TcpTUNNEL CAD

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User Manual

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1. Introduction

This guide describes the steps to follow to create a job, add the components and process the data measured in the field.

In TcpTunnel, the jobs are organized in projects. These ones store the information about horizontal and vertical alignments, superelevations, tunnel templates, etc, as well as the configuration parameters.

To create a new project, it's necessary that all files are in the same working folder. The minimum elements it must contain are the horizontal and vertical alignments and the tunnel templates. Additionally, it can be added superelevations and control points.

Once the project is created, it will be necessary to do the cross-sections calculation in order to run the most application commands, such as cross-section drawing, editing, area and volumes calculation, etc.

2. Project creation

To create a new job, the command **TcpTunnel > Crear Proyecto** must be executed. This command will open a dialog to enter the project name and select the working folder. As previously commented, the project must be created in the same folder as its components.
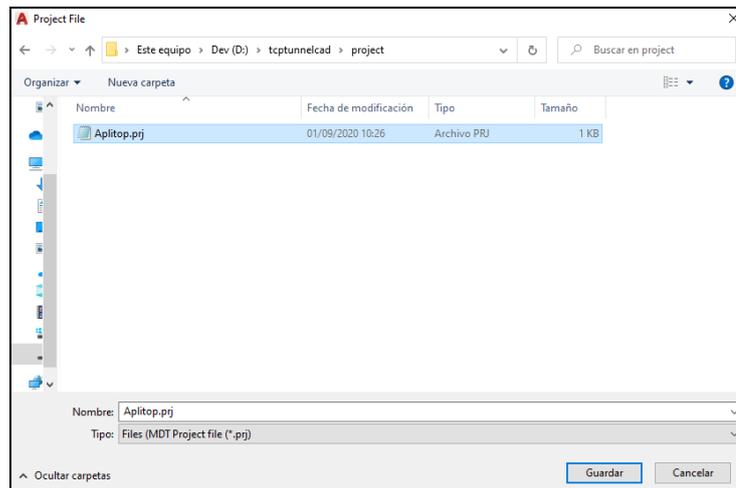
After entering the project name, the following window will be open:
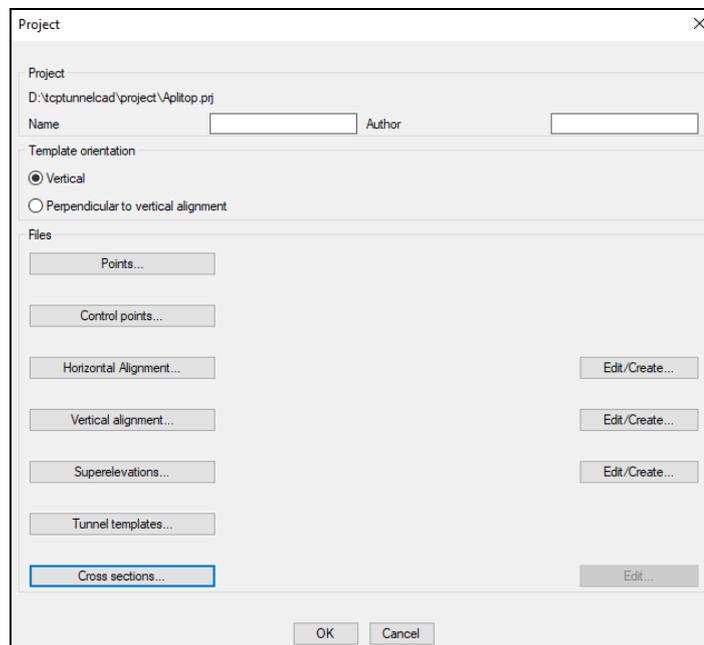

Optionally, **Name** and **Author** can be entered.

In section *Template orientation*, it must be selected if the cross-sections will be created *Vertical* or *Perpendicular to vertical alignment*, depending on the vertical alignment slopes. For large slopes, the second option should be selected.

Then, the project components must be added:

Horizontal alignment: Horizontal alignment in propietary format, with ***.eje** extension, clicking *Horizontal alignment…* button, or imported from LandXML file in the editor, clicking *Edit/Create* button.

