

AMBERG TUNNEL - Tutorial


Project creation - Axis

Amberg Tunnel version: 2.25

In this tutorial you will learn

This tutorial will walk you through the process of creating the project, establishing, and validating the tunnel axis.

Tutorial takes approximately 20 minutes.

 For more detailed information see manual → Amberg Tunnel → Help → Base module

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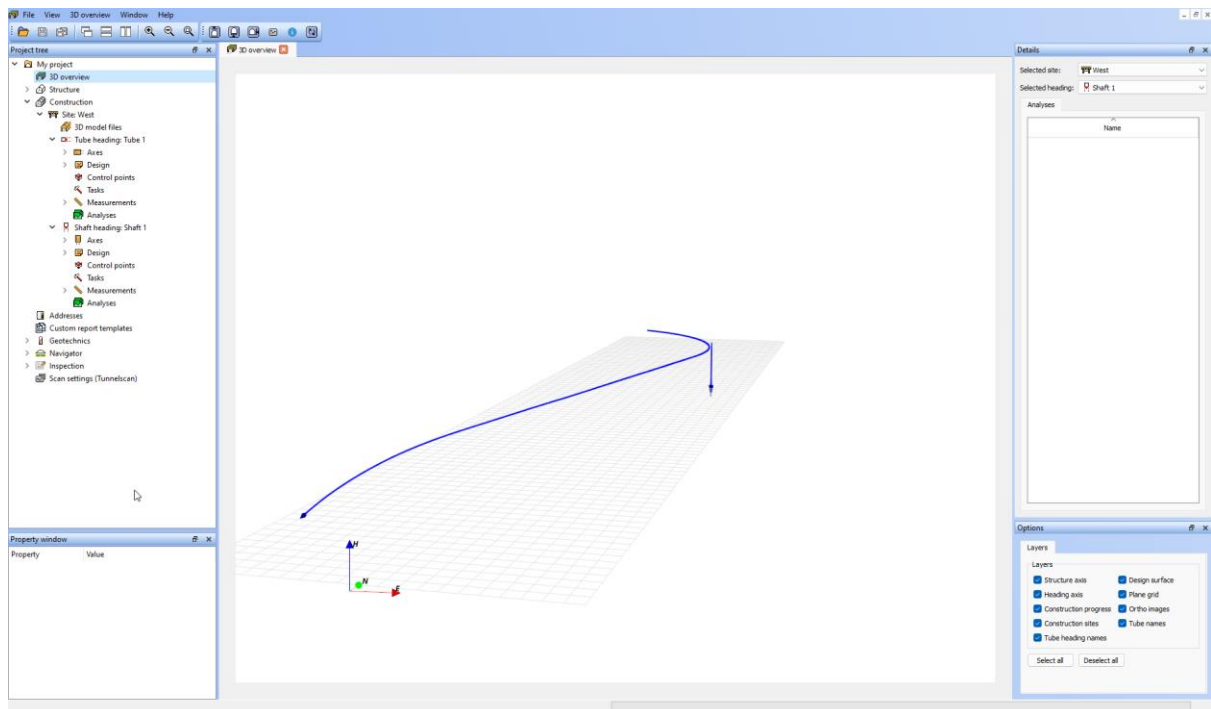
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Demo data

Download the project from our home page and unzip it:

https://ambergtechnologies.com/fileadmin/fileadmin/user_upload/amberg-technologies/downloads/AmbergTunnel2/Tutorials/Tutorial Axis definition.zip

The folder contains data for import and a final project created in this tutorial.



Project Overview

The individual steps are also described in a video tutorial below.

<https://www.youtube.com/playlist?list=PLdAutjItdJ9BjCkcUMDesV4mQu6-mgYHB>

Download & Install

Please download the software from the following link. You will be just asked for contact information, so we can reach out to you later if you have any further questions.

