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Workshop – X9 Building Surfaces Using InRoads

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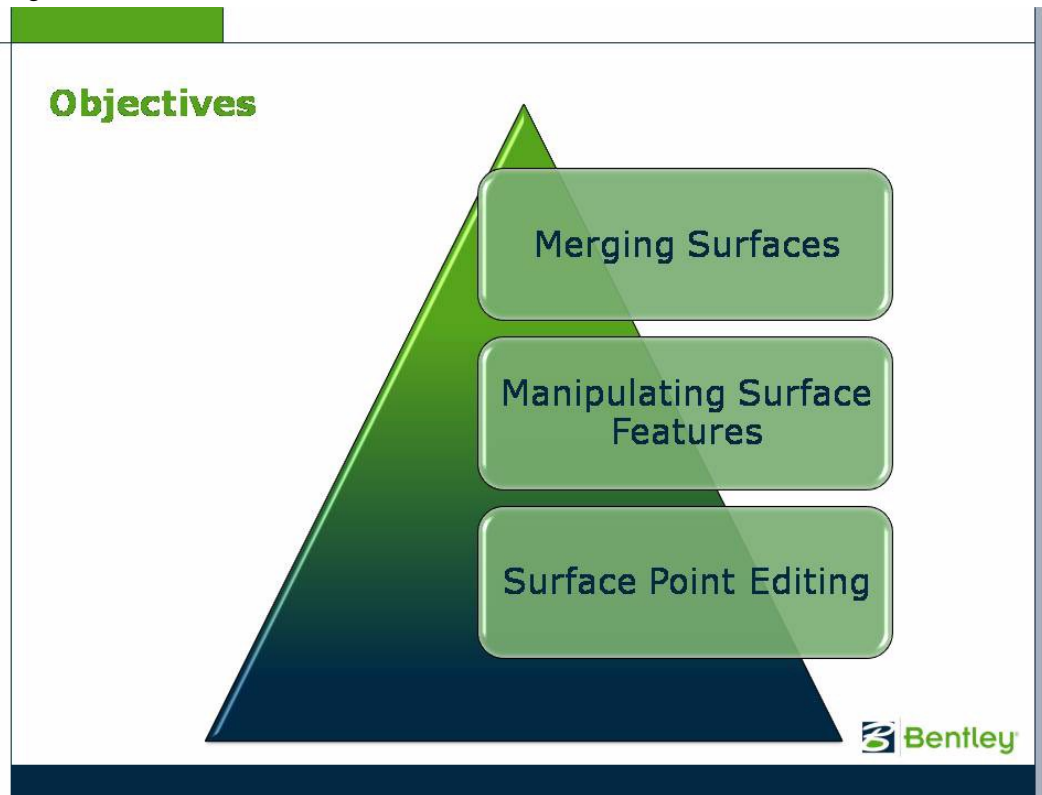
Introduction to Surface Editing



W23-Introduction to Surface Editing



Lesson Objectives



In this Lesson we will

- Learn how to Merge surfaces
- Learn how to Edit Surface Features
- Learn how to move a surface

Starting InRoads

Starting InRoads

- Start InRoads
- Load the files for this Lesson



Starting InRoads

- 1 Double-click the Power InRoads icon.
The MicroStation Manager appears.

If there is no icon, then an alternate path for launching InRoads is **Start > Programs > Bentley > Power InRoads (SELECTseries 2) > Power InRoads**

Open a CAD File

- 1 Set the directory to *C:\Nordic Workshops\X09-Building Surfaces Using InRoads\Editing\Practice>Edit Surfaces*
- 2 Open the CAD file *Edit Surfaces.dgn*

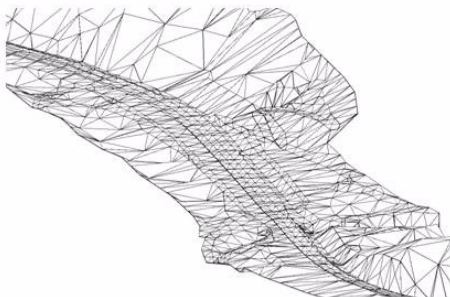
Opening the Preference file and the Surface files

- 1 From the InRoads menu, select **File > Open**
- 2 Set the *Files of type* to *InRoads Files (*.rwk,*.dtm,*.alg,*.itl,*.sdb,*.xin)*
- 3 Change the *Look in* directory to *C:\Nordic Workshops\X09-Building Surfaces Using InRoads \Standards\Preferences*
- 4 Select the file *InRoads Training.xin*

- 5 Click **Open**
- 6 Change the *Look in* directory to *C:\2007 IUTC\W05 Introduction to Surface Editing\Pratice>Edit Surfaces*
- 7 Select the file *20070822_ASabia_Survey.dtm*
- 8 Click **Open**
- 9 Select the file *20070823_ASabia_Survey.dtm*
- 10 Open then **Close**


The two dtm files (surface files) that where opened were generated from two daily raw survey file that where processed using InRoads Survey.

What is a Surface? A Review



- **Surface**
 - A representation of the physical terrain
 - Also known as Digital Terrain Model (DTM)
 - Defined by connecting surface points together to form triangles
 - Triangulation

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What is a Surface?

A surface is an representation of the physical terrain. Surface points are connected together to form surface triangles. This process is known as Triangulation.

The terms surface and Digital Terrain Model (DTM) can be used interchangeably. Both terms refer to a triangulated model representing a physical terrain such as the existing ground or proposed design.

Current versions of InRoads software typically use the term surface instead of digital terrain model or DTM. However, many other software applications refer to their models as digital terrain models.

Features

Points create a surface and the points are grouped together in to features. A feature can represent all the points in a top of curb or an edge of pavement.

What is a Feature?

What is a Feature-A Review

- Features
 - An InRoads term for the points or lines that are contained in a surface



HINT—remember the term “Feature.” You will depend on them as you learn InRoads.



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What is a Surface Feature?

A Surface feature is anything that is in the DTM. The data could be used to generate contours (triangulated together) or non-triangulated data like an underground water pipe. A surface feature could be anything that a survey crew might have observed and recorder when surveying.

So a feature could be a single survey observation, like a rim elevation shot to a manhole, or it could be a line of observations like an edge of pavement or a top of curb.

