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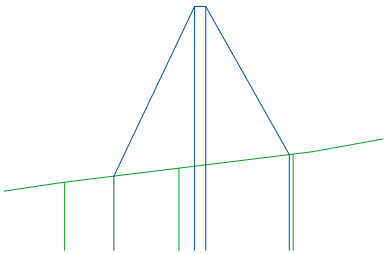
Ground Modelling, Road Design and Land Survey software for Civil Engineering, Environmental and Landscape applications working within CAD.



# Bund design



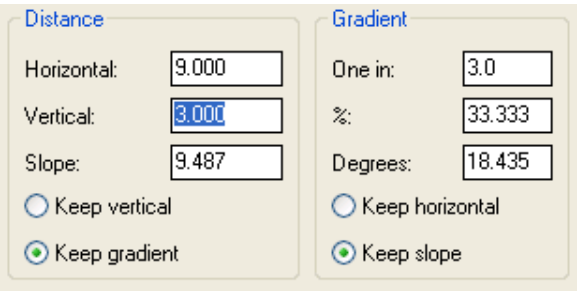
| | Starting with 2D Polyline representing | Top definition * | Possible application |
|---|---|---|---|
| Method 1 | Toe | Following existing ground | Sound or visibility barrier |
| Method 2 | Top | Following existing ground | Sound or visibility barrier |
| Method 3 | Toe | Horizontal | Flood barrier or other water application |
| Method 4 | Top | Horizontal | Flood barrier or other water application |
| Method 5 | Toe 1 & Toe 2 | Self defining from both toes | Sound or visibility barrier |

* Note that the top may be flat (e.g. 2 metres wide) or have a cross fall for drainage.

## Method 1

### Step 1

Starting with one Toe represented as a 2D Polyline and the existing ground model. Menu item *Ground Modelling, Drape, Drape entities* to represent this toe as a 3D Polyline. One side of the bund top may now be represented at a constant height relative to this 3D Polyline by using menu item *3D Polylines, Offset*. In the example to the right the bund is 3 metres high with a gradient of 1 in 3.




### Step 2

Repeat the menu item to define the other side of the top. Enter the width of the bund top in Horizontal and note that for a flat top set Vertical to 0.000 or if a cross fall or gradient is required enter this as One in 40 for example.

### Step 3

Fix the other toe from the second top created above by using menu item *Ground Modelling, Embankments*. The embankment offsets show where the embankment has been calculated and may be erased to simplify the drawing.

## Method 2

### Step 1

Starting with one side of the Top represented as a 2D Polyline and the existing ground model. Menu item *Ground Modelling, Drape, Drape entities* to represent the top as a 3D Polyline. Use *3D utilities, Move Vertically by* to raise this by the desired height.

### Step 2

To draw the other side of the top use *3D Polylines, Offset*. Enter the width of the bund top in Horizontal and note that for a flat top set Vertical to 0.000 or if a cross fall or gradient is required enter this as One in 40 for example.

### Step 3

Fix both toes by relating them to each top using *Ground Modelling, Embankments*. The embankment offsets show where the embankment has been calculated and may be erased to simplify the drawing.

## Method 3

### Step 1

Starting with one Toe represented as a 2D Polyline and the existing ground model. Menu item *Ground Modelling, Drape, Drape entities* to represent this toe as a 3D Polyline. To fix the top relative to this toe we need to use the *Embankments* program but before we can there has to be a model defining a surface at a level that will be the bund top. Use menu item *Ground Modelling, Create Model, Uniform surface* to make a model at the specified level (this can also create a sloping model). We can now run *Ground Modelling, Embankments* to define the top from the toe using the uniform surface model.

### Step 2

To draw the other side of the top use *3D Polylines, Offset*. Enter the width of the bund top in Horizontal and note that for a flat top set Vertical to 0.000 or if a cross fall or gradient is required enter this as One in 40 for example.

### Step 3

Fix the other toe from the second top created above by using menu item *Ground Modelling, Embankments*. The embankment offsets show where the embankments have been calculated and may be erased to simplify the drawing.

## Method 4

### Step 1

Starting with one side of the Top represented as a 2D Polyline and the existing ground model. Use menu item *3D utilities, Move Vertically* to raise this by the desired height to represent the bund top.

### Step 2

To draw the other side of the top use *3D Polylines, Offset*. Enter the width of the bund top in Horizontal and note that for a flat top set Vertical to 0.000 or if a cross fall or gradient is required enter this as One in 40 for example.

### Step 3

Fix both toes by relating them to each top using *Ground Modelling, Embankments*. The embankment offsets show where the embankment has been calculated and may be erased to simplify the drawing.

## Method 5

### Step 1

Starting with both toes represented as 2D Polylines and the existing ground model. Use menu item *Ground Modelling, Drape, Drape entities* to convert both into 3D Polylines.

### Step 2

We now need to define the embankment from the first 3D Polyline at 1 in 2.5 for example. To do this we need to make a “nominal construction model” that will be a horizontal surface that will have an elevation defined by being four or five times the height of the bund at the highest point along the first toe. For example if the first toe 3D Polyline has a highest point on the ground of 81.0 and the typical bund height will be 4.0 then a “nominal construction model” with an elevation of 100.0 should be fine. Use menu item *Ground Modelling, Create Model, Uniform surface* to make this model.

### Step 3

*Ground Modelling, Embankments* to draw embankment at 1 in 2.5 for example up to the 100.0 nominal model. The second toe must be “covered” by the embankment.

### Step 4

The next thing to do is to make a ground model representing the first embankment so that the calculation of the second embankment will have something to interface - use *Ground Modelling, Create Model, from Embankment Offsets*.

