TxDOT Survey Manual

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Manual Notice 2011-1

From: Judy Skeen, P. E., Director, Technology Services Division

Manual: *TxDOT Survey Manual*

Effective Date: April 01, 2011

Purpose

To communicate changes and additions to TxDOT's surveying procedures, as well as provide general reference for surveying procedures performed by and for the Texas Department of Transportation (TxDOT).

The further intent of this manual is to incorporate changes in technology and the evolution of surveying methodologies and policies at TxDOT. This manual is for use by TxDOT employees, TxDOT contractors and consultants.

Contents

This manual provides information on the use of surveying technology to perform surveys at the state and district level, including small-scale mapping projects.

This manual also incorporates appropriate reference material for surveying as well as the laws, rules, and regulations adopted by the Texas Board of Professional Land Surveying (TBPLS) to ensure TxDOT's compliance with all applicable laws.

Overall Changes

Minor changes and edits were made throughout the manual for grammar, correctness, and clarity.

Specific Changes

Chapter 3, Preliminary Surveying

Re-numbered figures throughout the chapter due to deletions and replacement mentioned below.

Section 4, Photogrammetry

- Deleted Figure 3-1, Ground Control Submission Form (2154). Replaced the figure with a link directly to the form.
- Replaced previously numbered Figure 3-4, Example of Control Target Layout and Naming with updated version. Figure 3-4 re-numbered to Figure 3-3.

Section 5, GPS Surveying

- Deleted Figure 3-6, Sample GPS Log Sheet. Replaced the figure with a table.

Chapter 5, Right of Way Surveying

Re-numbered figures throughout the chapter due to deletions mentioned below.

Section 4, ROW Mapping Requirements

- Deleted Figures 5-1 through 5-11. Replaced figures with a table containing links to the sample ROW parcels.

Section 5, ROW Map Components

- Deleted Figure 5-12. Replaced the figure with a link to the sample ROW title sheet.
- Deleted Figure 5-13. Replaced the figure with a link to the sample ROW map sheet.

Instructions

Users are encouraged to print this manual double-sided from the PDF. To ensure manual currency, check the publishing date of printed manuals against the manual found on the General Services Division Online Manuals System website.

Contact

Please address your comments, concerns, or questions regarding this manual's information policies, guidelines, procedures, and practices to the TxDOT Standing Committee on Surveying (SCOS).

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Manual Notice 2010-1

From: Judy Skeen, P. E., Director, Technology Services Division

Manual: *TxDOT Survey Manual*

Effective Date: June 01, 2010

Purpose

To communicate changes and additions to TxDOT's surveying procedures, as well as provide general reference for surveying procedures performed by and for the Texas Department of Transportation (TxDOT).

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Overall Changes

The *TxDOT GPS User's Manual* has been incorporated into the *TxDOT Survey Manual*. The *TxDOT GPS User's Manual* is now retired.

The manuals figures and tables were renumbered as necessary to accommodate those from the *TxDOT GPS User's Manual*. Minor changes and edits were made throughout the manual for grammar, corrections, and clarity.

Specific Changes

Chapter 1, Introduction

Section 3, Manual Overview

- Updated information under Manual Creation subheading

- Added new subsection, How to Get Help

Section 4, Standing Committee on Surveying

- Under the subheading, Committee Background and Members updated 4th paragraph to reflect current Standing Committee on Surveying members

Chapter 2, General Surveying Procedures

Section 1, General Surveying Procedures

- Under subsection, 22 Texas Administrative Code §663.16. Boundary Construction
  - Added third bullet
  - Added information to 3rd paragraph beneath last bullet regarding record data
- Under subsection, 22 Texas Administrative Code §663.17. Monumentation, added detailed information regarding an electronic copy of a written description
- Under subsection, 22 Texas Administrative Code §663.19. Plat / Description / Report, added several paragraphs referring to preliminary documents

Section 3, Introduction to Surveying

- Added the following 5 subsections from the *TxDOT GPS User's Manual*:
  - Planning
  - Reconnaissance
  - Satellite Health and Availability for GPS Surveying
  - Sky Visibility for GPS Surveying
  - Satellite Geometry for GPS Surveying
- Added new paragraph regarding TxDOT feature codes in Trimble format under subheading, Data Collection subsection.

