ADA Curb Ramp Design Automation Tool

> <u>User Manual</u> 11/6/2019

Illinois Department of Transportation Bureau of Design District 1 Region 1

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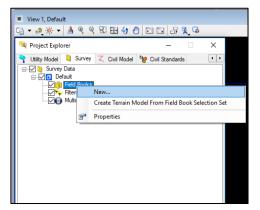
1. Defining Geometric Design in CADD

Define geometric design in MicroStation utilizing BDE and PROWAG design guidelines and standards.

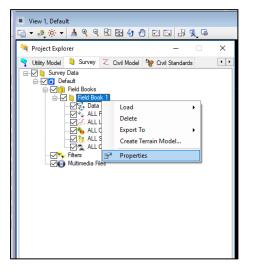
2. Creating Design Points

Design points are created for the proposed design at each node using the following steps:

2.1 Creating a new survey field book in Project Explorer



2.2 Renaming field book

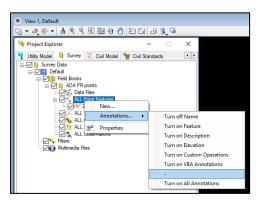


File -> Project Explorer -> Survey Tab -> right click on Field Books -> New.

Right click on new Field book -> Properties -> enter new name in the name property field.

② Element Information		-	×
Selection ADA PR points			
Field Book			^
Name	ADA PR points		
Control Points	0		
Data Files	0		
Linear Features	0		
Point Features	0		
Setup Points	0		
Observation Points	0		

2.3 Modifying point display (Optional)

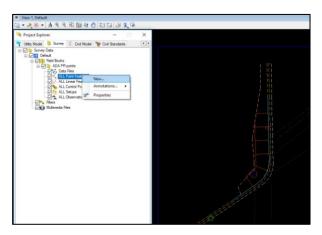


Turn on levels TOPO_POINT SPC CELL and TOPO_POINT NUMBERS.

Modify point annotation to only display point name by right clicking on All Point Features -> Annotation -> selecting on/off properties to be displayed.

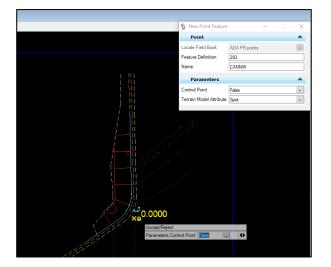
4

2.4 Placing design points



Open the New Point Feature Toolbox by: Right click on All Point Features -> New.

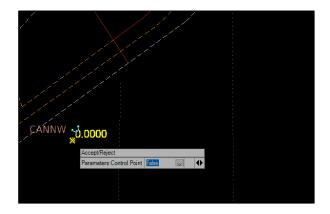
2.4.1 Inputting design point properties



Select the newly created field book from drop down menu -> Set the feature definition to 293 -> Create a 5-character name unique to this corner -> Set Control point to False -> Set Terrain Model Attribute to Spot. Continue to next step without exiting any tools, i.e., don't right-click.

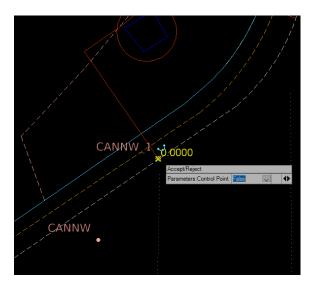
NOTE: It is imperative for the name to be 5-characters in length. No more, no less.

2.4.2 Placing proposed dummy design point



Click through the prompts until a point and elevation appears highlighted in yellow -> click somewhere outside of the sidewalk area to create the dummy point. Continue to next step without exiting any tools.

2.4.3 Placing proposed design points



Continue placing rest of points at nodes of proposed geometric design. Each point, by default, will be assigned a corresponding number following the name and an _.

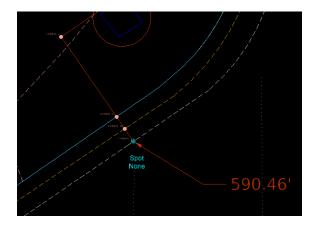
To simplify later steps, abide by some point-placement convention where, for example, the adjacent points are placed in the direction where the proposed elevation will descend.

2.4.4 Modification of proposed design points (as needed)



Move points by clicking on the point and selecting the center handle. Rename points by going into element information of the point and entering a new name.

- 2.5 Inputting existing elevations of proposed design points
- 2.5.1 Creating elevation labels (existing points only)





Use the Label Terrain Spots tool, under the Civil Tools task tab -> Terrain Model. Select the existing terrain model when prompted -> Click on the existing design point -> Click to place label.

2.5.2 Inputting existing elevation into design points

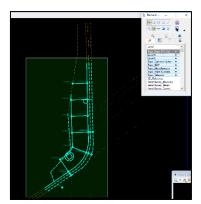
Name	CANNW_1	
Display	True	
Feature Definition	293	
Link Code	None	
Zone	1	
Description		
Terrain Model Attribute	Spot	
Attributes Pair		
Control Codes		
Easting	1173525.8498	
Northing	1889108.3580	
Elevation	590.6400	
Data File Name		
VBA Macro		
Field Book Name	ADA PR points	
Style Name	293	
Media File		
Time Stamp	N/A	

Open element information window for the point -> Enter the elevation, placed using the label, into the elevation field.

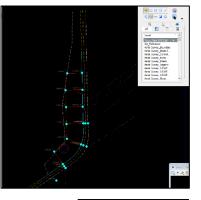
3. Exporting Design Points into ADA Automation Tool

Data for points created is extracted from CADD and imported into ADA Automation Tool using the following steps:

3.1 Selecting design points









Select all elements in the corner to-bedesigned -> turn off selection for all elements not in the grey TOPO_POINT SPC CELL level. NOTE: End-result of selection should only include points created.

