

Introduction

Objective:

The objective of this excel sheet is to calculate the subsidence of six different types of road constructions. These road constructions each have the objective to reduce the subsidence of the road. The six different types of road constructions are described in the professional article.

Theorie and formula of Koppejan:

To calculate the subsidence the theorie and formula of Koppejan is applied. Depending on whether the load of the road construction is bigger than the preconsolidation pressure (P_g), the following formula is used:

$$Z_{z+i} = d \left(\frac{1}{C_{p1}} + \frac{1}{C_{s1}} \log t \right) \ln \left(\frac{\bar{\sigma}_k + P_g}{\sigma_k} \right) + d \left(\frac{1}{C_{p2}} + \frac{1}{C_{s2}} \log t \right) \ln \left(\frac{\bar{\sigma}_k + \Delta\sigma_k}{\sigma_k + P_g} \right)$$

If the preconsolidation pressure is bigger than the load of the road construction the following formula is used:

$$Z_{z+i} = d \left(\frac{1}{C_{p1}} + \frac{1}{C_{s1}} \log t \right) \ln \left(\frac{\bar{\sigma}_k + \Delta\sigma_k}{\sigma_k} \right)$$

The parameters in the formulas above are:

Z_{z+i} = Subsidence of the layer (metres)

d = Layer thickness (metres)

P_g = preconsolidation pressure (KN/m²)

$\sigma_k = \bar{\sigma}_k$ = Average grainpressure per layer (KN/m²)

$\Delta\sigma_k$ = Load (KN/m²)

$C_{p1} = C_p$ = Primary compression coefficient below preconsolidation pressure (-)

$C_{s1} = C_s$ = Secular compression coefficient below preconsolidation pressure (-)

$C_{p2} = C'_p$ = Primary compression coefficient above preconsolidation pressure (-)

$C_{s2} = C'_s$ = Secular compression coefficient above preconsolidation pressure (-)

t = Time of subsidence calculated (days)

$t_0 = 1$

Remarks:

The P_g , C_p , C_s , C'_p & C'_s values are depending on the project location.

The height of the current road construction is ca. 1,4 metres. If a new road construction is bigger than the 1,4m the first layer will be excavated. How much this layer will be excavated depends on the hieght of the new road construction.

The editable and control cells are marked the following in this excel sheet:

 Editable cells

 Control cells

Password: HRdelta