Falsework Grade Check & Camber Strips with Civil 3D

By Jessica Waller, P.E.

Falsework Grades and Camber using Civil 3D

1. What files you need from Structures Design.
2. How to Create Layers
3. How to change the Bridge Plan View Orientation
4. Draw Spline for Bridge Camber
5. Create a New Dimension Style
6. Draw in Falsework Bents
7. How to Measure Falsework Bents for Bridge Camber
8. How to get Camber Strip Dimensions
9. Check Deck Elevations at Falsework Bent Posts

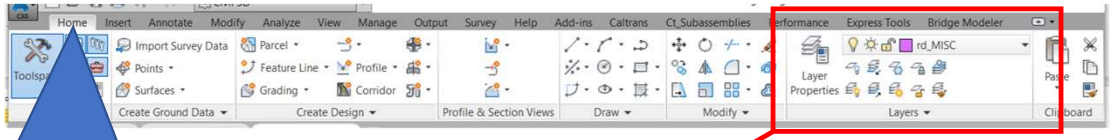
WHAT FILES YOU NEED

1. The Bridge Alignment .xml file
2. The Bridge Deck Surface .xml file
3. A .dwg file of the 2D Bridge Layout in Real World Coordinates, (including but limited to):
   - Abutment layout
   - Abutment centerlines
   - Bent/Pier layout
   - Bent/pier centerlines
   - Column layout
   - Girder centerlines
   - Edge of Deck
   - BB & EB
   - Wingwalls
   - Bearing locations

Consult your Structures Designer for assistance in obtaining these files and combining them into a single **.dwg** file for you to use.

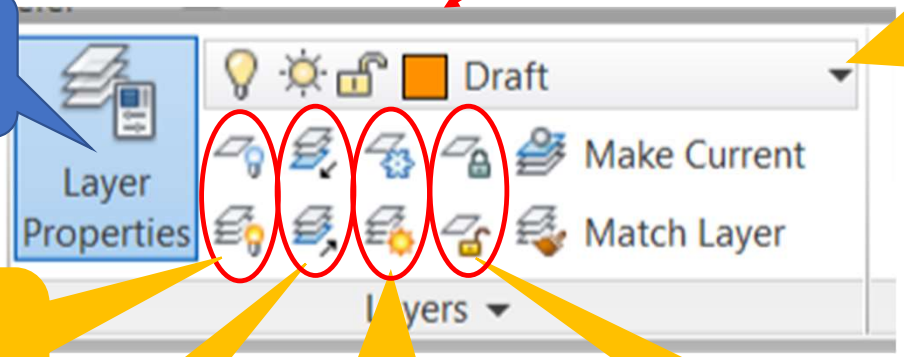
CREATE LAYERS

Each object has a base **LAYER** on which the object physically resides. You can control the display of these layers and create new layers as needed.



1. Click the **HOME** tab

2. Click to bring up the **LAYER MANAGER**



Click to **switch between the layers**

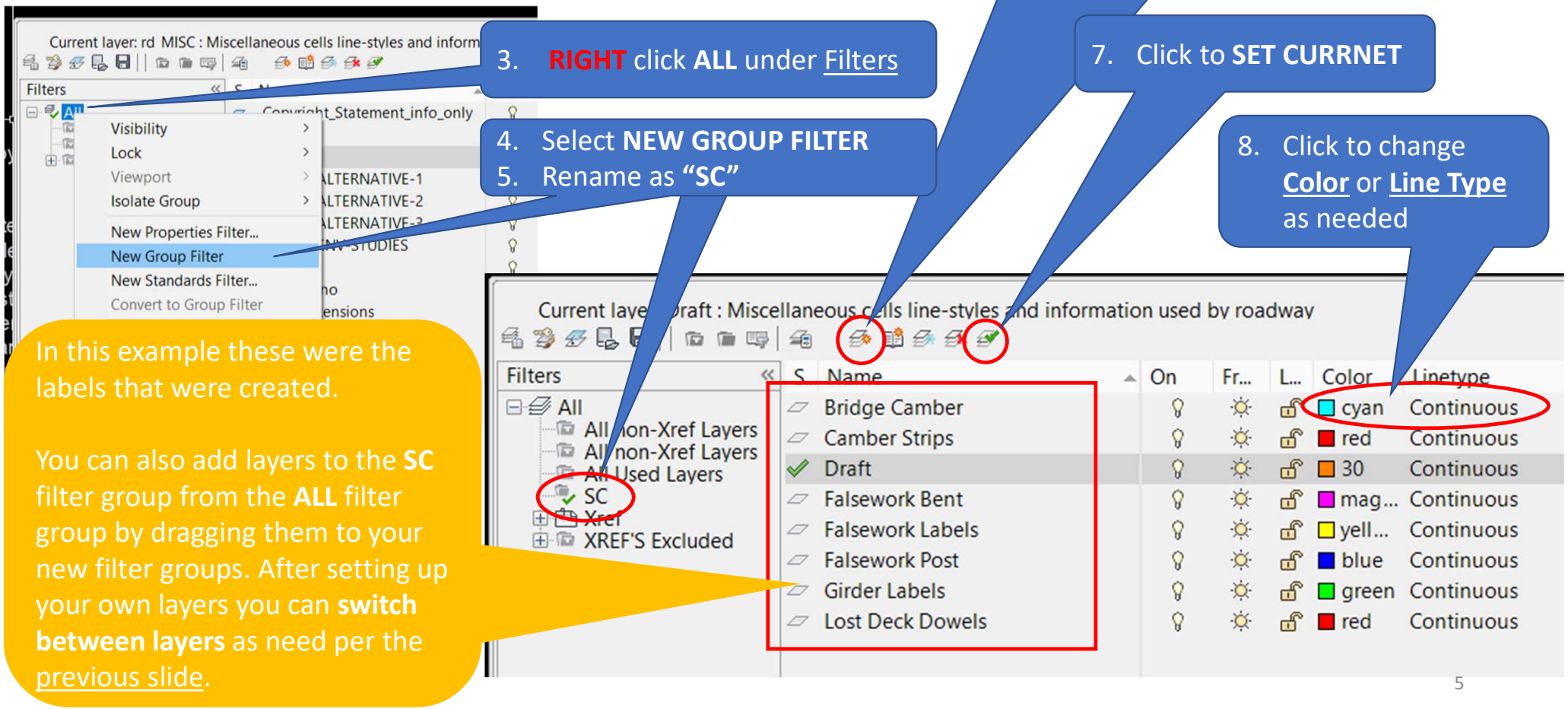
Layer **ON** and **OFF**. Allows you to reduce the line clutter.

Isolate layers one at a time, and then brings all the layers back.

If you **FREEZE** a layer instead of turning it **OFF**, you'll see a boost in performance of the program.

Layer **LOCK** and **UNLOCK**. Keeps you from deleting a line on accident

CREATE LAYERS

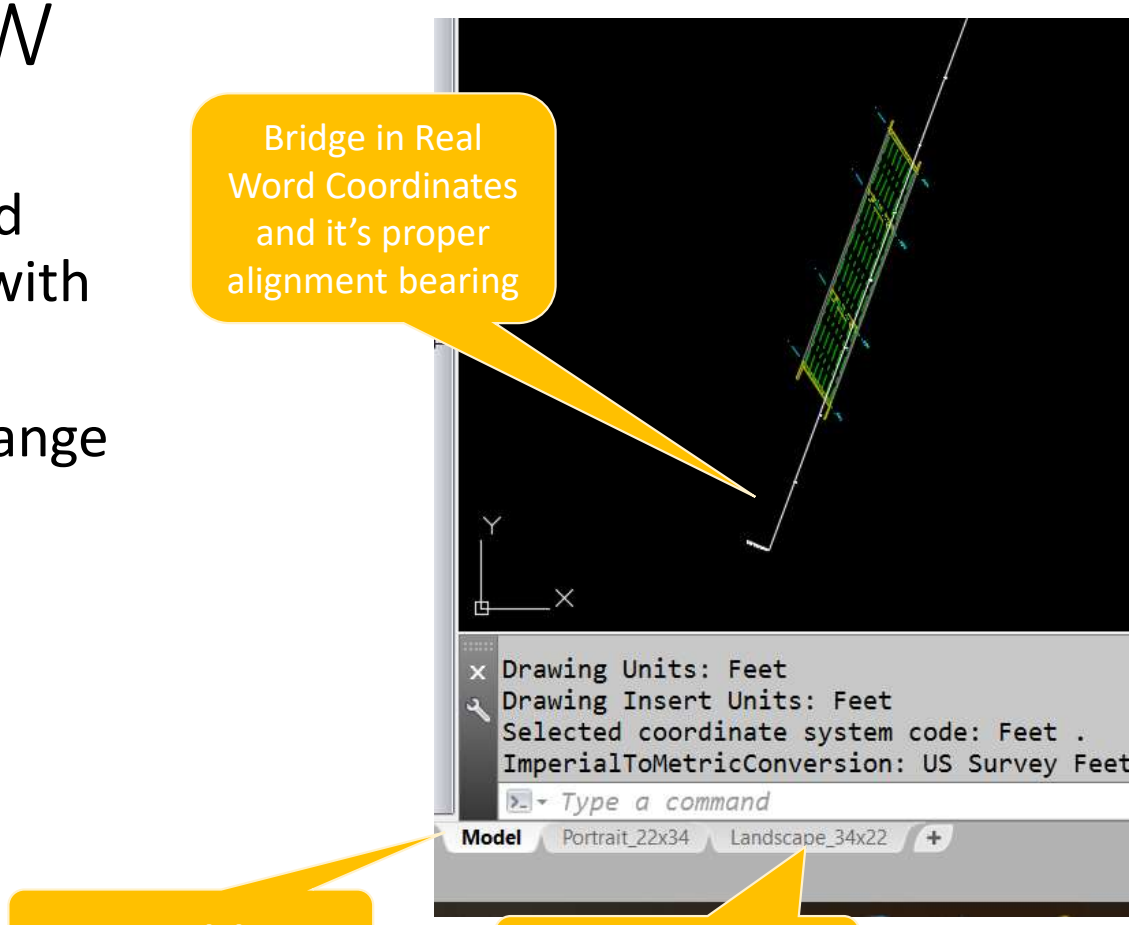


In this example these were the labels that were created.

You can also add layers to the **SC** filter group from the **ALL** filter group by dragging them to your new filter groups. After setting up your own layers you can **switch between layers** as need per the previous slide.

CHANGE PLAN VIEW

- Keep the Model in real world coordinates and alignment with it's bearing
- Switch to Paper Space to change your plan view orientation
- Within Paper Space you can change the model space orientation and while maintaining the model's coordinated.

