CI10457

Merry Go Roundabout
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Learning Objectives

• Discover best practices for starting a project and sharing it between Civil 3D and Vehicle Tracking.
• Learn how to use Civil 3D to create alignments and profiles of intersections that are used to create the Roundabout.
• Learn how to use Vehicle Tracking to create roundabouts from those alignments and finished ground profiles that can then be converted into Civil 3D corridors.
• Demonstrate the project design for clients by driving the roundabout in Vehicle Tracking and Civil 3D.

Description

How many steps does it take you to fully design a roundabout after you create your profiles and alignments?

It can take as few as three.

In this course, we'll use two products to create alignments, profiles, and a fully designed roundabout. Vehicle Tracking is the solution to creating a corridor of a fully designed roundabout in Civil 3D.

We'll cover best practices, workarounds, shortcuts, and the pros and cons of using Vehicle Tracking. You will also see examples of projects in which a variety of products can be used, as well as methods for modifying roundabouts. You will also create a client presentation of the design for a project.

Your AU Experts

Heidi Boutwell graduated from Mt. Hood CC in 1998 with an AAS in Civil Engineering Technology. Over the last 15+ years, she has worked as a Civil and Structural Designer, Drafter and Technician in the Civil Engineering world. In 2006 she became the first president of the NWUG Civil 3D AUGI User Group located in Portland, Or and later that year found her first love, teaching. She began teaching Autodesk Civil 3D 2007 to her fellow industry people while employed with a reseller. Heidi has presented several times at AU in the past. Currently she is the Infrastructure Content Manager of 4D Technologies and CADLearning. She trains individuals and companies on how to use many Infrastructure related programs from Autodesk such as Civil 3D, Vehicle Tracking, InfraWorks 360, Map 3D, Navisworks Simulate, Navisworks Manage, Navisworks Freedom, Configurator 360, BIM Field 360 and BIM 360 Glue.
Introduction

Creating roundabouts in Civil 3D has been a challenge for most designers and engineers over the years. Civil 3D provides us with a method to create intersections and roads with corridors, but not a method to create roundabouts. Granted, you can use Corridors in Civil 3D to create a corridor, but it won't assist you in any way with profile or alignment creation—you must do that on your own. Most of the time, Engineers and Designers end up using a combination of alignments, profiles, corridors, and feature lines to create their roundabouts. Vehicle Tracking makes it so much easier that it's really worth looking at just for the ability to create a complex or simple roundabout in only 3 steps.

Autodesk Vehicle Tracking has been morphing since its conception. Over the years, Autodesk Vehicle Tracking has grown into a suite of transportation-related programs that include vehicle swept path prediction for steered vehicles, light rail vehicles, and aircraft, as well as parking layout design and roundabout design.

Autodesk Vehicle Tracking can be installed on different flavors of Autodesk products, which include AutoCAD, AutoCAD Architecture, AutoCAD Map 3D, AutoCAD Utility Design, AutoCAD Plant 3D, and AutoCAD Civil 3D. You can also install Autodesk Vehicle Tracking on Bentley’s MicroStation v8i Select Series 1, 2 and 3. Demonstrations for this class will utilize Autodesk Civil 3D with Vehicle Tracking.

So what is Autodesk Vehicle Tracking? Well, Vehicle Tracking allows you to model vehicle behavior. You select from a wide range of predefined vehicles and then drive that vehicle through a series of required maneuvers in your model. If you cannot quite find the vehicle that you want to use, then you can always modify or create a new vehicle and add it to an existing library for future use. The aim of Autodesk Vehicle Tracking is to provide accurate swept path predictions for different types of vehicles, not precise simulations of driving conditions for those vehicles. Also, Autodesk Vehicle Tracking provides the ability to create Parking Lot Layouts with parking standards that you can modify, as well as Roundabouts or junctions, again with standards that you can modify to your design’s needs.

