# Using InRoads Survey for Data Reduction

**Colorado Department of Transportation** 

CADD and Engineering Innovation Updated November 19, 2010 Version V8i Select Series 2



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This manual may be freely copied or distributed for the purpose of providing the Colorado Department of Transportation and Colorado customers a consistent guide to using the Bentley suite of products to meet CDOT's design and drafting standards.

## **Software Versions**

The software products referred to in this publication are furnished under a license and may only be used in accordance with the terms of such license. This document intended for use with the following software versions:

MicroStation® version 08.11.07.443 InRoads® version 08.11.07.428 CDOT Configuration Version 05.00.00

# **Document Conventions**

There are several conventions that are used throughout this document to indicate actions to be taken or to highlight important information. The conventions are as follows:

<u>ltem</u>	<u>Meaning</u>
View Perimeter	a command name or a file that you are to select
Tools > Options	a command path that you are to select – usually from the pull-down menus
Document Name	the name of a document that is not hyperlinked
Emphasis	style used when referring to important word or phrases
Hyperlink	style used when you have a direct link to another document on the web
Key in	entering data with the keyboard
Quote	style used to indicate an external source quotation
Note: text	information about a command or process that you should pay particular attention to
1. Numbered Steps	actions that you are to perform as part of the lab activities
<d> or Data</d>	press the data button on the mouse
<r> or Reset</r>	press the reset button on the mouse
<t> or Tentative</t>	press the tentative button on the mouse

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	Dialog Items
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]	Final Export and save

# **Chapter 1 - Introduction to CDOT**

# An Introduction to CDOT V8i SS2 Configuration

This document outlines the Colorado Department of Transportation's (CDOT) standardized CADD procedures. Topics are covered in detail and curriculum has been developed providing a foundation for CDOT users to effectively learn. The material covered is structured as a project motivated learning experience modeled after CDOT engineering workflows.

The remaining sections of this document present the reference material for each subject with supporting lab work for the student.

## **Chapter Objectives:**

- Identify the Training Directory Structure
- Where to find MicroStation V8i SS2 and InRoads V8i SS2 reference material
- Where to find MicroStation V8i SS2 and InRoads V8i SS2 lab material
- Where to look for help

# **Reference Material**

CDOT has developed a reference material library for the CDOT user working with the Bentley MicroStation V8i SS2 and InRoads V8i SS2 software.

- A Practical Guide for Using MicroStation V8i SS2
- A Practical Guide for Using InRoads V8i SS2

## A Practical Guide for Using MicroStation V8i SS2

This guide breaks down the use of MicroStation V8i SS2 into manageable modules placing emphasis on the CDOT workflow.

- Getting Started in MicroStation
- ♦ Levels
- Working in a CDOT 3D Design Model
- Creating a CDOT Project
- Creating Your Design Graphics
- Manipulating and Modifying Design Graphics
- Cells and Patterns
- Grouping Design Graphics
- Creating Sheets
- Annotating and Plotting Sheets

# A Practical Guide for Using InRoads V8i SS2

This guide breaks down the use of InRoads V8i SS2 into manageable modules placing emphasis on the CDOT design workflows.

- Getting Started in InRoads
- Reports
- Typical Sections
- Roadway Modeling
- Surface Editing]
- Initial Geometry Procedures
- Cross Sections
- Volumes
- Initial Surface Procedures
- Defining Vertical Geometry
- Profiles
- InRoads Options
- Hydraulics
- Creating Plan Sheets
- Surface Fundamentals
- Other Helpful Tools
- Defining Geometry

# Lab Material

CDOT has developed a lab material library for CDOT user's working with the Bentley MicroStation V8i SS2 and InRoads V8i SS2 software.

- Labs for Using MicroStation V8i SS2
- Labs for Using InRoads V8i SS2

# Labs for Using MicroStation V8i SS2

Labs have been created for MicroStation V8i SS2 placing emphasis on the CDOT workflows.

- Getting Started In MicroStation V8i SS2
- Levels
- 3D View Controls
- Creating the Project and Design Model
- Drawing Basics using the CDOT Menu
- Draw the Median Island Nose Section
- Place Guardrail Lines
- Create 3D Utility Graphics
- Create Landscape Graphics
- Create Hydraulics Graphics
- Draw a Bridge Typical Section

- Create Plan/Profile Sheet for the Intersection
- Create a Project Specific Border
- Create a 40-Scale Plan Sheet
- Create a Bridge General Layout Sheet at Different Scales
- Create a General Notes Sheets
- Create the Standard Plans List Sheets
- Create a Title Sheet
- Annotate the Intersection Plan/Profile Sheet
- Annotate the Bridge General Layout Sheet
- Printing to a Printer
- Batch Printing to PDF

## Labs for Using InRoads V8i SS2

Labs have been created for MicroStation V8i SS2 placing emphasis on the CDOT workflows.

- Building Components
- Building Sections
- Modifying Templates
- Corridors & Template Drops
- Superelevation Wizard
- Point Controls, Secondary Alignments and Parametric Constraints
- Modifying Single Template Drops and Target Aliasing
- Creating Design Surfaces
- Cross Sections, Volumes and Reports
- Creating Plan Sheets

# **Training Directory Structure**

CDOT has developed a training directory structure replicating a CDOT project directory structure for use in all training. The directory has been designed so the top level (project) directory is used to designate the job project code. During training, the project code will be 12345. Sub-directories for each CDOT specialty group are included under the project directory.

# **Training Directory Structure**

All of the files for class are located in the *C:\Projects\12345* directory. This directory structure, as well as the file names used, conforms to the CDOT standards. More information on the CDOT directory structure and file naming convention is found in the *Creating a CDOT Project* chapter.



# How To Get Help

There are many resources available to assist you when working on your CDOT CADD project. These resources can be found on the *CDOT CADD & Engineering Innovation* website. See the *CADD Resources* chapter for detailed information on each of these options.

## CDOT CADD & Engineering Processes & ProjectWise Website

The CDOT CADD & Engineering Processes & ProjectWise Website is available at: <u>http://www.coloradodot.info/business/designsupport/cadd</u>. The website provides CDOT users with up to date information, tools, and resources related to CADD.

This website is a valuable resource for CADD users and includes:

## CADD Library

The **CADD** Library page provides links to manuals, newsletters, standard details, etc. One extremely useful link is to the **Tips and Tricks** section for MicroStation and InRoads.

#### **CADD Manual**

The *CDOT Computer Aided Design and Drafting (CADD) Manual* outlines CDOT's use of Bentley's MicroStation and InRoads software. It can be accessed several different ways including:

- From the Windows Start menu:
   Start > All Programs > \_CDOT\_CADD\_Information > V08.11.XX-V8i SS2 > Workflows
- From the CDOT Menu: CDOT Help > Workflows

#### **Request & Support**

This page provides CADD help solutions where you can help, submit questions and requests, and obtain InRoads Survey and MicroStation support.

There is also a link to *IT Services* for hardware support, "how to" instructions, installation, training files, and dual monitor and work space setup.

## **CADD & Engineering Processes**

The CDOT CADD & Engineering Processes Website is available at: <u>http://</u><u>www.coloradodot.info/business/designsupport/cadd</u>. The website provides CDOT consultants with the latest MicroStation/InRoads configurations, CADD Workflows, manuals, training materials, resources, CADD detail library, CDOT Standards and Design Guides, and more.



## **CADD** Manager

Contact the CDOT CADD Manager at <u>CADDManager@dot.state.co.us</u> for additional help or questions.

# Chapter 2 - Getting Started with InRoads Survey

# InRoads Survey Interface

Remember, InRoads Survey is running on top of MicroStation. That means the InRoads interface can be moved outside the MicroStation environment to another screen and that the InRoads interface may hide MicroStation dialog boxes.

There are four main parts to the InRoads Survey Interface, the **Menu Bar**, **Workspace Bar**, **Information Window** and **Status Bar**.



## Menu Bar

Menu	ı Bar						
<u>F</u> ile	<u>S</u> urface	<u>G</u> eometry	Survey	<u>E</u> valuation	Dr <u>a</u> fting	<u>T</u> ools	Help
			yew Ref Bes Eric Finc Finc Finc Creation Som Som Net Net Som Net Som Net Som Net Som Net Som Net Net Net Net Net Net Net Net Net Net	v Survey Data resh View leperate Grap /lew l Point in View dpook Data trol Codes vey Style Filte work work Symbolic ete Survey Data to S vey Data to S vey Data to S vey Data to D arse Survey D staform Syrvey L Report	a hics / pgy ata urface eometry rainage ata / Data	, ,	Planimetrics     Symbols     Names     Codes     Elevations     Erors     Notes     Network      Write Survey Data to Graphics

- The Menu Bar pull-down menus are used to access commands, settings, and toolbars.
- An arrow > in the pull down will expand to a submenu.
- ... In the pull down will open a dialog by that name.
- The pull-down menus will vary with the application add-ins that are loaded.

## Workspace Bar

Workspace Bar
B-▲ Survey Data
💐 Surfaces 🔡 Geometry 🖄 Preferences 🛕 Survey

- The Workspace Bar is used to manage and separate the different file formats of the program.
- Right clicking is allowed in the Workspace Bar. The active shortcut menu will vary depending on which Tab is selected.
- The Workspace Bar can be undocked as shown here but it is not recommended.
- To switch between tabs use the scroll arrows or right click to open a short cut menu.

## **Information Window**



- The Information Window varies depending on which Workspace Bar tab is selected.
- Right clicking is allowed in the Information Window. The active shortcut menu will vary depending on what feature was selected.

## Status Bar

Bentley InRoads Survey XM Edition	
<u>File Surface Geometry Survey Evalu</u>	uation Dr <u>a</u> fting <u>T</u> ools <u>H</u> elp
	Book Name
E-A Survey Data	Book 1
Book 1	
Preferences 🔉 Survey 🔹 🕨	
Imports survey data from a variety of form	nats

• Located in the lower left hand corner of the InRoads Survey Interface, the status bar is used for file processing feedback and tool descriptions.