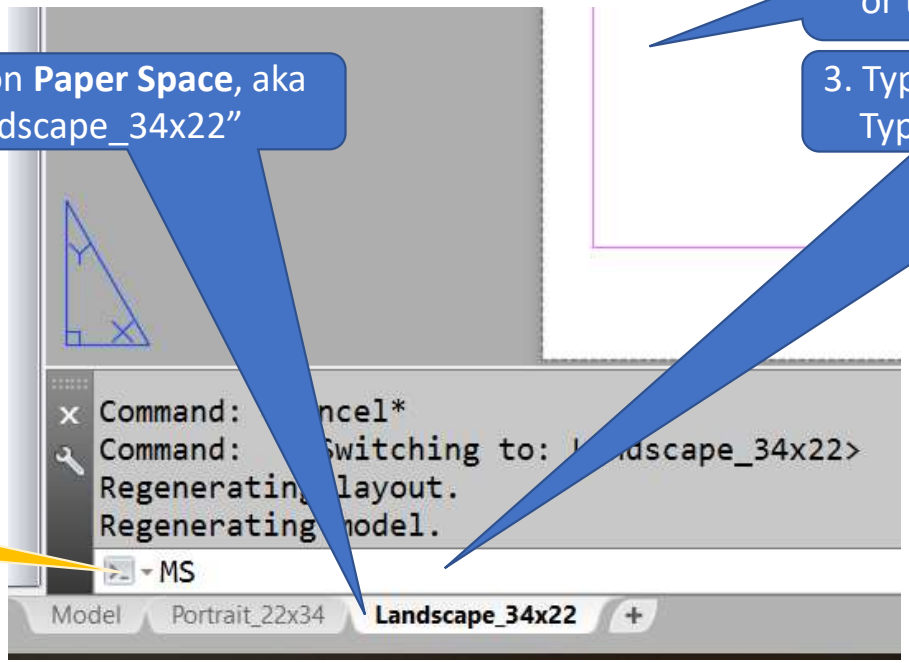


CHANGE PLAN VIEW

2. Left click twice within the purple box or type "**MS**" in the command bar then **spacebar**

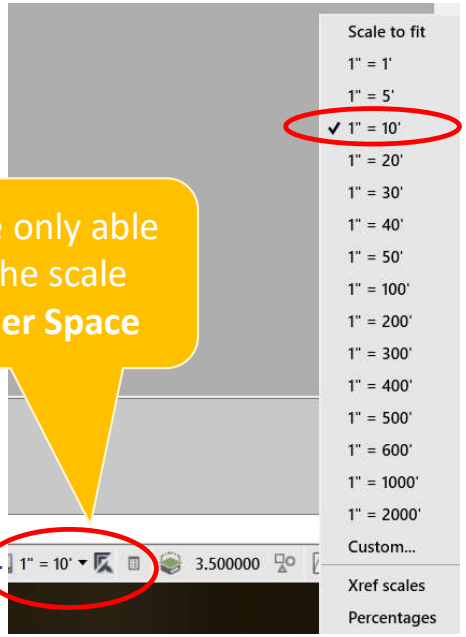
1. Click on **Paper Space**, aka "Landscape_34x22"

3. Type "**Z**" (Zoom) then **spacebar**
Type "**E**" (Extends) then **spacebar**



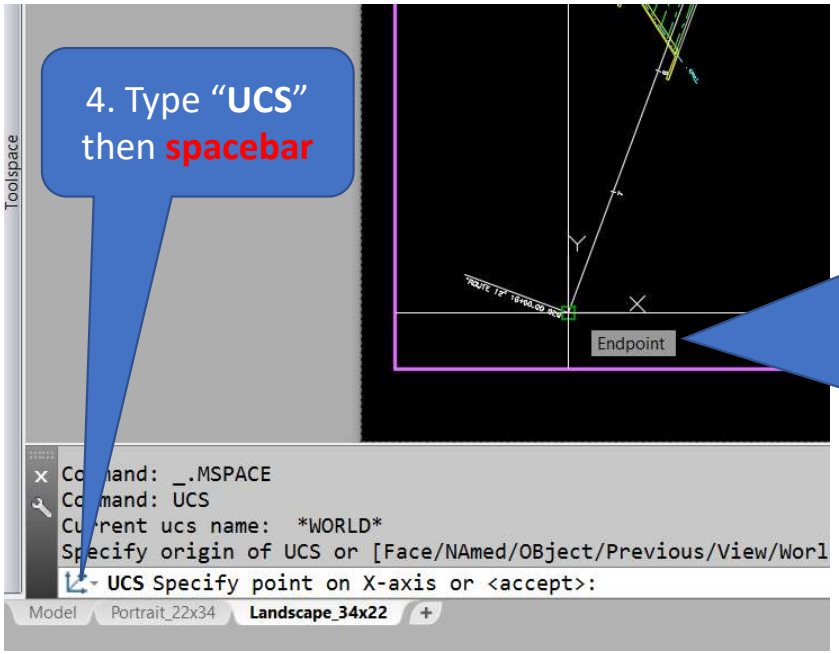
Command Bar

Note: You are only able to change the scale while in **Paper Space**

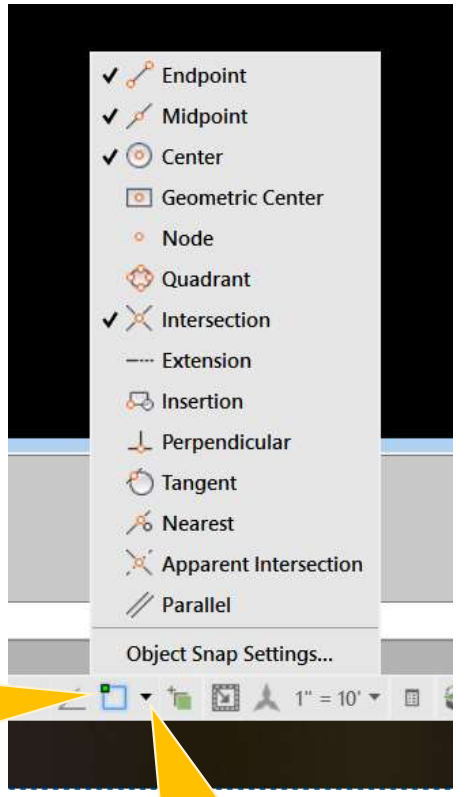


4. Pan to center your bridge in the viewport
5. Click the down arrow next to the Scale to Fit. Select **1" = 10'**

CHANGE PLAN VIEW



5. Select the down station Endpoint (green square appears) of the alignment
6. Select the up station Endpoint of the alignment
7. Hit **Enter** key to accept command
8. Type "**PLAN**" and then **Enter** key and then **spacebar** for <current>



Make sure your Object Snap Setting is **ON** and "**Endpoint**" is checked. Have "**Midpoint**" and "**Intersection**" checked as well.

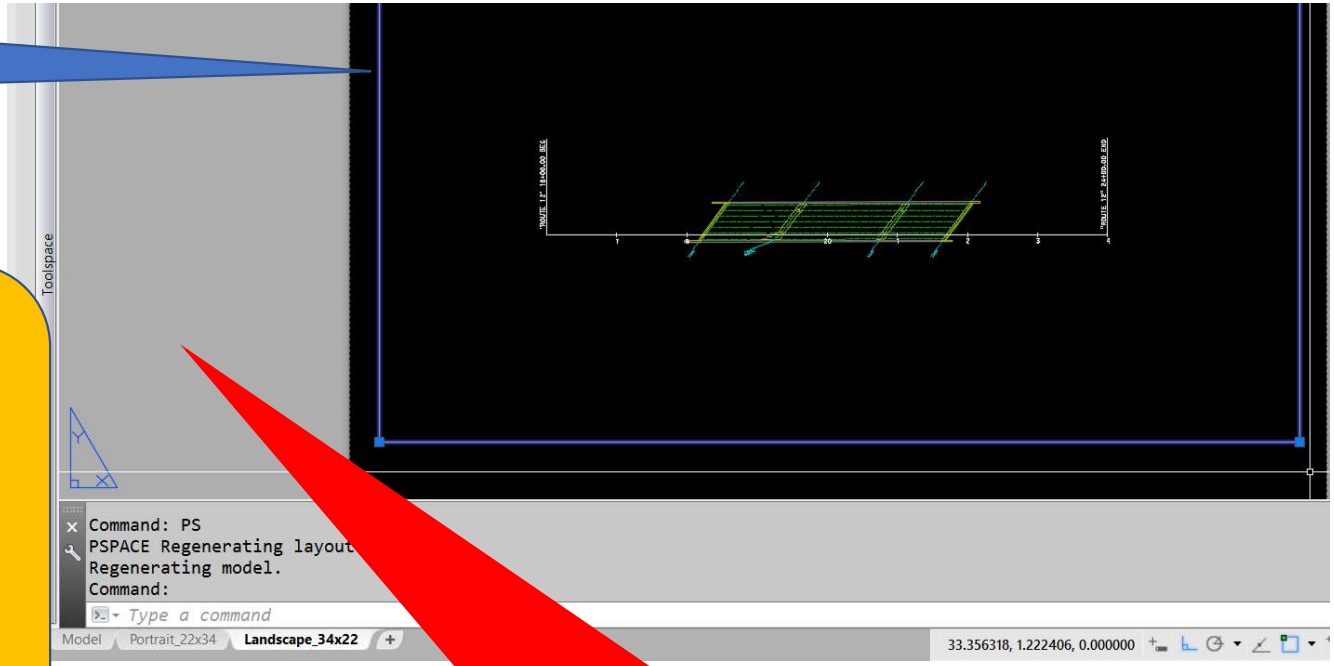
Select the down arrow to bring up this menu

DRAW BRIDGE CAMBER SPLINE

1. While in Paper Space, **double** left click the **VIEWPORT** (purple box). NOT in the box.

This will expand the viewport so that you are working within Model Space in the new ordination. To escape Model Space, type "**PS**" and return to Paper Space.

