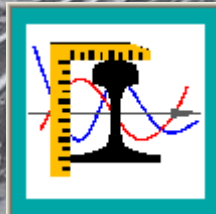


RaiLab Clearance 2010

v.2.5.37

USER MANUAL



Introduction

RaiLab Clearance 2010 is railway aiding design application for analysis of train envelope on a cross-section. It can be used for comprehensive analysis of train positions in relation to each other or additional object. The application allows to measure distances, take into account various tolerances and automatically analyse the whole route.



Main program window

Main window is divided into three parts.

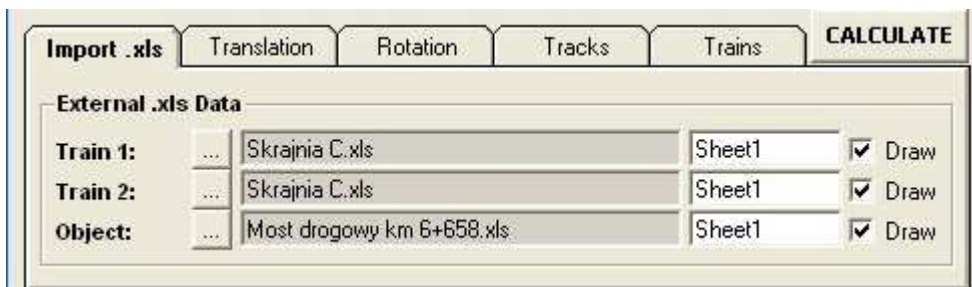
The first part gives access to menu commands.



In the second part the user decides about basic information regarding track position and type of trains.

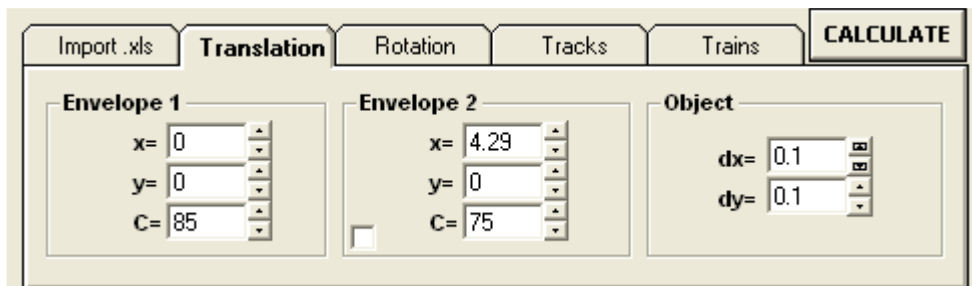
Tab: **Import .xls:**

Allows to import data from Excel file. Before importing the sheet, the user must enter sheet name (here: Sheet1) and then click „...” button.



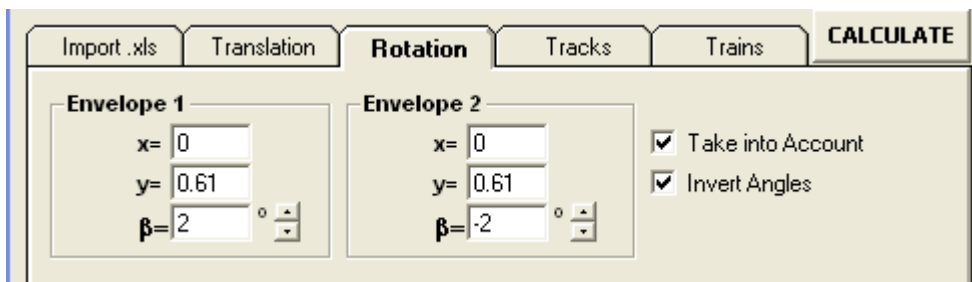
Tab **Translation:**

Here the user defines mutual position of tracks (x, y and cant). It is comfortable to take the level of the first track as $x=0$ and $y=0$ and for the second one as $x=[\text{CL to CL distance}]$ and $y=[\text{difference in track height}]$. Buttons in Object frame are for shifting object position.



Tab **Rotation:**

Here rotation point of train body can be defined (important for some railway administrations). This function may not be included in the analysis.



Tab Tracks:

Allows to define rail gauges. Important tool in case of analysing non-standard tracks.

Track 1:	Track 2:
Track Gauge: 1435 mm	Track Gauge: 1435 mm
Rail CL to CL: 1505 mm	Rail CL to CL: 1505 mm

Tab Trains:

Here length of wagons can be defined. Important only if ET-CT method is used to analyse effect of track curvature.

For Track 1	For Track 2
L= 21.7 m	L= 21.7 m
W= 15.34 m	W= 15.34 m

In the third part of main window the user defines way of curvature analysis, tolerances, measurements and analysis of the whole route.

Tab **Curvature**:

Here horizontal and vertical curvature of tracks can be defined. There are 3 ways to calculate end and centre throws: as a function of radius only, as a function of wagon dimensions and curved radius (ET-CT method) and as a predefined value. To include additional throw from vertical curvature, length of wagon must be given in Trains tab.

The screenshot shows a software interface with four tabs: **Curvature**, **Tolerances**, **Measurements**, and **Route Analysis**. The **Curvature** tab is active and contains two main sections: **Horizontal Curvature of Tracks** and **Vertical Curvature of Tracks**.

