12D Super Alignment

Parametric Design:

The new super alignment utilises not only alignment design by the Fixed and Free method, but introduces a complete new approach to horizontal and vertical road design.

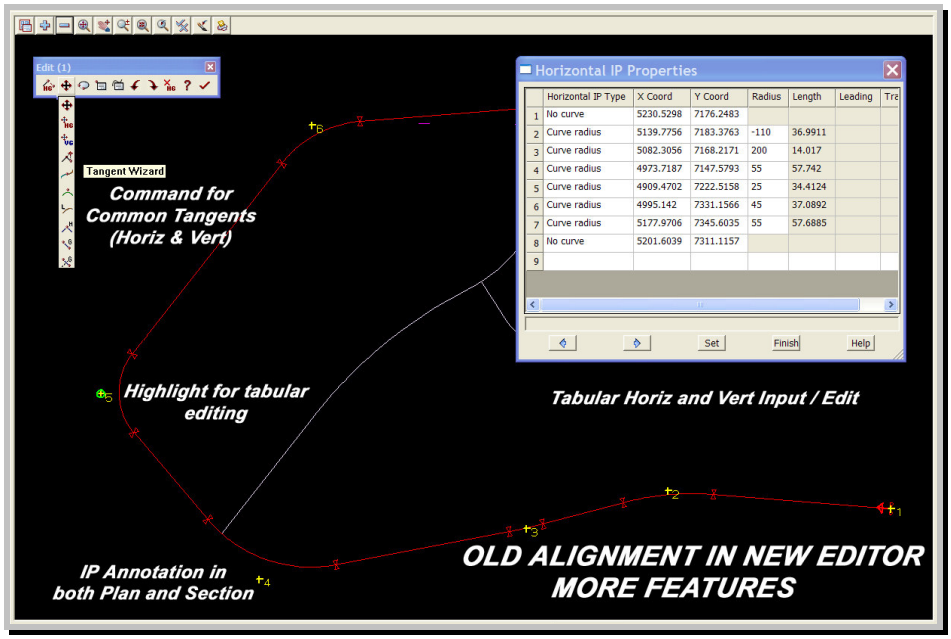
Particular attention has been paid to the editor's graphics (highlighting of IPs and Elements, tangent points and chainage direction).

- The traditional IP Alignment string options have been implemented, along with many new features.
- The ***Fixed*** elements include various types of straights and arcs (***all with the 12D "pick with direction input" and perpendicular offsets***)
- There is a combination of floating or ***Free*** lines, arcs and spirals as well as back to back and arc to arc transitional spirals.
- The vertical options include fixed and free grades and parabolas, apex and asymmetric parabolas along with fixed parabolas through 3 points and a free parabola through a known point.
- The user can also **combine** IP method with Element design…..resulting in the ultimate alignment string.
- Auto ***chainage labelling*** in horizontal and vertical. User can crop the alignment string at the start or end and alter the start or end chainage or leave as is. The complete alignment is still available, but only the section designated by the start and end points is visible.
- ***The Closed alignment*** feature (for roundabouts and tracks etc.) incorporates the automatic matching of start and end grade and level.
- Because solving your alignment (with the element data supplied) may not always be possible,12D's super alignment, **graphically highlights** the part or parts of the alignment that cannot be solved with red X's.
- All measurements such as *at point, string from point etc*. have been rationalised for the input of chainage, level and the new value of **% grade**.

While the traditional use of the fixed and floating method of design may have been primarily for rail or highway interchange work, 12D's super alignment has been developed for those disciplines, as well as for use in the creation of:

