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A
Cálculo analítico Aydan e Kawamoto.

Planilha para determinação da condição de taludes sujeitos a tombamento flexural - Método de Aydan & Kawamoto (1992)

Ângulo do talude (graus):	80	Altura do talude (m):	0.15	Número de lâminas:	15		
Mergulho das Camadas (graus):	70	Espessura da lâmina rochosa (m):	0.03	NA (fração da altura do talude):	0		

Parâmetros para cálculo da altura das lâminas:

h =	0.13
n2 =	3
n1 =	12

Obs.: se P >= 0 para a última coluna o talude é instável e vice-versa)

Coluna	Espessura (m)	Altura (m)	γ (kN/m3)	σt (kPa)	ϕ (graus)	μ	W (kN)	N (kN)	T (kN)	I (m4)	h (m)	P (kN)	P0 (kN)	ϕr (graus)	c (kPa)	Pcis (kN)	Pcis0 (kN)	TOMB.	CISALH.
1	0.03	0.01	12.4	4	40	0.839	0.00	0.00	0.00	2.25E-06	0.005	-0.05	-0.05	32.2	393	-7.86	-7.86	N_TOMBA	N_CIS.
2	0.03	0.02	12.4	4	40	0.839	0.01	0.01	0.00	2.25E-06	0.016	-0.02	-0.02	32.2	393	-7.86	-7.86	N_TOMBA	N_CIS.
3	0.03	0.03	12.4	4	40	0.839	0.01	0.01	0.00	2.25E-06	0.027	-0.02	-0.02	32.2	393	-7.86	-7.86	N_TOMBA	N_CIS.
4	0.03	0.04	12.4	4	40	0.839	0.02	0.02	0.01	2.25E-06	0.038	-0.01	-0.01	32.2	393	-7.86	-7.86	N_TOMBA	N_CIS.
5	0.03	0.05	12.4	4	40	0.839	0.02	0.02	0.01	2.25E-06	0.049	-0.01	-0.01	32.2	393	-7.86	-7.86	N_TOMBA	N_CIS.
6	0.03	0.07	12.4	4	40	0.839	0.02	0.02	0.01	2.25E-06	0.060	-0.01	-0.01	32.2	393	-7.86	-7.86	N_TOMBA	N_CIS.
7	0.03	0.08	12.4	4	40	0.839	0.03	0.03	0.01	2.25E-06	0.071	-0.01	-0.01	32.2	393	-7.86	-7.86	N_TOMBA	N_CIS.
8	0.03	0.09	12.4	4	40	0.839	0.03	0.03	0.01	2.25E-06	0.082	0.00	0.00	32.2	393	-7.86	-7.86	N_TOMBA	N_CIS.
9	0.03	0.10	12.4	4	40	0.839	0.04	0.03	0.01	2.25E-06	0.093	0.00	0.00	32.2	393	-7.86	-7.86	N_TOMBA	N_CIS.
10	0.03	0.11	12.4	4	40	0.839	0.04	0.04	0.01	2.25E-06	0.104	0.00	0.00	32.2	393	-7.86	-7.86	N_TOMBA	N_CIS.
11	0.03	0.12	12.4	4	40	0.839	0.04	0.04	0.02	2.25E-06	0.115	0.00	0.01	32.2	393	-7.86	-7.86	TOMBA	N_CIS.
12	0.03	0.13	12.4	4	40	0.839	0.05	0.05	0.02	2.25E-06	0.126	0.01	0.01	32.2	393	-7.85	-7.85	TOMBA	N_CIS.
13	0.03	0.09	12.4	4	40	0.839	0.03	0.03	0.01	2.25E-06	0.110	0.01	0.02	32.2	393	-7.85	-7.85	TOMBA	N_CIS.
14	0.03	0.04	12.4	4	40	0.839	0.02	0.02	0.01	2.25E-06	0.066	0.01	0.02	32.2	393	-7.84	-7.84	TOMBA	N_CIS.
15	0.03	0.00	12.4	4	40	0.839	0.00	0.00	0.00	2.25E-06	0.022	-0.02	-0.02	32.2	393	-7.84	-7.84	N_TOMBA	N_CIS.

