



Construction staking encompasses those items included in the contract for a given transportation improvement project. The staking contractor is responsible to know the standards and specifications for each item staked.

A large portion of engineering cost is represented by construction staking. If errors occur in staking, the cost can be considerable to WisDOT and/or the contractor. The survey crew is to stake according to the standards stated in each section and must build in independent checks to eliminate errors. For example: an operation involving a level should never be terminated without checking into a known elevation. Alignment operations, such a bridge layout or sewer staking, are not to be left before checking into known control points and benchmarks.

7-15.1 Staking Contractor Duties

7-15.1.1 Preliminary Research and Data Gathering

The staking contractor should:

- Obtain, from the prime contractor, the approved plans, special provisions, and specifications for the project. Plan revisions may occur, so check with engineer throughout project for changes to the approved plan.
- Obtain material from the department necessary for the interpretation of the approved plan. This includes the current standard specs, all supplemental specifications, and other relevant publications.
- Obtain supplemental existing project information from the engineer (digital, previously computed, etc.).

7-15.1.2 Field Investigation

The staking contractor should:

- Field locate controlling plan survey data for the project.
- When necessary, establish horizontal and vertical control that is in compliance with Third Order Class II accuracy in relation to the existing project control.
- Record all information in field books and make them available to the engineer. This includes a description of control and all related notes for this control.
- Immediately bring to the attention of the engineer any discrepancies or errors.
- Do not set out anything without first field verifying for accuracy.

7-15.1.3 Computations

The staking contractor should:

- Check with the engineer to ensure that alignment, profiles, and grades have not changed from what is shown on the approved plan.
- Compute grades/alignment from approved plans and/or contact with engineer on the availability of information.
- Keep neat and accurate field notes of work being performed.

7-15.1.4 Field Notes

Construction survey notes generated by hand are to be recorded in bound field books. If data has been developed by computer, three-ring binders are acceptable.

On the cover of all field books/binders:

- WisDOT project identification (ID) number
- Subject (alignment, slope stake, bench marks, etc.)
- Each book numbered for cross-referencing

In the front section of all field books/binders:

- Engineer's name, address and phone number
- An index of book contents
- Pages are to be numbered

Each day's notes should include:

- Date
- Weather

- Crew
- Location
- Instrument type
- Crew chief's signature

Errors should have a line drawn through them or the word "void" printed across a page, and a note referring to the location where the correct notes are to be found. Erasers are not to be used.

All computations and field notes are to be included in the files at the end of the project and are a matter of record. Various examples of field notes are included throughout this manual. Computations, such as grade sheets and bridge notes are to be included. All notes are to be neat, clean, legible, and complete so another crew can continue the work.

Field notes must be made available to the engineer upon request. It may be desirable to leave the original or a copy in the field office.

7-15.2 Equipment

It will be up to the discretion of the staking contractor to use the appropriate equipment to ensure required accuracies are met for each item. The staking contractor must decide what equipment to use.

All equipment should be maintained and calibrated before fieldwork. These calibration results should be recorded in the field books as a matter of record.

7-15.3 Control

7-15.3.1 Horizontal

Accuracy must be met. The tool to get the job done does not matter, whether it is transit and tape, total station, or GPS. The control on the plan controls the project. GPS equipment must be calibrated to the plan control unless sufficient checks have been completed to insure coordinate systems match.

7-15.3.2 Vertical

If using a conventional automatic level, the proper rod should be used for the accuracy desired. Longer rods with multiple sections provide for greater changes in elevation, but tend to wear faster and require more maintenance that will decrease the accuracy. Heights out of GPS equipment are often ellipsoidal not orthometric. Elevations on a plan are orthometric.

7-15.4 Monumentation

Construction layout monuments should be a solid material, a type consistent with the terrain, and set to provide a degree of permanence for the intended use. Sufficient monuments and offset information should be provided to enable the user to check the accuracy of any point or line established.

Monuments should be witnessed in a manner that allows them to be easily found by the user in a reasonable period of time. Any witness stakes or laths that show offsets and/or cut/fill data should also show sufficient information to identify horizontal position of the point being referenced.

7-15.5 Diggers Hot Line

Digger's Hot Line should be called when any monuments are being driven deeper than approximately two feet. The plan may show a gas line 10 feet right of the centerline but the utilities may have since been relocated.

In Wisconsin, call Diggers Hot Line at (800) 242-8511.

7-15.6 Stakes

Stakes must have sufficient stiffness, section modulus and length to remain stable during normal grading operations. Stakes suggested in each procedure may need to be modified to fit field conditions. Stakes should have a smooth surface to allow for marking legibly.

The following are suggested stake types and uses:

- 1" x 2" x 18" flats - centerline, offset lines, slope stakes, fence line, information, etc.
- 2" x 2" x 12" hubs or 20 penny nails or spikes - curb and gutter, pipe grades, blue tops, miscellaneous grade and line references, etc.
- 1" x 2" x (12", 24", 36", or 48") guards - easements, clearing limits, guard stakes, etc.
- Wood lath - visual protection for stakes and hubs, and extreme cuts and fills.

Also note the following points regarding construction stakes:

- For centerline control points or reference points, PK nails or 6" - 8" spikes will be allowed in lieu of hubs and

tacks.

- Permanent marking pen may be used in some situations in lieu of a tack.
- Length of stake will vary depending on terrain, vegetation, and soil type.
- The above recommended stakes may vary due to regional preference and availability.
- A flag may be an appropriate guard stake.
- Different abbreviations are used throughout the manual to show options, for example: (S) or O/S both depict "offset."