3.2 Generating a point report

✓ Civil Tools 1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	· · ·	nn Source: Mart		A: StationOffse A: StationOffse A: StationOffse	et xsl et Along Single Alignmen et Along Single Alignmen et Along Single Alignmen et Elevation Feature xsl et Northing Easting xsl	tExistGround.xsl	
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	Base	Description: line (Active) Alignment: GeomScrat File Name: S:WP/PLA	NPREPIK Smith Squad Des_	RR/2. Projects/14. ADA Spreadsheet/ADA	A RampoMS Files\Try 4Main Presentation AD	A file1.dgn Note: Al units in this report are in feet units	ss specified otherwise.
 ズ Horizontal Geometry 	Base	Description: line (Active) Alignment: GeomScratt File Name: S:W/P/P/A Last Revised: 10/28/2019 Input Grid Factor: Station	NPREPIK Smith SquadiDes_ 15.11.39 Offset	Northing	Easting	Note: Al units in this report are in feet unle Elevation	Feature
∠ Horizontal Geometry	Base	Description: Iline (Active) Alignment: GeomScratu File Name: S:WPIPLA Last Revised: 10/28/2019 Input Grid Factor: Station 1+21.21	NPREPIK Smith Squad/Des_ 15:11:39 Offset -10:6124	Northing 1889099 5427	Easting 1173522.4329	Note: All units in this report are in feet unles Elevation 0.0000	Feature 293
ズ Horizontal Geometry ₩ Vertical Geometry	Base Point CANNW CANNW 14	Description: Line (Active) Alignment: GeomScratt File Name: S:WPPLA Last Revised: 10/28/2019 Input Grid Factor: Station 1+21.21 1+29.65	NPREPIK Smith Squad Des_ 15:11:39 0ffset -10:6124 -15:9031	Northing 1899099 5427 1889108 7009	Easting 1173522.4329 1173526.3522	Note: All units in this report are in feet units Elevation 0.0000 590.4600	Feature 293 293
 Z Horizontal Geometry Wertical Geometry Terrain Model 	Base Point CANNY_14 CANNY_13	Description: Line (Active) Allignment: GeomScrat File Name: S:WPPCA Last Revised: 1028/2019 Input Grid Factor Station 1+21.21 1+28.65 1+28.65	NPREPIK.Smth SquadDes_ 15:11:39 0ffset -10.6124 -15.9031 -16.6896	Northing 1889099.5427 1889108.7009 1889109.3481	Easting 1173522.4329 1173526.5522 1173525.9054	Note: Al units in this report are in feel units Elevation 0.0000 590.4600 590.4712	Feature 293 293 293 293
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 Horizontal Geometry Vertical Geometry Terrain Model Corridor Modeling Model Interoperability Civil Cells 3D Geometry 	Image: Control of the contro	Description: Ites (Active) Alignment: Constitution Elevel half annexe: StruPC-LU Last Review 10/023/019 legen Const Factor 1-22 85 1-22 85 1-22 85 1-22 85 1-23 85 1-23 85 1-23 85 1-23 85 1-23 85 1-23 85 1-23 85 1-23 85 1-24 85 1	NPREPK Gmb SquadDes 15:1139 700et -10:014 -15:8011 -15:801 -15:801 -15:801 -15:801 -15:801 -15:801 -15:801 -15:802 -15:802 -15:802 -15:112 -15:802 -15:112 -15	Northing 109099-5427 109909-5427 109909-5421 109909-544 109910-5744 109914-0911 109914-7582 109914-7580 109914-7580 109914-2541 109912-2300 1099122-200 1099122-200 1099122-200 1099122-200	Easting 117552,439 117555,842 117555,852 117555,854 117552,819 117555,844 117555,844 117555,1492 117555,1492 117555,1492 117552,240 117552	Effect: Al with it is in the result are in her with Elevation 0.000 99.4000 99.40000 99.40000 99.400000 99.40000 99.40000 99.40000 99.40000 99.400000 99.400000 99.40000000 99.400000000000000000000000000000000000	Feature 283

With points selected use the Point Feature Station Offset Elevation Report tool, found under Civil Tools task tab -> Analysis & Reporting. Follow prompts by selecting any base line that runs through the project -> left-click to create report. A report will open. If a base line, like an alignment, is not available, create one using Line Between Points tool under Civil Tools -> Horizontal Geometry.

