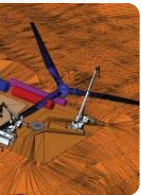




Using 3D Models after the Design Process

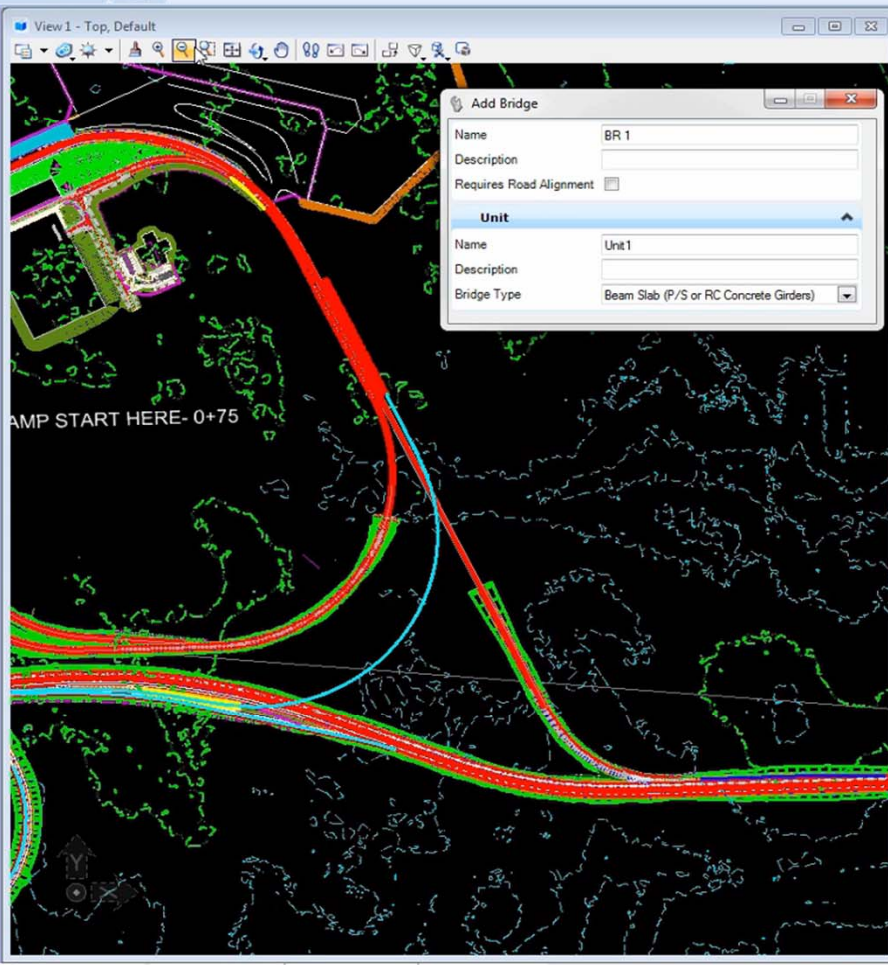
Alexander Mabrich, PE, MSc / Xin Luo, PE PhD



Agenda

- Clearance Verification
- Geometry and Quantity Reports
- Scheduling and Construction Planning
- Intelligent Models
- Construction and Inspection

- Tasks
- Model Interoperability
- Civil
- Terrain Model Tools
- 3D Geometry Tools
- Vertical Geometry Tools
- Corridor Modeling
- Civil Cells
- Bridge Tools
- Civil Tools
- Drawing
- Drawing Composition
- Solids Modeling
- Surface Modeling
- Feature Modeling
- Visualization
- Animation



Add Bridge

Name BR 1

Description

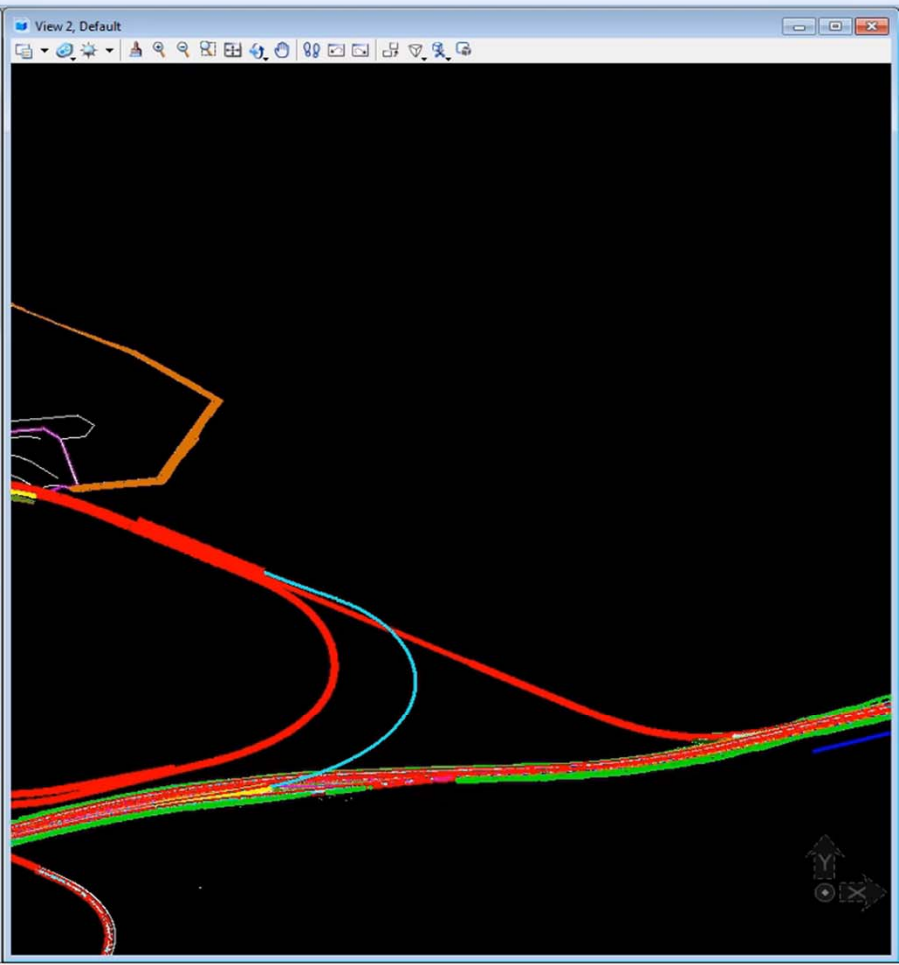
Requires Road Alignment

Unit

Name Unit 1

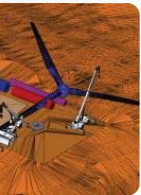
Description

Bridge Type Beam Slab (P/S or RC Concrete Girders)



