CES322142

InfraWorks—Bringing Your Bridge Project to Life InfraWorks with Autodesk Connector for ArcGIS –

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Applied Software Technology, Inc.

Learning Objectives

- Learn about InfraWorks Bridge Design
- Learn about Line Girder Analysis
- Learn about bridge to component road
- Learn about bridge deck, girder group, and cross-sections
- Learn about the Autodesk Connector for ArcGIS with InfraWorks

Description

Learn how to enable designers, engineers, and planners everywhere to capture and compel stakeholders from near and afar—specifically, learn how to explore preliminary design options and optimize project performance by living, breathing, engineering roads and bridges in a modeling context. Explore workflows: specialize in roadway design, bridge design with line girder analysis, and adding details that enable engineers to communicate and get better-informed results with InfraWorks and the Autodesk Connector for ArcGIS.

Speaker(s)

Kenneth L. Driscol

Kenneth is a Senior Technical Specialist in Civil Infrastructure for Applied Software with over 20 years' experience in the Civil Engineering industry. Prior to joining the Autodesk reseller partner channel, he was a Design Engineer for an ENR 500 ranked design firm. Kenneth is an Autodesk Certified Product Support Professional and has reached the level of Civil Engineering Certified Implementation Expert. He regularly conducts seminars on the use of Autodesk Technology in civil engineering and regularly provides implementation services, customization, training, and

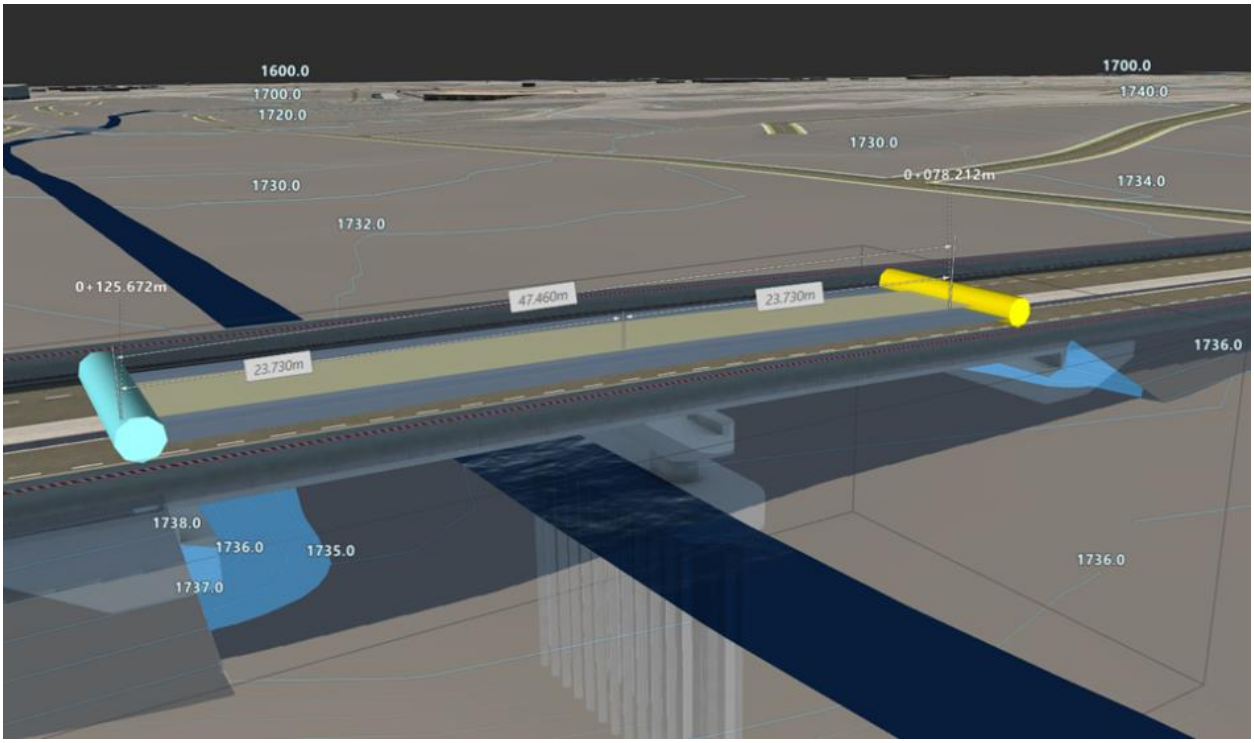
support to civil engineering professionals on Autodesk A/E/C BIM Technology Portfolio products. He has become the regional expert on BIM for Civil as it pertains to civil engineering practices and interoperability between other design disciplines in the AEC enterprise. In addition to his civil engineering background, he also has been involved with field surveying and electronic data reduction. During his entire professional career Kenneth has used Autodesk products. During his tenure with a number of leading Civil Engineering firms, he participated in and led a number of projects for road design and improvement, underground utilities, site development, and storm and sanitary drainage design. Kenneth has diligently worked with Transportation clients who have transitioned with Autodesk and Bentley products to bridge the gap with data translation and production work: migrating data between AutoCAD Civil 3D and Bentley InRoads and Bentley GEOPAK software with the Civil Engineering Data Translator cloud service; and uploading design source files and converting them to target project data formats without having to install Bentley software.

For the last 15 years, he has been a Senior Civil Application Specialist concentrating in Civil 3D, InfraWorks, Surveying, Map 3D, Hydrology and GIS services and instruction. Kenneth is Applied Software's Senior Civil instructor and provides software demonstrations, custom and standardized classroom training, mentoring, and technical support.

PROFESSIONAL EDUCATION & CERTIFICATIONS

Autodesk Implementation Expert
Certified Autodesk Instructor
Autodesk ICE Certified (Civil Implementation Expert)
Autodesk Product Support Expert
FDOT (Florida Department of Transportation) Certified Expert
InfraWorks 360 Roads & Bridges Certification
Autodesk AutoCAD Civil 3D Certified Professional
Autodesk Storm & Sanitary Analysis Certified Professional

What's Autodesk InfraWorks Bridge Design
Autodesk Bridge Design for InfraWorks gives you the tools to model and design bridges in the context of your overall infrastructure design project.



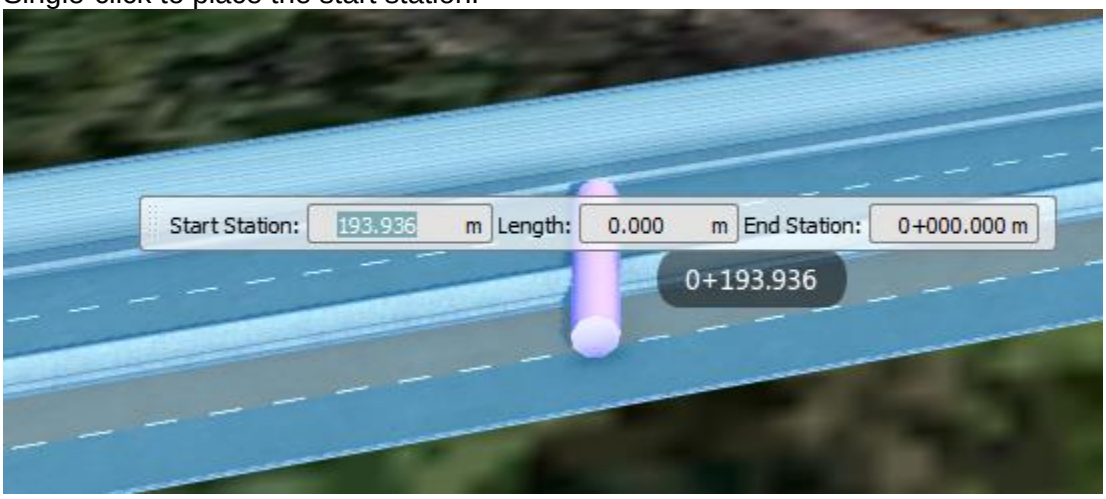
InfraWorks supports Precast I Girder and Steel Plate Girder bridge types, which support different bridge deck, abutment, piers, girder, and bearing components. Default settings for these concrete and steel bridge types are represented by concrete and steel bridge assemblies within the Bridge catalog of the Style Palette. You can also modify these bridge styles, or create new ones to apply to your bridge. Bridges can be added to component roads using right-click menu options.

