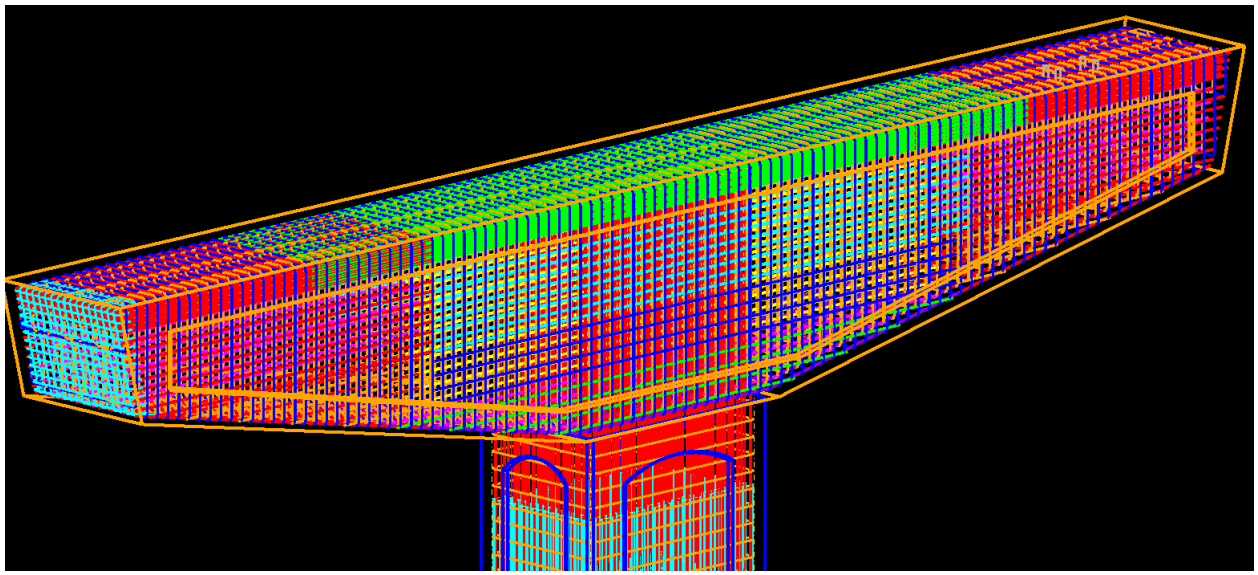
FDOTConnect for OpenBridge Modeler & ProStructures



3D Rebar Modeling

White Paper

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State of Florida

Department of Transportation

FDOTConnect

for

OpenBridge Modeler & ProStructures

3D Rebar Modeling

White Paper

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TALLAHASSEE, FLORIDA

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1 INTRODUCTION

1.1 Overview

Bentley offers a standalone application called **ProStructures**, originally developed for vertical building projects. This software includes two primary workflows:

- **ProConcrete** – for rebar modeling and detailing
- **ProSteel** – for steel detailing

Although ProStructures was designed for buildings, the **ProConcrete** tools are highly effective for bridge reinforcement modeling.

OpenBridge Modeler (OBM) integrates all the essential ProConcrete tools needed to model rebar in 3D and assign bar marks. However, OBM 2024 does not include the 2D detailing tools available in the full ProStructures suite. Future versions should include the 2D detailing tools as well.

In short:

- Use **OBM** for 3D rebar modeling and bar mark assignment.
- Use **ProStructures (ProConcrete)** when you need to produce traditional 2D reinforcement detailing plans (until they are added to OBM.

1.2 How ProConcrete Handles Elements

ProConcrete uses its own proprietary element types, which are **not native MicroStation elements**. To enable reinforcement modeling on MicroStation geometry, ProConcrete creates a **clone** of the original element when you begin modeling reinforcement. This clone is placed on the **PC_CONCRETE** level.

Important considerations:

- If the original MicroStation element changes in size or shape, the ProConcrete clone **does not update automatically**.
- To refresh the clone geometry, **double-click the clone and select OK** in the dialog box.
- After updating, it's recommended to **change the level from PC_CONCRETE back to the appropriate project level** for better control and consistency in your model.

1.3 Rebar Modeling Methodologies

There are three main ways in which to model rebar with the ProConcrete tools inside OBM:

1.3.1 Face Based Guidelines

Faced based rebar modeling consists of extracting outlines of the concrete faces of our elements and using the custom reinforcement tools with the extracted guidelines to model reinforcement. This is the preferred method as it can conform with our irregular bridge geometry and reinforcement will update automatically/dynamically when the concrete elements change since they are using the faces of the concrete. Another reason this method is powerful is that the extracted faces and the intersections of those faces can be tied to variables, giving you precise control over them up simply updating the variables.

The following rebar tools are support the Face Based method:

- Single Rebar
- Single RebarSet
- Irregular Dispatch
- Single Rebar Distribution

Below are various Face Based Tools that can be used to create guidelines for rebar modeling:

Associative Extraction

Used to extract an associative face and edge from a solid or surface. The extracted faces and edges still maintain their association with the parent solids, such that in case you modify the solid, the extracted face or edge is also modified accordingly.

Setting	Description
Face Offset	Allows you to place the face or edge at the set offset distance from the solid. The Value can be set negative, that will create the face offset inward the solid. You can also assign a variable to this setting by clicking the Variable icon ***(x)*** next to the text field.
Level, Weight,..	Sets the symbology attributes —Level, Color, Weight, Style, and Class for the solid edge by checking the respective check box and selecting the option in each to override the default. When unselected, the currently active attributes get applied. Active session settings are retained.

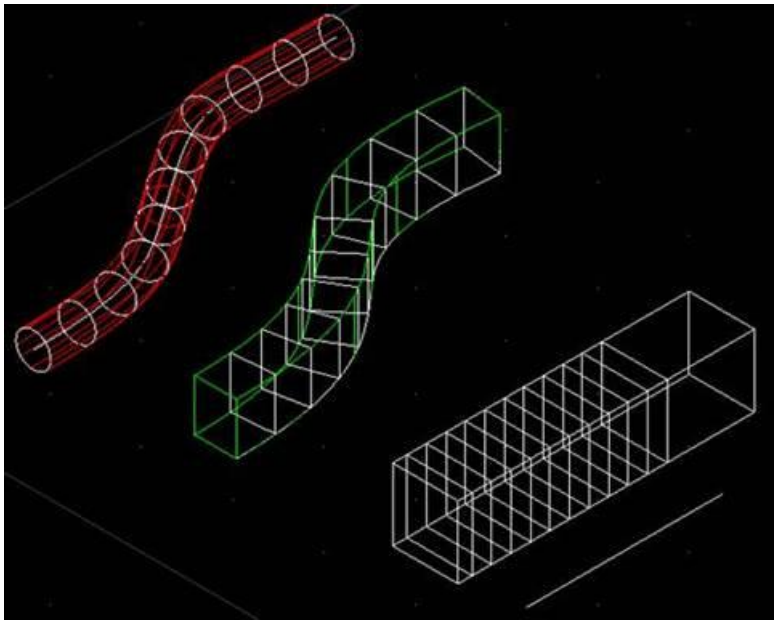
Associative Intersection

Used to create an associative intersecting edge between two associative faces of a solid. The resulting intersections are essentially lines that can be used as guidelines for rebar modeling. The rebar solid /surfaces that are set face offset using the (**Associative Extraction**) are selected when associating intersections.

Associative Slice

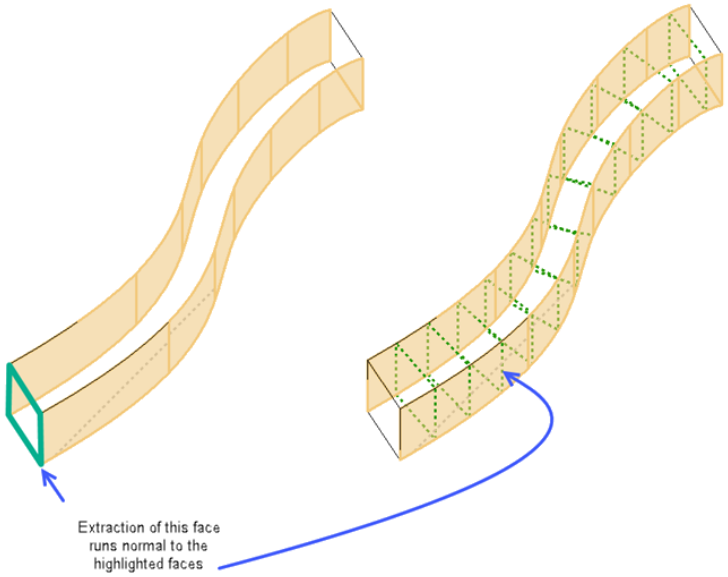
Used to create associative cross-section slices on solid along a path. The tool prompts you to select Solid to be slices, followed by the Path element. The path would be a line, arc or curve, based on the nature of the solid. When accepted, you will get the number of slices introduced to the selected solid. Each of these slices associates the properties of parent solid.

Setting	Description
Slice By	You can slice the solid by: • **Quantity** – when set, you need to enter the Quantity. • **Distance** – when set, you need to enter the Distance.
Quantity	Enabled for Slice by: Quantity. Sets the quantity for slices. The solid will have those number of slices of equal length. You can also assign a variable to this setting by clicking the Variable icon ***(x)*** next to the text field.
Distance	Enabled for Slice by: Distance. Sets the distance for the resultant slice. Entering the distance will determine the number of slices. You can also assign a variable to this setting by clicking the Variable icon ***(x)*** next to the text field.



Every splice is tangential at any point on the path it is drawn. The path along which the slices are created governs the associativity between solid and slices. However, you can select any slice to work further. The settings are retained in the current DGN.

The tool creates an offset face normal to the curve of the object extrusion. The solid extruded on a curve, arc or bi-spline can be reinforced correctly by rotating the offset faces along the curve.



1.3.2 Manual Guidelines

The last method is manually drawing guidelines. This can consist of manually drawing the guidelines and using the custom reinforcing tools, or just drawing the centerline of bar guidelines and using the single rebar tool to apply the rebar. You can also extract edges as guidelines to use in this method, but those cannot be controlled with variables.

Manual Guidelines are fast and easy to draw in most cases and should not be looked at as a last resort. Oftentimes it will be your only option if Face Based methods don't work with the geometry you have.

1.3.3 Element Based

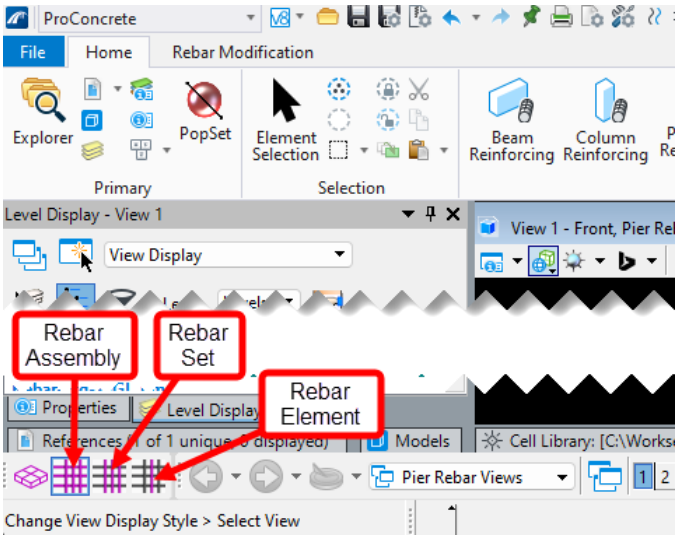
This method consists of using the: Beam Reinforcing, Column Reinforcing, Pad Footing, & Slab tools. These tools were built for the vertical buildings world where everything is straight and plumb to the world, and all the bars are evenly spaced. They can still be used for our bridge geometry such as piers, but the results you get vary greatly. This is because our bridge pier geometry is does not conform to the shapes that these tools were built for. Therefore, if you use them and select a bridge pier element, it may not place things as you would think. It will require manipulation in order to achieve the results you want. Another way to use these tools in bridge piers is to model a "ghost" element inside ProConcrete (usually rectangular) and use that to model the reinforcement with these tools. The downside to this is that the ghost element will not update automatically if your main pier concrete elements change. Using these dialog bases tools do have some advantages though, such as stirrups and ties are much easier to model. **Overall, Element Based tools are not recommended to be used in bridge geometry until further enhancements are made.** Becoming an expert at Face Based or Manual Guidelines is a better option.

1.4 Selecting & Editing Rebar

To open and adjust rebar once it has been placed, simply select the rebar, and double click on it. This will open the rebar dialog box.

There are three methods of selecting rebar in ProConcrete. These selection options are found at the bottom of the screen as shown below:

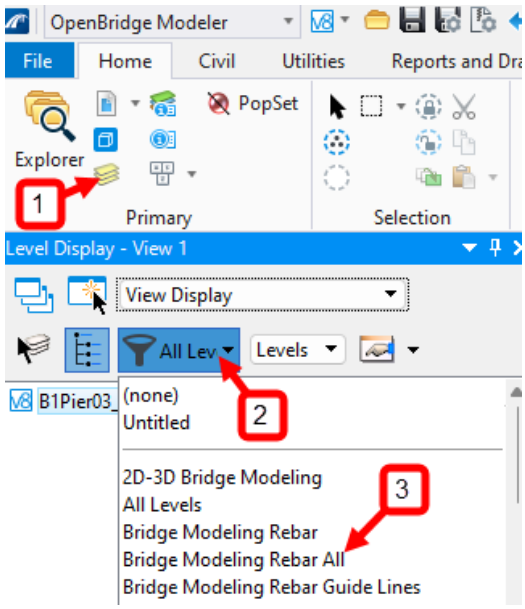
- Rebar Assembly - this includes all bars in both X & Y directions in a single rebar set
- Rebar Set - this will select a set of bars in a single direction (X or Y)
- Rebar Element - this will allow you to select a single rebar element within a set



1.5 Filtering Levels

Isolating the rebar modeling levels makes it easier to find and turn on/off rebar related levels. Double clicking on a level in the level display will activate that level.

1. Open up the level display
2. Click on the filter button
3. Select **Bridge Modeling Rebar All**



1.6 Rebar Templates

Templates allow you to save your rebar modeling settings for later use: bar size, spacing, end conditions, and level. The FDOT workspace already has base templates setup, with a focus on the level property. Choosing the correct level can be time consuming as the list you choose from is not always in alphabetical order. Each template number corresponds to the level number of the rebar element.

Templates will be used extensively in the exercises.

Setting	Description
Load Template	Loads a template into your current project. When you click on this button, the template marked in the selection list is loaded and the input fields of the dialog box are filled in accordingly. Then, the dialog will be closed immediately. You can also double-click the list entry for this command.
Save Template As	Saves your template settings. Create a new folder or subfolder for settings in your template. By clicking on this button, you can save the settings entered in the dialog frame using a name indicated by you. You first have to select the desired list branch where your template has to be saved and then click . Now an entry with a standard name is created the name of which can be modified immediately or at a later moment. To overwrite an existing entry, select the corresponding entry instead of a list branch.
New Folder	Creates a new folder or subfolder for settings in your template. By clicking on this button, you can create a new branch (folder) on the topmost level or even within a list branch to save your templates. First select the desired list branch and then click .

Setting	Description
Import	Imports a template to your current project. Click on this button to add other templates of the same type to your current template file. This may be a single template, a list branch or the complete file. A file selection dialog opens where you can select the template file to be imported. It is checked whether you selected the same type. If the name of some list branches of the imported template file is identical with the entry in the existing file, you can decide for each branch individually whether the existing data have to be overwritten or not. The new branches or templates are only added; they may be re-organized later by using drag and drop.
Sort	Sorts folders alphabetically. Click on this button, and the alphabetical order of the display list is turned upside down. You can reach entries which are placed further down without having to scroll up and down the list. First, you have to select a list branch the order of which has to be changed. Sorting can be defined for each branch individually.
Help	Opens online help.

1.7 Display Rules

By default, the FDOT workspace assigns different colors to 3D rebar levels based on the associated concrete element. While this color-coding helps distinguish between elements, it can still be challenging to visually isolate specific rebar components—especially when many elements are modeled. In such cases, the view can quickly become cluttered, resembling a tangled “rat’s nest.”

This is where **Display Rules** become invaluable.

A **Display Rule** is a set of criteria that controls how elements are displayed in any view of a design. These rules allow you to dynamically adjust the **symbology**, **appearance**, and **visibility** of elements based on properties such as:

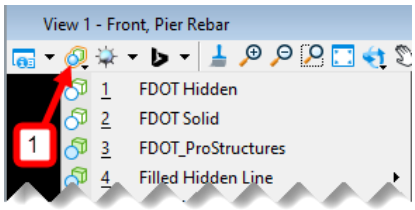
- Element attributes
- Named groups
- View settings
- Model or reference files

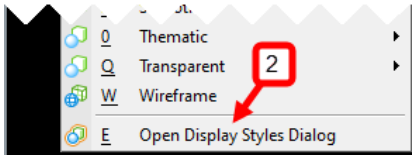
The FDOT workspace includes a display rule specifically designed for 3D rebar modeling: **STR_RebarColorizeLevels.**

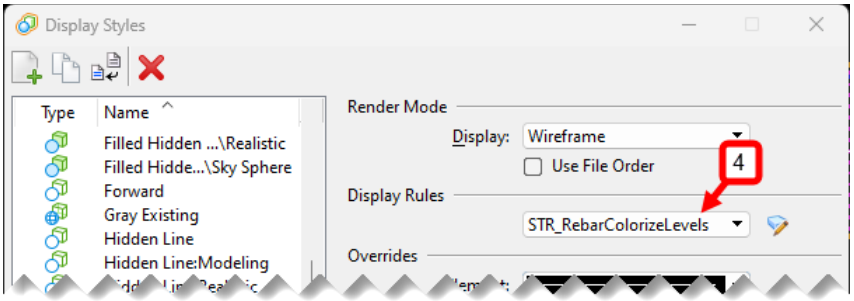
When activated, this rule assigns a unique color to each consecutive 3D rebar level, ensuring that no two adjacent levels share the same color. This dramatically improves visual clarity, making it easier to distinguish individual rebar elements within complex models.

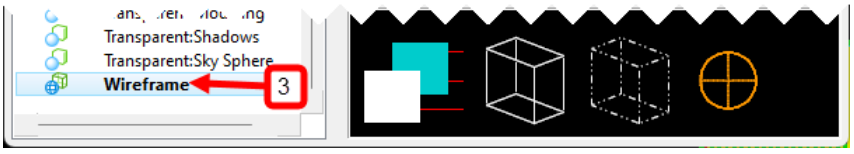
To apply the STR_RebarColorizeLevels display rule, do the following:

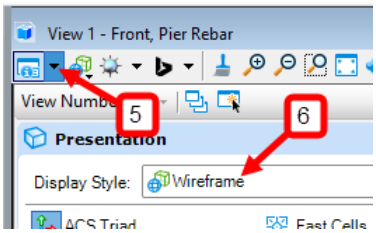
1. Left click and hold the display style button
2. Open Display Styles Dialog
3. Select the Wireframe display style
4. Select the STR_RebarColorizeLevels display rule
5. Left click and hold the View Attribute drop down
6. Select the Wireframe display style







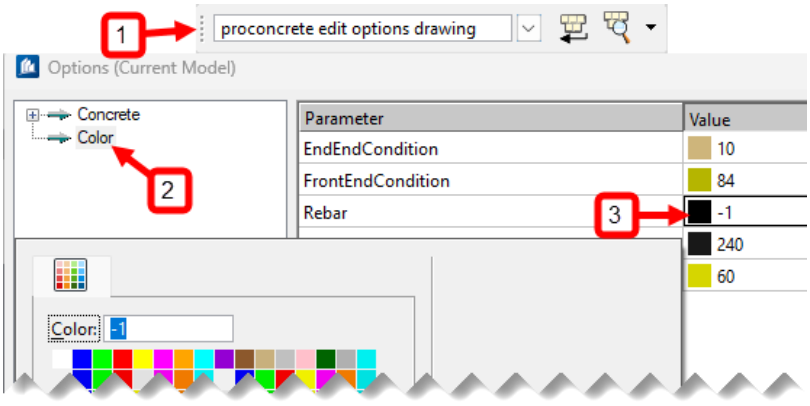


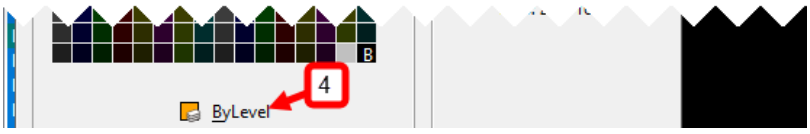


1.8 Settings

Sometimes the original default settings will come back into a file and need to get updates. By default, ProConcrete will override the rebar level color with green. You will need to do the following to change this to By Level:

1. Hit Enter to activate the Key-In & type in “proconcrete edit options drawing” and hit enter
2. Click on color
3. Click on the rebar value
4. Select By Level & hit ok





2 PIER REINFORCEMENT

When modeling reinforcement in bridge structures, piers are among the most important elements to focus on. This is because they typically involve the most complex reinforcement configurations and are more prone to clashes and constructability challenges than other components.

In this training module, we will walk through the process of modeling reinforcement for the three primary components of a pier:

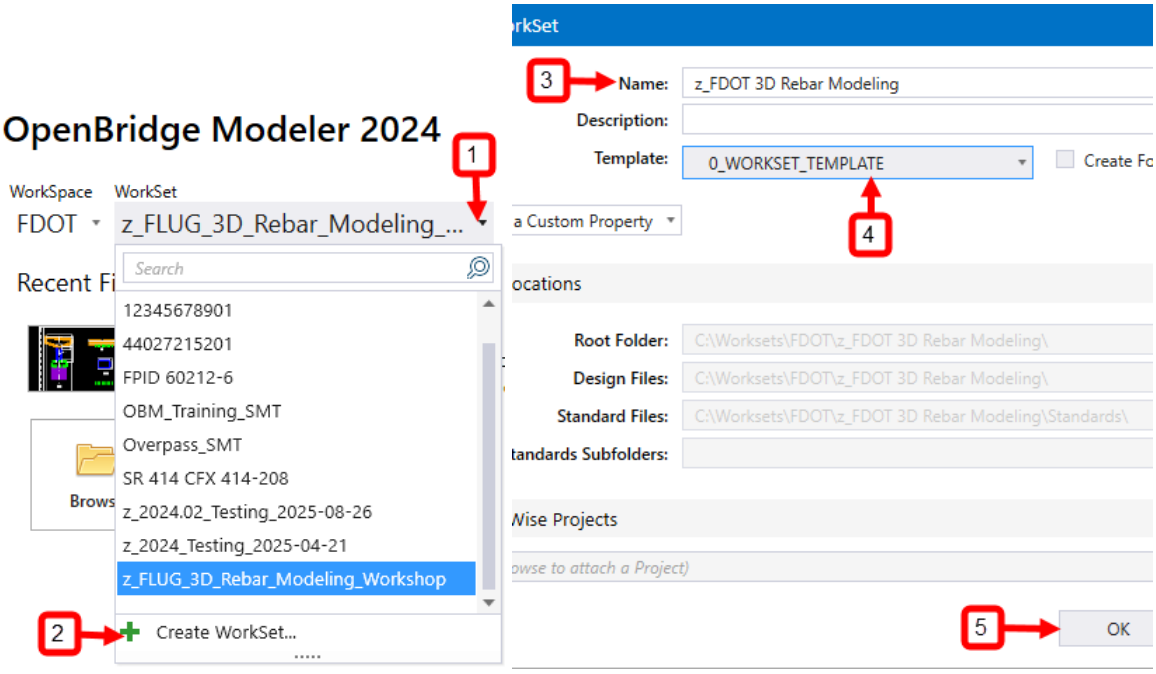
- Footing
- Column
- Cap

By the end of this exercise, you will understand best practices for reinforcement modeling in these areas and be better equipped to identify and resolve potential issues early in the design process.

2.1 Workset & File Setup

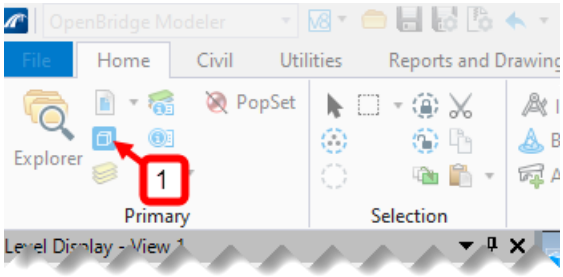
2.1.1 Create Workset and Open B1Pier03_Begin.dgn

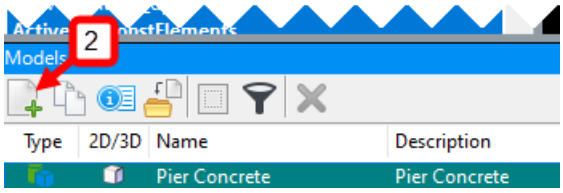
1. Open OpenBridge Modeler through the FDOT Icon and click on the Workset dropdown. If the FDOT workspace is not available, try opening the FDOT Workspace Doctor app and clicking “Configure Workspace”.
2. Create WorkSet
3. Enter name as: z_FDOT 3D Rebar Modeling
4. Set the Template as 0_WORKSET_TEMPLATE
5. OK
6. Copy the B1Pier03_Begin.dgn file to the Structures folder and open it

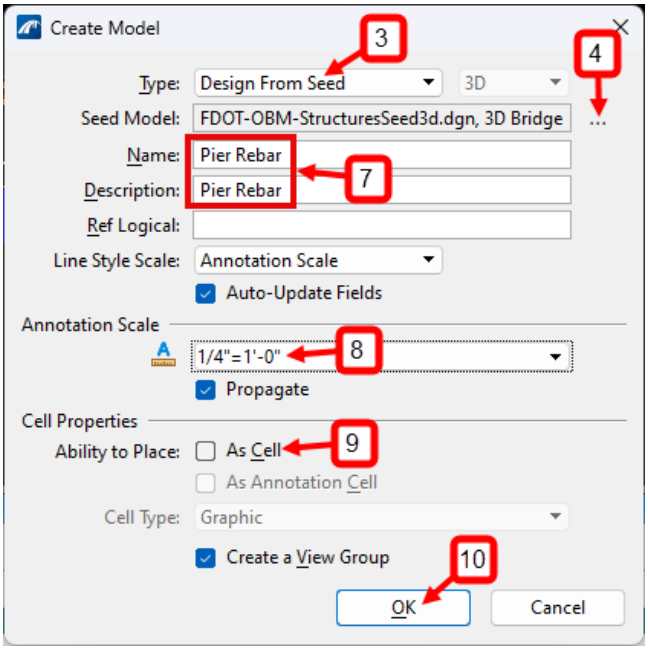


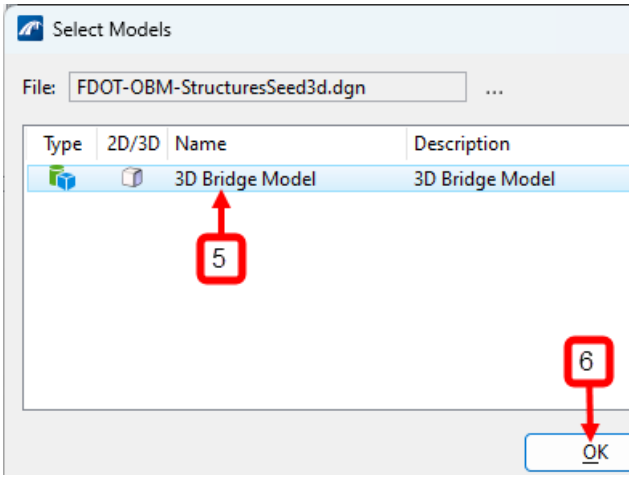
2.1.2 *Create Pier Rebar Model*

1. Models
2. Create New Model
3. Choose Design From Seed
4. Click on the "…" button to select the seed
5. Choose the 3D Bridge Model
6. OK
7. Name and Description as Pier Rebar
8. Set Annotation Scale to ¼" = 1'-0"
9. Uncheck "As Cell"
10. OK



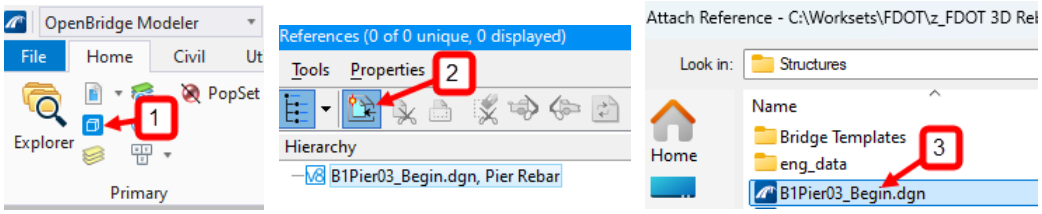


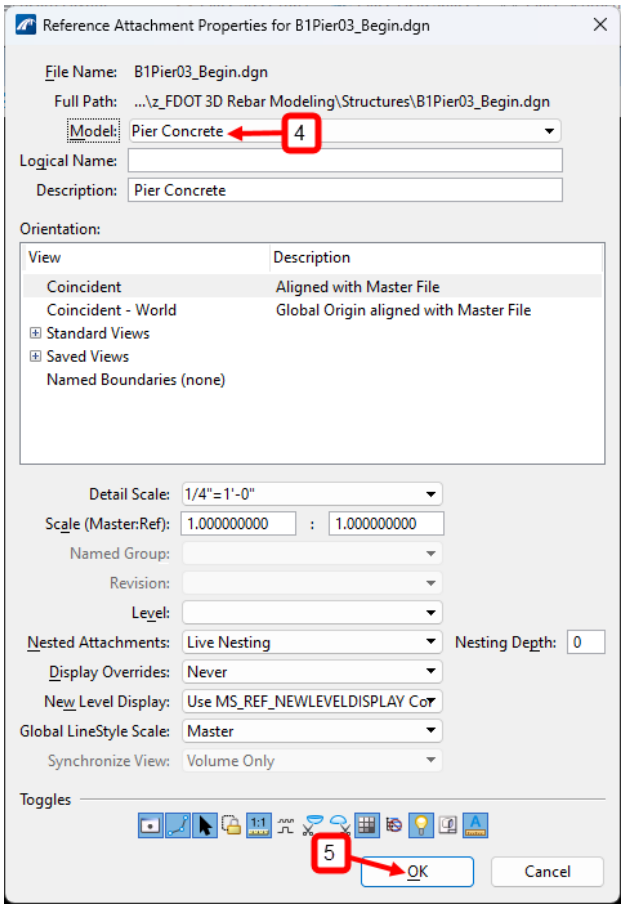


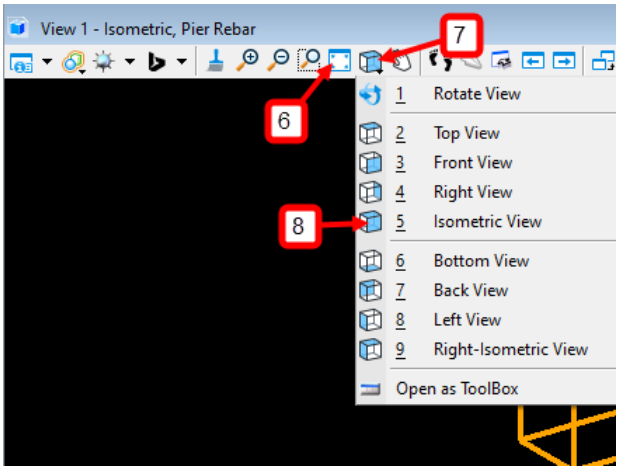


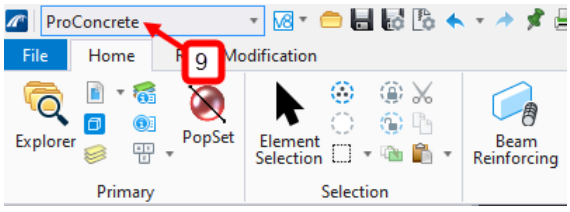
2.1.3 *Reference in Pier Concrete Model*

1. Attach Tools
2. Attach Reference
3. Select B1Pier03_Begin.dgn
4. Select Pier Concrete model
5. OK
6. Fit View
7. Left Click & Hold
8. Isometric View
9. Change your Workflow to ProConcrete