Horizontal Curvature of Tracks:

- Take into Account
- Check Outside
- Track 1:**
 - R1 = 500 m
 - End And Centre Throw:
 - $\frac{36000}{R1}$ mm
 - ET = [] m
 - CT = [] m
 - 80 mm
- Track 2:**
 - R2 = 500 m
 - End And Centre Throw:
 - $\frac{36000}{R2}$ mm
 - ET = [] m
 - CT = [] m
 - 90 mm

Vertical Curvature of Tracks:

- Take into Account
- Track 1:**
 - R1 = 6000 m
 - T1 = 0.005 m
- Track 2:**
 - R2 = 6000 m
 - T2 = 0.005 m

Tab Tolerances:

This tab allows to include execution or measurement tolerances of the existing track as well as kinematic envelope tolerances. Lateral, vertical and cant tolerances can be included. Track lateral tolerances can be diversified according to the radius of track curvature.

Curvature	Tolerances	Measurements	Route Analysis
			<input type="checkbox"/> Check Outside
Track Tolerances			
Lateral (+)	dla R<= 2000	35 mm	35 mm
	dla R> 2000	25 mm	25 mm
Vertical (+)		15 mm	15 mm
Cant (+)		10 mm	10 mm
Kinematic Envelope Tolerances			
Lateral (+)		60 mm	60 mm
Vertical (+)		50 mm	50 mm
<input type="checkbox"/> Take into Account		<input type="checkbox"/> Take into Account	

Tab **Measurements**:

This tool is for measuring the distance between points of envelope or between the envelope and an object. Measurement can be done between vertices or perpendicularly from one to the other point of the object being measured. The minimum distance can be also defined by pressing F1 button or choosing the right menu command. The programme will then analyse all possible measurement settings and find minimum distance. If there are many points on envelopes it makes sense to limit measurement points to these ones that matter in this particular case.

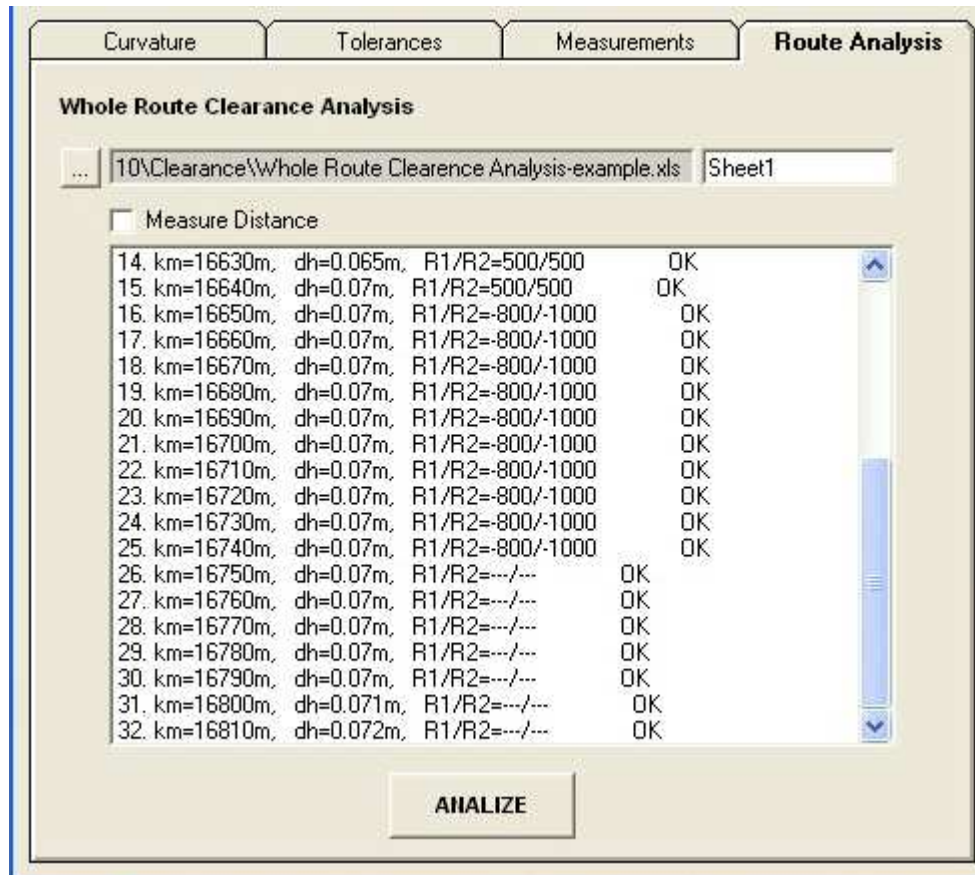
The screenshot shows the 'Measurements' tab of a software interface. It features four tabs at the top: 'Curvature', 'Tolerances', 'Measurements', and 'Route Analysis'. The 'Measurements' tab is selected and contains the following elements:

- Element 1:** Radio buttons for 'Train 1', 'Train 2', and 'Object' (selected). A 'Point' field with the value '8' and a spinner.
- Element 2:** Radio buttons for 'Train 1' (selected), 'Train 2', and 'Object'. A 'Point' field with the value '19' and a spinner.
- Measurement:** Radio buttons for 'Between Vertices' and 'Perpendicular' (selected). A 'Distance:' field with the value '0.644'.
- Measurement Limitations:** A checked checkbox and a table of values for 'Train 1', 'Train 2', and 'Object'.

