Superstructure School

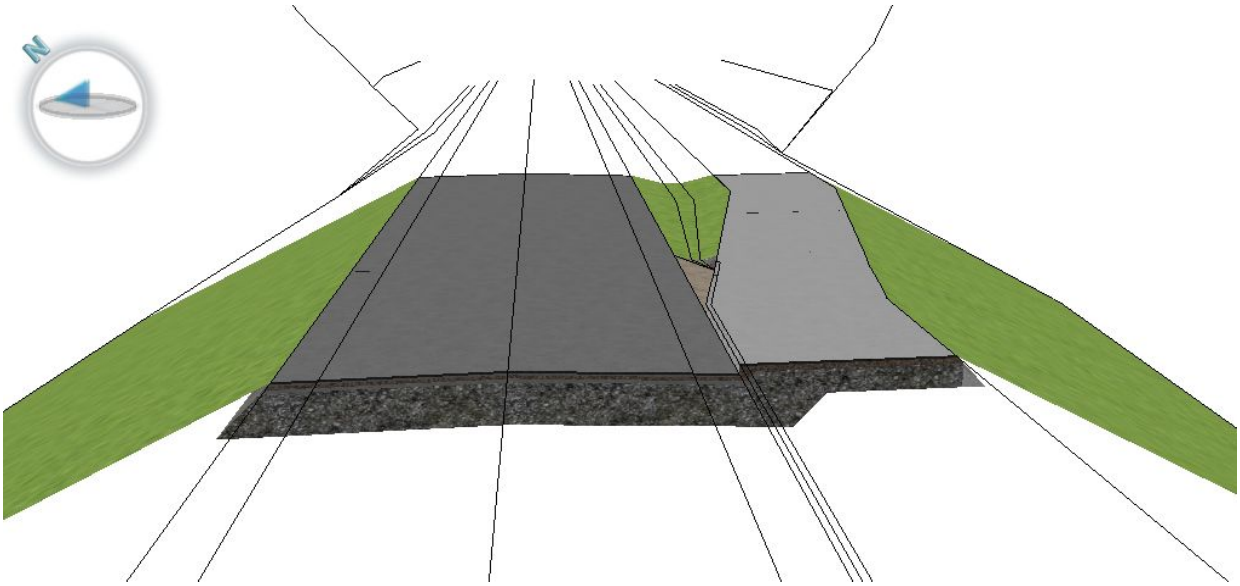
March, 2019

The “Superstructure School” is meant to be a little document with tips and tricks that you can include in you designs. We get supportcases every week regarding handling of pavement and will through this Superstructure School look into some of these and other examples.

Pavement transitions between road and walk/bike areas

In our last newsletter we showed you how to model the pavement so that it has a good fit between the road superstructure and a sidewalk or a bike/walkpath. A transition between these two solutions is a tricky situation that can be hard to model.

Here we will show what you can achieve with using only one model and how it can look if you allow yourself to use multiple road models.



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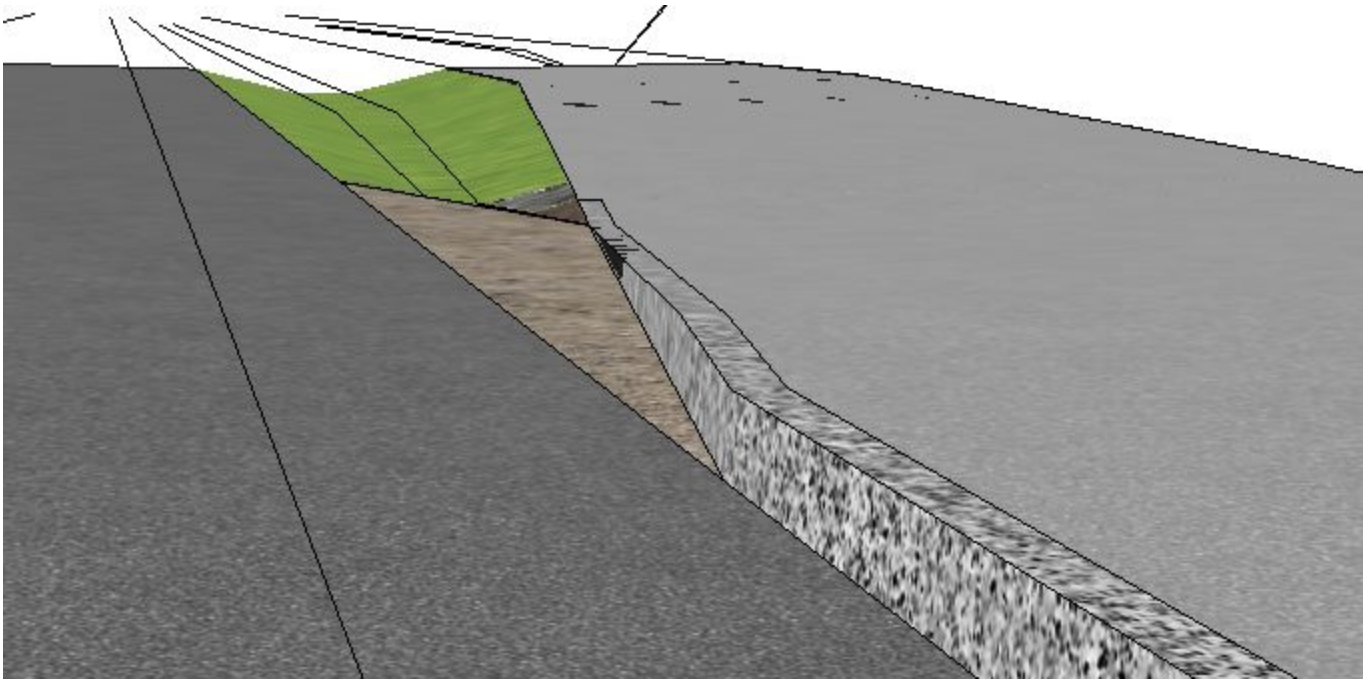
Transition modelled with one road model

