Survey Field Note Standards

October, 2006
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Purpose and Intended Use

The purpose of this document is to provide standards for recording survey field notes and supporting electronic data on Oregon Department of Transportation (ODOT) projects.

These standards are to be adhered to by all ODOT surveyors and private surveyors doing work for ODOT under contract.

As with any ODOT survey policy, deviation from the standards shall only be permitted in unusual situations, where logic and reason so dictate. Any deviation from the standards requires that the ODOT Chief of Surveys be notified and the deviation documented in the field survey narrative.

This is a living document, it may be updated often to adapt to new procedures developed in response to rapidly changing technology. For the most current version go to Geometronics Web Site.

There are sections of the document that are void of information. In those situations, there are no specific requirements beyond those that are described in “Elements Common To All Survey Field Notes”. Those sections will be revised as specific needs arise.

Suggested changes and any errors discovered in the document should be forwarded to the ODOT Chief of Surveys for consideration.

How to use this document

Read and follow all items described in “Elements Common to All Survey Field Notes”

and

Read and follow all items described in the section specific to the survey task being performed.
What Constitutes Original Survey Field Notes?

Field Notes are generally considered to be one of the most important aspects of a survey. In many cases it may be the only remaining evidence that we have of the conditions at the time of the survey. All field notes must be recorded at the time the work is being done. A surveyor’s (and thus ODOT’s) competency and credibility may be judged by the quality of the field notes.

In the case of electronic data collection, ODOT considers “original field notes” to be the combination of the original electronically collected data and supporting hand written field notes.

All original field notes should be done in pencil and cannot contain CAD drawings, transcribed voice recordings, or any processed or ‘resultant’ data. However, processed data such as digital photos may be attached to the field notes as supporting information.

Elements Common to All Survey Field Notes

- Field notes must be recorded at the time of the survey.
- Field notes will be recorded on official ODOT forms.
- Field notes will be recorded using pencil, with lead appropriate for the conditions.
- Each Electronic Data Collection File shall be accompanied by its own set of field notes.
- If corrections to the notes are necessary, a line will be drawn through the error (without obscuring it) and the correct value or information written adjacent to it. Any entries made to the field notes subsequent to the actual survey should be shown in RED.
- Each set of field notes shall have a title sheet. Use the same form as required by the specific task, except in the case of electronic data collection, where Form #734-2135A is to be used.
• The full names of all crew members, who participated in the survey described in the field notes, will be recorded on the title sheet. It is acceptable to use crew member initials on individual pages.

• The instrument operator, rod person and note keeper will be identified on each page of the field notes.

• Page numbering will be in normal “book” format. The Title page will be “1”, the next left page “2”, the next right page “3” ...

• A “special notes” or “legend” page will be used if notes contain non-standard abbreviations or symbols.

• Code information will not be recorded in the notes as numeric values. Instead, the intent of the code will be described in plain language.

• It is acceptable to record approximate Latitude/Longitude positions for Control Points, or other objects, in the field notes as an aid to future surveyors attempting to find the item. These positions will not substitute for a vicinity sketch, where required. Typically, the position would be attained through the use of a handheld navigation grade GPS receiver. If this option is used, the field note title sheet must contain a statement describing the accuracy of the Latitude/Longitude positions shown.

• Additionally, all electronic data collection notes will also include the following:

Each time the instrument is set up the field note will contain a “Setup Line”. This will include: Instrument @ Point (#), height of instrument, description of occupied point, Backsight @ Point (#), description of backsight point, and height of backsight target.

Survey Tasks

Horizontal Control Networks

<table>
<thead>
<tr>
<th>Form Number</th>
<th>Point Number Range</th>
<th>Example on Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>734-2135</td>
<td>1 - 499</td>
<td>16 &amp; 17</td>
</tr>
</tbody>
</table>
Horizontal control network notes will include:

- A Sketch for each instrument setup showing the network points and lines of observation.

- A vicinity sketch for each point in the network. The sketch is only necessary the first time the point is referenced in the notes. The sketch should have just enough detail to help future surveyors find the point, and should not be a time consuming task.

- North arrow (up or to the left of the page).

- Detailed descriptions of monuments.

- The last page(s) of network notes may have an overall schematic of the entire network.

- No electronically captured measurement data (Horizontal Angles, Vertical Angles or Slope Distances) should be recorded in the field notes.

- Form #734-3185 “Report on Survey Mark” will be filled out and submitted to Geometronics reporting the condition of all HARN, Triangulation Station, PLSS, and other found government survey control monuments. This is done so that Geometronics can update it’s records and/or forward the information to the responsible agency.

