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# How to Make the Most of Rebar Detailing Using Revit

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## Learning Objectives

- Discover the tools and best practices for rebar placement and modification.
- Learn how to propagate rebar in simple and complex structural elements, for shape-driven and free-form rebar.
- Learn how to avoid clashes, create 3D shape-driven rebar, and configure the project for rebar detailing.
- Learn how to create documentation for rebar drawings and gain techniques for rebar presentation, including displacement in view.

## Description

In this class, you'll learn techniques and best practices for rebar modeling and detailing using Revit software. We'll use practical examples and explore in-depth the tools available for rebar placement, modification, and clash avoidance. You'll learn how to use the propagate rebar tool for populating the model with reinforcement, in both simple and complex structural elements, using shape-driven and free-form rebar. Finally, we'll create rebar fabrication drawings, and learn techniques for rebar visualization and presentation, displaced rebar representation, and the use of tags, multi-rebar annotations, and schedules.

## Speaker



Ovidiu Paunescu is a Senior Product Owner at Autodesk, where he coordinates the development of Revit's capabilities in rebar modeling and detailing. He has vast experience in structural design and detailing of concrete and steel structures, having worked on the design of many large-scale building projects in Romania and internationally. He holds a Master of Science degree in Structural Engineering from the Technical University of Civil Engineering in Bucharest, and he is a Certified Professional for Revit, Structural and Architectural disciplines, and for AutoCAD.

**Table of contents**

<b>How to Make the Most of Rebar Detailing Using Revit.....</b>	<b>1</b>
<b>Learning Objectives .....</b>	<b>1</b>
<b>Description.....</b>	<b>1</b>
<b>Speaker .....</b>	<b>1</b>
<b>Introduction .....</b>	<b>4</b>
<b>Discover the tools and best practices for rebar placement and modification .....</b>	<b>4</b>
Shape driven rebar .....	7
Expand to host .....	8
Placement by two points.....	9
Sketch rebar.....	11
Rebar set cut by section view.....	12
How to create a rebar shape family .....	13
Free form rebar .....	16
Aligned distribution .....	16
Surface distribution.....	18
Specify shape code for custom bent free form rebar .....	19
Rebar couplers .....	20
Select or automatically match the coupler type.....	20
Cougliers connecting arc bars .....	20
Align couplers to create post-tensioning anchors.....	21
<b>Learn how to propagate rebar in simple and complex structural elements, for shape-driven and free-form rebar.....</b>	<b>22</b>
How propagate rebar works .....	22
Propagate rebar by host.....	22
Propagate rebar by face.....	23
Similar hosts and face matching .....	23
Hosts and neighbors .....	25
Propagation around openings .....	25
Rebar constraints and couplers.....	26
Propagate free form rebar .....	26
<b>Learn how to avoid clashes, create 3D shape-driven rebar, and configure the project for rebar detailing.....</b>	<b>27</b>
Move rebar in a set .....	27
Edit bars in a set or system .....	27

Quick selection and edit .....	28
Edit bars in area reinforcement.....	29
Move bars using dimensions .....	29
Remove individual bars in a set.....	30
Resetting moved and removed bars .....	31
Rebar couplers and moved bars.....	31
Review modified sets.....	32
Simple 3D rebar shapes.....	32
Hook rotation, rebar shapes and numbering.....	33
Override hook lengths by instance .....	34
Edit multiple rebar set constraints at once.....	35
Include hooks or end treatments in shape definition.....	36
Real vs nominal bar diameter.....	37
Show the rebar cover in schedules and tags.....	38
Set rebar as unobscured.....	38
<b>Learn how to create documentation for rebar drawings and gain techniques for rebar presentation, including displacement in view.....</b>	<b>40</b>
Edit rebar presentation options .....	40
Default bar presentation for rebar sets .....	40
Set the color of rebar by using filters .....	41
Multi-rebar annotations .....	41
Multi-leader tags for rebar .....	42
Placement and hosts .....	42
Snap and merge leaders .....	43
Show and hide leaders.....	43
Displaced rebar representation .....	45

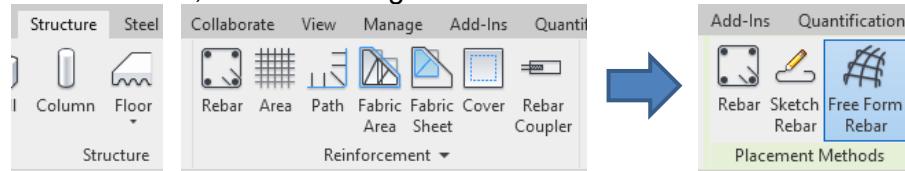
## Introduction

In this class I will cover some of the tools and best practices for detailing rebar using Revit, with a focus on shape driven rebar and features from Revit 2021 to 2023. First, we will look at rebar placement and modification, continue with rebar propagation, which represents a simpler way of populating the model with reinforcement. In the third chapter we look at moving and removing bars from sets, creating simple 3D shapes, editing multiple constraints and project configuration. In the last chapter we look at annotating the rebar drawings and showing rebar displaced in views.

### Discover the tools and best practices for rebar placement and modification

The reinforcement tools available in Revit can be used to model the reinforcement in a wide variety of building components ranging from typical columns, beams, walls, and floors to complex curved elements or double curved elements in civil structures.

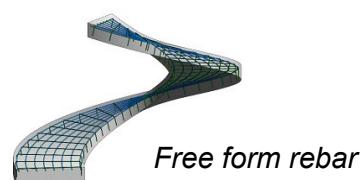
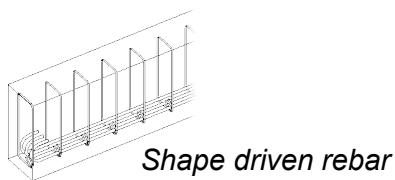
These tools can be accessed from the Structure tab > Reinforcement panel or the reinforcement tab in the contextual ribbon, when selecting concrete elements.



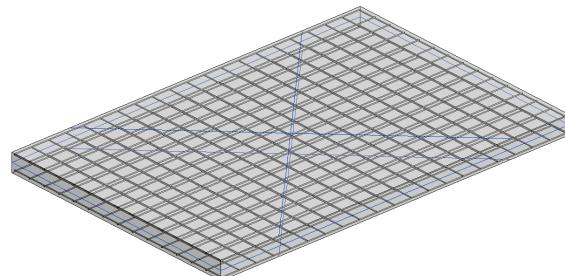
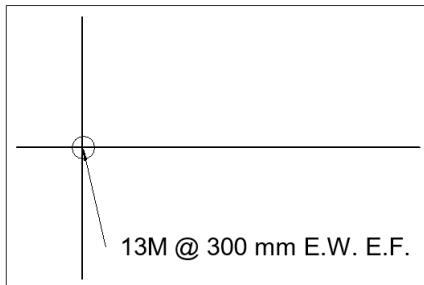
Here's a breakdown by category and the distinct types of families that make up each reinforcement element:

- Structural Rebar
  - Rebar Bar (System)
  - Rebar Hook (System)
  - End Treatment (System)
  - Rebar Shape (Loadable family)
- Structural Area Reinforcement
- Structural Path Reinforcement
- Structural Fabric Areas
  - Structural Fabric Area (System)
- Structural Fabric Reinforcement
  - Fabric Sheet (System)
  - Fabric Wire (System)
- Structural Rebar Couplers
  - Rebar Coupler (Loadable family)

Based on how the rebar geometry is generated, we can further divide rebar into **shape driven rebar**, which gets its geometry from a rebar shape family and **free form rebar**, which can have any geometry and doesn't require a rebar shape family.



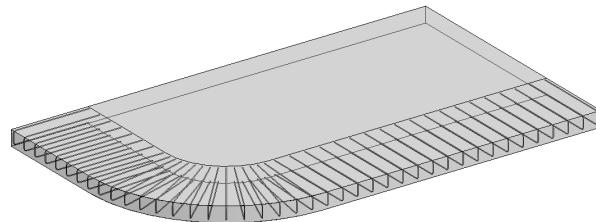
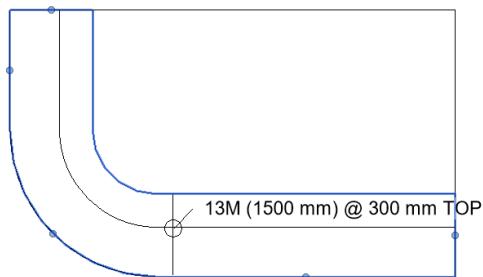
Use **Area Reinforcement** to create up to four layers of reinforcement, in walls and floors. It uses a sketch to define the contour in which the bars are created and has options like spacing, bar type, hooks.



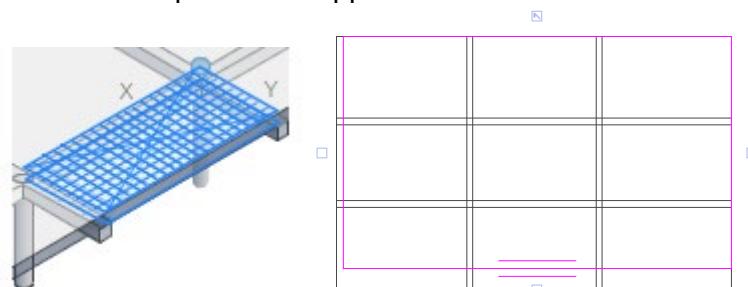
You can use the **Path Reinforcement** tool to create shape driven reinforcement distributed along a path, in walls and floors.

The path needs to be an open contour but can be made of different lines and arcs. It doesn't allow all rebar shapes to be used and filters out rebar shapes that have angles other than 90 deg between the segments.

It also has the option to alternate bars with different shapes.



You can use the **Fabric Reinforcement** to place individual fabric sheets in walls and floors or you can use the **Fabric Area** to place overlapped fabric sheets in the same types of elements.



You can also define fabric sheets that are bent in one direction, by using the "Bend Sketch" during placement.

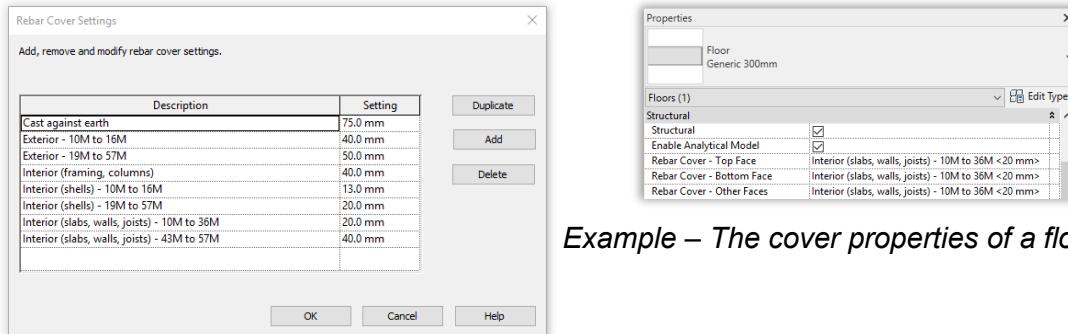
**Rebar Couplers** are used to connect Rebar together (shape driven and free form). In the case of shape driven rebar, couplers shorten and extend the bars, sync the layout options between connected sets.

For free form bars, they can be used to connect bars, which are perfectly aligned and cannot be moved to shorten or extend the bars. This is because free form rebar relies entirely on its relationship with the concrete host, and its geometry can only be altered by the changes of that host geometry.

## Rebar Cover

Another useful tool in the reinforcement panel is the Rebar Cover tool. This allows you to override the cover of an element by face or for the entire element.

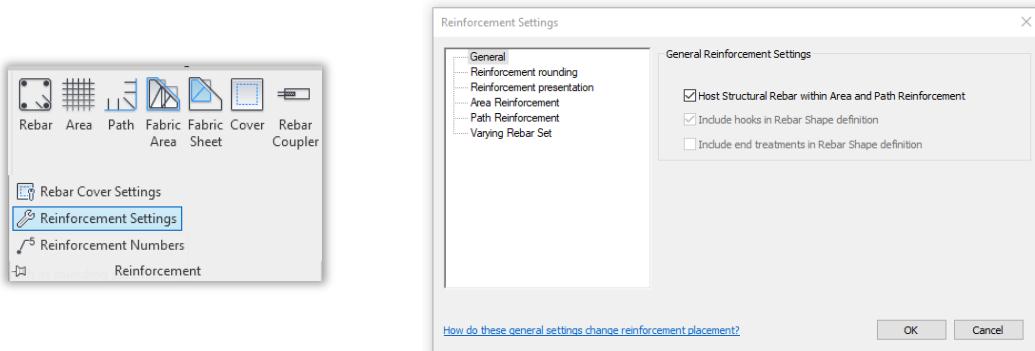
There are different values of covers defined and you can add more. Each element that can host rebar will have a default cover specified.



*Example – The cover properties of a floor*

## Reinforcement Settings

Here you can set important things, like whether to include hooks or end treatments in the rebar shape definition (needs to be set when there is no rebar in the project), reinforcement rounding, reinforcement presentation (the default settings for presentation when a set is created). It also includes naming for the layers of area and path reinforcement and how varying rebar sets are numbered.



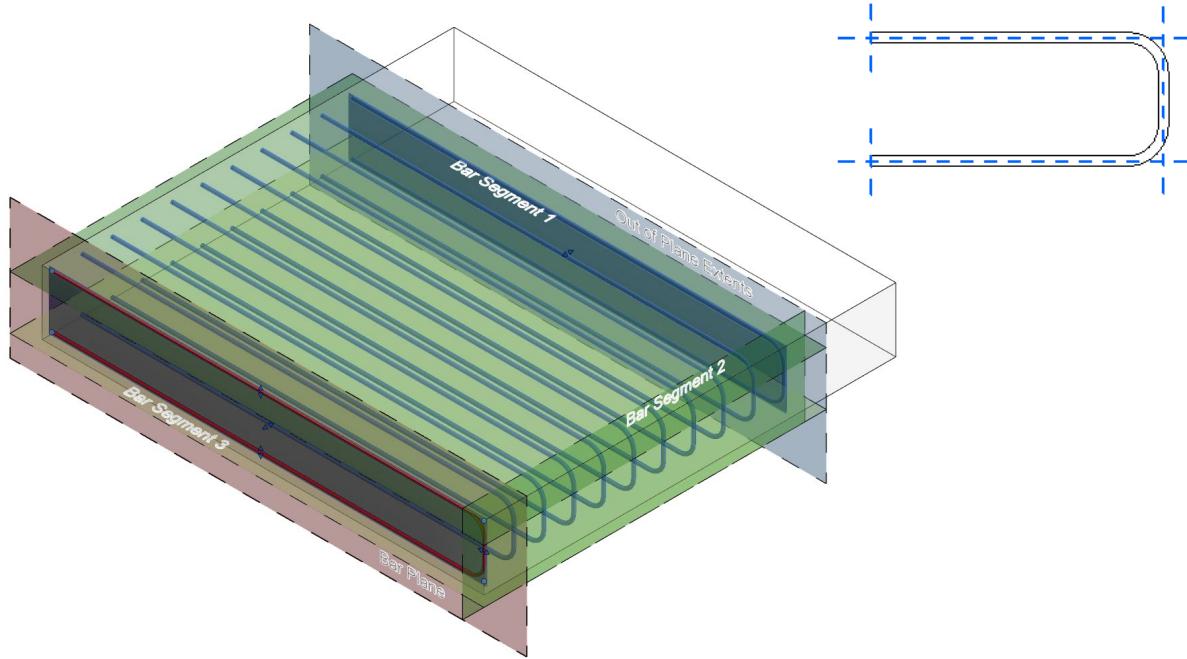
## Reinforcement Numbers

Reinforcement elements are numbered on placement. Numbering allows identical reinforcement elements to be matched for schedules and tags.

In assigned partitions, the rebar, fabric sheet, and rebar coupler numbers match those of the same type, size, material, and shape.

### Shape driven rebar

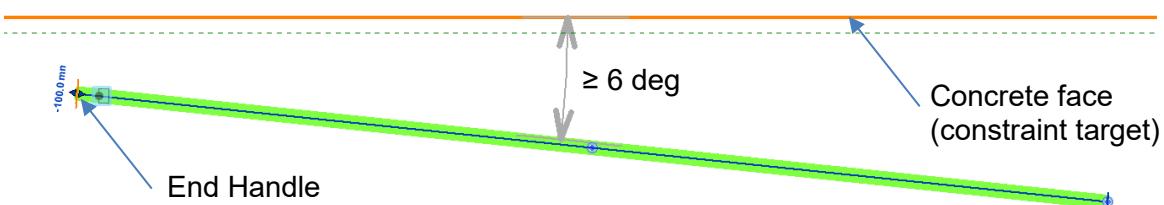
This type of structural rebar gets its geometry from a rebar shape family. The rebar has automatic and manual constraints that ensure it follows the changes of the concrete host or other bars constrained to it.



Each rebar set has constraints that make it react to changes of the host.

- **Bar Plane** – the plane where all the curves of the first bar in the set are located
- **Out of Plane Extent** – the plane containing the curves of the last bar in the set (to where the set extends)
- **Bar Segment 1 ... n** – the plane of each bar segment - these are perpendicular to the bar plane
- **Bar Start / End** - where the start and end of the bar is positioned

All these planes or bar handles can constrain to faces to which they are parallel. For shape driven rebar it's one constraint target per face. The Bar Start / End are the only handles which can constrain to non-parallel, non-planar faces, as long as the adjacent segment is at an angle greater than 6 degrees with respect to the target face.



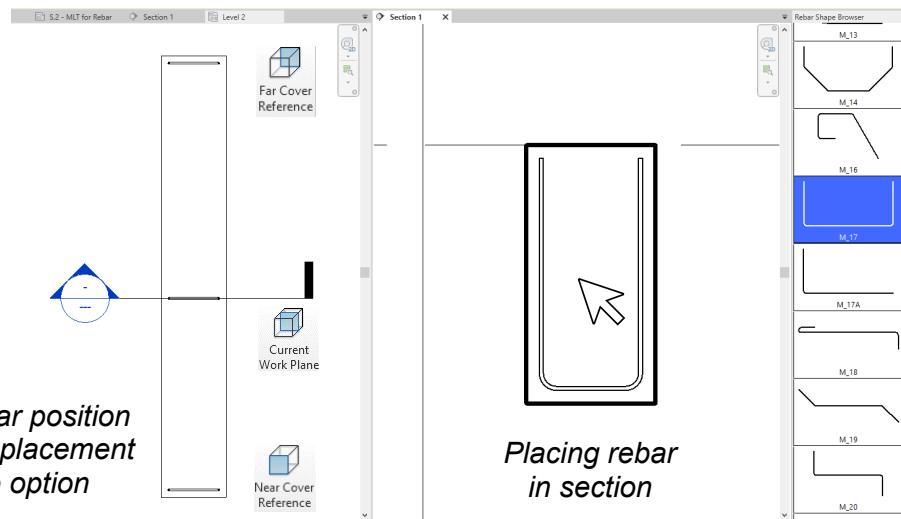
You can find more information about constraints and how to manage them in my Autodesk University 2019 class, [Rebar Modeling in Revit: Keep It in Check](#).