The transition between different pavement types are in general a bit challenging because the principals for the design changes drastically. Surfaces come and go, or methods are added/removed.

To avoid dragging the traffic separator ditch all the way into the narrowest part between the asphalt shoulder and kerbstone we have added a gravel shoulder to take up the difference in the beginning. An alternative is to also let the asphalt shoulder expand in this area.



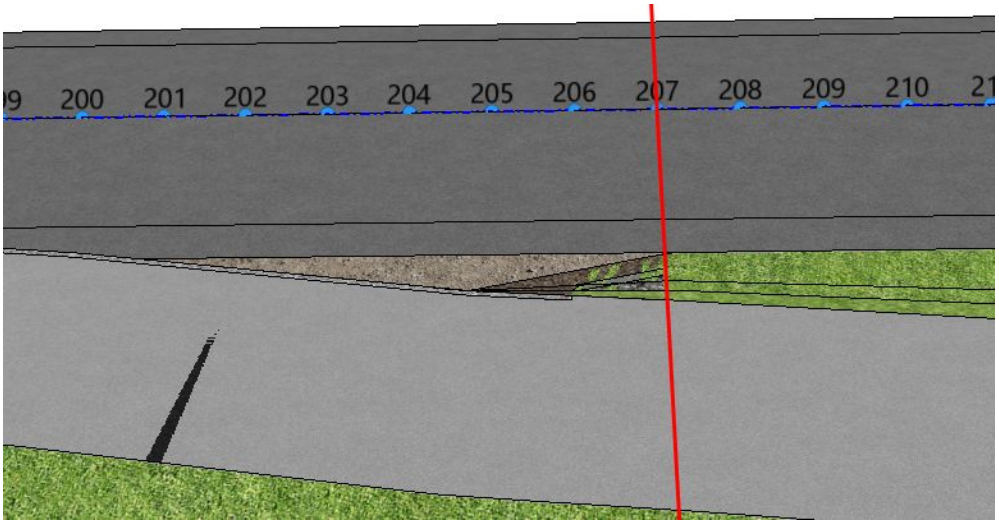
In our newsletter for February we added “Gradual layer” for surface 2.01.

The cleanest results we get if we make a copy of the pavement for the kerbstone solution where we instead of using surface 2.01 as gradual layer, we use 2.05 which represents the gravel shoulder. As putting both gradual layer solutions into one pavement template doesn’t cause any problems in this case, we just do that instead.

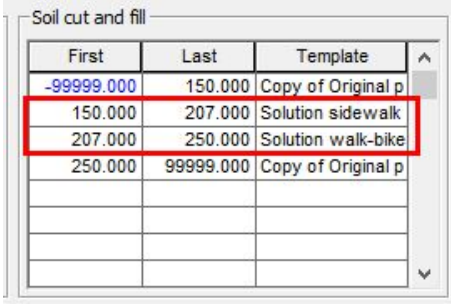
Start surface	Extra distance	Load gradient	Trans. gradient
2.01 R. Asphaltshoulder	0.000	-1.000	1.000
2.05 R. Gravelshoulder	0.000	-1.000	1.000

Pavement | Inner slope | **Gradual layers** | Rehabilitation | Median

At some point along the model we need to change the pavement templates from the sidewalk/kerbstone-solution, to the walk-bikepath solution. This transition we have chosen to put in chainage 207 for our model, where the gravel shoulder ends against the asphalt shoulder and the ditch as already started a bit.



It is natural to place the transition between the pavement templates somewhere between chainage 205-207.


