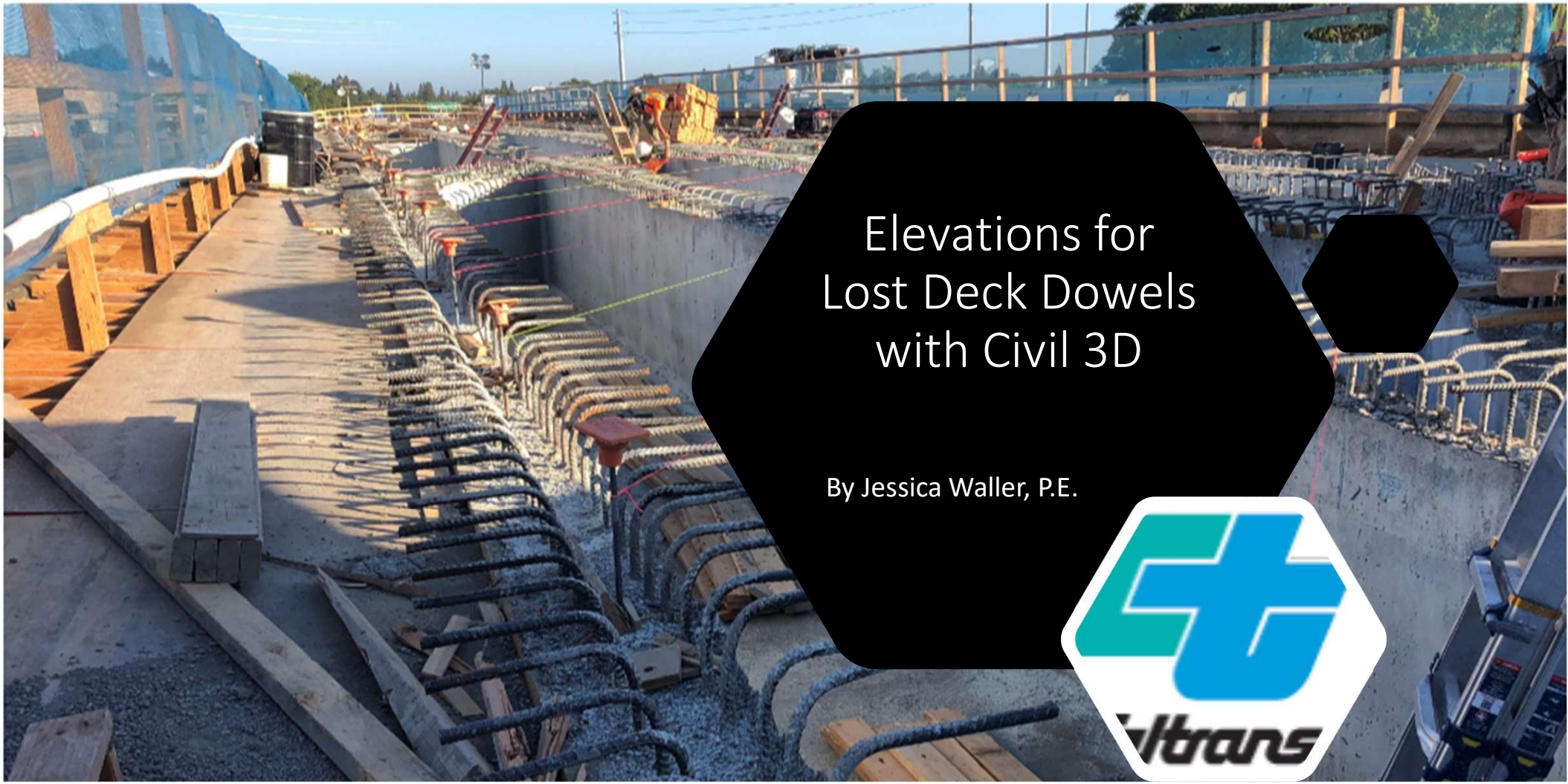


Elevations for Lost Deck Dowels with Civil 3D

By Jessica Waller, P.E.

Elevations for Lost Deck Dowels with 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. Label Drawing
7. Draw in Deck Dowel Bar Locations
8. Create Point Elevations
9. Export Elevations to Excel
10. Calculate Deck Grades with Excel

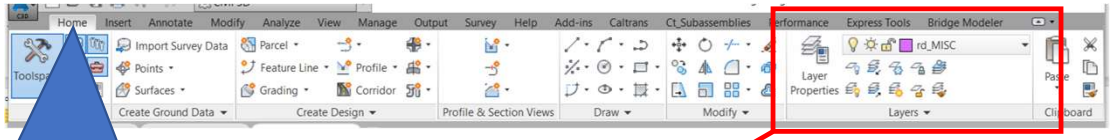
WHAT FILES YOU NEED

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.

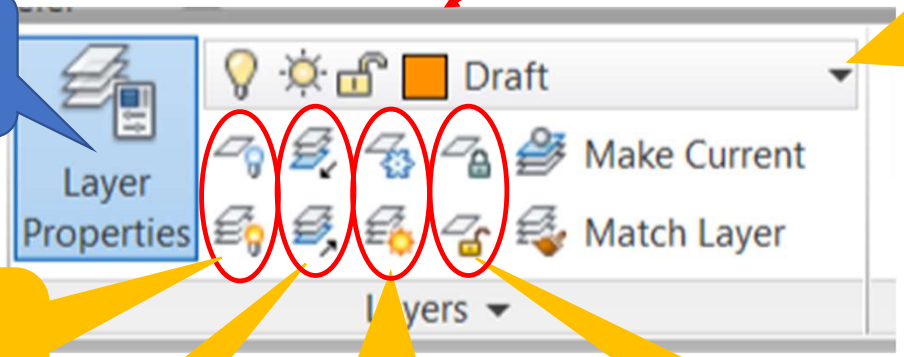
CREATE LAYERS

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**

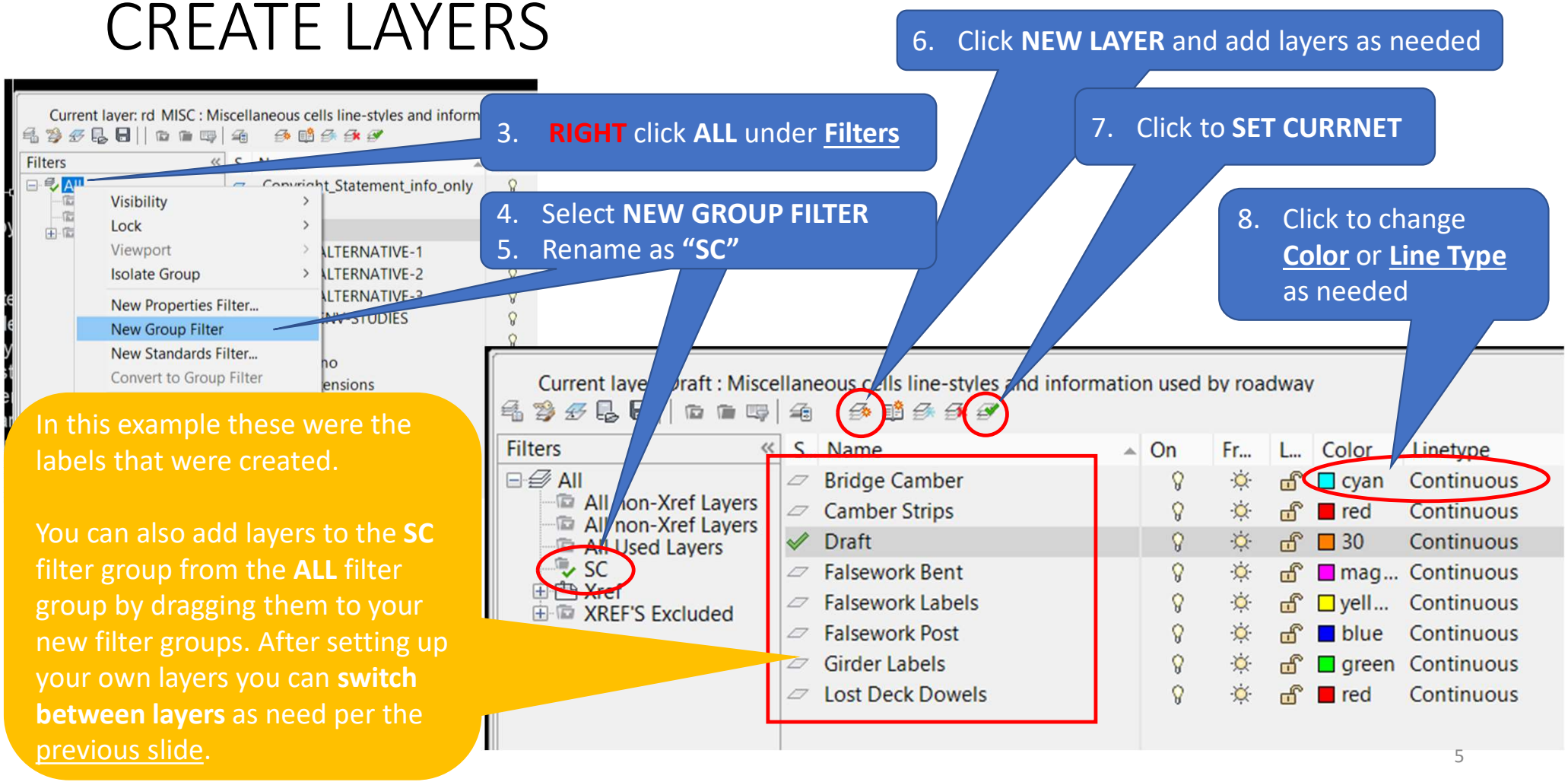
Layer **ON** and **OFF**. Allows you to reduce the line clutter.

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

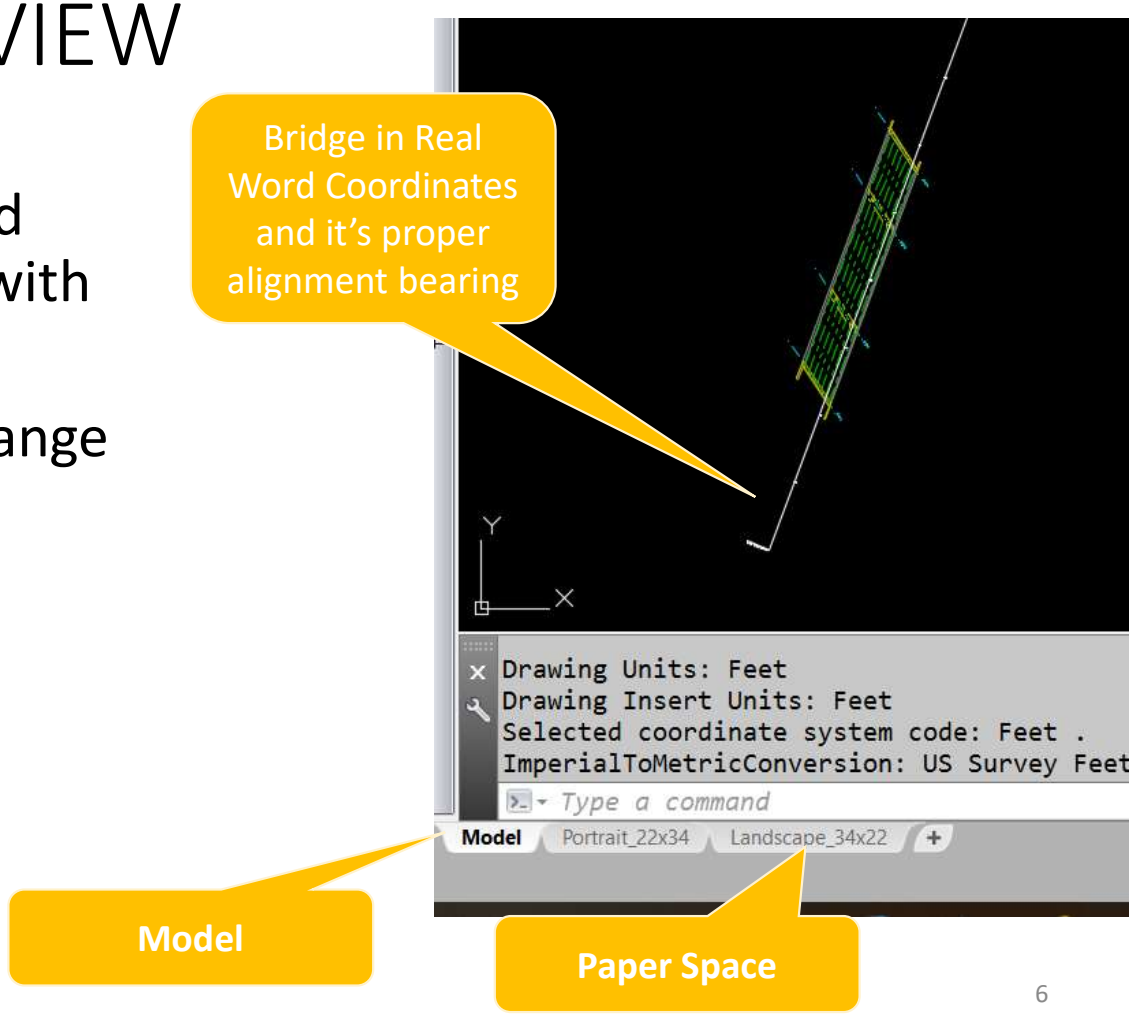


In this example these were the labels that were created.

