



O-Calc[®] Pro 6.0 Line Design

Quick Start Guide

Osmose O-Calc® Pro 6.0 Line Design Quick Start Guide
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Table of Contents

Getting Started – What is O-Calc Pro Line Design?	6
Understanding Line Design Interface.....	7
Main Line Design Area	7
Line Design Tabs.....	7
Poles Tab	7
GIS Files Tab	8
Map Tab	8
Clearance Tab.....	9
Updates to Other Areas & Features.....	9
3D View Tab	9
Capacity Calculation.....	10
Default Loadcase.....	10
Auto-Guy	10
Creating Line Designs.....	12
Using the Line Design Wizard	12
Using Existing .pplx Files to Start a Line	13
Adding Existing .pplx Files to an Existing Line Design	14
Linking Spans between Poles in a Line Design.....	15
Rules for Linking Spans	17
Switching the Active Pole in 3D View	19
Un-Linking Spans in Line Design.....	19
Connecting Spans with Jumper Cables	19
Using Created Pole to Generate Next Pole.....	20
Splitting Spans to Insert a Pole	20
Merging Spans to Remove a Pole	22
Performing an Analysis and Reading the Results.....	23
Useful Features and Tools.....	25
Profile View	25
Other ‘View’ Options	25
Performing Stringing and Adding Drops	26
What Next?	27

Getting Started – What is O-Calc Pro® Line Design?

O-Calc Pro® Version 6.0 Line Design is Pole Loading Software that dramatically changes the way poles can be analyzed. In previous versions, only one pole could be analyzed at a time. A single pole was modeled with all appropriate attachments and pole loading regulation parameters, to return a value for the pole's maximum capacity utilization. The calculation determined if the pole was compliant with NESC, GO95, or other Safety Standards.

In O-Calc® Pro Line Design, a line of poles can be modeled and analyzed together, considering the interactions between the poles and how load is distributed across the line of poles. This document walks you through the various ways to create a line design, as well as the features that are new or different from previous versions.

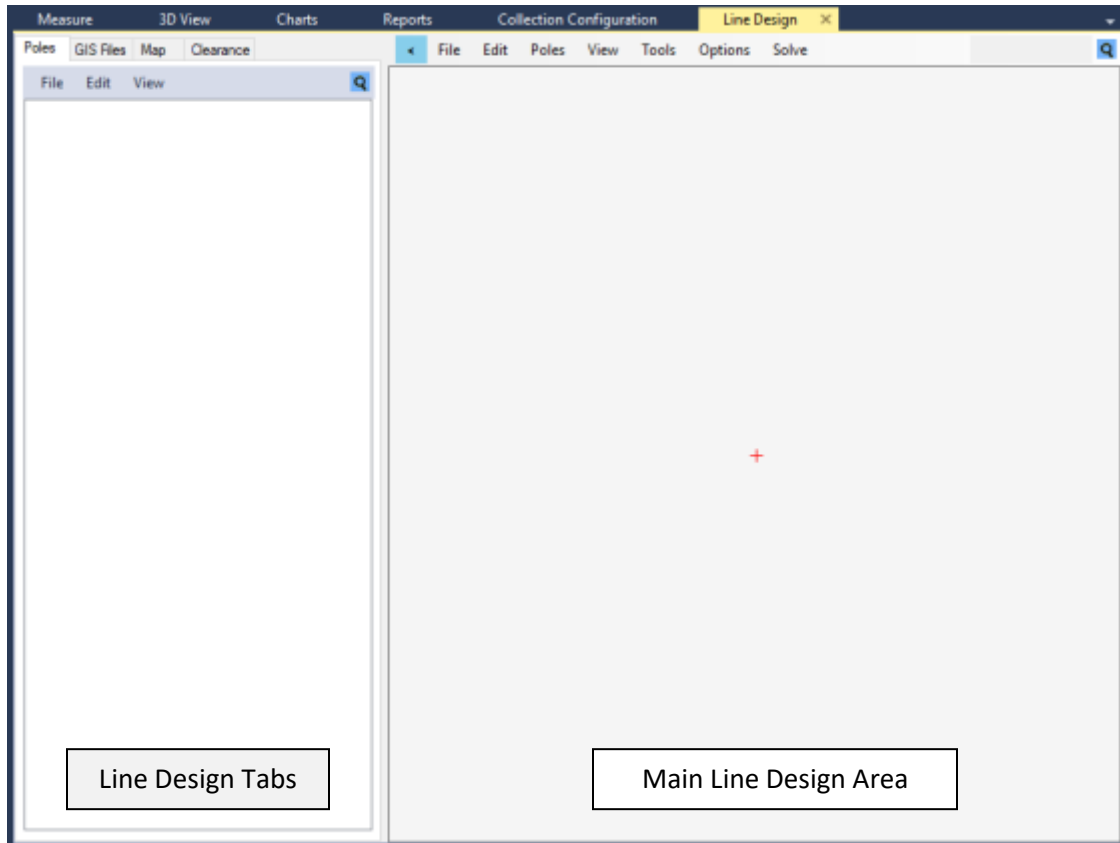
Some of these features include:

- Generating a line of poles using a Line Design Wizard Tool
- Adding existing .pplx files to a line design
- Linking spans between poles using drag-and-drop functionality
- Simplified stringing of new spans between poles
- Connectivity from pole to pole using jumper cables
- Advanced clearance analysis using 3D clearance buffers
- Incorporation of maps and client GIS data in new map view
- Analysis report dedicated to analyzing a circuit of poles
- 3D View enhancements for easy editing of line designs

For a more comprehensive review of the new features and options, please see the O-Calc Pro® Line Design User Guide.

Understanding Line Design Interface

A new tab can be found next to the existing 3D View, Measure, Charts, and Reports tabs in the O-Calc® Pro interface.



This new tab has two main sections; one is identified as the Main Line Design Area, while the other contains a set of Line Design Tabs for Poles, GIS Files, Maps, and Clearance Rules.

Main Line Design Area

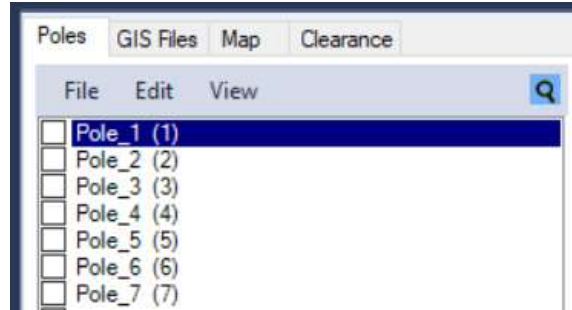
This portion of the interface will display the poles of a line design in a geospatial way, as well as other resources that a user would need to accurately create a new line design. This area can display map server tiles as well as client GIS Data.

Line Design Tabs

The tabs in this portion of the interface allow a user to manage the poles in a line design, as well as additional GIS files, maps, and clearance rules.

Poles Tab

The Poles Tab will be blank until poles are added to a new line design, or an existing line design has been opened. Once poles are added, a numbered list of the poles will be displayed.



The numbering of each pole, the number in the parenthesis, indicates the current order for the poles. This order is used for other tools, like the order in which stringing is performed and the order in which poles are drawn in profile view.

