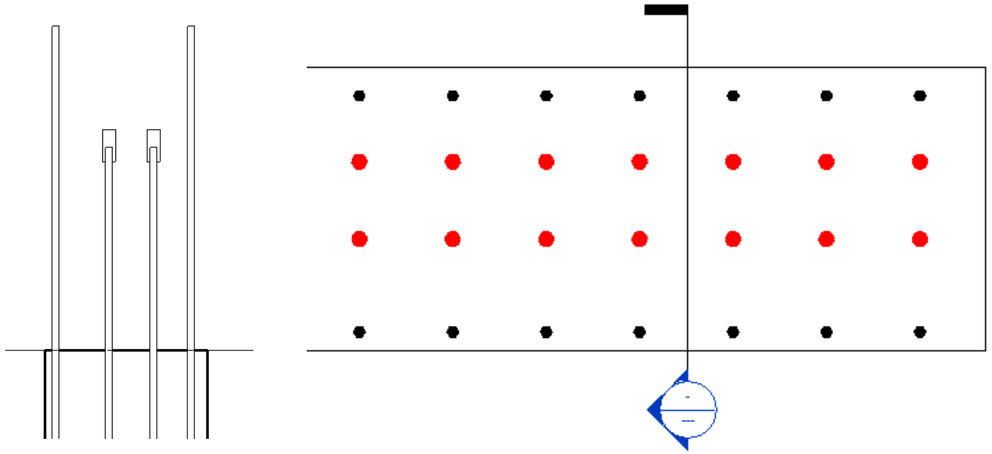
Couplers are only visible when the angle between the coupler axis and the view is below 75 degrees.

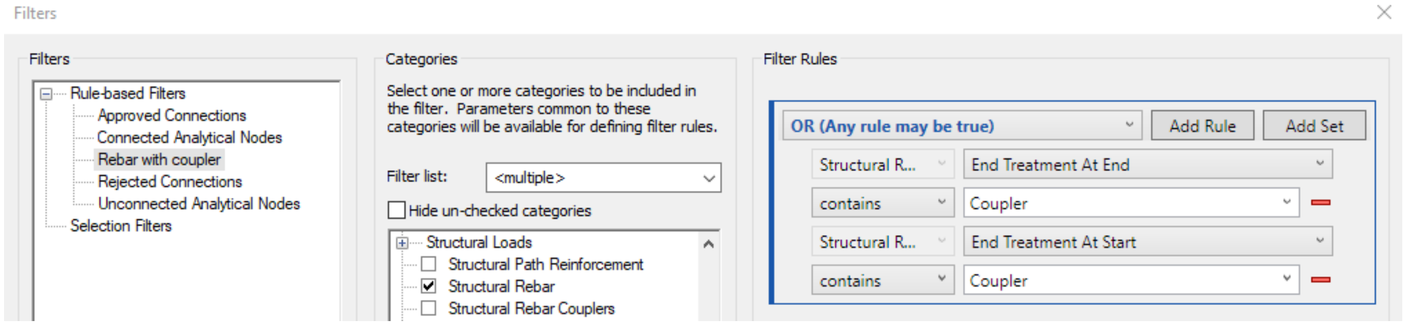


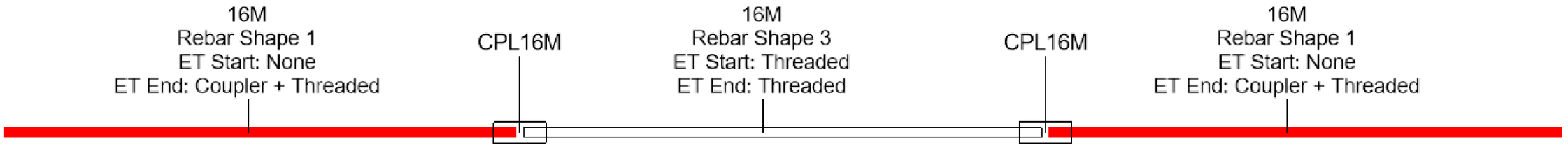
13. Define rebar shapes with attached rebar couplers

Specify if bars will be delivered with couplers already attached

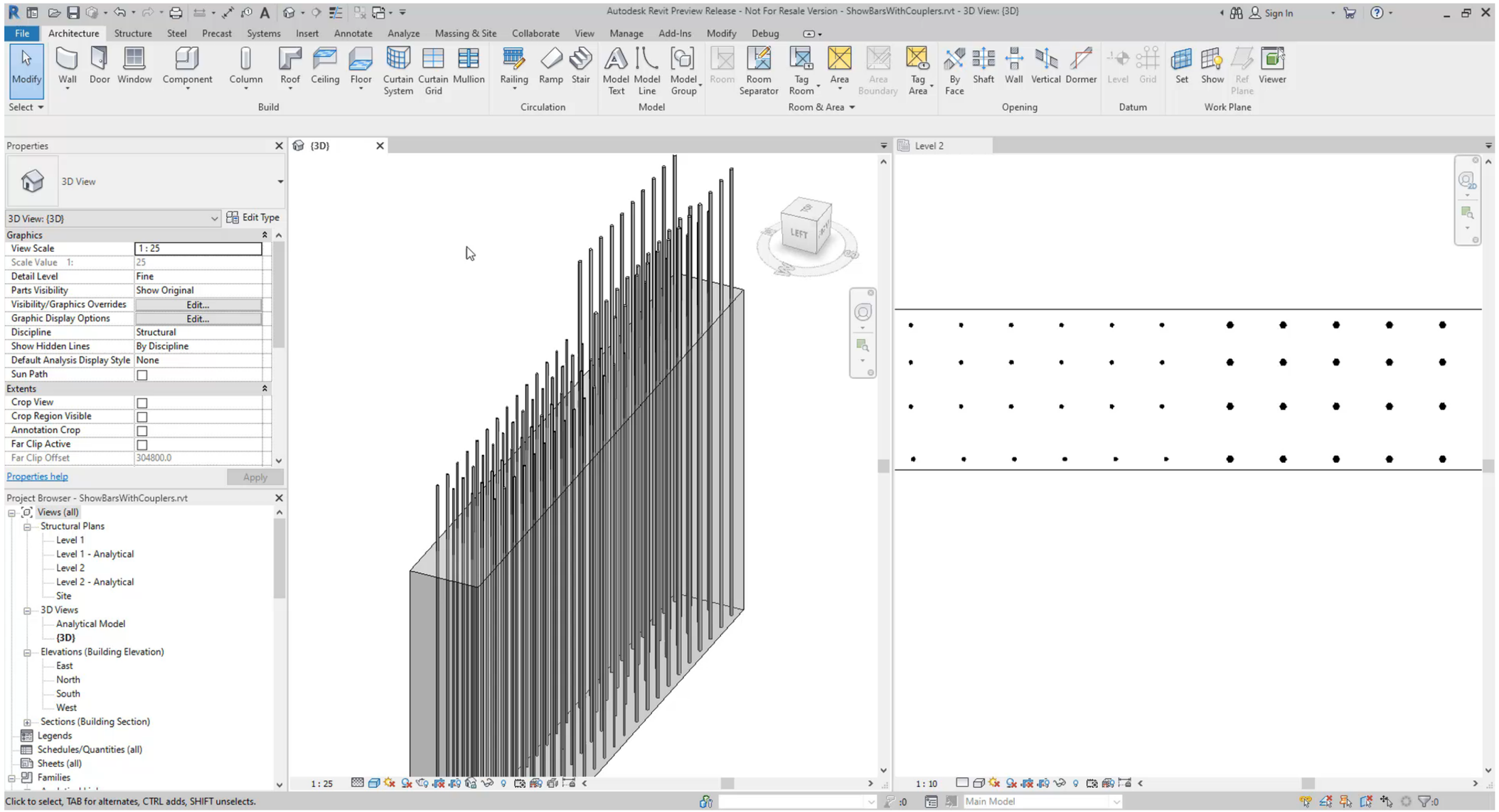
- Configure the end treatment to also include coupler for Bar 1 (1st bar clicked)
- Add filters for bars containing Coupler in End Treatment
- Identify the bars in plan views and when cut by the view as having couplers





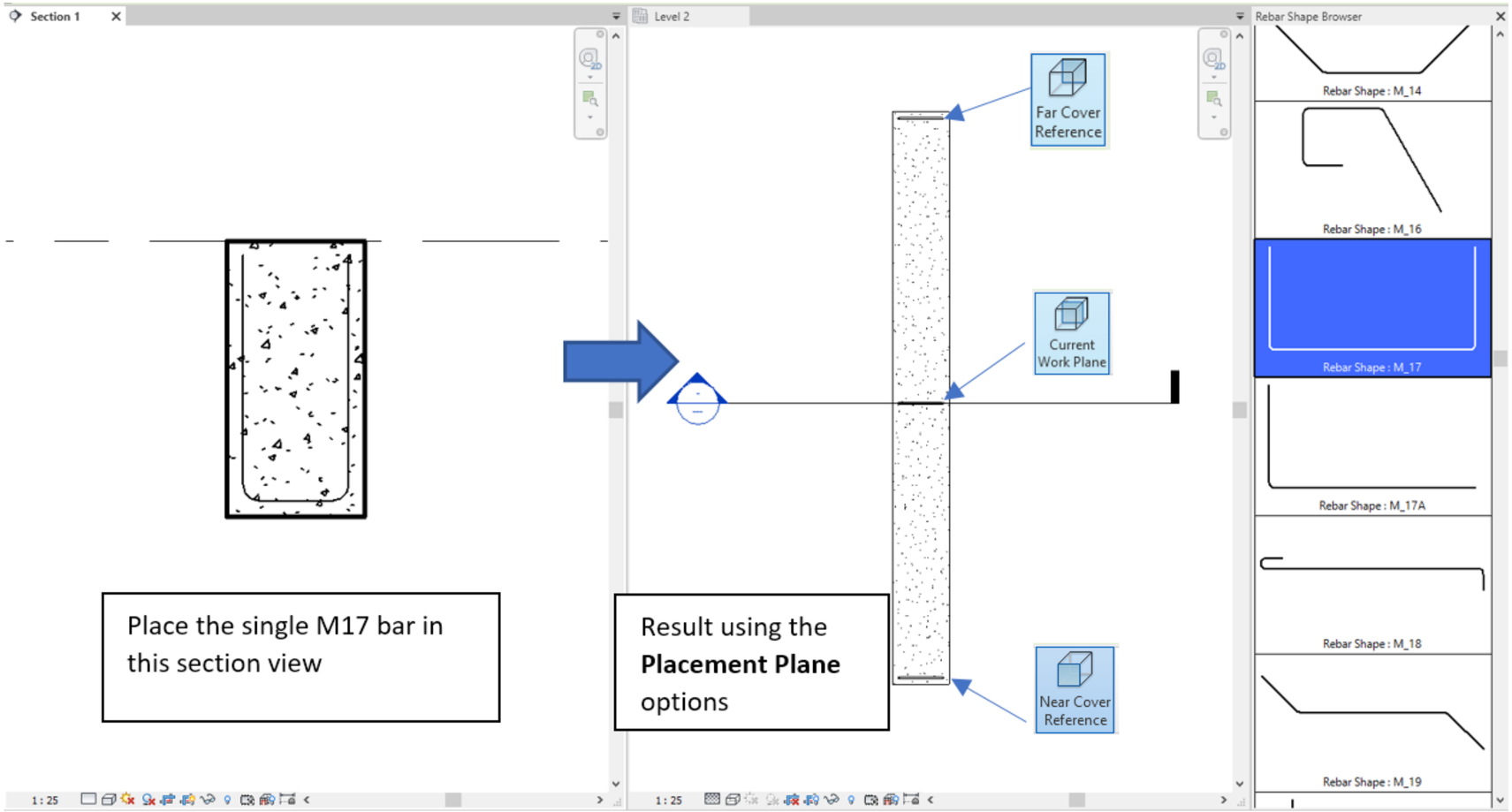


13. Define rebar shapes with attached rebar couplers



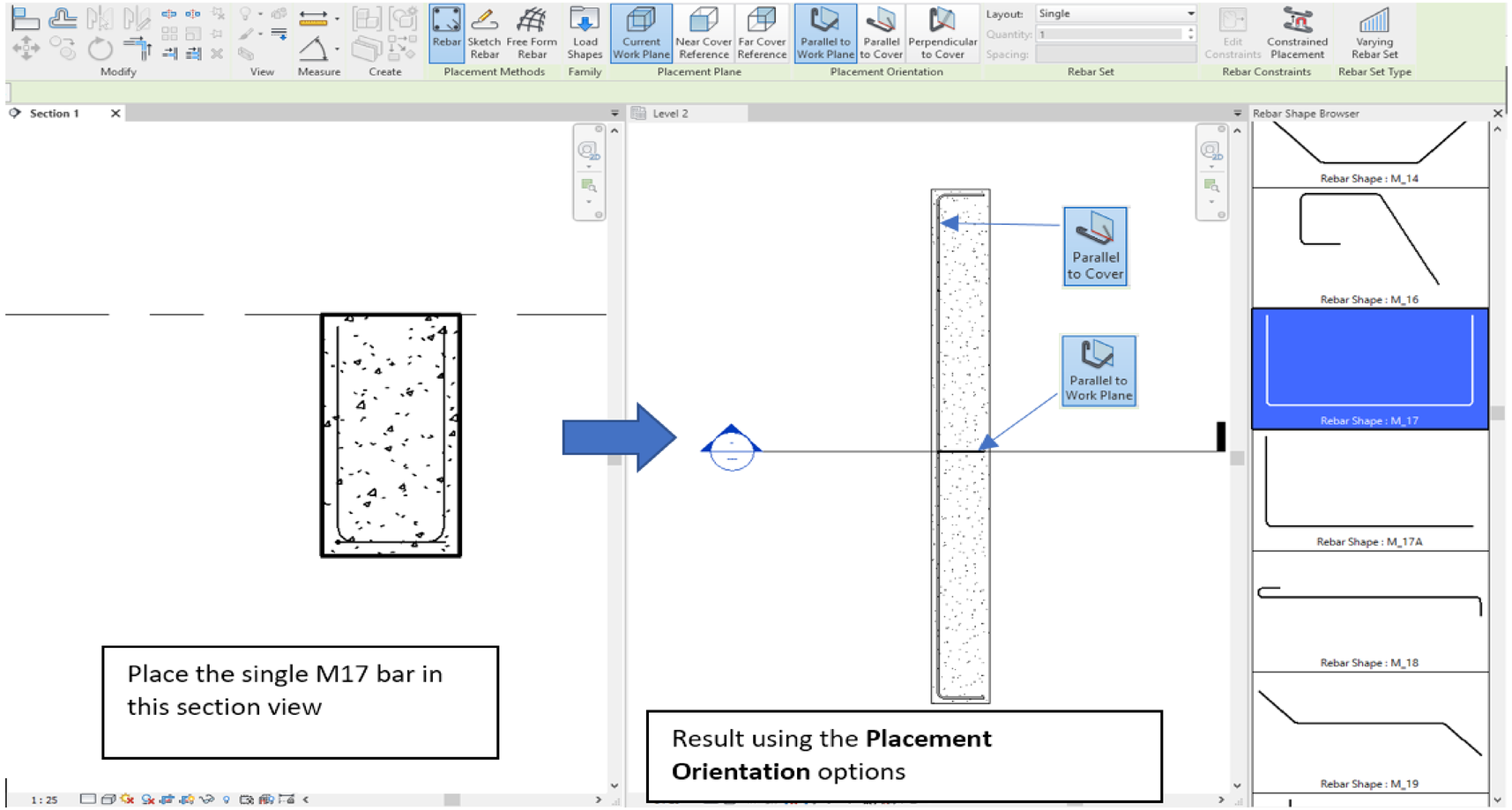
14. Placement Plane and Orientation of shape driven rebar

Placing a single bar in the section view positions within the element according to the placement plane setting



14. Placement Plane and Orientation of shape driven rebar

Placement orientation selects how the bar is positioned in the element with respect to the concrete faces and bar plane



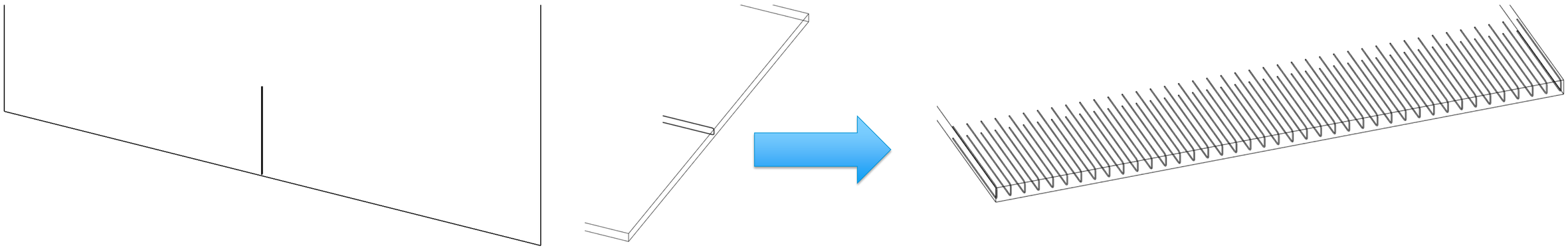
15. Use “Shift” to lock the bar orientation to an element face

Press and hold Shift to keep the bar parallel to the highlighted face

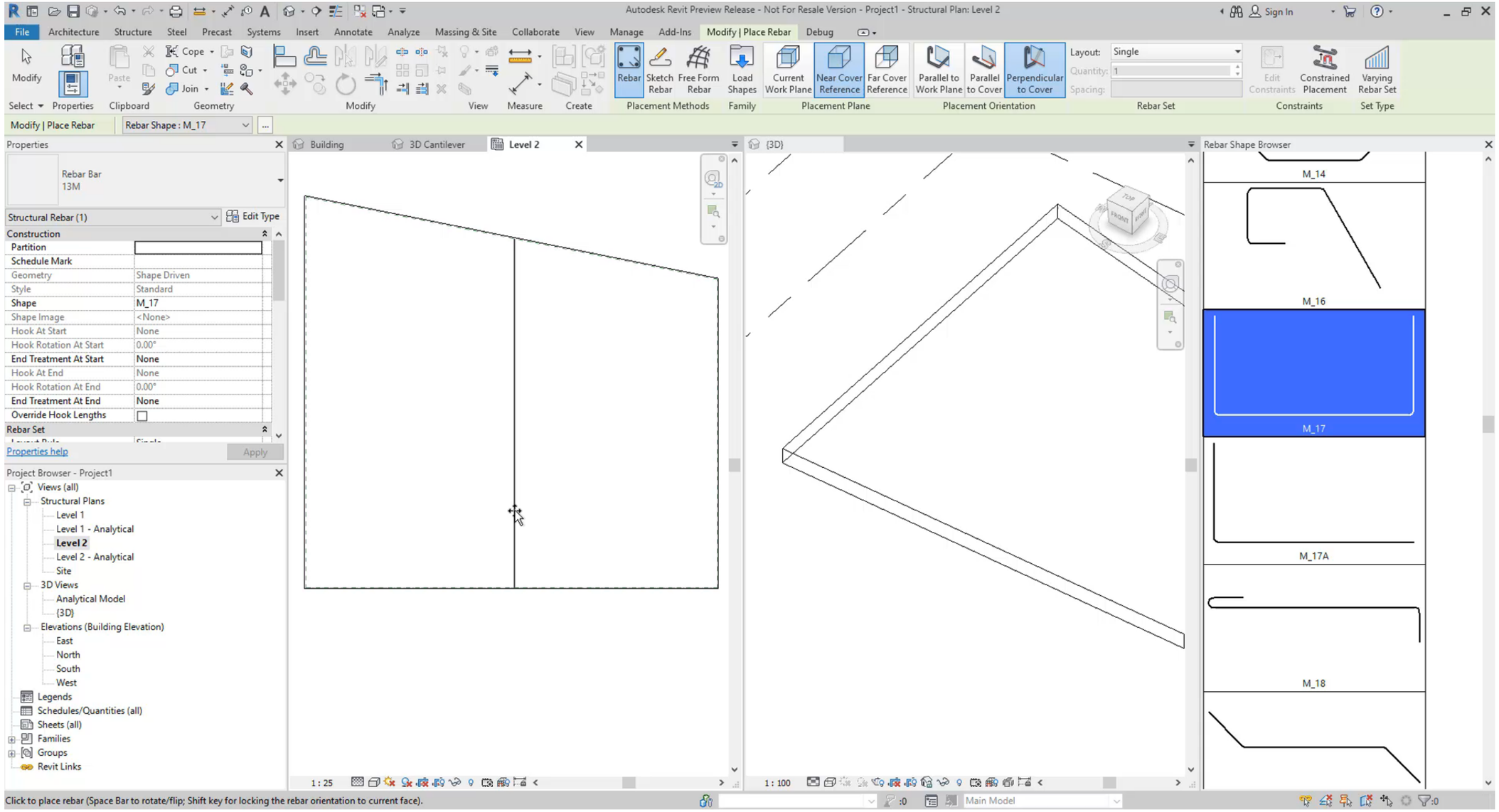
16. Place an inclined distribution in a slab