3.3 Exporting report in .xls format

Open wser\8.11.9\en\			Che	tion Offeret Neithing Eastin	ng Elevation Feature Report		
Append	1 1000000		Sta	tion Offset Northing Eastin	ng Elevation Feature Report		
	1000000			Report Created	10/28/2019		
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rgacy-RoadwayDesign	Point	Station	Offset	Northing	Easting	Elevation	Feature
galDescription	Automatical and a second se						293
pCheck ling	CANNW	1+21.21	-10.6124	1889099.5427	1173522.4329	0.0000	
ociete	CANNW_14	1+29.65	-15.9031	1889108.7009	1173526 3522	590.4600	293
hemas	CANNW_13	1+29.65	-16.6896	1889109.3481	1173525.9054	590.4712	293
ht Visbility skeaut	CANNW_12	1+29.65	-17.4531	1889109.9764	1173525.4716	590.5256	293
aveout ationOffset	CANNW_6	1+29.65	-22.4530	1869114.0911	1173522.6310	590.6256	293
GiviToolsStationOffset.xsl	CANNW_5	1+34.33	-23.1929	1889117.3582	1173526.0423	590.7200	293
CiviToolsStationOffsetExtended.xsl IHSDMLandXML.xsl	CANNW_11	1+36.73	-18.8052	1889115.1197	1173630.5133	590.6696	293
Profile Existing Proposed Elevation xal	CANNW_4	1+36.92	-27.1906	1889122 1210	1173525.8943	590.7200	293
Profile Existing Proposed Elevation Extended xal	CANNW_15	1+37.09	-18.1389	1889114.7798	1173531.1922	590.6156	293
Profile Station Bevation xel	CANNW_16	1+37.65	-17.1086	1889114.2541	1173532.2420	590.6000	293
Profile Station Bevation ASCII xal Profile Station Offset Elevation ASCII xal	CANNW 3	1+39.65	-31.3795	1889127.1189	1173525.7497	590 7923	293
StationBaseCompare xsl	CANNW 10	1+41.75	-24.0613	1889122 2996	1173531.6416	590 7200	293
StationBaseCoordinates.xsl	CANNW 17	1+42 30	-23 7002	1889122 3202	1173532 3048	590 6728	293
StationBaseCrossSlope xal StationBaseStropledCrossSlope xal	CANINV_2	1+42.40	-35 5572	1889132 1175	1173525.6256	590 8922	293
StationBaseSingle xsl	CANINW 18	1+43.05	-23.2124	1889122 3480	1173533.2006	590 6900	293
StationBaseVerticalClearance xsl	CANINV 9	1+44.48	-28 2502	1889127 2975	1173531.4970	590 7923	293
StationBaseWGrades.xsl StationOffset.xsl	CANNW 1	1+45.59	-39.4461	1889137, 1325	1173526.0319	591.3100	293
StationOffsetAongSingleAlignment xal	CANNW 8	1+47.22	-32.4277	1889132 2950	1173531.3732	590 8922	293
StationOffsetAlongSingleAlignmentExistGround.xal	CANNW 7	1+49.99	-36 5923	1889137.2954	1173531.2733	590.0522	293
] StationOffsetAongSingleAlignmentWRadius.xsl] StationOffsetElevationFeature.xsl	CANNWV_7	1+49.99	-36.5923	1889137.2954	11/3531.2/33	591.2400	293
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Set report format to: StationOffsetNorthingEastingElev ationFeature from the left sidebar. Format of the report needs to match that shown in sub-steps 3.2 and 3.3. It can be modified through Tools -> Format Options. Then, click File -> Save as. Save file in XLS (excel) format somewhere in your project folder.

NOTE: it is recommended to name the exported excel file after the corner name, i.e., 5-character name.

3.4 Copying report data into ADA Automation Tool spreadsheet

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CANNW 14		-15.9031				293		ANNW 14.1889108			3 3				Rep	ort Created: 1	10/28/2019						
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CANNW 12	1+29.65	-17.4531	1889109.976	1173525.5	590.5256	293		ANNW 12,1889109.															
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CANNW_5	1+34.33	-23.1929	1889117.358	1173526	590.72	293		ANNW 5,1889117.3				Baseline	Active) Alignmo		atch								
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ANNW_15	1+37.09	-18.1389	1889114.78	1173531.2	590.6156	293		ANNW_15,1889114.			29: 5				Main Present	ation ADA file	1.dgn						
ANNW_16	1+37.65	-17.1086	1889114.254	1173532.2	590.6	293	(ANNW 16,1889114.	2541,117353	2.242,590.6,293	2	0		rd: 10/28/201	9 15:11 Note: All units in	s this report on	a in feet un	405					
ANNW_3	1+39.65	-31.3795	1889127.119	1173525.7	590.7923	293	(ANNW_3,1889127.1	189,1173525	.7497,591.1537,2	93 1	1	Input Grid Fac	or:	mores call units in		fied otherw						
ANNW_10	1+41.75	-24.0613	1889122.3	1173531.6	590.72	293	(ANNW_10,1889122.	2996,117353	1.6416,590.739,2		2											
ANNW_17	1+42.30	-23.7002	1889122.32	1173532.3	590.6728	293	(ANNW_17,1889122.	3202,117353	2.3048,590.6918		3											
ANNW_2	1+42.40	-35.5572	1889132.118	1173525.6	590.8922	293	(CANNW_2,1889132.1	175,1173525	.6256,591.1537,2		4 Point		Station (Northing	Easting	Elevation			
ANNW_18	1+43.05	-23.2124	1889122.348	1173533.2	590.69	293	(ANNW_18,1889122	348,1173533	.2006,590.69,293	1	6 CANNW 14		1+21.21 -					3 1173522.43		293 293		
ANNW_9	1+44.48	-28 2502	1889127.298	1173531.5	590.7923	293	(CANNW_9,1889127.2	975,1173531	.497,591.1537,29	3	7 CANNW 13		1+29.65					8 1173525.90		293		
CANNW_1	1+45.59	-39.4461	1889137.133	1173526	591.31	293	(ANNW_1,1889137.1	325,1173526	.0319,591.31,293	3	CANNW 12		1+29.65 -					6 1173525.47				
CANNW_8	1+47.22	-32.4277	1889132.296	1173531.4	590.8922	293	(ANNW_8,1889132.2	96,1173531.	3732,591.1537,29	3 7	CANNW 6		1+29.66 -					1 1173522.63				
CANNW_7	1+49.99	-36.5923	1889137 295	1173531.3	591.24	293	0	ANNW_7,1889137.2	954,1173531	.2733,591.24,293	2	CANNW_5		1+34.33 -					8 1173526.04		293		
											2	CANNW_11		1+35.73 - 1+36.92 -				1889115.12	1173530.51		293 293		
											2	3 CANNW 15		1+30.92 -					1173531.19				
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											2	S CANNW_3		1+39.65 -					9 1173525.75				
											2	6 CANNW_10		1+41.75 -				1889122.3	1173531.643		293		
											2	7 CANNW_17 8 CANNW 2		1+42.30 - 1+42.40 -				1889122.32	1173532.30 8 1173525.62		293		
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Copy the 7-column block from the report Excel Sheet into the first seven columns of the CADD_DATA tab in the ADA_Automation_Tool spreadsheet. Note that all points in the CADD_DATA tab need to be unique. To overwrite a point that is already in the CADD_DATA sheet with a new location, either copy the point row from the MicroStation exported excel into the CADD_DATA tab over the point to be replaced, or simply overwrite all points in the same manner. New points can be added in the same way.

