

Swept Path – How to use

1. Introduction

The purpose of this design specification is to define the functionality for creating swept paths for rail vehicles. The swept path will be created as do not triangulate features / components in a DTM.

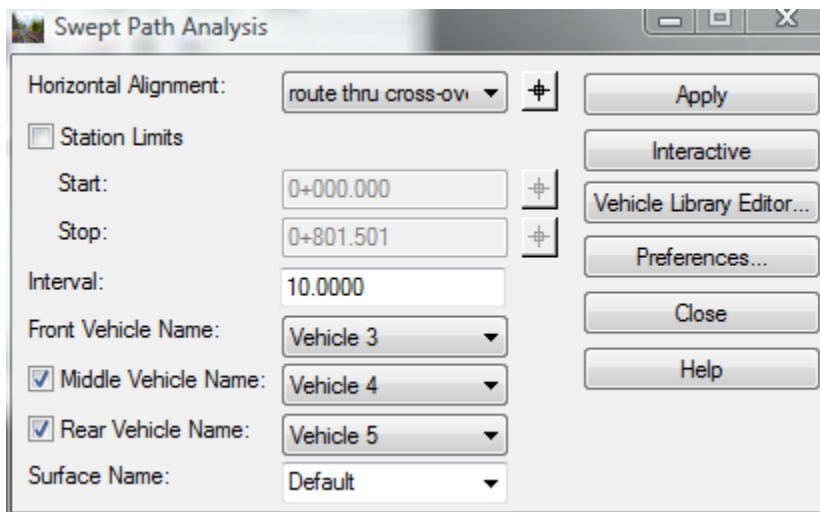
Also, it will be displayed as a mesh in MicroStation. In AutoCAD the user will need to use the **Surface > View** commands to visualize the swept path.

The vehicle library will be an XML file. The software will allow the user to create and edit vehicles. The bases of the vehicle definition will be graphics, which have been refined by the user.

2. Swept Path Analysis

2.1.1 Swept Path Dialog

The **Swept Path Analysis** user interface appears as follows:



The *Horizontal Alignment* combo box and data point button allows the user to define the horizontal alignment for creating the swept path.

The *Station Limits* check box, *Start* and *Stop* station text input fields and data point buttons allow the user to define the station limits.

The *Interval* text input field allows the user to define the interval for creating the swept path.

Note:

Selecting an interval that is too large may cause an ill-defined swept path. This would be particularly true in a cross-over or very tight radii situations. The user should use the *Interactive* functionality to investigate these areas of the geometry. A minimum interval of 1 meter may be small enough!

The *Front Vehicle Name* combo box allows the user to select a vehicle for creating the swept path. The vehicles are defined in the [Swept Path Vehicles.xml](#) file and can be created with the **Vehicle Library Editor**.

The *Middle Vehicle Name* check box and combo box allows the user to select an optional middle vehicle for creating the swept path.

The *Rear Vehicle Name* check box and combo box allows the user to select an optional rear vehicle for creating the swept path.

The *Surface Name* text input combo box allows the user to define the surface, which will be the result of the swept path creation process.

The *Apply* creates the swept path based upon the settings on the dialog and the vehicle definition. The swept path(s) will be added to the surface. Once created in the surface, these features may be displayed in the following:

- Surface > View Surface > Components
- Surface > View Surface > Features
- Evaluation > Cross Section > Create and Update
- Drafting > Place Cross Section Note can be used to annotate from the swept path to fixed objects.

Note:

No attempt will be made to delete the graphics or surface created with this command.

In MicroStation the swept path will be displayed as a mesh.

In AutoCAD the user will need to use the **Surface > View** commands to visualize the swept path.

The *Interactive* button will allow the user to interactive move the vehicle(s) along an alignment. The following:

1. At the *Identify alignment* prompt, the user should data point to select the horizontal alignment. Clicking a reset will return to the dialog.
2. At the *Identify point* prompt, the user may data point to place the vehicle(s) within the graphics file. Clicking a rest will return to step 1.

Note:

The graphics that are displayed in the interactive mode are permanent and have no intelligence. These graphics can be manipulated / deleted within the graphics environment.