Vertical alignment: Vertical alignment in propietary format, with ***.ras** extension, clicking *Vertical alignment…* button, or imported from LandXML file in the editor, clicking *Edit/Create* button.
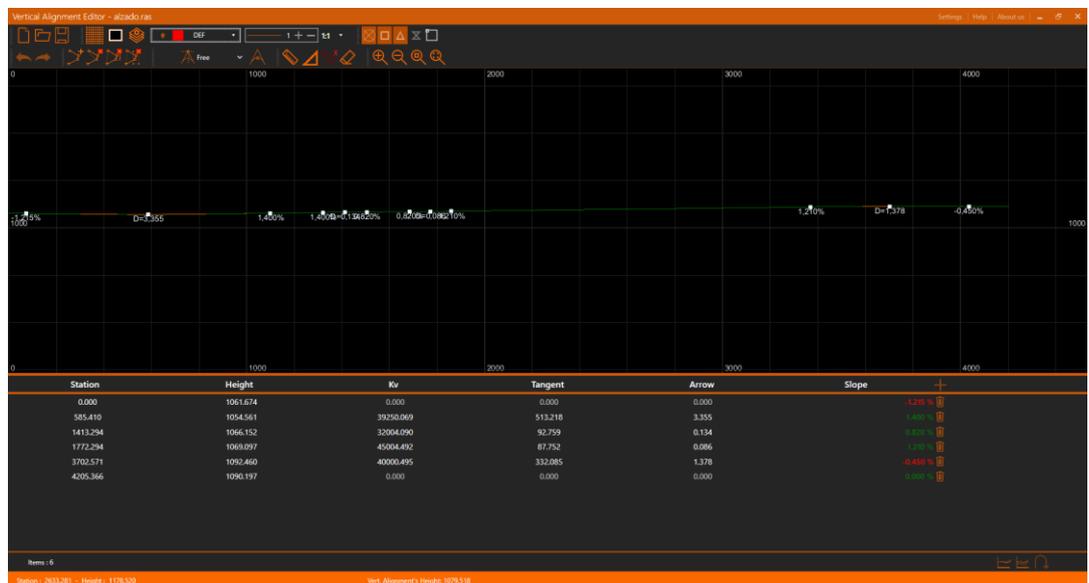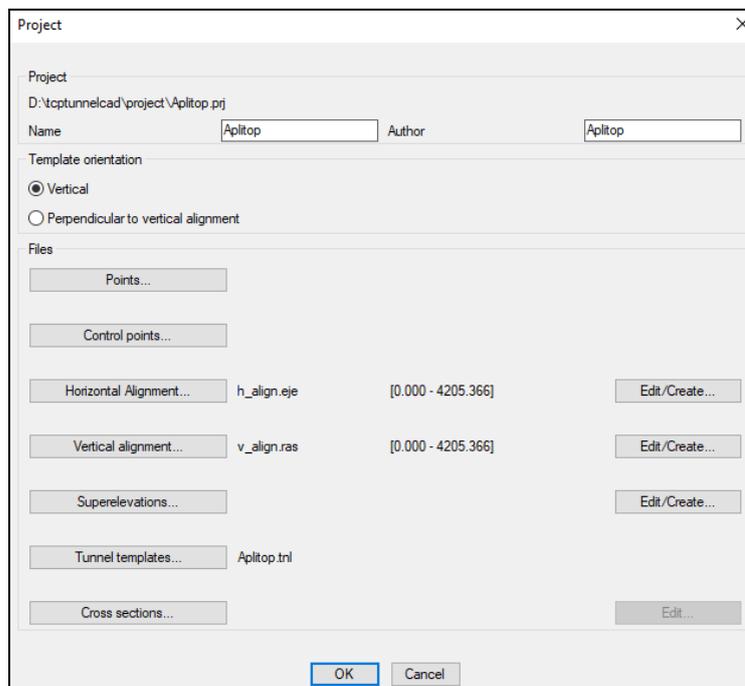

Tunnel tempaltes: Theoretical tunnel templates in propietary format, with ***.tnl** extension, clicking *Tunnel templates…* button. By default, the program will create an empty file of this type.

