Ground Modelling, Road Design and Land Survey software for Civil Engineering, Environmental and Landscape applications working within CAD.

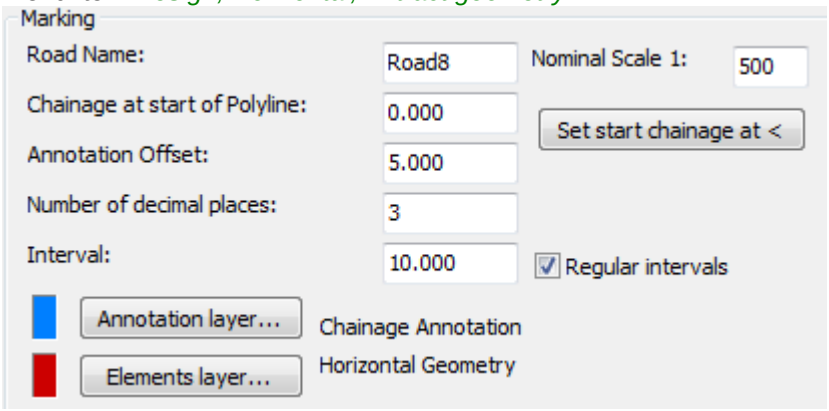
Road design

Starting with a ground model representing the existing site :-

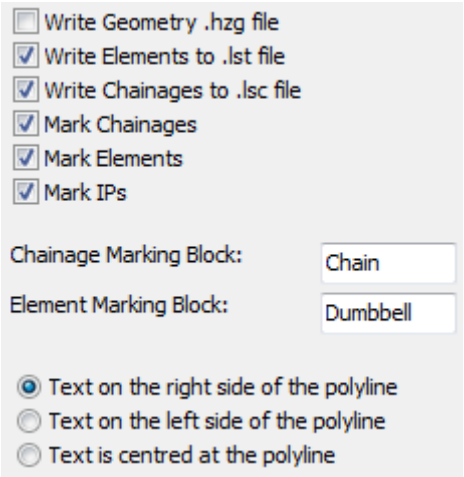
Step 1 Horizontal Alignment

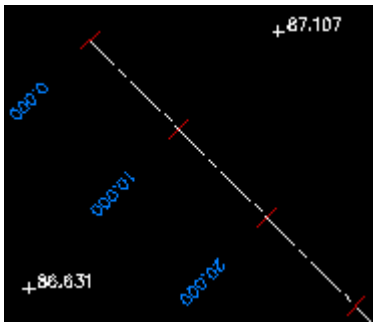
The Horizontal Alignment is represented as a 2D Polyline and in typical use this will include tangential arc elements and will be the centre of the proposed road. The start of the Polyline will have a default chainage of 0.000. If curves with specified radii are required use draw Lines defining start, intersection points and end followed by menu item *Horizontal,Draw Curves* to construct Arcs.

To extract geometry from the 2D Polyline to enable annotation and writing of simple co-ordinate listing files use menu item *Design, Horizontal, Extract geometry*



Enter the road name and click Additional file and drawing options to confirm settings as shown for typical use :-





*Tip When drawing a 2D Polyline and constructing tangential arc elements and it is then required to fix a tangential straight from the end of an arc type L ↵ L ↵

Step 2 Create and draw existing long and cross sections

Ground Modelling, Create Section For example name this Road8exLong.sek
Ground Modelling, Create Cross Sections For example name this Road8exCross.sek

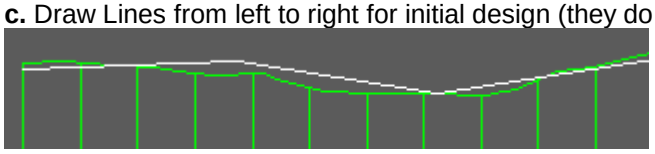
Draw the existing sections (in a different drawing if the existing drawing is very large and complex) using :-
Sections, Draw Section
Sections, Draw Cross Sections
For typical use draw the long section using type “B” (or your own section type) with a five times vertical magnification (1:500 horizontal, 1:100 vertical). Draw the cross sections using type “C” (or your own section type) with a two times vertical magnification (1:200 horizontal, 1:100 vertical).

Step 3 Vertical Alignment

a. *Design, Vertical, Mark Horizontal data on section* To annotate the horizontal geometry on the section.

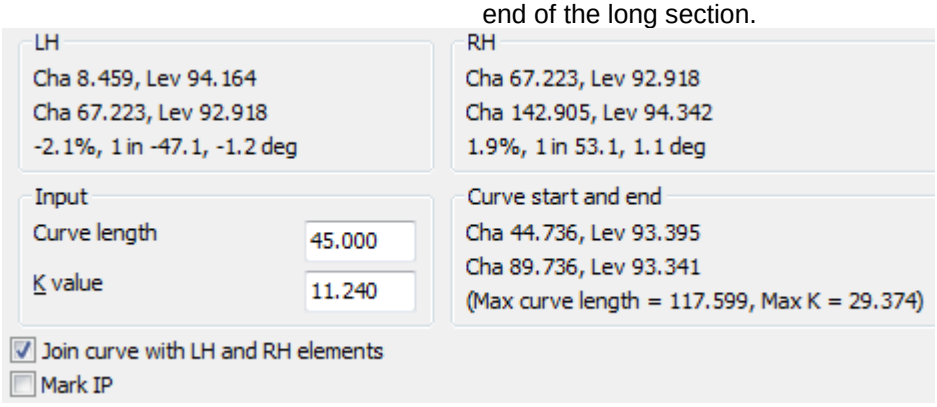
Working on the long section the initial construction stage uses menu items in the “middle chunk” of the *Sections* menu :-
b. *Add to section(s), Draw features* To mark locations important to the design.

c. Draw Lines from left to right for initial design (they do not have to meet).



d. *Enquire and fix Gradient of Line* To set the gradients of the Lines (drawn left to right).