In this class, you will learn about using Autodesk Vehicle Tracking, an add-on, for-purchase program for Civil 3D. In order to produce a good design result in only 3 steps, you will need to set up Vehicle Tracking properly before you create the roundabout. With that in mind, we will also cover how to set up your design and vehicle tracking junction standards, including the junction/roundabout design standards, finished ground profiles, and alignments. You will also learn how to swap to a different design standard for a roundabout. By setting up Vehicle Tracking properly, you will achieve a good design the first time you create a roundabout.

So, what do you need in your design before you create roundabouts?

- 2 alignments that intersect.
- Intersecting alignments with design finished ground centerline profiles that cross near the same elevation at their intersection locations.
- Junction/Roundabout standards required for the jurisdiction of the design.

Once you have all of the information required, you can begin creating a roundabout in Vehicle Tracking.
Creating a Quick Roundabout

Three simple and easy steps to making a basic roundabout:

**Step 1.** Design your intersection in Civil 3D. Make sure you have centerline finished ground profiles for both intersecting roads, and that they meet in the correct elevation location.

![Figure 1: Finished Ground Profiles of Intersecting Alignments](image1.png)

**Figure 1:** Finished Ground Profiles of Intersecting Alignments

**Step 2.** Select the desired roundabout type from Vehicle Tracking’s Junction Standard Explorer and then follow the steps in the wizard for New Junction. Give your junction a name, and click OK. Finally, select the intersection point of the intersecting alignments or intersection in plan view for the location of the roundabout.

![Figure 2 & 3: Junction Standard Explorer, Plan View of Intersecting Alignments](image2.png)

**Figure 2 & 3:** Junction Standard Explorer, Plan View of Intersecting Alignments

**Step 3.** Select each leg or alignment that will become part of the roundabout, give each leg a name in the New Leg dialog, and click OK. When you’re done, if the New Leg dialog is still active, click Cancel; if not, then just press ENTER.
Poof! After a moment or two, a roundabout is instantly created, complete with a corridor for the roundabout, along with additional alignments, profiles, and assemblies.
Modifying a Junction Standard

Before you create your roundabout, first set up your Junction/Roundabout standards:

**Step 1.** Select Junction Standard Explorer from the Junctions panel of the Vehicle Tracking ribbon in Civil 3D.

**Step 2.** In the Junction Standard Explorer, select the junction you wish to start from, then right-click and select Edit a Copy…. This creates a copy of that library standard that you can now modify. Once you are done modifying it, you can also save your new library with a unique name and share it with others.
Step 3. In the Junction Standard Editor, rename the library in the General tab, then make the changes necessary throughout the dialog box to match the jurisdictions’ requirements for your design. The diagram you see in the image below can be turned on and off by selecting the Diagram button in the Junction Standard Editor.

**Figure 7: Editing a copy of a Junction Standard Library**
Step 4. Let’s set this up for a State of Virginia Roundabout. Here’s the link:
http://www.virginiadot.org/business/resources/LocDes/Presentations_L_n_D/vdot_design.pdf

Don’t get me wrong—there are many different US publications out there on roundabout design. Just about all of them refer to FHWA.

In the Junction Standard Editor, select Roundel Geometry, Central Island. You’ll set this up for a Rural Single Lane Roundabout 25 MPH, meant to handle a WB-67 semi (or WB-20). In the image below, you can see the settings that have now been set. Enter these into your editor.

![Central Island Design Numbers](image)

**Figure 8: Central Island Design Numbers**

In the Junction Standard Editor, select Roundel Geometry, Circulatory Lanes. In the image below, you can see the settings that have now been set. Enter these into your editor.

![Circulatory Lanes Design Numbers](image)

**Figure 9: Circulatory Lanes Design Numbers**
In the Junction Standard Editor, select **Roundel Geometry, Level & Grades**. In the image below, you can see the settings that have now been set. Enter these into your editor. Leave the Crown Lines option deselected.

**Figure 10: Levels & Grades Design Numbers**

In the Junction Standard Editor, select **Leg Geometry, Approach**. In the image below, you can see the settings that have now been set. Enter these into your editor.