Element	Train 1	Train 2	Object
Element 1	8		
Element 2	19		
Limitation 1	15	21	
Limitation 2	1	48	
Limitation 3	1	10	

Tab: Route Analysis

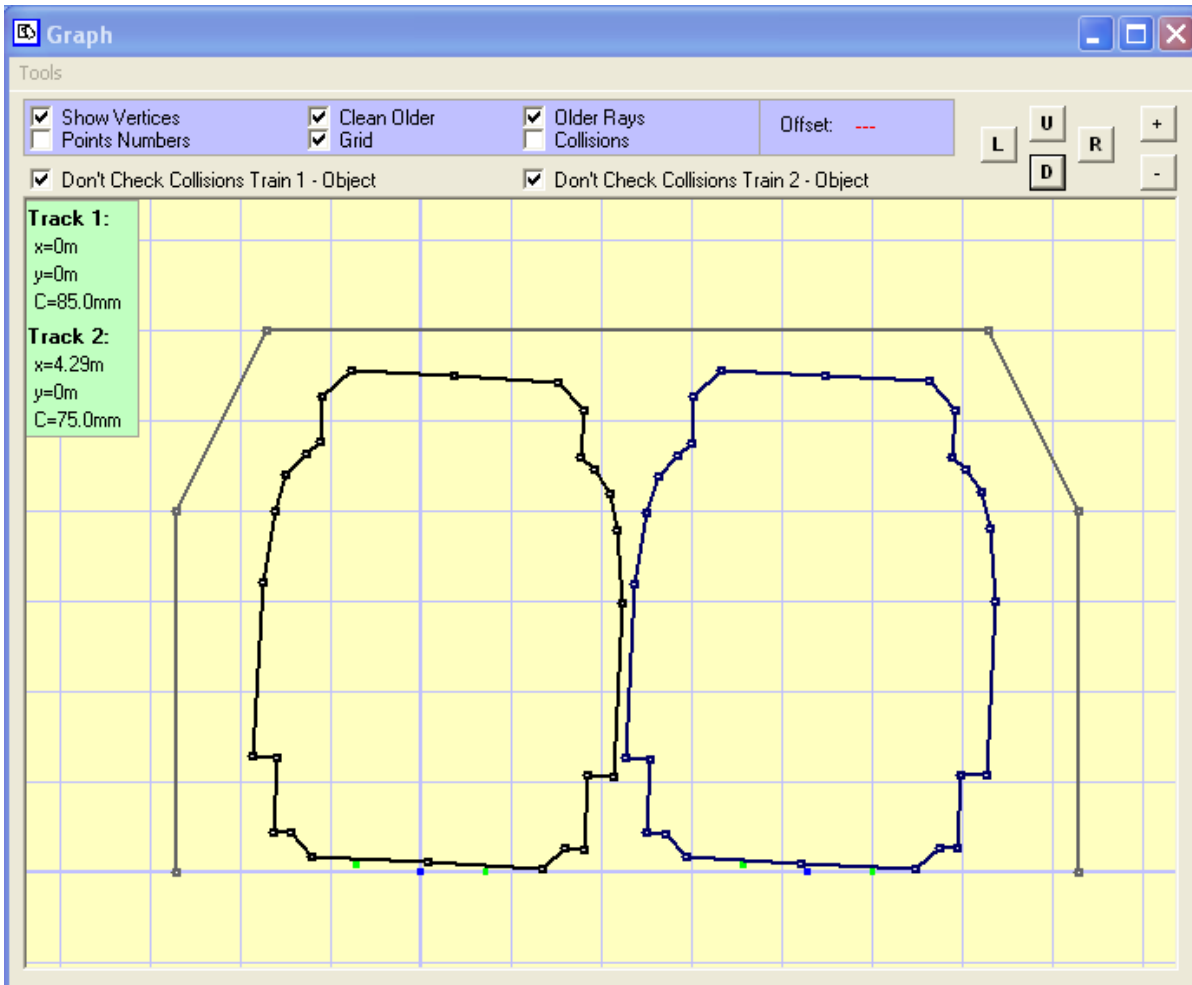
Here the user can enter information about the whole route and analyse clearance automatically. Data must be in *.xls files and include: km, track gauge, level of the first track (first track should be defined as comparative level equal 0), radius of the first track, cant of the first track, level of the second track (difference in height to the first track), radius of the second track, cant of the second track. Measure Distance option can be ticked but it can considerably extend time of the analysis. When the analysis is finished, the following results are shown in the window: km, height difference, track radii and info about envelope collision. This information is helpful for finding particular cross-sections. When one of the rows is clicked, the appropriate cross-section is shown in graphic window.

