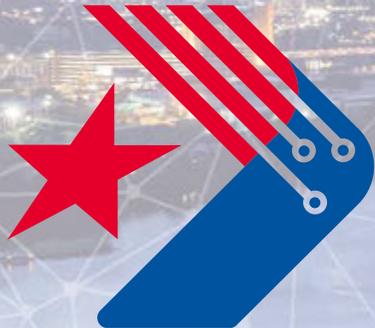


TxDOT Digital Delivery Program

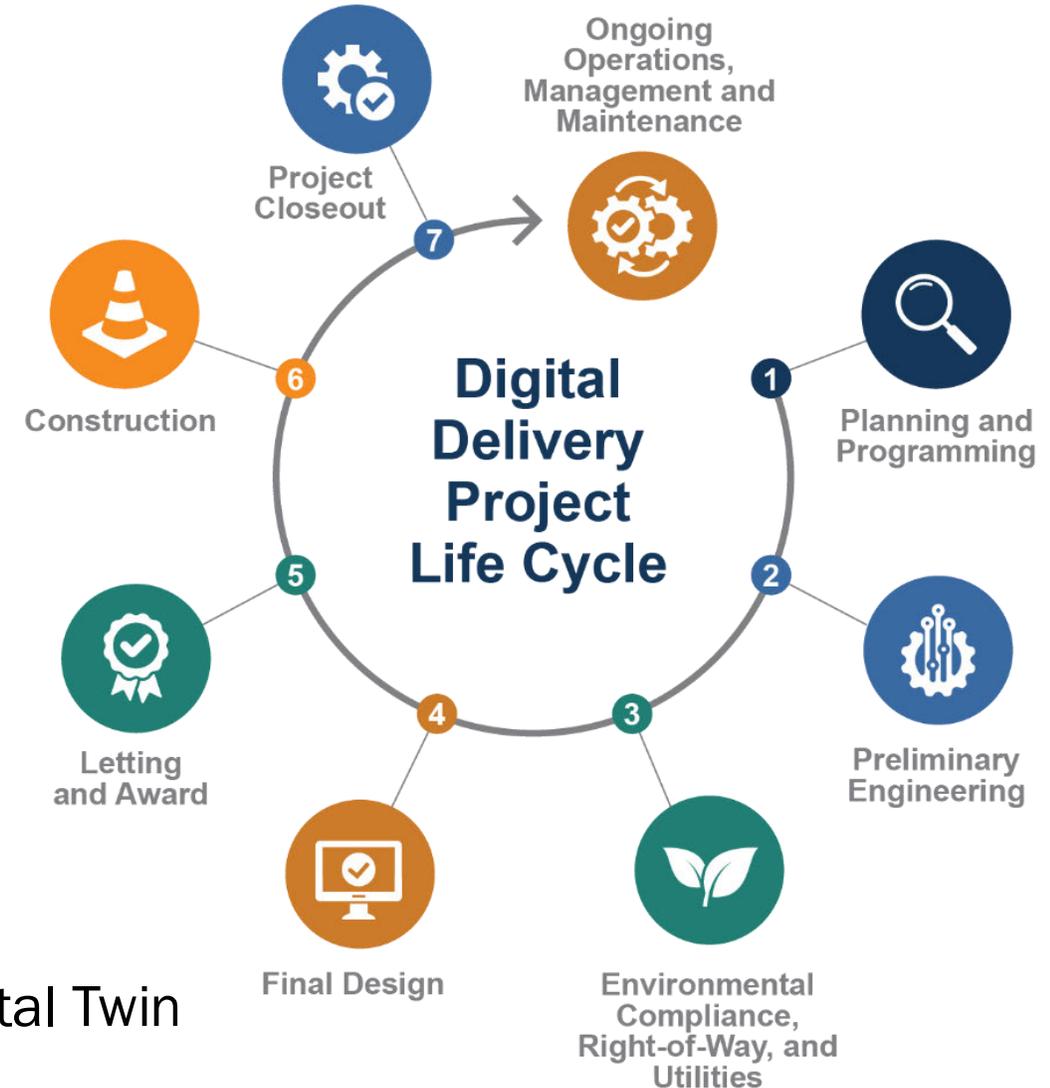
2025



What is Digital Delivery?

Replacing Traditional Plans with Digital Design Models

- Model as the Legal Document (MALD)
- Advanced 3D modeling
- Digital design review tools
 - Design and Construction
- Data-rich design models
 - Design, Construction, Asset Management, Digital Twin



DDP Pilot Project Program

Pilot Project Digital Delivery Goals

DESIGN

3D modeling
constructability and
clash detection

Data attribution to CAD
elements for model-based
quantity reporting

Digital review tools for
model review and
comment resolution

DELIVERABLES

Models as legal
documents

3D Model Breaklines for
Automated Machine
Guidance (AMG) and
estimating

CONSTRUCTION

Digital review in the field

Digital as-builts e-Ticketing
for materials
documentation

Digital construction
management tool

ASSET MANAGEMENT

Data attribute to CAD
elements for asset tracking

Digital as-builts



Pilot Project Tracker

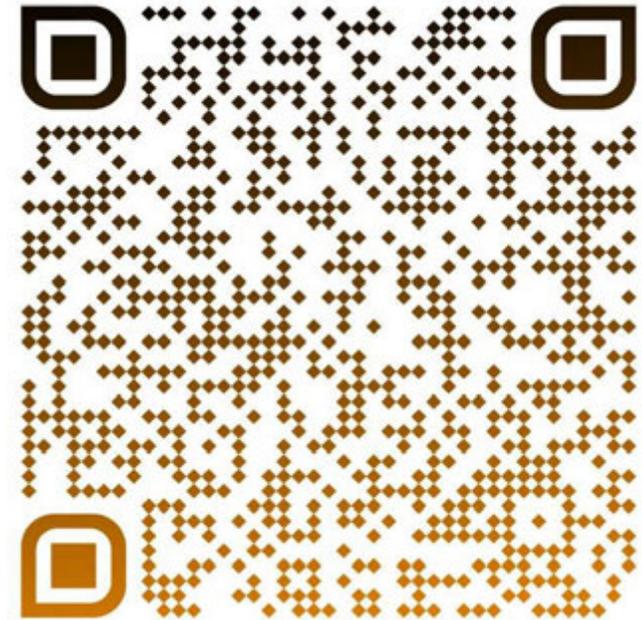
HIGHWAY NAME	DISTRICT	SCOPE	LETTING DATE
FM 1977	San Antonio	PS&E. 0.311 mi. reconstruction and widening from FM 621 to the Guadalupe/ Caldwell county line.	January 2025
FM 1929	San Angelo	PS&E. ~8.5 mi. of rehabilitation of existing road from US 83 to Lake County Rd.	November 2026
FM 236	Yoakum	PS&E. ~5 mi. conversion from 2 to 3 lane facility. Includes proposed roadway realignment, widening, medians, and drainage improvements.	May 2027
US 83	Laredo	Schematic and PS&E. 3.741 mi. roadway widening and reconstruction from 1 mi. north of SH 255 to Los Botines Ln.	September 2027
FM 971	Austin	PS&E. 3.14 mi. roadway widening from CR 334 to SH 95. Includes proposed pedestrian and drainage improvements.	October 2027



Change Management

Outreach

- District Roadshows
 - Visited all 25 districts from April to August 2024
 - Overview presentation; Design, Construction, Asset Management/Maintenance, Pilot Projects, Feedback
- Industry Roadshows
 - Present offsite to industry partners
 - AGC/ACEC Chapters, specific companies, etc.
 - For contractors and consultants
- Webinars



Digital Delivery Impact Assessment Document

- Identify impacts and opportunities
- Used to guide development of policy, guidelines, SOPs
- Guides discipline-specific Impact Assessments

Digital Delivery Impact Assessment – Overview of the Project Lifecycle								
Scoping	Preliminary Engineering	Project Setup	Design	QA/QC	Letting	Construction	Inspection	Asset Management & Maintenance
Define project type and applicable model use cases and document in the Design Summary Report (DSR)	Determine survey and data acquisition requirements.	Establish roles, responsibilities, & access controls specific to Digital Delivery.	Detailed design and deliverables according to RFI, LOD, and data protocol requirements.	Complete Quality Control checks for review of model development deliverables and documentation (Data by Design built or not built projects).	Define 'legal' and 'fit' information only for all files in the letting package.	Incorporate new methods for design reading and interpretation that reduce file traditional plan sheets.	Complete project verifications using established procedures for Digital Delivery.	Follow requirements and establish processes for data transfer between other TxDOT systems used for asset management and maintenance. Design build process may vary.
	Determine survey contractual requirements.	Establish survey requirements.	Perform data development and processing for digital delivery and modeling requirements.	Complete Design Change Review (Performed by DEC with priority overalls on ALL projects).	Complete pricing and sealing the all files in the letting package. Including survey files. (Once approved by a state subagency on ALL projects)	Ability to use all deliverables for automated machine guidance and estimating.	Complete project verifications using established procedures for Digital Delivery.	Call out asset information per the Data Delivery requirements and in coordination with all asset owners and the CO-DM Initiative.
	Determine method, quality, and utility requirements.	Determine the LOD and digital data needs based on project type and modal uses.	Detailed allocations to meet Digital Delivery use case requirements.	Coordinate QC with other agencies.	Provide a project protocol or standard naming to contractors and deliverables formats.	Submit any necessary change orders.	Model based verifications and take off for quantities for change data.	Coordinate data retention policy and processes for asset management with automated notifications sent to asset owners.
	Determine data/data equipment requirements.	Perform in-line software performance and volume test to choose best project.	Create and maintain federated models.		Follow established and new procedures for Digital Delivery.	Implement as-built procedures.		Manage as-built model and process stable common data environment. Design build team may own Asset Management and Maintenance and should be included in the contract language.
			Create and maintain a file inventory LOD at decision to all contractor deliverables.		Follow user protocols for file change and data transfer during letting and the Design-Build RFP process.	Provide additional support during construct on take off.		
			Secure BOM and environmental design and permitting as disconnected and transferred to construction.		Provide level of verifications and provisions as needed.	Verify survey control points during start of construction.		
								Perform data retention policy and processes for project records with automated notifications sent to asset owners.

Figure 1. Overview of the Project Lifecycle

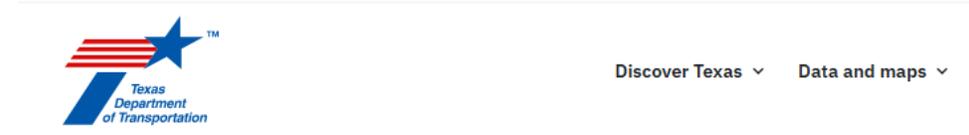
Digital Delivery Documents

Planning and Policy documents:

- Strategic Plan
- Implementation Plan
- Communication Plan

Digital Delivery Toolbox:

- DD QC Process PS&E Submittals
- DD PS&E QC Checklist
- DD PS&E Checklist Overview and Instructions
- 3D Model Breakline Creation Process
- Template Point Naming Convention



[Home](#) / [Business](#) / [Project development resources](#) / [Digital Delivery](#)

Digital Delivery documents

→ Planning and policy documentation

- [TxDOT DDP Strategic Plan](#)
- [TxDOT DDP Implementation Plan](#)
- [TxDOT DDP Communication Plan](#)
- [Expectation of Use of OpenRoads Designer](#)
- [Digital Delivery Impact Assessment – Overview of the Project Lifecycle](#)

→ Digital Delivery Toolbox

- [Digital Delivery QC Process PS&E Submittals](#)
- [Digital Delivery PS&E QC Checklist](#)
- [Digital Delivery PS&E QC Checklist Overview & Instructions](#)
- [3D Model Breakline Creation Process](#)
- [Template Point Naming Convention](#)
- [Using Bentley Infrastructure Cloud Platform \(ICP\) for Design Review](#)
- [TxDOT DDP Level of Development \(LOD\) Spreadsheet](#)

Model Delivery to Contractors

The background of the slide features a dark blue aerial view of a city at night, with lights reflecting on a river. A large, semi-transparent white network of interconnected nodes and lines is overlaid on the right side of the image, extending from the top right corner towards the center. The top right corner of the slide is decorated with geometric shapes in red, dark blue, and light grey.

