Texas Department of Transportation
Digital Delivery Program

**3D Bridge Modeling
Best Practices**
August 2025

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Introduction

This guidance document is intended for design and project delivery teams and must be followed to ensure deliverables consistently meet TxDOT requirements. Links to additional resources will be provided within this document and should be referred to when more detail is required.

Transition to Digital Delivery

TxDOT is transitioning to utilizing the model as the contract deliverable through the adoption of OpenRoads technology. To prepare the agency to utilize model files throughout design and construction, 3D bridge models will be delivered to TxDOT for review. These models will convey the roadway alignment, bridge geometry and design information. At this time, these models will not be used as contract documents. The transition to utilizing the model as the contract deliverable will occur after more pilot project testing is complete. This initiative aligns with the Expectation of Use of OpenBridge Designer released in 2022.

Expectation of Use of OpenBridge Designer (txdot.gov)

Reach out to bridge3ddesign@txdot.gov for questions and support.

Requirements

Modeling Requirements

At this stage of Digital Delivery, OpenBridge Modeler (OBM) is used to convey information to the best of the program's capabilities. The user is to model the geometry of their structure and include design information in the element attributes. If the program is unable to accurately model the structure, please reach out to bridge3ddesign@txdot.gov. Examples of design information are listed below. The intent is that all design information is included in the model.

- Material Properties

- Reinforcement Information

- Bid Code Items

- Specification References

- Standard References

The Digital Delivery Program will increase requirements such as modeling elements to specified Levels of Development as the program matures. For more information on Levels of Development please see the Model Development Standards (MDS) Guidance.

Source: https://www.txdot.gov/business/resources/digital-delivery/digital-delivery-documents.html

Version Requirements

TxDOT tests workspaces and templates with each version of OpenRoads Designer (ORD) and OBM. The use of more recent versions than the ones listed as approved poses a risk to the accuracy of project files. The approved version at the time that the project contract is signed is

the version that is required. The use of subsequent versions can be used at the discretion of the district.

The approved versions of ORD and OBM can be found on TxDOT's website for Bentley CONNECT Edition Data:

Source: https://www.txdot.gov/business/resources/digital-delivery/bentley-connect-data.html

OpenBridge Designer (OBD) Implementation FAQs is a document that explains the intended use of OBD and answers frequently asked questions. Find the document at the location below:

Source: https://www.txdot.gov/content/dam/docs/division/brg/obd-faq.pdf

File Naming and Storage Convention

The OBM Drafting Workflow found on the TxDOT website outlines the naming convention for the following:

- ProjectWise Project Folder Structure
- Working File Naming Convention
- Plan Sheet File Naming Convention
- Model Naming Convention and Description

Source: https://www.txdot.gov/content/dam/docs/division/brg/obm-drafting-workflow.pdf

Reference Files

Reference files are files that are referenced in the model to either build the model from or bring in information. There are two types of reference files: dependent and independent.

Dependent Files

Dependent files are files that the model is built upon. The model will be affected if these files are updated. These files should be set to a **nesting level of 0** to allow for faster processing and improve the stability of the file.

The following dependent files need to be attached as a reference prior to placing bridge elements:

- 3D Alignment: Consult with the roadway team to select the correct alignment file for the bridge.
- Terrain: Ensure that the bridge model is based on the most recent terrain data. This includes considering any changes due to excavation, grading, fill, or other site modifications.
- Superelevations: Coordinate with the roadway design team to ensure the bridge design is compatible with the planned cross slopes/superelevation. This may involve adjusting the bridge's vertical alignment or structural elements.

Independent Files

Files used as reference and do not affect the bridge model when updated are considered independent files. Independent files may be live nested (nesting level of 1 or greater) within a container model to allow for easier navigation within the references and levels dialog.

The following independent files can be attached as a reference to provide supplementary information to help designers visualize the project boundaries and constraints and improve coordination with other discipline teams.

- Corridor, design and supplemental alg model files

- Other bridge, retaining all and minor structure models

- Drainage models

- Utility models

- Supplementary discipline models

This suggested workflow will help simplify the model environment.

Submittals

The expectations for submittals are listed below.

Initial Milestone (30%) / Preliminary Bridge Layout Review (PBLR)

The general bridge geometry is to be modeled, matching the bridge layout to the best of the program's capabilities. When the 3D bridge model is referenced into the 3D corridor, the bridge shall align, both vertically and horizontally, in the bridge location of the 3D corridor. The 3D bridge model shall consist of 3D elements for slab, beams, abutments, wingwalls, caps, columns, and foundations.

The input report is required.

Sealed Milestone (100%)

The final bridge design geometry is to be modeled to the same specifications of the PBLR.

The OBM Comparison Report is required.

File Storage

Internal projects will be posted to ProjectWise. External projects will be compressed in a zip folder and submitted to box.com or other approved method of transfer. Ensure to **include applicable reference files** with all submittals.

For more information on milestone requirements see the table below.

Model Submittal Milestone Requirements

See the table below for 30% and 100% model submittal requirements.