Use the Varying Rebar Set and constrain both ends to the same inclined edge of the slab

- Place a single bar at the desired angle with respect to a face
- Select the bar and click the Varying Rebar Set option
- Edit the bar constraints and constrain the far end(s) to the same face
- Change the layout to something like Maximum Spacing and adjust the set extents



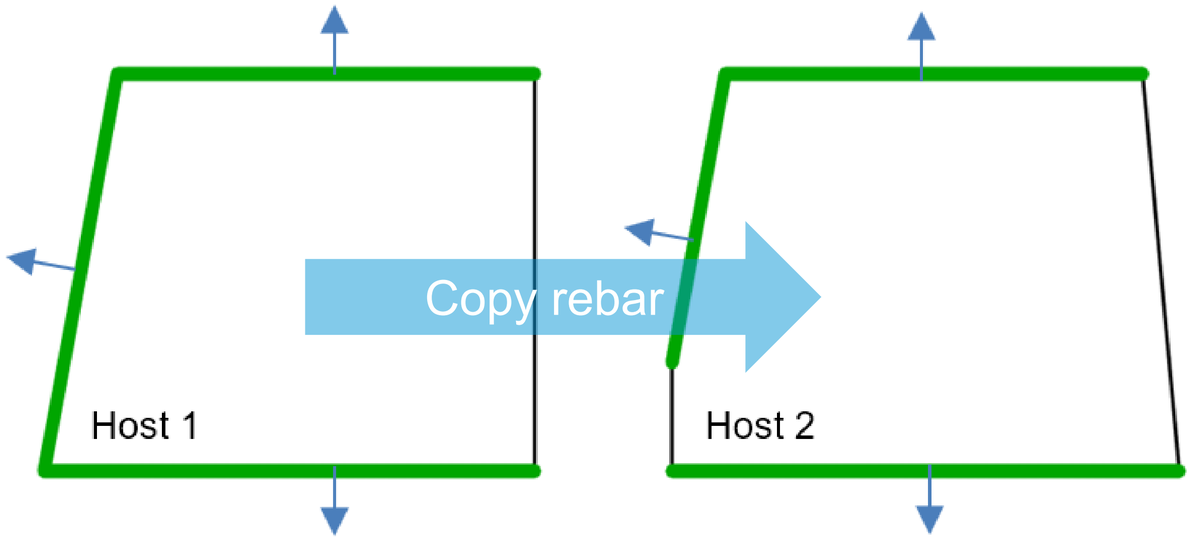
16. Place an inclined distribution in a slab



17. Preserve preferred constraints when copying bars

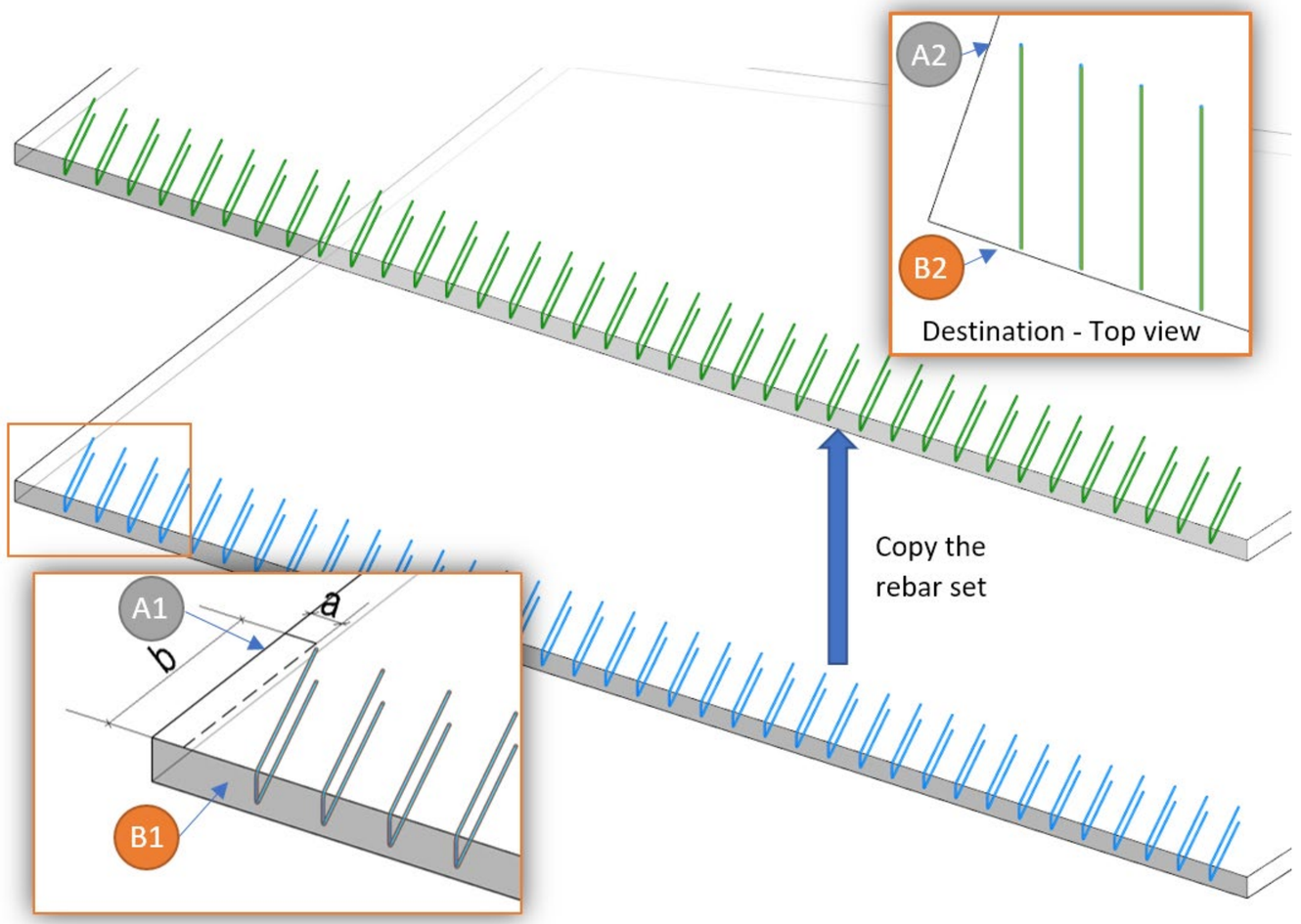
When copying rebar with preferred constraints between two hosts, the constraints are matched to similar faces in the destination host.

- **To set a preferred constraint:**
  - Select a rebar or rebar set > Edit Constraints
  - Select the desired handle and click a new concrete face or change the offset to that face; that handle will now follow that concrete face and not try to find a new target

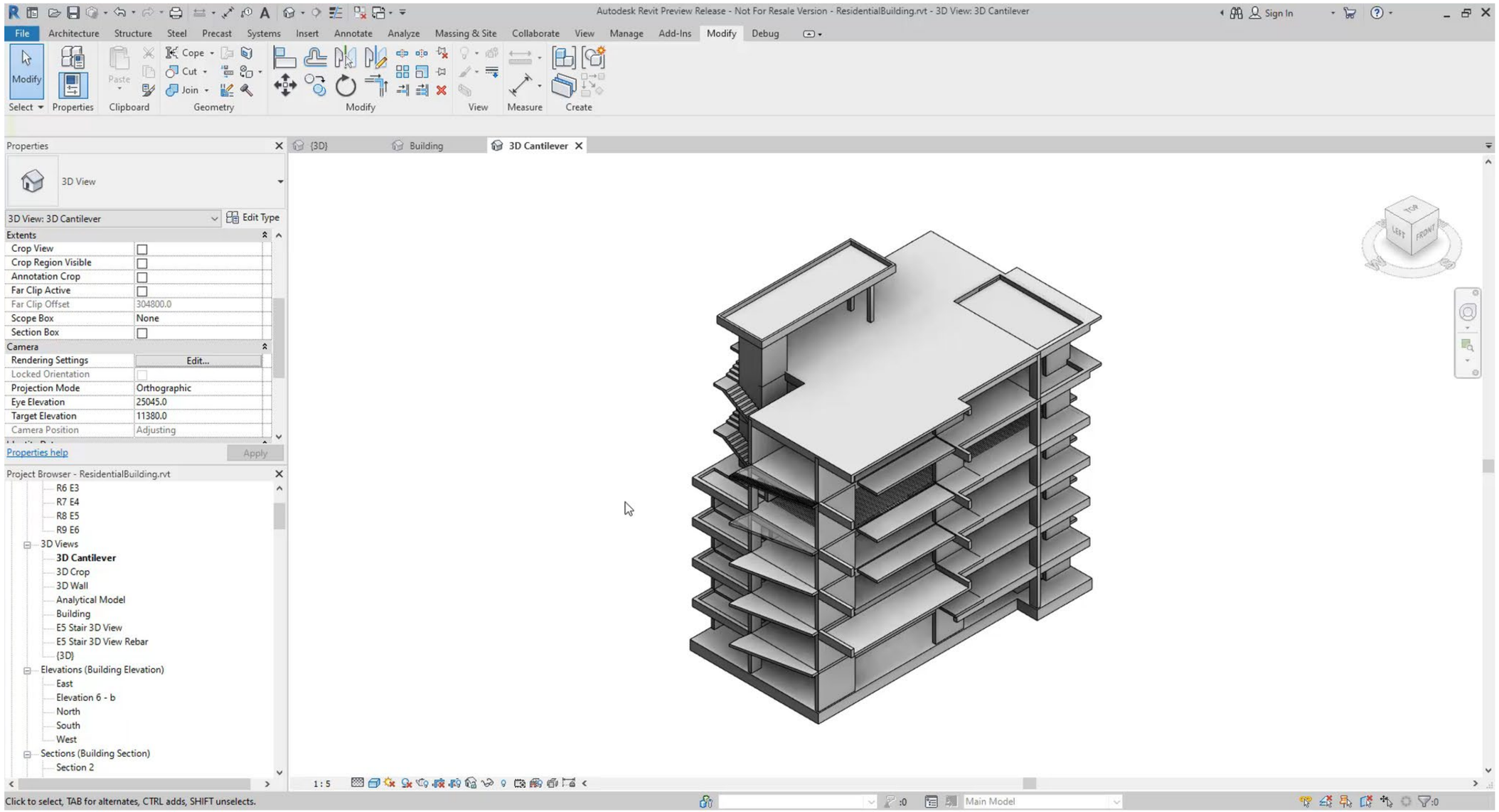


17. Preserve preferred constraints when copying bars

The set is not automatically constrained to the closest face, but finds the matching preferred constraint

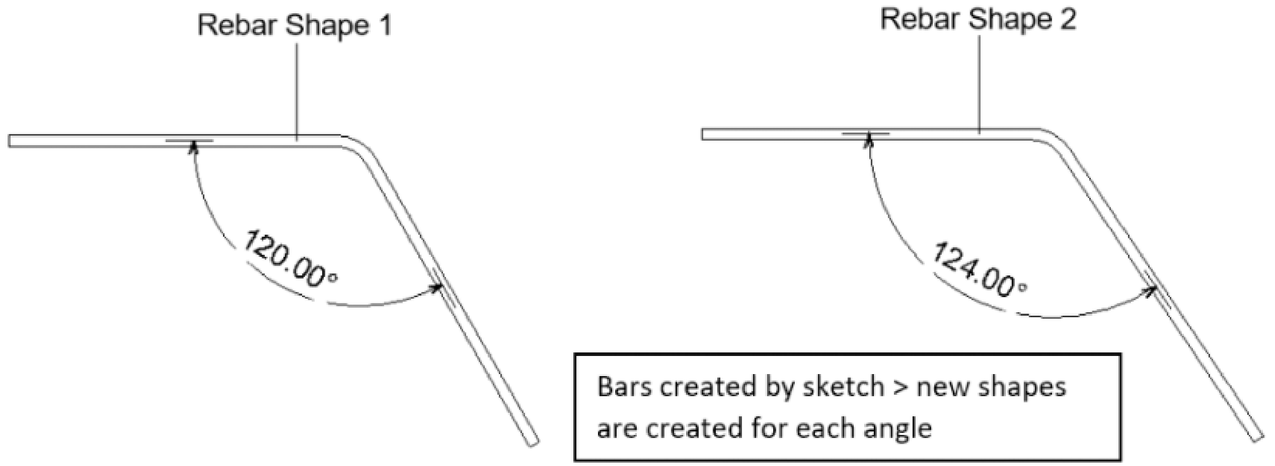


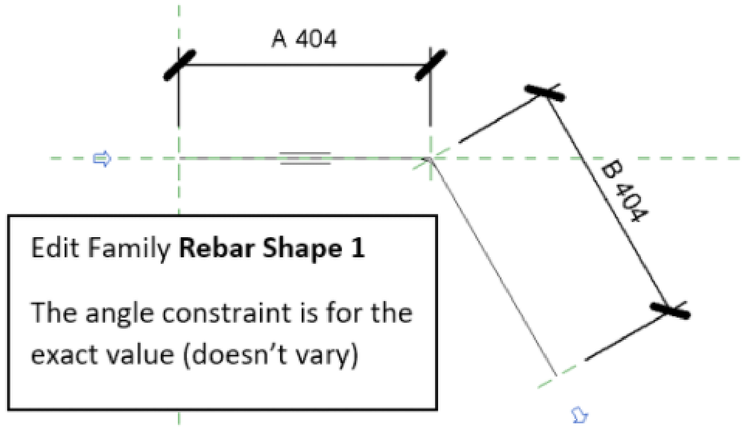
17.Preserve preferred constraints when copying bars



18. Change a shape angle freely

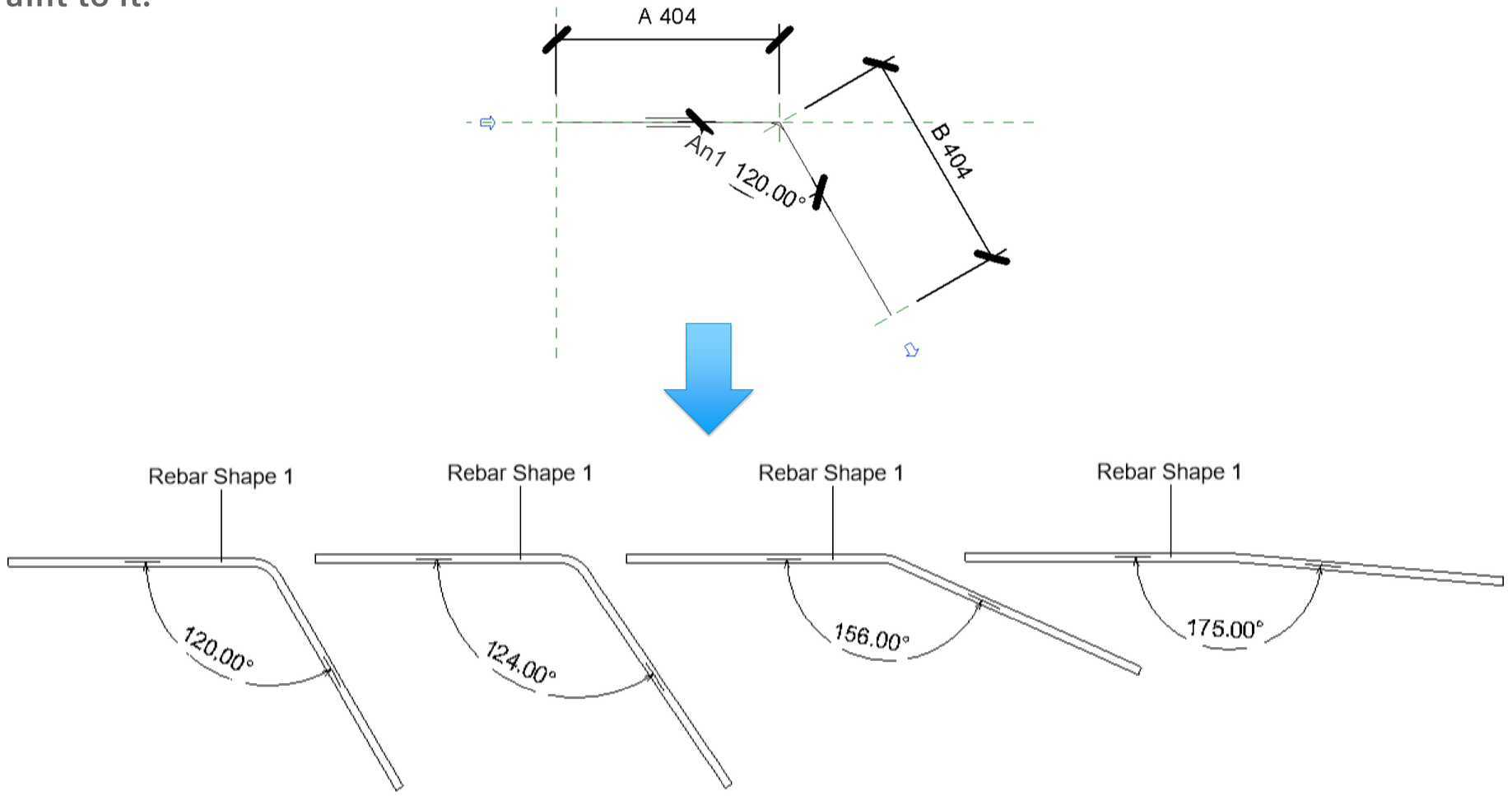
Rebar shapes have internal constraints that keep segments at an angle, so small variations will produce new shapes



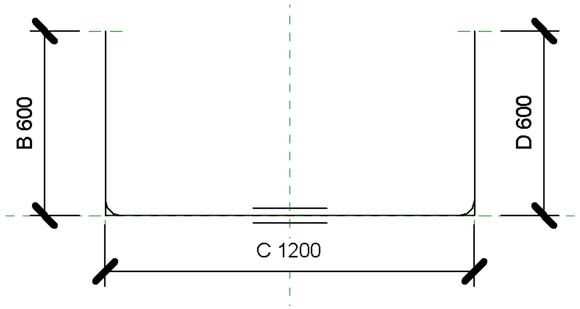


18. Change a shape angle freely

To make sure that the segment moves freely from 0 to 90 deg or 90 to 180 deg, you need to assign an angle constraint to it.