- subdivision road centrelines
- kerb returns
- roundabouts
- culdesacs

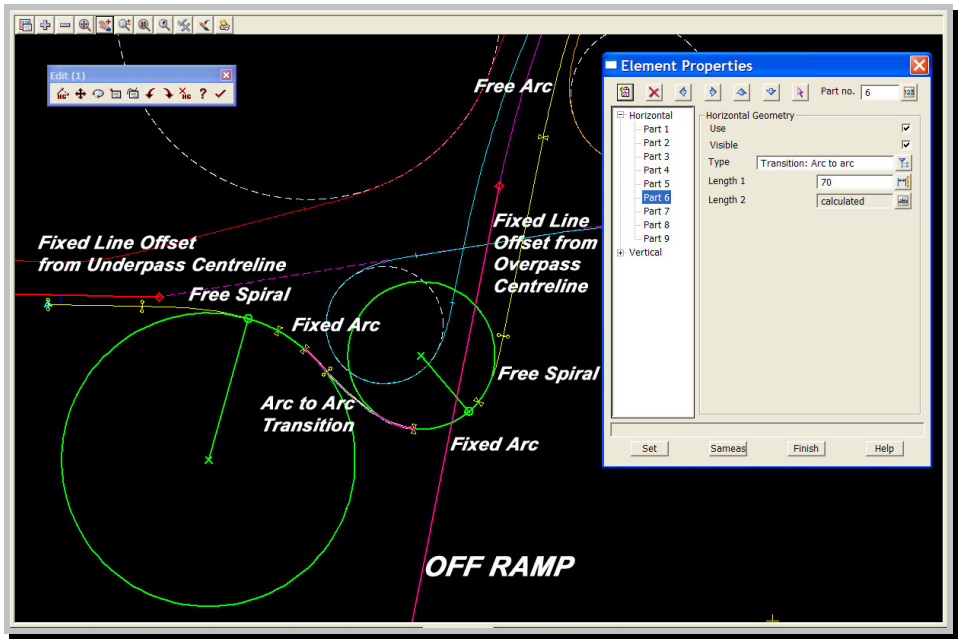
Old Alignment in the new editor:



Including the old IP alignment design method in the new editor enhances the learning process and gives the experienced user access to new features.

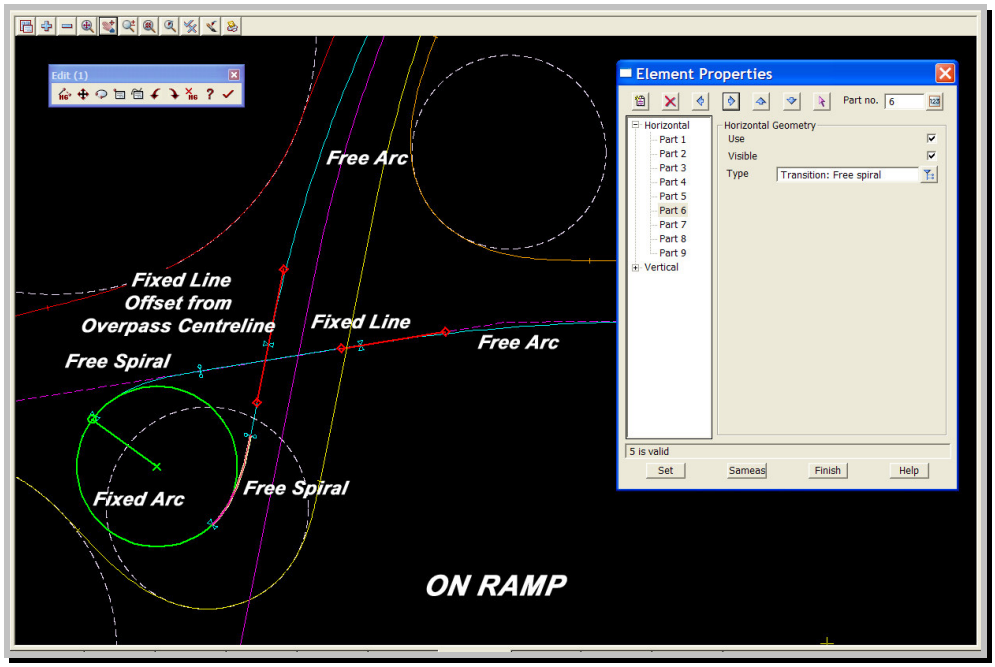
- Easy access via pull down menus
- IP highlight and numbering in plan and section
- New common tangent wizard in horizontal and vertical
- New grade change options in section
- Tabular input and edit

Interchange Super Alignment Geometry:

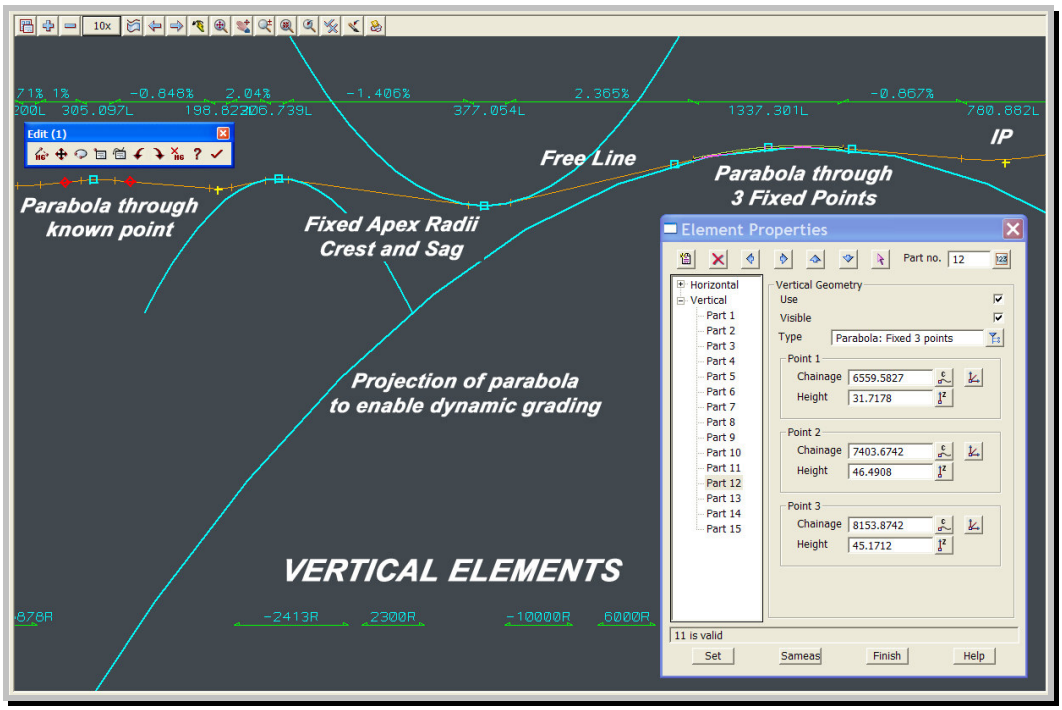


These fixed and free interchange geometry layouts incorporate most of the horizontal element features available.

- Free Arc
- Fixed Line Offset
- Free Spiral
- Fixed Arc
- Arc to arc Transitional Spiral



Vertical Elements

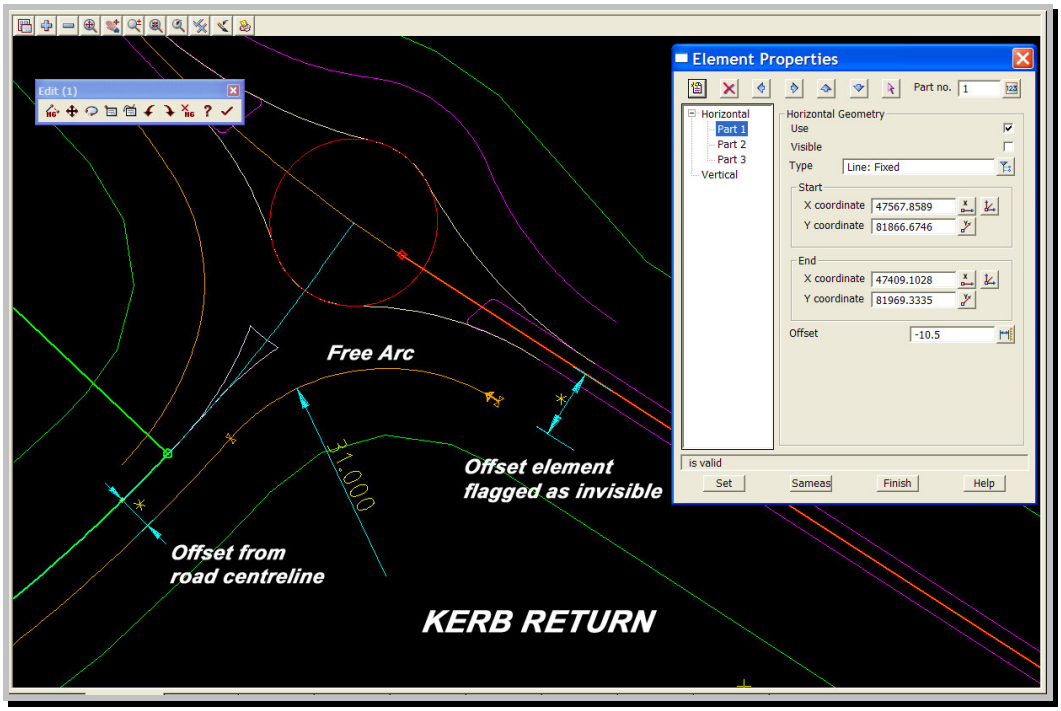


The combination of a variety of element features and the existing IP design, enable the new super alignment to solve many of the vertical issues lacking in the old editor.

Such as:

- Level and Grade tie in at intersections.
  - Fixed grade through a known point
  - Free parabola through a known point
  - Floating parabola through 2 points
- Matching existing tin surface
  - Fixed parabola through 3 points
- Crests and sags
  - Fixed apex radius
  - Free apex R.L.

