

Multiple Alignments & Phased Construction in PLS-CADD

2011 PLS-CADD ATUG

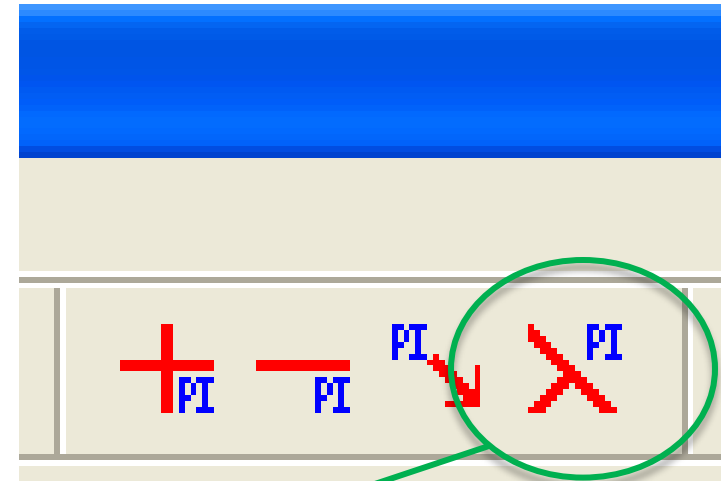
Presented by:
Jesse Kohler

Project Details

- ▶ Substation rebuild project
- ▶ 2 – 345kV lines & 9 – 115kV lines
- ▶ 3 of the 115kV lines transition underground
- ▶ ~5–7 temporary configurations
 - (still in development)
- ▶ All structures created as method 4 mostly for presentation purposes.
- ▶ Load trees developed for both transmission and substation termination structures

General Definitions & Terms

- ▶ To help give background to some of the terms used in this document
- ▶ Alignments are used as a framework in PLS in which to place structures and wires
- ▶ You are only allowed 1 “alignment” per .xyz file
- ▶ However, within that .xyz file you can create multiple alignments, all of which add up to the “alignment” of your .xyz file
- ▶ You can add multiple alignments in 2 ways
- ▶ 1: Independent alignments create completely separate alignments
- ▶ 2: Branch alignments spur off other main alignments.
- ▶ Access to the multiple alignment tools in PLS are found by clicking on this button in the tool bar