Figura A.1: Cálculo analítico tombamento flexural pelo método de Aydan e Kawamoto 7.

B
Cálculo analítico Bloco-flexural, método Amini et al.

Peso esp. N/m3	23800
Gravidades	21,81
Espessura das colunas	0.01
Ângulo da descontinuidade	18
Ângulo de atrito	24
I inercia	8.33E-08
sig t	1.10E+06

N	hn	W	hn+1	hn-1	Pn	Pn-1,t	Pn-1,s	Pn-1,s,t	Pn-1,t,s	pn-flex
	0.2207									
1	0.2207	1145.90	0.2207	0.2244	680.64					751.94
2	0.2244	1165.11	0.2207	0.2274	751.94	879.95	585.67	1073.60	1197.80	
3	0.2274	1180.69	0.2244	0.2312	1197.80					1268.16
4	0.2312	1200.42	0.2274	0.235	1268.16	1383.68	1096.85	1567.40	1686.72	
5	0.235	1220.15	0.2312	0.2376	1686.72					1757.51
6	0.2376	1233.65	0.235	0.2412	1757.51	1871.27	1581.46	2045.56	2163.80	
7	0.2412	1252.34	0.2376	0.2334	2163.80					2233.51
8	0.2334	1211.84	0.2412	0.2466	2233.51	2428.10	2060.57	2329.53	2392.63	
9	0.2466	1280.38	0.2334	0.2509	2428.10					2502.84
10	0.2509	1302.70	0.2466	0.2539	2502.84	2592.12	2316.93	2792.13	2914.51	
11	0.2539	1318.28	0.2509	0.2565	2914.51					2986.87
12	0.2565	1331.78	0.2539	0.2501	2986.87	3085.83	2796.81	3474.45	3663.63	
13	0.2501	1298.55	0.2565	0.239	3663.63					3625.09
14	0.239	1240.91	0.2501	0.2322	3625.09	3892.96	3448.00	4104.61	4288.35	
15	0.2322	1205.61	0.239	0.223	4288.35					4183.70
16	0.223	1157.84	0.2322	0.2131	4183.70	4426.98	4018.46	4765.35	4980.86	
17	0.2131	1106.44	0.223	0.2055	4980.86					4736.02
18	0.2055	1066.98	0.2131	0.1943	4736.02	4948.73	4583.75	5391.02	5627.84	
19	0.1943	1008.83	0.2055	0.1849	5627.84					5253.63
20	0.1849	960.02	0.1943	0.1775	5253.63	5517.85	5116.62	5722.81	5893.05	
21	0.1775	921.60	0.1849	0.1681	5893.05					5549.09
22	0.1681	872.79	0.1775	0.1598	5549.09	5822.58	5424.53	6071.36	6255.22	
23	0.1598	829.70	0.1681	0.1506	6255.22					5791.81
24	0.1506	781.93	0.1598	0.142	5791.81	6070.53	5680.22	6346.00	6536.47	
25	0.142	737.28	0.1506	0.1326	6536.47					5956.45
26	0.1326	688.47	0.142	0.1243	5956.45	6260.39	5858.20	6504.27	6688.81	
27	0.1243	645.38	0.1326	0.1141	6688.81					6004.53
28	0.1141	592.42	0.1243	0.1057	6004.53	6373.85	5919.99	6591.57	6784.99	
29	0.1057	548.81	0.1141	0.0968	6784.99					5947.32
30	0.0968	502.60	0.1057	0.0875	5947.32	6273.55	5875.60	6701.85	6948.32	
31	0.0875	454.31	0.0968	0.0795	6948.32					5852.99
32	0.0795	412.77	0.0875	0.0702	5852.99	6153.27	5794.08	6723.29	7008.70	
33	0.0702	364.49	0.0795	0.0607	7008.70					5646.30
34	0.0607	315.16	0.0702	0.0522	5646.30	6139.85	5601.33	6558.02	6861.72	
35	0.0522	271.03	0.0607	0.0435	6861.72					5185.91
36	0.0435	225.86	0.0522	0.0345	5185.91	5702.52	5153.68	6627.18	7198.79	
37	0.0345	179.13	0.0435	0.0253	7198.79					4694.69
38	0.0253	131.36	0.0345	0.017	4694.69	5571.29	4675.95	7340.35	9608.92	
39	0.017	88.27	0.0253	0.0085	9608.92					4494.62
40	0.0085	44.13	0.017	0.005	4494.62	6617.09	4488.32	1724.95	6575.48	
41	0.005	25.96	0.0085	0	6617.09					0.04