FILE	FILE TYPE	SUBMITTAL	
		30% or PBLR	100%
Transmittal letter for each submittal listing file names and types	PDF	X	X
OBM file for each bridge	DGN	X	X
OBD file used to access each OBM file, if any	OBD	X	X
Reference Files	DGN	X	X
OBM generated Input Report	PDF	X	X
Deliverable Plan Checklist	PDF	X	X
Model Deliverable Checklist	PDF	X	X
Design Criteria Checklist	PDF	X	X
Plan Checklist	PDF	X	X
OBM generated Quantities Report	PDF		X
OBM generated Bearing Seat Elevations Report	PDF		X
OpenBridge Modeler Comparison Report	PDF		X
Set of all applicable plan sheets	PDF		X

Bridge Modeling

Training Manual

TxDOT Bridge Division developed the OpenBridge Designer (OBD) and OpenBridge Modeler (OBM) Training Manual to provide guidance on how to create bridge models from start to finish.

Some topics include:

- File creation and opening

- Creating a bridge model with precast girders

- Creating a bridge model with steel girders

- Placing riprap

- Generating reports

- Creating and manipulating bridge templates

- Plan sheet creation

- Interoperability, assumptions and limitations with LEAP Concrete, LEAP Steel and RM Bridge Connect.

For guidance on the topics listed above please reference the TxDOT site listed below.

Source: https://www.txdot.gov/content/dam/docs/division/brg/txdot-obd-training-manual.pdf

TxDOT Workspace Libraries

TxDOT created resources in the TxDOT workspace library to assist the user in creating TxDOT bridge elements. Use of custom solids modeling, custom parametric cells, or generative components is not required. If a custom project element is required, include the description of the element and explanation of need in the OBM Comparison Report.

Some of these resources include:

- Dimension Styles

- Text Styles

- Seed Files

- Annotation Groups

- Border Files

- Bridge Templates

Source: https://ftp.txdot.gov/pub/txdot/brg/obd-workspace.pdf

Model Checklist

Checklists have been created to ensure consistency and accuracy. The Digital Delivery PS&E QC Checklist include the following tabs that contain bridge specific information.

- Deliverable Plan – clarifies the requirements for each submittal.

- Model Deliverable Plan – identifies required files associated with the model.

- Design Criteria QC – verifies the model is technically accurate.

- Model QC – verifies the models are developed in a consistent manner.

- Plan QC – verifies plan sheets are developed in a consistent manner and complete.

Upon completion, these tabs are to be converted to PDFs and submitted with all submittals that include bridge model(s).

Source: https://www.txdot.gov/business/resources/digital-delivery/digital-delivery-documents.html

Sheet Creation

At this stage in Digital Delivery, traditional plan sheets are required. They can be created through traditional methods or cut directly from OBM. Reference the OBM Drafting Workflow for a step-by-step process of cutting sheets from the model. Note this will not be necessary once the model is used as the legal deliverable.

Source: https://www.txdot.gov/content/dam/docs/division/brg/obm-drafting-workflow.pdf

Reporting

OBM Comparison Report

The OBM Comparison Report enable users to describe their bridge and identify discrepancies between the model and the design. The two main items for comparison are the bearing seat elevations and quantities. Also required in the OBM Comparison Report are the bulleted items below. This is required at the 100% Submittal.

- Description of Bridges – Number of spans, Beam Type, Skew, Vertical Curve, Horizontal Curve, Cross Slope and any unique bridge features. This data is used to categorize software issues. The user can add additional information or special information as they see fit.

- Findings of Geometry Comparison – Description of the user's findings when comparing the model to design geometry, i.e. bearing seat elevations discrepancies or end of slab width discrepancies.

- Findings of Estimated Quantities Comparison – Description of the user's findings when comparing the quantities determined from traditional methods to the quantity reports generated in OBM.

- Discussion of Areas of Improvement for the Software – Any suggestions for improvement to add ease of use or resolution to identified problems with the bridge model in question.

The OBM Comparison Report is located at the TxDOT site below.

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

Bearing Seat Elevations

The bearing seat elevations generated by OBM should not be relied upon for design at this time. Bearing Seat Elevations should be determined by traditional methods and compared to the bearing seat elevations generated by OBM. TxDOT is working with Bentley to modify OBM so the program can calculate bearing seat elevations according to TxDOT's beam placement standards. TxDOT is asking for bearing seat elevation comparisons with the 100% Design Submittal. The Bearing Seat Comparison Sheet provided on the TxDOT website can be used as a resource. Other formats of comparison are acceptable.

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

Quantity Reports

OBM quantities should be verified prior to being used in contract documents. Project quantities should be determined by traditional methods and compared to the quantity reports generated by OBM. TxDOT is working with Bentley to improve OBM so the program can accurately calculate quantities. TxDOT is asking for quantity comparisons with the 100% Design Submittal. The Quantity Comparison Sheet provided on the TxDOT website can be used as a resource. Other formats of comparison are acceptable but should include the information below.