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 TO 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.

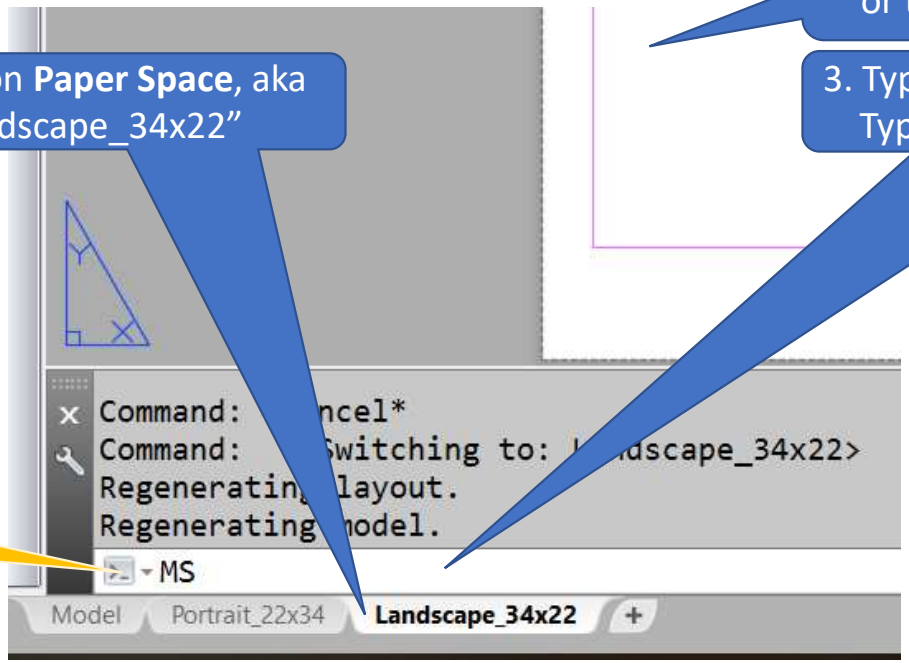


CHANGE TO PLAN VIEW

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

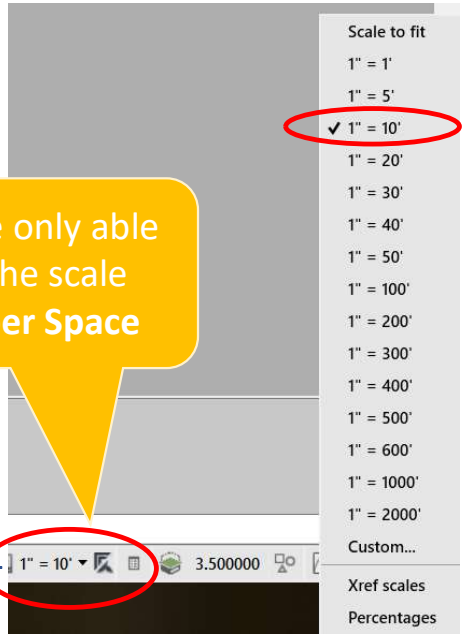
1. Click on **Paper Space**, aka "Landscape_34x22"

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



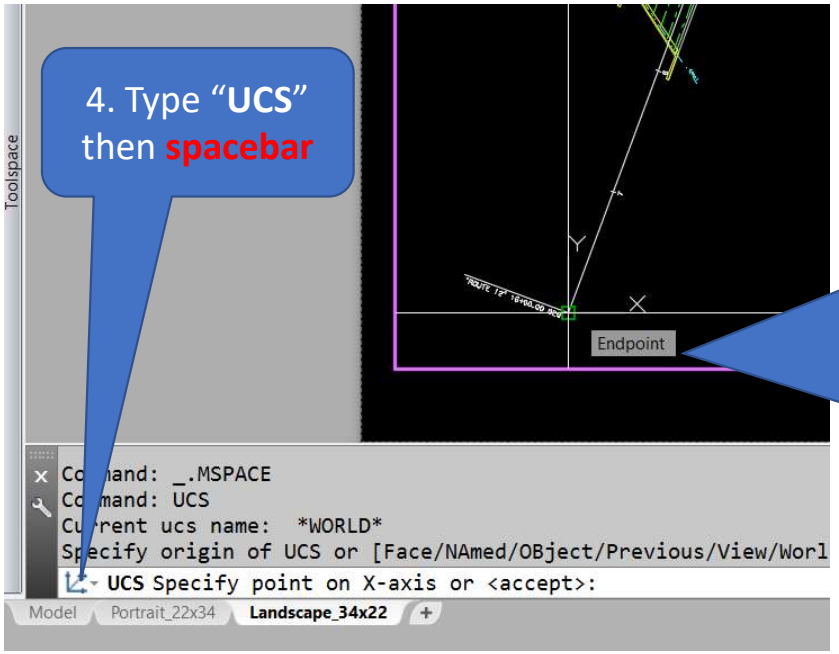
Command Bar

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

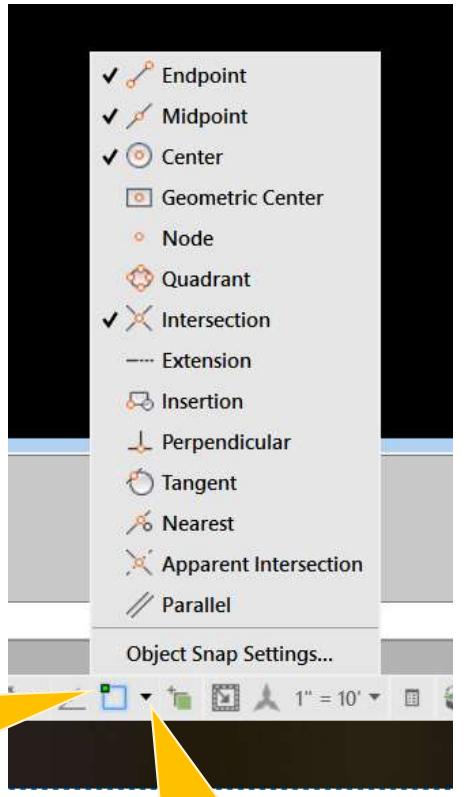


4. Pan to center your bridge in the viewport
5. Click the down arrow next to the Scale to Fit.
Select **1" = 10'**

CHANGE TO 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.

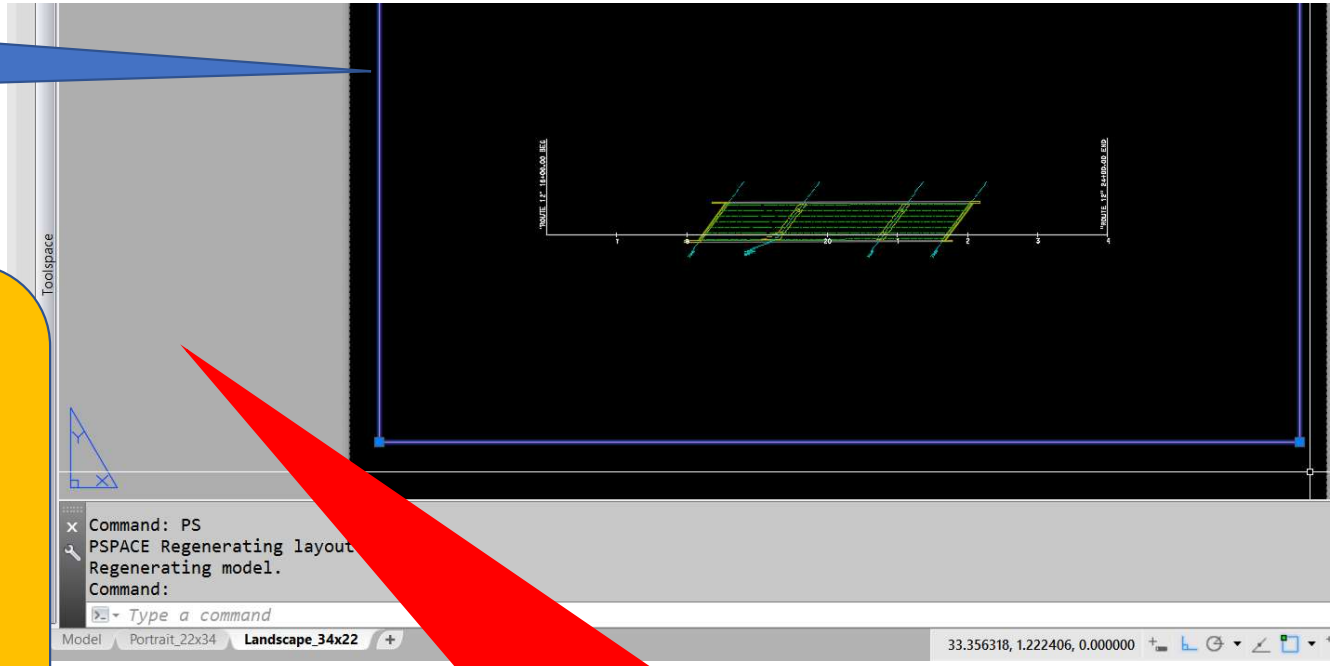
Select the down arrow to being up this menu

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**.

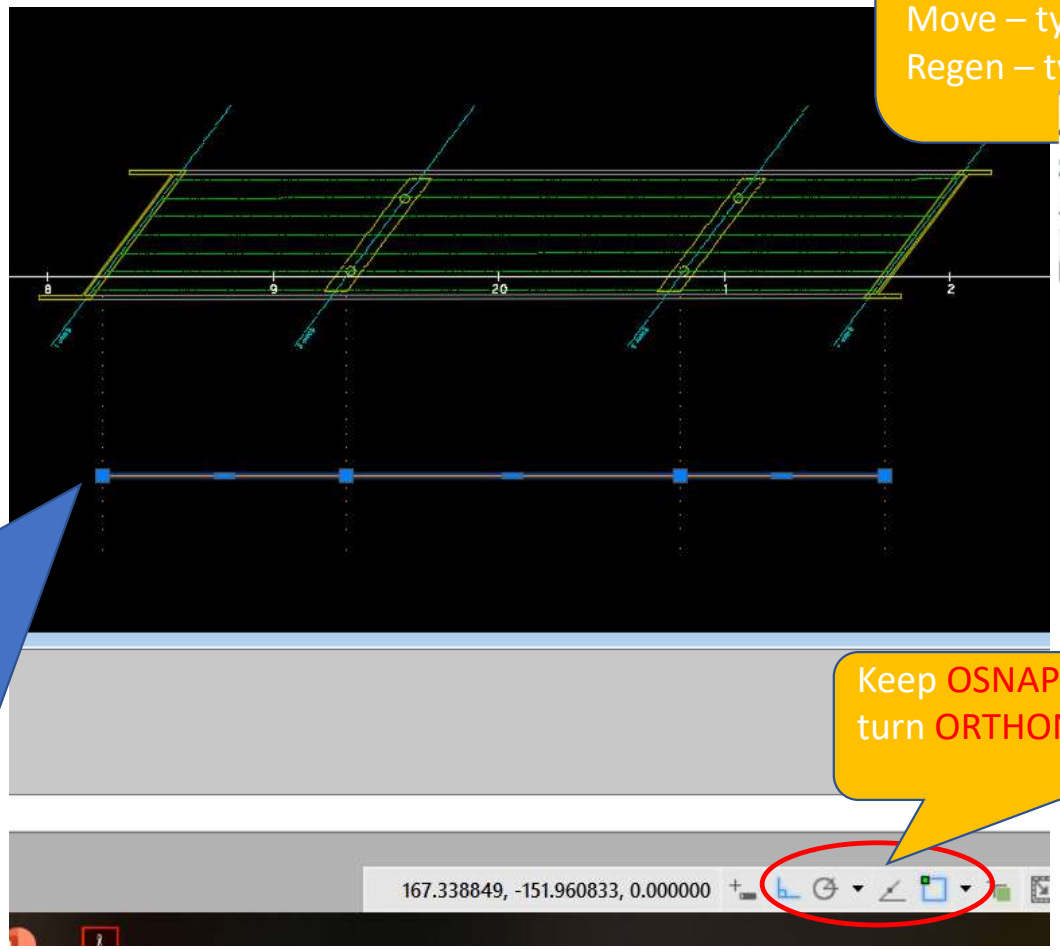
If you draw in Paper Space, the annotation will be off.