- Form #734-2298 “Project Notification to County Surveyors” will be filled out and submitted to the appropriate County Surveyor providing a list of all the PLSS monuments within the project limits. A copy of the form will also be included in the Location packet to be eventually forwarded to the Construction Project Manager.

### Vertical Control Networks

<table>
<thead>
<tr>
<th>Form Number</th>
<th>Point Number Range</th>
<th>Example on Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>734-2135 (Digital)</td>
<td>9,000 – 9,999</td>
<td></td>
</tr>
<tr>
<td>734-3034 (Optical)</td>
<td>TP1, TP2, TP3 . . .</td>
<td>19</td>
</tr>
</tbody>
</table>

Vertical control notes will include:
• Detailed descriptions for benchmarks and temporary benchmarks.

• Rubbings, sketches, or photographs of the benchmark monument will be included in the last page(s) of the notes.

• The record elevations of benchmarks shown.

• Digital level notes will not include measurement data.

• Closure information (permitted and actual)

• Form #734-3185 “Report on Survey Mark” will be filled out and submitted to Geometronics reporting the condition of the benchmark.

• When Leveling through existing points use the numbers previously assigned to those points.

### Mapping (Planimetric and DTM)

<table>
<thead>
<tr>
<th>Form Number</th>
<th>Point Number Range</th>
<th>Example on Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>734-2135</td>
<td>50,000 and Up</td>
<td>20</td>
</tr>
</tbody>
</table>

Field notes for the mapping of Planimetric and DTM features will include:

• An entry, including the running Topo point number, if the associated code is not completely self explanatory. This reduction in note keeping requires appropriate field communication/verification procedures to minimize data entry errors.

• Any standard ODOT survey abbreviation. Any non-standard abbreviation used shall be noted in a “special notes” page attached to the field notes.

• Running point number and target height for each Backsight/Elevation Check-in measurement.

• No electronically captured measurement data should be recorded in the field notes.
• All changes in rod height noted with a brief HR=(new rod height)

• Any point or line not having a predetermined code, typically entered as a Generic Point or Line.

• Descriptions or details about items that are not fully described by the associated code.

• The following routinely collected features will require recording additional data as shown:

  Approaches: type
  Barriers: type, condition
  Bents: if required, note dimensions, construction, condition
  Box Culverts: note dimensions, condition, and any other important characteristics of culvert such as end treatments
  Curb: type, condition, construction
  Fences: construction, height, condition
  Gates: construction, dimensions, condition
  Guardrails: type, condition, exposure
  Inlets: size, invert, condition, type of pipe
  Manholes: invert, pipe location, cone rotation
  Pipes: size, construction, condition
  Poles: owner, number, construction, transformers, where wires go
  Signs: post, size, condition, legend, construction, direction facing
  Trees: species (or common name), size (diameter at breast height)
  Walls: width, construction, condition
  Water flow: if practical, note flow direction of open water channels

Other specific circumstances may require such additional information as: doorway elevations, water valve depths, wire heights, etc.

The additional data listed above does not need to be recorded if it had been previously collected as part of the project’s Roadside Inventory, Sign Log, or Drainage Study.
• Any complex coding such as Template Definitions must be recorded in the field notes.

### Strategic Points

<table>
<thead>
<tr>
<th>Form Number</th>
<th>Point Number Range</th>
<th>Example on Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>734-2135</td>
<td>500 - 799</td>
<td></td>
</tr>
</tbody>
</table>

Field Notes for Strategic Points will include:

• Point number and target height.

• Detailed descriptions of points.

### Controlled Strategic Points

<table>
<thead>
<tr>
<th>Form Number</th>
<th>Point Number Range</th>
<th>Example on Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>734-2135</td>
<td>800 - 999</td>
<td></td>
</tr>
</tbody>
</table>

Field Notes for Strategic Points will include:

• Point number and target height.

• Detailed descriptions of points.

### Monument Ties

<table>
<thead>
<tr>
<th>Form Number</th>
<th>Point Number Range</th>
<th>Example on Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>734-2135</td>
<td>1000 - 2999</td>
<td>18</td>
</tr>
</tbody>
</table>

Field Notes for Monument Ties will include:

• A sketch for each Setup showing the Occupied Point, Backsight and Monuments tied.

• Point numbers.

• A detailed description of Monuments.

### Cross-Sections
Field Notes for Cross Sections using traditional methods with a level & tape will:

- Be recorded with centerline going from the bottom to the top of the page. Terrain to the right of centerline will be recorded on the right page, and left of the centerline on the left page.