OpenBridge Modeler

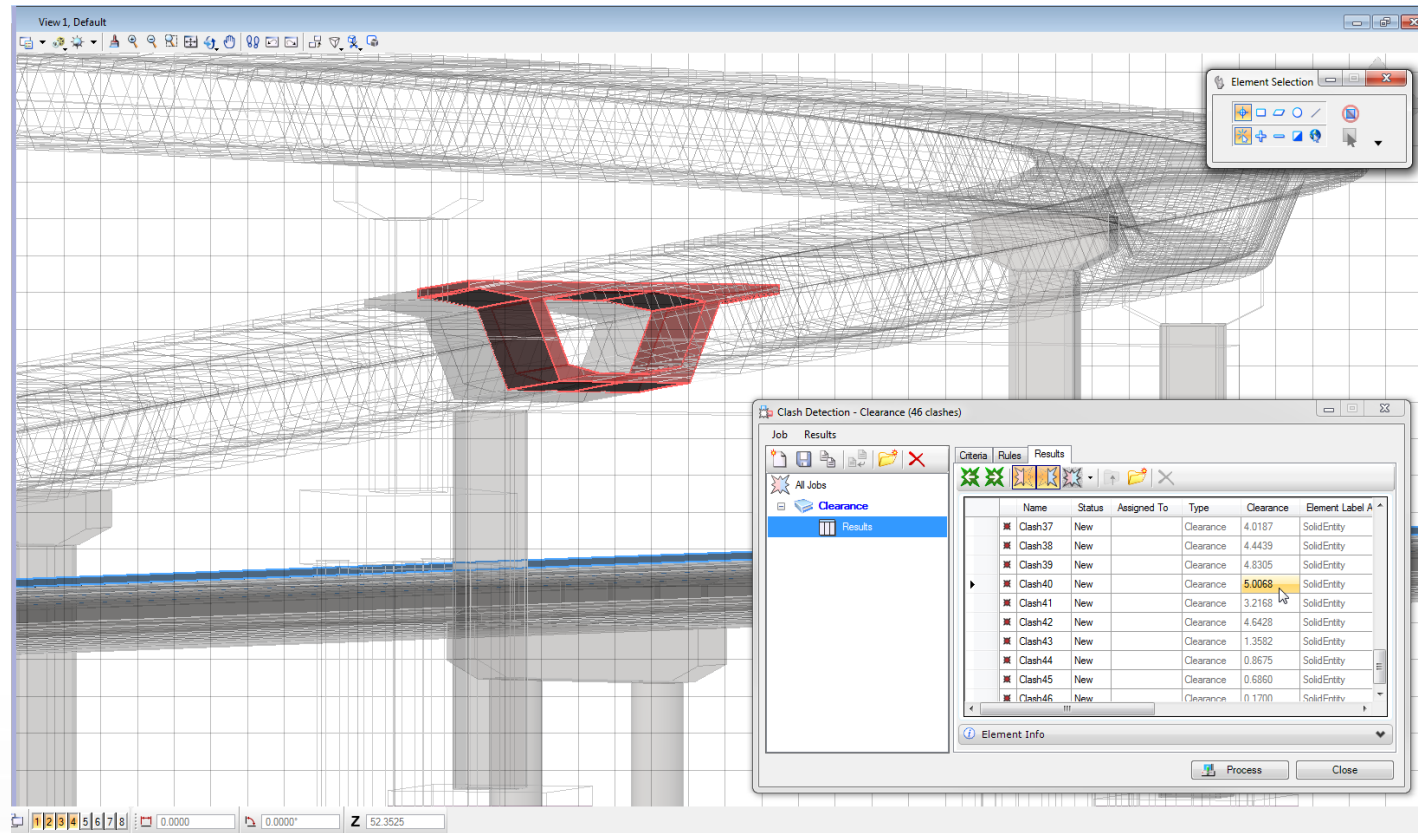




Clearance Verification

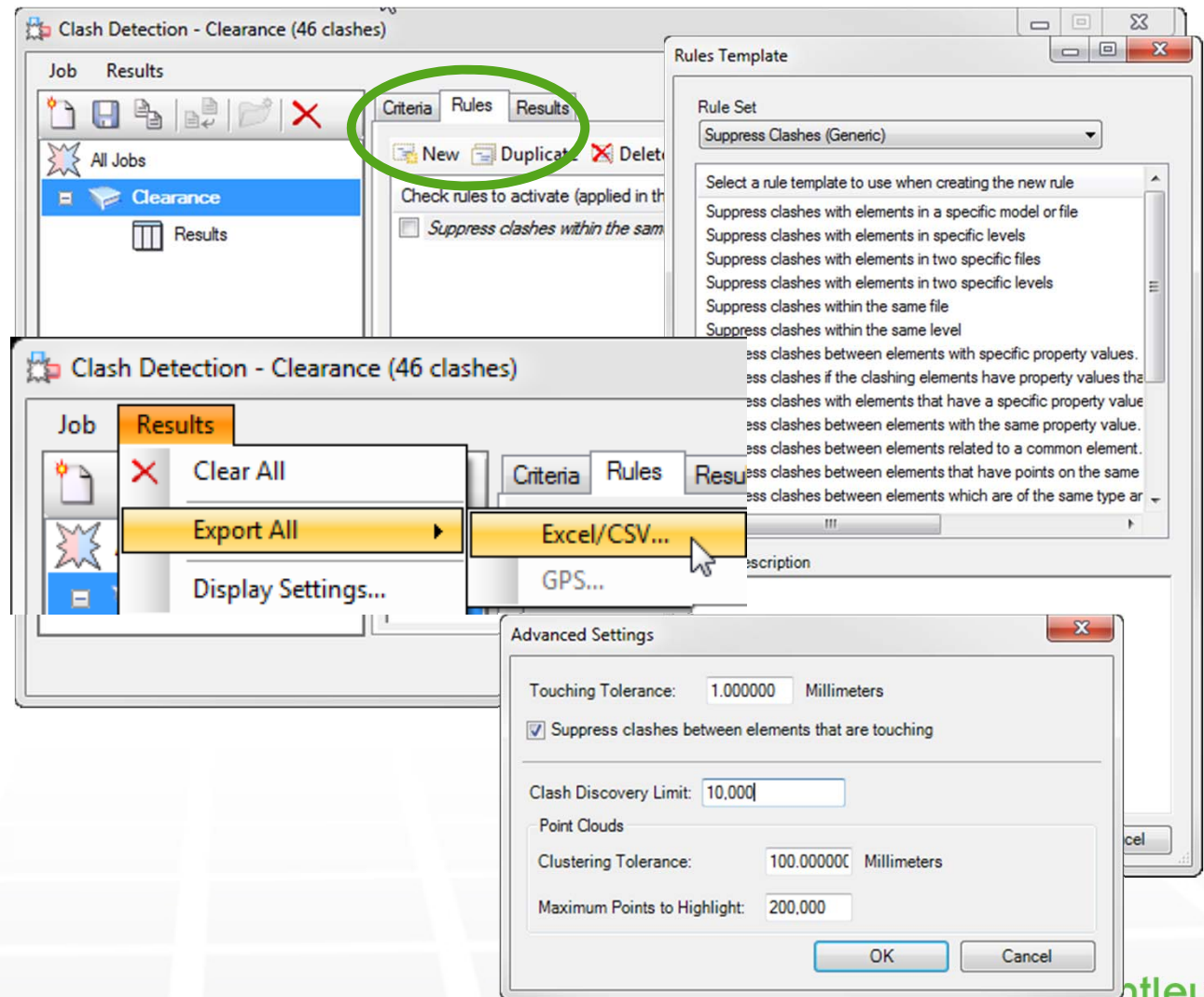
Clearance Verification

- Use Clash Detection tool
 - Tools > Clash Detection
 - Setup by level symbology or...
- Check all kind of clearances: horizontal / vertical
- Works with reference files
- Checks among any 3D elements



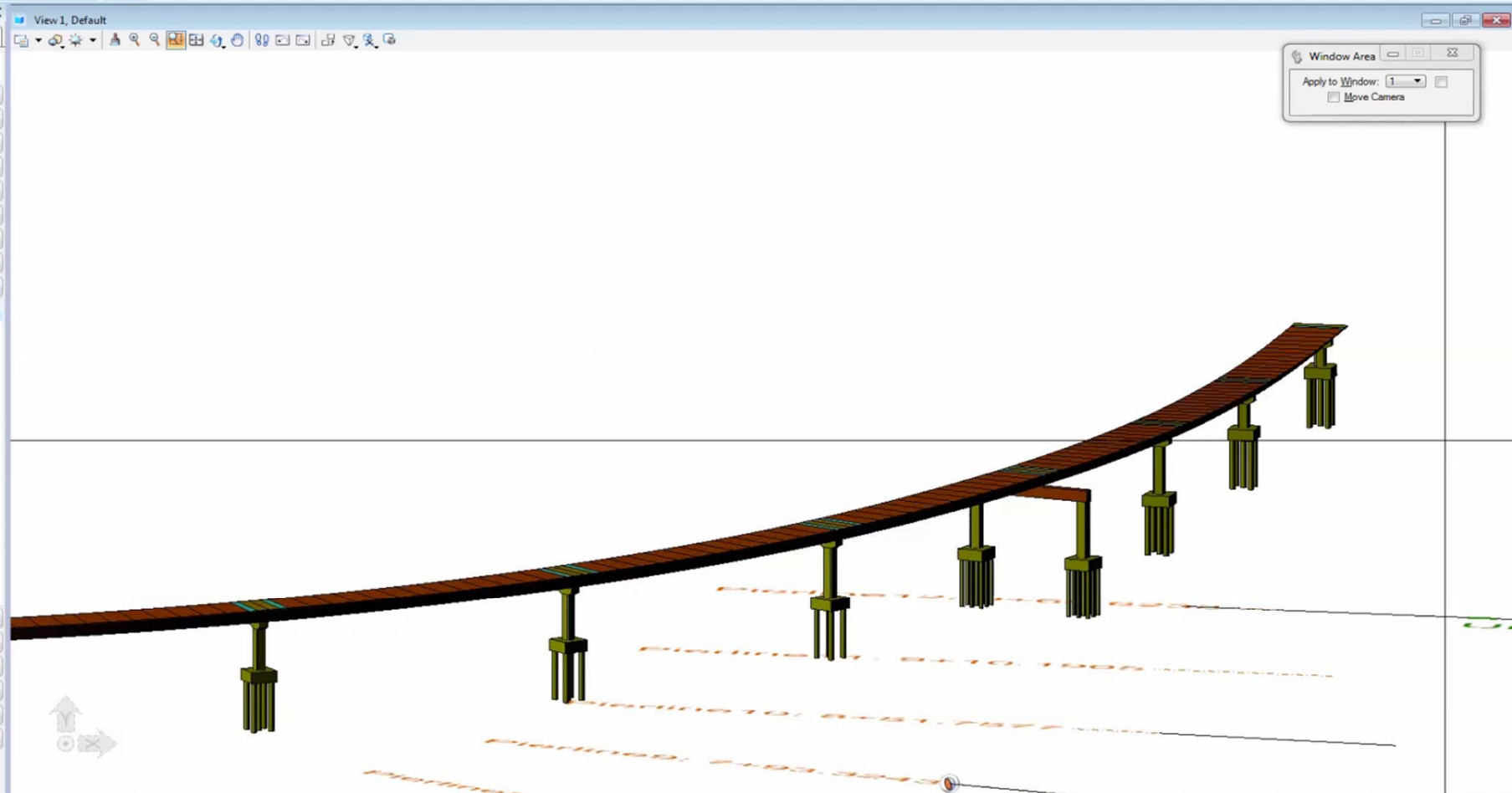
Clearance Verification

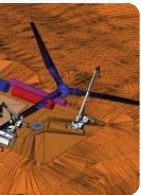
- Use Rules to refine the conflict detection.
- Export results to Excel
- Works also with Point Clouds



Tasks

- Model Interoperability
- Civil
- Terrain Model Tools
- 3D Geometry Tools
- Vertical Geometry Tools
- Corridor Modeling
- Civil Cells
- Bridge Tools
- Civil Tools
- Drawing**
- Drawing Composition
- Solids Modeling
- Surface Modeling
- Feature Modeling
- Visualization
- Animation