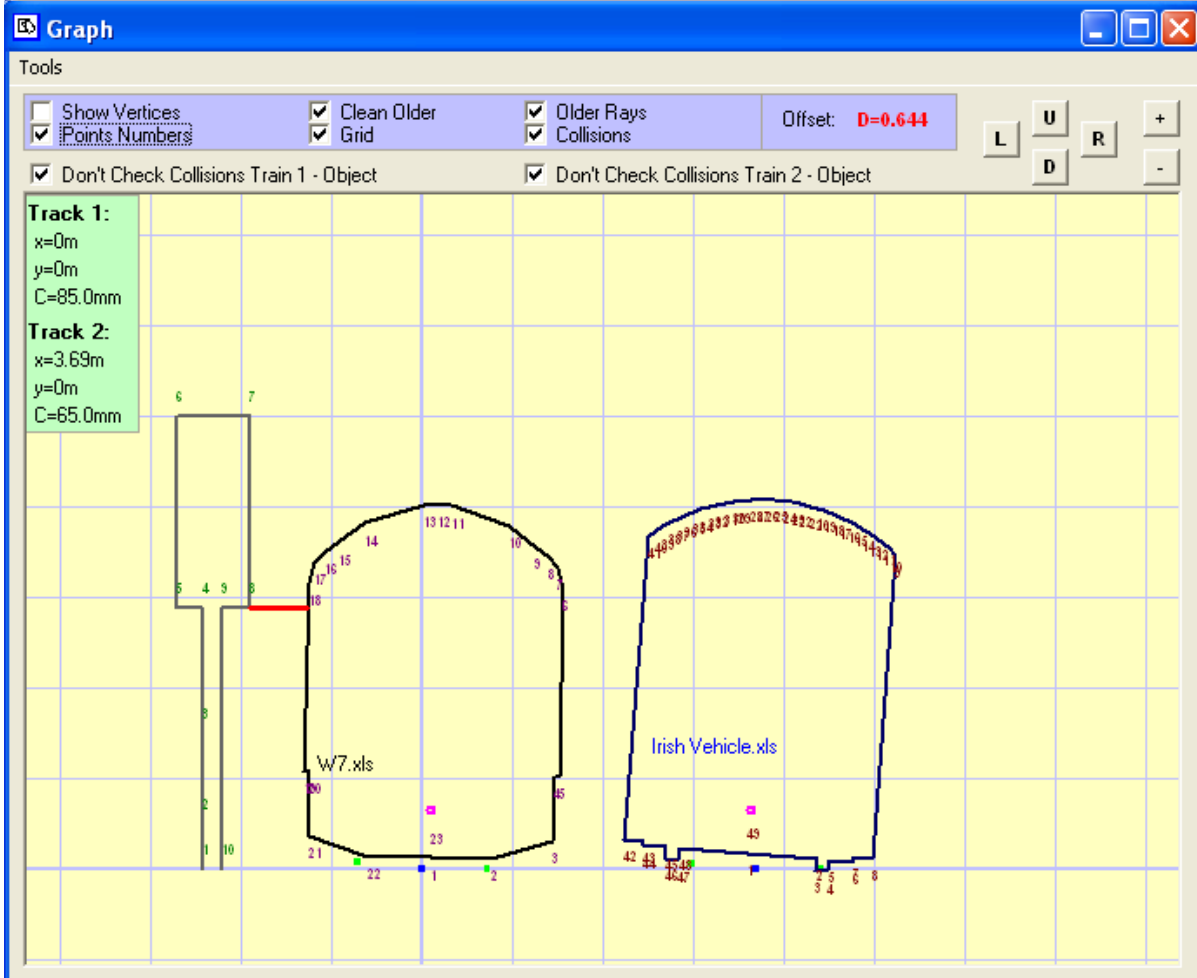
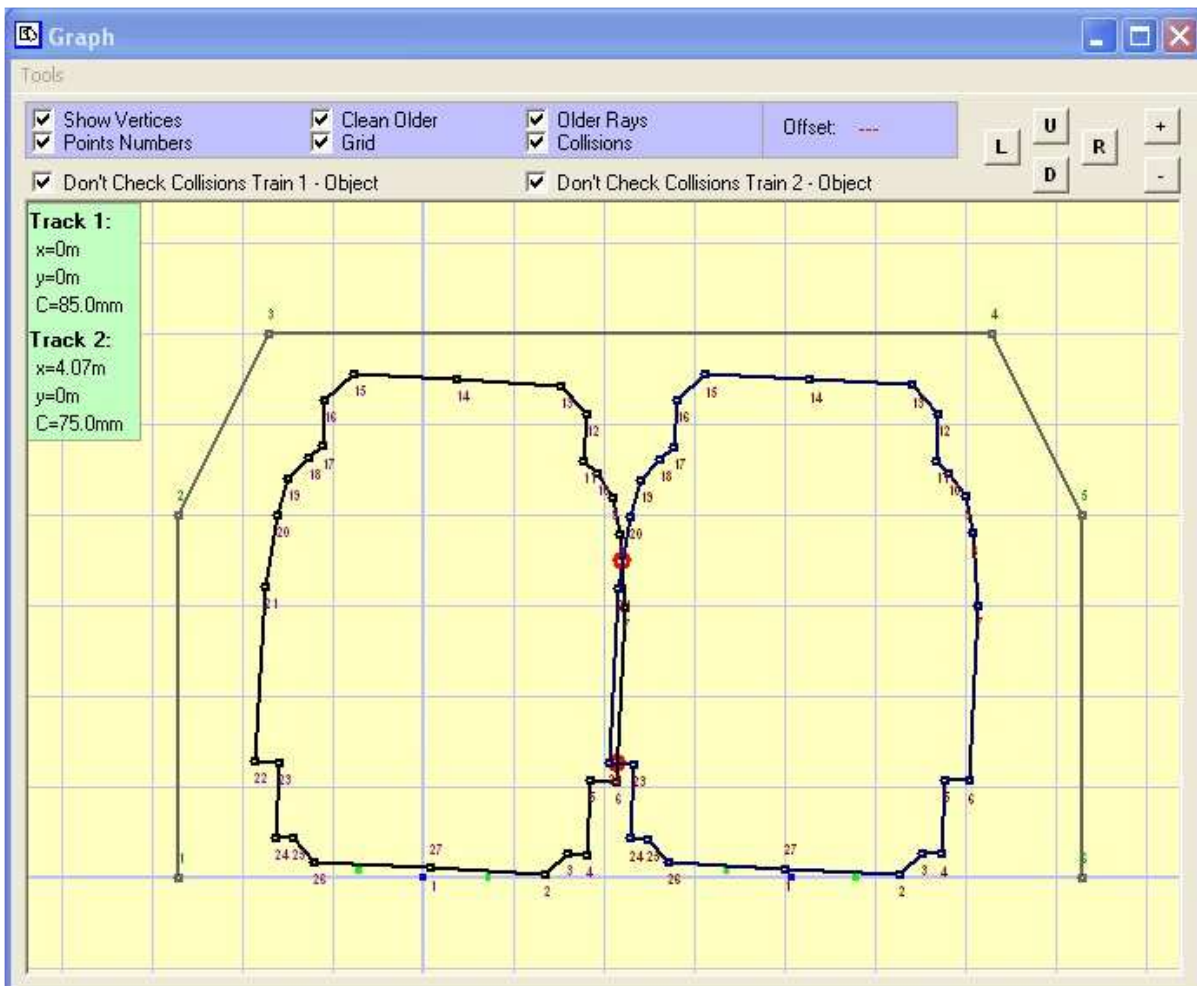


