	Project: Gabion accordance with I	Retaining Wa 3S8002:1994.	all Analysis	& De	esign, In	Jot	o Ref.
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## **GABION RETAINING WALL ANALYSIS AND DESIGN (BS8002:1994)**



## Wall geometry

Width of gabion 1;	w <sub>1</sub> = <b>2700</b> mm
Height of gabion 1;	h <sub>1</sub> = <b>700</b> mm
Width of gabion 2;	w <sub>2</sub> = <b>2300</b> mm
Height of gabion 2;	h <sub>2</sub> = <b>700</b> mm
Step to front face between 1 and 2;	s <sub>2</sub> = <b>0</b> mm
Width of gabion 3;	w <sub>3</sub> = <b>2000</b> mm
Height of gabion 3;	h <sub>3</sub> = <b>600</b> mm
Step to front face between 2 and 3;	s <sub>3</sub> = <b>0</b> mm

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Wall inclination;	·	ε <b>= 5</b> de	g			·
<b>Wall fill</b> Gabion fill unit weight;		γ <sub>d</sub> = <b>15</b>	kN/m <sup>3</sup>			

## Centre of gravity

Horizontal distance to centre of gravity gabion 1;	x <sub>g1</sub> = w <sub>1</sub> / 2 = <b>1350</b> mm
Horizontal distance to centre of gravity gabion 2;	$x_{g2} = w_2 / 2 + s_2 = 1150 \text{ mm}$
Horizontal distance to centre of gravity gabion 3;	$x_{g3} = w_3 / 2 + s_2 + s_3 = 1000 \text{ mm}$
Vertical distance to centre of gravity gabion 1;	y <sub>g1</sub> = h <sub>1</sub> / 2 = <b>350</b> mm
Vertical distance to centre of gravity gabion 2;	$y_{g2} = h_2 / 2 + h_1 = 1050 \text{ mm}$
Vertical distance to centre of gravity gabion 3;	$y_{g3} = h_3 / 2 + h_1 + h_2 = 1700 \text{ mm}$
Weight of gabion 1;	$W_{g1} = \gamma_d \times w_1 \times h_1 = 28.4 \text{ kN/m}$
Weight of gabion 2;	$W_{g2} = \gamma_d \times w_2 \times h_2 = $ <b>24.2</b> kN/m
Weight of gabion 3;	$W_{g3} = \gamma_d \times w_3 \times h_3 = \textbf{18.0} \text{ kN/m}$
Weight of entire gabion;	$W_g = W_{g1} + W_{g2} + W_{g3} = 70.5 \text{ kN/m}$
Horiz distance to centre of gravity entire gabion;	$x_{g} = ((W_{g1} \times x_{g1}) + (W_{g2} \times x_{g2}) + (W_{g3} \times x_{g3})) / W_{g} =$
<b>1192</b> mm	
Vert distance to centre of gravity entire gabion;	$y_g = ((W_{g1} \times y_{g1}) + (W_{g2} \times y_{g2}) + (W_{g3} \times y_{g3})) / W_g =$
<b>934</b> mm	
Correcting for wall inclination horiz dist;	$X_g = x_g \times cos(\epsilon) + y_g \times sin(\epsilon) = 1269 \text{ mm}$
Vertical change in height due to wall inclination;	$H_f = y_{g3} + h_3/2 - ((y_{g3} + h_3/2) \times cos(\epsilon) - (x_{g3} + w_3/2) \times cos(\epsilon) - (x_{$
sin(ε)) = <b>182</b> mm	
Calculate effective height of wall	
Effective height of wall;	$H = (y_{g3} + h_3 / 2) + (w_1 \times sin(\epsilon)) - H_f = 2053 \text{ mm}$
Height of wall from toe to front edge of top gabion;	$H_{incl} = ((y_{g3} + h_3 / 2) \times cos(ε) - (x_{g3} - (w_3 / 2)) \times sin(ε))$
= <b>1992</b> mm	
Calculate the angle of rear plane of wall	
Effective angle of rear plane of wall;	$\alpha = Atan [(y_{\alpha 3} + (h_3 / 2)) / (w_1 - (x_{\alpha 3} + (w_3 / 2)))] + \varepsilon =$
<b>75.7</b> deg	
Calculate the effective face angle	
Effective face angle;	$\theta$ = 90 deg - $\varepsilon$ = <b>85.0</b> deg
Soil parameters	
Slope of retained soil:	$\beta = 0.0 \text{ deg}$
Mobilization factor;	M = <b>1.0</b>
Internal angle of friction for retained soil;	φ' = <b>38.0</b> deg
Saturated density of retained soil:	$\gamma_{\rm s} = 23 \text{ kN/m}^3$
Coefficient for wall friction:	K = <b>0.9</b>
Wall friction;	$\delta = \phi' \times K = 34.2 \text{ deg}$
Design angle of base friction:	$\delta_{\rm b} = 30.0  \rm deg$
Bearing capacity of founding soil:	$q = 110 \text{ kN/m}^2$
	-1