Soil cut and fill
First
Last
Template
-99999.000
150.000
Copy of Original p
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207.000
Solution sidewalk
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Solution walk-bike
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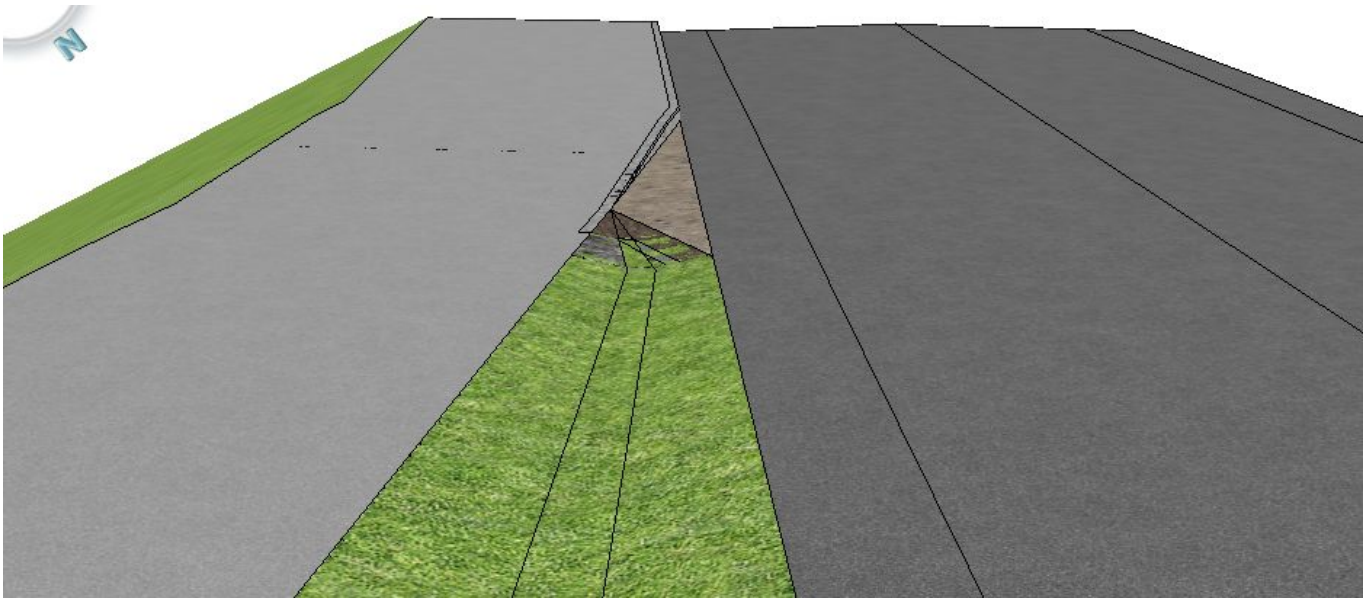
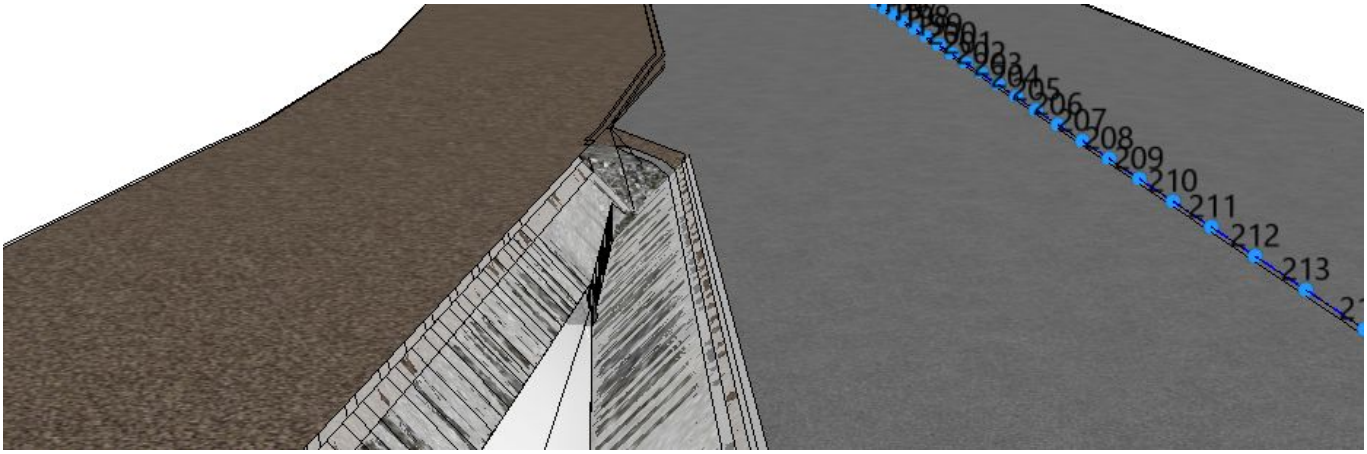
When we look at the 3D-results they generally look OK on the surface.

