

From Theory to Reality: How We Actually Delivered the First Contractual IFC Bridge Project in the US

Michael Baker

INTERNATIONAL

Joe Brenner, P.E - Director of Bridge Technologies

Hanjin Hu, Ph.D., P.E. - Technical Manager

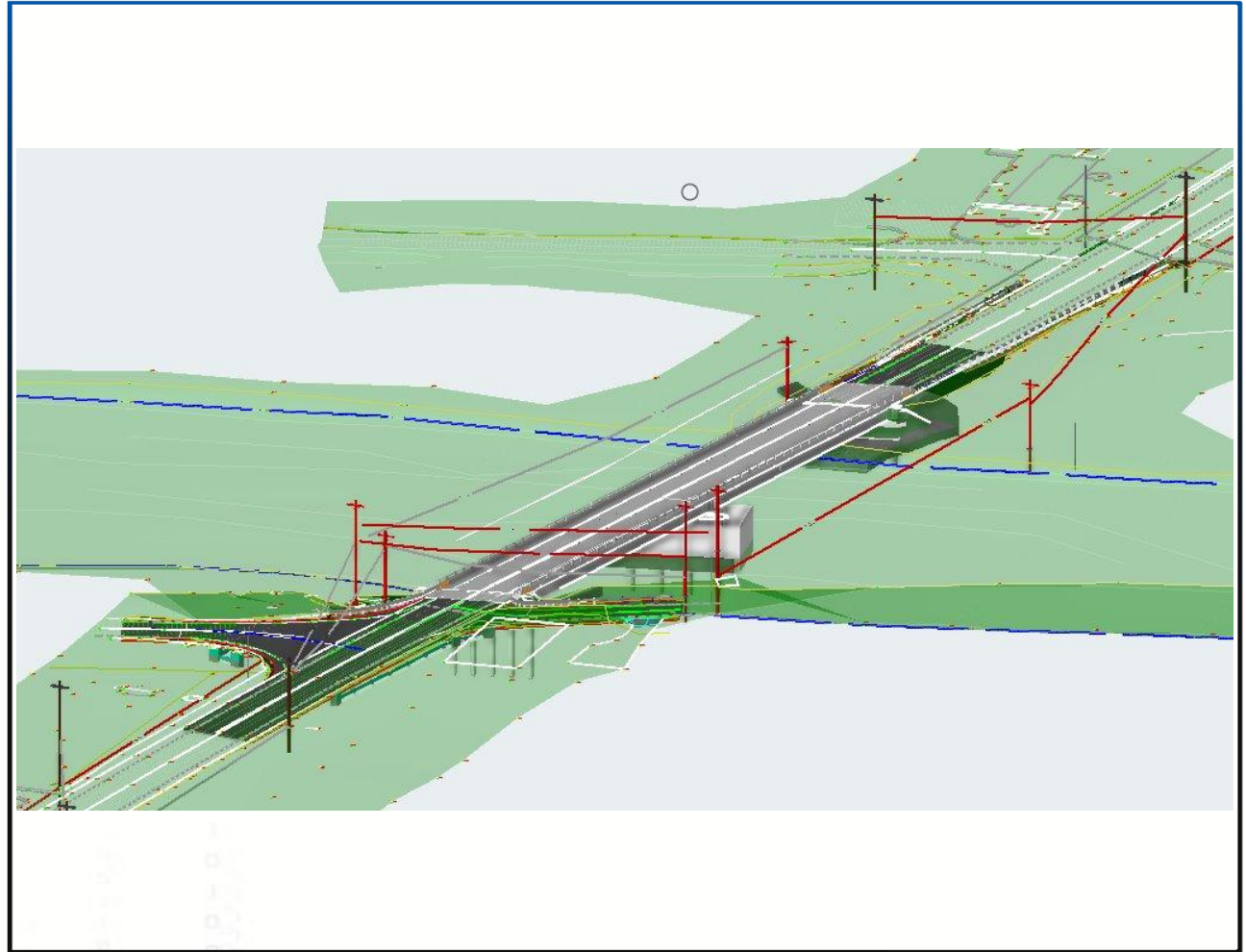
Cagin Yakar - Chief Executive Officer



PennDOT ADCMS Pilot Projects

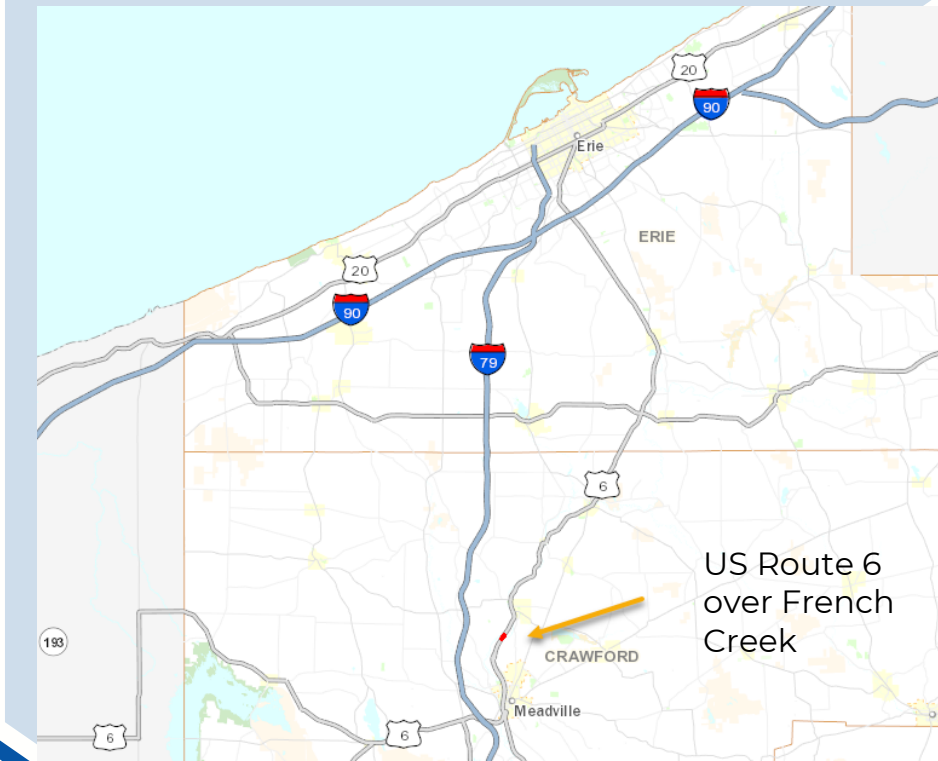
US Route 6 French Creek Parkway

- 2-Span Steel Plate Girders
- Integral Abutments
- Lead Designer: Michael Baker Intl.

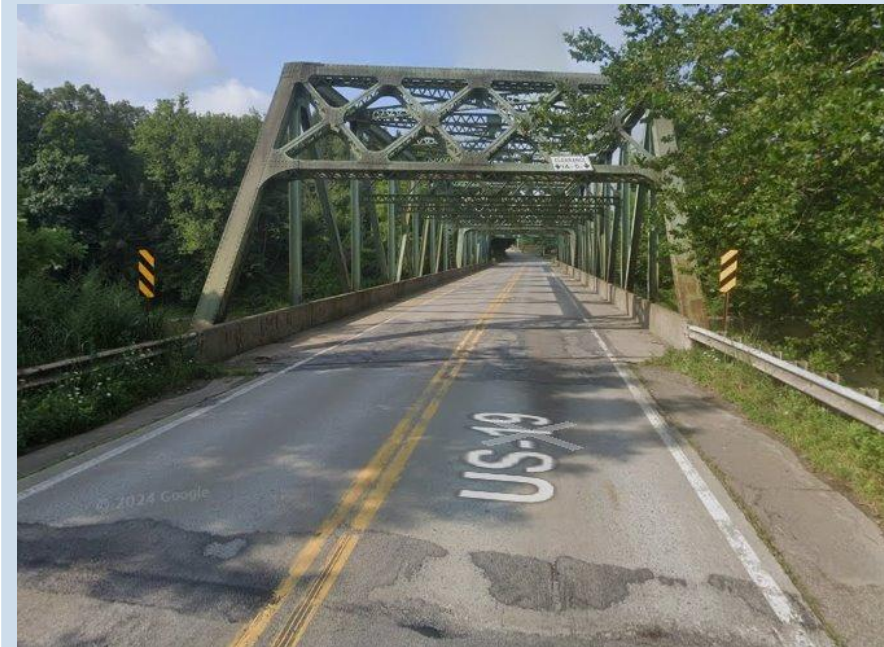


US R6 Over French Creek

Location Map – US Route 6 Bridge Over French Creek in Crawford County, PA



Existing Bridge – Steel Truss Structure Scheduled for Replacement

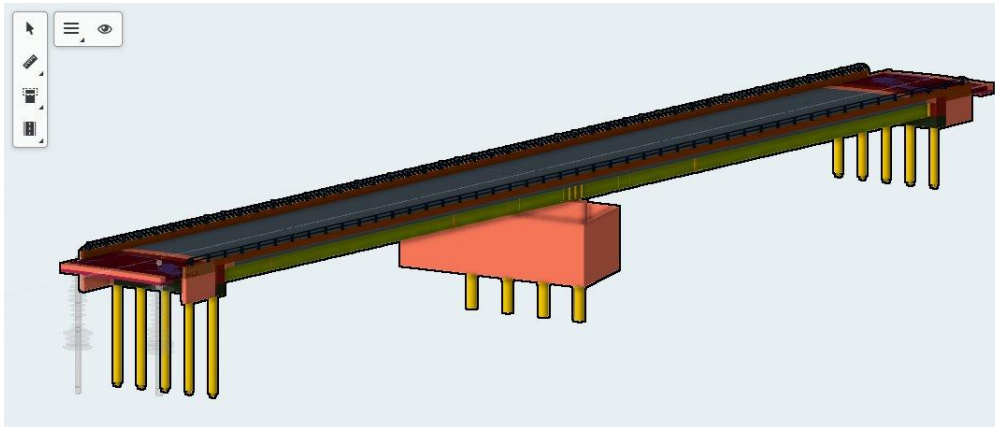


Design Strategy: Deliverables and Tools

Our deliverables include a federated model and supporting 2D plans.

