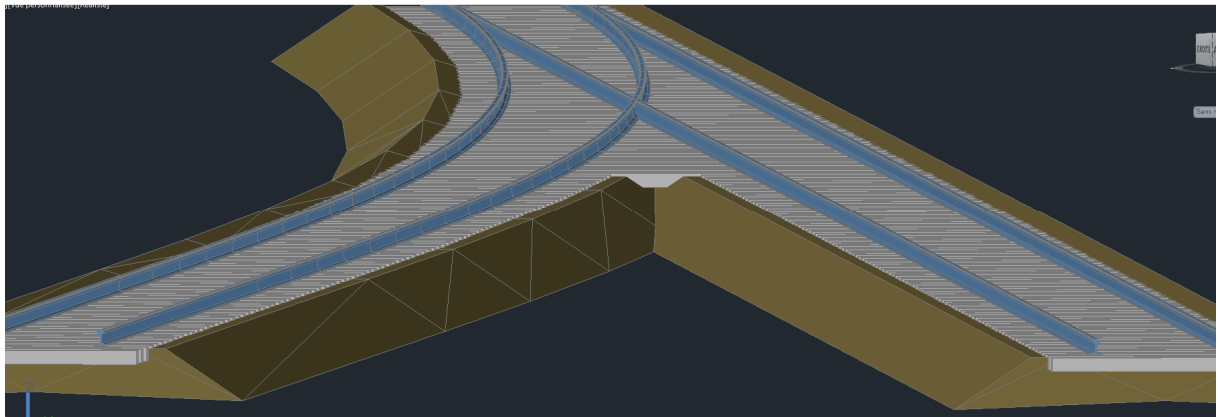


Release 10.2



The 2D/3D railroad design software

SoftLine V10 - Presentation -

Presentation

- SoftLine is distributed by OTP, a CAD application design specialist.
- SoftLine is an application that is entirely dedicated to designing **2D and 3D** rail projects.
- Within AutoCAD or Bricscad, SoftLine lets you design all kinds of rail lines (Train, Metro, Tram), automatically generating tracks, longitudinal profiles, cross profiles and quantities, all in **multi-route** mode.
- SoftLine automatically generates the **digital mock-up** by reading the project data. (Rails, ballast, sleepers, formations, DTMs and earthwork)
- All of the objects generated by SoftLine are non-proprietary DWG entities that are easily exportable.
- Softline support **LandXML** and is « **IFC Rail Ready** »
- Managing turnouts is simple, fully customisable and does not require a library of blocks. Any turnout definition can be created by the user. Turnouts can be drawn in 2D or 3D.
- Thanks to its innovative design, SoftLine does not require an outside database nor is there any need to first build-up typical profiles.
- SoftLine is dynamic: Even without a typical profile, any change made to any data automatically updates the entire project.
- Its interface is simple and intuitive. All of the data collected can be numerical or graphical.
- SoftLine is fully customisable and is configurable project by project. (For language, turnout types, typical blocs, dimensioning, etc.)

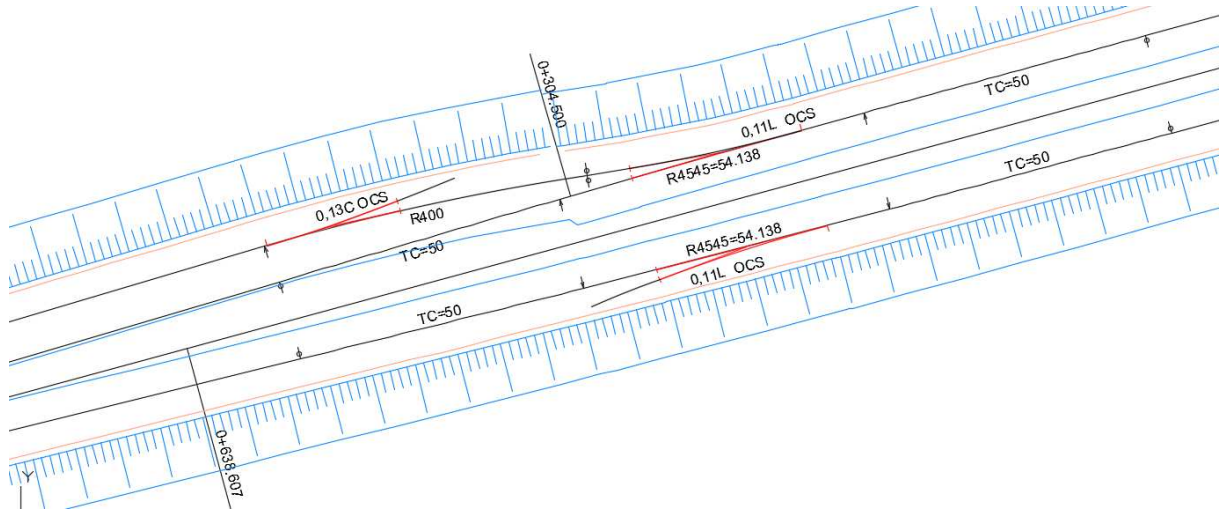
Compatibility

- SoftLine V10 is compatible with Windows 7 to Windows 10.
- SoftLine runs on AutoCAD 2015 to 2022 64 bit versions and on BricsCAD V18, 19, 20 and 22.1 pro 64 bits.
- Available in English and French language versions.

SoftLine V10 - Presentation -

Track alignment

- A complete set of location programs lets you automatically locate trace elements with or without clothoid connections:



- Subsequent modification of the curve radius is possible with automatic clothoid relocation.
- Configuring the dimensioning text for every kind of element.
- Automatically updating the horizontal alignment after a change of scale.
- The ability to use all of the AutoCAD commands on trace elements.
- Dimensioning is possible for every curve, configurable by table or listing showing all of the geometric data for the curve and its framing clothoids as well as the safety characteristics (cant, insufficiency, insufficiency variation, etc.) i.e. a possible total of 40 parameters per curve.

SoftLine V10 - Presentation -

Design checking

- A design checking function, run beforehand or afterwards, is present in the form of a palette that allows the user to check compliance with comfort and safety rules, configurable by type of traffic:

CURVES SUPERVISOR

Speed

350

Km/h

Radius

4500

m

Cant

180

mm

✓

Theoretical cant

323 mm

Cant insufficiency

143 mm

⚠

Cant excess

0 mm

✓

Lateral acceleration

0.93 m/s²

Clothoid length

360 m

Cant variation

0.50 mm/m

✓

Cant insufficiency

39 mm/s

⚠

Cant excess variation

0 mm/s

✓

Calculated K coefficient

810000

Traffic

☒ HSR

☐ Standard

☐ Freight

☐ Metro

☐ Tramway

Legend:

⚠

 Exceeding of the standard limits

✗

 Exceeding of the exceptional limits

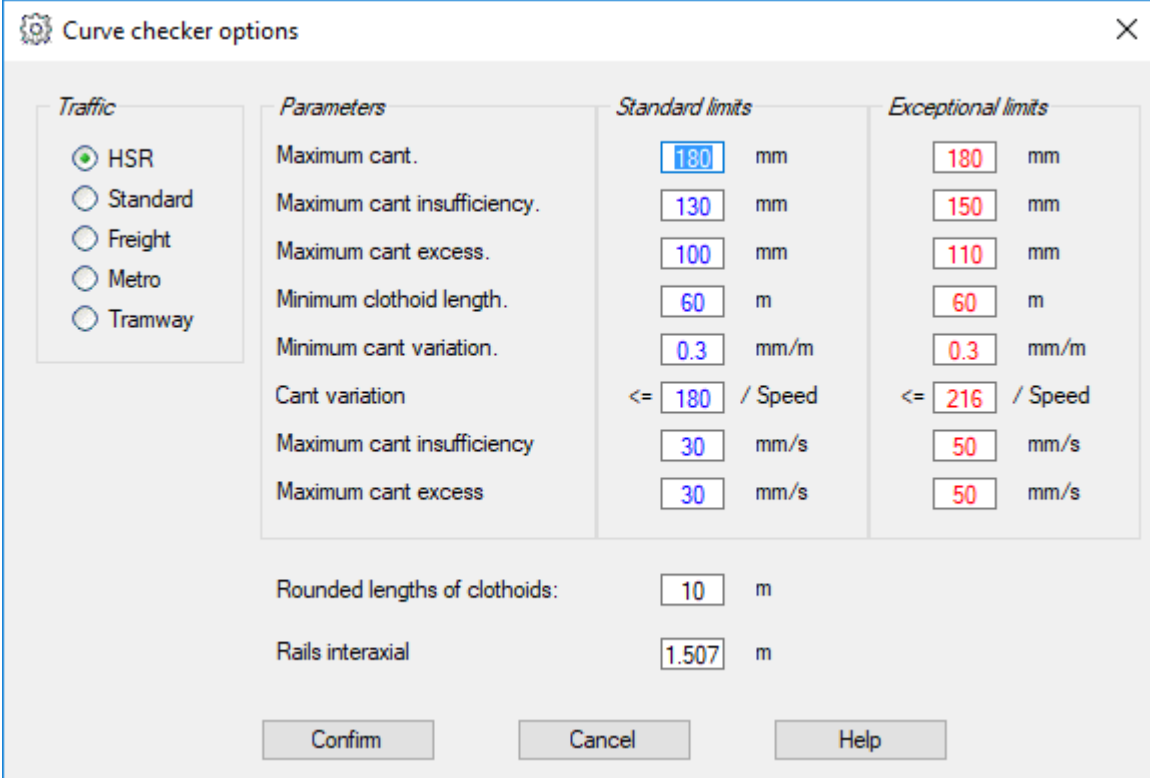
⚙

 Parameters

SoftLine®

SoftLine V10 - Presentation -

- Configuring safety and comfort standards by type of traffic:



