



This Engineering Instruction was developed as an interim document to establish surveying standards and requirements until the DelDOT Surveying Manual has been finalized. This document also addresses the requirements for submitting survey files to DelDOT.

Surveying Classifications and Accuracy Standards

DelDOT utilizes the Survey Classifications and Accuracy Standards that have been established by the Federal Geodetic Control Subcommittee (FGDS), with modifications, as shown in the chart in the attached – Appendix A.

In summary:

Terrain Data Feature Location (Topographic Surveys)

- Linear / Proportional Horizontal Accuracy: C3 Order, 1:10,000
- Linear / Proportional Vertical Accuracy: Maximum Misclosure $e = 0.05 \text{ ft. } \sqrt{D}$
where e = hundredths of a foot and D = distance in miles
- Surveying Method: Total Station Positioning System, radial side shots from Secondary Project Control. All data is captured in observational mode.
- Required Datum Systems: Horizontal = NAD83; Vertical = NAVD88; GPS = Model 12B Geoid or most current model.
- Typical Applications: Terrain Data Surveys and Construction Stakeout Surveys.

Right of Way Mapping Feature Location

- Linear / Proportional Horizontal Accuracy: C3 Order, 1:10,000
- Linear / Proportional Vertical Accuracy: N/A

Surveying Method: Total Station Positioning System, multiple side shots from Secondary Project Control. All data is captured in observational mode.

- Required Datum Systems: Horizontal = NAD83; Vertical = NAVD88; GPS = Model 12B Geoid or most current model.
- Typical Applications: Right of Way Mapping

**Survey File Submissions to DelDOT**

DelDOT utilizes the following applications from Bentley for Surveying and CADD:

- Survey: OpenRoads Designer*
- CADD: MicroStation CONNECT*

DelDOT requires that the following deliverables be provided for every survey file submission:

- DGN Fieldbook and Terrain File – This file contains the final adjusted survey data for the project. The terrain is auto generated from the data stored within the fieldbook. The data contained in this file is stored in an observational mode format. If translation is required to create this file, then all supporting files need to be included to show that original survey data was collected in an observational mode. The DelDOT Project Manager may request the unadjusted RAW data file when necessary.
- DGN Graphics File – This file contains the graphics that are exported from the final adjusted survey DGN file. This file is to be provided in a 3D format.
- ICS File – This file contains point data information that is exported from the final adjusted survey DGN file in an ASCII format.

* - Software versions shall comply with the versions stated in the [DelDOT CADD Wiki](#).

Appendix A - Delaware Department of Transportation Survey Classifications and Accuracy Standards

	Standards		Procedures		Applications - Typical Surveys	
	Linear / Proportional Accuracy		Surveying Method			
	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical
Control Network Densification and Extension	B-Order 1:1,000,000	2nd-Order Maximum Misclosure e = 0.03 ft. √D	GPS: Static	Digital Level/Bar Code Rods	High Precision Geodetic Network (HPGN)	
Primary Project Control - GPS Base Stations	C1 Order 1:100,000	Maximum Misclosure e = 0.03 ft. √D	GPS: Static	GPS: Static DL: Digital Level/Bar Code Rods TL: 1 Sec Least Count Total Station	Primary Project Control: GPS Base Stations	Primary Project Control: GPS Base Station Elevations
Primary Project Control - GPS Azimuth Pairs	C2-I Order 1:50,000	Maximum Misclosure e = 0.03 ft. √D	GPS: Static	GPS: Static DL: Digital Level/Bar Code Rods TL: 1 Sec Least Count Total Station	Primary Project Control: Azimuth Pairs	Primary Project Control: Azimuth Pair Elevations
Secondary Project Control	C2-II Order 1:20,000	Maximum Misclosure e = 0.03 ft. √D	GPS: Static, Fast Static TPS: Single Route Traverse	BM: Digital Level/Bar Code Rods Baseline Stations: Differential Leveling, GPS, Trigonometric Leveling	Secondary Project Control Survey Baseline Stations	Secondary Project Control Baseline Stations Elevations Bench Marks
Photo Control	C2-II Order 1:20,000	Maximum Misclosure e = 0.03 ft. √D	GPS: Static, Fast Static, Kinematic LRTK, NRTK TPS: Single Route Traverse, Multiple Sideshot, Multiple Observation	Level: Differential Leveling TPS: Trigonometric Leveling GPS: Static, Fast Static, Kinematic	Photogrammetric Ground Control	
Terrain Data (Topographic) Feature Location	C3 Order 1:10,000	Maximum Misclosure e = 0.05 ft. √D	TPS: Radial Sideshots from Secondary Project Control	TPS: Radial Sideshots from Secondary Project Control	Terrain Data (Topographic) Survey Construction Stakeout Survey	
ROW Mapping Feature Location	C3 Order 1:10,000	N/A	TPS: Multiple Sideshots from Secondary Project Control	N/A	Right of Way Mapping Surveys Location of Real Property Monumentation	

Legend:

DL = Differential Level Techniques

TL = Trigonometric Leveling Techniques

TPS = Total Station Positioning System Techniques

GPS = Global Positioning System Techniques

LRTK = Local Real Time Kinematics Techniques

NRTK = Network Real Time Kinematics Techniques

Notes:

- 1) The standards provided in this document are based on the Federal Geodetic Control Subcommittee (FGCS) standards and specifications.
- 2) The maximum misclosure (e) is in hundredths of a foot, and D = distance in miles.
- 3) Network Accuracy: Repeatability of connection to NAD83 or NAVD88 datum at 95% confidence level.
- 4) Local Accuracy: Repeatability of station to station connections at 95% confidence level.