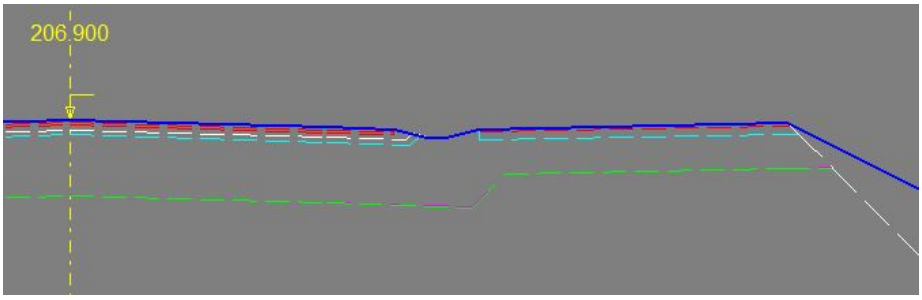


Apparently it also looks OK for the pavement layers aswell.

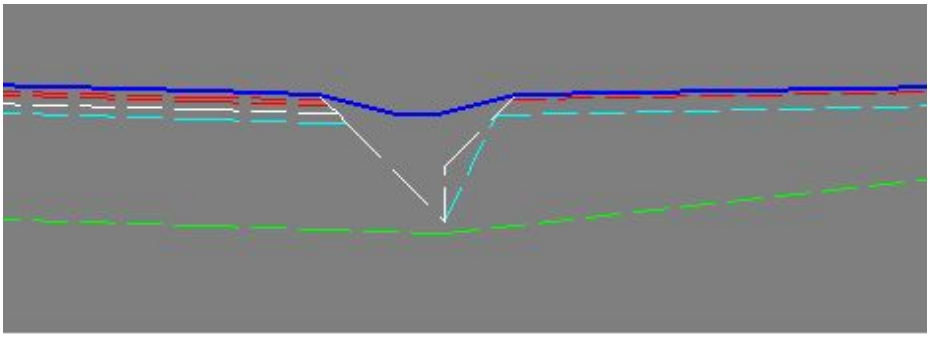


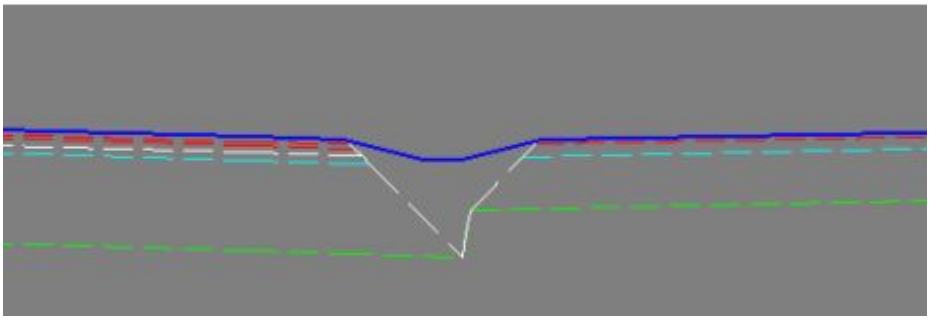
But if we look closer at our results we see that the model has challenges in the transition that you should consider wheter or not to deal with.

Ch. 206.900; Kerbstone solution with small ditch started



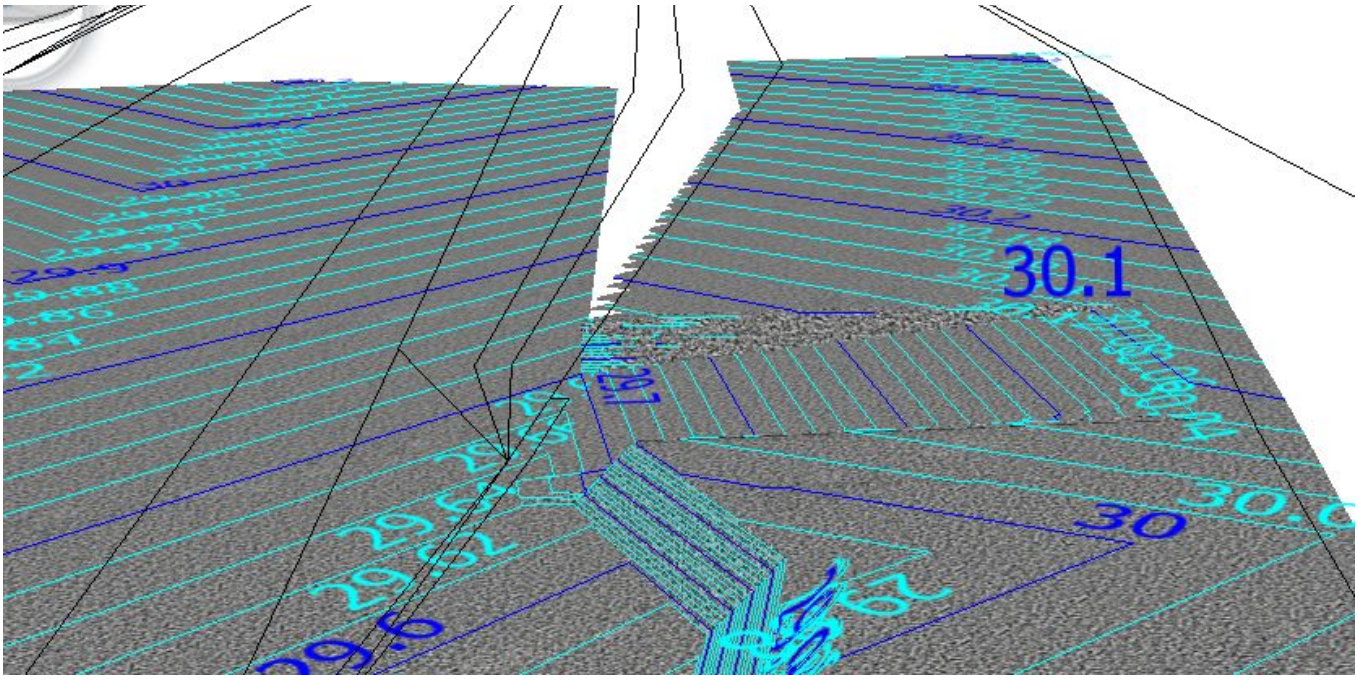
Ch. 207.100; Bike/Walkpath solution with/without challenges.





