

BENTLEY USER GROUP DENMARK

Working toget

Bentley Systems, Incorporated 2010

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InRoads Horizontal and Vertical Geometry

- Stored in an .ALG geometry project file
- Provides multi-user access via a .LCK lock file
- Contains COGO points Horizontal, Vertical and Cant alignments
- Organized in a parent child data structure





Benefits of InRoads geometry

- Stored in a separate file (can have multiple projects loaded)
- Works with graphic coordinates as well as geometry point coordinates
- Point names are optional (names can be non-numeric)
- Geometry locks ease use and eliminate confusion
- Select buttons provide quick input without need for key-in



Auto Annotation: View Options

- Update annotation as the geometry is created / edited
 - Based upon
 - Alignment's style
 - Persisted command's preferences
 - Allows different "type of alignments" to display differently
 - A road baseline would have:
 - Horizontal annotation
 - Stationing
 - Curve set annotation
 - A right of way take would have:
 - Horizontal annotation



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Methods of geometry creation

- Classic Coordinate Geometry COGO commands
 - •Store, Locate, Traverse
- ASCII import via TIW

Style: Default Define By: Northing/Easting Name: Northing: 0.00 Feasting: 0.00 Horizontal Alignment: Define I: 0.00 Heip Direction 1 Northing: 0.00 + Elevation: 0.00 + Direction 2 Name: Direction 1 Direction 2 Name: Direction 2 Name: Direction: Northing: 0.00 + 0.00 + 0.00 + 0.00 + 0.00		Method: • Angle Direction Curve Backsight • Point: Direction: • N 00^00000"E Occupied Point • Point: Name: • 0.00 Easting: • 0.00 Elevation: • 0.00 Instrument Ht: • 0.00 Poresight Point • Name: 1 • Description:	Inset Point Mode Apply ● To Cogo Buffer Edite Alignment ● Before Alignment Undo ● Atter Alignment Undo ● Radial Help Course 00°00'00" ◆ Rodus ♥ 0.00 ◆ ● 000 ◆ Course 0.00 ◆ Radus 0.00 ◆ Rod Height: 0.00 ◆ Ø0'fiset: 0.00 ◆
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Text Import Wizard

- Removed classic support
 - Duplicate and redundant functionality
- Enhanced horizontal to read a multi-line element definition with
 - On alignment points (i.e. PC, PT, TS, SC, CS, ST)
 - Off alignment points (i.e. CC, SPI)

Apply Filter to	Original Data Type	
All Lines	 Fixed Width - Fields are aligned in columns 	Help
O Lines that Start With: PNT	Oplimited - Characters separate each field	
CC Lines that Include:	Defined Filters:	
Segments of Text	Name Description	Add
Start: Include Start in Import	Include PInclude lines that start with 'PNT'	Delete
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Traverse Adjustments

- Again similar to *Traverse Edit*, but all editing is within the grid!
 - Workflow oriented
 - Data Entry > Adjustments > Transformations

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Methods of geometry creation

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- •Desig based •Desig •Table

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🚟 Horizontal Table Editor

Easting

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2138553.368

2144165.862

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2145481.185

Curve Sets: Northing

1526341.766

1526003.185

1525654.801

1524230.936

1523328.323

Horizontal Design Criteria

- Curve Set Based
 - Add PI & Insert PI
- Looks up radius based upon speed / maximum superelevation

..\data\imperial\Horizontal Design Checks.txt

Design Criteria					
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		65.	.06	.11	1637.
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Vertical Design Criteria

- Curve Set Based
 - Add PI & Insert PI
- Looks up K based upon speed / lower or upper limits
 - ..\data\imperial\Vertical Design Checks.txt

Table Name nRoads Gro Speed: Limits:	up V8.11\data\imperial\Vertic	cal Design Check	s.txt	Close Browse Preference Help									
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Horizontal Table Editor

- Invokes Add, Insert, Move and Delete PI commands
- Redesign All
 - Based up Horizontal Design Criteria
 - Either invoke the *Horizontal Design Criteria* command or <Ctrl> right click and change the speed and / or maximum superelevation

OM			Roads and	Bridges		No.	Bentle
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Horizontal	Table Editor						4.000
Llovinental	Table Editor						

Vertical Table Editor

- Invokes *Add*, *Insert*, *Move* and *Delete PI* commands
- Redesign All
 - Based up Vertical Design Criteria
 - Either invoke the Vertical Design Criteria command or <Ctrl> right click and change the speed and limits

Station Elev	vation Ahea	d Slope Len	oth I	
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152+64.98 953	3.60			



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Traverse Edit...
Metes and Bounds...