Federated IFC Model

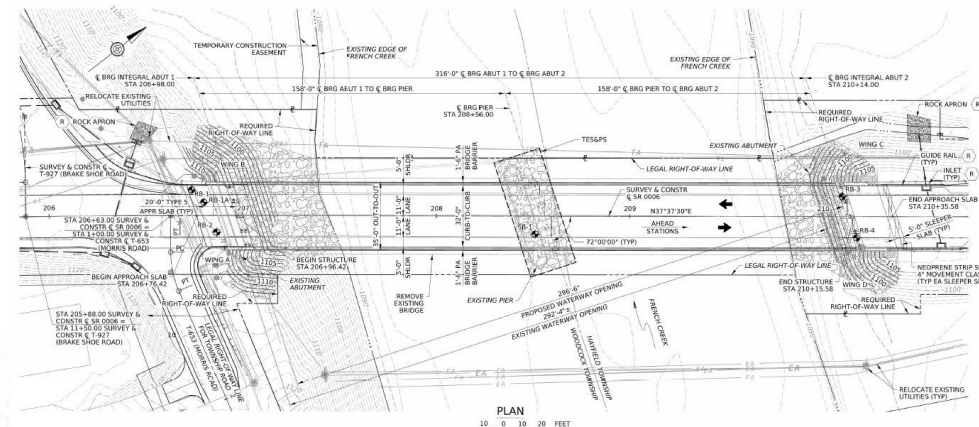
- OpenBrIM: Bridge geometry, materials, and detailed components
- Bentley OBM/Prostructures: Reinforcements



IFC Model

2D Plans

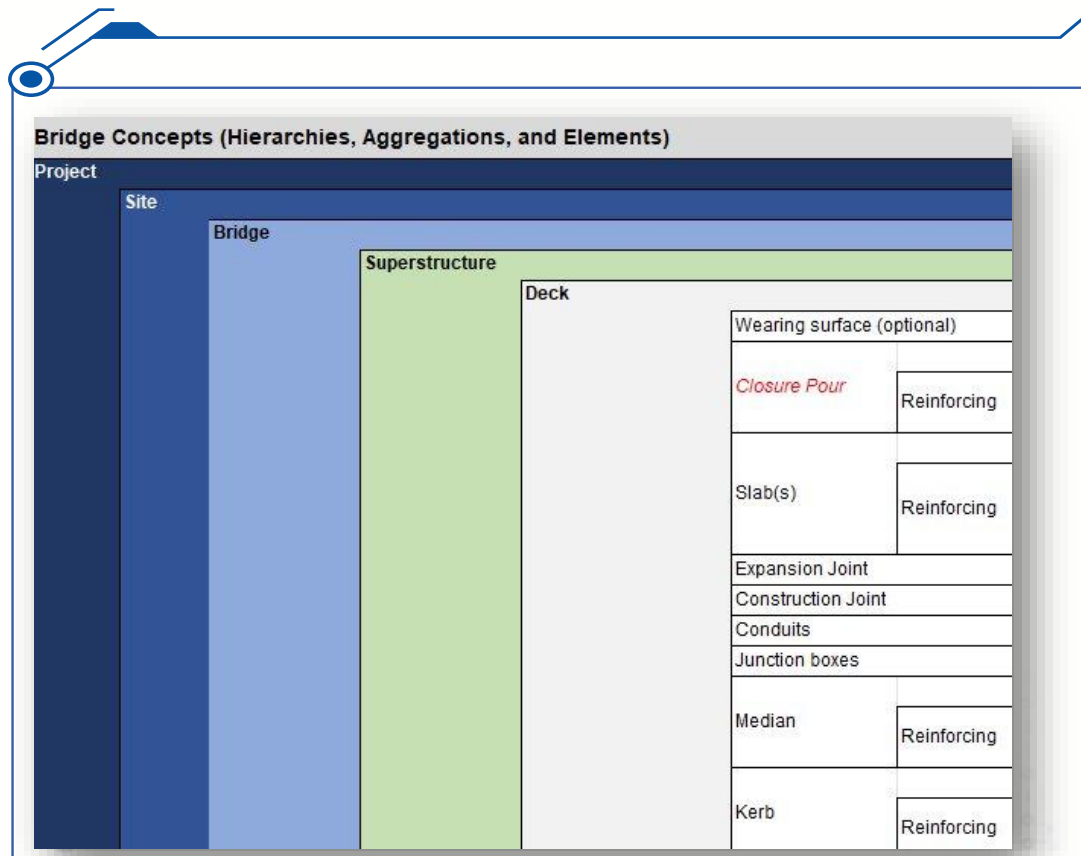
- Bentley OpenBridge Modeler and MicroStation: General notes, camber tables, detailed views, etc.