## Expand to host

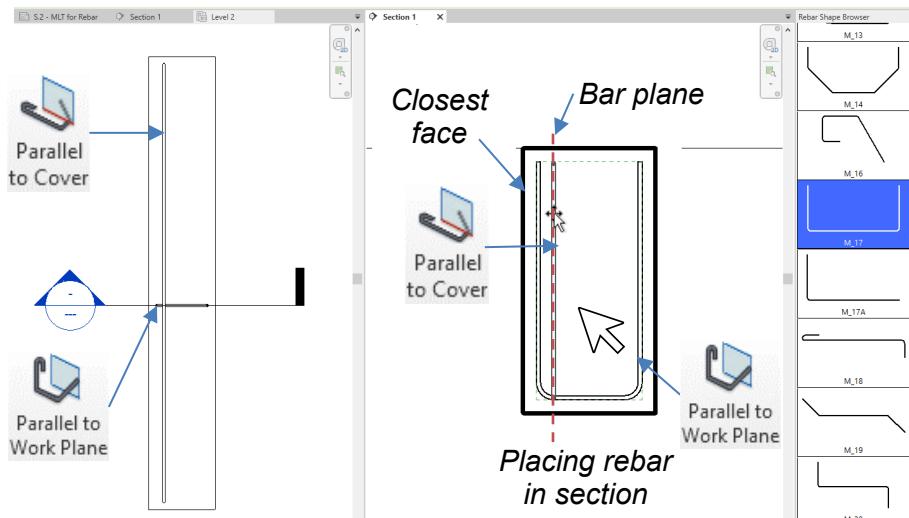
The rebar shape is expanded to a rectangular box that is automatically detected inside the concrete host.

Available options during placement:

- **Rebar Type** – select this from the type selector
- **Rebar Shape** – you can select this from the properties palette or from the rebar shape browser
- **Layout** – you can select this from the properties palette or from the Modify | Place Rebar tab > Rebar Set panel.
- **Placement Plane** defines where the rebar is placed inside the host. When placing a set of bars, the set expands to fill the host, so near cover or far cover can do the same thing.



- **Placement Orientation** determines how the bar is oriented with respect to the bar plane and cursor position.



## Placement by two points

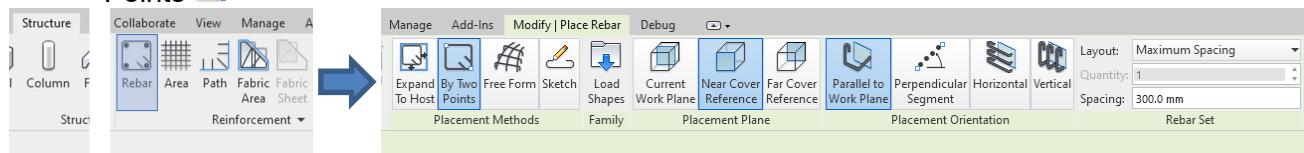
This placement method allows you to place rebar to exact dimensions and aligned to any reference. It is available starting with Revit 2022.

### How it works

A rebar created by expanding the rebar shape to a bounding box defined by two points. For single segment straight bars, dimension and direction can be specified directly.

### Placement

- Go to the Structure tab > Reinforcement panel > Rebar
- In the **Modify | Place Rebar contextual tab > Placement Methods panel**, click **By Two Points**



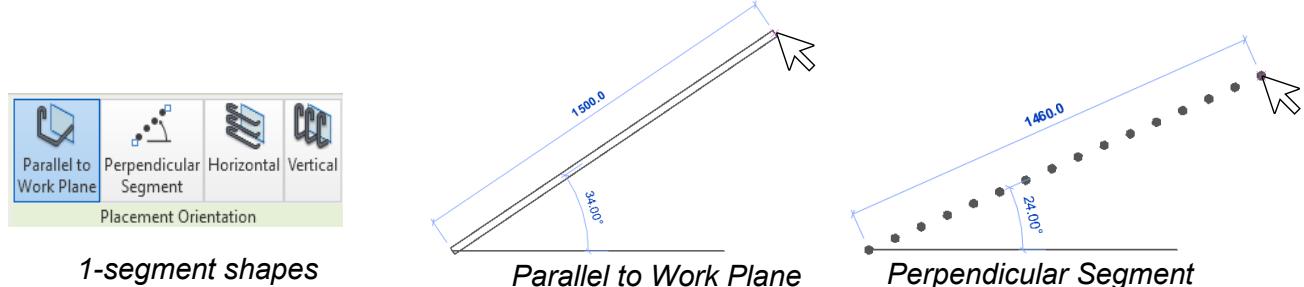
- Select the rebar type, layout of the set, rebar shape
- Choose the placement orientation option; this has the same behavior as for expand to host
- Hover the cursor inside a valid host to place the first point
- Define the dimensions of the bar or extents of the set and click the second point to place

### Placement Orientation

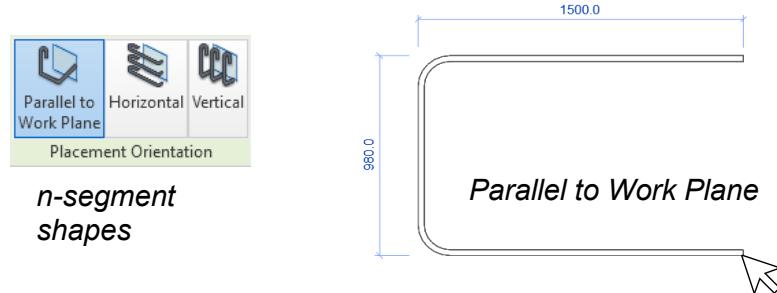
Use the **Parallel to Work Plane** option to place the bar plane parallel to the current work plane, or as a **Horizontal** or **Vertical** set, with the bar plane perpendicular to the work plane.

**TIP:** Use the brackets "[" or "]" to quickly toggle between orientation options. These also work for the existing, Expand to Host option.

For **single segment rebar shapes**, you can place the **bar or set rotated in any direction** using the **Parallel to Work Plane** and **Perpendicular Segment** options. These options also allow automatic alignment to visible references and direct input of the bar or set lengths through the temporary dimension.



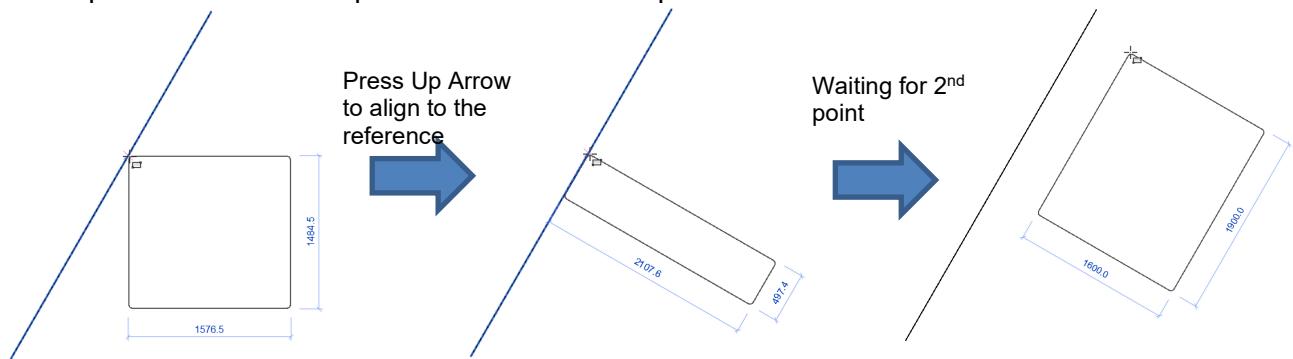
For **rebar shapes with multiple segments**, Parallel to Work Plane expands the shape in a box defined by the two points.



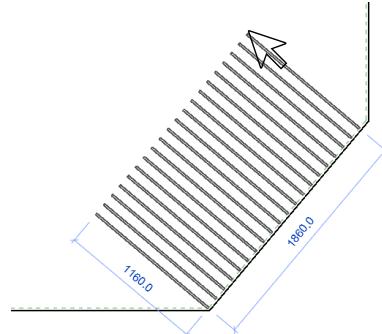
### Aligning to any reference

The box that defines the size of the rebar can also be **aligned to any reference** in the project, by **pressing the Up Arrow** while hovering over the reference. **This can be done before or after the first click.**

Press Up Arrow over white space OR exit the rebar placement to reset the rotation.



Aligning a rebar set works similarly



### Show Tooltip

For the **Expand to Host** and **By Two Points** placement methods, there is a new visual indication of the options that are available at any step, in the form of a tooltip that follows the cursor.

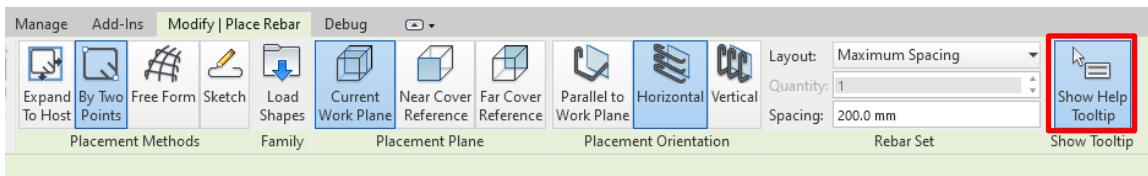
Space [ or ]	Rotate / Flip
Up Arrow	Cycle through orientation options Align to highlighted reference



The tooltip shows information like toggling placement options, rotating/flipping the rebar shape or aligning to a reference.

You can turn it off by toggling the Show Tooltip command in the Modify | Place Rebar ribbon.

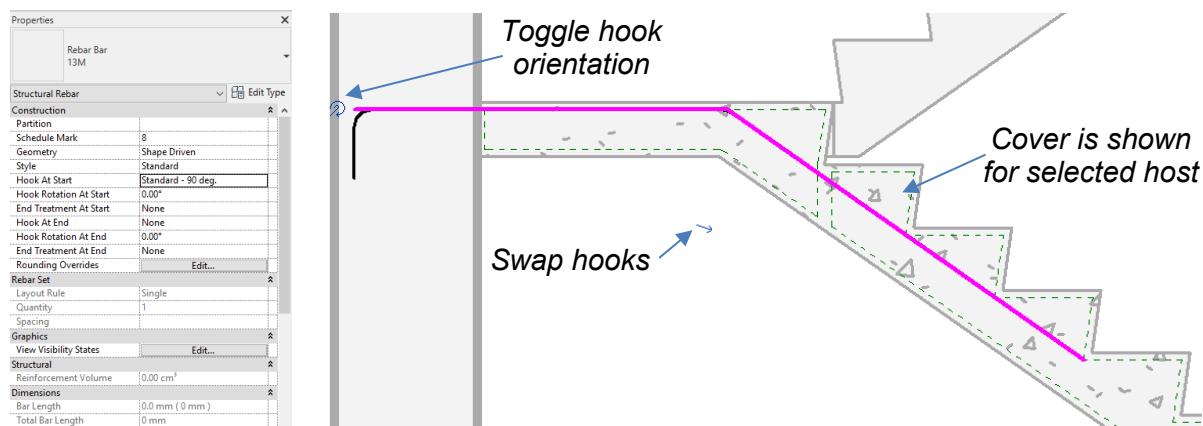
The tooltip status is maintained after closing the Revit session.



## Sketch rebar

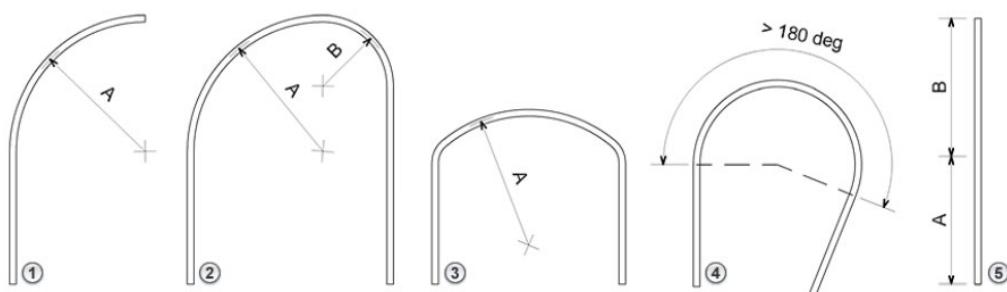
Using this method, you can sketch custom shapes directly in the context of the element. A new rebar shape family is created when you click finish, unless the sketch matches an existing shape, in which case that shape is set for the rebar.

The options selected during sketching will determine the characteristics of the rebar shape family (style – stirrup or standard, hooks and hook rotation, end treatment, shape driven or free form)



## Unsupported shape geometry

The following geometries are not currently supported in Revit rebar shapes. You can still create rebar with these geometries, but you must use free form rebar.

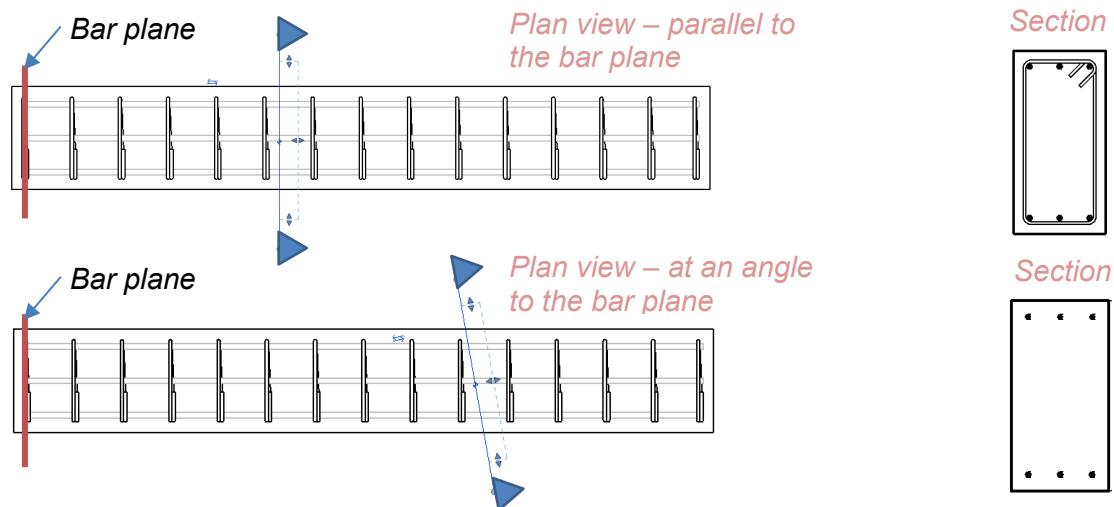


(1) Shaped ending in an arc; (2) Consecutive arcs; (3) Arcs not tangent to adjacent segments; (4) Arcs greater than 180 degrees between adjacent segments; (5) Almost collinear adjacent segments.

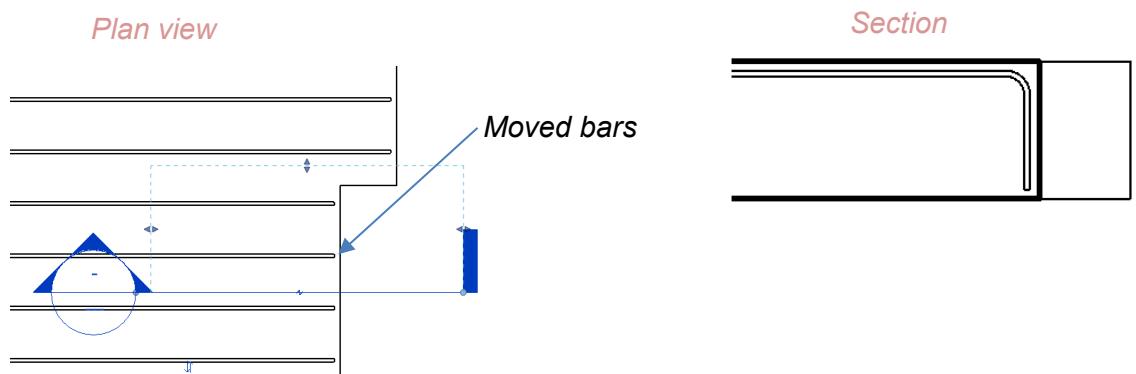
### Rebar set cut by section view

When a rebar set is cut by a section view, that is parallel to the bar plane, the transverse reinforcement is always shown in that section view, even if no bars fall inside the section view range. This is done to ensure that the design intent is expressed correctly, even in situations where a change in layout would result in hiding of the stirrup in the section view.

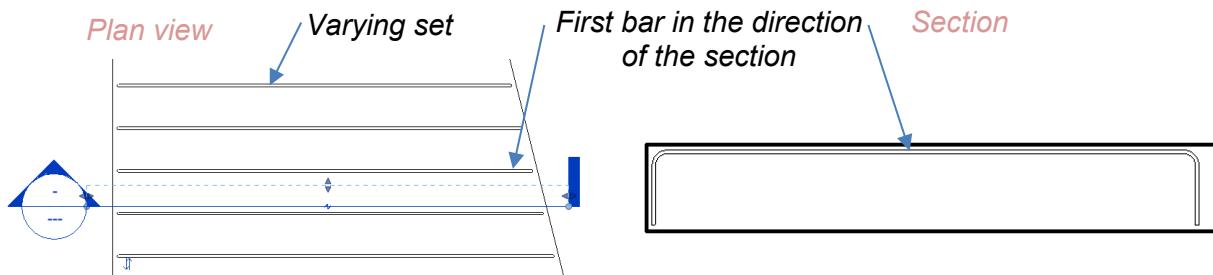
The way this works is the first bar in the set is projected to the section view plane and displayed.



If at least one bar in the set is moved or removed, all the bars in the section range are displayed.



In the case of varying rebar sets, the first bar in the direction of the section is projected to the section plane and displayed, even if it's not inside the view range.



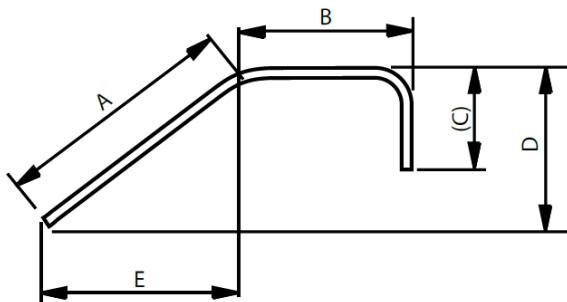
## How to create a rebar shape family

You can edit rebar shape families to specify internal constraints and change how the various segment lengths are reported. Although you can edit rebar shapes like any other families, they do possess some limitations and requirements, which include:

- The rebar shape family doesn't flex when changing the parameter values
- Rebar is made up of lines and doesn't move in the family environment, like it does in the project
- Reference planes and dimensions that are not used to define the rebar shape family will be removed silently when loading the family into the project

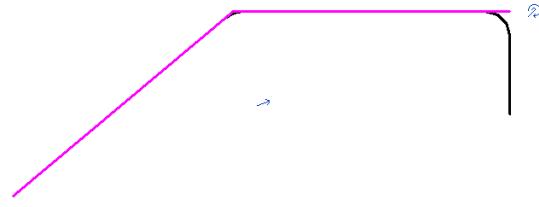
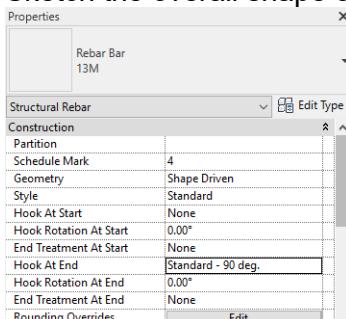
### Sketch rebar shape

Let's start by first sketching the shape we want to create inside the project. We will define rebar shape 27 from the British Standard.