Traverse Adjustments...

🗩 Create/Edit Alignment by Cogo Points...

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Methods of geometry creation

- Specialized tools for geometry creation
 - Curve Fitting
 - Lot Layout, Cul-de-sac commands
 - One, two, three centered curves
 - Parallel, join
 - Copy Geometry



Curve Fitting

• Fit an alignment through a series of points

- Horizontal & Vertical
- Horizontal only
- Vertical only

Curve Fitting			
From Primary Control:	SV916	• •	Apply Close
To V Create Horizontal			nop
Create Vertical			
Vertical Parent:	SV54	-	
Alignment Name:	Existing Centerline		
Description:			
Style:	Default	-	
Horizontal Tolerance:	0.500		
Vertical Tolerance:	0.250		
Standard Lift:	0.000		
Vertical Alignment i	s Lines Only		



Chain Points

- Create a xyz horizontal alignment
- Or feature
 - Open or closed shape

🎬 Chain Po	pints 🖂 🖂 🗶
Points:	Apply
Selected:	Close
Name	Description
158	Existing Point of Cur
160	Existing Point of Cur Help
161	Existing Point of Cur
171	Existing Point of Cur
172	Existing Point of Cur
Create:	V Horizontal Feature
Name:	Chained centerline
Description:	
Style:	Existing Centerlines 🔹
Bandwidth:	10.000
Create a	s a Closed Alignment or Feature

Bentley



Methods of geometry creation

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🚟 Edit / Review Horizontal

Regression Points: Name

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 Element based 	Simplified Horizontal Element	Add Fixed Line
alignment	Settings	Add Free Line
creation	Leading Transition: 0.000 Close Idd Floating Curve Radius: 1186.000 Design Calc Idd Free Curve	Add Floating Curve
 Can be created as discontinuous alignment Advanced 	Trailing Transition: 0.000 Help lefine Spiral Help Help Index Point 1 Index Point 1 Northing: 278606.943 Index Point 1 Index Point 1 Northing: 278606.943 Index Point 1 Index Point 1	 Define Spiral Connect Elements Cut Element Join Elements Move Element Conv Element
Regression tools – Simplified element tools	Easting: 135184.912 Direction: N 00^0000" E Fadius: 0.000 Point 2 Name: Northing: 0.000 Check Horizontal Integrity Easting: 0.000 Type Statio Northin Easting Direction Northin Easting Direction Northin Easting Timestion Direction: N 00^00 Type Statio Northin Easting Northin Easting Timestion Direction: N 00^00 Type Statio Northin Easting Northin Easting Timestion Direction: N 00^00 Type Statio Northin Easting Northin Easting Timestion Easting: 0.000 Circular 0+4311 278578.48 135201.65 N 13*2111*1. Radius: 0.000 Circular 1+82.25 278713.05 135156.4 N N Make First 1349887.75 Northing @ Start	Add Fixed Element Add Fixed Element Edit Element Check Integrity Radius Const Integr E Apply 373.450 0K 0K 0K 1002.38 PK 0K 0K Help
Edit / Review Horizontal Regression Points	▲ □ ▲ 3471.06.15400.15401.144 Move Forward	0K 0K 0K 360.138 0K 0K 0K
Name Northing Easting Style Include in Status Offs 3 278536.544 135201.646 Default No Normal 0.000 0 278542.423 135200.252 Default No Normal 0.000 1 278562.808 135195.446 Default No Normal 0.000 2 278583.489 135195.059 Default No Normal 0.000 2 278582.484 13519.059 Default No Normal 0.000 3 278591.35 135187.735 Default No Normal 0.000 4 278620.474 135181.634 Default No Normal 0.000 5 278620.474 135181.634 Default Normal 0.000 6 278632.179 13517.5426 Default Normal 0.000 7 278645.333 135175.426 Default Normal 0.000 3 278669.820 <td>Close 9669.14134239.26N 44 Detecte 133917.97 ✓ Enting @ End set Weight ✓ 133917.97N 0 ✓ Esting @ End 0.010 Select Only Select Only 13390.84N 0 13390.84N 0 13390.84N 0 0.010 O.010 Select & Regress </td> <td>1047.146 OK OK OK 545.820 OK OK OK 2362.393 OK OK OK 374.771 OK OK OK -1038.80 OK OK Last</td>	Close 9669.14134239.26N 44 Detecte 133917.97 ✓ Enting @ End set Weight ✓ 133917.97N 0 ✓ Esting @ End 0.010 Select Only Select Only 13390.84N 0 13390.84N 0 13390.84N 0 0.010 O.010 Select & Regress	1047.146 OK OK OK 545.820 OK OK OK 2362.393 OK OK OK 374.771 OK OK OK -1038.80 OK OK Last
16 WWW.BENTLEY.COM	Roads and Bridges	🗃 Bentley