Quantity and Geometry Reports

Quantity Reports

- Quantities
 - Concrete in v1.0
 - Rebar in future versions
 - Cost Estimates included
 - Unit price in Library

Bridge Name: BR 1

Bridge Unit: Unit1 :: Segmental Bridge

Materials Quantity Report

Superstructure Quantities

Component Name	Segment Type	Material Name	Material Type	Pay Unit	Unit Price	Quantity	Cost
1	Expansion EndBent	Precast Segmental Box Girders B	Concrete	Cubic Meter	1200.00	11.54	13842.58
2	Closure	Deck Concrete	Concrete	Cubic Meter	850.00	8.28	7041.80
3	3	Precast Segmental Box Girders A	Concrete	Cubic Meter	1230.00	25.95	31924.40
4	4	Precast Segmental Box Girders A	Concrete	Cubic Meter	1230.00	25.95	31924.40
5	5	Precast Segmental Box Girders A	Concrete	Cubic Meter	1230.00	25.95	31924.40

Geometry Reports

- Echo input report
 - Review your data entry.
- Deck Elevations
 - Flexible reporting point options
- Beam/Seat Elevations
- Support Elevations

Bridge Name: BR 1

Bridge Unit: Unit1 :: Segmental Bridge

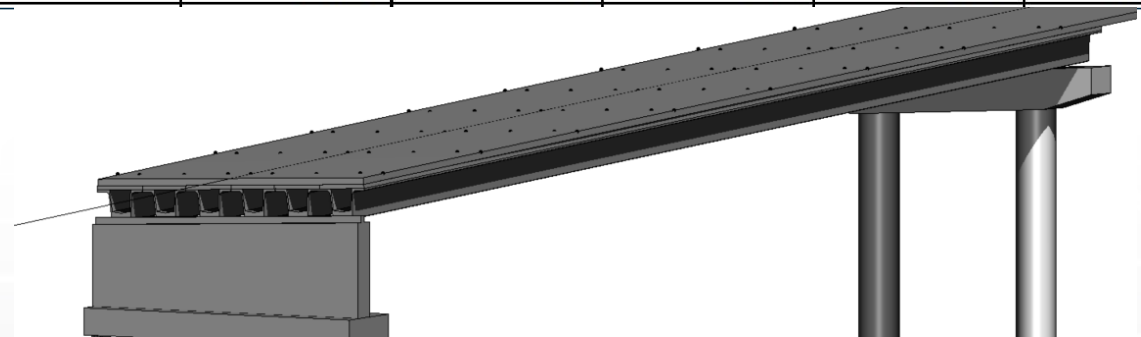
Deck Elevation Report

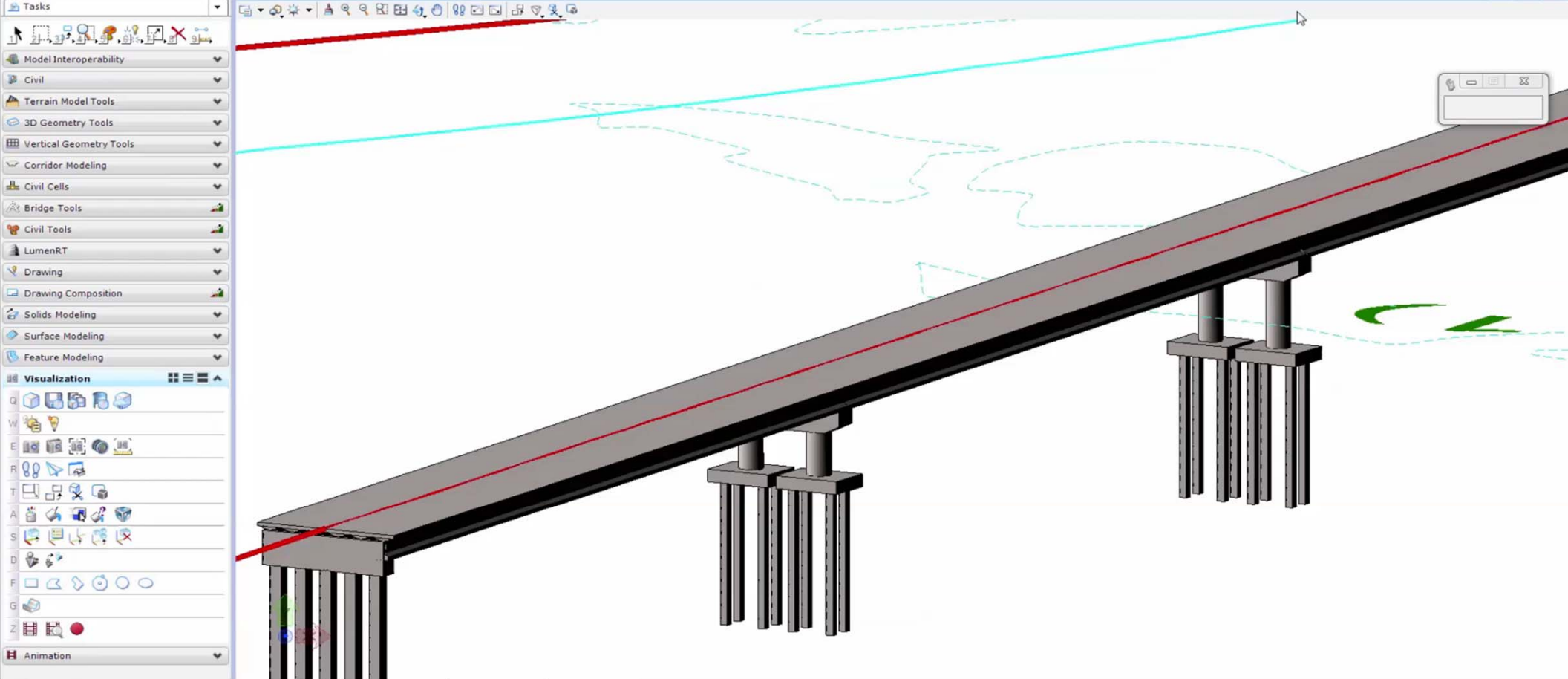
Normal to alignment

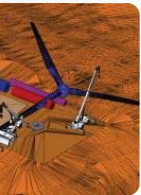
Alignment TE01a with offset = -2.0000,0.0000,2.0000

Span 4

Name	Station - Bridge Alg(m)	Offset - Bridge Alg(m)	Elevation(m)	X(m)	Y(m)
::2::Closure	5+00.7119	-2.0000	54.4114	239901.5708	3969219.7443
::2::Closure	5+00.7119	0.0000	54.4114	239902.7337	3969218.1171
::2::Closure	5+00.7119	2.0000	54.4114	239903.8966	3969216.4900
::3	5+01.1731	-2.0000	54.4183	239901.9429	3969220.0107
::3	5+01.1731	-0.0000	54.4183	239903.1087	3969218.3857
::3	5+01.1731	2.0000	54.4183	239904.2746	3969216.7606
::4	5+05.6731	-2.0000	54.4858	239905.5474	3969222.6452
::4	5+05.6731	0.0000	54.4858	239906.7417	3969221.0410



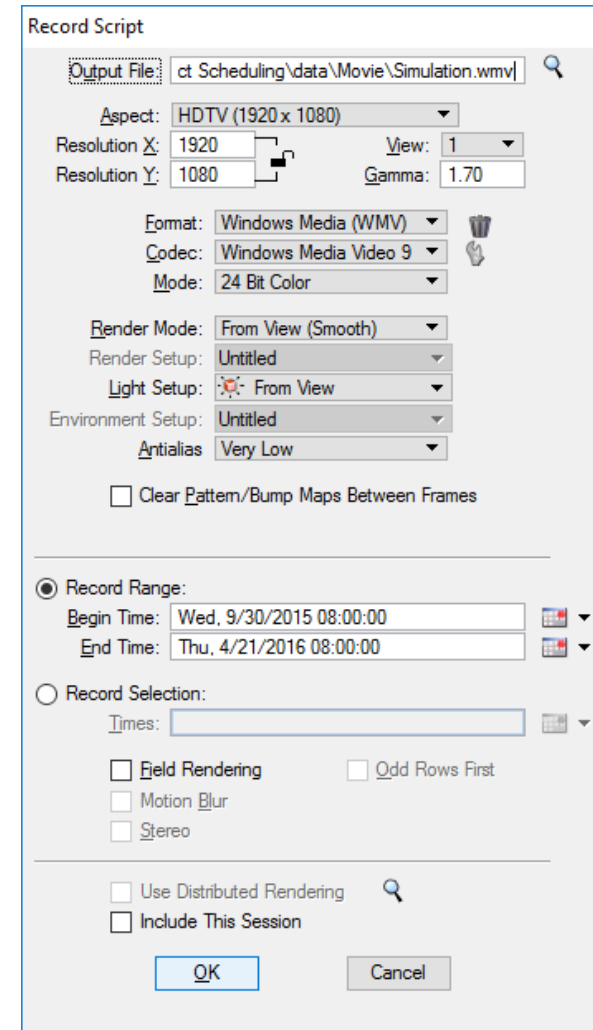
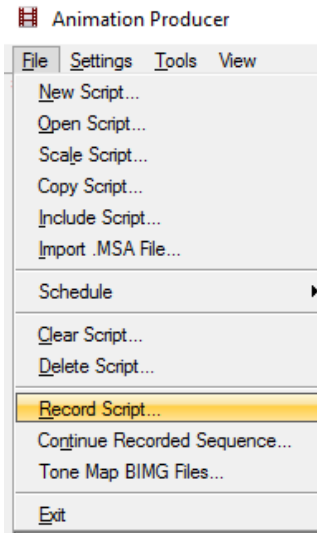




