BIM for Bridges and Structures
Pilot Project Updates – Utah DOT

Mark Daniels
UDOT Structures Design Manager
Presentation Outline

- Goals
- Recent Experience
- Design
- Bid Letting
- Construction
- What’s Next?
Digital Delivery

Goals

- Produce a more optimal design
- Improve information transfer
- Obtain and manage better data to improve decision making
- Improve efficiency
• I-80 over UPRR at Blackrock
• I-80 over UPRR at Blackrock
BIM for Bridges and Structures
Recent Experience
BIM for Bridges and Structures
Recent Experience
• SR-36 over I-80
BIM for Bridges and Structures
Recent Experience

• 5600 West Over UPRR
• 5600 West Over UPRR

- Value/Construction Year: $86.8M /2019
- Design: Consultant
- Delivery Method: DBB
- MALD without plan sheets
<table>
<thead>
<tr>
<th>Element</th>
<th>Geometry</th>
<th>M&amp;P</th>
<th>Details</th>
<th>Notes</th>
<th>NBI#</th>
<th>Special Provision</th>
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<tr>
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Model Development

Solids Model Creation

Reinforcing Steel Detailing

Application of Attributes to Elements

Publish Model
Solids Model Creation
Reinforcing Steel Detailing
Application of Attributes to Model
Publish Models for Review and Construction
BIM for Bridges and Structures
*Design*
BIM for Bridges and Structures

- Design
- QC/QA
- Output Reports
- Verification Checklists
- Reviews
- Acceptance
### BIM for Bridges and Structures
#### Design

**Output Reports**

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**Materials Quantity Report**

<table>
<thead>
<tr>
<th>Component Name</th>
<th>Component Type</th>
<th>Material Name</th>
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<td>LW AA(LSF)</td>
<td>Concrete</td>
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<td>Approach Slab 1</td>
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<td>NW AA(LSF)</td>
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<td>Approach Slab 2</td>
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<td>Sleeper Slab 1</td>
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<tr>
<td>Bay &amp; Precast Panels A</td>
<td>Deck</td>
<td>LW AAA(AE)</td>
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<td>CIP Deck</td>
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<td>Bay 3 Precast Panels A</td>
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Verification Checklists

**Girder Bearings**
- Girder Bearings
- Pay Item 1 – Structural Steel (051207020)
- Specification 1 – Structural Steel (051207020)
- Specification 2 – Elastomeric Bearings (034121)

**3D BIM Rebar Detailing**
- Piles
  - Property – Pipe 16 Std
  - $F'c = 3$ ksi
  - Type – A ($A$)
  - Typepile – ASTM A252 Grade 3
  - $F_y = 45$ ksi
  - Name – A1-1

<table>
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<tr>
<th>Footings</th>
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<tbody>
<tr>
<td>DPH</td>
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</table>

**Main Reinforcement**
- Desc: 6PL3
- Verify reinforcement clearances to all faces
- Verify bar size and grade of material Use E class steel for all epoxy coat.
- Verify spacing used is within limits or design
- Verify correct number of bars have been modeled
- Verify all end conditions including standard bend diameters
- Check for any clash locations, small adjustments in

| DPH |
| DPH |
Reviews
The Structural Documentation Package for PIN 14413 SR-172: 5600 W. Railroad Crossing project is ready for Final Structural Acceptance. The ProjectWise links for the deliverables required on the Final Structural Acceptance (SS1) form are organized by structure drawing number and document type. Microstation files are included in the Structures folder in ProjectWise but links are not provided. The project team plans to submit the document package into the Region on 02/20/2019 for advertising.

Project Documents:
Structure Certification Memo:
- 14413 Certification Memo Structures.pdf

F-900
Final Structural Acceptance (SS1)
- 14412 Acceptance F-900_Final ACC_20190215.pdf

Structure Models
- 14413 F-900_OBM.dgn
- 14412 Structures_additional_info.dgn
- 14413 F-900_Master Container Bridge only.imodel
- 14412 F-900_Master Container.imodel
- 14413 F-900_Master Container_3d.dgn
- 14413 F-900 Prostructure_Slab-Abutment.dgn
- 14413 F-900 Prostructure_Slab-BentCap.dgn
- 14413 F-900 Prostructure_Slab-Column.dgn

Structure Model Attachments
- 14413 F-900_Quantities Report.xlsx
- 14413 F-900_Screed Elevation Report.xlsx
- 14413 F-900_Bearing Sept Elevation Report.xlsx
- 14413 F-900_Pilar Elevation Report.xlsx

Compiled Structural Detail Sheets
- 14413 F-900 Plans Adv_20190219.pdf

MEMORANDUM

TO: All Bidding Contractors

FROM: Kevin Farley, PE


This memorandum shall serve as certification that the data files for the subject project have been completed and are applicable UDOT standard drawings and specifications.

The seals herein located apply to all files that are listed in Appendix A. For information only files are also listed as such below on the same attachment.

Any design changes made during construction must be coordinated through the Resident Engineer and must be reflected in the As-Constructed data provided at construction completion as stated in the contract documents.

SPECIAL CONSIDERATIONS

- Due to project scheduling and budget restrictions, reinforcement for F-900 is presented in one of two different ways: 1) See model files for 3D modeling reinforcement for: abutment and bent Cap, abutment and bent caps, all columns, all footings and all piles. 2) See detail sheet files for reinforcing for: slabs, sleepers, slabs, parapets and curbs. Reinforcement located in detail sheet files are presented in the reinforcement schedule detail sheet. Reinforcement schedules and quantities from the 3D models and quantities from the detail sheet drawings are summarized in the reinforcement report.

- Due to software limitations, sold elements within the OBM file are reporting incorrect attributes. The following properties list for the associated element must be ignored:

- For Model Element:
- Properties Heading to be Ignored:
- Location of Correct Information:
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Design Challenges
MEMORANDUM

TO: All Bidding Contractors

FROM: Corey Nelson

SUBJECT: Contractual Electronic Data and For Information Only Data

Project Number: S-423959, PIN: 14421

This memorandum shall serve as certification that all electronic design data files for the subproject have been completed in accordance with all applicable UDOT standard drawings and specifications.

The seals herein located apply to all files that are the legal contractual files as listed in Appendix A. For information only files are also listed as such below on the same attachment.

Any design changes made during construction must be coordinated through the Resident Engineer and must be reflected in the As-constructed data provided at construction completion as stated in the contract documents.

APPENDIX A: ELECTRONIC DESIGN NAMES AND DESCRIPTIONS

<table>
<thead>
<tr>
<th>FILE NAME</th>
<th>DESCRIPTION</th>
<th>ENGINEER OF RECORD</th>
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<tbody>
<tr>
<td>14421_Alignments.dgn</td>
<td>MicroStation - Graphical Alignments file</td>
<td>Corey Nelson (South) Derek Lebahn (North)</td>
</tr>
<tr>
<td>14421_Layouts.dgn</td>
<td>MicroStation - Design layout graphics</td>
<td>Corey Nelson (South) Derek Lebahn (North)</td>
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</table>
BIM for Bridges and Structures
Construction

Training
Inspection
BIM for Bridges and Structures
Construction
As-Constructed
Construction Challenges
BIM for Bridges and Structures

What’s Next?

• Capture Project Lessons Learned
• Develop Project Delivery Manual for Digital Delivery
• Partner with Software Developers
• Review Contract Terms and Conditions
• Next Project…
Thank You