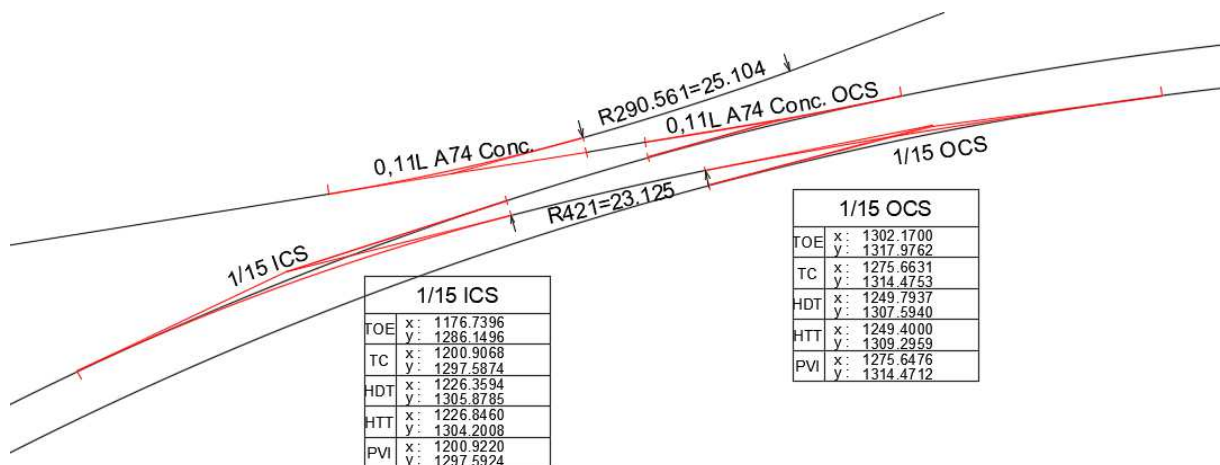
The dialog box titled "Curve checker options" contains a "Traffic" section with radio buttons for HSR (selected), Standard, Freight, Metro, and Tramway. It features a table with "Parameters" and their corresponding "Standard limits" and "Exceptional limits". The "Standard limits" column includes input fields for values like 180, 130, 100, 60, 0.3, and 30, with units such as mm, m, mm/m, and mm/s. The "Exceptional limits" column shows values like 180, 150, 110, 60, 0.3, and 50. Below the table, there are input fields for "Rounded lengths of clothoids" (10 m) and "Rails interaxial" (1.507 m). At the bottom are "Confirm", "Cancel", and "Help" buttons.

Traffic	Parameters	Standard limits	Exceptional limits
<input checked="" type="radio"/> HSR <input type="radio"/> Standard <input type="radio"/> Freight <input type="radio"/> Metro <input type="radio"/> Tramway	Maximum cant.	180 mm	180 mm
	Maximum cant insufficiency.	130 mm	150 mm
	Maximum cant excess.	100 mm	110 mm
	Minimum clothoid length.	60 m	60 m
	Minimum cant variation.	0.3 mm/m	0.3 mm/m
	Cant variation	≤ 180 / Speed	≤ 216 / Speed
	Maximum cant insufficiency	30 mm/s	50 mm/s
	Maximum cant excess	30 mm/s	50 mm/s
Rounded lengths of clothoids:		10 m	
Rails interaxial		1.507 m	

Confirm Cancel Help

Turnouts

- Automatically locating straight or curved turnouts.
- Automatically locating cross-overs on curves.
- Allowing for common sleeper lengths after the heel.
- Support for a turned track output on a curve, straight line or counter-curve.
- Support for placing curved turnouts with cant or counter-cant.
- Managing Tangent, Intersecting and Symmetrical turnouts.
- Managing crossings and double crossing switches.
- Automatically dimensioning turnouts on the plan view.
- Summarizing turnouts on a listing.
- Integrating turnouts into routes.
- Automatically marking turnouts on longitudinal profiles.
- Handling turnouts on cross profiles.
- Fully configurable turnout creation and modification without the need for a block library.
- Customising turnout drawings.



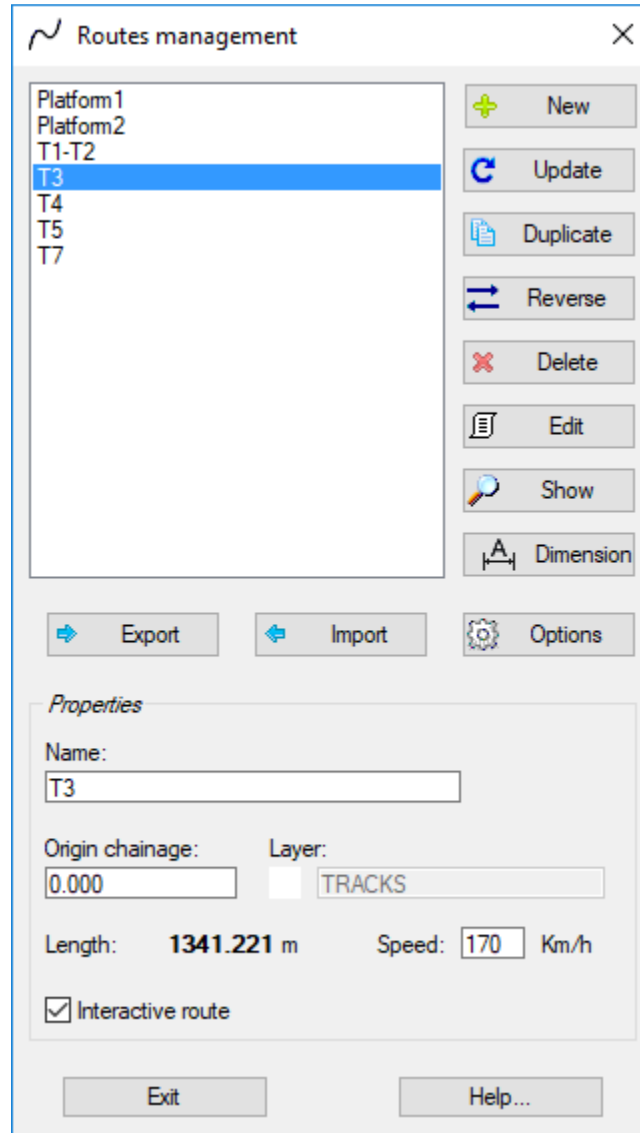
Adding or modify a customized turnout is quiet easy:

Turnout settings										
Label	L1	L2	L3	OCR	OCL	OCCL	SOL	Angle	Type	
0,11C U50 Wood	12.326	15.824	15.824	210	6.9	0	8.7	6.97477600	SEC	+
190-1:9	14.06	14.06	14.06	253.858	4.051	300	11	6.97477600	SEC	-

Output Curve (Length and Radius), Output Counter-Curve (Length and Radius) can be defined.

Routes

- Automatically creating routes comprising all kinds of geometric elements (alignments, clothoids, curves and turnouts) whether contiguous or tangent A drawing may contain an unlimited number of routes:



- Exports in LandXML format
- Importing routes between DWG files.
- Duplicating routes to facilitate the creation of longitudinal profile variations.
- Reversing the route direction.
- Dynamically managing the origin KM point.
- The ability to automatically update longitudinal profile chainages if the trace is changed
- The ability to directly create routes from topographical readings of (2D or 3D) rail strings
- The ability to create routes from any dwg drawing.

Editing routes

Seven edit types on text or Excel files for XYZ coordinates:

1. Axis calculation: The start and end points for every element with the length, cumulative length, centre and radii of the curves and track turnout tags.
2. Sequencing: Calculates a point based on a given constant step with an indication of the chainage and the X, Y, Z coordinates for each point.
3. Sequencing + Axis calculation: The same processing as the "Sequencing" function completed with axis calculation information.
4. Rails and ballast: Sequencing based on a given constant step with an indication of the chainage, route X, Y, Z coordinates, levels of each rail and the ballast heights under every rail. On single or double track lines. (Equivalent to PL92)
5. Projecting a polygonal: Calculates the transverse and level offsets between the route and a polygonal in the form of a 2D or 3D polyline: (E.g. for raising a track)
6. Full listing with sequencing based on a given constant step, comprising all of the characteristic points for the horizontal alignment and the longitudinal profile, the tangent vertexes, the nil slope points, the NG levels and the rail levels. (Equivalent to PL90)
7. Curve parameters: Generates the geometric characteristic set and parameters for every curve.