Scheduling and Construction Planning

Scheduling

1. Connect the model with Project Scheduling software.
2. Add extra field matching the task with the MicroStation Level Name that will be constructed in that task.
3. Save the schedule in XML format.
4. Open the Animation Producer, and switch to the Scheduling View
5. Import the Schedule in the Animator.
6. Link the level name with the task.
7. Select Tools > Preview to start the simulation.
8. Record the simulation



Tasks

- Civil Tools
- Analysis & Reporting
- General Geometry
- Horizontal Geometry
- Vertical Geometry
- Terrain Model
- Corridor Modeling
- Model Interoperability
- Civil Cells
- 3D Geometry
- Survey
- OpenRoads Help
- Drawing
- Visualization
- Animation

View 1, Default

Milwaukee Bridge Schedule.mpp - Project Standard

Alex Mabrich

FILE TASK RESOURCE REPORT PROJECT VIEW GANTT CHART TOOLS FORMAT

Gantt Chart View

Clipboard Font Schedule

Manually Schedule Auto Schedule

Inspect Move Mode

Task Summary Milestone

Information

Notes Details Add to Timeline

Find Clear Scroll to Task Fill Editing

Start: Wed 9/30/15

Finish: Thu 4/21/16

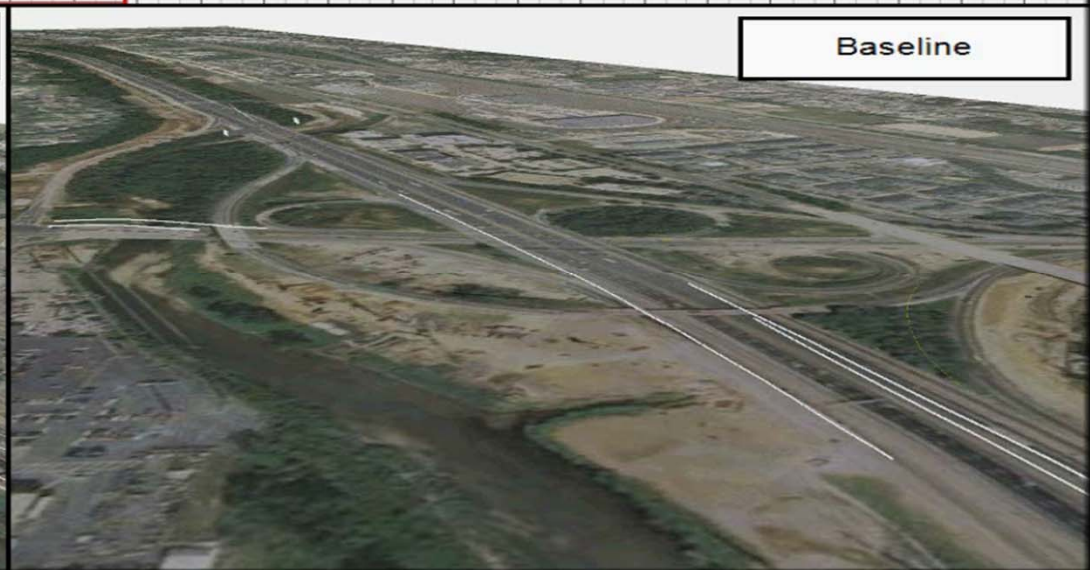
Add tasks with dates to the timeline

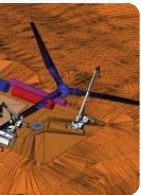
Task Mode	Task Name	Text1	Duration	Start	November 1	December 1	January 1	February 1	March 1						
					10/25	11/8	11/22	12/6	12/20	1/3	1/17	1/31	2/14	2/28	3/13
1	Notice to Proceed		1 day?	Wed											
2	Construct Bridge		203 days	Thu											
3	Construct Piles Phase 1	Piles-Phase 1	28 days	Thu											
4	Construct Piles Phase 2	Piles-Phase 2	28 days	Thu											
5	Construct Piles Phase 3	Piles-Phase 3	28 days	Thu											
6	Construct Bents	Bent	30 days	Thu											
7	Place Beams Phase 1	Beam-Phase 1	14 days	Sat											
8	Place Beams Phase 2	Beam-Phase 2	20 days	Sat											
9	Place Beams Phase 3	Beam-Phase 3	10 days	Fri											
10	Construct Deck	Deck	45 days	Mor											
11	Construct Drainage System		97 days	Sun											
12	Place Manholes Phase 1	SS_Manholes-Phase 1	22 days	Sun											
13	Place Piping Phase 1	SS_Piping-Phase 1	20 days	Mor											
14	Place Manholes Phase 2	SS_Manholes-Phase 2	30 days	Sun											
15	Place Piping Phase 2	SS_Piping-Phase 2	25 days	Tue											

