BIM for Infrastructure Peer Exchange

Uses of BIM in NYSDOT Region 11 (NYC)

Craig Ruyle, P.E., Regional Director, NYSDOT Region 11
K Bridge

- NYSDOT developed 4D/5D Modeling requirements for a large Design-Build Project.
- Progress payments were made from the model and cost-loaded CPM Schedule.
- The DB Team used the model as part of the construction process.
- The model was updated as construction progressed.
The 3D model is used in construction for scheduling and project control (4D) applications
Using the 3D model in construction for scheduling (4D), project control, payments (5D) and analysis.
3D/4D/5D Modeling Applications

Modeling and Performing the Steel Erection
3D/4D/5D Modeling Applications

Modeling and Setting the Pier Table
K Bridge

Connector Abutment and T-Walls
K Bridge, D900011

Aerial View of the Brooklyn Approach Looking West from Main Span South Pylon November 2015
K Bridge, D900011

Construction progress utilizing the 3D model, scheduling (4D), and project control (5D)
3D/4D/5D Modeling Applications

K Bridge

Payments

• 7 Items included in the RFP
• DB Construction Item broken down into 34 payment items
• Each of these items was used for the high level Work Breakdown Structure in the CPM
• CPM is cost and resource loaded

ITEM 800.01000015: DESIGN BUILD – DESIGN SERVICES
ITEM 800.02000015: DESIGN BUILD – CONSTRUCTION INSPECTION SERVICES
ITEM 800.03000015: DESIGN BUILD – QUALITY CONTROL SERVICES
ITEM 800.04000015: DESIGN BUILD – FORCE ACCOUNT WORK
ITEM 800.05000015: DESIGN BUILD – SITE MOBILIZATION
ITEM 800.0600NN15: DESIGN BUILD – CONSTRUCTION WORK
ITEM 800.09000015: DESIGN BUILD – PARTNERING WORKSHOP
K Bridge

Payments
Proposed KGI 3

- Ramp from SB VWE to Union Tpk
- Connection to Ramp JRP
- SB VWE Mainline Viaduct
- NB VWE
KGI 3 Specification: Description of Work
This work shall consist of utilizing the 3D CADD Model furnished with the contract documents for updating on a monthly basis and for providing 4D and 5D animations of work planned and completed in correlation to the CPM schedule and including associated payments during construction through completion, and, provide an updated and complete 3D CADD Model as an ‘As-Built’ record. The 3D CADD Model ‘As-Built’ shall include any underground utilities installed and any existing underground utilities encountered during construction as part of the contract, in accordance with the contract documents and as directed by the Engineer.

- The first D-B-B CIM Spec for NYSDOT (and the US)!
The 3D model was used for design development and to assess constructability.
3D design model information is used to assess optimized construction phasing
• 3D modeling is the key
KGI Proposed General Construction Sequence

1. Realign NYC MTA Jamaica Yard Perimeter Road at north approach
2. Construct temporary SB VWE south approach
3. Construct proposed SB VWE Viaduct east stage section offline, east of existing
4. Construct north approach in stages from east to west
5. Shift traffic to completed SB VWE Viaduct east stage and demolish existing
6. Construct SB VWE Connection to WB JRP
7. Construct SB VWE Viaduct west stage
8. Construct proposed Ramp to Union Tpke east stage offline, east of existing
9. Shift traffic to completed Ramp to Union Tpke east stage and demolish existing
10. Construct Ramp to Union Tpke west stage
11. Structures are built to accommodate future Phase 4 at-grade traffic pattern
KGI 3 Proposed Construction Sequence
KGI 3 Proposed Construction Sequence
KGI 3 Comparing Proposed And Actual Construction Sequence

2/17/2018
Week: 66

Erect diaphragms and lateral bracing between girders G5, G4 and G3 (BN: 1076696)

5/28/2018
Week: 80

Span 2 - Install reinforcement for east portion of deck (BN: 1076890)
KGI 3 Uses of the Model
KGI 3 Performance Measures

1. **Constructability**
   - Bidability (Bidder input)
   - Buildability (Contractor and bidder input)

2. **Schedule Adherence**
   - Work Planning, Early Detection and Resolution of Field Condition Issues

3. **Cost Adherence**
   - Data Accuracy, Completeness, Integration & Usability

4. **Quality**
   - Orders on Contract: Number and Magnitude
   - CIM 3D, 4D, 5D Applications Utilized

5. **Project Management and Control**
   - Improved Communication and Coordination
   - Data Accuracy, Completeness, Latency and Accessibility

6. **Risk Management**
   - Planning, Identification, Analysis, Response, Monitoring and Control

7. **Innovation** Creating new value by meeting needs customers didn’t know they had

8. **Safety**

9. **Earned Value**
   Assessment of the *scope* baseline with the *cost* baseline, along with the *schedule* baseline to form the *performance* baseline. EVM develops and monitors three key dimensions for each project: Planned Value (PV); Actual Value (AV); Earned Value (EV)
Coordination

• NYSDOT is working closely with the Contractor to ensure full understanding of expectations of the 3D, 4D and 5D modeling, including LOD and deliverables – Monthly coordination meetings

• Data collection and reporting is required – performance data collected on a regular basis

• Construction and CI will be utilizing the same 3D ‘model of record’ to coordinate, identify possible problems early (predictive analysis) and resolve
3D/4D/5D Modeling Applications

KGI 4 Proposal Animation
3D/4D/5D Modeling Applications

KGI 4 Proposal Animation
3D/4D/5D Modeling Applications

KGI 4 4D/5D Model

5/31/2020
Week: 98