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Active Pressure using Coulomb Theory;

$$K_{a} = (\sin(\alpha + \phi')^{2})/[(\sin(\alpha))^{2} \times \sin(\alpha - \delta) \times (1 + \sqrt{[(\sin(\phi' + \delta) \times \sin(\phi' - \beta)) / (\sin(\alpha - \delta) \times \sin(\alpha + \beta))]}^{2}] = 0.352$$

Load	in	g
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Surcharge;	$p_o = 10 \text{ kN/m}^2$
Horizontal line load;	F <sub>h</sub> = <b>10</b> kN/m
Vertical height of horizontal load from top gabion;	H <sub>hl</sub> = <b>0</b> mm
Dist of horiz. load from leading edge of top gabion;	D <sub>hl</sub> = <b>0</b> mm
Vertical height from toe;	$d_{hl} = (H_{incl} + H_{hl} - D_{hl} \times tan(\epsilon)) = 1992 \text{ mm}$
Horizontal distance of horiz. load from toe;	$b_{hl} = (H_{incl} / tan(\theta) + D_{hl}) = 174 \text{ mm}$
Vertical line load;	$F_v = 5 \text{ kN/m}$
Dist of vert. load from leading edge of top gabion;	D <sub>vl</sub> = <b>0</b> mm
Horizontal distance of vert. load from toe;	$b_{vl} = (H_{incl} / tan(\theta) + D_{vl}) = 174 \text{ mm}$
Surcharge loading as equiv height of soil;	$h_{s} = p_{o} / \gamma_{s} = 435 \text{ mm}$
Active thrust due to soil;	$P_{a,soil} = 0.5 \times K_a \times \gamma_s \times H^2 = \textbf{17.1 kN/m}$
Active thrust due to surcharge;	$P_{a,surch} = p_o \times K_a \times H = 7.2 \text{ kN/m}$
Total active thrust;	$P_a = P_{a,soil} + P_{a,surch} = 24.3 \text{ kN/m}$
Total thrust resolved horizontally;	$P_h = P_a \times cos(90 - \alpha + \delta) = 16.1 \text{ kN/m}$
Total thrust resolved vertically;	$P_{v} = P_{a} \times \sin(90 - \alpha + \delta) = 18.2 \text{ kN/m}$
Height above toe thrust acts if $\alpha$ is 0;	$d_{h,soil} = H \times (H + 3 \times h_s) / (3 \times (H + 2 \times h_s)) = \textbf{786}$
mm	
Height above toe thrust acts;	$d_h = d_{h,soil} - w_1 \times sin(\epsilon) = 551 \text{ mm}$
Horiz distance to where thrust acts;	$b_v = w_1 \times cos(\epsilon) - (d_{h,soil} / tan (\alpha)) = 2489mm$
Overturning stability – take moments about the	toe
Overturning moment;	$M_o = (P_h \times d_h) + (F_h \times d_{hl}) = \textbf{28.8 kNm/m}$
Restoring moment;	$M_{R} = (P_{v} \times b_{v}) + (W_{g} \times X_{g}) + (F_{v} \times b_{vl}) = \textbf{135.7}$
kNm/m	
Factor of safety for overturning;	$F_{o,M} = M_R / M_o = 4.71$
Min allowable factor of safety for overturning;	F <sub>o,M,min</sub> = <b>2.00</b>
PASS - Design FOS for overtu	rning exceeds min allowable FOS for overturning
Sliding stability – ignore any passive pressure in	nfront of structure
Total vertical force;	$N = W_g + P_v + F_v = 93.7 \text{ kN/m}$