Interactive Guided Tour of Project

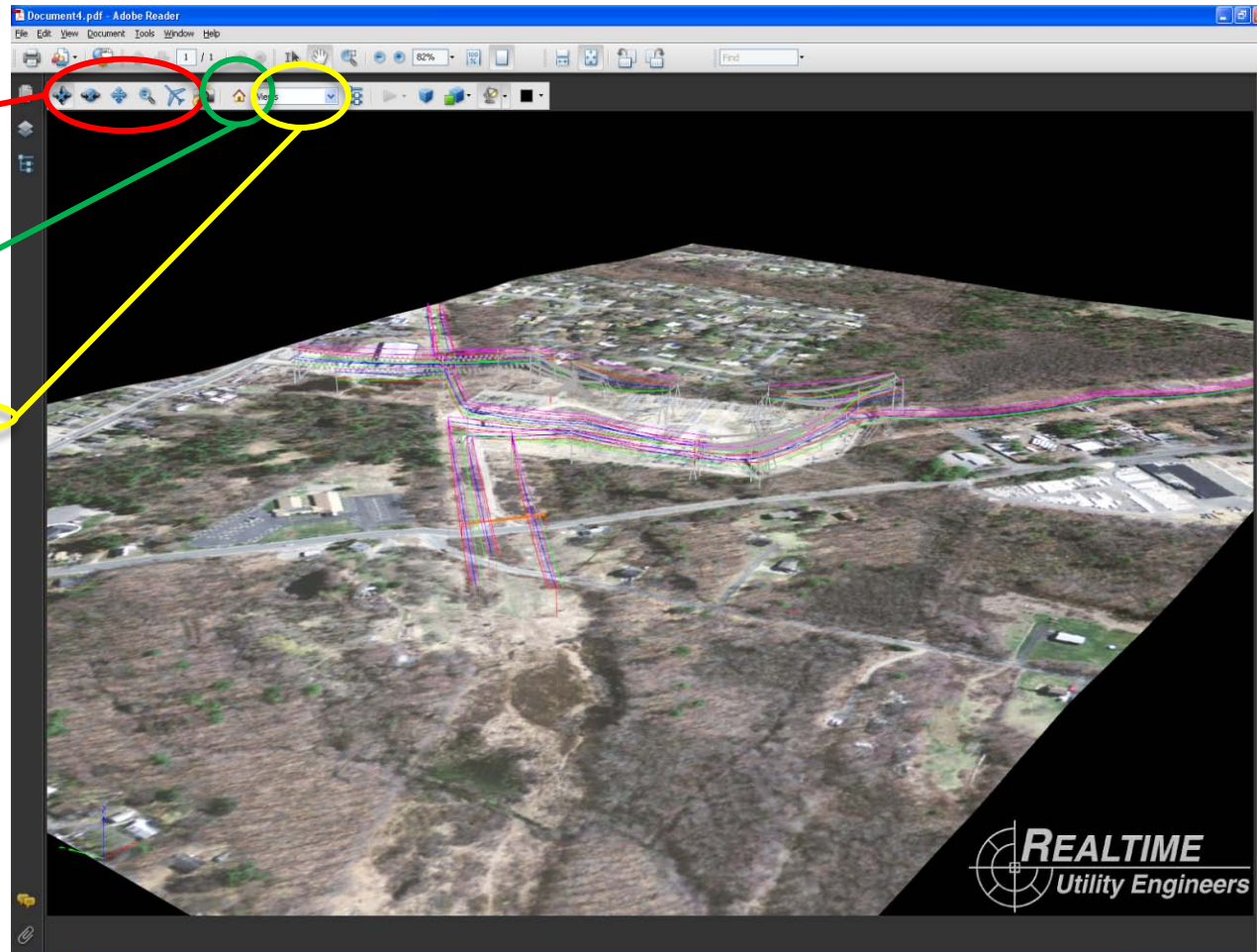
3 Dimensional PDF Instruction page

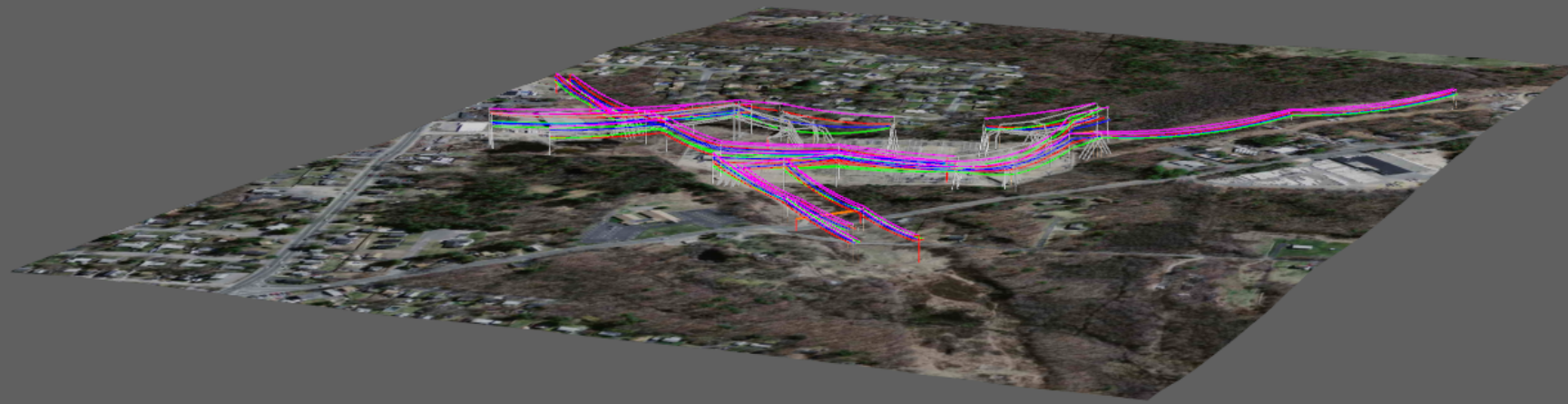
- ▶ The next page is pdf that can be viewed and operated by anyone with Adobe Reader (free)
- ▶ It contains:
 - Fully rendered PLS-CADD model with 11 different lines with both permanent conditions & 5 temporary configurations (accented by gray dashed catenaries)
 - Method 4 structures
 - Digital elevation model with aerial imagery drape
 - Color coded wires indicate phasing
- ▶ Things you can do:

- Rotate
- Spin
- Pan
- Zoom
- Fly

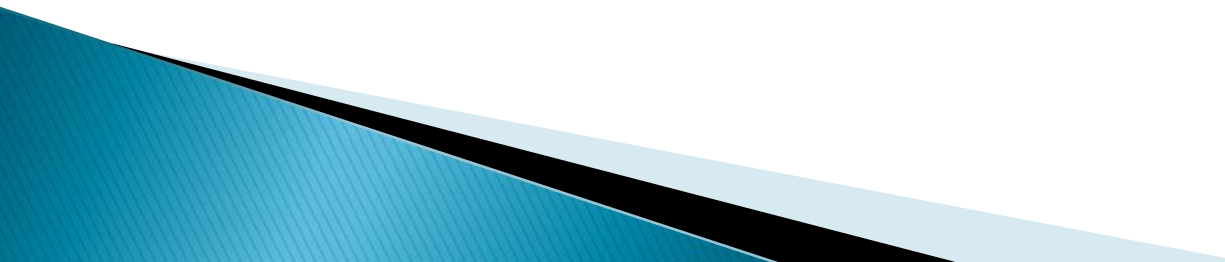
- Start Over (if you get lost)

- Take a guided tour by clicking on various views





Structure Orientation (part 1)

- ▶ The next few slides demonstrate how to properly orientate a structure that is used in a permanent and temporary configuration
 - ▶ The first slide will show the incorrect method
 - ▶ The second slide will show the correct method
- 



