

LAB 5 - Evaluating Clearances and Conflicts

This section covers how to evaluate design data for minimum clearances. Alignments, Surfaces and Features will be used in the evaluation. Since the alignments and surfaces represent finished grade elevation, the depth of the bridge structure must be taken into account as well.

Chapter Objectives:

- Learn to find the minimum clearance between crossing vertical alignments.
- Learn some of the tools available for finding areas with potential clearance issues.
- Learn how to use MicroStation along with feature graphics to check clearances.

The following files are used in this lab:

- C:\Projects\12345\Bridge\Working \CU12345BRDG_Model.dgn
- C:\Workspace\Workspace-CDOT_XM\Standards-Global\InRoads\Preferences\CDOT_Civil.xin
- C:\Projects\12345\Design\InRoads\12345 SH119
- C:\Projects\12345\Design\InRoads\12345 SH52
- C:\Projects\12345\Design\InRoads\12345 SH119 SH52 Interchange.alg
- C:\Workspace\Workspace-CDOT_XM\Standards-Global\InRoads\Templates\CDOT_Template-Library.itl

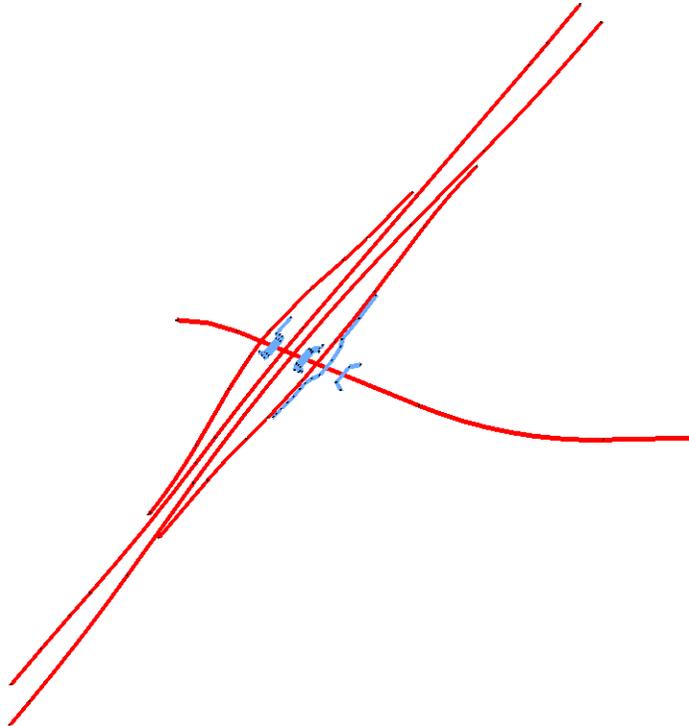
Lab 5.1 - Open Data Files

1. Open MicroStation and InRoads using the *C:\Projects\12345\Bridge\Working \CU12345BRDG_Model.dgn* file.
2. Verify the correct *XIN* file is loaded.
3. Select **File > Open** from the InRoads menu.
4. Open *C:\Projects\12345\Design\InRoads\12345 SH119*, *12345 SH52* and *12345 SH119 SH52 Interchange.alg*.

Lab 5.2 - Intersecting Alignment Reports

1. Delete any MicroStation graphics currently in the design file.

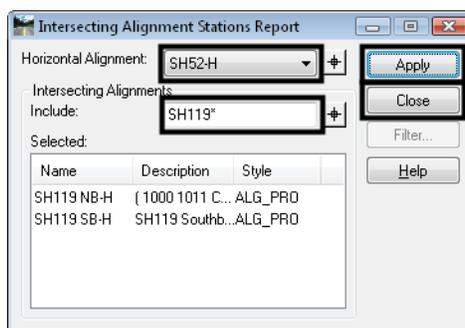
2. Select **Geometry > View Geometry > All Horizontals**.



3. Select **Tools > XML Reports > Intersecting Alignment Stations**.

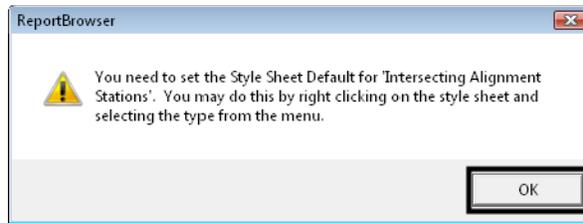
Note: This report returns the stationing of both intersecting alignments, along with the coordinates of the intersection and the elevation difference between the two active verticals.

4. For the *Horizontal Alignment*, select **SH52-H**.
5. For the *Intersecting Alignments*, key in **SH119*** to select both NB and SB.



6. Select **Apply**.

- If the default style sheet has not been set for this report, a Report Browser message will appear. Select **OK** if it does.