SoftLine V10 - Presentation -

Example of an output to Excel (PL90):

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	Transitions.dwg																						
2	09/07/2019																						
3	Full listing																						
4	Route: DV																						
5	From PK 0+000.000 To PK 0+554.353																						
6	Ref Level: Low rail																						
7																							
8																							
9																							
10																							
11	PK	X	Y	Z	Levels	NG	Cant (mm)	Rails levels			Vertical alignment			Horizontal alignment			Particular points						
12	0+000.000	123.5239	84.8194	43.071	43.071		0	43.071	43.071	43.071	43.071	43.071											
13	0+000.000	123.5239	84.8194	43.071	43.071		0	43.071	43.071	43.071	43.071	43.071							CC				
14	0+000.001	123.5239	84.8194	43.071	43.071		0	43.071	43.071	43.071	43.071	43.071							SL	154.353			
15	0+020.000	141.7645	93.0353	43.361	43.361		0	43.361	43.361	43.361	43.361	43.361											
16	0+040.000	159.9990	101.2512	43.651	43.651		0	43.651	43.651	43.651	43.651	43.651											
17	0+060.000	178.2336	109.4670	43.941	43.941		0	43.941	43.941	43.941	43.941	43.941											
18	0+080.000	196.4682	117.6829	44.231	44.231		0	44.231	44.231	44.231	44.231	44.231											
19	0+100.000	214.7027	125.8988	44.521	44.521		0	44.521	44.521	44.521	44.521	44.521											
20	0+120.000	232.9373	134.1147	44.811	44.811		0	44.811	44.811	44.811	44.811	44.811											
21	0+140.000	251.1719	142.3305	45.101	45.101		0	45.101	45.101	45.101	45.101	45.101											
22	0+154.353	264.2576	148.2265	45.309	45.309		0	45.309	45.309	45.309	45.309	45.309							TC	100.000			
23	0+160.000	283.4065	150.5463	45.331	45.331		8	45.405	45.337	45.336	45.366	45.366											
24	0+180.000	287.6446	158.7537	45.661	45.661		36	45.744	45.708	45.705	45.663	45.663											
25	0+200.000	305.8572	166.3300	45.971	45.971		64	46.084	46.020	46.013	45.943	45.943											
26	0+220.000	324.1744	175.0506	46.261	46.261		32	46.423	46.331	46.322	46.230	46.230											
27	0+240.000	342.4863	183.0912	46.551	46.551		120	46.763	46.643	46.631	46.511	46.511											
28	0+254.353	355.6562	188.7563	46.759	46.759		140	47.007	46.867	46.852	46.712	46.712							CU	300.000	-300.000		
29	0+260.000	360.8450	191.0271	46.841	46.841		140	47.089	46.943	46.934	46.794	46.794											
30	0+272.856	372.6725	195.0645	47.027	47.027		140	47.275	47.135	47.120	46.980	46.980							CS	148.500	14.50	-3000.000	
31	0+280.000	379.2549	198.8420	47.122	47.122		140	47.370	47.230	47.215	47.075	47.075											
32	0+300.000	397.7165	206.5341	47.296	47.296		140	47.546	47.406	47.391	47.251	47.251											
33	0+316.352	412.8469	212.7316	47.342	47.342		140	47.590	47.450	47.436	47.296	47.296							NSP		0.00	-3000.000	
34	0+320.000	416.2290	214.1028	47.340	47.340		140	47.588	47.448	47.433	47.293	47.293											
35	0+340.000	434.7916	221.5480	47.249	47.249		140	47.437	47.297	47.282	47.142	47.142											
36	0+347.106	441.3963	224.9633	47.185	47.185		140	47.433	47.293	47.278	47.138	47.138							PVI		-10.25	-3000.000	
37	0+360.000	453.4033	228.9632	47.025	47.025		140	47.273	47.133	47.118	46.978	46.978											
38	0+380.000	472.0635	236.0663	46.867	46.867		140	46.915	46.775	46.760	46.620	46.620											
39	0+400.000	490.7712	243.1867	46.716	46.716		140	46.424	46.284	46.269	46.129	46.129											
40	0+420.000	509.5257	250.0863	45.551	45.551		140	45.739	45.659	45.645	45.505	45.505											
41	0+421.356	510.7985	250.5527	45.505	45.505		140	45.753	45.613	45.598	45.458	45.458							CC/CS		-35.00	-35.00	
42	0+440.000	528.3260	256.3067	44.852	44.852		140	45.100	44.960	44.946	44.806	44.806											
43	0+460.000	547.1714	263.6056	44.152	44.152		140	44.400	44.260	44.246	44.106	44.106											
44	0+480.000	566.0611	270.7168	43.452	43.452		140	43.700	43.560	43.546	43.406	43.406											

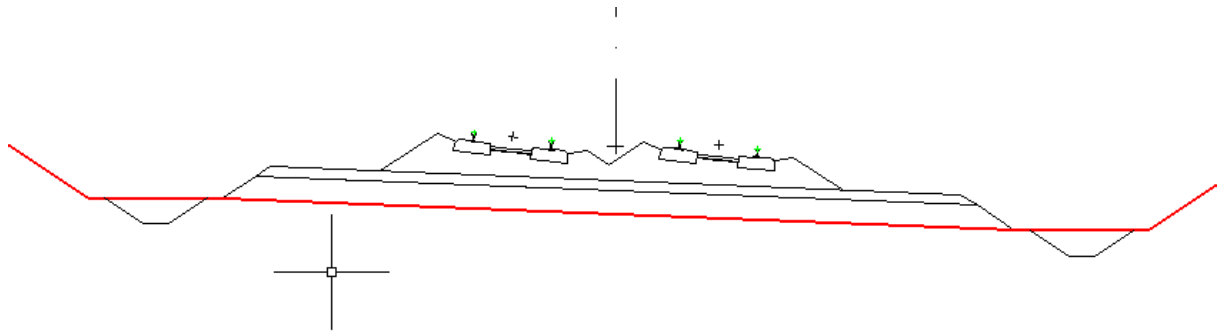
Example of an output to Excel (PL92):

A		B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	
3		Rails and ballast		Slope unit : %															
4		Route: DV		Ballast unit: cm															
5		From KP 0+000.000 To KP 0+554.353		Cant unit : mm															
6		Ref Level: Low rail																	
General data				Track 1						Formation or Structure Extras					Track 2				
Label	Chainage	X	Y	Z Project	Cant	Left rail		Right rail		Left slope	Sommet (Z'')	Lateral Gap	Right Slope	Left rail		Right rail			
						Ballast wid.	Z Rail	Ballast wid.	Z Rail					Ballast wid.	Z Rail	Ballast wid.	Z Rail		
CC/CR	0+000.000	123.530	84.819	43.071	0	36	43.071	30	43.071	0.04	42.421	0.000	-0.04	30	43.071	36	43.071		
	0+000.000	123.530	84.819	43.071	0	36	43.071	30	43.071	0.04	42.421	0.000	-0.04	30	43.071	36	43.071		
	0+000.001	123.530	84.820	43.071	0	36	43.071	30	43.071	0.04	42.421	0.000	-0.04	30	43.071	36	43.071		
	0+020.000	141.765	93.035	43.361	0	36	43.361	30	43.361	0.04	42.711	0.000	-0.04	30	43.361	36	43.361		
	0+040.000	159.999	101.251	43.651	0	36	43.651	30	43.651	0.04	43.001	0.000	-0.04	30	43.651	36	43.651		
	0+060.000	178.234	109.467	43.941	0	37	43.941	31	43.941	0.04	43.287	0.000	-0.04	31	43.941	37	43.941		
	0+080.000	196.468	117.683	44.231	0	39	44.231	34	44.231	0.03	43.527	0.000	-0.03	34	44.231	39	44.231		
S-STR	0+098.742	213.556	125.382	44.502	0	41	44.502	38	44.502	0.02	43.752	0.000	-0.02	38	44.502	41	44.502		
	0+100.000	214.703	125.899	44.521	0	41	44.521	38	44.521	0.02	43.771	0.000	-0.02	38	44.521	41	44.521		
	0+120.000	232.937	134.115	44.811	0	41	44.811	38	44.811	0.02	44.061	0.000	-0.02	38	44.811	41	44.811		
	0+140.000	251.172	142.331	45.101	0	41	45.101	38	45.101	0.02	44.359	0.000	-0.02	38	45.101	41	45.101		
SL/TC	0+154.353	264.258	148.227	45.309	0	41	45.309	38	45.309	0.02	44.561	0.000	-0.02	38	45.309	41	45.309		
	0+160.000	269.407	150.546	45.391	-8	41	45.405	38	45.397	0.02	44.641	0.000	-0.02	38	45.396	40	45.388		
	0+180.000	287.645	158.754	45.681	-36	44	45.744	39	45.708	0.01	44.931	0.000	-0.02	40	45.705	40	45.669		
	0+200.000	305.897	166.930	45.971	-64	47	46.084	40	46.020	0.00	45.221	0.000	-0.02	42	46.013	39	45.949		
TUNNEL	0+218.167	322.498	174.309	46.234	-89	49	46.392	41	46.303	-0.01	45.484	0.000	-0.02	44	46.294	38	46.204		
	0+220.000	324.174	175.051	46.261	-92	49	46.423	41	46.331	-0.01	45.511	0.000	-0.02	44	46.322	38	46.230		
	0+240.000	342.487	183.091	46.551	-120	52	46.763	42	46.643	-0.01	45.801	0.000	-0.02	46	46.631	37	46.511		
TC/CU	0+254.353	355.656	188.798	46.759	-140	54	47.007	43	46.867	-0.02	45.009	0.000	-0.02	47	46.852	36	46.712		
	0+260.000	360.845	191.027	46.841	-140	54	47.069	43	46.949	-0.02	45.091	0.000	-0.02	47	46.934	36	46.794		
CS/CC	0+272.856	379.253	196.065	47.027	-140	54	47.275	43	47.135	-0.02	46.277	0.000	-0.02	47	47.120	36	46.980		
	0+280.000	392.575	198.842	47.122	-140	54	47.370	43	47.230	-0.02	46.372	0.000	-0.02	47	47.215	36	47.075		
	0+300.000	397.717	206.534	47.298	-140	54	47.546	43	47.406	-0.02	46.548	0.000	-0.02	47	47.391	36	47.251		
	0+320.000	416.229	214.103	47.340	-140	54	47.688	43	47.448	-0.02	46.590	0.000	-0.02	47	47.433	36	47.293		
E-STR	0+337.592	432.554	220.658	47.267	-140	54	47.515	43	47.375	-0.02	46.517	0.000	-0.02	47	47.361	36	47.221		
	0+340.000	434.792	221.548	47.249	-140	53	47.497	42	47.357	-0.02	46.505	0.000	-0.02	47	47.343	36	47.203		
	0+360.000	453.403	228.869	47.025	-140	45	47.273	36	47.133	-0.03	46.331	0.000	-0.03	43	47.118	34	46.978		
	0+380.000	472.064	236.066	46.667	-140	38	46.915	30	46.775	-0.04	46.017	0.000	-0.04	40	46.761	32	46.621		
	0+400.000	490.771	243.139	46.176	-140	38	46.424	30	46.284	-0.04	45.526	0.000	-0.04	40	46.270	32	46.130		