Intersection Layout



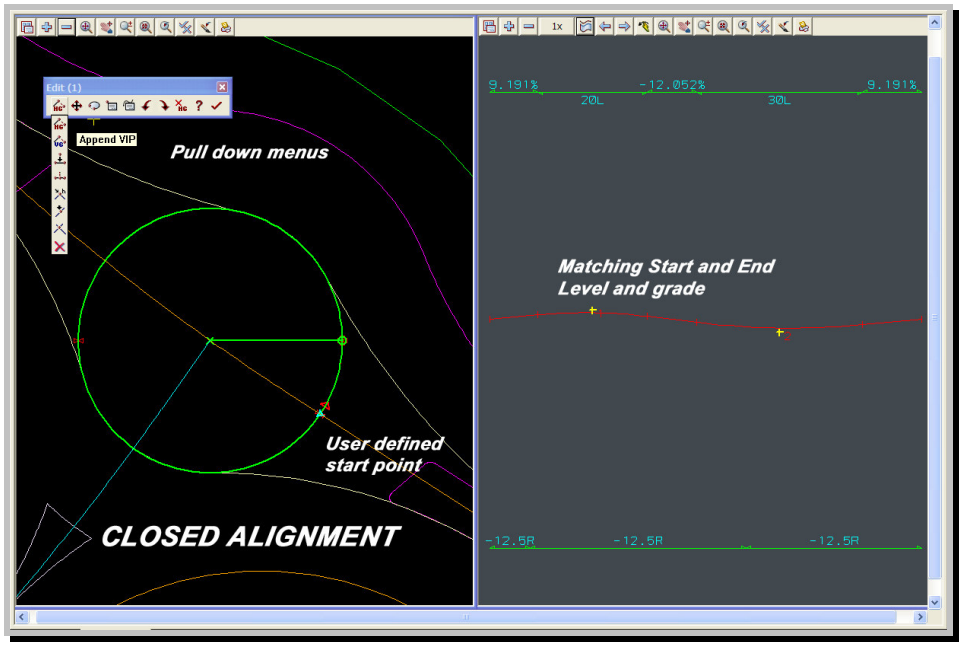
In the Kerb Return example the road centrelines, whether they be straights or arcs, have been selected and an offset assigned to locate the new kerb line.

The ***Free Arc*** is then floated between to form the radius kerb return.
Notice that the approach and departure segments can be flagged as invisible, but are permanently embedded in the alignment geometry.

There is no need to parallel the centrelines as you would in normal Cad.

If the offset road width changes, alter it in the editor and 12D will try and solve the new layout.

Roundabout Grading

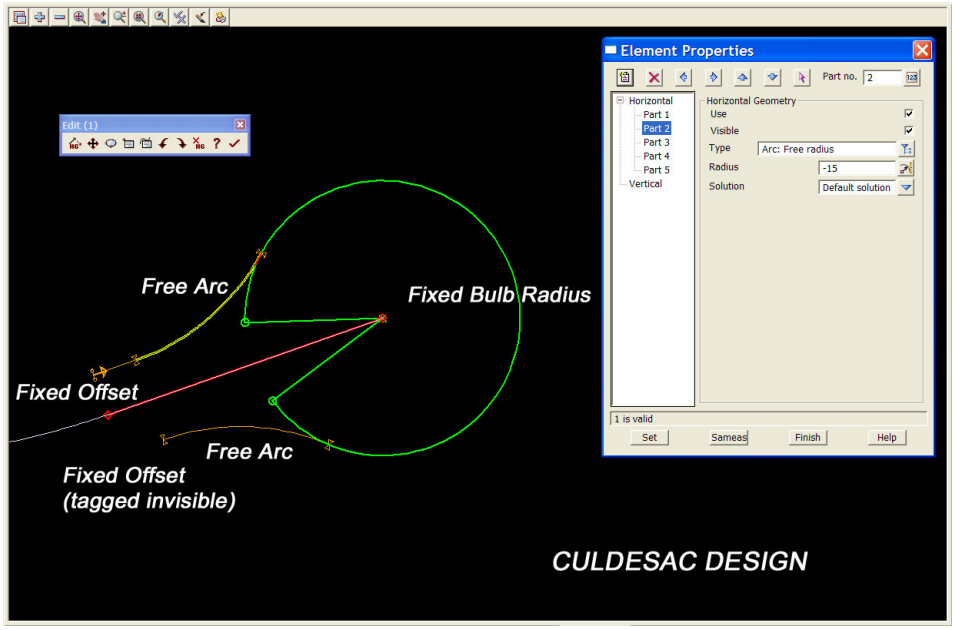


The closed alignment allows matching of start and end level and grade.