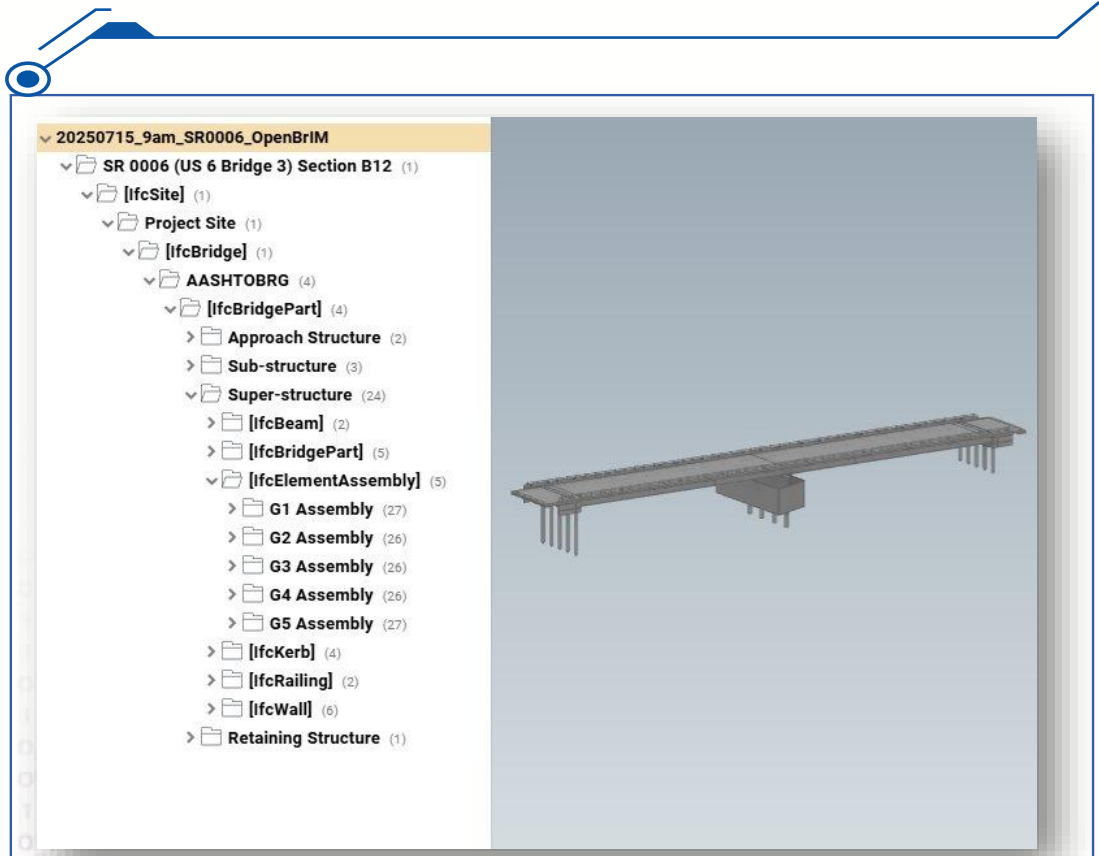
Supplemental 2D Plans

IFC Export: Entity Hierarchy

TPF-5(372), BIM for Bridges



IFC Entity Hierarchy in Viewer

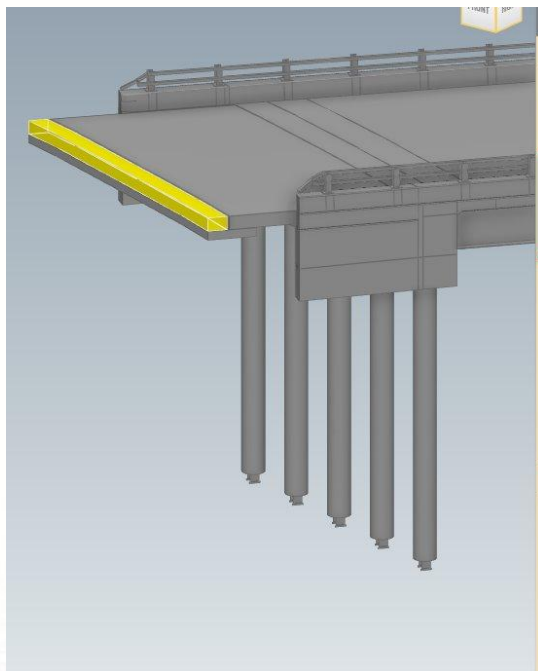


IFC Export: Entity Mapping

IFC Entity Mapping

| Bridge Design: OBM + BD/BC Sheets | | | IFC mapping for bridge concepts (Hierarchy) | |
|-----------------------------------|------------------|-------------|---|--|
| | Concrete | Reinforcing | IfcReinforcingBar. | |
| | diaphragm | | IfcReinforcingMesh | |
| | Drip bar | | IfcDiscreteAccessory.USERDEFINED:DRIPBAR | |
| 06 Structures | | | | |
| 06.01 | | | | |
| Approach structure | Approach slab | | IfcBridgePart.USERDEFINED:APPROACH_STRUCT | |
| | | | IfcSlab.APPROACH SLAB | |
| | | Strip seal | IfcDiscreteAccessory.USERDEFINED:STRIPSEAL | |
| | | Reinforcing | IfcReinforcingBar. | |
| | Sleeper headwall | | IfcReinforcingMesh | |
| | | Reinforcing | IfcSlab.USERDEFINED:HEADWALL | |
| | | | IfcReinforcingBar. | |
| | Sleeper slab | | IfcReinforcingMesh | |
| | | | IfcReinforcingBar.ANCHORING | |
| | | | IfcFooting.STRIP FOOTING | |
| | | Reinforcing | IfcReinforcingBar. | |
| | | | IfcReinforcingMesh | |
| | | Shear | IfcReinforcingBar.ANCHORING | |

IFC Entity for Sleeper Headwall



The image shows a 3D model of a bridge structure. A specific component, the sleeper headwall, is highlighted in yellow. To the right of the model is a detailed IFC entity data table for the selected object.

| IfcSlab | |
|--------------------------|------------------------------------|
| Characteristics | |
| General Data | |
| GlobalId | 2h51MFTdapfde42Qwk0wV0 |
| Name | OBPSSHW1 |
| Description | description |
| ObjectType | |
| ObjectType | HEADWALL |
| PredefinedType | |
| PredefinedType | .USERDEFINED. |
| ContainedInStructure | |
| RelatingStructure | IfcBridgePart A... |
| IfcObjectPlacement | |
| PlacementRelTo | <Absolute> |
| Location | [398903.9274; 171078.7874; 0.0000] |
| Axis | [0.0000; 0.0000; 1.0000] |
| RefDirection | [1.0000; 0.0000; 0.0000] |
| Geometric Representation | |
| Body | Tessellation |
| Properties | |
| Dimensions | |
| Depth [ft] | 1.5000 |
| Length [ft] | 2.1029 |
| Width [ft] | 31.8333 |
| General Properties | |
| Location for Quantity | Approach Slab 1 |
| Material | PennDOT_Class_AAAP_Normal_Wt |
| Name | Sleeper Slab Headwall 1 |

IFC Export: Defining Properties

We defined IFC Psets and properties in Excel, including metadata, IFC data mapping, source references, and value specifications.

| Entity | Property Set | Property | Source | Value | Unit | IFC Entity | IFC Value Type |
|---------|------------------------|--|------------|-------------------------------|------|------------|----------------|
| Bearing | General Properties | Connected by | IDM | | | | |
| | | Connected Elements | IDM | | | | |
| | | Description | IDM | | | | |
| | | Dimension | IDM | | | | |
| | | Identification | IDM | | | | |
| | | Location for Quantity | IDM, PennD | Abutment 1, 2, Pier 1 | | IfcBearing | IFCLABEL |
| | | Material | IDM | Neoprene rubber 50 duromete | | IfcBearing | IFCLABEL |
| | | Quantity | IDM | | | | |
| | | Type | IDM, PennD | Elastomeric | | IfcBearing | IFCLABEL |
| | | Name | IDS | ELBRNG1 | | IfcBearing | IFCLABEL |
| | Layout | Centerline of Bearing Offset from Horizontal Control Line (HCL) [ft] | IDM | 15.5 | ft | IfcBearing | IFCREAL |
| | | Distance from Centerline of Bearing to Centerline of Support [ft] | IDM | 0 | ft | IfcBearing | IFCREAL |
| | PennDOT_Bearing | Details/Notes | PennDOT | See 2D Details and Notes | | IfcBearing | IFCLABEL |
| | | NBI# | PennDOT | 310 | | IfcBearing | IFCLABEL |
| | | Applicable BC Standards | PennDOT | BC-755M | | IfcBearing | IFCLABEL |
| | | Element Detail Designation (EDD) | PennDOT | D-2 | | IfcBearing | IFCLABEL |
| | | Element Information Designation (EID) | PennDOT | I-2 | | IfcBearing | IFCLABEL |
| | | Fixity | PennDOT | Fixed | | IfcBearing | IFCLABEL |
| | PennDOT_BearingPayItem | Designation | PennDOT | None | | IfcBearing | IFCLABEL |
| | | ECMS Pay Item | PennDOT | (Part of LS 8120-0001) | | IfcBearing | IFCLABEL |
| | | Description | PennDOT | Laminated neoprene bearing p | | IfcBearing | IFCLABEL |
| | | Unit | PennDOT | Each | | IfcBearing | IFCLABEL |
| | | Note1 | PennDOT | See approximate quantity tabl | | IfcBearing | IFCLABEL |
| | | Note2 | PennDOT | None | | IfcBearing | IFCLABEL |

Bridge Modeling: Overview

We used **OpenBrIM** to model and export the bridge to IFC.

- **Key Features**
 - Parametric modeling
 - Built-in IFC export based on IDM and IDS
- **Collaboration** with OpenBrIM developer:
 - Feature enhancements
 - Quick turnaround for IFC export improvements

IFC Delivery: OpenBrIM Vision

The software must support four key capabilities:

1. 3D Object Creation

- Rapid generation of 3D objects
- Minimal manual effort required

2. Hierarchy

- Structured representation of bridge components

3. Full Coverage of IFC Entities

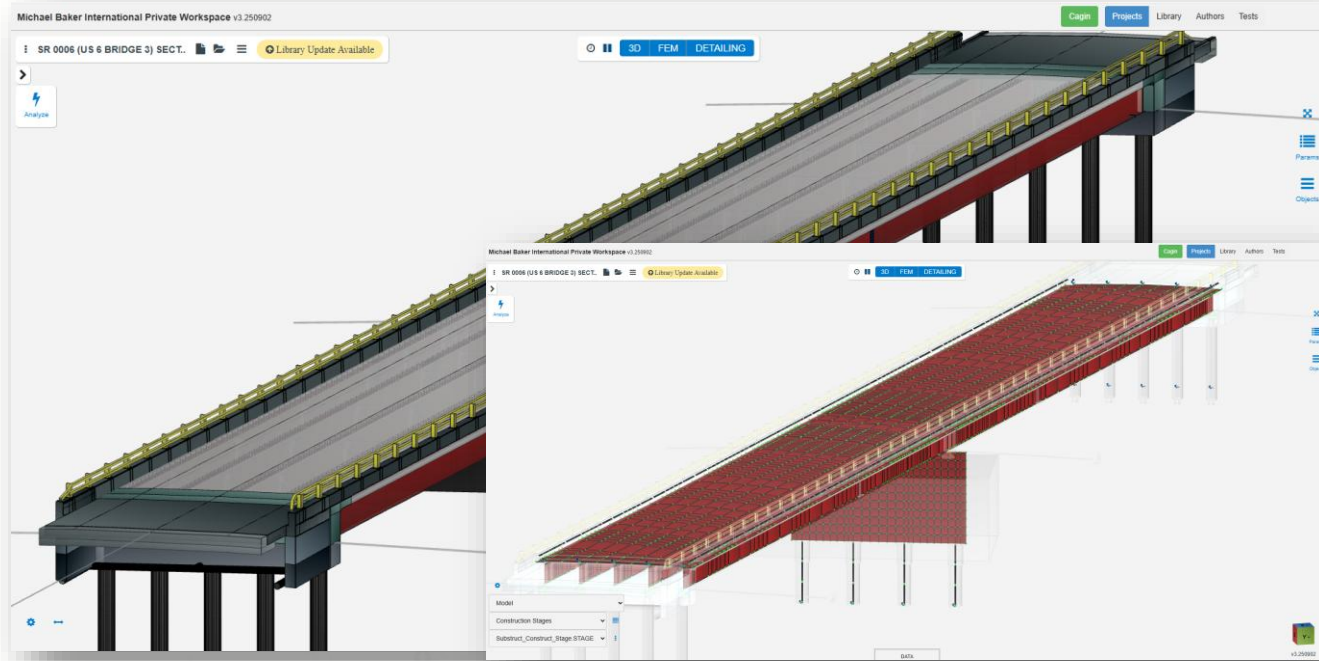
- Support for all entity types defined in IFC