Total vertical force;	$N = W_g + P_v + F_v = 93.7 \text{ kN/m}$
Total horizontal force;	$T = P_h + F_h = 26.1 \text{ kN/m}$
Sliding force;	$F_f = T \times cos (\epsilon) - N \times sin (\epsilon) = 17.8 \text{ kN/m}$
Resistance to sliding;	$F_{R} = (N \times cos (\epsilon) + T \times sin (\epsilon)) \times tan (\delta_{b}) = \textbf{55.2}$
kN/m	
Factor of safety for sliding;	$F_{o,S} = F_R / F_f = 3.09$
Min allowable factor of safety for sliding;	F <sub>o,S,min</sub> = <b>1.50</b>

PASS - Design FOS for sliding exceeds min allowable FOS for sliding

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Pressure at base			<u> </u>				
Force normal to base;		$N_s = (N$	$\times$ cos ( $\epsilon$ ) + T $\times$ sin	(ε)) = <b>95.6</b> k	N/m		
Eccentricity;		e = (w <sub>1</sub>	$/ 2) - (M_R - M_o) / N_o$	l <sub>s</sub> = <b>232</b> mm			
			Reaction acts with	hin middle t	third of base		
Pressure at toe;		$\sigma_{toe} = (I$	$N_s / w_1) \times (1 + (6 \times e^{-1}))$	e / w <sub>1</sub> )) = <b>53.</b>	<b>7</b> kN/m <sup>2</sup>		
Pressure at heel;		$\sigma_{\text{heel}} = 0$	$(N_s / w_1) \times (1 - (6 \times e^{-1}))$	e / w1 )) = <b>17</b>	′ <b>.1</b> kN/m²		
PA	SS - Allowable be	aring press	ure exceeds max o	design pres	sure to base		
Check for sliding and over	rturning between	courses 1 ar	nd 2				
Centre of gravity			-				
Horizontal distance to centre	e of gravity gabion	2: $X_{\alpha 2} = W_{\alpha 2}$	∞ / 2 = <b>1150</b> mm				
Horizontal distance to centre	e of gravity gabion	3; $X_{\alpha 3} = W_{\alpha 3}$	<sub>3</sub> / 2 + s <sub>3</sub> = <b>1000</b> mr	n			
Vertical distance to centre of	f gravity gabion 2;	$y_{q2} = h_2$	2 / 2 = <b>350</b> mm				
Vertical distance to centre of	f gravity gabion 3;	$y_{g3} = h_3$	$y_{g3} = h_3 / 2 + h_2 = 1000 \text{ mm}$ $W_{g2} = \gamma_d \times w_2 \times h_2 = 24.2 \text{ kN/m}$				
Weight of gabion 2;		$W_{g2} = \gamma$					
Weight of gabion 3;		$W_{g3} = \gamma$	$d_d \times w_3 \times h_3 = $ <b>18.0</b> k	N/m			
Weight of entire gabion;		$W_g = W$	/ <sub>g2</sub> + W <sub>g3</sub> = <b>42.2</b> kN/	/m			
Horiz distance to centre of g	ravity entire gabior	$x_g = ((V $	$V_{g2}  imes x_{g2}$ ) + ( $W_{g3}  imes x_{g2}$ )	( <sub>g3</sub> )) / W <sub>g</sub> = <b>1</b>	<b>086</b> mm		
Vert distance to centre of gra	avity entire gabion;	$y_g = ((V$	$V_{g2} \times y_{g2}$ ) + ( $W_{g3} \times y_{g2}$ )	/ <sub>g3</sub> )) / W <sub>g</sub> = <b>6</b>	<b>28</b> mm		
Correcting for wall inclination	n horiz dist;	$X_g = X_g$	$\times \cos(\varepsilon) + y_g \times \sin(\varepsilon)$	ε) = <b>1137</b> mr	n		
Vertical change in height du $sin(\varepsilon)) = 179 mm$	e to wall inclination	; $H_f = y_{g3}$	<sub>3</sub> + h <sub>3</sub> /2 - ((y <sub>g3</sub> + h <sub>3</sub> /2	2) × cos(ε) - (	$(x_{g3} + w_3/2) \times$		
Calculate effective height	of wall						
Effective height of wall:		$H = (y_{a})$	3 + h3 / 2) + (w <sub>2</sub> × si	n(ε)) - H <sub>f</sub> = <b>1</b>	<b>321</b> mm		
Height of wall from toe to fro	ont edge of top gab	on: $H_{incl} = ($	$(v_{03} + h_3 / 2) \times \cos(a)$	ε) - (X <sub>n3</sub> - (W <sub>3</sub>	/ 2)) × sin(ε))		
= <b>1295</b> mm	5	,		, , ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	11 - XM		
Calculate the angle of rear	plane of wall						
Effective angle of rear plane	of wall:	α =Atai	n [(y <sub>a3</sub> + (h <sub>3</sub> / 2)) / (v	V2 - (X03 + (M	/ <sub>3</sub> / 2)))] + ε =		
82.0 deg	,			- ( 90 - (	- ///1		
Calculate the effective fac	e angle						
Effective face angle:		$\theta = 90$	deg - ε = <b>85.0</b> dea				
		-	2 0				
Surcharge:		n. <b>= 10</b>	kN/m <sup>2</sup>				
Horizontal line load:		Fh = 10	kN/m				
Vertical height of horizontal	load from top gabic	on; $H_{hl} = 0$	mm				
Dist of horiz. load from leadi	ng edge of top gab	ion; $D_{hl} = 0$	mm				
Vertical height from toe;		d <sub>hl</sub> = (H	$_{incl}$ + H <sub>hl</sub> – D <sub>hl</sub> × tan(	(ε)) = <b>1295</b> n	nm		
Horizontal distance of horiz.	load from toe;	b <sub>hl</sub> = (H	$_{incl}$ / tan( $\theta$ ) + D <sub>hl</sub> ) =	<b>113</b> mm			
		`	,				
Vertical line load;		$F_v = 5 k$	kN/m				