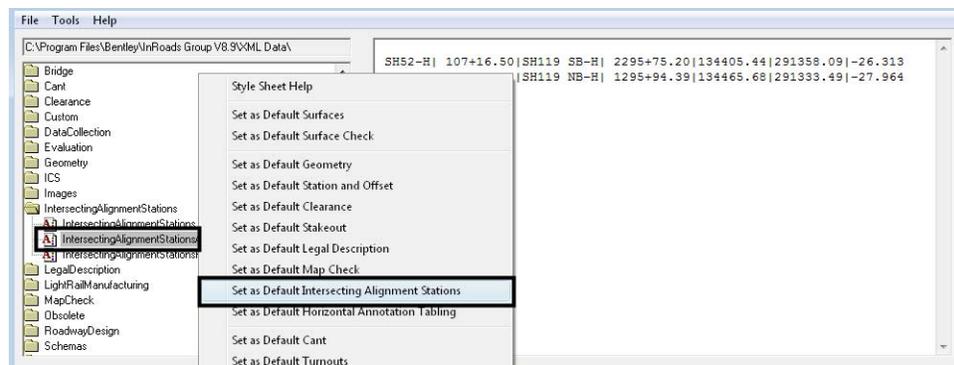
- Select the **IntersectingAlignmentStations > IntersectingAlignmentStationsASCII** report format.



Note: This report lists the stationing of each of the crossing alignments, along with the coordinates of the crossing point and the elevation difference. The report can be printed or saved as a text file if desired.

Important! The last active vertical alignment under each horizontal is used to determine the vertical clearance. In this case, each horizontal has only one vertical, so it is not a concern.

- Right-click on the format and select **Set as Default Intersecting Alignment Stations**.



- Close the **Report** dialog.

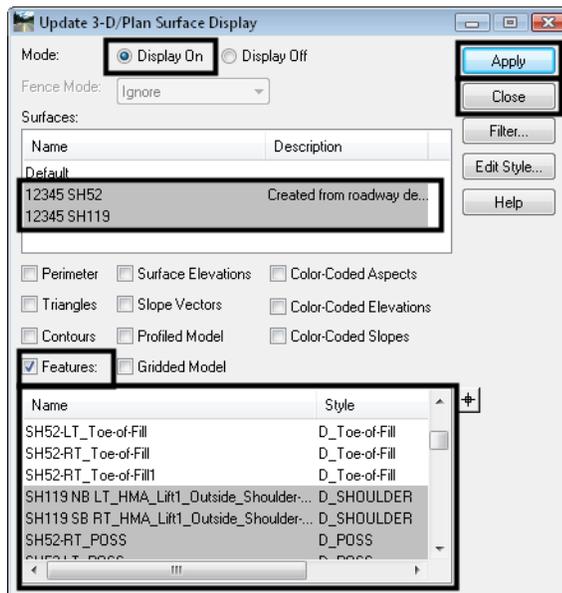
If this report is needed at all feature intersections rather than only at the centerline intersections, the following steps may be used.

11. Close the *Intersection Alignment Stations Report* dialog.
12. **Delete** all the alignment graphics.
13. Toggle on the **Feature Filter Lock**.
14. Set the *Feature Filter* to *XS_Excluded from Triangulation*.



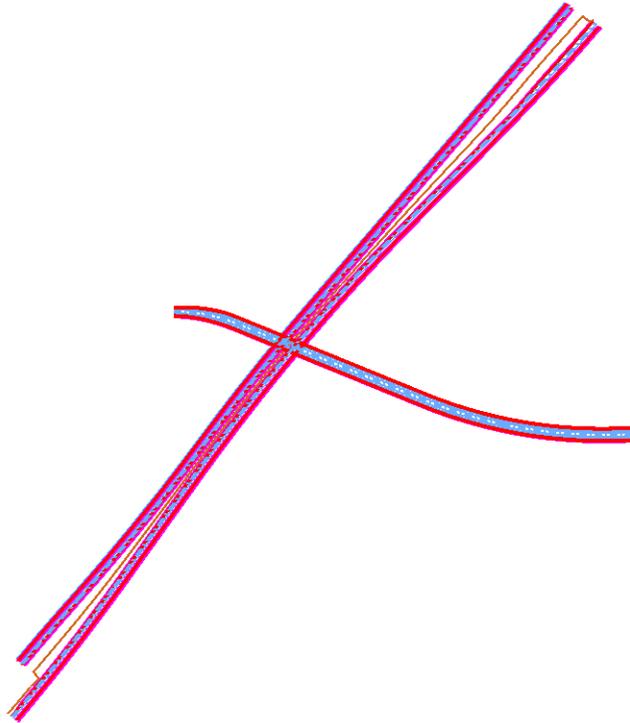
Note: This filter allows only triangulated features to show in dialog boxes. In the next step, the features for SH52 are displayed and the non-triangulated features are not needed.

15. Select **Surface > Update 3D Plan/Surface Display**.
16. Toggle *Display On*.
17. Highlight the surfaces *12345 SH52* and *12345 SH119*.
18. Toggle on *Features*.
19. In the feature list, right-click and *Select All*.
20. <D> on the *Style* header to sort by style name.
21. Holding down your <Ctrl> key, <D> on all the *Cut* and *Fill* Features, the *Exterior* and the *3:1 Slope* features to de-select them. All other features should be highlighted.