The challenges we see in the cross-sections we also see in 3D.

Here we have picked the objects for the filter course and showing it with 2cm contour intervals. We see a flatter area in the middle of the transition.



Transition modelled with multiple road models

If the solution that we showed in the previous section doesn't give good enough results the walk/bikepath-solution could be designed as a separate road model.

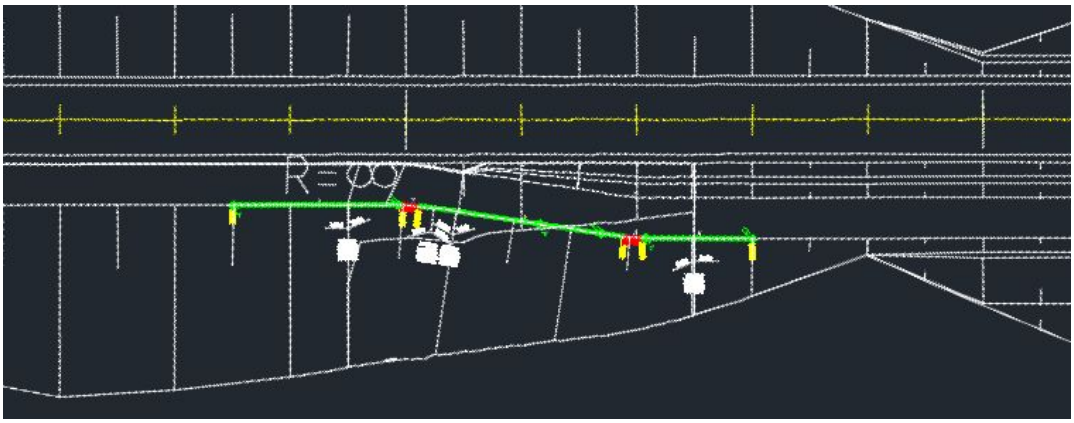
TIP

The principals that we use here could be useful in other situations where one wants to separate the walk/bikepath from the main model.

Many of the principals are also good tools and practice for establishing walk/bikepath-solutions along existing roads where the challenge is often related to getting the walk/bikepath in the correct horizontal/vertical placement, and getting the pavement transitions against existing road as you would like.

From the road model you already have, place the alignment for our new road model on the outer edge of the walk/bikepath. The advantage of this is that we move the alignment away from "all that happens", helping us achieve our desired results.

Placing the walk/bikepath alignment in horizontal and vertical we get alot of help from the underlying road model that we already have made in the part of this document. This model already has a surface that is relatively good, so I try to trace that surface also making necessary adjustments along the way to make it even better.



From our new alignment we make a road model expanding to the left with the same shape and form as the original walk/bikepath.

