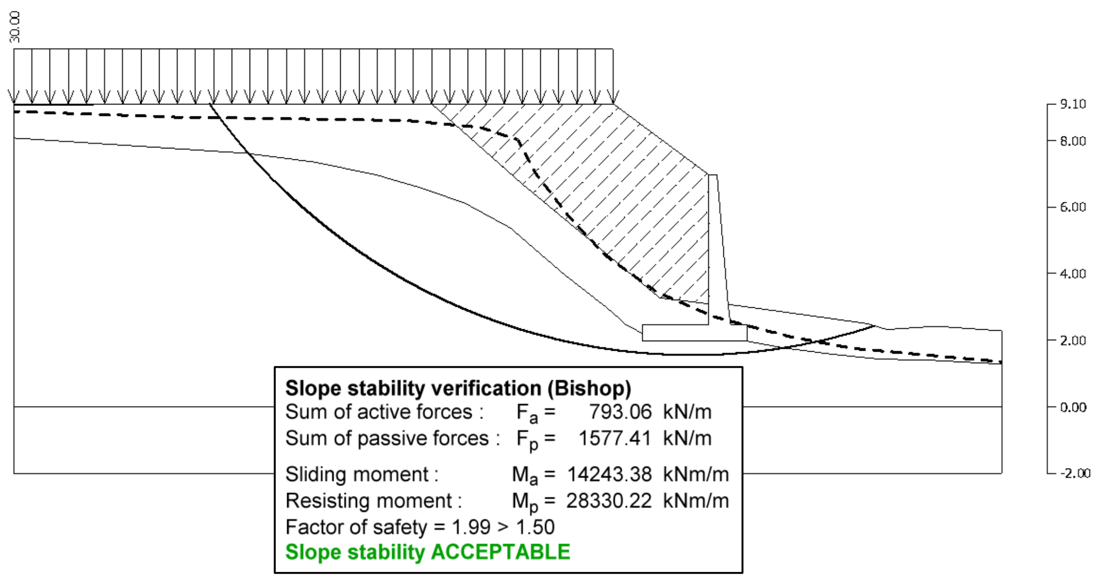
ANEXO B
MEMORIAS DE CÁLCULO
ANALISIS DE ESTABILIDAD CORTE#1
(CONDICIONES PSEUDO-ESTATICAS)



CALCULATION REPORT - SLOPE STABILITY ANALYSIS (PROFILE#1)

INPUT DATA

Project

Task : DISEÑO MURO DE CONTENCION EN CONCRETO REFORZADO
Descript. : COLEGIO RURAL PALMIRA - M/PIO DE SAN VICENTE DE CHUCURÍ (S/DER)
Author : ING. GUILLERMO GALINDO GUERRERO – ING. CLAUDIA PATRICIA RINCON M.

Date : 15/10/2015

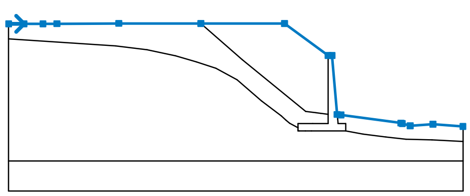
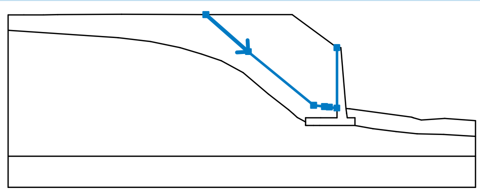
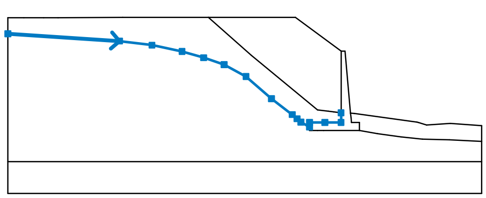
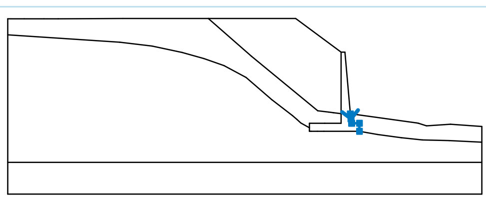
Settings

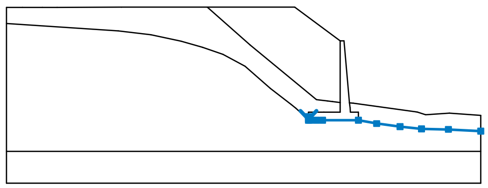
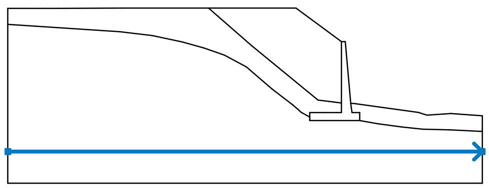
USA - Safety factor
Stability analysis