19. Define a formula to compute the bar length for a given shape

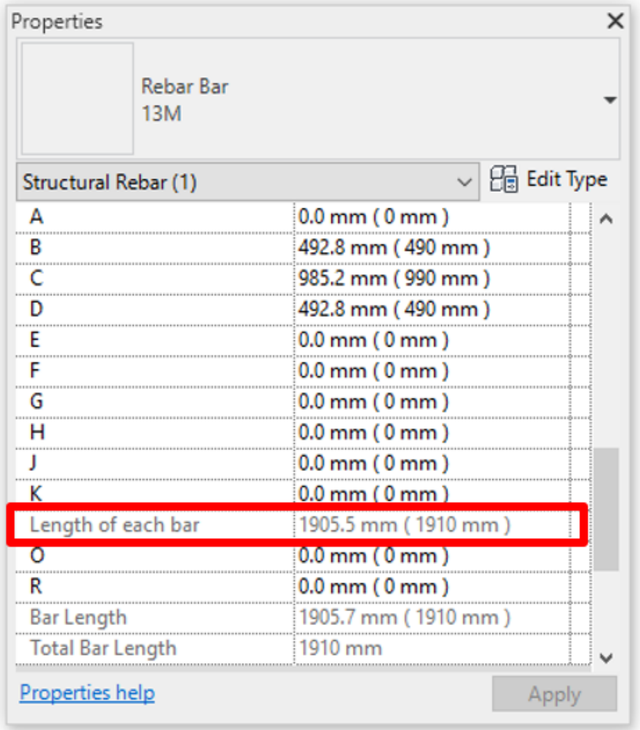


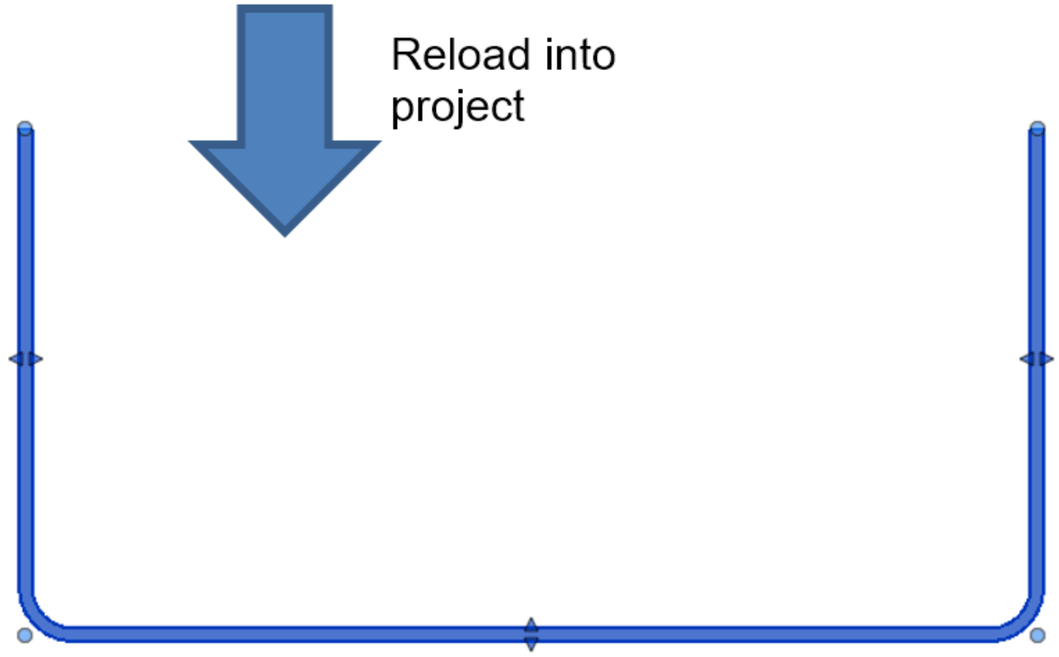
Rebar Shape Parameters

Search parameters

Parameter	Value	Formula
End Tangent Hook Length (default)	115.0 mm	=
End Hook Offset Length (default)	80.0 mm	=
End Hook Length (default)	115.0 mm	=
Bend Diameter (default)	100.0 mm	=
Bar Diameter (default)	10.0 mm	=
Dimensions		
R (default)	0.0 mm	=
O (default)	0.0 mm	=
Length of each bar (default)	2470.0 mm	= B + C + D - Bend Diameter / 2 - 2 * Bar Diameter
K (default)	0.0 mm	=
J (default)	0.0 mm	=

19. Define a formula to compute the bar length for a given shape

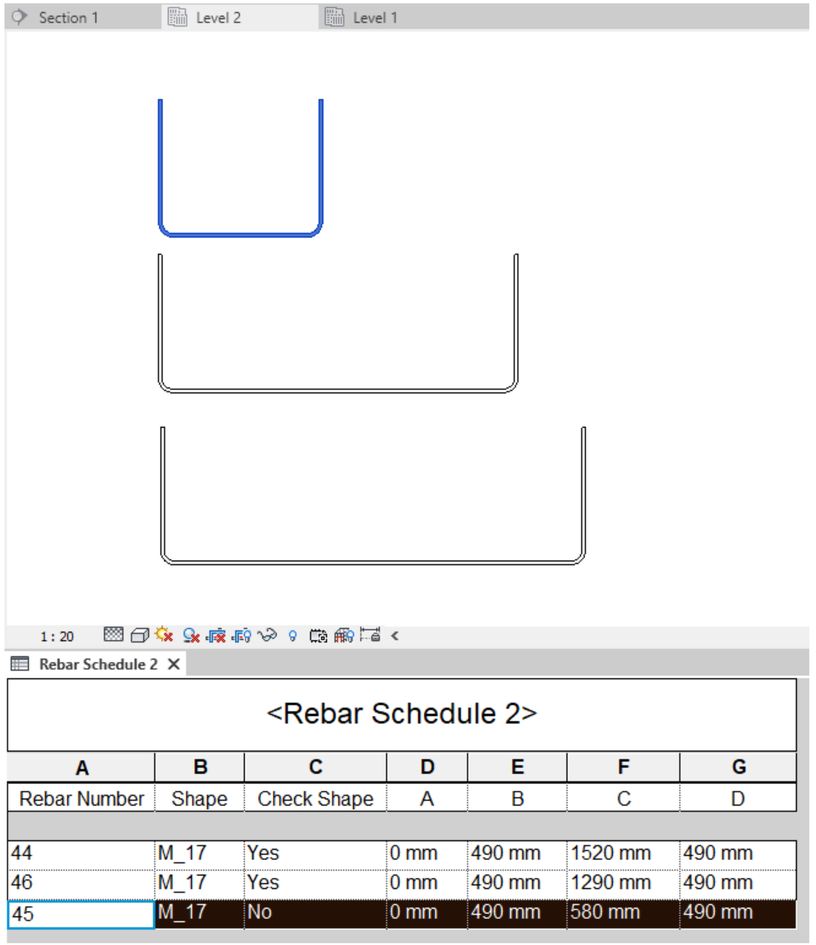




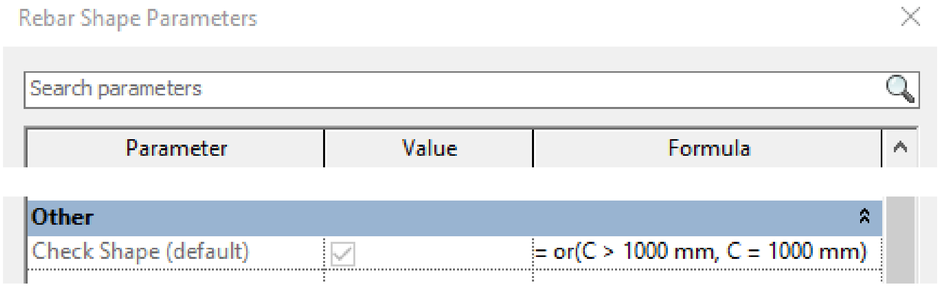
20. Check bar segment lengths

Ensure each bar has a minimum or maximum length of each segment, total bar length or other combination by adding a check for each rebar shape family in the project

- Edit the shape family
- Define a yes/no shared parameter called Check Shape
- Add a formula to check if C is greater than or equal to 1.0 m
- We can write this as “OR (C > 1 m, C = 1 m)”
- Load into project and overwrite
- Use a schedule to check each bar

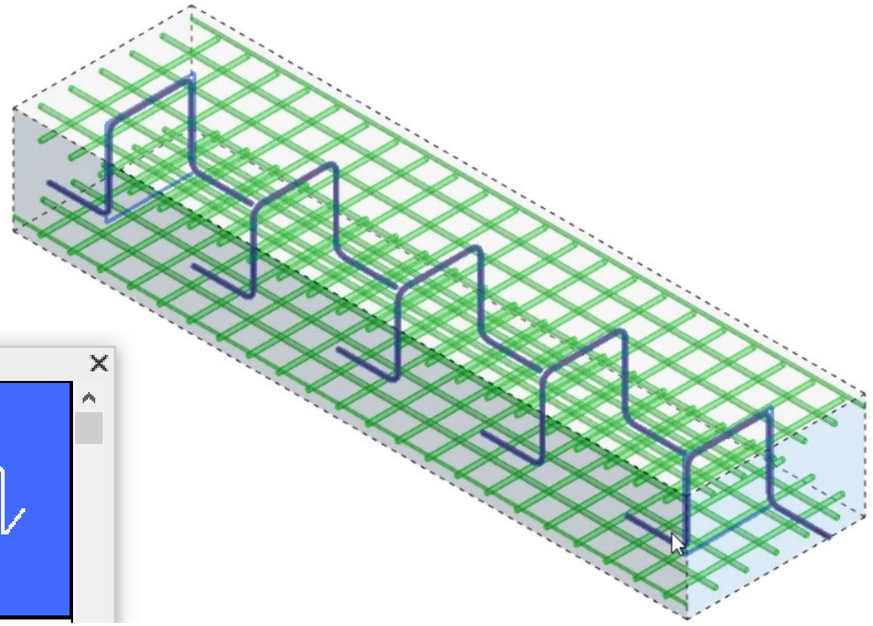


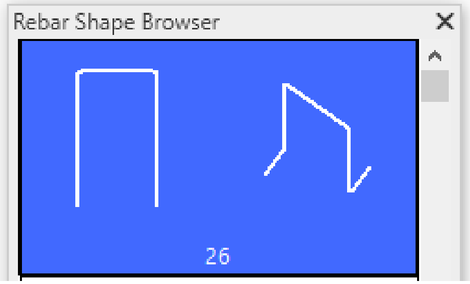
A	B	C	D	E	F	G
Rebar Number	Shape	Check Shape	A	B	C	D
44	M_17	Yes	0 mm	490 mm	1520 mm	490 mm
46	M_17	Yes	0 mm	490 mm	1290 mm	490 mm
45	M_17	No	0 mm	490 mm	580 mm	490 mm



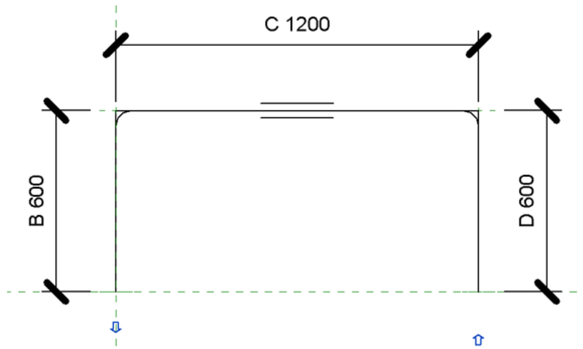
21. Create a rebar chair by rotating hooks

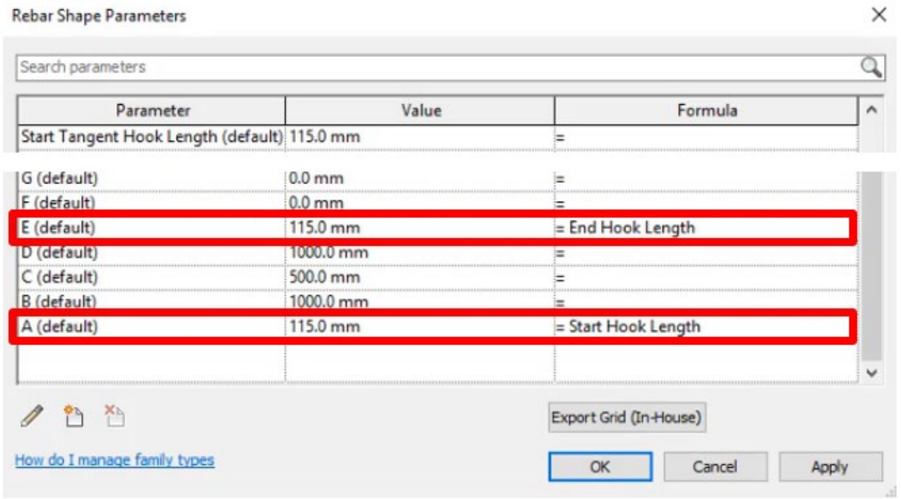
- Create a U shape bar, by sketching or placing an existing shape
- Add 90 deg hooks at each end
- Rotate one hook to 90 degrees and the other to 270 degrees



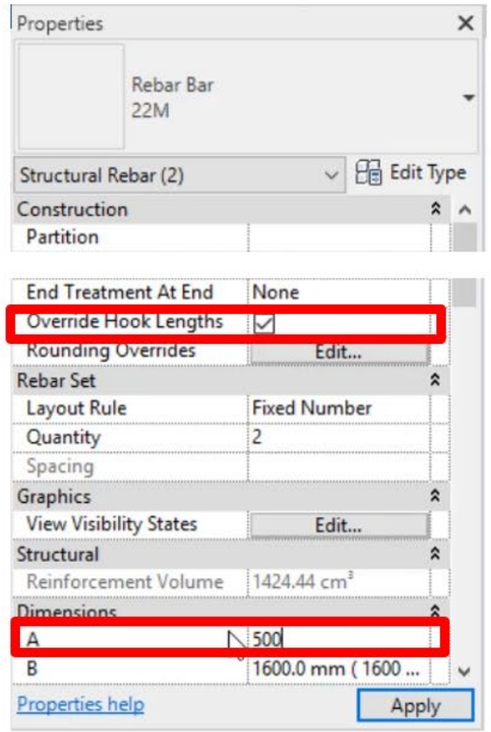


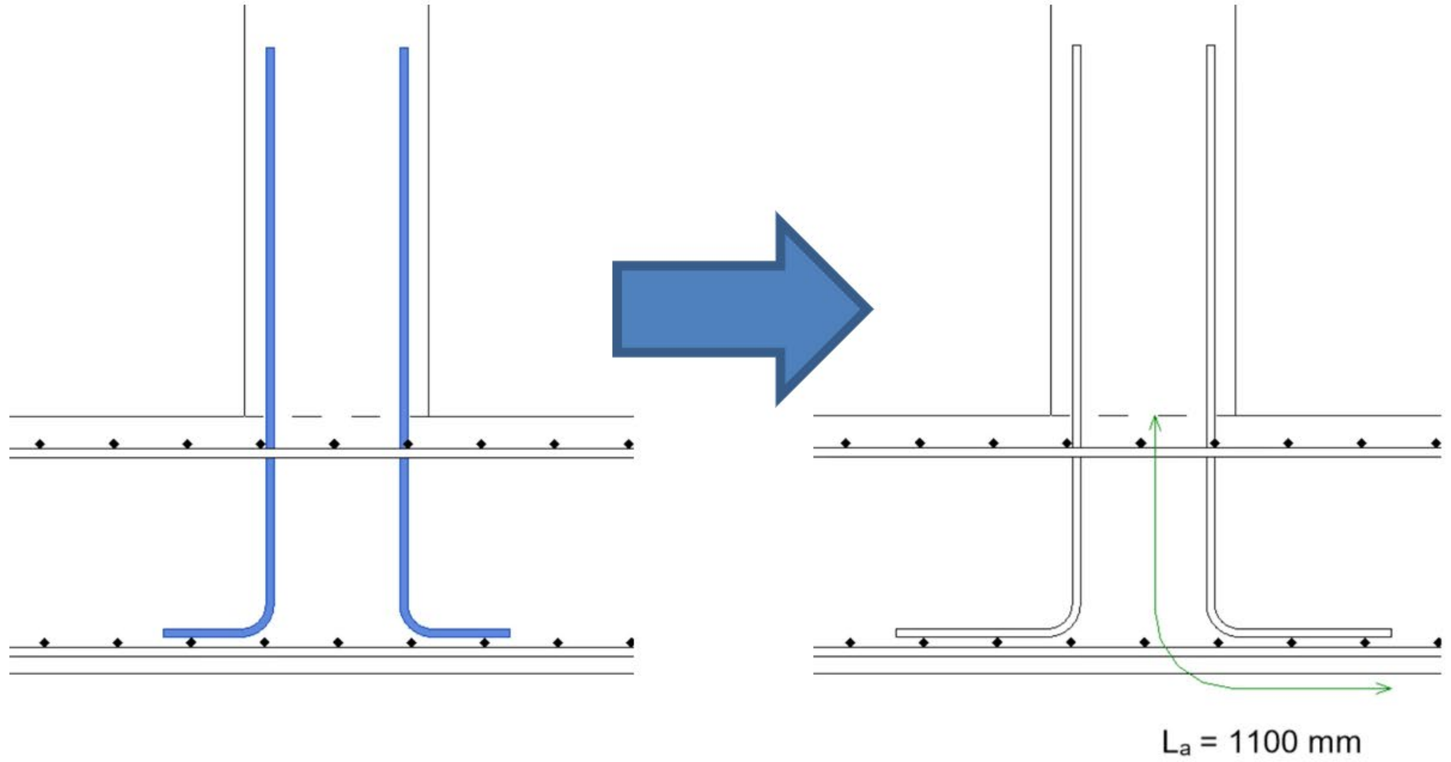
- Configure the parameters reporting the hook lengths by editing the shape family



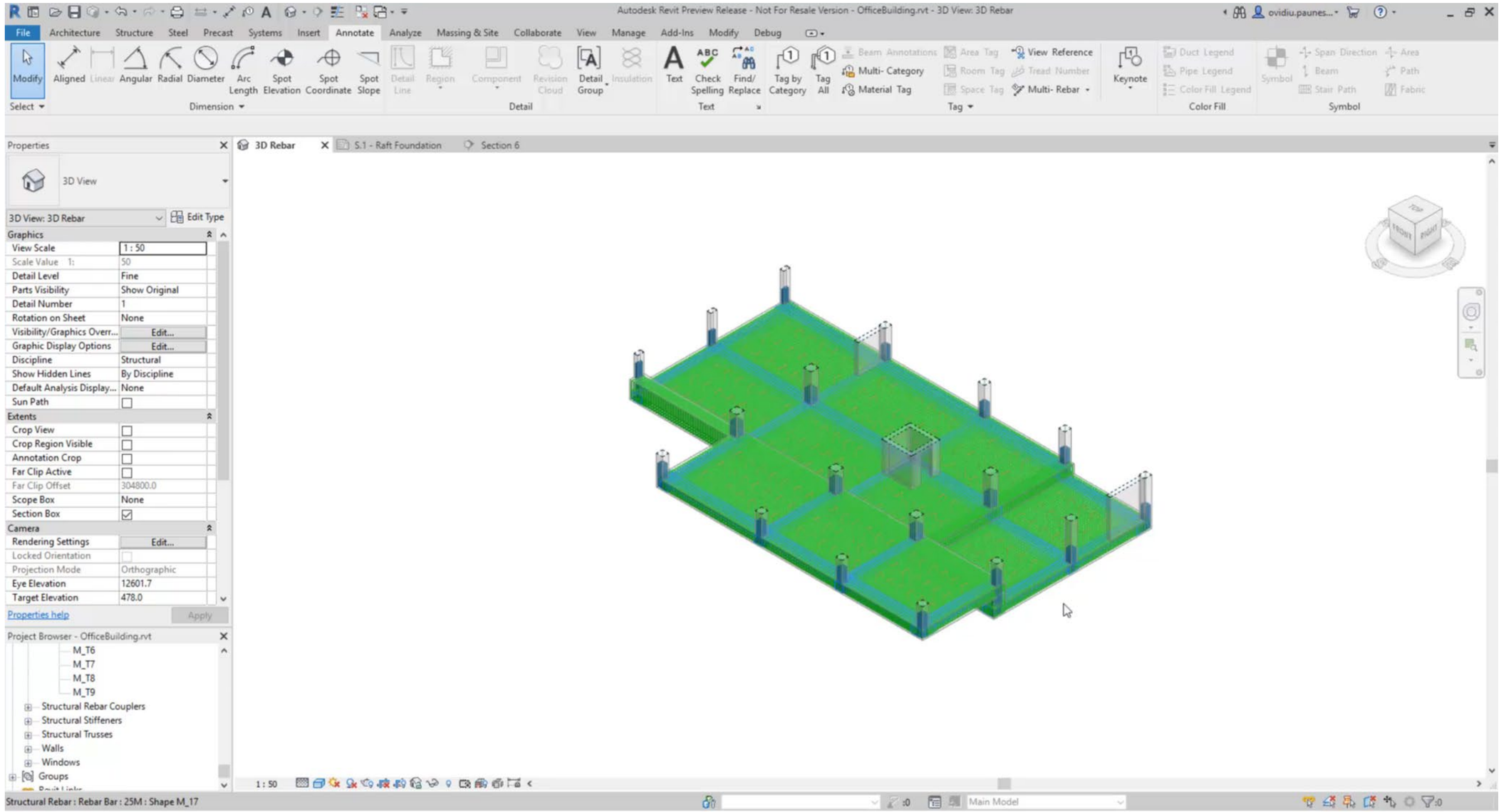


22. Override hook lengths by instance



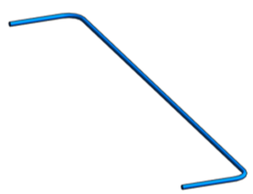
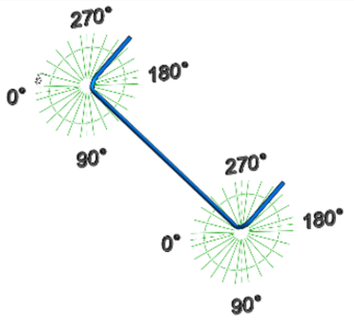
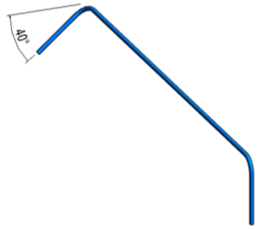
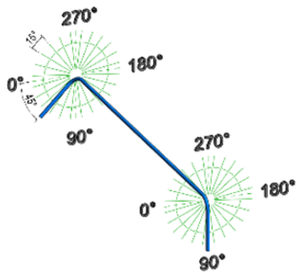