Figura B.1: Cálculo analítico do tombamento bloco-flexural no talude A; Amini et al.(2010).

Peso esp. N/m3	23800
Gravidades	21.31
Espessura das colunas	0.01
Ângulo da descontinuidade	18
ângulo de atrito	24
I inercia	8.33E-08
sig t	1.10E+06

N	hn	W	hn+1	hn-1	Pn	Pn-1,t	Pn-1,s	Pn-1,s,t	Pn-1,t,s	pn-flex
	0.2207									
1	0.2207	1119.34	0.2207	0.2244	664.86					732.60
2	0.2244	1138.11	0.2207	0.2274	732.60	857.72	570.19	1046.92	1168.27	
3	0.2274	1153.32	0.2244	0.2312	1168.27					1250.62
4	0.2312	1172.60	0.2274	0.235	1250.62	1363.04	1083.28	1542.24	1658.61	
5	0.235	1191.87	0.2312	0.2376	1658.61					1752.74
6	0.2376	1205.05	0.235	0.2412	1752.74	1862.79	1580.77	2032.12	2147.12	
7	0.2412	1223.31	0.2376	0.2334	2147.12					2245.05
8	0.2334	1183.75	0.2412	0.2466	2245.05	2436.04	2076.12	2331.55	2391.46	
9	0.2466	1250.70	0.2334	0.2509	2436.04					2642.50
10	0.2509	1272.51	0.2466	0.2539	2642.50	2722.82	2460.90	2915.48	3032.55	
11	0.2539	1287.72	0.2509	0.2565	3032.55					3134.23
12	0.2565	1300.91	0.2539	0.2501	3134.23	3224.94	2948.58	3613.38	3798.97	
13	0.2501	1268.45	0.2565	0.239	3798.97					3750.44
14	0.239	1212.16	0.2501	0.2322	3750.44	4017.93	3577.46	4222.45	4402.94	
15	0.2322	1177.67	0.239	0.223	4402.94					4288.97
16	0.223	1131.01	0.2322	0.2131	4288.97	4530.92	4127.57	4866.05	5079.13	
17	0.2131	1080.80	0.223	0.2055	5079.13					4824.47
18	0.2055	1042.25	0.2131	0.1943	4824.47	5035.28	4675.73	5476.23	5711.08	
19	0.1943	985.45	0.2055	0.1849	5711.08					5327.39
20	0.1849	937.77	0.1943	0.1775	5327.39	5590.72	5193.56	5791.27	5959.14	
21	0.1775	900.24	0.1849	0.1681	5959.14					5608.03
22	0.1681	852.57	0.1775	0.1598	5608.03	5880.71	5486.36	6126.01	6307.83	
23	0.1598	810.47	0.1681	0.1506	6307.83					5837.87
24	0.1506	763.81	0.1598	0.142	5837.87	6115.81	5728.87	6388.38	6577.05	
25	0.142	720.19	0.1506	0.1326	6577.05					5991.29
26	0.1326	672.52	0.142	0.1243	5991.29	6294.64	5895.32	6535.76	6718.71	
27	0.1243	630.42	0.1326	0.1141	6718.71					6029.64
28	0.1141	578.69	0.1243	0.1057	6029.64	6398.68	5947.06	6613.89	6805.95	
29	0.1057	536.09	0.1141	0.0968	6805.95					5964.35
30	0.0968	490.95	0.1057	0.0875	5964.35	6290.13	5894.29	6716.81	6962.17	
31	0.0875	443.78	0.0968	0.0795	6962.17					5863.64
32	0.0795	403.21	0.0875	0.0702	5863.64	6163.49	5806.10	6732.28	7016.75	
33	0.0702	356.04	0.0795	0.0607	7016.75					5652.05
34	0.0607	307.86	0.0702	0.0522	5652.05	6145.51	5608.11	6562.48	6865.43	
35	0.0522	264.75	0.0607	0.0435	6865.43					5188.22
36	0.0435	220.62	0.0522	0.0345	5188.22	5704.81	5156.73	6628.73	7199.75	
37	0.0345	174.98	0.0435	0.0253	7199.75					4695.03
38	0.0253	128.32	0.0345	0.017	4695.03	5571.80	4676.72	7340.61	9608.75	
39	0.017	86.22	0.0253	0.0085	9608.75					4494.45
40	0.0085	43.11	0.017	0.005	4494.45	6617.25	4488.30	1726.79	6574.06	
41	0.005	25.36	0.0085	0	6617.25					0.13

