

Using EziField to Stake a Road (or other regular structure)

Here we have a simple example of a section of road that is 240 metres long and contains a curve.

We have three known points

1. N 1051.525 E 1012.697 Z 100
2. N 1050.929 E 1126.607 IP of Curve 300m Radius
3. N 1001.966 E 1244.416 Z 101

These points make up the centerline of the road which will have a lane either side, 3.5m wide with a crossfall of – 1%.

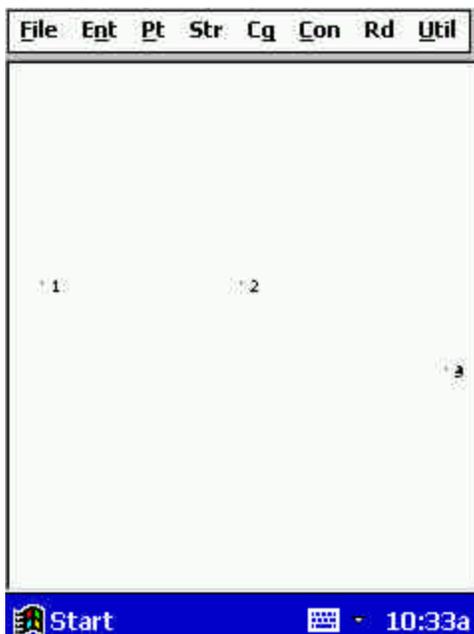
We wish to calculate the points along the edge of the pavement every 20 metres to be able to stake them out.

Regardless of the length or shape of the structure you need to locate, the process in Ezifield basically consists of completing the following steps in order.

1. Enter the Horizontal IP's and define the alignment as a string.
2. Enter the Vertical IP's which define the Design Grading
3. Define a Template
4. Define where the Stakes are to be located.
5. Calculate the Points

Start Ezifield, and either open an existing job, or start on a new one using the blank job provided.

1. Enter and Define the Alignment.



The first step here is to add in the known points, which are Horizontal Intersection Points of the proposed alignment.

Whether you have 3 or 300, the process is the same in that you either type in their coordinates, use the Cogo routines to calculate their location, or bring them across from the desktop where you may have imported them from a DWG or other digital file..

Select Pts followed by Add.

It is simply a matter of filling in the fields with the relevant information.

Please note that at this stage of its career Ezifield prompts for East first then North, so make sure you put the values in the correct field.

After you have added the 3 known points you should Zoom Extents to see the whole job, like that shown at left.

In this case there is a curve involved in the alignment, and if you have curves and/or transitions in an alignment we suggest that you use Route Curve to calculate them and store the string .

Select Road followed by Route Curve.

You will see the Route Curve screen appear.

First thing to do is to define the folder where the alignment string will be stored and the name of the string.

If you use the Pull Down arrow on the Folder field you should see a folder called 'lots' and that will be fine, so just select it. If you do not see it, simply type 'lots' into the field.

As far as the Name goes, you can use whatever name you like, but here I will use 'cl1'.

Once the new alignment has been named, you need to specify the points which define it. You do this by entering them in the 'Entry Line' and then pressing Add to add them to the table.

You enter the Point Number of the IP, a space, a Zero for "Dist"(in a future update the program will calculate the length from IP to IP and put it in place of this zero), a space, Incoming Transition Length or zero if none, space, Radius of the curve (or zero if on a straight), space and Outgoing Transition length or zero.

Once you have entered the relevant values press the Add button and these will appear in the table.

Here you would enter in turn

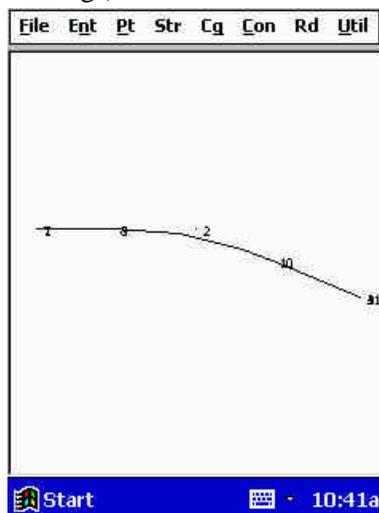
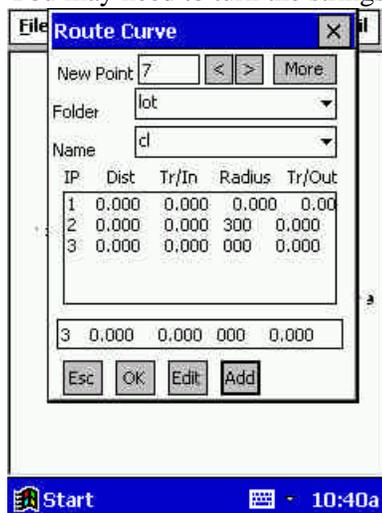
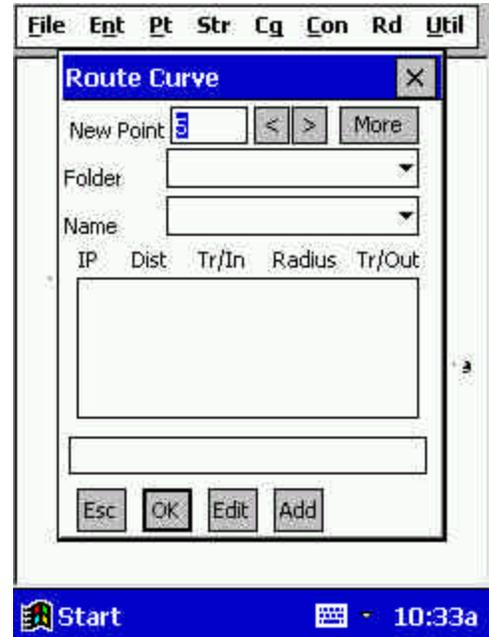
- 1 0 0 0 Add
- 2 0 0 300 0 Add
- 3 0 0 0 0 Add.