In the same way that Horizontal Alignments are represented Vertical Alignments are also represented as 2D Polylines. The 2D Polyline may be drawn directly on the long section with tangential arc elements but in typical use the alignment is constructed from the series of Lines referred to above that are used to fix a series of vertical curves :-
e. *Design, Vertical, Curves* To define a series of individual curves by curve length and K value. This builds a 2D Polyline – use Extend and Trim commands for example to ensure that the vertical alignment starts and ends exactly at the start and end of the long section.



Design, Vertical, Curves dialogue with typical settings – the initial curve length has been rounded up to 45.000

f. *Vertical, Alignment utilities Optimise* To move the 2D Polyline up or down if required to balance the cut and fill. Note that this calculation works on the two Polylines only and does not “know about” any channels or embankments etc. Use CAD commands to regain any “connectivity” to fixed points on the section such as the exact start and end.

g. To extract the geometry from the Vertical Alignment 2D Polyline use *Design, Vertical, Extract geometry*. This will annotate the section and write a .vtg file (e.g. call this Road7.vtg). Note that the relationship between Horizontal and Vertical Alignments is not “one to one” as more than one .vtg file (from alternative vertical designs) can be used in the String design functions.

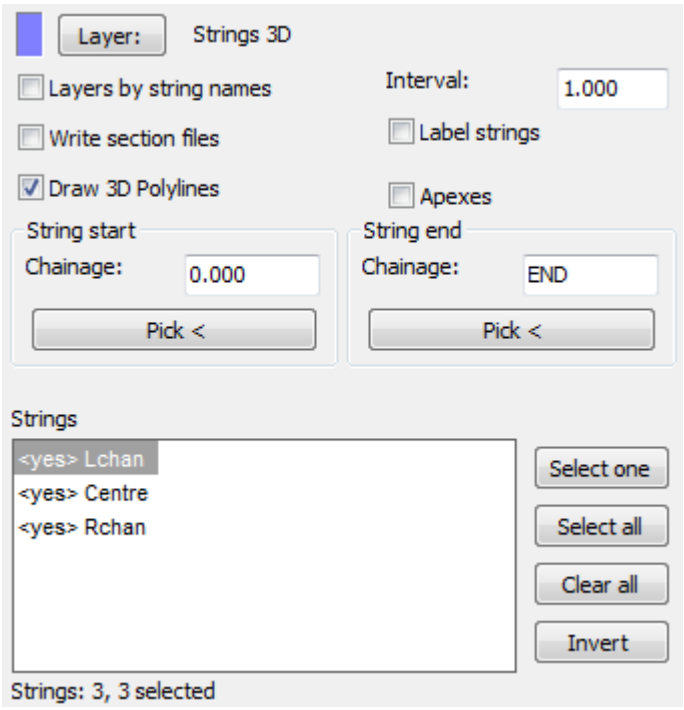
Step 4 Define the Design Strings

To relate channels, kerbs, verges and footpaths etc. to the Horizontal and Vertical Alignments they need to be defined and saved in a .stg file. The relationship is by offsets and gradients and may include variable widths and superelevation. Note that when a Horizontal Alignment (2D Polyline) and Vertical Alignment (.vtg file) are combined the Master String exists but only within the context of the String Design functions.

Design, Strings, Define or Edit To define the strings – note that for typical use only the Centre will be related to the Master String. The left channel will be related to the centre, the left kerb related to the left channel and the left footpath related to the left kerb. String files may store the definition of a standard road and used for many roads and many projects or may have specific horizontal and vertical channel geometry etc. to be related to one Master String on one project only.

Step 5 Draw the Design Strings

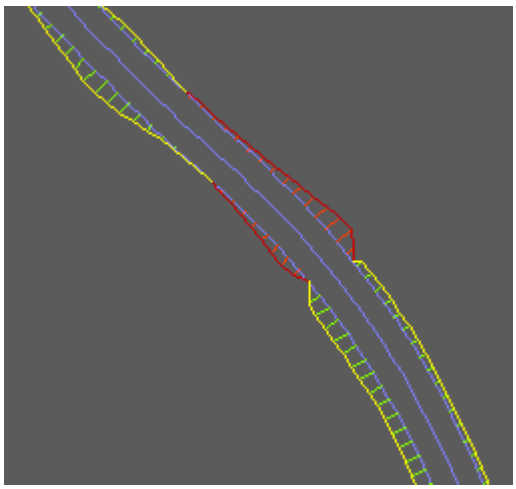
Design, Strings, 3D Draw To draw the centre and channels etc. as 3D Polylines.



Typical settings for drawing design strings

Step 6 Relate the Design Strings to the Site Model

Ground Modelling, Embankments To relate the “external “ channels or verges etc. to the model at specified batter gradients for cut and fill.



Design strings and embankments

Step 7 Proposed cross sections and reports

Design, Strings, Cross Sections and Reports To write a section file with cross sections calculated at user specified regular intervals (for example the output file name could be Road8propCross.sek). Confirm that the embankment gradients are set correctly. To add these proposed cross sections to the existing ones drawn at step 2 use menu item *Sections, Superimpose, Cross Sections*.