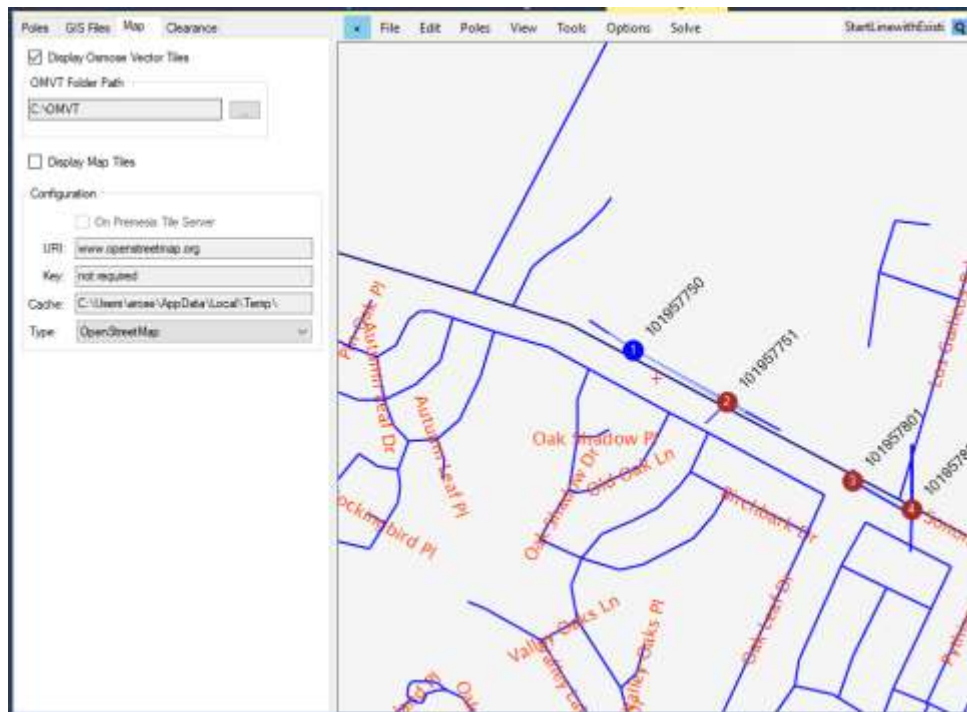
Pole order can be changed by dragging-and-dropping the items in the list to be above or below another item in the list. Additionally, under the View drop-down list in the Poles tab, there is an option called **Sort/Check Helper**, which allows a user to position the mouse overtop of poles, in the order they would like them placed. More information on this feature can be found in the full Line Design User Guide.

GIS Files Tab

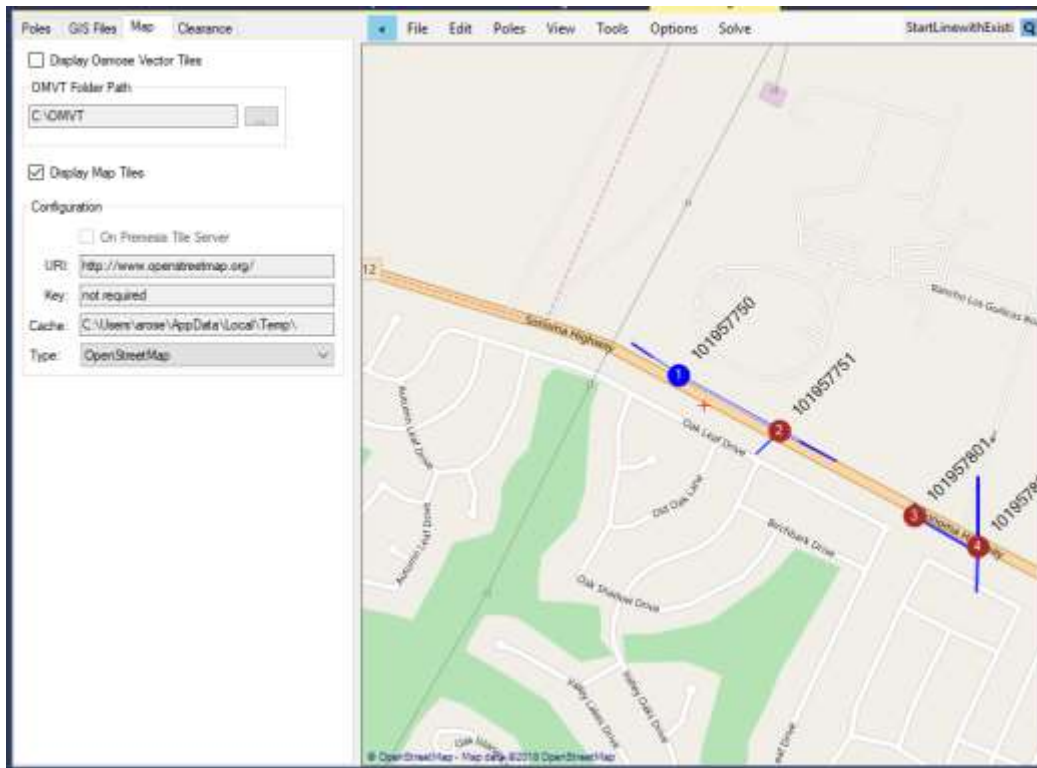
This area allows a user to add to or remove GIS files or layers from the Main Line Design Area. User defined data such as Shapefiles and GeoJSON files are examples of GIS layers that can both be added to a line design.

Map Tab

This area allows a user to display a map in the Main Line Design Area to assist in the modeling of a line design. Osmose Vector Tiles can be displayed, which show simplified roads and labels. Additionally other Public Domain GIS Data can also be displayed.



Additionally, a background map from OpenStreet, Google Maps, or Bing Maps can be rendered, provided that an API Key is entered if required.



For some maps, a key may be required that must be obtained by the user from the host's website. Osmose does not provide a key to the user.

Clearance Tab

This tab allows a user to create and manage clearance rules to be applied to the line design. Like the standard O-Calc Pro clearance analysis tool, rules can be created to manage violations that may occur between spans and various objects like surfaces, foliage and structures. The main difference in O-Calc Pro® Line Design is that the clearance rules can be verified in 3D rather than in profile, one vector at a time. Furthermore the clearance rules can be applied to the full line at one time, and even include different rule definitions based on different surface types.

Updates to Other Areas & Features

In addition to the new Line Design Tab, some other areas of the program have been updated to work in sync with the line design features.

3D View Tab

Most of the changes to other interface areas can be seen in the 3D View tab. The first major change is that all poles in a line design can be seen at the same time in the 3D View tab.

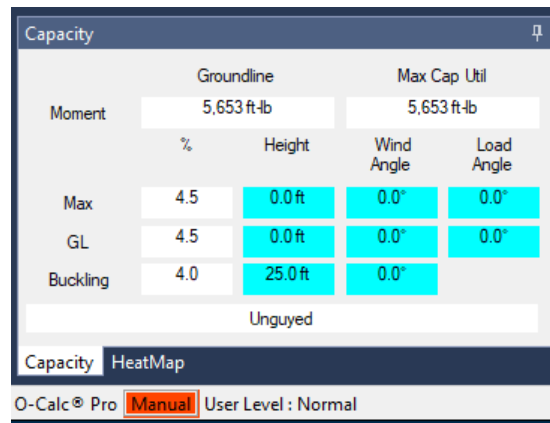
While there is still a compass shown in the 3D View tab, this compass is only shown under the **active pole** of the line design. Only one pole may be active at a time. The components of the active pole are

also listed in the inventory. Switching the active pole can be done in the 3D view tab by left-clicking on the pole you wish to activate.

Additionally, new buttons have been added to the bottom right-hand corner of the 3D View tab. These buttons control the spacing between the poles in the 3D rendering of the line design. These values do not represent actual span lengths between poles, but rather the scaling of the distance between poles that are drawn. This will make it easier to view poles that may be greater distances apart. A filter has also been added to allow a user to display all spans, those that are linked, or those that are not linked.

Capacity Calculation

The capacity meter is set to manual mode in Line Design; the default setting to automatically calculate this value has been altered. Typically, the percent maximum capacity utilization is automatically calculated for the user each time a change to the model is made. This option can be turned off under the Options menu. However, in line design, automatic calculation is turned off by default. This is indicated in the bottom ribbon of the interface, right below the capacity utilization window.



Clicking on the “Manual” button will run the calculation for the active pole, provided each pole in the line has been assigned a loadcase. To run a calculation on the entire circuit, please see the steps outlined in the [Performing an Analysis and Reading the Results](#) section.

Default Loadcase

In line design, the loadcase is set based on the loadcase from the pole used to start a line. For instance, when creating a line design using the wizard, a user will start out with one pole. The loadcase applied to this pole will automatically be applied to each subsequent pole created in the wizard.

Additionally, creating a line design using a set of existing .pplx files will maintain the loadcase that had been set on those poles. It is also possible to have poles in a line with different loadcases. In this case, when a new pole is added, it adopts the loadcase of the pole identified as pole number 1 in the list of poles in the line design.