Added the following sections from the *TxDOT GPS User's Manual*:

- Section 4, Surveying with GPS
- Section 5, Coordinate Systems
  - Updated Figure 2-1. CORS Stations and TxDOT RTK Networks
- Section 6, Units and Data
  - Added new paragraph under subheading, Surface Coordinates vs. State Plane Grid Coordinates
- Section 7, Metadata

Chapter 3, Preliminary Surveying

General Changes

- Deleted the following tables: Table 3.2 TxDOT Local Accuracy Classification for GPS, and Table 3.3 TxDOT Network Design Specifications for GPS.
  - Renumbered the chapter tables due to the deletion of some tables and the addition of others from the *TxDOT GPS User's Manual*.

Specific Changes

- Added the following tables from the *TxDOT GPS User's Manual*:
  - Table 3.2 TxDOT Level of Survey Accuracy
  - Table 3.7 Minimum Observation Times for Survey Levels 2 and 3
  - Table 3.11 Minimum TxDOT Network Design Specifications
  - Table 3.12 Steps in Processing the Data
  - Table 3.13 Office Procedures Guidelines

Section 1, Horizontal Control Surveys

- Added the following subsections from the *TxDOT GPS User's Manual*:
  - GPS Control (formally "Control")
  - Monumentation for New Stations
  - Tolerances
  - Accuracy Standards
  - TxDOT Standard Levels of GPS Accuracy
- Edited Table 3.2 TxDOT Level of GPS Accuracy to remove, "Wing Panels for Horizontal Positions" from Level 4
  - Removed paragraph under Table 3.2 regarding wing panels

Section 2, Vertical Control Surveys

- Edited last paragraph under Field Methods to add reference information
  - Added subsection, GPS Orthometric Height from the *TxDOT GPS User's Manual*

Section 5, GPS Surveying

- Edited information under subsection, Level 3 Surveys and subsection, Level 4 Surveys
- Added 12 subsections from the TxDOT GPS User's Manual
  - Data Collection Forms
  - Static Observations Field Procedures
  - RTK field Procedures
  - Rover Settings

- Rover Initialization
- RTK for Wing Panels
- RTK for Topographical Surveys
- GPS Receiver
- GPS Antenna
- GPS-RTK Rover Rod
- Tripods
- Tribrachs

- Changed previous Figure 3-6 to a non-numbered table, Examples of Horizontal & Vertical Map Check Statistical Computations, for better readability
- Added Table 3.6 TxDOT GPS Positioning Specifications
- Updated TxDOT Regional Reference Points (RRP) map, Figure 3-7

Added Section 6, Internet Resources, from the *TxDOT GPS User's Manual*

Section 7, GPS Static Surveying

- Added 7 subsections from the TxDOT GPS User's Manual
  - FastStatic (Rapid Static) Positioning
  - Troubleshooting Problematic Baselines
  - Network Baseline
  - Accuracy Standards for Network Baselines
  - Example of a Network Design Procedure
  - Minimally Constrained Adjustment
  - Fully Constrained Adjustment

Section 9, Geodetic Surveying

- Made minor correction in example solution information under subsection, Geodetic Azimuth to Grid Azimuth

Chapter 4, Design Surveying

Section 1, Descriptions and Definitions of Survey Types

- Renumbered tables as necessary
- Added the following subsections from the *TxDOT GPS User's Manual*:
  - Monumentation for New Stations
  - Naming Convention for Level 1 and Level 2 Monuments

- Control Point Data Sheets

- Added Table 4.2 Standard County Designer Codes from *TxDOT GPS Users' Manual* (was Figure 6-1 in that manual)
- Edited Table 4.3 Control Point Data Sheets for:
  - Northing, Easting, and Combined Adjustment Factor decimal places correction
- Edited Table 4.4 TSPS Manual of Practice Chart for Tolerances for Conditions for:
  - Second row, "Error in Traverse Closure," second column made minor corrections
- Added Section 4, Surveying Vertical Networks with GPS from *TxDOT GPS User's Manual*.

Chapter 5, Right of Way Surveying

Section 3, Field Work Instructions

- Under subsection, Information Provided by the State for ROW Mapping, added text regarding authorization to 7th bullet

Changes to Appendices

- Appendix A, contains the References, which was added from the *TxDOT GPS User's Manual*
- Appendix B, remains Second Term Calculations
- Appendix C, remains Monumentation
- Appendix D, contains the Glossary
  - Merged the terms and definitions from the *TxDOT GPS User's Manual*.