Four Phases

	Implementation Steps	2024				2025				2026				TBD
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Phase 1 Quality Review (Internal Only)	Develop Plan													
	Develop & Deploy SOPs													
	Develop & Deploy Technology													
	Develop & Deploy Training													
	Develop & Deploy Policy													
	Phase 1 in effect													
Phase 2 FIO Models to Contractors (Interim For-Information-Only)	Develop Plan													
	Develop & Deploy SOPs													
	Develop & Deploy Technology													
	Develop & Deploy Training													
	Develop & Deploy Policy													
	Phase 2 in effect													
Phase 3 FIO Models to Contractors (Full Implementation For-Information-Only)	Develop Plan													
	Develop & Deploy SOPs													
	Develop & Deploy Technology													
	Develop & Deploy Training													
	Develop & Deploy Policy													
	Phase 3 in effect													
Phase 4 Models to Contractor as Legal Documents (MALD)	Develop Plan													
	Develop & Deploy SOPs													
	Develop & Deploy Technology													
	Develop & Deploy Training													
	Develop & Deploy Policy													
	Phase 4 in effect													



Phase 1 – Quality Review

Models requested from participating Districts for quality review

- Workspace
- Modeling techniques
- Export of 3D model breaklines

Resources from DDP team

- QC Process and Checklist
- Training for DES Division staff
- Pilot Process and Checklist on FM 1977

Implementation Steps	2024				2025				2026				TBD
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Develop Plan													
Develop & Deploy SOPs													
Develop & Deploy Technology													
Develop & Deploy Training													
Develop & Deploy Policy													
Phase 1 in effect													

Phase 2 – Models as FIO (interim)

Projects submit for contractor review

- To help contracting community to prepare for MALD
- Expedite the bidding process

Resources from DDP team

- QC Checklist
- Develop 3D Breakline Curation Process
- Template Point Naming Convention

Updated: January 2025

TxDOT Model Deliverable Plan								
Discipline	Deliverable	Format (additional file types may be requested)	Initial Milestone (30%)	PBLR	Detailed Milestone (60%)	Final Milestone (90/95%)	Sealed Milestone (100%)	Ready To Let (RTL) *For-Information-Only*
GENERAL MODEL FILES	Right of Way Layout	DGN	•	•	•	•	•	
	Right of Way Annotation	DGN	•	•	•	•	•	
TRAFFIC CONTROL PLAN (TCP) MODEL FILES	TCP Layout	DGN			•	•	•	
	TCP Annotation	DGN			•	•	•	
	TCP Container	DGN			•	•	•	
SURVEY MODEL FILES	TCP 3D Model Breaklines	DGN			•	•	•	
	Aerial Imagery	DGN	•	•	•	•	•	
	Existing Container	DGN	•	•	•	•	•	
	Survey Topo	DGN	•	•	•	•	•	
ROADWAY MODEL FILES	Existing Terrain	DGN/XML	•	•	•	•	•	•
	Roadway Container	DGN	•	•	•	•	•	
	Horizontal and Vertical Alignment	DGN/XML	•	•	•	•	•	•
	Roadway Layout	DGN	•	•	•	•	•	
	Roadway Annotation	DGN	•	•	•	•	•	
	Roadway Corridor	DGN	•	•	•	•	•	•
	Roadway Proposed Surface	DGN/XML			As Requested	•	•	•
	Roadway 3D Model Breaklines	DGN/XML				•	•	•
	Removal Layout	DGN			•	•	•	
	Removal Annotation	DGN			•	•	•	
RETAINING/NOISE WALL (RW) MODEL FILES	RW Layout	DGN		•	•	•	•	
	RW Container	DGN		•	•	•	•	
	RW Annotation	DGN		•	•	•	•	
DRAINAGE MODEL FILES	Drainage Area Map	DGN	•	•	•	•	•	
	Drainage Layout	DGN		•	•	•	•	
	Drainage Container	DGN		•	•	•	•	
	Drainage Annotation	DGN		•	•	•	•	
UTILITY MODEL FILES	Existing Utility Layout	DGN			•	•	•	
	Proposed Utility Layout	DGN			•	•	•	

Phase 2 – Models as FIO (interim)

- Submit 3D Models as FIO this summer
 - See QC Checklist – Model Deliverable Plan for specific files to be delivered for FIO
- All projects that have earthwork/roadway models
- Discussing if these go on District FTP site or part of Final PS&E submittal

Updated: January 2025

		TxDOT Model Deliverable Plan							
Discipline	Deliverable	Format (additional file types may be requested)	Initial Milestone (30%)	PBLR	Detailed Milestone (60%)	Final Milestone (90/95%)	Sealed Milestone (100%)	Ready To Let (RTL) *For-Information-Only*	
GENERAL MODEL FILES	Right of Way Layout	DGN	•	•	•	•	•		
	Right of Way Annotation	DGN	•	•	•	•	•		
TRAFFIC CONTROL PLAN (TCP) MODEL FILES	TCP Layout	DGN			•	•	•		
	TCP Annotation	DGN			•	•	•		
	TCP Container	DGN			•	•	•		
	TCP 3D Model Breaklines	DGN			•	•	•		
SURVEY MODEL FILES	Aerial Imagery	DGN	•	•	•	•	•		
	Existing Container	DGN	•	•	•	•	•		
	Survey Topo	DGN	•	•	•	•	•		
	Existing Terrain	DGN/XML	•	•	•	•	•	•	
ROADWAY MODEL FILES	Roadway Container	DGN	•	•	•	•	•		
	Horizontal and Vertical Alignment	DGN/XML	•	•	•	•	•	•	
	Roadway Layout	DGN	•	•	•	•	•		
	Roadway Annotation	DGN	•	•	•	•	•		
	Roadway Corridor	DGN	•	•	•	•	•	•	
	Roadway Proposed Surface	DGN/XML			As Requested	•	•	•	
	Roadway 3D Model Breaklines	DGN/XML				•	•	•	
	Removal Layout	DGN			•	•	•		
Removal Annotation	DGN			•	•	•			
RETAINING/NOISE WALL (RW) MODEL FILES	RW Layout	DGN		•	•	•	•		
	RW Container	DGN		•	•	•	•		
	RW Annotation	DGN		•	•	•	•		
DRAINAGE MODEL FILES	Drainage Area Map	DGN	•	•	•	•	•		
	Drainage Layout	DGN		•	•	•	•		
	Drainage Container	DGN		•	•	•	•		
	Drainage Annotation	DGN		•	•	•	•		
UTILITY MODEL FILES	Existing Utility Layout	DGN			•	•	•		
	Proposed Utility Layout	DGN			•	•	•		

Phase 3 – Models as FIO (full)

Building on Phase 2

- 3D review solution
- 3D software workflows
- Corridor ITL available

Implementation Steps	2024				2025				2026				TBD
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Develop Plan													
Develop & Deploy SOPs													
Develop & Deploy Technology													
Develop & Deploy Training													
Develop & Deploy Policy													
Phase 3 in effect													

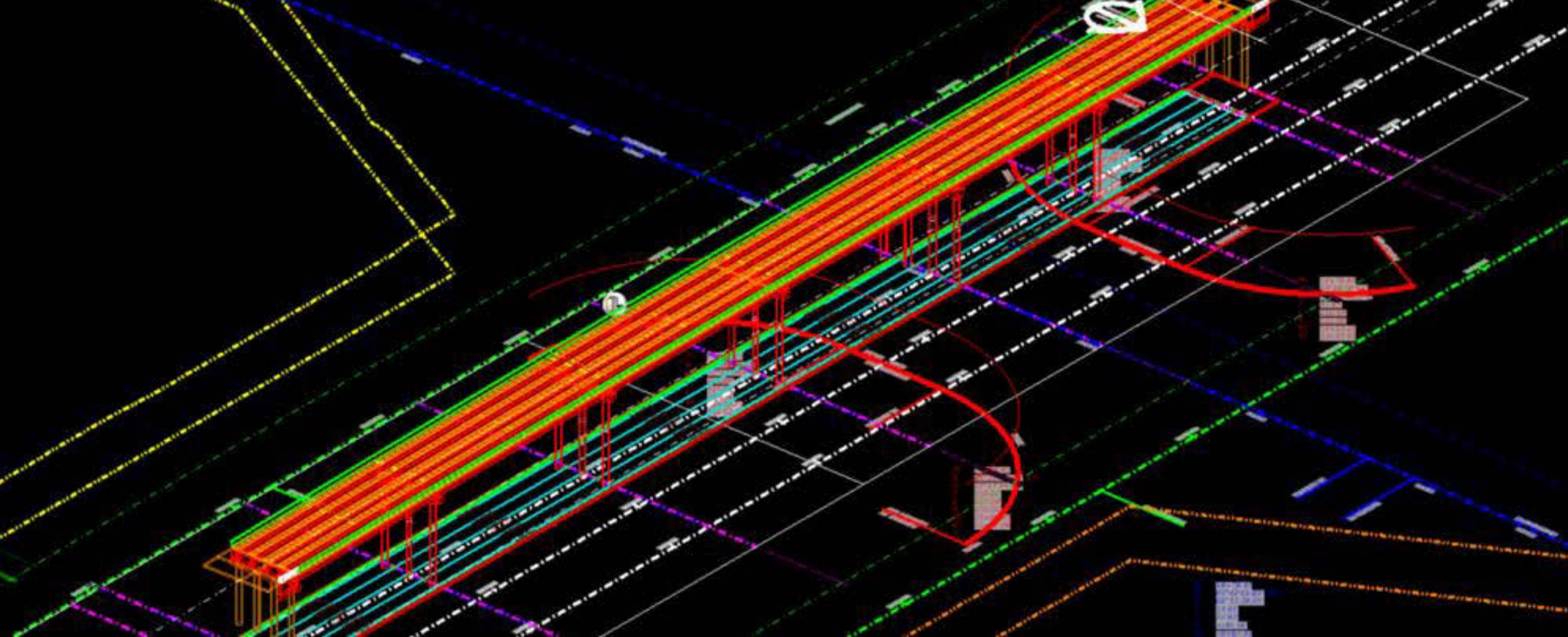
Phase 4 – MALD

- Develop Final MDS and LOD
- Develop additional 3D cells and feature types
- Develop MALD Use case requirements
- Implement MALD on all applicable projects

Implementation Steps	2024				2025				2026				TBD
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Develop Plan													
Develop & Deploy SOPs													
Develop & Deploy Technology													
Develop & Deploy Training													
Develop & Deploy Policy													
Phase 4 in effect													



Questions



Digital Delivery at TxDOT: The Bridge Perspective

Courtney Holle, P.E., TxDOT Bridge Division



April 16, 2025

Table of Contents

- 1 | Digital Delivery: What's New with Bridge
- 2 | Expectations
- 3 | Resources
- 4 | Future



Overview

Bridge Division has been working to **test** software, **develop** training, and **prepare** resources for the transition to the model as the legal document.

Resources, Training and available policy documents can be found on the TxDOT 3D Bridge Modeling Website linked below.

<https://www.txdot.gov/business/resources/highway/bridge/3d-bridge-modeling.html>

Test

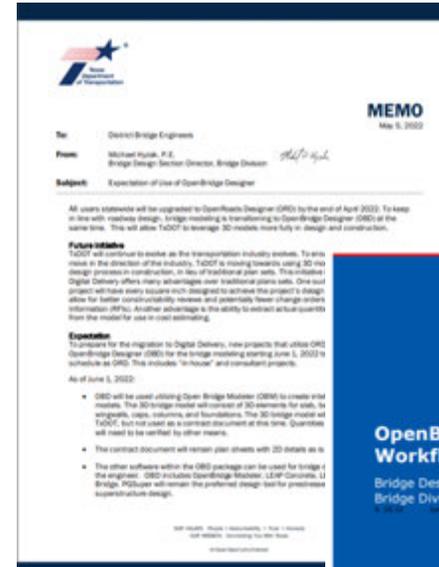
Develop

Prepare



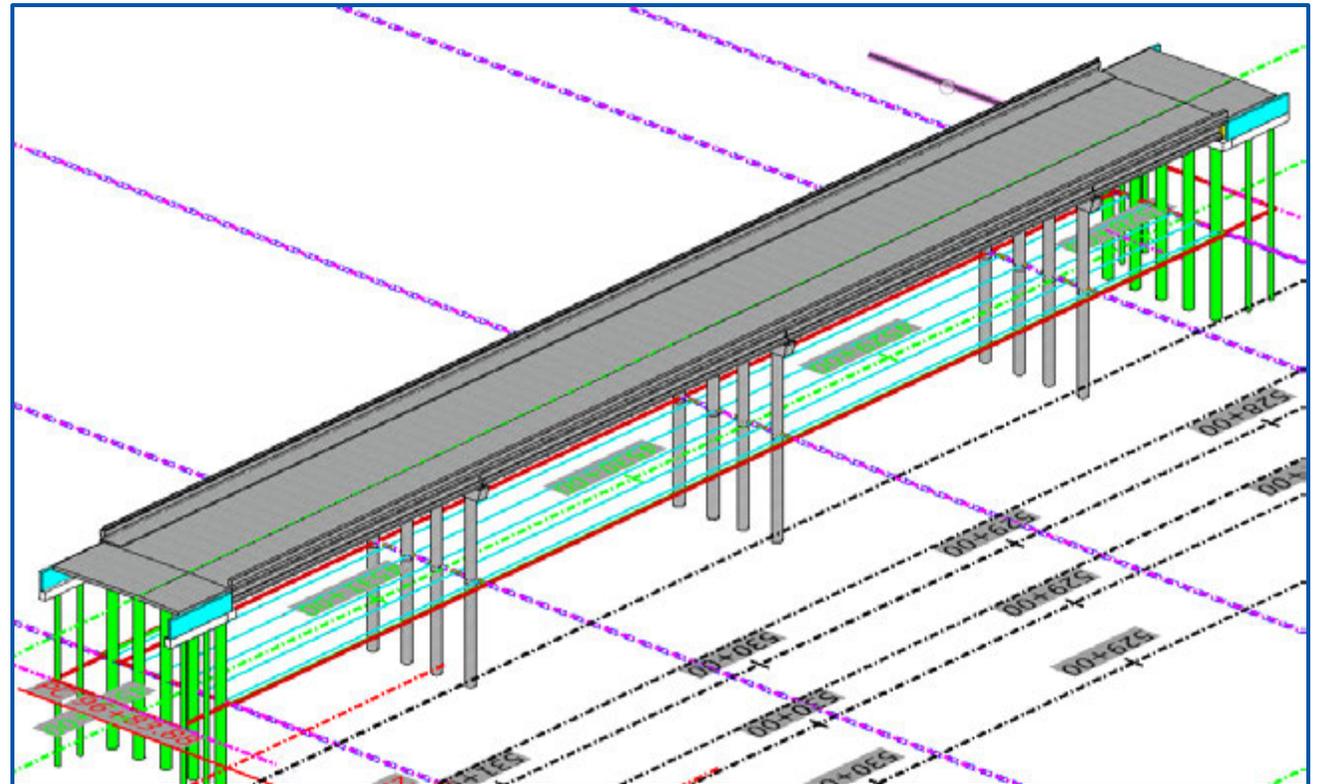
List of Policy Documents

- Expectations of Use Memo (Posted)
- OBM Drafting Workflow (Posted)
- Bridge Modeling Guidance (Internal Review)
- 3D Bridge Modeling Best Practices (Internal Review)