22. Override hook lengths by instance

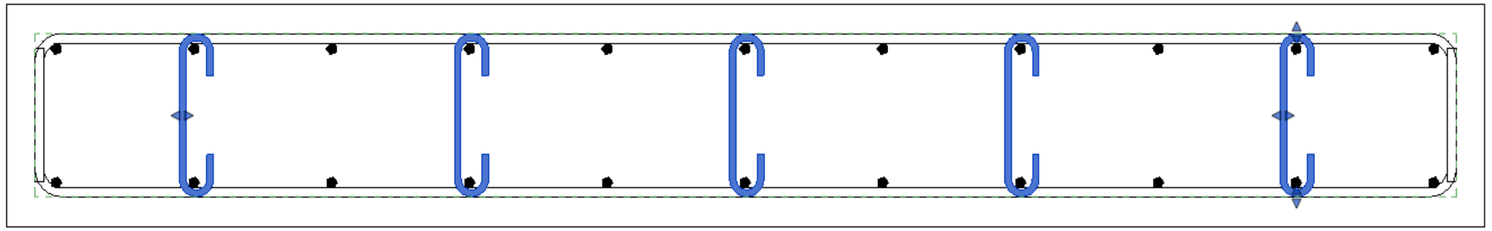


23. Hook rotations and rebar shape matching

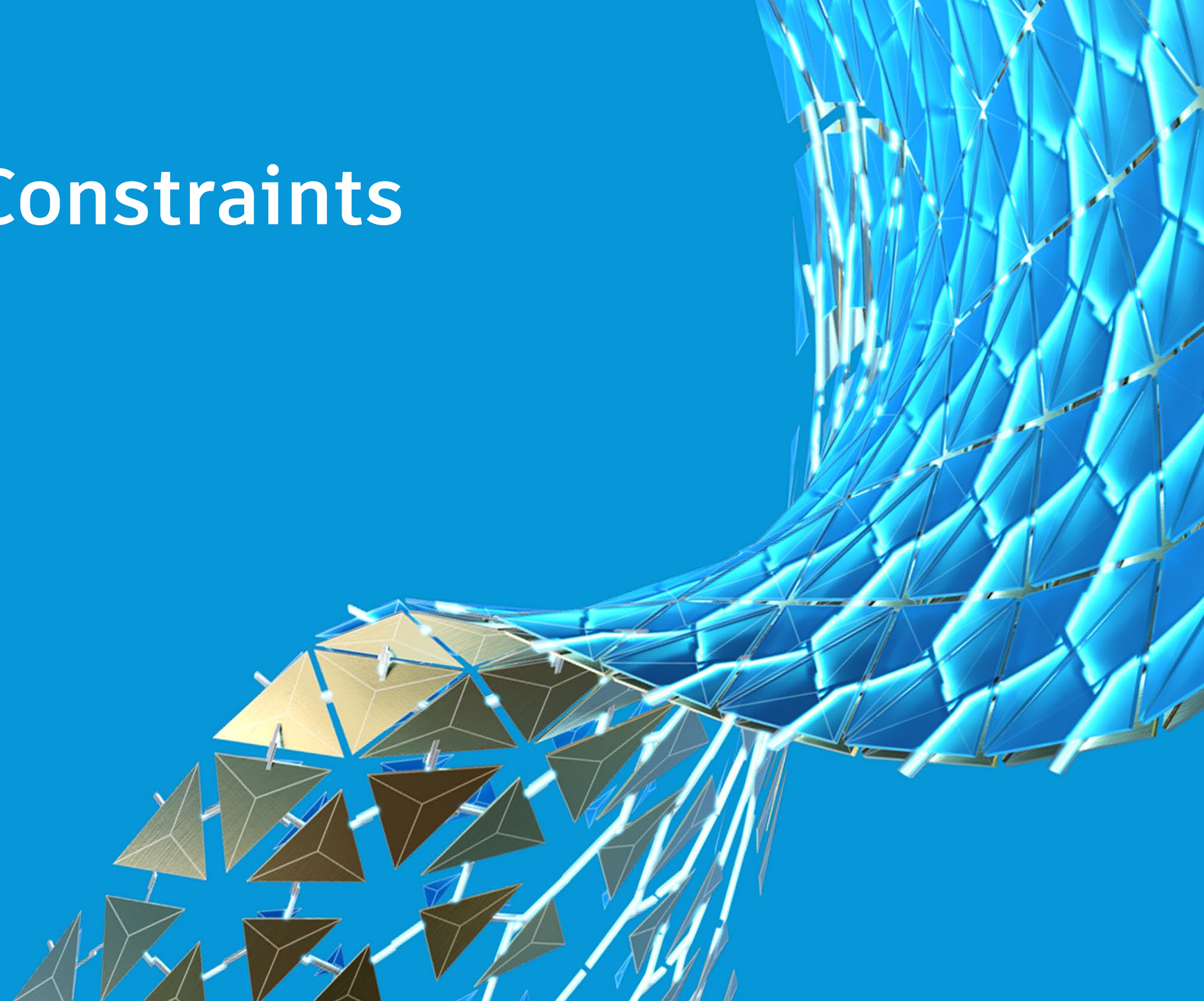
- A new shape is created at each 15-degree interval, unless the hooks have the same rotation
- The Rebar Number is updated for each change of the rotation

				
Rebar Number	1	1	3	4
Shape	02	02	Rebar Shape 1	Rebar Shape 1
Hook Rotation at Start	0°	230°	40°	45°
Hook Rotation at End	0°	230°	90°	90°

- **Example** – Wall ties to the vertical bars (hooks rotated 90 deg)

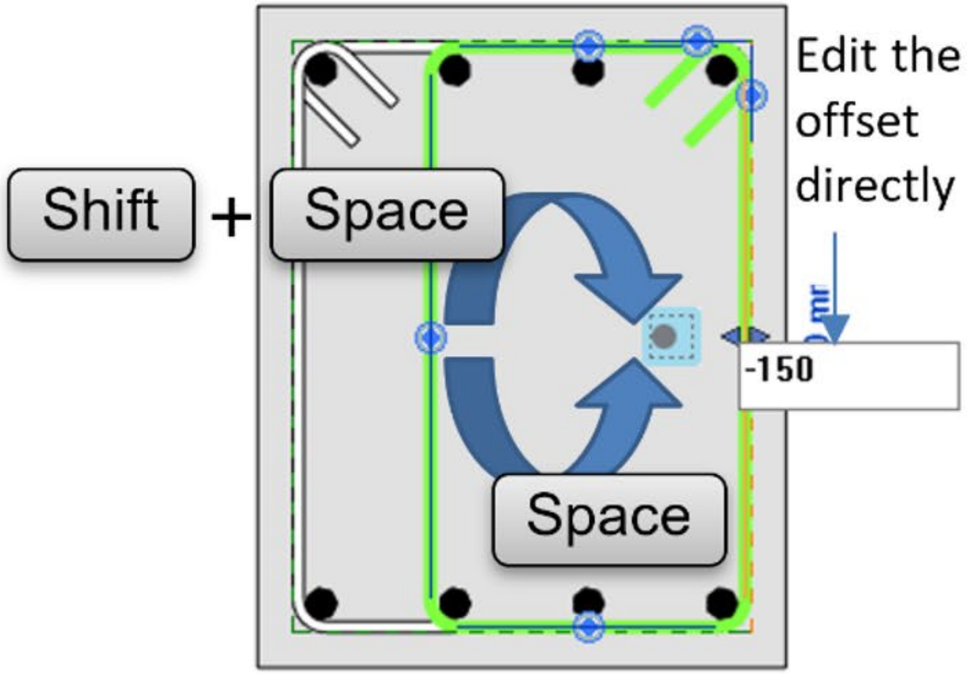


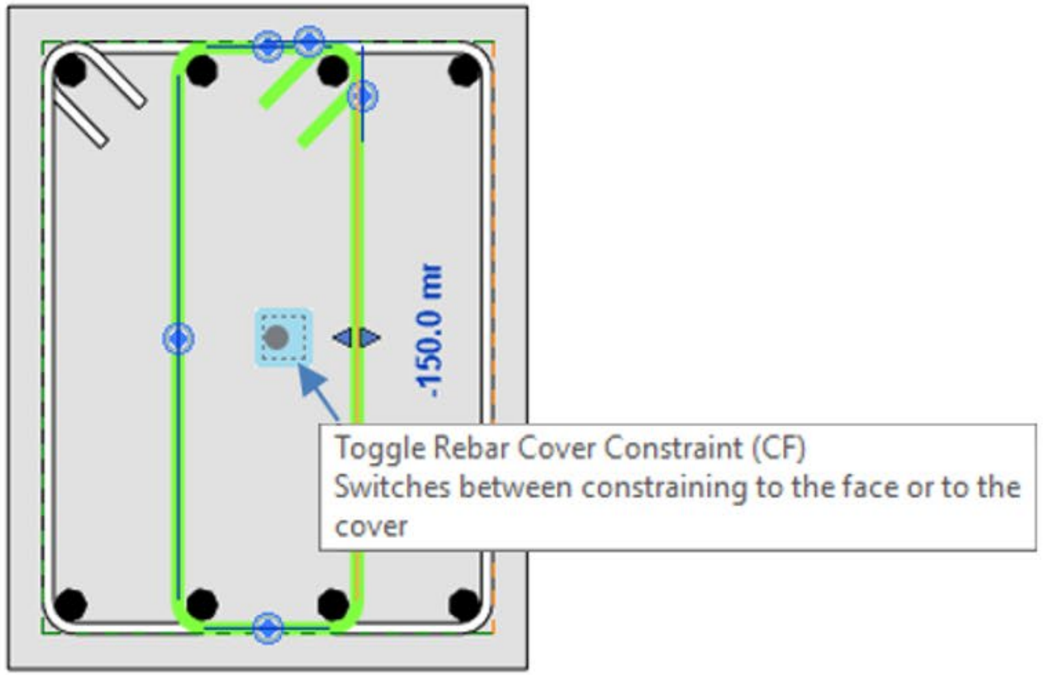
Edit Rebar Constraints



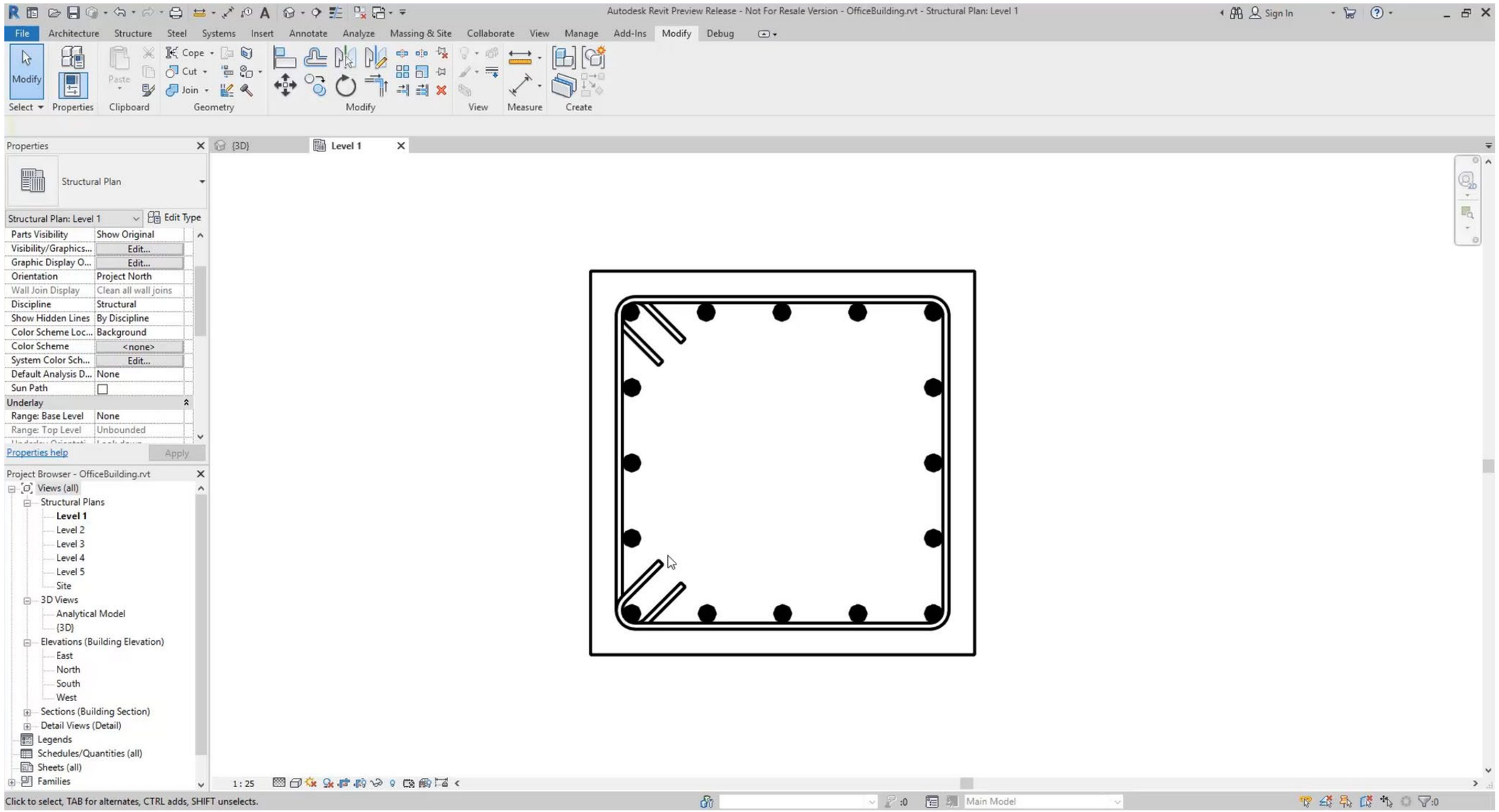
24. Navigate rebar constraints editing faster

- Space bar to cycle between the visible handles (Shift + Space cycles the opposite way),
- Enter to Finish editing. Esc to Cancel
- Shortcut keys for controls (e.g. Cover or face – CF)
- Direct input of offset





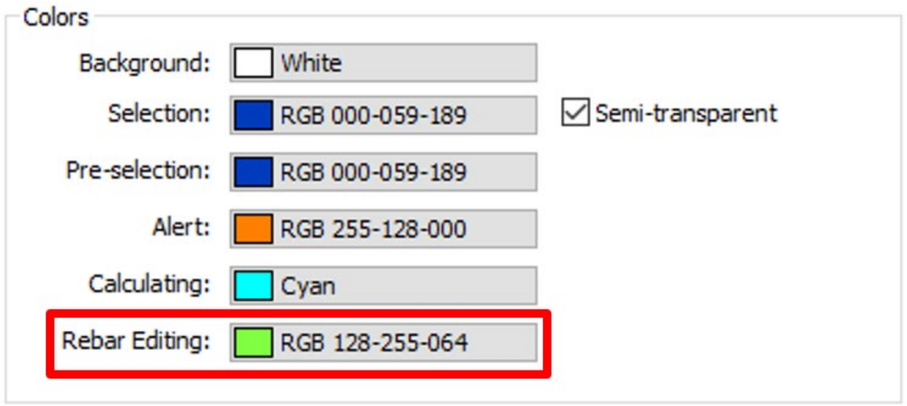
24. Navigate rebar constraints editing faster



25. Change the highlight color of the edited bar during Edit Constraints

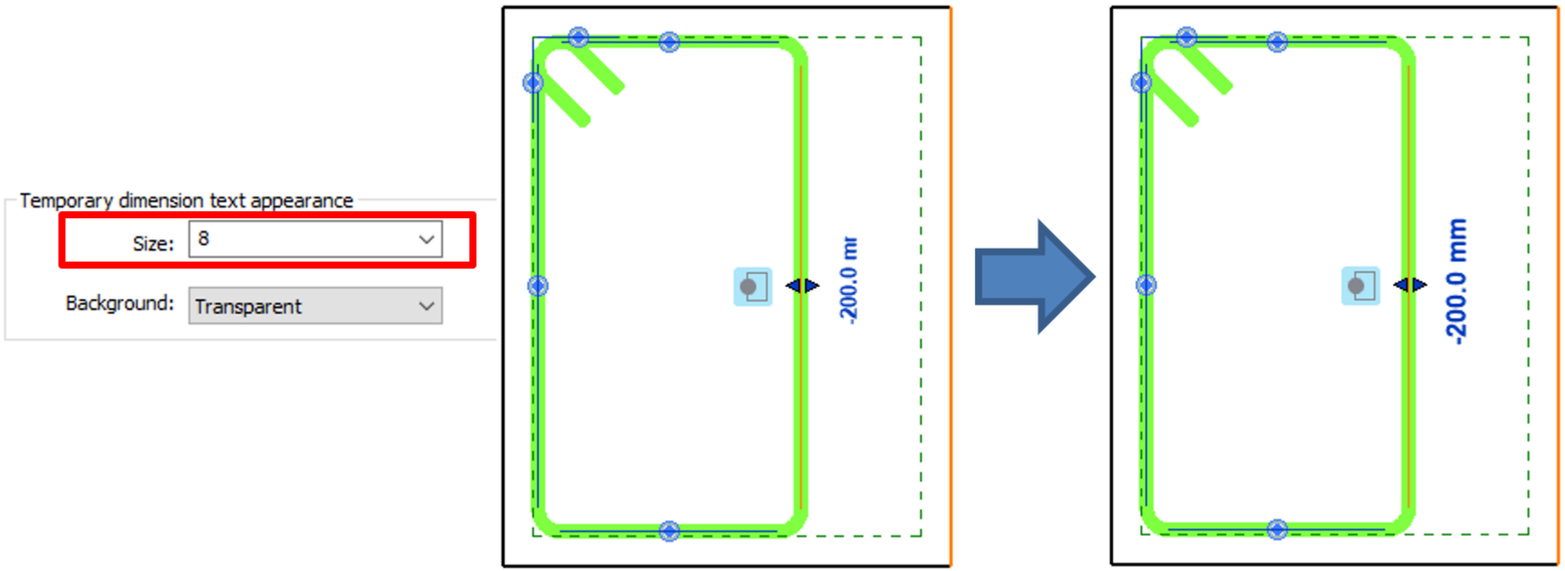
Go to Application menu > Options > select Graphics > Colors panel > Rebar Editing

The default color is Green RGB 128-255-064 and it's stored in Revit.ini

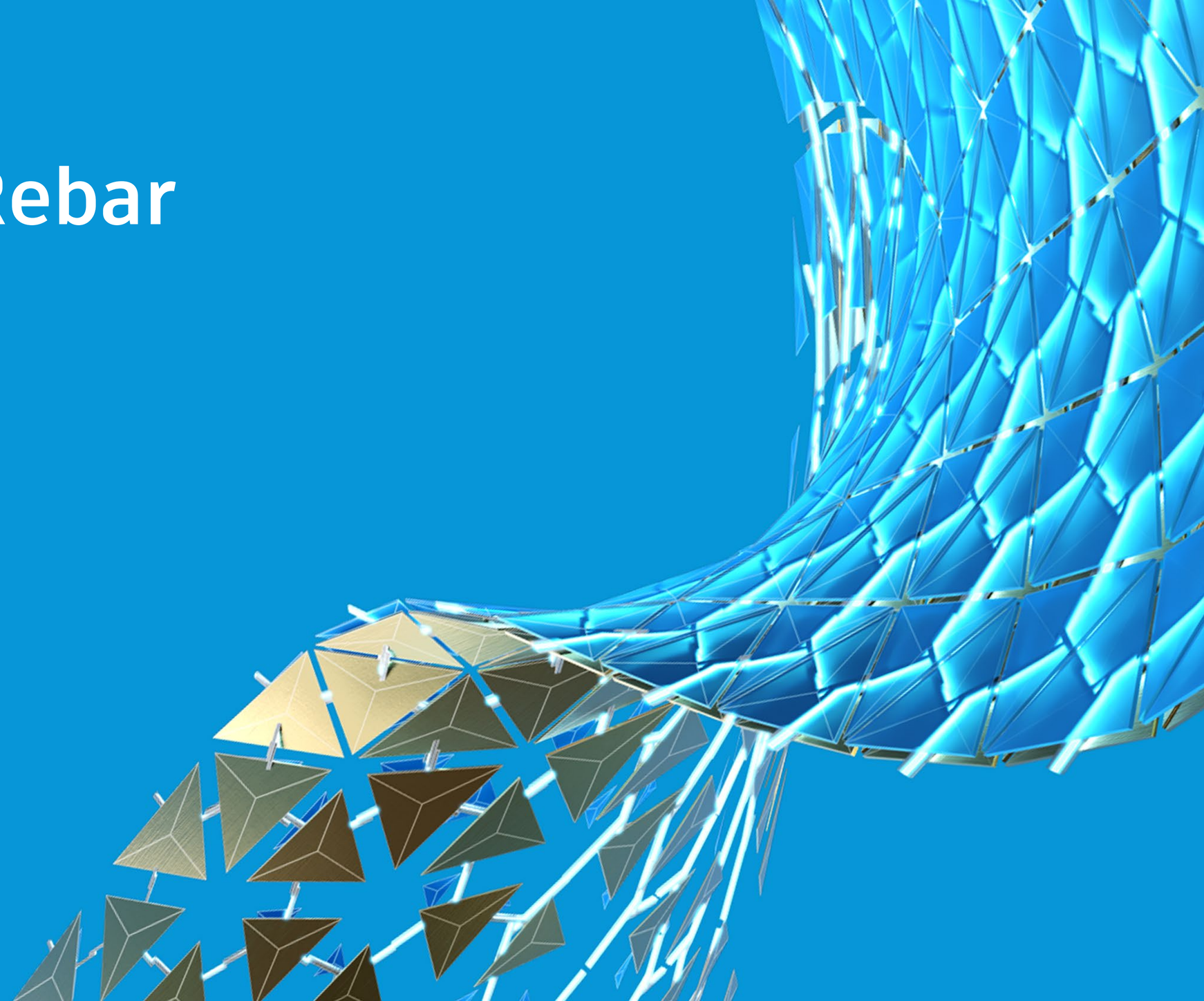


26. Change the text size of the offset control during Edit Constraints

Application menu > Options > select Graphics > Temporary dimension text appearance panel



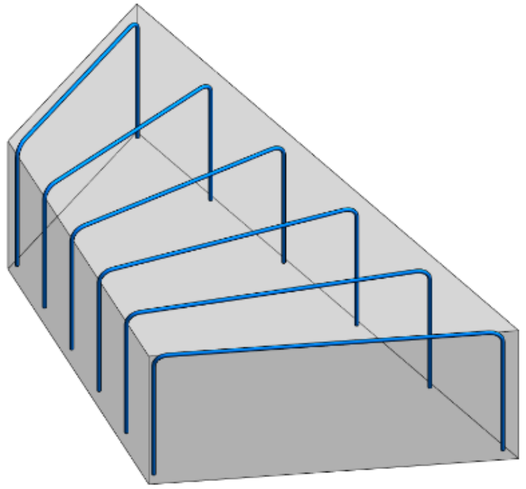
Free Form Rebar

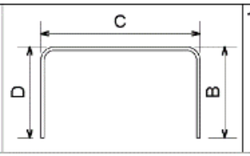


27. Matching free form rebar to regular rebar shapes

You can specify if a free form bar will be bent in the shop by changing its Workshop Instructions parameter to Bend.