Verification methodology : Safety factors (ASD)

Safety factors			
Permanent design situation			
Safety factor :	SF_S =	1.50	[–]

Interface

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		0.00	9.07	1.02	9.07	2.27	9.07
		3.19	9.08	7.28	9.10	12.70	9.09
		18.22	9.09	21.10	6.97	21.35	6.97
		21.69	3.07	21.94	3.04	25.90	2.50
		26.00	2.47	26.51	2.32	28.02	2.42
		30.00	2.28				
2		12.70	9.09	15.42	6.71	19.61	3.27
		20.30	3.19	20.62	3.15	21.10	3.09
		21.10	6.97				
3		0.00	8.07	7.07	7.61	9.13	7.35
		11.03	6.96	12.40	6.56	13.69	6.12
		15.08	5.37	16.70	3.98	18.01	2.97
		18.31	2.71	18.55	2.49	19.10	2.19
		19.10	2.47	20.07	2.47	21.10	2.47
		21.10	3.09				
4		21.69	3.07	21.73	2.75	21.76	2.47
		22.26	2.47	22.26	1.97		

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
5		19.10	2.19	19.10	2.04	19.10	1.97
		19.20	1.97	19.60	1.97	20.00	1.97
		22.26	1.97	23.41	1.76	24.90	1.57
		26.25	1.43	27.95	1.39	30.00	1.28
6		0.00	0.00	30.00	0.00		

Soil parameters - effective stress state

No.	Name	Pattern	φ_{ef} [°]	c_{ef} [kPa]	γ [kN/m^3]
1	RELLENO		30.00	0.00	19.00
2	MACIZO ROCOSO		11.65	71.00	19.10
3	SUELO COLUVIAL		20.00	10.00	18.00

Soil parameters - uplift

No.	Name	Pattern	γ_{sat} [kN/m^3]	γ_s [kN/m^3]	n [–]
1	RELLENO		20.00		
2	MACIZO ROCOSO		22.30		
3	SUELO COLUVIAL		20.00		

Soil parameters

RELLENO

Unit weight : γ = 19.00 kN/m^3
Stress-state : effective
Angle of internal friction : φ_{ef} = 30.00 °
Cohesion of soil : c_{ef} = 0.00 kPa
Saturated unit weight : γ_{sat} = 20.00 kN/m^3

MACIZO ROCOSO

Unit weight : γ = 19.10 kN/m^3

Stress-state :	effective	
Angle of internal friction :	φ_{ef} =	11.65 °
Cohesion of soil :	c_{ef} =	71.00 kPa
Saturated unit weight :	γ_{sat} =	22.30 kN/m^3

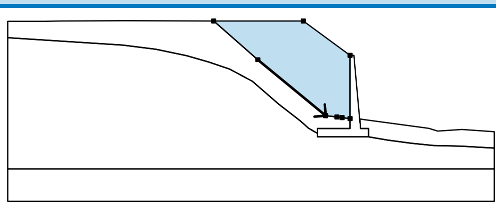
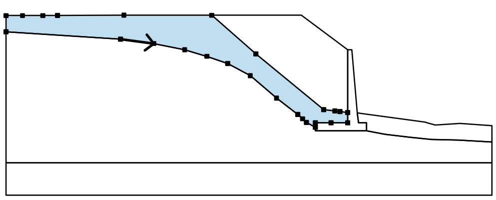
SUELO COLUVIAL

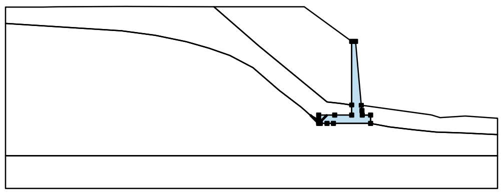
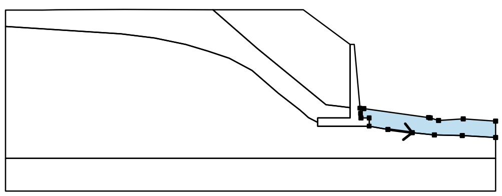
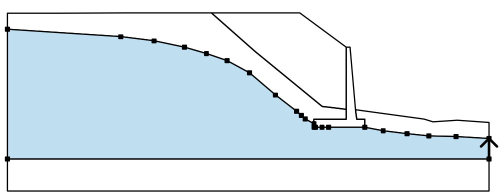
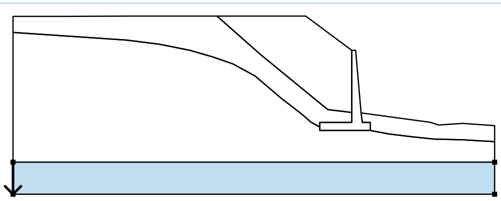
Unit weight :	γ =	18.00 kN/m^3
Stress-state :	effective	
Angle of internal friction :	φ_{ef} =	20.00 °
Cohesion of soil :	c_{ef} =	10.00 kPa
Saturated unit weight :	γ_{sat} =	20.00 kN/m^3