Figura B.2: Cálculo analítico da estabilidade do talude A considerando as mudanças dos pontos de aplicação das forças.

Peso esp. N/m3	23800
Gravidades	37.95
Espessura das colunas	0.01
Ângulo da descontinuidade	32
Ângulo de atrito	24
I inercia	8.33E-08
sig t	1.10E+06

N	hn	W	hn+1	hn-1	Pn	Pn-1,t	Pn-1,s	Pn-1,s,t	Pn-1,t,s	pn-flex
	0.2207									
1	0.2207	1145.90	0.2207	0.2244	680.64					751.94
2	0.2244	1165.11	0.2207	0.2274	751.94	879.95	585.67	1073.60	1197.80	
3	0.2274	1180.69	0.2244	0.2312	1197.80					1268.16
4	0.2312	1200.42	0.2274	0.235	1268.16	1383.68	1096.85	1567.40	1686.72	
5	0.235	1220.15	0.2312	0.2376	1686.72					1757.51
6	0.2376	1233.65	0.235	0.2412	1757.51	1871.27	1581.46	2045.56	2163.80	
7	0.2412	1252.34	0.2376	0.2334	2163.80					2233.51
8	0.2334	1211.84	0.2412	0.2466	2233.51	2428.10	2060.57	2329.53	2392.63	
9	0.2466	1280.38	0.2334	0.2509	2428.10					2502.84
10	0.2509	1302.70	0.2466	0.2539	2502.84	2592.12	2316.93	2792.13	2914.51	
11	0.2539	1318.28	0.2509	0.2565	2914.51					2986.87
12	0.2565	1331.78	0.2539	0.2501	2986.87	3085.83	2796.81	3474.45	3663.63	
13	0.2501	1298.55	0.2565	0.239	3663.63					3625.09
14	0.239	1240.91	0.2501	0.2322	3625.09	3892.96	3448.00	4104.61	4288.35	
15	0.2322	1205.61	0.239	0.223	4288.35					4183.70
16	0.223	1157.84	0.2322	0.2131	4183.70	4426.98	4018.46	4765.35	4980.86	
17	0.2131	1106.44	0.223	0.2055	4980.86					4736.02
18	0.2055	1066.98	0.2131	0.1943	4736.02	4948.73	4583.75	5391.02	5627.84	
19	0.1943	1008.83	0.2055	0.1849	5627.84					5253.63
20	0.1849	960.02	0.1943	0.1775	5253.63	5517.85	5116.62	5722.81	5893.05	
21	0.1775	921.60	0.1849	0.1681	5893.05					5549.09
22	0.1681	872.79	0.1775	0.1598	5549.09	5822.58	5424.53	6071.36	6255.22	
23	0.1598	829.70	0.1681	0.1506	6255.22					5791.81
24	0.1506	781.93	0.1598	0.142	5791.81	6070.53	5680.22	6346.00	6536.47	
25	0.142	737.28	0.1506	0.1326	6536.47					5956.45
26	0.1326	688.47	0.142	0.1243	5956.45	6260.39	5858.20	6504.27	6688.81	
27	0.1243	645.38	0.1326	0.1141	6688.81					6004.53
28	0.1141	592.42	0.1243	0.1057	6004.53	6373.85	5919.99	6591.57	6784.99	
29	0.1057	548.81	0.1141	0.0968	6784.99					5947.32
30	0.0968	502.60	0.1057	0.0875	5947.32	6273.55	5875.60	6701.85	6948.32	
31	0.0875	454.31	0.0968	0.0795	6948.32					5852.99
32	0.0795	412.77	0.0875	0.0702	5852.99	6153.27	5794.08	6723.29	7008.70	
33	0.0702	364.49	0.0795	0.0607	7008.70					5646.30
34	0.0607	315.16	0.0702	0.0522	5646.30	6139.85	5601.33	6558.02	6861.72	
35	0.0522	271.03	0.0607	0.0435	6861.72					5185.91
36	0.0435	225.86	0.0522	0.0345	5185.91	5702.52	5153.68	6627.18	7198.79	
37	0.0345	179.13	0.0435	0.0253	7198.79					4694.69
38	0.0253	131.36	0.0345	0.017	4694.69	5571.29	4675.95	7340.35	9608.92	
39	0.017	88.27	0.0253	0.0085	9608.92					4494.62
40	0.0085	44.13	0.017	0.005	4494.62	6617.09	4488.32	1724.95	6575.48	
41	0.005	25.96	0.0085	0	6617.09					0.04