Note: Some of the features are de-selected because for the next series of steps, you only want the backbone features displayed.

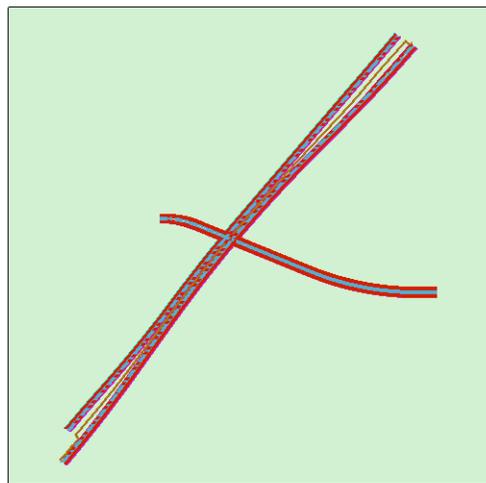
22. <D> Apply.



Note: The features should be displayed in the file as shown. If not, try the previous steps again.

23. Close Update 3D Plan/Surface Display.

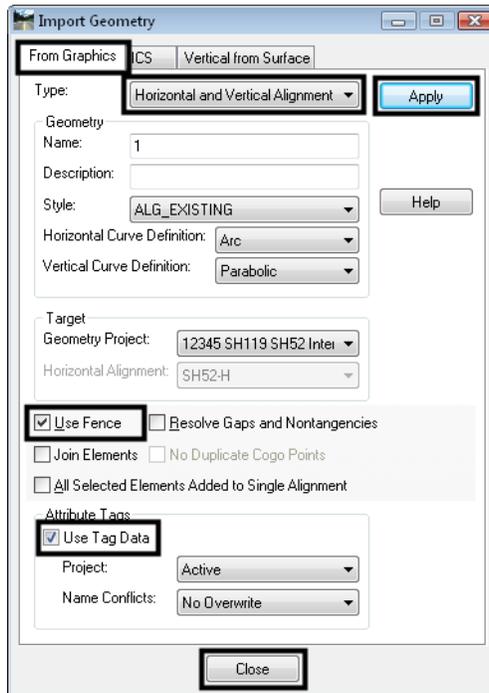
24. Select MicroStation **Place Fence** and place a fence around all of the features.



25. Select **File > Import > Geometry**.

26. On the **From Graphics** tab, select **Horizontal and Vertical Alignment** for the **Type**.

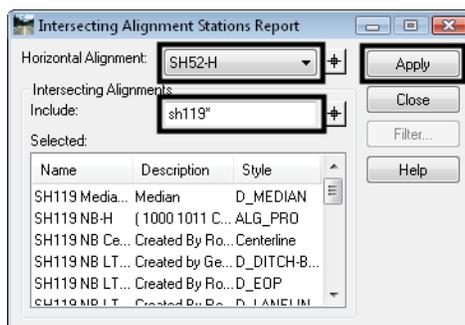
27. Verify the **Target Geometry Project** is **12345 SH119 SH52 Interchange**.
28. Toggle on **Use Fence**.
29. Toggle on **Use Tag Data**.



30. <D> **Apply**.

Note: All of the graphics in the fence are imported as alignment. Since they were displayed as features and have tags, the alignments are named the same as the feature names.

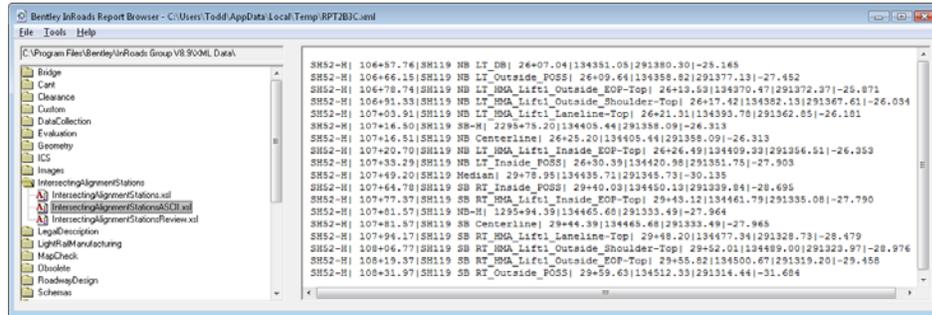
31. Select **Tools > XML Reports > Intersection Alignment Stations**.
32. For the **Horizontal Alignment**, select **SH52-H**.
33. For the **Intersecting Alignments**, key in **SH119*** to select all of the crossing alignments.



34. <D> **Apply**.

Note: When an alignment is imported from graphics, the default stationing begins with 0+00.00, so the stations shown for the imported alignments do not correspond with the actual stationing.