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Horizontal distance of vert	load from toe:	b <sub>vi</sub> = (Hi	$d_{\text{red}} / \tan(\theta) + D_{\text{vl}} = 1^{\circ}$	13 mm		
Surcharge loading as equiv	height of soil:	$b_{s} = p_{o}$	$v_{s} = 435 \text{ mm}$			
Active thrust due to soil:		Pa soil =	$0.5 \times K_a \times \gamma_s \times H^2 = 1$	<b>7.1</b> kN/m		
Active thrust due to surchar	ae:	Pa surch =	= D <sub>0</sub> × K <sub>a</sub> × H = <b>4.7</b> k	N/m		
Total active thrust:	90,	$P_a = P_a$	soil + $P_{a surch} = 11.7 \text{ k}$	N/m		
Total thrust resolved horizo	ntally;	$P_h = P_a$	$\times \cos(90 - \alpha + \delta) = 8$	<b>3.7</b> kN/m		
Total thrust resolved vertica	lly;	$P_v = P_a$	$\times \sin(90 - \alpha + \delta) = 7$	<b>.9</b> kN/m		
Height above toe thrust acts	s if $\alpha$ is 0;	$d_{h,soil} = 1$	$H \times (H + 3 \times h_s) / (3)$	× (H + 2 ×	h <sub>s</sub> )) = <b>528</b>	
mm	·	.,			-,,	
Height above toe thrust acts	5;	$d_h = d_{h,s}$	$w_{coil} - w_2 \times \sin(\varepsilon) = 32$	<b>7</b> mm		
Horiz distance to where three	ust acts;	$b_v = w_2$	$\times \cos(\varepsilon) - (d_{h,soil} / tai)$	n (α)) = <b>22</b>	<b>17</b> mm	
Overturning stability – tak	e moments abou	t the toe				
Overturning moment;		$M_{02} = (F_{02})^{-1}$	$P_h \times d_h$ ) + ( $F_h \times d_{hl}$ ) =	15.8 kNm	/m	
Restoring moment;		M <sub>R2</sub> = (I	$P_v \times b_v$ + ( $W_a \times X_a$ ) -	+ ( $F_v \times b_{vl}$ )	= 65.9	
kNm/m						
Factor of safety for overturn	ing;	$F_{o,M2} = I$	M <sub>R2</sub> / M <sub>o2</sub> = <b>4.17</b>			
Min allowable factor of safe	ty for overturning;	F <sub>o,M,min</sub> :	= 2.00			
PASS -	Design FOS for o	verturning ex	ceeds min allowab	le FOS foi	r overturning	g
Sliding stability – ignore a	iny passive press	sure infront of	structure			
Total vertical force;		$N = W_g$	$+ P_v + F_v = 55.0 \text{ kN/}$	'n		
Total horizontal force;		T = P <sub>h</sub> +	- F <sub>h</sub> = <b>18.7</b> kN/m			
Sliding force;		F <sub>f2</sub> = T :	$\times \cos(\epsilon) - N \times \sin(\epsilon)$	) = <b>13.8</b> kN	l/m	
Resistance to sliding;		F <sub>R2</sub> = (N	$I \times \cos(\epsilon) + T \times \sin(\epsilon)$	(ε)) × tan (δ	δ <sub>bg</sub> ) = <b>39.5</b>	
kN/m						
Factor of safety for sliding;		$F_{o,S2} = F$	F <sub>R2</sub> / F <sub>f2</sub> = <b>2.86</b>			
Min allowable factor of safe	ty for sliding;	F <sub>o,S,min</sub> =	= 1.50			
	PASS - Design	FOS for slidi	ng exceeds min alle	owable FC	)S for sliding	g
Check for sliding and ove	rturning between	courses 2 an	<u>d 3</u>			
Centre of gravity						