Types of Features

Types of Features

- **Random**
 - Have no direct relationship to any other point
- **Breakline**
 - Linear discontinuity
 - Restrict how triangles are formed
- **Exterior**
 - Outside edge of the surface model
- **Interior**
 - Interior closed shape. A hole in the model.



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Random

Random features, also called spot points, represent non-uniformly spaced points that have no direct relationship to other points. Random features are commonly found when the surveyed area consists of an open field or grassy area, since there are no identifiable terrain features.

Breakline

Breakline features represent a linear discontinuity in a surface such as a ridge, ditch, edge of pavement, center line, or curb. The breakline feature type specifies that all points in the feature are connected as a linear segment. When the surface is triangulated, the triangles are formed so that no triangle leg crosses any breakline features. This maintains the integrity of the slope between breakline feature points during triangulation, resulting in a more accurate surface.

Contour

Contour features are linear features that come from contour data, which is commonly available from mapping agencies. Contour features are triangulated in the same way as breakline features. Surfaces created from contour data are normally not as accurate as surfaces created from Breakline and Random features.

Interior

Interior features are closed shaped linear features that represent a void or hole in the surface. Examples include building footprints, lakes, and obscure areas. No triangles are formed inside the interior features. You can have unlimited interior features in a single surface.

Exterior

Exterior features are closed shaped linear features that form a boundary around the surface. No triangle will be formed outside the exterior feature. An exterior feature is commonly used to prevent triangles from being formed in areas where the survey data is not known. It is also used to maintain cut and fill lines on a proposed design. You can only have one exterior feature in a single surface.

Let's Take a Look

Let's Take a Look

- Surfaces Display
 - Display Contours
 - Display Surface Features
 - Update 3-D/Plan Surface Display



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Viewing the Surface but first the Style Lock

- 1 Select, from the InRoads menu, **Tools > Locks**.
- 2 Is there a check mark next to the word *Style*?
- 3 If No, go to the next step, if there is a check mark, click on the word *Style*, this will toggle it off.

Check **Tools > Locks** again to make sure the check mark is not next to the word *Style*.

Viewing Contours

- 1 Select **Surface > View Surface > Contours**.
- 2 Click the **Main** tab
- 3 Set the *Surface* to *20070822_ASabia_Survey*
- 4 Select the *Preferences* button.
- 5 Select *Existing Surface* preference set name and click **Load**.
- 6 Close the Preferences dialog.
- 7 Click **Apply** and observe the contours that are displayed.

The use the Fit View command in the CAD software to fit the graphics if needed.

8 Close View Contours

Displaying the Surface Features

- 1 Select **Surface > View Surface > Features**
- 2 Set the *Surface* to *20070822_ASabia_Survey*
Notice that all the features that can be displayed are already selected in the dialog.
- 3 Click **Apply**
- 4 Close View Features
- 5 Window in on the intersection and notice that the contours seem to follow the line work that is displayed

Cleaning Up the File

- 1 Select **Surface > Update 3-D/Plan Surface Display**
- 2 Select the *Surface 20070822_ASabia_Survey*
- 3 Toggle off Contours
- 4 Toggle off *Features* by right-clicking on the feature list and *Select None*

Bonus: Use a Filter to Display all E_Topo_Tree

- 5 Close Update 3-D/Plan Surface Display

Merge Surface

Merge Surface

- Combines two surfaces to create a third
 - Finished design surface "As-Built"
 - Knitting two surfaces together to form a large surface
 - Add points to a existing surface



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Merge Surfaces

The Merge Surfaces command combines the data contained in one surface (the Original surface) with the data in another surface (the Design surface). The software places the combined data from these two surfaces into a third surface, the Destination surface. The two surfaces you want to merge may overlap or be adjacent to one another. In areas of common coverage between the two surfaces, the data from the Design surface, rather than from the Original surface, will be placed into the Destination surface. However, you can choose to also include points from the Original surface in areas of common coverage by using the Retain All Original Surface Points option.

- 1 From the InRoads menu, select **Surface > Edit Surface > Merge Surfaces**.
- 2 Set the *Original Surface* to *20070822_ASabia_Survey*
- 3 Set the *Design Surface* to *20070823_ASabia_Survey*.
- 4 Enter **Surface Edit Class** in the *Destination Surface* field.

This is the name of the new combined surface that will be created.

- 5 Click to enable the *Retain All Original Surface Points* check box.
Enabling this check box ensures all points from both the original and the design surfaces are copied to the new surface. If disabled, the points from the original surface where the original and design surfaces overlap are not copied to the new surface.
- 6 Click to enable the *Retain Features Excluded from Triangulation* check box.
Enabling this check box ensures all points in the surfaces that are excluded from triangulation are copied to the new surface. If disabled, these points would not be copied to the new surface.
- 7 Clear the *Add Design Surface Edge as Breakline* check box
- 8 In the Duplicate Names section, select *Rename*.
This tells InRoads to rename features if a feature by the same name already exists in the destination feature. The feature is renamed by adding a unique number suffix to the existing name.
- 9 Click **Apply**.
- 10 Click **Close** to dismiss the Merge dialog box.

Viewing Contours

- 1 Select **Surface > View Surface > Contours**.
- 2 Click the **Main** tab
- 3 Set the *Surface* to *Surface Edit Class*
- 4 Click **Apply** and observe the contours that are displayed.
The use the Fit View command in the CAD software to fit the graphics if needed.
- 5 Close View Contours

Cleaning Up the File

- 1 Select **Surface > Update 3-D/Plan Surface Display**
- 2 Set the *Surface* to *Surface Edit Class*
- 3 Toggle off *Contours*
- 5 Click **Apply**
All the graphic types selected for that surface will erase
- 6 Close Update 3-D/Plan Surface Display

Display the Surface Perimeter

The Surface Perimeter is the outside edge of the surface data based on the triangulated surface.

- 1 Select **Surface > View Surface > Perimeter**
- 2 Set the *Surface* to *Surface Edit Class*
- 3 Click **Apply**
- 4 Close View Perimeter.

Transform Surface

Transform Surface



- Scale between metric and Imperial units
 - US Survey Foot
 - International Foot
- Move horizontally and/or vertically
- Rotate
- Set to one elevation
- Least Squares fit



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Transform Surface

The Transform Surface command modifies the coordinates of random, breakline, interior boundary, and exterior boundary points. You can use this command to convert imperial data to metric, and metric data to imperial.