- The Station for the cross-section will be recorded in the appropriate column on both (left and right) pages.

- Elevations may be recorded in plus or minus values from centerline, or in elevations relative to the project datum.

- Record all topographic information encountered along the cross-section in the row above the cross-section data.

- For cross-sections that are not perpendicular to the centerline, the skew angle must be noted.

Profiles

Field Notes for Profiles using Mechanical/Optical levels will:

- Be recorded from top to bottom of the page. The direction of the profile may, or may not, be ahead on centerline.

- The left page will contain six columns (from left to right); Station, Backsight, Height of Instrument, Foresight, Profile Elevation, and BM Elevation.

- The right page will contain description of points as needed.

Culvert Staking

(culvert data sheet)
Alignment Staking

Field Notes for Alignment Staking using traditional methods without on-board programs will:

- Be recorded from the bottom to the top of the page (with centerline going up the page).
- The left page will contain four columns (from left to right; Station, Deflection, Long Chord, and Description).
- The right page will contain a diagram of the alignment segment detailed in the left page.

Construction Feature Staking

Referencing (points & lines)

Slope Staking

Re-measure / pay quantities
Log Files

Most on-board instrument programs currently in use by ODOT survey crews generate a log file that records information about the particular activity being performed.

Some of the on-board programs record data to both the program’s log file, and to the raw data “gsi” file when pressing the “store” button on the instrument. The log file contains resultant and/or reformatted data, along with other pertinent data such as; program name, date, equipment number, etc., while the “gsi” file contains only the actual raw measurements.

A complete and proper record of the survey would include the log file, raw data, and in some cases the supporting hand written field notes.

An electronic copy of any log file generated will be saved in the “reports” subfolder and handled similarly to other electronic data associated with field notes described in this document.
Electronic Data Handling

The diagram above shows the standard file and folder organization structure for each project. Each project will have a primary folder named xxxxx (where xxxx is the 5 digit key number)

- The folder named “Consult” will contain all survey data delivered by any consultants working on the project.
- The folder named “Correspondence” will contain all correspondence sent or received by the surveyors involved in this project.
- The folder named “Final_Products” will contain all the final project products. These include the Key#.dgn, Key#.dtm and Key#.alg.
- The folder named “Geodetic” will contain all data related to Geodetic Control. This folder is only necessary if the project involved Geodetic Control.
- The folder named “GSI” will contain edited gsi files.
• The folder named “InRoads_Survey” will contain all working files. These include: .rwk, .fwd, .dtm, .alg, .dgn and .xin.
• The folder named “LGO” will contain all the LGO (GPS) project files.
• The folder named “Orig_GPS” will contain all the original DBX data files. These files are to be created, and placed in this folder, when LGO prompts the user to ‘Create a backup’ after importing DBX data.
• The folder named “Orig_GSI” will contain “write protected” or “Read-only” original raw data files.
• The folder named “Photos” will contain Digital Photographs.
• The folder named “Reports” will contain log files, Sets Summaries, Least Squares, Confidence Point, and other survey related reports.
• The folder named “Stakeout” will contain layout data.
• Any of these folders may have sub-folders under them as need to the specific for the project.

Survey Data Backups

The survey crew chief is responsible for the organization, storage, and backups of survey related data.

Data Backup technology and related processes are constantly evolving. Refer to the appropriate document that describes the current procedures for backing up project data.
File Naming Standards

The following table describes ODOT's File Naming standards for survey data:

<table>
<thead>
<tr>
<th>File Name</th>
<th>For Survey Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>xxxxxxxy.yyy.zzz</td>
<td>Mapping (Topography)</td>
</tr>
<tr>
<td>xxxxxxxy.yyy.zzz</td>
<td>Horizontal Control Networks</td>
</tr>
<tr>
<td>xxxxxxxy.yyy.zzz</td>
<td>Monument Ties</td>
</tr>
<tr>
<td>xxxxxxxy.yyy.zzz</td>
<td>Levels (Elevations)</td>
</tr>
<tr>
<td>xxxxxxxy.yyy.zzz</td>
<td>Controlled Strategic Points</td>
</tr>
</tbody>
</table>

Where (xxxxx) = 5 digit project key number
(yy) = 2 digit serial number
(zzz) = 3 digit extension (from table below)