Figura B.3: Cálculo analítico do tombamento bloco-flexural no talude B; Amini et al.(2010).

Peso esp. N/m3	23800
Gravidades	34.76
Espessura das colunas	0.01
Ângulo da descontinuidade	32
ângulo de atrito	24
I inercia	8.33E-08
sig t	1.10E+06

N	hn (m)	W (N)	hn+1 (m)	hn-1 (m)	Pn (N)	Pn-1,t (N)	Pn-1,s (N)	Pn-1,s,t (N)	Pn-1,t,s (N)	Pn-flex
1	0.102	843.89	0.102	0.1077	368.50	540.93	528.85	502.18	496.42	
2	0.1077	891.05	0.102	0.1133	540.93					603.38
3	0.1133	937.38	0.1077	0.119	603.38	763.14	781.50	738.61	729.14	
4	0.119	984.54	0.1133	0.1247	781.50					887.91
5	0.1247	1031.70	0.119	0.1303	887.91	1053.90	1083.94	1024.73	1011.37	
6	0.1303	1078.03	0.1247	0.136	1083.94					1230.52
7	0.136	1125.19	0.1303	0.1416	1230.52	1401.71	1444.32	1365.44	1347.35	
8	0.1416	1171.52	0.136	0.1413	1444.32					1629.68
9	0.1413	1169.04	0.1416	0.153	1629.68	1856.46	1851.81	1628.69	1581.10	
10	0.153	1265.84	0.1413	0.1586	1856.46					2167.54
11	0.1586	1312.17	0.153	0.1643	2167.54	2342.75	2416.87	2283.90	2252.57	
12	0.1643	1359.33	0.1586	0.17	2416.87					2677.62
13	0.17	1406.49	0.1643	0.1756	2677.62	2855.30	2944.87	2791.72	2755.17	
14	0.1756	1452.82	0.17	0.1813	2944.87					3238.60
15	0.1813	1499.98	0.1756	0.1869	3238.60	3419.60	3523.61	3347.38	3304.88	
16	0.1869	1546.31	0.1813	0.1815	3523.61					3851.09
17	0.1815	1501.64	0.1869	0.175	3851.09	4233.99	4136.41	4369.20	4433.84	
18	0.175	1447.86	0.1815	0.1685	4433.84					4424.01
19	0.1685	1394.08	0.175	0.1621	4424.01	4812.07	4688.90	4921.65	4986.11	
20	0.1621	1341.13	0.1685	0.1556	4986.11					4888.07
21	0.1556	1287.35	0.1621	0.1491	4888.07	5258.41	5132.68	5376.61	5444.18	
22	0.1491	1233.58	0.1556	0.1426	5444.18					5247.96
