## Section 152. — CONSTRUCTION SURVEY AND STAKING

01 APR 2024 – FP-24

WFL Specification 01 APR 2024 1520040

Include the following on all projects requiring work in this Section.

NOTE:

Consult the Construction Operations Engineer and WFL-Survey on projects that do not have controls or earthwork.

Edit and Outline the Subsections under Construction Requirements to make survey requirements project specific, and identify requirements by project segment or station if needed for clarity.

Construction Requirements

### 152.04 General.

Delete the text of this Subsection and substitute the following:

Provide a crew supervisor on the project whenever surveying and staking is in progress. Provide survey instruments and supporting equipment capable of achieving the specified tolerances. If approved, construction equipment controlled with a GPS or Robotic Total Station (RTS) machine guidance system may be used in the construction of subgrade, subbase, and base aggregate courses, or other construction operations.

Provide acceptable tools and supplies of the type and quality suitable for highway survey work. Provide stakes and hubs of sufficient length to provide a solid set in the ground with sufficient surface area above ground for necessary legible and durable markings.

Include staking activities in the construction schedule submitted according to Section 155. Include the dates and sequence of each staking activity.

If the contractor establishes additional control, provide the contractor-established control network to the Government for verification.

WFL Specification 01 APR 2024 1520050

Include the following when the Government has set control points.

The Government has set horizontal and vertical control points for the project. The location and identity of each control point are shown on the plans.

WFL Specification 01 APR 2024 1520060

Include the following if the Government has set a stake only at the beginning of the project (such as for a station survey).

The Government will set a stake to identify the beginning of the project. No other control will be furnished. If the contractor establishes initial horizontal and vertical control for the project, provide the contractor-established control network to the Government for verification.

WFL Specification 01 APR 2024 1520080

Include the following in projects that meet both of the following requirements:

 Requires earthwork, and;

 The project was developed using 3D Design Software (Bentley Corridor Modeler, or Open Roads Designer).

Edit as needed to delete data that will not be provided. Do NOT edit to include additional data, or data in other formats without approval of Legal Counsel.

**(a) Government furnished information.** The Government will furnish the design data described below:

**(1)** Proposed horizontal alignment(s) and profile grade(s) in Portable Document Format (.pdf) and LandXML (.xml) formats;

**(2)** Cross Sections in Portable Document Format (.pdf);

**(3)** Earthwork volume report in Portable Document Format (.pdf);

**(4)** Superelevation report in Portable Document Format (.pdf) or Microsoft Excel (.xlsx) format;

**(5)** Clearing limits (based on theoretical catch points) in Portable Document Format (.pdf) or Microsoft Excel (.xlsx) format;

**(6)** Construction staking notes containing points at centerline, shoulders, and theoretical slope stake catch in Portable Document Format (.pdf) or Microsoft Excel (.xlsx) format;

**(7)** X, Y, Z coordinates of subgrade and base layer(s) points at centerline and shoulders, in Portable Document Format (.pdf) or Microsoft Excel (.xlsx) format;

**(8)** Proposed finished surface in LandXML (.xml) format;

**(9)** Proposed subgrade surface in LandXML (.xml) format:

**(10)** Proposed 3D breaklines in Drawing Exchange Format (.dxf);

**(11)** Existing ground surface in LandXML (.xml) format; and

**(12)** Control Point coordinates in Microsoft Excel (.xlsx) format.

Perform additional conversions and calculations as necessary for convenient use of Government-furnished data. The Contractor is responsible for the accuracy of all information converted from the Government-furnished data. Provide immediate notification of apparent errors in the furnished data.

WFL Specification 01 APR 2024 1520090

Include the following on all projects requiring work in this Section. Outline the following as needed on projects that do not have controls or earthwork.

**(b) Pre-survey meeting.** Before surveying or staking, discuss and coordinate the following with the CO:

**(1)** Surveying and staking methods;

**(2)** Stake marking;

**(3)** Grade control for courses of material;

**(4)** Referencing;

**(5)** Structure control;

**(6)** Field staking data;

**(7)** Localization of the GPS systems to the Government-established control points; and

**(8)** Other procedures and controls necessary for the work.

Do not start work until staking or 3D verification data for the affected work has been approved.

Preserve initial reference and control points. Notify the CO of missing control points or stakes at least 10 days before starting construction. Reestablish initial control points and obtain approval before starting construction.

Acceptance of the construction staking does not relieve the Contractor of responsibility for correcting errors discovered during the work and for bearing additional costs associated with the error.

Maintain legibility of stake markings for the duration of the project or until notified in writing the stakes are no longer needed. Replace stakes as necessary to ensure markings are maintained.

Record survey and measurement field data in an approved format. Submit as-staked data and corrections made to the Government-furnished survey data. Submit survey and measurement data at least weekly, while surveys are being conducted.

The construction survey and staking work may be spot-checked for accuracy, and unacceptable portions of work may be rejected. Resurvey rejected work, and correct work that is not within the tolerances specified in Table 152-1.

Remove and dispose of flagging, paint, lath, stakes, and other staking material after the project is complete.

Compute and provide calculations supporting pay quantities. Measure quantities within the tolerances established by the CO according to Section 109.

WFL Specification 01 APR 2024 1520110

Insert the following when modifying this Subsection. Edit instructions as needed to match the modifications made.

### 152.05 Survey and Staking Requirements.

Amend as follows:

WFL Specification 01 APR 2024 1520120

Consult with the Construction Operations Engineer assigned to the project.

Include the following on earthwork projects that meet both of the following requirements:

 Are likely to use Automated Machine Guidance grading methods, and;

 It has been determined that Government owned surveying equipment will not be available.

Add the following after the first paragraph:

When AMG methods are used, provide for exclusive Government use, all surveying equipment (such as RTS, GPS, data collectors, and reflectors), software, and data files necessary for Government quality assurance inspection of the grading work. Provide equipment of the same make, model and version being used to construct the project. Provide equipment at least two-weeks before starting work that relies on the equipment. Continuously ensure that data provided to the Government is the same version being used to construct the project. Maintain all equipment in good working order and provide replacements to the CO within two working days when breakdowns occur. The CO will return all supplied equipment upon project completion.

Provide two separate 8-hour training sessions on the use of the contractor-provided surveying equipment. Provide the first training session within one week after delivering equipment to the site. Provide the second training session upon request of the CO. Provide training on the project site by a manufacturers’ representative or as approved.