Machine Controlled Muck Excavation

Todd Kjolstad – Mankato Construction/MnDot
John Traxler – Mankato Construction/MnDot
Justin Kraus – Mankato Surveys/MnDot
Brett Mathiowetz – Mathiowetz Construction
Traditional style muck ex and recording of muck
(2011) CONSTRUCTION SURVEYING (DIGITAL SURFACE MODEL METHOD USING THE AMG-EXCAVATION SYSTEM)

S-46.3 DESCRIPTION
This work consists of using automated machine guidance to continually monitor and record each excavation operation for use in creating the Digital Surface Model used in quantification of excavated volumes (MdOT 1901.3-a).

The Advanced Materials and Technology Manual and forms are available on the MdOT Advanced Materials and Technology (AMT) Website at: http://www.dot.state.md.us/amt/index.html

A Definitions
Refer to Section 210 “Definitions” in the MdOT Advanced Materials and Technology Manual for definitions related to automated machine guidance for excavation methods not included below.

A.1 ADVANCED MATERIALS AND TECHNOLOGY MANUAL
A.1.1 Equipment Requirements

A.2 AUTOMATED MACHINE GUIDANCE (AMG) - EXCAVATION SYSTEM

The AMG-Excavation System is a grade control system attached to excavation equipment that uses either a 3D GNSS or Universal Total Station System to document and record excavation depths. The system is integrated with an onboard documentation system that displays real-time underground maps of excavation data, current excavator location, depth above or below design, and more.

A.3 MUCK EXCAVATION

See MdOT 2100.3 A.4/2106.3 A.4

A.4 IN-PLACE SURFACE

In the surface of the in-place pavement i.e., concrete, bituminous, surface aggregates, borrow areas, stabilized materials, or topsoil.

A.5 POND EXCAVATION

See MdOT 2100.3 A.5/2106.3 A.5

B Acronyms and Abbreviations
Refer to Sections 215 “Glossary of Acronyms and Abbreviations” in the MdOT Advanced Materials and Technology Manual for the full name or meaning of acronyms and/or abbreviations used within this provision.
GPS Mounted Backhoe
Muck Planned Bottom  Muck Planned Top
First day Checks

- Set elevation marks for excavator
- Test an area, shoot by hand and compare volumes with contractor
- Check the panned surfaces match field conditions.
Beginning Muck Ex S.P 0804-81
Progress image

3D image of Progress
Finished Muck Site
Panned Bottom VS Muck Excavated
Sensor on bucket malfunctioned
Machine Was turned off for part of a Day
Constant Adjustment

- Quantity of the holes Created from malfunctioned sensor:
  120 CY
- Quantity of the muck that was missed when the machine was turned off
  2,895 CY
- Constant Adjustment to add to the quantity
  2,775 CY
Final Muck Quantity Reports

Earthwork Volume Report

Unclassified surface compared to Unclassified surface

<table>
<thead>
<tr>
<th>Surfaces</th>
<th>Classification: Unclassified</th>
<th>Classification: Unclassified</th>
</tr>
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<tbody>
<tr>
<td>mucktopCHK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surface Report FINAL</td>
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Bank Volumes Based on Surface Geometry Alone

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Cut material</td>
<td>48,578.6 yd³</td>
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<tr>
<td>Fill material</td>
<td>3,367.6 yd³</td>
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<tr>
<td>Excess</td>
<td>45,211.0 yd³</td>
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</tbody>
</table>

MnDot Muck Total 48,579 CY + 2,775 CY = 51,354 CY

Contractor Muck Total 48,581 CY + 2,775 CY = 51,356 CY

Total estimated plan quantity: 51,326 CY