4. Properties

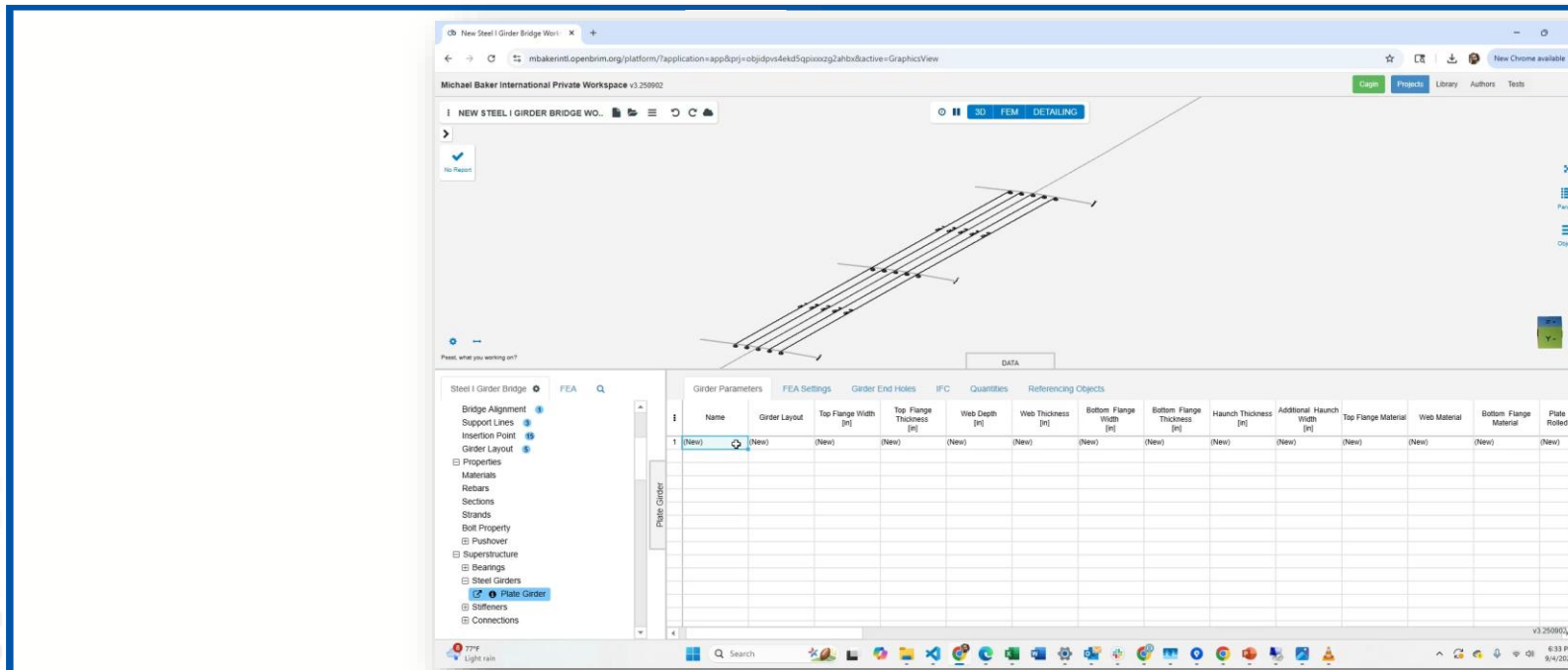
- Easy entry and management of property sets

OpenBrIM Platform

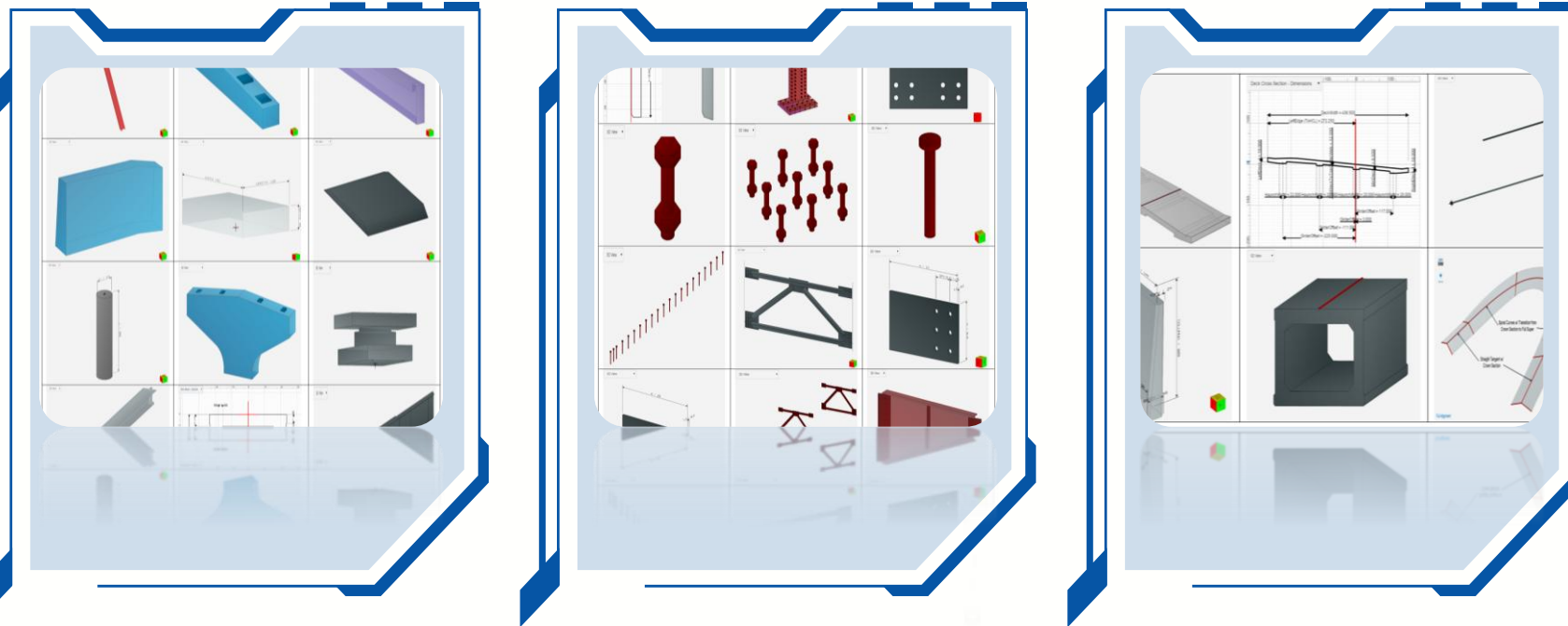
- Cloud-based, browser-accessible
- Integrated capabilities:
 - 3D modeling
 - Finite Element Analysis
 - Soil-structure interaction
 - AASHTO spec checks
 - Load rating
 - Quantities



Parametric Modeling in Action



OPENBRIM LIBRARY: BRIDGE ENGINEER'S FUNCTION CONTAINER



Transparent parametric dependencies

Customizable dependencies according to different project and company requirements

Reusable and modular way to define parametric relationships

OPENBRIM LIBRARY: BRIDGE ENGINEER'S FUNCTION CONTAINER



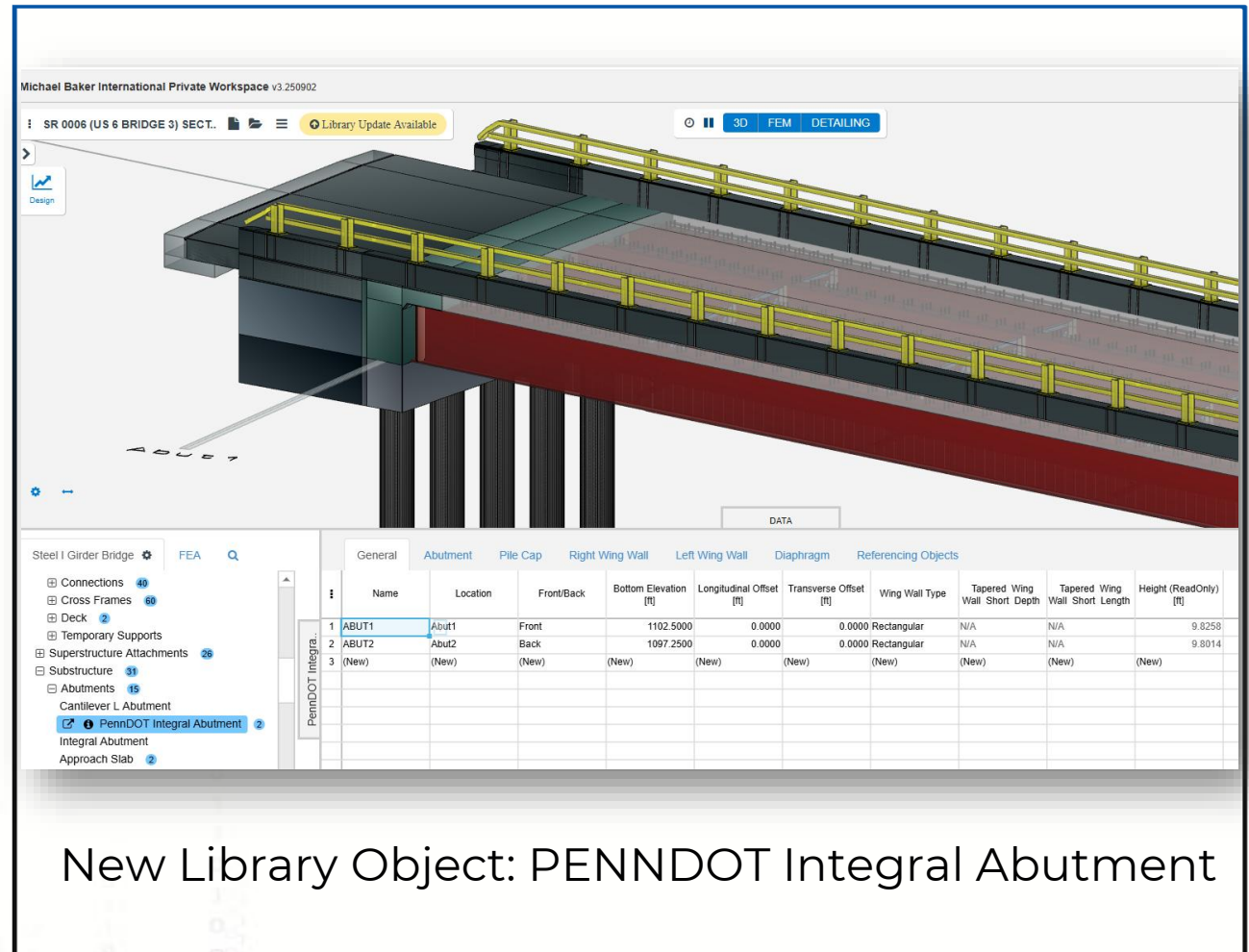
Parametric Bridge Library

LEGO Structures



Expanding the Open-Source Library

- Gaps in existing parametric library discovered during project
- New components created for SR6-B12
- Contribution back to open source for future projects



