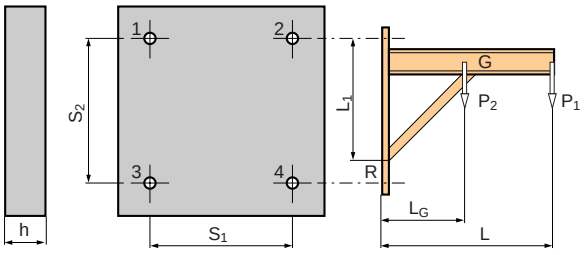
Examples

Example: SPIT TRIGA Z V12 anchor

Concrete : 25 Mpa – Non-cracked concrete
Thickness of base material : 200 mm



L = 1500 mm
L_g = 750 mm
S_1 = 165 mm
S_2 = 220 mm
No edge distance

P_1 = 6 kN
P_2 = 100 kg

CALCULATION OF THE DESIGN ACTIONS PER ANCHOR :

N_{Sd} = 17,8 kN
V_{Sd} = 1,75 kN

We must verify $\beta_V^{1,5} + \beta_V^{1,5} \leq 1$

TENSILE LOAD :

¬ $N_{Rd,p}$: failure mode not decisive

¬ $N_{Rd,c} = N^0_{Rd,c} \times \Psi_{S1} \times \Psi_{S2}$

$N^0_{Rd,c}$ = 24 kN
S_1 = 165 mm → Ψ_{S1} = 0,84
S_2 = 220 mm → Ψ_{S2} = 0,96
$N_{Rd,c}$ = 19,35 kN

¬ $N_{Rd,s}$ = 44,9 kN

¬ $N_{Rd} = \min (N_{Rd,p} ; N_{Rd,c} ; N_{Rd,s})$ = 19,35 kN

¬ $\beta_N = N_{Sd} / N_{Rd} \leq 1$ β_N = 17,8 / 19,35 = 0,92

SHEAR LOAD :

¬ $V_{Rd,c} = V^0_{Rd,c} \times \Psi_{S\_c,N}$

No edge distance → c/cmin = 3,2
S1 = 165 mm → s/cmin = 2,0
$\Psi_{S\_c,N}$ = 3,46
$V_{Rd,c}$ = 32,17 kN

¬ $V_{Rd,s}$ = 58,2 kN

¬ $V_{Rd} = \min (V_{Rd,c} ; V_{Rd,s})$ = 32,17 kN

¬ $\beta_V = V_{Sd} / V_{Rd} \leq 1$ β_V = 1,75 / 32,17 = 0,05

COMBINED LOAD

$\beta_V^{1,5} + \beta_V^{1,5} \leq 1$

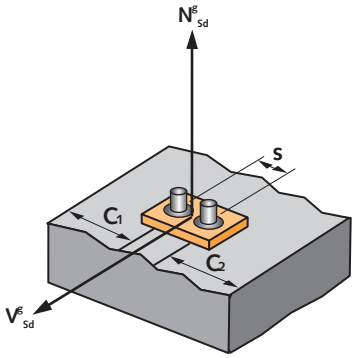
$(0,92)^{1,5} + (0,05)^{1,5} = 0,89 \leq 1$

The calculation is verified, so the anchor TRIGA Z V12 is suitable for this application.

Examples

Example: SPIT FIX Z-A4 M10 anchor with minimum embedment

Cracked concrete – class C20/25
Thickness of base material : 200 mm
S = 105 mm
C_1 = 100 mm
C_2 = 100 mm



DESIGN ACTIONS PER ANCHOR :

N_{Sd} = 3,2 kN
V_{Sd} = 4,2 kN

We must verify $\beta_V^{1,5} + \beta_V^{1,5} \leq 1$

TENSILE LOAD :

- $N_{Rd,p}$ = 4 kN
- $N_{Rd,c} = N^0_{Rd,c} \times \Psi_{S1} \times \Psi_{S2}$

  $N^0_{Rd,c}$ = 6,5 kN
  S = 100 mm → Ψ_S = 0,9
  C1x = 100 mm > (Ccr,N = 1,5.hef) → Ψ_{C1X} = 1
  C2x = 100 mm > (Ccr,N = 1,5.hef) → Ψ_{C2X} = 1
  $N_{Rd,c}$ = 5,85 kN
- $N_{Rd,s}$ = 14,4 kN
- $N_{Rd} = \min (N_{Rd,p} ; N_{Rd,c} ; N_{Rd,s})$ = 4 kN
- $\beta_N = N_{Sd} / N_{Rd} \leq 1$ → β_N = 3,2 / 4 = 0,8