23	0.1426	1179.80	0.1491	0.1361	5247.96	5600.83	5472.13	5723.10	5792.57	
24	0.1361	1126.02	0.1426	0.1269	5792.57					5497.31
25	0.1269	1049.90	0.1361	0.1232	5497.31	5946.08	5696.80	5726.34	5734.11	
26	0.1232	1019.29	0.1269	0.1167	5946.08					5675.22
27	0.1167	965.51	0.1232	0.1102	5675.22	5995.54	5858.67	6129.34	6204.23	
28	0.1102	911.74	0.1167	0.1037	6204.23					5691.71
29	0.1037	857.96	0.1102	0.0972	5691.71	5996.35	5854.73	6137.78	6216.20	
30	0.0972	804.18	0.1037	0.0907	6216.20					5585.19
31	0.0907	750.40	0.0972	0.0843	5585.19	5875.03	5727.78	6013.77	6093.13	
32	0.0843	697.45	0.0907	0.0778	6093.13					5341.29
33	0.0778	643.68	0.0843	0.0713	5341.29	5617.34	5463.60	5781.62	5870.94	
34	0.0713	589.90	0.0778	0.0648	5870.94					4967.20
35	0.0648	536.12	0.0713	0.0583	4967.20	5231.13	5069.07	5414.46	5513.52	
36	0.0583	482.34	0.0648	0.0519	5513.52					4440.06
37	0.0519	429.39	0.0583	0.0454	4440.06	4685.38	4521.65	4906.78	5022.76	
38	0.0454	375.62	0.0519	0.0389	5022.76					3741.37
39	0.0389	321.84	0.0454	0.0324	3741.37	3988.51	3802.52	4256.68	4412.63	
40	0.0324	268.06	0.0389	0.0259	4412.63					2838.47
41	0.0259	214.28	0.0324	0.0194	2838.47	3084.58	2879.18	3498.49	3837.75	
42	0.0194	160.51	0.0259	0.013	3837.75					1712.77
43	0.013	107.56	0.0194	0.0065	1712.77	1962.81	1733.21	4285.70	-158.33	
44	0.0065	53.78	0.013	0	4285.70					-0.02

Figura B.4: Cálculo analítico da estabilidade do talude B considerando as mudanças dos pontos de aplicação das forças.

Peso esp. N/m3	23800
Gravidades	20.42
Espessura das colunas	0.01
Ângulo da descontinuidade	32
ângulo de atrito	24
I inercia	8.33E-08
sig t	1.10E+06