You would then see a screen like that below left.

(Note if your values do not 'line up' directly below the headings immediately do not worry, they will next time you come in, and we are working on getting it 'prettier' with all the different screen sizes in these devices)

When you select the OK button the program will calculate the relevant points and store the string away.

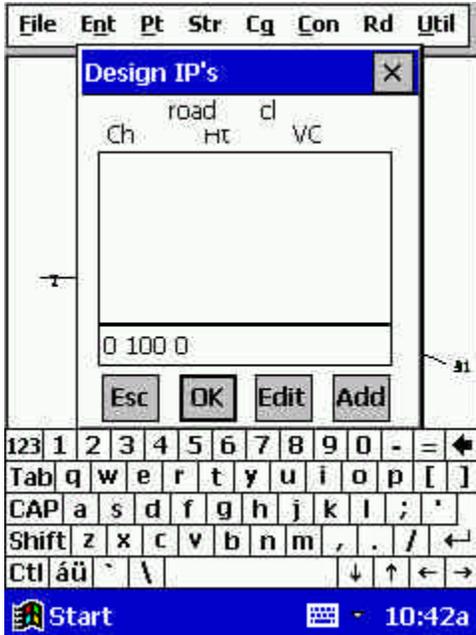
You may need to turn the strings on (AltS or Util >Strings) to see the screen below right.



2. Define Vertical Grading.

The next step is to enter the Vertical Intersection Points and Vertical Curves if any.

In this case we have a straight grade from the start to the end of the section.



Select Road followed by IP Table to see the following screen. Again you enter the values on the 'Entry Line' and then select the Add button to put them into the table.

Here you enter the 'Chainage' of the IP, a space, the Elevation/Reduced Level/Height of the IP and the Length of VC if any, or zero if none .

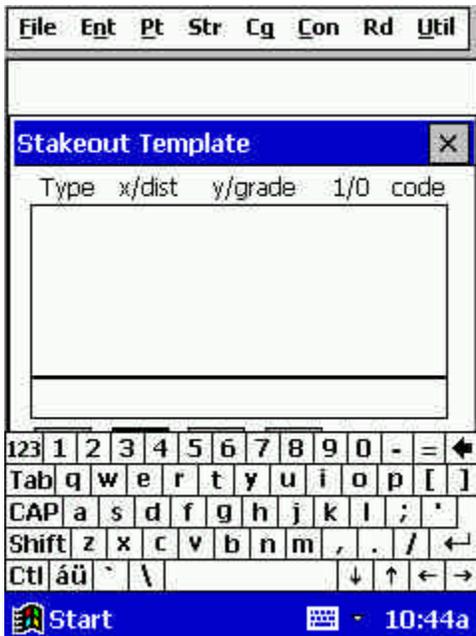
Note that Ezifield works with a through or running chainage and does not understand 'stationing' at this stage of its career. So a chainage of 0+90 is simply entered as 90, and if the station interval is 100, a value of 1+23.5 would be entered as 123.5 (basically remove the '+' from a stationed value and it should be OK in most cases)

In this case the road will go from a height of 100 at the start of Chainage 0 to a height of 101 at Chainage 240.

Enter the following two lines;
0 100 0 Add
240 101 0 Add.

3. Define the Template

Here we have been told that the points to be staked are 3.5 metres off the alignment and at a grade of 1% below the height on the alignment.



Select Road followed by Templates, and you will see the Template entry screen as shown at left.

Here you need to use one of the 'Types' to define the particular leg, and with the information given, the type we need is a 'grade'. (For full descriptions of the Template facilities, and the entry types available, please refer to the Ezifield manual.)

For this type you enter the word 'grade', a space, the Horizontal Distance, a space, the Grade/Crossfall, a Space, Y or N to calculate points at the end of the leg or not, a space, and the Code to allocate to these points.

Here type in ; grade 3.5 -1 Y ER followed by Add.

Please note the Heading reads 'I/O' instead of 'Y/N' and will be altered in the next release – earlier version require a 1 or a 0 instead of a Y or N, and the housekeeping hasn't kept pace with the development.