Adding a bridge to a component road

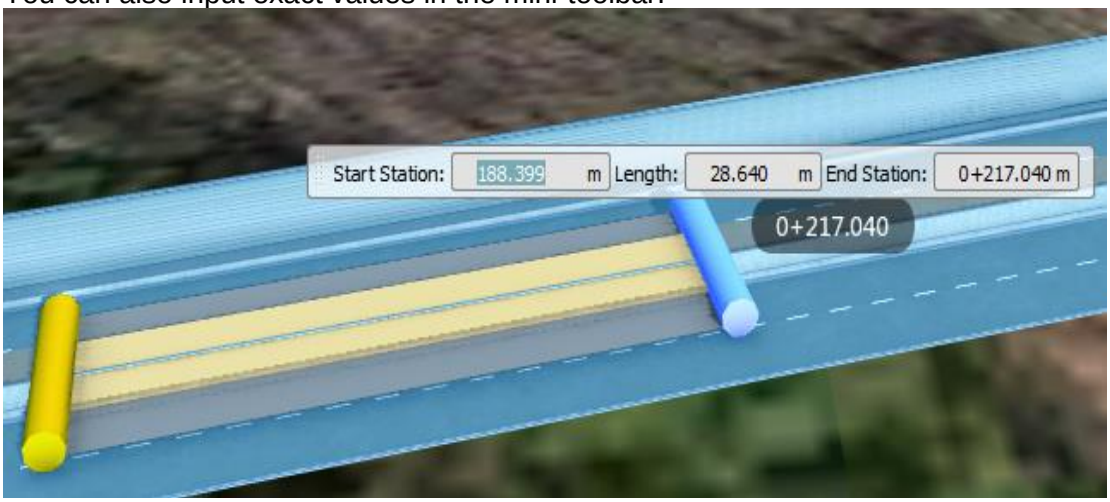
Bridges can be added to component roads. Use in-canvas sliders to specify the start and end station locations of a bridge within a component road and thus determine its length. Select a bridge and press the delete key to remove it from a model or proposal.
Important: The roadway surface for bridges within component roads is stylized depending upon how the component road assembly is configured.

Select a component road.
Note: You can convert a planning road to a component road

1. Right-click and choose Add Structure ➤ Bridge.
2. Select a bridge style from the Select Style dialog.
   InfraWorks supports precast Concrete Girder, Steel Girder, or generic bridge styles.
3. Hover your cursor over the roadway and use the slider grip to choose a location for the bridge start station.
   Single-click to place the start station.



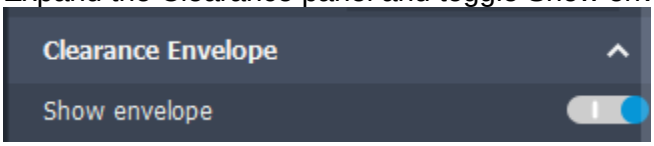
4. Move your cursor along the roadway and single-click to place the bridge end station.
   You can also input exact values in the mini-toolbar.



Clearance Envelope and Update Vertical Profile.

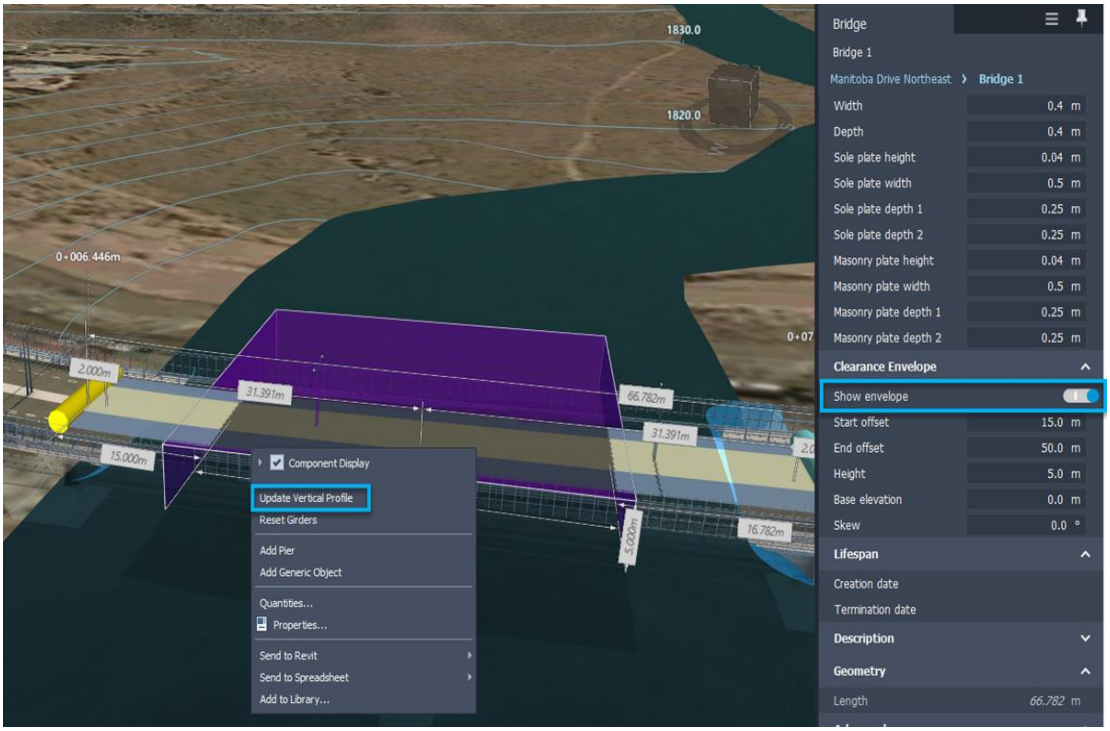
Review and modify the clearance envelope height, location, and skew, and update the bridge's vertical profile.

1. Select the bridge to display its attributes in the Stack
2. Expand the Clearance panel and toggle Show envelope to the on position.



Note: The clearance envelope is shown on your model as a purple box.

3. Click the Height field to input a new value.
   Note: The height of the clearance envelope is based upon road elevation, not terrain elevation.
4. To modify the location and skew of the clearance, click the value(s) next to Start Offset and/or End Offset, Base Elevation, or Skew. Input any desired value(s) then press Enter.
5. Right-click on the bridge and click Update Vertical Profile to enforce the new clearance attributes.



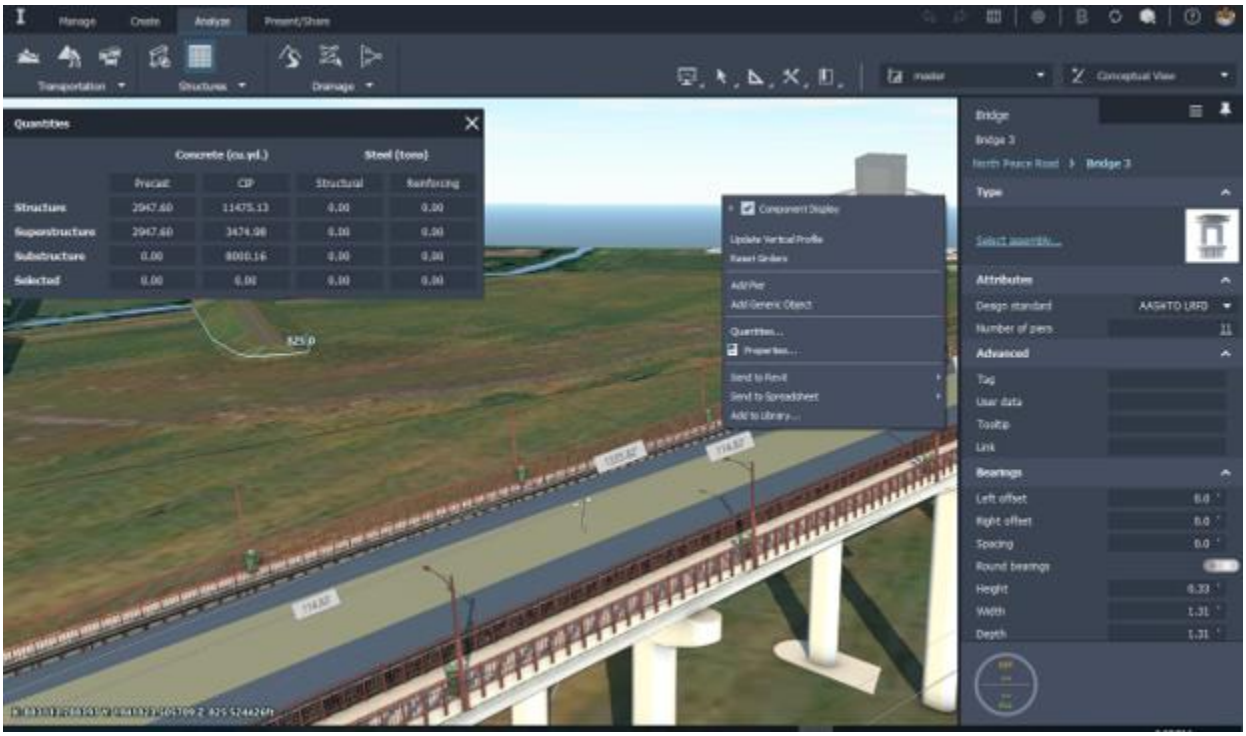
Your bridge will re-generate with your modifications to the clearance envelope attributes.

To send a bridge to Autodesk Revit

Note: You can also send a tunnel to Autodesk Revit. See “To send a tunnel to Autodesk Revit” for more information.
Select a bridge.
Right-click on the bridge.
Expand the Send to Revit menu options.