Auto-Guy

The Auto-Guy feature allows a user to take a default guying assembly, and place the entire assembly on the pole. The guy wire’s attachment height is set to the point on the pole where the user has right-clicked, while the anchor is placed in a position that corrects the pole the most. In Line Design, before

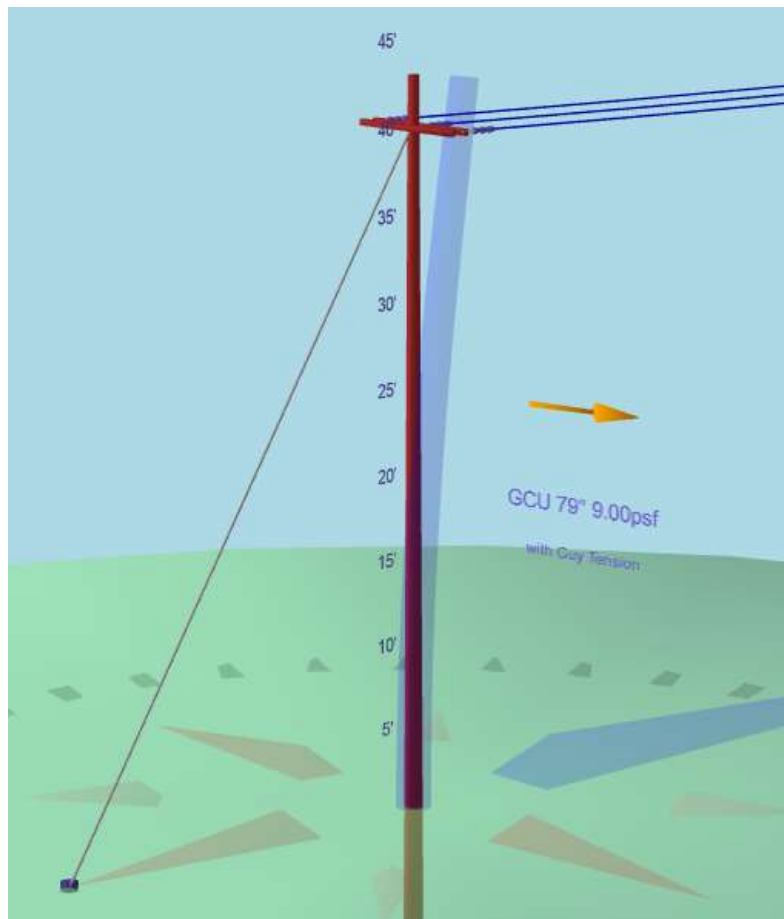
the auto-guy functionality can be applied to a pole, this particular pole must have a pole loading calculation, which can be run by following the steps outlined in the [Auto-Guy](#) section of this document.

Creating Line Designs

This section outlines the options for starting a new line design. Primarily, a user will create a line design by using the line design wizard, creating one from an existing .pplx file, or creating one from a set of .pplx files.

Using the Line Design Wizard

The Line Design Wizard is the easiest option for creating a new line design. Typically, this would start with a dead-end structure that is modeled in the traditional way; this structure could be considered the start or the end of the line.



Once the start or end of the line is created and saved as a .pplx file, the following steps can be used to build a line design that has the same components on the subsequent poles as the starting pole.

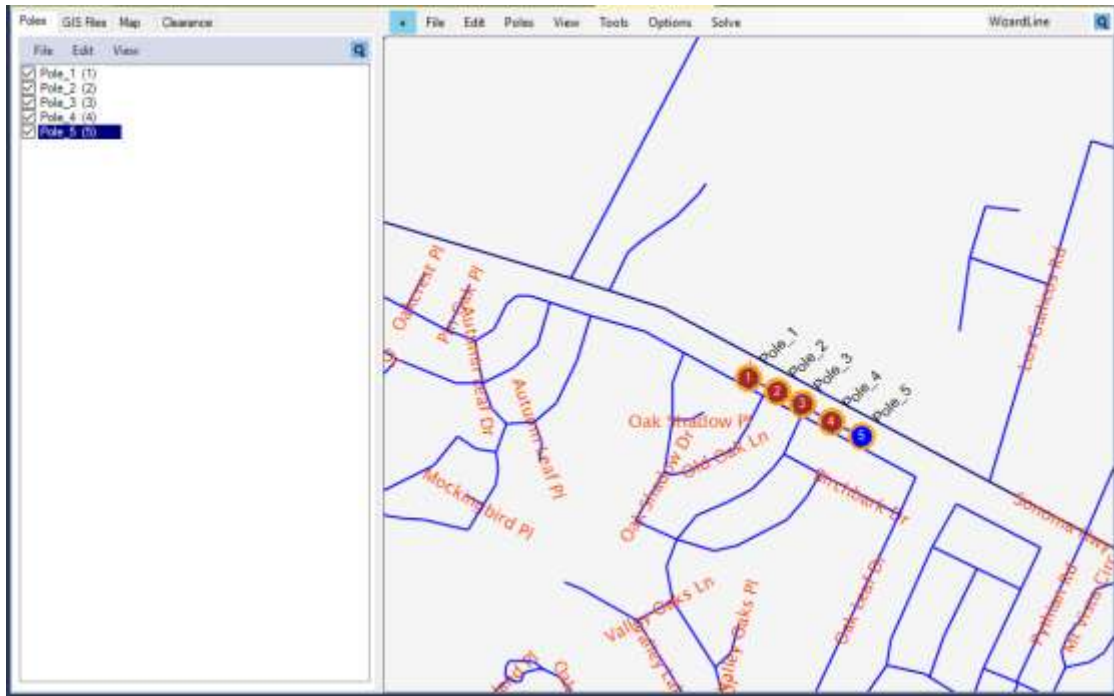
1. Open or create a deadend pole
2. In the Main Line Design Area, select **File > New Line Design > Using Line Wizard**
3. Ensure maps are displayed to determine where to position poles
4. Left-click on the map in the Main Line Design Area to place the pole

****Note:** Accuracy of pole position can be adjusted at any time by repositioning the pole; this functionality is outlined in the full O-Calc Pro® 6.0 Line Design User Guide

5. Enter a Pole ID if desired, then click 'OK'
6. Verify a red dot is placed on the map for this pole

This will create the beginnings of a line design. The pole is not added to the poles tab until the line design has been finished. Next, to add additional poles to the line design, follow these steps:

1. Left-click on a place for the next pole
2. Update the Pole ID
3. Continue adding as many poles as needed for the line
4. When finished, click the yellow "Extend" option, in the ribbon of the Main Line Design Area
5. When prompted, name and save the Line Design
6. Verify each pole is added to the Poles list, each with the correct number



By using the wizard, all of the pole are created and linked together, saving the user time and effort to link the spans of each pole to their neighbors.

Once all poles have been added and modified, the line design can be saved and analyzed.

Using Existing .pplx Files to Start a Line

An experienced O-Calc® Pro user will have created many .pplx files in the past. These .pplx files may even be part of the same line of poles. Rather than starting from scratch, a user can take existing .pplx files and create a new line design from them, provided they have a valid Latitude and Longitude.

To begin, open any existing .plx file. This file will be shown in the 3D View Window as it normally is within O-Calc® Pro.

Next, in the Line Design tab's main ribbon:

1. Select **File > New Line Design > Start Line with Current Pole(s)**
2. Enter a file name, then save the Line Design File (.plld)
3. Click Ok

This will add the .plx file to the list of Poles under the Line Design tab.