The screenshot displays a 3D model of a bridge structure with yellow railings and a red abutment. Below the model is a data table titled "DATA" with tabs for General, Abutment, Pile Cap, Right Wing Wall, Left Wing Wall, Diaphragm, and Referencing Objects. The "Abutment" tab is active, showing a table with columns: Name, Location, Front/Back, Bottom Elevation [ft], Longitudinal Offset [ft], Transverse Offset [ft], Wing Wall Type, Tapered Wing Wall Short Depth, Tapered Wing Wall Short Length, and Height (Read Only) [ft]. The table lists three abutments: ABUT1, ABUT2, and a new entry (New).

| | Name | Location | Front/Back | Bottom Elevation [ft] | Longitudinal Offset [ft] | Transverse Offset [ft] | Wing Wall Type | Tapered Wing Wall Short Depth | Tapered Wing Wall Short Length | Height (Read Only) [ft] |
|---|-------|----------|------------|-----------------------|--------------------------|------------------------|----------------|-------------------------------|--------------------------------|-------------------------|
| 1 | ABUT1 | Abut1 | Front | 1102.5000 | 0.0000 | 0.0000 | Rectangular | N/A | N/A | 9.8258 |
| 2 | ABUT2 | Abut2 | Back | 1097.2500 | 0.0000 | 0.0000 | Rectangular | N/A | N/A | 9.8014 |
| 3 | (New) | (New) | (New) | (New) | (New) | (New) | (New) | (New) | (New) | (New) |

New Library Object: PENNDOT Integral Abutment

IFC Delivery: OpenBrIM Vision

Based on U.S. standards (currently TPF-5(372) BIM for Bridges)

- Predefined **Entities** for each bridge object
- Predefined **Hierarchy** for each bridge object

The screenshot displays the OpenBrIM software interface. On the left is a project tree for a 'Steel I Girder Bridge'. The tree includes a search bar and a list of components with counts: Girder Layout (14), Properties (23), Superstructure (463), Superstructure Attachments (5), Substructure (40), Abutments (2), End/Interior Bent, Pier (24), Foundation (6), Rectangular Footing (6), Custom Footing, Pile (8), Soil Structure Interaction, and Temporary Shoring. The 'Rectangular Footing' component is selected. On the right is a table with tabs for 'Footing', 'FEM', 'Flexural Reinforcements', 'Shear Reinforcements', 'Side Reinforcements', and 'IFC'. The 'Footing' tab is active, showing a table with 7 rows. The first six rows are for existing footings (RF1 to RF6), and the seventh row is for a new footing. The table columns are Name, Type, Predefined Type, Parent, Properties, and IFC.

| | Name | Type | Predefined Type | Parent | Properties | IFC |
|---|-------|-----------|-----------------|--------|------------|-----|
| 1 | RF1 | fcFooting | FOOTING | BRIDGE | | |
| 2 | RF2 | fcFooting | FOOTING | BRIDGE | | |
| 3 | RF3 | fcFooting | FOOTING | BRIDGE | | |
| 4 | RF4 | fcFooting | FOOTING | BRIDGE | | |
| 5 | RF5 | fcFooting | FOOTING | BRIDGE | | |
| 6 | RF6 | fcFooting | FOOTING | BRIDGE | | |
| 7 | (New) | (New) | (New) | (New) | (New) | |

IFC Delivery: OpenBrIM Vision

Property Standards

Baseline Standard – AASHTO IDM

- Core property definitions for U.S. transportation projects
- Defines common parameters across agencies

State-Specific Parameters

- Each DOT may extend or adjust IDM
- Local standards/specifications drive these properties

BuildingSMART / IFC Global Parameters

- Ensures compatibility across software platforms

Project-Specific Requirements

- Unique parameters requested by owners, contractors, or fabricators

OpenBrIM Implementation

- Assign parameters easily (Excel-style references)
- Define parametric relationships to support change management
- Customize parameters flexibly
- Import predefined parameters quickly from the library

IFC Delivery: OpenBrIM Vision

SR 0006 (US 6 Bridge 3) Section

mbakerintl.openbrim.org/platform/?application=app&prj=objidsk3htsjf6mjycwo2ga4f&active=GraphicsView

Michael Baker International Private Workspace v3.250902

SR 0006 (US 6 BRIDGE 3) SECT..

3D FEM DETAILING

rendering...

Pass!, what you working on?

Steel I Girder Bridge

- Bridge Alignment 1
- Support Lines 3
- Insertion Point 15
- Girder Layout 5
- Properties 53 6
- Superstructure 214
 - Bearings 35
 - Steel Girders 5
 - Plate Girder 5
 - Stiffeners 72
 - Connections 40
 - Cross Frames 60
 - Deck 2
 - Temporary Supports
 - Superstructure Attachments 26
- Substructure 31
- Tendon

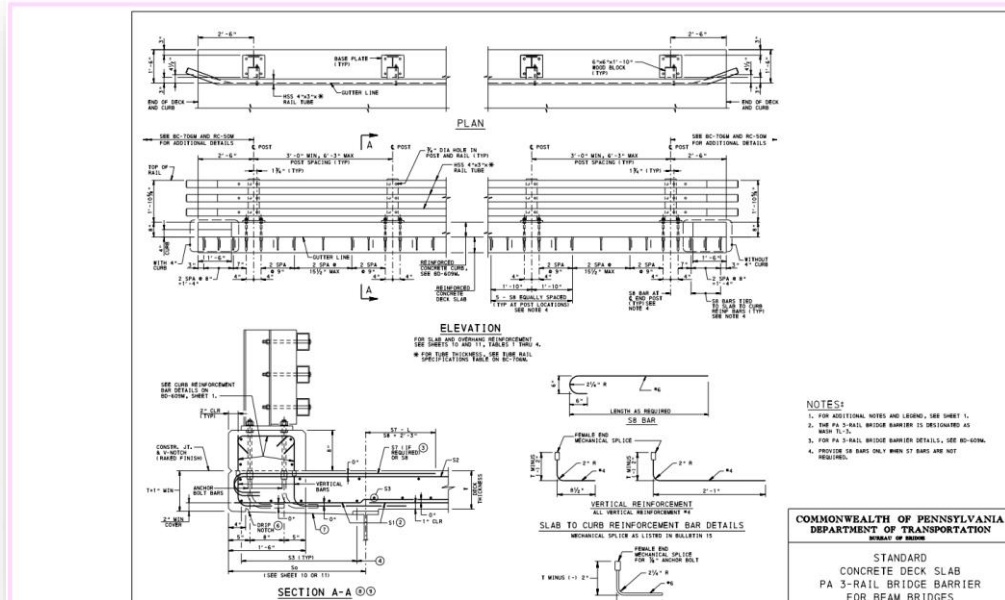
Girder Parameters FEA Settings Girder End Holes IFC Quantities Referencing Objects

| | Name | Type | Predefined Type | Parent | Properties |
|---|-------|---------|-----------------|----------------|------------|
| 1 | G1 | IfcBeam | BEAM | SUPERSTRUCTURE | |
| 2 | G2 | IfcBeam | BEAM | SUPERSTRUCTURE | |
| 3 | G3 | IfcBeam | BEAM | SUPERSTRUCTURE | |
| 4 | G4 | IfcBeam | BEAM | SUPERSTRUCTURE | |
| 5 | G5 | IfcBeam | BEAM | SUPERSTRUCTURE | |
| 6 | (New) | (New) | (New) | (New) | (New) |

v3.250902

Reimagining Standard Drawings as Parametric 3D IFC Objects

Current Practice (DOT Standard Contracts)



Proposed Future

- Same concept, but in **parametric 3D**
- Each typical drawing → **a parametric 3D object – open source**
- Direct export to **IFC 3D**
- Machine-readable, reusable, contract-compliant
- Collaboration Framework (if agencies provide funding):
 - Consultants (e.g., Michael Baker): Quality Control (QC)
 - Technology Providers (e.g., OpenBrIM): Coding and Implementation

Finding the Right Software Partner for Digital Delivery

The Reality Today

- Agencies and consultants expect “magic software” to solve all problems.
- Even project engineers may lack clarity on the exact requirements.
- Standards are still evolving and incomplete.
- IFC/IDS specifications are still under development.
- Project deliverables are frequently vague or inconsistently defined.

What to Look For

- Don't just evaluate software features.
- Choose a **partner**, not just a vendor.
- Seek a team experienced with real bridge projects.
- Work with people who can help navigate unknowns and adapt as standards mature.
- A partner that applies agile development practices.
- A platform designed for rapid iteration and continuous improvement.

