



## **DIVISION 1300 -- PROJECT SURVEYS**

### **1300.01 GENERAL REQUIREMENTS**

- A. General. Horizontal and Vertical Control. *SSHC Section 114*, Construction Surveying, requires that certain vertical and horizontal control stakes be set for the various items of work to be constructed. This is interpreted to mean the Department will provide the contractor with sufficient intermediate grade and alignment points or stakes, so the contractor can construct the work according to contract documents. Remember the contract plans were created from the preliminary survey which may be several years old by the time construction starts.
- B. Grade And Alignment Stakes. When grade and alignment stakes, including intermediate points, are set by an NDR survey crew, the Department will be responsible for correctness of staking. The contractor shall be responsible for the correct transposing of data from the construction stakes to the work.
- C. Staking. Refer to NDR training book "Introductory Surveying" for instructions on construction staking for the various types of work (Use the stock control number "70-79600" to obtain the manual from Logistics.). District 4 has a written a "Preliminary Survey Manual" that is available on the "Network Neighborhood". There is also a GeoPak Course Guide "NDOR Survey with GeoPak Survey 98" available from Roadway Design.
- D. The Department's ROW Line. The Department's ROW line is not usually placed by registered land surveyors. Therefore it is not usually a legal description of our boundary. Use of rebar to mark the Department's ROW can be misleading. Our NDOR caps should be treated as "temporary" monuments.
- E. Consultant Survey Data. Consultant survey data must be electronically compatible with GeoPak.
- F. Consultant Surveyors. Consultant Surveyors must provide reports of all on site survey activity either in advance of the activity or immediately following the activity so the Department can readily check all stake locations and other survey information provided.
- G. Survey Accuracy
  - 1. The required accuracy for construction survey staking are as shown in Table 1300.1a.
  - 2. The required accuracy for construction survey closures are as shown in Table 1300.1b
  - 3. Bench levels, control points, and any significant location should be checked against two known locations.
  - 4. All computations should be checked by someone on the survey crew, other than the person who did the initial computation. The check should be done in the field while still on site.

**Table 1300.1A**  
**Survey Staking Accuracy Requirements\***

<b>Description</b>	<b>Metric (m)</b>	<b>English (ft.)</b>
Alignment (Project) PI's, PT's, etc. and CP's/BM's	0.003	0.01
Farmstead Drives	0.3	1
Field Entrances	0.3	1
County Roads	0.03	0.1
Intersecting Highways	0.003	0.01
Telephone Poles/Power Poles (offset)	0.3	1
Drainage Pipes (Stationing)	0.3	1
Length of Pipe	0.3	1
Box Culverts (Stationing)	0.3	1
Length of Pipe	0.03	0.1
Bridges (Stationing)	0.003	0.01
Wells (Stationing/offset)	0.3	1
Cross-Section Slope Stakes; Rough Grading Stakes; Hub Line	.03	.1
Final Grading (Blue Tops)	.015	.05
Paving Hubs	.0063	.01
POT, PI, PC, PT, ETC	0.003	0.01

**\*All locations are to be based on a known location and checked against another known location.**

<b>Table 1300.1B</b> <b>Maximum Closure Allowance For Survey Tasks And Activities*.</b> <b>(Checking In At A Known Bench Or Other Control Point)</b>		
<b>Activity</b>	<b>Conventional Survey Methods. (Differential Leveling)</b>	<b>Modern Survey Methods (Total Station Type, Trigonometric Level, Survey)</b>
Paving Hubs	< or = 0.05' vertically. (Always adjust out any error encountered on paving grades) Horizontally hubs should always be set sighting thru to the next point, eliminating any error.	It's not recommended that you set paving hubs using this method. As vertical control is not as accurate using trigonometric methods.
Blue Tops	< or = .07' vertically. (Always adjust out any error encountered on blue top grades) Horizontally hubs should always be set sighting thru to the next point eliminating any error in the alignment. Outside hubs should be set pulling a tape perpendicular to centerline.	< or = .07' for vertical closure. < or = to .15' for horizontal closure
Slope Staking	< or = 0.10' vertically. Horizontal alignment is established pulling a tape perpendicular to centerline.	< or = 0.10' vertically. < or = .50' horizontally
Bridges:	< or = .01' horizontally and vertically	It's not recommended that you stake bridges using this method. . As vertical control is not as accurate using trigonometric methods.
Culverts	< or = 0.10' vertically. < Or = to 0.5' horizontally	< or = .10' vertically. < or = 0.5' horizontally
Cross-Sections & Borrow Pits	< or = .15' vertically. < or = 1.0' horizontally	< or = .15 vertically. < or = 1.0' horizontally
Bench Levels	Use formula- .05' multiplied by square root of miles. Any error should be adjusted out thru the entire level run. Use .035' for preliminary bench levels.	It's not recommended that you established benches using this method. . As vertical control is not as accurate using trigonometric methods.
Alignment	< or = .05' horizontally	< or = .05' horizontally
Storm Sewer Systems	< or = 0.05' vertically. < or = to 0.1' horizontally. NOTE: Inlets need to be accurate within a couple of hundreds from centerline to insure proper placement of wall, back of curb and inlet throat.	< or = 0.05' vertically. < or = to 0.1' horizontally.

\*All units are represented in feet.

\*Note: Under no circumstance should accuracy be compromised. This chart is only to be used as a guide to help you understand the closure tolerance that may be allowed before you need to take the time reviewing your work. These numbers may not fit all situations. If you have any questions it's best to consult with your project manager.