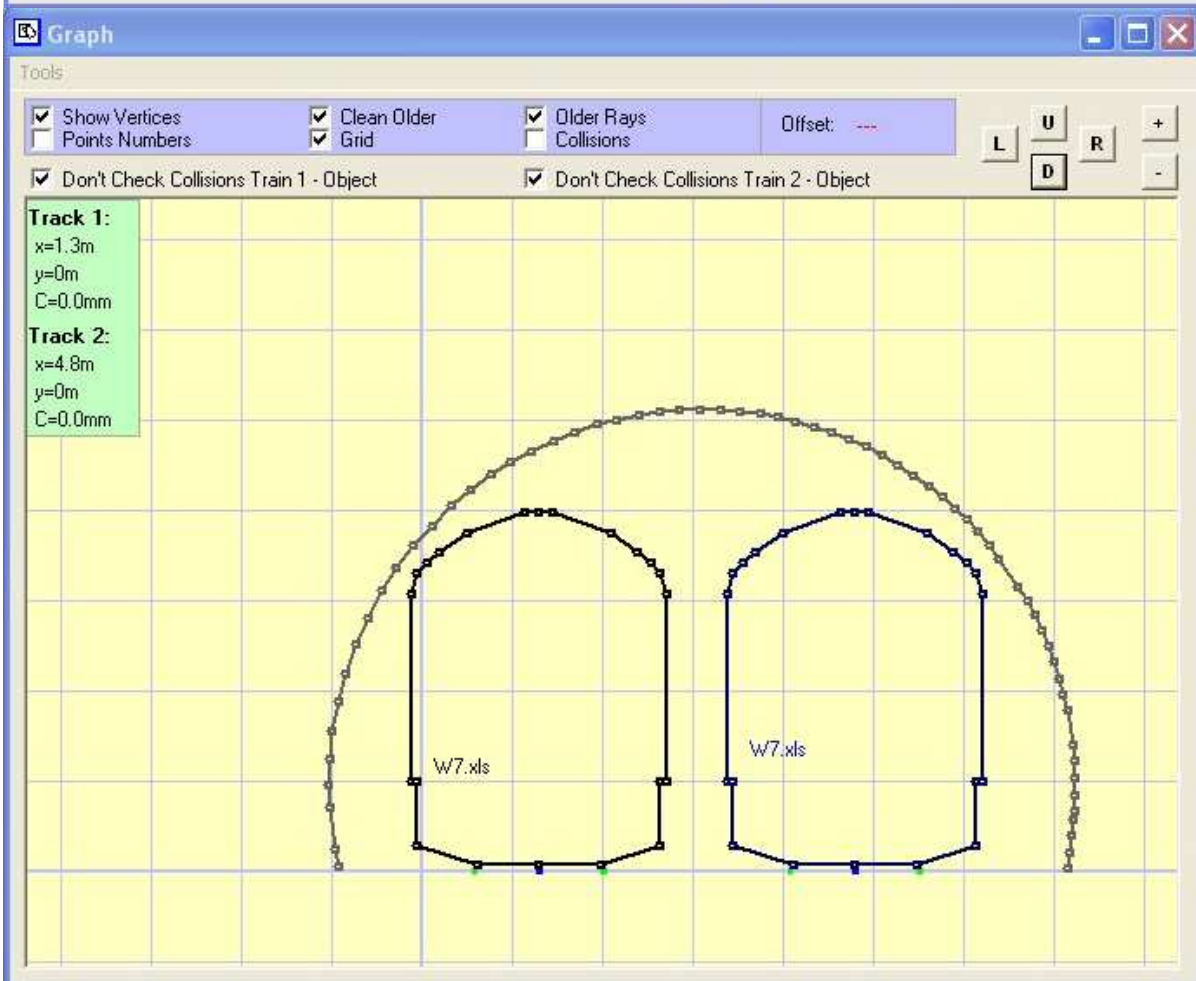
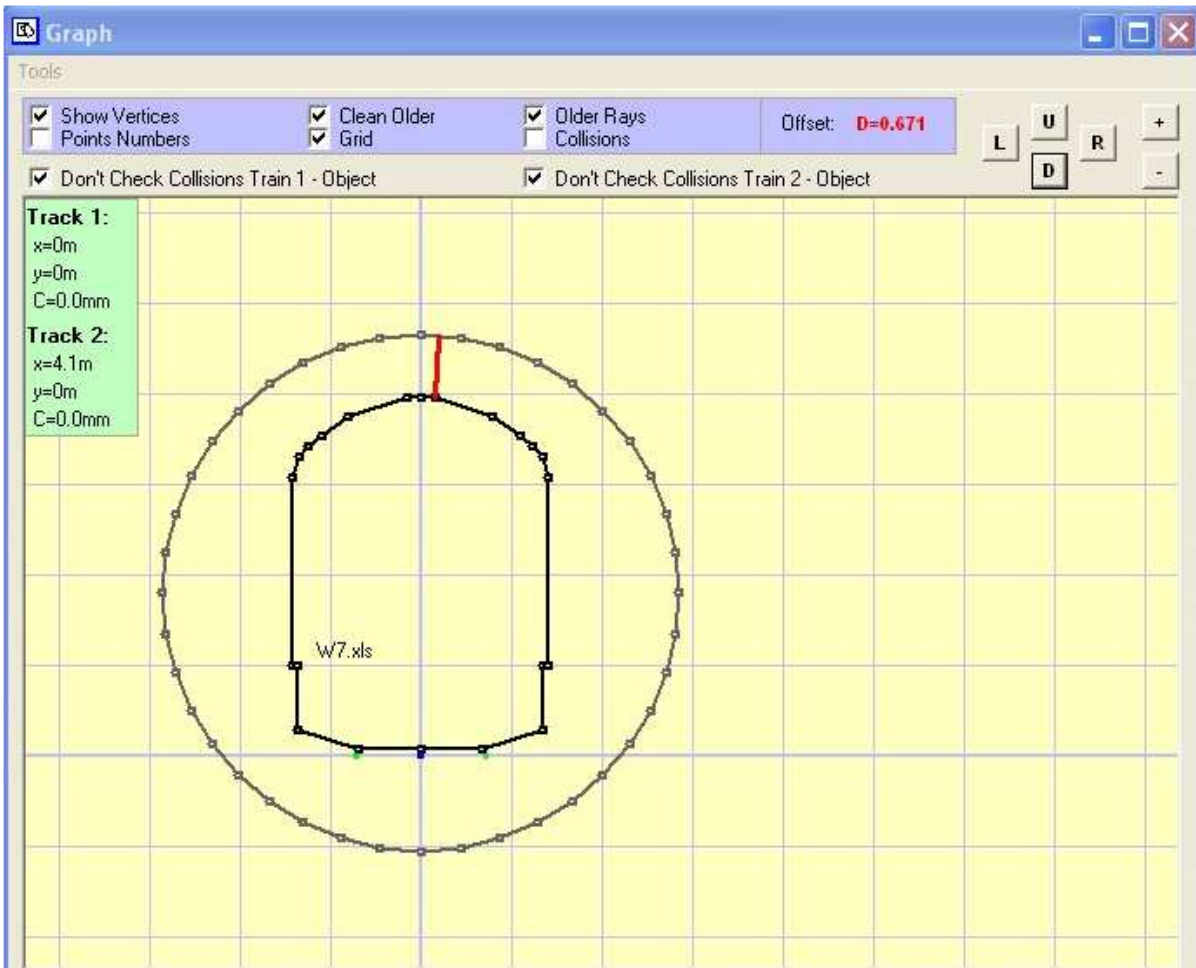
Graph

