InfraWorks 360—Bringing Your Road and Bridge Project to Life
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Learning Objectives
- Learn about master roadway tools
- Learn how to use Analysis and Optimization tools
- Learn how to import real-world data
- Learn how to utilize Bridge Analysis tools
- Understand the capabilities of Bridge Design for InfraWorks 360

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 drainage design step by step with the creation of new drainage designs, adding details that enable engineers to communicate and get better-informed results with the Drainage Design Module.

Your AU Expert
Kenneth L. Driscol

Kenneth Driscol graduated from University of Akron with a degree in Civil Engineering and Construction Technology.

Ken 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. Mr. Driscol 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. Ken 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 Ken has used Autodesk products. During his tenure with a number of leading Civil Engineering firms, Ken participated in and led a number of projects for road design and improvement, underground utilities, site development and storm and sanitary drainage design.
Ken has diligently worked with Transportation clients who have transitioned with Autodesk and Bentley products to bridge the gap with data translation and production work. Specifically migrate data between AutoCAD Civil 3D and Bentley InRoads and Bentley GEOPAK software with the Civil Engineering Data Translator cloud service. Upload design source files and convert them to target project data formats without having to install Bentley software.

For the last 10 years, he has been a Senior Civil Application Specialist concentrating in Land Desktop, Civil 3D, Surveying, Map 3D, Hydrology and GIS services and instruction. Ken 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 InfraWorks 360

Communicate the idea of engineering large-scale preliminary designs in the context of the built environment. Extending your capabilities......Roadway, drainage and bridges!

Let’s start with the Model Builder...

Open up the model provided called AU 2015 - MA83F!
What is Roadway and Bridge Design for InfraWorks 360?

Roadway Design for InfraWorks 360 is an add-on module for InfraWorks 360. It adds functionality to InfraWorks 360 that allows you to design roads using engineering approaches and principles such as horizontal and vertical curve geometry, slope grading, intersection design, and many others. How do you know if you have this module included in your installation? The most obvious clue is that you will see the Roadway Design and Bridge Design icons on the main toolbar in the top left of your InfraWorks screen.

You can only add this module to InfraWorks 360. The standalone version that comes with a Suite, for example, does not have the capability to accept add-on modules. You must also have the roadway design module entitled by your software administrator (which might be you).

What do you get with this module? Well, expanding this toolbar will reveal that you have three main toolsets: Analysis, Design, and Review (from left to right in the image below).

Analysis
The analysis toolbar has three commands on it, but only one is additional to the InfraWorks core functionality. It is the Profile Optimization tool.

Design
In this toolset we see the four road types:
Highway, Arterial, Collector, and Local. There are some other commands but they are duplicates of InfraWorks Core Features.

In this toolset you will find 5 tools that are additional to the core InfraWorks toolset. They are Profile View, Sight Distance, and Profile Optimization (also on the Analysis toolbar), Civil 3D Drawings, and Job Monitor. These commands all perform completely different functions so we'll get into the details later on in this document.
Seeing the tools gives you an idea what commands are available but until you use them, you won’t see that these tools actually work differently than core InfraWorks tools. For example, when you draw a road using one of the road tools, the geometry is line-curve-spiral (spiral is optional) like you would see when designing an alignment in Civil 3D, for instance. This is much different from the spline behavior of the core InfraWorks road tools.

You’ll find these types of differences with vertical design as well with the ability to grip-edit the elevation of a PVI within the model or within the Profile View window.
Creating Roads
Creating roads with the roadway module is easy. Simply click one of the road tools on the Design toolbar. The tools are named Highway Roads, Arterial Roads, Collector Roads, and Local Roads. The default design speed for each one of these is highest for Highway Roads and decreases as you move through the tools to Local Roads. Why is this important? The design speed controls the defaults for horizontal and vertical geometry. You can also change the design speed to whatever you want after clicking the first point.

Editing Roads and Bridges with Asset Cards
As you might guess, while creating roads is incredibly simple, the tools available for editing roads are quite sophisticated, especially when compared with the InfraWorks core tools. The additional tools provided by the Roadway module include a new asset card, new gizmos (a 3D version of AutoCAD grips), windows, context menus, and more. Of all the available modules, Roadway Design for InfraWorks 360 has the highest volume of additional tools.

When you click on a design road, you’ll see the Road asset card which has many functions. It manages several different features sets of a design road and you can choose which one using the Edit Mode option. Edit modes include: Geometry, Style, Lanes Forward, Lanes Backward, and Roadside Grading.
Gizmo and Context Menus
The roadway module offers a whole set of gizmos for graphical editing. The following gizmos can be used to change values or the location of the associated key geometric components.