If you have Autodesk Revit 2016 or newer installed on your local system, you can open your InfraWorks bridge in an existing Revit model, create a new Revit model for your bridge, or update an existing bridge in your Revit model that was previously sent to Revit from InfraWorks.

Note: If you created a new Revit model with this Send to Revit operation, you will be prompted to choose a save location on your local system.



Bridge deck, girder group, and cross-sections

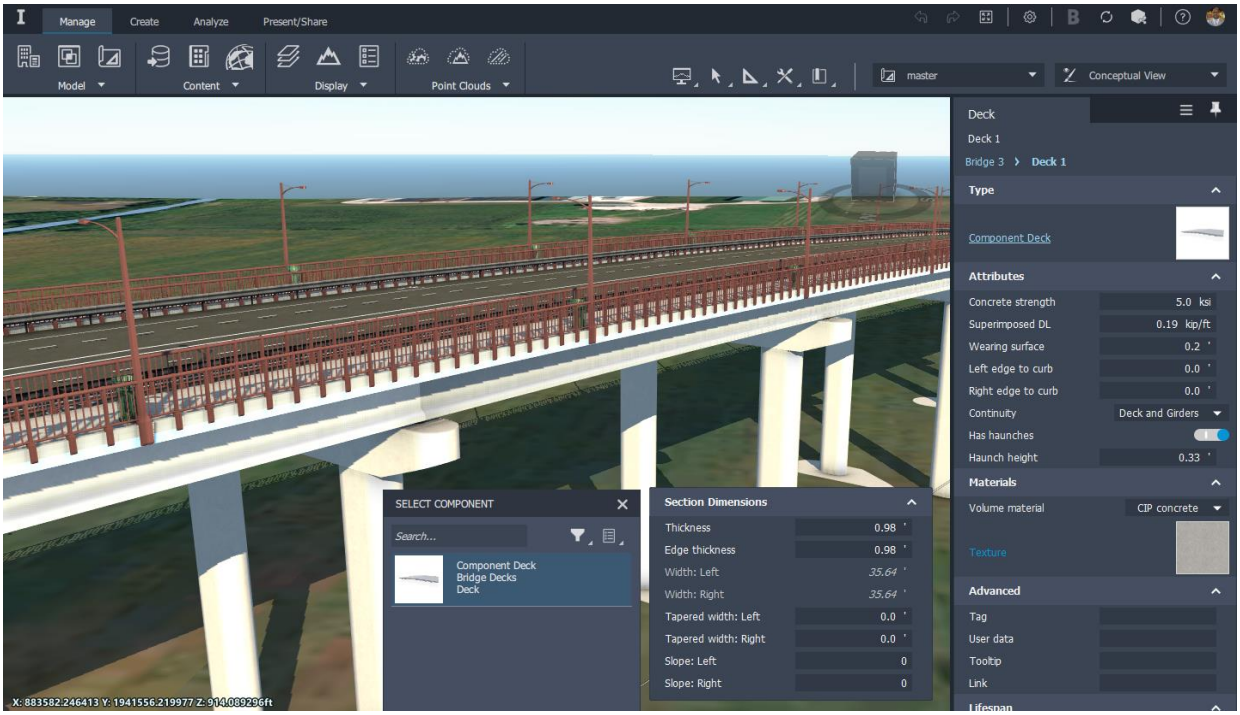
1. Select the bridge. Attributes for the bridge will display in the Stack.
   As a best practice, tilt your view until you can see the bridge's girders, then single-click a girder. This will select the bridge.
2. Click the bridge deck to select it. Attributes for the deck display in the Stack.
   Tip: Display or hide bridge components to see a better view of the bridge deck.
3. *Type*
   - Click the Component Deck type thumbnail image to view a schematic.
   - Click the orange Component Deck type name to view available deck components.
4. *Attributes*
   - Modify concrete strength, superimposed dead load intensity, the thickness of the roadway wearing surface, and distances between the deck edges and inner barrier/curb edges.
   - Set bridge deck continuity.

- Toggle haunches for your bridge deck on or off, and modify haunch height. Haunches are supported for bridges with eight or less girders per girder group.

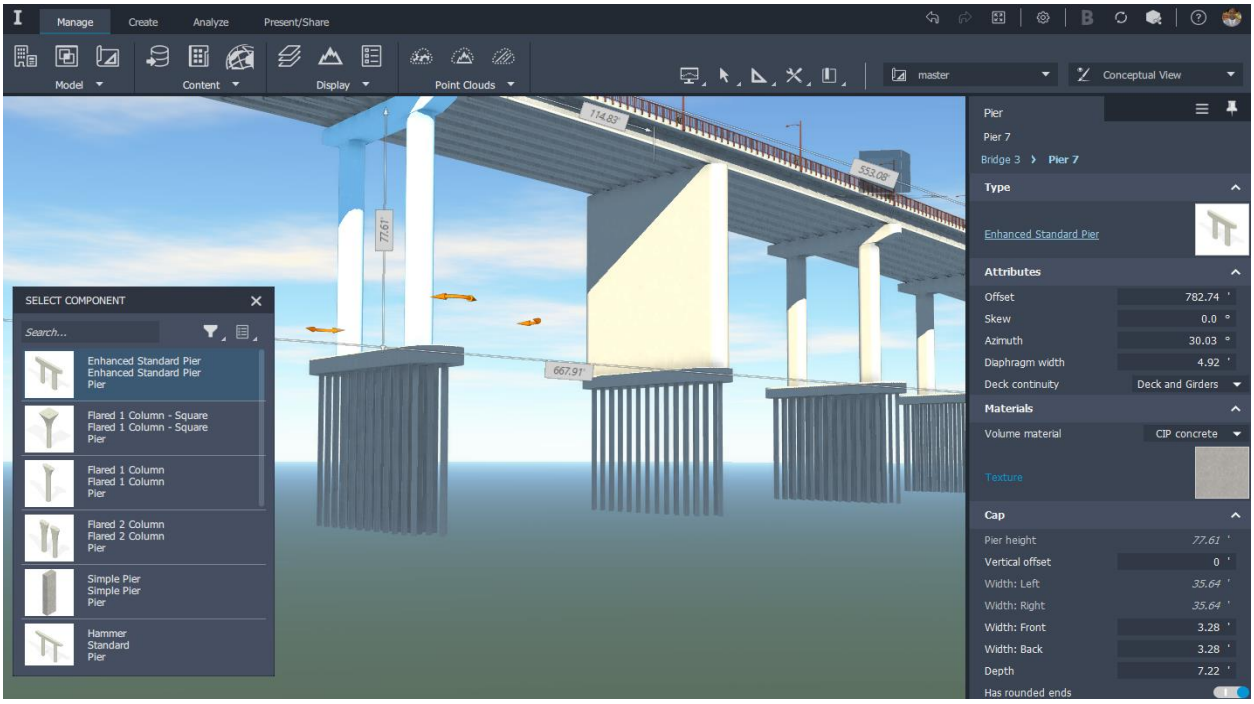
Note: Haunches are not supported if a girder crosses the centerline of the bridge deck. Therefore using an odd number of girders will not allow for haunches unless you offset the center girder from the center of the bridge deck.

5. *Materials*
    - Volume Material: Choose between CIP concrete, Precast concrete, Structural steel, or other.
    - Click the texture thumbnail image to choose a different deck material from the Material/Bridge style catalog.
6. *Section Dimensions*
    - Modify thickness, edge thickness, tapered width, and slope for the entire bridge deck.
    - You can inspect and modify cross-sections of your bridge deck at any point along the alignment in order to configure thickness, edge thickness, tapered width, and slope attributes for individual sections of the bridge deck.

    Note: For bridges in superelevated roads, the deck will automatically match the superelevation slopes of the roadway.
7. *Geometry*
    - Bridge deck length is defined by the overall length of your bridge. Modify bridge start and end stations to modify deck length.
    - When a bridge is added to a component road, the bridge deck width will re-size to match the varying width of the component road assembly above it, even if the component road assembly is modified.
8. *Lifespan*: add Creation and Termination date values if you want to Use Model Time.
9. *Advanced*: map data source properties to the selected bridge deck, as well as add a Link or Tooltip. See: About Creating Links, Tooltips, and Watermarks.
10. *Description:* optionally, add a description.



