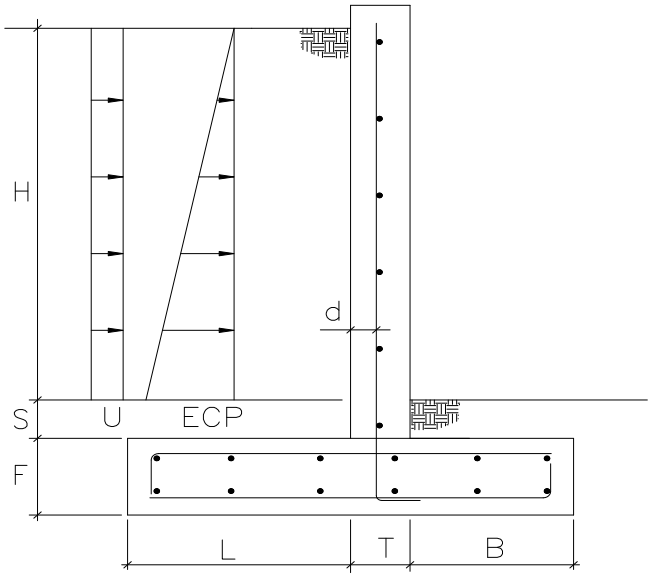

Retaining Walls H=8'-6"

$H := 8.5$ $S := .5$ $F := 1$ $B := 5$ $T := .666$ $L := 1$ $ECP := 40$ $U := 9$

$$Mot := U \cdot H \cdot H \cdot \left(\frac{H}{2} + S + F\right) + ECP \cdot H \cdot \frac{H}{2} \cdot \left(\frac{H}{3} + S + F\right)$$ $Mot = 10000.6$ $Soildensity := 130$

$Friction := .45$ $fc := 4$ $d := 6$

Weights

$Wall := T \cdot (H + S) \cdot 150$ $Wall = 899.1$

$Soil := L \cdot (H + S) \cdot Soildensity$ $Soil = 1170$

$Ftg := 150 \cdot F \cdot (B + T + L)$ $Ftg = 999.9$

$W := Wall + Soil + Ftg$

$$Mr := Wall \cdot \left(B + \frac{T}{2}\right) + Soil \cdot \left(B + T + \frac{L}{2}\right) + Ftg \cdot \frac{(B + T + L)}{2}$$ $Mr = 15341.787$

$$OvertuningFOS := \frac{Mr}{Mot}$$ $OvertuningFOS = 1.534$ ok

$$Xb := \frac{Mr - Mot}{W}$$ $Xb = 1.74$

$$qmax := 2 \cdot \frac{W}{3 \cdot Xb}$$ $qmax = 1175.615$ ok

Sliding With Seismic

$Vsliding := U \cdot H \cdot H + ECP \cdot H \cdot \frac{H}{2}$ $Vsliding = 2095.25$

$NoBattPiles := 32$ $WallLength := 39$ $VpileperFt := \frac{NoBattPiles \cdot 2000}{WallLength}$ $VpileperFt = 1641.026$

$Vpass := F \cdot 300 \cdot \frac{F}{2}$ $Vpass = 150$ $Vsl := W \cdot Friction$ $Vsl = 1381.05$

$SlidingFOS := \frac{Vpass + Vsl + VpileperFt}{Vsliding}$ $SlidingFOS = 1.51$ ok

Sliding Without Seismic

$Vsliding := ECP \cdot H \cdot \frac{H}{2}$ $Vsliding = 1445$

$Vpass := F \cdot 300 \cdot \frac{F}{2}$ $Vpass = 150$ $Vsl := W \cdot Friction$ $Vsl = 1381.05$

$SlidingFOS := \frac{Vpass + Vsl + VpileperFt}{Vsliding}$ $SlidingFOS = 2.2$ ok

Wall Bending

$Mu := 1.4U \cdot H \cdot H \cdot \left(\frac{H}{2} + .5\right) \cdot .001 + 1.6 \cdot ECP \cdot H \cdot \frac{H}{2} \cdot \left(\frac{H}{3} + .5\right) \cdot .001$ $Mu = 12.031$

$A := .2 + .31$ $Spacing := 12$ $As := A \cdot \frac{12}{Spacing}$ $a := \frac{As \cdot 60}{.85 \cdot 12fc}$ $a = 0.75$

$Mc := .9 \cdot 60 \cdot As \cdot \frac{\left(d - \frac{a}{2}\right)}{12}$ $Mc = 12.909$ ok Use: #5&#4v@12"

Footing Bending

$As := .31$ $a := \frac{As \cdot 60}{.85 \cdot 12 \cdot fc}$ $d := 9$

$Mc := .9 \cdot 60 \cdot As \cdot \frac{\left(d - \frac{a}{2}\right)}{12}$ $Mc = 12.237$ ok Use: #5&#4@12"

Retaining Walls H=6'-0"

$H := 6$ $S := .5$ $F := 1$ $B := 4$ $T := .666$ $L := 1$ $ECP := 40$ $U := 9$

$Mot := U \cdot H \cdot H \cdot \left(\frac{H}{2} + S + F \right) + ECP \cdot H \cdot \frac{H}{2} \cdot \left(\frac{H}{3} + S + F \right)$ $Mot = 3978$ $Soildensity := 130$

$Friction := .4$ $fc := 4$ $d := 4$

Weights

$Wall := T \cdot (H + S) \cdot 150$ $Wall = 649.35$

$Soil := L \cdot (H + S) \cdot Soildensity$ $Soil = 845$

$Ftg := 150 \cdot (F + S) \cdot (B + T + L)$ $Ftg = 1274.85$

$W := Wall + Soil + Ftg$

$Mr := Wall \cdot \left(B + \frac{T}{2} \right) + Soil \cdot \left(B + T + \frac{L}{2} \right) + Ftg \cdot \frac{(B + T + L)}{2}$ $Mr = 10790.554$