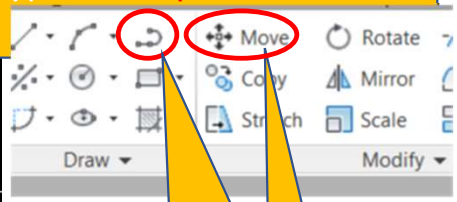
Before moving forward.
If you still see this gray space on your screen, your view has **NOT** expanded into **Model Space**. Type "PS" and repeat step 1.

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.



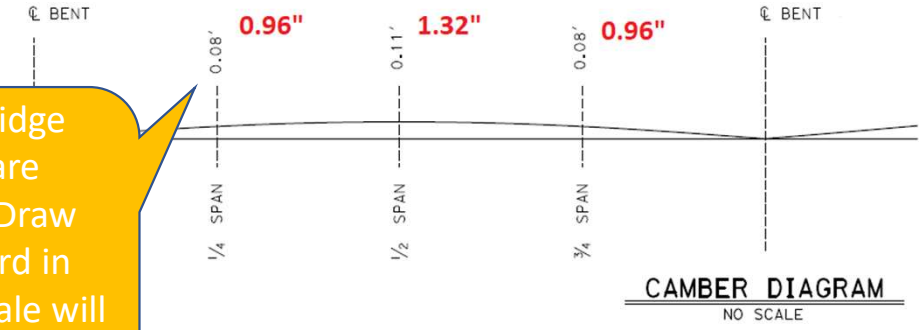
Reminder:
Polyline – type "**PL**" spacebar
Line – type "**L**" spacebar
Move – type "**M**" spacebar
Regen – type "**RE**" spacebar



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

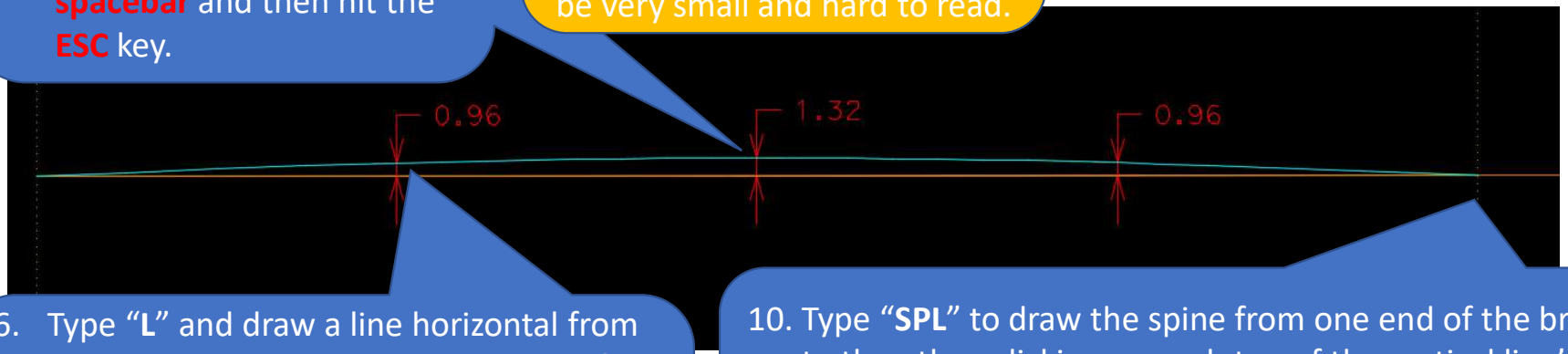
Keep OSNAP turned **ON** and turn ORTHOMODE **ON**

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.

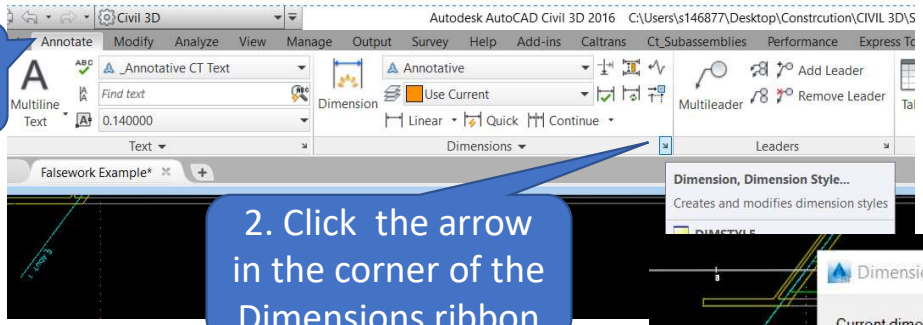


6. Type "**L**" and draw a line horizontal from endpoint to midpoint, the midpoint of this new line will give you the ¼ span.
7. Type "**L**" and draw the vertical lines upward at this new midpoint.
8. Repeat step 6 & 7 for ¾ span point.
9. Repeat for remaining span.

10. Type "**SPL**" to draw the spine from one end of the bridge to the other, clicking on each top of the vertical line's 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**

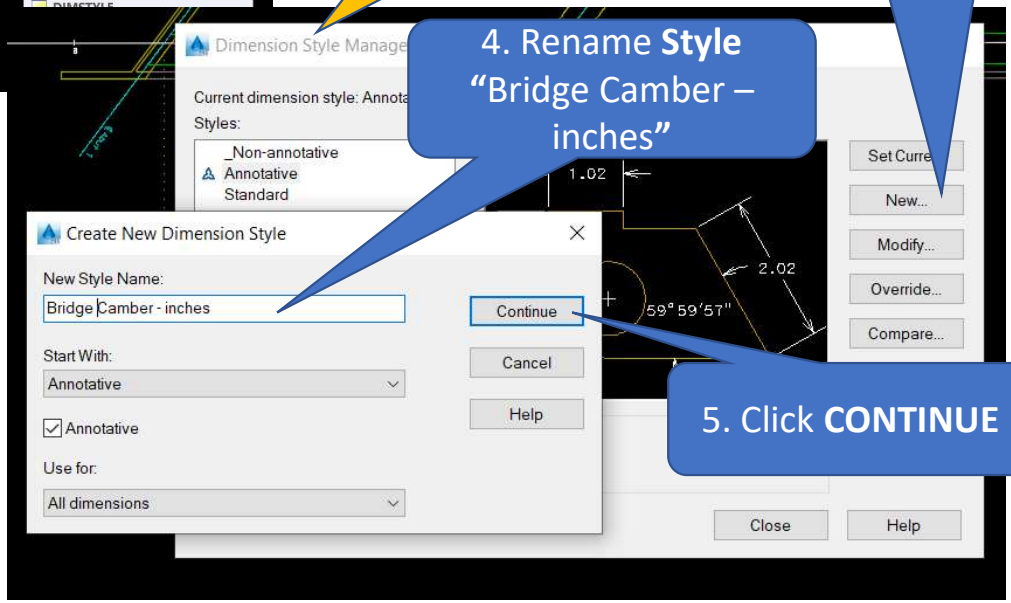


2. Click the arrow in the corner of the Dimensions ribbon

This opens up the **Dimension Style Manager**

3. Click **NEW…**

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

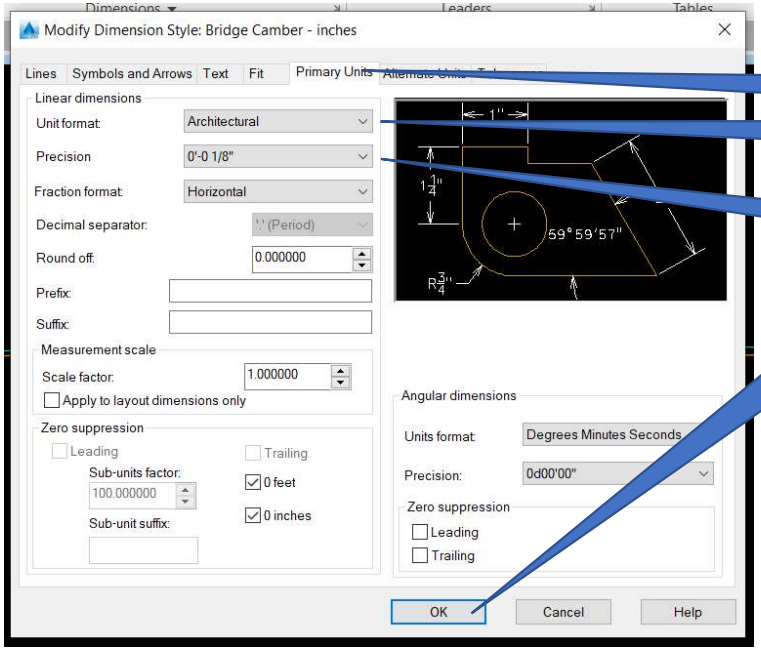


5. Click **CONTINUE**

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



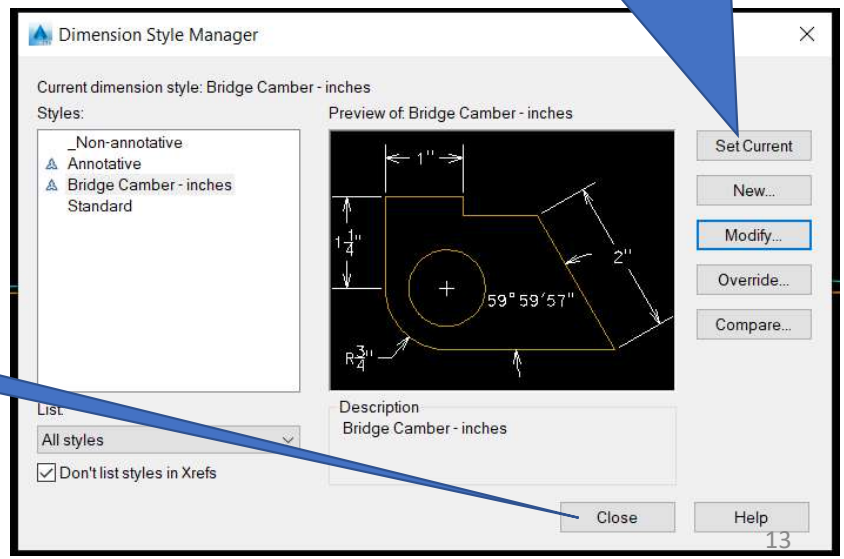
6. Click **PRIMARY UNITS** tab

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

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

9. Click **OK**

10. Click **SET CURRENT**



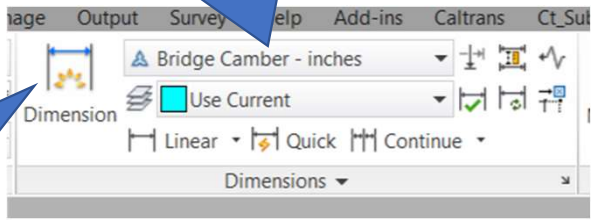
11. Click **CLOSE**

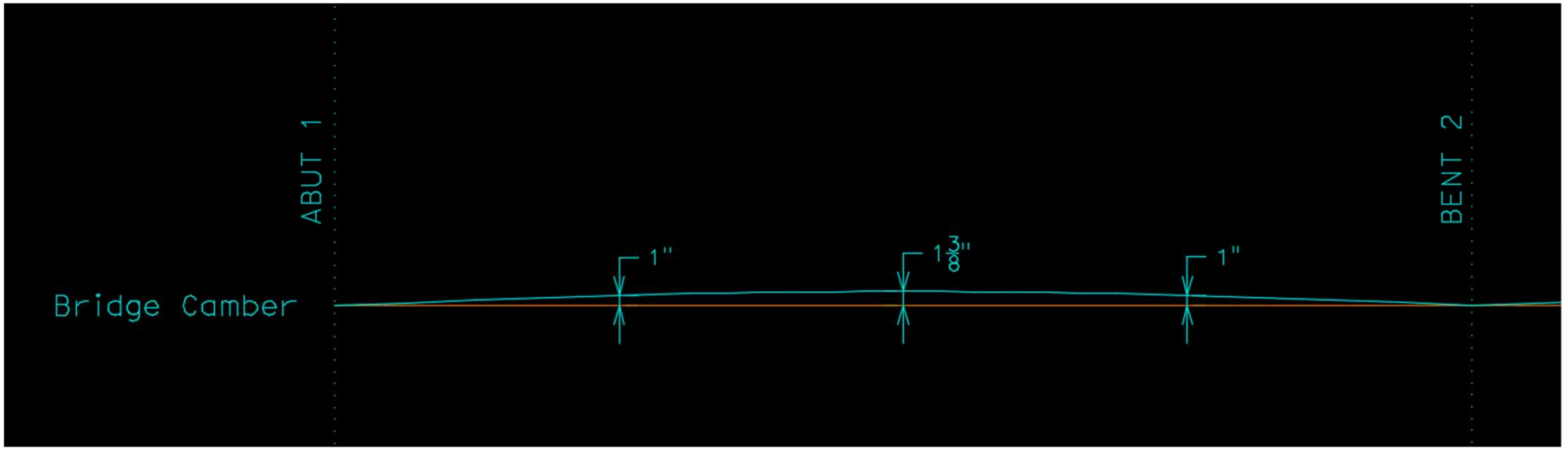
CREATE NEW DIMENSION STYLE

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.