4. Generating Proposed Design Using ADA Automation Tool

Data for proposed design is generated utilizing an algorithm applied in the ADA Automation Tool in the form of a spreadsheet using the following steps:

		TABLE 1. POINTS			-			TABLE 2. SE	GMEN	ITS		-				1 12			TABL	E 3. OUTPUT	
ļ	Point	Elevation (ft)	EX./PR.	From	To	Туре	Max Slope	Min Slope	+/-	MAX	MIN	Slope	Length	Elev. Ditt.		CALCULATE	1	Point	STATION	OFFSET	ELEVATIO
	_		PR							0.00%	0.00%	0.00%									
	-		PR	-		-				0.00%	0.00%	0.00%	-			PECIFIED PARAN					-
			PR		2 2	-				0.00%	0.00%	0.00%			CHECK FOR RC	UNDING ERROR		-			-
			PR	-	-		-			0.00%	0.00%	0.00%	-			OPTIMIZE					
			PR		5			0		0.00%	0.00%	0.00%						5			2
			PR							0.00%	0.00%	0.00%									
			PR							0.00%	0.00%	0.00%			Category	Max	Min				
			PR							0.00%	0.00%	0.00%			Cross Slope Depressed Carb	2	0				
			PR	-	-		-			0.00%	0.00%	0.00%	-		Gutter Flag	0	0				-
			PR		2 2					0.00%	0.00%	0.00%	-		Landing	2	0				-
			PR				-			0.00%	0.00%	0.00%			Ramp	8.3	0				
Ì			PR							0.00%	0.00%	0.00%			Sidewalk	5	0				1
			PR							0.00%	0.00%	0.00%									
			PR					5		0.00%	0.00%	0.00%			Legand						-
			PR	-	-		-			0.00%	0.00%	0.00%				ROUNDING ERRO		-			
			PR				-	-		0.00%	0.00%	0.00%				VIOLATES SLOPE	RANGES	-			
i			PR		-		-			0.00%	0.00%	0.00%						-	-		-
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ADA Automation Tool is a spreadsheet consisting of 3 main tabs: 1. Instruction, 2. CADD_Data, and 3. Corner Name. 3rd tab can be copied over for each ramp/corner to be designed.

4.1 Renaming template sheet



After copying data extracted from CADD to the CADD_DATA tab, first step is to rename the 3rd tab after the corner to be designed using the same 5character name assigned during Step 2 Creating Design Points.

4.2 Listing design points in *Table 1*

B1	*	1 ×	∫≈ TABL	
	в	E	F	
1	- 22	TABLE 1. POINTS	s j	
2	Point	Elevation (ft)	EX./PR.	1
3	2	625.11	PR	
4	3	625.03	PR	
5	4	624.96	PR	
6	6	625.11	PR	
7	7	625.02	PR	
8	8	625.05	PR	
9	10	624.96	PR	
10		625.06	PR	

In Table 1 under column B, list all points of the proposed design using their numbers (or letters if changed in CADD to letters). Proposed points are to be listed in rows 3 to 45, and existing points are to be listed in rows 47 to 71.

Н	1	Ĵ	K	L	M	N	0	Q	R	S
5	41		97 - 14	TABLE 2.	SEGN	MENTS				14
From	To	Туре	Max Slope	Min Slope	+/-	MAX	MIN	Slope	Length	Elev. Dif
0	1					#N/A	0.00%	-8.25%	5.46	0.45
1	2					#N/A	0.00%	-1.60%	5.00	0.08
2	3					#N/A	0.00%	-6.97%	14.50	1.01
3	4				4	#N/A	0.00%	-2.00%	5.00	0.10
4	5					#N/A	0.00%	- <mark>4</mark> .49%	4.45	0.20
5	6		3			#N/A	0.00%	-2.00%	4.99	0.10
6	14					#N/A	0.00%	-1.79%	5.02	0.09
7	8					#N/A	0.00%	- <mark>8.1</mark> 4%	5.89	0.48
8	9					#N/A	0.00%	-0.74%	5.38	0.04

4.3 Listing design segments in *Table 2*

NOTE: in Table 1 and 2 under columns A and E, duplicate entries are pointed out through a red highlight. Points and segments must be unique

In Table 2 under columns H and I, list all segments of the proposed design. Proposed segments are to be listed in rows 3 to 45. It is optional to listed existing segments in rows 47 to 71. Length, slope and elevation difference will automatically populate.

4.4 Defining types of segment in *Table 2*

		1					0			
Н	1	J	K	L	M	N	0	Q	R	S
				TABLE 2.	SEGN	IENIS				
From	То	Туре	Max Slope	Min Slope	+/-	MAX	MIN	Slope	Length	Elev. Dif
0	1	Ramp				8.20%	0.00%	-8.25%	5.46	0.45
1	2	Landing				1.90%	0.00%	-1.60%	5.00	0.08
2	3	Ramp				8.20%	0.00%	-6.97%	14.50	1.01
3	4	Landing				1.90%	0.00%	-2.00%	5.00	0.10
4	5	Ramp				8.20%	0.00%	-4.49%	4.45	0.20
5	6	Landing				1.90%	0.00%	-2.00%	4.99	0.10
6	14	Landing				1.90%	0.00%	-1.79%	5.02	0.09
7	8	Ramp				8.20%	0.00%	-8.14%	5.89	0.48
8	9	Landing				1.90%	0.00%	-0.74%	5.38	0.04

The maximum and minimum slope under columns N and O are used by the algorithm as constraints to generate the proposed design. These slopes are determined by the type listed under column J, any slope overrides under column K and L, and slope direction if defined under column M.

