QC the Model: 3D Modeling Tips for Deliverables

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( Central Office )
Description:

- In this session we will discuss 3D engineered models.
  - Brief FDOT CADD/Industry History
  - 3D engineered models and to what detail?
  - QA and QC as defined by FDOT
  - QC review on the Model, checklist and tools
  - 3D deliverables
History and Background: How did we get here?

- FDOT – legacy software
  GEOPAK/MicroStation (2d based for plans)
- FDOT Open CADD Platform
  MicroStation and AutoCAD
- FDOT – contemporary software
  OpenRoads, Civil3d (3d model based for designing models and plans)
- Contractors – making models from plans
  ??? uugh
- Consultants – plans and models, oh my!
- Future- Design Office bulletin forth coming
When is 3D model delivery required?

- Project Suite - Work Program Code – 3DPR?
- What do the District Project Managers require?
- What’s in the Professional Services Contract?
- What the CADD Manual defines for deliverables?
... and to what level of detail?

- Details to be defined/negotiated with District PM

### DRAFT - Additional Staff Hour Considerations for 3D Design Deliverables - DRAFT

<table>
<thead>
<tr>
<th>Task No.</th>
<th>Task</th>
<th>Units</th>
<th>Staff Hour Range</th>
<th>Basis for Staff Hour Range</th>
<th>Notes following 9/13/18 Meeting</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.5.1</td>
<td>EXISTING TASK (Horizontal/Vertical) Master Design Plan</td>
<td>LS</td>
<td>See Book for Staff Hour Range</td>
<td></td>
<td>Team agreed on Centerline (CL) Mile (plus add-ons).</td>
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<tr>
<td>4.5.2</td>
<td>1D Design Model (30%)</td>
<td>Corridor Mile</td>
<td>1 to 24</td>
<td>Lower range projects (single alignment corridor or uniform typical sections which tie to the existing terrain): 1 - 8 hours per mile. Middle range projects (multiple alignments with few templates or specialized cross slope conditions, super transitions or other complex profile conditions): 8 - 16 hours per mile. Upper range projects: Multiple alignments / corridors which target or merge with adjacent corridors including multi-level designs): 24 - 48 hours per mile.</td>
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<tr>
<td>4.5.3</td>
<td>1D Design Model (60%)</td>
<td>Each and Corridor Mile</td>
<td>1 - 24</td>
<td>Add detail that allow the commencement of right of way mapping. This would include the addition of intersections, crossings, piers, medians, traffic separators, retaining walls, barrier walls, guide rail terminals, side slopes, ditches and ponds. Ranges per each: Lower range items (crosses, crossovers, rural intersections, ponds): 1 - 4 hours each. Middle range items (urban intersections): 4 - 8 hours each. Upper range items (roundabouts, DDI): 8 - 24 hours each.</td>
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<tr>
<td>4.5.4</td>
<td>1D Design Model (90%)</td>
<td>Each</td>
<td>1 to 4</td>
<td>Add detail to model to include non-critical modeling areas which have minor impacts on earthwork quantities. Includes driveways, bridge end and bent grading, Mitred end section grading, etc.</td>
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<tr>
<td>4.5.5</td>
<td>1D Design Model (100%)</td>
<td>Each</td>
<td>0.5 to 4</td>
<td>Add detail to the model to include non-critical items such as ADA Curb Ramps, Traffic Separator bulk heads, 1D Standard, 1D Drainage Structures and other miscellaneous details.</td>
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**FDOT**
QA / QC the model

**Quality Assurance (QA) and Quality Control (QC)** are two processes used to ensure the public receives a quality product.

- Quality Assurance is the responsibility of, and performed by the Central Office.
- Quality Control is a responsibility of the District Offices, and is performed by the Districts and their Agents (Consultants), as appropriate.
Quality Assurance

News

FDOT2017 C3D State Kit Software
*Posted: October 3, 2016*
The FDOT2017 C3D State Kit (version 01.00.00) is now available.

FDOT2016 C3D MR1 State Kit Software
*Posted: October 3, 2016*
The FDOT2016 C3D MR1 State Kit (version 01.01.00) is now available. FDOT2016 C3D MR1 contains updates necessitated by changes to Design Standards, Plans Preparation Manual (PPM), and the Basis of Estimates (BOE) as well as bug fixes to address reported issues.

FDOTSS4 MR2 CADD Software
*Posted: October 3, 2016*
The FDOTSS4 MR2 CADD Software (version 01.02.00) is now available.