Expectations - 3D Bridge Modeling

- Deliverable
 - 3D intelligent bridge model
 - Slab
 - Beams
 - Cap
 - Abutments
 - Columns
 - Wingwalls
 - Foundations
 - Submittals
 - Rails
 - PBLR and 100% submittals
 - When ORD model is required
 - At district's discretion



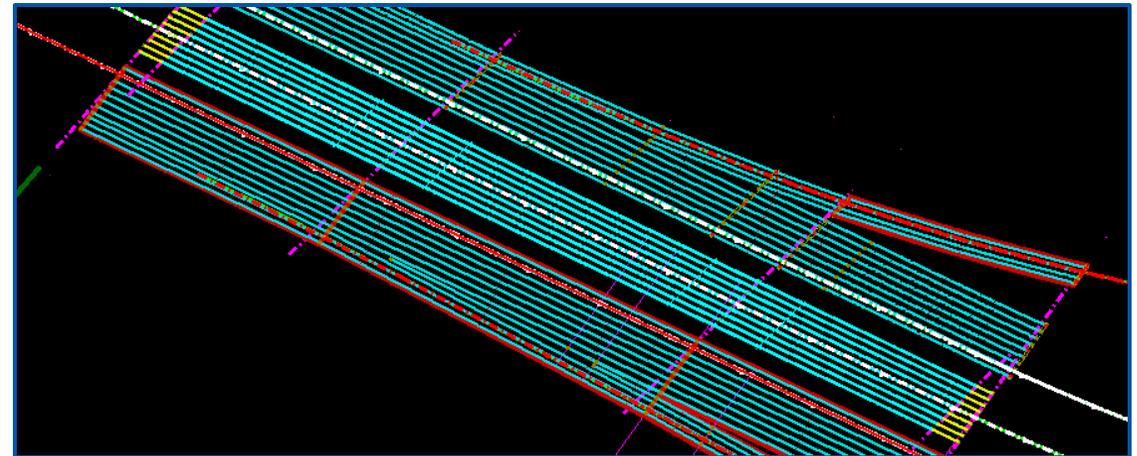
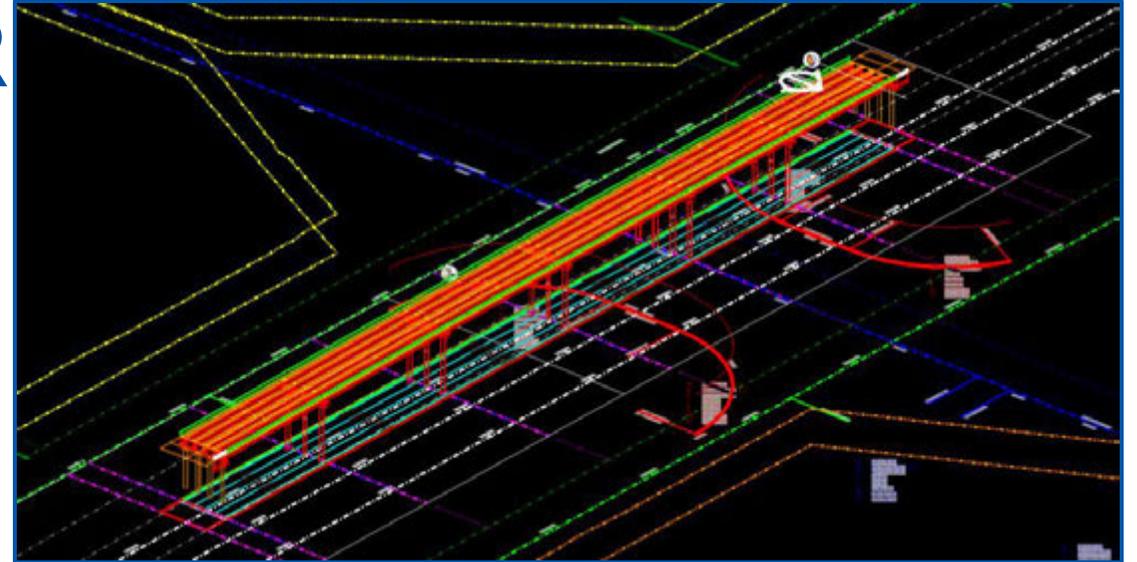
Expectations - Submittals

- 2D sheets for contract documents
- Model stored on Projectwise
- Designer needs to verify model quantities and geometry.
- Roadway and Bridge models in separate DGN files and submitted at same milestones.



3D Bridge Model in PBLR

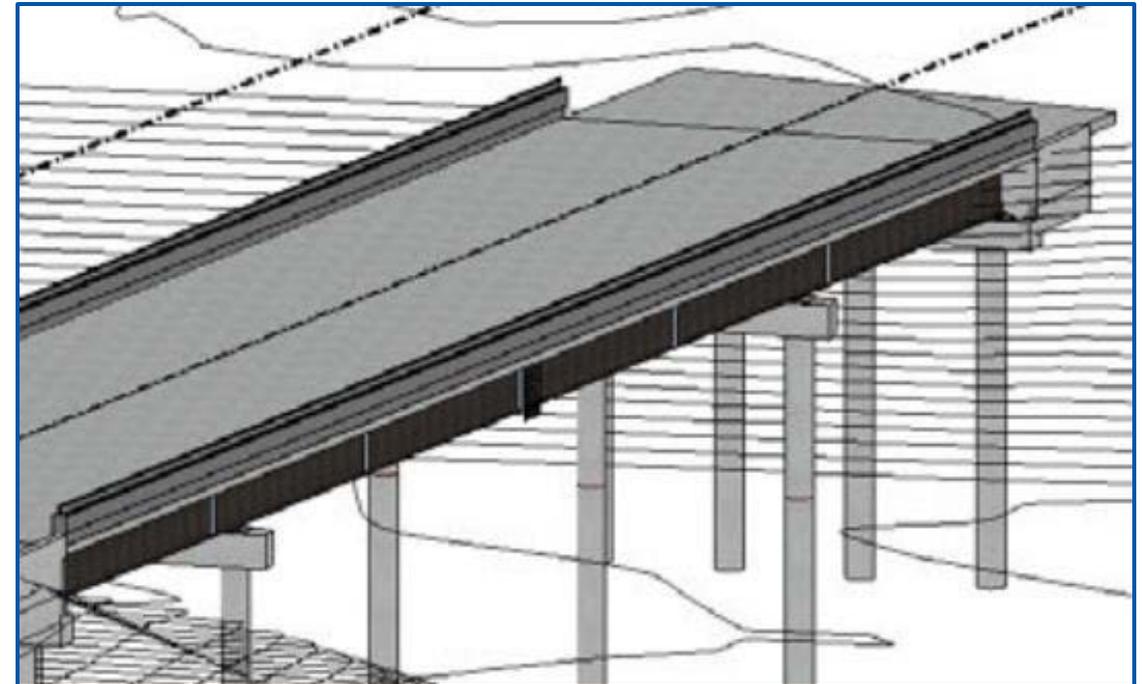
- 3D Model Completeness Checklist
 - <https://ftp.txdot.gov/pub/txdot/des/ord/3d-model-completion-checklist.pdf>
- Include reference files in PBLR folder
- Verify OBM version
- Exception to 3D Bridge Models
 - Culverts
 - Repair/Maintenance
 - Rail Retrofits



Resources

Below are the resources found on the TxDOT 3D Bridge Modeling Website.

- OBM Workspace Files
- OBM Templates
- Training
- Frequently asked questions
- OBM Comparison Bearing Seat Elevations
- OBM Comparison Quantities



Workspace

The intent of OpenBridge Designer Workspace Contents document is to describe the bridge specific contents of TxDOT's Workspace.

- Dimension and Text Styles
- Drawing Seeds and Annotation Groups
- Border Files and Sheet Seeds
- Seed Files
- Bridge Templates
- Additional Components



OpenBridge Designer

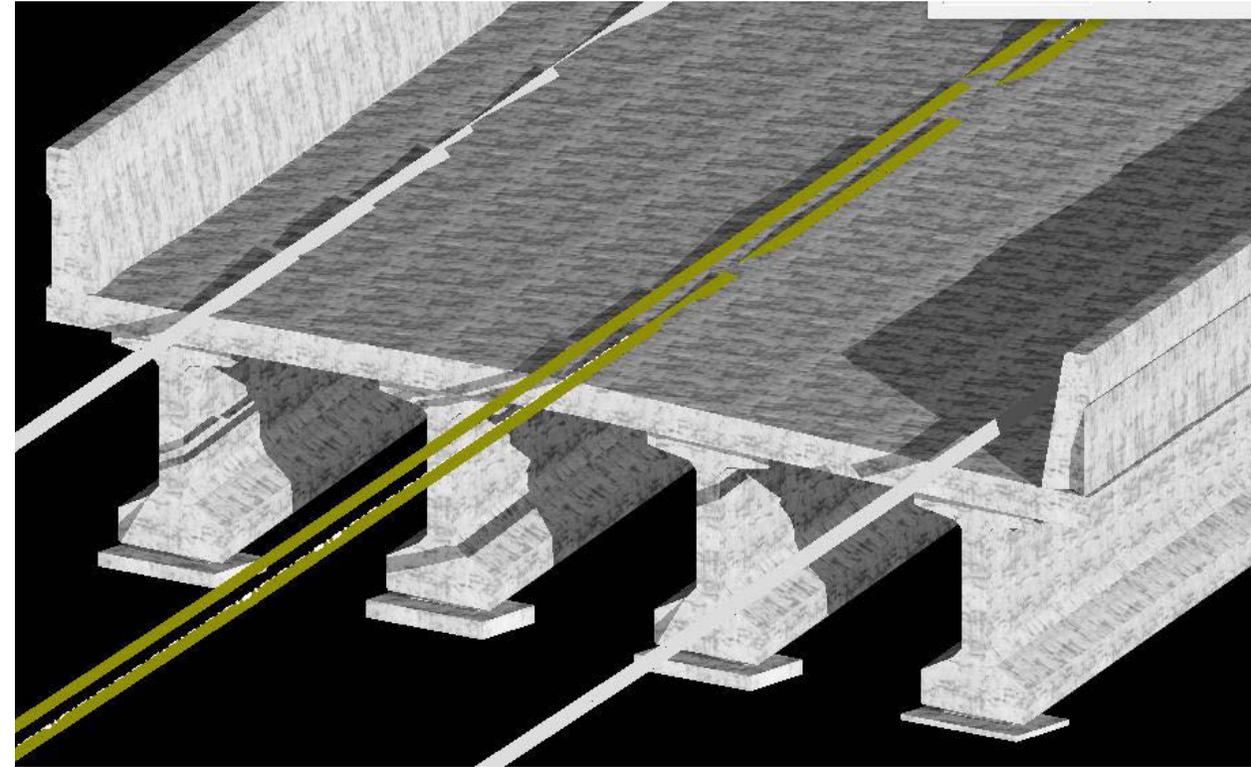
Workspace Contents

Bridge Division



Templates

- We have been working with Bentley to develop our templates
- For now only Standard drawings are being used for templates
- Current templates
 - Deck
 - Railing
 - Beams
 - Bents
 - Abutments



Bridge showing Railing, Deck, Beams, Bearing Pads and Seats. Roadway and abutment turned off for clarity.