ID	Name	Duration	Start	Finish
ST00060	Telegraph Road	1189d	27/11/06	16/06/11

Side by Side Management Report

Baseline Scenario 1
 v
 Best Scenario 2
 Including Best EVA

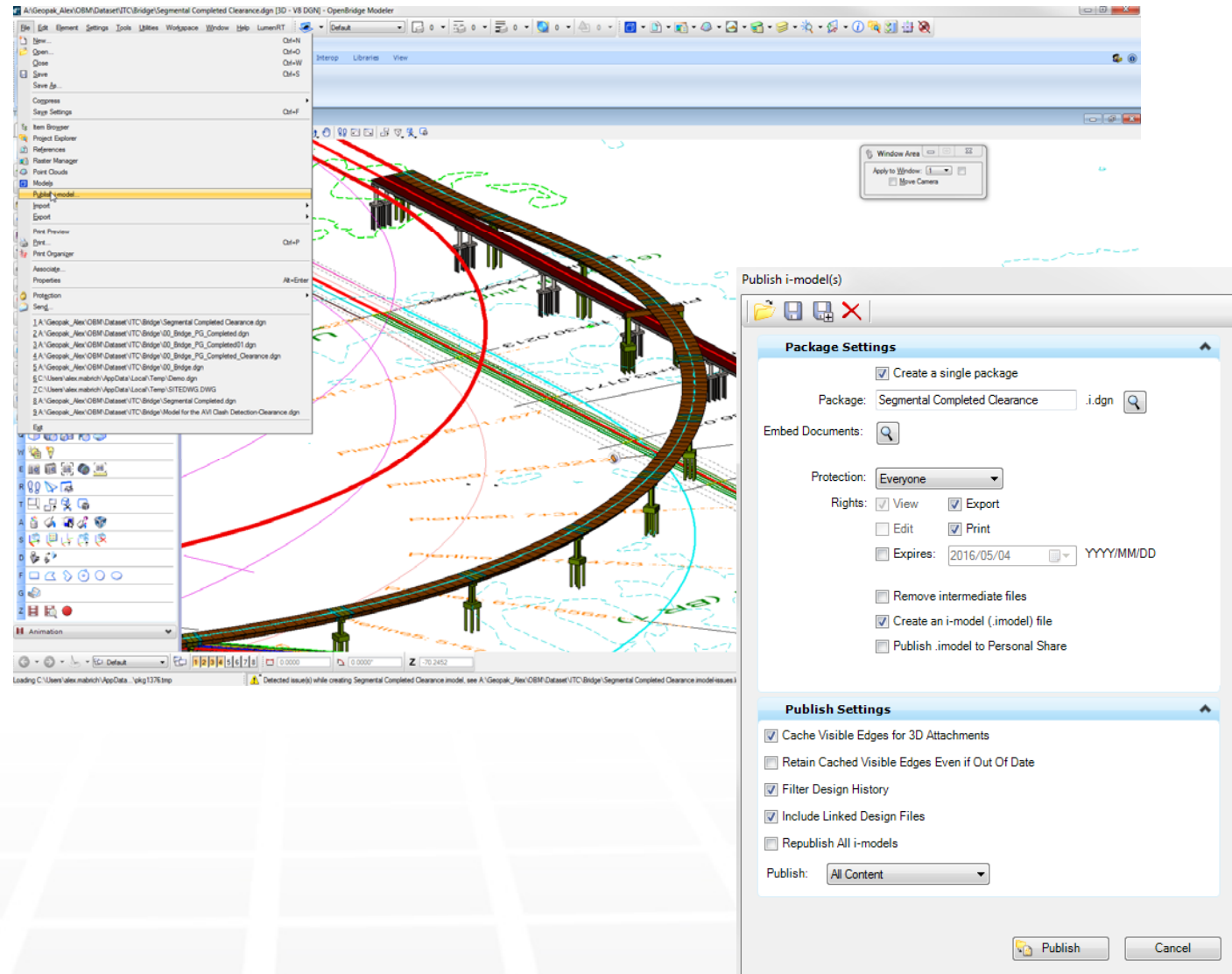




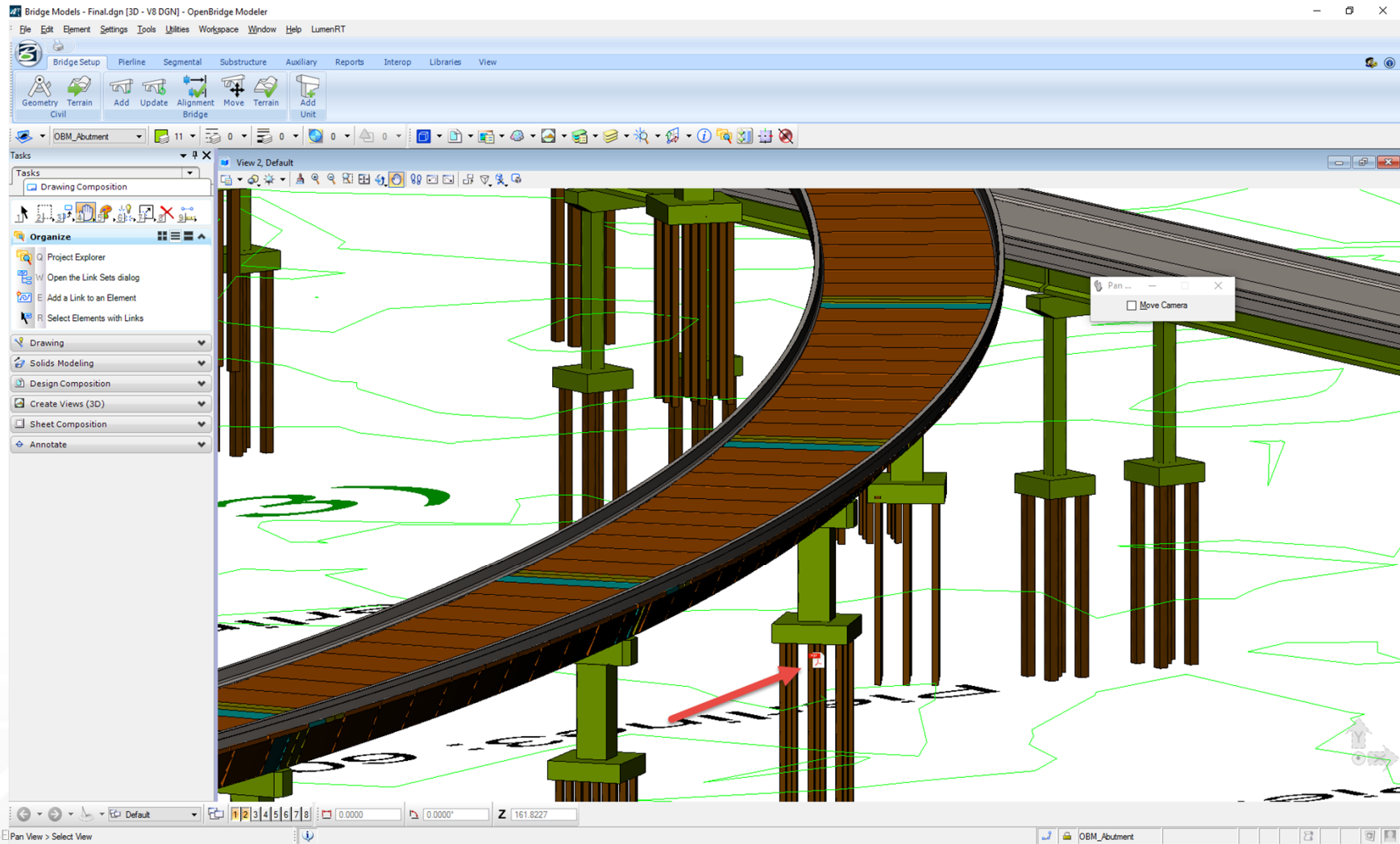
Intelligent Models

Publishing i-models

- File > Publish i-model
- Read only file for information exchange
- No need of additional applications.
- All reference files are included. Complete package including mobile.
- Open with Bentley Navigator.
- Could be open in other CADD software.

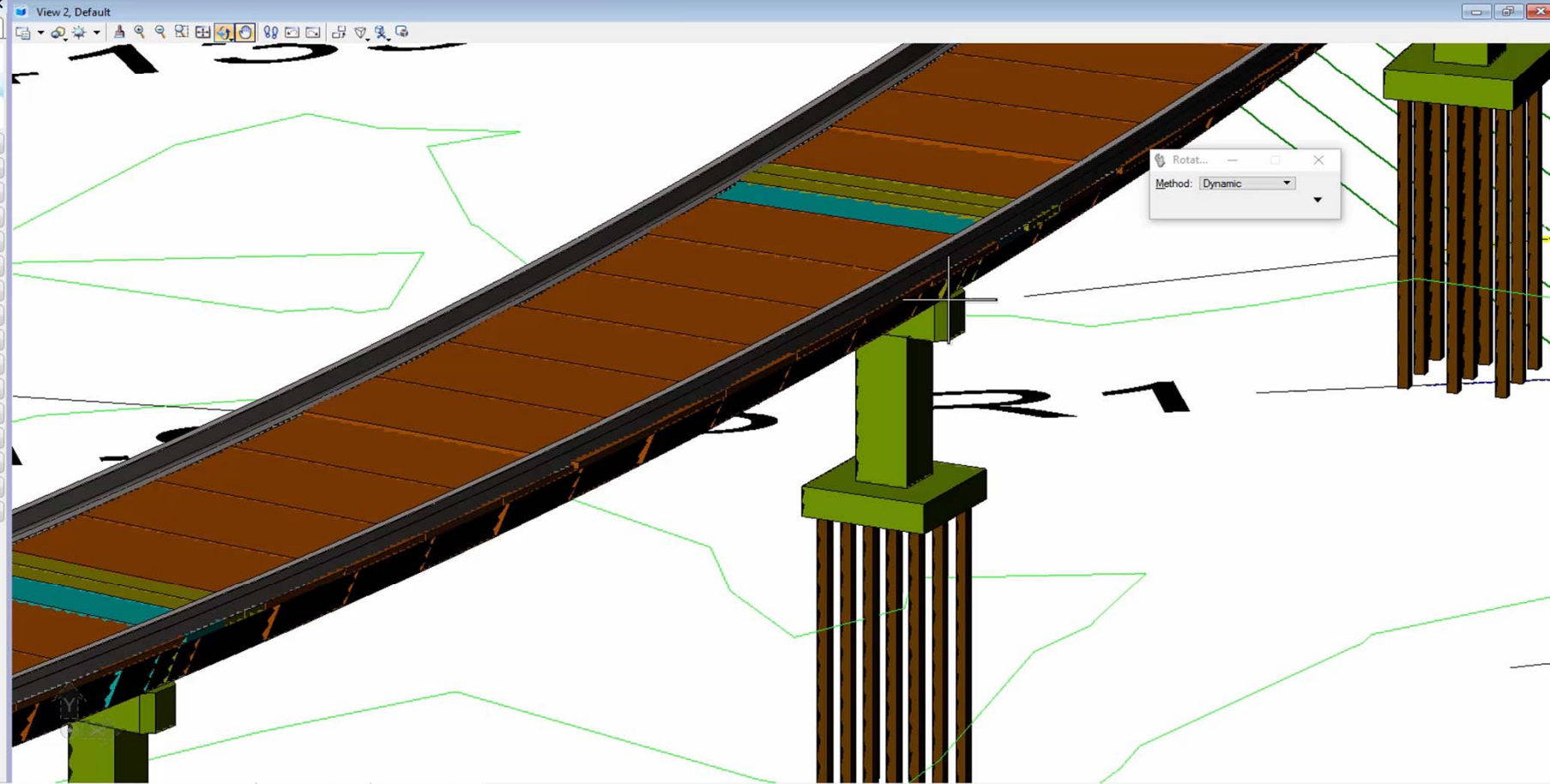


Augmented Model





- Tasks
- Model Interoperability
- Civil
- Terrain Model Tools
- 3D Geometry Tools
- Vertical Geometry Tools
- Corridor Modeling
- Civil Cells
- Bridge Tools
- Civil Tools
- LumenRT
- Drawing
- Drawing Composition
- Solids Modeling
- Surface Modeling
- Feature Modeling
- Visualization
- Animation



Rotat...
Method: Dynamic

Link Construction Documents

The screenshot displays the Bentley Navigator V8i interface for a 3D model of a bridge. The main window shows a 3D view of a pier with a bearing. A red box highlights the 3D view, and a circular inset provides a magnified view of the bearing assembly. The Project Explorer on the left shows the model hierarchy. The Element Information panel on the right shows the selected element, 'Bearing - Friction Pendulum Bearing', with its properties and links.