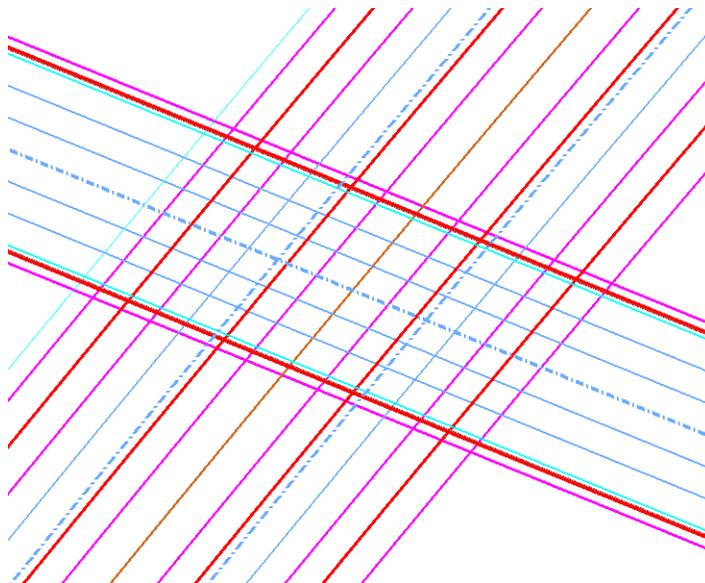
35. Close the **Report** dialog when finished reviewing the data.



36. Close the **Intersection Alignment Stations Report** dialog.
37. Select the MicroStation **Place Fence** command to clear the fence.

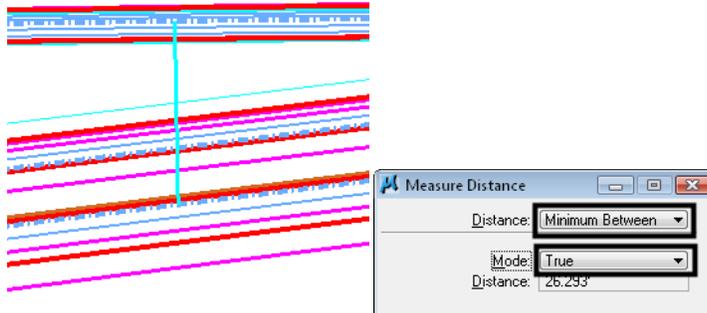
Lab 5.3 - MicroStation Measurements

1. Zoom into the bridge area.



2. On the MicroStation menu, select **Measure Distance**.
3. Set the **Distance** to **Minimum Between**.
4. Set the **Mode** to **True**.
5. <D> on one of the SH52 Features.

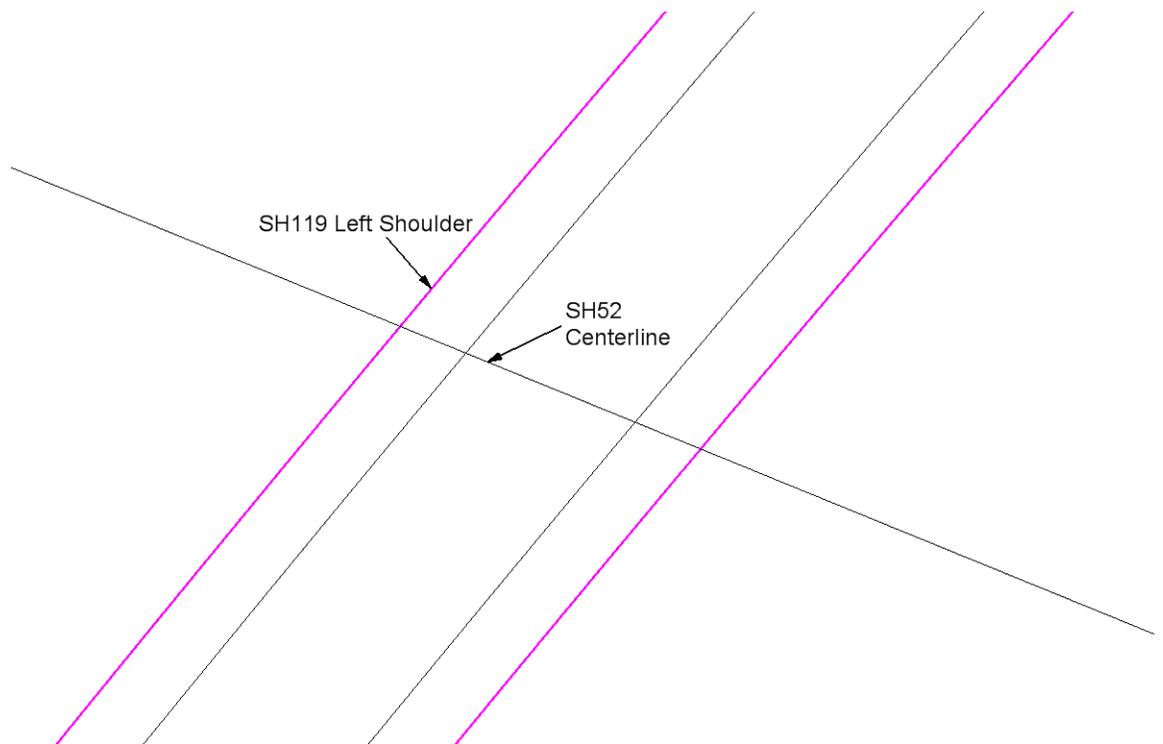
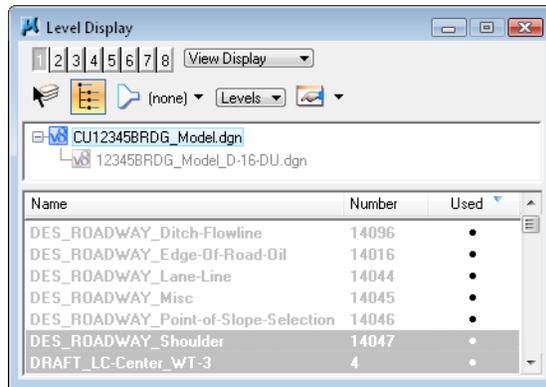
6. <D> on one of the SH119 Features.