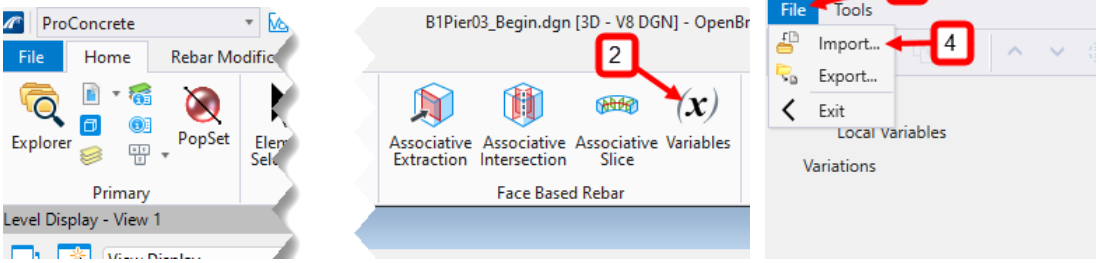


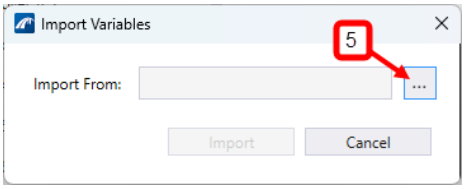


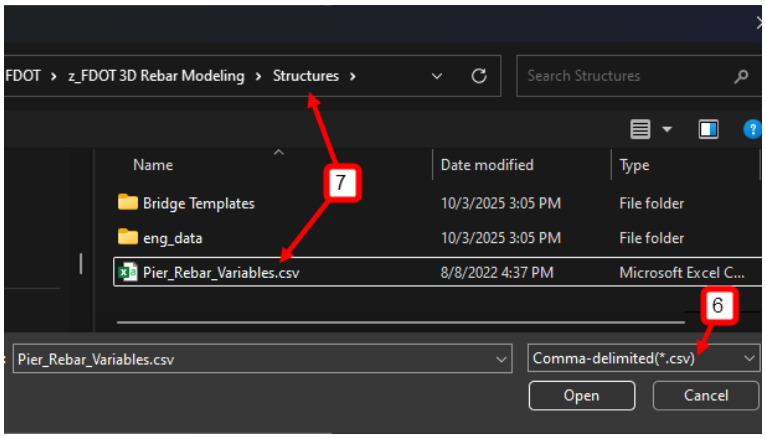
2.2 Footing

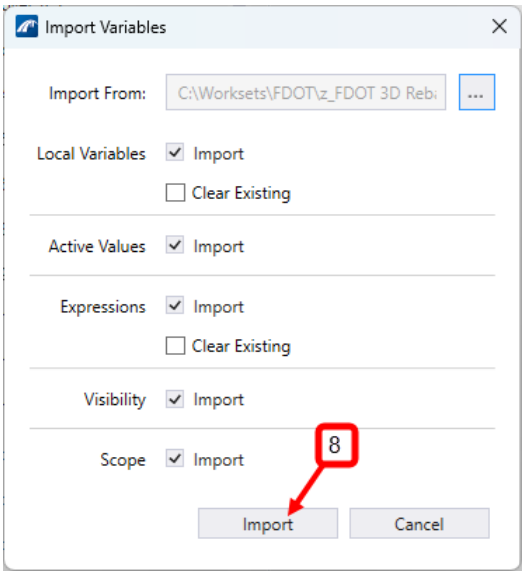
2.2.1 Import Rebar Variables

1. Copy the Pier_Rebar_Variables.csv to the Structures folder
2. Variables
3. File
4. Import
5. Select the "…" button
6. Change the file type to Comma-delimited(*.csv)
7. Navigate to the Pier_Rebar_Variables.csv file and open it
8. Check the boxes, click Import, then close the Variables dialog box







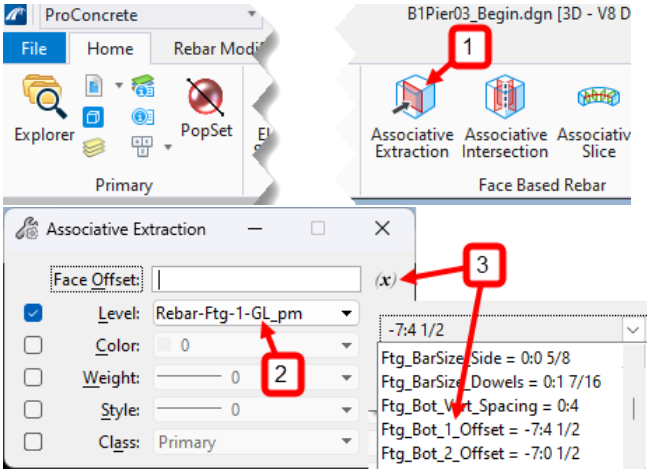


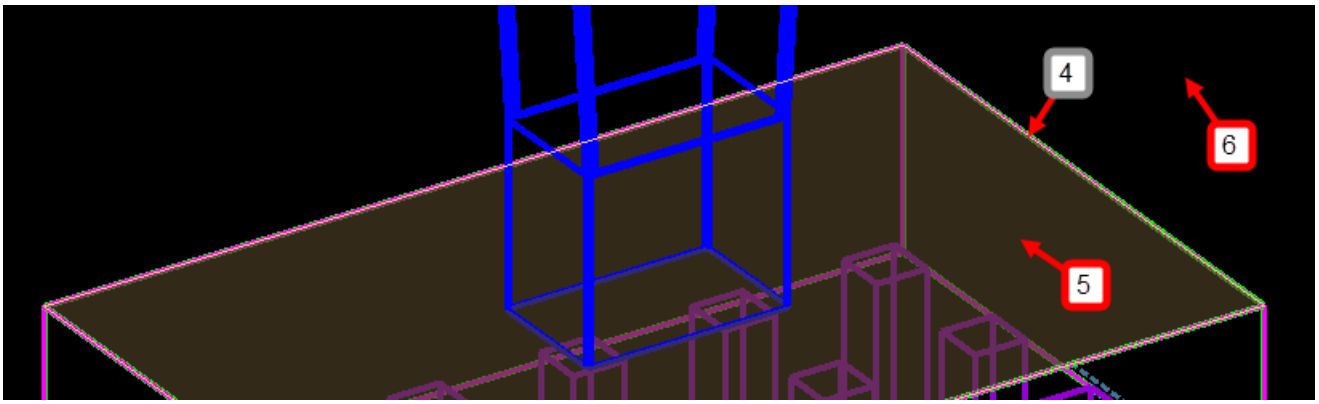
2.2.2 *Extract Footing Guidelines*

Bottom Bars

1. Select Associative Extraction
2. Set your level to *Rebar-Ftg-1-GL_pm*
3. Set the face offset variable as *Ftg_Bot_1_Offset*
4. Select the footing concrete element
5. Select the top face of the footing
6. Left click to accept
7. Repeat steps above, but use the variable Ftg_Bot_2_Offset

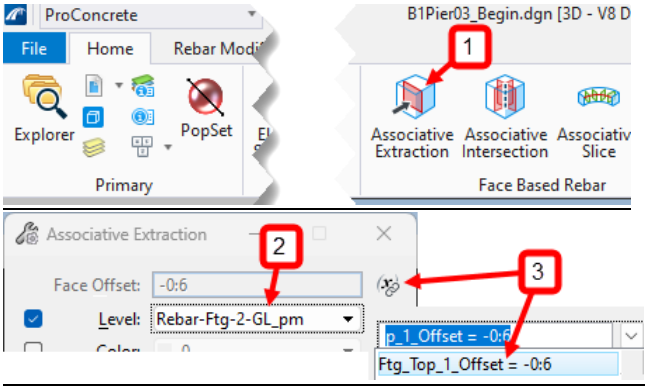
Note: the reason we use the footing top face to place the bottom bars is that the bottom face will have pile embed cutouts in it if referencing an OBM pier.

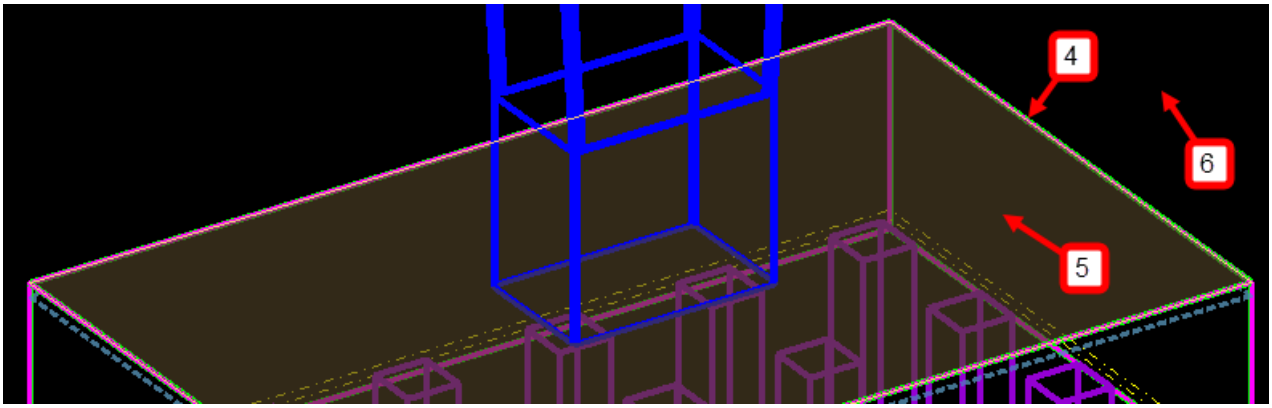




Top Bars

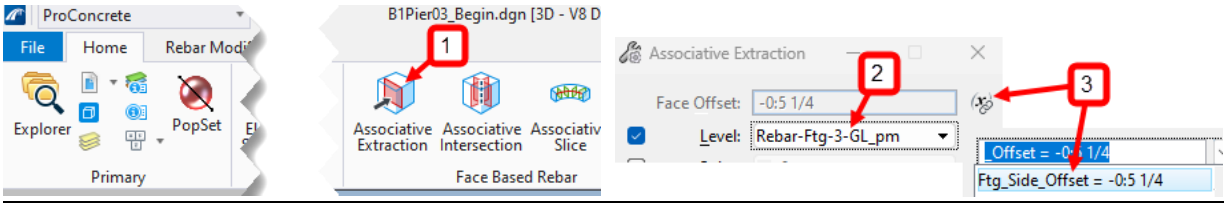
1. Select Associative Extraction
2. Set your level to Rebar-Ftg-2-GL_pm
3. Set the face offset variable as Ftg_Top_1_Offset
4. Select the footing concrete element
5. Select the top face of the footing
6. Left click off to the side to accept

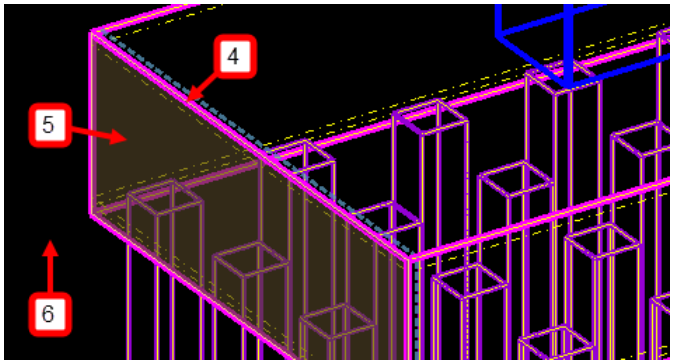




Left/Right Face Bars

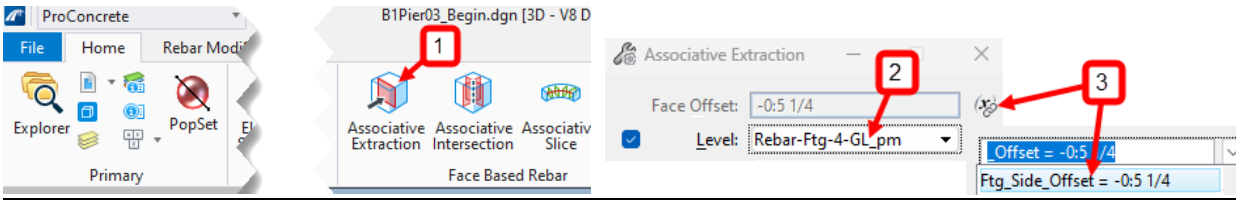
1. Select Associative Extraction
2. Set your level to Rebar-Ftg-3-GL_pm
3. Set the face offset variable as Ftg_Side_Offset
4. Select the footing concrete element
5. Select the left side face of the footing
6. Left click off to the side to accept
7. Repeat above steps for right side face. Note, you can select a face “through” a face by right clicking to toggle through face selection.

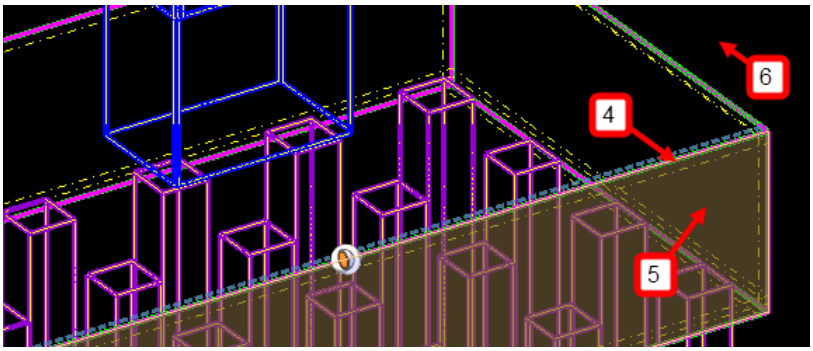




Front/Back Face Bars

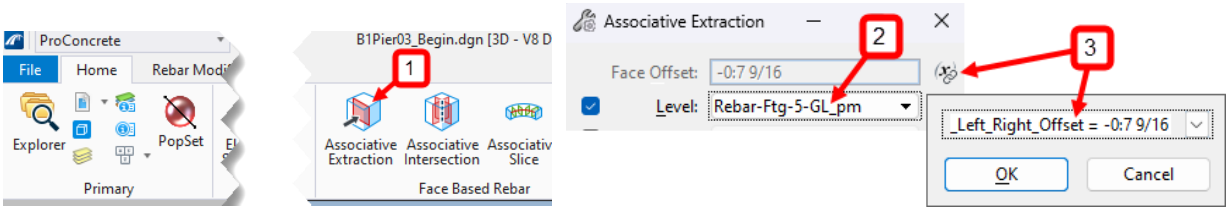
1. Select Associative Extraction
2. Set your level to Rebar-Ftg-4-GL_pm
3. Set the face offset variable as Ftg_Side_Offset
4. Select the footing concrete element
5. Select the front face of the footing
6. Left click off to the side to accept
7. Repeat above steps for back face

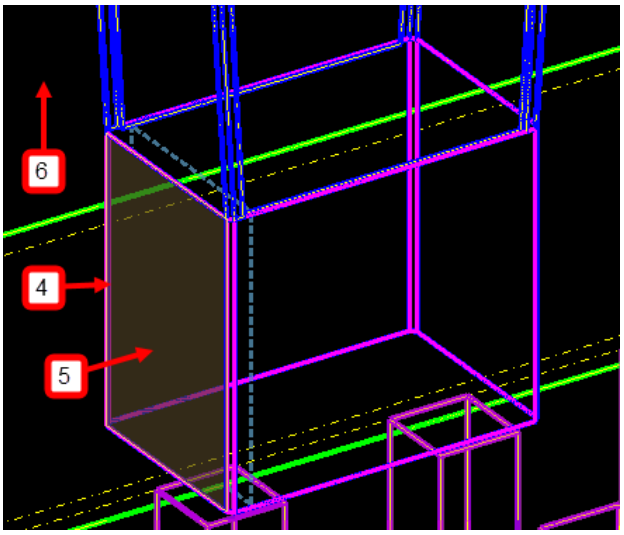


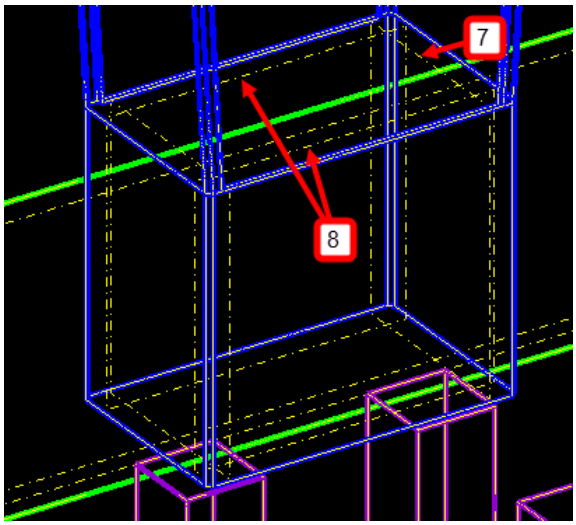


Footing/Column Dowels

1. Select Associative Extraction
2. Set active level to Rebar-Ftg-5_pm
3. Set the face offset variable to Ftg_Dowels_Left_Right_Offset
4. Select the bottom of column element
5. Select the left face of the bottom of column
6. Left click off to the side to accept
7. Repeat above steps for Right face
8. Repeat above steps for front and back faces, but make sure you switch the face extraction offset variable to Ftg_Dowels_Front_Back_Offset

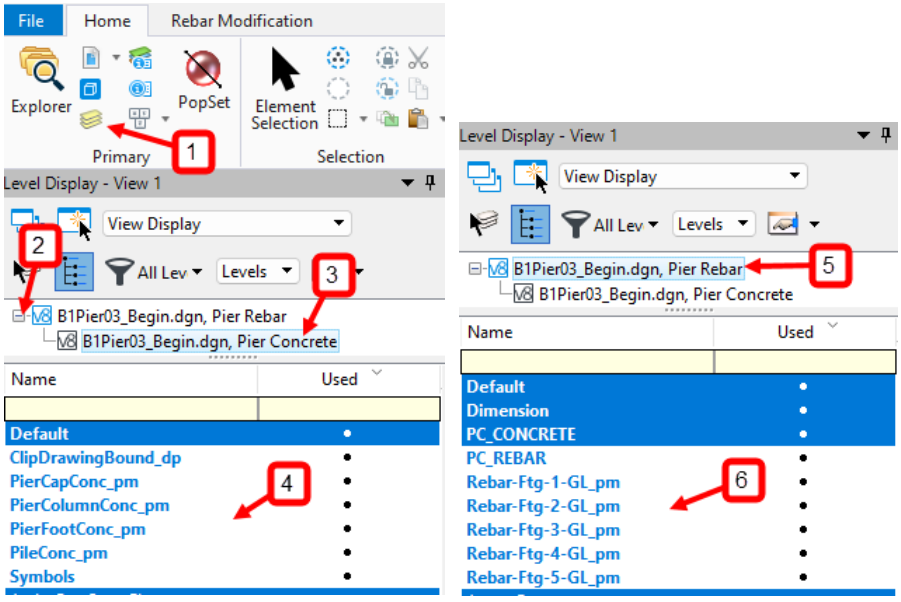




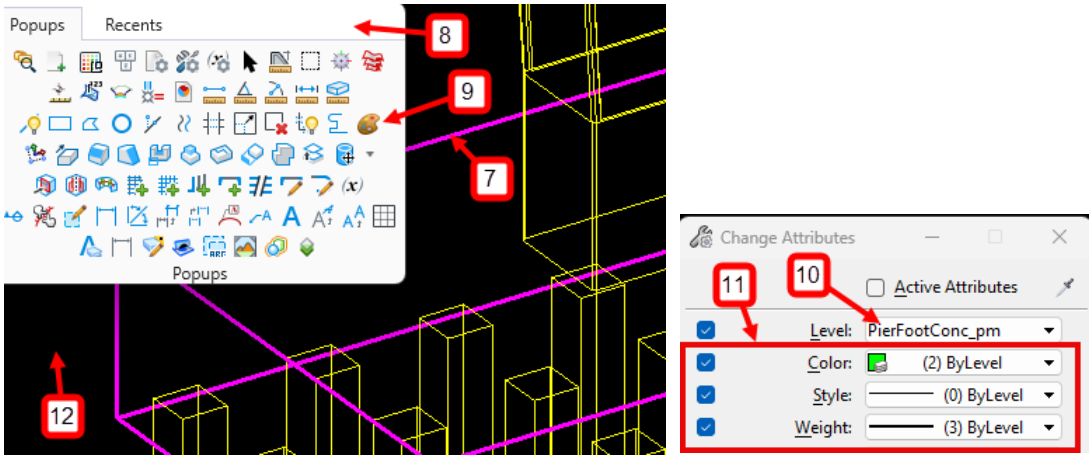


2.2.3 *Adjust ProConrete Clone Elements*

1. Open Level Display
2. Click the (+) sign to expand the tree
3. Select the Pier Concrete model
4. Turn off all levels
5. Select Pier Rebar model
6. Turn off all guideline levels



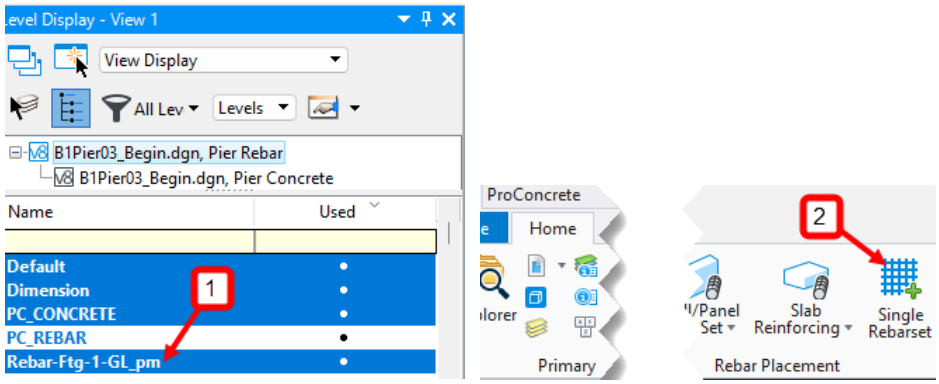
7. Select Footing element
8. Hit Spacebar to open Pop-Up menu
9. Change Element Attributes
10. Select the PierFootConc_pm level
11. Change Color, Style, and Weight to “By Level”
12. Left click to accept

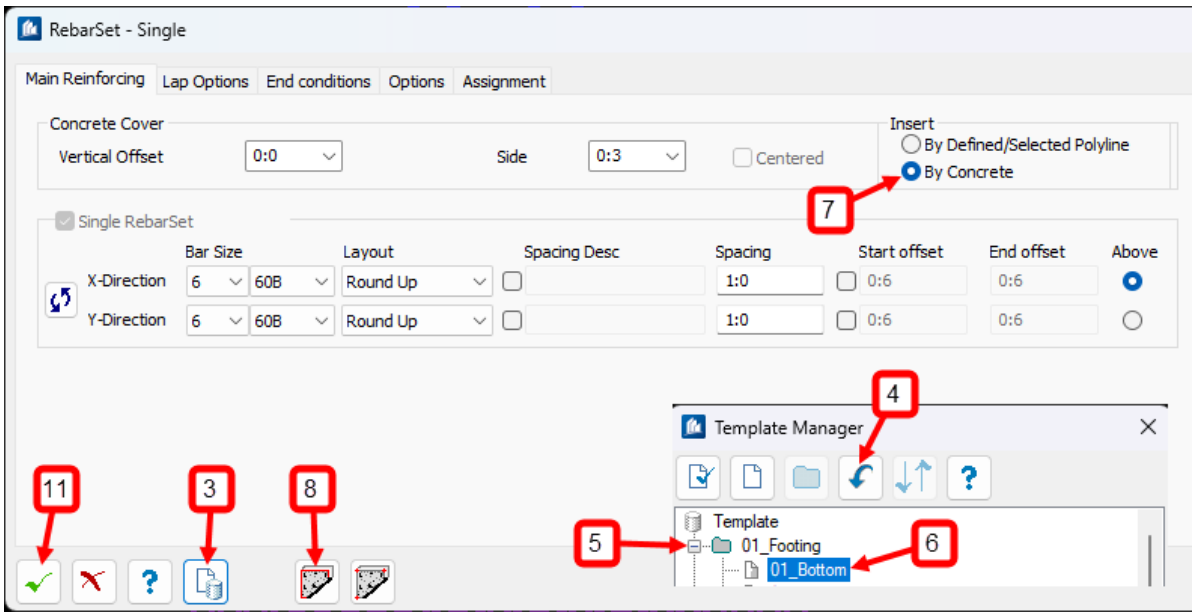


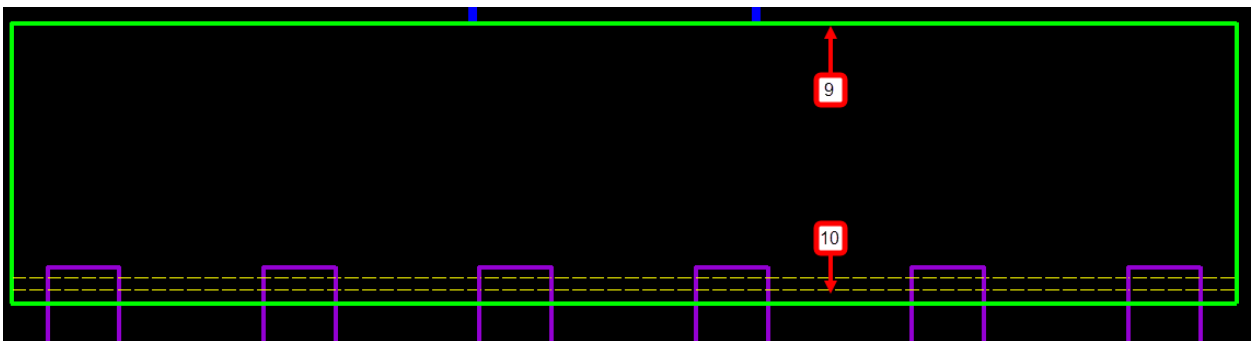
13. Repeat steps 7-12 for: pile elements (PileConc_pm) and column elements (PierColumnConc_pm)

2.2.4 *Bottom Bars*

1. Turn on the Rebar-Ftg-1-GL_pm level and switch to a front view (Shift + Right Click, F)
2. Select Single Rebarset
3. Template
4. Import, navigate to the *SingleRebarSet.tpl* file that you downloaded with the dataset & open
5. Expand the footing folder
6. Double click 01_Bottom
7. Select By Concrete
8. Select Concrete/Define Poly
9. Select the footing
10. Select the bottom guideline
11. Click the green checkmark
12. Repeat steps 2-9 for the second layer of bottom reinforcement

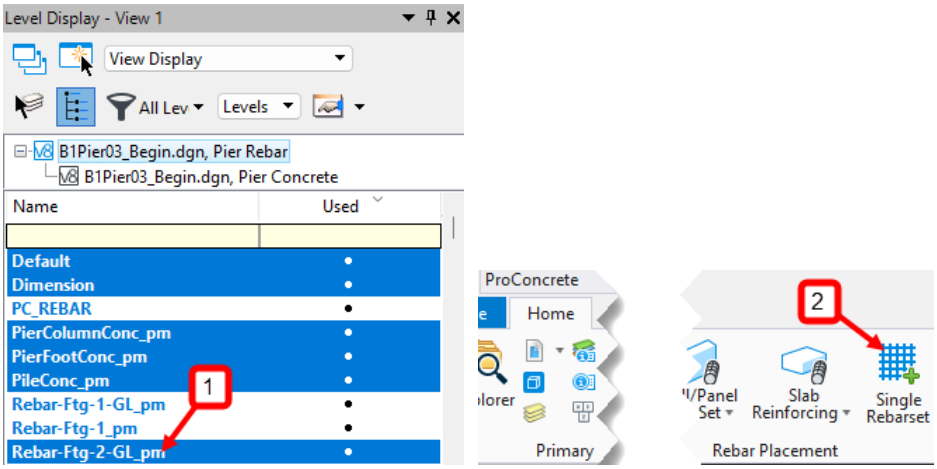


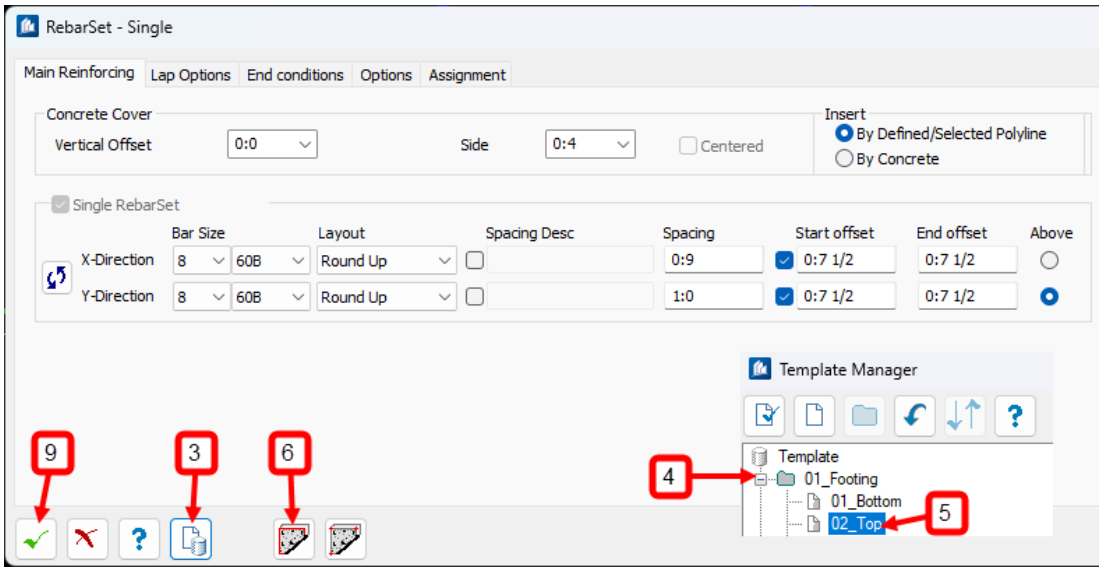




2.2.5 *Top Bars*

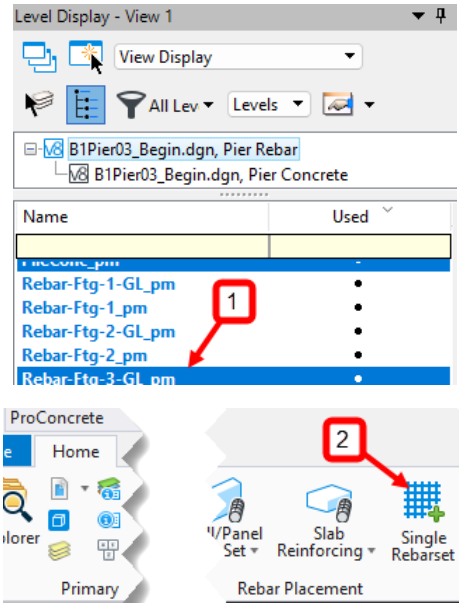
1. Turn on the Rebar-Ftg-2-GL_pm level, turn other levels off
2. Single Rebarset
3. Template
4. Expand the footing folder
5. Double click 02_Top
6. Select Concrete/Define Poly
7. Select the footing
8. Select the top guideline
9. Click the green checkmark