**Figure 11: Leg Geometry, Approach Road Design Numbers**
In the Junction Standard Editor, select **Leg Geometry, Entry**. In the image below, you can see the settings that have now been set. Enter these into your editor.

**Figure 12: Leg Geometry, Roundabout Entry Road Design Numbers**

In the Junction Standard Editor, select **Leg Geometry, Exit**. In the image below, you can see the settings that have now been set. Enter these into your editor.

**Figure 13: Leg Geometry, Roundabout Exit Road Design Numbers**

In the Junction Standard Editor, select **Leg Geometry, Levels & Grades**. In the image below, you can see the settings that have now been set. Enter these into your editor.
By now, you’ve got the process down. Once you’ve set all the design parameters, select **Apply** and then **Close**. Your new design will appear under the Pool library in the Junction Standard Explorer, ready for you to select and use.
Step 5. To save this new library definition for your roundabout, select the roundabout design you created, and then right-click and select **Save Standard File**.

![Image of software interface showing Save Standard File option]

**Figure 15: Saving a Library Standard**

Step 6. To share your library with others, right-click the library standard, and from the context menu, select **Share Standard** after you have saved the file first, of course.
Creating a 2D Swappable Roundabout

Setting Up the Drawing Settings for a 2D or 3D with corridor Roundabout:

**Step 1.** From the Vehicle Tracking ribbon, Settings panel drop-down, select Drawing Settings. Expand Junctions and then select Corridor.

In this part of the Drawing Settings dialog, you can turn on and off the corridor or 3D creation of roundabouts and junctions. When creating a roundabout for the first time, you may not select the correct size and may need to swap the roundabout design for a different design. If you start with a 3D roundabout, by selecting the options for Create Corridor, Create Alignments, and Create Profiles, as shown below, then you’ll only be able to swap the roundabout to a new design one time. If you leave these options—Create Corridor, Create Alignments and Create Profiles—deselected in the drawing settings, then you will be able to perform multiple design swaps with the 2D roundabout that is created in your model.

**Figure 16:** Drawing Settings, Junctions, Corridor Controls.

**Step 2.** Select your roundabout design by selecting New Roundabout on the Junctions panel of the Vehicle Tracking ribbon. Select the design standard you created, then the intersection in plan view where the roundabout will go. Name your new roundabout, then begin to select the road alignments that will enter and exit the roundabouts, also known as the legs. Once you’re done, press ENTER and your 2D roundabout will appear.

**Step 3.** To swap to a different roundabout design, on the Junctions panel of the Vehicle Tracking ribbon, select Edit Roundabout and then select your 2D or 3D roundabout.
In the Junction Properties dialog, on the General tab, change the Standard Used by selecting the ellipses... button.

![Junction Properties Dialog](image)

In the Junction Standard Explorer, select your new design standard, and then click OK. A warning dialog will appear, asking you to confirm the design parameter change. Click OK. Back in Junction Properties, to change to the new design, click Apply.

**Step 4.** To create a 3D Roundabout, once you've decided on a 2D design, from the Drawing Settings dialog, simply select Create Alignments, Create Profiles, and Create Corridor, and then select OK. Your 2D corridor in your model will turn into a 3D model. This can take a few minutes, as the program creates the necessary alignments, profiles, and corridor for your 3D roundabout.
Finding The New Alignments, Profiles, and Assemblies That Vehicle Tracking Created

Where are those new alignments, profiles, and assemblies that Vehicle Tracking made?

**Step 1.** In the Drawing Settings, turn on the options to Create Alignments, Create Profiles, and Create Corridor.

**Step 2.** Delete the roundabout that fits from the model.

**Step 3.** Replace the removed roundabout with a new one. Give it a name, and add in the legs. Once the corridor is created, you’ll locate all the alignments.

**Step 4.** In the Toolspace, Prospector, expand Alignments > Centerline Alignments. All of the alignments used to create the roundabout appear.

**Step 5.** Alignment, profile, and assembly layers are located under JTN2* in the Layer Manager.
Step 6. Freeze the Roundabout corridor, and then send the roundabout linework to The Back. All the alignment lines are in white and are now accessible for selection. You can add labels to them, if you so desire.