Note: The *Minimum Distance* between the features is the vertical clearance.

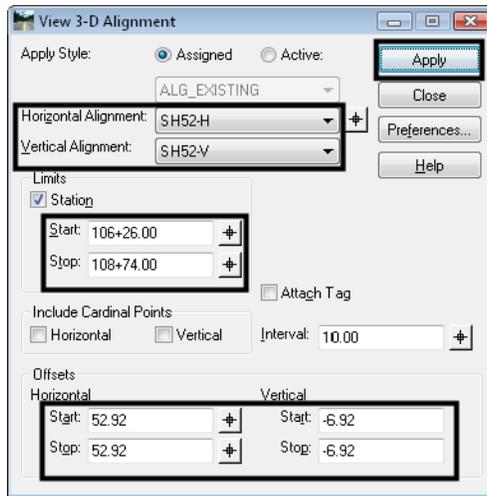
If you want to check the minimum clearance between the shoulder and the edge of girder, you will need a MicroStation graphic representing the girder placed at the correct 3D location in the file. There are several methods for obtaining the girder element. One method is to use the *View 3D Alignment* command in InRoads. This command combines the horizontal and vertical alignment to create a 3D MicroStation element. You can use this command to view the centerline of SH52 and apply the correct offsets for any of the girders.

- Turn off all levels except **DES_Roadway_Shoulder** (the SH119 shoulder lines) and **DRAFT_LC-Center_WT-3** (roadway centerlines).



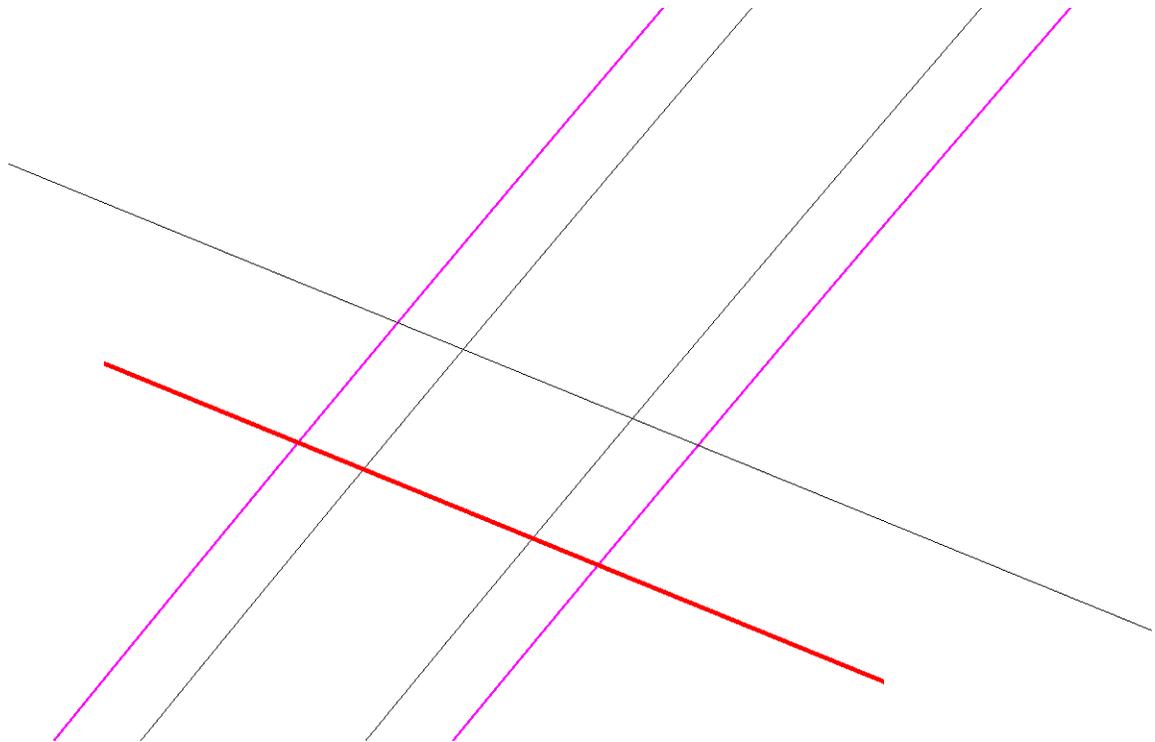
- Select **Geometry > View Geometry > 3D Alignment**.
- Set **Horizontal Alignment** to **SH52-H** and **Vertical Alignment** to **SH52-V**.
- In the **Limits** section, key in **106+00** for the **Start** station limit and **109+00** for the **Stop** station limit.