# **Project Defaults**

Setting project defaults prior to working on any project will save time navigating to directories and will ensure the correct InRoads resources are loaded.

Set Project Defaults		Σ
Configuration Name:	CDOT ROW_Survey Discipline	Apply
Default Preferences		Close
		New
Preferences (* xin):	\$(CDOT_PREF)\CDOT_Civil.xin	Сору
Tumouts (*.bxt):		Rename
Drainage Structures (*.dat):		Delete
Rainfall Data (*.idf):		Browse
Bridge Sections (*.txt):		
Drafting Notes (*.dft):	\$(CDOT_WKSP)Standards-Global\InRoads\Notes\CDOT-Notes.df	Event
Pay Items (*.mdb):	\$(MS_DEF)	Export
Default Directory Pathe		нер
ProjectWise Directory:		
Project Default Directory:	\$(MS_DEF)\ROW_Survey\	
Report Directory:	\$(MS_DEF)ROW_Survey\InRoads\Reports\	
Projects (*.rwk):	\$(MS_DEF)ROW_Survey\InRoads\	
Surfaces (*.dtm):	\$(MS_DEF)ROW_Survey\InRoads\DTM\	
Geometry Projects (*.alg):	\$(MS_DEF)ROW_Survey\InRoads\Geometry\	
Template Libraries (*.itl):		
Roadway Design (*.ird):	\$(MS_DEF)	
Survey Data (*.fwd):	\$(MS_DEF)ROW_Survey\InRoads\Field_Books\	
Drainage (*.sdb):	\$(MS_DEF)	
Style Sheet (*xsl):	C:\Program Files\Workspace-CDOT\Standards-Global\InRoads\XML Sty	le Sheets
Quantity Manager (*.mdb):	\$(MS_DEF)	
Default Grid Factor	Export	
Grid Factor: 1.0000	Active Only	

# **Dialog Items**

- Configuration Name Select from the drop down to change the current project directories and resources.
- Default Preferences

In this section the user enters specific file names with extension names (types) InRoads will be using. The different file types and their uses are as follows:

- Preferences (\*.xin) The main file used to define the symbology and dialog preferences.
- ◆ \*Turnouts (\*.txt) File used to define turnouts.
- \*Drainage Structures (\*.dat) File used by Storm and Sanitary software.
- \*Rainfall Data (\*.idf) (\*.rtc) File used to calculate rainfall.
- \*Bridge Sections (\*.txt) File used to define bridge sections.
- ◆ \*Drafting Notes (\*.dft) File used by InRoads drafting tools.

- \*Pay Items (\*.mdb) File used to calculate pay items and quantities.
- \*Site Modeler Options (\*.spf) default site modeler preferences file.
- Default Directory Paths.

This section defines directory paths for loading and saving files inside InRoads.

- ProjectWise Directory: the default location of files stored in ProjectWise
- Project Default Directory: default location for opening, saving, importing, and exporting general files.
- Report Directory default location where report files such as TXT and XML are generated by the report browser.
- Projects (\*.rwk) default location of Project's files.
- Surfaces (\*.dtm) default location of Surface files.
- Geometry Projects (\*.alg) default location of Geometry Project files.
- \*Template Libraries (\*.itl) default location of Typical Sections Library files.
- \*Roadway Design (\*.ird) default location of Roadway Library files.
- Survey Data (\*.fwd) default location of Survey Data files.
- \*Drainage (\*.sdb) default location of Drainage files.
- Sheet Style (\*.xsl) default location of Sheet Style files for XML reports.
- \*Quantity Manager (\*.mdb) default location of Quantity Manager Files.
- \*Site Modeler Projects (\*.gsf) default location of Site Modeler Projects.

\* Files and directories that do not impact survey applications.

## **Toolbars**

Toolbars can be opened and docked in the InRoads interface. Toolbars in InRoads Survey can be customized to fit the users workflow or personal preference.

From the pull-down menu, select Tools > Customize. The Customize dialog will appear.

Customize		
Toolbars Commands	Keyboard Macros Export Import	
Toolbars: Version Locks Menu Bar Profile Review Geometry Snaps (AutoCAD) Surface Utilities Version Survey Survey Tools User Add-ins View Secometry View Survey Data Vetures	Show Tool Tips      With Shortcut Keys	Reset All New Rename Delete Help
	Close	

## Survey Toolbar



## View Survey Data Toolbar



#### Locks Toolbar



## **Docked Toolbars**



# **Survey Options - General Tab**

Survey Options dialog controls additional settings required by Survey. The Survey options can be modified by the user and are stored as an FXP file. Some of the main aspects of this dialog are the control of planimetric scale and the Fieldbook Audit Trail file which tracks changes to the fieldbook and features table.

From the pull-down menu, select Tools > Survey Options [General].

🔣 Survey Opt	ions			×
General Uni	ts Symbology	Corrections	Observation Standar	d Deviation
Chord Height	0.010000	1		
Point Seed:	1			Help
Figure Seed:	1			
Cell Scale:	100.00			
Text Scale:	20.00	Field	book Audit Trail File N	lame:
Line Scale:	100.00			
File Options	Cada Emm		invo Computed Coord	inates .
		J	dd/Edit Audit Trail	nates
Convert	Numeric Codes to	Correspondir	ad Aloba Codes on Im	oort
		Conception		
View Option	ns ic Refresh	🔽 S	egregate Text by Sym	bology Level
Automat	ic Update of Surfa	ace		
	Settings			
Use Cus	tom Operations	V A	ttach Default Tags	
📃 Use Syn	bols	<b>V</b> A	ttach Attribute Tags	
Use Cel	s			
Include	Custom Operation	s, Symbols an	d Cells in Single Cell	
	ОК	Preferenc	es Cancel	]

## **Dialog Items**

- **Chord Height:** Controls the curve stroking of elements when saved to graphics, surfaces, and alignments. The smaller the value, the greater number of vertices generated.
- **Point Seed:** Seed number used when adding points to the survey fieldbook.
- **Figure Seed:** Seed number used when saving linear planimetrics to a geometry project.
- **Cell Scale:** Scale factor used when writing survey feature Cells to graphics.
- **Text Scale:** Scale factor used when writing survey feature Text to graphics.
- Line Scale: Scale factor used when writing survey feature Line Styles to graphics.
- **Fieldbook Audit Trail File Name:** Text file that saves all edits from the fieldbook and feature table. The file will show the edits Before and After.

## • File Options

- **Resolve Code Errors** If checked, all code errors found while importing will be taken care of by the **Resolve Code Error** dialog.
- Log Code Errors Will open the Results dialog at the end of the import allowing the errors to be saved to a text file.
- **Save Computed Coordinates** If checked, any computed coordinates will be saved to the fieldbook as individual points.
- Add/Edit Audit Trail If checked, displays the **Results** dialog after each edit is made. Even with it unchecked the file will still keep track of edits.
- **Convert Numeric Codes to Corresponding Alpha Codes on Import** If checked the numeric codes used in the field will be converted to alpha codes in the fieldbook.

#### View Options

- Automatic Refresh If checked, will regenerate the displayed graphics after each edit.
- **Segregate Text by Feature Level** If checked, will save the symbols, point names, codes, notes, errors, and elevations to the same level as the survey feature.
- Automatic Update of Surface If checked, the surface created by exporting the fieldbook to surface, is updated when subsequent changes are made to the fieldbook.

#### Planimetric Settings

- **Use Custom Operations** If checked, all Custom Operations from the Survey Feature Table will be displayed.
- **Use Symbols** If checked, all symbols from the Survey Feature table will be displayed.
- **Use Cells** If checked, all Cells from the Survey Feature table will be displayed.
- Include Custom Operations, Symbols and Cells in Single Cell If checked, all items will be combined into a single cell called NULL.
- **Attach Default Tags** If checked, a default InRoads tag will be defined and attached to the MicroStation graphic when written to a design file.
- **Attach Attribute Tags** If checked, a tag, with attribute information and values will be attached to the MicroStation graphic when written to a design file.

# **Survey Options - Units Tab**

Survey Options *Units* tab controls how raw, linear, and angular, survey data is read by the Fieldbook. The Survey units set in this dialog box have priority over InRoads units options set elsewhere when processing or manipulating Survey data.

• From the pull-down menu, select **Tools > Survey Options > [Units]**.

ieneral Units Symb	ology Corrections Observation Sta	ndard Deviation
Linear Format		
Units:	US Feet 👻	
Precision:	0.12 🔹	Help
Angular Format		
Units:	Degrees -	
Precision:	0.12 🔻	
Angle Orientation		
Azimuth:	North O South	
Face:	Right O Left	
Vertical Observation:	Zenith	
Save FWD Data Prec	ision	
Height:	0.12 -	
Angle:	0 🗸	
Distance:	0.12 -	
Coordinate:	0.123 👻	

# **Survey Options - Symbology Tab**

Survey Options *Symbology* tab controls view planimetrics such as Symbols, Point Names, Codes, Elevations, Errors, and Notes. There are two types of settings for each planimetric display. For the dynamic display of graphics the settings are opened with the **Edit View** button. For the design graphics written to the file the settings are opened with the **Edit** button.

• From the pull-down menu, select **Tools > Survey Options > (Symbology)** 

Seneral Units	Symbology	Corrections	Observation	Standar	d Deviation
Justify Elevation	on at Decima				Edit View
Elevation Precisio	on: 0.12				Help
Point Text Symbo	ol: 🗙		ĩ		Thop
Symbology:					
Object	N	lame			
Text Point Symbo	ols			BYL	
Text Point Name	s			BYL	
Text Point Codes	8			BYL	
Text Point Eleva	tions			BYL	
Text Point Errors				BYL	
Text Point Notes				BYL	

# Chapter 3 - Working with InRoads Survey – Overview

# Fieldbook Data dialog

The **Fieldbook Data** dialog in InRoads Survey allows the user to manage survey data. In addition to viewing the station and observations, the dialog allows editing and adding points to the fieldbook.

