PROKON Support Portal

Bearing Pressure Calculation

Michael - 2019-10-22 - 0 Comments - in C14:Concrete retaining wall design

How is the bearing pressure calculated beneath the base in the retaining wall module?

Overturning:

The program checks the stability for overturning of the wall by assuming rotation about the lower front corner of the base. If a shear key is used and it is located within one quarter of base width from the front, the program also checks for rotation about the bottom of the shear key, and then uses the worst case. The program indicates the point of rotation with a circle either around the front corner of the base or the bottom of the shear key as illustrated in the images below:

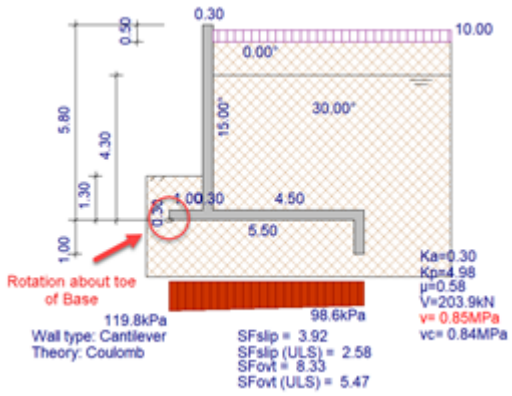

Figure 1 : Sum of moments taken about the front corner of the base

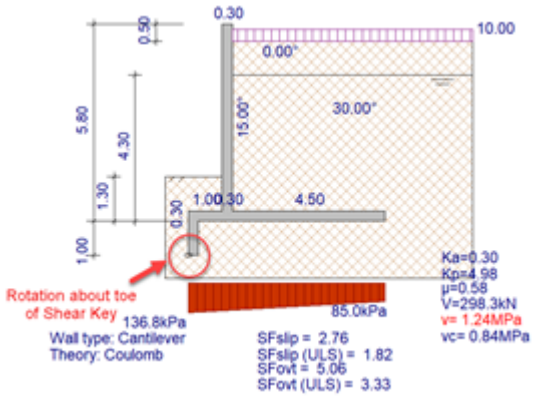

Figure 2: Sum of moments taken about the front corner of the shear key

Eccentricity:

The point of action of the resultant force (X_R) is calculated by summing all the horizontal and vertical forces acting on the retaining wall about the rotation point and then dividing by the vector sum of the vertical forces:

$$X_R = \frac{\mathrm{Mr} - \mathrm{Mo}}{\mathrm{Pv}}$$

Mr: Stabilising moment at serviceability limit states ((kN.m)

Mo: Destabilising moment at serviceability limit states (kN.m)

Pv: Vector sum of vertical forces at serviceability limit states (kN)

X_R: Point of action of the resultant force (m)

The eccentricity of the resultant force from the centre of the base is then calculated:

$$e = \frac{B}{2} - X_R$$

B: Total length of the base (m)

e: Eccentricity of the resultant force (m)

* Calculation of the stabilising and destabilising moments are shown within the retaining wall calcsheet and helpfile

Bearing Pressure:

The location of the resultant force is then used to determine the minimum, θ_{min}, and maximum, $\theta_{max,}$ bearing pressures acting on the base of the retaining wall. The following conditions are used to determine the bearing pressures:

Case 1:

If the resultant force is acting within the middle third of the base, $e < \frac{B}{6}$

$$\theta_{max} = \frac{Pv}{B}(1 + \frac{6e}{B})$$

$$\theta_{min} = \frac{Pv}{B}(1 - \frac{6e}{B})$$

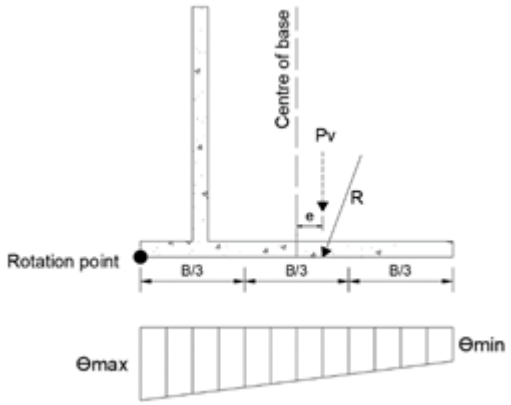

Figure 3: Resultant force acting within the middle third of the base

Case 2:

If the resultant force is acting on the middle third of the base, $e = \frac{B}{6}$

$$\theta_{max} = \frac{2Pv}{B}$$

$$\theta_{min} = 0$$

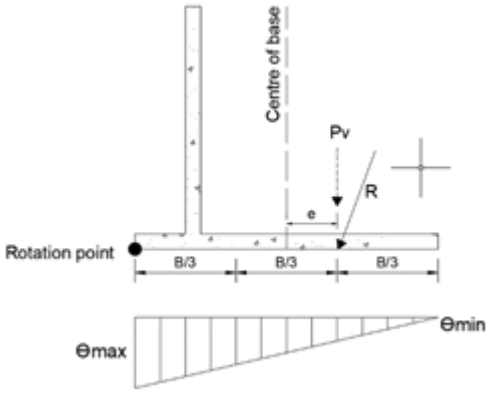

Figure 4: Resultant force acting on the middle third of the base

Case 3:

If the resultant force is acting outside the middle third of the base, $e > \frac{B}{6}$

$$\theta_{max} = \frac{2Pv}{3X_R}$$

$$\theta_{min} = \theta_{max}\frac{3X_R - B}{3X_R}$$

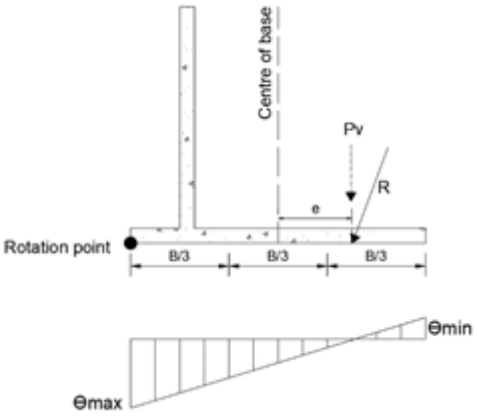

Figure 5: Resultant force acting outside the middle third of the base