STRINGING CONDUCTOR ON FLEXIBLE TSP'S

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PLS-CADD User Group Meeting

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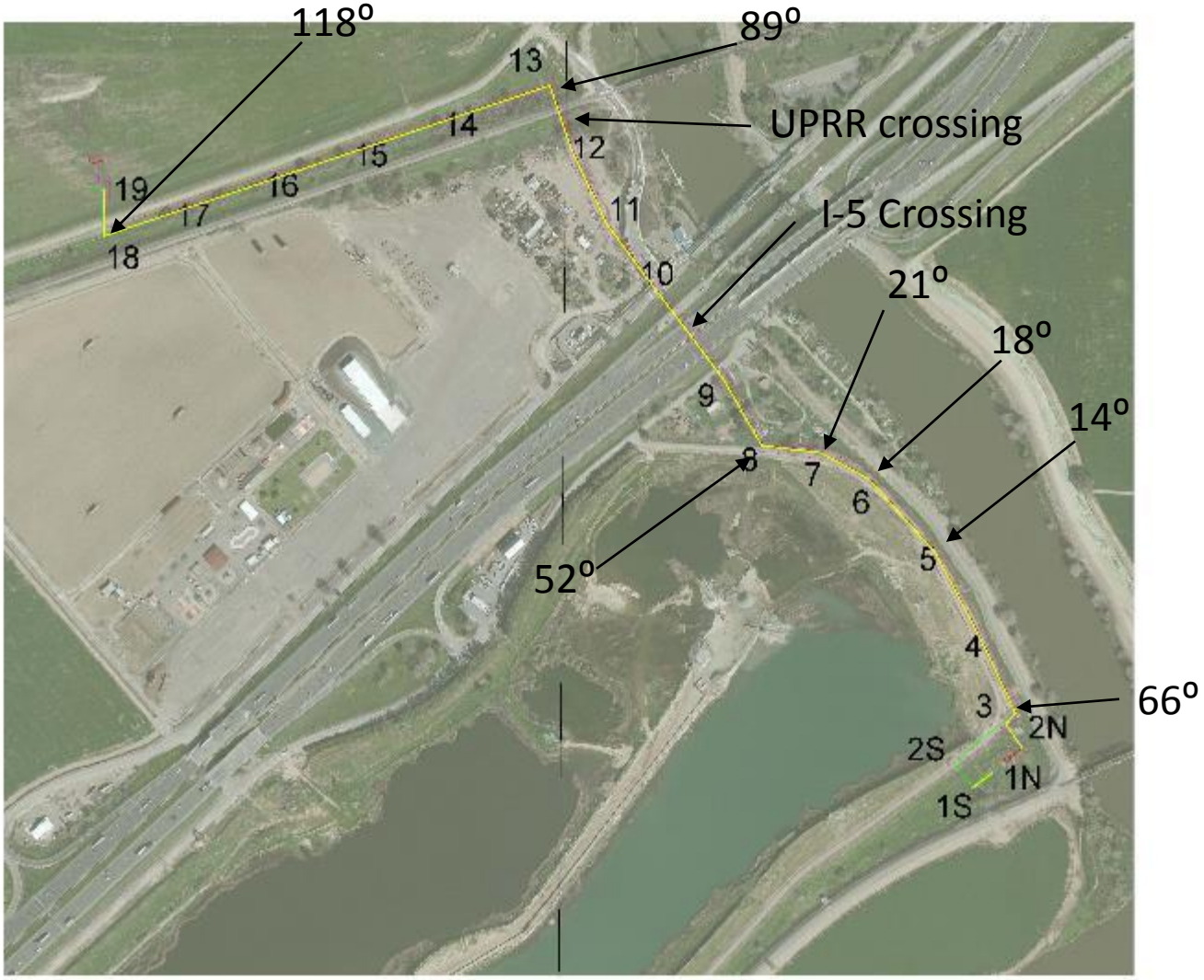
Line Map