Pier attributes



Annotation for Bridges

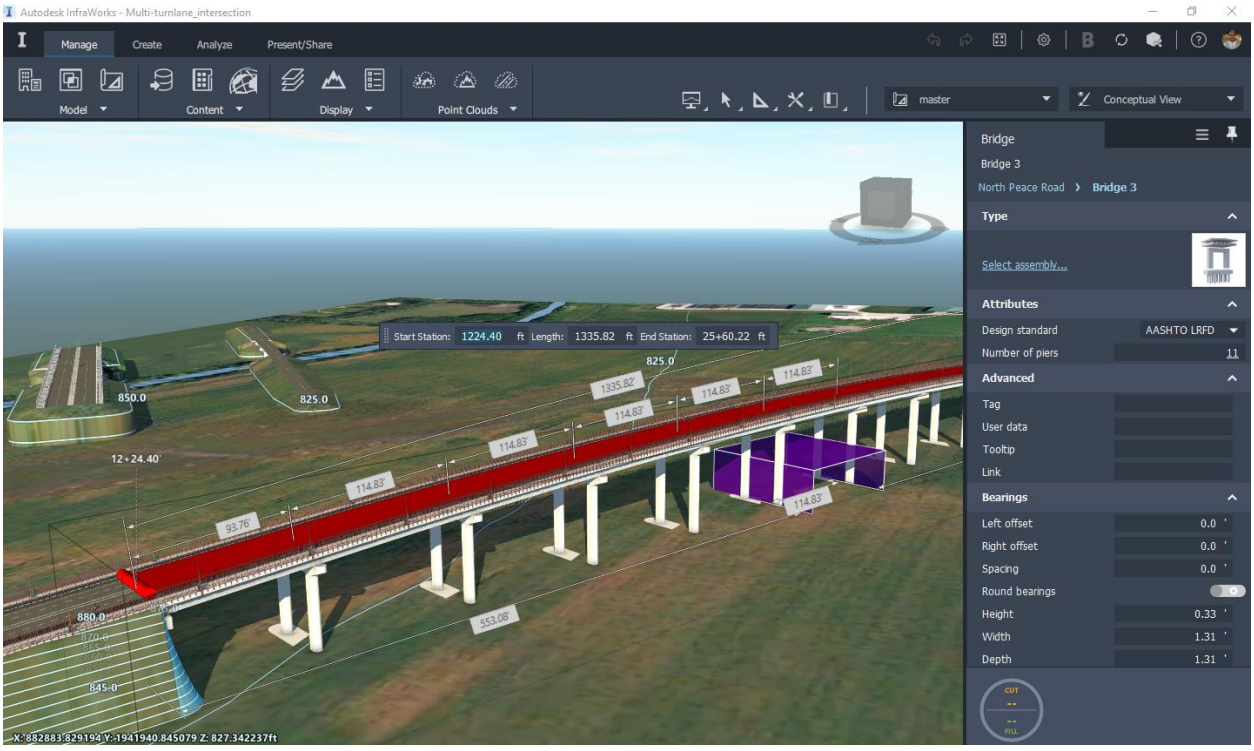
InfraWorks displays in-canvas labels of bridge and bridge component dimensions depending on your selection and view position.

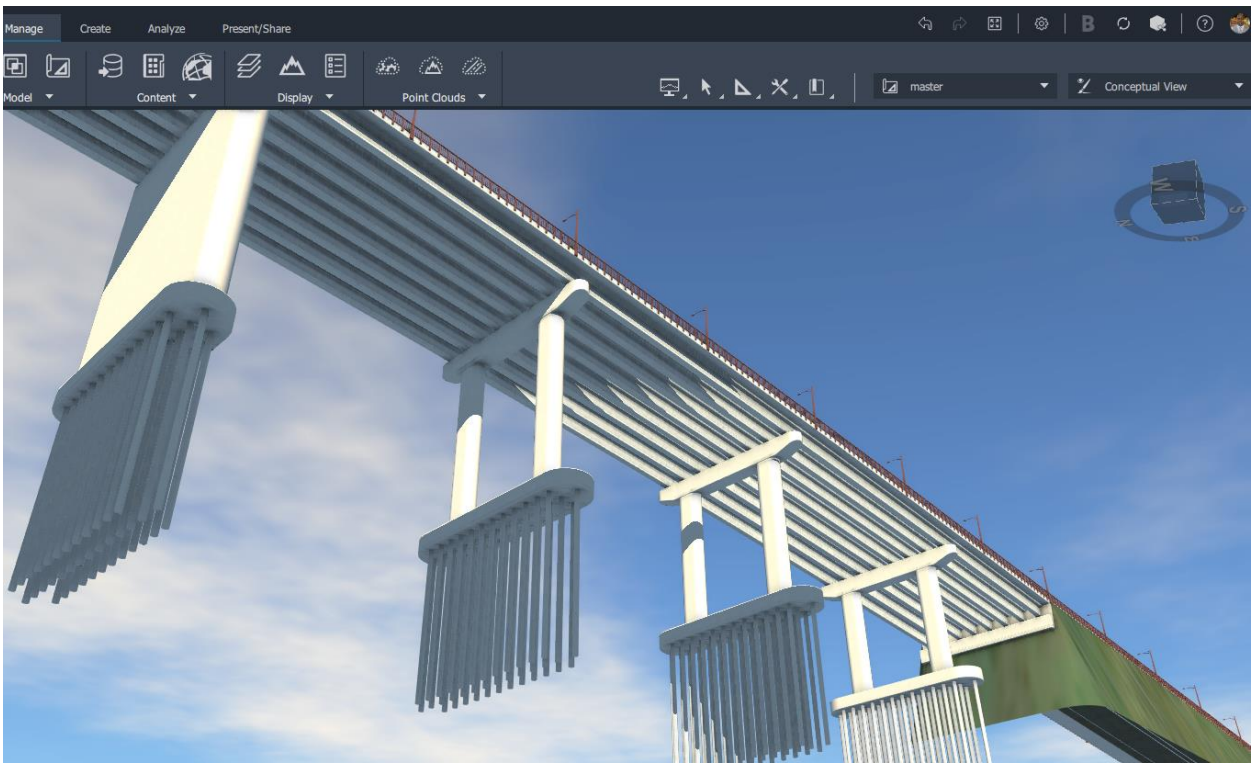
Bridge component dimension labels are not editable in-canvas, but provide information and visual feedback to help in modifying and reviewing the overall bridge design. You can modify the corresponding bridge component dimensions in the Stack. If you need more information about a specific dimension label, hover over the corresponding value in the Stack to view a tooltip with more information.

Depending on your selection and viewport position, the model will display values for:

- Bridge start and end station offsets.
- Length between abutments.
- Clearance envelope start offset, end offset, length, and height.
- Start and end spacing of girder group segments.
- Nominal length of girder group segments.
- Girder start offset, end offset and length.

Similar to how labels for component roads function in InfraWorks, bridge dimension labels are dynamic and also respond to your zoom level. If you modify the value for a bridge or bridge component dimension in the Stack, the corresponding label value will update in-canvas.





Selection of a bridge or bridge components
You can select an entire bridge, groups of components like girder segment groups, or individual component parts like piers, foundations, girders, the bridge deck, and abutments.

Select Bridge

Left-click once on a component road or bridge to select the component road containing the bridge.

Click the bridge name in the Stack to view, select, or modify a different bridge in your model.

Select a girder group

With the bridge selected, left-click on an interior or exterior girder.

Tip: Right-click on a selected bridge to display the context menu. You can display or hide bridge components for easier viewing of bridge girders and the substructure.

Click the girder group name in the Stack to view, select or modify a different girder group.

Select a girder

With a girder group selected, left-click on an interior or exterior girder to select the individual girder.

Click the girder name in the Stack to view, select, or modify a different individual girder.

Select a pier

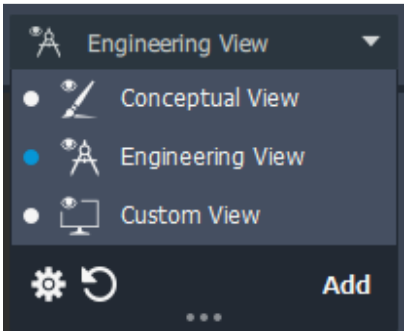
With the bridge selected, left-click on a pier to select it.

Click the pier name in the Stack to view, select, or modify a different pier.

Select a pier foundation

With the bridge selected, left-click on a pier foundation to select it.

Tip: Expand the View menu dropdown



then click ➤ to adjust terrain surface opacity.

Click the pier foundation name in the Stack to view, select, or modify a different pier foundation.

Select an abutment

With the bridge selected, left-click on an abutment to select it.

Click the abutment name in the Stack to view, select, or modify a different abutment.