Element Information

Selection
Bearing - Friction Pendulum Bearing

Extended

Raw Data

Properties

Catalog Type	Bearing
Catalog Instance	Friction Pendulum Bearing
01. National Bridge Elem	316
02. Element ID	514256
03a. Group	Pier
03b. Sub Group 1	Bearing
04. Description	Bearing type XYZ
05a. Specifications	(See Link [1])
05b. Rating/Maintenance	(See Link [0])
06a. Coordinates	659587.74N, 815715.24E
06b. Bridge	West Bound
06c. Pier	23
06d. Beam Line	5
07. Manufacturer	Manufacturer ABC
08. Installation Date	6/10/2013
09. Coating/Finish	None
10. Fabrication Sheet	(See Link [2])
11. Construction Record	(See Link [3])

Links

Links	4
Links[0]	Sample Bridge Inspect
Links[1]	FP-Bearing_RM Bridge
Links[2]	FP-Bearing.pdf
Links[3]	FP-Bearing2.jpg

Bridge_Model_03.27-Final.overlay.dgn [3D - V8 DGN] - Bentley Navigator V8i (SELECTseries 4)

File Edit Settings Tools Review Window Help

X 659432.65E Y 815694.76E Z 26.9470

Project Explorer View 1 - Isometric, Default

- Bridge_Model_03.27-Fina
 - Column Plan
 - Deck Plan
 - Elevation @ Pier 24
 - Full View
 - P23-P24 Clipped
 - Preview
 - Section @ Pier 23

Items

Active

Expand a panel to display items

Element Information

Selection

- Steel Beam - Beams

Material

Extended

Raw Data

Properties

Catalog Type	Steel Beam
Catalog Instance	Beams
Beam End 1 Moment	-175,745 k-ft
Beam End 1 Shear	-3009 k
Beam End 2 Moment	-229485 k-ft
Beam End 2 Shear	3316 k
Beam End Point	Pier 24
Beam Length	350.00 ft
Beam Line Number	5
Beam Material	Steel Grade 50
Beam Material Density	0.49 kip per Cu. Ft
Beam Name	Custom Section
Beam Orientation Vector	N 89 5' 56" E
Beam Placement point	Offset 40.00 ft Right
Beam Section Name	Custom Section
Beam Start Point	Pier 23
Beam Structural Material	Steel Grade 50
Beam Unit Weight	0.490 kip per Cu. Ft
Beam Volume (Gross)	802.7368 Cu. Ft
Beam Volume (Net)	802.7368 Cu. Ft
Beam Weight (gross vol)	393.3410 kip
Beam Weight (length * u	171.5 kip per Sq. ft
Beam Weight (net volum	393.3410 kip
Element ID	9055
ID Description	Main Longitudinal Member
ID Item ID	Westbound Bridge Span 2

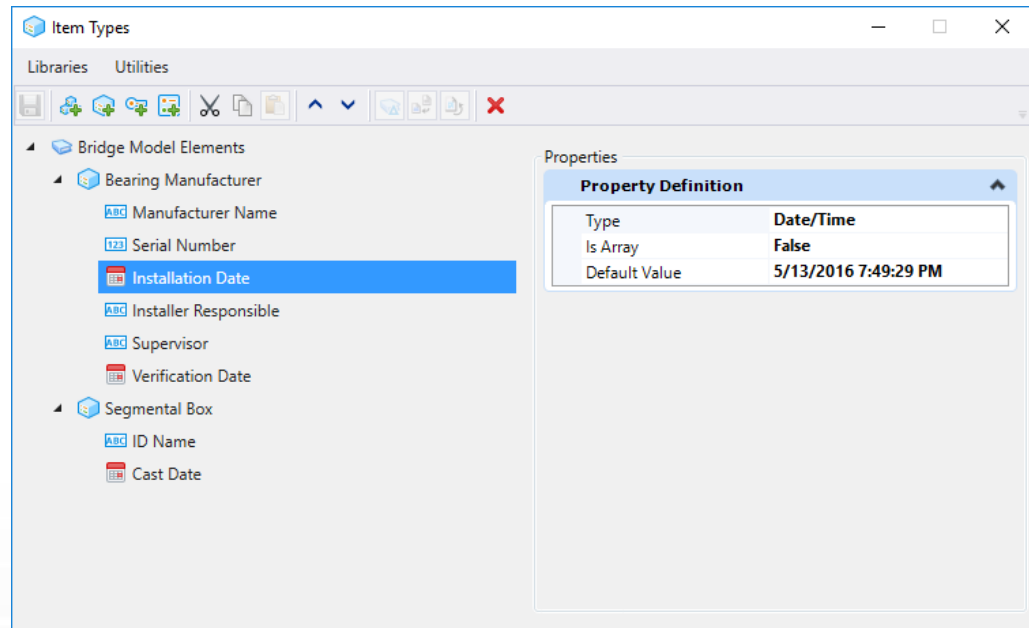
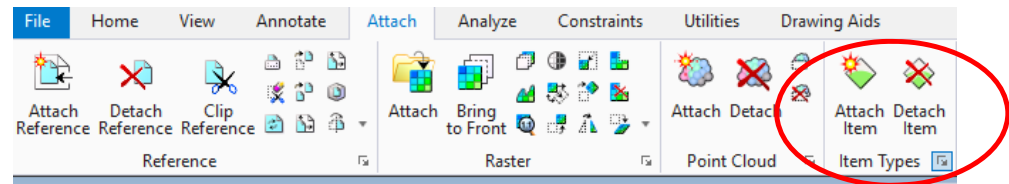
Element Selection

Mesh, Level: Element Groups:U6_WB_Sp4_Steel, Ref: Reviewed

659432.6553, 815694.7665, 26.94

Adding Extra Intelligence to the Model

- Custom data not generated by Bentley design or modeling software.
- Adding extra information to the elements in the model.
- Custom library of property items.
- Import from DGN or DGNLIB
- Available as a standard tool in MicroStation CONNECT edition.
- Attach > Attach Item in the Items Types group.



Bridge Models - Final.dgn [3D - V8 DGN] - MicroStation

File Home View Annotate Attach Analyze Constraints Utilities Drawing Aids

None OBM_Abutment

11 0 0 0 0

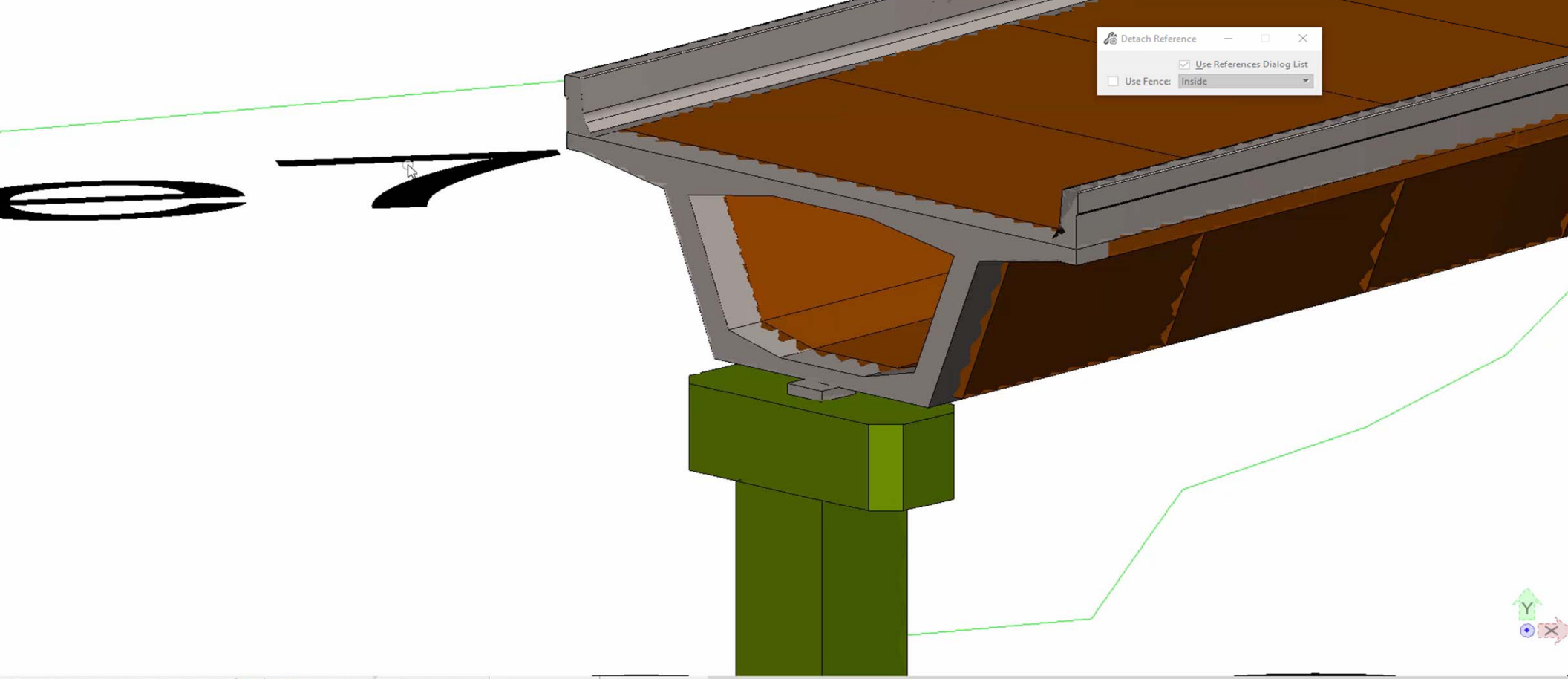
Attributes Primary Selection Placement Manipulate Modify Groups

Explorer Attach Tools Models Level Display Element Selection Fence Tools Line Tools Arc Tools Ellipse Tools Move Copy Rotate Modify Element Break Element Trim Multiple Create Region

Search Ribbon (F4)

View 2, Default

Navigation icons: Home, View, Rotate, Zoom, etc.



Navigation icons: Home, View, Rotate, Zoom, etc.