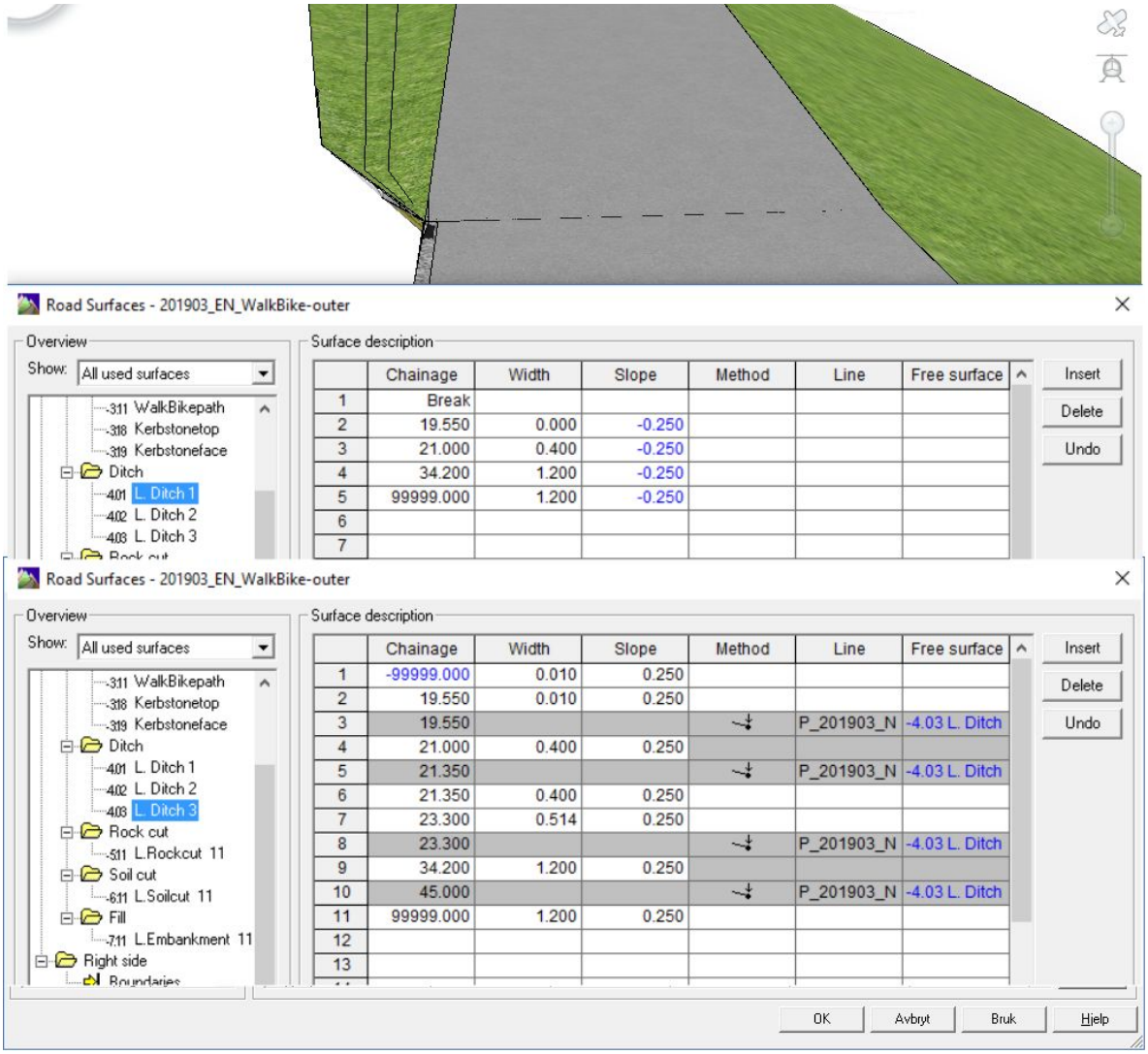
Our calculation basis is the terrain and our main road model.

Since the walk/bikepath model replaces the similar surfaces in the main road model we need to remove these surfaces and here we have used a BREAK in the description over 30 meters where the walk/bikepath model is located.

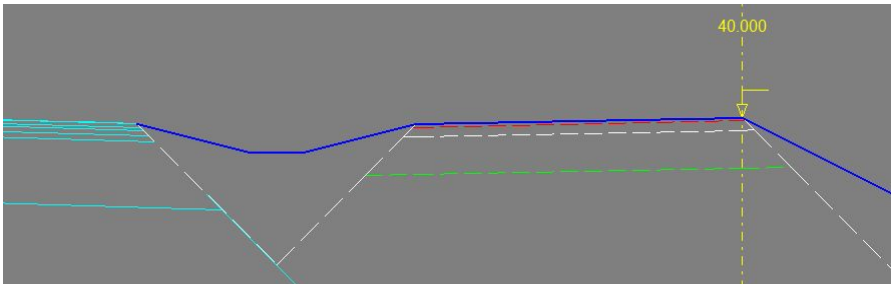
To not have to use surfaces from surfacegroup 3 to define the ditch we have used the Embankment Ditch function to force the ditch surfaces “ON” on the lefthand side of the walk/bikepath even when we are on an Embankment.

The ditches are defined so that they initially start with 0cm width (except for surface -4.03 that gets 1cm width).

These widen out stepwise and surface -4.03 uses an alignment as surface edge that goes along the main road models shoulder to get a good connection between the models.



Here we see the walk/bikepath portion of the model.


40.000

For the kerbstone solution it is a bit harder to get right without some extra steps.

We use the function for Detailed Pavement to get everything right in this case.

If you don't know of the function for "Detailed pavement" we recommend that you take a look at some of our YouTube-videos about the topic or take a look at our Novapoint Resource Center.

http://help.novapoint.com/doku.php?id=en:np:road:ribbon_in_novapoint:design:detailed_pavement:start

Here we have defined the left side with 2 surfaces and an endsurface.