This command modifies the data in a surface called the Original Surface and places the results in a surface called the Destination Surface.

Rotation is assumed to be clockwise from original to destination coordinates.

The transformation is affected by applying a rotation, scale, delta X, and delta Y to each point in the data. Rotation and scale are applied relative to the original point, while delta X and delta Y are deduced from the coordinates of the original and destination points.

This command automatically triangulates the Destination Surface.

Displaying a Control Point

- 1 Select **Surface > View Surface > Features**
- 2 Set the *Surface* to *Surface Edit Class*
- 3 In the *Features* list, click on the *Style* header twice
This will sort the list of features alphabetically by Style name
- 4 Select the feature *PM_MN_Monument1004*. It should now be the only feature highlighted.
This is a feature with only one point. It is a survey control point that the Surveyors entered the coordinate in the field. The location was enter improperly.
- 5 Click **Apply**.
- 6 Close View Features

Transforming the Surface

Notice in the design file that there is a location labeled Actual Location of Monument 1004. This is where the surface feature should have displayed. In the next steps, a copy of the whole surface will be moved to the correct location.

- 1 Select **Surface > Edit Surface > Transform Surface**
- 2 Set the *Original Surface* to *Surface Edit Class*
- 3 For the *Destination Surface* enter **Corrected Class Surface**.
- 4 Set the *Method* to *Custom*
- 5 Leave the *Angle* set to **0^00'00.0"**.
- 6 *Horizontal Scale* and *Vertical Scale* should be set to **1.00**
- 7 In the *Included Features* section, right click in the list of features.
- 8 From the pop-up menu select **Select All**
- 9 Activate *Replace* in the *Duplicate Names* section
It should not matter here at this time since the destination surface is being created new.
- 10 In the *Original Point* section, click on the *Northing Easting* graphic select button.
- 11 In the view, snap to and accept the point near the arrow end of the note *Entered Location Monument 1004*
- 12 In the *Destination Point* section, click on the *Northing Easting* graphic select button.
- 13 In the view, snap to and accept the circle labeled *Actual Location Monument 1004*
- 14 Click **Apply**
- 15 After processing, click **Close** on the Transform Surface tool.

Displaying a Control Point

- 1 Select **Surface > View Surface > Features**
- 2 Set the *Surface* to *Corrected Class Surface*
- 3 In the *Features* list, click on the *Style* header twice
This will sort the list of features alphabetically by Style name
- 4 Select the feature *PM_MN_Monument1004*. It should now be the only feature highlighted.
This is a feature with only one point. It is a survey control point that the Surveyors entered the coordinate in the field. The location was enter improperly.
- 5 Click **Apply**.
There should now be a point display in the circle. (If zoomed in close, that point is a triangle)
- 6 Close View Features

Display the Surface Perimeter

The Surface Perimeter is the outside edge of the surface data based on the triangulated surface.

- 1 Select **Surface > View Surface > Perimeter**
- 2 Set the *Surface* to *Corrected Class Surface*
- 3 Click **Apply**
- 4 Close View Perimeter.

Cleaning Up the File

- 1 Select **Surface > Update 3-D/Plan Surface Display**
- 2 Select the *Surface Corrected Class Surface*
- 3 Toggle off *Perimeter*
- 4 Right click in the list of features.
- 5 From the pop-up menu select **Select None**

All the graphic types selected for that surface will erase

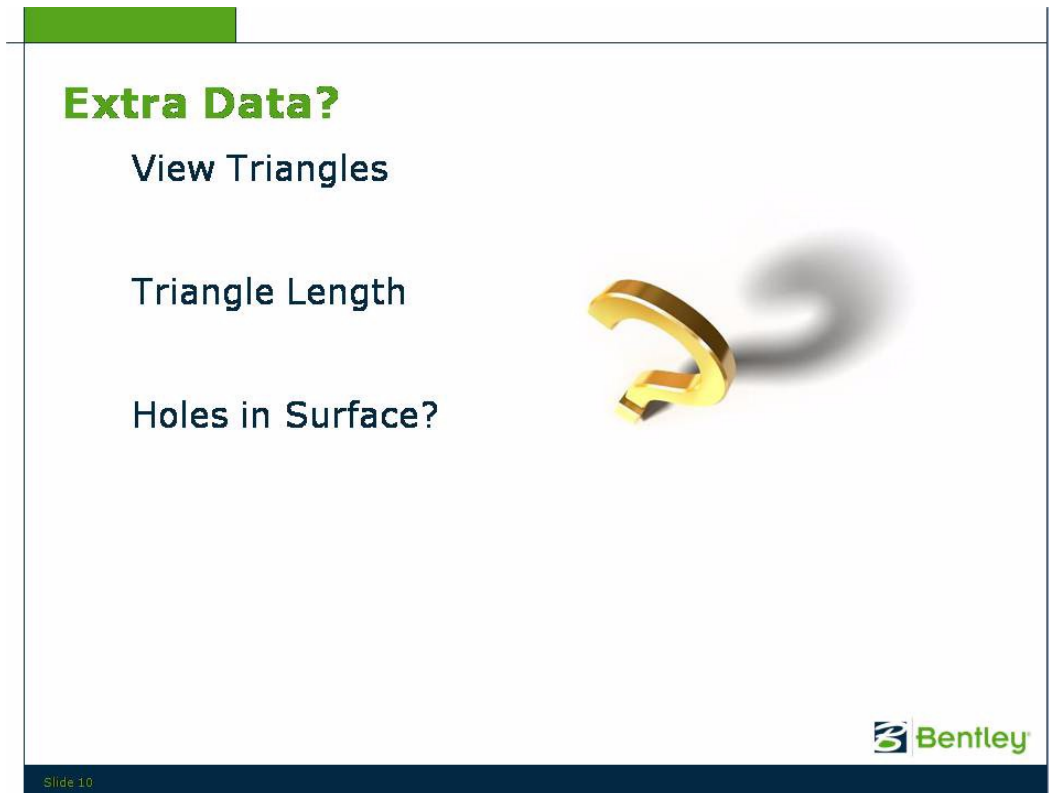
- 6 Close Update 3-D/Plan Surface Display

Saving the Surface

When working with Surfaces, it is always a good idea to save the changes that were made from time to time. The total edits to the surface need not be complete but when a point is reached that is good, then it is a good time to save.