Superelevations: File in propietary format, with ***.per** extension, clicking *Superelevations…* button. This file is optional and it includes the rotations which will be applied to the tunnel templates.

> **Control points**: File in propietary format, with ***.bse** extension, clicking ***Control points…*** button. This file is optional and it includes the coordinates of the control points which will allow to do the positioning in the field, in the case of using TcpTunnel for total station.

Once the components are selected, ***OK*** button must be clicked to finish the project creation.

3. Tunnel template creation

The program allows one to add to the project one or more theoretical tunnel templates. These ones must be included in a ***.dwg** or ***.dxf** file.
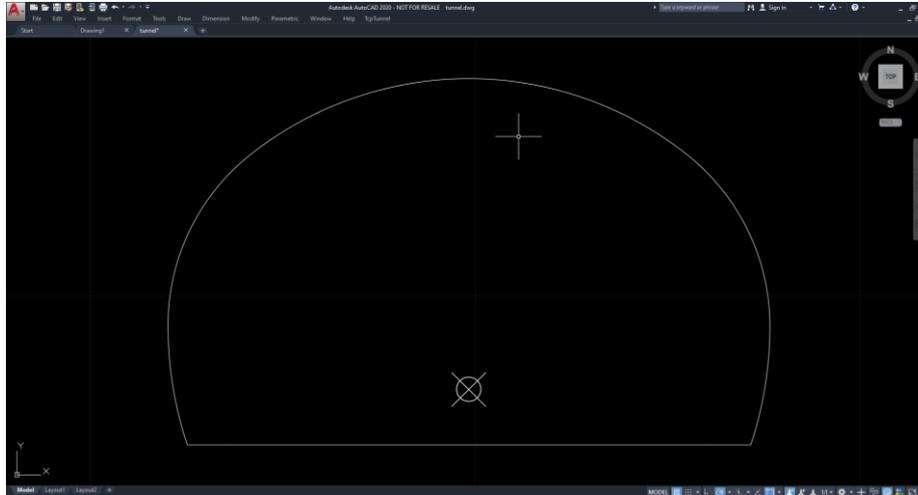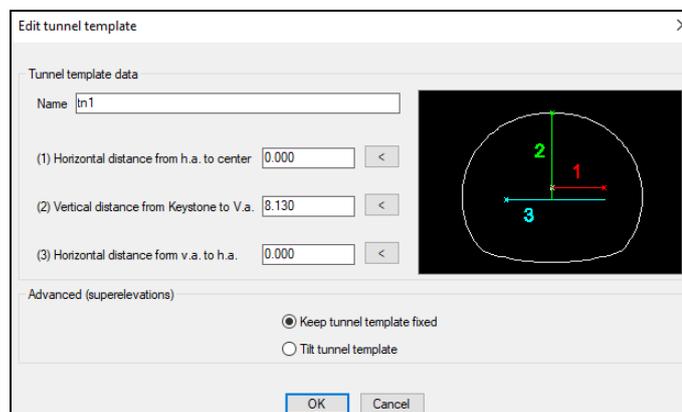

To do this process, once the project is created and the drawing is opened, the command **TcpTunnel > Edit tunnel templates** must be executed.
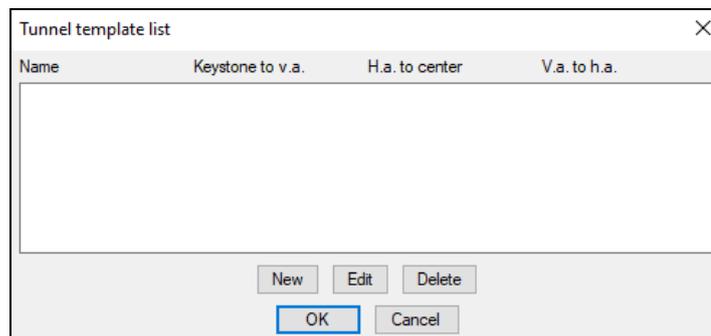
Then, click **_New_** button to add a tunnel template. The program asks for selecting, on the drawing, the polyline which define the tunnel template.