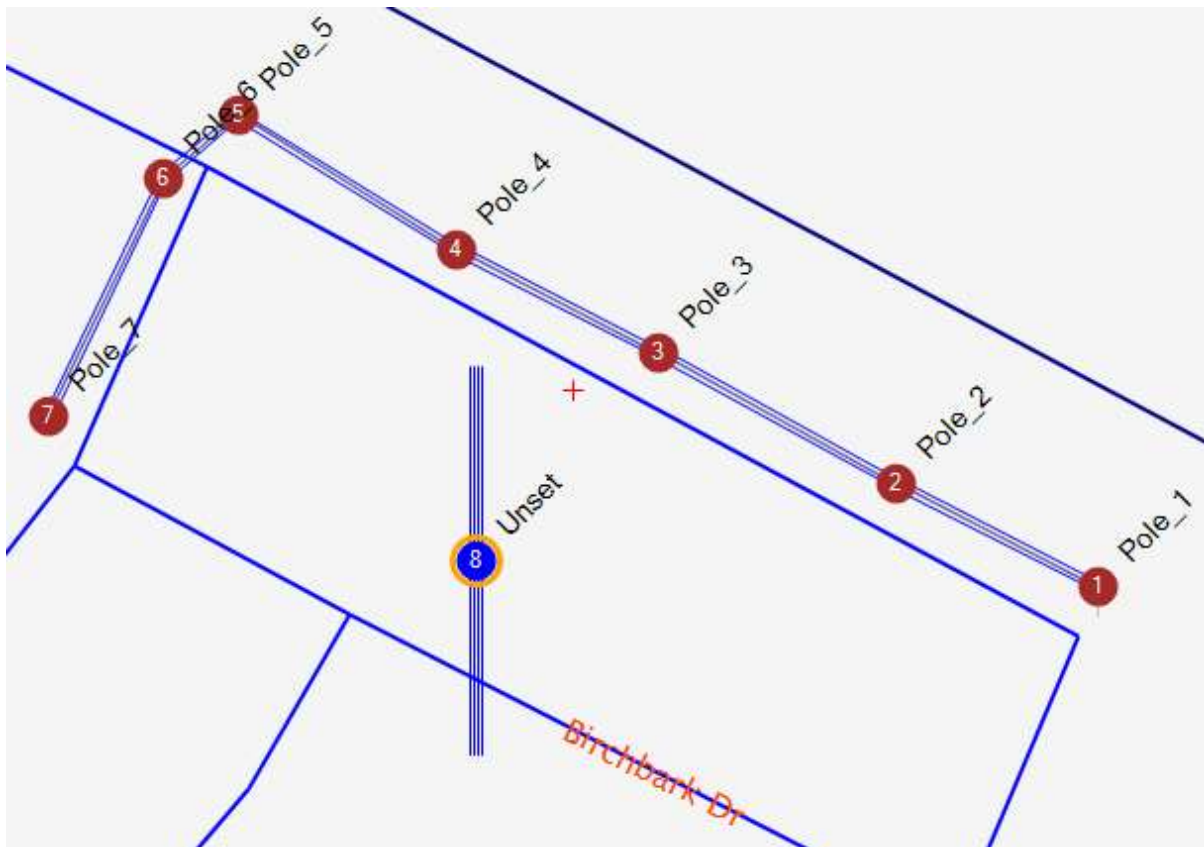
Adding Existing .plx Files to an Existing Line Design

Once the line has been started, additional existing .plx files can be added to a design.

1. In the Poles list of the Line Design Tab, select the **File** drop-down
2. Select **Add PPLX Files to Line Design**
3. In the pop-up window, select one or more poles to add to design
 - a. Hold down CTRL Key to select multiple poles
4. Click Open

***Note: A pole that is added using this method must have valid Latitude and Longitude coordinates within the .plx file*

The selected poles are added to the line design window. The added pole will need to be 'hooked up' to one of the other poles in the line.

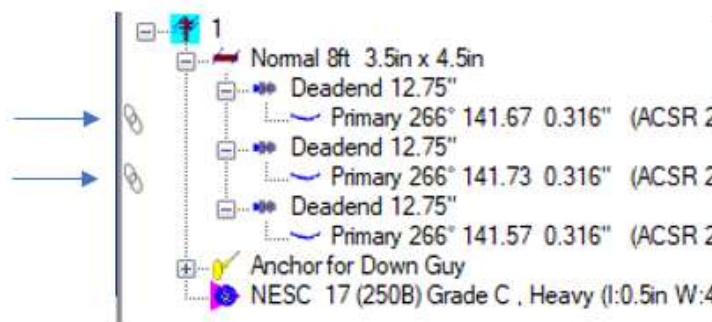


****Note:** If a pole that is added is not within 10 Kilometers of another pole in the line design, an error message will display.

Linking Spans between Poles in a Line Design

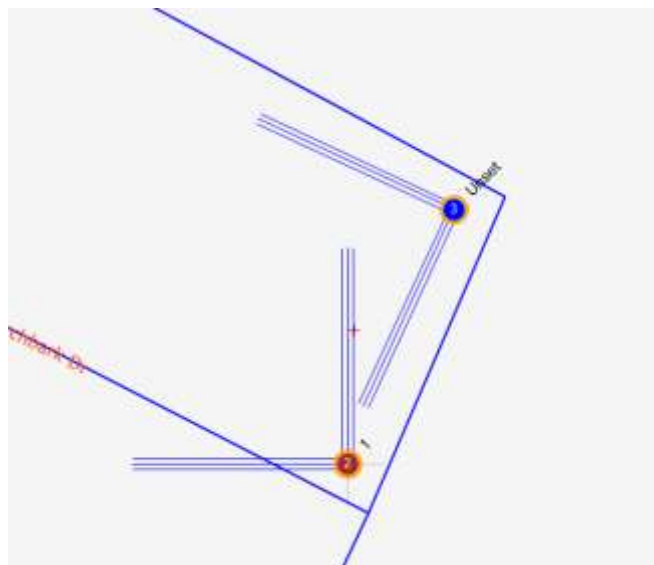
When multiple existing .pplx files are used to create a new Line Design, or are added to a Line Design, the individual poles are not linked to one another by the spans. When two spans are linked, it means that the span goes from one pole to the next, with the load of that span being shared between all poles that the span is on, that are linked.

Spans are linked for the user when other methods, such as the Line Design Wizard, are used to generate a line of poles. When spans are linked, a chain-link symbol will be shown next to that span in the inventory list, as shown below.



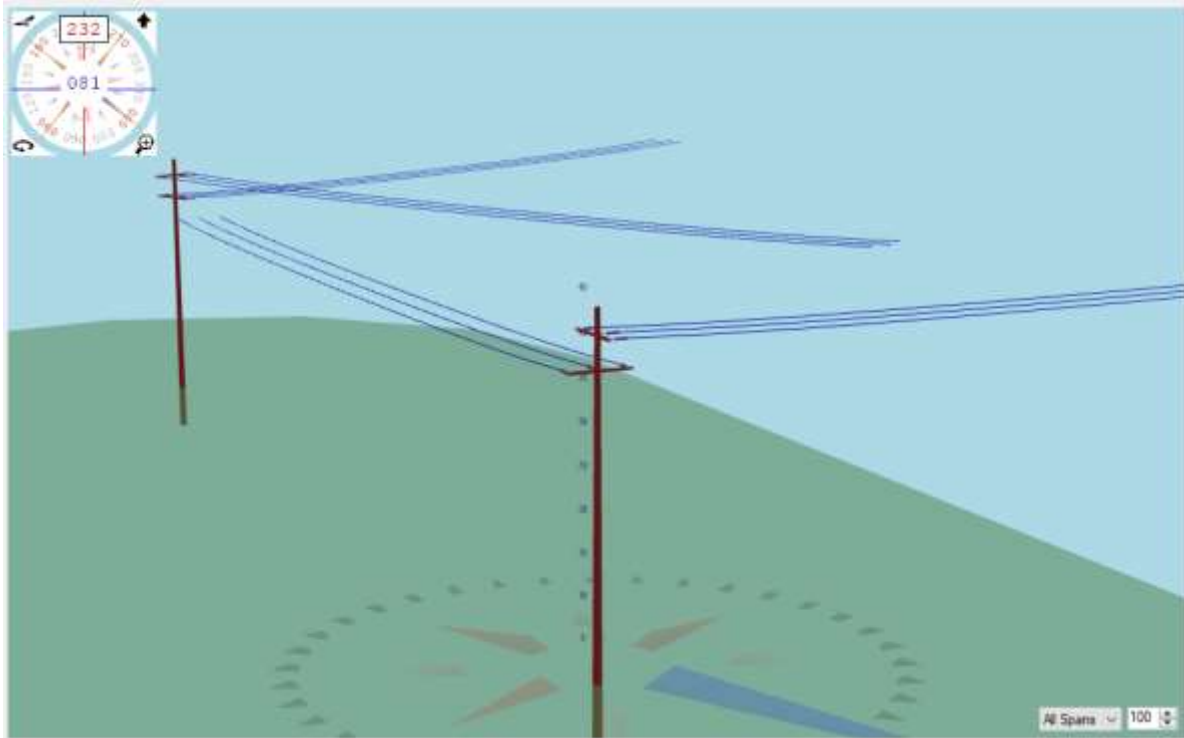
This symbol indicates that this span is linked to a span on the next pole in the line. Without linking, the load of the span on each pole will not be shared, and thus the analysis of the entire circuit will be incorrect.

