LAB 22 - Modeling Around Bridge Abutments

Modeling the surface at the ends of a bridge can accomplished using a variety of tools. This lab illustrates a simple slope, but more complex slopes can be modeled using the same tools and methodologies. In general, you will be using InRoads tools to create breaklines that define the desired surface. For additional information on the tools used here as well as others, please see the *Surface Editing* chapter of the *Practical Guide for Using InRoads XM*.

Chapter Objectives::

- To develop an understanding of modeling surfaces without templates.
- To learn how some of InRoads' Surface tools can create breaklines necessary for modeling surfaces at the ends of a bridge.

Lab 22.1 - Create the Surface East of the Bridge

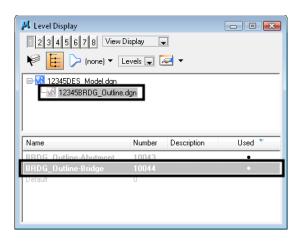
In this section, the design surface is used to create a smaller surface for the portion of the roadway East of the bridge. This surface will subsequently be used as the basis for the grading around the bridge abutment.

Open MicroStation and InRoads using the 12345DES_Model.dgn file.

- 1. Select **File > Open** from the InRoads menu.
- 2. Open 12345 SH52 71st intersection.dtm, 12345 SH119 SH52 interchange.alg, and 12345 existing ground for interchange.dtm.
- 3. Select **File > Reference** from the MicroStation menu.
- 4. Select Tools > Attach.
- 5. Select C:\Projects\12345\Bridge\Drawings\Reference_Files\12345BRDG_Outline.dgn.

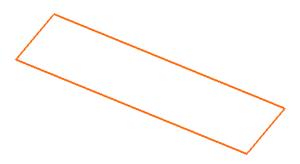
-	5BRDG_Outline.dgn awings\Reference Files\12345BRDG Outline.dgn		
	Default		
Logical Name:			
_	Aligned with Master File		
Orientation:			
View	Description		
Coincident	Aligned with Master File		
Coincident · World	Global Origin aligned with Master File		
Standard Views			
Top Front			
Right			
Isometric			
Bottom			
T l	■		
Toggles:			
Sc <u>a</u> le (Master:Ref)	1.000000 : 1.000000		
N 10			
Named Grou <u>p</u> :			
Revision:			
Clip Boundary Element:	Copy To Master 💂		
Le <u>v</u> el:			
Nested Attachments:	No Nesting Depth: 1		
Display Overrides:	Allow		
Ne <u>w</u> Level Display:			
Global LineStyle Scale:	Master 📿		

- 6. **<D> OK** to accept the default reference settings.
- 7. In the *Level Display* dialog, toggle on the reference file level *BRDG_Outline-Bridge*.



8. *Fit* the view.

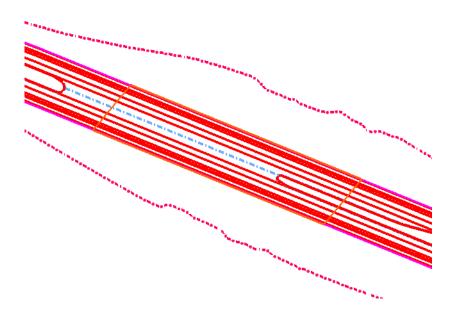
An outline of the proposed bridge is shown in the file.



- 9. Set the *Pen/Pencil* lock to *Pencil*
- 10. Select Surface > Update 3D/Plan Surface Display.
- 11. Toggle *Display On* and highlight the intersection surface.
- 12. Toggle on *Features*.

- 🕌 Update 3-D/Plan Surface Display - • 💌 Mode: Oisplay On Display Off Apply Fence <u>M</u>od Ignore ÷ Close S<u>u</u>rfaces: Filter.. Name Description Edit Style. Default SH52 71st intersection <u>H</u>elp 7345 evicting Perimeter Surface Elevations Color-Coded Aspects Triangles Slope Vectors Color-Coded Elevations Contours Profiled Model Color-Coded Slopes Gridded Model V <u>F</u>eatures: + Style 71 RT_Edge-of-Pavement D_CONC_Pvmt 71 RT_Laneline 71 RT_POSS D_CONC_Pvmt D_POSS 71 RT_Shoulder D_SHOULDER 71 Toe-of-Fill D_Toe-of-Fill 71 Top-of-Cut D_Top-of-Cut
- 13. Right-click in the feature list and choose Select All.

