

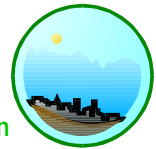
The CEDRA Corporation's COMMAND OF THE MONTH

A monthly information bulletin

March 2007

FEATURED COMMAND

Horizontal Alignment
(street centerline) Design



Application Description

In the world of street design a major component in the design process is the layout of the horizontal alignment or street centerline. The phrase horizontal alignment is used, rather than street centerline, because it is a more generic term. Horizontal alignments can be used in the layout of pipelines and other types of utilities in addition to the layout of street centerlines.

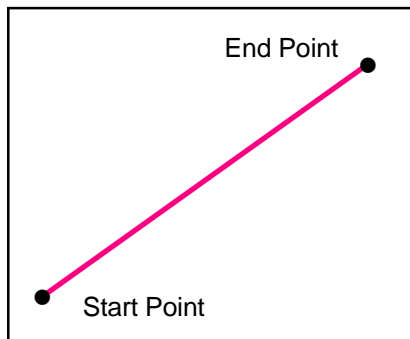


Figure 1
Two Point Horizontal Alignment

A horizontal alignment can be as simple as a two-point line, that is, the alignment consists of a start point and an end point, see Figure 1, or as complicated as having multiple line and curve features, such as the red elements shown in Figure 2. As such, tools other than the conventional line and curve creation commands are required.

The CEDRA Solution

To address the application of creating horizontal alignments, the CEDRA-AVland™ software offers the CEDRA-AVland Menus, see Figure 3, and the

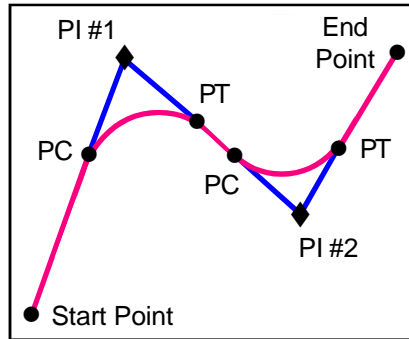


Figure 2
Horizontal Alignment PI Components

CEDRA-AVland HAlignment Tools, see Figure 4, toolbars. These toolbars are available only for ArcGIS® users.

Command Of The Month bulletin

This month's issue discusses the process of designing a horizontal alignment or street centerline.

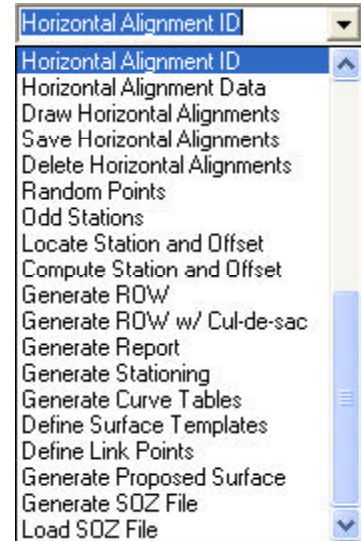


Figure 3
CEDRA-AVland-HAlignmentMenus
Toolbar

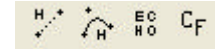


Figure 4
CEDRA-AVland-HAlignmentTools
Toolbar

Horiz. Alignment Design - Overview

The basic concept behind the design of a horizontal alignment is that the user will:

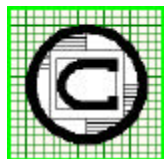
- Assign an identification (ID), such as a number, 1, 2, 3 and so forth.
- Define the start and end points of the alignment, and
- Introduce horizontal points of intersections (PIs), as needed.

In laying out the horizontal alignment, the user can display, as may be required, any pertinent information, such as, con-

tours, aerial imagery, etc. It should be noted that laying out a horizontal alignment is often an iterative process. Rarely, if ever, does a designer position the horizontal alignment perfectly the first time. As such, the tools in the CEDRA-AVland HAlignment Tools toolbar provide the functionality to edit or manipulate a horizontal alignment.

A. Horiz. Alignment ID Specification

Prior to developing any geometry for a horizontal alignment, the user must select the [Horizontal Alignment ID] command and specify the horizontal alignment ID.



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The value entered in this command designates the current active horizontal alignment ID. Almost all of the commands in the CEDRA-AVland Menus toolbar reference the current active horizontal alignment ID.

Once the command has been activated, perform the following:

1. Enter the desired horizontal alignment ID explicitly or select from the choice list one of the available horizontal alignment IDs, see Figure 5.

