

WISCONSIN CONSTRUCTION SPECIFICATION

25. GPS Machine Control Construction

1. SCOPE

The work consists of the contractor performing construction using global positioning system (GPS) machine guidance to establish the horizontal and vertical position of earthwork.

2. EQUIPMENT AND MATERIALS

The contractor may use GPS machine guidance construction for all or part of the work.

3. QUALITY OF WORK

The contractor must achieve the required accuracy, for the construction operations. The technician may require the contractor to revert to conventional staking and surveying methods for all or part of the work at any point during construction if, in the technician's opinion, the GPS machine guidance is producing unacceptable results.

The material moved, placed and compacted must conform to the neat lines and grades, cross sections, and dimensions the construction plan and digital terrain model (DTM) the technician establishes. (DTM = Computer aided design and drafting generated surfaces).

The contractor must protect and preserve known property and survey marks, land monuments, horizontal and vertical control points.

4. DTM AND OTHER ELECTRONIC INFORMATION

a. Joint Responsibility

The technician and contractor shall agree on the meaning of all stakes, measurements, marks, DTM, and horizontal and vertical control points before the contractor begins work.

No layout stakes are required for earthwork completed using GPS machine guidance. Coordinate with the technician throughout the course of construction to ensure that work performed using GPS machine guidance conforms to the construction plan and that the methods employed conform to the contractor's GPS work plan.

GPS machine guidance issues shall be addressed as soon they arise.

b. Agency Responsibility

The DTM and other electronic GPS coordinates and elevations, used as primary control and for design, will be provided to the landowner after receiving the contractor's request. The information will be provided to the contractor if the landowner approves in writing. The technician will also furnish horizontal alignments, profiles, and elevations, used to develop the DTM, as requested. DTM information and associated data will be supplied in LandXML format or in an agreed upon format at the discretion of the technician.

If any errors or discrepancies are identified by the contractor, the technician will determine what revisions may be required. The technician will revise the surface, if necessary, to address errors or discrepancies that the contractor identifies.

The technician may check the work of the contractor at any time. The technician will provide the results of these checks to the contractor.

c. Contractor Responsibility

At any time after the contract is awarded, the contractor:

- May request the DTM and other electronic GPS coordinates and elevations used as primary control and for design.
- Must submit a written work plan for technician review at least 5 days before the preconstruction conference. The technician will review and approve the plan.
- Must construct the elements of the project as the contractor's GPS work plan provides.
- Must implement the work plan.
- Must update the work plan as necessary during construction of the project.
- Must check the provided DTM. The DTM may not be modified by the contractor.
- Must immediately notify the technician of any errors or discrepancies in technician provided information.
- Must conduct compatibility checks and accuracy checks of horizontal and vertical positions that either the technician or the contractor establishes in the field.
- Must set and maintain construction stakes or marks as necessary to achieve the required accuracy and to support the method of operations.
- Suspend related operations until the technician gives approval to proceed.

The work plan should discuss how GPS machine guidance technology will be integrated into the project, including, but do not limit to, the following:

- Designate which portions of the contract will be done using GPS machine guidance and which portions will be done using conventional staking.
- Describe the manufacturer, model, and software version of the GPS equipment.
- Provide information on the qualifications of contractor staff; include formal training and field experience.
- Designate a single staff person as the primary contact for GPS technology issues.
- Describe site calibration procedures. Describe the site calibration and checking frequency as well as how the site calibration and checking information are to be documented.
- Describe the contractor's quality control procedures. Describe procedures for checking periodic sensor calibration, mechanical calibration, blade wear, routine adjustments, and maintenance of equipment; include the frequency and type of checks performed to ensure that the constructed grades conform to the construction plan.

5. SITE CALIBRATION

Designate a set of control points that surround your project, including a total of at least 4 horizontal and vertical points for site calibration. Incorporate the technician provided control framework used for the original survey and design; include at least one additional control point not used for site calibration.

Locate GPS base stations away from obstacles that may cause multipath errors.

Calibrate the site by determining the parameters governing the transformation of GPS information into the project coordinate system.

A site calibration is not necessary when using the pre-defined coordinate system of the design with a GPS base station or Virtual Reference System; a vertical calibration is required in this case.

At a minimum, check the calibration at the start of each day as described in the contractor's GPS work plan. Perform these checks at individual control points not used in the initial site calibration.

Report out-of-tolerance checks to the technician. The measured position must match the established position at each individual control point within the following tolerances:

- Horizontally to 0.10 feet or less
- Vertically to 0.05 feet or less

Discuss the previous week's daily calibration check results at the progress meeting for monitoring the GPS work.

6. ACCEPTANCE

The job will not be accepted until all surveys are complete and required documentation has been determined complete. The technician shall conduct quality assurance checking. Checking shall include the visual review of the project and random surveys to check for accuracy.