

POWER LINE[®] **POWER LINE**

S Y S T E M S . I N C .

Unbalanced Loading in PLS-CADD

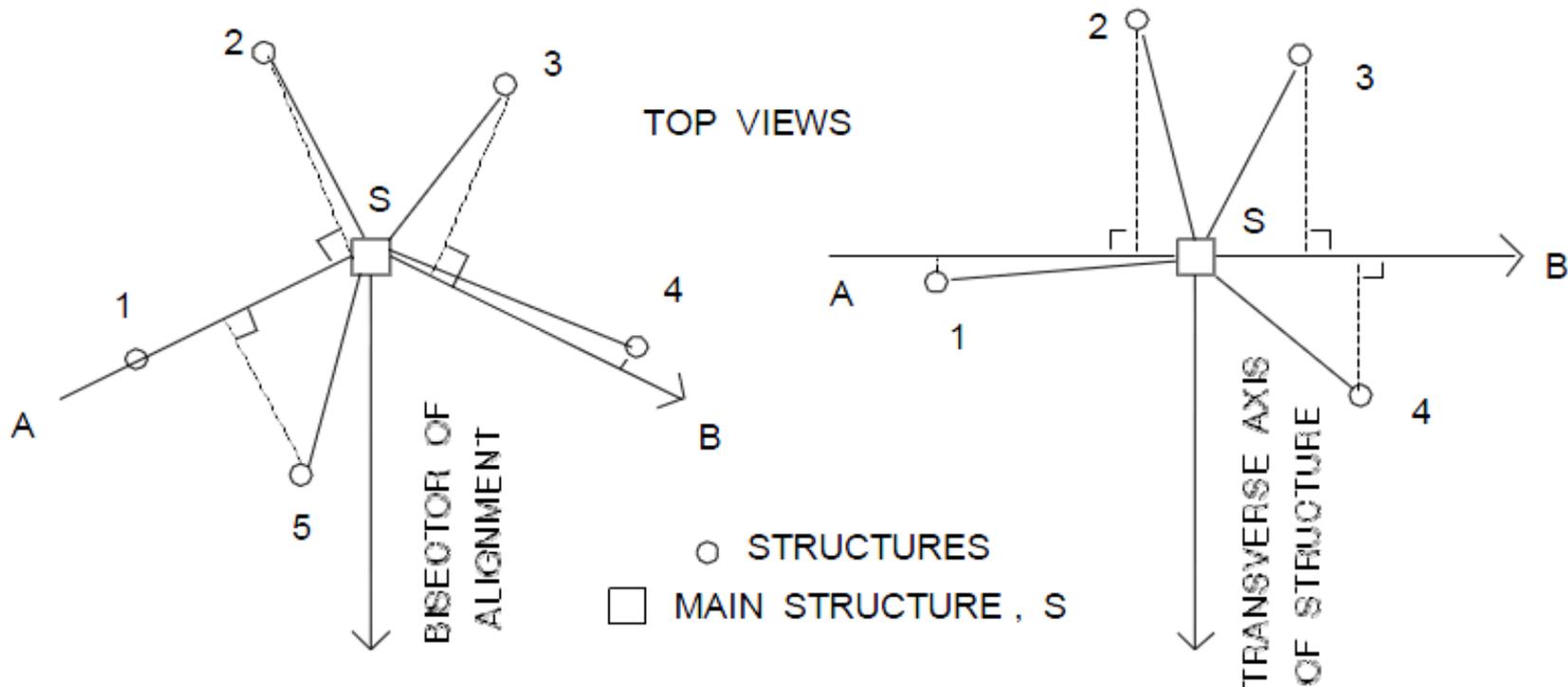
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by

Otto J. Lynch, P.E.

Unbalanced Loading in PLS-CADD

- Section 7.3.12.7 Unbalanced Loading
 - Page 124 of our latest PLS-CADD Manual



STRUCTURES IN FULL PLS - CADD

A - S - B IS ALIGNMENT

STRUCTURES IN PLS - CADD / LITE

A - S - B IS FICTITIOUS ALIGNMENT
IN LONGITUDINAL DIR. OF STRUCTURE

SPAN # - S IS A BACK SPAN FOR STRUCT. S IF ITS PROJECTION ON ALIGNMENT
IS TO THE LEFT OF S - OTHERWISE IT IS AN AHEAD SPAN

Fig. 7.3-9a Definitions of Back and Ahead Spans

Unbalanced Loading in PLS-CADD

- **Criteria / Structure Loads**
 - Select “Yes” in the Adjust Cable Loads Column
 - “Command” up to 10 Different Definitions of Unbalanced Loadings for Combined Loadings

Unbalanced Loading in PLS-CADD

- 7.3.12.7.1 Adjust Percent of Horizontal Tension
 - The vertical, transverse and longitudinal reactions at the end of the will be based on a reduced horizontal tension H loads which is the original unreduced tension adjusted by the percent value you enter in the adjacent “Value - % - # Subconductors”.
 - This option is only available with ruling span modeling (Level 1).