• From the pull-down menu, select **Survey > Fieldbook Data...** 

Stations:	*	Duplicates	Only		-	Help
Station Name	North	ing Easti	ng Elev	ation C	ode Statu	JS .
CO RD 33						
GAP 27_33						
Found monume	ents					
•						•
	<u>  &lt;</u> 1078		>			
bservations:	<  1078		▼ >	X		
Dbservations: Point Name	Northing	Easting	▼ ≥	]≱] Code	Stat	us 🔺 .
Doservations: Point Name	Northing 1558562.8.	Easting 3282329.6.	▼ ≥ Elevation6505.88	Code 1078	Stat FA	us 📩
Doservations: Point Name 106 107	Northing 1558562.8. 1555920.9.	Easting 3282329.6. 3282335.4.	▼ ≥ Elevation6505.886545.91	Code 1078 1078	Stat FA FA	us 🔺
Dbservations: Point Name 106 107 2070	Northing 1558562.8. 1555920.9. 1555976.4.	Easting 3282329.6. 3282335.4. 3281511.3.	✓ ≥ Elevation6505.886545.916574.93	Code 1078 1078 1075	Stat FA FA F	us 🔺
Point Name Point Name 106 107 2070 105	Northing 1558562.8. 1555920.9. 1555976.4. 1558527.8.	Easting 3282329.6. 3282335.4. 3281511.3. 3279643.1.	▼ ≥ Elevation6505.886545.916574.936585.79	Code 1078 1078 1075 1077	Stat FA FA F FAN	us 🔺
Point Name Point Name 106 107 2070 105 2050	Northing 1558562.8. 1555920.9. 1555976.4. 1558527.8. 1555913.3.	Easting .3282329.6. .3282335.4. .3281511.3. .3279643.1. .3280349.7.	▼ ≥ Elevation6505.886545.916574.936585.796608.33	Code 1078 1078 1075 1077 1075	Stat FA FA FAN F	us 🔺

## **Dialog Items**

• Survey Options - opens the Survey Options dialog box.

🔣 Survey Options				×
General Units S	ymbology	Corrections	Observation Stand	ard Deviation
Chord Height:	0.010000			
Point Seed:	1			Help
Figure Seed:	1			
Cell Scale:	100.00			
Text Scale:	20.00	Field	lbook Audit Trail File	Name:
Line Scale:	100.00			
File Options	Errors	2	Gave Computed Coor	dinates
Convert Numer	s ic Codes to	Correspondi	ng Alpha Codes on Ir	nport
View Options				
Automatic Refr	esh	<b>V</b>	Segregate Text by Sy	mbology Level
Automatic Upd	ate of Surfa	ace		
Planimetric Setting	s			
Use Custom Op	perations	<b>V</b>	Attach Default Tags	
Use Symbols		<b>V</b>	Attach Attribute Tags	
Use Cells				
Include Custom	Operation	s, Symbols ar	nd Cells in Single Cell	
	ОК	Preference	es Cancel	

• Survey Style Filter - opens the Survey Style Filter dialog box.

🔀 Survey Style Filter	
Filter Name:	ОК
Start With:      All     None	Cancel
Build Selection	Save
Properties: Description	Save As
Value:	Delete
Mode:  Include	Values
Add Rule Replace Rule	Help
Rules:	
Include All Codes	Move Up
	Move Down
	Delete Rule
	Clear All

- **Example :** Report opens the Save dialog box to generate a report.
- **Note:** The report is generated based on what stations/observations are selected prior to clicking the report button. To generate a report on the entire fieldbook select all the Stations in the fieldbook then click the **Report** button.

🗱 Point Code Find and Replace	23
Find what:	Next Error
Replace with:	Find Next
Match whole word only	Replace
Match case	Replace All
	Close
	Help

• <sup>the section for the section</sup>

- **Select Figure** will only locate the nearest planimetric feature or chainage. The fieldbook will highlight the start of the chainage.
- **Insert Parallel Point** will add an additional point to a chain based on an existing reference chain.
- **Duplicates** filters only duplicate points found in the Stations or Observations. To view duplicate points select it from the drop down box.

# **Duplicate Points General Rules:**

## Rule #1

If a Point Name is duplicated in a Station Setup then the two points are averaged.

Station 764

Observation 2000

Observation 2000

Observation 2001

Observation 2002

## Rule #2

If a Point Name is duplicated in two different Station Setups the points are not averaged and each point is used.

Station 764

Observation 2000

Observation 2001

Observation 2002

#### Station 766

Observation 2000

Observation 3001

Observation 3002

**Note:** For more information on how duplicate points are handled in InRoads Survey select the Help button.

# Stations

The top half of the dialog is the Stations or Instrument setup point.

# Chainage

Chainage commands are a useful way to locate displayed planimetric features. Use the buttons **First**  $\bowtie$ , **Previous**  $\triangleleft$ , **Next**  $\triangleright$ , and **Last**  $\bowtie$  to conveniently follow a chain.

# Observations

The bottom half of the dialog is the Observations or topo shots from the corresponding instrument setup.

📓 Fieldbook	Data - 12345	SURV_Fieldi	DOOK					
x 7 E F	<b>***</b>	Duplicates	Only	~		Help		
Stations:								
Station Name	e North	ing Eastir	ng Eleva	ation Code	Status		+	
CO RD 33								
GAP 27_33							-	Stations
Found monum	ients							
•						- Þ.		
Chainsen (								
Chainage: 👔	< 1078		<b>•</b> >				_	- Chainage
Chainage: [< Observations:	(<) 1078		• >					- Chainage
Chainage: [ Observations: Point Name	( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )	Easting	▼ > Elevation	Code	Status	•	+	- Chainage
Chainage: [k Observations: Point Name 106	<ul> <li>1078</li> <li>Northing</li> <li>1558562.8.</li> </ul>	Easting 3282329.6.	Elevation6505.88	Code 1078	Status	•	+	- Chainage
Chainage: Dbservations: Point Name 106 107	Northing 1558562.8 1555920.9	Easting 	<ul> <li>Elevation</li> <li>6505.88</li> <li>6545.91</li> </ul>	Code 1078 1078	Status FA FA	*	+	- Chainage
Chainage: Doservations: Point Name 106 107 2070	Northing 1558562.8. 1555920.9. 1555976.4.	Easting .3282329.6. .3282335.4. .3281511.3.	<ul> <li>Elevation</li> <li>.6505.88</li> <li>.6545.91</li> <li>.6574.93</li> </ul>	Code 1078 1078 1075	Status FA FA F	•	+	Chainage
Chainage: Dbservations: Point Name 106 107 2070 105	Northing 1558562.8. 1555920.9. 1555976.4. 1558527.8.	Easting .3282329.6. .3282335.4. .3281511.3. .3279643.1.	<ul> <li>Elevation</li> <li>.6505.88</li> <li>.6545.91</li> <li>.6574.93</li> <li>.6585.79</li> </ul>	Code 1078 1075 1077	Status FA FA F FAN	•	+	Chainage
Chainage: Dbservations: Point Name 106 107 2070 105 2050	Northing 1558562.8 1555920.9 1555976.4 1558527.8 1555913.3	Easting .3282329.6. .3282335.4. .3281511.3. .3279643.1. .3280349.7.	<ul> <li>Elevation</li> <li>.6505.88</li> <li>.6545.91</li> <li>.6574.93</li> <li>.6585.79</li> <li>.6608.33</li> </ul>	Code 1078 1078 1075 1077 1075	Status FA FA FAN F	•	+	Chainage
Chainage: Dbservations: Point Name 106 107 2070 105 2050 108	Northing 1558562.8 1555920.9 1555976.4 1558527.8 1555913.3 1555844.0	Easting .3282329.6. .3282335.4. .3281511.3. .3279643.1. .3280349.7. .3279671.7.	<ul> <li>Elevation</li> <li>.6505.88</li> <li>.6545.91</li> <li>.6574.93</li> <li>.6585.79</li> <li>.6608.33</li> <li>.6623.76</li> </ul>	Code 1078 1078 1075 1077 1075 1078	Status FA FA FAN F FAN FA	4	+	- Chainage Observatior

# **Chapter 4 - Feature Codes and Control Codes**

The Feature Styles defined for Survey control how a feature is displayed in the design file, written to a DTM, or exported to Geometry.

There are two main types of graphic displays: lines and cells. Additionally, there are a few codes that place text through the use of Custom Operations. The Styles definition also controls, through the association with a Named Symbology, the symbology for the graphics such as level, color, style, and weight.

Extensive effort has been made to ensure the correct symbology is defined in the Feature Style. Changes to Feature Styles will be made only by the CDOT CADD Manager. Any suggested changes should be submitted to the CADD Manager as all of CDOT's InRoads configuration is stored in the standard delivered CDOT\_Civil.xin file.

# Style Manager dialog

The Style Manager dialog controls how each surveyed feature is displayed graphically. Each feature can be displayed as Lines, Cells, Text, or Symbols. The feature definitions have been standardized by CDOT and should only be modified by the CADD manager.