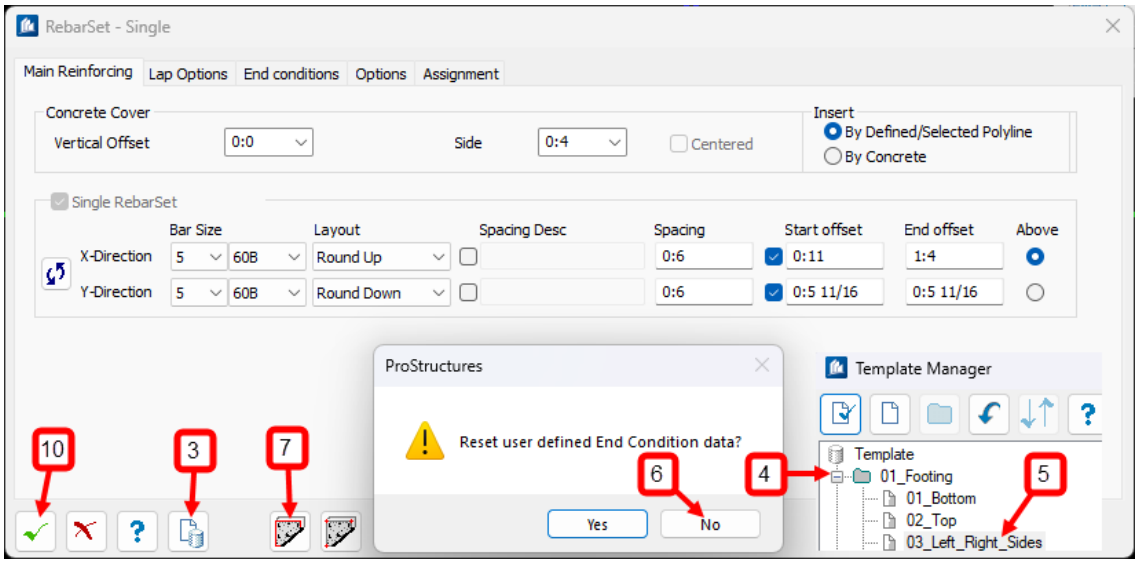


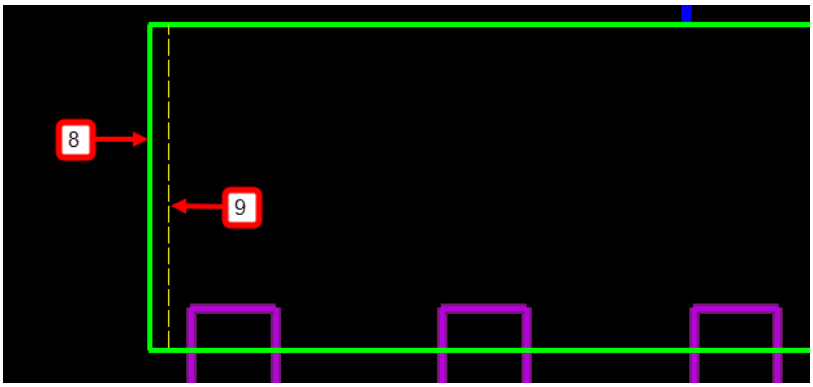


2.2.6 *Left/Right Face Bars*

1. Turn on the Rebar-Ftg-3-GL_pm level, turn other levels off
2. Single Rebarset
3. Template
4. Expand the footing folder
5. Double click 03_Left_Right_Sides
6. Click No two times (sometimes this message will not come up)
7. Select Concrete/Define Poly
8. Select the footing
9. Select the left side guideline
10. Click the green checkmark
11. Repeat steps 2-9 for the right side

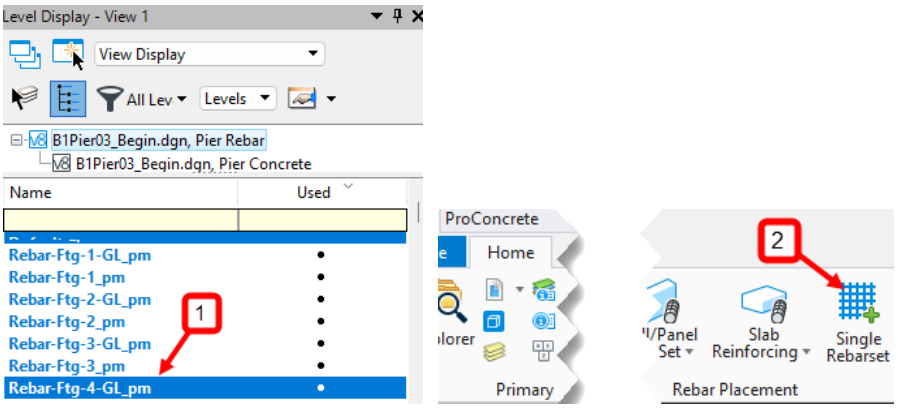


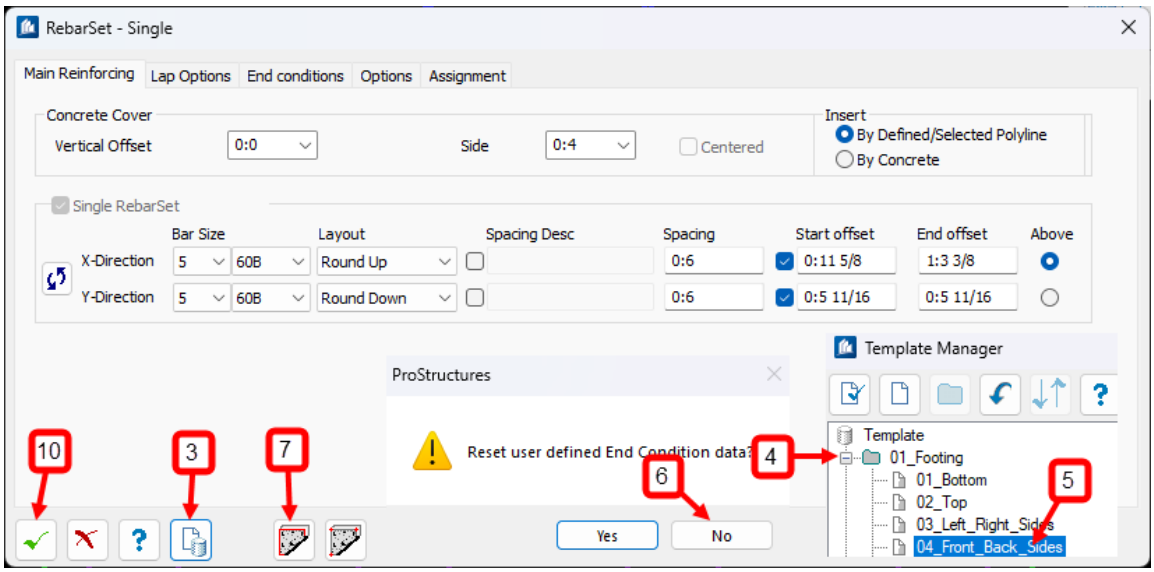


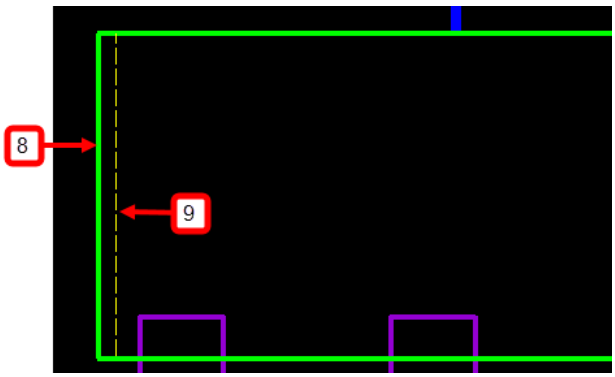


2.2.7 *Front/Back Face Bars*

1. Turn on the Rebar-Ftg-4-GL_pm level, turn other levels off, switch to a left view (Shift + Right Click, L)
2. Single Rebarset
3. Template
4. Expand the footing folder
5. Double click 04_Front_Back_Sides
6. Click No two times (sometimes this message will not come up)
7. Select Concrete/Define Poly
8. Select the footing
9. Select the left side guideline
10. Click the green checkmark
11. Repeat steps 2-9 for the right side

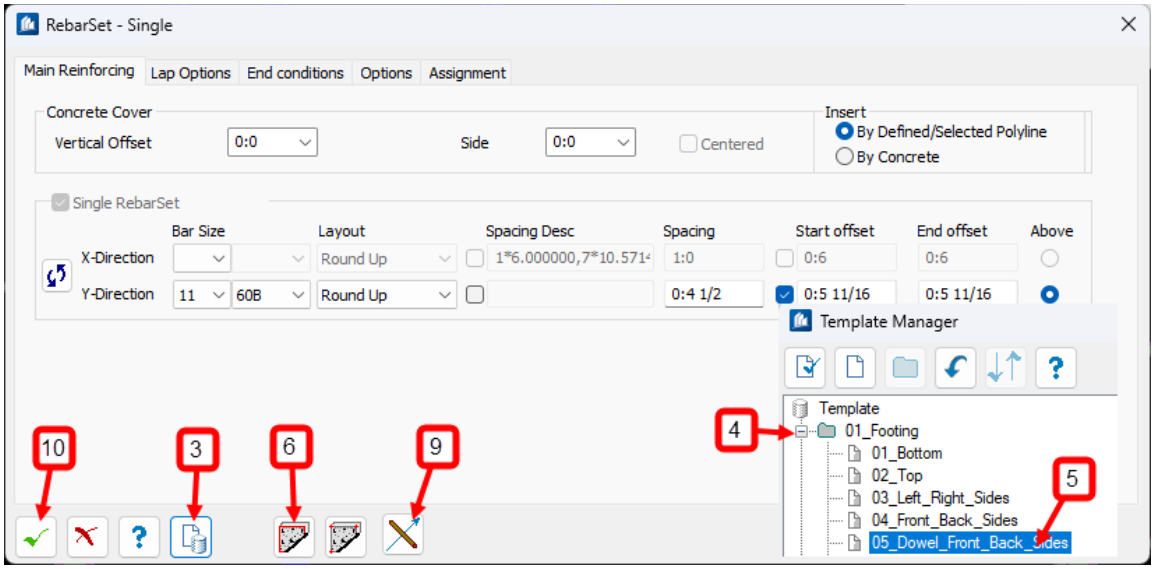


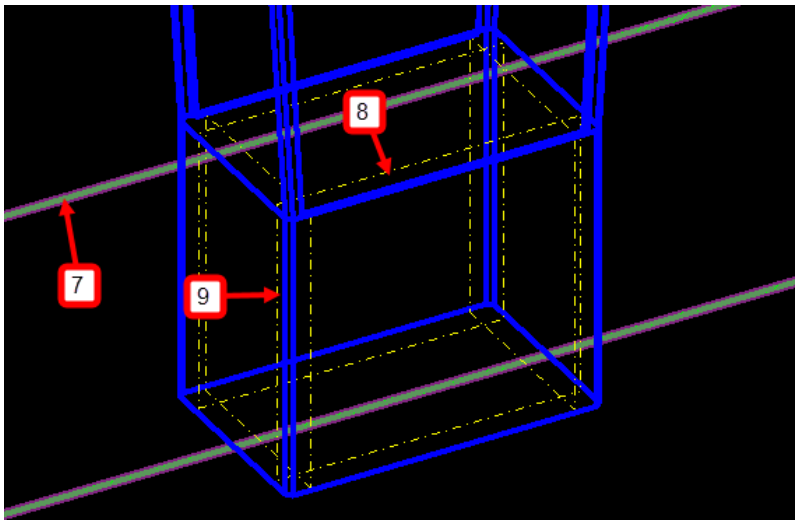




2.2.8 *Footing/Column Dowel Bars*

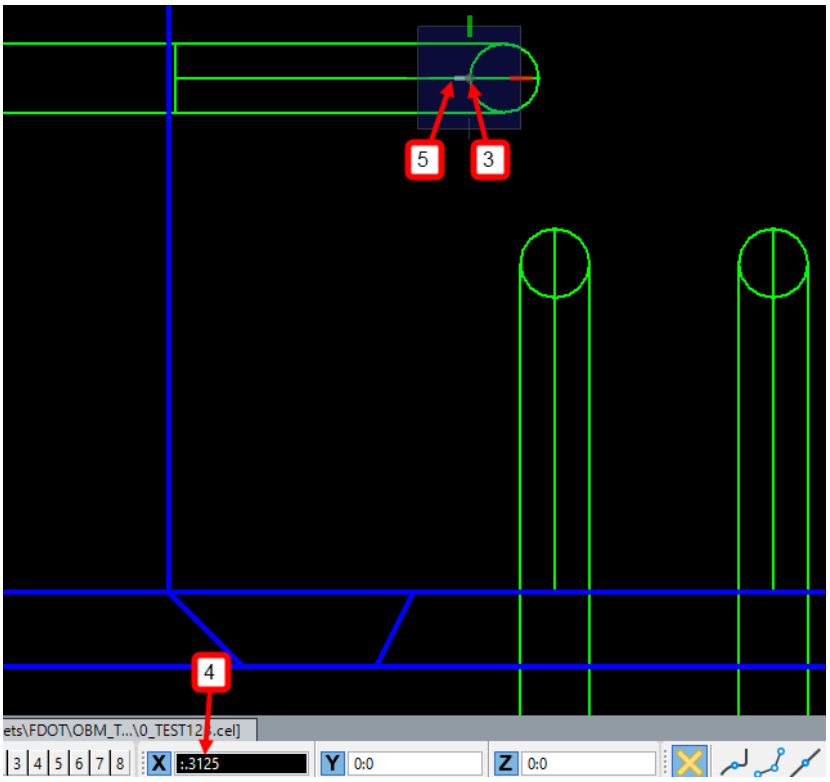
1. Turn on the Rebar-Ftg-5-GL_pm level, turn other levels off, switch to a left view (Shift + Right Click, L)
2. Single Rebarset
3. Template
4. Expand the footing folder
5. Double click 05_Dowel_Front_Back_Sides
6. Select Concrete/Define Poly
7. Select the footing
8. Select the front side guideline
9. If bars come in upside down, click the Select Direction for RebarSets and select the left vertical line
10. Click the green checkmark
11. Repeat steps 2-10 for the back side
12. Repeat steps 2-10 for the left and right sides, but use the 05_Dowel_Left_Right_Sides



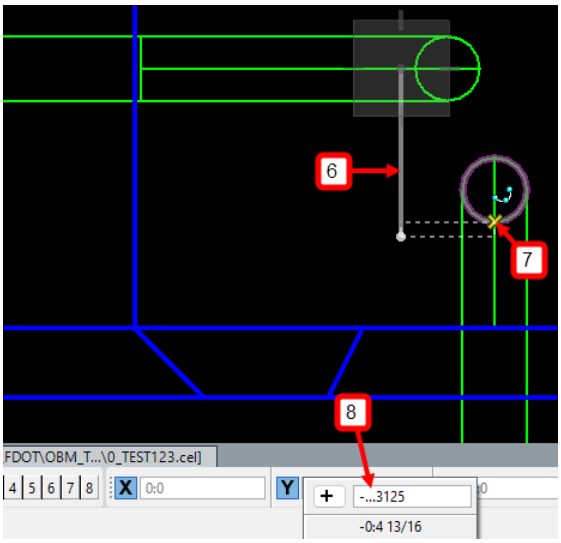


2.2.9 *Column Dowel Stirrups*

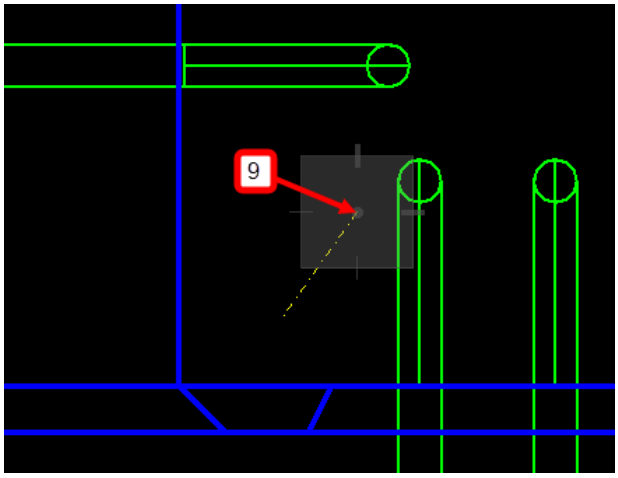
1. Set active level to Rebar-Ftg-6-GL_pm and switch to a top view (Shift + Right Click, T)
2. Hit Spacebar to bring up the pop-up menu, select the Place SmartLine tool
3. Zoom in to the bottom left corner of the column, hover over the outside of the first left face bar and hit O on the keyboard to set the origin of accudraw compass to that point
4. Move your cursor over to the left and lock the accudraw compass to the X axis (Enter on keyboard). In the X-axis input, enter in "-…3125"
    a. #5 bar diameter is 0.625", half of that is 0.3125", the ".." in front of that is to get it into inches
5. Hit O on the keyboard to move the accudraw origin to that point



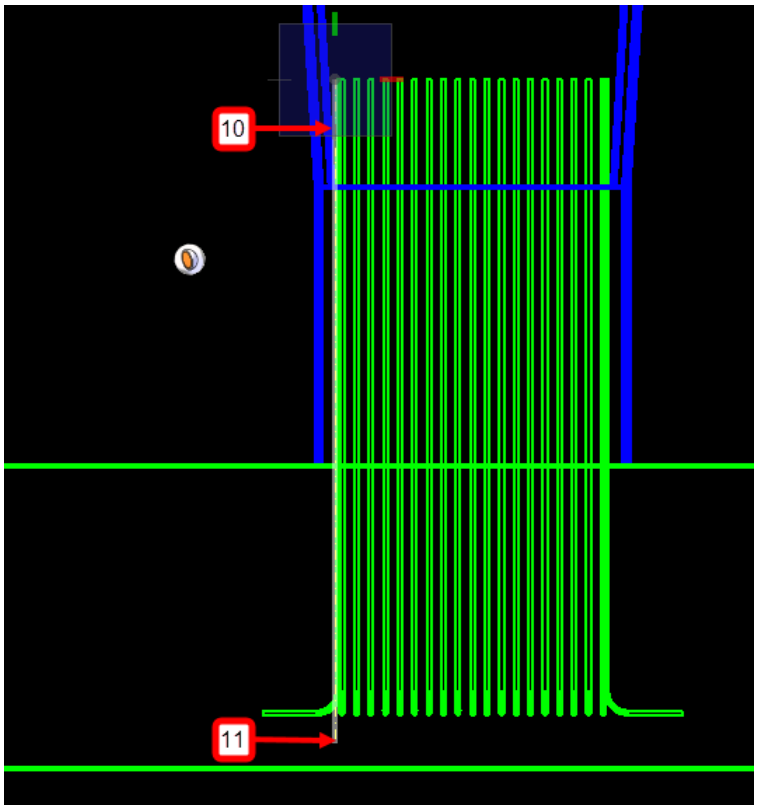
6. Move your cursor down and lock the Y-axis (Enter)
7. Hover your mouse over the outside of the first front face bar until it snaps to it
8. In the Y-axis input, hit "++" on your keyboard to activate the pop up calculator and enter in "…3125"



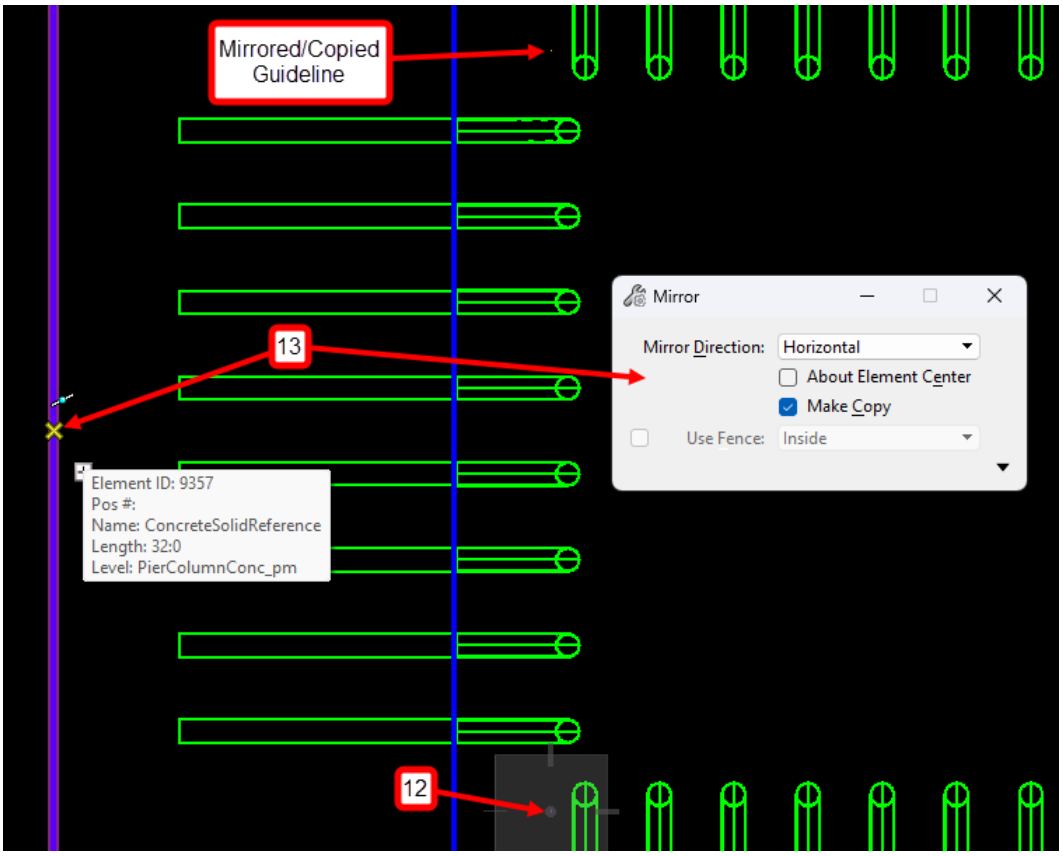
9. Hit Enter on keyboard to accept the pop up calculator value and left click to place the start point of the guideline.



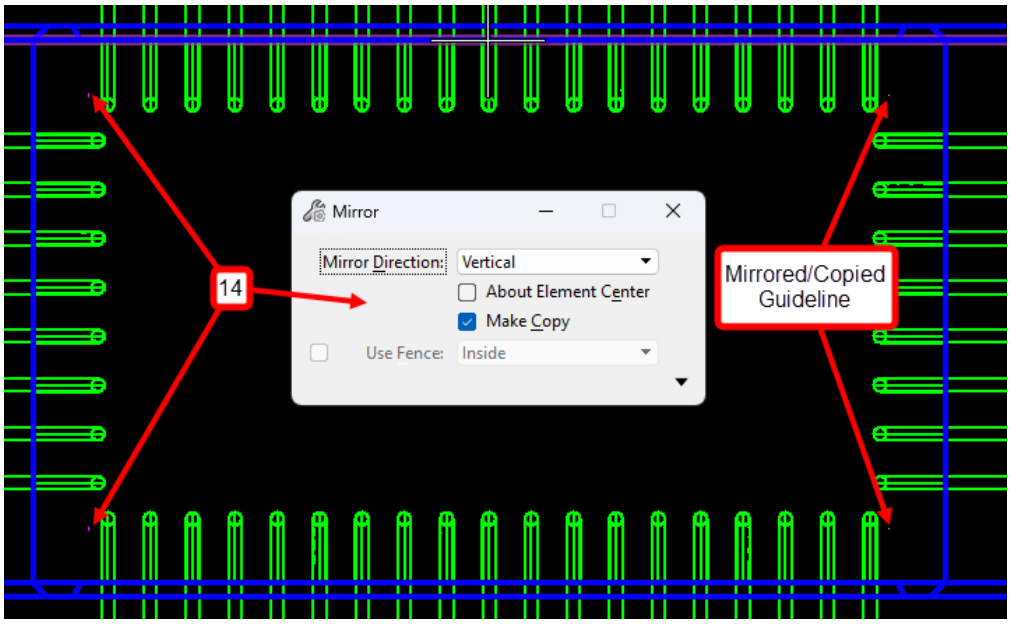
10. Switch to a front view (Shift + Right Click, F), click in one of the accudraw coordinates to activate it, and lock the Y-Axis (Enter). You may have to hit F again to rotate the accudraw compass to the front view.
11. Left click below the bottom of the dowel hook to place the end of the stirrup guideline and right click to cancel out of the line command



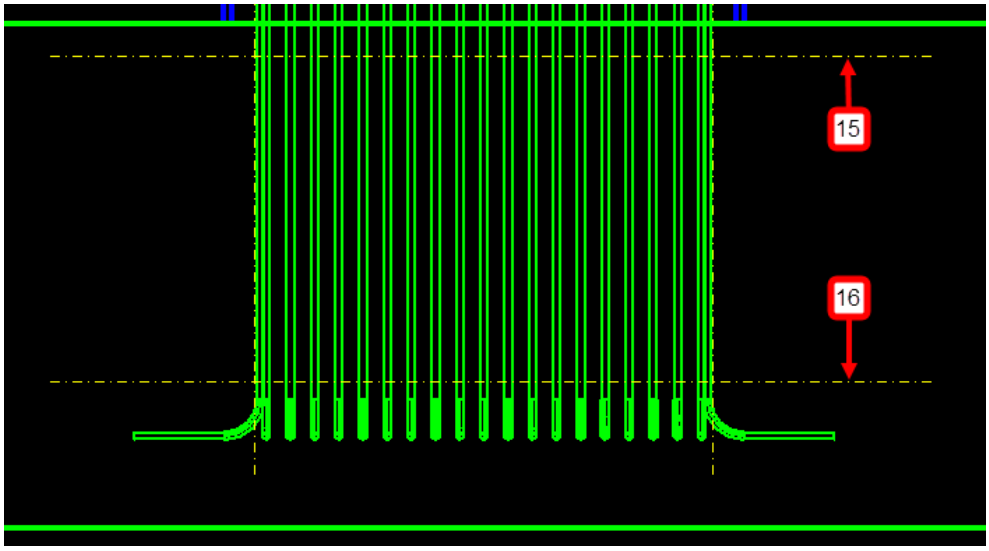
12. Switch to a top view (Shift + Right Click, T), select the guideline you just placed
13. Mirror (Q, Y) about the horizontal, snapping to midpoint of the side of the column. Make sure to select Make Copy.



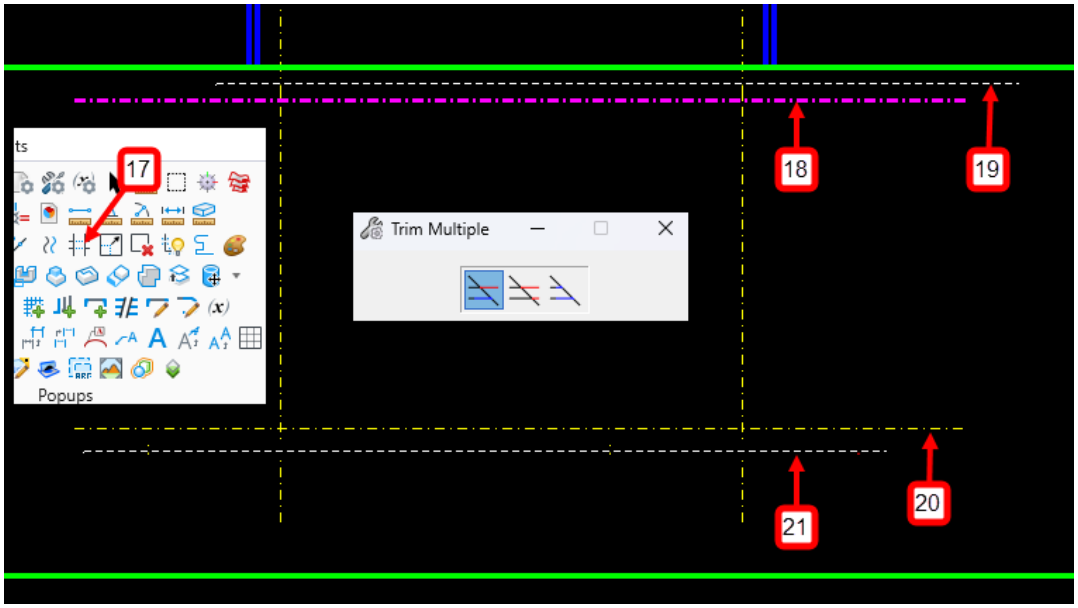
14. Select both of those left guidelines and mirror/copy again, this time about the vertical, snapping to the center of the column



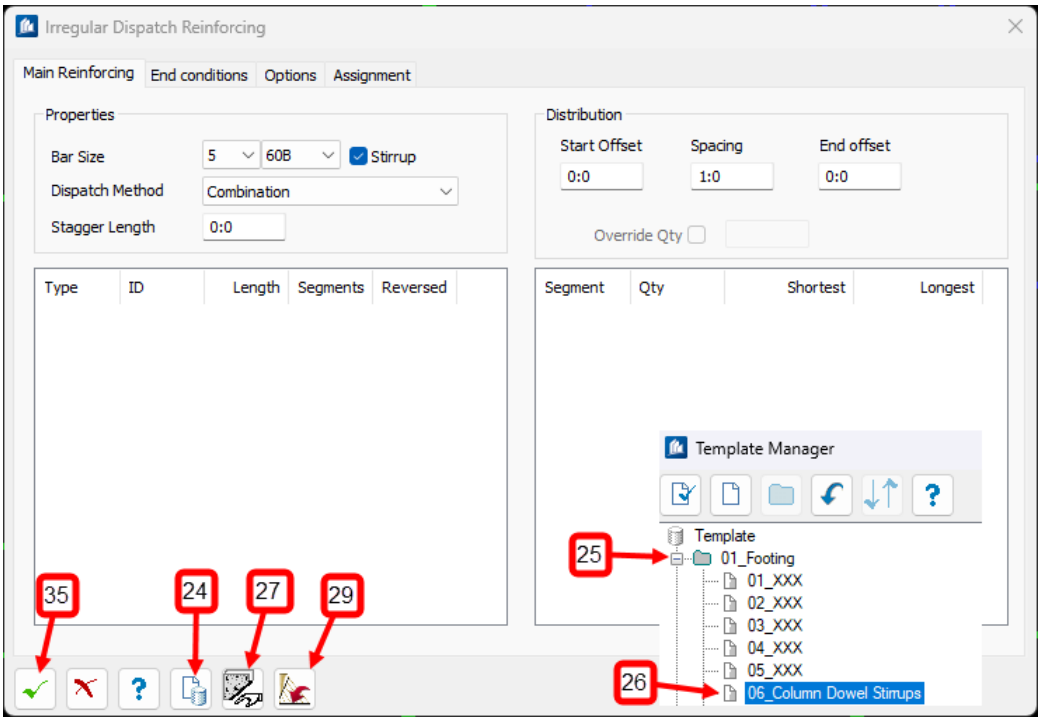
15. Switch to a front view (Shift + Right Click, F), select the SmartLine tool, & draw a temp horizontal trim line at the centerline of the first stirrup: 6” below top of footing
    a. Hint: when you activate the smart line tool, hover over the top of the footing and hit O on your keyboard to set your accudraw origin there, then move down 6” & left click to start your smartline placement.
16. Copy (Q, E) that line down to where you want the last stirrup to be
    a. Hint: we have 5 spaces of 12”. When you copy down the line, enter “..12*5” in the Y-axis input and it will copy that line down 12” * 5.

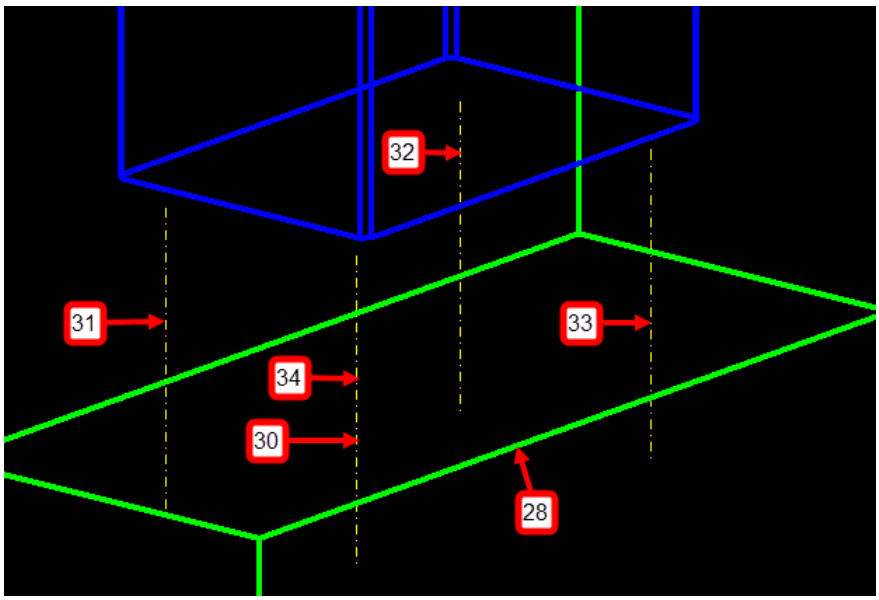


17. Turn off the footing dowel level so you only see the guidelines and select Trim Multiple from pop up menu
18. Select the trim line (cutting element)
19. Click and drag across the guidelines you want to trim down. Right click when done.
20. Select the bottom trim line
21. Click and drag across the guidelines you want to trim down
22. Delete the temp trim line you created. Switch to an isometric view and make sure the guidelines look correct.