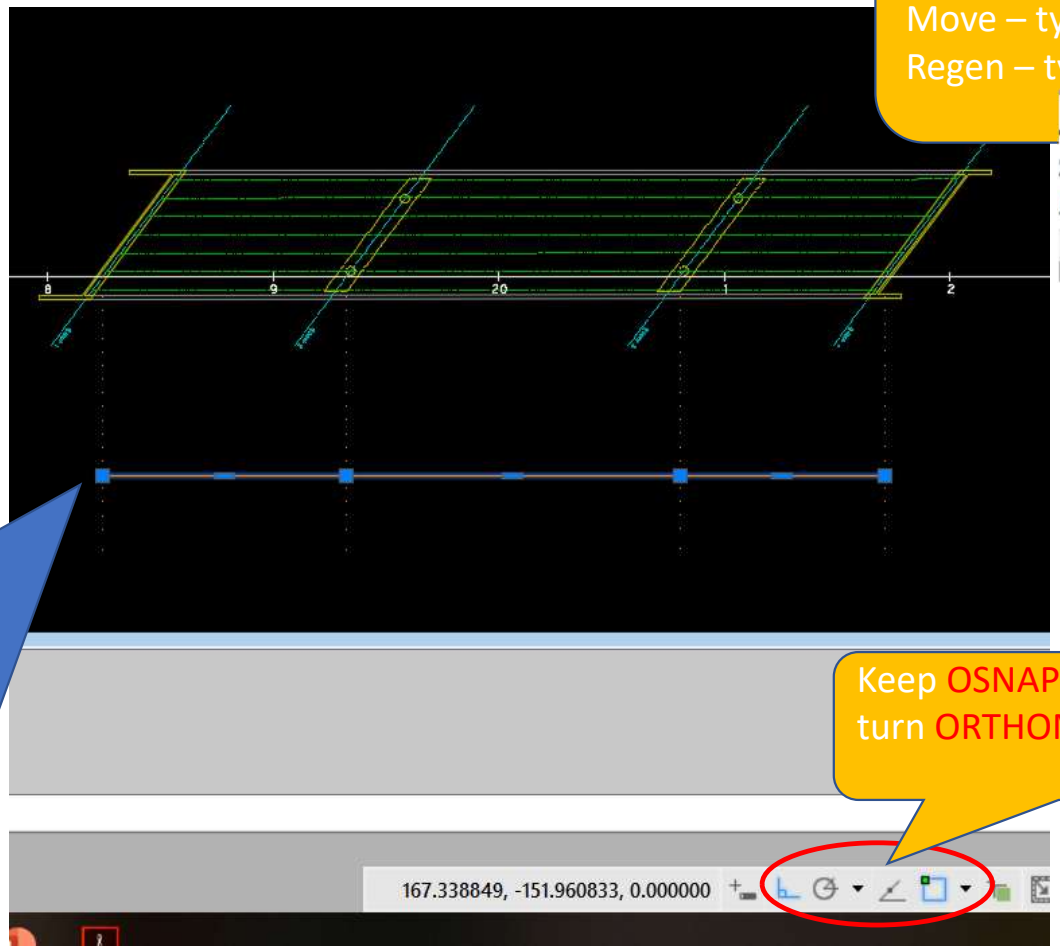
If you draw in Paper Space, the annotation will be incorrect.



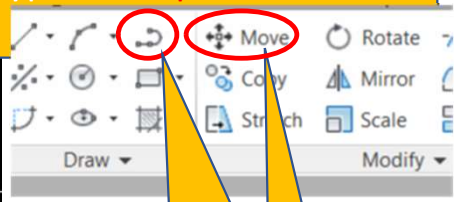
Before moving forward.
If you still see this gray space on your screen, your view has **NOT** expanded into **Model Space**. Type "PS" and repeat step 1.

DRAW CAMBER SPLINE

2. Type "**PL**" **spacebar** and draw a Polyline along the bridge alignment, click on each bent centerline intersection (green cross appears).
3. Type "**M**" **spacebar** and move the new line below the bridge layout.
4. Project new lines downwards from the bent centerlines and alignment intersections.



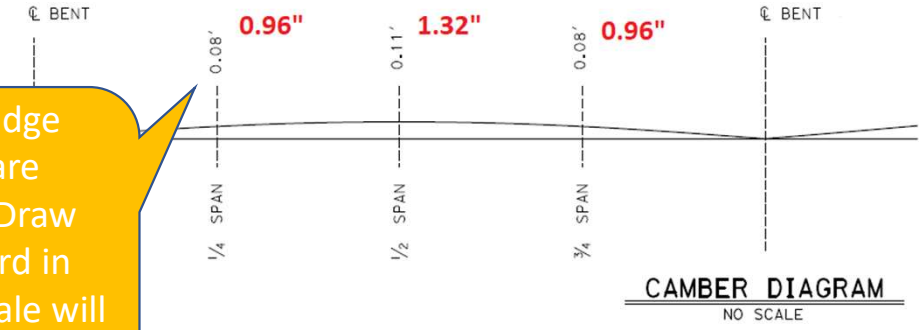
Reminder:
Polyline – type "**PL**" spacebar
Line – type "**L**" spacebar
Move – type "**M**" spacebar
Regen – type "**RE**" spacebar



Or use the POLYLINE and MOVE button on the **HOME** tab

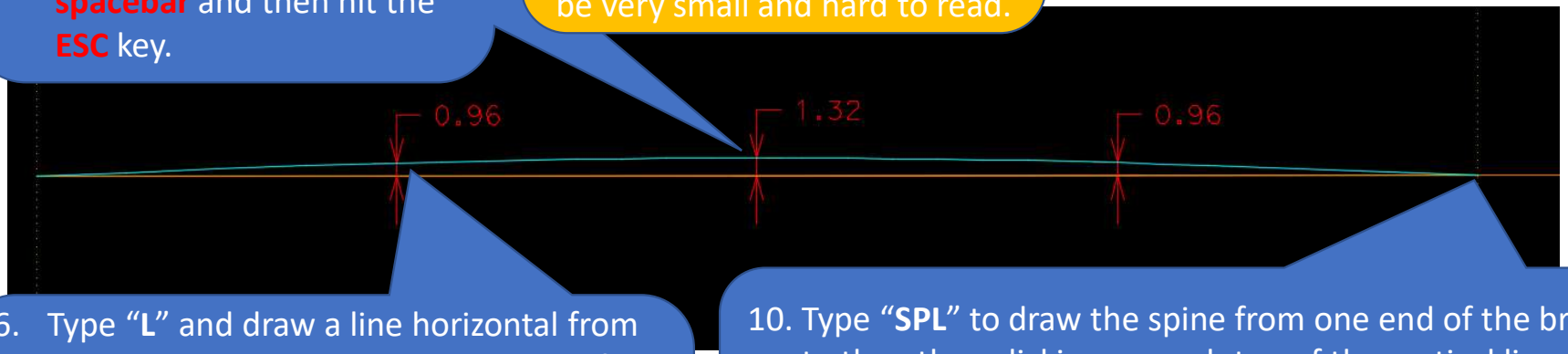
Keep OSNAP turned **ON** and turn ORTHOMODE **ON**

DRAW CAMBER SPLINE



5. Type "**L**" **spacebar** and draw a vertical line upward at midpoint (green triangle appears), type the camber height in inches (i.e. "1.32") **spacebar** and then hit the **ESC** key.

In this example the bridge camber dimensions are converted into inches. Draw your vertical line upward in inches otherwise your scale will be very small and hard to read.

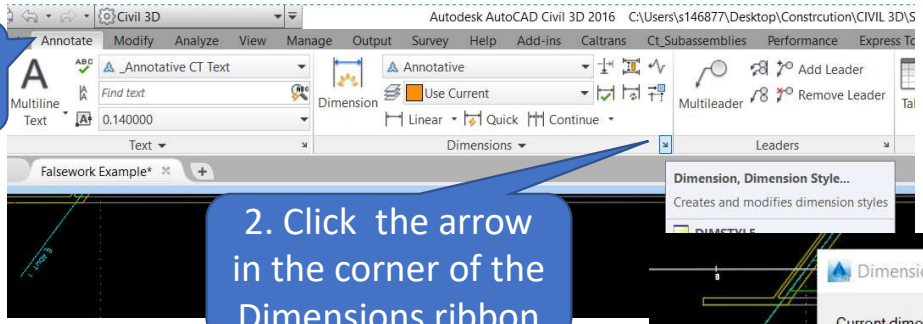


6. Type "**L**" and draw a line horizontal from endpoint to midpoint, the midpoint of this new line will give you the ¼ span.
7. Type "**L**" and draw the vertical lines upward at this new midpoint.
8. Repeat step 6 & 7 for ¾ span point.
9. Repeat for remaining span.

10. Type "**SPL**" to draw the spine from one end of the bridge to the other, clicking on each top of the vertical line endpoints and at zero for each support. Drag your cursor in the direction that the line ends and hit the **ENTER** key to escape the command.

CREATE NEW DIMENSION STYLE

1. Click **ANNOTATE**

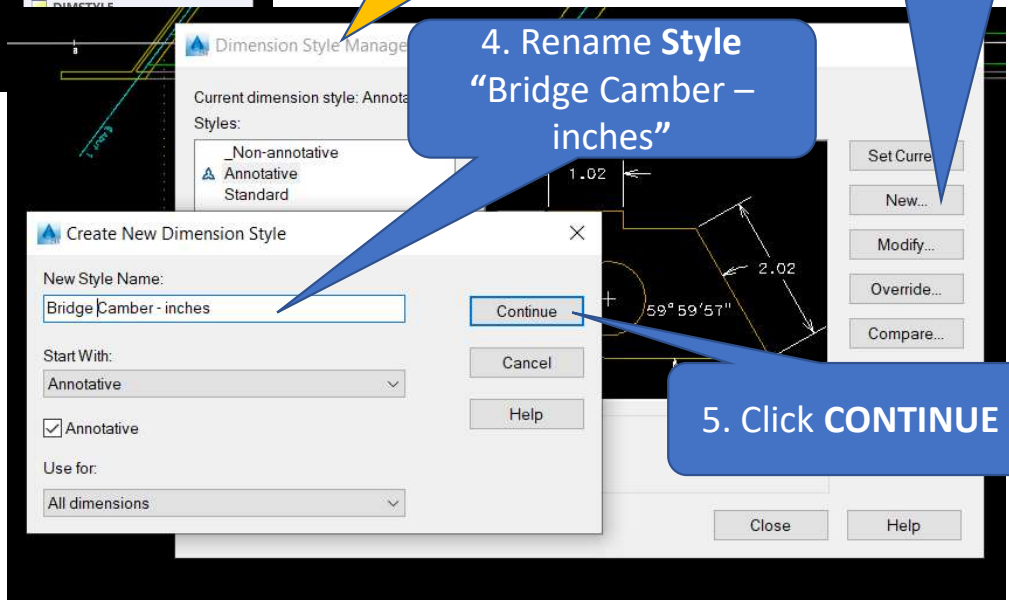


2. Click the arrow in the corner of the Dimensions ribbon

This opens up the **Dimension Style Manager**

3. Click **NEW…**

4. Rename **Style** “Bridge Camber – inches”

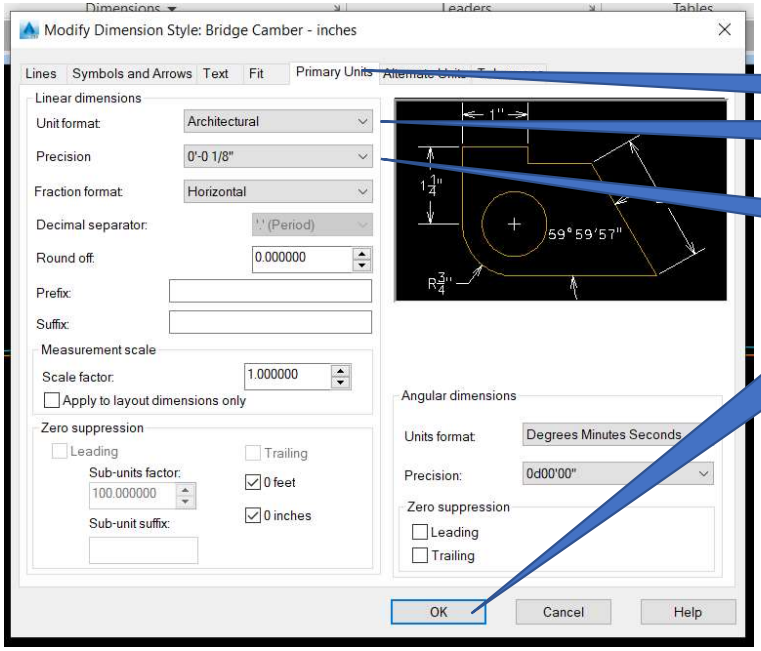


5. Click **CONTINUE**

Keep in mind, you are drawing the vertical in inches and the horizontal is still in feet.