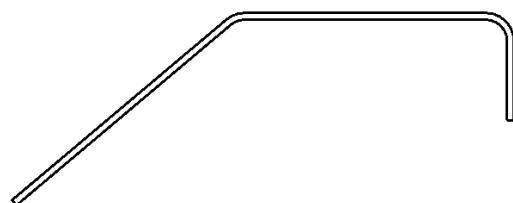


Steps:

- Go to Structure tab > Reinforcement panel > Rebar and click Sketch Rebar
- Select a concrete host
- Sketch the overall shape of the bar; add a standard 90 deg. hook at the end



- Click Finish to create the new shape; now you can rename the shape to "27"

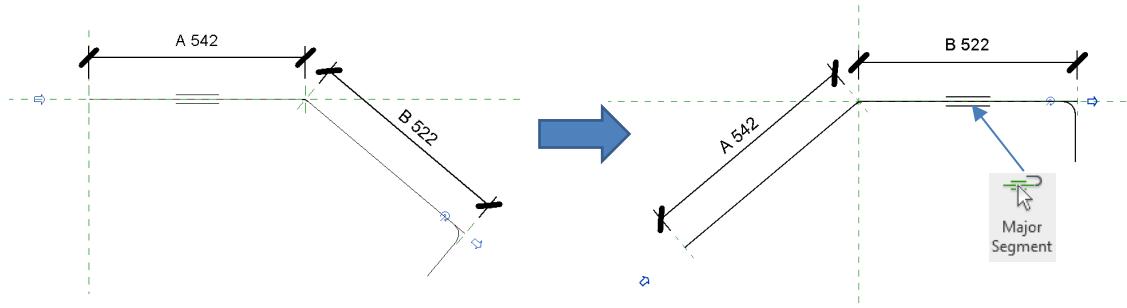


### Configure the rebar shape family

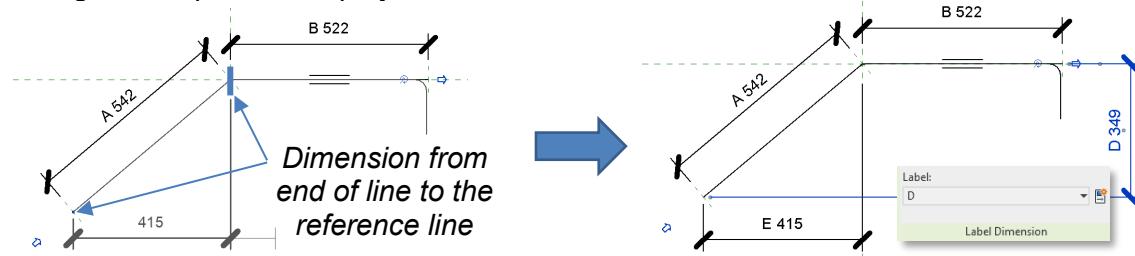
Now we want to configure the family to correctly report the segment lengths and also make the inclined segment angle variable. This means it can move between 90 and 180 deg.

Steps:

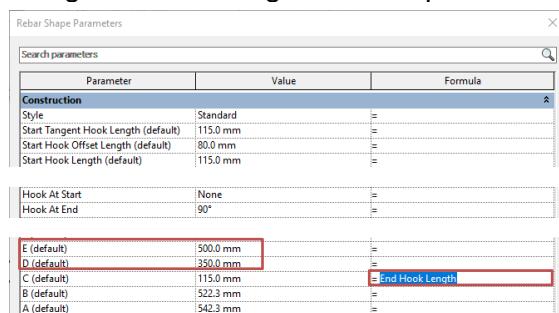
- Select the bar and click Edit Family  
Inside the family the segments already have length constraints. These are dimensions from the reference lines at the ends, with a parameter label.
- Select the lines and rotate like in the shape image, aligned to the two reference planes
- Click the major segment command and select segment "B"  
The major segment determines how the bar is oriented inside the rebar shape browser



- Create the "D" and "E" dimensions and assign the labels, by selecting each dimension and selecting it from the label dropdown in the Label Dimension panel  
Adding orthogonal dimensions to a segment, allows this segment to move freely when loading the shape into the project.



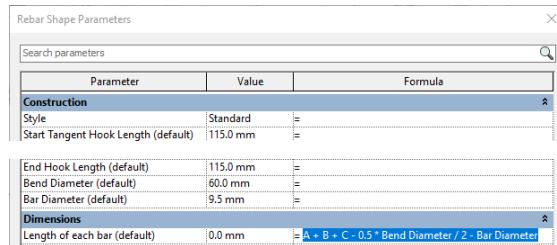
- Go to the Modify tab > Properties panel and click the Family Types command. Here you can set a default value for the assigned parameters (D, E)  
The rebar shape status will show an error if the parameters don't have a default value.  
The default values you set inside the rebar shape family define its dimensions in the rebar shape browser representation.
- Assign the hook length to the C parameter, by adding the parameter name in the formula



Optionally, you can define a formula to compute the bar length according to the standard you are using. For shape 27 of the British Standard, this is  $A + B + C - 0.5r - d$ , where  $r$  is the bending radius and  $d$  is the bar diameter.

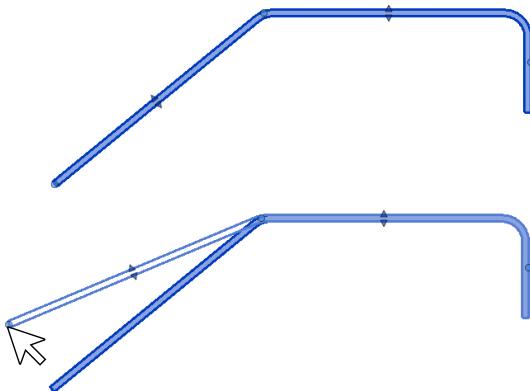
Steps:

- Define a new shared parameter for the bar length. We can call it *Length of each bar*
  - Click new parameter
  - Add a new parameter to an existing parameter definition file, pick the rebar shapes definition file or create a new one
  - Make the unit type to be Reinforcement Length and add it to the Dimensions category
  - For rebar shapes the only option is instance type
- Add the formula to the new parameter. Apart from the A, B, C parameters, you can use any of the terms in the Construction category. The values they show are the default values. Once loaded into the project, they will use the values of the assigned rebar type



- Load the shape into the project and check the reported values  
Rebar shows the rounded value in brackets.  
The end segment moves freely because of the E and D dimensions. You can get the same result by adding an angular constraint.

Dimensions	
A	528.1 mm ( 530 mm )
B	522.3 mm ( 520 mm )
C	200.0 mm ( 200 mm )
D	334.1 mm ( 330 mm )
E	408.9 mm ( 410 mm )
F	0.0 mm ( 0 mm )
G	0.0 mm ( 0 mm )
H	0.0 mm ( 0 mm )
J	0.0 mm ( 0 mm )
K	0.0 mm ( 0 mm )
Length of each bar	1217.7 mm ( 1220 mm )
O	0.0 mm ( 0 mm )
R	0.0 mm ( 0 mm )
Bar Length	1211.9 mm ( 1210 mm )
Total Bar Length	1210 mm



Tips:

- Remove all the unused parameters in the rebar shape family to avoid showing 0 in the rebar schedule. The cell will show a blank cell this way.
- Add new parameters or use parameters that you don't report in the schedule if you just need to have a certain behavior for the bar (like this example of moving the segment freely), but don't need to report those parameter values.

## Free form rebar

Unlike shape driven, the geometry of free form rebar is defined by the geometry of the host. Free form rebar can have any geometry and automatically update when the host element changes. The bars can match the geometry to rebar shapes, and report information like segment lengths.

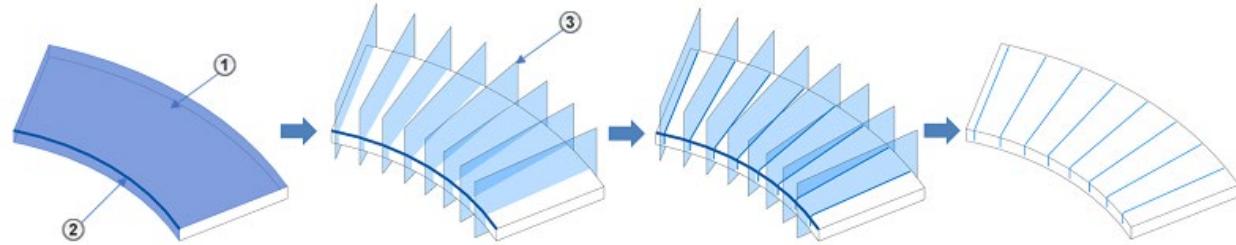
## Aligned distribution

You can use the aligned distribution free form rebar to create rebar sets with planar bars distributed along the faces of a structural element and aligned to a distribution path.

### How it works

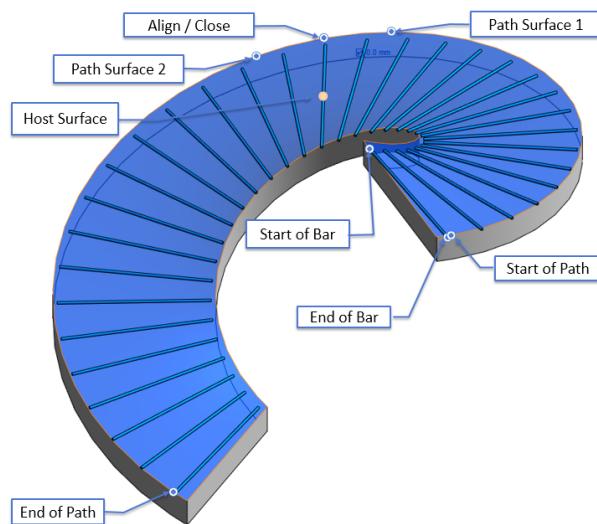
The bars in an aligned distribution are created at the intersection of each individual bar plane ③ with the host surface ①. All the bars are planar, respect the cover of the host and are aligned to the distribution path, by default.

The path ② is the edge of an element that can host rebar. You can directly select the path when you place the rebar set. You click on structural element edges during set placement to select the path. You can edit the path by adding or removing faces from the Path Surface 1 and Path Surface 2 constraints, in edit constraints mode.



### Aligned distribution constraints

Each bar handle has a constraint target (one or more faces), an offset and options to constrain to the face or to the concrete cover.

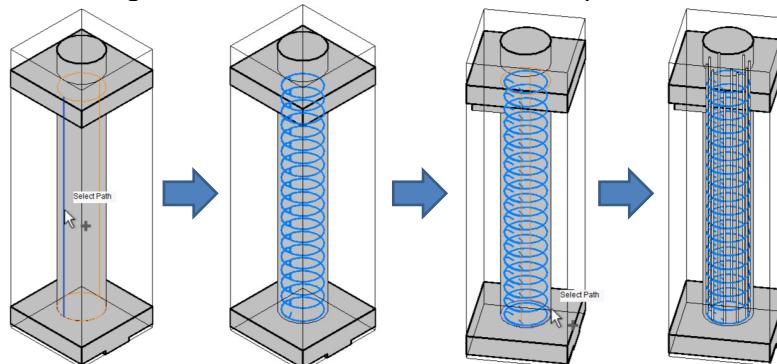


## How to place

A practical use case for aligned distribution, which I also highlighted in the free form rebar placement video in the class presentation, is the **reinforcement of circular columns**.

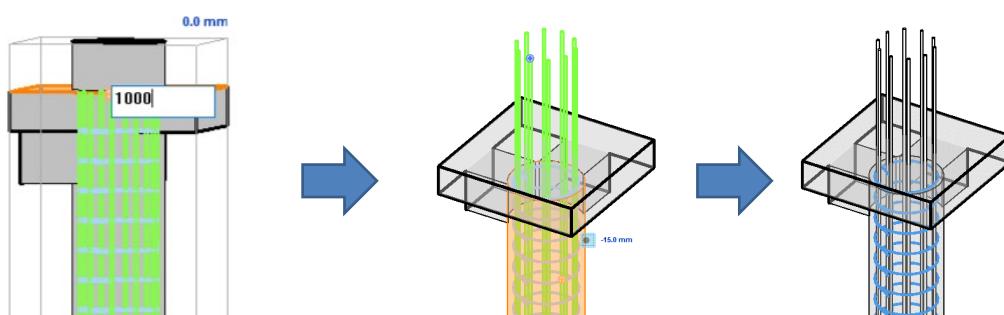
For this we can use the following steps:

- Click Structure tab > Reinforcement panel > Rebar, in the placement methods panel select, Free Form Rebar and click the Aligned Distribution
- Select the set layout, rebar type
- From the properties palette, set the style to Stirrup / Tie, add 135 deg hooks at both ends
- Select the Host Surface (column side faces) and click Next
- Select the vertical edge as the distribution path and click Finish
- The stirrups are created
- Restart the command and change the rebar type, style to standard and no hooks; layout fixed number 10 bars
- Select the host surface (column side faces); click Next
- Select the round edge at the bottom as the distribution path



After placing the longitudinal bars, we can edit the rebar constraints and set a splice length for bars in the column on the next level. To do this, you can follow these steps:

- Select the longitudinal rebar
- Go to Modify | Structural rebar tab > Constraints panel > Click Edit Constraints
- Select the end of the bars that is positioned towards the top of the column
- Click the top of the slab to set that as the constraint target and set the offset to 1000mm
- Click the Host Surface handle and edit the offset to account for the stirrup diameter



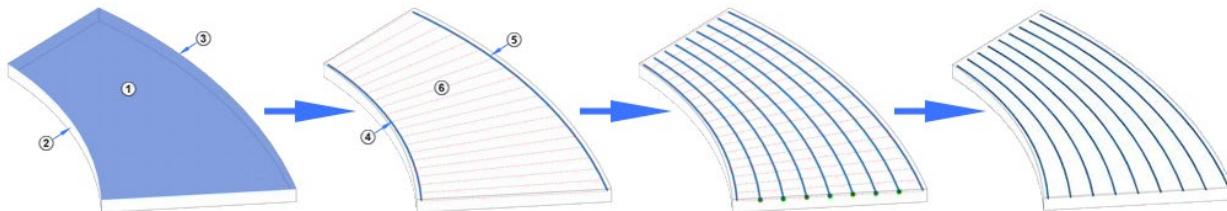
For more information about the placement, behavior and editing constraints for aligned distribution free form rebar, check out my Autodesk University 2019 class, [Rebar Modeling in Revit: Keep It in Check](#).

## Surface distribution

Free form rebar surface distribution populates the surfaces of irregularly shaped hosts with variable non-planar distribution.

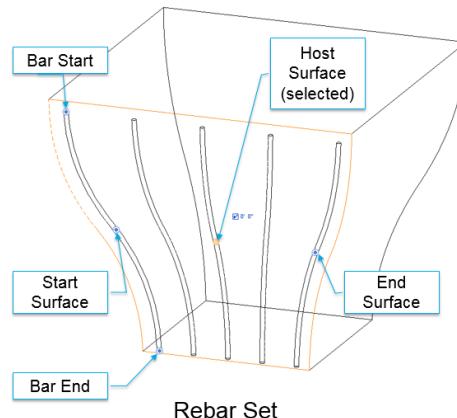
### How it works

The bars are created by interpolating between the first and last bars of a surface distribution set. The curves follow the host surface geometry and respect the cover of the host. First, the intersection of the start surface ② and the host surface ① places the first bar. Next, the intersection of the end ③ surface and the host surface places the second bar. Finally, the remaining bars (as specified in the rebar set layout) interpolate ⑥ between the first ④ and last ⑤ bars.



### Surface distribution constraints

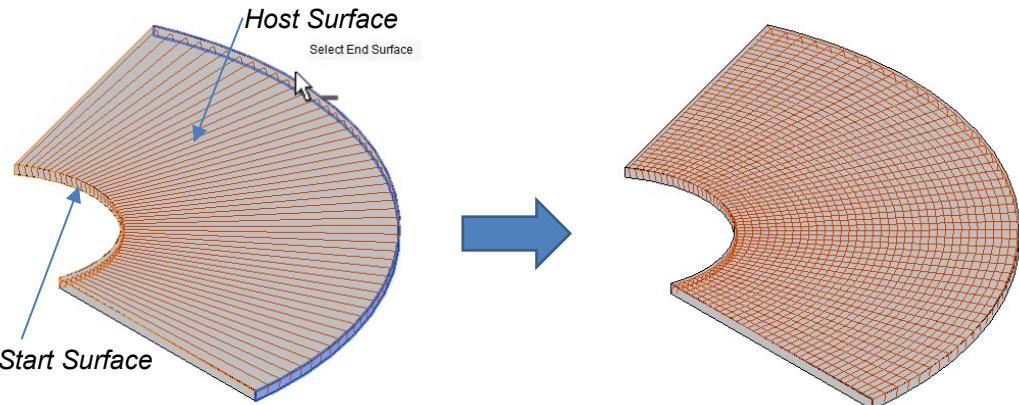
Each bar handle has a constraint target (one or more faces), an offset and options to constrain to the face or to the concrete cover.



### How to place

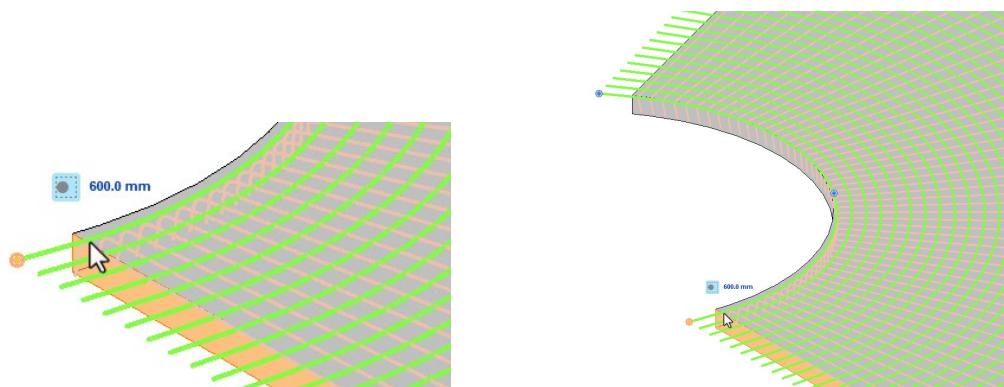
For this example, I am using the modeling of the ramp longitudinal rebar, from the class presentation video. To model this rebar, we can follow these steps:

- Click Structure tab > Reinforcement panel > Rebar, in the placement methods panel select, Free Form Rebar and click the Surface Distribution
- Select the set layout, rebar type
- Select the Host Surface (top of ramp) and click Next
- Select the Start Surface (side face of ramp) and click Next
- Select the End Surface (other side face of ramp) and click Finish



After placement, we can edit the rebar constraints and set an anchoring for the ends of the bars:

- Select the rebar set and edit the rebar constraints.
- Select the rebar ends and edit the offset with respect to the ends of the ramp
- Select the host offset handle and edit the offset to not clash with the transverse rebar.

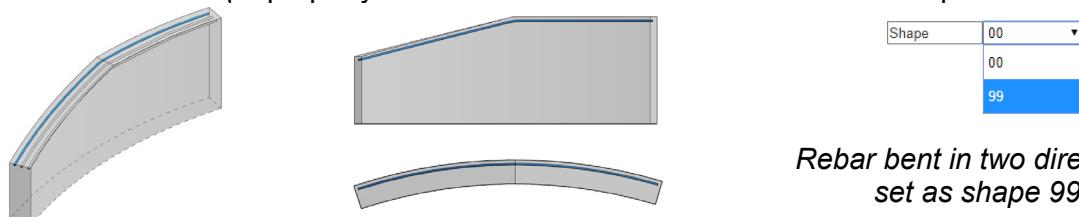


For more information about the placement, behavior and editing constraints for surface distribution free form rebar, check out my Autodesk University 2019 class, [Rebar Modeling in Revit: Keep It in Check](#).