Changes to Index

- Added pertinent terms and information from the *TxDOT GPS User's Manual.*

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Manual Notice 2008-1

From: Judy Skeen, P. E., Director, Technology Services Division

Manual: *TxDOT Survey Manual*

Effective Date: January 01, 2008

Purpose

To communicate changes and additions to TxDOT's surveying procedures and information, as well as provide general reference for surveying procedures performed by and for the Texas Department of Transportation (TxDOT).

The further intent of this manual is to incorporate changes in technology and the evolution of surveying methodologies and policies at TxDOT. This manual is for use by TxDOT employees and TxDOT contractors and consultants.

Contents

This manual provides information on the use of surveying technology to perform surveys at the state and district level, including small-scale mapping projects.

This manual also incorporates appropriate reference material for surveying as well as the laws, rules and regulations adopted by the Texas Board of Professional Land Surveying (TBPLS) to ensure TxDOT's compliance with all applicable laws.

Changes

Chapter 2, General Surveying Procedures

- Section 3, Introduction to Surveying, subsection, Survey Review and DTM replaced first sentence for clarification

Chapter 3, Preliminary Surveying

- Section 1, Horizontal Control Surveys, edited information in subsection, Monuments for correction and clarity
- Section 1, Horizontal Control Surveys, corrected, Table 3.1 TSPS Tolerances for Conventional Traverse (Category 7)" title, added "Category 7"
- Section 2, Vertical Control Surveys, edited information in subsection, Monuments for correction and clarity

- Section 2, Vertical Control Surveys, corrected title, Table 3.4 TSPS Table of Tolerances for Conditions (Category 8)"
- Section 4, Photogrammetry - replaced entire section
- Section 5, GPS Surveying - edited the following subsections for correction and clarity:
  - Level 5a Surveys. Also added new level, "Level 5b"
  - Level 6 Surveys
  - Level 7 Surveys
  - Requirements and Specifications
  - Equipment and Software
  - Datum and Project Control, 7th paragraph
- Section 6, GPS Static Surveying the following items were changed:
  - updated title of Table 3.7, changed from "Planning" to "GPS Static Observation Planning"
  - Table 3.12 changed to Table 3.7
  - Table 3.13 changed to Table 3.8
  - Table 3.14 changed to Table 3.9
- Section 8, Geodetic Surveying, in subsection, Choosing an Appropriate Project CAF removed the first three paragraphs and replaced with new wording

Chapter 4, Design Surveying

- Section 1, Descriptions and Definitions of Survey Types:
  - edited information in subsection, Monuments for correction and clarity
  - edited information in subsection, Horizontal Control for correction and clarity
- Section 3, Trigonometric Leveling. Added information to this section

Chapter 5, Right of Way Surveying

- Section 4, ROW Mapping Requirements. Edited subsection, Texas State Plane Coordinate System for correction and clarity
- Section 5, ROW Map Components. Edited subsection, Certification and Monuments for correction and clarity

Appendix C, Monumentation

- added Appendix C, Monumentation explains TxDOT approved monument settings in various soil conditions with examples and figures

Supersedes

This revision of the *TxDOT Survey Manual* supersedes the last revision, dated January 2006.

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Manual Notice 2006-1

To: Users of TxDOT Information Resources

From: Judy Skeen, P. E., Director,
Information Systems Division

Manual: *TxDOT Survey Manual*

Effective Date: February 1, 2006

Purpose

To provide general reference for surveying procedures performed by and for the Texas Department of Transportation (TxDOT). The publication of this manual establishes minimum standards, policies, and procedures of surveying for TxDOT.

The further intent of this manual is to incorporate changes in technology and the evolution of surveying methodology and policies at TxDOT.

This manual is for use by TxDOT employees and TxDOT contractors and consultants. Development of this manual provides users with the concepts, policies, standards, procedures, and practices that govern TxDOT surveying functions.

Contents

This manual provides information on the use of surveying technology to perform surveys at the state and district level down to small-scale mapping projects. Additionally, Appendix A provides a glossary for definitions of terms used within the manual.

This manual also incorporates appropriate reference material for surveying as well as the laws, rules and regulations adopted by the Texas Board of Professional Land Surveying (TBPLS) to ensure TxDOT's compliance with all applicable laws.

Supersedes

The online *TxDOT Survey Manual* supersedes the TxDOT Survey Guide dated, February 1999.

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