To help allevate confusion, you can create a new **DIMENSION STYLE** to read in inches and label your drawing accordingly.

CREATE NEW DIMENSION STYLE



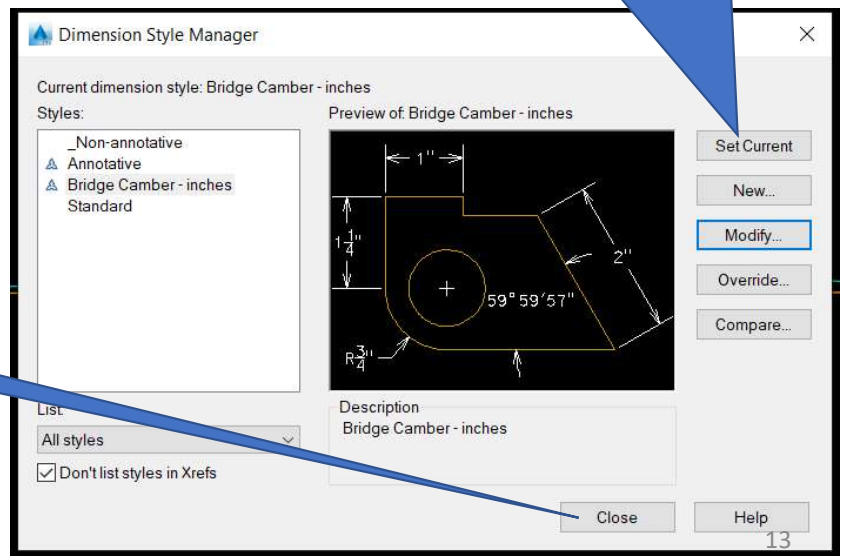
6. Click **PRIMARY UNITS** tab

7. Change the Unit format to "**Architectural**"

8. Change Precision to **1/8"**

9. Click **OK**

10. Click **SET CURRENT**



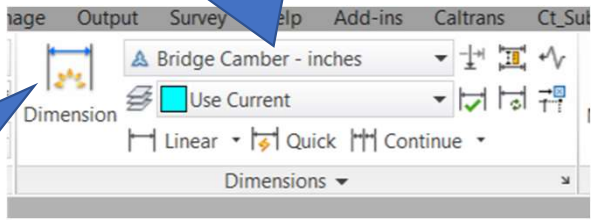
11. Click **CLOSE**

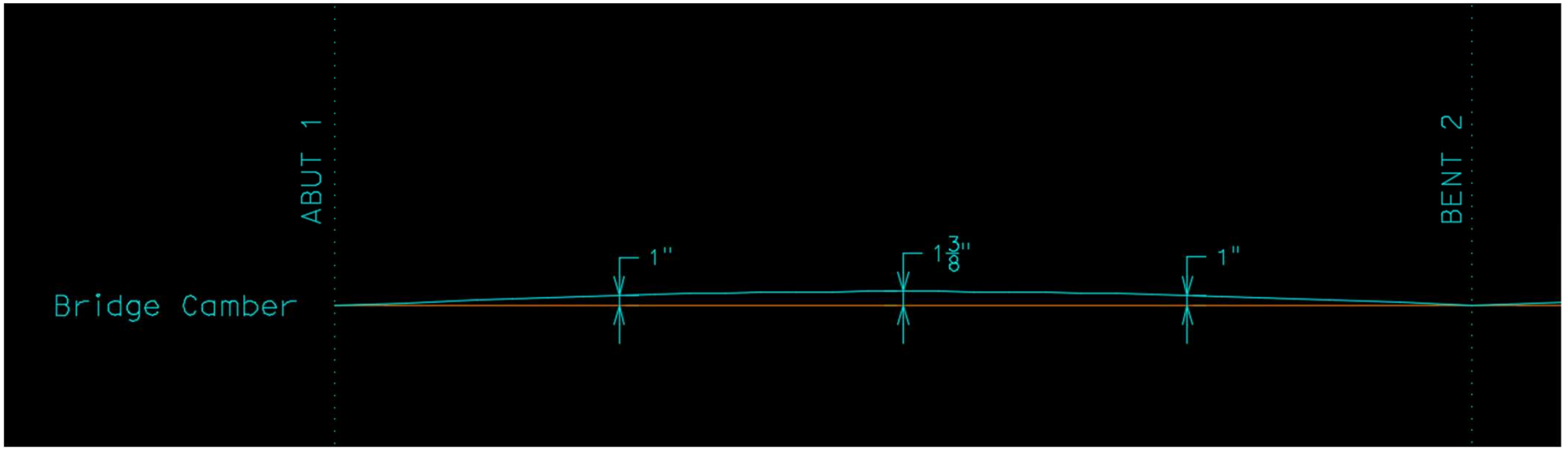
CREATE NEW DIMENSION STYLE

Label the bridge camber height

12. On the **ANNOTATE** tab, change the Dimension Style to read in inches

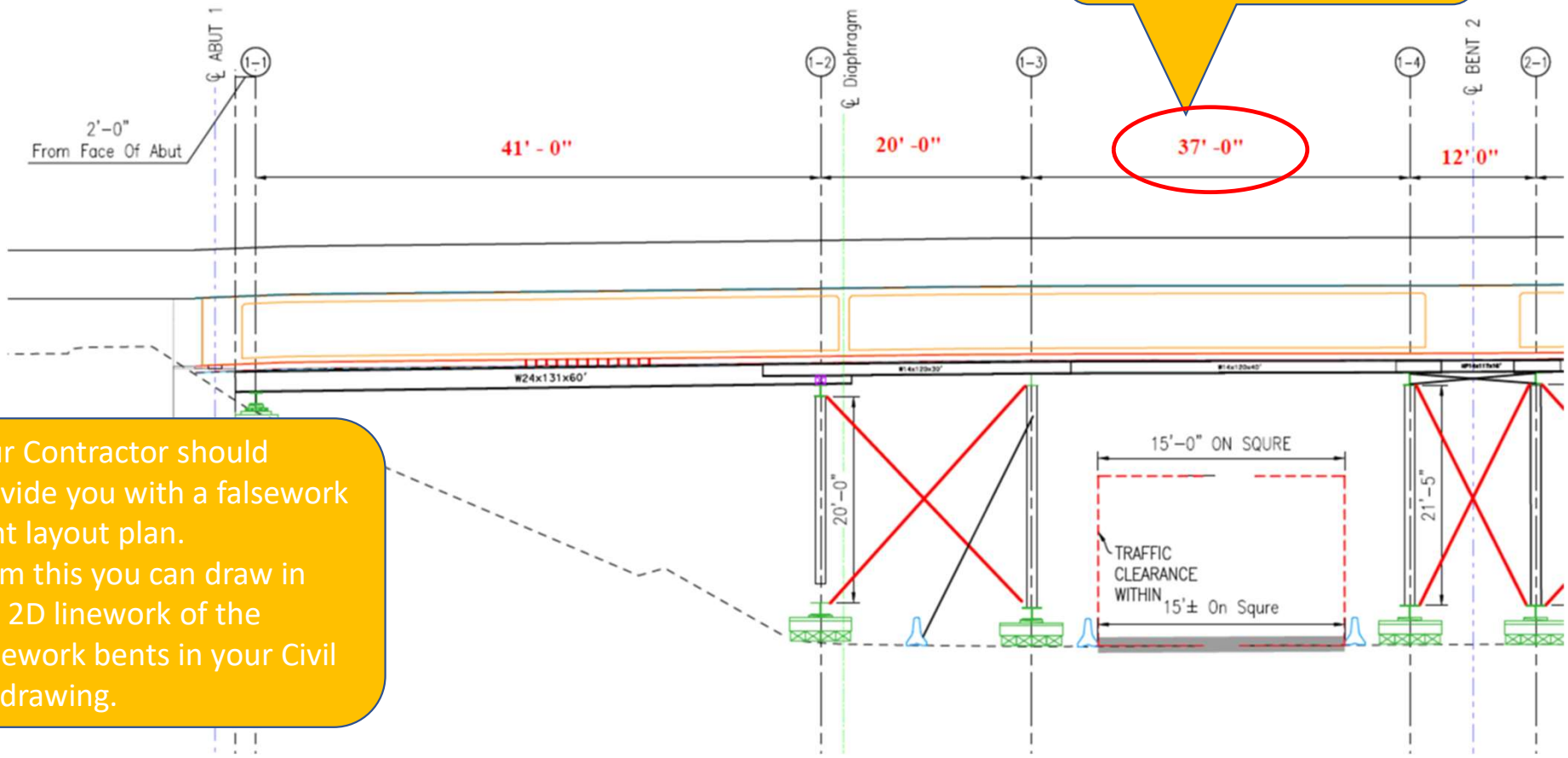
13. Click **DIMENSION** and select the two ends of each line.





DRAW IN FALSEWORK

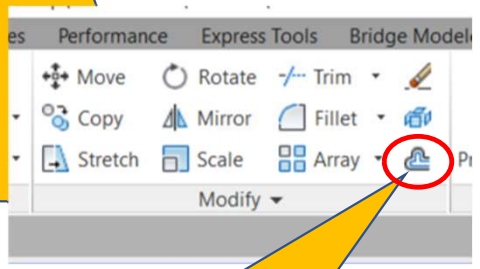
In this example, these are the falsework bent dimensions.



Your Contractor should provide you with a falsework bent layout plan.
From this you can draw in the 2D linework of the falsework bents in your Civil 3D drawing.

