Case Study: Iowa DOT 3D Model Deliverable

I-80 Eastbound Ramps at I-380
Outline

• Project overview
• BIM for Infrastructure approach
• Available technologies
• Model development
• Results
• Contractor bidding and training
• Project letting
• Lessons learned
Iowa DOT I-80/I-380 Interchange

Left image: HDR Engineering, used with permission; Right image: Google Earth; Iowa DOT logo: Used with permission
3D Model Scope

Off-ramp from I-80 eastbound

Image: HDR Engineering, used with permission
3D Model Scope

Ramp B to southbound I-380

Image: HDR Engineering, used with permission
3D Model Scope

Ramp H to northbound I-380
3D Model Scope
BIM for Infrastructure Approach

Model Element Breakdown

Images: HDR Engineering, used with permission
BIM for Infrastructure Approach

Federated Model
# BIM for Infrastructure Approach

<table>
<thead>
<tr>
<th>Model Elements</th>
<th>CONSTRUCTION DOCUMENTATION</th>
<th>CONSTRUCTION</th>
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<tr>
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<tr>
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<tr>
<td>Level 4 Wingswalls</td>
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<td>Level 4 Bridge Foundation Footings</td>
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<tr>
<td>Level 4 Bridge Piers and Bents</td>
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<tr>
<td>Level 3 Bridge Superstructure</td>
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<tr>
<td>Level 4 Bridge Decks and Deck Supports</td>
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<tr>
<td>Level 4 Bridge Beams</td>
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<tr>
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<td>Level 4 Bridge Median Barriers</td>
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<td>Level 3 Bridge Signalling and Control</td>
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<td>Level 4 Bridge Noise Walls</td>
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**Notes:**
- LOD: Level of Development
- Grade: Model Element Grade
- MEA: Model Element Author
- Add Data Spec: Add Data Specifications
- Notes: Additional Notes

**Model Elements:****
- Included in Project
- Level of Development (LOD, Grade, and Model Element Author (MEA))

**Construction Documents:**
- Construction Documentation
- Construction As-Built

**Federal Highway Administration:**
- U.S. Department of Transportation
- U.S. Department of Transportation

**Page:** 10
BIM for Infrastructure Approach

Level of Development (simplified)

100  Concept
200  Preliminary
300  Final Design
350-400  Construction-Fabrication

Images: HDR Engineering, used with permission
Results

**INITIAL APPROACH**
Provide BIM model for information

**FINAL APPROACH**
Hybrid Model
- Ramp BH & H bridges - 2D plan deliverable (*BIM model for information*)
- Ramp B bridge - BIM model deliverable (*BIM model deliverable with links augmenting model*)

**DESIRED RESULTS**
- Reduce contractor risk
- Promote BIM usage
- Gather information on BIM usage (*during construction*)
Results

Ramp BH
- 2D Plans
- BIM Info Only

Ramp H
- 2D Plans
- BIM Info Only

Ramp B
- BIM Deliverable

Image: HDR Engineering, used with permission
Results

Appendix A: Digital Contract Files Listing

The digital files listed below are contained within the bid order package, associated with the project number IM-080-6(355)239-13-52 available for download at:
http://www.iowadot.gov/contracts/lettings.html

| Special Provision developed for digital file delivery |

**STRUCTURAL DESIGN**

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

[Signature]  [Date]

[Printed or Typed Name]

* License renewal date is [date]*

Digital files shown in the table below are covered by this seal listed in pages: 1 of 1.

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**References**

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- List of files and access instructions
- Software requirements
- Information hierarchy
- LOD table for each element type
- List of known deficiencies within the model
- Appendix with seal and list of covered digital files
- List of referenced files provided for information only
Contractor Bidding

Model Deliverables
Contractor Training

Contractors and subs unfamiliar with software

Provided multiple training sessions to
• Office of Bridges & Structures
• District
• Contractors

Recorded hour-long training video using the Ramp B model

Images: HDR, used with permission
Project Letting

July 31, 2018

$38.2M

$250K

PROJECT AWARDED
APPARENT LOW BID
UNDER ENGINEER’S ESTIMATE
CONTRACTOR ATTENDED ALL AGC MEETINGS

Images: HDR, used with permission
Lessons Learned

- OBM capable of only basic structure element shapes
- Rebar model was not able to be directly transferred to bar bending equipment
- More than one program will be needed to supply desired complex shapes
- Industry continues to struggle with access model data
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