SoftLine V10 - Presentation -

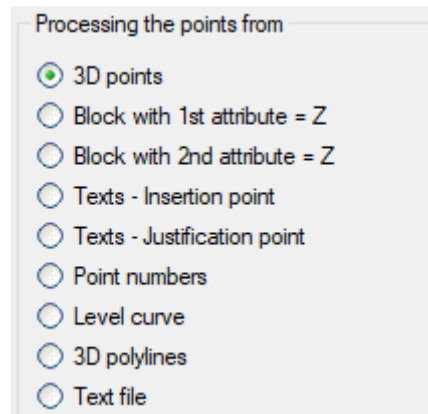
Managing cant

- Ability to manually handle cant curve by curve
- Ability to use counter-cant
- Managing cant on curved turnouts
- Checking design errors
- Ability to automatically calculate cant using a line coefficient defined by route.
- By single or double track lines.
- Choice of cant mode on double track lines: Conventional track, HSR, British, Swiss.



Digitising the Natural Ground

- Automatically creating clouds of points whatever the topographic file format:



- Triangulating the cloud of points, Delaunay's method under stress, no limit to the number of facets.
- Automatically handling stress lines.
- Automatic and configurable envelope detection (Alpha Shapes)
- Support for a number of DTMs in the same DWG.

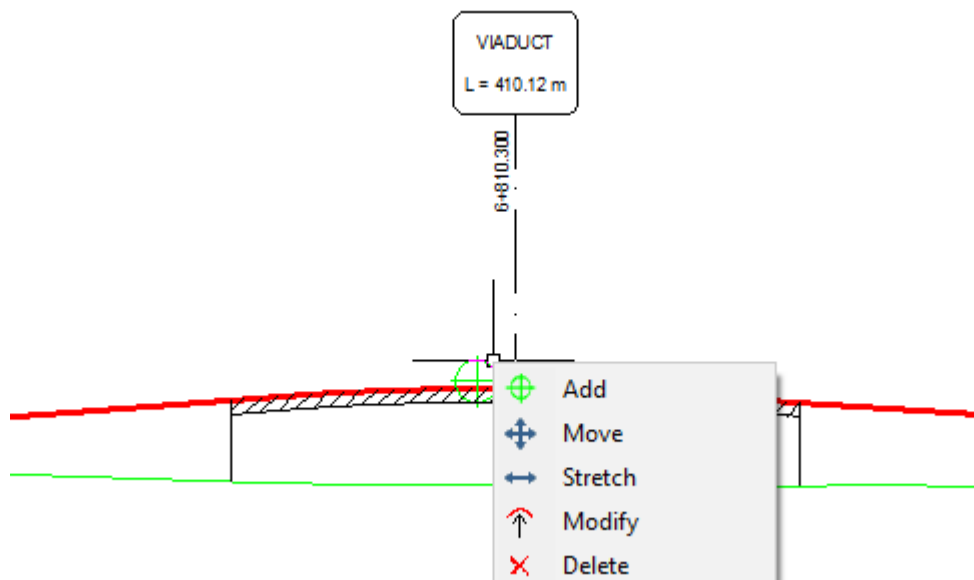
SoftLine V10 - Presentation -

Managing existing crossings:

- Managing boundaries. (Cities/Towns, Streets, etc.)
- Separate management for utility networks, roadways and watercourses using dedicated layers.
- Editing overall or route-based crossings.

Managing structures

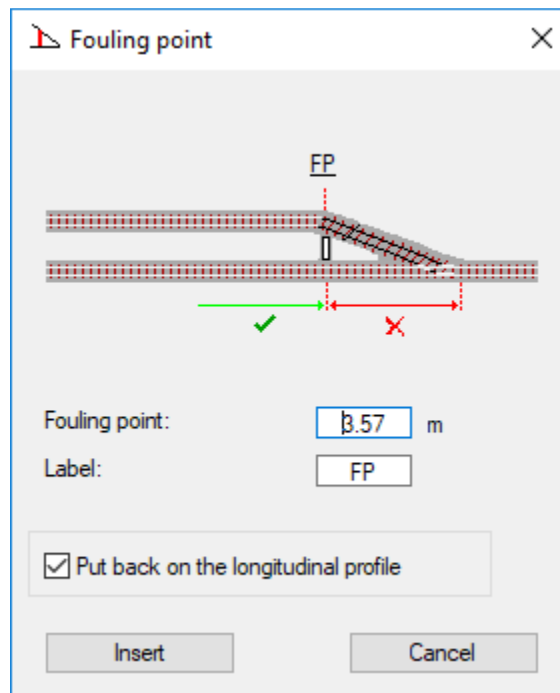
- Managing structures by route.
- Automatically updating chainage and angles when the trace changes.
- Automatically updating chainage and angles when the topography changes.
- Automatically drawing structures to scale on the longitudinal profiles.
- Automatically carrying over structure tags onto the longitudinal profile and horizontal alignment.
- Dynamically managing drawing structures on the longitudinal profiles.
- Configuring the structure type labels – Multiple languages are supported.
- The ability to graphically draw structures by designating the axis or the ends on the horizontal alignment or the longitudinal profile.
- Exporting to Excel.
- Possible structure linking with the earthworks.
- Taking into account the structure areas in the ballast and rail summaries edited.



SoftLine V10 - Presentation -

Tags

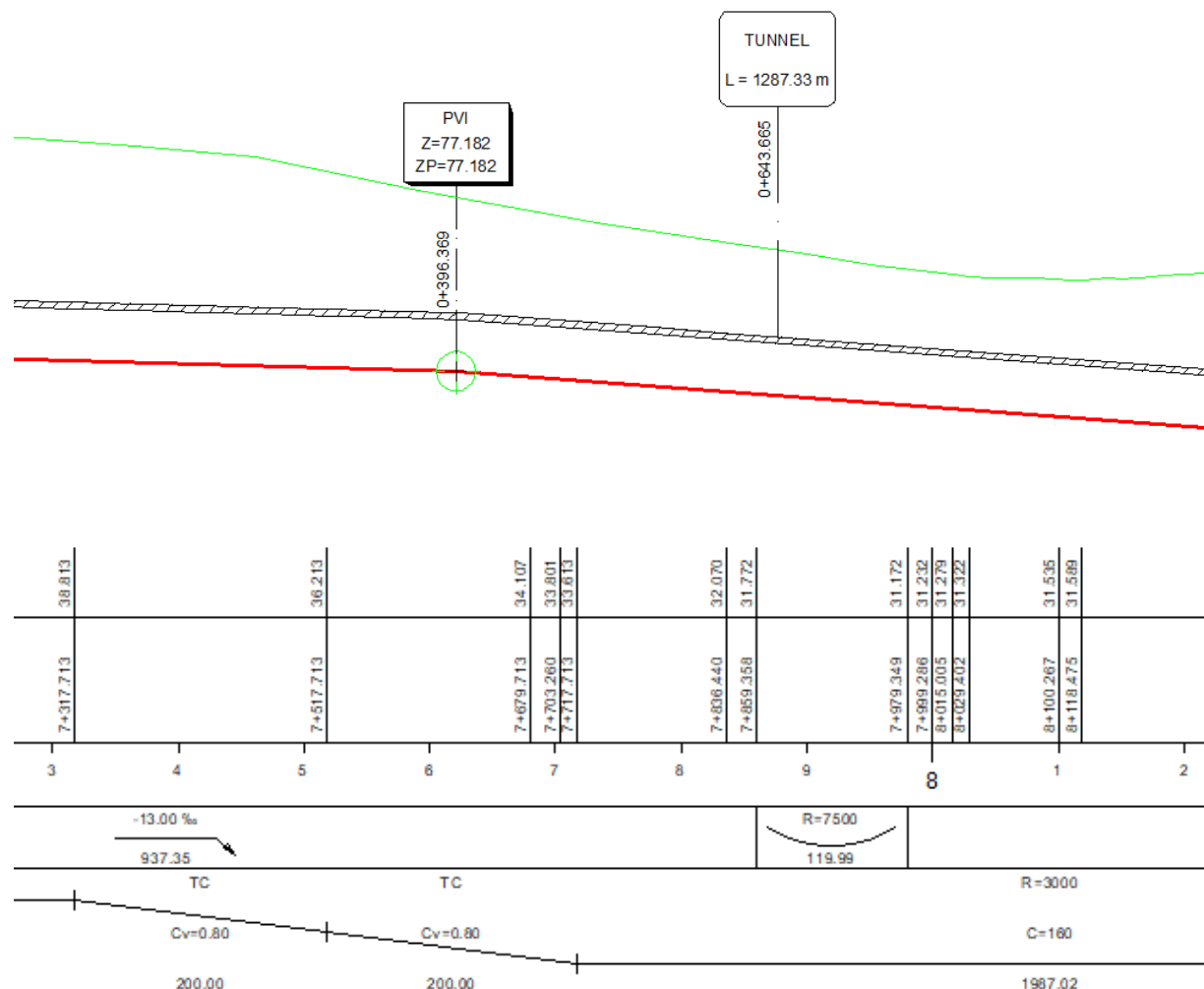
- Automatically drawing tags at any point or chainage along a route.
- Automatically updating tags if the trace or the origin KM is modified.
- Hectometric or kilometric graduations.
- Automatically drawing fouling points.
- Levelling at constant intervals. (Formation, route or existing)