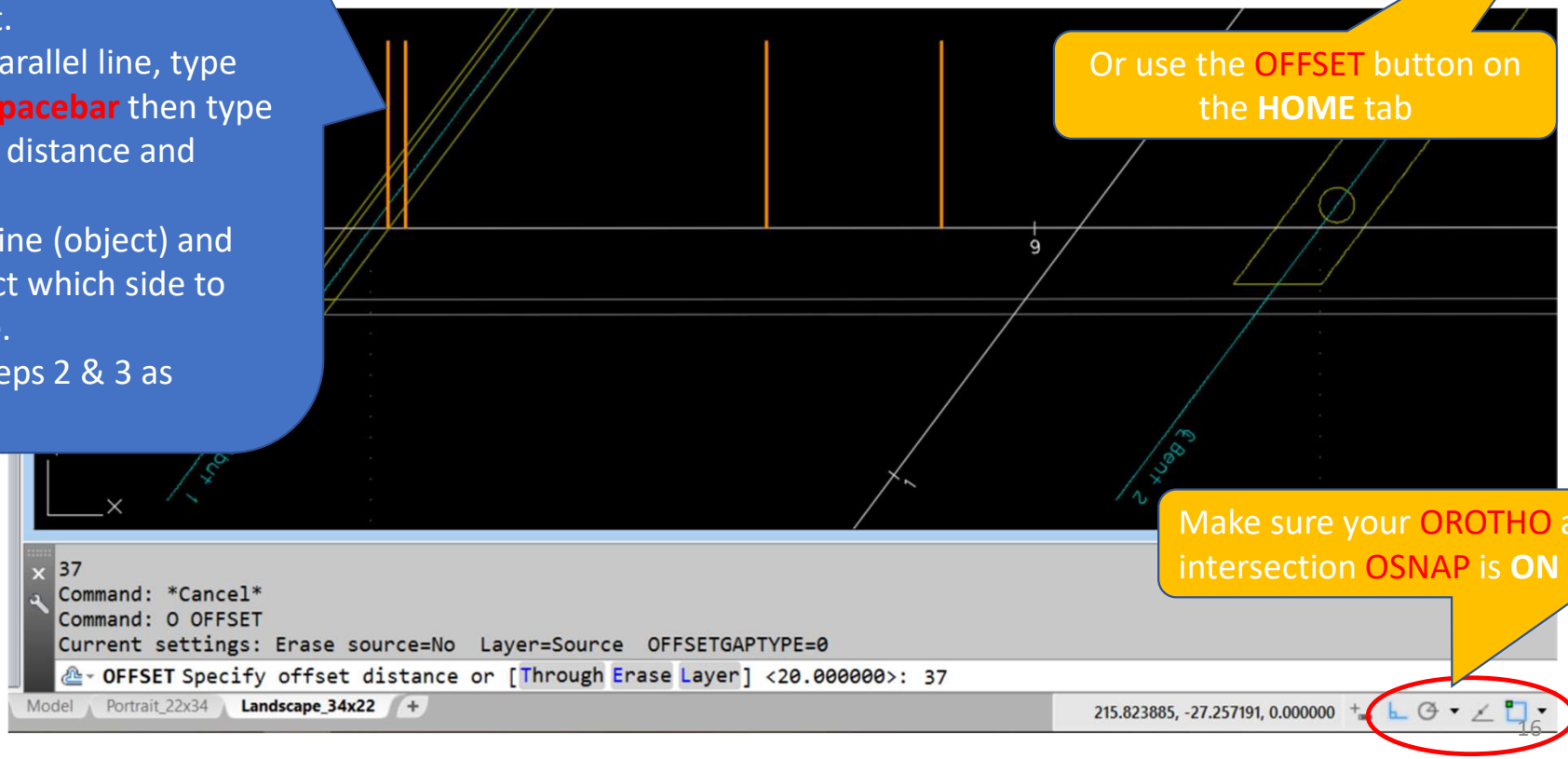
DRAW IN FALSEWORK

Reminder:
Line – type "**L**" spacebar
Offset – type "**O**" spacebar
Regen – type "**RE**" spacebar



1. Draw a vertical line upward perpendicular to the bridge alignment.
2. Offset a parallel line, type "**O**" and **spacebar** then type the offset distance and **spacebar**.
3. Click the line (object) and then select which side to offset line.
4. Repeat steps 2 & 3 as needed.

Or use the OFFSET button on the **HOME** tab

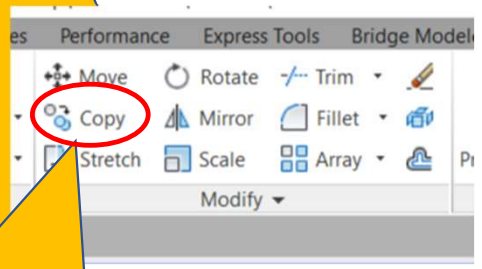


Make sure your OROTHO and intersection OSNAP is **ON**

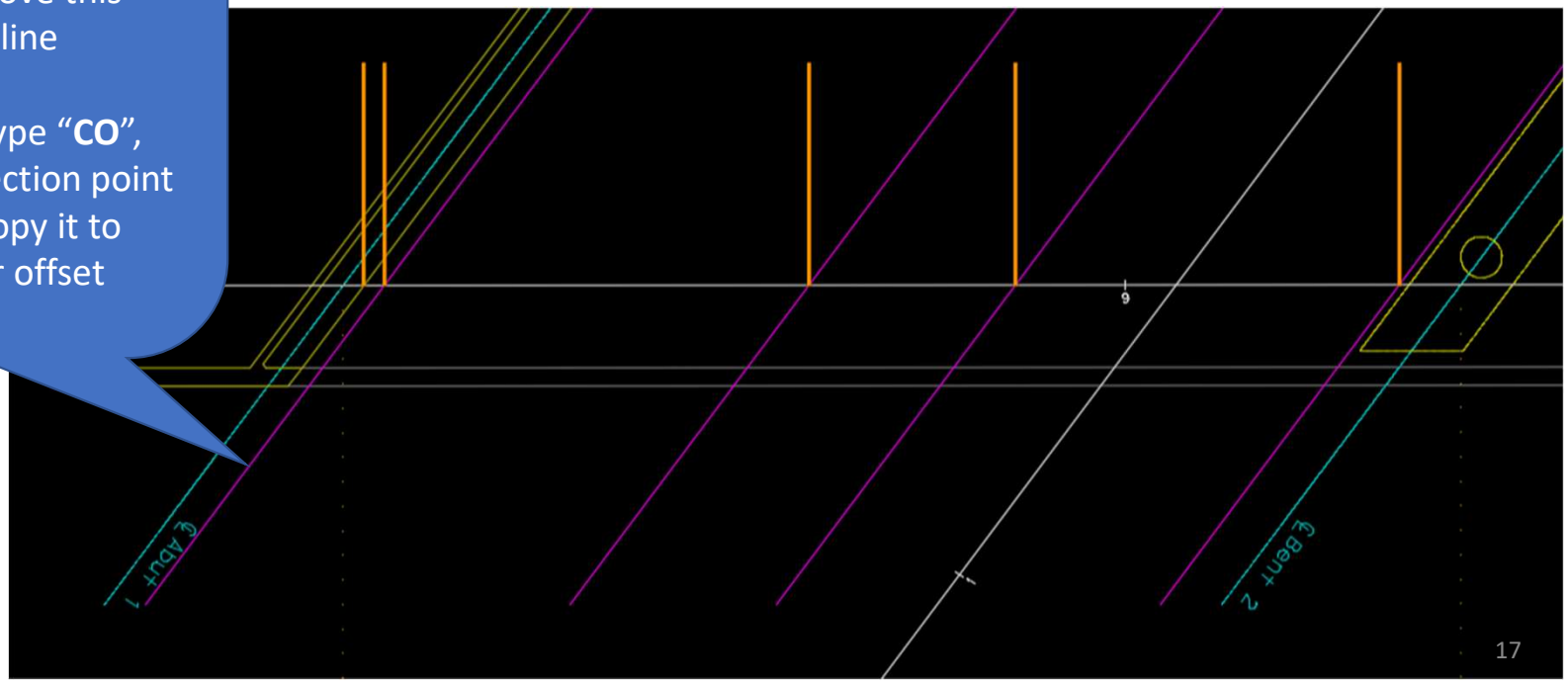
DRAW IN FALSEWORK

1. Draw a new line along the abutment centerline.
2. Select the line at the intersection of the bridge alignment and move this line to the offset line location.
3. Select the line. Type “**CO**”, select the intersection point of this line and copy it to each of the other offset lines.

Reminder:
Line – type “**L**” spacebar
Move – type “**M**” spacebar
Copy – type “**CO**” spacebar
Regen – type “**RE**” spacebar