When existing .pplx files are used to create a line design, the spans are not linked. This connection between them must be done manually, using the 3D View window. For example, below is a picture of such a scenario:



These two poles would need to be connected to analyze them as a single line design; in other words, to account for the interactions between the two poles.

In a line design created with at least two existing .pplx files, go to the 3D View tab. All poles in the design will be shown in 3D View, but the compass will display under the active pole.

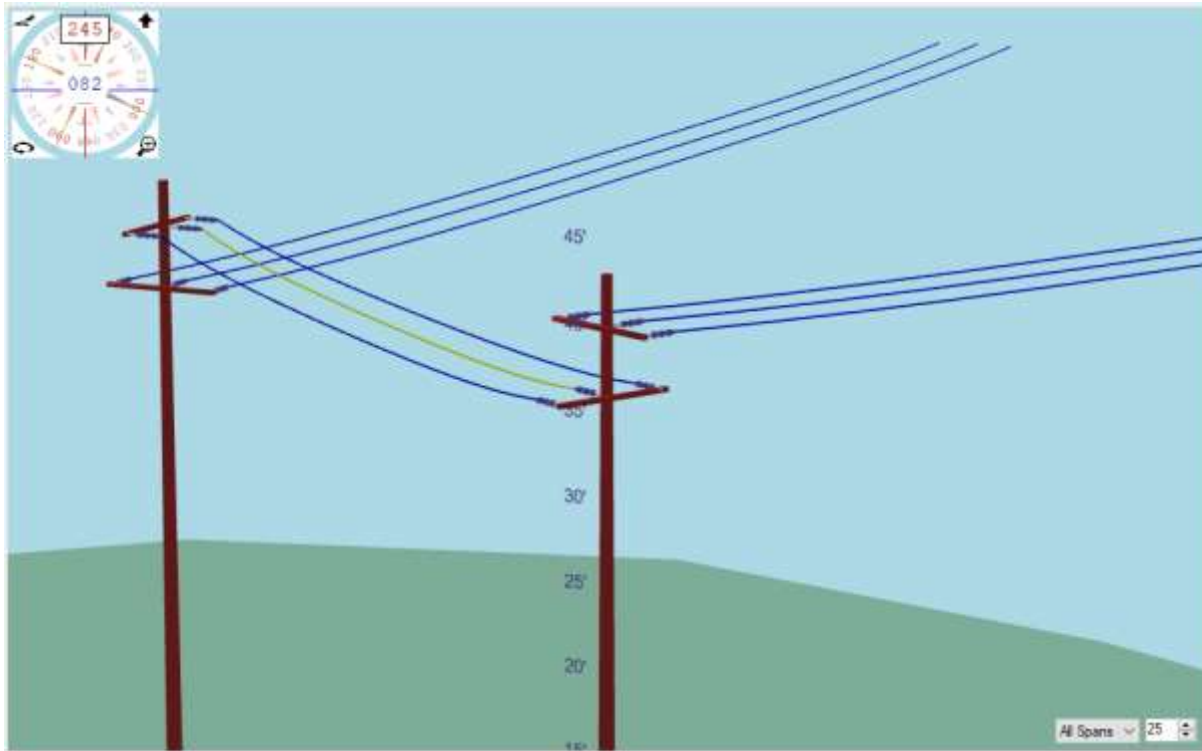


Notice in the previous image that the compass only appears under one of the poles – this is the active one in this design. The active pole is displayed in the Inventory window, and is the pole currently being edited.

***Note: Normal 3D View navigation (zooming, panning, rotating) still function in the same way.*

To link spans from one pole to the spans of another:

1. Select a span on the active pole in the 3D View tab
2. Left-click and hold on the span
3. Drag the cursor, while maintaining the left-click, to the span to be linked to the next pole in the line
4. When the replace symbol is visible, release the left-click
5. Verify that the spans are now linked in the Inventory window, by noting the link symbols next to the linked span. Additionally, the filter option in the 3D View window can be set to view any linked or un-linked spans.



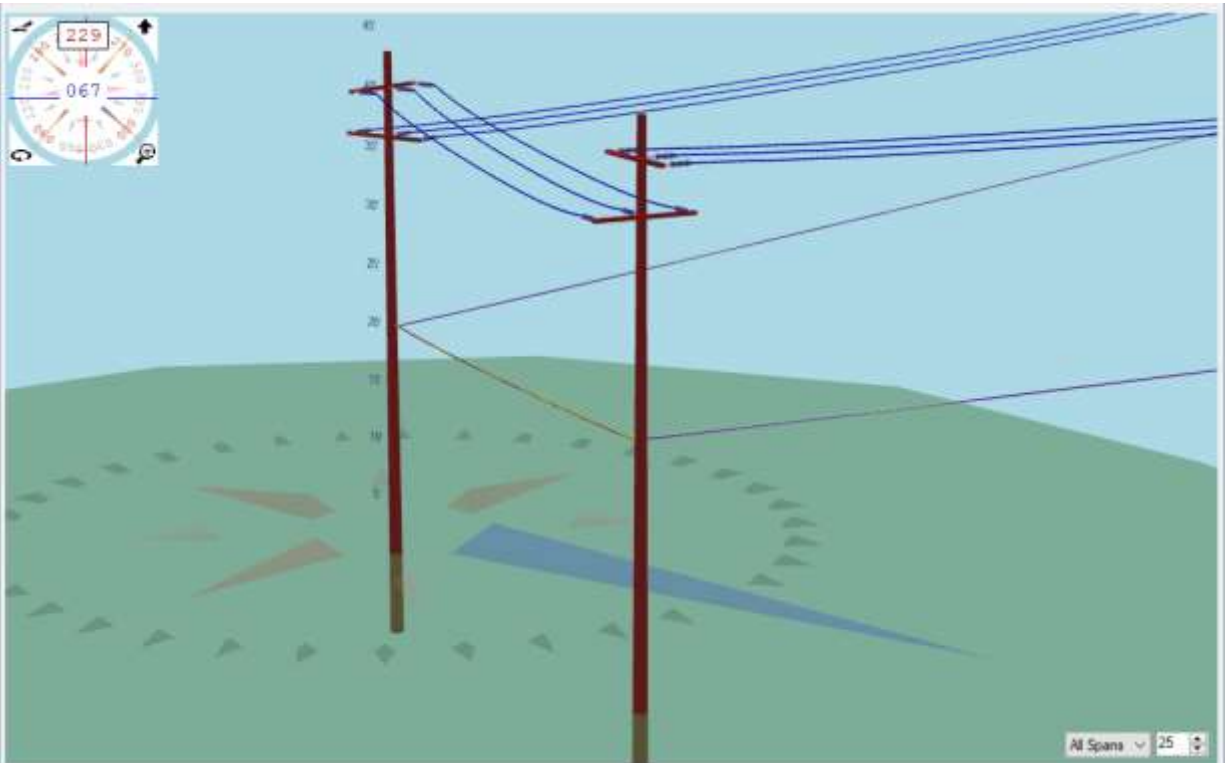
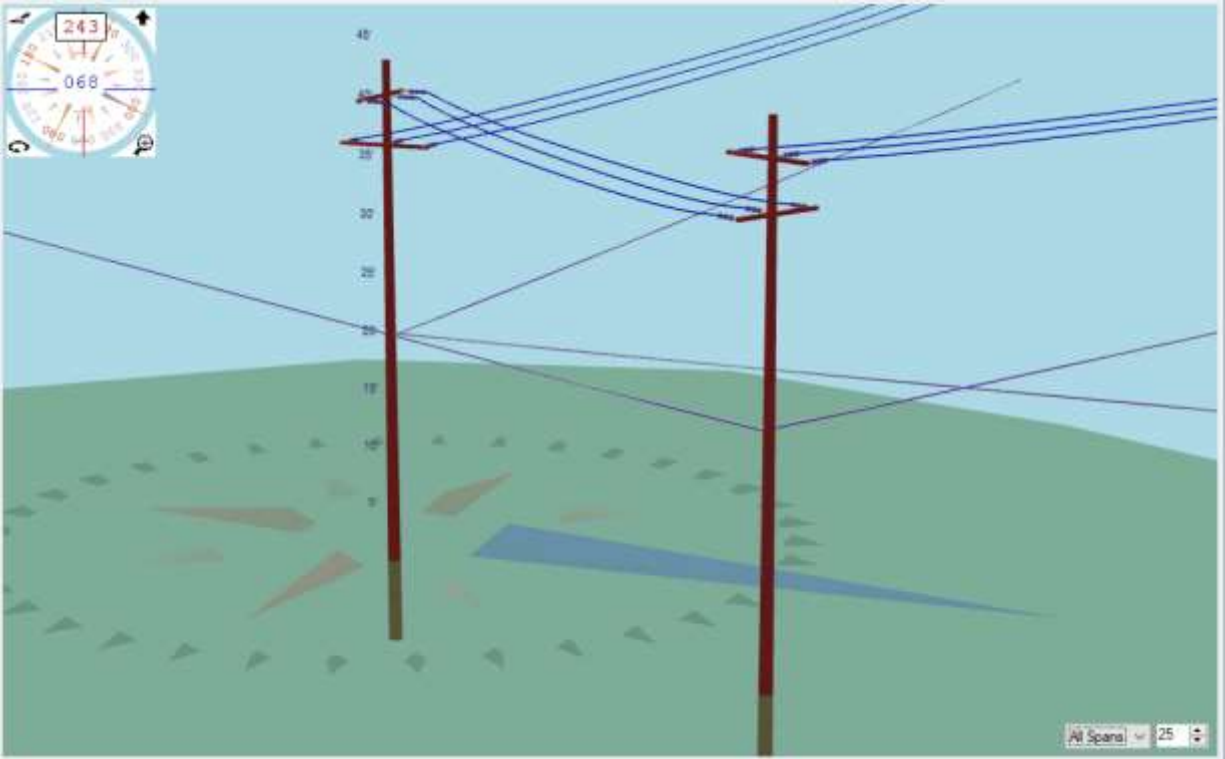
To link communication spans, or span bundles from one pole to the span bundles of another:

1. Select the messenger wire of the communication bundle on the active pole in the 3D View or Inventory tab
2. Left-click and hold on the messenger
3. Drag the cursor, while maintaining the left-click, to the messenger being linked to the next pole in the line
4. When the replace symbol is visible, release the left-click
5. Verify that the spans are now linked by looking for the chain-link symbol in the inventory window; Alternatively, the filter option in the 3D View window can be set to view any linked or un-linked spans.

Rules for Linking Spans

Certain rules are in place to ensure that linking spans is done in a logical way. Below are the main rules that must be followed for spans to be linked together.

- Spans to be linked must be of the same type (Primary, Secondary, Neutral, etc).
- Spans to be linked must be of the same description (AAAC 30.58 KDM AKRON, AAC 4 AWG 7 STRAND ROSE, etc.)
- Spans cannot be linked if they are already linked to another span
- Communication bundles that are linked may have different messenger sizes; the messenger used to start the link is applied to the rest of the link. Additionally, any communication spans from the origin communication bundle are used to replace the communication spans in the bundle that is being linked to.



***Note: Linking of spans can also be performed in the Main Line Design Area's map view.*

Switching the Active Pole in 3D View

Note that when connecting existing .pplx files, only the spans on the **active** pole may be selected and linked to spans on an adjacent pole. Once the active pole is connected to adjacent poles, proceed to the next pole in the line to continue the linking process. There are two ways to switch the active pole, outlined below.

To switch the active pole in 3D View:

1. Go to the 3D View tab
2. Left-click on the next pole in the line
3. Wait a moment, then verify that the clicked pole is now shown in the Inventory window
4. Continue linking spans

Alternatively, selecting a different pole from the list of poles in the line design will also change the active pole:

1. Go to the Line Design Tab
2. In the Line Design Tabs, select the Poles tab
3. Left-click on another pole in the line
4. Verify that the selected pole is shown in the Inventory Window
5. Continue linking spans

Un-Linking Spans in Line Design

If for some reason you link two spans that should not be linked, you are able to Un-link them. To un-link spans, simply right-click on the linked span on the currently active pole and select “Un-Link Span”. This will break the connection *for this pole*. Next, go to the pole with the other span that was part of this connection. Right-click on that span, and select “Un-Link Span”. It is imperative that when spans are un-linked, both parts of the link should be disconnected, even if this action has already been performed on one of the spans involved.

If both ends of the link are not un-linked, it will not be possible to link together new spans with these, or link them back together.

Connecting Spans with Jumper Cables

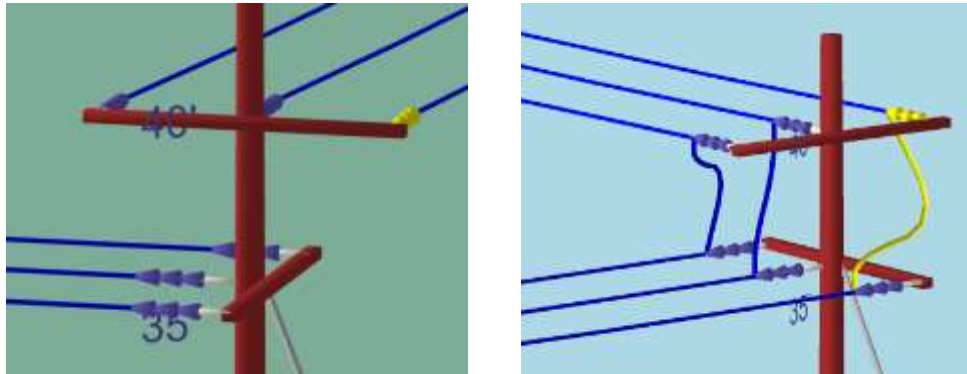
As a new component of O-Calc Pro® 6.0, a user can now model jumper cables between spans on a pole. In situations like a double deadend, these jumper cables allow for the connectivity of the model to continue, for features like stringing a new span or replacing a span type across an entire line.

To add a jumper between insulators on a pole, follow these steps:

1. Select the first insulator that the jumper will start from
2. Left-click and hold on that insulator, drag-and-drop while maintaining the left-click, to the insulator the jumper will terminate at
3. Upon releasing the left-click, a menu will appear
4. Select the “Add Jumper” option
5. Verify that a jumper cable is drawn between the two insulators involved.

Jumper cables can also be drawn between an insulator and an object, by using what is called a Terminal. The Terminal is a point where the Jumper cables will end, typically placed as a point near equipment, such as a transformer.

Note that jumper cables can go from one insulator, to another, but not loop around back to the original insulator.



Using Created Pole to Generate Next Pole

In Line Design, an entire pole can essentially be copied, and inserted as the next pole in a line. This ensures connectivity to the previous pole, as well as ensures that all the spans and equipment from the first pole continue onto the next.

In an existing line design, the following steps can be used to copy a pole and essentially repeat it as the next pole in a line.