<https://ambergtechnologies.com/private-area/amberg-tunnel/software-manuals>

Demo license

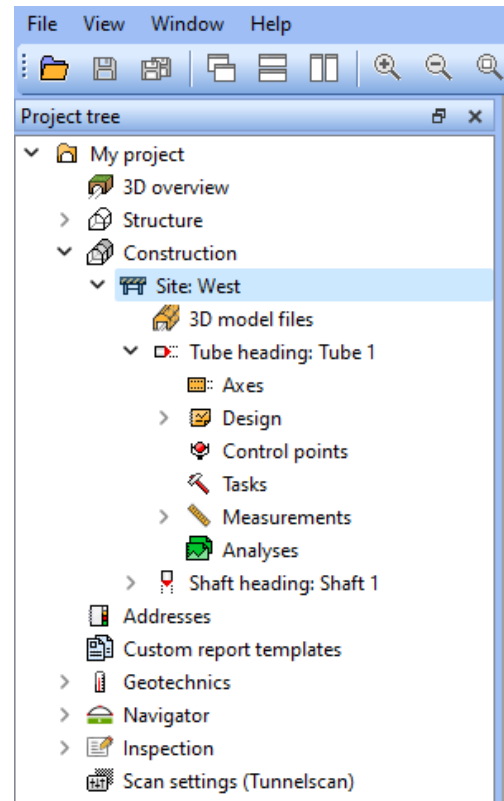
You can contact support.tunnel@amberg.ch to get a 1-week demo license.

How to create a project in Amberg Tunnel

Once you start Amberg Tunnel with a valid license or a demo license, the process of creating the project can start.

1. Step: Project creation

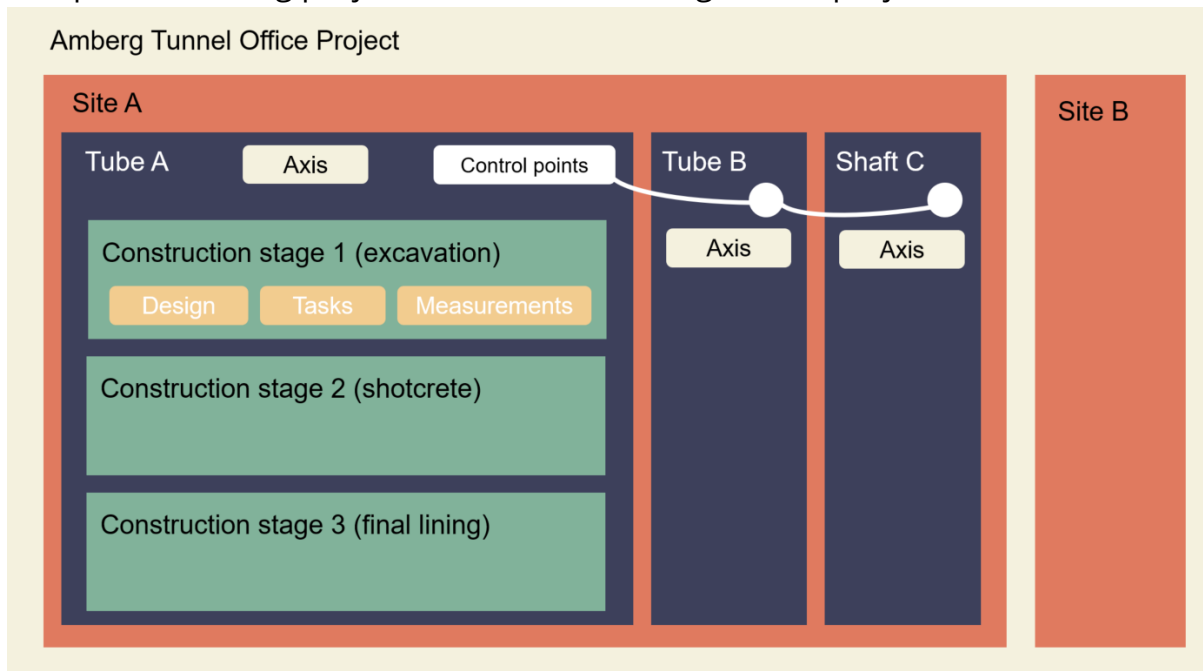
- ▶ Find the top bar menu and go to **File - New Project**
- ▶ The project creation wizard will appear. Press **Next**.
- ▶ Fill in the **Project name** "My project" and press **Next**
- ▶ **Add** the construction site "West" and press **Next** (You can also add sites later.)
- ▶ You can add a **Tube** and **Shaft** headings already. But we will do it later. Press **Next**.
- ▶ Fill the information about your company and add the logo (This can also be defined later.) Press **Next**.
- ▶ Specify the **path** to the folder where the project will be stored (e.g. ...\\1. Project creation\\My project) and press **Next** and **Finish**



i The folder will store all project-related files including automatically created subfolders and configuration files.