From the pull-down menu, select **Tools > Style Manager...** 

Show Styles with	Properties ce	Surface Properties	Geometry Tabling	Close
Include Geom	etry Point	Display Cross Section	Line Tabling	New
Include Geom	etry Line	Display Profile	Arc Tabling	Edit
Include Geom	etry Arc	Pay Item	Spiral Tabling	Copy
Include Geom	etry Spiral	Survey Properties		Copy Settings.
Include Surve	у	Custom Operations	Attributes	Delete
				Rename
				Help
Preference File: C	:\Workspace	Workspace-CDOT_V8i\Stand	ards-Global\InRoads\Preferences\(	CDOT_Civil.xin
Numeric Code	Name		Description	Alpha Code
4175	T_Air Cond	l Unit	Air Conditioning Unit	
2575	T_Alum Lig	ht Standard	Aluminum Light Standard	
3919	T_Archaeld	ogical Site	Archaelogical Site	
3919 3951	T_Archaelo T_Archaelo	ogical Site ogical Site Symb	Archaelogical Site Archaelogical Site Symbol	
3919 3951 1824	T_Archaelo T_Archaelo T_Asphalt	ogical Site ogical Site Symb Rundown	Archaelogical Site Archaelogical Site Symbol Asphalt Rundown	
3919 3951 1824 2322	T_Archaelo T_Archaelo T_Asphalt T_Asphalt	ogical Site ogical Site Symb Rundown Slope & Ditch Paving	Archaelogical Site Archaelogical Site Symbol Asphalt Rundown Asphalt Slope & Ditch Paving	C
3919 3951 1824 2322 5912	T_Archaeld T_Archaeld T_Asphalt T_Asphalt T_Avalanc	ogical Site ogical Site Symb Rundown Slope & Ditch Paving he Chute	Archaelogical Site Archaelogical Site Symbol Asphalt Rundown Asphalt Slope & Ditch Paving Avalanche Chute	C
3919 3951 1824 2322 5912 3501	T_Archaeld T_Archaeld T_Asphalt T_Asphalt T_Avalanc T_Back of	ogical Site ogical Site Symb Rundown Slope & Ditch Paving he Chute Curb	Archaelogical Site Archaelogical Site Symbol Asphalt Rundown Asphalt Slope & Ditch Paving Avalanche Chute Back of Curb	C
3919 3951 1824 2322 5912 3501 5110	T_Archaek T_Archaek T_Asphalt T_Asphalt T_Avalanc T_Back of T_Barricad	ogical Site ogical Site Symb Rundown Slope & Ditch Paving he Chute Curb es	Archaelogical Site Archaelogical Site Symbol Asphalt Rundown Asphalt Slope & Ditch Paving Avalanche Chute Back of Curb Bamicades	C
3919 3951 1824 2322 5912 3501 5110 4125	T_Archaek T_Archaek T_Asphalt T_Asphalt T_Avalanc T_Back of T_Barricad T_Bathroor	ogical Site ogical Site Symb Rundown Slope & Ditch Paving he Chute Curb es m	Archaelogical Site Archaelogical Site Symbol Asphalt Rundown Asphalt Slope & Ditch Paving Avalanche Chute Back of Curb Bamicades Bathroom	
3919 3951 1824 2322 5912 3501 5110 4125 1076	T_Archaek T_Archaek T_Asphalt T_Asphalt T_Asphalt T_Back of T_Barricad T_Bathroor T_Bench M	ogical Site ogical Site Symb Rundown Slope & Ditch Paving he Chute Curb es n Mark	Archaelogical Site Archaelogical Site Symbol Asphalt Rundown Asphalt Slope & Ditch Paving Avalanche Chute Back of Curb Bamicades Bathroom Bench Mark	
3919 3951 1824 2322 5912 3501 5110 4125 1076 3715	T_Archaek T_Archaek T_Asphalt T_Asphalt T_Asphalt T_Back of T_Barcad T_Bathroor T_Bench M T_Bike Pat	ogical Site ogical Site Symb Rundown Slope & Ditch Paving he Chute Curb es m Mark dark	Archaelogical Site Archaelogical Site Symbol Asphalt Rundown Asphalt Slope & Ditch Paving Avalanche Chute Back of Curb Baricades Bathroom Bench Mark Bike Path (Bituminous)	
3319 3951 1824 2322 5912 3501 5110 4125 1076 3715 3712	T_Archaek T_Archaek T_Asphalt T_Asphalt T_Avalanc T_Back of T_Barricad T_Barricad T_Bathroor T_Bench M T_Bike Pat	ogical Site ogical Site Symb Rundown Slope & Ditch Paving he Chute Curb es m Mark alark h (Bituminous) ch (Conc)	Archaelogical Site Archaelogical Site Symbol Asphalt Rundown Asphalt Slope & Ditch Paving Avalanche Chute Back of Curb Baricades Bathroom Bench Mark Bike Path (Bituminous) Bike Path (Concrete)	

# **Feature Styles**

## **Dialog Filtering:**

- Toggle on '**Include Survey**' to filter the dialog to show only features configured specifically for data collection.
- Additional toggles for styles that have attributes defined for *Custom Operations* and *Attributes* further refines the list of displayed styles.

🔊 Style Manager			- 0 🔀
Show Styles with Include Surfac Include Geom Include Geom Include Geom Include Geom Include Geom	Properties     Surface Properties       ce     Display Plan       etry Point     Display Cross Section       etry Line     Display Profile       etry Arc     Pay Item       etry Spiral     Survey Properties       y     Value	Geometry Tabling Point Tabling Line Tabling Arc Tabling Spiral Tabling	Close New Edt Copy Copy Settings Delete Rename
Desferrers Dies C	Wedenson Wedenson CDOT V& Star	darde Global \ In Roade \ Preferencee \ CDO	T Civil xin
Freierence File: C	. Workspace Workspace-CDOT_Vor\Star	dalds-diobal (in toads (i tererences (CDO	
Numeric Code	Name	Description	Alpha Code
Numeric Code 4175	Name T_Air Cond Unit	Description Air Conditioning Unit	Alpha Code
Numeric Code 4175 2575	Name T_Air Cond Unit T_Alum Light Standard	Description Air Conditioning Unit Aluminum Light Standard	Alpha Code
Numeric Code 4175 2575 3951	Name T_Air Cond Unit T_Aum Light Standard T_Archaelogical Site Symb	Description Air Conditioning Unit Aluminum Light Standard Archaelogical Site Symbol	Alpha Code
Numeric Code 4175 2575 3951 1076	Name T_Air Cond Unit T_Alum Light Standard T_Archaelogical Site Symb T_Bench Mark	Description Air Conditioning Unit Aluminum Light Standard Archaelogical Site Symbol Bench Mark	Alpha Code
Numeric Code 4175 2575 3951 1076 5075	Name T_Air Cond Unit T_Alum Light Standard T_Archaelogical Site Symb T_Bench Mark T_Billboard Under 10ft	Description Air Conditioning Unit Aluminum Light Standard Archaelogical Site Symbol Bench Mark Billboard 10ft or Less	Alpha Code
Numeric Code 4175 2575 3951 1076 5075 5076	Name T_Air Cond Unit T_Air Cond Unit T_Archaelogical Site Symb T_Bench Mark T_Billboard Under 10ft T_Billboard Under 10ft Light	Description Air Conditioning Unit Aluminum Light Standard Archaelogical Site Symbol Bench Mark Billboard 10ft or Less Billboard 10ft or Less (Lighted)	Alpha Code
Numeric Code 4175 2575 3951 1076 5075 5076 1083	Name T_Air Cond Unit T_Air Cond Unit T_Alum Light Standard T_Archaelogical Site Symb T_Bench Mark T_Billboard Under 10ft T_Billboard Under 10ft T_BLM Marker	Description Air Conditioning Unit Aluminum Light Standard Archaelogical Site Symbol Bench Mark Billboard 10ft or Less Billboard 10ft or Less (Lighted) BLM Marker	Alpha Code
Numeric Code 4175 2575 3951 1076 5075 5076 1083 5951	Name T_Air Cond Unit T_Alum Light Standard T_Archaelogical Site Symb T_Bench Mark T_Billboard Under 10ft T_Billboard Under 10ft T_BLM Marker T_Boulder Under 6ft	Description Air Conditioning Unit Aluminum Light Standard Archaelogical Site Symbol Bench Mark Billboard 10ft or Less Billboard 10ft or L	Alpha Code
Numeric Code 4175 2575 3951 1076 5075 5076 1083 5951 2376	Name T_Air Cond Unit T_Alum Light Standard T_Archaelogical Site Symb T_Bench Mark T_Billboard Under 10ft T_Billboard Under 10ft T_Billboard Under 10ft T_Boulder Under 6ft T_Bridge Column	Air Conditioning Unit Aurinum Light Standard Archaelogical Site Symbol Bench Mark Billboard 10ft or Less Billboard 10ft or Less Billboard 10ft or Less (Lighted) BLM Marker Boulder Under 6ft Bridge Column	Alpha Code
Numeric Code 4175 2575 3951 1076 5075 5076 1083 5951 2376 2375	Name T_Air Cond Unit T_Alum Light Standard T_Archaelogical Site Symb T_Bench Mark T_Billboard Under 10ft T_Billboard Under 10ft T_Billboard Under 0ft T_Boulder Under 6ft T_Bridge Column T_Bridge Drain Hole	Description Air Conditioning Unit Aluminum Light Standard Archaelogical Site Symbol Bench Mark Billboard 10ft or Less Billboard 10ft or Less (Lighted) BLM Marker Boulder Under 6ft Bridge Column Bridge Drain Hole	Alpha Code
Numeric Code 4175 2575 3951 1076 5075 5076 1083 5951 2376 2375 4199	Name T_Air Cond Unit T_Alum Light Standard T_Archaelogical Site Symb T_Bench Mark T_Billboard Under 10ft T_BLIM Marker T_Boulder Under 6ft T_Bridge Column T_Bridge Drain Hole T_Buildings Misc	Description Air Conditioning Unit Aluminum Light Standard Archaelogical Site Symbol Bench Mark Billboard 10ft or Less Billboard 10ft or L	Alpha Code
Numeric Code 4175 2575 3951 1076 5075 5076 1083 5951 2376 2375 4199 3088	Name T_Air Cond Unit T_Aum Light Standard T_Archaelogical Site Symb T_Bench Mark T_Billboard Under 10ft T_Billboard Under 10ft T_BLM Marker T_Boulder Under 6ft T_Bridge Column T_Bridge Drain Hole T_Buildings Misc T_Buildings Misc	Description Air Conditioning Unit Aluminum Light Standard Archaelogical Site Symbol Bench Mark Billboard 10ft or Less Billboard 10ft or Less Billboard 10ft or Less (Lighted) BLM Marker Boulder Under 6ft Bridge Column Bridge Drain Hole Buildings Misc Bus Stop Bench Symbol	Alpha Code
Numeric Code 4175 2575 3951 1076 5075 5076 1083 5951 2376 2375 4199 3088 5180	Name T_Air Cond Unit T_Aum Light Standard T_Archaelogical Site Symb T_Bench Mark T_Billboard Under 10ft T_Billboard Under 10ft T_BLM Marker T_Boulder Under 6ft T_Bridge Column T_Bridge Drain Hole T_Buildings Misc T_Buildings Mi	Description Air Conditioning Unit Aluminum Light Standard Archaelogical Site Symbol Bench Mark Billboard 10ft or Less Billboard 10ft or Less Billboard 10ft or Less (Lighted) BLM Marker Boulder Under 6ft Bridge Column Bridge Drain Hole Buildings Misc Bus Stop Bench Symbol Butterfly Sign	Alpha Code

## Feature Editing:

From the list of Features, **<D>** a specific Feature and select **Edit** on the *Style Manager* dialog to open the *Edit Style* dialog. The *Edit Style* dialog controls the attributes for each available *Feature* in the CDOT configuration including survey coding for field collection and processing.