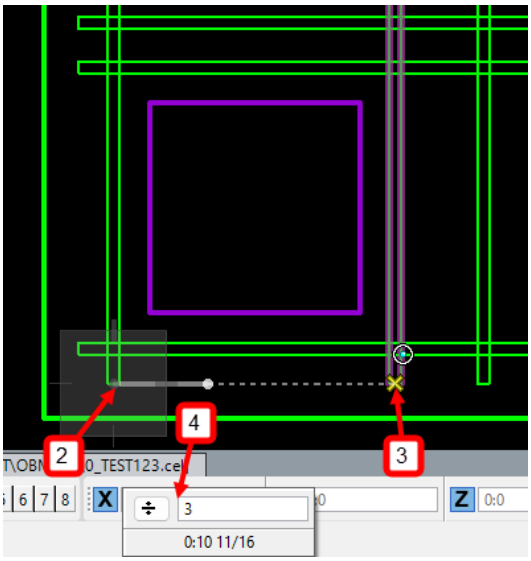
23. Switch to an isometric view & select the Irregular Dispatch Reinforcing tool from Rebar Placement section
24. Template, Import, navigate to the IrregularDispatch.tpl file that you downloaded with the dataset, similar to step 2.2.4.4
25. Expand the footing folder
26. Double click 06_Column_Dowel_Stirrups
27. Select Concrete
28. Select the footing
29. Select Guideline(s)
30. Select front left guideline
31. Select back left guideline
32. Select back right guideline
33. Select front right guideline
34. Select front let guideline again, right click to end guideline selection
35. Click the green checkmark

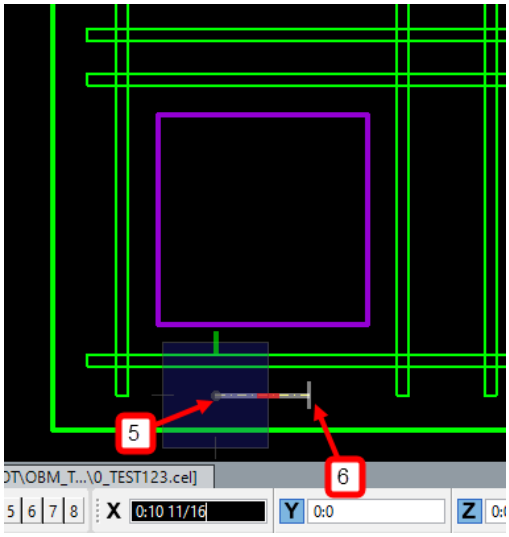




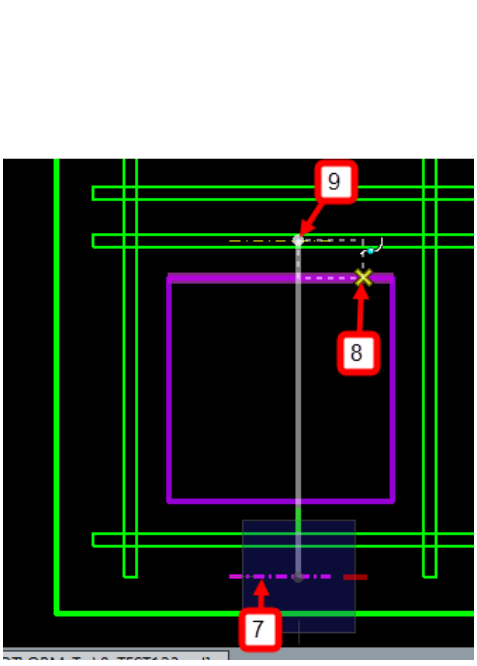
2.2.10 Bars Between Pile

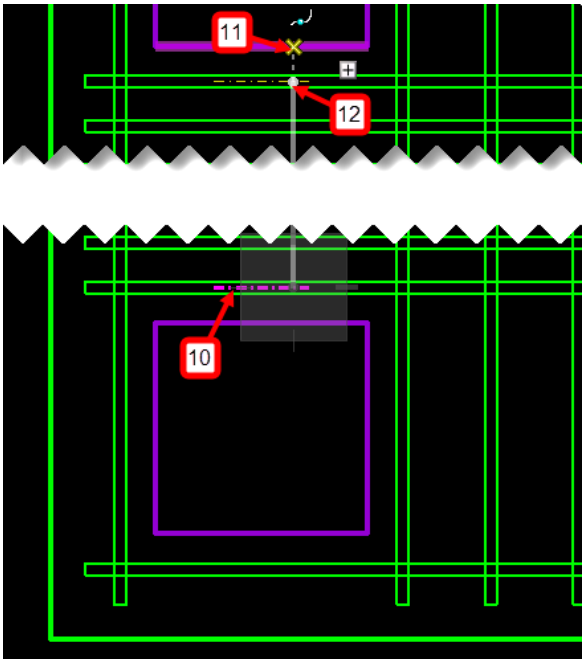
1. Set active level to Rebar-Ftg-7-GL_pm, switch to a top view (Shift + Right Click, T), and zoom into bottom left of footing
2. Activate Place SmartLine tool, activate center snap, hover over end of outer bar, and hit “O”
3. Hover over first interior bar with center snap
4. Hit divide button on keyboard to bring up the pop up calculator and enter “3”, for three equal spaces
5. Left click to start your SmartLine placement
6. Move your cursor to the right, locking your accudraw compass to the X-axis until it snaps to the distance previously calculated by the pop up calculator



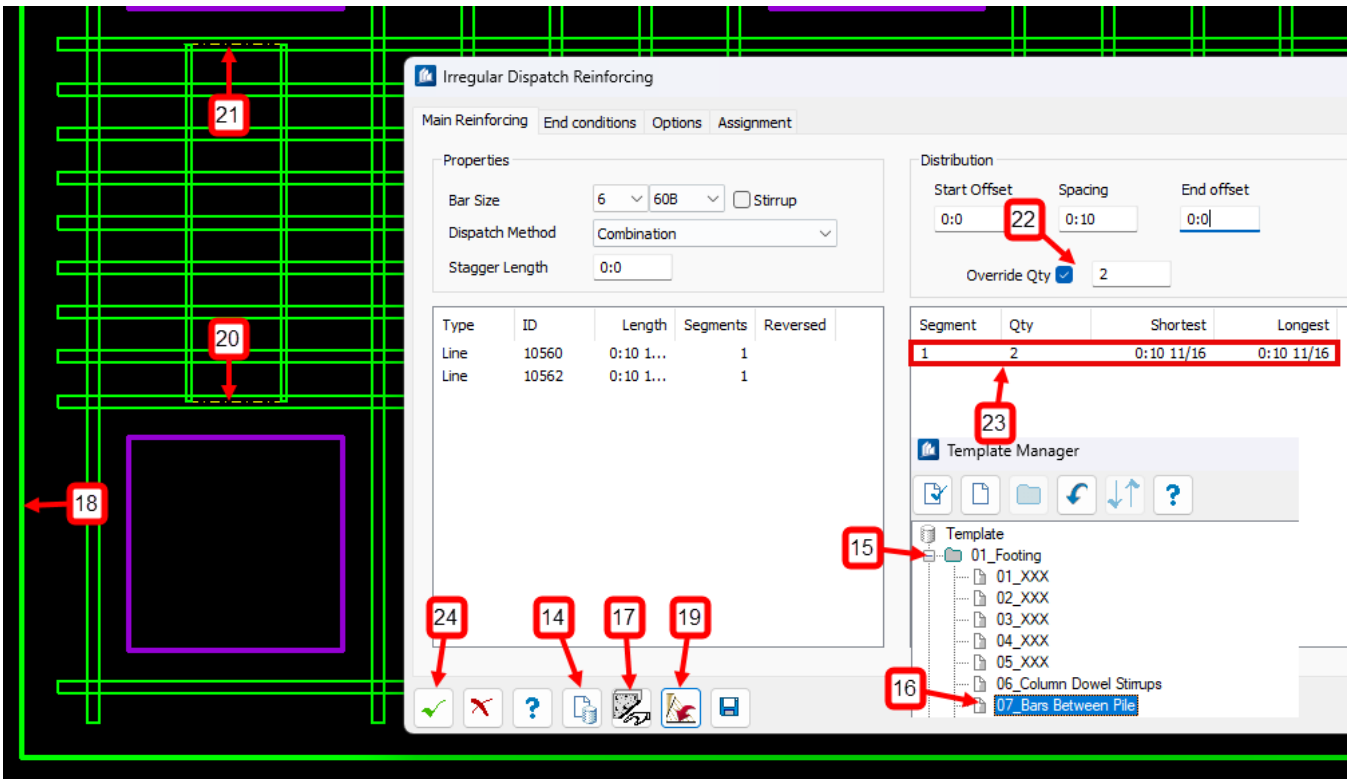


7. Select the line you just created, Move (Q, W), click on the line you created
8. Move your cursor up, lock your accudraw compass to the X-axis, hover over the top pile line
9. Type “++..4” and left click. This moves the line 4” past the edge of pile.
10. Select the line again, Copy (Q, E), click on the line
11. Move your cursor up, lock your accudraw compass to the Y-axis, hover over the bottom pile line of adjacent pile
12. Type “--..4” and left click. This copies the line 4” down from the edge of adjacent pile.

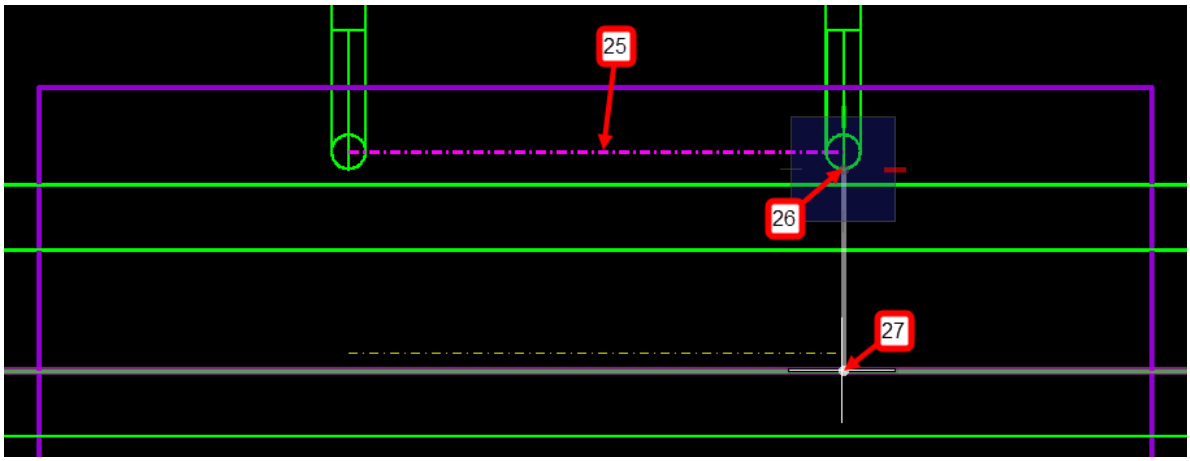




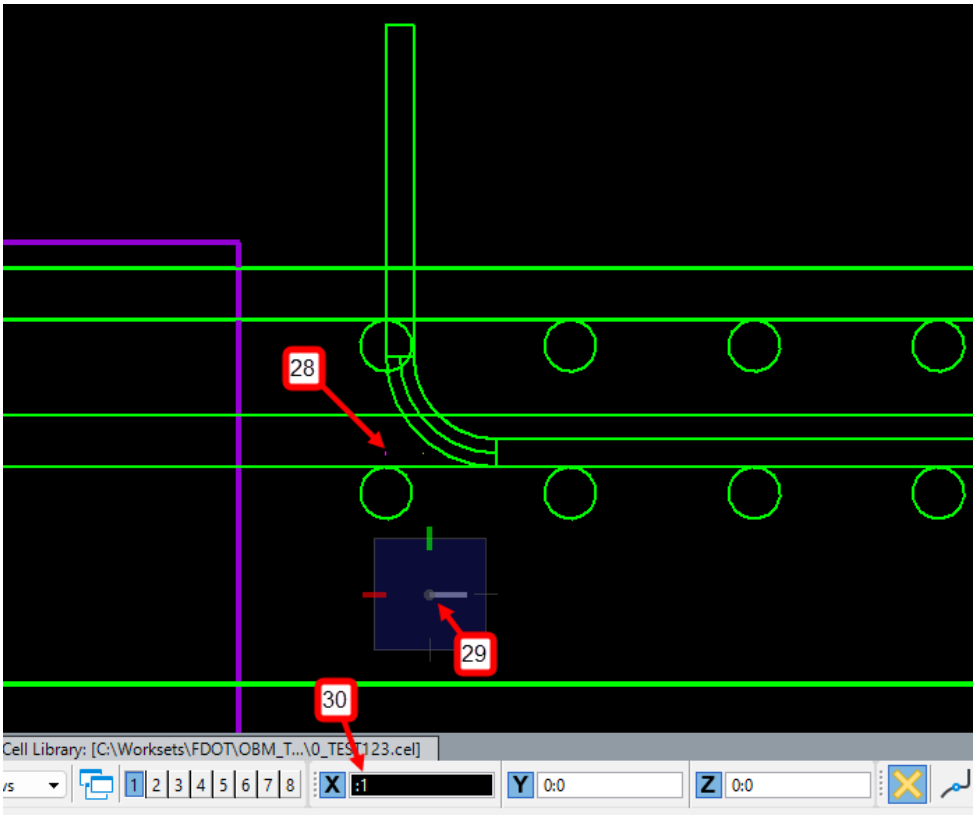
13. Select the Irregular Dispatch tool from Rebar Placement section
14. Template
15. Expand the footing folder
16. Double click 07_Bars_Between_Pile
17. Select Concrete
18. Select the footing
19. Select Guideline(s)
20. Select bottom guideline
21. Select top guideline, right click to end guideline selection
22. Check the box for quantity override and enter 2
23. Select Segment 1 in the table to apply the quantity override
24. Click the green checkmark

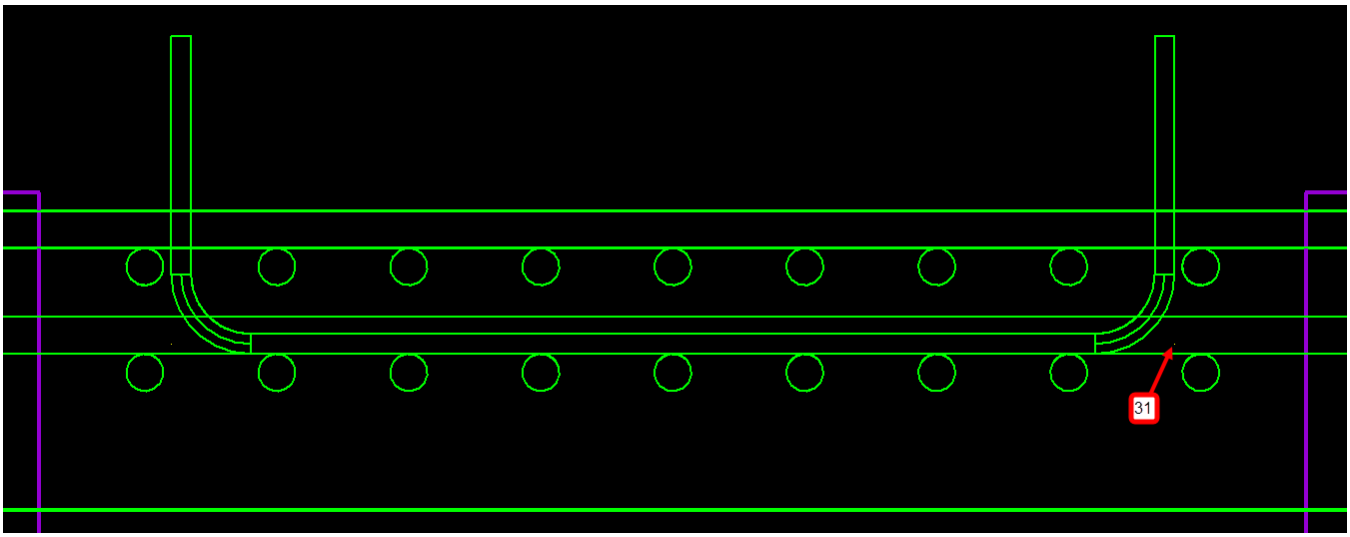


25. Go to a front view (Shift + Right Click, F), drag select (down and to the left) the two guidelines
26. Move (Q, W), snap to the bottom of the bar bend
27. Move your cursor down, lock the accudraw compass to the Y-axis, and snap to the bar you want these bars between pile to sit on.

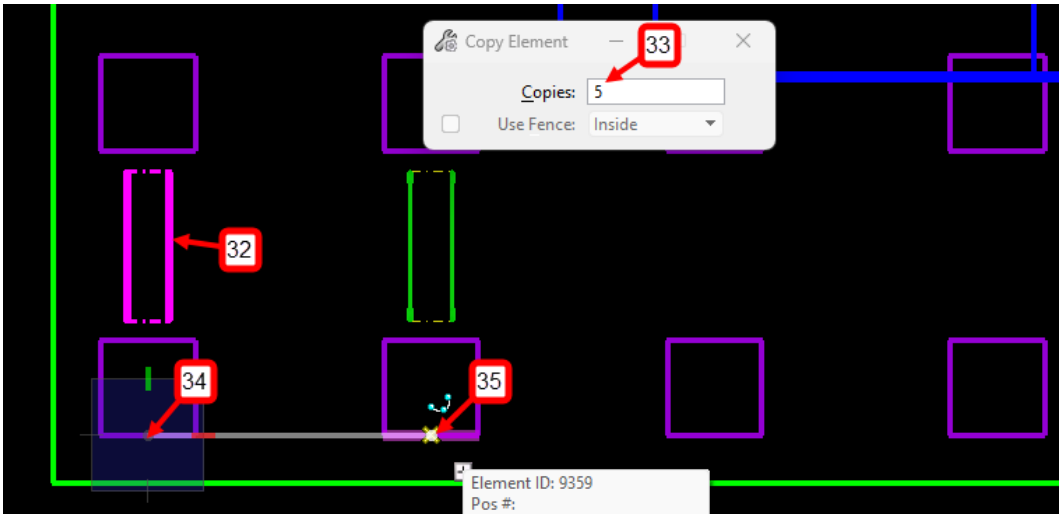


28. Switch to a Left view (Shift + Right Click, L) and select the left guideline
29. Move (Q, W), left click anywhere to pick begin move point and move your cursor to the right, locking accudraw compass to the X-axis
30. Type in "..1" and left click to accept move distance
31. Repeat steps 28-30 for the right guideline, except move the cursor to the left in step 29

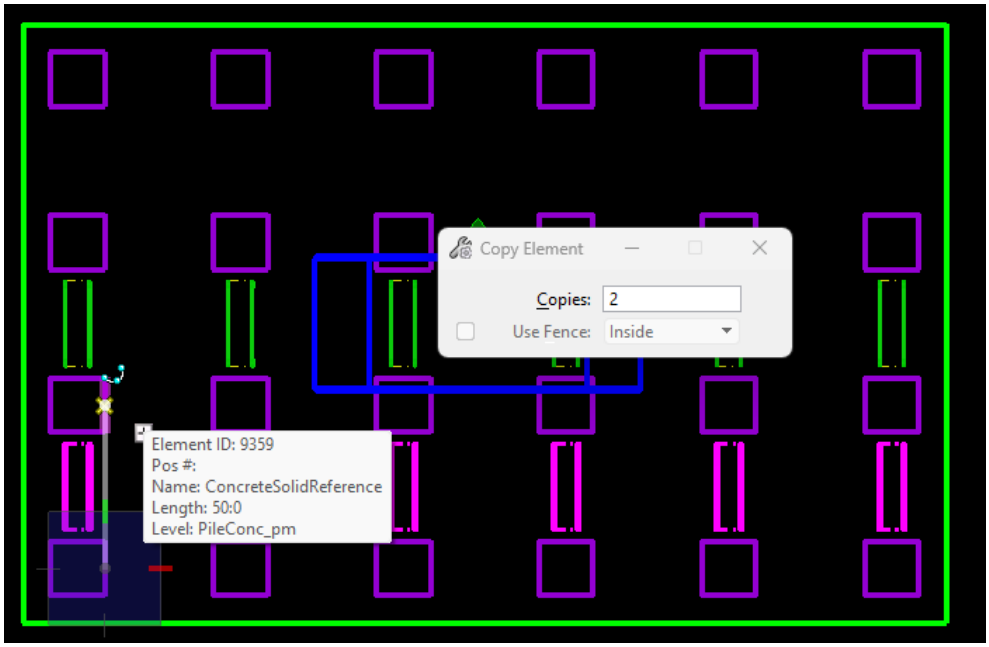




32. Switch to a Top view (Shift + Right Click, T), turn off Rebar-Ftg-1_pm level, and drag select (to the right) the guidelines and rebar you just placed
33. Copy (Q, E) and type in 5
34. Left click & snap to mid-point of a pile
35. Left click & snap to mid-point of adjacent



36. Repeat steps 32-35, but change copy amount to 2 and move upwards



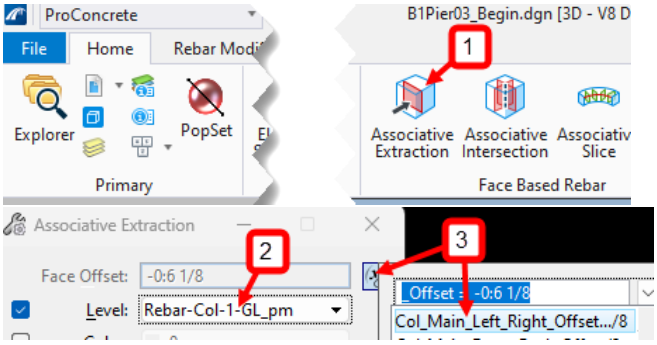
Note: The bars in between the pile in the opposite direction can be done in a similar manner.

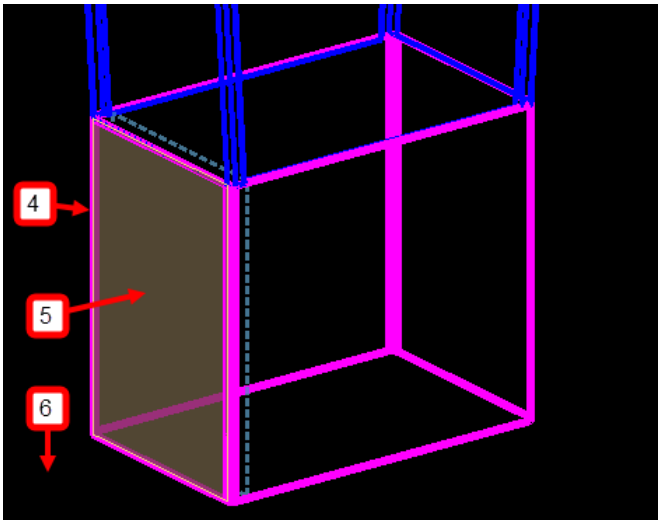
2.3 Column

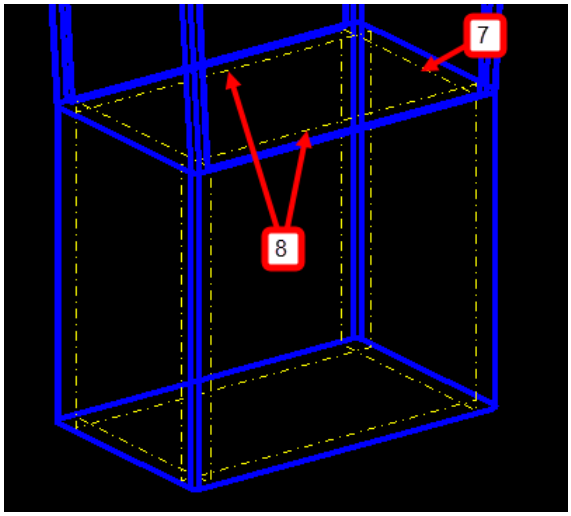
Turn off all levels except PierColumnConc_pm

2.3.1 Main Vertical Bars

1. Select Associative Extraction
2. Set your level to Rebar-Col-1-GL_pm
3. Set the face offset variable as Col_Main_Left_Right_Offset
4. Select the bottom column concrete element
5. Select the left face of the bottom column element
6. Left click off to the side to accept
7. Repeat above steps for the right face
8. Repeat above steps for front and back faces, make sure to set the face offset variable as Col_Main_Front_Back_Offset

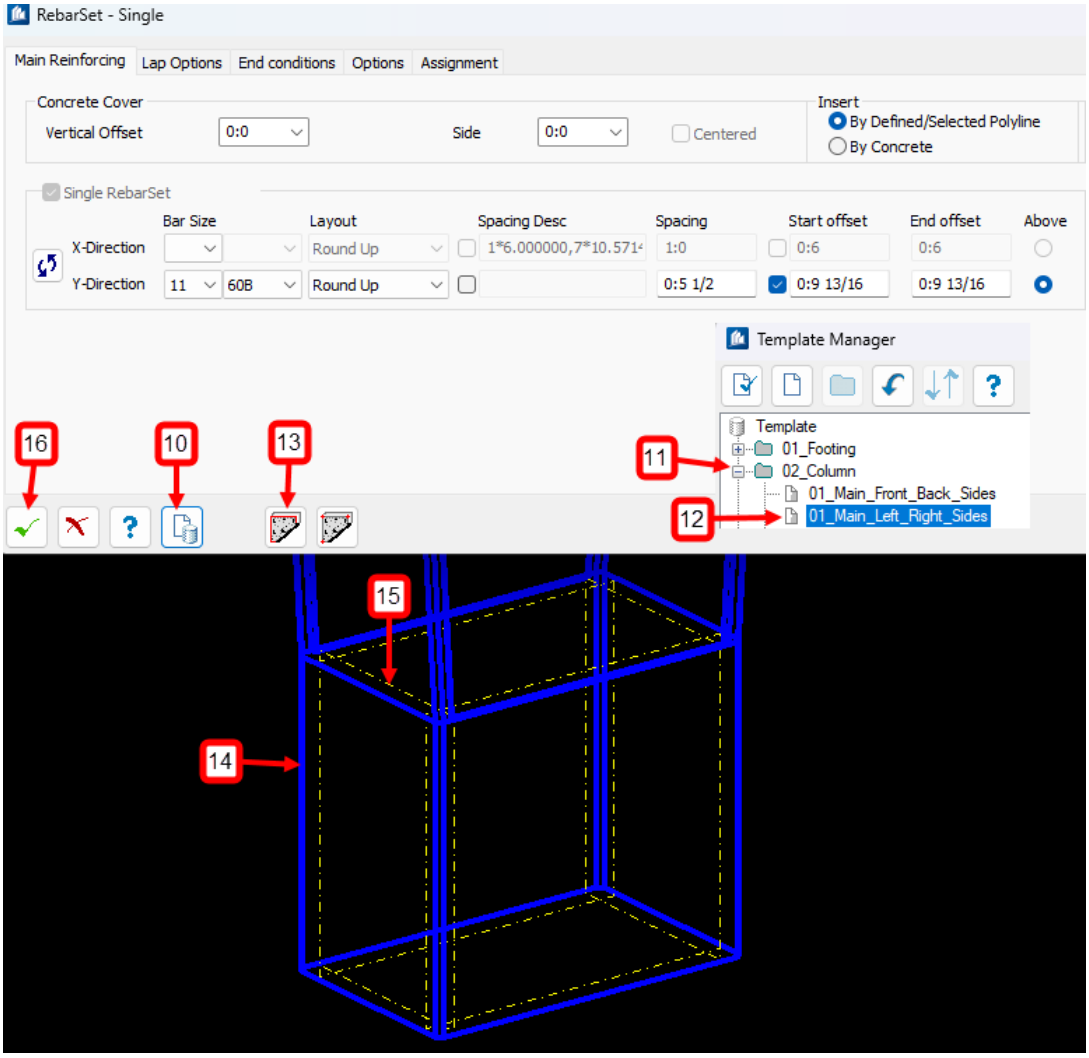


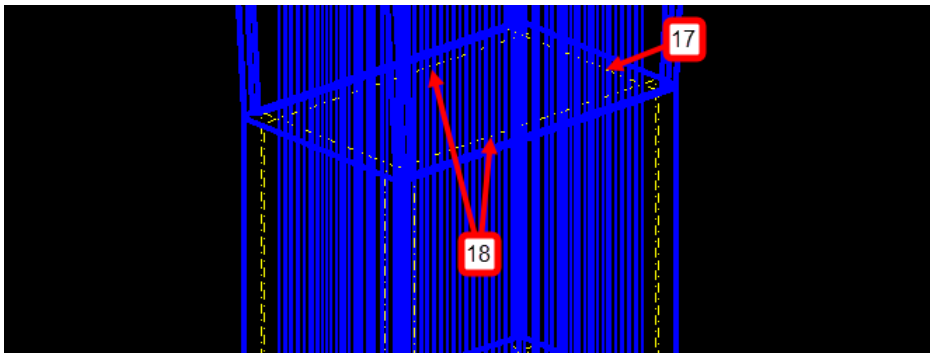




9. Select Single Rebarset

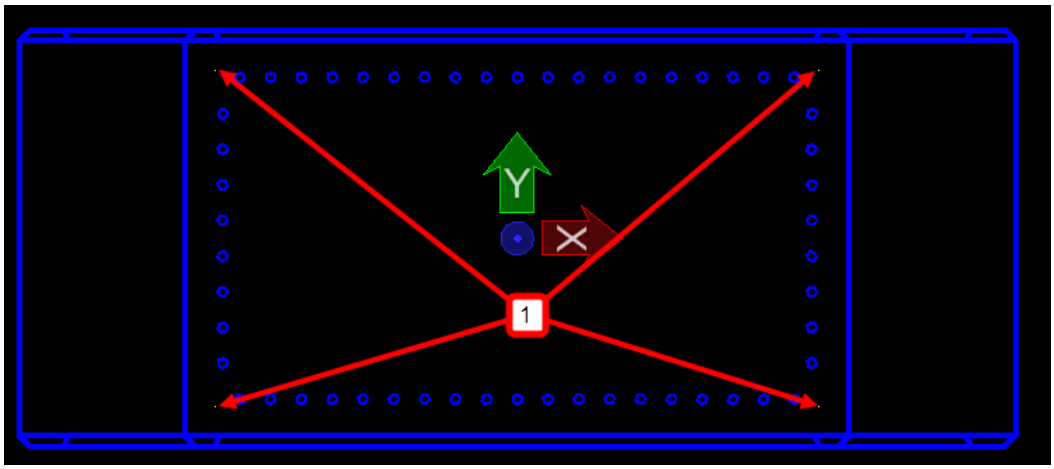
10. Template
11. Expand the Column folder
12. Double click 01_Main_Left_Right_Sides
13. Select Concrete/Define Poly
14. Select the bottom column
15. Select the left face guideline
16. Click the green checkmark
17. Repeat above steps for right face column bars
18. Repeat above steps for front and back face column bars, except choose 01_Main_Front_Back_Sides. If bars come in upside down (going in wrong direction) follow same steps as 2.2.8.9 to fix them.



