

Part 540 – Field Surveys

540.0 General

Concise, accurate, and legible engineering notes are necessary to document planning, design, and construction. They provide the basis for expenditure of Federal and other funds for conservation installations. Title 210, National Engineering Handbook (NEH), Part 650, Chapter 1, “Engineering Surveys,” provides the recommended format for engineering notes and related staking.

540.1 Responsibility

- A. All surveys and surveyor qualifications must comply with local and State regulations, as applicable.
- B. The information from basic staking of earthwork normally becomes the basis for measurement of payment quantities. Therefore, basic staking must be performed by NRCS, an architect-engineer (A-E), the local contracting organization, the owner, or the contractor as described within the appropriate construction contracts, grants, or agreements.

540.2 Format

- A. Each State conservation engineer (SCE) is to establish the format and minimum requirements for engineering notekeeping based on 210-NEH. Engineering records are to be uniform to simplify training, improve clarity and overall efficiency, and allow consistency if personnel change through the course of a project. If local contracting organizations elect to use their own engineering staffs or if consulting engineers or other qualified persons, such as licensed surveyors, perform the survey, notekeeping must be of comparable quality and similar content to the sample format in 210-NEH. When using electronic data collection systems to record survey data, the SCE must develop a method to secure electronic copies of the recorded data in at least two separate locations.
- B. For class V-VIII jobs and work performed by Federal or local contract—
 - (1) Bound field notebooks must be used to record engineering surveys and notes when electronic data collection systems are not used.
 - (2) When electronic data collection systems are used to record the engineering surveys, an unaltered electronic copy of the survey data must be downloaded from the data collector and permanently stored in a location along with other important survey information for that project. A backup copy of the electronic survey data must also be kept in a separate location.
- C. Loose-leaf notebooks, special forms, or electronic copies of downloaded electronic data may be used for recording engineering surveys, notes, and design data for onfarm conservation practices (class I-IV jobs) such as ponds, terraces, diversions, waterways, and animal waste management facilities. The documentation for the engineering surveys for conservation practices must provide the minimum information as outlined in 210-NEH.

540.3 Light Detection and Ranging (LiDAR) Data

Ground elevation data obtained through the LiDAR remote sensing method can facilitate the planning and design of engineering practices. LiDAR data must meet fundamental vertical accuracy for the desired quality level considering the planning or design need. Minimum LiDAR quality levels recommended for practice design use and applicable practice types are presented in Surveying Technical Note 210-SRVN-01, “Using LiDAR for Planning and Designing Engineering Practices.”

540.4 Precision and Accuracy

The required precision and accuracy of each survey will vary with its purpose; therefore, each SCE must establish the minimum requirements for precision and accuracy within the framework outlined in the NEH.

540.5 Staking

A. Basic Staking.—“Basic staking” is defined as alignment and grade stakes for structures other than embankments and channels. For channels and embankments, basic staking includes alignment and grade stakes plus slope stakes at the normal interval for the work. Normal interval is 100-foot stations on tangents and may decrease to as little as 25 feet on sharp curves. When construction pay quantities are determined from basic staking, a fair and equitable description of the ground surface is needed for the calculation of performance quantities.

B. Construction Stakes.—Additional stakes necessary for forming the structure, constructing the slopes of embankments above the slope stakes, or constructing the sides of channels below the slope stakes or between stations are “construction” stakes. They are the responsibility of the construction contractor.

540.6 Contractor Surveys

Contractor surveys apply to construction contracts and conservation operations that require the contractor to provide basic staking, quantity surveys, measurements, and computations for progress payments. When authorized, contractors will provide original and final surveys for final quantity determinations. 210-NEH, Part 642, “Specifications for Construction Contracts,” must be used to provide contract requirements for contractor surveys. Surveys completed under conservation operations must follow the requirements of 210-NEH, Part 650, Chapter 1, “Engineering Surveys.” Primary controls, which include items such as baselines, control points, and bench marks, must be sufficiently defined to allow the contractor to perform the required surveys.

540.7 Checking

NRCS employees or individuals under contract with NRCS must conduct quality assurance checking. Checking includes a visual review of survey markings, notes, and random surveys to check for accuracy.