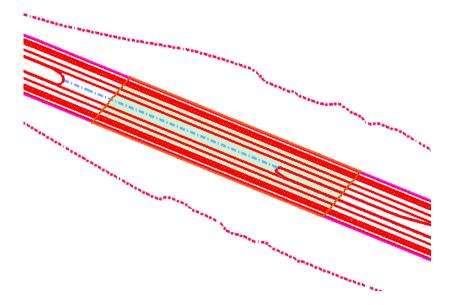
14. **<D> Apply**.



All of the features are shown in the file.

- 15. On the MicroStation menu, choose Place Fence.
- 16. In the *Tool Settings* box, change the *Fence Type* to *Element*.

17. $\langle D \rangle$ on the bridge outline in the design file.

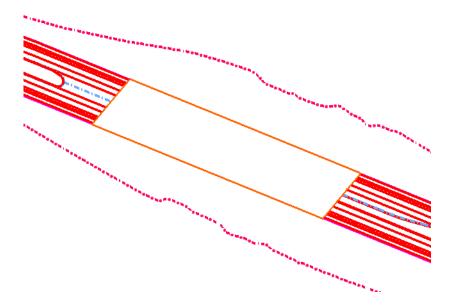


- 18. Choose Surface > Edit Surface > Delete Feature.
- 19. Set the *Surface* to *SH5271st Intersection*.
- 20. Set the *Fence Mode* to *Inside*.
- 21. Right-click in the feature list and choose Select All.

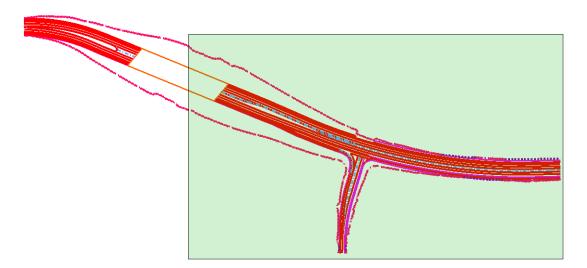
Surface: SH52 71st Fence Mode: Inside	SH52 71st intersecti ▼] Inside ▼]		
Name	Style	Desc 🔶	Filter
71 RT_Edge-of-Pavement	D_CONC_Pvmt	Create	<u>R</u> esults
71 RT_Laneline	D_CONC_Pvmt	Create	Help
71 RT_POSS	D_POSS	Create	
71 RT_Shoulder	D_SHOULDER	Create	
71 Toe-of-Fill	D_Toe-of-Fill	Create	
71 Top-of-Cut	D_Top-of-Cut	Create	
710 1 1		- · · ·	

- 22. <D> Apply.
- 23. When prompted to *Delete selected feature(s)*, select **OK**.
- 24. Close the dialog box.
- 25. Clear the fence.

The features inside the bridge outline are removed from the surface. Next, the features on the East side of the bridge are copied to create a new surface.



- 26. Choose Place Fence.
- 27. In the *Tool Settings* box, change the *Fence Type* to *Block*.
- 28. Place a fence that encompasses all features East of the bridge as shown.



- 29. Select Surface > Edit Surface > Copy Portion of Surface.
- 30. Set the *Surface* to *SH52* 71st intersection.
- 31. Key in the Destination Surface SH52 71st East of Bridge.
- 32. Set the *Fence Mode* to *Inside*.