Horizontal distance to centre of gravity gabion 3;	x <sub>g3</sub> = w <sub>3</sub> / 2 = <b>1000</b> mm
Vertical distance to centre of gravity gabion 3;	y <sub>g3</sub> = h <sub>3</sub> / 2 = <b>300</b> mm
Weight of gabion 3;	$W_{g3} = \gamma_d \times w_3 \times h_3 = \textbf{18.0 kN/m}$
Weight of entire gabion;	$W_g = W_{g3} = 18.0 \text{ kN/m}$
Horiz distance to centre of gravity entire gabion;	$x_g = ((W_{g3} \times x_{g3})) / W_g = 1000 \text{ mm}$
Vert distance to centre of gravity entire gabion;	$y_g = ((W_{g3} \times y_{g3})) / W_g = 300 \text{ mm}$
Correcting for wall inclination horiz dist;	$X_g = x_g \times cos(\epsilon) + y_g \times sin(\epsilon) = \textbf{1022} \text{ mm}$
Vertical change in height due to wall inclination;	$H_{f} = y_{g3} + h_{3}/2 - ((y_{g3} + h_{3}/2) \times cos(\epsilon) - (x_{g3} + w_{3}/2) \times cos(\epsilon) - (x_{g3$
sin(ε)) = <b>177</b> mm	