🧱 Edit Style			
Name:	Description: BLM Marker Include Definition For Surface Feature Geometry Point Feature Geometry Line Feature Geometry Arc Feature Geometry Spiral Feature Survey Feature		
		Apply	Close Help

#### • Graphic Attributes

An InRoads Survey Fieldbook can be written to 3 different deliverables. These are; Planimetrics (CAD file), to a Surface (DTM), and to Geometry project (ALG). For each of these outputs unique graphic attributes can be associated during the export. Each definition corresponds to a Named Symbology in the CDOT\_Civil.xin file. This will be covered later in this chapter.

#### • Attach Tag

Attaches a MicroStation tag value to the feature when written to the design value, such as DTM type, Point name, Preference, and Description. To review attached tags use the Review Tags button from the Main toolbar in MicroStation.

Name:	Value:	
type	Do Not Contour	-
group	12345SURVFieldbook01	=
name	3154_2	
preference	T_ROW Marker	
description	Right of Way Marker	
•	III	+ +

Detailed information about survey features can be viewed by expanding the *Survey Feature* leaf.

🔣 Edit Style		
Name:	Feature Type: Breakline	
		Apply Close Help

## Edit Style dialog

• Name:

The selected *Style*.

- Feature Type
  - Random

*Regular* or *spot* elevations. These points do not have a direct relationship with adjoining points other than a linear interpolation. For example: high or low elevations, topography shots such as trees, valves, signs, etc.

Breakline

Breaklines are comprised of linear features where a change in grade may occur. For example: curb lines, a roadway crown, edge of pavement, ditches, ridges, toe of slope, etc. A breakline must contain at least 2 points and will restrict triangulation from crossing.

Interior

Interior boundaries are comprised of a closed shape. They define obscure areas (voids) in a surface model. Triangulation does not occur inside interior boundaries thereby eliminating any contouring, surface modeling, or volume computations within said interior feature. Multiple interior boundaries can exist in a surface model.

For Example: Bodies of water, building pads, areas not surveyed, etc.

• Exterior

By definition, an exterior boundary must be a closed shape. It defines the limits of the data InRoads can work with. Only one exterior boundary can exist in a surface model. For example: limits of survey data or limits of slope intercepts for a new design.

## • Exclude from Triangulation

These shots will collect the X,Y, and Z position of the feature but when it comes time for InRoads to triangulate the DTM these points will be left out of the surface model. Think of underground utilities or a shot on the top nut of a hydrant. If these shots were part of the triangulation there would be incorrect pits and spikes in the DTM. However these points are stored in the DTM for other purposes such as profile or cross section display.

## Draw Line to Previous Same Code

Controls planimetric line work for the specific feature. This option is used in conjunction with the control code **ST**.

## Draw Connecting Line

Controls planimetric line work for the specific feature. This option is used in conjunction with the control codes **JPT**, **JNC**, and - (dash).

## • Scale Cell to Ground

Overrides all scale factors and uses a scale factor of 1 for cell placement

#### • Symbology leaf



 Defines the *Named Symbology* associated with the Style which in-turn defines graphic attributes for Plan line, text, and point symbology (cell) when writing the field book to a CAD file as planimetrics. • Codes leaf

🧱 Edit Style		
Name:	Alpha Codes Selected: Add Delete Numeric Code: 1083	
	Apply Close	Help

## Alpha Code

Alpha codes are used as an additional way to collect the survey data in the field. Alpha feature codes are not to be used as part of the CDOT collection process.

#### Numeric Code

Associates a unique numeric code with the Feature Style.
#### • Attributes leaf

Edit Style				
Edit Style       Name:       Image:       Image: <t< td=""><td>Name ROT</td><td>Type Numeric</td><td>Description ROTATION</td><td></td></t<>	Name ROT	Type Numeric	Description ROTATION	
		Add.		Delete
		Арр	ly Close	Help

- Attributes are used to help further define or control survey features collected in the field. Attributes can be collected as numeric or alpha data. As an example, additional information such as size, flow, and silt levels in a culvert pipe can be added to a single shot taken in the field. Any survey shots taken in the field without attributes defined will display an 'A' in the status column of the electronic fieldbook. If a value is defined, a 'V' will display in the fieldbook.
- Custom Operations leaf
  - Custom operations can be thought of as a script file or a list of commands that are run on a certain survey feature. It can be used to control graphic types, symbology, text, placement, and also perform math functions. MicroStation and InRoads key-ins are used to enter commands strings. To view examples of custom operations <D> the Help button.

#### • Graphic Attributes

As mentioned previously, an InRoads Survey Fieldbook can be written to 3 different deliverables. These are: Planimetrics (CAD file), to a Surface (DTM), and to Geometry project (ALG). For each of these outputs unique graphic attributes can be associated during the export. This style corresponds to a Named Symbology in the CDOT\_Civil.xin file.

Edit Style						
Edit Style	Symbology Name:	T_BLM Mark	xer_1 New	) <u>Edt</u>		
				Apply	Close	Help

### Edit Style dialog

Selecting the *Edit* button in the symbology portion of the Edit Style dialog opens the identified Named Symbology.

	Edit Named Symbo	ology	
N	lame: T_BLM N	Narker_1	Apply
	Description: T_BLM N	Marker_1	Close
ſ	Symbology		
	Use	Level	
	Default Line	Not Initialized	
	Default Text	Not Initialized	
	Default Point	Not Initialized	
	Plan Line	TOPO_MONUMENT_BLM-MaBYL	Copy
	Plan Text	TOPO_MONUMENT_BLM-MaBYL	
	Plan Point	TOPO_MONUMENT_BLM-MaBYL	Неір
l '	Profile Line	Not Initialized	
	Profile Text	Not Initialized	
	Profile Point	Not Initialized	
	Cross Section Line	Not Initialized	
	Cross Section Text	Not Initialized	
	Cross Section Point	Not Initialized	
	L	Uninitialize Edit	

Identifying a specific attribute and selecting *Edit* opens additional detailed information on how the graphics will be written as linework, text, or cell to the CAD file.

#### • Line Symbology

Controls the Level, Color, Style, and weight of lines or arcs for individual features written to graphics.

🔣 Line Syn	nbology	23
Level:	TOPO_MONUMENT_BLM-Ma 👻	ОК
Color:	ByLevel	Cancel
Line Style:	(0) ByLevel 🔹	Help
Scale:	1.0000	
Weight:	(1)ByLevel -	
🔲 Fill		

#### • Text Symbology

Controls the symbology, text size, and font for any text displayed with through the use of custom operations.

🔣 Text Symbolo	ду		<b>X</b>
Text Style:			• OK
Level:	TOPO_MONU	IMENT_BLM-Ma	Cancel
Color:	ByLevel		Help
Weight:		-(1)ByLevel	•
Font:	🔑 Engineerin	ig .	-
Justification:	Left Top		-
Height:	0.07		
Width:	0.07		
Line Spacing:	0.04		
View Independ	ent		
Rotation	e to Object	Offsets	n
Absolute Ang	le	Before Rota	tion
Angle: 0^0	0'00''	Horizontal:	0.00
		Vertical:	0.00

#### • Point Symbology

Controls the symbology, text size, and font for any text displayed with through the use of custom operations.

Point Sy	mbology				
	Symbol		ĺ	Cell	ОК
Display:	Symbol	-			Cancel
Level:	TOPO_MONUMENT_BLM-Ma	-			Help
Color:	ByLevel				
Weight:	(1)ByLevel	-	Display:	Fnd BLM mon	T
Font:	🖊 Engineering - Monospaced	-	Level:	TOPO_MONUMENT	_BLM-Ma 👻
Character:	÷		X Scale:	1.0000	
Height:	0.14		Y Scale:	1.0000	
Width:	0.11		Z Scale:	1.0000	
Rotation Angle F	Relative to Object		Rotation Angle F	Relative to Object	
Angle:	0^00'00''		Angle:	0^00'00''	

**Note:** The radio buttons for both Symbol and Cell display is disabled for all survey items represented by cells in the CDOT configuration. The placement of these is accomplished through the use of *Custom Operations* so field-collected attributes such as rotation can be applied at time of cell placement.

A symbol is a custom font character, similar to a True Type Font Wingdings. Symbols can be used in addition to any cells being placed. CDOT does not currently use any Symbols.

### **Control Codes**

Control Codes are also stored in the CDOT\_Civil.xin file. To access these select **Survey > Control Codes**. Control codes are used in conjunction with CDOT's *Numeric feature codes*. By using control codes the surveyor can define such items as the beginning of strings, points of tangency, offset shots as well as other shot modifiers. Control codes can be either alpha (upper or lower case) or numeric characters and are input following the feature code. Each code has an example below.