33. If all Features are not highlighted, Right-Click in the feature list and choose Select All.

🐂 Copy Portion of	Surface		- • •
<u>S</u> ource Surface:	SH52 71st intersec	ti 💌	Apply
Destination Surface:	SH52 71st East of I	B 👻	Close
Fence <u>M</u> ode:	Inside		Filter
<u>F</u> eatures:	·		
Name	Style	Description	Hesults
71 RT_Edge-of-Pav	eD_CONC_Pvmt	Created By Roadway	<u>H</u> elp
71 RT_Laneline	D_CONC_Pvmt	Created By Roadway	
71 RT_POSS	D_POSS	Created By Roadway	
71 RT_Shoulder	D_SHOULDER	Created By Roadway	
71 Toe-of-Fill	D_Toe-of-Fill	Created By Roadway	
71 Top-of-Cut	D_Top-of-Cut	Created By Roadway	
71Centerline	Centerline	Created By Roadway	
741 T E 1 / D	D CONC D I	C I IN D I	
Duplicate Names:			
) Append 🕐) Repla <u>c</u> e 🛛 🔘 R <u>e</u> r	name	

- 34. **<D> Apply**, then **Close** the dialog box.
- 35. Choose File > Save As.
- 36. Set the Save As Type to Surfaces (*.dtm).
- 37. Use the drop-down to set the Active Surface to 12345 SH52 71st East of Bridge.
 - **Note:** If the file name is not listed, use the drop-down again to select the active surface and the same name will appear in the *Name* field. You can then add the 12345 prefix to the file name on the hard drive.
- 38. <D> Save.
- 39. Select Surface > Update 3D/Plan Surface Display.
- 40. Toggle *Display Off* and highlight the intersection surface.
- 41. Toggle on *Features*.

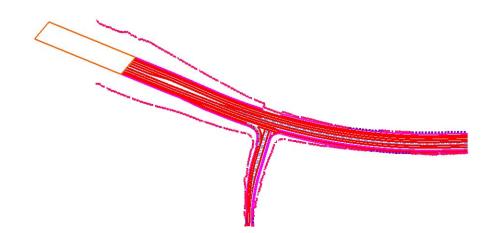
42. Right-click in the feature list and choose Select All.

🐂 Update 3-	D/Plan Surface Display		- • •
Mode:	💿 Display <u>O</u> n 🚺 💿 <u>D</u> is	splay Off	Apply
Fence <u>M</u> ode:	Inside		Close
S <u>u</u> rfaces:		_	
Name		Description	Filter
Default			Edit Style
SH52 71 st int	ersection		Help
SH52 71st Ea	g ground for interchange ast of Bridge	5H1195H 52 existing gr	·
Perimeter	Surface <u>E</u> levations	Color-Coded Aspects	
🔲 <u>T</u> riangles	Slope Vectors	Color-Coded Elevations	
Contours	Profiled Model	Color-Coded Slopes	
<u>▼</u> Eeatures:	🔲 <u>G</u> ridded Model		
Name		Style	+
71 RT_Edge-	of-Pavement	D_CONC_Pvmt	1
71 RT_Laneli	ne	D_CONC_Pvmt	
71 RT_POSS		D_POSS	
71 RT_Shoul	der	D_SHOULDER	
71 Toe-of-Fill		D_Toe-of-Fill	
71 Top-of-Cul	:	D_Top-of-Cut	-
740 1 1			

- 43. **<D> Apply**.
- 44. Toggle *Display On* and highlight the *SH52 71st East of Bridge* surface.
- 45. Toggle on *Features*.
- 46. Right-click in the feature list and choose Select All.

🕌 Update 3-D/Plan Surface Display	1	
Mode: 💿 Display <u>O</u> n 🔘 <u>D</u> i	isplay Off	Apply
Fence Mode: Inside	•	Close
S <u>u</u> rfaces:		Filter
Name	Description	
Default		Edit Style
SH52 71st intersection 12345 evisting ground for interchange	CU110 CU EO aviativa es	<u>H</u> elp
SH52 71st East of Bridge	SHILLA SHIAZ PAKANG DI	
Perimeter Surface Elevations	Color-Coded Aspects	-
Iriangles Slope Vectors	Color-Coded Elevations	
Contours Profiled Model	Color-Coded Slopes	
🔽 <u>F</u> eatures: 🔲 <u>G</u> ridded Model		
Name	Stule	+
71 RT_Edge-of-Pavement	D_CONC_Pvmt	1
71 RT_Laneline	D_CONC_Pvmt	
71 RT_POSS	D_POSS	
71 RT_Shoulder 71 Toe-of-Fill	D_SHOULDER D_Toe-of-Fill	
71 Top-of-Cut	D Top-of-Cut	
710		

47. <D> Apply.