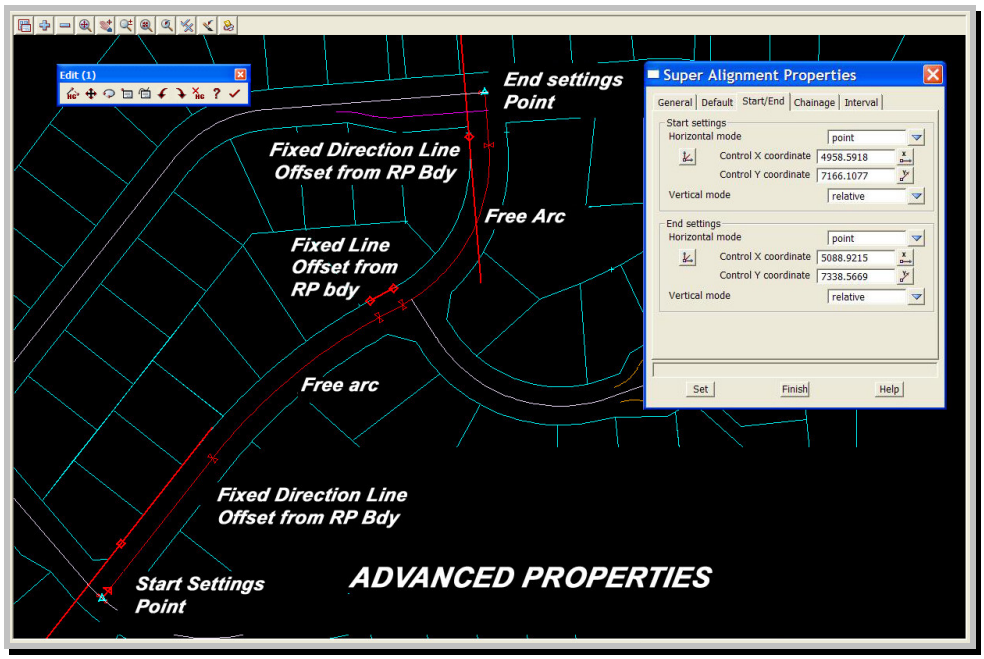
Under the new properties panel, a user defined chainage start point is easily located without splitting and joining strings.

The dynamic editing in the section view automatically sets a flat grade from the first IP input and matches grade during subsequent IP inserts.