After doing the selection, the following data are requested:
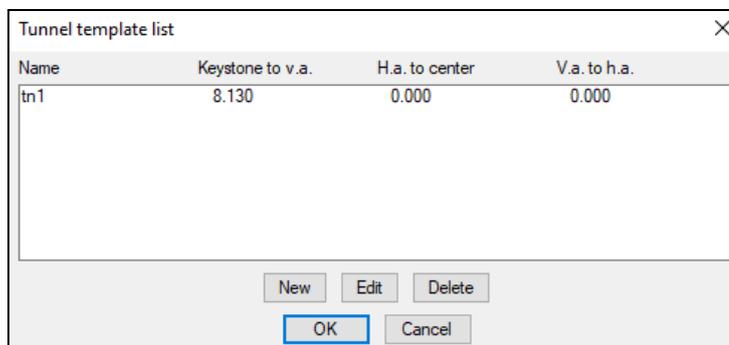
Name of the tunnel template.

Horizontal distance from h.a. to center: Horizontal distance from horizontal alignment to the geometric center of the tunnel template. This point is drawn over the tunnel template when the polyline is selected. If the distance is known, it can be entered manually, otherwise, clicking < button, two points can be selected on the drawing to calculate it automatically.

Vertical distance from keystone to v.a.: Vertical distance from keystone to vertical alignment. Also, it can be entered manually or calculated graphically.

Horizontal distance from v.a. to h.a.: Horizontal distance from horizontal alignment to vertical alignment. As in the two previous options, it can be entered manually or calculated graphically selecting the two points.

Advanced (superelevations): If the project includes superelevation table, the program can rotate the tunnel template using to this table (**tilt tunnel template**) or cut the sidewalls of the tunnel template (**Keep tunnel template fixed**).

Once the data have been entered, *OK* button must be clicked to create the tunnel template.

This one will be added to the list of the project tunnel templates clicking *OK* button.

4. Tunnel template assignments

After creating the tunnel templates, the program must know what tunnel template must be used for each section, along the horizontal alignment. For doing this, the command **TcpTunnel > Tunnel template assignments** must be executed.
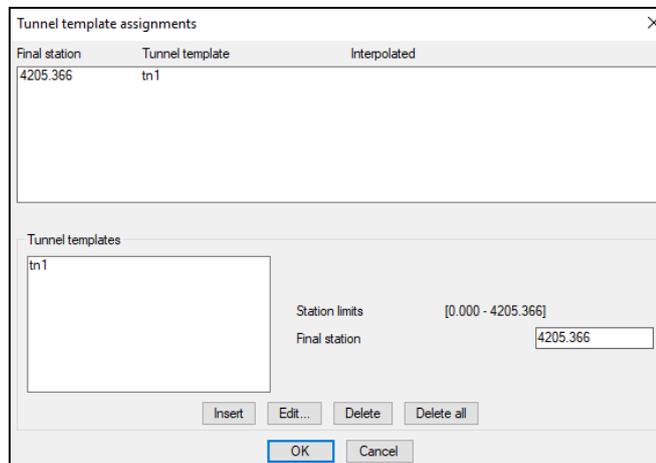
In this window, the tunnel template assignment list is shown together with a section to manage them. By default, the first tunnel template is assigned along the horizontal alignment.

To add a new assignment, the name of the tunnel template must be selected from the list on the left, enter the **_Final station_** and click **_Insert_** button. The initial station of the section is the final station of the previous assignment or the initial station of the horizontal alignment if there's not any assignment.

The program will interpolate automatically the tunnel templates if they have the same number of vertexes and the elements are of the same type (line or curve).
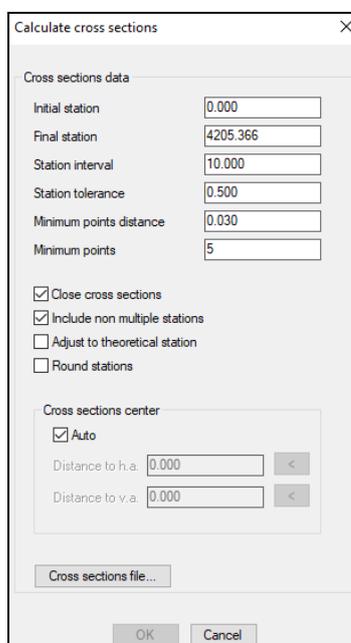
5. Cross-section calculation

After finishing the project definition, it is ready to import a point file and do the cross-section calculation.