Description	Alpha	Numeric	-	ОК
Start	ST	1		
Close	CL	2		Save
Point of Curvature	BC	3	1	Cancel
Point of Tangency	EC	4	l	Cancer
Exclude from Triangulation	×	5		Help
Random	RND	6		
Rectangle	RECT	None		
Close Rectangle	CLR	7		
Nontangent Curve	NT	8		
Join Point	JPT	None		
Join Nearest Code	JNC	None		
Distance	DIST	None		
Template	TMPL	None		
Cross Section	×s	None		
Add to Adjustment Set	ADJ	None		
Extend Arc	EXTARC	None		
Single Point Arc	SPC	None	- ÷	

Intersection Control Code example



• Start

Alpha *ST* | Numeric *1* 

Control Code *Start* begins planimetric lines; there is no code to end a string. InRoads Survey will continue a string until no further data is collected using that code and string identifier. If the same code and string identifier is entered using the ST control code, the previous string will be terminated and a new string begun. See the example below for feature code 1316.02 (feature.string# ST)



**Note:** It is not mandatory that string identifiers be used. This is only necessary if you wish to collect data using identical feature codes and need to develop multiple strings simultaneously. Examples of this may be when surveying in a crisscross fashion and wish to collect multiple 1310 (edge of oil) strings. If surveying in a linear fashion (collecting the entire length of the physical feature) a code such as 1310 st could be used and reused when moving from one pavement edge to another

• Close

Alpha *CL* | Numeric 2

Control Code Close will create a closed shape from the last shot to the first shot of the feature. Closed shapes in InRoads can be used as Interior or Exterior DTM point types. Closed shapes in MicroStation will become linestrings.



**Note:** Only a survey feature with a point type Breakline will honor the Close control code when it is pushed to a surface.

• Point of Curvature

Alpha *BC* | Numeric *3* 

Control code Point of Curvature identifies the beginning of the curve. The incoming tangent of the curve controls the degree of curve.

• Point of Tangency

Alpha *EC* | Numeric *4* 

Control code Point of Tangency identifies the end of the curve. The outgoing tangent of the curve controls the degree of curve



- **Note:** If a single point on arc is taken then the tangent lines are ignored and the curve is generated by the three points PC, POC, and PT.
- **Note:** If more than one point is taken on the arc then the tangent lines are used when calculating the PC and PT of the curve. CDOT has standardized using the control code NT non-tangent to follow all BC and EC shots. Coding with NT will not add calculated PC's and PT's to the linear features. The PC's and PT's will be observed points as in the field.

• Exclude from Triangulation

Alpha X | Numeric 5

Control code Exclude from Triangulation identifies points that will not (and should not) be used to generate surface contours. Any point not resting on the terrain should be excluded from triangulation. Points that are coded with "X" could include such items as fire hydrants, manhole inverts, benchmarks and control points, valve boxes, and other similar features.



Random

Alpha *RND* | Numeric *6* 

Control code Random overwrites DTM point types set in the Survey Feature table. For example Breaklines become Random types and Do Not Contour point types become Random points Excluded from triangulation.

• Rectangle

### Alpha **RECT** | Numeric **None**

Control code Rectangle will draw a rectangle based on two points shot in the field and a measured distance. The two points collected in the filed define the direction of the baseline and the measured distance defines the width. The previous two points collected in the filed define the direction of the baseline. To turn left of the baseline use a negative number (-15); to turn right of the baseline use a positive number (15). Each added point using the Rectangle command will be considered a derived point in Survey.



**Note:** Only a survey feature with a point type Breakline will honor the Rectangle control code when it is pushed to a surface.

• Close Rectangle

Alpha *CLR* | Numeric 7

Control code Close Rectangle will draw a trapezoid based on three points shot in the field. The last two points become the baseline and the fourth point generated will be 90 degrees to the baseline.



**Note:** Only a survey feature with a point type Breakline will honor the Close Rectangle control code when it is pushed to a surface.

• Nontangent Curve

Alpha *NT* | Numeric 8

Control code Nontangent Curve identifies a curve that will be nontangent to either the incoming or outgoing tangent lines. This control code works in conjunction with BC or EC.



• Join Point

Alpha JPT | Numeric None

Control code Join Point will draw a connecting line to the specified point number in the fieldbook using the current feature style.



• Join Nearest Code

Alpha JNC | Numeric None

Control code Join Nearest Code will locate the closest code specified and draw a connecting line using the current feature style.



• Distance

Alpha DIST | Numeric None

Control code Distance will continue to draw lines based on measured distances and direction. The previous two points collected in the filed will define the direction the next point will be calculated from. The angle will always be a 90 degree deflection angle, turned looking forward from the last point collected or calculated. To turn left of the baseline use a negative number (-25) to turn right of the baseline use a positive number (10). *Each point using the Distance command will be considered a derived point in Survey and will also be used in calculation of DTM surfaces and ALG geometry alignments.* 

**Note:** Attention should be paid to the elevations assigned by this method that the surface is only as good as this info is. There may be work-arounds for these instances, but if accurate info is needed, the effort should be made in the field to collect actual data.



**Note:** Only a survey feature with a point type Breakline will honor the Distance control code when it is pushed to a surface.

• Template

#### Alpha *TMPL* | Numeric *None*

Control code Template defines multiple survey features that are uniform in distance and elevation from a baseline. Using the template control code will lessen the number of shots needed in the field.



Cross Section

Alpha *XS* | Numeric *None* 

Control code Cross Section allows any uniform set of corridor shots to be collected efficiently. Start by collecting the start of each new feature, and then continue to collect the shots in a crossing pattern.



**Note:** When the raw data is imported into the field book it will convert the code XS to the correct feature code.

• Add to Adjustment Set

Alpha ADJ | Numeric None

Control code Add to Adjustment Set defines a sideshot of an unknown point to be included to the adjustment set data.

• Extend Arc

Alpha EXTARC | Numeric None

Extend Arc command works with the code PC to create a circular shape. The shape is created by joining two arcs which are defined by three shots taken in the field



**Note:** When the feature is pushed to a DTM the feature will not keep the circular shape. The DTM feature will be made up of two line segments.

• Single Point Arc

Alpha SPC | Numeric None

Single Point Arc command will place a best fit curve with out the use of a Begin or End curve control code.



**Note:** The locations of the BC and EC will be computed. There is no numeric equivalent for the SPC control code.

# **Chapter 5 - Exporting the Fieldbook – Overview**

## Write Survey Data to Graphics dialog

Writing Survey data to graphics creates the MicroStation design file (DGN) basemap. Once the file has been saved to a MicroStation design file there no longer is a link between the InRoads Survey fieldbook and MicroStation graphics. If there are changes that need to be made to the graphics, modify the InRoads Survey fieldbook and then re-export the graphics.

🧱 Write Survey Data to Grap	. 🕳 🗆 💌
Include:	Apply Filter
Image: Codes       Image: Codes	
Planarize Elevation: 0.00 Curve Stroking Mode: Horizont	al and Vertical

## **Dialog Items:**

- Planimetrics if checked Planimetrics such as lines, chorded arcs, and cells will be saved to the design file
- *Symbols* if checked a tic mark representing the location of the shot will be saved to the design file.
- $\frac{1}{2}$  Names if checked the point name of the shot will be saved to the design file.
- *Codes* if checked the point feature code of the shot will be saved to the design file.
- Flevations if checked the point elevation of the shot will be saved to the design file.
- **A** *Errors* if checked any errors in the fieldbook will be saved to the design file.
- **\*** Notes if checked any notes in the fieldbook will be saved to the design file.
- $\nabla$  *Network* if checked any traverse legs will be saved to the design file.
- Apply Apply will save the checked items to the design file
- *Filter* will allow the user to include or exclude any feature codes by a set of rules. Only the feature codes that pass through the filter will be saved to the design file.
- **Note:** The symbology for Symbols, Points, Elevations, Notes, Errors, and Codes is controlled in the Survey Options dialog.

### Planarize

• *Elevation* – if checked all points will place at a defined elevation.

## **Curve Stroking Modes**

Curves generated from Survey are chorded arcs based on the Chord Height distance in the **Survey Options** dialog. MicroStation will generate a number of small line segments to represent the arc. There are three settings for generating arcs in 2D and 3D graphics.

### Horizontal and Vertical

The curve is created by multipoint splines in the x, y, and z directions. In extreme variations in elevations unwanted sag or crest of a curve may occur.

#### Horizontal Only ٠

The curve is created by multipoint splines only in the x and y directions. The elevations or z values of the points are interpolated linearly between points.

#### Do Not Stroke

The curve is not created. It will be represented as linear elements between points.



HORIZONTAL STROKING



## Survey Data to Surface dialog

Writing Survey data to surface creates the Digital Terrain Model (DTM). Each feature is triangulated based on the Point type set in the Survey Feature Style. The intelligence built in to the feature comes from the Feature Style setting in the Survey leaf of the Feature Style dialog.

Survey Data To Surface	:	8
Surface Name:	Default -	ОК
Parent Name:		Cancel
Description:	Use Style Description	Filter
Tolerance:	0.00	Preferences
Maximum Segment Length:	0.00	
Curve Stroking Mode:	Horizontal and Vertical 👻	. Help
Always Use:	Alpha Code 🗸	·
Triangulate Surface		
Empty Surface		
Duplicate Names: © Replace       Rename		

## **Dialog Items:**

• Surface Name

Key-in field to create a new empty surface for export from survey. If a surface has already been created, choose it from the drop down arrow.

• Description

Each feature in the DTM will be unique. When the feature is pushed to the DTM it will use one of the following options from the Feature table for the description.

- Use Feature Definition
- Use Attributes
- Use Codes
- Tolerance

Tolerance will set the minimum distance between points. If there are any points closer than the minimum, the points will be dropped from the surface. If the value is set to 0 then tolerance is ignored and all points will be used in the surface.

• Maximum Segment Length

Maximum Segment Length defines the point density of an element. If points were taken every 100 feet and the segment length was set to 25 feet then the result would be three additional points along the feature that would be used in the triangulation.

### **Curve Stroking Mode**

Curve Stroking Mode defines a curve horizontally and vertically. Curves in InRoads are defined by short line segments from the Survey Options dialog Chord Height.

• Horizontal and Vertical

The curve is created by multipoint splines in the x, y, and z directions. If extreme variations in elevations exist, unwanted sag or crest of a curve may occur.

#### • Horizontal Only

The curve is created by multipoint splines only in the x and y directions. The elevations or z values of the points are interpolated linearly between points.

• Do Not Stroke

The curve is not created. It will be represented as linear elements between points.