- In the **Offsets** section, key in **52.92** for **Horizontal Start** and **Stop**. Key in **-6.92** for the **Vertical Start** and **Stop**.



Note: For this bridge, there are 5 girders on each side of the centerline spaced at 10'-7" on center, making the outmost girder a horizontal offset of 52.92 feet from the centerline. The vertical offset to the bottom of the girder is 6.92 feet.

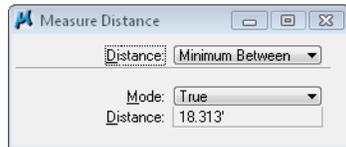
- <D> **Apply**, then **Close**.



Note: The red line represents the outermost girder on the right side of the SH52 and placed in the file at the correct horizontal and vertical offset from the centerline.

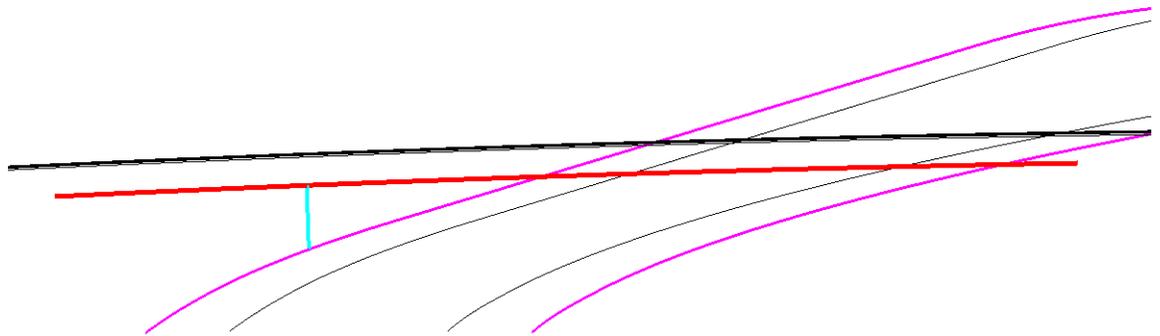
- On the MicroStation menu, select **Measure Distance**.

14. Set the **Distance** to **Minimum Between**.
15. Set the **Mode** to **True**.
16. <D> on one of the SH52 girder (red line).
17. <D> on one of the SH119 left shoulder (left purple line).



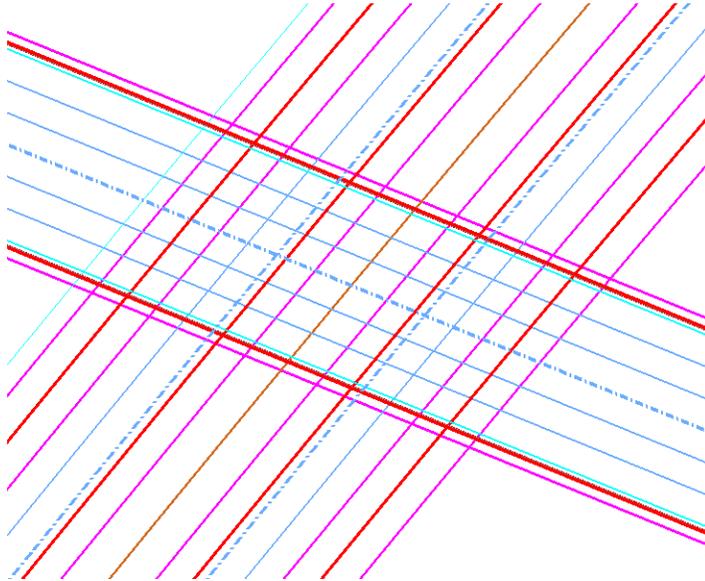
Note: The minimum vertical distance from the girder to the shoulder is displayed in the tool settings box.

18. If you like, you can dynamically rotate your view to get a dynamic display (blue line) of where the minimum distance occurs.



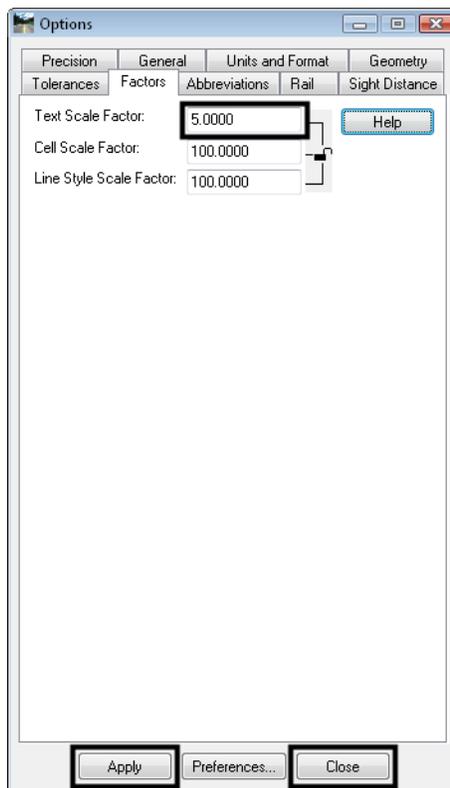
19. If you rotated your view, rotate the view back to **Top**.
20. **Delete** the girder element (red line).