LABEL DRAWING

1. Click the **ANNOTATE** tab

Click to add **TEXT**

Click to add **DIMENSION**

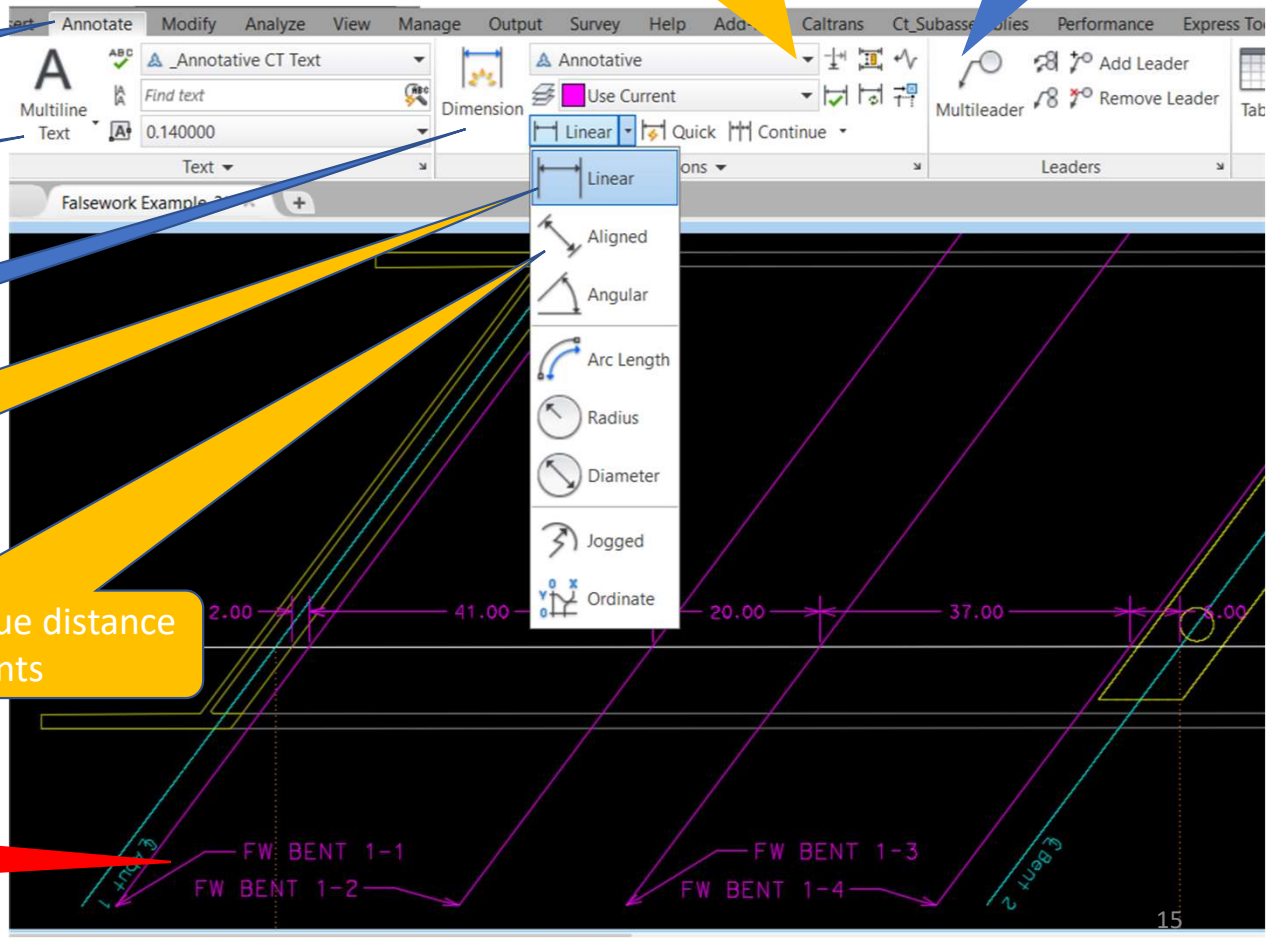
LINEAR – labels the dimension horizontal or vertical distance.

ALINDNED – labels the true distance between two points

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

Flip between the different **DIMENSION STYLES**

Click for **TEXT w/ LEADER**

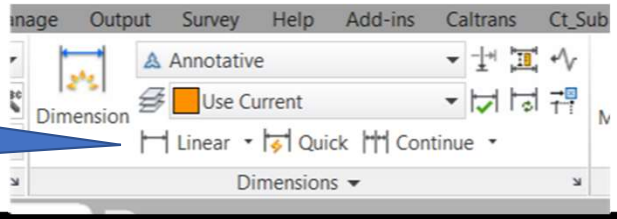


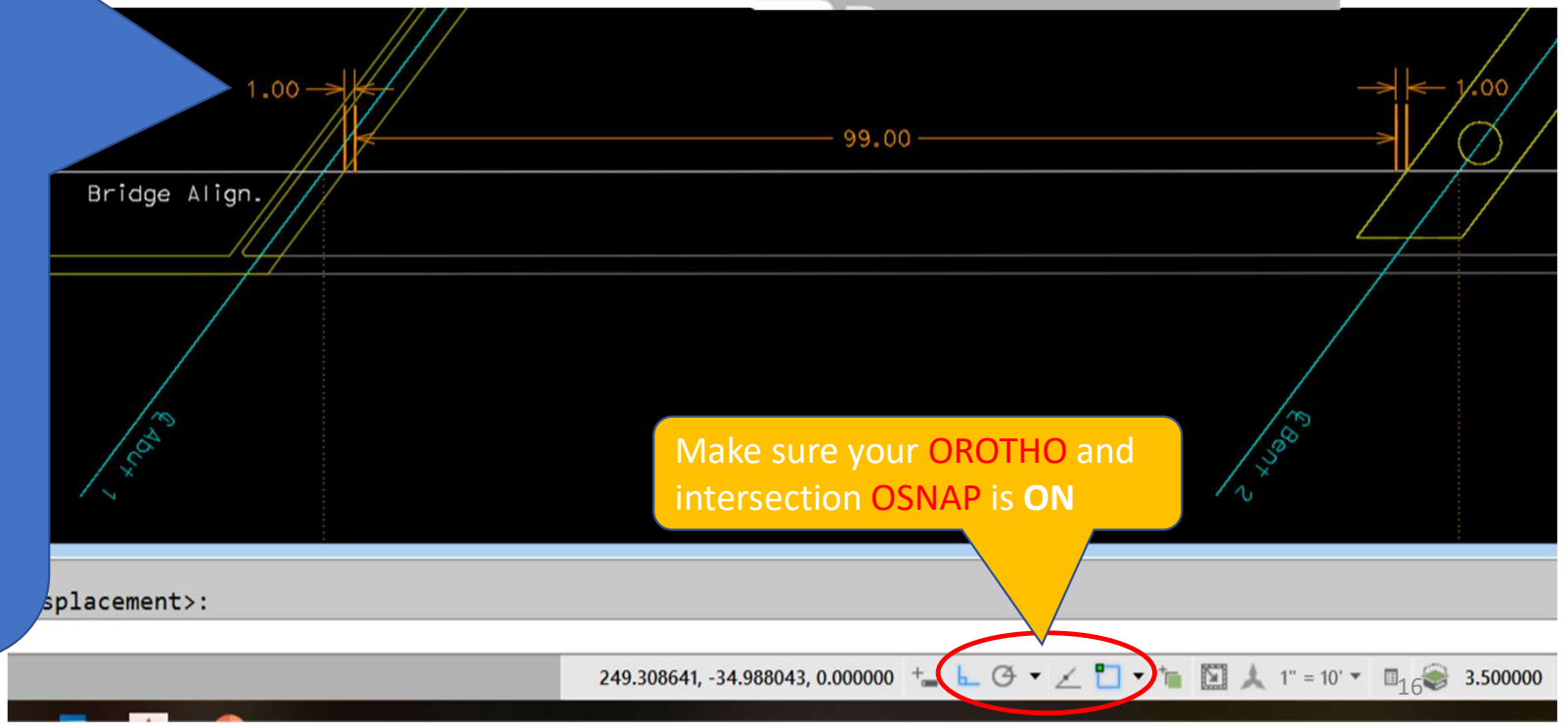
DRAW IN DECK DOWEL LOCATIONS

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

1. Draw a vertical line upward perpendicular to the bridge alignment at the intersection of the abut. face and one at the face of Bent 2.
2. Offset two parallel line from the abut and bent, Type "**O**" and **spacebar** then type a distance of 1-ft and **spacebar**
3. Click the line (object) and then select the side towards midspan.

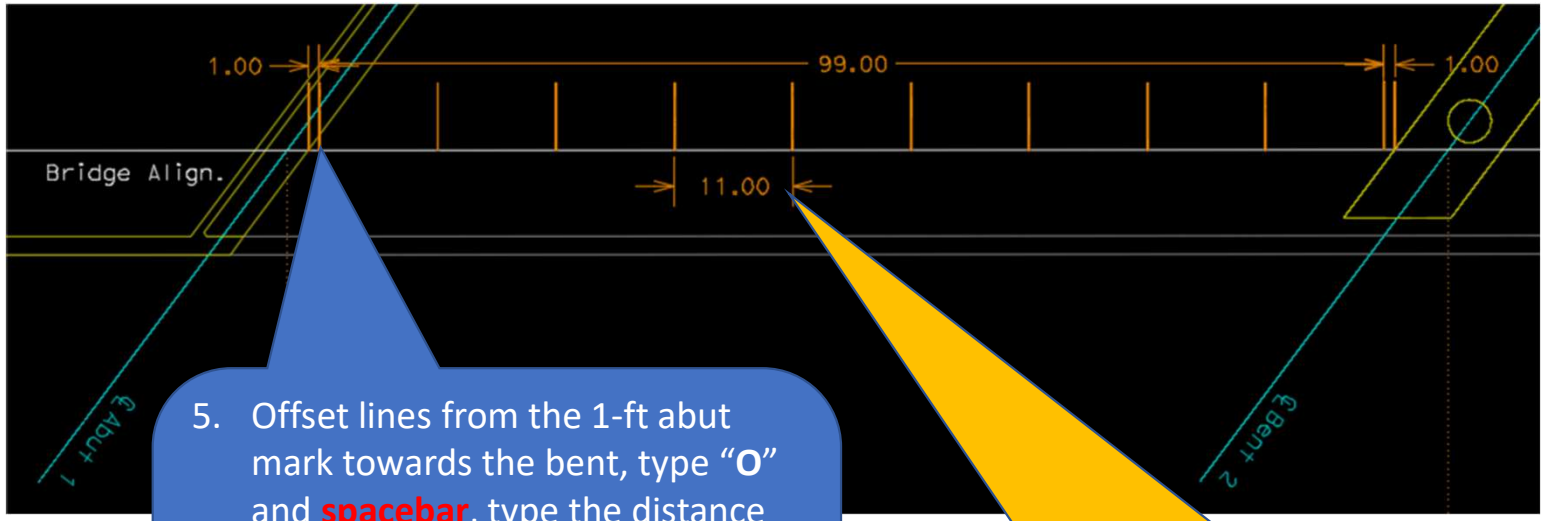
4. Click **LINEAR** and measure the distance between these two new lines.