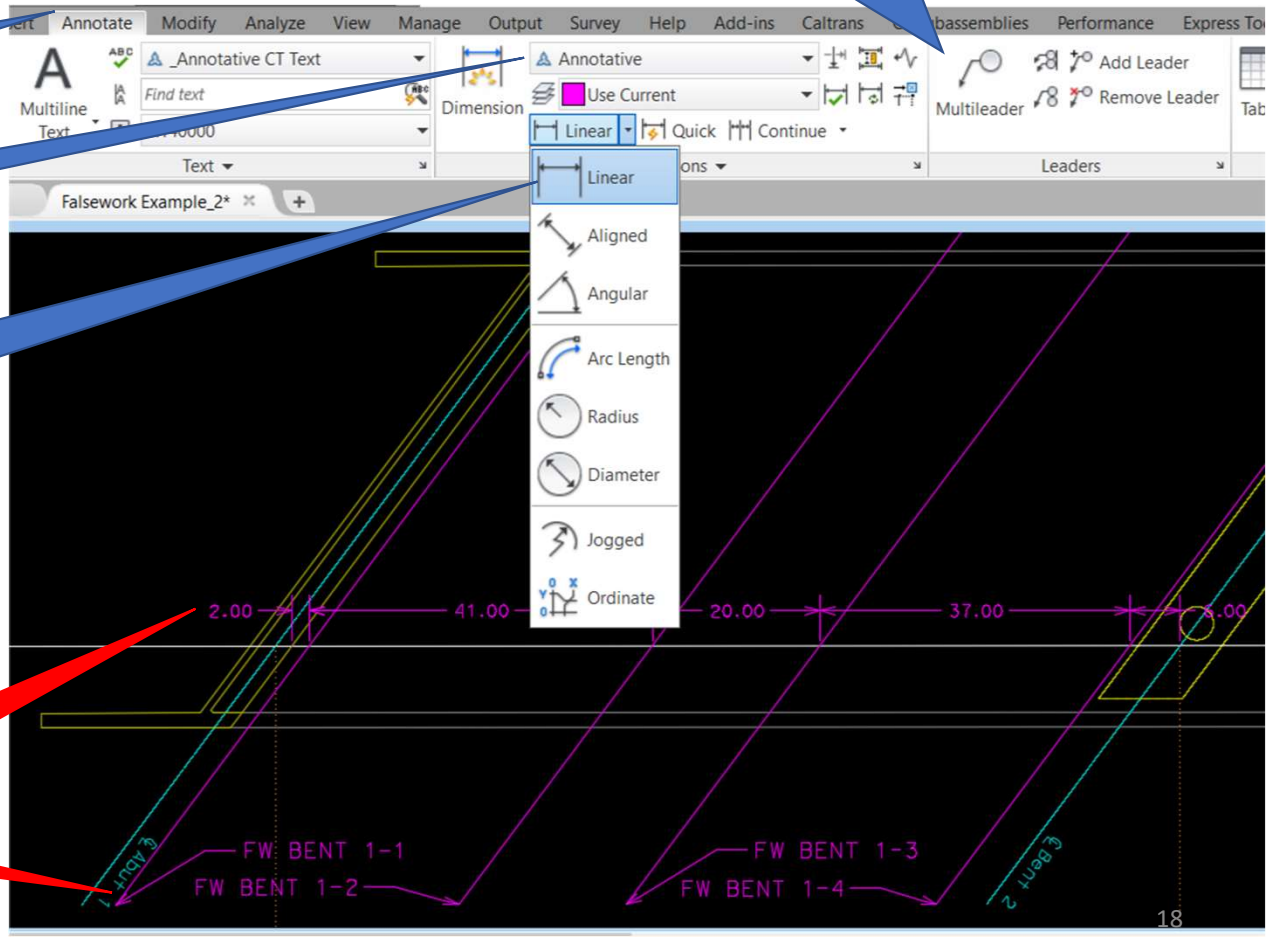


Or use the COPY button on the **HOME** tab



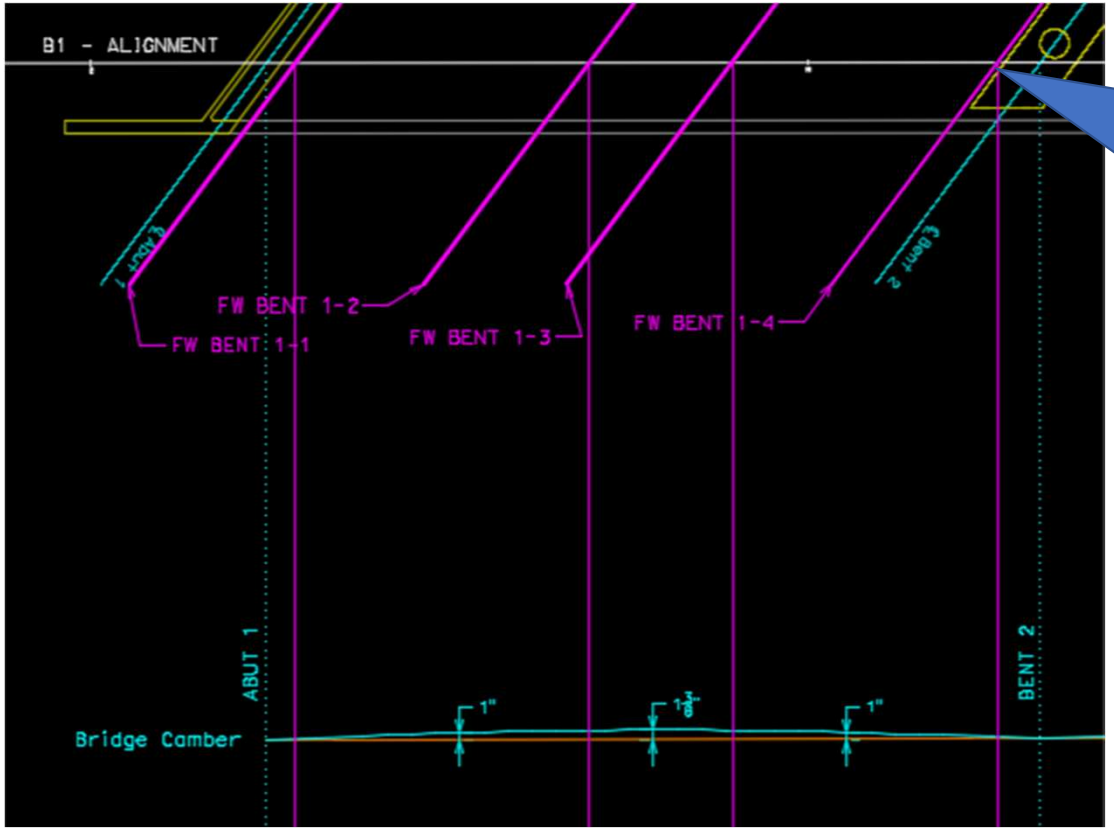
LABEL FALSEWORK

1. Click the **ANNOTATE** tab
2. Change to "**Annotative**"
3. Select the **LINEAR** or **ALIGNED** and click each intersection point.
4. Select Multileader to label bents.



It's good practice to label your drawing and verify all dimensions.

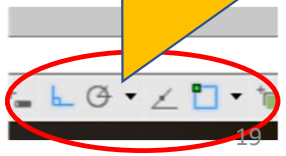
CAMBER AT FW BENT



Reminder:
Line – type "**L**" spacebar
Copy– type "**CO**" spacebar

1. Draw a line at the intersection point of the falsework bent and the bridge alignment. Project the line down to your bridge camber drawing below.
2. Copy this line for each falsework bent.

Make sure your OROTHO and intersection OSNAP is **ON**

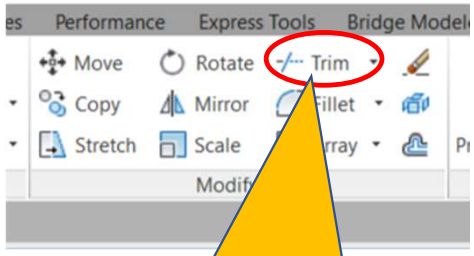


CAMBER AT FW BENT

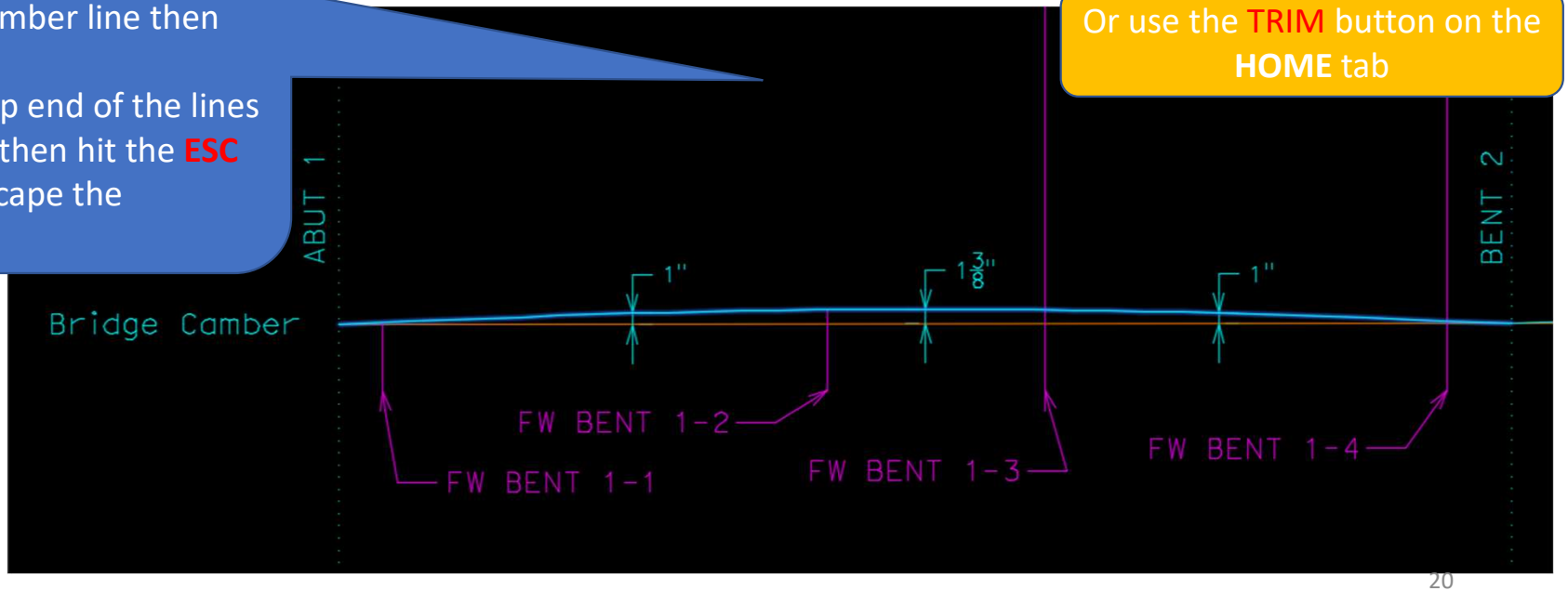
Trim the projected lines for the falsework bents to the bridge camber line.

3. Type "**TR**" **spacebar** and select the camber line then **spacebar**.
4. Select the top end of the lines to trimmed, then hit the **ESC** button to escape the command.

