

**Delaware Department of Transportation
Division of Transportation Solutions
Design Guidance Memorandum**

Memorandum Number 1-19

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|-----------------------|----------------------------|----------------------------------|
| 1. Road Design Manual | 2. Bridge Design Manual | 3. Utilities Design Manual |
| 4. Real Estate Manual | 5. Standard Specifications | 6. Standard Construction Details |

Title: Machine Control Effective date: 7/30/2007

Sections to Implement:

- | | | |
|---|---|--|
| <input checked="" type="checkbox"/> Project Development | <input checked="" type="checkbox"/> Planning | <input type="checkbox"/> DTC |
| <input checked="" type="checkbox"/> Bridge | <input checked="" type="checkbox"/> Quality | <input checked="" type="checkbox"/> Construction |
| <input type="checkbox"/> Team Support | <input checked="" type="checkbox"/> Maintenance &
Operations | <input checked="" type="checkbox"/> Traffic |
| <input type="checkbox"/> Utilities | | <input type="checkbox"/> Other _____ |

I. Purpose

To provide guidance on determining which projects will provide electronic data to contractors for the use of Global Positioning Systems (GPS) Machine Control grading techniques during construction, and what design elements need to be considered.

II. Design Guidance

1. The decision to use Machine Control should be made during the initial scoping of the project. Machine Control should be considered when a project has large earthwork quantities and/or isolated areas such as large stormwater management ponds and wetland mitigation areas requiring significant earthwork.
2. Machine Control should be considered in the application of sub-base material spreading, mass earthmoving, and general site preparation.
3. Any project being considered shall have complete ground survey of the existing topography. The existing DTM shall cover all areas that will use machine control. Projects that use aerial survey information in final design will not be considered.
4. The proposed DTM should be developed with a maximum triangle length of 25 feet for all areas that will use Machine Control.
5. Cross sections with complete existing and proposed information must be generated and available prior to project advertisement.
6. Project areas that do not have a clear view of the horizon or meander through wooded areas (such as bike trails or pedestrian paths through parks) may not work well with Machine Control.
7. Vertical control using Machine Control Technology is not yet sophisticated enough to meet highway construction specifications of ± 0.01 feet. Grading around bridge approaches, bridge construction, excavation around walls, fine grading and paving are operations that shall not be completed with this technology.

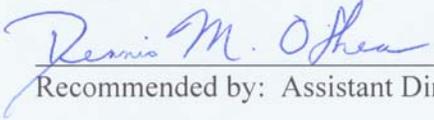
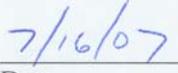
8. The following files will be made available to the contractor for use with the Global Positioning System Machine Control Grading Specification:
 - a. Existing DTM file compatible with software currently used by the Delaware Department of Transportation (DelDOT).
 - b. Proposed DTM file compatible with software currently used by DelDOT.
 - c. Design file containing only the proposed 3D triangles of the DTM model.
9. The following files will be made available to the contractor for all projects:
 - a. ASCII data files with coordinates for all proposed points and elevations.
 - b. CAL files of all plan sheets.
10. The Project Managers and Design Resource Engineer shall review the computer files to be provided.
11. The *Electronic File Sharing Release Form* must be completed prior to releasing any electronic files to the contractor. This form is available on DelDOT's Design Resource Center website at http://deldot.gov/static/business/project_development/highway.shtml

III. Justification

This technology is designed to minimize construction survey stakeout, and reduce construction time. This should also reduce the number of hours and costs for Construction Engineering.

Prepared by: Quality Section

Date: 7/6/2007

 Recommended by: Assistant Director – Design	 Date
 Approved: Chief Engineer	 Date

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