### Always Use:

Defines what each feature style name will be in the surface. CDOT has defined a Style for each survey feature that corresponds to an InRoads Feature Style. By default if it is unchecked the feature style will be assigned in the following order.

- **Style** Preference Style name defined in the feature table.
- Alpha Code
- Numeric Code

### Triangulate Surface

If checked the Triangulate Surface dialog will appear after the surface has been exported.

## **Triangulate Surface dialog**

This dialog will appear when triangulate surface in the **Survey to Surface** dialog is checked. Exporting Survey data to Surface without triangulating it will result with the data being pushed to the surface, but the triangle network will not exist yet.

Surface: Default   Description:  Maximum Length: 0.00  Extended Data Checks Lock Triangulation  Results Number of Points:	🧱 Triangulate Su	irface		
Description: Maximum Length: 0.00 Extended Data Checks Lock Triangulation Results Number of Points:	Surface:	Default	•	Apply
Maximum Length: 0.00 + Help Extended Data Checks Lock Triangulation Results Number of Points:	Description:			Close
Extended Data Checks Lock Triangulation Results Number of Points:	Maximum Length:	0.00	+	Help
Results Number of Points:	Extended Data	Checks	🔲 Lock Triangulatio	on
	Results Number of Points	:		
Number of Thangles:	Number of Triang	les:		
Elapsed Time (Seconds): More	Elapsed Time (Se	econds):		More

## **Dialog items:**

- *Surface* drop down box shows the active surface by default, other surfaces selectable from the drop down.
- *Extended Data Checks* checks DTM integrity (during triangulation) as to crossing breaklines and miss-matched elevations.
- *Maximum Length* maximum length of any one triangle segment (leg) can span during the triangulation process. If set to 0, triangle legs can extend to any length. Used to constrain triangulation to prevent unnecessary 'surface' data.
  - ◆ <u>+</u> Target button define a Maximum Length distance by picking two points in a MicroStation view.
- *Load Tagged Graphics* scans the design file for any InRoads tagged data and loads the elements into the surface.
- Delete Surface Contents empties the surface prior to adding any tagged elements.
- *Results* readout of triangulation outcome.
- More... More opens the Surface Properties dialog.

## Multiple Feature coding and the DTM

• Rule #1 Multicoded linear features to be triangulated

Survey linear features that are also DTM point type breaklines will be moved to the Surface. When duplicate points are triangulated, one will be dropped and will create a shared triangulation point.



• Rule #2 Multicoded linear features with random points to be triangulated

Survey linear features and random points will be moved to the Surface. However, when duplicate points are triangulated the breakline will override and the random point will be dropped entirely from the surface.

The only way to keep this from happening is to exclude the random point from triangulation with a control code "X". This will allow the feature to remain part of the surface.



• Rule #3 Multicoded linear features excluded from triangulation with random points to be triangulated

Survey linear features that are excluded from triangulation and random point types will be moved to the Surface. When duplicate points are triangulated the linear feature will remain and the random point will be used for triangulation.



## Survey Data to Geometry dialog

Saving Survey Data to Geometry creates a Geometry Project (ALG) which can contain multiple horizontal and vertical alignments from any planimetric linear feature. Any single point such as property corners or trees will also be saved to the same Geometry Project and placed into the Cogo buffer.

🌃 Survey Data to	Geometry	<b></b>
Project Name:	Default	<ul> <li>Apply</li> </ul>
Description:	Use Style Description	Close
Curve Stroking:	Horizontal and Vertical	Filter
Duplicate Names:	Replace	Preferences
Empty Project	Rename	Help
Build Extended I Insert: Attribute Name Attribute Value Code Note Extended Descrip	obescription	고꾋ㅋㅋ
4		

### **Dialog Items:**

• Project Name

Key-in field to create a new empty Geometry Project for export from survey. If a Geometry Project has already been created, choose it from the drop down arrow.

• Description

Each alignment in the Geometry Project will be unique. When the alignment is pushed to the Geometry Project it will use one of the following options from the Feature table for its description.

- Use Feature Definition
- Use Attributes
- Use Codes

## **Curve Stroking**

Curve Stroking mode defines a curve horizontally and vertically. Curves in InRoads Survey are defined by short line segments from the Survey Options dialog Chord Height. If a simple curve is collected in the field when the curve is exported to an alignment the curve data is calculated and stored as a curve. The curve will most likely be shown as noncollinear.

• Horizontal and Vertical

The curve is created by multipoint splines in the x, y, and z directions. In extreme variations in elevations unwanted sag or crest of a curve may occur.

#### • Horizontal Only

The curve is created by multipoint splines only in the x and y directions. The elevations or z values of the points are interpolated linearly between points.

• Do Not Stroke

The curve is not created. It will be represented as linear elements between points

### **Duplicate Names**

Replace

Any duplicate names will be replaced or overwritten in the Geometry Project.

• Rename

Any duplicate names that exist in the Geometry Project will be remain and new Horizontal Alignments and Cogo points will be appended to the file with a new name.

### **Empty Project**

If checked everything in the Geometry Project will be removed before the new Survey Geometry is exported.

### **Build Extended Description**

Will allow the user to pass along survey collected data such attribute values on culverts to the Geometry Project. The information of the Cogo point can be viewed by opening the *Edit / Review Extended Descriptions*. The dialog can be opened from the InRoads pull down menu **Geometry > Cogo Points > Edit / Review Extended Descriptions**.

🔣 Edit / Re	view Extended Descriptions			x
Name:	3784 🔻	+	Apply	
Description:	Gas Meter Low Pressure		Close	
Style:	T_Gas Meter Low Pressure 💌		Open Link	
Extended De	escription:		Help	
ROT =110 4579 Gas Meter n	ote			*
File Name:				
Projects\12	345\ROW_Survey\Survey\Pho	tos\g	asmeter.jpg	

# **Chapter 6 - Importing Data**

## **Resolving Code Error dialog**

🖳 Resolve Co	ode Error	×
Error:	'6001.00210 CLS'	Retry
Point Name:	13619	Ignore
Description:	6001.00210 CLS	Ignore All
Change To:	6001.00210 CLS	Features
Suggestions:		Browso
		browse
		Help
Log File Name:		

### Dialog Items:

- Change To field used to type the new correct feature code
- Suggestions pick list of codes that nearly matches. Only available when using Alpha feature codes.
- Log File Name specifies a text file name and directory that can save out the code errors that are found.
- Retry Retry rechecks the Change To field to make sure the updated code is correct.
- Ignore the current code that has an error will be ignored during import.
- Ignore All Ignore All all codes that have errors will be ignored and will be added to the fieldbook.
- Features opens the Feature Table dialog.
- Browse... Browse opens the Save As dialog. The Browse button only becomes active when the Log File Name field is selected.

## **Resolving Code Errors options**

### **Suggestions**

- Choose one of the Suggestions: to change the code.
- **<D>** the **Retry** button. The code will be corrected and processed. The dialog will then move on to the next code error. Continue correcting code errors until complete.

Resolve Code Error		
Error:	'6001.00210 CLS'	Retry
Point Name:	13619	Ignore
Description:	6001.00210 CLS	lanore All
Change To:	6001.00210 CLS	Features
Suggestions:		
		Drowse
		Help
Log File Name		

## **Manually Correct**

- Key in the correct code in the Change To: field.
- **<D>** the **Retry** button. The code will be corrected and processed. The dialog will then move on to the next code error. Continue correcting code errors until complete.

🖳 Resolve Code Error 🛛 🛛 🔀		
Error:	'6001.00210 CLS'	Retry
Point Name:	13619	Ignore
Description:	6001.00210 CLS	
Change To:	6001.00210 CLS	Features
Suggestions:		Teatures
		Browse
		Help
Log File Name:		

### Ignore

- When unsure of the correct code **<D>** the **Ignore** button.
- The code will be ignored. The dialog will then move on to the next code error. Continue ignoring code errors until complete.
- The Results dialog will appear showing what codes still have errors. This report can be saved as a text file to the project directory or dismissed.

Error:	'6001.00210 CLS'	Retry
Point Name:	13619	Ignore
Description:	6001.00210 CLS	Ignore All
Change To:	6001.00210 CLS	Features
Suggestions:		Browse
		Help

## Ignore All

- When unsure of all the correct codes **<D>** the **Ignore All** button.
- All codes will be ignored. The Resolve Code Error dialog will then close.
- The Results dialog will appear showing what codes still have errors. This report can be saved as a text file to the project directory or dismissed.

Resolve Code Error		
Error:	'6001.00210 CLS'	Retry
Point Name:	13619	Ignore
Description:	6001.00210 CLS	Ignore All
Change To:	6001.00210 CLS	Features
Suggestions:		Browse
		Help
Log File Name	:	

### **Saving Error Results**

```
Results
                                                                                              -
                                                                                            Close
 Error Log
                                                                                          Save As.
 Point: 13619
 Description: 6001.00210 CLS
Error: Code, "6001.00210 CLS", not found in the Feature table
                                                                                          Append..
                                                                                           Display
 Point: 6533
 Description: 1669
Error: Code, "1669", not found in the Feature table
                                                                                            Print
                                                                                            Help
 Point: 7385
                  5882
"5882", not found in the Feature table
 Description:
Error: Code,
                                                                                    *
                                                                                >
```

#### **Dialog items:**

- Save As... Save As − opens the Save As dialog. This will create a text file that can be opened in Notepad.
- Append... Append opens the Append dialog allowing the user to add additional errors to the end of an existing file.
- Display Display will write the text to graphics. The text will be displayed using the active text style.
- Print Print opens the Print Setup dialog. The file will be printed and will not save the file to disk.

### Finding Points in a MicroStation View

Find point in View command will locate a specified point in the active fieldbook and center the point in the active MicroStation view.