How We Actually Delivered the First Contractual IFC Bridge Project in the US



Live Support through Slack

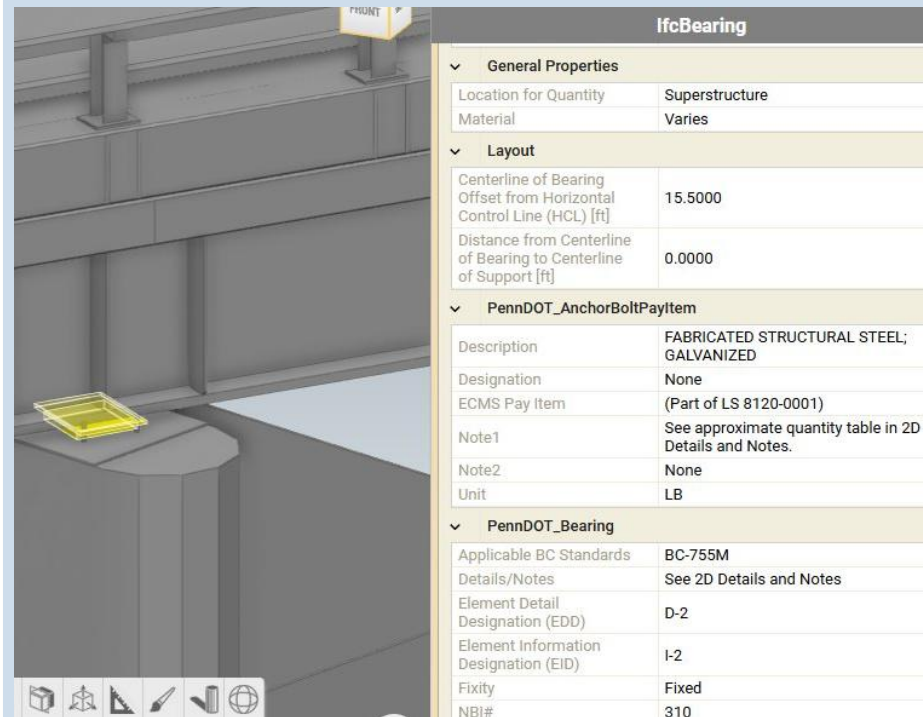
Rapid Continuous Iterations

Contents

| | |
|--|----|
| OpenBrIM Outstanding Requests..... | 1 |
| Top priority..... | 3 |
| 1. Approach slab cross slope (ISS-00037)..... | 3 |
| 2. Cross frame station and flipping side..... | 6 |
| Critical..... | 7 |
| 1. Anchor bolts in the bearing top plate (ISS-00019)..... | 7 |
| 2. Material for pedestal (ISS-00021)..... | 10 |
| 3. Chamfer @ Abutment Diaphragm (ISS-00060)..... | 11 |
| 4. Materials for bolt, nut, and washer..... | 13 |
| 5. Barrier railing end - Follow up..... | 14 |
| 6. Slope of top surface of pile cap (bearing seat)..... | 16 |
| 7. Cross frame stiffener must extend full height of web..... | 18 |
| 8. Gap in abutment diaphragm and barrier..... | 19 |
| 9. Shear Connector head diameter and thickness..... | 20 |
| Nice to have..... | 22 |
| 1. 6" Structure Foundation Drain (ISS-00047) - TODO..... | 22 |
| 2. Jacking inserts (ISS-00058) - TODO..... | 23 |
| 3. Nut and washer in field splice..... | 23 |
| Investigate only if everything else is done..... | 24 |
| IFC Mapping..... | 25 |
| High Priority..... | 25 |
| 1. Shear connector studs are not being exported..... | 25 |
| 2. Properties need to be exported to IFC..... | 26 |
| 3. IFC mapping..... | 27 |
| 4. Drip bar and temporary shoring IFC export..... | 28 |
| 5. Pedestal..... | 29 |
| 6. Bearing properties (ISS-00020)..... | 30 |

IFC Export: Reviewing Properties

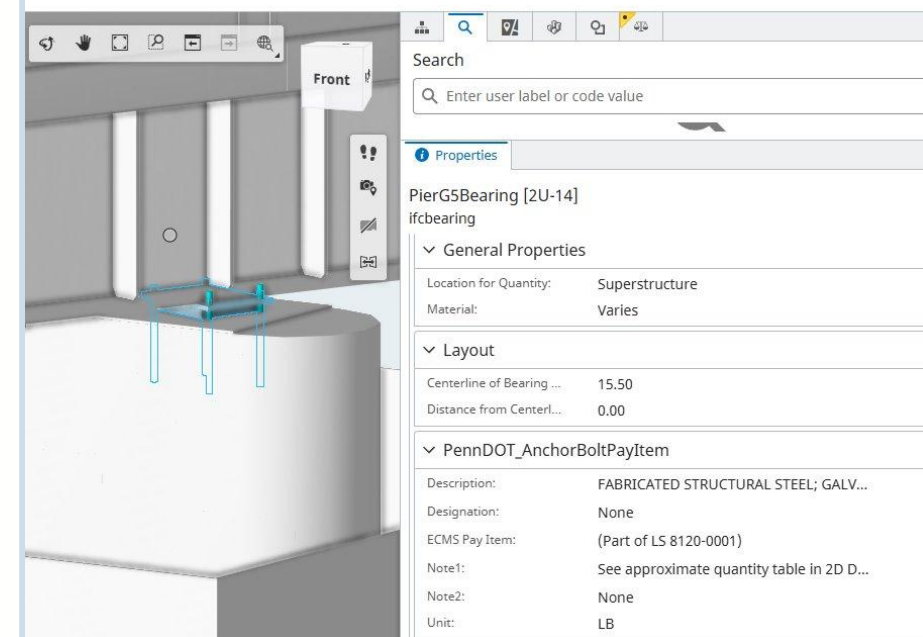
We verified the IFC properties using **IFC viewers** and **Infrastructure Cloud** to ensure accuracy and completeness.



The screenshot shows a 3D model of a bridge pier with a yellow rectangular object on top. To the right of the model is a table titled 'IfcBearing' with the following sections:

| IfcBearing | |
|--|---|
| General Properties | |
| Location for Quantity | Superstructure |
| Material | Varies |
| Layout | |
| Centerline of Bearing Offset from Horizontal Control Line (HCL) [ft] | 15.5000 |
| Distance from Centerline of Bearing to Centerline of Support [ft] | 0.0000 |
| PennDOT_AnchorBoltPayItem | |
| Description | FABRICATED STRUCTURAL STEEL; GALVANIZED |
| Designation | None |
| ECMS Pay Item | (Part of LS 8120-0001) |
| Note1 | See approximate quantity table in 2D Details and Notes. |
| Note2 | None |
| Unit | LB |
| PennDOT_Bearing | |
| Applicable BC Standards | BC-755M |
| Details/Notes | See 2D Details and Notes |
| Element Detail Designation (EDD) | D-2 |
| Element Information Designation (EID) | I-2 |
| Fixity | Fixed |
| NBI# | 310 |

IFC Properties for Bearing (IFC viewers)



The screenshot shows a 3D model of a bridge pier with a blue rectangular object on top. To the right of the model is a table titled 'PierGSBearing [2U-14] ifcbearing' with the following sections:

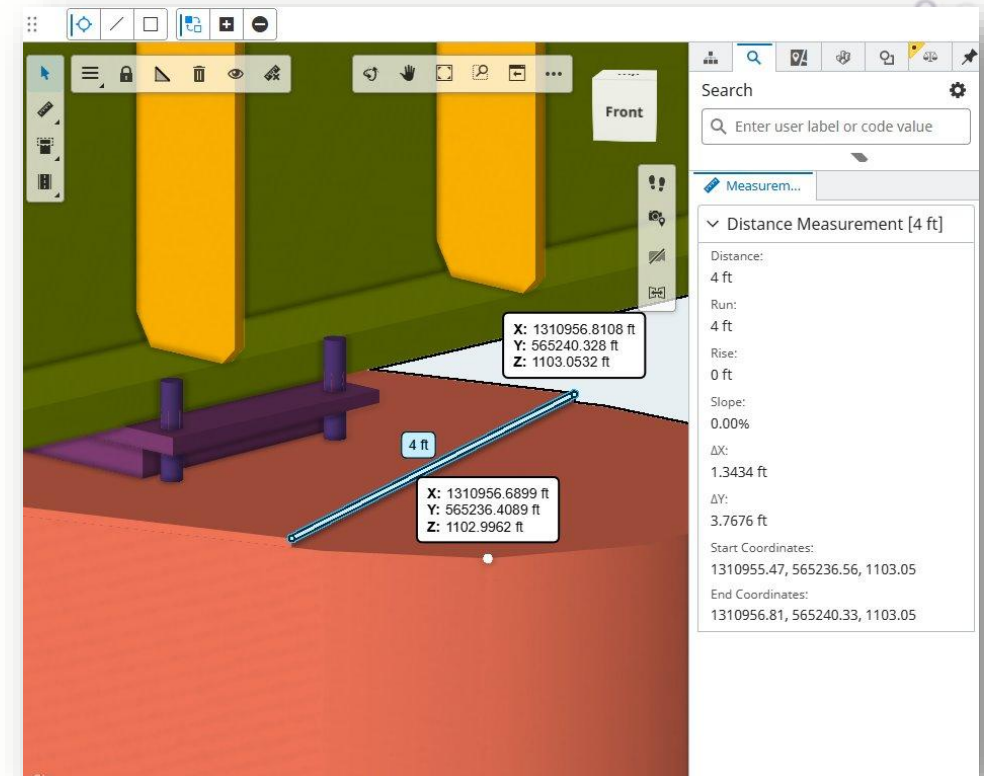
| PierGSBearing [2U-14] ifcbearing | |
|----------------------------------|---|
| General Properties | |
| Location for Quantity: | Superstructure |
| Material: | Varies |
| Layout | |
| Centerline of Bearing ... | 15.50 |
| Distance from Centerl... | 0.00 |
| PennDOT_AnchorBoltPayItem | |
| Description: | FABRICATED STRUCTURAL STEEL; GALV... |
| Designation: | None |
| ECMS Pay Item: | (Part of LS 8120-0001) |
| Note1: | See approximate quantity table in 2D D... |
| Note2: | None |
| Unit: | LB |