118°
89°
UPRR crossing
I-5 Crossing
21°
18°
14°
52°
66°
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2N
2S
1N
1S

Study Project

- Double Circuit Line
- Poles Directly Embedded
- 19 Poles
- 14 angles
- 1 Interstate Crossing
- 1 UPRR Crossing

Project Installation

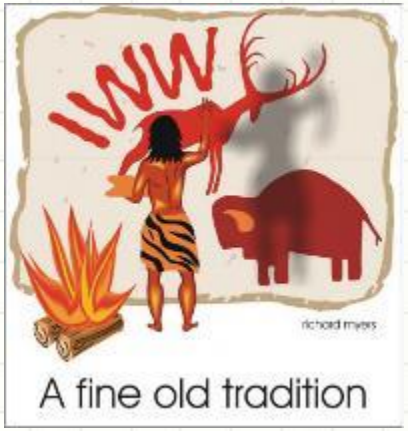
- Rake to allow for deflection
- Setting the embedded sections
- Order of Construction
  - UPRR
  - Interstate
- Order of Stringing and sagging
  - Both Circuits
  - One at a time
- Final adjustments

Stringing on TSP's

- Poles deflect
  - Deflection shortens span
  - Tension reduced
- Angles
  - Rake on bisector
  - String through and cut in
- Controlling Stringing – Several Methods
  - Stringing Charts
  - Project Specific Stringing Data
  - Trial and Error

Tradition (an aside)

- Grandfathered Standards
  - Must use or merely a resource?
  - What if they are wrong?
- Contractor's problem
  - It's in their contract
  - Who suffers if they don't do it right?
- Should we write new standards (internal to the Utility)?
  - It is a daunting task to change a standard
  - Maybe we can be clever and re-interpret the existing ones?
- It's a special case to be solved in the field.
  - Is it really?
  - Fireman to the rescue, again?
- Question
- What standards do you follow?



Challenges

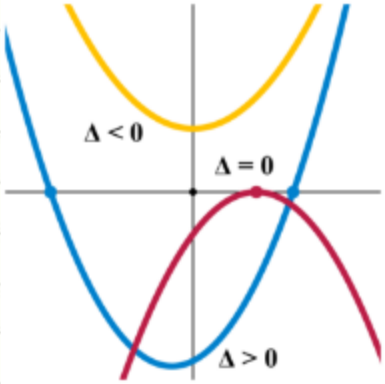
- Large Angle in UPRR Span
- Short Duration for I-5 Crossing
- Sag Charts
  - Communication to Contractor
  - Initial Data
  - Sag Check Data

Setting Procedure

- Angles and Deadends That are not Terminals
  - Rake on bisector
  - String Through
  - Cut in
  - Sag
  - Add Jumpers
- Large Angle Deadends
  - Rake on bisector
  - String to both sides
  - Sag one side
  - Sag the other