Temporary Alignment

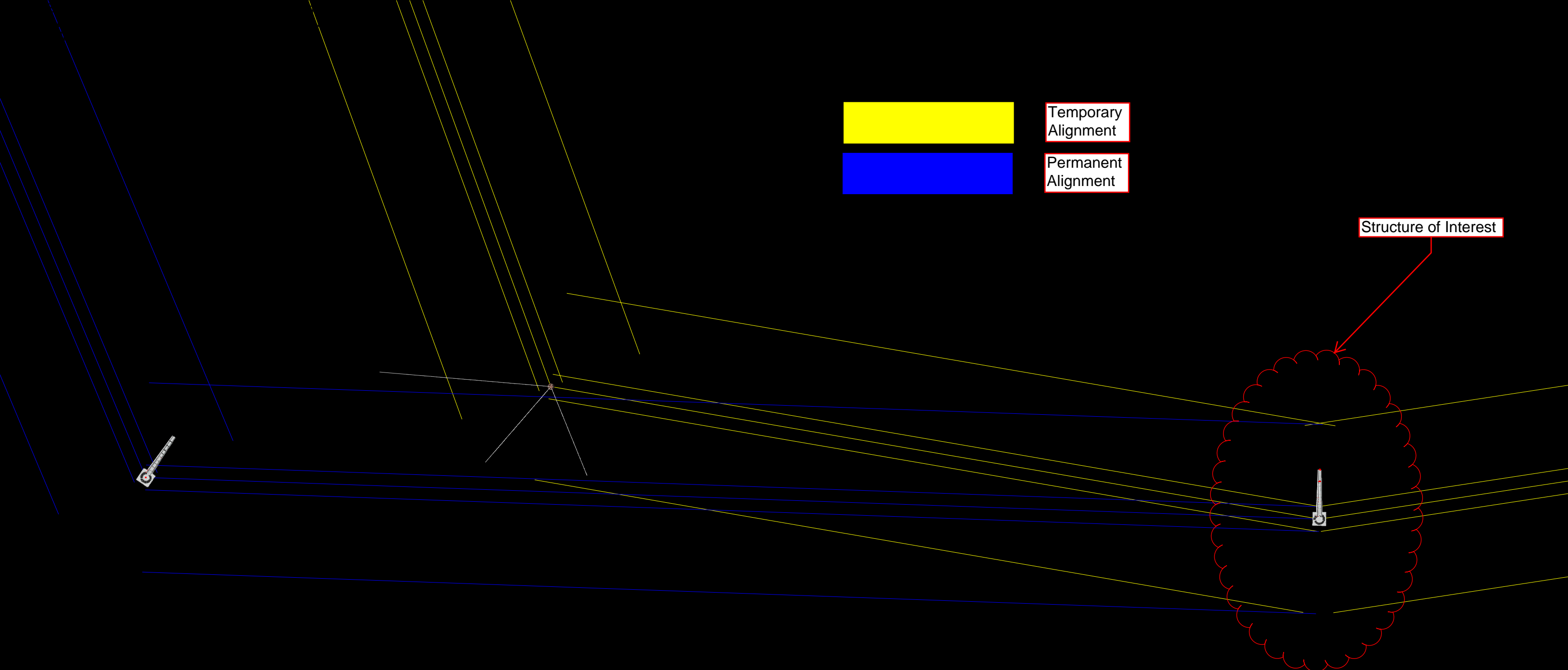


Permanent Alignment

Structure of Interest



**METHOD 1
WRONG WAY**



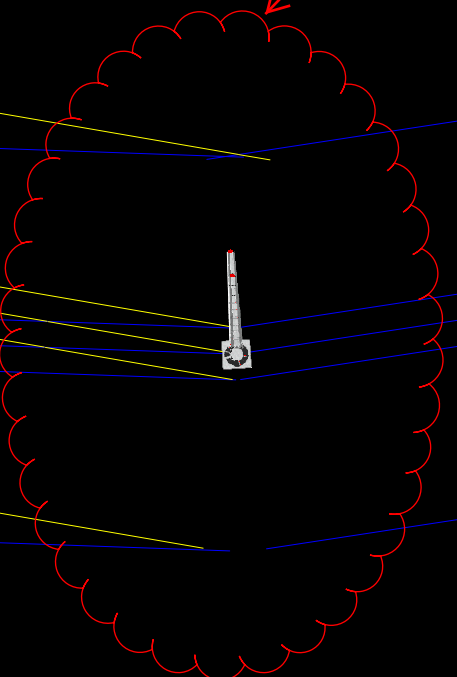


Temporary Alignment

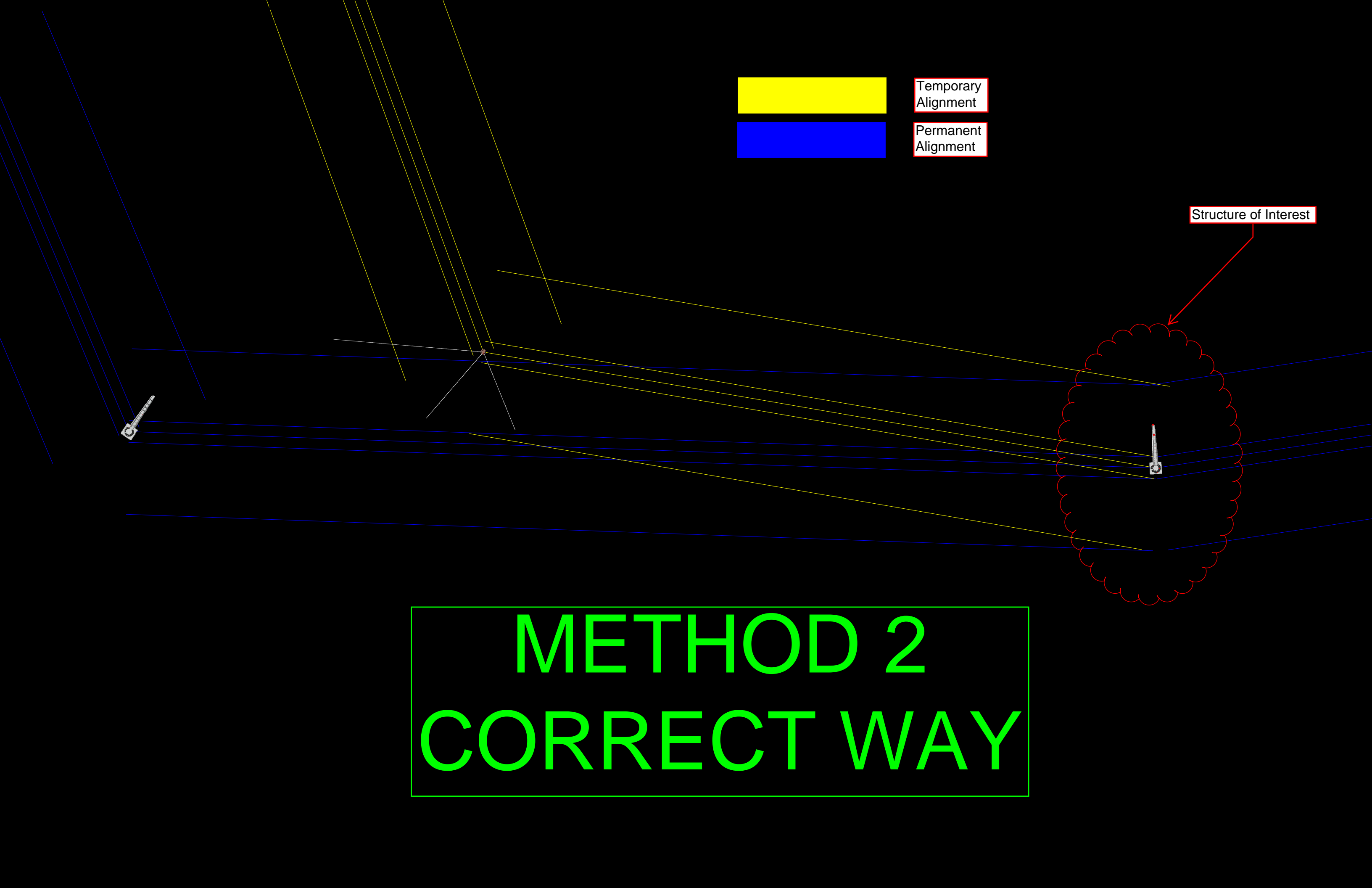


Permanent Alignment

Structure of Interest

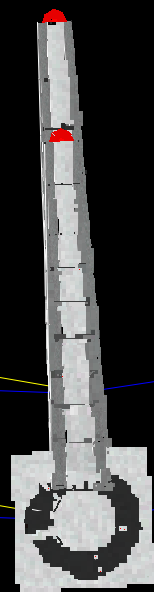


**METHOD 2
CORRECT WAY**

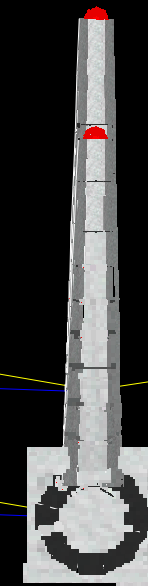


Structure Orientation (part 1)

- ▶ Notice a difference?
- ▶ Let's take a closer look at the structure of interest with the 2 methods side by side