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-	OPTIMIZE		
Category	Max	Min	3
		0	
	2		4.
Cross Slope	2	71	
Cross Slope Depressed Curb	7.2	7.1	
Cross Slope	-		
Cross Slope Depressed Curb Gutter Flag	7.2 5	0	2

Under column J, define the type of each segment. Types will determine the allowable slope range for each segment as defined in the Category table under columns X, Y, and Z.

			H1	•	▼ : × ✓ fr TABLE 2. SEGMENTS									
		9		н	I	Ú.	ĸ	L	M	N	0	Q	R	S
	Y	Z	1					TABLE 2.	SEG	MENTS				
		2	2	From	То	Туре	Max Slope	Min Slope	+/-	MAX	MIN	Slope	Length	Elev. Diff
		- 1	3	0	1	Ramp				8.20%	0.00%	-8.25%	5.46	0.45
	CALCULATE		4	1	2	Landing				1.90%	0.00%	-1.60%	5.00	0.08
			5	2	3	Ramp				8.20%	0.00%	-6.97%	14.50	1.01
			3	4	Landing				1.90%	0.00%	-2.00%	5.00	0.10	
7			4	5	Ramp				8.20%	0.00%	-4.49%	4.45	0.20	
CHECK FOR ROUNDING ERROR			5	6	Landing	0			1.90%	0.00%	-2.00%	4.99	0.10	
			6	14	Landing				1.90%	0.00%	-1.79%	5.02	0.09	
	or minee	4	10	7	8	Ramp	8.20%			8.20%	0.00%	-8.14%	5.89	0.48
			11 12	8	9	Landing	1.90%			1.90%	0.00%	-0.74%	5.38	0.04
			12	9	10	Ramp				8.20%	0.00%	-7.23%	15.36	1.11
			13	10	11	Landing				1.90%	0.00%	-1.90%	5.27	0.10
Category	Max	Min	14	11	12	Ramp	0	0		8.20%	0.00%	-4.05%	4.69	0.19
Cross Slope	2	0	15	12	14	Landing				1.90%	0.00%	-1.90%	5.26	0.10
Depressed Curb	7.2	7.1	16	1	8	Cross Slope				1.90%	0.00%	-0.79%	5.09	0.04
Gutter Flag	5	0	17	2	9	Cross Slope				1.90%	0.00%	0.00%	5.08	0.00
9	2	0	18	3	10	Cross Slope				1.90%	0.00%	-1.94%	5.16	0.10
Landing	17	176	19	4	11	Cross Slope				1.90%	0.00%	-1.98%	5.06	0.10
Ramp	8.3	0	1. 12		INSTRU	JCTIONS CAD	D DATA	ANNW		(+)				
Sidewalk	5	0	Read	ly 🛅										

4.5 Overwriting maximum and minimum slope in *Table 2* (as needed)

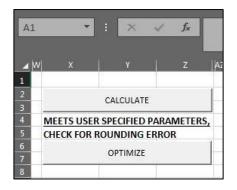
In TABLE 2. under columns K and L, overwrite allowable slope range for individual segments as needed.

4.6 Defining slope direction in *Table 2* (as needed)

;	н	1	j j	ĸ	L	M	N	0	Q	R	5
					TABLE 2.	SEGI	MENTS	81 - O	181 - S		10
F	rom	То	Туре	Max Slope	Min Slope	+/-	MAX	MIN	Slope	Length	Elev. D
	0	1	Ramp				8.20%	0.00%	-8.25%	5.46	0.45
	1	2	Landing		1		1.90%	0.00%	-1.60%	5.00	0.08
	2	3	Ramp				8.20%	0.00%	-6.97%	14.50	1.01
	3	4	Landing				1.90%	0.00%	-2.00%	5.00	0.10
	4	5	Ramp				8.20%	0.00%	-4.49%	4.45	0.20
	5	6	Landing				1.90%	0.00%	-2.00%	4.99	0.10
	6	14	Landing				1.90%	0.00%	-1.79%	5.02	0.09
	7	8	Ramp	8.20%		-	0.00%	-8.20%	-8.14%	5.89	-0.48
	8	9	Landing	1.90%		-	0.00%	-1.90%	-0.74%	5.38	-0.04
	9	10	Ramp				8.20%	0.00%	-7.23%	15.36	1.11
	10	11	Landing				1.90%	0.00%	-1.90%	5.27	0.10
	11	12	Ramp				8.20%	0.00%	-4.05%	4.69	0.19
	12	14	Landing				1.90%	0.00%	-1.90%	5.26	0.10
	1	8	Cross Slope		Ŭ Ŭ		1.90%	0.00%	-0.79%	5.09	0.04
	2	9	Cross Slope				1.90%	0.00%	0.00%	5.08	0.00
	3	10	Cross Slope				1.90%	0.00%	-1.94%	5.16	0.10
	4	11	Cross Slope				1.90%	0.00%	-1.98%	5.06	0.10

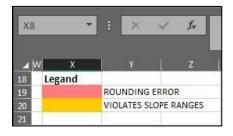
In Table 2. under column M, define slope direction for segments. For example, a segment from 1 to 2 with a slope direction of + indicates that the calculated slope will go up from 1 to 2. Accordingly, a segment from 1 to 2 with a slope direction of - indicates that the calculated slope will go down from 1 to 2. Moreover, if slope direction is left blank, it can go either up or down.

4.7 Running optimization algorithm



Click the CALCULATE button under columns X, Y, and Z to generate the design. An algorithm is applied attempting to generate elevations for the proposed design that are within allowable slope ranges specified by user.

This algorithm is limited to 40 iterations to save time. The OPTIMIZE button will continue the iteration process from the 40th iteration onward.



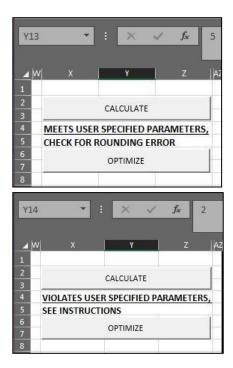
Slopes calculated using generated proposed elevations will either not be highlighted, highlighted in red, or highlighted in yellow.