IFC Properties for Bearing (Infrastructure Cloud)

Review: QA/QC Using Infrastructure Cloud

Review Contents

- **Geometry:** Roadway and bridge stationing and elevation
- **Locations:** Placement of bearings, cross frames, and key elements
- **Dimensions:** Girder sizes and section transitions
- **Studs and bolts:** Shear stud and splice bolt counts and spacing
- **Details:** Curb transitions, v-notches, jacking holes
- **IFC properties:** Materials and PennDOT items

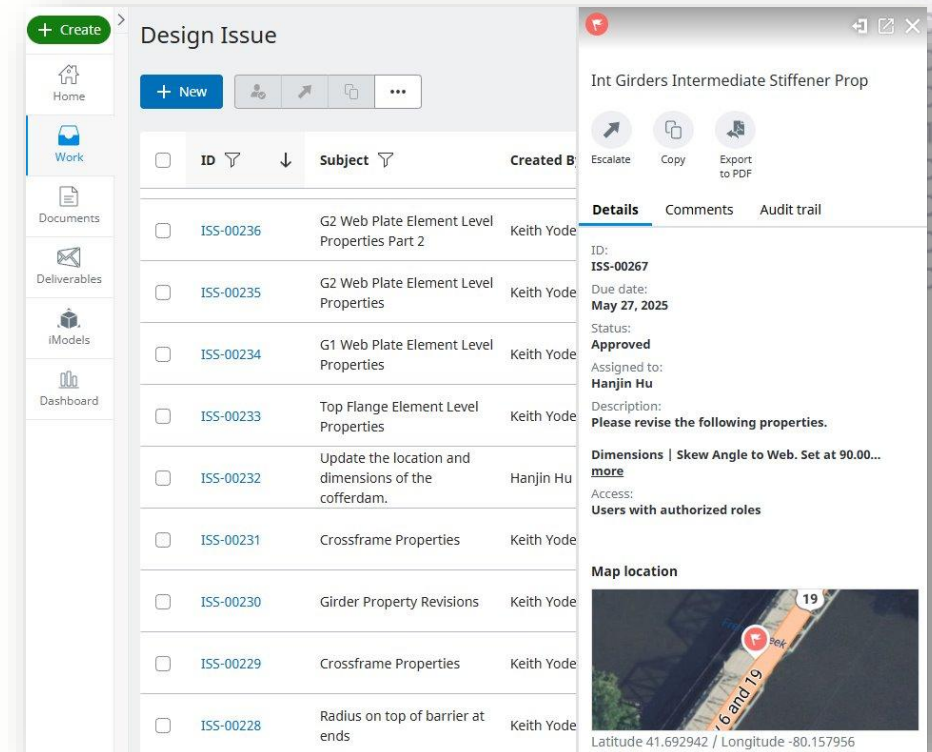


Model Validation with Infrastructure Cloud

Review: Issue Documentation in Infrastructure Cloud

Issue Logging

- Reviewers documented issues directly in the platform.
- Each issue entry included:
 - Descriptive comments
 - Precise location references
 - Annotated screenshots for visual clarity
- Issues were assigned to designers, triggering notifications for action.
- After addressing each issue, designers reassigned it to the original reviewer for backcheck and confirmation.



Issue Documented in Infrastructure Cloud

Summary and Tracking using

Summary and Tracking:

- Documented which components were reviewed and by whom.
- Tracked **issue ownership**: who identified, addressed, and backchecked each item.
- Recorded **timestamps** for each stage of issue resolution.
- Maintained **status updates** and reviewer **comments** for transparency and follow-up.

- ## Summary and Tracking:
- Documented which components were reviewed and by whom.
 - Tracked **issue ownership**: who identified, addressed, and backchecked each item.
 - Recorded **timestamps** for each stage of issue resolution.
 - Maintained **status updates** and reviewer **comments** for transparency and follow-up.

| | A | B | C | D | E |
|----|-----------------------|---|---------------------|--------------------------------|---|
| 1 | | | | | |
| 2 | Bridge #: | US Route 6 French Creek Parkway | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | Element | Criteria | (Initials and Date) | Checked By (Initials and Date) | Saved View or other location |
| 6 | Element Definitions | Elements on correct Feature Definitions/Element Templates/IFC Classifications per PennDOT Recommended Digital Delivery Guides | HH | KMY - Various Dates | SR6 Model Element Prop.pdf |
| 9 | Stations & Elevations | Horizontal and vertical alignments in 3D model match the roadway geometry | HH | KMY 3/17/25 | Baseline Geom Check.pdf |
| 10 | | Begin/End of Bridge Stations | HH | KMY 3/14/25 | Bridge Stations Check.pdf |
| 11 | | Abutment - C/L Bearing Stations | HH | KMY 3/14/25 | Bridge Stations Check.pdf |
| 12 | | Pier - C/L Bearing Station | HH | KMY 3/14/25 | Bridge Stations Check.pdf |
| 13 | | Begin/End Approach Slab Stations | HH | KMY 3/14/25 | Bridge Stations Check.pdf |
| 14 | | Begin/End Header Slab Stations | HH | KMY 3/14/25 | Bridge Stations Check.pdf |
| 16 | Deck | Lane widths | HH | RMS 2/19/25 | https://mbakerintl-my.sharepoint.com/:wddocx?d=1&id=8c3e3f3d-4000-4000-a000-000000000000 |
| 17 | | Shoulder widths | HH | RMS 2/19/25 | https://mbakerintl-my.sharepoint.com/:wddocx?d=1&id=8c3e3f3d-4000-4000-a000-000000000000 |
| 19 | | Outside barrier widths | HH | RMS 2/19/25 | https://mbakerintl-my.sharepoint.com/:wddocx?d=1&id=8c3e3f3d-4000-4000-a000-000000000000 |
| 20 | | Increased Thickness of Overhangs | HH | KMY 6-6-25 | |
| 21 | | Width of Bridge (Provide min-max range where variable width is present) | HH | RMS 2/19/25 | https://mbakerintl-my.sharepoint.com/:wddocx?d=1&id=8c3e3f3d-4000-4000-a000-000000000000 |

Issue Summary and Tracking with Excel

Validation: bSI Validation Service

To verify IFC file quality and compliance, we used the bSI Validation Service to check syntax, schema rules, normative standards, and industry practices.

bSI Validation Service Dashboard

| <input type="checkbox"/> File Name | STEP Syntax [Ⓢ] | IFC Schema [Ⓢ] | Normative IFC Rules [Ⓢ] | Industry Practices [Ⓢ] |
|--|--------------------------|-------------------------|----------------------------------|---------------------------------|
| <input type="checkbox"/> 20250718_4pm_SR0006_OpenBrIM.ifc | ✓ | ✓ | ✓ | ✓ |
| <input type="checkbox"/> 20250715_9am_SR0006_OpenBrIM.ifc | ✓ | ✓ | ✓ | ✓ |
| <input type="checkbox"/> 20250710_1pm_SR0006_OpenBrIM.ifc | ✓ | ✓ | ! | ⚠ |
| <input type="checkbox"/> 20250617_10am_SR0006_OpenBrIM.ifc | ✓ | ✓ | ✓ | ✓ |
| <input type="checkbox"/> 20250612_9am_SR0006_OpenBrIM.ifc | ✓ | ✓ | ✓ | ✓ |

Sample Validation Warning

| | |
|--|---|
| File Name in Header | 20250710_1pm_SR0006_OpenBrIM.ifc |
| File Name | 20250710_1pm_SR0006_OpenBrIM.ifc |
| File Size | 59.69 MB |
| File Date | 2025-07-10T17:19:06.636Z |
| Industry Practices | <input type="checkbox"/> Include Passed, Disabled and N |
| GRF002 - EPSG Code In Coordinate Reference System (occurred 1 time) | |
| <p>Ⓢ The rule verifies that the name of the coordinate reference system refers to a valid EPSG code from the official EPSG geodetic parameter dataset. EPSG code validation is performed using the pyproj library, which includes a local copy of the official EPSG dataset (https://epsg.org) maintained by IOGP. https://pyproj4.github.io/pyproj/stable/api/database.html</p> <p>https://github.com/buildingSMART/ifc-gherkin-rules/blob/main/features/rules/GRF/GRF002_EPSG-code-in-coordinate-reference-system.feature</p> | |
| Severity | Warning |
| Id | #36 |
| Entity | IfcProjectedCRS |
| Expected | The value must refer to a valid EPSG code |
| Observed | PA_North_83GCS_2011 |

Validation: bSI Validation Service

To verify the IFC model against specific data requirements for bridge design handover, we used an IDS developed for TPF-5(372), BIM for Bridges.