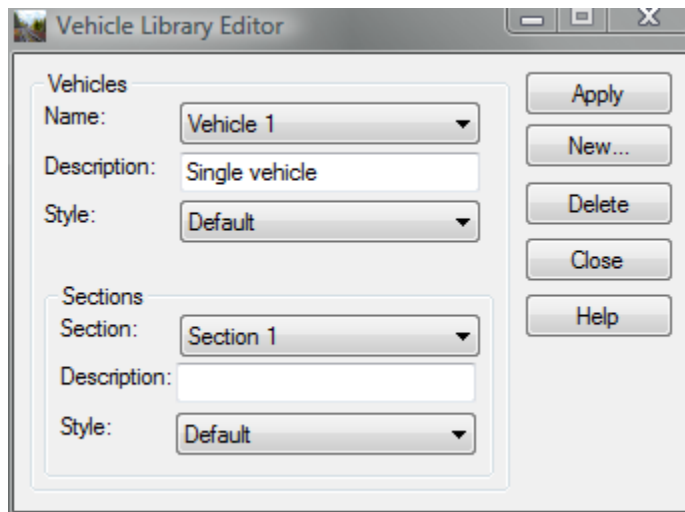
The *Vehicle Library Editor* allows the user to create vehicles.

The *Preference* button will save the settings into the preference file

The *Close* button dismisses the dialog.

2.1.2 Vehicle Library Editor

The user interface appears as follows:



Within the *Vehicles* group box are the following:

The *Name* combo box lists all vehicles in the vehicle library.

The *Description* text input field allows the user to define a description for the current vehicle.

The *Style* combo box defines a style for the current vehicle.

Within the *Sections* group box are the following:

The *Section* combo box lists all sections for the current vehicle.

The *Description* text input field allows the user to define a description for the current section.

The *Style* combo box defines a style for the current section.

The *Apply* button automatically updates the Vehicle Library file.

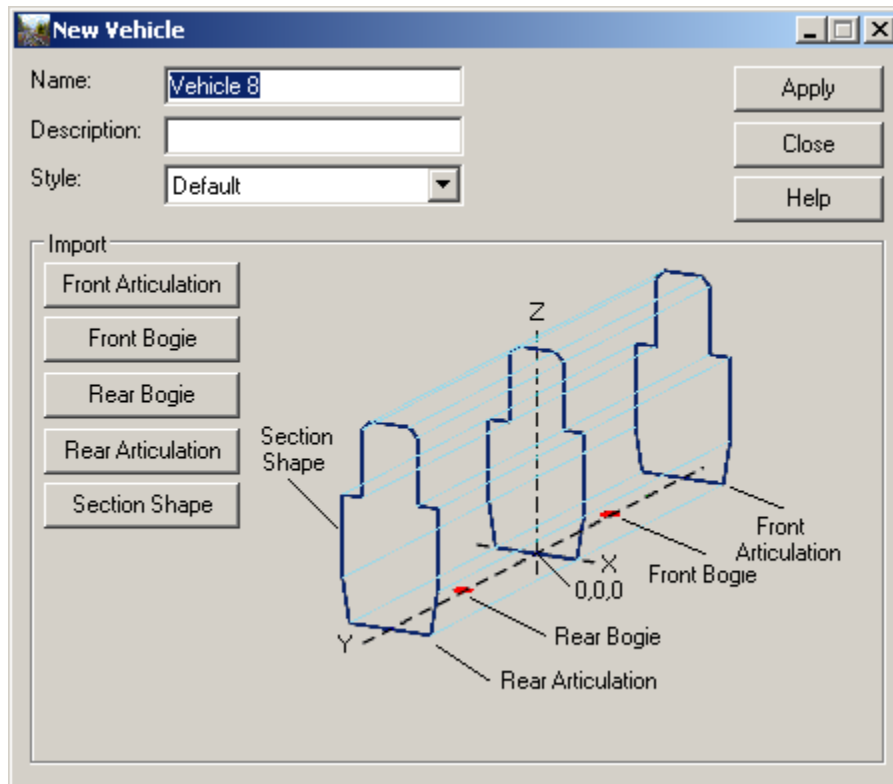
The *New* button allows the user to create a new vehicle, which will be described in the next section.

The *Delete* allows the user to delete the current vehicle.

The *Close* button will dismiss the dialog.

2.1.3 New Vehicle

The user interface appears as follows:



The *Name* text input field allows the user to define a unique name for the new vehicle.

The *Description* text input field allows the user to define as description for the new vehicle.

The *Style* combo box allows the user to assign a style for the new vehicle.

The *Apply* button will write the new vehicle to the C:\Program Files\Bentley\Bentley Rail Track V8.11\data\metric\Swept Envelope Vehicles.xml file.