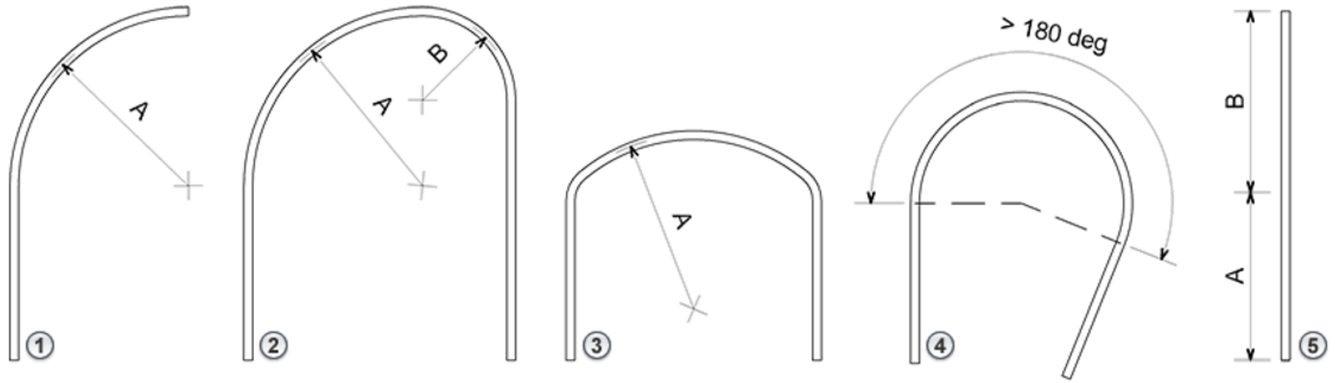
- You can edit the segment length parameters (A, B, C) of the matched rebar shape by locating the shape in the Project Browser, edit the shape family and assign the desired parameters.



Rebar Schedule									
Rebar Number	Type	Workshop Instructions	Shape	Quantity	Bar Length	Shape Image	B	C	D
1	25M	Bend	M_17	6	3530 mm ... 4410 mm		1110 mm	1450 mm ... 2320 mm	1110 mm

27. Matching free form rebar to regular rebar shapes

The free form bar will revert to Keep Straight if the bar geometry of at least one bar in the set does not follow the rebar shape family rules outlined below

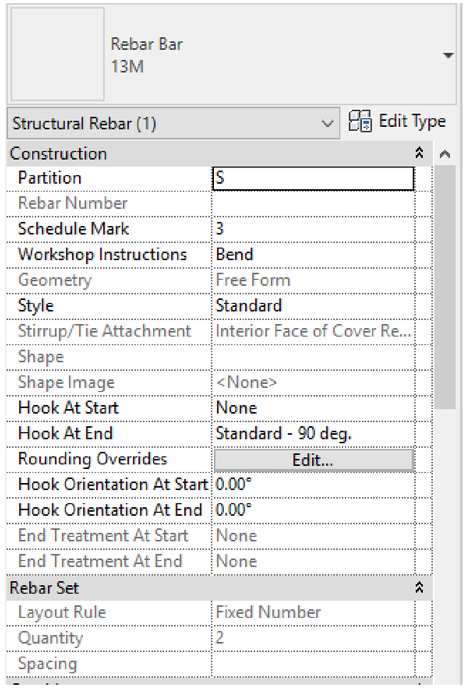


Geometry that is not allowed in rebar shape families:

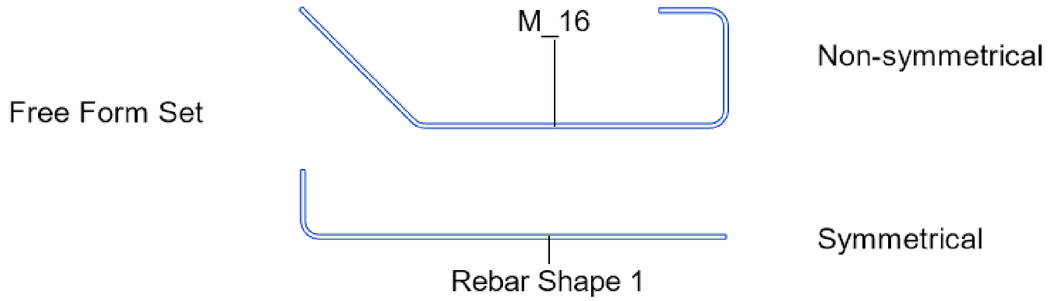
① Shaped ending in an arc.
② Consecutive arcs.
③ Arcs not tangent to adjacent segments.
④ Arcs greater than 180 degrees between adjacent segments.
⑤ Almost collinear adjacent segments.

28. One set, many different shapes

Free form bars in the same set can match to different rebar shapes.



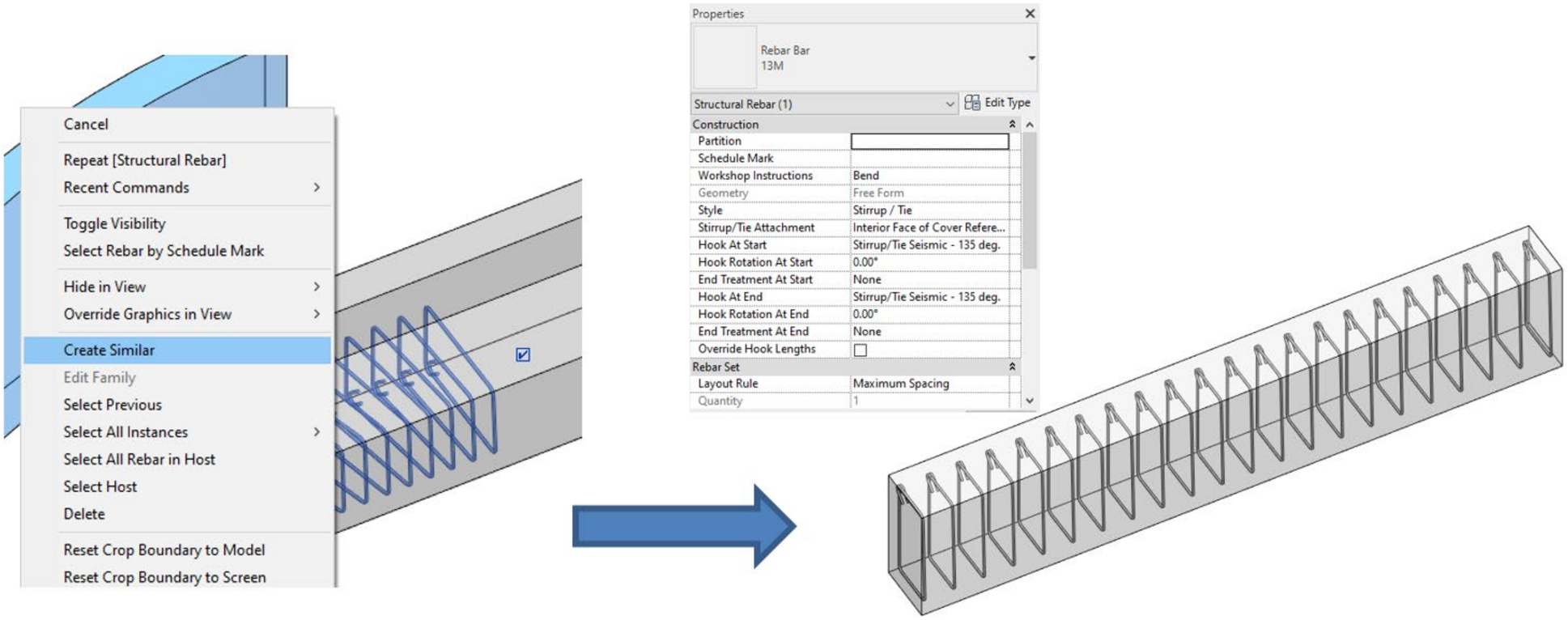
Hooks		
Shape	Hook At Start	Hook At End
M_16	None	Standard - 90 deg.
Rebar Shape 1	Standard - 90 deg.	None



29. Create Similar with all options for free form rebar

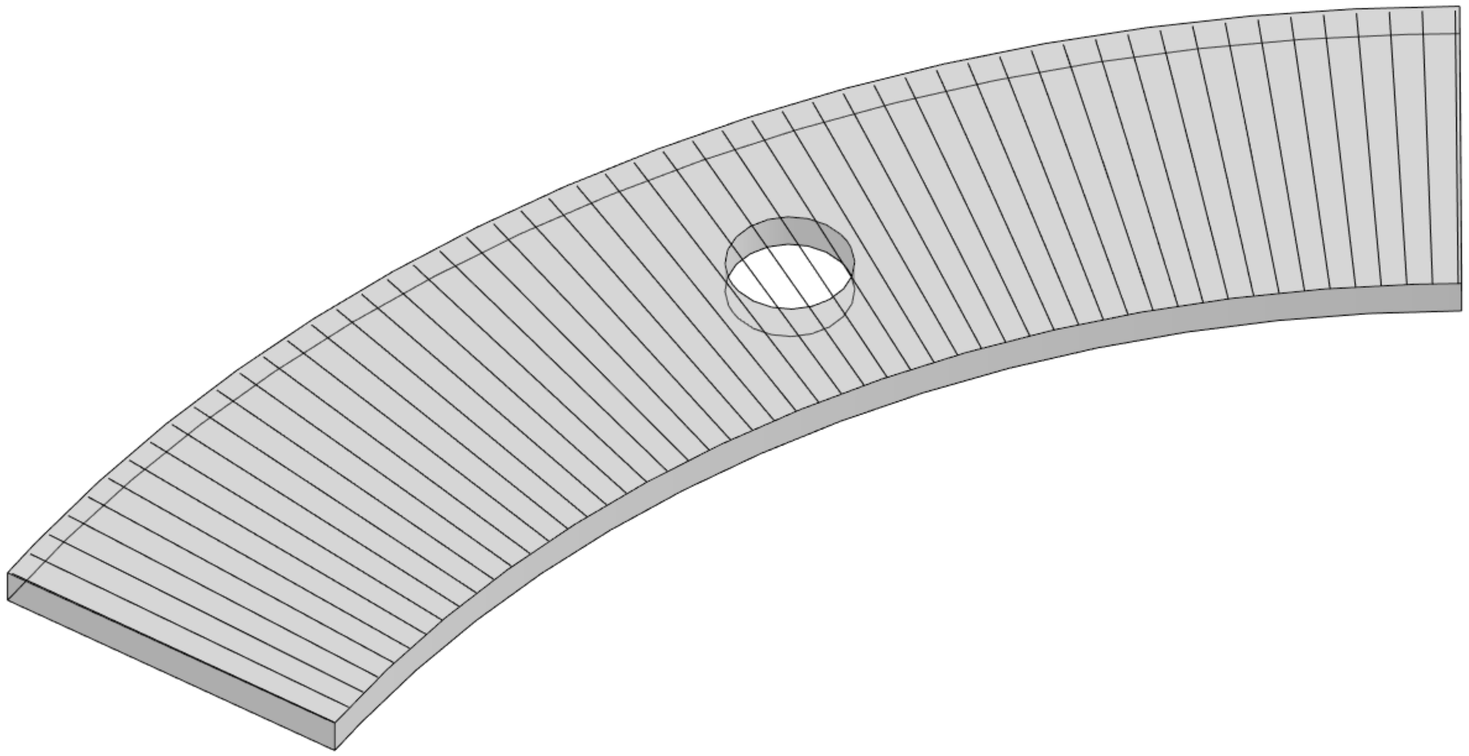
Select a free form rebar set > Create Similar

- All options are set for the new bar – Distribution type (Surface or Aligned), Rebar Type, Set Layout, Hooks



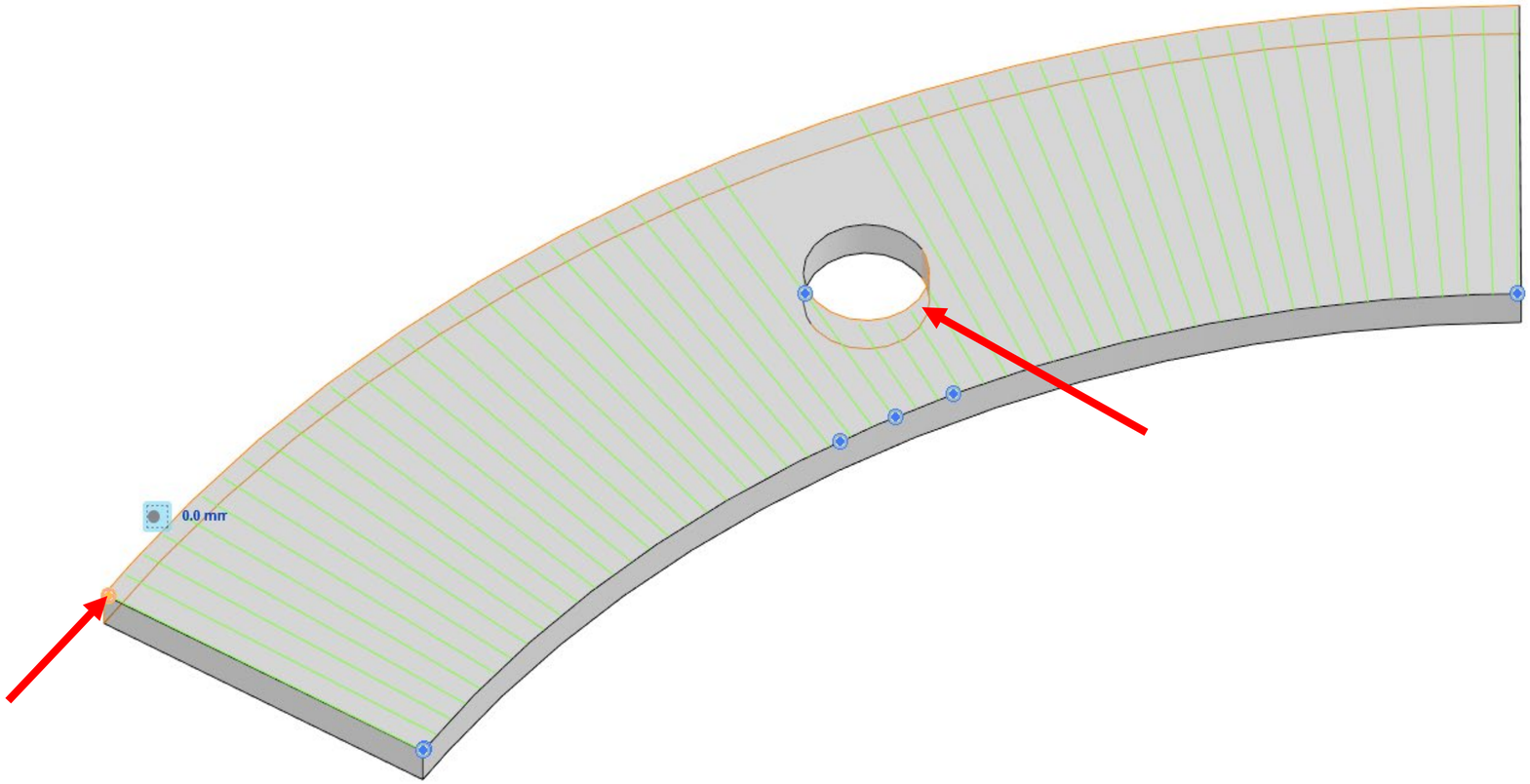
30. Free form rebar and openings

By default free form bars go through openings.



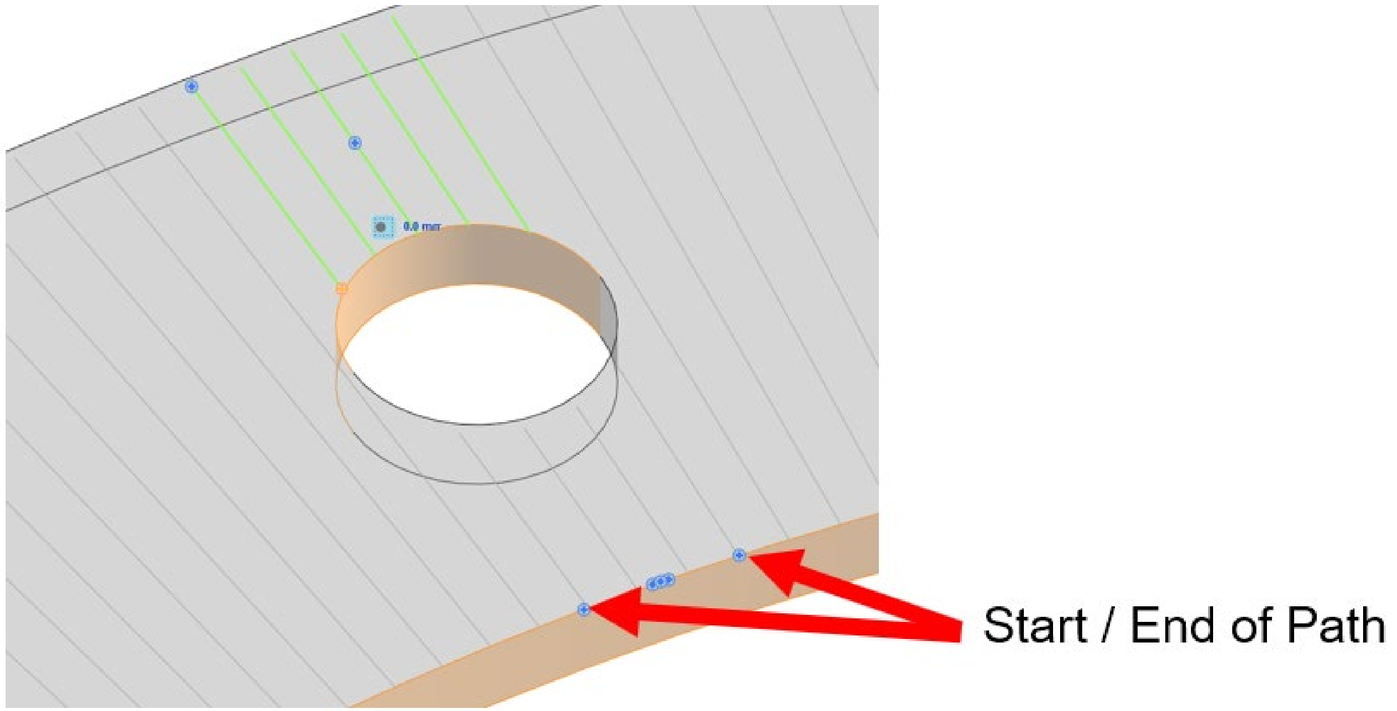
30. Free form rebar and openings

To stop the bars at the face of the opening (concrete cover), you need to trim one of the ends to the face of the opening, by using Edit Constraints



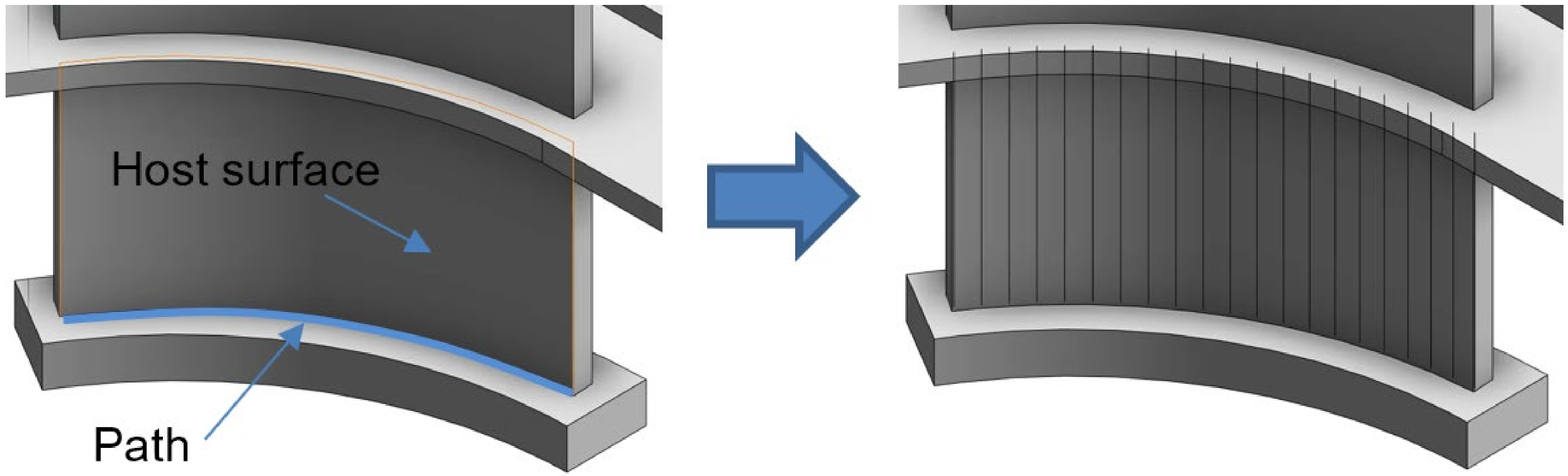
30. Free form rebar and openings

To add the missing bars, you can create another set, drag it back from the ends (of the path) or use some additional geometry to define the bars next to the opening.