SHEAR LOAD :

- $V_{Rd,c} = V^0_{Rd,c} \times f_{\beta,V} \times \Psi_{S\_c,N}$

  Shear loading direction : angle β = 90° / edge concrete : $f_{\beta,V}$ = 2
  No edge distance in the shear direction → c/cmin = 3,2
  S1 = 100 mm → s/cmin = 1,5
  $\Psi_{S\_c,N}$ = 3,31
  $V^0_{Rd,c}$ = 4,1 kN
  $V_{Rd,c}$ = 27 kN
- $V_{Rd,s}$ = 12 kN
- $V_{Rd} = \min (V_{Rd,c} ; V_{Rd,s})$ = 12 kN
- $\beta_V = V_{Sd} / V_{Rd} \leq 1$ → β_V = 4,2 / 12 = 0,35

COMBINED LOAD

$\beta_V^{1,5} + \beta_V^{1,5} \leq 1$

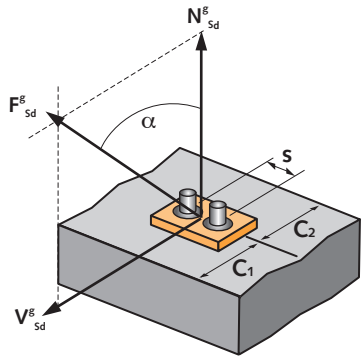
$(0,8)^{1,5} + (0,35)^{1,5} = 0,92 \leq 1$

The calculation is verified, so the anchor FIX Z-A4 M10 (minimum anchorage) is suitable for this application.

Examples

Example: SPIT EPOMAX M16 anchor (with MAXIMA rod)

Non-cracked concrete – class C20/25
Thickness of base material : 350 mm
S = 130 mm
C1 = 170 mm
C2 = 170 mm
An oblique load F^g_{Sd} = 28 kN with F^g_{Sd} = 55° is applied in the middle of the base plate



N^g_{Sd} = F^g_{Sd} x cos (55°) = 28 x cos (55°) = 16 kN
then per anchor **N_{Sd} = 16 / 2 = 8 kN**
V^g_{Sd} = F^g_{Sd} x sin (55°)= 28 x sin (55°) = 22,9 kN
then per anchor **V_{Sd} = 22,9 / 2 = 11,45 kN**

TENSILE LOAD :

- $N_{Rd,p}$ = 23,1 kN
- $N_{Rd,c} = N^0_{Rd,c} \times \Psi_{S1} \times \Psi_{S2}$
  $N^0_{Rd,c}$ = 23,1 kN
  S = 130 mm → Ψ_S = 0,76
  C1 = C2 = 170 mm → Ψ_C = 1
  $N_{Rd,c}$ = 17,55 kN
- $N_{Rd,s}$ = 55,6 kN
- $N_{Rd} = \min (N_{Rd,p} ; N_{Rd,c} ; N_{Rd,s})$ = 17,55 kN
- $\beta_N = N_{Sd} / N_{Rd} \leq 1$
  β_N = 8 / 17,55 = 0,45

SHEAR LOAD :

- $V_{Rd,c} = V^0_{Rd,c} \times f_{\beta,V} \times \Psi_{S\_c,N}$
  Shear loading direction : angle β = 0° / edge concrete : $f_{\beta,V}$ = 1
  Cmin = 65 mm
  C1 = 170 mm - edge distance in the shear direction → c/cmin = 2,6
  S = 130 mm → s/cmin = 2,0
  $\Psi_{S\_c,N}$ = 2,63
  $V^0_{Rd,c}$ = 5,7 kN
  $V_{Rd,c}$ = 15 kN
- $V_{Rd,s}$ = 32,9 kN
- $V_{Rd} = \min (V_{Rd,c} ; V_{Rd,s})$ = 15 kN
- $\beta_V = V_{Sd} / V_{Rd} \leq 1$
  β_V = 11,45/ 15 = 0,76

COMBINED LOAD

$\beta_V^{1,5} + \beta_V^{1,5} \leq 1$

$(0,45)^{1,5} + (0,76)^{1,5} = 0,96 \leq 1$

The calculation is verified, so the anchor EPOMAX M16 (with MAXIMA rod) is suitable for this application.