This window shows outcomes of the analysis. It can be decided if envelope points should be additionally marked with circles and numbered, if previous outcomes should be cleared etc. If Collisions is ticked, additional windows are shown: collision point results and distances between rails.

Here are a few views of graph window:

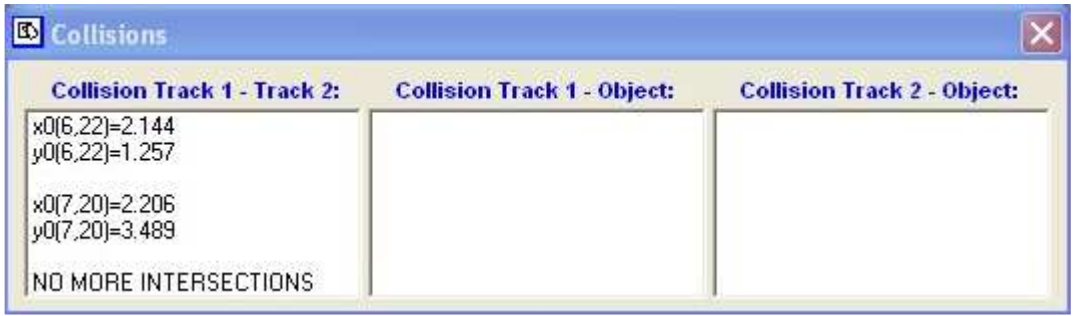






Collisions:

Here co-ordinates of points of intersections are shown.



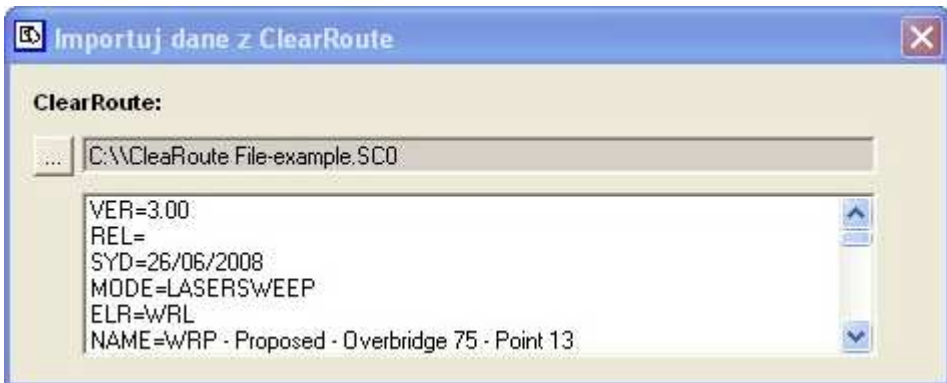
Info:

This window shows distances between rails. For distances between running edges the values without brackets are real distances, while the values in brackets mean distances measured as plan projection.