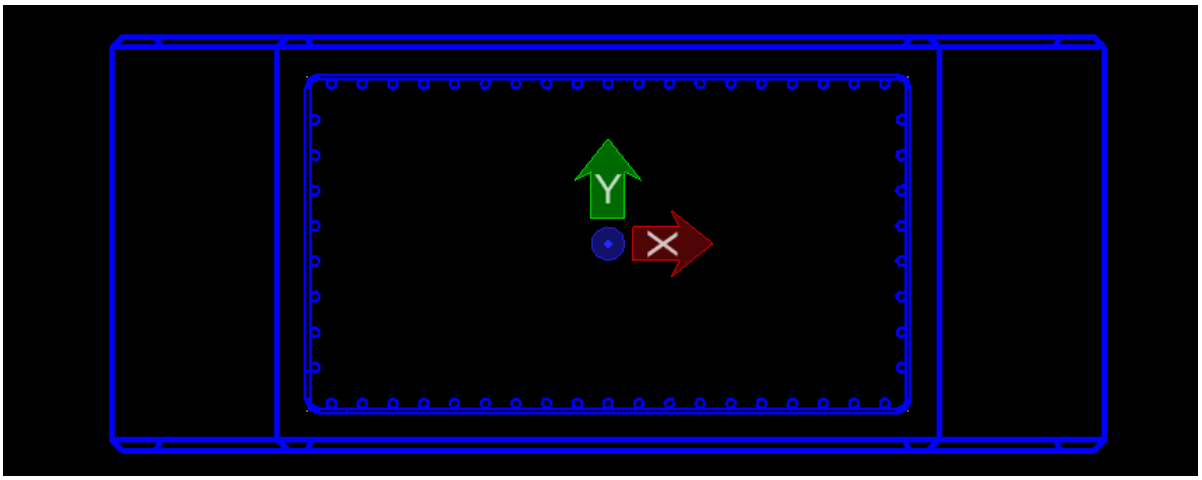


2.3.2 *Stirrups*

1. Create stirrup guidelines similar to section 2.2.9, Steps 1-22, except use Rebar-Col-2-GL_pm level and trim the guidelines to top of column and bottom of column

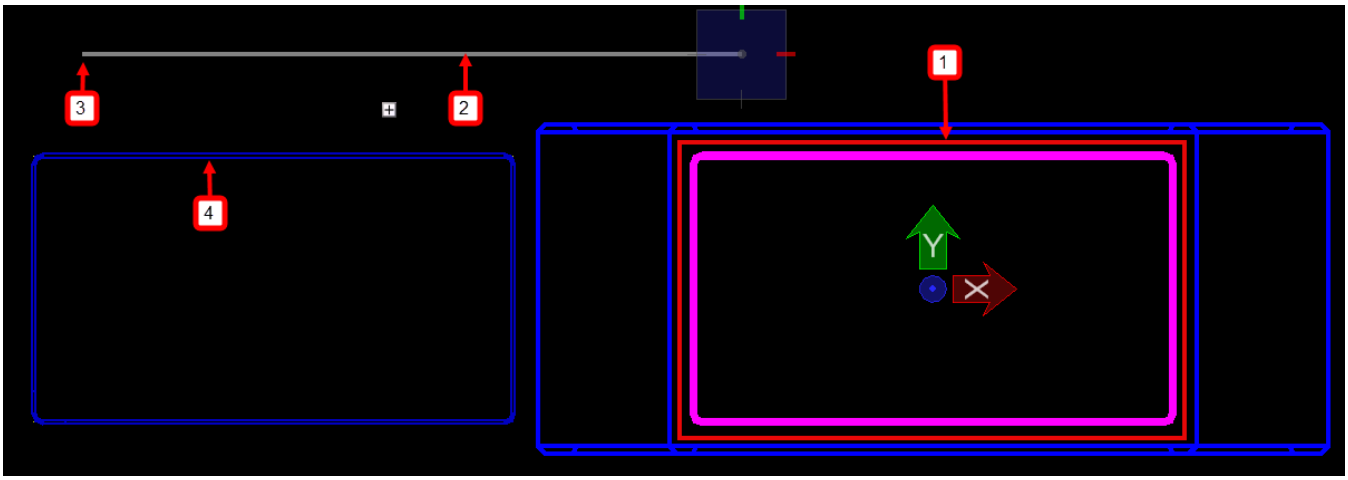


2. Model stirrups similar to section 2.2.9, Steps 23-35, except use the 02_Stirrup template and stay in the top (plan) view when selecting the guidelines

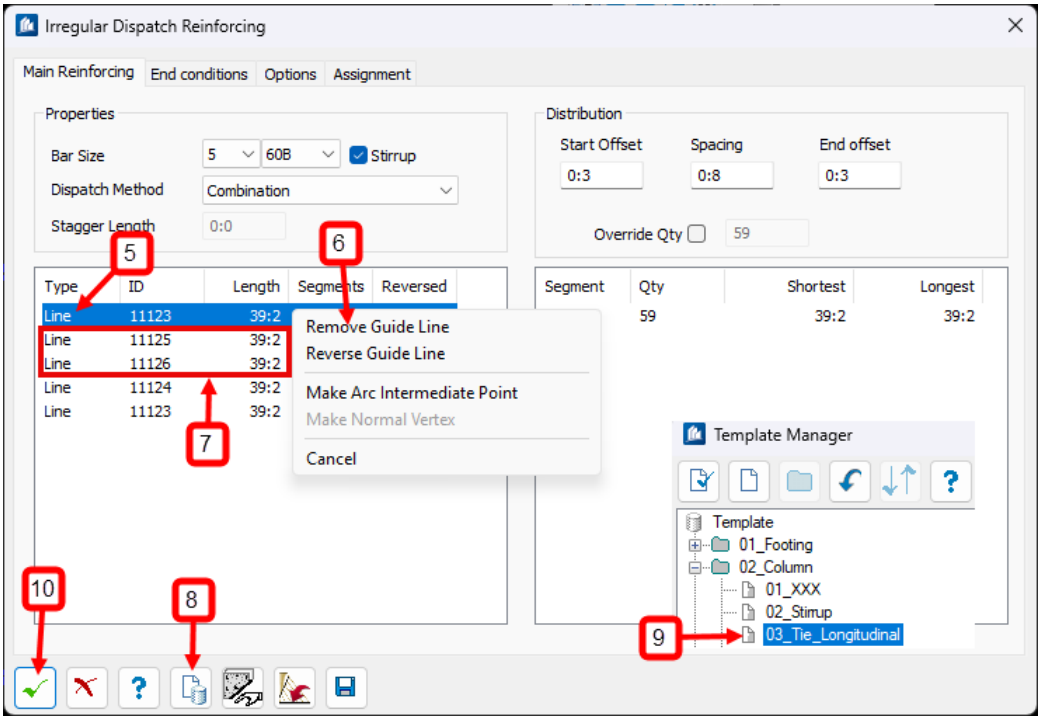


2.3.3 *Ties*

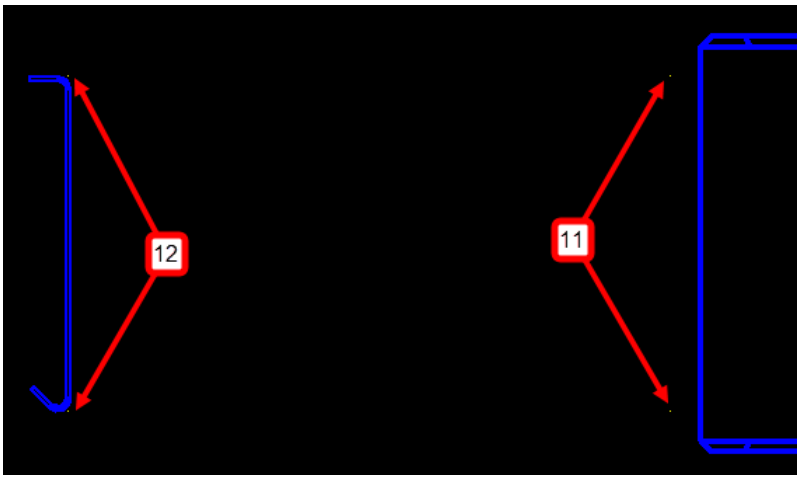
1. Stay in the top view shown above, turn off the column main bars (Rebar-Col-2-GL_pm) level, drag select all the guidelines and stirrups previously created
2. Copy (Q, E), left click, move your cursor to the left locking accudraw compass to X-axis (Enter), type 10
3. Left click to finish the copy command
4. Double click the copied bars to open the irregular dispatch dialog box



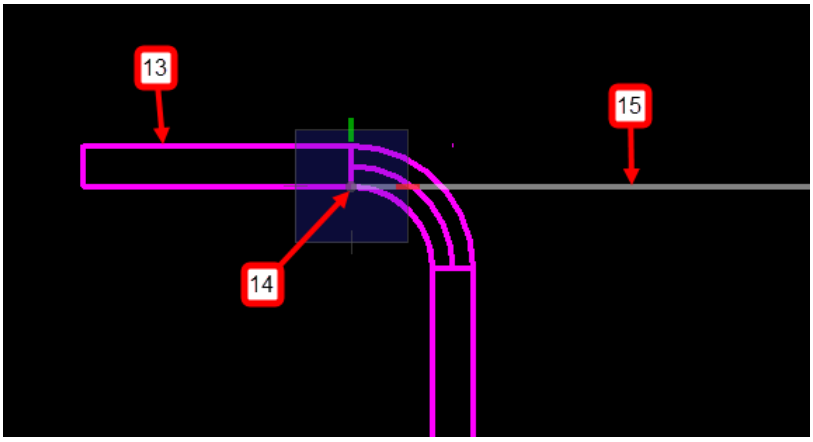
5. Select the first line segment in the list and right click
6. Remove Guide Line
7. Repeat to remove the next two lines at the top of the list until there are only two remaining
8. Template
9. 03_Tie_Longitudinal
10. Click the green checkmark



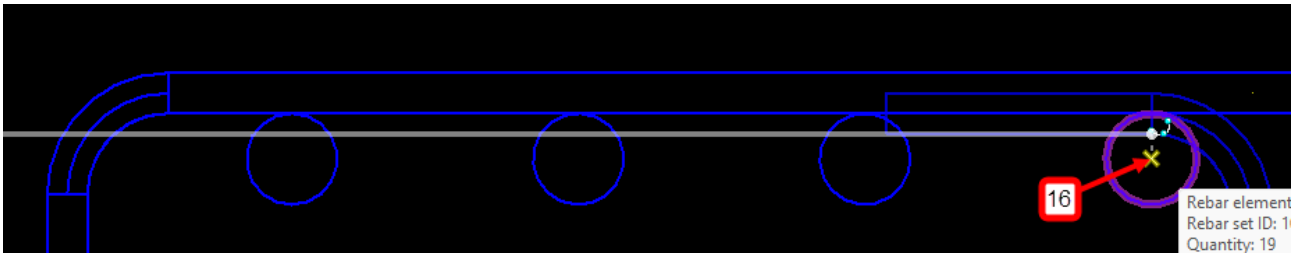
11. Delete the two stray guidelines that are no longer being used
12. Select the two remaining guidelines and use the Change Element Attribute tool to change their level to Rebar-Col-3-GL_pm, similar to how it was done in 2.2.3, Steps 8-12. Note that the 135 hook and 180 hook may be reversed from what is shown, this is ok.



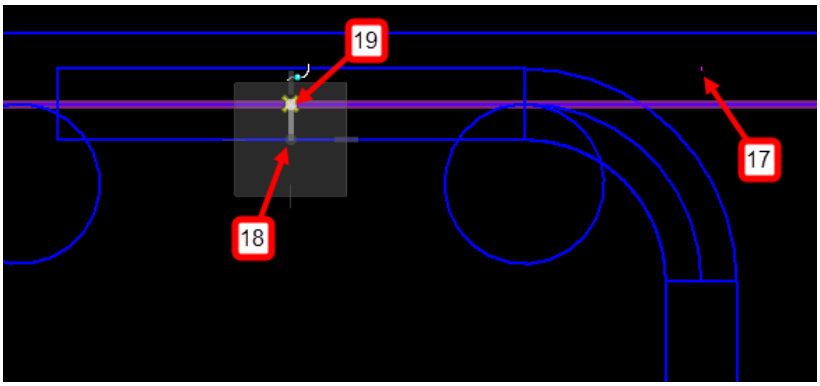
13. Turn column bar level back on and drag select the longitudinal ties and guidelines we just created, move (Q,W)
14. Left click and snap to the inside face of the 90 deg bend
15. Move your cursor to the right, locking the accudraw compass to the X-axis



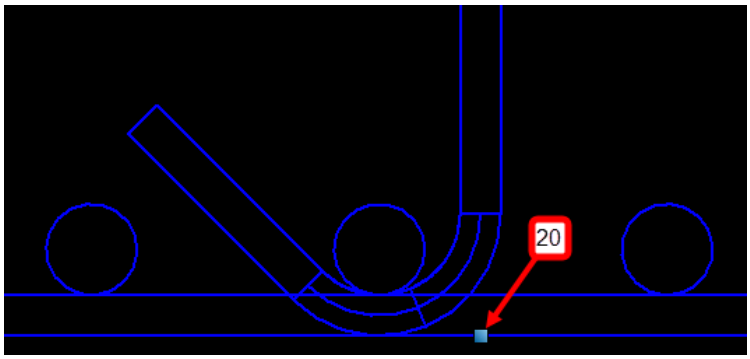
16. Left click snap to the center of the fourth bar inwards from face of column



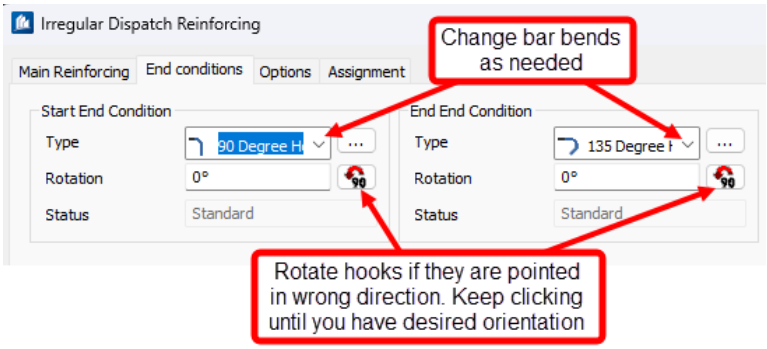
17. Select the guideline at the 90 deg bend, move (Q,W)
18. Left click on the inside of the straight 90 deg bend
19. Move your cursor up, locking the accudraw compass to the Y-axis, left click and snap to the inside face of the main stirrup bar



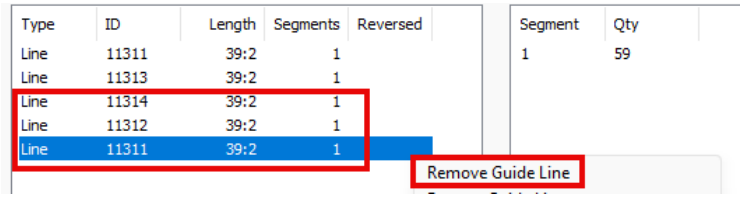
20. Repeat steps 17-19 on the other end of the tie that has the 135 deg hook. Move the guideline down half a bar diameter: 0.3125”



From this point, you can select the ties and their associated guidelines, copy them over to other desired locations, and modify end conditions as needed, switching the start and end conditions and rotating the hooks as needed.

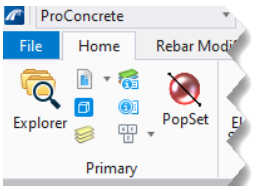


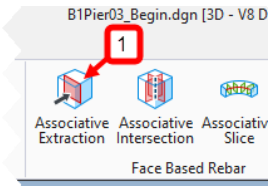
Follow the same steps above for transverse ties, except use the 04_Tie_Transverse template and remove the last three line segments from the list.

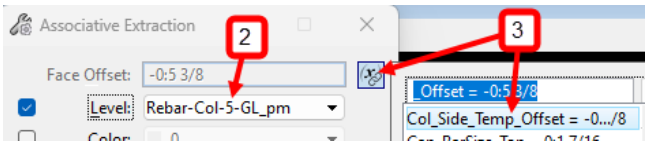


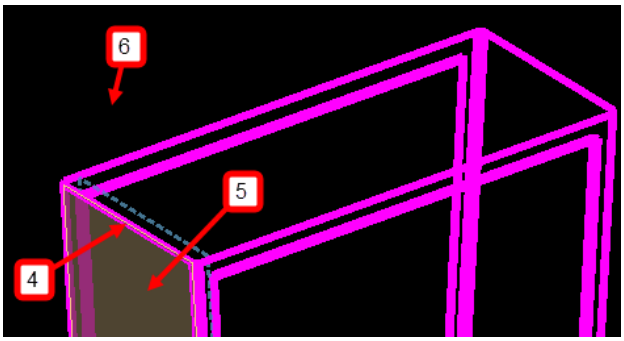
2.3.4 *Left/Right Face Bars*

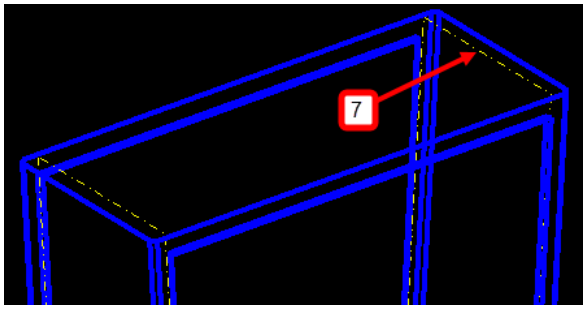
1. Switch to an isometric view & select Associative Extraction
2. Set your level to Rebar-Col-5-GL_pm
3. Set the face offset variable as Col_Side_Temp_Offset
4. Select the upper column concrete element
5. Select the left inclined face of the upper column element
6. Left click off to the side to accept
7. Repeat above steps for the right face



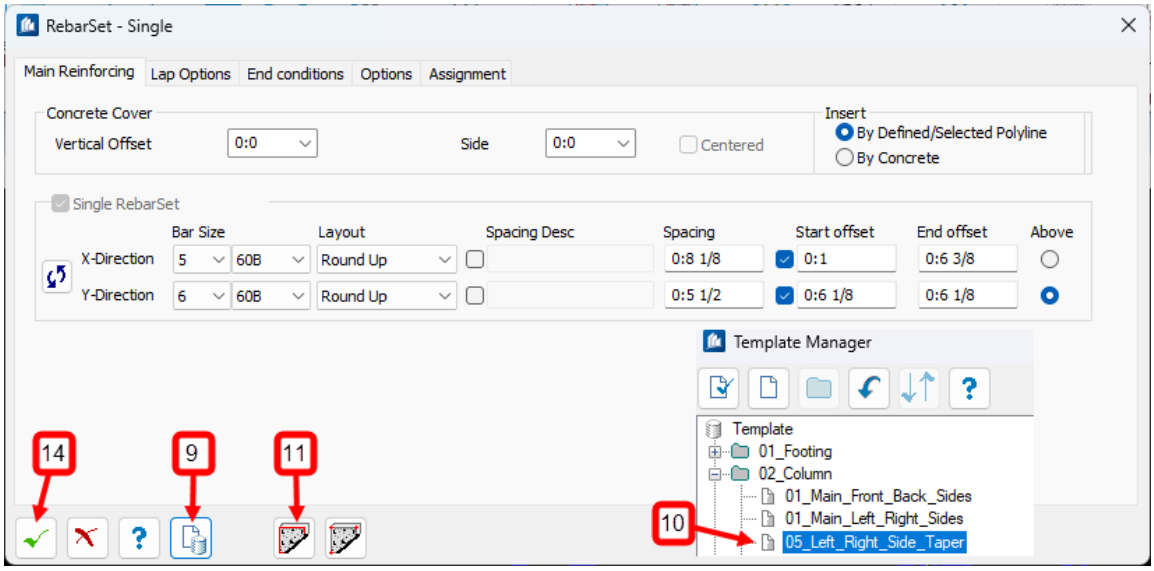


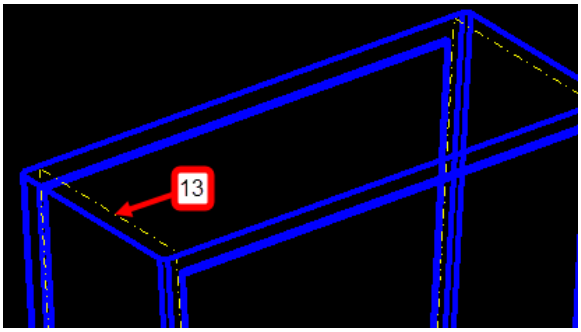


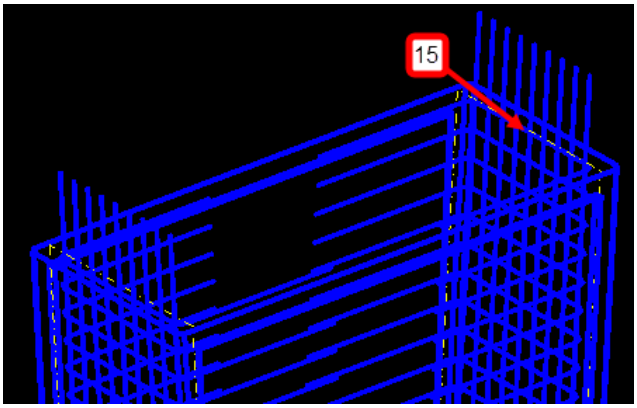




8. Select Single Rebarset
9. Select template
10. Double click 05_Left_Right_Side_Taper
11. Select Concrete/Define Polyline
12. Select the bottom column concrete element
13. Select the left face guideline
14. Click the green checkmark
15. Repeat the steps above for the right side



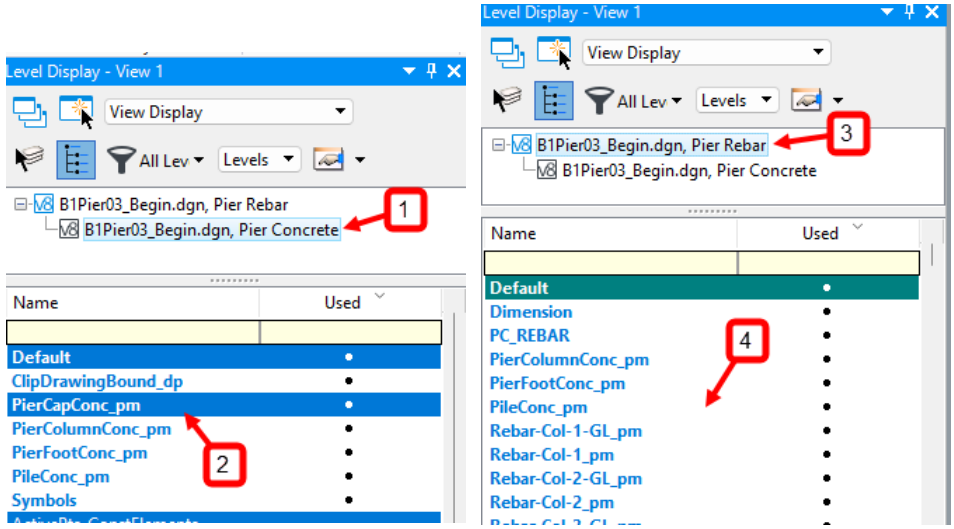




2.4 Cap

The first step in modeling the cap rebar is to isolate what we want to focus on (Cap) by turning everything else off:

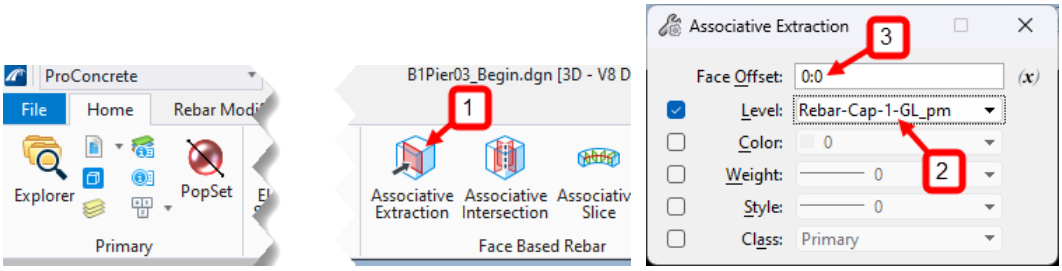
1. In the Level Display, select the Pier Concrete Model
2. Turn off all pier levels except PierCapConc_pm
3. Select the Pier Rebar model
4. Turn off all levels

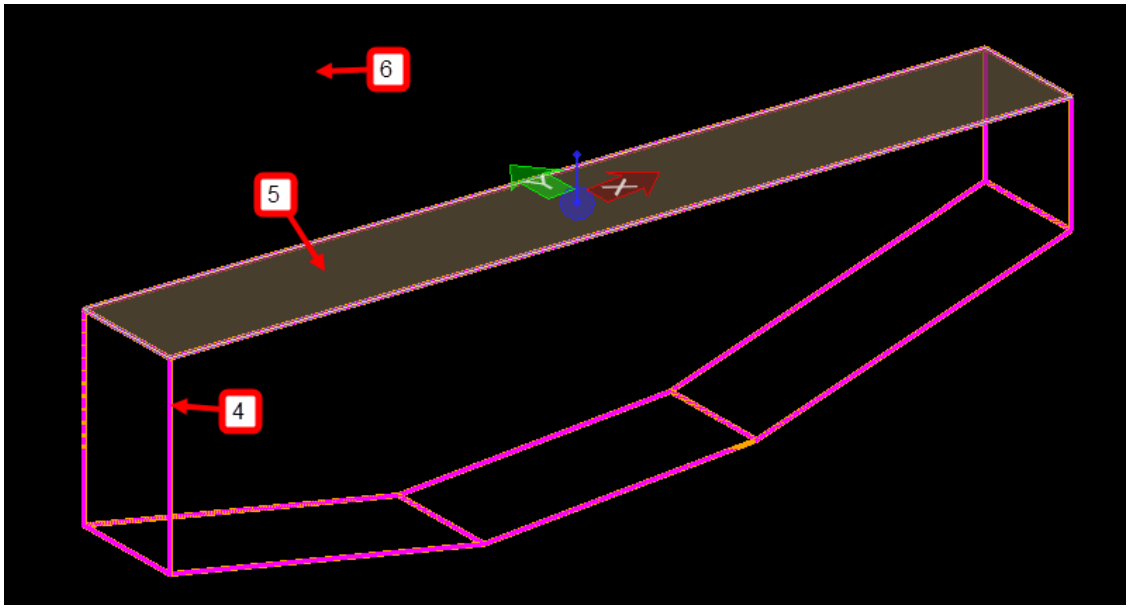


2.4.1 Top Main Bars

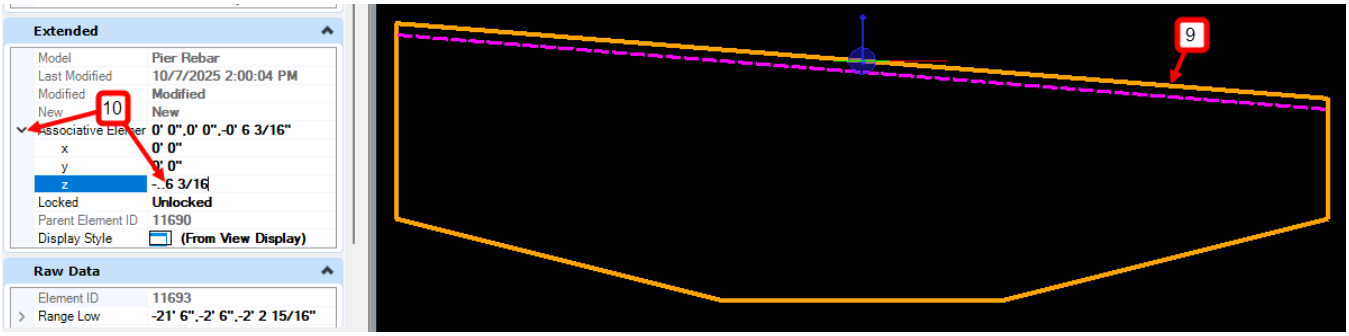
The associative extraction tool copy/offsets the face perpendicular to the original face. Currently (3/11/25) there is no option to offset the face in other directions such as Design Z. Because of this, if the top of the cap is sloped you will have to set the extraction distance as 0, then move the extracted face downwards in the design Z direction manually by adjusting it's properties. If the top of the cap is not sloped or if you do wish to extract the top of cap face in the perpendicular direction, you can use the cap offset variables when extracting the face for the top main bars.

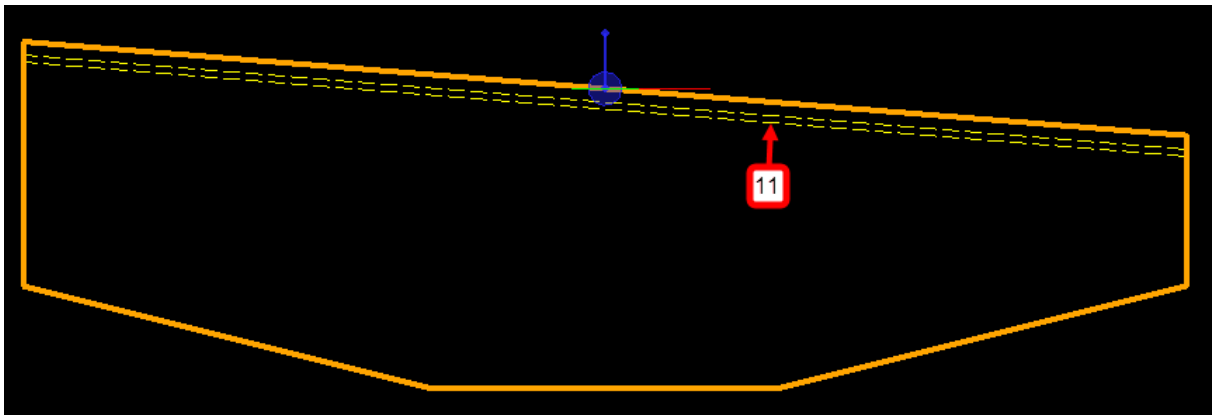
1. Select Associative Extraction
2. Set your level to Rebar-Cap-1-GL_pm
3. Set the face offset to 0
4. Select the cap concrete element
5. Select the top face of the cap
6. Left click off to the side to accept



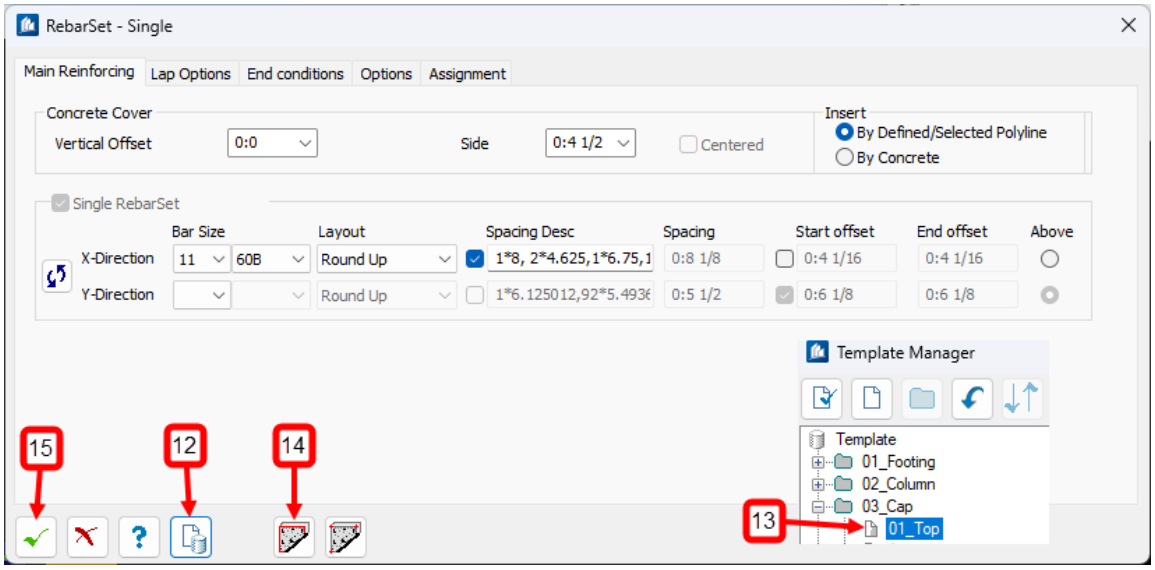


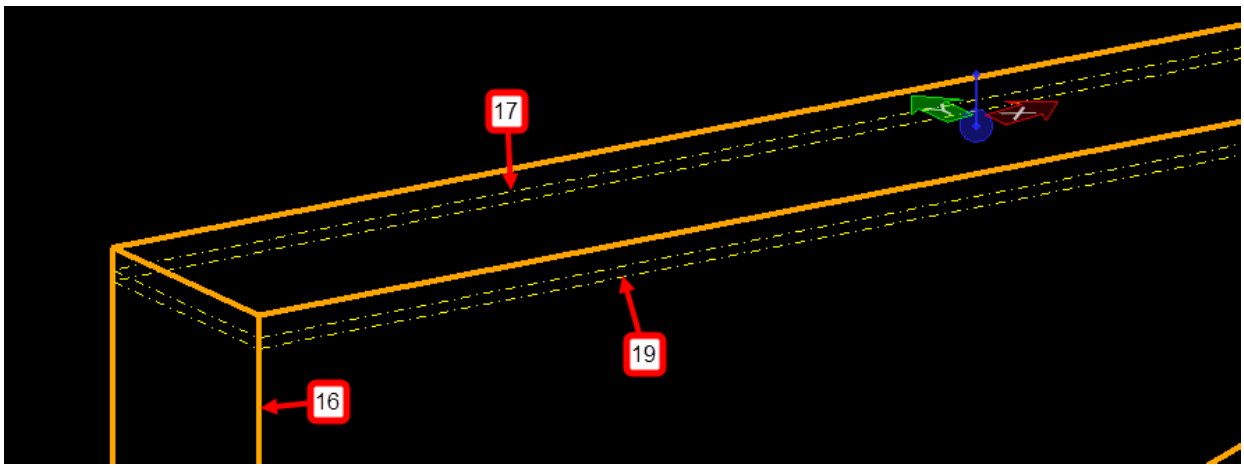
7. Select the Pier Concrete model in the level display and turn off the PierCapConc_pm level
8. Select the Pier Rebar model in the level display and change the cap level to PierCapConc_pm similar to 2.2.3, Steps 7-12.
9. Switch to a front view (Shift + Right Click, F) and select the extracted face guideline (right click to toggle element selection to select the guideline which is "behind" the pier cap line in the front view)
10. Open properties, and under Associative Element Translation set the distance you wish to move the extraction down in the Z direction: cover + stirrup diameter + main bar diameter = -6 3/16"
11. Repeat the above steps for any a second layer, but add the layer spacing (3”) to the previous translation distance: -6 3/16" - 3" = -9 3/16"