A red highlight is an indication that the slope is outside slope range specified by user due to rounding error. A yellow highlight is an indication that the slope is outside slope range specified by user due to feasibility or seeding problem. No highlight indicates slope is within range.

NOTE: it's worth mentioning that the shorter the segment the larger the rounding error.

A message is displayed between the CALCULATE and OPTIMIZE buttons indicative of design status.

4.7.1 Seeding problem



Simply, problem due to seeding can be ruled out by clicking on CALCULATE multiple times, provided after the each run the design violates specified slope ranges.

Every time the CALCULATE button is clicked a random seed, i.e., elevations within the range of existing elevations, is used as a starting point for all elevations in the algorithm. Some random seeds are worse than others leading to the violation of specified slope ranges in some cases. The probability of having a "bad" random seed is about 50% so by running the algorithm multiple times the user can be confident that the violation of slope ranges is NOT due to a bad seed rather, due to feasibility. A random seed for a starting point is also the reason why the user might come across a case where multiple generated proposed designs meeting user specified slope ranges have different proposed elevations. However, if the design meets user specified slope ranges that's all that matters.

4.8 Extracting data from ADA Automation Tool

							н
Point	- Station -	Offset	 Northing 	- Easting	 Elevation 	✓ Feature ✓	Output
CANNW_0	0+86.55	-36.8071	1917354.134	1116916.957	623.96	293	CANNW_0,1917354.1337,1116916.9565,623.96,293
CANNW_1	0+81.34	-38.419	1917354.233	1116911.5	0	293	CANNW_1,1917354.233,1116911.5001,623.51,293
CANNW_10	0+61.16	-42.8388	1917352.87	1116890.884	0	293	CANNW_10,1917352.8696,1116890.8843,622.32,293
CANNW_11	0+56.89	-45.9339	1917354.656	1116885.923	0	293	CANNW_11,1917354.6561,1116885.9227,622.22,293
CANNW_12	0+53.17	-48.804	1917356.381	1116881.557	0	293	CANNW 12,1917356.3808,1116881.5568,622.03,293
CANNW_13	0+48.81	-51.8049	1917358.05	1116876.53	0	293	CANNW_13,1917358.0504,1116876.5298,621.89,293
CANNW_14	0+49.19	-52.2409	1917358.577	1116876.781	0	293	CANNW_14,1917358.5769,1116876.7808,621.93,293
CANNW_15	0+47.92	-50.8114	1917356.851	1116875.958	621.82	293	CANNW_15,1917356.8507,1116875.9579,621.82,293
CANNW_16	0+52.82	-48.3616	1917355.858	1116881.341	0	293	CANNW_16,1917355.8578,1116881.3408,621.99,293
CANNW_17	0+52.03	-47.3748	1917354.691	1116880.859	621.99	293	CANNW_17,1917354.6911,1116880.859,621.99,293
CANNW_18	0+56.54	-45.4609	1917354.107	1116885.726	0	293	CANNW_18,1917354.1067,1116885.7257,622.21,293
CANNW_19	0+55.80	-44.6683	1917353.139	1116885.234	622.17	293	CANNW_19,1917353.1393,1116885.2338,622.17,293
CANNW_2	0+76.67	-40.2124	1917354.659	1116906.518	0	293	CANNW_2,1917354.6587,1116906.5182,623.43,293
CANNW_20	0+60.84	-42.3482	1917352.31	1116890.717	0	293	CANNW_20,1917352.3104,1116890.7168,622.32,293
CANNW_21	0+60.23	-41.4097	1917351.241	1116890.396	622.38	293	CANNW_21,1917351.2407,1116890.3963,622.38,293
CANNW_3	0+63.95	-47.1769	1917357.814	1116892.366	0	293	CANNW_3,1917357.8142,1116892.3657,622.42,293
CANNW_4	0+59.85	-50.0309	1917359.415	1116887.629	0	293	CANNW_4,1917359.4147,1116887.6288,622.32,293
CANNW 5	0+56.32	-52.7542	1917361.051	1116883.486	0	293	CANNW 5,1917361.0511,1116883.4856,622.12,293

4.8.1 Extracting design data in .txt format

CADD_DATA tab under column I is populated automatically with proposed design information. Once the proposed design is determined compliant, information is ready to be copied out to a .txt file format as will be explained in the next step (Step 5).

🔺 AZ	BA	BB	BC	BD	в
1		TABLE 3.	OUTPUT		
2	Point	STATION	OFFSET	ELEVATION	
3	1	0+81.34	-38.42	623.51	
4	2	0+76.67	-40.21	623.43	
5	3	0+63.95	-47.18	622.42	
6	4	0+59.85	-50.03	622.32	
7	5	0+56.32	-52.75	622.12	
8	6	0+52.53	-55.99	622.02	
9	8	0+79.69	-33.60	623.47	
10	9	0+74.67	-35.54	623.43	
11	10	0+61.16	-42.84	622.32	
12	11	0+56.89	-45.93	622.22	
13	12	0+53.17	-48.80	622.03	
14	13	0+48.81	-51.80	621.89	
15	14	0+49.19	-52.24	621.93	
16	16	0+52.82	-48.36	621.99	
17	18	0+56.54	-45.46	622.21	
18	20	0+60.84	-42.35	622.32	
19				-	

4.8.2 Extracting plan preparation data

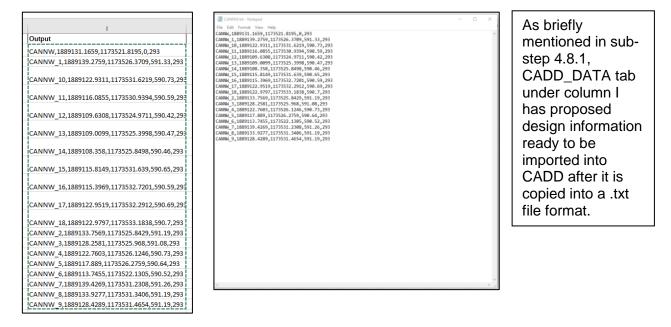
Table 3. under columns BA to BD, is an output table for planpreparation purposes available with proposed design information.