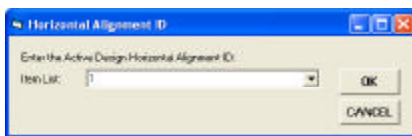



Figure 5
Horizontal Alignment ID Specification

2. Click at the:
 - *Cancel* button to terminate the command, or the
 - *OK* button to confirm the entry.

B. Horiz. Alignment Start/End Points

With the current active horizontal alignment ID set, the user can now define the alignment's start and end points. To do so, use the  tool, see Figure 2. This single tool is used to define both the start and end points of an alignment.

1. Make a pick in the map area to define the alignment's start point.

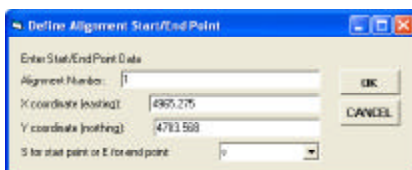


Figure 6
Alignment Start Point Multi-Input Dialog Box

2. As shown in Figure 6, click at the:
 - *Cancel* button to abort the command, or the
 - *OK* button to confirm the location of the alignment's start point.

The only parameter that needs to be responded to in Figure 6 is the last one, which indicates whether the start or end point of the horizontal alignment is being defined. Selecting the *S* option denotes that the user has selected the location of the horizontal alignment's start point. The top three parameters are for visual inspection only. Altering these values will not effect the position of the start or end point.

3. Make a pick in the map area to define the alignment's end point.

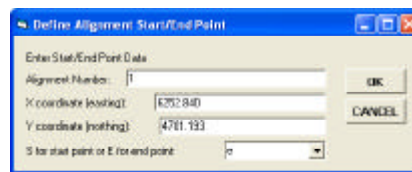


Figure 7
Alignment End Point Multi-Input Dialog Box

4. Select the *E* option from the choice list at the bottom of the dialog box shown in Figure 7, and then click at the:
 - *Cancel* button to abort the command, or the
 - *OK* button to confirm the location of the alignment's end point.

Again only the last parameter in Figure 7 needs to be responded to. Selecting the *E* option denotes that the user has selected the location of the horizontal alignment's end point.


Once the *OK* button is selected, the command will, if both the start and end points have been properly defined, will draw a line connecting the two points.

The alignment's start and end points are stored in a layer called *Alignments-PIs*, while the line which represents the alignment itself is stored in a layer called *Alignments-Lines*.

When a user inserts a PI into an alignment, the PI will be stored in the *Alignments-PIs* layer, while the points representing the PC and PT locations of a

horizontal curve with no spiral will be stored in a layer called *Alignments-Points*. Likewise, if a horizontal curve with a spiral has been defined, the TS, SC, CS and ST points will also be stored in the *Alignments-Points* layer.

C. Define Horiz. Alignment PI Points

Once the start and end points of a horizontal alignment have been defined, the user can then introduce one or many points of intersections (PIs). To do so, use the  tool, see Figure 4.

This single tool operates in five different modes. As such, upon activation the user will be asked to select the desired mode of operation. Shown in Figure 8 is the choice list that is presented by the tool.

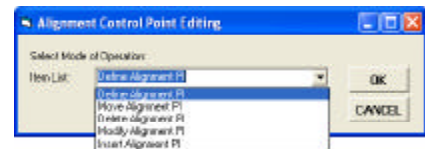


Figure 8
Available PI Modes of Operation

When a PI is to be defined, the user should select the Define Alignment PI option as shown in Figure 8.

Once the command has been activated, perform the following:

1. Select the Define Alignment PI option from the choice list shown in Figure 8, click at the:
 - *Cancel* button to terminate the command, or the
 - *OK* button to continue with the processing.
2. Make a pick in the map area to define the alignment's PI location.
3. Enter the appropriate values for the various PI parameters shown in Figure 9, click at the:
 - *Cancel* button to terminate the command, or the
 - *OK* button to introduce the PI into the alignment.

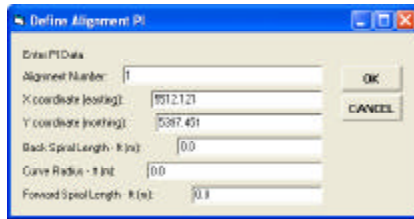


Figure 9
Define PI Multi-Input Dialog Box

Once the OK button is selected, the command will add a new PI into the specified alignment number. The new PI is placed at the end of the list of PIs currently defined for the specified alignment number.

Steps 2 and 3 can now be repeated to introduce additional PIs as may be needed.

All of the parameters shown in Figure 9 can be edited or altered by the user. None of the parameters are for display purposes only. Whatever values are entered in Figure 9 will have a direct effect on the definition of the PI.