Rigid bodies

No.	Name	Sample	γ [kN/m^3]
1	CONCRETO 3000 Psi		24.00

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m] x	z	x	z	Assigned soil
1		15.42	6.71	19.61	3.27	RELLENO
		20.30	3.19	20.62	3.15	
		21.10	3.09	21.10	6.97	
		18.22	9.09	12.70	9.09	
2		7.07	7.61	9.13	7.35	SUELO COLUVIAL
		11.03	6.96	12.40	6.56	
		13.69	6.12	15.08	5.37	
		16.70	3.98	18.01	2.97	
		18.31	2.71	18.55	2.49	
		19.10	2.19	19.10	2.47	
		20.07	2.47	21.10	2.47	
		21.10	3.09	20.62	3.15	
		20.30	3.19	19.61	3.27	
		15.42	6.71	12.70	9.09	
		7.28	9.10	3.19	9.08	
		2.27	9.07	1.02	9.07	
		0.00	9.07	0.00	8.07	

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		X	z	x	z	
3		19.10	2.04	19.10	1.97	CONCRETO 3000 Psi
		19.20	1.97	19.60	1.97	
		20.00	1.97	22.26	1.97	
		22.26	2.47	21.76	2.47	
		21.73	2.75	21.69	3.07	
		21.35	6.97	21.10	6.97	
		21.10	3.09	21.10	2.47	
		20.07	2.47	19.10	2.47	
		19.10	2.19			
4		23.41	1.76	24.90	1.57	SUELO COLUVIAL
		26.25	1.43	27.95	1.39	
		30.00	1.28	30.00	2.28	
		28.02	2.42	26.51	2.32	
		26.00	2.47	25.90	2.50	
		21.94	3.04	21.69	3.07	
		21.73	2.75	21.76	2.47	
		22.26	2.47	22.26	1.97	
5		30.00	0.00	30.00	1.28	MACIZO ROCOSO
		27.95	1.39	26.25	1.43	
		24.90	1.57	23.41	1.76	
		22.26	1.97	20.00	1.97	
		19.60	1.97	19.20	1.97	
		19.10	1.97	19.10	2.04	
		19.10	2.19	18.55	2.49	
		18.31	2.71	18.01	2.97	
		16.70	3.98	15.08	5.37	
		13.69	6.12	12.40	6.56	
		11.03	6.96	9.13	7.35	
		7.07	7.61	0.00	8.07	
		0.00	0.00			
6		0.00	0.00	0.00	-2.00	MACIZO ROCOSO
		30.00	-2.00	30.00	0.00	

Surcharge

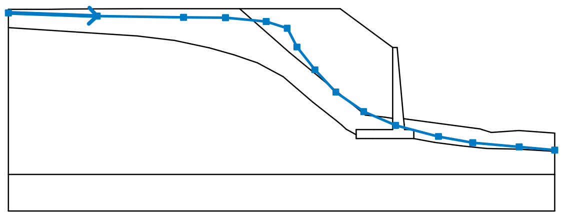
No.	Type	Type of action	Location	Origin	Length	Width	Slope	Magnitude		
			z [m]	x [m]	l [m]	b [m]	α [°]	q, q_1, f, F	q_2	unit
1	strip	permanent	on terrain	x = 0.00	l = 18.20		0.00	30.00		kN/m2

Surcharges

No.	Name
1	CARGA#1

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		0.00	8.87	4.87	8.70	9.62	8.63
		11.92	8.60	14.16	8.39	15.31	8.02
		15.85	7.00	16.83	5.75	17.98	4.53
		19.51	3.45	21.27	2.70	23.61	2.09
		25.50	1.75	28.05	1.52	30.00	1.35

Tensile crack

Tensile crack not inputted.

Earthquake

Horizontal seismic coefficient : K_h = 0.15
Vertical seismic coefficient : K_v = 0.15

Settings of the stage of construction

Design situation : permanent

Results (Stage of construction 1)

Analysis 1

Circular slip surface

Slip surface parameters							
Center :	x =	20.58	[m]	Angles :	α_1 =	-54.55	[°]
	z =	19.51	[m]		α_2 =	18.01	[°]
Radius :	R =	17.96	[m]				
Analysis of the slip surface without optimization.							

Slope stability verification (Bishop)
Sum of active forces : F_a = 793.06 kN/m
Sum of passive forces : F_p = 1577.41 kN/m

Sliding moment : M_a = 14243.38 kNm/m
Resisting moment : M_p = 28330.22 kNm/m
Factor of safety = 1.99 > 1.50
Slope stability ACCEPTABLE

Name : Analysis Profile #1	Stage - Analysis : 1 - 1