A AZ	BA	ВВ	BC	BD	BE
1		TABLE 3.	OUTPUT		
2	Point	NORTHING	EASTING	ELEVATION	
3	1	1917354.23	1116911.50	623.51	
4	2	1917354.66	1116906.52	623.43	
5	3	1917357.81	1116892.37	622.42	
6	4	1917359.41	1116887.63	622.32	
7	5	1917361.05	1116883.49	622.12	
8	6	1917363.11	1116878.94	622.02	
9	8	1917349.15	1116911.26	623.47	
10	9	1917349.62	1116905.90	623.43	
11	10	1917352.87	1116890.88	622.32	
12	11	1917354.66	1116885.92	622.22	
13	12	1917356.38	1116881.56	622.03	
14	13	1917358.05	1116876.53	621.89	
15	14	1917358.58	1116876.78	621.93	
16	16	1917355.86	1116881.34	621.99	
17	18	1917354.11	1116885.73	622.21	
18	20	1917352.31	1116890.72	622.32	
19					

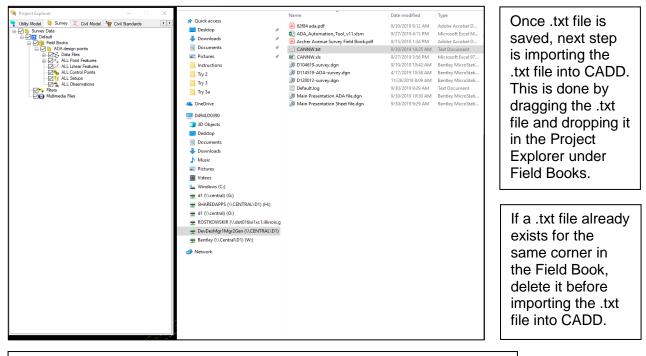
Through a drop-down menu, STATION and OFFSET can be changed to NORTHING and EASTING, as needed. 5. Importing Design Points from ADA Automation Tool into CADD

Data for proposed design is exported from ADA Automation Tool and imported into CADD using the following steps:

5.1 Saving extracted data

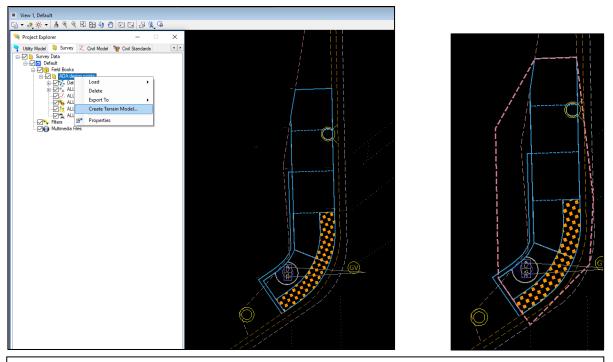


5.2 Importing extracted data into CADD



Once dropped, prompts will ask for format and override options. The format must be IDOT D1-Comma-PtNumNEZCodeCode. Then override all.

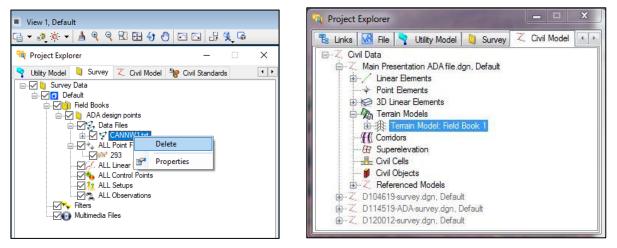
5.3 Creating a terrain model



Once data is imported into CADD, next step is to create a terrain from imported data. This is done by clicking on Project Explorer -> right click on Field Books -> Create Terrain Model. The terrain model should show as seen in second image above. If the terrain doesn't show, check if Terrain EX level and Terrain Ex Exterior are turned on.

If a Terrain Model already exists for the Field Book in Project Explorer under Terrain Models in the Civil Model tab, delete the Terrain Model and recreate it using data imported to the Field Book.

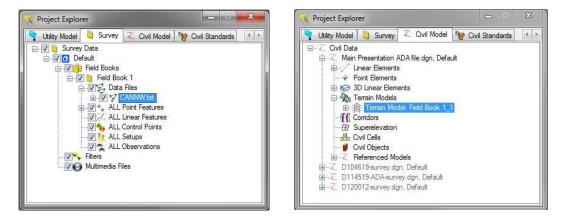
5.3.1 Overwriting imported data



To overwrite the imported data, one must delete the .txt file in Project Explorer under Field Books in the Survey tab. In addition, the terrain must be deleted in Project Explorer under Terrain Models in the Civil Model tab. 5.4 Modify Design (as needed)

The design can be modified by adding, removing or relocating design points as needed using the following steps:

- 1. Modify geometric design
- 2. Create or move design points as needed to match modified design (Step 2: Creating Design Points)
- 3. Export points (Step 3: Exporting Points into ADA Automation Tool)
- 4. Overwrite all points (in CADD_DATA tab of ADA Automation Tool)
- 5. Update design points and segments (in redesigned corner tab of ADA Automation Tool)
- 6. In CADD, delete text file and terrain model in Project Explorer (as they will be replaced/recreated)



7. Import points into CADD and recreate the terrain model (Step 5: Importing Points from ADA Automation Tool into CADD)

NOTE: cross-validate terrain model elevations with spreadsheet elevations to ensure the terrain model has updated with revised elevations.