Beginning at the top of the dialog box, the user is able to control the following:

Data Line 1 - Alignment Number

The horizontal alignment ID that the new PI is to be added to.

Data Line 2 - X coordinate

The x coordinate or easting of the PI's location.

Data Line 3 - Y coordinate

The y coordinate or northing of the PI's location.

Data Line 4 - Back Spiral Length

The back spiral length associated with the PI.

Data Line 5 - Curve Radius


The curve radius value associated with the PI.

Data Line 6 - Forward Spiral Length

The forward spiral length associated with the PI.

If the user wishes to undo the creation of the PI, the {Edit} [Undo Define PI] command can be selected.

Editing Horiz. Alignment PI Points

As stated at the outset of this bulletin, the process of laying out a horizontal alignment is an iterative process. For example, once a PI has been defined, the user will more than likely want to move the PI, change some of the PI parameters or delete a PI. To perform these types of edit operations, the  tool can be used, see Figure 4.

The discussion below presents the various editing operations which are available.

Moving Horiz. Alignment PI Points

When a PI is to be moved, the user should select the Move Alignment PI option as shown in Figure 8.

Once the command has been activated, perform the following:

1. Select the Move Alignment PI option from the choice list shown in Figure 8, click at the:
 - *Cancel* button to terminate the command, or the
 - *OK* button to continue with the processing.
2. Make a pick in the map area to identify the horizontal alignment's PI that is to be moved.

If a PI was found under Step 2:

3. The user should pause for a second while the command redraws the horizontal alignment, at which point, the user can then move the cursor. As the cursor is moved, the command redraws the horizontal alignment to reflect the new position of

the PI. Once the desired position is achieved, the user makes a single click with the left mouse button to finalize the moving of the PI. Under this mode of operation, the radii of all of the PIs in the alignment are maintained.

If a PI was not found under Step 2:

3. The command will insert a new PI at the location of the pick which was made in Step 2. No dialog box will be presented to the user and the PI will be assigned values of 0.0 for the Back Spiral, Curve Radius and Forward Spiral parameters.

Once Step 3 is completed, the command remains in the move alignment PI mode of operation thus enabling the user to select another PI for processing. This mode of operation remains in effect until another command is selected.

If the user wishes to undo the modification of the horizontal alignment, the {Edit} [Undo Move PI] command can be selected.

Deleting Horiz. Alignment PI Points

When a PI is to be deleted, the user should select the Delete Alignment PI option as shown in Figure 8.

Once the command has been activated, perform the following:

1. Select the Delete Alignment PI option from the choice list shown in Figure 8, click at the:
 - *Cancel* button to terminate the command, or the
 - *OK* button to continue with the processing.
2. Make a pick in the map area to identify the horizontal alignment's PI that is to be deleted.

If a PI was found under Step 2:

3. The command will delete the selected PI and redraw the horizontal alignment.

If a PI was not found under Step 2:

- The command will insert a new PI at the location of the pick which was made in Step 2. No dialog box will be presented to the user and the PI will be assigned values of 0.0 for the Back Spiral, Curve Radius and Forward Spiral parameters.

Once Step 3 is completed, the command remains in the delete alignment PI mode of operation thus enabling the user to select another PI for deletion. This mode of operation remains in effect until another command is selected.

If the user wishes to undo the modification of the horizontal alignment, the {Edit} [Undo Delete PI] command can be selected.

Modify Horiz. Alignment PI Points

When a PI is to be modified, the user should select the Modify Alignment PI option as shown in Figure 8.

Once the command has been activated, perform the following:

- Select the Modify Alignment PI option from the choice list shown in Figure 8, click at the:
 - Cancel button to terminate the command, or the
 - OK button to continue with the processing.
- Make a pick in the map area to identify the horizontal alignment's PI that is to be modified.

If a PI was found under Step 2:

- Enter the appropriate values for the various PI parameters shown in Figure 10, click at the:
 - Cancel button to terminate the command, or the
 - OK button to modify the PI.

As can be seen from Figure 10, the user has a great deal of control over how the PI can be modified. Begin-

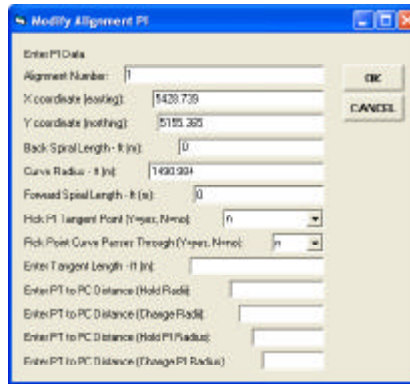


Figure 10
Modify PI Multi-Input Dialog Box

ning at the top of the dialog box, the user is able to control the following:

Data Line 1 - Alignment Number

The horizontal alignment ID that the PI is associated with (read only).