First, execute **TcpTunnel > Edit project** command and select the point file.
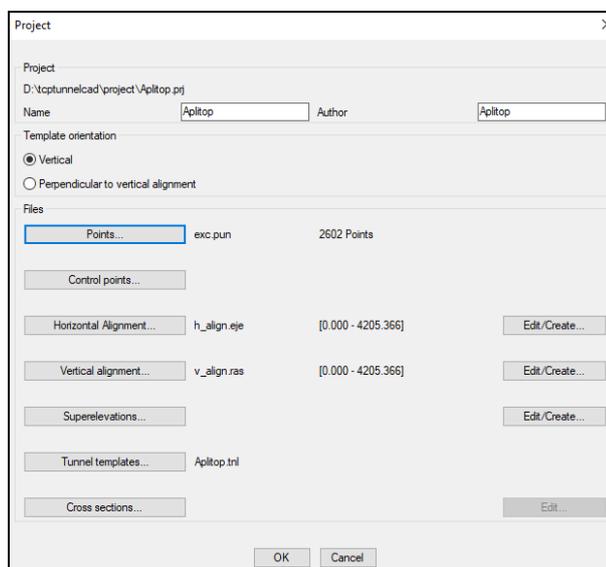
Then, click ***OK*** button and run the command **TcpTunnel > Calculate Cross-sections**.

In this window, the main data to be entered are:

Initial and ***Final stations*** of the point cloud.

Station interval and *tolerance* used to measure the point cloud.

Name of the *Cross-section file* where the data will be stored.

When clicking *OK* button, the program will start analyzing the points and, then, it will generate the cross-sections.
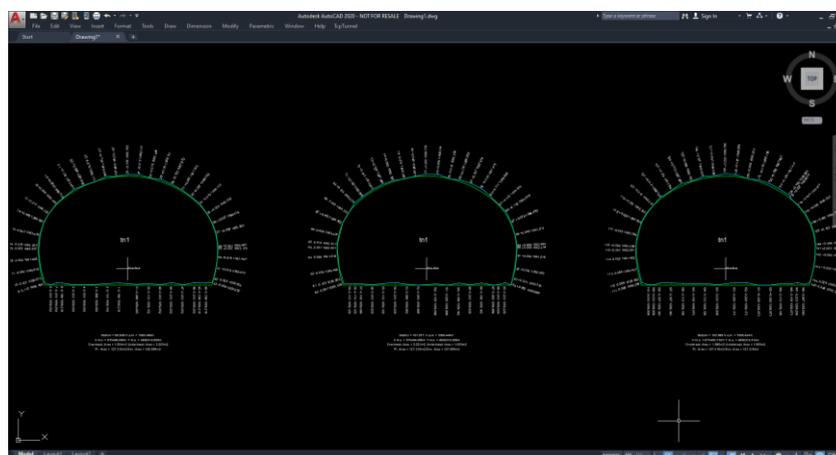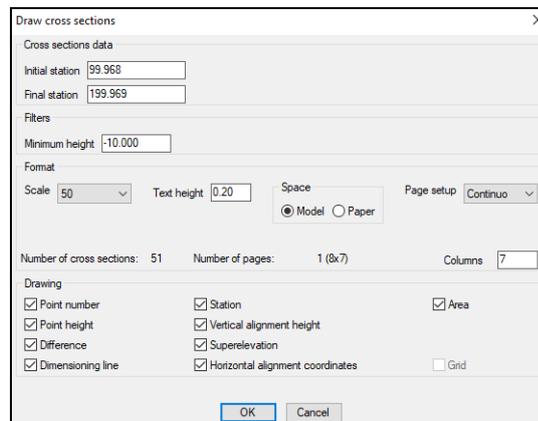
6. Cross-section operations