About Line Girder Analysis

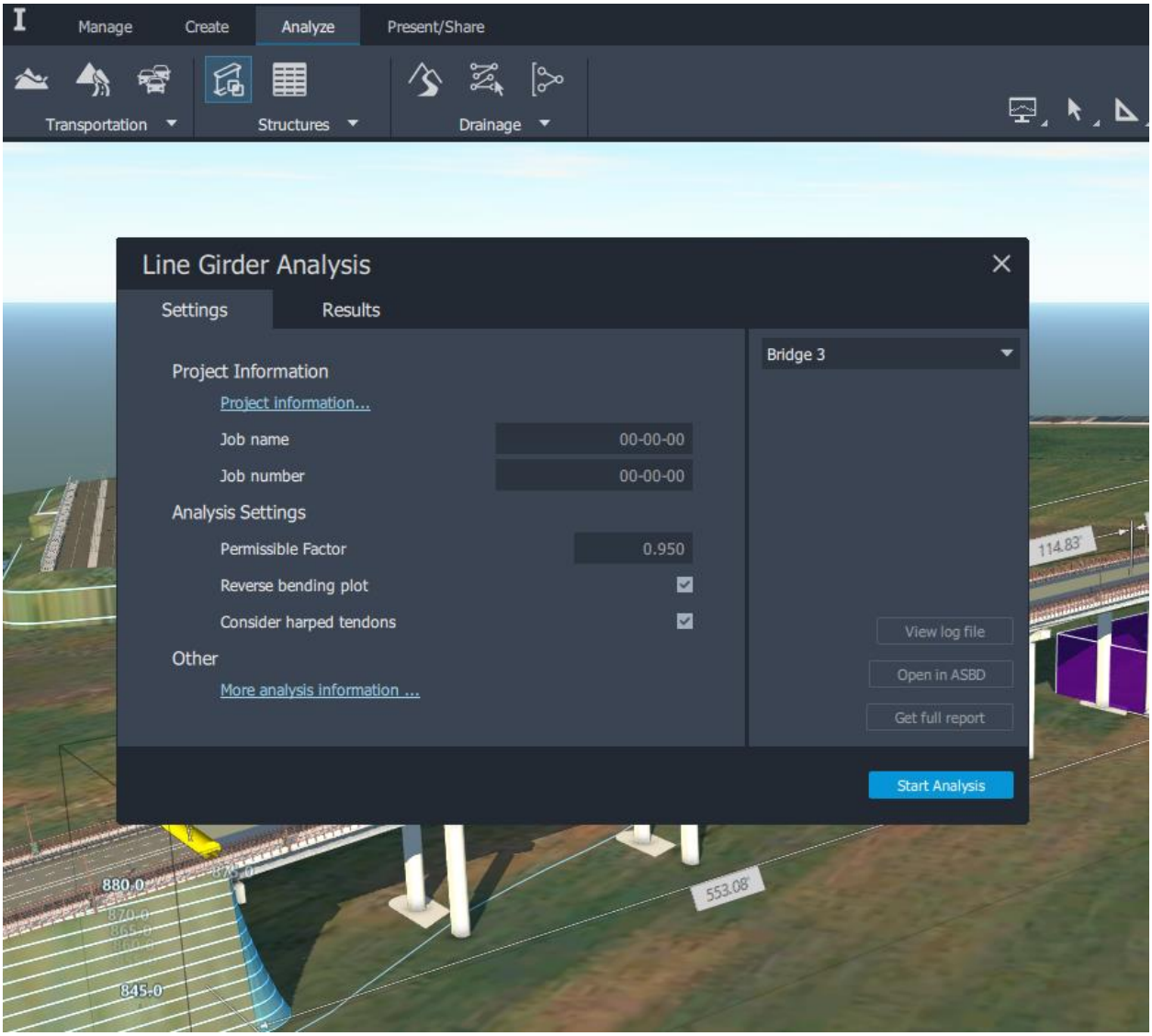
Perform analysis and design checks on all the pre-stressed girders of your concrete bridges. This is an InfraWorks cloud service you can use to verify the structural strength of bridge girders. You can experiment with multiple bridge designs and restart girder line analysis without spending any cloud credits. Cloud credits are charged only for the full girder design documentation (provided in PDF format).

When you select a bridge in a model or proposal and start line girder analysis, InfraWorks will validate the initial rules-based layout of your bridge girders and compare your designs against bridge

design standards that you can choose from, including AASHTO LRFD, British, Australian, and Eurocode.

Key results can be viewed in-canvas. This does not require cloud credits.

Line Girder Analysis



Line Girder Analysis and Autodesk Structural Bridge Design

When you are ready, you can use your cloud credits to purchase full girder design documentation for the selected concrete bridge. When you select Get Full Report, InfraWorks creates a new proposal in your model so that you can compare designs. Before you purchase

the full report, you can view or download a full-length sample in PDF format. See Line Girder Analysis sample report.

When you purchase the full report, Line Girder Analysis also generates a full model of your bridge that you can open and work with in the standalone version of Autodesk Structural Bridge Design as well. See the Autodesk Structural Bridge Design help.

Once you have completed Line Girder Analysis, click the icon next to the Get Report button.

If you have Autodesk Structural Bridge Design 2016 or a more recent version installed, the line beam model containing the selected girder will be opened directly in the application so that you can continue with detailed design. If you do not have it installed, you will be directed to a website where you can learn more about Autodesk Structural Bridge Design. See Autodesk Cloud Credits for more information about cloud credits.

Autodesk Connector for ArcGIS with InfraWorks

You can bring ArcGIS datasets into your InfraWorks models, save back edited content, and publish and export InfraWorks data for use in ArcGIS.

-  **Autodesk Connector for ArcGIS**: Bring ArcGIS data into your InfraWorks models using the Autodesk Connector for ArcGIS. Sign in to ArcGIS and then specify an area of interest, a dataset to use, and the InfraWorks feature types to create from the ArcGIS data. For more information, see To add data from ArcGIS.

Note: Bringing ArcGIS data into your model does not require an ArcGIS account. If you don't have an ArcGIS account, you can access public data. If you have an ArcGIS account, you can also access data from your organization and your groups, as well as data that you have created.

-  **Data Source panel**: Save edited InfraWorks features back to ArcGIS and remove datasets. For more information, see To manage ArcGIS datasets.

Saving datasets back to ArcGIS requires an ArcGIS account with editing privileges. For more information, see About ArcGIS Roles and Privileges.

-  **Publish to ArcGIS**: Publish InfraWorks features to ArcGIS. Sign in to ArcGIS and then specify the InfraWorks features to publish, define layers, add tags, and specify the publishing location. You can also specify whether to share the published content with your ArcGIS groups and whether it is editable. For more information, see To publish InfraWorks features to ArcGIS.

Publishing requires an ArcGIS account with publishing privileges. For more information, see About ArcGIS Roles and Privileges.

After you publish content, it is available from your My Content location in ArcGIS after you sign in.

-  **Export to FGDB**: Export InfraWorks features to a file geodatabase (FGDB) that can be used in ArcGIS. Specify the InfraWorks features to export and then specify the name and location for the file geodatabase. For more information, see To export to FDGB.

The Export to FGDB tool saves the file geodatabase to a specified folder and does not require an ArcGIS account or publishing privileges.

What about coordinate systems

- Before bringing ArcGIS data into a model with the Autodesk Connector for ArcGIS, install the ArcGIS Projection Engine Data. The Projection Engine Data prevents a coordinate offset from occurring when you bring ArcGIS data into a model.
- To prevent a coordinate offset issue from occurring when you save back to ArcGIS, use a coordinate system that has an EPSG code.
- To publish to ArcGIS and to export objects to a file geodatabase (FGDB), the model must use a supported coordinate system.

Note: Some coordinate systems are not supported when publishing to ArcGIS or exporting to FGDB.

If a model is assigned an unsupported coordinate system, publishing to ArcGIS or exporting to FGDB will not proceed.

In addition, there are three categories of coordinate systems which are not supported:

- Obsolete Coordinate Systems
- Arbitrary X-Y Coordinate Systems
- Test Only Coordinate Systems

Adding data from Autodesk Connector for ArcGIS with InfraWorks

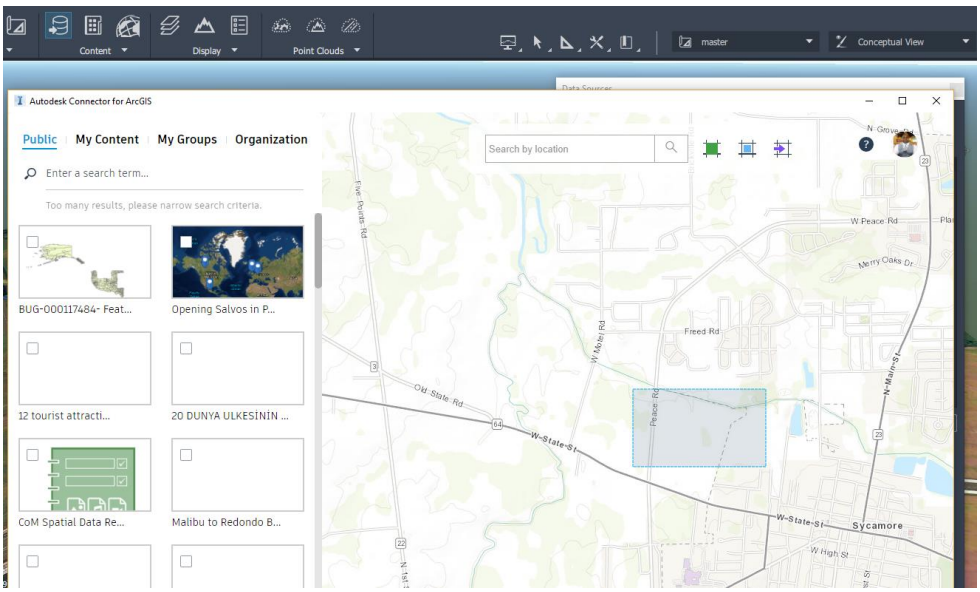
Use the Autodesk Connector for ArcGIS to add data layers directly to your Autodesk InfraWorks models as configured features.