- The FDOT Workspaces will check the 3D design model file for CADD compliance when a file is exited or use the QC Check tool directly.
**QC the model**

- Who will review the model?
  - Consultant Designers, Engineers, Project Managers, EOR
  - FDOT District Project Reviewer
  - Other agency's; FHWA, local cities and counties, Permitting, Utility Companies, etc..
    (How does this project affect me?)
  - Contract Estimators
  - Contractors
QC the model

◆ What will they want to QC?
  ✓ Does the model look complete visually
    - gaps, spikes, overlaps, transitions, harmonization's
  ✓ Normal checklist items?
    - Horizontal Vertical Curves, Tapers, K-values,
    - Pavement Lanes, Shoulders, Sidewalks, Curbs
    - Are the slopes correct, superelevation, slope breaks
    - Clearances, conflicts utilities, drainage, signs, etc.
    - Are the depths correct, pavement, sidewalk, base, driveways
  ✓ Does the model match the plans or … Do the plans match the model?
  ✓ 3D Deliverables
# 3D Engineered Model QC Checklist

<table>
<thead>
<tr>
<th>Implementation Items</th>
<th>Originator</th>
<th>Reviewer</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td>Geographical Coordinate System has been defined in the model(s)/design file</td>
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<tr>
<td>3D Baseline/Centerline has been displayed in the model(s)</td>
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<tr>
<td>Referenced 3D model break lines match the 2D planmetric lines</td>
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<tr>
<td>Review of model(s) for completeness, visually:</td>
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<tr>
<td>- Gaps along the model</td>
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<td>- Spikes or lips along seams</td>
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<tr>
<td>- Overlapping components</td>
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<td></td>
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<tr>
<td>- Transitions between corridors and templates</td>
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<tr>
<td>- Transitions between varying slope values</td>
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<td></td>
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<tr>
<td>- Slopes harmonization with existing surface</td>
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<td>- Median Crossovers</td>
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<tr>
<td>- Separator Islands</td>
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<tr>
<td>Component Depths match the Typical Section:</td>
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<tr>
<td>- Pavement Layers</td>
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<tr>
<td>- Driveway</td>
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<td>- Sidewalk</td>
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<tr>
<td>- Concrete</td>
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<tr>
<td>Verify Station Offset Elevation at Critical Location:</td>
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<td>- EOP at Drainage Nodes</td>
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<td>- Begin / End Taper Transitions</td>
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<tr>
<td>- Begin / End Radius</td>
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<tr>
<td>Verify Cross Slopes:</td>
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<tr>
<td>- Pavement Lanes</td>
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<tr>
<td>- Shoulders</td>
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<td>- Sidewalk</td>
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<tr>
<td>- Cross Over Medians</td>
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<tr>
<td>- Slopes</td>
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<tr>
<td>Vertical Clearance</td>
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<tr>
<td>Clash Detection - Interference Checking</td>
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<tr>
<td>3D Deliverable Created</td>
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<tr>
<td>- XML files for Corridor Alignments</td>
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<tr>
<td>- XML files for Existing and Proposed Surfaces (verified against 3D design)</td>
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<tr>
<td>- <em>Sun</em> or <em>Dwg</em> files for 2D and 3D lines</td>
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<tr>
<td>- <em>Dgn</em> file for OpenRoads Design Delivery</td>
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</table>
**QC model applications**

- What non CADD tools are available?
  - DGN files
    - Bentley Navigator
    - Bentley DGN Viewer
  - 3D pdf tools
    - Adobe Reader
    - Bluebeam
  - I models and tablets for field review
    - OpenRoads Navigator Connect
    - Bentley Navigator Connect
  - Construction Software
    - AGTEK
    - Trimble Business Center
QC model applications

- What non CADD tools are available?
  - XML files
    - FDOTSS4 XML Visualizer
3D Deliverables

- What is delivered for the contractor?
  - Alignments and profiles in xml file
  - Existing and Final Grade surface in xml file
  - 2D planimetrics and 3D breaklines files in dgn or dwg

Future Integrated Models

- 3D Drainage Network model?
- 3D Bridge Model?
- 3D Utility Model?
- 3D Signals, Lighting, Signing?
**Summary and Questions**

- We, FDOT, are developing QC review list. This issue has been identified as something we will give credence to in the future along with more guidance.

- Other States have been also addressing this topic and have gone so far as having technical review meetings, similar to field review meetings, for all state holders in a project. These meeting put the 3D model on a large screen with a skilled operator “driving” to check many of the things listed above.

- All said, this topic has been recognized and it is maturing day by day!

Hope this helps?
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