Templates: Decks

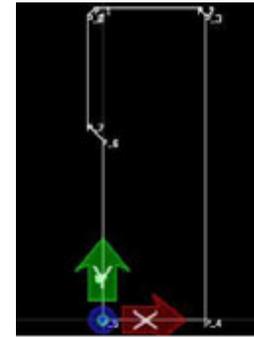
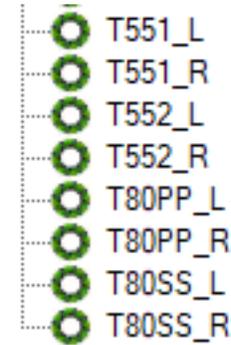
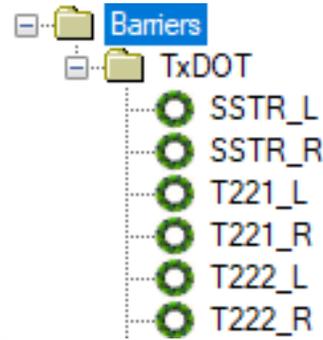
- Decks – This only sets the standard deck thickness (8.5”). Two templates are available.



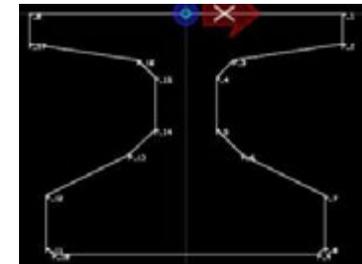
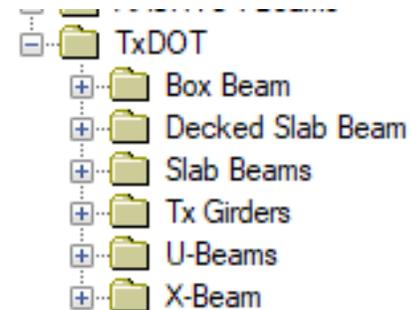
** The template contains the lines where the break back goes as a guide to use later in the modification of the solid to create the break back.

Templates: Rails and Beams

- Traffic Rails – OBM only supports solid elements so we only have the solid traffic rails as templates.



- All Standard Concrete Beams – Steel beams must be defined per case, rolled beams are available for selection.

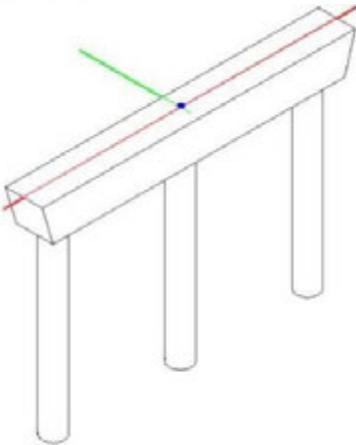


Templates: Interior Bents and Abutments

- Standard Interior Bents

- TxDOT
 - Interior Bent for Adj Box Beams
 - Interior Bent for CIP Slab Spans
 - Interior Bent for Deck Slab Beams
 - Interior Bent for Pan Form
 - Interior Bent for Slab Beams
 - Interior Bent for Steel Beams
 - Interior Bent for TxGirder and Similar

With Drilled Shafts

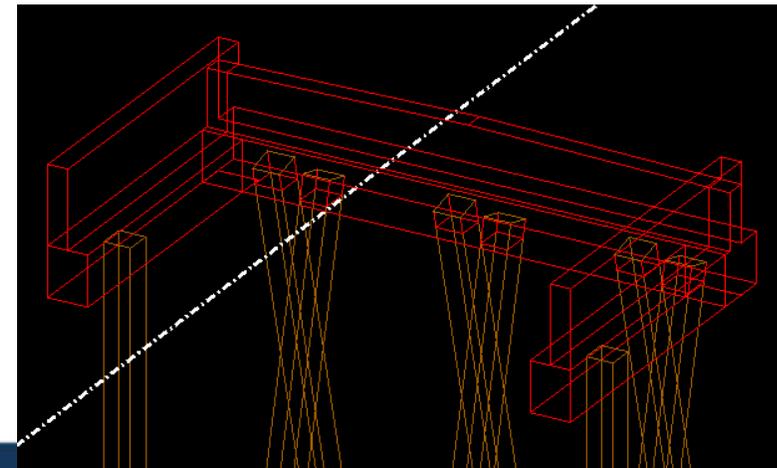


- TxDOT
 - Interior Bent for Adj Box Beams
 - Interior Bent for CIP Slab Span
 - Interior Bent for Deck Slab Beams
 - Interior Bent for Pan Form
 - Interior Bent for Slab Beams
 - Interior Bent for Steel Beams
 - Interior Trestle Bents for TxGirder and similar

With Piles

- Standard Abutments – Only abutments that do not have break backs were created as templates.

- TxDOT
 - Abut for Adj Box Beams with DS
 - Abut for Adj Box Beams with Piles
 - Abut for Deck Slab Beams with DS
 - Abut for Deck Slab Beams with Piles
 - Abut for Slab Beams with DS
 - Abut for Slab Beams with Piles



3D Line Styles

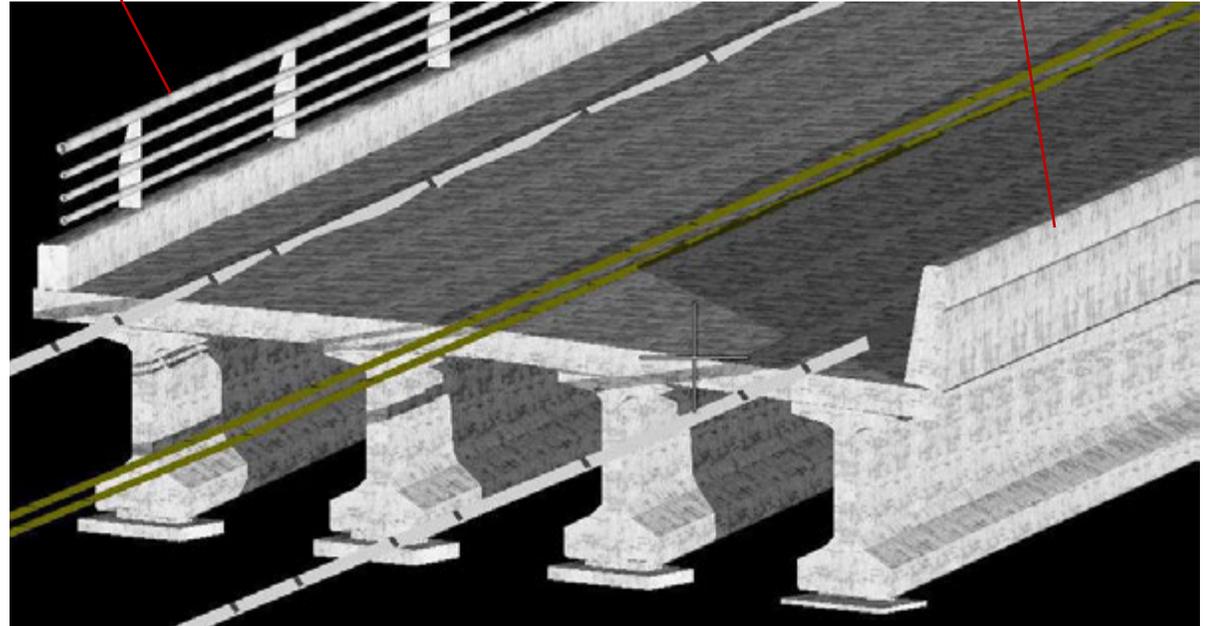
- The following rails have been created as 3D Line Styles

Rail 3D Line Style C1W

Rail Template SSTR

T1F
T1W
T2P
T223
T224
T401
T402
T411
T631
T631LS
T66
T80HT

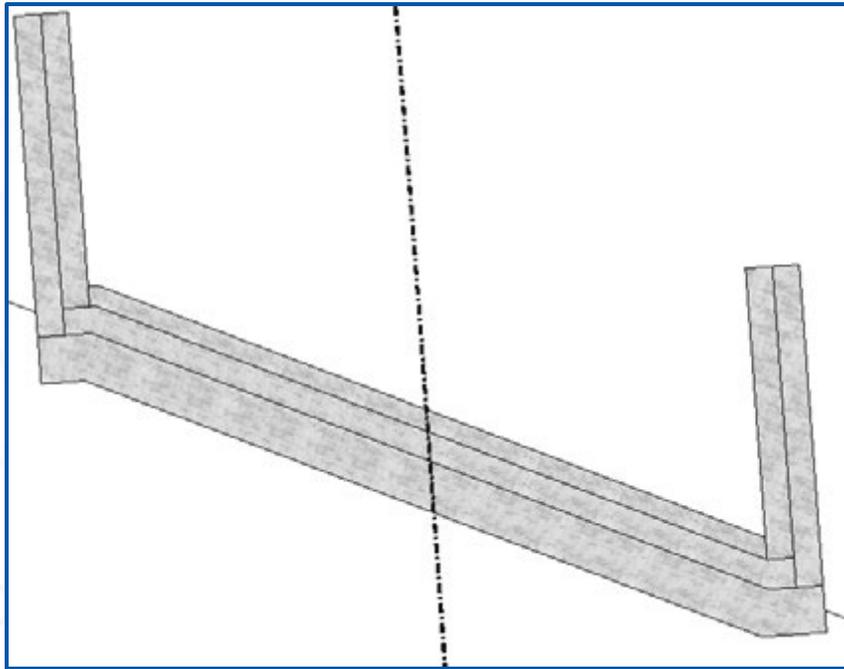
C1W
C2P
C221
C223
C402
C411
C412
C66
PR11
PR22
PR3



These are the rails created as 3D line styles. These do not reflect all rails used in TxDOT. Each rail was separated into Left and Right and their respective parapet line style.

Parametric Cells

- Parametric cells support cross slope, breakbacks, wingwalls, different number of columns/drilled shafts, and drilled shafts in wingwalls as applicable.



