Workflow Changes to Support Digital Construction – Design Deliverables

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Overview

- Getting Started
- Understanding Deliverables
- Quality Control of 3D Deliverables
- Level of Detail
What Is a 3D Engineered Model?

3D Engineered Model

- 3D Engineered Model: A digital graphical representation of proposed facility/site data consisting of x, y, and z coordinates for producing objects in three-dimensions to communicate design intent useful for visualization, analysis, animation, simulation, plans, specifications, estimates production, and life-cycle asset management.

3D Engineered Model in Wireframe View
Incorporating Cost and Schedule Information

Adding Project Schedules (4D)

Screenshot of 4D Model
Incorporating Cost and Schedule Information

• Adding Project Cost Information (5D)
  
  ➢ FHWA defines 5D modeling as:

  “A 4D model intelligently linked with cost information for a project”
How to Get Started

• Establish Goals up Front!:
  ➢ Calculation of Quantities
  ➢ Visualization/Virtual Reality
  ➢ Design Analysis/Quality Control
  ➢ Automated Machine Guidance
  ➢ BIM Execution Plan
    ➢ What are we modeling?
    ➢ When are we modeling it?
    ➢ To what level of detail are we modeling it?
## Level of Accuracy

**ITEM 625.1001 11 - 3D CADD MODEL**

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### Level of Detail

- 100 – Conceptual
- 200 – Approximate Geometry
- 300 – Precise Geometry
- 400 – Fabrication
- 500 – Asbuilts

#### Table 4 - 3D CADD, 4D and 5D CIM Model Level of Development by Discipline

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<td>Exist Conditions</td>
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<tr>
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<td>Exist Conditions</td>
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Enhanced Quality Assurance in Design

• 3D and Drivethrough views
• Clash Detection
• Clearance Measurements
Level of Detail – AMG Deliverables

• Depends on Ultimate Use
• Grading – 10’- 25’ is fine
• Paving 1’-5’ is better
• Needs to be closer in Vertical Curves and Superelevation Transitions
Understanding Deliverables

• Deliverables are Different for Grading and Paving
• Surfaces
• Accuracy
• 3D Breaklines
• Alignments
Automated Machine Guidance

• Grading Deliverables
  ➢ Surface – Triangulated Network (LandXML)
  ➢ 3D Breaklines

• Paving Deliverables
  ➢ 3D Breaklines

Photos Courtesy of Michigan Department of Transportation Photography and Video Services Unit
AMG Paving - Inputs
AMG Paving - Inputs
CAD Standards

- Level/Layer File names
- File Naming
- Alignments
- Templates
- Point Controls
- Makes it easier on your designers and on downstream users
- Document the files
AMG - Deliverables

• Alignments
  ➢ LandXML format
• Grading Surfaces
  ➢ LandXML format
• Paving
  ➢ DXF
• Other CAD Files
• KMZ files
Other Considerations

• Delivery of Data to Contractor
  ➢ Pre-letting or Post-Letting

• Pre-letting allows the contractor to factor in the quality of the data they are getting

• Does not give any contractor a competitive advantage