

**Section D**

**NSPS MODEL STANDARDS**

**FOR CONSTRUCTION LAYOUT SURVEYS**

Approved 3/12/02

**1. INTRODUCTION**

A professional surveyor (Surveyor) shall approach the task of construction staking in precisely the same manner as any survey in which a high degree of competence is required. The public welfare shall be paramount in the Surveyor's decision to take on such a task.

Surveyors shall only concern themselves with the direct interpretation of an approved set of plans. It is not the responsibility of the Surveyor or the surveyor's staff to correct or revise erroneous architectural or engineering plans. If the approved design plans are found to lack sufficient information for proper layout, the Surveyor shall immediately notify his client, the owner, the engineer and/or architect responsible for the project.

Proper field procedures shall be employed to ensure correct placement of construction stakes or other control. Appropriate precautionary measures shall be taken to protect the Surveyors employees, agents, and others from undue physical risks associated with construction projects.

**2. PROCEDURAL STANDARDS**

**A. Preliminary Research and Planning**

The Surveyor shall:

1. Obtain from the client, or other proper sources, the approved contract documents (plans and specifications) setting forth the project for which the layout survey is to be performed.
2. Determine the appropriate number of horizontal and vertical monuments to be established and the relationship of those monuments to construction lines, grades and offsets.

## **B. Analysis of Research and Preliminary Conclusions**

The surveyor shall:

1. Examine and analyze the data.
2. Test the consistency of the data and bring any inconsistencies to the attention of the client.
3. Plan the necessary methods and procedures for conducting the construction survey.

## **C. Field Investigation and Layout**

The Surveyor shall, in coordination with the client:

1. Search for and substantiate monuments, lines or objects indicated by the construction documents as the intended references for the horizontal and vertical project datum.
2. When necessary, establish, adjust and monument the control points and lines needed to perform the layout survey.
3. Establish the final layout control monuments in proper relationship to construction lines and grades.
4. Obtain sufficient check measurements to verify the work.
5. Record all information on/in an appropriate form.
6. Immediately bring to the attention of the client or his designated representative any inconsistencies disclosed by the survey or by examination of the plans.
7. Refuse to set layout monuments for any inconsistent portion of the project until authorized to do so in writing by the client.

## **3. TECHNICAL MINIMUMS**

### **A. Measurements**

Measurements shall be obtained with an accuracy compatible with Section 4 of these construction standards or as required in a written agreement with the client or within the construction documents.

## **B. Monumentation.**

1. Construction layout monuments shall be of a type and character consistent with intended use.
2. Monuments shall be set in a manner providing a degree of permanency consistent with the terrain, physical features and intended use.
3. Sufficient monuments and offset information shall be provided to enable the user to check the accuracy of any point or line established therefrom.
4. Monuments shall be witnessed in a manner that will allow them to be easily found by the user for a reasonable period of time. Any witness stakes or laths that show offsets and/or cut-and-fill data should be labeled with sufficient information to identify the position of the point being referenced.

## **C. Field Notes**

All pertinent information, measurements and observations made in the field during the course of the survey shall be recorded on an appropriate form (e.g., cut sheet) and in a manner that is clear and legible.

## **D. Presentation of Data**

When requested, the client shall be furnished with the results of the survey on an appropriate form, such as plats, maps, grade sheets, etc. It is important to note that to be effective and useful, any document depicting completed fieldwork must be prepared in a timely manner and reviewed by the client prior to construction taking place. The form selected should show the following:

1. The client's name, date of the fieldwork, file number and the Surveyor's name, address, signature and registration number.
2. A location description of the project referenced to the title description and political subdivision or to the geographic location, and when appropriate, the specific description of the constructed facility surveyed.
3. The identification of the construction documents used in the survey, a statement as to whether they were marked on their face as "approved," and the date of their latest revision.
4. Sufficient information to reference the layout to the construction documents.
5. Identification of the horizontal and vertical datum on which the survey was based and the specific descriptions of the monuments that were used.
6. North arrow and scale.

7. Horizontal dimensions and directions with sufficient notations to indicate their source, such as per plans or calculated from data shown on plans.

8. All pertinent monuments with a notation indicating which were found and which were set, and identified as to their character. Found monuments should be accompanied by a reference as to their origin when it is known. Where there is no available documented reference, this should be so stated.
9. Sufficient information for all layout control lines and points to allow retracement of the work with minimal difficulty.
10. Any discrepancies or inconsistencies between the construction documents and the layout as surveyed and shown on markups, with a statement of the Surveyor's authority for deviating from the construction documents.
11. A qualifying statement of excluded information.
12. An index and cross reference when the presentation consists of more than a single document.
13. When requested, a certificate stating the final date of the field survey and that the survey was conducted either by or under the direction the Surveyor. The certificate should bear the signature, registration number and seal of the Surveyor and the date of certification.

#### 4. RELATIVE POSITIONAL ACCURACY

The following relative positional accuracies are provided as a guide for the placement of stakes or other materials utilized to mark the location of proposed fixed works:

	<b>Horizontal Positional Accuracy</b>		<b>Vertical Positional Accuracy</b>	
	<b>Meters</b>	<b>Feet</b>	<b>Meters</b>	<b>Feet</b>
Rough Grading Stakes	± 300 mm	± 1.0 ft	± 60 mm	± 0.20 ft
Subgrade Red Head Stakes	± 150mm	± 0.50 ft	± 15 mm	± 0.05 ft
Finish Grade Blue Top Stakes	± 150 mm	± 0.50 ft	± 15 mm	± 0.05 ft
Building Offset Stakes	± 10 mm	± 0.03 ft	± 10 mm	± 0.03 ft
Sewer Offset Stakes	± 30 mm	± 0.10 ft	± 10 mm	± 0.03 ft
Waterline Offset Stakes	± 30 mm	± 0.10 ft	± 30 mm	± 0.10 ft
Hydrant Offset Stakes	± 30 mm	± 0.10 ft	± 15 mm	± 0.05 ft
Street Lights	± 60 mm	± 0.20 ft	± 30 mm	± 0.10 ft
Curb Offsets	± 15 mm	± 0.05 ft	± 10 mm	± 0.03 ft

Positional Accuracy is given at the 95 percent confidence level

## 5. ELECTRONIC DATA DISTRIBUTION

The client may request the Surveyor to provide the survey data in an electronic format. These formats include such files as CADD drawing files, digital terrain model (DTM) files, or digital elevation model (DEM) files. When the Surveyor provides these files, they are only for the benefit of the client on this specific survey. In every case the surveyor shall also provide a signed and sealed hard copy drawing or representation of the survey. This drawing shall be the official plat or map and shall be deemed to be correct and superior to the electronic data. The electronic data file shall also contain a statement that the file is not a certified document and that the official document was issued and sealed by *(name and registration number of the Surveyor)* on *(date)*.

The Surveyor may also need to address additional liability issues in appropriate contract language.