#### Specify shape code for custom bent free form rebar

For 3D free form rebar or bars with geometry that can't be [matched to Revit rebar shapes](#) (Workshop Instructions parameter set to Keep Straight), you can specify a custom shape code. To do this you can follow the following steps:

- Duplicate the 00 shape in the project (or any single segment shape)
- Rename it to whatever the shape code you want to use (e.g., 99)
- Go to the shape property of the free form bar and select the new shape



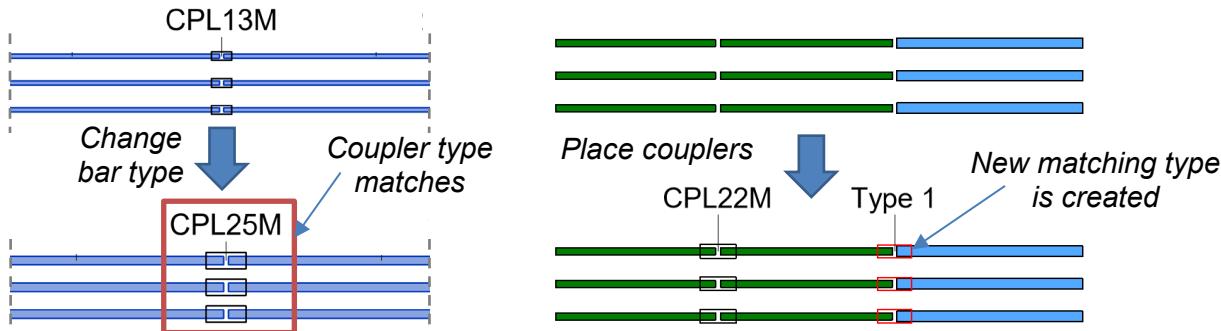
## Rebar couplers

You can use couplers to connect two rebar sets together or place at the ends of bars. Couplers have fully customizable geometry and synchronize the layout of connected sets. The ability to place couplers has been around since Revit 2017.

- Click Structure tab > Reinforcement panel > Rebar Coupler
- Click one of the placement options, Place on Bar End or Place between Two Bars
- In the Type selector at the top of the Properties palette, select the desired rebar coupler type.
- Place the coupler on rebar.
  - For placement on the end of a bar, select the desired end of the rebar.
  - For placement between two bars, select two valid rebar instances. The second bar selected will reposition and shorten as necessary for the coupler.
- For a coupler to connect two rebar instances, the connected ends must be no more than the distance of 10 bar diameters apart. The bars cannot be offset more than 3 bar diameters from one another.

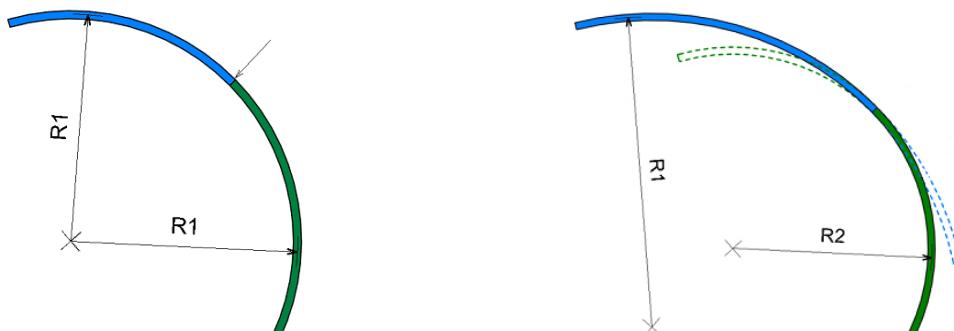
## Select or automatically match the coupler type

The rebar coupler size will be automatically adjusted to match the bars you are trying to connect or to match the sizes you set for bars that are already connected. If a matching coupler type does not exist in the project, a new coupler type will be created.



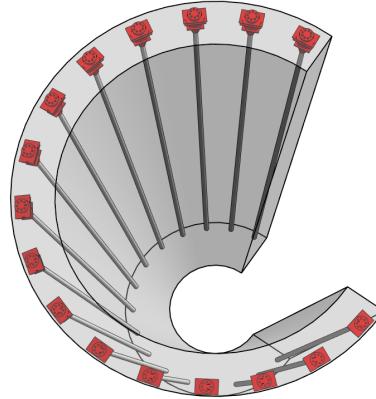
## Couplers connecting arc bars

To place a rebar coupler between two arc bars, the two bars need to have the same center. The bar ends must be in the coupler tolerance of 10 bar diameters in order to be connected. Tangent arc bars that don't have the same center can only be connected if the coupler is not cutting any part of either bar (they remain in the "tangent" position).

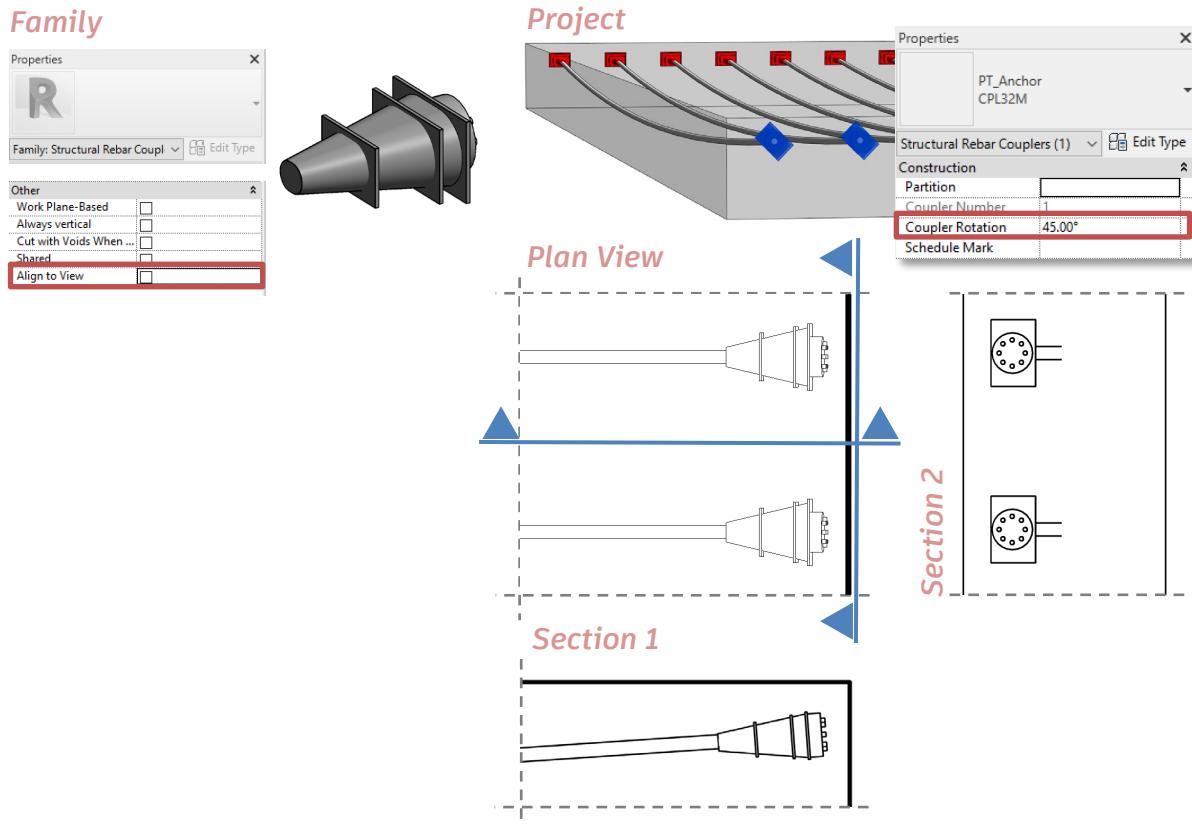


## Align couplers to create post-tensioning anchors

Couplers can automatically align to the bar end. For free form rebar, the default position is perpendicular to the host surface. This capability allows couplers to be used for modeling post-tensioning anchors.



To enable the coupler rotation and alignment to the bar end, you can edit the coupler family and uncheck the Align to View property. When checked this makes the coupler always orient itself to the view (in 2D views).



For more information about working with couplers, including customization of end treatments, you can review the [help topics related to couplers](#).

## Learn how to propagate rebar in simple and complex structural elements, for shape-driven and free-form rebar

### How propagate rebar works

Adaptive rebar propagation copies and adapts shape driven and free form rebar from the source host to destination hosts. This feature is available starting with Revit 2023.

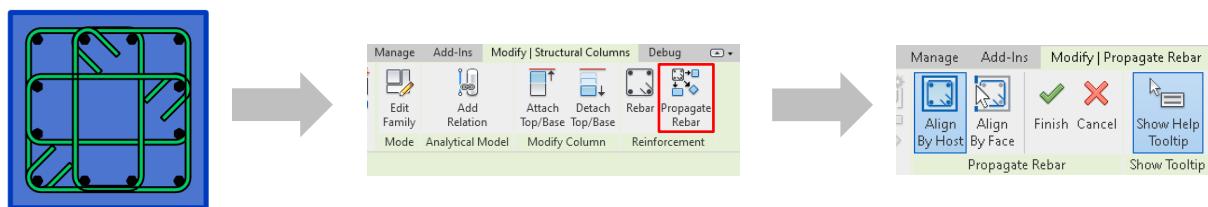
The bars are adapted by aligning the hosts and matching the corresponding faces. The host alignment is either done automatically, when using Align by Host or manually, by specifying an original and destination face, when using Align by Face mode.

Any existing rebar in the destination hosts is ignored, so propagating twice will duplicate the reinforcement. There is no connection between the original and propagated rebar.

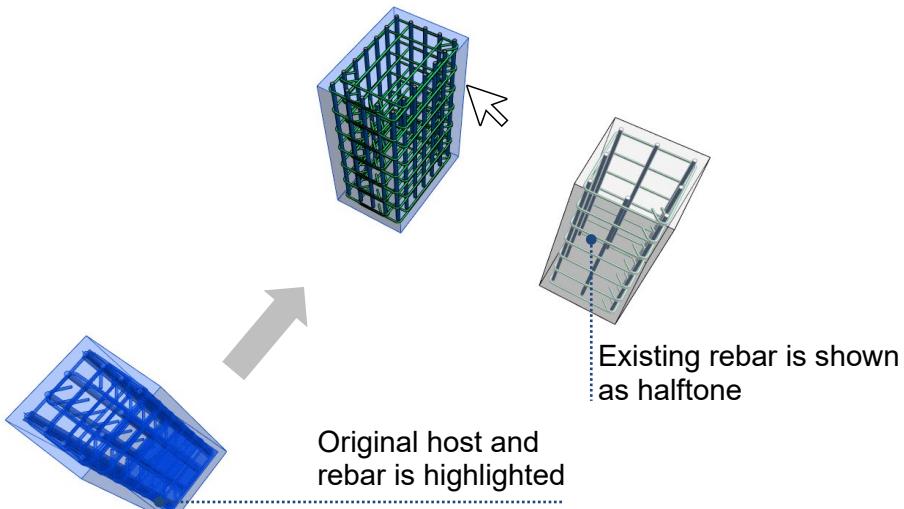
### Propagate rebar by host

This is the default mode when starting the Propagate Rebar command with a concrete host selected. The bars are propagated from the original host to the selected destination hosts (one to many). Propagating rebar from a group of elements (e.g., continuous beam, portal frame) is currently not supported.

- Select a concrete element that hosts rebar > Modify | (Concrete Element Category) tab> Reinforcement panel > Propagate Rebar



- Select the destination hosts.  
Click to add / remove from the selection. Ctrl + window / crossing window to add, Shift to remove from the selection
- Finish to place the rebar or Esc to cancel

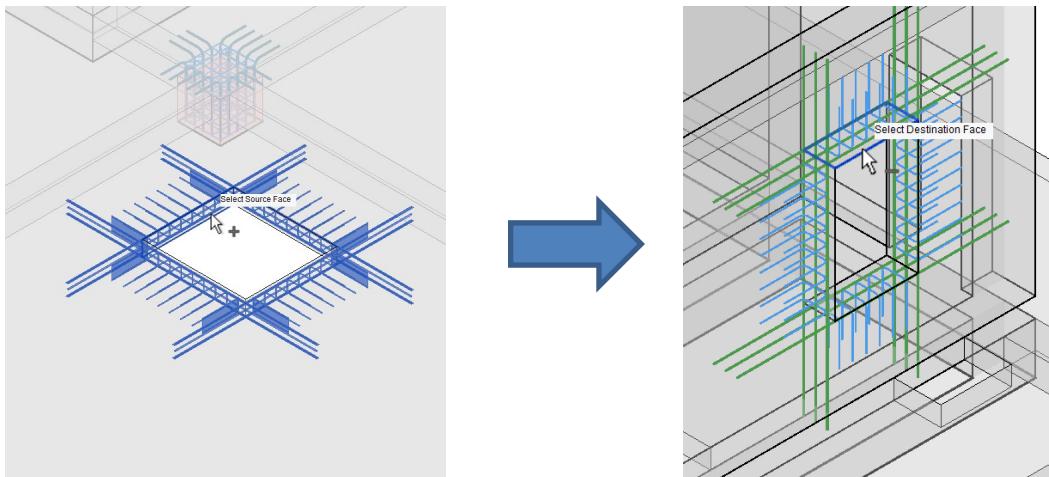


## Propagate rebar by face

This mode copies and adapts the rebar by orienting it with respect to the original and destination face. Rebar can be propagated to hosts of distinct categories and even inside the same host.

To propagate aligned by face you can do the following steps:

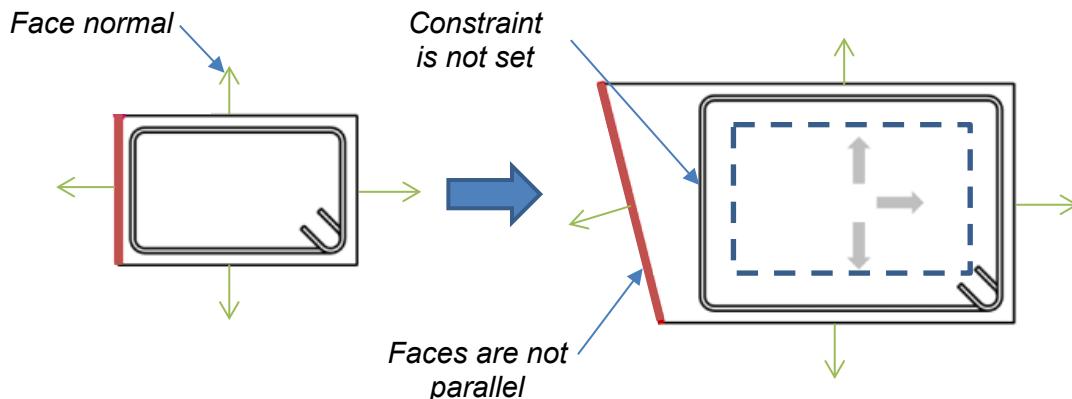
- Select one or more rebar sets
- In the Modify | Structural Rebar tab > Host panel > Propagate Rebar
- Select the original face from the host of the selected rebar  
If the selection contains rebar from other hosts, they get filtered out at this step.
- Select one or more destination faces. The rebar is adapted and shown as preview for each selected face
- Click Finish to place the rebar or Cancel to discard changes and exit the Propagate Rebar command

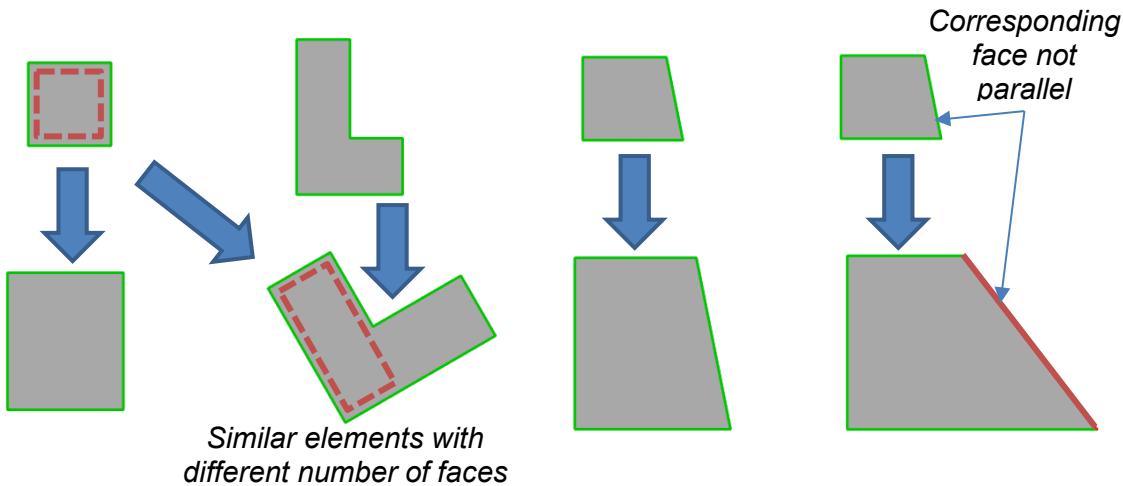


**TIP:** Use Enter to Finish and create the rebar or Esc to discard the changes and exit rebar previewed in the selected destination hosts.

## Similar hosts and face matching

Propagate rebar works for concrete hosts which are similar. Two concrete hosts are similar if their corresponding faces are parallel and oriented in the same direction (face normal is a vector pointing towards the outside of the concrete element). If some faces are not parallel, they will not be set as constraints for the propagated rebar.

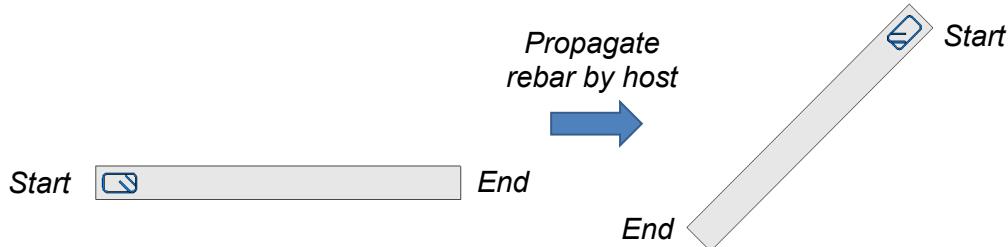




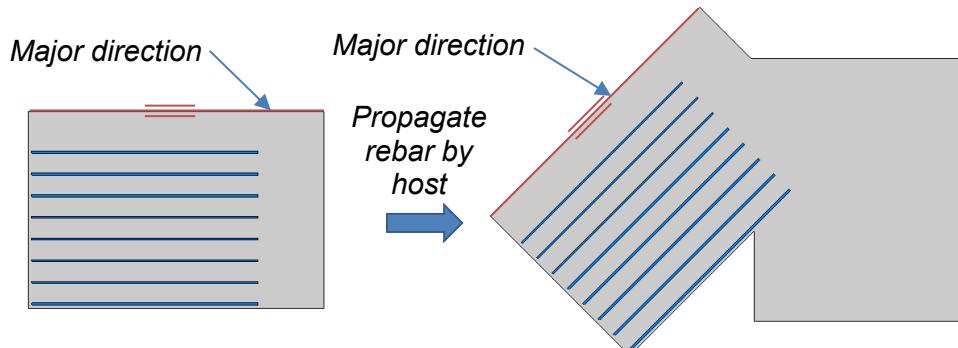
For **elements based on loadable families** (Structural Columns, Framing) the transformation from the source to the destination host is determined automatically by the system. The families should be modeled with respect to the same coordinate system, otherwise the faces will not be considered parallel and matching.