The Autodesk Connector for ArcGIS® uses your ESRI ArcGIS login information to connect InfraWorks to your ArcGIS data. Once you've signed in, use the Autodesk Connector

for ArcGIS to browse available datasets and add ArcGIS data layers to your InfraWorks models as features. The Autodesk Connector for ArcGIS supports Esri ArcGIS Online and Enterprise portals.

The following InfraWorks features are supported when adding ArcGIS datasets to an InfraWorks model:

- Barriers
- Buildings
- City Furniture
- Coverages
- Culverts
- Drainage End Structures
- Easements
- Parcels
- Pipelines
- Pipe Connectors
- Points of Interest (POIs)
- Railways
- Right of Ways
- Roads
- Traffic Study Areas
- Trees
- Water Areas
- Watersheds


Content
Display
Point Clouds
master
Conceptual View
Autodesk Connector for ArcGIS
Public
My Content
My Groups
Organization
Enter a search term...
Too many results, please narrow search criteria.
BUG-000117484- Feat...
Opening Salvos in P...
12 tourist attracti...
20 DUNYA ULKESININ ...
CoM Spatial Data Re...
Malibu to Redondo B...
Search by location
W Peace Rd
Merry Oaks Dr
Freed Rd
W Mytel Rd
Old State Rd
W State St
Peace Rd
N Main St
Sycamore
W High St

1. From InfraWorks Home, choose one of the following options:
    - Open an existing InfraWorks model
    - Create a new InfraWorks model from scratch
    - Create a new InfraWorks model with Model Builder
2. In an InfraWorks model, Click Manage ➤ Content ➤  .

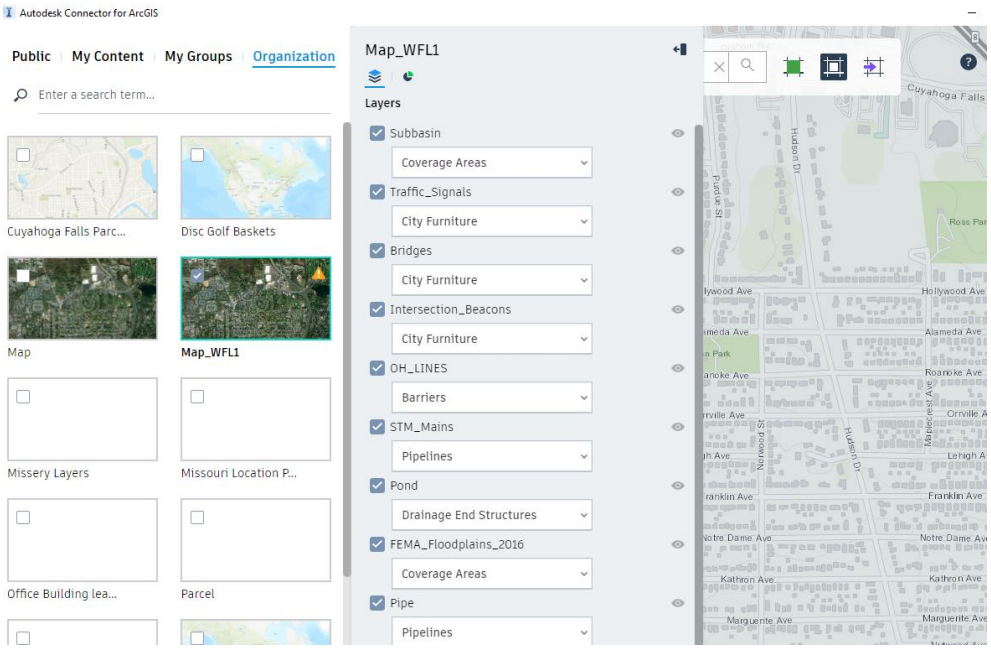
    A login page displays.

    Tip: You can also open the Autodesk Connector for ArcGIS through the Data Sources panel.

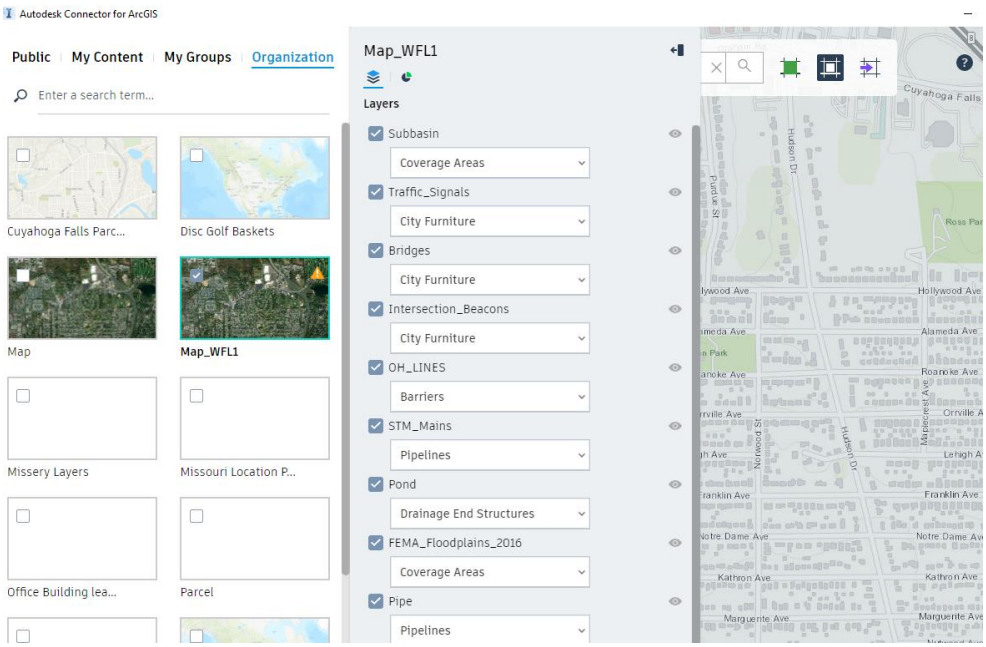
3. Sign in with your Esri ArcGIS credentials.

The Autodesk Connector for ArcGIS opens.

Note: If this is an existing InfraWorks model, the Autodesk Connector for ArcGIS displays your current model extents by default.



4. Navigate to your area of interest.
    - Enter a location name, address, or point of interest in the search bar. You can also input longitudinal and latitudinal coordinates.
    - Use the mouse to pan and zoom, or use the zoom in/out tools (+/- buttons) to further refine your search.



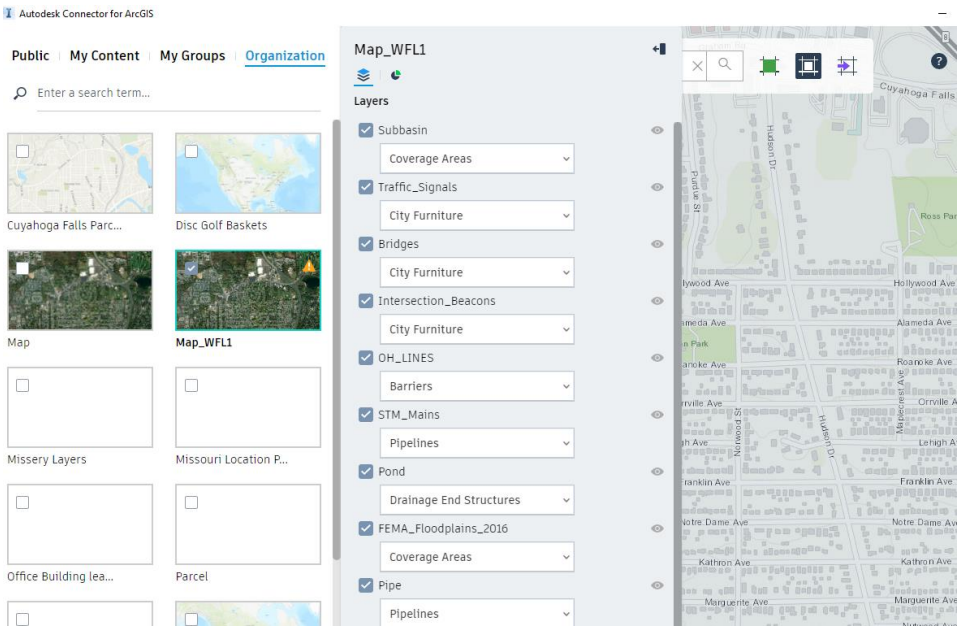
5. Select the area of interest using any of the following methods:

- Click  to select the current map extents.