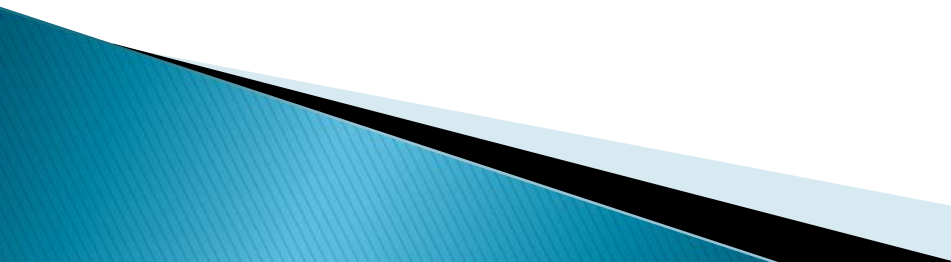


**METHOD 2
CORRECT WAY**



**METHOD 1
WRONG WAY**

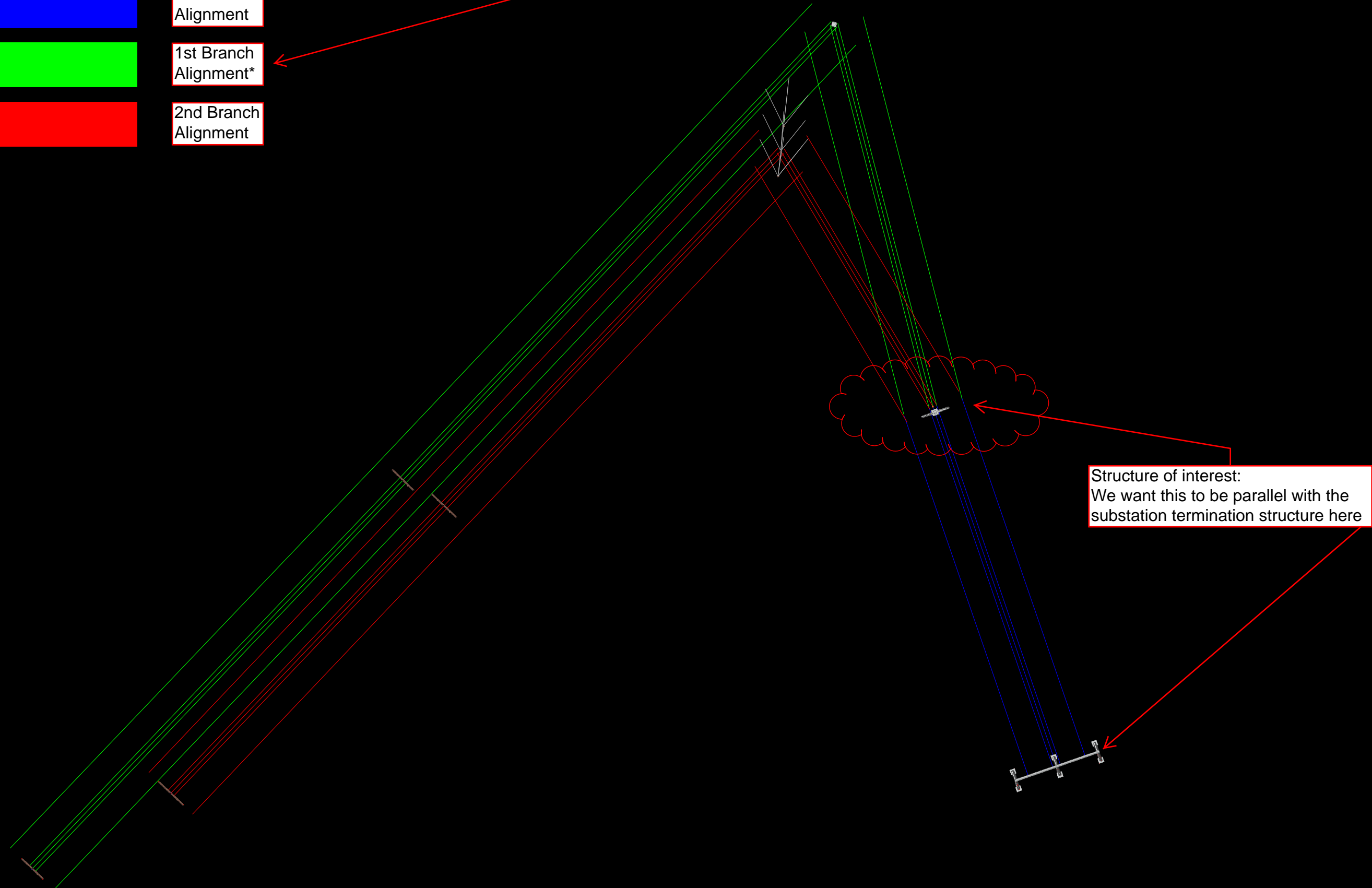
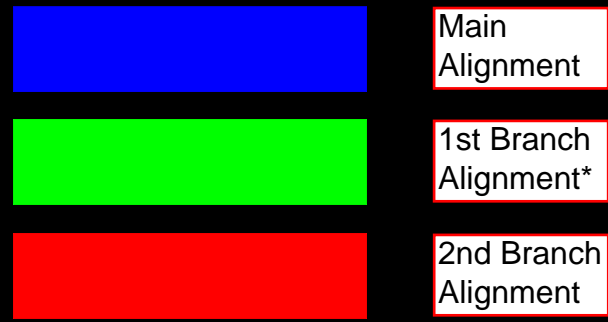
Structure Orientation (part 1)

- ▶ If you notice our structure's arms are pointed in slightly different directions
 - ▶ The takeaway here is that the natural instinct is to build the alignment for the temporary configuration first because it will be built first, then the permanent as a branch
 - ▶ If you're not careful you could end up with a structure that's askew and someone in the field asking "Does that structure look cock-eyed to you?"
 - ▶ The correct method is to model the permanent alignment first and create the temporary as a branch
 - ▶ This will ensure that your structure's transverse axis is aligned with the bisector of the permanent line angle
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Structure Orientation (part 2)