When **propagating rebar by host in walls**, the orientation (start > end) of the element is considered when aligning the rebar.



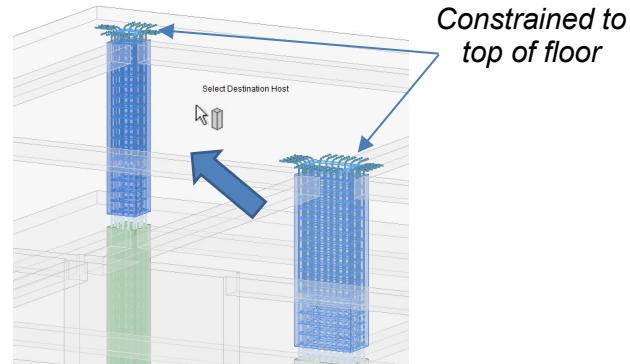
**Propagation of rebar in floors**, uses the major direction to determine the transformation that overlaps the source host to the destination.



## Hosts and neighbors

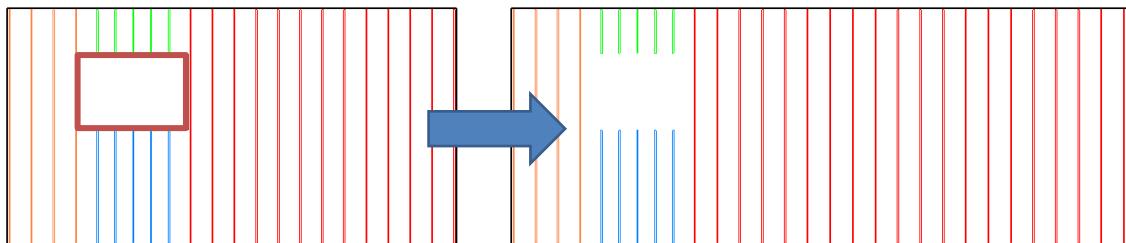
If the rebar has constraints to faces of another, joined to the host (neighbor), a face of the same category will be matched at the destination.

One example of this is the propagation of the vertical bars inside the column, which are constrained to the top of the slab. The system searches for a parallel face from the Floor category.

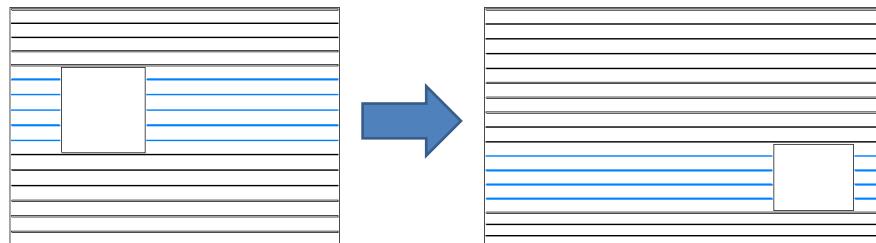


## Propagation around openings

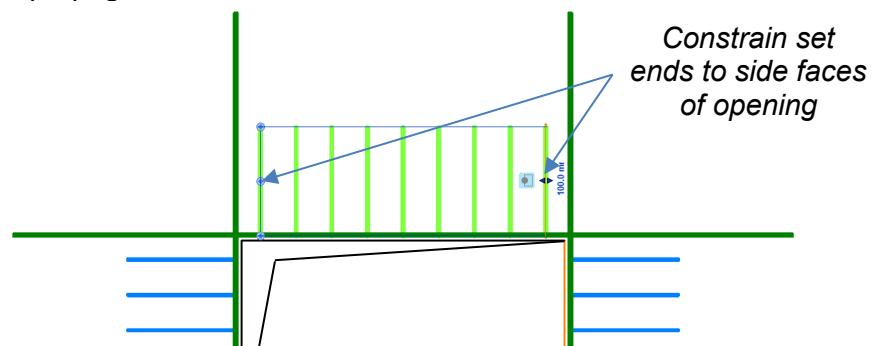
Opening faces are identified separately from the other host faces. This means that if no opening faces are found at the destination, the bars constrained to those faces are not adapted correctly.



When propagating between elements with openings, it is recommended that the elements have the same number of openings.

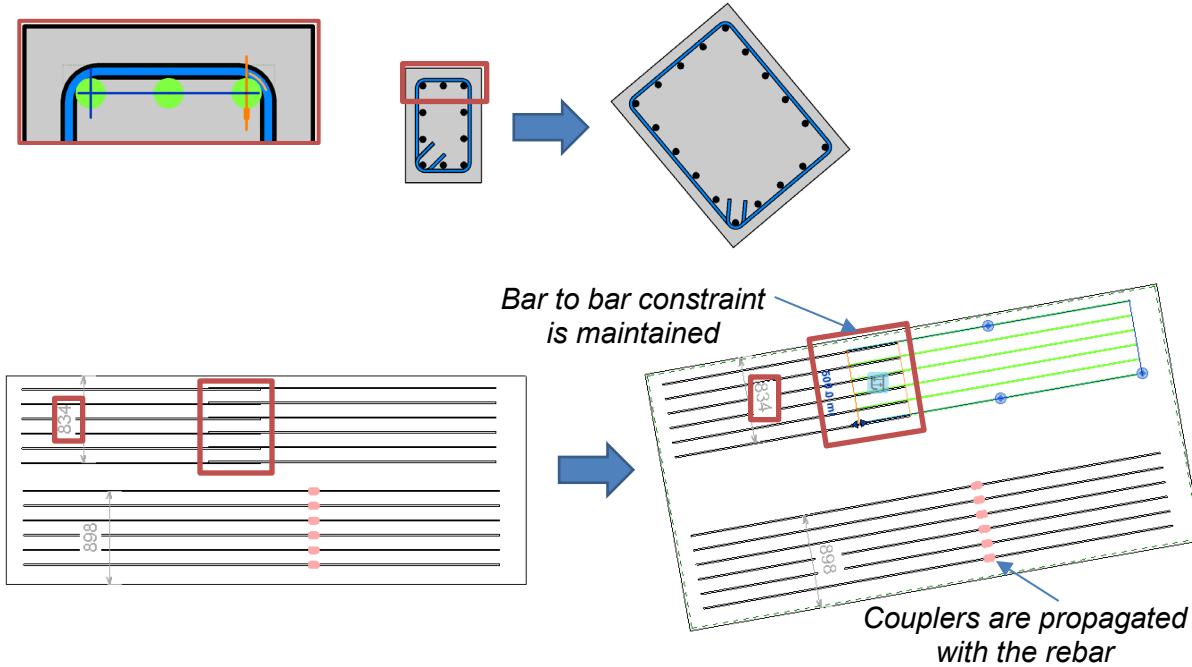


For propagating all the reinforcement by host, or just the reinforcement along the opening, it is always recommended to constrain the bars to the opening faces. The better you set up the constraints, the better propagate rebar will work.



## Rebar constraints and couplers

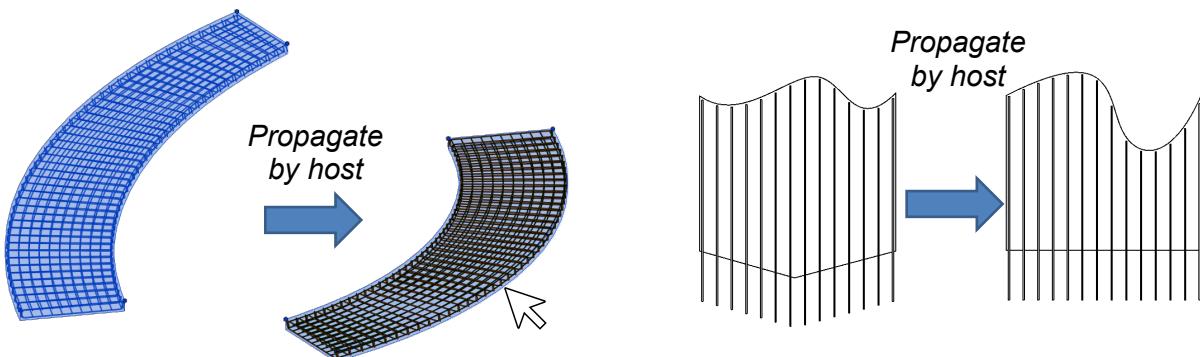
The constraints between bars are maintained if they are propagated together. Some constraints between bars are set automatically (e.g., standard bars to stirrup corners), others can be set manually (e.g., bar to bar constraints in perpendicular layers, splicing between bars).



For more information about the behavior and editing rebar constraints, check out my Autodesk University 2019 class, [Rebar Modeling in Revit: Keep It in Check](#).

## Propagate free form rebar

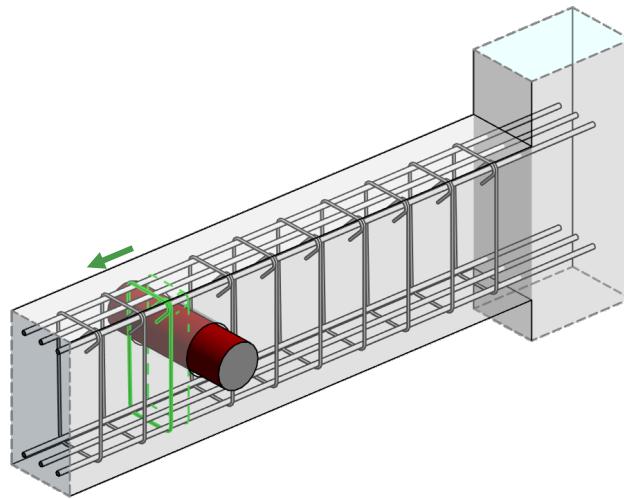
Propagating free form rebar works the same way as shape driven, with the only exception that matching of corresponding faces is done even if the faces are not parallel. This is because free form rebar can have any geometry and can constrain to any face.



## Learn how to avoid clashes, create 3D shape-driven rebar, and configure the project for rebar detailing

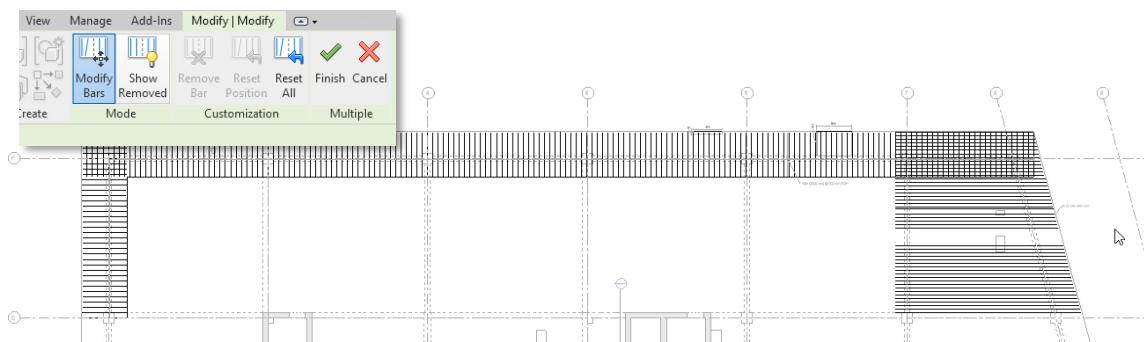
### Move rebar in a set

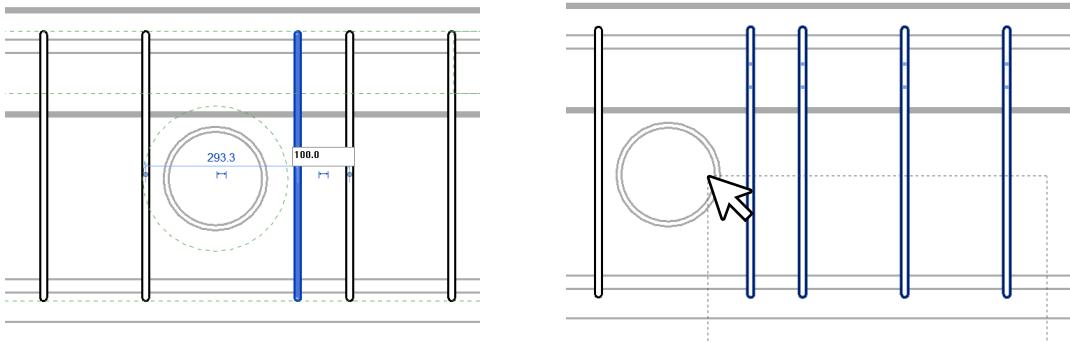
The most efficient way to reinforce concrete elements is to use rebar sets rather than single bars. For situations where some of the bars are clashing with other building components, you can move or remove individual bars in rebar sets, but also in rebar systems, like path and area reinforcement. This allows the clashes to be avoided while maintaining the logic of the rebar set. Removed bars don't appear in any views and are not counted in schedules.



### Edit bars in a set or system

- Select one or more rebar sets, path, or area reinforcement systems
- In the Modify | Structural Rebar > Customization panel > click **Edit Bars** (the default mode is Modify Bars)
- Select one bar and move it using temporary dimensions
- Select several bars and move them using Move, Rotate or Nudge
- Press Finish to accept the changes, Cancel to discard the edits





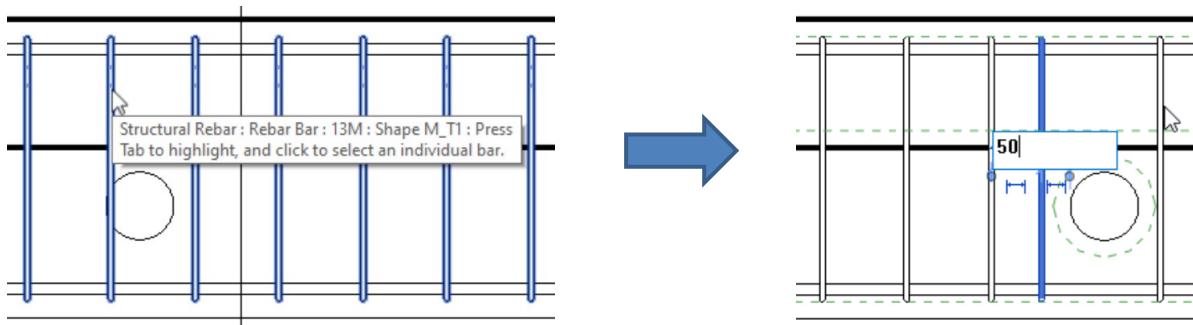
*Moving a bar by editing the temporary dimension and selecting several bars*

**TIP:** Change the temporary dimension reference to any other parallel reference to precisely move the bar with respect to that reference (e.g., the side of the opening)

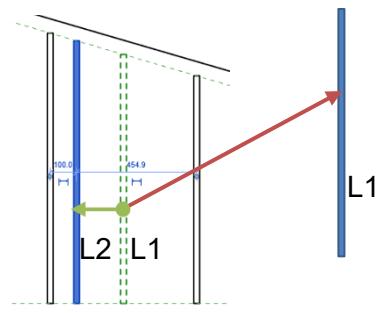
#### Quick selection and edit

For quick edits (moving or removing one or few bars in **sets or path reinforcement**), you can use **Tab + Click to select individual bars directly**, without accessing the Edit Bars command.

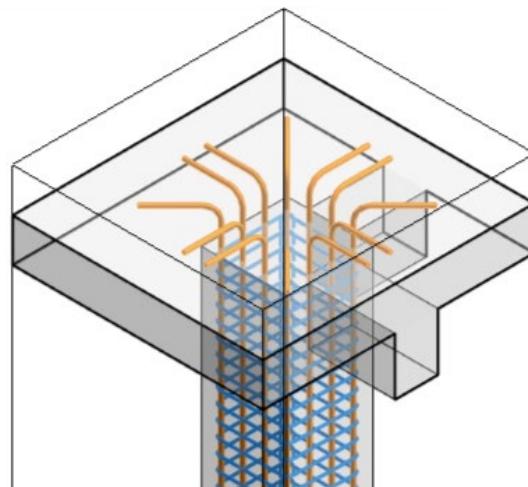
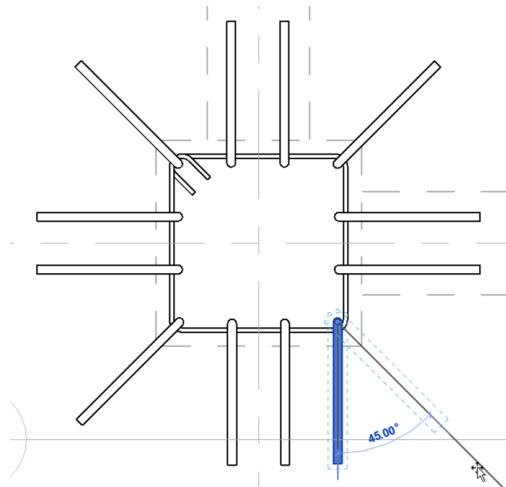
- Press **Tab** to highlight the desired bar and **click to select** the highlighted bar
- Move the bar or bars using Move, Rotate, Nudge or by editing the temporary dimensions displayed when the bar is selected
- (Optional) Move several bars at the same time by adding them to the selection using **Ctrl + click**.



**Note:** When moving bars in a varying distribution in the direction of the set, the bars are shortened or extended according to the varying edge of the concrete element.



The bars can be rotated or moved in any direction, not just the bar plane. For example, the vertical bars in a column can be rotated such that they fan out in the slab where they are terminated.

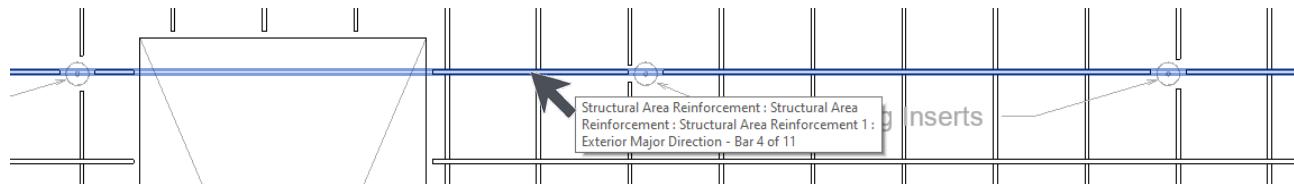


### Edit bars in area reinforcement

To select, move and remove individual bars in an area reinforcement system, select the system or any set generated by it and click Edit Bars.

The area reinforcement is different from sets and path because you are selecting uncut bars or lines generated by the area system on each layer of the system (Top/Exterior, Bottom/Interior, Major direction and Minor direction).

Rebar sets inside the area system are generated by cutting the lines with openings in the concrete host.