### Step 5

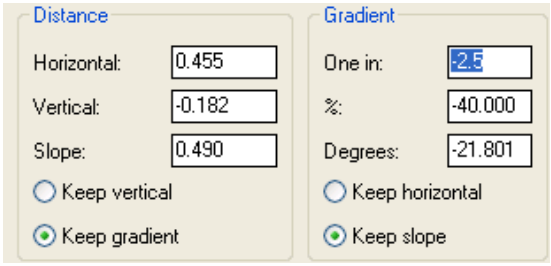
*Ground Modelling, Embankments* to draw the second embankment from the second toe to the model made from the first embankment in item 4 above (with gradient of 1 in 3.0 for example). The apex is now fixed.

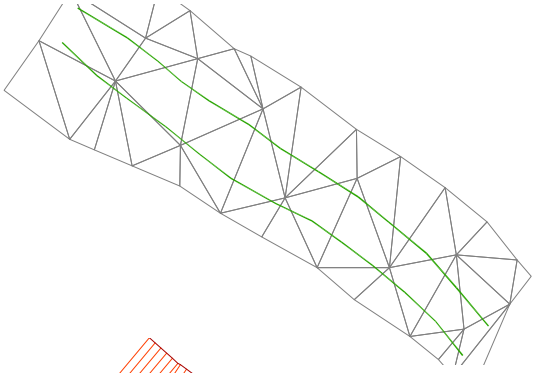
### Step 6

To calculate a flat top use menu item *3D utilities, Calculate for flat top bund* Enter the width of the bund top (e.g. 1.0), first embankment gradient (e.g. 1 in 2.5) and second embankment gradient (e.g. 1 in 3.0) the height difference from the apex is calculated – copy this from the command line.

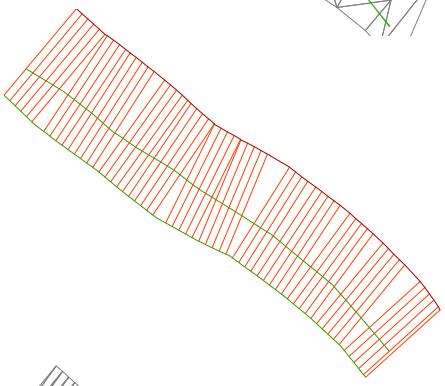
## Step 7

To fix the first top use *3D Polylines, Offset*. Pick the 3D Polyline representing the apex, indicate which side, paste the height from the apex to the flat top with an added "-" into Vertical: and enter the gradient (1 in 2.5 in this example). Repeat to fix the other top and delete the apex.

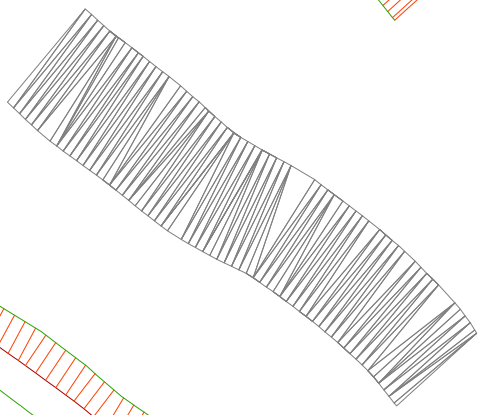


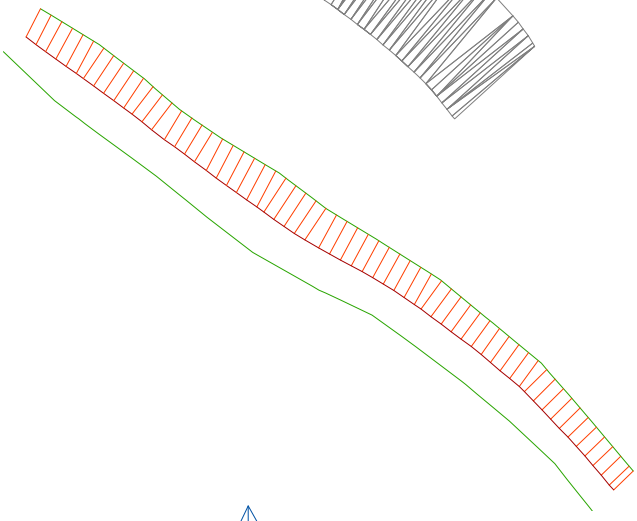
Both toes shown in green (with site model triangles)



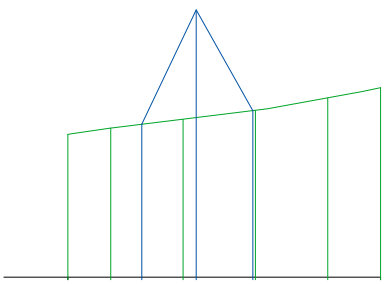
First embankment from first toe to uniform surface model



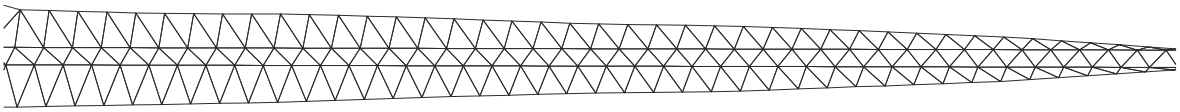
Model made from first embankment



Second embankment from second toe to first embankment model to fix apex shown in red



Section before flat top has been added



The result after all methods is the wire frame design i.e. four 3D Polylines. Create the design model from these to enable volume calculations etc.