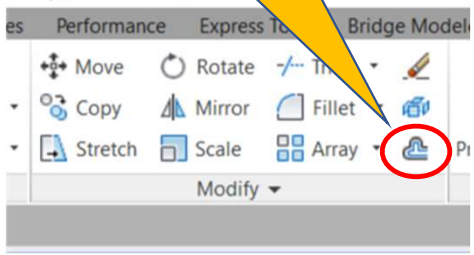


DRAW IN DECK DOWEL LOCATIONS

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



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

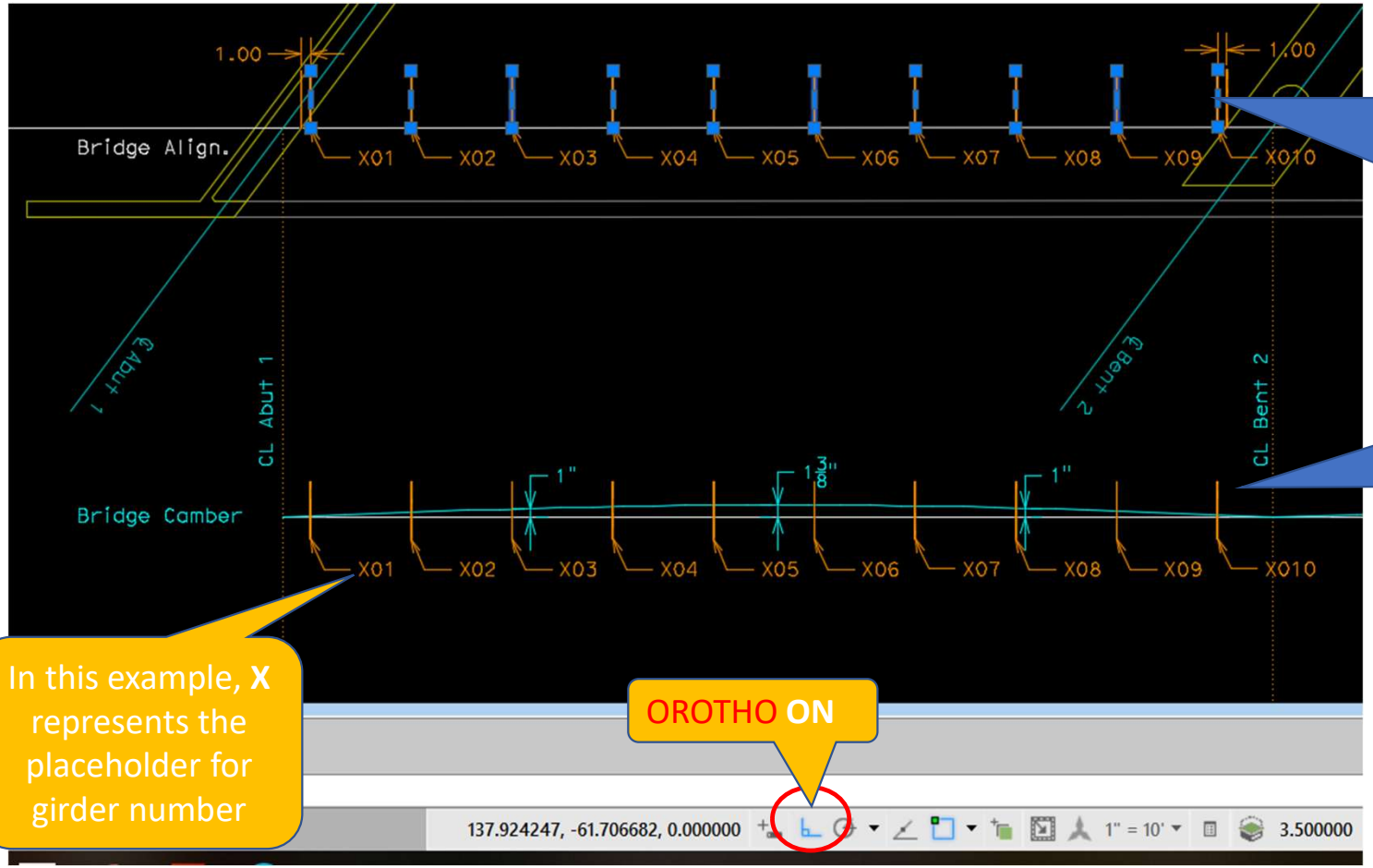


5. Offset lines from the 1-ft abut mark towards the bent, type "**O**" and **spacebar**, type the distance you just measured/9 **spacebar** (i.e. 99/9)
6. Click the line (object) and then select side towards the bent. Repeat until you reach the 1-ft mark from the face of bent.

You should have 9 equal spaces (or any spacing you like) between the 1-ft offset face of abutment and bent.

This will be your DECK DOWEL BAR spacing.

DRAW IN DECK DOWEL LOCATIONS



Reminder:
Copy – type "**CO**" spacebar
MOVE – type "**M**" spacebar
Regen – type "**RE**" spacebar

7. Select each of these line (the face of abut. and face of bent is NOT needed), type "**CO**" **spacebar**

8. Select anywhere on the screen and drag the copied lines to the bridge camber.

In this example, **X** represents the placeholder for girder number

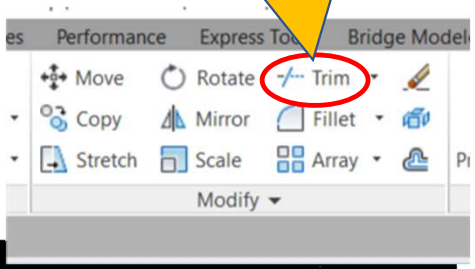
DRAW IN DECK DOWEL LOCATIONS

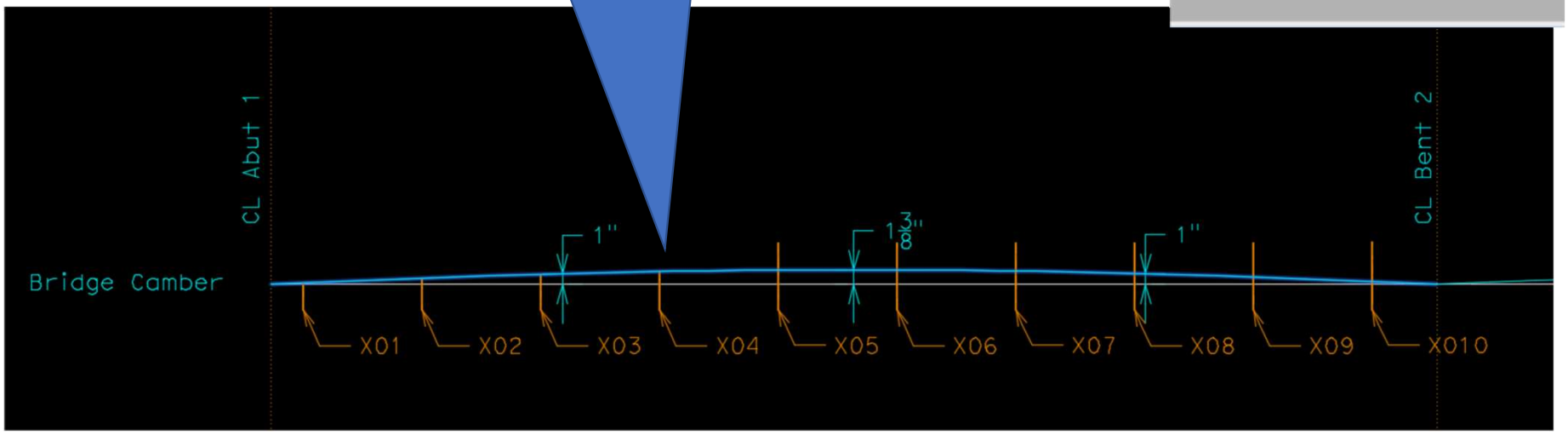
Trim the dowel bar location lines to the bridge camber line.