Working on Another Idea

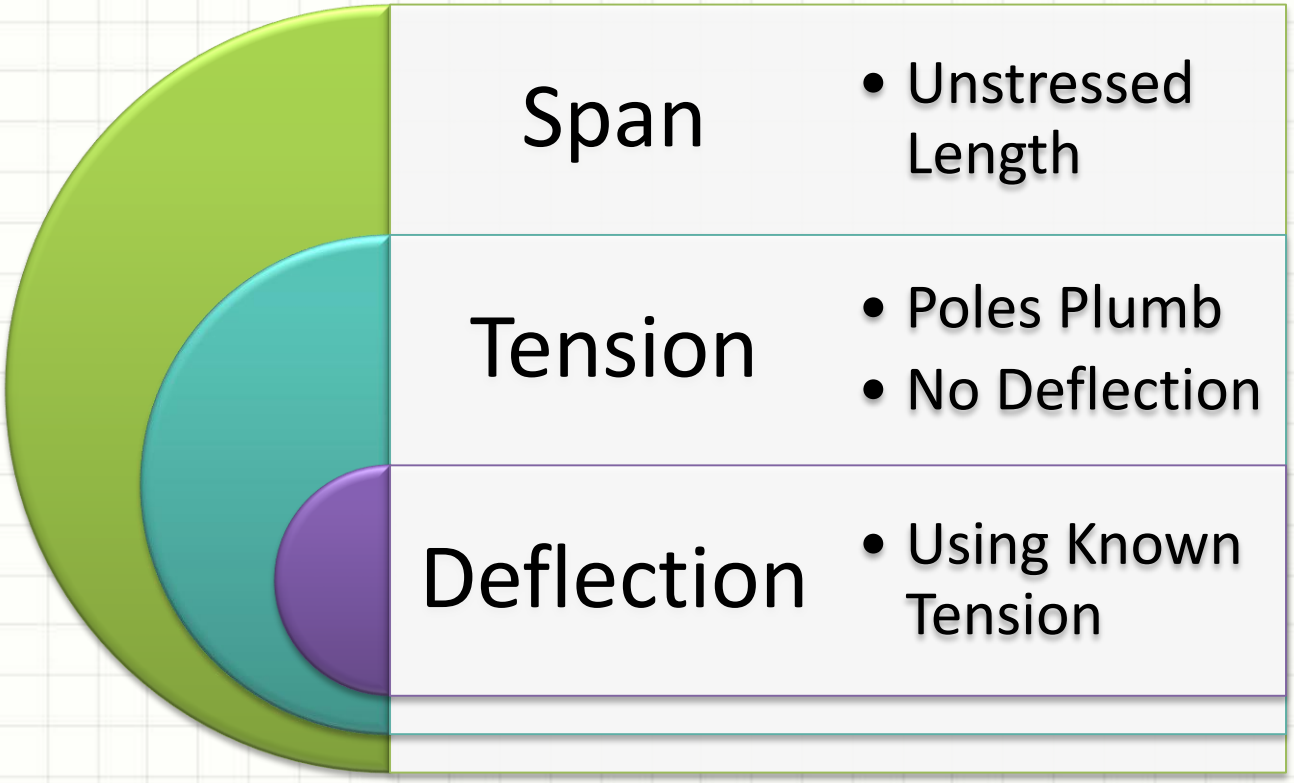
- The sags and tensions are readily determined for a rigid structure.
- Therefore, the unstressed length can be determined for the rigid structure case.
- However, the structure is not rigid.
- Deflection changes the span.
- The unstressed length stays the same.
- What is the sag and tension at equilibrium?