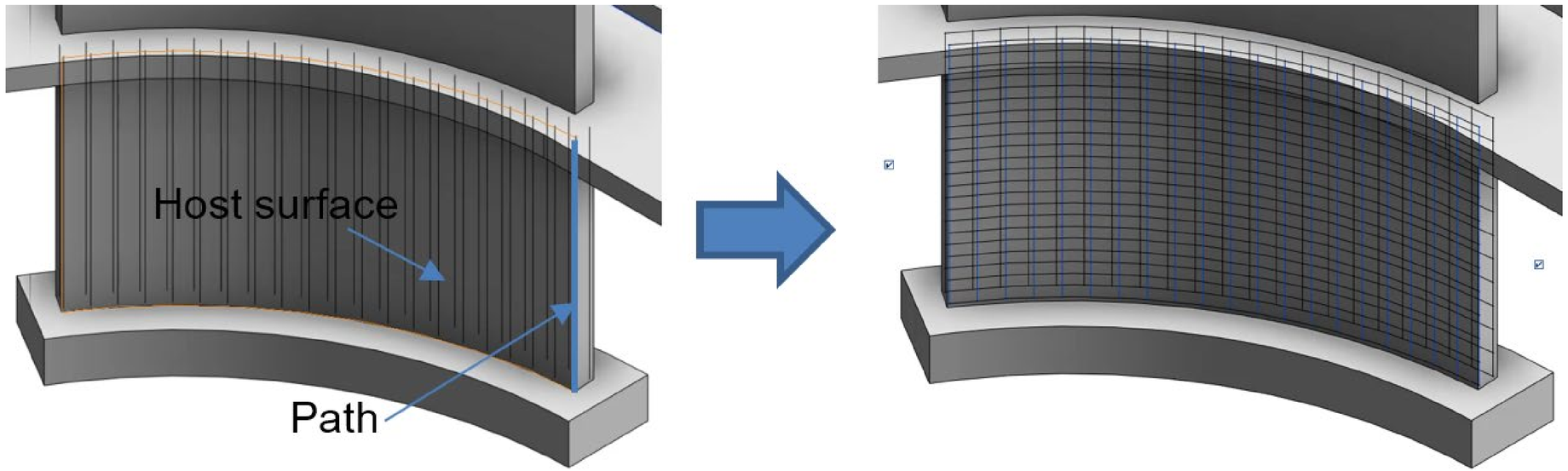
31. Use aligned distribution to create sets in curved walls

Vertical reinforcement > Horizontal path

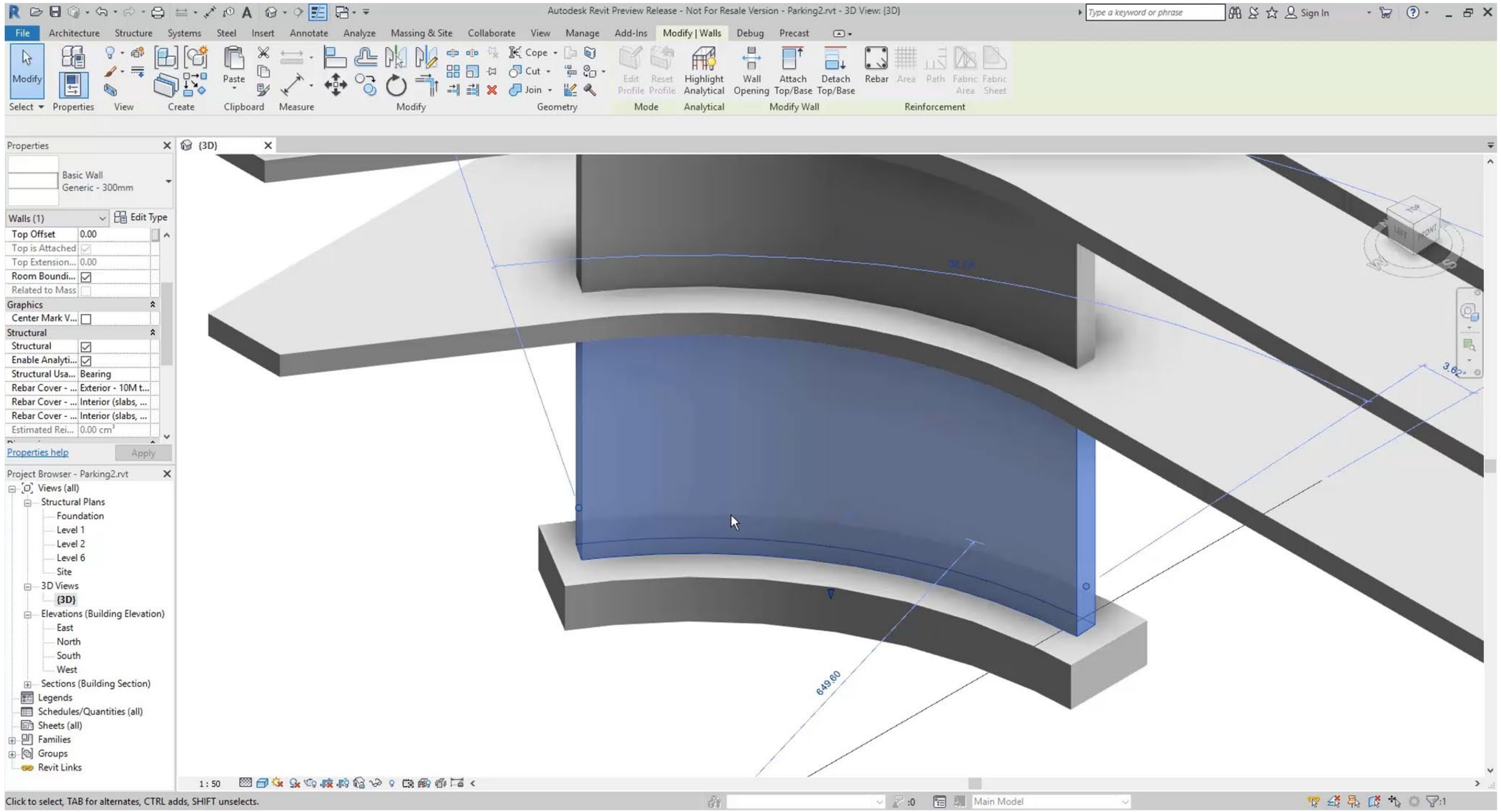


31. Use aligned distribution to create sets in curved walls

Horizontal reinforcement > Vertical Path



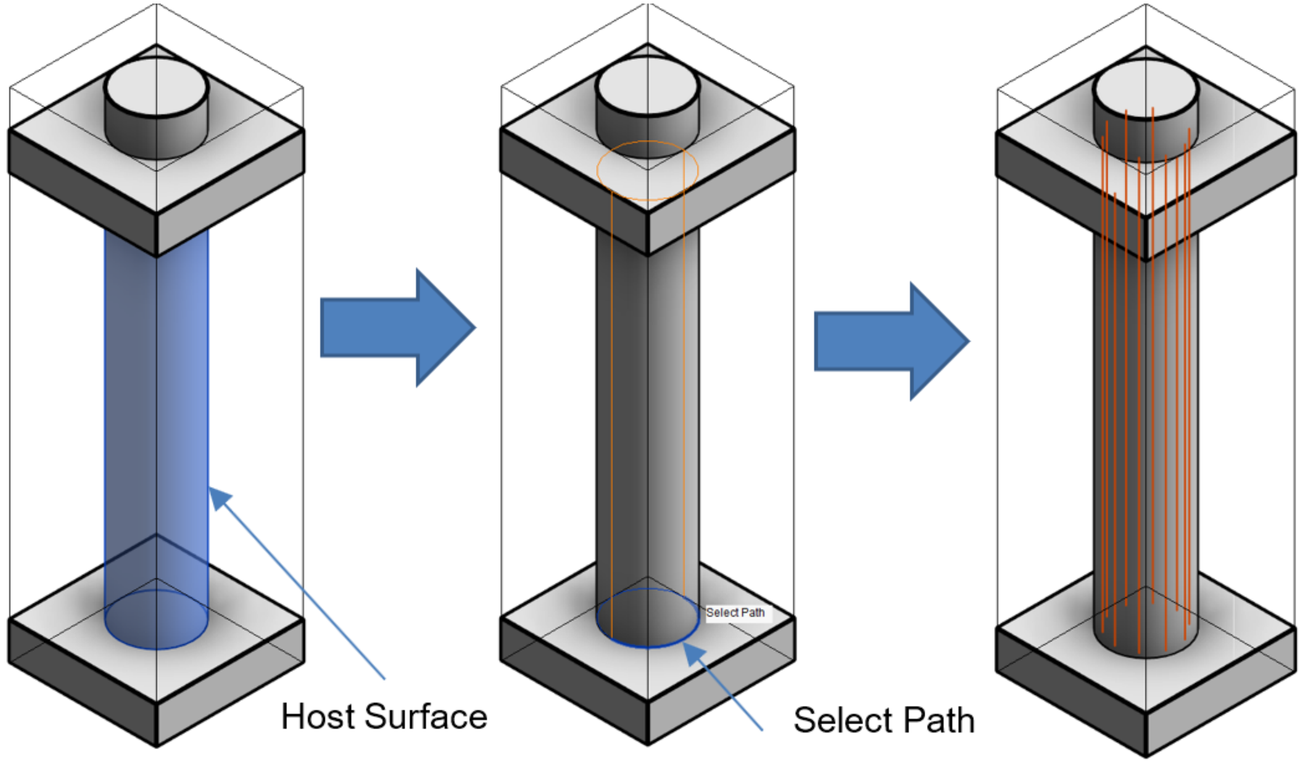
31. Use aligned distribution to create sets in curved walls

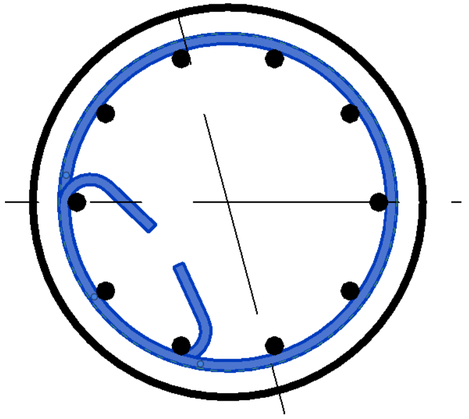


32. Place vertical bars and stirrups in round column

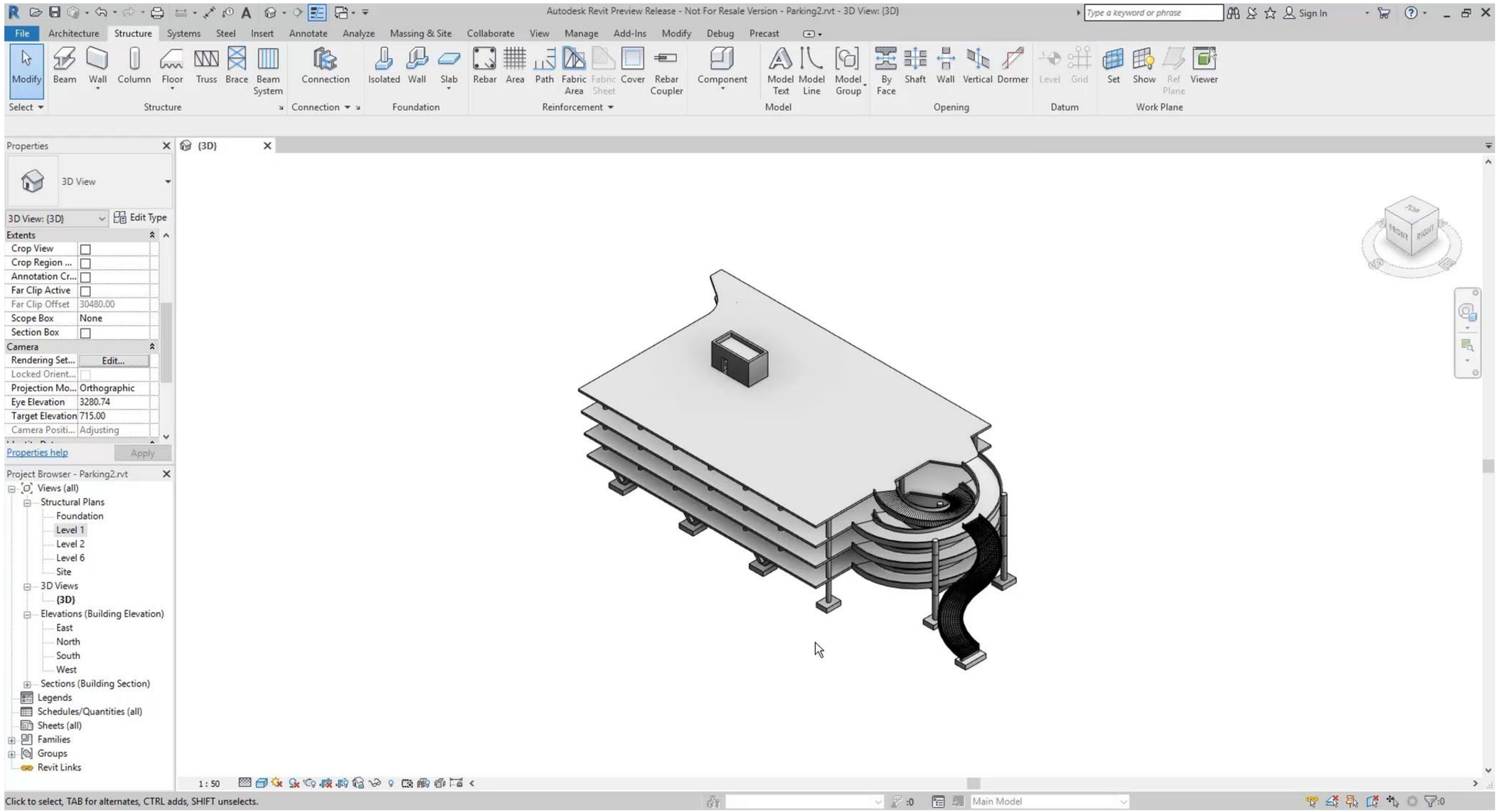
The vertical bars can be modeled as a set, which reacts to changes of the column size

For the stirrups, shape driven rebar also works, while for free form the vertical path needs to be selected



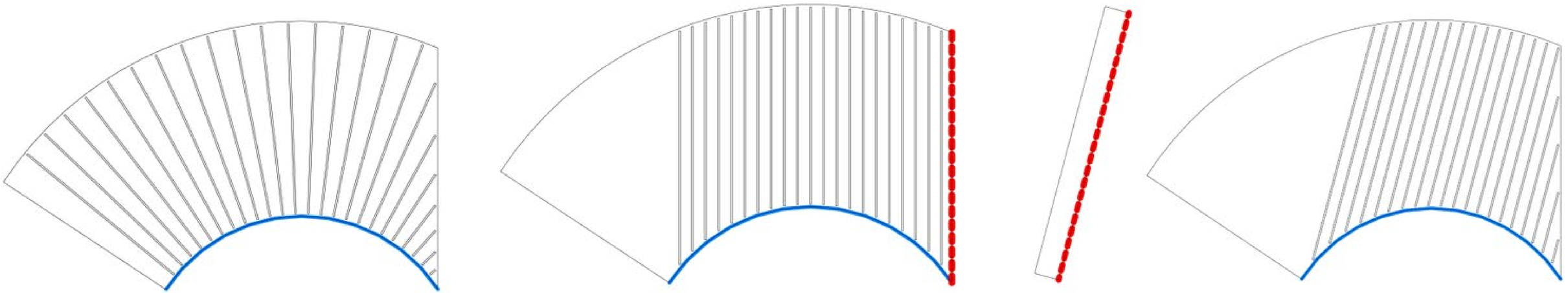


32. Place vertical bars and stirrups in round column



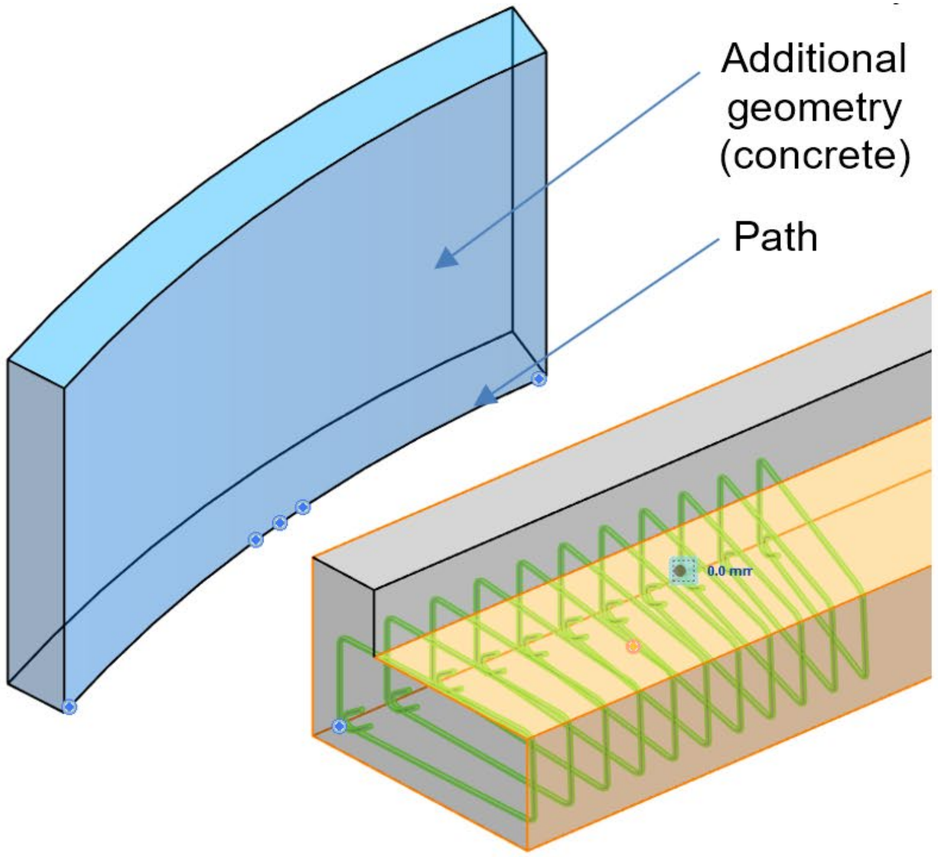
33. Make the bars in an aligned distribution parallel to a concrete face

- Select an aligned distribution set
- Edit Constraints and select the **Align / Close bar handle**
- **Click a planar face** in the model (must not be parallel or almost parallel to the distribution path)