1 2 3 4 5 6 7 8

X -552669.9991 Y 7156496.6607 Z 1569620.0913

Detach Reference > Select reference

OBM_Abutment

Adding Extra Intelligence to the Model

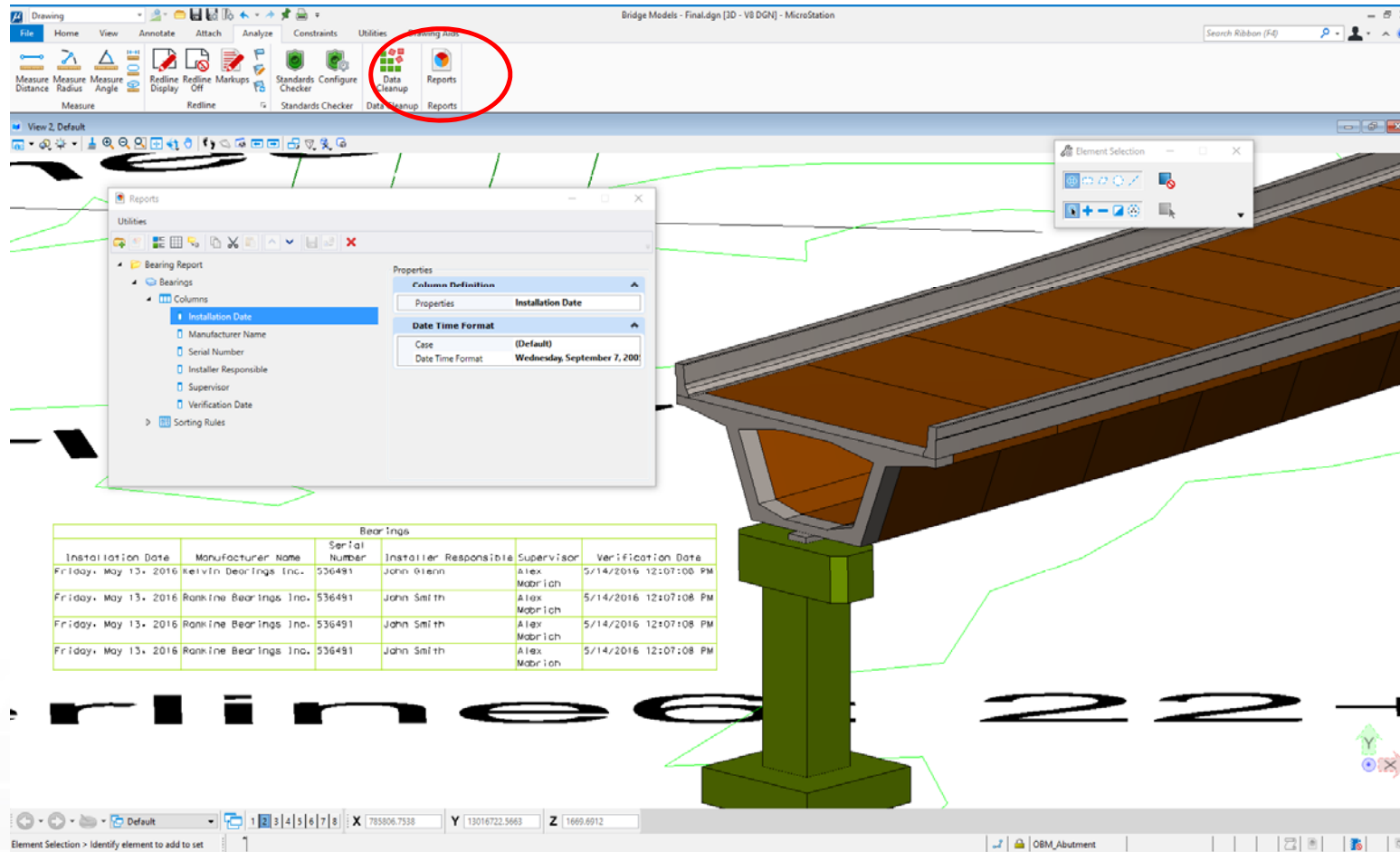
- Decide the level of detail in the elements.

The image shows a 3D wireframe model of a bridge structure. A purple arrow points from a specific cable anchorage element in the model to a detailed property table. The table lists various geometric and dynamic properties for the selected element.

Property	Value	Query
Base Offset	0.0000	
CABLE ANCHORAGE BEARING Depth	2.0000	
CABLE ANCHORAGE BEARING Depth	2.0000	
CABLE ANCHORAGE BEARING Top	0.2917	
CABLE ANCHORAGE BOT OF STM MNT FL	0.3542	
CABLE ANCHORAGE FLANGE Hb	1.5575	
CABLE ANCHORAGE FLANGE Hb	1.5575	
CABLE ANCHORAGE FLANGE H	2.1950	
CABLE ANCHORAGE FLANGE H	2.1950	
CABLE ANCHORAGE FLANGE LEG	3.6336	
CABLE ANCHORAGE FLANGE LEG	3.6336	
CABLE ANCHORAGE STM MNT PLT T	0.0729	
DELTA Y2 Y3	0.3315	
DELTA Y2 Y3	0.3315	
DELTA Y2 Y3	0.3315	
DELTA Y2 Ygirder	2.5000	
DELTA Y2 Ygirder	2.5000	
DELTA Y2 Ygirder	2.5000	
Depth Offset	0.0000	
Dynamics	3D	
GIRDER TOP FLANGE THK	0.1667	
Rel./Active ACS	Disabled	
Sense Distance	1.0000	
Side Offset	No Offset	
WORK POINT B1 X	1099.0138	
WORK POINT B1 Y	51.8269	
WORK POINT B1 Z	136.0347	
WORK POINT B2 X	1095.9978	
WORK POINT B2 Y	51.9999	
WORK POINT B3 X	1084.4146	
WORK POINT B3 Y	52.6629	
WORK POINT B3 Y	52.6629	
WORK POINT B3 Y	52.6629	
WORK POINT B3 Z	143.3167	
WORK POINT B4 X	1079.9388	
WORK POINT B4 Y	67.6182	

Generate Reports on the Model

- Custom reports in MicroStation CONNECT.
- Sorting options
- Tables as graphics in DGN, or spreadsheets
- Display formatting options.



Bridge Models - Final.dgn [3D - V8 DGN] - MicroStation

File Home View Annotate Attach Analyze Constraints Utilities Drawing Aids

None OBM_Abutment

11 0 0 0 0

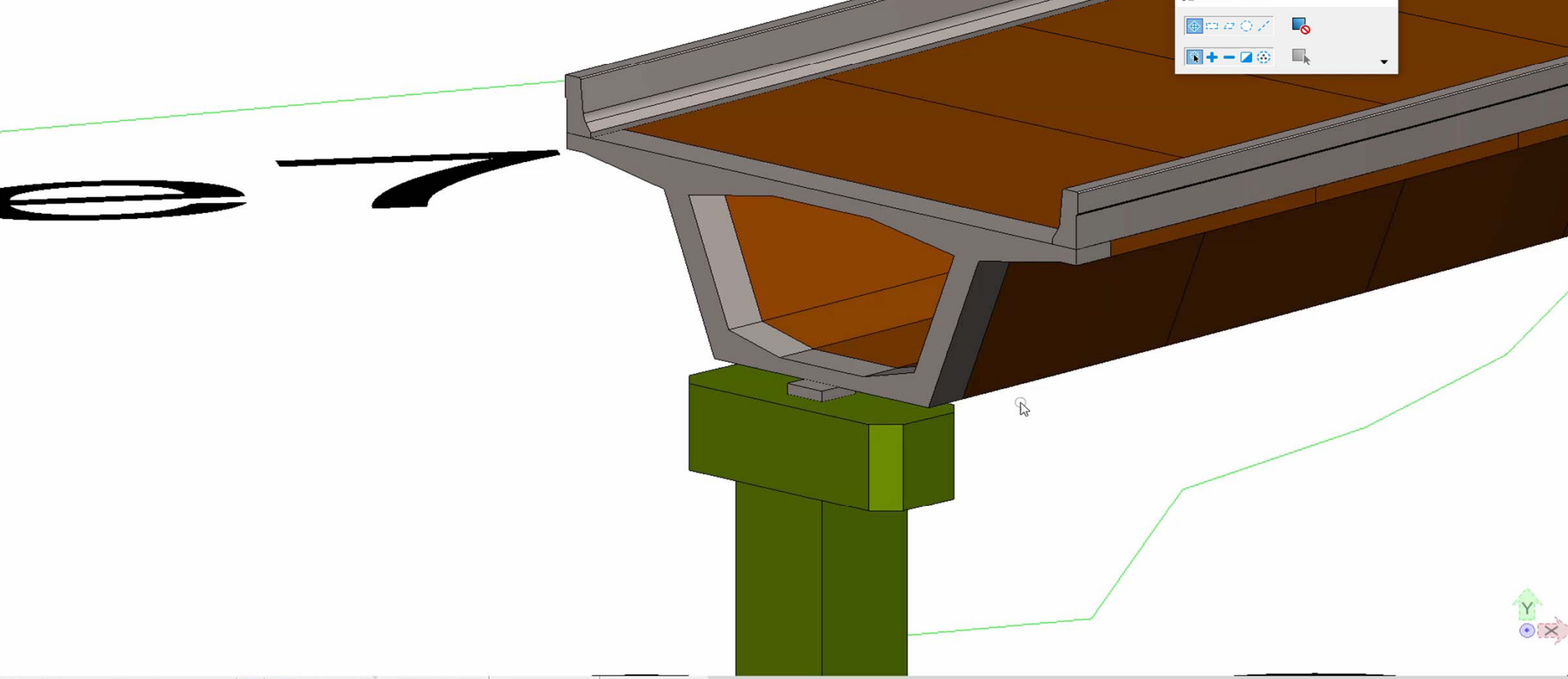
Attributes Primary Selection Placement Manipulate Modify Groups