IDS Snippet

General data

Specifications

1. 01 Project

2. 01.01 Owner / Engineer

3. 01.01.01 Person

4. 01.01.02 Organization

5. 01.03 Documentation References

6. 02 Site

7. 02.01 Georeferencing

8. 02.01.01 ProjectedCRS

9. 02.01.02 GeographicCRS

10. 02.01.03 Benchmark (Landmark)

11. 03 Bridge

12. 04 Superstructure

13. 04.01 Deck

14. 04.01.01 Deck Slab

15. 04.01.02 Haunch

16. 04.01.03 Deck Wearing Surface

17. 04.01.04 Closure Pour

18. 04.01.05 Median

19. 04.01.06 Expansion Joint

01 Project

General

Filters

Requirements

Name

01 Project

Instructions

IFC versions

IFC4X3_ADD2

Specification in readable format

The model **MUST** contain entities that have

- IFC class **IFCPROJECT**

that **MEET** the following requirements

- MUST HAVE attribute **Name**
- MUST HAVE property **ContractNumber** of Pset **usBridge_ProjectCommon** (IFCTEXT)
- MUST HAVE property **DatePrepared** of Pset **usBridge_ProjectCommon** (IFCDATETIME)
- MUST HAVE property **DesignNumber** of Pset **usBridge_ProjectCommon** (IFCLABEL)
- MUST HAVE property **ModelVersion** of Pset **usBridge_ProjectCommon** (IFCLABEL)
- MUST HAVE property **ProjectIDNumber** of Pset **usBridge_ProjectCommon** (IFCLABEL)
- MAY HAVE property **ProjectURL** of Pset **usBridge_ProjectCommon** (IFCLABEL)

IDS Validation Results

US Bridges and Structures Design-to-Construction Exchange

20250718_4pm_SR0006_OpenBrlM.ifc

2025-08-04 15:00:20

Summary

100%

Pass 1748

Specifications passed: 91 / 91

Requirements passed: 269 / 269

Checks passed: 1748 /

01 Project

Basic project identification information

100%

Pass

Checks passed: 7 / 7

Elements passed: 1 / 1

Applicability

All IFCPROJECT data

Requirements

1. The Name shall be provided

2. ContractNumber data shall be provided in the dataset usBridge_ProjectCommon

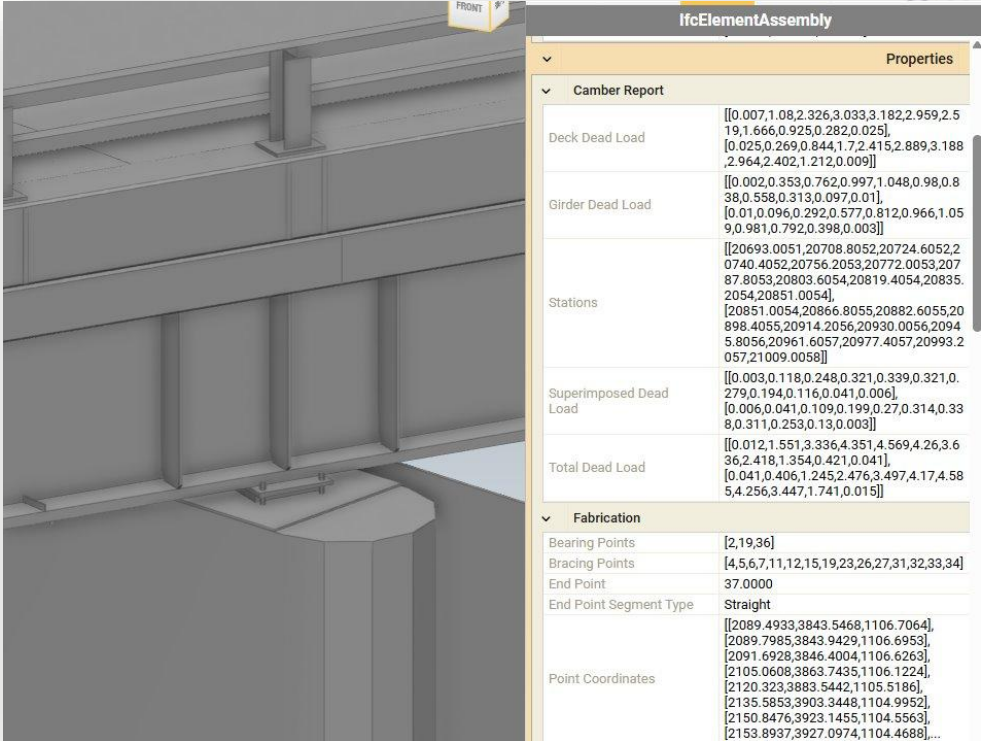
3. DatePrepared data shall be provided in the dataset usBridge_ProjectCommon

Downstream Use Case: Data for Fabricator

To support fabrication, key data were embedded in the IFC model based on fabricator requirements.

Data Provided

- Control point coordinates
- Camber values
- Girder transitions
- Additional fabrication details



The screenshot shows a 3D model of a bridge structure with a properties panel open on the right. The panel is titled 'IfcElementAssembly' and contains a 'Properties' section. The 'Camber Report' section lists various data points for the bridge, including Deck Dead Load, Girder Dead Load, Stations, Superimposed Dead Load, and Total Dead Load. The 'Fabrication' section lists Bearing Points, Bracing Points, End Point, End Point Segment Type, and Point Coordinates.

| IfcElementAssembly Properties | |
|-------------------------------|--|
| Camber Report | |
| Deck Dead Load | [[0.007,1.08,2.326,3.033,3.182,2.959,2.519,1.666,0.925,0.282,0.025], [0.025,0.269,0.844,1.72,4.15,2.889,3.188,2.964,2.402,1.212,0.009]] |
| Girder Dead Load | [[0.002,0.353,0.762,0.997,1.048,0.98,0.838,0.558,0.313,0.097,0.01], [0.01,0.096,0.292,0.577,0.812,0.966,1.059,0.981,0.792,0.398,0.003]] |
| Stations | [[20693.0051,20708.8052,20724.6052,20740.4052,20756.2053,20772.0053,20787.8053,20803.6054,20819.4054,20835.2054,20851.0054], [20851.0054,20866.8055,20882.6055,20898.4055,20914.2056,20930.0056,20945.8056,20961.6057,20977.4057,20993.2057,21009.0058]] |
| Superimposed Dead Load | [[0.003,0.118,0.248,0.321,0.339,0.321,0.279,0.194,0.116,0.041,0.006], [0.006,0.041,0.109,0.199,0.27,0.314,0.338,0.311,0.253,0.13,0.003]] |
| Total Dead Load | [[0.012,1.551,3.336,4.351,4.569,4.26,3.636,2.418,1.354,0.421,0.041], [0.041,0.406,1.245,2.476,3.497,4.17,4.585,4.256,3.447,1.741,0.015]] |
| Fabrication | |
| Bearing Points | [2,19,36] |
| Bracing Points | [4,5,6,7,11,12,15,19,23,26,27,31,32,33,34] |
| End Point | 37.0000 |
| End Point Segment Type | Straight |
| Point Coordinates | [[2089.4933,3843.5468,1106.7064], [2089.7985,3843.9429,1106.6953], [2091.6928,3846.4004,1106.6263], [2105.0608,3863.7435,1106.1224], [2120.323,3883.5442,1105.5186], [2135.5853,3903.3448,1104.9952], [2150.8476,3923.1455,1104.5563], [2153.8937,3927.0974,1104.4688]] |

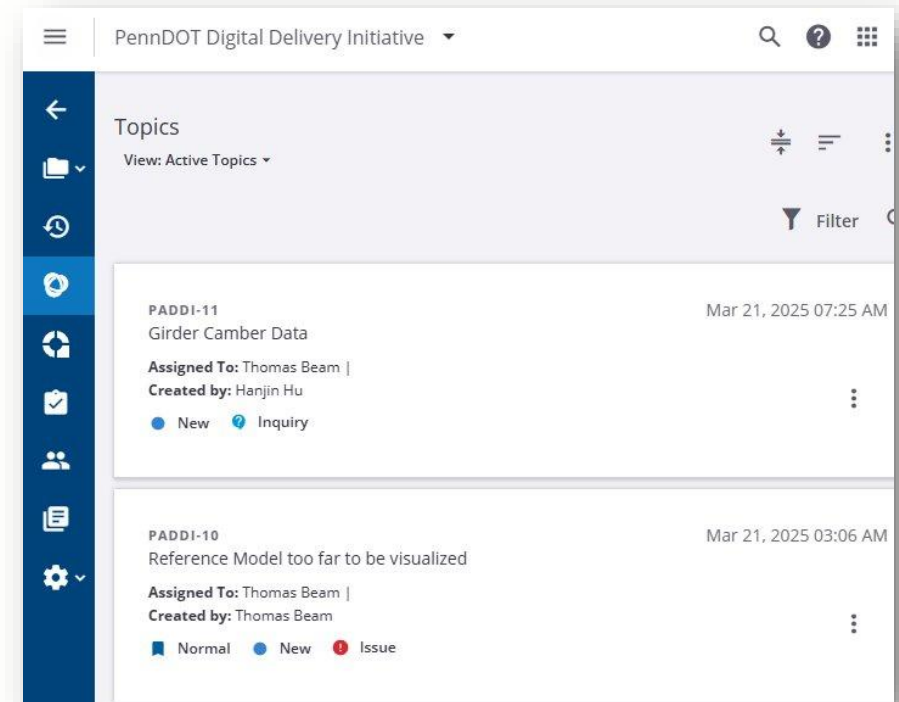
IFC Properties for Fabricators

Downstream Use Case: Communication

Coordination with fabricator was managed through Trimble Connect using BCF for issue tracking and resolution.

Communication

- **Trimble Connect** platform: Enabled real-time collaboration and model-based communication.
- **BCF threads**: Used to raise questions, assign tasks, and share feedback.
- **Issue lifecycle**: Designers responded to fabricator comments and provided updates directly in the shared environment.



Communication with Trimble Connect

Replication Path for Other Agencies

- Steps a DOT can take now
- How this project sets a framework for future digital delivery