34. Use an external path to fan out bars

The external path must be an edge of an element that can host rebar

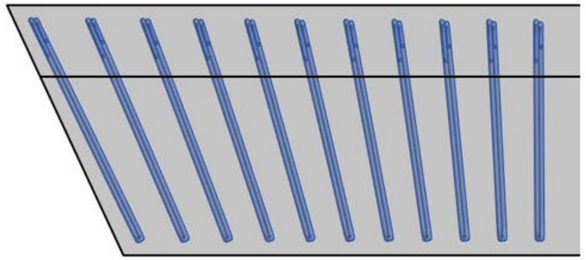


Properties

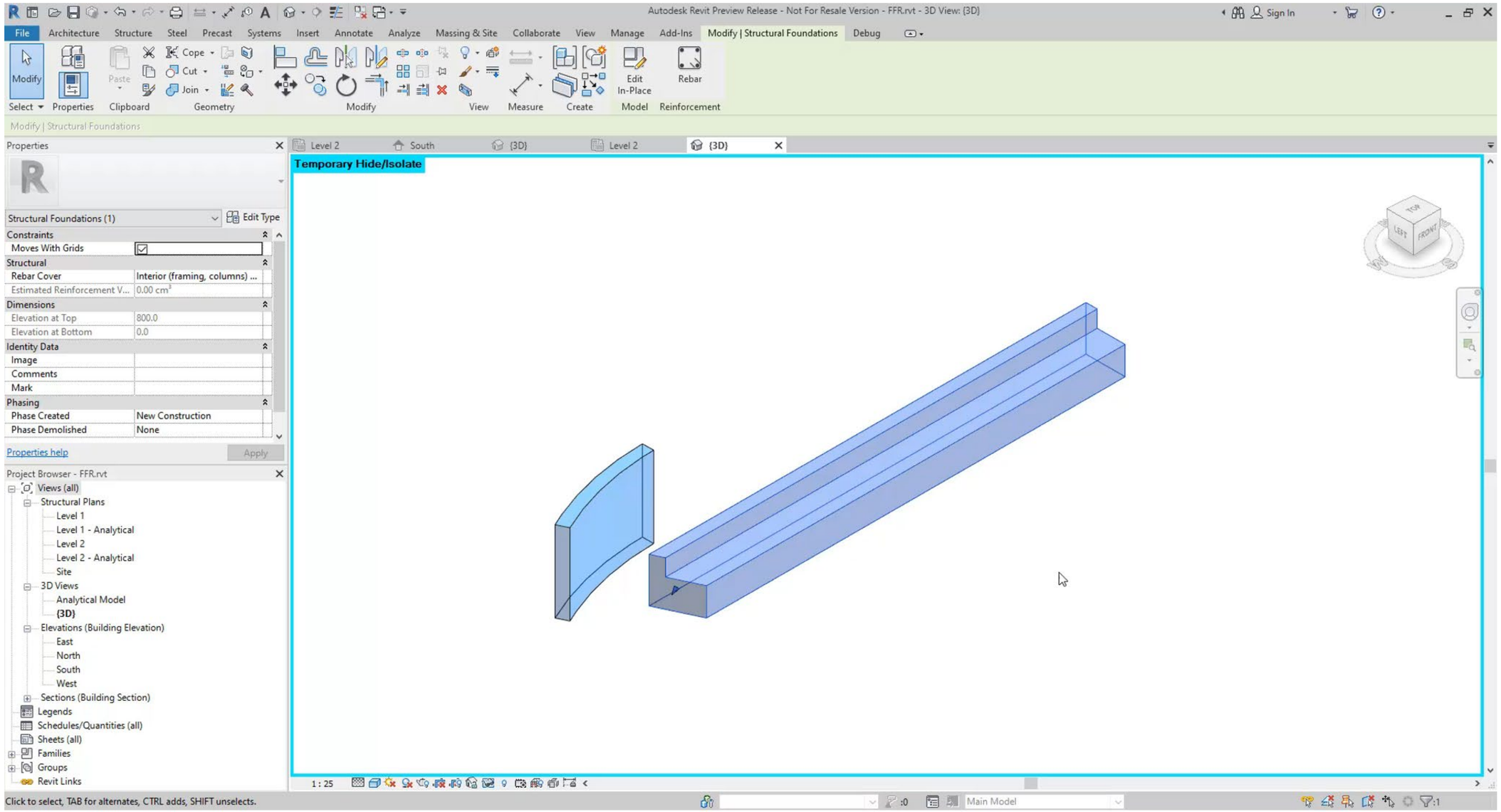
Rebar Bar
13M

Structural Rebar (1) | Edit Typ

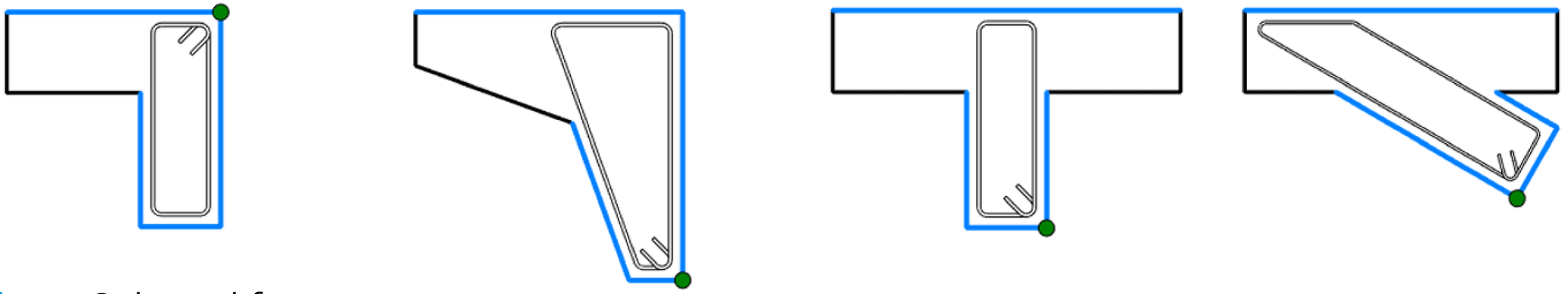
Geometry	Free Form
Style	Stirrup / Tie
Stirrup/Tie Attachment	Interior Face of Cover Refere...
Shape	M_T1
Shape Image	<None>
Hook At Start	Stirrup/Tie Seismic - 135 deg.
Hook Rotation At Start	0.00°
End Treatment At Start	None
Hook At End	Stirrup/Tie Seismic - 135 deg.
Hook Rotation At End	0.00°
End Treatment At End	None
Override Hook Lengths	☐
Rounding Overrides	Edit...
Rebar Set	
Layout Rule	Maximum Spacing
Quantity	11
Spacing	200.0 mm



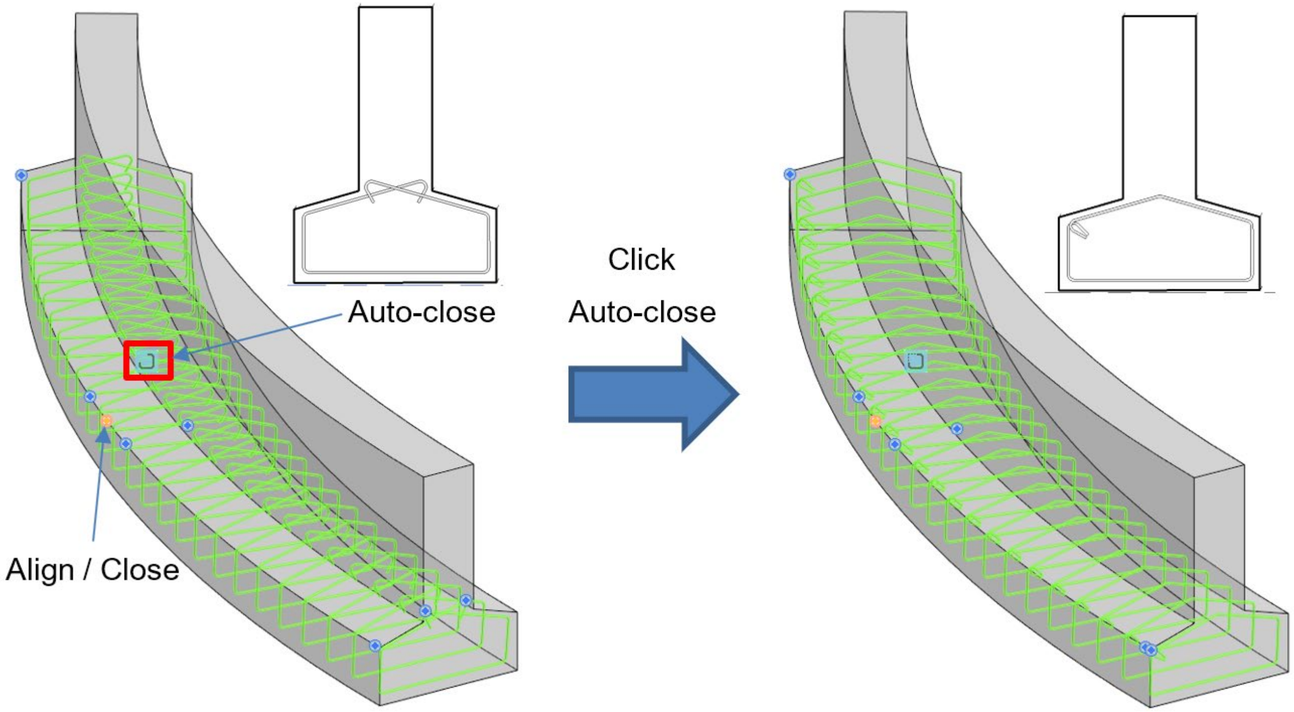
34. Use an external path to fan out bars



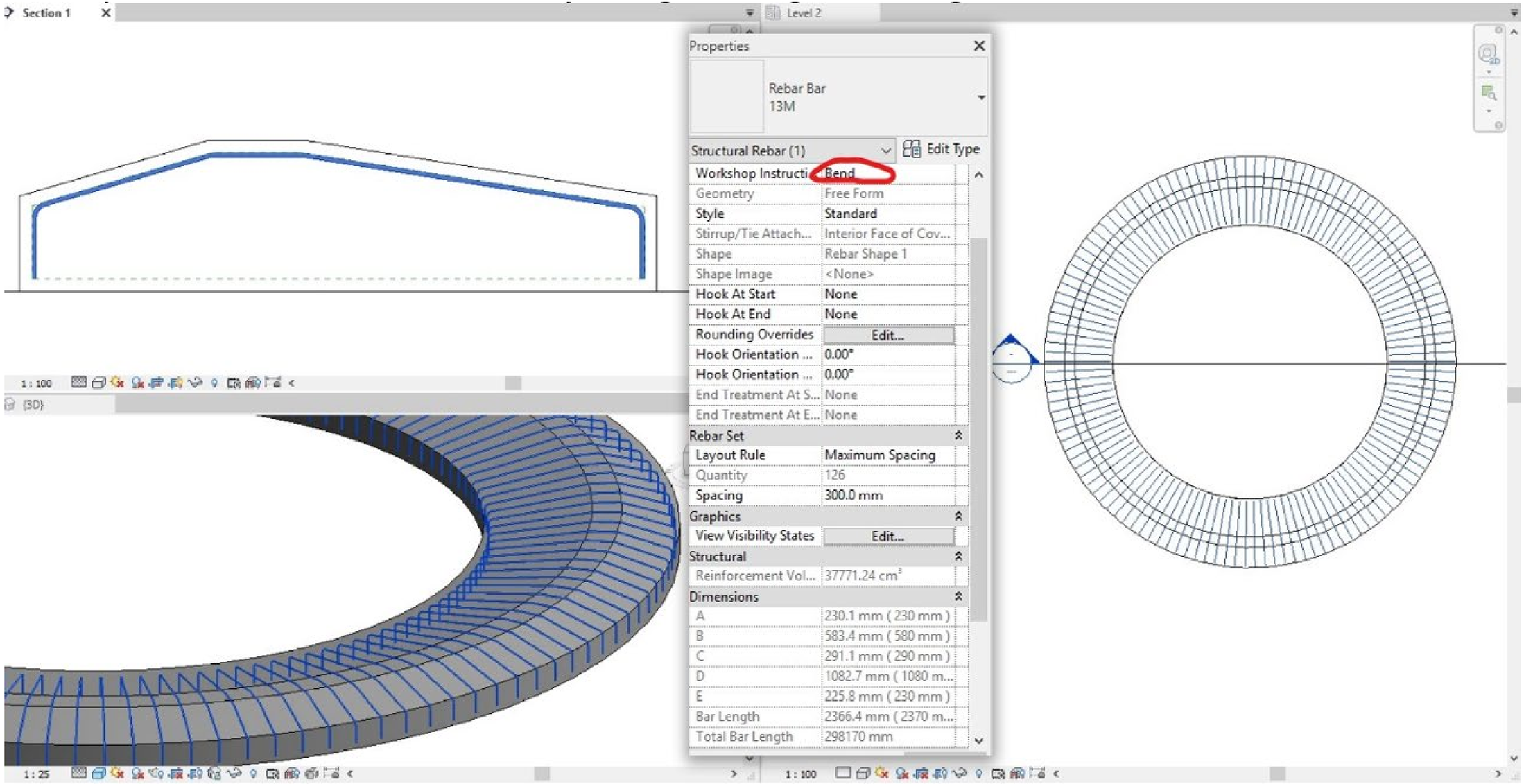
35. Create stirrups by auto-closing aligned distribution bars



Blue *– Selected faces*
Green *– Distribution path*

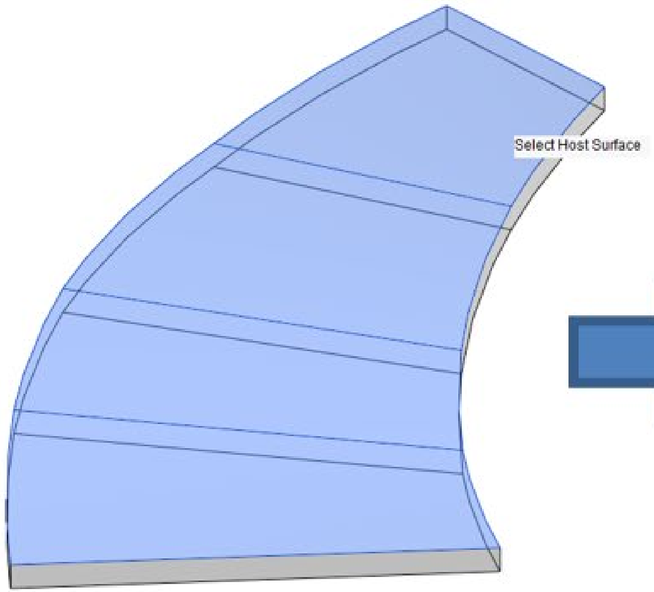


36. Reinforce circular foundation and extract fabrication information

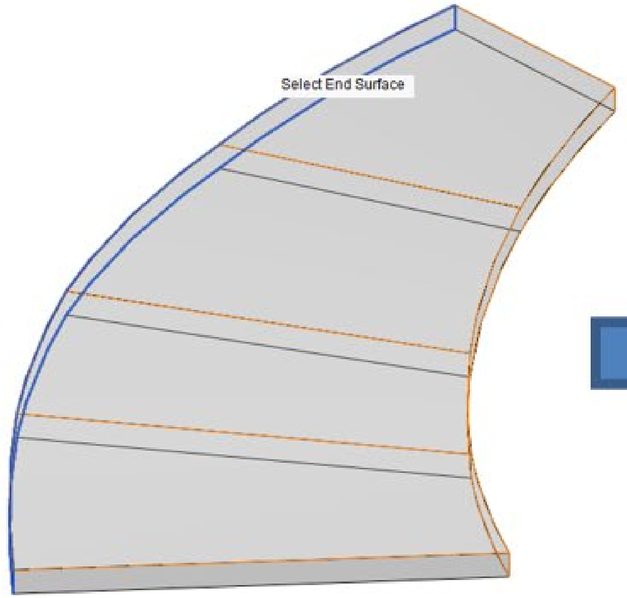


37. Place surface distribution bars across element with many faces

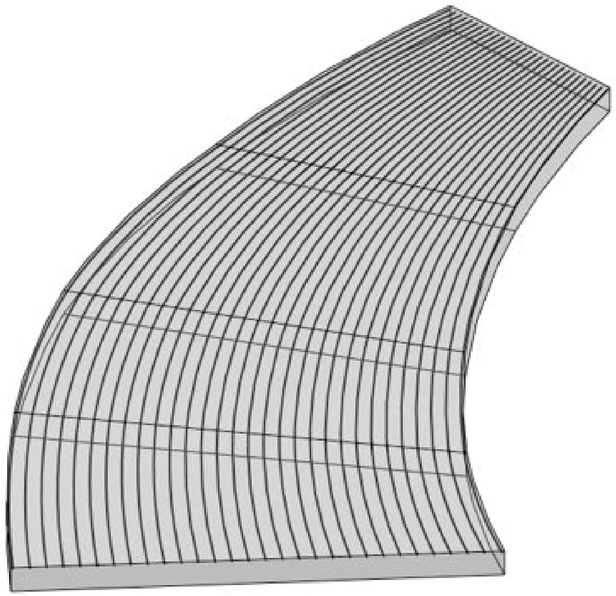
You can use the surface distribution free form rebar to model the longitudinal bars in a deck made up of multiple faces.