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

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

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



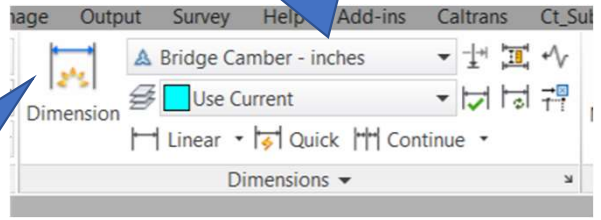


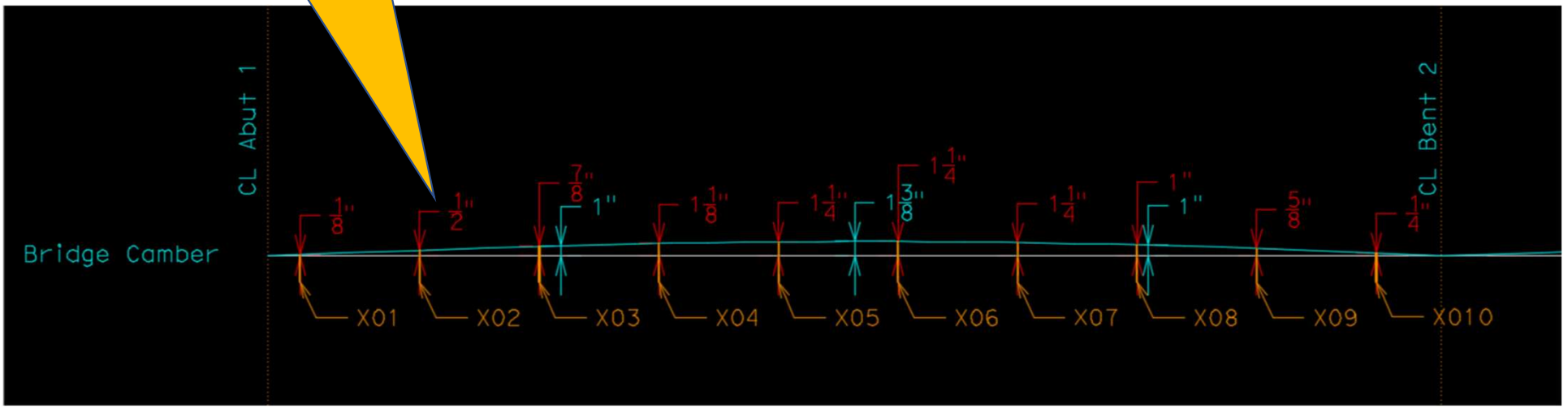
DRAW IN DECK DOWEL LOCATIONS

11. On the **ANNOTATE** tab, use the Dimension Style previously created

Label the bridge camber height at each of the dowel bar locations

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

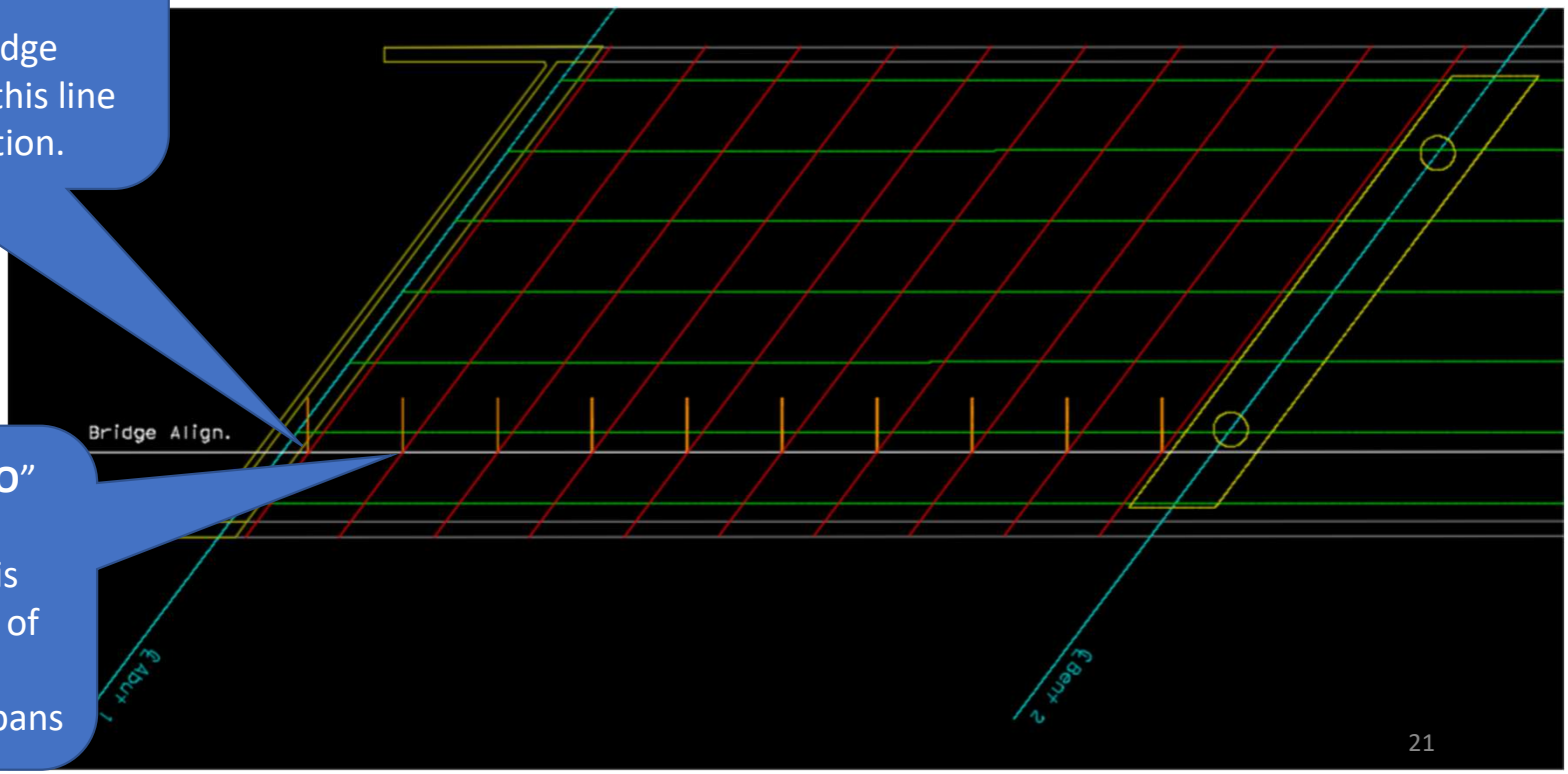




DRAW IN DECK DOWEL LOCATIONS

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

13. Draw a new line along the abutment centerline.
14. Select the line at the intersection of the bridge alignment and move this line to the dowel bar location.

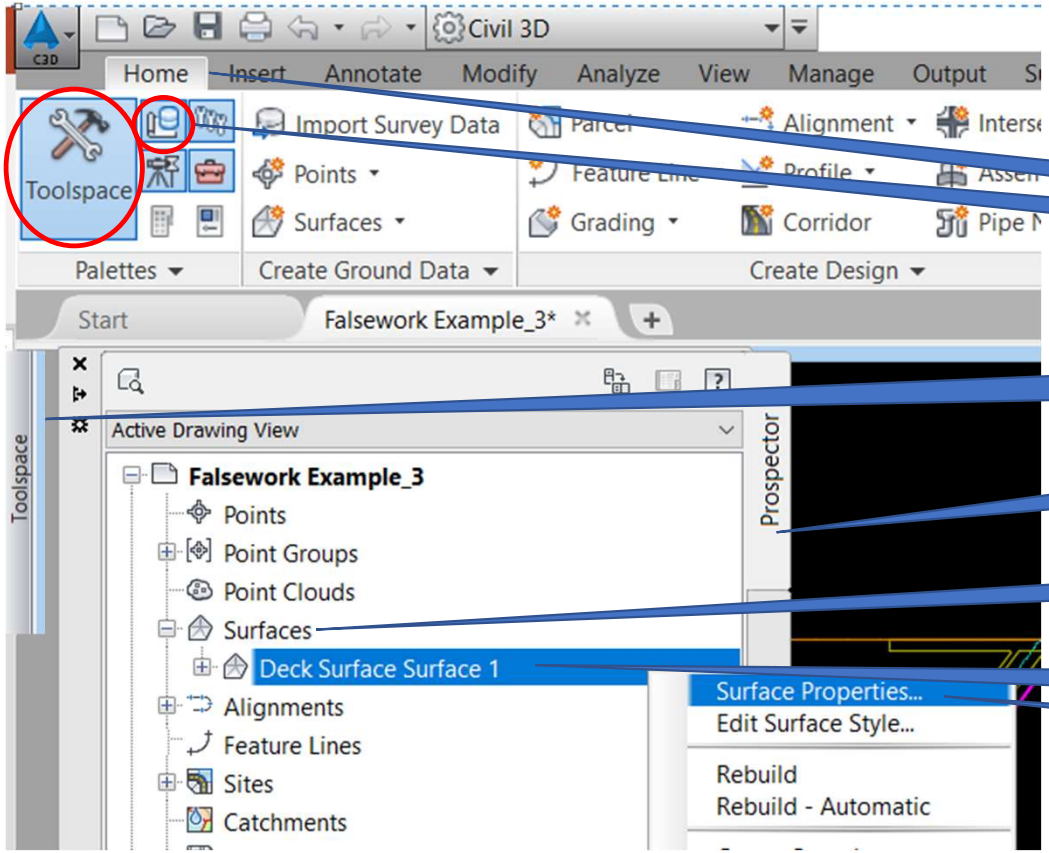


15. Select the line. Type "**CO**" **spacebar**, select the intersection point of this line and copy it to each of the other offset lines.
16. Repeat for remaining spans

CREATE POINT ELEVATIONS

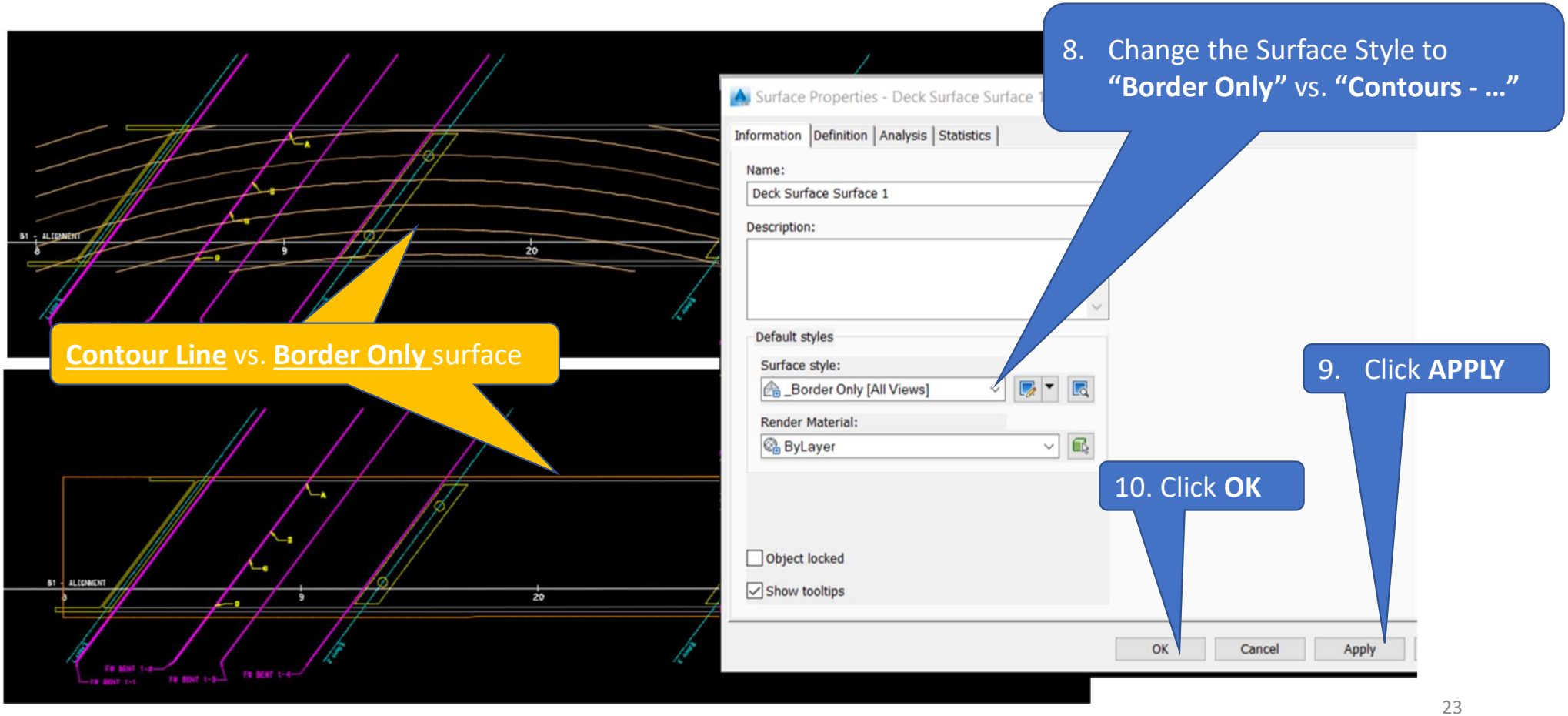
Traditionally a **4-Scale** uses contour lines for the deck surface however, it is easier to work with a surface as "**Border Only**". This will help eliminate errors while using OSNAP.

If your surface is "**Border Only**" already you can **skip** this and go to slide 24.



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**"

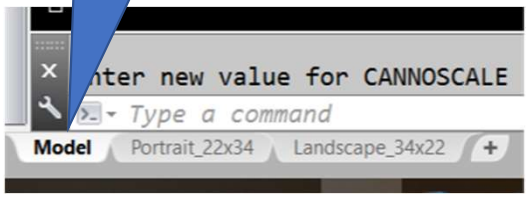
CREATE POINT ELEVATIONS



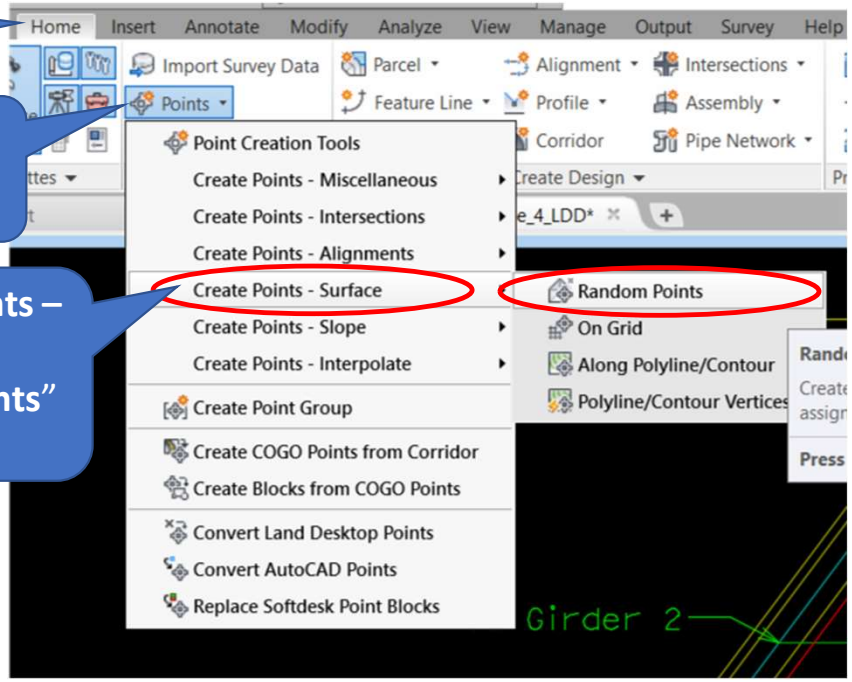
CREATE POINT ELEVATIONS

The size of the text for points is easier to read within the **MODEL** than in Paper Space. Suggest switching to Model Space.