- ▶ Similarly the next few slides will show how to use intermediary PI's to ensure a structure's transverse axis stays parallel to another structure's transverse axis, in this case the substation termination structure

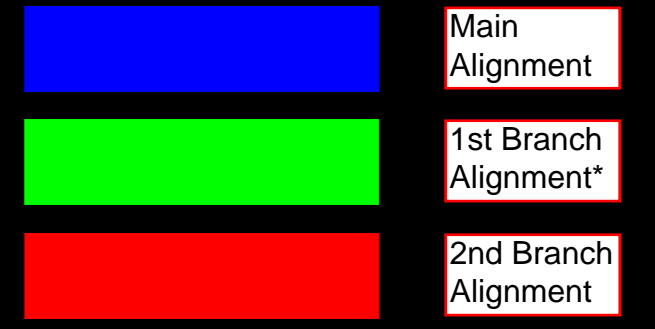
*Techincally still part of the main alignment, but color changed for presentation purposes.
You can't have 2 branches coming off from 1 PI



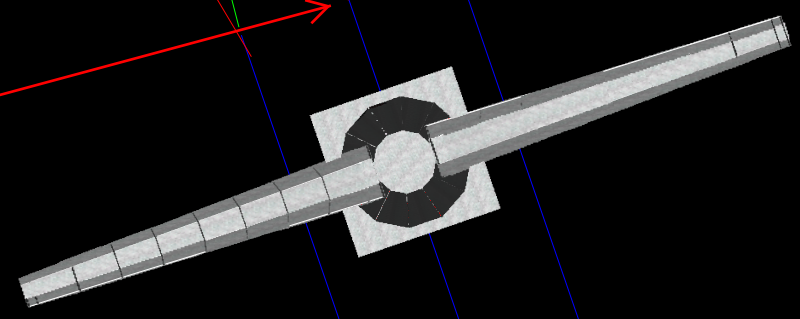
Structure of interest:
We want this to be parallel with the
substation termination structure here

Structure Orientation (part 2)

- ▶ The last slide showed the correct method for orientating our structure to make it parallel to the substation termination structure by way of creating a false PI.
- ▶ Now let's zoom in and view that structure up close and its alignment creation