- ▶ The new Amberg Tunnel project has been created.

Amberg Tunnel project can contain multiple sites. Each site can contain multiple tubes and shafts. Each tube or shaft has 1 axis. This allows you to manage complex tunnelling projects within one Amberg Tunnel project.



Creation of a site in the project

We have already created 1 site during the project creation. You can add another site if you want.

- ▶ In the **Project Tree** → **Construction** (Right-click) → Add **construction site**
- ▶ Specify the **name** (*West2*) and press **OK**

Creation of a heading in the project

Under each site you can have one or more tube or shaft headings. We will now create one tube and one shaft in the *West* heading.

- ▶ Right-click on the Site node (**Site: West**) → **Add Tube heading**
- ▶ Specify the **Name** (*Tube 1*) and press **OK**

Let's repeat the steps for shaft.

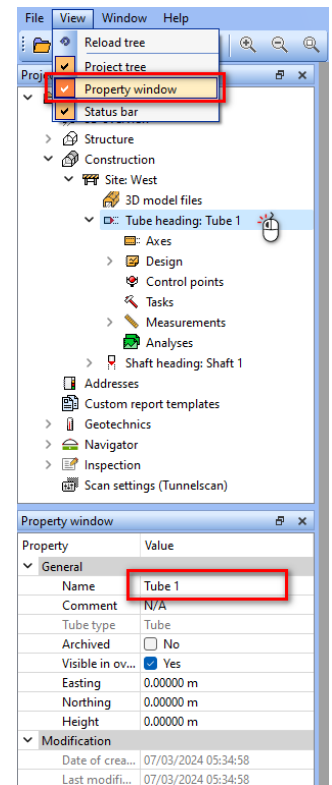
- ▶ Right-click on the Site node (**Site: West**) → **Add Shaft heading**
- ▶ Specify the **Name** (*Shaft 1*) and press **OK**

i A tube can be any tunnel including tunnels with a steep slope.
A shaft is always vertical.

Property window

If you want to change the name, make a comment, or archive some of the created items (Site, Heading, Construction stages, Tasks, Analysis) later, you can do that in the property window.

- ▶ To show the property window, go to the **Top bar menu - View - Property window**
- ▶ Select (Left click) any of the listed items
- ▶ Make some changes in the property window.



2. Step: Axis definition and validation

Once you have created a heading the next step is to define the tunnel axis. An axis is the most important part of the tunnel design in Amberg Tunnel. The rest of the tunnel design is referenced to the axis.

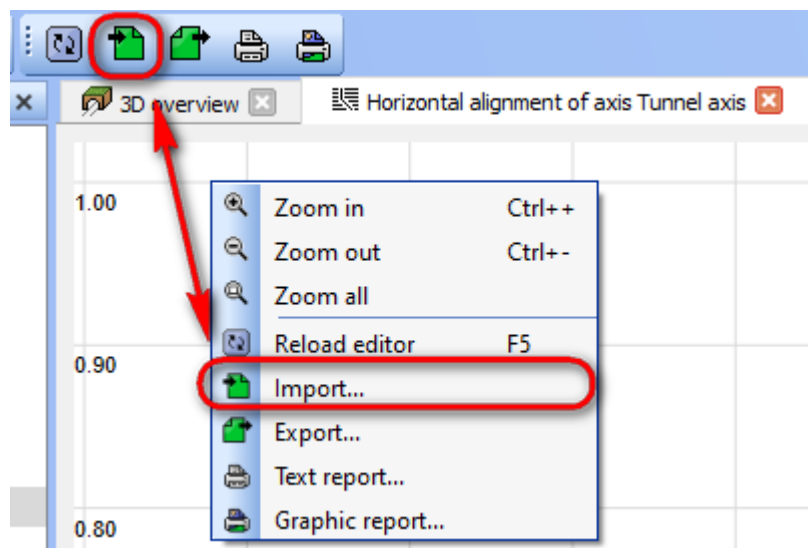
The tunnel axis is created from a horizontal and vertical alignment, from these two elements the 3D curve is calculated.