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- 7.3.12.7.1 Adjust Percent of Horizontal Tension
 - For example, you could model a broken conductor situation where you expect the Residual Static Load to be 70% of the original tension by specifying a 0 % of tension in the back span and a 70% of tension in the ahead span.

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- 7.3.12.7.2 Specify Number of Broken Subconductors
 - If you specify “# Broken Subconductors”, you will have to enter the number of broken subconductors in the adjacent “Value - % - # Subconductors” column. If the affected span has only one wire, you can only enter one broken subconductor. If the affected span has several subconductors, you can enter one or more broken subconductors.

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- 7.3.12.7.2 Specify Number of Broken Subconductors
 - With Level 1 load modeling, this option simply removes the load transmitted by the broken cable to the structure but does not change the loads from the still intact cables in the span (bundle) or from the cables on the other side of the structure. With Level 2, 3 or 4 modeling, the broken cable (s) is physically removed from the model, but the finite element analysis determines new tensions in the system after the removal.

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- 7.3.12.7.2 Specify Number of Broken Subconductors
 - This option can be used with Level 1 modeling to determine the loads on one side only of a rigid dead end structure: one load case where you break all the subconductors in the back spans and another one where you break all the subconductors in the ahead spans.

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- 7.3.12.7.2 Specify Number of Broken Subconductors
 - This option can also be used with Levels 2, 3 or 4 modeling to determine the load from a broken conductor next to a suspension insulator. The analysis would account for the reduction in tension due to the longitudinal insulator swing.

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- **7.3.12.7.3 Add a Concentrated Vertical Load**
 - If you specify “Add Vertical Load“, you will have to enter the value of that load in the adjacent “Value - % - # Subconductors“ column. This load will be added to the vertical load coming from the selected span. It is multiplied by the Load Factor for Vertical load (see Section 7.3.12.6) before being added. The transverse and longitudinal components of the finite element structure loads can be affected since the load is applied to the tip of the insulator prior to sag tension which can increase the transverse and longitudinal components of the load. The transverse and longitudinal components are not affected in ruling span since the additional load is simply added to the ruling span loads and do not impact the sag and tension of the conductor. This, and the following two options, can be used for all wire modeling levels (Levels 1 to 4).

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- 7.3.12.7.4 Add a Concentrated Transverse Load
 - If you specify “Add Transverse Load“, you will have to enter the value of that load in the adjacent “Value - % - # Subconductors“ column. This load will be added to the transverse load coming from the selected span (i.e. it is perpendicular to the span). It is multiplied by the Load Factor for Wind before being added. The vertical and longitudinal components of the finite element structure loads can be affected since the load is applied to the tip of the insulator prior to sag tension which can increase the vertical and longitudinal components of the load. The vertical and longitudinal components are not affected in ruling span since the additional load is simply added to the ruling span loads and do not impact the sag and tension of the conductor.

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- 7.3.12.7.5 Add a Concentrated Longitudinal Load
 - If you specify “Add Longitudinal Load“, you will have to enter the value of that load in the adjacent “Value - % - # Subconductors“ column. This load will be added to the longitudinal load coming from the selected span, i.e. it is in the direction of the span. It is multiplied by the Load Factor for Tension before being added. The vertical and transverse components of the finite element structure loads can be affected since the load is applied to the tip of the insulator prior to sag tension which can increase the vertical and transverse components of the load. The vertical and longitudinal components are not affected in ruling span since the additional load is simply added to the ruling span loads and do not impact the sag and tension of the conductor.

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- **7.3.12.7.6 Adjust Ice Thickness**
 - If you specify “% Ice Thickness“, the ice thickness on the specified wire (s) will be adjusted by the % amount that you enter in the adjacent “Value - % - # Subconductors“ column. This option can only be used with Levels 2, 3 or 4 wire modeling. With this method, longitudinal insulator swings at all suspension structures and longitudinal deflections at all attachment points with nonzero longitudinal stiffness are accounted for. This option should not be used with Level 1 modeling because that modeling is not capable of handling longitudinal insulator swings. If you use this option with Level 1, you will get very conservative longitudinal loads.

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- 7.3.12.7.7 Adjust Vertical (or Transverse or Longitudinal) Load
 - If you specify “Percent Vertical (or Transverse or Longitudinal) Load“ for a particular span, the vertical (or transverse or longitudinal) reactions at the end of the selected span (see Fig. 7.3-9) will be adjusted by the percentage that you enter in the adjacent “Value - % - # Subconductors“ column before it becomes a load on the supporting structure.

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- 7.3.12.7.7 Adjust Vertical (or Transverse or Longitudinal) Load
 - While "unbalanced" loading as described above is available, there is no easy way in PLS-CADD to generate loads from "pattern" loading, for example ice load on every other span. For "pattern" loading, you can selectively load individual spans with ice as discussed in Section N.5.

Unbalanced Loading in PLS-CADD

- Review Above Concepts Live in PLS-CADD