Culdesac

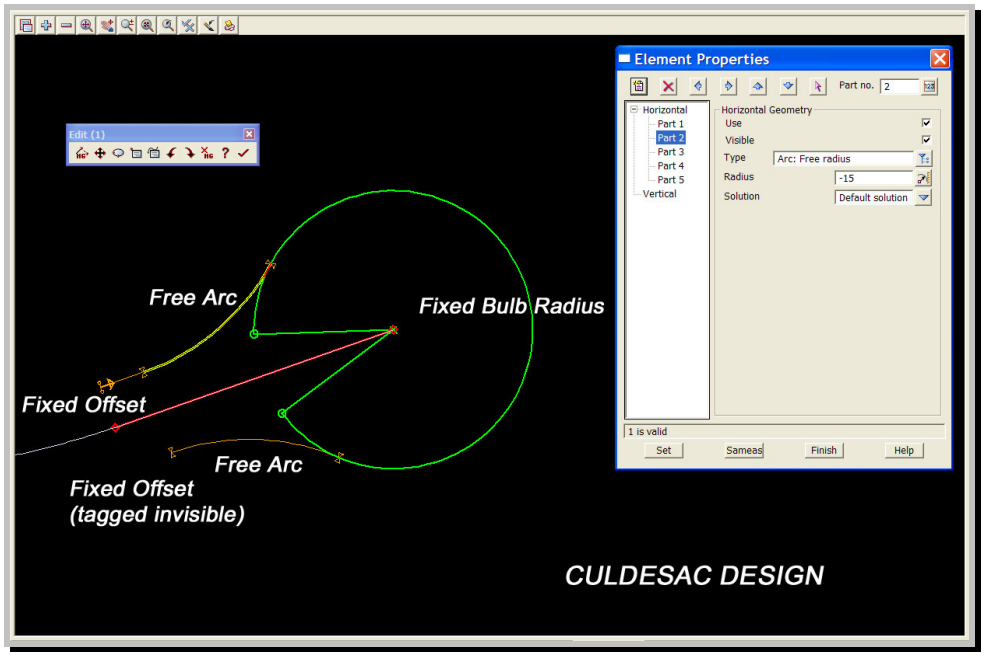


Typical Subdivision Applications



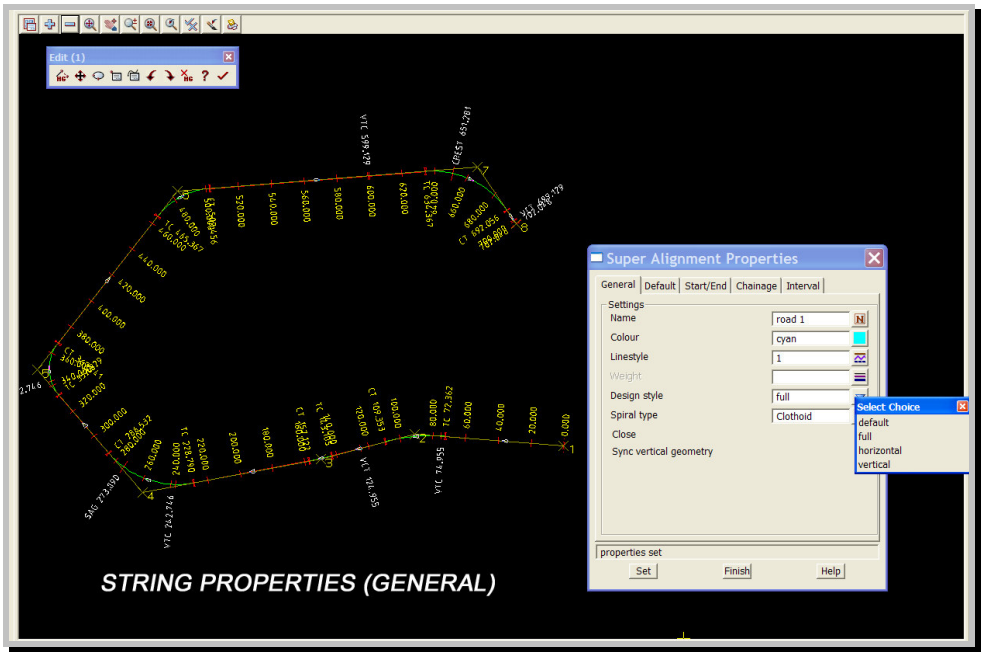
The setup of the road centreline uses the projected ***Fixed Direction Line*** with an ***offset*** from the property boundary.

Note the user start and end points specified as a point at the intersection of the loop road centreline and the projected element.



String Properties.

General (Auto chainage labelling)



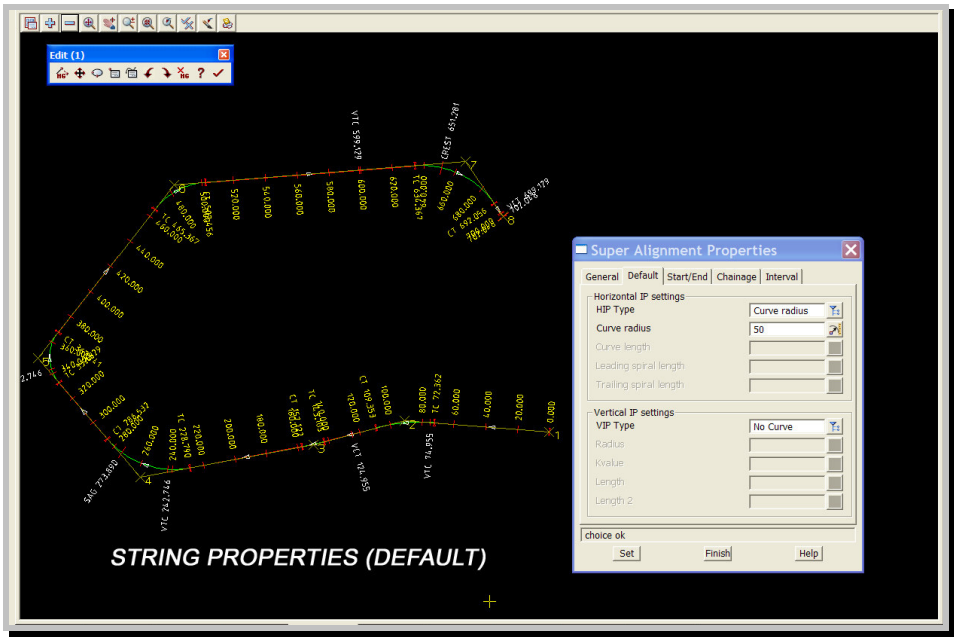
The ***Design style*** option automatically labels all the chainages in various formats (full, horizontal and vertical). The default choice does no labelling at all.
All the styles are user definable and are found under the menu:

Strings->Create->Alignment->Super alignment style

The ***Sync vertical geometry*** option will perform small adjustments on the vertical geometry as the horizontal is being changed (shortened or lengthened as the case may be).
Any parabolic curve affected is held relative to its original position (e.g. opposite a side road intersection) by adjusting the grades in relation to the differing chainages.
The parabola length is maintained, but depending on the severity of the changes, some adjustment may be done to the IP level and position.
Large deviations or alterations to the horizontal geometry may not be logically synced in the vertical. Options under the IP edit for moving sections of vertical geometry by a relative chainage may be a better option.

String Properties.

Default (HIP & VIP Types)



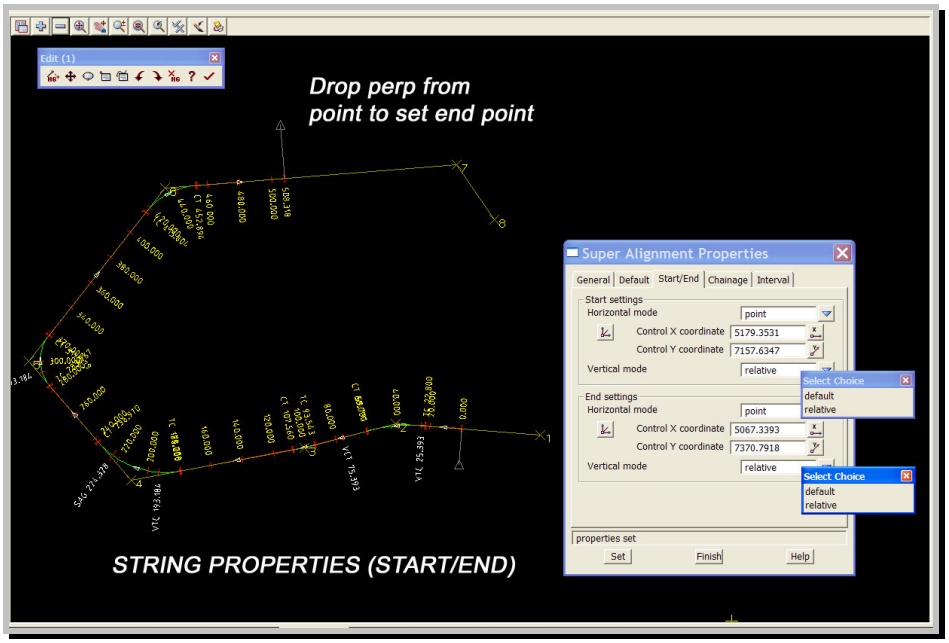
A default can be set for IP type (horizontal and vertical)

In the example above a default HIP curve radius has been set. (Curve radius e.g. 50).

As each IP is placed a radius of 50 will be automatically set at the IP.

String Properties.

Start / End (Chainage Options)



The above alignment has had the start and end points set, thus cropping the overall alignment back (the labelling shows only that part of the alignment to be used).

Under ***string properties (Start/End)*** the user can locate a point (either on the alignment or offset), from which a perpendicular is dropped for the start and end chainage points.

If the ***segment*** mode is used then the perpendicular dropped point locates the segment as the start and end segments (line or arc).