Lab 22.2 - Create a Feature at the Bridge

In this section, a breakline feature is created to 'cap' the end of the roadway features where the bridge starts.

1. In the *Level Display* dialog, toggle off the reference file level *BRDG_Outline-Bridge*.

2345678	Levels 💂		
∃ <mark>VS</mark> 12345DES Model.dan —VS 12345BRDG_Dutline	e.dgn		
lame	Number	Description	Used 🔻
BDG Outline-Abutment	10043		•
DDD D JE D LL	10044		•
RDG_Outline-Bridge			

- 2. Select Surface > Design Surface > Place Feature.
- 3. Set the *Surface* to *SH52* 71st East of Bridge.
- 4. Type in *abutment1* for the *Feature Name*.
- 5. Type in a description if desired.
- 6. Set the *Feature Style* to *D_CONC_Pvmt*.

7. Set the *Point Type* to *Breakline*.

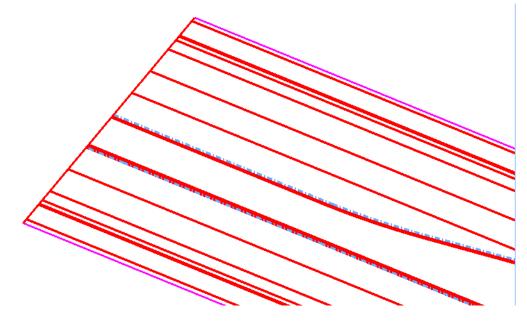
🐂 Place Feature		- • ×
S <u>u</u> rface:	SH52 71st East of Bridge 🛛 👻	Apply
Feature Name: Descriptjion: Feature Style: Pgint Type: Duplicate Name: Append Exclude from	🔘 Repla <u>c</u> e 🛛 🕘 Rena <u>m</u> e	Close Ne <u>w</u> Style <u>H</u> elp
Triangulate Su Dynamics Settin Northing/Eas Eleyation: Distance: Direction: Slope:	gs and Intervals	

8. **<D> Apply**.

9. *Do not* toggle on either option on the *Set Elevation* dialog that appears.

🐂 Set Elevation	×
Specify Elevation:	0.00
Elevation from Surface:	SH52 71st East 💌
Elevation Adjustment:	0.00

10. Snap to the end of each of the roadway features from POSS to POSS as shown.



Note: If you want to use *AccuSnap*, hold down your *<Ctrl>* and *<Shift>* keys and MicroStation's AccuSnap works while using InRoads commands.

11. $\langle \mathbf{R} \rangle$ when done.

Lab 22.3 - Create the Grading Surface

In this section, the *Generate Sloped Surface* command is used to create a grading surface from the roadway down to the existing ground, effectively under the bridge.

1. In the *Level Display* dialog, toggle on the reference file level *BRDG_Outline-Abutment*.

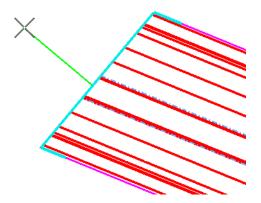
📕 Level Display				• 🗙
1 2 3 4 5 6 7 8 View Display 🖵				
🌾 📴 ⊳ (none) 🕶 🛙	🌾 📴 ⊳ (none) 🔻 Levels 🖵 🛹 🔻			
□-₩ <u>3 12345DES_Model.dan</u> -₩3 12345BRDG_Outline	dan			
12343BHD/d_Uuline	augn			
Name	Number	Description	Us	ed 🔻
Name BRDG_Outline-Abutment	Number 10043	Description	Us	ed 🔻
BRDG_Outline-Abutment BRDG_Outline-Bridge		Description	Us	ed T
BRDG_Outline-Abutment	10043	Description	Us	ed V
BRDG_Outline-Abutment BRDG_Outline-Bridge	10043	Description	Us	ed V
BRDG_Outline-Abutment BRDG_Outline-Bridge	10043	Description	Us	ed V

- **Note:** A green line displays that wraps around the edge of the roadway. This is the line from which the sloped surface is generated.
- 2. Select Surface > Design Surface > Generate Sloped Surface.
- 3. Make sure the *Locate Feature / Locate Graphics* lock is set to *Locate Graphics*.
- 4. Set the *Intercept Surface* to 12345 existing ground for interchange.
- 5. Set the Destination Surface to SH52 71st East of Bridge.