6. Labeling Design

Labeling data for proposed design is performed in CADD using the following steps:



6.1 Labeling slopes for proposed design

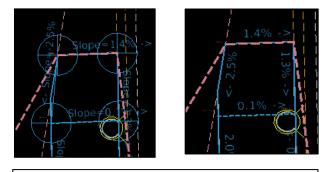
Set active level to Level 47 and use the Analyze Between Points tool to create rough labels for sidewalk slopes.

The Analyze Between Points tool is located under the Civil Tools task tab -> Terrain model. Select the newly created terrain model when prompted. The terrain model is an object referenced in from the 3D model in the same file under the TERRAIN_EX and TERRAIN_EX_ EXTERIOR levels. When creating slope labels for crosswalks be sure to select the existing terrain model from the survey file instead.

Make sure nothing important is drawn in level 47 (other than slope labels) as it will be modified by a macro in the following step.

6.1.1 Cleaning up labeled slopes

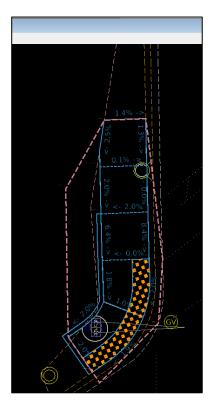
View 1, De	fault
🗐 😵 🖉	- 👌 🍳 G
CADDV8I	×
PLOT Lvis	SS4-noAnno
Plot text	SS4-Anno
Text	SS4-XS
ExhibitTXT	ADASlope
ARROW	CelMod
ARROW SS4	Crvdat
RIOT	Sequnc
W-area	Seed_Area
Sheets	Fix Line Style
Cells	ChFont
Survey	RefRen
Macros	Convert Calc
Menus	AA asst
GeoMap	FFence
BackUp	RmAttr
Details	ТОР
Bridge	AsciiOffset
Ref Save	Init
CLEAR	MORE

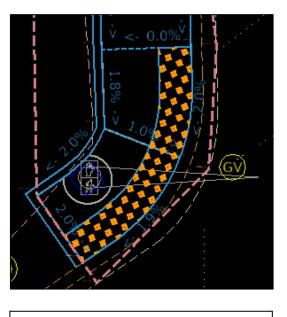


Delete the extra lines and "Slope=" text by running the ADASlope macro from the D1 Blue Menu. The ADASlope macro is found under the Blue Menu -> Macros. This macro deletes all lines and arcs from level 47 and finds and replaces all "Slope=-" and "Slope=" with a blank. This step can be done manually if a macro is not available.

The formatting of the output of this tool is controlled by the active text style and Design file settings. To change the text format, select the standard Place Text tool and select the desired text style. To change the precision, go to Slope Precision option under Settings -> Design file -> Civil Formatting -> Profile Settings Tab.

6.1.2 Adjusting label location

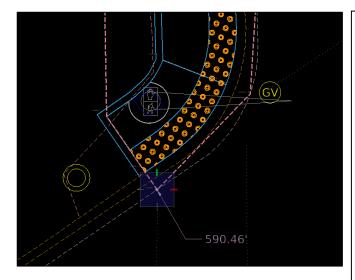




Fine tune the location of the sidewalk slope labels as needed. This can be done by manually moving labels to desired location.

6.2 Labeling elevations for proposed design

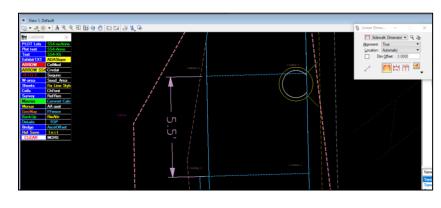
Tasks 👻 🗸	łΧ
🎸 Civil Tools	•
ो ⊒.ज.4.5.8%.≆ ∢≝.≛.¥],
🎸 Analysis & Reporting	۷
ी General Geometry	٠
Z Horizontal Geometry	۷
🖽 Vertical Geometry	۷
峇 Terrain Model 🛛 🔡 🗮 🚍	^
ff Corridor Modeling	*
Model Interoperability	*
Livil Cells	*
2 3D Geometry	*
X Survey	**
📽 OpenRoads Help	۲
Y Drawing	۲



Use the Label Terrain Spots tool, under the Civil Tools task tab -> Terrain. Select the new terrain model when prompted -> Click on the existing design point -> Click to place label. Set the active level to an appropriate level other than level 47 and label point elevations using the Label Terrain Spots tool. The formatting of the output of this tool is controlled by the active text style, active dimension style, and the Design file settings. The text and dimension styles are controlled in the same way as the standard Place Note tool through the Label Terrain Spot Toolbox. To change the precision, go to Elevation Precision option under Settings -> Design file -> Civil Formatting -> Profile Settings Tab.

6.3 Labeling dimensions of proposed design





Dimension labeling is done using the standard Dimension Linear tool.

7. Troubleshooting

7.1 Snapping malfunction

Problem: snapping tool not functioning properly when placing newly created points (points not snapping, MicroStation crashing etc.)

Solution: turn off snaps while placing new points, then turn on snaps to modify point location.

7.2 Design point disappearance

Problem: newly created points are disappearing as they're being created. Solution: turn off snaps while placing new points.

7.3 Design point information

Problem: point information not updating when imported into CADD. Solution: in Project Explorer delete .txt file and terrain model. Reimport design data from ADA Automation Tool. Also, sometimes restarting MicroStation might help. As a last resort, delete the points as well as the text file and terrain model in the project explorer before reimporting the points from the text file. Be aware that doing so changes the behavior of the points. For example, now deleting the text file from project explorer will also delete the points.

7.4 Terrain display

Problem: created terrain not displaying. Solution: use proper Feature Definition for creating points, i.e., 293, and turn on levels Terrain Ex and Terrain Ex Exterior.

7.5 Spreadsheet is slow

Problem: ADA Automation Tool is slow. Solution: create a new copy of the file.

8. Contact Information

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