21. Turn on all levels to view all SH52 and SH119 roadway features.

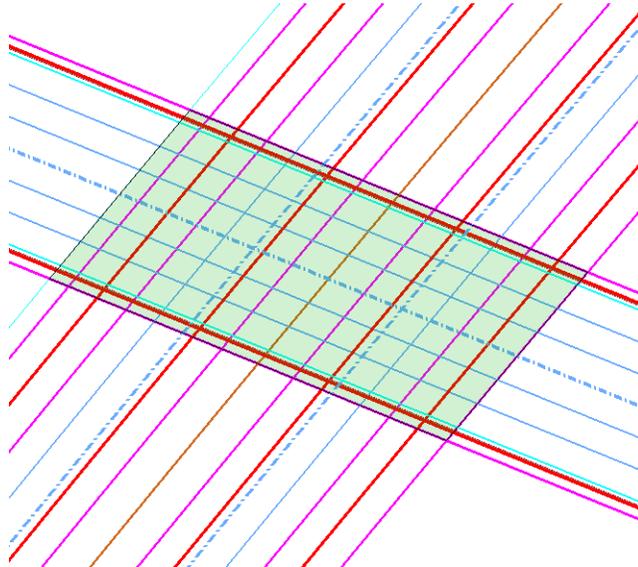


Lab 5.4 - Isopach Surface

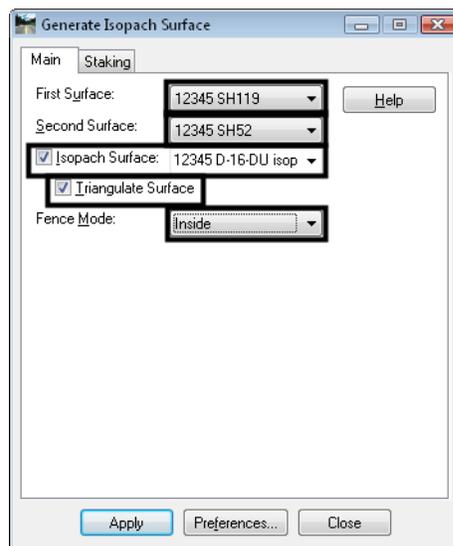
1. The surfaces can also be used for a more visual look at the clearances.
2. Select **Tools > Options > Factors** and set the *Text Scale Factor* to **5**.



- Place a MicroStation fence around the area where the bridge will be as shown.

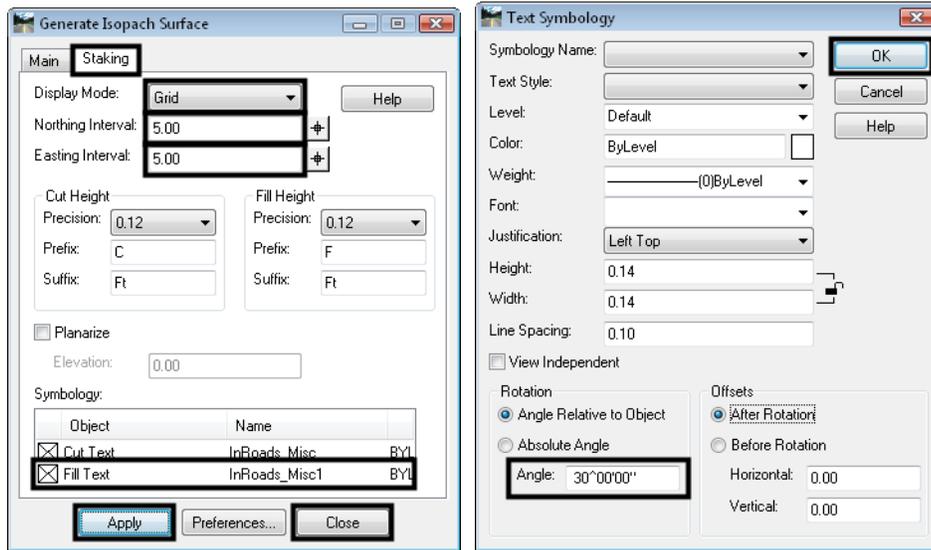


- Select **Surface > Design Surface > Generate Isopach Surface**.
 - Set the *First Surface* to **SH119**.
 - Set the *Second Surface* to **SH52**.
 - Toggle on *Isopach Surface* and key in **12345 D-16-DU isopach** for the surface name.
- Note:** This surface will be created when the command is applied.
- Toggle on *Triangulate Surface*.
 - Set the **Fence Mode** to **Inside**.