Explorer Attach Tools Models Level Display Element Selection Fence Tools Line Tools Arc Tools Ellipse Tools Move Copy Rotate Modify Element Break Element Trim Multiple Create Region

Search Ribbon (F4)

View 2, Default

Element Selection

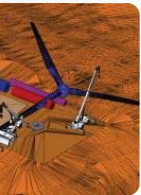


Element Selection > Identify element to add to set

1 2 3 4 5 6 7 8

X 785793.3468 Y 13016721.6954 Z 1654.9916

OBM_Abutment



Construction and Inspection

Design 3D Models To Asset Inspection

inspect^{tech} Main Collector Maintenance Manager Administration Internal Help

Main Dashboard Add Widget

Report Status Count - Past Year

Last Accessed Assets

Asset Name	Asset Code
Cable Stayed Bridge	CSB
Victoria Bridge	Victoria Bridge
Box Beam Bridge	Box Beam Bridge
Rail Bridge	Rail Bridge
Hotman Bridge	Hotman Bridge

My Reports Created Per Month

Recent Logins

Inspector	Date
Demo, Demo	06/14/2013 8:04:14 AM
Demo, Bentley	03/18/2013 10:28:00 PM
Demo, Admin	03/08/2013 3:58:38 PM
Demo, Mobile	02/01/2013 2:03:57 AM

My Messages (1)


	Date	Message From	Message Title
Delete	01/19/2013	Administrator, InspectTech	Upcoming Maintenance
Delete	11/30/2012	Administrator, InspectTech	Upcoming Maintenance
Delete	10/12/2012	Administrator, InspectTech	Upcoming Maintenance

Bridge Construction Inspection

inspect^{tech} Main Collector Maintenance Manager Administration Internal Help

Forms Designer

Bridge Construction Inspector Checklist



Bridge Construction Inspector's Checklist

PIN:

County:

Federal Project No.:

State Project No.:

Bridge Name:

CEI Bridge Inspection Representative:

Bridge Identification No.:

Project Description:

Activity Verified	Date Inspected/Verified	Corrective Action Taken (Y/N)
1. Stationing of all structures	<input type="text"/>	<input type="text" value="Dropdown"/>
2. Pile lengths documented at each substructure	<input type="text"/>	<input type="text" value="Dropdown"/>
3. Plans footing elevation	<input type="text"/>	<input type="text" value="Dropdown"/>
4. Footing position and skew	<input type="text"/>	<input type="text" value="Dropdown"/>
5. Footing reinforcement size and spacing, column steel projection	<input type="text"/>	<input type="text" value="Dropdown"/>
6. Column longitudinal and transverse steel size and spacing	<input type="text"/>	<input type="text" value="Dropdown"/>
7. Bridge seat elevation @ exterior beams of abutments and intermediate supports	<input type="text"/>	<input type="text" value="Dropdown"/>
8. Concrete cylinder strengths meet contract minimums for all substructures	<input type="text"/>	<input type="text" value="Dropdown"/>
9. Deck reinforcement location and size	<input type="text"/>	<input type="text" value="Dropdown"/>
10. Proper screed rail elevations set	<input type="text"/>	<input type="text" value="Dropdown"/>
11. Plans deck thickness computed before	<input type="text"/>	<input type="text" value="Dropdown"/>

Controls

Label

Image

Checkbox

Memo

Specialty Controls

Template Controls

Properties

Information:

Name:

Element Type:

Functionality:

Tab Index:

Read Only:

Show Field Choice Name:

Positioning:

Top:

Left:

Width:

Height:

Display:

© Copyright 2014 Bentley Systems, Inc. InspectTech - Administrator, InspectTech - Logout

DEMO

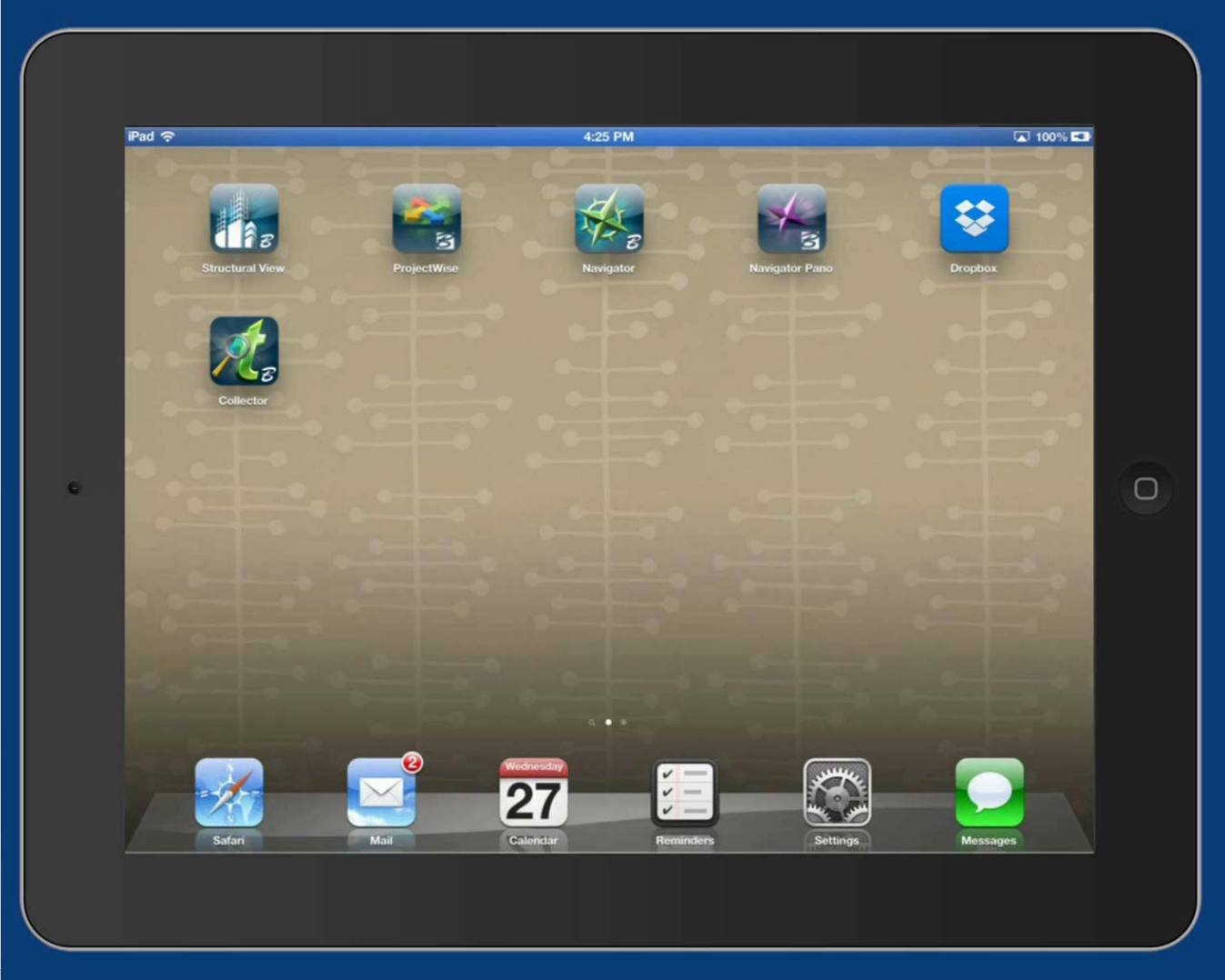
Intelligent Model in Construction

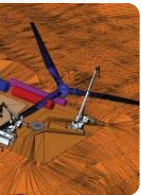
The screenshot displays the Navigator CONNECT software interface. The main window shows a 3D model of a bridge structure, including a brown deck, blue steel beams, and a green support pier. A red arrow points from a metadata panel on the right to a specific component in the model. The metadata panel is titled 'Miscellaneous' and contains the following information:

- Model:** Bridge Models - Alex_Final
- Level:** Bridge Models - Alex_Final - default
- Bearing Manufacturer:**
 - Manufacturer Name:** Rankine Bearings Inc.
 - Serial Number:** 536491
 - Installation Date:** 5/13/2016 7:49:29 PM
 - Installer Responsible:** John Smith
 - Supervisor:** Alex Mabrich
 - Verification Date:** 5/14/2016 12:07:08 PM
- Segmental Box:**
 - ID Name:** S-1
 - Cast Date:** 5/13/2016 12:07:56 PM

A tooltip over the bridge structure reads: "Level: Bridge Models - Alex_Final - default; Model: Bridge Models - Alex_Final". The Navigator CONNECT logo is visible in the bottom left corner.

Mobile Inspection



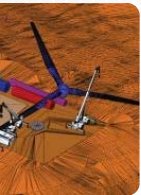


Summary

Summary

1. The model is not just a 3D model...it is an intelligent 3D model.
2. Use in all phases of the project, from design to construction to asset management.
3. Accurate modeling allows:
 - a. Clearance Verification
 - b. Geometry and quantity reports
 - c. Schedule and construction planning
 - d. Add extra intelligence to elements
 - e. Reports on the model
4. Ecosystem of Bentley solutions...which we already know and use every day.





Thank You !