• From the pull-down menu, select **Survey > Find Point in View...** 

濕 Find Poi	int in View		_ 🗆 🗙
Point Name:	14260	+	Apply
Radius:	10.00		Close
			Help

### **Dialog items:**

- Point Name key-in field to enter point numbers.
- Radius view ratio around the specified point.
- Target button select point from the MicroStation view

• Apply Apply – executes the locate and centers the point to the view
## **Chapter 7 - Fieldbook Edits**

### Fieldbook Data dialog

Fieldbook	Data - 1234	5SURV_Fi	eldboo	k					23
<u>v</u> 🛛 🖿	**	Duplicat	es Only			-		Help	
Stations:									
Station Name	North	ing Ea	sting	Elevati	on C	ode	Statu	JS ^	+
CO RD 33								Ξ	
GAP 27_33									
Found monume	ents							-	
•	III							F	
Chainage: Dr					-				
Chainage. K	10/8			• 20	×				
Observations:						_	_		
Point Name	Northing	Easting	Elev	unting the	Code		_		
			2.01	allon	Code	State	JS	Hc ^	<u>+</u>
106	1558562.8.	3282329	.66505	.88 <sup>-</sup>	1078	State FA	JS	Ho ^	–
106 107	1558562.8. 1555920.9.	.3282329	66505 46545	.88 <sup>-</sup> .91 -	Lode 1078 1078	Stati FA FA	JS	Hc ^	<u>+</u>
106 107 2070	1558562.8. 1555920.9. 1555976.4.		66505 46545 36574	.88 .91 .93	1078 1078 1075	Stati FA FA F	SL	Hc ^	<u>+</u>
106 107 2070 105	1558562.8. 1555920.9. 1555976.4. 1558527.8.		66505 46545 36574 16585	.88 .91 .93 .79	1078 1078 1075 1077	FA FA F FAN	JS	Hc ^	<u>+</u>
106 107 2070 105 2050	1558562.8. 1555920.9. 1555976.4. 1558527.8. 1555913.3.		66505 46545 36574 16585 76608	.88 .91 .93 .79	1078 1078 1075 1075 1077 1075	FA FA F FAN FAN F	JS	Hc ^	
106 107 2070 105 2050 108	1558562.8. 1555920.9. 1555976.4. 1558527.8. 1555913.3. 1555884.0.		66505 46545 36574 16585 76608 76623	.88 .91 .93 .79 .33	Code 1078 1078 1075 1075 1075 1078	FA FA FAN FAN F FA	JS	Hc ^	<u>+</u>
106 107 2070 105 2050 108 2140	1558562.8. 1555920.9. 1555976.4. 1558527.8. 1555913.3. 1555884.0. 1555292.7.		66505 46545 36574 16585 76608 76623 56476		1078 1078 1075 1075 1075 1075 1078 1075	FA FA FAN FAN F FA FA	JS	Hc A	
106 107 2070 105 2050 108 2140 2160	1558562.8 1555920.9. 1555976.4. 1555976.4. 1555913.3. 1555884.0. 1555292.7. 1555292.7.		66505 46545 36574 16585 76608 76623 56476 76447		1078 1078 1075 1075 1075 1075 1075 1075	FA FA FAN FAN FA FA F F	JS	Hc A	
106 107 2070 105 2050 108 2140 2160	1558562.8. 1555920.9. 1555976.4. 1558527.8. 1555913.3. 1555884.0. 1555292.7. 1555023.3.	.3282329 3282335 3281511 3279643 3280349 3279671 3285275 3286494 3286494	66505 46545 36574 16585 76608 76608 76623 56476 76447	88 .91 .93 .79 .33 .76 .81 .64	1078 1078 1075 1077 1075 1078 1075 1075	FA FA FAN FAN F FA F F	US	Hc ~	

- Status Codes
  - N The point has a Note
  - **E** The point has been Edited
  - **F** The point is Fixed or has been keyed in
  - ◆ **A** The point has an Attribute associated to the Survey Feature
  - V- The point has a Value for an associated Attribute
  - ◆ I The point has been Inserted into the fieldbook
  - **C** The point has been adjusted

### **Find Observation dialog**

Find Observ	ation			×
Station:	I		Apply	
Point Name:			Close	
Code:			Edit	
Fence Mode:	Ignore	-		
Target Height Minimum:			ныр	
Maximum:				
		1		
Station	Point Name	Northing	Easting	Ele

#### **Dialog items:**

- *Station* key-in field used to locate Station point numbers in the active fieldbook.
- *Point Name* key-in field used to locate Observation point numbers in the active fieldbook.
- Code key-in field used to locate Alpha or Numeric codes in the active fieldbook.
- *Fence Mode* used to constrain a lookup area. If a fence is placed in the design file then the item will be activated so fence mode is selectable.
- *Target Height* locates survey shots based on a target height range
  - ♦ Minimum
  - ♦ Maximum
- *List* points found based on the selection criteria.
  - Use the Shift and Ctrl keys to select multiple points in the list.
- *Apply* locates the points in the active fieldbook and places them in the list section.
- *Edit* opens the **Edit Observation** dialog for the selected point numbers.
  - **Note:** Standard wild cards such as the asterisk "\*"and question mark "?" can be used in the Station. Point Name, and Code key in fields. Value ranges can also be defined in the Point Name key in field by using a dash and brackets.

### **Edit Observation dialog**

When editing points in the electronic fieldbook the original raw imported data is *not* edited. The **Edit Observation** dialog allows the fields that are not grayed out to be edited. After the point has been edited the point will show an "E" in the Status column of the fieldbook. Edits will also be tracked in the Audit Trail file.

Edit Observation					- • 🗙
Point Name:	4059	K<	Notes:		Apply
Туре:	Fixed -				Close
Horizontal Observation:					Help
Vertical Observaton:					
Slope Distance:			Attributes:		
Code:	4375		Code	Name	Value
Target Height:			4375	ROT	
Northing:	1555947.38				
Easting:	3283045.72	+			
Elevation:	6533.20				

#### Dialog items:

- *Point Name* assigned point value in the fieldbook.
  - Use the arrows to easily cycle through the points.
- *Type* definition of the point in the fieldbook
  - *Computed* point is defined from measured distances and angles.
  - *Fixed* point is based on a set of coordinates fixed by key-in or by an absolute observation (GPS).
  - *Geometry* point is defined in the Cogo buffer.
- *Horizontal Observation* measured value
- *Vertical Observation* measured value
- *Slope Distance* measured value
- *Code* feature and control codes
- Target Height prism height above measured point
- *Notes* any notes added to the shots in the field
- Northing, Easting, Elevation point values for point
- Attributes any additional information collected for the point

## **Chapter 8 - DTM Evaluation**

As part of the deliverables the survey department will provide to the designers is the Surface DTM file. The DTM file is to be an exact copy of what exists in the fieldbook. Meaning that any edits required to the DTM for correction of crossing breaklines or busted elevations is fixed first in the Survey fieldbook and the DTM is then reexported from the fieldbook.

## **Surface Properties dialog**

						17 - 14 - 14 - 14 - 14 - 14 - 14 - 14 -	
Surface:	12345SUF	RVSurface 🔻					Report
Name:	12345SUF	RVSurface01					Help
Description:	Existing Gr	ound from mu					
Maximum Length	0.00						
reference:	Existing 10	)' Mjr - 2' N 🔻					
Гуре:	Existing	•	Data Totals	Active	Features	Deleted	Total
Use Extende	d Data Check	s	Random:	19745	377	4184	23929
Lock Triangu	lation		Breakline:	14548	1314	8	14556
Data Range			Contour:	0	0	0	0
Point Type:	Total	•	Inferred:	0		0	0
Northing:	Minimum 1531966.21	Maximum 1559691.32	Interior:	0	0	0	0
Easting:	3235499.38	3304750.88	Exterior:	768	1	8480	9248
Elevation:	6328 23	6795 73	All Points:	35061	1744	12672	47733
Liordion.	0020.20	0700.70	Triangles:	66573		775	67348

#### **Dialog Items**

- Surface drop-down shows the active surface by default, other surfaces are selectable
- *Name* the name of the DTM as InRoads has it stored in memory (not necessarily the file name on disk). The surface can be renamed here by typing in a new name.
- *Description* user defined description
- *Maximum Length* maximum length any one triangle segment (leg) can span during the triangulation process. If set to 0, triangle legs can extend to any length. Used to constrain triangulation to prevent unnecessary 'surface' data.
- *Preference* predetermined display settings bypasses the **View Contour** dialog box if the Style lock is enabled.
- *Type* surface identifier for cross sections, used in end-area volume computations. Set to 'Existing' for newly created original ground surfaces.
- Use Extended Data Checks checks DTM integrity (during triangulation) for crossing breaklines and miss-matched elevations. Will eliminate crossing breaklines and miss-matched elevations by deleting segments or elevations. These errors should be corrected in the fieldbook.

- **Report** generates a separate window summarizing surface properties. The generated report can be printed, written to the CAD file, or stored as an ASCII file
- *Lock Triangulation* user will not be prompted to retriangulate when surface data is out of date. Not recommended for use.
- *Data Range* selectable field to show minimum and maximum Northing, Easting, and Elevation of surface features.
- Data Totals displays as summary of the surface composition.
- *Advanced* tab graphic display attribute settings (named symbologies) related to profiles & cross section display of the surface. Also input fields for defining multiple-line parallel offsets for use in profile display. The 'Use Features Only' check box instructs InRoads to interpolate cross-section elevations from crossing features vs. from triangle legs.

### **Data File Naming & Saving**

- As noted above, a user can rename a surface in the **Surface Properties** dialog. A critical point to remember is that InRoads is a memory based program. The name given the file on disk can differ from the name used in memory. While they do not have to be the same, it is highly recommended that they share a common name.
- Assigning a different name to a surface in the Surface Properties dialog box or by using Surface > Rename Surface simply redefines the surface name as it resides in memory, not on disk.
- Renaming a surface in both memory and on disk is a two step process. Use one of the methods described in the preceding paragraph to rename the surface in memory and then use the **File > Save As** command, using the new name, to save it to disk.

# **Chapter 9 - Exporting the Fieldbook**

## **Final Export and save**

The fieldbook has been corrected until there are no more visible errors. Now the fieldbook will be exported to a DGN, DTM, and ALG files.

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