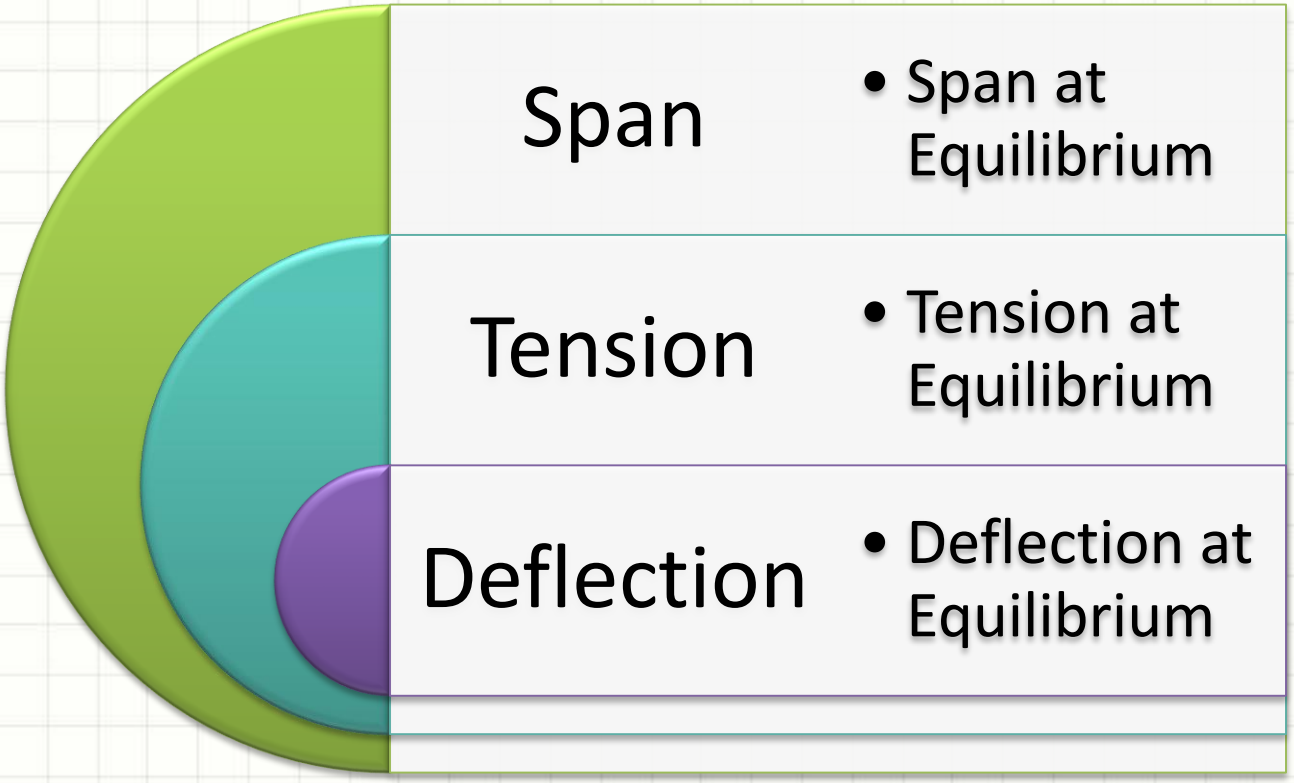
Stating The Problem

- The sags and tensions are known for a rigid structure.
- Therefore, the unstressed length can be determined for the rigid structure case.
- However, the structure is not rigid.
- Deflection changes the span.
- The unstressed length stays the same.
- What is the sag and tension at equilibrium?

