Chapter 1: Horizontal and Vertical Element Geometry

Chapter Overview
This chapter addresses the following major topics:
How the Horizontal and Vertical Element commands work
Alignment Integrity
The various Horizontal Element commands
The Vertical Element commands

While the Horizontal and Vertical Curve Set commands provide full workflow functionality, the requirement to locate PI's in a sequence is often not the ideal way to input geometry. Wouldn't you like the wide-open capability found in CAD programs like the ability to place arcs in any order and then connect them tangentially? The Horizontal Element and Vertical Element Geometry Tools allow this sort of wide-open functionality.

## Section 1 - How the Horizontal Element Commands work

The Horizontal and Vertical Element commands work with the InRoads Geometry Project Horizontal and Vertical Alignments and must be managed appropriately. InRoads Alignments are a collection of tangents and curves, not necessarily in sequence, not necessarily connected and, if connected, not necessarily coincident or collinear at the connections. The Horizontal and Vertical Element commands work with any of these "non standard" alignments.

The Horizontal and Vertical Curve Set commands, however, do require collinear, coincident, sequential connections. If you try to use a Horizontal or Vertical Curve Set command on an alignment not meeting these conditions, you will get an error message.

Horizontal and Vertical Elements are an InRoads Application Add-in and must be toggled ON in the InRoads>Tools>Application Add-In box.

If the Horizontal and Vertical Element menus are not visible in the InRoads>Geometry menu, then:

1. Select InRoads>Tools>Application Add-ins.
2. Toggle ON the Horizontal and Vertical Elements Add In
3. Hit OK.
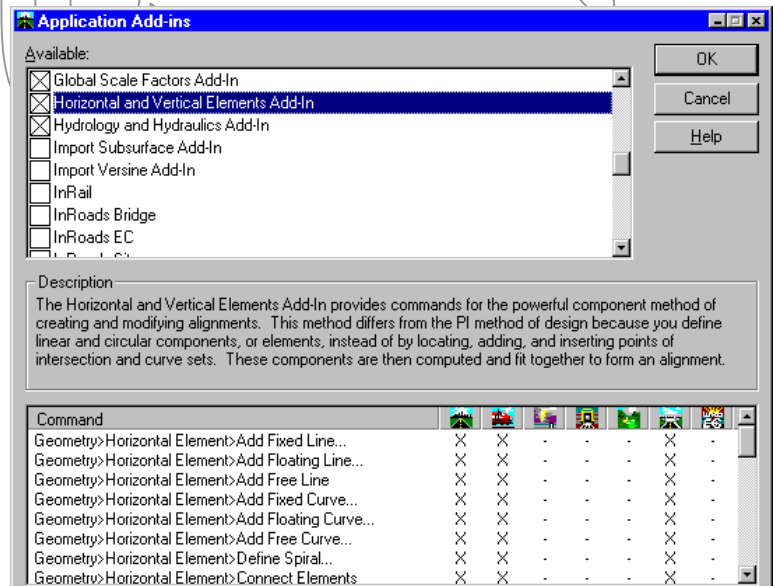
The Horizontal and Vertical Element menus should now be visible.

The InRoads>Geometry>Horizontal Element menu shows the commands. Notice the "Fixed," "Floating," and "Free" Lines and Curves.

Fixed means that the element is "free-standing," not connected (directly) with another element.

Floating means the element connects at one side to another element.

Free means it connects two elements.

Rather than memorize the difference between "Floating" and "Free" it is easier to just look at the icons. The icons have a dashed object representing what the command connects to. The Floating Lines and Curves have a dashed object at one end and the Free have dashed objects at both ends..
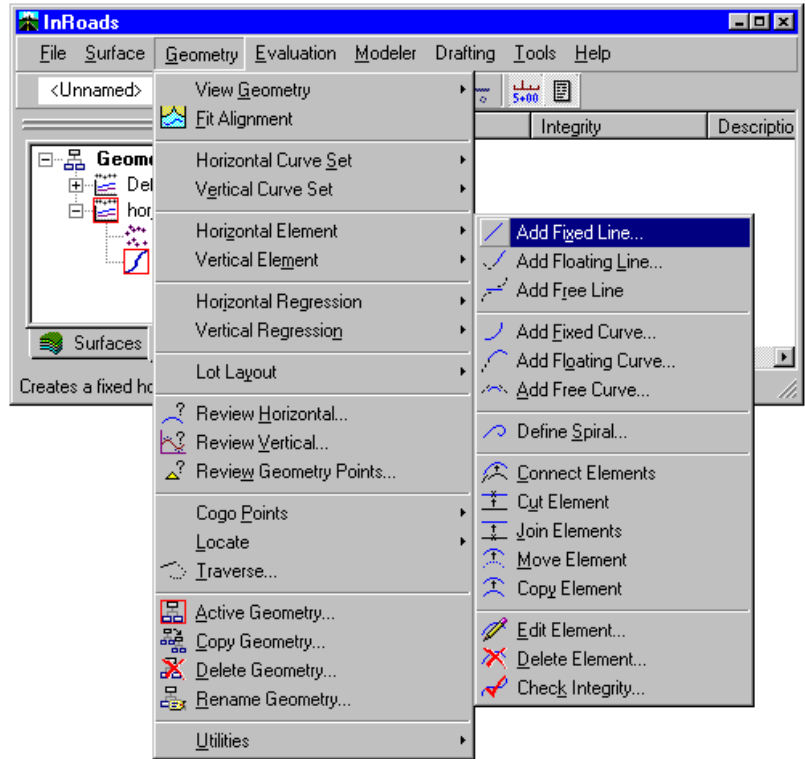
Display the Horizontal Alignment Toolbar.