Abutment for TxGirders

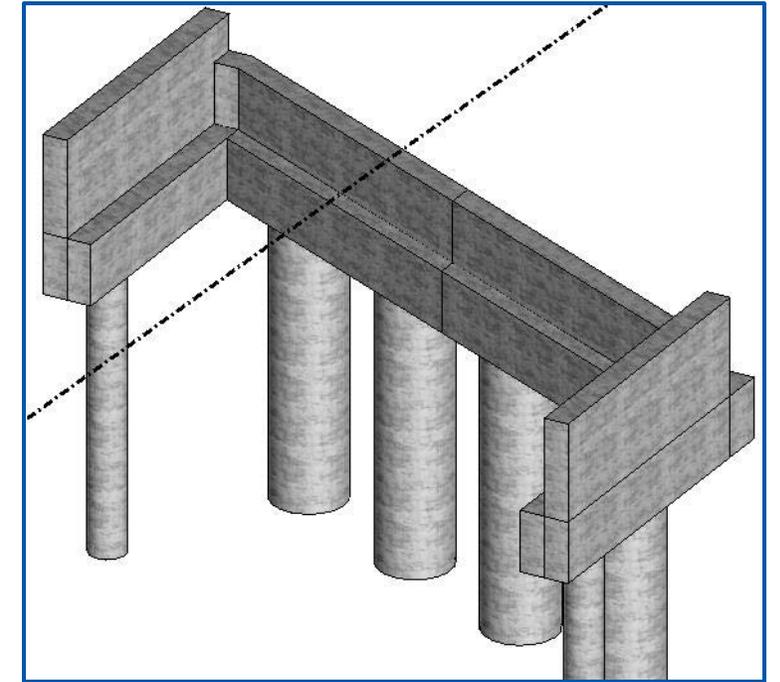
Abutment for X Beams

Abutment for U Beams

Abutment for Slab Beams

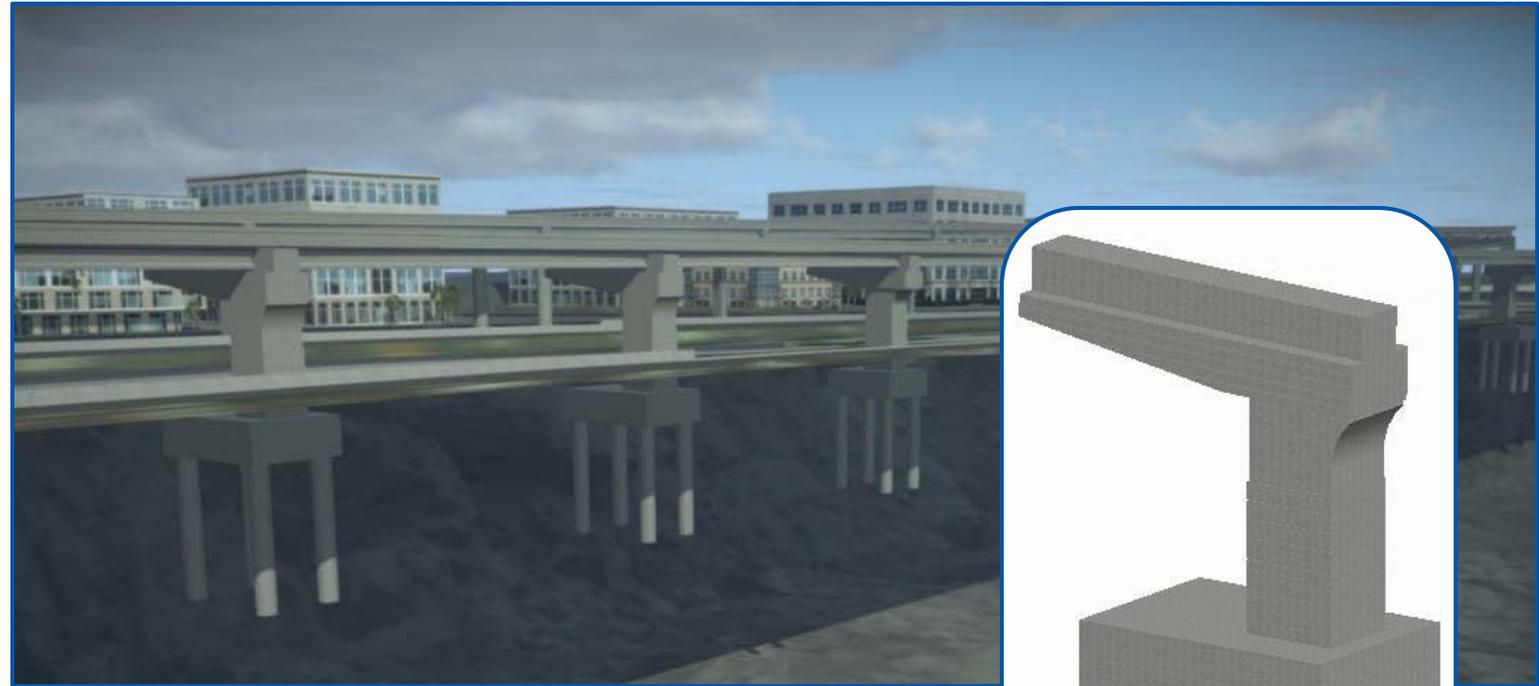
Abutment for CIP Slab Spans

Abutment for Steel Beams



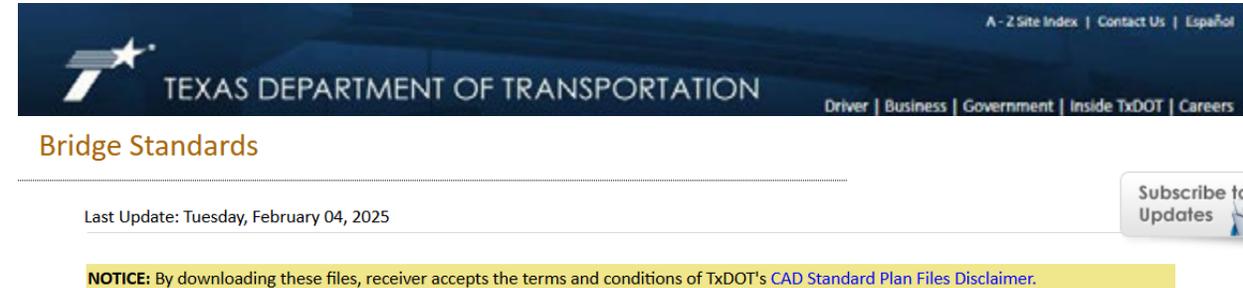
3D Solids – When Workspace Doesn't Have What You Need

- When templates and parametric cells don't work...
- There are always 3D Microstation cells.
 - Drawback – no OBM intelligence attached to the element



Standard Bridge OBM Templates

- Prestressed Concrete I-Girders
 - 4 girders (24 ft rdwy width)
 - 5 girders (40 ft. rdwy width)
 - 6 girders (48 ft. rdwy width)
- Prestressed Concrete Slab and Box Beams
 - 24 ft, 28 ft, and 30 ft. rdwy widths



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TEXAS DEPARTMENT OF TRANSPORTATION

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Bridge Standards

Last Update: Tuesday, February 04, 2025

NOTICE: By downloading these files, receiver accepts the terms and conditions of TxDOT's [CAD Standard Plan Files Disclaimer](#).

Subscribe to Updates

4. Bridge templates that model standard bridges for Open Bridge Modeler (OBM).

- A. [Prestr. Spread Box Beams \(X-Beams\).zip](#)
- B. [Prestressed U-Beams.zip](#)
- C. [Prestressed TxGirders.zip](#)
- D. [Prestressed Slab Beams.zip](#)
- E. [Prestr. Adjacent Box Beams.zip](#)

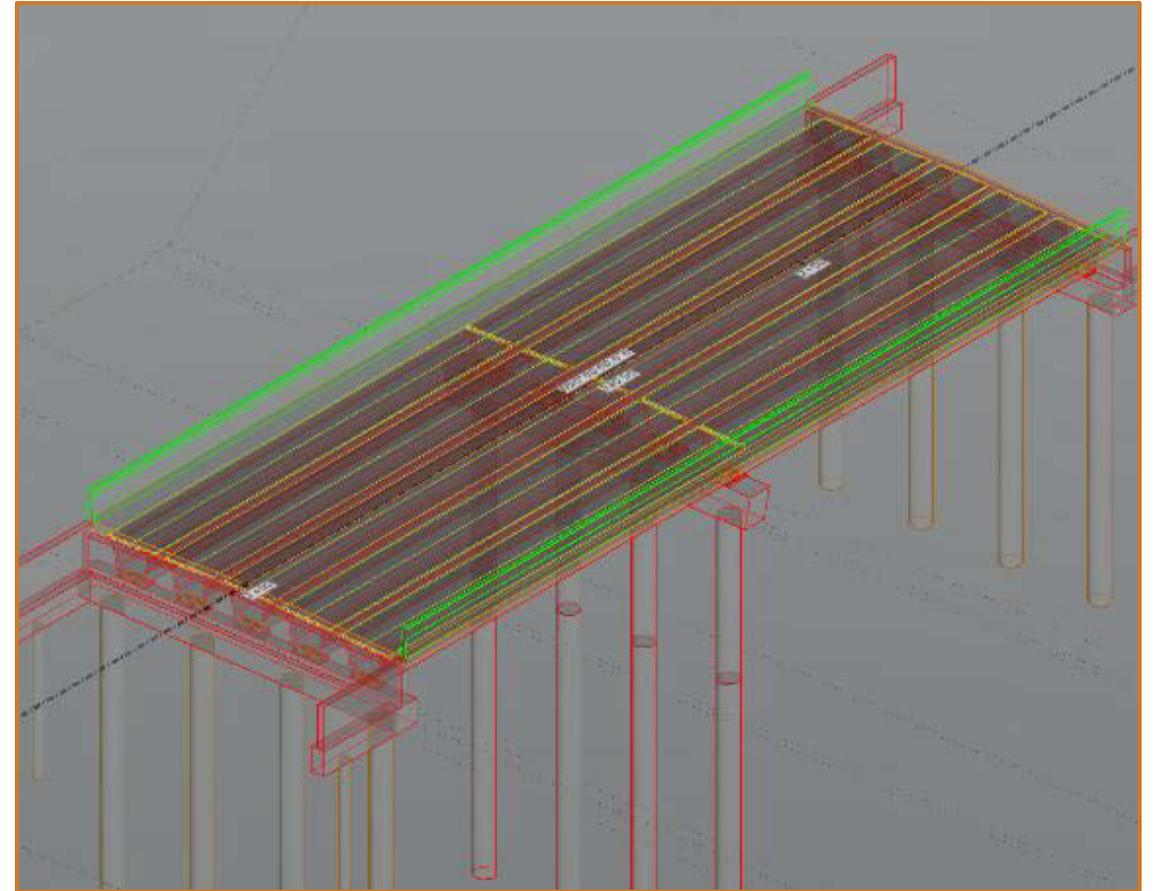
4. Bridge templates that model standard bridges for Open Bridge Modeler (OBM)

- A. [Prestr. Spread Box Beams \(X-Beams\).zip](#)
- B. [Prestressed U-Beams.zip](#)
- C. [Prestressed TxGirders.zip](#)
- D. [Prestressed Slab Beams.zip](#)
- E. [Prestr. Adjacent Box Beams.zip](#)



Standard Bridge OBM Templates

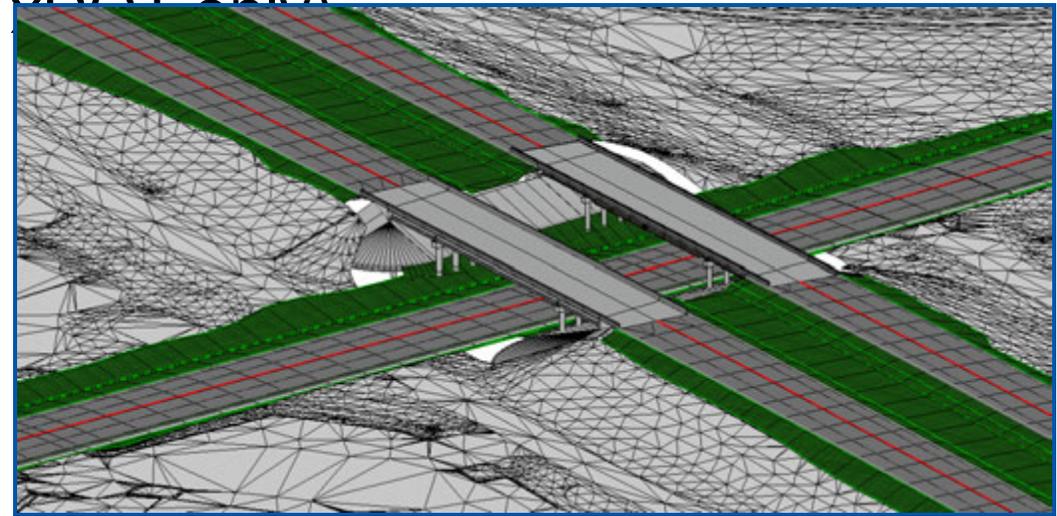
- Prestressed Concrete X-Beams
 - 4 girders (32 ft rdwy width)
 - 5 girders (38 ft. rdwy width)
 - 6 girders (44 ft. rdwy width)
- Prestressed Concrete U-Beams
 - 4 girders (40 ft rdwy width)
 - 5 girders (48 ft. rdwy width)



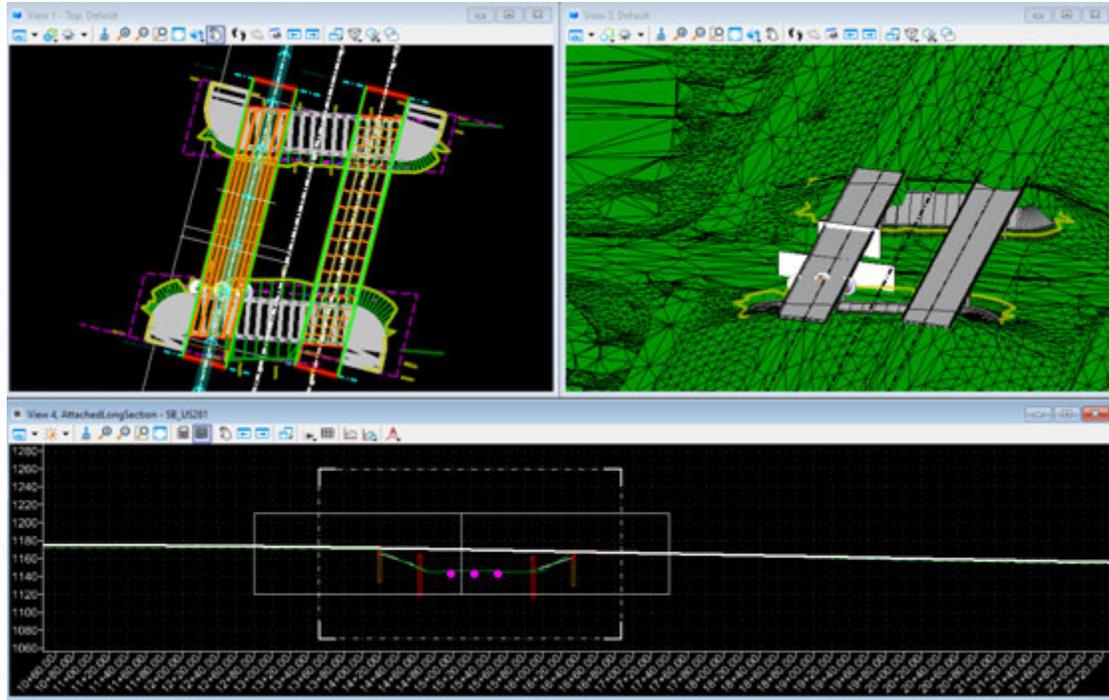
Training

TxDOT Bridge Division developed the OpenBridge Designer/Modeler Training Manual used in the BRG300 training and is offered as self paced, virtual instructor led (TxDOT only), or in person instructor led (TxDOT only).