- Point of intersection (PI)
- Tangent
- Point of curvature (PC) or point of tangency (PT)
- Curve radius
- Point of vertical intersection (PVI)
- Point of vertical curvature (PVC) or point of vertical tangency (PVT)
- High/low point (vertical curve)
Context Menus
The roadway module provides several additional context menus that allow you to perform key operations with your road design.

If you right-click a tangent section of a road in plan view you’ll see the following context menu which allows you to add points (PIs) to the layout as well as other functions. If you right-click a curve or PI in plan view, you’ll see this context menu which allows you to remove PIs, design curves and spirals, and more.

If you right-click a tangent while in 3D view, you’ll get this menu where you can add PVIs along with other functions, depending on which modules you are entitled to. If you right-click a vertical curve or PVI while in 3D view, you’ll see this menu where you can remove the PVI, see curve properties, add or remove a vertical curve, and much more.

Style Zones
One of the advanced features with the roadway module is that you can create multiple style zones on your road and apply a different style to each one. The process is simple: just set the Edit Mode to Style on the Road Asset card, then use the icons on the fly-out to add or split a style zone.
Next you’ll be prompted to select a style for the new zone. Just pick what you want and click the model to locate the new zone (one point to split and two points to add a new zone). At any time you can use the Road asset card in Style mode to change the style applied to a zone. You can also use the style zone gizmos to graphically change where a style zone starts and ends.

**Lane Zones**

Another advanced feature with the roadway module is that you can change the number of lanes within a given section of road through the use of lane zones. Lane zones function much like style zones in that you can add zones or split current zones. Then it’s just a matter of setting the number of lanes for a given zone by clicking it and setting the Lanes value in the Road asset card. To do this, you’ll need to have the Edit Mode option set to either Lanes Forward or Lanes Backward. Like style zones, there is a gizmo that lets you graphically set the start or end point of a zone.
Roadside Grading
One of the most powerful features of the roadway module is the ability to create fixed-slope roadside grading. The road tools in the core InfraWorks tool set only perform fixed-width grading which means that the location where the slope ties into existing ground is at a fixed distance from the road. Often, this is not a practical or desired configuration for true engineered roads. In those instances, a fixed-slope approach is typically desired where the configuration is holding a constant slope and tying in along an irregular path. In the two images below, the first road is shown with fixed width grading. Notice how the slopes at the far end are exceedingly steep and how overall the tie-in occurs along a straight line. In the second image, a constant slope of 3:1 is held allowing more practical slopes and a tie-in line that meanders.
By default, a road will be created with fixed-width grading. To change to fixed-slope grading, simply select the road to show the Road asset card, set the Edit Mode to Roadside Grading, and select Fixed Slope. Set the Cut Slope and Fill Slope values to match your design requirements. You’ll also want to set the Grading Limit value to a large number, otherwise your slopes will be “cut short” and be graded vertically outside the grading limit.

Sight Distance Analysis
Adequate sight distance is a deal breaker in most road design projects. InfraWorks has a robust set of graphical dynamic sight distance tools that let you know if your design is going to work very early in the design process. To launch the tool you simply click the Sight Distance icon on
the Analysis toolbar and then click the road you would like to analyze. Next, select the Method: passing or headlight sight distance, and choose the direction and lane. You can also include road decorations (signs, light posts, etc.) in the analysis. Once you have chosen all your options, simply click Analyze and watch the model come to life. Colors in the model will indicate where there is a clear line of sight where there is sight failure due to the curvature of the road, and where there are obstructions.

You can use the Visual Options section to choose which components you would like to see. Also, the Place Sight Pin tool can be used to analyze a specific location on the road.
Sight distance analysis is also available for intersections. The options for intersections are a bit different because now you’re dealing with turn direction and the type of traffic control (stop versus yield, etc.) The outcome is the same, however, with live graphics appearing in the model to show you how your design performs from a sight distance perspective.

**Intersections**

Another great feature of the roadway module is the way it handles intersection design. With core InfraWorks it’s a “you get what you get” scenario: you really have no control over the outcome of an intersection. With the roadway module, you can adjust the curb return radii, add turning lanes, control paint striping, and more. You can even choose a design vehicle and have InfraWorks design the intersection for you.
Conclusion

Roadway and Bridge Design for InfraWorks 360 allows you to perform engineering-based preliminary road and bridge design by adding the following functions to InfraWorks 360:

- 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
- Sight distance analysis
- Profile optimization
- Automatic export to Civil 3D
- Intersection design
- 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 from Bridge Design

Drainage Design

- Standards-driven watershed analysis
- Delineate watersheds (cloud service)
- Standards-driven culvert placement and sizing
- Storm sewer network modeling (culvert reporting)
- Drainage catalog and quantities
- Automated pavement drainage layout
- Inlet and pipe design
- Outfalls design

With these advanced capabilities you can perform some serious preliminary road design and bridge design alternatives that can be carried through to detailed design in Civil 3D with little to no loss of effort.