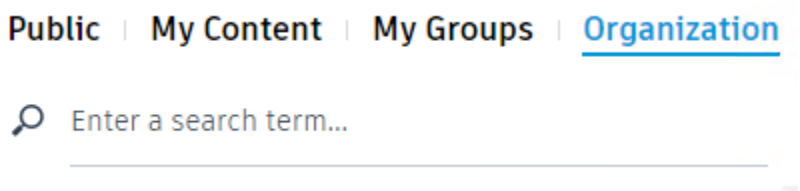
Note: This is the default selection method.

- Click  to draw a rectangular area of interest on the map.
- Click  to draw a polygonal area of interest on the map.
- Click  to import a polygonal area of interest from a SHP file.

If you draw or import the area of interest, it is displayed as a boundary box.



6. Browse available datasets for the selected area of interest using the My Content, My Groups, Organization, and Public filters.



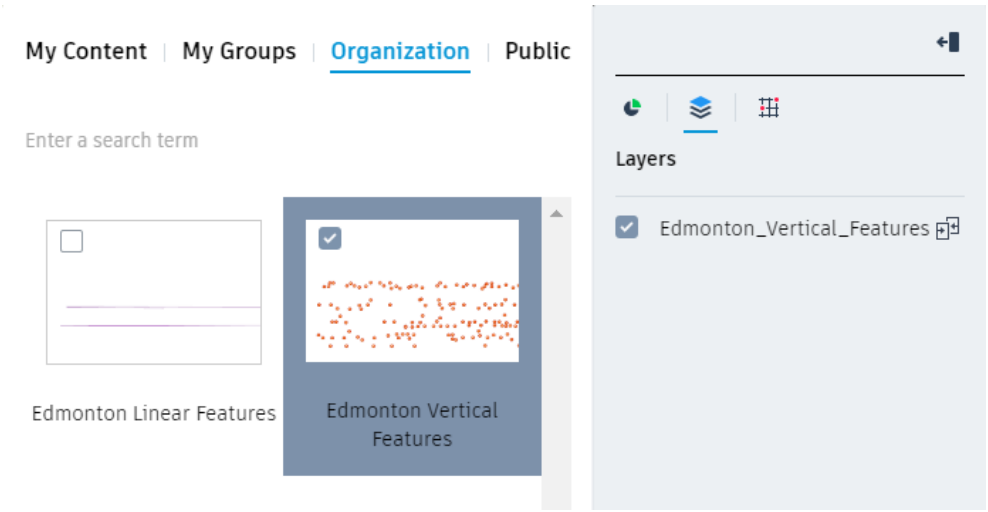
See the ArcGIS Online Help to understand how to find and work with your ArcGIS Online content.

Tip: If you do not see any available datasets, try zooming out from your area of interest.

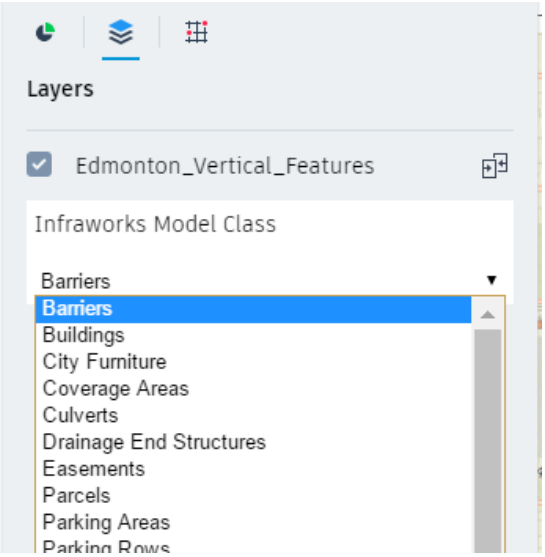
7. Select the check box for the datasets that you want to bring into InfraWorks.

The warning symbol ⚠ indicates that the feature type needs to be specified for the selected layer.

8. In the Layers tab for each selected dataset, checkmark the data layers that you want to add to your InfraWorks models.



9. Click  .
10. Select a feature type for each dataset.



The ArcGIS data layer is generated as model objects in InfraWorks using the feature types that you select.

11. Click Add to design project.

The ArcGIS data layers are added to your InfraWorks model as configured data sources.

- You can review and modify configuration options in the Data Source panel.
- You cannot modify Feature Type for ArcGIS data once it has been added to InfraWorks. Instead, delete the data source from the InfraWorks Data Sources panel and add a new ArcGIS dataset.

- If the ArcGIS online data source for an InfraWorks feature is modified, select that data source in the InfraWorks Data Sources panel and click Refresh Data Source. This will fetch updates from the ArcGIS data source and apply updated geometry and attributes to associated features in your InfraWorks model.
- Review metadata attributes for an InfraWorks feature that was generated from an ArcGIS data source in the Stack, the Properties Palette, and the Data Table. You can also customize which attributes display in the Stack. See To configure attributes.
- With appropriate permissions, users of InfraWorks that load a dataset from ArcGIS will now be able to commit local changes back to the Esri feature service using the Save Back command from the right-click context menu in the Data Sources panel. See To save back to the ArcGIS feature service.

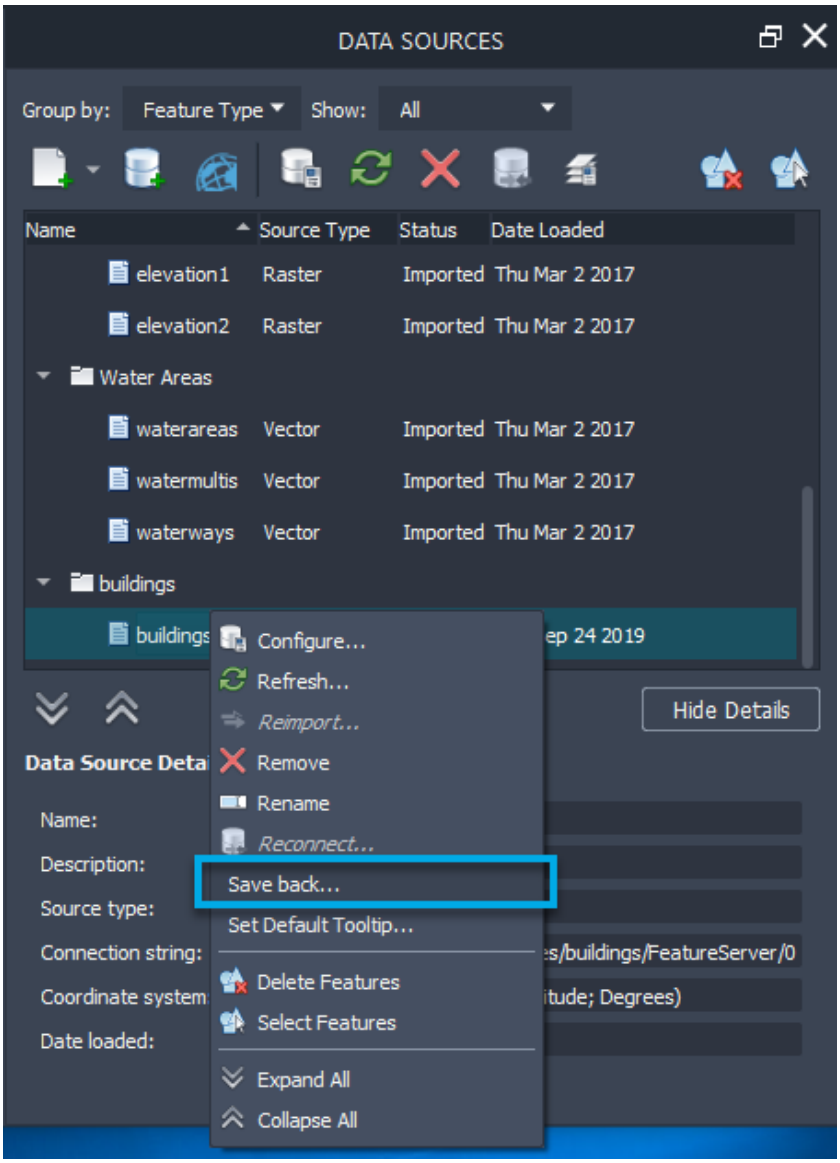
Save Back and Publish Options

If you add ArcGIS data to an InfraWorks model and then modify the feature data in your model, you can use the Save Back command to update the Esri ArcGIS feature service with your changes.

You can save the following InfraWorks features back to ArcGIS: (List of Features)

To save back changes to ArcGIS, you need to have editing privileges.

1. Click Manage ➤ Content ➤ (Data Sources).
2. Select an ArcGIS-based data source from the Data Sources panel. This must be an ArcGIS dataset that was added to your model using the Autodesk Connector for ArcGIS.
3. Right-click.
4. Click Save back...