$OvertuningFOS := \frac{Mr}{Mot}$ $OvertuningFOS = 2.713$ ok with seismic

$Xb := \frac{Mr - Mot}{W}$ $Xb = 2.46$

$qmax := 2 \cdot \frac{W}{3 \cdot Xb}$ $qmax = 750.425$ ok

Sliding With Seismic

$Vsliding := U \cdot H \cdot H + ECP \cdot H \cdot \frac{H}{2}$ $Vsliding = 1044$

$Vpass := F \cdot 300 \cdot \frac{F}{2}$ $Vpass = 150$ $Vsl := W \cdot Friction$ $Vsl = 1107.68$

$SlidingFOS := \frac{Vpass + Vsl}{Vsliding}$ $SlidingFOS = 1.2$ ok with seismic

Sliding Without Seismic

$Vsliding := ECP \cdot H \cdot \frac{H}{2}$ $Vsliding = 720$

$Vpass := F \cdot 300 \cdot \frac{F}{2}$ $Vpass = 150$ $Vsl := W \cdot Friction$ $Vsl = 1107.68$

$SlidingFOS := \frac{Vpass + Vsl}{Vsliding}$ $SlidingFOS = 1.75$ ok without seismic

Wall Bending

$Mu := 1.4U \cdot H \cdot H \cdot \left(\frac{H}{2} + .5\right) \cdot .001 + 1.6 \cdot ECP \cdot H \cdot \frac{H}{2} \cdot \left(\frac{H}{3} + .5\right) \cdot .001$ $Mu = 4.468$ $d := 4$

$A := .4$ $Spacing := 12$ $As := A \cdot \frac{12}{Spacing}$ $a := \frac{As \cdot 60}{.85 \cdot 12fc}$ $a = 0.59$

$Mc := .9 \cdot 60 \cdot As \cdot \frac{\left(d - \frac{a}{2}\right)}{12}$ $Mc = 6.671$ ok Use: #5v@12"

Footing Bending

$As := .31$ $a := \frac{As \cdot 60}{.85 \cdot 12 \cdot fc}$ $d := 9$

$Mc := .9 \cdot 60 \cdot As \cdot \frac{\left(d - \frac{a}{2}\right)}{12}$ $Mc = 12.237$ ok Use: #4@6"

Retaining Walls H=4'-0"

$H := 4$ $S := .5$ $F := 1$ $B := 2$ $T := .666$ $L := 1$ $ECP := 40$ $U := 9$

$Mot := U \cdot H \cdot H \cdot \left(\frac{H}{2} + S + F\right) + ECP \cdot H \cdot \frac{H}{2} \cdot \left(\frac{H}{3} + S + F\right)$ $Mot = 1410.7$ $Soildensity := 130$

$Friction := .4$ $fc := 4$ $d := 4$

Weights

$Wall := T \cdot (H + S) \cdot 150$ $Wall = 449.55$

$Soil := L \cdot (H + S) \cdot Soildensity$ $Soil = 585$

$Ftg := 150 \cdot (F + S) \cdot (B + T + L)$ $Ftg = 824.85$

$W := Wall + Soil + Ftg$

$Mr := Wall \cdot \left(B + \frac{T}{2}\right) + Soil \cdot \left(B + T + \frac{L}{2}\right) + Ftg \cdot \frac{(B + T + L)}{2}$ $Mr = 4412.86$

$OvertuningFOS := \frac{Mr}{Mot}$ $OvertuningFOS = 3.128$ ok with seismic

$Xb := \frac{Mr - Mot}{W}$ $Xb = 1.615$

$qmax := 2 \cdot \frac{W}{3 \cdot Xb}$ $qmax = 767.743$ ok

Sliding With Seismic

$Vsliding := U \cdot H \cdot H + ECP \cdot H \cdot \frac{H}{2}$ $Vsliding = 464$

$Vpass := F \cdot 300 \cdot \frac{F}{2}$ $Vpass = 150$ $Vsl := W \cdot Friction$ $Vsl = 743.76$

$SlidingFOS := \frac{Vpass + Vsl}{Vsliding}$ $SlidingFOS = 1.93$ ok with seismic

Sliding Without Seismic

$Vsliding := ECP \cdot H \cdot \frac{H}{2}$ $Vsliding = 320$

$Vpass := F \cdot 300 \cdot \frac{F}{2}$ $Vpass = 150$ $Vsl := W \cdot Friction$ $Vsl = 743.76$

$SlidingFOS := \frac{Vpass + Vsl}{Vsliding}$ $SlidingFOS = 2.79$ ok without seismic

Wall Bending

$Mu := 1.4U \cdot H \cdot H \cdot \left(\frac{H}{2} + .5\right) \cdot .001 + 1.6 \cdot ECP \cdot H \cdot \frac{H}{2} \cdot \left(\frac{H}{3} + .5\right) \cdot .001$ $Mu = 1.443$

$A := .2$ $Spacing := 12$ $As := A \cdot \frac{12}{Spacing}$ $a := \frac{As \cdot 60}{.85 \cdot 12fc}$ $a = 0.29$

$Mc := .9 \cdot 60 \cdot As \cdot \frac{\left(d - \frac{a}{2}\right)}{12}$ $Mc = 3.468$ ok Use: #4v@12"

Footing Bending

$As := .31$ $a := \frac{As \cdot 60}{.85 \cdot 12 \cdot fc}$ $d := 9$

$Mc := .9 \cdot 60 \cdot As \cdot \frac{\left(d - \frac{a}{2}\right)}{12}$ $Mc = 12.237$ ok Use: #5@12"