- 1 Select **File > Save As**
- 2 Change the *Save as type* to *Surfaces (*.dtm)*
- 3 Set the *Save in* directory to *C:\Nordic Workshops\X09-Building Surfaces Using InRoads\Practice\Edit Surfaces*
- 4 Set *Active* to *Corrected Class Surface*
- 5 Make sure the *File name* is **Corrected Class Surface.dtm**
- 6 Click **Save**
- 7 Close the Save As tool.

Extra Data?



Extra Data?

- View Triangles
- Triangle Length
- Holes in Surface?

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Extra Data

There are times when a surface appears to have extra data or improper data in a survey. This could be caused by triangulation. It is not the fault of the routine, it is just the connection of the points across areas that there is no real data. In the next steps, you will learn how to clean up that problem.

Display Triangles

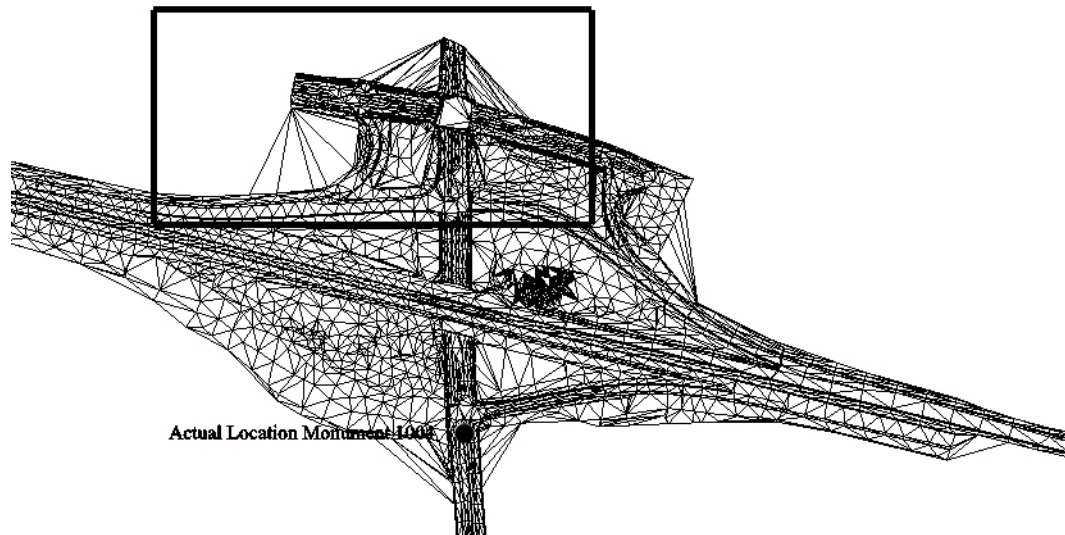
- 1 From the InRoads menu select **Surface > View Surface > Triangles**.
- 2 Set the *Surface* to *Corrected Class Surface*
- 3 Click **Apply**.
- 4 Click **Close**.

Notice the large triangles extending from the cross road to the next ramp taper to the west. These triangles should not be in the surface. One way to limit the formation of triangles is using the Maximum Length setting.

Bulk Cleanup of Erroneous Triangles

- 1 Select the **Surface > Triangulate Surface** tool.
- 2 Make sure that the *Surface* is set to *Corrected Class Surface*

- 3 Set the *Maximum Length* to **100.00**.
The *Maximum Length* option defines the longest possible triangle leg. Any triangles that require a leg longer than this value will not be created. A value of 0 allows any triangle length to be created.
- 4 Click **Apply**.
The surface is triangulated.
- 5 Close the Triangulate Surface dialog box.
- 6 Display the triangles for the surface (Hint: **Surface > View Surface > Triangles**).
Notice the gaps in the triangles in the west side of the surface. It looks as if there is data missing that should be there. To solve this problem, the *Maximum Length* needs to be a little larger than 100 feet
- 7 Select **Surface > Triangulate Surface** tool.
- 8 Make sure that the *Surface* is set to *Corrected Class Surface*
- 9 Set the *Maximum Length* to **400.00**.
- 10 Click **Apply**.
- 11 Close the Triangulate Surface dialog box.
- 12 Display the triangles for the surface (Hint: **Surface > View Surface > Triangles**).



Triangles displayed with maximum length of 400.

Generally speaking the triangle model is much improved. There are no obvious holes or gaps in the surface. However, examination of the area to the north of the ramps (the area enclosed with the box) shows that there are still some extra triangles that should be removed.

Delete Triangle and Create Exterior

Delete Triangle and Create Exterior

- Deletes Triangle only
 - Will be created again when surface is re-triangulated
- Display Perimeter
- Import Graphic
- Review the results



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Cleanup of Erroneous Triangles

- 1 **Zoom In** or **Window** into the northern part of the intersection as shown in the prior illustration.
- 2 Select **Surface > Edit Surface > Delete Triangle**.
- 3 Verify the *Surface* is set to *Corrected Class Surface*.
- 4 Click **Apply**.

- 5 When prompted to *Identify triangle*, click on the inside of the arc starting at a location where it appears the triangles should not exist. Use the illustration below to help locate that spot.

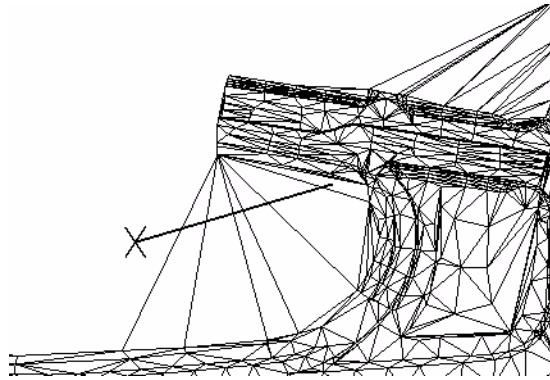


Illustration of where the triangles are to be deleted.