N	hn (m)	W (N)	hn+1 (m)	hn-1 (m)	Normal	Pn (N)	Pn-1,t (N)	Pn-1,s (N)	Pn-1,s,t (N)	Pn-1,t,s (N)	Pn-flex
1	0.102	495.72	0.102	0.1077	420.3909	216.46	317.75	310.65	294.98	291.61	
2	0.1077	523.42	0.102	0.1133	523.338	317.75					281.86
3	0.1133	550.63	0.1077	0.119	483.9602	281.86	382.14	386.49	371.31	367.96	
4	0.119	578.34	0.1133	0.1247	578.3352	386.49					382.74
5	0.1247	606.04	0.119	0.1303	-569.489	382.74	491.54	497.89	480.48	476.56	
6	0.1303	633.25	0.1247	0.136	633.2528	497.89					523.14
7	0.136	660.95	0.1303	0.1416	660.9546	523.14	638.61	648.73	625.45	620.11	
8	0.1416	688.17	0.136	0.1413	688.1703	648.73					701.24
9	0.1413	686.71	0.1416	0.153	686.7123	701.24	841.97	831.72	743.58	724.78	
10	0.153	743.57	0.1413	0.1586	743.5739	841.97					959.46
11	0.1586	770.79	0.153	0.1643	770.7897	959.46	1082.26	1105.91	1059.43	1048.48	
12	0.1643	798.49	0.1586	0.17	798.4914	1105.91					1209.62
13	0.17	826.19	0.1643	0.1756	826.1932	1209.62	1335.68	1366.60	1310.62	1297.26	
14	0.1756	853.41	0.17	0.1813	853.409	1366.60					1492.80
15	0.1813	881.11	0.1756	0.1869	881.1107	1492.80	1622.06	1660.22	1592.75	1576.48	
16	0.1869	908.33	0.1813	0.1815	908.3265	1660.22					1808.81
17	0.1815	882.08	0.1869	0.175	882.0827	1808.81	2031.36	1976.41	2104.08	2139.53	
18	0.175	850.49	0.1815	0.1685	850.493	2139.53					2120.30
19	0.1685	818.90	0.175	0.1621	818.9033	2120.30	2342.44	2275.90	2402.77	2437.90	
20	0.1621	787.80	0.1685	0.1556	787.7995	2437.90					2367.22
21	0.1556	756.21	0.1621	0.1491	756.2098	2367.22	2578.13	2510.90	2642.29	2678.69	
22	0.1491	724.62	0.1556	0.1426	724.62	2678.69					2551.53
23	0.1426	693.03	0.1491	0.1361	512.9939	2551.53	2751.19	2683.21	2816.86	2853.85	
24	0.1361	661.44	0.1426	0.1269	661.4406	2853.85					2669.68
25	0.1269	616.73	0.1361	0.1232	616.7289	2669.68	2912.36	2786.87	2810.04	2816.13	
26	0.1232	598.75	0.1269	0.1167	598.7471	2912.36					2731.32
27	0.1167	567.16	0.1232	0.1102	567.1573	2731.32	2908.91	2839.09	2978.63	3017.24	
28	0.1102	535.57	0.1167	0.1037	535.5676	3017.24					2710.34
29	0.1037	503.98	0.1102	0.0972	503.9779	2710.34	2876.79	2806.10	2949.06	2988.67	
30	0.0972	472.39	0.1037	0.0907	472.3881	2988.67					2615.13
31	0.0907	440.80	0.0972	0.0843	440.7984	2615.13	2770.36	2698.89	2839.83	2878.95	
32	0.0843	409.69	0.0907	0.0778	409.6946	2878.95					2437.69
33	0.0778	378.10	0.0843	0.0713	378.1049	2437.69	2581.42	2509.53	2660.61	2703.05	
34	0.0713	346.52	0.0778	0.0648	346.5151	2703.05					2179.70
35	0.0648	314.93	0.0713	0.0583	314.9254	2179.70	2311.42	2239.54	2395.67	2440.45	
36	0.0583	283.34	0.0648	0.0519	283.3357	2440.45					1827.47
37	0.0519	252.23	0.0583	0.0454	252.2319	1827.47	1942.28	1875.40	2036.63	2085.18	
38	0.0454	220.64	0.0519	0.0389	220.6422	2085.18					1367.81
39	0.0389	189.05	0.0454	0.0324	189.0524	1367.81	1469.29	1403.73	1569.39	1626.27	
40	0.0324	157.46	0.0389	0.0259	157.4627	1626.27					774.85
41	0.0259	125.87	0.0324	0.0194	125.873	774.85	848.86	798.77	959.88	1048.14	
42	0.0194	94.28	0.0259	0.013	94.28322	1048.14					0.66
43	0.013	63.18	0.0194	0.0065	63.17948	0.66	-3.11	12.67	-85.86	85.68	
44	0.0065	31.59	0.013	0	31.58974	85.68					-1179.38

Figura B.5: Cálculo analítico do tombamento bloco-flexural no talude B com a re-definição da "coluna chave" e considerando a mudança dos pontos de aplicação das forças