"Simplified" Horizontal Elements

- Horizontal Elements without dialogs
 - Well, there is a *Settings* dialog, which defines the radius and optional spiral lengths!
 - This dialog is active even during graphics input
 - Add Fixed, Float and Free elements
 - Move
 - Edit
 - Delete

– MicroStation only functionality!

Magent Settings		
Leading Transition:	0.00	Close
Radius:	1206.00	Design Calc
Trailing Transition:	0.00	Help



"Simplified" Vertical Elements

- Vertical Elements without dialogs
 - Well, there is a Settings dialog, which defines the K or length of curve!
 - This dialog is active even during graphics input
 - Add Fixed, Float and Free elements
 - Move
 - Edit
 - Delete

- Simplified Vertical Element 🛛
- MicroStation only functionality!

Settings		
Dynamics		Close
Station:	10.00	Help
Elevation:	0.00	
Grade:	0.200%	
Define Curve by K = I/(g2 - g1)	50.00	

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Add Fixed Horizontal Element

- Add lines, circular arcs and transitions from a single dialog
 - Radii of 0 is a line
 - Equal non-zero radii is a circular arc
 - Unequal radii is a clothoid

A	dd Fixed H	orizontal Element		
Poi	int 1			Apply
1	Name:			~
	Northing:	1360189.238	+	Close
	Easting:	1959176.438		Undo
	Direction:	N 65^32'50.0" E	+	Help
	Radius:	1000.000	+	
	Name:			
	Name:			
	Northing:	0.000	-+-	
	Easting:	0.000		
	Direction:	N 0^00'00.0" E	-	
	Radius:	500.000	-	
V	Length:	200.000	+	
	-			

Roads and Bridges

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Geometry review and reporting

- Can review geometry directly from the Inroads Explorer
- Horizontal review provide alignment, element and curve set view
- Geometry points are reviewed via COGO, alignment, and geometry points
- Reporting is accessed via XML reporting as well as Report/Results dialog
- Design Checks for standards compliance



Design Checking

- Not just warnings!
 - Now it also indicates if the geometry is acceptable!
 - Good for QC

	crinali	Geilliari hali	Har	isiapiu	Interactive
General Roads		UEN Standards			strian Hail
Туре:	Hori	zontal Alignment	~		Apply
Geometry Project:	Def	ault	~		Browse
Horizontal Alignmen	t Cou	ntry Road 1534	*	+	E dit
Vertical Alignment:		•			AE.752346
☑ Include Children Definition:	◯ Sing	le Classification	⊙ M	Lultiple Cl	Help
Include Children Definition: Classification:	◯ Sing	le Classification Freeway	• M	Lultiple Cl	Help
Include Children Definition: Classification: Terrain:	Sing GS-1M Level	le Classification Freeway	• M	Lultiple Cl	Help
✓ Include Children Definition: Classification: Terrain: Design Speed:	Sing GS-1M Level	le Classification Freeway	• M		Help
✓ Include Children Definition: Classification: Terrain: Design Speed: Classification File:	Sing GS-1M Level 50 d:\data	le Classification Freeway \design checking	⊙ M g.t∺t	ultiple Cl	Help