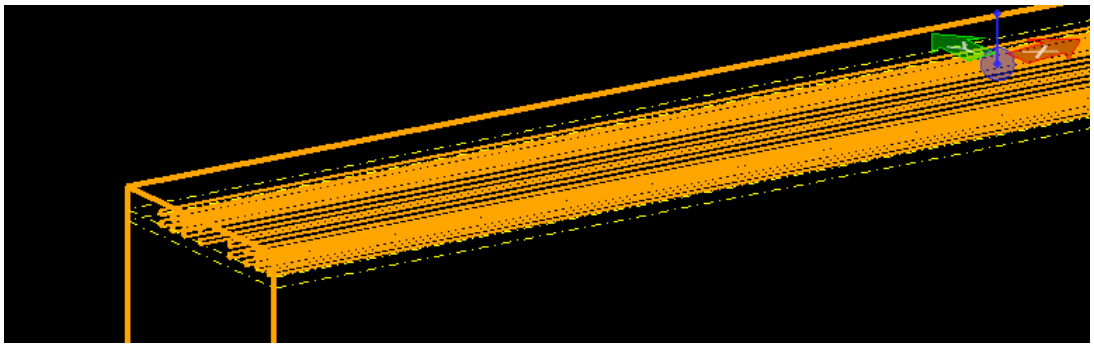




12. Select Single Rebarset & switch to an isometric view
13. Template
14. Double click 01_Top
15. Select Concrete/Define Poly
16. Select the cap
17. Select the top guideline
18. Click the green checkmark
19. Repeat above steps for second row

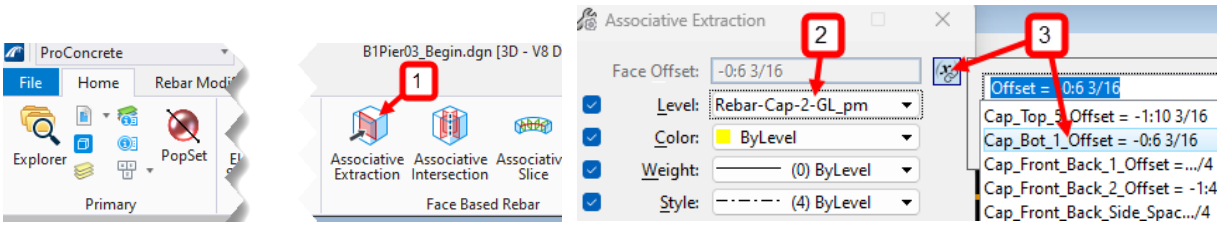


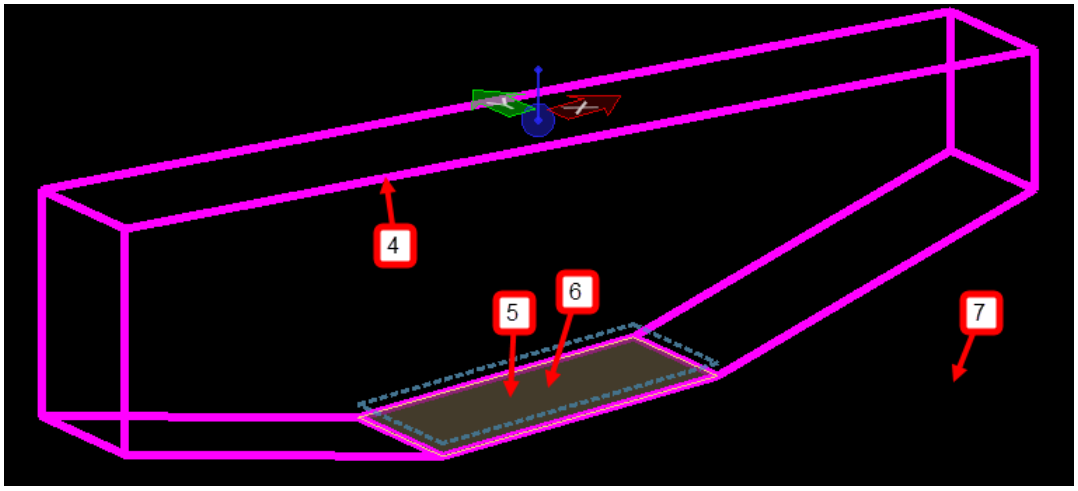




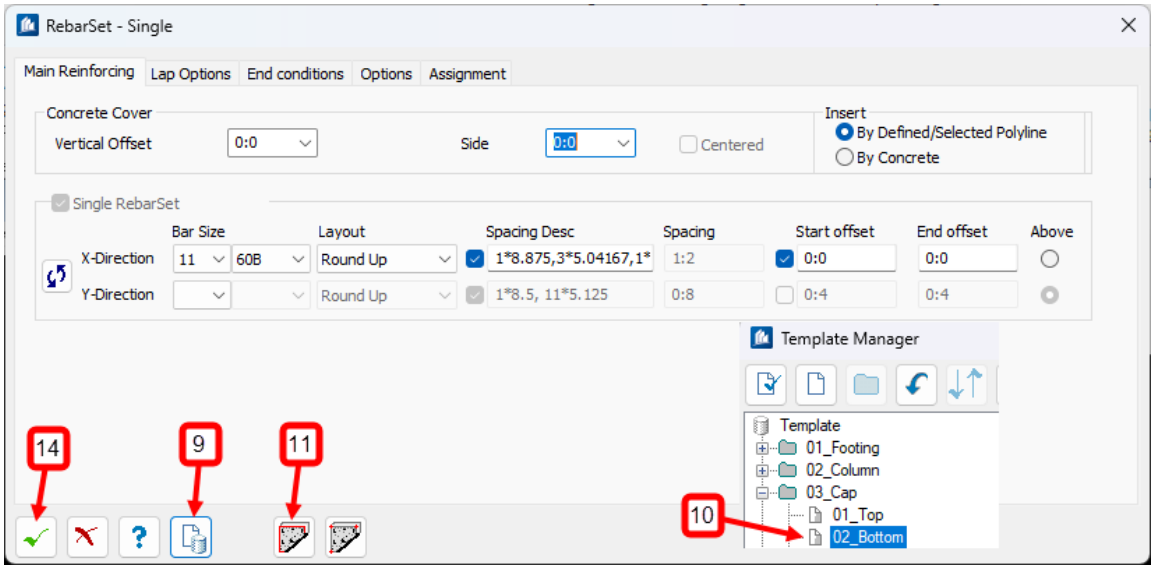
2.4.2 *Bottom Main Bars*

1. Select Associative Extraction
2. Set your level to Rebar-Cap-2-GL_pm
3. Set the face offset variable to Cap_Bot_1_Offset
4. Select the cap concrete element
5. Select the bottom face of the cap
6. Right click to toggle through face selection to get to bottom of cap face
7. Left click off to the side to accept

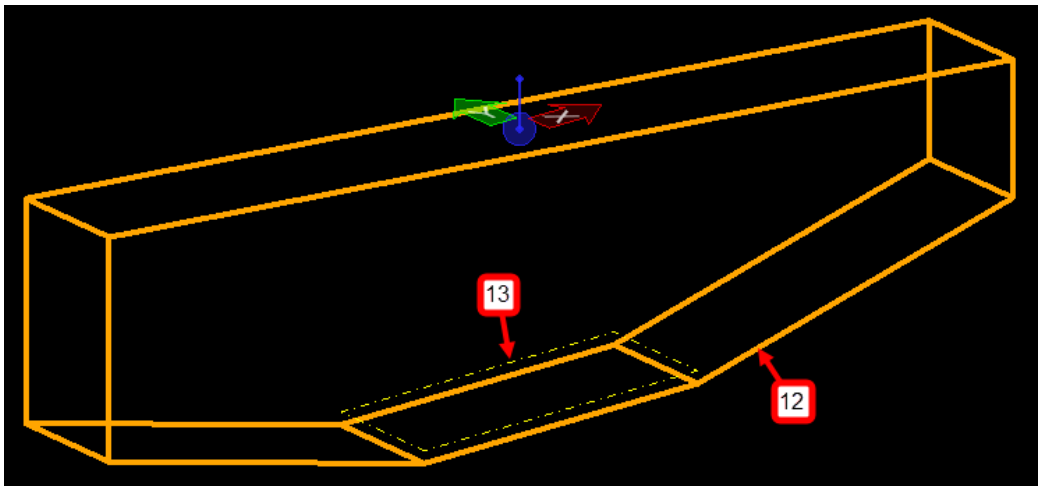


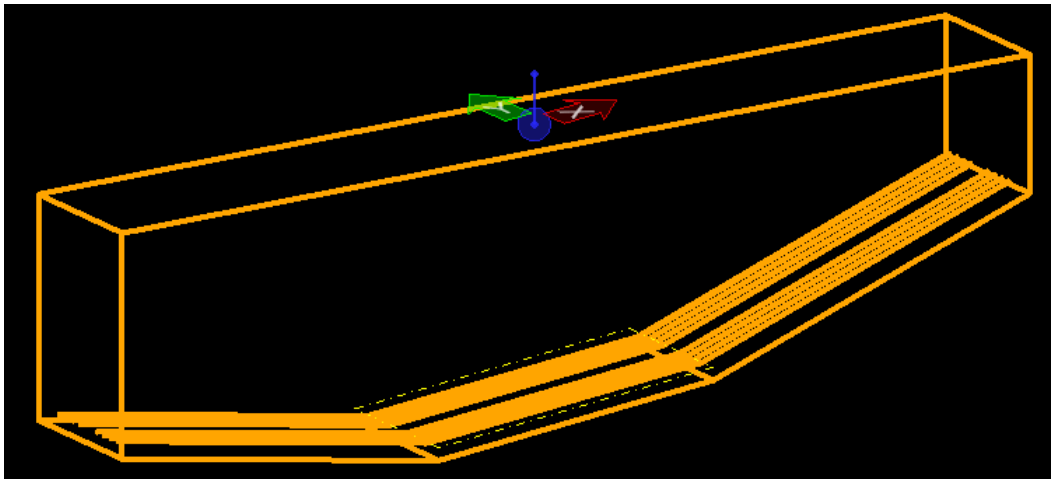


8. Select Single Rebarset
9. Template
10. Double click 02_Bottom
11. Select Concrete/Define Poly



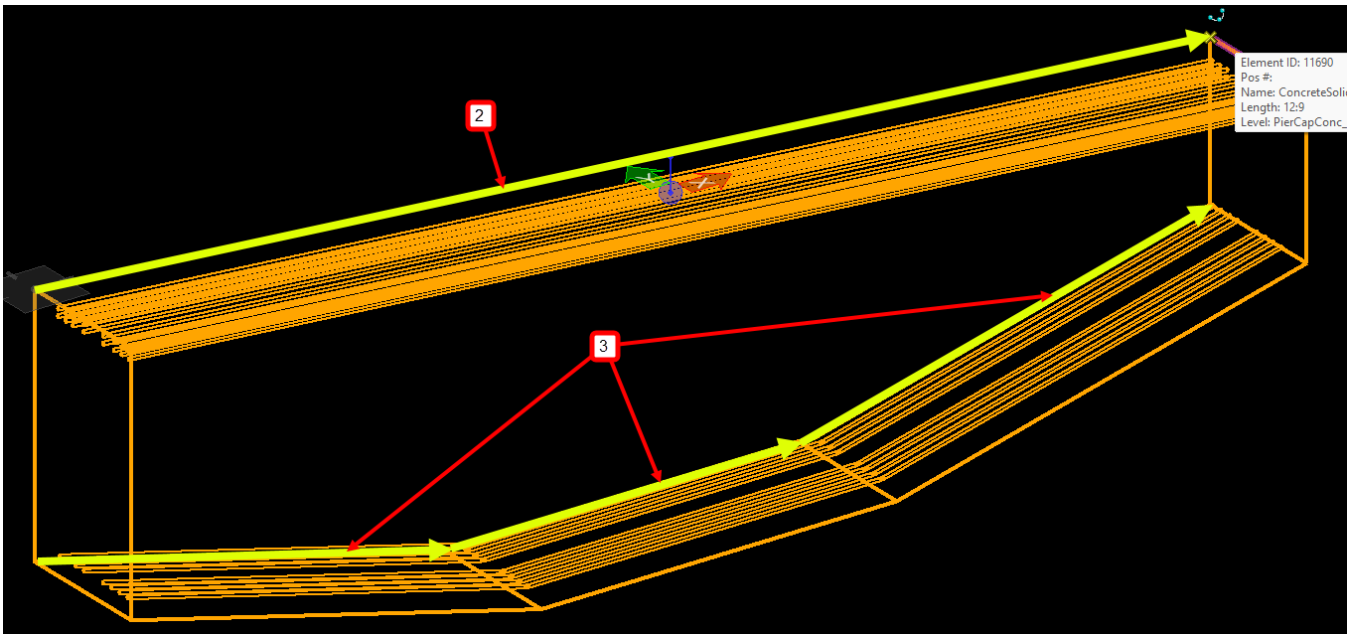
12. Select the cap
13. Select the bottom guideline
14. Click the green checkmark



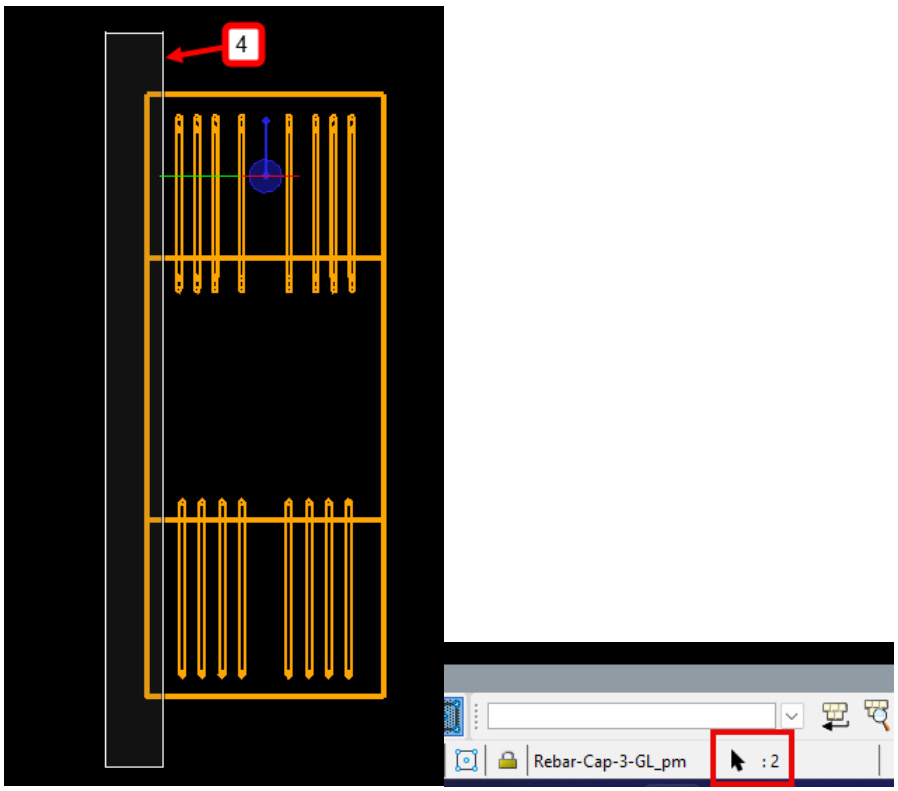


2.4.3 *Exterior Stirrup Guidelines*

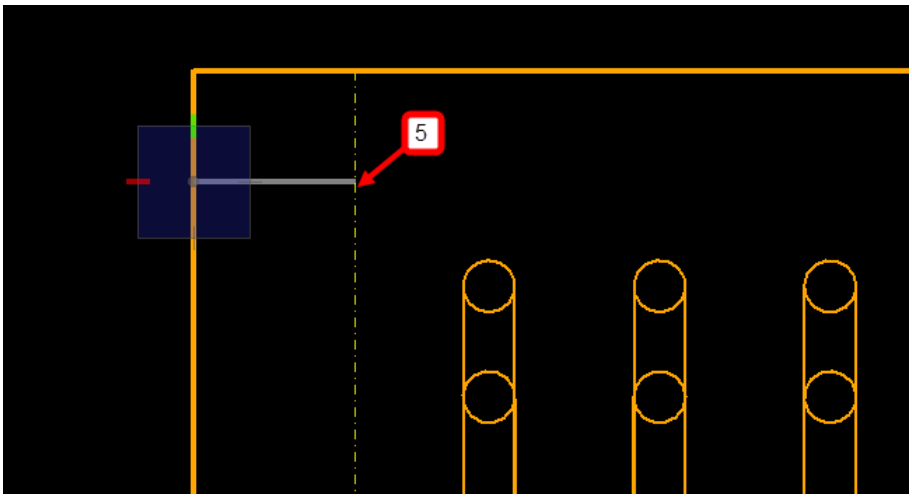
1. Turn on Rebar-Cap-1_pm and Rebar-Cap-2_pm levels, and set Rebar-Cap-3_pm as your active level
2. Hit Spacebar and activate the Place SmartLine tool and trace back side top of cap line
3. Trace the back side bottom of cap line



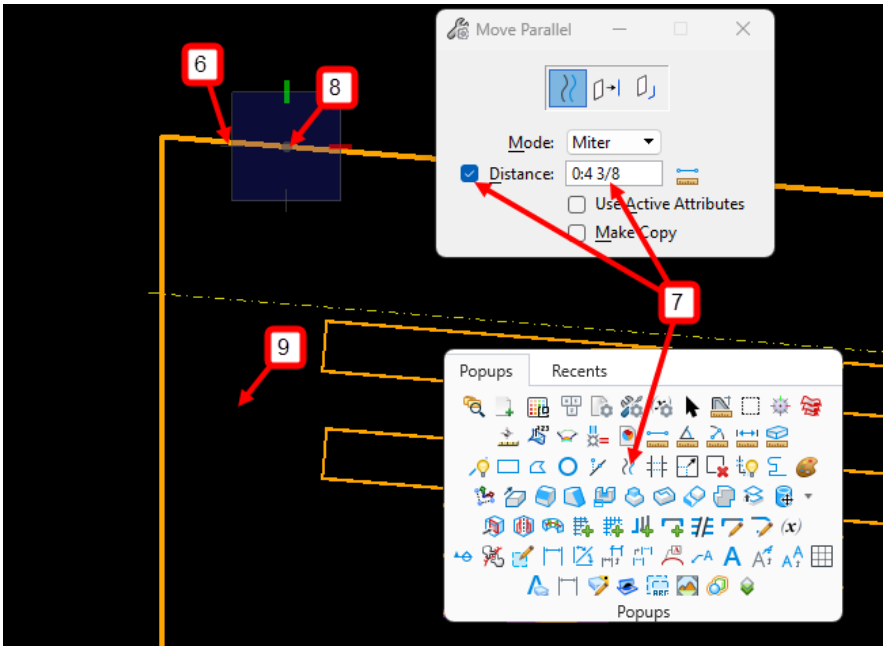
4. Switch to a left view (Shift + Right Click, L) and drag select the two guidelines you just drew. Verify the two lines are selected by checking the # of elements selected area.



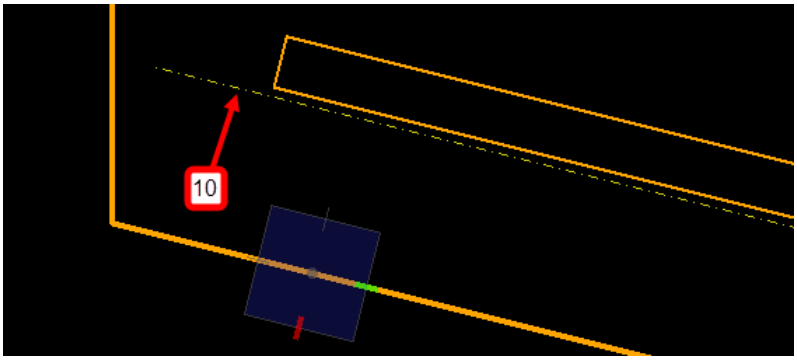
5. Move (Q, W) them inward by: cover + 1/2 bar diameter (4" + 0.75"/2) =..4.375



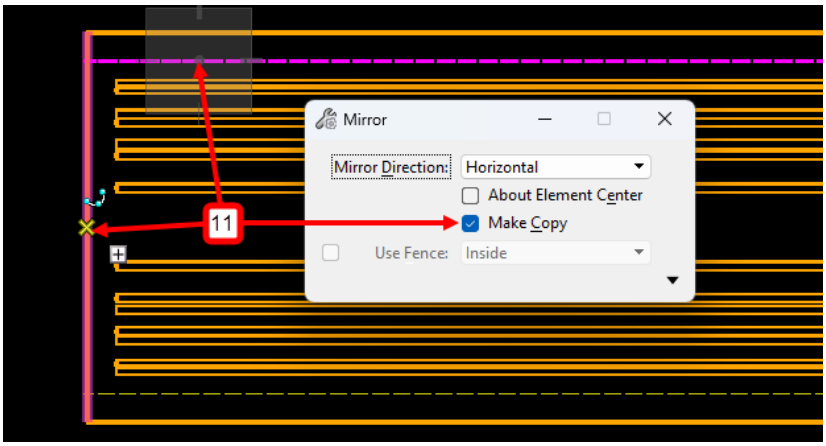
6. Switch to a front view (Shift + Right Click, F), select the top guideline (you may have to right click to cycle through selection to get it)
7. Spacebar, Move Parallel, type in the distance to move: cover + 1/2 bar diameter (4" + 0.75"/2) = ..4.375
8. Left click the line and hit F on the keyboard to rotate the accudraw compass to the front view
9. Move your cursor down and left click to finish moving the line



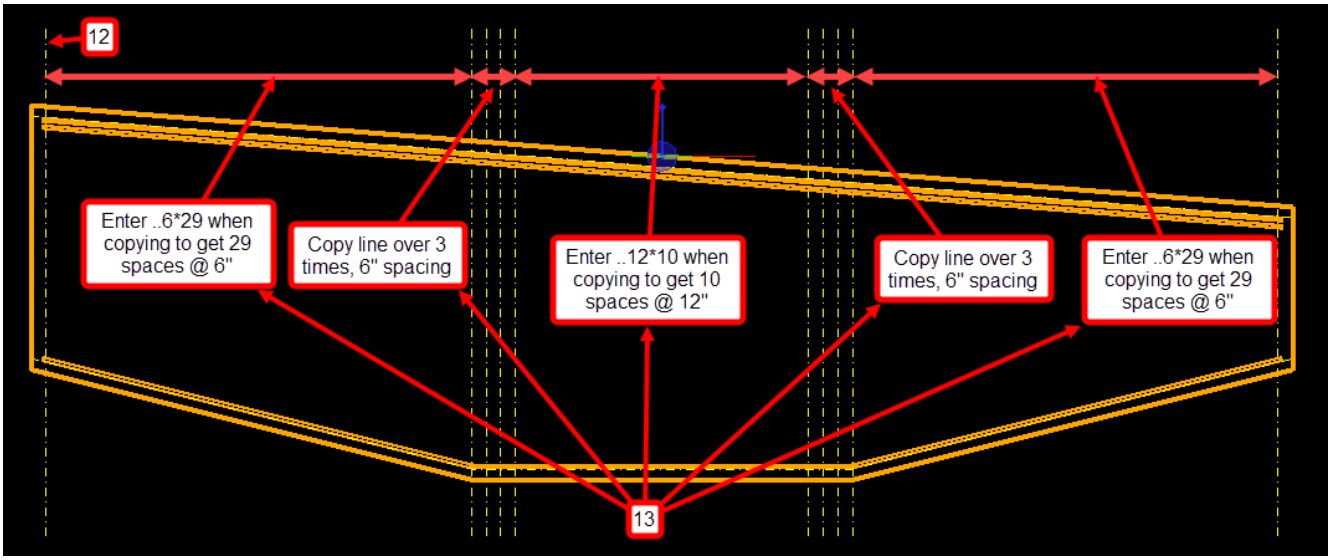
10. Repeat the step above with the bottom guideline



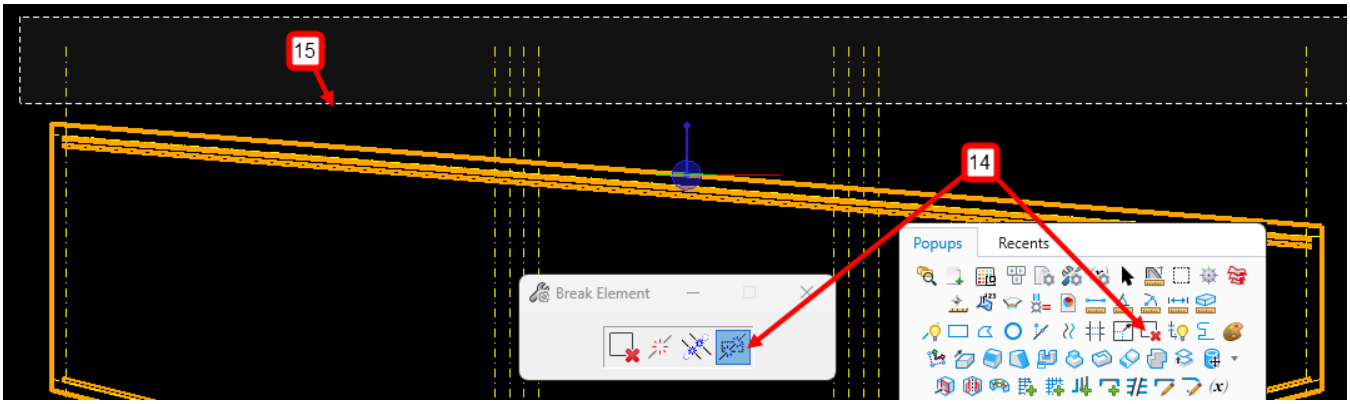
11. Switch to a top view (Shift + Right Click, T), select both guidelines (left drag selection to get the bottom one as well), and mirror (Q, Y) about the horizontal snapping to the center of the cap (make a copy checked)



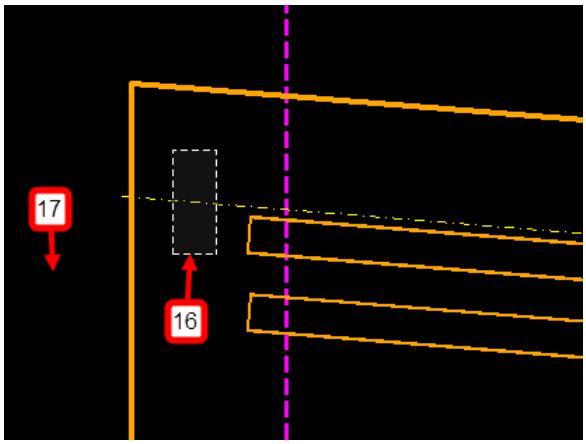
12. Switch to a front view, select smart line tool, draw a temp line in the vertical direction, and move it to the left edge of the cap, then move it over 6” to the right.
13. Copy (Q, E) that line over horizontally to each spacing zone start & end. Also place copy of the line before & after the bottom of cap taper points. When using the copy, if you know you have 29 spaces @ 6", then type in ..6*29 in the accudraw input to let Microstation do the math for you.