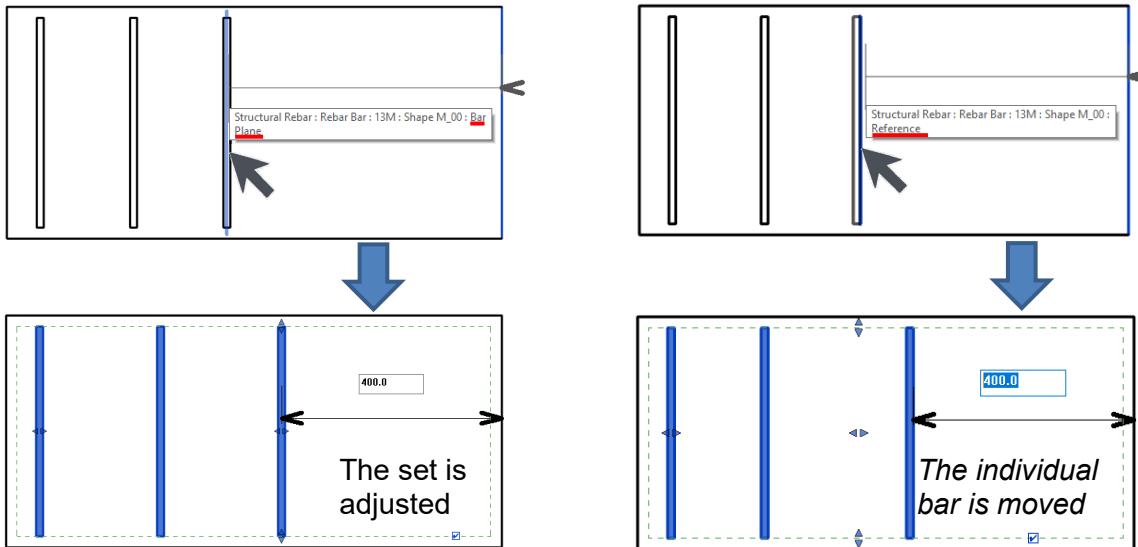


### Move bars using dimensions

You can precisely move individual bars in a **rebar set or path reinforcement** by using dimensions:

- To move a bar using a dimension use the following steps:
- Select a dimension type (linear or aligned)
- Dimension between a bar in the set and some other reference (e.g., the side of the opening)
- Select the rebar set and edit the dimension value

**Note:** Edit the dimension to “Reference” to move the individual bar OR edit the dimension to a rebar handle to change the set extents or bar geometry (e.g., dimensioning to Bar Plane will adjust the layout of the set)



**Note:** Dimensions cannot be locked when one of the references is rebar. This is because dimensional constraints to rebar can conflict with internal rebar constraints and may cause unexpected updates during regeneration.

### Remove individual bars in a set

To remove one or more bars from a set, you can use the following steps:

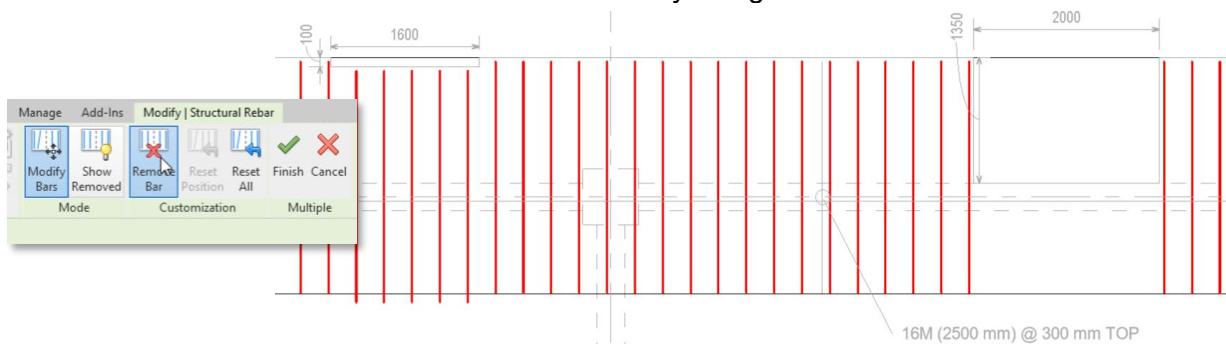
- Select a rebar set, path, or area reinforcement
- In the Modify | Structural Rebar > Customization panel > Click Edit Bars (the default mode is Modify Bars)
- Select one or more bars and click Remove Bar

**Note:** You can select and edit multiple sets or a combination of sets and path systems at the same time.

Alternatively, for **rebar sets and path reinforcement**, select the bars directly by using the following steps:

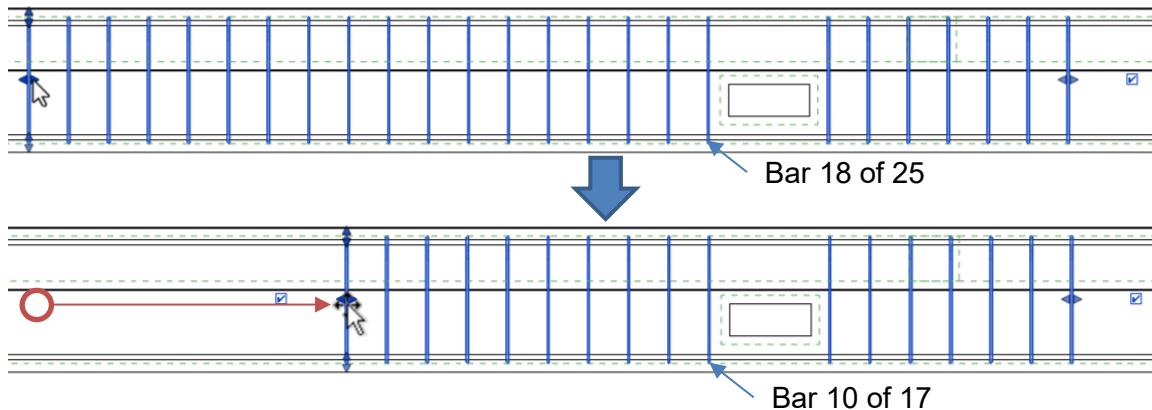
- Move the cursor over a bar
- Press **Tab** until the bar is highlighted
- Click to select the highlighted bar
- Click **Modify | Structural Rebar > Customization panel > Remove Bar** OR select **Remove Bar** from the right click menu

**Note:** You can add additional bars to the selection by using **Ctrl + Click**.



The gaps resulting from removing bars are maintained when adjusting the layout of the set. The bar indices are renumbered to maintain that relative position.

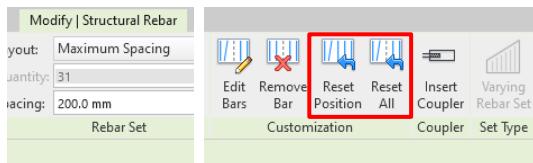
The bar positions can appear to shift when dragging the set handles to adjust the extent of the set, when the layout is set to maximum spacing.



### Resetting moved and removed bars

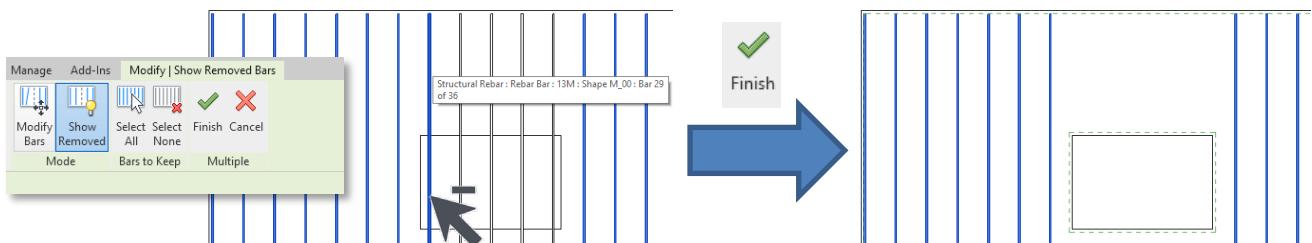
To **reset a moved bar to its original position**, select the set > Edit Bars > Select the moved bar > click *Modify | Structural Rebar > Customization panel > Reset Position*

To **reset all the bars** in the set/system (moved or removed), click **Reset All** in the Customization panel during Edit Bars or select any of the bars and click *Modify | Structural Rebar > Customization panel > Reset All*



To **show the removed bars**, switch to the **Show Removed Bars** mode in the *Modify | Edit Bars > Mode panel*.

To **reset just some of the bars**, just select them in this mode and click finish or switch to Modify Bars. The selected bars are maintained in the set, while the deselected bars are removed (this option is similar to the Select command in Presentation Options)



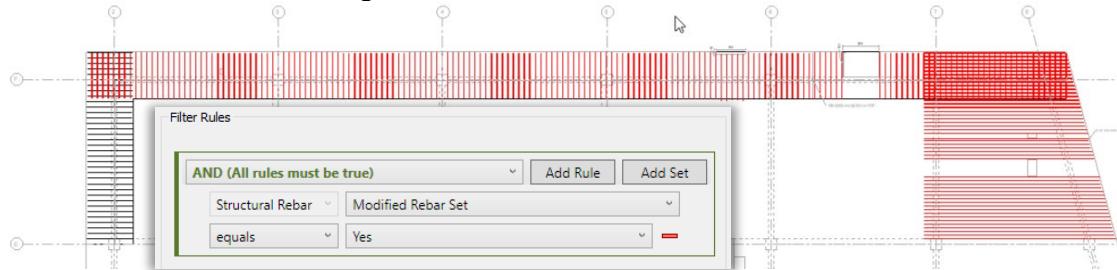
### Rebar couplers and moved bars

Rebar couplers can be used to connect rebar sets with compatible layouts. Once connected, the coupler synchronizes the layouts between the sets, so removing or moving bars in one set, removes or moves all the corresponding bars in the connected sets.

## Review modified sets

You can quickly identify rebar sets in the project or inside a path reinforcement that contain moved or removed bars, by using rebar schedules, tags or filters, based on the value of the **Modified Rebar Set** parameter (Yes / No).

This can be useful when checking the correct



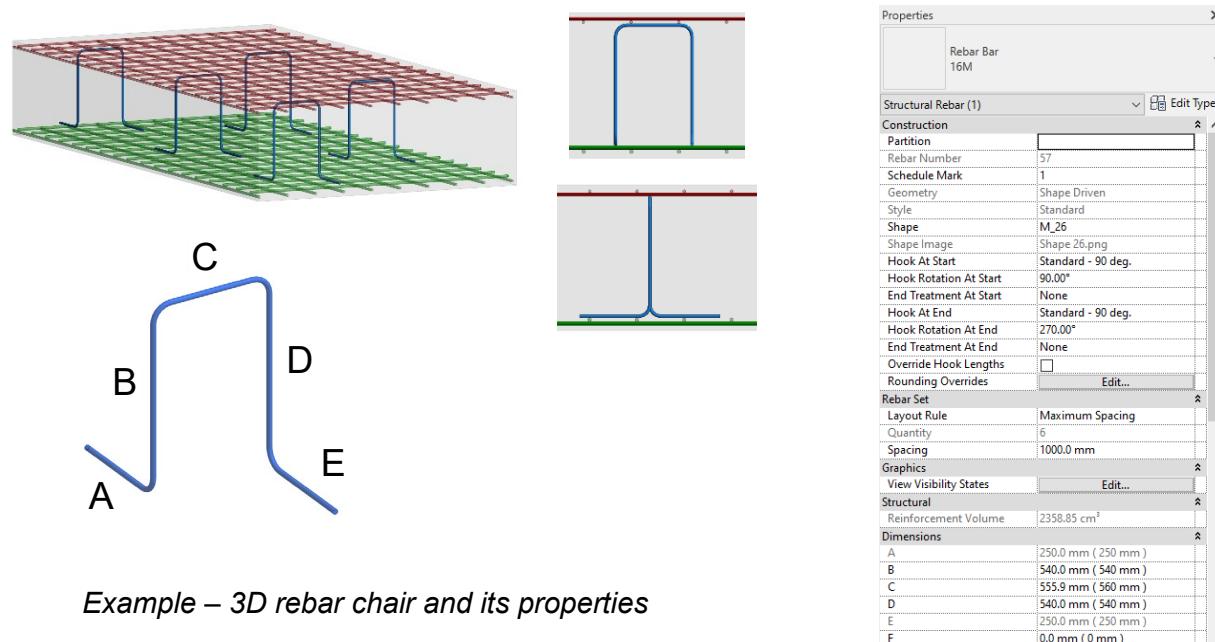
## Simple 3D rebar shapes

You can create 3D shapes by rotating the hooks 360 degrees. One of the most common shapes is the rebar chair shape with hooks rotated 90 and 270 degrees, respectively.

Place rebar with 3D rotated hooks or rotate the hooks of existing bars.

The bar shape will be matched to an existing shape with similar rotation, or a new shape will be created at various hook rotation intervals.

**TIP:** Make sure you have the hooks included in the rebar shape definition, for the shape matching behavior to occur as described above (*Structure > Reinforcement Settings > General Reinforcement Settings*)

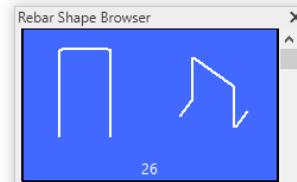


Point	Dimension	Value
A	Length	250.0 mm (250 mm)
B	Length	540.0 mm (540 mm)
C	Length	555.9 mm (560 mm)
D	Length	540.0 mm (540 mm)
E	Length	250.0 mm (250 mm)
F	Length	0.0 mm (0 mm)

*Example – 3D rebar chair and its properties*

These 3D shapes, as well as the existing multi-planar bars are displayed in plan and isometric view, in the rebar shape browser.

Choose the desired shape during rebar placement, but also when changing the shape of an existing bar.



### Hook rotation, rebar shapes and numbering

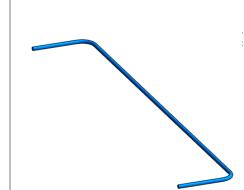
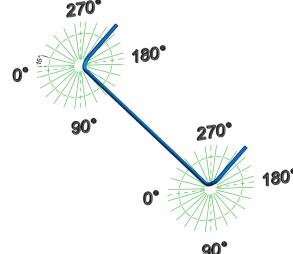
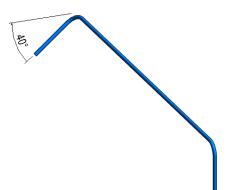
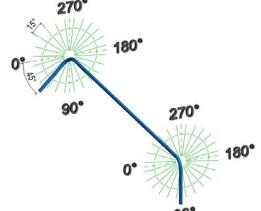
Hook rotation is considered when defining a rebar shape if hooks are included in the rebar shape definition.

**Rebar numbering** compares hook rotation along with the other segment length parameters.

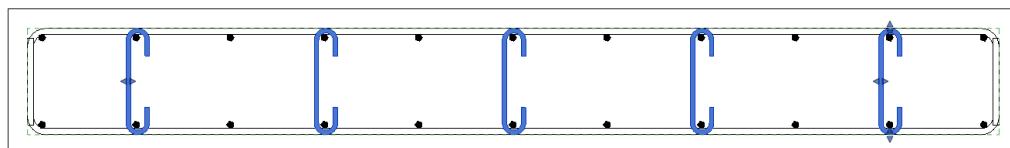
In the simple case of a straight bar, identical rotations will keep the hooks in the same plane and match to a rebar shape with 0-degree rotation (standard shapes in the library).

If the hooks have **different rotations** (they are not in the same plane), a **new shape is created for each 15-degree interval**.

In the following example, the two bars have the same rebar shape because the rotation angle of the hook at start is in the same 15-degree interval. The rebar numbers are different because the hook rotations are different (40 and 45 degrees)

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

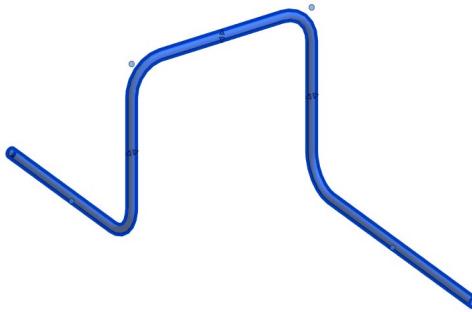
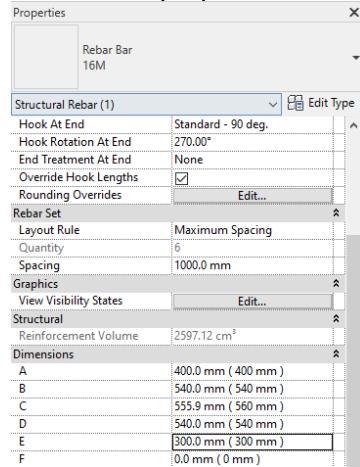
**TIP:** You can use this rotation to model ties in a wall, distributed in one direction, but connecting bars in another direction.



## Override hook lengths by instance

Use the “Override Hook Lengths” control in the properties palette or in a rebar schedule to edit the lengths of hooks directly for each rebar instance.

This is applicable for any rebar with hooks and requires that the hook lengths to be assigned to a rebar shape parameter.

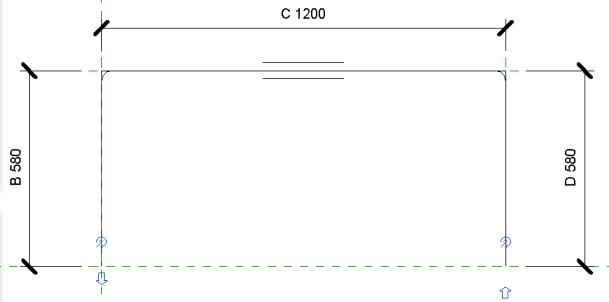
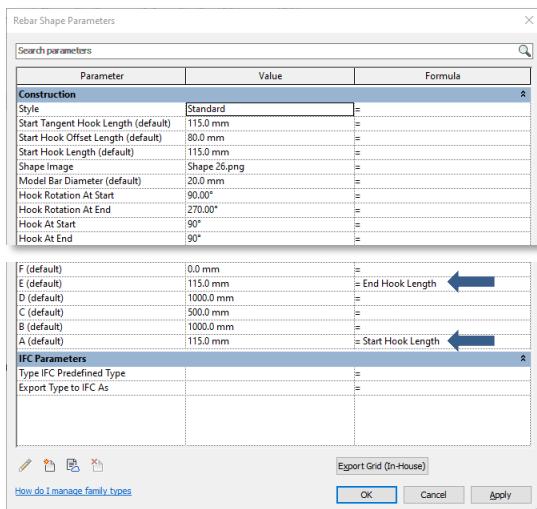


Overriding the hook lengths for a rebar chair

When you sketch a new rebar shape, hook lengths are automatically assigned to the rebar parameters, so that you can directly edit the hook lengths.

To add hook lengths to the parameters of an existing shape, or set the desired parameters to control the hook lengths, you can do the following steps:

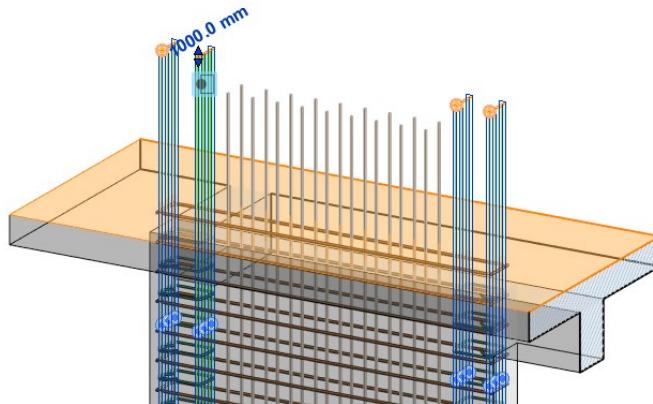
- Edit the rebar shape family
- Click the Family Types command
- Edit the rebar shape parameters and set the Start / End Hook Length formulas



For more information on how the hook lengths are measured, based on the bending angle check out this [Revit help article](#).