6. Set the other options as shown in the dialog. Be sure to toggle on and key in the feature names for *Transverse*, *Source* and *Catch Point*.

🦮 Generate Sloped Surf	ace		- • •		
Main Advanced					
Current Locate Mode:	Graphics		Filter		
Source Surface:	SH52 71st East of B 💌		New Style		
Intercept		7			
Surface:	12345 existing grour 🔻				
Elevation:	0.00				
Destination Surface:	SH52 71st East of B 👻	1			
Inter <u>v</u> al:	10.00	+			
Cut Slope: 33.00%	📃 To:	33.00%			
Fill Slope: -33.00%	; 📃 To:	-33.00%			
Apply to <u>B</u> oth Sides	<u> </u>	Surface			
Feature		0 . 1			
Name	e: t-Transverse 🛛 👻	Style: + Default			
Tick Marks	-Transverse +		•		
	t-Top 👻	+ Default	-		
	t-Toe-of-Fill 🔹	+ D_Toe-of-Fill	•		
Point Typ <u>e</u> :	Breakline 🔻	1	, , , , , , , , , , , , , , , , , , , ,		
Point Density Interval:	0.00				
Duplicate Names:					
O Append O	Repla <u>c</u> e 💿 Rena <u>m</u> e				
Exclude from Triang	gulation 📃 Generate <u>G</u>	àraphics Only			
	Apply Preference	ces Close			

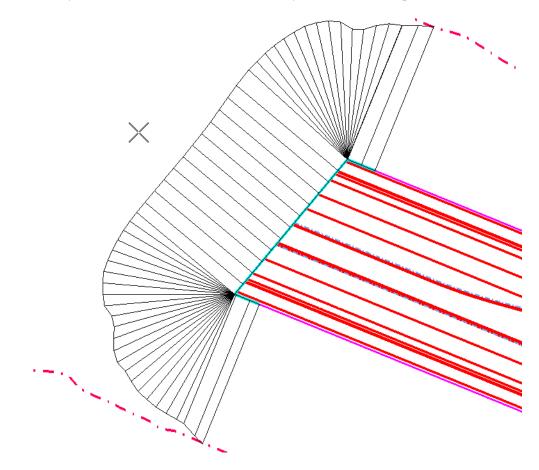
- 7. **<D> Apply**.
- 8. **<D>** to select the green line at the edge of the roadway.
- 9. **<D>** again to accept the line.



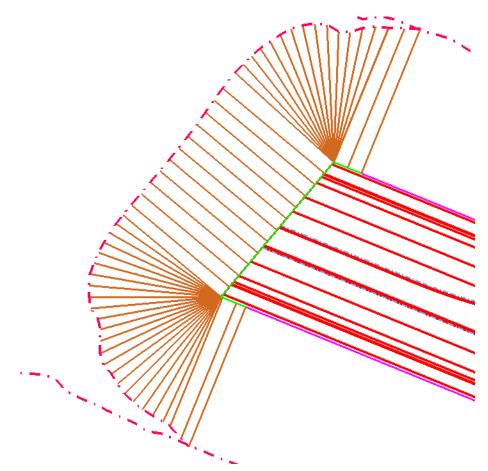
10. **<R>** to Reset for Entire Line.

The *Generate Sloped Surface* command can be used to create a slope from just a portion of the line, which is why the prompts allow specifying a *Start* and *End* location. Here, an <**R**> is used, since the slopes need to be created for the entire source line.