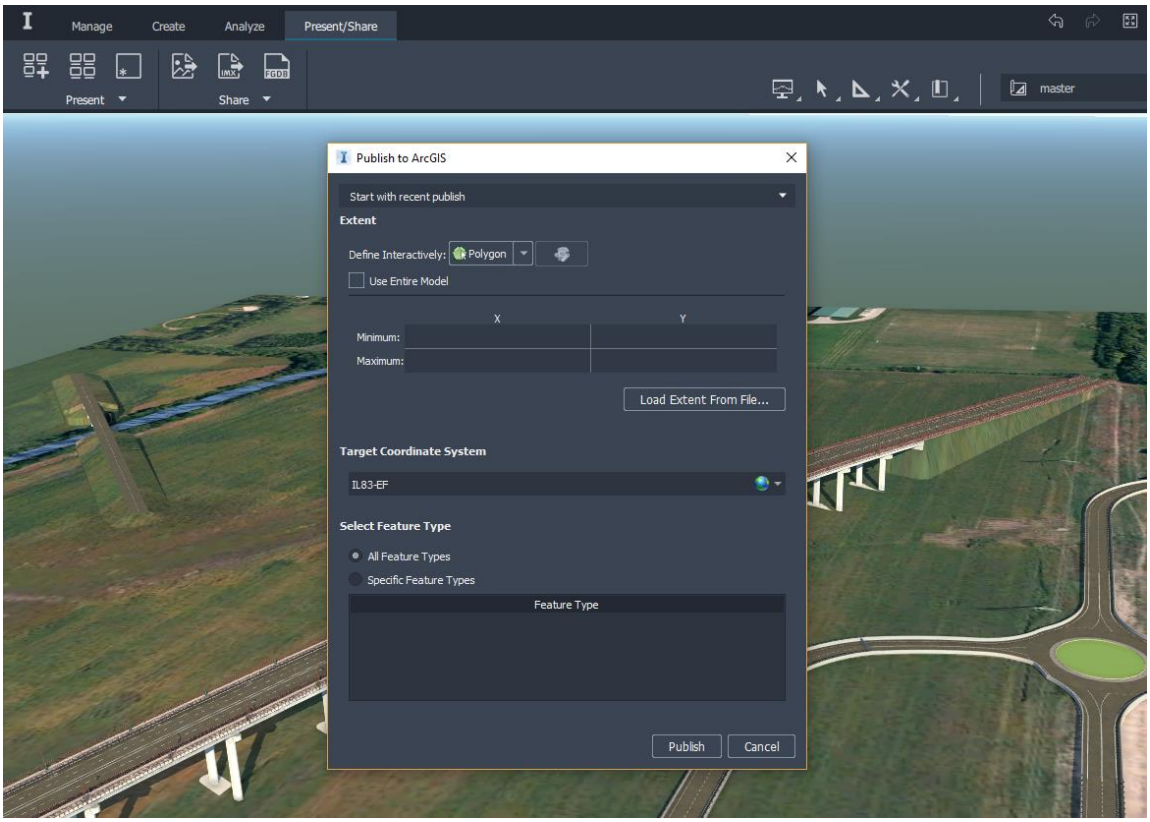


Support for saving back changes to ArcGIS

Some InfraWorks features that are created using the Autodesk Connector for ArcGIS cannot be saved back to the original ArcGIS data layer. If you want to be able to save back changes later, you can assign the InfraWorks feature types that support Save Back when you add data layers to an InfraWorks model from the Autodesk Connector for ArcGIS.

To publish to ArcGIS

1. Click the Present/Share tab ➤ Share ➤ Publish to ArcGIS.
   If you are not currently logged in to ArcGIS, the login dialog box is displayed.
2. Sign in to ArcGIS. The Publish to ArcGIS dialog box displays.
3. Define the extent of your model to include in the Publish to ArcGIS operation.
4. Specify a Target Coordinate System.
5. Select Feature Type.
6. Click Publish.



The Publish to ArcGIS wizard displays, starting with the Area of Interest page. This page shows the area on the map where the selected objects will be published. This is a read-only view that is displayed so you can verify that the published objects will be published to the correct location.

7. Review the area and click Next.
   The Layer Definition page is displayed.
8. Specify the ArcGIS feature types to create and the layer names and then click Next.
   The Item Settings page is displayed.
9. Specify the service name, description, tags, and sharing settings and then click Next.

Note: It is required to specify a unique Service Name and at least one tag.
The Publishing Location page is displayed.
10. Specify the publishing location within your My Content folder.
11. After specifying the publishing location, click Publish to publish the content.
After you publish content, a message dialog box will be displayed with a link to the ArcGIS website. Go to the ArcGIS website, sign in to your account, and click the Content tab.

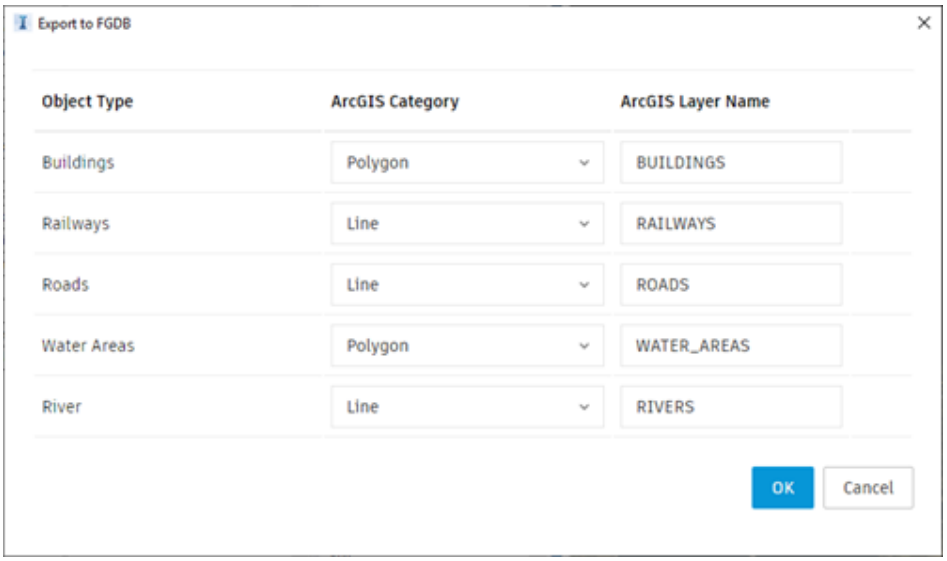
Note: Some coordinate systems are not supported when publishing to ArcGIS or exporting to FGDB.
If a model is assigned an unsupported coordinate system, publishing to ArcGIS or exporting to FGDB will not proceed.
In addition, there are three categories of coordinate systems which are not supported:

- Obsolete Coordinate Systems
- Arbitrary X-Y Coordinate Systems
- Test Only Coordinate Systems

To export objects to FGDB

1. Click the Present/Share tab ➤ Share ➤ 

Export FGDB.
The Export to FGDB dialog displays
2. Define the export extent in your model using the Extent section of the dialog
3. Assign a Target Coordinate System if one is not assigned already.
4. Specify the save location for the exported file(s) using the Target File(s) section of the dialog.
5. Select whether to export all feature types or a choose specific feature types to export in the Select Feature Type section of the dialog.
6. Click Export.
The Export to FGDB dialog appears.
7. Map the exported InfraWorks feature types to what will be the resulting ArcGIS Category and Layer Names.
8. Click OK.



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Roles and Privileges Required to Exchange Data with ArcGIS

You can bring ArcGIS data into your model without having an ArcGIS account. However, to publish to ArcGIS or to save back your changes to ArcGIS, you must have an ArcGIS account and be assigned a role that has certain privileges.

See the ArcGIS Online Help for information about user types, roles, and privileges.

Task/ArcGIS Role Required

Bringing public data into a model

- No ArcGIS account or role required.
- By logging in as a guest, you can access public data without having an ArcGIS account.

Bringing data from your organization into a model

- Viewer, Data Editor, User, Publisher, or Administrator

Saving back changes to ArcGIS

- Data Editor, User, Publisher, or Administrator

Publishing to ArcGIS

- Publisher or Administrator

Exporting to FGDB

- No ArcGIS account or role required. Exported files are saved locally**.**

Conclusion

Bridge Design for InfraWorks allows you to perform engineering-based preliminary road and bridge design by adding the following functions to InfraWorks:

- Horizontal curve and spiral geometry
- Vertical curve geometry
- Profile view
- Gizmos for performing horizontal and vertical editing
- Rules-based design which controls horizontal and vertical geometry
- Style zones
- Lane zones
- Roadside grading
- Profile optimization
- Automatic export to Civil 3D
- Bridge design
- Review material quantities
- Check conformance to clearance envelopes (bridge quantities)
- Lay out rule-driven girder bridges (precast girder catalog)
- Evaluate multiple bridge design alternatives
- Data migration to Civil 3D and Revit from Bridge Design

Autodesk Connector for ArcGIS with InfraWorks

Connect GIS data to digital design models to make better decisions and deliver more resilient infrastructure projects.

“The Autodesk Connector for ArcGIS is the first step toward realizing the vision of the partnership between Autodesk and Esri to integrate BIM and GIS workflows.”

GIS Informs BIM; BIM Fuels GIS by providing a real-world context of an asset’s existing environment within which designers and engineers can explore and evaluate design and Construction.