Reminder:
Trim – type "**TR**" spacebar
Extend – type "**EX**" spacebar

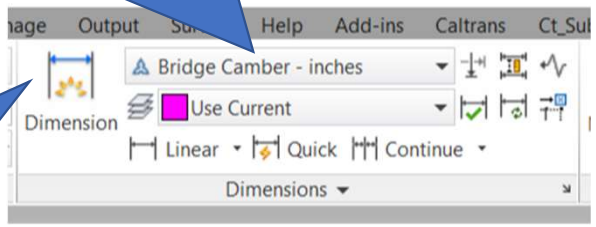


Or use the TRIM button on the **HOME** tab



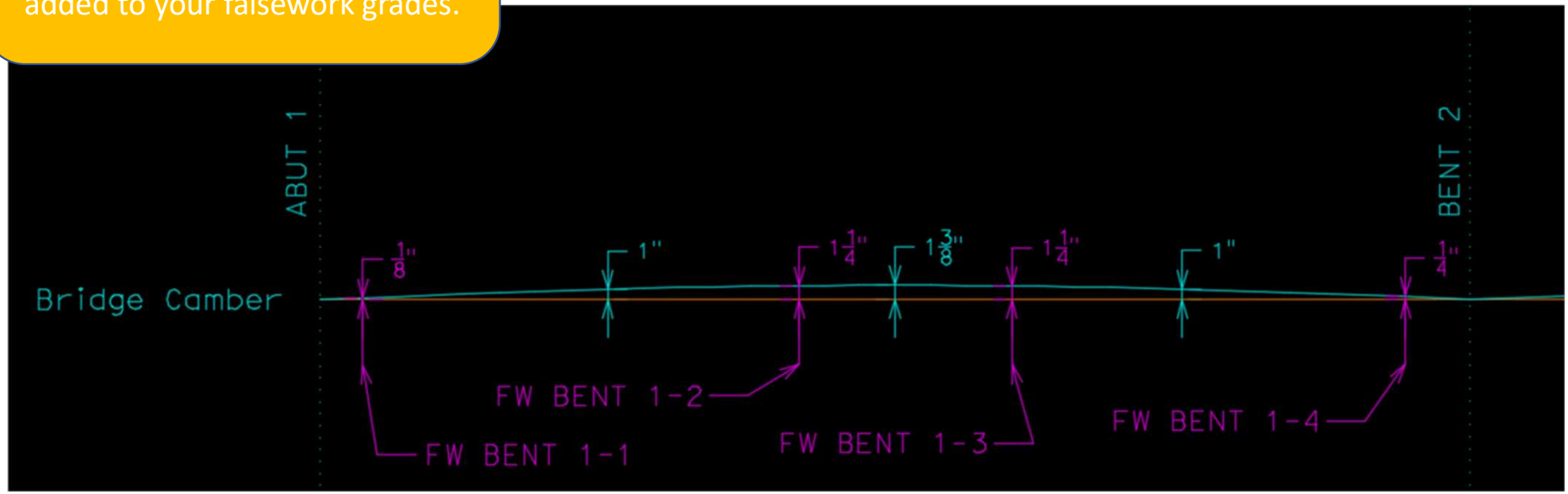
CAMBER AT FW BENT

5. On the **ANNOTATE** tab, change the Dimension Style to read in inches



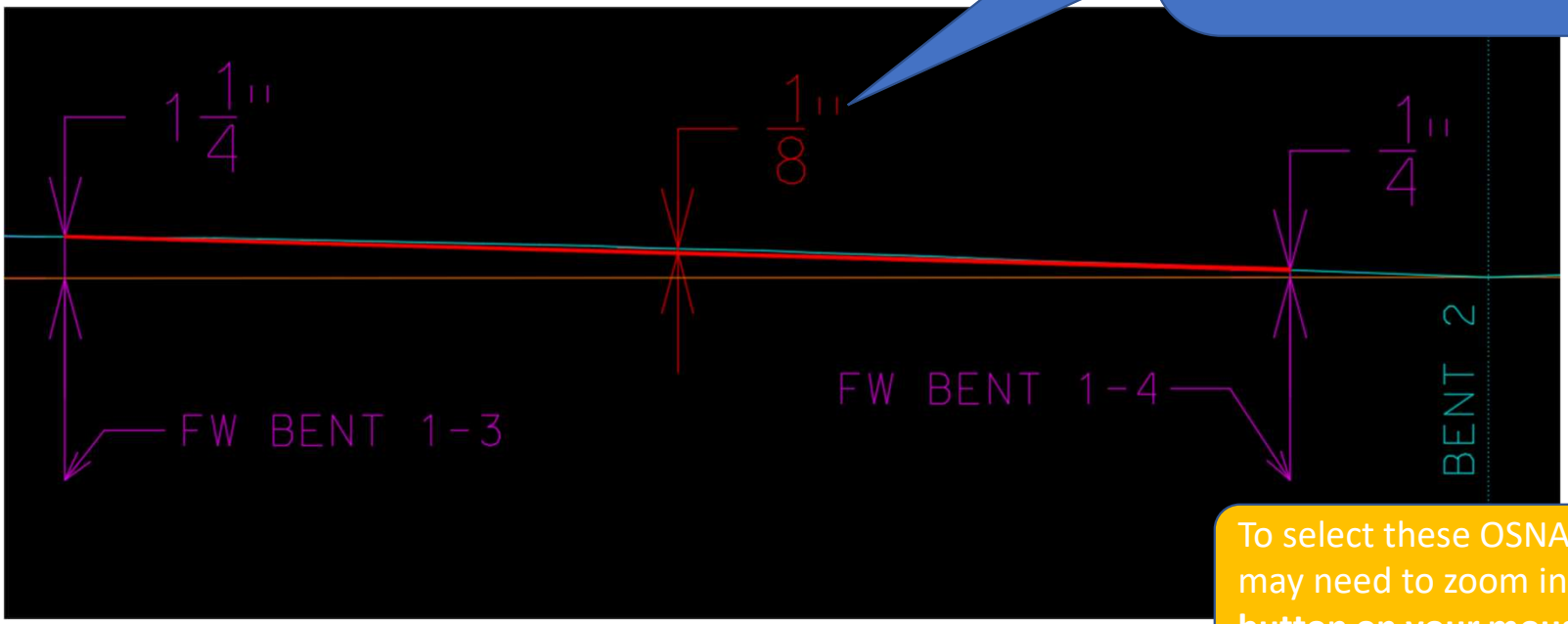
6. Click Dimension and select the two ends of each line.

Label the dimensions of the camber height at each falsework bent. This dimensions will be added to your falsework grades.



CAMBER STRIPS

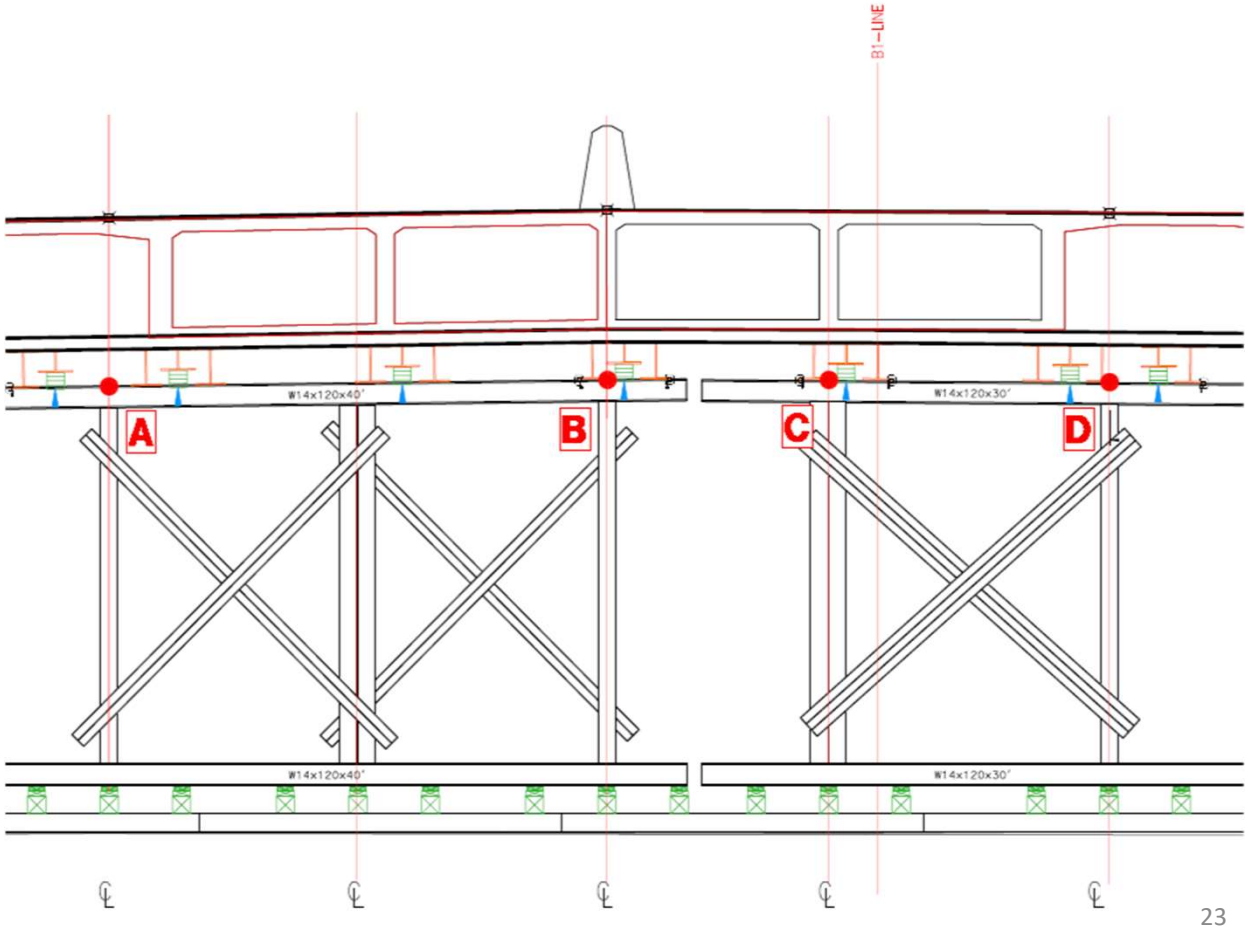
1. Draw a line from the top of one falsework bent to the other. Snap to each endpoint, **OSNAP** should be on.
2. At the midpoint, draw a vertical line upward, **ORTHO** should be on.
3. Label the dimension.
4. Repeat for ¼ lengths as needed.



To select these OSNAP points you may need to zoom in. Use the **scroll button on your mouse** to zoom.