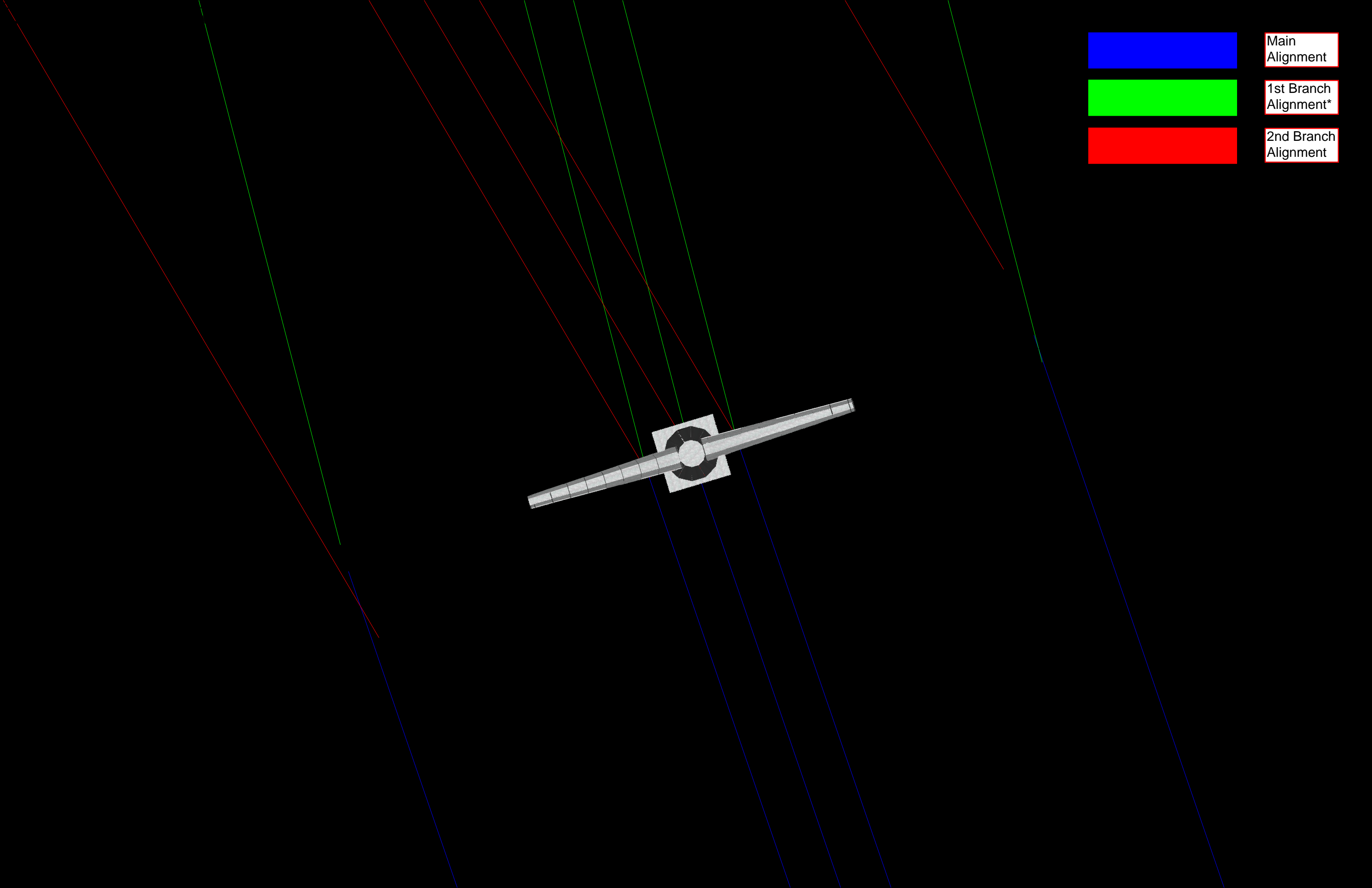


False PI



Structure Orientation (part 2)

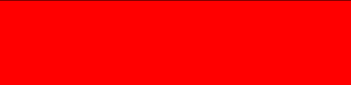
- ▶ Notice on the previous slide how the addition of the false PI creates a little additional segment of alignment that keeps our structure's transverse axis parallel to the substation termination structure.
- ▶ The next slide will show for comparison what happens if the false PI is removed. Notice how our structure is no longer orientated correctly.
- ▶ The difference in this case is very subtle, but it could be enough that it may get noticed in the field. Also in this case if I happened to have made the 2nd branch alignment first the difference would be much more noticeable due to the size of the line angle.



Main
Alignment



1st Branch
Alignment*



2nd Branch
Alignment

Multiple Alignment Rules & Tips

- ▶ **#1 Rule:** if you know you're going to have multiple alignments, before you place a single PI, stop and plan out how the alignment will work. And how you will string from one structure to the next.
- ▶ **#2 Rule:** You can only string up-station, not back.
- ▶ **#3 Rule:** You can string to any other alignment in your file so long as you follow rule #2.

- ▶ **Tip #1:** If you have a congested area shrink the terrain widths down to something like 5 ft. It will clear up the plan view so you can see which alignment goes where.
- ▶ **Tip #2:** You can now display individual alignment sections with different colors.
- ▶ **Tip #3:** When placing structures be sure to follow the tracer ball to see which alignment you're placing it on. Then snap to the point you'd like. Very useful if you have PI's stacked on top of each other.
- ▶ **Tip #4:** Create separate feature codes for PI's. Works great for snapping.
- ▶ **Tip #5:** Having dead ends makes life easier. Remember that with a dead end you can string "backwards" in a sense. This is possible provided you follow Rule #2 and you string in 2 different directions. 1 could be your main alignment and the other a branch for example. Just keep in mind that this will cause you to have either 2 ahead spans if you're stringing out from this structure, or 2 back spans if you're stringing into it.
- ▶ **Tip #6:** You can display the alignment in the 3D view. There's various display options located in the "F1" menu.

Pictures of the project

- ▶ The next few pages show a couple pictures of the actual project being constructed. These are photos from 1 of the early stages of temporary construction.







Thank you and questions

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