Data Line 2 - X coordinate

The x coordinate or easting of the PI's location.

Data Line 3 - Y coordinate

The y coordinate or northing of the PI's location.

Data Line 4 - Back Spiral Length

The back spiral length associated with the PI.

Data Line 5 - Curve Radius

The curve radius value associated with the PI.

Data Line 6 - Forward Spiral Length

The forward spiral length associated with the PI.

Data Line 7 - Pick PI Tangent Point

Selecting the y option denotes that the user wishes to make a pick to identify the PI's tangent point.

Data Line 8 - Pick Point Curve Passes Through

Selecting the y option denotes that the user wishes to make a pick to identify a point in which the horizontal curve passes through.

Data Line 9 - Enter Tangent Length

The tangent length associated with the PI.

Data Line 10 - Enter PT to PC Distance (Hold Radii)

The distance between the selected PI's PT location and the immediately subsequent PI's PC location.

This mode of editing results in both PIs positions being altered with the radii associated with both PIs remaining the same.

Data Line 11 - Enter PT to PC Distance (Change Radii)

The distance between the selected PI's PT location and the immediately subsequent PI's PC location.

This mode of editing results in the position of both PIs remaining the same and the radii associated with both PIs being modified.

Data Line 12 - Enter PT to PC Distance (Hold PI Radius)

The distance between the selected PI's PT location and the immediately subsequent PI's PC location.

This mode of editing results in the position of the selected PI being altered, while its radius remains the same. The radius and position of the subsequent PI are unaltered.

Data Line 13 - Enter PT to PC Distance (Change PI Radius)

The distance between the selected PI's PT location and the immediately subsequent PI's PC location.

This mode of editing results in the position of the selected PI remaining the same but the radius of the selected PI is modified. The radius and position of the subsequent PI are unaltered.

- 4a. If the n option is selected under data lines 7 or 8, the multi-input dialog box of Figure 10 is re-displayed and Step 3 is repeated.

Once the Cancel button under Step 3 has been selected, the command remains in the modify alignment PI mode of operation thus enabling the user to select another PI for modification. This mode of operation remains in effect until another command is selected.

- 4b. If the y option is selected under data lines 7 or 8, make a pick in the map area to identify the appropriate point.

Once the pick has been made, the command will redraw the horizontal alignment and prompts the user to select another PI for modification.

If the user wishes to undo the modification of the horizontal alignment, the {Edit} [Undo Modify PI] command can be selected.

If a PI was not found under Step 2:

- 3. The command will operate in a Define Alignment PI mode of operation. The reader is referred to Step 3 under the C. Define Horiz. Alignment PI Points section.

If the user wishes to undo the creation of the PI, the {Edit} [Undo Define PI] command can be selected.

Insert a Horiz. Alignment PI

When a PI is to be inserted, the user should select the Insert Alignment PI option as shown in Figure 8.

Once the command has been activated, perform the following:

- 1. Select the Insert Alignment PI option from the choice list shown in Figure 8, click at the:
 - Cancel button to terminate the command, or the
 - OK button to continue with the processing.

- 2. Make a pick in the map area to identify the horizontal alignment's PI that is to be processed.

If a PI was found under Step 2:

- 3. The command will prompt the user to select the location of the PI which precedes the PI to be inserted. That is, the PI which is inserted is added immediately after the PI that was found in Step 2.
- 4. Make a pick in the map area to identify the location of the PI to be inserted.

Once the pick has been made, the command will insert a new PI immediately after the PI which was selected in Step 2, assigning the new PI values of 0.0 for the Back Spiral, Curve Radius and Forward Spiral parameters.


If a PI was not found under Step 2:

- 3. The command will insert a new PI at the location of the pick made in Step 2. This PI is added to the end of the list of PIs in the current active horizontal alignment ID. No dialog box will be presented to the user and the PI will be assigned values of 0.0 for the Back Spiral, Curve Radius and Forward Spiral parameters.

If the user wishes to undo the modification of the horizontal alignment, the {Edit} [Undo Define PI] command can be selected.

Editing Horiz. Alignment Start/End Points

As described with the PIs, it is possible to modify the start and end points of a

horizontal alignment, such as, moving the points, modifying the coordinates of the points or deleting the points. To perform these types of edit operations, the  tool can be used, see Figure 4.