- 6 Move the cursor to the left. The triangles to be deleted highlight as the dynamic line passes over them.
- 7 Position the cursor to the outside of the triangles and click.
The highlighted triangles will be deleted if the operation is accepted.
- 8 Click again to accept deleting the triangles.
The triangles are deleted from the surface and the graphic display is automatically updated.
- 9 Now it is your turn. Delete a few triangles in the intersect quadrants just to the north east and north west of the arc area using the illustration below as a guide. If a mistake is made, re-triangulate the surface and start over.

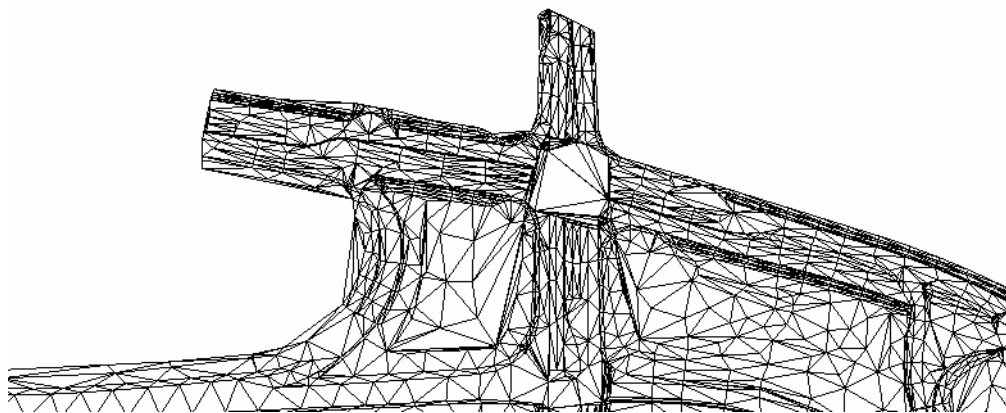


Illustration of what the intersection should look like after the triangles are deleted.

Adding an Exterior Boundary to a Surface

Triangles deleted from a surface will be regenerated if the surface is triangulated again. To permanently delete triangles around the exterior of a surface, an exterior boundary is required.

After the triangles are removed from the outer extents of a surface, the perimeter of the surface is displayed into a graphics file. This produces an element around the cleaned up outer boundary of the surface. The graphic element can be loaded into the surface as an exterior boundary element. Once the exterior boundary element is defined in the surface, future triangulations will respect the boundary and no triangles will be formed outside of it.

Cleaning Up the File

- 1 Select **Surface > Update 3-D/Plan Surface Display**
- 2 Set the *Surface* to *Corrected Class Surface*
- 3 Toggle off *Triangles*

All the graphic types selected for that surface will erase

- 4 Close Update 3-D/Plan Surface Display

Displaying the Perimeter

- 1 Select the **Surface > View Surface > View Perimeter**.
- 2 Set the *Surface* to *Corrected Class Surface*
- 3 Click **Apply**.

The perimeter of the modified surface is displayed.

- 4 Close the dialog box.

Add the Exterior Boundary

- 1 Select **File > Import > Surface**.
This tool is used to read graphic data and create a feature in the surface.
- 2 Select the **From Graphics** tab.
- 3 Set the *Surface* to *Corrected Class Surface*.
- 4 Set *Load From* to *Single Element*.
- 5 Set the *Elevations* to *Use Element Elevations*.
- 6 Enter **Exterior** in the *Seed Name* field.
This defines the name of the new feature created.
- 7 Set the *Feature Style* to *E_SURF_OriginalGround*.

- 8 Set the *Point Type* to *Exterior*.
- 9 Click **Apply**.
- 10 When prompted to *Identify element*, click on the perimeter graphic.
- 11 Click to accept it if the whole element highlights. If only part of the element highlights, right-click until the whole element highlights.

The new exterior boundary feature is extracted from graphics and loaded into the surface.
- 12 Close the dialog box.

Triangulate and Display

- 1 Triangulate the *Corrected Class Surface* making sure that the *Maximum Length* is set to **0.00**.

Since there is now an exterior boundary to define the outer limit of the surface, the *Maximum Length* parameter no longer needs to be defined to restrict which triangles get created.
- 2 Display the triangles for the *Corrected Class Surface*

Save the Surface

- 1 Select **File > Save > Surface**

Since the surface *Corrected Class Surface* is the active surface and was once saved in this lesson, the changes that were done to the surface are now incorporated to the file that was on the disk. Before saving the file, the file on the disk had only the updates up to the time the surface was last saved.

Cleaning Up the File

- 1 Select From the MicroStation menu **Edit > Select All**
- 2 Click **Delete Element**

Review of a Feature

Review of a Feature

- Display of a single feature
- Review the features elevation
- Excluding a feature from triangulation
- Deleting a feature from a surface



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There are two features in this surface that do not belong. The name of these features are TP_MM_ConcreteSlab1391 and TP_MM_ConcreteSlab1392. In this section, you will be presented with two different ways these features can be handled. One method is to exclude the feature from being used in triangulation, the other way is to completely delete the feature from the surface.

- 1 Select **Surface > View Surface > Features**.
 - 2 Set the *Surface* to *Corrected Class Surface*
 - 3 Scroll through the list of *Features* and click on the feature *TP_MM_ConcreteSlab1391*
 - 4 Hold the **CTRL** key down on the keyboard and click on the feature *TP_MM_ConcreteSlab1392*
 - 5 Release the **CTRL** key
 - 6 Click **Apply**
 - 7 Fit the View
- There should be two lines displayed.
- 8 Right click in the *Feature* list
 - 9 On the Pop-up menu, select **Select All**

10 Click **Apply**

There should now be a line between the two concrete slab features.

11 Dismiss the View Features tool.

Reviewing a Feature

There are a couple of ways to review a feature in InRoads. The Feature Properties tool is one way to review a feature. The Feature Properties tool can be used to change the Style associated with a feature, the feature type (Breakline, Random, etc.) and the name of the feature. The points that are the feature can also be listed and reported on.