The *Import Front Articulation* button allows the user to define the vehicle's front articulation point. This point is optional. The user will select this *point* in graphics.

The *Import Front Bogie* button allows the user to define the vehicle's front bogie point. This point is required. The user will select this *point* in graphics.

The *Import Rear Bogie* button allows the user to define the vehicle's rear bogie point. This point is required. The user will select this *point* in graphics.

The *Import Rear Articulation* button allows the user to define the vehicle's rear articulation point. This point is optional. The user will select this *point* in graphics.

The *Import Section Shape* button allows the user to define cross-sectional shapes that represent the vehicles outline. The user will select *line-strings* in graphics.

The *Close* button dismisses the dialog.

Note:

The graphics that represent the front and rear articulation and bogie points need to be points in the design file. The section shapes need to be line-strings or linear shapes that represent the vehicle. The orientation of these graphics in plan view is as follows:

- The vehicle front to back is from north to south (i.e. the front's y coordinate is greater than the back's y coordinate)
- The vehicle's left to right side is from west to east (i.e. the left side's x coordinate is less than the right side's x coordinate)
- The vehicle's height is from the rail plane.
- The front and rear articulation and bogie points, should have an elevation (z) of 0.
- The center of the vehicle should have an x and y at 0,0

In order to get a correct representation of the swept path, sections must be defined at the following location on the vehicle:

- Front
- Middle, which is the a section centered between the front bogie and the rear bogie
- Rear

The reader should carefully review the predefined vehicles in .. At this moment the following examples are provided:

Vehicle 1, is to a structure gauge envelope

Vehicle 2, is a single car and is not intended to be incorporated with any other vehicle

Vehicle 3 thru 5, is intended to be incorporated together in a triplet. Note the *ControlPoints* arrangement in the XML file.

Vehicle 6 and 7, is intended to be incorporated together into a pair. Note the *ControlPoints* arrangement and the Section 2's *station* position.

2.2 Workflow Overview

The following workflow:

- Create a horizontal alignment
- Create a vertical alignment
- Create a cant alignment
- Create the swept path surface features / components with the Swept Path Analysis command
- View the swept path features / components with Surface > View commands
- View the swept path features / components with Evaluation > Cross Section > Create and Update commands.

2.3 Data Dependencies

The software will look for vehicles in the following file *Program Files\Bentley\Bentley Rail Track V8.11\data\metric\Swept Envelope Vehicles.xml* or *Program Files\Bentley\InRoads Group V8.11\data\imperial\Swept Envelope Vehicles.xml*

```
- <VehiclesFile>
- <Vehicles>
  <Vehicle name="V1" description="" style="Default" />
  - <ControlPoints>
    <ControlPoint name="Front Articulator" x="15.000000" y="0.000000" z="0.000000" />
    <ControlPoint name="Front Bogie" x="12.000000" y="0.000000" z="0.000000" />
    <ControlPoint name="Rear Bogie" x="-12.000000" y="0.000000" z="0.000000" />
    <ControlPoint name="Rear Articulator" x="-15.000000" y="0.000000" z="0.000000" />
  </ControlPoints>
  - <Sections>
    - <Section name="Section 1" description="" style="Default" station="1.000000">
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      <Point x="15.000000" y="4.000000" />
      <Point x="15.000000" y="0.500000" />
      <Point x="15.000000" y="0.500000" />
    </Section>
    - <Section name="Section 2" description="" style="Default" station="1.500000">
      <Point x="12.000000" y="0.500000" />
      <Point x="12.000000" y="4.500000" />
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      <Point x="12.000000" y="0.500000" />
      <Point x="12.000000" y="0.500000" />
    </Section>
    - <Section name="Section 3" description="" style="Default" station="1.500000">
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      <Point x="0.000000" y="0.500000" />
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    </Section>
    - <Section name="Section 4" description="" style="Default" station="1.500000">
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      <Point x="-12.000000" y="0.500000" />
      <Point x="-12.000000" y="0.500000" />
    </Section>
    - <Section name="Section 5" description="" style="Default" station="1.000000">
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      <Point x="-15.000000" y="4.000000" />
      <Point x="-15.000000" y="4.000000" />
      <Point x="-15.000000" y="0.500000" />
      <Point x="-15.000000" y="0.500000" />
    </Section>
  </Sections>
</Vehicles>
</VehiclesFile>
```