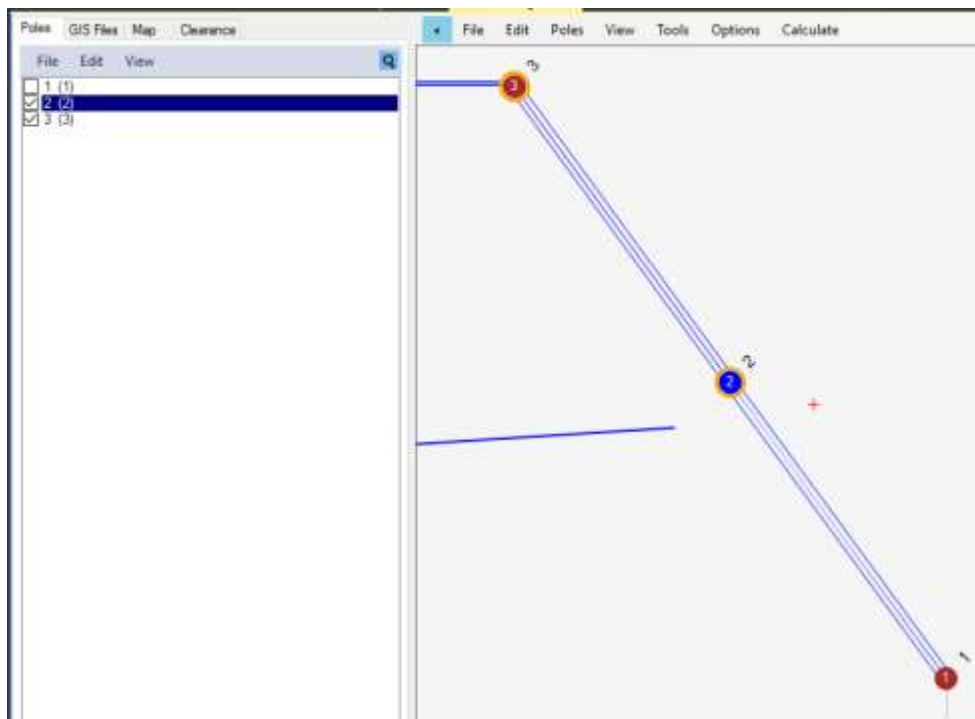
1. Select the pole to be copied
2. In the Main Line Design Area, go to **Tools**
3. Select the **Extend or Branch Line > Extend Line from Current Pole** option
4. Assign a Pole ID
5. Click on the map to set the location of the new pole
6. Click 'OK' in the Geolocation Window
7. Verify that a new pole was added to the map and listed in the Poles tab
8. Link spans when appropriate

Splitting Spans to Insert a Pole

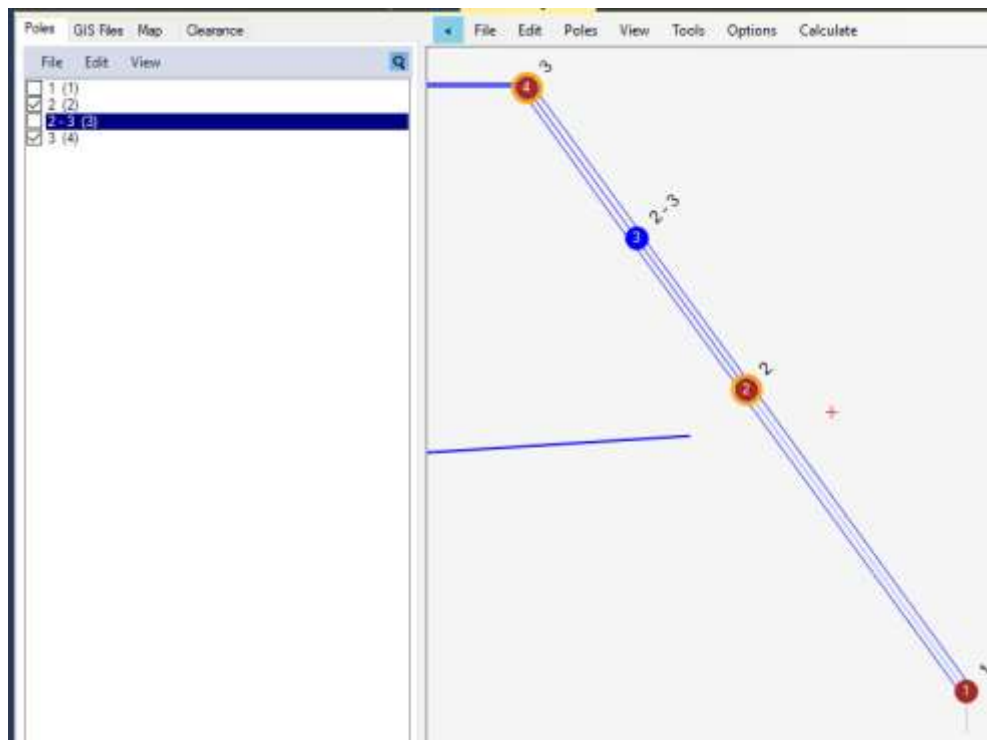
Once an analysis is performed, a user may find that the poles in the line fail because of span lengths that are too long, applying too much tension to one or more poles in the line design. To remedy this, an option exists to split span lengths, and insert a pole at the midpoint.

Begin with two connected poles, with spans of any distance. Let's say 200 feet, as this is the default span length in O-Cal Pro.

1. Go to the Line Design Tabs, under the Poles Tab
2. Check the boxes for exactly two poles whose spans are to be split



3. Select the **Edit** option in the Poles tab
4. Select **Split Spans and Insert Pole**



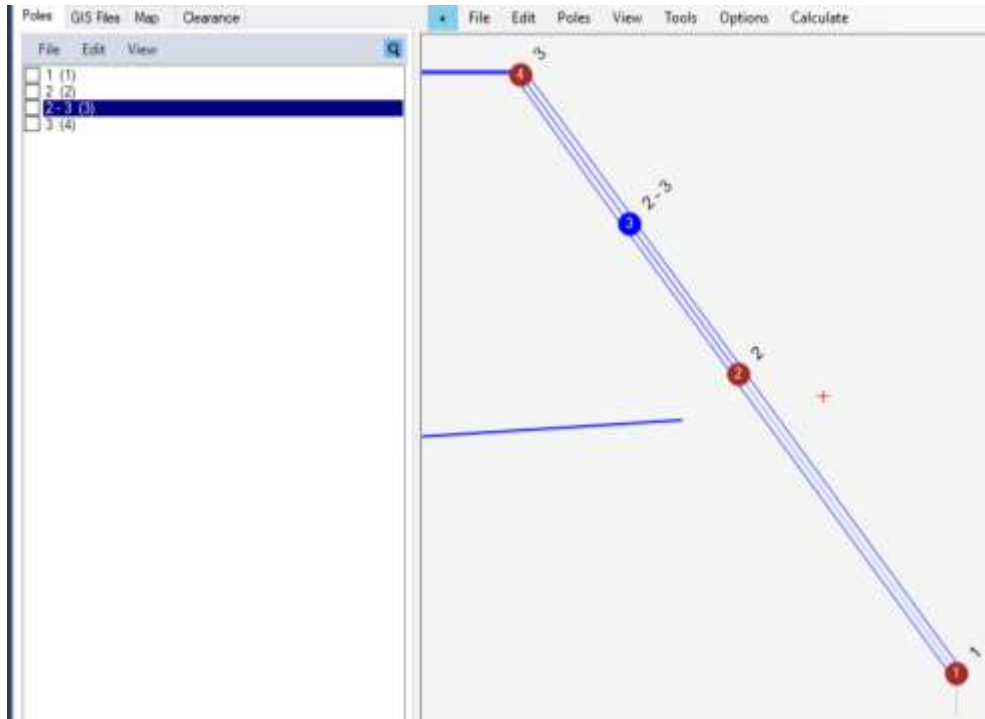
5. Verify pole added to design
6. Make appropriate edits to pole and Save

Merging Spans to Remove a Pole

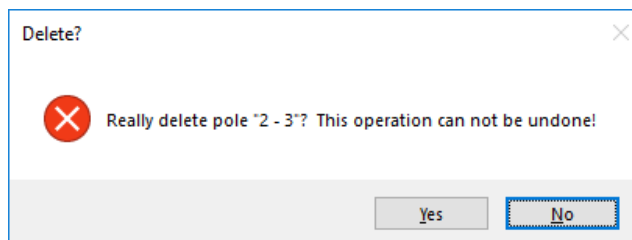
On the other hand, once an analysis is performed, a user may find that a pole is not needed in an area. In this situation, an option exists to merge together spans from two selected poles, and remove any poles between them.

Begin with at least three poles, two end poles with one pole between them.

1. Go to the Line Design Tab, under the Poles Tab
2. Select (highlight) the pole to be removed



3. Select the **Edit** option in the Poles Tab
4. Select **Remove Pole and Merge Spans**
5. When prompted, select 'Yes' to delete the selected pole



6. Verify pole was removed from design
7. Make appropriate edits to the remaining poles and Save

Performing an Analysis and Reading the Results

As previously stated, automatic calculation of the loading on a pole is disabled when the Line Design features are being used. Instead, when a line is complete, a user has the option to solve a single pole, or the entire line.