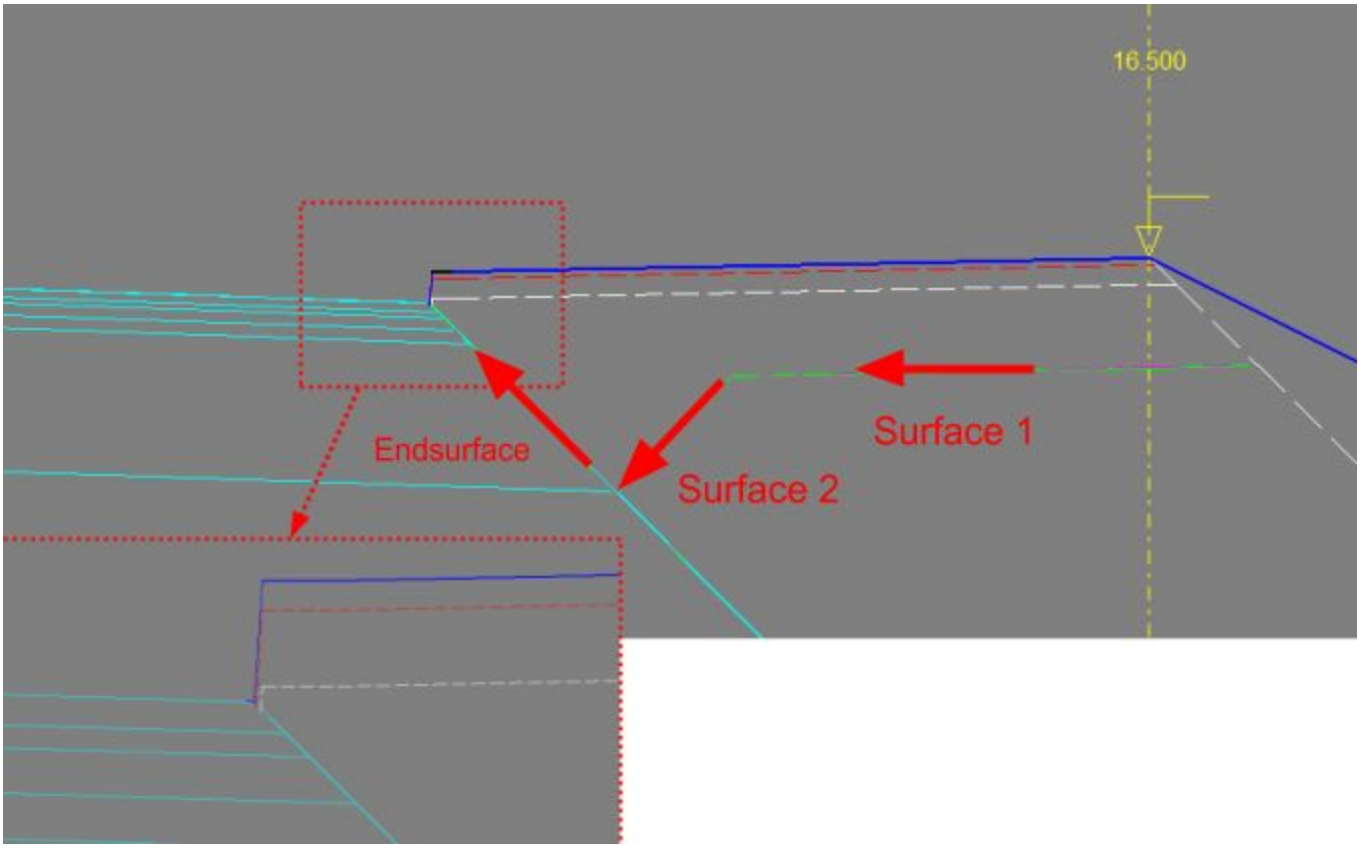
Surface 1: Same slope as walk/bikepath surface with a user-defined width.

Surface 2: Slope -1:1 with a "dummy" width (here 1cm)