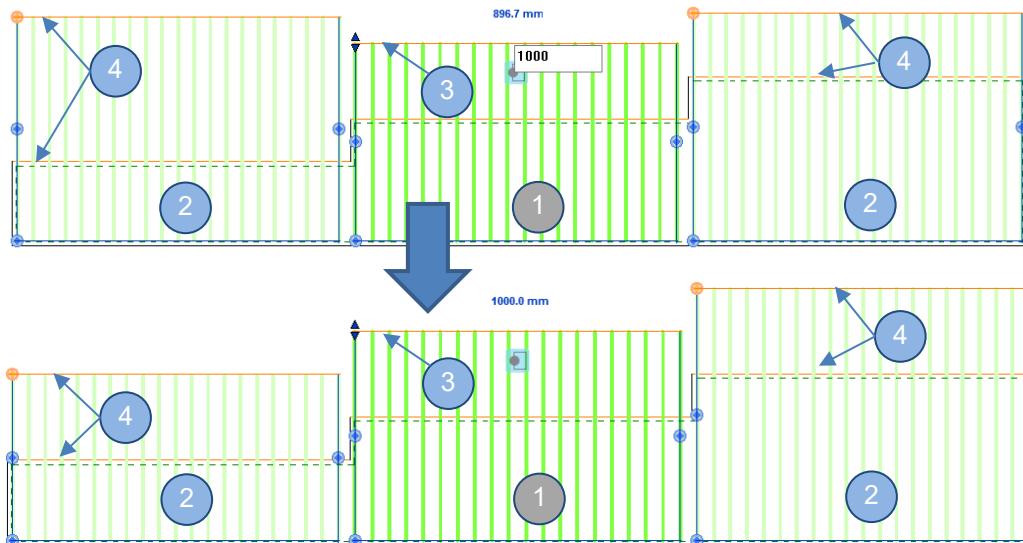
## Edit multiple rebar set constraints at once

Rebar constraints ensure the bar adjusts when the concrete geometry or other bars change. You can make precise adjustments to the bars, like setting the anchoring length or distance to the concrete or other bars, by editing the rebar constraints. Starting with Revit 2022.1, you can edit multiple constraints at the same time.



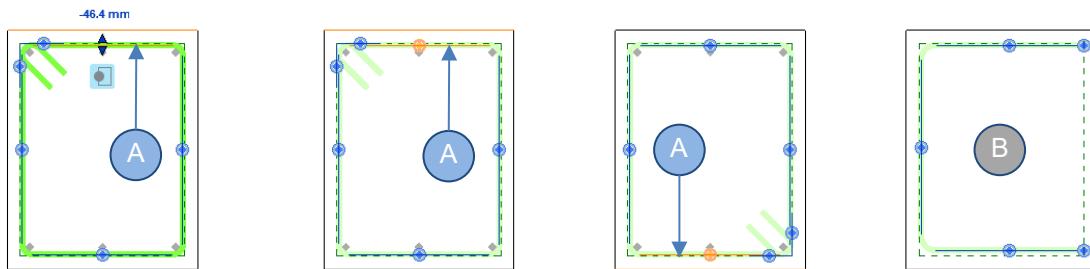
### How to use

- Select multiple rebar sets
- Go to Modify | Structural Rebar tab > Constraints panel > Click Edit Constraints
- Click a handle of one of the sets; the corresponding handles are highlighted for the other sets
- Edit the offset to set it for all bars in the selection
- To change the constraint target for all the bars, click a new valid concrete face or bar segment



*Example – (1) main set and (2) secondary sets; (3) the current handle – End of Bar handle is selected; (4) the corresponding handles (End of Bar) and targets are highlighted for all the other sets in the selection*

The main set is considered the one for which the handle is selected and is shown in full color. This handle shows the offset and options (constraint to face / to cover etc.). The other sets are shown in halftone, using the edit constraints color (green by default). The constraint targets for all corresponding handles are shown in orange color.



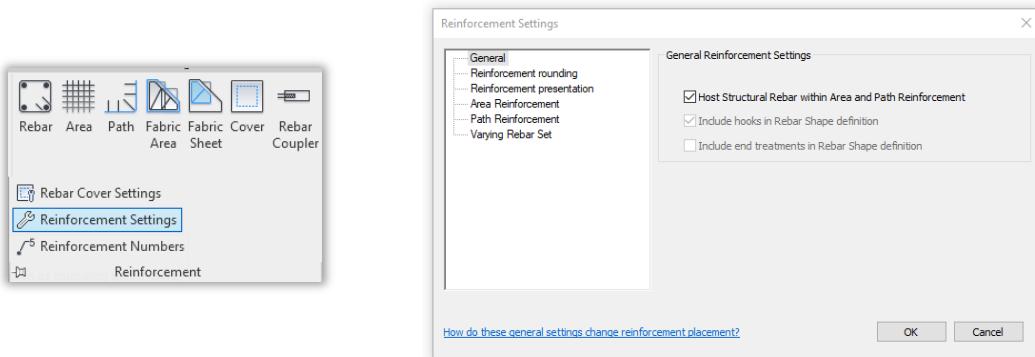
*Example – (A) Bar Segment 4 handle and corresponding handles (Bar Segment 4); (B) No handle highlighted because the shape has only 3*

### Include hooks or end treatments in shape definition

These project level settings determine how rebar behaves when adding hooks or end treatments to existing bars. These can be modified only when there is no rebar placed in the project.

To change these options:

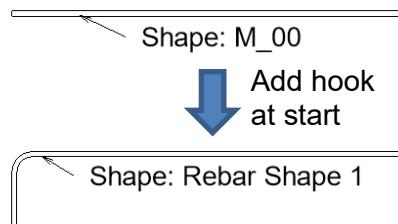
- Go to the Structure tab > Reinforcement > Reinforcement settings > General
- Check include hooks in Rebar Shape definition (make sure there are no rebar placed in the project)



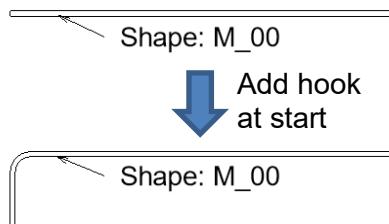
Here's a simple example to check how this option works:

- Check the include hooks in the rebar shape definition option
- Place a straight bar (shape 00)
- Add hook at start > Notice that a new shape has been created (Rebar Shape 1)
- Add hook at end for the same bar > the shape matches to 01 or M\_01

Hooks included



Hooks not included



**TIP:** You can cut (CTRL+X) the rebar, change the settings and Paste (CTRL+V) in the same place, into the project. Of course, if the rebar is not annotated in various views, which would cause those annotations to be deleted.

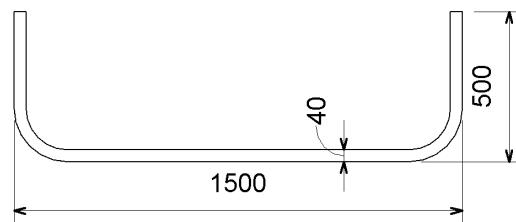
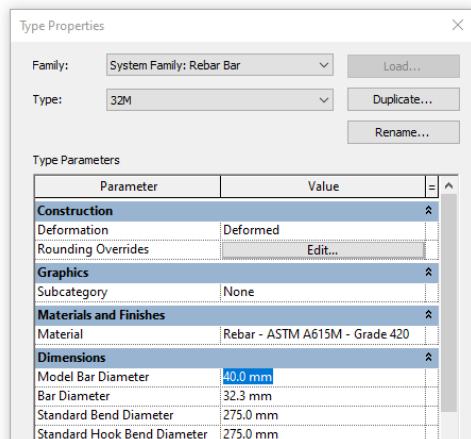
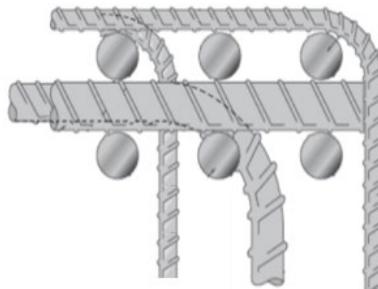
### Real vs nominal bar diameter

You can model rebar using a larger bar diameter, which considers the ribs, so that you can avoid clashes with other bars, in concrete elements with a lot of large diameter bars.

Properties like the reinforcement volume, hook lengths auto-calculation, rebar couplers all use the nominal bar diameter (known in Revit as Bar Diameter).

#### How to use

- Select a rebar or rebar type
- Edit type properties
- Edit the value of the **Model Bar Diameter**



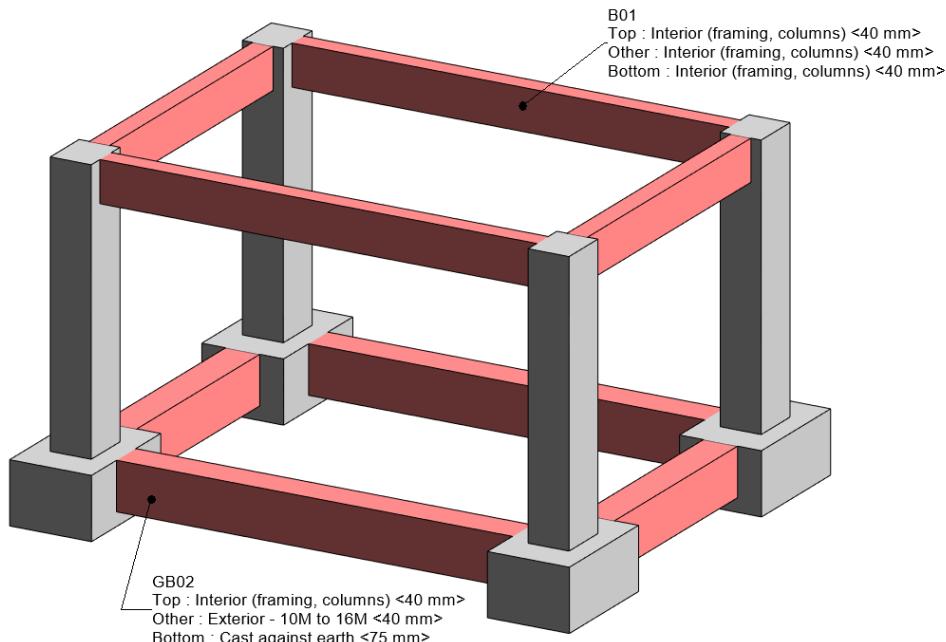
Rebar constraints, distances to the concrete cover, bar geometry and segment lengths are computed using the **Model Bar Diameter**.

The **Bar Diameter** parameter is used for computing the reinforcement volume, auto calculating the hook lengths and rebar coupler placement.

## Show the rebar cover in schedules and tags

Starting with Revit 2023, you can show the assigned concrete cover of structural elements in schedules and tags. This can improve the quality assurance process when building your model or can be used to produce more comprehensive documentation.

Here's a simple example where the assigned cover for concrete beams is shown inside the schedule:

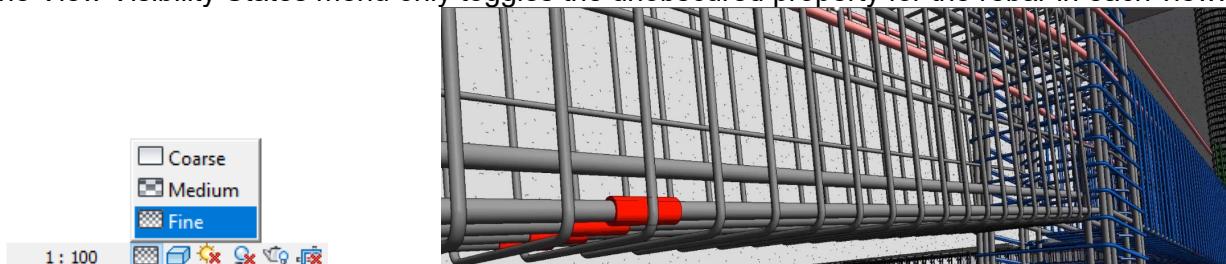


Structural Framing Schedule						
Type	Length	Count	Rebar Cover - Top Face	Rebar Cover - Other Faces	Rebar Cover - Bottom Face	
B01	4.25 m	2	Interior (framing, columns) <40 mm>	Interior (framing, columns) <40 mm>	Interior (framing, columns) <40 mm>	
B01	6.40 m	2	Interior (framing, columns) <40 mm>	Interior (framing, columns) <40 mm>	Interior (framing, columns) <40 mm>	
GB02	3.20 m	2	Interior (framing, columns) <40 mm>	Exterior - 10M to 16M <40 mm>	Cast against earth <75 mm>	
GB02	5.80 m	2	Interior (framing, columns) <40 mm>	Exterior - 10M to 16M <40 mm>	Cast against earth <75 mm>	

## Set rebar as unobscured

Rebar has a unique property among Revit elements, to show through the other elements, and this property is called unobscured. This is different than removing the bars from the set, as toggling unobscured on or off simply hides the rebar in a certain view.

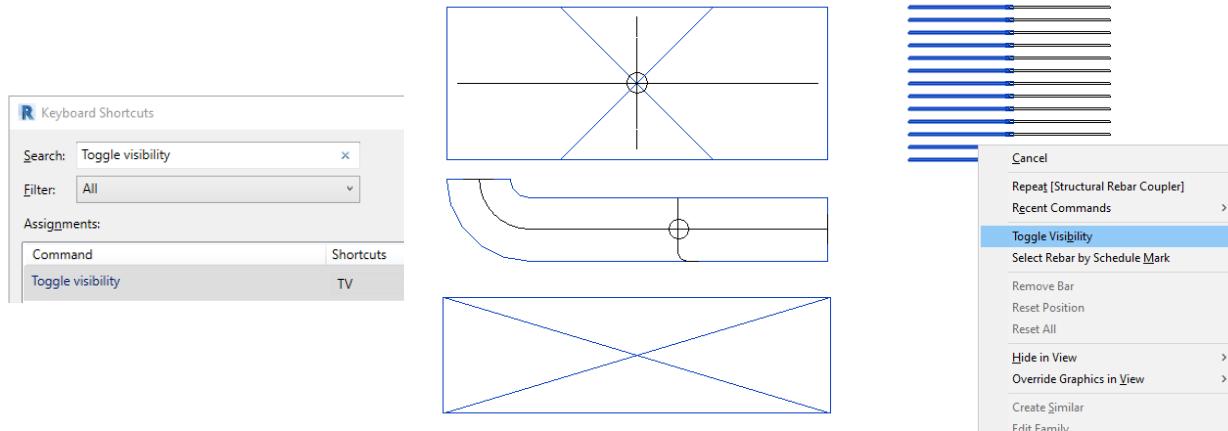
Starting with Revit 2023, the **solid representation is controlled only by the level of detail**, so the View Visibility States menu only toggles the unobscured property for the rebar in each view.



Rebar is automatically set to unobscured in the creation view and all section views in the project. Area, path, and fabric reinforcement are not set to unobscured in the creation view.

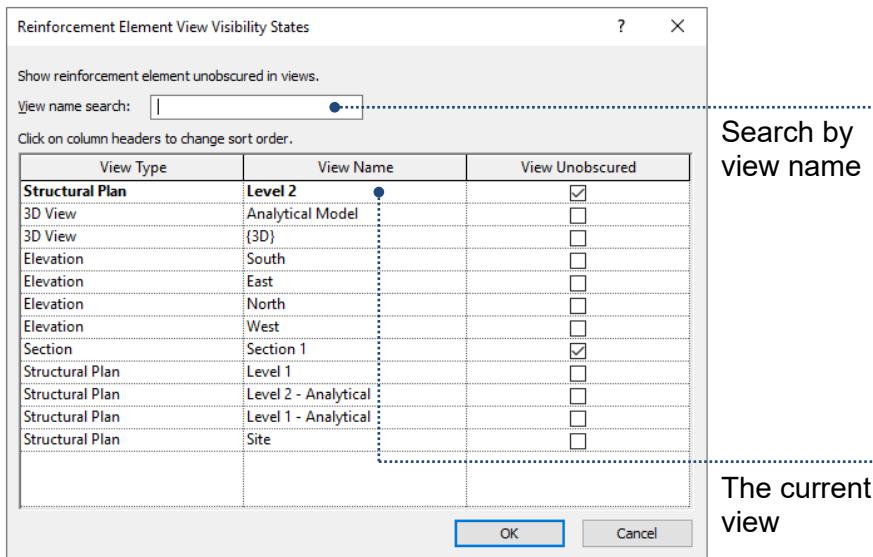
To make a reinforcement element unobscured, you can select it, right click, and select the Toggle Visibility command.

Alternatively, you can set a keyboard shortcut for the Toggle visibility command. This command works for Area, Path, Rebar, Fabric Sheets and Rebar Couplers.



To change this property for one or more reinforcement elements in one or more views:

- Select all the reinforcement elements for which you want to change this property
- Go to the properties palette > View Visibility States and click Edit



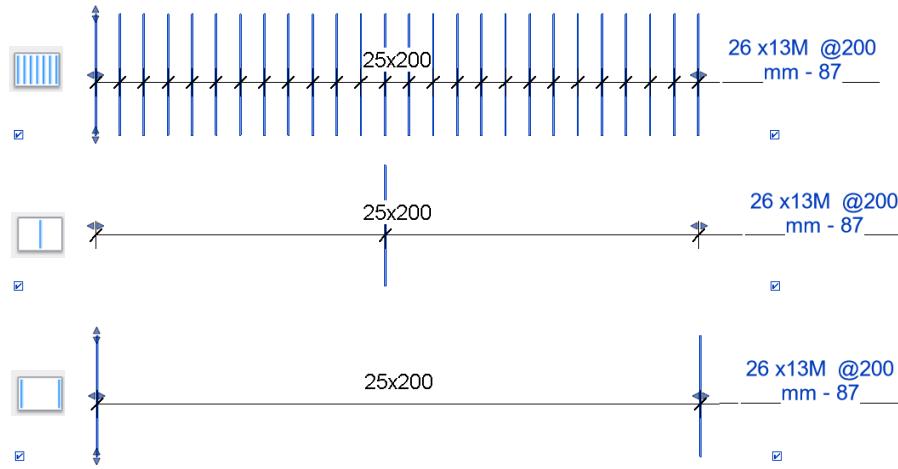
## Learn how to create documentation for rebar drawings and gain techniques for rebar presentation, including displacement in view

### Edit rebar presentation options

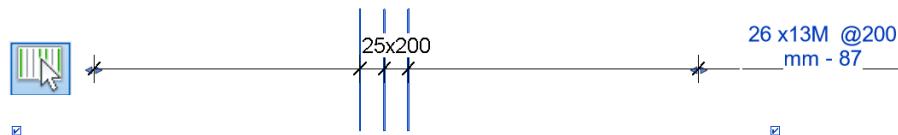
Rebar presentation options allow you to simplify the view but show enough of the bars in the set to express the design intent.

#### How it works

- Select the rebar set
- Click one of the presentation options in the Modify | Structural Rebar tab > Presentation panel – Show All, Show Middle, Show First and Last



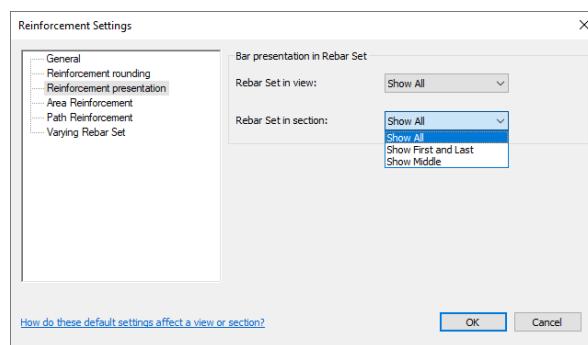
- Optionally, click Modify | Structural Rebar tab > Presentation panel > Select to specify individual bars to represent the set and select which bars to show



### Default bar presentation for rebar sets

You can specify the default presentation options for sets that are not cut by the view (in view) or for sets that are cut by the view (in section).