DECK ELEVATIONS AT FALSEWORK POSTS

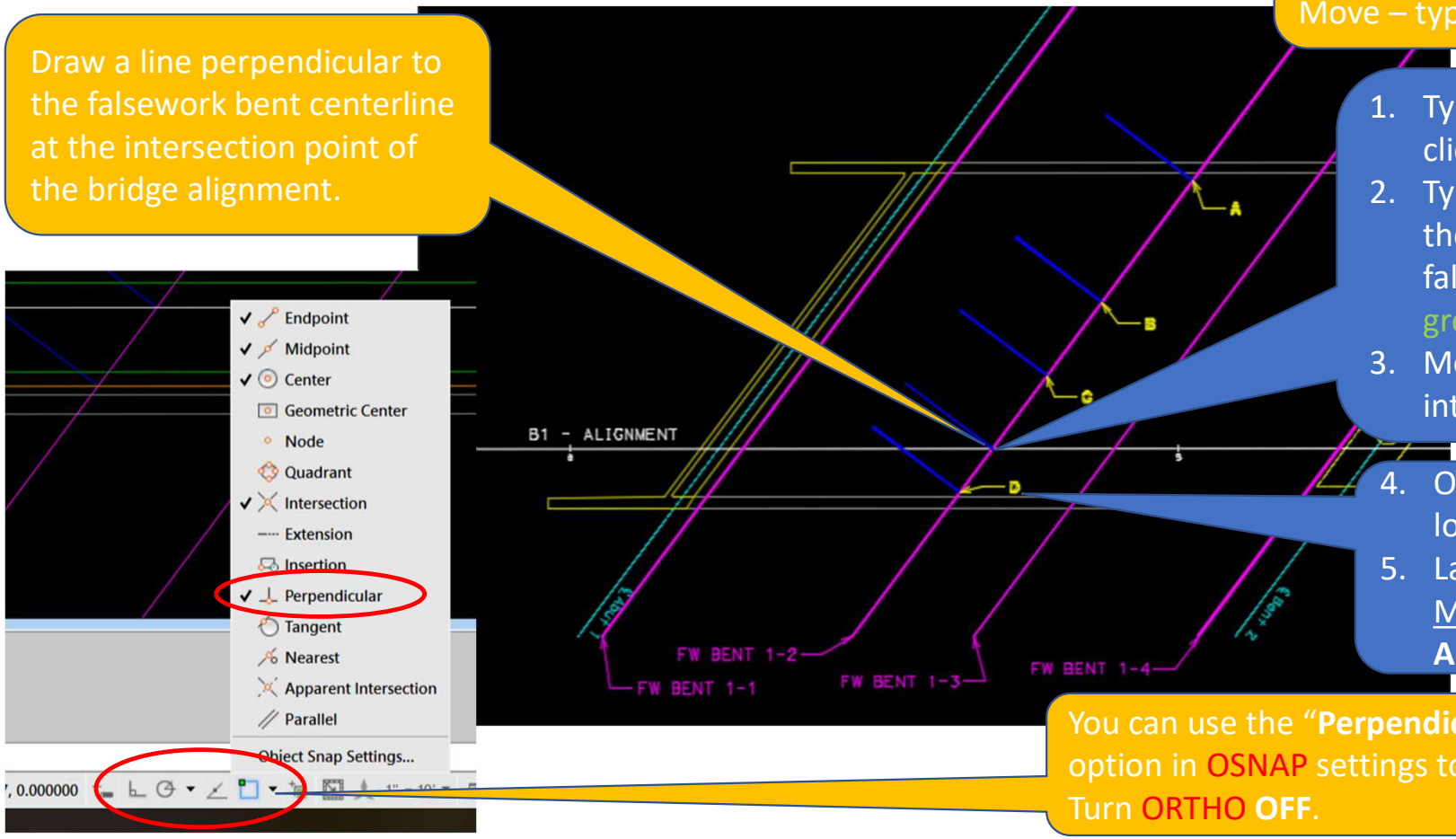
Your Contractor should provide you with a falsework post layout. Pay attention to the offset of the post dimensions, verify if these dimensions are normal to the bridge or along the skew.



DECK ELEVATIONS AT FW POSTS

Reminder:
Line – type "**L**" spacebar
Offset – type "**O**" spacebar
Move – type "**M**" spacebar

Draw a line perpendicular to the falsework bent centerline at the intersection point of the bridge alignment.



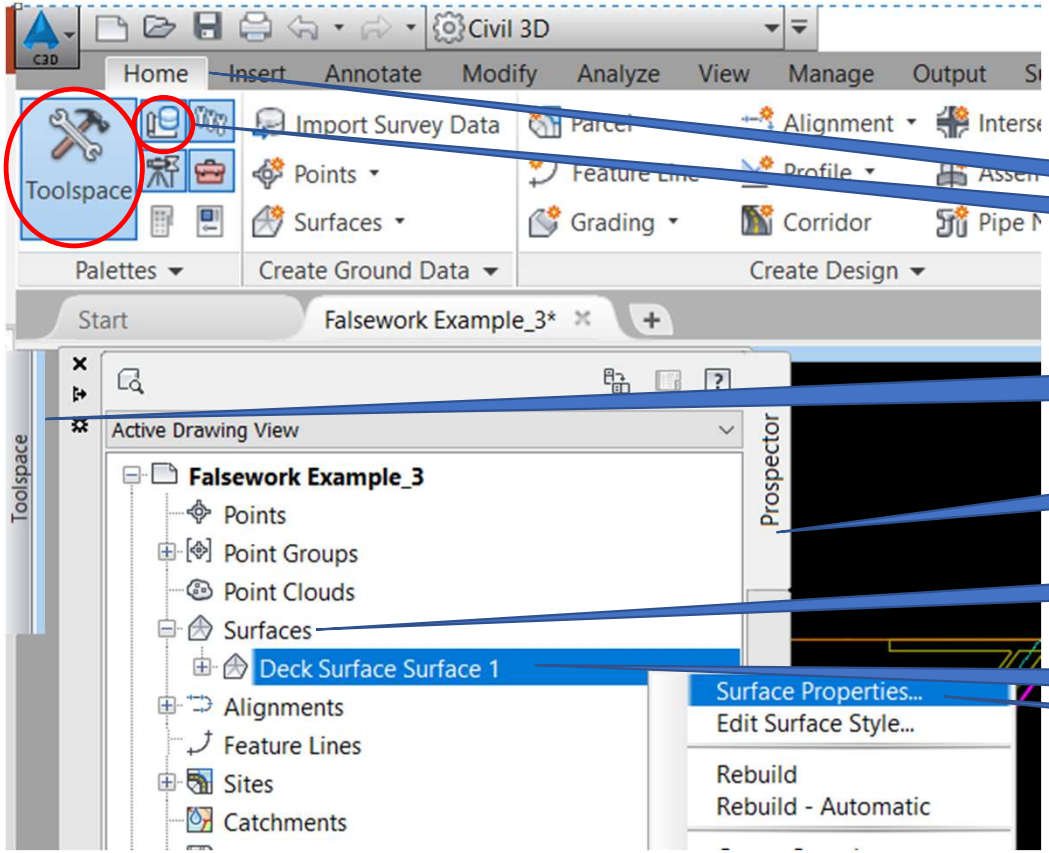
1. Type "**L**" **spacebar**, then click on the screen.
2. Type "**PER**" **spacebar**, then select the falsework centerline, a green angle will appear.
3. Move this line to the intersection point.
4. Offset lines to each post location.
5. Label post with Multileader, under the **ANNOTATE** tab.

You can use the "**Perpendicular**" option in OSNAP settings too.
Turn ORTHO **OFF**.

CREATE POINT ELEVATIONS

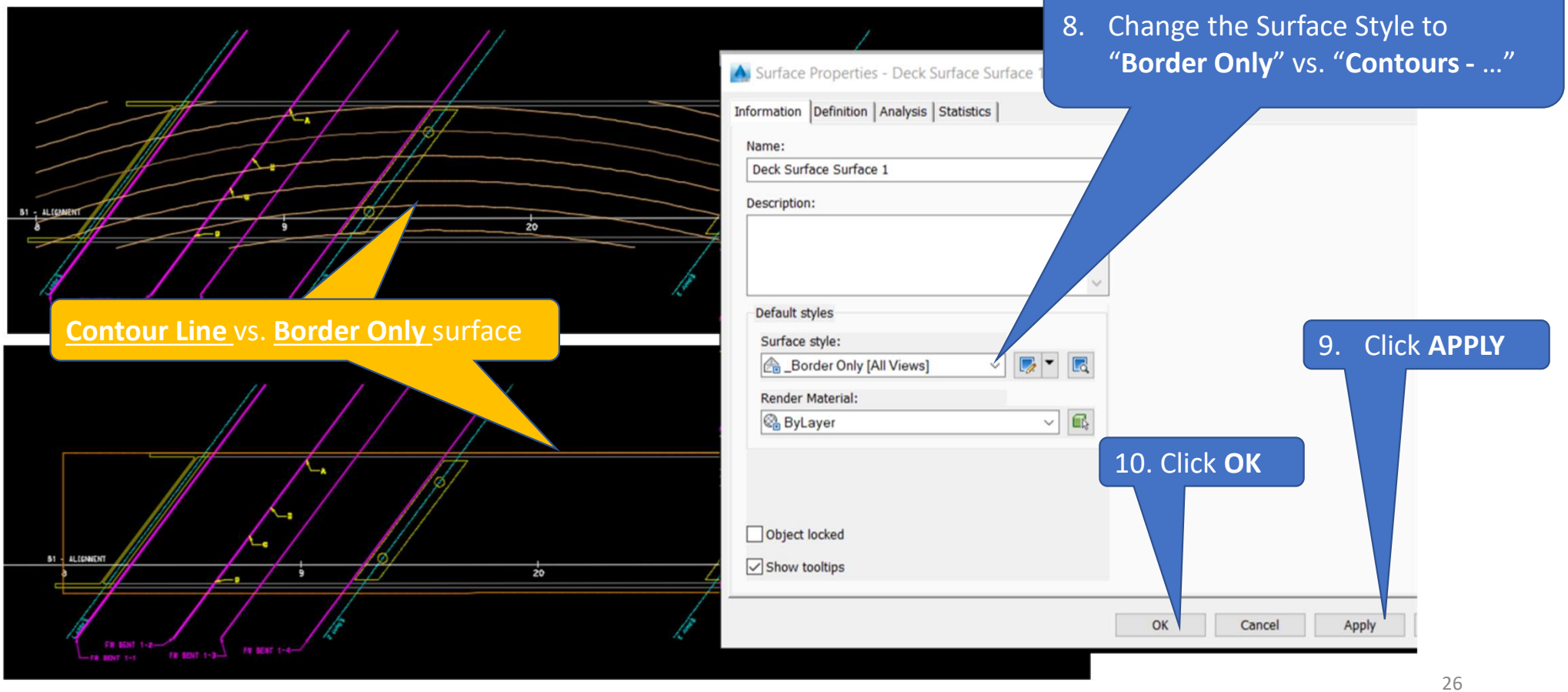
Traditionally a **4-Scale** uses contour lines for the deck surface however, it is easier to work with a surface as "**Border Only**". This will eliminate errors while using OSNAP.

If your surface is "**Border Only**" already you can **skip** this and go to slide 27.



1. Click the **HOME** tab
2. Make sure **TOOLSPACE** and "**Prospector**" are **ON**
3. Move your cursor across the docked **TOOLSPACE** if it is not already open
4. Click the **PROSPECTOR** side tab
5. Expand "**Surfaces**" by clicking the "**+**"
6. **Right** click on the "**Deck Surface…**"
7. Click on "**Surface Properties**"

DECK ELEVATIONS AT FW POSTS



DECK ELEVATIONS AT FW POSTS

1. Click the **ANNOTATE** tab
2. Click **ADD LABELS**
3. Select "**Surface**"
4. Select "**Spot Elevation**"
5. Click **ADD**
6. Click post locations

Unlike your 2D linework on the bridge layout, the Deck Surface is in 3D. From this surface you can get a deck elevation at any point.

If the elevation points are too small to read, Zoom **OUT** and regenerate the model. Type "**RE**" spacebar and zoom back in.

See the tutorial "**Create Deck Elevation Points**" on how to export points to Excel.