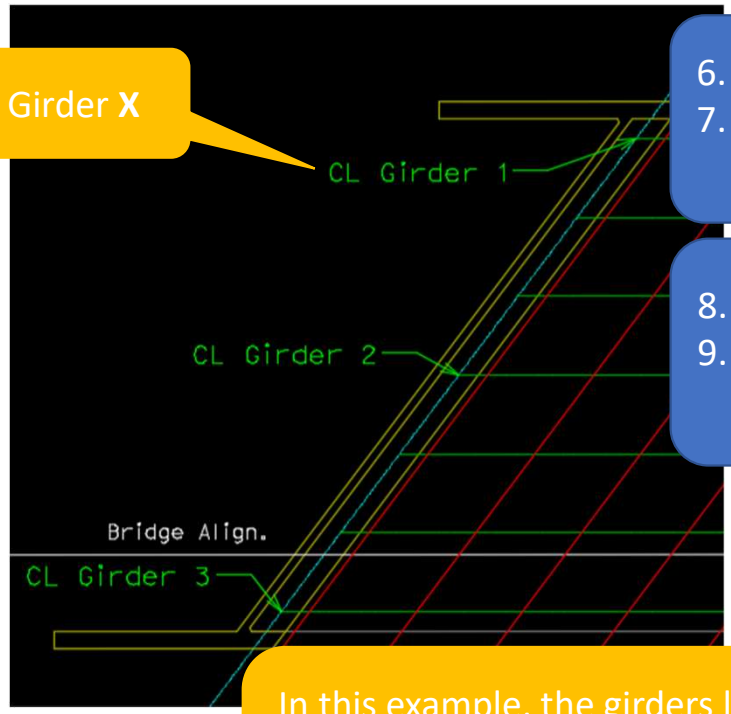
1. Switch to **MODEL** space



2. Click **HOME** tab
3. Click **POINTS** (under CREATE GROUND DATA)
4. Select "**Create points – Surface**"
5. Click "**Random Points**"

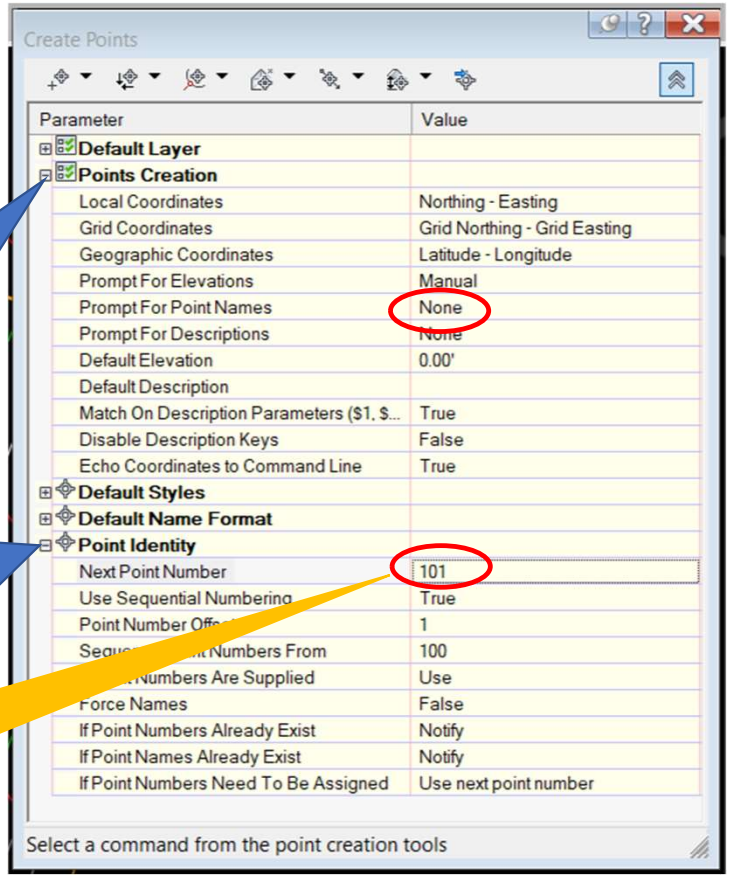


CREATE POINT ELEVATIONS



6. Expand Points Creation
7. Change "**Prompt for Point Names**" to read "**NONE**"

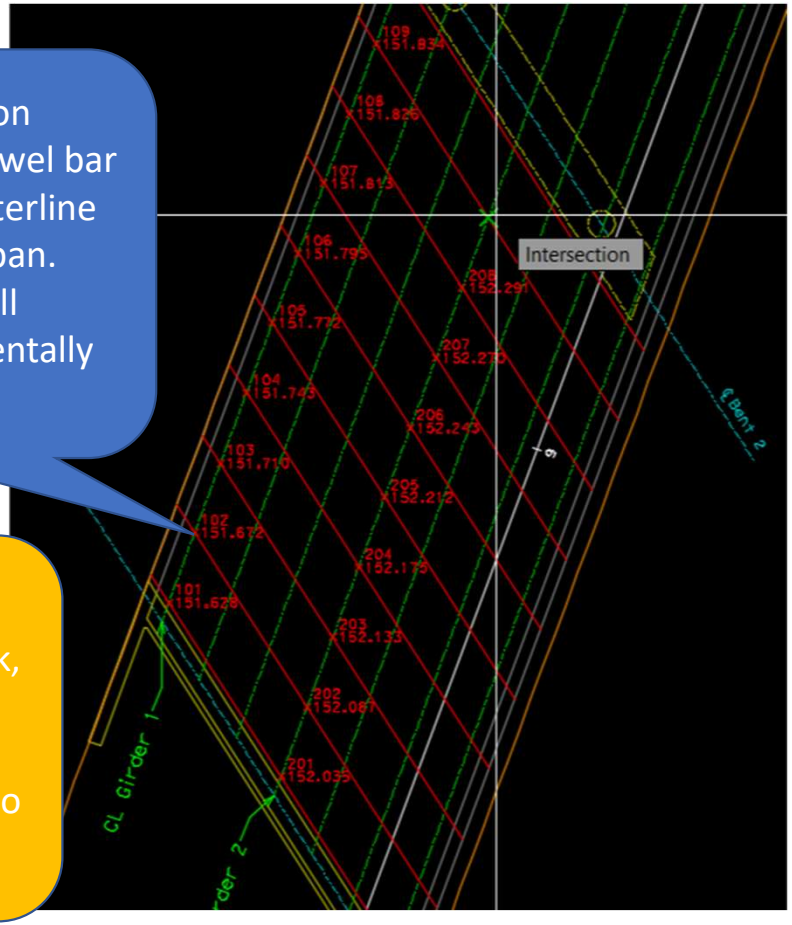
8. Expand Point Identify
9. Change the "**Next Point Number**" as need



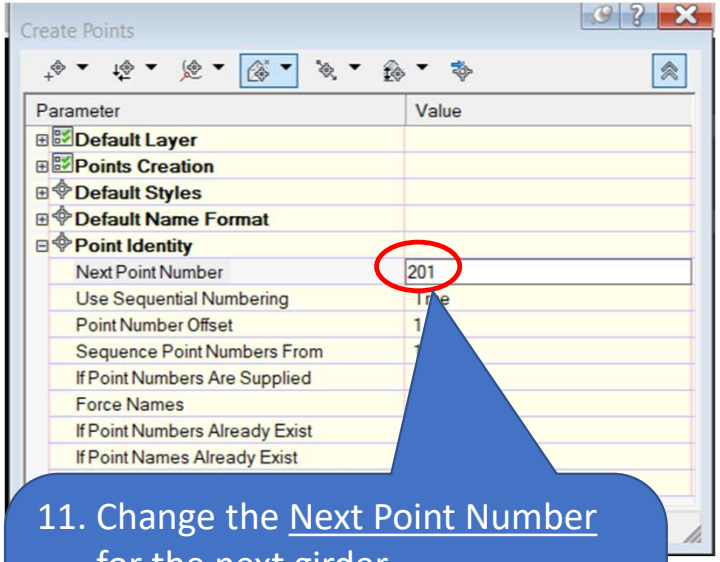
In this example, the girders labeled 1, 2 & 3 will have lost deck dowel bars. For tracking purposes, the points for Girder 1 will be labeled in the **100's**, Girder 2 will be in the **200's**, Girder 3 will be in the **300's**.

CREATE POINT ELEVATIONS

10. Select each intersection point between the dowel bar locations and the centerline of Girder 1 for each span. The point numbers will automatically incrementally increase by one.



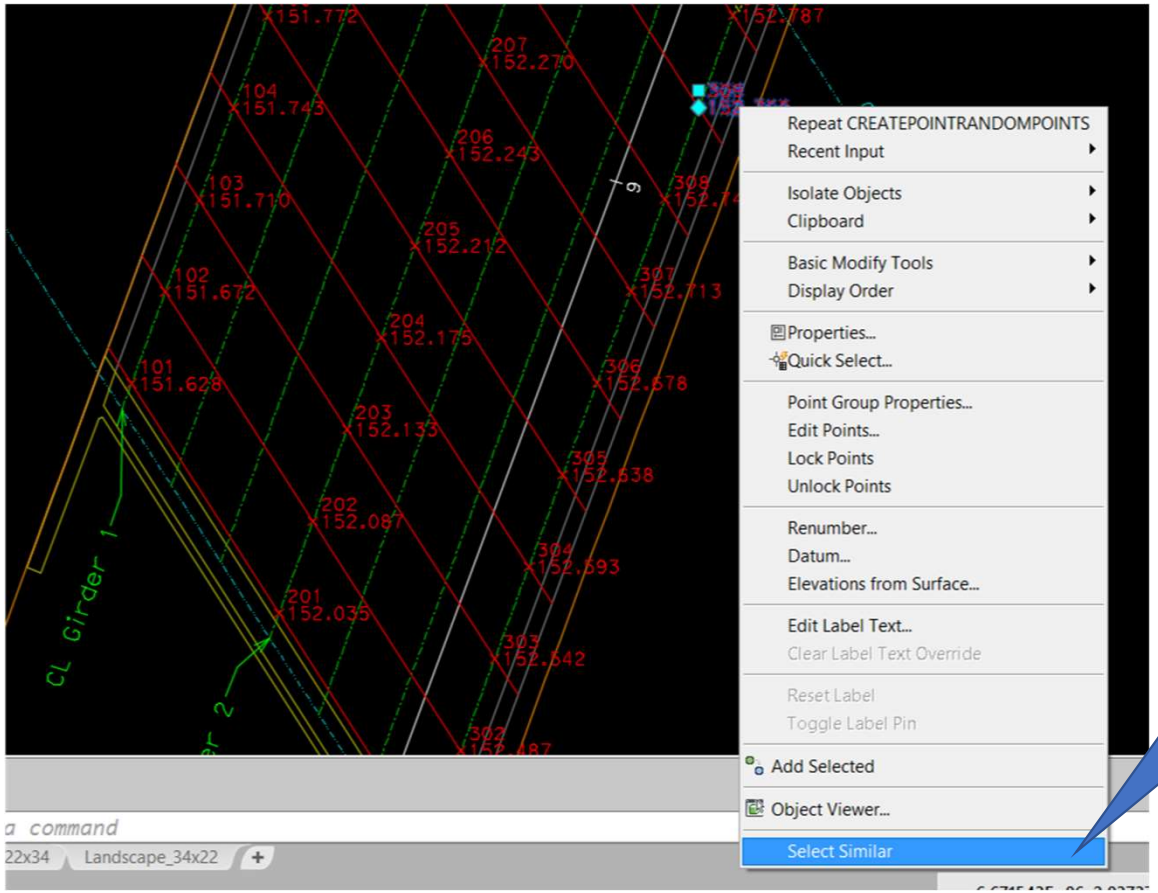
If you select the wrong location by accident, **DELETE** the point. **DO NOT** move the point, the elevation will be wrong.



11. Change the Next Point Number for the next girder.
12. Select the next intersection points along the new girder.
13. Repeat steps 11-12 for each girder as needed.

TIP:
Regenerate your line work, type "**RE**" spacebar. The text and dashed lines will reboot and this will help to select intersection points.

CREATE POINT ELEVATIONS



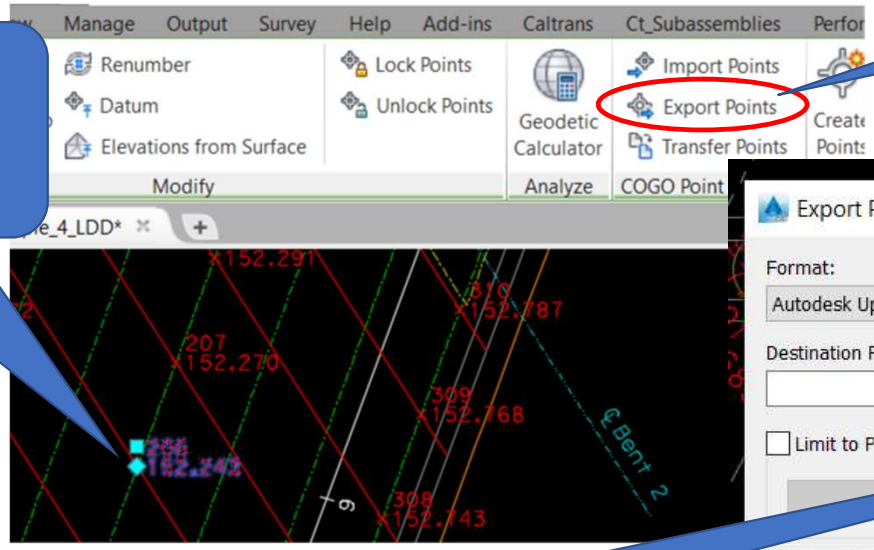
If you need to **START OVER** over a quick way to delete all the points at once.