1 Select **Surface > Feature > Feature Properties**

2 Make sure the *Surface* is set to *Corrected Class Surface*

3 Click on the Graphic Select button next to the list of features

4 Select the line that is located between the two Concrete Slab lines

5 Accept the highlighted line

This should be the feature *RD_ED_ShoulderPavedEdge1295*

6 Click **List Points**

7 Review the listed points and pay attention to the elevation (The Z coordinate)

The elevation range on this feature is 1987.20 to 2001.93

8 Close the Results dialog.

Reviewing Another Feature

1 Scroll through the list of *Features* and click on the feature
TP_MM_ConcreteSlab1391

2 Click **List Points**

3 Review the listed points and pay attention to the elevation (The Z coordinate)

Notice that the two points on this feature are at elevation 1982.26 and 1982.24

4 Close the Results dialog

5 Select the feature *TP_MM_ConcreteSlab1392*

6 Click **List Points**

7 Review the listed points and pay attention to the elevation (The Z coordinate)

Notice that the two pints on this feature are at elevation 1982.28 and 1982.24

8 Close the Results dialog

Since a pavement shoulder is 5 or more feet above these slabs, then either the elevation or location is wrong for the slab. Either way, they do not need to be in the triangle network.

Exclude from Triangulation

To see the results of the edits that are about to be done, the contours will be displayed.

- 1 Leave the Feature Properties tool displayed
- 2 Select **Surface > View Surface > Contours**
- 3 Click **Apply**
Since the surface Corrected Class Surface is the active surface, we did not have to worry about checking the Surface setting
- 4 Notice there are contours between the two slab lines and the edge of pavement line that are between them
- 5 On the Feature Properties tool, select the *Feature TP_MM_ConcreteSlab1392*
The feature should still be selected for the passed active.
- 6 In the *Triangulation* section, toggle on *Exclude from Triangulation*
- 7 Click **Apply** on the Feature Properties tool
- 8 Click **Apply** on the View Contours tool
- 9 A *Triangles are out of date warning* will display. Click **Yes** to have the surface re-triangulate.
- 10 Notice that the contours between the pavement edge and the lower slab line are now gone.
- 11 Close the Feature properties tool but leave the View Contours tool displayed.

Deleting a Feature

The feature TP_MM_ConcreteSlab1391 will be deleted out of the surface.

- 1 Select **Surface > Edit Surface > Delete Feature**
- 2 Select the feature *TP_MM_ConcreteSlab1391*
- 3 Click **Apply** on the Delete Feature tool
- 4 A confirmation dialog will display, click **OK**
- 5 Notice that the feature is erased from the view.
- 6 Close Delete Feature
- 7 Click **Apply** on the View Contours tool
- 8 A *Triangles are out of date warning* will display. Click **Yes** to have the surface re-triangulate.
- 9 Notice that the two contours above the edge of pavement line are now gone.
- 10 Close View Contours

Which Method is Best?

The big difference here is that by using the Delete Feature tool, the feature is not in the surface. That means is that if there was a reason that feature was in the surface, now there is no access to that feature. So which method is better to use. **It** all depends on why you need the feature in the surface and not in the triangle network.

Generate Longitudinal Feature

Generate Longitudinal Feature

- Creates a longitudinal feature based on existing features or graphic elements.
- The new feature can be based on horizontal offsets, vertical offsets, slopes, absolute elevations, and even slope projections derived from other elements or features.



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Generate Longitudinal Feature

This command creates a longitudinal feature based on existing features or graphic elements. This command lets you define your new feature based on horizontal offsets, vertical offsets, slopes, absolute elevations, and even slope projections derived from other elements or features. You can use this command with lines and polylines. If your existing data is 2D, you can use this command to help you model the actual slopes and elevations of the surface. This command also solves the problem of arcs being locked to one elevation.

After you choose Apply, the command prompts you for various elements (a primary element, a reference element, and so on). The prompts vary depending on the settings you have chosen on the Controls tab.

When you go to accept or reject the solution offered by the command, your cursor position is significant. As you move your cursor, the solution can be presented on the left or right side of the selected elements. Position your cursor appropriately when you accept the solution.

Locate Lock

Locate Lock

- The lock applies when the locate (Graphic Select) button is used to specify a position in the graphics file
- The Locate lock determines whether to snap to graphics displayed in the graphics file or to snap to the position occupied by a feature in the active surface.



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Locate Lock

The Locate lock applies when you use a locate button to specify a position in the graphics file. (Locate buttons are found throughout the interface. Each button is indicated by cross hairs icon.) The Locate lock determines whether to snap to graphics displayed in the graphics file or to snap to the position occupied by a feature in the active surface.

If the lock is set to graphics (the icon shows a single, red line), locate actions will seek the nearest displayed graphics.

If the lock is set to features (the icon shows an image of a surface), locate actions will seek the position of the nearest feature in the active surface whether or not the feature is actually displayed. You can use the locate lock to locate features that are not even displayed. If they exist in the DTM, the locate will find them.

Follow Me

Follow Me ...

- Check the Locate Lock setting
- Create a feature using the Generate Longitudinal Feature tool



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Creating a Feature

- 1 Select **Tools > Locks**
- 2 If the icon next to **Locate** does not look like the icon below, then click **Locate** if it does then click in the view.



Locate Lock set to Locate Features

- 3 Select **Surface > Design Surface > Generate Longitudinal Feature**
- 4 Click on the **Main** tab
- 5 In *Reference Feature* section, toggle on *Interval* and enter **0.25**
The interval is how often a point will be created, in this case every .25 feet.
- 6 In the *Longitudinal Feature* section, set the *Mode* to *New*
- 7 Toggle off *Generate Graphics Only*
- 8 Enter **New Slab** for the *Name*
- 9 Set *E_TOPO_Foundation* for the *Feature Style*

- 10 Set the *Point Type* to *Breakline*
- 11 Toggle on *Exclude from Triangulation*

The Controls tab

- 1 Click the **Controls** tab
- 2 In the *Horizontal* section, set the *Method* to *Offset from Primary Feature*
- 3 Enter **1 . 25** for both the *Start Offset* and the *Stop Offset*
- 4 In the *Vertical* section, set the *Method* to *Offset/Offset*
- 5 Enter **0 . 00** for both the *Start Offset* and the *Stop Offset*

This means that the new feature will have the same elevations as the feature that is being selected as the reference feature.
- 6 Click **Apply**
- 7 When prompted to *Identify Primary Feature*, select the line that represents the feature *TP_MM_ConcreteSlab1392*