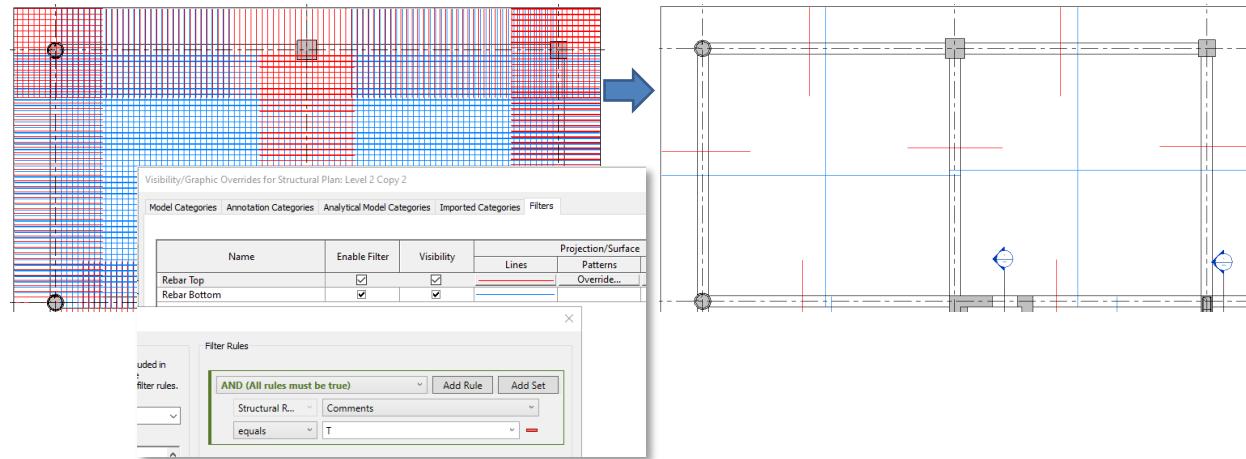
To do this, click the Structure tab > Reinforcement panel drop-down > Reinforcement settings and click on Reinforcement Presentation



## Set the color of rebar by using filters

You can use filters based to set the color of rebar, either by rebar type (diameter) or by some other criteria, to ensure consistency of the modeling.

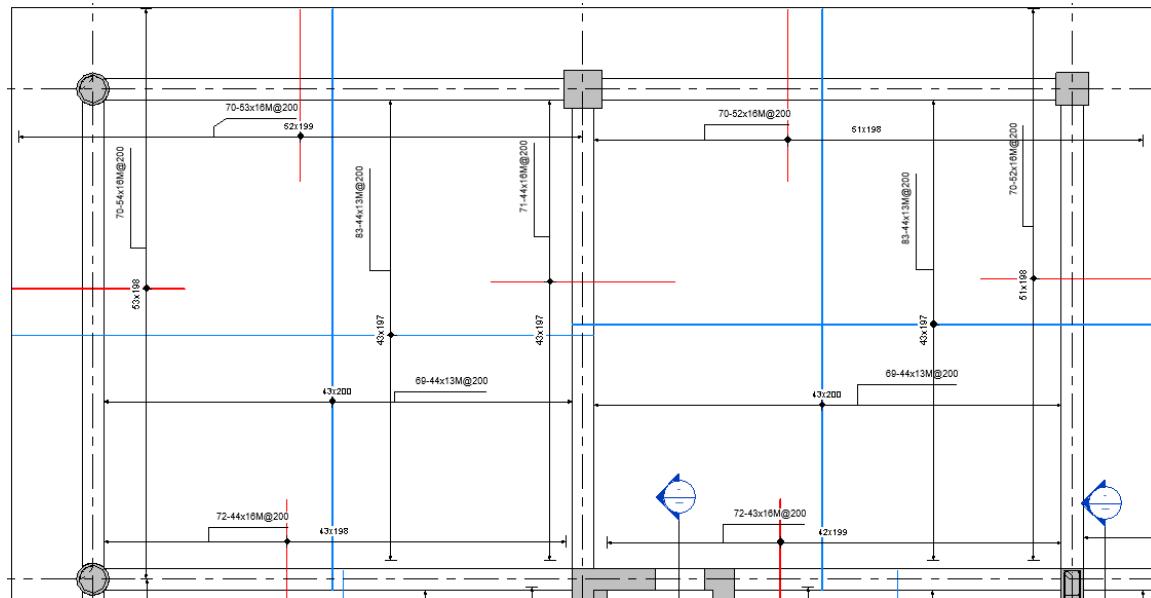
In the Demo – Annotate Rebar Drawings video, I am showing the top bars in red and the bottom bars in blue. This is done by configuring two filters based on the Comments parameter with “T” and “B” values



## Multi-rebar annotations

Use multi-rebar annotations to show the extents of the sets and information about the rebar, like rebar number, diameter, length, spacing etc., using the embedded dimensions and tag.

There are two types of MRA, linear, which are aligned to the horizontal and vertical axis of the view and aligned MRA, for which the dimensions are aligned to the selected rebar.



## Multi-leader tags for rebar

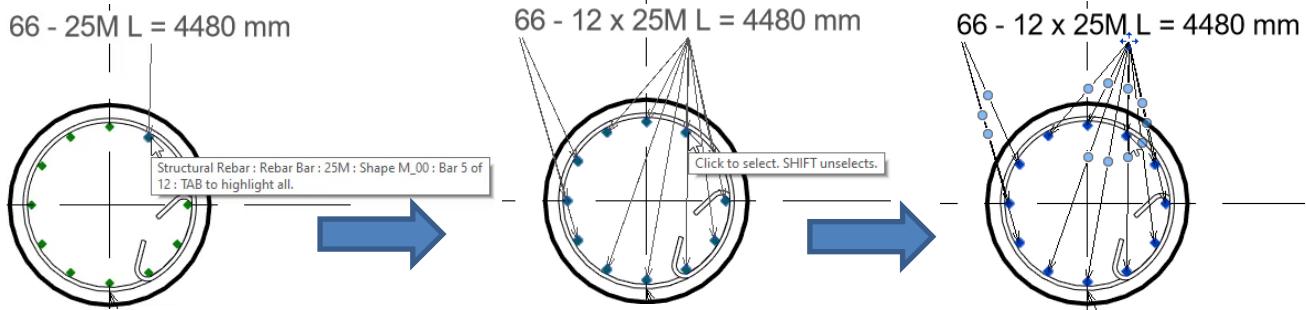
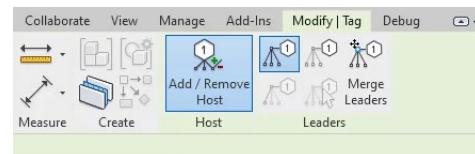
Starting with Revit 2023, you can tag individual bars in one or more rebar sets using multi-leader tags.

You can customize the appearance of the tag leaders, move them together or control the visibility of individual leaders.

These enhancements work for most of the tag types like Tag by Category, Multi-Category, Material Tag, Keynote Tag, Material Keynote Tag.

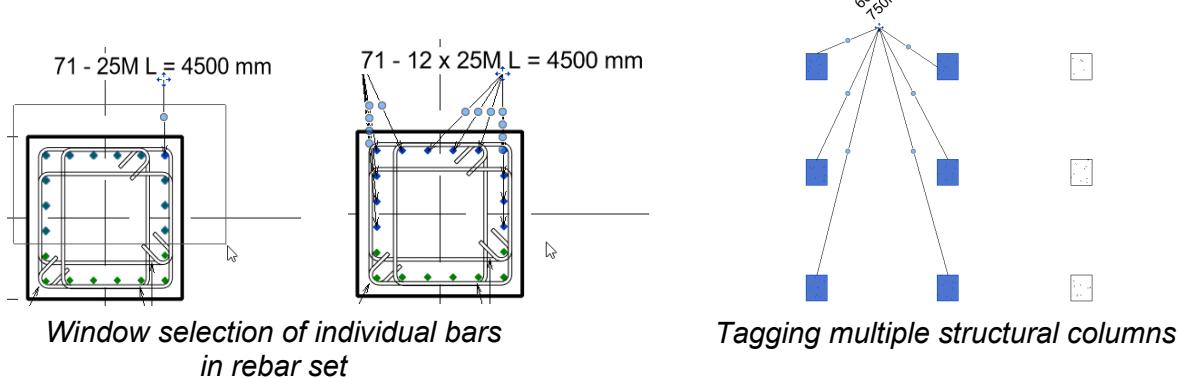
### Placement and hosts

- Go to the Annotate tab > Tag panel > Tag by Category
- Click **Add / Remove Host** to add multiple leaders
- Click one or more bars to tag
- Use the **Tab** key, when hovering over a bar, to **highlight all the bars in the set**, and click to tag.



**TIP:** You can use **Tab** to quickly highlight all the **elements of the same sub-category** in a **steel connection** (e.g., all the bolts inside the connection).

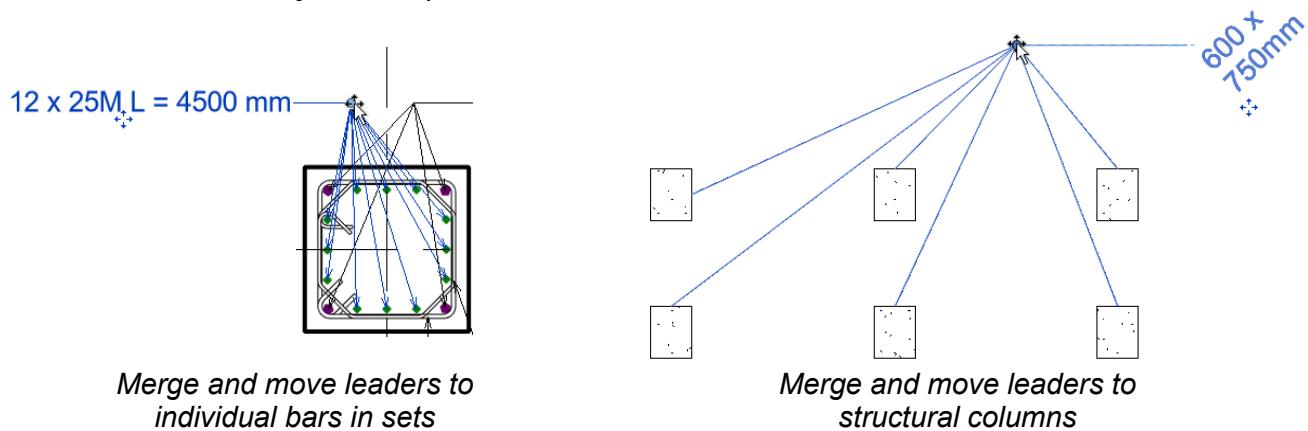
For all elements in Revit, you can use the **window selection, after the first leader is added**. In case of Tag by Category, this determines the category of the tag that is used. The selection is filtered to include only elements of that category.



Use the **Add/Remove Host** command to **add leaders** to additional elements or **remove** tagged elements from the selection.

### Snap and merge leaders

You can now snap the tag leaders together individually, and precisely position them, or move all the leaders together, by using the Merge Leaders  command. The leaders can be adjusted on placement or for existing tags.

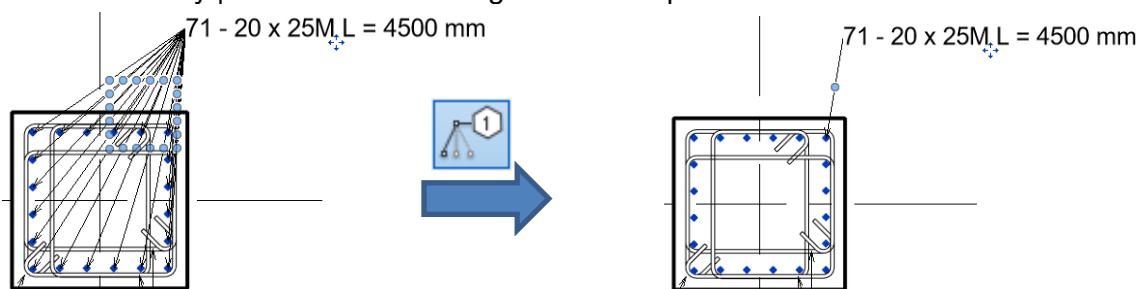


### Show and hide leaders

You can tag multiple elements, but only show one or some of the tag leaders, to make the drawings less cluttered.

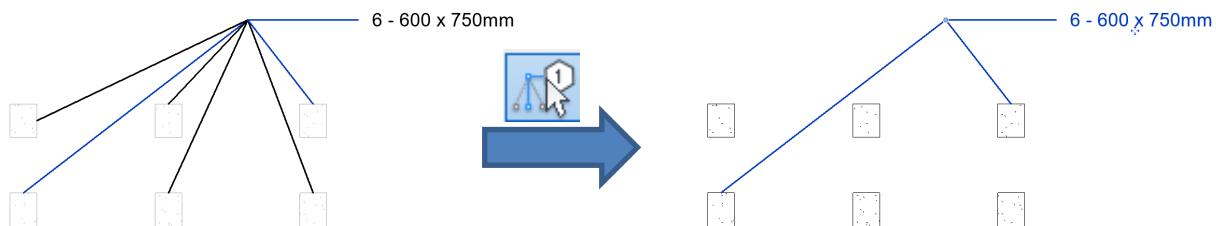
To show one leader, when tagging multiple rebar:

- Select a tag with multiple leaders
- Go to Modify | Structural Rebar Tags > Leaders panel > Show One Leader

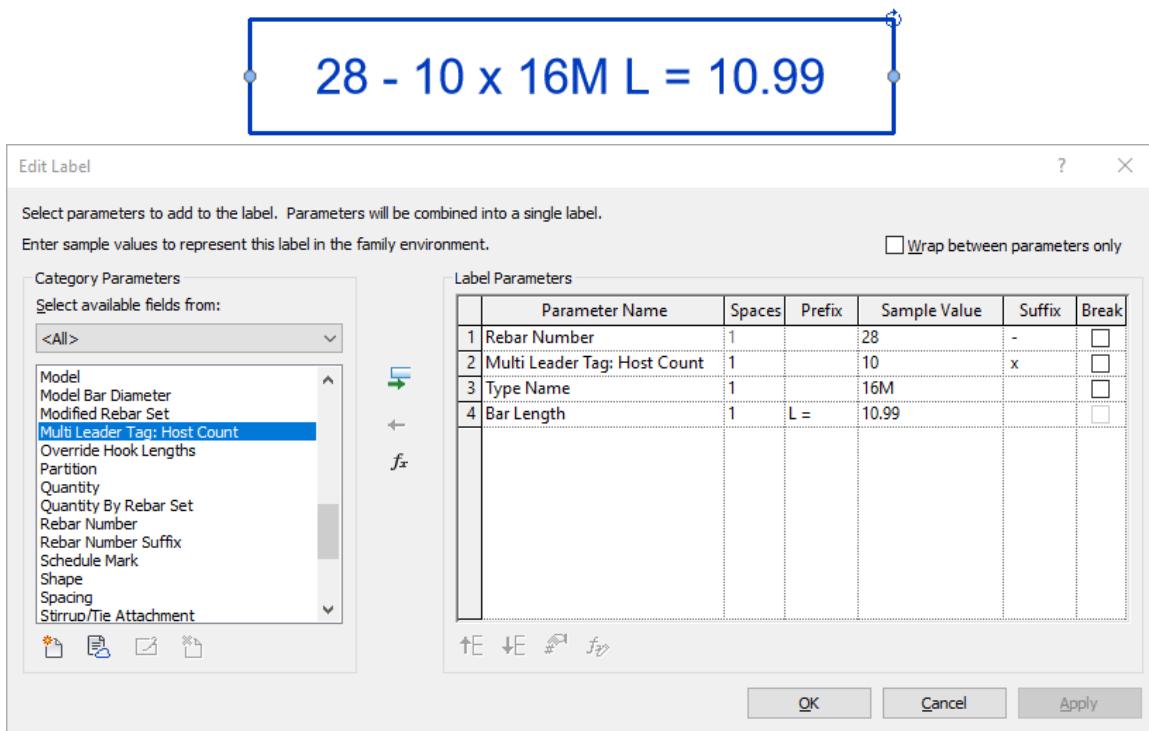


For a structural column example, to show 2 out of the 6 leaders:

- Go to Modify | Structural Rebar Tags > Leaders panel > Click **Select Leaders to Show**
- **Select the leaders you want to show** and de-select the others
- Click Finish



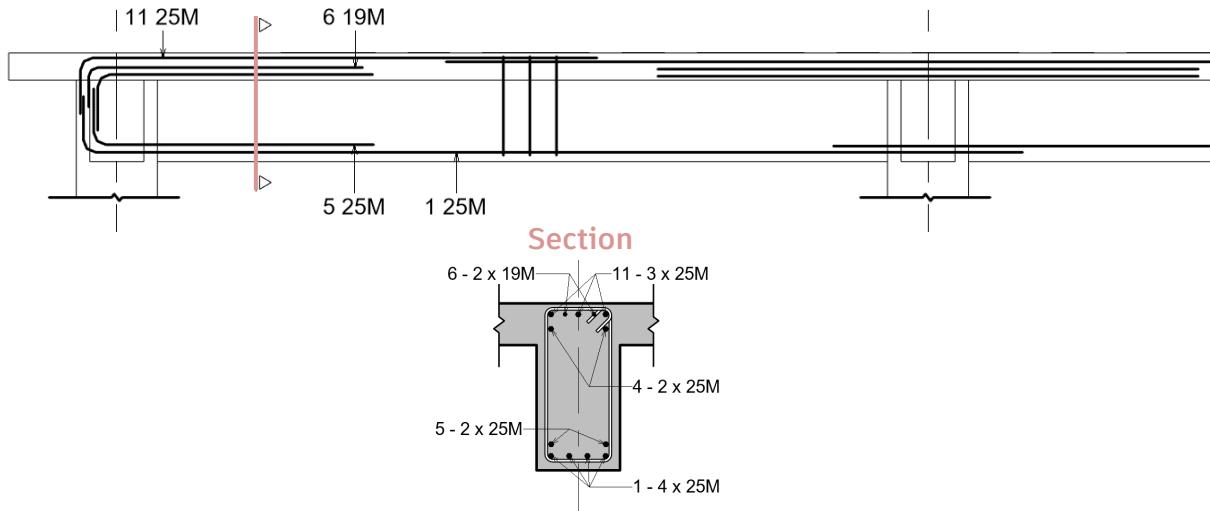
**TIP:** To show the number of tagged elements, you need to edit the tag family, select and edit the tag label and **add the Host Count parameter**. You can filter the list of available fields by either choosing the Multi Leader Tags category or choosing the <All> option.



### Displaced rebar representation

You can use the Displace Elements command to create view specific depictions of how the bars fit inside the element, without modifying the actual rebar model. This command works in 2D views starting with Revit 2023.

Elements displaced using this command, in both 2D and 3D views, can be tagged in the displaced position.



**TIP:** To select the original element, you can hover over the displaced one (displacement set), press Tab and Click. Then you can change its properties, for example. Alternatively, you can do a crossing window selection of displacement set and filter the original element category.

To reset one or more displaced rebar, or any displacement set, to its original position, just select it and click Reset.