Due to the intuitiveness of these icons and the iterative nature of using these commands, it is extremely useful to have the toolbar available when using these commands.

4. Select InRoads>Tools>Customize.
5. Toggle On the Horizontal Element Toolbar.
6. Close the Customize form.

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Integrity

Character may or may not matter to voters, but Integrity matters to InRoads. Traditional InRoads Alignment functionality requires all elements in an alignment to be sequential and the endpoints for consecutive segments to be coincident. Kinks (non-collinearities) between segments is allowed, but is typically not good design. InRoads has a property for alignments called "Integrity." Statuses include "Coincident/Collinear", "Non-collinear," "Non-coincident." Integrity is a field that is available in the results pane of the InRoads Explorer.

Like the wide-open workflows associated with graphic editing, there is no long, structured "workflow sequence" mandated by the Element commands. There are a few concepts to keep in mind. There is a direction to each element that is placed. Since the elements can be placed in any order and any direction, there needs to be a little cleanup/QC at the end to verify the alignment Integrity ("real" Roadway alignments seldom change direction in midstream). Since these elements are parts of a Horizontal or Vertical Alignments, they must still be managed within the framework of the Geometry Project.

Forms and Prompts

The Element commands communicate via forms and via prompts. The forms setup the options and the prompts control the sequence.

The form to the right is for the Add Fixed Horizontal Line command. It will place a Horizontal Line, free-standing, to the active Horizontal alignment. The active Alignment may be blank or there may be other elements in the Alignment.

Geometrically, there are two ways to place a line: via Two Points or via a Point, Direction and Distance. These are the two options provided by the form's Mode.

The Mode is the primary control which should be selected by the user. Depending on the Mode, certain fields must be filled in before hitting the Apply button. Most of the other controls do not necessarily need to be filled in. InRoads gets the remaining required information interactively from its prompts.

Perhaps more than any other functionality in InRoads, users need to develop a "feel" to the commands in order to become productive. This "feel" can be gained by just a little bit of practice. "Wrong" choices can be deleted using the Horizontal Element Delete command.

Note: these commands honor the InRoads Point/Element lock.

7. Change the CAD file to `xHorizontalAlignments`.
8. Zoom to points `D1` and `D2`.

Starting Simple: Add Fixed Line

9. Create a New "Practice" Horizontal Alignment. Practice Good Naming Conventions. This exercise will refer to "`xPractice_D`."
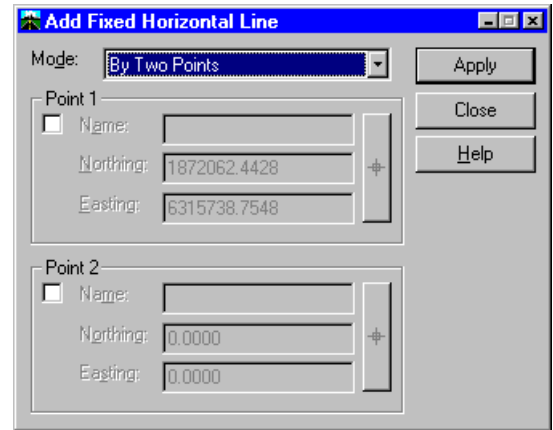
We will now create a single Horizontal Line.

10. Select Add Fixed Line

Horizontal Element

The Add Fixed Horizontal Line form is invoked.

Add Fixed Horizontal Line

Mode: By Two Points

The checkboxes under Point 1 and Point 2 allow
precision input.

Point 1
Name:
Northing: 1872062.4428
Easting: 6315738.7548

11. Leave the checkboxes blank.

12. Hit Apply.

Point 2
Name:
Northing: 0.0000
Easting: 0.0000

Apply
Close
Help

The form is minimized. The next few steps will seem very much like the Add PI interactive steps.

The prompt reads "Identify first point".

13. Place a datapoint near or on point D1.

A PI is placed at the datapoint. The prompt reads "Identify second point".

14. Notice the rubberbanding. Place a datapoint near or on point D2.

A second PI is placed at the datapoint. The
prompt reads "Accept/Reject.

D2

D1

D3

15. Accept the solution.

The first Line or "tangent" has been placed. The command continues and the prompt reads "Identify second point" much like the Add PI command. What we will do next cannot be done with the Add PI command.

16. Hit the Reset button once.

The prompt now reads "Identify first point".

17. Place a datapoint near or on point D3.

A PI is placed at the datapoint. The prompt reads "Identify second point".

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