The prompt will now read *Accept/Reject TP_MM_ConcreteSlab1392*
- 8 Click in the view to accept the feature.
- 9 When prompted to *Identify Reference Feature*, click on and accept the feature *TP_MM_ConcreteSlab1392*
- 10 When prompted *Identify beginning/Reset for Entire*, right click.
- 11 When prompted to *Identify location*, click near the top of the view

A new feature has just been added to the surface.
- 12 Close Generate Longitudinal Feature

Edit Feature Point

Edit Feature Point

- Edit the positions of individual points within a feature
- Insert a point midway between two existing points
- Points can be edited using the Back and Ahead Parameters (More)
 - Length to a point
 - Directions
 - Slope



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Edit Feature Point

The Edit Feature Point command allows you to edit the positions of individual points within a feature. The simplest way to do this is to just key in the northing, easting, and elevation values that you want. However, the command does offer more advanced methods of defining new coordinates for a point. Specifically, you can define the position of a feature point by defining its distance, direction, or slope from either the previous or next point in the feature.

You can also use this command to insert a point midway between two existing points by using the Insert button. The new point is inserted midway between the current point and the previous point. The current point is the one specified in the Point field on the dialog box and is indicated in graphics by a small box with an X in it.

After using the Insert button or specifying a value in any field, you must click Apply or the point will not be added/edited.

Editing a Point Using the Back and Ahead Parameters

If the Back and Ahead parameters are not displayed on your dialog box, click the More button to display the full dialog box.

Editing the parameters in the Back and Ahead groups boxes is an indirect way of defining the northing, easting, and elevation of the current point. When you key in a value anywhere in the dialog box, the indicator for the current point moves to the newly defined position, indicating the proposed solution. If you want the solution, click Apply; otherwise, use the Close button to exit the command.

At any time, the Back and Ahead parameters show the computed distance (Length), direction, and slope values from the current point to the back and ahead points. Changing a value in one of the Back parameters affects the corresponding value in the Ahead parameters, and vice versa.

Editing a Feature Point

- 1 Select **Surface > Edit Surface > Edit Feature Point.**
- 2 Set the *Feature* to *New Slab*
A box should now be displayed at the end of the feature
- 3 Use the arrow buttons in the Point line and follow the location of the box.
The box is the point location indicator.
- 4 Using the arrows, stop at point 5
Notice the Northing, Easting and Elevation of the point is listed.
- 5 Click the Graphic Select button for the *Northing* and *Easting* only.
- 6 Move the cursor around and notice that a temporary line will move indicating where the breakline and the point is located.
- 7 Click in the view to set the location of the point
Notice now that the location box is off the line. The box is indicating where the point will be moved if the Apply button is clicked
- 8 Click **Apply**
The feature is now updated in the surface and the graphic of the feature is also updated in the view.

More

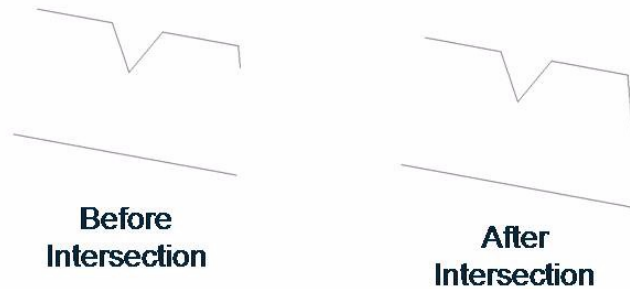
- 1 Click the **More >>** button
- 2 Notice the *Back* and *Ahead* information. This is the directions, distances and slopes from the active point to the points back and ahead of this point.
- 3 Using the arrow buttons for the point, go to the end of the feature *New Slab*
This should be point 10
- 4 In the *Back* section, change the *Direction* to **N 5.0 W** and **TAB**.
Notice that the point location box is now south of the feature
- 5 Click **Apply**

- 6 Using the arrow buttons for the point, go to *Point 9*
Notice that the *Ahead* direction is now *S 5-''0'00.0"E*
- 7 Close Edit Feature Point

Intersect Features

Intersect Features

- Extends two features to a point of intersection
 - Features may exist in different surfaces



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Intersect Features

This tool will extend two features to intersect. This intersection point will be common for both features. This command does not combine the two features.

- 1 Select **Surface > Edit Surface > Intersect Features**
- 2 In the *Feature 1* section, set the *Surface* to *Corrected Class Surface*
- 3 Using either the graphic select button or using the drop down list, set the *Name* to *New Slab*
- 4 In the *Feature 2* section, set the *Surface* to *Corrected Class Surface*
- 5 Using either the graphic select button or using the drop down list, set the *Name* to *TP_MM_ConcreteSlab1392*
- 6 In the *Elevation* section, toggle on *Match at Feature 1*
Do Not Change intersects the features without modifying the elevation of any feature points.
- 7 Click **Apply**

Temporary graphics appear displaying a possibly result. If there was more than one possible, then as the cursor was moved in the view, the closest solution to the cursor will display.

- 8 Click in the view
- 9 Close Intersect Features.

Question Authority

Are the two features really at the same elevation?

- 1 Select **Surface > Edit Surface > Edit Feature Point**
- 2 Using either the graphic select button or using the drop down list, set the *Feature* to *New Slab*
Notice that there is now 11 points and not just 10.
- 3 Use the arrow buttons and “walk” the feature until the end.
Notice the direction the feature points are in.
Note that the elevation is 1982.28
- 4 Using either the graphic select button or using the drop down list, set the *Feature* to *TP_MM_ConcreteSlab1392*
Notice that there is now 3 points and not just the 2 there before.
- 5 Use the arrow buttons and “walk” the feature until the end.
Note that the elevation is 1982.22 So the Intersect Features tool will add a point to the features involved.
- 6 Leave the Edit Feature Point tool active.

Reverse Feature Direction

Reverse Feature Direction

- Reverses the order of the points along a feature
 - Direction is important for Design Surface Commands
 - Direction is important for the Roadway Designer Command if a feature is being used as a baseline.



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Reverse Feature Direction

The Reverse Feature Direction command reverses the order of the points along a feature, making the first point the last point. This procedure affects the order in which points in a feature are processed in commands such as Edit Feature Point.