- File Creation/Opening
- Creating a Bridge Model with Precast Girders and Steel Girders
- Placing Riprap
- Generating Reports
- Creating and Manipulating Bridge Templates
- Sheet Creation

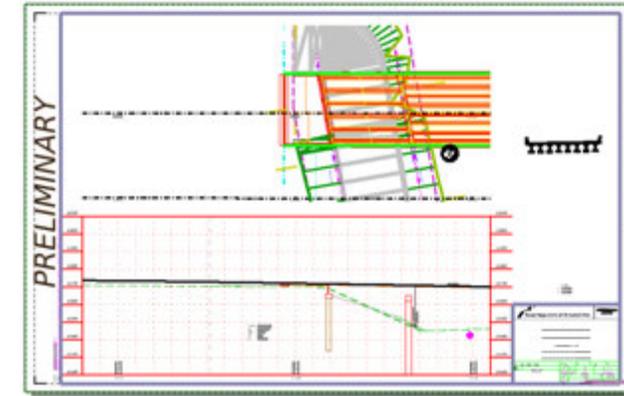
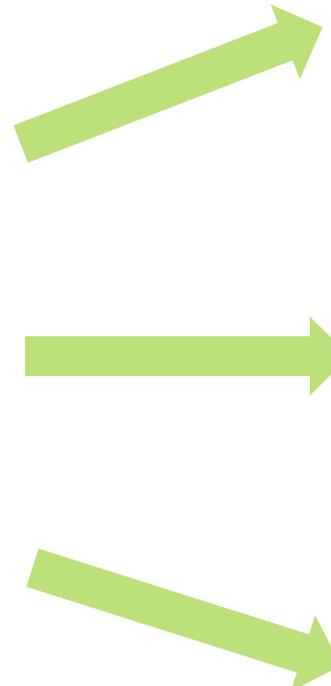


3D Bridge Models/2D Sheets

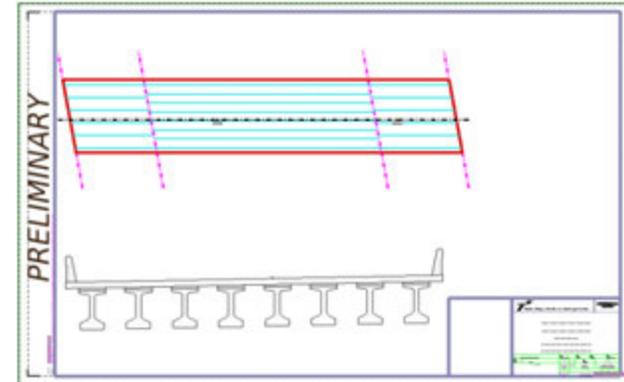


A single container file can be used to reference in all Models, for plan production. (Ensure the Live nesting at the sheet level is set to at least 3, and 2 in the container file)

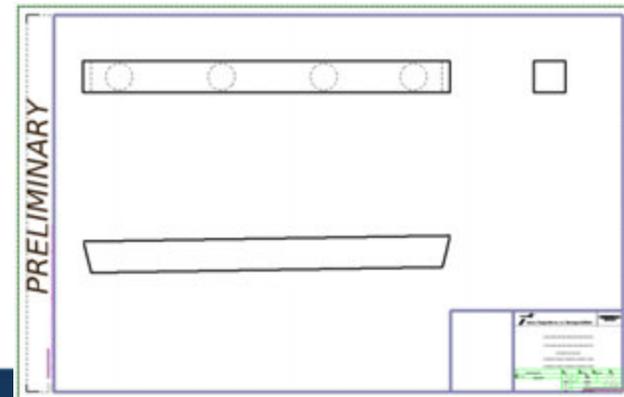
Updates to the Model get sent to the sheets.



Layout Sheets



Superstructure Sheets



Substructure Sheets

Comparison – Model vs. Traditional Methods

Number of Beams: 5 | Number of Bents: 2

Bearing Seat Elevations - One Pad per Beam

Open Bridge Modeler Report					
Location	Beam 1	Beam 2	Beam 3	Beam 4	Beam 5
Abutment 1 Fwd	50.5798	50.4347	50.2894	50.1439	49.9984
Bent 2 Back	51.6904	51.5365	51.3824	51.2282	51.0741
Bent 2 Fwd	51.705	51.551	51.3968	51.2425	51.0884
Bent 3 Back	52.3354	52.1726	52.0097	51.8466	51.6845
Bent 3 Fwd	52.342	52.179	52.016	51.8527	51.6906
Abutment 4 Back	52.4921	52.3205	52.1486	51.9766	51.8047

LS4 Output from BGS

Location	Beam 1	Beam 2	Beam 3	Beam 4	Beam 5
Abutment 1 Fwd	50.581	50.436	50.29	50.145	49.999
Bent 2 Back	51.691	51.538	51.384	51.229	51.074
Bent 2 Fwd	51.706	51.552	51.397	51.243	51.089
Bent 3 Back	52.336	52.174	52.011	51.848	51.685
Bent 3 Fwd	52.343	52.18	52.017	51.853	51.691
Abutment 4 Back	52.493	52.321	52.149	51.977	51.805

Discrepancies

Location	Beam 1	Beam 2	Beam 3	Beam 4	Beam 5
Abutment 1 Fwd	-0.001	-0.001	-0.001	-0.001	-0.001
Bent 2 Back	-0.001	-0.002	-0.002	-0.001	-0.001
Bent 2 Fwd	-0.001	-0.001	0.000	-0.001	-0.001
Bent 3 Back	-0.001	-0.001	-0.001	-0.001	-0.001
Bent 3 Fwd	-0.001	-0.001	-0.001	0.000	-0.001
Abutment 4 Back	-0.001	0.000	0.000	0.000	-0.001

Bearing Seats

OpenBridge Modeler Comparison Report

Brief Description of Bridges

The US 77 SBML Overpass at CR2340 bridge is a straight 15-degree skew bridge that is mostly standard. The abutments are the only non-standard component because there is a retaining wall on one side of each abutment.

Findings of Geometry Comparison

The geometry comparison showed the following:

The biggest difference between bearing seat elevations was 0.0016'.

Findings of Estimated Quantities Comparison

The estimated quantities comparison showed the following:

Only a few quantities are close to hand calculations. Some quantities with significant differences are the beams, bent footings, and rails. I have no idea why the beams are so different. The bent footings are different because 3 pile footings are not available in OBM, so I had to use 4 pile square footings. The rails are different because you can't extend the rail along wingwalls, so you must use line elements that don't appear in the quantities.

Discussion of Areas of Improvement for the Software

Limitations of OpenBridge Modeler experienced during this project are:

It's hard to accurately model abutments and wingwalls because they are separate elements. The rails cannot easily be extended over wingwalls. Not all of the standard footings are available.

Proposed enhancements for OpenBridge Modeler are:

Introduce an intuitive system to create abutments that include wingwalls rather than having to place the wingwalls as a separate element. Allow extending rails over wingwalls. Add all of the standard footings.

Report

QUANTITIES:

OpenBridge Modeler Quantities

Superstructure Quantities

Component Name	Pay Unit	Quantity
Approach Slab	CY	38.256
Deck	CY	393.521
Approach Slab	CY	38.256
Haunch	CY	82.778
Beams (Conc)	LF	2490.000

Substructure Quantities

Component Name	Pay Unit	Quantity
Abutment Cap	CY	19.694
Abutment Drilled Shaft	LF	320.000
Abutment Brng Seats	CY	0.146
Bent Cap	CY	17.527
Bent Cols	CY	13.520
Bent Footing	CY	19.791
Bent Piles	LF	720.000
Bent Brng Seats	CY	0.318
Bent Cap	CY	17.527
Bent Cols	CY	14.252
Bent Footing	CY	19.791
Bent Piles	LF	720.000
Bent Brng Seats	CY	0.313
Abutment Cap	CY	19.697
Abutment Drilled Shaft	LF	320.000
Abutment Brng Seats	CY	0.150
Wingwall Wall	CY	3.937
Wingwall Cap	CY	3.160
Wingwall Drilled Shaft	LF	40.000
Wingwall Wall	CY	3.936
Wingwall Cap	CY	3.209
Wingwall Drilled Shaft	LF	40.000

Miscellaneous Quantities

Component Name	Pay Unit	Quantity
Bearing Pads	EA	30.000
Barrier	LF	750.000

Manually calculated or Other method Quantities

Superstructure Quantities

Component Name	Pay Unit	Quantity	Discrepancies
Approach Slab	CY	38.300	-0.044
Deck	CY	393.519	0.002
Approach Slab	CY	38.300	-0.044
Haunch	CY	48.300	34.478
Beams (Conc)	LF	1867.420	622.580

Substructure Quantities

Component Name	Pay Unit	Quantity	Discrepancies
Abutment Cap	CY	17.800	1.894
Abutment Drilled Shaft	LF	320.000	0.000
Abutment Brng Seats	CY	0.024	0.122
Bent Cap	CY	17.800	-0.273
Bent Cols	CY	12.600	0.920
Bent Footing	CY	14.400	5.391
Bent Piles	LF	720.000	0.000
Bent Brng Seats	CY	0.252	0.066
Bent Cap	CY	17.800	-0.273
Bent Cols	CY	13.400	0.852
Bent Footing	CY	14.400	5.391
Bent Piles	LF	720.000	0.000
Bent Brng Seats	CY	0.252	0.061
Abutment Cap	CY	17.800	1.897
Abutment Drilled Shaft	LF	320.000	0.000
Abutment Brng Seats	CY	0.024	0.126
Wingwall Wall	CY	4.091	-0.154
Wingwall Cap	CY	3.423	-0.263
Wingwall Drilled Shaft	LF	40.000	0.000
Wingwall Wall	CY	4.091	-0.155
Wingwall Cap	CY	3.423	-0.214
Wingwall Drilled Shaft	LF	40.000	0.000

Miscellaneous Quantities

Component Name	Pay Unit	Quantity	Discrepancies
Bearing Pads	EA	30.000	0.000
Barrier	LF	788.000	-38.000

Quantities

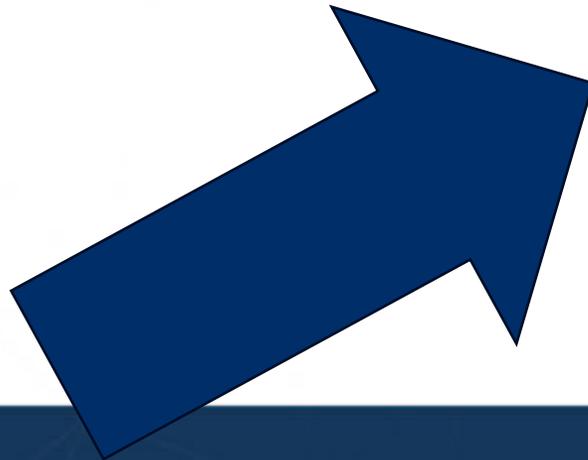


OBM Requirements going forward

Currently, OBM models are required with PBLR and 100% submittals. Comparison reports are required at the 100% submittal.