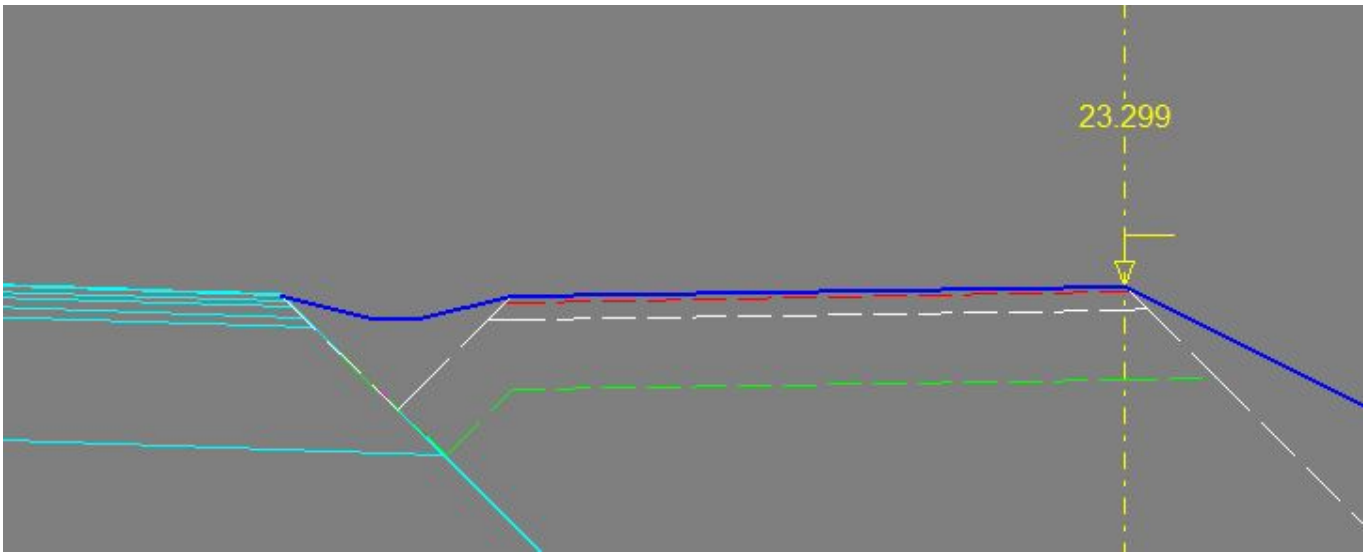
Endsurface: Endsurface method 2 up to road surface -4.03.

Since endsurface method 2 is going to a road surface with a fixed slope then the surface before this, Surface 2, will extend automatically to make it all fit. Therefore it was enough to just defined this with a small width.

The startpoint for Surface 2 is decided by Surface 1 which in this specific chainage is measured to 2,03m.



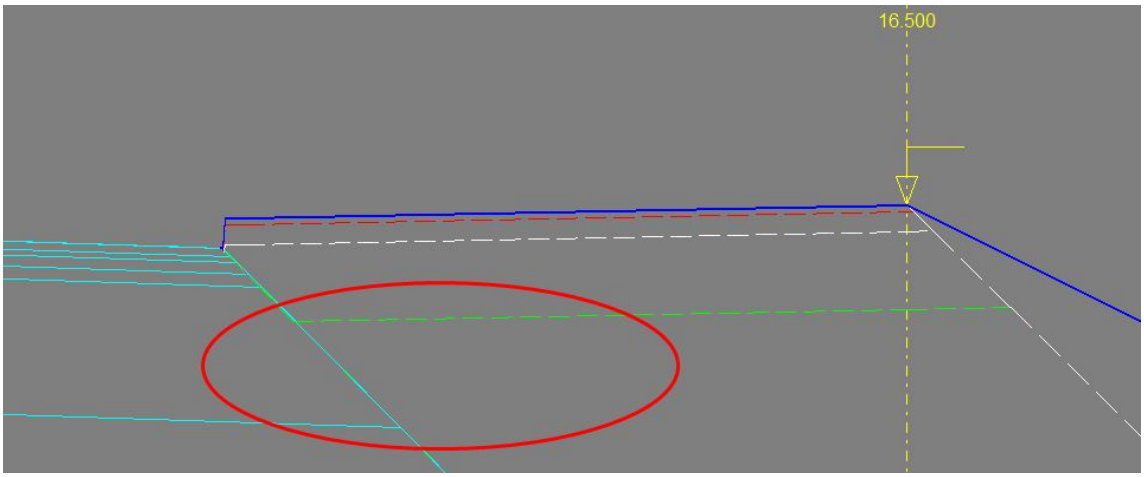
In the transition between the solutions it is possible to model as shown below.



TIP

It is not necessary to specifically define all the chainages, for many of them will be looking the same, but you should go over all the chainages and check that the result looks like what you wanted to achieve.

If we had excluded Surface 2 in the Detailed pavement description the results would also be easier to model and we would get the results we see below. In many cases it could also be a good enough result.



In addition to this there are used more "tricks" to reach the desired solution:

Walk/bikepath model:

- *Alignment as surface edge that follows the lowest part of the kerbstone/inner part of the walk/bikepath. Walk/bikepath model uses this with method 1, and the walk/bikepath surface is also used as a free surface.*
- *Embankment ditch with close to 0cm width on the ditch surfaces where the "don't exist".*
- *Small road surface on the righthand side of the alignment (ca 1cm) so that the pavement gets established there as well.*

Main road model:

- *Alignment as surface edge on the outer edge of the shouldersurfaces (here we have also used a continous outermost surface for surface 2.05 with 1cm). We have used the function for "Save surface edge as alignment". The -4.03-ditchsurface uses this alignment for a seemless connection.*
- *Removed the kerbstone/ditch/walk-bikepath surfaces in the area where the walk/bikepath model is established. Have used BREAK in the road surface descriptions.*
- *Embankment slope 7.11 is set with -1:1 slope to not create quantities for the inner slope under the walk/bikepath model.*

A final check of the 3D-results shows that we have achieved what we want for these models.

Note that the “strange” surface poking up is just the filter course that follows the roadbed in the walk/bikepath model.