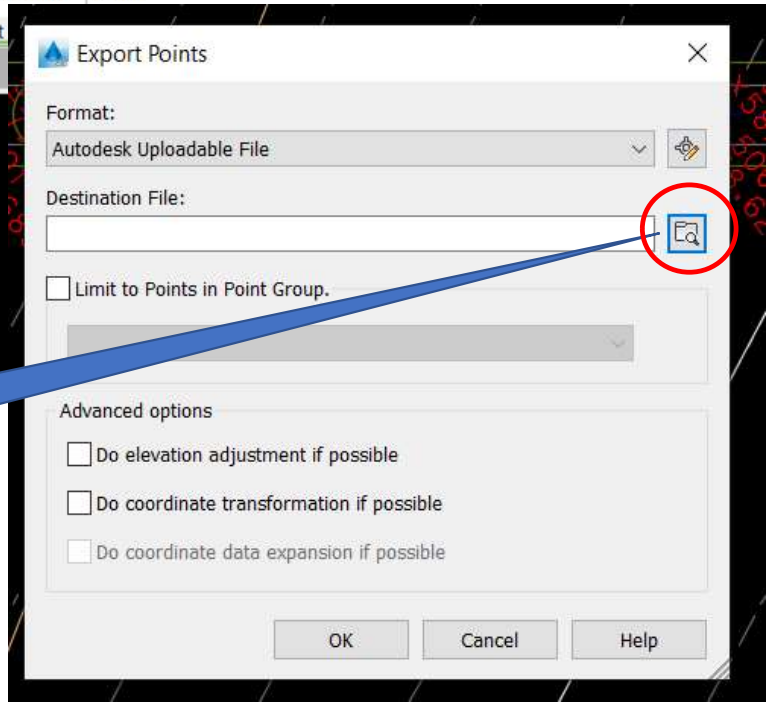
1. Select a point
2. **Right** click, select "**Select Similar**"
3. Hit the **DELETE** key

EXPORT ELEVATIONS TO EXCEL

1. Select one of the points. The **COGO POINTS** tab will automatically popup

2. Click **EXPORT POINTS**





3. Click to direct where to save the file
4. Save As **".csv "** file

EXPORT ELEVATIONS TO EXCEL

The **.csv** file will automatically export as:
Pt # / Northing / Easting / Elev.

	A	B	C	D
1	101	2037346	6671475	151.6285
2	102	2037356	6671478	
3	103	2037366	6671482	151.7
4	104	2037377	6671486	151.7434
5	105	2037387	6671490	151.7717
6	106	2037397	6671494	151.795
7	107	2037407	6671497	151.8131
8	108	2037418	6671501	151.8262
9	109	2037428	6671505	151.8343
10	110	2037438	6671509	151.8374
11	201	2037320	6671491	152.0347
12	202	2037330	6671495	152.0866
13	203	2037340	6671499	152.1333
14	204	2037351	6671503	152.1755
15	205	2037361	6671506	152.2123
16	206	2037371	6671510	152.2433
17	207	2037382	6671514	152.2699
18	208	2037392	6671518	152.2915
19	209	2037402	6671522	152.308
20	210	2037413	6671526	152.3195
21	301	2037294	6671508	152.4269

5. Delete the **Nothing & Easting** columns
6. Save file as **".xlsx"**

In this example, only the first span was done. **Before** exporting your points, it is recommended that you create deck elevation points for all spans then export.

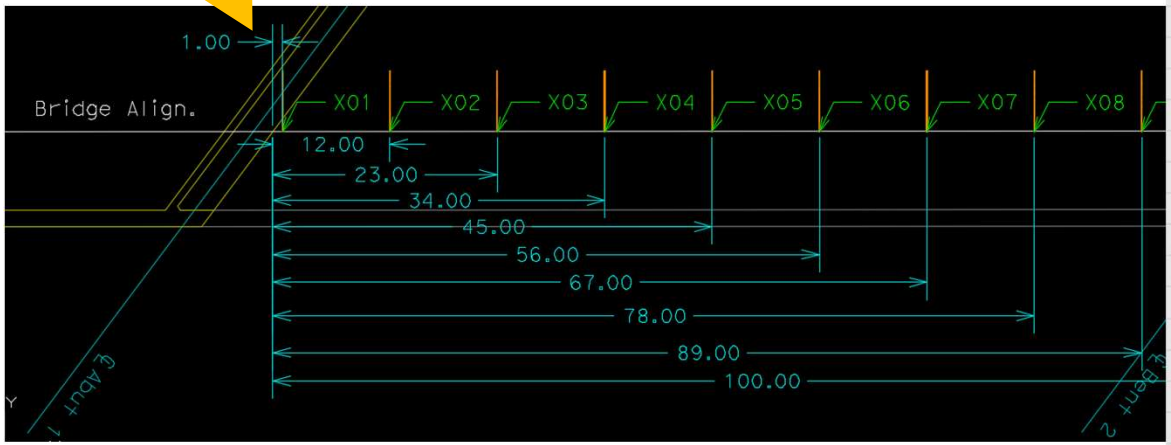
7. Add new columns as needed and label

	A	B	C	D	E	F	G	H
1								
2	GIRDER #	Offset (ft)	PT#	Deck Elev. (ft)	Bridge Camber (in)	3/4" Overlay (ft)	**DECK GRADE (ft)**	
3			101	151.6285				
4			102	151.6718				
5			103	151.7101				
6			104	151.7434				
7			105	151.7717				
8	1		106	151.795				
9			107	151.8131				
10			108	151.8262				
11			109	151.8343				
12			110	151.8374				
13			201	152.0347				
14			202	152.0866				
15			203	152.1333				
16			204	152.1755				
17			205	152.2123				
18	2		206	152.2433				
19			207	152.2699				
20			208	152.2915				
21			209	152.308				
22			210	152.3195				
23			301	152.4269				
24			302	152.4872				
25			303	152.5424				
26			304	152.5926				
27			305	152.6376				

EXPORT ELEVATIONS TO EXCEL

Reminder:
These are the **LOST DECK DOWLE BAR** locations for this example of the first span. These are the offset distances from the face of Abut 1 to the face of Bent 2.

7. Manually enter in the distances from your Civil 3D file to Excel.
8. Copy for each girder
9. Repeat as needed for all other spans.



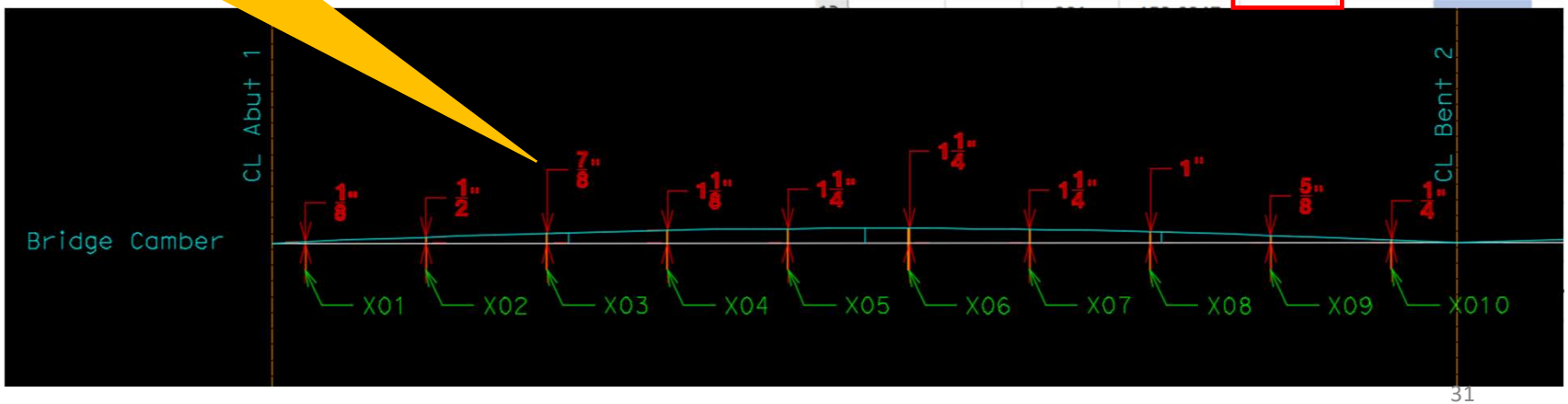
	A	B	C	D	E	F	G	H
1								
2	GIRDER #	Offset (ft)	PT#	Deck Elev. (ft)	Bridge Camber (in)	3/4" Overlay (ft)	**DECK GRADE (ft)**	
3		**1.00**	101	151.6285				
4		**12.00**	102	151.6718				
5		**23.00**	103	151.7101				
6		**34.00**	104	151.7434				
7	**1**	**45.00**	105	151.7717				
8		**56.00**	106	151.795				
9		**67.00**	107	151.8131				
10		**78.00**	108	151.8262				
11		**89.00**	109	151.8343				
12		**100.00**	110	151.8374				
13			201	152.0347				
14			202	152.0866				
15			203	152.1333				
16			204	152.1755				
17			205	152.2123				
18	**2**		206	152.2433				
19			207	152.2699				
20			208	152.2915				
21			209	152.308				
22			210	152.3195				
23			301	152.4269				
24			302	152.4872				
25			303	152.5424				
26			304	152.5926				
27			305	152.6376				

EXPORT ELEVATIONS TO EXCEL

Reminder:
These are the camber dimensions for the lost deck dowel bar locations for this example for span 1.

10. Manually enter the dimensions from your Civil 3D file to Excel.
11. Copy for each girder
12. Repeat as needed for all other spans.

	A	B	C	D	E	F	G
1							
2	GIRDER #	Offset (ft)	PT#	Deck Elev. (ft)	Bridge Camber (in)	-3/4" Overlay (ft)	DECK GRADE (ft)
3		1.00	101	151.6285	**0.125**		
4		12.00	102	151.6718	**0.5**		
5		23.00	103	151.7101	**0.875**		
6		34.00	104	151.7434	**1.125**		
7	1	45.00	105	151.7717	**1.25**		
8		56.00	106	151.795	**1.25**		
9		[illegible]	107	151.8131	**1.25**		
10		[illegible]	108	151.8262	**1**		
11		[illegible]	[illegible]	151.8343	**0.625**		
12		100.00	110	[illegible]	**0.25**		



CALCULATE DECK GRADES WITH EXCEL

A	B	C	D	E	F	G
GIRDER #	Offset (ft)	PT#	Deck Elev. (ft)	Bridge Camber (in)	-3/4" Overlay (ft)	**DECK GRADE (ft)**
1	1.00	101	151.6285	0.125	-0.0625	**151.58**
	12.00	102	151.6718	0.5	-0.0625	**151.65**
	23.00	103	151.7101	0.875	-0.0625	**151.72**
	34.00	104	151.7434	1.125	-0.0625	**151.77**
	45.00	105	151.7717	1.25	-0.0625	**151.81**
	56.00	106	151.795	1.25	-0.0625	**151.84**
	67.00	107	151.8131	1.25	-0.0625	**151.85**
	78.00	108	151.8262	1	-0.0625	**151.85**
	89.00	109	151.8343	0.625	-0.0625	**151.82**
	100.00	110	151.8374	0.25	-0.0625	**151.80**
2	1.00	201	152.0347	0.125	-0.0625	**151.98**
	12.00	202	152.0866	0.5	-0.0625	**152.07**
	23.00	203	152.1333	0.875	-0.0625	**152.14**
	34.00	204	152.1755	1.125	-0.0625	**152.21**
	45.00	205	152.2123	1.25	-0.0625	**152.25**
	56.00	206	152.2433	1.25	-0.0625	**152.28**
	67.00	207	152.2699	1.25	-0.0625	**152.31**
	78.00	208	152.2915	1	-0.0625	**152.31**
	89.00	209	152.308	0.625	-0.0625	**152.30**
	100.00	210	152.3195	0.25	-0.0625	**152.28**
	1.00	301	152.4269	0.125	-0.0625	**152.37**
	12.00	302	152.4872	0.5	-0.0625	**152.47**

These are the FIELD DECK GRADES for the **LOST DECK DOWEL BARS.** In this example, there is a ¾" deck overlay.

13. Add the Deck Elevations and Camber to get the Deck Grades (include the overlay if applicable).