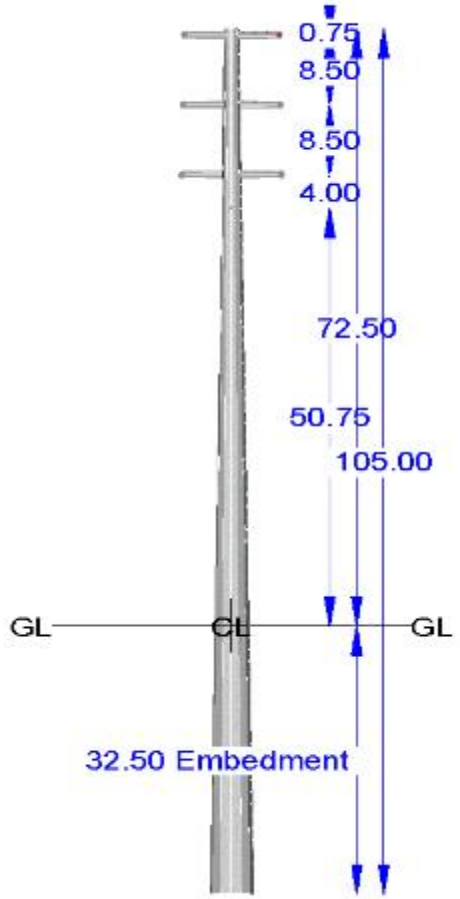
Known Parameters



Unknown Parameters

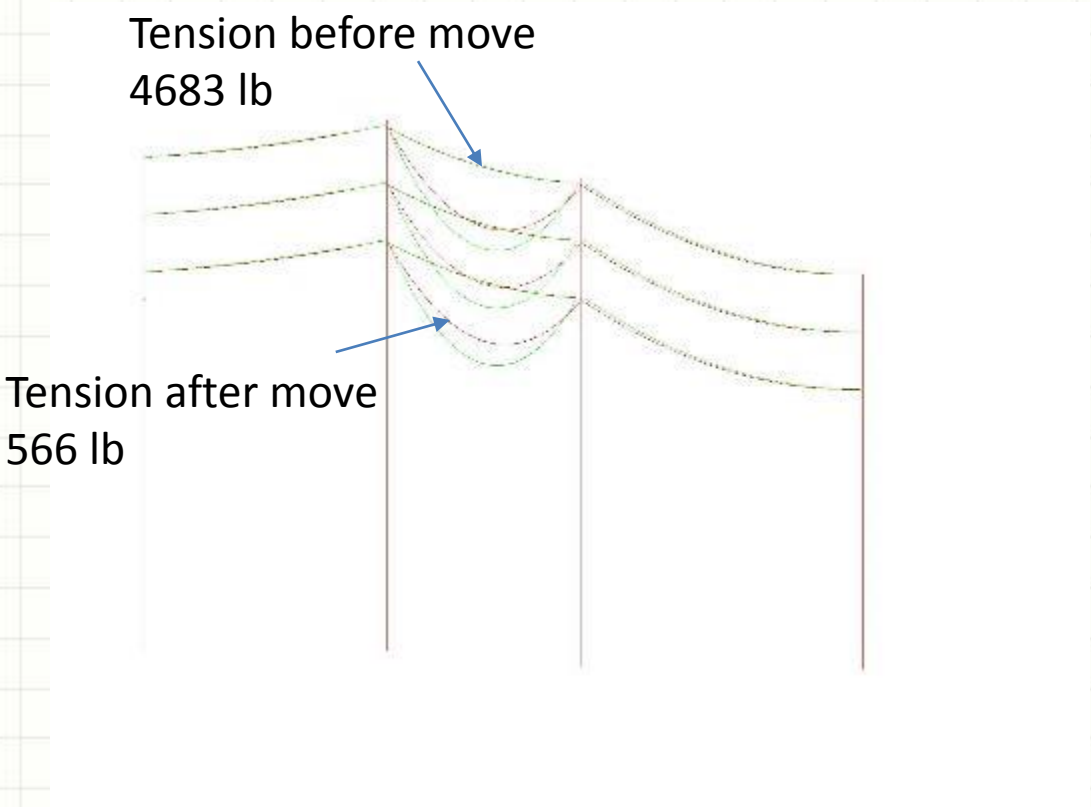


Example Structure



Deflections

- Tip deflection from PLS-POLE = 21” at 60^{o} F
- Procedure Investigated
  - Move pole 12 21” toward pole 13 to simulate deflection
  - Results unrealistic



Deflections Considering Equilibrium

- The reduction in tension due to the deflection of pole 13 drops rapidly.
- An imbalance is created at pole 12, which also deflects and so on down the line.
- The unstressed length was determined from the rigid case
- The tension can be determined for the reduced span length
- When the other side is strung, the span will be back to the original length at design tension.

PLS CAD tools

- Equaling Tensions at Poles
- Flexible Pole Models
- Sections must be clipped in
- Find Tension using “Sag-Tension” under sections
- Find Unstressed Length under “section modify”

What's Next

- Updating the Construction Specification
- Prepare Sag Charts
- Check Sags after Construction
- Continue to Develop a workable analytical method to include deflection dynamically

Summary

- Construction will proceed using the techniques described
- The dynamic deflection analysis is a work in progress
- I still use a graphical method
  - Trial and error adjusting span lengths until unstressed lengths result in equalized tensions
- Why haven't we had many more problems?
  - TSP's are very forgiving
  - They move to where they are most comfortable.

Questions and Discussion?