SECTION 105.8: AUTOMATED MACHINE GUIDANCE-DB

General

Section 105.8 of the Standard Specifications is amended by adding the following:

This Supplemental Specification describes the process required in order for the Contractor to utilize Automated Machine Guidance (AMG) on design-build projects, and to ensure that the end results generated by equipment using AMG are in conformance with the tolerances required for conventional stakeout.

Those areas not covered by this special provision are subject to the requirements of Subsection 105.8.

The Contractor is responsible for all errors resulting from the use of AMG. Correct all deficiencies to the satisfaction of the RCE at no additional cost to the Department.

EQUIPMENT

Provide all equipment required to accomplish AMG. Use equipment that generates end results meeting the current Standard Specification for Highway Construction and all applicable supplemental specifications and special provisions.

CONSTRUCTION

1. Inform and gain approval from the Engineer prior to the use of AMG on a project.

    a. Discuss all AMG work at the Pre-Construction meeting or a minimum of 60 days prior to its use.
    b. Demonstrate capabilities, accuracy, and reliability of the intended AMG procedure if required by the Engineer.
    c. Perform any supplemental staking as directed by the Engineer.

2. Provide electronic engineering data (EED) files to SCDOT prior to beginning AMG operations. The EED files will contain the following information and be in the native formats and other software formats as described below. The method of exchange of electronic data will be mutually agreed upon at the pre-construction meeting or 60 days prior to its use.

    a. Survey Controls:
        - Control points
        - Bench marks
        - Project datum and scale factors
    b. CADD Files:
        - CADD files for plans, profiles, and other 2D linear features
        - CADD files for cross sections
        - Coordinate Geometry database such as GEOPAK GPK file
    c. Data Files:
        - Horizontal Alignments in LandXML format
        - Vertical Alignments in LandXML format
        - 3D surface model DTM files in in LandXML format for finish grade
        - 2D or 3D break lines in DGN or DXF format for finish grade
        - Horizontal and vertical alignments report in ASCII format

- Cross section report in station, offset, elevation (SOE) format

d. Other Documents – Adobe Acrobat Portable Document Format (.pdf) is the preferred format for exchanging documents such as reports, drawings, and maps. Other formats may be used if preapproved by the Engineer.

2. Where electing to use AMG, submit to the RCE a centerline and profile verification report or CADD drawings that records differences between the 3D AMG model and proposed designs. If the proposed cross sections were not created from the 3D AMG model, generate "red-line" cross sections from the 3D AMG model at a minimum of 50 feet interval and overlay to the proposed design cross sections. Provide to the RCE the "red-line" cross section sheets in PDF format.

If the 3D AMG Model is revised during construction, submit the revised Model to the RCE with a detailed narrative outlining any changes made to the Model.

3. At least 30 days prior to use AMG, submit to the RCE a written AMG work plan which includes:

a. Location and scope of work to be completed using AMG.
b. A description of the manufacturer, model, and control software version of the AMG equipment.
c. A description of how the proposed additional (new) project control points will be established and a map showing their locations.
d. Completed SCDOT Survey Control Plan Form.
e. Project site calibration procedures, including equipment calibration and calibration frequency.
f. A description of the setup of the system to be used.
g. Designation of a single staff person as the primary contact for any issues.
h. PE or PLS seal and signature.

4. The RCE may perform spot checks of grades, surveying calculations, records, field procedures, and actual staking as the RCE deems necessary. If the RCE determines the work is not being performed in a manner that will assure accurate results, the RCE may order such work to be redone to the requirements of the contract documents at no additional cost to the Department. At minimum, check, and if necessary, recalibrate the AMG system at the beginning of each work day and any time the results are suspected of being out of conformance with the specifications. Calibration results and out of tolerance checks will be provided to the RCE.

5. Establish supplemental project control points as needed for AMG operations. At minimum, establish secondary control points at appropriate intervals along the length of the project at intervals not to exceed 1000 feet. Establish the horizontal position of these points using methods where the relative horizontal accuracy meets the Class A Urban Survey accuracy standard (*Standards of Practice Manual for Surveying in South Carolina*). Establish the elevation of these control points using differential or trigonometric leveling from the project benchmarks with maximum allowable error of $0.05\sqrt{L}$, where L is the length of level run in miles. Provide a digital copy of all new control point information to the RCE. Department review of control point information in no way relieves the Contractor for responsibility for any and all errors resulting from their efforts. Correct all deficiencies to the satisfaction of the RCE at no additional cost to the Department.

6. Provide a clearly marked station stake at a minimum of every 500 feet on an offset from the edge of pavement as specified by the RCE.

METHOD OF MEASUREMENT

The use of AMG will be considered incidental to the project, and therefore, there is no specific measurement of quantities for this item.

PAYMENT

The use of AMG is incidental to other project costs. No additional payment will be made for the use of AMG.