Step 7. To view the profiles, in the Prospector, expand the alignment you need the profile from and expand profiles. To place them in a profile view, from the Home ribbon, Profile & Section Views panel, select Profile View > Create Profile View. In the dialog, select the alignment you wish to see under Select Alignment and then follow the dialog through, just like creating a new profile from scratch. When you’re ready to place the profile in the model, select Create Profile View. Once you place the profile in the model, you can change the style, add labels, and if you need to, you can adjust the original geometry.

Step 8. Let’s locate the Assemblies. To quickly find the assemblies that were created with the Roundabout command, in the Prospector, expand Assemblies. Select one of the roundabout assemblies you see; they will be named according to how you named your roundabout. Right-click and select Zoom To. The model zooms to the assembly. You’ll want to see them all, so zoom out a little with your scroll wheel.
Assemblies for roundabouts contain no sidewalks, curbs, or gutters. The alignments are attached to the outside lane portion of the assembly and not the centerline. You can add sidewalk, planter strips, curbs, and gutters, but you'll need to experiment with which assemblies to add those to. Not all assemblies can have extra items added to them. Oh, and don't bother changing the assembly lane width if the existing roundabout does NOT meet up with your corridor. You'll need to edit the approach lanes of the roundabout properties to modify the lane widths.

Since the assemblies are attached to alignments that follow the curb line or edge of asphalt, if you change their width, they'll only overlap in the middle and not stretch to the new width, as the alignment is in a fixed position on the outside edge of the roadway.

**Figure 20: Typical Assembly Created by Vehicle Tracking for a Roundabout**
Drive The Design

Now that you have a Roundabout in the model, drive it with a vehicle.

**Step 1.** From the Swept Paths Panel, select the Vehicle Library Explorer.

**Step 2.** In the Vehicle Explorer, double-click the vehicle that will be used to create a swept path.

**Step 3.** Do NOT make the vehicle the default vehicle.

**Step 4.** Accept the default scale of 1 in the Scale dialog.

**Step 5.** Place the vehicle in the model following your corridor.
Step 6. Align the vehicle to the corridor lane that the vehicle will travel.

Step 7. Click Proceed in the Position Vehicle dialog and begin tracing out the swept path. Right-click once to end the swept path creation.

Repeat this process for one more vehicle.
The end result should be two swept paths from two vehicles.

**Figure 24: Two Swept Paths Going Along the Roundabout**

**Step 8.** With 2 swept paths in the model driving around the roundabout, you can animate the paths. **Select both paths.** Then from the **Review** panel, select **Animate**.

**Step 9.** In the Vehicle Tracking Animation toolbar, select **Advanced** to expand the toolbar.

**Figure 25: Vehicle Tracking Animation Toolbar in Advanced Mode**

**Step 10.** Both paths must show up in green, at least. Red indicates a potential issue with the swept path, such as a bad turning radius.

**Step 11.** From here, you can click the **Play** button to drive the design.
Step 12. Or, you can change the point of view by selecting the **Fly By Camera** button. In the Camera Control dialog, you can change which vehicle the Camera will follow and which vehicle or path is the target. Once you have the camera set to the path and vehicle you want, then back in the Vehicle Tracking Animation toolbar, you can select **Play** and the animation will begin.

![Camera Control Dialog](image)

**Figure 26: Camera Control Dialog**

**Step 13.** You can also animate the design in 3D by selecting the **Animate in 3D** button on the Vehicle Tracking Animation toolbar. This will drive the design in 3D from a viewpoint above both vehicles.

![Animate in 3D](image)

**Figure 27: Animate in 3D**

**Conclusion**

This concludes this class on Autodesk Vehicle Tracking, Merry Go Roundabout. As you have seen, there is a simple 3-step process to creating a roundabout in Civil 3D with Vehicle Tracking. As always, set up your roundabout design standards first before you actually create the roundabout in Civil 3D with Vehicle Tracking.