Checking stopping sight distances for alignment 'Default'

10+550.0000

Classification: GS-1M Freeway Terrain: Rolling Speed: 60 Warning: Desirable minimum stopping sight distance exceeded! Desirable minimum length should be: 499.1020 Actual length: 300.0000

11+050.0000 Classification: GS-1M Freeway Terrain: Rolling Speed: 60 Acceptable: Actual length is greater than desirable minimum stopping sight distance. Desirable minimum stopping sight distance: 205.0000 Actual length: 200.0000 Actual length: 300.0000

Alignment:	Default		+	OK		
Start Station:	127+00.0000				+	Cancel
Stop Station:	186+19.156	64			+	Δdd
Classification:	GS-3M 150	I0 < ADT < 20	00	~		
Ferrain:	Rolling			~		Update
Design Speed:	50			*		Delete
						Help
Alignment	Start St	Stop St	Class	ificat	ion	T S
Default	100+00.00	127+00.00	GS-3M	150	0 < R	ollin35
Default	127+00.00	. 186+19.15	GS-3M	150	0 < R	ollin50
Country Roa	10+00.000	. 20+00.023 . 37+65.007	GS-4M	50 <	: AD R	ollin30



Point Validation

- Moved <u>obscure</u> functionality from *Review Point* to a new *XML Point Validation Report*
 - Uses geometry selection filter
 - Works with alpha-numeric names as numeric
 - Checks for duplicates
 - Validates coordinates for liked named points

Horizontal /	Alignments •	+	Cogo Points Include:			+	Apply
Selected:			Selected:				Close
Name	Description Style	-	Name	Description	Style		Filter
DE3	C/L PEQU MAIN_P		1		PROP_E		Help
DE6	C/L GOLF MAIN_P		2		PROP_E		
DE7	C/L US 78 MAIN_P		3		PROP_E		
DE8	C/L STOFF MAIN_P		4		PROP_E		
DE19	C/L HWY 1MAIN_P		5		PROP_E		
DE20	LL - GOLF MAIN_P		6		PROP_E		
DE21	LL - GOLF MAIN_P		7		PROP_E	Ŧ	

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Demonstration

🖌 Design Checks								
Dutch Rail German F	ail Italian Rail	Transrap	oid Interac	tive				
General Roads CE	N Standards	Austrian Rail	Danish F	Rail				
Туре:	Horizontal Alignmer	nt 💌	Apply					
Geometry Project:	Design	*	Browse					
Horizontal Alignment:	CONST	+	Edit					
Vertical Alignment:	Profile Grade	✓ +	Help					
🔽 Include Children								
Definition: 🔿 S	ingle Classification	n 💿 Multip	ole Classificatio	ons				
Classification: GS-	1M Freeway	1	1					
Terrain: Rol	ing		1					
Design Speed: 50			v					
Classification File: C:\F	Program Files\Bent	ley\InRoads	Group V8.11\d	dat				
Design Criteria File: C:\F	^o rogram Files\Bent	ley\InRoads	Group V8.11\a	dat				
Pre	ferences	Close						
	🙀 Edit Class	ification I	File				1	>
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	Stop Station:	50+00.00			+		Add	
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	lerrain:	Level		*			Delete	1
	Design Speed:	60		*			Delete	ר
							нер	J
	Alignment	Start St	Stop St	Classifical	tion	T	S	
	CONST	0+00.00 50+00.00	50+00.00 70+00.00	GS-1M Free GS-1M Free	eway eway	Level	60 50	
	CONST	70+00.00	100+00.00	GS-1M Free	eway	Rollin.	65	

×



Conclusion

• Questions?

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