Select Host Surface

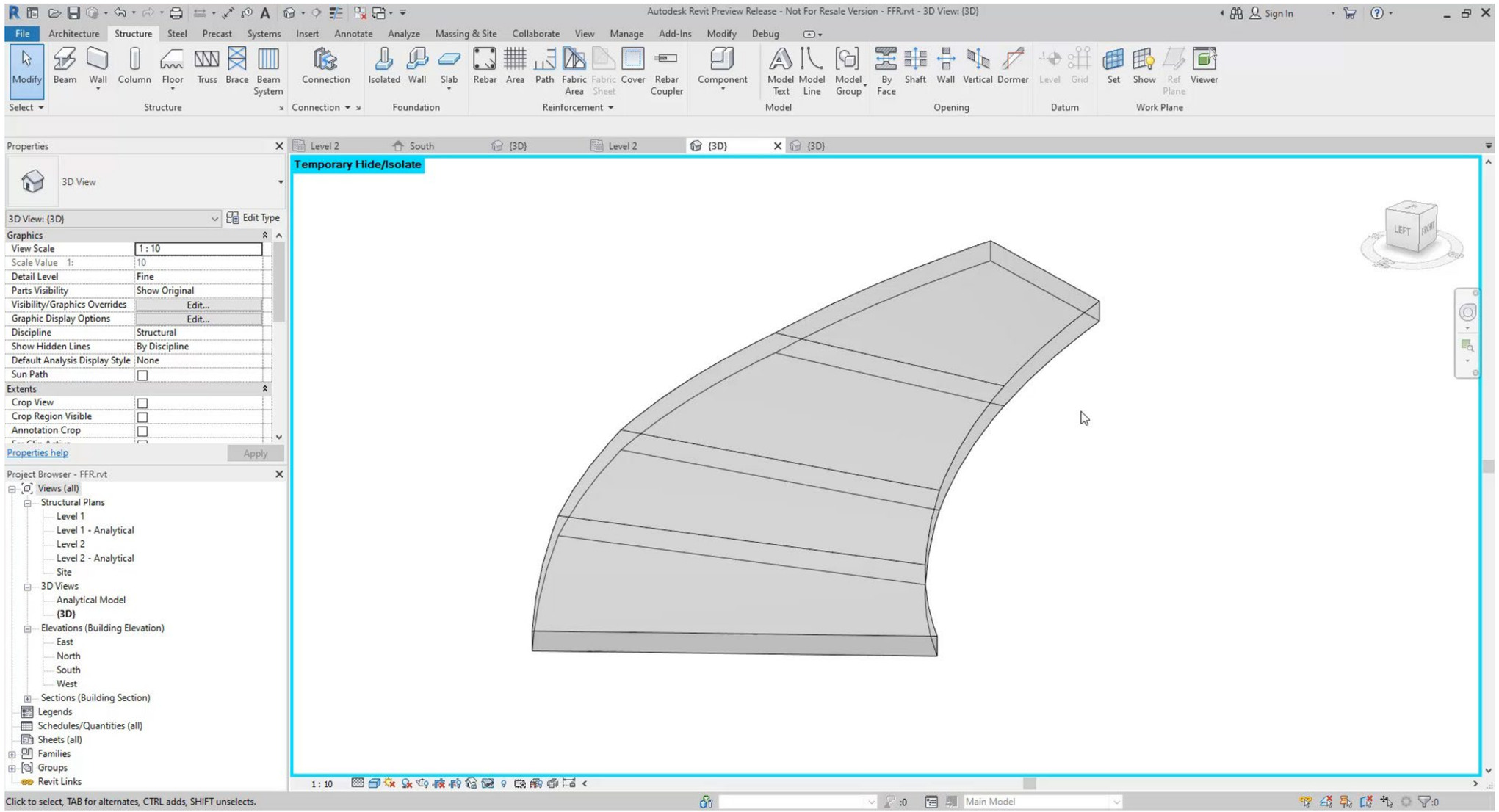


Select Start/End Surface



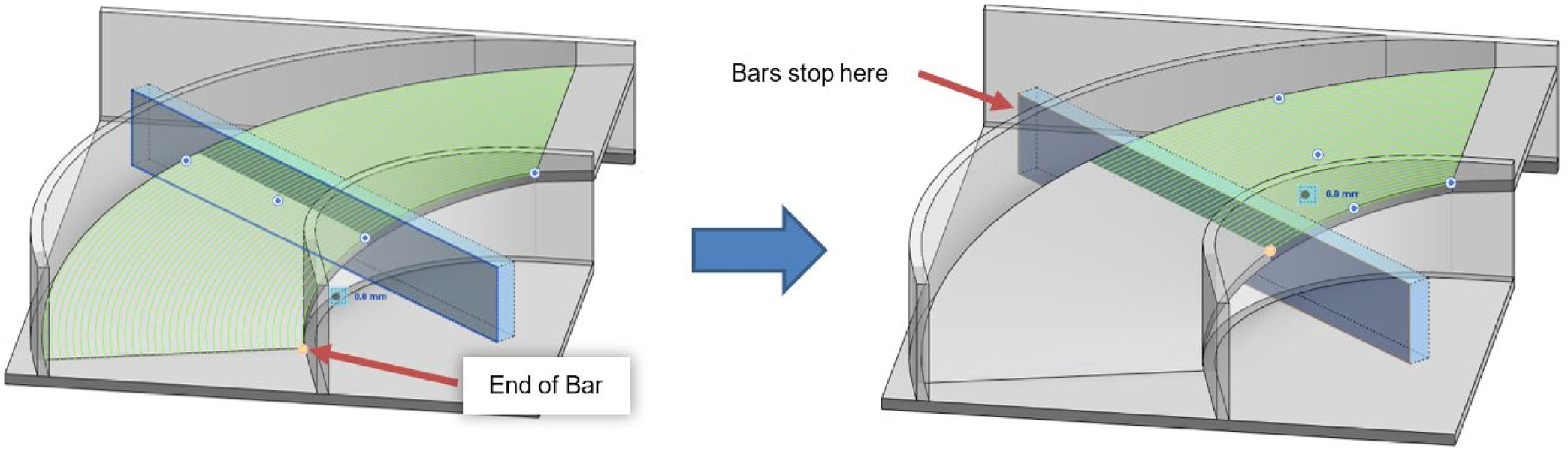
Set is created

37. Place surface distribution bars across element with many faces

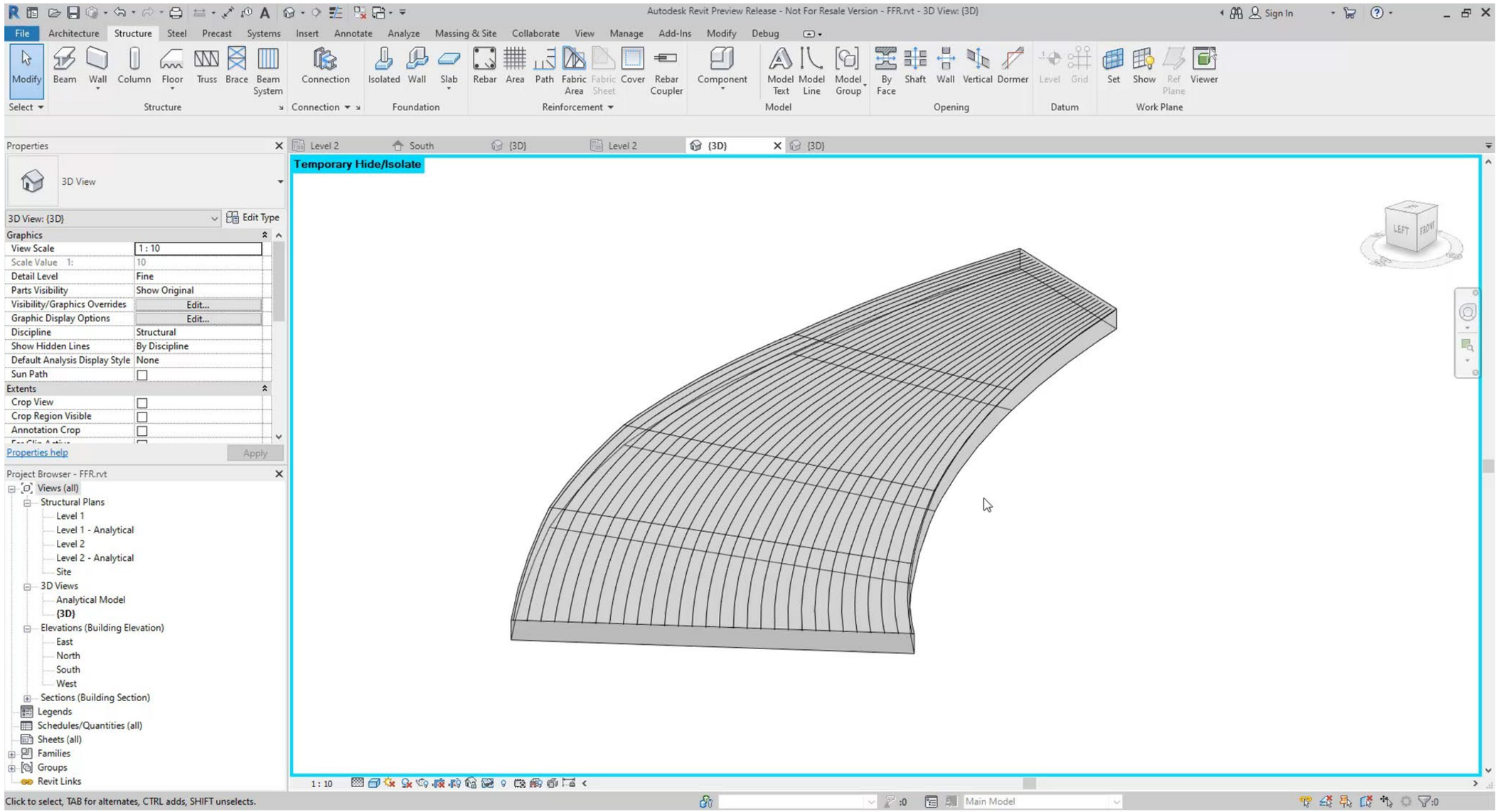


38. Splice free form bars by using additional geometry

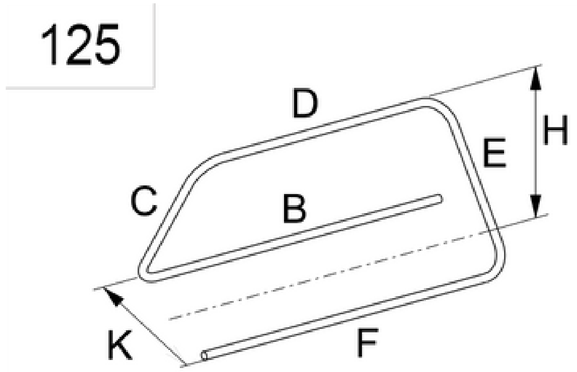
Constrain ends to either side of additional geometry to create the splice

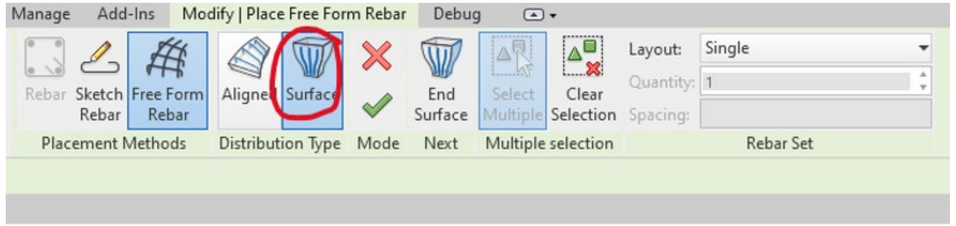


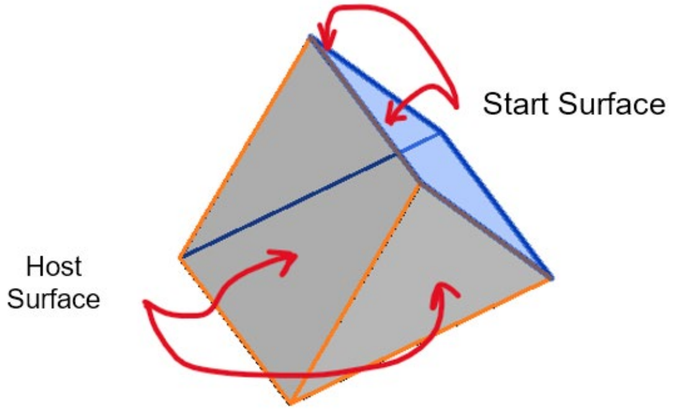
38. Splice free form bars by using additional geometry

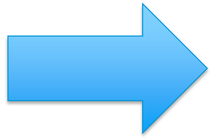


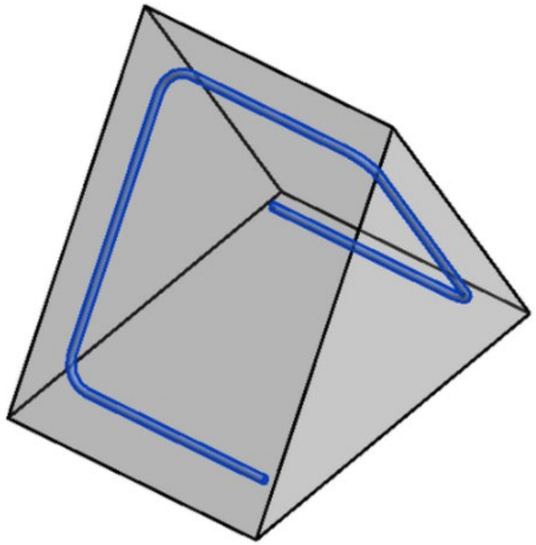
39. Create a custom triangular rebar standee shape using free form rebar

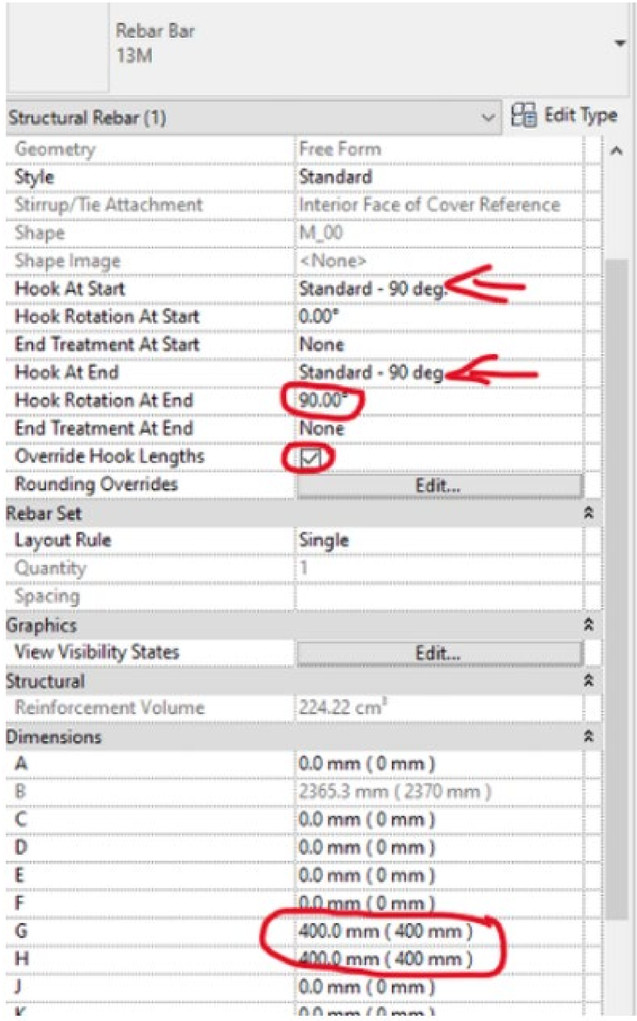






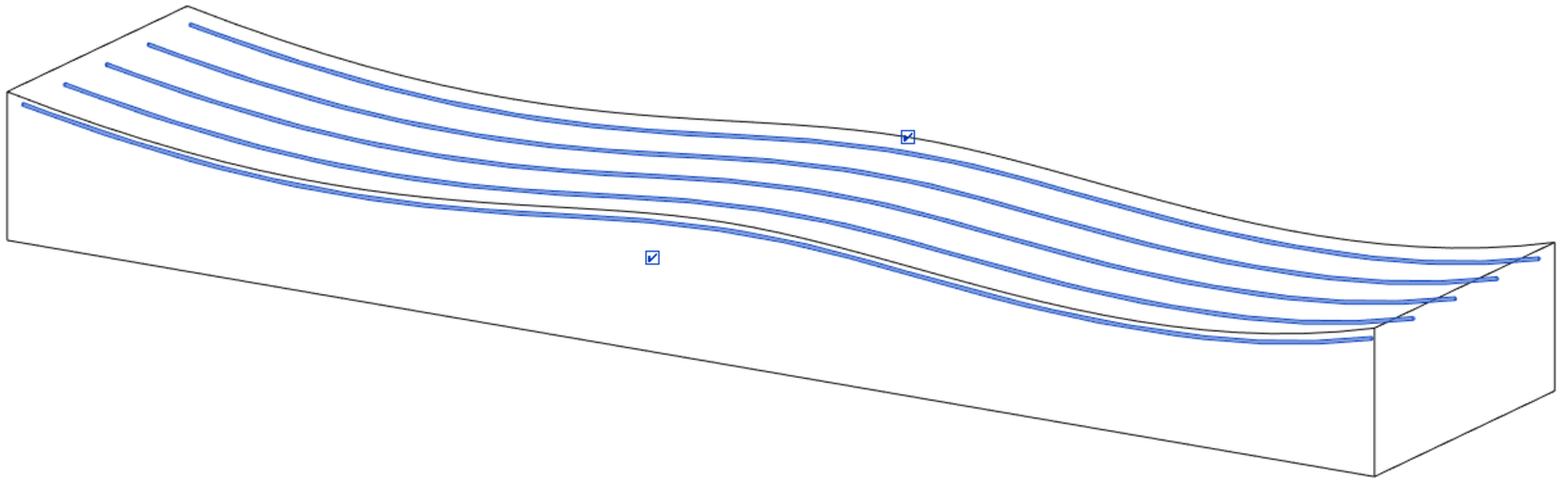


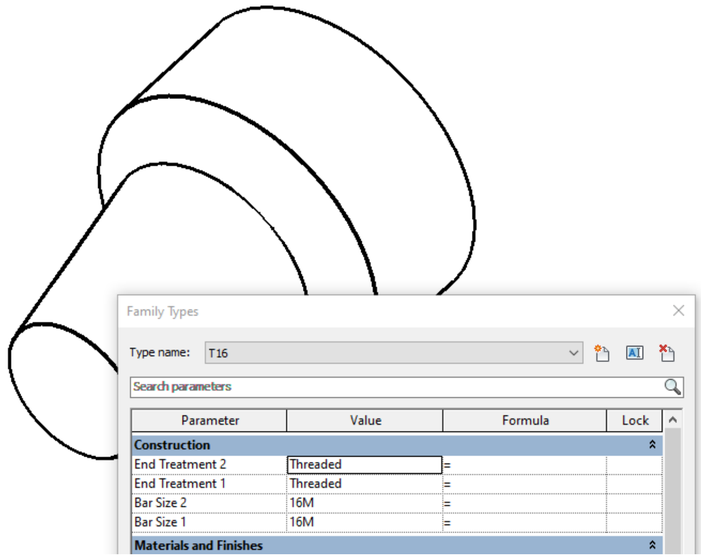




40. Model post-tensioning tendons by using free form rebar and couplers

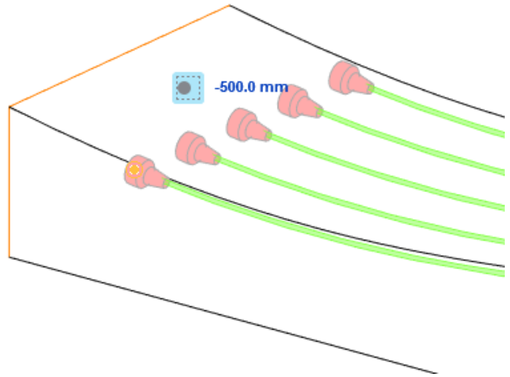
- Bars are generated by dedicated element (valid host) – family or model-in-place
- Adjust the additional geometry to adjust the tendon geometry
- Model the anchors using couplers

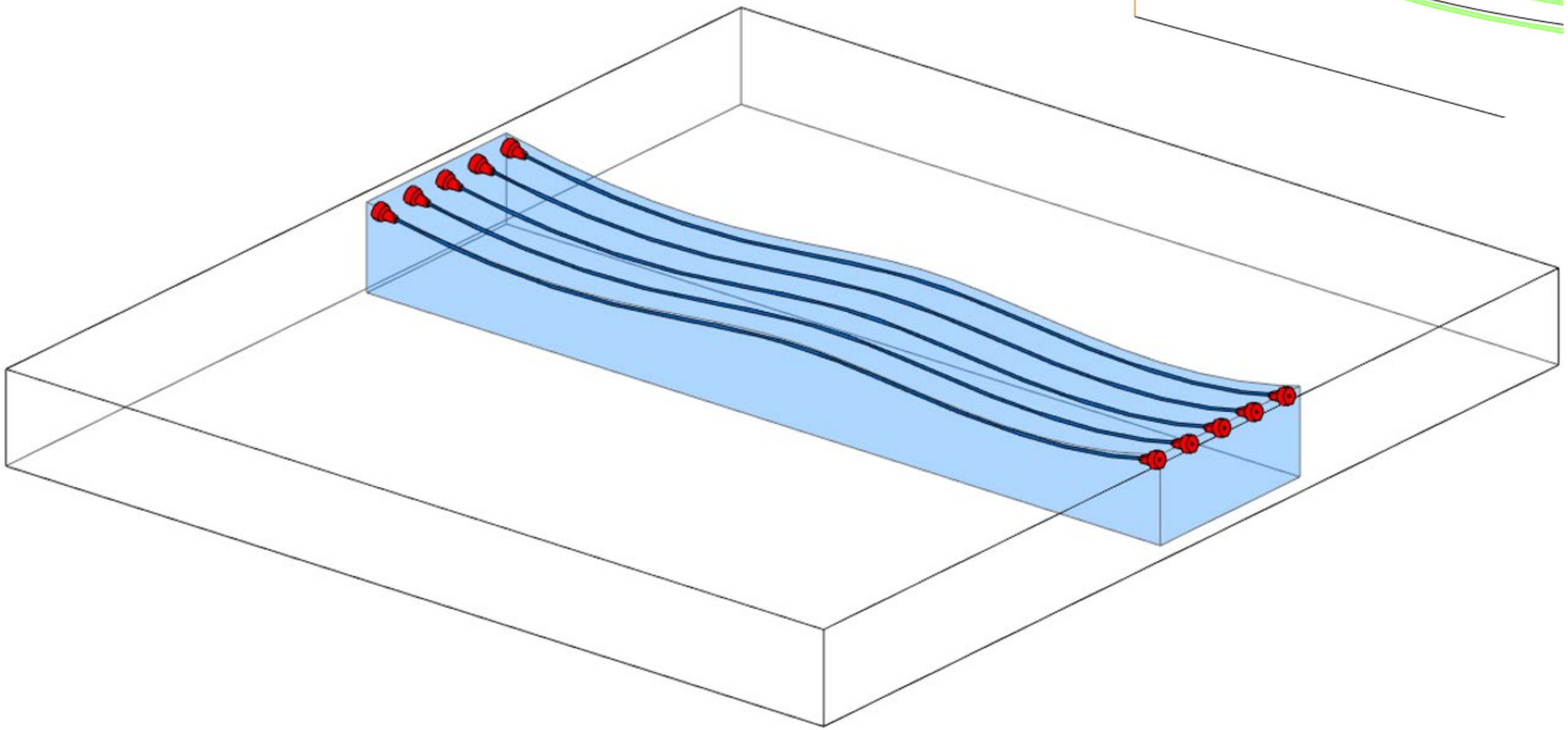




40. Model post-tensioning tendons by using free form rebar and couplers

- Adjust the offset to trim back the free form bars
- Hide the geometry used to define the set





40. Model post-tensioning tendons by using free form rebar and couplers