- 1 Select **Surface > Edit Surface > Reverse Feature Direction**
- 2 When prompted *Identify feature*, select the feature *New Slab*
- 3 When prompted *Accept/Reject New Slab*, left click in the view to accept
- 4 Right click to exit the command

Did it work?

- 1 On the Edit Feature Point tool, use either the graphic select button or use the drop down list to set the *Feature* to *New Slab*
- 2 Notice that *Point 1* is now at the intersection point with the feature *TP_MM_ConcreteSlab1392*
- 3 Use the arrow buttons and “walk” the feature until the end.
Is the feature now in the reverse direction?
- 4 Close Edit Feature Point

Join Features

Join Features

- Combines two distinct features into one
- Using the name of the first feature selected
- The second feature is deleted
- Direction of points based on either the first feature selected or the direction of both features.



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Join Features

The join Features command combines two distinct features into one. The command prompts you to identify one feature and then another. After you identify the features, the command combines the points from both features and saves the resulting feature using the name of the first feature that you identified. The other feature (the second one that you identified) is deleted. The direction of the feature is based either on the direction of the points of the first feature selected or the general direction of both features points.

- 1 Select **Surface > Edit Surface > Join Features**
- 2 When prompted to *Identify feature*, select the feature *New Slab*
- 3 When prompted to *Accept/Reject New Slab*, left click in the view to accept.
- 4 When prompted to *Identify feature*, select the feature *TP_MM_ConcreteSlab1392*
- 5 When prompted to *Accept/Reject TP_MM_ConcreteSlab1392*, left click in the view to accept
- 6 Right click to exit the command.

Did it work?

- 1 Select **Surface > Edit Surface > Edit Feature Point**
- 2 On the Edit Feature Point tool, use either the graphic select button or use the drop down list to set the *Feature* to *New Slab*
- 3 Notice that the first point is where the start of *TP_MM_ConcreteSlab1392*.
- 4 Use the arrow buttons and “walk” the feature until the end.
Notice there is now 13 points on this feature. The two common points where combined as one point.
- 5 Close the Edit Feature Point tool

Changing the Feature

Changing the Feature

- Using Feature Properties to change the feature type
- Including the feature back into the surface.
- Look at the contours



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So far, the feature New Slab has been excluded from triangulation. Now the feature will be added into the triangle network and also the feature type will be changed.

- 1 Select **Surface > Feature > Feature Properties**
- 2 Make sure the *Surface* is set to *Corrected Class Surface*
- 3 Use either the graphic select button or select from the list of *Features* the feature *New Slab*
- 4 In the *Triangulation* section change the *Feature Type* to *Interior*
- 5 Toggle off *Exclude from Triangulation*
- 6 Click **Apply**
- 7 Close the Feature Properties tool

Displaying the Changes

- 1 Select **Surface > View Surface > Contours**
- 2 Click **Apply**
- 3 A *Triangles are out of date warning* will display. Click **Yes** to have the surface re-triangulate.

- 4 Notice that the contours will display up to graphic of New Slab on the right, but why does it look as if there is a line on the left?

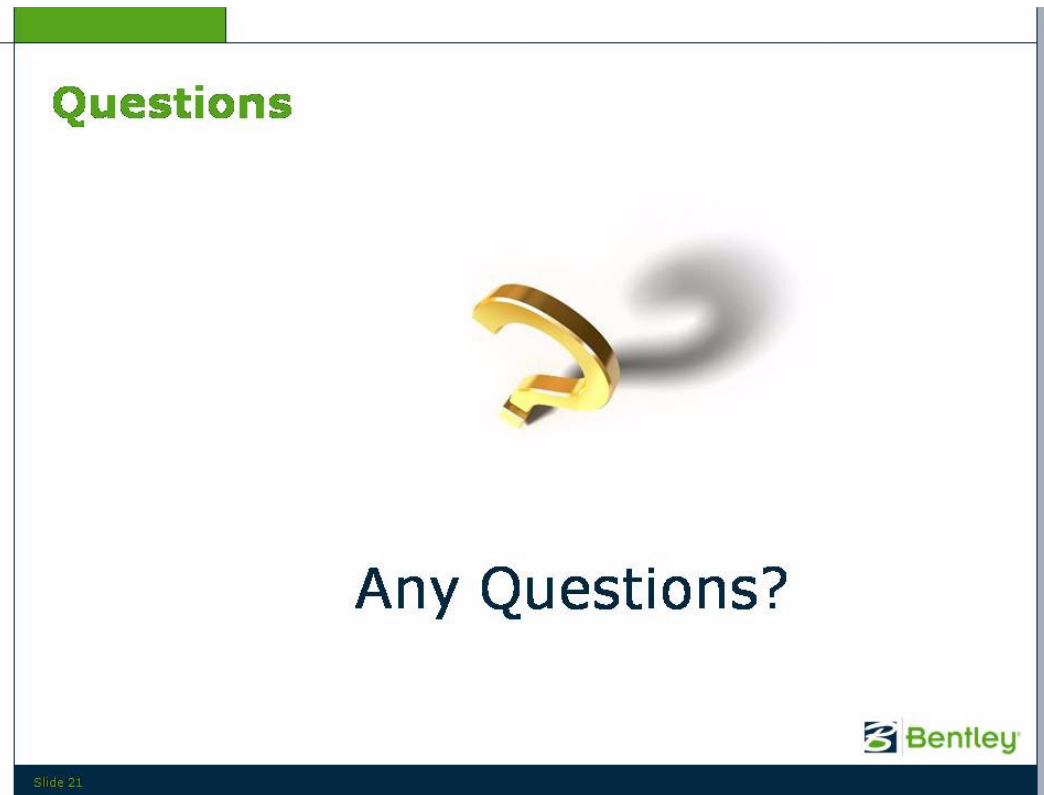
An Interior feature type is a closed shape. If the feature being placed in the surface is an Interior type and is not closed, Inroads will connect the two end points. This is true with Exterior feature types also.

- 5 Close View Contours
- 6 Select **Surface > View Surface > Features**
- 7 Click **Apply**
- 8 Notice that the New Slab feature is closed.

If the feature is changed back to breakline, the feature will still remain closed because a closing point had to be added.

- 9 Close any open tools.

Questions



Questions?

- 1 When through, exit the product.
- 2 If prompted to save any surface files, click **No to All**