SoftLine V10 - Presentation -

Longitudinal profiles

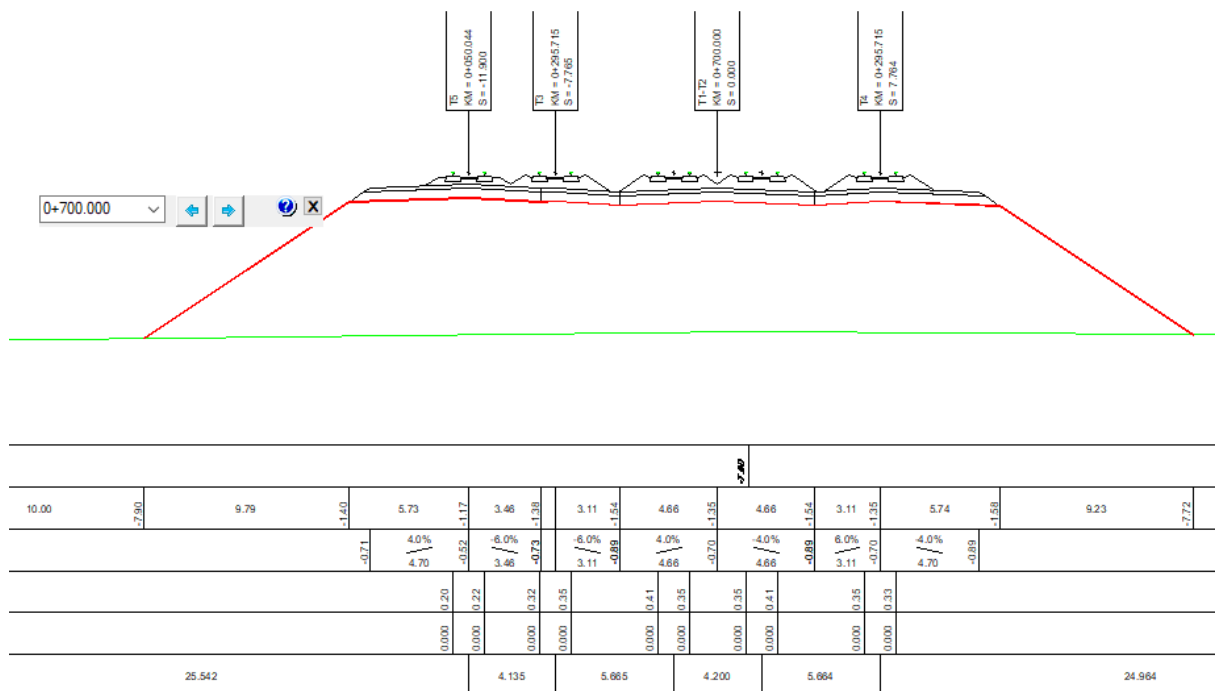
- Automatically drawing longitudinal profiles: Drawing crossings, NG profile, project profile, boundaries, tags and drawing structures, turnouts (toes and heels), horizontal alignment synoptic with configurable cant values, cut and fill heights, tangent vertexes, nil slope points.
- Mixed design process by entering points or working dynamically from a dedicated command menu.
- Automatically drawing tags from the longitudinal profile onto the horizontal alignment.
- As longitudinal profile drawings are interactive, you can add, mode and delete tangent vertexes. Any change to a vertex will cause the drawing and its dimensioning to be completely updated.
- NG copy function between two chainages. The offset value may be positive, nil or negative.
- Projection function for longitudinal profiles for other routes or topographical polygonals.
- Round and max. slope options.



SoftLine V10 - Presentation -

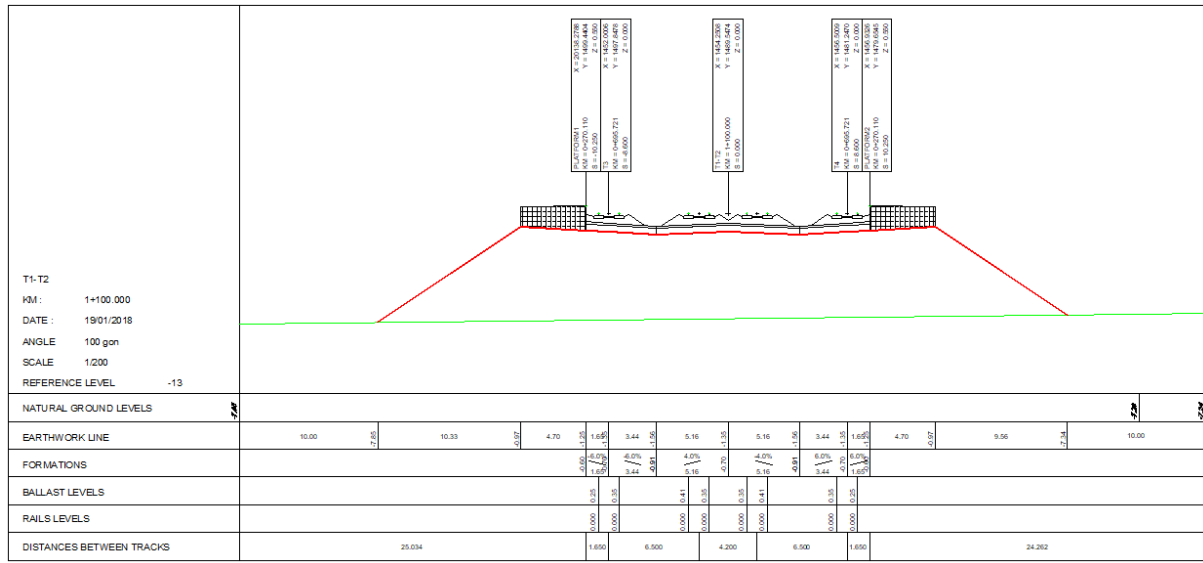
Rail formation

- No typical profiles, formations can be viewed at any point along a route
- No outside database
- Auto-intersecting formations in multiple route mode
- Automatic and configurable canting
- Managing turnout areas
- Managing structure areas
- Managing concrete track-beds
- Managing crushed stone formations
- Managing existing formations (raising or excavating)
- Detecting excess and under ballasting
- Setting by low rail or P Point
- Possible offset between P Point and formation crest
- Graphic data collection
- Meshed or solid 3D modelling
- Blanket and subgrade quantities by definition area
- Managing formation jumps



SoftLine V10 - Presentation -

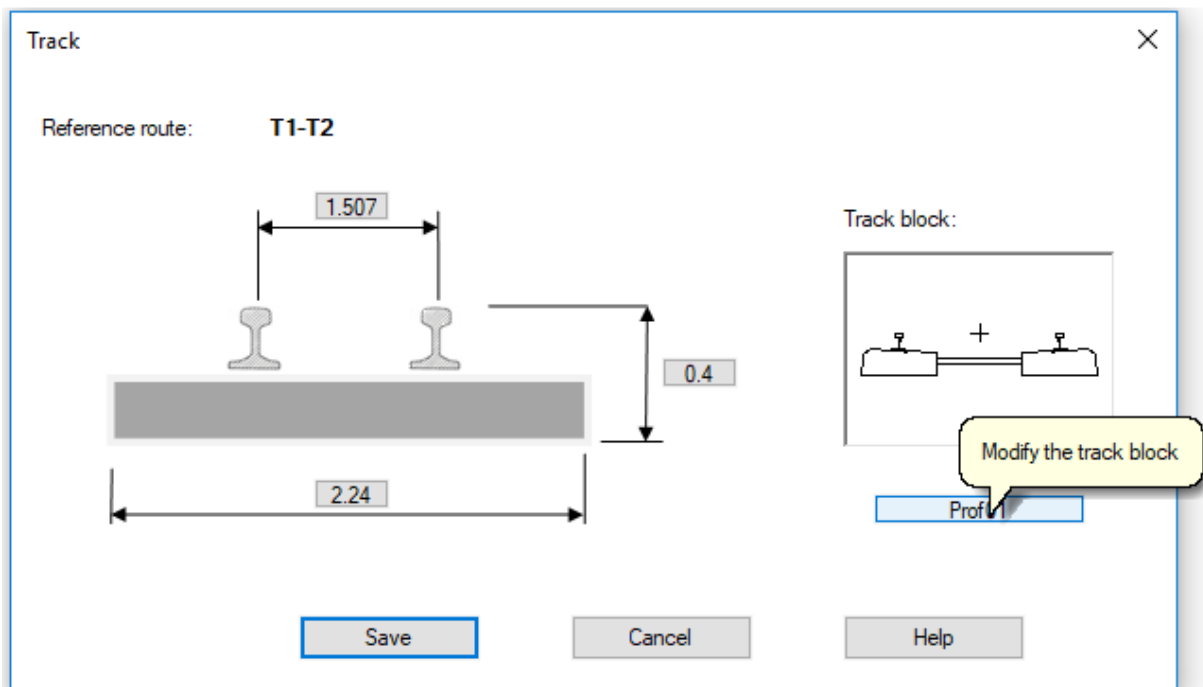
Example of automatic drawing in the passenger platform area:



Track equipment

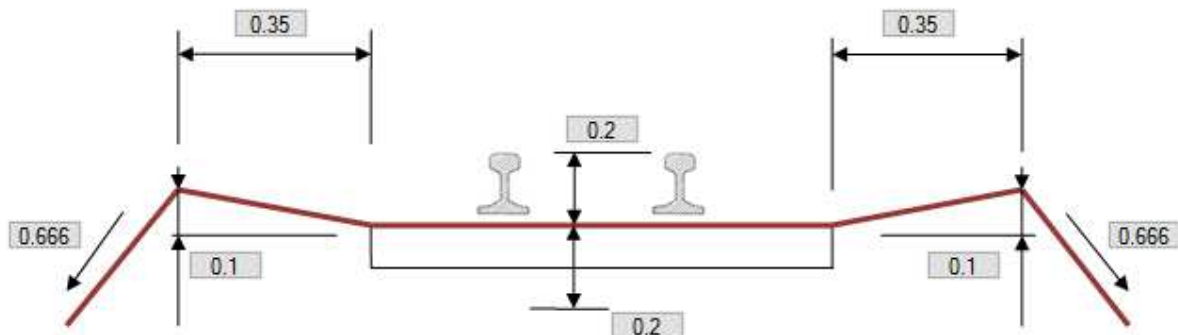
- A number of types of rails and sleepers are possible along the same route.
- Drawing rail strings in 2D or 3D
- Modelling rails and sleepers in 3D

:



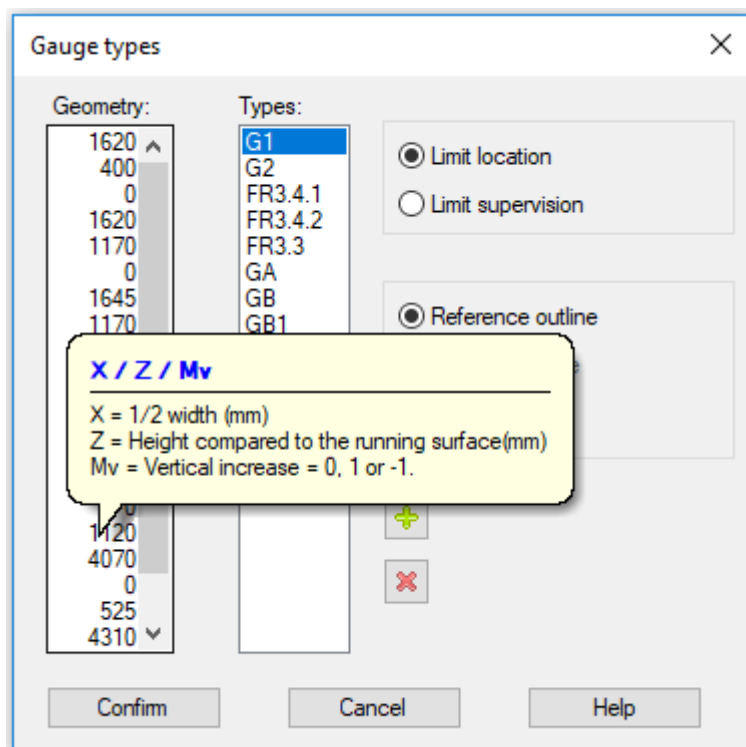
Ballast

- Lateral and longitudinal ballast dimension definitions.
- Modelling the ballast in 3D on single or double track lines.
- Support for areas with or without ballast along the same route.
- Automatic intersections between ballast in multiple route mode.
- Quantities by definition areas.



Gauges

Drawing cross profiles with standard gauges::

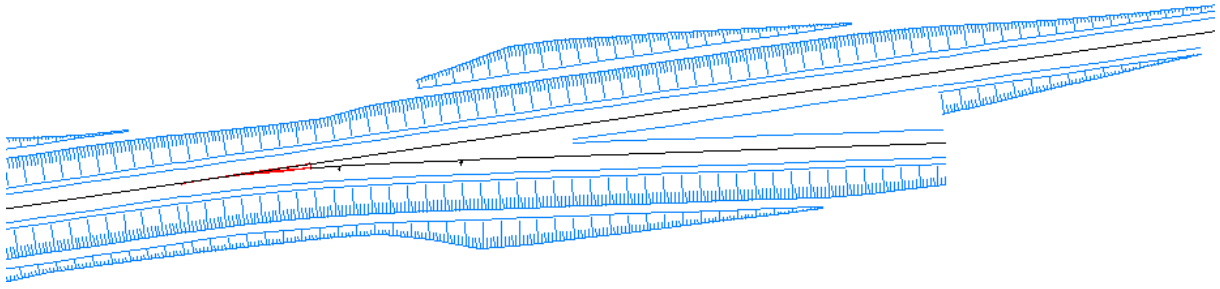


SoftLine V10 - Presentation -

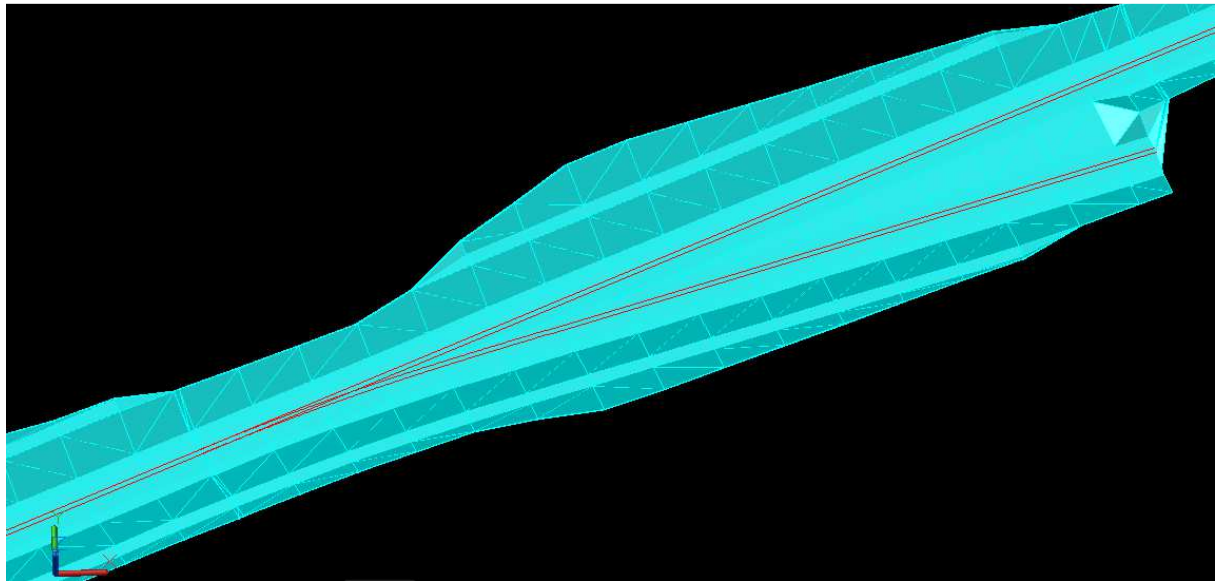
Earthwork

- Defining Constitutive Elements of Earthwork: NG Embankments, Berms, Ditches, Excess widths, Benches.
- No typical profiles.
- Graphically collecting data for longitudinal definition areas for every element.
- Multiple routes, dirt entrances to multiple references.
- Possibilities for multiple definition areas.
- Possibilities for creating any shape (attached merlon, crest merlon, retention basin, turnout assembly area, release ditch, etc.)
- Defining embankments by heights and/or widths and/or slopes.
- Automatic connection to NG for embankment + berm sets.
- Automatic berm starting and stopping.
- Duplicating elements using Copy / Paste.
- Possibilities for drawing ditches in cut or fill areas.
- Managing earthwork jumps.
- Possibilities for automatically generating earthwork jumps on structures.
- Managing 2D guidelines (automatic XY attachment) on excess widths and embankments.
- Managing 3D guidelines (automatic XYZ attachment) on excess widths and embankments.
- Managing constants and relative chainage.
- Automatic constant and relative chainage updating if the axis calculation is modified.
- Automatically updating data if the origin KM is modified.
- Automatically drawing the 2D, 3D horizontal alignment with or without barbs.
- Possible barb setting and customisation.
- Possible differentiation between embankment cut/fill, peak lines/base lines.
- Quarter cone drawings
- 3D modelling
- Creating DTMs by integrating the project into the existing layout.
- Design checks and switchable alert when earthworks are not closed.
- Configurable horizontal alignment and 3D modelling accuracy
- Multiple route quantities.
- Quantities for individual structures or using chainage.
- Managing stripping volumes and surface areas.
- Managing earthwork jumps.