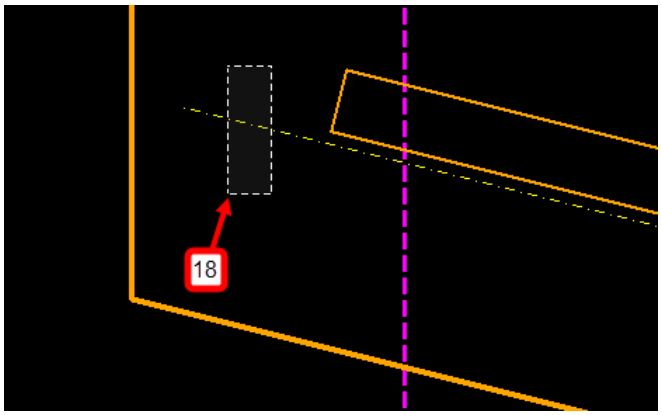


14. Spacebar to bring up pop up menu, select the break element tool and click By Element
15. Drag select to the left all the cutting/break lines

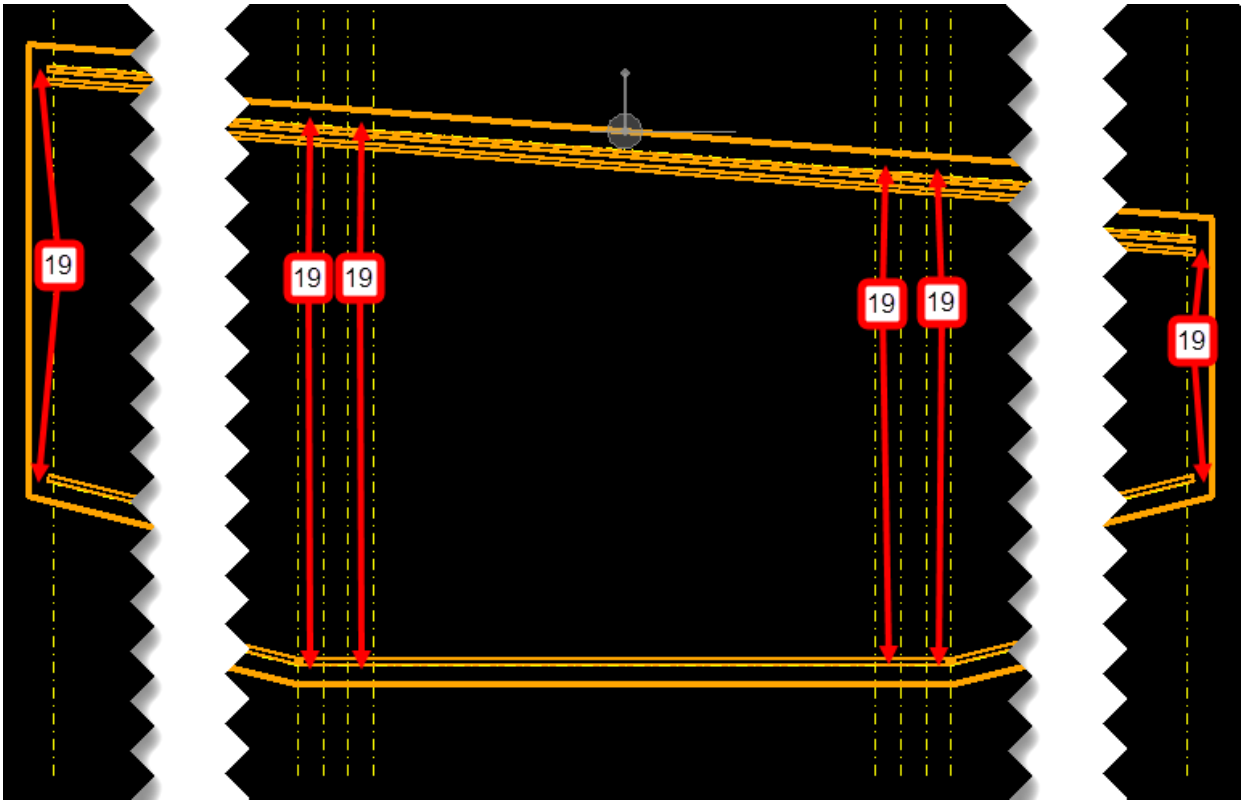


16. Drag select to the left the top guidelines to break
17. Left click to accept
18. Repeat steps 15-17 for the bottom guidelines

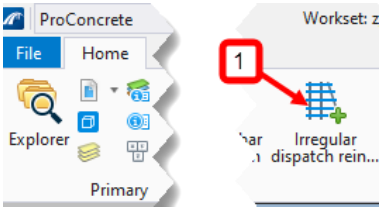




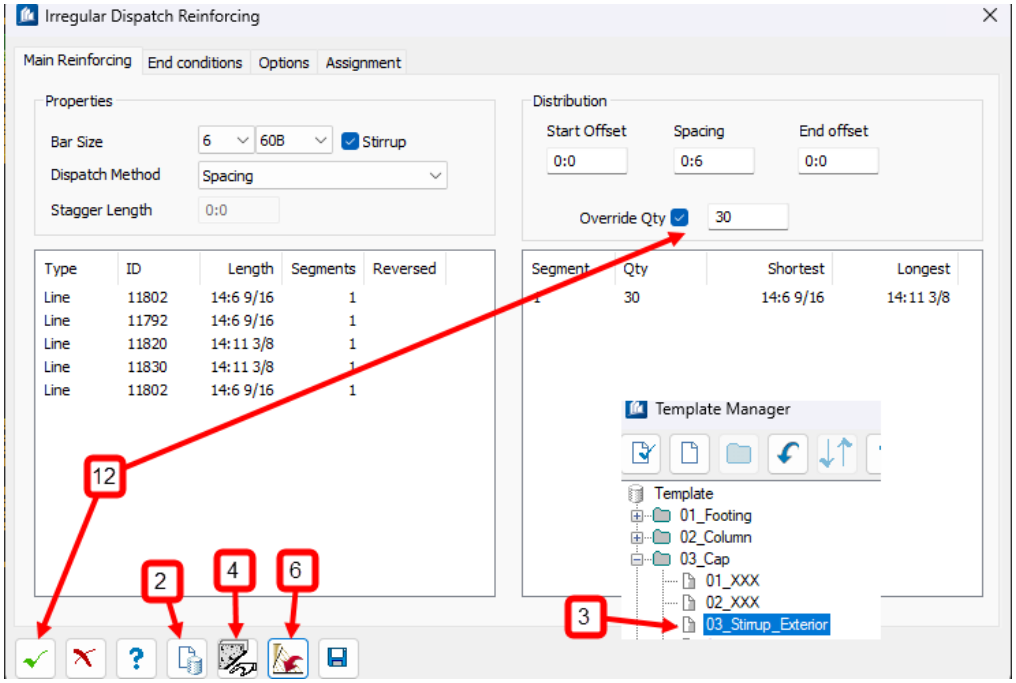
19. Delete the guideline segments that are not needed

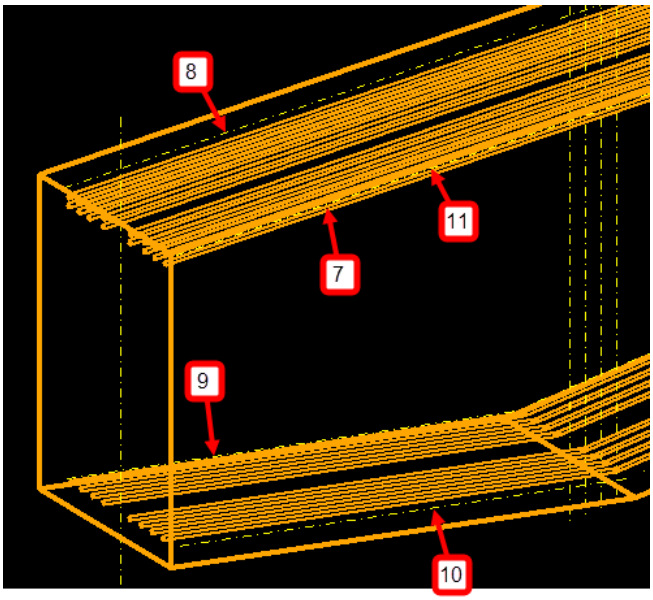


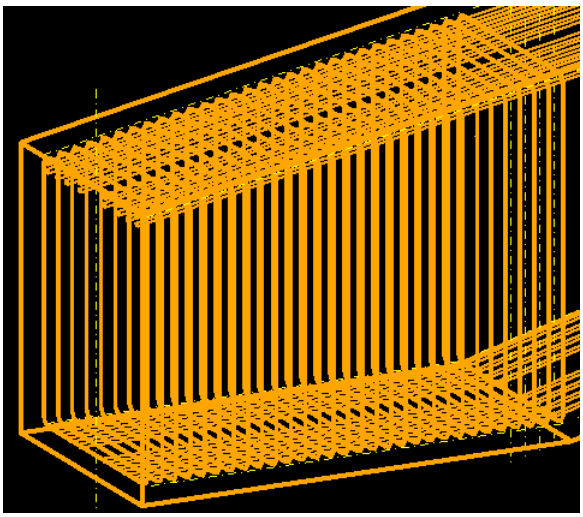
2.4.4 *Exterior Stirrups*



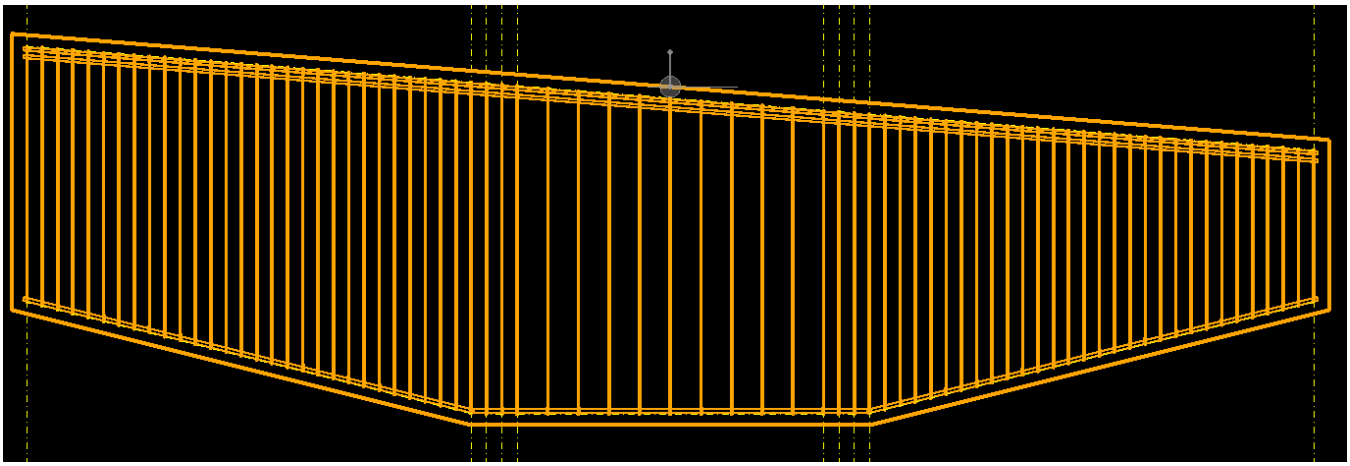
1. Switch to an isometric view & select the Irregular Dispatch tool from Rebar Placement section
2. Template
3. Double click 03_Stirrup_Exterior
4. Select Concrete
5. Select the cap
6. Select Guideline(s)
7. Select front left guideline
8. Select back left guideline
9. Select back right guideline
10. Select front right guideline
11. Select front let guideline again, right click to end guideline selection
12. Override the quantity to 30 and click the green checkmark





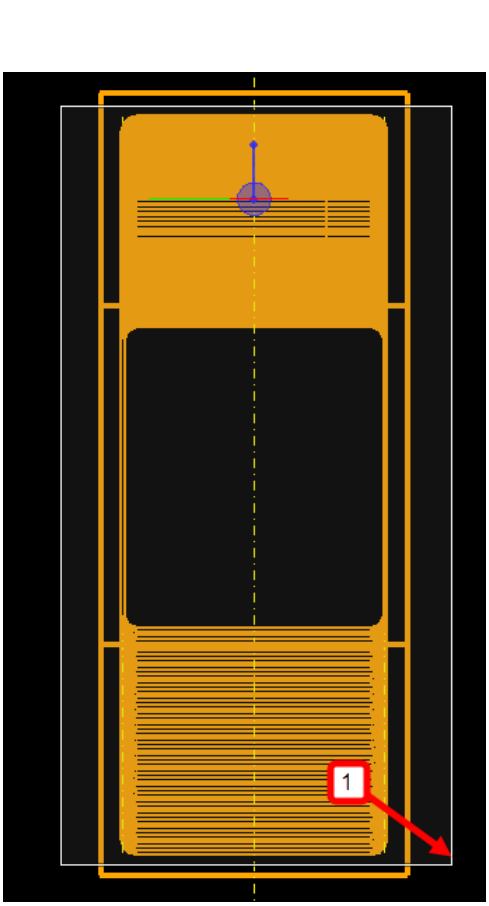


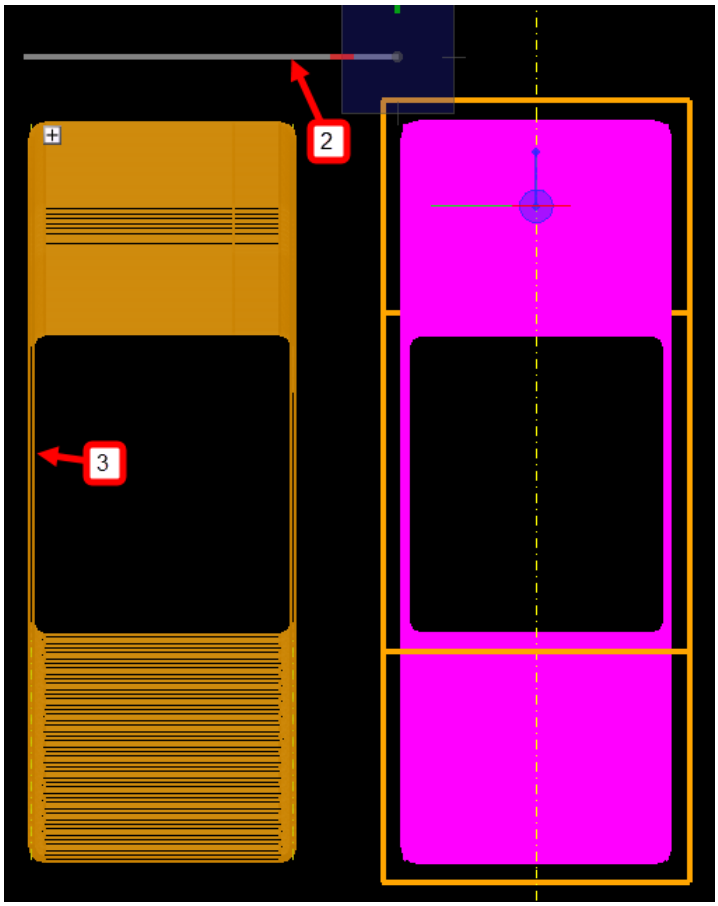
13. Repeat steps 1-12 for the remaining guideline groups. The spacing of stirrups over the center of the cap is 1'. Note that for cap stirrups you almost always will override the quantity, decreasing the quantity it calculates by 1.



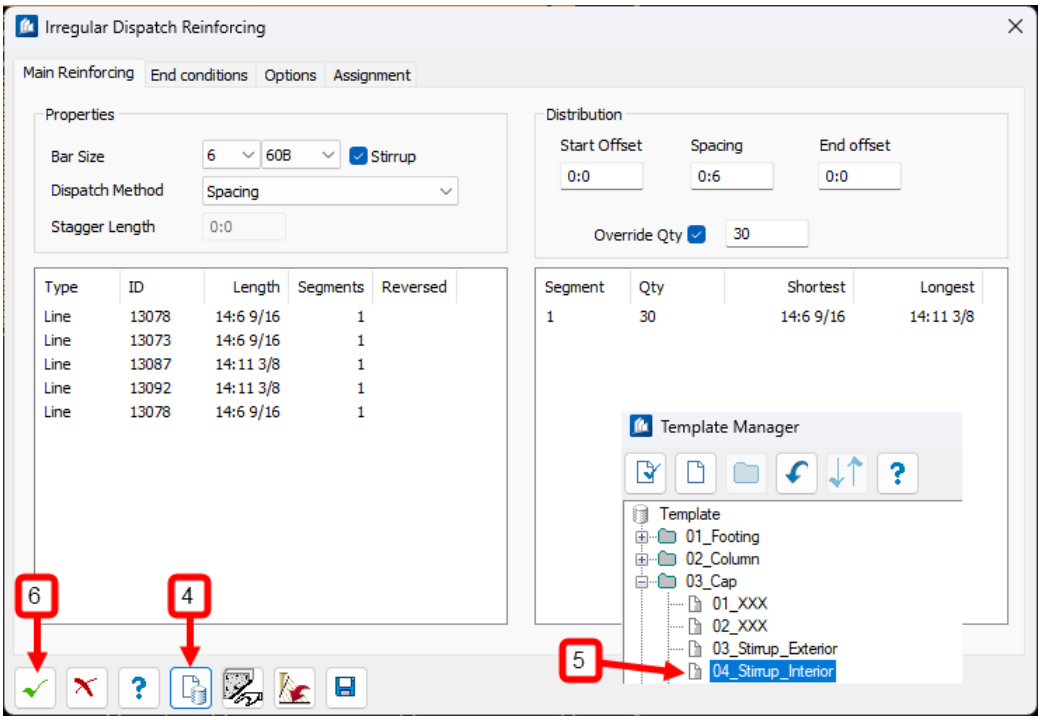
2.4.5 Interior Stirrups

1. Switch to a left side view, turn off Rebar-Cap-1_pm & Rebar-Cap-2_pm levels and select all exterior stirrups & their guidelines
2. Copy (Q,E) them to the left of the cap
3. Double click on each set of groups of bars you copied to open the dialog box

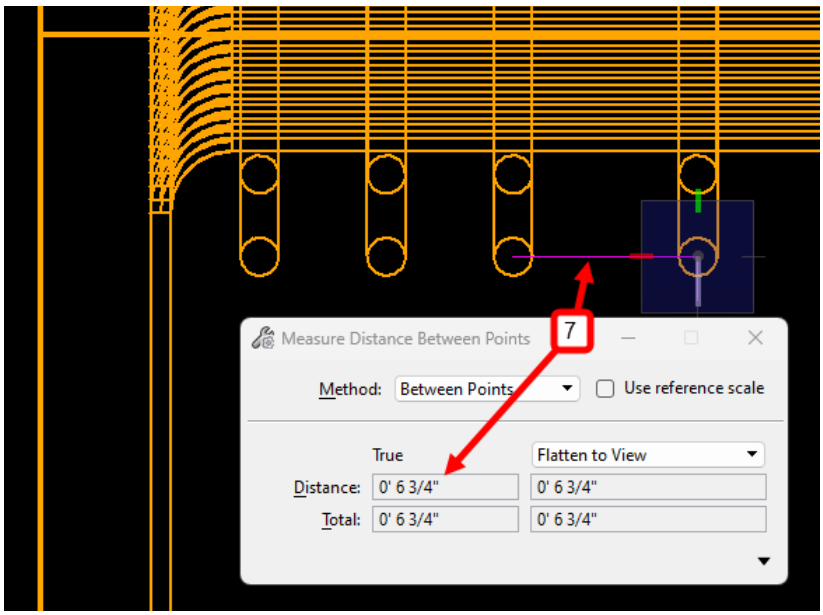




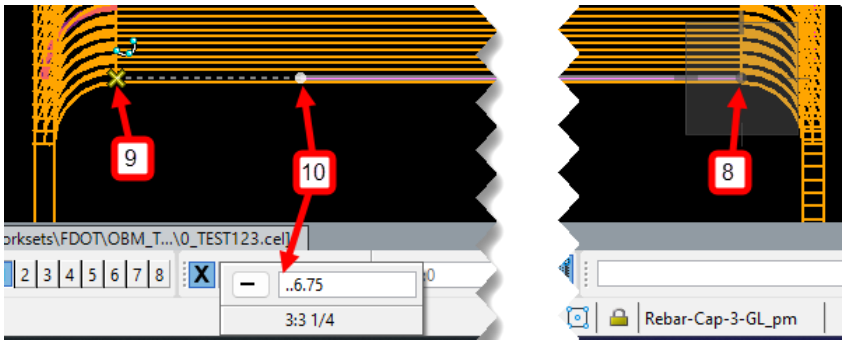
4. Template
5. Double click on the 04_Stirrup_Interior
6. Click the green check mark



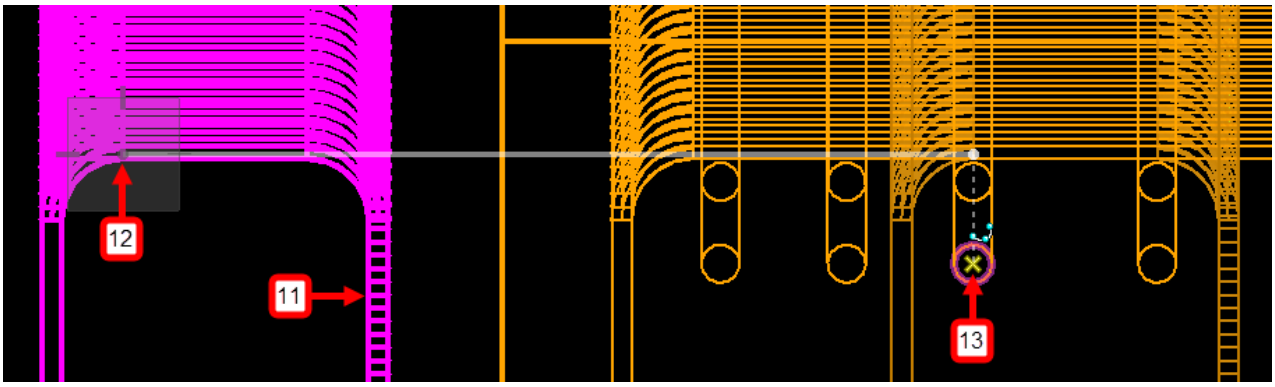
7. Turn Rebar-Cap-1_pm back on and measure the distance between the main bars that you want bends of the interior stirrup to line up with to line up with



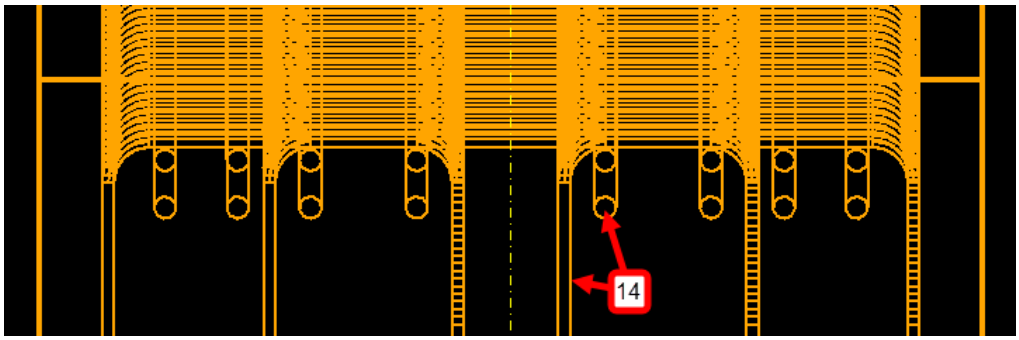
8. On the bars you copied to the left, select the right guidelines and move (Q,W) them over horizontally to the left, starting/snapping from the begin of the right horizontal bend
9. Hover over to the begin of the left bend as a reference point
10. Type in --..6.75 to move 6.75” back from that reference point you are hovering over



11. Select all the bars you just adjusted and all their associated guidelines
12. Copy (Q,E) and snap to the begin of the left bar bend
13. Move your cursor to the right locking accudraw compass to the X-axis and snap to center of bar shown

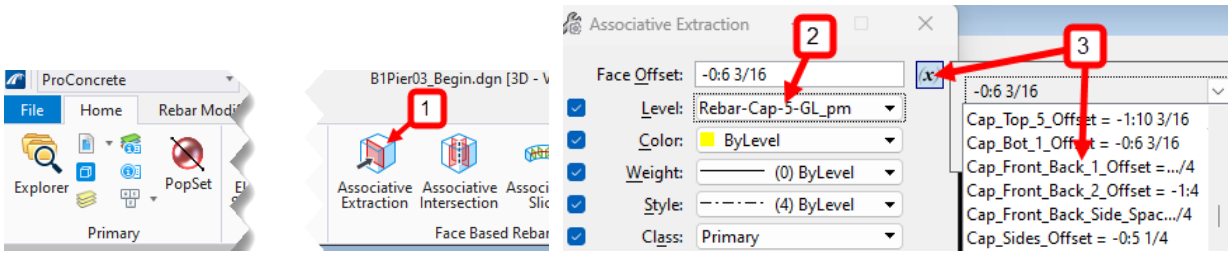


14. Repeat the steps above, except Move (Q,W) this time, to the location shown

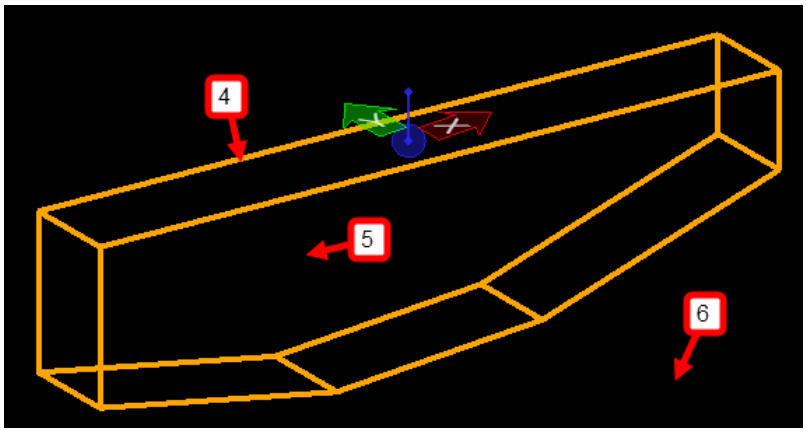


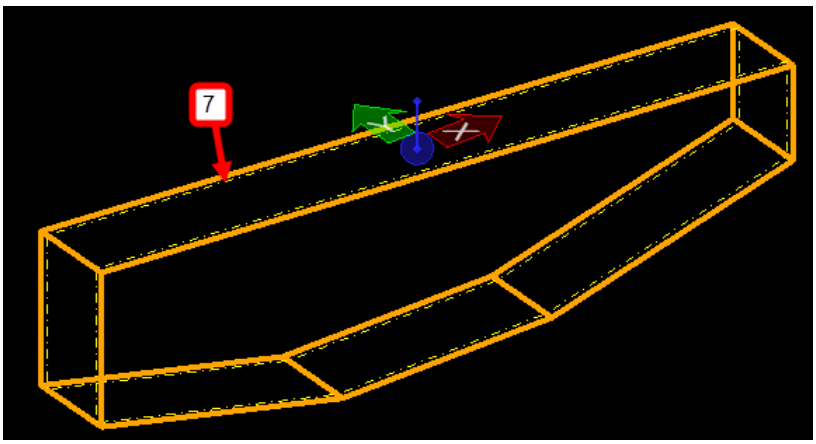
2.4.6 *Front/Back Face Bars*

1. Switch to an isometric view, turn off all previous cap bar & guideline levels, & select Associative Extraction
2. Set your level to Rebar-Cap-5-GL_pm
3. Set the face offset variable as Cap_Front_Back_1_Offset

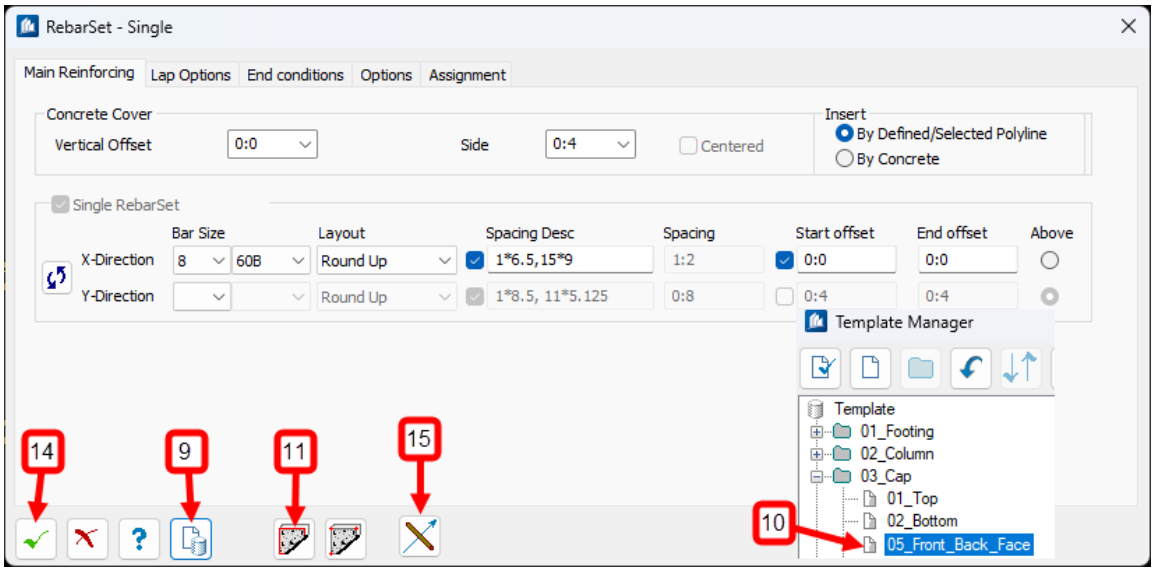


4. Select the upper column concrete element
5. Select the front face of the cap
6. Left click off to the side to accept
7. Repeat above steps for the back face

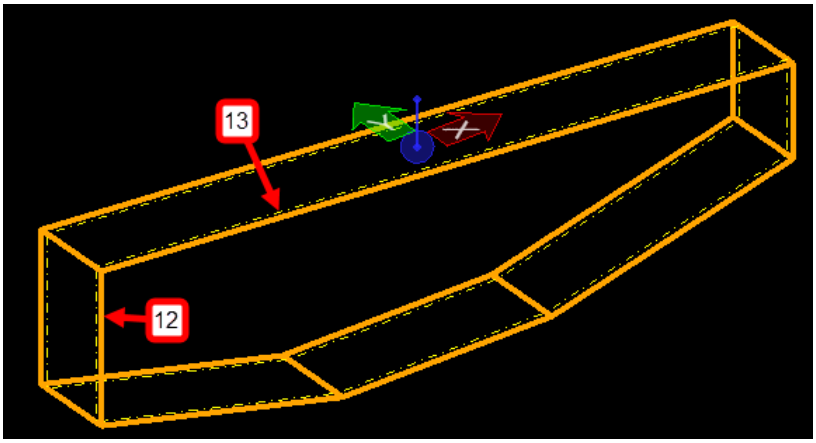


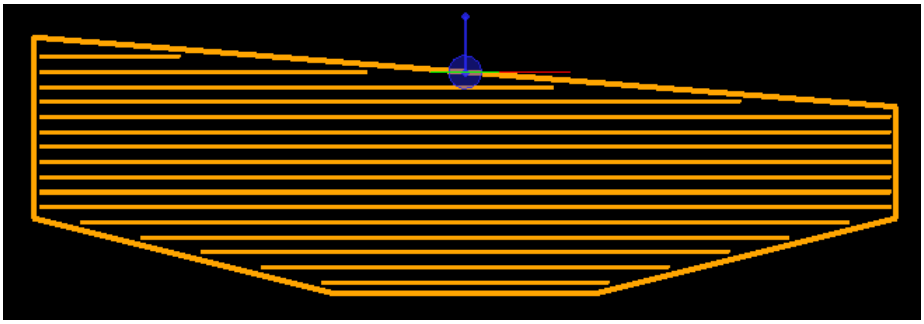


8. Select Single Rebarset
9. Template
10. Double click 05_Front_Back_Face
11. Select Concrete/Define Poly

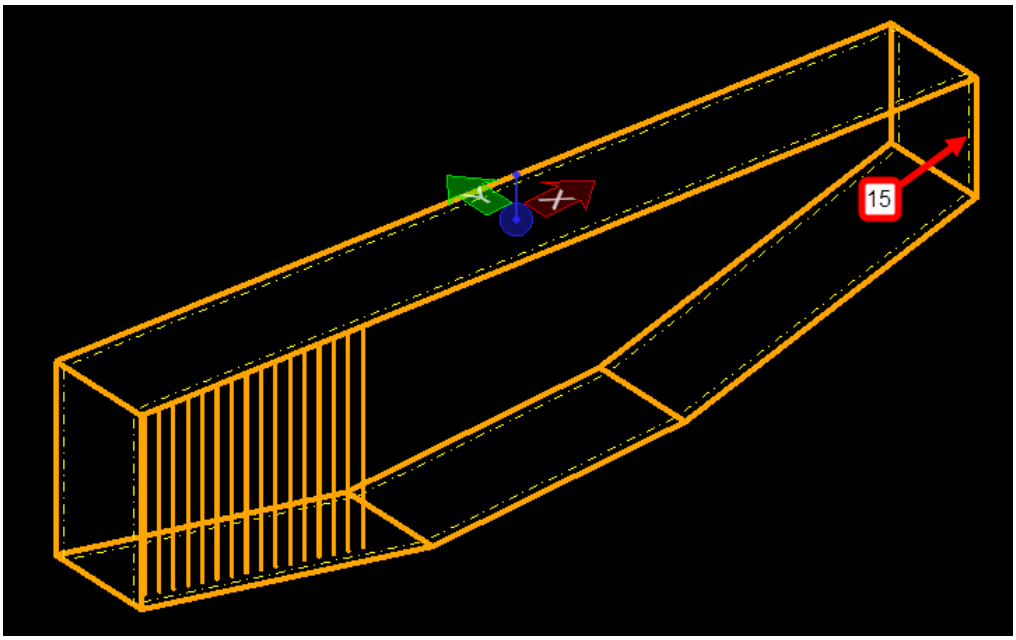


12. Select the cap
13. Select the front face guideline
14. Click the green checkmark



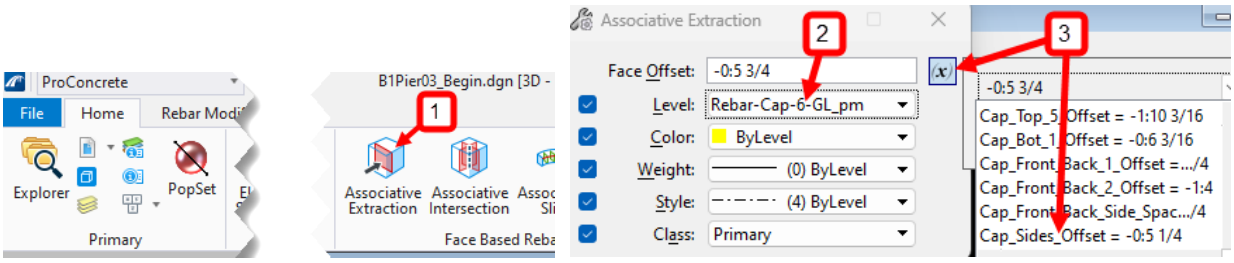


15. If the bars don’t look like the screenshot above, click on Select Direction for RebarSets (shown on previous page)
16. Click on the right vertical line