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Calculate effective height	of wall					
Effective height of wall;		H = (y <sub>g3</sub>	+ $h_3 / 2$ ) + ( $w_3 \times$	$sin(\epsilon)$ ) - $H_f = 59$	<b>98</b> mm	
Height of wall from toe to fr = <b>598</b> mm	ont edge of top gabi	on; $H_{incl} = ($	$y_{g3} + h_3 / 2) \times co$	98(ε) - (x <sub>g3</sub> - (w <sub>3</sub> ,	/ 2)) × sin(ε))	
Calculate the angle of rea	r plane of wall					
Effective angle of rear plan	e of wall;	α =90 d	eg + ε = <b>95.0</b> de	g		
Calculate the effective fac	ce angle					
Effective face angle;	0	θ = 90 c	leg - ε = <b>85.0</b> de	g		
Loading						
Surcharge;		p <sub>o</sub> = <b>10</b>	kN/m <sup>2</sup>			
Horizontal line load;		F <sub>h</sub> = <b>10</b>	kN/m			
Vertical height of horizontal	load from top gabic	on; H <sub>hl</sub> = <b>0</b> i	nm			
Dist of horiz. load from lead	ling edge of top gab	ion; D <sub>hl</sub> = <b>0</b> I	nm			
Vertical height from toe;		$d_{hl} = (H_{l})$	$_{\rm ncl}$ + $H_{\rm hl}$ – $D_{\rm hl}$ × ta	an(ε)) = <b>598</b> mr	n	
Horizontal distance of horiz	. load from toe;	$b_{hl} = (H_{l})$	$ncl / tan(\theta) + D_{hl}$	= <b>52</b> mm		
Vertical line load;		F <sub>v</sub> = <b>5</b> k	N/m			
Dist of vert. load from leadi	ng edge of top gabic	$Dn;  D_{vl} = 0$	nm	<b>FO</b>		
Horizontal distance of vert.	load from toe;	$D_{VI} = (H_i)$	$n_{cl} / \tan(\theta) + D_{vl}$	= 32 mm		
Active thrust due to seil:	rieight of soll;	$n_s = p_o / p_o / p_o = -$	γ <sub>s</sub> = <b>433</b> mm	$^{2} - 1.4 \text{ kN/m}$		
Active thrust due to surpha		Γ <sub>a,soil</sub> =	$\mathbf{U}.\mathbf{J} \times \mathbf{R}_{a} \times \gamma_{s} \times \mathbf{H}$	= 1.4 NN/III		
Total active thrust	iye,	$P_a$ , surch =	$= p_0 \times R_a \times H = 2$	s kN/m		
Total thrust resolved horizo	intally:	$P_{h} = P_{a}$	$\times \cos(90 - \alpha + \delta)$	) = <b>3.1</b> kN/m		
Total thrust resolved vertica	allv:	$P_v = P_a$	$\times \sin(90 - \alpha + \delta)$	= <b>1.7</b> kN/m		
Height above toe thrust act	s if $\alpha$ is 0;	d <sub>h soil</sub> =	H × (H + 3 × h <sub>e</sub> ) /	/ (3 × (H + 2 × h	n <sub>s</sub> )) = <b>258</b>	
mm		1,001	, - 3 <b>)</b> ,		-//	
Height above toe thrust act	s;	$d_h = d_{h,s}$	$w_{soil} - w_3 \times sin(\varepsilon) =$	• <b>84</b> mm		
Horiz distance to where thr	ust acts;	$b_v = w_3$	$\times \cos(\epsilon) - (d_{h,soil})$	/ tan (α)) = <b>201</b>	<b>5</b> mm	
Overturning stability – tal	ke moments about	the toe				
Overturning moment;		$M_{03} = (F_{03})^2$	$P_h \times d_h$ ) + ( $F_h \times d_h$ )	<sub>hl</sub> ) = <b>6.2</b> kNm/m	ı	
Restoring moment;		M <sub>R3</sub> = (I	$P_v \times b_v$ ) + ( $W_g \times X_g$	$(K_g) + (F_v \times b_{vl}) =$	= 22.2	
kNm/m						
Factor of safety for overturn	ning;	F <sub>o,M3</sub> =	$M_{R3} / M_{o3} = 3.55$			
Min allowable factor of safe	ety for overturning;	F <sub>o,M,min</sub> :	= 2.00			_
PASS -	Design FOS for ov	erturning ex	ceeds min allow	wable FOS for	overturning	1
Sliding stability – ignore	any passive pressu	ure infront of	structure			
Total vertical force;		N = W <sub>g</sub>	$+ P_v + F_v = 24.7$	kN/m		
l otal norizontal force;			$-r_{\rm h} = 13.1  {\rm KN/m}$	n (a) - 10 0 LAL	/m	
Siluing loice;		$\Gamma_{f3} = 1$	< τος (ε) – in × si	$II(\varepsilon) = IU.9 KN$	/111	

GEODOMISI Ltd Dr. Costas Sachpazis Civil & Geotechnical Engineering Consulting Company for Structural Engineering, Soil Mechanics, Rock Mechanics, Foundation Engineering & Retaining Structures. Tel: (+30) 210 5231827, 210 5711263 - Fax: (+30) 201711461 - Mobile: (+30) 6936425722 & (+44) 7585939944, costas@sachpazis.info	Project: Gabion accordance with I	Retaining Wa 3S8002:1994.	all Analysis &	Design, In	Jot	o Ref.
	Section Civil & Geotechnical Engineering				Sheet no./rev. 1	
	Calc. by Dr. C. Sachpazis	Date 15/04/2014	Chk'd by	Date	App'd by	Date
Resistance to sliding;	$F_{R3} = (N \times \cos{(\epsilon)} + T \times \sin{(\epsilon)}) \times \tan{(\delta_{bg})} = 18.1$					

kN/m

Factor of safety for sliding;

Min allowable factor of safety for sliding;

 $F_{o,S3} = F_{R3} / F_{f3} = 1.66$ 

F<sub>o,S,min</sub> = **1.50** 

PASS - Design FOS for sliding exceeds min allowable FOS for sliding