11. Move your cursor to the left of the line until you see the sideslopes form.

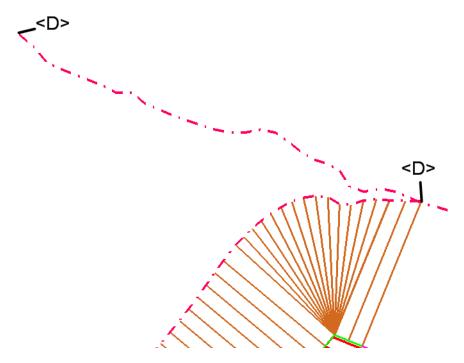


12. **<D>** to Accept the location.



- 13. **<R>** to exit the command.
- 14. **<D> Close** to close the dialog.
- 15. Save the Surface.
- 16. Select Surface > Edit Surface > Partial Delete.
 - **Note:** *Partial Delete* is used just like the MicroStation *Partial Delete*, except it works on features. Here it is used to clean up the toes of slope that extend beyond the sloped surface.
- 17. **<D>** on the Toe-of-Fill on the North side of the roadway to select it as the feature to partial delete.

18. **<D>** on the left end to identify the *Start Point*, then again where the new toe and old toe come together as shown for the *End Point*.

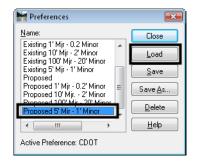


- 19. Repeat for the Toe-of-Fill on the South side of the roadway.
- **Note:** You may want to toggle off *Line Styles* under Settings > View Attributes to see the ends of the lines more clearly.
- 20. Save the Surface.
- 21. Choose Surface > Triangulate Surface.

🐂 Triangulate Su	uface		- • •
Surface:	SH52 71st East of Brid	⊊ ▼	Apply
Description:			Close
Maximum Length:	0.00	+	Help
🔲 Extended Data	Checks	Lock Triangulation	
Features	Graphics	Results Number of Points:	
📃 Delete Surfac	e Contents	Number of Triangles:	
Filter Tolerand	e: 0.00	Elapsed Time (Secon	ids):
			More

- 22. <D> Apply.
- 23. Select Surface > View Surface > Contours.

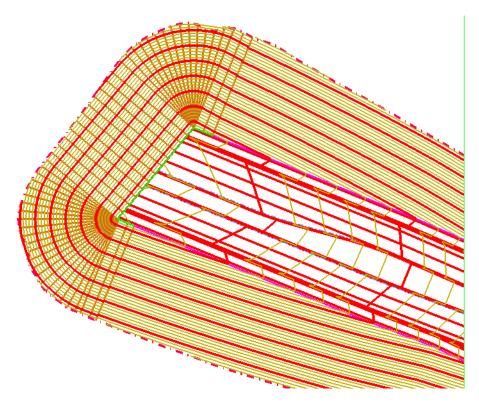
24. <D> Preferences and highlight *Proposed 5' Mjr – 1' Minor*.



- 25. **<D> Load**, then **Close**.
- 26. Set the *Surface* to *SH52* 71st East of Bridge.
- 27. Toggle off *Labels* if desired.

🖌 View	Contours		- 0 💌
Main	Advanced L	abels.	
S <u>u</u> rfac	e:	SH52 7	1st East of B ▼ <u>H</u> elp
Fence	Mode:	Inside	· ·
Interva	l:	1.00	
Min <u>o</u> rs	per Major:	4	×
Symbo	logy:)bject		Name
_	ajor Contours		Name DTM_Prop_Contour_Maj BYL
	ajor Contours		DTM_Prop_Contour_MajBTL DTM_Prop_Contour_MinBYL
М	ajor Labels		DTM_Prop_Contour_Te BYL
ШМ	inor Labels		DTM_Prop_Contour_Te BYL
— М	ajor Depressior	n Co	DTM_Prop_Contour_De BYL
Шм	inor Depressior	n Co	DTM_Prop_Contour_De BYL
[Apply	Prefe	rences Close

28. **<D> Apply** to see the contours.



29. **<D> Close**.

Chapter Summary:

- The *Design Surface* and *Edit Surface* tools can be used to modify existing surfaces and add to them as necessary to accomplish your design model.
- Modeling the ends of a bridge can be accomplished using a base model of the roadway, and adding features to define the desired surface.