Now at this stage you may say this is fine in theory, but in real life I place an 'offset' stake which is offset both horizontally and vertically to the actual edge of the pavement.

No problem. If that is what you want to do, simply add another line to your template to specify that position.

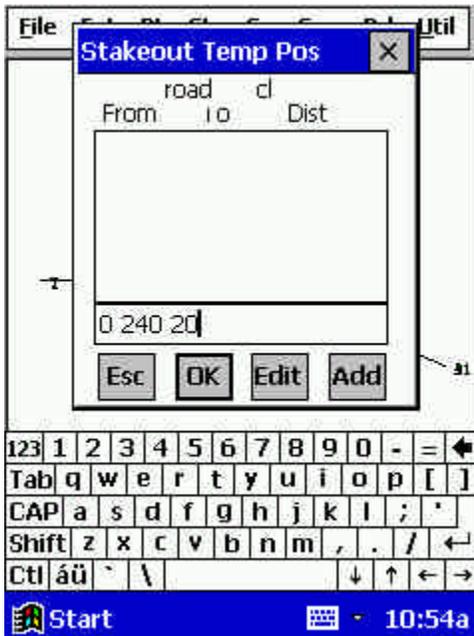
For example, say you wished to offset 3 metres horizontally and 1 metre vertically from the design edge of pavement, and you didn't wish to mark the actual edge of road.

Your template would now become
grade 3.5 -1 N ER
goto 3 1 Y ST.

Note that Ezifield is also capable of calculating the 'batter points/catch points' as you go if you have a triangulated model of the original ground surface in the job. That capability will be covered in a later example.

4. Define Where Stakes are to be Located.

To locate the Stakes at regular intervals along the alignment, you select Temp Pos, which is cryptic shorthand for Template Positioning.



The screen will appear as seen at left.

On the entry line you type in the From/Start Chainage, a space, the To/End Chainage, a space, the Dist/Interval at which to apply the template to calculate the points.

Here we want stakes every 20 metres from start to finish for the initial set of stakes to be used by the heavy equipment.

Enter
0 240 20 Add.

Obviously if you wished to have stakes at 20metres on the straight and 10 metres around the curve when you get to the 'fine trim' stage, you could obtain the Chainages of the TP's (use Points > Edit to see points 6 with a Chainage of 54.867 and 8 with a Chainage of 171.466.

In that case you would enter
0 54.87 20 Add
54.87 171.47 10 Add
171.47 240 20 Add

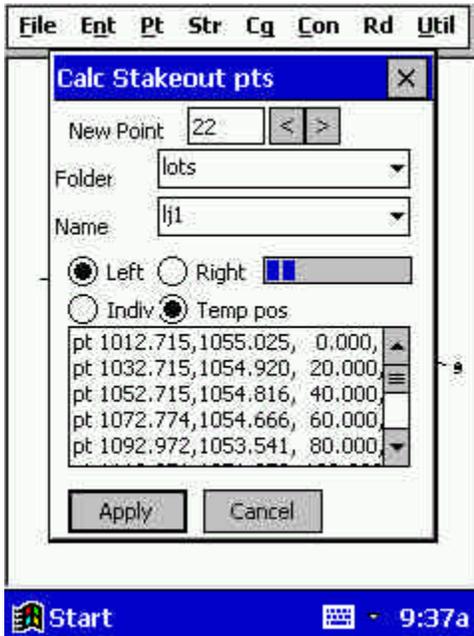
If you also need to stake locations for pipes, culverts or whatever else there may be, which are not at these 'regular intervals', you need Individual Points. Select Road > Indiv Points to specify the chainage and the offset at which to calculate the point.

In this case you can also enter a 'height' of the point to be staked, since generally at these odd intervals you need to locate inverts of pipes or pits that are at a height not directly related to the design grading.

I leave it for you to investigate the Individual Point screen for yourself as the methodology is the same as for all the other entry screens.

5. Calculate the Points

When you are ready to calculate the points select Road followed by Recalc Pts.



The screen will appear as seen at left.

If you wish to allocate points into discrete Point Ranges you can set the 'New Point' number as needed, otherwise Ezifield will simply allocate the next available point number.

You need to select the alignment you wish to use, so use the Pull down facilities to select the relevant folder and name of the alignment. Obviously in this job the step is a little redundant, but in real work you will often have a variety of alignments stored in the one job, representing different sections of the project.

Once the alignment has been specified, you can select whether you wish to locate the stakes on the left or the right of the alignment. If you wish to have stakes on both sides, simply run this routine twice.

On the next line down you specify whether to apply the values in Templates, or to calculate individual points.

Again, if you need both templates and individual locations, simply run the routine twice.

When you have decided what to calculate on this occasion, press the Apply button.

You will see a list appear showing the coordinates and chainages of the points calculated.

Once you close down this screen you should see the newly calculated points located along your alignment.

Below left you can see we have calculated on the left side of the alignment, and below right you see the result after we have run the routine a second time to calculate along the right side.

Now you can stake out the points as required using the Total Station or GPS.