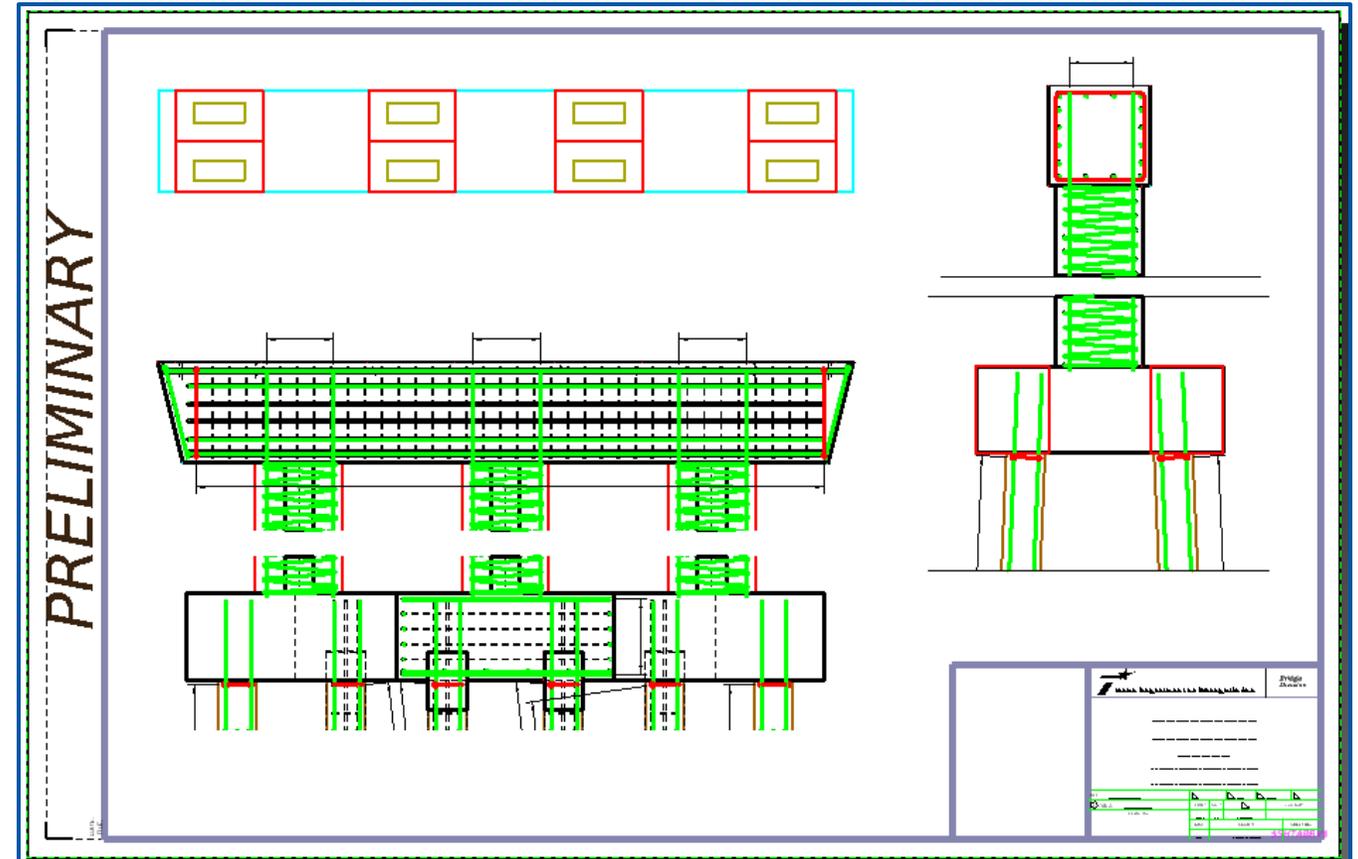
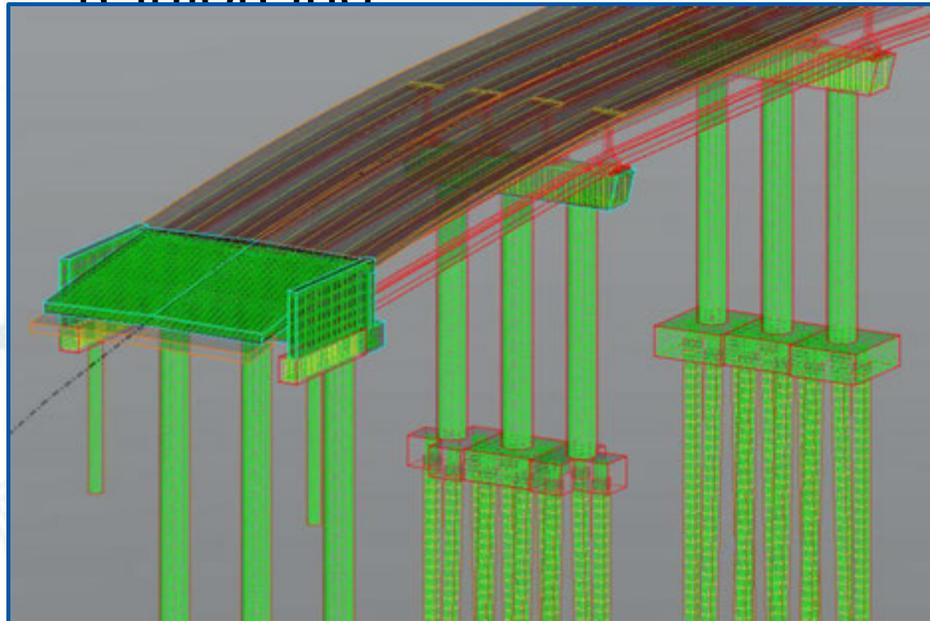
Once the policy documents are finalized, models are to be submitted with every design package as FIO.

The model will eventually be used as the legal document (MALD). BRG will work with Design Division for this rollout and implementation.



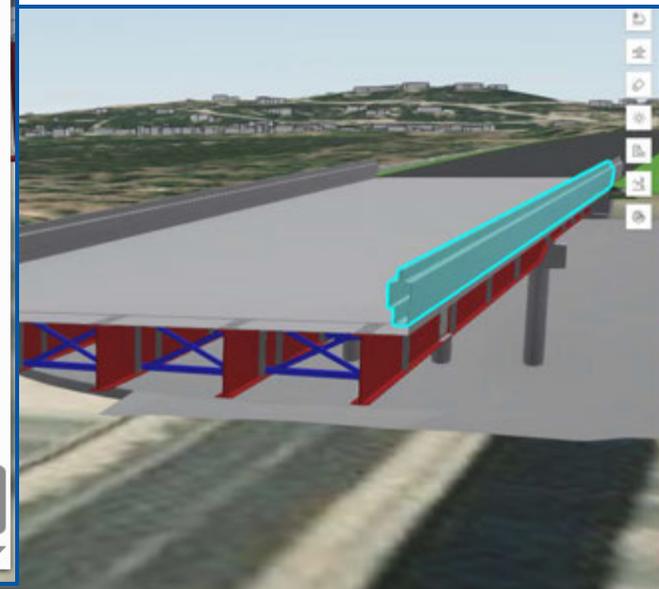
3D Reinforcing

- The next stage is to develop training and start using ProConcrete to detail and label all possible reinforcing



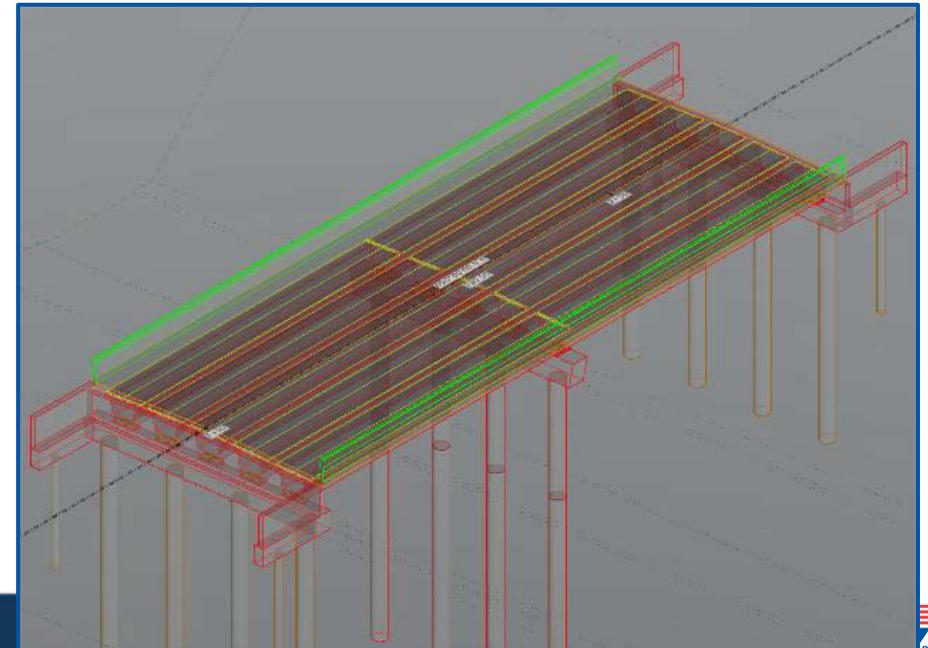
Pilot Projects

- Looking for Bridge Pilot Projects.
- Learn what is needed by fabricators and consultants.
- Determine if a Bridge 3D model can alone be the contract document or if we need to include supplemental sheets.
- How to handle one-off designs and standard bridges.



Bridge Digital Delivery

- Best Practices Document (Upcoming)
- Bridge pilot projects for digital delivery
- Send feedback to bridge3ddesign@txdot.gov
- Workspace – TxDOT templates
 - Wide Flange Girders (Need)
 - Inverted Tee caps (Need)
- Worksets/Project Templates – For project specific changes



TxDOT Bridge Resources Recap

- Got More Questions?
 - TxDOT.gov
 - <https://www.txdot.gov/business/resources/highway/bridge/3d-bridge-modeling.html>
 - Email
 - BRG_Bridge3DDesign
<bridge3ddesign@txdot.gov>

Resources

-  [Expectation of Use of OpenBridge Designer](#)
- [OpenBridge Designer Workspace Files](#)
-  [OpenBridge Designer Workspace Readme](#)
-  [OpenBridge Designer FAQs](#)
- [Bridge Standards - OBM Templates](#) 
-  [3D Model Completion Checklist](#)
-  [OBM Comparison Report Template](#)
- [OBM Comparison Bearing Seat Elevations](#)
- [OBM Comparison Quantities](#)
-  [OBM Drafting Workflow](#)

OpenBridge Modeler Training 2024

-  [TxDOT OBM Training Manual](#)
-  [TxDOT OBM Training Videos](#)
-  [BRG300-OBM.zip](#)



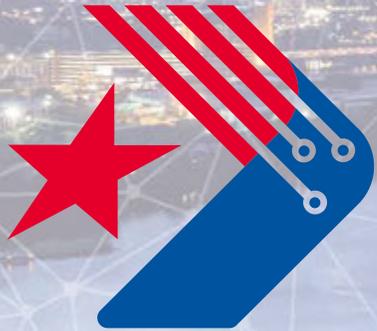


bridge3ddesign@txdot.gov



April 16, 2025

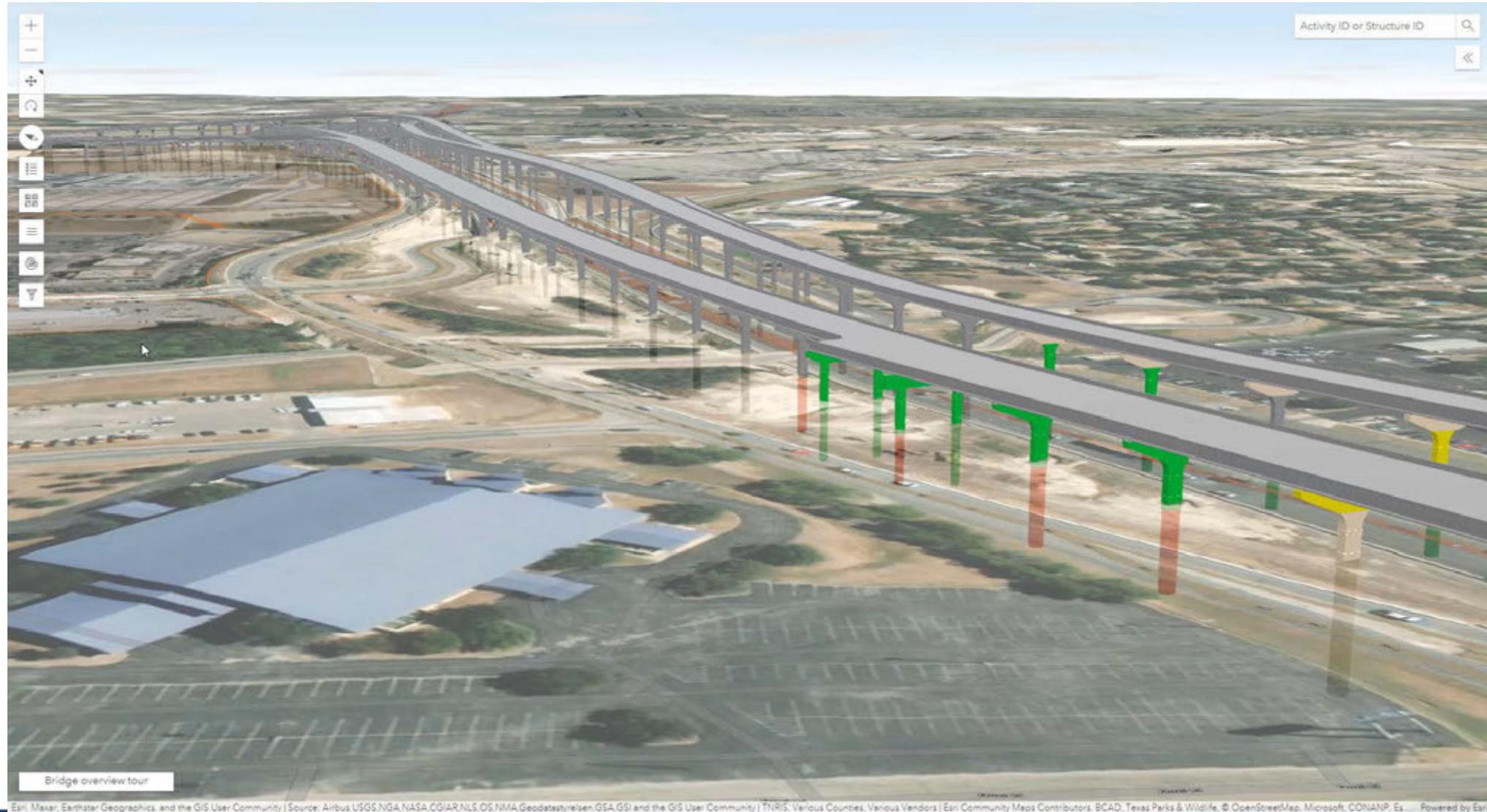
TxDOT's Digital Delivery A Look Ahead



Digital Delivery is ~~Change~~ ~~Ma~~ Designment



Digital Delivery is Innovation



Esri, Maxar, Earthstar Geographics, and the GIS User Community | Source: Airbus, USGS, NGA, NASA, CGIAR, NLS, OS, NIMA, Geodatasystem, GSA, GSI and the GIS User Community | TNRIS, Various Counties, Various Vendors | Esri Community Maps Contributors, BCAD, Texas Parks & Wildlife, © OpenStreetMap, Microsoft, CONANP, Esri. Powered by Esri.