The discussion below presents the three editing operations which are available. Under all three types of editing scenarios, the first step is to identify the alignment start or end point to be processed. As such:

- 1. Make a pick in the map area to identify the alignment's start or end point that is to be processed.

Moving Horiz. Alignment Start/End Points

If an alignment Start or End Point was found under Step 1:

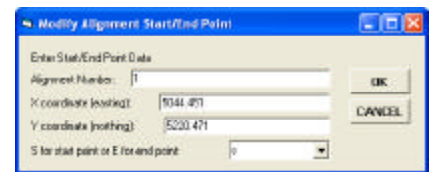


Figure 11
Modify Alignment Start/End Point

- 2. As shown in Figure 11, click at the:
 - Cancel button to abort the command, or the
 - OK button to continue with the processing.

No parameter in the multi-input dialog of Figure 11 needs to be modified.

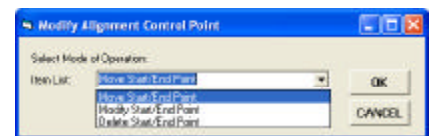


Figure 12
Available Modes of Operation

- 3. Select the Move Start/End Point option from the choice list shown in Figure 12, click at the:
 - Cancel button to terminate the command, or the
 - OK button to continue with the processing.

4. Make a pick in the map area to identify the new location of the alignment's start or end point.

Once the pick has been made, the command will redraw the horizontal alignment.

If an alignment Start or End Point was not found under Step 1:

2. The command will operate in a define mode of operation. The reader is referred to Step 2 under the B. Horiz. Alignment Start/End Points section.

If the user wishes to undo the modification of the horizontal alignment, the {Edit} [Undo Alignment Op] command can be selected.

Modifying Horiz. Alignment Start/End Points

If an alignment Start or End Point was found under Step 1:

2. Enter the desired new coordinates and as shown in Figure 11, click at the:
 - *Cancel* button to abort the command, or the
 - *OK* button to continue with the processing.

The only parameters that should be modified in the multi-input dialog of Figure 11 should be the coordinate values (data lines 2 and 3).

3. Select the Modify Start/End Point option from the choice list shown in Figure 12, click at the:
 - *Cancel* button to terminate the command, or the
 - *OK* button to continue with the processing.

Once the OK button has been selected, the command will redraw the horizontal alignment repositioning the start or end point, depending upon which was selected, using the values entered in Step 2.

If an alignment Start or End Point was not found under Step 1:

2. The command will operate in a define mode of operation. The reader is referred to Step 2 under the B. Horiz. Alignment Start/End Points section.

If the user wishes to undo the modification of the horizontal alignment, the {Edit} [Undo Alignment Op] command can be selected.

Delete Horiz. Alignment Start/End Points

If an alignment Start or End Point was found under Step 1:

2. As shown in Figure 11, click at the:
 - *Cancel* button to abort the command, or the
 - *OK* button to continue with the processing.

No parameter in the multi-input dialog of Figure 11 needs to be modified.

3. Select the Delete Start/End Point option from the choice list shown in Figure 12, click at the:
 - *Cancel* button to terminate the command, or the
 - *OK* button to continue with the processing.




Once the pick has been made, the command will redraw the horizontal alignment.

If an alignment Start or End Point was not found under Step 1:

2. The command will operate in a define mode of operation. The reader is referred to Step 2 under the B. Horiz. Alignment Start/End Points section.

If the user wishes to undo the modification of the horizontal alignment, the {Edit} [Undo Alignment Op] command can be selected.

Notes

1. When using the Modify Alignment PI option within the  tool, the tangent distance is referred to as the distance from either the PC or PT of the horizontal curve to the PI, see Figure 2. This pertains to the data line 9 parameter.
2. When using the Modify Alignment PI option within the  tool and entering a value for one of the parameters in data line items 10 through 13, refer to Figure 2. If the last PI in the horizontal alignment is selected (PI#2 in Figure 2), the command will treat the end point of the alignment as a PI with values of 0.0 for the Back Spiral, Curve Radius and Forward Spiral parameters.
3. When using the Move Alignment PI option within the  tool the best performance will be achieved by making an annotation layers invisible prior to using this option.

Summary

For those users who are involved with subdivision design, pipelines or other types of applications where a horizontal alignment is required, you will find the CEDRA-AVland Menus and the CEDRA-AVland HAlignment Tools toolbars very useful. As always, if there are any requests for additional functionality in the manipulation of horizontal alignments, please feel free to let us know.

If you have a request for Command Of The Month, feel free to phone, fax or e-mail your request to The CEDRA Corporation.