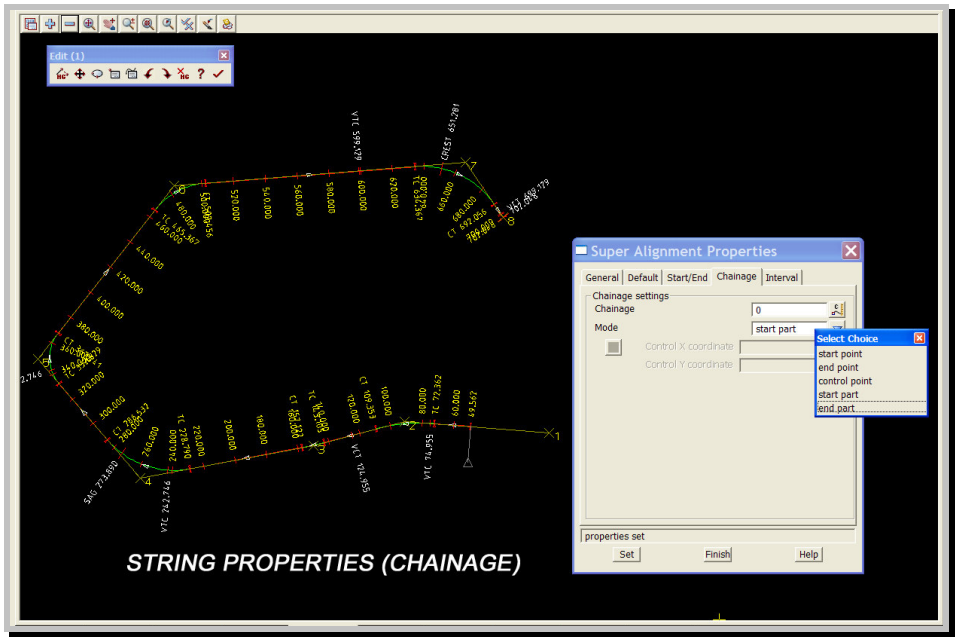
The Vertical mode is set as default or relative.

- ***Default*** shows the entire alignment vertical grading.
- ***Relative*** shows only the geometry over stage 1.

The entire geometry is always part of the alignment but just not shown. This eliminates the Cad tasks of splitting the complete alignment into different stages.

String Properties.

Chainage (Start / End Design and Labelling)



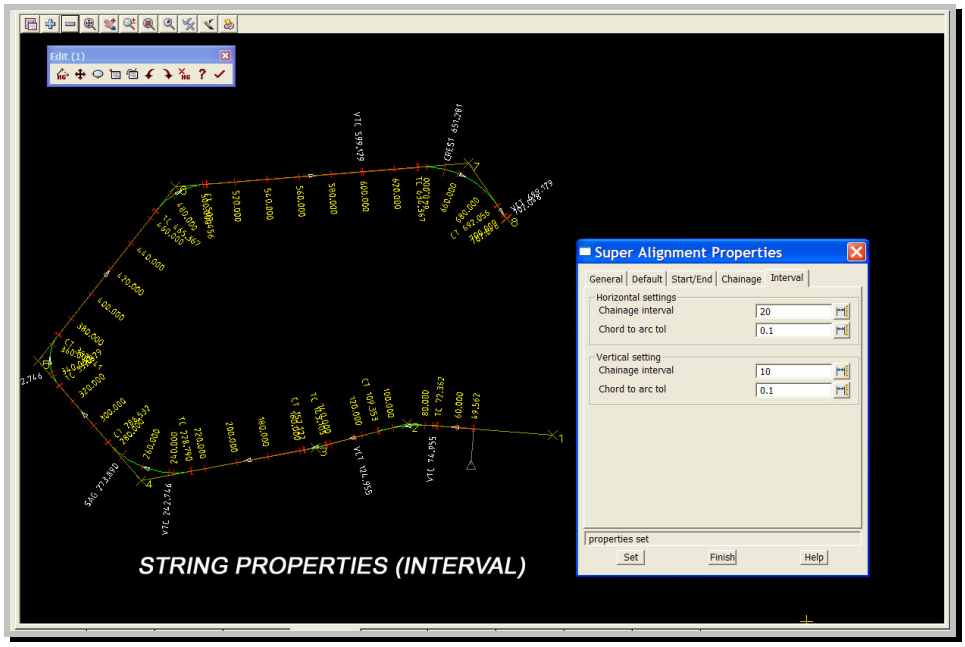
Control of the start and/or end chainage of the alignment is set here.
The start and/or end chainage is set in the chainage box to 0 as a default. The value set pertains to the start and/or end point set either by the **original creation points** or from the ones set under the **Start/End** tab.

The ***start part or end part*** options above are used in conjunction with any start or end pints set under the Start/End tab.
The chainage at these points can be set relative to the original start or end part of the alignment.
The chainage box would still be set to 0 e.g. but the labelling chainage would show the relative chainage (e.g. 49.562)

The ***control point*** option will set a point anywhere along the alignment and lock in that point to the chainage value set.

String Properties.

Interval (Chainage Labelling and Sectioning)



The chainage interval above is used for labelling chainages in the *Design Style* options on the **General** tab.

The ***chord to arc tolerance*** in the vertical setting is used in the apply many to produce extra cross sections over parabolas, that may appear along a horizontal straight and not a curve.

Apply many cross sections are now produced at critical vertical points (tangents, crests and sags) when the super alignment is used as a reference string.

Dynamic Element and IP Tabulation

Design->Apply->String Alignment Table