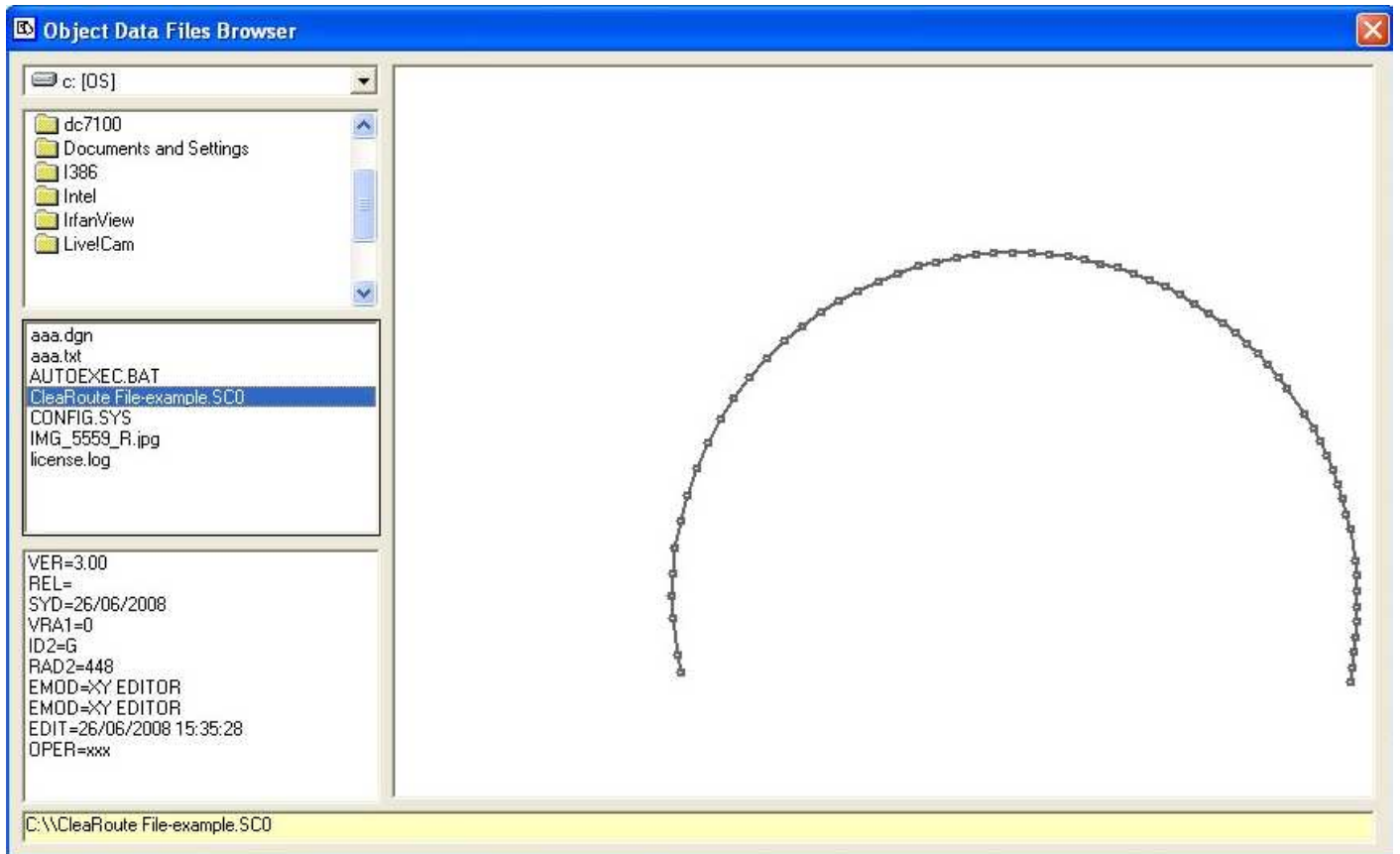
Import data from ClearRoute:

Imports data from *.sco files. Additional data regarding envelope and programme which it was created in are entered in this window. Envelope is shown in graphic window.



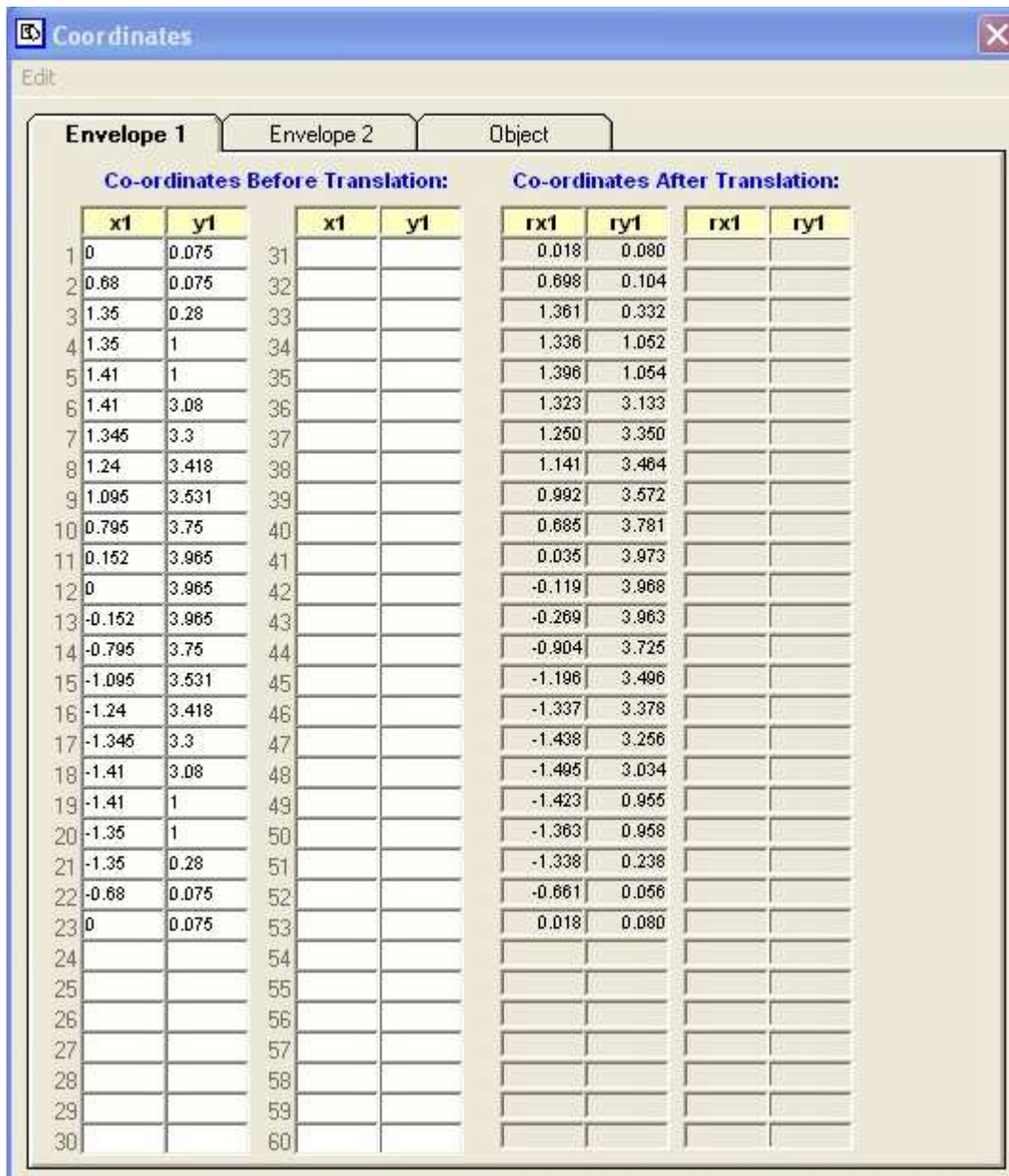
Object Data Files Browser:

Browser for *.sco files. XY data of object outline can be sent for analysis by double clicking a chosen file (here – file sent for analysis is highlighted).



Coordinates:

This tool is to enter and edit data regarding envelopes and objects. It is possible to export these data to MicroStation or AutoCAD.

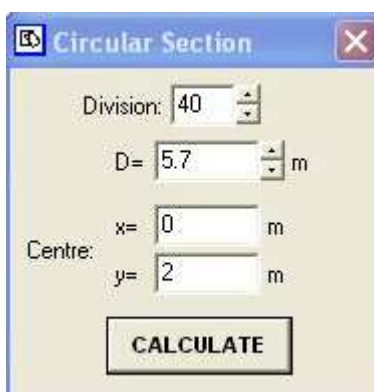


The 'Coordinates' dialog box is titled 'Edit' and contains three tabs: 'Envelope 1', 'Envelope 2', and 'Object'. The 'Envelope 1' tab is active. It displays two columns of data: 'Co-ordinates Before Translation' and 'Co-ordinates After Translation'. Each column has four sub-columns: 'x1', 'y1', 'x1', and 'y1'. The rows are numbered from 1 to 30. The 'Co-ordinates After Translation' column has two sub-columns: 'rx1' and 'ry1'. The data is as follows:

	x1	y1	x1	y1	rx1	ry1	rx1	ry1
1	0	0.075	31		0.018	0.080		
2	0.68	0.075	32		0.698	0.104		
3	1.35	0.28	33		1.361	0.332		
4	1.35	1	34		1.336	1.052		
5	1.41	1	35		1.396	1.054		
6	1.41	3.08	36		1.323	3.133		
7	1.345	3.3	37		1.250	3.350		
8	1.24	3.418	38		1.141	3.464		
9	1.095	3.531	39		0.992	3.572		
10	0.795	3.75	40		0.685	3.781		
11	0.152	3.965	41		0.035	3.973		
12	0	3.965	42		-0.119	3.968		
13	-0.152	3.965	43		-0.269	3.963		
14	-0.795	3.75	44		-0.904	3.725		
15	-1.095	3.531	45		-1.196	3.496		
16	-1.24	3.418	46		-1.337	3.378		
17	-1.345	3.3	47		-1.438	3.256		
18	-1.41	3.08	48		-1.495	3.034		
19	-1.41	1	49		-1.423	0.955		
20	-1.35	1	50		-1.363	0.958		
21	-1.35	0.28	51		-1.338	0.238		
22	-0.68	0.075	52		-0.661	0.056		
23	0	0.075	53		0.018	0.080		
24			54					
25			55					
26			56					
27			57					
28			58					
29			59					
30			60					

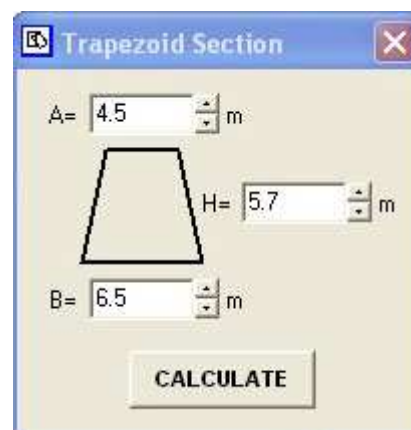
Circular Section and Trapezoid Section:

Can be used to generate cross section of tunnels etc.



The 'Circular Section' dialog box has the following fields and a button:

- Division: 40
- D= 5.7 m
- Centre: x= 0 m, y= 2 m
- CALCULATE button



The 'Trapezoid Section' dialog box has the following fields, a diagram, and a button:

- A= 4.5 m
- H= 5.7 m
- B= 6.5 m
- Diagram of a trapezoid with top width A, bottom width B, and height H.
- CALCULATE button