- ▶ In the **Project tree** go to **Construction** → **Site: Site West** → **Tube heading: Tube 1** → **Axes** (Right-click) → **Add heading axis**
- ▶ Enter the name "*Tunnel axis*" and press **OK**
- ▶ Expand the created axis

i There can be only 1 axis per heading.

Horizontal alignment

- ▶ Open **Horizontal alignment** (double-click)
- ▶ Select **Import** from the toolbar on the top or **right-click** in **2D graphic view** and find **Import**



- ▶ Choose ... \1. Axis\Heading Axis HA.dxf and press **OK**

i In the DXF file definition there is no variable for a clothoid definition but only for straight and arc elements. If you have an alignment with a clothoid element, then this element is segmented into small straight lines. During the import, you can convert these straight lines back to a clothoid element.

- ▶ In the dialog window press the **Automatic convert** button and observe how the list of elements is shortened as the short straight lines are converted into clothoids. Now all the possible clothoids are found and created.
- ▶ Set the **Stationing start** to **-422.029m**
- ▶ Press **OK**
- ▶ Press the **Save** button


Import axis from DXF

DXF element preview

Nr	Stationing start [m]	Stationing end [m]	Length [m]	Type	Easting start [m]	Northing start [m]	Easting end [m]	Northing end [m]	Radius start [m]	Radius end [m]	Azimuth start [GON]	Azimuth end [GON]
1	-422.03	-146.94	275.092	Arc	677,531.383	245,197.085	677,693.953	244,983.745	354.000	354.000	133.811	183.282
2	-146.94	-16.63	130.305	Arc	677,693.953	244,983.745	677,704.649	244,854.585	362.000	362.000	183.282	206.198
3	-16.63	58.37	75.000	Clothoid	677,704.649	244,854.585	677,692.231	244,780.656	362.000	0.000	206.198	212.793
4	58.37	159.22	100.850	Straight	677,692.231	244,780.656	677,672.102	244,681.835	N/A	N/A	212.793	212.793
5	159.22	159.70	0.484	Arc	677,672.102	244,681.835	677,672.006	244,681.361	-750.002	-750.002	212.793	212.752
6	159.70	564.96	405.257	Straight	677,672.006	244,681.361	677,591.374	244,284.207	N/A	N/A	212.752	212.752
7	564.96	565.47	0.515	Arc	677,591.374	244,284.207	677,591.272	244,283.702	1,600.029	1,600.029	212.749	212.770
8	565.47	735.64	170.161	Straight	677,591.272	244,283.702	677,557.362	244,116.953	N/A	N/A	212.772	212.772
9	735.64	797.64	62.000	Clothoid	677,557.362	244,116.953	677,545.703	244,056.063	0.000	-904.000	212.772	210.589
10	797.64	1,128.52	330.888	Arc	677,545.703	244,056.063	677,551.192	243,727.064	-904.000	-904.000	210.589	187.287

Stationing start:

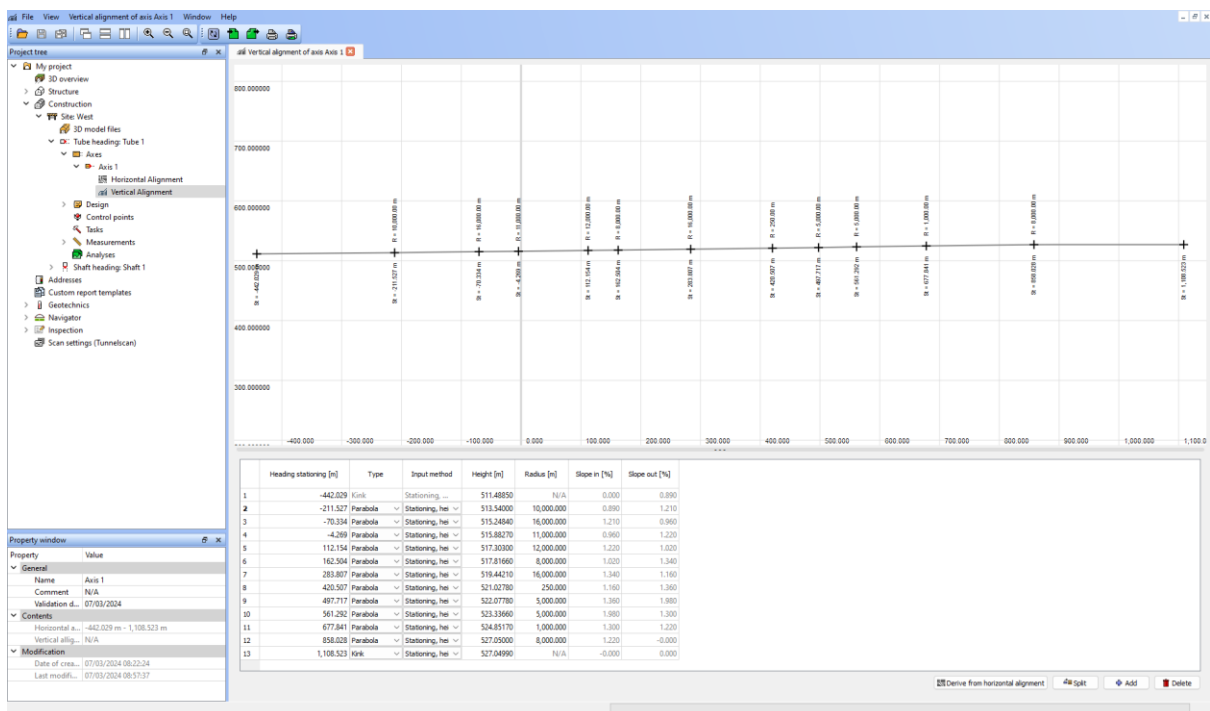
Nr	Heading stationing start [m]	Heading stationing end [m]	Length [m]	Type	Input method	Easting start [m]	Northing start [m]	Easting end [m]	Northing end [m]	Radius start [m]	Radius end [m]	Azimuth start [GON]	Azimuth end [GON]	Parameter [m]	Stationing err. [m]	Azimuth err. [GON]	Pos
1	-422.029	-146.937	275.092	Arc	Start, end, sta	677,531.38270	245,197.08540	677,693.95295	244,983.74510	354.000	354.000	133.811	183.282	N/A	0.000	0.000	
2	-146.937	-16.632	130.305	Arc	Start, end, sta	677,693.95290	244,983.74520	677,704.64910	244,854.58488	362.000	362.000	183.282	206.198	N/A	-0.000	0.000	
3	-16.632	38.368	75.000	Clothoid	Start, start, end	677,704.64910	244,854.58480	677,692.23120	244,780.65614	362.000	0.000	206.198	212.793	164.773	0.000	0.000	
4	38.368	139.249	100.881	Straight	Start, end, sta	677,692.23120	244,780.65620	677,672.09578	244,681.80509	N/A	N/A	212.793	212.793	N/A	0.000	0.000	
5	139.249	139.733	0.484	Arc	Start, end, sta	677,672.09580	244,681.80510	677,671.99935	244,681.33081	-750.000	-750.000	212.793	212.751	N/A	0.000	0.000	
6	139.733	544.959	405.228	Straight	Start, end, sta	677,671.99930	244,681.33090	677,591.37418	244,284.20681	N/A	N/A	212.752	212.752	N/A	0.000	0.000	
7	544.959	545.474	0.515	Arc	Start, end, sta	677,591.37420	244,284.20680	677,591.27161	244,283.70162	1,600.000	1,600.000	212.751	212.772	N/A	-0.000	0.000	
8	545.474	715.635	170.161	Straight	Start, end, sta	677,591.27160	244,283.70160	677,557.36201	244,116.95346	N/A	N/A	212.772	212.772	N/A	0.000	0.000	
9	715.635	777.635	62.000	Clothoid	Start, start, end	677,557.36200	244,116.95330	677,545.70238	244,056.06297	0.000	-904.000	212.772	210.589	236.745	0.000	0.000	
10	777.635	1,128.523	330.888	Arc	Start, end, sta	677,545.70230	244,056.06300	677,551.19194	243,727.06443	-904.000	-904.000	210.589	187.287	N/A	-0.000	0.000	

i Make sure there are no warnings and errors in your created axis (azimuth, stationing, positioning). They are displayed in the last 3 columns and highlighted with a warning sign  at the start of the line.