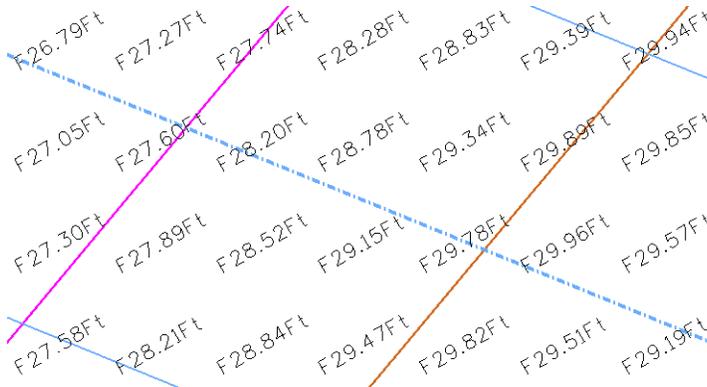


- Select the *Staking Tab*.

11. Set the *Display Mode* to *Grid*.
12. Set the *Northing* and *Easting Intervals* to *5.00*.
13. <D> <D> on the *Fill Text Symbology* and set the *Rotation Angle* to *30^00'00"*, then <D> OK.



14. <D> **Apply**, then **Close**.
15. Clear the fence.
16. Fit the MicroStation view, then window into the bridge area.



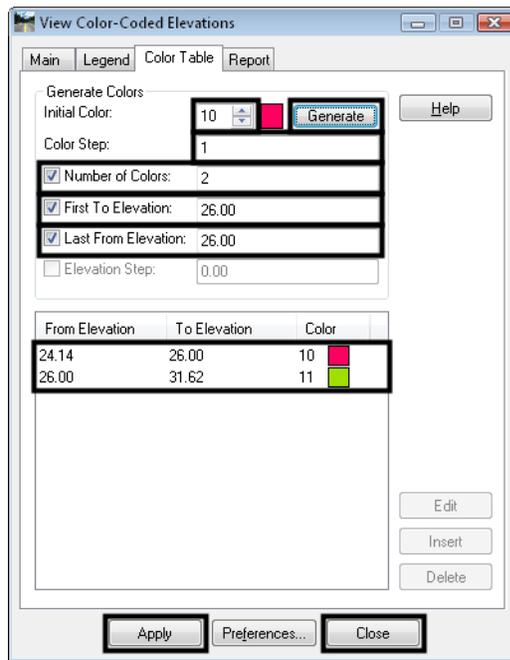
Note: The text in the file denotes the difference between the two surfaces on a 5' grid interval. In addition, a surface was generated with points on a 5' grid, with each point's elevation being the difference. This surface can be used to help visualize any potential conflicts.

17. Delete all the graphics in the design file.
18. Select **Surface > View Surface > Color Coded Elevations**.
19. Set the *Surface* to *12345 D-16-DU isopach*.

20. Set the **Color Mode** to **Automatic**.
21. Select the **Color Table** tab.
22. Set the **Initial Color** to **10**.
23. Key in **1** for the **Color Step**.
24. Toggle on **Number of Colors** and key in **2**.
25. Toggle on **First and Last Elevation Options** and set each to **26.00**.

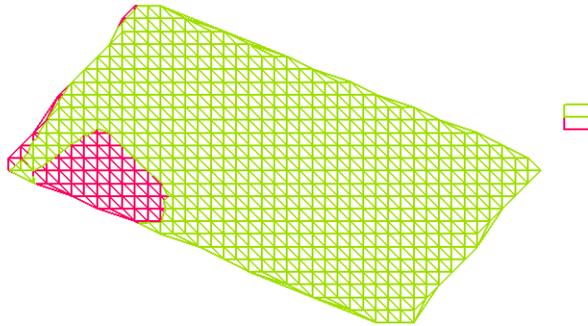
Note: The elevation is where the color will change on the display from color 10 to color 11, indicating that everything color 10 has a clearance of less than 26 feet, while everything color 11 has a clearance of more than 26 feet.

26. <D> **Generate**.



27. <D> **Apply**.

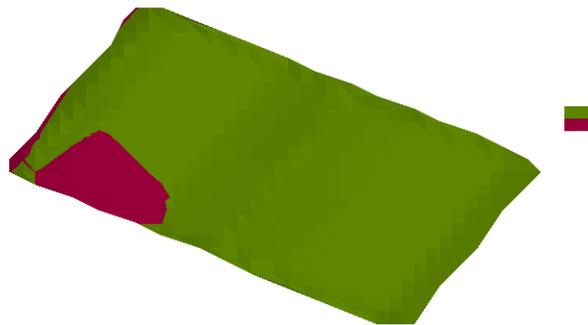
28. <D> in the design file for the location of the legend.



29. <D> Close

30. On the MicroStation menu, select **Utilities > Render > Smooth**.

31. <D> in the view.



32. Try other elevations to isolate potential areas of conflict.

Chapter Summary:

- The vertical clearance between InRoads alignments can be checked easily with an ***XML Report***.
- Surface Features can be imported as alignments to run the same report.
- MicroStation measure commands are used to check the minimum distance between graphic elements.
- An ***isopach*** surface generated between two design surfaces will help determine areas of potential clearance issues.