Most of the application commands require that the cross-section file has been previously created in the project.
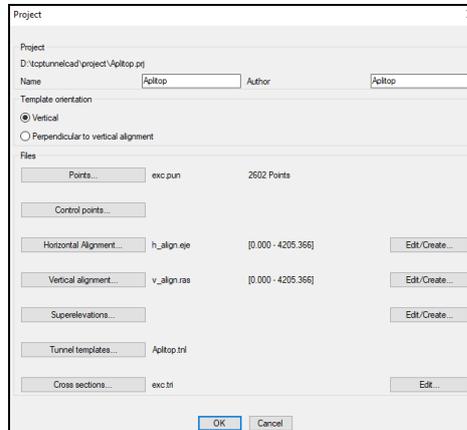
The main commands are shown below:

Cross-section drawing: It draws on CAD, with different formats, the cross-sections calculated. It allows one to configure the elements to draw.

Edit cross-sections: It allows one to modify the cross-sections, adding and removing vertexes with different criteria.
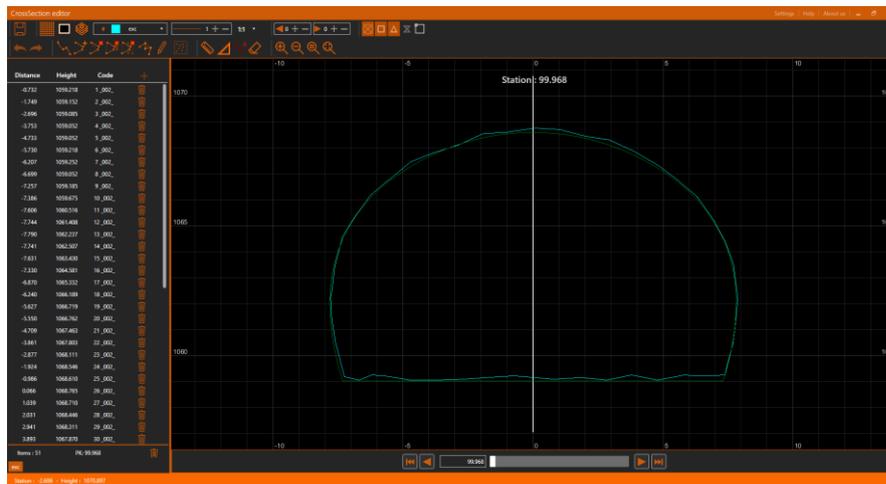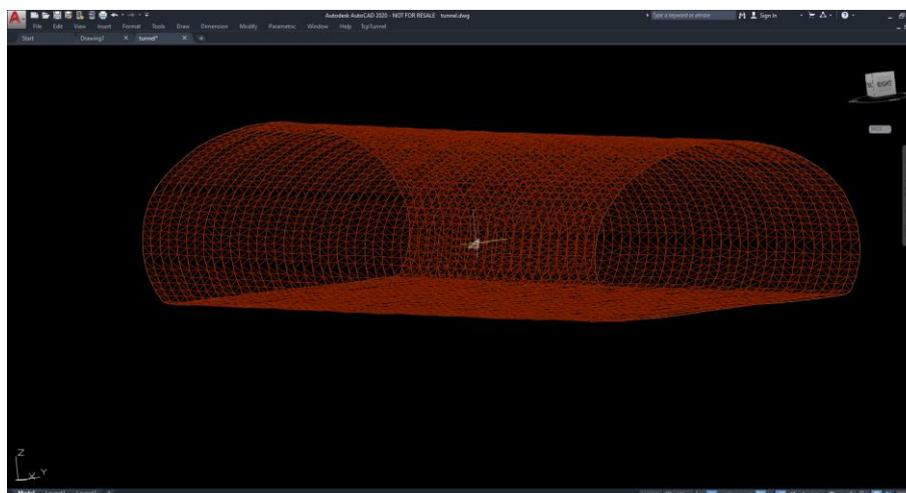

Volume report: It shows an area and volume report of the project cross-sections, within the station range entered.

3D model: It creates a 3D model of the tunnel, allowing one to do a virtual route.

Compare cross-sections: It allows one to compare two cross-section files Permite comparar dos ficheros de perfiles corresponding to different phases of the project.