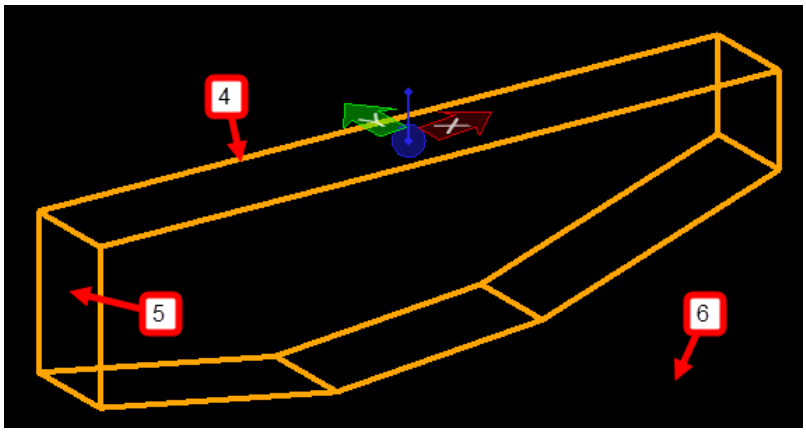


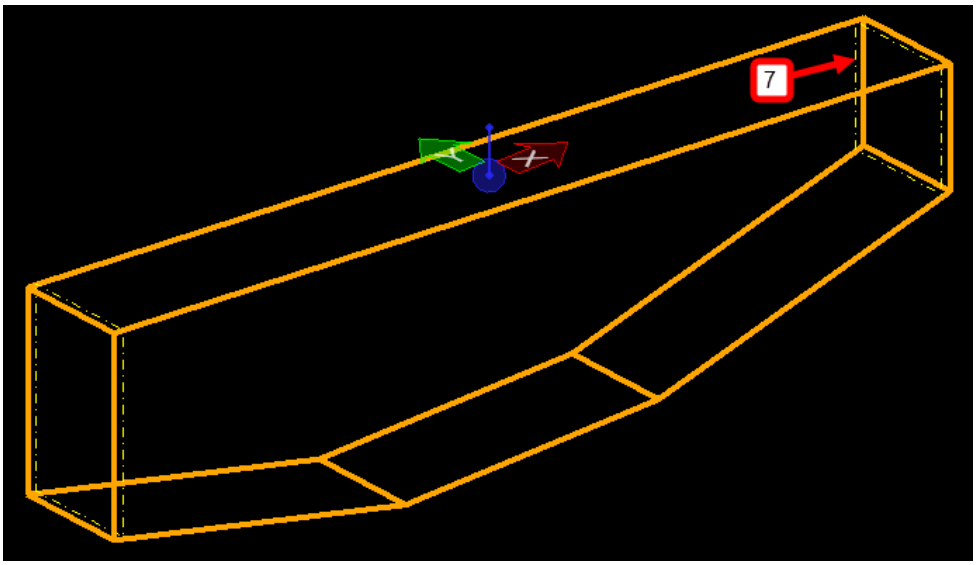
2.4.7 *Left/Right Face Bars*

1. Switch to an isometric view, turn off all previous cap bar & guideline levels, & select Associative Extraction
2. Set your level to Rebar-Cap-6-GL_pm
3. Set the face offset variable as Cap_Sides_Offset

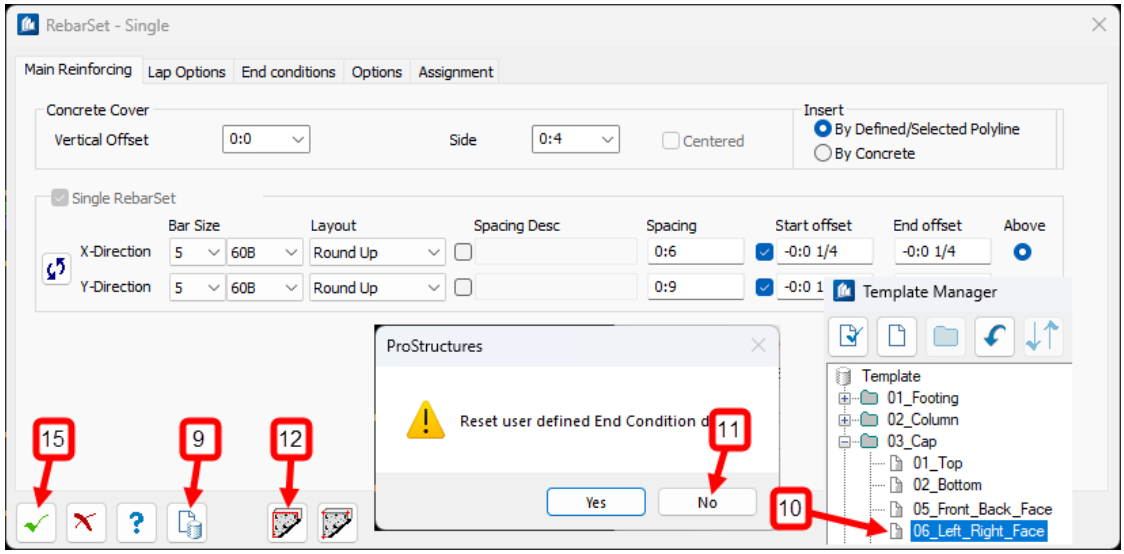


4. Select the upper column concrete element
5. Select the left face of the cap
6. Left click off to the side to accept
7. Repeat above steps for the right face

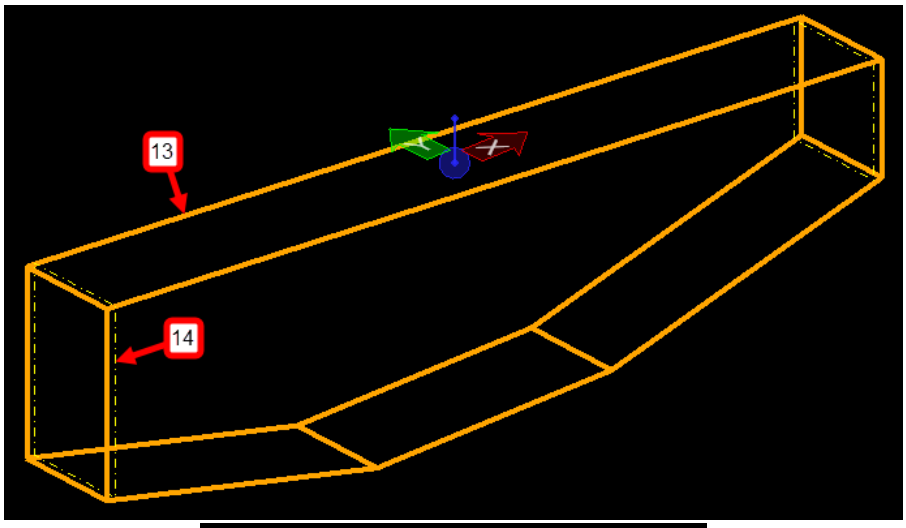


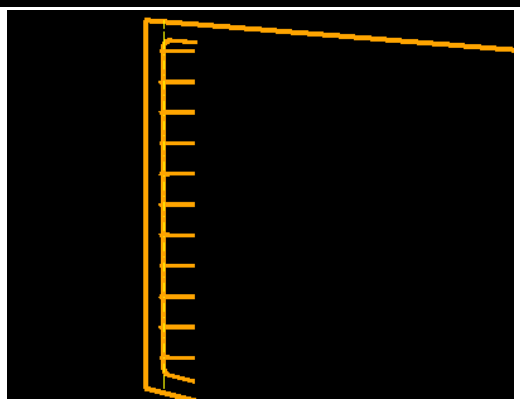


8. Select Single Rebarset
9. Template
10. Double click 06_Left_Right_Face
11. Select No
12. Select Concrete/Define Poly

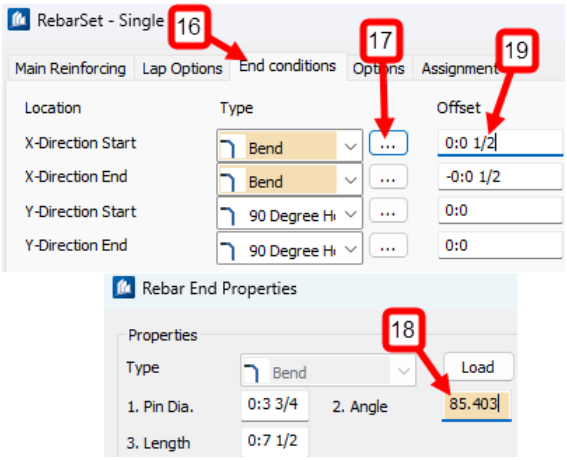


13. Select the cap
14. Select the left face guideline
15. Click the green checkmark





16. Repeat steps above for right side, except click on End Conditions tab
17. Click the … button next to X-Direction Start
18. Change the angle to 85.403 and click the green check mark in that dialog box
19. Change the offset to 1/2"
20. Click the green checkmark



2.5 Positioning Bars (Assigning Bar Marks)

Positioning is the process identifying the shape of each bar, which concrete element the bar belongs to, and assigning bar marks to the bars. It is the last step before generating 2D plans from the 3D rebar model.

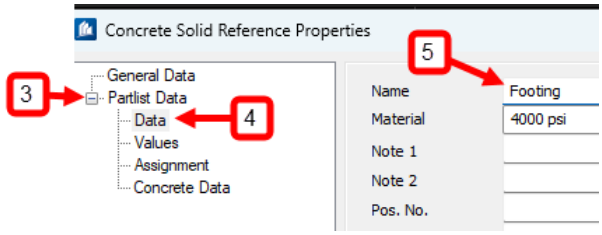
Setting	Description
Type	Here, you enter the type of the position number. • **Numerical** – The position numbers are composed of numbers only. • **Alphabetical** – The position numbers are composed of letters only. The order then is A, B, ..., Z, AA, AB, ... etc. • **Alphanumerical** (Mixed) – The position numbers are composed of a numerical and an alphanumerical part. The numerical part is following the alphanumerical part, the order is A1, A2, ..., A9, B1, B2 etc. The number of numerical positions can be preset under ‘Limits‘. • **Macro** – The position numbers are composed of numbers, characters, or both.
Filter	If you want to position only certain component parts, you can apply a filter defining which elements of your construction have to be equipped with a position number or with a shipping number. Select the parts to apply positioning to: • All Parts • Only Empty • Only Changed
Last Concrete	The last number assigned to a concrete element.
Last Cages	The last number assigned to a rebar cage.
Last Rebars	The last number assigned to an individual rebar.
Increment	Enter the automatic increase in numbers (normally the increment is 1). For example, type **1** to assign the next integer. Type **10** to increment numbers by 10.
Next	Displays the next position number to be assigned. Enter the single part position number that has to be added to the first part to be positioned a new. The next positioning number assigned is the "Last" (part or concrete, cages, rebar) number plus the specified Increment.
Position Number Options	Opens the Automatic Position Settings dialog, used to filter and sort groups and parts.
Position Flag Styles	For Alphabetical and Alphanumerical types, opens the *Position Number Line* dialog where when **Without I,O** is checked, the 0 and 1 shall be used with alphanumeric / mixed numeric position number. (For Macro type, opens the Positioning Macros dialog, which is used to build macro for concrete, cage, and rebar.
Reset Position Numbers	Resets the manual positioning to standard values, by setting the position number to standard values —Numerical: 0, Alphabetical: A, Alphanumerical: A0. All these reset "last numbers" to 0, A, or A0 serve as the "starting points" for assigning new numbers.
Assign Bar Marks	When checked, assigns currently set bar marks to rebar.

Setting	Description
Open Bar Factory Settings	Opens the Bar Factory Settings dialog, which is used to set bar markings to a given shape.
Automatic Position Buttons	Assign position numbers to all parts with the given settings.

2.5.1 Update Concrete Names

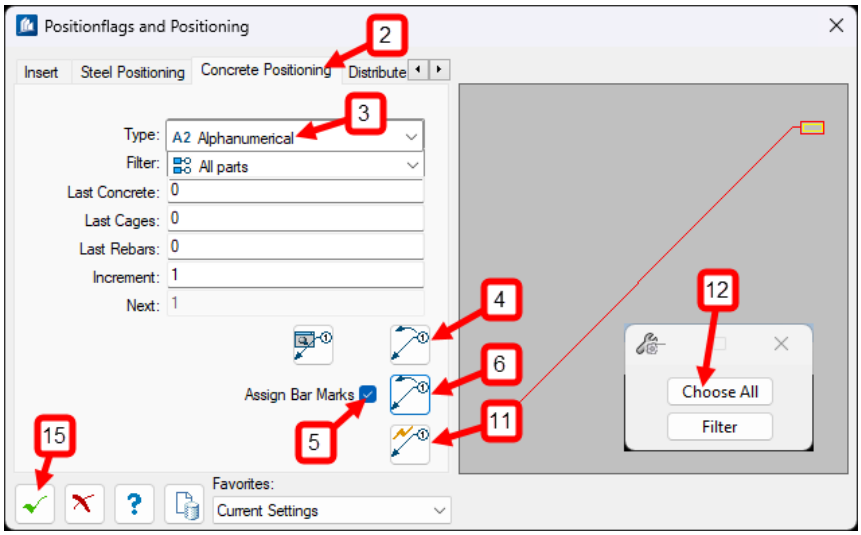
Note, this could have been done earlier, as soon as the ProConcrete clone was created.

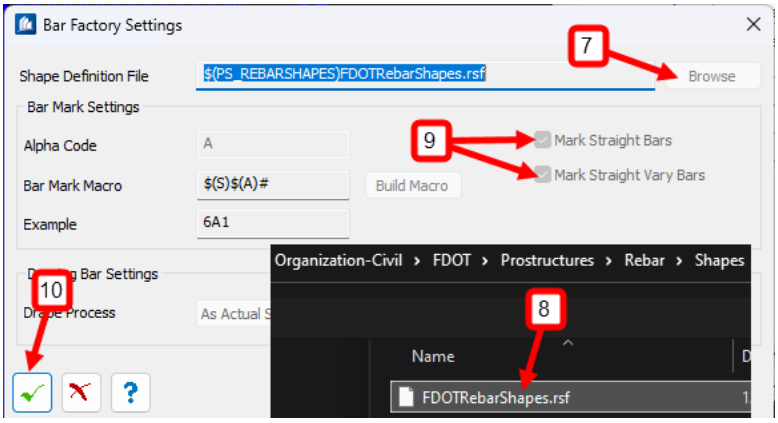
1. Turn on all Concrete levels, rebar levels, but not the guideline levels
2. Double click on the footing element
3. Expand Partlist Data
4. Data
5. Change Name to Footing
6. Repeat the steps above for the column and cap elements, changing names to Column and Cap



2.5.2 Position Bars

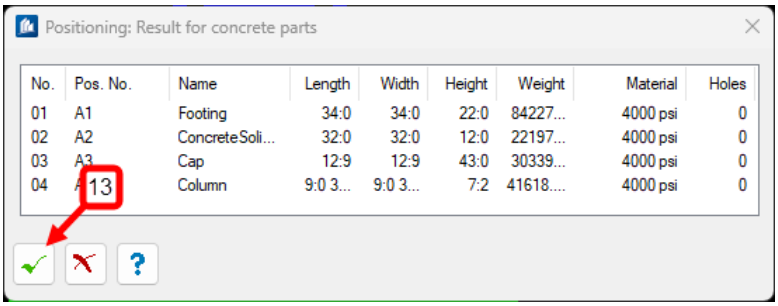
1. Click on Positioning
2. Concrete Positioning
3. Select A2 Alphanumerical
4. Set Position
5. Check Assign Bar Marks
6. Open Factory Settings
7. Browse
8. Select FDOTRebarShapes.rsf
9. Check Mark Straight Bars and Mark Varies Bars
10. Green Checkmark

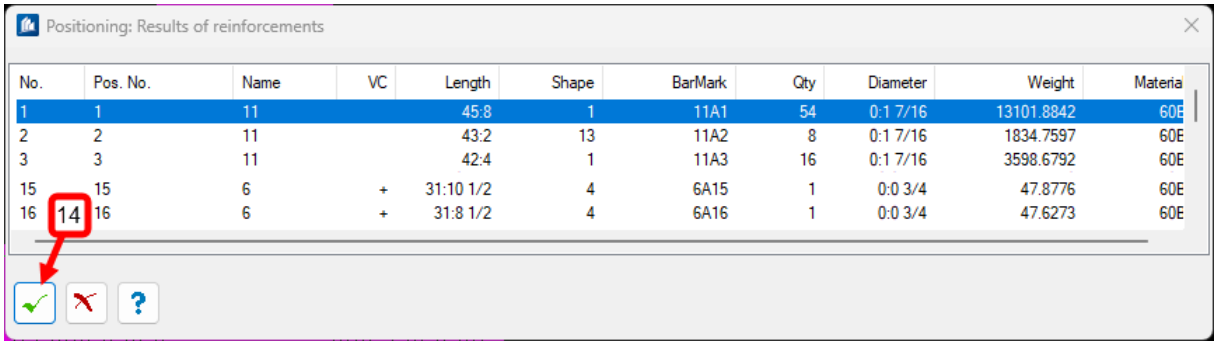




11. Process Automatic Positioning (screenshot on previous page)
12. Choose All (screenshot on previous page)

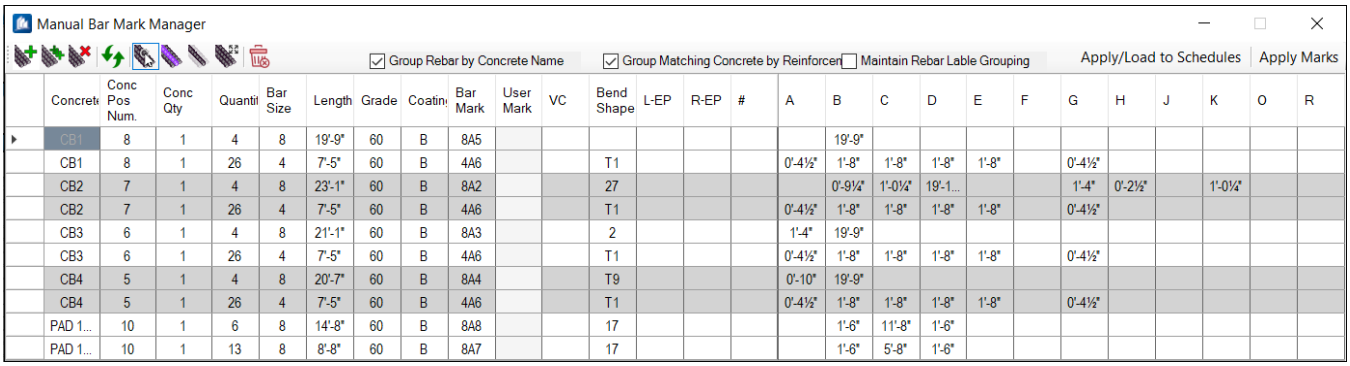
13. Green checkmark for Concrete Parts
14. Green checkmark for Reinforcements
15. Green checkmark





2.6 Manual Bar Marks

Used to attach User Marks to 3D rebar in addition to the regular Bar Marks generated during Rebar Positioning. While it is advised to use Bar Marking generated with the Positioning tool, User Marks are very flexible and should be used in scenarios that Positioning cannot accommodate. One restriction of the bar marking with the Positioning tool is that it can only assign one alpha character in a given rebar model. For our pier example, we will have unique alpha characters for each element: Footing (F), Column (C), and Cap (P)



Concrete	Conc Pos Num.	Conc Qty	Quantity	Bar Size	Length	Grade	Coating	Bar Mark	User Mark	VC	Bend Shape	L-EP	R-EP	#	A	B	C	D	E	F	G	H	J	K	O	R
CB1	8	1	4	8	19'-9"	60	B	8A5								19'-9"										
CB1	8	1	26	4	7'-5"	60	B	4A6			T1				0'-4½"	1'-8"	1'-8"	1'-8"	1'-8"		0'-4½"					
CB2	7	1	4	8	23'-1"	60	B	8A2			27					0'-9¼"	1'-0¼"	19'-1...			1'-4"	0'-2½"		1'-0¼"		
CB2	7	1	26	4	7'-5"	60	B	4A6			T1				0'-4½"	1'-8"	1'-8"	1'-8"	1'-8"		0'-4½"					
CB3	6	1	4	8	21'-1"	60	B	8A3			2				1'-4"	19'-9"										
CB3	6	1	26	4	7'-5"	60	B	4A6			T1				0'-4½"	1'-8"	1'-8"	1'-8"	1'-8"		0'-4½"					
CB4	5	1	4	8	20'-7"	60	B	8A4			T9				0'-10"	19'-9"										
CB4	5	1	26	4	7'-5"	60	B	4A6			T1				0'-4½"	1'-8"	1'-8"	1'-8"	1'-8"		0'-4½"					
PAD 1...	10	1	6	8	14'-8"	60	B	8A8			17					1'-6"	11'-8"	1'-6"								
PAD 1...	10	1	13	8	8'-8"	60	B	8A7			17					1'-6"	5'-8"	1'-6"								

Setting	Description
Load Selected Rebar Elements	Loads selected rebar's data into the table.
Add Rebar to Existing Selection	Adds selected rebar's data to the table.
Clear Selection	Removes selected rebar from the table.
Refresh current data	Reloads and recalculates the data shown in the table.
Select Bars	Sets the locate option to select the bar when used.
Highlight Bars	Sets the locate option to highlight the bar when used.
Isolate Bars	Sets the locate option to isolate the bar when used by turning the display off of all other bars in the model.
Zoom to Bars	Sets the locate option to zoom into the bar when used.
Remove User Marks Applied to Current Selection	Removes any user marks you applied to the selected schedule.

Setting	Description
Group Rebar by Concrete Name	When on, the table rows are grouped and sorted by the **Concrete Name** property. The **Concrete Name** column is moved to be the first column in the table. When off, the table is sorted by Quantity.
Group Matching Concrete by Reinforcement	Activated when **Group Rebar by Concrete Name** is checked. When on, the table is re-sorted by **Conc. Pos. Num.**. The **Conc. Pos. Num.** column is moved to be the second column in the table after the **Concrete Name** column.
Maintain Rebar Label Grouping	Activated when **Group Rebar by Concrete Name** and **Group Matching Concrete by Reinforcement** are checked. When on, the grouped bars are listed un-grouped and sorted by **Conc. Pos. Num.**.
Apply/Load to Schedules	Applies/loads the manual marks to the schedule in Schedule Generator. Clicking opens the **Rebar Schedule Generator**
Apply Marks	Applies marks to the selected table.

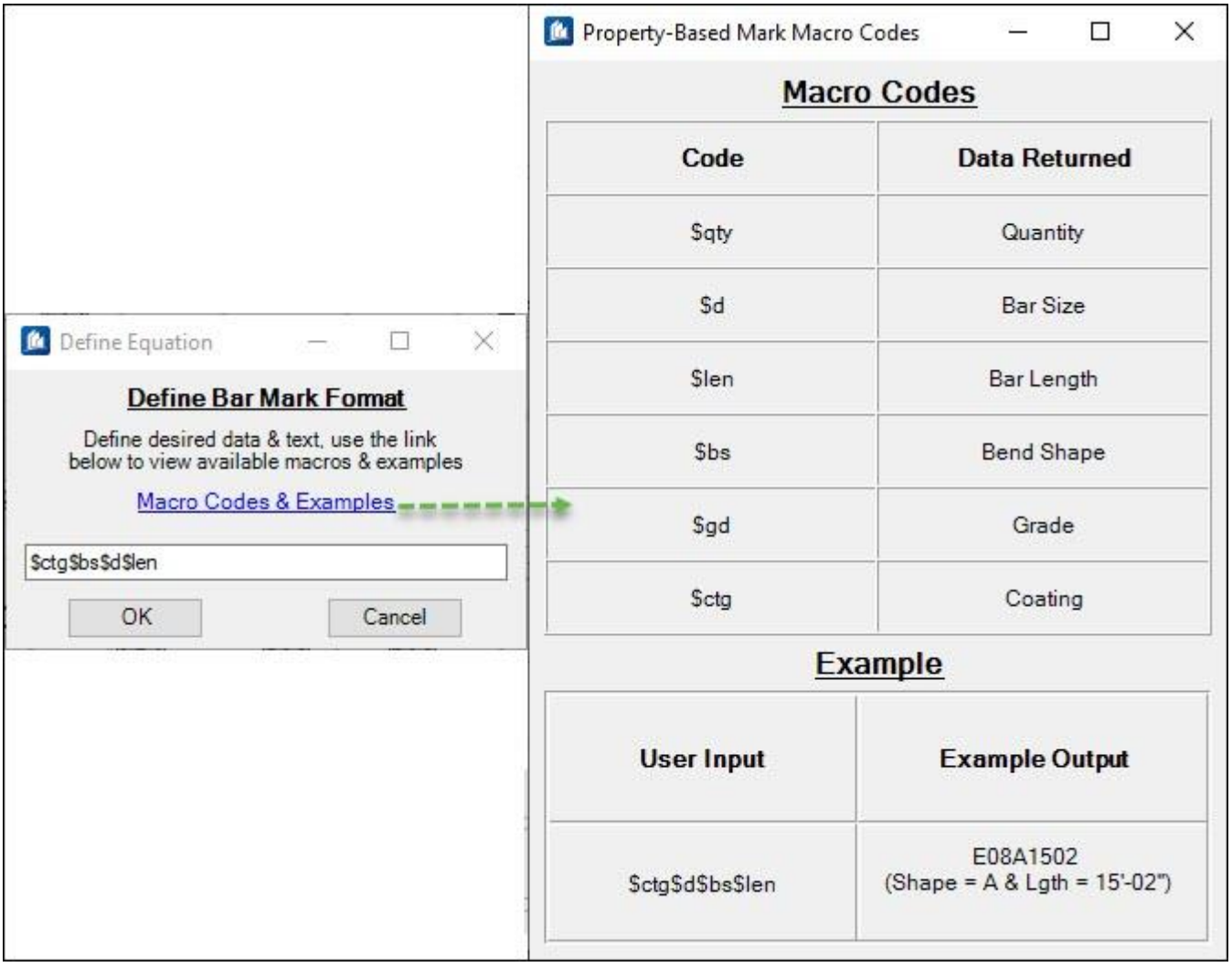
Right Click Menu Options:

Setting	Description
Modify Alpha Character for Selection	Modifies the user-defined bar mark value by setting a new alpha character. You can modify all the user-defined bar mark values at once.

Mark All Sequentially	• **With Alpha**
	  ○ **Continuous Numbering** - Modifies the user-defined bar mark value sequentially (continuous numbering) by setting a new alpha character and numeric value.
	  ○ **Restart for Each Concrete Element** - Modifies the user-defined bar mark value by accepting a new alpha character and numeric value where the numeric values are categorized as per the concrete element.
	• **Sequence Number Only**
	  ○ **Continuous Numbering** - Modifies the user-defined bar mark value sequentially (continuous numbering) by setting a numeric value.
	  ○ **Restart for Each Concrete Element** - Modifies the user-defined bar mark value by accepting a numeric value where the numeric values are categorized as per the concrete element.

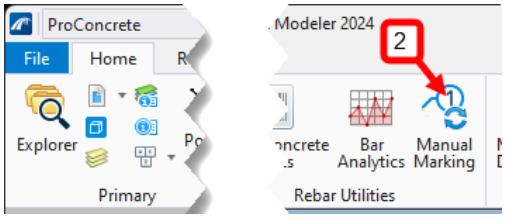
Modify Bar Mark for Selection	Modifies the user-defined bar mark value by accepting the custom values that include alpha characters, numeric values, special characters, etc.
Locate Rebar element(s) in Model	Identifies the rebar element(s) in a model for the selected bar mark.
Locate Concrete Element(s) in Model	Identifies the concrete element(s) in a model for the selected bar mark.

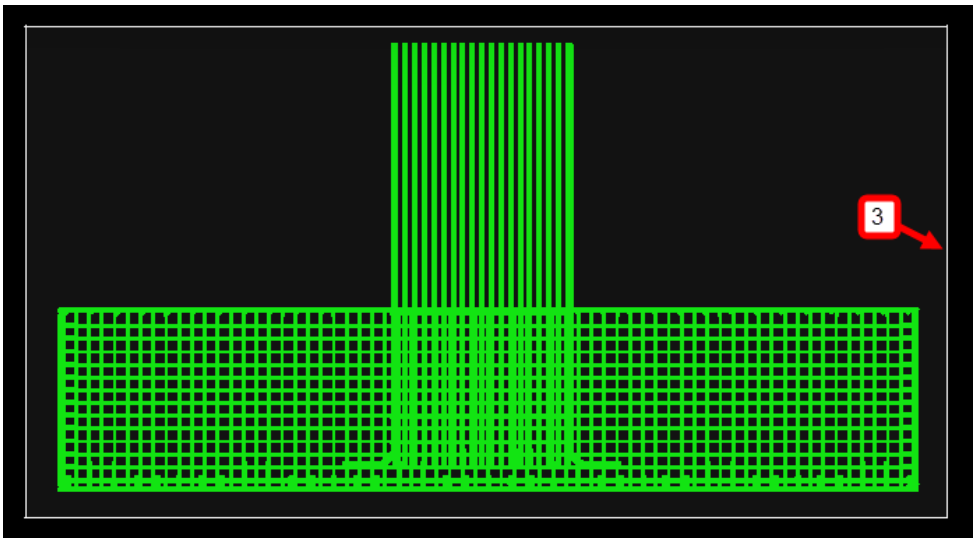
Setting	Description
Modify Vary Mark Range Separator	
Property-based Bar Marks	• **Apply property-based bar marks to selection** - Applies the property-based bar mark format to the selected user-defined bar mark. • **Apply property-based bar marks to all** - Applies the property-based bar mark format to all the user-defined bar marks. • **Define Property-based Bar Mark Format** - Defines the property-based bar mark format based on the macro codes and examples.



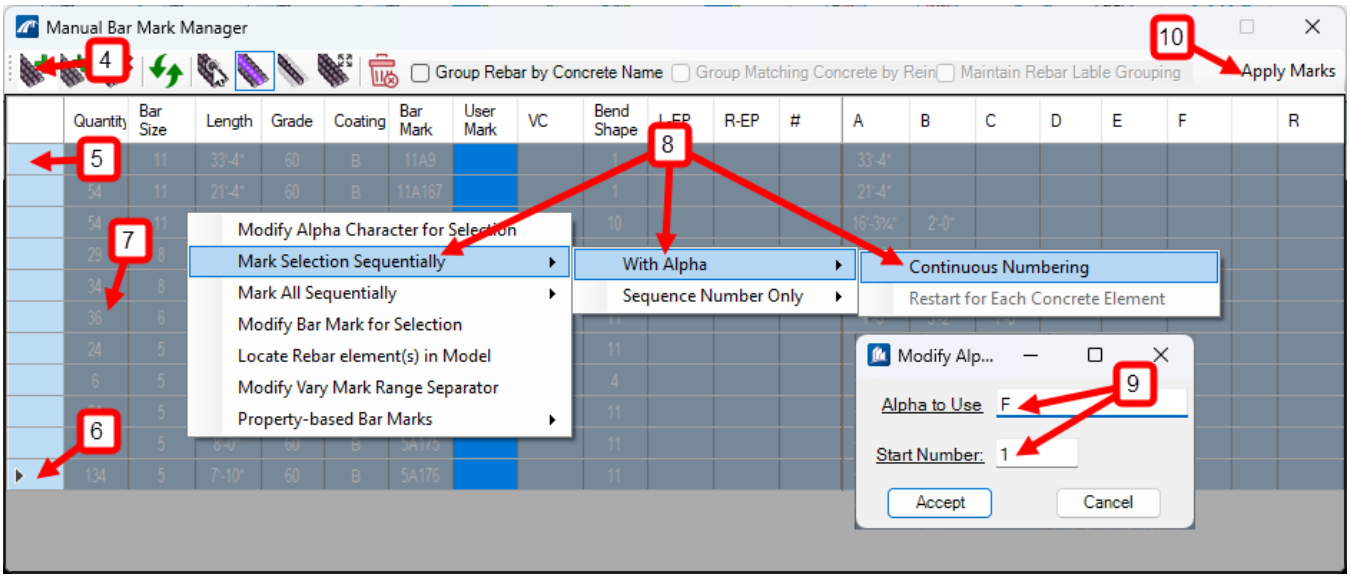
2.6.1 *Apply Manual Bar Marks*

1. Turn off all levels except the footing rebar levels
2. Manual Marking
3. Select all the footing rebar





4. Load Selected Rebar Element
5. Left click the first cell
6. Hold Shift and left click the bottom cell
7. Right Click
8. Mark Selection Sequentially > With Alpha > Continuous Numbering
9. Enter: F, 1, & click Accept
10. Apply Bar Marks



Notes

- To assign your own manual marks you can double click in a User Mark cell and enter your own value.
- To locate a bar, select the row(s), right click, Locate Rebar Element(s) In Model. You can have it: Select, Highlight, Isolate, or Zoom To. See Locate options in the table at the beginning of this section.