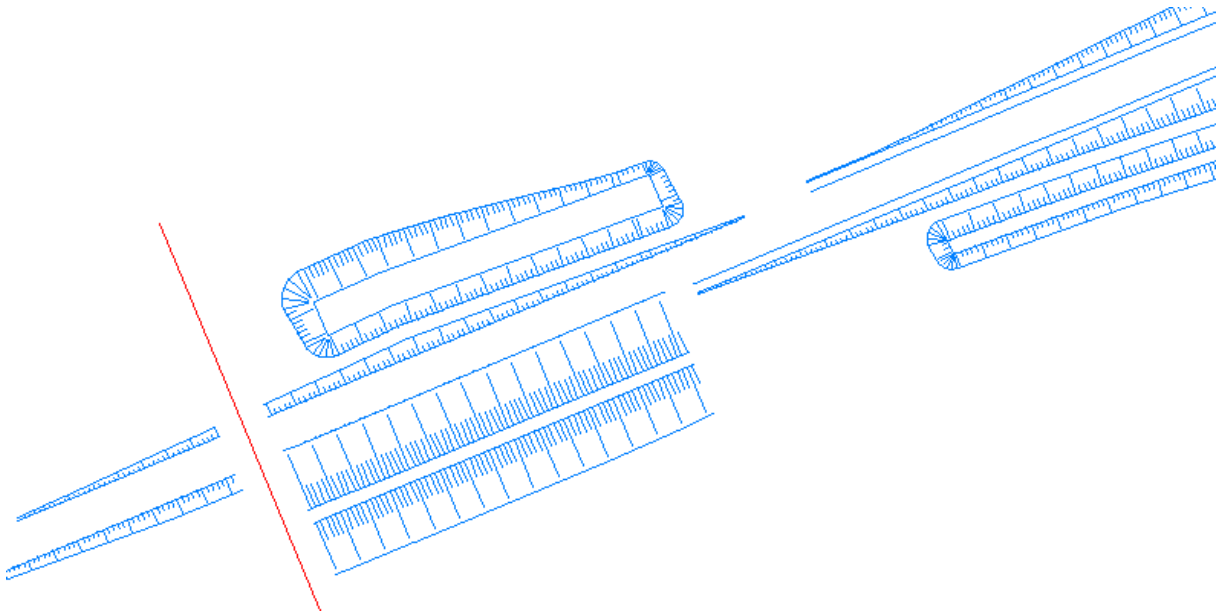
SoftLine V10 - Presentation -



2D drawing of a multi route earthwork on a connection area



3D Modelling of a multi route earthwork on a connection area



- Earthworks sample with :*
- Attached merlon
 - Crest merlon
 - Retention basin
 - Automatic jump on rail bridge

Eartwork quantities by elementary works

	A	B	C	D	E	F	G	H	I	J	K	L	M
1													
2	Project: Earthworks.dwg												
3	Date: 15/10/2018												
4	Reference route: TEST												
5	Multi-route: Yes												
6	From PK 1+000.000 To PK 2+445.984												
7													
8													
9													
10													
11													
12	CUT	501	1+000.000	1+514.364	1+257.182	74 619,097	121 723,455	196 342,553	0,000	4,277	4,277	28744,27	8623,281
13	FILL	502	1+514.364	1+620.954	1+567.659	69,663	0,000	69,663	798,580	1 404,538	2 203,118	1776,80	533,039
14	PRA		1+620.954	1+635.954	1+628.454								
15	FILL	503	1+635.954	1+751.170	1+693.562	9 919,688	179,126	10 098,814	925,011	29 356,124	30 281,135	8506,12	6250,965
16	JUMP		1+751.170	1+751.180	1+751.175								
17	CUT	504	1+751.180	1+787.968	1+769.574	401,955	65,369	467,324	146,679	43,505	190,184	779,86	233,959
18	CUT	505	1+787.968	2+445.984	2+116.976	165 405,604	160 301,096	325 706,700	4,931	3 875,016	3 879,946	41901,54	12639,630
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12	1+000.000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	29,9
13	1+020.000	20,000	3802,044	3631,779	7433,823	7434	0,000	0,000	0,000	0,000	0,000	1162	348,667	0	28,3
14	1+040.000	40,000	2903,435	3298,444	6201,879	13636	0,000	0,000	0,000	0,000	0,000	2258	328,736	677	28,6
15	1+060.000	60,000	2314,187	3303,544	5617,731	19253	0,000	0,000	0,000	0,000	0,000	3335	323,123	1001	28,9
16	1+080.000	80,000	2110,399	3305,880	5416,279	24670	0,000	0,000	0,000	0,000	0,000	4339	301,171	1302	29,3
17	1+100.000	100,000	1954,171	3264,386	5218,558	29888	0,000	0,000	0,000	0,000	0,000	5314	292,535	1594	29,9
18	1+120.000	120,000	1812,452	3238,526	5050,377	34939	0,000	0,000	0,000	0,000	0,000	6287	291,979	1886	30,5
19	1+140.000	140,000	1684,426	3251,694	4936,120	39875	0,000	0,000	0,000	0,000	0,000	7259	291,492	2178	31,4
20	1+160.000	160,000	1962,529	3460,506	5423,035	45298	0,000	0,000	0,000	0,000	0,000	8272	303,931	2482	32,8
21	1+180.000	180,000	3166,479	5033,490	8199,970	53498	0,000	0,000	0,000	0,000	0,000	9476	361,289	2843	38,4
22	1+200.000	200,000	4772,473	7813,126	12585,599	66084	0,000	0,000	0,000	0,000	0,000	10911	430,522	3273	45,2
23	1+220.000	220,000	6541,592	10068,068	16609,660	82694	0,000	0,000	0,000	0,000	0,000	12500	476,662	3750	45,7
24	1+240.000	240,000	7005,191	10033,394	17038,585	99732	0,000	0,000	0,000	0,000	0,000	14142	492,641	4243	46,2
25	1+260.000	260,000	6233,764	9610,980	15844,744	115577	0,000	0,000	0,000	0,000	0,000	15766	487,155	4730	46,7
26	1+280.000	280,000	5466,766	9127,386	14594,151	130171	0,000	0,000	0,000	0,000	0,000	17365	479,617	5210	47,2
27	1+300.000	300,000	4739,062	8582,436	13321,498	143493	0,000	0,000	0,000	0,000	0,000	18939	472,078	5682	47,7
28	1+320.000	320,000	4050,743	7976,038	12026,781	155519	0,000	0,000	0,000	0,000	0,000	20487	464,539	6146	48,2
29	1+340.000	340,000	3401,878	7308,121	10709,999	166229	0,000	0,000	0,000	0,000	0,000	22010	457,000	6603	48,6
30	1+360.000	360,000	2792,517	6597,078	9389,596	175619	0,000	0,000	0,000	0,000	0,000	23454	432,991	7036	45,5
31	1+380.000	380,000	2234,418	5883,901	8118,319	183737	0,000	0,000	0,000	0,000	0,000	24811	407,219	7443	46,0
32	1+400.000	400,000	1781,090	3608,437	5389,527	189127	0,000	0,000	0,000	0,000	0,000	25846	310,477	7754	16,8

Note: All units in this report are in meters, square meters and cubic meters unless specified otherwise.

Eartwork quantities

SoftLine V10 - Presentation -

Digital mock-up

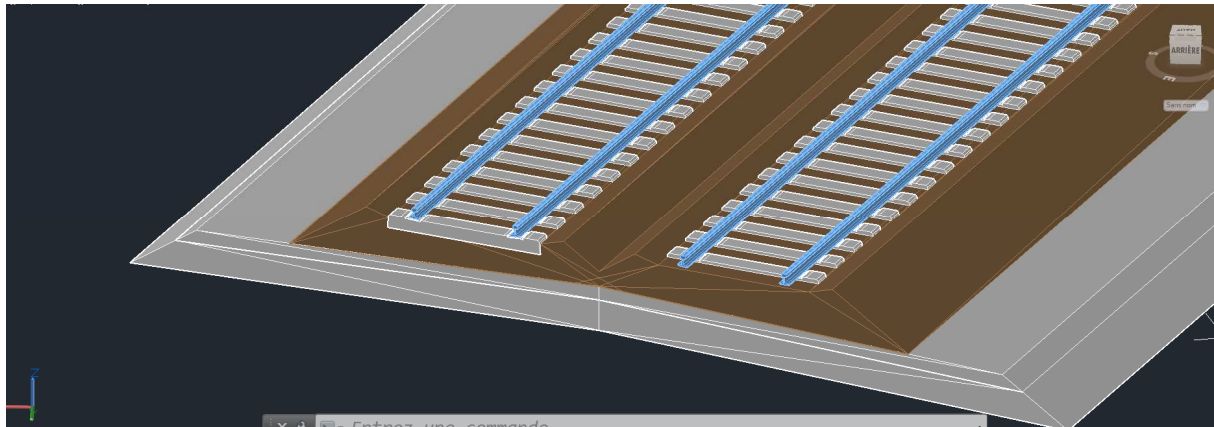
The digital mock-up comprises 3D modelling of the elements that make up the project:

- Rails
- Sleepers
- Ballast
- Formation
- Earthworks

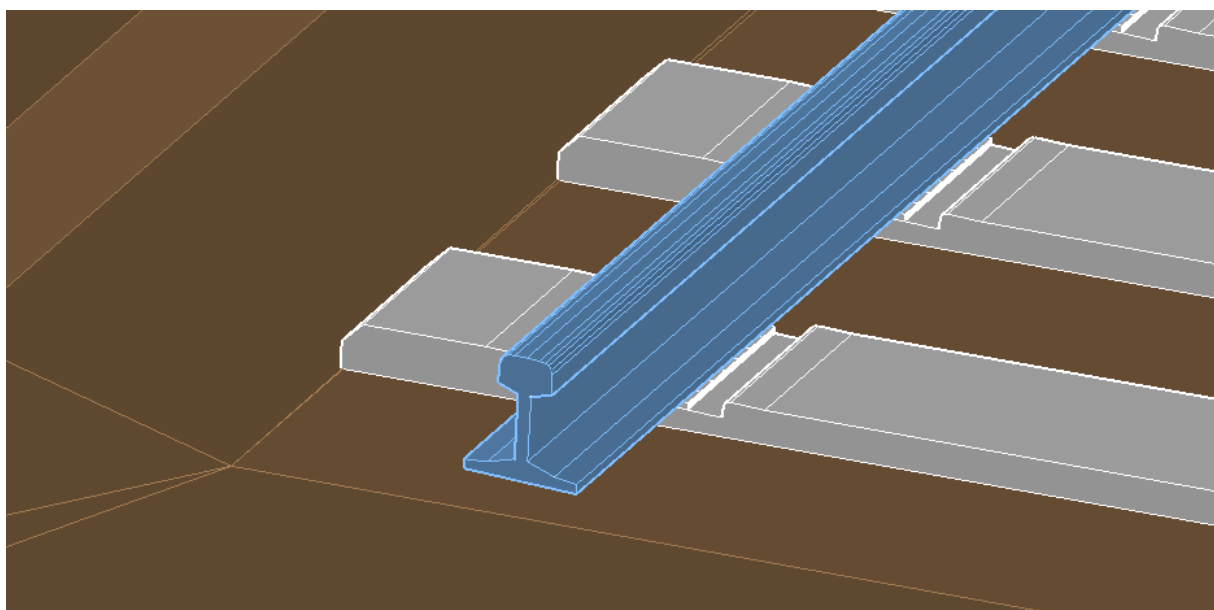
The modelling matches the true and accurate representation of every element, by reading the definition data for each of the elements (axis calculation, vertical alignment and cant).

The elements generated are AutoCAD entities (mesh surfaces or 3D solids) and therefore easily exported.

Examples of 3D images generated:

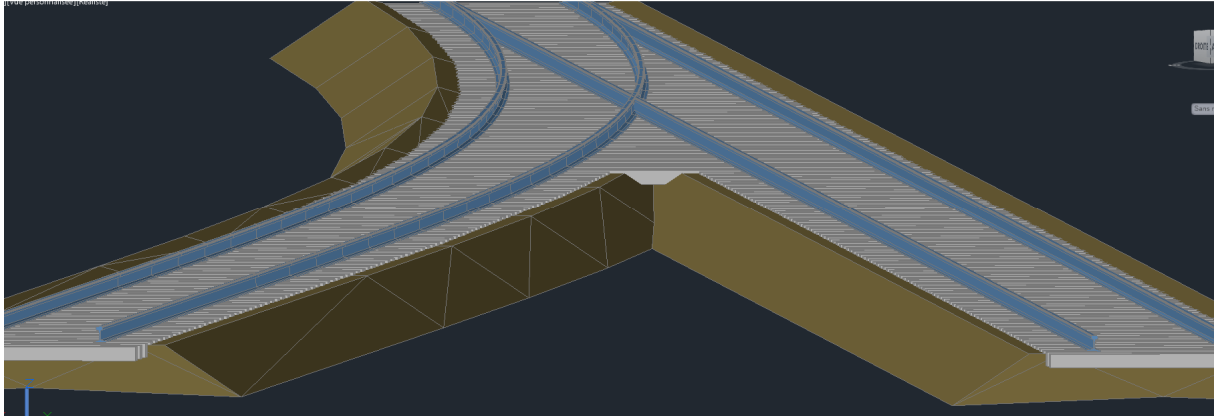


Double track with ballast and formation

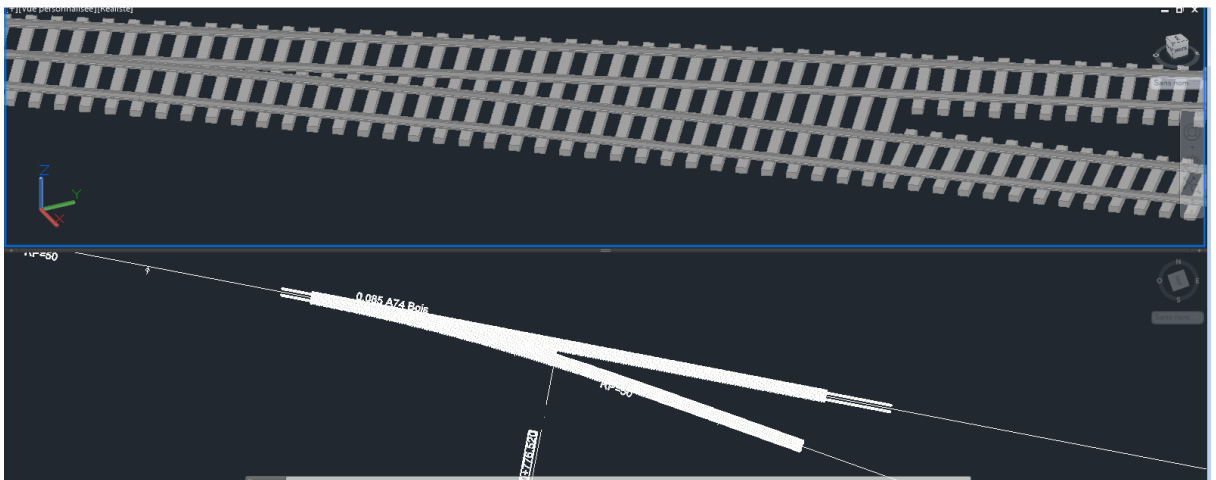


Zoom on rail UIC60 and sleeper M240 (canted)

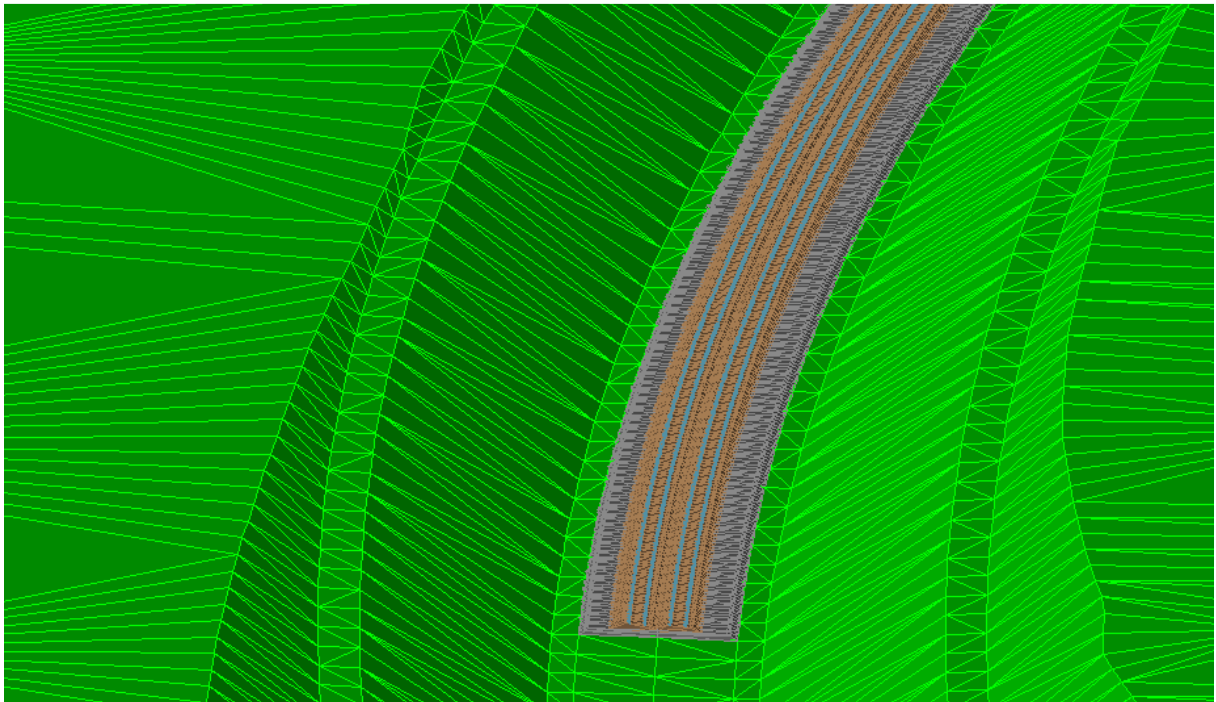
SoftLine V10 - Presentation -



Railway connection with concrete turnout



Transition between common sleepers/ single sleepers



Integration of the project inside the DTM