Once a line design is finished, use the following steps to generate a report:

1. In the Main Line Design Area ribbon, select **Solve**
2. Choose **Entire Line** from the menu
3. Select either fixed or Swept Wind
 - a. For Fixed Wind, Set the wind angle, click “OK”
 - b. For Swept Wind, set the start angle, end angle and increment for analysis, click “OK”
4. The report will generate in the Reports tab

The report generated in the reports tab will look something like this:

O-Calc® Pro Standard Report

O-Calc® Pro Whole Line Analysis
Report Created: 7/18/2018

Worst Wind: 255
Worst Pole: Pole 1
Worst MCU: 240.71

		Wind Angle:0			
Pole		GCU	VCU	TCU	MCU
Pole 2		68.78	5.85	69.12	69.12
Pole 1		225.16	5.38	225.47	225.47
		Guy		Tension	Capacity

		Wind Angle:15			
Pole		GCU	VCU	TCU	MCU
Pole 2		68.46	5.85	68.8	68.8
Pole 1		221.84	5.38	222.15	222.15
		Guy		Tension	Capacity

On this report, several pieces of information are provided:

- Name of Line Design in Upper-left corner
- Overall Worst Wind Direction
- Worst Pole in the Line – or the pole with the highest MCU under the worst-case conditions
- The value of the worst Pole’s MCU
- In subsequent sections, each wind angle is shown for the calculation that was run, along with values for each pole in the line, given a certain wind angle
 - GCU – Groundline Capacity Utilization
 - VCU – Vertical Capacity Utilization
 - TCU – Total Capacity Utilization
 - MCU – Maximum Capacity Utilization

- Guying information would also be provided, if guying were present on any poles in the line.

An analysis can also be run on an individual pole. To do this, select a pole from the list in the Line Design area.

1. In the Main Line Design Area ribbon, select **Solve**
2. Choose **Current Pole** from the menu
3. The calculation will run, and the Capacity Display will show the overall MCU
4. More details can be seen for this pole in the Reports tab, by running any of the available reports.

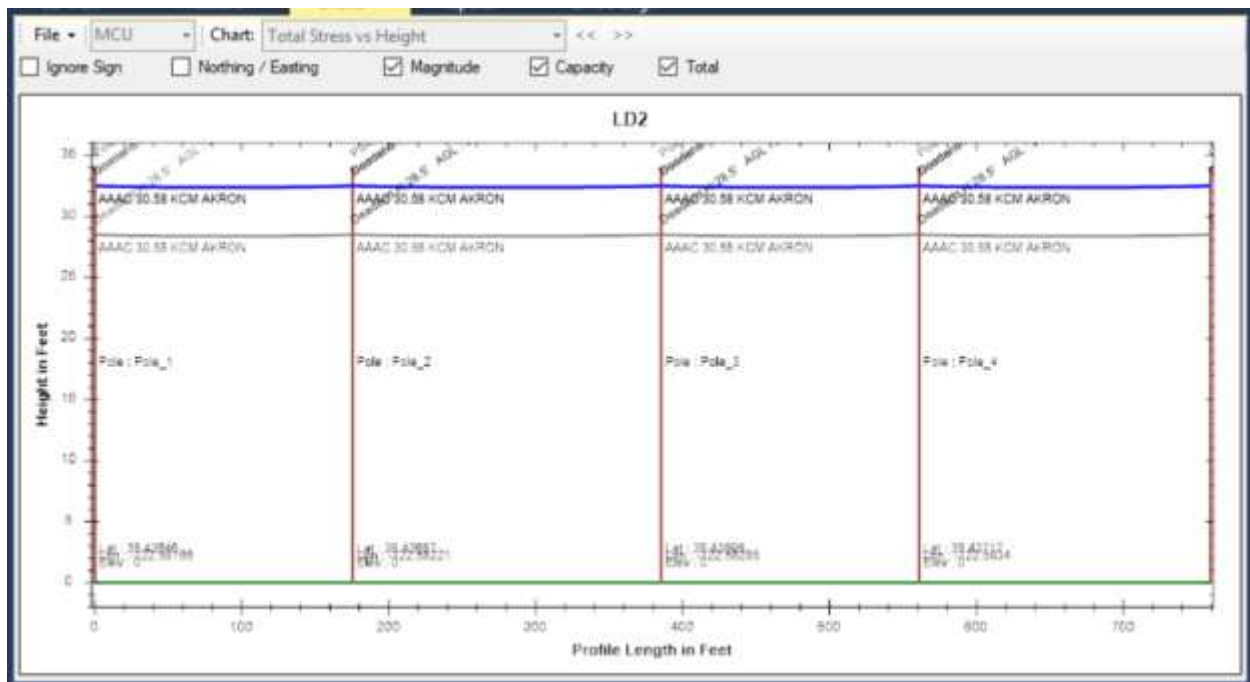
Useful Features and Tools

In the Main Line Design Area ribbon, there are several additional dropdown menus. This list contains several features that may be useful when getting started with line design.

Profile View

It is possible to view a profile of a set of poles in a line, like how schematic view is displayed for a single pole in previous versions of O-Calc Pro®. To utilize this feature, follow these steps:

1. Complete and save a line design
2. Check the poles to be included in the profile from those listed in the Poles Tab
3. In the Main Line Design Area, select the **View** drop-down list
4. Select **Profile View**
5. Verify poles in the profile view in the Charts tab



Profile view can be extremely useful, especially in cases where elevation data is significant to the analysis of the line.

Other 'View' Options

Additional options are available to help a user navigate around the Line Design Area. The 'View' drop-down list in the Main Line Design Area ribbon provides several options for easily navigating to a location.

The **Zoom to Poles** option will pan to and focus on the selected poles in the Main Line Design Area.

The **Center on Coordinate** option allows a user to enter a specific coordinate in the Geolocation window, and will move to that location.

The **Center on Address** option allows a user to type in an address, which will then move the center of the display to that location.

Performing Stringing and Adding Drops

A valuable tool available is the ability to perform stringing, or attach a span to the entire length of a line, running from one pole to the next. First, a default stringing assembly must be set up.

1. In the Master or User Catalog, find a stringing assembly
 - a. An assembly could be any crossarm or insulator with a wire on it, or a span head guy
2. Right-click on the desired assembly, and select **Set Line Design Stringing Assembly**
3. In the line design tab, select (check) all the poles that you wish to add the stringing assembly to
 - a. Pole order is important here; stringing is performed from the pole identified as 1, to 2, to 3, and so on. Poles out of order will have the stringing assembly drawn in that order.
4. In the **Tools** drop-down menu in the line design tab, select **Perform Stringing**
5. Select either all of the poles, or the selected (checked) poles
6. Enter the height at which the stringing assembly will be placed; click “OK”
7. Verify that the stringing assembly has been added to all the selected poles

Once a span has been placed using this option, additional edits can be made. These can include changing the positioning of the insulator on each pole, or changing properties of the span itself.

To add drops to a pole, a similar process is used:

1. In the Master or User Catalog, find a stringing assembly
 - a. An assembly could be any crossarm or insulator with a wire on it, or a span head guy
2. Right-click on the desired assembly, and select **Set Line Design Stringing Assembly**
3. In the line design tab, select the pole you wish to add drops to; if multiple poles are checked, the drops will be added to the active pole
4. In the **Tools** drop-down menu in the line design tab, select **Add Drops to Current Pole**
5. Enter the height at which the drop will be placed on the pole; click “OK”
6. In the main line design drawing area, notice the cursor display lat and long values wherever it is placed. Click on the screen where the service drop or drops should end.
 - a. Clicking in multiple spots will add a service drop ending at each of the clicked locations
7. When done placing drops, click the yellow **Add Drops (Click here when done)** button in the main line design ribbon

After placement, these can be edited as well.

What Next?

Congratulations! You have successfully finished the O-Calc Pro® Line Design Quick Start Guide. You are well on your way to becoming a Line Design expert!

Additional material on these and more advanced topics can be found in the Line Design User Guide. Plus, there are [YouTube video's](#) and [wiki page articles](#) available online for review, each with a focus on a particular topic.