<table>
<thead>
<tr>
<th>Extension</th>
<th>For</th>
</tr>
</thead>
<tbody>
<tr>
<td>.gsi</td>
<td>Raw Data Files (downloaded from collector)</td>
</tr>
<tr>
<td>.sav</td>
<td>“Write protected” or “Read-only” original Raw Data Files (downloaded from collector)</td>
</tr>
<tr>
<td>.lev</td>
<td>Digilev Reports</td>
</tr>
<tr>
<td>.cpg</td>
<td>Confidence Point Ground Elevation Reports</td>
</tr>
<tr>
<td>.cpm</td>
<td>Confidence Point Model Elevation Reports</td>
</tr>
<tr>
<td>.cpa</td>
<td>Confidence Point Analysis Reports</td>
</tr>
</tbody>
</table>
# Point Numbering Standards

The following table describes ODOT’s Point Numbering standards for survey data:

<table>
<thead>
<tr>
<th>Item</th>
<th>Starting Number</th>
<th>Ending Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geodetic Control Monuments</td>
<td>Alphanumeric Name</td>
<td></td>
</tr>
<tr>
<td>Horizontal Control Network Points</td>
<td>1</td>
<td>499</td>
</tr>
<tr>
<td>Strategic Points</td>
<td>500</td>
<td>799</td>
</tr>
<tr>
<td>Controlled Strategic Points</td>
<td>800</td>
<td>999</td>
</tr>
<tr>
<td>Found Monuments</td>
<td>1,000</td>
<td>2,999</td>
</tr>
<tr>
<td>Photo Pre-Marks (Pre-2003, Do Not Use)</td>
<td>3,000</td>
<td>4,999</td>
</tr>
<tr>
<td>Set Monuments</td>
<td>5,000</td>
<td>6,999</td>
</tr>
<tr>
<td>Photo Pre-Marks (w/GPS Elevations)</td>
<td>7,000</td>
<td>7,999</td>
</tr>
<tr>
<td>Photo Pre-Marks (w/Differential Elevations)</td>
<td>8,000</td>
<td>8,999</td>
</tr>
<tr>
<td>Differential Leveling Turn Points</td>
<td>9,000</td>
<td>9,999</td>
</tr>
<tr>
<td>Miscellaneous Points for Construction</td>
<td>10,000</td>
<td>14,999</td>
</tr>
<tr>
<td>Reserved for Future Use</td>
<td>15,000</td>
<td>49,999</td>
</tr>
<tr>
<td>Topographic Features</td>
<td>50,000</td>
<td>None</td>
</tr>
</tbody>
</table>

These are the Point Numbers to be written on stakes, recorded in the field data, and written in the field notes at the time of the survey. After processing the data in CAiCE (ODOT’s current survey software), the feature name will be added to the Point Number (as a prefix) to create a Point Name. This Point Name will only be used within CAiCE.
Archiving

Hardcopies of Field Notes

When a project is completed, the original field notes and hard copies of any electronic data dealing with project control and monument ties will be sent to:

Oregon Department of Transportation
Geometronics Unit – Maps and Plans Center
Transportation Building, Room 29
Salem, OR 97310
Contact: Lloyd Bledsoe
(503) 986-3792
lloyd.bledsoe@odot.state.or.us

Verify Contact before sending packet

Copies of the archived notes (described above) and the remaining original Location survey notes for the project will be sent to the Construction Project Manager’s office, where it will be stored for 5 years after the completion of construction before being destroyed.

Electronic Data

When a project is completed or shelved for a lengthy period, all associated data related to the project should be archived. The survey crew chief is responsible for assuring that all survey related data is organized and archived.

Archiving technology and related processes are constantly evolving. Refer to the appropriate document that describes the current procedures for archiving project data. This information is available on the Geometronics Web site.
Examples

Electronic Data Title Sheet (form #734-2135A)
Example 2

Example Network Notes (form #734-2135)
Example 3

Example Monument Tie Note (form #734-2135)
Example 4

Example Optical Level Circuit (form #734-3034)
Example 5

Example Topo Notes (form #734-3025)
Example 6

Example Profile Notes (form #734-3034)
Example 7

Example Cross Section Note (form #734-3032)
Example 8

Example Reference Point Notes (should be on form 734-3033)
Example 9

Example Culvert Staking Note (this is a non standard form)
Example 10

Culvert Data Note (form 734-3247M)
Rubbings & photos

There are several methods for providing an accurate image of monument details in field notes. Sketches and or rubbings will still be done, though the use of digital photos as additional information is becoming more commonplace.

Digital photo of ODOT station “09294-5”

Rubbing of ODOT Station “Billy”