Digital Delivery from National Perspective

FHWA

- Building Information Modeling and Digital As-Built Buy In
- Oversees the Advanced Digital Construction Management System (ADCMS) and Accelerated Innovation Deployment (AID) grants
- Transportation Pooled Fund: Building Information Modeling (BIM) for Bridges (TPF-5(523)) and Infrastructure (TPF-5(480))

AASHTO

- Joint Technical Committee on Electronic Engineering Standards (JTCEES)
- Joint Subcommittee on Data Standardization (JStan)
- Adoption of Industry Foundation Classes (IFC) Schema

Transportation Research Board

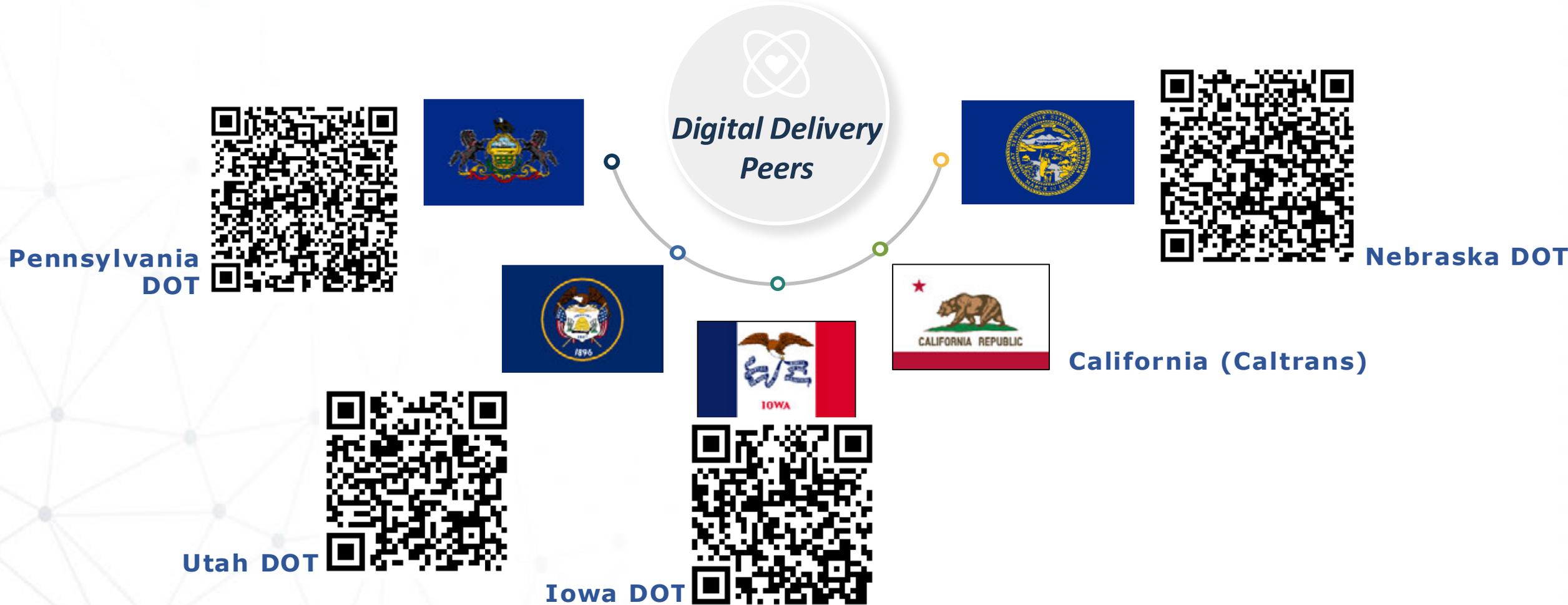
- NCHRP 10-110A: Guide to Using 3D Models for Construction Inspection
- NCHRP 10-141: Guide for Digital Project Delivery: Integrating Design and Construction



Digital Delivery from State DOT Perspective

Digital Delivery Programs

Peer Exchange Opportunities



Transportation Pool Funds

Who is involved?

- Arizona Department of Transportation
- California Department of Transportation
- Connecticut Department of Transportation
- Florida Department of Transportation
- Georgia Department of Transportation
- Illinois Department of Transportation
- Indiana Department of Transportation
- Iowa Department of Transportation
- Kentucky Transportation Cabinet
- Michigan Department of Transportation
- Minnesota Department of Transportation
- Mississippi Department of Transportation
- Montana Department of Transportation
- Nebraska Department of Transportation
- New York State Department of Transportation
- North Carolina Department of Transportation
- Oklahoma Transportation
- Pennsylvania Department of Transportation
- South Carolina Department of Transportation
- Utah Department of Transportation
- Washington State Department of Transportation
- Wisconsin Department of Transportation

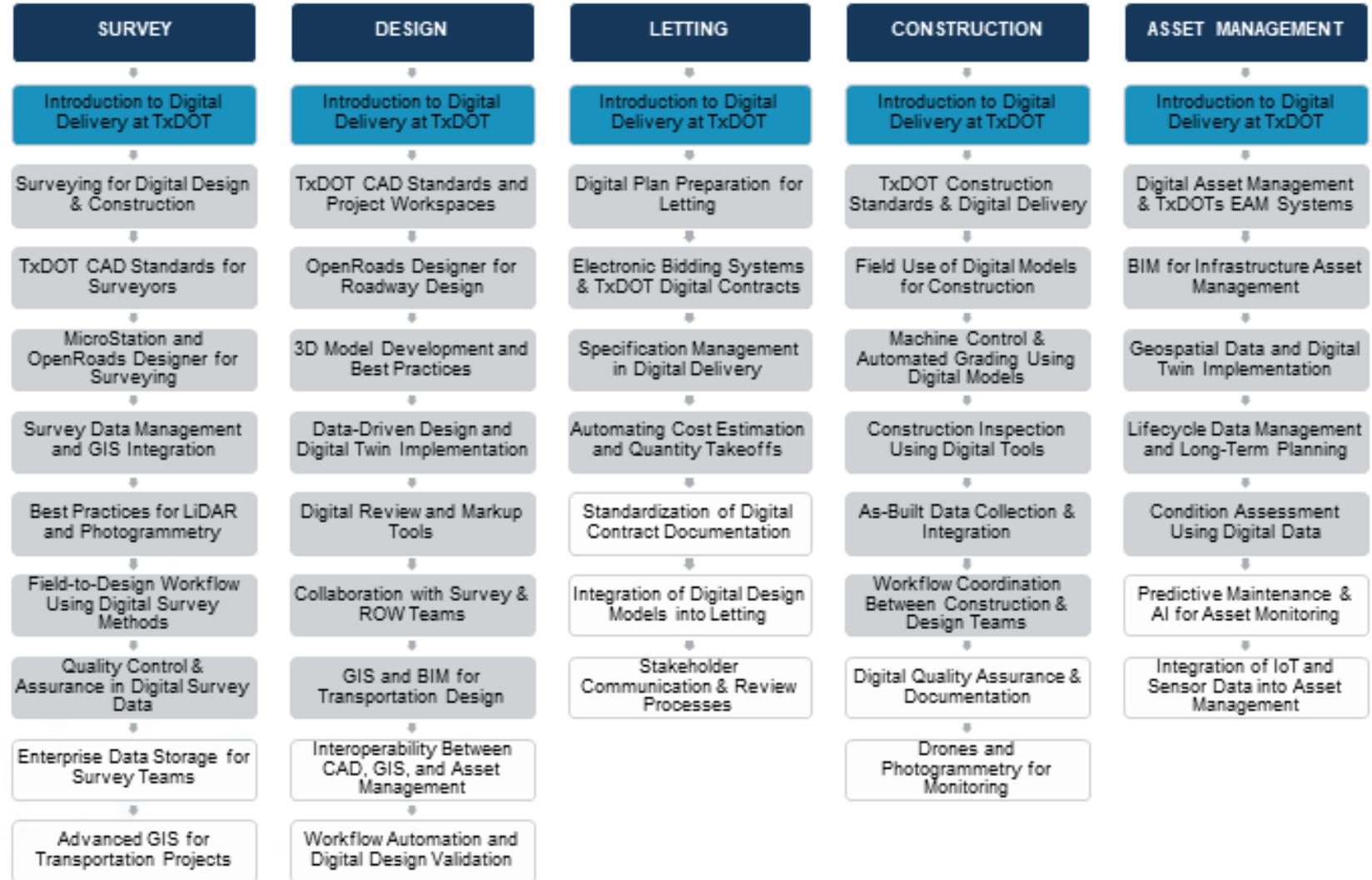


Digital Delivery for TxDOT

Training Efforts

Goal is to Align Training with Our Vision of DD Implementation

- Identified Path Segmentation
- Working with Workforce Development
- Piloting training classes
- University Outreach



Design

Goal is to Increase Accuracy While Reducing Produce Time and Cost

- Upgrading projects from Microstation V8i due to Windows 11 upgrade
- Development of a standard review processes and workflows
- Implementation of Model Development Standards and Level of Development



Design



- + BENEFITS:**
 - **Increased accuracy** of design through advanced 3D modeling.
 - **Reduced time and cost** for plan production and estimating.
 - **Model-based quantities** through data-rich models and custom quantity reporting.
 - Enhanced graphical representation of design for **communication with stakeholders**.
 - Improved methods of **constructability analysis**, conflict identification, and cross discipline collaboration.
- INITIATIVES:**
 - Develop **Model Development Standards** and Level of Development (LOD).
 - Develop a **QC process and checklist** for model review.
 - Implement **CAD workspace enhancements** including 3D features and item types.
 - Build a **Digital Delivery toolbox** with design and deliverable guidance including:
 - » File naming convention
 - » Deliverables list
 - » 3D model breakline curation process
 - » Digital signing and sealing
 - » Item type requirements
 - » More..

Construction

Goal is to Make Construction and Inspection More Efficient and Low Cost

- Using new methodology for bid codes and specifications
- Reduce time for project estimation
- Implement improved inspection processes and workflows
- Development of digital as-builts



Construction



- + BENEFITS:**
 - **Improved communication** and collaboration with contractors.
 - **Automated machine guidance (AMG)** can easily integrate design models.
 - **Reduced time** for estimating and bid preparation.
 - **Lower and more accurate bids** due to quantity take offs using model deliverables.
 - **Reduction of errors** and omissions in construction documents.
 - **Increased safety** in field due to faster construction and inspection methods.
 - **Visualized construction** scheduling, phasing and staging opportunities.
- INITIATIVES:**
 - Develop **digital inspection process** and tools that allow for viewing and interacting with the model, and efficiently verifying, measuring, and tracking quantities for payment.
 - Develop methods of **digital as-built** data collection.
 - Develop **specification** for collection of digital as-built data.
 - Improve **connected project data** management workflows.
 - Develop project records **data standards**.
 - **Integration** of payment forms and project documentation with design models.
 - Develop best practices for **replacing plan sheets** with the design model in the field.

Asset Management

Goal is to Have Accessible Data Attributes From CAD Elements for Asset Tracking

- Standardized Asset Data
- Multi-Divisional Collaboration of Data Collection
- Information Management Process



Asset Management


**BENEFITS:**

- **Centralized Design and Construction Data** – Simplified access and collaboration.
- **Prioritized Asset Insights** – Data quality is enhanced for critical transportation assets, allowing data driven decisions and resource allocation.
- **Data-Driven Planning** – Improved asset information empowers informed planning strategies for maintenance, upgrades, and future development.
- **Predictive Maintenance and Lifecycle Optimization** – Condition forecasting and lifecycle analysis leading to proactive maintenance and extended asset lifespans.

**INITIATIVES:**

- **Data Collection** – Capture comprehensive design and construction data for key transportation assets.
- **Unified Data Repository** – Establish a central data hub to store all relevant asset information in a secure and accessible manner.
- **Standardized Asset Data** – Develop a standardized data schema that facilitates efficient asset lifecycle management and analysis.
- **Data Integrity** – Implement data workflows with robust validation procedures to guarantee the accuracy and quality of the information collected.

Change Management

Goal is Not Just Focus on the Process but the People

- Future Roadshows
- Partnerships with Community Colleges and Universities



Safety



Digital Delivery Reminders

- If you have questions, please reach out via email:



digital-delivery@txdot.gov

- Also stop by our updated website at <https://www.txdot.gov/business/resources/digital-delivery.html> or scan the QR code for more info!



Questions?