Vertical alignment

The vertical alignment will now be imported from an xml file.

- ▶ Open **Vertical alignment** (double-click)
- ▶ Select **Import** from the toolbar on the top or **right-click in the 2D graphic view** and find **Import**
- ▶ Choose ...\\1. Axis\\ **Heading Axis VA.xml** and press OK
- ▶ Press the **Save** button



Manual definition

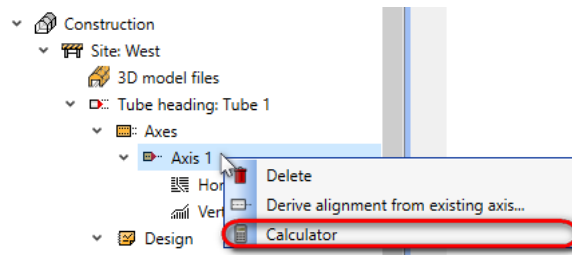
If the only axis definition available is a PDF, or the design needs to be manually edited, you can always do so in the editor.

- ▶ Find the **Add**, **Split** and **Delete** button in the right-bottom corner. These functions allow you to create and edit the axis.
- ▶ The table contains the columns **Type** and **Input method**. These columns contain dropdown menus with various geometry types and input methods that can be selected.

Validation of created axis

Most of the time in a project you receive a tunnel axis defined in LandXML format together with an Excel table with derived absolute coordinates along it in a specific interval (1m, 5m, 10m). Now to export these points in the same interval from Amberg Tunnel we will use Axis calculator.

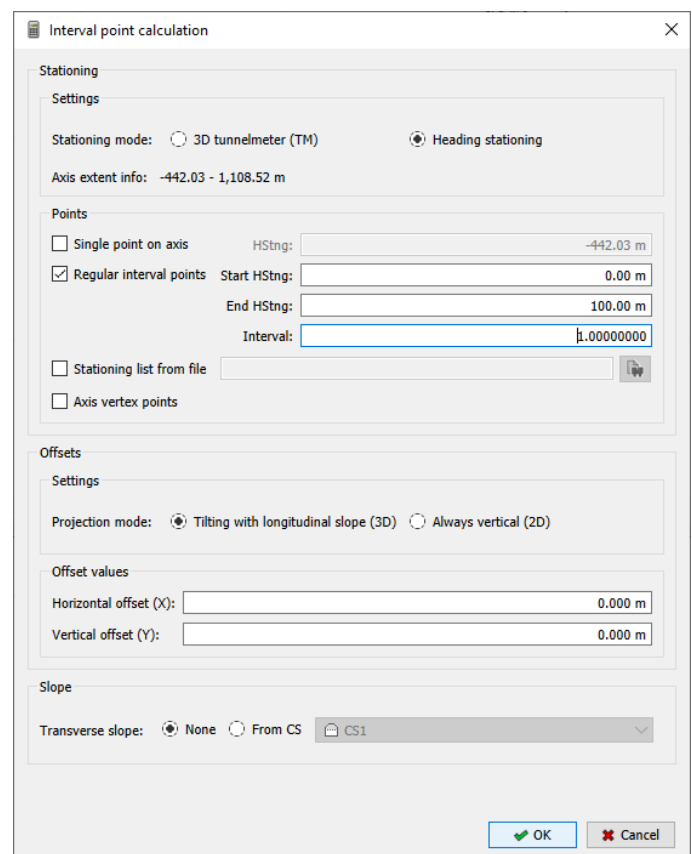
- ▶ In the **Project tree** go to **Construction** → **Site: Site West** → **Tube heading: Tube 1** → **heading: Tube 1** → **Axes** → Right-click → Click on **Calculator**



- ▶ Select **Interval point calculations** from the tool bar on the top or right-click somewhere and find **Interval point calculations**
- ▶ Select **Regular interval points** and use the following parameters
 - Start HS: 0 m
 - End HS: 100 m
 - Interval: 1 m
- ▶ Press OK

Absolute and relative coordinates are derived from the input parameters. Now it can be exported it to DXF or CSV.

- ▶ Right-click anywhere inside 2D graphic view or table
- ▶ Choose **“Export DXF”** or **“Export to text file”** and save the file



i You can also select the data in the table and copy & paste them to Excel directly (without using the export function).